Digitized by the Internet Archive
in 2010 with funding from
University of Toronto

http://www.archive.org/details/engineeringnewsr84newy

inol.

Engineering News-Record

A Consolidation of Engineering News and Engineering Record

A JOURNAL OF CIVIL ENGINEERING AND CONSTRUCTION

ISSUED WEEKLY

VOLUME LXXXIV

January 1 to June 30, 1920

15-8640
28/1/21

McGRAW-HILL COMPANY, INC.
10TH AVENUE AT 36TH STREET
NEW YORK

TA
1
E6
v.84
cop.2

ENGINEERING NEWS-RECORD

INDEX TO VOLUME LXXXIV

January 1 to June 30, 1920

PAGES			
Jan. 1	1	to	64
Jan. 8	65	to	112
Jan. 15	113	to	160
Jan. 22	161	to	208
Jan. 29	209	to	256
Feb. 5	257	to	304
Feb. 12	305	to	352
Feb. 19	353	to	400
Feb. 26	401	to	448
Mar. 4	449	to	496
Mar. 11	497	to	550
Mar. 18	551	to	600
Mar. 25	601	to	648
Apr. 1	649	to	696
Apr. 8	697	to	744
Apr. 15	745	to	704
Apr. 22	795	to	840
Apr. 29	841	to	888
May 6	889	to	936
May 13	937	to	986
May 20	987	to	1036
May 27	1037	to	1084
June 3	1085	to	1132
June 10	1133	to	1180
Juno 17	1181	to	1228
June 24	1229	to	1276

A

Page

- A frame with 15-part line used for pulling steel sheet piles........h*56
- **ACCIDENTS**
  - Bridge washout, Chartier's Creek, Pa., breaks gas mains n1271
  - Derailment caused by speed too great for elevation of outer rail....*433, (J. G. Sullivan) letter 832
  - To railroad employees decrease........ 329
  - Train, for year........ 84
- Acetylene torch repairs standing steel derrick mast (J. C. Lamon)........h108
- Adams, J. D., on altitude observation of the sun for meridian........*864
- Adams, R. M., on tile drainage of irrigated land, Twin Falls, Idaho........ 961
- Adams, T., on suitable areas for regional plans 950
- Adventure in engineering (P. B. McDonald) 17; (Incog.) letter 98; (Incog. No. 2 and P. B. McDonald) letters 194; (T. F. Quilty) letter 292.
- Advertise engineering service as commodity (H. M. Holmes)....letter 589, (P. M. Fogg (letter, with editorial comment) 684
- Advertisement, romance of........ 526
- Aërial photography and city planning..... 950
- Aërial tramways for India........ 850
- **AERONAUTICS**
  - Airplane for mapping forests........ 224
  - Balloons, dirigible, hangar at Lakehurst, N. J., largest in world........*892
  - Route maps, Engineer Corps to prepare..n109
  - Struts, wooden, tests of........ 915
- Affiliated Engineering Societies of Minnesota arguments for salary increases........1164
- Afghanistan, building, hydro-electric plant in (A. C. Jewett)........ *68
- Agitator, air, speeds floc formation...... 899
- Agricultural engineers discuss farming problems n109
- Air agitator speeds floc formation 899
- Air lift unwaters St. Louis water-works tunnels (E. E. Wall)........*857
- Airplanes, see Aëronautics
- Akron, Ohio, new water tank for........ 191
  - Wants bids for water-works improvements n445
- Alabama highways, bond issue voted......n493
- Alameda, Cal., new zoning ordinance (C. E. Hewes) 46
- **ALASKA**
  - Alaska free from unrest 379
  - Highways, Army appropriation for..... 919
  - Lignite and spruce compared with North Dakota 951
- Alaska Railway, difficulties of winter work 952
  - Staff reorganized n108
  - Progress n1224
  - Will need men........ 381
  - Work for 1920 season........ 850
- Albany, N. Y., "scum buster" for Imhoff tank vents *1207
- Albany engineers' attitude on Am. Soc. C. E. questionnaire........n692
  - City laborers ask $5 a day........e1133
- Alberta, Can., experiments on duty of water a*1002
  - Health administration........ 94
- Albuquerque, N. M., establishes group insurance for employees 1238
- Algoma; Steel Corporation, Sault Ste. Marie, Can., thermit weld used on ore-dock tie-rods 620
- Alkali damages part of Winnipeg concrete aqueduct, to be underdrained........*1097
  - In crops, how much can they tolerate?.. 953
- Allied Machinery Center exhibition........n249
- Alpine tunnel cuts underground flows; their restoration *1054
- Alvord, J. W., on what risks should cities take in installing relatively untried processes? e114, 132
- Alvord report, on Am. Soc. C. E. development report........e212

Page

- **AMERICAN ASSOCIATION OF ENGINEERS**
  - Activities and future responsibilities (C. E. Drayer) a1023
  - And Federation of American Engineering Societies e1134, 1136
  - And organizing conference n1033
  - And proposed engineering federation e1039, 1074
  - Approves home-building project........n980
  - Charleston, W. Va., chapter questions candidates for public office n1129
  - Chicago Chapter investigates suspension of city engineers........e937
  - Committee on consulting fees appointed.n1272
  - Committee on salaries of engineering teachers n253
    - Drafts schedule n1273
  - Convention ....n792, n884, n980, e988, abstracts 1022, n1031
  - Co-operation of engineers forwarded by (C. E. Drayer)........letter 340
  - County highway engineers, proposed salary schedule........ 371
  - Delegates to Organizing Conference....n1080
  - Detroit Chapter wants law against strikes n885
  - Employment service (E. B. Miller)....a1024
  - Federal Department formed at Washington n1177
  - Five thousand applications received in two weeks' drive........ n57
  - Future of, address by L. K. Sherman.... 999
  - Growth, etc........e1039
  - Hoover, H. C., to become member........n1127
  - Idaho Society of Engineers now Idaho Chapter n253
  - Interstate Commerce Commission designates A. A. E. official representative of engineers n690
  - "Let it be technical society—nothing else" (F. L. Stuart)........letter 641
  - Lincoln, Neb., chapter considers licensing n1082
  - Membership........n547, n692, n741, n884
  - Membership drive nets 6,500........n158
  - Michigan Engineering Society discusses union with A. A. E........n300
  - Motion-picture publicity for engineers..n347
  - Municipal engineers' salaries proposed by 898
  - Nominates W. F. Milligan and W. J. Potts for Railway Labor Board......n740
  - Nominations for office........n931
  - Officers, character of........e988
  - Organization and work (F. H. Newell).a1022
  - Pittsburgh Chapter expels union draftsman n789
  - Plans group insurance........n980
  - Protests against classification of railway engineers n691
  - Publicity campaign results n302
  - Railway conference to be held........n546
  - Railway engineers of A. A. E. hold second conference 633
  - Salary increases obtained by........ 637
  - Seeks presidential candidates' views....n1080
  - Should handle nontechnical work of federated engineering societies, says secretary (C. E. Drayer)........letter 390
  - Standing committee reports........a1024
  - Will not support national societies' plan for comprehensive body, correspondent believes (J. H. Morgan)........letter 52
  - Will send delegates to Organizing Conference n980
- American Association of State Highway Officials executive committee urges membership in international roads congress n790
- **AMERICAN CONCRETE INSTITUTE**
  - Meeting in Chicago........e402, n443
  - Proposed standard building regulations..e745
  - Shear, another vote on........e745
  - Shear, values proposed to........a*465
  - Waking up e257
- American Engineering Standards Committee, safety codes referred to, n57; begins work, n1176
- American Federation of Labor, see Labor
- American Geographical Society awards Daly medal to Dr. G. O. Smith........n*791
- American Institute of Architects, disciplinary procedure (H. W. Sellers) e649, 677
  - Reports on design and construction of bridges, etc., by engineers or architects e1038, n1079
- American Institute of Consulting Engineers, annual meeting n204
  - Council condemns putting architects in charge of bridges........n492
  - Elects officers........n299
  - Reaffirms stand on bridge design by architects n1223
- American Institute of Electrical Engineers discusses power unification and retailing e498
  - Elects officers n1081
- American Institute of Mining and Metallurgical Engineers elects Hoover president e401, n443
- American Lumber Association, see American Wholesale Lumber Association
- American Medical Association's record system suggested for engineers (E. Judson) 875
- American Meteorological Society, work, etc. (R. E. Horton)........letter 927
- American Public Health Association, report on sewage effluents with and without dilution a1161

Page

- **AMERICAN RAILWAY ENGINEERING ASSOCIATION**
  - Abstracts of committee reports....637, 657, 704, 709, 783, 806
  - Bridge specification adopted........e603, 613
  - Committee on economics of railway location, views of........e602, 613
  - Convention.....e449, e492, e602, e603, n643
    - Technical discussions at........ 613
  - H. R. Safford new president........n*595
  - Standards, wider use urged........ 614
  - Symposium on bridge construction...... e65
  - Track-stress committee, report....e403, a*406, ("Railway") letter 586
  - Will join Engineering Council........n837
- American Road Builders' Association, annual convention........n397, e402
- American Shipbuilding Co., plant at Wyandotte, Mich., water for drinking treated by violet rays (W. L. Decker)........*572
- American Society for Municipal Improvements, October meeting........n739
- American Society for Testing Materials, nominations n932
  - Program of meeting........n932
- American Society of Agricultural Engineers' meeting n109
- **AMERICAN SOCIETY OF CIVIL ENGINEERS**
  - Alvord report........e212
  - Annual meeting........n107, n199, n252
    - To be held in Portland, Ore........n932
  - Attitude toward Organizing Conference..n883
  - Board of Direction declares only engineers not architects should design bridges e1134, n1175 (see also Architects)
  - Development Committee program indorsed by H. McDonald, past president; letter. 735
    - Questionnaire, see Am. Soc. C. E., Questionnaire
  - Report to be considered at annual meeting of society........e113
  - Report approved e211
  - Davis, A. P., elected president........n*199
  - Delegates to Organizing Conference n1079 n1080
  - Development Committee, see Committee on Development
  - Discusses highway construction........n644
  - Discusses relations of engineer to future military activities........n201
  - Dues, non-resident membership, increase proposed (P. Clow, W. J. Heiser, W. S. St. John, A. W. A. Eden and C. E. Haywood) ....letter 735
  - Group opposes "comprehensive organization" of engineers........e402, n442 letters by F. C. Noble, G. W. Fuller, A. Hazen 485, letter by R. Modjeski, 585, letter by H. McDonald 735
  - Highway Committee appointed........n2109
  - Hunt, C. W., retires as secretary..e209, *214
  - Highway construction discussed n644
  - Illinois Association discusses development report n58
  - Discusses questionnaire........n490
  - Internal changes suggested........e114
  - Internal affairs in the questionnaire (G. S. Williams)........letter 537
  - Joint Conference Committee report......e113
  - Meeting, annual. See Annual Meeting.
  - Membership 9441........n930
  - Membership list, alphabetical, in new year book e745
  - Membership on May 25 1920 (H. S. Crocker) ....letter 1219
  - New York Section approves licensing...n789
    - Discusses freight congestion at New York 1020
    - Gossip....n490, (R. Ridgeway and L. D. Rights) ....letter 536
    - Meetings....e987, 1020, elects officers, etc. n1033
    - Middle West member attends meeting ....728 (F. Lavis) letter 83
    - Organized n445
    - Progressive, and opportunity........e698
  - Northwestern members act on questionnaire n740
  - Organizing Conference Am. Soc. C. E. to be represented e891, n930
  - Patent legislation, members urged to aid n692
  - Questionnaire:
    - Albany engineers' attitude........n692
    - Complete vote on........ 848
    - External relations of societies (C. W. Hunt, C. W. Wood and R. E. Davis) ....letters 534
    - If Question 3 should fail?........e601
    - Internal affairs in (G. S. Williams) ....letter 537
    - Local section action on (R. L. Humphrey) ....letter e649, 689
    - Northwestern members act on........n740
    - Obligation of members to vote on.... e305, (F. T. Lawton and G. S. Williams) letters 489, 488
    - Results of........e795, n835, (I. Randolph) ....letter 978
    - To be canvassed Apr. 16........e649
    - Vote of "no" urged (J. A. Bensel) ....letter 591
    - Vote on ....n789, e795, n835 (I. Randolph)....letter 978
    - Vote on it! (R. L. Humphrey).letter 735

*illustrated; e. editorials; h. hints; n. news notes; a. abstract

Page
Why vote "no" on external questions (W. E. Belcher)..............letter 686
"Word of caution"......e402, n442; letter by F. C. Noble, G. W. Fuller, A. Hazen 485, letter by R. Modjeski 585, letter by H. McDonald 735.
Shall it enter field of civic and economic affairs? (F. H. Newell)......letter 536
Should not participate in nontechnical activities (R. Smillie and others)..........letter 642
Southern California Association, discusses Los Angeles building ordinance and terminals..........n1081
St. Louis Members offer substitute plan for unified national body.......... 147
War memorial, New York, society representation advised..........n837
"Word of Caution" on "comprehensive organization" sent to members...... e442, n442; letters by F. C. Noble, G. W. Fuller, A. Hazen 485, letter by R. Modjeski 585, letter by H. McDonald 735.
Year book, new..........e745
Track-stress Committee, report....e403, a*406 ("Railway") letter 586
American Society of Military Engineers, see Society of Military Engineers.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

Alliance with industrial conference (C. W. Koiner)..........letter 54
Annual spring meeting..........n1034
Code of ethics, proposed new, discussed, n1080, approved..........1261
Philadelphia Section, should Juniors vote?..........755
To have professional sections..........n543
Withdraws from National Industrial Conference Board..........e401
American Water Works Association, convention program..........n885
Invites Canadians..........n1128
California Section being formed..........n931
Convention..........e1181
Illinois section meets..........n690
Nominations..........n205
American Wholesale Lumber Association formed to obtain grading rules..........n1178
American Wood Preservers' Association, annual meeting..........n252, n396
Anchor pins of Cornwall cantilever bridge bored out and renewed (H. T. Welty)..........*453
Anderson, Ind., board overrules objections to sewer..........n1131; contract let, n1131
Angus Lieut. W. M. with C. Francis on leaky cross-connection located by alkali test..........e1181, *1187
Ants, white, see white ants.
Appalachian Good Roads Association to meet..........n157

APPLIANCES

A-frame with 15-part line used for pulling steel sheet piles..........h*56
Belt, slab-finishing, home-made device for operating..........n*344
Bucket, power, one trip takes full batch..........n*550
Can-and-candle device speeds up rod readings in tunnel..........h55
Car-loading hopper for draglines and grab buckets (R. E. Post)..........n*979
Chisel-bar holder prevents hammered hands..........h*198
Cleaning track ballast, new machine for..........n*112
Concrete pressure pipe joint, new....n*496
Curb and gutter finisher, home-made..h*592
Device maintains true batter in masonry wall (H. D. Hurley)..........h*638
Guard insures sawyer's safety..........h*979
Loader, self-feeding, handles heavy material..........n*63
Pipe pusher cuts cost of under-pavement cable conduits (C. A. Frankinhoff)...h489
Punch for bridge work, quick field (C. J. Bennett)..........h*638
Saw guard insures safety..........h*979
Truck, industrial, new, moves and elevates material..........n*400
Appraisers, engineer, for irrigated or drained lands..........1100
Aqueduct, Winnipeg, Man., damaged by alkali, to be underdrained..........*1097
Arbitration contract clauses, plea for (E. T. Johnson)..........letter 1070
Arch reaction influence lines by deflection diagrams (C. D. McCullough)..........*675
Arches, elastic, in masonry (E. Godfrey).*948
Fixed-end analysis of (C. B. McCullough)..........*675

ARCHITECTS

And design of bridges, Delaware River and Pittsburgh......e209, 323, n250, n300, n397, 435, n541 (M. Thompson) letter 585, e1038, n1079, e1134, n1175, a1223 (F. C. Shenehon)..........1251
Ethics, code of (H. W. Sellers)..e649, 677
Licensing relation to engineers (F. C. Shenehon).......... 171
Argentina building program..........n792
Expected to bid on entire rail surplus...n318
Arkansas highways, dirt, conditions shown by rainfall data.......... 920
Highways, motor trucks endanger, road engineer says..........e1086
Armour Institute gets $8,000,000..........n411

ARMY (see also **WAR DEPARTMENT**)

Camp and cantonment construction criticized by Congressmen..........e812, 849
Chief Engineer, A. E. F., historical report 116
Chief of Engineers, appointment delay Col L. H. Beach nominated etc...... n 57, n106, e115, n153, n157, e163, n201, n251, n301, n*347
To have short assignment.......... n57
Construction Corps, Division, Service:
And Engineer Corps in bill draft.....n346
Auxiliary meets and organizes..........n490
Becomes part of Quartermaster Corps.n1271
Close vote in Senate..........n836
Defeated in House..........n645
On trial.......... 386
Placed by bill in Quartermaster Corps.n493
Representative Reavis speaks for....n647
Separate, House votes for..........n596
Separate, Senate votes for..........n883
Contracts, suspended, nearing settlment.n491
Co-ordinate system simplifies triangulation (Lieut. H. A. Foster)..........*1006
And Construction Service in bill draft.n346
Corps of Engineers, bill provides 650 officers..........n884
Changes in..........n933
Civilians' pay held up..........n930
Corps of Engineers to prepare aërial route maps..........n109
Examinations for..........n1226
Engineer property returned.......... 283
Engineers, being organized into society..........n394, e449
Engineers, *The Military Engineer* succeeds *Professional Memoirs*..........n492
Equipment for state highways..........n303
General Staff to supervise Army mapmaking and surveys..........n109
Langfitt report in demand..........n250
Mapmaking to be supervised by General Staff..........n109
Motor equipment, excess, allotted to states for highway work..........924
Surveys to be supervised by General Staff..........n109
Triangulation simplified by Army co-ordinate system (Lieut. H. A. Foster)..........*1006
Tractors for state roads..........n346
Army Supply Base, Philadelphia, planning and progress (C. Penrose).......... e552, *554, *627
Arnold, J. R., on basin footings rest on rubble lining of well..........n*1126
Art and science in engineering..........620
Ashmore, Pa., engine terminal for Lehigh Valley R.R..........*514
Ashokan Highway, construction and maintenance (G. G. Henness)..........*652
Associated Engineers of Spokane (J. C. Ralston)..........e401, 436
Associated General Contractors, committee proposes new contract provisions......1119
Convention..........n57, n203, e209
Opportunity and responsibility of......e452
Perfect organization..........n441
Questionnaire on car shortage..........n1274
Association of Canadian Building and Construction Industries organized..........n445
Association of Mississippi Valley State Highway Departments to discuss concrete roads..........n250
Association of Ohio Technical Societies, see Ohio Technical Societies.
Association of Railway Executives' advertisements..........e305
Asphalt coating for exposed steel in waterfront concrete..........1075
Interests object to New York's highway policy..........n1030
Sheet—suitability of various bases and costs (Capt. F. S. Besson)......96, (A. W. Dow and F. S. Besson) letter 538
Asphalt Association annual meeting......n840
Moves..........n644
Assay Office, New York City, deep substructure built in quicksand by caisson-inclosure method (T. K. Thomson)....*165
Good work on (T. K. Thomson)....letter 437
Astoria, Ore., marine railway for 5000-ton ships (C. O. Crisman)..........*1150
Atchafalaya River, closure recommended..1016
Atlanta city-planning board..........n443
Hope for better government..........e1133
Impressions here and there.......... 94
New coagulation basin for water purification plant..........e937, *958
New swimming and wading pools, open-air..........*673
Atlantic County, New Jersey, lets costly highway contract..........n981
Austin Co. of Cleveland gets contract for Standard Oil Co. buildings in Levant....n299
Automobile political party, national, suggested..........e1086
Automobile railway track, patent on....n*794
Automobiles, urban problem..........1043

B

Baker, C. W., appointed to membership, executive committee, Ntional Department of Public Works Association....n150
On future of inland water transportation....*19, e67, 85, *137, 184, 231, (R. H. Blain) letter, with ed. comment, 292, (W. G. Wilkins) letter 292, (E. Gray) letter, with ed. comment 293, (W. G. Wilkins) letter 293, (E. Gray) letter, with ed. comment, 487, (J. Wilkes) letter 541, (E. R Conant) letter 585, J. A. Ockerson and others 763
On is railway employee overpaid and under worked?..........*385, (F. A. Molitor) letter, with comment C. W. Baker, 539, (R. B. Everett) letter, with editorial comment, 832
On organization of other professions...1250
Plan of railroad control (F. W. Harris)..........letter 52
Balboa, C. Z., three ships in drydock at once..........1100
Page
Balderston, C., on ice inside cast-iron column raises floor..........*1166
Balloons, see Aëronautics.
Baltimore County, Md., road oils in...... 828
Baltimore, Md., enlargement of water-supply recommended..........n301
Garbage feeding contract terms.......... 416
Water-supply, $18,000,000 enlargement advised.......... 386
Bamman, F. C., on Army camp garbage prices for two years.......... 230
On first year's operation Washington, D. C., municipal garbage reduction works..........*908
Band stand, marble, moved (G. J. Trinkaus)..........n*1125
Bankhead Highway, Rockwall County, Texas, selling methods secure bidders (J. Montgomery)..........*976
Bar, notched, impact tests compared..... 861
Barge, articulated concrete, for dredge crane..........*1241
Barge lines, see Waterways, Inland.
Barges and towboats for Mississippi River.1194
Barnes, A. A., on discharge of smooth wood-stave pipe and wood channels..... 228
Barrett Co., plans road lectures..........n301
Barrier, simple, protects mountain culverts.*918
Bartholomew, H., engaged as consultant, Washington, D. C., Zoning..........n1034
On progress of St. Louis, Mo., major street plan..........e937, *954
Basin footings rest on rubble lining of well (J. R. Arnold)..........n*1126
Batchelder, G. W., on Worcester waterworks reservoirs drawn down against spring floods.......... 762
Bath-house concrete slabs, thin, cast and handled on edge..........*912
Batter, true, in masonry wall, maintained by device (H. D. Hurley)..........h*638
Bayles, G. H., on sewage siphon designed in spite of meager reference data......*974
Beach Col., L. H., new Chief of Engineer ......n157; e163; career, n201; opposition to, n251; n301; n*347
Will support big river and harbor appropriation..........n397

BEAMS

I-beam capacities, errors of approximate rules for (E. Piercy)......letter 686, (G. S. Burrell)) letter 1029
Concrete, see Beams, Reinforced-Concrete.
Reinforced-Concrete, diagram with top and bottom steel (A. G. Hayden).... *634, (R. R. Martel) letter *880, (F. H. Burnette) letter 1173
Steel deflections (R. Fleming)....*1040, e1085, 1104, (D. M. Dodds) letter 1269
Weakening by flange holes (R. Fleming)..........*1040, e1085, 1104
Bedford, Ind., limestone workers, physical effects of pneumatic tools on..........n834
Beet pulp disintegrates concrete.......... 338
Belgium, recovery from war..........e161
Belt conveyor assists excavation..........h788
Bennett, C. J., on quick field punch for bridge work..........h*638
Bennett, C. S., on tractor aids in cellar excavation..........h344
Berlin, Germany, population.......... 635
Berresford, A. W., heads electrical engineers..........n1081
Besson, Capt. F. S., on sheet asphalt, varing bases and costs..........96, (A. W. Dow and F. S. Besson) letters 538
Bethlehem, Pa., bridge bid rejected......n597
Bhakra Dam, India, to have height of 395 feet.......... 480
Bin, grain, circular concrete, 18-foot, loading test of (P. J. Hansen)..........*316
Birth and death registration areas..e697, *732
Bishop, C. T., defended against plagiarism charge (Prof. J. C. Tracy)..........letter 786
Black, Maj. Gen. W. M., heads new engineering firm..........n1225
Black, McKenney & Stewart, new engineering firm..........n1225
Blacksmithing, good, needed in drilling (D. E. Dunn)..........h*1126
Blasting concrete in congested districts...h592
Blasting, mortar tamping reduces powder cost.......... 946
TNT practicable for ordinary blasting.... h1078
Bloomington, Ill., typhoid outbreak due to leaky cross-connection..........e939, (G. W. Booth) letter, with editorial comment, 1124, e1181, (G. W. Lee and H. A. Whittaker, letters 1219
Blueprinting, book review.......... 389
Blueprints, big replaced by small, loose-leaf photos (C. W. Geiger)..........*959
Board of Surveys and maps, see United States Board.
Boiler footings, concrete, curious cracks in (H. E. Miller)..........letter *926
Boise project, Idaho, design and construction of inverted siphon..........*860
Bolshevism, "Americanism vs. Bolshevism" (Hanson), book review.......... 784
In France and England, no..........e551
Leaf from Lenin's policy on manpower (F. A Kellor)..........517, (D. E. Gelwix) letter 787
Bond, Maj. P. S. (with others) on inland waterway transportation.......... 763
Bond issues "brass-band" bond voting (W. P. Bullock)..........letter 640
Book prices again given in *Engineering News-Record*.......... 388

BOOKS

"American Civil Engineers' Handbook" (Merriman).......... 580
"Americanism vs. Bolshevism" (Hanson).......... 784
"Blueprinting" (Friese)..........

Page
  - "Building the Pacific Railway" (Sabin) 580
  - "Business Library, The" (Krause).... 581
  - "California Highways" (Blow) 1216
  - "City Manager in Dayton" (Rightor).. 783
  - "Coming of Centralized Purchasing in State Governments" (Buck).......... 784
  - "Design of Masonry Weirs" (Pillai), reviewed by F. Teichman............. 782
  - "Deterioration of Structures of Timber, etc., in Sea Water" 1217
  - "Estimating Concrete Buildings" (Mayers) 782
  - "Highway Inspector's Handbook" (reviewed by H. E. Breed).......... 388
  - "Historical Report, Chief Engineer, A. E. F." 146
  - "Inventions" (Baff) 1026
  - "Iron Bacteria" (Ellis).............. 783
  - Merriman's "American Civil Engineers' Handbook" 580
  - "Modern Industrial Movements"........ 389
  - "Modern Roads" (Boulnois)........... 784
  - "Motor Truck Design and Construction" (Schaefer) 582
  - "Motor Vehicles and Their Engines" (Fraser) 582
  - "Nebraska Civil Administrative Code".. 389
  - "New Ideals in Planning of Cities, Towns and Villages (Nolen)........ 389
  - "Opportunities in Engineering" (Horton).1218
  - "Outlook for Research and Invention, The" (Hopkins) 581
  - "Principles of Government Purchasing" (Thomas) 784
  - "Principles of Reinforced-Concrete Construction" (Turneaure and Maurer).. 146
  - "Retaining Walls (Paaswell), review by E. Godfrey, 1026, (G. Paaswell) letter 1215
  - "Retrenchment and Reorganization in State Government of New York"..... 389
  - "Structural Drafting and Design of Details" (Bishop) review by R. Fleming.1215
  - "Technical Writing" (Rickard) review by P. B. McDonald..................1027
  - "Useful Data on Reinforced-Concrete Buildings" 146
  - "Water Powers of British-Columbia (White) 581
  - "What of the City?" (Moody)........1027
- Books, French scientific................ 322
- Borchard, E. K., on signaling concrete mixer by lights.....................h*104
- Borers, marine, see Teredos.
- Boston dry dock, device maintains true batter in masonry wall (H. D. Hurley) h*638
  - Dry dock government pays for........n982
- Boston harbor vehicular tunnel recommended n302
- Boston Army Supply Base, cost-plus contract satisfactory on.................*326
- Boston-Washington super-power investigation n1082
- Bradt, S. E., on relation of motor-vehicle license to highway construction....... 73
- Brady, C. T., Jr., on engineering education and life 31
- "Brass-band" bond voting (W. P. Bullock) letter 640
- Brattleboro, Vt., large highway bridge wrecked by pressure of cake ice (Prof. G. F. Eckhard)....................*902
- Brazil, Paulista Railway to be electrified. n933
  - Proposed irrigation projects........... 91
- Bread, plea for, through road construction postponement (J. Wilkes).......letter 1222
- Breakwater, rubble, deposited from railway on ice, Port Arthur, Ont.. ......*1261
- Breed, H. E., on continuity of operation essential to success of industrial railway *273
  - Review of "Highway Inspector's Handbook" (Hubbard).................. 388
- Brentlinger, H. A., on colored figures mark transit points......................h*1125
- Brick clays and shales of Minnesota...... 773
  - Lug or lugless? (P. K. De Voe and others) 618
  - Made from waste granular granite...... 963

BRIDGES

- Arch reaction influence lines by deflection diagrams (C. B. McCullough)........*675
- Architect as designer. See Architects.
- Ballasted and concrete, impact formula applicable to (H. M. Gibb)..........*874
- Bascule, double-deck, Michigan Ave., Chicago *950
  - Publicity for.....................e890. (A. J. Hammond) letter, with editorial comment 1076
- Bascule, gantry, high, for handling heavy members...................... *79
- Bascule lift span between cantilevers ......*564, (J. A. L. Waddell) letter 687
- Bascule, three double-leaf at Seattle (F. A. Rapp)......*718, heavy foundation work *774
  - Heavy foundation work (F. A. Rapp) *774
- Belle Isle Detroit, can go ahead......n644
- Bethlehem, Pa., bid rejected..........n597
- Camden, Philadelphia Council urged to appropriate money for...............e161
  - Supported by Mayor Moore of Philadelphi n251
- Cantilever Poughkeepsie, reconstructed for heavy traffic (C. E. Chase).... e497, *528
- Cantilevers, bascule lift span between ......*564, (J. A. L. Waddell) letter 687
- Castleton, N. Y., see Bridges, Hudson River.
- Chartiers Creek, Pa., washout breaks gas mains n1271
- Chemung River, Elmira, N. Y., competitive designs and bids asked......n983
- Chicago bascule, see Bridges, Bascule.

Page
- China, stone beam, 60 years old (D. F. McLeod) *321
- Cohoes, fails as wood flooring burns, n543, to be investigated..........n*593
- Concrete and ballasted, impact formula adapted to (H. M. Gibb)..........*874
- Concrete:
  - And stone, Pittsburgh, show low maintenance cost 953
  - Arch, truss centering used for 113-ft. arch (C. E. McCullough) *851
  - Design, special, Miami Conservancy District *1142
  - Longest arch span being built at Minneapolis *335
  - Longest concrete girder bridge built in California *427
  - Luten patents, decision against, sustained 417
  - Raised by screw jacks............h*881
  - Through arch bridge to give large waterway (F. W. Epps) correction 183
  - Unique plant for seven-span arch bridge (A. Richards and W. Carmichael) *76
- Concrete-incased steel arch of 340-ft. span, proposed at Oregon City........*416
- Connecticut River, at Springfield, Mass., engineers for......n202, (C. M. Spofford) *817
- Construction, Dr. J. A. L. Waddell on letter 687
- Construction, symposium on.......... e65
- Delaware River, open competition suggested n596
  - Philadelphia Council urged to appropriate money for..............e161
  - Supported by Mayor Moore of Philadelphia n25
  - To be controlled by architects, not engineers.......e209, n250, (M. Thompson) letter 585
- Designer, architect as, see Architects.
- Designs, competitive, asked on Elmira, N. Y. bridge.....................n983
- Detroit, bascule replaces swing bridge over Rogue River..................n1083
- Detroit-Belle Isle, part of contract confirmed n493
- Elmira, N. Y., across Chemung River, competitive designs and bids asked...n983
- Engineers or architects to design and construct? See Architects.
- Erection, light, improvised cableway for h*105
- Failure, see Bridges, Cohoes, and Chartiers Creek.
- Ferry-boat swing bridge.............. 724
- Floor fires.......................... 779
- Floors, combination wood and asphalt (J. G. McMillan)..............letter 437
- Foundations, small, carried away by floods e987
- Great Western Gateway, New York State, contractor may forfeit deposit check n60
- Highway:
  - Bascule, double-deck, Chicago.......*951
  - Concrete and stone, Pittsburgh, show low maintenance cost............ 953
  - Large, wrecked by pressure of cake ice, Brattleboro, Vt. (Prof. G. F. Eckhard) *902
  - Load distribution over stringers....*1209
  - More, in Oregon..................... 222
  - New York's......................... 633
  - Salt River, California, longest concrete girder bridge..............*427
  - Strengthening county bridge to carry motor truck (M. Goodkind)......*617
  - Temporary structures, economy of (E. E. Greenwood).............letter 586
  - Tests, load distribution over stringers.*1209
- Hudson River..........................e161
- Hudson River, at Castleton, N. Y., court approves shorter span..............n545
- Ice pressure wrecks large highway bridge, Brattleboro, Vt. (Prof. G. F. Eckhard) *902
- Impact formula, see Bridges, Railway, Impact Formula.
- Interstate, safety of e1183
- Key across Potomac, concrete seals cofferdam h*688
- Liftable, for Pittsburgh..............*1171
- Loadings and Poughkeepsie bridge reconstruction (C. E. Chase)....e497, *528
- Longest spans........................ 315
- Mexican Railway, between Cordoba and Orizaba (E. Low)...........letter *586
- Michigan Avenue, Chicago, see Bridges, Bascule.
- Minneapolis, longest concrete arch span being built..........................*335
- New Zealand, longest suspension (F. W. Furkert) ....letter 1222
- Niagara River bridge bill signed by President n296
- Ohio River, at Cincinnati, to be built.n689
- Ohio River, at Louisville, proposed....n647
- Ohio River, to be renewed by Cincinnati Southern n1273
- Philadelphia, council urged by Mayor Moore to appropriate money for....e161
- Piers made from old boilers..........*129
- Pipe sprinkler system for long bridge.*123
- Pittsburgh, should engineers or architects design and construct? See Architects.
- Pittsburgh, Henderson liftable bridge plan for.........................*1171
- Platte River, reconstruction...........*287
- Ponton, emergency, to be built by Army engineers n302
- Potomac River, Key Bridge, concrete seals cofferdam h*688
  - Provided for in deficiency bill.......n349
- Poughkeepsie, reconstructing for heavy traffic (C. E. Chase)..........e497, *528

Page
- Punch, quick field for bridge work (C. J. Bennett) h*638
- Railway:
  - Anchor pins of Cornwall cantilever bridge bored out and renewed (T. T. Welty) *453
  - Cantilever, Cornwall, anchor pins bored out and renewed (H. T. Welty)....*453
  - Chicago, Milwaukee & St. Paul, over Missouri River at Chamberlain, S. D., pile and concrete piers.........*824
  - Chicago, Rock Island & Pacific at Platte River, reconstruction.......*287
  - Concrete and pile piers, C. M. & St. Paul Ry. bridge at Chamberlain, S. D...........................*824
  - Cornwall cantilever, anchor pins bored out and renewed (H. T. Welty)....*453
  - Impact formula adapted to ballasted and concrete bridges (H. M. Gibb).. 874
  - Inspections and records............. 193
  - Painting experiences (A. H. Sabin) letter 339
  - Painting, light colors advocated...... 806
  - Paints, light colors advocated........ 806
  - Pile and concrete piers, C. M. & St. Paul Ry. bridge at Chamberlain, S. D...........................*824
  - Reinforcement, possibilities in...e306, (E. E. Greenwood) letter 586, (J. A. L. Waddell).............letter 687
  - Safety at U. S.-Canada border.......e1183
  - Specification adopted by American Railway Engineering Association..e603, 613
  - St. Lawrence River, Ottawa & New York Ry., anchor pins bored out and renewed (H. T. Welty)...........*453
  - Swingbridge accident of new kind; repair of damage to S. P. bridge at Oakland, Cal...............n109, *829
- Reconstruction of Platte River bridge.. *287
- Reinforcement work, originality in (C. E. Chase).....................e497, *528
- Rio Grande, and gagings (B. Wilson and A. J. Henry)...............letters 339
- Rocky Point, Ore., truss centering used for 113-ft. concrete arch (C. B. McCullough) *851
- Rogue River, at Detroit, bascule supersedes swing bridge...............n1083
- Rogue River, Ore., truss centering used for 113-ft. concrete arch (C. B. McCullough) *851
- Safety of, on U. S.-Canada border, and interstate e1183
- Salt River, California, longest concrete girder bridge.......................*427
- Spans, longest....................... 315
- Specification adopted by American Railway Engineering Association....e603, 613
- Springfield, Mass., engineers for....n202, (C. M. Spofford) *817
- Sprinkler, pipe, system for long bridge..*123
- Steel arch of 340-ft. span, concrete-incased, proposed, at Oregon City....*416
- Stone and concrete, Pittsburgh, show low maintenance cost.................. 953
- Stone beam in China 60 years old (D. F. McLeod) *321
- Swing; accident of new kind; repair of damage.....................n109, *829
- Timber arch, Lowell, Mass., replaced..*1117
- Toll, over Delaware, to be acquired by condemnation n1178
- Toll, New York and Pennsylvania, progress toward purchasing.............n348
- Wabash R.R. over Rogue River at Detroit, bascule supersedes swing bridge n1083
- Willamette River at Oregon City, Ore., proposed concrete-incased steel arch of 340-ft. span *416

Bridgeton, N. J., water filtration plant, air agitator speeds floc formation.......... 899
Bridgewater project, Western Carolina Power Co. reservoir and plant (W. S. Lee and R. Pfaehler)...........................*1088
Brighton Beach, New York, thin bath-house concrete slabs cast and handled on edge.*912
Brinckerhoff, H. M., on planning transit development in Cleveland..........e797, *803
British canals, traffic on 998
British engineers' fees.................. 978
British ministry of transport............ 507
British Guiana, water powers............ 996
Brittleness in sheet lead................ 907
Brockway, T. L., on all-sand aggregate for concrete in Middle Western roads......a573
Brodie, J. A., elected president of Institution of Civil Engineers..............n1179
Brooklyn, N. Y., electrically welded mill building 708
Brown, R. T., on graph records progress of road-survey parties..................*333
Bucket, paver, one trip takes full batch..n*550
Bucyrus, Ohio, water-works, basin footings rest on rubble lining of well (J. R. Arnold) h*1126
Budget, national, must come...........e1133
Buffalo, N. Y., engineers co-operate with Chamber of Commerce..............n1083
  Garbage feeding contract terms........ 416

BUILDING AND BUILDINGS

- Budgeting to available labor and materials............................e651, e889
- Construction, rising prices should be halted (H. W. Foote).....e65, letter 98
- Costs, how they have increased since 1913 (L. K. Sherman).............*267
- Diagram checks completion of small details h738
- Framing, steel, of narrow Waterman Building, Chicago..................*913
- Narrow, steel framing.................*913
- Prohibited where no sewers............ 51
- Regulations, standard, proposed by Concrete Institute.......................e745
- Senate plans to stimulate construction..n932

*illustrated; e, editorials; h, hints; n, news notes; a, abstracts.

Page
  Steelwork, detailing.... (E. Godfrey) letter 194; (E. E. Halmos) letter 196
Building industries ask car service........n1128
Building materials, scarce................e401
Building trades, New York, receive flat increase of $1 per day.................. 951
Building Officials' Conference to be held in Chicago n298
Bunkhouse, standard portable, on Hetch Hetchy project h*107
Bunsen, O. G. on sequence of notes for and calculation of cross-section............*472
Burdick, C. B., on present status of flood protection 15
Bureau of Commerce creates western European division........................ n60
Bureau of Mines, tunnel air investigation cancelled by House committee.........n299

BUREAU OF PUBLIC ROADS
$540,000 appropriated for n693
  Begins subgrade study..........e1037, 1072
  No great enlargement..................n153
  Tests bearing power of soils...........1117
  To classify roads...........n546, 635, e650

BUREAU OF STANDARDS
  Tests:
    Cement finely ground................1155
    Cement plaster on gypsum............1072
    Concrete consistency by flow table (G. M. Williams)..................*1044
    Concrete, good, shown to be watertight under 35-ft. head................. 924
    Silicate baths in curing concrete 1046
    Stored cement........................1067
    Two-way tile and concrete floor....*1118
    Wetness of aggregates 1267
    Wooden struts.. 915
Burlington County, New Jersey, county highway surfaced with city pavements (J. Logan) 379
Bush, E. W., on two sets of plans for contractor h638
Business recognizes engineer...........e1085
Butler, A. D., on felling concrete chimney. *899
Butler, Pres. N. M., on progress in engineering education at Columbia University...a823
Buying, intelligence in.................. 526
Bypass, controlled, to suction permits continuous pumping...........h*104, h*1174

C

Cable conduits, under-pavement, pipe pusher cuts cost (C. A. Frankinhoff).........h489
Cableway, improvised for light bridge erection h*105
  Long, supplied French Army front..... 245
Cache County, Utah, reconsiders road bonds n1175

CAISSONS
  Gates for dry docks, structural design (E. E. Halmos) *89
  Inclosure method used in building Assay Office substructure in quicksand (T. K. Thomson) *165
  Large open, sinking at Milwaukee, Wis. methods used *916
  Seat, concrete, in rock grouted watertight h*542
"Cal" increases cement hardening rate....h248
Calaveras County, Cal., metal flume quickly erected from pile scaffold........h*1078
Calcium chloride, effect on steel in concrete 973
Calcium oxychloride increases cement-hardening rate h248
Calder committee, to study housing situation, organized n1034

CALIFORNIA
  Cities (Oakland district) new $90,000,000 water-supply project (C. E. Hickok) n1223
  Engineers favor Hoover for president..n595
  Faces uncertainty in road program ...n297
  Highways:
    Asphaltic concrete (C. S. Pope).....1095
    Bond issues, not much demand for..n297
    Book on, by B. Blow..............1216
    Construction assured by bond sale...n547
    Reinforcing concrete pavements on highways *1255
  Interest in irrigation increasing........ 925
  Motor transport in (K. Q. Volk). e551, *568
  Power administrator, jurisdiction extended n740
  Power all in one system..............1052
    New, increasing.................... 877
    Projects 1051
    To be controlled during drought.n543, n740
  Water conservation needed e401, 429
California Debris Commission, new members n603
California Institute of Technology, new name of Throop College n885
California Section American Water Works Association being formed n931
California State Prison, activated-sludge plant 1260
Camp Meade builders banquet............n112

CANADA
  Bridges on border, safety of..........e1183
  Construction industries favor standard contract n318
  Contractors and material dealers organize n115
  Demands in engineering education.e354 a369
  Develops water power (O. Lefebvre) . e401 a423
  Engineers forming Welfare Association..n791
  Engineers' licensing n106 e981
  Engineers move to improve status......n692
  Highways Government outlines policy..n318
  Import duty on plans, to aid profession, asked by Royal Architectural Institute n887
  Institute of Professional Civil Servants being formed n791
  Power statistics 1187
  Proposed irrigation projects 91
  Railways, National, $47,000,000 deficit for n741
  Royal Architectural Institute asks duty on plans to aid profession.........n887
  Water power development 1149
  Water-works men invited by American W. W. Association n1127
Canadian National Railways, deficit..e746, e843
Canadian Northern Rys., early surveying (H. K. Wicksteed) 513, 670
  Early surveying (H. K. Wicksteed).... 513
Canadian Pacific offers McGill scholarship..n984
  Orders $15,000,000 equipment n647

CANALS
  British, traffic on 998
  Capacity decreased by insect larvæ..... 923
  Cape Cod shut down pending ownership decision n596
  New York Barge Canal:
    $25,000,000 wanted for n301
    Construction of; New York Central accomodates itself to canal (B. S. Voorhees) e497, *500
    State control deferred n1128
    Terminals to be completed n932
    Traffic and prospects 512
    What it has cost taxpayers (E. Gray, with editorial comment, and W. G. Wilkins) ....letters 293
  Panama, see Panama Canal.
  Removable flume over canal permits passage of hydraulic dredge h248
  Screen, self-cleaning, for small canals...*128
  Soundings and stream measurements unique rod for *51
  Welland Canal, spiral stairway made of precast concrete members *919
    Work to resume n740
Canal Zone and Panama City per capita water consumption (R. C. Hardman)..*1099
Canal Zone, swamp drained by conduits under culvert floor (R. C. Hardman)..*925
Can-and-candle device speeds up rod readings in tunnel h55
Candidates for public office questioned by engineers of Charleston, W. Va........n1129
Cantonment construction criticized by Congressmen e842, 849
Cape Cod Canal, see Canals, Cape Cod.
"Cape Fear," holes repaired with cement gun *1113
Car for current-meter gaging stations (G. H. Ellis) *80
Car-loading hopper for draglines and grab buckets (R. E. Post) h*979
Carlisle, J. N., not responsible for statements in *Engineering News-Record*....n107
Carmichael, W., and A. Richards, on unique plant concretes seven-span arch bridge. *76
Carnegie Corporation to give $5,000,000 for research n249
Carnegie Foundation report...............1141
Carnegie Steel Co., heavy industrial railway in Monongahela Valley *604
Carpenters strike at McKeesport, Pa.....n1129
Castleton bridge, New York, see Bridges, Hudson River.
Catalog file an efficient (R. G. Roesch)..1165
Catawba River, N. C., dam Bridgewater power project, reservoir and plant (W. S. Lee and R. Pfaehler) *1088
Causeway being built near Singapore....1058

CEMENT
  Exports, value rather than quantity as measure (G. O. Smith)........letter 148
  Hardening rate increased by new material "Cal" h248
  Plaster on gypsum 1072
  Production in 1919 ....n931
  Sack cleaning machine saves money...1204
  Tests:
    Consistency made by British engineers.1211
    Finely ground 1155
    Sieve tests check closely............1200
    Storage, effect on strength........*1263
    Stored 1067, *1263
Cement gun coats wood piles *225
Cement gun repairs holes in concrete ship. *1113
Census asks strike loss data of manufacturers n153
Census, Cincinnati and Washington figures first out n446
  New York e1133, n1176
  Shows decline in rate of city and town growth n983
Central Railroad of New Jersey, design and operation of modern car-dump coal pier .... *759, correction 854
Chain conveyor delivers concrete to forms n*936
Chains, surveyor's, steel, tests of extension in *957

CHAMBER OF COMMERCE, U. S.
  Industrial Section meeting n838
  Referendum of national Public Works Department..... n205, n791; result against department n1178
  Stillwell, L. B., and H. Elliott appointed directors n1079, e1085
  To hold annual meeting n893 n790
  Two engineers named directors.... n1079
Chamberlain, S. D., C. M. & St. P. bridge pile and concrete piers.............. *824
Champaign-Urbana Ill., activated-sludge experiments n1031
Chandler, E. L., with E. W. Lane, on measuring upward pressure under masonry dam, Dayton, Ohio e987, *1014
Chaney R. C., on surveys for flood protection, Columbus, Ohio *966
Channel improvement brings marine borers inland 75
Channel lining, concrete, laid with large traveling form *1056
Channels, open, Herschel weir for gaging in a*711
  Wood, and smooth wood-stave pipes, discharge of (A. A. Barnes) 228
Chappaqua, N. Y., simple mechanical control for dosing sewage beds (P. Thompson) *1018
Charles River, report on pollution of...... 715
Charleston, W. Va. engineers question candidates for public office n1129
Chart for discharge of water columns supplying locomotives (F. D. Yeaton)..*1013
Chase, C. E., on reconstructing Poughkeepsie bridge for heavy traffic ..e497, *528
Chattahoochee River flood damage *431
Chemung River bridge, Elmira, N. Y., competitive designs and bids asked......n983
Cherry Creek power house, Hetch Hetchy project, deer ladder a necessity in flume. *950
Chesapeake & Ohio Railroad shallow pit coaling station, Handley, W. Va.......*520

CHICAGO
  Bond issues voted down e841
  Building-height limit raised 68 feet.....n646
  Commercial associations appeal for public utilities e1230, n1272
  Engineers, suspended, societies make investigation e937
  Hospital bill favored by House committee n61
  Housing project 1198
  Illinois Central defers improvements..n1127
  Improvements voted down e841
  Local governments, consolidation urged.n300
  Michigan Ave. double-deck bascule bridge, see Bridges, Bascule.
  Municipal improvement bonds fail to carry n836
  Plan Commission reports........e1229, 1241
  Planning, city 1027
  Public works, bonds for n547
  Sanitary District plan to regulate Great Lakes level by Niagara dam (F. C. Shenehon) ....e305, *308, correction 512
    Road design places stress on drainage. *285
  Sewage treatment plans 873
  Stops proposed road work n204
  Street section new form adopted in Chicago (H. J. Fixmer)..........letter *588
  Warehouse, collapse of, checked by underpinning (G. F. Paul) *945
  Waterman Building, steel framing of narrow building *913
  Water-supply, additional, 1920-1955... *855, e891
    Needs considered n398
  Water-works, new plan for e891
Chicago Drainage Canal, flow of lake to, restricted n1274
Chicago & Alton shops at Bloomington, Ill., typhoid outbreak due to leaky cross-connection....e939, (G. W. Booth) letter with editorial comment, 1124.
Chicago, Milwaukee & St. Paul Ry., bridge over Missouri at Chamberlain, S. D..*824
  Opens electric operation on new division.n545
  Resurveys of old lines (J. G. Wetherell).*575
Chief Engineer, A. E. F., see Army, United States, Chief Engineer.
Chief of Engineers, U. S. A., see Army U. S., Chief of Engineers.
Chimney, concrete, felling (A. D. Butler).*899
  Construction companies indicted........ n59
  Constructors, case against disposed of..n445
  High concrete, built on steel roof....... 317
China, engineers, pay of (R. F. Goodrich).1021
  North, engineering in (D. F. McLeod).. 862
  Railways in 1013
  Stone beam bridge 60 years old (D. F. McLeod) *321
  Water-power from Yangtze River, China. 145
Chinese, shall they be imported to relieve labor shortage? (J. Ericson) letter 926, (E. E. Wall) letter 1029, (J. Ericson and others), letters 1121 (H. S. Crocker and F. C. Finkle) letters 1219.
Chisel-bar holder prevents hammered hands h*198
Churchill, F. A., on tamping templet expedites brick-road construction *282
Chutes to mixer serve as measuring boxes.h788
Cincinnati census figures n446
  Motorized freight transfer cuts terminal costs e498, *598, e889
Circles areas of segments (D. W. Starkey) letter *880, (J. R. Murray) ... letter *1173

CITIES
Albuquerque, N. M., establishes group insurance for employees 1238
  Atlanta, hope for better government .e1133
  Automobile problem 1043
  Census shows decline in rate of growth n983
  Chicago improvements, etc., see Chicago
  Cleveland street congestion (H. M. Brinckerhoff) e797, *803
  Commissioner-manager study, intensive . 782
  Community service in highway construction, Mineral Wells, Tex. (W. W. McClendon) 1098
  Conference on planning 904
  Cross-city thoroughfare to relieve Detroit congestion *1116
  Dallas, Tex. zoning studies..........n836
  Denver water-works, operation under city control 869
  Detroit planning progress in 809
    Street railway project, work started .n838
  Duquesne Pa., bond issue fails.. n1226
  Engineers, pay and service......e746, e1086
    Pay from engineer's point of view . 946
    Salaries proposed by American Association of Engineers 898

Page
  Experiment stations to reduce city risks (A. Wolman)....letter, with editorial comment 339
  Foundry, municipal, established by Johannesburg, S. A. 1238
  Garbage, see Garbage.
  Gas holders lawful structures 325
  Georgia, Municipal League promotes hydro-electric projects 825
  Grain and freight port terminal, municipal, Portland Ore. *179
  Housing, municipal e1182
  How mayor of Southern town saved "engineering expense" (N. C. Hughes, Jr.) ....letter 831
  Insurance, group, for all municipal employees, Albuquerque, N. M. 1238
  Johannesburg, S. A., establishes municipal foundry 1238
  Kansas City, Mo., planning commission created n347
    Sanitation to be studied by Engineers' Club Committee n1178
    Traffic studied by Engineers' Club...1213
  Labor, where will wages stop?........e1133
  Madison, Wis., rejects municipal street railway ownership n838
  May condemn for residential district.... 571
  Minutes, public improvement, shortcomings of (F. B. Tucker)...........1053
  Montreal, new charter proposed.......n1224
  Municipal League of Georgia promotes hydro-electric projects 825
  Municipal ownership, Madison, Wis., rejects municipal street railway ownership n838
    Street-railway system, Detroit votes for n792
    Paving plants, municipally owned ..1099
  Oklahoma City calls for engineers on sewage problem n886
  Omaha buys gas works n1179
  Pittsburgh improvement bonds fail to draw bids n837
  Planning; see also Regional Planning.
    Aërial photography in.............. 950
    And railroad terminal problem (Col. W. J. Wilgus) e889, *901
    Brief survey of, book review........ 389
    Commission, Chicago..........n547, 1241
    Commission created for Kansas City, Mo. n347
    Commission, large, for Los Angeles, Cal. n741
    National conference on e745, 904
    New viewpoints of 1027
    Progress in Detroit 802
  Public improvement minutes, shortcomings of (F. B. Tucker) 1053
  Rapid transit and street congestion in Cleveland (H. M. Brinckerhoff).e797, *803
  Records and reports, common weakness of 805
  Refuse disposal, see Garbage.
  Repair shop, municipal, of Los Angeles, work of 37
  Reports and records, common weakness of 805
  Rising cost effects as viewed in Iowa... 876
  St. Louis, Mo., progress of major street plan (H. Bartholomew) e937, *954
  St. Paul, Minn., planning board opens office n931
  Street congestion and rapid transit in Cleveland (H. M. Brinckerhoff).e797, *803
  Street plan, St. Louis, Mo., progress of (H. Bartholomew) e937, *954
  Terminal planning (Col. W. J. Wilgus).. e889, *901
  Transit and Traffic:
    Cleveland, Ohio, voters fail to approve.n981
    Kansas City, Mo., studied by Engineers' Club 1213
    Cleveland subway bonds defeated....n885
    New York system, work on, during 1919 246
    New York traffic 14
    Study of e259, n646
  Tulsa, Okla., to establish garbage collection e1229
  Washington, D. C., zoning work starts..n1034
  Water plants permitted to run down..e890
  What risks should cities take in installing relatively untried processes? (Morris Knowles and others) e114, 132, (A. Wolman) letter, with editorial comment 339.
  Work, pocket specifications for........ 785
  Zoning:
    Alameda, Cal., ordinance (C. E. Hewes) 46
    Dallas, Tex. n836, 1170
    District of Columbia, signed..n493, n1034
    East Cleveland, Ohio, part of ordinance upheld 1019
    Newark, N. J., adopted n209
    Niagara Falls, N. Y., ordinance...... 527
    Portland, Ore., ordinance 899
    Providence, R. I., urged n300
    Washington, D. C. n493, n1034
  Zoning ordinances, simplicity of classification in (address by H. S. Swan).. 374

City Planning Conference 904
Civil Service Examinations..............
  61, 111, 158, 206, 254, 547, 742, 886, 934, 1227, 1274
Clairton branch, Monongahela Southern R. R., Carnegie Steel Co. heavy industrial line *604
Clamp fastening for track rails *336
Claremont Terminal, Jersey City, see Lehigh Valley Railroad.
Clay blanket stops leakage in earth dam (B. E. Torpen) *365
Clay, blue, troubles with (L. B. Alexander) letter 195

Page
CLEVELAND, OHIO
  Buildings prohibited where no sewers.. 51
  Public Hall, steel framing for.........*414
  Sewage-works contract awarded........n300
  Street congestion and rapid transit (H. M. Brinckerhoff) e797, *803
  Street railway terminal subways, operating contract for n301
  Subway bonds defeated n885, n981
  Union depot ordinance lapses n298
  Water-works enlargement recommended..n1225
Cleveland-Cliffs Iron Co. mine, Ishpeming, Mich., 484 ft. drilled in 432 hours....1095
Coal pier, modern car-dump (Central Railroad of New Jersey), design and operation....................*759, correction 854
Coal prices in Paris 1062
Coal saving by electrifying railroads....1107
Coaling station, shallow pit, for Chesapeake & Ohio, Handley, W. Va. *520
Coast and Geodetic Survey, nomination...n392
  Equal-area projection of sphere an aid to mapping (R. L. Faris) *1204
Cobbles mixed in concrete e451
Cofferdam, economical (E. H. Sweet)....h*592
  On rough rock bottom sealed by concrete h*688
  Small, used in dry-dock construction, Philadelphia Navy Yard (C. A. Lee) *748, letter 1077
  Unwatering lock site of New Orleans harbor canal (G. R. Goethals)..........*940
Cohoes bridge fails as wood flooring burns n543, to be investigated n*593
Collapse of warehouse checked by underpinning, Chicago (G. F. Paul).........*945
Collins, R. G., Jr., an appeal to highway contractors, and Why is there no profit in building highways? e116, 122, (L. E. Gaskins) ....letter 341 e452
  On how lower highway building costs? 703, (B. H. Piepmeier) .....letter 1076
Colorado engineers classified 830
  Proposes three state railway tunnels... n205, *716
Colorado River control considered by League of the Southwest n933
  Flood danger passed n1223
Colorado Society of Engineers aids extension engineering courses n110
  Free employment service indorsed (W. M. McMechen) ....letter 148
Columbia Basin Irrigation Project, Washington, main features. 456
Columbia Highway, concrete structures serve double purpose *334
Columbia University, progress in engineering education at a823
Columbus, Ohio, bureau of waterworks extension formed n982
  Surveys for flood protection (R. C. Chaney) *966
Columns, concrete, designed with cast-iron core (W. H. Roney, Jr.) *459
  Designing for bending moment (H. L. Bowman) letter 588, (E. Godfrey) letter 685
  Pairs, not equally safe under stress (E. Godfrey).....*948, (C. C. Hulbert) letter with editorial comment, 1222, (E. Godfrey) letter 1268
  Strength, sane study of e602
Comber, S. C., investigates British Guiana water powers 996
Comedy of an error (H. C. Ives and G. B. Zahnlser) ....letters 53
Commerce Chamber, see Chamber of Commerce.
Community service in highway construction, Mineral Wells, Tex. (W. W. McClendon).1098
Compressed Air Magazine, changes in..... 389
Compton, R. K., on lug or lugless brick?.. 618
CONCRETE (MATERIAL), see also CONCRETE BEAMS, etc.
  Aggregate, all-sand (T. L. Brockway). 573
  Aggregate proportions for equal strength concrete (A. N. Johnson).......e938, 964
  Aggregates, wet, make concrete too strong 1267
  American Concrete Institute, meeting in Chicago e402, n443
    Waking up e257
  Asphalt protects steel in water-front concrete 1075
  Beet pulp disintegrates concrete 338
  Bituminous, determining bitumen content (R. M. Green) 871
  Blasting, in congested districts........h592
  Chain conveyor delivers concrete to forms n*936
  Cobbles, mixed in e451
  Consistency, see Concrete, Tests.
  Cured in silicate baths 1046
  Destroyed in vacuum in Calaveras Dam culvert *1197
  Disintegration causes scrapping of ocean pier *621
  Equal strength, aggregate proportions for (A. N. Johnson) e938, 964
  "Flowability" measured (G. M. Williams) *1044
  Flow table measures consistency (G. M. Williams) *1044
  Forms, see Concrete Forms.
  Impurities, organic, see Concrete, Tests.
  Joint Committee organizes n446
  Mixing, Chutes to mixer serve as measuring boxes h788
  Mixing, premixing no benefit.......335, 473
    Signaling mixer by lights (E. K. Borchard) h*104
    Transfer table switches batch cars. h*104
  Organic impurities, see Concrete, Tests.
  Premixing no benefit 335, 473
  Pressure on forms measured in tests (E. B. Smith) a*665
  Proportioning, fineness modulus theory, a method of applying (A. N. Johnson) e938, 964

Page
  Proportioning, mixing concrete by surface areas on actual work (R. B. Young) e6, *33, correction 72, comment by G. M. Williams, R. B. Young and H. A. Davis, 811.
  Reinforced: ....
    Asphalt protects exposed steel in water-front concrete 1076
    Bars discussed by American Railway Engineering Association 615
    Bar sizes to be restricted 430
    Calcium chloride, effect on steel...... 973
    Handbook (book review) 146
    Principles of construction (book review; Turneaure and Maurer) 146
    Shear, safe unit stress in, in proposed building regulations e745
  Seals cofferdams on rough rock bottom.h*688
  Shear values proposed to Concrete Institute a*465
  Ships, see Ships, Concrete.
  Silicate baths, in curing concrete.....1046
  Tests:
    Consistency, British engineers interested in 1211
    "Flowability," etc., measured by flow table (G. M. Williams) *1044
    Determining bitumen content in bituminous concrete (R. M. Green)....... 871
    Organic impurities injure concrete...1244
    Premixing no benefit 473
    Pressure on forms measured in tests (E. B. Smith) a*665
    Protection against fire a469
    Shear values proposed to Concrete Institute a*465
    Silicate baths in curing 1046
    Slump test device for field use.....h*198
    Wet aggregates make concrete too strong 1267
  Waterfront, San Francisco, asphalt protects exposed steel 1075
  Watertight under 35-ft. head, tests show. 924
  Winter concreting made safe by close regulation (G. A. Stockhus)........h197
  Without stone; all-sand aggregate (T. L. Brockway) 573
  Worms 709
CONCRETE BEAMS, BUILDINGS, COLUMNS, Etc.
  Beams on San Francisco waterfront protected by asphalt 1075
  Boiler footings, curious cracks in (H. E. Miller) ....letter *926
  Blocks and the Hudson tunnel....e552, n594
  Building, huge, for New York City....n1081
  Channel lining laid with large traveling form *1056
  Columns with cast-iron core, designing (W. H. Roney, Jr.)...............*459
  Conveyor, chain, delivers concrete to forms n*936
  Facing placed on old masonry sea wall, at Nassau, B. W. I. *996
  Forms:
    Collapsible used in pouring walls of deep circular pits, Detroit.......h*1030
    Dam, shifted by swinging stages....h*440
    Design for Miami flood-control dam conduits *430
    Hanging for curb work (D. H. Fleming) h*638
    Pressure on, measured in tests (E. B. Smith) a*665
    Self-sustaining, for casing of steel girders (C. A. Peck) h*688
    Spacer held in position by nail cast into end h*197
    Traveling, large, lays concrete lining Onondaga Creek channel *1056
  House construction, conference to be held n60, e401, n441
  "Lumber" used in small irrigation structures (R. W. Olmsted) *1167
  Pipes, large, rolled by horses h*151
  Plug and grout injection close tunnel leak, Modderfontein, South Africa...h1030
  Pressure pipe joint, new n*496
  Slabs, thin, for bathhouse, cast and handled on edge *912
  Structures serve double purpose on Columbia Highway *334
  Tunnel, concrete block construction, controversy over, see Hudson River Vehicular Tunnel.
  Work and embankment work for oil reservoirs, El Segundo, Cal. *905
Concrete plant, tower guying methods...h*1270
Concreting plant, unique, for seven-span arch bridge (A. Richards and W. Carmichael) *76
Concreting plants, two, for large foundation area, Granite City, Ill. *1107
Concreting, winter, made safe by close regulation (G. A. Stockhus)............h197
Conduits, cable, under-pavement, cost cut by pipe pusher (C. A. Frankiohoff)..h489
  Dam, Miami flood-control, form design for *430
Conference on City Planning 904
Congress and the cantonments e842, 849
Congressional committee on compensation reports n595
Connecticut highways, load limit reduced to save soft roads n789
  Traffic on 506
  Truck weight limit reduced to save soft roads n789
Construction camps, bunkhouse, portable, on Hetch Hetchy project h*197
CONSTRUCTION
  Budgeting to available labor and materials e651, e88
  Corporations' share of 1917 taxes.... 43
  Crisis e889
  Engineering (C. Penrose)..e552, *554, *627
Page

*Illustrated; e, editorials; h, hints; n, news notes; a, abstracts.

Page
  Equipment rental values for (F. J. Herlihy) 125
  Industries complete federation...n689, e745
  Management, codifying (C. Penrose)... e552, *554, *627
  Materials, new railway rates asked...n1224
  Outlook in 1920 (A. W. Welch)....... *63
  Shortage to be studied by Senate committee n1175
  Work, Senate plans to stimulate......n932
Construction Corps (Division, Service) see Army, U. S., Construction Corps.
Consular service wants "retired engineers" e66, n106
Consulting engineers, see Engineers, Consulting.
CONTRACTORS, see also CONTRACTS
  Associated General Contractors, see Associated General Contractors.
  Characterized by financier a233
  Claim for loss recognized by Government n933
  Contractors or "large" contractors for highway work? (D. W. Robbins)... 583
  Define practice outside home territory..n981
  Equipment rental, estimating h1126
  Extra compensation on tunnel work....n301
  Illinois, discuss highway work n298
  Immigration policy, contractors and.....e747
  Investigate material prices n980
  May forfeit deposit check............ n60
  Naval structures, contractors on, relief promised to n741
  New Jersey, relief proposed............n933
  Organization e209
  Organized contracting, opportunity and responsibility of e452
  Plans, two sets of (E. W. Bush).....h638
  Pooling prohibited by Kentucky bill ...n447
  Present attitude of contractors........e452
  Publicity for h393
  Relations discussed at Indiana Society of Engineers' meeting n298
  River and harbor, bill would relieve them of war cost increases n740
  Stealing labor ...e889, (F. G. Webber) letter 1123
  To hold annual sessions in Chicago..... n57
  Toronto, will not submit checks on private work n693
CONTRACTS, see also CONTRACTORS
  Arbitration clauses, plea for (E. T. Johnson) ....letter 1076
  Army, suspended, nearing settlement...n491
  Clauses which disregard square deal (F. J. Herlihy) 457
  Cost-plus, in cantonment construction, criticized by Congressmen....e842, 849
    Satisfactory on Boston Army base..*326
  Labor costs, variable, provided for in Wanaque Dam contract 734
  Leavenworth Bridge Co.'s claim for loss recognized by Government n933
  New provisions proposed by Associated General Contractors Committee 1119
  Public, on cost-plus minus penalty basis.n932
  St. Louis, Mo., labor problems and city contracts n740
  Standard favored by Canadian construction industries n348
  Wanaque Dam contract provides for variable labor costs 734
Conveyor, chain, delivers concrete to forms n*936
Cooper, Col., H. L., appointed consulting engineer, Muscle Shoals n1130
  Reports made on his Muscle Shoals work n1082
Co-operative system of education, progress of e698, n739
Coos Bay, Oregon, to be developed as rail and water terminal n109
Cornell University faculty to receive more pay n597
  President resigns n398
Cory, H. T., to pass on Nile irrigation plans n*204
Cosby, S., promoted to colonel..........n693
Cost of living see Economics.
Cost-plus contracts, see Contracts, Cost-Plus.
Costs of materials and wages on Erie, Pa., flood-control project (F. Gannett)..... *852
Cotton mill, largest single unit, under construction n838
Council of National Defense criticized in cantonment construction e842, 849
Crandell, J. S., on treatment for saving wood-block pavements *968
CRANES
  And excavator, convertible.. ....n*936
  Gantry, high, for handling heavy members of large bascule *79
  Hammerhead, largest derrick built to erect *172
  Pontoon, 150-ton capacity, at Mare Island Navy Yard................ *1245
  Runway support, heavy timber framing.*1016
  Strain-gage measurements on large floating crane 680
Cranford, N. J., board takes up railroad problem n302
Crisman, C. O., on marine railway for 5000-ton ships, Astoria, Ore. *1156
Cristobal, C. Z., precast concrete roof trusses in pier shed (G. W. Truo)....*1232
Crossover practice, argument on Pittsburgh bridge case (F. C. Shenehon).........1254
Cross-section, sequence of notes for and calculation of (O. G. Bunsen).........*472
Crusher stone, stopped when overload breaks safety bolt n986
Culverts, mountain, protected by simple barrier *918
  Tested under deep fill n61
Curb and gutter finisher, homemade.....h*592

Page
Current-meter gaging stations, car for (G. H. Ellis) *80
Curve problems, compound, simple solutions of *378
Curve, reverse, a problem (W. H. Adams) letter *832, (A. C. Love) ......letter 978
Curves lined accurately to templet in sewer tunnels (A. L. Sears) h*737
Curves, plotting, conversion table for (J. G. Walsh) ....letter 486
Cut-over land, engineering aspects of stump removal 830

D

Daily, C. M., on Water jets and sand blasts clean St. Louis filters.........e1181, *1198
Dallas, Tex., zoning...............n836, 1170
Daly medal awarded to Dr. G. O. Smith..n*791
DAMS
  Arch, thin, design details and field methods ....*474 correction 779
  Bhakra, India, to have 395 feet height.. 480
  Blankets, upstream, Miami project, at Dayton (E. W. Lane and E. L. Chandler) e987, *1014
  Calaveras, concrete destroyed in vacuum in culvert *1197
  Catawba, construction, etc. (W. S. Lee and R. Pfaehler).....................*1088
  Cedar Lake, new plan for..............n296
  Cerro de Pasco, Peru, clay blanket stops leakage (B. E. Torpen)...............*365
  Concrete arch, Kerkhoff, built from superposed trestle....*421, see also.... 474
  Concrete, design details and field methods on thin arch dam, Warm Springs *474, correction 779
  Construction:
    Forms shifted by swinging stages....h*440
    Kerkhoff, California....*421, see also 474
    Practical points in constructing hydraulic fill dams..................h929
  Earth dam cores, microscopic examination (J. C. Dow).....................letter 585
    Leakage in, stopped by clay blanket (B. E. Torpen)...................*365
  Gibraltar, California *1003
  Gibraltar, Cal., chutes to mixer serve as measuring boxes.......................h788
  Highest, Bhakra Dam, India, to be..... 480
  Hydraulic dam cores, microscopic examination (J. C. Dow)...........letter 585
  Hydraulic fill, practical points in constructing h929
  Kerkhoff, California, concrete arch dam built from superposed trestle....*421, see also 474
  Lake Huascacocha, Peru, clay blanket stops leakage (B. E. Torpen).........*365
  Masonry, design of, an Indian engineer on 782
    Measuring upward pressure under Dayton, Ohio (E. W. Lane and E. L. Chandler)..................e987, *1014
  Miami Flood Conservancy District design of dams and auxiliary structures....*1142
  Muscle Shoals construction............n*106
  Niagara, for regulation of Great Lakes level, proposed (F. C. Shenehon), e305, *398, correction..................... 512
  Tainter gate design, some fundamental of (A. H. Reeves)................letter 391
  Upstream blankets, Miami project at Dayton (E. W. Lane and E. L. Chandler) e987, *1014
  Wanaque, bids rejected................n932
  Warm Springs, Oregon, design details and field methods on thin arch dam..*474, correction 779
    Forms shifted by swinging stages...h*440
  Water-supply, Gibraltar, for Santa Barbara, Cal. *1003
Danville, Ill., traps and leaping weir eliminate odors from waste in sewer......*1051
  Water supply, removing of taste-producing protozoa 1214
Daugherty, J. R., on water-supply typhoid outbreak, Lansing, Mich *92
Davis, A. P., change in title............n1081
  Elected president Am. Soc. C. E.......n*199
Davis, H. A., on proportioning concrete for Government ships. 813
Dayton, Ohio, "City manager in" (Righter), book review.......... 783
  Flood-protection works, see Miami Flood-Protection Works
Deakyne, Lieut. Col. H., new member Mississippi River Commission...............n*545
  Promoted to colonel...................n693
Death and birth registration areas..e697, *732
Death rate, abnormal, in 1918 due to influenza 584
Decay of timber roofs checked by preheating ....
Decker, W. L., on water for shipyard drinking fountains treated by violet rays....*571
Decorah, Iowa, flood-protection reservoir..*565
Deer ladders a necessity in flume... ....*950
Delaware health bulletins 116
Delaware, Lackawanna & Western R.R., service tests of treated ties.......... 511
Denver a seaport e987
  Engineering affairs in (Impressions Here and There)..........................1066
  Water plant, operation under city control 869
  Water rates and home rule............n203
Denver & Rio Grande R.R., engine terminal at Soldier Summit, Utah......*1069, *1159
Denver Civic and Commercial Association to study watermeter proposal.........n397
Department of Public Works, see Public Works Department
  Largest, built to erect great hammerhead crane *172
  Mast, steel, repaired by acetylene torch (J. C. Lamon)...........................h198

Page
DERRICKS
  Stiff-leg, converted into dragline excavators, markes railway fill............h*151
  Stiff-leg, with wood members, mounted on pier roof..............................*382
  Tower anchored to pile foundation, heavy timber framing..........................*1016
Design, structural steel, stray points in (R. Fleming).............. *1040, e1085, 1104
Des Moines, Iowa, water-supply curtailed by suction well settlement.................*223
Details, small, checked by diagram......h*738
DETROIT
  Bridges, see Bridges, Detroit
  City-planning progress 802
  Collapsible forms used in pouring walls of deep circular pits..............h*1030
  Consulting committee for big sewer program n154
  Contracts for four miles of steel water mains n694
  Cross-city thoroughfare to relieve congestion *1116
  Filtration plant, new (T. A. Leisen)...*1194
  General Motor Co.'s Durant Building keeping track of excavation.........h737
  Public contract for sanitarium on cost-plus minus penalty basis..........n932
  Sewer construction curves lined accurately to templet in tunnels (A. L. Sears) h*737
  Street railway project, work started....n838
  Subway grade crossings obviated.......n301
  Votes to build municipal street-railway system n792
Detroit Engineering Society votes to join "comprehensive organization"..........n933
De Voe, P. K., on lug or lugless brick?.... 618
Diagrams, arch reaction influence lines by deflection diagrams (C. B. McCullough) *675
  Checks completion of small details....h*738
  Concrete-beam, with top and bottom steel (A. G. Hayden)......*634, (R. R. Martel) letter *880
Diehl, G. C., on Is town efficient unit for any highway administration? 1062
  On lug or lugless brick?.............. 618
District of Columbia, see Washington, D. C.
Ditch dug to receive surplus excavation from trench.............................h*105
Dittoe, W. H., on what risks should cities take in installing relatively untried processes?.........................e114, 133
Dollar, value of (Sober)...letter 98, (R. L. Sites) ....letter 101
Douglas fir ties, relative durability....... 976
Downes, J. R., on utilizing Imhoff sludge on land at Plainfield sewage works.... 859
Drafting, half-round strip protects tracings (C. Nye)...........................h*929
Drafting, small loose-leaf photos replace big blueprints (C. W. Geiger)...........*959
  Structural, and design of details, book by Bishop, reviewed by R. Fleming.....1215
Draftsmen, union, expelled from Pittsburgh Chapter, A. A. E.........................n789
Dragline excavator, car-loading hopper for (R. E. Post)...........................n*979
  From stiff-leg derrick, makes railway fill h*151
  Loads scow anchored in channel it dug (A. I. Silander)......................h*55
  New *936
DRAINAGE, See Also LAND RECLAMATION
  Ditches, maintenance work on, studies of (H. M. Lynde)..........................*713
  Engineer-appraisers for irrigated or drained lands 1100
  Illinois conference......................n397
  Illinois Drainage and River Improvement Association formed n691
  Salt River Irrigation Project, results and proposals 921
  Sand sluiced to centrifugal pump......h834
  Swamp drained by conduits under culvert floor, Canal Zone, (R. C. Hardman)..*925
  Tile, for seepage relief, on irrigated land, Twin Falls, Idaho (R. M. Adams).... 961
  Timber clearing in drainage districts.... 616
  Wisconsin University assists in......... 897
  Works maintenance in Minnesota (E. V. Willard) ....letter 54
Drane, W. H., engineer of highways, Smith County, Tennessee n253
Drawings reduced or enlarged by straightedge and revolving boards (G. H. Gilchrist) *377
Dredges, hydraulic passage over canal permitted by removable flume............h248
  Portable repair plant for... ....h295
Drilling 484 ft. in 432 hours.............1095
Drilling holes in frozen ground (L. G. Hall) ....h542, (T. Tremblay)...............h738
Drill steel sharpener, improved..........n*794
Drills, efficiency requires good blacksmithing (D. E. Dunn)......................h*1126
  Submarine, on high frames for land work h*152
Drinker, Dr. H. S., retires as president of Lehigh University................ .n1082
Drinking water, fountain treated by violet rays (W. L. Decker)...................*572
Drop hammers used in driving steel sheeting in hard ground (C. A. Lee)..letter 1077, also *748
  Works under water on bridge foundation piles h*393
DRY DOCKS
  Balboa, C. Z., three ships docked at once 1100
  Boston, device maintains true batter in masonry wall (H. D. Hurley) . .h*638
    Government pays for.. .. n982
  Caisson gates, structural design (E. E. Halmos) *89
  Commonwealth, at Boston, opened. n107
  Construction complicated by soft ground (C. A. Lee)............*748 letter 1077
  Large for St John N B. 435

*illustrated; e, editorials; h, hints; n, news notes; a, abstracts

Page

- Duffey, E., responsible for statements in Engineering News-Record, not J. N. Carlisle n107
- Duluth, Minn., may condemn for residential district 571
- Dunn, D. E., on good blacksmithing needed in drilling h*1126
- Duquesne, Pa., bond issue fails....n1226
- Durant Building, Detroit Keeping track of excavation progress h737
- Dustproof state health laboratory rooms..1063
- Dutton, E. R., on lug or lugless brick?.... 618
- Dynamite cost reduced by mortar tamping.. 946

E

- Early days in the North Country (H. K. Wicksteed)....513, 670
- Earth, bearing power, tested by Public Roads Bureau....1117
  - Fills, shrinkage..615, a637, (E. E. R. Tratman) e1229, 1256
  - Foundations and science....e215
  - Soil swelling observed in pile driving (W. T. Quinn)....letter *1124
- Earthwork in loose fills, shrinkage of (E. E. R. Tratman) e1229, 1256
- East Chicago, Ind., Sinclair Refining Co., temporary trusses support roof forms (P. S. Toney) h*1270
- East Cleveland, Ohio, zoning ordinance, part of, upheld....1019
- Eastern Connecticut Power Co. station at Montville, high concrete chimney built on steel roof.... 317
- Eastern Europe, Red Cross sanitary survey outlined 807
- Eastland County, Texas, to open bids on $5,000,000 road job....n1033
- Eastman, G., donor of $4,000,000 to Massachusetts Institute of Technology......n154
- Ebner, G., on higher duty of irrigation water 828
- Eccentric loading in rigid frames (F. E. Richart) *331
- Eckert, N. A., on frogless switch sidetracks muck cars at tunnel heading.........h*489
- Eckbard, Prof. G. F., on large highway bridge wrecked by cake ice pressure, Brattleboro, Vt. *902

ECONOMICS

- Cost of living and prices....1103
  - Cost of living increases 73 per cent..18; 82 per cent.... 578
    - Relation of war taxes to (R. B. Everett).......letter, with editorial comment, 832
  - Dollar, value of (Sober)....letter, 98; (R. L. Sites)....letter 101
  - Dollars not proper measure of exports (G. O. Smith)....letter 148
  - Industrial situation e1
  - Labor proposes broad program....n693, e699
  - Leaf from Lenin's policy on manpower (F. A. Kellor)....517, (D. E. Gelwix) letter 787
  - Prices and cost of living....1103
  - Proletarian mind, the (P. B. McDonald) 1042
  - War taxes and cost of living (R. B. Everett)....letter, with editorial comment 832
- Edison medal for 1919 awarded to W. L. R. Emmet....n156

EDUCATION

- California Institute of Technology, new name of Throop College............n885
- Canadian demands in............e354 a369
- Canadian Pacific Ry. offers McGill scholarship n984
- Carnegie Foundation report....1141
- Columbia University, progress in engineering education a823
- Co-operative system, at Harvard, etc. ....e698, n739 (F. H. Plaisted) letter 1172, n1129
- Course in how to use the mind........1011
- Engineering:
  - And life (C. T. Brady, Jr.).......... 31
  - Instructors' pay (see Engineers, Pay)
  - Some forces in (H. A. Watt)........ 771
  - Extension courses at University of California....n443; at Colorado University n110
  - Students at University of Illinois.... 130
- Enrollment in schools greater than in 1917 .... *10
- Highway engineering fellowship offered at University of Michigan............n983
- Highway inspection methods taught at Oregon State College (S. H. Graf)....1012
- Industrial course at Penn. State College.n1129
- Iowa State College semi-centennial....n1178
- Management engineering course at Columbia University................n346
- Massachusetts Institute of Technology and consulting work...............e259
- McGill scholarship offered by Canadian Pacific Ry. n984
- More engineers needed....n1082
- Navy engineering classes resumed......n157
- Professional spirit in engineering education (C. R. Mann) 1242
- Purdue annual road school to cover 18 subjects n108
- Record of 1919.... e2
- Salaries of educators, $50,000,000 gift for n107
  - A. A. E. appoints committee on......n253
  - Faculty, Illinois University..........e939
- Some forces in (H. A. Watt).......... 771
- Structural designing, call for practical view in teaching (E. Godfrey)...*948, corrections 1068
- Throop College becomes California Institute of Technology................n885
- University of Colorado extension engineering courses n110
- University of Illinois, engineering students at.... 130
- University of Illinois, salaries of faculty e939
- Year (1919) in.... e2
- Edwards, Governor, of New Jersey, proposed reorganization of State Highway Department e353
  - Vetoes New York port treaty bill......n883
- Edwards, H. H., on brick laid on 1-in. base good after four years..........1207, e1229
- Electric railways, screw spikes on........1191
- Electrification of railroads, fuel saving by.1107
- Electrolysis, steel water main, St. Louis, Mo., is serious.... 911
- Elevator, grain, Portland, Ore., foundation troubles....e161, *176, (A. M. Crain) letter 485
- Elicker, C. S., on topographic survey of Flint, Mich...........*700, correction 878
- Elliott, H., director U. S. Chamber of Commerce n1079, e1085
- Ellis, G. H., on car for current-meter gaging stations *80
- Elmira, N. Y., bridge across Chemung River, competitive designs and bids asked.....n983
- El Segundo, Cal., oil reservoirs, embankment and concrete work....*905
- Embankment and concrete work for large oil reservoirs, El Segundo, Cal.........*905
- Embankments, scour prevented by use of wire bags filled with cobbles (A. A. Northrop) h*834
  - Shrinkage of loose fills in (E. E. R. Tratman) 1256
- Emergency Fleet Corporation makes motion study of side launching....*470
- Emigration, Greeks return to native land.. 870
- Emmet, W. L. R., awarded Edison medal..n156
- Employment Bureau, Engineering Societies', work 48
- Employment service, free, of Colorado society indorsed (W. M. McMechen)..letter 148
- Engineer-appraisers for irrigated or drained lands....1100, e1133
- Engineer-managers in operation of irrigation works e163

ENGINEERING, see also ENGINEERS

- And adventure (P. B. McDonald)....17, (Incog.) letter 98, (Incog. No. 2 and P. B. McDonald) letters 194, (T. F. Quilty) letter 292
- Art and science in.... 620
- Coming year (1920).... e2
- Detail, art in....e1085
- Education and life (C. T. Brady, Jr.).... 31
- Factors in irrigated farm appraisals....1100
- History found in advertisements....... 526
- History of, needed (R. Fleming)....322, (C. Prelini) letter 580, (E. Low) letter *586, (H. S. Jacoby) letter 782
- Management engineering course at Columbia University n346
- Municipal, see Municipal Engineering
- Organization ultimate aim of..........a918
- Precarious position.... e3
- Present position.........673, correction 957
- Publicity—why and how (C. B. Smith) a1025
- Record of 1919.... e1
- Service as commodity, advertise (H. M. Holmes)....589, (P. M. Fogg) letter, with editorial comment 684
- Service, law of supply and demand..... 637
- Titles, this winter's styles in......e66, n106
- *Engineering and Mining Journal* offers prizes for shaft-sinking record h1174

ENGINEERING COUNCIL

- Action in Pittsburgh bridge case unauthorized, says Am. Soc. C. E. board e1134, n1175
- American Railway Engineering Association will join....n837
- Approves universal military training and reserve n598
- Asks contributions....n153
- Asks societies to indorse salary classification n1224
- Committee on Classification and Compensation report.... 217
- Committee on licensing distributes model license law....n107
  - Letter to, by F. C. Shenehon, on relation of engineers to architects..... 174
- Committee's report on compensation of engineers e116, *117
- Military affairs committee named......n201
- Reports on design and construction of bridges, etc., by engineers or architects e1038, n1079
- Requests Chamber of Commerce to consider referendum on Public Works Department n205
- Salary classification indorsed by New York Municipal Engineers..........n1127
- To confer with members of Congress....n739
- Vote on Public Works Department....n1034
- Work and financing discussed by societies n249
- Engineering education, see Education.
- Engineering Foundation seeks endowments n1176
- Engineering Institute of Canada, convention n206, n296, e306, 318
  - Move to improve status of Canadian engineers n692
  - Ross, R. A., elected president.........n*345
  - To fix rates of pay....n080

ENGINEERING NEWS-RECORD

- Book prices resumed in.... 388
- Highway number, Feb. 5....e257
- Issue for transportation engineers......e497
- History and editorial staff.... 1
- Mehren, E. J., sails for Europe to investigate conditions n883
- Railroad issue, Mar 11
- Read in House of Representatives.....e1182
- Water-works number, June 17.
- *Engineering Progress*, new monthly in English, Spanish and German 1217
- Engineering Society of Wisconsin meets...n447
- Engineering Standards Committee, see American Engineering Standards Committee

ENGINEERS, see also ENGINEERING

- American, in foreign countries, opportunities for (F. Lavis)....a1024
- American to build pipe line in France..n982
- And architects, as bridge designers, see Architects
- And Public Works Department....e162, 169, (M. O. Leighton) letter........ 292
- And railway problem..........e1230, 1260
- Architect, relation to (F. C. Shenehon).. 174
- Army, being organized into society.n394, e449
- Army, *The Military Engineer* succeeds *Professional Memoirs*....n492
- As railway executives e1229
- Assistant, on river and harbor work, bill to aid....n397
- British, higher rates for consultants...1186
  - "Who's Who" to be published....n1036
- "Business" and "professional" classification ("Business Engineer").....letter 977
- Business recognizes e1085
- Canadian, see Engineering Institute of Canada
- City, pay and service.........e746, e1086
  - Pay from engineer's point of view e938, 946
  - Pay of Sacramento filtration staff.... 80
  - Should attend National Conference on City Planning e745
- Colorado, classified.... 830
- Consulting, fee schedule, Kansas City district 878
- Consulting, fees, A. A. E. committee appointed n1272
  - Higher rates for, British....1186
  - One man's income and costs........e258
  - Retained as witness against client, ethics of case decided.... 670
- Co-operation, how shall it be effected? (C. E. Drayer)....letter 340
- Direct relief to New York freight tie-up.n1225
- Federal, classified as to duties and pay.. 780
- Fees, British, considered by Institution of Civil Engineers.... 978
  - Not excessive in Government housing (C. P. Chase)....letter 294
- Grade engineer a (W. S. Keller)...letter 639
- Hall of Fame, engineers for....e651
- Have they "one-track" minds?.... 246
- Highway, Massachusetts commission's, pay of....*224
- Highway, Tennessee—job or profession? (W. H. Drane)....letter 878
- How one became rich.... 592
- Ibañez's references to resented (E. Low). letter 1219
- Ills of, some, and remedies suggested (S. M. Swaab)..482, (H. W. Kenney) letter 1029
- Immigration policy, engineers and......e747
- Industrial Conference why not engineers on? (W. M. Butts)....letter 53, (J. B. Marcellus) letter 293
- Interest in public questions discussed by H. C. Hoover.... 418
- Irrigation works managers....e163
- Job or profession? (W. H. Drane)..letter 878
- Juniors caring for activities of.... 929
- Killed acting as switchman—J. W. Wilkinson n981
- Licensing:
  - Canadian model law drafted...n106, n981
  - Engineers of three states promote laws n348
  - Idaho examinations to be held..n493, n934
  - Institution of Civil Engineers (British) works for law....e601
  - Iowa law, early results.... 833
  - Minnesota law, recommendations....1115
  - Model law distributed by Engineering Council committee....n107
  - Nebraska bill considered by societies n1082
  - New York State law....n646, n789, n838, n886, n1031, e1037, correction 1096
  - Progress in 1919.... e2
  - Relation of engineer to architect (F. C. Shenehon) 174
  - Society of Engineers (British) objects to Institution as sole judge...... 872
  - Virginia passes certification bill......n647
- Looking at the other fellow's job......e889
- "Man-power," menace of (D. E. Gelwix) letter 787
- Military, being organized into society n394, e449
- Military, soldier-civilian co-operation.... e 450, (Col. G. A. Youngberg) letter 639
- More needed....n1092
- Municipal, see Engineers, City, also Municipal Engineering
- Or architects, to design bridge, see Architects
- Pay:
  - British engineers' fees.... 978
  - Chinese (R. F. Goodrich)....1021
  - City and state engineers' low pay shown by questionnaire.... 217
  - City engineer of Worcester, Mass., salary and service....e746
  - City engineers', A. A. E. proposes schedule 898
  - Comparison of work and salaries in Pacific Coast cities.... 18
  - Congressional committee reports......n595
  - Consultation fees, A. A. E. committee on n1272
  - County highway engineers proposed schedule 371
  - Engineering Council asks societies to indorse classification n1224
  - Engineering Council committees' report e116, *117
  - Engineering Council classification indorsed by New York Municipal Engineers n1127
  - Engineering Institute of Canada to fix rates n980
  - Engineering teachers', A. A. E. appoints committee.........n253; schedule, n1273

*illustrated; e, editorials; h, hints; n, news notes; a, abstracts.

Page
  Engineering teachers' (W. M. Wilson) letter 1124
  Federal engineers classified as to duties and pay 780
  Federal engineers' salary increases, proposed....561, 754, (A. Miedwig) letter 879
  Fee schedule for consulting engineers, Kansas City district.............. 878
  From engineer's point of view..e938, 946
  Higher rates for consultants (British).1186
  "Holier than thou" (F. W. Harris) letter 149
  How other professions are organized; effect on fees (C. W. Baker)........1250
  Income and costs.......................e258
  Increase arguments by Minnesota societies 1164
  Iowa salary increases............... 907
  Leader needed (F. W. Harris)...letter 149
  Massachusetts Highway Commission engineers' *224
  New York City engineers and officials discuss salaries n930, e938
  Precarious position of engineering... e3
  Railway engineers' salaries, progress in adjusting n60
  Sacramento, Cal., filtration staff salaries 80
  Should all engineers be engineers? (W. S. Miller)...............letter 149
  Some ills of the engineer, and suggested remedies (S. M. Swaab)..482, (H. W. Kenney) letter 1029
  Supply and demand law of......... 637
  Transit construction staff, New York City receives increase............n254
  Undergraduate on (B. M. Larrabee) letter 247
  Work faithfully—work with faith (W. W. Hagerty)....letter 437, (F. W. Harris) letter 591
 Pittsburgh civil engineers say architects should not design bridges......n544 (see also Architects)
 Present position........673, correction 957
 Profession or job? (W. H. Drane)..letter 878
 "Professional" and "business" classification suggested ("Business Engineer") letter 977
 Publicity for, J. H. McGraw on........1141
  Lesson in (Chicago bascule bridge) ....e890, (A. J. Hammond) letter with editorial comment 1076
  Should advertise service (H. M. Holmes)...letter 589 (P. M. Fogg) letter, with editorial comment 684
 Qualifications discussed by New York Municipal Engineers n1127
 Question candidates for public office...n1129
  A. A. E., hold second conference.... 633
  Classification, protest against........n691
  Issue for, Mar. 11
  Manual labor during strike..........n885
  Special training for................a657
  Task ahead of.......................e449
 Railway Labor Board, engineers named for n740
 Record system suggested by Doctors' (E. Judson) 875
 Registration, see Engineers, Licensing
 Relation to architect (F. C. Shenehon) 174
 Relations to military affairs discussed by Am. Soc. C. E.......................n201
 Responsibility in social problems.......a366
 Retired, invited to enter consular service e66, n106
 Salary, see Engineers, Pay
 Should all engineers be engineers? (W. S. Miller) ....letter 149
 Should they pay to improve status? (M. Kincaid) ....letter 340
 Social function of, lectures on.........n157
 Soldier-civilian co-operation..e450, (Col. G. A. Youngberg) letter 639
 Spokane, how affiliated (J. C. Ralston) e401, 436
 Status of (E. M. Goldstine)......letter 343
 Suspension, in Chicago; societies make investigation e937
 Technical writing.......................1027
 Testing, meet...........................n492
 Titles, this winter's styles in......e66, n106
 To design industrial buildings (M. Thompson) ....letter 585
 Tracings, rights in, of engineer and client ("Engineer") ....letter 685
 Transportation, issue for Mar. 11
 Two classes.......................... 618
 Unionization: (see also Engineers, Pay)
  leader needed (F. W. Harris)....letter 149
  Pittsburgh Chapter, A. A. E., expels union draftsman n789
 Westminster Abbey, engineers in (E. J. Mehren) 1170
 Wood, Gen. L., views on the engineer.... 577
 Work and salaries in Pacific Coast cities 18
 Writing, technical 1027

Engineers' Society of Western Pennsylvania disapproves entrusting bridges to architects 223
  Wants engineers to pass upon architects' bridge plans n300

ENGLAND
  And direct action......................e551
  And foreign trade......................e551
  Engineers, see Engineers, British.
  Highways, random observations (E. J. Mehren) 1207
  Highway classification..........e650, n691
  Hours of labor and wages............ 192
  Ministry of Transport, views upon operation 659
  Motor vehicle taxation, proposed.......1098
  No Bolshevism in......................e551
  Railroad work in..................... 422
English, Spanish and German monthly, *Engineering Progress*................1217
Enright B. sues for $57,807 additional compensation n741

Epps F. W., on through concrete arch bridge to give large waterway, correction 183
  On turntable for trucks h*979
Equation nomographic solutions of cubic (S. Okabe) *1249
Equipment rental, estimating...........h1126
Erie, Pa., flood-control project, progress and costs (F. Gannett) *852
Erie, R.R., R. S. Parsons appointed general manager n*983
Erosion, bank, checked by retarding jetties 612
Error, comedy of an (H. C. Ives and G. B. Zahniser) ....letters 53
Etching, deep, and rail defects.......... 573
Ethics case decided by Institute of Consulting Engineers...................... 670
Evans, J. W., on what risks should cities take in installing relatively untried processes? e114, 134

EXCAVATION
  Assisted by belt conveyor.............h788
  Keeping track of progress on General Motors Building, Detroit............h737
  Navy Yard, Philadelphia, dry dock, soft ground complicates construction (C. A. Lee)..................*748, letter 1077
  Surplus, from trench, ditch dug to receive h*105
  Trench, expedited by inclined skids...h*1174
Excavator and crane, convertible, Bucyrus Co. n*936
  Dragline, from stiff-leg derricks, makes railway fill.......................h*151
  Dragline, new........................n*936
Exchange rates and foreign trade...e353, e551

F

Factory roof, decay checked by proper heating *578
Falling loads on floors, dangerous stresses from (J. W. Ledoux) 873
Fame, Hall of, an engineer for..........e651
Faris, R. L., on equal-area projection of sphere an aid to mapping *1204
Farm appraisals, engineering factors in irrigated farms 1100
Farming problems discussed by agricultural engineers n109
Fay, Spofford & Thorndike, engineers for Springfield, Mass., bridge n202
Federal enginers classified as to duties and pay..780; new salary schedules urged. 561
Federal Highway Council urges road plank in party platforms n1033
  Urges snow removal from roads...... 32
Federal road district new, formed........n302
Federation of American Engineering Societies, see Societies, Federation, etc.
Fence posts pulled by tractor (H. H. Sitterley) h*248
Ferry-boat swing bridge 726
Field manual for Idaho highway department 333
File, catalog, an efficient (R. G. Roesch)..1165
Fill, earth, shrinkage of.....615, a637, (E. E. R. Ttratman).........e1229,1256
  Hydraulic, pipe turned often to equalize wear h295
  Railway, made with stiff-leg derrick dragline h*151

FILTERS
  Cleaned by water jets and sand blast St. Louis (C. M. Daily)........e1181, *1198
  Control of operation by Illinois........ 103
  Detroit, new 350-million gallon water filtration plant (T. A. Leisen).......*1194
  Improvements and reconstruction, Flint, Mich., water-supply *1189
  Pressure, on gravity supply, Lynchburg, Va. (R Messer and A. S. Holway)..*1205
  Sand, building up e1181
  Sandwasher evolution, Toronto (W. Gore) e1181, *1192
  State supervision, results of 922
  Water, instruction for Texas operators.n302
Filtration, water, cost at Washington, D. C. 1054
Filtration plant, largest at Detroit (T. A. Leisen) *1194
Filtros plates successfully cleaned 754
Financier characterizes contractor a233
Findley, M. G., on piledriver has double set of leads h*881
  On progress on New Orleans inner harbor-navigation canal *808
Finland, new highway laws 1120
Fir paving block specifications adopted by wood preservers n396
Fire prevention taught in schools........1214
Fire protection equipment and pumps for large buildings 1020
Fire protection for Seattle oil pier......1204
Fires in treated bridge floors 779
Fleming, D. H., on hanging forms for curb work h*638
Fleming, R., on need for a history of engineering....322, (C Prelini) letter 580, (E. Low) letter *586, (H. S. Jacoby) letter 782.
  On stray points in structural steel design *1041, e1085, 1104
  Review of "Structural Drafting and Design of Details" (Bishop)..........1215
Fletcher-Smith bill for land reclamation...e650
Flint, Mich., topographic survey of (C. S. Elicker ....*700, correction 873
  Water supply, filter improvements and reconstruction *1189
Floc formation speeded by air agitator 890

FLOODS AND FLOOD PROTECTION
  Bridge foundations, small, carried away..e987
  Colorado River danger passed n1223
  Columbus, Ohio, surveys (R C. Chaney).*906
  Emergency engineering after Georgia flood (C. E. Wideberg) *431
  Erie, Pa., progress and costs on project (F. Gannett) *852
  Georgia emergency engineering after (C. E. Wideberg) *431
  Hopkinsville, Ky., detaining reservoir proposed n930
  Indianapolis approves $2,000,000 protection work n1131
  Kaw River protection problem 920
  Miami works, see Miami Flood Protection Works.
  Passaic River Valley, channel improvement on upper Passaic River 770
  Present status (C. B. Burdick)......... 15
  Protection reservoir for Decorah, Iowa..*565
  Rio Grande, lower, bridges and gagings on river (B. Wilson and A. J. Henry) letters 339
  River regulation in new aspect e104
  Worcester water-works reservoir drawn down against spring floods (G. W. Batchelder) 762
Floor block, patent sought on n794
Floors, dangerous stresses on, from falling loads (J. W. Ledoux) 873
  Raised by ice inside cast-iron column (C. Balderston) *1166
  Tie rods in, *notes on spacing (R. Fleming) *1040, e1085, 1104
  Two-way tile and concrete, stress-deformation tests *1118
Flows, underground, cut by Alpine tunnel; their restoration *1054
Flume, deer ladders a necessity in........*950
  Life of, prolonged by roofing paper lining *131
  Metal quickly erected from pile scaffold h*1078
  Removable, over canal permits passage of hydraulic dredge h248
  Settled restored to level by derrick traveler h*929
Foreign countries, opportunities for American engineers (F. Lavis) a1024
Foreign exchange e353
Foreign Fields, Notes From, see Notes From Foreign Fields.
Foreign Trade, see Trade, Foreign.
Forest fire patrol and mapping, airplane for, in Oregon 224
Forests, national, $450,000 appropriated for roads, etc. n693
  Water supplies from 289
Forest Products Laboratory tests on water and moist air for absorption tests....1004
  To celebrate tenth anniversary n740
Forest reserves roads, campaign for large appropriation n157
Forestry, national, state and municipal... 473
  Station for California University......n249
Forest Service, United States, Col. W. B. Greeley to succeed H. S. Graves.......n597
Forests, snow and water-supply (J. C. Stevens)...letter 150, (T. D. Coffin) letter 392.
Forms, see Concrete Forms.
Foster Lieut. H. A., on rectangular coordinates used in surveys and maps... *962, *1006
  On triangulation simplified by Army coordinate system *1006
Foundation Co., New Orleans shipyard, heavy timber framing *1016

FOUNDATIONS
  Caisson-inclosure method used in building Assay Office substructure in quicksand (T. K. Thomson) *165
  Clay, blue, troubles with (L. B. Alexander) ....letter 195
  Concreting plants, two, for large area Granite City, Ill *1107
  Dry-dock construction, soft ground complicates (C. A. Lee) .....*748, letter 1077
  Earth, and science e215
  Pinch piling at Portland, Ore., grain elevator....e161, *176, (A. M. Crain) letter 485.
  Troubles at Portland, Ore., grain elevator....e161, *170, (A. M. Crain) letter 485.
  Underpinning, skillful checks warehouse collapse, Chicago (G. F. Paul)......*945
Founder Societies meet with Western Society of Engineers e841, n883
Frames, rigid, eccentric loading in (F. E. Richart) *331
Framing, steel, for Public Hall, Cleveland..*414
  Of narrow building *913

FRANCE
  Bibliography, war number 322
  Highways, signboards for 923
  Lumber, use of 1208
  No Bolshevism in e551
  Pipe line to be built by American engineers n982
  Railways, reconstruction 136
  Reconstruction, figures on 290
   Not for American engineers and contractors n59
   Progress 136
   Work slow 1113
  State aid for cheap dwellings 1112
Francis, C., with Lieut. W. M. Angus, on leaky cross-connection located by alkali test e1181, *1187
Frankinhoff, C. A., on pipe pusher cuts cost of under-pavement cable conduits. h489

FREIGHT
  Blockade on railways..........e988, e1037
  Car shortage questionnaire, Associated General Contractors'................n1274
  Congestion, New York City, belt line suggested 1020

*illustrated; e, editorials; h, hints; n, news notes; a, abstracts.

Page
  Gravity Yard for Michigan Central at Niles, Mich. *81
  Handling equipment, Port of Seattle (G. F. Nicholson) *37, e65
  Handling facilities at planned Lehigh Valley terminal, New York *970
  Motor trucks used for Kern River Project *868
  Motorized freight cuts terminal costs.... e498, *508, e889
  New York City congestion, belt line suggested 1020
  Engineers direct relief n1225
  Pier at Seattle, Wash., new, ease of operation governs design (G. F. Nicholson) *1101
  Problem, New York City e601
  Terminals, congestion and motor transfer e498, *508, e889
    Municipal, Portland, Ore. (W. P. Hardesty) *179
    Problems (Col. W. J. Wilgus)..e889, *901
  Wharf-house for variable rivers (G. W. McAlpin) *947
Friction heads for water supply for highway construction (R. E. S. Geare)....h928
Fritz, John, medal for Orville Wright ...n932
Frozen ground, drilling holes in (L. G. Hall)..........h542, (T. Tremblay) h738
Fuel saving by electrifying railroads......1107
Full day's work, industry's need (F. S. Parrigin) .... letter 195
Fuller, G. A. Co., buys shipyard from Shipping Board n202
Fuller, G. A. Co., to erect office buildings in Tokio n597

G

Galveston, Tex., grade elevation recommended 1238
Gannett, F., on progress and costs on Erie Pa., flood-control project *852
Gantry, high, used for handling heavy members of large bascule *79
GARBAGE
  Collection and hog feeding, and refuse collection, Salt Lake City (S. J. Truman) 959
  Collection should be done by city public works not health department....... e1229
  Disposal, Philadelphia, ... 1196
  Feeding in Baltimore, Newark and Buffalo, summary of contract terms..... 416
  Feeding to hogs at St. Paul 289
  Memphis, Tenn., to have new system ...n598
  Paper-wrapped, makes trouble ...907, e937
  Prices for two years at Army camps (F. C. Bamman) 230
  Reduction plant, Rochester, N. Y., and elsewhere e257, n298
  St. Louis contract renewed n741
  Washington, D. C., municipal reduction works, first year's operation (F. C. Bamman) *908
Garbage-fed hogs in Army camp, philosophic reflections on 72
Garford Motor Truck Co. establishes transportation bureau n694
Gas holders lawful structures 325
Gas hose, specifications 91
Gate, paper, replaces clay in jointing cast-iron pipe 575
Geare, R. E. S., on friction heads for water supply for highway construction..h928
Geen, B., president British Society of Engineers, on present position of engineering. 673
Geiger, C. W., on small loose-leaf photos replace big blueprints *959
  On timber track takes spoil from basement h*788
General Electric Co. leases Remington war plant n694
General Motors Building, Detroit, keeping track of progress on excavation h737
Geological Survey, United States, to map Haiti n301
Geologist as engineer 1155
George, E. E., on estimating manhole costs.*231
Georgia, hydro-electric projects promoted by Municipal League 825
German, English and Spanish monthly, *Engineering Progress*....... 1217
Gibb, H. M. on an impact formula applicable to ballast and concrete bridges..*874
Gibraltar Dam, see Dams, Gibraltar.
Gilchrist, G. H., on drawings reduced or enlarged by straight-edge and revolving boards *377
Girder connections, eccentric (C. L. Carman)..letter 99, (W. M. Wilson) letter 100, (W. R. Davis) letter *342, (T. S. Needels) letter *343.
Girders, plate, design, etc. (R. Fleming) *1040, e1085, 1104
  Steel, incased by concrete; self-sustaining forms for (C. A. Peck) h*688
  Stresses on (E. Godfrey) *948
Godfrey, E., on call for practical view in structural teaching......*948, corrections 1068, (C. T. Morris) letter 1172, (C. C. Hulbert) letter 1222, letter by E. Godfrey, 1268.
  Review of "Retaining Walls"....... 1026
Goethals, G. R., on unwatering lock site of New Orleans harbor canal *940
Goethals, Gen. G. W., discusses Hudson River vehicle tunnel e697, 729
Goethals, Maj. Gen. G. W., in new firm..n1274
Golden Gate, depth of water 1043
Goldmark, H., in Goethals, Wells & Co...n1274
Goodkind, M., on strengthening county bridge to carry motor trucks....... *617
Goodrich, R. D., on pay of Chinese engineers 1021
Good Roads Congress, annual....n1129, n1226

Page
Gore, W., on sandwashers for drifting-sand water filter, Toronto e1181, *1192
Government business methods scrutinized.n155
  Housing, engineering fees not excessive (C. P. Chase) .... letter 294
  Needs reorganizing e889
  Pays for Boston dry dock n982
  Purchasing, centralized (book reviews). 784
Grab buckets, car-loading hopper for (R. E. Post) h*979
Graf, S. H., on highway inspection methods taught at Oregon State College 1012
Grain, elevator, Portland, Ore., foundation troubles ....e161, *176, (A. M. Crain) letter 485
Grand Trunk Ry. management committee named n1131
Granite, waste granular, made into brick.. 963
Granite City, Ill., concreting plants, two, for large foundation area, St. Louis Coke & Chemical Co. *1107
  Construction work on outlet sewer in soft soil *337
  Large combined outlet sewer 461
Gravel and sand storage, plant for (G. W. McAlpin) h*928
Gravity freight yard for Michigan Central *81
Gray's Lake-Volo highway, Illinois, construction methods *1163
Great Britain, highways, advisory committee appointed n596
  Highways, untried methods needed.....1065
Great Central Ry., England, retaining wall in deep cut displaced by slide....... 870
Great Lakes regulation, by Niagara dam (F. C. Shenehon)..e305, *308, correction 512
Greeks return to native land 870
Greeley, Col. W. B., to succeed H. S. Graves as chief forester n597
Green, R. M., on determining bitumen content in bituminous concrete 871
Greenheart, resistance to marine borers.... 704
Gregory, C. E., on operating results of Dyckman Street, New York, sewage-screening plant .171, corrections 526, 787
  On what risks should cities take in installing relatively untried processes?.. e114, 133
Gregory, Prof. J. H., appointed consulting engineer, Columbus, Ohio, water-works extension n982
Ground, frozen, drilling holes in (L. G. Hall)..........h542, (T. Tremblay) h738
Grout injection and concrete plug close tunnel leak, Modderfontein, South Africa..h1030
Grouting tunnels and shafts, precautions in h344
Gypsum, cement plaster on 1072

H

Halifax, N. S., universal metering recommended n789
Hall, L. G., on drilling holes in frozen ground....h542, (T Tremblay)....h738
Hall of Fame, an engineer for....... e651
Haiti to be mapped by United States Geological Survey n301
Halmos E. E., on structural design of caisson gates for dry docks....... *89
Hamilton, Ont., harbor, report on....... n154
Hammers, drop, better than steam in driving steel sheeting in hard ground (C. A. Lee)....... letter 1077, also *748
  Works under water on bridge foundation piles h*393
Hancock-Dollar Bay highway, Michigan, night work with artificial light....... h393
Handley, W. Va., shallow pit coaling station for Chesapeake & Ohio....... *520
Hangar for dirigibles, Lakehurst, N. J., largest in world....... *892
Hansen, P. J., on loading test of 18-foot circular concrete grain bin....... *316
Hanson, O., "Americanism vs. Bolshevism" (book review)....... 784
Harbors, see Ports and Harbors
Hardesty, W. P., on municipal grain and freight port terminal at Portland, Ore..*179
Harding, Brig. Gen. C., retired....... n*789
Harding, H. M., on driving piles through ice h*882
Hardman, R. C., on bomb and bullet proof magazine has double roof, Panama..*998
  On large concrete oil tank built for Panama Canal *380
  On per capita water consumption in Canal Zone and City of Panama....*1099
  On swamp drained by conduits under floor of culvert, Canal Zone....... *925
Harris County, Texas, ferry-boat swing bridge 726
Hartford, Conn., underground structures laid haphazard....... *170
Hartford-New London trunk line, contract let n694
Harvard University, co-operative system adopted....... e698, n739
Hatton, T. C., on activated-sludge plant for Milwaukee e989, *990
Haulage, industrial, prizes awarded in Lakewood treatise contest....... n840
Hawaii, ground water to be studied.....n156
Hawaii, rain-gage, 900-in., on peak of Kauai 1166
Hayden, A. G., on concrete-beam diagram with top and bottom steel....*634, (R. R. Martel) letter *880, (F. H. Burnette) letter 1173
Health, Public, see Sanitation
Heating, proper, checks decay of timber roofs *578
"Hen and the egg"....... e987
Henry, S. T., on Through the Panama Canal 727
Herlihy, F. J., on charts tell cost of concrete paving....... e257, *261
  On construction trestle plans and quantity tables (F. J. Herlihy)....e843, *844
  On contract clauses which disregard square deal....... 457

Page
  On rental values for construction equipment 125
Herrold, G. H., heads city planning board, St. Paul....... n597
  Managing director St. Paul, Minn., planning board n931
Herschel, C., on need for endowed American hydraulic laboratory......a1239, e1230
Herschel weir for gaging in open channels a*710
Hetch Hetchy project, see Water Supply, San Francisco
Hewes, C. E., on new Alameda, Cal., zoning ordinance 46
Hickok, C. E., on water project for Oakland, Cal., district n1223
Higgins, T. C., on temporary power station aids in hydro-electric development....h*542
Highway transport discussed at motor truck show n107

HIGHWAYS (see also names of States)
  Administration and taxation—Is town efficient unit? (G. C. Diehl)....... 1062
  Alabama, bond issue voted....... n493
  Alaska, Army appropriation for....... 919
  Allied debt to be used for building roads, bill proposes....... n1178
  American Road Builders' Association, annual convention n397, e402
  American Society of Civil Engineers appoints highway committee....... n109
  Appeal to highway contractors (R. G. Collins, Jr.)....e116, 122, (L. E. Gaskins) letter 341, e452
  Appalachian Good Roads Association to meet n157
  Appropriations for investigations....... n741
  Army motor equipment, excess, allotted to states 924
  Ashokan, construction and maintenance (G. G. Honness)....... *652
  Asphalt, "boils" caused by metals in fills beneath 426
  Asphalt constructed on macadam base...*372
  Asphalt interests object to New York's highway policy....... n1036
  Asphalt, Michigan, two miles a month averaged *432
  Association of Mississippi Valley State Highway Departments to discuss concrete roads....... n250
  Atlantic City, N. J., hydraulic-fill highway across salt marsh....... *192
  Atlantic County, New Jersey, lets costly contract n981
  Barrett Co. plans lectures....... n301
  Base, value of top soil as base (D. S. Humphrey)....566, (G. E. Mattingly) letter 833
  Bids, Pennsylvania....... e353
  Bituminous pavement repair, old material for *290
  Bond issues:
    Alabama votes for....... n493
    Authorized issues total nearly $500,000,000 .... n202
    Billion for road work possible....... 802
    Cache County, Utah, reconsiders....n1175
    California, assures road work....... n547
    California, not much demand for....n297
    Ohio work blocked by decision......n1036
    Texas counties, four, vote $450,000..n741
  Brick:
    Brick laid on 1-in. base good after four years (H. H Edwards)....1207, e1229
    Lug or lugless? (P K. De Voe and others) 618
    Lugless, experience with (W. C. Holmes) .... letter 196
    Old, resurfaced (E. Stingel)....... 861
  Bridges, see Bridges, Highway
  British, advisory committee appointed..n596
    To be classified....... 807
    Untried methods needed....... 1065
  Building costs, how lower? (R. G. Collins, Jr.).....703, (B. H. Piepmeier) letter 1076
  Bulletins to be issued Massachusetts..n1130
  Bureau of Public Roads begins subgrade study....... e1037, 1072
    No great enlargement....... n153
    To classify roads....... n546
  California, asphaltic concrete (C. S. Pope) 1095
    Book by B. Blow....... 1216
    Construction assured by bond sale....n547
    Reinforcing concrete pavements on highways *1255
    State faces uncertainty in program...n297
    Work stopped....... n1273
  Canadian Government outlines policy....n346
  Chicago Sanitary District stops proposed work n204
  City pavements for county highway (J. Logan) 379
  Classification, English....... e650, n691
  Classification undertaken by Bureau of Public Roads....... 635, e650
  Columbia, concrete structures serve double purpose....... *334
  Community service in highway construction Mineral Wells, Tex. (W. W. McClendon) 1098
  Concrete:
    Aggregate proportions for equal strength concrete (A. N. Johnson)....e938, 964
    All-sand aggregate in Middle Western roads (T. L. Brockway)....... a573
    Asphaltic, as built in California (C. S. Pope) 1095
    Association of Mississippi Valley State Highway Departments to hold meeting on....... n250
    Asphaltic, laid on gravel base (E. F. Petersen) *277
    Bituminous and Waterbound macadam, rejuvenated (C. F. Puff)....... 922
    Bituminous, determining bitumen content (R. M. Green)....... 871
    Bucket paver, one trip takes full batch n*550

*illustrated; e, editorials; h, hints; n, news notes; a, abstracts.

Page
Highways (continued)
  Charts tell cost (F. J. Herlihy) .e257, *261
  Failure, etc., Maryland (J. N. Mackall) 914
  Fast building with concrete hauled four miles *280
  Four million dollar contract let by Arizona county n1271
  Home-made device for operating slab-finishing belt....................h*344
  Mississippi Valley states discuss......n348
  "Nail template" for highway thickness h*140
  New York State highways 67.5 per cent concrete......................... 290
  Old, macadam used to increase width. *461
  Old, widened at low cost, Milwaukee County, Wisconsin *848
  Pennsylvania bids.....................e353
  Plant for rapid progress.......... *28
  Proportioned aggregate hauled in ten-batch trucks.....................*1068
  Reinforcing concrete pavements on California highways *1255
  Resurfacing an old brick road (E. Stingel) 861
  Sack cleaning machine saves money. 1204
  Service tracks safely shifted to road slab five days old...............h248
  Stock piles, wide-spaced and wet haulage successful...................*1163
  Study of experience urged (F. G. Simmons) ....letter, with editorial comment, 1221.
  Traveling bin cuts cost of charging paving mixer.....................h*295
  Wisconsin program cut in half.......n930
  Wooden roller used in striking (S. B. Slack) h*1125

Condition bulletins, Massachusetts to issue n1130
Conditions shown by rainfall data..... 920
Connecticut, traffic on................ 506
Connecticut, Truck weight limit reduced to save soft roads.................n789
Construction:
  And motor-vehicle licenses (S. E. Bradt) 73
  Asphaltic concrete roads as built in California (C. S. Pope)..........1095
  Asphaltic concrete laid on gravel base (E. F. Petersen)...................*277
  Asphalt road constructed on macadam base *372
  Can rainy day hazard be eliminated?..e889
  Charts tell cost of concrete paving (F. J. Herlihy)...................*261
  Continuous, needed..................e890
  Costs how lower? (R. G. Collins, Jr.) ....703 (B. H. Piepmeier) letter 1076
  County highway surfaced with city pavements (J. Logan)............ 379
  Crown of concrete base checked by chalk line (H. H. Sitterley).......h198
  Developments in 1919 in use of machinery (C. S. Hill)............... 9
  Discussed by Am. Soc. C. E..........n644
  Friction heads for water supply (R. E. S. Geare) h928
  Home-made device for operating slab-finishing belt, Marshalltown, Iowa h*344
  In 1919 and lessons for 1920........ e5
  Industrial railways, continuity of operation essential to success (H. E. Breed) *273
  Machinery for highway construction, developments in 1919 (C. S. Hill) e5, 8
  Night work successful with artificial light h393
  Old concrete road, Milwaukee County, Wisconsin, widened at low cost...*848
  Old macadam used to increase width of concrete road......................*461
  Plank surfacing suggested for secondary highways (G. Kershaw) *1052, e1086
  Plant for rapid progress on concrete road contract...................... *28
  Program of 1920.....................e257
  Proportioned aggregate hauled in ten-batch trucks.....................*1068
  Reinforcing pavements on California highways *1255
  Resurfacing old brick road (E. Stingel) 861
  Sack cleaning machine saves money. .1204
  Stockpiles, wide-spaced, and wet haulage successful *1163
  Tamping templet expedites brick-road construction (F. A. Churchill).....*282
  Turntable for trucks (F. W. Epps)..h*979
  Two miles a month averaged on Michigan road *432
  Where is our program taking us? (J. N. Mackall)...................... 914
  Why is there no profit in? (R. G. Collins Jr.....e116, 122, (L. E. Gaskins) letter 341, e452
  Wooden roller used in striking concrete (S. B. Slack)..................h*1125

Contract lettings, Tentative plans for, Illinois n297
Contractors discuss work, Illinois.......n298
Contractors, large, seek reforms in contracting (C. S. Hill)............... 15
Contractors or "large" contractors for highway work? (D. W. Robbins)..... 583
Contractors, Wyoming seeks co-operation from 521
Contracts no bids in Pennsylvania, Ohio and New York on some contracts.. e551
  Selling plan secures bidders (J. Montgomery) *976
  Time between making of contracts and beginning of work..........e937, *949
Convict labor, Nebraska to try, for grading n1271
Co-operation from contractors sought in Wyoming 521
Co-operation in construction (L. E. Gaskins) ....letter 341
Co-operation of e649
Cost estimates standardized by Wisconsin e649, e650, 663
Cost of, high...........................e353
Costs, building, how lower? (R. G. Collins, Jr.).....703, (B. H. Piepmeier) letter 1076
County surfaced with city pavements (J. Logan)......................... 379
County, variable designs for systems (J. Y. McClintock)...................... 243
Curtailed construction, shall it be voluntary or enforced?................e451
Curbs, hanging forms for (D. H. Fleming) h*638
Cut in construction urged by engineers and contractors.....................n1081
Daily report on winter condition, Pennsylvania n61
Data to be given contractors, Montana, ahead of bid advertising.............n297
Design:
  Heavy-traffic road design places stress on drainage *284
  Inclined planes instead of curve suggested for surfaces.................*227
  Variable, for county systems........ 243
Destruction threatened by overloaded motor trucks (G. H. Pride)...e115 letter 149, (H. C. Boyden) letter 486, (H. E. Phelps) letter 831
Dirt roads, conditions shown by rainfall data, Arkansas.................... 920
Drainage and foundations (L. K. Zerbe) letter 639
  Heavy-traffic road design places stress on drainage....................*284
  Improper, and highway failures (A. A. Young) ....letter 486
Earth, sand for maintenance (N. S. Mullican) 943
Eastland County, Texas, to open bids on $5,000,000 job.....................n1033
Endangered by motor trucks, Arkansas engineer says.........................e1086
Engineering fellowships offered at University of Michigan...................n983
Engineering News-Record highway number e257
Engineers and contractors urge cut in construction n1081
Engineers county, proposed schedule.... 371
Engineers, pay of Massachusetts Highway Commission engineers................*224
English, classification...........e650, n691
  Problem 413
  Random observations (E. J. Mehren) 1267
Equipment bill fails.................n1274
Estimating, short cuts (F. J. Herlihy) e257, *261
Failure Bureau of Public Roads begins subgrade study e1037, 1072
Failures, and improper drainage (A. A. Young) ....letter 486
Federal aid:
  Engineer board appointed...........1128
  Funds, available................... 973
  Hearings on Townsend and other bills n153, n836, n982, 1169
  Highway Council urges road plank in party platforms n1033
  Why Federal aid will not build national system 336
Federal road district, new, formed.....n302
Field manual for Idaho department..... 333
Finances, Allied debt to be used for road building, bill proposes..............n1178
Finances, see Highways, Bond Issues
Finland, new laws 1120
Fir block specifications adopted by wood preservers n396
Forest reserve, campaign for large appropriation n157
Forms, hanging, for curb work (D. H. Fleming) h*638
Foundations and drainage (L. K. Zerbe) letter 639
France, signboards for.............. 923
Frost action on....e449, (A. A. Young) letter 591
Good Roads Congress, annual...n1129, n1226
Grade engineer, a (W. S. Keller)..letter 639
Granite block, blistered by flooding.... 128
Graph records progress of survey parties (R. T. Brown)........................*333
Hanging forms for curb work (D. H. Fleming) h*638
Hartford-New London trunk line, contract let n691
Hearings on bills before Senate committee.......................n932, n982
How build roads this year?...........e551
Hydraulic-fill, across salt marsh........*193
Idaho, field manual for highway department, Idaho....................... 333
  Program large.....................n1273
Illinois abandons 1920 program........n597
  Construction in 1919 (B. H. Piepmeir) e937, *949
  Contractors and officials discuss work.n298
Impact and wear on surfaces.... . .*723
Inclined planes instead of curves suggested for surfaces....*227, (H. J. Fixmer) letter *388
Indiana, commission reorganized......n1274
  Money tight for contractors.......n1274
  Partial payments on construction raised n1274
Industrial railways, see Highways, Construction
Inspection methods taught at Oregon State College (S. H. Graf)....... 1012
Inspector's handbook reviewed by H. E. Breed 388
International Road Congress...........e149
  Resumes bulletin n147
  United States may join.............n1226
  Membership in is urged by American Association of State Highway Officials executive committee n790
Investigations, appropriations for n741
Iowa divided into districts. n291
  Continuous construction needed......e890
  One-third of program under contract..n931
  Primary road fund of more than $5,000,000 ....n347
Kentucky, commission appointed......n1272
Lectures planned by Barrett Co.........n301
Lincoln Highway Association to build "ideal section"......................n1130
Lincoln, about $9,000,000 spent in 1919 325
  In New Jersey.......................1058
Load limit reduced to save soft Connecticut roads..........................n789
Location, economic, need for....(G. F. Syme) e354, 383, (F. W. Harris) letter 589 (R. C. Barnett) letter 641, (F. Lavis) letter 786
Macadam, light bituminous treatment for (C. A. Hogentogler)............. *44
  Old, reconstructed by two concrete strips *461
Machinery, use of; developments in 1919 (C. S. Hill)........................e5, 8
Main roads must be designed for freight traffic 481
Maine, Town road aid................ 97
Maintenance, developments in New York State *265
  Untried methods needed in Great Britain 1065
Map, special, aids bidders (J. Montgomery) *976
Maricopa County, Ariz., lets $4,000,000 contract n1271
Massachusetts, bulletins to be issued on conditions n1130
  Program totals $7,000,000...........n838
Materials:
  A. R. Hirst pleads for cars..........n983
  Investigation, increase for...........1365
  Portland Cement Association protests against limitations n1177
  Prices to be furnished to members by South Carolina Good Roads Institute n741
  Rates on interstate hauls reduced....n154
  Tests of; testing engineers meet......n492
Michigan, two miles a month averaged..*432
Middle Atlantic States program........1162
Mileage, state, contracted for.......... 439
Milwaukee County, Wisconsin, old concrete road widened at low cost.......*848
Minnesota, new construction suspended n1033
"Modern Roads" (Boulnois) book review 784
Montana; data to be given to contractors before bid advertising..............n297
Motion pictures to promote better roads, West Virginia.........................n157
Motor transport economics discussed at conferences n205
Motor vehicle weight, effect on roads discussed by Traffic Association.........e987
Moving pictures, see Highways, Motion Pictures
National Research Council names road committees n251
Nebraska, to try convict labor........n1271
New Jersey:
  Department proposed reorganization..e353
  Department to combat truck overloading n1035
  Department employees hold banquet..n110
  Engineers study future traffic........n204
  Lincoln Highway in..................1058
  Salaried commission proposed........n297
New York:
  67.5 per cent concrete.. 290
  Department to buy machinery, Commissioner Greene urges...............n302
  Developments in maintenance........*265
  Governor Smith asks funds..........n297
  No bids on some contracts..........e551
  Program suspended e938, n980, n1036
  Traffic data......................... 752
Night work successful with artificial light h393
North Carolina Commission, to issue monthly bulletin.....................n936
  Secondary, plank surfacing suggested (G. Kershaw) *1052, e1086, (H. J. Spelman) letter 1222
  Officials and contractors discuss plans, Illinois n61
Ohio, delay in construction urged.......n739
  No bids on some contracts...........e551
  Work blocked by bond decision......n1036
  Work not to stop...................n838
Oils, in Baltimore County, Md.......... 828
Ontario, plans made..................n299
Oregon engineers named... ....n302
  Starts move for large forest road appropriation n157
Paved only half width, pending funds..*471
Pavements, bituminous, old material for *290
Pavements, Oregon bill aims at patent pavements n347
Pavements, wood block treatment for saving (J. S. Crandell).............*968
Pennsylvania, bids e353
  Daily report on winter conditions ... n61
  No bids on some contracts..........e551
  Program n1177
  State leads in mileage contracted for.. 439
  State prepares to put own crews on construction n297
  Township rewards distributed........ 818
Permanent International Association of Road Congresses, see Highways, International Road Congress.
Philadelphia rejuvenated (C. F. Puff). 922
Plank surfacing suggested for secondary highways (G. Kershaw) *1052, e1086, (H. J. Spelman) letter 122
Postponement urged because of labor shortage (J. Wilkes) ....letter 1222
Problem of e3
Promotion, too much.................e1086
Public, get appropriations.............n741
Purdue annual road school to cover 18 subjects n108

*Illustrated; e, editorials; h, hints; n, news notes; a, abstracts.

Page
  Rainfall data show conditions.......... 920
  Repairs, Bureau of Public Roads begins subgrade study e1037, 1072
  Sand for earth road maintenance, North Carolina (N. S. Mullican).......... 943
  Secondary, plank surfacing suggested (G. Kershaw)..*1052, e1086, (H. J. Spelman) letter 1222
  Sheet asphalt—suitability of varying bases and costs (Capt. F. S. Besson) ....96, (A. W. Dow and F. S. Besson) letters 538
  Siskiyou grade, Oregon, paved only half width, pending funds...............*470
  Slab-finishing belt, home-made device for operating h*344
  Snow removal urged by Federal Highway Council 32
  Soils, subgrade, bearing power tested...1117
  South Carolina Good Roads Institute formed n741
    Graph records progress of survey parties (R. T. Brown)................*333
  Spokane County, Washington, program..n302
  Spring break-up....e449, (A. A. Young) letter 591
  State, Army equipment for......n303, n346
    Mileage contracted for.............. 439
  Streets, curb and gutter finisher, home-made h*592
    New form of street section adopted in Chicago (H. J. Fixmer)....letter *588
  Subgrade study, Bureau of Public Roads begins e1037, 1072
  Survey parties, graph records progress (R. T. Brown)....................*323
  Tamping templet expedites brick construction (F. A. Churchill)................*282
  Texas, work in.......................... 192
  To be classified by Public Roads Bureau n546
  Top soil as base, value of (D. S. Humphrey)......566 (G. E. Mattingly) letter 833
  Town, the—is it efficient unit for any highway administration? (G. C. Diehl) 1662
  Town-road aid in Maine.............. 97
  Townseod bill, see Highways, Federal Aid
  Township rewards distributed (Pennsylvania) 818
  Tractors to be loaned by War Department to states n838
  Traffic data, New York State.......... 752
  Treatment, light bituminous, for macadam roads (C. A. Hogentogler).... *44
  Truck weight limit reduced to save soft roads, Connecticut n789
  Tructractor added to builder's equipment n*256
  Two miles a month averaged, Michigan *432
  War Department equipment, transfer of more proposed n739
  War Department's equipment, transfer to Public Roads Bureau favored by House committee n838
  Waterbound macadam and bituminous concrete, Philadelphia, rejuvenated (C. F. Puff) 922
  Wear and impact on surfaces..........*723
  Why is there no profit in building? (R. G. Collins Jr.)....e116, 122 (L. E. Gaskins) letter 341, e452
  Winter conditions, daily report on Pennsylvania n61
  Wisconsin, A. R. Hirst pleads for cars..n983
    Concrete road program cut in half...n930
    Cost estimates standardized e649, e650, 663
  Wood-block pavement, fails through contraction and flotation (W. W. Horner) *814, e841
    Sanded, not slippery................ 198
    Treatment for saving (J. S. Crandell) *968
  Wyoming, co-operation from contractors sought 521
Hill, C. S. on developments in use of machinery for highway construction....e5, 8
  On large contractors seek reform in highway contracting.................... 15
Hines, Gen. F. T., has charge of waterway operation n544
Hines, W. D., succeeded by J. B. Payne as rail director.............. ....n1082
Hirst, A. R., pleads for cars to ship highway building materials...... .. ..n983
Hiscano, R. A. (with others) on inland waterway transportation..... 763
History of engineering needed (R. Fleming) .. 322 (C. Prelini) letter 580 (E Low) letter *586 (H. S. Jacoby) letter 782
Hoboken, N. J., right to charge city higher price for water denied..................n493
Hocking Valley R.R. studies low grades for heavy traffic line.................... 244
Hodge, Col. H. W., honored by New York commissions n110
Hog feeding, and garbage, see Garbage
Hogentogler, C. A., on light bituminous treatment for macadam roads.......... *44
Hogs, Arkansas razor backs, and Panama Canal (R. L. Kirkpatrick)....871, (H. N. Pharr) letter 1124
Holes in frozen ground, drilling (L. G. Hall)....h542 (T. Tremblay) h738
Holland, C. M., on Hudson River vehicular tunnel......e356, *357, (G. H. Pride) letter 587, e601, 777, (J. Forgie) letter 977
Holmes mine, Ispeming, Mich., 484 ft. drilled in 432 hours..................1695
Holway, A. S., with R. Messer, on pressure filter at Lynchburg, Va., on gravity supply *1265
Honness, G. G. on construction and maintenance of Ashokan highway..........*652
Hoover, C. B and McGuire, C. D., on dilution requirements of sewage and sewage effluents......................... 755
Hoover, C. B., apointed engineer in charge Columbus, Ohio, water-works extension n982
  For president...........................e552
  Indorsed by California engineers, n595; by Minneapolis Engineers' Club, n931, by St. Paul Engineers' Society, n1033
  New president of American Institute of Mining and Metallurgical Engineers.. e401, n443
  On engineer's interest in public questions 418
  On railways and shipping and industrial relations e450
  Receives Washington Award..........n*491
  To become A. A. E, member..........n1127
Hopkinsville, Ky., detaining reservoir proposed for............................n931
Hopper, car-loading, for draglines and grab buckets (R. E. Post)...............h*979
Horner, W. W., on lug or lugless brick?... 618
  On reconstruction of outlet end of sewer, St. Louis..........................*1059
  On wood-block pavement fails through contraction and flotation.......*814, e841
Horses roll large concrete pipes.........h*151
Horton, T., on what risks should cities take in installing relatively untried processes? e114, 134

HOUSING, see also BUILDINGS
  Chicago project 1198
  Committee organized to study.........n1034
  Crisis, Senate to investigate...........n837
  France, state aid for cheap dwellings...1112
  How building costs have increased since 1913 (L. K. Sherman)..............*367
  Italy, activities in....................1073
  Local legislation on...................e697
  Municipal e1182
Housing Corporation "investigated" by Senate committee.......................... 386
Houston, Tex., record forms for activated-sludge plants.......................... *75
Hudson Bay Ry. work, maintenance only.n1224
  Study for new terminal recommended...1244
Hudson River bridge at Castleton, N. Y., see Bridges, Hudson River
Hudson River, bridges and tunnels........e161
  Pier encroachment authorized by Secretary of War..................384, n597
  Piers, New York City again demands extension into Hudson..................n597

HUDSON RIVER VEHICULAR TUNNEL
  Bill passed over Governor Edwards' veto n934, e938 n980
  Completing the enterprise.............e451
  Concrete blocks and........e552, n594, 624
  Contract authorized n1127
  Desgns and bidding methods....777, (J. Forgie) letter 977
  Discussed....e356 *357, (G. H Pride) letter 587, e601
  Discussed by General Goethals....e697, 729
  Engineers discuss traffic and type......n442
  Goethals concrete block tunnel called impracticable n490
  Six lines of traffic demanded for........n543
  Two-line vehicle tunnel opposed by National Highway Traffic Association....n593
Huff C. L., on lug or lugless brick?..... 618
Human element in industry, subject of meeting n447
Humphrey, D. S., on value of top soil as base for modern highways...566, (G. E. Mattingly) letter 833
Hunt, C. W., retires as secretary Am. Soc. C. E...............................e209, *214
Hunt, G. M., on brush coat should follow trimming of treated timber............*753
Hunt, Capt. R. W., gives fund for award for prize paper.............................n108
Hurley, H. D., on device maintains true batter in masonry wall................h*638

HYDRAULICS
  Discharge of smooth wood-stave pipes and wood channels (A. A. Barnes).... 228
  Friction head for water supply for highway construction (R. E. S. Geare)....h928
  Herschel weir for gaging in open channels a*710
  Laboratory, need for endowed...a1239, e1230
  Penstocks and surge tanks, design, nomographic solution of cubic equation (S. Okabe) *1249
  Plan to regulate Great Lakes level by Niagara dam (F. C. Shenehon)..e305, *308, correction 512
Hydro-Electric Power see Water Power
Hydro-Electric Power Commission, Ontario, see Queenston-Chippawa Canal Work
Hylan, Mayor J. F., "swings a pick"......e451

I

I-beams, see Beams.
Ibañez, V. B., novelist on engineers, references resented (E. Low) ....letter 1219
Ice, broken from water tank by rifle shots, 847
  Driving piles through (H. M. Harding).h*882
  Inside cast-iron column raises floor (C. Balderston) *1168
  Pressure wrecks large highway bridge, Brattleboro, Vt. (Prof. G. F. Eckhard).*902
Idaho, engineering license examinations to be held n493, n934
  Highways, field manual for department, 333
  Large program..........................n1273
Idaho Irrigation Congress n301
Idaho Society of Engineers now Idaho Chapter, A A. E. n253

ILLINOIS
  Abandons 1920 highway program......n597
  Contractors discuss highway work....n298
  Drainage conference n397
  Highway lettings, tentative plans.......n297
  Highway construction in 1919 (B. H. Piepmeir) e937, *949
  Waterway authorized by War Department n303
  Waterway to connect Lakes and Mississippi 433
  Water works men talk of service and treatment n690
Illinois Central, defers improvements in Chicago n1127
  Water service organization *676
Illinois Drainage and River Improvement Association formed n691
Illinois Society of Engineers' meeting....n300
Illinois University, see University of Illinois.
Imhoff tanks, sludge, etc., see Sewage Treatment.
Immigration, Chinese, for labor, see Labor, Chinese.
  Conference to be held n689
  Policy, sane relation of engineers and contractors to e747
Impact tests of notched bars compared.. 861

IMPRESSIONS HERE AND THERE
  Atlanta, Ga. 94
  Denver, enginering affairs in 1066
  Engineering Institute of Canada...e306, 318
  Highway work in Texas 192
  Housing corporation "investigated" by Senate committee 387
  Intelligence in buying 526
  Middle West member attends Am. Soc. C. E. meeting in New York..728, (F. Lavis) letter 831.
  Romance of advertisement 526
  Texas, highway work 192
Incline elevator takes spoil from basement (C. W. Geiger) h*788
Inclined plane instead of curve suggested for highway surfaces......*227, (H. J. Fixmer) letter *588.
Indeterminato structures, see Structures, Indeterminate.
India, aërial tramways for 850
  Irrigation projects in Punjab 431
Indiana:
  Highways Commission reorganized....n1274
    Money tight for contractors.......n1274
    Partial payments on construction raised n1274
Indiana lake cities joint sewage disposal of *481
Indiana Society of Engineers meeting.....n298
Indianapolis approves $2,000,000 flood protection work n1131
  Belt line to be elevated n931
Industrial buildings, engineers to design (M. Thompson) ....letter 585
Industrial Conference, alliance of American Society of Mechanical Engineers with (C. W. Koiner)......................letter 54
  Preliminary statement 19, e66
  Why not engineers on? (W. M. Butts) ....letter 53, (J. B. Marcellus) letter 293
Industrial Conference (Second) report....n645
Industrial course at Pennsylvania State College n1129
  Haulage, prizes awarded in Lakewood treatise contest n840
  Railways, see Railways, Industrial.
  Relations Hoover's views on e450
  Situation e1
  Truck, new, moves and elevates material n*490
Influenza caused abnormal death rate in 1918 584
Inland waterways, see Waterways Inland.
Insect larvæ decrease canal capacity.... 923
Institute of Consulting Engineers decides ethics case 670
Institute of Professional Civil Servants (Canadian) being formed n791
Institution of Civil Engineers and fees.... 978
  Favors licensing law e601
  J. A. Brodie elected president n1179
  London home *1214
  Objection made to its being sole judge of registration 872
  Urges higher rates for consultants.....1186
Institutions and their councils 1002
Intelligence in buying 526
International General Electric Co. gets contract to electrify South American railroad n933
International Joint Commission, F. C. Shenehon proposed for..n1079, n1128, (G. H. Herrold) letter 1172.
  On St Lawrence River, hearings..e405, n930
International Motor Co. tests of solid and pneumatic tires (A. F. Masury)........*668
International Road Association see Highways, International Road Congress.
International Transcontinental Ry. (European), new Polish link opened........1163
Interstate bridges, safety of e1183
Interstate Commerce Commission calls value and rate hearing n545
  Designates A. A. E. official representative of engineers n690
  Hears arguments on valuation principles.n155
  New members n982

IOWA
  Divided into road districts n201
  Engineers' salary increases 907
  Engineers vote on state consolidation..n984
  Highway, continuous construction needed.n890
    Primary road fund of more than $5,000,000 ....n347
    Program one-third under contract...n931
  Registration law, early results 833
  Rising cost effects on city work discussed by Iowa Engineering Society 876
Iowa Engineering Society discusses rising cost effects on city work 876
  Takes in locals n447
  To include all state societies and clubs, under consolidation plan n984
Iowa State College has semi-centennial..n1178
Iron bacteria (book review) 783

Page

IRRIGATION
  Alberta, Can., duty of water, experiments on a*1002
  Boise project, Idaho, design and construction of inverted siphon *860
  California interest increasing 925
  Canada, Brazil and Palestine, proposed projects 91
  Canal capacity decreased by insect larvæ 923
  Canal lining, concrete, costs compared, Orland project 975
  Chance for success of $250,000,000 reclamation bond issue plea....n347
  Classification of projects 1100, e1133
  Columbia Basin project, Washington, main features 456
  Drainage, results and proposals on Salt River Project 921
    Tile, for seepage relief Twin Falls, Idaho (R. M. Adams) 961
  Duty of water, Alberta Can., experiments on a*1002
  Duty of water, higher (G. Ebner).... 828
  Duty of water in (E. A. Moritz)....1150
  Engineer appraisers' work....1100, e1133
  Engineer-managers in operation of works e163
  Farm appraisals, engineering factors in.1100
  Flume, life of, prolonged by roofing paper lining *131
  Flume, settled, restored to level by derrick traveler h*929
  Flumes and siphons, King Hill project, reconstruction of *661
  Idaho congress n301
  India, projects in Punjab 431
  Inverted siphon, design and construction, Boise project *860
  King Hill project, reconstruction of siphon and flumes *661
  Mesopotamia 752
  Minidoka Project, results e258
  Nile River, plans to be passed upon by H. T. Cory n*204
  Notus Canal, Idaho, design and construction of inverted siphon *860
  Orland project, costs of concrete canal lining compared 975
  Precast concrete slabs for small structures (R. W. Olmsted) *1167
  Punjab, India, projects 431
  Reclamation Service, invasion ("Western Engineer" and A. P. Davis)...letters 438
  Removable flume over canal permits passage of hydraulic dredge h248
  Results as shown by Minidoka Project..e258
  Salt River Project, drainage results and proposals 920
  Seepage water head saved, Boise project, Idaho *860
  Siphon, inverted, design and construction, Boise project *860
  Siphons and flumes, King Hill project, reconstruction of *661
  Teel project, progress 136
  Tile drainage for seepage relief, Twin Falls, Idaho (R. M. Adams).... 961
  Use of water in (E. A. Moritz) 1150
  Utah, plans in territory near Salt Lake City *1064 e1087
  Western states adding to agricultural areas 317

Isaacs, J. D., half century of constructive engineering service *756
Ishpeming, Mich., iron mine, 484 ft. drilled in 432 hours 1095
Italy authorizes credit corporation for public works 276
  Housing activities 1073

J

Jack, Esther M., elected president North Dakota Society of Engineers n693
Jackson Mills, Nashua, N. H., an economical cofferdam (E. H. Sweet) h*592
Japan, Stone & Webster to build hydro-electric plant in n299
Japanese commission to study tunnel construction problems n741
Jersey City, N. J., Claremont Terminal, see Lehigh Valley Railroad.
Jetties, retarding, stop bank erosion.... 612
Jewett, A. C., on building hydro-electric plant in Afghanistan *68
Jewish engineers outline program for Palestine development n156
Joaquin Light & Power Co., Fresno, Cal., plank protects steam shovel from blast h*152
Johannesburg S. A., establishes municipal foundry 1238
Johnson, A. N., on aggregate proportions for equal strength concrete e938, 964
Johore, Strait of, causeway being built. 1058
Joint Committee on Concrete and Reinforced Concrete organizes n446
Joint Conference Committee issues call for Organizing Conference n883
  Report on comprehensive national body (J. H. Morgan) ....letter 52
  Report, defeated in Am. Soc. C. E. questionnaire.... e795 n835, (I. Randolph) letter 978.
  Report indorsed by Ohio technical societies n790
Joint Engineering Societies dinner, with Western Society of Engineers.. .e841 n883
Judson, E., on record of engineers suggested by doctors' system 875
Juniors, caring for activities of 920

Page

K

Kansas highway officials study road construction problems n886
  Intestinal malady probably not due to water-supply 338
Kansas City district, fees for consulting engineers 878
Kansas City, Kan., Kaw River flood protection problem 920
Kansas City, Mo. National Cloak & Suit Co. warehouse, diagram checks small details h*738
  Planning commission created for n347
  Traffic studied by Engineers' Club....1213
  Water-works capacity to be increased ... 807
Kansas City Engineers' Club appoints civic sanitation committee n1178
  Studies city's traffic 1213
Kansas City Southern valuation case decided for railroad n546, e553, 563
Kaw River flood protection problem, report on 920
Keechelus Dam, Wash., movable support for sinking pumps (R. E. Post)....h*1078
Kellor, F. A., on a leaf from Lenin's policy on manpower....517, (D. E. Gelwix) letter 787.
Kelly Col. W., member California Debris Commission n693
Kentucky Highway Commission appointed.n1272
Kerkhoff power project, tunnel, etc., see San Joaquin Light and Power Corporation.
Kern River, California, project No. 3, freighting with motor trucks *868
  Water storage developed 471
Kershaw, G. on plank surfacing suggested for secondary highways *1052, e1086
Key Bridge, Potomac River, see Bridges, Key Bridge.
Kiln, dry corrosion of steel in concrete roof (A. H. Weber) 915
Kiln drying taught by mail 591
King Hill siphon and flumes, reconstruction of *661
Kingsley, Maj. E. A., receives French decoration n793
Kingston-on-Thames, England, sludge utilization 366
Kirkpatrick, R. L., on Panama Canal and Arkansas razor backs....874, (H. N. Pharr) letter 1124.
Knellogy, A. (P. G. Smith) 513
Knowles, M., on what risks should cities take in installing relatively untried processes? e114, 132
Knowles M., and M. R. Scharff, on new specifications for public health officers. 39
Knowles and Pratt engineering organizations combined n447
Knowles, Morris, Inc., staff dinner n740
Kuntz, G. T., on lifting turntable out of pit without jacking *1005

L

LABOR
  American Federation of Labor proposes broad economic program....n693, e699
    New labor thinking e699
  And prohibition e353
  British, Priestman wage-fixing scheme.. 11
  Building trades, New York, receive flat increase of $1 per day 951
  Chinese, shall it be imported to relieve shortage? (J. Ericson)....letter 926, (E. E. Wall) letter 1029, (J. Ericson and others) letters 1121, (H. S. Croker and F. C. Finkle) letters 1219, (J. Ericson and W. R. Conard) letters 1268
  City, where will wages stop?....e1133
  Contractors define practice outside home territory n981
  Contractor steals...e889, (F. G. Webber) letter 1123.
  Cost, is workman responsible? (D Patch) 876
  Cost of, on Erie, Pa., flood-control project (F. Gannett) *852
  Cost of living rises 82 per cent 578
  Direct action none in England....e551
  England and direct action e551
  England, hours and wages in 192
  Full day's work industry's need (F. S. Parrigin) ....letter 195
  Greeks return to native land.... 870
  High cost on warehouse 295
  High in Tasmania 276
  Hours and wages in England 192
  Human element in industry....n447
  Immigration policy, sane e747
  Industrial Conference report on proposed method of settling disputes .. 49 e66
  Industrial Conference (Second) report...n645
  Is workman responsible for high labor cost? (D. Patch) 876
  Leaf from Lenin's policy on manpower (F A. Kellor)....517, (D. E. Gelwix) letter 787.
  "Man power" engineer, menace of (D E Gelwix) ....letter 787
  New labor thinking e690
  Priestman wage-fixing scheme 11
  Prohibition and the foreign born, e747, (L. D. Rights) letter 831 (E. P Gilman) letter, with editorial comment 927, (T C. Satterthwait and others) letters 1122, (C. Shepard) letter 1268
  Proletarian mind, the (P. B. McDonald).1042
  Proposes broad economic program ... n693, e699
  Railway Labor Board appointed and meets n837
    Engineers nominated for n740

Page

  Railway employee, is he overpaid and underworked? (C. W. Baker)....*385, (F. A. Molitor) letter with comment by C. W. Baker, 539, (R. B. Everett) letter with editorial comment, 832.
  Railway, wages an element in railway improvement 615
  Railway, wages and efficiency 1260
  Revolution, the real....e354, (P. B. McDonald) letter 487.
  Shortage—Postponement of road construction urged (J. Wilkes)....letter 1222
  St. Louis building industry, control sought by local Building Trades Council.... e1085, n1130
  St. Louis, labor problems and city contracts n740
  Stolen by contractor....e889, (F. G. Webber) letter 1123.
  Strikes:
    Carpenters' at McKeesport, Pa....n1129
    Data asked of manufacturers, by census n153
    Detroit Chapter, A. A. E., wants law against n885
    Industrial Conferences' reports.... 49, e66, n645
    New York City freight, engineers direct relief n1225
    Railway....e745, e796, n885, n981
    Railway: engineers do manual labor..n885
    Railway, engineer, J. W. Wilkinson, Killed acting as switchman....n981
    Track and shop workers', strike order suspended n398
  Train operation as affected by new wage schedules a704
  Turnover....e354, (P. B. McDonald) letter 487.
  Variable costs provided for in Wanaque Dam contract 734
  Wages and hours in England 192
  Women in British industry 418
Laboratory, hydraulic, need for endowed a1239, e1230
Laboratory rooms, dustproof 1003
Lackawanna R.R., see Delaware, Lackawanna & Western R.R.
Lakehurst, N. J., navy dirigible hangar, largest in world *892
Lakewood Engineering Co., industrial haulage treatise contest, prizes awarded...n840
Lake Worth Drainage District, Florida, sand sluiced to centrifugal pump....h*834
Lamon, J. C., on acetylene torch repairs standing steel derrick mast h198
Lamphear, R. S., on activated-sludge experiments at Worcester, Mass. *819

LAND RECLAMATION
  Bill, interests favoring open Washington office n300
  Chance for success of $250,000,000 bond issue plea n347
  Engineering aspects of stump removal. 130
  More needed e650
  Policy urged n206
  Unused lands, report on development of. 375
Landslide displaces retaining wall in deep cut 870
Lane, E. W., with E. L. Chandler on measuring upward pressure under masonry dam, Dayton, Ohio e987, *1014
Lang, C. F., to preside at Chamber of Commerce Industrial Production Section meeting—with biography n838
Langfitt, Gen. W. C., report in demand..n250
Lansing, Mich., water-supply typhoid outbreak (J. R. Daugherty) *92
Larmon, F. P., on results of completely metering Omaha water supply....*1186
Larvæ, insect, decrease canal capacity 923
Launching a 10-inch undersea pipe line for oil (H. Leonard) *658
Launchings, ship, see Ships, Launching.
Lavis F., on opportunities for American engineers in foreign countries a1024
Leacock, Prof. S., on prohibition and the foreign-born e747, 831
Lead sheet, brittleness in 907
  Substitute experience in St. Louis 415
League of the Southwest considers Colorado River control n933
Leaks in water mains, methods of detecting *1061
Leather, sole, wear resistance tested 717
Leavenworth Bridge Co., claim for loss recognized by Government n933
Ledoux, J. W., on dangerous stresses from falling loads on floors 873
Lee, Lieut. Com. C. A., on soft ground complicates dry-dock construction .... *718, letter 1077
Lee, W. S., enters consulting field....n*643
  With R Pfaehler, on reservoir and plant for new Southern water power....*1088
Lefebvre, O on how Quebec controls water power e101, a423

LEGISLATION
  Alaska highways, Army appropriation for 919
  Army bill places Construction Division in Quartermaster Corps n493
  Assistant engineers on river and harbor work, bills to aid n397
  Budget, national must come e1133
  Chicago hospital bill favored by House committee n61
  Construction Corps, see Army, U. S., Construction Corps.
  Corps of Engineers, bill provides 650 officers n881
    Civilians' pay held up n930
  Cummins bill gives railroads more time to pay for betterments n1082
    Opposed in part by shippers e258

*illustrated; e, editorials; h, hints; n, news notes; a, abstracts.

Page
  District of Columbia zoning bill signed..n493
  Engineers' licensing, see Engineers, Licensing.
  Federal engineers' salary increases, proposed ......754, (A. Miedwig) letter 879
  Federal Reserve act, proposed amendment, referendum on n543
  Forestry station for California University.n249
  Highway, allied debt to be used for road buildiog, proposal made n1178
  Highway bills hearings begin n932
  Highway materials, increase for investigation recommended 1065
    Bill fails n1274
  Housing e697
  Hudson River vehicular tunnel, see Hudson River Vehicular Tunnel.
  Kentucky bill to prohibit bridge pooling.n447
  Land reclamation bill, interests favoring open Washington office n300
    Fletcher-Smith bill e650
  Licensing, engineers, see Engineers, Licensing.
  Merchant marine act, two sections suspended by board n1226
  Motor-track sizes and loading (New York State), bill regulates n647
  New Jersey contractors, relief proposed..n933
  New Jersey State Highway Department, proposed reorganization e353
  New York Barge Canal, state control deferred n1128
    Terminals to be completed n932
  New York port treaty bill vetoed by Governor Edwards n883
  New York State water power, no law this year n1129
  Niagara River bridge bill signed by President n296
  Ohio health district law weakened.... 960
  Oregon bill aims at patent pavements....n347
  Patent reform bill passes House n932
  "Pork barrel" bills cut n300
  Potomac Key bridge provided for in emergency bill n349
  Public buildings bill, none this session..n300
  Public Works Department, see Public Works Department.
  Railway control, see Railways, Control.
  Rivers and harbors bill n300, n397, n837, n1128
    Passed n1226
    Allotments made.....................n1273
  Topographic mapping, funds for.......1261
  Speedway Hospital, Chicago, gets increased appropriation from Hnuse....n493
  Surveying, Government, funds for......n932
  Topographic mapping, funds for.......1261
  Townsend highway bill see Highways, Townsend bill.
  War contracts, relief promised to contractors on naval structures n741
  War cost increases, bill would relieve river and harbor contractors n740
  War Department equipment, for road building, transfer of more proposed..n739
  War supplies, bill for transferring.n546, n838
  Water-power bill passed, etc., by Congress......n202, n932, n980, c1085, n1127, President fails to approve, e1133, n1175 hopes raised, n1223, has it became law? e1231, signed 1271
  Water power, Boston-Washington superpower investigation n1082
  Waterways control bill introduced, another n933
Lehigh Valley R.R., engine terminal at Ashmore, Pa. ....•514
  Piers of record length planned for New York (Claremont) terminal ....•970
  Work started on Claremont Terminal ...n885
Leisen, T. A., on Detroit's new filtration plant ....•1194
Lenin's policy on manpower a leaf from (F. A. Kellor)....517, (D. E. Gelwix) letter 787.
Leonard, H., on launching a 10-inch undersea pipe line for oil ....•658
Leonard, Lieut. Col. R. W., address on engineer's responsibility in social problems.a366
Levant, buildings in, contract let........n299
Levee system, Mississippi Valley, development ....•284
Levee work, colored figures mark transit points (H. A. Brentlinger)..........h•1125
Ley, F. T., Co., has large building jobs in Peru n157
Libraries, special, census being compiled.. 582, n598
Lignite and spruce, Alaska and North Dakota compared 951
Limestone workers, physical effects of pneumatic tools on h834
Limnoria, see Teredos.
Lincoln (Neb.) Gas & Electric Co., belt conveyor assists excavation h788
Lincoln Highway, see Highways, Lincoln Highway.
Lincoln Park, Chicago, marble band stand moved (G. J. Trinkaus) ....h•1125
Live load on schoolroom floor, Minneapolis, shown by tests 924
Living, cost of, increases 18, 578
Load, live, on schoolroom floor shown by tests, Minneapolis 924
Loader, self-feeding, handles heavy material ....n•63
Loading, eccentric, in rigid frames (F. E. Richart) ....•331
  Test of 18-foot circular concrete grain bin (P. J. Hansen) ....•316
Loads, falling, on floors; dangerous stresses from (J. W. Ledoux) 873
Lock-pile-load distributions under (M. G. Findley) ....•392
Locks, New Orleans harbor canal unwatered by means of cofferdams (G. R. Goethals) ....•940

Page
Locomotives, see Railways, Locomotives.
Logan, J., on county highways surfaced with city pavements 379
Logarith tables, errors in, more about (O. H. Tripp) ....letter 247
London, impressions, by E. J. Mehren..... e1133, 1169, •1213
  Building restricted 1255
  Engineering center of British Empire (E. J. Mehren) ....•1213
  More underground railways n299
Long Island City, soil swelling in pile driving (W. T. Quinn)..........letter •1124
Looking at the other fellow's job........e889

LOS ANGELES
  Aqueduct power plant nearing completion n647
  Arc welding outfit used before tapping steel water pipe ....e1181, •1212
  Engineers discuss building ordinance and terminals n1081
  Large planning commission created.....n741
  Municipal cement mill will make potash.n694
  Municipal repair shop, work of 37
  Union terminal n345
  Warehouse, timber track takes spoil from basement (C. W. Geiger).........h•788
Lowell, Mass., timber arch bridge, old, replaced ....•1117
Lukesch, G. R., promoted to lieutenant colonel n693
Lumber, American Wholesale Lumber Association formed; to obtain grading rules. n546, n1178
Lumber, French, use of..................1208
Luten patents, decision against, sustained. 417
  Letter from Mr. Luten's attorney, R. T. MacFall 1220
Lynchburg, Va., water supply, pressure filters on gravity supply (R. Messer and A S. Holway) ....•1205
Lynde, H. M., on studies of maintenance work on drainage ditches..............•713

M

Machinery exhibit, New York n249
Mackall, J. N., on where is our road program taking us? 914
Maclaurin, Dr. R. C., obituary ....e161, •203
Madison, Wis., rejects municipal street railway ownership n838
Madrid subway construction resumed ...n299
Maetzel, H., on lug or lugless brick?.... 618
Magazine, bomb and bullet proof, has double roof Panama (R. C. Hardman).•998
Magnesium fluosilicate in curing concrete.1046
Mail tunnel plan in large cities to be studied by commission n790
Maine, highways, town road aid......... 97
  Temporary power station aids in hydro-electric development (T. C. Higgins).h•542
Management engineering course at Columbia University n346
Manchester, Eng., additional water-supply. 272
Manhole costs, estimating (E. E. George)..•231
  In steel tanks, reinforcement......... 952
Mann, C. R., on professional spirit in engineering education 1242
Manual, field, for Idaho highway department 333

MAPS AND MAP MAKING (see also SURVEYS)
  Advisory Council to Board of Surveys and Maps named n1177
  Army to be supervised by General Staff.n109
  Conference in Washington n491, n595
  Equal-area project of sphere an aid (R. L. Faris) ....•1204
  Federal agencies, work to be co-ordinated n546
  Grid system for progressive maps in U. S. (Lieut. A. H. Foster).........letter 1269
  Military, rectangular co-ordinates used (Lieut. H. A. Foster)....•962, •1006, letter 1269.
  Topographic, funds for 1261
  Triangular problems, rectangular co-ordinates used in solving (Lieut. H. A. Foster) ....•962, •1006
  United States Board of Surveys and Maps to have advisory council n789
  United States topographic, completion urged n595
Mare Island Navy Yard, pontoon crane 150-ton capacity ....•1245
Maricopa County, Ariz., lets $4,000,000 highway contract n1271
Marine borers, see Teredos.
Marine railway for 5000-ton ships, Astoria, Ore. (C. O. Crisman) ....•1156
Marseilles France, subway system for.. 242
Marshalltown, Iowa, home-made device for operating slab-finishing belt ....h•344
Maryland highways, failure, etc. (J. N. Mackall) 914
Masonry, elastic arches in (E. Godfrey)....•948
Masonry wall, device maintains true batter (H. D. Hurley) ....h•638
Massachusetts highways, bulletins to be isued on conditions n1130
  Highways, program totals $7,000,000..n838
  Public water-supplies the rule in...... 459
  To issue road condition bulletins....n1130
Massachusetts Highway Commission, engineers' salaries ....•224
Massachusetts Institute of Technology and consulting work e259
  Committee control for n296
  Co-operative plan a success n1129
  G. Eastman is donor of $4,000,000....n154
  Starts *The Tech Engineering News*....582
Masury, A. F., on tests reveal relative values of pneumatic and solid tires.... •668, (L. E. Moore) letter 786.

Page
MATERIALS
  Contractors investigate prices n980
  Cost of, on Erie, Pa., flood-control project (F. Gannett) ....•852
  Heavy, handled by railway spreader car.•866
  High, in Tasmania 276
  Prices, spring, in New York (A. W. Welch) n352
  Rates new railway, asked by Construction industries n1224
Material Handling Machinery Manufacturers' Association meeting..n208, n399, n493; elects officers, n792.
Mathematic gymnastics, a feat in (R. L. Kirkpatrick)......874, (H. N. Pharr) letter 1124 .
McAlpin, G. W., on plant for sand and gravel storage ....h•928
  On wharf-house for variable rivers ....•947
McClendon, W. W., on community service in highway construction, Mineral Wells, Tex. 1098
McClintic-Marshall Panama claim still fails to win approval n792
McClintock, J. Y., on variable designs for county highway system 243
McClure, F. A., city engineer of Worcester, Mass., salary and service e746, e1086
McCook Aviation Field, curious cracks in concrete boiler footings (H. E. Miller) letter •926
McCullough, C. B., on arch reaction influence lines by deflection diagrams....•675
  On truss centering used for 113-ft. concrete arch ....•851
McDonald, P. B., on engineering and adventure ......17, (Incog.) letter 98, (Incog. No. 2 and P. B. McDonald) letters 194, (T. F. Quilty) letter 292.
  On mutual-admiration societies 1109
  On professional plagiarism....477, (E. Campbell) letter 585, (S. Baker and P. B. McDonald) letters 685, (J. C. Tracy) letter 786.
  On the proletarian mind 1042
  Review of "Technical Writing" (Rickard) 1027
McGill University, Canadian Pacific offers scholarship in n984
McGraw, J. H., on publicity for engineers..1141
McGuire, C. D., and Hoover, C. B., on dilution requirements of sewage and sewage effluents 755
McKeesport, Pa., carpenters' strike n1129
McKenney, Col. C. A., in new firm.......n1225
McLeod, D. F., on engineering in North China 863
  On stone beam bridge in China 60 years old ....•321
Mehren, E. J., impressions of London.... e1133, 1169, •1213
  On engineering center of British Empire •1213
  On random highway observations in England 1267
  Sails for Europe to investigate conditions n883
Memphis, Tenn., to have new system of garbage disposal n598
  Water works surveyed n741
Mercer County, New Jersey, highway bridges strengthened (M. Goodkind)....•617
Merchant marine act, two sections suspended by board n1226
Merrill-Stevens Shipbuilding Corporation, Jacksonville, Fla., motion study of side launching ....•470
Mesopotamia, irrigation in 752
Messer, R., with A. S. Holway, on pressure filters at Lynchburg, Va., on gravity supply ....•1205
Metalium as substitute for lead for pipe joints 415
  For jointing pipe, paper gate replaces clay 575
Metcalf & Eddy, on what risks should cities take in installing relatively untried processes? e114, 132
Meteorological Society, work, etc. (R. E. Horton) ....letter 927
Metering, universal, recommended in Halifax, N. S. ....•789

METERS
  And low water consumption, St. Paul, Minn. 1166
  Chicago, selective metering only proposed for new water-supply ....•855, e891
  Circular housing cheaper than square... 266
  Denver Civic and Commercial Association to study proposal n397
  Federal Government buildings, Washington, D. C., metering 852
  Omaha water supply completely metered, results (F. P. Larmon) ....•1186
  Water, progress on standard specifications n691
Metric system opposed 616
  To promote 582
Metropolitan Life Ins. Co. printing plant, Long Island City, soil swelling in pile driving (W. T. Quinn).......letter •1124
Mexico, engineers' work in (E. Low).letter 1219
  Launching 10-inch undersea pipe line for oil (H. Leonard) ....•658

MIAMI FLOOD PROTECTION WORKS
  Colored figures mark transit points (H. A. Brentlinger) ....h•1125
  Dams and auxiliary structures, design of ....•1142
  Flood, highest since 1913, tests works..•944
  Form design for dam conduits ....•430
  Measuring upward pressure under masonry dam, Dayton (E. W. Lane and F. L. Chandler) ....e987, •1014
  Pipe for hydraulic fill turned often to equalize wear h295

•illustrated; e, editorials; h, hints; n, news notes; a, abstracts.

Page
  Railway fill made with stiffleg derrick dragline h*151
Michigan highways, two miles a month averaged *432
Michigan Central, gravity freight yard at Niles, Mich. *81
Michigan Engineering Society discusses union with A. A. E. n300
Michigan University, see University of Michigan.
Middle Atlantic States highway building program 1162
Military engineers See Engineers, Military.
Military Engineers' Society, see Society of American Military Engineers.
Military training and reserve approved by Engineering Council n598
Mill building, electrically welded, under erection in Brooklyn e698 *708
Mill Creek flood-control, see Erie, Pa.
Milligan, W. F., nominated for Railway Labor Board n740
Military Engineer, The, succeeds *Professional Memoirs* n492

MILWAUKEE
  Activated-sludge plant for (T. C. Hatton) e989, *990, (see also 511 and n1079)
  Bid date for fine sewage screens advanced n789
  Caisson, large open, sinking of *916
  Fine-screen specifications for activated-sludge plant....511, construction postponed n1079.
  Harbor plans accepted n545
  Sewage station centrifugal tests 1171
  Water supply, difficulty again with tastes and odor 1155
Milwaukee County, Wisconsin, old concrete road widened at low cost *848
Mind, how to use, a course in 1011
Mind, proletarian (P. B. McDonald)....1042
Minerals, value, real, not measured in dollars (G. O. Smith) ....letter 148
Mineral Wells, Tex., community service in highway construction (W. W. McClendon) 1098
Mines, *Engineering and Mining Journal* offers prizes for shift-sinking record .h1174
  Iron; railway spreader car handles heavy materials *866
  Railway spreader car handles heavy materials *866
Minidoka Project results e258
Ministry of Transport, British 507
Ministry of Transport, British views upon operation 659
Minneapolis, longest concrete arch span being built there *335
  May condemn for residential district... 571
  Paper-wrapped garbage makes trouble.. ....907, e937
  Tests show actual live load on schoolroom floor 924
Minneapolis Engineers' Club indorses Hoover n931

MINNESOTA
  Architects and engineers plan united action n1177
  Clays and shales inventoried 773
  Cross-connections, water supply, forbidden by law (H. A. Whittaker) ..letter 1219
  Drainage works maintenance (E. V. Willard) ....letter 54
  Engineers and architects plan united action n1177
  New highway construction suspended..n1033
  License law, recommendations 1115
  Studies stream pollution 684
  Typhoid fever in, reduction of....*921
Minnesota Affiliated Societies' arguments for increased pay 1164
Minnesota Joint Engineering Board indorses Shenehon for Joint Commission n1128
Minutes, public improvement, shortcomings (F. B. Tucker) 1053
Mississippi River, barges and towboats for. 1194
Mississippi River Commission, Lieut. Col. H. Deakyne new member n*545
  Members n490
Mississippi Valley associations merged .. n1038
  Levee system, development *284
  States discuss concrete roads n318
Mississippi Valley Waterways Association to hold convention n593
Missouri River, retarding jetties check bank erosion 612
Mitchell, C. H., address on Canadian demands in engineering education ..e354, a369
Modderfontein, South Africa, concrete plug and grout injection close tunnel leak.h1030
Monongahela Southern Ry.; Carnegie Steel Co. heavy industrial railway branch....*604
Montana, highway engineers meet n59
  To give data to highway contractors before bid advertising n297
Montezuma, Iowa, Imhoff operation simplified by extra drain—unit costs given. 332
Montgomery, J., on selling methods for highway work *976
Montreal, aqueduct enlargement to be completed for water-supply only ..n491, n982
  New charter proposed n1224
  Water-works strike n345, n391
Montville power station Eastern Connecticut Power Co., high concrete chimney built on steel roof 317
Moore, Mayor J. H., of Philadelphia, supports Camden bridge n251
  Urges council to appropriate money for Camden bridge e161
Moose Jaw Sask., joint water-supply scheme with Regina n837
Moritz, E. A., on use of water in irrigation 1150
Morris, F. P., on South American railway system needs new links *182
Morse, E. K., Pittsburgh transit commissioner, removed by mayor n446
Morse, O. R. on elements of railroad value graphically shown (O. R. Morse) *271
Mortar tamping reduces powder cost.... 946
  Tests, consistency, made by British engineers 1211
Motion-picture publicity for engineers....n347
  Used by West Virginia to promote better roads n157

MOTOR VEHICLES
  Arkansas roads endangered, engineer says e1086
  California, motor transport in (K. Q. Volk) e551, *568
  Demountable bodies *216
  Economies of transportion discussed at conferences n205
  English, and the road problem 413
  English, taxation proposed 1098
  Freighting with, Kern River Project....*868
  Garford Motor Truck Co. establishes transportation bureau n694
  Lakewood Engineering Co. industrial haul treatise contest, prizes awarded .n840
  Licenses and highway construction (S. E. Bradt) 73
  Overloaded, threaten destruction of roads (G. H. Pride)....e115, letter 149, (H. C. Boyden) letter 486, (H. E. Phelps) 831
  Overloading, to be combatted by New Jersey highway department....n1034
  Pennsylvania registers many 571
  Political party suggested e1086
  Postal service 286
  Semi-trailers subject to tax....n1178
  Show in New York City n107
  Sizes and loading, bill (New York State) regulates n647
  Strengthening county bridge to carry motor trucks (M. Goodkind) *617
  Taxation, English, proposed 1098
  Ten-batch trucks haul proportioned aggregate for road *1068
  Truck and trailer do work of 40-foot railroad car n*160
  Truck carries 16-ton load on mountain roads *1202
  Truck regulation favored by New Jersey Highway Commission n1225
  Turntable for trucks (F. W. Epps)...h*979
  Weight, effect on highways, discussed by National Highway Traffic Association..e987
  Weight limit reduced to save soft roads.n789
Mount Vernon, Ill., water supply, removal of taste-producing protozoa 1214
Moving pictures, see Motion Pictures.
Muck cars at tunnel heading sidetracked by frogless switch (N. A. Eckert)....h*489
Mucking with steam shovels speeds up tunnel driving *314
Mullican, N. S., on sand for earth road maintenance 943
Municipal Engineering, see Cities, Garbage Sewers, etc.
Municipal Engineers of City of New York discuss salaries with city officials.... n930, e938
  Indorse Council's pay classification ...n1127
Municipal League of Georgia promotes hydro-electric projects 825
Muscle Shoals, Col. Cooper appointed consulting engineer n1130
  Dam construction n*106
  Nitrate plant on trial 386
  Work, conflict in reports on n1082
Mutual-admiration societies (P. B. McDonald) 1109

N

Nagler, F., new hydro-turbine runner shows epochal development *271
Nail cast into end holds form spacer in position h*197
Nashua, N. H., economical cofferdam at Jackson Mills (E. H. Sweet)....h*592
Nassau, B. W. I., quay walls protected by concrete facing *996
National Academy of Sciences to build in Washington n933
  To share in $5,000,000 Carnegie fund..n249
National Association of Railway Executives protests Senate excess earnings provisions n108
National Association of Sand and Gravel Producers meets n398
National Board of Fire Underwriters against cross-connections between city and private water supplies (G. W. Booth).... letter 1121 e1181
National Conference on City Planning to be held e745
National Conference on Concrete House Construction e401, n441
National Defense, Council of, see Council of National Defense.
National Federation of Construction Industries approves Public Works Department n1081
  Asks car service n1128
  Asks new rates on materials n1224
  Convention....n249, n492, n680, e745
  Creates staff council e745
  Names reconstruction committee.. n1225
National Fire Protection Association meeting and officers elected 1020
National Highway Traffic Association, annual meeting n1034
  Discusses motor vehicle weight and roads e987
  Opposes two-line Hudson vehicle tunnel..n593
National Industrial Conference Board, American Society of Mechanical Engineers withdraws from e101
  Reports 82 per cent rise in living costs. 578
National Industrial Traffic League opposes parts of Cummins bill e258
  For higher railway rates e1182
National Paving Brick Manufacturers' Association, specifications, new.... 618
National Public Works Department Association, contribution from....n155, n252
National Public Works Department Association, first convention..n57, e162, 169, (M. O. Leighton) letter 292.
National Research Council, road committees named n251
  Elects officers n1129
  To share in $5,000,000 Carnegie fund..n249
National Safety Council, engineering section, to meet n790
National Shippers' Conference proposals on railroad control e258
National Waterways Council proposed....n933
Navy dirigible hangar, at Lakehurst, N. J., largest in world *892
  Engineering classes resumed n157
Navy Yard, Mare Island, pontoon crane, 150-ton capacity *1245
Navy Yard, Philadelphia dry-dock construction (C. A. Lee)....*748, letter 1077
  Largest derrick built to great hammerhead crane *172
Nebraska, civil administrative code 389
  To try convict labor for grading highways n1271
Newark, N. J., garbage feeding contract terms 416
  Zoning ordinance adopted n202
New Brunswick timber surveys and cruises. 320
Newell, Prof. F. H., on Chamber of Commerce committee on public works department n253

NEW JERSEY
  Contractors, relief proposed n933
  Highways:
    Commission favors truck regulation.n1225
    County engineers study future traffic.n204
    Department employees' banquet n110
    Department, proposed reorganization..e353
    Department to combat truck overloading n1634
    Engineers study future traffic n204
    Lincoln Highway in 1058
    Salaried road commission proposed....n297
New Jersey Sewage Works Association meets n493
New Orleans, La., funds needed to renew water plant e890
New Orleans harbor canal, unwatering lock site (G. R. Goethals) *940
  Inner harbor—navigation canal (M. G. Findley) *808
  Rainfall statistics, analysis of.... 963
  Shipyard, Foundation Co., heavy timber framing *1016
New York Central Railroad accomodates itself to Barge Canal (B. S. Voorhees).. e497, *500
  Wins suit for shorter Hudson span n545

NEW YORK CITY
  Belt line suggested to ease terminal congestion 1020
  Census report e1133 n1176
  Concrete building, huge, being erected..n1081
  Demands extension of piers into Hudson.n597
  Engineers' salaries discussed by Municipal Engineers' society and city officials n930, e938
  Freight congestion e601
    Engineers direct relief n1225
  Harbor:
    Belt line suggested for relief....1020
    City postpones action on interstate control n253
    Hudson River pier encroachment authorized by Secretary of War.... 384 n597
    Incompetence and.....e697, (E. C. Moore) letter 879.
    Joint control now before legislatures..n739
    Piers of record length planned for terminal *970
    Port policy....e1038, *1047
    Staten Island pier layout criticised.. e1038, *1047
    Staten Island, N. Y., piers, prospects brighter n109
    Treaty not read e889
    Treaty bill vetoed by Governor Edwards n883
    Work started on rail and deep-water terminal n885
  Housing legislation e697
  Hudson River pier encroachment authorized by Secretary of War..384, n597
  Hudson River tunnel, see Hudson River Vehicular Tunnel.
  Manhattan public service appointments..n110
  Pensions for employees n1079
  Piers of record length planned for terminal *970
  Port, see New York City Harbor.
  Rapid transit, traffic on systems.... 14
    Bad faith by city alleged by contractors n1272
    Construction engineering staff receives pay increase n254
    Work during 1919 246
  Snowbound e355, n*394, 395
  Snow removal, city to spend $4,000,000 for equipment n1223
    Engineers for, etc. e355 n*394, n395 e451, n493
  Subway; see New York City, Rapid Transit.
  Terminal, rail and deep-water, work started n858
  Traffic experiment on Fifth Avenue... e402 *434

*illustrated; e, editorials; h, hints; n, news notes; a, abstracts.

Page
War memorial committee, Am. Soc. C. E. representation advised n837
Western Electric Co. and New York Telephone Co., huge concrete building being erected n1081

NEW YORK STATE
  Barge Canal, see Canals, New York Barge.
  Department of Health, dustproof laboratory rooms 1063
  Engineers' licensing bill passed and signed....n838, n886, n1031, e1037, correction 1096.
  Government, reorganization, book review 389
  Health laboratory building 420
  Highways:
    67.5 per cent concrete 290
    Bridges 633
    Department to buy machinery, Comsioner urges n302
    Developments in maintenance *265
    Governor Smith asks funds n297
    No bids on some contracts e551
    Policy, asphalt interests object to..n1036
    Program suspended....e938 n980, n1036
    Traffic data 752
Newspapers, technical articles in.........e937
New Zealand, longest suspension bridge (F. W. Furkert) ....letter 1222

NIAGARA, POWER, ETC.
  Dam, proposed, for regulation of Great Lakes level (F. C. Shenehon)..e305, *308, correction 512.
  Extension of 112,500 horsepower dedicated n61
  More water may be drawn from n59
  Power, hearing and report on..n1032, n1178
  River regulation (F. C. Shenehon)..e305 *318, correction 512.
Niagara Falls, N. Y., zoning ordinance.. 527
Niagara River bridge bill signed by President n296
Nicholson, G. F., on design of new Seattle pier *1101
  On freight-handling equipment, Port of Seattle *37, e65
Night road work successful with artificial light h393
Nile River irrigation plans to be passed upon by H. C. Cory n*204
Niles, Mich., gravity freight yard for Michigan Central *81
Nitrate plant, Muscle Shoals, on trial..... 386
Nitrate plants, Congressional investigation of e1085, 1120
Nomographic solution of cubic equation S. Okabe) *1249
Norfolk, Va., more water for n1223
North Carolina drainage districts, maintenance work on ditches (H. W. Lynde).*713
  Highway commission to issue monthly bulletin n936
  Highways, secondary, plank surfacing suggested (G. Kershaw) *1052, (H. J. Spelman) letter 1222
North Country, early days in (H. K. Wicksteed) 513, 670
North Dakota Society of Engineers meeting; woman elected president n693
Northrop, A. A., on wire bags filled with cobbles prevent scour h*834
Notched-bar impact tests compared 863

NOTES FROM FOREIGN FIELDS
  Engineering in North China (D. F. McLeod) 862
  England random highway observations (E. J. Mehren) 1267
  London, impressions of (E. J. Mehren) e1133, 1169, *1213
    Engineering center of British Empire (E. J. Mehren) *1213
  Panama Canal, through the (S T. Henry) 726
Notus Canal, Idaho, design and construction of inverted siphon *860
Nova Scotia, hydro-electric power development begins 1248
Nye C., on half-round strip protects tracings h*929

O

Oakland, Cal., district, $90,000,000 water project for (C. E. Hickok) n1223
Oberteuffer R. K., on fast work on Kerkhoff tunnel h1174

OBITUARY
  Atkinson, I. M., 696.
  Bard D. C., 351; Barker, T. A., 112; Beattie, W. S., 549; Berry, J. S. 549; Blakeslee, G. E., 351; Bogart, J., *887; Bradbury, B., 1132 Brashear, Dr. J. A., 840; Bray, Prof. C. D., 351; Brewer, H. G., 304; Broennimann, A. E., 1228; Brown, W. M., 1180; Bundock, S., 985; Burbank, G. B., 549
  Caldwell, R. L., 550; Chatigny, A., 1228; Chapman, R. H., 304; Chapman R. H., 351; Coe, W. W., 743; Creelman, F., 304
  Davis, Prof. J. B., 696; Decker, J. H., 713; Decker, J. H., 888; Duff, W. A., 549; Dysard, E. E., 350
  Edwards, J. M., 1132; Etheredge, A., 888
  Flory S., 1276; Foley, T., 1132; Ford, T. B., 351; Fraim, J. B., 1132; Fuller, F. L., 743
  Gault, A. K., 888; Gayley, J., 495; Gillies, J., 112; Graff, J. W., 888; Green, A., 840; Gregory, C. E., 448
  Hamlin, H., 1036; Hamlin, H., 1084; Hansen, A. C., 495; Hartwell, H. W., 112; Hartwell, R. A., 1036; Hetrick, Maj. H. S., 112; Holbrook, F., 351; Hutton, S., 1132; Hyatt, J. W., 1036
  Jennings, H., 549; Johnston, J. W., 1132; Jones, Maj. T. H., 985
  Kaerth, J. W., 495; Kimball, F. H., 62; Kleinschmidt, A., 696; Knowlton, W. C., 888
  Kuppler, C., 1132
  Little, G. A., 63; Loomis, T. H., 549; Lupfer, A. M., 549
  Maclaurin, Dr. R. C., e161, *203; Malone, J., 63; Manville, L. R., 496; Martin, F. A., 696; Martin, F. A., 840; Martling, D. D., 600; McCarthy, D. B., 600; McCullough, C. H., 793; Miller, J. E., 985; Miller, J. J., 744; Miller, J. L., 496; Munro, G. Reid, 743
  Newcomb, M. B., 793; Newell H. F., 793; Norcross, O. W., 495; Norcross, O. W., 744
  Olney, G. R., 495; Ormay, A. L. 696; Osborne, H., 743
  Paradis, P., 495; Parmer, C., 1276; Peary, Rear Admiral R. E., 549; Peterson, A. W., 304; Pratt, R. W., 304; Pressinger, W. P., 1276; Putnam, L. J., 1180
  Robinson, D. O., 1084; Rogers, J., 600; Rogers, S. D., 112; Ruhl, H T., 600
  Salph, Dr. A. V., 744; Samson, A., 985; Scullin, J., 1276; Shepard W., 495; Shepherd, J. W., 549; Simpson, G. C., 549; Smith, E. F., 304; Smith, Capt. F. R., 549; Spilsbury, E. G., 1180; Stone, R., 1132; Strack, T. P., 696; Swartz, J. H., 112
  Talcott, Col. T. M. R., 1084; Thorne, W. V., 549; Throop, F. W., 744; Tufts, A. 495
  Value, B. R., 1228; Vinal, C. H., 1276; Von Babo, A., 985
  Wakefield, R., 495; Walker, R. M., 495; Walsh, E. T., 351; Weston, G., 159; Weston G., 351; Wilcox, J. W., 351; Wilkinson, J. W., 981; Winston, J. C., 985; Wood, E. F., 160; Wood, E. F., 351; Woods, W., E., 744; Woolf, A. E. 888
Ockerson, J. A. (with others) on inland waterway transportation............. 763
OHIO
  Filters, technical control of...........1005
  Health district law weakened.......... 960
  Highways:
    Delay in construction urged.........n739
    No bids on some contracts..........e551
    Work blocked by bond decision......n1036
    Work not to stop...................n838
  Sanitary districts, creation and powers.. 144
Ohio River sand supply................ 324
  Wharf-house for variable rivers (G. W. McAlpin) *947
Ohio Technical Societies elect officers.....n790
Ohio Technical Societies indorse Joint Conference report.........................n790
Oil, launching a 10-inch undersea pipe line for oil (H. Leonard)..................*658
  Reservoirs, embankment and concrete work, El Segundo, Cal..............*905
  Road, in Baltimore County, Md......... 828
Okabe, S., on nomographic solution of cubic equation *1249
Oklahoma abandoned electrolytic sewage-treatment plants...............e1115, *135
Oklahoma City calls for engineers on sewage problem n886
  Impounding reservoir for water-supply..*478
Oleum, Cal., teredos work under 40-lb. pressure 1075
Oliver Iron Mining Co., Minnesota, railway spreader car handles heavy materials...*866
Olmsted, R. W., on precast concrete slabs for small irrigation structures........*1167
Omaha buys gas works................n1179
  Water supply completely metered, results (F. P. Larmon) *1186
Onondaga Creek, N. Y., traveling form lays concrete lining channel...............*1056
Onset, Mass., water-works, composite distribution system..................... 770
Ontario road plans made...............n299
Ore handling facilities at planned Lehigh Valley terminal, New York.............*970
OREGON
  Forest fire patrol and mapping, airplanes for 224
  Highways:
    Bill aims at patent pavements......n347
    Commission standardizes methods of analysis of indeterminate structures (C. B McCullough...............*675
    Engineers named n302
    More highway bridge construction.... 222
  Starts move for large forest-road appropriation n157
  Water-power development booming...... 680
Oregon City, proposed bridge across Willamette *406
Oregon State College, highway inspection methods taught (S. H. Graf)..........1012
Oregon-Washington Navigation Co. pier at Seattle, stiff-leg derrick with wood members mounted on roof.................*382
Organization engineering, ultimate aim of.a918
Organizing Conference of Societies, see Societies, Organizing Conference
Orland project California, costs of concrete canal lining compared................ 975
O'Shaughnessy, J., honored after 50 years' service, Columbus, O., water-works....n1082
Ottawa Branch, Engineering Institute of Canada, gets good publicity (M. F. Cochrane) ....letter 150
Ottawa & New York Ry., bridge over St. Lawrence, anchor pins bored out and renewed (H. T. Welty)..................*453
Oxyhydrate of calcium increases cement hardening rate h248

Page
P

Pacific coast cities comparison of engineering work and salaries.................. 18
Pacific Northwest Traction Co. trestle treated with gunite *225
Paint experience (A. H. Sabin)......letter 339
Painting, light colors advocated for bridge paints 806
Palestine development, board of Zionist engineers for n1561, n691
  Proposed irrigation projects........... 91

PANAMA CANAL
  And Arkansas razor backs (R. L. Kirkpatrick)....874, (H. N. Pharr) letter 1124
  Large concrete oil tank built for (R. C. Hardman) *380
  Magazine, bomb and bullet proof, has double roof (R. C. Hardman).......*998
  McClintic-Marshall claim still fails to win approval n792
  Operation financial results............ 74
  Pier shed, precast concrete roof trusses (G. W. True) *1232
  Slide delays ships..............n693, n792
  Through the canal (S. T. Henry)....... 726
Panama City and Canal Zone, per capita water consumption (R C. Hardman)..*1099
Paper gate replaces clay in jointing cast-iron pipe 575
Papers read before societies too long.....e1087
Paper-wrapped garbage makes trouble, Minneapolis 907, e937
Paris coal prices.......................1062
Parliamentary procedure, engineers lack knowledge e209
Parsons, R. S., appointed general manager, Erie R.R.........................n*983
Passaic River, upper, channel improvement 770
Passaic Valley sewer work to be investigated n299
Patch, D., on Is workman responsible for high labor cost?...................... 876

PATENTS
  Automobile railway track............n*791
  Floor block, new, patent sought........n791
  Legislation, Am. Soc. C. E. members urged to aid n692
  Luten, on concrete bridges, decision against sustained 417
    Letter from Mr. Luten's attorney, R. T. MacFall 1220
  Reform bill passes House.............n932
Paul, G. F., on underpinning checks warehouse collapse, Chicago...............*945
Paulista Railway Co., Brazil, to be electrified n933
Paving brick, lug or lugless? (P. K. De Voe and others) 618
Paving plants, municipally and government owned in U. S.....................1099
Payne, Sec. J. B., succeeds W. D. Hines as rail director n1082
Peck, C. A., on self-sustaining forms for concrete casing of steel girders.......h*688
Peekskill, N. Y., water-works, new pumping plant (H. W. Taylor).................*1114

PENNSYLVANIA
  Highways:
    Bids e353
    Daily report on winter conditions.... n61
    No bids on some contracts..........e551
    Program n1177
    State leads in mileage contracted for. 439
    State prepares to put own crews on road construction..................n297
    Township highway rewards distributed 818
  Motor vehicles, many registered........ 571
Pennsylvania Art Commission wants architects, not engineers to control Delaware River bridge....e209, n250, (M. Thompson) letter 585
Pennsylvania State College industrial course n1129
Penrose, C., on planning and progress on a big construction job.......e552, *554, *627
Penstock design, nomographic solution of cubic equation (S. Okabe)............*1249
Permanent International Association of Road Congresses, see Highways, International Road Congresses.
Peru, large jobs in, awarded to F. T. Ley Co. n157
Peterson, E. F., on asphaltic concrete laid on gravel base.......................*277
Pfaehler, R., with W. S. Lee, on reservoir and plant for new Southern water power *1088
Philadelphia asks bids on street improvements n319
  Council urged by Mayor Moore to appropriate money for Camden bridge......e161
  Highways rejuvenated (C. F. Puff)..... 922
  Refuse disposal 1196
  Water-works strike, threatened, called off..n643
Philadelphia Army Base, planning and progress (C. Penrose)..........e552, *554, *627
Philadelphia, Navy Yard dry dock soft ground complicates construction (C. A. Lee) ....*748, letter 1077
Philadelphia Society of Municipal Engineers, for putting engineers in charge of big bridges 435
Philippines, bascule lift span between cantilevers....*564, (J. A. L. Waddell) letter 687
Pholas, see Teredos
Phospherus and sulphur in steel to be investigated e260, 291
Photographs, small loose-leaf, replace big blueprints (C. W. Geiger)............*959
Photography, aërial, and city planning..... 950
Picric acid plant, Government, power unit sold n545
Piepmeir, B. H., on road construction in Illinois during 1919.............e937, *979

*illustrated; e, editorials; h, hints; n, news notes; a, abstracts.

Page

PIERS
- Coal, modern car-dump (Central Railroad of New Jersey), design and operation.....*759, correction 854
- New, at Seattle, Wash., case of operation governs design (G. F. Nicholson)....*1101
- Ocean, to be scrapped because of concrete disintegration *621
- Record length, planned for New York terminal, Lehigh Valley R.R. *970
- Shed, Panama, precast concrete roof trusses (G. W. True).....*1232
- Staten Island, N. Y., prospects brighter..n109

PILES and PILE DRIVING
- Bridge foundation, drop hammer works under water on.....h*393
- Destroyed by teredos in waters not previously infested, San Francisco Bay..*1000
- Double set of leads, piledriver has (M. G. Findley) h*881
- Driving piles through ice (H. M. Harding) h*882
- Driving, soil swelling in (W. T. Quinn) letter *1124
- Drop hammer works under water on foundation piles h*393
- Load distributions under lock (M. G. Findley) .....letter *392
- Long, what will they carry? (C. Wernecke) .....letter *590
- Military pile driving with motor trck...h788
- Pinch piling at Portland, Ore., grain elevator......e161, *176 (A. M. Crain) letter 485
- Sheet piles, steel, pulled by A-frame with 15-part line h*56
- Street piles, tests of solid and laminated.*1201
- Treated, brush coat should follow trimming of treated timber (G. M. Hunt) *753
- Untreated, short service in San Francisco Bay 1253
- Wood, coated by cement gun.....*225

Pillsbury, G. B., promoted to lieutenant colonel n693

PIPE
- Asbestos and cement, made in Italy.... 724
- Cast-iron, jointing, paper gate replaces clay 575
- Cement and asbestos, made in Italy.... 724
- Concrete, large, rolled by horses.....h*151
- Concrete pressure pipe joint, new.....n*496
- For hydraulic fill turned often to equalize wear h295
- Oil, launching 10-inch undersea pipe line for oil (H. Leonard).....*658
- Pressure, concrete, new joint for.....n*496
- Steel, floated to place, sunk and bolted under water to form outfall.....*124
- Wood-stave, smooth, and wood channels, discharge of (A. A. Barnes)..... 228

Pipe line, steep, winter construction.....h151
- French, to be built by American engineers n982

Pipe pusher cuts cost of underpavement cable conduits (C. A. Frankinhoff)..h489
Pipe sprinkler system for long bridge.....*123
Pits, deep circular, collapsible forms used in pouring walls, Detroit.....h*1030

PITTSBURGH
- Bridges, should architects or engineers design? see Architects
- Bridges, Allegheny River, Henderson liftable bridge, plan for *1171
  - Concrete and stone, show low maintenance cost 953
- Bureau of Standards tests concrete resistance to fire.....a469
- Construction work inactive.....n1082
- Improvement bonds fail to draw bids..n837
- Street widening and improvement, no bids on n1081
- Transit commissioner removed by mayor.n446

Plagiarism, professional (P. B. McDonald) ....477, (E. Campbell) letter 585, (S. Baker and P. B. McDonald) letters 685, (J. C. Tracy) letter 786
Plainfield, N. J., sewage works, Imhoff sludge utilized on land (J. R. Downes).. 859
Plank covering protects steam shovel from blasts, Joaquin Light & Power Co.....h*152
Plans, two sets for contractor (E. W. Bush) h638
Plant for sand and gravel storage (G. W. McAlpin) h*928
Plate girders, see Girders, plate
Plumb plan renounced by Brotherhood of Railway Trainmen e796
Pneumatic tools, physical effects of, on limestone workers h834
Pocket specifications for city work..... 785
Point Pleasant, W. Va., wharf-house for variable rivers (G. W. McAlpin).....*947
Poland, new railroad line opened.....1103
"Polias," concrete ship, on Maine rocks *183, n981
Pontiac, Mich., to spend $1,500,000 on municipal work n597
Pope, C. S., on California asphaltic concrete roads 1095
Port Arthur, Ont., rubble breakwater deposited from railway on ice.....*1261
Portland cement, see Cement
Portland Cement Association protests against road construction limitation.....n1177
Portland, Ore., considering waterfront improvement n693
- Grain elevator, foundation troubles at ....e161, *176, (A. M. Crain) letter 485
- Municipal grain and freight port terminal (W. P. Hardesty).....*179
- Zoning ordinance 899

Port Lobos, Mex., launching 10-inch pipe line for oil (H. Leonard).....*658
- Assistant engineers, bills to aid.....n307
- Construction must start soon..... e65

PORTS AND HARBORS
- Coos Bay, Oregon, to be developed as rail and water terminal.....n109
- Cost of holding vessel in port..... *43
- Freight-handling equipment, Port of Seattle (G. F. Nicholson).....*37, e65
- Hamilton, Ont., report on proposed harbor n154
- Nassau, B. W. I., concrete facing protects old masonry sea wall.....*996
- New Orleans harbor canal, unwatering lock site (G. R. Goethals).....*940
  - Inner harbor—navigation canal, progress on (M. G. Findley).....*808
- New York City, see New York City, Harbor
- Portland, Ore., considering waterfront improvement n693
  - Municipal grain and freight port terminal (W. P. Hardesty).....*179
- Rivers and harbors bill, Senate adds $8,000,000 .....n837
- San Francisco, depth of water in Golden Gate 1043
- Sea wall, masonry, protected by concrete facing, Nassau, B. W. I.....*996
- Seattle, Wash., design of new pier (G. F. Nicholson) *1101
- Seattle, Smith's Cove terminal....*1101, fire protection, 1204.
- Statistics, new.....43, correction 152
- Toronto works, progress.....*724

Post, R. E., on car-loading hopper for draglines and grab buckets.....h*979
- On movable support for sinking pumps.h*1078

Postal Service, motor trucks in..... 286
Potomac River Bridge, Key Bridge, see Bridges, Potomac River
Potter, Col. C. L., heads Mississippi River Commission n490
Potts, W. J., nominated for Railway Labor Board n740
Poughkeepsie bridge reconstruction, and loadings (C. E. Chase).....e497, *528
Powder cost reduced by mortar tamping... 946
Power, see Water Power
Power statistics, Canadian 1187
Pratt and Knowles engineering organizations combined n447
Presidential candidates' views sought by A. A. E......n1080
Pressure transmission on soft soil, an effect of (W. T. Quinn) .....letter *1124
Prices and cost of living.....1103
- Raising, halt on (H. W. Foote) e65 letter 98
- Spring, in New York (A. W. Welch)....n352

Priestman wage-fixing scheme..... 11
Profession Memoirs superseded by The Military Engineer n492
Professional plagiarism, see Plagiarism, Professional
Professional spirit in engineering education (C. R. Mann) 1242
Professions other than engineering, how organized (C. W. Baker) 1250
Prohibition and labor and the foreign born ....e353, e747, (L. D. Rights) letter 831, (E. D. Gilman) letter, with editorial comment 927, (T. C. Satterthwait and others) letters 1122, (C. Shepard) letter 1268.
Proletarian mind, the (P. B. McDonald)...1042
Providence, R. I., water board to limit construction in 1920.....n302
- Zoning plan urged n300

Public buildings bill, none this session....n300
Public Health, see Sanitation
Public improvement minutes, short comings of (F. B. Tucker).....1053
Public Roads, Bureau of, see Bureau of Public Roads
Public works versus public waste.....n252

PUBLIC WORKS DEPARTMENT
- Bill, Senate Committee considers.....n394
- Chamber of Commerce considers referendum on, at request of Engineering Council n205
  - Issues questionnaire.....n791
  - Referendum against.....n1178
  - Investigation, bill provides for.....e889
- Engineering Council's vote on.....n1034
- Engineers and department....e162, 169 (M. O. Leighton) letter 292
- Fund now $20,000.....n981
- Interest extends.....n155
- National Federation of Construction Industries takes referendum on....n543, approves n1081
- National Public Works Department Association, contribution from.....n252
  - Convention...n57, e162, 169, (M. O. Leighton) letter 292
- Newell, Prof. F. H., on Chamber of Commerce committee.....n253
- No open opposition to bill.....n791
- None possible this year n1226
- Referendum on.....n543
- Republican platform on n1226
- St. Paul Association of Public and Business Affairs in favor n1033
- Urged at engineering mass meeting.....n445

Publicity, campaign of A. A. E., results..n302
- Engineering.....e890, (C. B. Smith) a1025, (A. J. Hammond) letter with editorial comment 1076
- For Contractor h393
- For engineers, J. H. McGraw on 1111

Puff, C. F., on waterbound macadam and bituminous concrete roads rejuvenated.. 922
Pump, centrifugal, by-pass pipe maintains suction h*1174
- Sinking, by means of movable support (R. E. Post).....h*1078

Pumping, continuous, by means of controlled by-pass to suction....h*104, h*1174
Pumping costs, by steam and electricity St. Paul, Minn 1202
Punch, for bridge work, quick field (C. J. Bennett) h*638
Punch shop, plank trusses, heavy timber framing *1016
Punjab, India, irrigation projects..... 431
Purchasing, Government, centralized (book reviews) 784
Purdue University annual road school to cover 18 subjects.....n108

Q

Quarry loading cost reduced by steam shovel 1109
Quay wall, masonry, protected by concrete facing, Nassau, B. W. I......*996
Quebec develops water power (O. Lefebore) e401, 1423
- New railroad, bill for.....n205
- Water-works in..... 912

Queenston-Chippawa canal work, A-frame with 15-part line used for pulling steel sheet piles h*56
- Insurance, pensions and sick benefits for employees n157
- Mixing concrete by surface areas on actual work (R. B. Young)...e6, *33, correction 72, comment by Young, G. M. Williams and H. A. Davis, 811
- Spoil dump to cover 200 acres maximum depth of 60 feet..... *42
- Submarine drills on high frames for land work h*152

R

Radio Corporation to build large wireless station n1080
Rails, see Railways, Rails.
Railway, marine, for 5000-ton ships, Astoria, Ore. (C. O. Crisman) *1156
Railway conference of A. A. E......n546

RAILWAYS, see also names of lines
- Accident near Vincent, Cal.; speed too great for elevation of outer rail caused derailment.....*433, (J. G. Sullivan) letter 832.
- Accidents to employees decrease 329
  - Train, for year 84
  - Train wrecks St. Louis viaduct.....n396
- Alaska, see Alaska, Railway.
- Ballast, track, new machine for cleaning n*112
- Bridges, see Bridges, Railway.
- Canadian, early surveys (H. K. Wicksteed) 513, 670
  - Government to purchase lines n1274
- Canadian National $47,000,000 deficit.. n741, e746, e848
- Canadian Pacific offers McGill scholarship n984
- Car shortage, contractors' questionnaire on n1274
- Central of New Jersey, modern car-dump coal pier, design and operation *759
- Chicago, Milwaukee & St. Paul, bridge over Missouri at Chamberlain, S. D..*824
  - Opens electric operation on new division n545
  - Resources of old lines (J. G. Wetherell) *575
- Chinese 1013
- Cincinnati Southern to renew Ohio River bridge n1273
- Coal pier, modern car-dump, design and operation (New Jersey Central).....*759
- Coaling station, shallow pit for Chesapeake & Ohio, Handley, W. Va.......*520
- Concrete roadbed for e796, *826
- Conference of A. A. E. n546
- Construction, heavy, on San Diego and Arizona Railway *481
- Control:
  - Agreement on bill n299, n398
  - And new mileage (J. Wilkes).....*196
  - Association of Railway Executives' advertisement e305
  - Back to private operation e449
  - Bills go to conference n59
  - Bill passed e404, n441
  - Compensation contracts, status of ... 426
  - Cranford, N. J., board takes up problem n302
  - Deterioration under.....890, e1038, 1074
  - Do shippers want railroad subsidy?...e258
  - Extension of Federal guarantee for six months agreed upon n153
  - Freight rates and the railway problem e1230, 1260
  - Hoover, H. C., views on e450
  - Improvements under government total $470,000,000 .....272, 1075
  - Legislation e7
  - Limitation of earnings taken up by conferees n206
  - Payments for betterments, bill gives more time for n1082
  - Payne, Sec. J. B., succeeds W. D. Hines as director n1082
  - Plan of C. W. Baker (F. W. Harris).. letter 52
  - Plumb plan renounced by Brotherhood of Railway Trainmen e796
  - Prosperous system and rate regulation e843
  - Railway officials protest Senate excess earnings provisions n108
  - Rate rule, new, not a guarantee.....e499
  - Return of railroads e1
  - Return Mar. 1 proclaimed by President n57
  - Virtual agreement reported n345
- Crisis in transportation.....e987, e1037
- Curve, reverse, a problem (W. H. Adams) ....letter *832, (A. C. Love) letter 978.
- Curves, conversion table for plotting (J. G. Walsh) ..... letter 186

*Illustrated; e, editorials; h, hints; n, news notes; a, abstracts.

Page

Delaware, Lackawanna and Western, tie renewal record for 19 years 810
Denver & Rio Grande, terminal at mountain summit *1069, *1159
Derailment caused by speed too great for elevation of outer rail, near Vincent, Cal............*433, (J. G. Sullivan) letter 832.
Electric, screw spikes on..............1191
Electrification, fuel saving by 1107
  Plans, South Africa 227
Employees, are they overworked and underworked? (C. W. Baker)....*385, (F. A. Molitor) letter with comment by C. W. Baker, 539, (R. B. Everett) letter with editorial comment 832.
Engine house, rectangular, concrete, Denver & Rio Grande *1159
Engine terminal for Lehigh Valley, new, at Ashmore, Pa. *514
Engine terminal for mountain division in Utah *1069, *1159
Engineers, see Engineers, Railways.
England, work in 422
Equipment "relocated" and delayed..e1037
Erie, R. S. Parsons appointed general manager n*983
Executives, engineers as..............e1229
Extension from public (R. H. Blain).... letter, with editorial comment, 292
Fill made with stiff-leg derrick dragline h*151
Finance and "value" e257
Finances, see Railways, Control.
Financially and physically, a review.... 12
Freight blockade e988, e1037
Freight rates and railway problem.... e1230, 1260
French, reconstruction 136
Grades, low, economy for heavy traffic.. a244, (A. C. Dennis and W. Michel) letters 736.
Great Central, England, retaining wall in deep cut displaced by slide 870
Hocking Valley studies low grades for heavy traffic line 244
Hudson Bay, study for new terminal recommended 1244
Hudson Bay, work confined to maintenance n1224
Improvements, new factors in planning.. e602, 613
  Needed, $1,000,000,000 yearly.e1230, 1260
  Under Government control total $470,000,000 ....272, 1075
Industrial, continuity of operation essential to success (H. E. Breed).....*273
Industrial, heavy, location and structures of *604
International Transcontinental Ry. (European), new Polish link opened 1103
Labor wages an element in improvement 615
Labor, wages and efficiency............1260
Labor Board appointed and meets.....n837
Labor Board, engineers named for.n740, n837
Legislation, see Railways, Control.
Lehigh Valley, new engine terminal at, Ashmore, Pa. *514
  Piers of record length planned for New York (Claremont) terminal........*970
  Work started on Claremont Terminal..n885
Location, economics of e602, 613
Locomotive and track....e403, a*406, ("Railway") letter 586.
Locomotives, chart for discharge of water columns supplying locomotives (F. D. Yeaton) *1013
Logging, tracklayer for *373
Materials, damaged and old, reclamation.a806
New York Central accommodates itself to Barge Canal (B. S. Voorhees)..e497, *500
Officers, future, training of...........1249
On ice deposits rubble breakwater, Port Arthur, Ont. *1261
Ottawa & New York, bridge over St. Lawrence, anchor pins bored out and renewed (H. T. Welty) *453
Paulista, Brazil, to be electrified.......n933
Physically and financially, a review.... 12
Plumb plan renounced by Brotherhood of Railway Trainmen e796
Polish, new line opened 1103
Problem, engineer and e1230, 1260
Prosperous systems and rate regulation..e843
Quebec, new, bill for n205
Rails:
  Argentine expected to bid on entire surplus n348
  Clamp fastening for *336
  Cracks in steel correlated with fissure defects 129
  Deep etching and defects 573
  Light-weight, War Department asks bids on n646
  Old, with high internal strains, contained no fissures 527
  Specifications, new, adopted by American Railway Engineering Association 613
  Spikes, screw, success depends largely on placing a733
  Spikes, screw, on electric railways...1191
  War Department issues commandeer order n347
Rates and service e1038, 1074
Rates, freight, and railway problem.... e1230, 1260
Rates, higher, do shippers want?......e1182
  New, asked on construction materials. n1224
Reclamation of damaged and old materials a806
Regulation, see Railways, Control.
Resurveys of old lines (J. G. Wetherell)*575
Reverse curve problem (W. H. Adams) ....letter *832, (A. C. Love) letter 978
Review of situation 12, e305
Roadbed, concrete..............e796, *826
San Diego and Arizona, heavy construction on *481
Screw spikes, success depends largely on placing a733
Service and rates e1038, 1074
Shortage of facilities e305
Skagit to be built by Seattle........... 456
Soldier Summit terminal, Utah..*1069, *1159
South America, system needs new links (F. B. Morris) *182
South American, to connect Amazon and West coast, to be constructed......n158
Southern Pacific, accident to swingbridge at Oakland, Cal., and repair of damage. n109, *829
Spikes, screw, seeRailways, Rails.
Split-switch turnout, method of laying out (R. L. Longshore and H. M. Kanarr).........letters 102, (L. E. Ratcliff) letters *341, (J. B. Babcock) letter 640.
Spreader car handles heavy materials...*866
Strike, see Labor, Strikes.
Subsidy, do shippers want?...........e258
Surveys, see also Railways, Resurvey.
  Conversion table for plotting curves (J. G. Walsh) ....letter 486
  Early, for Canadian railways (H. K. Wicksteed) 513, 670
  Sequence of notes for and calculation of cross-section (O. G. Bunsen)....*472
Switches, method of locating split-switch turnouts (L. E. Ratcliff)..letter *341, (J. B. Babcock) letter 640.
Terminal at mountain summit, Denver & Rio Grande R.R. *1069, *1159
Terminal congestion and motor transfer. e498, *508, e889
Terminal problems (Col. W. J. Wilgus) e889, *901
Ties:
  And ballast, counterbalance effect and behavior..........e403, a*406, ("Railway") letter 586.
  American Railway Engineering Association specification adopted 614
  Douglas fir, relative durability...... 976
  Reinforced-concrete, status of (C. H. Wakefield) e499, *522
  Renewal record for 19 years on D. L. and W. 810
  Renewals, methods of supervising ..a709
  Service tests of treated ties on Lackawanna 511
  Sodium fluoride as preservative......1253
  Steaming increases absorption 477
Tonnage maps for valuation (F. W. Harris) ....letter *1173
Track and shop workers' strike order suspended n398
Track:
  Ballast, new machine for cleaning.n*112
  Creepage on heavy grades, stopping (A. M. Shaw) ....letter 101
  Materials, discussed by American Railway Engineering Association 614
  Scale, with new features n*986
  Screw spikes, success depends largely on placing a733
  Simple solutions of compound curve problems *378
  Speed too great for elevation of outer rail caused derailment.......*433, (J. G. Sullivan) letter 832.
  Spikes, holding power of *47
  Stress committee, report.......e403, a*406, ("Railway") letter 586.
  Studies of; new counterbalance effect and behavior of tie and ballast.. e403, a*406, ("Railway") letter 586
Tracklayer for logging railroads.......*373
Traffic, heavy, economy of low grades for.......a244, (A. C. Dennis and W. Michel) letters 736.
Train control, automatic, on heavy-traffic lines, favored 337
Train operation as affected by new wage schedules a704
Tunnels, heavy construction on San Diego & Arizona Ry. *481
  State, three, proposed by Colorado...n205
Turntable lifted out of pit without jacking (G. T. Kuntz) *1005
Valuation:
  And a new rate rule e305
  Disagreement on basis in argument before I. C. C. n691
  Elements graphically shown (O. R. Morse) *271
  Finance and "value" e257
  Interstate Commerce Commission calls value and rate hearing n545
  Interstate Commerce Commission hears arguments on principles..........n155
  Kansas City Southern R.R. case, decision favors road....n546, e553, 563
  Step forward in e553, 563
  Tonnage maps for (F. W. Harris) .... letter *1173
Water economy e1181, 1202
Water Service organization *676
Rainfall data show road conditions...... 920
  Maximum, at Boston 582
  Statistics, New Orleans, La., analysis... 963
Rain gage, 900-in., on Hawaiian peak...1166
Ralston, J. C., on how engineers are affiliated at Spokane e401, 436
Rapid transit, see Cities, Transportation.
Rapp, F. A., on heavy foundation work for bascule bridge at Seattle *774
  On three double-leaf bascule bridges at Seattle..*718, heavy foundation *774.
Reavis, Representative, speaks for Construction Corps n647

Page

Reclamation, see Land Reclamation, also Drainage.
Reclamation Service changes n1081
  Invasion ("Western Engineer" and A. P. Davis) ....letters 438
  Report on development of unused lands. 375
Reconstruction committee named by Construction Industries Federation.......n1225
Records and reports, common weakness of. 805
Red Cross sanitary survey in Eastern Europe outlined 807
Red water plague, prevention of.........a381
Rees, Col. T., member California Debris Commission n693
Regina, Sask., joint water-supply scheme with Moose Jaw n837
Regional planning, suitable areas for..... 950
Reinforced concrete, see Concrete, Reinforced.
Reinforced-concrete beams, see Beams.
Remington Arms Co. war plant leased by General Electric Co. n694
Rental values for construction equipment (F. J. Herlihy) 125
Repair plant for dredges, portable........h295
Reports, common weakness of 805
Research Council, see National Research Council.

RESERVOIRS

  Bridgewater, N. C., construction, etc. (W. S. Lee and R. Pfaehler) *1088
  Decorah, Iowa, flood-protection........*565
  Flood-protection, for Decorah, Iowa...*565
  Oil, embankment and concrete work El Segundo, Cal. *905
  Oklahoma City, natural basin developed.*478
  Storage, formed by three widely separated dams, Bridgewater, N. C. (W. S. Lee and R. Pfaehler) *1088
  River, silt problem of, at Zuni Reservoir.a145
  Storage, development of natural basin as reservoir for Oklahoma City *478
Resurveys of old railroad lines (J. G. Wetherell) *575
Retaining wall in deep cut displaced by slide 870
Retaining wall theories (E. Godfrey)....*948
"Retaining Walls," by Paaswell, review by E. Godfrey 1026
Retarding jetties check bank erosion 612
Reverse curve problem (W. H. Adams).... letter *833, (A. C. Love) letter 978.
Revolution, real, the ......e354, (P. B. McDonald) letter 487.
Revolving boards and straightedge for reducing or enlarging drawings (G. H. Gilchrist) *377
Rhone River development plans 230
Richards, A., and W. Carmichael, on unique plant concretes seven-span arch bridge.. *76
Richart, F. E., on eccentric loading in rigid frames *331
Ridgway, R., on compensation from engineer's point of view............e938, 946
Rigid frames, eccentric loading in (F. E. Richart) *331
Rio Grande River, bridges and gagings (B. Wilson and A. J. Henry)........letters 339
River and harbor contractors, bill would relieve them of war cost increases......n740

RIVERS

  Assistant engineers, bills to aid.......n397
  Jetties, retarding, stop bank, erosion 612
  Regulation in new aspect e164
  Variable, wharf-house for (G. W. McAlpin) *947
Rivers and Harbors bill, see Legislation.
Rivets, will they have to go?.......e698, *708
Roads, see Highways.
Robbins, D. W., on contractors or "large" contractors for highway work?........ 583
Robert, Brig. Gen. H. M. an appreciation.*798
Robinson, D. P. & Co., Inc., merged with Westinghouse, Church, Kerr, Inc...n647, personnel n739.
Rochester, N. Y., garbage plant.....e257, n298
  Pocket specifications for city work 785
Rockefeller, J. D., gift of $50,000,000 for educators' salaries n107
Rocky Point, L. I., large wireless station to be built n1080
Rocky Point, Ore., bridge truss centering used for 115-ft. concrete arch (C. B. McCullough) *851
Rod readings in tunnel speeded up by can-and-candle device h55
Rod, unique, for canal soundings and stream measurements *51
Rods, tie, see Tie Rods.
Roesch, R G., on an efficient catalog file.1165
Rogue River bridge, Rocky Point, Ore., truss centering used for 113-ft. concrete arch (C. B. McCullough) *851
Rolled steel shapes, Anglo-American standards proposed n1034
Roney, W. H., Jr., on designing concrete columns with cast-iron core *459
Roof, concrete, over dry kiln, corrosion of steel in (A. H. Weber) 915
  Double, protects magazine from bombs and bullets, Panama (R. C. Hardman) *998
  Forms supported by temporary trusses (P. S. Toney) h*1270
  Snow loading allowance on (S. Wilmot) letter 1269
  Timber, decay checked by treatment.... *578
  Trusses, concrete compared with steel (G. W. True) *1232
  Trusses, punch shop, heavy timber framing *1016
Ross, R. A., new president of Engineering Institute of Canada n*345, n398
Royal Architectural Institute, Canada, asks duty on plans to aid profession n887

*illustrated; e, editorials; h, hints; n, news notes; a, abstracts.

Page

- Runner, hydro-turbine, new, shows epochal development *271
- Russia conditions discussed at joint meeting n1130
  - Leaf from Lenin's policy on manpower (F. A. Kellor)....517, (D. E. Gelwix) letter 787.
  - Soviets at work e699

S

SAFETY
- Accidents to railroad employees decrease 329
- Bridges at U. S.-Canada border, safety of e1183
- Chisel bar holder prevents hammered hands h*198
- Codes referred to Engineering Standards Committee n57
- Codes, work on is begun by Standards Committee n1176
- National Safety Council, engineering section, to meet n790
- Physical effects of pneumatic tools on limestone workers h834
- Sand blast dust, protection from........ 785
- Saw guard h*979

- Safford, H. R., new president American Railway Engineering Association n*595
- Salt Lake City garbage and refuse collection and hog feeding (S. J. Truman). 959
  - Needs additional water-supply........n691
  - Sewerage program, five-year, completed.*674
- Salt River bridge, California, longest concrete girder bridge *427
- Salt River Irrigation Project, Arizona, drainage results and proposals 921
- Sand and gravel producers meet n398
  - And gravel storage, plant for (G. W. McAlpin) h*928
  - Sluiced to centrifugal pump h834
  - Supply, Ohio River 324
- Sand blast dust, protection from 785
- San Diego & Arizona Railway Co., heavy construction *181

SAN FRANCISCO
- Depth of water in Golden Gate 1043
- Engineering building for, proposed by Engineers' Club n206
- New industrial development planned ...*319
- Waterfront, asphalt protects exposed steel in concrete 1075
- Water-supply:
  - Hetch Hetchy dam, concrete to be poured in June n59
  - Hetch Hetchy delay threatened..... e498, e649, e650
  - Hetch Hetchy tunnels, four bids received n885
  - Purchase of Spring Valley Water Co. proposed n301
  - Spring Valley Co., concrete destroyed in vacuum in culvert, Calaveras Dam *1197

- San Francisco Bay, teredos destroy piles *1000, 1253
- San Francisco Engineering Bureau replaces big blueprints with small loose-leaf photos (C. W. Geiger) *959

SANITATION
- Abnormal death rate in 1918 due to influenza 584
- Alberta, Can., health administration... 94
- Birth and death registration areas.e697 *732
- Bloomington, Ill., leaky cross-connection causes typhoid, kills 15....e939 (G. W. Booth) letter, with editorial comment, 1121.
- Buildings prohibited where no sewers, Cleveland, Ohio 51
- Death and birth registration areas e697, *732
- Delaware health bulletins 146
- Filters, Ohio technical control of......1005
- Health administration in Alberta, Can.. 94
- Kansas intestinal malady probably not due to water-supply 338
- Kansas City Engineers' Club appoints civic sanitation committee n1178
- New York State health laboratory building 420
- Ohio districts, creation and powers 144
- Ohio health district law weakened.... 960
- Public health officials, new specifications for (M. Knowles and M. R. Scharff). 39
- Public water-supplies, control by states *44 (H. S. Cummings) letter, with editorial comment, 926.
- Red Cross survey in Eastern Europe outlined 807
- State health authorities and water and sewage treatment.....e114, 133, (A. Wolman) letter with editorial comment, 339.
- Statistics, vital e697, *732
- Typhoid: see Typhoid.
- Vital statistics e697, *732
- Whipple, Prof. G. C., on mission against cholera and typhus n1083

- San Joaquin Light & Power Co. Kerkhoff Dam tunnel, etc., construction. *311, *421, h1174
- San Joaquin River, California water storage developed 471
- San Pablo and Suisun Bays, California, teredos destroy piles *1000
- Santa Barbara, Cal., Gibraltar water supply dam *1003
- Santa Monica, Cal., municipal pier to be scrapped because of concrete disintegration *621
- Sault Ste. Marie, Can., thermit weld used on ore dock tie-rods 620
- Saw guard insures safety h*79

Page

- Sawkins, J. H., on method of supporting track over trench with maximum clearance h*440
- Scaffolding, pile, quickly erects metal flume. h*1078
- Scale, track, with new features... ......nx986
- Scharff, M. R., and M. Knowles, on new specifications for public health officials 39
- Schoolroom floor, Minneapolis, live load on, shown by tests 924
- Schoonmaker, G. N., on revamping Toledo pumping station under service...e1181, *1184
- Schurman, Dr. J. G., resigns as president of Cornell University n398
- Schwab C. M., on success in life....e649, 681
- Scour prevented by wire bags filled with cobbles (A. A. Northrop) h*834
- Screen, self-cleaning for small canals....*128
- Screw jacks raise concrete bridge.....h*881
- "Scum buster" for Imhoff tank vents Albany N. Y. *1207
- Sea wall, masonry, protected by concrete facing, Nassau B. W. I. *996
- Searles' "Field Engineering," error in (H. C. Ives and G. B. Zahniser) ..letters 53
- Sears, A. L., on curves lined accurately to templet in sewer tunnels h*737

SEATTLE
- Bascule bridges, three double-leaf (F. A. Rapp) *718, *774
  - Heavy foundation work (F. A. Rapp) *774
- Cedar Lake dam new plan for n296
- Drop hammer works under water on bridge foundation piles h*393
- Pier, new, design of (G. F. Nicholson).*1101
- Port of, freight-handling equipment (G. F. Nicholson) *37, e65
  - Wood treatment on new pier *754
- Smith's Cove terminal...*1101, fire protection, 1204.
- Standard plans and specifications for city work 785
- To build Skagit railroad 456

- Sea water, effect on timber, metal, etc., book review 1217
- Sellers, H. W., on disciplinary procedure of American Institute of Architects...e649, 677
- "Selma," concrete ship, goes ashore....n1274
- Semi-trailers subject to tax............n1178
- Senate committee to study construction shortage n1175
  - Plans to stimulate construction work .n932
- Septic tank, ready-made, vitrified clay, two-story *936

SEWAGE TREATMENT AND SEWAGE WORKS see also **SEWERS**
- Activated sludge:
  - Experiments, Urbana-Champaign, Ill. . n1034
  - At Worcester, Mass. (R. S. Lamphear) *819
  - Moves forward, Milwaukee (T. C. Hatton) e989, *990
  - Plant filtros plates successfully cleaned 754
  - Plants, Houston, Tex., record forms for *75
  - Plant, California State Prison 1260
  - Plant, Milwaukee, fine-screen specifications......511, construction postponed, n1079
  - Process, considered at London 616
  - Utilization of (T. C. Hatton)...... e989, *990
- Automatic timed siphon designed in spite of meager reference data (G. H. Bayles) *974
- Calumet Sanitary District recommended..*480
- Centrifugal tests at Milwaukee station.1171
- Chicago Sanitary District plans........ 873
- Cleveland, Ohio, contract awarded n300
- Dilution requirements of sewage and sewage effluents (C. B. Hoover and C. D. McGuire) 755
- Dilution, with and without, for disposal of effluents, report on a1161
- Dosing beds, simple mechanical control (P. Thompson) *1018
- Drifting-sand mechanical filters at Toronto......e115, (A. Wolman) letter, with editorial comment 339.
- Effluents for disposal with and without dilution, report on a1161
- Electrolytic plants abandoned in Oklahoma......e115 *135, (A. Wolman) letter with editorial 339.
- Experiment stations to reduce city risks (A. Wolman)......letter, with editorial comment, 339.
- Filtros plates successfully cleaned 754
- Fine-screen specifications for activated-sludge plant Milwaukee......511, construction postponed, n1079.
- Imhoff sludge utilized on land at Plainfield, N. J. (J. R. Downes)......859, (R. Hering) letter 977.
- Imhoff tank operation simplified by extra drain-unit costs 332
  - Vents, "scum buster" for, Albany, N. Y. *1207
- Joint disposal of Indiana lake cities....*480
- Oklahoma, idle electrolytic works e115, *135
- Oklahoma City calls for engineers on sewage problem n886
- Plainfield, N. J., Imhoff sludge utilized on land (J. R. Downes) .859, (R. Hering) letter 977.
- Riensch Wurl screening plant, Dyckman Street New York, operating results (C. E. Gregory)......171, corrections 526, 787.
- Salt Lake City's five-year program completed *674

Page

- Screening plant, Dyckman Street, New York City operating results (C. E. Gregory)......171 corrections 526, 787.
- "Scum buster" for Imhoff tank vents..*1207
- Sedimentation advised for Syracuse, N. Y. n1272
- Septic tank, ready-made, vitrified clay, two-story n*936
- Siphon designed in spite of meager reference data (G. H. Bayles) *974
- Sludge utilization at Kingston-on-Thames, England 366
- State health authorities and sewage treatment (C. E. Gregory and W. H. Dittoe) .....e114 133, (A. Wolman) letter, with editorial comment, 339.
- Tipple-trough for dosing beds (P. Thompson) *1018
- Worcester, Mass., activated-sludge experiments (R. S. Lamphear) *819

SEWERS, see also **SEWAGE TREATMENT**
- Buildings prohibited where no sewers, Cleveland Ohio 51
- Construction:
  - Manhole costs, estimating (E. E. George) *231
  - Outlet, construction work, in soft soil.*337
  - Pipe, steel floated to place, sunk and bolted under water, to form outfall *124
  - Reconstruction of outlet end, St. Louis (W. W. Horner) *1059
  - Tunneling machines successful Detroit 329
  - Tunnels, curve lines accurately to templet in (A. L. Sears) h*737
  - Work on outlet sewer in soft soil...*337
- Detroit, consulting committee n151
  - Tunneling machines successful 329
- Manhole costs, estimating (E. E. George) *231
- Odors eliminated from waste by traps and leaping weir *1051
- Outlet large combined 461
- Passaic Valley outfall tunnel, contract awarded n107
- Passaic Valley, work to be investigated n299
- Springfield, Mass., relief sewers recommended............1055, correction 1169
- St. Louis, reconstruction of outlet end, Branch St. sewer (W. W. Horner)..*1059
- Traps and leaping weir eliminate odors from waste *1051
- Tunneling machines successful on Detroit sewers 329

- Shaft-sinking record prizes for..........h1174
- Shapes, rolled steel, Anglo-American standards proposed........................n1034
- Shear, another vote on................e745
  - Horizontal, excessive (R. Fleming).... *1040, e1085, 1104
- Sheet lead, brittleness in.............. 927
- Sheetpiles, solid and laminated, tests....*1201
- Shenehon F. C. indorsed for Joint Commission by Minnesota Engineering Board ....n1079 n1128 (G. H. Herrold) letter 1172
  - On Pittsburgh bridge case 1254
  - On plan to regulate Great Lakes level by Niagara dam....e305, *308, correction 512
  - On relation of engineer to architect.... 174
- Sherman C. W. on protecting iron and steel stand pipes from corrosion........a285
- Sherman L. K., inaugural address, A. A. E. 999
  - On increase in house building costs since 1913 .. ..*267
- Shipbuilding, see Ships and Shipbuilding
- Shippers, do they want a railroad subsidy? e258
  - Do they want higher railway rates?...e1182
- Shipping control, Hoover's views on......e450
- Shipping Board, United States, sells yard to Fuller Co........................n202
  - Suspends two provisions of merchant marine act n1226

SHIPS and SHIPBUILDING
- Shipbuilding American, in 1919........... 688
  - Concrete:
    - Barge, articulated, for dredge crane..*1241
    - Holes repaired with cement gun....*1113
    - Interior braces and stirrups added to tankers *705
    - "Polias" on Maine rocks......*483, n981
    - Proportioning concrete for Government ships (H. A. Davis) 813
    - "Selma" goes ashore n1274
    - Still experiments..............e450, a463
  - Cost of holding vessel in port 43
  - Great Britain, profits.. 878
  - Launching, side, of 6,000-ton vessel, motion study of *470
  - Marine railway for 5,000-ton ships, Astoria, Ore. (C. O. Crisman)........*1156
  - Yard sold to Fuller Co. by Board......n202
  - Yard, drinking fountain water treated by violet rays (W. L. Decker)..........*572
  - Yards sold and leased.................n154
- Shirley, H. G., on why Federal aid will not build national highway system 336
- Shoe leather, wear resistance tested....... 717
- Shovel, steam, see Steam Shovel
- Sierra Nevadas, snow surveys to be made.. n60
- Sieve tests, cement, check closely 1200
- Signaling concrete mixer by lights (E. K. Borchard) h*104
- Signboards for French highways......... 923
- Silander, A. L., on dragline excavator loads scow anchored in channel it dug........h*55
- Silicate baths in curing concrete.........1046
- Silt problem of river reservoirs, at Zuni reservoir a145
- Simplon Tunnel traffic diverted to avoid avalanche danger....... .... n58
- Sinclair Refining Co. building, East Chicago Ind temporary trusses support roof forms (P. S. Toney)...............h*1270
- Singapore causeway being built near . 1058
- Siphon, inverted design and construction

*Illustrated; e, editorials; h, hints; n, news notes; a, abstracts

Page

- Notus Canal, Idaho *860
- Sewage, designed in spite of meager reference data (G. H. Bayles) *974
- Siskiyou grade, Oregon, paved half width, pending funds *470
- Sitterley, H. H., on crown of concrete base checked by chalk line h198
  - On tractor pulls fence posts h*248
- Skagit Power Development railroad to be built 456
- Skids, inclined, expedite excavation of deep trench h*1174
- Slack, S. B., on wooden roller used in striking concrete h*1125
- Slide displaces retaining wall in deep cut.. 870
- Sludge, sewage, see Sewage Treatment.... n366
- Smith, C. B., on engineering publicity—why and how a1025
- Smith, E. B., on pressure of concrete on forms measured in tests a*665
- Smith, Dr. G. O., receives American Geographical Society Daly medal n*791
- Smith P. G., a Knellogy 512

SNOW AND SNOW REMOVAL

- Conditions in Toronto (E. M. Proctor) .... letter 687
- Depth in inches and water equivalent now reported by Weather Bureau.... 391
- Fall deficient, in California, threatens drought e401, 429
- Forests and water-supply (J. C. Stevens) ......letter 150, (T. D Coffin) letter 392
- Load on roofs, allowance for (S. Wilmot) letter 1269
- Plows, rotary, for city work......e209, *221, (L. Davidson) letter, with editorial comment 391
- Removal board, New York City, engineers predominate on n493
- Removal, engineers for e404
- Removal from roads urged by Federal Highway Council 82
- Removal, New York City, "Hylan swings a pick" e451
  - City to spend $4,000,000 for snow-removal equipment n1223
- Removal problem, new conception needed e355, n*394, 395
- Removal problems (L. Davidson)...... letter, with editorial comment 391
- Surveys in Sierras to be made n60
- Snyder, T. E., on protecting buildings against white ant *1110

SOCIETIES (see also names of individual societies)

- Employment bureau's work 48
- Federation......(J. H. Morgan) letter 52, 147, e211, n249, e601, e841, n883, a918
- Federation, proposed democratic representation in (M. L. Cooke)......letter, with editorial comment 439, e1039, 1074, n1079
- Federation of American Engineering Societies, foundation laid, constitution adopted e1134, 1136
  - How other professions are organized (C. W. Baker) 1250
  - Prompt action needed e1182
- Founder societies meet with Western Society of Engineers e841, n883
- Institutions and their councils 1002
- Interesting younger men in activities... 830
- Iowa, to be consolidated with Iowa Engineering Society, plan provides n984
- Joint Conference Committee report e113
- Defeated in Am. Soc. C. E. questionnaire......e705, n835, (I Randolph) letter 978
- Local to receive more recognition e212
- Mutual-admiration (P. B. McDonald)..1109
- Organizing Conference......n883, e891, n930, n980, n1031, n1033, e1037, e1039, 1074, n1079, n1080, e1134, 1136
  - A. A. E. attitude on n1033
  - A. A. E. delegates n980, n1080
  - Am. Soc. C. E. delegates n1079
  - Call issued n883
  - Engineer delegates named....n1031, e1037
  - Lays foundation for Federation of American Engineering Societies.... e1134, 1136
- Organization, ultimate aim of a918
- Ottawa, gets good publicity (M. F. Cochrane) .... letter 150
- Papers read are too long e1087
- Plan for comprehensive body, A. A. E. will not support, correspondent believes (J. H. Morgan) .... letter 52
- Publicity campaign results n302
- Publicity, good, obtained by Ottawa Society (M. F. Cochrane) .... letter 150
- Record of 1919 .... e1, e4
- Should Juniors vote? 755
- Single national society with locals and special sections (L. L. Tribus)..letter 541
- Spokane, how engineers are affiliated (J. C. Ralston) e401, 436
- Substitute plan for unified body offered by St Louis Members Am. Soc. C. E.. 147
- Unity progresses e841, n883
- Younger men, interesting them 830
- Society for Municipal Improvements, October meeting n739
- Society of American Military Engineers being organized n394, e449
  - New York Post formed n1272
  - Aims, etc. (Col. G. A. Youngberg).letter 639
  - *The Military Engineers*, official publication n492
- Society of Engineers (British) objects to institution as sole body to determine registration 872
- Society of Municipal Engineers of Philadelphia resents art commission's aspersion n300

Page

- Society of Terminal Engineers elects officers n1081
- Sodium fluoride as wood preservative....1253
- Sodium silicate in curing concrete......1046
- Soil, see Earth
- Soldier Summit, Utah, railroad terminal at *1069, *1159
- Sole leather, wear resistance tested...... 717
- Soundings, canal, and stream measurements, unique rod for *51
- South Africa, department of health for, 291
  - Railway electrification plans 227
- South America, railway system needs new links (F. B. Morris) *182
  - Railway to connect Amazon and west coast to be constructed n158
- South Carolina Department of Highways, graph records progress of survey parties (R. T. Brown) *333
  - Good Roads Institute formed n741
- South San Joaquin Irrigation District, California, uses "concrete lumber" (R. W. Olmsted) *1167
- Southern California Edison Co. developing water storage 471
  - Kern River Project No. 3, freighting with motor trucks *868
  - To float $5,000 000 bonds n1034
- Southern Pacific R.R., accident to swing-bridge at Oakland, Cal., and repair.... n109, *829
  - Development at San Francisco *319
- Soviets at work e699
- Spanish engineers urge big public-works program n58
- Spanish, English and German monthly, *Engineering Progress* 1217
- Specifications, pocket and other, for city work 785
- Speedway Hospital, Chicago, House votes increased appropriation n493
- Spikes, track, holding power *47
- Spiral stairway made of precast concrete members, Welland Canal *919
- Split-switch turnout, method of laying out (R. L. Longshore and H. M. Kanarr).... letters 102
- Spofford, C. M., on bridge across Connecticut at Springfield, Mass *817
- Spoil dump to cover 200 acres maximum depth of 60 feet *42
- Spoil taken from basement by timber track (C. W. Geiger) h*788
- Spokane Engineers, how affiliated (J. C. Ralston) e401, 436
  - Felling concrete chimney (A. D. Butler) *899
- Spokane County, Washington, road program n302
- Spreader car, railway, handles heavy materials *866
- Springfield, Mass., relief sewers recommended......1055, correction 1169
- Spring Valley, California, see San Francisco, Water Supply.
- Sprinkler, pipe, system for long bridge...*123
- Spruce and lignite, Alaska and North Dakota compared 951
- Spruce Production Division sells remaining equipment n154
- Spruce struts, tests of 915
- St. John, N. B., large dry dock for...... 435
- St. Lawrence River, battle over route to sea e405
- St. Lawrence River development, Canada and United States prepare 334
  - *Engineering News-Record* editorial read in Congress e1182
  - Engineers named n884
  - Hearings on n546, n930
  - (See also **International Joint Commission.**)

ST. LOUIS

- Bond issue of $24,000,000, city to vote on n349
- Bonds defeated by constitutional requirement......n983, e1037 n1080
- Building industry, control sought by local Building Trades Council.....e1085, n1130
- Garbage contract renewed n741
- Electrolysis of steel water main serious 911
- Labor problems and city contracts....n740
- Progress of major street plans (H. Bartholomew) e937, *954
- Sewer, Branch St., reconstruction of outlet end (W. W. Horner) *1059
- Viaduct wrecked by train n396
- Water department, lead substitute experience 415
- Water-works tunnels unwatered by air lift (E. E. Wall) *857
  - Water jets and sand blasts clean filters (C. M. Daily) e1181, *1198
- Wood-block pavement fails through contraction and flotation (W. W. Horner) *814, e841
- St. Louis Coke & Chemical Co., Granite City, Ill., two concreting plants for foundation *1107
- St. Paul, Minn., may condemn for residential district 571
  - Meters and low water consumption.....1166
  - Planning board, G. H. Herrold heads.n597
  - Planning board opens office n931
  - Union depot, new headhouse opened....n790
  - Water supply, electric and steam pumping costs 1202
- St. Paul Engineers' Society helps Public Works Department n1033
  - Indorses Hoover for President n1033
- Stairway, spiral, made of precast concrete members, Welland Canal *919
- Standard Oil Co. lets contract for buildings in Levant n299
  - Reservoirs at El Segundo, Cal., embankment and concrete work *905

Page

- Standards, Bureau of, see Bureau of Standards
- Standards Committee, see American Engineering Standards Committee n1170
- Standpipe, Chicopee, Mass., controversy over ......letter by W. J. Walsh and editorial comment, 246
  - Iron and steel, how protected from corrosion (C. W. Sherman) a285
- Staten Island (New York City) piers..... n109, n544, e1038, *1047
- Statistics, vital e697, *732
- Steam shovels, mucking with speeds up tunnel driving *314
  - Protected from blasts by planks, Joaquin Light & Power Co h*152
  - Reduces quarry loading cost 1109

STEEL

- Building, detailing........(E. Godfrey) letter 194; (E. E. Halmos) letter 196
- Corrosion of, in concrete roof over dry kiln (A. H. Weber) 915
- In concrete, effect of calcium chloride on 973
- Phosphorus and sulphur in, to be investigated e260, 291
- Rail, cracks in correlated with fissure defects 129
- Rolled shapes, Anglo-American standards proposed n1034
- Structural, design—stray points on (R Fleming) *1040, e1085, 1104
  - Spacing of tie rods, weakening of beams by flange holes, etc. (R. Fleming) *1040, e1085, 1104
- Sulphur and phosphorous in, to be investigated e260, 291
- Tests:
  - Cracks in rail steel correlated with fissure defects 129
  - Deep etching and rail defects...... 573
  - Research and specifications....e260, 291
  - Sulphur and phosphorous in, to be investigated e260, 291
- Steel framing for Cleveland Public Hall..*414
- Steel framing of narrow building *913
- Steel Corporation, decision e497
- Stewart, Lieut. Col. J., in new engineering firm n1225
- Stillwell, L. B., director U. S. Chember of Commerce n1079, e1085
- Stingel, E., on resurfacing an old brick road 861
- Stockhus, G. A., on close regulation makes winter concreting safe h197
- Stockton Township, Illinois, brick laid on 1-in. base good after four years (H. H. Edwards) 1207, e1229
- Stone, crushed, quarry loading cost reduced by steam shovel 1109
- Stone crusher, safety bolt breaks with overload n986
- Stone & Webster to build hydro-electric plant in Japan n299
- Storage of sand and gravel, plant for (G. W. McAdpin) h*928
- Straightedge and revolving boards for reducing or enlarging drawings (G. H. Gilchrist) *377
- Strain-gage measurements on large floating crane 680
- Stream measurements and canal soundings, unique rod *51
- Stream pollution studied by Minnesota.... 681
- Street sweepers' wages in England...... 659
- Stress-deformation tests on two-way tile and concrete floor *1119
- Stresses dangerous, on floors from falling loads (J. W. Ledoux) 873
- Stresses, secondary, and least work (E. Godfrey) *948
- Strikes, see Labor, Strikes.
- Structural designing call for practical view in teaching (E. Godfrey)......*949, corrections 1068 (C. T. Morris) letter 1172
- Structural steel design, stray points in (R Fleming) *1040, e1085, 1101
- Structural teaching, call for practical view in (E. Godfrey) .... *948, (C. C. Hulbert), letter 1222, (E. Godfrey) letter 1268
- Structures, indeterminate, methods of analysis standardized by Oregon Highway Department (C. B. McCullough) *675
- Struts wooden, tests of 915
- Stump removal, engineering aspects of... 136
- Submarine drills on high frames for land work h*152
- Success in life, address by C. M. Schwab. e649, 681
- Suisun and San Pablo Bays, California teredos destroy piles *1000
- Sulphur and phosphorus in steel to be investigated e260, 291
- Sun, altitude observation of, for meridian (J. D. Adams) *864
- Super-power, Eastern, to be investigated..n1082
- Surge tank, design, nomographic solution of cubic equation (S. Okabe) *1249
- Surveyer, A., on a course in how to use the mind 1011

SURVEYS AND SURVEYING

- Altitude observation of the sun for meridian (J. D. Adams) *864
- Army to be supervised by General Staff n109
- Chains, steel, tests of extension in....*957
- Colored figures mark transit points (H. A. Brentlinger) h*1125
- Columbus, Ohio, flood protection (R. C. Chaney) *966
- Flint, Mich., topographic survey of (C. S. Elicker) .... *700, correction 873
- Government, funds for n932
- Military, rectangular co-ordinates used (Lieut. H. A Foster) *962, *1006

*illustrated; e, editorials; h, hints; n, news notes; a, abstracts.

Page

Railway, conversion table for plotting curves (J. G. Walsh)........letter 486
  Cross-sections, sequence of notes for and calculation of (O. G. Bunsen) *472
  Early days in the North Country (H. K. Wicksteed) 513, 670
  Resurveys of old lines (J. G. Wetherell) *575
Rectangular co-ordinates used in surveys and maps (Lieut. H. A. Foster)..... *962, *1006
Sun, altitude observation, for meridian (J. D. Adams) *864
Topographic mapping, funds for...... 1261
Triangulation problems, rectangular co-ordinates used in solving (Lieut. H. A. Foster) *962, *1006
  Simplified by Army co-ordinate system (Lieut. H. A. Foster) *1006
Swaab, S. M., on suggested remedies for some ills of the engineer......481, (H. W. Kenney) letter 1029
Swamp drained by conduits under culvert floor, Canal Zone (R. C. Hardman) ...*925
Swan, H. S., on simplicity of classification in city zoning ordinances 374
Sweet, E. H., on an economical cofferdam h*592
Swimming and wading pools, new outdoor, Atlanta, Ga. *673
Switch, frogless, sidetracks muck cars at tunnel heading (N. A. Eckert) h*489
  Split, turnout, method of laying out (R. L. Longshore and H. M Kanarr) letters 102
Syme, G. F., on need for economic location of highways......e354, 383, (F. W. Harris) letter 589, (R. C. Barnett) letter 641
Syracuse, N. Y., large traveling form lays concrete lining, creek channel *1056
  Sedimentation for sewage advised......n1272
  Sewage-works report goes to consulting engineers n346

T

Tainter gate design, some fundamental of (A. H. Reeves) ....letter 391
Tamping with mortar reduces powder cost 946
Tank, oil, large concrete, built for Panama Canal (R C. Hardman) *380
Tanks, concrete, watertight under 35-ft. head 924
  Steel, reinforcement of manholes 952
  Water, ice removed by rifle shots 847
  Water, new, for Akron, Ohio.......... 191
Tasmania, labor and material costs high.. 276
Taxes, war, and cost of living (R. B. Everett)......letter with editorial comment 832
Taylor, H. W., on new pumping plant for Peekskill, N. Y., water works *1114
Tech Engineering News started.......... 582
Technical articles in newspapers........e937
Technical writing 1027
Technical Advisory Corporation formed .n1177
Technology Clubs Associated to meet in Philadelphia n545
Teel irrigation project, progress 136
Teichman, F., review of "The Design of Masonry Weirs" 782
Temporary structures, economy of (E. E. Greenwood) ....letter 586
Tennessee highway engineers—job or profession? (W. H. Drane) ....letter 878
Teredos brought inland by channel improvement 75
  Destroy piles, San Francisco Bay *1000, 1253
  Effect on timber, book review..........1217
  Resistance of greenheart to............704
  Work under 40-lb. pressure 1075
Terminal Engineers, see Society of Terminal Engineers.
Terminals, see Railways, Terminals.
Termites, see White Ants.
Testing Materials Society, see American Society for Testing Materials.
TESTS, see also CONCRETE, TESTS, STEEL, TESTS, etc.
  Ear, notched, impact tests, compared.... 861
  Engineers meet n492
  Gas hose 91
  Impact, of notched-bars, compared.... 863
  Loading, of 18-foot circular concrete grain bin (P. J. Hansen) *316
  Notched-bar impact tests compared.... 863
  Stress-deformation on two-way tile and concrete floor *1118
Texas counties, four, vote $150,000 for roads n741
  Highway work in 192
Texas Water-Works Association organizes..n399
Thermit weld used on ore-dock tie rods.. 620
Thompson, P., on simple mechanical control for dosing sewage beds..................*1018
Thomson, T. K., on deep substructure of Assay Office built in quicksand by Caisson-inclosure method *165
Throop College of Technology now California Institute of Technology n885
Tie rods in floors, spacing (R. Fleming).. *1040, e1085, 1104
  Ore-dock, thermit weld used on 620
Tile drainage of irrigated land for seepage relief, Twin Falls, Idaho (R. M. Adams) 961
Timber, see also Lumber and Wood Preservation:
  Clearing in drainage districts.......... 616
  Cruises and surveys, New Brunswick.... 320
  Resistance of greenheart to marine borers 704
Timber framing heavy, details of.......*1016
Timber roofs, decay checked by proper heating *578
Timber track takes spoil from basement C. W. Geiger) h*788

Page

Tires, pneumatic and soled, relative values revealed by tests (A. F. Masury)...... *668, (L. E. Moore) letter 786
TNT for ordinary blasting h1078
Tokio office buildings to be erected by American contractor n597
Toledo, Ohio, water-works, pumping station revamped under service (G. N. Schoonmaker) e1181, *1184
Toll bridges, see Bridges, Toll.
Toney, P. S., on temporary trusses support roof forms h*1270
Topeka, Kan., more water for n443
Topographic mapping, funds for 1261
Topographic survey of Flint, Mich. (C. S. Elicker)......*700, correction 873
Toronto contractors won't submit checks on private work n693
  Drifting-sand mechanical sewage filters ......e115, (A. Wolman) letter, with editorial comment 339
  Harbor works, progress *724
  Snow conditions in (E. M. Proctor) .. letter 687
  Water-works, sandwashers for drifting-sand rapid filter (W. Gore)..e1181, *1192
Torpen, B. E., on clay blanket stops leakage in earth dam *365
Towboats and barges for Mississippi River.1194
Tower guying methods, concrete chuting plant h*1270
Town, the—Is it efficient unit for any highway administration? (G. C. Diehl) 1062
Townsend bill, see Highways, Federal Aid
Townsend, Col. C. McD. (with others) on inland waterway transportation 763
Tracings protected by half-round strips (C. Nye)............................h*929
  Rights in, of engineer and client ("Engineer") ....letter 685
Track scale with new features..........n*986
  Supported over trench with maximum clearance (J. H. Sawkins) h*440
Tracklayer for logging railroads *373
TRACTORS
  Aids in cellar excavation (C. S. Bennett) h344
  Army for state roads n346
  New n*986
  Pulls fence posts (H. H. Sitterley) .h*248
  To be loaned by War Department to states n838
TRADE, FOREIGN
  Bureau of Commerce creates western European division n60
  Convention program n444
  England and foreign trade............e551
  Exchange rates, effect of.............e551
Trailer, with truck, does work of 40-foot railroad car *160
Trailer Manufacturers' Association meeting n208
Tramways, aërial, for India 850
Transfer table switches batch cars at mixer h*104
Transport, Ministry, British............ 597
Transport study, urban n646
Transportation crisis, a e988, e1037
Trapezoid, dividing into strips of equal area (R. B. McWhorter).....letter *194, correction 294, (H. H. Frenzel) letter 687
Traps and leaping weir eliminate odors from waste in sewer *1051
Tratman, E. E. R., on shrinkage of loosely filled earthwork in embankments......1256
Trench excavation expedited by inclined skids h*1174
Trestle treated with gunite *225
Trestles, construction plans and quantity tables (F. J. Herlihy) e843, *844
Triangulation, see Surveys.
Trinkaus, G. J., on moving marble band stand h*1125
Tri-State Water and Light Association convention n981
Trolley wire in tunnel, support for h55
Truck, new, moves and elevates material.n*400
Truetractor added to road-builder's equipment n*256
True, G. W., on precast concrete roof trusses in Panama pier shed *1232
Truman, S. J., on garbage and refuse collection and hog feeding, Salt Lake City.. 959
Truss centering used for 113-ft. concrete arch (C. B. McCullough) *851
Truss pins, stresses on (E Godfrey).....*918
Trusses, roof, see Roof trusses.
  Steel, unusual arrangement in Cleveland Public Hall *414
  Temporary, support roof forms (P. S. Toney) h*1270
Tucker, F. B., on shortcomings of public improvement minutes 1053
Tulsa Okla., to establish garbage collection e1229
TUNNELS AND TUNNELING
  Air lift unwaters tunnels, St. Louis Waterworks (E. E. Wall) *857
  Air investigation cancelled n299
  Alpine, cut underground flows; their restoration *1054
  Concrete blocks, controversy over, see Hudson River Vehicular Tunnel
  Construction problems to be studied by Japanese commission n741
  Driving speeded up by means of mucking with steam shovels *314
  Extra compensation for contractor n301
  Fast work on Kerkhoff tunnel (R. K Oberteuffer) h1174
  Grouting, precautions in h344
  Hetch Hetchy, see San Francisco, Water Supply.
  Hudson River, see Hudson River Vehicular Tunnel

Page

  Leak closed by concrete plug and grout injection Modderfontein, South Africa.h1030
  Machines successful on Detroit sewers 329
  Progress of 484 ft. in 432 hours.......1095
  Railway, see Railways, Tunnels.
  Shield, largest, designed to carry vehicular traffic under Hudson River...... e356, *357, (G. H. Pride) letter 587, e601
  St. Louis unwatered by air left (E. E. Wall) *857
Turner Construction Co. gives insurance policies to employees.................n69
  Work in 1919.........................n936
Turntable for trucks (F. W. Epps)....h*979
  Lifted out of pit without jacking (G. T. Kuntz) *1005
Tuscarawas County, Ohio, resurfacing old brick road (E. Stingel) 861
Twin Falls Canal Co., Idaho, tile drainage of irrigated land for seepage relief (R. M. Adams) 961
Typhoid fever, Bloomington, Ill., leaky cross-connection kills 15.......e939, G. W. Booth) letter with editorial comment 1124, e1181, (G. W. Lee and H. A. Whittaker)........letters 1219
  Minnesota, reduction of *921
  Water-supply outbreak, Lansing, Mich *92

U

Underground flows cut by Alpine tunnel; their restoration *1054
Underground structures laid haphazard, Hartford, Conn. *170
Underpinning checks warehouse collapse, Chicago (G. F. Paul) *945
Unemployment reduced by societies' bureau 48
Union Oil Co., Oleum, Cal., teredos work under 40-lb. pressure 1075
Union Pacific R.R., turntable lifted out of pit without jacking (G. T. Kuntz) ..*1005
United States Board of Surveys and Maps to have advisory council......n789; council named n1177
United States Bureau of Standards, see Bureau of Standards.
United States-Canada border, safety of bridges e1183
United States Chamber of Commerce, see Chamber of Commerce of United States.
United States Coast and Geodetic Survey, see Coast and Geodetic Survey.
United States Housing Corporation, see Housing Corporation.
United States may join international road congress n1226
United States Reclamation Service, see Reclamation Service.
United States Shipping Board sells yard to Fuller Co. n202
United States Steel Corporation decision .e497
UNIVERSITIES, see also EDUCATION
  California, engineering extension courses n443
    Forestry station for n249
  Colorado, extension engineering coures n110
  Illinois, engineering students at........ 130
    Salaries of faculty e939
  Michigan, highway engineering fellowships offered n983
  Wisconsin assists in land drainage...... 897
Unwatering lock site of New Orleans harbor canal (G. R. Goethals) *940
Urban transport study n646
Urbana-Champaign, Ill., activated-sludge experiments n1034
Uruguay, extensive engineering projects reported n694
Utah highways, Cache County reconsiders bonds n1175
  Irrigation plans in territory near Salt Lake City *1064 e1087
Utah Society of Engineers indorses water-supply bond issue n691

V

Vacuum, concrete destroyed in, Calaveras Dam culvert *1197
Valuation Railway, see Railways, Valuation.
Valuation, Spring Valley water system, valuation methods n740
Victoria, B C., water supply, heavy leakage from 12-in. concrete pipe *1210
Vincent, Cal., railroad accident near....... 433
Vital statistics e697, *732
Volk, K. Q., on passengers and freight carried more cheaply by motor than by railway e551, *568
Voorhees, S. B., on New York Central Railroad accommodates itself to Barge Canal e497, *500

W

Wakefield, C. H., on twenty years of reinforced-concrete ties e499, *522
Wall, E. A., on what risks should cities take in installing relatively untried processes? e114, 132
Wall, E. E., on St. Louis tunnels unwatered by air lift *857
Wall, masonry, true batter maintained by device (H. D. Hurley) h*838
Walls, retaining, book by G. Paaswell, reviewed by E. Godfrey, letter by Paaswell 1215
Wanaque Dam bids rejected n932
  Contract provides for variable labor costs 734
War expenditures to be investigated e161

*Illustrated; e, editorials; h, hints; n, news notes; a, abstracts.

Page
War, soldier-civilian engineer co-operation ......e450, (Col. G. A. Youngberg) 639.
War supplies, transfer of, conferees agree on bill n546

WAR DEPARTMENT, see also ARMY, U. S.
  Asks bids on light-weight rails......n646
  Equipment, transfer of more for road building, proposed n739
    Bill fails n1274
  Issues commandeer order for rails....n347
  Road-building equipment, transfer to Public Roads Bureau favored by House committee n838
  Supplies, conferees agree on bill for transferring n546
  Tractors to be loaned to states n838
  Would study waterway economics 1149

Ward, J. L., in Goethals, Wells & Co.....n1274
Warehouse collapse checked by skillful underpinning, Chicago (G. F. Paul)...*945
Warm Springs Dam, Oregon, design details and field methods on thin-arch dam ......*474, correction 779.
  Forms shifted by swinging stages h*440
Washington briefs n154, n693

WASHINGTON, D. C.
  Census figures n446
  Metering Government buildings 852
  Municipal garbage reduction works, first year's operation (F. C. Bamman) ...*908
  Water consumption 541
  Water filtration cost 1054
  Water-supply project for 1188
  Zoning bill signed n493
    Work starts n1034

Water consumption by railways and waste prevention e1181, 1202
Waterman Building, Chicago, steel framing of narrow building *913

WATER POWER
  Afghanistan, building hydro-electric plant in (A. C. Jewett) *68
  Bill passed by Senate, n202; conferees agree on, n932; held up in Senate, n980; passed by Congress, e1085; n1127; President fails to approve, e1133, n1175, hopes for, n1223; has it became law? e1231, signed, n1271.
  Bridgewater, N. C., project, reservoir and plant (W. S. Lee and R. Pfaehler) *1088
  British Guiana 996
  California:
    All in one system 1052
    Many projects in 1051
    Needs are increasing 877
    Power administrator, jurisdiction extended n740
    Storage developed on two streams... 471
    To be controlled during drought.... n543, n740
  Canada develops (O. Lefebvre)........ e401, a423, 1149
  Canadian, statistics 1187
  Eastern, super-power project to be investigated n1082
  Gain in February, April, 1919 368
  Georgia projects promoted by Municipal League 825
  Hydro-turbine runner, new, shows epochal development *271
  Japan, Stone & Webster to build plant. n299
  New York State, no law this year....n1129
  Niagara, extension, etc. n59, n61, n1032, n1178
  Nova Scotia, development begins.......1248
  Oregon, booming 680
  Planning ahead for e1182
  Rhone River plans 230
  Station temporary, aids in hydro-electric development (T. C. Higgins) n*542
  Storage developed on two California streams 471
  Unification and power retailing........e498
  Water-wheel design and operation, progress in 1208
  Yangtze River, China 145

Water purification, red water plague prevention of a381
Water service organization, railway......*676

WATER SUPPLY (see also WATER TREATMENT and WATER WORKS)
  Alkali test locates leaky cross-connection (Lieut. W. M. Angus and C. Francis) e1181, *1187
  Bloomington, Ill., leaky cross-connection causes typhoid outbreak........e939, (G. W. Booth) letter, with editorial comment, 1124, e1181, (G. W. Lee and H. A. Whittaker) letters 1219.
  California cities (Oakland district) new $90,000,000 project (C. E. Hickok)..n1223
  California, conservation needed....e401, 429
  Canal Zone and Panama City per capita consumption (R. C. Hardman) *1099
  Chicago, additional, 1920-55 ....*855, e891
    Needs considered n398
  Cross-connections forbidden by Minnesota law (H. A. Whittaker) ....letter 1219
  Danville, Ill., removal of taste-producing protozoa 1214
  Denver, civic body to study meter proposal n397
    Rates and home rule.............n203
  Des Moines, Iowa, curtailed by suction well settlement *223
  Detroit contracts for four miles of steel water mains n694
    New 350-million gallon filtration plant (T. A. Leisen) *1194
  District of Columbia, metering Government buildings 852
  Electrolysis of steel water main in St. Louis, Mo., serious 911
  Filters, see Filters (in F)
  Flint, Mich., filter improvements and reconstruction *1189
  Forest, snow and water-supply (J. C. Stevens) .....letter 150, (T. D. Coffin) 392.
  From national forests 289
  Grouting tunnels and shafts, precautions in h344
  Halifax, N. S., universal metering recommended n789
  Hoboken, N. J., right to charge city higher price denied n493
  Kansas, probably not to blame for intestinal malady 338
  Kansas City, to be studied by committee of Kansas City Engineers' Club....n1178
  Leakage, heavy from 42-in. concrete pipe. *1210
  Leaks in mains methods of detecting..*1061
  Leaky cross-section causes typhoid outbreak, see Water Supply, Bloomington, Ill.
  Leaky cross-connection located by alkali test (Lieut. W. M. Angus and C. Francis) e1181, *1187
  Lynchburg, Va., pressure filters on gravity supply (R. Messer and A S. Holway) *1205
  Manchester Eng. additional supply..... 272
  Massachusetts public water supplies the rule 459
  Metalium as substitute for lead for pipe joints 415
  Meters, see Meters.
  Milwaukee again has tastes and odor difficulty 1155
  Minnesota, cross-connections forbidden (H. A. Whittaker) ....letter 1219
  Moose Jaw, Sask, Joint Scheme with Regina n837
  Mount Vernon, Ill., removal of taste-producing protozoa 1214
  New York City, precautions in grouting tunnels and shafts h*344
  Norfolk, Va., more water for n1223
  Oklahoma City, impounding reservoir ..*478
  Omaha, metered completely, result (F. P. Larmon) *1186
  Panama City and Canal Zone, per capita consumption (R. C. Hardman) ...*1099
  Protozoa, taste-producing, in Illinois reservoirs, removal of 1214
  Public, state control of......*44, (H. S. Cummings), letter with editorial comment 926.
  Public, the rule in Massachusetts...... 459
  Railway, economy in use.......e1181, 1202
  Regina, Sask, Joint Scheme with Moose Jaw n837
  San Francisco, Hetch Hetchy project:
    18-mile tunnel contract awarded....n932
    Deer ladders a necessity in flume....*950
    Delay threatened e498, e649, e650
    Frogless switch sidetracks muck cars at tunnel heading (N. A. Eckert) h*489
    New plans for e649, e650
    Tunnels completed for $65 a foot.... 579
    Tunnels, four bids received n885
  San Francisco, Spring Valley Water Co. purchase proposed n301
    Spring Valley Co., concrete destroyed in vacuum in culvert, Calaveras Dam *1197
    Valuation methods n740
  Santa Barbara, Cal, Gibraltar dam ...*1003
  Saskatchewan cities, joint scheme n837
  Seattle, new conduit n885
  Shipyard fountain, treated by violet rays (W. L. Decker) *572
  St. Louis, Mo., electrolysis of steel water main serious 911
  St. Paul Minn., electric and steam pumping costs 1202
    Meters and low consumption 1166
  Standpipes, protection from corrosion (C. W. Sherman) a285
  Taste-producing protozoa, removal of...1214
  Topeka, Kan., more water for.......n443
  Victoria, B. C., heavy leakage from 42-in. concrete pipe *1210
  Washington, D. C., daily consumption.. 541
    Metering Government buildings ... 852
  Washington, D. C., and vicinity, project for 1188
  Waste reduction, experience in 566
  Xenia, Ohio, moves toward acquiring...e1086

WATER TREATMENT (see also WATER SUPPLY and WATER WORKS)
  Air agitator speeds floc formation 899
  Atlanta, Ga., new coagulation basin for water purification plant e937, *958
  Coagulation basin, new design, at Atlanta e937, *958
  Filters, see Filters (in F)
    State supervision, results of 922
  Filtration, cost at Washington, D. C....1051
  Multiple hopper bottom for settling basin at Atlanta, Ga e937, *958
  Washington, D. C., filtration cost 1054
  Water settling basin, multiple hopper bottom for, at Atlanta, Ga.....e937, *958

Water waste, by railways, prevention of. e1181, 1202

WATERWAYS, INLAND
  Barge line expenses announced by Railroad Administration n886
  Barge line operation, no appropriation for n545
  Economics, War Department would study.1149
  Control bill, another, introduced......n933
  Experience and prospects of inland waterway transportation (J. A. Ockerson and others) 763
  Future of transportation on inland waterways (C. W. Baker)......*19, e67, 85, *137, 184, 234, (R. H. Blain) letter with editorial comment 292, (W. G. Wilkins) letter 292, (E. Gray) letter, with editorial comment, 293 (W. G. Wilkins) letter 293, (E. Gray) letter, with editorial comment 487, (J. Wilkes) letter 541, (E. R. Conant) letter 585, J. A. Oekerson and others 763.
  Government operation under General Hines n544
  Great Lakes-Tidewater project—Denver a seaport e987
  Illinois, authorized by War Department. n303, 433
  Mississippi River, barges and towboats for 1194
  Mississippi Valley Waterways Association to hold convention n593
  National Council proposed n933
  Report on Government operation...... 506
  St. Lawrence River, see St. Lawrence.

WATER WORKS (see also WATER SUPPLY and WATER TREATMENT)
  Akron, Ohio, new tank for 191
    Wants bids for improvements n445
  Alkali damages Winnipeg aqueduct...... *1097, (B. Bronks) letter 1269
  Arc welding outfit used before tapping steel pipe, Los Angeles.....e1181, *1212
  Baltimore, $18,000,000 enlargement advised 386
    Enlargement recommended n301
  Bridgeton, N J., air agitator speeds floc formation 899
  Chicago, new plan for e891
  Cleveland, enlargement recommended...n1225
  Columbus, Ohio, bureau of water-works extension formed n982
  Composite distribution system for small water-works 770
  Denver, operation under city control .. 869
  Distribution system, composite, for small water-works 770
  Filters, see Filters (in F)
  Illinois water-works men talk of service and treatment n690
  Kansas City, Mo., capacity to be increased 807
  Los Angeles, arc welding outfit used before tapping steel pipe......e1181, *1212
  Loss-of-head in typical drifting-sand filter, Toronto (W. Gore) e1181 *1192
  Memphis, Tenn., works surveyed n741
  Meters, see Meters.
  Montreal, aqueduct to be completed ... n491, n982
    Strikers return to work..........n394
  Moose Jaw, Sask, joint scheme with Regina n837
  New Orleans, La., funds needed to renew plant e890
  Peekskill, N. Y., new pumping plant (H. W. Taylor) *1114
  Providence, R. I., water board to limit construction in 1920 ....n320
  Pump-to-pipe connections, Toledo (G. N. Schoonmaker) e1181, *1184
  Pumping costs, by steam and electricity, St. Paul, Minn. 1202
  Pumping plant, new, Peekskill, N. Y. (H. W. Taylor) *1114
  Pumping station revamped under service, Toledo (G. N. Schoonmaker)... e1181, *1184
  Quebec 912
  Regina joint scheme with Moose Jaw....n837
  Reproduction cost, estimates for........1063
  Run down e890
  Sand blast and water jets clean filters, St. Louis (C. M. Daily) e1181, *1198
  Sandwashers for drifting-sand rapid filter, Toronto (W. Gore).....e1181, *1192
  Saskatchewan cities, joint scheme n837
  Small, composite distribution system for 770
  St. Louis, air lift unwaters tunnels (E. E. Wall) *857
  Texas Association organizes n399
  Toledo pumping station revamped under service (G. N. Schoonmaker).e1181, *1184
  Toronto, sandwashers for drifting-sand rapid filter (W. Gore)......e1181, *1192
  Valves, hydraulically operated control central header system, Toledo (G. N. Schoonmaker) e1181, *1184
  Welding outfit used before tapping steel pipe, Los Angeles..........e1181, *1212
  Winnipeg, Man. aqueduct damaged by alkali, to be underdrained.....*1097, (B. Brooks) letter 1269
  Youngstown, Ohio, high prices postpone construction n399

Water-wheel design and operation, progress in 1208
Watson, M. W., on lug or lugless brick?. 618
Watt, Prof. H. A., on some forces in engineering education 771
Weber, A. H., on corrosion of steel in concrete roof over dry kiln 915
Webster, G. S., nominated for president American Society for Testing Materials.n932
Weekly Metergram, The, published...... 582
Weir, Herschel, for gaging in open channels a*710
  Leaping and traps eliminate odors from waste in sewer *1051
Welch, A. W., on construction outlook....n*63
  On spring prices in New York........n352
Weld, thermit, used on ore-dock tie rods.. 620
Welding, arc, aids water main tapping, Los Angeles e1181, *1212
Welding, electrically welded mill building under erection in Brooklyn e698, *708
  Will rivets have to go? e698, *708

*illustrated; e, editorials; h, hints; n, news notes; a, abstracts.

Page

Welland Canal, see Canals, Welland.
Well, rubble lining supports basin footing (J. R Arnold) h*1126
  Suction, settlement curtails Des Moines water supply *223
Wells, G. M., in Goethals, Wells & Co....n1274
Welty, H. T., on boring out and renewal of anchor pins of Cornwall cantilever bridge *453
Western Carolina Power Co. project, Bridgewater, N C., reservoir and plant (W. S. Lee and R. Pfaehler) *1088

WESTERN SOCIETY OF ENGINEERS

  At Joint Engineering Societies dinner . e841, n883
  Co-operates with civic bodies on Chicago water-supply n398
  Hunt award for prize paper n108
  Investigates suspension of city engineers e937
  Lunch meetings and talks n790
  Meetings......728 (F. Lavis) letter 831.
  Plans work, etc. n348

Western states adding to agricultural areas. 317
Westinghouse, Church, Kerr, Inc., merged with Dwight P. Robinson & Co., Inc..... n647, personnel n739.
Westminster Abbey, engineers in (E. J. Mehren) 1170
Weston R. S., appointed to membership, executive committee, National Department of Public Works Association n156
West Point, Ga., damaged by flood *431
West Virginia highways, moving pictures used to promote n157
Wetherell, J. G., on resurveys of old railroad lines *575
Weymouth, F. E., now chief engineer, Reclamation Service n1081
Wharf-house for variable rivers (G. W. McAlpin) *947
Wharves, see Piers.
What do you mean, worth? (Sober) .letter 98
Whipple, Prof. G. C., on mission against cholera and typhus n1083
White ants protecting buildings against (T. E. Snyder) *1110
Wicksteed, H. K., on early days in the North Country 513, 670
Wideberg, C. E., on emergency engineering after Georgia flood *131
Wilgus, Col W. J., elected president New York Section Am. Soc. C. E. n1033

Page

Wilkinson, J. W., killed acting as switchman n981
Willamette River bridge, proposed, at Oregon City *416
Williams, G. M., on concrete consistency measured by flow table *1044
  On concrete proportioning method...... 811, correction 968.
Winnipeg, Man., aqueduct damaged by alkali, to be underdrained..*1097, (B. Brooks) letter 1269
  Entertains Good Roads Congress......n1126
Wire bags filled with cobbles prevent scour (A. A. Northrop) h*834
Wireless station, large, to be built at Rocky Point, L. I......................n1080
Wisconsin, highways:
  A. R. Hirst pleads for cars n983
  Concrete program cut in half n930
  Cost estimates standardized e649, e650, 663
Wisconsin University see Universities.
Women in British industry 418
Wood, Gen. L., views on the engineer 577
Wood (see also Timber and Lumber), kiln drying taught by mail 591
  Variation in length of fibres 1263

WOOD PRESERVATION

  American Wood Preservers' Association, annual meeting n396
  Brush coat should follow trimming of treated timber (G. M. Hunt) *753
  Creosote and zinc processes, specifications for 615
  Fir paving block specifications adopted by preservers n396
  Open-tank methods used in treating 3,000,000 feet on the job............*754
  Piles coated with concrete by cement gun *225
  Protecting buildings against white ants (T. E. Snyder) *1110
  Sodium fluoride, use of 1253
  Steaming ties increases absorption 477
  Tie renewal record on D. L. and W. for 19 years 810
  Ties, service tests on Lackawanna .. 511
  Treatment for saving woodblock pavements (J. S. Crandell) *968
  Treating 3,000,000 feet of timber on the job *754
  Untreated piles, San Francisco Bay, short service of 1253
  Water and moist air for absorption tests1004
  Zinc and creosote processes, specifications for 615

Page

Wood-block pavement fails through contraction and flotation, St Louis (W. W. Horner) *814, e841
  Treatment for saving (J. S. Crandell) *968
Wooden struts, tests of................. 915
Worcester, Mass., activated sludge experiments (R. S. Lanphear)............*819
  City engineer, salary and service of e746, e1086
  Water-works reservoir drawn down against spring floods (G. W. Batchelder) 762
Worms, concrete 709
Worthington, Minn., home-made curb and gutter finisher h*593
Wright, O to receive John Fritz medal..n1032
Writing, technical 1027
Wyandotte, Mich., shipbuilding plant, drinking water treated by violet rays (W. L. Decker) *572
  Wyoming highways co-operation from contractors sought 521

X

Xenia, Ohio, moves toward acquiring water supply e1086
Xylotra see Teredos.

Y

Yangtze River, China, water-power from... 145
Yeaton, F. D., on chart for discharge of water columns supplying locomotives ..*1013
Young, R. B., on mixing concrete by surface areas on actual work......e6, *33, correction 72, comment by Young G. M. Williams and H. A. Davis, 811.
Youngstown, Ohio, water-works, high prices postpone construction n399

Z

Zionist engineers, board of, for Palestine development n691
Zionist Society of Engineers and Agriculture outlines Palestine program n156
Zoning, see Cities, Zoning.
Zuni Reservoir, New Mexico, silt problem 145

*illustrated; e, editorials; h, hints; n, news notes; a, abstracts.

0

A Consolidation of Engineering News and Engineering Record — McGraw-Hill Company, Inc.—JAMES H. McGRAW, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN
Editor

Volume 84 — NEW YORK, THURSDAY, JANUARY 1, 1920 — Number

"Engineering News-Record" is a consolidation of "Engineering News" and "Engineering Record," effected in 1917.

"Engineering News" was founded in 1874 by George H. Frost, as the "Engineer and Surveyor," which title subsequently became the "Engineer, Architect and Surveyor," then "Engineering News and American Railway Journal" and finally, "Engineering News," under the successive editorships of D. McN. Stauffer, Arthur M. Wellington and Charles Whiting Baker.

"Engineering Record" was established in 1877 by Henry C. Meyer as the "Plumber and Sanitary Engineer." The name was subsequently changed to the "Sanitary Engineer," "Engineering and Building Record" and, finally, to "Engineering Record." During his ownership of the paper, Mr. Meyer was directly responsible for the editorial policy. John M. Goodell became editor in 1902, and was succeeded by E. J. Mehren.

The staff of "Engineering News-Record" consists of
E. J. Mehren, *Editor*
R. K. Tomlin, Jr., *Managing Editor*
M. N. Baker — H. H. French
F. E. Schmitt — J. W. Shaver
F. C. Wight — G. A. N. Thall
Charles Whiting Baker, *Consulting Editor*
Chicago: W. W. DeBerard, E. E. R. Tratman, C. S. Hill
San Francisco: N. A. Bowers

Returning the Railroads

BY HIS proclamation of Dec. 24 ordering the return of the railroads Mar. 1 of this year, the President has swept away the cloud of uncertainty that enveloped the situation because of the failure of Congress to enact adequate legislation before Jan. 1, 1920. Under existing circumstances, the return of the properties now would result in serious complications. The way has been cleared for Congress to complete the difficult task of reconciling the differences in two vitally different measures upon which we comment elsewhere.

The Industrial Situation

AN EXTENDED review of the industrial situation is not warranted at the present time. The facts stand out too clearly to make comment necessary. We are painfully aware that the year has been unprecedented in the number and seriousness of labor difficulties. It is equally clear that the situation is decidedly better now than at any time since the armistice was signed. The coal difficulty, it is true, is still with us, and the probabilities are that we have ahead the necessity of adjusting a railroad-labor situation. But, by and large, there is a greater degree of sanity on the labor question than there was at the beginning of the year or in midsummer. We have proved some things to ourselves. We have demonstrated that the country stands for order, not anarchy. We have learned that the vast majority of the workers believe in improving the present order of society rather than in upsetting it and experimenting with a soviet regime. We have shown that in an issue between order and anarchy the people will make any sacrifices that order may triumph. At Boston the National Guard willingly assumed policing duty and thousands volunteered to serve in any capacity needed to maintain the law. In Kansas all classes flocked to the coal mines at the Governor's call. All of this helps to stabilize conditions. The nation has served notice on the reds that we will have no part with them. The demonstration of the public's position has encouraged the sane men in union labor ranks, and progressively saner handling of their problems can be expected there. In general, conditions are hopeful. We look forward toward improving conditions.

1919 in Engineering

SPEAKING generally, the year 1919 will go down in engineering history as one of inaction. Due to the inertia in recovering from the war's dislocation, to shortage of labor and materials and to high prices, all branches of civil engineering were subnormal except that of highway building. Toward the mid-year plans for municipal facilities and housing began to be developed vigorously, but the development did not start early enough in the year to come into the prominence that was accorded highway work. The latter occupied the center of the construction stage, though it, too, suffered curtailment because of the late letting of contracts and the shortage of both materials and labor. Aside from the vigor shown in the highway field, the foremost engineering problem was the disposition of the railways. True, the chief matters at issue are, in the broad sense, political, but their engineering interest is paramount because their solution will determine the policies governing railway expenditures. In nontechnical matters, interest centered upon the engineering societies' problem. The various development and aims and organization committees of the founder societies rendered their reports during the year, and all of them combined in a joint conference report looking to more effective federation by engineering societies. The American Society of Mechanical Engineers has received and approved the report of its aims and organization committee and of the joint conference committee, and this stands as the sole definite action. As in technical activities the year lacked fruitfulness, so did it also in engineering-society affairs. The year was one of adjustment, of settling down, of clarification of views, rather than of action.

The Coming Year

IN CONTRAST with the relative inaction of 1919, the year 1920 should be a busy one, the limits of activity being set by available supplies of materials and labor and, possibly, by prices. One cannot say that there is a spirit of optimism abroad—or of pessimism, either. It is, rather, a settled determination to go ahead despite conditions.

There are reasons enough to deter the timid. The industrial situation is not yet stable, though it has measurably improved. It was difficult to get materials during the latter part of 1919, and the shortage of railway cars, responsible for the curtailment, will be even worse in 1920. Prices are high; they may go higher, though we hope the peak has been reached. Our present inflation may end in collapse, while a presidential election year has often been given as the reason for proceeding cautiously.

Despite all these possibly adverse conditions, we look forward to a bigger year than the one just closed. In the work held back since the spring of 1917 there is a large volume that the projectors consider cannot be deferred longer, provided costs do not go higher. This is true, among other lines, of highway construction and of a goodly volume of municipal work.

As to labor, there is ground for expecting that, with greater distance from the war's excitement, we shall get greater efficiency. The use of machinery has increased materially in recent years, and it should be used even more widely in 1920. While, therefore, we shall undoubtedly find that the amount of work accomplished in 1920 will be dependent on the number of men that can be obtained, we may expect the work to be in larger volume than would be predicated on the performance in the latter half of 1919.

Labor shortage, of course, affects materials supply, but the limit there was set last year not by the labor available, but by the lack of railroad cars. Steps are being taken by highway officials to make their work less dependent upon rail transportation this year, and, if successful, their efforts should make a larger percentage of supply from existing commercial gravel and crushed-stone plants available for other construction operations.

High prices undoubtedly held back much work last year, particularly in the early part of the season. If prices hold where they now are, the price-factor will not be a serious deterrent this year; enough work will be offered to tax the materials and labor supplies to the utmost. Certainly, no considerable reduction in prices can be looked for. Demand will outstrip supply, with the inevitable tendency to force up prices. On the other hand, producers of materials realize the danger of curtailment should prices go higher, and will do all in their power to prevent a runaway market. The control of the situation, though, lies actually with owners and contractors. If they lose their heads and bid against each other beyond reason, nothing will be able to prevent sharp advances. In some quarters there is now evidence of a slowing up in the launching of new work—a slackening of the boom that appeared to be on the point of getting under way in the summer.

All things considered, however, the indications point to a busy year.

Progress in Licensing

FOUR states enacted license laws for engineers in 1919—Oregon, Colorado, Iowa and Michigan. This puts laws regulating the practice of engineering on the statute books of nearly one-quarter of the states of the Union, an indication that the movement is gaining headway fast. In none of the states have the laws with the more modern provisions been in force long enough to admit of experience, although an opinion from a prominent engineer-educator in Florida, which in 1917 adopted a law founded on the original suggestions of the American Society of Civil Engineers, is that engineers of the state are unanimous in thinking that the law is vastly better than the absence of one, but that it needs some revision.

Engineers in Ohio and Indiana have made efforts to secure laws, and probably at coming sessions results will be obtained. Other features in the movements are the drafting of a model licensing law by the American Institute of Architects, and another by a committee of Engineering Council. Two national bodies, the American Association of Engineers and the American Institute of Architects, have gone on record as favoring licensing.

Opinion on the justification for licensing is crystalizing definitely along the one tenable line, that of public benefit—protection of life, health and property. While there are direct benefits to the profession, they are generally regarded as subordinate.

Present opinion is that the law should be brief, should give much discretion to high-caliber examining boards, and stress educational qualifications and moral fitness.

A citizenship qualification is receiving more serious consideration than at first, while reciprocity features are made as nonhampering as possible, so that nothing will prevent projects attracting the best talent.

Opinion so far expressed in the states having laws is favorable rather than otherwise. With no counterwind blowing, it may be expected that the licensing movement will continue to gather force in 1920 and that the year will see new laws put on the statute books.

The Year in Engineering Education

ENGINEERING education, like most other activities, was the subject of much discussion a year ago. The school regime had been interrupted by the Students' Army Training Corps, and that had been preceded by the publication of Dr. Mann's report on engineering education. Within the colleges there was, as a result, questioning of the desirability of change; while on the outside was a strong feeling, confidently expressed, that this was not only an opportune time for introducing innovations in the engineering courses, but that engineering curricula were in need of revamping.

Now the year has passed. What has been the result of the ferment? On the whole, there have been few changes, but such as have been made are indicative of an attitude that promises future developments. These changes, too, show the influence of the Mann report and the S. A. T. C. experience.

In a number of schools, an effort is being made to introduce engineering subjects in the sophomore year, and thus at an earlier period give the student some notion of that with which his life is to be concerned. At the University of Minnesota, for example, in the sophomore year, there is now being taught a combination course in mathematics and mechanics, having this object in view. In several schools new courses in economics are being introduced, not in the dry-as-dust fashion of the liberal arts college, but as an adjunct of engineering problems. In other institutions, notably at Iowa State College, the "Camp Humphreys idea" is being tried. The attention of the student is directed in an engineering way to structures with which he has long been familiar. He is taught to see them in the new light, with the purpose of stimulating his interest and getting him to realize the character of the problem that he must encounter in practice. At the University of Cincinnati, at Yale, and at a number of other schools, stress is being placed upon labor relations. In several institutions, English for engineering students is being placed on a better basis and is being made the vehicle for broadening the student's grasp of history and economics.

The experiments are scattered and in their infancy. Such as they are, however, they seem to reflect the stimulus of the Mann report. The impress is deep enough to warrant the expectation of further developments. Should the effort to interest the student at an earlier period in engineering problems succeed to the extent of causing him to bring fresh energy to his work, the influence of the new methods will be a broad one.

One of the lessons which might have been drawn from the S. A. T. C. experience and from the methods developed in training mechanicians during the war has apparently made no impression. We refer to the possibility of instituting short courses—say of two years—in engineering, with the purpose of supplying the heavy demand for men to fill the lower professional ranks. The S. A. T. C. and mechanicians' courses certainly did show how intensive work could be given. Apparently, however, the teachers of engineering believe that they have no function or responsibility in trying to supply the demand for inspectors, junior draftsmen, etc. We cannot find that serious thought has been given to the subject by the engineering colleges, but to us such thinking would seem a natural consequence of the war-time intensive training experience. Possibly the failure of the S. A. T. C. may have discouraged thinking along these lines. That failure, however, was due to administrative difficulties rather than to the ideas underlying the non-military side of the work.

In general, then, while the year brought forth no great number of changes in engineering curricula, and possibly while we ought to be glad that the conservatism of the past has prevented us from being carried off our feet with ill-considered innovations, it is nevertheless true that there are certain encouraging signs. Going back to his own engineering course, practically every engineer will admit that his interest would have been heightened if there had been a live approach to the problems he was expected to meet in after life. The experience of the year 1919 indicates that some engineering teachers are considering methods of presenting problems in that spirit, and the indications are sufficient to warrant us in looking forward to solid results.

The Precarious Position of Engineering

THERE has been an unusual amount of activity in the year just passed regarding the compensation of engineers. Data have been gathered and compiled in an effective way, and salary recommendations prepared taking cognizance of the engineer's responsibility and of the shrunken value of the dollar.

The new activity has been due to the urge of the increased cost of living, which has been particularly hard upon the salaried class. Very few, however, even of those active in the recent efforts have appreciated thoroughly the seriousness of the situation. We say, without fear of contradiction, that the effects of the present inadequate salary scales will be far more serious to the public than to the engineer. The engineer can protect himself by leaving the profession, which he is doing in large numbers, but the public must bear with such engineering talent as will remain.

Every engineer knows that there is an alarmingly rapid drift out of engineering into commercial pursuits. The seriousness of this drift will be more evident if we give some consideration to the economic situation in which we find ourselves. In every branch of engineering we are at least three years in arrears in construction. War-time restrictions and shortage of labor and materials have prevented the normal amount of construction since the spring of 1917. There is a shortage of housing everywhere, and a shortage of housing necessarily is accompanied by shortage of all of the tributary urban facilities, such as water-supply, sewerage, paving, electric light and telephone service, urban railway transportation, etc.

In addition to the huge task of catching up on housing and municipal facilities, we have a far more urgent problem in highways. Their demand on the profession will alone be tremendous. According to the United States Bureau of Public Roads in 1920 there will be available for expenditure on construction $633,000,000, more than four times as much as has been available in the largest previous construction year. Right now the highway organizations are inadequately staffed, both in size and ability, for the tremendous program in hand. The difficulty is exactly that which befell our war-making agencies in 1917. Overnight they were obliged to increase their size threefold, fourfold, tenfold. Just that is happening in highway work. Except for the State of New York, the programs have been moderate, and the organizations of relatively small size. Upon such organizations, attuned to doing say $2,000,000 or $3,000,000 worth of work a season, have now been thrust $50,000,000 and $60,000,000 bond issues. All of this money is not available for expenditure in one year, but one state hopes to be able to put as much as $32,000,000 worth of work under contract for the next season. It paid out $10,000,000 last year and will probably pay out $25,000,000 in 1920. These are startlingly large sums, and while they represent one of the heaviest programs, $5,000,000 programs will be common this year.

Yet with these expenditures facing the profession, we find salaries so inadequate that there is an alarming desertion from the ranks. Men intrusted with the expenditure of millions get salaries of $5000 a year and less. In fact, the salaries above $5000 in public service are infrequent. Unless these salaries are raised, we shall not be able to hold men who can put these programs through with credit. Here and there self-sacrificing men will stay, but, by and large, the salaries must be made somewhat nearly adequate to the responsibility, in order to hold good men. The salaries of subordinates are even less commensurate with their responsibilities, and the difficulty of holding competent men proportionately greater.

If the present conditions persist—low salaries, and consequent desertion from professional ranks—there is certainty of disaster and serious reflection upon the engineering profession. There will be brought about an inefficient expenditure of public funds. Engineers will protect themselves by going into other and more lucrative pursuits. The public will be the sufferer.

We hold, therefore, that it is incumbent upon engineers as individuals, upon local engineering societies, and upon the national bodies, to concern themselves most seriously with the problem of engineers' compensation. In taking up the fight they should make no apology. The interests of the public are seriously at stake.

The Year in Society Affairs

THE beginning of the year 1919 found the engineering profession intensely interested in a study of the purposes of its societies. There was a feeling that the war had created new conditions of which cognizance had to be taken by changes in society ideals and organization.

Contrasted with the attitude, then, the interest in society affairs has waned very much. We take it that the average engineer has become engrossed with reëstablishing himself and with the largeness of the problems propounded by the reconstruction era.

Nevertheless, the year has brought a clarification of views regarding some of the society problems that have been confronting us. The reports of the various aims and development committees of the four founder societies have in only one case, as we read them, got down to anything of a fundamental nature, and that is the report of the development committee of the American Society of Civil Engineers. That document proposes changes in organization which correspond, in the main, to demands that have been growing for years. All of the reports agree in this, that the national technical societies should confine themselves to technical work, and that civic and welfare activities should be intrusted to a separate organization. This recommendation is accompanied by a recognition that the national technical societies cannot divest themselves of responsibility for the general welfare of the profession, and all of them provide, through concurrence in the Joint Conference Committee's report, for participation by the founder societies in a separate body whose sole function shall be public and welfare work.

The chief interest in society affairs now centers upon a method by which engineers shall look after their own welfare and have an influence upon civic questions of an engineering character. We have expressed the view that Engineering Council has failed to fasten itself upon the sympathies of the engineers of this country. We see no reason to change that view; the Joint Conference report is an expression of the same idea.

The Joint Conference Committee report proposes a substitute for the council, differing from the present body in that it will allow representation of local societies. While this should help the federated body to grasp the local needs of engineers, there is no expression of those needs in the report. There is no denying that Engineering Council has done some good things, but most of its activities have been on large problems in which the individual engineer has no personal interest. For example, its most ambitious endeavor—its coöperation in the efforts to establish a Department of Public Works—while a notable and laudable object, has not that personal appeal which will secure a large following. Its licensing and compensation activities, on the other hand, are of the type that awaken personal interest. The purposes set up for the federation in the Joint Conference Committee report partake chiefly of the general rather than of the intimate character.

The point of view needed, in our judgment, is that the federation should become a clearing house through which aid can be extended to the local societies. Take, for example, the matter of legislation. Every year sees a flood of state bills that affect engineers and engineering. A clearing house could collect and compare these measures and send to the local societies information on similar legislation—its success or failure—elsewhere. Such a handling of intersociety relations would make in each locality a host of supporters for the federation.

One development of the year stands out as notable—the increase in membership and in effective activity of the American Association of Engineers. Starting the year with less than 3000 members, it ended it with more than 10,000. Its organization work has been no less vigorous than its membership increase. It has dotted the country with chapters and clubs and has been successful in getting these bodies to work. While Engineering Council joined with the association in presenting to the Railroad Administration proposed new scales of salaries for engineers in railroad service, it has been the association and not Engineering Council that has secured the results. It initiated the movement in its conference of railroad engineers in Chicago in March, and through the organization of local bodies in railroad centers has effectively presented the matter to the regional directors. With equal activity it is now attacking licensing and the compensation of highway engineers and again will try to get results, not through headquarters communications, but by action of its subsidiary bodies. By its energy it has risen in a year's time from a relatively inconspicuous organization to one that must be reckoned with in the engineering-society activities of the country.

As to another feature of last year's activities—the union movement—a brief word is needed. Making rapid progress in the early part of the year, the impetus seems to have died down since summer. The locals are holding their own in some sections, but nowhere does there seem to be enthusiasm. This result was to be expected. As conditions become stabilized and compensations are adjusted, the union movement can be relied upon to pass entirely out of engineering ranks. Its views are entirely at variance with the normal thinking of engineers and will have no permanent hold on the sympathies of even the younger men. In special cases strength may be expected, but there is no possibility of large permanent development.

Where, then, do we stand today in engineering-society activities?

The fever of the early part of the year has gone, and a pretty sane type of thinking can be relied upon in connection with the proposed reorganizations of existing societies and the formation of a federated body. Radical innovations will not come. That which is fundamental in the various recommendations must, however, prevail. Failure to act promptly will merely prolong discussion and agitation until the needful changes are brought about. We are in hope that the principal recommendations of the report of the development committee of the American Society of Civil Engineers—those relating to district organizations and to the strengthening of the technical work of the society—will prevail, and that there will be effected a federation of engineering societies based on the fundamental idea of working as a clearing house or an agency for the locals. Such a federation will still handle the large national problems, but its strength and support would come because of its hold on the individual engineer through the service it would render him by coöperation with his local society.

Highway Construction in 1919 and Its Lessons for 1920

ROAD construction in 1919 was characterized by the extensive employment of large contracting organizations, and by the intensive use of construction machinery. These factors, which should have made for the construction of a large mileage, were offset by adverse factors, so that the programs lagged behind schedule. These adverse factors were an acute shortage of materials, a late start of work and unsatisfactory labor conditions.

While the available statistics are scant, they indicate the situation clearly. In 1916, the year of greatest highway activity, $136,000,000 was expended for paved-road construction. Precise values have not yet been determined for 1919, but in round figures the construction completed aggregated $138,000,000. There was under contract in 1919 work estimated to cost $165,000,000 which was not completed and which has been carried over into 1920. No estimates, even in round figures, are possible of the value of the equipment employed, nor of the number of construction organizations engaged in 1919 compared with previous years, but general observation testifies that both have been vastly greater.

Why has highway construction lagged? An answer to this question is the most important service which a review of the year 1919 can render, because, for every mile of highway under contract in 1919 it is planned to place two miles under contract in 1920. Two-thirds of a billion dollars are available to pay for paved-road construction during the new year. Should there be continuation of the conditions which have caused construction to lag in 1919, there is no hope of finishing the larger program contemplated for 1920. In fact, we may as well admit that even with the best of conditions, we cannot spend the money available for 1920.

With excellent success in securing contractors in 1919, less than half of the mileage which was under contract has been built. Late letting of contracts, shortage of materials and adverse labor conditions all tended to this result.

Contracts generally were awarded late in the season. A decided improvement was accomplished by letting large-mileage contracts, but these, due to their very size, involved delay the first season because of the longer time required to organize and to assemble plants.

Another cause of delay arising from contract conditions has been experimentation with new methods and equipment. Many general contractors, whose operations have normally been in other fields of construction, engaged in road work for the first time in 1919. Having no experience of their own, and the field lacking standardized practice, these contractors were encouraged to experiment in methods and machinery. No new methods is fully successful at the first attempt, and while development is proceeding construction lags.

Acute shortage of construction materials, and particularly of sand, gravel and broken stone, was the main cause of delay. Several circumstances were responsible for the shortage. Lack of railway cars and the ranking of the shipment of road materials as secondary to other traffic demands unquestionably headed the list. Contributing to the difficulty, however, were the crowding of producers in certain localities, which resulted in shipments that could not pass inspection, and a frequent grouping of operations so as to concentrate demands on a few producers, and on a single railway line.

Naturally, efforts were made to overcome the difficulties, but with small success. The most hopeful line of effort is in the direction of developing local material supplies at the roadside or within trucking or industrial-railway haul. This development is due to the fact that railway-car shortage was the chief element in causing materials shortage.

At the close of the season, a new development appeared in connection with materials supply which contains the elements of contention—an obvious and general swing toward state control of materials. Simultaneously contractors took a stand unqualifiedly in favor of complete control by the contractor of the purchase and shipment of materials. Without weighing these opposite ideas, the circumstances command attention because they involve the relationship of the large construction organization and the road officials in developing future road-construction programs.

Labor conditions as a factor in the lagging road construction program of 1919 reached beyond the supply of workmen to the supply of contractors and of engineers. There was a deficiency of workmen, and they were inefficient and unstable in the high degree characteristic of the times. Perhaps on the whole, because of the extensive substitution of machinery, the men in the construction gang contributed less to the year's lagging program than did unqualified contractors.

Analysis of the causes which have been cited as responsible for delayed progress in the highway-construction progam of 1919 is encouraging, because of the clarity with which it discloses that the causes are either temporary or can be largely eliminated by highway officials, except possibly as to materials. Upon car shortage must fall the responsibility for the shortage in paved roads completed last year, and to it, unless corrective measures are enforced, will have to be charged the failure to realize the construction plans of this year, where local supplies are not available.

New Concrete Proportioning Theories Put Into Practice

ANOTHER and most important chapter in the current studies of new methods of proportioning concrete is added by the paper by R. B. Young on p. 33 of this issue. Engineers who were only confused by the earlier discussions of water-cement ratio, fineness-modulus and surface area, and who were disposed to consider the whole matter highly academic, will begin to feel on more sure ground when they read of actual construction, ultimately to total a half-million yards of concrete, in which the concrete is proportioned not in the time-honored volumetric relation but according to quantities determined by desired strengths and the dimensional qualities of the aggregate. Further than that, there is every promise that the work of the laboratory experts will have a definite and salutary effect on the worrisome subject of wet or dry concrete.

Following the introduction of the chute method of placing concrete, and with the spread of reinforced concrete with its narrow forms and impeding steel, the early standards of a dry mix went by the board, and wetter and wetter mixtures became prevalent. Many warnings were given of the danger of this practice, but it was not until about two years ago that the quantitative effect of too much water was pointed out by Professor Abrams. At that time he laid down the principle that within the limits of practical aggregate and workability the strength of concrete is a function of the water-cement ratio in the mix. The practical application of such a principle hinged on the question of workability, and this he decided was a function of the grading of the aggregate, which he measured by a sieve-analysis constant known as the "fineness modulus." About the same time L. N. Edwards arrived at somewhat similar conclusions, except that he related the workability to the surface area of the aggregate.

Encouraged by these theories and the tests which led up to them, a number of engineers, who had been opposed to the prevalent wet mixes, established on their work requirements for dry concrete, and for lack of a better measure of workability specified a "slump" test which in various forms had been used in the different laboratories. According to this, all concrete had to take a certain minimum slump when released from a confining mold. The proportioning was still volumetric, except for the water, which was gaged by the results of the test. The most notable instance of such a specification was on the Illinois roads, and there it has not proved practicable. The tests prescribed almost invariably resulted in so dry a concrete that its workability was impossible, with the result that water was added according to ideas of foremen accustomed to the old, sloppy mix.

It appears, therefore, that a test which may indicate an optimum workability and a proper cement-water ratio in the laboratory is not adaptable to the varying conditions of the field. Here, then, is where Mr. Young's studies are a step forward, for he has decided that it is not necessary quantitatively to test field workability, since, according to the Abrams principle, which he considers his tests to have confirmed, water-cement ratio controls strength within the ranges of any practicable workability. It is only necessary, therefore, to establish that ratio for standard or normal laboratory consistency, and then to use it in the field, always remembering that it is the ratio of the water to the cement which must remain constant.

In other words, instead of following the customary practice of controlling workability by gaging the water alone, on the work of the Ontario Hydro-electric Power Commission a proper or desired consistency is attained by adding or subtracting *both* water and cement in the proportions established by laboratory and field tests of the aggregate to produce a concrete of the desired strength. The absurd reduction of such a practice would lead on the one hand to no cement paste at all, and on the other to aggregate scattered widely through a great mass of cement paste; but here the Edwards theory of surface-area control of workability, also confirmed by Mr. Young's tests, comes into play. For any given aggregate the field workability is confined in a fairly narrow range by the ability of the cement paste to cover the surface of the aggregate. So long as the cement-water ratio is correct, a consistency satisfactory to a practiced concrete worker will attain the desired strength.

Engineers will recognize the great advantages of such a method of proportioning, provided the theories on which it is based are proved correct. Once having ascertained the constants of an aggregate being used on a job, the quantities of aggregate or of cement and water, whichever is the more simple to control, can be fixed as to delivery to the mixer, and the consistency of the concrete varied almost from batch to batch by the simple changing of the variable ingredient, with the assurance that the resulting concrete will have constant strength. The troubles with the question of wet or dry concrete will be over.

It is not to be assumed, however, that such a millenial day for concrete has unquestionably arrived. There is still much controversy among testing specialists concerning the invariability of the water-cement law, and the crucial determination of a normal consistency is yet to be assured. As to the former, it seems to be the Bureau of Standards against the field, with the indications that within the fairly narrow limits of practicable aggregate grading the law holds. A number of laboratories are conducting tests which should give valuable information in a short time. Normal consistency for the "Hydro" tests is determined largely by eye, but Mr. Young states in his article that he thinks they are on the track of a quantitative determination. Something more consistent than the slump test must be found.

The scheme will work only when other principles of good concreting are followed. It does not relieve the builder of the necessity for having good, clean aggregate and water, of thoroughly mixing the concrete and of providing proper cement. Furthermore, it involves considerable laboratory and field investigation where skill and experience are required in high degree. However, if it furnishes a consistently strong concrete with a saving in cement and settles the water-content problem its general adoption is only a matter of time.

Railroad Legislation

NOW that the President has proclaimed the return of the railroads to their owners Mar. 1, 1920, there is more urgent need than ever for the enactment of an adequate law governing the regulation of the roads. Return on Jan. 1, 1920, as the President had contemplated, would have been followed by serious consequences. With the passage of the Cummins bill in the Senate Dec. 20, the House and Senate will begin to thrash out the differences in their respective measures. The differences are so great that delay would be almost certain were not the situation so urgent.

The Cummins bill bears evidence of a desire to grapple honestly and broadly with a difficult problem. On the whole, the measure presents a better basis upon which to work out a settlement than the Esch bill, passed by the House at the last session, because it recognizes the need of a better adjusted Federal regulation and a more definite plan of ratemaking. Assuming that private ownership and operation will continue, these are the two most important elements of the case. But we doubt that its labor provisions and the limitation of "excess" earnings by a diminishing proportion allowed the carrier would meet with ultimate success.

The Cummins provision creating a Federal Transportation Board, charged with the administration of various operating functions, hitherto thrust upon the overburdened Interstate Commerce Commission, is a step forward. Unfortunately, the Esch bill fails to recognize the need of some kind of Governmental *operating* body, charged with maintaining the efficiency of the transportation machine, as well as a *judicial* body endowed with regulative powers. True, the House bill contains commendable features designed to overcome difficulties by broadening the powers of the Interstate Commerce Commission in operating matters, but it is essentially a move to revert to the old status, with the Commission in complete control and furnished, on ratemaking, only with the old mandate that rates shall be "just and reasonable." The Commission is now so overburdened that it has not been able properly to discharge its present operating functions.

The Cummins bill faces the rate question more squarely than the Esch bill, with the command to the Commission that rates shall in general be made to produce definite returns. But it is to be regretted that both bills do not restrain state commissions from interference in rate matters. The Senate bill, however, wisely provides for Federal incorporation, which would bring about better regulation of finances and eliminate some of the conflicting features of state control.

As to wage disputes, the Esch bill is wholly inadequate in its failure to provide any definite method of adjustment and to recognize, in the make-up of its two labor boards, the great bodies of unorganized railroad employees. In general, public sentiment is inclining toward a stricter handling of the railroad-labor problem, and the Cummins provisions forbidding strikes will get wide support, in the belief that the community has the right to safeguard essential services. In the case of such services as the police, fire-protection and water-supply forces, the need of anti-strike laws is imperative. But there is at least room for doubt that the railroads are in the same category. The opinion is not at all uncommon that a general railroad strike would break down very quickly, with the public the victors. While we favor a strong policy, we believe that from the standpoint of expediency a plan forbidding strikes while the difficulties are under arbitration and allowing, say, three months for negotiations, would have a better chance of success.

It is generally agreed that consolidations of present companies are, within certain limits, desirable, but the Senate provision for making mergers compulsory at the end of seven years will be strenuously opposed by many of the strong companies, previously enjoying more than average prosperity through strategic geographical position. The weak roads will, in general, welcome it. The probability of long litigation should be considered. In this respect the Esch bill is the better, merely extending power to the Interstate Commerce Commission to approve mergers in the public interest.

The greatest objection to the Cummins bill is in the method imposed for restricting net earnings by taking from the companies a rapidly increasing proportion of the net, and its failure more clearly to define "value" as the basis of the 5½ per cent return upon which rates are to be determined. Public sentiment is set upon restriction of net profits of public utilities, but the method proposed gives insufficient recognition to efficiency and ability of management. Value, unsatisfactorily defined in the act, must, in so far as possible, be clearly set down in any measure contemplating fixed rates of return. Moreover, the rates of return, instead of being fixed, would better be made variable on new capital, subject to change at stated intervals and based upon actual conditions of the money market as determined by the Federal Reserve Board or other impartial body. Only in this way can the companies be *assured* of new capital for needed betterments.

In providing for the transition from Government to private operation, both measures temporarily guarantee incomes—the Esch bill for six months with a "revolving fund" of $250,000,000, and the Cummins bill for five months with a similar fund of $500,000,000. But the Esch bill as amended by the House provides that amounts due from the Government as rental shall be set off against amounts advanced by the Government for capital account, funding any additional indebtedness of the carrier at 6 per cent with the principal payable upon demand in five years. Such an arrangement would certainly impose a heavy burden upon the credit of companies without great financial strength.

To hasten agreement between the two branches of Congress, we hope that the President will transmit his promised message on the railroads as soon as Congress reconvenes after the holiday recess. The prospect now is brighter than ever for a successful settlement of the problem. While the undoubted influence of a highly organized and persistent propaganda for the Plumb plan must be considered, the Senate vote of 65 to 11 (just before the passage of the Cummins bill) against the La Follette measure for extending Federal control for two years is significant as well as gratifying. Although the rules of conference, if strictly adhered to, will prevent the addition of new features, we look forward to a report that will embody the best portions of both bills and result in the passage of a final law better than either.

Developments in 1919 in the Use of Machinery for Highway Construction

Progress Made in Determining Types of Plant Adapted to Rapid and Economical Construction—Use of Motor Trucks and Tractor-Trailers for Material Haulage Increases

By C. S. Hill
Associate Editor, *Engineering News-Record*

MACHINERY was more widely employed last year and in larger plant units than ever before in highway construction. Due to experimentation, unskilled direction and lack of experience in selecting plant, the results were not definite. Toward the end of the season, certain general conclusions began to be drawn. Experience had indicated which types and arrangement of equipment gave the better results. Nevertheless, highway builders will not find in the year's experience a definite answer to any specific question, not even to the question whether extensive machine equipment is wise.

The season, however, did advance highway construction plant practice in one respect: it pointed out the need for most careful coördination between the various items of plant, the introduction of the factory idea. In other words, it directed attention to the plant as a whole, rather than to individual machines or items of equipment. In addition, it helped to establish a broad classification for types of highway plant; it emphasized the importance of skilled direction of operation, and showed up weakness in plant design.

Broad Lessons Learned

In general, the chief advance of the year was the emphasis, above referred to, on the development of complete road-building plants. There was little new in the development of machines as such. The power finishing machine, which came nearest being new, was old, though not previously widely used, and so were other devices that in the last year were generally considered novelties.

Despite the fact that the chief advance of the year was in the direction of properly coördinated plant, the impression must not be given that there was universal appreciation of the idea. There was progress, however, in getting it accepted, and this progress was due to two circumstances: The adoption of large-mileage contracts and the extensive entrance into the field of large general construction companies. The large contract provided the opportunity and, perhaps, the need, and the large contractor possessed the necessary capital.

Progress during the year in determining the best types of plant, like the progress in the coördinated-plant idea, was partial. Four general types were used:

1. First in order of use and in the perfection with which the details had been worked out, was industrial-railway haulage of batches loaded at a central proportioning plant and charged directly to mixers traveling the subgrade.
2. Stationary mixing plants with long-distance haulage of wet concrete onto the subgrade.
3. Portable mixing plants, moved to widely spaced stock piles in succession, with short-distance wet haulage onto the subgrade.
4. The long-familiar paving-mixer outfit charged by wheeling from continuous stock piles on the subgrade.

Classified according to the magnitude of the operation, the first type led, followed closely by the third type; these were the popular plants for large operations of 10 to 20 miles of road, and were in general use for smaller operations also. Generally, the second and fourth types were confined to contracts of about five miles and never to those exceeding 10 miles.

Classified according to magnitude of investment, the first type of plant led in cost, with the second and third types close seconds and the fourth type well in the rear. Classified according to the number of units and the necessity for their close coördination, the types ranked about in the order in which they have been numbered. Classified according to general utility of the equipment, the order was about as follows: The first type of plant had the fewest major units which were suited to other operations than highway construction, the fourth type followed, the third type came next, and the second type had the greatest number of units which could be used for general construction.

Based on last year's records, which is unfair for reasons which are indicated further on, none of these plant units demonstrated great superiority over the others in average output for a season.

Large Versus Small Plants

The fact that under last year's conditions the small outfit suffered so little in comparison of output with that of the large plants, draws attention to the need for skilled management. Let it be clearly understood that in thus comparing outputs of small and of large plants, the latter exhibited much greater *rates* of output, but little, if any, greater *averages*. Better management of the smaller plants was possible under the conditions of acute materials shortage. They could be operated to full capacity when the large plant could not. They could be operated at part capacity at less cost per unit of production. This did not prove that the large plant was inferior; it merely demonstrated that large-plant conditions were necessary for successful large-plant operation.

In emphasizing the conditions required for the use of large plants, last year's experience performed its greatest service to the contractor. These requirements are:

1. Materials supply always equal to the output capacity.
2. Exact coördination of plant units in speed and capacity.
3. Precise routing of materials on the work.
4. Rigid maintenance of all machines in working order.
5. Planning ahead of operations, and
6. Complete recording and analysis of methods and results.

Experience last year, furthermore, made plain the fact that unless these conditions are assured, large-plant construction outfits will fall short of their possibilities and may prove unwise.

To recapitulate, the year's far-reaching developments in machine construction of highways were: Extension of the practice of the factory idea of coördinated equipment; broad definition of successful plant types, and emphasis on the importance of skilled direction of plant operations.

New Machines and Operations

Strictly speaking, no new road-building machines were developed. Several were new in the sense that they were generally used for the first time last year. Outstanding among these is the power compacting and finishing machine for concrete slabs. For quick reference, the machine development of the year may be considered under: Grading and subgrade preparation; unloading and proportioning of materials; transportation of materials; charging materials and mixing; placing and finishing pavement.

In heavy grading, tractor operation of plows, scarifiers, and grading machines was noticeably increased. The development of a definite practice of substituting tractors for horses in all operations requiring more than one team appeared. With tractor operation an indication also was had of the need for strengthening machines for uprooting and cutting down hard packed material like old macadam and gravel surfacing. For light grading or subgrade preparation there was an increased use of machines for fine finishing in order to meet the growing tendency of specifications to call for profiles exceedingly close to theoretical lines and surfaces. In some specifications ⅛ in. was the variation permitted. In design of novelty, the subgrade finisher or planing machine stood out most prominently. This machine rides on steel side forms set ahead accurately for slab construction, and is hauled by a road roller or tractor. With skilled operation, the fresno scraper was another successfully used device for close finishing.

Loading-plant practice in 1919 indicated that the ideas of contractors were still rather jumbled. Stationary elevator bins, traveling bins, and stock piles over tunnels, both surface and subsurface, were used about equally, with both locomotive cranes and derricks, and both large and small buckets for unloading. Toward the end of the year, favor leaned to the elevated bin plant. A growing inclination toward traveling bins as advantageous in cutting down switching and shunting operations was also apparent. Bulk handling of cement was the successful loading-plant experiment of the year. The experience of several contractors demonstrated the practicability of (1) safe shipment in open-top cars with tarpaulin covers; (2) unloading without waste by clamshell buckets; (3) storage in open-top bins with tarpaulin covers; (4) charging by measuring chutes without excessive dusting. Careful planning of material-handling appliances is sufficient to make the use of bulk cement entirely practicable in highway construction, with a consequent material saving, if the limited experience of the year is a safe criterion.

Job Transportation of Materials

Job transportation of materials was demonstrated anew by the year's experience to be the crucial task of modern paved-road construction. There were three types of haulage operations: (1) Haulage of raw materials to stock piles in the grade; (2) of dry batch from loading plant to mixer; and (3) wet batch from mixing plant to subgrade. Each of the three operations presented its special problem.

Increased use of motor trucks and of tractors with trailers was the year's new development in hauling material to stock pile on the grade. Success was dependent upon road conditions. Dirt roads in wet weather put the large-load, heavier vehicles virtually out of commission through reduced speed, even when the machines were not stalled. This led, as experience was gained, to the use of lighter trucks. The question whether light trucks, through greater ability to travel soft roads, might not increase the number of trips sufficiently to excel in haulage performance the larger, though slower, heavy trucks, was raised by the year's experience.

Dry-batch haulage to the mixer from a central loading plant, through the use of industrial-railway plant, was general. Gasoline locomotives were the motive power. Batches were carried in boxes on flat-cars or in car bodies removable from the trucks. In detail, the approach to a standard was not so close. Weight of locomotive and of truck, length of trains and size of batches, showed a great variation. The manifest haul was, however, less a lack of uniformity than one of capacity. To operate the modern three-bag batch or larger mixer at full capacity, greater speed was found necessary in carrying materials, and a demand for heavier equipment developed—for six-ton in place of three-ton locomotives; for 25-lb. instead of 20-lb. rail; for 20-car to 30-car trains instead of 10-car to 20-car trains; and for 15-mile speeds instead of eight-mile speeds.

Realization of the vital importance of thoroughly equipped industrial-railway plant, and its efficient operation, was the outstanding feature of the year. As employed on fast road work, the industrial railway is in miniature a modern commercial railway with intensive traffic. Train schedules, train loads, running speed, accident prevention and maintenance are essentials that must be planned, and the plan must be flexible to meet emergencies. The job of traffic manager is a position which this year's experience with industrial-railway haulage has raised to prime importance.

Wet-Batch Haulage Possible

Wet-batch haulage was demonstrated by the year's operations to be an important possibility. Two means of transportation were successful—motor trucks for long hauls and truck-tractors for short hauls. With hauls up to two miles no trouble was experienced in getting the mixture onto the grade without segregation on preliminary set. The disadvantages which were most evident were: (1) That hard roads are essential to continuous motor-truck operation; (2) that motor truck travel over finished subgrade necessitates a second finishing and rolling, and (3) that pumping and road side pipe lines continue necessary for curing the slab.

Toward the end of the year studies of plans for obviating these disadvantages had made progress. Wet-batch haulage by industrial railway was an obvious thought. This plan met the first two disadvantages but not the third. A more original plan was based on the reasoning that if the water in the wet batch could be prevented from escaping by absorption into the subgrade and by surface evaporation, the need of a water-supply on the grade would be eliminated. It was considered that this conservation of water might be effected by oiling the subgrade and by covering the concrete, immediately after finishing, with a thin skin of asphaltic material. Other considerations were the use of lighter trucks and the use of pneumatic tires.

The mixer experience of the year demonstrated that: (1) For high-speed road construction, mixers of greater strength and endurance in details are essential; (2) a number of mixers are incapable of handling dry mixtures speedily. Without much doubt, the use of dry mixtures will be extended. Whether they will prevail elsewhere than on paper is an open question. Observations of many operations under dry-mixture specifications last year led one to wonder how much of the concrete which went into pavement slab came strictly within the requirements of a 2-in. maximum slump. In the circumstances, then, it may not matter whether great effort is made to improve mixers for handling dry concrete, but the improvement of their strength and endurance is essential.

Machine finishing of concrete slabs was a success wherever employed. It produced a well-compacted concrete and a smooth, even surface. As a labor saver it demonstrated its right to a prominent place among road-making machines, whether dry mixtures or wet mixtures be used. A sturdy side form is necessary, and the year's experience indicated that side forms need to be made heavier to remain firm under the vibrating travel of the finisher and not to develop a permanent set. An observation which merits attention is the action of the machine in flushing to the surface an appreciable depth of mortar above the stone. This is an advantage, or the contrary, as one approves a mortar surface or holds that tough stone, flush with the surface, is essential to resist wear.

Heavier Standards Required

Greater ability to endure continuous hard service is, in general, a requirement of highway-construction equipment. There are individual machines which do not need strengthening, but, in general, weight and strength must be added. The nature of certain operations is such that responsibility rests on a single unit and so, when that unit fails, work stops. Duplication of such units is expensive, but that is not the most disadvantageous feature, in road work, of this ordinarily successful insurance of continuous production. If a mixer has a minor-part breakdown, for example, the time required to move a duplicate machine several miles into the field is seldom less than would be required to repair the break. Duplication of plant is scarcely practicable except in the sense of providing spare machines and parts; and, therefore, road machinery needs to be exceptionally well guaranteed against accident by strong construction. A master mechanic and a repair gang and ample spare parts are further insurance required on every heavily outfitted road-construction operation.

Heavily machine-equipped operations characterized the year's highway-construction methods. Under the conditions prevailing, the year's record of performance did not establish the superiority of large-plant methods. Management becomes a greater factor of success in large-plant operations, and heavier equipment in general is required to guarantee the intensive service which is its fundamental idea. Continuous output requires factory methods in maintaining raw-material supply, in routing operations, and in keeping equipment in working condition. These are the broad acquisitions, from last year's experience, to the knowledge of road-construction plant with which contractors undertake the new year's work.

Enrollment in Engineering Schools Greater Than in 1917

Attendance Little Less Than That of 1918, Which Was Swollen by S. A. T. C.—Only Mechanicals Decrease

To DETERMINE the present trend of engineering enrollment in the colleges, questionnaires requesting statistics on freshman registration and total enrollment in the five principal engineering courses for the college years beginning in 1917, 1918 and 1919 were sent by *Engineering News-Record* to 95 engineering schools. Of the institutions addressed, 85 answered, and of those answers, 74 contained sufficient information to determine their total engineering enrollment. Only 50, however, could be used to bring out comparisons for the three years in the five major engineering courses.

Engineering students enrolled in 74 colleges in the United States were totaled as follows: 23,167 in 1917; 34,122 in 1918; 33,937 in 1919. The corresponding freshman enrollment for those colleges was: 9,657 in 1917; 16,752 in 1918; 15,172 in 1919. The total enrollment gain of 1918 over the preceding year was 47%, while the 1919 total shows a loss of 0.5% from that of 1918. In the freshman registration of 1918 there was a gain of 73% over 1917; this year's freshman registration was 9% less than that of 1918. The total enrollment gain of 1919 over 1917 is 46%, while the total freshman registration gain of this year over 1917 is 57 per cent.

Although the questionnaire did not ask for it, several of the colleges inserted their 1916 figures, and from those it is estimated that the 1917 total enrollment in the engineering schools was about 25% below that of 1916, with freshman registration for 1917, however, only about 8% below 1916. In considering the large enrollment of last year, then, it must be noted that 1917 was a year of subnormal engineering student attendance. Also, the year 1918 was abnormal in that the Students' Army Training Corps increased both the total engineering enrollment and the freshman registration to an extraordinary degree. The engineering schools were asked for their enrollment figures as of the beginning of each college year and they included therefore the S. A. T. C. students. As the great majority of such students dropped out of their courses shortly after the signing of the armistice, the 1918 totals—as for a college year—are therefore, somewhat "watered."

It is known, then, from present data and from a canvass of the situation made in 1917, that the total engineering enrollment of 1917 was below normal, due to enlistment, the draft, and other causes, and the freshman registration of 1918 was unnatural in its extraordinary increase due to the S. A. T. C. Therefore, for the purpose of gaging this year's total engineering enrollment, 1917 and 1918 should be disregarded and a comparison drawn, instead, with that of 1916. Following that line, it is calculated that the total enrollment of engineering students for this year is approximately only 9% greater than that of 1916. This year's engineering freshman registration, however, is approximately 44% greater than that of 1916. The probable cause of the very large current freshman registration, nearly as large as the 1918 figure as distended by the S. A. T. C., was the delayed entrance of men in, or

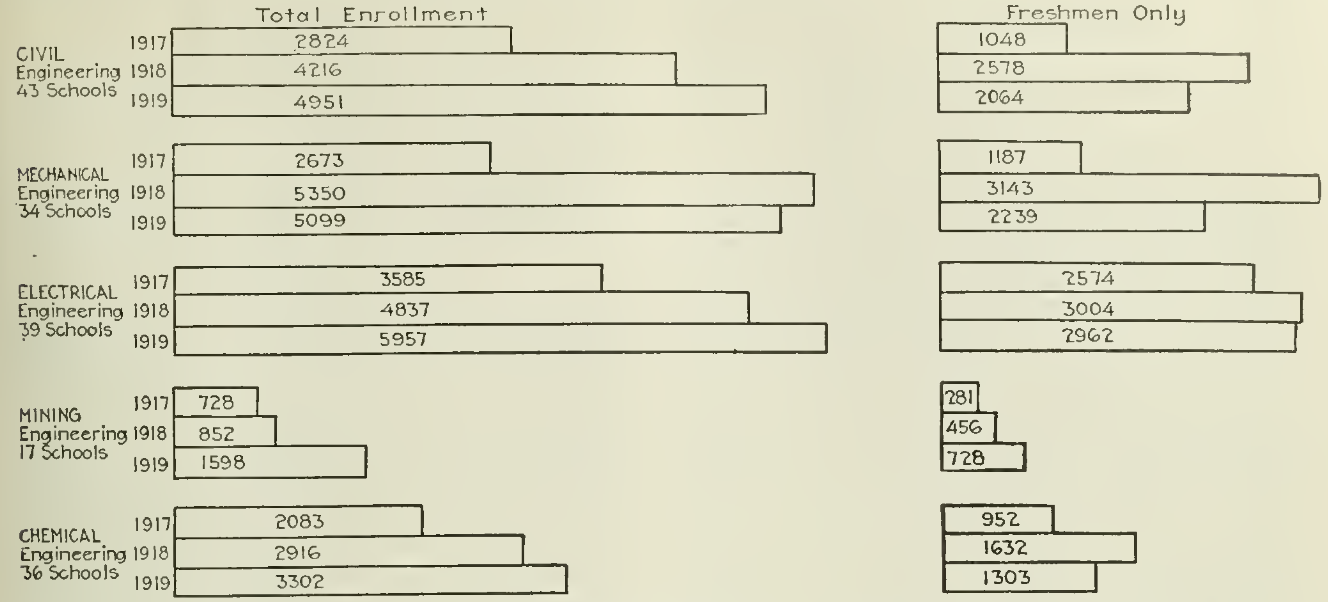


CHART SHOWS RELATIVE ATTENDANCE FOR PAST THREE YEARS IN 43 CIVIL ENGINEERING DEPARTMENTS, 34 MECHANICAL, 39 ELECTRICAL, 17 MINING AND 36 CHEMICAL

connected with, the military service during 1917 and 1918. It would be of value to know what portion of the S. A. T. C. attendance was really normal engineering attendance, but available data do not furnish that information.

In comparing enrollment and registration in the five major engineering courses for 1917 and 1918, the returns from 50 engineering colleges were found available in that they furnished the information desired. Fortunately, too, they are very well representative of the engineering institutions of the United States. The colleges whose information was used in compiling the accompanying chart are located in 29 states, as follows: 19 in six New England and Eastern states; 13 in five Central states; 7 in seven Southern states; 5 in five Western and Southwestern states; 6 in six Rocky Mountain and Pacific Coast states. Not all of the 50 schools offer courses in all five branches of engineering chosen to serve in a comparison; therefore the identity and the number of schools contributing to the total in each branch vary. Also, many of the schools offer courses other than those named in the questionnaire and used in the chart. The students enrolled therein are not included in the charted totals. No comparison in volume of enrollment can be made from the chart between the five branches of engineering, because of the fact that the figures for each have come from a different number of engineering schools.

The only comparisons set forth, then, are within each indicated branch of engineering, and consist of the 1917, 1918, and 1919 total enrollment figures and freshman registration figures for each. It is notable that mechanical engineering is the only branch which shows a decrease in total enrollment from last year. The explanation of such decrease, however, is offered in the excessive freshman registration of 1918, a large part of which, without doubt, was S. A. T. C. membership whose individuals have not enrolled this year. On the other hand, mining engineering is the only branch that shows an increase in freshman registration this year over that of 1918. This also is a circumstance which may be explained by the fact that the mining schools were affected to a very small degree by the S. A. T. C. during 1918. Electrical engineering shows the most consistent growth in total enrollment for the three years, with civil engineering second, mechanical, third, and mining engineering fourth in consistency. Except for mining engineering, electrical engineering had the smallest freshman loss this year, as it also had the smallest percentage of freshman gain last year, which facts are indicative that electrical engineering was less affected by the S. A. T. C. than was civil, mechanical or chemical engineering. It is curious to note that mining engineering, whose total enrollment has more than doubled in two years, has this year a freshman registration exactly equaling its total enrollment of 1917. A summation of the situation is to say that this year's total engineering student enrollment is about 9% greater than that of normal 1916; that electrical, civil, mining and chemical engineering have had consistent growth in enrollment during the past three years; and that mechanical engineering bore the greater part of the S. A. T. C. burden during 1918.

Priestman Wage-Fixing Scheme

A new plan for fixing wages has been devised by a firm manufacturing machinery in London, England. Information regarding what is called the Priestman scheme is contained in a recent issue of *Commerce Reports*. It was only recently made public by the Higher Production Council of Great Britain.. By this new scheme a standard of production is established; that is the amount of work produced by the ordinary effort of a certain number of men, this standard being the basis of pay. Through increased individual effort this standard can be exceeded, and every employee receives a percentage on his wages for all output in excess of his standard. It is explained that the friction often caused by piecework is thus eliminated, and a maximum output is more possible. The Higher Production Council describes the scheme as the "solvent of many, if not all, of the difficulties now facing industry." The firm initiating the scheme has increased its average output by 50% through the operation of the scheme.

The Railways—Financially and Physically

A Review of the Railroad Situation by a Student of the Problem Who Has Had Experience in the Financial, Operating and Engineering Departments

FACING the end of Federal control Mar. 1, 1920, the date set by the President in his proclamation issued Dec. 24, the railways today, like many veterans of the war, are "shot full of holes," "shell-shocked," "gassed" and all but ruined, financially, physically and morale-ly. It has taken ninety years to build up the splendid organization of our transportation systems, but in two short years that system has been disorganized, dismembered and disfigured to such an extent that it is scarcely recognizable. This is due directly to the centralization of control, which has taken away from the practical and efficient operating officials in the field the authority and initiative necessary to produce results. It will take years to recover from this condition.

The attempt to revise almost instantly the operation of 250,000 miles of railway, employing 2,000,000 persons, was an impossible task. The experiment has been proved not only expensive to the public but detrimental to our national prosperity. The necessity of operating the roads primarily in the interest of winning the war was paramount, but it would have been accomplished more effectively, at greatly reduced cost and without the disorganization of the railway systems, if it had been intrusted to a war board of eminent railway men, such as had control prior to Federal control, subject to the general supervision of such Governmental authority as may have been deemed essential to carry out the general policy of the Government.

The reorganization of the railways under Federal control by the appointment of regional directors, some of them charged with the operation of 130,000 miles of road, as was the case in the original Western region—later divided into three regions of about 45,000 miles each—was an impracticable plan. There is no man, however competent, who can possibly supervise such tremendous operations. The organization on so vast a scale broke down of its own weight. How much simpler it would have been to appoint each president as Federal manager of his own railway, with organization undisturbed, and give him the necessary authority, under a general, well defined policy, subject to a central board or commission of eminent railway men.

WHERE THE RAILWAYS STAND

The railways find themselves at the end of two years of Federal control in the following unenviable situation:

Financially, their credit is seriously affected and they are, therefore, unable to finance their obligations, except by the aid of the Government.

Physically, their property and equipment are in a depreciated condition; recovery to the point of rendering adequate service to the public will require years.

In organization they are dismembered and disrupted; morale and discipline are seriously affected.

As for labor, last but not least, the roads are saddled with a burden imposed by national agreements with labor organizations which are so drastic in many respects as to be almost prohibitive of reasonable operation.

One ray of hope remains—that the public has had its lesson in the results of Government ownership and operation and will want none of it. If the experience of the past two years has prevented the calamity of Government ownership, it is worth the cost.

FINANCIAL STATUS

It was expected that railways, generally, would be able to finance their obligations under Federal control, provided their "standard return" was promptly paid and the results of operation indicated that at the end of Federal control the net results would be sufficient to guarantee the necessary funds.

The failure to make contracts promptly with the roads, coupled with the unsatisfactory financial results of operation under Federal control, soon made it difficult for the roads, many of them strong ones, to secure funds except through the aid of the Government. It was thought that the increase in rates would remedy the difficulty and produce net earnings sufficient to reestablish confidence in railway securities, but unfortunately the amount yielded by the increase in rates was absorbed by the increase in wages given railway employees, so that the deficits continued. It was also believed that if the Railroad Administration had early come to the relief of the roads in financing their needs, credit would have been maintained and financing could have been effected without Government aid.

The result, however, was that most of the roads were obliged to depend upon the Government for financial aid, which wiped out the first revolving fund and made another appropriation necessary. When it was found that the rate increases were all absorbed by increased grants in wages, prudence should have suggested a further increase in rates to make Government operation at least self-sustaining.

The credit of the roads, at the end of Federal control will be such as to make future financing, for most of them, an extremely difficult matter unless Congress makes provision to strengthen their position by adequate revenue and takes care of the obligations now due the Government from the roads.

As an illustration, most roads finance their additions and their betterment and equipment expenditures by issues of long-time securities. Surplus from earnings is not sufficient to meet the needs currently. Now if the roads must pay the Government out of their standard return, which represents their earnings, many of them will be out of funds. The Government must assist the roads in strengthening their impaired credit; otherwise their financial structure will be seriously affected, with disaster to the country.

PHYSICAL CONDITION

The railways find themselves at the end of Federal control, as compared with the beginning of that period, in a depreciated physical condition with respect to roadway, tracks, structures and equipment. During the first year of Federal control, due to the heavy demand for war purposes, the railways were taxed to the limit to perform their functions, and on account of shortage of labor and material the maintenance of the properties and equipment was below that of the average of the "test period" (the three years which ended June 30, 1917). During the year 1919, on account of large deficits in operation, expenditures were curtailed in all directions, thereby adding to the deficiency in maintenance, so that the properties are in a greatly depreciated condition. As illustrating the serious physical condition of the roads, a few important items may be mentioned:

Rails—Normally it requires about 2,000,000 tons of steel rails per annum to meet the needs of the railways. The Railroad Administration has purchased directly only 200,000 tons of steel rails in two years, or 5 per cent of normal requirements. The corporations, fortunately, had some unfilled orders at the beginning of Federal control, otherwise the situation would have been even more critical.

Ties—The railways require annually about 100,000,000 ties. From present indications there will be a shortage, during the Federal-control period as compared with the test period, of about 25 per cent, or 50,000,000 ties.

Structures—There has been a large decrease during Federal control in maintenance of structures, such as bridges and buildings, fuel and water stations, largely due to shortage of labor and material and, during the past year, to curtailment of expenditures which in the aggregate will amount to millions of dollars.

Equipment—The Administration has purchased only 100,000 freight cars in two years and only about 90 per cent of these have been delivered. During the four years immediately prior to Federal control the railways built an average of 100,000 cars per year. The average retirement of freight cars amounts to about 80,000 cars per year, so that the Administration has purchased only about one-half as many cars during Federal control as was done by the corporations prior to Government operation, and for the past two years the retirements will exceed the replacements by about 60,000 cars. In addition to this, the freight equipment has not been maintained in normal condition, which means that at the end of Federal control there is not only less freight equipment but that much of it is unserviceable. With the large increase in tonnage which should be handled in 1920 and the probably prosperous succeeding years this situation is a serious one and will result in an extreme car shortage, with a detrimental effect upon our reconstruction period. It will require about 200,000 new cars in 1920 to make good the deficiency.

Locomotives—The Administration ordered 1415 new locomotives in 1918 and later 600 additional, or 2015 in the past two years. These locomotives have not all been delivered to date. The normal requirements are approximately 3000 additional locomotives per annum. During Federal control only 2000 locomotives have been added, or about one-third the normal requirements. It is difficult to see how the traffic of 1920 can be handled with the present locomotive equipment. Moreover, the power has not been maintained in as good condition during Federal control as prior thereto, due to the same causes as apply to freight-car equipment.

Passenger Cars—On June 30, 1916, in the Test period, the total passenger-car equipment consisted of 54,774 cars, and in December, 1918, it was 55,697, or an increase of only 923 cars. On account of troop movements, passenger equipment was so intensively used during the test period that it was not possible to release it sufficiently for necessary repairs, with the result that there is a large depreciation in its condition at the end of Federal control. The requirements for new passenger equipment will be at least twice the normal for the year 1920; in addition, the deficiency in maintenance of present equipment must be made up.

IMPROVEMENTS AND NEW LINES

During the first year of Federal control, 1918, the Administration had an ambitious program for additions and betterments, totalling about $1,250,000,000, but, owing to the shortage of labor and material, less than 40 per cent, or $430,000,000 was expended during that year. (In 1917 $572,000,000 was expended by the railways.)

During 1919, following the armistice, the additions and betterment program was largely curtailed, owing to the heavy deficits in operation and depletion of the revolving fund, and it is estimated that less than $300,000,000 was expended in 1919.

In some instances, improvements which were uncompleted were discontinued, and in others cancelled entirely. Much improvement work was stopped, owing to the requirement by the Administration that the corporations should finance the work from their own funds, which they were unable to do, owing to their inability to finance themselves. The result has been that in the two years of Federal control only about one-half the normal expenditures will have been made on improvements. In order adequately to meet the transportation needs of this country, from $1,000,000,000 to $1,500,000,000 will be required annually for the next five years.

In the matter of new lines and extensions, less mileage was added in 1918 than in any year for the past thirty years. Only 721 miles were built, of which 55 miles was in Alaska. Most of the mileage built was projected by the companies before Federal control. In 1914, 1500 miles, and in 1915, 1916 and 1917 approximately 1000 miles were built each year. There has been no incentive for capital to invest in railways, owing to the ever-decreasing margin between revenue and expenses, due to the mistaken policy of the Interstate Commerce Commission respecting rates.

The single-track mileage reported in operation Dec. 31, 1918, was 250,473, as against 252,029 on Dec. 31, 1917, a decrease of 1556 miles.

There are many regions sorely in need of transportation facilities which cannot be provided, owing to the unsatisfactory financial situation confronting the roads. The oil regions of Oklahoma and Texas are today restricted to about one-half their capacity output because of lack of transportation facilities. Many similar cases will arise when the country resumes its normal activity. If the railways cannot profitably operate their present mileage, whence will come the capital to provide additional lines?

RAILWAY LABOR SITUATION

The Director General, at the beginning of Federal control, encouraged railway employes to organize, to present their demands and make agreements covering wages and working conditions. Labor is entitled to a fair deal, but when that condition is met it is time that the public, including the owners of railways, should have consideration.

In May, 1918, General Order 27 was issued, and since that date numerous supplements, addenda and interpretations thereto have appeared. As the result of these increases, the annual cost of railway labor is advanced to approximately $1,200,000,000 over 1917. If the element of inefficiency of labor now, as compared with the pre-war period, is considered, it means that the annual labor cost is increased about $1,500,000,000 over 1917.

The total interest charges on funded and unfunded debt of the United States railways for 1917 was $431,000,000, and in 1918 $434,000,000, which means that the annual increase in wages to railway employees made during Federal control is equal to three and one-half times the interest on the indebtedness of the properties.

The dividends paid in 1916 on roads now under Federal control amounted to $337,000,000, or less than one-fourth the amount of annual increase in wages under Federal control.

The aggregate of interest on bonds and dividends on stock per year amounts to approximately $750,000,000, or about one-half the increased cost of labor per year under Federal control as compared with private control. In brief, the combined returns to capital of $18,000,000,000 invested in our railways is only about one-half the annual increases granted to railway labor under Federal control.

Why There is a Deficit

These are startling statements, but they are facts. They alone are sufficient to explain the large deficit in operation during Federal control.

The increase in freight and passenger rates made in June, 1918, is equal to about $900,000,000 per annum, and it was expected that this would meet the increase in wages to railway labor. The increased cost of railway labor alone will be easily one and one-half times the increase in rates.

Even in the face of these pertinent facts, the Director General has declined to ask for further increase in rates, because he thinks such a request would affect the cost of living, yet at the same time new increases in wages and working agreements are being made. These are burdens under which the railways must struggle when they are returned. It is the evident purpose that every craft and employee on railways shall be thoroughly organized before the end of Federal control. The conditions which are being included in these agreements are in some instances so impracticable as to be unworkable, except at prohibitive increases in labor costs. The practice of allowing "back pay," which in many cases was not expected, has cost the Administration several hundred millions, contributing to the deficit which the patient taxpayer must meet.

Railway labor receives higher pay here than in any other country. The total amounts to 54 per cent of the gross revenues. In England labor receives only 34 per cent of the gross. The compensation of American railway machinists has increased 135 per cent in the past three years. Moreover, the annual increase given railway labor during Federal control is about one and one-half times the standard return paid to the railways by the Government for the use of their properties. It is readily seen why the railway labor organizations demand a continuance of Federal control.

If railways are not given consideration, by increased rates, to meet these enormous increases in costs of operation, there will not be a solvent railway within a year after Federal control ends.

The railway problem is very simple if reduced to its lowest terms. No business can live if the expenses exceed the revenues, and it is plain that this condition confronts the railways at present. Unless an immediate increase in rates is given they cannot perform their functions.

The increase of 25 per cent in freight and 50 per cent in passenger rates has not been sufficient to meet the increase in wages and cost of materials. It can be easily determined what further increase in rates is necessary to meet the requirements. It is very evident from the situation outlined above that at least a further increase of 25 per cent in freight rates is necessary to make up the deficits in operation and give a fair return on the capital invested. If this were done, the railways would take care of themselves and the entire problem would be solved.

The Cummins bill which has just passed the Senate is a step in the right direction, and although in many respects imperfect, it would meet the situation until experience makes changes necessary. But the Cummins bill is so vastly different from the Esch bill, which has passed the House, that it may suffer changes in conference so radical that the amended measure will not meet the situation.

If the railways are returned without provisions to enable them to earn enough revenue to carry themselves a financial situation that will seriously affect the whole nation will be created. If the railways are properly provided for, the country will forge ahead and profit by the greatest industrial expansion that has ever been known.

The future of the railways and the welfare and prosperity of the country are so inextricably bound together that whatever be the fate of the former must be the fate of the latter. It is confidently expected that the great common sense of the American public will assert itself and insist upon a square deal for the railways.

Traffic on New York's Transit System

More than 2,000,000,000 persons rode on the elevated, subway and trolley lines of New York City during the fiscal years 1918 and 1919, according to figures compiled by the Public Service Commission for the First District. This is the largest traffic figure in the history of the city and represents an increase of nearly 104,500,000 over the previous fiscal year. Only two other years exceeded 1918-1919 in the amount of increase in traffic. Had it not been for the ravages of the influenza epidemic in the fall of 1918, it is fair to assume the increase for 1918-1919 would have been greater than in any other year, inasmuch as the increase from December, 1918, to June, 1919, inclusive, was 122,500,000. From this total, however, must be deducted a loss in traffic for the first five months of the fiscal year amounting to 17,000,000 passengers, of which the loss was 12,000,000 in October. The total increase was divided, 98,751,618 for the rapid-transit lines and 5,679,197 for the surface lines. The percentage of increase for all lines was 5.29. On the rapid-transit lines the percentage of increase was 8.93 and on the surface lines 0.65. The increase in passenger traffic brought a corresponding increase in revenue; but this latter increase was offset by operating expenses, which increased at a very much higher ratio, causing all the companies a total deficit in net income of $8,085,019

Present Status of Flood Protection

By C. B. Burdick
Of Alvord & Burdick, Consulting Engineers, Chicago

THE great floods of 1913 brought to a head many projects for flood relief that had been receiving more or less attention for many years. A great disaster was required to furnish the impetus necessary to carry the projects to the construction stage. The lesson, though costly, was sufficiently effective so that a start has been made on the construction program.

The Miami Conservancy District is going ahead courageously, in the face of the recent higher prices, with its program for detention reservoirs and channel improvements, running into upwards of $25,000,000, estimated on a pre-war basis. Columbus is at work upon its program for expending $3,500,000 to secure partial protection by enlarging the Scioto River channel within the city. Erie, Pa., is proceeding with structures for protection against the floods of Mill Creek, and Augusta, Ga., has just completed a $2,000,000 expenditure for levees. At Kansas City, the Kaw Valley Drainage District, through ten years of litigation, has succeeded in greatly improving the channel of the Kansas River within the city, including reconstruction of the numerous bridges and building of levees. This work has not reached the stage where complete protection is effected, and in the past winter voters turned down a $1,600,000 bond issue to complete the protective works.

Progress Made in Solution of Problems

The publicity occasioned by the great Ohio floods and the thorough studies which followed no doubt have served to direct other localities to the consideration of similar problems. While most of these problems have not as yet progressed beyond the investigation stage, advance is being made toward the solution.

In the St. Louis district, the City of St. Louis has prepared plans to inclose River Des Peres where it passes through the city, draining 110 square miles, largely suburban and rural territory, estimated to furnish about 40,000-sec.-ft. in flood. Across the Mississippi, at East St. Louis, the East Side Levee and Sanitary District has just completed studies which will solve the problem of the floods originating in the district, and upon the hills behind it, requiring improvements estimated to cost in excess of $2,000,000. Decorah, Iowa, presents an opportunity to construct a small detention dam which will protect the city against floods of Dry Run at a relatively small expenditure. Council Bluffs, in the same state, is another city where a small stream finding its outlet from the hilly country through the business district has caused damage and nuisance for two generations. It is expected that construction will be undertaken to the extent of about $1,000,000 during the coming year to correct this situation.

The recent studies of the detention basin, and the added knowledge in reference to floods that has been obtained in recent flood investigations, have made it desirable that some old problems be reconsidered in the light of later data. Every year something is added to the store of knowledge relating to the computations of floods and the measures for correcting them. Engineers will perform a valuable service to their communities and to engineering in general by measuring floods where the opportunity is offered, and assisting to record the related data that will make the information most useful to the science of hydrology. Progress is to be looked for in more extensive installation of rain gages and stream gages, and compilation of systematic records therefrom. Information relating to the storms and floods of watersheds of moderate size (say from 500 to 5000 square miles) has already been greatly increased through the Miami and Scioto studies. More information is needed concerning the watersheds of 100 square miles and less, which are affected by storms of an entirely different character.

Large Contractors Seek Reforms in Highway Contracting

First Season's Experience Proves Unsatisfactory—Higher Prices Must Be Asked if Present Conditions Continue

By C. S. Hill
Associate Editor, *Engineering News-Record*

A SEASON'S experience in actual construction has strengthened the conviction of large construction companies that changes are necessary to make highway contracting attractive. These companies assert that road contracting in 1919 has not paid; that construction progress has been unprofitably slow, and that, with conditions as they are, many organizations which have undertaken road construction in 1919 will not undertake further contracts except at increased prices. However, they say, furthermore, that with conditions changed in ways which they believe are open to road officials, increased prices may be unnecessary for a reasonable profit and progress may be accelerated.

As disclosed by inquiry last spring (*Engineering News-Record* of June 12, 1919, p. 1150), the disposition of managers of large contracting organizations was to undertake highway work as a stop-gap until construction activities were resumed by the railways and other private industries normally providing heavy construction contracts. The politics, narrow business practices and petty contract restrictions of highway work were cited as objections to permanent engagement. Six months' operation as indicated above has not greatly modified the original attitude of large contractors, but it has enabled them to estimate more accurately the strength of the various obstacles to profitable contracting which present conditions impose and to formulate somewhat precisely the changes in practice which are deemed essential.

Changes Specified

As formulated in the minds of construction managers, the changes needed to improve highway contracting conditions are classified under the following: Contract practices, materials supply, and plans and specifications. The points here made have been gathered in conference with contractors. Most of them have also been put forth in a memorandum addressed by the Associated General Contractors of America to the American Association of State Highway Officials.

To attract large construction organizations, highway contracts should be let in as large mileages as are practicable and should extend over more than one season. That in awarding contracts there should be the most careful investigation of the contractor's experience, organization, past performance and financial ability, and award should be made only to a contractor whose ability to accomplish the work, giving due consideration to its magnitude and difficulty, is beyond reasonable doubt. Contracts should comprise all work on the project—grading, paving, bridges and culverts—and should be let undivided. Until it has been definitely decided to undertake construction, bids ought not to be asked, and when bids are received contracts should be awarded within 10 days. If all bids are rejected, the lowest bidder should receive, as compensation for his estimate, ½% of his estimated cost of the work. Under present practice, flagrant abuses exist in asking bids merely to obtain prices and in holding guarantee checks for weeks and sometimes for months. Since large highway construction operations call for extensive preparatory work, assembling plant and materials and formulating construction plans, contracts should be awarded in the autumn, to insure an early spring start of construction.

State aid in obtaining materials, and not state supply, meets greatest favor from large contractors. They ask, therefore, (1) that state supply of materials be discontinued; (2) that the use of local aggregates be encouraged by materials surveys; (3) that estimates be allowed on materials in stock pile and be based on the total cost of materials and of handling; (4) that, whenever it is practicable, state inspection of road materials should be at the source, and (5) that highway departments should bring their full influence to the aid of the contractor in obtaining cars for the shipment of road materials.

To get close estimates, plans should be accurate and complete and should be ready for the contractor at least three weeks in advance of the date of receiving bids. Whenever changes in plans, after the contract is awarded, require increased work or involve delay, the extra work and the time lost should be paid for. On force-account work, the percentage paid the contractor should be computed on the total cost. When work is turned over to public use, it should be accepted and paid for in full, and the contractor should be relieved of responsibility for maintenance. Retained percentages should never exceed 10% of the cost of the contract.

None of the changes which have been enumerated, it is contended by contractors, asks of highway officials anything which engineering practice has not sanctioned. It is possible to demonstrate by examples that each one relates to a condition where abuses exist. All are considered to be mutually for the benefit of the public whose money is being expended, of the engineers who are directing this expenditure, and of the contractors.

CONTRACTORS MUST CONTROL WORK

Coördination of operations is absolutely essential to economical and uninterrupted progress in constructing paved roads. Divided control of operations hinders coördination. Control is divided (1) if one contractor performs certain units of the work and another contractor performs the remaining units; (2) if one party to a contract furnishes the materials and another handles and places them. The large construction companies, therefore, desire contracts covering all structures involved in any piece of road work, and object to any policy by which road officials furnish cement or aggregate or any other major construction material.

State-furnished materials have, it is considered, proved a drag on progress. The ordinary highway department functions slowly. It is chiefly concerned in getting the material at lowest cost. It is hobbled by red tape when emergencies demand quick action. It has no clear way of expediting movement by taking advantage of spot material at a price advance.

The contractor is restricted in none of the respects named. He is not wholly concerned in getting his material cheaply. His objective is finished construction, and if a premium wisely disposed helps, by expediting materials delivery, to finish construction more rapidly, he wants the unrestricted power to adopt that resort. He wants to buy when and where he pleases; to concentrate or to distribute his orders; to demand and to grant concessions. Unless there is this control, one of the chief functions for which his large organization has been perfected is taken away, and the power of the large contractor to conduct large operations is nullified.

State-furnished road materials, the large construction companies consider, is a close second to the "lowest-bid" doctrine in encouraging the tyro in contracting. These conditions, in some sections, it is pointed out, have ruined the credit of road contracting. They are multiplied by every additional action which makes contract getting easy, and state purchase and supply of materials does this. The theory that by throwing wide the doors to road contractors, the program of road construction is speeded up is held false. What is required from the state is not generosity in bestowing contracts but aid in helping the proved contractor, who has work, to hasten construction and earn a profit.

MODIFY PLANS TO MEET EMERGENCIES

Unless road officials exercise their discretion, as railway engineers and the engineers of other large employers of contract work do habitually, when the emergency arises, to modify the letter of the specifications, in order to simplify an immeasurably greater problem, the large general contractor contends that he cannot do road work at last season's contract prices and will withdraw from the field as fast as opportunities offer themselves in his original fields of activity. Claims urged by highway officials that they cannot delegate such important discretionary powers to the ordinary inspector, or think it unsafe to permit their exercise by any except the most competent engineers, are met with the final contention of the contractor:

More engineers and salaries great enough to secure the best trained engineers must be provided in order that: (1) Plans for construction shall be completed well ahead of contract lettings, which is not being done; (2) plans shall be complete and accurate, which is not now the fact; (3) decisions affecting speed and profits shall be rendered promptly and finally, which is not now the practice.

In general, then, while a goodly number of large contractors heretofore specializing in other lines have taken highway contracts during the past season, their experience to date has not led them to the conviction that they want to stay permanently in road contracting. Conditions are still far from being as satisfactory as those found on private work. The large contractors, seeing the large program of highway work ahead, are desirous of seeing such reasonable changes made as will allow them to regard highway work as one of their specialties. But unless the changes which to them appear reasonable and possible—because the desired conditions obtain on private work—are made, they will return to other lines as rapidly as they can.

Engineering and Adventure—

A Plea for a Return to Individualism as Against an Overdose of "System."

By P. B. McDonald
Assistant Professor of English, School of Applied Science, New York University

MANY young men choose engineering as a profession because it suggests adventure. Young men of Anglo-Celtic ancestry are particularly inclined to seek work that interests them, rather than to reconcile themselves to the laborious plodding that characterizes German method. The yearning for adventure is perfectly natural and fitting in a young American—or, for that matter, in an old American. The man who discovered America took a chance, as did the early settlers and pioneers, and it is not strange or discreditable that their descendants should hanker for the unknown, the far-away, and the romantic.

Yet the vigorous young graduate from an engineering college finds his superiors advising him to settle down and form a rut. Industrial officials frown upon adventure. To them an adventurous spirit is the cause for making machinery "foolproof." The young graduate is put to counting cars or copying maps or sampling ore-bins. This is the "valuable experience" which is to compensate for his small salary. His spontaneity is deadened, and he comes to consider his youthful ideas of engineering as all wrong. Perhaps a few years of drudging so sour him that, when he becomes a boss, he takes out his bad temper on the young graduates who come to work under him.

More serious is the effect upon workmen of putting them in charge of a boss who has become constitutionally opposed to anything interesting, different or adventurous. Ruskin pointed out many years ago, with that strange capacity for seeing into the future that some Victorians possessed, that the subdivision of labor when carried to extremes would make for unrest and discontent. A man that spends his days and years sharpening the points of pins is likely to provide receptive material for bolshevistic theories, even though his wages seem high. That same man's ancestors worked longer hours for smaller wages, but took their work more leisurely and saw more of interest in it, because their tasks were varied and invited originality. Writers on the Middle Ages tell us that in the Merrie England of that period men left their work reluctantly and dreamed of their plans for the morrow. The Gothic cathedrals are beautiful and inspiring because the workmen were allowed to express themselves. The work was not drudgery. Every trade had a guild, somewhat in the manner of the modern trade unions, but the spirit of labor was quite different from that of today.

The point is that it may not be entirely the fault of the employee if he is discontented. The employer has thought very little, if at all, about making work interesting for his subordinates. In the case of engineers, officials seem to take a malicious pleasure in showing the young man that there is no adventure in engineering, that it is all a sordid grinding of the nose, that spontaneity and originality are faults, not assets.

Of course, the employers are partly right. Life does not consist of always running to a fire, as Woodrow Wilson has pointed out. Much youthful enthusiasm is misdirected and sophomoric. But engineering, or life itself, need not be entirely a grind. If work can be designed to utilize the spirit of advanture inherent in American youth, the greatest possible effort should be made to permit the expression of such desires. As C. R. Mann says concerning engineering education, "the fundamental thing is to get the boys to want to do it."

The brief military experience of the United States during the late war showed very well what a difference enthusiasm makes. While there was a chance of adventure, young men were eager for the Army and would do marvels; after the armistice was signed, everyone was anxious to be discharged as soon as possible.

Speaking generally, adventure is a state of mind. A fat man living in a back street in Brooklyn may have it, while a young fellow traveling among gold mines and opera bouffé and señoritas may be absorbed in getting back home to the old, familiar routine. Probably the fat man would be the more interesting to work for. In reading the articles contributed to technical periodicals by prominent engineers, it is not difficult to distinguish those that see work in the light of romance and those that see only the grindstone. According to the blue laws of people of no imagination, the more dry-as-dust an engineer is, the more successful he is. Such, however, is not always the case, as is shown by the records of engineering life.

Engineering as a profession should invite creative imagination, diverse individualities, men with new ideas. There is no profession offering more real opportunities for adventure if properly encouraged. Engineering can take men to the ends of the earth, to exotic, colorful places where romance is in the atmosphere and each day is an adventure. The engineer in his laboratory is frequently probing the unknown, and, if his time is not taken completely for routine, he can adventure into worlds as interesting as those to which the traveler goes.

H. G. Wells (who occasionally has a bright intuition) maintains that, instead of the world being made "safe for democracy," it should be made as favorable as possible for personal adventure. People need adventure, and the nation which best supplies its people with opportunities for attaining their aspirations, both conscious and unconscious, will grow most powerful and persist the longest. A. J. Balfour suggested in one of his essays that the real cause for the downfall of Rome, of which dissipation and vice were only the outward sign, was that the ideals foisted upon the Roman people by its government were too Oriental to satisfy Western minds. American industry, likewise, may have become too Prussianized.

Perhaps the English people have best understood the desirability of encouraging the natural craving for adventure. Their financiers have taken chances in all parts of the world on all kinds of ventures. They have not been afraid to speculate in rubber in the East Indies or Africa, in tea in Ceylon, in railroads in South America, and in gold mines in any part of the world. A Harvard professor recently suggested that one reason why London deals in more commodities than does New York is that the American investor will not take the chances that an English investor will. The variety of stocks traded on the New York exchange is narrow compared with the extraordinary range of interests on the London exchange. We are not so adventurous or so individualistic as the English.

President Hadley of Yale pointed out in a recent article that for the past two decades a decided reaction has been evident against the extreme individualism of Herbert Spencer and other nineteenth-century writers. Individualism was criticized as being too eccentric and irregular. Dependable mediocrity became the policy of great industrial companies that had been made possible by the individualistic efforts of men of the previous generation. As Carlyle caustically remarked, "the end of the nineteenth century was characterized by the appointing of committees." Responsibility and authority became divided and dissipated, in some cases so thoroughly that many great enterprises took on the appearance of bureaucracies. A customer writing to a large firm about a trivial matter was likely to be "referred to clerk 85 of department 207," thence to another official of another department, and so on. Methods of German organization were copied and adopted, and men of pronounced individualistic mind were frowned upon.

This was the time when engineering ceased to be adventurous, and when the chief effort was directed to reducing life to the dull level of sharpening the points of pins. The men encouraged and promoted were the prosaic, obvious ones ranking above their fellows only in pushfulness and thick skins or a tendency to be deferential to those above. Even the most famous American inventor of the time came out with a dictum that genius was "perspiration, not inspiration," disregarding the suggestion of the ancient Greeks that a thing well done is done easily, overlooking also the important matter of natural adaptability and the advice of such leaders as Woodrow Wilson who recommend young men to follow their enthusiasm.

In an industrial democracy such as the United States, the men in control of the country's industries are, in a way, the ruling class. The permanence of what they build depends on the nature of the young men whom they train to take their places. In too many cases it appears that the men advanced in authority were picked for the immediate gains that they could show and not enough for the ultimate effect on the business. Men of narrow mind were advanced in the industries to increase temporary profits, at the expense of ultimate trouble in the form of labor unrest and general discontent. Such a policy is better in the flower than in the fruit.

It is too much to hope, of course, that industrial leaders shall be philosophers in the sense that Plato wished kings to be philosophers, but it is not a radical suggestion to recommend that the men chosen to direct important industries and undertakings should be somewhat broader in views than has been the case of recent years. There should be a return to individualism to the extent that recognition be made of the need for capable leaders and diverse personalities. Genius and talent, even in industrial fields, are liable to be capricious, and everything cannot be reduced to a system; even Henry Ford has remarked that there will always be some things on which we have to take a chance.

As applying to young engineers, the point is that rather than encourage them to settle down when their natures are opposed to it, employers should give some thought to turning youthful enthusiasm to legitimate effort without making the engineer into an engine. More of the present labor unrest than is generally recognized is the result of the mechanizing of work and of the application of the wrong kind of "efficiency."

Cost to Live Increases 73 Per Cent

According to a research report recently published by the National Industrial Conference Board, the cost of living, including food, shelter, clothing, fuel, heat and light and sundries, has, during the past five years, increased 73%. That five-year period is between July, 1914, and July, 1919. The basis for the determination of such a percentage increase in the cost of living is a study of the experiences of more than 11,000 families. The United States Bureau of Labor Statistics and other authoritative agencies reported before the war that the percentages of income spent on those items entering into the family budget were:

Food	43%
Shelter	18%
Clothing	13%
Fuel, heat and light	6%
Sundries	20%

The percentage increases found in separate items are:

Food	90%
Shelter	28%
Clothing	100%
Fuel, heat and light	57%
Sundries	63%

By combining the percentages of increase in the cost of the separate items an advance of 73% is found.

Comparison of Engineering Work and Salaries in Pacific Coast Cities

The accompanying table, showing the salaries that are received and the work that is performed by engineers and assistants in 13 California cities and in Phoenix, Ariz., was compiled recently by Arthur H. Adams, of the Department of Public Works, Long Beach, Cal.

	Salaries per Month													
City	City Engineer	Deputy Engineer	Chief Drafts' man	Draftsmen	Chief of Party	Transitman	Head Chainmen	Rear Chainmen	Stenographers	Street and Sewer Inspectors, per Day	Estimated Population, 1919	Assessed Valuation	Value of Improvements, Year 1919 to Date	Value of Proposed Improvements, Current Year
San Francisco	$1250	$350	$225	$150-175	$225	$165	$165	$125	$125	$6.00	600,000	$805,000,000	....	$1,000,000
Los Angeles	416.67	300	225	115- 155	135- 155	110- 135	95	85	80- 125	4 50- 5.00	630,000	622,045,550	$817,374	6,669,342
Oakland	375	275	185	150	215	160	125	125	100	5.00	215,000	150,000,000	....	....
San Diego	300	175	175	120- 150	150	140	100	95	130	5.00	100,000	78,790,000	....	....
Sacramento	300	175	5 per day	4 dy.	6 dy.	6 dy.	100	100	100	4 00	75,000	70,000,000	....	....
Berkeley	300	175	160	....	....	135	100	85	125	4 00- 5 00	70,000	46,000,000	20,000	....
Fresno	300	200	6 dy.	...	150	....	4 dy.	....	3 dy.	5.00	60,000	32,000,000	355,300	725,000
Stockton	250	150	..	5 dy.	6 dy.	....	4 dy.	4 dy.	...	5.00	50,000	54,000,000	281,800	...
Pasadena	250	185	150	135	150	135	100	100	115	6.00	45,000	66,451,397	...	90,641
Alameda	250	175	....	6 dy.	6 dy.	5 dy.	4 dy.	4 dy.	100	.....	32,000	21,000,000	30,000	40,000
Phoenix, Ariz.	250	175	165	150	165	125	90	90	110	5.00	30,000	....	....	....
Santa Barbara	225	150	130	104- 117	117	104	91	75	85	5.00	20,000	16,767,000	130,000	....
San Bernardino	185		125	3 50		...	3 dy.	3 dy.	..		22,000	......	...	..
Long Beach	175	150	140	5 dy	140	140	90	80	75	4 50	61,000	43,934,250	164,395	5,568,138

What Is the Future of Inland Water Transportation?—*Part I*

By Charles Whiting Baker

Consulting Editor, "Engineering News-Record"

There are here presented the results of a thorough study to determine the present economic position of inland water transportation, the field which it should occupy with relation to railway transport, and the consequent policy which should be adopted by the Government with reference to waterway development.

The investigation shows that traffic on nearly all inland waterways has all but disappeared. With few exceptions, the competition of waterways with railways is no longer of any consequence. The primary cause of the decline of the waterways is the extraordinarily low cost at which the railways of the United States are able to handle low-grade bulk freight, which is the only class of freight on which the waterways can hope to compete with railways.

The widespread belief in the great advantage of waterways, and the stock arguments in their favor, are fairly examined and are found to be based on conditions of the past, not those of the present.

The waterway was the only cheap means of transportaion before the railway came, and the invention of the steamboat multiplied the value of the waterway many times.

It was not until the railway had experienced a half century of development and the invention of the steel rail had made possible the use of heavy rolling stock that low-cost railway transport became possible.

In the battle between rail and water routes during the last quarter of the nineteenth century, public sympathy was strongly enlisted on the side of the waterway because it represented free competition as opposed to monopoly. The belief in the value of potential water competition to keep down railway rates has been almost universal. Government control of the railways has now demonstrated the fallacy of this belief.

The recent great increase in labor costs has hit the water carriers, notably coastwise steamers, much harder than the railways.

The success of water transport on the Great Lakes is shown to be due to conditions which cannot possibly be reproduced elsewhere.

I—Introduction—The Government's Policy Toward Inland Waterways

WHAT is the proper place of the navigable river and the canal in the country's transportation system? Can the steamboat and the barge compete with the railway train? If so, where and under what conditions? Should the United States continue to spend great sums improving rivers for navigation?

These questions are of pressing importance. There is on the one hand widespread belief among business men in the future of water transportation. The Chamber of Commerce of the United States adopted a waterway plank at its annual meeting in St. Louis in April, reading:

"We urge that the Government speedily complete river improvement projects already authorized, and that Congress provide for a comprehensive system of waterways with coördination of the services of waterways and railroads."

On the other hand, the public has become informed as to the practical failure of the Federal waterway improvement program. It is no secret that the annual river and harbor appropriation bill is commonly known as the "pork barrel" bill. Repeatedly on the floor of Congress has the wholesale waste in the Government's river and harbor work been exposed and condemned. Even the Presidential veto has at times been interposed, when the objectionable items in these bills became too scandalous.

The present is an opportune time to stop this waste. Drawing funds from the public treasury ostensibly for the improvement of navigation but really for flood protection, to benefit private interests, or to obtain the expenditure of Federal money in certain Congressional districts, is obtaining money under false pretenses. The nation can no longer afford, with the easy-going indifference of the past, to allow this waste to proceed unchecked. With a vast burden of war debt and huge continuing expenditures to remain long with us as a result of the war, rigid economy in national outlay is imperative.

The United States has spent many millions of dollars on inland rivers, and that, too, within recent years, where no navigation of any consequence now exists. It has built dams and locks on rivers where the only water traffic now is the floating of logs, and these went down stream more readily with the river in its original condition than with the navigation improvements. Surely it is time to stop such waste. Whatever sums the nation is to spend on waterway improvements should be concentrated on channels where the business will be sufficient to warrant the outlay. Scattering Federal money on all sorts of waterway projects, good, bad and indifferent, is an injury to the water transportation interests, not a benefit.

Government Lavish in Its Waterway Work

Waterway advocates have long asserted that the decadence of water transportation is due to the niggardly policy of the Federal Government regarding the inland waterways. How baseless is this assertion may be judged from the fact that the Federal Government has spent to the present time nearly a billion dollars[1] on river and harbor improvement, fully half of which has been devoted to inland waterways. In addition, over $300,000,000 has been spent by the states and by private corporations on inland canal construction. Most of these canals long ago became obsolete and were abandoned, though the one on which over half of the sum was spent, the New York Barge Canal, has only just been completed.

It may be supposed that the above-quoted figures for Government expenditures on waterways represent money spent many years ago, when inland water transportation was in its prime. The fact is, however, that fully half of all that the Federal Government has spent on river and harbor work has been spent within the past 15 years. Even on canals, the State of New York has spent within the past 15 years on its canal system two-thirds as much as all the outlay on all the canals in the United States previous to 1900.

In the face of this lavish expenditure on waterway improvement, inland water transportation has been steadily declining for many years. This is true not only of the smaller navigable streams but of the great rivers, including what was once the most important inland river transportation route in the United States, the Mississippi River.

The river steamboats on the Mississippi reached their climax of prosperity in the '70s. By 1890 the railways had shot so far ahead in the competition that St. Louis, the center of the river-borne commerce of the Mississippi valley, received 15 times as much freight by rail as by river steamboat. Statistics gathered by the St. Louis Merchants' Exchange show that in 1890 St. Louis received 663,730 tons of freight by river and shipped 601,862 tons. Sixteen years later, in 1906, the receipts at St. Louis by river had fallen to 327,670 tons and the shipments to 89,185 tons. During the same period the freight receipts by rail at St. Louis grew from 9,969,000 tons in 1890 to 27,292,000 tons in 1906. The rail shipments from St. Louis increased from 5,270,000 tons in 1890 to 17,672,000 tons in 1906.

Thus, while 30 years ago the receipts of freight by rail at St. Louis were 15 times as great as the receipts by river, a dozen years ago the river receipts had fallen to only 1% of the receipts by rail and the shipments by river were less than 0.50% of the shipments by rail.

There was, however, a widespread belief a dozen years ago that river transportation had reached its lowest ebb and that its revival might be confidently expected. Instead of that, the decline has continued. In 1918 St. Louis received 42,318,000 tons of freight by rail and only 60,450 tons by river. There were shipped out of the city 30,097,000 tons by the railways and 69,045 by the river. Thus, the steamboat commerce of St. Louis in the whole year of 1918 did not equal the railway commerce of half a day.

The few steamboats which still remain on the Mississippi and some of its tributaries are no longer competitors with the railways for through traffic. They are handling a small amount of local business only, on which the boat can for some special reason serve the shipper better than can the railway.

Meanwhile, the United States has gone on with its program of waterway improvement, and has spent money on inland rivers more lavishly during the past dozen years than ever before. The question whether the commerce which will use the improved channel will be sufficient to justify the expense is apparently a purely academic question in which no one in authority takes any interest. When a project is once officially adopted it is carried to completion even though the plans for it become obsolete during the preliminary stages.

The Hennepin Canal

A good illustration of the Government's conduct of its river and harbor work is the once famous Hennepin Canal in northern Illinois. This waterway was originally projected more than half a century ago as a short connection from the upper Illinois River to the Mississippi River. At that time river navigation was still a very active business in the central West. Waterways to compete with railways and cut down railway rates were being actively promoted. Elaborate computations were made to prove the great public benefit which the Hennepin Canal would confer in forcing the reduction of railway rates over a wide territory.

Very likely there was enough foundation for these claims, at the time when the project was first agitated, to bring about the exertion of railway influence, then powerful at Washington, to delay action by Congress. At any rate, there was a long period of inaction before the project was formally undertaken. Once started, the work proceeded at the leisurely pace usual on Government works. The river steamboat business, for whose benefit the canal was undertaken, dwindled away, but no one in authority paid any attention to that.

---

[1] The total of all Federal appropriations for river and harbor work, to July 18, 1918, was $971,142,916.

After something like a score of years spent in construction, the canal was opened for business in 1907. It had cost the Government $7,566,000. There has been expended on it since, for maintenance and operation, $1,716,000. The total traffic on the canal for the past five years has averaged only 12,060 tons per annum. Here is a total investment by the Government approximating $10,000,000, plus over $90,000 a year paid out in operating expenses, all to accommodate as much business in an entire year as is carried in a single day over many of the railway lines in the same district. The fourteen locks on the canal must be continuously tended even though the solitude of the lock tenders may be disturbed only once a month by a passing boat.

And yet the case of the Hennepin Canal is not quite so bad as that of some of the other Government works for the benefit of river navigation. At the Hennepin Canal there is at least a lot of well-built masonry structures to serve as a monument for the $10,000,000 expended. There are rivers on which great sums have been spent by the United States, and nothing is left now to show for it. Floods have swept away all vestige of the work done; and the commerce which the work was undertaken to benefit has never materialized.

The public is familiar with charges of gross waste in the conduct of Government business; and the common idea is that the waste is due to dishonesty or inefficiency on the part of Government employees. But the above examples well illustrate the fact that *the chief source of waste in the public business is lack of intelligent planning.* The rank and file of Government employes can carry on routine work very well. They can build a Hennepin Canal when the work is ordered, and make a good job of it. What is lacking is someone with enough intelligence and authority to determine which works are worth while to undertake and which are not, and with the courage, when a mistake has been made, to stop the throwing of good money after bad.

If one inquires the reason why the blind expenditure on waterways has gone on so long almost unquestioned, an answer is found in the fallacious ideas which are so widely held regarding water transportation. A voluminous literature has been circulated for many years, devoted to the advocacy of water transportation. Much of it is the work of writers gifted with enthusiasm but ignorant of the foundation engineering and economic facts respecting modern transportation methods. Many of these writers have been employed to advocate a cause, not to deal with the subject from a professional and unprejudiced point of view.

Practically the whole of this voluminous advocacy of waterways, in books, pamphlets, newspapers and public meetings—and even engineering treatises—rests upon the assumption that water transportation is cheaper than railway transportation. The time has come for an unprejudiced inquiry as to whether this assumption is correct.

II—A Century of Transportation Development

For a clear understanding of the present relations of water and rail transport, nothing can better aid than a brief review of the past century of transportation development. The revolutionary changes in transportation during the past hundred years have transformed the world to a degree that we of the present generation, who have always been accustomed to the conditions created by steam power transport on land and sea, find difficulty in comprehending.

At the beginning of the nineteenth century the art of transportation was in the primitive conditions that had prevailed for ages. The sole power available for land transport was man or animal muscle. On the water this had long been supplemented by one of the great powers of nature, the wind. This was available only for the ocean and other open waters; but inland the rivers were and had been from earliest times the chief highways for freight transport. A horse or man could pull many times as heavy a load on a barge floating on the water as on a cart. Not only such rivers as are now called navigable, but any stream large enough to float a rowboat, was then a better means of freight transport than a road on land.

The Gallatin Report of 1808

The vital importance of economical transportation in advancing the public welfare was fully realized by the statesmen of a century ago. In 1808, Albert Gallatin, secretary of the treasury, made a report on roads and canals which is famous as embodying the first comprehensive plan for carrying out public works by the Federal Government. The Gallatin report made no mention of steam transportation, although an appendix contained a letter from Robert Fulton, who had made his successful voyage with the "Clermont" a year earlier. Gallatin proposed a chain of canals along the Atlantic coast to connect inland tidal waters. Canals across the Appalachian mountains to connect the Atlantic coast rivers with the rivers of the Ohio basin he concluded to be impracticable. Hence he advised that "artificial roads" should be built across these mountains to connect the navigable rivers on each side.

How small and primitive was the water transportation of that day may be realized from Gallatin's references to the few canals then completed. The James River Canal at Richmond could pass boats of eight tons drawing 3 ft. of water. The canals along the Mohawk River were 2½ ft. deep and passed boats of 10 tons. The greatest canal work in the United States was the Middlesex Canal in eastern Massachusetts, connecting the Merrimac river with the harbor of Boston. This canal could pass boats of 24 tons; "but those in most general use are of smaller dimensions and are drawn by two horses at a speed of three miles an hour."

Practically all the work then being done on rivers and canals and on turnpike construction was by incorporated companies, and the financial results were, almost without exception, disappointing. Gallatin recommended that the Federal Government should undertake the construction of canals and highways and the improvement of navigable rivers, covering all the territory embraced in his report. He estimated the total cost at only $20,000,000, and continued:

survival of the fittest, but was due to unfair competition.

"An annual appropriation of $2,000,000 would accomplish all these great objects in 10 years and may, without inconvenience, be supplied in time of peace by the existing revenues and resources of the United States."

Verily, those were the days of small things.

It is difficult to realize fully today what Fulton's invention meant to the world at the beginning of the nineteenth century. The railway was not yet born; good highways were almost unknown. There had never existed in the world such a thing as cheap inland transportation. The population of all civilized countries was therefore concentrated near the seacoast, where water transportation was available. It was impossible to fill with people the great fertile plains in the interior of the continents, such as the valley of the Mississippi, because of the lack of transportation. Although two centuries had passed since the first European colonies were established in what is now the United States, only the region along the Atlantic coast had been occupied.

Crude as were the first steamboats, they were so great an advance over any previous means of inland transport that they were put into use with marvelous rapidity. The rivers had always been the chief arteries of traffic, and now steam power could replace human muscle in the propulsion of boats. For more than twoscore years the steamboat was the prime factor in the development of the Middle West.

THE RAILWAY ERA

The railway era began in 1825, when George Stephenson's famous locomotive, "Rocket," made its successful trial trip. The river steamboat and the canal boat were then well established. The same year that saw the birth of the railway witnessed also the completion of the Erie Canal by the State of New York. The importance of that waterway at that day in affording a cheap means of transportation between the central West, and the Atlantic coast, by connecting the Great Lakes and the Hudson River, it would be difficult to overestimate.

Stephenson's locomotive was built for high speed, not hauling power. Passenger and express business was the aim of the early railway promoters. They did not expect to compete with the river and canal for freight business; and the early railways were in fact too light and of too small capacity to move freight economically. These early railways were also very costly to construct and to operate. For the light traffic of the pioneer days, the river steamboat, operating on a road which nature had provided without cost, had no fear of railway competition. For the first three decades of the railway era, capital and labor were fully occupied in building railways in the thickly settled Atlantic coast states. The pioneering of the West had to wait.

Those were the halcyon days of the river steamboat. The Mississippi River and all its chief tributaries, where depth of water made navigation at all possible, were traversed by steamboats which were until the Civil War the chief and often the only means of transport. Not till a decade after the war did the decline of the Mississippi steamboat become evident.

In the Eastern states it was found at an early date that the railway had great advantages over the little artificial canals and over navigation on difficult rivers. The abandonment of the early Massachusetts canals followed closely on the coming of the railway. Year by year the railway became a more efficient means of transport; but its period of great development really began when the Bessemer steel rail began to displace the wrought-iron rail. The growth in size of cars and locomotives had been hitherto restricted by the rapid wear of the soft-iron rails. Bessemer's invention made possible that development of the railway as an economical freight carrier that has since taken place.

THE BATTLE BETWEEN RAIL AND WATER ROUTES

Before the coming of the steel rail, the battle between the railway and the steamboat had become active. Public sympathy, at first enthusiastic for the railway, had been enlisted on the side of the steamboat. Those pioneer railway lines were risky ventures, and the men who controlled them sought to make all the profits possible. They charged "what the traffic would bear," and few were prepared to deny their right to do so. The protest against this policy brought about the Granger agitation and legislation of the early '70s, which sought to establish just such control over railway transport and rates as was actually put in force half a century later.

At that time, few public men were bold enough to advocate direct Government control of railways. Sentiment was rather in favor of keeping alive competition, and especially competition by water routes. In 1872 a Senate committee headed by William Windom of Minnesota, who was later Secretary of the Treasury, made a remarkable report on transportation. After recommending legislation for Federal railway control on substantially the lines actually enacted in the first interstate commerce law 15 years later, the committee declared that "water routes when properly located not only afford the cheapest and best known means of transport for all heavy, bulky and cheap commodities, but they are also the natural competitors and most effective regulators of railway transportation."

The committee therefore recommended a system of water routes designed to carry the products of the Central West to the seaboard. Under the conditions then existing the recommendations were justified. At that time the average railway freight on a bushel of wheat from the Mississippi River to New York was 50c. A large part of the corn crop of the Middle West was not marketed because it could not stand the transportation charges. With the equipment and facilities and volume of traffic then prevailing, however, the railways in order to live were compelled to charge rates which today appear high.

Those were the days of sharp competition of railways with one another and of railways and water routes. Rates were made to meet competition as a matter of course. Where water lines were available, rail rates were reduced accordingly. No one questioned the railways' right to do this, any more than they questioned their right to meet the rate of a competing railway. So firmly was this fixed in the rate structure that in the interstate commerce act of 1887 the continuance of special rail rates to meet water competition was specifically authorized.

The period from 1875 to 1900 saw the rapid decline of inland water transportation, except on the Great Lakes. Waterway advocates assert that the driving out of the steamboat by the railway was not a case of the

The railway, even at that day, however, had great advantages over the waterway, apart from the question of relative rates. It is important to the shipper of freight that a carrier shall be responsible and shall give regular service. In its best days the river steamboat could not compete with rail service in these particulars. The water transportation line is subject to interruption by floods and by drought. The ice in winter in northern latitudes puts it out of business entirely during several months of the year. The risks of loss are many times as great as on goods sent by rail. These and other conditions, which will be more fully discussed later, greatly handicapped the water route in the competition.

The closing decade of the century was a period of great agitation among those who sought to maintain the position of water transportation. The idea of water-route competition benefiting the public had become firmly fixed. Congress undertook appropriations for waterway improvements on a larger scale than ever before.

PRESIDENT ROOSEVELT'S ADVOCACY OF WATERWAYS

At the close of the century practically all of the old inland canals had either been abandoned or had lost all commercial importance, except the Erie Canal, owned by the State of New York. This was so dilapidated, and traffic on it was so rapidly declining, that it was clear that this canal also was rapidly becoming obsolete. This was the situation that confronted Theodore Roosevelt when he became Governor of New York after the Spanish War; and he appointed a commission to investigate and report what action the state should take.

The commission recommended the reconstruction of the Erie Canal as a large barge canal, at an estimated cost of $101,000,000. That work was undertaken and is now practically completed.

The interest in waterway development which Colonel Roosevelt acquired at that time was doubtless one factor which led him to devote such energy to the Panama Canal enterprise when he became President. He also became strongly impressed with the waterway propaganda then current, and lent the influence of his magnetic personality to furthering waterway development. In 1907 he appointed an Inland Waterways Commission "to prepare and report a comprehensive plan for the improvement and control of the river systems of the United States."

The commission was largely made up of men identified with the Roosevelt policies, and committed to a considerable extent to the current agitation in favor of water-transportation development. It was not to be expected that a commission so constituted and appointed with such instructions would bring in a report in any way antagonistic to waterways. The commission, however, in the face of the facts which were revealed by the investigations of its experts, could not lay out and recommend for adoption any such great system of inland waterways as was doubtless expected at its creation. Instead, it recommended the establishment of a permanent Government body to plan systematically for waterway development. The report also contained intimations that a considerable part of the waterways system existing and planned was of doubtful value—to put it mildly. One notable clause in the report read:

"We recommend that any plans for improving the inland waterways shall take account of the present and prospective relation of rail lines to such waterways and shall ascertain, so far as may be, whether such waterways when improved will be effectively used in the face of railway competition."[2]

At the time when this report was rendered Congress and the President were at loggerheads. The report of the commission, which was appointed by the President without authority from Congress and which had no appropriation to pay for its work, had little influence with the legislators at the capital, and no action was taken on the Inland Waterway Commission's recommendations.

The only attempt which the Government has ever made, therefore, to investigate the water transportation situation (and even this was not a broad, unprejudiced investigation) has had little or no influence on its action. The Government has since pursued its work of waterway development as it always has done, without any systematic plan or policy. A waterway commission provided in the rivers and harbors bill of 1917 was never appointed by President Wilson.

THE ORGANIZED PROMOTION OF WATERWAY PROJECTS

The chief influence which has controlled the Federal appropriations for waterways is the organized propaganda in favor of such appropriations which has been carried on in wholesale fashion for many years. This propaganda has been successful in creating a widespread public opinion in favor of waterways. The public, and especially the commercial interests, implicitly believe that the waterway is inherently a cheaper means of transport than the railway, and that the provision of a waterway at Federal expense will therefore benefit the adjacent shippers and communities. Commercial organizations, therefore, can usually be officially enlisted in favor of waterway appropriations. Others active in promoting waterways are those interested in steamboat lines and in contracts for work on waterways. Still more influential are the interests which seek to have the Federal Government improve rivers ostensibly for navigation, but actually for flood protection.

With this pressure behind Congress, it is entirely natural that appropriations for waterways have been liberal. The individual Congressman has no means of sifting the claims made by the waterway promoters, and he has not the technical knowledge needed to uncover fallacies in the arguments presented. Very little attempt has been made to expose these fallacies. Arguments against waterway appropriation have been generally combated by the waterway promoters with the charge that the objector was "working for the railway interests."

There has thus grown up in the public mind the belief that advocacy of waterways and defence of water transportation are closely related to advocacy of public interests instead of private interests; of free competition in transportation rather than monopoly; of conservation and utilization of natural resources for the public benefit.

---

[2] A report on transportation by water in the United States was made by the Commissioner of Corporations at about the same time as the Inland Waterways Commission's report. This report was largely inspired by the theory that the cause of the decline of water transportation was the lack of proper terminals for freight handling, and especially the control of water terminals by railways. Neither of these investigations, therefore, was undertaken as a broad, unprejudiced study of the water-transport situation; and it is easy to detect in the reports the personal views of individual members. Nevertheless, these reports and the studies by expert investigators which accompanied them are the most nearly complete and valuable record of water-transport conditions in the United States that has ever been made.

This is so well recognized that a necessary plank in most political platforms for many years has been a declaration in favor of waterways. The candidate for public office feels sure of approval when he throws into his speeches a few ringing sentences urging improvement of the waterways and condemning the railways. It would be useless for him to pursue any other course. Were he to voice a doubt as to the soundness of the lavish expenditure on waterways, he would be assailed on every hand with quotations from many supposed authorities, all proving him in the wrong, and grave doubts of his sincerity and honesty would be at once aroused.

III—Changes During the Past Twelve Years

When the Inland Waterways Commission made its investigation a dozen years ago, it was taken for granted that the inland waterways ought to be improved and put into use. There were at that time enough of the old-time river steamboats still running on Western rivers to encourage the belief that inland water navigation might be revived and again become important. The cry had long been, Let the Government improve the channels, and the commerce will follow. The channel improvements had made great progress, and speedy results were looked for.

These results have not materialized. Instead of a revival of water transportation, there has been a continuous decline. The great expenditure of the Government on channel improvement has had, broadly speaking, no results. On the improvement of the Mississippi River below Rock Island, Ill., the Government has spent about $100,000,000, though, to be sure, a large part of this went into flood protection. The Mississippi is deeper, and better for navigation, than the Rhine, Europe's greatest interior waterway. Yet the Mississippi has been practically deserted by through traffic. On that river and most of its tributaries, on many of which the Government is still building and maintaining costly works for channel improvement, the few boats which remain are carrying local business only.

The official statistics giving the tonnage of water-borne commerce on inland rivers are misleading, because many inland rivers are still extensively used for floating logs and timber, and also because of the great increase in the use of rivers as a source of sand and gravel. To credit the Government's channel improvement works with the tonnage of logs floated downstream and with the tons of sand and gravel dredged from some nearby bar and towed a mile or two to a convenient site for unloading, is absurd. In most cases the sand and gravel would have been as easily obtained and the logs would be as readily floated with the river in its natural condition.

The various "projects" under which improvements of inland rivers are now being prosecuted were adopted in most cases many years ago. Many projects had their first inception during the '80s or '90s, when the country had just become aroused to the fact that the river steamboat was yielding to railway competition, and when the public demand was urgent that the waterways should be improved to hold their own with the railways. Where projects have been revamped it is generally with the idea of reconstruction on a larger scale. Very seldom has the question been squarely faced whether the time had not passed when the channel could be profitably used for navigation.

Probably the most powerful influence back of the campaign for Federal expenditure on waterways has been that of the property owners in the Mississippi valley. One of the most valuable public improvements of the last half century is the reclamation of the fertile lands along the Lower Mississippi River by the construction of levees and bank revetments, to protect the land from floods and make permanent the channel of the river. A large part of the money for this work has been supplied by the Federal Government; but its expenditure has been made ostensibly for the improvement of navigation. Three years ago a new precedent was established, and Congress made a direct appropriation for flood prevention on the lower Mississippi River. Thus one of the chief sources from which the propaganda in support of river appropriations has been financed has now been removed, and there is that much better chance of having the case of the waterways considered fairly on its merits.

No change during the past dozen years has been of greater importance in its bearing on the waterway question than the altered situation of the railways.

From the time when competition of the railway with the steamboat first became evident, the argument has been potent that waterways were a public necessity to keep down railway rates. That argument had its birth in the days when belief in railway competition as a necessary protection to the public was still almost universal. Better even than railway competition, it was held, was water competition, because steamboat lines could not be combined and controlled like competing railway lines.

Good Results From Government Railway Control

Of course, this argument for waterways became invalid when the Government established its direct control over railway rates. There still remained, however, a widespread belief in the value of water competition. Not until the recent transfer of the railways to Government control and operation has the public been able to view this matter in its true light.

It is now clear to everyone that the railways must have rates high enough to live on and continue operation; and not only that, but enable them to expand and develop to meet the country's necessities. If rates are insufficient for this, the deficit will have to be made up from the public treasury with money raised by taxation, as is actually being done today. If the dream of some of the waterway promoters were realized and "a comprehensive system of waterways" were constructed, and if that system operated to reduce railway rates, the deficit to be made up by the taxpayers would be that much larger.

One finds repeatedly in waterway literature the argument that waterways would be justified even if they were wholly unused, merely because of their influence in reducing railway rates. The present situation of the railways shows the absurdity of this reasoning. If the waterways were able to divert from the railways a large amount of business which the railways could handle at a profit, the deficit for the taxpayer to shoulder would be even greater.

Thus the great experiment of Government railway control, undertaken for the war emergency, has been a most valuable demonstration that the railway, as an absolute public necessity, must have rates high enough to enable it to live, and that any water transport line must be justified by what it can accomplish as an economic carrier. As a mere competitor of the railway it will be an injury and not a benefit to the public.

Government operation of the railways has also made it far easier to demonstrate to the public that unnecessary duplication of transportation lines is a waste and not a benefit. To build two railways where only one is needed, or both a railway and a waterway where the railway alone is sufficient, is a waste of capital and labor which results in a perpetual burden on the public. The waterway, to be economically justified, must be shown to be needed by the public in addition to the railway facilities, and must be needed to an extent that will bring traffic to it sufficient to yield a fair return on the cost.

Waterways To Relieve Railway Congestion

One of the arguments for water transportation which has been oftenest repeated is that waterways are needed to supplement railway facilities at times of railway congestion, so that the public need not lack for transportation at such times.

It is doubtful whether the many eminent men who have put forward this argument ever gave it enough serious study to find out what it would involve in its practical application. Since the argument has been put forward by various high authorities, it may be appropriate in this place to inquire what would be involved if waterways were built and used merely to carry the railway "peak loads."

Under normal business conditions, the railways of the country are capable of carrying all the business offered. At certain intervals, however, business expands more rapidly than railway facilities, and congestion of traffic and car shortage prevail. In 1906 and 1907 the greatest car shortage ever known in the United States occurred. In February, 1907, the demand for cars by shippers was 125,000 in excess of the supply. It was at exactly this time that the agitation for Government expenditure on waterways was most aggressive. Doubtless, many thousands of business men considered it fully demonstrated then that "a comprehensive system of waterways" was urgently needed to carry the traffic which the railways were unable to handle.

Near the close of 1907 came a business panic. The car shortage promptly disappeared, and a huge car surplus took its place. In 1908 and 1909 the railways of the United States had an average of over 100,000 idle cars. Companies which were hard pressed financially had to build many miles of new track on which to store their idle cars. Not for eight years—until 1916, when the war business came on—did the country again experience congestion of railway traffic and car shortage.

After the armistice was signed, railway traffic fell off materially, so that whereas in 1918 various railway companies were struggling to get each its share of the new cars which the Federal Railroad Administration was building, by the spring of 1919 the different companies were politely waiving their claims, and each was urging that some other road certainly ought to have its need for cars supplied first!

Suppose now it were seriously proposed to provide waterways, boats and terminals to carry traffic at such times only as the railways were unable to handle it. Merely to state such a proposition is to demonstrate its absurdity. Who would pay for boats to be used only a few months at a time, once in half a dozen years or so? No business concern would do it—and if it did its losses would soon put it out of business. The Government treasury might be called on to stand such a loss; but a transportation business which operated only in a rare emergency would certainly prove inadequate and inefficient when the emergency came. This is not a mere theory; it has just been proved by actual experience. During the memorable railway blockade of 1917-'18 the inland waterways were available, and a considerable number of old boats were obtainable for use on them, but the organization to use the waterways effectively was lacking, and consequently the waterways remained unused when transportation was in more urgent demand than ever before.

The absolute impotence of the waterways to supplement the railways at that crucial time is best shown by figures: The total river traffic of St. Louis was 151,590 tons in 1916; it was 150,380 tons in 1917, and in 1918, when railway congestion was most acute, it was 129,495 tons. In contrast with this, the railway traffic of St. Louis was 76,126,000 tons in 1917, and 72,354,000 tons in 1918. These figures show not only that river traffic actually declined during the year of greatest railway congestion ever known, but that the volume of railway business is so enormous that if the waterway were to be a really valuable supplement to the railway in times of traffic congestion it would have to be equipped with boats and terminals on a huge scale.

It will not escape notice, too, that only in a very few locations are waterways available to supplement railways, and that the worst railway congestion ever known in 1917-18 was during the winter months when the waterways were closed by ice anyway. Sufficient has been said, however, to show how chimerical is the proposition to use the waterways to relieve railway congestion.

Relative Capacity of Railways and Waterways

An argument closely akin to the one just dissected is the argument that waterways are needed to supplement the railways because of the great capacity of the waterways. It is known that a large amount of new capital must be invested in the country's railway system to enable it to expand to meet the growth of traffic, and it is urged that this increase in the country's transportation facilities should be made in the water transport lines rather than in the railways, on the ground that a given expenditure of capital in waterways would produce a greater additional capacity.

The facts and figures to substantiate such a claim, however, are lacking. The common idea that a waterway on a natural river costs substantially nothing to make and to maintain is fallacious. On the contrary, the few inland waterways of the United States, where there is any chance for a revival of traffic have cost as much per mile to improve as the cost of building a first-class railway.

Besides this, the traffic capacity of a railway is almost without exception fixed by the capacity of its terminals. The work on expansion of the railway system during the past decade has been almost all devoted to terminal enlargement and improvement, or else to extensions and branch lines in districts far inland, removed from navigable waterways. One can hardly identify a single piece of railway construction carried out during the past decade which would have been less necessary by reason of any practicable expansion of waterways.

The capacity of the waterway, like that of the railway, is fixed by the capacity of its terminals. In all the estimates of the capacity of water routes which have been made, one will look in vain for estimates of the cost of terminals commodious enough to care for a volume of traffic equal to the estimated capacity of the waterway.

Building Boats for Inland Waterways

Nothing is more illuminating as to the present condition and future prospects of inland water transportation than the condition of the boat building industry. If there are conditions which make probable an early revival of transportation on inland waters, those engaged in building craft for use there should be the first to foresee and prepare for such a revival.

The United States Census Bureau has just issued a bulletin giving statistics of shipbuilding for the entire United States, and containing figures for the industry for the years 1916 and 1914. The accompanying table gives the figures of most interest for the year 1916:

SHIPBUILDING IN 1916 ON INLAND WATERS

	Great Lakes	Mississippi River and tributaries	All Other Inland Waters
Number of concerns	131	101	97
Persons engaged	9,567	2,419	679
Capital employed	$36,024,371	$4,570,879	$1,368,762
Value of products	22,094,456	5,034,674	1,361,470
Value of work on new vessels	13,101,506	1,560,037	66,184
Value of repairs on vessels	6,465,800	1,063,853	256,549
Value of all other products	2,051,126	2,082,829	194,326
VESSELS LAUNCHED DURING 1916			
Number	89	234	9
Gross tonnage	121,234	50,593	925
Steam Vessels:			
Number	46	20	
Gross tonnage	102,464	3,618	
Barges:			
Number	13	190	5
Gross tonnage	4,100	46,426	880

It will be seen from this table that the building of boats for use on the Mississippi and all its tributaries is a business only one-ninth as large as shipbuilding on the Great Lakes. It employs about $4,500,000 capital and fewer than 2500 workmen. It is carried on by small concerns with an average capital less than $50,000 and employing fewer than 25 men. These concerns built in 1916 only 20 steamboats averaging 180 tons in size. They were occupied chiefly with repair work and the building of barges. The average size of the barges built was only about 250 tons.

It may be thought that the showing for 1916 represents a paralysis of business due to the war. Comparison with the figures for 1914 shows that, on the contrary, the war conditions stimulated the business considerably. The business of 1916 was more than double that of 1914.

In studying these figures, it must be remembered that the Mississippi and its navigable tributaries have an extent of several thousand miles, and there is in the aggregate a considerable amount of local business on these rivers, where small craft serve river communities which may not be reached by a railway. The building of boats for this purpose, and the building of boats to maintain the great fleet of vessels which the Government keeps busy on channel improvement works, are sufficient to account for the amount of boat building which is shown in these census statistics.

The Effect of Changes in Labor Costs

Few are aware of the revolutionary change in the conditions of water transportation which has been brought about by the enormous increase in the cost of labor. The increase has, of course, had serious effect on the railways and is, indeed, chiefly responsible for the present great deficit in railway net earnings. The water transport lines have been hit still harder; for the steamboat on inland waterways, being of relatively small tonnage, requires a much larger labor force to produce a thousand ton-miles of transportation than does the railway.

Those who hope to see the old-time steamboats come back to the Mississippi and other Western rivers have only to consider the cost of operating those boats at the present wage scale to see how baseless is such a hope. It was necessary for the steamboat which plied up and down the river, making frequent stops, to carry besides her regular crew of engineers and stokers a swarm of deck-hands to hustle freight on and off the boat at the landings, and bring cordwood on board for use under the boilers.

Today the wages of a deck-hand are at least four or five times what they were forty years ago, and the crew's wages are proportionately raised. No boat can afford to carry a crew large enough to handle freight on and off at landings in the old way; especially is this the case if boats are to be used for other than local traffic and to make long runs, as from New Orleans to Memphis or St. Louis.

It is only on these long runs, however, that the boat can have any chance of competing with the railway. On short hauls the difference in cost by rail and by boat will be too small to be controlling, and the shipper will send by whichever route offers best service in other respects.

Lack of Stevedores at River Ports

But on the long-distance voyage, what will the steamboat operator do about handling cargo? It takes ten days to a month for the voyage between New Orleans and St. Louis. It would be absurd to pay the wages and board during the voyage of sufficient deck-hands to handle the cargo at the terminals. The river boat, therefore, must now, like the ocean vessel, rely on local stevedore labor to load and unload her freight.

At New Orleans, as at any other great seaport, stevedoring is an organized business, and there is comparatively little difficulty in getting the cargo handled with reasonable promptness and moderate expense; but this is not the case at St. Louis or at any other city on an inland river. The volume of river steamboat business has for years been too small and too irregular to support any reliable stevedoring concerns. The river steamboat operator, therefore, must use such floating labor as he may be able to pick up to do the work of taking on and discharging cargo at a river port. Such labor is very inefficient and expensive. This condition is bound to continue, no matter how much money or how intelligent design may be expended on terminal facilities on inland rivers, until river transportation becomes a large business.

Again, the movement of vessels in river traffic is subject inevitably to great variation, so that the time of arrival of a boat at a port is uncertain. In order to keep stevedores on hand to be available when wanted, a great deal of idle time must be paid for. Even then, a boat will be subject to considerable delays in port waiting for a gang to handle her goods. This is true even of ocean transportation. In times when business is active and labor scarce, as was the case during the war, it is not uncommon for ocean vessels to be detained for days awaiting stevedores to handle the cargo.

High Labor Costs Hurt Coast Steamer Lines

Probably few are aware how severely the great advance in wages has hit the coastwise steamer lines. The ocean vessels were able to meet the wage increase by an even greater proportional increase in their cargo rates; but the coastwise vessels can obtain business only by maintaining rates below those of the railways, and the railway freight rates were raised only 25 per cent. The result has been to lower earnings in many cases below operating expenses. The Clyde Steamship Line in February, 1919, abandoned operation of its line from New York to Mobile and Tampa, which it had operated for 16 years, its line to Wilmington and Georgetown, in operation for 30 years, and its Philadelphia and Norfolk line, with a record of 50 years. On June 7 its line between New York and Philadelphia was also discontinued.

The longshoremen's strike, which tied up the port of New York for more than a month in October and November, 1919, was precipitated in part by the attempt of the Federal Wage Adjustment Board to fix a lower rate for handling cargo for coast vessels than for ocean vessels. The board publicly announced as its reason that the coast lines were operating on so narrow a margin that to grant the increase the longshoremen asked for, and which the board held was justified by the increased cost of living, would put some of the coast lines out of business.

Here are water routes with all the advantages of the deep water of the ocean and with long-established terminals for the economical handling of traffic, abandoned or on the point of abandonment because of inability to pay expenses in competition with the railway lines. If such water routes are unprofitable, it is surely worth inquiry whether the long-accepted idea that inland water transport in artificial channels is cheaper than rail transport holds good under present-day conditions.

IV—Transportation on the Great Lakes

There is one inland waterway in the United States on which traffic has increased at an enormous rate; and which has fully justified all the expenditure which the Federal Government has made on its improvement. This is the waterway through the Great Lakes.

Before the railway or the steamboat came, these great inland seas were the chief means of reaching the interior of the continent. Most of the early settlers of the region bordering the lakes emigrated by this route. The application of steam to navigation and the opening of the Erie Canal greatly stimulated the flow of population to this region, and the current of east and west traffic on the lakes assumed large proportion.

It was not till after the middle of the century that the railways between the Eastern seaboard and the Central West were developed to a point where they could compete at all efficiently with the lake vessels, and then their competition was only for merchandise freight. The bulk freight which forms the largest item in tonnage statistics could be carried so much more cheaply by the lake vessels that the combined lake and rail route was still the cheaper for through traffic, notwithstanding the cost of transferring freight from the cars to the boats at Chicago and back to the cars again at Buffalo.

Freight-Transferring Machinery

As the cost of rail transport was steadily reduced, lake transportation would have fallen off as river transport did, except that the cost of transferring bulk freights on the lakes was also reduced. Nowhere else in the world has machinery effected such marvelous reductions in the cost of transferring bulk freights between the railway car and the ship as on the Great Lakes. Nowhere else in the world does there exist so huge a volume of traffic in bulk freights as flows between the ports at the head of Lake Superior and those on the lower lakes. It is this huge volume of business, indeed, which has made possible the great investment in labor-saving machinery at the terminals.

About three-fourths of the traffic on the lakes is in iron ore and coal, transported in vessels of much larger capacity than the average ocean freight steamer. These vessels take on their load of ore at the head of the lakes from huge bins which discharge their contents into the hold by gravity. Only a few hours' stay in port are necessary before the vessel is ready to start on her return voyage. At the lower lake port the ore is removed from the hold by enormous automatic grab-buckets. Coal for the return trip is loaded on the boats by machines which pick up a full-size railway car, invert it and pour its burden of 50 to 70 tons of coal into a chute that discharges into the vessel's hold.

This machinery so greatly reduces the cost and the time necessary for the transfer between the railway car and the vessel that such a double transfer becomes possible without absorbing the saving made by the lower cost of the movement by vessel compared with the movement by rail.

To a considerably less extent, the same thing is true of the handling of wheat and other grains. The cost of transfer here, however, is much greater, and the net saving by the water route plus the transfer cost is not enough to prevent a large movement of grain to the seaboard by all-rail routes.

Lake Navigation Is Unique

The lake traffic is unlike any other inland water transportation. The vessels which carry it must be able to stand waves and storms only less severe than those of the ocean. They are deep draft vessels; not as deep, indeed, as the large ocean freighters, because the principal lake harbors permit a draft of only 21 ft., but substantially like ocean steamers and entirely unlike the broad, shallow-draft vessels used on other inland waterways.

The lake ore and coal freighters carry traffic at a ton-mile cost as low as that of ocean steamers, notwithstanding the handicap they are under of a comparatively short voyage and of idleness during five months of the year when ice blocks navigation. They are able to do this because of the machinery for rapidly loading and discharging the vessels which reduces the necessary time in port to a few hours and reduces to a very low figure the terminal expenses per ton carried.

It is important to understand clearly the lake traffic conditions, because one of the stock arguments of waterway advocates has long been the great volume of traffic and low rates on the Great Lakes. It seems almost needless to say that the conditions on the lakes cannot be duplicated on any inland river. Not the depth, the volume of possible traffic, or the huge expenditures on terminal machinery exist on any other inland water route; yet time and again the Great Lakes conditions are cited by waterway enthusiasts as illustrations of what might be done were "a comprehensive system of waterways" available.

A great amount of time and money has been expended in promoting various schemes for "deep waterways," on the assumption that because water transport is cheap on the deep water of the ocean and the lakes, goods could be carried at similar low cost on artificial deep-water channels.

The fallacy of this idea is made plain by the following quotation from the report of the Commissioner of Corporations on transportation by water, issued in 1909:

> The expense of securing channels of sufficient depth in rivers and canals for ocean or the larger Great Lakes steamers would, except in a few cases, be prohibitive if at all possible. If a sufficient depth were secured, other conditions would prevent their use by oceangoing vessels to any appreciable extent. . . . The important question to be determined is the relation between the cost of improving waterways and terminals and the reduction in transportation charges made possible by such improvements. This involves careful engineering study of the cost of improvements and the cost of transportation on waterways of different kinds.

Again, the great reduction in the cost of handling freight at the lake ports is made an argument for similar facilities elsewhere. But the great investment in ore bins and automatic shovels and car dumps at the lake ports is only warranted because of the volume of bulk freight traffic handled. Such low cost of handling has never been approached in the handling of merchandise freight at terminals. At these very lake ports there are few facilities for the economical handling of merchandise freight.

These are some of the reasons why the experience on the Great Lakes is not a safe guide for dealing with other inland water routes.

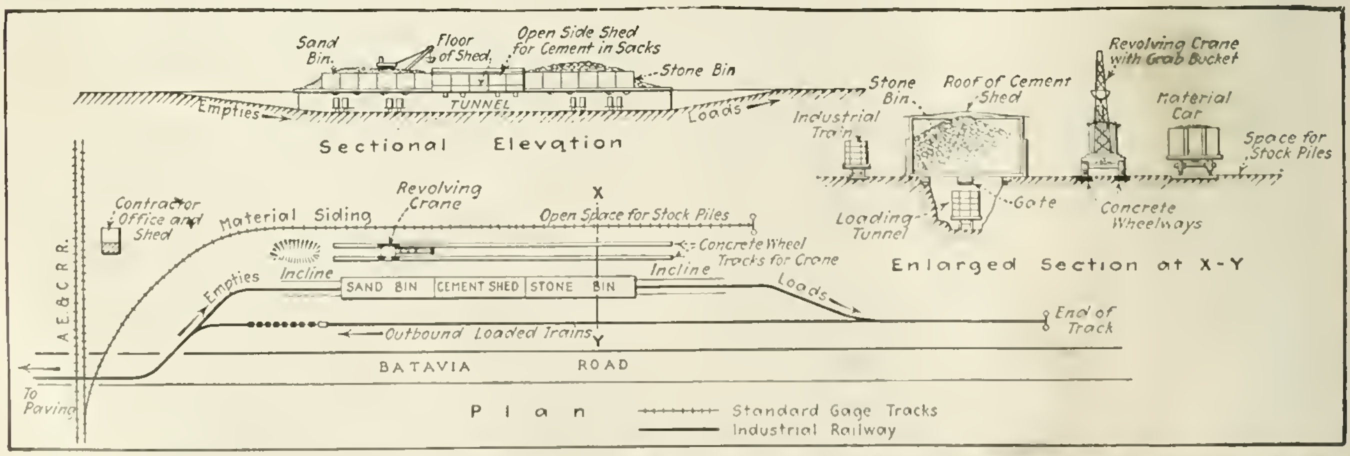
(To be continued)

Concrete Road Contract Has Plant for Rapid Progress

Batch Boxes Loaded in Tunnel Hauled on Industrial Railway With 5 Per Cent Grade to Large Mixer—Material Yard at Railway Crossing—Nine-Mile Contract

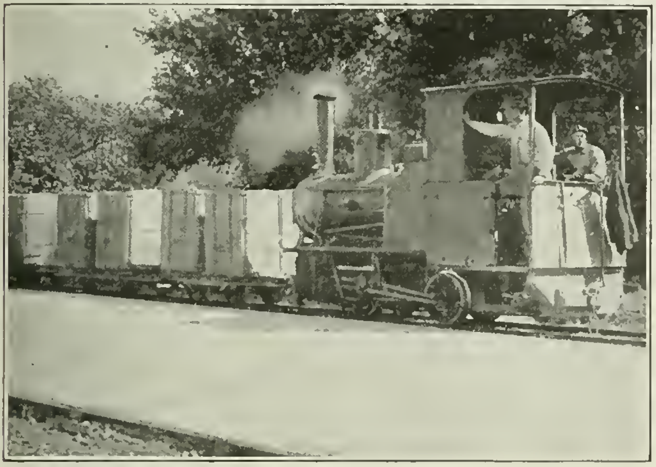
A TUNNEL system for loading batch boxes, a revolving crane traveling on concrete wheelways, a concrete mixer of high capacity, and large machinery equipment, are features of a construction outfit that has made a concreting record of a foot a minute on a nine-mile stretch of the Lincoln Highway near Wheaton, Ill. This record has been made only intermittently, owing to conditions of the material market and of transportation which make it impossible to maintain a full supply, while a 5% grade between the material yard and the mixer also causes some interruption of supply to the mixer.

The layout of the material yard is shown in the accompanying drawing. This yard is located about midway on the stretch of road, at the intersection of the Aurora, Elgin & Chicago Electric Ry., a spur from which is laid into the yard. Most of the cars are delivered in this way, and a recent railway strike lasting some weeks caused serious delay to the work. Some cars were shipped over the Chicago & Northwestern Ry. to Wheaton, the materials being then hauled to the yard in wagons, but this supply could not meet the requirements of continuous, rapid work. Slow and irregular deliveries have been a constant



LAYOUT OF MATERIAL YARD FOR NINE-MILE CONCRETE ROAD—BATCH BOXES ARE CHARGED IN TUNNEL FROM BINS LOADED BY ROAD CRANE trouble, so that progress is governed largely by conditions beyond the control of the contractor or his superintendent.

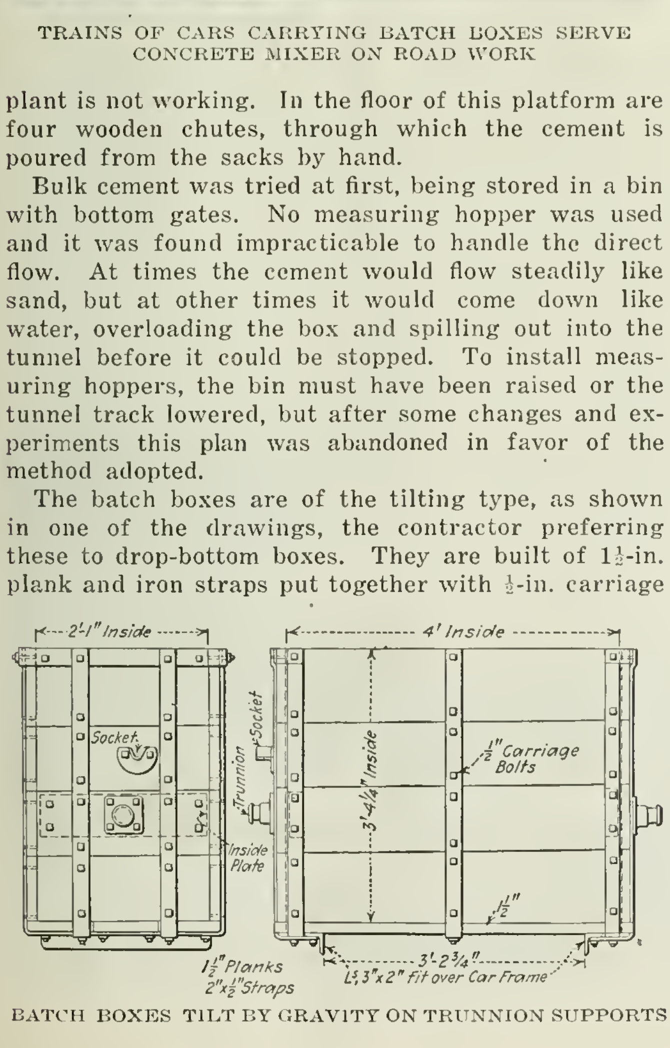
Batch boxes carried on the flat-cars of an industrial railway are employed for hauling material to the mixer. These are run under bins in the usual way, but instead of elevating the bins they are placed upon the ground over a tunnel or subway in which the track is laid. The sand and stone bins have the bottoms formed of transverse timbers (old car sills) laid close together, each bin having four loading gates. Between the two bins is a covered platform for the cement, having canvas side curtains for use when the plant is not working. In the floor of this platform are four wooden chutes, through which the cement is poured from the sacks by hand.



TRAINS OF CARS CARRYING BATCH BOXES SERVE CONCRETE MIXER ON ROAD WORK

Bulk cement was tried at first, being stored in a bin with bottom gates. No measuring hopper was used and it was found impracticable to handle the direct flow. At times the cement would flow steadily like sand, but at other times it would come down like water, overloading the box and spilling out into the tunnel before it could be stopped. To install measuring hoppers, the bin must have been raised or the tunnel track lowered, but after some changes and experiments this plan was abandoned in favor of the method adopted.

The batch boxes are of the tilting type, as shown in one of the drawings, the contractor preferring these to drop-bottom boxes. They are built of 1½-in. plank and iron straps put together with ½-in. carriage bolts. The inside dimensions are 48 x 25 in., and the boxes are 40¼ in. deep; the capacity is about 28 cu.ft. This was the first job on which these knockdown batch boxes were used. The iron parts were furnished by the Koppel Industrial Car & Equipment Co., being shipped in bundles to the job, where the contractor supplied the wood and did the assembling. There are trunnions on the ends, placed below the center of gravity so that the box will tilt readily. One end also has a catch or socket for a pin in the handling bail used at the mixer, this pin preventing the box from tilting prematurely.



BATCH BOXES TILT BY GRAVITY ON TRUNNION SUPPORTS

Two boxes are placed on each car. The empties are fed into the tunnel by gravity under control of brakes, a number of the cars having hand brakes. Two men in the tunnel place the cars under the gates of the sand bin and fill the boxes to a gage mark. They then shift the cars to the cement chutes for a four-sack charge, then on to the stone or gravel bin, and finally to the mouth of the tunnel.

A revolving crane on wide-tired road wheels and carrying a ¾-yd. grab bucket travels on a roadway between the bins and the railway siding, this roadway having concrete wheelways to give a good track for the crane in all weather. These wheelways are 6 in. thick and 24 in. wide and are 4 ft. apart, but as they were put in service too soon the concrete cracked badly and timber sills have been laid upon them. This crane unloads the cars and places the materials either in the bins or in stock piles from which they are rehandled as required. It is found that the crane can unload cement in sacks more rapidly than in bulk. A sack carload equivalent to 250 bbl. can be unloaded by two men in about four hours, as against five to six tons for an equal quantity of cement in bulk. As many as 18 sacks are handled by the bucket at one load. A slight grade on the siding enables the material cars to be moved along by means of pinch bars.

Portable track sections are used for the 24-in. industrial railway, these sections being 15 ft. long, with 20-lb. rails bolted to steel ties and having fishplate joints with four bolts. The track is laid along the side of the roadbed, outside the line of the forms, except that where the concrete road has been completed for some time the track is shifted upon it, being ballasted lightly with earth. Elsewhere the ballast is mainly stone obtained in dressing the old macadam surface.

Two grade crossings occur on this industrial railway, as shown by the plan. At the spur into the material yard the industrial line is at such a level that a 15-ft. section of track can be laid across the rails of the spur, being removed when this line is not in service or when cars are to be moved on the spur. At the crossing of the double-track main line, the industrial track is embedded in concrete, flush with the tops of the rails. This concrete is laid close against the outer side of the 20-lb. rails, while on the inside it is laid between angle guard rails which form the flangeway for the narrow-gage equipment.

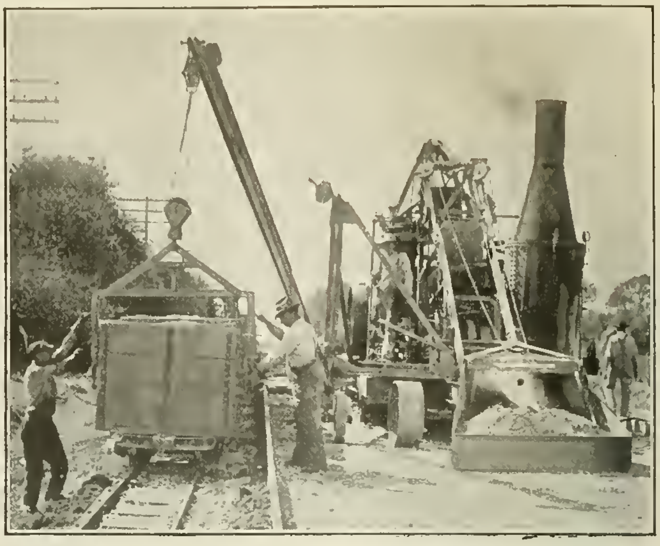
Two 7-ton locomotives and a number of cars and batch boxes constitute the transportation equipment serving the mixer. Practically all trains are pushed by the engines. The schedule provides for the leaving of trains from the material yard at 30-min. intervals. Each engine can take 12 cars (with 24 batches) on fairly level ground, but the heavy grades in this case limit the trains to eight cars, as a rule. In regular working, the first engine pulls a train from the tunnel and then pushes it over the running track as far as the foot of the 5% grade, where it puts four cars on a stub siding and so doubles the train over the grade to a turnout on the level. This is about a mile from the yard. The second engine, which has placed a train of empties on the turnout, pushes the loaded train on to the mixer, while the first engine goes into the turnout and pushes the empty train back to the yard.

At the mixer the cars are handled by three men, who place them in position for the derrick and then run them into a siding. Two of these men attach the boxes to the hoisting cable, swing them over to the charging skip, dump them and return them to the cars.

A mixer of 21-ft. capacity is used, and can deliver concrete sufficient for an advance of 1 ft. per minute for an 18-ft. slab of 8-in. concrete. It is estimated that the mixer is capable of making an advance of 500 ft. per day, but under the conditions noted the maximum so far has been about 300 ft. In two consecutive runs the 16 batches of each train were handled in 26 min. and 31 min. from the time the first batch box was lifted off the car until the last batch was dumped on the roadbed. A 1 : 2 : 3½ dry mixer of jelly-like consistency is produced which meets the slump test, using ordinarily 15 gal. of water per batch, but at times the concrete is fairly wet. Water is supplied by a pipe line laid along the road and connected to a city hydrant.

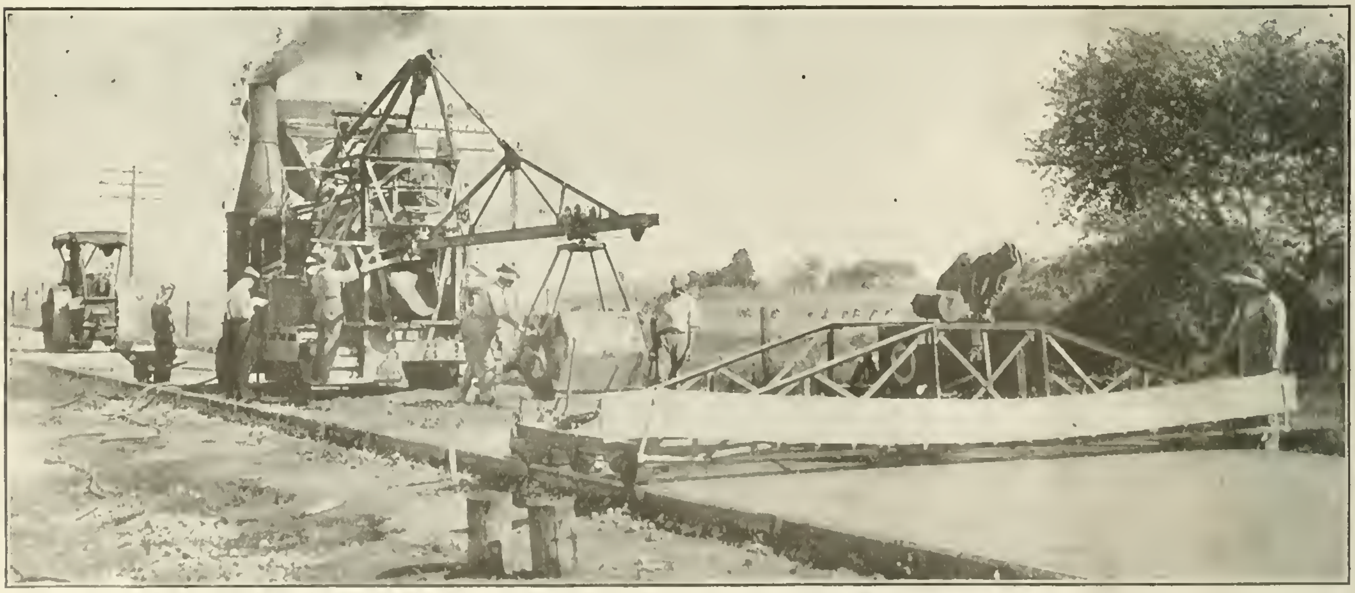
Attached to one forward corner of the mixer frame is a derrick mounted on a two-wheeled truck and with the hoisting line led to a drum on the mixer. This line carries an iron bail, the vertical sides of which end in loops to engage the trunnions of the batch boxes, while a pin thrust through a hole in one side of the bail engages the socket on the box, so that it cannot overturn while being swung. A bottom-discharge bucket places the concrete, this bucket traveling on a horizontal boom.

As soon as the concrete is spaded between the steel forms, a mechanical tamper is run over it, but usually the concrete is so deep that it piles up against the strikeboard and the men have to spade it away. The same machine gives a belt finish, but there is some hand floating of rough spots. On part of the work, the belt gave the familiar triangular marking of the surface, but when the speed of advance was reduced these markings were almost straight lines across the full width of the slab. The edges are finished in the usual way.



CONCRETE ROAD WORK WITH TILTING BATCH BOXES SWUNG FROM CAR TO CHARGING SKIP BY A PONY DERRICK

Canvas covers are laid directly upon the concrete when it has set, to protect it from the drying action of sun and wind, these covers being kept wet. Both earth cover and ponding are being used for curing, but here another trouble has been experienced in occasional interruption of the water supply, which is piped from city hydrants through metered connections. No expansion joints are used, the only joints being those at the ends of each day's work. Transverse cracks have already appeared, and will be filled with tar, this filling being a final treatment of the road. Graders will be used to remove the earth cover,



TAMPING MACHINE WITH FINISHING BELT FOLLOWS MIXER CLOSELY and graders or scrapers will build up the shoulders after the concreting has been completed.

Some heavy grading is required to lower old summits, but in the main the surface is a road of waterbound macadam laid only a few years ago. Large graders and scarifiers are used to level the surface to grade, the machines being hauled by powerful gasoline tractors. After the forms are placed the roadbed surface between them is dressed to a templet by hand and is then finished with a heavy steam roller.

The concreting gang consists of ten men with a timekeeper, distributed as follows: Three men handling batch boxes and cars; one operating hoists of derrick and charging skip; one firemen; one mixer operator; two spreading concrete; one operating tamping and belting machine; one floating rough spots and dressing the edges.

This work is being done on a joint contract by J. A. Ross and the Calumet Concrete Construction Co., Chicago, with Eben C. Chase as superintendent. It is under the direction of George N. Lamb, district engineer of the State Highway Department, Illinois Department of Public Works, with M. W. Embody as resident engineer.

Engineering Education and Life

Technical Training, if Broadened, Should Fit Men for Thousands of Executive Positions Outside of Engineering Field

By Cyrus Townsend Brady, Jr.
Resident Engineer, United States Steel Products Company, Buenos Aires, Argentina

FROM time immemorial man has built, with such degree of elaboration as he was able, objects to be used for his own comfort and convenience. At a certain stage of magnitude and complexity these objects or structures are called "engineering works," and a high degree of coördination of the various forms of man's mental and spiritual faculties then becomes necessary to insure that they may successfully fulfill the sole purpose for which they are conceived—the welfare of men.

Before that purpose is accomplished, these steps have usually to be mounted: (1) Exercises of the imagination—the mind must conceive existence of the project; (2) other minds must be interested in it—promotion; (3) a preliminary study of feasibility, cost and commensurate return, commercial or moral; (4) legal difficulties must be overcome; (5) finance; (6) final investigation, surveys, etc.; (7) the general design as influenced by degree of permanency desirable, future operation and maintenance, transportation, materials, labor, workmanship, etc.; (8) the detailed design; (9) preparation of specifications, letting of contracts, etc.; (10) construction; (11) operation; (12) management and marketing of product; (13) maintenance.

All these steps are of nearly equal importance and no one of them is of the slightest value to the world. Engineering projects are carried out for one reason and one only—that men may use them, and until they are put into successful use they are truly "useless." It is ignorance of this principle which causes woeful misconception in the minds of engineering students, to whom the whole of engineering seems comprised in step 8, although there is a vague recognition of an ancillary importance in steps 6, 7 and 10.

The schools are not entirely to be blamed for such misconception, as it is impossible to instill the absolutely essential habit of accuracy without insistence on the minutiæ of calculations. Yet the standard engineering course does tend to imbue the student with a concept of the engineer as a walking calculating machine who knows how to run surveying instruments. The real engineer is, or ought to be, much more than that. While it cannot be presumed that any one man will possess a mastery of all the steps previously mentioned he certainly must grasp the basic principles of them all. He should appreciate their relative value and recognize that his own activities are merely some of the various subordidnate functions in the one combined operation.

I believe good would come of abolishing half of the elaborate design courses given in the senior year of the ordinary engineering curriculum and substituting work in the lines of finance, promotion, law, accounting, etc. From matriculation to graduation an increasing share of the students' attention should be directed toward the use and the users of "engineering works," instead of entirely to the works themselves. Is there not a larger field for descriptive courses than is usually conceded? I remember studying in preparatory school the old-fashioned course in ancient history, chiefly concerned with names and dates of kings and battles, and the general view gained of the history of, say Greece, was a dreary confusion of the Delphic amphictyony and the hegemony of Athens. Recently I came across Breasted's "Ancient Times" and found it a splendid example of the new method of treatment in textbooks. The people of the early world are presented with their businesses, their ideas, their arts and sciences, their loves and hates, their everyday lives—in fine, as rational human beings. The history seems to live of itself, to move in one great wave of advancing and receding civilization, to compel the reader to recognize his kinship with them of old time—and it never once mentions the Delphic amphictyony. Why cannot engineering subjects be so taught as to kindle the imagination and fire the enthusiasm, not solely as elegant mathematical propositions, like the theorem of the three moments, but more as the very surest indices of our civilization?

TRAINED IN SCIENCE, BUT NOT "CULTURED"

Much has been written for the technical press concerning the "cultural value of the exact sciences" and Herbert Spencer's "unanswerable arguments" for them. Doubtless his arguments are unanswerable. I have not read them. Of course, any argument by so consummate a master of logic would be difficult of answer by us of less powerful mind—and yet the unanswerable arguments do not obviate the fact that many men trained in science are not what we call, for lack of a better word, "cultured." And especially is this true of engineering graduates. However, as engineering is not an exact, but an essentially empiric science, Mr. Spencer's cultural value may not apply to it. Young engineers are only too often afflicted—I know I was—with a half-hidden scorn of nontechnical, nonscientific ideas, occupations and persons, and with an unpleasant cocksureness as to the competency of their own unaided reason to solve correctly every problem presented to it. It is quite typical of the past century's "I am the master of my fate, the captain of my soul" philosophy.

We may grant that the scientific education need not necessarily deaden the poetic and imaginative faculties, and may lay the blame, in the majority of the cases of this common result, directly on the students themselves. It is they who demand more and more of intensive technical teaching and who are intolerant of anything else. Frequently it is only by severe pecuniary sacrifices that they are able to take their course at all, and the feeling that they cannot afford to devote any time to other topics is but natural. Nevertheless, we must deplore the fact that this attitude leads to an unfortunate repression of some of those higher emotions which are inherent in us all.

TRUE EDUCATION NEEDED BY THE ENGINEER

It is a sad commentary on our profession that it is necessary to expend so much energy in urging the "benefits of the study of English for engineers" and similar matters. It goes without saying that every educated man ought to pride himself on speaking his mother-tongue correctly, that he should enjoy the amazing wealth of the world's literature, and that he should appreciate it along with all the other arts which crown civilization; nor can anyone be considered a truly "educated" man who lacks discrimination in these things.

Good taste is largely a matter of education, and requires for its full development and expression a certain amount of leisure and especially the atmosphere of refined surroundings. The low wages of the engineer continually react to prevent his acquisition of the means for the satisfaction of those spiritual necessities, and their lack in turn prevents the full development of his character which would enable him to associate with men of affairs, and to overcome that excessive modesty which is the besetting sin of the middle-aged engineer. Finally the engineer's diffidence is a powerful factor in preventing his better compensation. Painful as it may be to admit this "vicious circle" of reasoning, reflection will suggest many examples of its continual effectiveness. It requires a true act of Christian resignation for many an engineer to continue in his profession; but who outside of it ever awards him even a meed of "psychological compensation" in honor and esteem? What engineering school ever brought this to the attention of its freshman class?

The belief that our engineering training fits us only for technical engineering work is the fundamental cause of our, too often melancholy, lot. In hard times the bachelor of arts who took a college course, or two, in music does not feel that he is thereby bound to hunt only for a job as bass-drummer—he takes the first thing that comes to his hand. Yet it seems that our only recourse is to look for vacancies for draftsmen or surveyors. Our training, provided it were only slightly broadened, should fit us for the thousands of executive positions in which a knowledge of engineering principles is of the utmost value. It should make us useful adjuncts to any kind of manufacturing; to the great field of scientific accounting; to banking institutions; to commercial business, not merely as salesmen of construction materials, but also in general office work. The young graduate must get rid of the feeling that his education has been wasted unless he commences work as drafsman, surveyor or inspector. It will astonish him to know that his ability to figure easily and accurately so simple a problem as the net cost in pesos per metric ton from a quotation in dollars per 100 lb. "less 25, 10, 5 and 5" usually impresses the American executive far more effectively than the display of the most profound knowledge of the theory of the elastic arch. The bachelor of science should feel as free as the bachelor of arts to accept any kind of job he can find. Cleaning ink wells, if necessary as a start, will not hurt him, and soon enough he will find that, beginning with his facility in arithmetic, he will be called upon for greater and broader applications of his scientific equipment and powers of thought. Adequate compensation, continuity of employment and the privilege of associating with broadminded men are not difficult of attainment in the commercial world.

In the great increase of American foreign commerce, due to the war, there have been and are now available many openings for engineers and for men of all business classes who are willing to live abroad. Many inducements have been offered to obtain the right kind of man, and therefore one phase of living abroad is seldom mentioned—that is, that the man's wife practically never shares his enthusiasm for fresh worlds to conquer, and she is almost invariably homesick. I have yet to meet one American girl who really likes living continuously outside the United States. They may be plucky enough not to complain, but the separation from their own people tells heavily on them. Whether the inducements offered ever outbalance the disadvantages is a point of perpetual dispute. Bachelors must take this to heart as well as married men, for after living abroad a short while the loneliness of the life will teach them the truth of Benedick's marvelously logical explanation that when he said he would die a bachelor he did not think he would live till he were married.

Federal Highway Council Urges Removal of Snow From Roads

With the advance of winter, the transportation bureau of the Federal Highway Council is calling the attention of state highway officials to the necessity for the removal of snow from highways as a means of preserving state roads and of maintaining all-year traffic service. Melting snow on roads, it was pointed out by officials of the transportation bureau, tends to soften the subgrade and loosen the base under the wearing surface, and this generally results in ruts which require repairing in the spring. The expense of clearing the snow from the roads, it was said, is less than the cost of repairing the roads after excessive amounts of snow have been allowed to thaw upon them. Traffic in winter over snow-covered roads results in more damage to the roads than more frequent traffic in the spring. Snow removal is also being urged by the transportation bureau as an indispensable part of all-year motor-truck transportation.

In advocating the transfer of short hauls from the railroads to motor-truck routes, the Federal Highway Council emphasizes the imperative need for having motor-truck roads free from snow in winter, pointing out that if motor-truck roads are snowbound in winter the short-haul traffic will necessarily revert to the railroads during that period of the year. State highway organizations are urged to obtain the necessary legislation to enable them to remove snow from the highways so that motor-truck transportation will not be unduly delayed during the winter months.

Mixing Concrete by Surface Areas on Actual Work

How Concrete Proportions Are Controlled and Varied on Construction Work of the Hydro-Electric Power Commission of Ontario—Concrete Specified by Strength

By Roderick B. Young
Assistant Laboratory Engineer, Hydro-Electric Power Commission of Ontario, Toronto, Ont.

DURING the past year there has been a great deal of discussion as to the proper method of proportioning concrete. The old volumetric system—the 1 : 2 : 4 concrete of the past—has been criticised and new methods advocated which proportion the cement and water according to certain characteristics in the aggregate. So far all the discussion, which was started by Prof. D. A. Abrams of the Structural Materials Laboratory of Chicago and L. N. Edwards, then bridge engineer of the city of Toronto, has been along experimental and theoretical lines. The Hydro-Electric Power Commission of Ontario, however, has for some time been studying the theories with a view to their application to practical work, and as a result has developed a method of proportioning which is being used on all of the concrete placed by the Commission, to total over half a million yards in the next three years. Some opposition has been encountered in its introduction, but this has been more because the concrete mixtures have been drier than formerly than from opposition to the system itself. It is not only more scientific in its theoretical basis, but it is providing concretes of the quality specified, and doing this more economically than the old-time methods of proportioning.

The system is based on a very simple foundation built upon a combination of the theories of Prof. Abrams and Mr. Edwards. Prof. Abrams has noted as a result of his experiments that, within the range of workable concrete mixtures, the compressive strength of a concrete bears a definite relation to the ratio between the volume of water and the volume of cement contained in the mixture from which it was made. This water-cement ratio, as it is called, is simply a measure of the quality of the cement paste used to glue the particles of aggregate together. Abrams has shown that for any given set of conditions—same aggregates, same cement, same age of concrete, etc.—concretes of equal water-cement ratio have approximately equal strength regardless of their cement content so long as their mixtures are practicable and workable.

The experimental studies in the laboratories of the Hydro-Electric Power Commission of Ontario corroborate this and have further shown that the mixing water required to obtain concrete mixtures of constant mobility varies as the surface area of the aggregates used. This being so, it follows that to maintain constant strength and therefore a fixed ratio between water and cement, it is necessary to vary the cement also as the surface area. This agrees with Mr. Edwards' surface-area theory.

In practice, concrete has to fulfil two conditions: it must have a strength at least equal to that fixed by the design of the structure of which it forms a part and it must be sufficiently plastic to handle and place properly during construction. It is evident that the first condition defines the quality of cement paste or water-cement ratio of the mix and the second the ratio of cement and water to surface area. If the ratio of cement to surface area and the water-cement ratio is known for any desired strength and plasticity the water content of the mix is likewise fixed. Therefore in proportioning, the cement-area relation need only be considered.

The foregoing forms the skeleton upon which has been built the system now in practical use by the Hydro-Electric Power Commission of Ontario. For any proposed aggregate, tabular relations are experimentally established between strength and water-cement ratio and between cement content and surface area, for one degree of plasticity known as normal or 1.00 consistency. Then if the normal consistency is satisfactory for the particular work in hand, the cement content and water-cement ratio corresponding to the quality of concrete specified are read off the tables and the mixtures proportioned accordingly. If the normal consistency is not satisfactory the consistency is varied by *changing both the cement and water proportionately*, thus maintaining the proper water-cement ratio, until the desired workability is obtained.

How Surface Areas Are Found

Surface areas are determined by the same method as employed by Mr. Edwards in his original investigation. The aggregate is separated by means of testing sieves into its component sizes and the number of particles per unit weight of each size is obtained by count. The assumption is made that these particles are spheres. It is then possible from these counts and the specific gravity of the material to calculate for each size of separation the surface area of the average particle and hence the total surface area in a pound of particles. This information is tabulated as in Table I and put into the form of charts as in Figs. 1 and 2. In calculating the surface area of a particular aggregate it is necessary to sieve it into the same sizes of separation as those used in obtaining the above data. The percentages lying between adjacent sieves are translated as so many pounds of each size material in 100 lb. of aggregate. The surface area corresponding to the weight of each size is read from the surface-area chart or calculated from the tabulated data. The sum of the different values thus obtained is the surface area per 100 lb. of aggregate. This may be changed by simple calculation to surface area per cubic foot.

It has been found experimentally that the dust—that is, anything below the No. 150 sieve—is more comparable to the cement than to the aggregate and that where it does not exceed five per cent it can be entirely ignored both in calculating surface area and in subsequent proportioning.

The actual operation of the method is as follows:

When a piece of construction involving concrete is contemplated a combined field and laboratory investigation is first made to determine the most suitable and economical sources of supply for the necessary aggregates. The extent of this investigation depends on circumstances but usually it consists of reports on deposits, samples from those deposits and field and lab-

TABLE I. SURFACE AREA PER 100 LB. FOR DIFFERENT SIZES OF SEPARATION OF SAND, GRAVEL AND CRUSHED STONE

Pass	Sieve No. Retained	Sand and Gravel Sq Ft. per 100 Lb.	Crushed Stone Sq.Ft. per 100 Lb.
2½	1½	23.6	36
1½	¾	42.7	62
¾	½	74.6	124
½	¼	130.0	163
¼	No. 6	255	...
No. 6	10	437	...
10	20	875	...
20	35	1744	...
35	65	3490	
65	150	6975	

oratory tests of these samples to determine their quality. This work is undertaken as far as possible in advance of actual construction.

Once the source has been determined from which the aggregate is to be taken, a quantity of the material, usually from 3000 to 5000 lb., is shipped to the laboratory for detailed investigations into its concrete-making properties. The first study undertaken is to determine the mechanical analysis of the combined fine and coarse aggregate which will give the most economical mixture, considering both workability and economy of materials. The most economical mixture is one containing the lowest surface area per cubic foot of material which can be successfully handled and placed. These studies are checked in the laboratory by making concrete mixtures of different gradings and observing their mobility and flowing properties.

The quantities of concrete handled in the laboratory are too small to allow of their exhibiting the same characteristics as do large masses of concrete and hence the final decision as to what is a workable mix must be made in the field. Coincident with this work the necessary grain counts and calculations are made to obtain the surface area per pound of each size of these materials and these results are charted.

The next step in the laboratory investigation is to determine for these materials the relation between cement content at normal consistency, water-cement ratio and compressive strength. Using the combination of fine and coarse aggregate giving the grading already determined as most suitable, a series of tests is made in which the cement is proportioned according to the surface area of the aggregate. Water is added to give mixtures of the same mobility. Concrete test specimens are made from these mixtures and tested in compression. These tests establish the relation between compressive strength and cement content at the normal or test consistency and between compressive strength and water-cement ratio for all consistencies, for the relation between water-cement ratio and strength is independent of the consistency and if established for one consistency holds equally for all others. Typical results of such tests are given in Table II. Figs. 3 and 4 are plotted from these data and are representative of a large number of curves obtained in similar manner.

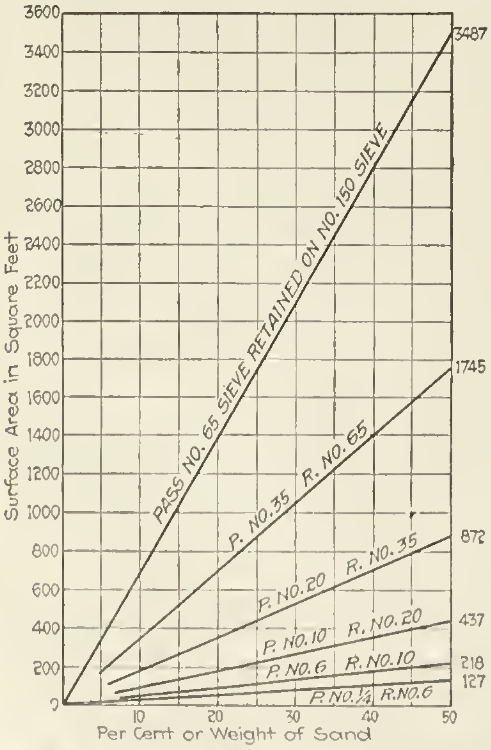


FIG. 1. RELATION BETWEEN PIT-RUN SAND GRADING AND SURFACE AREA

In proportioning cement by surface area the unit of measurement used is the lb. per 100 sq. ft. The number of different proportions in a series of tests depends upon circumstances. Where the work for which the tests are being carried out involves only a few thousand cubic yards of concrete, four sets of five specimens are made proportioned 1.5, 2.0, 2.5 and 3.0 lb. of cement per 100 sq. ft. of area and tested at 28 days. Where the yardage is considerable, six sets of ten specimens with a range of cement from 0.75 to 4.0 lb. per 100 sq. ft. of area are tested at both 28 and 90 days. Where the yardage is very large even more extensive investigations are warranted. In any case less than four sets are inadvisable and more are always to be recommended.

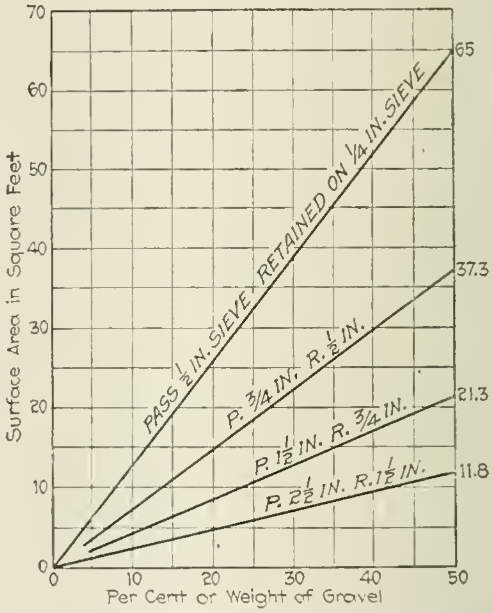


FIG. 2. RELATION BETWEEN PIT-RUN GRAVEL GRADING AND SURFACE AREA

In proportioning water the simplest way is for the operator to add the water until, in his judgment, the mixture is of the required mobility. With an experi-

TABLE II RELATION BETWEEN CEMENT CONTENT, WATER-CEMENT RATIO AND COMPRESSIVE STRENGTH

Series IB-1

Cement—Lb. per 100 sq ft.	0.75	1.5	2.0	2.5	3.0	4.0	5.0
Water-cement ratio.	1.994	1.118	0.915	0.780	0.697	0.590	0.526
Compressive strength, lb. per sq in	548	1337	1791	2290	2851	3426	4158

enced operator this method can be made to yield satisfactory results even with a wide range of cement ratios and differently graded aggregates. In the work of the Commission, however, a formula is used for determining the correct amount of water required to bring a mixture to the proper mobility. This formula is based on a theory as yet only partially established and its discussion is without the scope of this paper. It is not general in its application and its constants have to be determined for each different class of material. They are derived from the tests made when studying the relative mobility of the different combinations of aggregates. With this formula, mixtures have been obtained the mobility of which was so nearly equal that no difference could be detected by any means at our disposal.

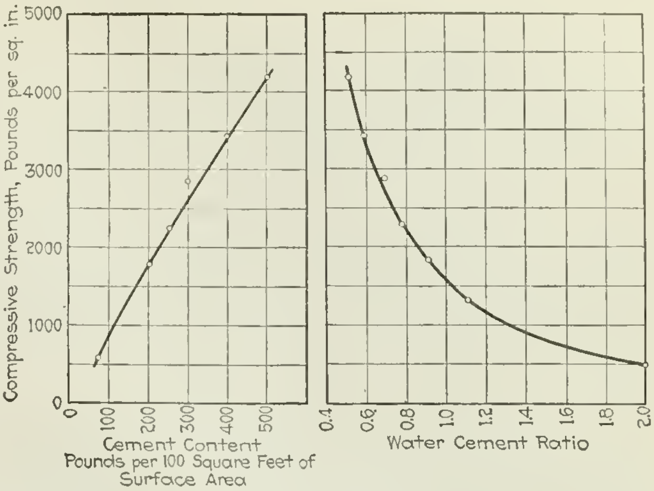
The concrete specifications of the Commission provide for four classes of concrete designated A, B, C, and D. Class A concrete is required to be of such quality as to show a minimum compressive strength of 2500 lb. per sq. in. at the age of 28 days when tested in accordance with the standard methods of testing of the Commission. Classes B, C, and D are required to have minimum compressive strengths of 2000, 1500 and 1000 lb. per sq. in. respectively under the same conditions. This form of specification has been adopted because it is considered more logical to specify the property desired of the concrete than to give a formula for the mixing of its ingredients.

In designing concrete mixtures to fulfill these specifications it is customary to allow a margin of from 300 to 500 lb. per sq. in. to take care of field conditions. A 300 lb. margin should be ample, however, if the operations of proportioning and placing are subject to careful inspection. Allowing a 300 lb. margin of safety, the ratio of cement to surface area which corresponds to each of the above classes of concrete would, in the case of the materials used in the tests cf Fig. 3, be those shown in Table III. These, however, hold only for concretes of the same plasticity as that used in the tests. As before noted, compressive strength depends on the water-cement ratio of the paste. From Fig. 3, therefore, is obtained the range of water-cement ratio which corresponds to both the minimum compressive strengths specified for each class and to that minimum compressive strength plus its margin of safety. The former is the maximum water-cement ratio allowable and must never be exceeded if concrete of the proper quality is to be obtained. The latter is the water-cement ratio normally worked for. These minimum and normal water-cement ratios are likewise given in Table III.

TABLE III. CEMENT RATIO AT NORMAL CONSISTENCY AND WATER-CEMENT RATIO CORRESPONDING TO CLASSES OF CONCRETE IN SPECIFICATIONS

Class	Minimum Specified Compressive Strength, Lbs. per Sq.In.	Cement.Lbs. per 100 Sq.Ft. Surface Area, Normal Consistency	Range of Water Cement Ratio Min.	Max.
A	2500	3.18	0.68	0.74
B	2000	2.58	0.78	0.86
C	1500	2.08	0.91	1.04
D	1000	1.48	1.14	1.37

By means of these tests and investigations all the data required for proportioning concrete mixtures are obtained. The next step is to apply these data to setting proportions in the field.



FIGS. 3 AND 4. CURVES ESTABLISHING RELATION BETWEEN COMPRESSIVE STRENGTH, WATER-CEMENT RATIO AND CEMENT CONTENT AT NORMAL CONSISTENCY

In the field the first step is to obtain the surface area per batch in order to proportion the cement. This requires, first a mechanical analysis of the different aggregates used, a determination of their weight per cubic foot and a knowledge of their moisture content and of the proportions in which the different aggregates are to be combined in the mix.

The proportions for the different aggregates are worked out using as a basis the data obtained by the laboratory in the preliminary studies of the most economical mixture. The aim is to get the leanest concrete which is workable, gives a good surface, has the requisite density and at the same time fulfills the requirements for water-cement ratio and hence for strength. Although the preliminary studies of the laboratory are of great value in obtaining this, the final proportions should actually be set in the field, for to some extent they depend on the type of structure being built, whether mass or reinforced, on the amount and spacing of the reinforcing, on whether the sections are thick or thin, on the maximum size of stone used and the quantity of this maximum size present in the coarse aggregate, on the consistency, on the quality of labor, etc.

The sieve analysis and other tests referred to are carried out by the field engineer with equipment supplied him for the purpose. The sieve analyses and weight per cubic foot determinations are performed similarly to those in the laboratory, except that the latter is made without drying the aggregate, as is laboratory practice. From the data of these tests and the surface area charts of Figs. 1 and 2 the surface area per 100 lb., or per cu. ft., and hence per batch, are determined.

The weight of cement required for normal or test consistency is found by multiplying the surface area per batch by the proper cement factor (Table III) for the class of concrete it is sought to obtain. This weight is usually given in terms of bags of cement. The quantity of gaging water is then calculated from the minimum water-cement ratio (Table III) corresponding to same class of concrete. In calculating the water, allowance must be made for moisture contained in the aggregate in its natural state. This has been found to be seldom less than two per cent, and is usually between three and four per cent. This last is a safe figure to use except directly after a rain when six or eight per cent. moisture should be allowed for. It is better practice, where circumstances permit, to determine the moisture content of the aggregate by actual test but this is not always possible. Experience has shown that if these tests are made a few times under different weather conditions, the engineer can then judge the proper moisture corrections of his aggregate so closely that only occasionally check tests become necessary. Moisture tests do not have to be made upon the coarse aggregate unless it is mixed with considerable fine aggregate, as the amount present is negligible.

Add Both Water and Cement

If the normal or test consistency is too dry for the work in hand, cement and water in the same proportion are added until the required mobility is obtained. If the consistency is wetter than necessary the cement and water are reduced in the same manner. The new consistency is defined in terms of its relation to the normal or 1.00 consistency. In further proportioning in which the same mobility is desired, the cement content for normal consistency is multiplied by this consistency factor, that is, by 1.10, 0.90, etc., as the case may be, and the water proportioned to give a cement paste of the proper water-cement ratio.

Natural aggregates are subject to changes in their grading and it is therefore necessary to test them frequently and alter the proportions of the concrete mixtures to suit. This involves a repetition of the mechanical analyses and calculations for surface area described before. It is not usually necessary to change the combination of the aggregates except where the variation in the materials is considerable, as when, in using a mixture of bank sand and crushed stone, the percentage of gravel in the former changes from, say, 25 per cent. to 40 per cent. When such occurs and changes in the proportions of the aggregate are necessary, the combinations which give the nearest approximation to the ideal grading are determined as was done in fixing the original proportions.

Finally samples of the actual concrete produced are taken periodically, made into standard test cylinders and sent into the laboratory. It is our practice to take these directly from the forms, to take two or three samples at a time and to test these at 28 days. Samples are taken whenever it is necessary to change the proportions, and oftener if deemed advisable by the engineer in charge. Careful record is kept of the portion of the structure represented by the samples, the proportions used, the approximate water-cement ratio and all other pertinent data.

Certain features peculiar to the use of this method bear emphasis. If the contractor is required by the specification to produce concrete of definite quality, then it is evident that to do so he must use concrete mixtures having water-cement ratios not greater than those corresponding to the minimum requirements of the specification. Where this is insisted upon the question of the proper consistency to use under any given set of conditions is one that can be left to the contractor for solution. The wetter mixes require more cement, the drier more labor to handle and place. The contractor will balance these two factors and may be depended upon to use the consistency that is cheapest. This will almost always be found to be the driest consistency practicable for the work in question.

The method allows the use of bank-run aggregates or mixtures of these with crushed rock or gravel. The former are seldom, if ever, economical in cement, but their use is sometimes advisable where the size of the job or other consideration makes their treatment unprofitable. The Commission has regularly used a mixture of screened crushed rock and bank sand and gravel. This practice has been found entirely satisfactory and the mixtures used have been economical in cement and no trouble has been experienced with them in getting concretes of the required strength.

Under ordinary conditions the only changes in proportions to compensate for changes in the aggregate occur in the cement. This is the easiest material to handle; it is also the most expensive. Changes in the proportions of the aggregates usually involve a disruption of the system of handling materials, give rise to confusion among the workmen and increase the difficulty of inspection. Changes in the quantity of cement involve a change in the routine of only one man, whose intelligence is usually superior to that of the laborer handling the aggregate. The proportions are more easily checked and inspection is simplified.

Proportioning by the surface area method allows the use of a smaller margin of safety than is permissible when the proportions must cover a wide variation of materials. To take advantage of the economies in cement, possible where this smaller factor of safety can be used, it is necessary to proportion the cement more closely than is customary in the field. Splitting a bag of cement in half is as fine a division as is ordinarily considered feasible in practical work. Where small mixers are used this is not enough, and some provision should be made to further subdivide a bag. An arrangement is not hard to devise and saves its cost many times over. If a quarter of a bag of cement can be saved on each one-half yard batch in a day's run of 160 cu.yd., it means a saving of 40 bags, or from $25 to $40, which will pay handsomely for the extra labor and equipment involved. On large mixers the saving does not usually warrant the extra trouble and expense. The Commission has under consideration proportioning the cement entirely by weight; eliminating, wherever possible, the bag as a unit of measurement.

Cost of Studies Moderate

The cost of the investigations is moderate. It is hardly debatable that an investigation of the concrete materials should be made prior to any work of importance. Experience has too often shown the danger of neglecting this precaution. Few will quarrel with the statement that tests should be made of the concrete produced. These precautionary measures are common to all methods, only here the laboratory investigations are carried out differently. Our experience, which covers the usual methods as well as those described here, has demonstrated that the studies and investigations for the latter cost less and yield more valuable information than those for the former. Their cost runs from $400 to $1000, depending on the size of the job, its distance from, and the experience and organization of the laboratory making the tests. These costs are moderate, considering the benefits to be gained. We are making an endeavor to develop approximate methods for use on the smallest jobs of a few hundred cubic yards or less. We believe it will soon be possible to make such studies as are necessary for these at a cost of from $50 to $75, and still retain the essential features of the method. It will usually be found that the cost of such investigations as are required will be offset by the savings effected by the more accurate proportioning possible.

METHOD GOOD IN COMPETITION

It will be of interest here to cite a recent experience of the Commission. On a job upon which the surface-area method is being regularly used a structure is also being built for an outside firm using methods specified by their engineers. On the same job another structure in which concrete of the same quality is called for is being built, using the surface-area method. Materials for the two structures are from the same sources and are mixed and placed with similar equipment. The results, shown in Table IV, from seven consecutive tests of field concrete specimens, some of which were from each of the jobs and which represent concrete placed simultaneously, illustrate the kind of results obtainable with the two methods.

TABLE IV

Cylinder No.	Class of Concrete	Proportions	Compressive Strength, Lbs. per Sq.In.	Method
90	B	1:2:4	2000	H. E. P. C.
91	B	1:2:4	2480	H. E. P. C.
92	B	1:2:4	1960	Foreign
93	B	1:2:4	1470	Foreign
94	B	1:2:4	1800	Foreign
95	B	1:2:4	1510	Foreign
96	B	1:2½:5	2090	H. E. P. C.

In the pouring represented by the last specimen the mix had been changed to a 1 : 2.5 : 5, yet the quality and mobility of the concrete were maintained at the standard desired.

The surface area method as here described has been found to take well in the field. The laboratory studies involved in its use are cheaper than those required for other methods and obtain information of wider application. The method has been found to give a means of estimating the relative economy of different aggregates because two factors, workability and strength, which were formerly variable have now been reduced to constants. The success so far obtained in its use has been so encouraging that it is now expected it will be used on all work undertaken in future by the Commission.

Work of the Los Angeles Municipal Repair Shop

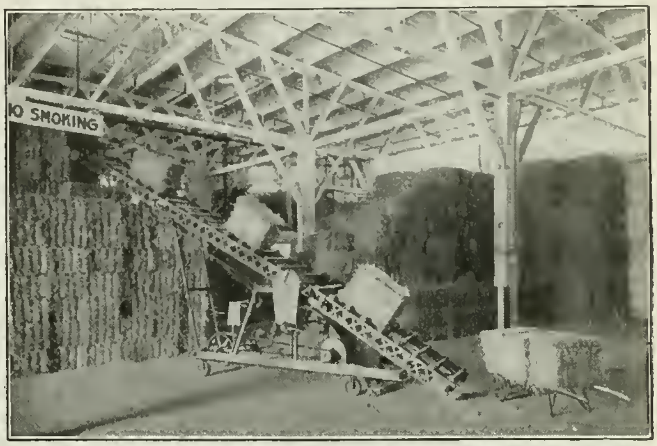
The municipal shop operated by the Board of Public Works of Los Angeles, Calif., does repair work on the following city-owned equipment, according to the annual report of the engineering department of Los Angeles for the year which ended June 30, 1919: Nineteen steam fire engines; 14 motor-driven fire engines; 40 hose, ladder and other fire-department trucks; 43 motor trucks used by other city departments; 105 passenger automobiles; 46 motorcycles; three asphalt pavement surface heaters; a municipal asphalt plant; an oil-heating plant; two rock-crushing plants; and miscellaneous equipment. During the fiscal year, 4504 jobs were completed, aggregating $120,289 in cost. A detailed card record is maintained for each automobile repaired. These repair data for the year covered are given in tabular form.

Freight-Handling Equipment at the Port of Seattle

Public Operations Tend To Encourage Experiment and Develop Labor-Saving and Freight-Handling Devices

BY GEORGE F. NICHOLSON
Chief Engineer, Port of Seattle

SEVEN years ago the Port of Seattle entered upon an extensive program of port improvements, and established the policy of sparing no reasonable expense or effort in providing the very best facilities and equipment for the class of business expected. Under this policy a great deal of experimental work with freight-handling and labor-saving devices has been carried on, and the port has been provided with more and better mechanical freight-handling equipment for handling miscellaneous cargoes, the writer believes, than any other port in the United States or Canada. This conclusion was reached after the writer visited last autumn all Atlantic, Gulf and Pacific ports.



CONVEYORS FOR STACKING BALED HAY AND SACKED WHEAT

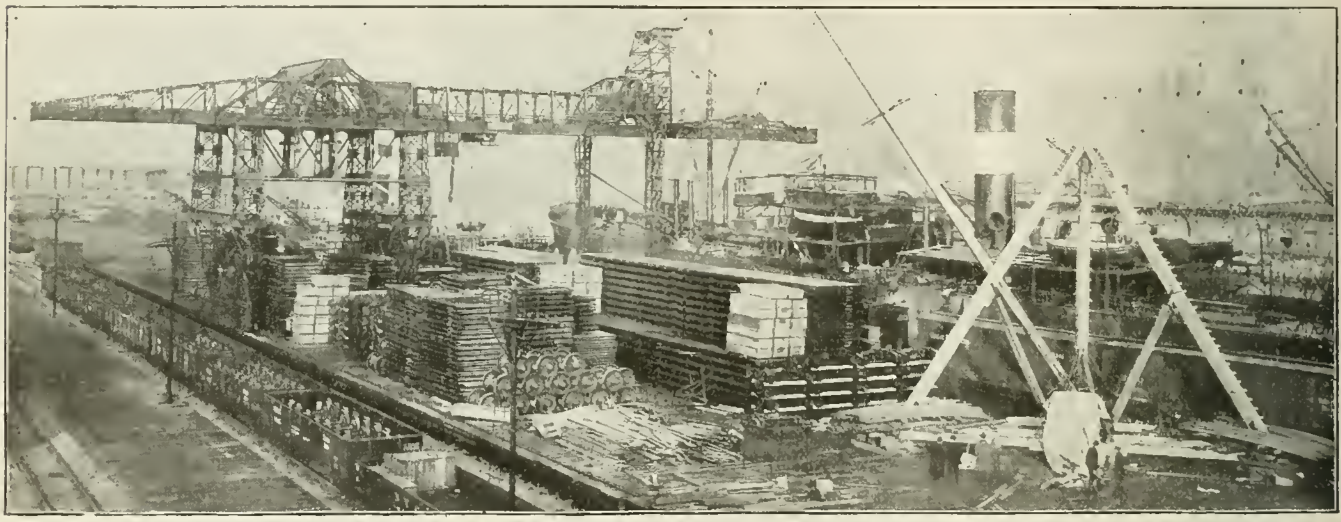
Public operation has apparent advantages over private in the matter of labor-saving and freight-handling devices. Under public control, when a labor-saving device is found to be an improvement on methods previously employed, it is provided and put in service, and employees can be encouraged to work out new plans or to suggest improvements on equipment in use. In contrast with this, the private dock owner is slow in taking up the matter of providing new mechanical equipment. As an illustration, when the Port of Seattle completed the Stacy St. pier, two electric tractors and a number of trailers were bought and assigned to it for handling cased salmon.

Up to that time no tractors had been used for work on the Seattle waterfront. However, many visitors came to study the operation of the new tractors, and within three weeks four electric tractors were on order for privately owned docks in the same port. This is not an isolated instance. It typifies the willingness to pioneer which has meant progress.

The development of the vegetable oil handling facilities at Seattle was described in *Engineering News-Record* of July 31, 1919, p. 204, and the portable stacking elevator, which solved the gunny-bale problem, in the issue of Nov. 13-20, 1919, p. 855.

Where the leasing system is in vogue, as in San Francisco, New York and other ports, the harbor board provides the facilities such as docks and warehouses and places upon the lessee the responsibility for providing handling equipment. Under such conditions, the writer believes, the lessee will be very slow to purchase handling equipment. The Port of New Orleans and the Public Dock Commission of Portland have already realized this, and their policy is now to work gradually into the publicly operated system.

The mechanical handling equipment of the Port of Seattle as now installed is valued at approximately $950,000. This, of course, does not include sprinkler and lighting systems or water-supply. The freight-handling equipment may be divided into two classes, heavy and light. The heavy equipment is used principally for handling export cargo consisting chiefly of iron and steel and lumber. This includes gantry cranes, portable locomotive cranes, stiff-leg derricks and a 100-ton shear-leg derrick. It is also contemplated to install a 100-ton revolving hammerhead crane on the new pier B, now under construction at Smith's Cove. This heavy equipment has been found indispensable in the export trade, and we do not know of any new equipment that could handle this class of commodities with more dispatch and economy.



TRANSFERRING FREIGHT AT SMITH'S COVE PIER, SEATTLE, WITH 100-TON GANTRY CRANE

The other class of equipment is the light equipment for handling the import cargo, which consists chiefly of large and small boxed, baled and sacked goods. This equipment includes inclined power conveyors, portable electric stacking elevators, stationary electric elevators, electric tractors with the necessary trailer, and other similar devices.

In case of sacked goods, such as wheat, sugar, beans, rice, and also in the case of baled hay and similar light bales, inclined power conveyors are used almost exclusively, and are operated in the same manner as the stacking elevators—that is, the inclined conveyor is placed at the pile and the truckers bring their goods to it. The crux of the problem of economically handling baled and sacked freight is in the stacking, because it is in that phase of the handling that the labor cost increases most rapidly. It is hard to improve on the two-wheel truck for short hauls, and it is because of this that many proposed mechanical handling schemes fail—that is, they attempt to carry miscellaneous freight from the ship's side to the interior of the shed. It will be found that even with the high cost of labor on the short hauls the two-wheel truck is cheaper.

A great deal has been said about the use of semi-portal cranes along the shed, and monorail or overhead rail systems for transit inside the sheds. The writer has come to the conclusion, however, that on account of the great number of markings on import cargoes coming into Seattle and the great amount of sorting necessary, the overhead monorail system would fail. For the freight that comes in sacks, boxes or bales, the use of light portable stacking equipment inside the shed served by two-wheel trucks seems to be the most economical and satisfactory method thus far developed.

A very considerable saving in the cost of handling freight is possible where transfer can be made between railroad cars and ships, or vice versa. It is essential to have two shipside tracks on the wharf for this operation. A very large proportion of the export cargo is handled in this manner in Seattle, and it will be found that the ship's tackle in this direct loading is as efficient as an expensive dock crane.

Seattle has found it desirable to use a special type of elevator for handling freight from one floor level to another. The last one installed has a capacity of nine tons and a 10 x 24-ft. platform which will accommodate six trailers at one time. In connection with the new Smith's Cove Terminal the installation of a much larger elevator, with an 11 x 40-ft. platform, is being considered. This would accommodate two tractor trains of five trailers each, or a total of 10 trailers, the tractors being used on either floor for hauling the trailers between the elevator and the pile.

Ship conveyors for the loading and unloading of ships are considered a most essential part of the port's equipment. For the accommodation of the second floor of the two-story transit sheds, an outside portable platform, moved to any location alongside the shed, is found very useful. With this equipment it is possible to deliver freight, with the aid of the ship's tackle, direct to the second-floor level with as much ease as it could be unloaded on the first-floor wharf. In some cases, at extreme low tide, it has been found impossible to reach the second-floor platforms with the short booms in use on some of the ships. This difficulty can be overcome by replacing the shorter booms with 50-ft. and 60-ft. booms, the latter being kept as spare booms on the wharf for use in such emergencies.

The installation of loading-out chutes, running from the second-floor level to the cars on depressed tracks or outside platform surface tracks and also the ship's hold on the water side, is important. With these inclined gravity chutes it is possible to load out goods from the second floor into cars very cheaply, and in actual practice it has been demonstrated that some sacked freight, for shipment by rail, can be loaded into cars more economically by use of gravity chutes from the second floor than it could have been trucked into cars from the first floor. By hinging gravity chutes to the portable second-floor platforms referred to, the result is, in effect, portable chutes which may be spotted in front of any car door in a long string of railroad cars located on the outside wharf tracks.

When heavy freights, such as iron, steel and lumber, are being handled over the open-wharf section, the locomotive cranes are kept in almost constant operation. They are used in loading and unloading ships and also in assembling cargo of this character on the wharf in order to expedite clearing a vessel after it has docked. Being portable, these cranes when not in operation can be used in connection with the piling of heavy materials on open storage property in the rear of terminals.

The 100-ton structural-steel shear-leg derrick on the Smith's Cove pier, shown in a view herewith, has been a most valuable piece of equipment for making heavy lifts and has paid for itself time and again, but it can be used to advantage only when heavy lifts are to be made direct from railroad car to ship or vice versa. If it is necessary to store a heavy piece of freight on the wharf it must be loaded on a railroad car with the derrick and then taken off again by some other means. A revolving crane would eliminate this trouble, and heavy loads could be placed for storage at any location on the wharf within the radius of the crane.

In equipping pier B, which is being built alongside the present Smith's Cove pier (pier A) the previous experience of the port will be of advantage in selecting freight-handling equipment. For example, instead of a shear-leg derrick, such as the one just mentioned, the next pier will have a 100-ton stationary revolving crane. There will also be two 10-ton portable gantry cranes on the open wharves of this new pier. These gantry cranes, although specialized equipment, resemble an elevated locomotive crane that operates back and forth the full width of the open wharf on a gantry bridge which travels the full length of the wharf.

It will be possible with this equipment to assemble cargo on the open wharf or to transfer it from the cars situated on any track on the pier. Such cargo can then be moved from the wharf to the ship's hold, or it will be possible to transfer cargo, from cars on the depressed tracks in the center of the pier, direct to the ship, without rehandling. This type of equipment will be a great improvement over the gantry crane in service on pier A, which, it must be admitted, has not proved entirely satisfactory. There are two serious drawbacks in the operation of the pier A gantry, as follows: (1) As it is of the underslung type of gantry crane, it has been difficult to handle long pieces of lumber and long bar-steel, because the bracing connecting the legs that support the gantry bridge interfere with the transfer of this freight from one side of the wharf to the other or from the wharf to the ship; (2) the shipside leg of the gantry crane is located so close to the face of the dock that it is impossible to move the gantry bridge along the wharf at certain stages of high tide, on account of the interference of the gantry bridge with the ship's rigging.

New Specifications for Public Health Officers

Abstract of Paper Read Before Sanitary Engineering Section of American Public Health Association Convention, October 27-30, 1919

By Morris Knowles and Maurice R. Scharff
Consulting Engineers, Pittsburgh

About seven years ago the authors presented before the Sanitary Engineering Section of the American Public Health Association at Washington, D. C., a paper entitled "Public Health Service—Not a Medical Monopoly." This paper showed that existing state laws required 172 out of 298 members of state boards of health, and 32 out of 46 state executive health officers or commissioners of health, to be physicians; and it upheld the thesis that the degree of Doctor of Medicine was not the only necessary, or indeed the best, qualification for a health executive, and that the cause of public health would be advanced if every state would remove the restriction limiting public health service to the medical or any other single profession, requiring instead that health officers should be trained and experienced in sanitary science and public health and qualified by administrative ability and judgment to perform the manifold functions of the modern public health officer.

Let us state at the beginning that our thesis was not in any sense that a medical man may not be well fitted to fill public health positions, or that a sanitary engineering course is better preparation for such work than a medical one. In fact, we would go so far as to say that a doctor of medicine who had had thorough training in sanitation and public health and who possessed the necessary administrative ability and judgment would probably be better qualified than a member of any other profession with similar education to fill such a position. What we did emphasize was that special training in public health, and administrative ability and experience, were all more essential than the medical degree. In other words, as Prof. C-E. A. Winslow put it in the discussion of the 1912 paper, we would consider a man with both kinds of training preferable to one with either kind alone; but would much prefer a man who knew public health and not medicine to one who knew medicine and not public health.

Since 1912 a number of developments have occurred which appear to the writers to justify the conclusion that there is a general agreement upon these "new specifications for health officers."

Crystallization of Opinion—Numerous expressions of opinion could be quoted from public health literature since 1912 to show the growth and development of the opinion that the ideal health officer must fulfill the new specifications. Dr. W S. Rankin said in his paper before the American Public Health Association convention at Jacksonville, Dec. 3, 1914:

> There is a prevalent error especially pronounced and dangerous to controvert in medical assemblages to the effect that the average physician will make, on his appointment or election to a health office, an efficient health officer. There is just as much sense in claiming that the average physician is a dermatologist, a pathologist, an ophthalmologist, a surgeon or any other specialist as that the average physician is a health officer whenever an undiscriminating public puts him where a health officer is supposed to be. The efficient health officer is a specialist—as much a specialist as is the surgeon or the ophthalmologist.

Assistant Surgeon General W. C. Rucker, of the U. S. Public Health Service, said in his paper on "A Program of Public Health for Cities" before the Cincinnati convention of the American Public Health Association, Oct. 24, 1916:

> Unfortunately, health has been considered in the past only as a medical problem, and the pendulum has been enthusiastically swung so far that health is almost regarded as an artificial state to be achieved and maintained solely through the interposition of medical safeguards. With entire consistency, health wardenship of cities has been committed solely to physicians, those who by training have been taught to consider the pathological in human life, the symptomatology and evidences of disease rather than the great basic, underlying essential factors which enter into and are the vital part in the creation, spread and perpetuation of sickness. Expert knowledge of disease is absolutely necessary for the work of health departments, but cannot be the foundation of a broad, municipal health policy.

In the discussion of this paper, Dr. J. N. Hurty said:

> We must all agree with Dr. Rucker that in the past public health has been considered as too strictly a medical matter or a physician's problem. We have all come to recognize that efficient health wardenship requires something more than a knowledge of the diagnosis and the treatment of disease.

And in the same discussion, Dr. Henry F. Vaughan said:

> Dr. Rucker has stated that health in the past has been considered solely as a medical problem, as an artificial state to be achieved and maintained solely through the interposition of medical safeguards. It seems to me that there are undoubtedly many phases of public health administration which can be handled more effectively and more efficiently by the business man or the engineer or by others.

Public Health Education—In 1913 the School of Public Health of Harvard University and the Massachusetts Institute of Technology was instituted. Other schools have followed the same line of development, and in 1918 Prof. Eugene C. Howe (*American Journal of Public Health*, Vol. VIII, p. 600) reviewed the courses of twenty institutions in the United States and Canada conducting special professional courses in public health, leading to degrees, certificates or diplomas in this subject. Among those institutions might be mentioned New York University, Johns Hopkins University, Ohio State University, Tulane University, Universities of Colorado, Pennsylvania and Wisconsin, Yale University, etc. It is no longer necessary, therefore, to employ sanitary engineers as health officers, as was formerly the case, because they were the only men available with a reasonable degree of special training in sanitary science and public health. The supply of trained health officers and their assistants, however, is still deficient, and the facilities for training of this kind should be increased and improved.

Legislation—Since 1912 at least two of the states have improved their public health legislation by incorporating into law the new specifications for health officers. Thus, Ohio, which formerly had a State Board of Health of seven, of which the Attorney General was an ex officio member, and a state health officer for whom no professional requirements were specified, passed a law in 1917 providing for a Commissioner of Health who must be "a physician skilled in sanitary science," and for a Board of Health to consist of the Commissioner and four other members, "at least two of whom must be physicians with training and experience in sanitary science." Still more recently, in 1919, New Mexico passed a law providing for a State Board of Health of three persons, not more than one of whom shall be a licensed physician; and a Commissioner, to be appointed by the State Board of Health, and who must be "a person having experience and special training in sanitary science and public health administration."

Sanitary Corps of the Army—Some of the most interesting examples of recent recognition of the necessity of securing health executives from outside the ranks of the medical profession have been afforded by our experience in the great war, and one of the best of these is found in the creation of the Sanitary Corps of the Army.

Paragraph 1386 of the Army regulations describes the duties of the Medical Department of the Army as follows:

> The Medical Department is charged with the duty of investigating the sanitary condition of the Army and making recommendations in reference thereto, of advising with reference to the location of permanent camps and posts, the adoption of systems of water supply and purification and the disposal of waste, with the duty of caring for the sick and wounded, making physical examination of officers and enlisted men, the management and control of military hospitals, the recruitment, inspection and control of the enlisted force of the medical department and of the nurse corps, and furnishing all medical and hospital supplies except for public animals.

The qualifications required of officers commissioned in this corps are that they shall be physicians, of age 21 to 32, and graduates of a reputable medical college. The requirements for a commission in the Medical Reserve Corps are that the applicant shall be a reputable physician (M.D.), in good standing in the community, in the active practice of his profession, licensed to practice medicine in the state where he resides, between 22 and 55 years of age, a citizen of the United States, and physically and professionally qualified.

When these qualifications are compared with the duties quoted above from the Army regulations, it will be easy to understand why, at the beginning of the war in 1917, it was recognized that these specifications were not complete for the officers required to fulfill these functions, and the Sanitary Corps of the Army was instituted. The qualifications required by the order creating this corps were as follows:

> The officers of said corps will be provided by assigning officers of the Medical Reserve Corps thereto, or by the appointment of citizens of the United States who are found under regulations established by the Secretary of War to possess especial skill in sanitation, in sanitary engineering, in bacteriology or other sciences related to sanitation and preventive medicine, or who possess other knowledge of special advantage to the Medical Department.

The sanitary engineers, bacteriologists and chemists of the Sanitary Corps rendered signal service in connection with the protection of the health of our armies in camps and cantonments in America, and in France. Unfortunately, however, it is understood that provision has not been made either to continue the Sanitary Corps as a permanent part of the Army, or to provide a reserve in which the experience gained by this corps during the war may be conserved for future emergencies. The discrepancy between the functions to be performed by the Medical Corps and the Medical Reserve Corps and the qualifications required of their members is as great today as it was at the beginning of the war in 1917.

U. S. Public Health Service—A somewhat analogous situation exists with respect to officers commissioned in the U. S. Public Health Service. To obtain a commission in this organization, an applicant must be a citizen of the United States, a graduate of a reputable medical college with one year's experience in a hospital or two years' private practice of medicine. These requirements have not changed substantially since the service was known as the Marine Hospital Service. Meanwhile, the Public Health Service has extended its activities to include a wide range of sanitary work; and since 1912 it has been specifically authorized by law to "study and investigate the diseases of man and the conditions influencing the propagation and spread thereof, including sanitation and sewage, and the pollution, either directly or indirectly, of the navigable streams and lakes of the United States." During the war, a vast extension of this sanitary work took place, covering the sanitation of extra-cantonment zones, extensive investigations of industrial hygiene, and assistance and advice on many sanitary engineering problems of water-supply, sewage disposal, etc. (see "War Activities of the U. S. Public Health Service," by Benjamin F. Warren, assistant surgeon general, and Charles F. Bolduan, chief of the Section of Public Health Education, U. S. Public Health Service).

It is of course true that, even prior to 1912, the Service employed certain pharmacists, technical assistants, etc., and that later, but prior to the war, the new work embarked upon required the addition of sanitary engineers, chemists, bacteriologists and other noncommissioned sanitary assistants. It remained for the war, however, to bring out the inadequacy of the commissioned personnel to assume responsible charge of the sanitary work of the Service in such an emergency. At the Conference of State and Territorial Health Officials, held April 30 to May 3, 1917, therefore, resolutions were adopted calling for the creation of a Public Health Reserve; and although the resultant legislation met with many vicissitudes in Congress, it was finally passed on October 27, 1918. This measure provided for the creation of a Public Health Reserve, and that:

"The President alone shall be authorized to appoint and commission in the said reserve such citizens as, upon examination prescribed by the President, shall be found physically, mentally and morally qualified to hold such commissions."

The personnel of this reserve was assembled long prior to the enactment of the legislation authorizing commissions, and this force, supplemented by units drawn from the Sanitary Service Bureau of the American Red Cross, permitted the Public Health Service to play an invaluable part in protecting the health, both of our troops and of the civilian population, under the unusually difficult conditions created by the war.

Fortunately, the life of the Public Health Reserve was not limited to the duration of the war, as the enabling measure provided that "said commission shall be in force for a period of five years, unless sooner terminated in the discretion of the President." And there is great promise in the existence of this trained body of sanitarians, ready for call in any national emergency—especially as the after-the-war program of the Service (see Supplement No. 35 to the "Public Health Reports") proposes to provide the members with opportunities for intensive training in public health for short periods at stated intervals, and also to order members of the reserve to active duty from time to time to participate in important field work.

PUBLIC HEALTH SERVICE COMMISSIONS

The provision of this reserve, however, does not completely meet the needs of the situation. The work of the Public Health Service in the future will be in larger and larger proportion devoted to sanitation, and in less and less measure restricted to the original work of the Marine Hospital Service for which the qualifications for permanent commissions were designed. One cannot but be impressed with this fact in examining the after-the-war program to which reference has been made above. It is proposed to carry out this program by the cooperation of Federal, state and local health authorities, and the Federal-aid extension principle is recommended. Among the subjects included in the program are industrial hygiene, rural hygiene, prevention of diseases of infancy and childhood, surveys of water-supplies, introduction and extension of methods of water purification, pasteurization of milk supplies, inspection of production and distribution of milk and milk products, extension of water carriage sewerage systems, establishment of standards of permissible pollution of streams, lakes and rivers used for water-supplies, malaria prevention, drainage, control of venereal disease and of tuberculosis, sanitary supervision of railways, enactment of proper building ordinances and sanitary supervision of housing, promulgation of standards for sewerage and sewage disposal, standard specifications for safe water and water purification, etc.

The mere enumeration of these subjects seems to the writers to suggest the desirability of revising the requirements for commissions in the Public Health Service, and of making provision in the permanent commissioned personnel for sanitarians whose training and experience qualify them especially for the work to be done.

CONCLUSION

The proposals brought forward in this paper may be summarized as follows:

1. The new specifications for health officers require that such officers be qualified, trained and experienced in sanitation, public health and public health administration.
2. A medical degree is not a satisfactory substitute for the requirements of this new specification, but it is a desirable, though not a necessary supplement thereto.
3. The cause of public health would be advanced if this new specification were incorporated in national,

state and municipal laws relating to the appointment or commissioning of health executives.

4. A permanent Sanitary Corps, and a Sanitary Reserve Corps, the members of which conformed to the specifications outlined above, would be a desirable addition to our Army.

5. The Public Health Reserve is a real accomplishment, to be developed and supported in every possible way. In addition, the commissioning of sanitarians in the Public Health Service itself would contribute to the important sanitary work which that Service will, in future, be called upon to do.

Big Spoil Dump To Cover 200 Acres Maximum Depth of 60 Feet

Excavation From Queenstown-Chippawa Canal To Total 15,000,000 Cubic Yards Being Transported to Dump in Electric Trains

PRACTICALLY all of the excavation from the Queenston-Chippawa power canal now being built by the Ontario Hydro-electric Power Commission around Niagara Falls had to be wasted. At one place a deep gorge crosses the line of the canal, and the nearby excavation to the amount of 1,500,000 yd. is being used to fill the approach gulleys, but most of the remainder of the dry cutting, to the amount of 15,000,000 cu.yd., is being spoiled in a dump which is merely a dump to get rid of the material.

There is in all about 10,000,000 cu.yd. of dry-earth excavation on the canal, but about 1,000,000 yd. of this will go to the small dumps. Rock excavation will total 4,700,000 cu.yd., in place of which 500,000 yd. will be used for concrete aggregate and 500,000 yd. for riprap, leaving 3,500,000 for the main dump and 200,000 to other dumps. As the rock will expand about 180% in breaking up and dumping, the big dump will have to take some 6,300,000 cu.yd. of broken rock.

This spoil dump is located about two miles to the northwest of about the middle of the canal, on property which was formerly a prosperous farm and orchard. About 240 acres was purchased for the purpose, but only 200 will be filled, according to present plans. The average fill over this entire area will be about 46 ft. with a maximum fill of 60 feet.

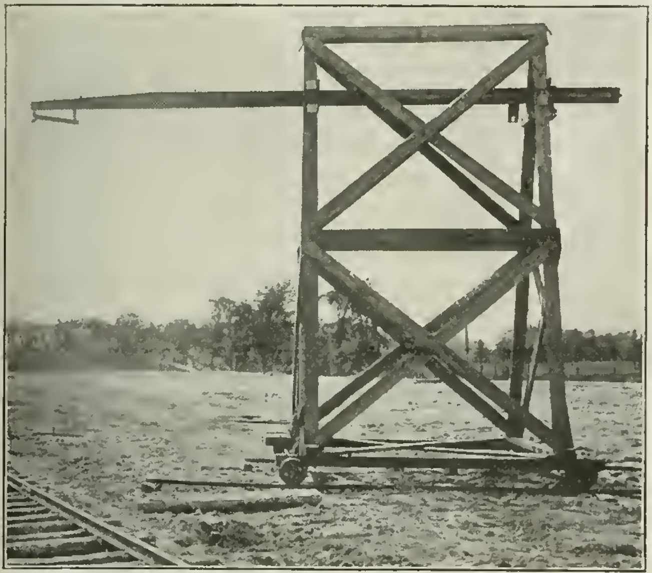
The fill is reached by a double-track spur of the construction railway which parallels the whole canal. This is a double-track standard-gage road of a type quite suitable for permanent way, although there are no present plans for its use beyond the construction period. It is laid with 70 and 85-lb. rail on well ballasted track, with a maximum grade of 1%, compensated. The whole line is electrified, the dump-car trains being drawn by 50-ton electric locomotives.

DUMPING STONE FROM THE CENTER TRESTLE

Throughout the line, the trolley wires are offset 7 ft. from the center line of the track, to permit the loading of dump cars and for clearance of the excavating

LOOKING ACROSS THE 15,000,000 YARD DUMP OF THE QUEENSTON CHIPPAWA POWER CANAL machines. On the dump, where the fill is moving from time to time, the trolleys are carried on portable frames, shown in the accompanying view. These timber frames, with outriggers for the trolley supports, are mounted on flanged wheels, which run on short sections of track, set up on the filled side of the tracks on which the dump trains run. As the fill progresses and the filling tracks need to be shifted, the portable frames are moved accordingly.

The railroad enters the trapezoidal shaped dump area at one corner, from which the dumping tracks fan out over the site. At first a trestle was built well out into the middle of the area and the fill started from it. On this trestle fixed trolley poles were used. In addition, the railway was continued around a hill at one side of the area, and end-dump spurs run out at intervals therefrom. Filling is then continued by shifting tracks from the center fill or the spurs, and side dumping. In this way a number of dumps are maintained sufficient to take care, without train interference, of all the spoil delivered.


PORTABLE TROLLEY FRAMES AT WHIRLPOOL FILL

At present about 24,000 cu.yd. of excavation—mixed rock and earth—is being delivered every 20-hour day. This requires about 300 trains per day of a maximum 10-car make-up. The cars are 16-yd. and 20-yd. capacity. The dry cut canal is nine miles long, and the two-mile dump spur takes off about six miles from the upper end of the canal.

The Queenston-Chippawa Canal is being built by force account under the direction of F. A. Gaby, chief engineer of the Hydro-electric Power Commission of Ontario, with H. G. Acres, hydraulic engineer of the commission, and J. B. Goodwin, works engineer, in immediate charge.

Cost of Holding Vessel in Port

An analysis of shipping costs made by the United States Shipping Board, says W. S. Meriwether of the board's information bureau, shows that the average daily cost of keeping a vessel in port exceeds $3000. The figures were made up for a 10,000-ton vessel. Because these port costs are so high, quicker turnaround of vessels is counted on to reduce cost of ocean carriage.

New Port and Shipping Statistics

During the war there was organized in the United States Shipping Board a branch termed the Port Facilities Commission, made up mainly of officers of the Army and Navy, with Maj. Gen. W. M. Black, U.S.A., as chairman, Rear Admiral H. H. Rousseau, U.S.N., vice-chairman, and Capt. F. T. Chambers, U.S.N., chief engineer. The commission has from time to time issued bulletins giving statistics of American ports, but it has collected a considerable quantity of such statistics which it has not been possible so far to have published. For the present, apparently, the commission will not be able to do very much active work, inasmuch as it has now been put entirely on an advisory basis, with the personnel reduced to the lowest degree. It is, however, willing and anxious to give consideration to any questions regarding port and harbor facilities in this country which may be directed to it. Meanwhile, there are available two documents, just published, which should be of considerable use to engineers interested in shipping.

These are the 68 pages of testimony in the hearings before the Committee on Merchant Marine and Fisheries in the House of Representatives, which includes the statements regarding the Shipping Board's interest in floating dry docks and a supplementary series of tabulations of shipping in the past generation. These are published as a part of the committee's inquiry into the operations of the United States Shipping Board, and should be available from the House of Representatives document room. The charts of shipping are entitled "Charts Showing Progressive Growth in Size of the World's Vessel Tonnage, 500 Tons Gross and Over, According to Classes of Tonnage, Length, Width, and Deep-Load Draft by Quinquennial Periods 1859 to 1918, and Analyses Thereof." In the charts are included graphic statistics of the coffee movement from Brazil to various parts of the states, forming one of a possible great number of similar analyses of various imports. There are also given the number and gross registered tonnage of all steamers afloat, total entrances of steamers in ports in this country, total number and length of drydock facilities, 1910-1917, gross registered tonnage of steamers afloat, distribution by states and commodities of agricultural products, distribution of textile manufactures and principal mining products. The remaining charts are devoted to the comparative technical statistics of war shipments. The second publication which is available is entitled "English Port Facilities," by Capt. F. T. Chambers. Captain Chambers made a trip to England during the war, and had exceptional facilities to gather full statistics of all of the English ports and harbors. The result is included in a large volume with a greater number of charts, maps, and details of English shipping terminal facilities than have ever been published before in this country.

Construction Corporation's Share of 1917 Taxes

Corporations engaged in construction paid income and excess-profit taxes during 1917 to the extent of $29,725,220, according to a compilation recently received by the Bureau of Internal Revenue. The total tax collected from corporations was $2,142,445,769. Of that amount 62% was paid by manufacturing corporations. Merchandising corporations paid 15% of the total. Mining corporations paid $212,365,019.

Light Bituminous Treatment for Macadam Roads

Thin Coatings Better Than Building Up Heavy Mats —Heavy Traffic Maintained at Moderate Costs—Tar Used

By Chester A. Hogentogler
Borough Engineer, Columbia, Penn.

SUCCESS in the preservation of macadam roads at Columbia, Penn., has been attained by the application of light treatments of bituminous material of high penetration. Low-penetration materials having a tendency to build up heavy mats have not been found satisfactory or economical. The manner in which these treated roads have supported heavy traffic, with moderate maintenance charges, is of interest as showing how many of the advantages offered by higher-priced pavements can be obtained without excessive cost. Tar has been found to be preferable as a binding material in this type of work.

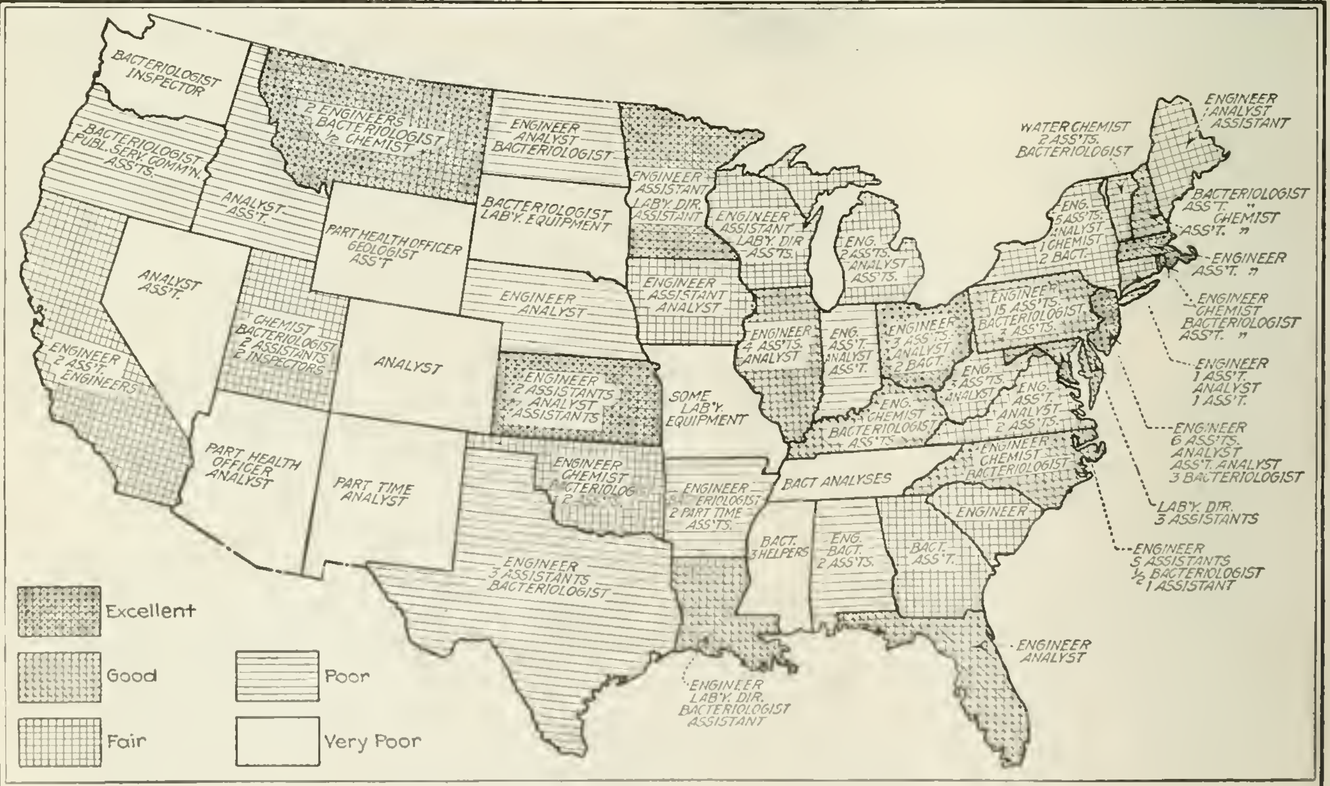
Generally speaking, treatments of this character are divided into three classes, according to the materials used and the results obtained. In the first class are those in which heavy bituminous materials with little or no penetrative power are applied, usually hot, and covered with a layer of stone chips or slag. The result is a heavy mat or carpet with little or no bond to the original macadam surface. In the second class are those treatments in which lightly penetrative materials are applied first to the original surface, and afterward the heavier binders are applied and covered with chips or slag. The result in this case is also a heavy mat or carpet with variable adhesion to the original surface. The third class consists of those treatments in which bituminous materials of highly penetrative, binding and hardening power are applied, usually cold, and covered with a light layer of sand to prevent tracking.

Since the first step in the disintegration of a macadam surface carrying motor traffic is the loosening up and forcing out of the small stone and dust binder from between the larger stones of the wearing course, the simplest method of preserving such surfaces is the application of a bituminous material of such quality that the bond will be tough enough to resist the stresses that are applied. If this dust and chip bond can be preserved, the large stones cannot become loose or pushed out, rutting will not occur, and the wear on the surface

---

Rating of State Sanitary Control of Public Water-Supplies

BASED on a rating scale having 1000 as perfect, the state control of water-supplies in the United States ranges from 970 points for Ohio and Michigan to 10 for Missouri. The rating, which was made by the United States Public Health Service, in 1919, shows seven states as "excellent," eight as "good," 15 as "fair," eight as "poor" and nine as "very poor." Details are given by the accompanying map. About two-thirds of the departments have one or more engineers, Pennsylvania leading with a chief engineer and 15 assistant engineers.


BACTERIOLOGIST INSPECTOR
BACTERIOLOGIST PUBL. SERV. COMM'N. ASS'TS.
ANALYST ASS'T.
2 ENGINEERS BACTERIOLOGIST ½ CHEMIST
ENGINEER ANALYST BACTERIOLOGIST
ENGINEER ASSISTANT LAB'Y. DIR. ASSISTANT
BACTERIOLOGIST LAB'Y. EQUIPMENT
PART HEALTH OFFICER GEOLOGIST ASS'T
ANALYST ASS'T.
ENGINEER ASSISTANT LAB'Y. DIR ASS'TS.
ENG. 2 ASS'TS. ANALYST ASS'TS.
WATER CHEMIST 2 ASS'TS. BACTERIOLOGIST
ENGINEER 1 ANALYST ASSISTANT
ENG. 5 ASS'TS. ANALYST 1 CHEMIST 2 BACT.
BACTERIOLOGIST ASS'T. " CHEMIST ASS'T. "
ENGINEER ASS'T. "
ENGINEER CHEMIST BACTERIOLOGIST ASS'T. "
ENGINEER 1 ASS'T. ANALYST 1 ASS'T.
ENGINEER 6 ASS'TS. ANALYST ASS'T. ANALYST 3 BACTERIOLOGIST
LAB'Y. DIR. 3 ASSISTANTS
ENGINEER 5 ASSISTANTS ½ BACTERIOLOGIST 1 ASSISTANT
ENGINEER ANALYST
ENGINEER ASSISTANT ANALYST
ENGINEER ANALYST
CHEMIST BACTERIOLOGIST 2 ASSISTANTS 2 INSPECTORS
ANALYST
ENGINEER 2 ASSISTANTS ANALYST ASSISTANTS
SOME LAB'Y. EQUIPMENT
ENGINEER 4 ASS'TS. ANALYST
ENG. ASS'T. ANALYST ASS'T.
ENGINEER 3 ASS'TS. ANALYST 2 BACT.
ENGINEER 15 ASS'TS. BACTERIOLOGIST 3 ASS'TS.
ENG. 3 ASS'TS. ANALYST
ENG. ASS'T. ANALYST 2 ASS'TS.
ENG. CHEMIST BACTERIOLOGIST ASS'TS.
ENGINEER CHEMIST BACTERIOLOGIST
ENGINEER 2 ASS'T. ENGINEERS
PART HEALTH OFFICER ANALYST
PART TIME ANALYST
ENGINEER CHEMIST BACTERIOLOG 2 ASS'TS.
ENGINEER BACTERIOLOGIST 2 PART TIME ASS'TS.
BACT ANALYSES
ENGINEER
BACT. 3 HELPERS
ENG. BACT. 2 ASS'TS.
BACT. ASS'T.
ENGINEER 3 ASSISTANTS BACTERIOLOGIST
ENGINEER LAB'Y. DIR. BACTERIOLOGIST ASSISTANT
ENGINEER ANALYST
Excellent
Good
Poor
Fair
Very Poor

Figures indicate Rating based on a possible 1000

Excellent		Good		Fair				Poor		Very Poor			
OHIO	970	FLA.	865	VT.	785	MICH.	710	ALA.	555	WASH.	340	WY.	110
MASS.	970	N.C.	855	CALIF.	775	OKLA.	710	ORE.	540	COLO.	260	MO.	10
KAN.	930	PENN.	850	TEX.	770	GA.	695	IND.	535	S.D.	250		
N.J.	910	LA.	850	CONN.	760	IOWA	660	NEB.	480	ARIZ.	225		
R.I.	910	KY.	835	VA.	760	UTAH	640	N.D.	470	N.M.	200		
MINN.	910	N.H.	835	MAINE	730	WIS.	630	ARK.	470	TENN.	160		
MONT	900	MD.	830	W. VA.	730	S.C.	615	NEV.	430	MISS.	130		
		ILL.	830	N.Y.	710			IDAHO	420				

will be dependent on the hardness and toughness of the larger stones of which it is composed.

The first two classes of treatment, involving the formation of a heavy mat on the original macadam, tend toward giving an uneven surface by cracking off in spots, where hard binders are used, and pushing and bunching when successive treatments of soft binders are used. Furthermore, the cost of these heavy carpets often warrants the construction of a more expensive type of surface. From observations covering a period of eight years, the writer has found the third class of treatment overcomes the objections referred to above.

Aside from the materials used in treatment, the character of the surface to be treated must be considered, if the best results are to be obtained. This is especially so with respect to the size of stones composing the wearing course. Upon this size depends, primarily, the success or failure of the treatment, and consequently the cost of maintenance. The Borough of Columbia has found that on streets where wearing courses are composed of stones less than 1½ in. in size, economy warrants resurfacing them with ballast ranging from 1½ to 3 in., in preference to attempting to maintain the original surface with bituminous materials. The extra expense of maintaining a surface composed of small stones is occasioned by the fact that after the first application a continuous breaking out in spots to a depth of about 1 in. results. These spots soon wear down to the foundation, or, if they are packed with bituminous material and stone, the cost becomes greater annually than the interest on the investment required to place a new surface composed of the larger sizes.

Consideration of the accompanying surface diagram shows the reason for this breaking out. The untreated macadam is a one-layer surface, and breaking begins at the top, where the stress is greatest. An application of bituminous binder transforms this single layer into a surface composed of two distinct layers, the top one of which is composed of bitumen, screenings and stone, and the bottom one of screenings and stone. Providing that a proper penetrating and binding material has been used, the weakest part of the original surface is along the plane between the two layers (shown on the diagram by the heavy black, irregular line), and it is along this plane that the top breaks away from the bottom, causing pot-holes, as noted above. The position of this plane of breaking is entirely dependent upon the size of the stones used. In order to overcome this, it is necessary that this plane of division be so far beneath the surface that the distributed unit stress at that point will be less than the adhesion.

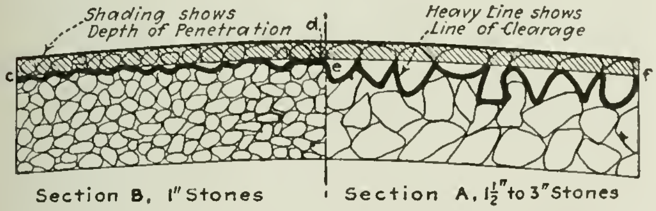

Shading shows Depth of Penetration
Heavy Line shows Line of Clearage
c
d
e
f
Section B, 1" Stones
Section A, 1½" to 3" Stones

DIAGRAM SHOWS PLANE OF CLEAVAGE ON LARGE AND SMALL STONE SURFACINGS

Section B of the diagram shows that, in a surface composed of 1-in. stone and ¾-in. penetration the position of this breaking plane is about 1 in. from the top, designated by the line b-d. With 1½- to 3-in. stone and ¾-in. penetration this plane e-f is shown by Section A of the diagram to vary from 1¼ to 3 in. from the top. It follows that for the same thrust at the surface the unit stresses resulting along the division plane in the small stone surface will be about four times as great as that along the plane in the large stone surface. More than that, the mechanical bond furnished by the larger stones offers greater resistance to separation than that of the smaller, making the ratio far more than 4 to 1.

It has been observed that traction-engine lugs will break out sections of treated small stone surfaces, while no impression is made on those composed of large stones. While small stone surfaces one year after treatment are often full of holes, adjoining surfaces composed of larger stone, from the same quarry, treated at the same time with similar material, are practically free from such breaks.

EXPERIENCE IN COLUMBIA

Since 1912 the Borough of Columbia has used various light and heavy materials, in an effort to preserve its macadam surfaces, and has finally adopted Tarvia-B covered with a light layer of sand, as the treatment which accomplishes most economically and effectively the required result. Before treatment the streets are resurfaced with large stone macadam. After proper seasoning the bituminous material is applied simply as a preservative or paint coat, with no attempt to build up a mat. The excess material is taken up by a thin layer of river sand.

As examples of the success of this treatment in Columbia, two streets carrying heavy traffic may be cited. The application of Tarvia-B was first made on N. 3rd St. in 1912, following the construction of a 6-in. macadam surface. The binder was applied by hand and spread by brooms at the rate of ¼ gal. per square yard, and covered with river sand at the rate of 1 cu.yd. to every 330 sq.yd. of surface. In 1913 a second application was made at the rate of 0.13 gal. per square yard, at a cost of 2c. Since then it has received annual treatments of tar and sand at the rate of 0.11 to 0.19 gal. at a total average cost of 2.3c. per square yard. This street carries the maximum traffic of a manufacturing town of 14,000 population, and, since 1914, has taken the foreign traffic of the Lincoln Highway. The street is very satisfactory as to appearance, cleanliness and suitableness for traffic.

Locust St., between 4th and 5th Sts., was resurfaced with limestone and coated with Tarvia-B and sand in 1913. The first application was made by hand at the rate of 0.27 gal. per square yard, and broomed. The cost was 4.6c. It was covered with river sand at the rate of 1 yd. to every 290 square yards. Since then it has received annual treatments at the rate of 0.15 gal., at a cost of 2.3c. per square yard. It carries the same traffic as N. 3rd Street.

From observation of coatings on over 600,000 sq.yd. of surface since 1912, on which the bituminous material was applied by means of gravity and pressure, horse-drawn and motor distributors, and by hand with brooms, the writer has found that the most satisfactory and protective coating can be had by sweeping the surface clean, applying the tar from a pouring pot, spreading it by push brooms and covering it with a light layer of sand, and immediately opening the street to traffic. By brooming the tar, a minimum quantity can be used, thus allowing none to stand in puddles or to run down at the sides. This saving in cost of tar more than offsets the additional cost of spreading by hand over that of spreading by machine.

Sand forms a harder and tougher resisting surface than chips or slag and presents a cleaner, smoother and more finished appearance to the eye. Notwithstanding this smooth appearance, there have been less complaints of horses slipping on sanded surfaces than on those covered with slag. Upon close examination of this matter, it is found that the sanded surfaces are actually rougher after several months' wear. While other coverings often wear so smooth as to offer almost no foothold for horses, the grains of sand, instead of wearing smooth, break out, leaving a sandpaper finish which effectually prevents slipping and skidding.

At present there are about 130,000 sq.yd. of street surface in the borough under the preferred treatment and giving satisfactory results. The average first coatings were made at the rate of 0.25 gal. per square yard and subsequent coats at from 0.1 to 0.2 gal., with a cubic yard of sand covering 300 sq.yd. The total average cost of first treatment from 1912 to 1918 was 4c. per square yard and subsequent treatments cost 2c. per square yard. In some residential sections with light traffic, treatments were required only every other year.

The average cost for the first 100,000 sq.yd. treated in 1919 was 3c. per square yard. The average rate of application was 0.15 gal., with a minimum of slightly less than 0.1 gal. per square yard. On an average, a cubic yard of sand covered 290 sq.yd. of surface. The total average cost of hauling and labor was 0.6c. per square yard. The maximum yardage was covered June 20, when a foreman, two carts and 11 men coated 9775 sq.yd. in an eight-hour working day. The average yardage of the work done by this force was 6000 in nine hours.

The New City Zoning Ordinance of Alameda, California

Eight Classes of Use Districts and Four Building-Height Districts Established—Area of Lot That May Be Built On

By Charles E. Hewes
City Manager, Alameda, Calif.

WHAT is probably the most completely worked out and comprehensive zoning ordinance so far adopted in the United States was passed by the Alameda City Council on the recommendation of the city manager and advisory city-planning commission in February, 1919, and became effective Mar. 18 following. Alameda is a city of approximately 35,000 population, with about four miles of industrial waterfront along the north side of the city, and recreation beaches on the south side, the main portion of the city being a large island, with a second undeveloped area of several square miles of farm land, on Bay Farm Island, to the southeast.

After a year's careful study of the tendencies of growth in all parts of the city and the preparation of use-of-property and heights-of buildings maps, the city's consultant in city planning, Charles H. Cheney, held neighborhood meetings and conferences in each of the principal districts and centers of the city, some 40 conferences in all being held. At these an agreement was reached concerning what protections would be for the best interest of property owners in each neighborhood. These neighborhood recommendations were then combined in a general zoning plan, and the whole was put up for public hearing as the preliminary form for the zoning regulations. So well had the preliminary work of education been done, however, that there were practically no objections to the ordinance, either at this time or at the later hearings after it was introduced before the city council.

This ordinance is expected to stabilize property values, prevent the deterioration of residence districts, help business by requiring its concentration at established centers, and by making a definite place for industries to locate and invest where they will be safe from protest and interference.

It combines the best features, we believe, of the Los Angeles, St. Louis and New York ordinances, and is similar to the zone ordinance adopted in Palo Alto (population 6000) in August, 1918.

The ordinance applies to new building permits only, the existing buildings and uses of property not being affected even though they fall outside the respective zones proper for them.

Eight Classes of Use Districts Found Necessary

Eight classes of use districts were found to be the minimum that would cover our requirements. The use districts are as follows:

Class I. Residence: Single-family dwellings only, covering about two-thirds of the residence area of the city.

Class II. Residence: Any kind of dwellings, flats, dormitories, apartments, hotels without stores, covering about one-third of the city, in which flats and apartments were already established.

Class III. Business and Public Use: Ordinary, better-class retail business, trades and professions, including residences of Classes I and II. Two principal business centers of the city, on Webster St. and on Park St., each some six blocks long, were put into this class, with smaller business districts of Class V adjoining them.

Class IV. Business and Public Use: Schools, public and semi-public buildings, churches, playgrounds, greenhouses and nurseries and parks, including single-family dwellings. All such institutions throughout the city have been placed in small districts of this class, comprising only the size of the lot which they occupy.

Class V. Business and Public Use: All types of business use of Class III, plus public garages, dyeing and cleaning establishments, wholesale business, warehouses, oil-supply stations and any kind of residence, or public use of Classes I, II, III or IV. They comprise small areas adjoining the Class III centers, and also many little local business centers at cross-roads in residence sections.

Class VI. Business and Public Use: Hospitals, sanitariums, charitable institutions, and any kind of residence of Classes I and II. As yet no districcts of this class have been assigned. Any new institutions of this type will have to have a public hearing and secure approval of the neighborhood and amendment of the zoning plan, before locating.

Class VII. Industrial Districts: All ordinary, nonobnoxious factories, warehouses and industries, including any business use, but excluding new residences of any kind. A district one-half mile wide and about three miles long, along the north water front, was established, where the present industries of the city are located. Another industrial district was also provided on Bay Farm Island, for future development. The first district is identical with the previous industrial zone established by ordinance a year ago, which, also, prohibited new dwellings from going in and blocking the growth of industry.

Class VIII. Industrial Districts: Obnoxious and odor-producing factories, including any business use, but excluding new residences of any kind. One district of this kind only has been established now, on the leeward side of the city, where the prevailing winds will blow smoke and odors away from the city, across the bay marshes to the eastward.

Building Height Limits Established

The ordinance also provides for protecting the various parts of the city from the dangers of overcrowding, and depreciation of property values by the building of scattered over-high structures. The following height districts were arranged to protect the existing tendencies of growth:

Two-and-a-half Story: All new buildings to be limited to a maximum of two stories and finished attic, not to exceed a total height of 35 ft. to the finished line of the attic floor above the curb. As over 99% of all the buildings in the city were found to be of this type, or less in height, the city felt justified in maintaining this tendency. This height limit was placed upon the residence districts of Class I.

Three-story: Not to exceed 40 ft. to the finished ceiling line of the third floor; established to cover the Webster St. business district and residence districts of Class II, for hotels, flats and dwellings.

Four-story: Not to exceed 50 ft. to the finished ceiling line of the fourth floor. One district of this kind only was established for the present, to cover the principal business center of Classes III and V on Park Street.

Eight-story: Not to exceed 90 ft. to the finished ceiling of the eighth story, to cover the industrial districts of Classes VII and VIII. This is perhaps a higher limit than necessary. The city's consultant advised four stories, which had been the limit in our previous industrial-zone ordinance of 1918. Some of the planning commission could not understand the need for any limits, and the compromise height of eight stories resulted.

Towers, tanks, chimneys, spires, etc., covering an area of not more than 15% of the lot, are allowed to be built up to any height.

Area Requirements to Insure Light and Air

In industrial districts of Classes VII and VIII, where windows are needed for light and air, a rear yard of not less than 5 ft. must be provided.

In business and public use districts of Classes III, IV, V and VI all yards and courts, where required for light and air, must not be less in dimensions than required for tenement houses in the California state tenement-house act.

In residence-use districts of Classes I and II, yards and courts, whatever use the building is put to, must be the same as for a dwelling in the California state dwelling-house act.

A special class of "home area districts" includes all Class I single-family dwelling districts and provides that no lot may hereafter be covered more than 50%. It was found that practically all of the dwellings in these districts now cover only from 20 to 25% of the lot, and that therefore this restriction would not be stringent.

I am glad to say that there are no "unrestricted districts" or unfinished portions of the zoning work in this ordinance, such as have been left in some of the larger cities, although it is less difficult in a small city to leave them in. Alameda, therefore, has complete control of the situation. However, new locations for industries, particularly adjoining railroad lines, and other changes of districts, can be brought about, by amending the ordinance and holding public hearings, in a very short time. No such changes, however, can hereafter be made without the neighborhood being consulted, and none of the city is left in uncertainty. We expect the ordinance to be amended from time to time to keep pace with the needs of the city as it grows.

With the zoning of the city settled upon, Alameda has a definite and exact basis on which to lay out a major-traffic street plan. The minor residential streets are determined by the zones established, and can be paved with less costly and narrower pavements, with more parking accordingly. The fire limits of the city can be rearranged to cover only business districts, and so no hardship is worked on other areas. A sound basis for mortgage loans has been established, thus stabilizing land values, and making a surer and easier foundation for city assessments and taxation.

Zoning is a fundamental move in city progress from which we anticipate a great deal of good in Alameda.

Holding Power of Track Spikes

Laboratory Tests Indicate Advantages of a Spike With Grooved Shank as Compared With Ordinary Drive Spike

COMPARATIVE tests on the holding power of two types of drive spikes indicate an advantage for a new design. The tests were made for the American Spike Co., New York, using a specially grooved shank over the ordinary cut spike. The former is the Sessler grip spike, shown in the accompanying drawing, while the latter is the standard chisel-point spike of the Pennsylvania Railroad, Western Lines, having a $\frac{5}{8}$-in. shank 6 in. long under the head. Screw spikes of the type used on the Delaware, Lackawanna & Western R. R. were included for comparison with the drive spikes. These tests were made at Columbia University, New York, by Albin H. Beyer and William J. Krefeld, in the laboratory of the department of civil engineering.

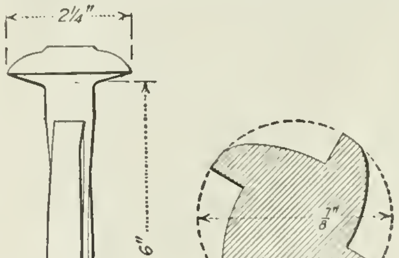


FIG. 1. NEW TRACK SPIKE HAS SPIRALLY GROOVED SHANK

Tests were made with both types of drive spikes driven into solid wood and into bored holes, the diameter of the hole being $\frac{1}{2}$ in. for the cut spike and $\frac{7}{16}$ in. for the grip spike. Taking an average of all the kinds of wood used and taking the hold of a cut spike driven without a hole as 100%, the other spikes show as follows: Cut spikes in hole, 93.1%; grip spike, 129.3% without hole and 122.7% with hole; screw spike with hole, 172.9%. While these results indicate a slightly greater initial resistance for the spikes driven into solid wood, the report states that this increase is of doubtful value, as the efficiency and ultimate life of a spike in a tie depends more upon the range of elastic behavior of the wood fibers, provided the friction between these fibers and the spike is sufficient.

A cut spike driven into solid wood crushes and bunches the fibres over a wide area, due largely to the splitting and wedging action being confined to one plane. With the grip spike this splitting action appears to be less, due partly to the shape of the point, but more particularly to the fact that the spike rotates in driving, its average turn being 63° in solid wood and 68° when driven in a bored hole. The report states that in this way the splitting and wedging action is not confined to one plane, and that the cumulative effect upon the wood fibers appears to be reduced. With both spikes the crushing and bunching of the wood fibers can be reduced materially by boring the hole. It may be noted that the effect on the wood depends largely upon the efficiency of the operator, and that the report explains that these test spikes were driven by a man inexperienced in track work.

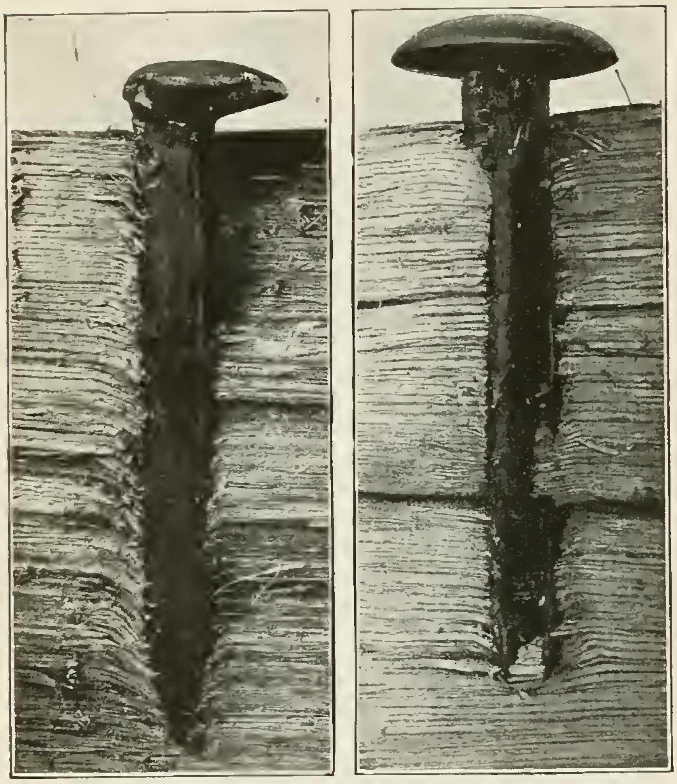


FIG. 2. DRIVE SECTIONS PRODUCED BY CUT AND GROOVED SHANK SPIKES USED IN TESTS

AVERAGE HOLDING POWER OF SPIKES

	Cut Spike No Hole lb.	Cut Spike ½-in. Hole lb.	Grip Spike No Hole lb.	Grip Spike $\frac{7}{16}$-in.-Hole lb.	Screw Spike in Hole lb.
Chestnut	5150	4908	7,180	6,100	9,100
Creosoted yellow pine	4850	4700	6,890	6,500	8,500
White oak	9020	8700	10,300	11,800	15,560
Douglas fir	4280	3539	5,200	4,600	7,170

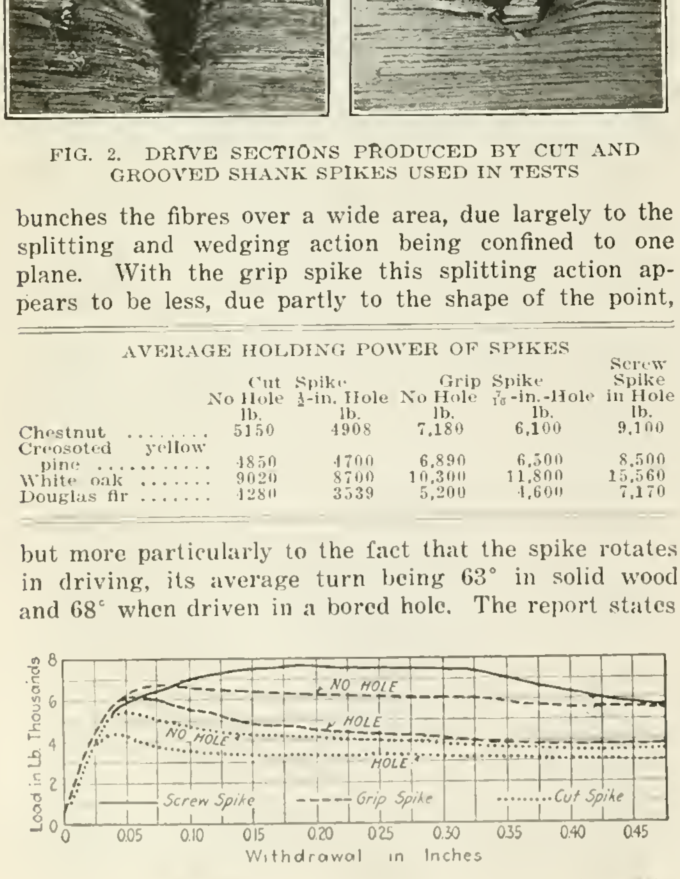


FIG. 3. COMPARISON OF PULLING TESTS OF SPIKES

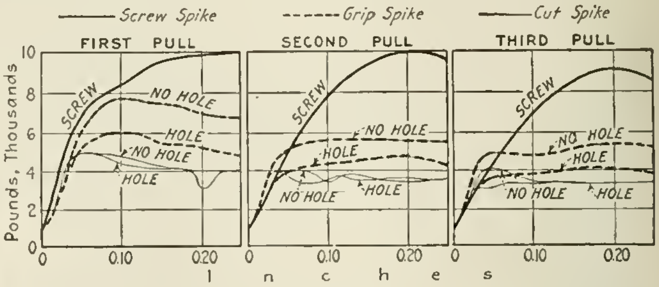


FIG. 4. COMPARISON OF RESULTS WITH REDRIVEN SPIKES

Sections of the drives of the ordinary cut spike and the grooved shank spike are shown in Fig. 2. The average results of the pulling tests are shown in the accompanying table and in Fig. 3, the latter representing tests in an untreated chestnut tie. Another set of tests was made with the spike pulled ¼ in. and then twice redriven and pulled, thus simulating the condition for track spikes which work loose and are driven home. Fig. 4 shows the results in chestnut ties. For the relative average elastic limits of withdrawal, taking the cut spike at 100% the report gives that of the grip spike as 129% and that of the screw spike as 90% for the elastic limit in bearing and 178% for the final yield point.

Unemployment Reduced by Societies' Bureau

The Engineering Societies' Employment Bureau's latest report to Engineering Council summarizes the bureau's activities for the ten months, Dec. 1, 1918-Sept. 30, 1919, in the following figures:

Men interviewed	17,083
Men registered	4,858
Men reported placed	1,000
Positions registered	1,988
Letters of application forwarded..	15,691
Pieces of mail sent out..........	19,974
Expenditures	$10,601.19

It is explained in the report that the figure for the number of men reported placed is only approximate and, indeed, much lower than it should be, due to the great difficulty of getting reports from men after they have obtained positions. The majority of the positions registered, the report says, pay from $125 to $175 per month. Col. Arthur Woods, late head of the War Department Employment Service, commended the work of the bureau and said that the cost of operation as shown in the bureau's report was very low, considering the highly technical and professional character of the men served. Although the joint bureau arrangement in New York City has been discontinued, the Engineering Societies' Bureau continues to coöperate with the War Department, the Red Cross, the Young Men's Christian Association, the War Camp Community Service, the Knights of Columbus, and all college organizations, which refer to the bureau all engineering applicants and positions listed. The number of engineers visiting the bureau's office in New York ranges from 60 to 70 per day.

Industrial Conference Makes Preliminary Statement

Body Appointed by President Invites Criticism of Plan for Federal Tribunal To Adjust Industrial Disputes

A "PRELIMINARY statement," submitted with the object of promoting discussion and constructive criticism, was made public Dec. 29 by the President's Industrial Conference. That portion of the report dealing with the mechanism for carrying out its tentative plan for the adjustment of industrial differences by a National Tribunal and Regional Boards is reproduced, in full, below:

INTRODUCTION

The Industrial Conference, convened by the President in Washington on Dec. 1, issues this statement in the desire that certain tentative proposals be given considerate study by interested individuals and organizations throughout the country. It will reassemble on Jan. 12 and will then carefully consider any constructive criticisms that may be submitted to it.

The Conference does not deem it useful at this time to enter upon a discussion of the causes of industrial unrest. It believes rather that its most important immediate contribution is the suggestion of practical measures which will serve to avert or postpone industrial conflicts.

In confining itself to the proposal of machinery for the adjustment of disputes, the Conference is far from wishing to exaggerate the importance of the mechanical as contrasted with the human elements in the situation. Our modern industrial organization, if it is not to become a failure, must yield to the individual a larger satisfaction with life. It makes possible a greater production of material things. But we have grown so accustomed to its complexity that we are in danger of forgetting that men are today more dependent on each other than ever before. The spirit of human fellowship and responsibility was easier to maintain when two or three worked side by side and saw the completed product pass from their hands. Yet their co-operation was actually less necessary because each by himself was more nearly capable, if circumstances demanded, to meet the needs of life. Today we have a complex interweaving of vital interests. But we have as yet failed to adjust our human relations to the facts of our economic interdependence. The process toward adjustment, though slow, nevertheless goes on. The right relationship between employer and employee in large industries can only be promoted by the deliberate organization of that relationship. Not only must the theory that labor is a commodity be abandoned, but the concept of leadership must be substituted for that of mastership. New machinery of democratic representation may be erected to suit the conditions of present industry and restore a measure of personal contact and a sense of responsibility between employer and employee. The more recent development of such machinery with the co-operation of organized labor is a hopeful sign. But back of any machinery must be the power which moves it. Human fellowship in industry may be either an empty phrase or a living fact. There is no magic formula. It can be a fact only if there is continuous and sincere effort for mutual understanding and an unfailing recognition that there is a community of interest between employer and employee.

Pending the growth of better relationships between employers and employees, the practical approach to the problem is to devise a method of preventing or retarding conflicts by providing machinery for the adjustment of differences. The Conference believes that it is possible to set up a more effective series of tribunals for the adjustment of disputes than at present exists. To be successful, such tribunals must be so organized as to operate promptly as well as impartially. There must be full participation by employers and employees. There must be representation of the public to safeguard the public interest. The machinery should not be used to promote unfairly the interests of organizations, either of labor or of capital. The plain fact is that the public has long been uneasy about the power of great employers; it is becoming uneasy about the power of great labor organizations. The community must be assured against domination by either. On the other hand, there must be equal assurance that such machinery will not be used to discriminate against organizations of employees or of employers. Both should be protected. The right of association on either side should not be affected or denied as a result of the erection of such tribunals.

The plan which follows does not propose to do away with the ultimate right to strike, to discharge, or to maintain the closed or the open shop. It is designed to bring about a frank meeting of the interested parties and cool and calm consideration of the questions involved, in association with other persons familiar with the industry.

The plan is national in scope and operation, yet it is decentralized. It is different from anything in operation elsewhere. It is based upon American experience and is designed to meet American conditions. To facilitate discussion, the plan submitted, while entirely tentative, is expressed in positive form and definite as to most details.

PLAN FOR BOARDS OF INQUIRY AND ADJUSTMENT

There shall be established a National Industrial Tribunal, and Regional Boards of Inquiry and Adjustment.

The National Industrial Tribunal shall have its headquarters in Washington, and shall be composed of nine members chosen by the President and confirmed by the Senate. Three shall represent the employers of the country and shall be appointed upon nomination of the Secretary of Commerce. Three shall represent employees and shall be appointed upon nomination of the Secretary of Labor. Three shall be representatives of the public interest. Not more than five of the members shall be of the same political party.

The tribunal shall be, in general, a board of appeal. Its determinations on disputes coming to it upon an appeal shall be by unanimous vote. In case it is unable to reach a determination, it shall make and publish majority and minority reports which shall be matters of public record.

The United States shall be divided into a specified number of industrial regions. The Conference suggests twelve regions with boundaries similar to those established under the Federal Reserve system, with such modifications as the industrial situation may make desirable.

In each region the President shall appoint a regional chairman. He shall be a representative of the public interest, shall be appointed for a term of three years and be eligible for reappointment.

Whenever in any industrial region, because of the multiplicity of disputes, prompt action by the Regional Board is impossible, or where the situation makes it desirable, the National Industrial Tribunal may in its discretion choose one or more vice-chairmen and provide for the establishment under their chairmanship of additional regional boards.

Panels of employers and employees for each region shall be prepared by the Secretary of Commerce and the Secretary of Labor, respectively, after conference with the employers and employees, respectively, of the regions. The panels shall be approved by the President.

At least twenty days before their submission to the President provisional lists for the panels in each region shall be published in such region.

The panels of employers shall be classified by industries, the panels of employees shall be classified by industries and subclassified by crafts. The names of employers and employees selected shall be at first entered on their respective panels in an order determined by lot.

The selection from the panels for service upon the Regional Boards shall be made in rotation by the regional chairman; after service the name of the one so chosen shall be transferred to the foot of his panel.

Whenever a dispute arises in a plant or group of plants which is not settled by agreement of the parties or by existing machinery, the chairman may on his motion, unless disapproved by the National Industrial Tribunal, and shall at the request of the Secretary of Commerce or the Secretary of Labor or the National Industrial Tribunal, request each side concerned in such dispute to submit it for adjustment to a Regional Board of Adjustment. To this end each side shall, if willing to make such submission, select within not less than two nor more than seven days, at the discretion of the chairman, a representative. Such selection shall be made in accordance with the rules and regulations to be laid down by the National Industrial Tribunal for the purpose of insuring free and prompt choice of the representatives.

When both sides shall have selected their representatives the chairman shall take from the top of the panels for the industry concerned, or in the case of employees for the craft or crafts concerned, names of employers and employees, respectively. The representatives selected by the two sides shall be entitled to a specified number of peremptory challenges of the names so taken from their respective panels. When two unchallenged names of employers and employees shall have been selected in this manner, they, with the chairman and the representatives selected by the two sides, shall constitute a Regional Board of Adjustment.

The appointment of representatives of both sides shall constitute an agreement to submit the issue for adjustment and further shall constitute an agreement by both sides that they will continue, or re-establish and continue, the status that existed at the time the dispute arose.

The Board of Adjustment so constituted shall proceed at once to hear the two sides for the purpose of reaching a determination. Such determination must be by unanimous vote. In case the board is unable to reach a determination the question shall, unless referred to an umpire, as later provided, pass upon appeal to the National Industrial Tribunal.

REGIONAL BOARDS OF INQUIRY

If either side to the dispute fails, within the period fixed by the chairman, to select its representative, the chairman shall proceed to organize a Regional Board of Inquiry. Such Regional Board of Inquiry shall consist of the regional chairman, two employers selected in the manner specified from the employers' panel, and two employees selected in like manner from the employees' panel and of the representative of either side that may have selected a representative and agreed to submit the dispute to the board. If neither side shall select a representative within the time fixed by the chairman, the Board of Inquiry shall consist of the chairman and the four panel members only.

Upon the selection of a representative, within the specified time, the side concerned shall be entitled to the specified number of peremptory challenges as provided above. The representative shall have the right to sit on the Board of Inquiry and to take full part as a member of such board in the proceedings thereof.

The Board of Inquiry as so constituted shall proceed to investigate the dispute and make and publish a report, or majority and minority reports, of the conclusions reached, within five days after the close of its hearings and within not more than thirty days from the date of issue of the original request by the chairman to the two sides to the dispute, unless extended on unanimous request of the board or the National Industrial Tribunal. It shall transmit copies of this report or reports to the Secretaries of Commerce and of Labor, respectively, and to the National Industrial Tribunal, where they shall be matters of public record.

At any time during the progress of the inquiry at which both sides shall have selected representatives and agreed to submit the dispute for adjustment, the Board of Inquiry shall become a Board of Adjustment by the admission to membership on the board of such representatives. The side or sides which appoint representatives after the date fixed in the original request of the chairman shall, because of its delay, suffer a reduction in the number of peremptory challenges to which it otherwise would have been entitled.

The Board of Adjustment so constituted shall proceed to the determination of the dispute as though it had been organized within the period originally fixed by the chairman.

When a Regional Board of Adjustment is unable to reach a unanimous determination it may by unanimous vote select an umpire and refer the dispute to him with the provision that his determination shall be final and shall have the same force and effect as a unanimous determination of such Regional Board.

Whenever the questions involved in a dispute extend beyond the boundaries of a single region, the regions to which the dispute extends shall, for the purpose of such dispute, be combined by order of the National Industrial Tribunal, which shall designate the chairman of one of the regions concerned to act as chairman in connection with the dispute in question.

Two employer members and two employee members shall be chosen from the combined panels of the regions involved in the dispute under rules and regulations to be established by the National Industrial Tribunal. The members representing the two sides to the dispute shall be chosen as in the case of a dispute in a single region.

A Regional Board of Inquiry or of Adjustment constituted for a dispute extending beyond the boundaries of a single region shall have the same rights and powers conferred upon a Regional Board for a single region.

Effect of Decision—Whenever an agreement is reached by the parties to a dispute or a determination is announced by a Regional Board of Adjustment, or by an Umpire, or by the National Industrial Tribunal, the agreement or determination shall have the full force and effect of a trade agreement which the parties to the dispute are bound to carry out.

GENERAL PROVISIONS

In connection with their task of inquiry and adjustment, the Regional Boards and the National Tribunal shall have the right to subpœna witnesses, to examine them under oath, to require the production of books and papers pertinent to the inquiry, and their assistance in all proper ways to enable the boards to ascertain the facts in reference to the causes of the dispute and the basis of a fair adjustment. Provision shall be made by law for the protection of witnesses and to prevent the misuse of any information so obtained.

All members of the tribunal and boards heretofore described, including the chairman and vice-chairman, shall be entitled to vote.

The President shall have the power of removal of the members of the tribunal and boards.

In the presentation of evidence to the tribunal and the boards each side shall have the right to present its position through representatives of its own choosing.

The Secretary of Commerce and the Secretary of Labor in making nominations for the National Industrial Tribunal and in preparing and revising the regional panels of employers and employees shall from time to time develop suitable systems to insure their selections being truly representative.

The National Industrial Tribunal, the Regional Boards of Adjustment, and the Umpires shall in each of their determinations specify the minimum period during which such determinations shall be effective and binding. In case of emergency a Regional Adjustment Board or the National Industrial Tribunal may, after hearing both sides, alter its determination by abridging or extending the period specified.

The terms of office of members of the National Industrial Tribunal shall be six years; at the outset three members, including one from each group, shall be appointed for a term of two years, three members for a term of four years, and three members for a term of six years; thereafter three members, one from each group, shall retire at the end of each period of two years. Members shall be eligible for reappointment.

The regional panels provided for hereinbefore shall be revised annually by the Secretaries of Commerce and of

Labor, respectively, in conference with the employers and employees, respectively, of each region.

Relation of Boards to Existing Machinery for Conciliation and Adjustment — The establishment of the National Industrial Tribunal and the Regional Boards described shall not affect existing machinery of conciliation, adjustment, and arbitration established under the Federal Government, under the governments of the several states and territories or subdivisions thereof, or under mutual agreements of employers and employees.

Any industrial agreement made between employers and employees may, by consent of the parties, be filed with the National Industrial Tribunal. Such filing shall constitute agreement by the parties that in the event of a dispute they will maintain the status existing at the time the dispute originated until a final determination, and that any dispute not adjusted by means of the machinery provided through the agreement shall pass on appeal to the National Industrial Tribunal for determination, as in the case of a dispute submitted on appeal from a Regional Board.

The report concludes with the declaration of policy that the interruption of essential public utilities is intolerable and that Government employees concerned with the administration of justice or the public safety should not be permitted to join organizations which authorize the use of the strike.

The report is signed by the following:

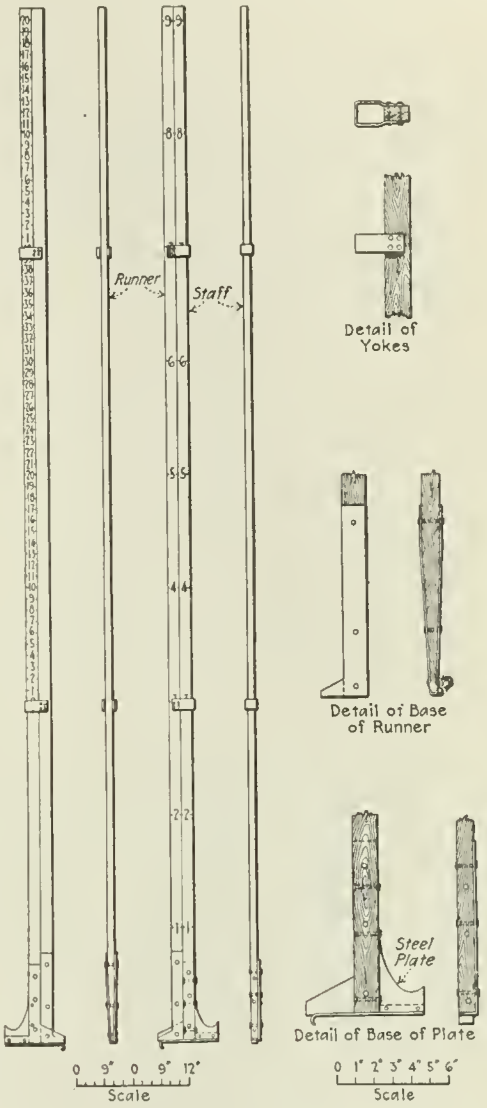
W. B. Wilson,
Chairman
Herbert Hoover.
Vice Chairman
Martin H. Glynn
Thomas W. Gregory
Richard Hooker
Stanley King
Samuel W. McCall
Henry M. Robinson
Julius Rosenwald
Oscar S. Straus
Henry C. Stuart
F. W. Taussig
William O. Thompson
Henry J. Waters
George W. Wickersham
Owen D. Young

Unique Rod Made for Canal Soundings and Stream Measurements

A COMBINATION rod, the chief function of which is to take soundings in irrigation canals, but which serves various other uses—including cutting grass and moss, or removing trash from headings, bridge piers, or trash racks—is a development of years of use of many devices by W. G. Steward, formerly assistant engineer, United States Reclamation Service, Boise, Idaho, and now associate professor of agricultural engineering at the University of Idaho, Moscow. Mr. Steward recommends that the pole, if made of properly selected straight-grained wood, can be used for vaulting narrow canals, for laying off sections at a station, and it may assist materially in taking stream measurements. Where close work is not required, the pole has been used as an ordinary level rod.

This rod is 9 ft. in length and fitted with a runner much the same as an ordinary level rod. The bottom of the staff is fitted with a foot plate. one end of which is curved under to hold the rod to the bottom of the section, where the water is deep and swift and the bottom is of hard, smooth material like concrete or rock. The base of the staff is made large, so as to get more nearly the mean elevation of the surface of the stream bed. Attached to the foot plate and the bottom of the staff is a curved, sharpened, steel plate which serves as a grass hook. The rod is graduated in feet on one side, the obverse being graduated in tenths, the zero being set at the top of the two yokes attached to the runner and set at elevations on the rod of 3 and 7 ft., respectively.

When soundings are taken, the bottom of the staff is allowed to rest on the bottom of the section of the canal, the runner being elevated until the base skims the water. Soundings 2 ft. or less may be read from the top of either the upper or lower yoke. When the water is over 4 ft. deep any reading on the upper 2 ft. is added to 4 ft. Where the water is over 6 ft. deep, 3 ft. is added to the figures opposite the base of the runner.



DETAILS OF COMBINATION SOUNDING ROD

Buildings Prohibited Where No Sewers

Under an ordinance passed by the City Council of Cleveland, Ohio, in November, 1919, the issuance of building permits on streets not provided with sewers is prohibited. There is a proviso, however, that the Commissioner of Buildings may issue such permits on receipt of a written statement from the Commissioner of Engineering that there is a prospect of sewerage facilities being provided within a reasonable time. A further proviso is to the effect that in exceptional cases a permit may be issued on the strength of a written communication from the Commissioner of Health that such action "will not jeopardize the public health and welfare because of the use to which the building may be put."

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Believes A. A. E. Will Not Support National Societies' Plan for Comprehensive Body

Sir—The report of the Joint Conference Committee of the four national societies, outlining a plan for a comprehensive national body, given on p. 835, and your editorial upon the same subject found on p. 846 of the Nov. 13-Nov. 20 issue, appear to me to overlook some very fundamental considerations.

For many years progressive members of the national technical societies preached the necessity for attending to the economic side of engineering. They tried many times to get something started similar to the plan now advocated. The younger engineers looked on with hope and expectation. The aristocracy of long years of experience set up by these societies through their high requirements for membership was accepted as a good thing. The thought was that these men of great technical ability would naturally be altruistic and of broad enough vision to see the human problems of the whole engineering field and provide the machinery for coping with them.

But those societies failed to see their opportunity and that duty. I believe I voice the attitude of thousands of the younger engineers when I say that we are skeptical of the old technical societies ever being capable of representing the whole profession of engineering, and particularly the interests of the younger engineers and those in less responsible positions. The plan of the Joint Conference Committee should have been laid out ten years ago and put into effect not later than five years ago. *Their opportunity is gone.*

Some of those who saw the need gave up the idea of ever getting the technical societies to take up that work. They gathered, and formed the American Association of Engineers as late as 1915, and this association is all that the Joint Conference Committee would have the technical societies become.

The early days of the new organization were overcast with doubt and misunderstanding. The ever-increasing stress of the economic conditions blinded many to the right course, and there were concerted attempts to make the association "a collective bargaining union." However strong those attempts may have been, A. A. E. never succumbed to them. Under the guidance of a few big engineers the structure and principles of this association became well founded upon professional ethics.

To-day A. A. E. is larger than any of the technical societies, and its rate of growth promises that within two years it will be larger than the combined national technical societies. It is thoroughly democratic, and its requirements for membership have been made low enough to make every professional technical man eligible and yet high enough to keep the nonprofessional man out.

Its structure is well designed to handle economic problems. The country is divided geographically into clubs, chapters and districts having complete jurisdiction over local problems not affecting more than their own localities, but which must coördinate their work through the national headquarters in all matters common to more than one locality. Then, in order to obtain direct information and concerted action in any branch of engineering, sections and departments are being formed. For instance, the New York Central Railroad Section is a part of the Railroad Department. Sections and departments do not have the same functions as clubs, chapters and districts, but are standing committees of a special character.

This association has done more for engineers in its four years of existence than all the technical societies together. A large percentage of its members are also members of national technical societies.

Now, does the Joint Conference Committee of the founder societies expect the members of A. A. E. to be so ungrateful for what the association has done as to throw it over and join a new combination? Would that be ethical? Certainly not. Does it not seem that the ethical procedure for the technical societies now is to acknowledge their shortcomings and give the new association their hearty support? The least they should do is not to compete with it.

The technical societies have done well for what they were designed, but how can anyone expect this proposed new combination to be a success built upon societies whose character and constitutions are not fitted for dealing with economic problems? The Bible teaches and history has proved, "No man putteth new wine into old bottles; else the new wine doth burst the bottles, and the wine is spilled, and the bottles will be marred; but new wine must be put into new bottles." (Mark II, 22).

J. HOLLOWAY MORGAN,
Certified Member, American Association of Engineers,
Washington, D. C.

Mr. Baker's Railroad Plan

Sir—Mr. Baker's article on the "Railway Problem" has exceptional merit. Very little that is written on this subject is worth reading, as apologists seem to control all publicity. The road to railroad bankruptcy has been a long one, and many gay buccaneers have ridden the investing public "high, wide and weary."

There is one book that will inform all engineers how the patient became so sick—Henry Clews' "Twenty-eight Years in Wall Street." This book contains the early history of the case. Read all about the mess that Uncle Dan'l and all of his kind have left us to clean up.

Section V of Mr. Baker's article, "The Danger of Too Centralized Control," deals with one of the most important phases of this question, and the present centralization is causing the collapse of the Interstate Commerce Commission by sheer weight of unfinished and "unknowable" business.

The railroad systems of this country are divided into two general areas—lines east and lines west of Chicago, St. Louis and the Mississippi River. If the Interstate Commerce Commission were divided into two equal parts we might hope for some constructive suggestions from it—the eastern division of the I. C. C., to have its headquarters in Washington, and the western division to have its headquarters in Kansas City.

The railroads to all practical intents and purposes are all one. The day of railroad competition is over; "the eggs are scrambled," and there is no use in trying to bring back past conditions. The solution offered of public corporations is apparently workable, but of course every plan will be discredited as much as possible which does not originate with Uncle Dan'l's nephews. Mr. Baker's article suffers by condensation. The topic and point of view are worthy of much ampler treatment and elucidation. If it were in book form, the number of public corporations could be outlined, etc.

Some years ago a prominent London financier said that he had no interest in an American railroad until it had been in bankruptcy. Let us all hope that *finis* has been written to the long, sordid chapter from the Erie to the New Haven. FRANK W. HARRIS.

Olympia, Wash.

The Comedy of an Error

Sir—The publishers and authors of "Field Engineering" thank Antonio Llano for discovering and reporting to them some months previously the error noted in *Engineering News-Record* of Nov. 27-Dec. 4, 1919, p. 962. While the error is strictly typographical, it is none the less serious. The mistake occurred in the first edition of "Searles" and extends through the fifty-ninth thousand. In September, 1919, the writer directed that the plate be corrected.

It is the writer's desire to have all text and reference books with which he has to deal free from error. Errors in his own works are immediately corrected in the plates, whenever found or reported, and when he finds errors in other books he notifies the authors or publishers. HOWARD CHAPIN IVES.

Worcester, Mass., Polytechnic Institute.

[It is an interesting subject for speculation whether the error in question would not have been corrected many years ago if all engineers followed the commendable example of Mr. Llano and of Professor Ives in notifying authors and publishers of errors in— The editor had got this far in his comment when the following letter came to his desk:—EDITOR.]

Sir—Twenty-five or twenty-six years ago the misprint in Searles' "Field Engineering," giving the log versed sine of 87°33 as 9.881026 instead of 9.981026, as you noted last week, caused an amusing and exasperating occurrence on the E. & A. division of the Pennsylvania Co. At that time the E. M. W. corps (the writer transitman) were re-running and putting spirals on a main-line curve just west of Greenville, Penn., a curve about a thousand feet or so long, a job that should take about a half day. We got the curve "dope," set the point of spiral curve and point of compound curve at each end, then staked out the middle or circular part of the curve. The angles closed O.K. but the chaining would not check—some 3 ft. out, as I recall it.

Two of us had "figured" the curve, so we jumped on the chainmen, and sat in the shade while they were finding their "bust." They reported the chaining O.K. So Buddy and I refigured the curve. *All O.K.* Then we reasoned with the chainmen, without gloves, and Buddy and I took the chain to show the boys how a curve should be chained and to be a lasting example to them of how to find material errors in chaining. Their chaining proved to be right, and the corps spent the rest of that day first checking the calculations, then checking the chaining. These simply would not agree, so we took the late train back to headquarters. There the assistant engineer, a martinet, wanted to know whether that Greenville curve was staked. "No, sir." "Well, you are taking too much time for it." "Be sure to finish it in the morning and get in at noon." "Yes, sir."

I spent that evening checking over the calculations from every point, still finding them right. I went out the next day determined to find the "bull" in the fieldwork. All day it was the same old story, check calculation, check field work, till Buddy and I concluded we had gone crazy.

That night the assistant engineer "blew up" and we all certainly got ——. When he stopped for breath I stated the case to him, and decided to get out. It was not safe around there.

The morning of the third day, behold the corps, and the assistant engineer, at work on the curve, the assistant engineer being given all the rope he wanted and directing the whole job minutely. Still no check. Did we work hard all day? We did.

Going home in the train that night, as almost the last point of attack, I suggested to the assistant engineer that the tables of logs in Searles *were wrong*. He had about used up all his explosive material, but I got some slight reaction with that remark, so I went on into another car. There I took out "Searles" and had a general look at each log we had used. When I came to the log vers of 87°33 (one of our angles) Bingo! The first figure of the mantissa had been running 9-9-9; then for 87°33 it was an *8*; then followed 9-9-9. *The mystery was solved.* The calculations and field work checked. At that time (1893) I notified the publishers of "Searles" of the error, so Antonio Llano will not get any quick action.

It is only fair to say that it is a billion to one shot that this is the only misprint in the Searles log tables. I would stake my life on their accuracy any day if necessary, after thirty years of use.

New Castle, Penn. G. B. ZAHNISER.

[That publishers are more alert now than they were a quarter century ago is indicated by Professor Ives' statement that no time was lost in correcting the error in the plates. It is still an interesting subject for speculation how many times the error in question was discovered since the first edition of "Searles" was published, and what percentage of those who found it took steps to have it corrected.—EDITOR.]

Why Not Engineers on Industrial Committee?

Sir—The President has appointed a new committee whose duties are to attack the cost of living, and in the specific instance of industrial disputes to suggest solutions. This is a great work, and one which should be well done, for it is difficult to overestimate its potential good.

Comments by authorities on the composition of this committee have, as far as noted by the writer, been quite favorable. The many sides of the public mind are presumably well represented.

But are the best interests of the country well cared for when out of so small a group at least eight are lawyers? Why not more engineers, the men who build and operate the railroads, steamship lines and the physical cities and are the "go betweens" for the restless employee and the equally disturbed employer? True, the vice-chairman, Mr. Hoover, is an engineer, but the profession has many men his equal, and the writer doubts that the best interests of the country are ever served in times of stress by the legal mind, which is not progressive and must have, for a crutch, a precedent upon which to function.

W. M. BUTTS,
Wendell M. Butts & Company, Civil and Mechanical Engineers.
San Francisco, Cal.

On the Alliance of the A. S. M. E. With the Industrial Conference

Sir—Your reference in your Oct. 23 issue to the American Society of Mechanical Engineers' alliance with the Industrial Conference Board was read with a great deal of interest by the writer, and I heartily agree with your point of view, which takes the same position as that of Morris Llewellyn Cooke in this matter.

The American Society of Mechanical Engineers should not be anti-labor or anti-capital, but should serve society as a whole, the public, as well as capital and labor. We should seek to be a balance wheel in these matters. Therefore, if we do not become entangled by alliances with either side we are in a much better position to serve the community as a whole. When I say the "community as a whole" I mean both capital and labor and the public.

As a member of the American Society of Mechanical Engineers I have taken this view, and also sent in my protest against our membership in the National Industrial Conference Board.

Your attitude regarding other societies aligning themselves with the Chamber of Commerce of the United States, etc., are well taken.

C. W. KOINER,
General Manager, Municipal Lighting Department, City of Pasadena.
Pasadena, Cal.

Drainage Works Maintenance in Minnesota

Sir—Your editorial on "Maintenance of Land Drainage Systems" (Oct. 16, 1919, p. 718), touches on a subject of vital concern to all drainage officials, and, it is hoped, will elicit a wide discussion.

Minnesota enacted in 1905 the first law outlining proceedings for the construction of drainage ditches within the state. This statute included a very general reference to the subject of repair and maintenance of drainage structures, by making it the duty of the boards of county commissioners to keep in repair all drainage improvements within their respective counties, and outlined a method of procedure to be followed in assessing and collecting the costs of doing the work.

The section of the law relating to repairs has been amended at every session of the legislature but one since its enactment, and I believe an honest effort has been made to seek out an efficient way of keeping public drainage ditches within the state in proper repair. The writer believes, however, that there is yet much to be accomplished along this line.

The causes which lead to the necessity of repairing drainage ditches are nearly always the caving-in of banks, the placing of obstructions in the ditch by careless and thoughtless settlers to afford temporary crossings or watering places for stock, the falling in of trees, etc. If funds were provided and it were made someone's duty to take immediate action to remedy these defects before the far-reaching effects caused by the lodging of silt and débris behind such obstructions had made necessary a formidable and expensive repair job, much expense and inconvenience could be saved the taxpayer.

The difficulty with placing the work of keeping ditches in repair with the county boards is obvious. It becomes no one's special duty to look after the smaller obstructions and defects before they have been the cause of sufficient mischief to cause some one individual or a number of individuals to demand action from the board. By the time the board has examined into the matters complained of and has authorized repairs, the drainage ditch in question has probably been so badly obstructed that to put it in its original condition will cost from 25% to 75% of its original cost.

The Minnesota legislature of 1917 authorized the boards of county commissioners of counties wherein drainage ditches costing in the aggregate $50,000 or more had been constructed to appoint a county ditch inspector (no qualifications) "whose duty it shall be to travel over the line of all such county and judicial ditches . . . . at least twice each season and inspect the same, observe . . . . what repairs . . . . may be necessary or proper, and immediately thereafter he shall make a full report in writing to the county board of his work, together with the estimate of the cost thereof," etc. It is then made the duty of the county board to act on the county ditch inspector's report at the "first meeting of the board following the filing of said report."

While providing for the appointment of an inspector may be a step forward, the effects of this provision will be far from hitting the vulnerable point—namely, securing immediate action at any time it might be found necessary and providing a fund, always available, from which to pay for minor emergency repairs. The removing of a load of hay placed intentionally or accidentally in an open ditch should not be made to await the filing of an inspector's report and a further delay for action on the report by the county board at its next following meeting. Neither should the crumbling of a bulkhead or the temporary obstruction of a costly underground tile drain be allowed to cumulate damages for a period of from one to five weeks awaiting favorable action and authority to repair from the county board. The old adage, "A stitch in time saves nine," can be no more forcibly demonstrated than in the immediate removal of obstruction from drainage ditches.

To provide for such a method of repairing drainage ditches the writer suggests:

1. The appointment of a qualified drainage engineer in each county of the state where drainage construction is a considerable factor of development, whose duty it shall be to supervise the repair and maintenance of drainage construction.

2. Authorizing the levying of a small annual tax—call it a sinking fund—upon all lands benefited by drainage, to meet the cost of keeping the systems in repair so that there will be funds available at all times.

3. Giving authority to the ditch inspector to expend for emergency repairs a sum not to exceed a certain amount for each such emergency job. Jobs requiring expenditures in excess of such stipulated amounts to be done only at the orders and by the authority given by the board of county commissioners.

E. V. WILLARD,
State Commissioner of Drainage and Waters.
Saint Paul, Minn.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Rod Readings in Tunnel Speeded Up By Can-and-Candle Device

A SIMPLE device used by the San Joaquin Light and Power Co. on the work under way at Auberry, Cal., has saved time in making direct readings on a rod in tunnels or where artificial light has to be used. Its purpose is to illuminate the figures on the rod at any height, by means of which the rodman can speedily change from one height to another.

The device consists of a gallon can with two holes made in its sides near the bottom large enough to thrust the rod through, the target having first been removed. The can is put on the rod with its bottom in a vertical plane, leaving the face of the rod visible through the open top of the can. The top is not entirely cut out of the can, just enough being left at one side to shield a candle fastened there. Thus, the candle illuminates the figures without shining directly toward the observer. The can is raised and lowered by means of a string passing from the can to the top of the rod and back down to a convenient height. In lieu of a pulley at the top of the rod the string is passed over the thumbscrew which is ordinarily used for setting the target.

Dragline Excavator Loads Scows Anchored in Channel It Dug

By A. I. Silander
Civil Engineer, Chicago, Ill.

AN UNUSUAL employment of a dragline excavator is being successfully demonstrated at North Evanston, Ill., as is indicated by the accompanying drawings. The National Brick Co. is under contract with the Sanitary District of Chicago to remove the clay spoil banks along the north channel. The National Brick Co. bought from the contractors, Shnable & Quinn, the excavator that dug this channel.

Fig. 1 shows a cross-section of this channel and one spoil bank, with the position of the 100-ft. boom excavator and the 30 x 100-foot deck scow.

The excavator travels parallel with the channel and heads into the spoil bank. The current in the channel is used in spotting the scow. In dumping, it is found by the operators of the apparatus, this bucket loads the scow without any jar or impact.

Fig. 2 shows a section parallel with the channel and shows also the digging slope with reference to the excavator. The bucket digs down hill and above the base of the excavator as successfully as it dug up hill and below the base of the excavator. After a cut has been completed, and just before moving up, the operator places a loaded bucket in the position shown, then, by dragging it in the direction of the arrow, he pushes away from himself the ridge or roll that accumulates in front of the excavator. By repeating this operation five or six times he cleans and trims up a 30-ft. pathway necessary for laying the next section of runway plank. The ridges outside of this pathway are picked up back of the excavator in passing them.

The Sanitary District is represented by G. M. Wisner, chief engineer, and by William Sullivan, resident engineer. The National Brick Co. is represented by C. J. Weber, general superintendent.

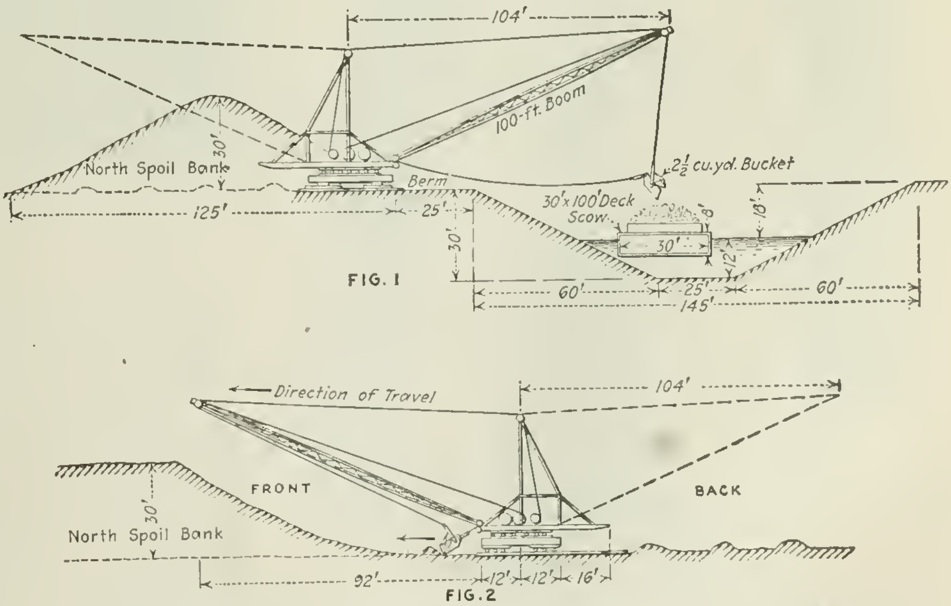


FIG. I

FIG. 2

WIDE RANGE OF EFFECTIVENESS OF DRAGLINE EXCAVATOR SHOWN ON SANITARY CANAL JOB

Convenient Support for Trolley Wire in Tunnels

IN DRIVING the tunnels for the Kerckhoff power plant, the San Joaquin Light and Power Co. of Fresno, Cal., is using electric locomotives operating at 250 volts d. c. If the trolley wire is left in place while the shots are fired, wire and supports are always damaged more or less, so that it has been found desirable to take it down, for each shot, for about 200 ft. back from the heading.

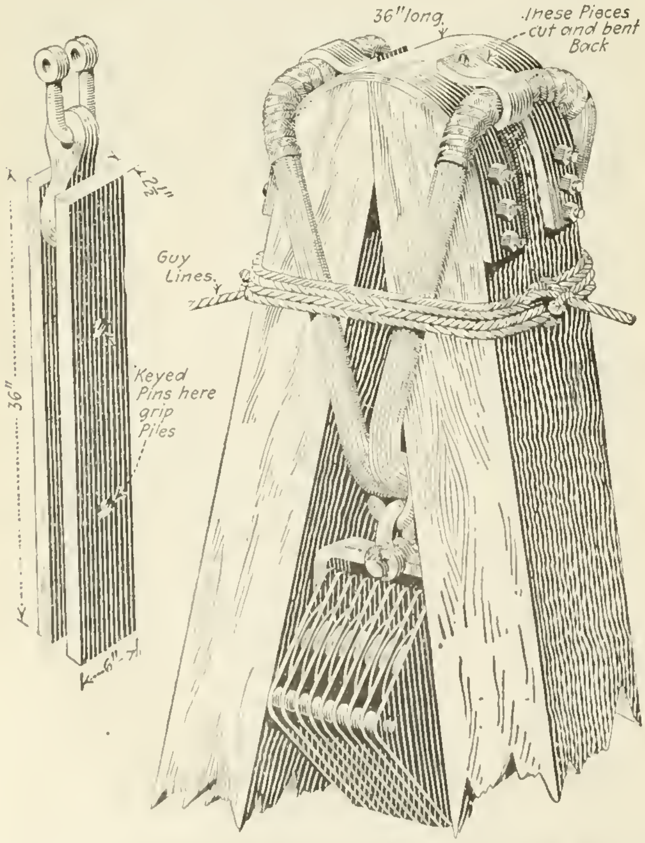
A plan for supporting the trolley wire which has been found very convenient in work of this sort is to drill holes at suitable intervals in the wall of the tunnel near the roof and to slip into these short pieces of 1½-in. pipe. These fit nicely the standard drill size used on the job. The insulator for the trolley wire is carried on a sleeve or slip ring which can be slipped over the end of the pipe and fastened at the desired point by means of a setscrew.

The advantage of this plan is in the ease and speed with which the trolley line can be taken down. At the first few supports near the heading the pipes as well as the slip rings are removed, in preparing for a shot. Farther back the pipe is left in place, the slip rings being loosened and slipped off so that the wire can be rolled up out of the way. The insulator carried on a sleeve, as used on this job, is a standard article, comparatively inexpensive. The pipe is required only in short pieces, such as can usually be cut up from scrap.

A-Frame With 15-Part Line Used For Pulling Steel Sheet Piles

STEEL sheet piles of the Lackawanna type are being pulled from about an average 40-ft. penetration with a specially devised A-frame rig, on the Queenston-Chippawa power canal of the Ontario Hydro-electric Power Commission. One of the bridges here is to carry an interurban electric railway across the canal, but it was built inside a sheeted excavation before the canal was dug. Now that the bridge is finished, the piles are being pulled before the canal has been dug up to the bridge walls.

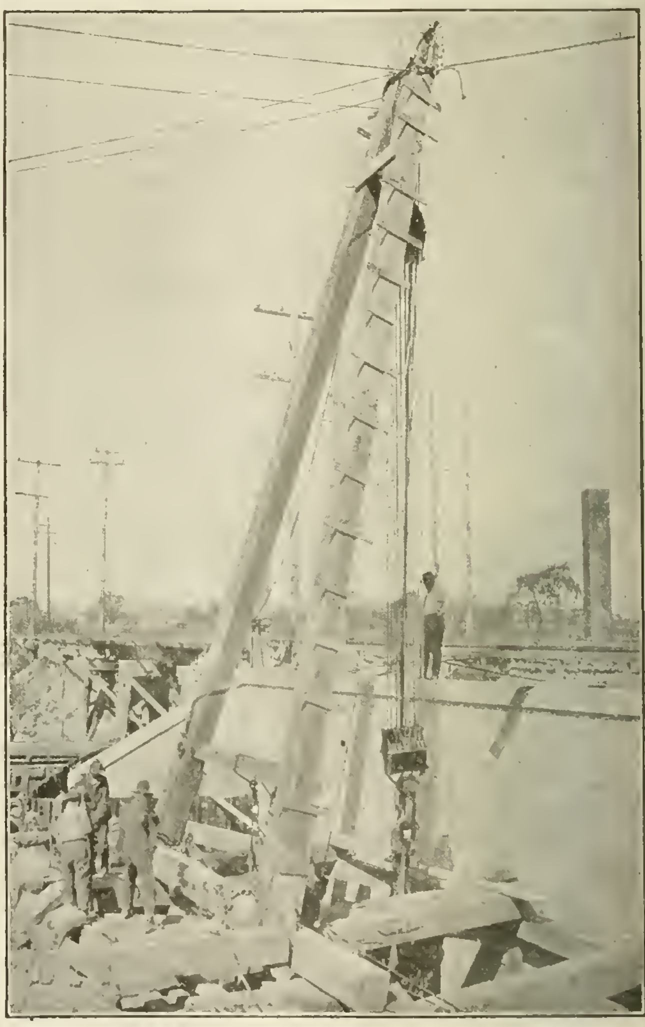
The rig comprises a heavy A-frame held by guy lines in slightly inclined position over the piles to be pulled, and carrying from the specially designed headframe the two-block 16-part line, at the bottom block of which is attached the pile-pulling grip. The frame is made up by 12x14-in. sticks heavily braced at the bottom and about 10 ft. from the bottom. The headpiece is a 6x1-in. steel plate bent over the curved top, as shown in the sketch herewith, and with interior loops made by cutting the plate as shown in the sketch and bending over and riveting down on the top. In these loops are hung wrapped cables which carry the top blocks. Just below the top band the guy lines are wound three or four times around the frame.



DETAILS OF A-FRAME PILE PULLER IN NIAGARA FALLS POWER CANAL

The superintendent in charge of the job states that the rig would be more effective if the frame were more thoroughly braced, both with crossbraces and with a heavy wedge block in the crotch, and also that there should be hardwood blocks tacked onto the outside of the frame sticks underneath the guy-line binding.

In the first efforts to pull, an ordinary clevis was used with a pin through a hole cut by a gas flame in the top of the sheet pile. This soon pulled out the pile web, so the grip shown in the accompanying sketch was devised. This consists of two 3-ft. plates 6 in. wide, hanging from the lower block, with two 2½-in. holes through which the pile is gripped by keyed pins passing also through holes cut by a gas flame in the top of the pile to be pulled. This jaw gives a long, frictional grip on the pile; this has proved very effective. In pulling, the frame has to be braced against timbers as shown. It is easily slid along these timbers from pile to pile as required.



PULLING SHEET PILES ON THE QUEENSTON-CHIPPAWA POWER CANAL NEAR NIAGARA FALLS

The work is in charge of J. B. Goodwin, who is works engineer, with A. C. D. Blanchard, the chief field engineer.

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

NEWS OF THE WEEK

New York, January 1, 1920

President Proclaims Return of Railroads March 1

Says Serious Complications Would Be Faced if Properties Went Back on First of Year

By a proclamation issued Dec. 24 the President announced that the railroads and express companies would be returned to private operation Mar. 1, 1920. The President's proclamation was accompanied by a statement issued from the White House that, under existing conditions, it was thought better to postpone the return of properties from the first of the year, in order to avoid legal and financial complications.

The President's proclamation follows:

> Whereas, in the exercise of authority committed to me by law, I have heretofore, through the Secretary of War, taken possession of and have, through the Director General of Railroads, exercised control over certain railroads, systems of transportation and property appurtenant thereto or connected therewith, including systems of coastwise and inland transportation, engaged in general transportation and owned or controlled by said railroads or systems of transportation, including also terminals, terminal companies and terminal associations, sleeping and parlor cars, private cars and private car lines, elevators, warehouses, telegraph and telephone lines, and all other equipment and appurtenances commonly used upon or operated as a part of such railroads and systems of transportation; and
>
> Whereas, I now deem it needful and desirable that all railroads, systems of transportation and property now under such Federal control be relinquished therefrom:
>
> Now, therefore, under authority of Section 14 of the Federal Control act approved Mar. 21, 1918, and of all other powers and provisions of law thereto me enabling, I, Woodrow Wilson, President of the United States, do hereby relinquish from Federal control, effective the first day of March, 1920, at 12:01 o'clock a.m., all railroads, systems of transportation, and property, of whatever kind, taken or held under such Federal control and not heretofore relinquished and restore the same to the possession and control of their respective owners.
>
> Walker D. Hines, director general of railroads, or his successor in office, is hereby authorized and directed, through such agents and agencies as he may determine in any manner not inconsistent with the provisions of said act of Mar. 21, 1918, to adjust, settle and close all matters, including the making of agreements for compensation, and all questions and disputes of whatsoever nature arising out of or incident to Federal control, until otherwise provided by proclamation of the President or by act of Congress; and generally to do and perform, as fully in all respects as the President is authorized to do, all and singular the acts and things necessary or proper, in order to carry into effect this proclamation and the relinquishment of said railroads, systems of transportation and property.
>
> For the purposes of accounting and for all other purposes this proclamation shall become effective on the first day of March, 1920, at 12:01 a.m.

At the same time Director General Hines issued a message to railroad officers and employees under Federal control, urging redoubled efforts to produce "the best and most economical railroad service possible during the remaining period of Federal control."

(*Concluded on page* 59)

Short Assignment for Chief of Engineers

(Washington Correspondence)

While the Secretary of War declines to make any prediction concerning when he will make his recommendation for the appointment of the Chief of Engineers, U. S. A., it is understood that he does not intend to make a recommendation which would place an officer at the head of the corps for a much longer period than the average tenancy. In the case of Col. Henry Jervey, for instance, 10 years would elapse before he becomes of retirement age. Col. W. C. Langfitt, if appointed, would hold office 4½ years, while Col. F. V. Abbot, if he should be the successful candidate for the post, would serve about two years.

A. A. E. Gets 5000 Applications in Two Weeks' Drive

More than 5000 applications for membership were received as a result of the Dec. 1-13 drive of the American Association of Engineers. The results are not yet tabulated, as the returns are not yet all in, but it is believed at the association's headquarters that the membership increase will be considerably in excess of that figure. The highest percentage of increase over existing chapter membership was that of Buffalo, which up to Dec. 20 was in excess of 300 per cent.

Safety Codes Referred to Engineering Standards Committee

As a result of a conference of organizations interested in uniform safety codes, held at Washington on Dec. 8 and 9, 1919, upon invitation of the Bureau of Standards, the American Engineering Standards Committee will be asked to assume direction of the drafting of safety codes.

The conference supplemented one held on Jan. 15, 1919, when a discussion took place that led to proposals for transforming the standards committee as then constituted into an association. Several months later the association proposal was laid before the founder societies of the committee in the form of a revised constitution, but the opposition to this led to its failure. In the meantime a vote of safety organizations was instituted by the Bureau of Standards, acting for the safety conference, to determine whether the safety-code work were best handled by an independent organization or by the standards committee. The vote went about three to one in favor of the latter alternative.

To Hold Public Works Meeting in Washington

Association Convention January 13-14 To Discuss Campaign Work for New Year

The National Public Works Department Association (formerly the Engineers, Architects and Constructors' Conference on National Public Works) will hold its convention in Washington, D. C., Jan. 13-14, 1920, to discuss the status of the campaign to date and make plans for the new year. A statement of purposes will be made. It is intended to initiate an intensive program.

On the first day of the meeting, after the report of the executive and finance committees, a communication from Gov. Frank O. Lowden of Illinois on "What a Department of Public Works Has Done for Illinois" will be presented. In the afternoon session, reports concerning campaign procedure will be made, and discussion will be open. The Jones-Reavis bill will be discussed by sections, with suggestions for amendment. Representative Reavis will address the meeting on the practical results to be achieved by a United States Department of Public Works, and Gen. R. C. Marshall, chief of the Construction Division, on "Practical Economies Secured by Standardization of Construction Activities."

On the second day of the meeting, "state teams" will confer with members of Congress previous to presenting their reports. Finances will be discussed, and the report of the committees on new organization, nominations, and resolutions will be presented.

Contractors To Hold Annual Session in Chicago

The annual meeting of the Associated General Contractors of America and affiliated organizations will be held in Chicago, Jan. 21-23, 1920. One of the features of the meeting will be a two-day national conference on construction problems, to be held in connection with the business sessions of the association and open to all general contractors, whether members of the A. G. C. or not. The first day of the conference will be devoted to a consideration of industrial relations, and means of greater production, and on the second day the conference will divide into four large groups, representing (1) building contractors; (2) highway contractors; (3) railroad contractors, and (4) public-works contractors, to discuss special problems of interest to these groups.

The business sessions of the annual meeting will be devoted to a discussion of the work of the association during the past year, as presented in the reports of the standing committees; to the election of officers; and to mapping out a program for the coming year. The annual banquet will be held Jan. 22.

At a meeting of the executive board of the association recently in New York, the report of the nominating committee was received. The following were proposed: For president, Frederick L. Cranford, president of Frederick L. Cranford, Inc., New York City; first vice-president, T. T. Flagler, president of the Flagler Co., Atlanta, Ga.; second vice-president, J. W. Cowper, president of the John W. Cowper Co., Buffalo; third vice-president, W. O. Winston, president of the Winston Bros. Co., Minneapolis; treasurer, C. F. Mullen, secretary and treasurer of the Masters & Mullen Construction Co., Cleveland. For members of the executive board (the terms of four of whom expire in January, 1923), R. T. Collins, Jr., Cumberland, Md.; Walter Cahill, Great Lakes Dredge & Dock Co., Chicago, Ill.; A. P. Bent, Bent Bros., Los Angeles, Cal., and George Watson, the Watson Co., Dallas, Tex.

Illinois Section, Am. Soc. C. E., Discusses Development Report

In a discussion, Dec. 19, 1919, of the development committee report of the American Society of Civil Engineers, at the annual meeting of the Illinois Association of Members of the Society, John W. Alvord, head of the analysis committee of the board of directors, outlined an alternative plan for the nontechnical activities. He would broaden and make more representative Engineering Council by having its membership made up mainly of the regular officers elected by the constituent societies and also of delegates from regional associations of societies. A biennial assembly of the estimated 127 members would handle the larger questions and appoint an executive staff or committee as the working body.

Closer coöperation of the association with the Western Society of Engineers will be effected, and combined technical meetings held, if provisions of a report submitted by A. J. Hammond are voted upon favorably in a forthcoming letter ballot. Informal vote was favorable to the idea. Former activities have been confined to nontechnical affairs.

The officers elected for the coming year are as follows: Albert F. Reichmann, chairman; A. J. Hammond, vice-chairman; W. D. Gerber, 913 Chamber of Commerce, Chicago, secretary-treasurer.

Simplon Traffic Diverted To Avoid Avalanche Danger

Exceptional avalanche conditions in Switzerland during the last two weeks of December led to fatalities and the temporary abandonment of railway traffic through the Simplon tunnel, because of threat of slides along both approaches.

Spanish Engineers Urge Big Public-Works Program

Four Thousand Attend National Congress—Public-Works Minister Recommends Expenditure of $601,800,000

(From "Engineering News-Record" Correspondent in Madrid)

The National Congress of Engineers completed Nov. 25 in Madrid the most important conference of technical, industrial and economic leaders that has ever been assembled in the history of Spain. The gathering of more than 4000 engineers and industrial authorities afforded a means of summing up the experience gained in the extensive expansion of Spanish industries brought about during the world war, and gave expression to authoritative conclusions concerning the economic development of Spain in the immediate future. The liberation of the country from dependency on foreign markets for the necessities of economic life was one of the dominating ideas of the congress. The necessity of economic independence from a military point of view was strongly emphasized. The representatives of the army and navy coöperated with civilian technical authorities in developing the plans whereby the industries of the country could most readily lend themselves to national defense. The most important action recommended as an economic-military expedient was the intensive development of mineral resources. Reforestation and agricultural development were cited as other works needed to place the country on a formidable military basis.

The conclusions and recommendations approved by the congress involved:

Governmental financial and legislative aid in the solution of the railroad problem.

A standard gage for all the railroads of Spain.

Creation of a permanent commission to study the standardization of materials, units, and conventional signs used in the mechanical industries and construction.

Establishment of a national testing bureau for machinery, materials of construction, and industrial products.

Increased transportation facilities to the mining districts.

A complete mineral survey of Spain.

A complete survey of the hydro-electric possibilities of the peninsula.

Construction of a network of power transmission lines for the distribution of hydro-electric energy over the entire country.

Increased expenditures on the maintenance of highways.

Construction of more roads into the forest regions for the removal of forest products.

Regulation of the construction of habitations for all classes of society.

Formation of commissions of employers and employees to harmonize industrial relations.

Industrial profit-sharing plan to apply to laborers and administrative forces.

Formation of a Sanitary Engineering Section in the next Congress of Engineers.

Postponement of legislation concerning public works until the Government shall have had sufficient time to make use of the studies made by the Congress of Engineers.

BIG APPROPRIATION RECOMMENDED

That the deliberations of the congress will be of immediate practical value to the nation was demonstrated in the closing session, which was presided over by the Minister of Public Works of the National Government. He announced that, in accordance with the conclusions of the Congress of Engineers, he is recommending to the Parliament the expenditure of $601,800,000 (3,009,000,000 pesetas) during the next ten years for the economic-industrial development of the country. It is recommended that the greater part of this amount be apportioned as follows:

$254,000,000 for the extension of the railroad system;

$193,000,000 for highways;

$48,600,000 for ports and navigation signals;

$14,000,000 for agricultural development and education;

$19,000,000 for reforestation;

$10,000,000 for a mineral survey of the country, laboratories of mineral analysis, and subsidies to mining industries.

The minister recommended that these funds be raised in such manner that future generations may bear a part of the expenditure. He will include in the bill of proposed legislation a revision of the present laws concerning hydro-electric concessions providing that the ownership of these power enterprises revert to the state after a specified interval, and that the Government share in the profits realized.

The Congress of Engineers was held under the auspices of the Institute of Civil Engineers of Madrid. Its success was largely due to Sr. Frederico La Viña, former president of the Institute, Sr. Francisco Teran, present presiding officer, and to Sr. Juan A. Perez Urruti, secretary-general of the congress. The convention enjoyed a large representation from the industries of the country and from various economic societies. The king took a very active interest in the proceedings. He visited the sessions and entertained the members of the congress in the royal palace. An industrial exhibition was held in conjunction with the congress, Nov. 16-25. It is undecided yet as to the date on which the next gathering of the congress will be effected, but it is generally estimated as five years hence.

The congress was called at a very opportune time, a time when Spain has not only the will but the financial means for extensive public undertakings. Notwithstanding the labor unrest, which is evident in nearly all countries, the conclusions of this congress of engineers seem to have expressed the national consciousness.

President Proclaims Return of Railroads March 1

(Concluded from page 57)

maining period of Federal control of the railroads."

In his message cabled to Congress last spring and read before both houses May 20, the President said: "The railroads will be handed over to their owners at the end of the calendar year." There had been some belief that the intention would actually be carried out, in spite of the fact that Congress had not passed a final bill. The President's action in naming March 1, 1920, as the date of return to private operation has met with general approval of corporate and Federal railway officers and leaders of Congress, including the House and Senate conferees who have before them the task of reconciling the differences of the Cummins and Esch bills.

Railroad Bills Go to Conference

With the passage of the Cummins bill in the Senate Dec. 20, the House and Senate Conference Committees began Dec. 23 the task of formulating a final measure, faced with the necessity of the enactment of a bill before the return of the railroads March 1 as proclaimed by the President. The Esch bill, passed by the House, differs from the Senate measure so vitally that the task is considered very difficult.

For the Senate the conferees are Messrs. Cummins, Poindexter, Kellogg, Pomerene and Robinson, and for the House they are George Esch, Edward L. Hamilton, Samuel E. Winslow, Thetus W. Sims and Alben W. Barcley.

In the meantime, labor interests are opposing the anti-strike features of the Cummins bill, and the railway machinists have threatened to walk out if these measures are adopted.

It is expected that it may be necessary for Congress to take actual votes on some of the principal points at issue before the conferees can render a final report. Under the rules of conference, provisions of either bill may be thrown out or altered but new material may not be introduced, although the rules are sometimes violated.

Plan To Pour Concrete on Hetch Hetchy Dam Next June

In a recent address before the San Francisco Association of Members of the American Society of Civil Engineers, M. M. O'Shaughnessy said of the Hetch Hetchy dam: "The foundation has been unwatered by means of a log crib dam 40 ft. high, 300 ft. upstream from the main dam. This turns the water of the river into the diversion tunnel, which is 23 x 25 ft. in section and 900 ft. long. A dam 25 ft. high just above the tunnel outlet prevents the water from backing up into the unwatered site. A steel caisson 120 ft. long in three sections has been arranged to be sunk immediately above and adjacent to the foundation of the main dam on the upstream side, so that the bottom can be entirely unwatered. It is hoped to have this work done by next June, when the foundation concrete will be poured."

The Hetch Hetchy dam contract, as was noted in *Engineering News-Record* of Aug. 7, 1919, p. 292, was awarded to the Utah Construction Co., July 31, under terms requiring its completion within three years.

Would Draw More Water From Niagara

Proposals for a new treaty between this country and Canada to provide for the withdrawal for power purposes of an additional 60,000 cu.ft. per second from the Niagara River above the Falls have been made to the State Department of the United States by Representative Clarence MacGregor, of New York. Under the present treaty the diversion of water for power purposes is limited to 36,000 cu.ft. per second by Canada and 20,000 cu.ft. by the United States. Under the treaty as proposed by Mr. MacGregor each country will be given 30,000 cu.ft. more than it has at present. The agitation for a new treaty will doubtless be seconded in Canada by the Hydro-electric Power Commission of Ontario, which, as noted in *Engineering News-Record* of Dec. 11-18, 1919, is now building a new project which will divert 10,000 sec.-ft. from above the Falls. On account of the greater efficiency of the use of the head and flow through this project, the commission will want to utilize it to its full capacity, but in so doing it will have to shut down several of the existing plants, on account of the restrictions of the Canadian use to the 36,000 cu.ft. per second which is now practically all being utilized in existing plants.

Chimney Construction Companies Indicted

In New York City on Dec. 17 a Federal Grand Jury indicted five chimney construction companies and more than a dozen of their officials on the charge of having organized and operated a trust for the construction of radial brick chimneys in violation of the Sherman anti-trust law. The indictment accuses the dependents with having sought to restrict the business of those allied with the defendant corporations, to fix prices, and to prevent competing concerns from using the same materials and methods in chimney building. It is charged that the Chimney Builders' Association was incorporated in 1914, and that the members agreed to send to the secretary of the association written information of every inquiry received from prospective customers, and to state each quotation or bid submitted. The companies indicted are the Alphons Custodis Chimney Construction Co., the M. W. Kellogg Co., H. G. K. Heinicke, Inc., Bergen & Lindeman, Inc., and the Heine Chimney Company.

French Reconstruction Not for United States Engineers and Contractors

(From "Engineering News-Record's" Correspondent in Madrid.)

Very little of the reconstruction of war-devastated regions of France is being done by American engineers and contractors. A recent investigation in France by *Engineering News-Record's* representative shows that one American corporation, having a permanent branch office in Paris, is working on contracts in Alsace for the rebuilding of three small cotton mills, the aggregate of the work running under $50,000. Another United States firm of contractors is occupied on similar small jobs, the bulk of the material for which is being purchased in France.

It seems unlikely that there will be many bulk contracts given for the reconstruction of whole towns or of large areas. The present construction is being done not directly for the French Government but for individual property owners in piecemeal lots. According to the French representatives of two American contractors, there is plenty of work for American concerns which are willing to finance their own work and wait for payment until the German indemnity is paid to the French Government and in turn handed over to the individuals who let the contracts. It may mean a long wait for the money.

It is the opinion of some American engineers now in France that engineers trained in the school of American practice are unsuited to European methods of construction. They have many humorous stories to tell concerning their collisions with the French idea of the way things should be done. Frequently, in dealing with the individual property owner, consideration must be taken not only of the Frenchman's own opinion of the way in which his house should be built, but of the opinions of his father and grandfather before him. However, there is no attempt by these Americans to disparage the work that the French engineer turns out.

The French wish to use their own engineers as extensively as possible. At the present time there is almost no demand for Yankee technical talent in France, and the probability is that there will be no such demand in the next few years. Due to a lack of capital and, to a certain extent, to the labor situation, the reconstruction has proceeded very slowly.

Montana Highway Engineers Meet

The Montana Highway Improvement Association held a meeting in Butte, Dec. 6, for the purpose of consolidating various district organizations into one state body. The organization decided to employ a salaried manager, who will devote his entire time to the management of the affairs of the association. Headquarters of the 11 districts will be established at Missoula, Great Falls, Helena, Butte, Havre, Roundup, Bozeman, Billings, Miles City, Glendive and Glasgow. Nelson Story of Bozeman was elected president of the consolidated organization and J. A. Harader, Bozeman, secretary.

The next meeting will be held in Billings, Jan. 10, 1920, when the State Highway Commission will meet with the association.

Turner Company Gives Insurance Policies to Employees

At the recent annual dinner of the Turner Construction Co., of New York, held in the ballroom of the Hotel Commodore and attended by 600 of the 800 straight-time employees, Henry C. Turner, president of the company, announced that the board of directors had decided to give all employees paid by the week or month, who had been one year with the company, life-insurance policies with premiums paid by the company.

James E. Kavanaugh, vice-president of the Metropolitan Life Insurance Co., explained the group insurance plan under which the policies were to be issued: To each employee of one year's service, $500, and $100 for each additional year up to a total of $2000. Foremen who have been with the company five years will receive $1000 as the initial amount of insurance. Others will receive amounts according to length of service.

Commerce Bureau Creates New Western European Division

The formation of a Western European Division to meet the growing and insistent demands of American business for facts concerning what is now the key situation in world trade was announced Dec. 5 by Philip B. Kennedy, director of the Bureau of Foreign and Domestic Commerce. For the present the new division will devote itself to England, France, Belgium, and possibly Holland.

The large volume of industrial, financial and commercial inquiries relating to western Europe have heretofore been handled by experts connected with various units in the bureau, but the mass of information now coming in from the many special investigations conducted during the summer and autumn, and the outstanding importance of the situation in western Europe as a factor in future commercial developments, have made it necessary to expand the facilities for handling the work and to center them.

The Western European Division will be in charge of F. W. Powell, who has just returned from England after completing a study of reconstruction in English industry, a report on which will shortly be published. Mr. Powell was connected with the War Trade Board during the war, and previous to that time was engaged in economic research. The division will be organized and conducted along the lines of the Latin-American, Far Eastern, and Russian divisions of the bureau.

Progress in Adjusting Railway Engineers' Salaries

Information concerning recent developments in the adjustment of compensation for railroad professional engineers has been gathered by the American Association of Engineers, which affords the following description of conditions in five regions:

Southwestern Region—Adjustments were made by the regional director, effective Nov. 1. While it is too early to determine just what increases are made, information from the St. Louis & San Francisco and the San Antonio & Aransas Pass indicate an average increase of $25.

Pocahontas Region—The regional director early in December stated that adjustments have been made on the Norfolk & Western and that one is being considered for the Chesapeake & Ohio and for the Virginian.

Allegheny Region—It is indicated that adjustments, effective Sept. 1, covered the Pennsylvania Lines, West, fairly well. A few departments of the Baltimore & Ohio were also included, but no other railroad.

Southern Region—A committee of engineers met at Atlanta late in October and drafted a tentative schedule, following the submission of new data to the regional director by the A. A. E. Sept. 25. The tentative schedule has been submitted to each Federal manager, with the request for recommendation in accordance therewith.

Eastern Region—Data from 1410 new questionnaires were presented to the regional director Nov. 26. He stated that he would take the matter under consideration. The data indicated that adjustments effective July 1 covered less than half of the railroads and less than 35% of the positions, and that present salaries on many roads, particularly the Delaware & Hudson, Erie, and New England roads were very low.

The association reports that the Federal managers were stumbling blocks where no adjustments were made. Therefore, each railroad section has been asked to prepare and transmit to them through official channels a report giving detailed recommendations for the adoption of the A. A. E. schedule on their respective roads.

Conference on Concrete House Construction

In the third week in February, 1920, there will be held at the Auditorium Hotel, Chicago, a national conference on concrete house construction which will be accompanied by meetings of a large number of associated interests. Co-operating in the movement for the conference are the American Concrete Institute, the Associated General Contractors of America, the Concrete Products Association, the Portland Cement Association, the Illinois Society of Architects and Illinois Chapter of the American Institute of Architects.

During the same week the conventions of the American Concrete Institute, the Concrete Products Association, the Concrete Block Machinery Association and the American Concrete Pipe Association will also be held. The conference itself will last from Feb. 17 to 19, 1920, inclusive. The exact dates of the other meetings have not been set. Information regarding them can be obtained from the National Conference on Concrete House Construction, 111 W. Washington St., Chicago, Ill.

To Make Surveys in Sierras

Snow surveys covering the entire length of the Sierra Nevada range are to be made for the purpose of determining the water-supply available from the snow fields and of perfecting a system of stream forecasting and control in the interests of irrigation, flood control and river navigation. This work will be done by co-operative action of the States of Nevada and Cailfornia, the former represented by Prof. J. E. Church, Jr., of the University of Nevada, and the latter by Maj. Paul M. Norboe, assistant state engineer of California. Snow surveys of this kind, with Professor Church's work in Nevada, were described in *Engineering News-Record* of Oct. 23, 1919, p. 766.

Contractor May Forfeit Deposit Check

Rising prices may lead the Walsh Construction Co. of Davenport, Iowa, to forfeit a $10,000 guarantee check on a contract which it has been awarded. The bid concerns the first part of the construction of the Great Western Gateway Bridge over the Mohawk River, between Schenectady and Scotia, New York, being built under the direction of the State Engineer of New York over the Mohawk River and the New York State Barge Canal at Schenectady.

It is a very long and expensive structure, and the work was divided for contract into four parts, the first of which included the construction of the approaches and abutments. Bids were opened for this part on Sept. 12. The Walsh company's bid of $198,880 was accepted by the state. The County and City of Schenectady deposited their share of the cost soon after the bids were opened, but there was considerable delay in the issuance of the Scotia bonds, and the Attorney General of the state ruled that the contract could not be let until all the parties had deposited their shares with the state. This was not completed until Dec. 3. Meanwhile, the price of materials had gone up to such an extent that the Walsh company refused to accept the contract. It is stated that figures show that the cost has increased $17,000 since the bid was made and that it would be cheaper for them to sacrifice the $10,000 certified check than to continue the work on the bid made. Certain business men in Schenectady have offered the Walsh company $10,000 bonus to accept the contract, but this has been refused. Local papers now report the probable offer of a larger bonus.

Pennsylvania To Report Daily on Winter Condition of Roads

The Pennsylvania State Highway Department has announced that it has completed plans whereby all of the main connected hard-surface highways will be kept open for winter traffic, particularly those sections where motor trucks can be used for the transportation of farm products to the centers of population. In order to keep the roads open the department has purchased 10 snow-plow truck attachments in addition to the 16 already on hand. There are also 225 road machines, which are the property of the department, and which will be transferred to the main lines of travel. The district organizations will handle snow removal as they do the department's general maintenance operation.

The State Highway Department on Wednesday, Dec. 10, 1919, began making daily reports on road conditions to meteorologists of the weather bureaus in Philadelphia and Pittsburgh. These bureaus will in turn inform motor clubs, manufacturers and the public in general of the condition of the main connected hard-surface highways over which east-west winter traffic passes. This surface includes the Lincoln Highway between Philadelphia and Pittsburgh, the National Pike within the boundaries of Pennsylvania, the highway between Chambersburg and Harrisburg; the William Penn Highway between Harrisburg and Philadelphia, and the William Penn Highway between Reading and Easton. Each of these thoroughfares has been divided into sections. Superintendents in the various counties will mail each day to the weather bureaus and to the State Highway Department cards giving the condition of the roadways by sections. If any marked changes occur during the night, telegraphic reports will be made the following morning.

Examine Culvert Being Tested Under Deep Fill

As a result of the pioneer work being done by the Iowa State Experiment Station on the action of culverts under earth fills, a joint committee of engineers and manufacturers visited Ames Dec. 4, to study a culvert which is being tested under a deep fill and to study the data already collected for a report on the investigation. The Iowa station is the only organization in the country which has done any work along the lines of actually determining the effect of earth fills and live loads on highway and railroad culverts.

Of the members of this committee on reinforced-concrete culvert-pipe specifications the following were present at the Ames meeting:

G. H. Tinker, Nickel Plate Railroad Co., Cleveland; A. F. Robinson, Santa Fé Railroad Co., Chicago; J. L. Zeidler, Zeidler Pipe Co., St. Joseph, Mo.; C. F. Bunte, Concrete Products Co. of America, Pittsburgh, Penn.; J. E. Moody, Massey Concrete Products Corporation, Chicago; L. D. Hadwin, Chicago, Milwaukee & St. Paul Railroad Co., Chicago; C. F. Wilson, C. H. Wilson and E. L. Arthur, Wilson Concrete Co., Red Oak, Iowa; V. R. Sladek, American Steel and Wire Co., Chicago; M. W. Loving, Portland Cement Association, Chicago.

Extension of 112,500 Hp. Is Dedicated at Niagara

Additions to Station No. 3 Opened by Throwing in First of Three 32,500 Kva.-Unit Installations

In the presence of about 500 prominent guests from Buffalo and Niagara Falls, the switch which formally placed in operation the first of three 32,500-kva. generators in the new addition to the Niagara Falls Power Co.'s No. 3 station, just below the international bridge on the American side, was thrown at 2:30 p.m., Dec. 20, 1919, by J. F. Schoellkopf, chairman of the board of directors of the company. The new extension adds 112,500 hp. to the company's capacity, raising it to a total of 450,000 hp. Station No. 3 is thereby increased from an installed capacity of 130,000 hp. to 242,500 horsepower.

The new unit consists of an Allis-Chalmers 25-cycle, three-phase, 12,000-volt generator rated at 32,500 kva., driven at 150 r.p.m. by a single runner, inward discharge Allis-Chalmers water turbine operating under an effective head of 215 ft. The shaft of the water wheel, directly connected to the generator, measures 27 in. in diameter. The entire unit, from the tailrace to the top of the Kingsbury bearing in the generator housing, stands 67 ft. high. The waterwheel is connected to a penstock 15½ ft. in diameter and 350 ft. long. This penstock opens into a forebay 78 ft. wide by 160 ft. long and 28 ft. deep, fed by a canal with its intake about one-half mile above the American Falls.

Illinois Highway Officials and Contractors Discuss Plans

Materials are available for any amount of paved road whose construction is contemplated in Illinois in 1920, and car service will be ample for handling materials until about August. By getting all materials needed for the season's work into stock pile by Aug. 1, 1920, there ought not to be great delay due to materials shortage. This action will require provision for storing about 25 per cent of the season's supply. In general, these were the conclusions announced at a conference in Chicago, Ill., on Dec. 26, 1919, of officials of the Illinois Division of Highways and representatives of some fifty highway contractors.

Contractors generally will prepare to accumulate stocks during the early months of the year. Other subjects discussed included the length of contracts, time limits, wages and prices, but no definite conclusions were reached.

Chicago Hospital Bill Is Favored by House Committee

Purchase of the 320-acre site for the Speedway Hospital in Chicago is authorized in a bill reported favorably to the House of Representatives by the Committee on Public Buildings and Grounds. The uncompleted hospital building is to be finished and five auxiliary buildings are to be constructed, in accordance with the terms of the bill, but the committee declined to allow the $2,500,000 provision for additional buildings.

The House committee suggested that the Secretary of the Treasury should make a regular estimate to cover that sum, after it has been shown conclusively that additional hospital facilities will be needed by the Government.

It was recommended by the committee that the part of the plant to be immediately completed provide for 995 beds, and in addition give the Public Health Service 120,000 sq.ft. of floor space in a fire-resisting building.

Civil Service Examinations

New Jersey. Deputy chief engineer, Department of Streets and Public Improvements, $6,000 per year, Jan. 28. File applications with State Civil Service Commission at Trenton.

New York State. Assistant sanitary engineer, State Department of Health, $2,000 per year (with possible increase to $2,400), Jan. 24. Apply to State Civil Service Commission at Albany before Jan. 20. Application forms for this examination will not be sent out after Jan. 12.

New York State. Engineering assistant, Office of State Engineer and Highway Department, $1080 to $1560 per year, Jan. 24.

New York State. Engineering draftsman, $1500 to $1800 per year, Jan. 24.

New York State. Junior assistant engineer, grade 1, Office of State Engineer and Highway Department, $1620 to $1860 per year, Jan. 24.

New York State. Junior assistant engineer, grade 2, Office of State Engineer and Highway Department, $1980 to $2280 per year, Jan. 25.

United States

For United States civil service examinations, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Architectural and structural steel draftsman, Lighthouse Service, Key West, Fla., $1560 per year, Jan. 6. File application before Jan. 6.

Fire-prevention engineer, office of Director of Purchase and Storage, War Department, duty throughout United States, $2500 to $4000 per year, Jan. 13. Application should be filed before that date.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

BRIDGE BUILDERS' & STRUCTURAL SOCIETY, 50 Church St., New York City; Jan. 16, New York City.

AMERICAN SOCIETY OF CIVIL ENGINEERS, 29 W. 39th St., New York City; Jan. 21-22, New York City.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA; 111 W. Washington St., Chicago; Jan. 21-23, Chicago.

ENGINEERING INSTITUTE OF CANADA; General Secretary, Fraser S. Keith, 176 Mansfield St., Montreal; Jan. 27-29, Montreal.

AMERICAN ROAD BUILDERS' ASSOCIATION, 150 Nassau St., New York City; Feb. 9-13, Louisville, Ky.

AMERICAN WOOD-PRESERVERS' ASSOCIATION; Secretary-Treasurer, F. J. Angier, Mt. Royal Station, Baltimore; Feb. 10-12, Chicago.

AMERICAN CONCRETE PIPE ASSOCIATION; 210 South La Salle. St., Chicago; Feb. 20-21, Chicago.

AMERICAN RAILWAY ENGINEERING ASSOCIATION; 1426 Manhattan Bldg., Chicago; March 16-18, Chicago.

The American Association of Engineers' second annual conference of professional engineers in railroad service will be held Mar. 15, 1920, in Chicago. The date named is the day previous to the opening of the convention of the American Railway Engineering Association.

The American Concrete Institute, through its board of direction, has appointed Harvey Whipple as secretary. The business office of the institute will be removed from Boston to Detroit; the new quarters will be at 314 New Telegraph Bldg. The board of direction announces that it has important plans for an energetic post-war renewal of activities looking to early standardization in certain design and construction practices.

A Newark, N. J., Chapter of the American Association of Engineers was recently formed, with the following officers: President, Frederic A. Reimer; vice-presidents, Robert A. Meeker and David Boswell; treasurer, John L. Vogel, and secretary, D. W. Krellurtz, West New York, N. J.

The Utica, N. Y., Engineering Society may be the name chosen for an organization of local engineers, the formation of which will be discussed at a meeting Jan. 7 at the Hotel Utica. All local technical engineers have been invited to the meeting. All interested are requested to communicate with Byron E. White, engineer, Utica Gas & Electric Company.

The Baltimore Chapter of the American Association of Engineers increased its membership about 182% during the two weeks of the recent membership campaign, and it was expected that membership in the chapter would reach 500 before the first of the year.

The Engineers and Architects' Association, Los Angeles Chapter of the American Association of Engineers, held a series of meetings in the week ending Dec. 29. They were, respectively, in charge of Carl A. Heinze, Public Service Department; J. F. Lambert, Pacific Electric Ry.; Forrest Casey, General Petroleum Co.; Frank J. Severy, Union Oil Co., and David E. Godfrey, of the State Highway Commission.

The Albany, N. Y., Society of Civil Engineers elected the following officers at the annual meeting Dec. 23: President, Frank H. Macy; vice-presidents, Emory E. Brandow, J. P. Graham and Thomas L. Watkins; secretary-treasurer, John W. Henry; librarian, John W. Carpenter.

The Engineers' Club of the Youngstown, Ohio, District held a regular monthly meeting Dec. 30, at which F. W. Funk, president of the club, presented a paper on "Improved Electric Transit in Youngstown and Interurban Vicinity."

PERSONAL NOTES

LIEUT. COL. D. H. SAWYER has become associated with James Stewart & Co., and will have charge as manager of the work of that company in Detroit and vicinity. Colonel Sawyer was constructing quartermaster in charge of the construction of Camp Grant, and constructing quartermaster of the nitrate plant at Cincinnati and the artillery cantonment at Fayetteville, N. C. Previous to the war he maintained, with his brothers, consulting offices for general engineering work in Spokane and Seattle.

M. C. BYERS, vice-president and general manager, Western Maryland Ry., and previously assistant to the president, is to become the operating head of the road when it is returned to private control, according to recent announcement. Mr. Byers was successively chief engineer of operation of the St. Louis & San Francisco R.R. and assistant to the president of the Great Northern.

CLARENCE H. FAY has been appointed commissioner of public works, Borough of Manhattan, New York City.

E. H. BALDWIN, previously assistant construction engineer, Guggenheim Bros., with supervision of construction work in South America, has been appointed chief construction engineer, Sinclair Refining Co., with headquarters in Chicago. He served 10 years with the Metropolitan Water and Sewerage Board of Massachusetts as assistant engineer and division engineer, followed by 12 years with the United States Reclamation Service as construction and supervising engineer and acting chief engineer of construction. He left the Reclamation Service in 1917 to go to South America for Guggenheim Brothers.

EDWARD B. LEWIS, formerly structural engineer, TOLTZ, KING & DAY, INC., St. Paul, has become associated with Clyde W. Smith, architect, in the general practice of architecture and engineering, with offices in the Andrus Bldg., Minneapolis.

PAUL D. PRATT, M. F. CURRAN, and L. C. BEATTIE have formed the STATE ENGINEERING & CONSTRUCTION CO., engineers and contractors, with headquarters at Helena, Mont.

WILLIAM W. PEARSE, since 1914 city architect and superintendent of buildings for Toronto, Ont., has resigned to become business manager of the Toronto Board of Education.

J. J. COLLINS, W. D. HAMMOND and LINTON HART, formerly of the Raymond Concrete Pile Co. and the Dock Contractor Co., have formed the Rollin Construction Corporation, to engage in general construction, with offices at 90 West St., New York City, and 80 Boylston St., Boston.

R. M. MORTON, formerly engineer of the Sacramento County, California, Highway Commission, has resigned to become chief engineer of the San Diego County Highway Commission, taking office Jan. 1, 1920.

CHARLES J. KALTENBACH has resigned as bridge engineer, West Virginia State Road Commission, to enter industrial work in Pittsburgh.

E. W. MCCOY and J. E. HAMMOND have opened offices in the Brunson Bldg., Columbus, Ohio, to engage in private practice.

C. A. ROTHROCK, former county road engineer, Morgan County, West Virginia, has joined the staff of the Portland Cement Association, with state headquarters at Parkersburg. Mr. Rothrock previously served as maintenance engineer, Los Angeles, Cal., County Highway Association.

OBITUARY

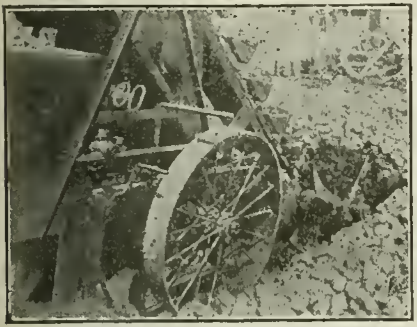
FRANCIS H. KIMBALL, architect of many of the large buildings in New York, died in that city Dec. 25, at the age of 74. In 1867 he entered the office of Gridley J. F. Bryant and Louis P. Rogers, architects, Boston, and afterward took charge of their Hartford office. From that time he was engaged continuously in architectural and structural work. He went to New York in 1879, and later designed several theater buildings, among other work. In 1893 he joined forces with C. K. Thompson to erect the Manhattan Life Bldg. in New York. Among the buildings which he designed are the Garrick, the Casino and Fifth Avenue Theaters, the United States Realty, Adams Express, City Investing, Empire, Trinity and Manhattan Life Buildings, all in New York City.

JAMES MALONE, who had served for many years as an engineer in the Department of Water-Supply, Gas and Electricity of New York City, died Dec. 23, 1919, in Brooklyn. He retired five years ago.

GEORGE A. LITTLE, superintendent of streets, Ottawa, Ont., died in that city Dec. 17, 1919, at the age of 61.

Self-Feeding Loader Handles Heavy Material

A self-feeding and self-propelling wagon loader, at the plant of the United States Cast-Iron Pipe & Foundry Co., Burlington, N. J., is reported to be doing the heaviest work a loader of this general type has ever performed. The material loaded is brick and débris from a cupola which the company has demolished. The accompanying illustration shows the size of the material handled, with the paddles of the loader digging a path and clearing the material away from the wheels so that the machine may be propelled forward by its own power.



SELF-FEEDING LOADER DIGS PATH THROUGH HEAVY MATERIAL

The loader is equipped with a swivel spout, instead of a chute, that is designed to swing to 180 deg., so that material can be discharged on either side of the machine as well as in front.

The loader was manufactured by the George Haiss Manufacturing Co., Inc., New York City.

BUSINESS NOTES

THE NEW YORK CONTINENTAL JEWELL FILTRATION CO. of Nutley, N. J., announces the appointment of Arthur M. Crane, formerly general sales manager, as general manager of the company, succeeding the late Robert E. Milligan. D. C. Williamson continues as chief engineer and E. K. Sorenson as secretary and assistant treasurer.

THE WALDO BROS. & BOND CO., Boston, has been formed through the consolidation of Waldo Bros., Inc., building materials, and the Harold L. Bond Co., construction equipment, both of Boston. The Waldo firm was established in 1869, and the Bond Co. in 1900. The officers and directors of the company are: President, Harold L. Bond; first vice-president, C. Sidney Waldo; vice-president, Llewellyn Howland; secretary, Harold C. Bond; sales manager, Frederic W. Mattheis; treasurer, James G. Lincoln. Other directors are Roger Ernst and Frank M. Bates. The offices and salesroom of the new company are at 181 Congress street.

THE READING IRON CO., has acquired the plant of the E. & G. Brooke Iron Co., Birdsboro, Pa., adding 16 double puddling furnaces to the existing equipment of the Reading company.

THE WESTINGHOUSE AIR BRAKE CO., Wilmerding, Pa., has created an export department, in charge of E. A. Craig. The department will be represented in the New York office by W. G. Kaylor and in South America by R. M. Oates.

THE TACONY STEEL CO., Cleveland, announces that A. E. De Clercq has joined its Cleveland sales force.

THE ECONOMY HOIST & BODY CO., INC., 405 Lexington Ave., New York City, will succeed the Economy Body Sales Co., under the same management, with A. W. Herbst as general manager and C. C. J. Culmer as sales manager.

THE AMERICAN STEAM CONVEYOR CORPORATION, Chicago, announces that the Atlas Machinery & Supply Co. is now handling the sale of the "American" steam ash conveyor in the St. Louis territory. The Atlas company is headed by William H. Patton, with offices at 1416 Syndicate Trust Bldg., St. Louis.

TRADE PUBLICATIONS

The following companies have issued trade publications:

THE MILWAUKEE AIR POWER PUMP CO., 886 Third St., Milwaukee, Wis.; pamphlets, 6 x 9 in., 4 to 30 pages, illustrated; all dealing with water systems for institutions, country clubs and homes, schools, farms and other places not served by city water systems. Small electric-light plants and septic tanks for sewage disposal are also described.

THE CITY IRON WORKS, Portland, Ore.; structural-steel and ornamental-iron work manual with tables of sizes, weights, etc., of metal work of the company's manufacture.

THE ALLIS-CHALMERS MANUFACTURING CO., Milwaukee, Wis.; bulletins Nos. 1411 and 1454, 8 x 10½ in., illustrated, 15 and 45 pages, respectively; bulletin No. 1411 gives the specifications of details of modern rock-crushing plant, and bulletin No. 1454 explains the operative principles of the Allis-Chalmers dust collector.

THE WARNER ELEVATOR MANUFACTURING CO., Cincinnati, Ohio; bulletin, 9 x 12 in., illustrated, 12 pages; descriptive matter on motors, cages, etc.

THE AMERICAN CEMENT MACHINE CO., INC., Keokuk, Iowa; catalog No. 920, 8½ x 11 in., 63 pages, illustrated, describing "'Boss' Labor-Saving Construction Machinery." It contains descriptions of various forms of contractors' concrete machinery and equipment, with illustrations of their use.

The Outlook for Construction in 1920

A Serious Shortage of Materials—Prices the Tangible But Not the Determining Factor in This Year's Work

By ALDEN W. WELCH

Of the Business News Department, McGraw-Hill Company

The present remarkable condition of the material market is not the work of any one cause. The steel strike, the coal shortage, the high prices and, finally, the unprecedented autumn volume of construction work, are the important factors that have produced a shortage in certain lines of building materials.

Last spring we were deploring the lethargy in the construction field; everything, except high prices and false prophets, urged tremendous activity. The country was years underbuilt. Nearly every state and municipality cried for repair and enlargement of public works, while the housing problem was every bit as acute as it is today. In spite of this, capital, suffering from an excess of caution, held back, waiting for conditions to "stabilize." With exasperating deliberation, work got under way, until now—even in this winter season—the demand for materials in many cases exceeds the supply.

DEMAND

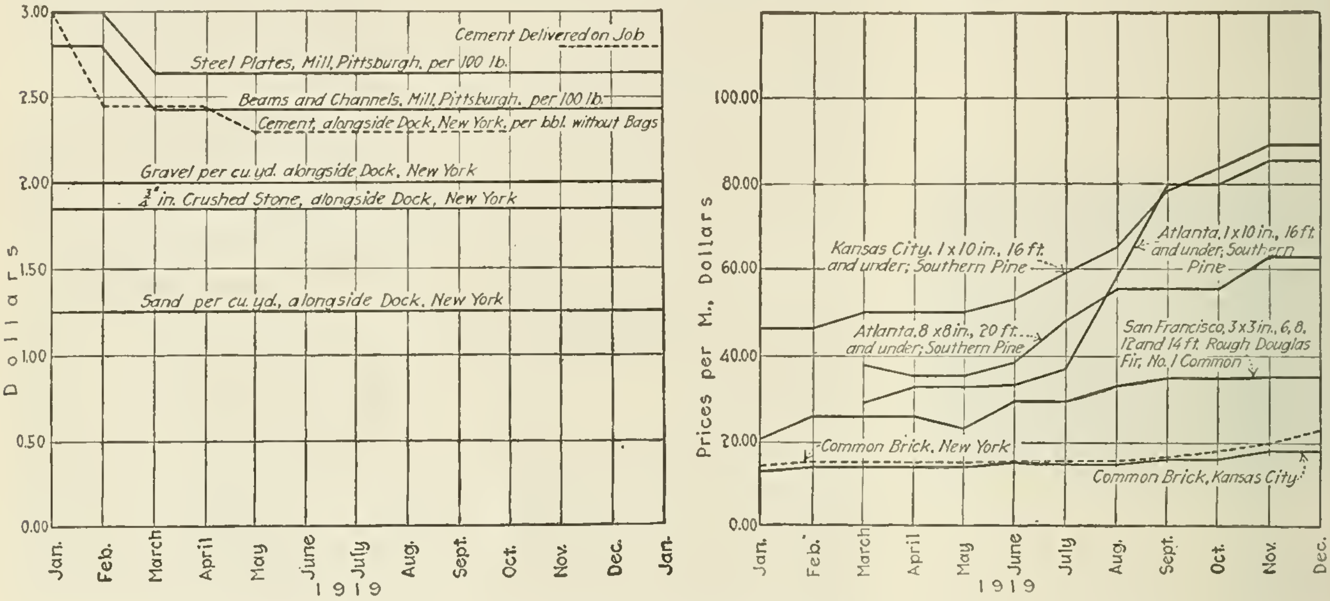
Some idea of the demand may be had by a comparison of the value of contracts being awarded at the present time and in similar periods of 1918 (an unusually dull year) and in 1913 (a normal year). Such a study will show that the present requisition on construction materials is quite unusual, in spite of the reduced purchasing power of the dollar.

The one tangible factor that held back construction and ultimately caused the present jam was the high level of prices. There is no denying that prices were high and are now still higher, but, whereas a year ago capital was demanding a radical reduction, capital now acknowledges that high prices are here to stay—for a few years, at least. What was called abnormal last January is now accepted as normal. In fact, there is a strong feeling—already substantiated in certain lines—that prices will be still higher next spring.

PRICES

What are the facts on prices? The quotations published monthly in *Engineering News-Record* furnish full and trustworthy data for study.

Basic construction materials divide into two classes, as regards price tendencies in 1919. One group, including steel and concreting materials, has remained practically stationary in quoted price; the other group, of which lumber and brick are the features, has advanced rapidly to unheard-of levels. The situation is graphically portrayed by the two charts.



PRICE TREND DIVIDES CONSTRUCTION MATERIALS INTO TWO GROUPS HAVING WIDELY DIFFERENT CHARACTERISTICS

The first set of curves is particularly remarkable for the steadiness with which prices of certain building materials have held during the year. Since last March there has been absolutely no fluctuation in prices of steel plates, structurals, cement, sand, gravel or crushed stone. Of course, during the past few months this steadiness has meant little to construction progress, owing to decreased production occasioned by strikes. Not only have the mills, in many instances, withdrawn quotations, but warehouse stocks have been seriously depleted as well. A shortage of railroad cars has aggravated the situation. It is almost impossible to obtain certain gages of steel sheets, and reinforcing steel is held at a premium. Consequently, it must be distinctly understood that the quoted steel prices have little meaning just at present. This speculative element, however, will endure only until the labor difficulties have been adjusted and the mills are on full production. Even so, it is equally conceivable that steel prices will advance about that time.

In the case of cement, stocks over the country are relatively light, owing to the small demand during the first half of 1919 and the heavy ordering in the last six months. Prices have fluctuated but little, but a general increase in the spring would not be surprising. Already two companies have advanced their price 25c. per barrel.

Prices of sand and gravel remain practically as they were a year ago, but it is significant that in important instances an advance of 25c. per cubic yard is asked for spring deliveries. New York men in this line state that seven years' work has piled up and that a booming 1920 is anticipated, with plenty of stock to supply the demand, however great the latter may be. With crushed stone the situation is much the same. In New York the official price is $1.85 per cubic yard; but 25c. more could easily be obtained for spring deliveries. Poor transportation facilities have seriously interfered with stone and gravel deliveries on highway work, and have thus thrown a heavy demand over into 1920.

As regards the second group of essential construction materials, a glance at the right-hand set of curves will indicate what has happened. In the case of lumber, heavy demand has made it possible to inflate the market. The effect of these lumber prices is far-reaching. It means a curtailment of the use of lumber and a turning, where possible, to steel and concrete on the part of former lumber users. The brick market is of a local nature, but in certain centers—notably New York and St. Louis—the prices are extremely high.

CONCLUSION

To sum up, the high prices of a year ago are in no case lower today. Half a year ago capital was reluctant to invest in what seemed inflated values; today the situation is reversed.

Far from subsiding, the vitality of today will probably be compounded in the spring, which promises to be the liveliest construction period in the history of the country. It would seem inevitable that prices should stiffen.

As a final argument, consider wages. Indicative is the recent agreement entered into between the Building Trades Employers' Association and the Building Trades Council, of New York, which reads: "In order to secure continuity of employment and uninterrupted production . . . . the working week shall consist of 44 hours; the rates of wages from Jan. 1, 1920, to Dec. 31, 1921, shall be as follows: Carpenters, $8 per day; dock builders, house shorers and sheet pilers, $7.50; composition roofers and waterproofers, $7.50; granite cutters, $8; hoisting engineers, $9; metallic lathers, roofers, painters, sheet-metal workers and tile layers, $8; plasterers, $8.50. . . . . Provided, should the cost of living materially change . . . . the wage schedule for 1921 shall be reopened and readjusted." It is further agreed that "the unions as a whole or as a single union shall not order any strike . . . . nor shall any member of the Building Trades Employers' Association lock out his employees." Finally, "the unions agree to furnish at all times sufficient men to man the work of the association."

This means that New York contractors and their men are ready to handle the expected spring rush, and it is believed that this is the attitude generally throughout the country. There are many indications that engineering and construction stand on the threshold of a big year. The country is so far underbuilt that prices have become subsidiary to necessity. Construction must go forward even in the event of a slightly rising market.

A Consolidation of Engineering News and Engineering Record McGraw-Hill Company, Inc.—JAMES H. MCGRAW, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN
Editor

Volume 84 NEW YORK, THURSDAY, JANUARY 8, 1920 Number 2

Machines Not Everything

MECHANICAL handling of freight at terminals is a manifest need of the future. Ship turnaround must be shortened and manual handling reduced, as one step in the decrease in the cost of goods delivered, which is only a part of the required increase in producing the world's needs. But there is danger in assuming that the adoption of machinery at terminals, just because it is machinery, without regard to its adaptability, will bring about the desired end. The fallacy of such a view is indicated by Mr. Nicholson in his article on the port of Seattle in our last issue. There are places, as he well points out, where a hand truck is by far the most economical machine of which a pier can boast, and it is by no means impossible that the much criticised cargo mast or ship tackle can in places handle many times as much freight as the most modern traveling crane or derrick. All of which only shows that designing terminal machinery is a highly technical matter calling for expert knowledge in each case. That knowledge can best be directed to the problem of the traffic as a whole, of getting the material moving without interference, and the machines or methods used to do this are special incidentals.

A Halt on Raising Prices

WE CANNOT commend too highly the view expressed in a letter in this issue by Howard W. Foote, president of the Northwestern Expanded Metal Co., setting forth that his organization has placed itself squarely on record as being opposed to further advances in the price of its product. Price advances sometimes are made with little thought of the possibility of instituting economies that will overcome increased wage and material costs. The easiest way is to pass the load along. The critical question is, "Can we get away with it?", meaning whether salesmen can dispose of the product at the advanced price. If the question be answered affirmatively, the advance is put into effect. To the credit of many large manufacturers, be it said that there has been serious consideration of the curtailment likely to follow in the wake of price advances, but all too often the manufacturer has sought no other justification than his ability to get the price. He has had preliminary justification in that his raw materials and his labor have gone up. Nevertheless, we are going to work out of this high-cost-of-living era at a fairly rapid rate only if all parties, the manufacturer and merchant, the worker and the public, are willing to make sacrifices. Mr. Foote shows that he wants to bear his part. A hotel in Chicago, taking the same stand, has decided not to advance its rates. In building materials, such an attitude is all the more desired right now, because with the shortage of construction materials there is going to be constant temptation to make increases.

A Symposium on Bridge Construction

WIDE circles will be affected by adopting the bridge specification that has been in preparation by a committee of the American Railway Engineering Association for several years past and is to come up for final consideration next March. Those who will be concerned in the result are certain to find even greater instructive value than will reside in the completed specifications, in an elaborate discussion of various specification clauses, just published by the association in its Bulletin 219. The discussion is made up of a series of criticisms and suggested alternative clauses, collected from prominent railway bridge men throughout the country, together with remarks in support of the specification clauses as drafted. Much of it relates to details of design and construction; other comments deal with loading, stresses, the relation between present and future safety, and similar factors of broad bearing on the subject. The views expressed contain as great a wealth of suggestion upon bridge design as has been offered to the structural profession for many years past. It is well worth note that the year of 1919, though, generally speaking, barren of prominent contributions to structural progress, has produced this compendium of expert opinion. Its influence will be felt, we believe, even beyond the life of the new specifications.

Port Construction Must Start Soon

FOREIGN trade has caught the imagination of the people of the United States. So far it cannot be said that much more than the imagination is involved, for the practical details are too remote to most business men to be grasped at once. This gap between hope and practice extends to port and harbor development, which must be one of the earliest steps in building up a foreign trade. Everywhere along the coasts, and in many places that are connected with the sea only by long and difficult waterways, there is public clamor for the development of the port to meet the demands of expected ocean business. And yet, with a few notable exceptions, actual construction is not going ahead. The Pacific coast, with its growing Oriental trade pressing upon it, is alive to the situation and is building now, but the Atlantic and Gulf ports, excepting Philadelphia and New Orleans, are doing more talking than anything else. New York, particularly, secure in its premier position, is in banderlog fashion telling of "the wonderful things we are going to do." On the Great Lakes, harbor construction is confined to the Federal Government's channel operations. In spite of this lethargy, the spirit of progress which undoubtedly animates the citizens of our port cities will soon have to be translated into actual works. Port authorities will be compelled before long to do more than make elaborate plans.

Machinery for Settling Industrial Disputes

THE MACHINERY proposed by the Industrial Conference for the settlement of industrial disputes, outlined in last week's issue, p. 49, is a step in the right direction. Our existing machinery of mediation and conciliation has proved inadequate. In fact, so little result has it had during the past year that the existence of mediation laws seems hardly to be known to the majority of our people.

Unlike its predecessor, the conference wisely refrained from discussion of the detailed relations that should obtain between employers and employees, realizing that no progress could be made in that direction. It is patent, of course, that the functioning of the proposed machinery will require sooner or later a definition of principles. But these will grow naturally as a body of practice and decisions and will, because of the regional makeup of the boards of inquiry and adjustment, have the backing of public opinion.

Basically, the merit of the plan proposed is that it will give all parties at issue, including the public, a clear view of the case. Disagreements are generally due to misunderstandings. When these are cleared conclusions are usually reached without the exercise of outside pressure. On the other hand, if the differences are fundamental—and more and more this happens in connection with widespread industrial disturbances—the mechanism of the boards of inquiry and adjustment will tend to separate the wheat from the chaff and concisely and clearly put the matter before the public—the court of last resort on such cases.

While the machinery proposed differs in detail from the conciliation and arbitration devices in use in other countries, in principle it is old. In a modern form, compulsory arbitration or inquiry runs back some twenty-five years—to the passage of the New Zealand compulsory arbitration act in 1894. It is now some seven or eight years since the last of the Australian states passed legislation with similar intent, though in two states the form takes that of compulsory wage boards rather than of compulsory arbitration proceedings. Canada passed its conciliation law in 1907.

As to one feature of the proposed measure, special comment is called for. There is no general prohibition of strikes, though when both parties have joined in the adjustment proceedings the existing status must be maintained. In so recommending, the Industrial Conference takes advantage of the experience of Australia and New Zealand. The best results seem to have come from a prohibition only of strikes without notice and of strikes while negotiations are under way.

The conference raises the questions as to the prohibition of strikes on essential public utilities. It does not settle the question, but says frankly that it shall have further consideration. In the end public opinion must prevail. As noted in the discussion of the Cummins bill in our last issue, there can be no denying the right of the community to forbid strikes in essential public-utility employment. It is not possible to tolerate suspension of work on the police, fire-protection and water-supply forces. It certainly is within the power of the community, too, to forbid strikes on railroads. Whether that is the wise procedure with a people saturated in the idea of liberty is open to question. Even recognizing the serious consequences to the community at large, it may be questioned whether it is not better to take some chance and to depend for solution upon an impartial inquiry, with a full setting of the salient facts before the public, forbidding, of course, suspension of work during the pendency of the negotiations. In other words, would it not be wise to extend to the railroads the same machinery for arbitration proposed by the Industrial Conference, with the added proviso that during the inquiry, whether the employees or the employers fail to participate, the suspension of work should not be permissible.

Everything considered, we believe that it would be well to put into effect the mechanism proposed. It would not be a panacea for industrial ills; the Industrial Conference realizes that fully. It would, however, give national sanction to a mechanism in each community for full inquiry into industrial difficulties. That national sanction would help to focus public attention and inspire confidence in the inquiry. There is little for either side to lose and much for themselves and for the public to be gained.

This Winter's Styles in Engineering Titles

MERE man, scanning the offerings of the shops in the daily press, is quickly reduced to a state of helplessness by the ever-changing nomenclature of things feminine. The good old days of silk and linen—straightforward, understandable terms—are no more. This is an age of specialization. To the lexicon of the department store fresh mysteries are added each day. Just when we pride ourselves in the knowledge that "georgette" is a filmy sort of material, and not the name of a French maid, we are staggered by reading of a sale of "duvetyn." But let us proceed no further. This is a dangerous field for masculine inquiry.

Nevertheless, there is apparent in the realm of engineering as in that of the emporium the same trend toward the new and the bizarre in the names of things. A generation ago it was the plain "civil engineer" who built the railroads, the bridges, the dams, the power plants and the other works by which the great sources of power in nature are directed for the use and convenience of man. In the tracks of this pioneer, however, followed a line of "specialists"—the "sanitary engineer," the "structural engineer," the "irrigation engineer," the "valuation engineer" and scores of others. Fresh impetus to the quest for distinctive titles was given by the advent of the "efficiency engineer" and it was not long before we had with us the "real estate engineer," the "industrial engineer," and even the "amusement engineer."

Until last week we felt sure that this winter's styles in engineer titles could offer nothing new. It has remained for the Consular Bureau in Washington, D. C., however, to dispel this illusion. The news dispatch on p. 106 of this issue heralds the discovery of an entirely new species of technical man—nothing else than the "retired engineer." Cloaked in the solemnity of official pronouncement, the call has gone out for "retired engineers," further referred to as "men with private means," to engage in consular work. Could the New Year bring a more welcome message? It is clear now that the rumblings of discontent in the national and local societies regarding inadequate pay and lowered status of the engineer in public esteem have little or no significance. Why have we been appointing these "committees on compensation" and listening to reports of "development committees"? Away with them! The week's news from a bureau of a great department of our Federal Government assures us—by inference, at least—that engineers actually do "retire," just like bankers, head waiters, apartment-house owners and other men "of independent means."

The profession is indebted to the Consular Bureau for its reference to the winter's offering of "retired engineers" enjoying "independent means." The case of the engineer as viewed by official Washington, however, is much like that of the stranded actor who was asked whether he could change a $20 bill: "No," he replied, "but thanks for the compliment."

The Future of Our Waterways

NOTHING could be clearer than that our present Government policy in waterway development is a huge mistake. We are throwing away millions every year in improving channels for navigation where no navigation of consequence now exists or ever can exist. At the same time we are neglecting opportunities where, by concentrating expenditure, waterways could be opened which would yield returns proportionate to their cost. It is common to blame the individual Congressman for this waste of the taxpayer's money, for this scattering of public funds over all the Congressional districts, but the blame lies back of him. He does only what his district expects him to do. Added to the desire for personal or community gain which actuates many of the waterway enthusiasts, there is a vast body of public opinion which unreasoningly believes that inland water transportation is an economic necessity and that it is being kept from its rightful development by sinister influences.

This is a most curious manifestation of crowd spirit, unexplainable except, possibly, in terms of psychology. There is no sound justification for the average man's belief in inland waterways. He is swayed by a cumulation of suggestive influences, which have been catalogued by one writer as "the lingering glory of our waterways, the widespread movement for the conservation of all our natural resources, the relation of waterways to the reclamation of flooded lands, to the development of water power, and to sanitation, the supposed remarkable cheapness of water transportation, the opposition to the monopolistic tendencies of railways, the inadequacy of the railway service to meet the country's needs, the alleged benefits of waterways even to the railways, the avowed advocacy of waterway development by railroad men, and the extensive use of waterways in foreign countries."

Some of these influences, it will be seen, are intangible. Others are of so practical a nature that they may be scientifically investigated, but behind the bulk of waterway enthusiasm is no basis of solid fact. Offhand it is assumed that waterway transportation is desirable and that the only matter to be decided is the number of years over which to spread the expenditure. Enthusiasm should have its place, but not as the sole instigator of the expenditures of public money. There must be a solid foundation of fact. It is in the effort to establish the beginnings of such a foundation, at least, that the article on inland waterway transportation by Charles Whiting Baker, which began in the last issue, was initiated.

The first part of the article is a strong indictment of the pro-waterway argument as generally stated. It is shown, first, that the past need for the waterway in railway rate control probably no longer exists; second, that most of the ventures in water transportation in the past generation, even the most recent efforts under favorable surroundings, have been failures, and, third, that European experiences which are constantly cited as favorable to waterways are by no means as rosy as painted. A later part of the article is devoted to the study of relative unit costs of transportation by water and by rail. Here Mr. Baker contends that railway transportation costs have been steadily reduced, until they are now below the figure at which boats can operate. In a few locations, such as the Great Lakes, traffic is moved by water at rates below rail rates, but the number of places where this is possible is very small. Even there a large part of the apparently lower cost of water transport is due to the fact that channels are made and maintained year after year at the expense of the Government.

All of the deductions are not unfavorable, however, for in the last section of the article are outlined the possible advantages to be gained by certain specific waterways, on which it is suggested Government funds might well be concentrated. In the main these are in the vicinity of crowded centers where railway terminal charges are high or are extensions of routes where a waterway business is already profitably established. Just here Mr. Baker's argument might well be extended. If it is good economics to build new waterways where existing ones have proved waterway business to exist, it may be worth-while in the case of some existing but unprofitable waterways to spend considerable sums in order to get reluctant business.

The prospects of waterway transportation are involved in a vicious circle. Business cannot be procured until there are facilities in the way of terminals and regular and responsible service. Such facilities will not be provided until business is in sight. The only hope for success, then, is in investing a certain amount of Government funds in promotion to be written off as the development charge which must be part of the expense of every new business. The scientific analysis asked for by Mr. Baker would doubtless show in some of our lame waterways that it would be a legitimate gamble to put in some good money in the hope that it would not turn out to be thrown after bad. Just sitting down and hoping that business will automatically develop can only result in failure. There must be some ordered solicitation and encouragement of business from a public which, however enthusiastic it may be for waterways in the abstract, individually is more apt to send its freight by rail.

This is the only major exception we would take to the study as presented by Mr. Baker.

His study, as a whole, is a demand for a more scientific analysis of the waterway-transportation problem, and a plea for a relief from the mass opinion which shouts at conventions for waterways without knowing very well what it is shouting for. Engineers are better able than any other class to understand the huge waste resulting from our present waterways policy, and their united influence, at least, may well be exerted to bring about a reform in the general attitude toward waterways and a more detailed and appreciative study of the economics involved.

Building a Hydro-Electric Plant in Afghanistan

Machinery for 1500-Kilowatt Plant Had To Be Transported 250 Miles Through Khyber Pass by Pack Horses, Camels and Elephant Trains—Only Native Labor Available—Delays of Years in Waiting for Material

By A. C. Jewett
Engineer, Fresno, Cal.

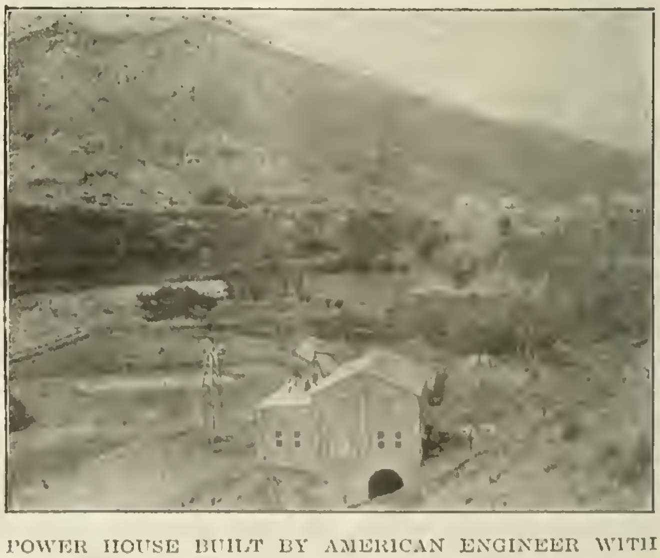
PART OF THE FEED CANAL IN THE AFGHANISTAN HYDRO-ELECTRIC POWER PLANT

FROM early in 1911 until late in 1918 the writer was engaged in Afghanistan in the construction of a hydro-electric project for the ruler of that country. The work included building the dam and power canal, the assembling and erection of the machinery of the generating station, and the erection of the distributing machinery for a 1,500-kva. hydro-electric plant, in a remote part of a wild country far away from any modern means of transportation and with the aid of only one or two white men. The difficulties in such out-of-the-way engineering were so numerous, and the methods adopted so different from those in accepted use in a developed country, that the writer feels a record of it is worthwhile.

In 1910 the late Amir of Afghanistan bought from an English firm the machinery and material for a hydro-electric plant. The purchase price was Rupees 1,100,000, or $367,000, and the terms were full payment in advance f.o.b. Bombay. The amir was to arrange and pay for transport from Bombay into Afghanistan and for all erection of plant, the selling firm agreeing to recommend an engineer and two associates to make the installation. The services of the writer, to act as chief engineer in charge of the work for the amir, were obtained through the company which supplied the electrical machinery. At that time the writer had but recently returned from Kashmir to the States, having just completed the installation of a hydro-electric scheme for the Kashmir government. When the writer reached India in May, 1911, a large part of the amir's plant had arrived at rail-end in Peshawar, and most of the rest was on the way or in process of manufacture, so that there was no opportunity to make any of the changes in the layout that were afterward found to be necessary.

The power house was situated at Jabl-us-Siraj (the site of the old City of Parwan), 50 miles north of Kabul by road. The amir intended the plant to furnish power for operating the government machine shops, gun factory, mint, boot factory and woolen mills located in Kabul, and incidentally to light his palaces. No coal is mined in Afghanistan, and as the country is deforested, wood is very scarce and high in price. The present cost of operating the shops and mills by steam is over $150,000 per year.

The generating plant consists of three 500-kva., 60-cycle, 2,300-volt, three-phase horizontal General Electric alternators, direct-connected to Francis turbines designed to operate under a head of 130 ft. The transmission voltage of 44,000 is stepped up through type "H" oil-filled, self-cooling transformers, there being two banks of three 310-kva. single-phase transformers. The transmission line is 42 miles long, and consists of a single three-phase circuit, the wire being No. 2 B. & S. copper-clad steel. The wires are supported on pin-type insulators mounted on 50-ft. Milliken galvanized steel towers spaced 560 ft. apart. The tele-



POWER HOUSE BUILT BY AMERICAN ENGINEER WITH NATIVE LABOR AT JABL-US-SIRAJ, AFGHANISTAN

LABOR WORKS CHEAP AND IS NUMEROUS, AND ELEPHANTS ARE A NECESSITY

phone line consists of two No. 8 B. & S. copper-clad steel wires placed 6 ft. below the power wires. There is a substation in Kabul with transformers that step the line voltage down to 2,300, the distributing voltage. All of the induction motors but two are large enough to operate directly off the 2,300-volt circuit. The distribution lines are supported on Hamilton sectionalized steel poles, wooden poles being practically unobtainable.

The transportation of the plant from Bombay to railend at Poshawar (1,500 miles), and from there, by pack horses, camels, bull carts and on trolleys drawn by elephants, 250 miles to the site of erection, was time-taking, difficult and costly. The route lay through the Khyber Pass, via Jellalabad, thence through the mountains to Kabul and Jabl-us-Siraj. Loads would be taken part way in the autumn and dumped and left at some sari, because of the snow in the passes. Camels cannot be used in the hot months because of a fly that kills them off in the Jellalabad district. The heavy pieces were hauled on heavy trucks drawn by elephants, of which there were only nine available, and it took them three months and more to make a round trip. They could not be used in winter on account of the cold. The transport was all in charge of the amir and his officers, and the work was done by Afghans. The cost of transport, including the graft, was equal to the first cost of the plant. It was impossible to get accurate figures on it, but the amir told the writer that it was making the cost double to him.

The man sent to Afghanistan to locate the site of the hydraulic plant and make the plans and estimates was quite beyond his depth, and made many mistakes, some that were ridiculous and more that were serious. The canal was 1½ miles long, and he estimated that 100 men would finish it in 46 days. It was located on a side hill for about one-third of its length, and the hill had a slope of 1:1 and 1:1½. There were many big boulders that had to be blasted, and the whole hillside had to be shifted, a quarter of a million cubic yards of spoil moved, and all by hand labor. It took an average of 500 men three years to finish it. The gentleman that made the estimate was a conscientious man, but an intelligent rogue would have cost the Afghans less. He died of smallpox over four years ago.

The first lot of men sent out on this work were equipped with wooden shovels; moreover, they were weavers and did not know how to shovel. The power canal followed the site of an irrigation ditch, and as this was on a side hill with a steep slope and irrigation could not be interrupted, it was necessary first to enlarge another irrigation ditch, taken out further up the river, so it would carry for both the upper and lower systems, before work could be started on the power canal. This upper ditch ran alongside a rock cliff, and there was a lot of blasting to do. It took the sappers and miners that the amir sent most of the season to finish it. After it was enlarged work was begun on the power canal. The second year the amir supplied 500 sappers and miners for the work; it took him till

MATERIAL BEING HAULED 250 MILES OVER THE KHYBER PASS IN ELEPHANT CARTS

FIVE MOURNFUL AFGHANS CONSCRIPTED FOR WORK BY THE SOLDIER ON THE LEFT

May to collect them. They were supplied with tools and material for blasting. The sappers and miners (they called themselves "saffer miners" and we called them "suffering beggars") blasted out the largest boulders, and those up to a ton were hauled out with elephants. The elephants—there were two of them—were a great help; one elephant would handle more stone than fifty men.

The river was a torrential stream. The building of the deflecting dam to turn the water into the canal was rather difficult, as there were no pumps, barring an old hand fire engine, nor was there any wood with which to build cofferdams or flumes. Cement delivered at the site cost $5 per cubic foot. The masons, *kalifa gil kars* (literally, "learned mud workers"), had never seen cement and had to be stood over with a stick to keep them from using it like mud. Most Afghan houses are built with sun-dried brick and mud, and it was difficult to get the "learned mud workers" to lay stone properly and be economical in the use of mortar. The labor was paid, but the pay was always months in arrears, and it was forced and unwilling. Masons got from 30 to 40c. a day and ordinary labor $1.60 per month. A man could get double that working for private parties. They ran away and were brought back and worked with leg-irons on. An Afghan dislikes anything that spells work, order or discipline; and most of them are past masters at shirking.

The power house had been located in a bend of the river bed in the dry season, and the river had to be turned to avoid its being flooded in the wet season. This took several months' work. The local bricks and lime were of very poor quality. Bricks left out in the rain melted down, the lime was slacked and full of stones and adulterated with earth. Condemned bricks and lime, sent away one day, came back the next. There was only thorny scrub with which to burn the bricks and lime, and it was not well burnt. The power house was of brick, and partly of some stone that had a good cleavage found in the Gurband Pass five miles away. It was impossible to use the lime mortar where it came in contact with water, for it melted like sugar, so the arch of the wheel pit was made with stone and cement and the walls of the pit were faced with stone laid in cement.

The work on the power house was held up nine months waiting for the girders that went on top of the central pilasters and supported the crane and roof. These were made up of three 12-in. I-beams riveted together with a plate. The manufacturers had been instructed to ship the beams separately to be riveted up at the site of erection, but they failed to follow instructions, and that part of the work was held up a whole season till the elephants could go for them.

The hydraulic apparatus gave a lot of trouble. The order for the turbines, which were made on the continent, had been sublet three times. The three turbine shafts were shipped in one case, and the case was broken up long before they reached rail-end, where they arrived red rusted and scarred. The shafts were condemned in Peshawar, and it was a year and eight months afterward before the replacements arrived at the power house. These were not turned true to gage (nor were the condemned ones); where there should have been press fits the bores were larger than the shafts, the worst instance being where the bore was 0.011 in. larger than the shaft, in the case of a coupling. The outlets to the receiver were riveted on crooked, the flanges did not line up with the gates, and had to be cut off and rotated to make the holes line up with those in the gate flanges. On assembling the turbines it was found that the flanges of the 27-in. 90° cast-iron elbows connecting to them were drilled wrong, and there was not enough stock in the flanges to permit drilling new holes. Over a year passed before these could be replaced.

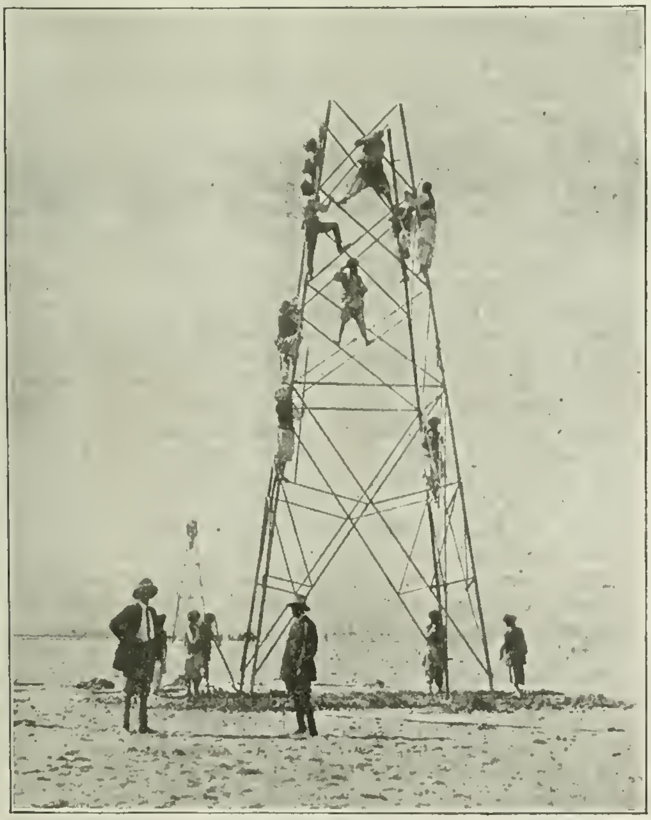
The angles of the penstock had to be changed and 250 ft. of additional pipe ordered, making it 600 ft. long. The pipe was 6 ft. in diameter, with four plates to the circumference. The plates were shipped drilled and were fabricated at the site of erection. There were upward of 40,000 rivets hand-driven by natives. Not only had riveters to be trained, but most of the tools had to be made. The rivets were snapped in, and the old blacksmith got fairly expert making snaps out of old churn drills and crowbars. The biggest day's work

NATIVE LABOR RIVETING STEEL PENSTOCKS

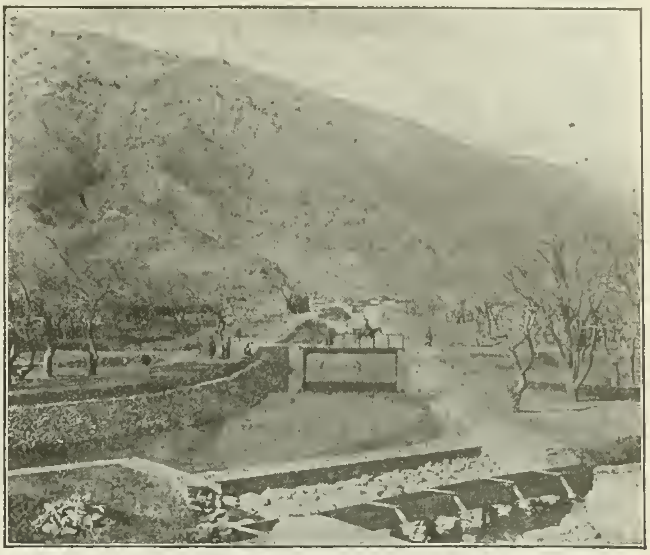
was nine hundred ⅝-in. rivets for one crew. Hammer men were changed every 20 min., and the average day's work was 300 rivets for one crew on longitudinal seams.

The transmission line had to be resurveyed and located. The iron for the steel towers was distributed by camels and elephants. It was first proposed to assemble the towers on the ground and raise them with a derrick in the usual way, using elephants instead of horses, but it was found to be safer and cheaper to build them up in position. The first few went a bit slowly until the men got used to the work. After a couple of weeks a crew of six men would erect two towers per day, at a labor cost of 48c. per tower. All the apparatus used was a light 20-ft. pole lashed to one corner angle, and two planks laid across the tower angles to stand on. The men got as expert as monkeys climbing about the towers, but not one of them knew whether a nut turned to the right or left to tighten without first trying it, nor did they ever learn. The wire was all tied in by Europeans; the natives could not be trusted to do it.

Labor was cheap, so cheap that it was very expensive. Skilled labor, native or European, was hard to get and hard to hold. Natives and Eurasians imported from India did not work out well under Afghan administration; they got the big-head and were hard to handle, as the amir would not discipline them as he did his own people. There are not many European workmen obtainable in the Far East that are useful on the construction work connected with a high-voltage plant. Of four men engaged in India, one took sick before crossing the border and another did not materialize. Of the two that came, one left inside of a year; he got a bad case of swelled head and struck for more pay, although he was getting more than he ever got before or probably ever will again. The other went on leave to India and volunteered in the Army. Two assistants that were obtained from the United States were thoroughly good and competent men. One stayed out his contract time and left in 1914; the other died of typhoid pneumonia. Of two others that came from the States, one went down to India with the body of the man that died and decided not to return. The services of the other, who was not an American citizen, were dispensed with some two years ago; he turned out to be lazy and untrustworthy, and it was easier to do any work that he was supposed to do than to do it over after him or oversee him. Of three other men engaged to come from the States, one volunteered in the air service and the others were conscripted. The services of two others were lost owing to Oriental procrastination and war conditions. The work was always undermanned, with never more than four white men on the job, and that only for a short period.



AFGHANS SOON LEARN TO ERECT TRANSMISSION TOWERS IN PLACE



LOOKING ALONG ONE OF THE CANALS IN THE AFGHAN HYDRO-ELECTRIC PROJECT

Costs of imported material were high. As stated, cement delivered was $5 per cubic foot, wood only obtainable in pieces the size of ordinary railway sleepers, and all doors, windows and other woodwork for the buildings had to be made from these and worked up by hand. The overhead charges were enormous, owing to the high cost of labor supervision and the long time required to make the installation. The time alone spent on tinkering up and making over the hydraulic apparatus would have paid for and installed three new first-class turbines. The only men capable of doing this work were the white men getting from $4,400 to $4,800 a year. An efficiency expert would have gone mad before he had been on the job 48 hours. The Americans on the job used to mourn over the utter impossibility of ever conveying to anyone outside the country the difficulties that had to be contended with in making the installation. There were all the natural difficulties of the country, unskilled and unwilling labor, the long distance to haul and pack in material, faulty hydraulic apparatus, loss and damage in transport (much of it due to poor packing and failure of shippers to follow instructions given) plus Oriental procrastination and delays due to war conditions.

The power-house installation was finally completed and the turbines started on Feb. 5, 1917. Three hours later a door of one of the three main butterfly valve gates failed, but quick work saved the plant from being flooded. On examination, both the doors in the other two gates were found to have failed and started to buckle. It was not possible to get new gates from England or Europe, and they were ordered to be made in Calcutta. Owing to war restrictions on manufacture and transport, it was a year and five months before the new gates were received.

PLANT IS FINALLY PUT IN SERVICE

The plant was again started, and transformers were filled with oil and tested and made ready for operation last October. Just at this time G. R. Baker, who had arranged to take over and operate the plant, died, and the other assistant left. The writer had obtained leave from the amir to go home before Mr. Baker fell ill, but was detained by the amir for some time after his death. It was only after considerable delay that the permit for leaving the country was formally received and the writer left in December, 1918.

The amir was the most progressive monarch that Afghanistan has had. His greatest fault was laziness and procrastination, and it might be said of him that he reigned but did not rule. He took a personal interest in the electric scheme and made many plans regarding the good it was to accomplish and the savings it would make.

His majesty the amir was assassinated Feb. 20, 1919, near Jellalabad, where he had gone to escape the cold winter in Kabul. He intended his eldest son, Inayatulla Khan, to succeed him, but his brother Nasrulla overawed the son and seized the throne. A third son of the late amir, Aminulla, who was in Kabul at the time of the assassination, got control of the treasury, and the guns and ammunition, got the soldiers and some of the people to declare for him and announced that he was the new amir. His uncle submitted and went to Kabul, where he was thrown into prison by the son, Aminulla.

The papers have since reported that Nasrulla has been poisoned. The people became restive under the new amir, and it is supposed he began the present war with the British in order to hold them together. The country is in a chaotic state at present, the British air forces have blown up the powder works at Kabul and pretty thoroughly bombed Jellalabad and the surrounding district. The new amir has sued for peace.

The present situation is that there is a modern hydro-electric transmission scheme in the country all ready to operate (barring the assembling of a few motors in Kabul), there is not a European left in the country, and there are no Afghans or anyone else there capable of running the plant. The machines and switchboard at the power house were covered with old tents and left under a guard. Later, the country may quiet down and somebody carry on with the operation of the plant. But, *khuda madonad* ("God knows"), as the Afghans say.

Cement Content By Surface Area Method

In printing Fig. 3 in R. B. Young's article "Mixing Concrete by Surface Areas on Actual Work," in the issue of Jan. 1, 1920, p. 35, the decimal points in the figures for the abscissas did not register. Cement contents therefore seem to be recorded as 100, 200, 300, etc., when as shown by Table III on the same page they should be 1.00, 2.00, 3.00, etc.

Philosophic Reflections on Garbage-Fed Hogs in an Army Camp

WITH the lapse of a year since hostilities ceased, there can surely be no harm in now making public an official report and "first indorsement" on the reaction to environment and treatment of two groups of hogs at one of our Army camps. The report reads:

Post Hospital, Fort Logan, Colorado.
Aug. 5, 1918.

From: D. A. Richardson, Contract Surgeon
To: The Surgeon
Subject: Sanitation Report

1. The company hog-pens located on the easterly sloping bank of the creek running west and south of this depot are of three groups, viz: a south, middle and north group.

2. The south group of seven pens and middle group of eight pens are unutterably filthy and in a most grossly unsanitary condition, both as regards the life of the hogs and as a menace to the welfare of the inhabitants of this depot and its immediate environment. The interior of these pens is covered with old bones and litter, and inside and immediately in front of each pig house proper are holes filled with urine and manure in which the hogs wallow. The hogs present a most unhappy appearance, and by their surliness of temper and fatigue demonstrate that they are troubled and harried not only by their environment, which is unnatural to porcine tastes, but also by the swarm of flies which are originating at this station.

3. The north group of six pens is quite clean and dry throughout, and the pigs demonstrate their contentment and satisfaction by activity, pleasant porcine demeanor and general cleanliness of body. There are no flies present in this north group of pens.

4. It is recommended that these pens be raked clean of bones and litter, the same be burned and not merely piled in heaps, and the interior of pens be properly graded and drained by ditches. This will guarantee a full financial return and benefit to this depot from the hogs themselves.

DANIEL A. RICHARDSON,
Sanitary Inspector.

After due reflection for 18 days, the foregoing report was returned, indorsed as follows:

1st Ind.

O.Q.M., Fort Logan, Colorado, Aug. 23, 1918 — to the Commanding Officer
Depot Returned.

1. This office learns with deep regret, that decent hogs must pine and fret, and lose their chaste and classic beauty, because some man neglects his duty. A sense of confidence misplaced offends a hog's æsthetic taste, and every effort should be bent, to keep him happy and content.

2. The undersigned is pleased to learn, that this inspector did discern, the difference in looks and style, between the hogs so coarse and vile, with manners surly and uncouth, in all the pens extending south, who not the least resemblance bore, to porkers of the Q.M. Corps (whose pens are farther to the north as in above report set forth). These animals so sleek and fine, the pink of excellence in swine, display upon their radiant features, the happy look of grateful creatures. The quartermaster's pigs alone, maintain this high and lofty tone, and their appearance fresh and fair, betokens kind and loving care.

3. The fact is not so widely known, though in this letter clearly shown, that making the surroundings cleaner will greatly change a hog's "demeanor." Although the fact is likewise true, that in the Army there are few, expert enough in their profession, to rightly read a hog's expression. To tell just where the trouble lies, by contemplation of his eyes, or by the wrinkles of his snoot, might stump the average recruit. It has been claimed that hogs will thrive, amid surroundings that would drive, an animal of lofty pride, to early death and suicide; that while his belly is kept full, he thinks this cleanly stuff is "bull"; that plenty in the way of eats, his cup of happiness completes.

4. As these opinions seem to vary, concerning what is necessary, to elevate the moral tone, within the hog's peculiar zone, it is most strongly recommended, that hogs in future be attended, by men expert in reading faces, who can at once detect the traces, upon the mournful physiog, of any poor disgruntled hog, that point to mental irritation or porcine trouble or vexation.

5. Psychology is thus combined, with physiognomy refined, and just a dash of the occult, might help the ultimate result. 'Tis thought the man in charge should be, a keen and competent M.D. Who but the medical department, could have of wisdom such assortment? Who but a graduate of college could have so vast a store of knowledge? The truth is we have no such store, of learning in the Q.M. Corps.

6. The main consensus of opinion, pertaining to the hog's dominion (which is perhaps not far amiss) appears to be about like this: Despite all scientific lore, a hog remains just as before; he makes a picturesque display, when viewed from far enough away; his grunt is musical and clear, providing you are not too near; he smells serenely sweet and clean, if proper distance intervene. But notwithstanding speculation, and philanthropic meditation, and theories of demagogues, most hogs will still remain—just hogs.

Z. N. Sturman,
Captain, Quartermaster Corps.

Relation of Motor-Vehicle License To Highway Construction

An Address Given at the Louisville Meeting of the American Association of State Highway Officials, December 8-11, 1919

By S. E. Bradt
Superintendent of Highways, State of Illinois

The question propounded in the topic assigned to me is one calling for the judgment of each individual; and his answer will be governed to a certain extent by conditions existing in his own state. Therefore, what I shall say may not exactly apply to all states, but will serve, nevertheless, as a basis for discussion.

The providing of funds for governmental expenditure has been a problem in all ages. Every great emergency, such as the prosecution of war by a nation, and every great necessity, involving large expenditure and calling for largely increased taxation, has brought about new methods of providing funds. The underlying principle of taxation is that the taxes shall be levied as far as possible in proportion to the benefits received. Its practical application, however, involves levying the taxes upon those who have the money with which to pay. This is illustrated very forcibly by the revenue measures passed by Congress to meet war expenditures. Again, in levying taxes for highway improvement it must be done in a manner that will meet the approval of those who are to pay the taxes, for the reason that any extraordinary expenditure has to be approved by the people at the polls. The more nearly these three factors—(1) levying the taxes according to benefits received; (2) upon the people who have the money; (3) and with the approval of those who pay—can be merged into the plan of taxation, the more equitable and the more successful the plan will be.

We naturally come back to the oft-discussed question as to who receives the benefits from road improvement. That there is a general public benefit to our entire citizenship, applying equally to those who do not use the roads as well as to those who do, is beyond question. We are well aware of the fact that cheaper distribution by reason of good roads will mean cheaper farm products for all the people; that more readily accessible schools and churches and places of amusement will bring about a general betterment of society; that the free movement of fresh foods to the centers of population will bring better health to the communities; that better roads bring better farm conditions and more intelligent farming, which will mean increased production.

Benefits Accrue to Motor-Vehicle Users

In addition to the general indirect benefits to all the people above referred to, there are direct and pecuniary benefits accruing to the users of the road. These, as you well know, arise from a saving of time to the car owner, a saving in wear of tires, a saving in repairs and in gasoline consumption, as well as from the added life of the car itself.

What these direct benefits to each car owner will average annually is a question over which there may be considerable difference of opinion. I think I am safe in saying, however, that there are very few people who will not place these benefits greatly in excess of the license fees charged at the present time by any of the states. So long as these fees do not exceed these direct benefits the tax is just and the motorist is not being harmed.

The motor license fees in Illinois averaged approximately $5 per car in 1917. In 1918 the fees were increased to an average of about $7 per car, and in 1919 the fees will average $10 per car. This fee will produce about $5,000,000 in 1920, which has already been appropriated as follows: For maintenance, $200,000, and the remainder to be expended on Federal-aid roads in connection with Federal money. This, however, is not all that is provided for road work in Illinois. During the same period there will be raised by general taxation through county and township levies about $15,000,000, or three times the amount received from motor license fees. In other words, the motorist, because of the direct benefits he receives, will be called upon to pay $5,000,000 because of these direct benefits. I do not believe this represents the correct ratio between the direct and indirect benefits of road improvement, and am of the opinion that there is considerable room for further increase in motor fees before we reach the right proportion. The above increases, however, serve to show the evolution in legislation and the change in public sentiment toward levying a larger tax on the motor vehicle.

Motorist Willing to Pay

Let us come back to the two practical factors in the problem of taxation mentioned above—namely, getting the money from the people who have it and getting it with their consent. The motorist not only *has* the small amount of money with which to pay his annual motor license fee, but *is willing*, even *anxious*, to approve any reasonable license fee that will bring about highway improvement. More than this, he is willing to pledge the payment of these fees over a long period of years as a basis for the payment of bond issues to be used for highway improvement. As evidence of this I would call attention to the fact that in Illinois the voters approved a $60,000,000 bond issue for highway improvement by a vote of 661,815 to 154,396; with the provision that the bonds and interest would be paid entirely from the motor license fees, which required a 100% increase in those fees. Approximately one-third of the voters were motorists, and the most enthusiastic supporters of the proposition throughout the state were these motorists. I do not think that the people of Illinois differ very materially from the people of other states in their attitude toward questions of this kind. Therefore, what can be done in Illinois can be done anywhere.

For this reason I do not hesitate to say that if motorists can be assured that the money is to be expended properly they stand ready to give their approval to any reasonable, direct tax on motor vehicles for highway improvement.

I said in opening this discussion that a great public necessity which would require an unusually large expenditure often calls for a change in our method of taxation. Undoubtedly the license fees were inaugurated because of the excessive damage to the existing macadam roads by automobile traffic. The increased motor traffic made it apparent that these roads not only must be maintained, but that thousands of miles of additional roads must be surfaced. The amount of money required today to improve sufficient roads to meet the demands of public sentiment throughout the United States runs into billions of dollars. To add the amount thus required to the present heavy general taxation would undoubtedly result in failure in many of the states; but if the motorist is willing to assume a reasonable proportion of this cost through motor license fees, to go direct to road improvement or to the payment of bonds for road improvement, I believe the money can be provided as rapidly as the country can find labor, materials and transportation to carry on the work. The placing of a reasonable proportion of the cost of construction and maintenance of our highways upon the motorist is not only equitable, but will make the task of raising the money comparatively easy.

Disposition of License Fee Moneys

There has been much discussion over the question whether motor license fees should be used for construction, some people holding to the view that this fund was intended for maintenance only and should be confined to that single purpose. In Illinois a dollar looks just the same whether derived from general taxation or from motor license fees; and whether it be used for one purpose or the other, or both, is a matter to be determined by local conditions. Maintenance is absolutely essential, and if a state requires for maintenance of its roads the entire amount derived from motor license fees it is perfectly proper to devote it entirely to that end. If it requires only a part of the fees for maintenance, then why not devote the remainder to construction? Our policy should be to charge a reasonable fee somewhat in proportion to the direct benefit received and then use the money to the best advantage and where it will do the most good.

There is another phase of the problem of taxing motor vehicles; that is, that it will ultimately reach a very large percentage of the taxpaying population. Several of the states at the present time have an average of one vehicle to every 6 or 8 of the population. Illinois at the present time has one car to about every 12; but the present increase indicates that by 1923 we shall have one car to every 8. This means an average of nearly one car to a family. Therefore, while the motor license fee taxation will not be uniform as to the valuation of property, it will be fairly equivalent to a general taxation on the basis of the population.

Before closing, I wish to say that it is generally recognized that horsepower rating as a basis for motor license fees is not equitable. The man who drives his Ford car 1,000 miles in a year pays the same fee as the man who drives the same car 20,000 miles in the same length of time. The man driving the 1,000 miles should undoubtedly pay more in proportion to the mileage travel than the man driving the 20,000 miles. But his total annual tax should not be the same.

We are all waiting for some ingenious individual to work out a more equitable plan, such as a graduated gasoline tax by which each vehicle would pay a fee in proportion to its weight and the mileage driven; that is, in proportion to its actual use of the road.

In conclusion, the demand which we are now facing for highway improvement, calling for a volume of money never before dreamed of in any scheme of internal improvement, places us in a position where we shall be obliged not only to use the old-established methods of raising money, but to resort to any other equitable plan which may be devised. The raising of funds for this work by a license fee to be paid by the individual who uses these highways and receives a large direct benefit from this improvement is surely an equitable and proper source of revenue, and the benefit is so pronounced that the motorist stands ready to offer this assistance.

As has been indicated, the proportion which the motorist should pay toward highway improvement and maintenance will differ in almost every instance because of varying conditions. The proportion will to a large extent be determined by the license fees charged. If fees are based on benefits to the motorist, it is apparent that the greater the mileage improved or maintained, the greater the benefits—that is, the broader the scale of your plans the larger should be your license fees.

These matters, therefore, are for local determination in accordance with local conditions and local public sentiment.

Financial Results of Panama Canal Operation

The Panama Canal, in the year which ended June 30, 1919, earned $241,822 more than its operating expenses. The total cost of maintaining and operating the canal during the year was $6,112,194. Of this amount, $3,382,163 was for overhead charges for civil government, hospitals, quarantine, sanitation, etc. Tolls on the vessels passing through the canal amounted to $6,156,118, and revenue from licenses, taxes, fines, and profits on business operations increased this to total earnings of $6,354,016. The expenditures for maintenance and operation do not include any allowances for depreciation of the plant and equipment or any interest charges on the capital invested in the canal. The entire investment of the United States in the canal up to June 30, 1919, is $365,416,000. In addition to this, the operating expenses have exceeded the revenue to date by $4,618,690. The net earnings over operating expenses last year were about half what they were in the preceding year, the falling off being due to a decrease of about $58,000 in revenues and an increase of about $192,000 in operating expenses.

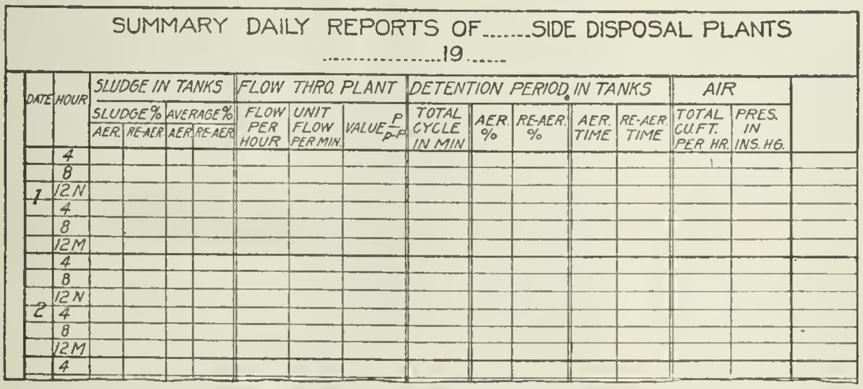
Record Forms for Activated-Sludge Plants, Houston, Texas

Carefully detailed records are being kept of the operating results of the two activated-sludge sewage-works at Houston, Texas. There are reproduced herewith one of the daily report sheets, dealing chiefly with the power plant operations for supplying air; the headings of a monthly summary of daily reports of tank operations; and the key used for distributing operating expenses under six main accounts with a total of 59 subheads.

Analytical and other data are recorded on forms not here reproduced. Daily records are platted by months on ten diagrams combined on a single large sheet. These include: (1) Air pressure; (2) sewage flow in gallons per hour; (3) air discharge in cubic feet per hour; (4) percentage of sludge in tanks; (5) hours of aëration in tanks; (6) average relative stability; (7) per cent of reduction of suspended solids and (8) of oxygen consumed; (9) nitrogen as free ammonia, nitrite and nitrate; (10) machinery record, including hours of operation of the various blowers and of the sludge pump, and also the power consumed in kilowatt-hours, the fuel oil to drive the blowers at one plant and the water used.

—-KEY FOR DISTRIBUTING EXPENSES AT ACTUATED SLUDGE PLANTS, HOUSTON, TEXAS

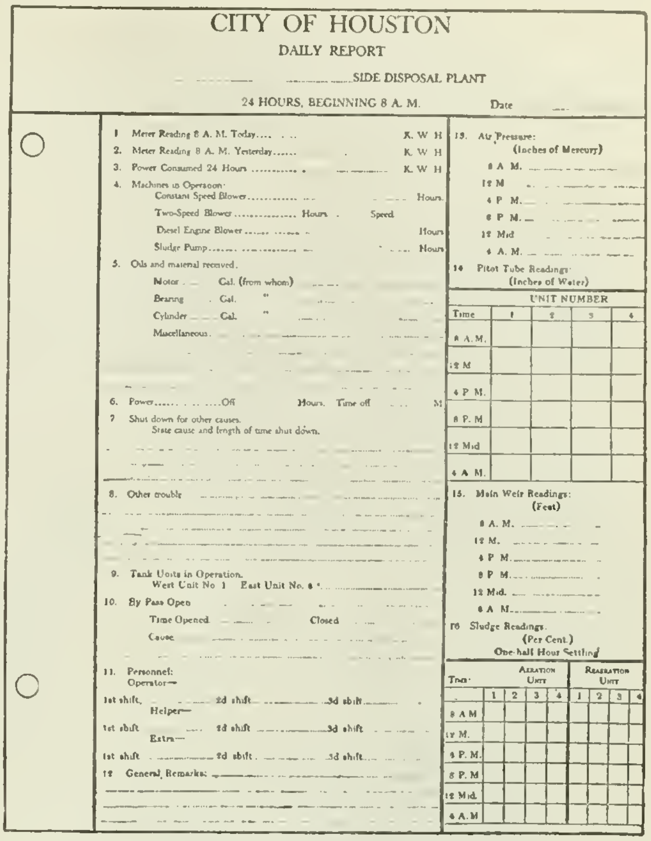
	Machinery:
A1	Constant speed motor
A2	Constant speed blower
A3	Variable speed blower
A4	Variable speed motor
A5	Oil engine blower
A6	Oil engine
A7	Sludge pump
A8	Sludge-pump motor
A9	Air compressor engine
A10	Air compressor
A11	Supplies (miscellaneous)
A12	Oil tanks
A13	New equipment
A14	Well pump and motor
A15	Gasoline pump
A16	Chain drive
	Building and Grounds:
B1	Cleaning drain ditches
B2	Maintenance slopes
B3	Painting buildings, doors, etc.
B4	Window and door glass
B5	Roads
B6	Supplies
B7	Lighting
B8	Heating
B9	Railroad track
B10	New equipment
B11	Air screen sheeting
	Concrete Tanks and Air Lines:
C1	Repair concrete tanks
C2	Repair C.-I. gates
C3	Painting air pipe and valves and repairs
C4	Filtros plate repairs
C5	Filtros plate casting repairs
C6	Water-pipe repairs
C7	Supplies (miscellaneous)
C8	New equipment (miscellaneous)
C9	Cleaning tanks
	Fuel, Power and Lubricating
D1	Fuel oil
D2	Cylinder oil
D3	Bearing oil
D4	Cup grease
D5	Electric power
D6	Water
D7	Supplies
D8	New equipment
	Regular Pay Rolls:
E1	Operators
E2	Tank attendants
E3	Supt. of sewers
E4	Office
E5	Chemist
	Laboratory and Office:
F1	Printing
F2	Phone
F3	Equipment
F4	Chemicals
F5	Sample bottles
F6	Sludge settling tubes
F7	Gasoline, oil, etc.
F8	Gages, pilot tubes, etc.
F9	Miscellaneous supplies
F10	Experiments



SUMMARY DAILY REPORTS OF ....SIDE DISPOSAL PLANTS
..................19......

DATE	HOUR	SLUDGE IN TANKS				FLOW THRO. PLANT			DETENTION PERIOD IN TANKS					AIR		
		SLUDGE %		AVERAGE %		FLOW PER HOUR	UNIT FLOW PER MIN.	VALUE $\frac{P}{P-F}$	TOTAL CYCLE IN MIN	AER. %	RE-AER. %	AER. TIME	RE-AER. TIME	TOTAL CU.FT. PER HR.	PRES. IN INS. HG.	
		AER.	RE-AER.	AER.	RE-AER.											
	4															
	8															
1	12N															
	4															
	8															
	12M															
	4															
	8															
	12N															
2	4															
	8															
	12M															
	4															

MONTHLY SUMMARY SHEET FOR ACTIVATED-SLUDGE PLANTS, HOUSTON, TEXAS



CITY OF HOUSTON
DAILY REPORT
.........SIDE DISPOSAL PLANT
24 HOURS, BEGINNING 8 A. M. Date

○

1 Meter Reading 8 A. M. Today .... K. W. H.
2. Meter Reading 8 A. M. Yesterday .... K. W. H.
3. Power Consumed 24 Hours .... K. W. H.
4. Machines in Operation:
Constant Speed Blower .... Hours.
Two-Speed Blower .... Hours. Speed
Diesel Engine Blower .... Hours
Sludge Pump .... Hours
5. Oils and material received.
Motor ... Gal. (from whom)
Bearing ... Gal. "
Cylinder ... Gal. "
Miscellaneous.
6. Power .... Off Hours. Time off ... M
7 Shut down for other causes.
State cause and length of time shut down.
8. Other trouble
9. Tank Units in Operation.
West Unit No 1 East Unit No. 8
10. By Pass Open
Time Opened ... Closed
Cause
11. Personnel:
Operator—
1st shift, ... 2d shift ... 3d shift ...
Helper—
1st shift ... 2d shift ... 3d shift ...
Extra—
1st shift ... 2d shift ... 3d shift ...
12 General Remarks:

○

13. Air Pressure:
(Inches of Mercury)
8 A. M.
12 M
4 P. M.
8 P. M.
12 Mid
4 A. M.
14 Pitot Tube Readings:
(Inches of Water)

Time	UNIT NUMBER 1	2	3	4
8 A. M.				
12 M				
4 P. M.				
8 P. M.				
12 Mid				
4 A. M.				

15. Main Weir Readings:
(Feet)
8 A. M.
12 M.
4 P. M.
8 P. M.
12 Mid.
4 A. M.
16 Sludge Readings.
(Per Cent.)
One-half Hour Settling

Time	Aeration Unit 1	2	3	4	Reaeration Unit 1	2	3	4
8 A M								
12 M.								
4 P. M.								
8 P. M								
12 Mid.								
4 A. M								

DAILY REPORT SHEET FOR ACTIVATED-SLUDGE PLANTS, HOUSTON, TEXAS

The two works have rated daily capacities of 10,000,000 and 5,000,000 gal. each. Some notes on operating experiences at the works were printed in *Engineering News-Record*, Dec. 11-18, 1919. J. S. McVea is city engineer and G. L. Fugate is principal assistant engineer in charge of sewage disposal.

Channel Improvement Brings Marine Borers Inland

Teredos have just been discovered in piling in the outlet of the Sacramento River, 20 or 25 miles farther from San Francisco Bay than ever before. Attacks on piling in wharves at Port Costa led to a study of the matter, and Southern Pacific R.R. officials have expressed the opinion that the condition may be expected to continue permanently. In this connection, engineers of the railroad company point out that although there was no appreciable tidal effect at Sacramento 10 years ago, now there is a 1½-ft. water-level fluctuation there, corresponding to a 6½-ft. tide at San Francisco. Reasons which have been suggested for this are that as the Sacramento River channel has been straightened, deepened and diked, the tide waters have been able to sweep farther inland, and that as more water has been diverted for irrigation the degree of salinity in the lower reaches of the river has probably increased. While there have been instances recorded of marine borers in fresh water, it is thought that the presence of the teredo in the Sacramento River is due to the incoming salt water.

Unique Plant Concretes Seven-Span Arch Bridge

Bulk Cement Mechanically Handled — Concrete From Central Mixing Plant Hoisted Twice and Spouted Three Times — Radial Spacer Devised for Ring Steel

By Arthur Richards and Warren Carmichael
Bridge Engineer Engineer

CO-ORDINATION of equipment and correlation of operations have been developed with particular care in constructing the Broad St. bridge over the Scioto River at Columbus, Ohio. A central mixing plant, from which concrete is hauled in hopper cars by a locomotive to a traveling tower, places all concrete in a 679-ft. seven-span arch bridge by direct chuting. All operations are mechanical, from the unloading of the bulk cement cars and the gating of sand and gravel direct from stock piles, until the concrete is spouted into the forms. At no time in an active construction program has it been necessary to stop the mixer because any other plant unit has fallen behind schedule, and in concreting arches continuous runs of from 40 to 50 hours have been required.

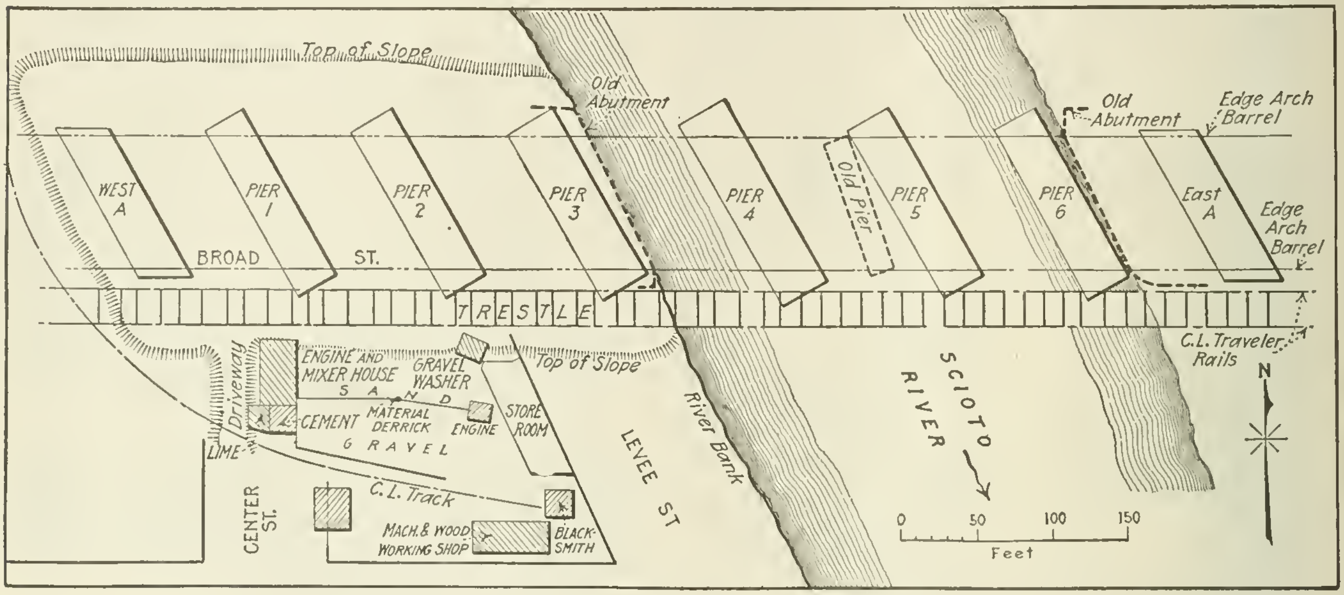


FIG. 1. PLANT LAYOUT FOR CONSTRUCTING BROAD STREET BRIDGE, COLUMBUS, OHIO

As shown by the plant layout plan, Fig. 1, the Broad St. bridge is on a skew of 30°. It is a part of the improvements involved in widening the Scioto River to reduce the flood danger to the City of Columbus, and it is a barrel-arch structure, with seven solid spandrel spans, two abutments and six piers. The length between faces of abutments is 679 ft. and the width over parapets is 87 ft. 8 in. The center span is 105 ft. and the spans on each side are 97 ft., 88 ft. and 78 ft. The foundations are in gravel overlying hardpan on bedrock, and consist of wide concrete footings in the gravel and without piles.

Substructure Construction

All foundations were constructed in steel sheet pile cofferdams, and in general involved methods commonly used; the methods being special to the conditions in a few details only. At the east abutment, due to distortion of the sheet piles by boulders, water in considerable volume came through the walls near the bottom and also up through the gravel bottom of the pit. The remedy for this was to build a form to the height of the footing slab about 6 in. inside the steel sheeting. Then on the gravel bottom 6 x 4 x 2-ft. stones from the old bridge abutment were placed so as to clear each other from 6 to 12 in. The concrete was poured on and between these stones, so that as the pouring proceeded the water was driven to the annular space between the form and the sheeting, whence it was removed by a 6-in. pump. Practically no wash of the concrete occurred. The abutment footings being on a slope, an effect of the use of the stones was the prevention of any flow of the wet concrete.

Under pier No. 4 there was a coarse, gray sand

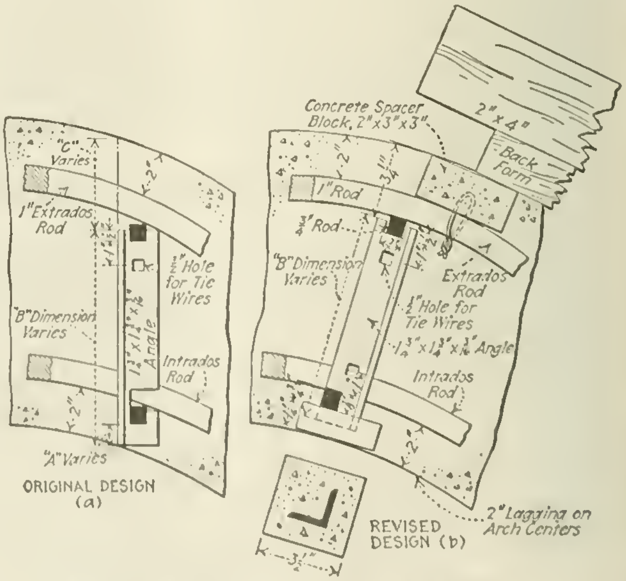


FIG. 2. METHODS OF SPACING ARCH-RING REINFORCEMENT

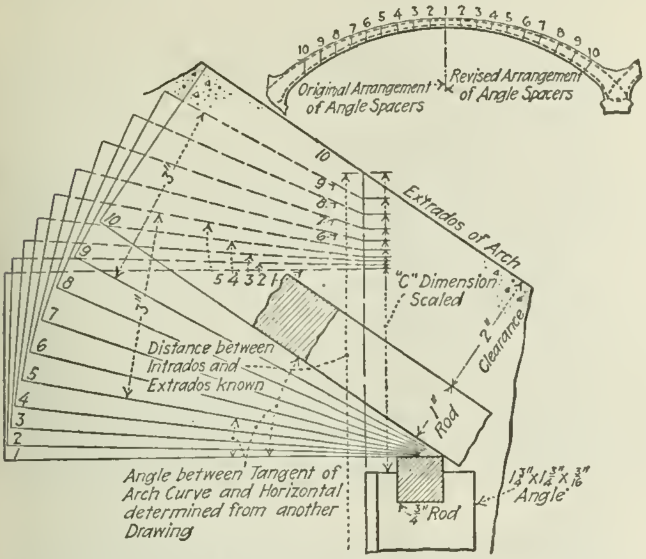

10 9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9 10
Original Arrangement of Angle Spacers
Revised Arrangement of Angle Spacers
Extrados of Arch
10
9
8
7
6
5 4 3 2 1
"C" Dimension Scaled
2" Clearance
3"
3"
Distance between Intrados and Extrados known
1" Rod
Angle between Tangent of Arch Curve and Horizontal determined from another Drawing
1¾"x1¾"x$\frac{3}{16}$" Angle
¾" Rod
10
9
8
7
6
5
4
3
2
1

FIG. 3. GRAPHIC METHOD OF DETERMINING LENGTHS OF SPACERS

through which the water boiled in such quantity as to make it hazardous to lower the level below the sand, because of danger of a blowout under the sheeting. Here forms were built inside the sheeting, as was done at the east abutment, and a 2-ft. bed of concrete was deposited in water over the entire bottom inside the form. Most of the flow was in this way forced to the annular space between the form and the sheeting, and in the few cases where the larger boils continued to rise through the concrete they were left unchecked until stopped by the footing concrete. A test of the bearing power of this sand foundation was described in *Engineering News-Record* of July 31, 1919, p. 208.

ARCH CONSTRUCTION

The arches are concreted as monoliths, the average volume of concrete being 1,200 cu-yd. for each. After the steel is in place on the center, the back forms are constructed up the arch, 6 ft. at a stage, using 2 x 16-ft. panels. Concrete is poured for two hours on one side, then operations are shifted to the other side for two hours. This procedure keeps the concrete green and gives the carpenters time to keep the back forms constructed ahead. At the crown of each arch, for about 25 ft., the concrete is placed without forms by the use of a mixture with less water.

Interesting experience has been developed in spacing reinforcement and holding the back forms in position. To maintain the proper distance between intrados and extrados reinforcement, angle spacers are used. The construction of these spacers for the first two arches is shown by Fig 2 (a). They are set 4 ft. apart along the arch and 6 ft. apart across the arch. Because of the curves of intrados and extrados, and because the spacers were set vertical, two dimensions *A* and *C*, not including the length *B* of the spacer, varied for each transverse set of spacers. Fig. 3 shows the graphical method adopted to determine these variables. In addition to the task of computing and checking *A* and *C*, this form of spacer proved objectionable from a construction viewpoint. The angle indents into the arch lagging and projects from the intrados when the centers are removed, involving either a rust spot or chipping and plastering. Also, because of the small bearing areas of the spacers nearer the haunches, excessive wiring is required to hold them in place, and this interferes with placing the concrete.

To remedy the difficulties experienced with the form of spacer shown by Fig. 2 (a), the arrangement shown by Fig. 2 (b) was devised. This design prevents the angle from touching the intrados forms; eliminates the two variables *A* and *C*, and, because of the radial position of the spacer, provides a firm bearing which necessitates only very little wiring. By wiring the concrete spacer block, as shown, to the extrados reinforcement, the back forms are held 2 in. from the steel without using struts which obstruct the concreting and when removed often permit the back forms to drop and squeeze out the green concrete.

CONSTRUCTION PLANT

During the pouring of an arch the construction force consists of two crews which work 12-hour shifts, and the time to run an arch varies from 40 to 50 continuous hours. When the concrete plant is operating properly, which is most of the time, it averages about 33 cu.yd. per hour, the time being divided as follows: Sixty sec. in the drum; 20 sec. for dumping; 10 sec. return of drum; 20 sec. charging drum; or 110 sec. total time per batch of 1 cu.yd. The correlation of the various units which comprise the complete concrete-handling

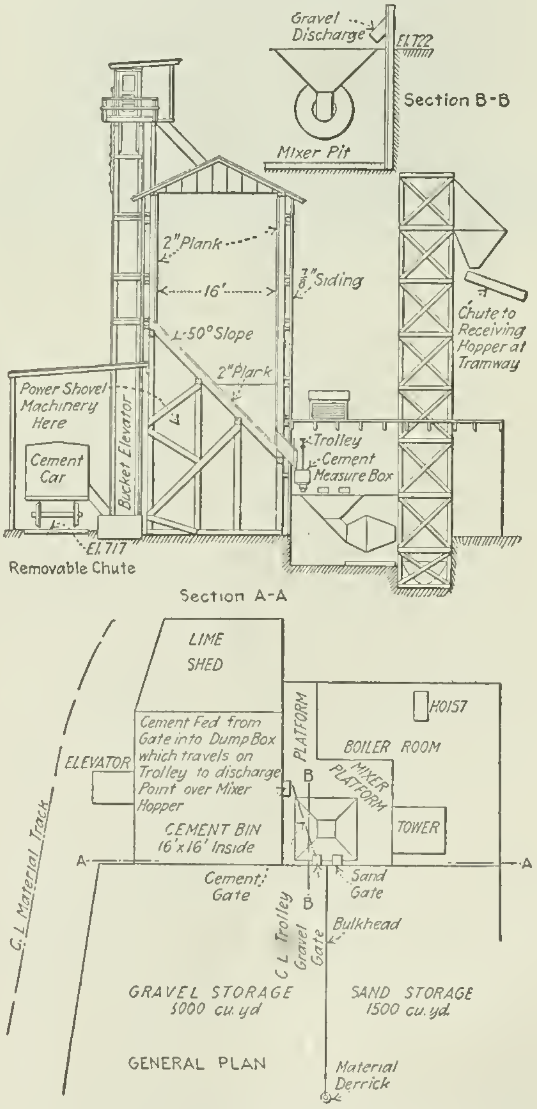


FIG. 4. DIAGRAM OF LAYOUT OF THE MIXING AND MATERIALS PLANTS

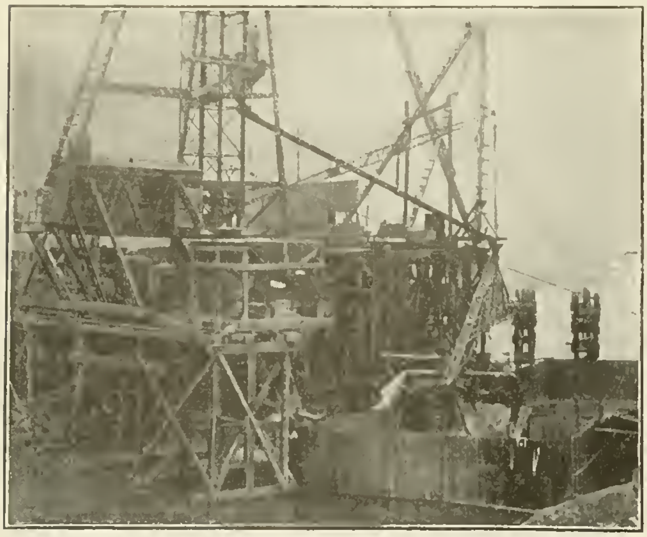


FIG. 5. CONCRETING A RIVER PIER

plant is excellent; at no time has it been necessary to stop the mixer on account of any of the other units falling behind the schedule.

Bulk Cement Mechanically Handled—Bulk cement is used, and the cement bin, Fig. 4, with its loading, storage and unloading features, has proved to be entirely satisfactory and economical in its operation. The bin has a capacity of 1,600 bbl., is 16 ft. square and 45 ft. high inside, and is constructed with a double wall to protect the cement from the weather. The floor has a 50° slope, the part near the discharge point being covered with sheet-iron plate to facilitate the movement of the cement.

The cement is unloaded from cars by an automatic electric car shovel, and is dumped directly into an elevator boot, from which it is conveyed by a bucket elevator to the top of the bin. It is taken from the bin through a vertical slice gate, and falls into a measuring box which is suspended from an I-beam trolley. The box is then pushed on the trolley for about 4 ft., and its contents are discharged into the mixer hopper. The box is in two sections, the lower one being for the hydrated lime and the upper one for the cement, the contents being released by the withdrawing of a horizontal sheet-metal gate which is located in the spout at the bottom of the box. In determining the size of the box, it was found that the volume of the cement as it came from the bin exceeded the theoretical volume, using the weight of cement as a basis, and the size of the box was increased to allow for the difference.

Aggregate Gated from Stock Pile—The method of handling sand and gravel from the storage piles to the mixer is somewhat out of the ordinary, has proved to be very economical and satisfactory, and is recommended where the topography will allow. The mixer is placed in a pit deep enough to bring the top of the charging hopper level with the elevation of the natural ground. A bulkhead is built near the edge of the hopper, and a division wall constructed at right angles to the bulkhead to separate the sand from the gravel in the storage yard. On each side of the division wall the bulkhead contains a gate through which the sand or gravel is passed to the charging hopper of the mixer. A derrick and clamshell for handling the sand and gravel takes these materials from the cars and dumps them on their respective sides of the division wall, and as the materials are being used in making concrete the derrick takes from the storage piles and dumps against the bulkheads, where the gates pass the materials to the mixer hopper.

This arrangement possesses an advantage over the overhead-bin type (1) in the cheaper construction cost and (2) in the fact that a breakdown in the material derrick cannot stop the concreting operations, as the material can be shoveled or moved in wheelbarrows to the gate openings.

Concrete Mechanically Distributed—One man controls the mixer, the aggregate-charging gates and the water. From the mixer the concrete is dumped into a bucket, is elevated by the plant tower and discharged into a chute which leads to a 2-yd. storage hopper, and from this hopper is discharged into two hopper cars which are hauled to the main tower which travels on the tramway.

The tramway extends along the entire site of the bridge and is located so as to clear the pier footings. It is constructed like an ordinary railroad trestle; carries a double-track narrow-gage railroad system over which operates a dinky engine and cars and which serves both as a medium for general hauling and for the transportation of mixed concrete; the tramway also carries the tracks for the traveling concrete tower. This tower consists of a 75-ft. quick-shift steel tower mounted in a wood frame, and is so constructed that the entire unit is stable when under load, requires no guying and may be moved on its own wheels by the dinky engine to any point on the tramway. The base of the tower is 36 ft. long, and the wheels operate on a 23-ft.-gage track. It is equipped with a steel boom and counterweight truss chute and has an effective operating radius of about 100 feet.

At the tower the concrete is discharged from the hopper cars into the tower bucket and is raised by an electric hoist to a tripping shoe which dumps the concrete into the final hopper, from which it flows through a gate into the final distribution chute. The truss chute can be raised or lowered so as to discharge the concrete mix from El. 700 to El. 740, and its flexibility

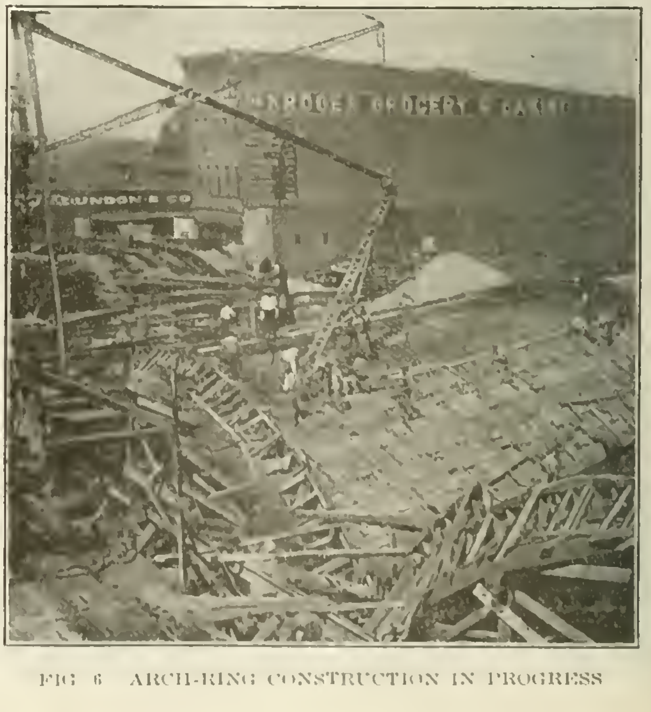


FIG. 6 ARCH-RING CONSTRUCTION IN PROGRESS

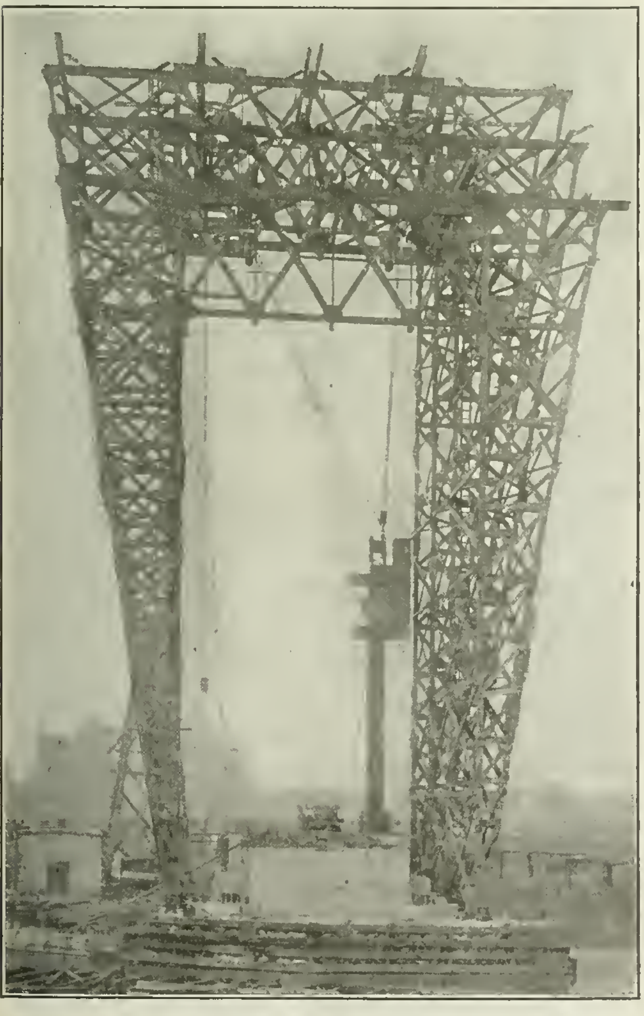
of vertical and horizontal motion allows for the placing of the concrete in all parts of the bridge structure without the expense of constructing costly additional chutes.

Gravel Mined on Job—As the material excavated from the piers consists of first-grade sand and gravel, a small plant was installed to crush, wash and screen the material, and inasmuch as the latest approved methods were incorporated in the plant, the sand and gravel produced has been exceptionally good.

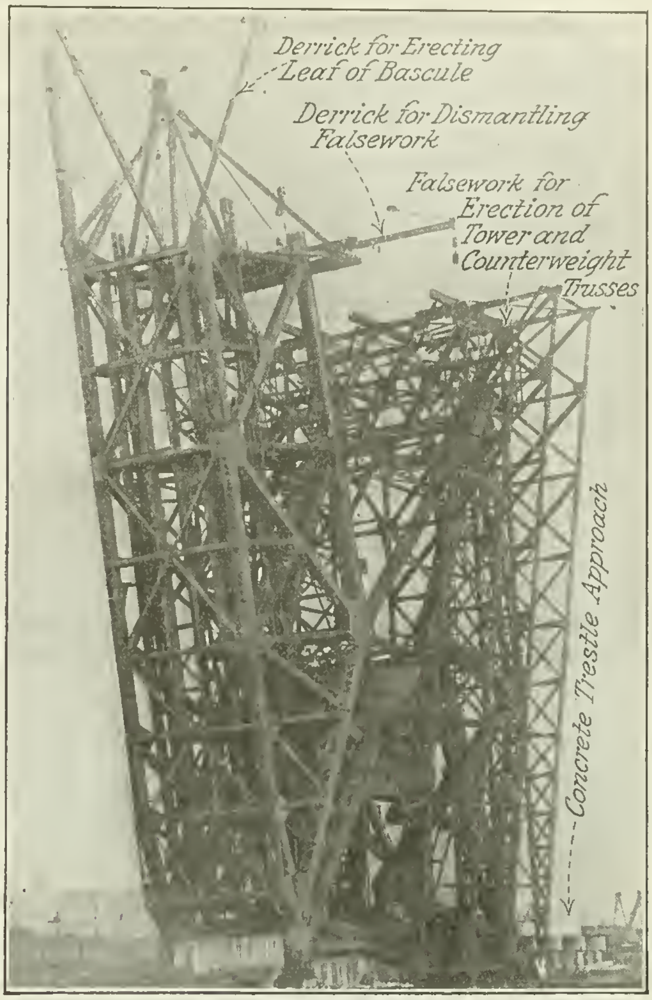
The bridge is being erected by the Carmichael-Cryder Co., of St. Louis, H. M. Cryder of the firm being directly in charge of the construction, with Charles Gove as superintendent and Warren Carmichael as engineer. It is being built for Franklin County, Ohio, under the supervision of the county engineer's office. Curtis C. Lattimer is the county engineer and Arthur Richards is the bridge engineer.

High Gantry Used for Handling Heavy Members of Large Bascule

A NEW departure in erecting bascule bridges was the use of timber falsework or a fixed gantry at the 260-ft. single-leaf double-track Strauss bascule bridge over the Chicago River for the St. Charles Air Line R.R., as shown in the accompanying views. This method was adopted by the contractor on account of the weights to be handled, the heaviest single pieces being the 70-ton rear sections of the bottom chords of the counterweight trusses with their trunnions.



GANTRY 168 FEET HIGH FOR ERECTION OF CHICAGO RIVER BASCULE BRIDGE


Derrick for Erecting Leaf of Bascule
Derrick for Dismantling Falsework
Falsework for Erection of Tower and Counterweight Trusses
Concrete Trestle Approach

BASCULE LEAF CARRIES DERRICK USED IN ITS ERECTION

This gantry consisted of four bents spaced 20 ft. on centers and carried on tracks 52 ft. apart at an elevation about 14 ft. below that of the railway tracks. Its extreme height was 168 ft. for the two rear bents and 118 ft. for the forward bent. Needle beams at right angles to the bents carried four sets of blocks and falls which were suspended approximately over the main and counterweight trunnions. The blocks were rigged in pairs on each side of the gantry, each pair being served by a hoisting engine located on the ground in the rear. The fixed tower, the counterweight trusses and links and that part of the moving leaf below the rear hip joint, were erected by means of the gantry.

In the erection of the remainder of the moving leaf a derrick was used, mounted upon it and shifted up as the work progressed, this being the more general method employed in building bridges of this kind. The derrick consisted of an A-frame traveling in timber guides bolted to the main trusses about midway between the chords and supported by timbers extending to the masonry below. The guides and supporting timbers were extended upward as the derrick was raised with the erection of the span. The forward boom handled the material for the floor system and bottom chord, which material was delivered on a barge. A rear boom handled material for the top chord and lateral system, part of this material being delivered on cars at the rear of the work. Both booms were used in placing the web members of the main trusses.

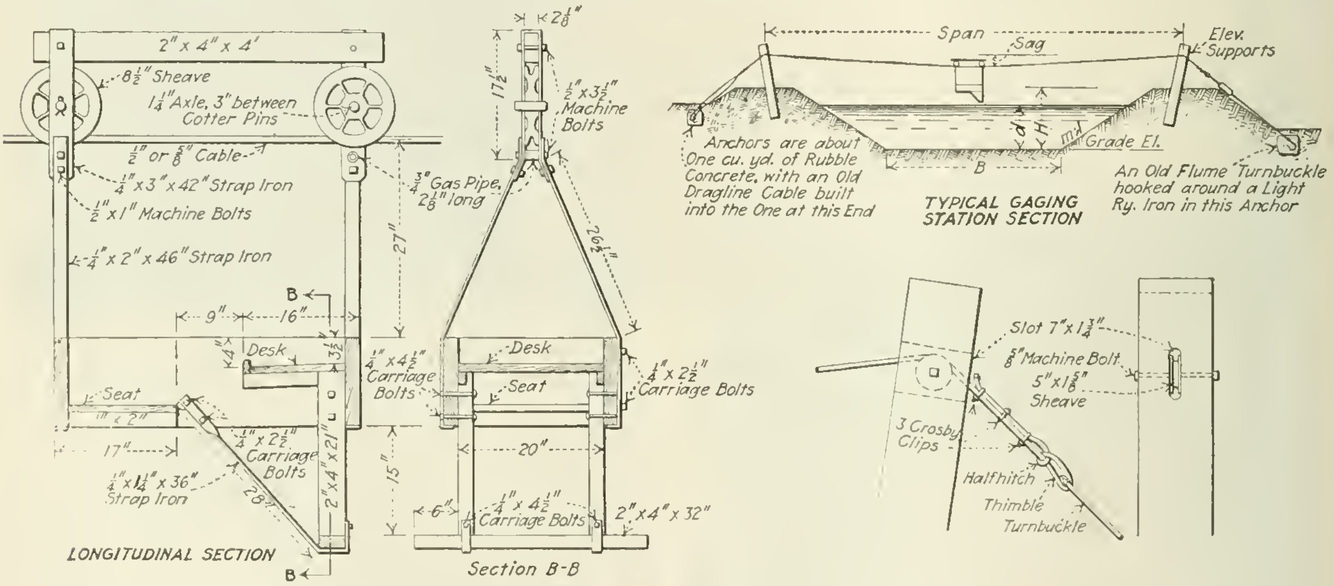
For taking down the gantry, a stiff-leg derrick was mounted on blocks bolted to the top chord of the bascule at about half the height of the open leaf. As this work progressed, the gantry was moved forward within reach of the derrick boom.

The Ferro Construction Co., Chicago, was the contractor for erection. This bridge was designed and built under the direction of A. S. Baldwin, formerly chief engineer (and now vice-president), and F. L. Thompson, present chief engineer, Illinois Central R.R., with Maro Johnson, assistant engineer, in direct charge of the work.

Car for Current-Meter Gaging Stations

By George Henry Ellis
Fairfield, Mont.

When using a current meter in a stream too deep to be waded, the instrument must be suspended from some support above the water. A bridge is used when convenient, sometimes a boat is used, and often a car is suspended from a cable stretched across the stream.



CAR FOR CURRENT-METER GAGING STATIONS

The United States Geological Survey has developed a standard car for this purpose. It is designed to carry two men and is described in the bulletins of the Survey. The writer, when assigned to the measurement of water in the canals of an irrigation project, figured out a design for a one-man car. Two of these cars were installed on the Shoshone project of the United States Reclamation Service in 1911. When later assigned to similar work on another project, he looked up his old design and after a few improvements placed it on the accompanying drawing. Six of these cars were installed on the Sun River project in 1917, and two more in 1919.

In building these cars, the cables and iron work were practically the only new material used. Even the cement in the anchors had been charged to other work and left over. The nearest sand and gravel was used, whether clean or not, as no strength was required, only weight. The short cables in the left anchors had been discarded by the draglines which built the canal. Their long ends were wound among the plum rock to form part of the aggregate. The heavy 1¼-in. turnbuckles in the other anchor were salvaged from other work. The short pieces of light rail which these hooked around were probably superfluous, but they were scrap, and at least made good aggregate. A wornout plow point was used for one of these. The poles were short pieces cut from cull transmission-line poles. The lumber was all second-hand.

The gages for these permanent stations are 4 x 6-in. timbers set in the sloping bank of the canal at 90° with the center line. They were graduated with an engineer's level and marked with brass tacks. Zero of the gage was set at the theoretical bottom grade of the canal.

The elevations of the poles supporting the cables were determined from the bottom grade by adding the water depth, a small clearance—the height of the car, 4½ ft.—and the computed sag. To determine this sag readily a diagram was prepared from a formula by Mr. Stevens, published in *Engineering News* of May 6, 1909. Half-inch rope was used on the two shortest spans, and ⅝-in. on all others.

Salaries for Sacramento Filtration Staff

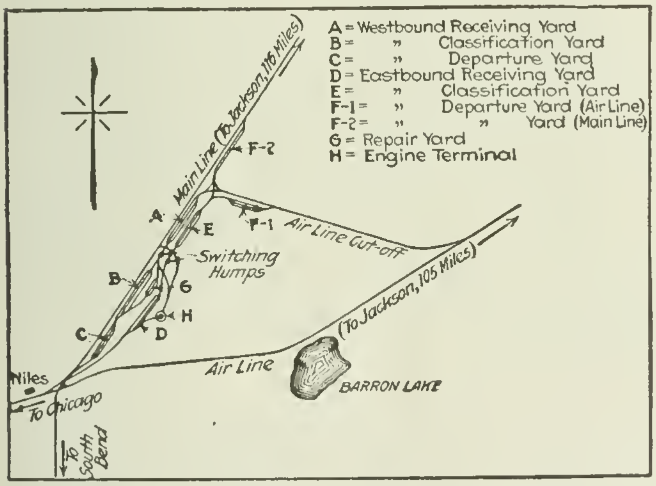
Design and construction of the Sacramento filtration plant is to be under a well paid staff of engineers. By recent ordinance creating the staff no engineer is to receive less than $1800. The schedule is as follows: Consulting engineer in chief, $50 per day plus expenses when actually employed; assistant consulting engineers, salaries to be fixed at time of employment; resident engineer, $6500; assistant hydraulic and filtration engineer, $5000; assistant structural engineer, $5000; assistant mechanical and electrical engineer, $5,000; office engineers, $3600; special assistant engineers, $3000; special chemist and bacteriologist, $15 per day and expenses; designers, $2700; draftsmen, $2400; assistant draftsman, $1800; field engineers, $3000; surveyors, $2700 junior field assistant, $1800, and engineering inspectors, $2400.

Gravity Freight Yard for Michigan Central Railroad

New Site for $4,000,000 Yard at Niles, Mich., Permits Free Design — Switching Humps Have No Scales — Engine and Car Facilities

NEW freight yards and engine terminals now being constructed by the Michigan Central R.R. at Niles, Mich., 93 miles from Chicago, will not only afford improved facilities for handling heavy traffic but will provide a change in operating conditions by the establishment of Niles as a new division point. The present division point is at Michigan City, Ind., 56 miles from Chicago, but the facilities here are old and inadequate and will be abandoned entirely. Thus the design and construction of the new facilities have not been hampered by any existing works on the site.

In the general design or layout a governing influence was the special condition imposed by the fact that Niles is a junction of two lines forming a loop between Jackson and Niles. This will be understood by reference to the accompanying sketch map. The "main line" or north side of the loop is 116 miles in length while the "air line" on the south is 105 miles. Through passenger service between Detroit and Chicago, 283 miles, is operated over the northern route, which serves a number of large cities; with these trains there is only one change of engines, this being at Kalamazoo, 142 miles from Detroit.


A = Westbound Receiving Yard
B = " Classification Yard
C = " Departure Yard
D = Eastbound Receiving Yard
E = " Classification Yard
F-1 = " Departure Yard (Air Line)
F-2 = " " Yard (Main Line)
G = Repair Yard
H = Engine Terminal
Main Line (To Jackson, 116 Miles)
F-2
A
E
F-1
Air Line Cut-off
Switching Humps
B
G
H
C
D
(To Jackson, 105 Miles)
Air Line
BARRON LAKE
Niles
To Chicago
To South Bend

NEW FREIGHT YARDS, ENGINE TERMINAL AND CUT-OFF ON MICHIGAN CENTRAL R.R. AT NILES, MICH.

For freight trains, the line is operated in three divisions, engines being changed at Jackson, 74 miles, and at Michigan City, 153 miles by the "main line," and 142 miles by the "air line." When the new facilities are completed the change will be at Niles, 116 and 105 miles from Jackson by the two lines respectively. At present there are about 20 through freight trains eastbound and the same number westbound per 24 hours. Nearly all trains are broken up here for classification, only a few eastbound fast-freight trains being excepted. All traffic is general freight, with no preponderance of any particular commodity.

The special operating conditions which influenced the yard design, as noted above, may be explained briefly as follows: Through freight trains were handled mainly over the "air line" until the double tracking on the "main line" in 1905, since which time this has been used largely for westbound through freight, leaving the single track "air line" for eastbound through freight. This latter is the heavier movement and is operated in standard full-load trains of about 3000 tons or 90 cars. When double-tracking is extended over this line it is probable that practically all through freight trains will be handled over the "air line." No facilities for cattle, for icing refrigerator cars or for transferring and consolidating less-than-carload freight are required at this point.

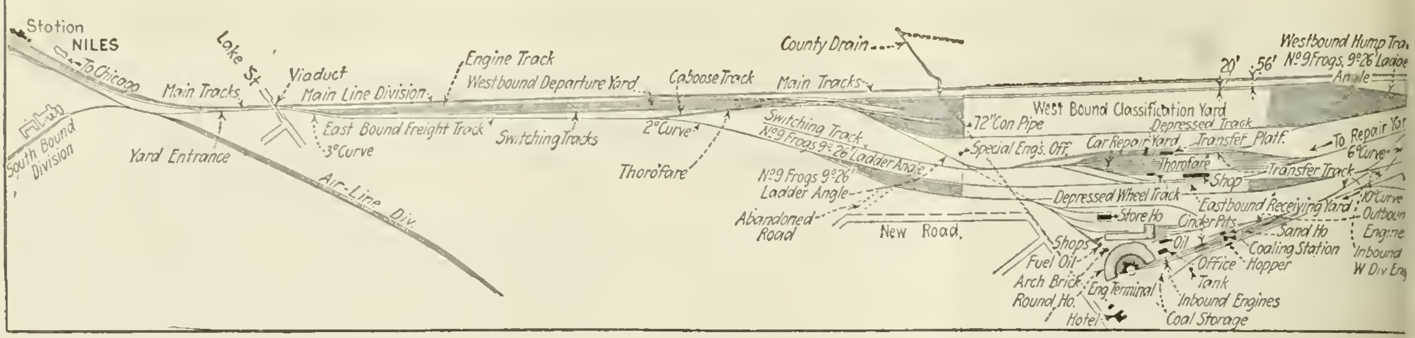
For the entire line between Chicago and Detroit, the established ruling grade is 20 ft. per mile eastbound and 25 ft. per mile westbound, although a few steeper grades still exist. On the main line there is only about a mile of 20-ft., maximum grade, this beginning near the station at Niles. On the "air line," however, there is about a 3-mile grade of 40-ft. per mile, extending from Niles to Barron Lake, so that eastbound through freight trains required the use of pusher engines for this distance. To avoid this long and relatively heavy grade against standard trains a four-mile cut-off is being built, connecting with the main line about four miles east of Niles, as shown on the sketch map. When this is completed the old line may be used only for switching purposes and for access to the ice houses at Barron Lake.

GENERAL LAYOUT OF YARD

The new yards and other facilities are located parallel with and on the east side of the main line from Niles to the junction of the "air line" cut-off. They will comprise westbound receiving, classification and departure yards arranged in tandem. The eastbound receiving and classification yards also will be in tandem, but followed by two separate departure yards on the main line and air line respectively. Classification will be done by gravity switching over two humps. In addition, there will be a car repair yard and an engine terminal with repair shops. The total length between end switches is 4.73 miles and the site has an area of about 560 acres.

It was intended at first to provide simply a modern substitute for the present obsolete facilities at Michigan City. In view of the heavy and increasing traffic, however, it was decided that real economy would be secured by designing such a yard as would meet the requirements of the near future and then building a sufficient part of this to take care of present conditions. The plan on the next two pages shows the complete layout, with certain temporary connections necessary for the operation of the first unit, particulars of which are outlined further.

For westbound traffic, the arrangements are as follows: Inbound trains enter a receiving yard having eight tracks, with space reserved for eight more. From this the trains will be passed over the hump and the cars switched by gravity into a classification yard having 28 tracks, with space reserved for 14 additional tracks. Beyond this is the departure yard, with four tracks, in which outbound trains will be made up ready for the road engines. For eastbound trains, the receiving yard will have eight tracks, with space for double the number; the classification yard will have 24 tracks



PLAN OF FREIGHT YARDS AND ENGINE TERMINAL FOR NEW

and space for 34, while the two departure yards will have twe and three tracks for the main line and air line divisions respectively. Departure tracks will not be equipped with air pipes for testing brakes.

TRACK AND SWITCHING HUMPS

The length of yard tracks will be about 4200 ft. for receiving and departure yards, while 4000 ft. is the minimum for classification yards. As the overall length of cars averages about 42 ft. this gives each track a capacity of at least 100 cars, which is the maximum train length, the average being about 90 cars. Body tracks in the yards have the arrangement of an alternate spacing of 13 and 15 ft., instead of a uniform spacing, to afford wider spaces for car inspectors and car checkers, besides providing for temporary piling of snow and track material. The spacing from main tracks and running tracks to the nearest yard track is 20 ft. on centers.

Ladder tracks will have an angle of 9°, 26′ and will be equipped with 15-ft. switch rails and No. 9 frogs. By using the Torrey system of switch layouts, with a lead of 72.43 ft. for such frogs, this arrangement gives a distance of 13 ft. between the point of frog and the next headlock or switchpoint, as shown in the detail drawing. No curve sharper than 7½° is allowed for full train movements and no curve in the entire yard system will exceed 10°. All tracks will be laid with 80-lb. rails. Slag ballast will be used for main tracks and gravel for yard tracks.

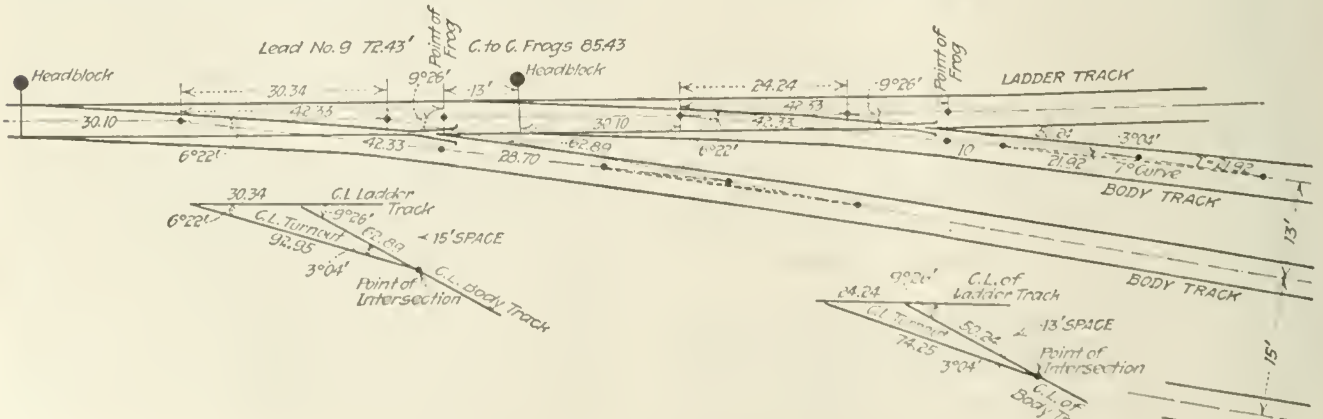
Hand operation of switches will be used for the classification yards. Car riders will be returned from these yards to the humps by gasoline motor cars or steam locomotives. For night work, electric "flood" lights will be placed on the hump, at the east end of the westbound receiving yard and at the west end of the classification yard. There will be several lights at each location, so that beams may be cast through the length of the several yards. They will be mounted on masts about 65 ft. high.

Profiles and grades of the switching humps will conform to the recommendations of the American Railway Engineering Association, except that operating conditions with the first unit and its hump will require lower elevation and flatter grades, as noted below. The accompanying table gives the profiles for the humps in this yard and in the new Markham yard of the Illinois Central R.R. at Chicago, as described in *Engineering News-Record* of Aug. 5, 1918, p. 313.

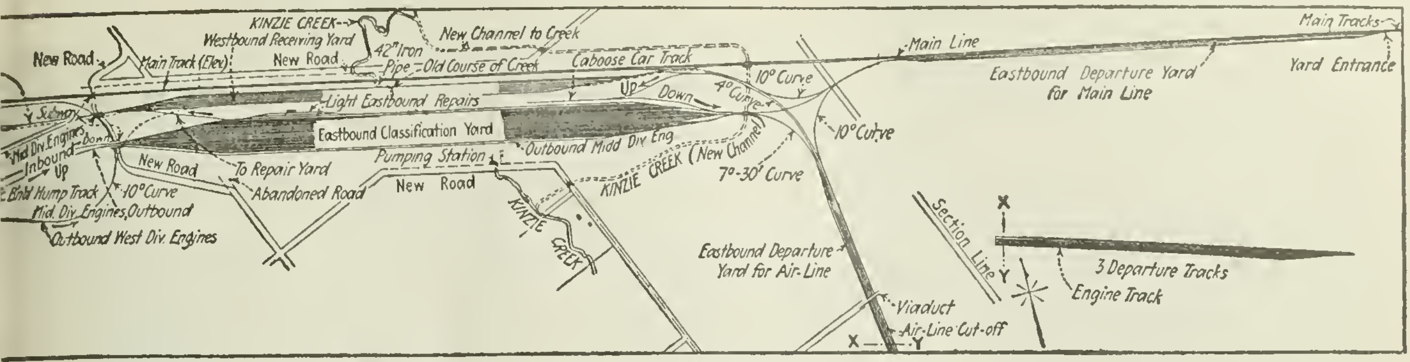
Vertical curves for changes in grade on the humps have been made as easy as practicable, with lengths usually not less than 50 ft. Where a longer run is available and entails no great additional expense these curves are made several hundred feet in length, as at the ends of the yards away from the hump and on the

PROFILES OF HUMPS FOR GRAVITY SWITCHING

Michigan Central R.R.		Illinois Central R.R.	
Niles Temporary	Niles Permanent	Markham Northbound	Markham Southbound
Approach Side: Up Grades			
From 0.2%	2800 ft. of 1%	1900 ft. level	2700 ft. of 1%
400 ft. of v. curve	60 ft. of v. curve up to rate of 1.67%	150 ft. of v. curve	150 ft. of v. curve
100 ft. of 0.5%		300 ft. of 2%	1100 ft. of 2%
200 ft. of v. curve	....	150 ft. of v. curve	150 ft. of v. curve
450 ft. of 1%	....	....	....
80 ft. of v. curve	....	....	....
440 ft. of 2.5%	....	....	....
Summit			
100 ft. of v. curve	60 ft. of v. curve of 1600 ft radius	75 ft. level*	75 ft. level*
Gravity Side: Down Grades			
....	....	150 ft. of v. curve	150 ft. of v. curve
30 ft. of 4%	60 ft. of 2%	150 ft of 3%	400 ft. of 3.5%
100 ft. of v. curve	40 ft. of v.c., 2000 ft. rad.	150 ft. of v. curve	150 ft. of v. curve
150 ft of 2%	50 ft. of 4%	400 ft. of 4%	450 ft. of 1 5%
250 ft. of v. curve	150 ft. of v. curve	150 ft. of v. curve	150 ft. of v. curve
Through Ladders and Yards: Down Grades			
3000 ft. of 0.5%	1300 ft. of 1%	1000 ft. of 1%	800 ft. of 0.75%
....	2100 ft. of 0.5%	....	....



TYPICAL LAYOUT OF LADDER TRACKS AND SWITCHES



DIVISION POINT OF THE MICHIGAN CENTRAL R.R. AT NILES, MICH.

main track of the new cut-off line. All vertical curves are figured as parabolas. No track scales will be placed on the humps as there is little weighing to be done at this point. Cars needing to be weighed will be passed over the hump to a track from which they will be taken to the yard scale later.

Caboose cars of trains coming in at the west end will be switched onto a single track connecting with the ladder of the rear end of the departure yard. At the east end, these cars will be switched on an ascending grade to a stub track, from which they can be passed down the same grade to trains on either of the two departure yards.

ENGINE TERMINAL AND CAR REPAIRS

A car repair yard located between the westbound classification and eastbound receiving yards will have eight tracks of 1400 to 1900 ft. clear length. These will be spaced alternately 20 ft. and 22 ft. on centers with a standard gage track in each 22-ft. space for a lorry or material car. Other facilities of this yard will include a material supply track and a depressed track for loading and unloading wheels. One track alongside a transfer platform will serve for shifting freight from damaged cars that cannot be forwarded without heavy repairs, the freight being reloaded into other cars on the same track. A depressed transfer track will facilitate the shifting of bulk freight directly from crippled cars into other cars.

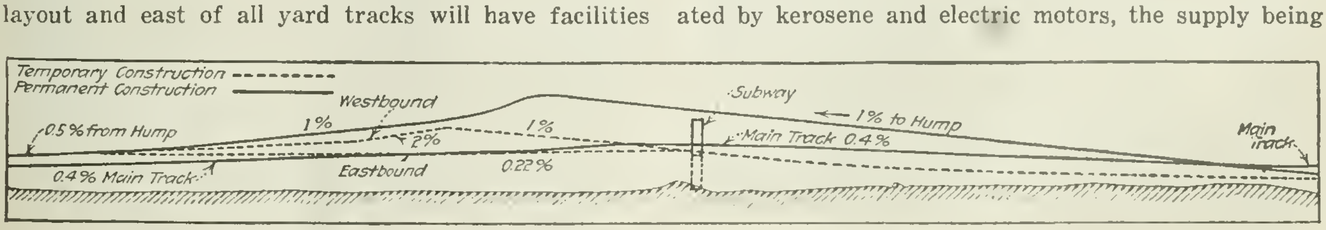
Cripple tracks from the westbound hump will enable cars to be switched directly to the repair yard instead of moving to the classification yard. In eastbound trains, the crippled cars will pass over the hump to a set of three repair tracks on the west side of the classification yard for light repair work and for the repair of cars of fast-freight lines. Eastbound cars needing heavier repairs will be held until a track is full and the train of cars then switched across to the westbound tracks and moved back to the main repair yard. Car repair tracks will be equipped with compressed air piping for the operation of pneumatic tools and for testing brakes.

An engine terminal located at the south end of the layout and east of all yard tracks will have facilities for handling, cleaning and coaling 60 engines daily, including the hump engines and yard switching engines, which latter will be few in number. Engines of eastbound trains can move directly from the receiving yard onto a lead track and then back directly onto this terminal, while from it they can go directly to the two eastbound departure yards. Special arrangements are required, however, for connection with the westbound yards. A track from the receiving yard passes under the humps and so enables inbound engines to reach the terminal without interference with switching movements. A semi-circular loop track of 10 deg. also passes under the humps and gives outgoing westbound engines access to the departure yard without interfering with eastbound trains pulling up the 20-ft. grade into the receiving yard. Inbound engines from the west, instead of going to the roundhouse, can take coal and water and pass directly over this loop to the departure yard and take outbound trains for the west if necessary.

A reinforced-concrete roundhouse 100 ft. deep will have stalls for 30 engines and a through approach track at the west side for emergency service. Space is provided for extending this building to provide 56 stalls and five approach tracks. An electrically operated 100-ft. turntable will be located 100 ft. from the house, being served by a three-track approach having two tracks for inbound engines and one for outbound engines. Provision is made for a second outbound track on this approach, all four tracks being served by a coaling station with a 600-ton bin spanning three tracks.

A cinder pit 125 ft. long, having a depressed track in the middle for cinder cars, serves the two inbound tracks. A sand storage and drying house is adjacent to the coaling station and connected to it so that engines can take coal and sand at the same time. Space for coal storage piles is provided, the coal to be moved to a hopper which feeds the elevating conveyor of the coaling station. Ample emergency facilities for turning locomotives are provided by the Y-tracks at the east end of the yard and the loop for outgoing westbound engines.

Water for the engines will be pumped to a 100,000-gal. elevated steel tank by duplicate equipments operated by kerosene and electric motors, the supply being



PROFILES OF TEMPORARY AND PERMANENT HUMPS FOR GRAVITY SWITCHING taken from Kinzie creek which is fed largely by springs and affords a constant supply of soft water that can be used without treatment. Drinking water from wells will be furnished to the buildings, but the wells have not sufficient capacity for the engine supply. Water columns for supplying the engines are located 100 ft. beyond the cinder pits, towards the roundhouse; one water column is provided also on the emergency approach track, about 200 ft. from the roundhouse. Near the west end of the westbound receiving yard will be a water column for convenient supply of the hump engine, but it is not expected that a similar arrangement will be necessary for the eastbound receiving yard, as this is near the engine terminal.

Adjacent to the roundhouse will be an engine repair shop 60 x 483 ft., containing a machine shop and a blacksmith and boiler shop; also an erecting shop 100 x 140 ft. with capacity for six engines. Space is provided for enlarging the building to double this capacity. Other buildings will include a storehouse, oil house and office. All of these will be of brick, with a steel roof for the repair shop. A brick hotel will provide accommodation for enginemen and trainmen whose homes are at the other end of the division. In the city, arrangements are being made by a local company to provide for the housing of the employees now living at Michigan City and who must move to Niles when the new terminal is put in service. This company has laid out subdivisions and built houses, besides inducing other firms and contractors to buy lots and erect houses, so that adequate accommodation will be available.

GRADING AND BRIDGES

Filling is required over Kinzie Creek and to build the switching humps, but there is very little cut in the yard proper as the ground is practically level. A cut 20 to 30 ft. deep is required for the eastbound departure yard, along the air-line cut-off. Extra land was purchased here for borrow pits sufficient to supply all filling. As the material is sand and gravel, with a very little clay, it has been found possible to select a fair material for ballasting the yard tracks. For the first unit of the yard the total grading will be about 800,000 cu.yd., while about 1,600,000 cu.yd. in addition will be needed for the completion of the entire layout.

The Niles yard is situated favorably with regard to highway crossings, there being a stretch of two miles from Lake St., which is carried by an overhead bridge, to the first highway. As this road is just beyond the humps it will be diverted so as to pass under them, while the main tracks also will be elevated so as to complete the separation of grades at this point. At both ends of the site are other road diversions.

Kinzie Creek crossed the yard site diagonally by a very crooked channel, but has been diverted to the east end where it will be crossed by three double track lines instead of by a group of 35 tracks. A stub of the old channel is left to serve the yard pumping station. Three 16-ft. I-beam spans with concrete abutments and deck carry the tracks across the stream, which is crossed also by two 16-ft. reinforced concrete slab spans for highways. A 72-in. reinforced concrete pipe will take care of a county drainage ditch that crossed the site and will receive also the drainage from the roundhouse and other buildings. All sewage, however, will be treated in septic tanks before being delivered to this pipe drain.

As the first unit of the work, the westbound receiving and classification yards have been built, with the engine terminal and five of the eight repair tracks, the two yards being temporarily divided longitudinally to provide for both eastbound and westbound business. This method of operation required special temporary connections, including a line from the present eastbound section to the westbound hump. Owing to this arrangement the hump could not be built to full height, its summit being 14 ft. below the final elevation. As designed, the approach grade was 1% which permitted only 300 ft. of 2% gravity grade. This has been improved by the use of a steeper approach grade, as shown in the foregoing table. While this does not permit of full gravity switching, it is of considerable assistance in classifying westbound trains.

Eastbound trains are switched by means of two temporary tail tracks at the west end of the yard, located adjacent to the future westbound departure yard. These are at the original ground level, from 2 ft. to 12 ft. above the main tracks, which are in a cut at this point. Thus the tail tracks avoid the 20-ft. grade which will exist in the departure yard.

This first unit was put in operation in November, 1919. It is expected to handle the present traffic up to about 25 trains each way daily, while the completed yard will have about double this capacity, with trains not exceeding 100 cars. The remainder of the work will be carried out as funds permit and when this is completed the engine terminal will be put in service. Michigan City will then be abandoned as a division point.

The total cost of the yard and equipment complete will be about $4,000,000 and about 700 employees will be required in the yard, shops and engine terminal. On the present unit, the grading and bridge work have been done by the Dominion Construction Co., Toronto, Canada; the buildings were erected by Joseph Nelson & Son, Chicago, and the coaling station by the Link Belt Co.

The general design of the yards and facilities for the new division point at Niles were prepared by W. D. Elder, assistant engineer, under the direction of J. F. Deimling, acting chief engineer of the Michigan Central R.R. during the absence of Col. G. H. Webb, chief engineer, while in Europe with the American expeditionary force. In direct charge of the field work was H. S. Evans, special engineer, who was succeeded by E. P. Phelps, assistant engineer. The buildings and water supply were in charge of H. A. Horning, superintendent of buildings, while the bridge designs were made under the supervision of G. C. Tuthill, bridge engineer.

Train Accidents for Year Reported by I. C. C. Bureau of Safety

The recent annual report of the chief of the Bureau of Safety of the Interstate Commerce Commission for the year which ended June 30, 1919, contains a record of 79 train accidents investigated by the bureau, of which 53 were collisions, 25 were derailments, and one was classed as "miscellaneous." The accidents resulted in the death of 336 persons and the injury of 1333, of whom 261 were killed and 1083 injured in collisions. Three of the derailments were due to defective mechanical equipment; four to track conditions; five to broken rails; three to improper operation of switches; three to poor condition of track; two to washouts, and one to malicious removal of rail connections.

What Is the Future of Inland Water Transportation?—*Part II*

By Charles Whiting Baker
Consulting Editor, Engineering News-Record

Two notable attempts to revive long-distance steamboat transportation on the Mississippi and Missouri Rivers are here described. In both cases the enterprise was backed by ample capital, had the benefit of expert engineering direction and received the enthusiastic support of shippers. In both cases the enterprise met complete financial failure and in the case of the company operating on the Mississippi River, it was explicitly declared that the channel conditions had nothing to do with the company's failure.

Both of these companies undertook to do business by carrying freight at 80 per cent of the railway rates. Their published expense accounts show that the earnings at this rate did not pay the operating expenses of the boats.

In 1915 the shippers who patronized the Missouri River boats saved about $10,000 *in reduced cost over railway charges. In order that the Missouri River navigation should be of public benefit commensurate with its cost it would have to save to shippers at least* $2,600,000 *per annum in freight charges.*

V—Continued from page 28

An Experiment in Carrying Merchandise Freight on the Mississippi River

In the voluminous literature on waterway transportation one finds repeatedly the statement that the proper field for the waterway in competition with the railway is the transportation of low-grade freight. The Windom committee of 1872 stated as one of its conclusions that "water routes, when properly located afford the cheapest means of transport for all heavy, bulky and cheap commodities." How meager was the information at the disposal of that committee may be gleaned from its estimate of the cost of improving the Mississippi River for navigation. The committee recommended:

"Improvement of the river, on a system to be provided by the War Department, to give 3½ to 5 ft. above Minneapolis, 4½ to 6 ft. below there to St. Louis, and 8 to 10 ft. at the lowest stages of the water from St. Louis to New Orleans; estimated cost, $5,000,000 plus $114,000 for reservoirs at the source of the river."

The committee's conclusion that the field of the waterway was the carrying of low-grade bulk freight, and, by implication, that the railway held first place for transporting other merchandise, appeared justified half a century ago. No one at that day foresaw the future development of the railway. The standard freight car was then of 10 tons capacity. Cars capable of carrying 100 tons and trainloads of 3000 tons were undreamed of.

The effect of the development in railway unit loads on the economics of transportation is little understood by the general public. One still hears the old-time argument that waterway competition will be a benefit to the railway because the waterway will relieve the railway of the unprofitable burden of carrying low-grade freight at low rates! On the other hand, the up-to-date promoters of motor-truck transport are today urging that local merchandise freight and express business should be turned over to the trucks, leaving the railway free to handle the heavy freight and the long-distance business to which it is adapted!

Of these two contradictory statements, the latter is nearer the truth. The railway of the present day, with its large capacity rolling stock, can handle full carloads and full trainloads, where the volume of traffic is sufficiently heavy, and make a profit from a freight rate which would have seemed incredibly small half a century ago.

The determining factor in the transfer of bulk freight from the river to the railway has not been the low cost of transport alone but the low cost of handling at the terminals. The railway's hopper-bottom car carries its burden to its final destination and then dumps, by gravity, its load of coal or ore or stone. Save for the rare cases where the cargo of a boat has its final destination at a plant on a waterfront, bulk freight sent by water must stand the cost of a transfer from boat to car and often of a double transfer; and a boat's cargo always has to be hoisted out from below water level.

WATER TRANSPORT FOR MERCHANDISE FREIGHT

Those who have recognized the controlling influence of transfer costs in transport at the present day have seen a possibility that the waterway might come back as an avenue for merchandise freight. Railway freight rates on first- and second-class merchandise freight, especially for less-than-carload shipments, are so much higher than the rates on low-grade bulk freight that the water route can carry goods at a differential below the rail rates and still charge a far higher price for its service than in hauling bulk freights.

Most important of all, the cost of transfer at terminals is a much smaller percentage of the total freight rates in the case of first-class merchandise than it is of low-grade freight. The commercial organizations, also, which stand sponsor for the waterway propaganda, are generally much more interested in the rates on merchandise than on bulk freights, more anxious to see water competition established in this field, and more inclined to liberal support of a water line which carries general merchandise shipments.

In the spring of 1916, there was begun a very interesting experiment in the transportation of merchandise freight on the Mississippi River between St. Louis and New Orleans. The Inland Navigation Co., with an authorized capitalization of $3,000,000, undertook to build and operate on the Mississippi River a line of steel barges propelled by oil engines. The president of the company, John H. Bernhard, is an engineer; and the plans of the enterprise were worked out with much ingenuity to reduce the labor cost and delays in handling goods in terminals. The company's general plan was to operate self-propelled barges of about 1400 tons nominal capacity and to give regular service between St. Louis and New Orleans with one intermediate stop at Memphis, to take on and discharge freight.

One boat, the "Inco No. 1," was completed, and made 19 trips between New Orleans and St. Louis between Mar. 24, 1916, and July 31, 1917. The total amount of freight carried on these 19 trips was 12,745 tons, or an average of 670 tons per trip, about two-thirds of the boat's capacity. The average freight rate received was $4.24 per ton. The total earnings from all freight carried were $54,046. From this there was deducted, for drayage, switching and other transfer charges paid by the Navigation company, $8072, leaving net freight receipts of $45,973. During this time the company paid out in terminal expenses for stevedoring, etc., $24,154, and in the operation of its barges $76,302, making a total of $100,456 direct operating expenses, and this does not include anything for interest and depreciation on investment. In addition to this, the company incurred general administration expenses, in connection with its enterprise, amounting to $116,362, so that its expenses exceeded its receipts by about $171,000.

When an enterprise meets with financial disaster, the details of its experience are usually unobtainable. Mr. Bernhard, however, with commendable public spirit, has made available complete records of the operation of his experimental barge and of the company which he organized to exploit it, from which records the above figures are taken.

WHY THE "INCO" FAILED

Mr. Bernhard ascribed the lack of success of his boat to two principal causes: First, an unsuccessful equipment of oil engines which caused great expense and serious delays in the operation of the boat, and, second, the very heavy expense at the terminals. More than 30% of the boat's time was spent lying at the wharves; this was due to the inefficiency of the terminals. The rate of receiving or discharging cargo averaged only 10 tons per hour, notwithstanding the fact that the boat was equipped with special cargo-handling machinery for the express purpose of lessening the labor cost and expediting the time spent in loading and unloading. Including loss and damage to freight at terminals, the total terminal expenses on the 12,745 tons carried averaged $2.45 per ton. The cost of operating the barge on the trips was excessive for the reasons above set forth; but had it been possible to run the barges as economically as the designers expected, the handling of freight at the terminals would have cost fully half as much as the cost of carrying it all the way from St. Louis to New Orleans.

It is of especial interest to note that no part whatever of the failure of the enterprise can be assigned to the condition of the river channel. For many years Mississippi steamboat operators complained that the depth of the water claimed by the Government engineers was not actually available, and that a large part of the difficulty of the river craft in competition with the railways was due to the channel conditions. Mr. Bernhard explicity states, however, that the delay caused by the condition of the channel to the "Inco No. 1" was only a few hours for the 19 trips which she made.

EFFECT OF PARTIAL LOADING ON COSTS

The experience of the Inland Navigation Co. illustrates well how deceptive figures for the cost of water transport may be which are based on the direct expenditures for the movement of the boat alone. On one of the trips of the "Inco No. 1" from St. Louis to New Orleans the direct operating expenses for the 10-day trip were only $1148. She carried about 500 tons of freight and earned $2456. Had she carried her full load of 1400 tons, and received an average freight rate of $5 per ton, her earnings on this trip would have been $7000. The cost for the voyage of 1200 miles, had she carried her full theoretical load, would have amounted to only two-thirds of a mill per ton-mile.

This looks like an enormously profitable business; but when the actual conditions are studied a different picture is seen. The carriage of merchandise freight is entirely different from the carriage of coal or other bulk freight. The boat carrying merchandise must make most of her voyages with only a partial cargo, and the river carrier is no exception to the rule.

While the "Inco No. 1" had a capacity for 1400 tons dead weight, about 1100 tons of general merchandise filled all her space; and her average load on the 19 voyages was only 670 tons. Mr. Bernhard believes the failure to obtain full loads for the boat was due to the difficulties with the engines that made it impossible to give regular service. He even computes that his company would have earned a profit if it had been able to operate regularly for the full season and carry its full load of 1400 tons on every voyage.

Waterway literature is full of theoretical computations of the cost of water transport based on the assumption of boats running always fully loaded, with no allowance for delays. But no transportation business ever enjoys such favorable conditions. The water carrier, like the rail carrier, must cope with great variations in the volume of traffic moving in different directions and at different seasons. This is especially the case where a steamboat gives a regular schedule service, as she must do to carry merchandise freight. She has to sail on a definite day, whether she has obtained a full cargo or merely a partial one. She must have capacity enough, too, to carry the business offered. If she leaves freight on the dock when she sails, the shipper will send his next consignment by rail. Again, as the business is open to free competition there is always the chance that competing boats will take away part of the traffic. For all these and other reasons, it is obvious that the boat carrying merchandise freight can only count on partial loads in estimating her earnings.

And again, in any transportation business the direct expenses are only a part of the operating costs. The overhead expenses have to be met as surely as the bills for coal and oil and crews' wages; and the overhead expenses of an organization able to do business in a modern way and render such service as a railway renders cannot be brought down to any small sum.

The experience of the "Inco No. 1" also sheds light on the favorite theory that large-capacity carriers are an essential feature for economical operation. This is true where the volume of business is sufficient and where terminal conditions are such as to permit rapid loading and discharging of cargo, as in the handling of ore on the Lakes. The "Inco No. 1" would have made no greater success had she been of 2000-ton instead of 1000-ton capacity. Any saving in the expenses per ton carried on the voyage would have been more than offset by the longer delays in port to load and discharge cargo.

VI—The Missouri River Improvement

Steamboat transportation on the Missouri River during the pioneer days of the West was of great value. As early as 1819 the first steamboat ascended the river to Council Bluffs. For many years the river was the chief means of transport west from the Mississippi to the frontier states of Kansas and Nebraska.

While the river was being used by steamboats prior to 1870, the Government spent very little on its improvement. It was not until 1878, when agitation over railway competition with water routes had become active, that Congress began to make large appropriations to improve the Missouri River. Yet, by this time the impotence of the shallow-draft Missouri River steamboat, subject to perils of snags and sandbars, to compete with the railways had become manifest. Nevertheless, Government work on the river continued; and it was not till 1902, when between seven and eight million dollars had been spent on the river, that Congress abolished the Missouri River Commission and suspended work on the river.

Renewal of Work on the River

The waterway agitation was most active during the years from 1900 to 1907, culminating in that year in President Roosevelt's appointment of the Inland Waterways Commission, before referred to. Urged by this agitation, Congress in 1907 ordered a preliminary survey to determine whether the Missouri was worth improvement for navigation. In response to this order a project was worked out by the Army engineers and recommended to Congress, for the improvement of the river from Kansas City to the mouth, at an estimated cost of $20,000,000, and an estimated annual expenditure for maintenance of $500,000.

The first appropriation of $1,000,000 for this work was contained in the rivers and harbors bill of 1910. Hon. Theodore E. Burton of Ohio had long been chairman of the rivers and harbors committee of the House, and was then in the Senate. Mr. Burton had been chairman of the Inland Waterways Commission in 1907 and had become aware how far river navigation had declined. As a member of the Senate committee he was instrumental in having inserted in the bill a provision requiring reëxamination of the project by a special board of engineers. This board was appointed. It approved the project, and in the rivers and harbors act of 1912 Congress formally adopted it.

The Deakyne Report

Three years later, after $6,250,000 had been appropriated for the work, Congress ordered a reëxamination of the Missouri River. In response, the engineer officer in charge of the district, Lieut. Col. Herbert Deakyne, submitted a report, the gist of which was as follows: Of the 309,684 tons of traffic on the river, floating logs and sand and gravel dredged from the river accounted for all but 37,551 tons. The total freight charge on this 37,551 tons of freight was about $41,000, and as the river freight rate was 80% of the rail rate the saving to shippers by the use of the river was about $10,000. Assuming that the Government could borrow money at 3%, its investment of $20,000,000 in improving the river would represent an annual fixed charge of $600,000. Adding to this the annual maintenance charge of $500,000 gave a total of $1,100,000 as the total annual cost of the river improvement.

"The improvement must stand or fall," said Lieutenant Colonel Deakyne, "on the question of prospective commerce." Regarding this he said that the Mississippi River, from Cairo to New Orleans, which had for many years had a navigable depth of over 6 ft. and was far better situated to attract a heavy traffic than the Missouri, carried, in 1913, only 258,709 tons. "If the Mississippi, under these conditions and with a 6-ft. channel, carries only this amount, it seems to me very doubtful whether the Missouri, at the same depth, would carry any more. . . . The Missouri River traffic would have to increase sevenfold to equal the Mississippi traffic, and more than a hundredfold to reach a figure commensurate with the cost of the work."

Lieutenant Colonel Deakyne's report stirred up a hornets' nest. From Minneapolis to New Orleans the organizations formed to promote waterway development rallied all their forces for defense. The newspapers outdid one another in attacks upon the engineer who had the courage to state the facts and express opinions contrary to those of his predecessors and superiors on whose recommendation the project had been adopted.

Colonel Townsend Approves Deakyne's Report

Lieutenant Colonel Deakyne's immediate superior, Col. C. McD. Townsend, however, approved his recommendation and said:

> It is believed that there is still opportunity for the revival of Western river commerce, but it should first be sought not on the tributaries but on the main river. There is neither the density of population nor the material seeking shipment on the tributaries of the Mississippi (except the Ohio) to cause such a revival. . . . The failure to utilize properly the improved channel from St. Louis to New Orleans should cause Congress to hesitate before continuing the large appropriations it is making for the Western rivers. . . . An opportunity should be afforded the American people to determine whether they want waterways, not by rhetorical efforts in river conventions but by practical utilization of the channels. Until such revival occurs, appropriations should be confined to maintaining the existing status.

The Board of Engineers for Rivers and Harbors, of which Col. W. M. Black (who later became a Major General and chief of engineers) was chairman, disapproved Lieutenant Colonel Deakyne's report after a hearing at Kansas City at which a great mass of testimony was presented favorable to the improvement. The most important of this testimony related to the operations of the Kansas City River Navigation Co. This company was organized in 1912 and raised about $1,000,000 by popular subscriptions among the business men of Kansas City. It operated in 1915 a fleet of two towboats and 13 steel barges. It had expended a considerable amount in experimental work to develop the most economical methods of river navigation, and the board of 1915 declared that it was "the most thorough attempt within the knowledge of the board to revive a river traffic that had disappeared under railway competition."

The avowed purpose of this boat line was to demonstrate the possibilities of profitable conduct of river transport at the present day in competition with the railway. Its rates on freight were fixed at 80% of the rail rate. It established a regular traffic department for getting business, and obtained joint rates with the railway companies and switching arrangements so that freight loaded at any switch track in Kansas City could be transferred to the terminal for loading on its boats.

Results of the Kansas City Boat Line

It is of interest, therefore, to see what results the company obtained. These may be briefly summarized as follows from its own report to the Board of Engineers, Oct. 30, 1915:

	1913	1914	1915 to Oct. 1
Total tons carried	9,784	13,677	27,306
Cost of operation per ton carried	$5.09	$4.04	$2.06
Cost of wharf labor, per ton carried	.81	.63	.66
Cost of transportation, per ton mile, mills.	10.3	8.4	3.58

Of these figures, the first two years represent more or less experimental operation while the business was getting started. In 1915, however, the company was operating a considerable fleet, and by its own statement was getting, much of the time, more freight than it could carry. Its cost of transportation in that year, however, *was more than its receipts from freight.* In other words, instead of demonstrating the advantage in cheapness of river transport over rail, the company's statement shows that it was carrying freight at less than rail rates by using part of its capital to pay running expenses.

Just how great was its deficit, the company gave no figures to show. The operating expenses on which the above figures are based, however, appear to be the cost of operating its boats and terminals alone. They do not include the overhead expenses of the organization, nor is anything whatever included for interest and depreciation on the company's investment in its fleet of boats, amounting to about $600,000. Allowing 6% for interest and only 5% for depreciation, the annual capital charge of the company was about $66,000, or about $2 per ton for every ton carried on its boats in 1915.

The record of the investigation of Missouri River navigation is a bulky volume known as "House Document No. 463, 64th Congress, 1st Session." One may search through all its 303 pages, and nowhere will he find an answer to the question, How can river transportation be conducted at a lower cost than railway transportation? There is no end of testimony from those who expatiated on the great advantage of the river transport over the railway on the *assumption* that it was cheaper; but it was all assumption.

The good faith of the pioneers and managers of the Kansas City River Navigation Co. is not questioned. They believed, as thousands of business men believe, that water transportation is inherently cheaper than railway transportation and that the commercial prosperity of their section depended on its reëstablishment. They found over 400 business firms and persons in their section who believed the same thing and were willing to back their belief by subscribing a few dollars or a few hundred dollars to a company to demonstrate this. The company spent nearly $1,000,000 in endeavoring to establish its business; but it never came within gunshot of carrying freight as cheaply as the railways, when all the elements of cost were taken into consideration It brought down its operating expenses to a very moderate figure, as shown above; but it failed wholly to show any prospect of profit from the operation of boat lines such as would encourage capital to invest in such lines as a business.

If there had been any profit or any prospect of profit in the business, the company would have undoubtedly continued in it; but after paying deficits out of capital every year from its organization, it seized the opportunity, when the Federal Railroad Administration undertook to operate inland waterways in 1917, to sell its boats to the Government and discontinue its business.

Improvement to Benefit Riparian Owners

There are two features in the extended investigation of this Missouri River project which deserve special attention. One is that one of the underlying motives for the agitation to have the United States improve the Missouri for navigation was to benefit the lands along the river. The owners of these lands and the communities interested are, of course, desirous of having the revetment of the river banks done at Federal expense. The Mississippi River precedent works in their favor. But if the Federal treasury is to be tapped to benefit owners of river bottom lands on the pretext of navigation improvement, the door will be opened to the spending of two dollars of public money to effect one dollar of benefit to the private individual. That way lies national bankruptcy.

No less dangerous is the argument, which occurs repeatedly in the hearing, that in computing the cost of a navigation improvement no allowance should be made for interest on the money which the Government expends. In other words it was seriously argued —and argued by members of Congress—that the Government ought to invest money in transportation improvements without any regard to whether the investment would effect an annual saving in transportation cost at least equal to the interest on the investment.

At the present time, with Government control and operation of the railways in force, the danger of this principle must be obvious to anyone. All possibilities of economy in Government operation of the railways or any other business are at an end if the question, "Will it pay?" may not be raised before undertaking any Government work.

How Much Must the Missouri River Earn in Order to Pay?

Turning back to the present condition of the Missouri River work: The latest report of the engineer in charge shows that between seven and eight million dollars has been spent on the work, and it is only about 27% completed. The great advance in labor and material will probably at least double the cost estimates of 1910 before the work is complete. That is to say, the 6-ft. deep channel will cost perhaps $40,000,000 to make and $1,000,000 annually to maintain. The interest charge on the work, too, can no longer be set at 3% as in 1910, but must be raised to at least 4% in view of prevailing rates on Government bonds. In other words, if the Missouri River improvement is worth making, it must show a saving in transportation costs equal to at least $2,600,000 per annum.

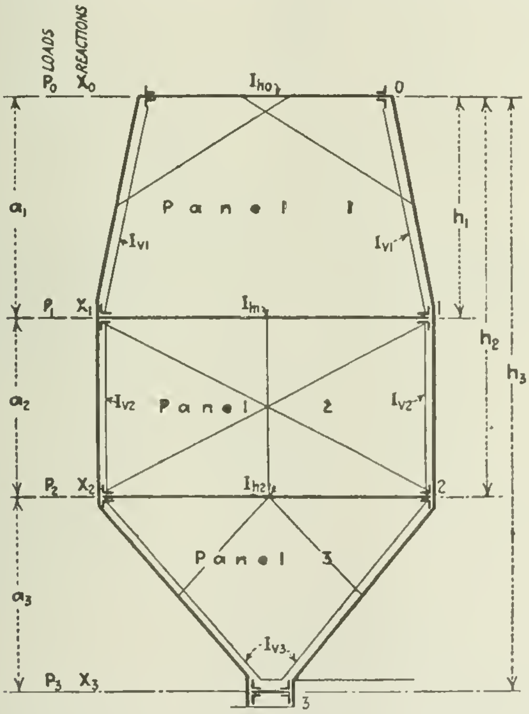
(To Be Continued)

Structural Design of Caisson Gates for Dry Docks

Theoretical Design, Using Method of Least Work With Practical Application to Actual Caisson Structure

By Eugene E. Halmos
Designing Engineer, Barclay Parsons & Klapp, New York City

CAISSON gates have almost universally replaced the earlier miter gates for the purpose of closing the entrance of modern graving docks. Two types of caisson gates have been developed: The sliding or rolling caisson, which is drawn back into a recess at the side for opening the dock, and the ship caisson, so-called from its resemblance in section to the hull of a ship which is floated into position and sunk into its seat by the admission of water in the ballast chamber of the gate. Ship caissons are extensively used in this country, and the figure and example shown in the present article refer to such gates. The formulas, however, hold good for the sliding caissons also.



CROSS-SECTION OF FLOATING CAISSON TO DRY DOCK

The caisson types of gates are built of steel or of reinforced concrete. They consist essentially of a number of horizontal girders and vertical frames, the whole covered by water-tight plating. The thrust of the water against the gate is resisted at the two side sills and the bottom sill—in other words, at three sides of the nearly rectangular structure (the sides, as a rule, having a slight batter), making it statically indeterminate.

However, with the help of certain permissible assumptions, the stresses in the several members of the structure can be determined by applying the principle of least work. The method of finding the stresses in miter gates by application of this principle was presented in Vol. 81, *Trans. Am. Soc. C. E.*, by H. Goldmark. Most of the notations in the present article are identical with those used by Mr Goldmark.

I. Theory

For the purposes of this demonstration it will be assumed:

1. That the gate consists of three horizontal girders and a keel (see drawing herewith).
2. That the water load is transmitted to the horizontals by the skin plates.
3. That the vertical frames are numerous enough to permit considering them as forming together with the skin plates, one integral vertical girder, the stiffness of which is evenly distributed along the length of the gate.
4. That there is perfect contact between the keel of the caisson and the bottom sill of the dock—in other words, that the keel (or, in case of sliding caissons, the lowest horizontal girder) cannot take bending stresses, not being able to deflect.

If the horizontal girders were so proportioned as to be stressed to the same unit stress under the water load tributary to each of them, and if the lowermost girder were free to deflect, it is evident that the elastic deformation of each girder would be the same, and no bending stress due to the thrust of water would be developed in the vertical girder.

The horizontal girders, however, are given dimensions with regard to other considerations than the water load only. The top girder is very often used as the floor of a bridge; the next horizontal forms the floor of the operating chamber, and frequently has substantial fender attachments, etc. Furthermore, as perfect sill contact is assumed at the keel, the deflection of the horizontals will always be unequal, and the stiffness of the vertical girder will result in transmitting part of the water-load upon the sill and in changing the load taken by the horizontals by positive or negative reactions on same.

Let

L_0, L_1, L_2 and L_3 = the lengths of the horizontal girders;

P_0, P_1, P_2 and P_3 = the direct water load on same per unit length;

x_0, x_1, x_2 and x_3 = the reactions of the vertical girder upon the horizontals, per unit length,

then the total load upon the horizontals will be:

$(P_0 + x_0)\,L_0$, $(P_1 + x_1)\,L_1$, $(P_2 + x_2)\,L_2$ and $(P_3 + x_3)\,L_3$, which latter is the sill reaction in the case here considered.

The horizontals divide the vertical girder into three panels. If L denotes the average length of the caisson, the forces acting on the vertical girder at the panel-points will be

$$x_0L,\ x_1L,\ x_2L \text{ and } x_3L.$$

The vertical girder will be in equilibrium, if

$$\Sigma x = x_0 + x_1 + x_2 + x_3 = 0 \qquad (1)$$

and $\Sigma M = x_0h_3 + x_1(h_3 - h_1) + x_2(h_3 - h_2) = 0 \qquad (2)$

In order to solve the four unknown reactions, two more equations are necessary, which will be furnished by the principle of least work. Let

W = the total work done by the internal forces upon the gate;

W_h = the work done in bending the horizontal girders:
W_v = the work done in bending the vertical girder,
en

$$W = W_h + W_v$$

Furthermore, let

M_{h_0}, M_{h_1} and M_{h_2} = the bending moment at any cross-section of the horizontal girders 0, 1 and 2;
M_{v_1}, M_{v_2} and M_{v_3} = the bending moment at any point of the vertical girder in each of the panels 1, 2 and 3;
I_{h_0}, I_{h_1} and I_{h_2} = the moment of inertia of the horizontals;
I_{v_1}, I_{v_2} and I_{v_3} = the moment of inertia of the vertical girder in each panel;
l = the distance of any point of the horizontal girders from the left support;
y = the distance of any point of the vertical girder from the upper panel-point in each panel;
E = the modulus of elasticity (supposed to be constant), then

$$W = \frac{1}{2E}\left(\int_o^{L_o} \frac{M_{ho}^2}{I_{ho}} dl + \int_o^{L_1} \frac{M_{h_1}^2}{I_{h_1}} dl + \int_o^{L_2} \frac{M_{h_2}^2}{I_{h_2}} dl + \int_o^{a_1} \frac{M_{v_1}^2}{I_{v_1}} dy + \int_o^{a_2} \frac{M_{v_2}^2}{I_{v_2}} dy + \int_o^{a_3} \frac{M_{v_3}^2}{I_{v_3}} dy\right)$$

If now M_h and M_v are expressed in terms of x_0, x_1, x_2 and x_3, in order to make the work a minimum, the partial derivatives of W with respect to the unknown reactions must all become equal to zero. However, as x_2 and x_3 can be expressed in terms of x_0 and x_1, the two equations of the form

$$\frac{\delta W}{\delta x_o} = 0 \text{ and } \frac{\delta W}{\delta x_1} = 0$$

will result.

In the above expression, for W the first three integrals represent the work of the internal forces in bending the horizontal girders 0, 1 and 2—girder 3 being omitted, for it is assumed that this girder does not take bending stresses but transmits the loads directly to the sill. The last three integrals represent the work done in bending the vertical girder.

II. DEVELOPMENT OF WORKING FORMULAS

From equations (1) and (2)

$$x_3 = -(x_0 + x_1 + x_2) \qquad (3)$$

$$x_2 = -\frac{x_o h_3 + x_1(h_3 - h_1)}{h_3 - h_2} \qquad (4)$$

As the relative position of the horizontal girders is known from the preliminary design, the numerical values of the coefficients of x_0 and x_1 can be readily determined. In the example here given, $h_1 = 9$ ft., $h_2 = 16.33$ ft,. $h_3 = 24.33$ feet.

Therefore, from (4)

$$x_2 = -(3.04\, x_0 + 1.92\, x_1) \qquad (5)$$

and, substituting this value in (3)

$$x_3 = 2.04\, x_0 + 0.92\, x_1 \qquad (6)$$

In the evaluation of $\frac{\delta W}{\delta x_o}$ and $\frac{\delta W}{\delta x_1}$ it may be seen that the factor $\frac{1}{E}$, being common to all members, can be omitted. It will also be assumed that the moment of inertia of each horizontal girder and of each panel of the vertical girder is constant and its value known from the preliminary design.

Horizontal Girders

In general

$$\frac{\delta W_h}{\delta x} = \frac{1}{I_h}\int_o^L M_h \frac{\delta M_h}{\delta x} dl, \text{ where}$$

$$M_h = \tfrac{1}{2}\, L\, (P + x)\left(l - \frac{l^2}{L}\right) \text{ and}$$

$$\frac{\delta M_h}{\delta x} = \tfrac{1}{2} L\left(l - \frac{l^2}{L}\right)$$

Derivatives with respect to x_0

Girder No. 0 $\frac{\delta W_{ho}}{\delta x_o} = \frac{L_o^5}{120\, I_{ho}}(P_0 + x_0)$

Girder No. 1 $\frac{\delta W_{h_1}}{\delta x_o} = 0$

Girder No. 2 $\frac{\delta W_{h_2}}{\delta x_o} = -\frac{3.04\, L_2^5}{120\, I_{h_2}}(P_2 - 3.04\, x_0 - 1.92\, x_1)$

Derivatives in the respect to x_1,

Girder No. 0 $\frac{\delta W_{ho}}{\delta x_1} = 0$

Girder No. 1 $\frac{\delta W_{h_1}}{\delta x_1} = \frac{L_1^5}{120\, I_{L_1}}(P_1 + x_1)$

Girder No. 2 $\frac{\delta W_{h_2}}{\delta x_1} = -\frac{1.92\, L_2^5}{120\, I_{h_2}}(P_2 - 3.04\, x_0 - 1.92\, x_1)$

Vertical Girder.

In general.

$$\frac{\delta W_v}{\delta x} = \frac{1}{I_v}\int_o M_v \frac{\delta M_v}{\delta x} dy.$$

The bending moments in the three panels and their derivatives with respect to x_0 and x_1 can be expressed as follows:

$$M_{v1} = Lx_o y,\ \frac{\delta M_{v1}}{\delta x_o} = Ly,\ \frac{\delta M_{v1}}{\delta x_1} = 0$$

$$M_{v_2} = L\,[x_0\,(h_1 + y) + x_1 y],\ \frac{\delta M_{v2}}{\delta x_o} = L\,(h_1 + y),$$

$$\frac{\delta M_{v2}}{\delta x_1} = Ly$$

$$M_{v_3} = L\,[x_o\,(h_2 - 2.04y) + x_1\,(h_2 - h_1 - 0.92y)]$$

$$\frac{\delta M_{v3}}{\delta x_o} = L\,(h_2 - 2.04\,y),\ \frac{\delta M_{v2}}{\delta x_1} = L\,(h_2 - h_1 - 0.92y)$$

Derivatives with respect to x_0

Panel No. 1 $\frac{\delta W_{v1}}{\delta x_o} = \frac{L^2}{I_{v1}}\,\tfrac{1}{3} a_1^3 x_o$

Panel No. 2 $\frac{\delta W_{v2}}{\delta x_o} = \frac{L^2}{I_{v2}}\left[x_o\left(h_1^2 a_2 + h_1 a_2^2 + \frac{a_2^3}{3}\right) + x_1\left(h_1\,\frac{a_2^2}{2} + \frac{a_2^3}{3}\right)\right]$

Panel No. 3 $\frac{\delta W_{v3}}{\delta x_o} = \frac{L^2}{I_{v3}}\,[x_o\,(h_2^2 a_3 - 2.04\, h_2 a_3^2 + 1.39\, a_3^3) + x_1\,(h_2^2 a_3 - h_1 h_2 a_3 - 1.48\, h_2 a_3^2 + 1.02\, h_1 a_3^2 + 0.63\, a_3^3)].$

Derivatives with respect to x_1

Panel No. 1 $\frac{\delta W_{v1}}{\delta x_1} = 0$

Panel No. 2 $\frac{\delta W_{v2}}{\delta x_1} = \frac{L^2}{I_{v2}}\left[x_o\left(h_1\,\frac{a_2^2}{2} + \frac{a_2}{3}\right) + x_1\,\frac{a_3^3}{3}\right]$

Panel No. 3 $\frac{\delta W_{v3}}{\delta x_1} = \frac{L^2}{I_{v3}} [x_o(h_2^2 a_3 - 1.48\, h_2 a_3^2 - h_1 h_2 a_3$

$+ 1.02\, h_1\, a_3^2 + 0.63\, a_3^3 + x_1\, (h_2^2\, a_3 - 2h_1\, h_2\, a_3 -$
$0.92\, h_2\, a_3^2 + h_1^2\, a_3 + 0.92\, h_1\, a_2^2 + 0.29\, a_3^3)]$.

All terms representing derivatives with respect to x_0 are then collected and equated to zero, and the same is done with terms representing derivatives with respect to x_1. The equations $\frac{\delta W}{\delta x_o} = 0$ and $\frac{\delta W}{\delta x_1} = 0$ are thus obtained, which, together with equations (5) and (6) will solve to four unknown reactions.

III.—Numerical Example

The cross-sectional sketch shown on the figure represents the general shape of a caisson gate designed for a shallow dry dock.

The dimensions in feet and direct waterloads in lbs. per linear foot are as follows:

$a_1 = 9$ ft.
$a_2 = 7.33$
$a_3 = 8$
$h_1 = 9$
$h_2 = 16.33$
$h_3 = 24.33$
$L_0 = 67.5$

$L_1 = 65.5$
$L_2 = 63.5$
$L_3 = 65.5$
$P_0 = 255$
$P_1 = 2900.$
$P_2 = 6540.$
$P_3 = 3820.$

As a first trial, the following moments of inertia were used:

$I_{ho} = 4.2$ ft.^{4}
$I_{h_1} = 17.5$ ft.^{4}
$I_{h_2} = 17$ ft.^{4}

$I_{v_1} = 21.2$ ft.^{4}
$I_{v_2} = 82.5$ ft.^{4}
$I_{v_3} = 70.5$ ft.^{4}

The resulting simultaneous equations are:

$$x_2 = -(3.04\, x_0 + 1.92\, x_1)$$
$$x_3 = 2.04\, x_0 + 0.92\, x.$$

$$7{,}635{,}100\, x_0 + 2{,}999{,}650\, x_1 - 9{,}314{,}000{,}000 = 0$$
$$2{,}999{,}650\, x_0 + 2{,}462{,}290\, x_1 - 4{,}580{,}000{,}000 = 0$$

The solution furnished the following values:

$x_0 = +\ 900$ lb. per linear foot.
$x_1 = +\ 780$ lb. per linear foot.
$x_2 = -\ 4200$ lb. per linear foot.
$x_3 = +\ 2520$ lb. per linear foot.

The unit loading of the horizontal girders, therefore, was:

$P_0 + x_0 = 1155$ lb. per linear foot.
$P_1 + x_1 = 3680$ lb. per linear foot.
$P_2 + x_2 = 2340$ lb. per linear foot.
$P_3 + x_3 = 6340$ lb. per linear foot (on the sill).

It can be seen that girder 0 is seriously overstressed, while girder 2 is greatly relieved through the influence of the vertical framing and sheathing.

The bending stresses calculated by this method will represent the total actual bending stresses induced in the horizontal girders by the water load. The webs of these members, however, should be made strong enough to withstand vertical loads, such as live load moving across the top of the gate, live load in the operating chamber, load of machinery and ballast placed on the web plates. In dimensioning the vertical framing, the weight of the structure carried by these frames, and local bending due to water load actually carried by the members of same, must be considered besides the loading found by the above method.

Proposed Irrigation Projects in Canada, Brazil and Palestine

SUMMARIZED notes on irrigation in foreign countries, from commercial reports given in the December *Reclamation Record*, indicate three fertile fields for irrigation engineers seeking activity out of the country.

Canada is probably furthest along. It has various projects affecting territory in the vicinity of Lethbridge, one in the Medicine Hat district, and a large scheme for obtaining water from the North Saskatchewan, near Rocky Mountain House, for the irrigation of a portion of eastern Alberta and western Saskatchewan.

In northeastern Brazil since 1877 more than 1,000,000 persons have starved, but irrigation from prospective stored water in one state alone would serve 2,400,000 acres. To the Brazilian national Congress in September President Pessoa recommended legislation permitting Governmental reclamation on a large scale involving the expenditure of $55,000,000.

A Palestine power and irrigation project has been proposed to meet the probable large-scale colonization of the Holy Land. A Norwegian engineer, Albert Hiorth, in the *Norwegian Trade Review* proposes a series of great power stations, utilizing, by means of a 37-mile tunnel, the difference in level between the Mediterranean and the Dead Sea. In addition to ordinary public utility uses, the power would be used for producing lime nitrate from the air, and for an irrigation pumping project involving a lowering of the Sea of Galilee. There are also proposed canals along the Jordan Valley and dams regulating flood flows; reclaiming the shallow southern part of the Dead Sea by means of a dam from Lisan westward; mining asphalt in the plains of Sodom and Gomorrah. Altogether, several hundred thousand acres would be reclaimed, possibly including the plain of Sharon. The estimated cost of the tunnel is $40,000,000 and of the power plant, canals, etc., $20,000,000.

Specifications for Gas Hose Worked Out by Tests

Research work of much practical value has been done by the Bureau of Standards in investigating the strength of flexible tubing for gas connections. Several dozen different kinds of tubing were examined, according to a full report of results given by R. S. McBride and W. M. Berry in Technologic Paper 133, recently published. The test work was based on a specification previously formulated by the American Gas Institute and the National Commercial Gas Association, and it revealed that various clauses of this specification are unduly severe, while others are not sufficiently definite; a revised specification is therefore proposed.

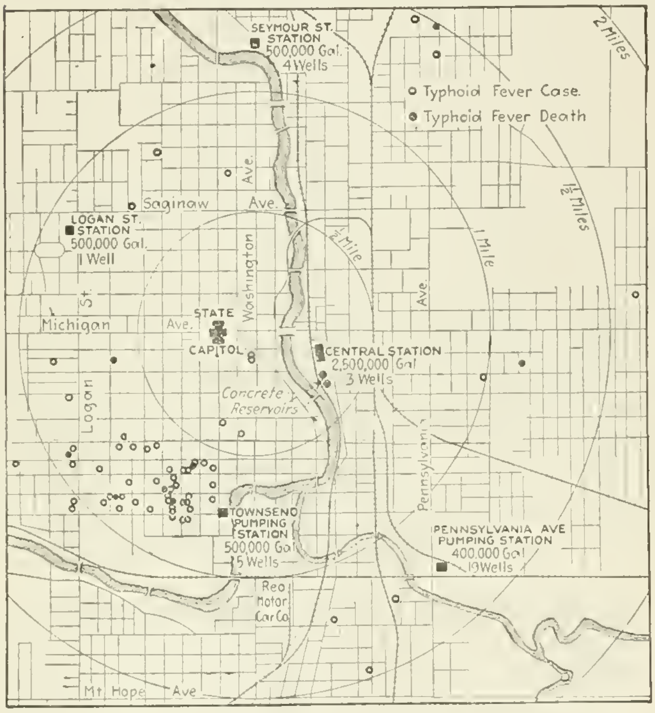
Chief among the requirements proposed are: A crushing resistance of at least 100 lb. per linear inch; a longitudinal tensile resistance of 75 lb.; ability to withstand a twist of 180° per foot or a moment of 2 lb. at an arm of 12 in.; flexibility sufficient to permit bending at 32° F. into a circle of 6-in. diameter, and kinking resistance sufficient to resist a pull of 2 to 8 lb. (according to flexibility) when the hose is bent into such a loop; no leakage greater than 0.02 cu.ft. per hour on a 6-ft. length, after any one of the preceding tests; freedom from softening after 24 hours at 125° F. moist heat; and end tips so securely attached that they will stand the strength tests mentioned.

Water-Supply Typhoid Outbreak at Lansing, Michigan

Wells with Leaky Casings Were Polluted by Sewage Forced Into the Soil During High Water in Grand River, March, 1919

By J. R. Daugherty
Assistant Engineer, State Department of Health

A WATER SUPPLY of 8,000,000 gal. daily is obtained by the City of Lansing from 32 artesian wells, 350 to 400 ft. deep in the "coal-measure" sandstone, the wells being cased into the rock, which is covered with 20 to 100 ft. of sand, gravel and mixed clay. There are five stations pumping directly into the mains, as shown by the accompanying map. The physical properties of the water, the depth of the wells and the absence of epidemics or sickness all tended to create a false sense of security which our investigations have proved was not based on fact. The top of the rock is coarse, poorly cemented and very likely to fissure, so that even though the casings were driven 3 to 5 ft. into rock they are not pollution-proof. There were neither thorough and regular investigations of the lead joints between suction pipes and casings nor any attempts made to build the frost pits water-tight, with the result that the piping was under water much of the time.



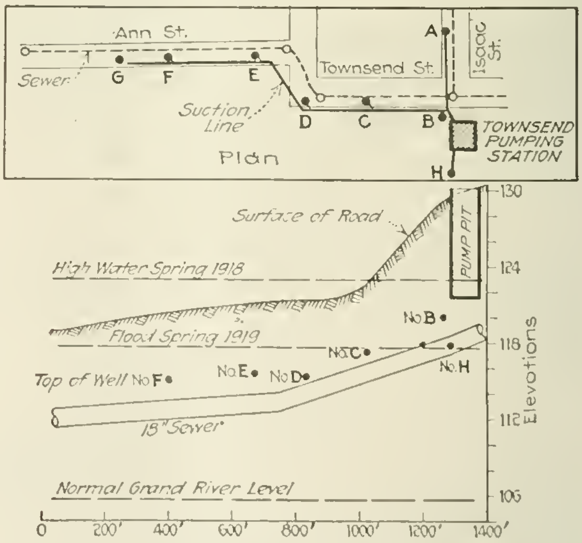
LOCATION OF WELLS AND TYPHOID CASES AT LANSING

During high water in the Grand River it had been usual to shut down the Townsend St. substation, owing to its location near the river, the proximity of the sewer, and the suspicion that it was the cause of a smaller epidemic in 1906. These wells being above the sewer and about 10 ft. higher than normal river level, as shown in the plan and section, more frequent pollution was thus avoided. While the station was shut down during floods, the artesian head prevented any flow of surface water into the pipes or else kept the dilution so high that no sickness resulted.

Heavy rains caused the Grand River to rise 8 ft. Mar. 16, 1919, reaching a stage of 12 ft., which placed a static head of 2½ ft. on the sewer at the wells and forced concentrated sewage into the sandy soil around them. Through an oversight the Townsend St. station was not shut down and the 22-in. vacuum generally maintained on the suction line pulled in so great a quantity of this seepage that dysentery was epidemic by the 18th. On the 19th the State Department of Health was notified of the condition and the first sample was taken. The station was ordered shut off and connected so as to pump to waste, thereby removing polluted water from the wells and enabling sampling to be begun.

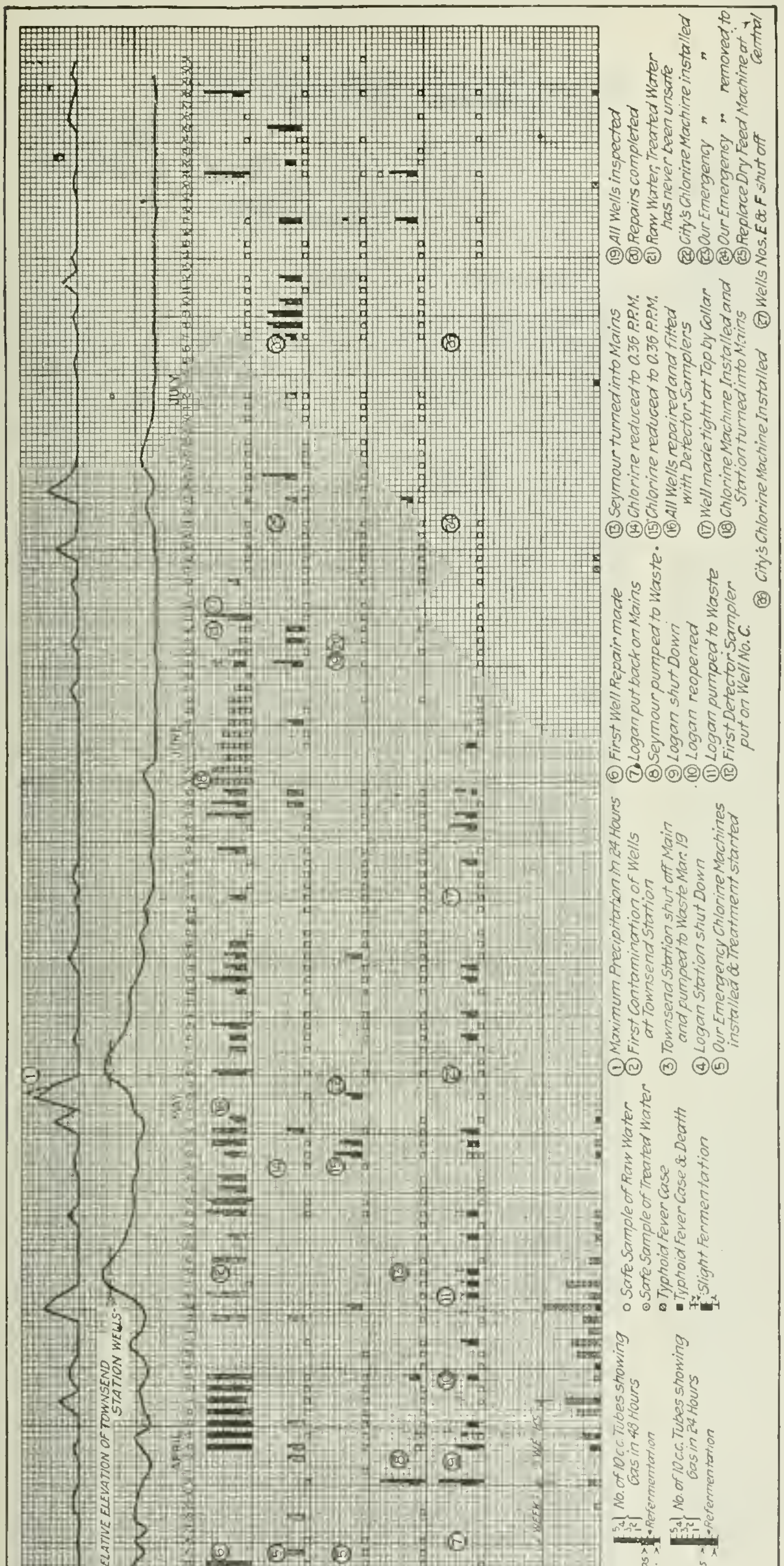
At this time the Seymour station alone showed safe, all the other stations being either unsafe or suspicious, and samples from the mains in various parts of the city showed a wide distribution of polluted water. On Mar. 20 the people were notified to boil the water and the Water Board was directed to send a rush order for chlorine for use with our two emergency chlorine machines. Continued flushing of dead ends was also ordered, and this helped remove the polluted water from the mains. Chlorine at the rate of 1.5 p.p.m. at the Central and Pennsylvania stations started Mar. 25, and had the mains sterile by Mar. 29.

The wells at the Townsend St. station were inspected Mar. 22, and it was found that a plainly audible leak at the top of well *C*, a poorly made and leaky lead joint at well *D*, and a recessed flange set on top of the casing of well *H* were allowing serious leakage of grossly polluted seepage to enter the casings. All the other wells appeared to be tight. The manholes were torn out and the wells repaired as recommended with standard flange couplings wherever possible. One of the original rich-cement mortar joints around the casing and suction line was extended to form the bottom of the old manholes, and although it was 8 in. thick the joint on well *C* leaked badly and there was evidence that several of the others were not tight. Where lead had been used the casing was cut off below the old lead joint and a new 6-in. lead joint was poured and calked. Watertight concrete manholes were ordered built at each of these wells.



RELATIONS OF WELLS, RIVER AND SEWER AT TOWNSEND PUMPING STATION

After these repairs were completed the samples from the Townsend St. station continued unsafe. The pump

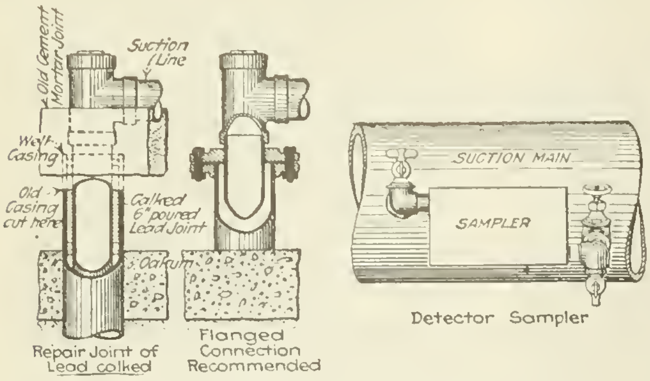


WATER-SUPPLY CONDITIONS IN RELATION TO TYPHOID EPIDEMIC

and suction line were so badly contaminated that samples from each well pumped separately failed to reveal which of the wells were still being polluted. To accomplish this, the writer designed a detector sampler and installed it on the suction line at each of these wells, as shown. With this device a representative sample under actual operating conditions could be taken at any time. The main valves on the sampler were left open, allowing constant circulation while the wells were being pumped. To obtain a sample both valves were closed, the top pet-cock was opened, and the sample was drained from the bottom pet-cock. A patent on the sampler has been applied for, and if this is granted steps will be taken to put the device on the market, as it has a wide application and usefulness that will be recognized by engineers and waterworks and public health officials.

After a series of 75 samples had been taken from the samplers on these wells, the State Department of Health, June 14, ordered wells *E* and *F* cut off and plugged. A decided improvement in the quality of the water from the station followed immediately, as is shown by the chart, proving the efficiency of the samplers under their first test. Samplers on each well of a group will detect contamination of a well which might not show under normal conditions in an analysis of a sample from the pump discharge, on account of the dilution received in the total quantity. Wells whose contamination is thus detected can be repaired or cut off before the amount of pollution becomes serious enough to cause an epidemic.

Over 3,000 cases of dysentery and an epidemic of 82 cases of typhoid fever followed by 11 deaths justified our ordering the City of Lansing to install chlorine machines in four of the five stations. Treatment has been continuous since the installation, but the dose has been decreased as the quality of the raw water has been improved by repairs. Chlorination may be discontinued if a long series of tests proves that any of these stations is delivering sterile water, but the machines will always be ready for immediate use in case of contamination of wells or for disinfecting dead-ends where stagnant water allows bacterial growth. Our recommendations have been based on the results of analyses of more than 800 samples of water collected by the writer during this investigation. The chart shows graphically the state laboratory reports of samples from the pumping

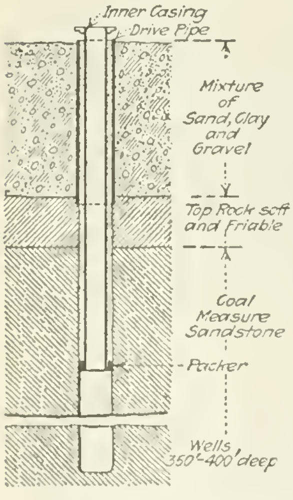


WELL-HEAD CONNECTIONS AS REPAIRED, AND SAMPLING DEVICE ON SUCTION MAIN

stations, also rainfall, river gagings and the typhoid fever epidemic history.

Lansing's experience is a very emphatic contradiction of the old deduction that because "the water always has been good" it always will be good. It is only a question of time before most well supplies become unsafe, on account of (1) deterioration of joints and piping; (2) pumpage in excess of normal capacity of the wells causing fissures at the bottom of the casings, and (3) careless abandonment of wells penetrating the same water-bearing strata.

The typhoid fever spot map and the discovery of the leakage at joints at the Townsend St. station prove that the first of the conditions mentioned above was the principal cause of the local epidemic. The data being accumulated show that the second condition also exists in some of the city wells, making necessary a repair as shown in the drawing of the double-cased well. Examinations of drillings from the top rock indicate that the insertion of an inner casing is advisable when the well is being drilled. Abandonment of wells without careful plugging will be a larger factor, as continued pumping tends to form lateral fissures in the sandstone, and polluted water is thus drawn down the old wells.



INNER CASING OF WELL SET IN CEMENT

The investigations at Lansing were made by the engineering division of the State Department of Health, under the direction of Edward D. Rich, state sanitary engineer, the writer being assistant engineer in charge of the work.

Provincial Health Administration in Alberta

Health affairs in the Province of Alberta, Canada, are in charge of a Department of Health, created by the latest session of the legislature. There are a minister of health, a deputy minister and a Provincial Board of Health consisting of two physicians and a sanitary engineer. In addition, there are a provincial sanitary engineer and five sanitary inspectors. Local boards of health are under the Provisional Board of Health.

Impressions Here and There

City, County and State Affairs in Atlanta

A FEW days spent in any of our leading cities will disclose to the observant engineer a variety of topics for comment. What follows concerning Atlanta is typical of conditions in any important center of population. This is particularly true of the political matters affecting engineering, for in Atlanta, as well as most other Southern and some Northern cities where one political party is overwhelmingly in the majority, it is a case of faction against faction instead of party against party that blocks Governmental efficiency and engineering progress.

Honey Bees and Water-Works—But Atlanta has at least one important city department in which politics does not seem to enter, or at least not to the extent of turning a man out of office with every change of administration. It may be more than coincidence that honey bees are the hobby of W. Z. Smith, and that for thirty years he has been on the staff of the Atlanta water-works, for the past ten years its manager. For beekeeping demands close attention in season and out of season, just as running a water-works efficiently requires a man to be on the job day and night. And then there is the reaction of beekeeping on the man, for certainly nothing excels a colony of bees as an example of organized community service, with every individual not merely working but also coöperating for the common good—and this is the kind of service a water-works superintendent should inspire his men to render and of which he himself should be capable.

State Binds City—No one familiar with the Atlanta water-works will deny that Mr. Smith has had his full measure of problems. The hardest of these has been the necessity of trying to run a large water-works with only scanty funds available for much-needed enlargements. More than once a goodly majority of the voters of Atlanta have approved bonds for water-works improvements, but to no avail. The failure of the bond authorization has been due to the fact that Atlanta, like many other Southern cities, is bound almost hand and foot, in its purely local financial operations, by statutory or constitutional limitations. In most cities a bare majority of votes carries a bond issue. Not so in Atlanta. At a bond election during the war, when it was imperative that pumping and water-purification capacity be increased to meet military, industrial and domestic needs, an almost unanimous vote (8444 to 128) for $500,000 of water bonds was of no effect because the affirmative votes lacked 784 of being two-thirds of the registered voters. In the emergency Mayor Candler, of Coca-Cola fame, personally underwrote a large pump contract—a thing not every mayor can do—and Fulton County also came to the rescue of a city not only well able to stand the cost of the needed water-works improvements but one which had recorded its willingness by a vote of 66 to 1. With this aid, two 30,000,000-gal. steam-turbine-driven centrifugal pumps are being installed, one at the river and one at the filters, and a second coagulation basin is being built.

Might not a larger measure of home rule well be extended by the legislature to Atlanta and to other Georgia cities as well, since most, if not all, of them appear to be in the same boat?

How much more serious the Atlanta water problems of the past few years would have been were not the city in the 100% metered class it is easy to imagine.

Some of the Atlanta water filters still in use were among the earliest mechanical filters built—Hyatt, dating from 1887. The plant has been enlarged several times since then, and the burden on the filters has been reduced by providing both coagulating basins and combined storage and settling reservoirs, the latter giving 7 to 10 days' sedimentation. This lightening of the filter burden is in line with what has been done elsewhere since the early days of mechanical filters when, with the confidence begotten of a promising innovation, it was first sought to make the filter do all the work. But is the virtual elimination of baffling from the new coagulation basin in line with the development of the art? The new basin has only one low cross-wall a short distance from the mixing chamber; and that appears to have been designed chiefly to bring into play the sediment hoppers—hoppers like those in a few sewage-settling basins, but rarely, if ever, used heretofore in water treatment. Knowledge of how the sediment hoppers will work in practice will be awaited with interest.

Snails Eat Algae on Sewage Beds—Besides being one of the earliest municipalities to use mechanical filters, Atlanta was the first large American city to put in Imhoff tanks for sewage treatment. The way these are working calls for no comment, but on looking across the sprinkling filters on can but speculate on whether the revolving ventilating cowls are paying capital charges. However this may be, snails on these sprinkling filters are certainly earning their "board and keep." Algæ growths were beginning to cause anxiety at the Peachtree Creek plant last spring, when Walter D. Marshall, assistant engineer in charge of sewage-works, noticed that they had disappeared in spots. Examination showed innumerable snails on the stones at the top of the beds. As the snails increased and spread the algæ disappeared. A single stone affords lodging place for as many as twenty snails, from the size of a pinhead up to ¼ in. in diameter. This suggests how little is yet known as to the entire range of biological forces that play, and that might be made to play, a part in sewage disposal.

Misadventures in Garbage Incineration—Like a score or so of other American cities that have gone to considerable expense to build high-temperature refuse destructors on the assumption that the heat from the destructors would yield a revenue to the city, Atlanta is not yet utilizing its destructor steam commercially. In fact, a strenuous effort was made to prevent the acceptance of the destructor from its builders. This seems to have been local political by-play, too common in American cities on a change in administration. The court decided that the destructor as built fulfilled the terms of the contract. The plant has been operated since May, 1916, but the heat has not been utilized. A year or so ago a contract was negotiated with the local electric company to buy current generated from the steam raised by the destructor, but the bond issue proposed to build the necessary generating plant, like the water bonds already noted, failed to receive the statutory majority, although the project had been indorsed by the city board of consulting engineers. Continued failure to utilize the steam from a destructor designed for that purpose is the more notable because the city has scrapped three different makes of furnaces, completed in 1894, 1900 and 1904. Why Atlanta should have had this series of misadventures in garbage incineration seems worthy of local investigation, as also why Atlanta burdens its board of health with the operation of a garbage destructor—a function now generally recognized as pertaining to the engineering or public-works department of a city. Is there some connection between the two?

A Unique Board Sidetracked—Atlanta stands almost alone among cities in having a local board of consulting engineers. But, thanks again to factional politics, the board does the city little good just now, for since the latest change in administration the consulting engineers are not consulted. If they were, perhaps there would be no ground for the remark of a local engineer that an expenditure of 15c. a yard for oiling wood-block pavements in Atlanta the past summer would have protected pavements which at present prices would cost several dollars a yard. Lacking this, the implication was, the wood blocks shrank in dry weather and let water under them and were lifted when rain came. Nothing was said to indicate that the failure to oil the wood blocks could be laid to the engineering department of the city. It may therefore be assumed that it rests with the governing body, or perchance ties in with lack of home-rule control of municipal affairs, which seems to leave Atlanta in a helpless state, from which its chief relief appears to come from the county.

County Aids City—Aside from its apparent ability and willingness to help out the City of Atlanta, Fulton County is notable because it has no bonded indebtedness and also on account of its extensive use of convict labor—facts which may explain the ability of the county to help the city. This help includes contributions of both money and labor. Apparently, the county is freer of legislative control than the city. Certainly, counties in other parts of the country could not, without getting into the courts, thus divert their funds and working forces for the benefit of a city. It should be noted, however, that counties in the South have larger powers than in most states of the north. It is also true that a large part of the funds of Fulton County are provided by the taxpayers of Atlanta, but scores of other cities pay nearly all the taxes of the counties in which they are located, without receiving any such help in return.

CONVICTS BUILD VIBROLITHIC PAVEMENTS

Convict labor on county work appears to be common in Georgia, and Fulton County seems to be its leading exponent. Convicts who have given trouble elsewhere are sent here with confidence. "Firm and fair" is the motto of the foremen and armed guards in charge of the convicts. No favoritism is shown. Some of the convicts, long-termers, have gained much experience in roadmaking. The convicts are mustered out from camp at sunrise and back at sunset. The actual working time is about nine hours a day. In poor weather, with little or no work done, sustenance costs make convict work expensive, says William Hansell, Jr., superintendent of public work of Fulton County. But, he thinks that on the whole it is less costly than contract work. Mr. Hansell might have added that the convicts have to be fed anyway, and are better off at work than idle.

As an illustration of what convicts can do, it may be mentioned that the major part of the work on a stretch of vibrolithic pavement just outside Atlanta was being done by convicts late in 1919—that is, the material was being moved to the concrete mixer, spread or smoothed with rakes after having been spouted to place, strewn with stone from a shovel and covered with boards ready for the vibrator, all by the convicts. These also removed the boards after vibration and smoothed or floated the surface with a piece of wood at the end of a long pole. The vibrators (gasoline engines mounted on rollers), however, were not handled by the convicts. Mr. Hansell thinks that when he began using the vibrators he got better pavements than without them, but he doubts the advantage of vibration now that he is able to produce better concrete than before he had his present amount of experience.

Highway Project Engineers—Atlanta engineers had their share of helping out in a recent emergency due to lack of state funds to meet Federal-aid appropriations—that is, they became "highway project engineers" by first signing a contract with the State Highway Department to become its employees, subject to its direction, and then, on being assigned to a specific county, entered into a contract with the county to do the engineering work on a Federal-aid project, for stipulated fees. The contract with the state was incorporated in the one with the county. After trial, the scheme does not appear to be popular with Atlanta engineers. Having to put up bonds, to advance money, to wait for pay, to be tied with red tape, and the lowness of the fees, are objections urged by one project engineer or another; but perhaps working on fee and waiting for pay were the most serious objections. Whether the project-engineer plan will be continued, or an engineering force created under the reorganized State Highway Department, is unknown at this writing. A seeming advantage of the present plan is that it may insure a higher grade of engineers to represent the counties than can be expected, as a rule, where county commissioners choose their own engineers; especially if, as is commonly true, they restrict their choice to county residents. Another possible advantage is that by combining in one the engineering representative of the state and of the county there are two instead of three engineers responsible for each Federal-aid project.

Society Action and Opportunity—It will be apparent from all the foregoing observations that city, county and state problems afford ample scope for the engineers of Atlanta, individually and collectively, to take a hand in civic affairs. This they seem inclined to do. At one of the monthly luncheons of the local members of the American Society of Civil Engineers a committee was appointed to confer with H. L. Collier, chief of construction of the City of Atlanta (really city engineer) on the question whether the three sewage-works of the city are being so operated as to assure full return on the investment. Attention might also well be given by Atlanta engineers to such other matters as why the city has scrapped three refuse incinerators and whether it is really losing anything by not utilizing the heat from the fourth; whether the garbage should not be fed to hogs instead of burned; whether or not garbage disposal should be under the Board of Health; whether or not the various city departments dealing with engineering matters have funds enough to meet the needs of the city efficiently; the financial and other relations of the city and county as regards public works; and the need of more home rule for Georgia cities. Suggesting these questions is easy enough to an outsider, but one does not need to be in Atlanta long to learn of various slumbering fires of factional politics that the discussion of some of these questions would cause to flash up. All the more reason, then, for engineers to take a vigorous part in Atlanta's civic affairs. They should lead in placing city engineering matters above factional politics. Finally, there should be brought to the attention of the engineers of Atlanta the desirability of an amendment to the city charter that will change the present irrational method of choosing the chief of construction, as the city engineer is called. He is now elected by popular vote—a practice that should not exist as regards any technical administrative official, city or state.

ATLANTA, GA.

Sheet Asphalt—Ideas On Suitability of Varying Bases—Costs

Washington's Half Century of Experience Indicates that Concrete Base Is Necessary as a Matter of Economy

BY F. S. BESSON

Captain, Corps of Engineers, U. S. A., on Duty With the Engineer Department, District of Columbia

EXPERIENCE with pavements in the District of Columbia indicates that a concrete base is necessary as a matter of economy. There are two types of surfaces for which such a base is used. One includes stone, brick and wood paving blocks, and the other continuous bituminous surfaces. In regard to the first type, material manufacturers, city and state engineers and Federal officials agree universally, and it is unexpected when similar agreement relative to bituminous wearing surfaces is not found.

However, statements are current that asphaltic surfaces over bituminous and old macadam bases not only cost less for construction, but also cost less for maintenance than when cement concrete bases are used. The reason for this greater economy is stated to be due to the fact that surface pushing and cracking are at their maximum when concrete base is used. The history of Washington's streets does not support this theory, as may be seen from a study of the pavements laid at various periods.

DIVISION INTO DIFFERENT PERIODS AND TYPES

These pavements may be divided into particular types laid at various periods in an attempt to get the most economical streets for the city. The first period is that from 1871 to 1878, during which time more than 700,000 yd. of bituminous pavements were constructed under a half dozen or more different patents. These pavements, including their surface courses, ran from 8 to 14 in. in depth. The base courses of some of them were so saturated with bituminous cement as to form a dense rigid concrete which gave many years of excellent service. A few such examples, though they have been resurfaced and much repaired, are still in existence. The bitumen in the base appears as bright and fresh as though just laid. These good pavements were the exceptions, and as a rule the bases of this first period had no stability. The cost of those that gave promise of reasonable service was as great as and often greater than if cement concrete had been used; and when the first Board of Commissioners was established in 1878 it abandoned the use of bituminous bases in favor of concrete. In the first concrete bases, imported and American natural cements with very lean proportions, about 1 : 4 : 10, were used under the primitive methods of 35 years ago. Nevertheless, good results were obtained, and since that time, with the exceptions noted herein, sheet asphalt on a 6-in. cement-concrete base has been the standard asphalt pavement of Washington.

Ten years after the first period, or about 1888, determined efforts were made to obtain a base at less cost than the standard, and recourse was once more had to bituminous mixtures, using the standard asphalt top for wearing surface. During the 6-year period from 1888 to 1893, 500,000 sq.yd. of pavement was laid with this base. The cost of concrete made with portland cement became less and less each year, and in 1893 reached a sufficiently low level to permit the commissioners to grasp the opportunity to abandon definitely the bituminous base. There have been later short periods during which departures have been made from the standard pavement, but these have but emphasized the hazard of using old macadam and bituminous bases. Though there are examples that have given undoubted serviceability, many others have not, due to the unreliability of assumptions as to traffic, climate, subsoil and drainage conditions. Portland-cement concrete best meets the requirements of a foundation which is dependent upon these conditions.

ANNUAL COST OF STANDARD SHEET ASPHALT PAVEMENTS

Data pertaining to the 3,000,000 sq.yd. of Washington's standard sheet asphalt on 1 : 3 : 7 concrete base show that this standard pavement may be depended upon to require an average of only 2c. per square yard per year for maintenance throughout a life of 25 years. This cost per square yard may be divided up as follows: First six yars, 0.0c.; years 7 to 11 inclusive, 0.5c. each; years 12, 13, 14, 15, 16 and 17, respectively, 1.0c., 1.5c., 2.0c., 2.5c., 3.5c. and 3.5c.; years 18 to 25, 4c. per year each. The cost of a pavement is the amount of money that it is necessary to deposit each year as a sinking fund in order to retire construction and maintenance costs at the end of a definite period. With interest at 5%, the following sums deposited annually at compound interest will pay these costs in 25 years: Six cents per year to pay construction cost of $3 per square yard; 15c. per year to pay interest on construction cost; 1.59c. per year to pay equated annual repairs; or a total of 22.59c. per square yard per year. The equated annual repairs are determined by the amount which it is necessary to deposit each year in order to amount at the end of the 25-year period to the total yearly maintenance cost compounded annually during that period.

After lapse of the period for which the life of the pavement is estimated, it is necessary to pay no further money for interest and depreciation annuity for the construction costs, and, instead of equating the annual repairs, it is but necessary to pay annually the cost of the yearly repairs. In other words, the annual cost of a pavement which has been in use for a longer period than the estimated life is only the amount of money spent yearly on the annual repair. The excellent service given by Washington's standard pavements during the period of superage, in comparison with bituminous-base pavements, is evidence concerning the real worth of the concrete bases.

ANNUAL COST OF BITUMINOUS BASE SHEET ASPHALT PAVEMENTS

Examination of data relative to those streets constructed with bituminous macadam base during the period 1888-1893, and an inspection of such of them as now exist, show the disavantages of using other than a rigid base for pavements subject to heavy traffic. Of the original 500,000 sq.yd. more than half have been replaced by standard asphalt pavement with 6-in. concrete base. Much of that remaining is permitted to exist only because it is on minor streets, subject to practically no heavy traffic. In many spots the base has become so defective that, when passed over by a truck, the pavement flexes as though it were thin ice. This bending of the 3-in. sheet-asphalt surface cracks it into small lozenge-shaped patches, and the pavement rapidly goes to pieces. The remaining 237,058 sq.yd. of this bituminous-base pavement now has an average age of 28 years and has averaged 4c. per square yard per year for maintenance. It must be realized that this is far from a representative average for the entire group of bituminous-base pavements in question, as those now in existence are the cream of the original group.

PRESERVATION OF PRESENT STONE ROADS

The greatest problem of road economics is how to preserve and utilize the large mileage of present stone roads. It is false economy to apply such utilization to heavily traveled streets and cover old macadam with sheet asphalt, the cost of which can be amortized satisfactorily only in the case of a pavement with long life, small maintenance cost and small traffic-transportation cost. In the use of old macadam roads as foundations, consideration must be given to the work necessary to bring the old road to proper grade and cross-section, which often completely destroys the bond of the old road. This bond is considered one of its assets as a foundation. In Washington some examples of asphalt pavements on old macadam bases have cost from 5 to 8c. per square yard per year for maintenance prior to giving 10 years of service. Rapidly increasing maintenance costs indicate early replacement which, however, is often indicated to a greater extent by resultant high transportation costs. Tabulated maintenance costs alone do not give a full history of a pavement. It is impracticable to maintain a pavement properly once it starts going to pieces. The hazard of macadam foundations for heavy traffic is shown by those existing in Washington, which in comparison with the standard asphalt pavement, are most unfavorable investments.

Town-Road Aid in Maine

Maine, at the legislative session which closed recently, passed a law to aid the towns in the maintenance of their roads. To benefit by the law the towns must have had a tax rate of at least 4 mills for road purposes for five years. The state aid amounts to $10 per mile of through or "route" highway per year, based on the four-mill levy. For each additional mill in the tax rate $1 per mile is added; that is, if the tax levy for road work is seven mills, the state will pay the town $13 per year for each mile of "route" highway.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

What Do You Mean, Worth?

Sir—In your issue of Dec. 25 I note the editorial, "What Makes a Record?" in which it is pointed out that dollar statistics today are apt to be deceptive as an interpretation of volume or quantity. The same thought is brought out, though in a lighter vein, by an item in F. P. A.'s column in the New York *Tribune* of Dec. 17. Possibly in view of the dry spell you may find it worth printing:

"The hotels of New York are said to have $5,000,000 worth of liquor on hand, but whether this means that it cost them $5,000,000 or they could sell it—and would—for $5,000,000 is not evident. When a bottle of whisky that cost 95c. is sold at 60c. a drinklet, it makes a difference when you say $5,000,000 worth. What do you mean, worth?" SOBER.

New York City.

[The nom de plume used by our correspondent is, to say the least, open to suspicion. Does the gentleman "protest too much?"—EDITOR.]

Greed and Reason in Construction Work

Sir—Conditions in the building industry are most peculiar, there being throughout the world a woeful lack of buildings of all types, more particularly houses and apartment buildings. In the United States this condition is due to an almost total suspension of so-called nonessential construction work during the war. In consequence of the shortage there is an unprecedented demand for houses and buildings of various types, and there have been varying predictions as to the period of time required before the supply will equal the demand. In all probability it will be several years before the demand is caught up with.

There is, in my judgment, an element of danger in the present situation. I refer now to the policy of business men in general and also labor, to boost prices and wages in the effort to "get theirs while the getting is good." Both labor and materials are unprecedently high; so high in fact, that were it not for the unusual housing problems there would be very little construction work done at present prices. As it is, a great volume of construction work of the speculative type and also many buildings which would be constructed for permanent investment, will be postponed indefinitely. Where the danger lies is in continuing to advance prices on all materials needed in construction work, for, while it is true that labor costs have advanced terrifically during the past two or three years, it is equally true that many advances which have been made in building materials and all other lines are unreasonable and unjustifiable. Unless business men in general call a halt on the ever-soaring prices, we will soon see a period of depression instead of the several years of splendid business which should be ours by reason of the existing conditions.

Despite the shortage and the unusual demand it is possible to halt the present building boom and when once checked it will be difficult to get under way again. Is it not better to be satisfied with a fair profit and have a prosperous condition throughout the building industry for several years than to have a comparatively short period of exorbitant profits and then a long period of depression? I believe it is.

Wise handling of the situation by manufacturers and dealers in building materials will insure for the industry a prosperous condition for several years, even though many other lines of business should be depressed in the near future, as has been predicted by statisticians and students of economics.

There is another angle which should be considered and that concerns the rights of the public which, after all, are greater than the interests of any individual or group of men. In line with the foregoing, the Northwestern Expanded Metal Co. has squarely placed itself on record as being opposed to further advances of any nature whatsoever. On the contrary we believe prices should be reduced where it is at all possible to do so without real injury to the individual business. I may add that we reduced prices of our products during the forepart of the present year and as we have made several wage advances since that time, we would be justified in increasing prices accordingly; but we have not done so, believing it the better policy to hold prices at their present level.

In my opinion, no business is justified in further advancing prices unless absolutely necessary to save the business from actual loss. This is not an original or novel idea, but is simply the application of common sense to the present situation, and both capital and labor will do well to take heed. By united action and a general adoption of this policy it will speedily bring the country back to a more normal condition and will tend to curb the spirit of unrest which permeates every walk of life. It will also postpone, if not actually avoid, the period of depression which we are headed for.

HOWARD W. FOOTE,
President, Northwestern Expanded Metal Co.

Chicago, Ill.

[The same plea for a unity of unselfish effort was voiced editorially in *Engineering-News Record* in the issue of Feb. 6, 1919, p. 267, under the caption "Are You Doing Your Share to Start Construction?"—EDITOR.]

Engineering and Adventure

Sir—I like very much Professor MacDonald's paper "Engineering and Adventure," in your issue of Jan. 1. Will you let me tell a tale that may further illumine the professor's thought and point a warning?

Seven years ago I was put at the head of an engineering enterprise. We were a new organization, competing with a matured institution—the recognized leader in the field. We gathered together a group of young men whose chief asset was enthusiasm. We set out to get the scalp of the older organization—to get it by doing a better job, by giving a product more nearly meeting the demands of the field. We got the adventure that Professor MacDonald speaks of without going beyond the shadows of New York's skyscrapers. With us the new enterprise was a game. We studied each of the team-mates carefully and impressed upon him that his personality had to show in the work of the new organization if he were to find the job worthwhile. We were not playing football, but the speed bursts were comparable to those long runs that drive the home crowd crazy at the big game of the season. Month by month we scanned the returns. There was no roaring grandstand to cheer us on, but our satisfaction was just as great when we saw the gap between us and our competitor narrowing. Whether we would have won no one knows. The race was closed by a consolidation, but there is reason to believe that the competitor thought it best to anticipate the inevitable.

So much for the adventure—Professor MacDonold's spirit of adventure. It's great. I'm for it. I believe that a real leader can put it into the most prosaic enterprise—like digging a ditch, or laying pavement base. You know the story of J. Waldo Smith and the New York Board of Water Supply. The flavor of that organization (I was never part of it) will linger till my dying day. There was adventure for you—the adventure of the Catskill Aqueduct—even though senoritas and sage brush were 3,000 miles away.

So much for the adventure. Now for the warning:

I had trained each of my team-mates to the point of view that he was an important man—and he was. We could not have spared a single one. But after the consolidation, with a bigger future opening, two of them seemed to get the idea that they had to have their own way or not play at all. I had petted them too much—and had failed to show them their weaknesses. One man—a hard, faithful worker, effective only under close guidance—finally left, demanding a "big job at big pay," while the other quit in a grouch. They and their team-mates had no complaint about salaries. In fact, looking back, I am inclined to think that rapid salary advances were part of their undoing.

Now I'm in a new game. I have inherited a goodly number of tried men and have added some likely youngsters. We're going about this job as the other team did after the old; and, as in the old job, we're going to win—win through the spirit of adventure that Professor MacDonald has exalted in his article. The wine of adventure will quicken our senses, the prospect of victory urge us on.

Adventure? Yes—but meanwhile I'm hoping that I may avoid the earlier mistake and not spoil the team, that I'll be able to develop the best in the men without turning their heads. For obvious reasons, Mr. Editor, you must let me sign myself INCOG.

New York City.

Eccentric Girder Connections

Sir—In your issue of Oct. 16, 1919 (Published Nov. 27, 1919), p. 730, there is an article "Common Errors in Detailing Steelwork for Buildings," by Edward Godfrey. It would appear from a practical analysis of some of the connections shown that Mr. Godfrey's recommendations tend rather to increase than to diminish the error.

Mr. Godfrey says that he has given the matter of failures much study, and has yet to find a single failure where fine theory needs to be brought in to explain the cause. It seems to the writer that had some theory been used in the design the failure would never have occurred. There are practical methods of course, but the so-called "practical designer" has no reason whatever to be "confused" or "disgusted" if his detail will not stand the proper analysis.

Take the case shown in Fig. 1 at (a), p. 731. The column can and should be designed for the combined bending and direct stress, which should not exceed the allowable unit stress as given by column formula. It is not easy to see how it could then bend or fail, and the writer can see no objection whatever to this design.

Referring to Fig. 1 at (b), p. 731, it is not quite clear to what extent the girder is assisting the column in bending; the shear acts at the same point, and the only difference in the two details is that one is attached to the column a little higher than the other. The column should be designed for the bending moment or at least a portion of it. Had the web plate of the girder been extended, forming a part of the column, as shown in Fig. 1 herewith, then the column could safely be designed for axial compression alone, neglecting any bending moment.

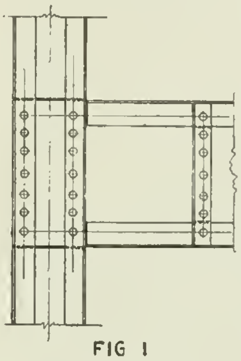


FIG 1

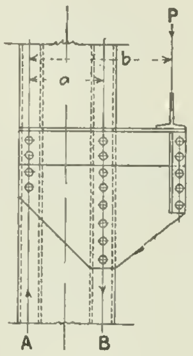


FIG. 2

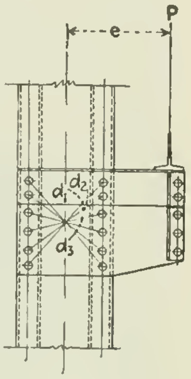


FIG. 3

Referring to Fig. 6, p. 732, it is not the writer's intention to go into any fine-spun theory, as Mr. Godfrey suggests, but to give a simple and logical solution of this connection which will give approximately the correct number of rivets in both rows A and B it will require little if any knowledge of the design of steel details, and will be somewhat more economical in both material and shopwork. Mr. Godfrey says: "By the principle of the law of the lever, the vertical force on the row of rivets B is Pb/a. If there are enough rivets in this row there will be more than enough in the row A, as the rivets in the latter row are forced upward." This is quite true, but why not continue by the same principle and find the upward force on the row of rivets A, which is $P(b-a)/a$? This would give a detail as shown in Fig. 2 herewith.

Another simple and practical detail for the same connection is given in Fig. 3. While both solutions give the same number of rivets in the connection, the one which distributes the rivets equally about the center of gravity of the group is to be recommended, as it has some theoretical basis for its adoption. Bearing in mind that the value of a rivet to resist bending moment when located at the center of gravity of the group is zero, also that its value varies as its distance from the center of gravity of the group, and that its moment of resistance varies as the square of this distance, the design is easily worked out on this hypothesis.

C. L. CARMAN,
Assistant Engineer, United States Engineer Office.
New York City.

Rigid Column Connections and Eccentric Load

Sir—In your issue of Oct. 16 you present an article by Edward Godfrey entitled "Common Errors in Detailing Steelwork for Buildings." In Fig. 1 of this article, reproduced herewith as Fig. 1, Mr. Godfrey shows what he has designated as good and bad connections for eccentric loads on columns. In connection with this discussion Mr. Godfrey presents his respects to those members of the engineering profession who make an effort to analyze statically indeterminate structures in these words:

"Ultratheorists will say (referring to *b* of Fig. 1) that by the theory of least work or the theory of relative rigidities the column should be designed for a portion of the bending moment. It is just this sort of theory and theorizing that confuses and disgusts the practical designer, and it is this that the writer believes has no place in structural design."

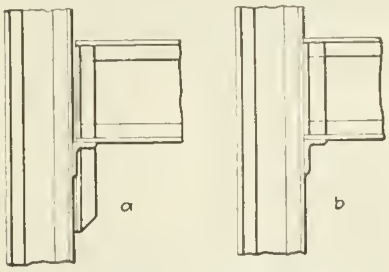


FIG. 1. MR. GODFREY'S ECCENTRIC AND IMPROVED COLUMN CONNECTIONS

With this statement before us let us compare *b*, the so-called good connection, with *a* the so-called bad connection. The fundamental difference between the two connections is that the connection *a* will resist the end shear of the girder, whereas the connection *b* will resist moment as well as shear. Mr. Godfrey states that the effect of the moment connection is to make a portion of the column act the same as part of the girder and the whole may be designed as if the girder extended to the center of the column and as if the columns were loaded centrally.

Fig. 2 herewith shows a loaded girder extending over and resting on the tops of two columns. Because of the deflection of the girder the loads on the columns are eccentric. If the connections between the girder and the columns of Fig. 2 were rigid the gap at B would not be formed; instead, the column would be bent in at the top, thus producing a moment in addition to the moment due to the load being eccentrically applied as at A. This is exactly the condition which exists in connection *b* in Fig. 1. For the connection angles of *b*, Fig. 1, not only exert on the face of the column a shear which acts as an eccentric load but also the connection angles exert a couple on the face of the column and this couple produces on the column a moment having the same sign as the moment due to the shear. In other words, considering the problem from a horse-sense standpoint, ignoring the ultratheorists, it would seem that connections *b* of Fig. 1 might cause a bigger moment in the column than is caused by connection *a*. That is, the so-called good connection may be the bad connection and the so-called bad connection may be the good connection.

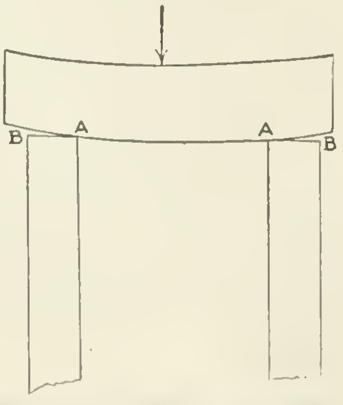


FIG. 2. DEFLECTION OF GIRDER RESTING ON TWO COLUMNS

Now I will ask Mr. Godfrey to overlook his prejudice and I will consult the ultratheorist.

In order to determine the moments in the column it will be necessary to fix geometrical quantities. Consider girder AA of Fig. 3. Then equating moments at A to zero[1] gives

$$2\,EK_{AA}\,\theta_A - \frac{1}{12}\,Wl + 4\,EK_{AB}\,\theta_A + 4\,EK_{AC}\,\theta_A = 0.$$

The constants are:

$$W = 100{,}000 \text{ lb.}$$

$$l = 240 \text{ in.}$$

$$K_{AA} = \frac{2506}{240} = 10.45 \text{ in.}^3$$

$$K_{AB} = K_{AC} = \frac{2764}{144} = 19.24 \text{ in.}^3$$

Substituting values of the constants in the equation gives $E\,\theta_A = 11{,}460$ lb. per sq.in. Then $M_{AB} = M_{AC} = 4\,EK_{AB}\,\theta_A = 4 \times 19.24 \times 11{,}460 = 884{,}000$ in.-lb.

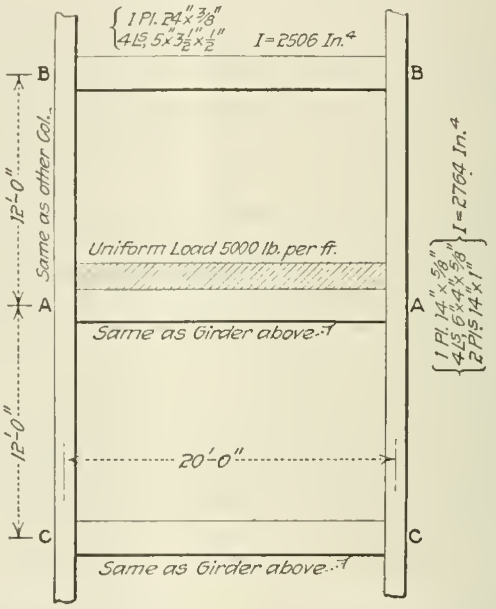


FIG. 3. A CONCRETE CASE OF GIRDERS AND COLUMNS

(This assumes that the columns are fixed at *B* and *C*; if the points B and C are hinged M_{AB} will be 846,000 in.-lb.)

If a connection of the type represented by *a*, Fig. 1, had been used the eccentricity would have been about 9 in. and the moment due to that eccentricity would have been 450,000 in.-lb. In other words, the so-called good connection *b*, designed to reduce the moment in the column, actually increases the moment 96%. Moreover, if the load on the girder had been a single concentrated load at the center the moment in the column with a Type *b* connection would have been 1,326,000 in.-lb., or 295% of the moment in the same column due to the same load if a Type *a* connection had been used.

No! Replacing Connection *a* with Connection *b* will not reduce the moment in a column due to an eccentric load. Neither is it safe to replace the ultratheorist with Mr. Godfrey's so-called "practical designer." What we need is a practical designer who knows his theory.

I have criticized Mr. Godfrey at considerable length because his error is closely related to a common error among structural designers. Structures are usually designed on the assumption that the connections are hinged whereas the structure is built with rigid connections. A very common opinion is that neglecting the fact that the connections are rigid increases the factor of safety. This is not necessarily true. With a very large number of structures making the connections rigid introduces large secondary stresses which are entirely ignored in the design. Personally, I cannot understand why in a structure that is easy to analyze a stress of only 16,000 lb. per sq.in. is allowable, whereas a stress of 20,000 to 24,000 lb. per sq.in. is allowable in a structure that is hard to analyze. The fact that the stress is a little more difficult to determine does not prevent the stress from entering the structure. The advent of the strain gage has shown that secondary stresses, which many supposed to exist only in the brain of a college professor, actually exist in steel structures.

---

[1] See equation A, p. 20, Bulletin No. 108, Engineering Experiment Station, University of Illinois, by Wilson, Richart and Weiss.

Even neglecting an unknown overstress of 25% is not the most dangerous result of a partial analysis of stresses. I believe that if the truth were known it would be found that 90% of structural failures have been due to the structure failing in a way that was not even considered in the design. I believe that a more careful analysis of structures, especially of an entirely new type, would cause the most likely method of failure to be discovered.

Stress calculations will always be left to a subordinate. Moreover, horse sense will always be used as the final check of a design. But the horse sense of a man who has computed secondary stresses and, especially of a man who has operated a strain gage, will call for quite a different design than the horse sense of a man who has only considered statically determinate stresses.

W. M. Wilson,
Associate Professor of Structural Engineering,
Urbana, Ill. University of Illinois.

Stopping Track Creepage on Heavy Grades

Sir—In the abstract published in *Engineering News-Record* of Nov. 27-Dec. 4, under the title "Track Creepage Stopped on Heavy Grades of Logging Railroads," some of the plans suggested do not conform to what has been considered good practice on most lines of railroads. "Old timers" can recall the use of rails that were slotted for the purpose of anchoring rails to the ties but with the advent of the modern slotted angle bar splice, the slotting of rails has generally disappeared. On the logging roads with which the writer has had experience, the rail section has been so light that he has never felt justified in reducing the effective section unnecessarily. It should be possible to get a satisfactory anchorage without cutting into the base of the rail at a vital point. Most writers on track and bridge maintenance advocate a careful avoidance of any sort of attachment of rails to bridge decks excepting those necessary to hold the rails down to the ties and to hold them to proper gage and line. Frequent instances of undue straining of bridges have occurred as a result of rigid connections of rails to ties or to stringers. It is generally considered preferable to anchor the rails well at the bridge approaches but to allow them free play longitudinally on the bridges. Even the spiking in angle bar slots or at ends of angle bars is prohibited on many roads.

The following methods are suggested to reduce the creeping of rails on heavy grades: (a) In laying track, see that proper provision is made at each joint for expansion, (b) keep all joints full bolted and nuts drawn up tight, (c) use extra length angle bars, spiking to three ties (through angle bar slots) at each joint, and (d) at such intervals as may be required, substitute a heavy timber "dead man" for the joint tie, (e) in special cases, such as at bridge ends, bolt long, heavy bars to joints, carrying these bars back and spiking to three or more ties. These may be bolted to outside of splices by using extra long bolts. If necessary, several sets of these may be placed at critical points.

Excepting in street railway construction, the writer has never found it feasible to insulate the rail from heat by covering with earth or gravel, though if conditions of traffic, drainage and track maintenance permit, such covering of the rails should assist materially in reducing the tendency of the rails to creep.

New Orleans. A. M. Shaw.

Changes in the Value of the Dollar

Sir—As a contemplation of conditions worse or more extreme than those prevailing at present has a soothing influence on most of us, perhaps you will allow me to comment, with this end in view, on the article appearing in the Nov. 27-Dec. 4 issue, p. 937, on "Changes in the Value of the Dollar." As both statements are obviously quite correct, does it not add unnecessary confusion to the issue to draw any fine distinction between the cheapness of gold (the dollar) and the high price of commodities, both meaning exactly and precisely the same thing? Any argument along this line must necessarily end where it began.

Broadly speaking, there is nothing new and unprecedented, so far as values are concerned, in the present economic period, nor is there apt to be any long-time permanence to these conditions. Your article deals almost exclusively with the symptoms, and not with the disease, or the cause itself.

An article in the November issue of the *World's Work* quotes Adam Smith as follows:

> The discovery of the abundant mines of America reduced, in the 16th century, the value of gold and silver in Europe to about a third of what it had been before. As it cost less labor to bring those metals from the mine to the market, so when they are brought thither they could purchase or command less labor; and this revolution in their value, though perhaps the greatest, is by no means the only one of which history gives some account.

and I further quote from this very able article itself:

> Since Adam Smith's time there have been five major movements in the purchasing power of gold, or in the price of commodities, as we more frequently consider it. For twenty years preceding 1809 there was an upward movement of prices which was entirely wiped out by the decline in the succeeding forty years following the Napoleonic wars. Then began the upward movement, coincident with the discovery of gold in California. This movement culminated after the sharp Civil War advances in this country. Then from the early '70s to 1896 there was a gradual downward movement which resulted in the free-silver agitation of that time. After 1896 gold production began to increase rapidly, due to the commercial application of the cyanide process for its extraction and to the discovery of gold in South Africa, Colorado and Alaska. This was the latest period of advancing prices, the one with which the present generation has had the most experience. It seems to have culminated in the revolution in prices due to the war.

It is further pointed out that since 1915 the gold production of the world has rapidly declined. So far this year over 90% of the gold produced in this country has been used in manufacturing and for purposes other than coinage. With the present known sources of gold, and present methods, this decrease will continue until only those mines will be left producing which could show a profit of at least 50% in 1914. Then the growing scarcity will again produce a relative value sufficient to stimulate production among the higher-priced producers. It is rather generally held that the arbitrary value of the gold standard is its own corrective. This process is now under way, and, as war-time restrictions are now lifted, it is being further helped by the export of some gold, treasury and otherwise.

The foregoing, I believe, may be considered as more or less orthodox. To this might be added the following surmise: Our Federal Reserve system has not had anything like a conclusive peace-time trial, and it seems at least plausible that even without the excessive war demand the vast amount of erstwhile restricted credit which it had to release, if used by the banks in general, would have promoted a cycle of inflation and higher prices in this country. Furthermore, during our participation in the war there was intensive (not to mention what amounted to compulsory) saving. Now we have had a year of intensively extravagant spending from these savings and high wages. A vast amount money has circulated from the sale of bonds. The latest treasury report shows a profit of several millions, due to retiring these bonds, below par.

With the exception of a limited number of monopolies —for instance, diamonds—the marginal factor in the law of supply and demand is infallible, and it requires but the smallest margin of scarcity or surplus in relation to the demand to effect the price greatly. Silver at present sells for a price actually above the coinage value. Iron and steel prices are high and firm, while copper commands a price less than the production cost of some fairly prominent plants.

It might be pertinent to say here that this marginal concept applies with equal force to your professional man. Each year our institutions add to the surplus of average ability. Further apparent injustices in the pay for brain workers in general is augmented by the lack of, and almost impossibility of, organization or union. Human beings may be equalized or unionized with some degree of fairness on a basis of manual labor, but scarcely the vaguest sort of a general value can be assigned to the brain worker, because of no comprehensive basis for a day's work. How could a union wage-scale work out for the "Brotherhood of Technical Journal Editors"? The professional man is still further entangled in a conspiracy known as "ethics," whatever that may be. Even assign for his benefit, if you will, a relation between gold and an index value, and you are still apt to leave him high and fairly dry, under existing conditions.

And now for any consolation that may be derived by a little further light on the statistics under your caption, "What the Statistics Prove." It is asserted . . . "these statistics prove that the cost of living today is higher—the purchasing power of the dollar is *lower* than it has been at any time." The statistics prove this because you have examined them over a very limited period only. In 1864 the Dun index was represented by the figure 312. The highest figure which you give (244.64) lacks just 67.36 points of eclipsing all records. From 1864 there was a decline for 33 years, until 1897 the index stood at 72.

It is further a fact that while our currency will purchase less in this country than for a considerable period heretofore, it will purchase more in some other markets than ever before.

The process of correction is again under way. Less gold is being produced and a large proportion of what is produced is going into the arts. Able minds are working on better methods and labor-saving devices to increase production and cheapen it. Europe will eventually not require so much of our margin, and it will then be up to the sales manager to function normally again, hustling around to dispose of, at lower prices, material on which labor may be willing to work an extra half-hour or so a day, in order to produce it competitively. Then will our professional and fixed salaried men wax very fat and maybe just a little superior once more. Labor's chief concern will be that due to the uncertainty of continuous employment.

R. L. SITES,
New York City. The Brown & Sites Company.

Method of Laying Out Split-Switch Turnout

Sir—Referring to the communication from L. C. Scott, p. 711 of *Engineering News-Record* of Oct. 9, 1919, entitled "Method of Laying Out Split-Switch Turnout":

It seems to me that the method outlined—that of setting up the transit at the point of the switch—is in error, since the lead curve does not begin at this point but at the heel of switch points.

In a modern turnout we have two tangents; that is, the line of switch rail produced and the line of frog rail produced. The only true turnout curve, therefore, is one that will connect heel of switch with toe of frog. For a given frog number, with distances from point of frog to toe of frog and from point of switch to heel of switch, as well as throw of switch, constant, there can be but one true connecting curve. With the various lengths of switch rails and frogs in use no one set of tables can be expected to fit all cases.

Since nearly every railroad has a standard length of switch rail and frog for given frog numbers, it would seem logical to compute the true turnout curve for each number of frog, establishing a standard lead distance for each frog. With this distance (adjusted for economical use of rails without cutting), point of switch and point of frog may be located and, if necessary, points on turnout curve established from measurements from main track rail.

The curve back of the frog has no relation to turnout curve, since the turnout has passed through a frog tangent of not less than 10 feet before reaching heel of frog. Good practice would require an additional frog tangent of at least 10 feet back of the frog proper, and the secondary curve to be sprung from this tangent, the curvature of this secondary curve being less than the turnout curve proper.

I do not believe that a competent trackman would install a turnout with the sharp angles mentioned by Mr. Scott, "stakes or no stakes." While it is true that a large percentage of derailments occur on turnouts, these are due in part to the use of longer and heavier engines and overloaded cars which cannot take the sharp curvature, but often to defective and dragging equipment catching on switch rods and guard rails.

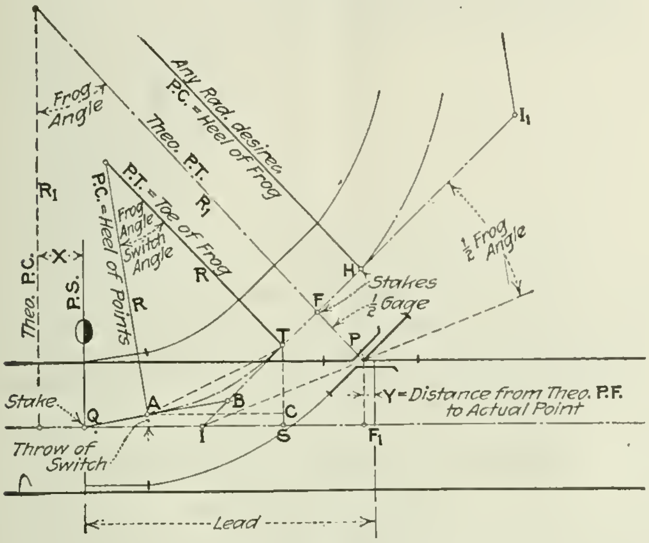
In my opinion, the only curve that needs the attention of the engineer is the curve back of the heel of the frog, and this in all cases should be handled from the frog tangent.

R. L. LONGSHORE.

Montpelier, Ohio.

Sir—Referring to L. C. Scott's letter on p. 711 of *Engineering News-Record*, of Oct. 9, 1919, relative to layouts for split switches:

The accompanying sketch shows the method of making switch layouts employed on the Union Pacific R.R.



LAYOUT FOR SPLIT SWITCH TURNOUT

Solution: Given frog angle, switch angle, dimensions of switch points and frog, and gage of track.

(1) Solve triangle IFP, obtaining IF ($IF = IF_1$) and IT.
(2) Solve triangle ITS, obtaining TS, CS, IS and TC.
(3) Solve triangle ATC, obtaining AC and AT, which is the long chord of a curve having a radius R, and semitangents BT and BA and a central angle equal to the frog angle minus the switch angle.

Lead = length of points + AC + SF_1 + distance from theoretical to actual point of frog.

(QA = length of points).
R_1 = radius of theoretical curve shown by Searles and others in turnout tables.
X = Distance from theoretical SC to point of switch and can be figured if desired.

To stake out:

Set up at I, turn off frog angle, and set stakes at Q_1, F, H, and I_1, etc.

This is the only way in which a simple curve can be obtained from the heel of the points to the toe of the frog with no tangent between points and frog.

I believe that if Mr. Scott will use this method in figuring one of his turnouts it will be clear to him that the length of the lead depends upon the length and angle of the points, and the distance from the toe to the point of the frog as well as the frog number or angle.

If tables of split switches are available based on the same (or approximately the same) lengths of frogs and switches as are being used, results should be satisfactory, provided the curve beyond the frog starts at or beyond the heel of the frog.

V. F. WETMORE.

Omaha.

Sir—Engineers will generally agree, I think, that the method of laying out a split switch turnout advocated by L. C. Scott in your issue of Oct. 9, 1919, p. 711, is preferable to the one advocated by the office engineer he mentions.

It is immaterial what degree of curve is used after leaving the frog, so long as it meets the requirements of the rolling stock used, or the standards of that particular road, since the curve of the turnout ends at the point of the frog, the line from that point being a tangent of at least the length of the frog itself, and can be of any greater amount necessary, the following curve being selected to suit conditions.

My practice has been to locate the point of frog so as to avoid cutting a rail; that is, the distance from the rail joint in the main track to the point of the frog, measured toward the point of switch, being made equal to the length of the frog from the heel to the point. At this point a hub is driven at half gage from the gage side of the nearest rail and outside of the track on the side on which the turnout is to be laid. The transit is set up over this hub, and a foresight taken along the main track parallel to it. An angle equal to the angle of the frog to be used is turned away from the track, and another hub driven on this line at about 10 ft. or more from the first one. From this last hub, the line is run to suit conditions as they may be found. The plus of the first hub, the point of the frog, is usually given as 0 plus the length of the lead of the turnout to be used, which can be taken from any standard book giving tables of this kind.

The location of the switch points can readily be determined by the track foreman from the same tables, or from his standard frog and switch plans, which generally are provided by the engineering department of the road. The plans will show also the ordinates of the lead rail for each different turnout used.

Of course, in congested or restricted locations this plan may have to be modified, as also in cases where turnouts occur on curves.

H. M. KANARR,

Punxsutawney, Penn. Civil and Mining Engineer.

To Control Filter Operation

Control of the operation of water-purification and sewage-treatment plants is now the big task of the Illinois Department of Health, according to Capt. Paul Hansen, chief engineer. On this subject he says: "There are a number of communities in Illinois that have filter plants that are little better than useless, simply because we cannot induce the local authorities to operate them properly. The operation of sewage-treatment plants is even worse than the operation of water purification plants. Fortunately, this does not so intimately affect the public health.

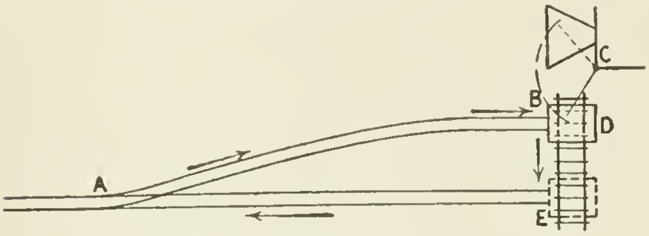
"I have been urging for several years that small communities retain the services of consulting engineers to guide them, in connection with the operation of water-purification and sewage-treatment plants. Such services can be had at a very nominal figure, and will be a decided advantage to both the engineer and the community. The community will benefit by the advice, and the engineer will have an opportunity to learn something of the operation of the plants which he is called upon to design. In the near future, we hope to supervise the operation of a small number of water-purification and sewage-treatment plants, merely as a demonstration of what can be accomplished by such occasional expert control."

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Transfer Table Switches Batch Cars at Mixer

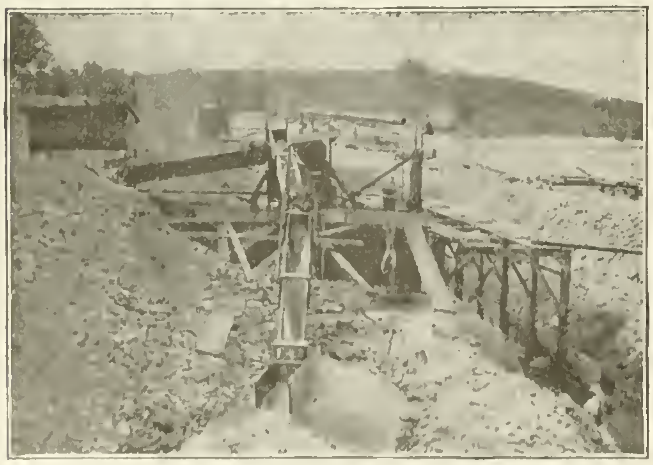
IN PUTTING in concrete base for asphalt pavement in Detroit, Mich., light industrial track is successfully employed for hauling proportioned batches for as short a haul as ¼ mile from stock pile to mixer. To permit quick shifting of loaded and empty cars at the mixer, the arrangement indicated by the diagram has been successful on work performed by W. E. Currie, general contractor, Detroit, Mich. Trains of cars, each carrying two batch boxes are pushed in on switch A B. The batch boxes are picked up and dumped by the mixer crane C. Then the batch car is run onto the transfer car D and shifted to track E A. As the last car is being discharged at the mixer, a second loaded train is pushed onto A B, and the locomotive uncouples and switches back to pick up on A E the empties of the first train. Based on the successful operation of this switch and transfer-car arrangement, a plan is contemplated by which the whole system A B E, including the transfer track, will be mounted on a triangular platform on low wheels, thus forming a portable switch to be moved by a niggerhead on the mixer.



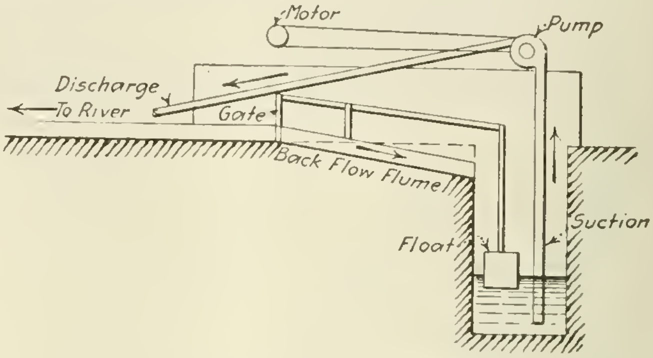
SWITCH AND TRANSFER FOR BATCH CARS

Controlled Bypass to Suction Permits Continuous Pumping

BY means of a simple float and wood gate the pump man handling the water from the trench of the Notus canal inverted siphon on the Boise Project of the U. S. Reclamation Service was able to keep his motor-driven centrifugal pump running continuously without losing suction. Enough water was allowed to drain back into the suction pit through the float-controlled gate to maintain a level varying not more than a foot. The rig consisted of a block of wood for a float attached to an upright connected to one end of a fence board lever with a fulcrum in the center. The other end of the lever raised and lowered a wood gate in a sluice box 12 in. wide, carrying water from the discharge end of the pump back to the suction pit.



CENTRIFUGAL KEPT RUNNING WITH HOMEMADE BYPASS

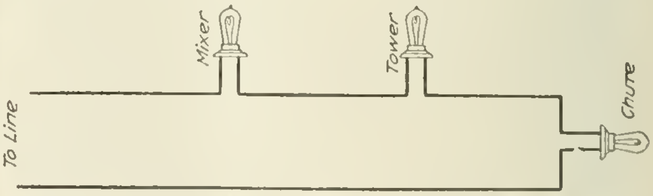


FLOAT CONTROLS DISCHARGE BACK TO SUMP

Signaling Concrete Mixer by Lights

By E. K. Borchard
Philadelphia, Penn.

ON A recent concreting job it was necessary to move delivery chutes frequently, which necessitated holding up the mixer and also the delivery from the discharge hopper at top of the hoist tower. Bells were first used as a means of signaling, but were sometimes not heard or were misunderstood. Signal lights connected in series, as shown in the illustration, proved much better than bells and were foolproof. When the concreting gang wanted to shift chutes, they turned out their light, which in turn automatically extinguished the lights at the tower head and the mixer. Instructions were given not to mix or send down concrete unless the lights burned, so this stopped the supply.



LAYOUT OF SERIES-CONNECTED LIGHTS AT MIXER

When the work was ready to proceed again, the concreting gang turned on their light, which lighted the other two also. By having the light at the end of the chute, the foreman or any of the gang could see at a glance whether concrete was coming, and there was no uncertainty concerning whether the signal had or had not been given.

The lights connected in this way burn dimly unless lower-voltage lamps are used.

Improvised Cableway for Light Bridge Erection

A CABLEWAY suitable for light bridge erection service, and which can be improvised from materials on the job, is illustrated as used by the British Army railway engineers in France. As described by Capt. I. Simson in the *Royal Engineers' Journal*, each pair of sheer legs consisted of two telegraph poles 50 ft. to 56 ft. long with butts about 11½ in. and tips 6 in. in diameter. The feet of each sheer leg were spaced 13 ft. apart, so that a railway truck with material could be run under the legs, and the material be picked off the truck by the lifting tackle. The sheers themselves were about 120 ft. apart. The runner, traveling and lifting tackles, and both back guys, consisted of 3½-in. to 4-in. manila rope. No blocks with more than three sheaves were available at the time. All lashings were of 2-in. rope, while ⅜-in. chain was used, in addition, at each crotch, to fasten the blocks of the runner tackle and back guys.

The arrangement of blocks shown had the following advantages: (1) Equal strain in all returns of each back guy and "runner" tackle; (2) easy adjustment for the considerable stretch that took place in all back guys and runner tackle; (3) by paying out on Q (not under load) the strain on the "runner" tackle was reduced to a minimum for heavy loads.

No derrick poles or tackles were required to erect the sheers. The legs were placed opposite their footings, both crotches lying away from the gap. Sheers B was lashed down to the railway track temporarily; while the crotch of sheers A was raised on a crib built up on a railway truck—the crotch thus being 12 ft. or so above rail level—and the feet tied back temporarily to the track. By pulling on the runner tackle in the direction Q1 from the side B of the gap, sheers A was pulled up and its back guys were made fast when A was leaning forward over the gap.

The free end of the runner tackle Q1 was then run over the second pulley of the double block at the crotch of sheers B, and, by pulling in the direction of Q2, sheers B was raised. When also leaning well forward the free end R1 of the back guy for B was made fast, and the free end Q2 of the runner tackle run through the snatch block, at foot of sheers B, in its final direction Q, in which it was made fast. The legs were adjusted for verticality by taking in or paying out on R1 and R2. The runner tackle was adjusted to suit by paying out or taking in Q. The operation of lowering was carried out by practically reversing the above process.

The sheer legs A—on the side of the gap to which material can be brought by rail or road—should be situated as near the edge of the gap as possible consistent with picking up the loads directly, and the running end P of the main fall should be run off on this side of the gap. Sheers B should be situated as far from the edge of the gap as the length of the cordage will allow. The object of this is to get the far end of the bridge near the center of the span. All loads then run down the runner tackle, until at the center of the span they are at their lowest point. If they have to go further than this, the loads must then be pulled up the runner by means of S1. Steel cable for the runner tackle would undoubtedly prove a great improvement.

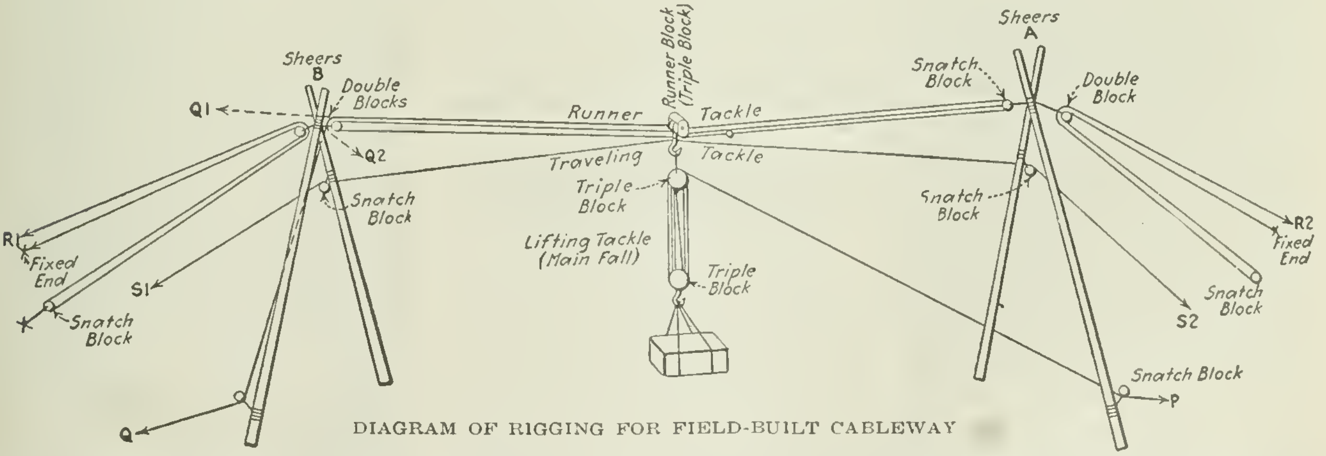
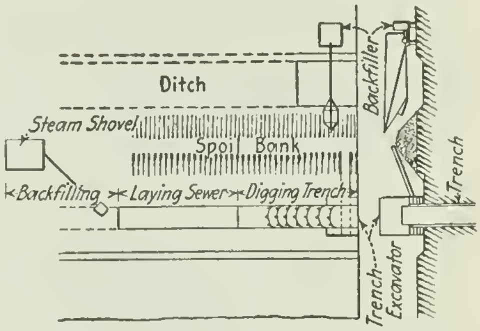


DIAGRAM OF RIGGING FOR FIELD-BUILT CABLEWAY

Ditch Dug to Receive Surplus Excavation From Trench

FACILITY in disposing of surplus excavation from sewer trench is gained by a Detroit contractor in in the manner indicated by the accompanying diagram. A 4-ft. trench about 20 ft. deep, for a 4 x 6 ft. egg-shaped brick sewer, is being dug by a trench excavator in an unpaved street in a sparsely built-up district. The material below the top soil is clay, which cannot be disposed of except by long haul to dumps, as property owners will not use it for grading or allow it to be scattered on their land. Since the volume of excavation displaced by the sewer had in some way to be wasted, the contractor excavated, with a steam shovel, a broad, shallow ditch. The excavation took only the top soil, which was loaded into wagons and which could be readily disposed of on nearby and often on adjacent lots. The volume of the ditch was approximately the volume of sewer displacement. A power backfiller taking from the spoil bank filled the ditch. Then the remainder of the spoil required to refill the trench was filled back by steam shovel. With the machine outfit indicated, about 35 ft. per day of 4 x 6-ft. brick sewer was averaged.



BACKFILLING METHOD ON DETROIT SEWER

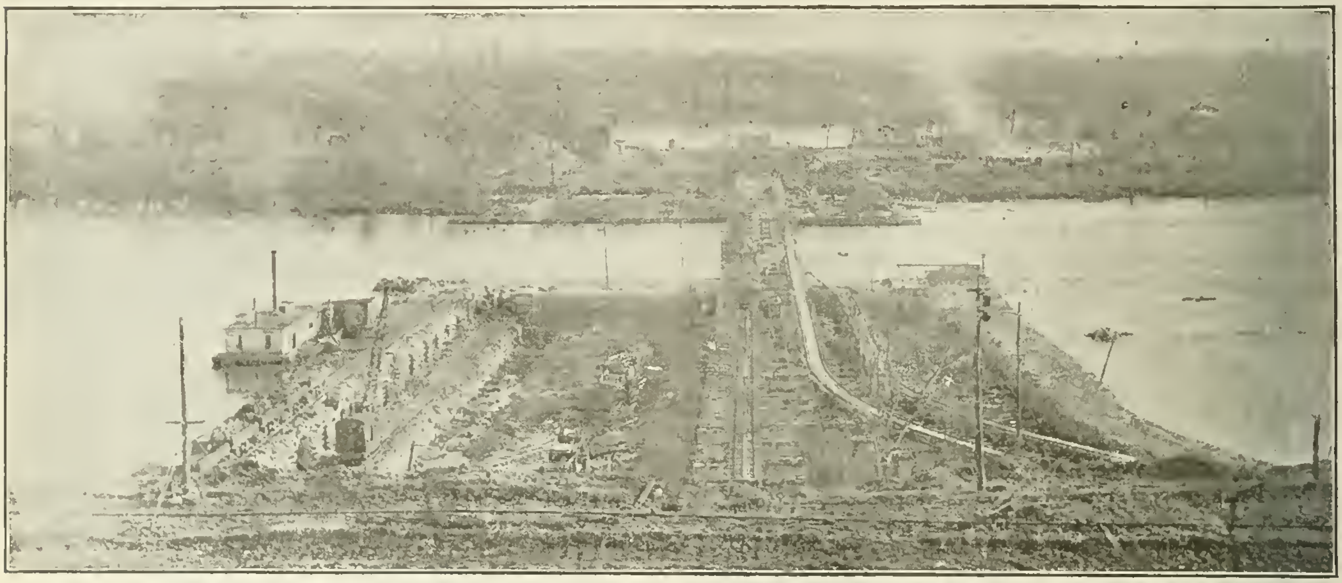
NEWS OF THE WEEK

New York, January 8, 1920

Progress on Muscle Shoals Dam Construction

One of the Largest Masonry Dams in the World Being Built by Federal Government on Tennessee

Construction is well under way on the so-called Wilson Dam, being built by the Government at Muscle Shoals on the Tennessee River at Florence, Ala., near Government nitrate plant No. 2, which was completed toward the end of the war. This dam, with its accompanying locks, is part of a project which has been before Congress for many years, but which was not authorized until the need of power for the nitrate plant could be urged in its favor. There was, however, no possibility of developing the power in time for its use in the nitrate plant, so steam power had to be provided for the war operation of that plant.



LOOKING SOUTH OVER CONSTRUCTION OPERATION ON WILSON DAM AT MUSCLE SHOALS, ALA.

The dam will be about 96 ft. high from bedrock to pool level and over 4,000 ft. long, and will have nearly 1,000,000 cu.yd. of masonry, which will place it among the largest in volume ever built. Eventually there will be at the south end of the dam enough turbines to generate 300,000 to 375,000 hp. At present four 30,000-hp. turbines will be installed. The bulk of the power so generated is to be supplied to the nitrate plant. At the north end of the dam there is a flight of locks, each 60 ft. wide, with 300 ft. available length. These, with the completion of dams 1 and 3 below and above, will constitute the navigation project.

Construction work on the dam is in the preparatory stage. About ten

(*Concluded on page* 108)

Consular Service Wants "Retired Engineers" With "Independent Means"

A consular examination has been set for Jan. 19. Officials of the Consular Bureau at Washington, D. C., have expressed a desire that retired engineers should take this examination so as to be on the eligible list for appointments requiring men with special training where that training would be particularly valuable to the United States.

The fact that younger men are not attracted by consular salaries has led to the conclusion that the parsimony of Congress in that respect can be met only by inducing men with private means to engage in the work.

[*Comment on this request for "retired engineers" will be found in the editorial columns of this issue.*—EDITOR.]

Chief of Engineers Appointment Delayed for President's Opinion

(*Washington Correspondence*)

The Secretary of War continues to decline to reply to inquiries as to when he expects to recommend a new Chief of Engineers, U. S. A. Some weeks ago it was understood that he regards the appointment of the Chief of Engineers of such importance that he will not take action until he has discussed the matter with the President. A few days ago Mr. Baker stated that he had not seen the President since his (Mr. Baker's) return from Panama. From this statement it is inferred that no recommendation from the Secretary of War may be expected pending its discussion with the President.

Canadian Model Registration Bill Is Drafted

Act Provides Medium for Regulation of All Professions Not Now Controlled

The draft of a comprehensive, professional registration bill to serve in Canada as model legislation, to be introduced into the various provincial legislatures, has been presented in a report of the Joint Committee of Technical Organizations to the several Canadian technical societies which the committee served. The draft provides for examination and registration in all branches of the technical professions and all other professions, with the specific exception of law, medicine, dentistry and surveying as long as their regulation is continued by existing laws.

The report recites that the two essential factors involved in creating the "status of the engineer" are, in their proper sequence, "recognition" and "remuneration." It says that the degree of the latter is proportionate to that of the former, which in turn is limited by the value of engineering service to the community at large. Publicity and legislation are given as the proper means of obtaining recognition, the former to be largely the result of engineer participation in public affairs. Publicity is called the offensive weapon and legislation the defensive.

The report says, in part: "The primary function of all legislation is the protection of the public. If this principle is rigidly applied to any engineering legislation that may be framed, it will be found that the engineer has

(*Concluded on page* 110)

Commonwealth Drydock Opened After Battleship Trial

The Commonwealth Drydock at Boston, the largest of its type on this side of the Atlantic has been opened for service, the first vessel to be docked being the U.S.S. Virginia which was floated into position at 9.50 a.m. Dec. 22 to test the dock's operation. The unwatering was accomplished by means of three electric pumps in about two hours. The capacity of the dock is 55,000,000 gal.

The Commonwealth Drydock was started three years ago under order of a special act of the Massachusetts Legislature. It was constructed under the supervision of the directors of the Port of Boston and later by the Waterways Commission of Massachusetts. It was flooded for the first time June 11, 1919. The drydock was purchased by the Government for $4,100,000 under agreement that the dock should be turned over completed in every respect. The cost to the state will be in excess of $3,000,000.

The structure is 1,170 ft. in length and 114 ft., 9 in. in depth. The depth over the sill at low water is 35 ft. The largest ship that can be accommodated is one of 1,150 ft. length, 115 ft. beam and 45 ft. draft. The foundations of the drydock rest on solid rock. The approaches are dredged to a depth of 37 ft. Two wet docks adjacent for berthing ships are planned by the Navy Department.

Discuss Highway Transport at Motor Truck Show

A series of highway transport conferences is attracting not only dealers and manufacturers of motor vehicles, but all those interested in truck transportation at the 8th Coast Artillery Armory, New York City. The conferences, being held in connection with the national motor truck show, began Monday afternoon, Jan. 5, and will continue until Saturday afternoon, Jan. 10.

Afternoon sessions are being devoted chiefly to subjects of most importance to those engaged in the motor truck business and the evening sessions to owners, operators, shippers and all others interested in truck operation and in the economics of highway transport. In the evening sessions separate subjects are being discussed, including the development in transportation, increase in motor haulage efficiency, rural motor express, aids to motor truck afficiency, and motor truck as compared with railroad freighting. Saturday afternoon three engineers, prominently identified with highway construction, will speak. They, and the subjects assigned them, are: Arthur H. Blanchard, professor in charge of highway engineering, University of Michigan, "Relation of Roads to Operating Cost"; H. Eltinge Breed, consulting engineer, New York City, "Progress in Highway Improvement"; and F. G. Thompson, State Highway Engineer, New Jersey, "Constructing Roads for Motor Truck Traffic."

Another Award of Contract for Passaic Valley Outfall Tunnel

After being twice abandoned by contractors, the construction of the New York Bay outfall tunnel of the Passaic Valley sewer was again contracted for Dec. 20. The Passaic Valley Sewerage Commission let a contract for the work to the Foundation Co. on a cost-plus contract estimated to involve a cost of $1,500,000. Bids had been asked on both lump-sum and cost-plus bases.

The legal position of cost-plus bidding under the state laws requiring competitive bidding for public work was in doubt for a time. It was decided by the commission's counsel that if the work to be let were new work, lump-sum bidding would be necessary, but that the present contract is an exception as it is a reletting of an abandoned contract. It is expected that the award will be attacked in court.

$50,000,000 Gift to Increase Salaries of Educators

Bringing the total of his philanthropic gifts to an estimated figure of half a billion, John D. Rockefeller has added to his former benefactions a gift of $100,000,000, which is the largest recorded single philanthropy. Half of the $100,000,000 is to be devoted to creating a higher degree of compensation for educators in colleges and universities. The other half will be devoted to medical research throughout the world. Its use will be directed by the Rockefeller Foundation.

The General Education Board, created by Rockefeller in 1902 and since given $52,000,000 for educational purposes, will direct the expenditure of the new $50,000,000 Christmas gift to college educators. Plans for following out that course will be decided upon at the Board's meeting in February.

The memorandum transferring the $50,000,000 to the care of the General Education Board reads as follows: "The attention of the American public has recently been drawn to the urgent and immediate necessity of providing more adequate salaries to members of the teaching profession. It is of the highest importance that those intrusted with the education of youth and the increase of knowledge should not be led to abandon their calling by reason of financial pressure or to cling to it amid discouragement due to financial limitations. It is of equal importance to our future welfare and progress that able and aspiring young men and women should not for similar reasons be deterred from devoting their lives to teaching.

"While this gift is made for the general purposes of the board, I should cordially indorse a decision to use the principal as well as the income as promptly and as largely as may seem wise for the purpose of co-operating with the higher institutions of learning in raising sums specifically devoted to the increase of teachers' salaries."

Program of Am. So. C. E. Annual Meeting Is Issued

The program for the sixty-seventh annual meeting of the American Society of Civil Engineers, to occur in the Engineering Societies Building, New York, Jan. 21 and 22, prescribes one day of solid business and one day of excursions with the two evenings given over to social entertainment. The feature of the business sessions, in which will take place the presenting of annual and special committee reports, the election of officers and appointments to the nominating committee, will be the discussion of the Development Committee's report. It is expected that the discussion of this report, which recommends comprehensive national organization of all engineers, will extend well toward the end of the afternoon of the twenty-first. The business session will be interrupted from 1 to 2:30 p.m. for the service of luncheon in the building to the members of the society.

At 9 p.m. a reception to the president will be given in the board room of the society followed by dancing to begin at 9:30. Supper will be served from 11 p.m.

The second day of the meeting will be devoted to an inspection of the Port of Embarkation of the United States Army at Hoboken, and of the Brooklyn Navy Yard. After the excursions there will be an informal smoker in the Engineering Societies Building at 8:30 p.m.

The committee in charge of the arrangements for the two days' meeting has the following members: Lewis D. Rights, chairman; Charles Gilman, George L. Lucas, Francis Mason and Charles Warren Hunt.

Model License Law Distributed to Elicit Discussion

Copies of the report of Engineering Council's Committee on Licensing, including the committee's model license law, have been mailed to engineers in all parts of the country for the purpose of drawing out discussion to guide Council in its consideration of the law.

The model law, an abstract of which was published in *Engineering News-Record* dated Oct. 16, p. 746, was framed to regulate the practice of engineers, architects, and land surveyors. It is the result of fourteen months of study and discussion by the committee of fifteen prominent engineer members, representing thirteen states and nine branches of engineering practice.

Not ex-Commissioner Carlisle

In *Engineering News-Record*, Dec. 25, 1919, a news story, p. 1079, concerning the road conference held at Albany credited certain statements to ex-Commissioner John N. Carlisle, which should have been attributed to ex-Commissioner Edwin Duffey.

Railway Officials Protest Senate Excess Earnings Provisions

The National Association of Railway Executives has submitted an additional memorandum to the Conference Committee of Congress, now engaged in adjusting the differences of the Esch and Cummins railroad bills, protesting against legislation limiting the earnings of strong companies and making the excess available to weaker lines. The memorandum questions the constitutionality of such legislation.

The recent conference of the heads of railway unions, called by Samuel Gompers, president of the American Federation of Labor, at the same time made public resolutions in favor of extending Government control for two years and against anti-strike legislation.

At this writing, the House and Senate conferees have deferred definite action on the principal points of difference of the two bills. Some minor points have been considered, including the car service sections and agreement has been reached on Government supervision of car distribution.

Meetings of the Association of Railway Executives are being held in Washington in regard to railroad legislation and changes necessary in reverting to private control. It was announced Jan. 5 that the Association favors the continuance of some features of operation under Federal control and has agreed upon the adoption of a rule for distributing cars, continuation of the system of operating statistics established by the Railroad Administration and the present method of collecting transportation charges.

Purdue's Annual Road School To Cover 18 Highway Subjects

Purdue University's sixth annual road school, scheduled for Jan. 27-29, 1920, will afford 18 lectures, on as many phases of highway work, to the state, county, and municipal road superintendents, engineers and contractors of Indiana. The highway subjects covered by the course are to be presented in the form of addresses by selected authorities and followed by discussion.

The attendance of Indiana highway men at this road school in past years varied between 100 and 150, according to George E. Martin, associate professor of highway engineering at Purdue, who believes this year's attendance will considerably exceed the larger figure. On the first night of the course the county surveyors', the county highway superintendents', and the highway contractors' associations of the state will hold their annual meetings.

The subjects and speakers for the course are: "The Indiana State Highway Commission," by L. H. Wright, director of the commission; "State Highway Construction," by H. K. Bishop, chief engineer of the commission; "Hauling Highway Materials," by a speaker not yet announced; "Gravel Roads," by T. R. Agg, professor of highway engineering, Iowa State College; "The Jog in the Road," by E. T. Minton, county surveyor, Tippecanoe County; "The Development of Concrete Roads," by C. D. Franks, district engineer, Portland Cement Association; "The Real Issue in Our Highway Problem," by H. E. Bilger, consulting engineer, Monmouth Stone Co.; "Highway Bridges," by William J. Titus, bridge engineer, Indiana State Highway Commission; "The Relation of the Bonding Company to Highway Work," by a representative of the Lion Bonding & Surety Co.; "Asphaltic-Macadam and Asphaltic-Concrete Pavements," by Arthur H. Blanchard, professor of highway engineering, University of Michigan; "Federal Aid in Indiana," by R. E. Toms, senior highway engineer, Bureau of Public Roads; "Demonstration of Testing of Road Materials," by R. B. Crepps, instructor in Purdue University; "Highway Lessons of the World War," by Prof. George E. Martin, Purdue University; "Construction and Maintenance of Bituminous-Macadam Roads," by Walter Buehler of the Barrett Co.; "The Work of the United States Weather Bureau in Reporting Road Conditions," by J. H. Armington of the bureau; "State Road Maintenance," by A. H. Hinkle, chief maintenance engineer, Indiana State Highway Commission; "The Development of Brick Roads," by Clarke Mandigo, consulting engineer, Western Paving-Brick Manufacturers' Association; "The Administration of the Highway Laws," by a representative of the State Board of Accounts.

Alaska Railway Staff Reorganized

Recent reorganization of the Alaska Government Ry. creates two grand divisions: The southern division, with offices at Anchorage, extends from Seward to Broad Pass, 315 miles, and includes all branch lines as well as the operation of the mines in the Matanuska coal fields; the northern division, with offices at Nenana, extends from Broad Pass to Fairbanks, 152 miles, and includes also the narrow-gage Tenana Valley Ry. Col. F. Mears is chairman and chief engineer of the Alaskan Engineering Commission, which is building and operating the railways. William Gerig, assistant chief engineer, is in charge of the southern division; Frederick D. Browne is engineer in charge of the northern division. Officers of the southern division include the following: F. A. Hansen, engineer of maintenance and construction; T. W. Secrest, assistant engineer of maintenance and construction; G. G. Jones, superintendent of construction; James Hanahan, assistant superintendent of track (Anchorage to end of track); Dan Leech, assistant superintendent of construction (on work north of end of track). The officers of the entire system include W. J. H. Fogelstrom, bridge engineer; Sumner Smith, resident mining engineer, and H. P. Warren, engineer in charge of construction supplies.

Progress on Muscle Shoals Dam Construction

(*Concluded from page* 106)

miles of railroad have been built. The first of six cofferdams was unwatered in August, 1919, and the rock has been largely removed from the excavation for the cutoff wall along the heel of the dam. A construction bridge, with concrete piers, and track level above ordinary flood heights, is being built upon the apron of the dam. About two-thirds of the total volume of 10,000 cu.yd. of concrete in the piers has been placed. This bridge will carry four standard-gage tracks and will handle all supplies and material going to the dam. On a fifth and wider track will be mounted seven 10-ton traveling tower derricks, with 90-ft. booms, which will lift the concrete in skips from the cars and place it in the dam. With these derricks in operation by next spring, it is planned to place 2,000 yd of concrete per day.

In order to provide the aggregate for the concrete, a dredging fleet is being assembled at Buck Island, nine miles below Florence. Two suction dredges will work at a bar of excellent sand and gravel, which will be screened and washed, and then towed upstream in barges. The last two or three miles' haul will be by rail to the three mixing plants. The largest plant, located on Jackson's Island in mid-stream, is equipped with two 4-yd. mixers; the other two each have two 2-yd. mixers.

Work on the south side of the river at the power-house site has just fairly commenced. A railroad connecting the nitrate plant with the abutment is nearly completed. Three additional traveling tower derricks will handle the concrete for this section of the dam.

The work is being prosecuted with hired labor, and the growing pay-roll now numbers 4,000 men. A construction camp, with facilities to house and mess about half this number, has been completed on the north bank, three miles from Florence, while housing facilities at Nitrate Plant No. 2 are available on the other side. The construction is under the immediate direction of the United States District Engineer, Lieutenant-Colonel Lytle Brown, Corps of Engineers, U. S. A. Of his assistants, Major S. C. Godfrey, Corps of Engineers, U. S. A., is in charge of Administration and Supply, Assistant Engineer D. A. Watt of the Engineering Division, and Assistant Engineers Joseph Wright and J. S. Butler of Construction Divisions 1 and 2 (north side and south side).

Robert W. Hunt Gives Fund for Award for Prize Paper

To assist in making membership in the Western Society of Engineers useful and hence attractive to the younger men of the profession, the Robert W. Hunt Award of $250 will be established for the best paper contributed to the proceedings of the society each year on any subject pertaining to the manufacture or treatment of iron or steel products. For this purpose Captain Hunt has placed $5,000 in trust in a Chicago bank.

While detailed conditions of the award are not yet available, it is known, in general, that the member must not be over 30 years of age or a member of the faculty of an educational institution. Should the judges consider no paper submitted in any year worthy that year's award, it is to go to St. Luke's Hospital, and if the society shall fail to make an award for five consecutive years the securities are to be turned over to the hospital.

Prospects Brighter for Staten Island Piers

One step further in the complicated procedure apparently necessary to bring about the construction of a terminal pier in New York City was made on Dec. 30 when the Board of Aldermen authorized an additional appropriation which brings the total authorization for piers at Stapleton, Staten Island, up to $14,563,032. These piers have been under discussion for about a year. They lie along the east shore of Staten Island just inside the Narrows, between two private dock terminals. As first contemplated by the City Department of Docks they were to be of the type common in New York City; that is, fairly narrow with a pier shed completely covering the pier. Later, criticisms of this type led the department to change the design of two of the piers at least, so that they will be over 200 ft. wide with the shed only covering the middle of the pier, leaving marginal spaces where freight-handling machinery may travel.

The comptroller of the City of New York refused to permit the authorization of the bonds for the piers until the Department of Docks had executed leases for them. Accordingly the department has procured leases for thirteen piers at a rate of revenue to the city of 7½ per cent on the investment, leaving one pier for open wharfage. Following the receipt of the dock leases by the Board of Estimate, the procedure now is for it to authorize the issuance of special revenue bonds. As soon as the bond issue is authorized the Department of Docks may proceed with the letting of contracts.

Engineer Corps to Prepare Aërial Route Maps

The Secretary of War has directed that the Corps of Engineers will be responsible for the preparation and production of aërial route maps for the use of the Air Service. The Engineer Corps is to be guided in such work by the technical requirements of the Air Service, and the latter is responsible for securing and furnishing such aërial data as may be needed. The Secretary's orders require conferences of the two services for the purpose of working out principles and methods of producing aërial route maps.

Railroad Swingbridge Damaged by Colliding Vessel

(By telegraph)

Traffic on the electrified division of the Southern Pacific R.R. at Oakland, Cal., was blocked on Jan. 6 by the effects of a peculiar accident. A lumber schooner ran into the railroad's 334-ft. swing span across the entrance to Oakland Harbor while the bridge was being closed. The collision locked bridge and vessel together, with the span partly resting on the bow of the schooner. The lower chord of the bridge was damaged. As the tidal rise is about 8 ft. emergency measures to decrease the lifting effect of the schooner were resorted to. A car of rails was loaded onto the bow of the ship, and the span was securely anchored to the center pier with chains.

Will Develop Coos Bay as Rail and Water Terminal

The Port of Coos Bay Commission, Marshfield, Ore., at a special meeting recently voted unanimously to construct and operate a terminal dock to provide a means of handling large freight shipments and to develop further Coos Bay as a rail and water shipping terminal.

In adopting the resolution it was decided that a suction dredge for clearing the channels of the various inlets and for maintaining the inner channel should be provided for in the bond issue covering the cost of the dock. It was estimated that $250,000 will be sufficient to pay for the new dock and the dredge. A special election will be called in Marshfield to vote the bonds.

Secretary Sengstacken of the Port of Coos Bay Commission has instructed James Polhemus and John D. Goss, engineers, to present the project to the Rivers and Harbors Committee of Congress and to the United States district engineer.

Agricultural Engineers Discuss Farming Problems

Civil and mechanical engineering and architecture all came within the scope of the annual meeting of the American Society of Agricultural Engineers, held in Chicago on Dec. 29-31, 1919. Land reclamation and drainage, soil erosion, farm sanitation, isolated water supply and the engineering aspect of stump removal to clear land for cultivation were among the subjects presented, mainly by professors of agricultural colleges. The paper on water supply, however, was prepared by L. C. Landis of the Milwaukee Air Power Pump Co., and related to a pneumatic pressure system for a supply from wells. Dynamometer tests on plows and farm machinery, outlined by F. W. Duffee, University of Wisconsin, suggested possible advantages of such tests on excavators and wagons employed in construction work. Other papers dealt with tractors, farm buildings, the application of power for lighting and for stationary and moving machinery. Strong emphasis on the necessity of applying machinery to farm work, both to compensate for labor shortage and to increase production, was placed by F. W. Ives, Ohio State University. The officers for 1920 include the following: President, F. N. G. Kranich, Hyatt Roller Bearing Co., Chicago; secretary, J. B. Davidson, Iowa State College, Ames, Iowa.

To Make Snow Surveys in Sierras

Snow surveys covering the entire length of the Sierra Nevada range are to be made for the purpose of determining the water-supply available from the snow fields and of perfecting a system of stream forecasting and control in the interests of irrigation, flood control and river navigation. This work will be done by co-operative action of the States of Nevada and California, the former represented by Prof. J. E. Church, Jr., of the University of Nevada, and the latter by Maj. Paul M. Norboe, assistant state engineer of California. Snow surveys of this kind, with Professor Church's work in Navada, were described in *Engineering News-Record* of Oct. 23, 1919, p. 766.

Am. Soc. C. E. Has Highway Committee

The American Society of Civil Engineers has appointed, through its Board of Direction, a special Highway Committee composed of H. Eltinge Breed, George W. Tillson and A. B. Fletcher. This committee will keep in touch with the development of the Government's plan for the construction and financing of national highways and will advise the society from time to time of these plans and of the activities of the Government through the submission of periodic reports and critical reviews.

General Staff to Supervise Army Map-Making and Surveys

According to an announcement issued Dec. 23 by the War Department, the General Staff will assume supervision of all surveying and mapping activities charged to the department. The Secretary of War has directed that the Military Intelligence Division of the General Staff will decide all questions pertaining to the procurement, reproduction and issue of maps.

The Chief of Engineers by the Secretary's order is designated as the custodian of all military maps based on surveys executed by agencies of the Government and intended for quantity distribution, including survey data relating thereto. He is also charged with the quantity distribution of such maps to the Army, in accordance with tables of issue prepared by the General Staff. The order further prescribes that, based upon requirements announced by the Military Intelligence Division of the General Staff, the Chief of Engineers will prepare programs for survey and map work, which, upon approval of the Chief of Staff, he will carry into effect.

Canadian Model Registration Bill Is Drafted

(*Concluded from page* 106)

received his full measure of protection, not as an engineer, but as a part of the body politic. All that engineers as a class are entitled to is some effective means of protecting their professional reputation and prestige. Legislation can certainly be framed to meet this end, and so framed as to be for, and not at the expense of, the public weal. Anything beyond this must be defined as 'class legislation,' which, in the final analysis, does not protect but stigmatizes, and would ultimately force the engineer into the position of having to protect his legislation instead of having his legislation protect him. Legislation is 'popular' legislation or 'class' legislation according to whether administrative control of registration and the issue of license is vested in the government or in a council or board appointed by the engineers themselves. The former has far the better chance of becoming law."

The draft submitted by the Joint Committee of Technical Organizations includes two pieces of legislation, partaking somewhat of the character of the Illinois and Michigan registration acts. The first covers the general principle and provides for the second. The general act makes provision for the framing and passage of a separate subsidiary act by and for any, or every, professional or vocational class. A description of the general act was presented thus:

Administrative Agency — The measure would create a Department of Registration under the jurisdiction of the Minister of Education and the office of Director of Registration.

Functions of Department of Registration — (a) To administer and enforce laws relating to the regulation of specific professions and technical occupations, and to formulate rules and regulations for administering the same and for the fair and impartial examination of candidates for registration.

(b) To establish and control the standard of preliminary education necessary for admission to training schools, colleges and universities.

(c) To provide, on appeal, for a re-examination of candidates and for rehearings in the case of action to revoke a license or certificate where it appears that justice has not been done.

Specific Legislation—Specific legislation for the regulation of any particular profession, technical occupation or branch thereof may be introduced (a) on the initiative of the Minister of Education, should he consider such procedure necessary in the public interest; or, (b) by request, through the Minister of Education, of a majority of the persons engaged in such professions, technical occupation, or branch thereof.

Certificates and Licenses—To be issued by the Department of Registration.

Exemptions—The provisions of this act shall not be enforcible in respect to the practice of law, medicine, dentistry and surveying as long as the laws now regulating these professions and occupations continue in force.

THE SUBSIDIARY MEASURE

Assuming that the general act as drafted would, by reason of its generality, require a minimum of amendment in the future, the committee drew up a specific subsidiary act covering the professional branch, mechanical engineering, as a model. The general act is to be called Part 1, and successive acts appended for each professional branch or vocation are to be called Part 2, Part 3, etc. Following is presented a description of such a subsidiary or ancillary act, as drafted by the committee:

Title—An Act to Regulate the Practice of .... and to provide for the registration of ....

Short Title—"The .... Registration Act."

Administration Agency — Under the general direction of and appointed by, the Department of Registration, a Board of Examiners, one of whom shall be a professor or associate professor of .... in the University of ...., and four other members, who shall be .... of recognized standing, who have had not less than ten years of bona fide experience in the practice of ...., and who have resided continuously in the Province of .... not less than five years.

Functions of the Board—(a) To receive applications for registration, and at their discretion accept those which properly come under the classifications they are delegated to examine, and to reject or refer elsewhere such applications as do not; (b) conduct hearings on matters relating to the revocation of, or refusal to renew, licenses or certificates, and at their discretion to revoke or refuse to renew the same; (c) establish regulations and rules or procedure for the proper administration of the law; (d) examine into and fix if necessary the standard of personal qualifications of applicants.

Reciprocal Registration — Provision to be made for registration of practitioners from foregin countries or other provinces.

Public Works — Provision making it obligatory that construction and maintenance work on provincial and municipal works be handled by qualified registrants under this act, in so far as it applies.

New Jersey Highway Employees Hold Banquet

Employees of the New Jersey State Highway Department held their first annual banquet Dec. 30 at the Hotel Miller in Trenton. Many of the 700 employees, including both those connected with the engineering and clerical forces, attended. Edward E. Reed, assistant state highway engineer, was toastmaster.

New Manhattan Public Service Appointments Made

In accordance with his announced standards for choosing his staff members—ability and experience in city government—Henry H. Curran, since Jan. 1 President of the Borough of Manhattan, New York City, has made three new appointments and retained two officials in the Public Works and the Highways Departments.

Clarence H. Fay is now Commissioner of Public Works. His salary is $7,200 a year. Mr. Fay was a Deputy Fire Commissioner in the Mitchel Administration. The new Assistant Commissioner of Public Works is John S. Shea, former sheriff of New York County. His salary is $6,000 a year. President Curran's Superintendent of Buildings, Rudolph P. Miller, whose salary is now $7,200, began his services in the city government in 1895 as a building inspector. From 1910 to 1914 Mr. Miller was Superintendent of Buildings in the Borough president's office during President McAneny's term. In 1914 and 1915 he was retained by the Board of Aldermen to revise the building code.

The Borough President has retained in office Amos Schaeffer as Consulting Engineer of the Borough and Clifford M. Pickney, Chief Engineer of Highways. Mr. Schaeffer has been in the city's service for the past twenty years. His salary is $7,200. Mr. Pickney, whose salary is $6,120 a year, has served the city for fifteen years.

Extension Engineering Courses Aided by Colorado Society

Extension courses in engineering subjects under the auspices of the Colorado Society of Engineers are to be given in Denver by the University of Colorado. The tentative plan contemplates the formation of separate classes of fifteen or more men for the study of each of the following subjects: "Reinforced Concrete," "Engineering Mathematics," and "Handbook Engineering." The classes are to be conducted on different nights of the week so that the student may take one or more of the subjects. The tuition (required to meet the expenses of the instructor) will be $8 for a four months' course in each of the subjects offered. Other subjects may be taken up under the plan if the required minimum of fifteen students is found.

Honor Colonel Hodge

In the minutes of the New York State Public Service Commission and of the Transit Construction Commission there has been included a resolution adopted by the respective commissioners, Lewis Nixon and John H. Delaney, in a recent joint sitting which expresses the regret of the two commissions in the death of Colonel Henry Wilson Hodge, and their sympathy to his bereaved family. Colonel Hodge had been a member of the Public Service Commission. An appreciation of his ability as an engineer, his services to the State of New York and his distinguished services to the Government of the United States as an engineer officer in France was also expressed in the resolution.

Civil Service Examinations

New Jersey. Deputy chief engineer, Department of Streets and Public Improvements, $6,000 per year, Jan. 28. File applications with State Civil Service Commission at Trenton.

New York State. Assistant sanitary engineer, State Department of Health, $2,000 per year (with possible increase to $2,400), Jan. 24. Apply to State Civil Service Commission at Albany before Jan. 20. Application forms for this examination will not be sent out after Jan. 12.

New York State. Engineering draftsman, $1500 to $1800 per year, Jan. 24.

New York State. Junior assistant engineer, grade 1, Office of State Engineer and Highway Department, $1620 to $1860 per year, Jan. 24.

New York State. Junior assistant engineer, grade 2, Office of State Engineer and Highway Department, $1980 to $2280 per year, Jan. 25.

United States

For United States civil service examination, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Fire-prevention engineer, office of Director of Purchase and Storage, War Department, duty throughout United States, $2500 to $4000 per year, Jan. 13. Application should be filed before that date.

Calendar

Annual Meetings

BRIDGE BUILDERS' & STRUCTURAL SOCIETY, 50 Church St., New York City; Jan. 16, New York City.

AMERICAN SOCIETY OF CIVIL ENGINEERS, 29 W. 39th St., New York City; Jan. 21-22, New York City.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA; 111 W. Washington St., Chicago; Jan. 21-23, Chicago.

ENGINEERING INSTITUTE OF CANADA; General Secretary, Fraser S. Keith, 176 Mansfield St., Montreal; Jan. 27-29. Montreal.

AMERICAN ROAD BUILDERS' ASSOCIATION, 150 Nassau St., New York City; Feb. 9-13, Louisville, Ky.

AMERICAN WOOD-PRESERVERS' ASSOCIATION; Secretary-Treasurer, F. J. Angier, Mt. Royal Station, Baltimore; Feb. 10-12, Chicago.

AMERICAN CONCRETE PIPE ASSOCIATION; 210 South La Salle St., Chicago; Feb. 20-21, Chicago.

AMERICAN RAILWAY ENGINEERING ASSOCIATION; 1426 Manhattan Bldg., Chicago; March 16-18, Chicago.

Engineering Societies

The Engineers' Club of Minneapolis met in the Main Engineering Building, University of Minnesota, Dec. 15 to hear a description of the construction of the St. Paul Union Depot given by W. C. Armstrong, chief engineer of the work. Mr. Armstrong's address was illustrated by lantern slides. The designs for the St. Paul Union Depot were described in *Engineering News-Record*, June 7, 1917, p. 486.

The Northwestern Association of Members of the American Society of Civil Engineers, in its regular bimonthly meeting in Minneapolis, Dec. 19 discussed the report of the parent society's Development Committee. The members present were concerned principally with that part of the committee's report proposing a comprehensive national organization of all engineers and allied technical professions. While no official action was taken by the association the trend of the discussion was against representation from every local engineering society as making a too unwieldy national organization. Since no substitute method of representation could be decided upon action was postponed until Jan. 6. The members present were constituted a committee to thoroughly study the report and present a written discussion at the Jan. 6 meeting.

The Indianapolis-Lafayette Section of the American Institute of Electrical Engineers went on record at its meeting in Indianapolis, Dec. 19, as favoring a return to the daylight-saving plan. The sentiment of the meeting was expressed in the form of a resolution.

"Modern Railroad Wire Systems" was the title of an address presented by John L. Niesse, telephone and telegraph engineer of the Big Four railroad.

The Western Society of Engineers was addressed on Dec. 22 by Walter Buehler on the latest developments in the use of wood block paving. Special points were the treatment methods to reduce bleeding to a minimum and the method of laying blocks on smooth concrete with only a slight coat of pitch.

The Engineers Club of Kansas City is voting on an amendment to its constitution which will make it the Kansas City Chapter of the A.A.E. At a meeting held Dec. 13, those attending considered and approved such an amendment and recommended it for the approval by vote of all members. A ballot and a copy of the amended constitution were mailed to all members on the 19th, with a letter advising that the polls would close 30 days thereafter. It is the intent of the new constitution and its by-laws that the club shall thereby lose none of its present powers of self-determination, but shall gain from the A.A.E. in national matters.

Personal Notes

Myron E. Fuller has resigned from the American International Shipbuilding Corp., Hog Island, Pa., to resume his work as assistant engineer with Fuller & McClintock, consulting engineers, New York City.

E. W. Pittman, formerly chief engineer of the John Eichleay, Jr., Co., has been appointed general manager of the Dravo Contracting Co.'s engineering works department, Pittsburgh.

J. W. Ledoux, consulting engineer of Philadelphia, has resigned as chief engineer of the American Pipe & Construction Co., in order to devote his entire time to his consulting practice. The severance of his connection with that company dates from Jan. 1, 1920. Mr. Ledoux's specialties are waterworks, valuation, arbitration, rate cases, and water-power development.

Harry N. Jenks has resigned his position as Assistant Engineer on the California State Board of Health to accept an appointment as Special Assistant Engineer, Filtration Division, City of Sacramento, Cal.

J. Lewis has resigned as engineer-manager of the Warm Springs irrigation projects at Vale, Ore., and will open an office for private practice in Portland, Ore.

Frank A. Marston has become a junior partner in the firm of Metcalf & Eddy, consulting engineers of Boston, with which firm he has been connected since 1907.

H. R. Abbott, recently supervising engineer of the sewage disposal and additional water supply at Fort Sheridan general hospital No. 28, announces the formation of the H. R. Abbott Company, engineers and contractors, Chamber of Commerce Building, Chicago. The company will specialize in water supply, water purification and sewage disposal contracts. Mr. Abbott was two years in government service, the first year being with the Sanitary Section of the Construction Division in charge of the design of sewers and sewage disposal of the southern camps, with headquarters in Washington. Previous to that he was assistant engineer of the Sanitary District of Chicago for eight years, and for the eight years previous he was with the Chicago elevated railroads. He had charge of the construction of the Metropolitan extensions to Douglas Park and Garfield Park.

Dr. William H. Walker, for many years head of the Research Library of Applied Chemistry at the Massachusetts Institute of Technology, has been named as head of the institute's new division of industrial cooperation and research. Dr. Walker was connected with the institute for twenty-five years before the war, and during the war served as colonel in the Chemical Warfare Service. He was in command of Edgewood Arsenal, Maryland, and was awarded the Distinguished Service Medal.

MARVIN CHASE, state hydraulic engineer, State of Washington, announces that he has not resigned that office, as noted in ENGINEERING NEWS-RECORD of Dec. 25. A recent news item stated that Mr. Chase had resigned the chairmanship of the State Reclamation Board.

M. O. O'BRIEN, C. O. O'BRIEN, S. K. SPELLACY, J. S. TAIT and **JOHN G. TAIT** have incorporated as the Ohio Willite Road Construction Co., with headquarters in Lima, Ohio.

PIERRE CHARTON of the firm of Beique & Charton, consulting engineers of Montreal, Can., who served as an officer in the French army during the World War, has just received the Croix de Guerre. His citation, contained in French General Orders, states that the award is made for his "energy, *sang froid*, and devotion to duty under fire."

OBITUARY

HENRY WALKER HARTWELL, architect and structural engineer of Boston, died at his home in Waltham, Mass., Dec. 31, 1919, after a prolonged illness. Mr. Hartwell for more than a score of years was identified with the architectural firm of Hartwell & Richardson which built many notable buildings in New England. Among the best-known are the old *Youths' Companion* Building in Boston, the Carney Building, Tremont St., Boston; the First Church, Plymouth, Mass.; Christ Church, Andover, Mass.; high schools at Springfield and Cambridge, Mass., as well as many other public buildings.

SOLOMON D. ROGERS, prominent construction engineer and inventor of Sacramento, Cal., died at his home there Dec. 20, at the age of sixty-three years. At the time of his death he was chief engineer of the Commercial Car Construction Co., and engaged in supervising the construction of a large car-building plant in which the company intends to manufacture a motor car invented by him.

T. A. BARKER, former Cleveland building contractor, who directed the erection of the Soldiers' and Sailors' monument and other public structures in Cleveland, died in his home in Phoenix, Ariz., Dec. 27, at the age of seventy-five.

As a young man Mr. Barker came to this country from England, settled in Cleveland, Ohio, and took up construction work. He became a specialist in exterior decorative work, his first notable performance being the erection of the Soldiers' and Sailors' monument. Later he was identified with the construction of the Federal Building, the First National Bank Building, and the courthouse in Cleveland. Upon the completion of the last-named building, five years ago, Mr. Barker retired, and with his family moved to Phoenix, Ariz.

MAJOR HAROLD S. HETRICK, Corps of Engineers, U. S. Army, was shot and fatally wounded by an unknown assailant in his home in New Orleans Jan. 2. Major Hetrick graduated from West Point in 1906. During the Great War he served as a temporary colonel of engineers. Latterly he had been in charge of the Corps of Engineer work between New Orleans and Vicksburg in the Mississippi District.

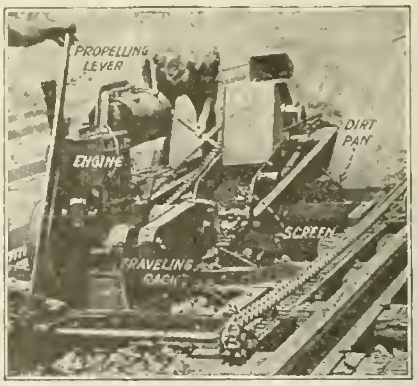
JOHN HANCOCK SWARTZ, inventor of the Eagle Water Meter, the dovetail box machine and of civil war grenades, died in Brooklyn Dec. 30 at the age of eighty-four.

JOHN GILLIES, eighty-five years old, builder of most of the big steamship piers on the North River in Manhattan, and of piers, bridges and drydocks at the Navy Yard in Brooklyn, died in New York City Dec. 31. Mr. Gillies was born in Nova Scotia. He entered the contracting business in New York City when a young man and continued it until his retirement about ten years ago. Thirty years ago he was the largest stock builder in New York steel.

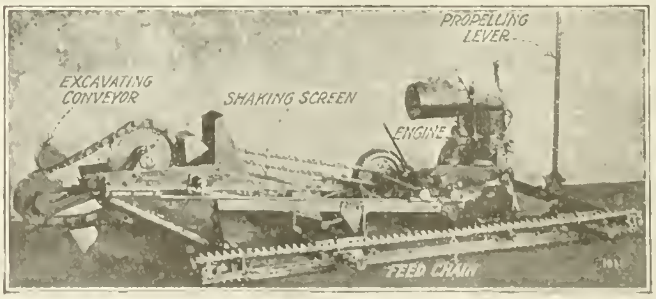
New Machine Cleans Track Ballast

A machine for cleaning old stone ballast in the track, which is being operated on the Pennsylvania R.R., indicates the possibility of an important saving in time, money and labor as compared with the more usual method of cleaning by a gang of men with picks and forks. Cinders and dirt accumulating in the ballast gradually clog it until proper drainage is prevented, so that periodical cleaning is required.

As the machine travels longitudinally along the space between the tracks, it digs, cleans and replaces the ballast in this space, while it will also clean ballast shoveled into it from between the ties of the tracks on either side. Its size (5 ft. wide by 8 ft. long) was limited by the necessity of keeping it clear of passing trains. The frame travels on two endless-chain tracks which ride on the ends of the ties and pass over pinions on two cross-shafts at the front and rear of the machine. These tracks are driven by a man operating a ratchet lever on the rear shaft, and it is stated that with one hand he can feed the machine forward while it is working in 18 in. of ballast. However, the machine can be made self-propelling, so as to eliminate one man of the present gang working with it.



PORTABLE MACHINE CLEANING BALLAST ON PENNSYLVANIA LINES



BALLAST-CLEANING MACHINE HAS BUCKET EXCAVATOR

A chain- and bucket-excavator and conveyor at the head of the machine digs to a depth of 18 in. below the ties and in a path about 12 in. wide. This width is limited by the clearance between trains at the height of the buckets in the upper or dumping position when passing over the head wheel. The ladder frame which carries the excavator is pivoted so that it can be raised when the machine is not in operation or is being shifted to or from its work. From the buckets the ballast is delivered to a flat, inclined shaking screen which is operated at high speed. The stone passing off the screen drops into place behind the machine, a V-shaped crossbar spreading it so as to fill the entire space between the ends of the ties. The dirt passes through the screen and is deposited on a flat pan or plate, from which it is removed with a shovel and piled at the outside of the roadbed for subsequent removal.

Five men constitute the working gang. Two of these work ahead of the machine, loosening the ballast around the ends of the ties and feeding it to the buckets with forks. A travel of 25 to 30 ft. is made in 35 to 45 min. It is stated that this distance is an average day's work for one man cleaning ballast with a fork, so that in an 8-hour day the machine with 5 men would do the work of a gang of 8 or 12 men and at 50% of the cost. Its service is too limited yet to permit of definite records of the performance.

The design of this machine was worked out by H. D. Pratt, engineer for the Link Belt Co., Philadelphia, at the request of the engineers of the Pennsylvania Railroad.

A Consolidation of Engineering News and Engineering Record McGraw-Hill Company, Inc.—James H. McGraw, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. Mehren
Editor

Volume 84 NEW YORK, THURSDAY, JANUARY 15, 1920 Number 3

What Will the Society Do About It?

NEXT week the American Society of Civil Engineers will consider at its annual meeting the report of the Committee on Development. What will the society do about it?

A year and a half ago, sensing the need of an appraisal of the society's activities, the board of direction appointed the committee. The latter has diligently sought the suggestions of members, has in two protracted meetings discussed the proposals, and has laid its conclusions before the members in a series of recommendations. The committee's work being done, the responsibility for action rests with the members.

Consideration of important questions in annual meetings has not always been satisfactory. The curt dismissal of the report on the amendment of the constitution some years ago is a case in point. Perfunctory handling of the present report is not to be expected, but nevertheless there is danger, because of the preponderance of members from one section, of a failure to present a true picture of the attitude of the membership. The attendance being largely Eastern, is also likely to be conservative. At the same time most of those present have no contact with members in outlying districts, and, even with the best of intentions, find it difficult to get the point of view of those living, let us say, west of Philadelphia and south of Washington.

If the attitude of those outside Districts 1, 2 and 3 is correctly presented, we believe that there will be heard a very general and strong approval of the committee's report. We have had direct word from twelve cities where there are local associations of members, and, without exception, the sentiment is summarized as favorable to the report. There are qualifications, of course, but there is a strong conviction that we have here a basis for desirable changes.

This attitude is all the more significant because the early reception of the report appeared to be an indifferent one. The document has won support in the degree it has been studied. This was to be expected from the very form of the report. The individual had to do his own appraising of the relative importance of the recommendations, and had himself to furnish the supporting reasons. These processes took time, but the resultant approval is all the more reason for expecting insistence upon the carrying out of the recommendations.

Unless the situation is anticipated, an obvious weakness of the report is likely to have an important effect at the meeting; the report proposes no practicable method by which the membership may express its views. General discussion will have the effect of clarification, but it is too much to expect that a letter ballot will be invited on the document as it stands. It spreads over too wide a field to ask for a blanket approval. Obviously separate ballot must be taken on the Joint Conference plan. The internal recommendations must be split into groups and as to each a question or two formulated that will be determinative of policy. Questions of that sort were formulated, we understand, and transmitted to the board of direction with the report, but those or similar questions will have to be put before the society next Wednesday, if discussion is not to "wander all over the lot" and be barren of results. Either the board must take the initiative of propounding such questions, or members of the committee on development must do so. The committee has been discharged, but its members individually must feel a responsibility until the report is disposed of.

We hope, therefore, that a clear, searching set of questions, relatively few in number, will be proposed at the outset of the discussion next Wednesday and that the outlying districts will be represented by those who know the views of their fellow members and have the ability to present them clearly and vigorously.

Only in this way can we expect action that will be purposeful and representative.

Joint Conference Committee Report

IT IS indicative of the present tendency of engineers' thinking that fully as much, if not more, interest is displayed in the report of the Joint Conference Committee as in that on the internal affairs of the society. The plan proposed may not be perfect. The funds asked are admittedly inadequate. But despite the deficiencies, we believe that the plan should be adopted.

The weightiest objection is that if local bodies came in in large numbers the representation of the founder societies in the national council and the executive committee would be disproportionately small. This objection is not, in our judgment, a very serious one. If there were likelihood of the local and state affiliations electing representatives who were out of sympathy with the founder societies there might be some cause for alarm. As a matter of fact, we all know that the leaders in the local bodies are, with rare exceptions, members of the nationals. They are at heart founder-society men.

There are other minor objections, but despite them we believe that the scheme should be put into effect. It can be amended later. It is now or never. If this plan be rejected, it will be a long day before any other federated plan will be taken up with enthusiasm.

In approving the plan there is possibility, in fact advisability, of reasonable qualifications. We should propose one of them ourselves, namely, that it be stipulated that a large part of the effort and funds of the body be expended on measures aimed to help the local organizations help themselves. This disposition would come about, to some extent, by the mere participation of the locals in the activities of the new body, but assurance should be offered the locals in advance that such is the intent and purpose of the federation.

Internal Changes

WITH reference to the internal changes suggested in the report there are some that can be passed over without discussion because, we believe, they will have general endorsement. Two which can be placed in that category are the recommendation involving the increase in technical activities and that which provides for nomination and election of directors by the districts. Obviously all of the recommendations regarding the increase in technical activities cannot be carried out until funds are made available, and when those funds do become available it will be proper to inquire as to the relative value of committee work and of the publication of papers. With reference to district nomination and election of directors, the legal aspects, under the New York State charter, must be looked into.

Some of the other internal recommendations cannot be passed over too lightly. The policy with reference to local sections, in particular, needs very thorough discussion. Undoubtedly it is desirable to build them up, but the scheme that provides that every member of the society shall be affiliated with a section seems primarily one to get funds from the national body. The committee's plan would result either in erecting a great many small sections, which because of their smallness would be incapable of doing worth-while work, or headquarters would be contributing to local sections for members living in the highways and byways, who could not attend section meetings and who would get no return for the moneys that the national organization would appropriate on their behalf to local section maintenance. These members could serve on the sectional special committees, but that alone would not seem to be adequate recompense for the per capita appropriation to the local body.

If the rebating of certain portions of the dues would apply only to those living within the confines of, or reasonable distance of, the section city, there could be little objection to the rebating.

Annual conferences of local sections are desirable, but to vest them with the power of a nominating committee would be possible only if the committee recommendation of putting every member in a section were carried out.

The proposed revision of membership requirements which would make it necessary to hold associate membership for two years before becoming a "member" is not desirable. Cases will always occur where applicants with qualifications for full member present themselves, and an ironclad rule obliging such a man to enter in a grade beneath his qualifications would have a tendency to keep some of these mature and desirable engineers out of the organization.

The committee suggests that dues "be adjusted." This can have no other meaning than that the dues should be increased. The society, like the individual, is suffering from the high cost of living, while demands for broadened activities are insistent.

In increasing dues an obvious procedure would be to raise those of "non-resident" members to equal the dues of "resident" members. It is high time to abolish the resident and non-resident distinction. The argument that the "resident" member has the advantage, being near headquarters, of attending meetings and using the library, has support in imagination rather than in fact. The library is an advantage for the *very, very few* who use it, but the meetings are of no more value than those of any local section. District 1 should be placed on exactly the same basis as other districts, so far as dues are concerned. A New York local section is badly needed, and when established can readily take care of meetings for the local members.

The various recommendations as sketched cover, as we see them, the essential points in the committee's report. The question to which most objection can be raised is, in our judgment, that of forcing every member into a local section. If it can be shown that every member of the society would draw benefit from it, the proposal is defensible. Otherwise it would be unthinkable, unless the members of the society by an overwhelming majority should indicate their desire of contributing to the support of the locals by giving them funds for which the corresponding members are not expected to get a return. It is entirely possible that the membership will consider the upbuilding of local sections so important that they would authorize such appropriation of funds, but its inequity could not be overcome save by devising some form of service for these men or justifying it on the basis of the larger returns that would accrue to all from the heightening of the general society activities.

As we see the work of the development committee, therefore, we believe that it should receive the approval of the society. We believe that the chief items should be submitted to letter ballot, so that the opinions of the members upon the proposed changes may be recorded. If the questions fairly embody the substance of the chief recommendations of the committee, and if the membership at large will study the questions thoroughly, we believe that the recommendations, saving those on membership requirements and the sectionalizing of the whole society, will get general support.

Symposium on Municipal Risks

OPINIONS by eight engineers on what risks cities should take with apparatus or processes in the experimental or development stage are printed on p. 132. Briefly, the concensus of opinion is that while some risk must be taken if progress is to be made, yet cities should not adopt undemonstrated processes or apparatus without assurance from competent disinterested engineers that the plant to be installed will do the required work, and do it as well and as cheaply as it can be done by well tried processes.

Risks by Big and Little Cities

ONE contributor in the symposium mentioned above rightly holds that a big city can afford heavier financial risks than can a small one. A large city, too, can afford to build a working-scale unit and test it under the direction of a staff of specialists—a thing rarely feasible for a small city. Moreover, the larger the city that adopts a less costly process than those already in use the greater the economic gain, even though the reaction upon the city tax rate or the utility service charge may be the same in either case. But it is also true that the larger the city that makes an unsuccessful venture in a new field the greater will be the economic loss to society.

Proper Attitude for State Boards

WHAT attitude should state health authorities take when passing on plans for innovations in water or sewage treatment that may do the required work but probably at far higher cost than it could be done by some well-tried method? A strong inclination to approve such doubtful plans is shown by one correspondent but this seems to be based largely on doubt as to the legality of disapproval if based on other than sanitary grounds. The argument of the context, however, needs to be carried only a little further to show, especially if illustrated by such experiences as those cited in the following paragraph, that when a city finds itself with an unnecessarily expensive plant it is likely to neglect upkeep, skimp on operation expense and perhaps shut down the plant.

Further Lessons from Oklahoma

ABANDONED electrolytic sewage-treatment plants in the State of Oklahoma, it appears from the report on p. 135 number six instead of the two mentioned in our issue of Nov. 27-Dec. 4. This strengthens the argument in that issue headed "Flying in the Face of Precedent," and reinforces some of the arguments in our symposium. If the six simple plants in Oklahoma were too complex and costly for small cities, what can be expected of the elaborate combination of electrolysis, lime treatment and thousands of revolving paddles, preceded by fine screens and followed by sedimentation, and yielding an immense volume of sludge, that has been so vigorously promoted farther east during the past few years?

Will Toronto Give Out Comparative Costs?

OKLAHOMA'S abandoned electrolytic sewage-works and the earlier plant abandoned at Danbury, Conn., cost little compared with the drifting-sand mechanical water filters at Toronto, discussed in our issue of Nov. 27-Dec. 4. It is only fair to say that Toronto had more to go on when it adopted this process than did the cities which built electrolytic sewage-treatment works, for Toronto operated a working-unit drifting-sand filter before contracting for its 72,000,000-gal. plant and could point to a few small municipal plants in regular use abroad. That is all past. Drifting-sand filters costing over a million dollars have been in operation long enough for those in charge to report purification results. Interest now centers in (1) the unit costs for operation and capital charges and (2) in a comparison of both purification and cost efficiency results with like figures for the slow-sand filters built a little earlier at Toronto. Thus far there has been silence on these points. Comparative data would be scanned eagerly by hundreds of engineers and city officials all over North America. May they be expected, and when?

Safeguard Investments in Roads

MR. PRIDE'S letter in this issue is most pertinent. In this billion-dollar highway construction era our attention is too apt to be centered upon types and mileages, and other issues are too apt to be obscured, if not obliterated. Not only should public officers who are intrusted with the expenditure of immense highway funds provide roads as nearly adequate to traffic requirements as a limited experience and an incomplete research allow, but they should take care to safeguard in every possible way the investment of a generous public. Road-building programs for the current year are generally extensive. Highway departments will be taxed, no doubt to their limits, in providing field and office forces to carry out these programs. But in the prosecution of such work those responsible for the administration of police powers must not forget that as great a responsibility rests upon them in guarding a public investment as rests upon the engineer in directing the original expenditure. Authority of those possessing police power is not vague. Statutes do exist in many states that limit the loading of vehicles; where there are none, they should be adopted without delay. When on the books, their enforcement is a matter of emphasizing equally all functions of highway departments, for it is as necessary for the engineer to hold responsible officials to the enforcement of existing legislation as it is for him to require careful construction by the contractor. Through such emphasis only can a full measure of co-operation be secured from road designer and builder, administrator and user, and the public that finances improvements.

Why Is the New Chief of Engineers Not Appointed?

NO SATISFACTORY explanation has yet come from Washington to account for the long delay, on the part of the Secretary of War, in naming the new Chief of Engineers, U. S. Army, although there is a rumor in circulation this week that the nomination has been forwarded to the President. For almost three months now the Corps of Engineers has been without a permanent head. A condition of this sort in any organization is generally the forerunner of unrest, inefficiency and lowered morale. It should not be allowed to continue. The delay would be unexplainable if there existed a dearth of officer personnel qualified to assume the responsibilities of head of the Corps. There is, however. no such shortage. In Colonel (lately Major-General) W. C. Langfitt there is available the former chief engineer of the American Expeditionary Forces, an officer eminently fitted to become the next Chief of Engineers. His more than two years of active duty in France, where he gained a thorough training in the combatant and non-combatant services which make up modern warfare, and his record of having handled with distinction, as head of the overseas Engineer forces, work involving executive capacity of a high order, would seem to single him out as the officer by whose elevation to permanent general rank the best interests of the Corps would be served.

Engineers, both in the Army and in civilian practice, are becoming decidly weary of the Fabian policy which the War Department is following in the case of the Engineer Corps. They are equally disgusted with Mr. Baker's spineless acquiescence in the practice which has apparently developed of discriminating against officers who have seen service overseas. In the matter of demotions from temporary rank it is the men who served with the A.E.F. who have suffered most, not the officers who got no nearer real action than a flat-top desk in Washington. It is a matter of speculation whether General Langfitt's prospects for promotion as things now stand in Washington, are not actually lessened by the fact that he served in France. There is said to be considerable friction between the men who served under General Pershing and the followers of General March, whose duties as Chief of Staff were performed at the national capital throughout the war.

It is important to furnish the corps quickly with an able, experienced leader. The corps is now merely drifting, and the members of the organization quite naturally are upset. With General Langfitt in charge there is every probability that a definite, wise policy would quickly be inaugurated. The corps must be headed by a strong man who can combat such influences as were evidently at work when the so-called March-Baker Army Bill—now apparently dead—endeavored by a broad usurpation of functions to shackle every one of the Army's Staff corps to the General Staff chariot. The decision has been pending since the first of November. It is high time for action.

The Classification and Compensation of Engineers

ENGINEERING Council's committee report on the compensation of engineers, presented at the Council meeting Dec. 18, is abstracted on p. 117 of this issue. The committee obtained records of the compensation of about 10,000 engineers employed by the Federal, state and muncipal governments and by the railways. With the sole exception of engineers engaged in shipbuilding work under the Government, who have benefited by the "Macy Award," the increases of salary to engineers in public service have been totally inadequate to offset the reduced value of the dollar.

Still more striking, if anything, is the fact that the heads of organizations employing engineers in public service, in their recommendations as to increases in salary to correct the injustice from which engineers now suffer, fail far short of increases sufficient to restore to the engineer the same rate of pay, measured in buying power, that he had in 1914 or 1915. It is clear that a campaign of education is necessary in order to make those who fix the pay of engineers understand what is justly due them. It is necessary, even, to give the engineer himself a proper understanding of what is really his due; and to encourage him, through every organization and means he can employ, to work for the establishment of the profession on the plane of compensation and public esteem which it belongs.

The first step in this campaign of education is to make widely known to the profession the information this committee has gathered; but this is only the first step. There must be a central organization which can make available to engineers everywhere the ammunition to use in appeals for proper compensation and which can co-operate and lead in every such movement. In this connection, the energetic work of the American Association of Engineers should serve as an example of what can be done.

Thus far Engineering Council committee has carried on its entire work by the voluntary service of its members, at large personal sacrifice of time and money. The work from now on assumes such magnitude that this method is no longer possible. The committee has asked Engineering Council for an appropriation of $10,000, to establish an organization which can successfully continue the campaign. Anyone who appreciates the size of the task and the expense such campaigns involve will realize that the $10,000 asked is a very small sum. The success of the effort for better pay depends entirely on the extent to which the profession will lend its financial support.

That there are great difficulties in the way of securing general acceptance of standard grades and salaries is, of course, true. The progress already made in such preliminary work as the committee has carried on, however, is very encouraging. It justifies the belief that if there is adequate financial support to the movement, the profession will gain millions of dollars annually in increased compensation. Nor will this gain be made at the expense of the public. The inevitable effect of the meager salaries which have been paid for the engineer's work in public service has been to injure the quality of that work. The economy and efficiency of public work, like private work, depends on the ability of the men placed in charge.

Now that the report is made, engineers must back it up not only with moral, but also with financial support. Without a well-organized campaign of education, vigorously pushed, the committee's work will go for naught.

An Appeal to Highway Contractors

ELSEWHERE in this issue is an appeal to the highway contractors of the country by R. G. Collins, Jr., the well-known New York contractor, now engaged in highway work at Cumberland, Md. He puts the situation clearly and correctly when he says that the contractors are not making money and that the public is not getting the roads. Moreover, if highway contracting continues to result for the contractor as unfortunately as it did in the year 1919, the highway program which the engineers are projecting cannot possibly be carried through. To get anywhere at all in the correction of difficulties, the contractors themselves need to come together, discuss frankly their difficulties, adopt the necessary measures where they themselves are at fault, and present to proper authority suggestions as to changes where the difficulties are beyond their control.

One gets an inkling of Mr. Collins' feeling in the matter from his article on "The Reason Why Contractors Lose Money on Highway Work," immediately succeeding his appeal. There are many new contractors doing highway work, and they have not figured properly upon the contingencies which must be met; but whether the chief reasons for the loss of money are to be found in the contractor's method of handling his work or in conditions imposed upon him by other parties, results that are worth while can only be expected if contractors generally understand the conditions and collectively work toward their removal. Nor need there be fear that if the contractors organize strongly they will try to impose upon the engineers. The latter always hold the whip hand. As we see the purpose of the organization which Mr. Collins urges upon his contractor bretheren, it is to shed light upon their difficulties so that, proceeding intelligently and fairly, they may build up an agency, with fairness to themselves, which will be able to carry through the enormous highway program which the country is projecting. Loss to the contractors, if widespread and general, inevitably will spell loss to the public in the public's inability to get its highways built.

Engineering Council's Committee Reports on Compensation of Engineers

Presents Uniform Grading Plan for "Professional" and "Sub-Professional" Services—Standard Salary Schedule Submitted—Duties and Titles Defined

A CLASSIFICATION of engineers, based on technical qualifications and duties, a standard salary schedule with definite ranges of pay within the several grades specified, and a plea for $10,000 for carrying on the great volume of work involved are the main features of the report which the committee on classification and compensation of engineers, consisting of Arthur S. Tuttle, chairman; Francis Lee Stuart, John C. Hoyt, Charles Whiting Baker and M. O. Leighton, submitted Dec. 18 to Engineering Council. The extracts which follow contain the main features of the report:

Interest Has Increased

Since Oct. 15, the date of the committee's last report, general interest in bringing about additional compensation for engineers has clearly increased. The general agitation has resulted in some degree of advancement to engineers in various services but without improvement in conditions to an extent which can be deemed in any way satisfactory, particularly where the higher grades of service are concerned.

In the meantime the field investigation by the committee's Federal government section has been completed; a follow-up communication has been sent out by the state, county and municipal section to all services which failed to respond to the original questionnaire, with the result of bringing in many additional replies; a classification for engineers in the Federal, state, county, municipal, and railroad services, with corresponding titles, duties and qualifications, has been definitely agreed upon; and tentative schedules for compensation and promotion have been formulated.

Findings and Conclusions

The investigations have shown the lack of any adequate or consistent employment policy with respect to professional engineers. This is evidenced by the following conditions which are believed to be largely responsible for the unsatisfactory status of men engaged in this class of work:

1. Absence of any uniform system of grading of positions.
2. Lack of uniformity in titles of positions with respect to duties.
3. Inequalities in compensation for positions of the same grade.
4. Generally inadequate compensation for services rendered.

To the end that these conditions may be corrected and proper and equitable conditions of employment established, the following principles and practices are recommended:

1. Positions should be classified in accordance with the type of work, and with the character of the duties to be performed and the qualifications necessary for their performance, as indicated by a system of grading.
2. Within the salary limits fixed for each grade, there should be a system of advancement through the grade based upon experience gained in the position and upon proof of increase in the proficiency of the employee in performing the duties of the grade.
3. Promotions from grade to grade should depend upon the existence of a vacancy in the higher grade and proof that the employee is qualified to fill the vacancy.
4. The determination of salary adequate to procure for and retain in engineering work a high class of employees, should take into account and properly weigh the following considerations:

(a) The capital invested, both in money and in time, in obtaining the requisite fundamental training.

(b) The amount and character of experience and the degree of personal ability required.

(c) The relative value of the classes of work to be performed.

(d) The amount paid for similar service in other lines of work.

(e) The amount necessary to enable the employee to maintain a standard of living commensurate with the general standards of the community for positions of similar dignity and responsibility.

5. In the interest of an adequate social policy, no position likely to be occupied by individuals of an age to assume family responsibilities should fail to pay an amount sufficient to permit the maintenance of the average family in reasonable decency and comfort.
6. In the interest of the employees as a whole and of the employer, a system should be established by which employees who fail to maintain satisfactory standards of service should be removed, transferred, demoted, or retired as may be equitable in the circumstances.

Classification

After a number of conferences between members of the varous sections of the committee, an agreement was reached as to the classification which may properly be fixed for all of the services represented. This was planned in such a way as to conform in general with the principles laid down by the committee at the outset, and with the form of questionnaire which was used by each of the sections in conducting its inquiry.

It appears to be well adapted to use not only in all of the services represented but also for all other forms of engineering activity. Its adoption will not only remove occasion for the great variety of titles which now exists, but will also make it practicable to establish a comparison of the compensation given for service of the same general character in a wide variety of fields, and at the same time be of material assistance in bringing about the desired standardization with respect to minimum salaries for the various grades.

The grades proposed have been divided into two classes, the "professional service" being deemed to include men who have received an engineering degree from an educational institution of recognized standing or who have obtained similar qualifications through practice of the profession and by mastering the fundamentals of engineering science. The "sub-professional service" includes assistants with at least a high-school education, who enter upon the practice of the profession in the performance of responsible duties for which an engineering training is not essential, but who through experience and study may fit themselves for the higher grades. The proposed classification is described in detail in appendix I.

RESULTS OF INVESTIGATION

The committee reviews briefly the work done in 1913 by a similar body of the American Society of Civil Engineers which reported that, from the meagre information obtained it was "convinced that the compensation for engineering work compares favorably with that received by men of any other profession." That a radical change of opinion has since taken place on the part of responsible department heads, is clearly evidenced by the fact that practically the entire Federal engineering service, except the War Department, has co-operated with Engineering Council's Committee in its inquiry, as have also 42 per cent of the state officials, and 70 per cent of the municipal officials to whom our inquiry has been addressed.

The financial status of 10,089 men in these services has now been revealed as compared with a total of 1,726 men who replied to the 1913-1916 inquiry. It also appears that those who responded in the previous investigation were largely confined to the engineers receiving maximum compensation. The average rate of present compensation shown by the new returns is as follows:

Service	Number of Men	Average Annual Compensation
Federal Government—Navy Department	594	$2,474
Federal Government (excluding War and Navy Depts)	3,956	1,814
Federal Government (excluding War Dept.)	4,550	1,900
State	2,222	1,700
Municipal	3,317	1,820

In comparing these returns with those received by the Am. Soc. C. E. Committee four years ago, the decrease in the value of the dollar since then should be borne in mind.

Owing to a ruling made as to the railroad service, the committee, as heretofore reported, has been unable to obtain at first hand similar detailed information as to the present compensation of railroad engineers; but that existing conditions are similar to those in the three services investigated is generally admitted as is also the interest of men engaged in this service in bringing about a remedy.

According to an official report made by Director-General Hines, submitted to the Senate on Nov. 14, the average pay of 10,810 assistant engineers and draftsmen in railway service in December, 1917, was $3.92 per day or $1,254 for a year of 320 days. In July, 1919, there were 10,370 assistant engineers and draftsmen in the railway service whose average pay was $5.22 per day, or $1,670 for a year of 320 days. This is an increase of 33 per cent over the pay of 1917. The above records apparently apply to all the professional engineers in railway service except those classed as general or division officers.

A SERIOUS SITUATION

It thus appears that 68 per cent of the engineers in the Federal service, other than the War Department, and 86 per cent of those in state and municipal service are receiving less pay than is required for the support of a family on a scale sufficient to provide for necessities (assumd at $2,200 per annum), to say nothing of the expense of giving children anything like the education with which the breadwinner was equipped.

It would seem reasonable to assume that men in the "junior aid" grade have not reached an age which would require compensation sufficient to support a family, but that the salary limitations for men in higher grades should clearly be sufficient to meet this need. On this basis it is safe to state that with anything like suitable compensation, not more than about 25 per cent of the entire engineering service, if properly organized should receive less than $2,200 per annum. The investigation made by the State and Municipal Section shows that the average age of the present incumbents of the lowest grades is actually about 27 years; if they are to be adequately provided for as permanent employees, the percentage of men to receive less than $2,200 is clearly negligible.

That a serious condition of unrest exists among engineers in the municipal and state services is clearly evidenced by explicit statements to that effect in 44 per cent of the questionnaires returned.

A comparison with the pay of the industrial worker who serves under the engineer also shows that the

SUMMARY OF PRESENT SALARIES BY GRADES IN FEDERAL SERVICE

Grade	General Description of Duties	16 Engineering Bureaus in Civil Establishments					4 Engineering Bureaus in Navy Department				
		No of Persons	Present Pay per Annum			Per Cent Increase of the Average Since July 1, 1915	No. of Persons	Present Pay per Annum			Per Cent Increase of the Average Since July 1, 1915
			Average	Maximum	Minimum			Average	Maximum	Minimum	
1	Chief administrative officer having full charge of organization, including determination of policy	15	$5,867	$10,000	$4,500	3.0	2	$9,450	$9,900*	$9,000*	0.0
2	Chief of major subdivision in responsible charge of large unit	83	3,801	7,500	1,800	5.0	4	6,381	9,000*	5,200	0.0
3	Chief of intermediate subdivision in responsible charge	209	3,104	5,000	1,800	9.9	22	4,312	5,634	2,304	57.6
4	Chief of minor subdivision	846	2,222	4,500	1,020	9.0	54	3,600	4,883	2,304	58.2
5	On general duty under direction but requiring special education and training and the use of initiative and originality	1,353	1,719	3,000	1,000	13.3	192	2,818	3,756	1,878	52.2
6 and 7	On subordinate duty requiring special education or training but not requiring special originality	1,092	1,293	2,817	600	12.0	218	1,954	4,257	1,500	38.4
8	On subordinate duty not requiring special education, training, or originality	169	975	1,340	480	19.3	81	1,379	2,254	1,002	37.2
	On special duty of responsible character requiring special qualifications and initiative Consulted (Excluded from Final Classification)	189	1,812	7,500	1,200	3.9	21	2,717	4,382	1,628	1.3
	Totals	3,956					594				

* Naval Officers, all others are civilian.

actual compensation paid for brawn is today greater than for engineering brain. The need for setting up some scale of compensation for the engineer to correct this serious condition is obvious, as is also that for the inquiry now being carried on by the committee.

Unless a radical improvement can be brought about, it seems evident that the profession cannot attract to or retain in it men of the caliber required to command the respect in which it has heretofore been held by the public. So long as engineers are continuously struggling with the problem of making even a bare living, their efficiency will be minimized and their incentive to work with other than a purely selfish interest will be lacking.

From the investigation made by each of the sections of the committee it appears that the heads of sixteen engineering bureaus in the Federal Government (excluding the Navy Department) have recommended an increase in present compensation averaging about 59 per cent, while similar increases for engineers in the state and municipal services, as recommended by the engineering heads, average only 26 per cent.

As a result of the inquiry now in progress under the direction of the Congressional Joint Commission on Reclassification of Salaries, the attention of all members of the Federal service has been drawn to this question in such a way as to make it one of close study and analysis, which condition doubtless accounts for the comparatively more modest recommendation made by the representatives of the State and Municipal services, whose reply to our inquiry has been individual and who have doubtless been confronted with the necessity of recognizing relationship to other workers in the same services in whose interests no concerted move of this character has been attempted.

The Federal section of the committee in formulating a standard compensation readjusted to the new conditions as to cost of living, has given special attention to the Macy Scale, this being dependent on an award made on Oct. 24, 1918, by the Shipping Wage Adjustment Board, which was designed to provide a uniform national wage scale for all shipbuilding workers, including a scale of compensation for draftsmen and copyists. This wage scale, which is generally known as the Macy scale, has since been adapted with modifications to the needs of certain bureaus in the Navy Department.

PROPOSED STANDARD SALARY SCHEDULE

Table I, showing standard salary ratings proposed for general adoption, has been prepared by the Federal Section of the Committee and is published for general discussion and criticism. The committee is not prepared at this time to recommend the final adoption of this schedule of compensation. It is not yet certain as to the wisdom of fixing even a minimum limit on the highest grades of service or of keeping the maximum of one grade below the minimum of the next grade also.

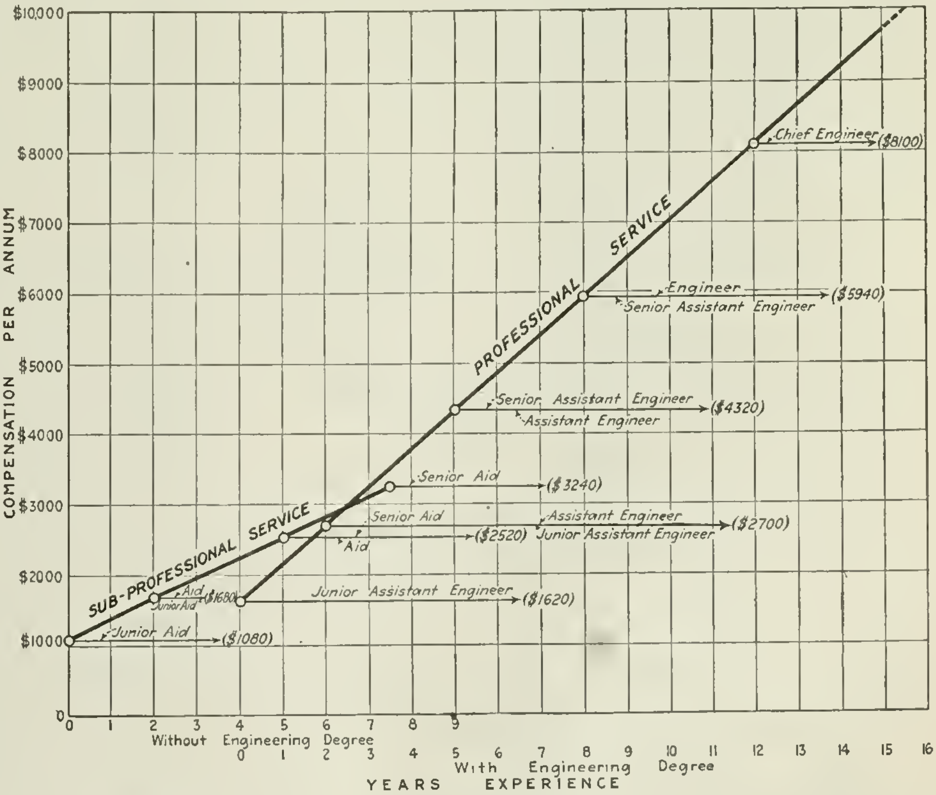
TABLE 1. PROPOSED STANDARD SALARY SCHEDULE FOR ENGINEERS TENTATIVELY PROPOSED BY THE COMMITTEE

Grade	Total Years' Experience Required to Qualify With Professional Degree	Without Professional Degree	——Salary Range—— Minimum	Maximum
8—Junior Aid	..	0	$1,080	$1,560
7—Aid	..	2	1,680	2,400
6—Senior Aid	..	5	2,520	3,240
5—Junior Assistant Engineer	0	4	1,620	2,580
4—Assistant Engineer	2	6	2,700	4,140
3—Senior Assistant Engineer	5	9	4,320	5,760
2—Engineer	8	12	5,940	No limit
1—Chief Engineer	12	16	8,100	No limit

The committee is also considering the provision to be made for advancement within the limits of a grade, for which a plan is suggested by the Federal Section. Under this plan it is proposed at yearly intervals, through ratings determined by a Personnel Board, to provide for awarding an increase in compensation to three-fourths of the men in a grade receiving less than the maximum compensation of the grade, who through fitness and industry have shown themselves to be of increased value to the service. Those in the highest third of this preferred list would each receive the maximum rate of increase, which under the proposed scale would be $480, while each of the next two-thirds would receive an increase of $240, the latter figure corresponding with what would then be the average increase for all of the men in the grade.

It would seem that pending the completion of the investigation, the scale of compensation herein presented and the plan for promotion within a grade is adapted to general use in all branches of engineering service.

Applying the average proposed salary to the present



PROPOSED MAXIMUM RATE FOR INCREASING COMPENSATION THROUGH VARIOUS GRADES incumbents of these positions, as reported in the State and Municipal services, it will be found that there would be a resulting increase in annual compensation totalling about $5,500,000 as compared with a total increase of $2,500,000 recommended by the service heads, against which should, however, be charged the economy growing out of the increased efficiency brought about by a restoration of morale.

The committee believes, that a general discussion of this question is desirable and that the consensus of opinion on the part of all concerned should be obtained.

Recommendations

The committee recommends:

First: That the classification of engineers in Federal, State, County, Municipal, and Railroad services, with the corresponding specifications as to qualifications and duties, as now submitted by the committee, be approved and recommended for general adoption, and that this action be communicated to all Federal, State, Municipal, and Railroad officials directly concerned, the list of such officials to include heads of Federal Bureaus, Governors, Mayors, Civil Service Commissioners, State Engineers, City Engineers, and Regional Directors, and that the assistance of national and local engineering societies and of the engineering press be invoked, to the end that general recognition of this classification may be secured. And also that pending the formal adoption of a plan for compensation and promotion, the one tentatively proposed by the Committee be recommended for use in the meantime.

Second: That active measures be advocated in the direction of bringing about uniform and general legislation of a suitable character to provide for the registration of engineers, in order that the proposed classification of professional engineering service may be insured the respect to which it should be entitled.

Third: That active steps be taken to obtain the views of the heads of all engineering bureaus representing federal, state, municipal, and railroad services as to the reasonableness of the schedule of compensation and as to the plan for advance within the limits of the grades as now tentatively proposed, as well as of other engineers affected directly or indirectly, through the sending out of another questionnaire to be prepared by the Committee, and that at the same time the views of engineers in all other branches of service be sought as to the adaptability of the recommended classification and of the tentative schedule for compensation and promotion, to their respective fields.

Fourth: That a sufficiently great edition of the substance of this report, suitably arranged, be printed to permit of giving it the maximum practicable publicity in engineering circles.

Fifth: That an appropriation of $10,000 be made available to provide for employing a secretary and such other assistants as may be required, and for meeting other incidental expenses involved in connection with the follow-up, publicity, and educational work required for the completion of this investigation and the production of practical results.

APPENDIX I.

Classification of Engineering Positions in Federal, State, County, Municipal, and Railroad Service

Professional Service

Grade 1—Chief Engineer—Duties: To act in chief administrative charge of a technical organization, or of a main division thereof; to determine the general policies of the organization under the limitations imposed by law, regulation, or other fixed requirement; to have final responsibility for the preparation of reports, cost estimates, designs, and specifications for the construction, maintenance, or operation of engineering works or projects; to have full charge of the collection and presentation of data for and the conduct of valuation proceedings; to conduct or direct the most comprehensive lines of engineering research.

Qualifications: Training and experience of a character to give substantial evidence of engineering knowledge and ability or of executive capacity of highest order along lines of work similar to those involved in the position to be occupied and of at least twelve years' duration, of which at least four years shall have been spent in duties of Engineer, or their equivalent, and at least five years in responsible charge of important work or projects. Fundamental training equivalent to that represented by professional degree granted upon the completion of a standard course of engineering instruction in an educational institution of recognized standing or, in abence of such degree, at least four years of additional experience. The completion of each full year of such standard course shall be considered the equivalent of one year of such additional experience.

Grade 2—Engineer—Duties: Under general administrative direction and within the limits of the general policies of the organization, to have responsible charge of and to initiate and determine policies for a major subdivision of an organization; to prepare for final executive action reports, cost estimates, designs, specifications, and valuation studies and data; to have immediate charge of the construction, maintenance, or operation of engineering works or projects of major importance; to conduct or direct major lines of engineering research; or to furnish for executive action expert or critical advice on engineering works, projects or policies.

Qualifications: Active professional practice or executive charge of work for at least eight years, of a character to demonstrate a high degree of initiative and of ability in the administration, design, or construction of engineering work or projects of major importance, of which at least three years shall have been spent in duties of Senior Assistant Engineer, or their equivalent, and at least three years in responsible charge of work. Fundamental training equivalent to that represented by professional degree granted upon the completion of a standard course of engineering instruction in an educational institution of recognized standing or, in absence of such degree, at least four years of additional experience. The completion of each full year of such standard course shall be considered the equivalent of one year of such additional experience.

Grade 3—Senior Assistant Engineer—Duties: Under general administrative and technical direction, to be in responsible charge of an intermediate division of an organization; to exercise independent engineering judgment and assume responsibility in studies and computations necessary for the preparation of reports, cost estimates, designs, specifications, or valuations; to have immediate charge of the construction, maintenance, or operation of important engineering works or projects; or to conduct or direct important lines of engineering research.

Qualifications: Active professional practice or executive charge of work for at least five years, of which at least three years shall have been spent in duties of Assistant Engineer, or their equivalent, with at least one year in responsible charge of work. Fundamental training equivalent to that represented by professional degree granted upon the completion of a standard course of engineering instruction in an educational institution of recognized standing or, in absence of such degree, at least four years of additional experience. The completion of each full year of such standard course shall be considered the equivalent of one year of such additional experience.

Grade 4—Assistant Engineer—Duties: Under specific administrative and technical direction, to be responsible for the conduct of the work of a minor subdivision of an organization; to collect and compile data for specific items of engineering studies; to take immediate charge of field survey projects and of the design and construction of minor engineering work; to lay out and develop work from specifications and to supervise the work of a drafting or computing force; or to conduct specific tests or investigations of apparatus, material, or processes.

Qualifications: Experience for at least two years in duties of Junior Assistant Engineer or their equivalent. Fundamental training equivalent to that represented by professional degree granted upon the completion of a standard course of engineering instruction in an educational institution of recognized standing or, in absence of such degree, at least four years of additional experience. The completion of each full year of such standard course shall be considered the equivalent of one year of such additional experience.

Grade 5—Junior Assistant Engineer—Duties: Under immediate supervision, to perform work involving the use of surveying, measuring, and drafting instruments; to take charge of parties on survey or construction work; to design details from sketches or specifications; to compute and compile data for reports or records; to inspect or investigate minor details of engineering work; or to perform routine tests of apparatus, material, or processes.

Qualifications: No experience required other than that involved in securing a professional degree upon the completion of a standard course of engineering instruction in an educational institution of recognized standing; but in absence of such degree, a high school education or its equivalent is required and at least four years' expereince in the use of surveying, measuring or drafting instruments, or the computation and compilation of engineering data, together with evidence of a knowledge of the fundamentals of engineering science sufficient, with further experience, to qualify for the higher professional grades. The completion of each full year of such standard course of engineering instruction shall be considered as the equivalent of one year of experience.

SUB-PROFESSIONAL SERVICE

Grade 6—Senior Aid—Office—Duties: To supervise the plotting of notes and maps, and to direct the work of a drafting or computing squad.

Qualifications: Experience for at least five years in tracing, lettering, drafting, and computing, of which at least three years shall have been spent in the duties of draftsman. Education equivalent to graduation from high school. The completion of each full year of a standard course of engineering instruction in an educational institution of recognized standing shall be considered as the equivalent of the experience otherwise required, with the provision, however, that at least one year shall have been spent in the duties of draftsman.

Grade 6—Senior Aid—Field—Duties: To direct work of field party on surveys or construction; to keep survey notes and engineering records; to supervise construction or repair work; to direct the work of computing surveys and estimates; to direct the work of making minor engineering computations.

Qualifications: Experience for at least five years in the use and care of surveying instruments, of which at least three years shall have been spent in the duties of instrumentman. Education equivalent to graduation from high school. The completion of each full year of a standard course of engineering instruction in an educational institution of recognized standing shall be considered as the equivalent of the experience otherwise required, with the provision, however, that at least one year shall have been spent in the duties of instrumentman.

Grade 7—Aid—Office—Duties: To prepare general working drawings where design is furnished; to plot notes and prepare maps; to design simple structures; to make computations and compile data for reports and records; to check plans, surveys, and other engineering data.

Qualifications: Experience for at least two years in tracing, lettering, drafting, and computing. Education equivalent to graduation from high school and familiarity with the use of the slide rule, and of logarithmic and other simple mathematical tables. The completion of each full year of a standard course of engineering instruction in an educational institution of recognized standing shall be considered as the equivalent of the experience otherwise required.

Grade 7—Aid—Field—Duties: To run surveying instruments and to adjust and care for same; to compute surveys and estimates; to make minor engineering computations; to inspect incidentally construction or repair work.

Qualifications: Experience for at least two years in the duties of rodman. Education equivalent to graduation from high school and familiarity with the construction, operation, and care of surveying instruments. The completion of each full year of a standard course of engineering instruction in an educational institution of recognized standing shall be considered as the equivalent of the experience otherwise required.

Grade 8—Junior Aid—Office—Duties: To trace and letter maps and plans; to make simple drawings from sketches and data; to make minor calculations.

Qualifications: Education equivalent to graduation from high school.

Grade 8—Junior Aid—Field—Duties: To run tape or levelling rod; to perform other miscellaneous subordinate duties in survey party in field or office, as directed.

Qualifications: Education equivalent to graduation from high school.

EXPERIENCE EQUIVALENTS FOR POST-GRADUATE WORK

An examination of the schedule shows that the minimum experience requirements for the various grades may be briefly summarized as follows:

			Education Experience in Years	
Service	Grade No	Title	With Degree in Engineering	Without Degree in Engineering
Sub-professional	8	Junior Aid.	0	0
Sub-professional	7	Aid	0	2
Sub-professional	6	Senior Aid	0	5
Professional	5	Junior Assistant Engineer	0	4
Professional	4	Assistant Engineer	2	6
Professional	3	Senior Assistant Engineer	5	9
Professional	2	Engineer	8	12
Professional	1	Chief Engineer	12	16

TYPICAL CLASSES OF POSITIONS

The following table illustrates the practicability of adapting the proposed classification to any particular grade or branch of the engineering service and in such a way as to clearly retain a description of the relative rank.

PROFESSIONAL SERVICE

1—Chief Engineer

Chief Engineer
State Engineer
City Engineer
Deputy Chief Engineer
Deputy City Engineer
Director, etc.

2—Engineer

Electrical Engineer
Mechanical Engineer
Mining Engineer
Chemical Engineer
Bridge Engineer
Sanitary Engineer
Tunnel Engineer
Maintenance of Way Engineer
Signal Engineer
Highway Engineer
Division Engineer
District Engineer
Sewer Engineer

(Similar descriptive titles could be used with the terms "Senior Assistant Engineer," "Assistant Engineer" and "Junior Assistant Engineer.")

SUB-PROFESSIONAL SRVICE

6—Senior Aid

Office—Chief Draftsman
Office—Chief Computer
Field—Chief Instrumentman
Filed—Chief Inspector

7—Aid

Office—Draftsman
Office—Computer
Field—Instrumentman
Field—Ihspector

8—Junior Aid

Office—Junior Draftsman
Office—Tracer
Field—Rodman
Field—Tapeman

The completion of each full year of post-graduate work in the specific subject of study or investigation appropriate to a particular service or branch of service shall be considered the equivalent of one and one-half years of general experience, but such substitution shall not thus be made for more than four years of such experience or be considered as reducing the requirements in any grade of the number of years engaged in the conduct or direction of responsible work.

An Appeal to Highway Contractors

THE people of the United States demand good highways and have backed up that demand by making available for this year's work between $600,000,000 and $700,000,000.

With this tremendous program before us what condition do we find? *The highways are being strewn with the wrecks of contractors' organizations*—and consequently

The public is not getting the highways.

During 1919 contractors built $136,000,000 worth of highways. How many of them made a dollar? How many of them lost dollars? We all know that highway construction was a losing game last year for the contractor, and unproductive, for the public.

Is this to be allowed to continue? If not, how are we, in the public's interest as well as our own, going about to help secure a change?

The first and most obvious thing to do is for every last one of us—large contractor and small—to get together. Practically every line of manufacture and many lines of construction are organized. The members get together frequently to discuss conditions, prices — everything affecting their business interests. Highway contractors, on the other hand, are unorganized.

The volume of highway work to be done is so enormous that there is plenty for all of us. To carry through the program in an American way — quickly, economically, profitably — our present point of view, our method of estimating and handling work must be changed. By present procedure, we are not getting the work done.

There is planned a Highway Contractors' Section of the Associated General Contractors, and although preliminary steps were taken in Chicago in November, 1919, in that direction, a grand opportunity for definitely launching the section is offered at the meeting of the association to be held in Chicago, Feb. 18. Whether a member of the association or not, let every contractor interested in highway construction be there, and let us start something worth while.

This is not a call from the Associated General Contractors. The writer is making an appeal on his personal responsibility. We must have an organization of some kind. Many of us are members of the A.G.C. already, and it seems at this time to be the best under which to get together.

If we do get together, become acquainted and discuss the situation carefully, we surely can evolve plans that will enable the contractor to live and grow, and thus, in turn, permit the successful handling of the enormous highway program for which the public is putting up the funds.

R. G. COLLINS, Jr.,
Contracting Engineer.
Cumberland, Md.

Why Is There No Profit in Building Highways?

By R. G. COLLINS, JR.
Contracting Engineer, Cumberland, Md.

WHY *have contractors failed to find a profit in building highways?*

With a fund of approximately $3,000,000,000 available within the next five years for a certain line of public improvement, demanded by the public, and to be executed by contractors, it seems that the above question should be given considerable thought before bids are made for the coming season's rush, which is estimated to total about $630,000,000.

The answer seems relatively simple to one who has come through the mill, and it is simply this:

Contractors have underestimated the many, always present factors which tend to cut down the monthly output of work, and have therefore bid too low.

You may have a first-class organization and equipment easily capable of building 600 to 700 ft. of 16-ft. road in ten hours, but the trouble is that the organization expense goes on every day in the month and season, *and so do the factors which cut down the output.*

ADVERSE FACTORS

The Weather—Contractors cannot figure without considering the weather and the best they can do in highway-building work is to minimize its delay by putting in industrial equipment, so that the delay is confined to the storm period and not to the muddy hauling condition and ruined subgrade produced by the storm. These conditions may continue for several days, and possibly until another storm comes.

Inspection Difficulties and Too Rigid Interpretation of Specifications—Contractors have always had to contend with inspection difficulties and too rigid interpretation of specifications, and have no reason to suppose that they will be less insisted upon in road work. State highway engineers at their convention in Louisville last month showed a disposition to take up in a fair-minded manner all the criticisms made of their specifications, their interpretations and procedure brought up in the paper presented by a representative of the Associated General Contractors. This subject is already under investigation by a joint committee of the two organizations just mentioned.

Shortage of Materials—Delay from shortage of materials can be minimized by stocking up as soon as the contract is signed and while advancing the grading and "fine grading," *but* the danger is always there.

Shortage of Labor—Shortage of labor can be minimized by the use of machinery wherever possible, but even then there will be machinery breakdowns for which allowance must be made.

The whole thing in a nutshell is just this:

Contractors have always had to confront and to battle with these adverse conditions. Why then demand that they be done away with?

To get some idea of how these factors affect the job, let us look at a few figures:

There is no doubt that the only way for a contractor to tackle highway construction in sections over 4 mi. in length is to put in cranes, 2-ft. gage tracks, cars and equipment, etc., to do away with common labor wherever possible. He must figure on having enough of this equipment, too; not 2 locomotives and 20 or 30 cars for a 10-mi. section, but 6 locomotives (3-ton) and 60 cars, 6 mi. of track and plenty of switches. This plant will cost from $80,000 to $90,000, and the depreciation and interest on this investment will come to at least 20 to 30c. per sq.yd. of pavement, for a 10-mi. contract of

16-ft. road. (Figuring that the plant cost is to be wiped out in three years.)

He must install a properly laid out yard for his material handling and storage, with probably his own railroad siding. A trestle is worth while on a section over 5 mi. long. This yard, trestle, siding, cement shed, etc., will cost him around $5,500 or 5½c. per sq.yd. on a 10-mi. contract (94,000 sq.yd.).

Laying his first narrow-gage tracks will cost 2c. per sq.yd., shifting and maintaining same being included in payroll.

His loss in small tools will amount to 2c. sq.yd. of pavement.

Freight to and from the contract, installation of equipment, arrangement of good housing for his labor will cost 5c.

His bond on the concrete item alone will cost between 4 and 4½c.

In all there is a total of 30c. per sq.yd. for equipment and 19c. for the other items.

This all sounds like a formidable handicap to carry along as a constant charge, *but* it is attendant upon this method of construction, which is admittedly the cheapest now available, for with this equipment we can count on the largest season's performance in the face of known difficulties.

If a contractor could have some insurance that, having purchased an equipment of this kind, it would be kept at work, as is the equipment of a contractor on railroad work, the 30c. charge might be reduced. Under present conditions, the figure is not high enough.

In this year, the contractor, in addition, will need to take particular care of his financing before bidding on work, as the purchase of machinery and materials on long terms is practically a thing of the past. Formerly in buying equipment similar to that needed for this work, very little cash was required at time of purchase, the remaining payments to be strung out over periods of six to twelve months. Now a large initial cash payment is demanded and the balance must be paid within four months.

Bonding companies also show a tendency to require a stronger financial standing and broader experience for applicants for bonds on road work.

PERFORMANCE

The equipment described when properly manned and handled can reasonably be said to have a capacity for placing 750 ft. of 16-ft. highway, 7-in. thick, in 10 hours, but if a contractor figures, in making his estimate, on accomplishing more than 12,000 sq.yd. in a month (300 ft. for each of 23 full days per month), he is making a sad, but sure, mistake. If the contractor risks any other form of haulage than industrial equipment, he should not figure on accomplishing more than half of the above yardage per month.

He *should* exceed this monthly performance, but so far not five contractors in the country have equalled it for each month that they were on a contract, *so why figure on something which is possible, but hasn't yet been accomplished, particularly when the factors preventing the accomplishment are beyond the contractor's control?*

Most highway contracts average from 3,000 to 5,000 cu.yd. of excavation per mile, and experience shows that for this class of grading there is not much profit at $1.50 per cu.yd., because the material has to be almost always loaded (steam-shovel work) and placed in fills, and then *must be rolled thoroughly and brought to the exact plane called for by the engineer's stakes.* There is no profit to be made in culvert masonry, even at $18 or $20 per cu.yd., so that practically the entire profit of the contract must be made in the placing of the concrete pavement.

How many bid on this basis, and yet wherein is this basis of arriving at the cost to the contractor not absolutely correct?

Pipe Sprinkler System for Long Bridge

A PIPE sprinkling system installed on the Mississippi River bridge between St. Louis, Mo., and Venice, Ill., is intended to eliminate the use of a sprinkling cart, to preserve the wood floor by preventing excessive shrinkage in hot weather, and to reduce the danger of fire. The floor consists of large blocks 3 x 4 ft., built up of planks on edge, bolted together. There are two roadways, 14 ft. wide between guard timbers. The length of bridge to be equipped for sprinkling is 7,000 feet.

SPRINKLER PIPE THROWS JETS OVER WOOD FLOOR OF BRIDGE

A 4-in. feeder main is laid behind and above the outer guard timber of each roadway, and has valves and hose connections for fire service. A pressure of 40 lb. is carried. For the sprinkler service, the bridge is divided into 15 sections of about 500 ft., and at the middle of each section the main is tapped with a ½-in. connection controlled by an angle valve. A branch connects this with a ½-in. pipe just below the main and laid along the top of the guard timber for 250 ft. in each direction.

These pipes are drilled with holes spaced 2 ft. apart at angles alternately 5° above and 5° below a horizontal plane and fitted with sprayers or nozzles arranged to throw alternate jets across the roadway at two angles. The orifices of the sprayers vary from No. 47 to No. 49 gage, increasing from the valve to the end of the section in order to compensate for loss due to friction and thus provide practically a uniform flow from all the nozzles.

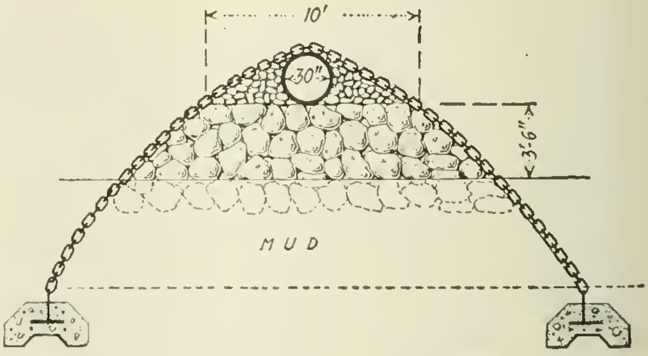
This sprinkling system is operated by the watchman or bridge tenders, who see that the floor is kept sufficiently moist to insure protection from fire and to provide the best wearing conditions for the paving. The water consumption is about the same as with sprinkler carts, but the latter could not keep the surface continually moist and interrupted traffic somewhat. Water taken directly from the river is supplied by a pumping plant in the electric-railway power station at the east end of the bridge. The system was devised by W. B. Huckaby, bridge superintendent, and was installed by him under the direction of E. D. Bell, general superintendent of the St. Louis Terminal Ry. (Illinois Traction System), which owns and operates the bridge.

Steel Pipe Floated to Place, Sunk and Bolted Under Water, To Form Outfall

THE town of Queensborough in Tasmania has laid **700 ft. of** 30-in.-steel outfall sewer pipe on a rock-fill foundation in the bed of the River Derwent by making each section buoyant, floating it to place, and flooding and sinking it for connection by a diver. The sewer was required for a separate drainage system caring for an area of 1100 acres and designed to provide for an ultimate population of 27,000. Its point of discharge is 26.5 ft. below low water. The pipe was made up of ½-in. steel plates in approximately 24-ft. lengths.

The bed of the river consisted of 5 ft. of mud lying on sand. A single row of guide piles was driven at 100-ft. intervals, and alongside these a stone foundation was dumped and graded. A punt, 36 x 18 x 4 ft., was equipped with two crab winches and timber outriggers fitted with block and tackle for adjusting levels of the sections being placed. The punt was located and made fast over the place where the pipe section was to be laid. On the river bank the pipes were bolted in 48-ft. lengths, and temporary timber bulkheads were fastened to the ends of each of these sections. A section was then launched from the bank, as shown in the accompanying picture, and towed to its location between the punt and guide piles. It was there lined with targets on the guide piles. Its timber bulkheads were removed, allowing the section to fill from the ends. Guided by the tackle of the punt, the pipe was sunk, bedded on its foundation, and then bolted to the preceding section by a diver. The pipe line was tied in place every 100 ft. by a special anchorage chain, each end of which was made fast to concrete blocks embedded in the mud. As a final operation, the line was covered with an additional rock fill, as shown in the cross-section. The guide piles were then removed upon completion of the work.

ALIGNING FLOATING PIPE BEFORE FLOODING AND SINKING



CROSS-SECTION OF OUTFALL SEWER

The engineer responsible for the design and execution of the work is H. E. Bellamy, Mem. Am. Soc. C. E., city engineer, of Hobart, Tasmania.

LAUNCHING 48-FOOT BULKHEADED SECTION OF STEEL PIPE TO BE FLOATED TO POINT OF PLACING IN RIVER BED

Rental Values for Construction Equipment

By F. J. HERLIHY
Concrete Department, Winston Bros. Co., Minneapolis, Minn.

OF the various elements of the cost of construction work there is none more important or on which there is a wider divergence of opinion than the value of plant rental. Contracting is a business in the same sense as is the mercantile trade and, to be successful, must be conducted on sound business principles. Each disbursement made must be properly charged against the product the contractor has to sell, i.e., against the structure he has contracted to build. Cost elements such as labor, material and items of expense incurred exclusively for the work in question can be charged to that work in their entirety and consequently present no especial difficulty.

In the case of plant cost, however, the foregoing principle does not apply, as a machine such as a steam shovel or hoisting engine, is bought not exclusively for a single job, but as a capital investment for future work. The first cost of equipment, then, can not be charged against any one job, but together with the accruing costs, such as interest, insurance, etc., it must be charged against all the work the equipment may reasonably be expected to execute throughout its useful life. The particular work in hand should only bear the cost to the contractor of owning the equipment while on that work, together with its share of the cost during the idle time between contracts.

There is a regrettable lack of uniformity in the charges made by contractors against construction work for plant rental. This condition can only result in throwing bids out of line. In cases where too high rental charges are made, the result is correspondingly high bids, but it is more serious when too low a plant charge is made. This often results in an actual loss, or at least in a reduction of or wiping out of the anticipated profit. This loss may not always be apparent as the contractor has nothing on his books to show the loss. He still has the plant on which this charge will not appear until the end of its useful life.

The essential thing for the contractor to ascertain at the outset when bidding on work is, of course, the value of the work to be done. This can only be ascertained after each element of cost of the contemplated work has been carefully analyzed and more especially is this true in these times of rapidly fluctuating prices. In this connection the accurate value of plant rental is equally important with the items of labor, supplies or any other cost element of the work. The true cost to the contractor of owning the plant and maintaining it in useful condition must be the basis on which the value of plant rental charges are founded. Fictitious values which only confuse the records should be discarded and no element of profit should be incorporated in the plant cost. Profits should be taken care of in the regular profit element of the estimate where they can be most properly handled.

It is obvious then, if our premise be correct, that the vital problem to solve is a determination of the cost to the contractor of owning equipment and maintaining it in useful condition throughout its life. This problem is a large one indeed and can only be solved by analyzing the different elements of plant cost, both capital and accrued, separately.

The cost to the contractor of owning equipment may be broadly defined as comprising: 1, capital investment; 2, interest on capital investment; 3, insurance; and 4, storage expense during idle time. The cost of maintaining the equipment in useful condition includes the cost of ordinary running and field repairs and the cost of general or shop repairs. The accompanying table is submitted as a convenient form in which to express the different elements of cost of plant rental, as well as to set down the results of the analysis. While the principles of plant rental are similar for all classes of contractors equipment, only the most commonly used units of grading contractors equipment will be considered here. In order to simplify the results and make the analysis more comprehensive, the table is so constructed that all charges are measured in terms of original cost, which is the known quantity in every instance. The column headed "Original capital cost" is intended to show typical costs only and is given as a basis on which the details of plant rental—both costs and percentages—are worked out. In actual practice the true first cost of the equipment should be substituted for that shown in the table and the analysis worked out accordingly, using as the other factors, the fixed percentages shown. Where the contractor owns several machines of the same class, size and type, which cost different prices, the average original cost should be used. Average depreciation only is considered in fixing the various factors of accrued costs, and charges shown in the table as depreciation will vary for the different makes of equipment on the same class of work and will be dependent more or less on the nature of the work for all classes of equipment. Average equipment working under ordinary conditions, covering the entire time the contractor may be in business, is considered. The figures shown in the table for repair items are based on present prices and average conditions. They will vary with the fluctuation of the labor and material market and with the different makes of equipment, depending more or less on the character of the work and the manner in which the equipment is handled. The percentage rate of depreciation and the average earning days per annum are quantities that experience alone can measure, a perusal of the records of contractors who have been using the class of equipment under consideration for an appreciable time being the only source of information. The factors used in the table for depreciation, average earning days per annum, and shop and field repairs show the writer's conclusions of their values based on his general experience, a perusal of extensive data on the subject and the records of a large grading contractor. Additional information was secured from several months' attendance at arbitration proceedings in which more than $600,000 worth of rental charges on equipment, similar to that shown in the table, were part of the issue. Several weeks were spent on the principles and rates of rental exclusively, and much expert testimony was adduced by both sides. The finding of the arbitrators, while not allowing all rental claimed for other reasons, approved the rates of rental contended for and the principles thereof in most instances. The rental rates in that case were based on practically the same percentages and principles as those in the table shown here, the cost of repairs being practically the only departure. As the rental factors in that case were based on pre-war conditions, this departure is necessary to bring the cost of these items into conformity with present values. Proceeding to analyze the different cost elements, we have:—

Different Cost Elements

Original Capital Cost.—This element represents the first cost of the equipment which must be recovered by charging off the depreciation periodically and from the proceeds of its sale at the end of its useful life. In fixing the annual rate of depreciation (average between idle and working time) due credit has been given the first cost of the equipment for its scrap or obsolescent value. The rate shown represents simply the rate of depreciation reduced to terms of original cost, which, if applied annually, against the first cost, will take care of the difference between first cost and the sale price at the end of the useful life. Obsolescence is considered as being reached with any piece of equipment when it must be discarded for one that will do the work more economically.

Interest on Capital Investment.—The rate shown in the table represents the rate, which, if applied annually against the first cost of the equipment, will take care of interest charges against the capital investment throughout the useful life of the equipment at the customary rate of 6 per cent per annum on the average capital value. Assuming the sale price at the end of the useful life at 25 per cent of the first cost, this makes the average capital value 62½ per cent of the first cost. For machines which have no sale price at the end of the useful life, the average capital value becomes 50 per cent of the first cost.

Insurance and Storage During Idle Time.—These two items of expense have been combined in the table because they are more or less related and the insurance item is less than one per cent per annum of the original capital cost. Most contractors find it more economical and certainly more satisfactory to have a central storage plant for equipment, so located that it will be easily accessible from, and in close proximity to, headquarters, than to have their equipment scattered about at several storage points. The charge for these elements of cost include interest, depreciation and maintenance of storage facilities, and all expense incurred for the storage of equipment, whether stored at the central storage plant or elsewhere. It also includes the expense of insurance on storage facilities and construction equipment. Where no insurance is carried, the contractor should make a charge for this item in any event as then the contractor assumes the risk. The annual percentage rate shown in the table is based on an annual cost of $15,000 to cover these items of expense on a construction plant, the first cost of which was $400,000. Of course this expense will vary with the quantity of equipment owned by the contractor and the value of the storage facilities, but the rate shown should be fairly representative for all conditions.

The columns headed "Rate of accrued charges on original cost" and "Total annual charge" in the table sum up the percentage and money charge, respectively, that must be applied annually against the first cost of each piece of equipment. These columns simply sum up the interest, depreciation, insurance and storage items just described. The values in the column headed "Total annual charge" will vary with the original capital cost, but those shown in the percentage column will remain constant and they are the key to finding the actual annual charge to be made in all cases.

Having arrived at the annual cost to the contractor of owning the equipment, the next thing to ascertain is how to apply the charge against the different contracts in order to come out whole. In making this application, it is necessary to understand that there is of necessity a certain amount of idle time between contracts during which the contractor has no work against which to apply the accrued costs of owning the equipment, and that contractors engage in the contracting business to stay indefinitely. It naturally follows that the contractor must carry on hand at all times enough equipment to enable him to bid on work with a certainty that he can equip the work in the time provided for by the specifications. The contractor, therefore, who fails to include charges in his plant rental rate during the earning time of the equipment that will absorb the accrued costs during the idle time between contracts upsets the very foundations of sound business principles and faces inevitable losses, either by way of being forced to dispose of the equipment quickly at the best price obtainable, or by assuming the accrued costs of holding it during the idle time between contracts. Of course, there is the alternative of renting the equipment during the idle time but that too has its uncertainties, as a renter will not always be available. If these premises are correct, the number of earning days, or the number of calendar days on which the equipment is assigned to work per annum is the factor to apply to the total annual charge in arriving at the correct daily rental charge to be made against the work. By this method, the total accrued costs of owning the equipment is absorbed by the earning time of the equipment and the enforced idle costs properly accounted for. The average number of earning days per year for the different classes of equipment, based on the information described at the beginning of this analysis is shown in the table. The values shown represent the number of calendar days and not actual working days intervening between the time the equipment has been shipped to the work and its return to the storage plant, or until it has been assigned to another job. In other words, rental should be charged against the work for each and every calendar day on which the equipment is assigned to the work, working days being too uncertain a factor on which to base. The column headed "Daily charge for interest, depreciation, insurance and storage" represents the values arrived at by dividing the annual charge for accrued expenses and charges by the average number of earning days per year. The rates shown in the column should be used only in making charges on work of such duration as to permit of shop and field repairs being charged directly against the work.

Maintaining Equipment in Useful Condition

Having disposed of the cost to the contractor of owning the equipment, there remains the expense of maintaining it in useful condition. This expense, as before stated, comprises the elements of general or shop repairs, and of field repairs. All construction equipment must be overhauled, and renewals and major repairs, commonly designated as shop repairs, made periodically. The cost of these repairs per earning day, is shown in the table. The expense of making these repairs cannot ordinarily be charged directly against the work, as they usually accrue on several contracts. The most satisfactory method of handling them is to provide a sinking fund by charging in the rental rate an amount daily that will accumulate a fund sufficient to cover the cost of these repairs at such periods as they are required. It is this daily charge that is shown in the column headed "General shop repairs daily" in the table.

Daily Rental Value Including Shop Repairs.—In the column of the table headed "Daily rental" will be found the values of rental per earning day for the different classes of equipment, including the allowance for sinking fund to take care of shop repairs. This represents the daily rental charge that should be made against each piece of equipment on ordinary work to take care of the annual charge and shop repairs. It is the values shown in this column of the table that should be used for all jobs except those which are of too short duration to allow for field repairs to be charged directly against the work and those which are long enough to allow both field and shop repairs to be charged directly against the work.

Field Repairs.—Field repairs are generally charged up directly against the work. They comprise simply such minor repairs and replacements as are due to the ordinary breakage and wear of parts that must be taken care of on the job to keep the equipment running. The column headed "Est. cost field repairs daily" gives the value of these repairs per earning day.

TOTAL RENTAL CHARGES

There is a final column in the table, headed "Total rental charges daily including field repairs" in which the daily charge shown in the column headed "Daily rental" is augmented by the addition of the field repair charge. This column is given for the information of the estimator who is concerned only with the total cost

RENTAL RATES FOR GRADING CONTRACTORS EQUIPMENT

Class of Equipment	Original Capital Cost	Equivalent Annual Interest Rate on Original Cost, Per Cent	Annual Rate of Depreciation on Original Cost, Per Cent	Annual Insurance and Storage Rate on Original Cost, Per Cent	Total Annual Rate of Accrued Charges on Original Cost, Per Cent	Total Annual Charge	Average Earning Days per Year	Daily Charge for Int. Dep. Ins. and Storage	General Shop Repairs Daily	Daily Rental	Estimated Cost Field Repairs Daily	Total Rental Charge Daily, including Field Repairs
Steam shovel	$12,000	3¾	12½	3¾	20	$2,400.00	200	$12 00	$4 00	$16 00	$4.00	$20.00
Steam shovel	20,000	3¾	12½	3¾	20	4,000.00	200	20.00	6 00	26 00	6.00	32.00
Steam shovel	30,000	3¾	12½	3¾	20	6,000 00	200	30.00	9 00	39.00	9.00	48.00
Steam shovel	90,000	3¾	12½	3¾	20	18,000.00	200	90.00	25 00	115.00	25.00	140.00
Drag line excavator	20,000	3¾	12½	3¾	20	4,000 00	200	20.00	10.00	30.00	10 00	40.00
Drag line excavator	30,000	3¾	12½	3¾	20	6,000.00	200	30.00	15 00	45.00	15 00	60.00
Standard gage locomotive	12,000	3¾	12½	3¾	20	2,400 00	200	12.00	5 00	17.00	5.00	22.00
Standard gage locomotive	16,000	3¾	7½	3¾	15	2,400.00	200	12.00	6.00	18.00	6.00	24.00
Standard gage locomotive	24,000	3¾	7½	3¾	15	3,600.00	200	18.00	8 00	26 00	8.00	34.00
Dinkey locomotive	4,000	3¾	12½	3¾	20	800 00	200	4 00	1.50	5.50	1.50	7.00
Dinkey locomotive	6,000	3¾	12½	3¾	20	1,200.00	200	6.00	2.50	8.50	2.50	11.00
Locomotive crane	20,000	3¾	12½	3¾	20	4,000.00	200	20 00	6 00	26.00	6 00	32.00
Jordansreader	9,000	3¾	12½	3¾	20	1,800.00	200	9.00	3 00	12.00	1.00	13.00
Rail per ton	48	3¾	7½	3¾	15	7.20	200	.04	01	05	.00	.05
Track throwing machine	6,000	3¾	12½	3¾	20	1,200 00	200	6 00	2.00	8 00	1 00	9.00
20-yd. air dump cars	3,750	3¾	12½	3¾	20	750.00	200	3 75	.25	4 00	.25	4.25
16-yd. air dump cars	2,800	3¾	12½	3¾	20	560.00	200	2 80	.20	3.00	.25	3.25
12-yd. air dump cars	2,000	3¾	12½	3¾	20	400.00	200	2 00	.15	2 15	.15	2.30
4-yd. dump cars	430	3¾	12½	3¾	20	86.00	200	.43	.07	.50	.10	.60
1½-yd. dump cars	110	3¾	12½	3¾	20	22.00	200	.11	.09	.20	.10	.30
1-yd. dump cars	90	3¾	12½	3¾	20	18.00	200	.09	.06	.15	.10	.25
Flat cars	1,000	3¾	7½	3¾	15	150.00	200	.75	.15	.90	10	1.00
Gasolinel ocomotive	3,200	3¾	12½	3¾	20	640.00	200	3.20	1.05	4.25	1 25	5.50
1-yd. Koppel cars, V shape	110	3¾	12½	3¾	20	22.00	200	.11	.04	.15	05	.20
Motor truck, 5-ton	6,000	3¾	22½	3¾	30	1,800 00	200	9.00	7 50	16.50	5 00	21.50
Automobile	2,000	3¾	31¼	15	50	1,000.00	200	5.00	2.50	7.50	2 50	10.00
Caterpillar tractor gas	5,000	3¾	12½	3¾	20	1,000 00	150	6.66	8.34	15 00	5 00	20.00
Vertical boiler	900	3¾	7½	3¾	15	135.00	100	1 35	.65	2 00	.00	2.00
Locomotive boiler	1,500	3¾	7½	3¾	15	225.00	100	2.25	1.00	3.25	00	3.25
Steam pump	500	3¾	7½	3¾	15	75.00	100	.75	.50	1 25	.00	1.25
Centrifugal pump, d c	1,500	3¾	7½	3¾	15	225.00	100	2.25	1.25	3.50	.50	4.00
Belted pump	300	3¾	7½	3¾	15	45 00	100	45	.30	.75	.00	.75
Deep well pump	600	3¾	7½	3¾	15	90.00	100	90	.60	1 50	.00	1.50
Gasolene engine	1,200	3¾	7½	3¾	15	180.00	100	1 80	.60	2.40	.10	2.50
Steam engine	1,800	3¾	7½	3¾	15	270.00	100	2 70	.90	3 60	.15	3.75
Hoisting engine	4,250	2¾	7½	3¾	15	637.50	100	6.38	2.12	8 50	.50	9.00
Horse pile driver	800	3¾	12½	3¾	20	160 00	100	1.60	.40	2 00	.00	2.00
Steam pile driver	2,000	3¾	12½	3¾	20	400 00	100	4.00	.75	4 75	.75	5.50
Track pile driver	10,000	3¾	7½	3¾	15	1,500.00	100	15.00	3 00	18 00	2.00	20.00
Steam pile hammer	2,500	3¾	7½	3¾	15	375.00	100	3.75	.75	4 50	.50	5.00
Air compressor	3,000	3¾	7½	3⅛	15	450.00	100	4.50	1.50	6 00	50	6.50
Electric motor	500	3¾	12½	3¾	20	100.00	100	1.00	.35	1 35	.15	1.50
Deep well drill	2,000	3¾	12½	3¾	20	400.00	100	4.00	.50	4 50	.50	5.00
Steam tripod drill	400	3¾	12½	3¾	20	80.00	100	.80	.20	1 00	.25	1.25
Jack hammer drill	140	3¾	12½	3¾	20	28.00	100	.28	.22	.50	.25	.75
Air steel sharpener	2,000	3¾	12½	3¾	20	400.00	100	4 00	.25	4 25	.25	4.50
Stiff leg derrick	2,000	3¾	12½	3¾	20	400.00	100	4.00	.50	4 50	.75	5.25
Forrest log loader	400	3¾	12½	3¾	20	80.00	100	.80	.20	1 00	.25	1.25
Lee wagon loader	225	3¾	12½	3¾	20	45.00	100	.45	.15	.60	.15	.75
Clam shell bucket	1,500	3¾	12½	3¾	20	300.00	100	3.00	.25	3.25	.25	3.50
Rock channeler machine	3,000	3¾	12½	3¾	20	600.00	100	6.00	2.00	8 00	1 00	9.00
Grading machine	1,350	3	23¼	3¾	30	405.00	150	2 70	1.30	4.00	1 00	5.00
Pony road grader	200	3	23¼	3¾	30	60.00	150	.40	.20	.60	.15	.75
Grading plow	30	3	23¼	3¾	30	9.00	150	.06	.04	.10	.00	.10
Dump wagon	180	3	23¼	3¾	30	54.00	150	.36	.34	.70	.15	.85
Hauling wagons	120	3	23¼	3¾	30	36.00	150	.24	.21	.45	.15	.60
Wheel scrapers	50	3	33¼	3¾	40	20 00	150	.13	.12	.25	.00	.25
Slip scrapers	8	3	43¾	3¾	50	4 00	150	.03	.02	05	.00	.05
Fresno	22	3	43¼	3¾	50	11 00	150	.07	.08	.15	.00	.15
Switches complete	150	3¾	7½	3¾	15	22.50	200	.11	.02	.13	.00	.13
2-in. galv. pipe per 100 ft	22	3¾	7½	3¾	15	3 30	200	.02	.01	.03	.00	.03
2½-in. galv. pipe per 100 ft	34	3¾	7½	3¾	15	5 10	200	.03	.01	.04	.00	.04
3-in. galv pipe per 100 ft	45	3¾	7½	3¾	15	6.75	200	.04	.01	.05	.00	.05

daily of the equipment to the work, as his charges must also include the cost of field repairs in making up the tender. The values in this column are used in charging out rental also on work of such short duration that the wearing of parts designated as field repairs will not accrue during the interval of time during which work is being carried on, thereby preventing the intelligent charging of the field repairs directly against the work.

In cases where a contractor is executing unit price or lump sum work on which force account jobs come up, requiring the use of equipment for short intervals of time less than weeks, it is recommended that rental charges be made on a working day basis instead of the earning day basis shown in the table. In this manner the lost time, including holidays, during the earning time of the machine, will be taken care of. It will usually be found that an increase of 25 per cent on the total rental rate, including field repairs, will cover this condition.

Some contractors charge the equipment directly against the work at its value when going on the work and crediting the work with its salvage value on completion of the work. This method should never be used except on cost plus work, and then only when the equipment is disposed of immediately on completion of the job. In this manner the work will be made to stand the actual money cost of owning the equipment while on the work. In case the contractor takes the equipment over on completion of the work at its actual value, it is inevitable that there will be a loss to him as he has no way of collecting the accrued costs, such as interest, depreciation, etc., for the idle time between contracts. The only remedy the contractor would have would be to place a fictitious value on the plant and this is neither desirable nor conducive of good relations between the contractor and the engineer or proprietor, as the case may be. The writer believes that the only safe way is to charge rental against the work on a daily rental basis.

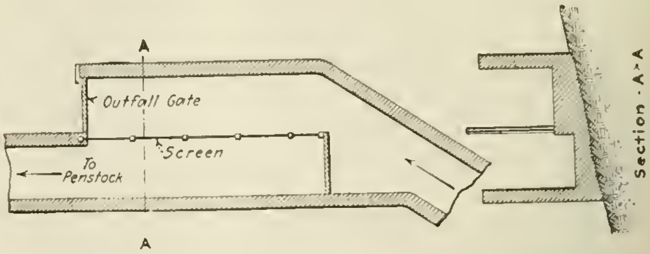
It should be kept in mind that all values shown in the table for equipment rental show actual costs and do not include any element of profit. Should the equipment be rented to outsiders, a profit should be added to the rates shown.

Flooding "Blisters" Granite Block Pavement

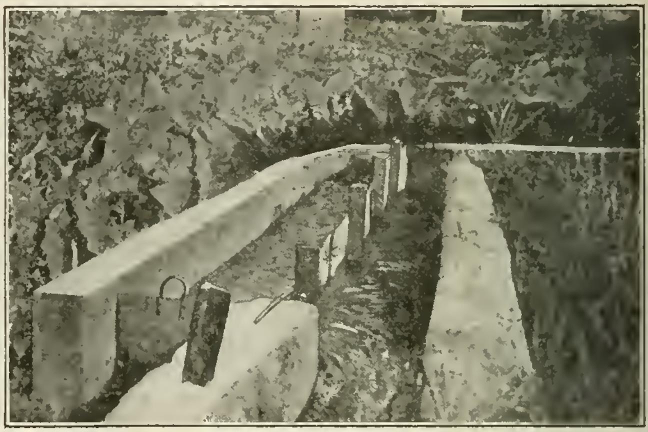
A considerable amount of granite block pavement was damaged through the breaking of a high-pressure water main at Walker and Baxter Sts., New York City. The break occurred in a granite block pavement laid on concrete in 1918, and the water made its way between the newly laid pavement and its concrete foundation on Walker St., from Baxter to Center, a distance of 190 ft. The result was that the granite paving was raised and left in blisters. These blisters rose as much as 2 ft. in some places and gradually sank until they rested on the earth washed in, leaving bumps from 3 in. to 6 in. in height. The granite pavement damaged was laid under the standard Manhattan specification, the filler being asphalt mixed with about an equal volume of hot sand and grouted into the joints with squeegees. The asphalt filler had a melting point between 115 deg. and 130 deg. F.; a penetration of 60 to 100 at 77 deg. F., and a ductility of at least 40 cm. at 77 deg. F.

Self-Cleaning Screen for Small Canals

A SCREEN that has worked successfully for six years, according to its owner, in keeping floating solids, leaves and other débris out of a small canal, is shown in the accompanying illustrations. The advantage claimed for the design is that the screen cleans itself automatically whenever the outfall gate is opened to provide a free flow past the screen as well as through it. The outfall gate sill is not low enough to permit all the water to be diverted, so the operation of cleaning the screen does not shut off the water from the penstock below. Presumably, the gate at the upper end of the screen was put in so that the flow of water through the screen could be reversed. This has evidently not been necessary, however, for A. H. Green of Canefield, Dominica, B.W.I, who sent the foregoing information, states that this upper gate has never been opened since it was installed.



DETAILS OF SELF-CLEANING CANAL SCREEN



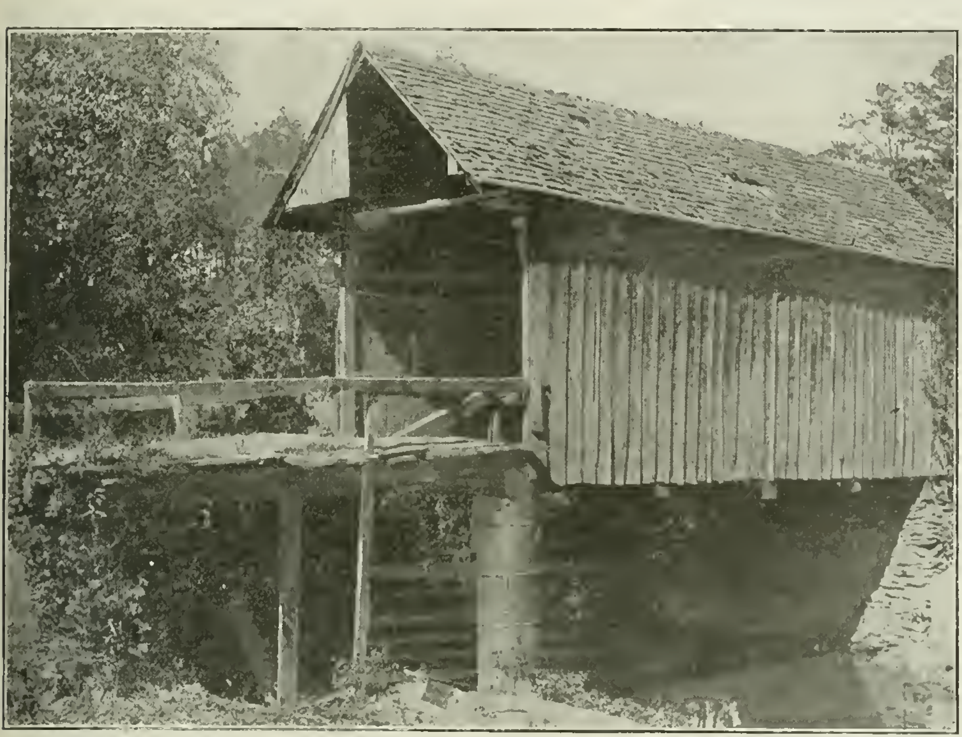
SCREEN IN OPERATION

SCREEN BEING CLEANED

Bridge Piers Made From Old Boilers

PRESUMABLY after one of the stone abutments had been washed out, one end of the bridge shown by the accompanying view was provided with a new support consisting of two cylinder piers, each made from two old domestic boilers riveted together and filled with conrete.

For braces between the posts and cross-beams of the bridge, the woods were searched for trees with limbs at right angles with the trunks. These were then cut and hewn to shape. The bridge was located in Milton County, Georgia, a county only a few miles north of Atlanta but untraversed by a railway. A 40-ft. span concrete bridge has recently replaced the old wooden bridge. The new bridge was the first Federal-aid bridge to be built in Georgia. It was built under the direction of Arthur Pew, consulting engineer, Atlanta, Ga., acting for Johnson & Morgan.



STONE ABUTMENT REPLACED BY PIERS MADE FROM OLD DOMESTIC BOILERS FILLED WITH CONCRETE

Cracks in Rail Steel Correlated with Fissure Defects

Fine Cracks Located by Deposit of Iron Dust From Oil Emulsion on Magnetized Piece Later Brought Out by Deep Etching

SIGNIFICANT indications tending to prove that transverse fissures in steel rails start from minute interior cracks have been discovered by Henry S. Rawdon, associate physicist, Bureau of Standards, in an investigation whose results are made public by the American Railway Engineering Association in a report of its rail committee, just issued. A method was perfected by which exceedingly fine cracks, not detectable by ordinary means (even high-power microscopic examination of a polished surface failing to locate them) were revealed on the surfaces of slices of rail steel without requiring the specimens to be destroyed or injured. Subsequent "deep etching" according to the procedure developed last year by Waring and Hofammann transformed such cracks into deep narrow gashes like those produced in typical steel from transverse-fissure rails in the numerous studies of such rails made during the past year. While the results hardly constitute final proof, they establish a very strong probability that the initial defects responsible for transverse fissures are very fine cracks existing in the steel before it is placed in service.

The essential studies were made on specimens from three rails which had developed fissures in the track. Horizontal slices from the heads of these rails showed no indication of defects when examined under the microscope. Then application was made of a magnetic method developed at the Bureau for inspecting gages: "The specimen, which must be polished on the surface as for microscopic examination, is magnetized and then immersed in kerosene or a similar liquid containing very fine iron dust in suspension. Cast-iron mud from disks used for lapping operations is admirable for the purpose. Particles of the iron dust collect upon the polished face of the magnetized specimen, and at the places where, because of a discontinuity within the metal, a change in the density of the magnetic flux occurs, orient themselves to correspond to the shape of the discontinuity. The specimens are finally washed in clean kerosene to remove as much as possible of the excess iron dust which is scattered over the surface." Applying this method to the rail specimens there were outlined in each, quite clearly, numerous lines (cracks) of greater or less length. Oblique illumination made them more clearly visible. Wiping off the iron dust and repeating the process gave the same results, just as definitely. Then the locations of the cracks were marked on the specimen, and by means of this orientation, after the specimens were wiped clean the defects were examined under the microscope, both before etching and after etching with 2 per cent alcoholic nitric acid (light micrographic etching). The etched specimens, even under a magnification of 500, gave only the faintest indication of cracks, an indication that would doubtless have been overlooked or interpreted in another way had the presence of the cracks not been known from the magnetic method. Finally, the specimens were etched deeply by immersion for some hours in hot hydrochloric acid. This operation developed at each of the cracks which the magnetic method had detected a deep gash of the kind known from previous deep-etching studies.

Following this clear-cut correlation between cracks and fissure defects—the gashes produced by deep etching having been pretty definitely correlated with actual transverse fissures by previous studies—one of the rail specimens was cut into strips, each including within its width a crack located magnetically, this crack being transverse to the strip. On breaking the strip, the fracture face showed a spot, corresponding to the crack, identical in appearance with those seen at the center of a transverse fissure, and with the "gray spots" often found in defective rails.

More definite proof that the faint lines revealed by the magnetic methods are cracks was given by a specimen in which a punch mark was made at each end of one of the lines traced out by the iron dust, so as to wedge apart the crack if it was a crack. Microscopic examination now showed the crack very distinctly as such.

On one of the rail specimens, in which the carbon content was low enough so that the grain boundaries were clearly outlined by ferrite envelopes, one of the magnetically located cracks was studied under the microscope after slightly enlarging it by etching it with concentrated hydrochloric acid. It was then seen that the crack passed through the grains and not along the grain boundaries. A crack found in a forging for a gun tube, however, was seen to be intercrystalline, that is, it passed along the grain boundaries. Mr. Rawdon concludes that this latter crack probably originated when the specimen was at high temperature, while the cracks in the rail steel were probably formed when the metal was cold.

Engineering Aspects of Stump Removal from Land

Machines and Explosives Are Available, but the Former Need Improvement—Millions of Acres Await Clearing

DEVELOPMENT of improved machinery and methods for the removal of tree stumps in order to open cut-over lands for cultivation is highly desirable for economic reasons in view of the great area of land to be cleared, but as yet there has been only a limited application of engineering skill and the methods now in use are not far different from those of early days. These were the basic ideas of a paper read late December, 1919, at the annual meeting of the American Society of Agricultural Engineers, in Chicago, by John Swenehart, in charge of land clearing investigations that have been conducted during the past two years at the College of Agriculture, University of Wisconsin.

He pointed out that in Wisconsin alone there are 10,000,000 acres of usable cut-over land averaging 60 stumps per acre, with a total of some 600,000,000 stumps to be removed. It is true that machines have been devised and explosives utilized, but their use is relatively limited and few of the numerous patents contain any practical ideas. Furthermore, says Mr. Swenehart, there are no contractors able to figure on such work and to carry it out, although in many cases it must be done on a large scale.

From the engineer's standpoint there are numerous factors to be considered in determining the methods and cost of stump removal. These include the soil, moisture conditions, kind of tree, character of roots and the size and age of stump. The water level has considerable influence upon the root system and upon the degree of difficulty in breaking the stump loose from its anchors. While a maple stump is hard to remove when green, its top and small roots will have rotted in a few years so that a light charge of dynamite will suffice for a large stump. On the other hand, a white-pine stump ten years old will be in good condition owing to its resinous content and even 60-year old stumps of this kind may be difficult problems.

Explosive force, mechanical power and animal power are available. In their application the speed of operation and the strength of materials are two important considerations, while the stacking of the removed stumps must be included. Experiments have been made in promoting decay by the application of chemicals, but these do not promise practical results.

Investigation with explosives has shown the desirability of using those which produce a slow heaving action rather than a quick shattering action. Dynamites composed chiefly of nitroglycerin and having the remainder of their content mostly of ammonia or sodium nitrate or other active basic materials which are themselves explosives, are gaining in use as they are safer, slower in action, less affected by freezing and produce less poisonous effects to the user than other dynamites. Old practice called for high-grade or shattering explosives, but the lower grades, with slower action, are equally, if not more, efficient with a reduction of 20% to 25% in cost.

In spite of reports of the terrific action of trinitrotoluene (T.N.T.) this has been found a very desirable explosive when used in small charges, as in land clearing. Where quantities of over 50 tons are required it would replace dynamite at equal price. Mr. Swenehart points out, however, that under present market and industrial conditions T.N.T. cannot be manufactured to compete with dynamite, but that on the other hand there is use for all the war salvage T.N.T. that can be obtained. More publicity should be given to electric blasting, as preferable to the cap and fuse method. Mud capping is applicable for splitting stumps. Depth of hole and proper tamping are important factors in getting efficient results.

Trial of machines on actual work has developed certain weak points in both engine-operated and horse-operated apparatus. A suitable machine must be simple, light in weight and of low price. In Mr. Swenehart's opinion it must develop both strength and reasonable speed on the pulling line, although where great strength is required the speed will be at a minimum. For old tough stumps a combination of stump puller and explosive is effective. In any case, the power machinery should include means for piling the stumps.

Engineering Students at University of Illinois

According to announcement from the University of Illinois, the number of engineering students Oct. 1 was very nearly 1700, or fully 50% more than the normal number for the past decade, and far more than had been anticipated. A little less than one-half—or, in round numbers, 750—are freshmen. The large freshman attendance is probably accounted for by the fact that it includes practically three years' accumulation, as many of these men would have entered in 1917 or 1918 had it not been for the war. Another cause for the large attendance is that Illinois does not discriminate against students from outside the state and has not raised the tuition or entrance fees. There is practically no cost to the students beyond board and lodging, except the $15 incidental fee for each semester.

Life of Flume Prolonged by Roofing Paper Lining

After Other Means of Stopping a 50% Leakage Had Failed the Paper Lining Kept the Leakage Below 10% for Five Years

A WOODEN flume that has now supplied a Southern California irrigation district for over 30 years began to leak badly a few years ago. The leakage increased despite remedial measures, until about 50% of the flow was escaping. The water company was losing revenue and there was danger of crop loss through water shortage, so immediate relief was necessary. On account of the high cost of permanent flume construction and the improbability of earning a return on investment of that sort, effort was made to find some cheap and effective means of reducing leakage in the old flume. Various expedients had been tried before this time. Sections of the flume box had been caulked and battened, or coated with hot asphalt, a layer of burlap applied, and a second coat of asphalt put on over the burlap. None of these expedients, however, reduced the leakage materially.

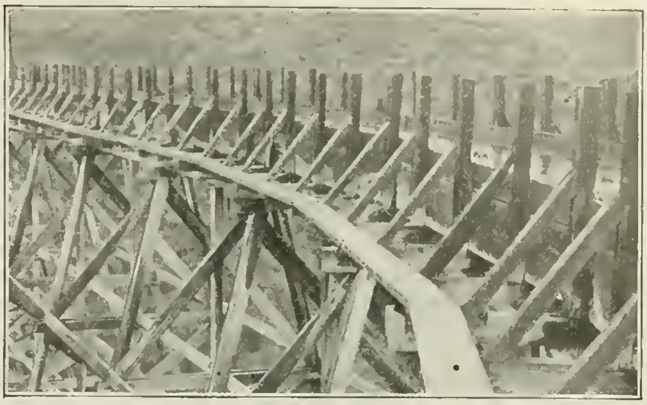
It was finally decided to try lining the flume with prepared roofing paper. Three methods were worked out and careful records of each were kept. The more effective of these reduced the leakage from 50% to about 3%. After five years of service the leakage is still kept down to about 10% by the occasional renewal of sections here and there.

PART OF 30-MILE FLUME WHOSE LIFE WAS PROLONGED 5 YEARS BY FELT LINING

Of the three types of lining tried, one was effective but cost too much, another was entirely unsatisfactory and after being in use for about two years was removed and replaced by a third type which was found to be entirely satisfactory and was adopted as standard. An advantage claimed for lining of the roofing paper type is the ease with which repairs or renewals are made. In addition to maintenance of this sort it has been found desirable to mop the entire lining with asphalt at intervals of at least two years.

THREE TYPES OF LINING

In the Type I lining the flume was strengthened wherever necessary, large cracks were plugged, flume box was swept and seams were mopped with asphalt. All this was done by company force. Contractors then flooded flume with hot asphalt, into which a layer of "P & B" asphalt saturated felt weighing 11 lb. per square was placed while the asphalt was still hot. The felt was lapped 3 in. at seams, and was reinforced in corners and at all joints with strips of Irish felt. The felt was then flooded with hot asphalt and 1-ply "Cronolite" roofing, weighing 37 lb. per square, was applied while asphalt was still hot. The lining was then mopped with hot asphalt. A total of 140,940 square feet of flume was lined in this way.



SHOWING HOW LINING WAS TACKED ON INSIDE OF FLUME

In the Type II lining the flume was prepared by the company's men as above. By mopping on hot asphalt the contractor then attached a strip of water proof felt to the flume box where the roofing paper joints would come. After mopping this felt strip one edge of the roofing sheet was nailed down to it and when the sheet had in turn been mopped the edge of the overlapping sheet was placed and nailed every two inches. Finally, the joint was mopped over the nail heads. The upper edge of the roofing on the sides of the flume was nailed without mopping. Two-ply Trino ready roofing was used in this type on 189,560 sq.ft. of flume. At least 35 lb. of asphalt per square was found to be desirable with this type.

In Type III the flume was prepared for lining by the company's men as already described. The contractor coated both flume and lining with hot asphalt and applied the lining while the asphalt was still hot, thus forming a tight bond between lining and flume box. Laps in the lining at joints were nailed with large flat-headed, roofing nails. A total of 1,051,402 sq.ft. of flume was lined in this way, using 2-ply Flaxine and Argonaut prepared roofing.

COSTS

The cost of preparing the flume for lining, hauling materials, supervision, etc., was $7,838.62, or $0.57 per square. This charge was made against all types of lining. California asphalt was used throughout. The costs were as follows:

TYPE I	
Preparing flume, etc., 1409.4 squares at $0.57..........	$799.67
Lining by contract, 1409.4 squares at $3.43...........	4,831.30
1409.4 squares at $4.......................	$5,630.97
TYPE II	
Preparing flume, etc., 1895.6 squares at $0.57........	$1,075.49
Lining by contract, 1895.6 squares at $2.47..........	4,678.07
1895.6 squares at $3.04..................	$5,752.56
TYPE III	
Preparing flume, etc., 10,514 squares at $0.57.........	$5,963.46
Lining by contract, 10,514 squares at $2.43..........	25,541.44
10,514 squares at $3.......................	$31,504.90
Total: 13,819 squares at $3.10....................	$42,889.43

The flume is owned by the Cuyamaca Water Company of San Diego County, of which Col. Ed. Fletcher is general manager. C. Harritt, superintendent, had charge of the experimental and maintenance work in lining the flume.

What Risks Should Cities Take in Installing Relatively Untried Processes?

Opinions by Consulting Engineers, Municipal Engineers and Engineers of State Departments of Health on Question Raised Editorially in "Engineering News-Record," Nov. 27-Dec. 4, 1919, with Particular Reference to Drifting Sand Filters and the Electrolytic Process of Sewage Treatment

MORRIS KNOWLES

Consulting Engineer, Pittsburgh, Pa.

I am glad that *Engineering News-Record* has called attention to the risks incident to installing processes or devices of an engineering nature still in the development stage. It is my opinion that a city may properly incur the expense of establishing experimental stations for the purpose of studying untried processes which promise returns sufficient to justify the expense. In fact, engineers employed by public agencies should encourage every such project which indicates the possibility of a real contribution to the advance of the art in question, and to the fund of engineering knowledge. I agree that "no material risk of this kind should be taken by the city without the approval of a competent, disinterested engineer." I am not prepared, however, to state that such was the situation at Toronto, for I have always understood that such experimentation was carried out under the supervision of the advised municipal authorities.

JOHN W. ALVORD

Consulting Engineer, New York City

I think that it is improper for the consulting engineer to recommend to a city any very large-sized construction based on novel or experimental processes. Desirable as these may appear for the moment, and as anxious as the engineer may be to keep up to date, it is nevertheless the part of wisdom to go slowly. It would be better, in my opinion, to postpone improvements, if possible, rather than to branch off of the beaten path in the hope of success along new and untried lines.

Sewage treatment is in my mind, particularly at this time, a branch of the engineer's work which has in the past suffered from too keen a desire to develop processes and methods which were at the time of their introduction not well demonstrated. At the same time, I believe that the engineer should be progressive enough, especially along lines which he has thoroughly mastered, to be in the habit of introducing minor experimental features in his designs, as this is about the only way in which engineers can make any progress that is worth while. One should be careful, however, to make such minor experiments in the most conservative way, planning them so that if they do not develop as anticipated they can be easily remodeled, if not successful, or can serve, without remodeling, well-known and well-tried methods.

METCALF & EDDY

Consulting Engineers, New York City

We were much interested in your discussion of the extent to which cities are justified in taking risks incident to the adoption of processes or devices still in the experimental stage.

Broadly speaking, the goal sought is that the city should secure that process and equipment which will accomplish what is necessary at the least cost. No one process or equipment should be adopted until it has been demonstrated to the satisfaction of a competent, disinterested engineer, skilled in the particular field of engineering under consideration, that it can accomplish the work desired of it, at an advantageous cost.

A large municipality is generally justified in taking the time and expending such moneys as may be necessary to thoroughly investigate available processes which give sufficient promise of meeting the two requirements above mentioned; but the determination of the fact that the process does or does not give such promise should be decided by a competent, disinterested engineer or board of engineers. Such investigations may well include experiments and, if practicable, a demonstration of the capabilities of the processes, for a period of time long enough to make the results reliable and conclusive and of such scope as to give adequate basis for the design of the new plant. A process which cannot be justified in this manner, should not be adopted.

It has sometimes been suggested that experiments and a demonstration be conducted for a definite period of time, such as one year, and that the city might well expend a sum equivalent to the interest for that period, on the investment required to install the plant. In some cases a longer period of time has been required for preliminary investigation, and the increase in expense thus involved has been justified either by the greater ultimate assurance of success resulting from the more adequate determination of the basis for design, or by preventing the loss which would have been involved by the adoption of an unsuccessful process.

It is to be noted, however, the large municipality can generally afford to go much further in its detailed investigations than can the small one. Similarly, the larger community can afford to adopt more highly complex methods of doing the work, because of the greater saving in investment which will thus result to it, than can the small community, to which the securing of competent service to operate such works might become a serious financial burden. This makes the more necessary the advice of a disinterested engineer, not only skilled in the technique of the work, but also one having financial grasp and ability to see whether or not the community is justified in making large expenditures for the particular work under consideration, in the face of its other municipal needs.

EDWARD A. WALL

Water Commissioner, St. Louis, Mo.

There are occasions when circumstances justify a municipality in experimenting with and developing machinery or processes intended to increase economy of operation or to produce improved conditions.

Such circumstances are not unusual as occurring in minor matters, where failure does not mean serious financial loss and where no great expenditure is involved. In fact, municipal departments are continually experimenting with new devices and methods, usually originated or suggested by their own employees. This, however, is a very different matter from backing an original venture designed to introduce a decided innovation.

In those cases where no practical solution has been found and where no satisfactory process has been developed, nor its character even indicated by the work done and the knowledge obtained, the municipality can very properly undertake pioneer work for its own advantage. The question of when a city or town should take such a risk thus becomes a matter of judgment in each case. If the final results prove satisfactory and show that the money was well spent, then the officials authorizing the expenditure showed good judgment, but if the scheme fails, the contrary is the case.

Not only every municipality but also every large corporation has in its history the record of many failures, mostly small, but here and there one large enough to command more than local attention. So long as human nature retains its propensity to gamble, both municipalities and individuals will delight in taking chances.

CHARLES E. GREGORY

Deputy Chief Engineer, North Jersey District Water-Supply Commission; formerly Engineer of Sewers, Borough of Manhattan, New York City

Your discussion of the Toronto experiment with "drifting-sand filters" and the proposed installations of the "direct-oxidation process" of sewage treatment is most timely and should be brought to the attention of all city officials who are contemplating the construction of large purification or other public works.

The officials intrusted by municipalities with the responsibility of deciding policies of sewage or water purification are usually non-technical men who must reach a conclusion based upon the evidence and opinions of others, and under certain conditions it is quite normal for them to be influenced very strongly by the well organized propaganda of salesmen or promoters who advocate the installation of patented or privately controlled processes or devices. These salesmen or promoters are not retarded in their efforts by professional ethics or the lack of financial support which is necessary to meet the legitimate expenses of any long-drawn-out controversy over a policy to be adopted, and the warning which you make against arriving at a decision without the support of the opinion of an unbiased and disinterested competent, technical adviser is so important that it should, I believe, be given publicity in the non-technical press and especially in all periodicals which reach responsible city officials.

The writer has had the opportunity to observe how the claims of the promoters appealed to responsible officials in New York City and how, upon the completion of a careful scientific investigation, these claims were almost wholly disproved. One of the common methods employed by promoters in matters of this kind is to pick out a novel feature of a process and unduly emphasize its function and importance, thus often leading to a conclusion which could not have been reached had all the elements of the case been given their due weight.

I believe the controversy about the real efficiency of the electrolytic process for treating sewage affords a good example of how the suitability of a system of treatment can be misunderstood by laymen and even by technical men not intimately familiar with sewage treatment. The award by the Franklin Institute of the Howard N. Potts Gold Medal to C. P. Landreth for his electrolytic sewage process seems to have been based very largely on the fact that a new element, the use of the electric current, had been added to the old and largely discarded chemical precipitation process even though such addition did not very materially change the results obtained by the older methods alone. To the layman, electricity is a sort of Aladdin lamp which may be expected to accomplish results such as the writer of any fairy story might imagine, and I believe this attitude has had much to do with the more or less successful promotion of electrolytic processes.

Before the experiments at Elmhurst (Borough of Queens, New York City) were made very extravagant claims were put out by the promoters who were then exploiting the Landreth process. These claims had to do with both costs and results. Practically none of the cost claims were verified and while a satisfactory effluent was obtained it was not materially better or different than could have been obtained by less expensive and better understood methods.

The direct oxidation of organic matter in sewage has been a subject for experimentation for a long time. The earlier experiments in aëration which indicated beneficial results were believed by some to be due to direct oxidation. Since then the development of the activated-sludge process has shown that the beneficial results obtained were probably almost wholly due to the action of aërobic bacteria rather than direct oxidation. It is probably true that the dissolved oxygen content of sewage is increased by the electrolytic process and that there is probably some small degree of direct oxidation, but it is not likely that the organic matter in the sewage, especially that in the form of suspended solids, would be broken up and oxidized in any appreciable quantity by the free oxygen liberated through the action of the electric current. The treatment of sewage by ozone has been repeatedly tried without satisfactory results, and even if direct oxidation were a practical method it has not been shown that the Landreth electrolytic process is the cheapest method of obtaining the free oxygen.

Sludge disposal is one of the most difficult and expensive elements of sewage treatment, and the large quantity of sludge to be cared for from the old chemical precipitation process was one of the strongest reasons for its unpopularity, whereas one of the strongest claims for favor put forth by the Imhoff tank is the small volume of inoffensive sludge. The lime-electrolytic process is no improvement in this respect on the older chemical precipitation processes.

The lime-electrolytic process, even if the more recent claims of the owners are admitted, does not promise greater efficiency, reliability or economy than other and better established processes, and while someone must "take steps in the dark" those who are to take them should be sure that they are toward something better and that the advantage to be gained is commensurate with the risk taken.

W. H. DITTOE

Chief Engineer, Ohio State Department of Health, Columbus, Ohio

Before a municipality adopts a method of water or sewage treatment, it is the duty of its officials to become reasonably certain of its applicability, efficiency, and economy of the method. As the layman is rarely, if ever, able to make such a decision, the advice of a competent and disinterested engineer is always necessary, and in case the method under consideration is a new one, and without good precedent, careful experimentation, testing and demonstration on a small scale are demanded. Such studies should be under the direction of a disinterested consulting engineer, or, in case of large projects, a board of consulting engineers, whose conclusions should determine the action of the municipal officials. No municipal governing body has the right to "take a chance" by proceeding without such care, regardless of individual opinions or preferences. Of course, we cannot expect the development of new methods and of improvements in established methods unless some municipality takes the lead in trying them out, but we can and should expect such municipality to be guided by established principles, precedents, if any exist, and, above all, by sound engineering advice.

J. W. EVANS

Engineer, Oklahoma State Department of Health, Oklahoma City

Your timely editorial on the risks taken by municipalities in installing public works should receive the careful attention not only of engineers but of all municipal officials. Just at present the cost of improvements is so great that mistakes which involve unwise or unnecessary expenditure in first cost or maintenance result in the omission of other needed public works. To stake large sums of the taxpayers' money on the success of a device which is experimental is therefore economically unjustifiable.

Reference has been made to the decision of two eastern cities to construct sewage-treatment plants involving the electrolytic process. This decision appears little short of folly in view of the fact that this process is still in the experimental stage, and that investigations heretofore made public have shown that the cost of sewage treatment by this method is much greater than by other processes. To Oklahoma engineers especially the expenditure of funds for electrolytic sewage treatment seems ill-advised because six plants of that type have been abandoned here and the seventh is off duty most of the time. [See p. 135 of this issue for reprint of a report by Mr. Evans.—Editor.]

The desire on the part of municipal officials to try something new is evidenced by a certain city of 2,500 in this State where an activated-sludge plant was built two years before the sewer system was placed in operation and while the city was without water. This plant is not provided with any means whatever for disposing of the sludge.

Too often city officials render themselves liable to criticism at the taxpayers' expense. In the words of one observer, "the officials are prone to have their engineering done by salesmen and manufacturing companies rather than by engineers whose judgment is less likely to be affected by a desire to market their equipment."

THEODORE HORTON

Chief Engineer, New York State Department of Health, Albany, N. Y.

The question, what risks a city should take in adopting new processes, is a very pertinent one. To see it in proper perspective, one must realize that no great advancement in any field can take place without experiments on a large scale. Just how far a state department having jurisdiction over cities should permit them to experiment with new or untried methods or whether it should permit them to experiment at all, is, I presume, the question at issue.

My personal opinion is that if a municipality is fully advised as to the experimental nature of any new and untried project which it contemplates installing, the State Department is thoroughly justified in approving the plans if it thinks the experiment will prove successful. If, on the other hand, the State Department feels that the proposition is too experimental in nature, and there is any indication that it may prove a failure, I think the department is justified in disapproving it. In other words, I believe in allowing the municipality to use its own discretion in carrying out a plan which is experimental, providing the State Department feels that there is a strong probability that the works will prove effective—particularly if, as in New York State, the approval is based upon conditions that the plant must be successful or else so changed as to make it so. We find many municipalities that are thoroughly aware of the experimental nature of the plans which are presented to the State Department of Health by them and who are willing to take the responsibility for the success of the plans; and wherever I am convinced that the plans will probably work effectively, even though the plans may not be the best, I usually recommend approval of them.

In large experimental plants, like the drifting-sand filters, which have never been tried out, I usually do not recommend the approval of plans unless accompanied by experimental results on a smaller scale to justify my belief that the larger scale experiment will work, or unless the municipality can point to some plant, large or small, which is in actual operation and from which the data concerning its success can be obtained upon investigation. Personally, I am rather inclined to err on the side of approving experimental works on a large scale, giving the benefit of the doubt to the municipality in its desire to experiment, where I am reasonably satisfied that the experiment will prove successful, since I believe that progress in these fields is only made by full-sized experimental plants. In all such undertakings, however, I always advise that it is much better for the city to experiment on a full-sized unit before rushing to put in a large plant containing a great many units, and to determine the success of the single unit before making expenditures for the complete plant.

Conversely, I would point out that there are some types of plants both in the water-supply and sewage disposal field which are considered experimental and in the development stage, where, however, the fundamental factors in regard to them are well known and established and particularly in regard to defects and excessive cost. I do not believe that the State Department is justified in approving a plant of such a type, for in this case the department would know of the obvious and insurmountable defects and objectionable features and would have knowledge that there are other types of recognized superiority which would accomplish better results at less cost. Where such plants are under consideration and such definite knowledge exists, the State Department might feel justified, and perhaps be justified, in disapproving the plans.

There is some question as to the legality of disapproving plans which may produce effective results notwithstanding the apparent relative inefficiency and lack of economy of the apparatus and methods. In other words, if one of these semi-experimental plants, not fully developed, will produce results which are satisfactory and meet the fundamental requirements of the State Department in regard to effluents or in regard to stream pollution, it is a question whether the State Department would have the legal right to disapprove the plans notwithstanding the relative lack of efficiency or economy of the apparatus proposed.

Finally, I feel that there is no hard and fast rule that can be applied to a question of this kind. The complexity of factors, engineering, economic, legal and administrative, do not permit of such formulation. I am pleased, however, to express my personal views on the subject so far as they can be expressed within these limitations.

Idle Electrolytic Sewage-Works in Oklahoma

Only One of Seven Plants Built Now in Use—Official Report by J. A. Evans, Engineer State Department of Public Health

THE prominence which has been given by recent engineering periodicals to a discussion of the electrolytic process of sewage disposal justifies a review of the experience obtained by Oklahoma municipalities with plants of that type.

The seven electrolytic disposal plants in Oklahoma were constructed during the years 1913 to 1915, prior to the operation of the present law requiring approval by the State Department of Public Health. The popularity of the process may have been traceable to overzealous salesmanship, the common belief that electricity could be made to perform any feat, and a desire on the part of engineers to test on a practical scale a new process of sewage disposal. That this popularity was brief is evidenced by the fact that of the seven plants only one is now operating, and that during but eight hours per day.

An electrolytic plant for treating sewage usually includes a preliminary settling tank, troughs through which the settled sewage flows longitudinally between thin metal plates, motor generator sets for production of direct current, wiring between generator and plates so arranged that current passes from plate to plate through the sewage. The purification is probably effected by chlorine and hydroxides which are produced by the action of electric current on the sewage. In the Oklahoma plants no attempt has been made to use lime or other chemicals. The following brief description shows what conditions the plants in Oklahoma were expected to meet and what results were obtained.

At Oklahoma City two plants were built, one to treat packinghouse wastes after screening and settling, and the other to treat domestic sewage after passage through a septic tank. For about eighteen months an attempt was made to operate the former plant. The difficulties encountered in disposing of solids, keeping plates clean, and broken parts replaced, combined with the fact that a thorough test made by B. M. Hart, city engineer, showed no appreciable purification, caused the abandonment of this plant. The other plant, treating domestic sewage, was abandoned after five years' service. No records are available showing that any purification was effected by this plant, but the residents along the stream into which the sewage discharges make great claims for it. However, it is believed that much of the purification noticed was accomplished by the septic tank, which has not been cared for since the abandonment of the electrical equipment. The plant is equipped with two 20-hp. motor generator sets, four troughs, 18 x 24 in. x 42 ft., each trough having 13 sets, 29 plates, 12 x 24 x ½ in., placed ½ in. apart. The area supplying this plant is a residential section of ten thousand people.

At Duncan, a city of about 2,500, a plant was built in 1913 consisting of a small receiving tank, a centrifugal pump lifting sewage from the bottom of the tank, electrolytic troughs and motor generator sets. This plant was abandoned after five years' service because of the high expense for repairs and because skilled attendants were not available.

The Dewey plant was shut down after six years' operation because the plates were worn out.

At Henryetta the electrolytic process was abandoned in 1917 after four years' service. The operator states that its use was discontinued because tests failed to show that any good results were being obtained.

At Coalgate a plant was built in 1914 and never used. This plant included a receiving tank for storing the sewage, a centrifugal pump delivering to troughs and the usual arrangement of plates. No direct-current machine was provided with the equipment, and the city found, after constructing a power line to operate the pump, that the motor was not designed for city current.

TROUGH ROOM OF ELECTROLYTIC SEWAGE-TREATMENT PLANT AT DURANT, OKLAHOMA

The Durant electrolytic plant, which is still being operated during a portion of the day, includes a modified Imhoff tank, distributing tank, three troughs and three motor-generator sets. Current is being applied at 160 amp. and 4 volts. Only one trough is now being used, the clarified sewage being retained in this trough three to five minutes. The operator devotes a part of his time to an incinerator which is located near by, and the necessity for his presence at the incinerator probably explains why the electrolytic plant is still operated.

It is impossible to obtain any accurate data of cost of operation of the electrolytic plants in this State because not one of them is being satisfactorily operated. The failure of these plants in Oklahoma is traceable in part to neglect by the builders to properly instruct the municipalities in caring for the equipment. At several plants an attempt was apparently made to obliterate all traces of the whereabouts of the manufacturers, no plans or directions being left and all nameplates being removed from motors and other parts. However, the entire blame for failure does not attach to the process nor to the builders, because the municipal governments have usually made but half-hearted efforts to get results.

A ten-day test was made in September and October, 1914, of the Durant electrolytic plant by J. E. Welker, then assistant engineer for the Kansas State Board of Health. (See *Engineering News*, Sept. 21, 1916, p. 547.) His conclusion, based on a great many bacterial and putrescibility examinations of samples taken at various stages of the process is in part: "As a result of the experimental data, three main points are brought into evidence: (1) Deodorization of sewage; (2) high stability of effluent; (3) variation in bacterial reduction."

Another test was conducted during August and September of the same year by Louis A. Turley, then state bacteriologist of Oklahoma. The results obtained by him showed a higher bacterial reduction and lower putrescibility values than were obtained by Mr. Welker. Mr. Turley concludes that "if the treatment is adapted to the character of the sewage an effluent will be obtained stable in character and with a bacterial content reduced to a minimum."

Samples from the Durant plant analyzed Nov. 21, 1919, by the Oklahoma State Health Laboratory gave the following bacterial count: Average of four samples from entrance to trough, 955,000 per c.c.; average of six samples from outlet to trough, 889,000 per c.c.

From an inspection of the electrolytic disposal plants in this State and a study of the test data available it is concluded that:

1. With skilled attendance and properly designed units the electrolytic process can be made an effective means of further purifying settled sewage.
2. This process should not be installed in municipal plants in Oklahoma because results equivalent to the best that can be produced by the electrolytic process are more easily, economically and continuously obtained by other types of disposal plant.
3. The average municipality will not give sufficient attention to an electrolytic plant to justify the expenditure of an installation.

Progress on the Teel Irrigation Project

PROGRESS on the 2¼-mile rock tunnel for the Teel Irrigation District in Umatilla County, Oregon, has reached 18 ft. per heading per day. The tunnel will divert water from the John Day River watershed to that of the Umatilla River. It will be fed by a 17-mile collecting canal, tapping Camas, Hidaway and Cable Creeks. From the tunnel the water will flow through the natural channel of Butter Creek for 35 miles to a point where it will be diverted and distributed. The lands to be irrigated lie at El. 600 to 900 ft. above sea level in the neighborhood of Echo, Ore.

In addition to the tunnel and main canal there will be diversion dams, sidehill flumes, trestle flumes, inverted siphons, concrete drops and chutes, cement-lined ditches and other special construction works. A sawmill plant with an output capacity of 30,000 ft. b.m. daily has been installed on Camas Creek.

The tunnel is 12,341 ft. long, 8 ft. wide and 7 ft. high in the clear, with an arched roof. Its grade is 0.5% and the greatest depth below the surface is 640 ft. At each end is a plant with 190-hp. boilers and engines driving 10 x 12-in. compressors. A 50-in. fan draws the smoke and foul air from the face of the tunnel through an 18-in. pipe, so that the muckers are usually at work in from 3 to 5 minutes after a blast has been fired.

At each tunnel face are two air drills mounted side by side on a horizontal bar. Three 8-hour shifts are worked at each end of the tunnel, with two drillers and three muckers. They average 6 ft. per shift or 18 ft. per day, except that where timbering is required the progress is from 10 to 12 ft. per day. The rock is basalt, more or less broken at the beginning but becoming harder as the work progresses.

About 14 miles of excavation will be required for the main canal, about one mile of this being in solid rock and the remainder in a heavy black clayey loam. The bottom width is 25 ft. with side slopes of 1 on 1. This excavation is being done at the rate of about 1,000 cu.yd. per day by a caterpillar-mounted steam shovel, having a 1½-yd. bucket. About a mile of canal had been excavated by the middle of November.

The diversion dam is of timber, rock and earth, 195 ft. long, with an overflow crest or spillway 155 ft. long. An abutment connects it with the wall of the canyon at the east end while a combination headgate and abutment connects it with the canal at the west end. There are four controlling gates in the dam.

Construction work was commenced about Sept. 1. It is expected that excavation will be continued during the winter, but the flumes and trestles will not be started until spring, the main canal being at about El. 3,600 ft. W. B. Hinkle, consulting engineer, Echo, Ore., is engineer-in-chief for the Teel Irrigation District.

French Reconstruction Progress

According to a report from Paris written by Consul-General A. M. Thackara, and published in a recent issue of *Commerce Reports*, the Nord and the Est, the two principal French railroads suffering the most during the war, have been almost entirely reconstructed. It is predicted that a resumption of normal traffic will be possible in a few months.

On the line of the Nord but 1 kilometer or ⅝ mile of double track remains to be repaired, and this is over bridges in the course of reconstruction. The number of kilometers of double track not yet in service has been reduced to 15 kilometers and of single track 12 kilometers; these are short lengths approaching important bridges under reconstruction. All stations along the line of the Nord are in service. During October, 49 brigdes and viaducts were completed, bringing the total definitely completed to 256 out of 601. The reconstruction of the remainder is being carried on normally, the chief difficulties being inability of the French metallurgical industry to deliver quickly, and inability to secure structural steel in France on short order.

At the time of the signing of the armistice the length of double track to be repaired on the Est railroad amounted to 577 miles of double track and 126 miles of single track. Of these by November, 1919, 519 miles of double and 122 miles of single track have been repaired, leaving but 58 miles of double and 4 miles of single track to be completed. By the end of November but 20 miles remained to be reconstructed. Forty-six out of a total of 214 bridges have been definitely finished.

What Is the Future of Inland Water Transportation?—*Part III*

By Charles Whiting Baker
Consulting Editor, Engineering News-Record

The Ohio River and the Erie Canal are two inland waterways most favorably located to attract a heavy volume of traffic. The Government is spending about $100,000,000 on the Ohio River. The State of New York has spent $150,000,000 in the past 20 years on the improvement of the Erie and other state canals. The Erie Canal is practically completed. The Ohio River work is completed from Pittsburgh downstream two-thirds of the distance to Cairo. The Ohio River improvement, when completed, will cost the taxpayer's in interest, depreciation and operating expenses about $2,500,000 per annum. It will have to save at least that amount in reduced cost of carrying by water instead of by rail to make the work justifiable. The present traffic on the Ohio is small and the prospects for a large increase are not encouraging.

The traffic on the New York State canals has decreased one-half in the past six years, and two-thirds of that remaining is sand, gravel, stone and low-grade bulk freight. This season the Erie Canal carried only 300,000 tons of merchandise freight, and it cost the state's taxpayers over $20 for every ton of such freight moved. Few new boats are being built, for there is not profit enough in boat operation to attract capital.

VII—Continued from page 89

Traffic on the Ohio River

A method of transportation on inland waters of much lower cost than by steamboat is transport by barges, several of which are propelled by one power vessel. In the lake traffic the use of towed barges has been an important factor in reducing the cost of transport. Along the Atlantic coast, the use of barges and tugs has been demonstrated to be the cheapest method of moving low-grade bulk freights, such as coal.

The uncertainty of labor for handling cargo at the terminals is one of the conditions that have caused the substitution of the barge in place of the steamboat on those inland rivers where some remnant of water transportation still remains. The barge is inexpensive compared with the steamboat. The barge can be tied up to await the time when labor can be obtained to unload her without keeping idle a whole crew, as happens when a steamboat is similarly delayed. Barge transport is much slower and more uncertain than transport by a steamboat which sails on schedule time, and this makes the barge unsuitable for many classes of merchandise freight. Even for such bulk freight as grain, prompt movement by rail may often protect the shipper from the loss, through changing market price, which he might incur were the shipment sent by water.

Coal Transport by Barges on the Ohio

The most extensive use of barges on inland waterways is on the Monongahela and Ohio Rivers. There are coal mines in the valley of the Monongahela so close to the stream that the mine cars can be dumped directly into the barges in the river. A large proportion of this coal is delivered at Pittsburgh, only a short distance away, but for many years there were large shipments from these mines down the Ohio and the Mississippi Rivers to New Orleans, with a smaller amount to St. Louis and other cities on the lower Mississippi. An Ohio River coal barge holds from 500 to

800 tons. A fleet of 25 or more barges is handled by a single towboat, and at times single tows carrying 50,000 tons or more of coal have gone down the Ohio River. This movement took place only during high water.

The Monongahela River was improved for navigation many years ago by a series of dams and locks. In the pools behind the dams the coal barges accumulate as they are loaded, until a season of high water breaks the blockade and allows the movement downstream to begin.

Under these conditions most of the power for transportation is furnished by the current of the river. The towboat is chiefly used to steer the mass of barges and keep them in the channel. When lumber was cheap, the coal barges used were of light construction, costing less than a dollar per ton of coal carried, and were commonly sold or broken up for firewood or lumber at New Orleans. The cost of towing back and repairing was more than the cost of new boats.

Limitations of Barge Transportation

The transport of coal by this method was the lowest-cost transportation ever known. The tonnage moved in a single unit was greater by far than has ever been moved by any other method. The favorable conditions were partly offset by others. The movement was very slow. Where the empty barge was towed back up the river for another load, the total time required was so great that a barge could make only one or two trips to New Orleans in a year. The risk of loss was heavy. A considerable percentage of the barges were crushed or sunk with their loads. There was no return freight. A small tonnage of merchandise freight could be had, but would not stand the risks and long delay incident to transport on a coal barge. In fact, with the rise in the price of coal, the losses by river transport constitute a considerable handicap to the use of the coal barge compared with shipment by rail.

Nor is the financial factor to be overlooked. On a shipment by river, the coal-mine owner has to store his coal for months while the river is closed by ice or the water is too low for the coal fleet to start, and between one and two months were required for the long voyage to New Orleans. All this time his working capital was tied up. When an operator ships his coal by rail the daily output of his mine is on its way to market in a few hours from the time it is raised from the shaft.

Decline of Coal Shipments by River on the Ohio

The old mines along the Monongahela River from which many millions of tons of coal have gone to the Pittsburgh and New Orleans markets are becoming exhausted. Much of the coal mined in this valley is now being taken from mines located so far back from the river that the coal must be loaded on railway cars at the mine.

Many of the industrial works located in the narrow valley at and near Pittsburgh have facilities for unloading coal from river barges, but elsewhere most buyers of coal can receive it only in cars. On a large proportion of the coal mined and marketed in the Ohio valley, therefore, there must be transfers from the railway car to the barge and back again to the car if the river is to be used for its transport.

For the New Orleans trade, the river coal long had the advantage that much of the coal business was for the supply of ocean steamers, and the river barge could lie alongside the steamer to discharge its load. Within recent years New Orleans is receiving a coal supply from nearby mines in Alabama. This comes by rail and also by water down the Warrior River and through protected waters along the Gulf coast, so that barge transportation is feasible all the way. The mines in the Pittsburgh district have an enormous and profitable nearby market for their coal among the industries of the Ohio valley, and it pays them better now to sell it there than stand the long haul to New Orleans in competition with the nearby Alabama coal. Still more recently oil fuel has largely displaced coal in the New Orleans market.

Traffic Possibilities of the Ohio River

The large tonnage transported on the Ohio River was long the last citadel of those who believed in the future of inland river transport. While on all other inland rivers the official statistics showed the steady decline of navigation, the tonnage on the Ohio River for many years showed a steady though small increase. The great bulk of this tonnage was coal, floated downstream to New Orleans as already recited; yet it was believed to demonstrate the possibilities of inland water transport.

A score of years ago, when some of the Government authorities gave really serious study to the situation and prospects of inland water transport, it was the general belief that the Ohio offered better prospects of becoming an important avenue for transportation than any other river in the country.

Only in a densely populated region of heavy traffic can an inland water route be a success. Water transport can at best be only an auxiliary to rail transport, for boats can only run a part of the year and an industry must depend on rail transport anyway while the boats are tied up.

The great drawback to profitable navigation on the Mississippi River is the lack of business. There is not a city of any size from Memphis to New Orleans. The agricultural products along the lower river are shipped by rail to market. It would be too expensive and difficult to reach the river with its great range of level.

The Ohio valley, however, has become a densely populated industrial region. It produces a vast quantity of bulky products demanding low-cost transportation. It possessed already a large volume of river business. Therefore it was believed that if any river in the United States could command enough traffic to justify its improvement, it was the Ohio.

Plan for Ohio Slack-Water Navigation

There is a fall of about 470 feet in the Ohio River in the 970 miles of its course from Pittsburgh to Cairo, where it joins the Mississippi. The rapid current produced by this fall at high water was rather favorable than otherwise to the downstream transportation of the great coal tows. For upstream traffic, of course, the current was a heavy handicap; but a worse one was the shallow water on the bars during the low-water season.

In the years following the Civil War, engineers believed that inland water transportation had a great future and that European practice in making swift rivers navigable by the construction of dams and locks should be followed by the United States. Work began on a number of rivers tributary to the Ohio; but the Ohio itself was already navigable by steamboats, so Government work on it was devoted to channel improvements at the worst locations, until 1880, when the first dam and lock were built near Pittsburgh. It was not till 1910 that the Government adopted a complete project for slack-watering the entire river.

This project involves the building of locks and movable dams at 53 different points on the river, and is planned to give a navigable depth of 9 ft. of water at all seasons of the year. The work was estimated to cost $63,731,488, and the annual cost of operation was estimated at $810,000. At present 29 locks and dams have been finished, and 15 more are under construction. On 9 others work has not yet begun. The completed dams control the river from Pittsburgh downstream for about 250 miles. The present estimate of the total cost of construction is $76,434,000. About $50,000,000 has already been expended, besides $7,000,000 for operation and maintenance of the locks and dams already completed. The Government had spent $17,000,000 on the Ohio before the present project was adopted, making a total of $74,000,000 to date.

WATER TERMINALS ON THE OHIO

In November last, Col. Lansing H. Beach, the engineer officer in general charge of the Ohio River improvement, made a detailed report of the terminal situation on the Ohio River. The necessity for adequate terminals for the economical handling of water traffic is nowhere more evident than on the Ohio. The river has a greater fluctuation of water level, it is believed, than any other navigable stream on the globe. The range between high and low water is from 40 to 70 ft. at different points. The edge of the stream at high water is 300 to 1,000 ft. back from its edge at low water. Terminal facilities at a locality must provide for handling freight at low water and at high water and at every intermediate stage. The structure must not obstruct materially the flow of the river at flood stage. It must provide a convenient and safe landing place for boats, and traffic must not be interfered with by the deposit of mud which occurs at all stages above low water.

The wharf boat, according to Colonel Beach, meets these conditions more fully and more economically than any method that has yet been devised. The boat is moored in front of a paved landing, up which a roadway leads to the top of the bank. The plan in most favor is to transport freight by motor trucks from the wharf boat up the paved roadway and thence to the city's business district. All the larger cities along the river are preparing plans for large and expensive terminals equipped to handle passenger and merchandise freight, and intend to have them ready for use as soon as the river channel improvement has advanced far enough to make low-water navigation practicable.

Colonel Beach made a census of the boats on the Ohio. It shows a total of 35 packets, 71 towboats, 369 flat-boats, 121 coal boats and 965 barges.

The question whether transportation will be developed on the Ohio, turns, in Colonel Beach's opinion, on whether the railways are to be allowed to compete with the water lines or will be compelled to coöperate with them. Colonel Beach recommends that the Interstate Commerce Commission be required to exercise the same supervision over water carriers as over rail carriers, and to fix a minimum rate as well as a maximum rate for water transport. Furthermore, he urges that rail and water carriers should be compelled to issue through bills of lading and prorate with each other under supervision by the Interstate Commerce Commission.

Illustrating the necessity for such changes in the law, to prevent the railways from throttling the river traffic, Colonel Beach gives a list of 19 coal-handling terminals on the river front at Cincinnati which have been abandoned since the railways advanced the rates on river-borne coal formerly distributed from Cincinnati.

In the above-quoted report of Colonel Beach one finds again the tacit assumption that river transportation is inherently cheaper than rail transport, so that if the railways can be prevented from using their powers to compete unfairly with the boats, traffic will gravitate to the river. But is this true? Can the boats carry freight at lower cost than the railways?

In view of the facts developed in the preceding chapters, there is little doubt that in almost every case the determining factor in the movement of traffic will be the cost of handling at terminals and transfer points. not the cost of handling by rail or river.

In discussing the handling of merchandise freight on the Ohio, Colonel Beach clearly sets forth the great difficulties in constructing and maintaining freight terminals, and concludes that the wharf boat is about the only feasible solution.

But landing freight on a wharf boat means at most seasons of the year a long, uphill haul out of the river channel. The wharf boat answers for small shipments, but such shipments are a small part of present-day traffic. The shipper or receiver of carload lots in most cases has a private siding at his works or warehouse and could not possibly afford to ship by water and haul the freight by truck to or from a wharf boat.

In the hearing before the Board of Engineers on the Missouri River improvement, referred to in the preceding chapter, one of the witnesses was the traffic manager of the Kansas City Missouri Navigation Co., a man of long experience in freight handling. He declared that with wharf-boat terminals the river could never compete with the railway. Not until the Kansas City boat line had railway tracks at its terminal wharf, and arranged to take and deliver freight from any private railway siding in Kansas City, was it able to obtain any considerable business.

In the shipment of low-grade freights—coal, coke, stone, ore, lumber, etc.—in the Ohio valley, the determining factor again will be the terminal and transfer conditions. Coal mined on the banks of the Ohio's navigable tributaries, which can be discharged from the mine cars directly into a barge, may in future, as in the past, furnish a considerable traffic on the Ohio when destined to plants directly on its banks. The same thing is true of other bulk freights when shipped from one river-bank point to another, but it is difficult to see how the Ohio River can attract any considerable volume of through traffic where either origin or destination is remote from the river. The added cost of transfer will usually absorb any possible saving of the water rate over the rail rate.

There is one condition which may in future, perhaps, result in a considerable movement of local traffic on the Ohio River. That is the heavy cost of moving freight by rail through congested railway yards. Take for example the movement of materials in the Pittsburgh district between a plant on the Monongahela and one on the Allegheny. The distance may be only a few miles, and yet the cost of moving a car of freight over that distance where tracks are crowded with trains and through congested yards may be as great as the cost of hauling it two or three hundred miles by rail on an open main-line road.

This was the controlling argument, probably, in the recent decision by the Secretary of War to compel the raising of bridges over the Allegheny River at Pittsburgh. There is no volume of traffic now using the river that justifies the great expenditure necessary to rebuild these bridges. It was urged, however, that in future, with the rapidly growing traffic in the Pittsburgh district, the river-front plants will find increasing advantage in moving freight between river points by water instead of by rail.

Financial Aspect of the Ohio River

If the slack-watered Ohio River is to justify the Government's expenditure upon it, it will have to carry an enormous volume of traffic. Of course, the river carrier, here as everywhere, does not compete on an even basis with the railway. The boat owner uses a channel provided and maintained for him free of cost. Even the terminals which he uses are in future to be provided largely at the expense of municipal taxpayers. If the boat rates are lower than the rail rates, therefore, it does not show that water transport is less costly. The water carrier ought to carry goods at lower cost for part of this expense is borne by the taxpayers, while the rail carrier has to provide and maintain his own road and stations and, besides, pay heavy taxes on them.

The latest published estimate of slack-watering the Ohio is $76,434,000. The official estimate of annual operating cost, made when the project was first adopted, was $810,000. Of course, both these figures must be largely increased today. It will probably cost $100,000,000 by the time the Ohio River work is done, and the annual operating cost will be easily $1,500,000. The interest charge, at current rates on Government bonds, should be at least 4½%. Besides this, there must be an allowance for depreciation aside from the ordinary repairs included in the above statement of operating expenses. The first dams built on the Ohio already require reconstruction. A depreciation charge of 1½% allows at least as long a life for these works as can be safely assumed. The total annual cost of the Ohio River navigation works will be then as follows:

Operating expenses	$1,500,000
Interest	4,500,000
Depreciation	1,500,000
Total	$7,500,000

Thus the Ohio River, if it is to justify the Government's outlay upon it as an economical transportation route, must carry traffic enough so that the saving in freight over the cost of sending the same goods by rail will be at least $7,500,000 per annum. Even then, the river will not be effecting any real service to the country. The net result will be to take about $7,500,000 from the Federal treasury and distribute it among a few thousand shippers who are in position to send goods by the Ohio River, and eventually among a few million consumers, who may perhaps benefit by part of the saving which these shippers make.

VIII—The New York Barge Canal

The greatest investment in a single inland waterway ever made in the United States—or, for that matter, in the world—was the construction of the New York Barge Canal by the State of New York. The total amount of bond issues by the State for this work is now $154,500,000.

The original Erie Canal, which the Barge Canal replaces, was, during the first fifty years of its history, from 1825 to 1875, a factor of enormous importance in the transportation system of the United States. As the only water route between the Mississippi valley and the Atlantic seaboard, it exercised a controlling influence on transportation rates for half a century. The traffic on the canal continued to grow until 1880; but during the fifteen years following the Civil War it became increasingly evident year by year that the supremacy of the canal had departed. The business of the railways grew many times as fast as the business of the canal.

The tolls which were paid by boats using the canal down to 1880 were sufficient to pay the operating expenses and also repay to the State its entire expenditure on the canal. In the hope that the canal might hold its own in competition with the railways, the tolls were abolished in 1880; but this had no effect in stimulating business, and the continuous decline of traffic on the canal dates from that year.

New York City Commerce and the Erie Canal

The preëminent commercial position of the City and port of New York was originally attained, according to common belief, as a result of the Erie Canal water route. The export grain merchants of New York in the years from 1880 to 1900 found their business diverted to the rival ports of Baltimore and Newport News. Led by prominent men in this trade, the commercial interests of New York urged the reconstruction of the Erie Canal to make it a water route which could again hold its own against all competing routes, as did the original Erie Canal.

Many plans for the enlargement of the canal were discussed, but that finally adopted in 1901 was for a waterway capable of accommodating barges of 1,000-ton capacity. Before work had proceeded far, alterations were made in the depth and width so that boats of a maximum capacity of 2,000 tons would be able to navigate the canal. Elaborate computations were made to demonstrate that barges of this size could transport grain from Lake Erie to New York City at so low a price as to be superior to any possible railway competition.

A Canal Designed to Compel Freight Transfers

There was, however, one governing motive in the design of the canal which did not appear on the surface. It was the intention to have the canal able to carry business from Buffalo to New York in competition with e railways, but not commodious enough for vessels t to navigate the lakes or the ocean. A waterway hich would do this would, of course, eliminate the ecessity for transferring freight at Buffalo and also at New York City. It was the commercial interests in these two cities—or, more specifically, those engaged in the storage and transfer of grain—that brought about the adoption of the canal project against the opposition of the rest of the state.

Not only is the new barge canal too shallow to admit deep-draft lake vessels; but the canal is crossed by many fixed bridges with only 15½ ft. headroom above water level. This, of course, prevents the operation on the canal of lake or ocean vessels of the ordinary type, even those of very small size, and was believed to insure Buffalo absolutely against the loss of its transfer business on traffic through the canal.

That the projectors of the barge canal were far from possessing a broad view of the transportation problem is shown by their total neglect of the terminal problem, in their original plan. Not until work on the canal had been in progress for several years did anyone awake to the fact that unless the canal was provided with adequate terminals along its route it would be unable to handle business economically. An additional bond issue was made by the state in 1912; under this, terminals have been undertaken at the various cities along the line of the canal. When the barge canal was planned, in 1900, the old Erie Canal and the other canals in the state canal system were still handling about 3,000,000 tons a year.

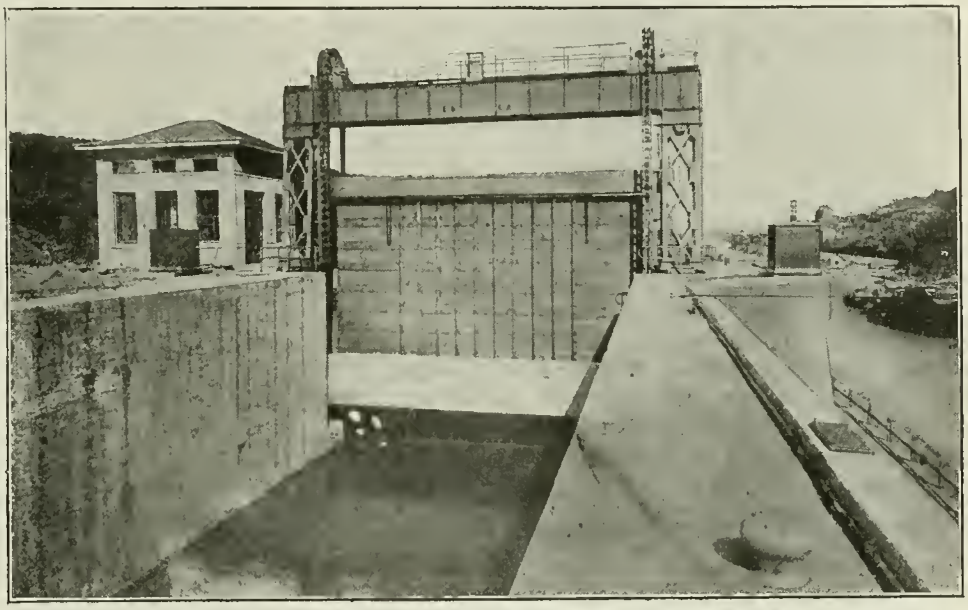
Most of this, however, was business of local importance. The canal had ceased to be an important competitor of the railway. Of the total traffic, only about one-third was tonnage moved toward tidewater on the Erie Canal, the object for which New York originally embarked in the canal business.

It was, naturally, expected that the prospect of the new waterway would stimulate the canal business; but during the years while construction on the Barge Canal has been in progress, traffic on the canal has rapidly declined. In 1917, the total freight moved on all the canals of New York State was only 1,297,000 tons. Less than 100,000 tons of this was moved toward tidewater on the Erie Canal, and only 18,000 tons of this was grain and other agricultural products. Thus the grain trade, which the canal was, originally, chiefly planned to accommodate, had practically disappeared.

The loss of this grain business by the canal was not due merely to the competition of the railways which parallel it. The importance which the Great Lakes at one time held for east and west traffic has departed. Grain shipped by all-rail routes to Baltimore and Newport News competes successfully with the all-rail and lake-and-rail routes to New York and New England seaports. There has also been a great movement of the centers of grain production. The states of the upper Mississippi valley, which formerly sent enormous quantities of grain to the seaboard, now ship their products in the form of dressed meats. The grain-raising region west of the Mississippi, which has become important in the past thirty years, now exports a large share of its product by way of New Orleans and Galveston, instead of the Atlantic ports.

LACK OF BOATS FOR THE NEW CANAL

With the approaching completion of the Barge Canal, there has been much question as to where the boats were coming from to use what the state has provided. Here is a transportation route on whose creation over $150,000,000 has been expended, for the free use of anyone who desires to operate boats upon it. But there are no concerns in sight, ready with the capital and the organization to build and operate boats and carry on transportation on the scale which those who planned the canal nearly twenty years ago contemplated.



ON THE NEW YORK BARGE CANAL—MANY LOCKS, BUT NO SHIPS

There are still left seven or eight hundred of the old wooden Erie Canal boats, most of them in an advanced stage of decay. Few new boats have been built in recent years. The reason assigned was that it was unwise to build small boats when the enlarged canal was so near completion, and it was equally unwise to build large boats until the canal was ready to accommodate them.

Following the entry of the United States into the war came an unprecedented congestion of the railways and an insistent demand for supplementary means of transportation. Attention was at once turned to the New York Barge Canal, but it was found that few of the old-time canal boats were in decent condition, and also that their operators were unable to meet the demand for reliable and regular service. The conditions of the labor and material markets were not such that anyone could undertake the building of boats by private enterprise.

The Federal Railroad Administration, therefore, in May, 1918, undertook to create facilities for the use of the Barge Canal. Contracts were let for new barges, but it was not possible to complete these in time for the summer of 1918. The Federal railway manager in charge, therefore, leased some 200 of the old canal barges and towboats and undertook to carry on a transportation business with them.

The official report of Director General McAdoo, at the end of 1918, stated that the expectation was that a heavy eastbound canal business in grain would develop for these boats; but, as a matter of fact, this grain was shipped by the owners by rail. Notwithstanding the railway congestion of 1918 and the fact that the canal passes through a densely populated industrial region, the vessels of this Government fleet were idle on account of no cargoes, a total of 3,367 days from the time their operation began in May until the close of navigation. The barges were also delayed a total of 1,445 days, awaiting opportunities to transfer cargo to ocean vessels in the port of New York.

It was attempted to move coal by the canal to manufacturing concerns located along the line of the canal. Many of the concerns said they preferred delivery by rail. There was practically no coal-unloading machinery for boats along the canal. The concerns which might have received the coal would not purchase such machinery, and the canal manager was not at liberty to make such an investment.

An attempt was made to establish a packet freight service for merchandise freight between Buffalo and Albany, and agencies were established in 11 cities. The boats obtainable, however, were not satisfactory, and the enterprise was not a financial success. Later results in Government operation on this canal are given in a following chapter.

EXPERIENCE IN COMMERCIAL OPERATION ON THE CANAL

It is of interest to turn, now, to the experience of the only incorporated company now carrying on a commercial business on the barge canal, the Shippers' Navigation Co., of New York and Syracuse.[1] This company operates a fleet of about 50 barges between Buffalo and New York City. These barges are of only about 300-ton capacity. The new boats which the company plans to build to enlarge its fleet will be of the same capacity, or very little larger than the boats which were used on the old Erie Canal.

In other words, notwithstanding the huge investment by the state to make a waterway capable of moving large boats, the leading concern now doing business on this waterway finds the size of boat used in the old canal a more profitable carrier.

The reasons for this are illuminating, for they bring out in strong relief the necessity for studying actual commercial conditions in solving transportation problems. Engineers have become accustomed to assume as axiomatic that the larger the size of carrier the cheaper will be the transportation. Such assumptions may lead to most dangerous errors and serious losses.

ADVANTAGES OF SMALL BOATS

Some of the reasons why the company is continuing the use of the 300-ton barge are as follows: The canal is closed to traffic five to six months of the year. A company engaged in transportation business must maintain its organization and activities the year round. The 300-ton barges which run on the canal in summer are used during the winter in lighterage business in and about the port of New York. Such use is, if anything, more profitable than use during the navigation season on the canal. A 300-ton barge is about as large as can be profitably handled in the lighterage business.

Even when the canal business alone is considered, the economical size of boats is determined not only by conditions in the eastward movement of traffic but by those of the westward movement as well. In order to do a paying business in operating boats on the canal, it is necessary to seek return cargo. Even if a great volume of grain were moving from Buffalo to New York, so that boats of 1,000 to 2,000 tons could obtain full loads continuously, there is no business for boats of that size moving from New York westward. There is no shipper of freight in the port of New York who can deliver over 200 tons of freight at one time—for lack of space to store it, if for no other reason. If a barge of 800- to 1,000-ton capacity had to be moved around to four or five different points in New York harbor to take on its load, its delays in port would be so great as to absorb any saving due to its larger size. Further than this, there are only two business concerns between New York and Buffalo big enough to receive more than 200 tons of freight at one time.

Even if a 1,000-ton or 2,000-ton barge loaded with grain were brought to New York, it could seldom be unloaded economically. Most export grain from New York is taken by ocean liners. These carry also general cargo, which pays a higher rate than grain, and they take such grain only as may be necessary to fill up. Thus it is likely that only one or two holds in an ocean vessel will be loaded with grain.

If a 1,000-ton barge were brought alongside an ocean steamer lying in her slip, the barge would be so long as to interfere with the transfer of cargo to other holds than the one receiving grain. The barge might also be so wide, with the portable grain elevator lying alongside, as to block the movement of other vessels in the slip.

These facts are an illuminating illustration of how transfer conditions at the terminals, and not the condition of transport, are the determining factor in controlling routes of transportation today. Another significant fact of the same sort is that the Shippers' Navigation Co. is engaged only in through business between New York City and Buffalo. On that business it professes itself able to move traffic at about 80% of all-rail rates, including in this marine insurance on the goods handled, which it has to give to place its service on a parity with rail service. On shipments for shorter distances on the canal, the company states that the saving by the water route is not enough to enable it to compete with the rail rate.

There may be those who will argue that the company might, by using 1,000- or 2,000 ton barges, so reduce its transportation costs that it could compete with the railway on the shorter-distance hauls. Before accepting such an idea it will be well to consider the very economical method by which the company now moves its boats. One power boat (which also carries cargo) pushes one barge ahead and tows four behind. Thus a single crew moves some 1,800 tons in a single fleet, or about the same amount as a 2,000-ton self-propelled barge would carry. Apart from the commercial conditions just explained, therefore the 300-ton barge when thus moved in fleets is very likely as cheap a carrier, when all the items of interest, depreciation, labor and power are included, as the 2,000-ton barge.

---

[1] This is the only company operating on the barge canal proper. The Lake Champlain Transportation Co. is a long established company operating barges between New York and Canadian points via the Hudson River, the Champlain Canal, Lake Champlain and the Canadian canals.

Limitations in Canal Operation

And it must also be set down here that the canal usable by 2,000-ton barges is still uncompleted. The boats now using the canal are still limited to 8½ ft. draft as a maximum, even on the sections which are supposed to be entirely completed, such as the Champlain Canal from the Hudson River to Lake Champlain. The draft which vessels will finally be able to carry on the canal remains to be determined. Other considerations come in besides the depth over the lock sills.

The common idea is that transport on a canal is absolutely devoid of danger, and this is true so far as such perils of storm as threaten ocean vessels are concerned; but the chief danger to all floating craft is grounding; and a loaded canal barge is always moving with her hull close to the bottom of the channel. Along the canal a sudden local summer shower may discharge into the channel a few cubic yards of sand and gravel, just enough for a boat to run aground on, strain her hull and start leaks that will fill her with water before she can be floated off. Of course, the boat with her cargo is not lost, and salvage is easy; but the injury to the cargo by water and to the hull and the delay, involving, perhaps, other boats besides the one which grounded, count up very heavily in dollars and cents.

Other dangers occur in the sections where the channels of the Mohawk River and upper Hudson River are used for navigation. When these rivers are in flood, heavy currents may drive boats out of the channel, and the deposits from each flood may produce shoals which will endanger boats when the river falls again. If the theoretical depth of 12 ft. is finally made actually available for safe use by boats of 10-ft. draft, frequent dredging will be necessary to keep the channel free from the deposits it is constantly receiving.

Operations on the Champlain Canal

The firm of Witherbee, Sherman & Co., which operates extensive iron mines a few miles back of Port Henry, near the southern end of Lake Champlain, is using the Champlain Canal on a considerable scale. The late Frank S. Witherbee, former head of this firm, was a member of the commission appointed by Governor Roosevelt in 1900 which made the original plans for the Barge Canal.

This firm has a fleet of canal barges which load ore at Port Henry and transport it down the lake to Whitehall, through the Champlain Canal to the upper Hudson and down that river to New York, a total distance of about 265 miles. The boats used are wooden barges of about 500-ton capacity, built with timbers heavy enough to stand the load of ore and the service of the five-ton grab-bucket which is used in unloading the ore. The boats are operated in fleets, one power boat moving usually four others. The firm has built a 1,000-ton barge, but has not yet put it in operation on account of the channel conditions just explained.

Besides this company the Lake Champlain Transportation Co. operates canal barges between New York and Montreal, traversing the Hudson River, the Champlain Canal, Lake Champlain and the Canadian canals from the foot of Lake Champlain to the St. Lawrence. The tonnage moved on the Champlain Canal approaches that of the Erie Canal.

Hon. Henry W. Hill of Buffalo, testifying before the House Committee on Interstate and Foreign Commerce on Sept. 16, 1919, declared that the State of New York had constructed the best canal system in the world. It is open for the free use of commerce without tolls and the state even operates tugs which haul barges for their owners at a charge less than the cost of operation.

Mr. Hill was one of the prominent figures in bringing about the undertaking of this waterway, nearly twenty years ago. The statistics showing the decline of traffic on the New York canals, given by Mr. Hill himself at the conclusion of his testimony, are a more eloquent demonstration of the business failure of the project thus far than words could possibly be. They are as follows:

TOTAL TRAFFIC ON ALL NEW YORK CANALS

Year	Tons Carried
1914	2,080,850
1915	1,858,114
1916	1,625,050
1917	1,297,225
1918	1,159,270

These figures show that the traffic on the canals has steadily declined during five years, when the congestion of transportation lines has been greater than was ever before known. During the present year, 1919, the total traffic on the New York canals up to Nov. 1 was 1,074,308 tons, an increase of only 7% over 1918, notwithstanding the added facilities afforded by the Federal Government fleet of barges.

What the Canal Freight Costs the Taxpayers

Of what did this 1,074,308 tons of freight consist? Over one-third was sand, gravel, stone and clay. The balance was made up of such low-grade freight as coal, iron ore, ice, lumber, pulpwood and forest products. When this tonnage of low-grade freight is deducted, the total traffic of higher class merchandise on all the New York canals this year to Nov. 1, was only 367,000 tons in round numbers.

But we shall get a still clearer idea how completely is the New York barge canal a business failure if we examine the statistics of traffic on the Erie Canal alone —the waterway across the state from Lake Erie to the Hudson River. It was on this section that the bulk of the state's $155,000,000 was spent, and it was the hope of a vast flow of traffic over this route that induced the state to undertake the enterprise. The figures of total traffic for the season of 1919 to Nov. 1 on the Erie Canal alone are as follows:

Total tonnage		730,000
Sand, gravel, stone and clay	332,734	
Ice	26,932	
Lumber	22,979	
Coal	25,640	
Salt	28,815	
Total low-grade freights		437,100
Balance, all other freight		292,900

Twenty years ago the sanguine promoters of the barge canal figured on the vast volumes of grain which would seek that waterway. In the present year, up to Nov. 1, all the wheat and corn carried on the Erie Canal amounted to only 15,926 tons.

The taxpayers of New York are paying annually about $6,000,000 in interest charges on the bonds issued to build the state canals and about $2,000,000 additional to operate and maintain these canals, or about $8,000,000 per annum in round numbers. At least three-fourths of this expenditure is chargeable to the Erie Canal, so that the cost to the taxpayers is about $8 per ton to have 730,000 tons of freight carried by water instead of by rail. If we exclude the low grade freights, we have $6,000,000 outlay by the taxpayers to have less than 300,000 tons of higher class freight carried by water, or over $20 per ton moved.

It needs no argument to prove that unless the New Yok canals can attract a far larger traffic than now uses them, it will be absurd to burden the state's taxpayers indefinitely with the heavy cost of the canal operation and maintenance.

And it must be said that no material increase of traffic on the New York canals is now in sight. Aside from the boats built for the Federal Government, an occasional barge built for some individual, and a few boats for the Shippers Navigation Co. above noted, no boats are being built for use on the canals. And the reason is obvious. There is no prospect of profit in the inland water transportation business sufficient to attract capital because of the low cost with which freight is now moved by rail.

Had Mr. Hill and the other waterway enthusiasts, who nearly a score of years ago induced the State of New York to embark in the barge canal enterprise, foreseen the steady disuse of the waterways by shippers which these figures show, the work would never have been undertaken.

It may be put on record here that the present writer opposed the barge canal project at its inception and published, in *Engineering News* nearly twenty years ago, a symposium of opinions from able engineers and transportation experts to the effect that the canal, when built, could not transport traffic at a lower cost than the cost by rail. But the barge canal promoters were deaf to the opinions of engineers and chose rather to be guided by the opinions of merchants who were seeking to benefit their own business.

(To Be Continued)

Method of Creation and Powers of Joint Sanitary Districts in Ohio

On Petition, Courts May Create Stream Sanitation, Sewerage and Water-Supply Districts to Build and Maintain Works

JOINT sanitary districts composed of two or more political subdivisions are authorized by an act of the Ohio legislature of 1919. Such districts have power to prevent and correct stream pollution; to clean and improve stream channels; to regulate stream flow for sanitary purposes; and to construct water-supply and water-purification works and sewerage and sewage-treatment systems. The formation of sanitary districts is under the control of the Court of Common Pleas of the county in which the district is located. If the district is in more than one county, the court of jurisdiction is composed of a judge from the Common Pleas Court of each county represented. Proceedings for the formation of sanitary districts may be instituted by petitions signed by 500 freeholders, or by a majority of the freeholders, or by owners of more than half the property in area or in value within the limits of the proposed districts; in place of freeholders, the proceedings may be started by the governing body of any public corporation lying wholly or partly within the proposed district. In the case of water-supply districts the petitions must be signed by the governing bodies of each municipality in the proposed district, or by a majority of the freeholders of each political subdivision or part thereof included, and also by any public-service corporation supplying water in the proposed district. After a public hearing and an adjudication of all questions of jurisdiction, the court with whom any such petition is filed may grant the petition for a sanitary district, and on doing so shall notify the Secretary of State, whereupon the district becomes a political subdivision of the state.

Sanitary districts thus created are administered by a director, or by a board of directors if in more than one county, appointed by the court with jurisdiction so as to give each county in the district one director. Any such director or board of directors is authorized to appoint a chief engineer, attorney, secretary and such other officers, agents and assistants as may be necessary, and to fix their compensation.

Where a district has been organized for purposes other than public water-supply, no outlet for the discharge of sewage or other liquid waste, and no sewage-treatment or disposal works shall be built in the district until the plans therefor have been approved by the district director or directors.

District boards shall cause a plan to be prepared for the improvement for which the district was formed and shall submit such plans to the state department of health for approval. The plan shall then be open for inspection and objection before adoption as the official plan of the district, but if within 10 days of approval objections are filed with the court with jurisdiction, the court shall give a hearing and then either adopt or reject the plan, or else refer it back for amendment. If rejected, a new plan must again be submitted to the court.

When the plan is finally approved by the court, the director or directors of the district have authority to execute it. If it is decided to do the work by contract, then "contracts in amounts to exceed $10,000 shall be advertised" and the board "may let said contracts to the lowest and best bidder."

Appraisers recommended by the district directors must be appointed by the court with jurisdiction to appraise lands taken for district use and also damages, if any, "accruing to cities, villages, counties, townships and other public corporations, as political entities, and to the State of Ohio," the appraisements to be subject to approval by the court and to adjudication by it if objections are filed.

To finance a district, the act provides for preliminary, bond and maintenance funds. The bond fund is supplied by bond issues met by assessments on the property benefited, such bonds not to exceed 90% of the total assessments. Maintenance funds are to be raised annually by assessments for benefits, but in any one year shall not exceed 1% of the benefit assessments for construction, unless specifically authorized by the court. In the case of works for water-supply the maintenance fund is to be provided from the sale of water.

Compensation for directors and apprasiers is to be fixed by the courts with jurisdiction, according to the time devoted to the work.

Silt Problem of River Reservoirs

Zuni Reservoir Will Become Useless Unless Deposit Is Removed—Removal Is a Difficulty—Similar Cases Are Cited

LOSS of 60.7% of the capacity of a reservoir in 12½ years due to silting which averaged 4.86% annually is the condition which obtains at the Zuni reservoir of the U. S. Indian Irrigation Service near Gallup, New Mexico. At this rate, by 1921 the storage will be insufficient for a normal year, while in 1926 the silting will reach to within 1 ft. of the present spillway level. If this level is raised 10 ft., the reservoir will be filled with silt by 1939. These conditions are described by H. F. Robinson in a paper on "The Silt Problem of the Zuni Reservoir" in the "Proceedings" of the American Society of Civil Engineers for August, 1919, page 483.

This silt problem must be faced in practically all reservoirs in the western part of the country, especially those formed in the bed of a stream by damming the channel, says Mr. Robinson, and unless some means can be found for removing the deposit it will impair the storage capacity and eventually fill the basin. This is true particularly of flashy streams which are dry for a considerable portion of the time and subject to freshets and floods at intervals. These floods coming down the dry bed will cause greater erosion than if the bed was continually wet. It is stated that Lake McMillan, in New Mexico, lost 60% of its capacity in 15 years, while the Austin reservoir in Texas lost 38% in four years and 48% in seven years.

The Zuni reservoir is formed by a dam in the Zuni River, built in 1902-1907. Its capacity is 15,811 acre-feet at the original spillway elevation of 1000 ft. above sea level and 10,213 acre-feet at the 991-ft. elevation, which has been maintained since a failure of the original spillway in 1909 (see *Engineering News*, Dec. 2, 1909, p. 597). With the dam in this position all silt is caught in the reservoir, except that which passes out through the valves or is carried over the spillway when the water is flowing into a full reservoir. Observations indicate that in four years the silt deposited was 3.2% of the runoff; in the next 1½ years it was 5.4% and in the next three years 7.3%. Wet seasons then changed the conditions, so that during the four years ending in January, 1918, the silt percentage was only 0.58%. For the period of 12½ years, the runoff has been 326,648 acre-feet and the silt deposit 5507 acre-feet, the average silt deposit being 1.88% of the water flow. A sample showed an apparent proportion of 55% of silt after one day, which decreased to 16% in four months, after which no further settlement was expected.

Higher percentages of silt content in rivers of the southwest region are noted by Mr. Robinson. In the Rio Grande, from 1897 to 1912, the range was from 4.14% in 1911 to 0.78% in 1905, but there was a maximum of 14.87% for one day and a monthly mean of 7.9%, the former representing about the maximum quantity ordinarily carried in suspension. A sample from Bonito Creek, in Arizona, showed over 13% of sediment after 30 days, while a sample taken during a flood in the Moencopi Wash, in Arizona, showed 85% sediment and 15% turbid water after two days, so that the flood flow was practically liquid mud. The Kaw River, in Kansas, has shown from 41.6% to 80.7% of silt.

This last case has been assumed to indicate the extraordinary influence of great floods in causing erosion, but Mr. Robinson states that while this may be true for large rivers it does not seem to apply to the flashy streams of the southwest. In these streams the lesser volume of water in a year, coming in a few periods of runoff, seems to carry the greatest quantity of silt. He suggests that during such lesser runoff the ground is dry and easily eroded by the flood while during the greater runoff it is moist and therefore not so subject to erosion.

Removal of the silt is a difficult problem that must be faced or the Zuni project will have to be abandoned within 20 years. It will be necessary to raise the spillway capacity in a year or two as the present water capacity of the reservoir is only slightly in excess of one year's need for the 3500 acres now under cultivation. Riprapping the banks to prevent erosion has been suggested, but Mr. Robinson considers this of doubtful utility and impracticable on account of the length of the main stream, while water at the head of feeder streams appears to be as heavily charged as that of the main stream. Large sluices at low elevations are not likely to be of much effect. Experience with such sluices at the St. John's reservoir, in Arizona, and the Austin reservoir in Texas, indicate that the only result would be a channel in the silt, no wider than the opening and extending back for a short distance with almost vertical sides.

An automatic suction dredge apparatus, as proposed by J. H. Quinton, consulting engineer for the project, is considered by Mr. Robinson to be the only plan that seems feasible. This plan includes a floating pipe line connected with the lowest valve in the outlet tower, which valve is below the present bottom of the reservoir. On a barge would be mounted a cutter and nozzle, with a small vacuum pump and a gasoline engine to operate the cutter. With a flow started through this pipe line, no further power would be required except for the vacuum pump, connected to the highest point on the pipe line. If all the water drawn from the reservoir was taken out in this way large quantities of silt would be removed. On the other hand, in dry seasons there would not be sufficient water to waste, so that the silt-laden water would have to run into the canal, which has no silt trap. Thus the silt might fill up the two siphons or be deposited along the canal, causing considerable expense and trouble for its removal.

Water Power from Yangtze River

A scheme has been elaborated by S. J. Powell, according to *The Engineer*, London, for the utilization of the water powers of the Yangtze River in China. Working on the assumption that the flow of the river at Chungking varies between 75,000 cu.ft. per second at low water up to over ten times that amount during the average flood, he estimates that a total of 31,000,000 hp. could be got from the river. The scheme includes the erection of seven dams to maintain the river always at flood level, thus eliminating the rapids between Wushan and Chungking. These dams would be constructed at Wushan, Kueichaufu, Nganping, below Yunyanghsien, above Siaokiang, above Chungchow, and at Fuchau. Each dam would have three locks, with a lift of 18 ft. 8 in. The estimated cost is £8,260,000, made up as follows: Improvement of rapids, £450,000; dams and locks, £7,210,000; hydro-electric plant, £600,000.

ENGINEERING LITERATURE

A REVIEW OF BOOKS AND A LISTING OF NEW PUBLICATIONS

Our Engineers in France

HISTORICAL REPORT OF CHIEF ENGINEER, AMERICAN EXPEDITIONARY FORCES, 1917-19: Including all Operations of the Engineer Department. Washington, D. C.: War Department. Cloth; 6 x 9 in; pp. 437; illustrated 90c from Superintendent of Documents, Washington, D. C.

To bring into so small a volume a readable review of the operations of the engineers under the command of the chief engineer of the American Expeditionary Forces, numbering 174,000 officers and men on Nov. 11, 1918, is a feat that deserves hearty commendation. The task was successfully achieved by giving in the main report, now available, "the salient features of the organization and operations of the Engineer Department," and by reserving for appendixes the "technical discussion, departmental and special reports, regimental histories" and other detailed matter.

The main report is written in three parts: (1) Organization and development of the Engineer Department from May 18, 1917; (2) military engineering, including all special services—such as water-supply; (3) supplies, construction and forestry. A few pages at the end are devoted to the "chief engineer's observations and recommendations covering the future organization and activities of the Engineer Service, in relation to another possible great war."

Well selected illustrations, both line and halftone, add to the interest and value of the report which was prepared under the direction of Major General W. C. Langfitt, chief engineer, A. E. F. The report will be prized by all who took part in the operations reviewed, besides appealing to engineers generally. The price of less than a dollar put upon the volume by the superintendent of documents brings the report within the reach of all who wish for it, provided their order is sent in before the edition is exhausted.

Reinforced-Concrete Handbook

USEFUL DATA: On Reinforced Concrete Buildings for the Designer and Estimator—By the Engineering Staff of the Corrugated Bar Company, Inc., Buffalo, N. Y. Leather; 5 x 8 in.; pp. 216; illustrated.

Steel designers have become so used to the structural handbooks, Cambria, Carnegie, and their like, that they hardly realize what it would mean not to have them. Concrete designers, however, have never had in their particular field a satisfactory handbook of this sort. The one or two efforts which have been made have not proved successful enough to be remembered by the run of engineers. The book "Useful Data" just issued by the Corrugated Bar Co., gives promise of a more hopeful future.

It fairly represents the concrete analogue of the steel handbook. A small part is devoted to the usual list of standard mathematical tables and of physical constants which are necessary to the designer, but the main features are tables and diagrams of design founded on the standard theories as applied by the engineers of the company. These references are remarkably complete and are prepared for all possible variations in stress and load units, so as to be applicable to varying specifications and conditions. While the company has prepared these data from its own designing experience, it has been very free from imposing any of the requirements of its own products, so far as can be seen.

Such books are not for the novice. One ignorant of the principles of reinforced concrete cannot hope by the aid of such a collection of data to become a finished designer. The knowledge of what to reject and how to utilize information comes only with practice, but for rapid or preliminary designing, and for checking, the tables and diagrams should be most useful to those who in theory are well enough grounded to know what they are doing.

Unfortunately for our readers, we are not permitted by the post-office department to state here how much this book will cost them. It must suffice to quote the following letter from the company: "We are offering the book to those of the engineering profession who may be interested, at a nominal price, merely covering the actual mechanical cost of the printing and binding.

Turneaure and Maurer Revised

PRINCIPLES OF REINFORCED CONCRETE CONSTRUCTION—By F. E. Turneaure, Dean of the College of Engineering, University of Wisconsin, and E. R. Maurer, Professor of Mechanics, University of Wisconsin. Third Edition, Revised and Enlarged. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 6 x 9 in.; pp. 485; illustrated.

For so comparatively novel a material as reinforced concrete, knowledge is in a continual state of change. True, the rate of change is steadily decreasing, and standards and theories are becoming stabilized, but new information continues to develop. To keep up with this progress, a text such as Turneaure and Maurer must be revised at fairly short intervals. This responsibility the authors recognize. The current edition, just issued, is the third; the other two appeared in 1907 and 1909.

To cover completely a given field is honor enough for any book. Such honor may truly be given to this treatise in the field of reinforced-concrete theory. To the study of the concrete itself or of the materials that go to make it only cursory attention is given. The treatment of completed structures is only sufficient to illustrate applications, but the book brings down to the latest date the applications of those principles of mechanics underlying the design of reinforced concrete. For reference or for study it is informing and authoritative.

The third edition, besides being somewhat rearranged, has more extensive treatment of the theory of beam action, and new and up-to-date matter on flat slabs and continuous beams. It is in those subjects that most has been learned since the second edition was issued.

Delaware Issues Health Bulletins

The *Delaware Health News*, as the new monthly is called, is issued by the State Board of Health at Dover. Chester H. Wells is special health commissioner and sanitary engineer to the board.

PUBLICATIONS RECEIVED

Under a Postoffice Department ruling made applicable to *Engineering News-Record* in July, 1919, it is no longer possible to give the prices of new publications announced under this head or of books reviewed in the preceding columns. Readers will therefore have to obtain this information as best they can. Most of the public documents and of the pamphlets announced may be obtained free on application, or at least by paying postage. So far as possible, the name and address of the publisher of each book and pamphlet are given in each entry.

ANNUAL REPORT OF THE DIRECTOR BUREAU OF STANDARDS, June 1918-19—Washington, D. C.: Bureau of Standards. Paper; 6 x 9 in.; pp. 293.

ANNUAL REPORT OF THE SUPERINTENDENT, UNITED STATES COAST AND GEODETIC SURVEY, June, 1918-19—Washington, D. C.: U. S. Coast and Geodetic Survey. Cloth; 6 x 9 in.; pp. 150; folding maps.

BEHAVIOR OF WROUGHT MANGANESE BRONZE EXPOSED TO CORROSION WHILE UNDER TENSILE STRESS—By P. D. Merica, Physicist, and R. W. Woodward, Associate Physicist, Washington, D. C.: Bureau of Standards. Paper; 7 x 10 in.; pp. 9; illustrated. 5c. from Superintendent of Documents.

BUILDING ORDINANCE—Chicago, Ill.: National Lumber Manfacturers Association. Cloth; 5 x 8 in.; pp. 60; illustrated.

This standard "building ordinance" is intended to be used as a model by small towns or cities, where there is no code in existence. Unfortunately for its wide use it over emphasizes the lumber end of building.

BUILDING THE PACIFIC RAILWAY: The Construction-Story of America's First Iron Throughfare Between the Missouri River and California, etc.—By Edwin L. Sabin. Philadelphia and London: J. B. Lippincott Co. Cloth; 5 x 8 in.; pp. 317; illustrated.

ECONOMICS OF THE CONSTRUCTION INDUSTRY—Washington, D. C.: U. S. Department of Labor. Paper; 6 x 9 in.; pp. 263; illustrated.

EFFECT OF VIBRATION, JIGGING AND PRESSURE ON FRESH CONCETE—By Duff A. Abrams, Professor in Charge of Structural Materials Laboratory, Lewis Institute. (Authorized Reprint from the Proceedings of the American Concrete Institute, Vol. XV, 1919) Chicago, Ill.: The Laboratory. Paper; 6 x 9 in.; pp. 23; illustrated.

FOREST DEVASTATION: A National Danger and a Plan to Meet It; Submitted for Consideration to The Society of American Foresters by The Committee for the Application of Forestry. Stanford University, Cal.: The Society. Paper: 6 x 9 in.; pp. 37.

HIGHWAY INSPECTOR'S HANDBOOK—By Prevost Hubbard, Chemical Engineer, The Asphalt Association, Formerly Chief, Division of Road Material Tests and Research, Bureau of Public Roads, U. S. Department of Agriculture. New York: John Wiley & Sons, Inc., London: Chapman & Hall, Ltd. Flexible Fabrikoid; 4 x 7 in.; pp. 372; illustrated.

MECHANICAL PROPERTIES AND RESISTANCE TO CORROSION OF ROLLED LIGHT ALLOYS OF ALUMINUM AND MAGNESIUM WITH COPPER, WITH NICKEL, AND WITH MANGANESE—By P. D. Merica, Physicist, R. G. Waltenberg, Assistant Physicist and A. N. Finn, Associate Chemist, Bureau of Standards. Washington, D. C. Bureau of Standards. Paper; 7 x 10 in.; pp. 13; illustrated. 5c. from Superintendent of Documents.

NEW IDEALS IN THE PLANNING OF CITIES, TOWNS AND VILLAGES—John Nolen, Town and City Planner. New York: American City Bureau. Cloth; 5 x 8 in.; pp. 138; illustrated.

THE NEW WATER SUPPLY SYSTEM OF VICTORIA, BRITISH COLUMBIA—New York: Sanderson & Porter. Paper; 8 x 11 in.; pp. 16; illustrated.

ANNUAL REPORT OF THE DIRECTOR OF THE BUREAU OF MINES; June 1918-19. Washington, D. C.: Bureau of Mines. Paper; 6 x 9 in.; pp. 120; illustrated. 15c. from Superintendent of Documents.

NOTES ON GRAIN PRESSURES IN STORAGE BINS—By W. J. Larkin, Jr., Consultant in Bulk Grain Handling. Washington, D. C.: United States Department of Agriculture. Paper; 6 x 9 in.; pp. 16; illustrated. 5c. from Superintendent of Documents.

OUT OF THE RUINS—By George B. Ford, American Red Cross Reconstruction Bureau in France. New York: The Century Co. Cloth; 5 x 8 in.; pp. 263; illustrated.

Reviews the devastations of war in France and the public and private measures for relief during and since the war as well as the various efforts at reconstruction, including recent progress by the French Government. Contains a large amount of statistical detail in small compass which, with other information is effectively presented. The text is eloquently supplemented by the illustrations.

PRINCIPLES OF INDUSTRIAL ORGANIZATION—By Dexter S. Kimball, A.B., M.E., Professor of Machine Design and Construction in Sibley College, Cornell University. Mem. Am. Soc. M. E. etc. Sound Edition, Revised and Enlarged. New York: McGraw-Hill Co., Inc. London: Hill Publishing Co., Ltd. Cloth; 6 x 9 in.; pp. 325; illustrated.

Rearrangement, revision and enlargement of a book originally based on lectures before the seniors of the Sibley College of Mechanical Engineering, Cornell University. The first edition was noticed at length, and favorably, in "Engineering News," Jan. 15, 1914, p. 157, and more briefly in "Engineering Record," Sept. 15, 1913, p. 560.

SEATTLE HARBOR ISLAND TERMINAL—Seattle, Wash.: The East Waterway Dock & Warehouse Co. Paper; 8 x 11 in.; pp. 62; illustrated.

SOCIETY SERVICE

A Section Dealing with
the Results of Teamwork by Technical Men

St. Louis Members Offer Substitute Plan for Unified National Body

The St. Louis Association of Members of the American Society of Civil Engineers recently held two special meetings to discuss the report of that society's Committee on Development. At the first meeting the details of the report were discussed, and those parts dealing with technical activities and internal relations of the local association met with general approval, although reservations were made in certain details. Among other things the meeting refused to approve the provision that applicants must enter the society in the grades of associate or lower. The idea of a national engineering organization was unanimously indorsed, and the opinion expressed that the organization should be developed by enlarging the scope of the present engineering council.

At the second meeting, through the courtesy of Edward E. Wall, a preliminary draft of the report of the committee of the society's Board of Direction, which was appointed to review the development committee's work, was read. The meeting was unable to approve of this report in its entirety, and after a very extended discussion voiced its approval of a revised scheme for a national engineering organization, which was the personal work of Mr. Wall. In the outline of this scheme, which follows, it will be noted that, like the other plans, it provides for an organization to be dominated by the Four Founder Societies. It was worked out in considerable detail, and was approved as presenting a very practical plan of organization.

NATIONAL ORGANIZATION—COMPONENT PARTS

1. Four Founder Societies:	
American Society of Civil Engineers	9,000
American Institute of Mining and Metallurgical Engineers	5,000
American Society Mechanical Engineers	12,000
American Institute Electrical Engineers	14,000
2. Local affiliations.	
3. District Councils.	
4. The National Council.	

NATIONAL COUNCIL

The National Council to be composed of representatives from the Four Founder Societies and from the District Councils, on the following basis of representation:

The presidents and latest living past presidents of each of the Four Founder Societies to be ex-officio members not only of the National Council but also of its Executive Board; one of the presidents of the Four Founder Societies shall be elected president of the National Council; the Founder Societies shall also be entitled to additional representation on the Council, in proportion to their total memberships—one representative for the first 1,000 members or fraction thereof, and one additional representative for every additional 1,000 members or major fraction thereof—these last mentioned representatives to be selected by each society through the vote of its local sections so as to secure as equitable a geographical distribution of its representation as is possible.

Each District Council shall be entitled to one representative on the National Council for the first 500 to 2,000 members of the Local Affiliations creating it, and an additional representative for every additional 2,000 members or major fraction thereof accredited to the Local Affiliations of that district. These representatives to be selected by votes of the Local Affiliations in the same manner as members of the District Council are elected, viz.:

Each Local Affiliation in a district shall elect its member, or members, of the District Council according to a general scheme of elections, which shall be agreed upon later, and incorporated in the by-laws of all Local Affiliations. Each Local Affiliation shall be entitled to a member of the District Council for a membership of 50 to 200 inclusive and an additional member for every additional 200 members or major fraction thereof.

LOCAL AFFILIATIONS DEFINED

A Local Affiliation is to be understood as an association of local engineers organized primarily for the professional improvement of its members and for the purpose of advancing the interests of the profession through taking an active part in local affairs, technical as well as civic. These must not be confused with the Local Sections of the National Societies nor understood to be the same. Membership of Local Sections is confined to persons who are members of the National Societies while the membership of Local Affiliations is restricted only by its own laws. Local Sections will continue to be as at present, concerned only with the internal affairs of their National Societies. Engineers may be, and are now, members of both Local Sections and Local Affiliations. Local Sections, as organizations, will have no representation on District Councils, but their members may belong to Local Affiliations and thus have a voice in the election of such Councils. Local Affiliations are intended to be organizations to which all engineers may and should belong, regardless of the branch of engineering under which their study and work are classified—civil, mechanical, mining, electrical or chemical. The Four Founder Societies may prescribe regulations as to the establishment of Local Affiliations and the territory allotted to each as well as defining the boundaries of districts electing District Councils; may accept Local Affiliations already in existence, such as Associated Engineering Societies of St. Louis, etc., and may encourage and direct the creation of others as may be necessary.

EXECUTIVE BOARD

The Executive Board of the National Council shall consist of twenty members, eight of which shall be the presidents and past presidents of the Four Founder Societies, and the remaining twelve to be elected by the National Council from its membership.

Assume 120,000 engineers, 40,000 belonging to four Founder Societies; then National Council would be composed as follows:

American Society Civil Engineers	11 members
American Institute of Mining and Metallurgical Engineers	7 members
American Society Mechanical Engineers	14 members
American Institute Electrical Engineers	16 members
District Councils	40 members
Total	88 members
Executive Board	
Members from Founder Societies	8
Members elected by National Council	12

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Don't Measure With Dollars

Sir—I note in an editorial in your issue of Dec. 25, 1919, p. 1037, under the heading "What Makes a Record," reference to the statement of the Geological Survey wherein value rather than quantity was used as the measure of cement exports. I do not place my hand upon such a statement by the Survey, but I have no doubt we have issued several such statistical statements in the past.

I am writing to tell you that I wholly agree with the position that you take and as evidence of that take the occasion to call your attention to a couple of paragraphs in something that I said at St. Louis in November.

GEORGE OTIS SMITH,
Director, U. S. Geological Survey.

Washington, D. C.

[The two paragraphs follow:—EDITOR.]

The exact measure of our contribution to the world, however, is not the dollar. Some of us with a statistical bent love to note the fact that the value of our country's annual mineral production passed the billion dollar mark in 1899, reached the two billion mark in 1907, exceeded three billion dollars in 1916, and attained five billions in 1917, and five and a half billions last year. Yet the total value of our annual output is a starting point for economic self-examination rather than a goal reached that justifies self-glorification. The dollar is a handy measuring stick, but the results it gives need to be verified; quantity and quality of commodities give the truer measure of their usefulness. As a newspaper editor recently put it: "We don't eat dollar marks—we consume production."

The reported value at the mine mouth of our coal output may be significant of wages and possible profits to the mine workers and mine owners, but it does not measure the heat units made available for the world's work and comfort. So, if we look behind the camouflage of increased prices, we see that the jump of nearly a billion and a half dollars in 1917 did not mean that our mines contributed an additional 42 per cent to the world's needs. As a matter of fact, of such essential metals as copper, iron, and lead as well as gold and silver, there was a decreased output, a loss to the world, aggregating more than half a million tons. Again, last year the half billion dollar increase in market value expressed not an increase but a decrease in tonnage of such leading items as iron, lead, zinc, gold, and silver. In short, the number of loaded freight cars that daily leave your plant gives a good measure of your usefulness to the world, irrespective of the size of your daily bank deposit.

Indorses Free Employment Service Given by Colorado Society of Engineers

Sir—It is with surprise that we read in your issue of Oct. 30-Nov. 6, 1919, p. 831, the letter of S. Sergeant Newbury, president of the Business Men's Clearing House, an employment agency of Denver, with reference to the free employment agency conducted by the Colorado Society of Engineers. We believe Mr. Newbury's animus to be caused by the thought of the future rather than by any present indignation. The paragraph referred to by him and to which he takes such violent exception, may perhaps be news in fact or Mr. Newbury would possibly not have deemed it necessary to word his distaste so strongly.

The point we wish to emphasize is that the Colorado Society of Engineers has as one of its objects the establishment of a free, efficient and worthy employment service, run by men trained in engineering work—a bureau that will reach all engineers, regardless of their affiliation with this or that organization, and render to them a personal service, free from the burden and humiliation of an excessive fee for that service.

In conclusion, let us say that when employers of engineers fully realize that such efficient and disinterested employment service is in the field to stay, we believe that they will find it of advantage to their work to patronize it to the fullest extent. The wonder is that private, self-interested employment agencies, charging excessive rates for mechanical services, are able at all to recruit workers of the grade of general intelligence expected of the engineering employee.

W. M. McMechen,
Denver, Colo. Colorado Society of Engineers.

Need Rigid Laws To Save Highways From Overloaded Motor Trucks

Sir—There has grown up within the last two years an abuse of highways which will cause the utter destruction of our growing system in a very short space of time unless it is handled adequately and immediately. Owing to the greatly increased use of motor trucks in recent years, they are operated largely by people who are unfamiliar with the characteristics of these vehicles and their relation to the road-beds over which they run. The greatest abuse that the highways are subject to at the present time is gross overloading of the motor trucks which utilize them. Owing to the fact that most of the motor trucks operated in this country are comparatively new, coupled with the ignorance of owners as to the extremely detrimental effect of overloading, this practice has grown by leaps and bounds to a degree which never existed before the war.

It is unquestionably the case, having been proven many times, that overloading will wreck a motor truck in a very short time. and although the initial earnings derived therefrom are very attractive, the net result over a period of years will lead to extremely heavy financial loss to the owner of the trucks. However, insofar as his personal welfare is concerned, that is solely his own affair. The highways, however, are built at the expense of the general public, and their financial damage is much greater than that which occurs to the trucks, great as that may be. And there is the additional detriment that the man who causes the damage is not heavily penalized for his abuse of the highways.

The remedy for this situation is quite plain. Many states and municipalities in this country have well-defined laws controlling the maximum weights which may be placed on motor trucks. In most instances the law even stipulates the weight per inch of tire width. But, to the best of my knowledge, in no state is any concerted effort being made to inforce these laws.

The writer owns and operates a large fleet of motor trucks, and realizes how tremendously serviceable the motor truck is in our advanced stage of civilization. He realizes quite fully, however, that misuse of motor trucks, and an abuse of the public highways which make it possible to operate them will, ultimately, be extremely disastrous.

Would it not be possible, therefore, to invite your co-operation in suggesting to the various municipal and state highway authorities to inforce the laws which have been so carefully formulated, to the point of conserving our highways for their proper usage? Even the most selfish motor-truck operator must realize by abusing the highways through overloading, speeding and undertiring, the highways immediately deteriorate, that his business experience will be most disastrous.

George H. Pride,
New York City. Heavy Haulage Company

"Holier Than Thou"

Sir—A good many criticisms of union methods have a great Pecksniffian air to one who has been through the mill. Labor unions only tried, in the main, to place a union price on a certain amount of union physical labor.

Typical of all corporations, what was it the railroads did to use in "ye goode olde days"? This: standardized brain power—a standard wage for all engineers regardless of the degree of their responsibility—a heavy construction residency in the mountains, same price as scratch work in the sage bush—same pay for all locators, experience counting for nothing. Some years ago railroad locators were needed on a certain job and experienced men were hard to find; still $175 a month was the standard wage. The reason for the scarcity was that the more intelligent men had quit and sought other work. Did the railroad raise wages because the supply was short? They did not. They hired green men at the standard wage.

Another railroad company, to avoid paying resident engineers $125 per month, called them "instrument men" at $100 for the same work and the same responsibility—a resident engineer in charge of construction dubbed "instrument man." It is an old story to old-timers, but all this "holier-than-thou" attitude toward labor is foolish in the extreme.

The engineer, by and large, is a skilled laborer and if he is going to get a higher wage for his commodity he will have to follow the example of the packers, Standard Oil, the steel trust, the plumbers and brick layers, and other high-class sellers of their own wares. They are in possession of the industrial secret that, given control of the supply, the demand will take care of itself. The old law of supply and demand is only for the use of the uninitiated.

If there is any Moses in the engineering profession, a man who can raise wages, a man who can talk facts and actual conditions, a very respectful hearing awaits him. F. W. Harris.

Olympia, Wash.

Should All Engineers Be Engineers?

Sir—Some months ago I addressed an open letter to the *Engineering News-Record* adding a thought to the much-discussed subject of compensation for engineers. This letter was in answer to that of a young man whose engineering aspirations had been somewhat dampened through his association with underpaid engineers during the war.

In response to this published letter I have received from all sections of the country, and even Scotland, appeals from graduates and others not long in practice, asking for friendly advice on how to break the limitations of environment and get into the open field of trade and competition.

These letters are full of human interest. I say "are" because these letters still exist, and will always be among my prized possessions. You will see why later.

They have come right from the hearts of men thoroughly disgusted and dissatisfied with their results in the engineering profession, and who are groping for a chance to expand and do something with greater possibilities for them. They seem to feel that they are merely moving parts of a machine—essential to proper functioning, but limited in their spheres of personal activity and opportunity. They feel within them vibrant power, a tremendous potential force, which is fuming and fomenting for outlet. They feel they have a mighty stride, but their limiting conditions hinder their progress to mincing steps.

I have religiously answered every one of these letters, and would like to hear from more men similarly situated, for the advice I have passed on to a few has been acted upon. Some days ago I received a grateful note from one of my Southern correspondents stating that he had followed my suggestions and in four months had doubled his former salary, founded a home, and felt that at last he had "hit his stride"

Right here is a good time to bring out a thought which may encourage further suggestions: How many are trying to be engineers, who should be something else?

Many a lawyer would make a better mechanic, and likewise hundreds of half-hearted engineers, struggling and striving, would find their gait in another field. This conclusion was vividly impressed upon me a few days ago. When talking with one of my salesmen I found that previous to his entrance into sales work he had been a sad failure in contracting and engineering. He is a natural salesman, and gives promise of being a headliner in production with our company.

In this connection, and as a specific remedy, why not recommend to our colleges that every freshman on entering and registering for a course be required to go before a committee competent to make a vocational analysis to determine the student's native qualifications and inclinations for the course outlined and for the life work he proposes to follow. No rules for analysis would prove infallible, but, on the average, a large number of misfits would be started on the road to pronounced success.

I would like to have some suggestions from your college correspondents. My own experience prompts a very intense interest. William S. Miller.

Cleveland, Ohio. The Lakewood Engineering Co.

Ottawa Society Gets Good Publicity

Sir—I note in your issue for Nov. 27, 1919, an interesting account of the publicity methods adopted by the local chapters of the American Association of Engineers. This matter has received considerable attention from the Ottawa Branch of the Engineering Institute of Canada, and it might be of interest to some of the local engineering societies in the United States to know the methods which are adopted by this branch to obtain publicity for monthly luncheons.

The usual method is to have an editorial in one, or both, of the local morning papers to appear on the day of the luncheon, to call attention in a general way to the subject to be discussed, this is followed the next day by a full report of the meeting. Very good results have recently been obtained, as may be seen from cuttings of the Ottawa *Citizen* giving the editorials and reports of the last two luncheon meetings, held Dec. 4 and 18, 1919.

The first was a "military luncheon," the guest of honor being Maj. Gen. Sir Edward Morrison, commander of the Canadian Artillery Corps in France.

The second was a "naval luncheon," the guests being the officers of Lord Jellicoe's staff now touring the Dominion and the leading Canadian naval authorities, including Admiral Sir Charles Kingsmill, director of the Canadian Naval Service. This second luncheon was also noteworthy on account of the important speech made by His Excellency, the Governor General of Canada, who is an honorary member of the institute, on the future naval policy of the empire.

M. F. Cochrane,
Branch Secretary,
Engineering Institute of Canada, Ottawa Branch.

[Inclosed with the foregoing letter were two postcards each bearing printed details of one of the meetings, and clippings of one of the editorials and two of the stories reporting the meetings. The editorial was given 7 in. of space in the Ottawa *Citizen.* Each of the stories, in the same newspaper, filled two columns and carried double-column heads.—Editor.]

Forests, Snow and Water-Supply

Sir—The article on "Determination of Water-Supply from Snow Fields," in your issue of Oct. 23, contains some very valuable figures on snow densities concerning which field data have heretofore been lacking.

The water equivalent per unit volume of snow, called "density," is given in Table I for depths from 10 to 160 in. and altitudes from 5000 to 9000 ft., during mid-winter and early spring, and embraces the results of several thousand determinations on the Sierra Nevada Mountains in Nevada. These data, in addition to their general intrinsic value, throw some very interesting sidelights on the much-discussed question of the influence of forests on water-supply. If one will average all the columns headed "Density" in that table he will find that the average density of snow in the open was 42.4%; average density of snow in thin forest 41.1%; average density of snow in dense forest 38.0%.

This means that snow in the open stored practically 12% more water than equal depths in dense forests. It is also well known that depths of snow in the open at the beginning of spring are from 10 to 20% greater than in the forest (see *Journal of Electricity,* March 15 and July 1, 1919). Hence it appears that the open country has a greater water-storage capacity than the forested area by from 20 to 30 per cent.

In other words, the forests have the effect of dissipating a large per cent. of the total snow fall. The reason for this is obvious when we consider that the trees catch a large portion of every snowfall and hold it until evaporated, the evaporation in inches of water depth from snow being several times that from a water surface. The portion thus dissipated is lost to the water-supply of that region.

In localities where the entire supply is reservoired for irrigation, as in many sections of the West, the *total supply* is the all-important factor, since the extent of agricultural areas is limited thereby. In such localities we must value the forests for timber, grazing, recreation and aesthetic qualities on the positive side, and for their water-conserving facilities on the negative side. J. C. Stevens.

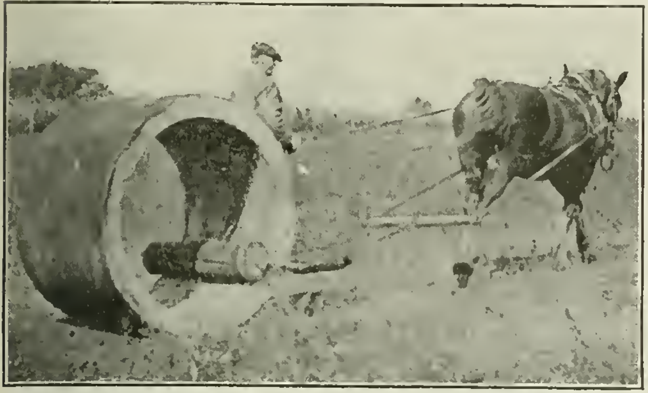
Portland, Ore.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Horses Roll Large Concrete Pipes

ROLLING large concrete pipes by horses, and placing them by means of a dragline excavator, were methods used in construction of a land-drainage system north of Worthington, Minn. The length of haul was from 100 to 600 ft., over low, wet ground where trucks could not be operated. Each pipe section was 42 in. in diameter and 36 ft. long, weighing 1970 lb. and hauled by one horse, as shown in the illustration. Two chains hitched to the middle of the singletree were attached to the ends of a wooden roller placed inside the pipe, one chain being hooked to the roller and readily detached. The chains carried also a smaller roller in front which served to prevent the pipe from rolling when the horse stopped or was going down grade, the slackening of the chain causing the roller to drop.


HORSE HAULS 42-INCH CONCRETE PIPE

This method effected a large saving in labor cost, as four men could not roll the pipes over soft ground, while one man could handle two horses and pipes. As the ditch was made with a dragline machine having a 50-ft. boom this machine was used also to pick up the pipes by a chain sling with hooks and swing them into place. The contractor for this work was the McCracken Concrete Pipe Co., Luverne, Minn.

Winter Construction of Steep Pipe Line

A TEN-INCH pipe line, 2,088 ft. long on a grade of about 45 per cent, with two to seven ft. of snow on frozen ground, was built without special discomfort except in connecting the flange joints during zero weather. This was in the Selkirk mountains, British Columbia, and was for a hydro-electric plant. The first 960 ft. had a grade of 41 per cent, then 730 ft. of 42.9 per cent and the remainder 45.6 per cent. Spiral riveted pipe with forged-steel flanges was used for the 960-ft. stretch. This included 390 ft. of 9-in. pipe of No. 12 gage, weighing 420 lb. per 30-ft. length; 300 ft. of 10-in. No. 12 pipe weighing 450 lb., and the remainder 10-in. No. 14 pipe weighing 330 lb. per length. Beyond this was 10-in. and 12-in. wire-wound wood-stave pipe weighing about 240 lb.

Each pipe was carried on two 2-ft. sleds and was hauled by two teams hitched to the forward sled. For about 400 ft., however, with a grade steeper than 45 per cent, it was necessary to use a single block and tackle. This distribution of the pipe required two teams and three to four men for 14½ days and cost 15c. per lineal foot. Trenching to a maximum depth of 10 ft. was required, as the flanged connections did not permit of much bending of the pipe line. A 35-ft. length was excavated and when a pipe section had been laid and connected it was covered with material from the next length of trench. Grade was given by a carpenter's level and a wood triangle.

Tunnels were used occasionally where the depth was over 7 ft., in order to avoid digging through the snow and the frozen moss and soil. On this steep grade it was easy to throw the dirt from the tunnel over the preceding length of pipe. Before lowering the pipe, its rear end was heated in a stove to remove all snow and ice which would interfere with making the flange joint. Excavation was in cemented glacial drift, with few boulders larger than one-man size. The 361 cu.yd. cost $2.40 per yd., although in summer it could have been done by contract for 96c. per yard.

Trestles 1 ft. to 16 ft. high aggregated 1,100 ft., requiring 18,320 ft. b.m. of round timber, cut and hewed on the ground. Bents were spaced 10 ft. on centers. Sills and caps were hewed on two sides. No timbers had to be carried more than 80 ft. On account of almost continuous snowfall the pipe was laid as soon as two or three bents were constructed. Trestle construction, including cutting and hewing of timber, cost $3.64 per 1000 ft. b.m. The cost of laying the entire pipe line was about 14c. per foot. Wages were $5 per day and board, except that the foreman received $6. This work was described in the *Engineering and Mining Journal* of Nov. 22-29, 1919, by William W. Elmer, Portland, Ore.

Railway Fill Made With Stiffleg Derrick Dragline

TWO stiffleg derricks converted into dragline excavators have completed 65,000 cu.yd. of railway embankment for the Miami Conservancy District at a cost of 26.7c. per cu.yd. The embankment was 1½ miles long across flat land and the converted derricks

TWIN DERRICK DRAGLINES BUILD RAILWAY EMBANKMENT

worked as shown by the illustration, one on each side taking material from parallel borrow pits. An advantage of the machines, as compared with other forms of grading equipment ordinarily employed, was their ability to excavate below the ground water line, which, on these flat lands, was only 3 ft. below the surface.

Both derricks were originally of timber construction and had 12-ft. ball wheels, about 9 x 10 in., 3-drum hoists and 4½ x 5-in. swing engines with 4 x 8½-ft. vertical boilers operating at 100-lb. pressure. One cost originally $4,300 and the other $4,000. The timber booms were removed and replaced by steel booms, 62 ft. long and made from the stifflegs of a steel derrick which had been re-equipped. For embankment work machines were mounted on 30 x 30-ft. frames and traveled on 8-in. rollers on timber ways about 18 in. high.

Due to rather heavy work pulling stumps and to originally too-small cables and too-light ironing, breakages were rather frequent, as indicated by the cable bill of $1,405 and the bill of $628 for replacing sheaves.

Operation of the draglines proper required 1 foreman, 2 dragline runners, 2 firemen, 1 pumpman and 8 laborers—14 in all. In addition, 2 to 3 men were kept on the embankment dressing the crown and slopes. The working day was 10 hours, of which a 2-hour loss, due to stoppages for repairs, oiling, moving ahead, etc., was considered normal. The job took about four months. Operating expenses were as follows:

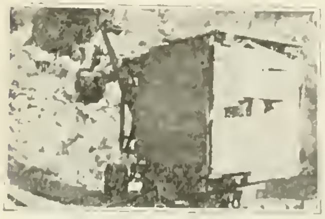
Shop repairs, $2,407.33; labor, $13,331.14; materials (cable, coal, etc.), $3,062.80; field accounting, $220.96; hauling draglines Osborn to Dayton, $216.96; Dayton garage, $8.42; total, $19,247.61.

The total material moved was 65,000 cu.yd., giving an operating cost per cubic yard of 29.6c. Deducting time lost for retubing boilers and cost of repairs of same, these items not being fairly chargeable to the job, reduces the cost to 26.7c. This represents a contractor's cost, with materials, repairs and labor obtained in the open market, and no overhead except for field accounting.

This work was performed by force account by the Miami Conservancy District, Arthur E. Morgan, chief engineer, Charles H. Paul, assistant chief engineer, and C. H. Locher, construction manager.

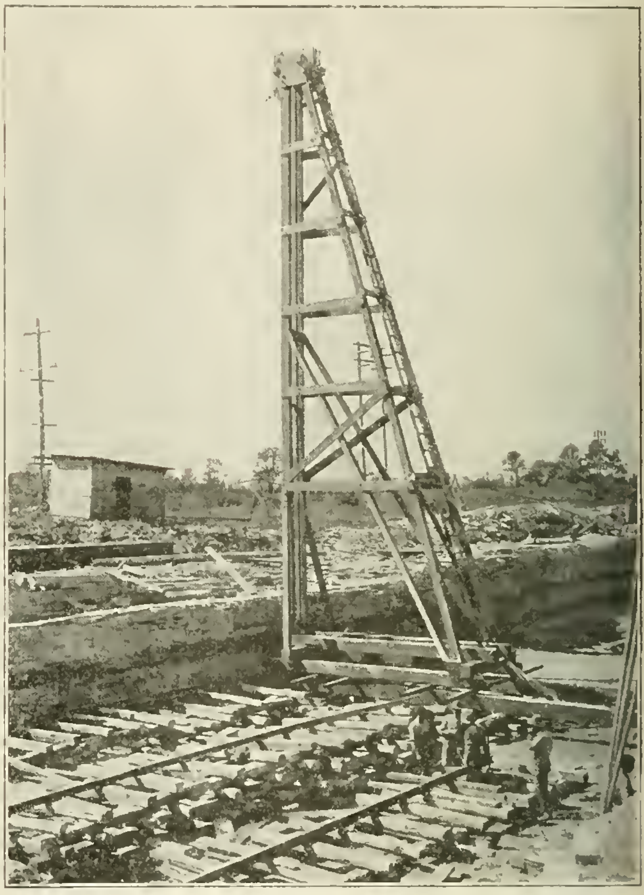
Plank Covering Protects Steam Shovel from Blasts

In excavating a power-house site in solid rock, the Joaquin Light & Power Co. of Fresno, Cal., is using a steam shovel operated by compressed air for loading dump cars. The blasting is frequent and it is not convenient to get the shovel into shelter for each shot. Accordingly, the stack was removed, a timber frame was built up around the boiler and planking was put on the top and the sides for protection from flying rocks. When the blast is ready the shovel is left wherever it is working after swinging it around so its boarded-up end is facing the blast. No damage to the shovel has resulted, although the 2-in. planking has been smashed in several places, as the picture shows.


HOUSING SHIELDS SHOVEL FROM FLYING ROCK

Submarine Drills Mounted on High Frames For Land Work

For the rock excavation at the lower end of the Queenston-Chippawa power canal, the Ontario Hydro-Electric Power Commission has installed a number of submarine drills mounted on high frames similar in design to a pile-driver rig. The section to be excavated is in the Niagara limestone and is rectangular, 48 ft. wide and varying in depth from 40 to 60 ft. The upper 10 ft. of the faces is cut with channelers, but below that the drilling from top to bottom is done with submarine drills, of a maximum diameter of 4½ in. and a minimum of 2 in.


PILE-DRIVER RIG CARRIES SUBMARINE DRILL FOR LAND WORK

Each drill is carried in the 55-ft. leads of the rig from the main line of a hoist mounted on the platform behind the leads, a spare line on the spool being used to elevate the drill steels when required. The frames are mounted on skids or rollers, as shown in the view of one on which the drill has not yet been mounted. Five of the drills are working across the 48-ft. cut, two as close as possible to the face and the other three spaced equally in the intervening space.

Civilians on Port Facilities Commission

Inadvertently the statement was made in Engineering News-Record, Jan. 1, 1920, p. 43, that the Port and Harbor Facilities Commission of the United States Shipping Board of the United States Shipping Board was made up "mainly" of Army and Navy officers. While the chairman, vice-chairman and chief engineer are in the Army and Navy, the other six members are railway, shipping and transportation experts.

NEWS OF THE WEEK

New York, January 15, 1920

Agree on Six Months' Extension of Federal Rail Guarantee

While no agreement has been reached by the joint committee of the Senate and House, at this writing, on the more important points of difference of the Esch and Cummins railroad bills, the confreres completed agreement on Jan. 9 continuing the standard return to the railroad corporations for a period of six months after the termination of Federal control, and providing a $300,000,000 revolving fund for the purpose and from which carriers will be permitted to borrow temporarily.

Last week a split occurred in the ranks of the railway executives when Daniel Willard, president of the Baltimore & Ohio, Howard Elliott, president of the Northern Pacific, F. D. Underwood, president of the Erie and others opposed the stand taken by A. P. Thom, general counsel of the Association of Railway Executives, against the rate-making provisions of the Cummins bill limiting "excess" earnings. Disagreement regarding this feature of the legislation followed a meeting called by Mr. Thom to oppose these portions of the bill. Judge R. S. Lovett, chairman of the Union Pacific, appears to be leading the fight against the limitation of earnings as now proposed.

On Jan. 8 representatives of the National Grange, in an interview with Senator Cummins of the Interstate Commerce Committee, "presented the views of the farmers" asking for a prompt return of the railroads and strongly urging the retention of anti-strike clauses of the Cummins bill. On Jan. 9 the National Industrial Traffic League, representing a large number of shippers, addressed a telegram to the confreres advocating the elimination of all reference to a Transportation Board, favoring anti-strike legislation and "unalterably opposed" to fixing minimum or maximum rate of return and limiting "excess" earnings.

No Great Enlargement of Bureau of Public Roads

(Washington Correspondence)

It has become widely circulated that legislation is being considered providing for an immediate enlargement of the Bureau of Public Roads. This is not the case. As the Federal-aid activities increase there naturally is a gradual growth taking place in the Bureau of Public Roads. Forty-two per cent of the bureau's personnel was in the military service during the war. This gave rise to the greatest difficulties in handling the bureau's work during the war period, but most of its experienced men have returned and its work is now being conducted on practically a normal basis. Closer contact with the state highway departments is being established by the stationing of representatives of the bureau in various state capitals.

Chief of Engineers Recommended But Identity Withheld

The Secretary of War has let it be known that he has made his recommendation to the President for the new Chief of Engineers. He declines positively to state whose name went forward. Owing to the illness of the President there has been considerable delay in forwarding nominations to the Senate for confirmation and it is possible that some time may elapse before the name of the nominee for Chief of Engineers becomes known. On the other hand, due to the importance of the position, it is possible that it may go to the Senate any day.

Revised Townsend Highway Bill Discussion Soon

(Washington Correspondence)

No plans yet have been made for hearings on the revised Townsend Highway Bill. Senator Townsend's presence in Washington has been prevented by the death of Mrs. Townsend. It is believed, however, that the opening of hearings will not be delayed greatly, and that active attention on the part of the Senate Committee on Post Offices and Post Roads will be centered in the near future on the bill which has as its main objects the construction of a national highway system and the creation of a Federal Highway Commission.

Census Asks Strike Loss Data of Manufactures

In gathering information for the census of manufactures the blanks now being mailed by the Bureau of the Census contain, for the first time, an inquiry intended to disclose losses caused by strikes. A paragraph was included in the questionnaire at the request of the National Association of Manufacturers which will not only show the direct economic loss sustained by industry and the country on account of strikes and consequent interruptions of production, but of indirect losses as well. This latter will include, for example, a plant which is closed on account of the coal strike and could not operate for the reason that fuel was not available. It is expected that the compilation of accurate figures as to losses from strikes will furnish the public with impressive information in that connection.

Engineering Council Asks Contributions

$45,000 Needed To Carry Out Program Planned for 1920—Statement Cites Work Done and in Progress

Engineering Council's need of $30,000 in excess of the $15,000 expected from the engineering societies and its belief that the benefit of its service to the engineering profession is so appreciated as to render certain the receipt of that amount in general contributions, are presented in a statement outlining its accomplishments and plans. The statement, issued over the signature of Council's secretary, Alfred D. Flinn, follows:

"Engineers of the United States evidently want such services as Engineering Council has been rendering for two years and a half. Many expressions of appreciation have been received. Desires for larger and more varied services are frequent. Council's member societies have provided for it as liberally as they could from their treasuries; but as Council's services are not limited to the 41,000 members of these societies, and as the incomes of the societies are not adequate to all the needs, it was recently decided to give engineers throughout the country an opportunity to contribute individually to the financial support of the Council, thus showing the measure of their earnestness in desiring the enlargement of the work. Letters have been sent to 50,000 engineers to meet the present emergency.

"In appealing for support Council presents the following partial statement of work done and in progress:

WORK DONE AND IN PROGRESS

Held organizing meeting June 27, 1917.

Furnished the Government 4,000 names of engineers for war service.

Engineering Societies Employment Bureau since the armistice, has registered 5,000 engineers and assistants (mostly returned soldiers and sailors) and aided thousands of them to positions, at no cost to the individuals, but at an expense of more than $15,000 to Council's member societies.

Aided Naval Consulting Board and Army General Staff in examining 135,000 suggestions and inventions for war devices.

Assisted Fuel Administrator and Bureau of Mines in fuel conservation.

Helped secure exemption of engineer students from military service until completion of technical training.

Opposed "anti-efficiency" proposals in bills before Congress.

Supplied Congress information about waterpower; is working on other water conservation problems.

Aided in organizing National Federation of Construction Industries.

A Washington office has been maintained since Jan. 1, 1919, in charge of M. O. Leighton, chairman, National Service Committee, giving a varied service to engineers, especially in supplying information concerning congressional and department activities, also useful to Government.

Assembled in Chicago, in Apr. 1919, a conference of 74 technical organizations having 105,000 members. This conference, permanently organized, drafted the Jones-Reavis Bill, and is advocating its passage

(Concluded on v. 156)

WASHINGTON BRIEFS

Preparatory to turning back the railroads, the Railroad Administration has ordered a general material inventory to be taken as of Feb. 29.

Technical education for Army officers is one of the matters being discussed at a conference of department and division commanders with the War Department, which began Jan. 12.

Frank P. Trott of Arizona has been nominated by the President to be Surveyor General of Arizona. Gilman Bullard of Helena has been nominated for the same position in Montana.

Construction division contracts originally amounting to $8,354,283 have been settled for $2,257,912, the War Department reports.

On the reconvening of Congress after the recess, an effort was made immediately by Senator Calder of New York to bring up the bill providing for a zone system to regulate the height and use of buildings in Washington. The measure was blocked, temporarily at least, by Senator Thomas of Colorado, who objected because the bill creates another commission.

The hearings on the bill which recently passed the House, providing for the abolition of the United States Housing Corporation, were begun by the Senate Committee on Buildings and Grounds Jan. 12.

The Interdepartmental Board on Survey and Maps set up a permanent organization Jan. 13. The headquarters of the Board is in an office in the Interior Building.

Report on Proposed Harbor at Hamilton, Ontario

John M. Wilson, district engineer, Public Works Department of Canada, who has charge of the Central Ontario District, has just made a report to the Hamilton Harbor Commission on a proposed development of the Port of Hamilton, Ont. The city now has a population of 110,000, but is growing very rapidly, particularly in its industries. The proposed harbor scheme is intended to take care of the growth of the city for a number of years to come, but has certain provisions for early construction. The proposition resembles very much the new harbor development at Toronto, and shows the influence of the Toronto harbor engineers who acted in an advisory capacity. It provides, in general, for ships drawing 30 ft. of water to dock in slips on the present shore line and along wharves constructed out into the harbor, the reclamation of considerable of the inner harbor area by dredging which will deepen the central harbor, service of the industrial lines with cheap electric transportation concentrated on a marginal way, and the creation of park lands, recreation centers, and a boulevard drive around the entire water front. The completion of the work would leave Hamilton harbor with an area of 4380 acres or 6.8 square miles, having a governing depth for navigation of 30 ft., compared with the present 4500 acres having a depth of 18 ft. There will be added 1250 acres of park and residential property, 1198 acres of land suitable for industrial purposes, and 6.26 miles of docking accommodations. The sum required for immediate consideration is about $4,500,000, which it is suggested should be apportioned among the Dominion Government, the City of Hamilton and the Hamilton Harbor Commission, after the same general scheme which was followed in Toronto.

George Eastman Is Technology's Mysterious "Mr. Smith"

The general curiosity concerning the identity of the so-called Mr. Smith who offered the Massachusetts Institute of Technology a $4,000,000 endowment, conditioned upon its acquiring another equal amount, was satisfied at an M. I. T. alumni dinner in Boston, Jan. 10, when George Eastman, Kodak multimillionaire, was announced as the donor.

At the time of the dinner the amount needed to match the gift of Mr. Eastman had been raised by those working for the M. I. T. endowment fund, and the announcement there that Mr. Eastman had made good his promise was cheered to the roof. Mr. Eastman's present gift to Boston "Tech" raises the total of his presentations to the sum of $11,000,000.

General T. Coleman du Pont, president of the Alumni Association, presided at the dinner and was one of the principal speakers. Other speakers were Frank A. Vanderlip, Otto Kahn, Theodore N. Vail, Matthew C. Brush, Charles A. Stone, E. S. Webster, W. C. Potter, Charles Hayden.

Shipyards Sold and Leased

Two sales of wooden shipyards are reported from the Puget Sound region. Supple & Martin have bought the Columbia Engineering Works wooden shipyard at Linnton, Ore., from the receiver of the yard. This yard was closed last July on account of financial trouble. It is said that the new owners intend to use it for building barges, wooden schooners, and sailing vessels, small steamers, and ship supplies. The Sanderson & Porter yard at Raymond, Wash., has been sold by the Emergency Fleet Corporation.

In the East an important transaction was completed on Jan. 9 by the leasing of the Newark Bay shipyard (agency yard) to the Submarine Boat Corporation for four years from Nov. 15 past. The total rental is $4,000,000. The right to buy the site from the City of Newark is included. The Emergency Fleet Corporation also agree to continue the contracts for all except 32 of the 150 vessels which the yard was planned to build. At the same time the Submarine Boat Corporation buys the steel for the 32 ships canceled, at one-half its cost raw, plus the cost of fabrication.

Detroit Has Consulting Committee for Big Sewer Program

Following the recent action of the Detroit City Council, authorizing the Commissioner of Public Works to appoint a sewer commission to act with him in an advisory capacity in carrying out the city's sewer program, a committee of three engineers and two contractors has been selected. The men named are: W. S. Kinnear, consulting engineer of Detroit and New York; Prof. William C. Hoad, Sanitary Engineering Department, University of Michigan; E. D. Rich, State Sanitary Engineer of Michigan; George R. Cooke and J. A. Mercier, Detroit contractors.

Owing to the fact that public work was halted to a considerable extent during the period of the war, and also that Detroit in that time experienced an unprecedented growth, it is deemed necessary to carry out a sewer program in 1920 involving expenditures of about $1,000,000 a month. It is believed by the Commissioner of Public Works that a bond issue should be voted to provide funds for the new sewers, since the usual annual appropriation, which could not be materially increased, would necessitate spreading the needed sewer improvements over a period of several years.

In letting contracts recently increasing difficulty has been experienced in getting satisfactory bids as the contractors bid very high to protect themselves from the increasing cost of labor and material. The question of the availability of lump sum bids may result in the devising of a new kind of contract.

The work proposed for 1920 is part of the extensive sewer system planned for the City of Detroit by City Engineer Clarence W. Hubbell.

Spruce Production Division Sells Remaining Equipment

The remainder of the unsold equipment of the United States Spruce Production Corporation was disposed of recently at an auction sale. The equipment has been stored in the cut-up plant at Vancouver, Wash. The plant has been used since December, 1918, as a central assembly point for all equipment shipped in from other cities and woods camps. The methods of handling the very large stocks assembled there was described in *Engineering News-Record* of May 15, 1919, p. 967.

Nothing remains unsold at the Vancouver yards except the buildings, and these may be taken over intact by the War Department to be used in connection with Vancouver Barracks, located nearby. The properties of the Corporation which could not be collected at one point, such as railroads, mills, etc., have not all been disposed of, but negotiations are well along toward conclusion for most of these. A small staff of officers is still located in Portland closing up affairs.

I. C. C. Hears Arguments on Valuation Principles

Interpretations of Act Applying to Pending Decisions Presented by Parties at Interest

(Washington Correspondence)

Parties at interest in the physical valuation of the railroads by the Interstate Commerce Commission presented oral arguments before the full membership of the Commission, in Washington, Jan. 6-8, regarding the interpretation of the Valuation Act with particular respect to pending decisions, as in the Kansas City Southern case and the Texas Midland case, in which a tentative valuation was reported without fixing a single sum as the value of the property. Counsel appeared in behalf of the Railroad Presidents' Conference Committee, the Kansas City Southern R.R. and other carriers, and the National Association of Railway and Utilities Commissioners, as well as the Interstate Commerce Commission.

In October, 1916, when the Commission filed the tentative valuation of the Texas Midland, which did not contain a single sum as the value of the property, it was thought that action concerning final value should not be taken until after a comparatively large number of tentative valuations had been prepared and served and the interested parties been given an opportunity to be heard fully upon the question, according to the annual report of the Interstate Commerce Commission to Congress Dec. 1, 1919. The Commission also states that it was considered preferable that full opportunity for discussion be provided to aid in a final settlement, and hearings were arranged for Jan. 6-8 after postponement from May 27, 1919, at the request of the Carriers' Conference Committee, presented for the reason that tentative valuations had not, at that time, been served for any of the large "standard" railroads represented by that Committee. Briefs had been filed, previous to the oral hearing, by the parties at interest, including 97 per cent of all of the railroads of the United States.

In presenting the case for the National Association of Railway and Utilities Commissioners, John E. Benton, solicitor for the Association and its Valuation Committee, stated that the Commission ought not to attempt the finding of final value of a carrier in the proceedings, on the ground that the Valuation Act empowered the Commission to determine value only for the reason that its jurisdiction arises from its rate-making powers and not from the valuation amendment. Mr. Benton also emphasized the need for considering appreciation in connection with financial history for true determination of value without duplication.

P. J. Farrell, chief counsel for the Interstate Commerce Commission, concluded his argument with a statement that, at present, rate-making is the only purpose, under the act to regulate commerce, for which the Commission can use the final value of common-carrier property, but if in the future it becomes necessary to fix a final value of such property for some other purpose, any necessary modifications of the value for rate-making purposes can be made readily. Mr. Farrell also emphasized the importance of financial history in the determination of values for rate-making purposes.

In behalf of the Presidents' Conference Committee of the Carriers, W. G. Brantley said, "There exists in a railroad property a structural value determined by the cost of reproduction method, the amount of which is not affected by the raising or lowering of rates while the intangible values, based in part upon net earnings, are influenced by the fluctuations of rates." It was also stated that the commissioners are engaged in making a report to Congress on the value of railroad properties and that Congress has directed how the report shall be made: Separate reports of the tangible and intangible elements of value in each railroad property. It was stated that the burden of proof, as well as the responsibility for making this report, rests upon the Commission and not upon the carriers and that the connection of the carriers with the making of the report is only co-operative.

As a result of the hearings it is thought that the Commission will proceed to issue statements of final valuation in the near future as rapidly as tentative valuations can be prepared, although no intimation has been given of its intentions, at this writing.

Reduce Rates on Interstate Hauls of Road Material

The New York State Highway Commission has attacked successfully the rates being charged on road building material on interstate hauls over Federally controlled railroads. In two instances the Interstate Commerce Commission has ruled that rates charged were unreasonable and has prescribed reasonable rates. The success in these cases is expected to induce similar complaints to be filed in New York and in other states. In connection with its opinion the Interstate Commerce Commission makes the following statement:

"By provision of Traffic Circular No. 9, dated April 14, 1919, the carriers under Federal control were authorized to apply rates on crushed stone, sand and gravel, shipped during the period from May 1 to Dec. 31, 1919, inclusive, when for use in road building or road maintenance, and when consigned to, and the freight thereon is paid by, state government, of 10c. per net ton less than the regularly published tariff rates in effect at the time, but with a minimum charge of 40c. per net ton. This special authorization may be applicable with respect to the rates herein found to be reasonable, but we have no authority to require it to be observed."

Contributions from the National Public Works Department Association

By M. O. Leighton, Chairman

PUBLISHER'S NOTE: *The space occupied under this caption is donated to serve as a means of frequent and intimate communication between the National Public Works Department Association and the members of the profession. The contributor takes full authority for the statements made.*

IS THIS A $4,000,000,000 COUNTRY?

As the public works campaign progresses it has become more and more apparent that interest in the project extends far beyond the technical fields that were represented at the Chicago conference where this campaign organization was set up and the movement took definite shape. In these days of high Government costs, which are now borne largely by direct taxation, the interest of the citizen in the efficient and economical conduct of Government business has become intensified. The big budget of nearly $5,000,000,000 sent to Congress a few days since by the Secretary of the Treasury has startled Congress and fallen wet-blanketwise on the country. Deducting about $1,000,000,000 for interest on war debt, there remains $4,000,000,000 for Government upkeep in these times of international peace.

Is this a $4,000,000,000 country? Members of Congress evidently believe not, and yet as they collectively scan the items which make up this enormous Treasury estimate it becomes increasingly difficult to choose those which shall be eliminated. Every item has its strong supporters and therefore each must have its particular merits. Who shall select those that are unworthy?

We were willing to pay the price of bad business organization and the enormous wastes resulting while we were affluent and did not feel the pinch. In former years we paid largely through tariff and indirect internal revenue imposts. This was a tax anaesthetic. Now we feel it, first because we get an annual bill for our share, and second because the bill has grown so large. Therefore, it being conceded that practically all the items in the Treasury estimate are worthy, the next step is to determine whether they should cost so much. Is there an open bunghole in our barrel?

Now comes scrutiny of our Federal business methods, and as the public-works functions constitute the largest item we have the banker, merchant, manufacturer and public utility man all properly interested in correcting a condition of business unorganization which would wreck the strongest private industrial institution that ever took form The technical men of the coutry are therefore the pioneers in a public-works movement. Men and women in other avocations are quite as much interested.

Recognizing the foregoing premises the executive committee of this organization, at its recent meeting, laid plans for a more inclusive campaign program by authorizing the officers to invite participation by all industrial organizations. The first step taken was to change the long name of the federation that has been conducting the campaign, and which by specific mention of engineers, architects and constructors has by inference excluded all others. This organization is now known as The National Public Works Department Association. From time to time as the industrial and commercial interest of the country are brought in representation will be given them on the executive committee.

In response to a resolution supported by a brief presented by Engineering Council, the board of directors of the United States Chamber of Commerce, has authorized the appointment of a special committee of the Chamber to investigate and report on our project for a department of public works. It is our hope that the logic and merit of the plan will so commend itself to the committee that the Chamber will be persuaded to present the matter for referendum to the member bodies throughout the United States.

Changes in Executive Committee

Charles Whiting Baker, consulting editor, *Engineering News-Record*, and a member of Engineering Council was appointed to the Executive Committee of the Association to succeed W. A. Nichols, Jr., resigned. Robert Spur Weston of Boston, Mass., was added to the committee to represent the chemical profession.

Every day brings new assurances in substantial form concerning growth of conviction among members of Congress and professional and business men as to the necessity for a National Department of Public Works. Records and resolutions reporting favorable action by professional, industrial and civic organizations are being received with almost every mail delivery. Many of the State campaign committees are accomplishing splendid results and we have yet to receive a single unfavorable expression from any of the many members of Congress who have been approached from "back home" on the subject. Your chairman knows the dangers of optimism in the appraisal of a campaign of this kind but he does not hesitate to assert that during an 18-year period of participation in and close observation of national campaigns of this nature he has never known of one in which, at a stage comparable with the present, the prospects were so bright from the legislative standpoint. He heartily wishes he could say as much with respect to financial aspects. If this campaign fails it will be because its originators justify their old reputation as to "unresponsiveness, aloofness and indifference."

Edison Award to W. L. R. Emmet

At a recent meeting of the Board of Directors of the American Institute of Electrical Engineers, the Edison Medal Committee reported that the Edison Medal for the year 1919 had been awarded to W. L. R. Emmet for "inventions and developments of electrical apparatus and prime movers."

Jewish Engineers Outline Program for Palestine Development

A preliminary program for the industrial and agricultural development of Palestine was presented in reports read to a 3-day convention of the Zionist Society of Engineers and Agriculture in New York City, ending Dec. 29. The Society is made up of members of the parent Zionist Society who are technical men and experts in industrial and agricultural lines. Its purpose is to prepare from available information a survey report of all improvements needed, and, as far as possible, their design and cost on the basis of the first 100,000 expected Jewish immigrants to Palestine following the favorable settlement of that region's political status. The report is intended to serve the parent organization as a budget guide in collecting funds for the Zionist movement.

The ambitious development contemplated in the engineering section's reports, presented by James Haines, engineering secretary, includes: Extensive water-power, water-supply, and sewage projects; the irrigation of 3,700 acres and the drainage of 5,000 acres of the Hullah Valley; the creation of modern harbor facilities at Jaffa or Haifa; building of a system of railroads and highways; temporary housing; and construction and equipment of all such industrial plants whose raw material is available and whose product will be for home consumption.

The Society's plans were designed to make the expected Jewish communities of Palestine as nearly self-supporting as possible.

To Study Ground Water in Hawaii

Representatives of the ground-waters division of the United States Geological Survey will sail from San Francisco Jan. 22, 1920, for the Hawaiian Islands, where they will make a detailed study of the ground-water conditions on the islands, with a view toward giving them a better supply of water. O. E. Meinzer, W. O. Clark and L. F. Noble will conduct the study.

The investigation has been authorized at the request of the Governor of the Hawaiian Islands, and it is believed that this survey will be one of a series to follow later, involving the geologic mapping of the entire islands, and also aiming toward increasing the water-supply at Honolulu and for the Army and the Navy.

The Governor of the islands has authorized an expenditure of $15,000 to cover the cost of the preliminary survey, to be conducted under the direction of the groundwaters division of the Geological Survey.

Engineering Council Asks Contributions

(*Concluded from p.* 153)

for the establishment of a National Department of Public Works, by modification of existing departments. Chamber of Commerce, U. S. A., has been petitioned to submit this project to referendum of its members.

Conferences of the fourteen Government offices engaged in map-making have been brought about through an appeal to the President, with prospects of greatly accelerating completion of the topographical map of the United States.

Aided in securing increases of pay for railway technical engineers.

Committee on Classification and Compensation of Engineers, with sections on railroads, Federal Government, and municipal and state governments, is getting results. Is working with Congressional Joint Commission on Reclassification of Salaries.

Aided in reinstatement of 350 engineers unfairly dismissed by City of New York.

Recently organized a Committee on Types of Government Contracts.

Drafted a typical general law for registration of engineers.

Requested the President to appoint engineer members of the Interstate Commerce Commission and of the International Joint Commission.

Assisted the State of New York in preparing a scheme for reorganization of state government.

Is studying curricula of engineering schools, making suggestions as opportunity offers.

Joined with National Research Council in a report on improvement of the patent system and practice, on which legislation has been based.

Participated in organizing the National Board for Jurisdictional Awards in the Building Industry and has a member thereon.

On invitation of the House of Representatives committee, sent delegates to present testimony on a national budget.

Engineering Council has 40 general correspondents and 27 correspondents of its Water Conservation Committee, distributed throughout the country. It has 22 committees, of whose 125 members 72 live at a distance from New York.

More Funds Needed for Greater Work

Larger resources are needed for continuing and enlarging the work of Engineering Council. Let every Engineer help!

Council needs not less than $45,000 for 1920, and of this sum at least $30,000 must come from general contributions.

EXPECTED INCOME FOR 1920

From four founder societies	$12,000
From other member societies	3,000
From general contributions	30,000
Total	$45,000

PROPOSED EXPENDITURES FOR 1920

New York office, salaries, postage, printing travel, and general expenses	$12,000
Washington office, similar items	12,000
Committee on Classification and Compensation of Engineers	10,000
Other committees (see foregoing statement of work done)	5,000
Contingencies (new work and unforeseeable expenses)	6,000
Total	$45,000

For 1919 the total income was $50,000, including $25,000 advanced by Chairman Channing and not yet repaid. The expenditures have been:

New York office—salaries, equipment, travel, postage, telegraph, telephone, printing and miscellaneous	$7,500
Appeal for funds for 1920	2,000
Engineering Societies Employment Bureau	13,500
Washington office (including promotion of National Department of Public Works)	25,000
Committee on Licensing Engineers	1,000
Committee on Classification and Compensation of Engineers, and other committees	1,000
	$50,000

"Those desiring to contribute to Engineering Council are requested to make checks payable to United Engineering Society, 29 West 39th St., New York City. United Engineering Society is the organization created by the Founder Societies (the Civil, Mining, Mechanical, and Electrical engineers), to administer certain property and funds for joint activities."

Insurance, Pensions and Sick Benefits for Canadian Hydro Employees

Sir Adam Beck, chairman of the Ontario Hydro-Electric Power Commission, has announced that a plan providing pensions, insurance and sick benefits to the employees of the Commission has been formulated and will be put into effect as of Nov. 1. About 2,500 employees will be affected, although only the sick benefit provisions of the plan will apply to female employees. Pensions and insurance will be available to men after fifteen years of service with the Commission.

Pensions will be paid to men when they reach the age of sixty-five, or before that age if permanently disabled. The amount of pension to be granted will be one-eightieth of the recipient's average pay for the last five years before his retirement, multiplied by the number of years employed.

The insurance plan provides for the payment to the estate of a male employee, upon his death, of a sum amounting to 5 per cent of his salary for each year he has served, provided that it does not exceed twice the current salary. The sick benefit, which will apply to permanent employees of both sexes, stipulates that any person incapacitated by illness will be carried on the regular pay list for one week and thereafter transferred to and carried on the benefit list. The scale of sick benefit payments has not yet been fixed.

In formulating its plans the Commission assumed that, due to marriages, very few of the female employees would complete the fifteen years of service required for pension and insurance, and a special savings scheme has been arranged for them. A savings account will be opened for each woman in which will be deposited every year 5 per cent of her year's salary. When she leaves the service she will be paid the accrued amount. The cost of all benefits granted its employees will be paid by the Commission.

Lectures on The Social Function of the Engineer

The New School for Social Research of New York has arranged for a series of weekly lectures on "The Social Function of the Engineer," to begin Feb. 2 and be given each Tuesday evening thereafter for twelve weeks at the school, 465 West 23d St., New York City. The course will be conducted by Guido H. Marx, professor of mechanical engineering at Stanford University. The theory upon which the course is based is that the production and distribution of goods is now fundamentally an engineering as well as a social problem. The engineer's function is to insure the full use and unimpeded operation of the material resources and industrial equipment of the nation, with a view to secure a larger volume of production and a more adequate distribution of the output. The course will be directed primarily to technical men, and its purpose will be to reach a common understanding of the existing industrial and social problem. The fee for the course is $20.

The New School of Social Research at which this course will be given was founded last year by a group of men who believed that there was educational need for an institution of the kind. Its purpose is to supply instruction of a "post-graduate" character, although an academic degree is not required for admission. There is no grant of degrees.

The list of instructors includes Robert Bruère, Thorstein Veblen, Charles A. Beard and John Dewey, while among the directors are Herbert Croly and Alvin Johnson of the *New Republic.*

Col. L. H. Beach To Be Chief of Engineers

A dispatch from "Engineering News-Record's" Washington correspondent, received just as this week's issue was going to press, states that the President will nominate Col. Lansing H. Beach as Chief of Engineers U. S. Army.

American Contractor Has Large Building Jobs in Peru

Contracts for the construction of several government buildings, a large cathedral and a number of apartment houses and housing groups in Lima, Peru, have been awarded to an American construction firm, the Fred T. Ley Co. The company's contracts with the Catholic Church, the Peruvian government and the housing interests are said to run into several millions of dollars.

Nearly all the structures will be of reinforced concrete and all skilled labor for the work will be taken from the United States. The Fred T. Ley Co. has its main office in Springfield, Mass., and branches in Boston, New York City, Buffalo and Philadelphia. It is understood that it has a very large construction organization and that nearly the entire force will be sent down to execute the South American contracts.

Navy Engineering Classes Resumed

As another step toward the return to former peace conditions the Navy has resumed the pre-war custom of training part of the Annapolis men in advanced engineering at Columbia University. Three groups have been officially assigned to such duty.

Oregon Starts Move for Large Forest-Road Appropriation

Under the leadership of the Chamber of Commerce of Portland, Ore., civic organizations in that state, and other Coast and Rocky Mountain states are launching a campaign to obtain a Government appropriation of $100,000,000 for the construction of highways through forest reserves. A conference of representatives from Oregon, Washington, California, Arizona, New Mexico, Nevada, Idaho, Wyoming, Montana and Colorado will be held with a view to the appointment of about twenty-five business men who will go to Washington, D. C., to work for the appropriation. It has been suggested that allocation of the appropriation be extended over a 10-year period and allotment made to the states on the same basis as now obtains in the construction of roads through forest reserves.

West Virginia Boosts for Better Roads With Film Drama

"The Road Ahead for West Virginia" is the title of a two-reel motion picture which is being used in West Virginia to promote the adoption of the proposed constitutional amendment authorizing the State legislature to construct 4,500 miles of hard surface highway. James W. Brooks, editorial director of the Highway Industries Association of Washington, D. C., and author and director of the West Virginia film production, spent considerable time in getting his "cast" together and in selecting locations for filming the scenes. The film was made with the idea of not only providing the general public with an idea of what improvements are necessary in West Virginia roads, but also in acquainting it with the life along the roads. The author and director of the production asserts that "the camera has been set on facts and nothing but facts." A circuit rider, a country doctor and undergraduate co-ed from the state university lend local color and animation.

Appalachian Good Roads Association To Meet

Uniform state laws regulating the speed of motor vehicles and the loads placed upon them, together with a reciprocal relationship between the various states in reference to the use of vehicles; the urgent necessity of an interstate system of hard surface highways; and other questions will be among matters for discussion at the Asheville session of the Appalachian Good Roads Association to be held Feb. 26-28. The governors of each of the eleven states comprising this association—Maryland, Virginia, West Virginia, Kentucky, North and South Carolina, Georgia, Florida, Alabama, Tennessee and Arkansas—have been requested to name delegates at large. Besides these, the chambers of commerce, boards of trade, good roads and automobile associations in the various states have also been requested to send representatives.

Would Build Railroad Connecting Amazon and West Coast

The Chilean Congress has authorized the government to contract with a Chilean-Ecuadorean syndicate for the construction of a railroad to extend eastward from Porto Bolivar, Ecuador, into Brazil, giving a Pacific outlet to hitherto inaccessible territory. It is proposed to extend the line over 500 miles to Porto Para on the Amazon River, at an estimated cost of about $30,000,000.

A. A. E. Membership Drive Nets 6,500

The results of the membership drive held during December by the American Association of Engineers finally have been tabulated. Buffalo Chapter won first prize for chapters having a membership of more than 100 with an increase of 318 per cent. For the chapter or club having less than 100 members at the close of the drive the Ogden (Utah) Club won first place with an increase of 209 per cent. The three members of the association obtaining the highest number of individual subscriptions were F. P. Obee of Toledo, Ohio; J. W. Shera of Chicago and Professor Samuel M. P. Dolan of the Oregon State College. They turned in 131, 100 and 66 membership applications respectively.

The chapters which followed Buffalo were Lincoln with 310 per cent, University of Nebraska with 302 per cent and Toledo with 194 per cent. The largest number of applicants per chaper obtained during the drive was 474, obtained by the Chicago Chapter. Of this number 100 were obtained by one man. The second largest chapter in point of number of applications was the Oregon Chapter with 353. The number obtained by the Buffalo Chapter was 242. The Lincoln Chapter and the University of Nebraska Chapter are located in the same city, and had they been consolidated would have won first place.

The membership of the A. A. E. at the close of business on Dec. 31 was 10,423, more than 6,500 applications for membership having been received during the month of December.

Civil Service Examinations

New Jersey. Deputy chief engineer, Department of Streets and Public Improvements, $6,000 per year, Jan. 28. File applications with State Civil Service Commission at Trenton.

United States

For United States civil service examination, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Chief of Road Survey Party, $1,800 to $2,100 per year. File application before Feb. 10, 1920.

Transitman for road survey, $1,200 to $1,800 per year. File application before Feb. 10, 1920.

Highway draftsman, $1,200 to $1,800 per year. File application before Feb. 10, 1920.

Topographic and subsurface draftsman, Grade 1, $5.20 per day; Grade 2, $6 to $7.20 per day. File application before Jan. 27, 1920.

Ceramic assistant, to fill a vacancy at the Ceramic Experiment Station in the Bureau of Mines, Columbus, Ohio, $1,200 to $1,800 per year, and to fill vacancies in positions requiring similar qualifications. File application before Feb. 10, 1920.

Canada

The Civil Service Commission of Canada will receive applications from residents of Canada, qualified to fill the following positions:

Shipyard superintendent, Sorel, P. Q., salary $3,000.

Foresters, salary $1,680.

Junior engineers, initial salary $1,680.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

BRIDGE BUILDERS' & STRUCTURAL SOCIETY, 50 Church St., New York City; Jan. 16, New York City.

AMERICAN SOCIETY OF CIVIL ENGINEERS, 29 W. 39th St., New York City; Jan. 21-22, New York City.

ENGINEERING INSTITUTE OF CANADA; General Secretary, Fraser S. Keith, 176 Mansfield St., Montreal; Jan. 27-29, Montreal.

NATIONAL HIGHWAY TRAFFIC ASSOCIATION, 247 W. 54th St., New York City; Jan. 29, Chicago.

AMERICAN ROAD BUILDERS' ASSOCIATION, 150 Nassau St., New York City; Feb. 9-13, Louisville, Ky.

AMERICAN WOOD-PRESERVERS' ASSOCIATION; Secretary-Treasurer, F. J. Angier, Mt. Royal Station, Baltimore; Feb. 10-12, Chicago.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA; 111 W. Washington St., Chicago; Feb. 18-19, Chicago.

AMERICAN CONCRETE PIPE ASSOCIATION; 210 South La Salle St., Chicago; Feb. 20-21, Chicago.

AMERICAN RAILWAY ENGINEERING ASSOCIATION; 1426 Manhattan Bldg., Chicago; March 16-18, Chicago.

The Western Society of Engineers, Jan. 5, was addressed by Charles Piez, president of the Link Belt Co. on "The Tentative Report of the President's Industrial Commission." The annual dinner of the society will be held Jan. 28. The formation of several new sections—gas, telephone, industrial and railroad—necessitates holding meetings twice a week. A. J. Hammond will speak at an early date before the railroad section on "The Chicago Union Station." Duff A. Abrams, Jan. 12, spoke on "Experimental Studies in Concrete Design at Lewis Institute" before the bridge and structural section. For 1920 this section elected A. W. Dilling, chairman; J. E. Love, vice-chairman, and H. H. Hadsall, director. The society will be addressed at a meeting in February by Herbert C. Hoover, head of the relief commission for Europe and vice-chairman of President Wilson's industrial commission. At that meeting the Washington Award, founded by John W. Alvord of Chicago, will be presented to Mr. Hoover for "pre-eminent services in promoting the public welfare as chairman of the commission for relief of Belgium and as food administrator of the United States." The award is made by a commission representing the Western Society of Engineers and the four national societies of civil, mechanical, mining and electrical engineers.

The Florida Engineering Society will hold its annual meeting Feb. 16 and 17 in Tampa. J. R. Benton of Gainesville is secretary.

The National Drainage Congress will hold a meeting at the Harrington Hotel, Washington, D. C., Jan. 23 and 24, at which time a statement will be prepared concerning its policy in regard to private development and Federal aid. Edmund T. Perkins, Chicago, is president.

Baltimore Chapter, American Association of Engineers, has elected the following officers: J. Harry Gross, president; S. P. J. Patenall, first vice-president; J. H. Adams, second vice-president; Milton J. Ruark, treasurer; Arthur D. Ihlang, secretary. The chapter is growing rapidly and now has about 500 members.

The Chicago Chapter of the American Association of Engineers, Jan. 2, elected the following officers for 1920: President, W. J. H. Strong; vice-presidents, C. L. Currier, W. H. Dean, A. M. Cornell and T. A. Dungan; secretary, J. G. Hoban; treasurer, L. D. Lea. Papers recently presented to the chapter are "Stabilizing the Dollar," by Prof. Wilson, University of Illinois, and "Basis of Appeal for Increased Compensation," by W. E. Vogelback.

The Cleveland Chapter of the American Association of Engineers at its last regular monthly meeting voted to indorse, and to urge other engineering societies in Ohio to indorse, the bill recently introduced into the State Legislature, removing the limitation from the number and salary of map draftsmen in the County Surveyor's map room. The present legislation, passed in 1890, and unrevised since that time according to County Surveyor Stinchcomb of Cuyahoga County, Ohio, provides for not more than four draftsmen at a maximum salary of $1,500 per man. Increased volume of work necessitates fifteen men in Cuyahoga County at the present time. These men are actually at work, many of them illegally, it is believed. The majority of them are said to be receiving more than $1,500 per year, also illegally but unavoidably, due to the impossibility of securing competent men at the old figure. The bill if passed will affect the five counties in Ohio which maintain drafting rooms.

The Butte (Mont.) Chapter of the A. A. E. is advocating the merging of all engineering societies of Butte "for the benefit, the enlightenment and the progress of each organization. especially in dealing with state questions," according to a recent statement issued at its headquarters.

The Casper Club of the American Association of Engineers met Dec. 28 and elected the following officers: N. P. Nelson, assistant engineer, Burlington Ry., president and H. F. Johnson, resident engineer State Highway Commission, secretary.

The Engineers' Club of Cincinnati recently elected F. W. Willey of the Willey-Wray Electric Co. president; F. R. Healy, superintendent of the Union Gas & Electric Co. vice-president, and E. A. Gast, secretary and treasurer. The following were elected directors: George W. Galbraith, E. A. Muller, Frank Raschig, A. F. Shepard, G. M. Braume, Ward Baldwin and William P. Fosdick.

The Richmond Chapter of the American Association of Engineers recently effected a permanent organization with the following officers: President, J. C. Dickerman; vice-president, Arthur Scrivenor; secretary, A. S. Holway; treasurer, J. Henley Walker.

PERSONAL NOTES

Assistant Professor J. B. Kommers of the Department of Mechanics at the University of Wisconsin, has been appointed special research associate professor of engineering materials at the University of Illinois Engineering Experiment Station. Professor Kommers has a leave of absence from the University of Wisconsin to take immediate charge of the testing work of the Joint Investigation of the Fatigue of Metals, now in progress at the University of Illinois, under the auspices of the National Research Council, Engineering Foundation, and University of Illinois Experiment Station.

Francis H. M. Riley, formerly with Vaughn & Meyer, consulting engineers, Milwaukee, has become Wisconsin representative for the Vulcan Soot Cleaner Co., Vulcan Fuel Economy Co., and the Green Engineering Co.

H. T. Cory, consulting engineer of the U. S. Reclamation Service, leaves for Egypt Jan. 20, where he will serve as one of three members of an international commission which has been selected to pass on plans for irrigation work on the Nile River.

Marcellus P. Lee, who recently was discharged as captain, Engineers, U. S. A., has become connected with Clarkson & Gaines, architects, Fort Worth, Texas, as superintendent of construction and engineer in charge of their Amarillo, Texas, office.

Lieut. H. J. LaLonde, recently discharged from the 71st Field Artillery, has accepted a position with the St. Louis office of the Portland Cement Association.

Burr M. Stark, Assoc. M. Am. Soc. C. E., formerly associated with Morrell Vrooman, consulting engineer of Gloversville, N. Y., has been appointed Commissioner of Public Works of Amsterdam, N. Y., with the duties of City Engineer, as this position has been abolished and the office consolidated with that of Commissioner. Mr. Stark has engaged in municipal engineering during the past eight years.

John A. Stevens, vice-president of the American Society of Mechanical Engineers and consulting engineer in power-plant design and construction, has opened an office in Fall River, Mass., to handle business in the southern New England district. Carl J. Sittinger will be in charge of the office.

Roy N. Stewart, county engineer of Richland Co., Mont., has been appointed city manager of Scobey, Mont.

Walter E. Doolittle has left the Idaho State Highway Department to accept a position with the county engineer at Colfax, Wash.

A. W. Mahon has tendered his resignation as state engineer of Montana and member of the Montana State Highway Commission in order to enter private practice.

A. D. Butler has been reappointed city engineer of Spokane, Wash., and Leonard Funk is continued as Commissioner of Public Works for that city.

J. F. Ellington has resigned as chief engineer of Joseph E. Nelson & Sons to organize, with O. G. Miller, formerly in the general manager's office of the Illinois Central R.R., the firm of Ellington & Miller, Inc., general contractors specializing in railway buildings and terminals. The offices of the new firm are at 417 S. Dearborn St., Chicago, Ill.

L. R. Owen, senior member of Owen & Plummer, Inc., engineers, Johnstown, Pa., is now borough engineer of Brownstown Borough, Cambria County.

A. C. Lagerwall, resident engineer of the Douglas Co. Federal-aid roads, with C. B. Holmes and N. F. Strachan, has opened an engineering office at Lawrence, Kan. Mr. Lagerwall was formerly connected with the Portland Cement Association. Mr. Strachan is Associate Professor of civil engineering at the University of Kansas. Mr. Holmes had formerly served as assistant under Mr. Lagerwall in county road work.

N. H. Davis, head of the department of civil engineering at the University of Florida, has been retained by the commissioners of Smith County, Tenn., as chief engineer in charge of road construction.

Chester R. Anthony, Altoona, has been appointed engineer of the Borough of Roaring Spring, Blair County.

O. P. Thomas, Johnstown, Pa., has been re-elected borough engineer of Westmont Borough, Cambria County.

H. B. Kirkland, captain in the construction division of the Army until Jan. 1, has resumed his duties as president of the Concrete Mixing & Placing Co., with offices in the First National Bank Building, Chicago. Captain Kirkland was in charge of water-works and sewer construction and of purchases for the Delaware Ordnance Depot at Fredericktown, N. J. Recently he has been engineer officer at the Chicago Storage Depot transforming a Symington arms plant into a storage warehouse.

Alfred D. Ludlow, formerly connected with the Engineering Department of Kansas City, sewer section, is now engaged in consulting work in that city.

Frank R. Lanagan has been reappointed city engineer of Albany during the second term of the Mayor. Other reappointments in the Albany city administration are J. Sheldon Frost, Commissioner of Public Safety. and Wallace Greenalch, Commissioner of Public Works.

William W. Cox, for ten years connected with the Michigan State Highway Department, has been appointed Road Manager of St. Clair Co., Michigan, to carry out an extensive road building program in that county.

Floyd H. Fish, recently employed in the Research Department of the Great Western Sugar Co., Denver, Colorado, has been appointed special research test assistant at the University of Illinois Engineering Experiment Station. He will be one of the test party engaged in the investigation of fatigue of metals at that institution.

OBITUARY

George Weston, engineer of the Philadelphia Rapid Transit Co. and for some years assistant chief engineer of the Board of Supervising

Engineers in control of the Chicago tractor system, died in Philadelphia, Jan. 7. He was born at Kalamazoo, Mich., Jan. 20, 1861, and began his engineering career in 1880 as a rodman on the Missouri, Kansas & Texas R.R. He was connected with the construction of some of the early cable railways in Chicago and later carried out their conversion to electric traction, while in later years he was occupied largely in street railway improvement and valuation work. He was appointed to the Board of Supervising Engineers in 1907 and resigned in January, 1919, to go to the Philadelphia company.

EZRA FRED WOOD, consulting engineer with the International Nickel Co., died suddenly on Jan. 5 in the subway, at the age of sixty-one. He was one of the organizers of the company in 1902, coming to it from the Carnegie Steel Co., with which he had been connected for twenty years. Until two years ago he was vice-president. He was graduated from the University of Michigan and was a recognized authority on metallurgy.

Truck and Trailer Do Work of 40-Foot Railroad Car

Inability of the Westcott Motor Co., Springfield, Ohio, to obtain railroad cars to ship automobile bodies from Muncie, Ind., to its Springfield warehouses, led the company to employ the J. S. Wagner Transfer & Storage Co., Springfield, to haul bodies by auto truck. With truck and Troy trailers the transfer company hauled 21 of these bodies at a trip, the 200-mile round trip being made in 20 hours. The 21 light-6 touring car bodies—equal to the number that can be loaded into a 40-ft. railroad car—average about 500 lb. apiece, making a total load of only 10,500 lb. for both truck and trailer. The trailer is equipped with special racks, has a 22-ft. chassis and is of three-ton capacity. Protection from rough weather is offered the touring-car bodies by a large canvas envelope that fits closely over them.

BUSINESS NOTES

THE CANADIAN ENGINEERING AGENCY, INC., has been appointed and the Pearson Engineering Corporation has ceased to act as purchasing agents for the following companies: Ebro Irrigation & Power Co., Ltd.; Cataluna Railways, Ltd., and Allied Co.; Mexico Tramways Co.; Mexican Light & Power Co., Ltd., and Allied Co.; Rio de Janeiro Tramway, Light & Power Co., Ltd.; Rio de Janeiro and Sao Paulo Telephone Co.; Societe Anonyme du Gaz de Rio de Janeiro and Allied Co.; Sao Paulo Tramway, Light & Power Co., Ltd.; Sao Paulo Electric Co., Ltd., and Allied Companies. Louis J. Hirt is the consulting engineer and Walter P. Plummer is in charge of the purchasing department.

THE WICKWIRE STEEL CO., Buffalo, a $5,000,000 corporation, has been acquired by the Clinton-Wright Wire Co., a $16,000,000 Massachusetts corporation, after negotiations extending over a period of several months. The consolidated interests, which will be the second largest steel and wire industry in the world, will be known as the Wickwire-Spencer Steel Corporation, with a capitalization of more than $20,000,000. The principal officers of the corporation will be: president, T. Harry Wickwire, Buffalo; vice-president, Ward A. Wickwire, Buffalo; vice-president and general manager, George M. Thompson, president of the Clinton-Wright Co.

WILLIAM R. CONARD, AND J. STEWART BUZBY, who for a number of years has been actively associated with Mr. Conard as principal assistant, have formed a partnership for the continuation of the business of inspection and tests of materials, with especial relation to water and gas works supplies, and of reports, specifications, designs and general engineering, under the name of Conard & Buzby.

THE SOUTHERN ENGINEERING CO. of New Orleans has changed its name to that of Davidson Bros., with C. P. Davidson and W. H. Davidson remaining as partners in the firm's business of representing machinery and steel concerns.

TRADE PUBLICATIONS

The following companies have issued trade publications:

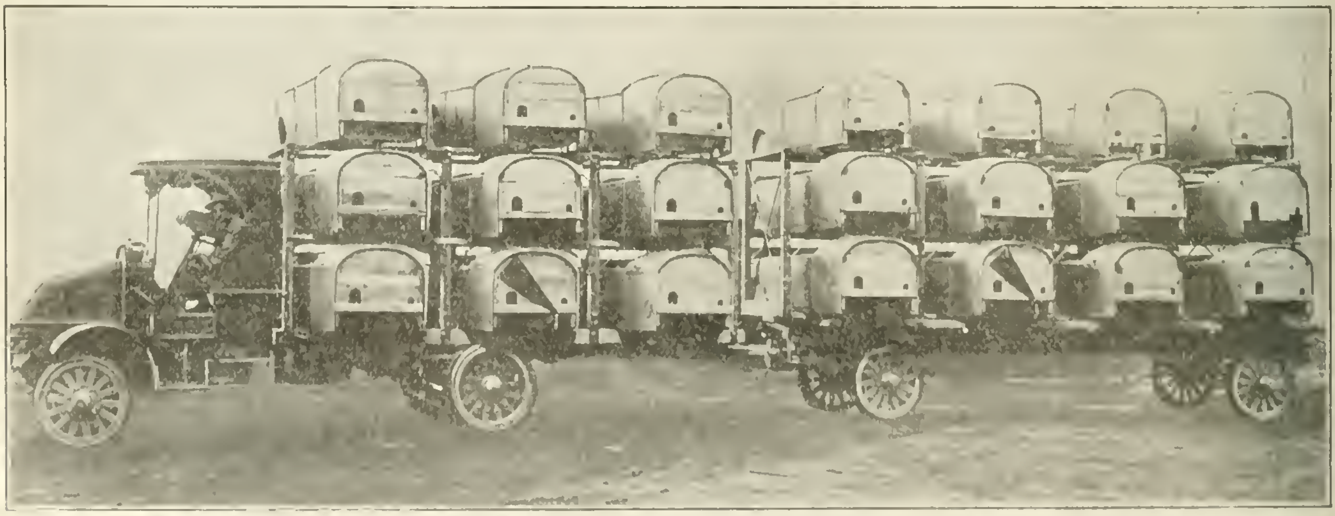
GUARANTY TRUST COMPANY OF NEW YORK; pamphlet, 4½ x 7 in., 30 pp., entitled "Federal Stamp Taxes on Original Issues of Stocks and Bonds and Transfers of Stocks." The pamphlet describes the stamp tax, and its application to and computation for various forms of paper issues.

F. C. AUSTIN CO., INC., Chicago; 16-sheet folder, 10 x 10½ in., presenting graphic illustrations of the Austin tube and drum mixers; also booklet, 7 x 10 in., 84 pp., describing and illustrating the Austin tube mixer, as adapted for various classes of work.

THE AUTOCAR CO., Ardmore, Pa.; 6 x 8 in. pamphlet of 7 pp. containing seven illustrations of Autocar equipment and a list of several hundred Autocar owners, to whom the text invites reference.

THE DAVIS-BOURNONVILLE CO., Jersey City, N. J.; bulletin, 8½ x 11 in., eight pages, illustrated, on "Directions for Installation and Operation of Davis Acetylene Generators Nos. 25, 50 and 100," prepared especially for users of the equipment.

THE AMERICAN CEMENT MACHINE CO., INC, Keokuk, Iowa; catalog No. 920, 8½ x 11 in., 63 pages, illustrated, describing, "'Boss' Labor-Saving Construction Machinery." It contains descriptions of various forms of contractors' concrete machinery and equipment, with illustrations of their use.



AUTOMOBILE BODIES HAULED BY TRUCK

A Consolidation of Engineering News and Engineering Record McGraw-Hill Company, Inc.—JAMES H. MCGRAW, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN
Editor

Volume 84 NEW YORK, THURSDAY, JANUARY 22, 1920 Number 4

Richard C. Maclaurin

THE death of Dr. Maclaurin removes from the ranks of the profession a man whose career as a leader in engineering education developed at meteoric speed and whose future influence promised to be even larger than it was at his death. A mathematical physicist by avocation, he was called to the presidency of the Massachusetts Institute of Technology at a time when that school found its future hampered by inadequate plant. Dr. Maclaurin's vision, personal magnitude, and administrative genius were equal to the situation. The great buildings on the left bank of the Charles River were projected, financed and completed in a time so short that we still marvel at the accomplishment. True, he was fortunate in finding the mysterious "Mr. Smith," but had he not found him the new buildings would have materialized nevertheless, for Dr. Maclaurin's vision and personality were compelling. He would have found other means to build into enduring fabric the physical plant of which he dreamed. Nor must he be looked on solely as a great financial administrator. He was as truly a leader in engineering education. Preserving the sound traditions of the institute, he injected a new virility. Courses that broke new paths were introduced whenever there was a demonstrated need; those in business and engineering administration, in chemical and in aëronautical engineering are notable examples of courageous leadership in new fields. Such a leader the engineering profession could ill afford to lose.

Words of Promise from Philadelphia

A BROADMINDED view of municipal interests and responsibilities was voiced by Mayor Moore of Philadelphia last week when he urged the city council to appropriate money for the Camden bridge. He asserted that the city will derive great benefit from improved connection with its New Jersey suburbs and their outlying territory, and that on that account it ought to contribute to the construction fund. This view of the matter, natural though it be, contrasts strikingly with the view that has prevailed for years—for generations—in New York, where the same situation exists, with the Hudson in place of the Delaware. Commercial and political interests in New York City have always taken the attitude that the city should not participate in bridging or tunneling the Hudson, on the ground that such connection would benefit the New Jersey communities at the expense of New York. It is State money, not city money, that is to build the highway tunnel to Jersey City, soon to be started; and probably it will be State or else private capital that will undertake to construct a bridge across the Hudson, in the future, for the tradition that a city's growth must be halted at a State line is still powerful among New Yorkers. In time, the truer view taken by Mayor Moore will prevail generally. At present it is a most hopeful symptom of a growing concept of municipal responsibilities.

Hindsight vs. Foresight

THE COUNTRY might as well be prepared for several months of excited investigation of war extravagances. Exigencies of political strategy explain many things. Engineers and contractors are going to come in for more than their fair share of such criticisms as the Congressional investigating committees are called upon to make, because so large a part of the war expenditures in this country, at least, went toward construction. Comment as to the virtue of such criticisms must await a specific case. Although the armistice was signed in November, 1918, a canvass of the country in July of that year would have found about 95 per cent of our citizens betting on another year of war. This the critical Congressman choses to forget. With him hindsight rises superior to foresight. Because a certain plant, designed to supply munitions in the spring of 1919, never reached production, its designers are held up to public reproach. Apparently, any bright young man should have foreseen the eleventh of November. Such criticism carries its own answer and the engineers who are subjected to it should understand that they have the sympathy of their fellows.

Belgium's Recovery

ENCOURAGING, indeed, is the news that comes from Belgium regarding its industrial recovery. In a recent booklet on the subject D. L. Blount, recently director-general of the Central Office of Information, Ministry of Economics of Belgium, places the following estimates on resumption of industry: Coal mines, 94 per cent normal; refined sugar, 100 per cent; cotton spindles in operation, 75 per cent; cotton looms, 60 per cent; wool products, 75 per cent; shoes, 70 per cent; window glass, 34 per cent; plate glass, 36 per cent; steel mills, 30 per cent, while 12 blast furnaces are now producing 10 per cent of the output of the 54 blast furnaces in operation before the war. Of the machinery taken away during German occupation, 5,069 pieces out of 9,797 have been recovered. The agricultural production in 1919 surpassed the average for the years just preceding the war, the yield of wheat, oats, barley, and rye having been particularly good. In the light of the unfavorable reports current in the newspapers regarding conditions abroad, this showing of Belgium is very encouraging. It warrants the hope that a return to normal will not be as long deferred as we have been led to expect.

Pinch Piling Soft Ground

SOME of the complications of soft ground foundations are nicely illustrated in the Portland grain elevator case described on another page. The records indicate that the observed phenomena in pile driving were not sufficiently regarded during the construction of the foundations, and that there was undue confidence engendered by the high load carrying capacity of a single test pile. In a soft foundation such as this, a single pile carries its load by a pyramidal distribution to its base, the slope of the pyramid depending on the cohesion of the soil and the friction between the soil and the pile. One pile, therefore, may distribute its load from the foot-square area at its top to an area of 25 sq.ft. at its bottom, thereby having a ratio of bearing to load of 25 to 1. In a group of such piles, however, driven side by side, the bearing areas intersect so that the ratio of load to bearing by no means remains the same as for the single pile. In a large foundation such as that covered by the Portland elevator the load is transmitted from the area of the footings to an area 40 ft. below the footings of a size increased only by the slope of the load on the outside row of piles. The bearing area, therefore, may be but slightly greater, say 10 or 15 per cent, than the loading area at the top of the piles, and the superiority of the pile foundation over a floating foundation of the same area is represented only by this proportion, provided the same soil conditions prevail throughout the 40-ft. depth.

Pinch piling such as was used in the Portland elevator helps by increasing the area at the base of the piles and thereby providing a lower unit loading by spreading the bearing area. There can be no increased bearing value in the piles due to friction except, as has been mentioned, that due to the small sloping of the load on the outer row of piles, nor will the pinch piling measurably increase the value of the foundations by compression of the soil between the piles, any more than the additional driving of piles, such as was resorted to in the Portland original footing, will help the bearing value, except insofar as it stiffens up the soil outside the footing area and thereby increases its friction angle and consequently the distributed bearing area.

At Portland the pinch piles act in effect as spread footings and have so reduced the unit load at their base as to make the loading safe at present. Just how much of the retardation or stopping of the settlement is due to this decreased unit bearing effect, and how much to the removal of the heavy hydraulic earth fill in the basement of the structure, time only will tell. The settlement will, however, serve to call new attention to the fact that piling is largely a device to transmit load from a soft soil to one of greater carrying capacity and that unless it reaches such a stronger stratum it tends to be a rather uneconomical form of spread footing.

Engineers and the Public Works Department

NINE months ago a group of engineers met in Chicago to plan a campaign which would result in the coördination of all engineering functions of the Government in one great Department of Public Works. The occasion was significant, not so much because of the purpose of the meeting, though that is entirely desirable and laudable, but because it was the first time that the whole engineering profession had joined, without regard to special society affiliations, to contribute to the improvement of national conditions. It was a step toward a professional integration which has long been sought and which must be preliminary to any improvement in the much discussed "status of the engineer."

Last week the successor to that group met in Washington to take stock of the progress of the campaign. The reactions were generally optimistic. Representatives from at least 100,000 engineers from every section of the country reported widespread approval among engineers of the proposed Governmental reform and a not unfavorable attitude of members of Congress who had been approached. Criticism of the main features of the proposed bill formulating the department were practically negligible; indeed, it was hinted that some definite opposition would be desirable. And yet it cannot be denied that the movement is languishing; its failure is imminent from the cause that underlies so many good movements—lack of funds.

This prospective failure is something that concerns all engineers; its occurrence would discredit the profession. If there were any considerable opposition to the Department of Public Works idea among engineers or if there were any pronounced objection to the present campaign voiced by engineering societies, the situation would not be so clear. With the entire profession approving the plan, the collapse of the Public Works Department campaign would be a lamentable display of weakness. It would be a blow to engineering morale from which there would be no early recovery.

There may be many reasons why the engineers cannot reform the Government of the United States, but it should not be for the lack of the $90,000 that will be required to finance the Public Works Department propaganda for the next year. Every society represented in the association should realize that; every one should appreciate the convention's clear-headedness in rejecting the proposed establishment of individual memberships at $5 a year—it would only take 18,000 members—in favor of the present society representation. The organization of the association is loose, but it is good and it should be effective. With the responsibility for raising its quota upon every State delegation, money-raising activities become centered. For the credit of the profession each center must do its duty.

One other development of the Washington meeting presents some complications. That is the very evident desire of the backers of the movement to extend its scope so that it will include, either now or in a not too remote future, the efficient reorganization of the United States Government. Such an enlargement of the association's field may be suggested by practical reasons, for some who are not engineers will lend their support if a wide reform is attempted. Such a broadening of scope seems to us undesirable. Instead, we should shape our appeal to make the business man and the general taxpayer see how they are to be benefited by the economies to be effected by the organization of a Department of Public Works. Obviously it will be proper to indicate that the formation of a department having such a logical and consistent basis would be but the first step in a general reorganization of the Government's executive departments, but the association should not pledge itself to carry the reform beyond this first step of putting all of the engineering and public-works activities together.

Moreover, if the Public Works Department Association were to set itself up as the destroyer of governmental inefficiency it would have to present greater claims to knowledge of governmental affairs than was displayed at Washington. It must have no doubt as to where the Bureau of Education belongs, and it must not so much as countenance a suggestion that a Federal insane asylum be put under the jurisdiction of that fiscal abnormality, the District of Columbia. So long as it professes only to coördinate engineering activities, it can shift responsibility for other branches of the Government, but once it got outside that field it would lose the confidence of Congress if it did not have definite knowledge and defendable opinions on the great machine which it essayed to overhaul.

Engineer-Managers in the Operation of Irrigation Works

MANY irrigation projects, both public and private, have now been completed. A few are in the hands of engineer-managers, and the number so handled is rapidly increasing. The former days, when a likely farmer might become a ditch rider, and in turn might work up through a watermaster's position to that of manager of the project, are rapidly disappearing. Technical men are coming into their own in the supervisory positions. Attendance recently at a water commissioners' meeting presided over by a former well known consulting hydraulic engineer as the executive head, convinced the writer more than ever that this is true. Almost every problem that was discussed, from the exchange or purchase of stored water to the adjustment of the minor complaint of a farmer as to non-receipt of what he considered his full quota of water, was handled expeditiously, without friction, because the facts were primarily engineering ones and the engineer had supporting data practically carrying its own decision.

Engineers and designers of new projects will benefit materially from having their work handled understandingly by engineers, and a rapid development of standards should accrue to the profession. Added support will be given to assumptions made in designs. The United States Reclamation Service is now standardizing small structures found in operation to be successful and satisfactory. A 10-in. pipe turnout and gate through an earth embankment, henceforth, need not be redesigned by every new batch of civil service recruits. Sluice gates, weirs, drops and like minor structures have been changed in small operating details by the engineer-managers of the Reclamation Service until the production of "shelf hardware" standards is now possible. Much more work in the standardization of larger structures and in the way of doing things and meeting recurring problems will be done if engineers are employed. Knowledge of what does and does not work, set forth by engineers on a given project, should save managers of other projects much work and obviate many difficulties, at the same time reducing operating costs.

Hydrographic problems on a project are largely engineering. Apportionment of water in accordance with evaporation can best be made by engineers. They can also best determine ditch losses, soil conditions, depth and general subsoil porosity, ground water levels, the rate of draining and all seepage difficulties. And danger of drowning out can be predicted by engineers several years before actual drowning out occurs, so that precautionary measures can be taken well in advance. Land that is producing at its maximum can easily stand the seepage safely factor cost. The operator is the one who should recognize the need for drainage first and spread the propaganda for action long before actual damage results.

Control of supply becomes more and more distinctly an engineer's problem because, with development to capacity, conservation of every portion must be observed most scrupulously. No sites for the storage of water are available at such ridiculously low figures as those of the past. In consequence, stored water hereafter will be required to do its full duty. Apportionment in accordance with priorities and requirements is becoming an absolute necessity. Only the engineers can do it scientifically and hence satisfactorily. Just how is water delivered? What will be the total supply for the season? How much can the farmer expect if there is a shortage? In many cases one-half and one-third or less "heads" were available in 1919 than usual. Prognostications based on engineering data of rainfall, snowfall, runoff and actual storage will be credited far more and can be acted upon more coöperatively than the guesses of the non-scientific farmer, politician, or business type of man heretofore occupying the managerial positions in canal companies or elective watermaster jobs in irrigation districts. Engineers in other lines owe it to the profession to encourage the pioneers who enter operating positions, and should support them in every way possible.

Filling the Vacancy of Chief of Engineers

THE announcement of the nomination of Colonel Lansing H. Beach as Chief of Engineers, United States Army, comes as a disappointment to those who confidently expected that the selection of the new head of the Corps of Engineers would be based upon demonstrated capacity for leadership in engineer operations in modern warfare, as shown by actual service with the American Expeditionary Forces in France. If such standards had governed, the former chief engineer of the A. E. F., Major-General W. C. Langfitt, would have been chosen as the new Chief of Engineers. The highest honor which can be bestowed upon an officer of the Engineer Corps, therefore, goes not to a man who performed brilliant service in the theater of operations during the late war, nor to a man who, at Washington, played a conspicuous part in the organization and administrative work necessary to back up the efforts of our combatant forces, but to a man who, throughout the period of hostilities, was engaged in the usual river and harbor work. Let it be understood that the foregoing comment is in no way a reflection upon Colonel Beach; he is a soldier, and obeyed orders as to his assignment during the war, just as he now obeys orders in becoming Chief of the Corps.

With reference to the promotion it should be noted that the seniority rule was broken in naming the new Chief of Engineers. In the natural succession Colonel F. V. Abbot would have been the nominee. The argument cannot be advanced in support of the appointment just made, therefore, that it was necessary to follow precedent by promoting the man at the top of the list, for Colonel Beach was No. 6, a single number above Colonel Langfitt in the roster of colonels.

The case, however, is one with a far broader significance than the mere promotion of an individual. The real issue is one of principle. There could be no excuse for breaking the seniority rule except to appoint the best man, but the inference to be drawn from the War Department's nomination is that war service, presumably the supreme test of an officer's ability, is to be disregarded. Rumor in Washington has it that in making the selection Secretary Baker was actuated by a desire to side-step what might become another item in the March-Pershing controversy, but that does not change the fact.

The corps would have been the better, in our judgment, for the appointment of a man of the broadest experience in that for which the corps is primarily organized—the study, and, when necessary, prosecution of military engineering work.

River Regulation in a New Aspect

IN NO single field of civil engineering is development so pronounced as in flood protection. It was one of the very few subjects of public-works construction to grow into prominence during the disturbed five years of world war. Now, with the new year, it holds out promise of great coming activity.

Its prominence must be credited largely to the exemplary work for the protection of the Miami Valley, though the discussions and planning elsewhere, as at Columbus and Erie, no doubt contributed to the result. But the underlying factor is economic necessity, the essential importance to well-ordered communities of preventing the destruction and business disruption caused by recurring floods. Recognition of this necessity grew as the magnitude and frequency of the losses impressed themselves upon ever wider circles of the public.

Hitherto several distinct causes tended to hamper the development of flood protection. Losses being infrequent and irregular, any single impetus to the building of protective works was not maintained long enough to assure their execution, in the absence of a sufficiently wide appreciation of the issues involved. In most cases either the problem or its solution was regional rather than local. Means for securing regional action were wanting. The legislative status of the subject was unsatisfactory, a condition now being remedied by new legislation or the better administration of existing laws. Even locally, the fact that losses were confined to small parts of a community proved hampering, for the effect of such partial losses on the community as a whole was commonly ignored. And, not least important, there was the fact that streams were not (and still are not) definitely under one—or any—jurisdiction. All these hampering causes are being removed or rendered ineffective as general interest in the subject extends.

Simultaneous with this growth of interest, there is coming about an active appreciation of the wide range of problems presented by flood losses and their prevention. It is axiomatic today that no fixed formula or device is capable of fitting the remarkable diversity of conditions encountered in flood-protection planning. The great differences in hydraulic stream character would alone make each individual case a new one; but, superimposed on these are equally momentous variations in topography, in rainfall, runoff and concentration, and in the values at risk as well as in the distribution of these values among the flood contours. It is obvious that in general no approach to a solution can be made until all of these elements have been investigated. Yet this was not adequately realized until recently. It is only slightly extravagant to say that an inversion of method in attacking flood problems has come about: that some years ago it was common to attempt to adapt a flood stream to a particular type of preventive or protective construction, whereas now it is known to be necessary that constructional types singly or in combination be selected according to the specific dictates of the physical conditions. This is an important advance.

An even greater advance of thought is bound to grow out of flood studies, however. When they are viewed from the standpoint of flood protection, rivers and river regulation will appear in a quite new aspect. Streams will come to be regarded as hydraulic and hydrological entities, each of which in all of its characteristics concerns the community taken as a whole. Following this a new meaning will attach to river regulation; namely, that it is the administration of a stream as an entity.

In the past the relation of the public to a stream has apparently been fractional and incomplete. The stream was looked upon as a source of water supply, or as a drainage channel, or as a source of power or an agency of destruction, or as a means of navigation. It was under divided jurisdiction, moreover, and commonly under no particular jurisdiction. Because of this habit of view, it was possible for such accidents to happen as the Black River flood in Wisconsin, a case in which river utilization was planned from a single viewpoint and others neglected, with calamitous results. Because of this same view, river regulation remained a virtually nonexistent activity, except for the scattered and "single-track" work of the War Department. It was thus possible for the Government to spend many millions for improving a stream within its low-water width and at the same time ignore deliberately all river effects above the low-water shore line. In fact, the traditional view was nowhere so seriously faulty as in its effect: it tended to paralyze all initiatory action for improving or utilizing rivers.

Responsibility for this unfortunate condition rests in large part, we think, on Congress and the War Department; the former for assuming absolute control over the navigation function of rivers and failing to take account of or allocate jurisdiction over other functions; the War Department for administering its control narrowly in the interests of navigation. The fault lies, indeed more in the administration than in the law, for in spite of the narrow mandatory provisions of the law a reasonably liberal interpretation would have extended its application to many other purposes as being necessarily involved through their intimate connection with the main one.

River control, as a whole, is in its infancy, relative to other engineering subjects. It is certain to grow as the navigation view of river administration becomes less dominant. The time for the supremacy of this view is over. We believe that the view which will develop and lead to progress is that river administration is the responsibility of associated localities or regions, and that its technical problems are the responsibility of the civil engineering profession as a whole.

A noteworthy phase of the situation created by past conditions is that, although only large streams came under navigation control of the Federal authorities, yet the inhibitive influence of this control extended to the minor streams. And this matter is of importance because according to present indications the greater number of flood-protective and other river-regulation problems will arise on the smaller rivers and brooks. Even now there are several cases of such streams in the planning stage, besides those on which construction is progressing, while on the other hand no flood problem of a navigable river is active. However, the paralysis of civilian engineering thought with respect to river regulation has been serious, and a great deal of study lies ahead in preparing for the proper handling of the work that will need to be done. As the larger view of regulation comes more fully into being, it is likely to prove a powerful stimulus to this study.

Deep Substructure of Assay Office Built in Quicksand by Caisson-Inclosure Method

Excavation for Vault to Depth of Thirty Feet Below Groundwater Surface Carried Out Successfully Inside Caisson Cofferdam—Joints Sealed by Stockramming

By T. Kennard Thomson
Consulting Engineer, New York City

FOUNDATION conditions typical for the quicksand district of the New York financial district were encountered in very difficult work required to build a deep vault as the below-ground portion of the new Assay Office building on Wall St., New York City. The soil at the site is quicksand that will run like water; rock is about 50 ft. and groundwater about 20 ft. below street level. In this material it was required to build a substructure five stories deep below the surface—down to rock and, in fact, cutting 4 or 5 ft. into the rock—without disturbing adjoining buildings, especially the United States Subtreasury directly to the west and the 9-story Gallatin Bank to the east. The problem was handled successfully by a careful selection of working methods to suit the conditions. A caisson cofferdam was constructed, as shown completed in the view Fig. 1, and the soil inside was excavated without any trouble from leakage or pressure or movement from the ground. Prior to excavating, the joints between the several caissons of the cofferdam were sealed with clay by the stockramming process, this being the most prominent instance of the use of this process for a number of years; the results thus produced were extremely satisfactory.

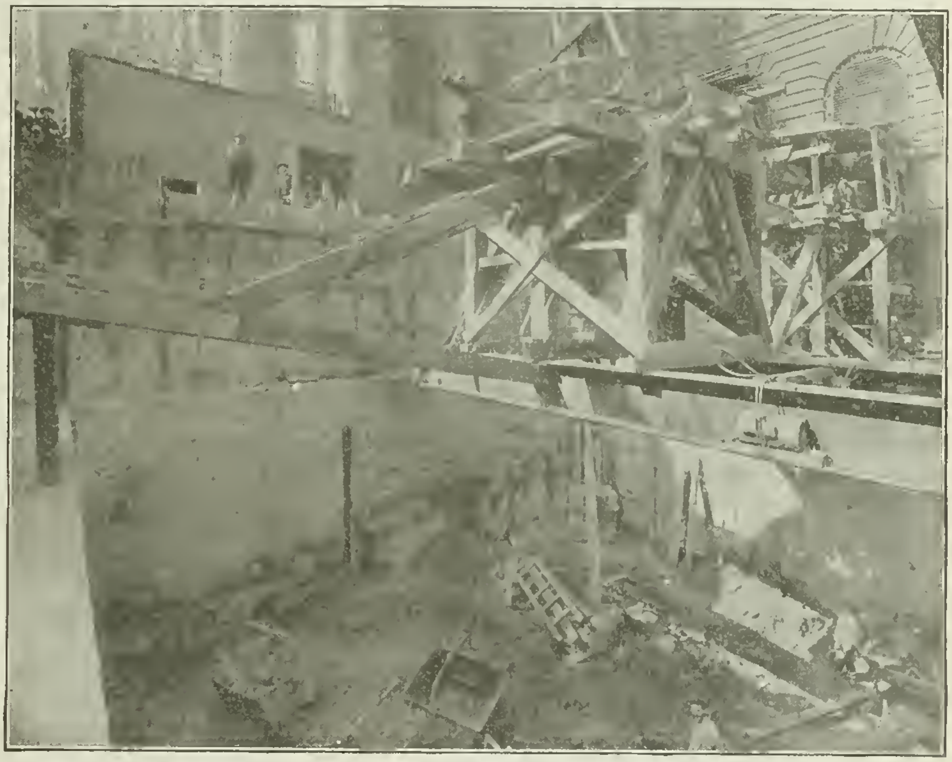


FIG. 1. COMPLETED CAISSON COFFERDAM OF NEW ASSAY BUILDING, BEING EXCAVATED WITHOUT BRACING

No leakage through joint between caisson in far wall, open below cast cap except for rammed seal of clay

An account of the work is given in the following, preceded by a statement of the foundation work for what is now the older portion of the Assay Building—namely, the refinery building—constructed 10 years ago. The caisson work of that structure differed in notable particulars from those of the more recent operation.

Refinery Building Caisson Foundations

In 1909 the United States Treasury Department let a contract to the Merrill-Ruckgaber Co. for building the foundations of a nine-story addition to the Assay Building in New York City, an addition subsequently called the Refinery Building, situated north of the Assay Building and in the middle of the block between Wall and Pine Sts. The contract included the underpinning of 25 and 27 Pine St., one by the Breuchaud method, with 3-ft. cylinders, and one by the Thomson collapsible-caisson method, as modified by Mr. Merrill; in the latter, caissons were used similar to those described by F. R. Eastman in *Engineering News-Record* of Aug. 21, 1919, p. 369, except that the cylinders were welded instead of being made of riveted sections, and were 4 ft. in diameter. The refinery building foundations themselves comprised 26 caissons, about 6 ft. square each, of reinforced concrete.

These caissons had all of the concrete placed on the deck before sinking started. In the group shown by Fig. 2, three caissons on the east side of the lot, the one at the left is nearly all down so that only the lock is seen, the middle one has the lock in place ready for sinking, while the third has just had the forms stripped and is ready for the lock. At this point four caissons were built up complete and were sunk to bedrock in two days each. There were 26 caissons in all, which reached rock at El. —26.3 to —31.3 ft., sidewalk elevation being +21.86; groundwater was reached at +8.85.

A Mattson lock was used in this work, with satisfactory results. The caisson concrete was built up in 5-ft. lifts, whereas in the recent work on the foundations of the main Assay Building the concrete from cutting-edge to ground line was all placed in one day. The solidity and imperviousness obtained by the latter method was not so essential in the earlier work, where the caissons were to support the building only and not act as cofferdam and retaining wall. The 1909 work was completed successfully, thanks to the exceedingly great care used by the contractor, without underpinning the corners of the adjoining Gallatin Bank or the old Subtreasury Building. An example of the care taken was the late Mr. Merrill's decision to use a pneumatic caisson for sinking an elevator pit, although the depth was only 6 ft. below the surface of the water. In the local circumstances, this was probably the most economical as well as the latest method, since the quicksand at the site runs very freely indeed. Mr. Merrill probably established the record for least depth of a pneumatic caisson. On account of the care used in the work, he would have been willing not to have underpinned the buildings at 25 and 27 Pine St., but the Government engineers did not care to take any chances, and therefore required him to put underpinning cylinders (3-ft. and 4-ft.) under the buildings.

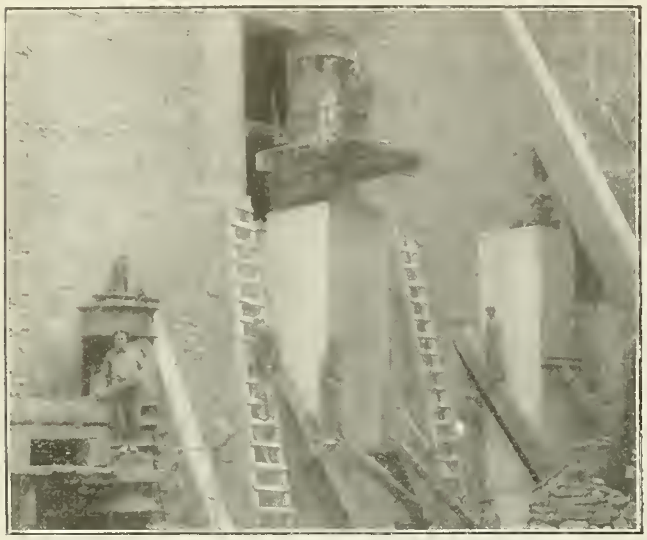


FIG. 2. CAISSONS ON EACH SIDE OF REFINERY BUILDING, 1909

Construction of the refinery building was conducted under the supervision of Robert A. Greenfield (now Major), with the writer as consulting engineer.

New Assay Building

Several years after the completion of the refinery building, the historic old Assay Building on Wall St. was torn down, and bids were asked for constructing a new building. The first bids exceeded the appropriation, and it was not until the summer of 1918 that satisfactory bids were received. Acting Supervising Architect James A. Wetmore let a contract to Charles T. Wills, Inc., for a lump sum, at a time when very few contractors would even talk about a lump-sum contract, in view of the uncertainty of the money, labor, and materials market under war conditions. The bid accepted was the second lowest, the low bidder having failed to qualify.

The building has five stories above street level and five stories below, so that it involved remarkably deep excavation, which meant difficult construction. Another bidder offered to do the work by the cofferdam method, but the Supervising Architect's office wisely refused to consider it; a similar job carried out by this method with maximum depth only 10 ft. below groundwater level resulted in a lawsuit in which each side spent probably $25,000, and in which the damage claimed was four times that amount. It would have been a very risky matter to attempt to put an open cofferdam in at the Assay Building site, over 30 ft. below water level, where the quicksand runs like water. In similar ground, even careful pneumatic caisson work has caused settlement of foundations over a hundred feet away, although foundations near the excavation were not affected. It might be noticed also, concerning the practicability of the method, that in constructing the Municipal Building, about a mile to the north, the contractors, before starting the caisson work, dug a sump and attempted to lower the water level by pumping, but they lowered it only 4 in. in three weeks' work, and then, naturally, gave up the attempt.

The contractor sublet the foundation work to the Underpinning & Foundation Co.; doing all the caisson work, excavation, etc., and underpinning the Subtreasury and the Gallatin Bank. Subsequently the writer was retained by the supervising architect to act as consulting engineer and inspect the work. Figs. 3 and 4 explain the general nature of the work by vertical section through the foundation and by a plan of the caissons.

Underpinning Operations

As finally carried out, the underpinning of the Subtreasury comprised six 12-in. pipes and sixteen 15-in. pipes jacked down to hardpan under the east wall. They were grouped in six clusters or piers, the one under the heavy steps on the Wall St. front consisting of two 12-in pipes and the others of four each.

A pit was excavated under the old basement walls about 5 ft. wide by 6 ft. high, to give room for driving down the pipes. The hydraulic jacks were aided by water jet at pressures up to 80 lb. per square inch. The cutting edges of the pipes actually penetrated several inches into the hardpan, until stopped on a boulder. The sand was forced out of the pipe by water jet, and the pipe was then filled with concrete by means of a bottom-dump bucket just large enough in diameter to work inside of the pipe, and about 30 in. high. After each and every pipe had been filled with concrete it was capped with horizontal and vertical I-beams, wedged in place with steel wedges, and tested by means of a hydraulic jack to either 80 or 90 tons. This test was kept on until there was no further settlement or penetration, and while the jack was still acting the wedges were driven home. The penetration under the test varied from ¼ in. to, in one case, 3⅝ in. After the whole pier or cluster had been so treated, the rest of the space which had been cut out of the wall was filled with concrete.

Cluster 1, of two 12-in. pipes, was under the Wall St. steps, and it was not considered safe to put more than 38 tons pressure on; these pipes were stopped under that pressure at elevations —15.47 and —18.1. All other pipes were stopped on a boulder, the hardest kind of stone found in New York.

Similar methods were used under the west wall of the Gallatin Bank, where seven clusters of four and one cluster of three 15-in. pipes were put down. All the underpinning was completed during the last three months of 1918. There has been absolutely no settlement in any of the adjoining buildings or in the street surface.

The Assay Building contract called for a ring formed of 10 caissons, each 5½ ft. wide, to form the walls of

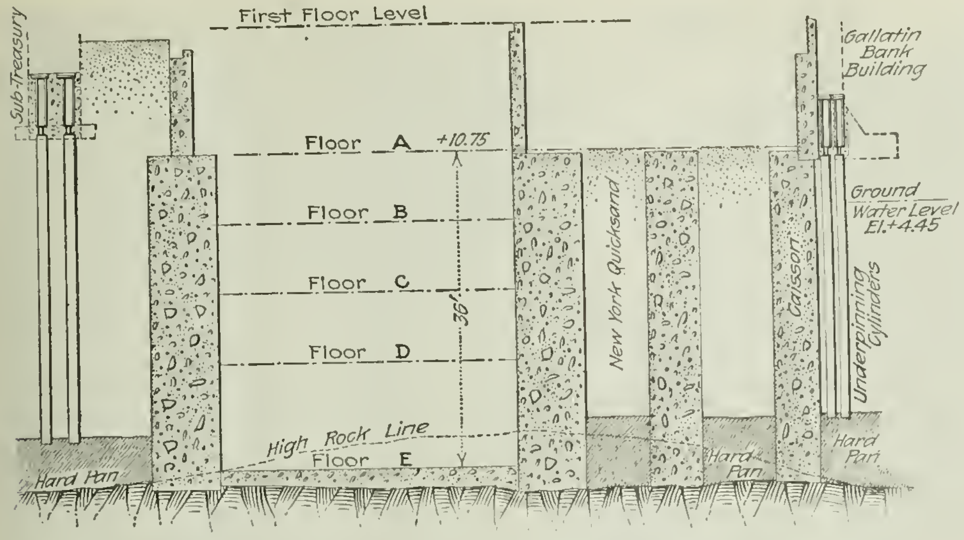


FIG. 3. VERTICAL SECTION OF NEW ASSAY BUILDING FOUNDATION, WEST TO EAST

the vault, an inclosure 38 ft. x 43 ft. (north and south). As the bottom of the excavation was to be 35 ft. below groundwater, the 5½-ft. wall would not be safe without heavy timber bracing while the cellar was being dug. It was therefore decided to increase the north, east, and west caissons to a width of 8 ft., which made timber bracing unnecessary. Two heavy struts were put in a place as a precaution, each consisting of four 12 x 12 timbers connected by blanks so as to form a strut about 4 ft. square, one north and south, the other east and west. As the wedges were loose when the struts were removed, the wedges at their ends were loose, showing that they were not needed. It should be stated here, though, that the concrete in the working chamber extended below the cutting-edge through the hardpan to bedrock, thereby giving the caissons a good anchorage; and, to make doubly sure, we connected all of the caissons together by means of a concrete cap 3 ft. thick and as wide as the caisson.

When the caisson width was increased to 8 ft., the number of caissons was decreased from 10 to 8, thereby saving two joints between caissons. All eight of the caissons were built in place before any sinking started. The concrete from cutting edge to water line, about 26 ft. high, was poured in one operation, which generally took a day and part of the night; the joint of milk of lime formed between two days' work is apt to be gradually washed out, allowing seepage to find its way through sooner or later.

The two 5½-ft. caissons, (south) took four days to sink, while the 8-ft. caissons, which were longer than the narrow ones, only took three days each, with the same number of sandhogs in each (generally four). The caissons were first ditched from 5 to 10 ft., and then the air pressure work commenced. In one case an attempt was made to sink two adjoining caissons at the same time, but this mistake was not repeated.

The concrete, of 1:2:4 mixture, had a waterproofing compound consisting of 3 lb. of integral waterproofing to each 100 lb. of cement.

The joints between these caissons were made as follows: Two 6 x 8-in. timbers were attached about three feet apart to the ends of the caisson to be sunk first, so that the next caisson could not get within 6 in. of it. These timbers extend from the cutting-edge to the groundwater surface (top of caisson). After all the caissons forming the vaults were completed from bedrock to the ground level, a 4-in. steel pipe was jetted down between the caissons in the space between the timber separators to the cutting-edge. After the sand was washed out of the pipe, clay rolled into shapes somewhat bigger than an ear of corn was rammed into the pipe, several lumps were dropped down the pipe, and a steel rod just large enough to work easily inside of the pipe was used as a ramrod to force the clay out at the bottom, gentle blows from a piledriver assisting the process.

The pipe was raised, in successive stages, as the ramming progressed so that finally the clay seal was completed to the top. The amount of clay used was approximately one-half the volume of the space between the caissons and the separators—that is, half of a space 6 in. by 3 ft. by the depth from top of caisson to cutting edge.

While it is very essential to have the clay compacted, hard enough to hold the water pressure back while the cellar is being excavated, utmost care must be exercised, on the other hand, to see that the ramming is not overdone. It has been found this "stockramming," as it is called, has an accumulative action and is powerful enough to separate the caissons. Stockramming through a single 10-in. pipe for the Croton Acqueduct cracked and lifted 500 cu.yd. of masonry.

This clay in the joints successfully held back a head of 35 ft. of water while the cellar was being excavated, and permitted the removal of the sand from between

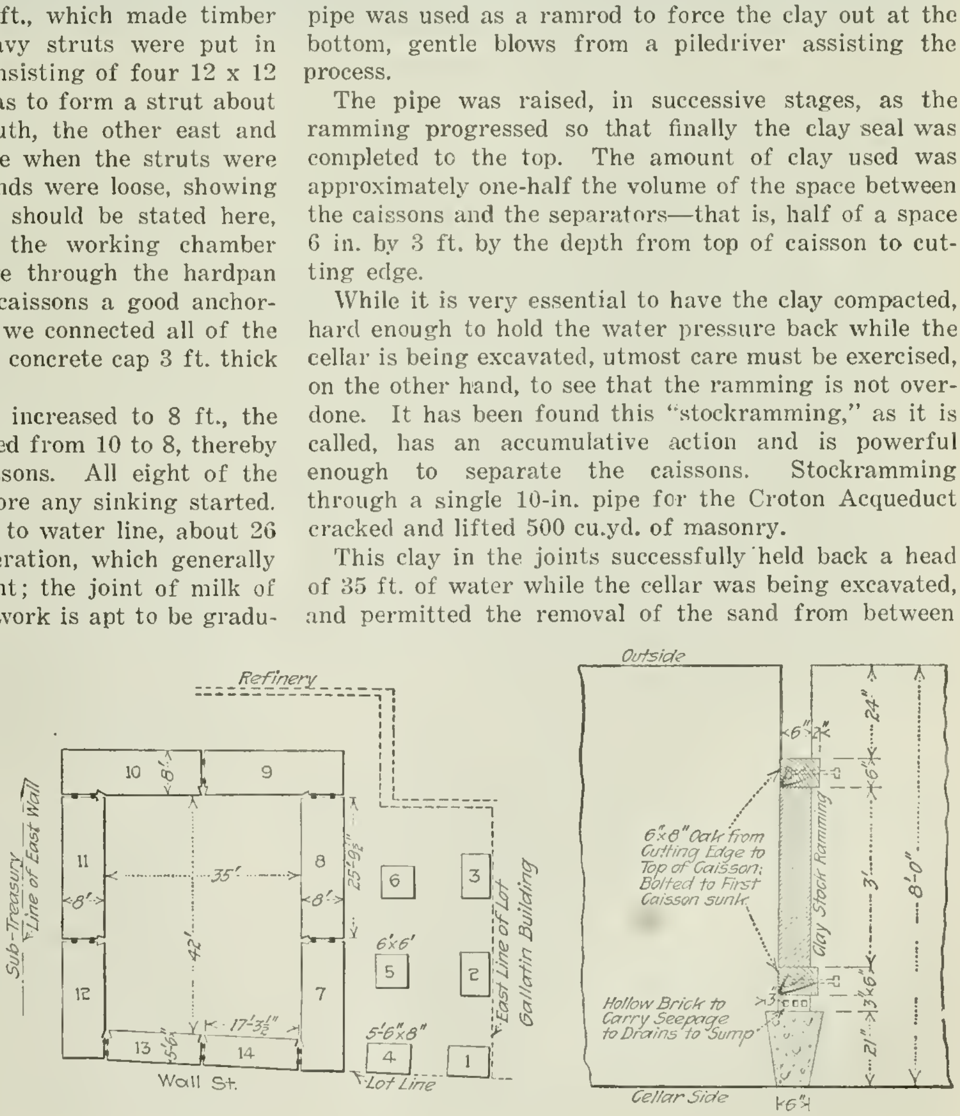

Refinery
10
8'
9
11
8'
35'
8
8'
25'-9½"
6
3
12
42'
7
17'-3½"
13
5'6"
14
Wall St.
6'x6'
5
2
5'-6"x8"
4
1
Lot Line
Sub-Treasury Line of East Wall
East Line of Lot Gallatin Building
Outside
6"
24"
6"
6"x8" Oak from Cutting Edge to Top of Caisson; Bolted to First Caisson sunk
Clay Stock Ramming
3'
8'-0"
Hollow Brick to Carry Seepage to Drains to Sump
3'6"
21"
Cellar Side
6"

FIG. 4. PLAN OF CAISSON FOUNDATION AND JOINT DETAIL

FIGS. 5 AND 6. STOCKRAMMING TO SEAL JOINTS BETWEEN CAISSONS

the two caissons back to the first timber separator. The space so cleared was then filled with concrete. By referring to the plan, it will be seen how the writer devised a wedge shape for this concrete. This kind of a joint is not only the cheapest but much the safest that has yet been used. The joints made in halfmoon shape (double) with the aid of compressed air, lose much more material, and in one case caused the death of one man, by burning, and the severe injury of several others, owing to a candle setting fire to the rope which was lowering some oakum to be used for stopping leaks.

The thickness of hardpan passed through by the caissons was from 3 to 8 ft., and in addition from 2 to 5 ft. of solid rock was removed to get greater depth for the cellar. Rock surface as found ranged from El. —24.5 to —30.1 ft. Wherever possible to avoid doing so, the writer thinks such rock should not be removed, as the blasting makes it impossible to stop a certain amount of flow through the fissures in the rock. In many cases it would be cheaper and better to have a wider and shallower sub-basement.

Filling the Caisson Working-Chambers

When a caisson had reached rock, its working chamber was filled by the following procedure: The concrete, mixed very wet, was dumped from the concrete lock at the top of the shaft until the chamber was filled to within 30 in. of the bottom of the shaft. This concrete was allowed to set under pressure for over 24 hours; the air pressure had of course been reduced for each foot above the cutting edge (a failure so to reduce the air pressure once resulted in a serious blowout). After the concrete in the chamber had set 24 hours or more, the pressure was taken off, the airlock removed, and exceedingly wet concrete was dumped down the shaft. At each end of the caisson a vent pipe had been provided from the deck of the chamber to the top, to prevent any air being trapped under the deck, and in each case the grout was forced up these vent pipes to a distance of 12 to 20 ft. above the deck, good evidence that the air chamber had been properly filled. The writer has been using this method of filling the working chamber for over ten years, and thinks it much more reliable as well as much cheaper than the older methods.

In addition to the eight caissons forming the sides of the sub-basement (four floors below water level and five floors below street level), six caissons ranging from 5 ft. square to 5½ x 8 ft. were sunk in the space between the sub-basement and the Gallatin Bank, to carry the columns for that portion of the building. Two hundred tons of cast-iron blocks were used in sinking them, to overcome the friction of the quicksand on the caisson.

In the caisson work three shifts of men were worked eight hours each, with three to four men in the working chamber. While sometimes a gang would be taken out of one caisson to ditch or level up another caisson, there was practically only one gang working at a time. They made very good time, getting a caisson down in two to four days. In fact the sandhogs seem to be the only laborers that have maintained their old record for speed.

It may be remarked that groundwater level was at El. +4.45 in 1918, whereas it was +8.85 on the adjoining lot when the foundations for the refinery building were put down in 1909. In nearly all cases, until very recently, groundwater level has been found above high-tide level, usually from 4 to 9 ft. But recently, on one job, it has been found to be 2 ft. below high-tide level, probably due to recent excavations.

About 2 ft. of concrete was laid directly on the blasted rock, stopping a few small leaks but not the larger ones. On top of this, 16-oz. sheet-copper pans were laid under the column bases. The column bases were then set, and in the space between the walls and the columns terra cotta blocks were placed to carry any seepage to the sump. Tar and felt was then spread between the walls and the sheet copper, which it overlapped, and finally the whole was covered with 2 ft. of good concrete.

James A. Wetmore, supervising architect of the Treasury Department, had general direction of the work; B. A. Appleyard represented him as superintendent in charge of the construction of the Assay Building. Charles T. Wills, Inc., the general contractors for the whole building, had the foundation work carried out by the Underpinning & Foundation Co. as subcontractors. The writer acted as consulting and supervising engineer for the supervising architect.

First Convention of Public Works Department Association

Delegates Meet To Consider Progress and Prospects of Plan To Co-ordinate Government Engineering Activities

NINETY-FIVE delegates from engineering and allied societies met in Washington Jan. 13 and 14 at the first convention of the National Public Works Department Association, which has developed from the conference held in Chicago April 19, 1919. The Chicago conference was called by Engineering Council to consider the desirability of organizing the engineers of the country to promote the formation of a Federal Department of Public Works under which would be gathered all of the engineering activities of the Government. So favorable were the responses from the representatives of the seventy odd societies that there was organized the Engineers', Architects' and Constructors' Conference on National Public Works with headquarters in Washington, under M. O. Leighton as chairman and C. T. Chenery as secretary. This organization, with its name changed to the National Public Works Department Association, has been functioning now for something over six months. The recent meeting was called to report progress and consider prospects.

Four sessions were held; reports of the officers and committees were heard, discussions of the Public Works Department bill now before Congress were held, addresses by Governor Lowden of Illinois, Representative Reavis, the author of the bill, and General Marshall of the Construction Division of the Army, were listened to and prospective action considered. One morning was devoted to visits by state delegations to Congressmen and in the evening of the first day a smoker was tendered by the Washington Society of Engineers. The main result of the meeting was that the delegates learned first-hand of the activities in the various states and in the home office, sensed, from their contact with Congressmen, the difficulties of the campaign and were impressed with what is probably the critical factor at the present time, the immediate necessity for more funds. In consequence they all went home with a better perspective of the movement and with some definite ideas as to how to put it across.

As projected at Chicago the Association was to be made up of technical men alone. From the headquarters at Washington, state organizations were built up from the various technical societies and functioned independently, under advice and information furnished from Washington. According to reports presented at the meeting, these state bodies have devoted themselves mainly to organization, though in a few states propaganda methods, reminiscent of the war-time "drives," have been meeting with more than indifferent success. So far, however, most of the local efforts have been toward publicity, with the idea that so complete a reformation of governmental methods as is embodied in the Public Works Department must have public support, which can be gained only through a public appreciation of the benefits to be derived. As the movement grew, its backers became convinced that it should have the co-operation of more than the technical professions which recognized its need. Accordingly, only recently, attempt has been made to enlist the aid of business men who would be benefited by a more efficient operation of the Government. This idea was well expressed by Chairman Leighton in the following paragraphs of his opening address:

> We here assembled are asking Congress to do the obvious thing. Give the Government a business-like organization. Co-ordinate the functions so that the processes of Government business shall dove-tail. Cut out the wastes and the duplications. Abolish the rivalry between departments. We advocate a Department of Public Works not merely to secure technical symmetry in our Federal organization, desirable as that end may be. Our advocacy is, in its essential features, an attempt to close some of the open ports which every ship has.
>
> When this organization was set up at Chicago I think that none of us—certainly not the speaker—had an adequate idea of the scope of the movement. We saw a loose and inefficient public works organization, divided and sub-divided into many different provinces. As technical men we know how organically wrong that was. Of the wastes and inefficiencies we were well aware. With the necessity for a co-ordinated structure, by virtue of which the technical and semi-technical fields of the Government could be rendered efficient and business-like we were profoundly impressed. But that our effort, our idea, our legislative bill would become the cornerstone of a structure embodying efficiency in all departments of Government, we could hardly foresee. As an organization our effort is still focused on a Department of Public Works and that alone. But we realize that with that principle established—that example set—reform in other provinces of Government business activity will occur by the mere logic of events. We are pioneers.
>
> This is the reason why our project for a Department of Public Works strikes straight home to the business man, the manufacturer, the contractor and the merchant, all of whom are represented here today. The technical men who met at Chicago last April to set up this organization built better than they knew. While the project retains all the virtues that appealed to us when it was launched—of technical excellence, of rational Government organization, of economy and efficiency, we now see that it reaches to national and to business prosperity, to the fiscal welfare of the nation, to the individual welfare of the productive business.
>
> We may as well recognize and admit the fact that individual initiative in America will not continue to be that spontaneous thing that it has been in the past if the rewards are to be divided and a part of them are to be wasted in the support of a chaotic Government business organization. The burdens of every business organization in the country are magnified by Government business inefficiency. We want no good and proper thing to be withheld from our Government nor in turn by our Government.

Following this idea, there were represented at the convention a number of manufacturers' and business bodies. It cannot be said that they contributed much to the discussions, except for some specific criticisms of the proposed bill, which will be mentioned later. They did, however, indicate in the purposes of the Association a lively interest that gave promise of future support, which will doubtless be sought by the executive committee.

Outside of the reports from the delegates, the main subjects of discussion were future organization, the text of the proposed bill, and finances. Each is under the jurisdiction of a special committee and on each some definite action was taken.

The Jones-Reavis bill (Sen. 2232; H. R. 6649) proposing the inclusion in the Department of the Interior, which is to be renamed the Department of Public Works, of practically all of the engineering activities of the Government and the assignment to other departments of the non-engineering bureaus of the Interior Department, has been introduced in both houses and referred to committees. It apparently has not been seriously considered by either of the committees nor was there a definite prospect of hearings on it. One of the results of the convention—and particularly of the calls made by delegates on Congressmen—will probably be the resurrection of the bill from committee and early consideration through hearings. Up to now, the Public Works Department Association has included in its literature the statement that it urged the passage of this bill. The convention brought out the fact that the Association does this with reservations.

These reservations were brought about by criticisms, mainly by non-engineering interests, of the disposition of the various non-engineering bureaus which have to be transferred out of the Department of the Interior. Particular criticism was leveled at the assignment of the Bureau of Education to the Department of Labor. In order to meet these criticisms the convention adopted, unanimously, a resolution stating that the Association is not particularly concerned with the disposition of the non-technical bureaus, feeling that the main purpose to be achieved—that is, the co-ordination of engineering activities—is the important feature of the movement and that the assignment of non-technical activities can be taken care of as Congress sees fit, without diminishing the effectiveness of the proposed department. Aside from this, the discussion on the bill was negligible. No comment to speak of was made on the make-up of the new department as provided for in the bill and the convention approved the statement of the committee that at present it was inadvisable to make any changes in the text of the bill.

New organization and finances are interwoven. So far the Association has been largely financed by Engineering Council, which has advanced $18,000, and by contributions from state organizations of something over $6,000. Of this there is left about $5,000, or about enough to finance the Washington office six weeks. The budget calls for an expenditure by headquarters of $3,500 a month, and suggests an expenditure by the state organizations for the next six months of $4,800 per month. The delegates agreed that the latter sum should be raised by the respective states for their own use, which leaves an annual budget of $42,000 plus the reimbursement to Engineering Council of its $18,000, or a total of $60,000 to be raised for a year's work. This sum has been apportioned to the various states in proportion to population, and the delegates went home promising that each state's quota should be raised, the details to be left to the respective states.

This apportioning, however, is not new. Last year an apportionment to the states on a similar basis was made, with a total of $100,000 in view. From this apportionment, the $6,300 from the various state organizations was received. It, therefore, became evident early in the convention that this question of finances was critical. Unless some method of raising funds more successfully could be devised, the movement must die. Largely with this in mind, probably, the committee on new organization brought in a report which proposed a system of individual memberships at $5 a year, with graduated higher memberships, patrons, etc., at higher amounts. While containing clauses which might be construed as recommendations for the continuance of the present rather loose form of representative organization, this report immediately impressed the delegates as a radical revision of the association which was not only unwise but unworkable. The criticisms were so forcible, that the report was returned and a new one brought in in which the direct representation and membership idea was discarded, but great emphasis laid on the need for more funds. Both reports contained recommendations for the enlargement of the Association to include "business, professional and social bodies." The rejected report, moreover, contained recommendations for the budget system in the Federal Government and for a general reorganization of governmental activities looking toward efficiency. These clauses, after criticisms from the floor, were omitted from the adopted report.

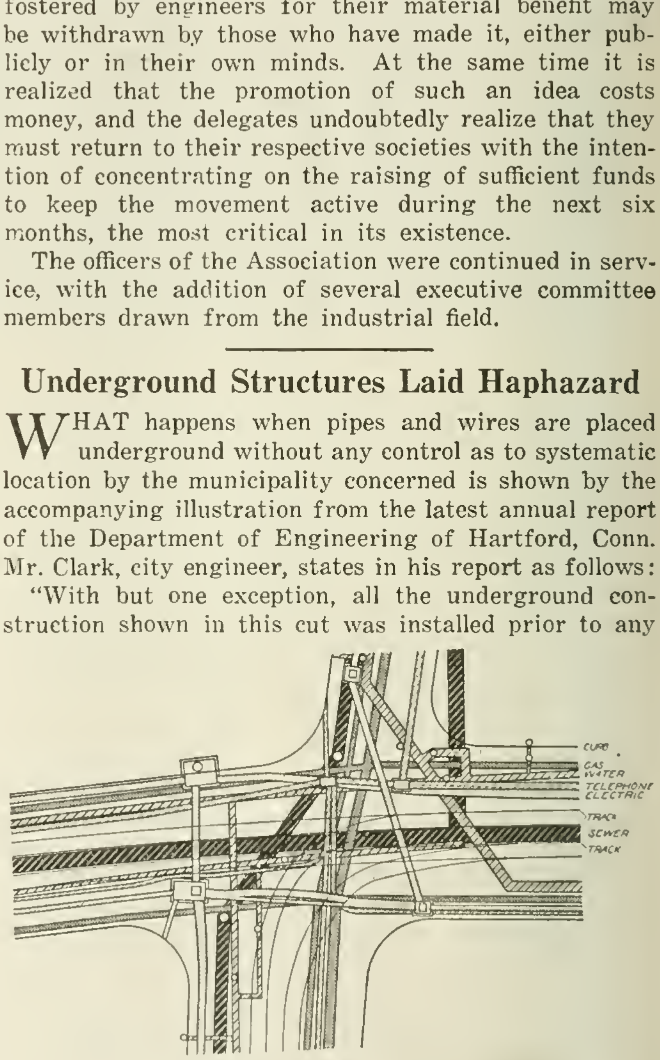
The result of the action on the committee reports is that the Association is to continue along the same lines as it has during the past few months, except that an effort is to be made to give the movement a wider appeal, so that the accusation that it is being fostered by engineers for their material benefit may be withdrawn by those who have made it, either publicly or in their own minds. At the same time it is realized that the promotion of such an idea costs money, and the delegates undoubtedly realize that they must return to their respective societies with the intention of concentrating on the raising of sufficient funds to keep the movement active during the next six months, the most critical in its existence.

The officers of the Association were continued in service, with the addition of several executive committee members drawn from the industrial field.

Underground Structures Laid Haphazard

WHAT happens when pipes and wires are placed underground without any control as to systematic location by the municipality concerned is shown by the accompanying illustration from the latest annual report of the Department of Engineering of Hartford, Conn. Mr. Clark, city engineer, states in his report as follows:

"With but one exception, all the underground construction shown in this cut was installed prior to any attempt on the city's part to regulate or exercise any appreciable control over sub-surface work. The resultant random positions of structures in this intersection, and there are many others in the same condition, make it extremely difficult to assign locations for new work. If all these structures had been assigned locations according to present methods a great deal more space would be available for enlargements and for a probable high-pressure water system for fire protection, or any other future installation."



HAPHAZARD ARRANGEMENT OF UNDERGROUND STRUCTURES, HARTFORD, CONN.

Operating Results of Dyckman Street Sewage-Screening Plant

Scanty Data on Riensch-Wurl Screens Added to by Working Tests in New York City—Other Results Compared

By Charles E. Gregory
Formerly Chief Engineer of Sewers, Borough of Manhattan, New York City

VERY few reliable data showing the normal operating efficiency of fine screens in this country are available. A recent test of the Riensch-Wurl screening plant at the foot of Dyckman St., Borough of Manhattan, New York City, furnishes some much needed information on this subject.

The plant consists of two 14-ft. disk screens, and the present flow averages a little less than 2,000,000 gal. a day. The sewage reaches the plant in less than 20 min. from its most remote source and is not badly broken up. A description of the plant was published in *Engineering News-Record* of Apr. 3. 1919, p. 672.

The test here reported was conducted jointly under the supervision of Kenneth Allen, sanitary engineer of the Board of Estimate and Apportionment, and the

TABLE 1. TESTS OF RIENSCH-WURL SCREENS, DYCKMAN STREET PLANT, BOROUGH OF MANHATTAN, NEW YORK CITY

		June 9		June 9-10		June 10	
		10:15 a.m. to 2:15 p.m. (Shower 12-12:30)	2:15 p.m. to 6:15 p.m. (Light shower at 2:45)	6:15 p.m. to 10:15 p.m.	10:15 p.m. to 2:15 a.m.	2:15 a.m. to 6:15 a.m.	6:15 a.m. to 10:15 a.m.
Sewage Flow:							
Volume	gal.	384,600	269,300	285,600	230,200	166,100	350,900
Rate	m.g.d.	2.308	1.616	1.714	1.381	0.997	2.105
Analytical Results:							
Raw Sewage:							
Suspended solids	p.p.m.	276	84	86	53	40	168
Volatile	p.p.m.	179	76	79	50	34	142
Ash	p.p.m.	97	8	7	3	6	26
Settleable solids	p.p.m.	226	41	56	53	40	106
Volatile	p.p.m.	143	33	49	50	34	92
Ash	p.p.m.	83	8	7	3	6	14
Screened Sewage:							
Suspended solids	p.p.m.	233	60	60	34	3	110
Volatile	p.p.m.	146	55	55	34	3	90
Ash	p.p.m.	87	5	5	0	0	20
Settleable solids	p.p.m.	183	17	30	34	3	48
Volatile	p.p.m.	110	12	25	34	3	40
Ash	p.p.m.	73	5	5	0	0	8
Screenings:							
Removed by $\frac{3}{64}$-in. screen	p.p.m.	43	24	26	19	3.7	58
Moisture	%	78.7	75.9	79.4	76.1	79.8	78.4
Dry material	%	21.3	24.1	20.6	23.9	20.2	21.6
Ash (dry basis)	%	22.2	13.5	6.6	16.5	15.2	9.7
Volume	cu.ft.	11.16	4.52	5.28	3.11	0.66	13.59
Volume per m.g.	cu.ft.	29.02	16.8	18.4	13.5	4.0	38.7
Weight	lb.	644	226	303½	152	25	781½
Weight per m.g.	lb.	1,675	839	1,063	660	151	2,227
Weight per cu.ft.	lb.	57.7	50.0	57.4	48.9	37.9	57.5
Power consumed	k.w.h.	36	28	26	27	29	27
Power consumed per m.g.	k.w.h.	94	104	91	117	175	77
Head lost—average	ft.	0.25	0.16	0.12	0.08	0.07	0.29
Removal of suspended matter	%	15.6	29.0	30.6	35.8	9.25	34.6
Removal of settleable solids	%	19.0	58.9	46.8	35.8	9.25	54.8

		June 18		June 18-19		June 19	
		10:00 a.m. to 2:00 p.m.	2:00 p.m. to 6:00 p.m.	6:00 p.m. to 10:00 p.m.	10:00 p.m. to 2:00 a.m.	2:00 a.m. to 6:00 a.m.	6:00 a.m. to 10:00 a.m.
Sewage Flow:							
Volume	gal.	326,400	268,300	273,100	230,100	156,700	299,900
Rate	m.g.d.	1.958	1.610	1.639	1.380	0.940	1.799
Analytical results:							
Raw Sewage:							
Suspended solids	p.p.m.	139	113	122	73	28	197
Volatile	p.p.m.	91	76	91	56	28	147
Ash	p.p.m.	48	37	31	17	0	50
Settleable solids	p.p.m.	62	69	92	73	28	119
Volatile	p.p.m.	21	46	76	56	28	80
Ash	p.p.m.	41	23	16	17	0	39
Screened sewage:							
Suspended solids	p.p.m.	118	100	100	60	24	160
Volatile	p.p.m.	72	64	70	44	24	114
Ash	p.p.m.	46	36	30	16	0	46
Settleable solids	p.p.m.	41	56	70	60	24	82
Volatile	p.p.m.	2	34	55	44	24	47
Ash	p.p.m.	39	22	15	16	0	35
Screenings:							
Removed by $\frac{1}{16}$-in. screen	p.p.m.	21	13	22	13	4	37
Moisture	%	79.7	81.0	79.5	82.4	84.3	84.4
Dry material	%	20.3	19.0	20.5	17.6	15.7	15.6
Ash (dry basis)	%	10.1	8.1	6.7	7.7	11.2	10.2
Volume	cu.ft.	5.18	2.76	4.55	2.89	0.66	9.84
Volume per m.g.	cu.ft.	15.9	10.3	16.7	12.6	4.21	32.8
Weight	lb.	283	148	244	137	36	593
Weight per m.g.	lb.	868	552	893	595	230	1,977
Weight per cu.ft.	lb.	54.6	53.6	53.6	47.4	54.5	60.3
Power consumed	k.w.h.	32	36	31	32	28	28
Power consumed per m.g.	k.w.h.	98	135	114	139	178	93
Head lost—average	ft.	0.018	0.012	0.027	0.015	0.041	0.031
Removal of suspended matter	%	15.1	11.5	18.0	17.8	14.3	18.8
Removal of settleable solids	%	33.9	18.8	23.9	17.8	14.3	31.1

SUMMARY OF RESULTS OF 24-HOUR TESTS

	Screen No. 1	Screen No. 2
Width of slot	$\frac{3}{64}$ in.	$\frac{1}{16}$ in.
Speed	0.5 r.p.m.	0.426 r.p.m.
Day of week	Mon.-Tues.	Wed.-Thurs.
Flow	1,687,700 gal.	1,554,500 gal.
Raw sewage:		
Suspended matter	137 p.p.m.	122 p.p.m.
Settleable solids	100 p.p.m.	78 p.p.m.
Screened sewage:		
Suspended matter	101 p.p.m.	102 p.p.m.
Settleable solids	64 p.p.m.	58 p.p.m.
Removed by screen:		
Suspended matter	36 p.p.m.	20 p.p.m.
Settleable solids	36 p.p.m.	20 p.p.m.

	Screen No. 1	Screen No. 2
Screenings:		
Moisture	78.5%	81.7%
Dry material	21.4%	18.3%
Ash (dry basis)	14.1%	9.1%
Volatile matter	85.9%	91.9%
Volume	38.32 cu.ft.	25.88 cu.ft.
Volume per m.g.	22.7 cu.ft.	16.65 cu.ft.
Weight	2,132 lb.	1,443 lb.
Weight per m.g.	1,264 lb.	928 lb.
Weight per cu.ft.	55.6 lb.	55.8 lb.
Removal of suspended matter	26.3%	16.6%
Removal of settleable solids	36.0%	19.4%

TABLE II. COMPARATIVE RESULTS OF TESTS OF VARIOUS RIENSCH-WURL SCREENS

Location	Diameter, Ft.	Slot, In.	Flow, 1,000,000 Gal. D.	Screenings per 1,000,000 Gal. Cu.Ft.	Screenings per 1,000,000 Gal. Lb.	Dry Material per 1,000,000 Gal., Lb.	Per Cent. Removal Suspended Matter	Per Cent. Removal Settleable Solids	Remarks
Dresden, Germany	26.2	0 08	26	26.2	5,970	955	31 0	. .	84% moisture in screenings
Mainz, Germany	14.8	0 08	3 3-17.4	.	790	...	36.0	42.0	Experimental
Daytona, Fla	8.0	6/64	0.4-0.5	18.8	1,080	...	....	....	Day sewage
Long Beach, Calif	14.0	5/64	2.6	27.0	1,810	235	16.2	....	87% moisture in screenings
Manhattan, N. Y	14.0	1/32	1.74	22.7	1,264	270	26.3	36 0	80% moisture in screenings
	14 0	1/16	1.74	16.65	928	170	16.4	19 6	
Plainfield, N. J..	10.0	1/16	3.53	16.3	1,510	...	....	. . .	

author. The chemical determinations were made by W. T. Carpenter. The period of the test covered two entire days, and three 4-hour periods on other days.

The flow of sewage was continuously measured by a sharp-edged weir 2 ft. long placed in the outlet gate below the screen so as not to interfere, by ponding, with the sewage as it approached the screen. The record of depths on the weir was made by a Freize register adjusted to record directly the actual depths.

Samples were taken from the effluent below the screen at 15-min. intervals and combined every four hours into a composite sample. The screenings for each corresponding period were measured for volume in cylindrical metal cans, were weighed and then dumped on a concrete floor, and quartered down for a composite sample for analysis. As the screenings are brushed off from the disk they are caught in a metal can with perforated bottom, so that any surplus moisture may readily drain away.

Conditions were normal, as far as could be judged in advance. There were light showers June 9, but they did not appreciably increase the flow in the sewer and probably had no influence on the result. The screenings removed June 9 were somewhat less than on many previous days, but the flow may have been less or the sewage weaker.

The strength of the raw sewage was found by adding the screenings removed to the suspended solids found for each corresponding four-hour sample. This method eliminates errors of sampling and removes doubt as to whether the effluent is the identical sewage which was sampled before treatment.

Table I gives the results in detail and closely confirms the 32% removal found in the less careful tests made when the plant was first put in operation; the results were published in *Engineering News-Record* of Apr. 3, 1919. At that time the flow was greater, the volume and weight of screenings were greater, but the percentage of moisture found in the screenings was from 5 to 10% less. This moisture content alone would account for the difference in the final result.

As before, the 3/64-in. by 2-in. slot removed about 50% more materials than the 1/16-in. by 2-in. opening. Attention is directed to the small loss of head through the screen, especially on the one with 1/16-in. openings.

The normal estimated capacity of each 14-ft. screen is 5,000,000 gal. per day. The current flow of 2,000,000 gal. or less covers only a sector below the crown of the hat-shaped disk, and consequently there is a smaller proportion of partially obstructed openings than when more of the disk is submerged. The greater depths and greater velocity through the openings when the screen is running at full capacity cause a greater loss of head, although it has seldom reached six inches.

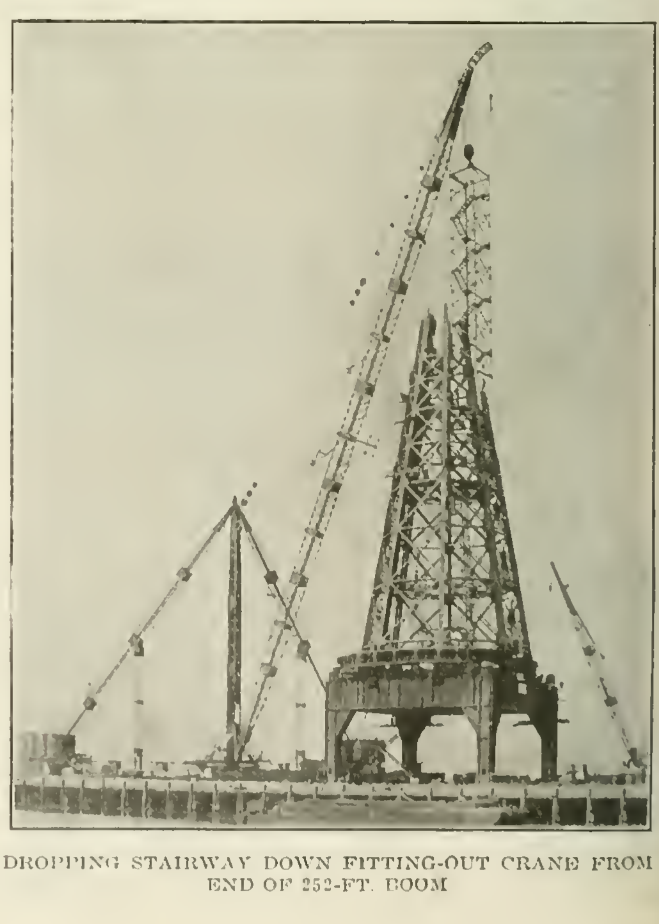
The wide variations in the strength and flow of sewage and screenings removed throughout the day, as well as from day to day, indicate that only a long series of tests can firmly establish the average efficiency of the device, but the fact, really more important, that it does not remove from each 1,000,000 gal. of sewage from 1200 to 1500 lb. of sludge is well established by the daily records of the maintenance department.

There is also appended for comparison a table of results at other places (Table II).

Largest Derrick Built to Erect Great Hammerhead Crane

Handles 40 Tons at 125-Ft. Reach of 252-Ft. Boom In Building 350-Ton Fitting-Out Crane At Philadelphia Navy Yard

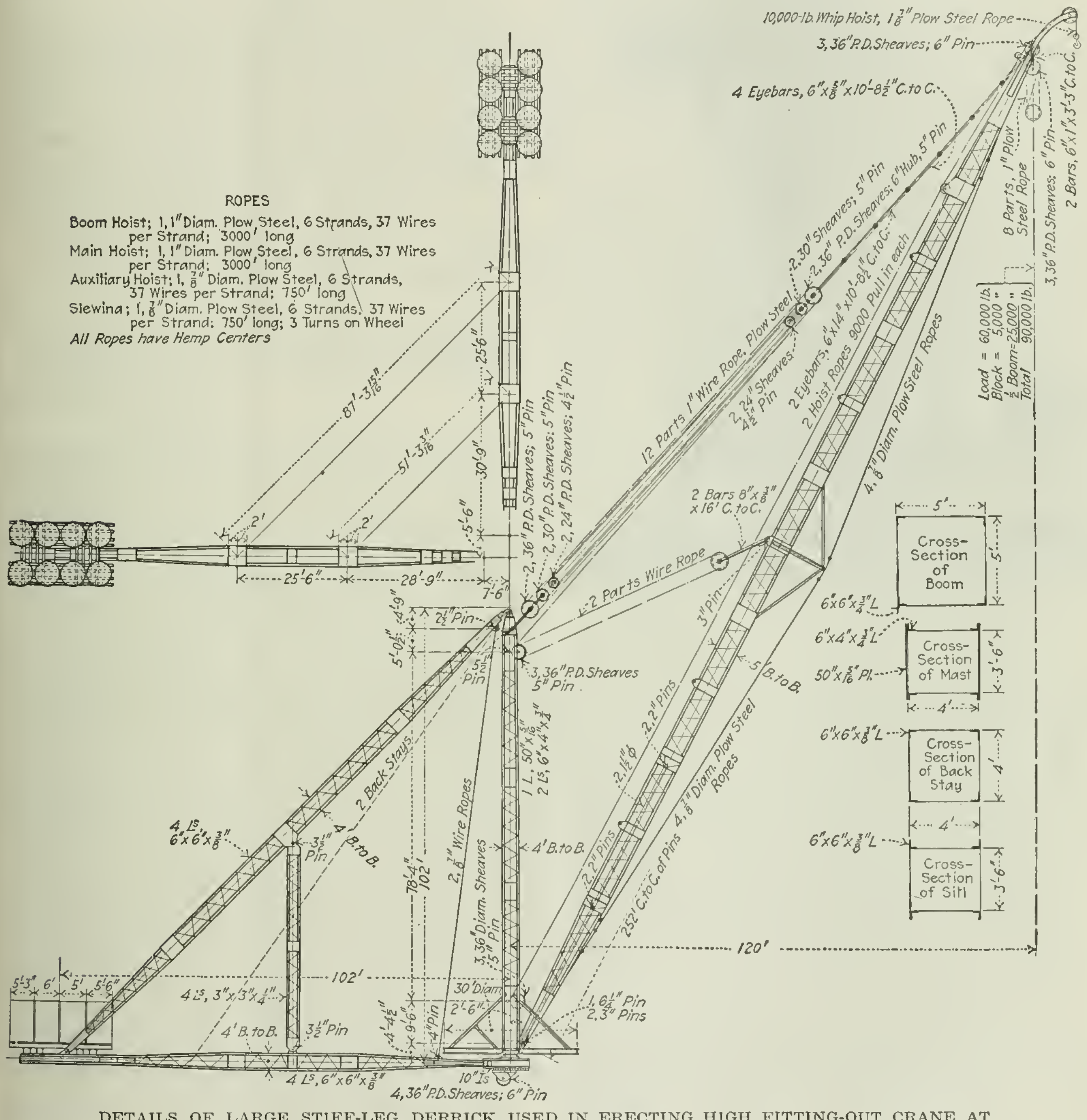
TO erect the enormous 350-ton fitting-out crane at the Philadelphia Navy Yard, the McMyler Interstate Co. of Cleveland, Ohio, has designed and built a steel stiff-leg derrick of unprecendented size, capable of carrying 40 tons with a 125-ft. reach and a 252-ft. boom. With the addition of the 13-ft. goose-neck on the end of the boom and the 10-ft. lift of the base of the mast, this rig can handle 5 tons at a height of 270 ft. above the pier deck on which it rests. The derrick was especially built for the erection of this particular



DROPPING STAIRWAY DOWN FITTING-OUT CRANE FROM END OF 252-FT. BOOM crane, but it was designed for easy erection and demounting, so that it can be readily transported for use elsewhere.

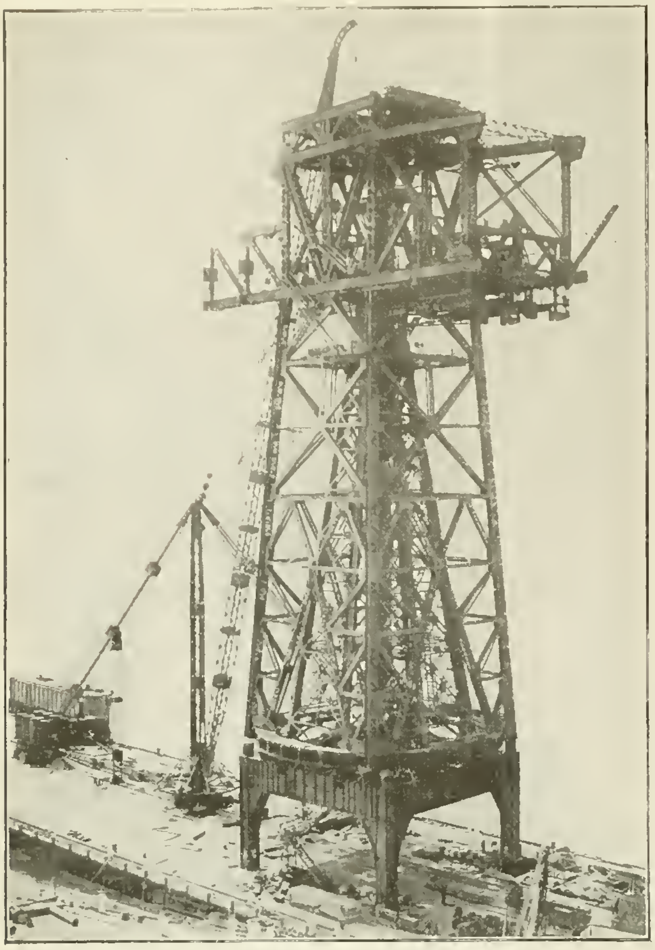
The 350-ft. hammerhead crane is the largest capacity crane ever built. It was designed by the McMyler Interstate Co. at the general specification of the Navy Department for the new fitting-out pier at the Philadelphia Navy Yard. The detailed design of the crane is extremely interesting, but the authorities do not care to enter into it until after it has been tested. Its extreme height above the pier deck is 230 ft., and due to a special effort to increase ship fabrication and reduce erection costs, there were single pieces running up to 40 tons in weight to be erected in place.

This whole structure is near the end of a comparatively narrow pier on which practically all of the material in erection was brought by truck or train, although it was possible to bring some in by barge beside the pier. In the erection one derrick described here was utilized for placing practically all material, although a locomotive crane running out on the track of the pier was also available. The view showing the latest stage of completion herewith was taken in September, the work of erection having started last spring.


ROPES
Boom Hoist; 1, 1" Diam. Plow Steel, 6 Strands, 37 Wires per Strand; 3000' long
Main Hoist; 1, 1" Diam. Plow Steel, 6 Strands, 37 Wires per Strand; 3000' long
Auxiliary Hoist; 1, 7/8" Diam. Plow Steel, 6 Strands, 37 Wires per Strand; 750' long
Slewina; 1, 7/8" Diam. Plow Steel, 6 Strands, 37 Wires per Strand; 750' long; 3 Turns on Wheel
All Ropes have Hemp Centers
10,000-lb. Whip Hoist, 1 7/8" Plow Steel Rope
3, 36" P.D. Sheaves; 6" Pin
4 Eyebars, 6"x5/8"x10'-8 1/2" C. to C.
2, 30" Sheaves; 5" Pin
2, 36" P.D. Sheaves; 6" Hub, 5" Pin
12 Parts 1" Wire Rope, Plow Steel
2, 24" Sheaves 4 1/2" Pin
2 Eyebars, 6"x1/4"x10'-8 1/2" C. to C.
2 Hoist Ropes 9000 Pull in each
4, 7/8" Diam. Plow Steel Ropes
8 Parts, 1" Plow Steel Rope
3, 36" P.D. Sheaves; 6" Pin
2 Bars, 6"x1"x3'-3" C. to C.
Load = 60,000 lb.
Block = 5,000 "
1/2 Boom = 25,000 "
Total 90,000 lb.
87'-3 15/16"
51'-3 3/16"
25'-6"
30'-9"
5'-6"
2'
2'
25'-6"
28'-9"
7'-6"
2, 36" P.D. Sheaves; 5" Pin
2, 30" P.D. Sheaves; 5" Pin
2, 24" P.D. Sheaves; 4 1/2" Pin
2 Bars 8"x3/8" x16' C. to C.
2 Parts Wire Rope
Cross-Section of Boom
5'
5'
6"x6"x3/4" L
6"x4"x3/4" L
50"x5/16" Pl.
Cross-Section of Mast
3'-6"
4'
6"x6"x3/8" L
Cross-Section of Back Stay
4'
4'
6"x6"x3/8" L
Cross-Section of Sill
3'-6"
4'-9"
5'-0 1/2"
2 1/2" Pin
5 1/2" Pin
3, 36" P.D. Sheaves 5" Pin
3" Pin
5' B. to B.
2, 2" Pins
2 1/2" Pins
2, 2" Pins
252' C. to C. of Pins
4, 7/8" Diam. Plow Steel Ropes
1 L, 50"x5/16" 2 Ls, 6"x4"x3/4"
2 Back Stays
4 Ls, 6"x6"x3/8"
3 1/2" Pin
4' B. to B.
78'-4 1/2"
102'
2, 7/8" Wire Ropes
4' B. to B.
3, 36" Diam. Sheaves 5" Pin
120'
102'
5'3" 6' 5' 5'6"
4 Ls, 3"x3"x1/2"
4' B. to B.
3 1/2" Pin
4'-4 1/2"
9'-6"
4" Pin
30" Diam.
2'-6"
1, 6 1/4" Pin
2, 3" Pins
4 Ls, 6"x6"x3/8"
10" Is
4, 36" P.D. Sheaves; 6" Pin

DETAILS OF LARGE STIFF-LEG DERRICK USED IN ERECTING HIGH FITTING-OUT CRANE AT PHILADELPHIA NAVY YARD

The erecting derrick is of the regulation stiff-leg arrangement, and is extraordinary mainly on account of its size. As shown in the drawing the boom is 252 ft. long c. to c. of pins, and has in addition a gooseneck extending 13 ft. farther. The mast is 102 ft. high and the sill extends back 102 ft. The stiff-legs have each a vertical pin-connected brace midway of their length. All members are of latticed angle sections, varying as shown in the drawing, and all main joints are pin connected. The boom is additionally stiffened



FITTING-OUT CRANE NEARING COMPLETION

with four ⅞-in. plowsteel ropes trussed out from a middle post. According to the design shown, the live-load capacity is 30 tons at 120 ft., but the derrick has been used to carry 40 tons at 125 ft.

The main mast is supported on a special pin bearing bathed in oil, with the base resting on a I-beam grillage supported on blocking from the pier deck. The ends of each stiff-leg are supported on similar blocking and in the location where erected one of the stiff-legs extends out over the water and has had a special pile platform built to carry it. The counterweights at the stiff-legs have been designed especially for ease in re-erection. Each counterweight consists of eight large steel tanks erected on an I-beam grillage. These tanks are of different diameters, 5 ft., 5 ft. 3 in., 5 ft. 6 in., and 6 ft., so that, with two tanks of each of the four dimensions, they can be nested for easy transportation. In place as counterweights they are filled with water, giving a total loading of 75 tons for each counterweight, but for transporting they can be put one within the other and the smallest one filled with very small tools and equipment, requiring only the car space sufficient to carry four of the tanks. All other parts of the derrick are demountable so as to be packed in freight cars.

Control of the derrick is in the hands of one man, working in the engine room just alongside of the counterweights on the pier. In this engine room is a double-cylinder triple-tandem drum steam-driven hoisting engine, and two separate single-drum electric hoists. The two front drums of the steam hoist control the main fall, the third drum of the main hoist the secondary fall on the goose-neck, one of the electric drums controls the boom and the other the bull wheel. Two speeds on the main fall are available.

The topping lift is reaved through a 12-part line to the top of the boom with one two-part and one fixed line to intermediate points on the boom. The 12-part top fall feeds through two sets of three double-sheave pulleys, the upper of which are tied to the top of the boom with an eye-bar connnection.

Provision is made at the bottom of the main mast for the bottom sheave to be shifted to fit any horizontal angle of spread of the legs, so that the engine can be located anywhere between the stiff-legs that the site requires. Furthermore, extra rivet holes are punched in the grillage frame under the main mast, so that the stiff-leg sills can be moved at variable angles 14 ft. either way from the center at the end of the stiff-leg.

The whole work was under the supervision of the Corps of Civil Engineers of the United States Navy, Capt. A. L. Parsons, Public Works Officer, and Lt.-Com. O. A. Mechlin, Assistant Public Works Officer.

Relation of Engineer to Architect

—*A Discussion*

BY FRANCIS C. SHENEHON

Editor's Note: The report of Engineering Council's Committee on Licensing Engineers, which contained a model license law to regulate the practice of engineering and architecture, was published by Council Dec. 19, 1919. Appended to the published report was a letter written to T. L. Condron, chairman of the Committee on Licensing Engineers, by Francis C. Shenehon, one of the Committee's most active members. The letter was written in anticipation of the possible opposition of some engineers to the inclusion of architects in an engineering bill and is an admirable presentation of the case for a general bill covering the two professions. The text of the letter follows:

In order to review in my own mind our reasons for the inclusion of architects in our bill—and to keep these reasons active in your mind—I am discussing at some length the situation which confronted us and the avenues which our minds traversed in reaching our conclusion.

Historically, we find the builders of fortifications, the military engineer; and the builder of dwellings and temples, the architect, was earliest on the ground. The distinction was then between soldier and architect, not between engineer and architect. All of us who have translated him remember that Julius Cæsar built a bridge, and we know of the military Roman roads of England. In his illuminating lecture on "The Romance of Engineering," Professor C. J. Tilden of Yale says that Vitruvius in his treatise, written about the beginning of the Christian Era, divides the field of architecture into three main divisions:

1. The art of building.
    - (a) The construction of fortified towns and of works for general use in public places.
        - I. For defensive purposes—the planning of walls, towers and gates—permanent devices for resistance against hostile attacks.
        - II. For religious purposes—the erection of fanes and temples to the immortal gods.
        - III. For utilitarian purposes—the provision of meeting places for public use, such as harbors, markets, colonnades, baths, theaters, promenades, and all similar arrangements.
    - (b) The putting up of structures for private individuals.
2. The making of time-pieces (sundials, water clocks, etc.).
3. The construction of machinery.

(a) Civil—water wheels, screw pumps, hydrometers, etc.
(b) Military — balistæ, catapults, rams, siege machines, etc.

The very considerable Avignon bridge across the Rhone River (about 1200 A.D.), with eighteen clear arch spans from 65 to 80 ft. each, in a swift-flowing river subject to ice jambs, was regarded as a work of architecture. The term architect of bridges is authentic. Michelangelo (1475-1564) was not only the Architect of St. Peters, but he designed the fortifications of Rome.

Leonardo da Vinci (1452-1519) not only made plans for the Milan Cathedral, and painted the "Last Supper" and "Mona Lisa," but he was a chief military engineer, and a hydraulic engineer dealing with irrigation, river control and harbor works, and designed a flight of six vessel-locks. The utilization of his creative imagination in directing the forces of nature appears to have appealed to him no less strongly than in architecture, sculpture and painting. He styled himself engineer as well as architect.

"Master Builders"

The term architect in its etymology means "Master Builder." Should the determination of the field of architecture rest on a historical basis, its scope would be far wider than latter-day engineers would wish to concede. The wonder is not the present encroachment of architects upon the legitimate field of engineering, but the expanse of the fields, once interchangeable, over which engineers have gained sole dominion.

It is not material to put one's finger on the year when a distinct cleavage was visible between architecture and engineering, because the two are so closely knit now that it will require a surgical operation to separate them. It appears that in the evolution of construction two classes of builders, blood-brothers, in fact, have by some vagary of word-growth been verbally torn apart and their kinship sometimes questioned. It is odd that in this juggling of old terms and the emergence of new terms, one class of engineers — and a class whose work is of the highly specialized, technical kind which deals with the direction of great mechanical forces—has kept the old family name, the Naval Architect.

What I am endeavoring to accent is that an accident of name-evolution has tended to segregate one class of master-builders from the other classes of master-builders, and that this segregation does not grow out of any vital difference in fact. It may be thought that initiative and imagination are the qualities of architects, while engineers deal with the prose of construction. Analysis will, however, reveal the fact that 80 per cent of the architectural structures of our cities are commonplace, with no peculiar beauty or originality. Now and again a Woolworth building springs sky-ward, worthy of the phrase "frozen music," and we recognize again the master-builder of the sixteenth century. But the same quality of mind went into the wireless telegraph, the airplane, the Panama Canal and hydroelectric developments and transmission at Niagara. Engineers without creative imagination are as mediocre as architects without the same vital and indispensable attribute of the master-builder. Architects must recognize that scientific imagination is on the same high plane as their own best creative thought; and engineers must concede the aesthetic contribution of architects in adding to the durable satisfactions of life. Both are creative workers.

An architect is an engineer whose higher activities are those of an artist; and the two kinds of activity are blended in an individual man; in some cases the architect is $99\frac{44}{100}$ per cent engineer, and sometimes he is $99\frac{44}{100}$ per cent artist; and in some cases the blend is fifty-fifty. As the activities of architects reach out from the nucleus of fundamental builder into fields of art, so the activities of engineers, all centered on this same nucleus, reach into individualized fields. The mining engineer is much geologist and chemist; the sanitary engineer reaches toward the biological sciences and medicine; valuation engineers are part economists; the mechanical engineer touches industrial zones; the electrical engineer dwells on the frontiers where his particular manifestation of energy leads him; the hydraulic engineer is part magician and part meteorologist; and all are inventors.

The structural engineer must spend part of his time denying that he is an architect; but at times has been required to take out a license as an architect to continue his customary practice. The architectural engineer is the missing link.

The practice of all these various master-builders is woven together in a single fabric; it forms a single polychromatic profession. There is no more reason for excluding the architect from the fraternity of master-builders than for excluding an admiralty lawyer from his legal kin because his practice has a somewhat different complexion; or of excluding an eye, ear and throat specialist from the balance of medical men because of his particular field.

Strength in United Profession

The strength and welfare of all master-builders lie in the solidity of a single, great, united profession, not in divided counsels. The Architects' Model Law is a proclamation of secession, and menaces fields of practice not territorially belonging to architecture. The Structural Engineers' Law of Illinois was a necessary defensive measure tending further to disintegrate the profession as a whole. Why not an Electrical Engineers' Law, a Mining Engineers' Law, and others, each branch fighting for itself and by itself? In 1861, the secession of certain Southern States threatened the Union. Imagine our world power, had the theory of state sovereignty prevailed and this country been broken up into little nationalities like the Balkans! Modern organization is tending toward consolidations, not dissolutions; and the uniform law proposed for all master-builders is constructive in its large purpose to end factional divergences and to provide for influential, powerful co-operation.

Perhaps the action of the engineers in writing architects into its Uniform Bill may be construed as a little indelicate because architects were not represented on the Committee or in the Council. But the building of a preliminary bill is only one step toward the ultimate bill which may be enacted into law. The bill presented is a text upon which discussion is to be centered to the end that a final perfected bill may be evolved. With the Architects' Model Law, affecting engineers, issued as a perfected document for passage by the varius states, and the Engineers' Bill, affecting architects, still plastic, it is desirable that archiects be invited to from part of a new committee to reconcile differences, and write out a single bill.

The Architects' Model Law is not unalterably engraved in stone. A committee's recommended bill, even when underwritten by the concurrence of a large assembly voting for its adoption, is not an unchangeable finality. Men who have dealt with the conclusions of assemblies know something of the imperfection of majority votes, which a chance might have swerved into a minority vote; and men who have served on committees know something of the accidental make-up of committees, the pre-occupation of the members and the bare margin of judgment on which vital features hinge.

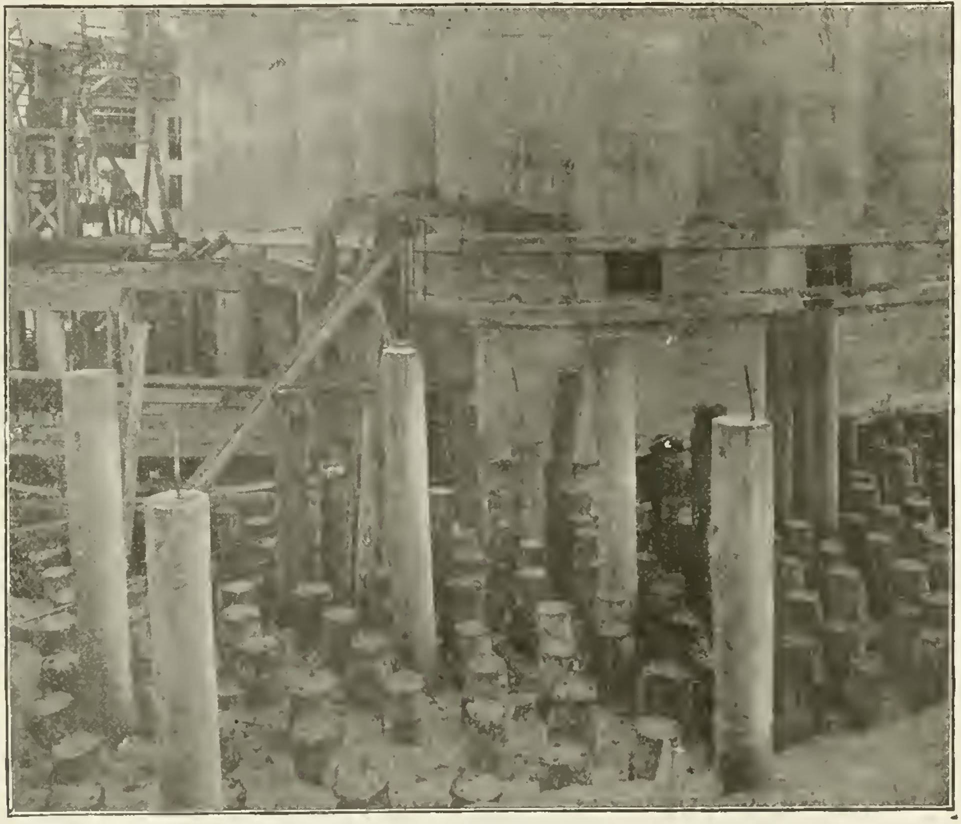
The Architects' Law in Illinois created bitterness, antagonism and division—internal warfare among the master-builders. The Engineers' Bill may for a time encounter opposition, but as it protects the architect and the engineer without discrimination, and works with the utmost of economy in administration for the welfare of all, it is hard to see how it can provoke honest hostility.

The Architects' Model Bill can never become law in any state where engineers are awake to the menace of its provisions, and are organized to circumvent unwholesome legislation. It carries its own death sentence when truly interpreted to a legislature. When architects fully comprehend this fact perhaps a practicable compromise bill may be agreed upon, which can be supported by all engineers and all architects, and has a chance to be enacted into law. Perhaps the smooth functioning of the Michigan Law, which includes engineers, architects and land surveyors is evidence of the desirable inclusion of a License Law.

Foundation Troubles of Portland City Grain Elevator

Settlement of Large Concrete Structure Stopped by Driving Pinch Piles To Compress Soft Ground Already Piled

CONSTRUCTION progress on the new concrete grain elevator being built for the City of Portland, Ore., was stopped last spring because of what promised to be a serious subsidence of the structure. At one corner the settlement reached 2 ft. and was progressing with the addition of load. A board of consulting engineers called in to report on the conditions and a method of curing them advised as a tentative remedy to stiffen up the already piled soft ground by driving rows of so-called pinch piles around the entire structure. This was started and proved successful in stopping the subsidence, so construction was resumed and is being carried to its conclusion simultaneously with the pinch-pile operations. At the same time an excessive load, in the way of hydraulic fill sand in the base of the elevator, was removed.



PINCH PILES FIRST DRIVEN AROUND NORTHEAST CORNER OF STORAGE ANNEX. CURTAIN WALLS NOT YET BUILT

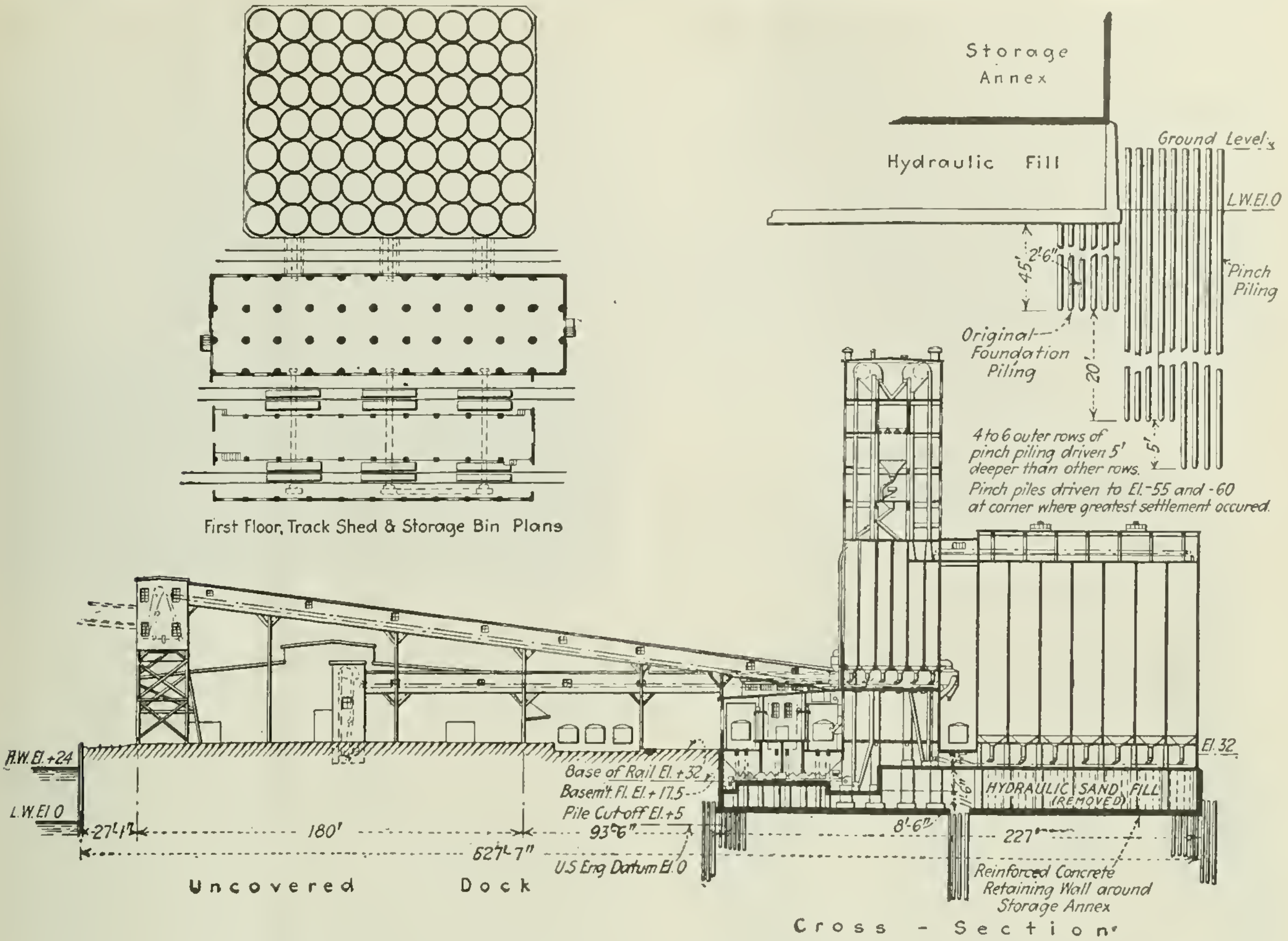
The municipal grain elevator at Portland is a part of the new St. Johns Terminal being built by the city on the east bank of the Willamette River, about seven miles north of the central part of the city. It is described in an article on p. 179 of this issue. The grain elevator consists of a track shed, an operating house, and a storage annex, built in that order back from a marginal pier, which is in effect a wharf. The elevator is of reinforced concrete, with a track shed two stories high, an operating house 162 x 46 ft. in plan and 178 ft. high, and a storage annex 136 x 105 ft. in plan and 100 ft. high. The whole structure is carried on a 3-ft. concrete mat supported on wooden piles, which were assumed in the design to be loaded to 25 tons each under full load. About 4,300 piles were driven.

The site of the elevator originally was a flat about 10 ft. above low-water level of the river, which is about 300 ft. away from the nearest part of the track shed. The entire surface of the terminal is being brought to El. +32 (zero being low water) by a hydraulic fill pumped in from the river. In constructing the elevator, excavation was made in the original bank to El. +4.5 and the entire area covered with piles spaced about 2 ft. 6 in. on center and from 40 to 45 ft. in length. On these piles the concrete mat 3 ft. thick was poured with the piles cut off at El. +5.0; that is, they had 6 in. embedment. On the mat, pedestals were erected to carry the elevator structure at the various levels shown in the accompanying cross-section. Under the storage annex and in most of the operating house pedestals are about 16.2 ft. long; that is, the bottom of the 15-in. floor of the structure is at El. +23.8. This 16-ft. space was then filled in with the hydraulic fill which is to be carried eventually to El. +32.

About the time the storage annex had reached two-thirds of its full height and when the operating house reached only 12 or 15 ft. above the ground a marked settlement was observed in the structures. The settlement began with the pumping in of the sand fill and continued from November, 1918, to May, 1919. Meanwhile pouring of concrete was under way but was suspended in January, 1919.

The subsidence, which was eventually stopped, as will be noted hereafter, amounted at its greatest to the following distances in feet: Maximum subsidence in the storage annex, northeast corner, 1.96; southwest corner, 0.76; southeast corner, 1.40; northwest corner, 1.15; operating house, southeast corner, 0.62; northeast corner, 1.72; track shed, 0.21 to 0.37. At the same time subsidence was occurring in other points on the hydraulic fill, as shown by the fact that trees 300 to 500 ft. from the elevator, on which benchmarks had been established, were found to have settled about 1 ft. The unit loading on the respective foundations at about this time—precise dates cannot be given because filling was going on all the time—amounted to about 15 tons per pile in the storage annex, 9 tons per pile in the operating house and 17 tons per pile in the track shed.

A board of five engineers, in January, 1919, was called together to advise the city how to stop the subsidence and safeguard the structure. This board in April, 1919, submitted a majority report, signed by F. W. Boschke, Robert A. Cummings and Howard T. Holmes, and a minority report signed by W. R. Phillips.


Storage Annex
Hydraulic Fill
Ground Level
L.W.El.0
Pinch Piling
2'6"
45'
20'
5'
Original Foundation Piling
4 to 6 outer rows of pinch piling driven 5' deeper than other rows.
Pinch piles driven to El.-55 and -60 at corner where greatest settlement occured.
First Floor, Track Shed & Storage Bin Plans
H.W.El.+24
L.W.El 0
27'-1"
180'
93'-6"
527'-7"
Base of Rail El.+32
Basem't Fl. El.+17.5
Pile Cut-off El.+5
U.S. Eng. Datum El. 0
8'-6"
227'
El.32
HYDRAULIC SAND FILL (REMOVED)
Reinforced Concrete Retaining Wall around Storage Annex
Uncovered Dock
Cross-Section

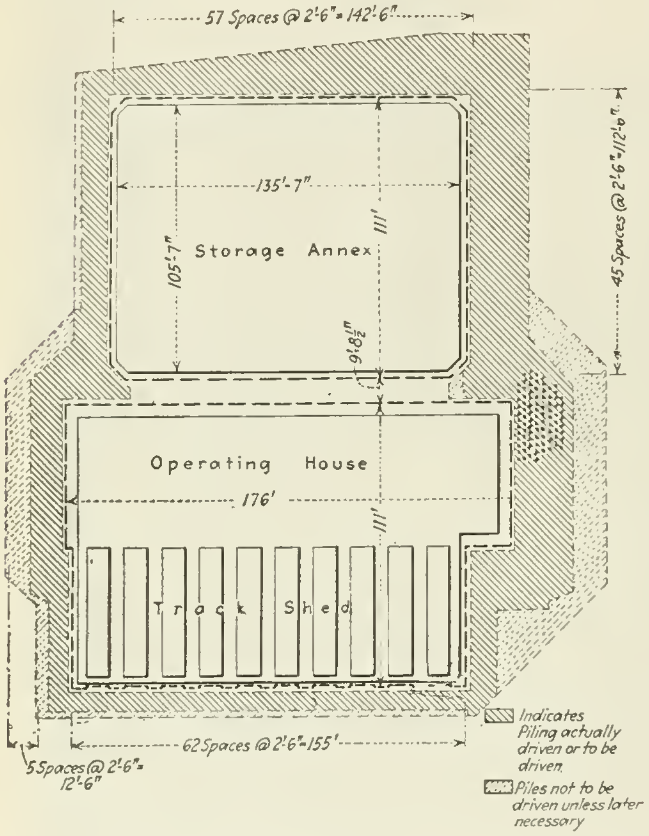
SECTIONS THROUGH GRAIN ELEVATOR SHOWING FOUNDATION CONDITIONS

The majority report states that there were fourteen test piles driven before the foundation work on the elevator was started. These piles were fairly well distributed over the area, and ranged in length from 49.4 ft. up to 101 ft. and had penetrations up to a maximum of 78.8 ft. or to an elevation of –70. The board found, however, that in several instances even with these long piles the penetration under the last blow of the hammer, with that hammer falling as much as 25 ft., was very great, too great, in fact, to warrant the conclusion that piles even of this length would carry safely the load of 25 tons each through a soil of this character when grouped as closely as they were under the structures. They state that the piles as actually driven under the storage annex ranged from 40 to 45 ft. in length and that they are "unable to understand why this length of pile was selected rather than a longer length. It is our opinion that the first piles driven should have indicated the necessity for a further investigation as to the bearing power of the soil upon which the buildings were to be erected."

The report further states that in addition to the test piles driven there were certain borings made to determine the character of the subsoil. These borings were not made, however, until after the subsidence was known to have started and the information which the borings furnished was not conclusive largely because of the way in which the samples were removed from the pipe. The report states, however, that the consulting engineers feel that the borings were sufficient to indicate a subsoil of considerable fluidity which again would seem to indicate the necessity for obtaining more information. The report continues: "One pile located in the midst of a large number in the southeast corner of the storage annex was tested with a load of 80,000 lb. or 40 tons, approximately 1.6 times the load for which it was designed." At this point the report enters into a discussion of the theory of the foundations which reads as follows:

"The deduction seemed to be that if one pile loaded to this amount showed no subsidence, a large group of piles would be entirely safe when loaded to $\frac{10}{16}$ of that load. It is our opinion that this deduction is erroneous. We note that a small group of piles supporting the dock had been loaded by placing sand on the dock to as much as 60 or possibly 70 tons on each pile, and we have no information that any subsidence has taken place, but it is our opinion that this again should not be used as evidence that a large number of piles driven in a comparatively small area would stand anything like this amount of load per pile in a semi-fluid material of the character of this soil. The piles under the operating house and the storage annex were driven on 2 ft. 6 in. centers, consequently when the load was applied on this structure the actual effect was to get one large pile equivalent in area to the area of the storage annex plus the area of the operating house plus the intervening area between the buildings, and it is erroneous to assume that the bearing power of 4300 odd piles driven in this manner would sustain 4300 times the load which one pile will carry. The sustaining power of such a group of piles is limited to the skin friction or shearing value of the perimeter of the entire mass plus the bearing power of the area under that mass. The only remedy that seems to have been adopted at any time during the construction when it was discovered that these piles were driven too easily was to add more piles, which did not improve the situation. From the information furnished us by your engineers and from information which we have obtained in our investigation, we are of the opinion that below the slab there is no soil to a depth of –41 of such a character as will bear the uniform load of approximately 3.8 tons per square foot, which is the ultimate live-load and dead load of these two structures.

"Summarizing our conclusions as to the cause of the trouble, we would state that it is our opinion that too great a load per square foot was placed upon the foundation because of the character of the material at which the load was applied and the piles were driven so close together that they simply acted as a means to transfer the surface load to a point at an elevation –41, where the bearing value of the soil is at least no greater than that at the surface."


57 Spaces @ 2'-6" = 142'-6"
45 Spaces @ 2'-6" = 112'-6"
135'-7"
105'-7"
111'
9'-8½"
Storage Annex
Operating House
176'
111'
Track Shed
62 Spaces @ 2'-6" = 155'
5 Spaces @ 2'-6" = 12'-6"
▨ Indicates Piling actually driven or to be driven.
▒ Piles not to be driven unless later necessary

PLAN OF ELEVATOR SHOWING LOCATION OF PINCH PILES

Further studies by the board showed that a layer of clay 3 ft. or thereabouts thick lies below the old bank and that below that the soil is a soft sand or silt to a depth of somewhere around –160, where there is apparently a hard gravel.

In suggesting remedies the board first recommended that the surrounding soil be compressed by driving additional piles so as to increase the perimeter of the mass upon which the load bears and at the same time to increase the area of the base to which the load is finally transferred. This was suggested as a preliminary scheme which if it did not work could be followed by one of two methods suggested by the board. The first was to sink concrete cylinders under the present structure carrying the whole load to the gravel stratum with such reductions of loads thereto as could be safely carried by the superposed ground, and the second was to so spread foundations on which to float the entire structure, moving the operating house, however, to a new position. The minority report did not feel any of the piling or floating foundation schemes would serve and recommended that the cylinder foundation scheme be carried through.

After considering the various methods of stopping the subsidence, the plan of driving the so-called pinch piles, as recommended in the majority report of the board of engineers, was adopted by the city engineers. This provided for driving rows of piling outside of and parallel to the outer edges of the foundation piling. The first row was driven about 25 ft. away from the structure with succeeding rows inside the first one, thus gradually drawing in on the foundation.

As the maximum subsidence had occurred at the northeast corner of the storage annex, the first of the pinch piles was driven there. As soon as the first few piles were put down the subsidence stopped. It had previously been slowly but steadily going on for some time. As successive rows of pinch piling were put down the driving was more and more difficult as the work drew nearer to the structure. This effect was so pronounced that the number of rows originally contemplated was reduced along parts of the work. However, it was realized at the outset that no exact rule could be laid down and the arrangement with the contractor was that engineers of the dock commission would decide from time to time whether the amount of pinch piling should be increased or decreased.

The foundation piles under the storage annex extend to a depth of 40 to 45 ft. below low-water level. The pinch piles were put down 15 to 20 ft. deeper than this, the first four or six outer rows being driven 5 ft. deeper than the remainder. The pinch piling is to be carried around all four sides of the storage annex, filling in the narrow strip between this structure and the operating house. The piling is also being carried around the outside of operating house and track shed, as shown in the accompanying plan, so that a complete enclosure of the foundation area will be effected. In this work a total of 2,684 piles are to be driven, of which 2,134 were in place by Dec. 15.

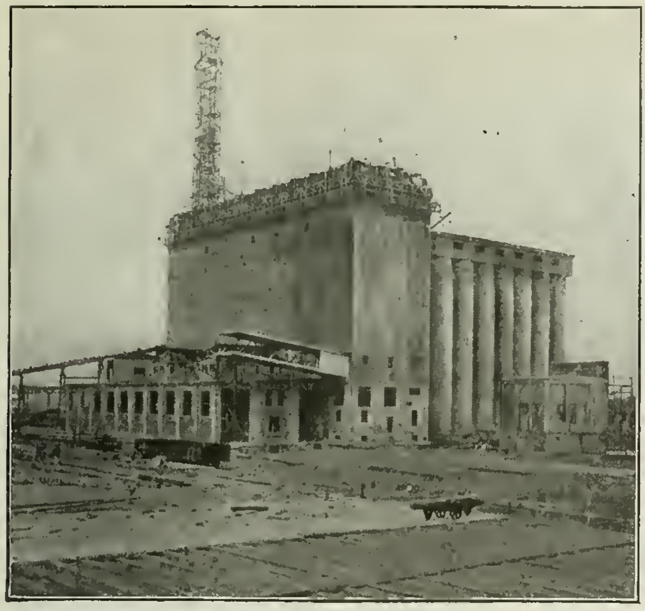
At the time of considering the plan of repair the following tabulations of existing loads and loads to be added were compiled for the three structures. All loads are expressed in pounds.

STORAGE ANNEX

(Concrete work finished to El. 121)

Part	Load to Date	Load to Be Added	Total
Concrete mat on piles, foundations work considered as 140 lb. per cu ft.	6,760,800		
Hydraulic fill	26,996,250		
Concrete to El 121	35,203,500		
Fills in bin bottoms	3,239,900		
Cupola forms	115,200		
Cupola concrete		1,406,800	
Wheat, 755,100 bu. at 60 lb.		45,306,000	
Machinery and belts		143,000	
Live-load on roof		402,000	
	75,315,650	47,258,600	119,574,250

Loading at this time was 60.5 per cent of ultimate load and amounted to 14¾ tons per pile in original foundation.



VIEW OF GRAIN ELEVATOR TAKEN OCT. 25, 1919

OPERATING HOUSE
(Work carried up to El 58)

Part	Load to Date	Load to Be Added	Total Loading
Mat	4,070,000	....	....
Hydraulic fill	14,258,200	....	....
Concrete to El. 36	5,514,200	....	....
Concrete walls and columns to El. 58	2,110,000	....	....
Forms for bin deck	92,000	....	....
Concrete to top of house from El. 58 (less forms)	....	27,486,400	....
Bin fills	....	1,383,000	....
Wheat 329,000 bu. at 60 lb.	....	19,740,000	....
Live load on floors	....	3,319,200	....
Live load on roof	....	227,000	....
Total weights	26,044,400	52,155,600	78,200,000

Loading at this time was 33.4 per cent of total load, and amounted to 16.3 tons per pile in original foundation.

TRACK SHED
(Built up to El. 32 and 36)

Part	Load to Date	Load to Be Added	Total Loading
Concrete in footings	2,080,000	....	....
Hydraulic fill on footings, 32,500 cu.ft. at 120	3,900,000	....	....
Concrete to top of sack platform	7,750,000	....	....
Forms for cols. and roof	70,500	....	....
Live-load on floor	....	848,000	....
Concrete to top, less wt. of forms, 70,500 lb.	....	1,679,500	....
Wheat in hoppers, 18,000 bu. at 60 lb.	....	1,080,000	....
Live-load on roof at 20 lb. per sq.ft.	....	176,000	....
Total weights	13,800,500	3,783,500	17,584,000

Loading at this time was 78.5 per cent of total load and amounted to 17.5 tons per pile.

These analyses of the loads showed what a material increase there would be in the safety factor if the hydraulic fill on the footings were removed. This fill was therefore removed by sluicing and pumping from under all three structures. After the removal of the fill the openings around the space it occupied were walled up with concrete and finished with the cement gun.

The satisfactory condition of the foundation noted as it became more compacted has convinced the engineers in charge that the structures can be used just as was originally intended.

G. B. Hegardt, Chief Engineer of the Commission of Public Docks of Portland, has charge of the work on the grain elevator. G. W. Boschke is consulting engineer and Robert Wakefield holds the contract for driving the pinch piling. The elevator was designed by Witherspoon Englar & Co., elevator engineers, of Chicago.

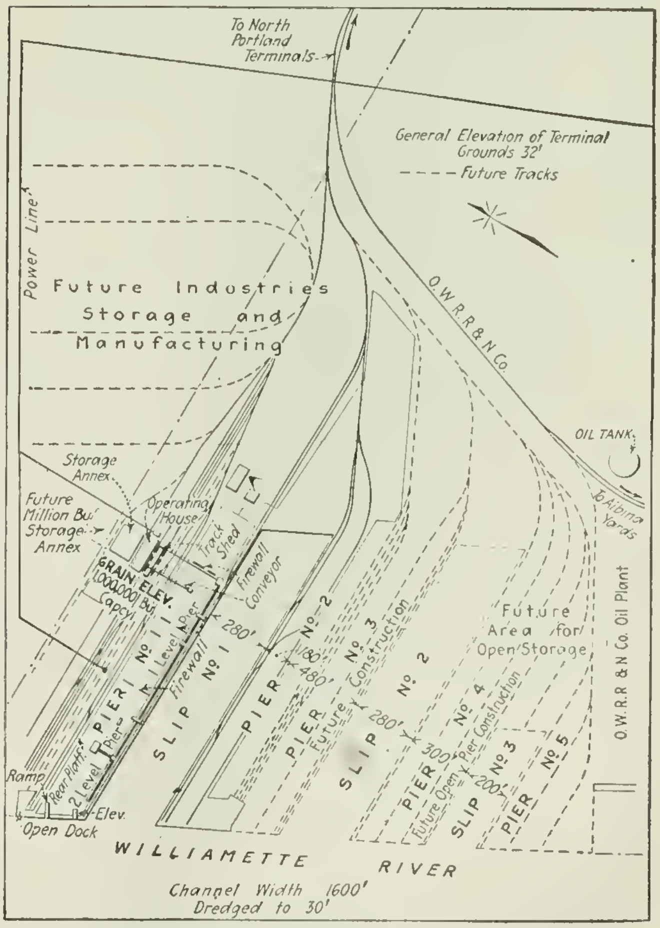
Municipal Grain and Freight Port Terminal at Portland, Ore.

City Is Completing Two Piers and a Large Grain Elevator on River Seven Miles Below Business District

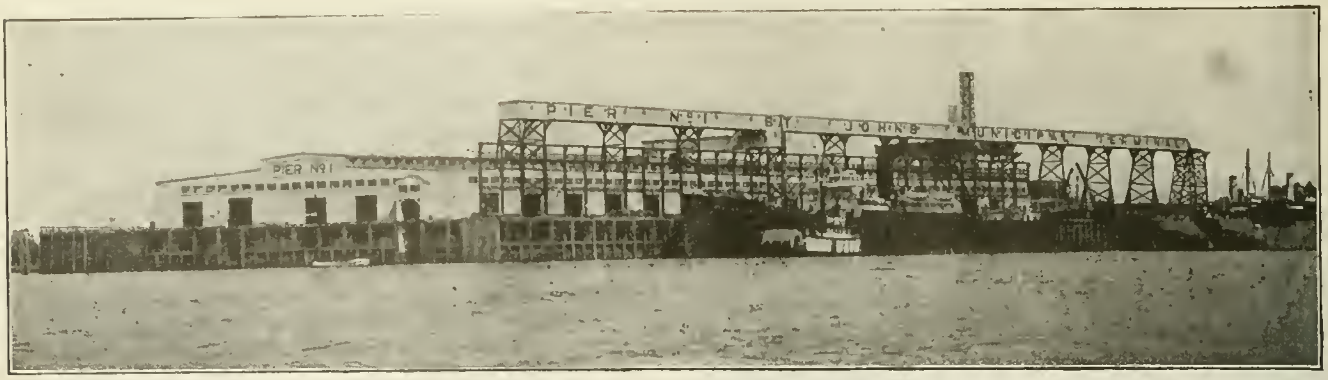
By W. P. Hardesty
617 Chamber of Commerce Building, Portland, Ore.

PACIFIC coast cities have been very much alive in the last few years to the possibilities of ocean trade and have spent and are spending many millions in developing their ports for the more efficient and economical handling of sea-borne freight. Portland, Ore., has been one of the leading communities in this respect, particularly in the extension of municipal construction and control. In 1910 the voters authorized the creation of a Commission of Public Docks to be appointed by the Mayor, and also authorized an issue of $2,500,000 of bonds for the acquirement of lands and construction of public docks. Under this plan two large modern docks have already been constructed and equipped. Under a bond issue of $3,000,000 in 1917, work is well under way on a large municipal terminal, which includes a grain elevator with necessary storage annexes as well as a freight terminal for more economical handling of bulk freight.

Portland has long been an important grain-shipping point, at times leading in annual grain shipments over any other port in the United States. The city has determinedly striven to maintain its standing as an ocean-shipping point for all classes of freight, although located



LAYOUT OF ST. JOHNS TERMINAL—PIERS 1 AND 2 AND GRAIN ELEVATOR NOW UNDER CONSTRUCTION



LOOKING NORTHERLY OVER THE COMPLETED PIER 1

110 miles inland, measured along the channels of the Columbia and Willamette Rivers. It has a big natural advantage in the Columbia River which affords water grades for railways far into the interior as well as to the ocean. For this reason the large wheat-growing sections of eastern Oregon and Washington are naturally tributary to the city.

Handling of grain in sacks only has been the practice at ocean-shipping points in Oregon and Washington until recently. This expensive method is now becoming out of date, both on account of the cost of handling and the cost of sacks, so that the provision of grain elevators for handling in bulk was seen to be a necessity.

The Commission, acting under instructions of the 1917 bond issue, selected a site at the extreme lower end of the city's frontage on the Willamette, at a point about seven miles from the center of town, and on the east side of the river. This point is only 3½ miles above the junction of the Willamette with the Columbia River, and 105 miles from the mouth of the latter. The location chosen, being at the lower end of St. Johns (an annexed town), the entire site, with all the facilities being created, has been designated as the "St. Johns Terminal." A body of land covering 153.55 acres, and having a frontage of 2,500 ft. on the Willamette, was purchased.

Of the tract, approximately 130 acres is naturally low-lying, being partly submerged by the river during floods. To render the site available it has been necessary to fill in, by hydraulic dredging from the river, all of the low land to be occupied, to an elevation of 32 ft. above low water. Nearly 3,000,000 cu.yd. of sand have been pumped in for this portion, and approximately 1,500,000 more will be required to complete to the contemplated high land elevation when all of the site is used.

At the site selected, the Willamette has a width of 1,600 ft. between harbor lines. To utilize the entire width of the river for a fairway for vessels using the terminal, the Port of Portland Commission (another municipal body) undertook to dredge the full width to a minimum depth of 30 ft., at low water. A 30-in. suction dredge has been used, free of charge to the project, and the dredged sand has been delivered at the shore, from which the Dock Commission extended the pipe line to where needed and performed all shore operations with its own force of laborers. By this means the cost to the project has been reduced to about 6½c. per cu.yd.

The St. Johns Terminal consists essentially of piers with ship slips, of a reinforced-concrete elevator embracing track-shed, operating house and a storage annex, of tanks for oil storage, and of open area for industrial and manufacturing concerns that may be established in the future.

The formation of the piers and slips has principally been the work of the Port of Portland, and the J. A. McEachran Co. A 20-in. suction dredge was furnished by the Port Commission at a cost of $300 to $400 per day and used in excavating the slips to a depth of 30 ft. below low water. Nearly 700,000 cu.yd. were dredged for Slip No. 1. The contract of the McEachran Co. included construction of Pier No. 1, as originally designed. This pier is to be 220 ft. wide by 1,500 ft. long, by the plans calling for its enlargement. It has a lower floor (20 ft. above low water), available except during a few weeks of high water, possible in each year. The upper floor, 35 ft. above low water, is available at all stages.

The pier is of wood construction, built as follows: A fill is made, reaching to the full height to support the upper floor for 74 ft. width at the northerly side of the pier, while on the southerly side the slope of the fill runs down at about 2 to 1 slope to 30 ft. depth below low water at the edge of the ship slip, a distance of 146 ft. For this latter portion of the width, the structure is supported on piles, while for the former the flooring is laid directly on the fill.

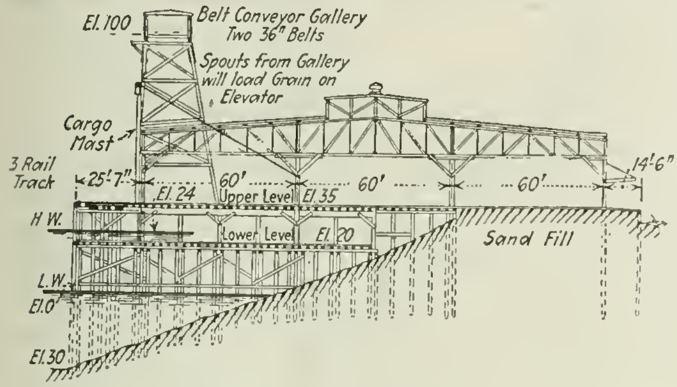
Above the main floor is erected a transit shed 180 ft. wide and running the full length of the pier, leaving an open platform 20 ft. wide on either side. The entire pier is divided into four parts by three fire walls extending across it at intervals of 600 ft., 300 ft., and 300 ft. The shed is of slow-burning construction, and is provided with a sprinkler system. The pier is equipped with movable ramps, with 45-ton and 15-ton railroad cranes, sacking bins, and all facilities for loading ocean-going vessels with grain. A shipping gallery, erected on top of the main structure, runs the full length of the pier, and it is equipped with two lines of belt conveyors, by which grain can be carried the full length to the river front, or be diverted by trippers for delivery to vessels anywhere along the adjacent slip.

Next south of Pier 1 is Slip No. 1, 280 x 1,500 ft. and 30 ft. deep at low water. Adjoining it is Pier 2, also being completed at this time. This pier is an open dock, 180 x 1,500 ft. It will be equipped with gantry cranes for handling the heaviest loads, and with large steel tanks for handling bulk oil from the Orient and also molasses coming from the Hawaiian Islands.

At the easterly end of the slip is an open viaduct connecting Piers 1 and 2. This viaduct is virtually an end dock, giving loading facilities at end of the slip. It is intended, ultimately, to erect sheds on Piers 2 and 3, and to have open storage on Piers 4 and 5. Mechanical appliances will be supplied for economical and rapid handling of the freight.

For the preparation of the plans, estimates, specifications and contract for the elevator, the Witherspoon-Englar Co., grain-elevator engineers of Chicago, were employed, and this work was done under the direction of the Commission at its office in Portland.

The elevator consists of a track shed 58 x 151 ft., with track space outside for 68 loaded cars, an operating house 162 ft. long, 46 ft. wide, and 178 ft. high, and the storage annex 136 ft. long, 105 ft. wide, and 100 ft. high. All these structures are of reinforced concrete.



TYPICAL TRANSVERSE SECTION THROUGH TWO-LEVEL SECTION OF PIER 1

The operating house has 79 bins of varying size and an aggregate capacity of 298,700 bushels. The storage annex consists of 63 bins of 15 ft. diameter, and 85 ft. height, and capacity varying from 10,300 to 12,200 bushels each, and 36 inter-space bins holding 2,200 bushels each, giving a total bin capacity of 755,100 bushels. The total storage is thus 1,053,800 bushels, and connections are arranged for an additional storage annex to be built in the future and holding 1,000,000 bushels more. The operating house has machinery for handling this increased storage. It is estimated that the handling capacity will then be 10,000,000 to 12,000,000 bushels annually. The unloading capacity is 120,000 bushels per day, while loading can be done at 20,000 bushels per hour.

Electric power is used throughout in the operation of the plant. Each unit can be operated independently, and electric signals and telephones are used throughout the plant.

For the foundation the entire area was excavated to about 4 ft. above low water. Piles were then driven, spaced 2½ ft. c. to c. normally, but closer where the ground was quite soft. The formation here is mostly silt. Piles averaging 40 to 50 ft. cutoff were driven, 204,000 lin.ft., at 22½c. per foot, being required. On the pile foundation a 3-ft. reinforced-concrete slab was laid, reaching 6 in. down over the tops of the piles. On this slab were erected pedestals or columns, reaching up to the proper heights to support the different basement floor levels.

The space between the foundation slab and the basement floors was filled in with sand pumped from the river. The basement floors, being below the high-water level, were waterproofed by a thick layer of waterproofing material, embedded in the concrete, and this waterproofing was extended up the walls to elevation 32 ft. above low water.

The elevator work was let in one contract, excluding, however, the excavation and the driving of piling, and also the filling in above the concrete slab before-mentioned.

Early in 1919 there was some trouble with subsidence in the elevator, which is now being corrected by the driving of extra piles. The difficulties are described in an article on p. 176 of this issue.

SPECIAL FORM OF BASE-PRICE CONTRACT

The contract for construction of the main elevator, and also the contract of the J. A. McEachran Co., for Pier No. 1, had some unusual features. Owing to rapidly fluctuating prices due to war conditions it was decided to provide for a base price for every item of material and labor, and to allow for current variations in cost of these items. A series of elaborate schedules for the different classes of labor and materials was incorporated in the proposal and contract, and the bidder named a base rate for each item. The schedules for the grain elevator contract include:

(1) Scale of wages at the site, Portland and vicinity. Under this are the subdivisions of Building Trades Work (with a long list covering all occupations concerned), Machine Shop Work, Sheet Metal Shop Work, and Foundry Work. The wages for an ordinary 8-hr. day, and also for overtime, holidays and Sundays (usually double) were designated by the Commission.

(2) Government prices for materials, f.o.b. Pittsburgh, Pa., these being inserted by the bidder. The prices per ton for pig iron, sheets, plates and shapes, and per pound for shafting, brass and babbitt, were called for.

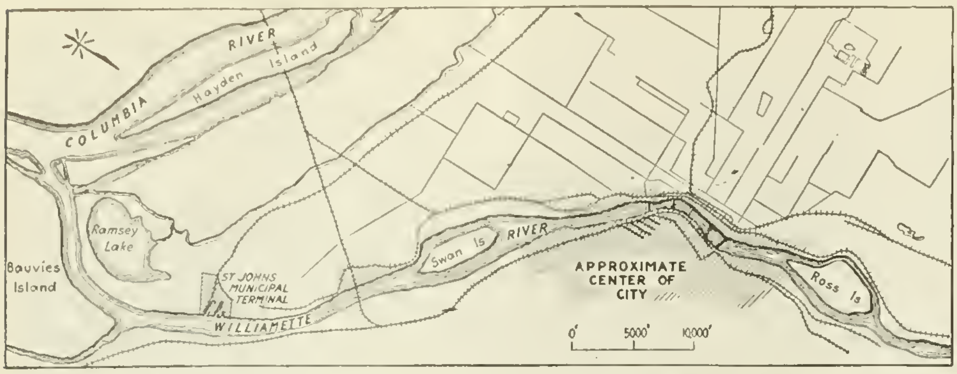
(3) Scale of wages per hour for fabricating said materials. These were inserted by the bidder, and covered the occupations in Machine Shop Work, Sheet Metal Shop Work, and Foundry Work.

(4) Cost of freight on the fabricated products. No schedule of rates was inserted, it being considered unnecessary, as the rates are not subject to dispute.

This contract operated as follows: (1) No variation was made in the pay to the contractor if none of the prices changed in the foregoing schedules (they being current at the time bids were advertised for), but the contractor was paid for the finished work at the lump price bid therefor. (2) For increase in any schedule prices the contractor was allowed for the increase in cost to him over what it would have been if there had been no such increase in rates. (3) For any decrease in schedule rates the compensation to the contractor was reduced correspondingly.

Fixing of reasonable time limits was, of course, necessary to cover the purchase and fabrication of materials Running from the date of the contract, 30 calendar days was fixed as a reasonable length of time within which the contractor and all of his subcontractors (manufacturers) should purchase materials, and 135 days was fixed as a reasonable time in which to complete the fabrication of the said materials. The contractor was not entitled to any increases which occurred after the time limits fixed above.

As to variation in freight rates, the contractor was not entitled to compensation for any increases which occurred unless the fabricated material was transported within sufficient time to allow for the installation of the same, and the completion of the contract in time. The time limit for the completed work was 225 days.



MAP SHOWING LOCATION OF ST. JOHNS TERMINAL, THE MUNICIPAL PORT PROJECT AT PORTLAND, ORE.

Manifestly, this contract required a very full cost-keeping record for the Commission. All original bills for material were submitted and checked, and the time of employees was carefully kept. The going cost of labor at the elevator site was determined by the Commission, being based on prevailing rates of wages, and the contractor was required to apply to the Commission and secure approval of any proposed increased rates of pay before he was given credit for them. The going cost of materials at Pittsburgh, and the going cost of fabricating same was determined by responsible agencies employed by the Commission. The changes in freight rates were taken from the tariffs.

The contract for the elevator and appurtenances was awarded on April 9, 1918, to Grant Smith & Co., of Portland, the estimated amount (base price) being $798,383.

The reinforcing steel and the cement were furnished by the Commission, without charge to the contractor, and were delivered at the site. The Commission bent the steel to the required shapes at one of the municipal docks in the city, which served as a storeyard for it. Following are the kinds of material and equipment furnished by the Commission, together with the amounts paid to the manufacturers:

Reinforcing steel	$93,030
Cement	85,100
Motors and transformers	31,965
Rubber belting	41,000
Grain-cleaning machinery	7,600
	$258,695

Of the contracts before mentioned, that of the J. A. McEachran Co., for Pier 1 was completed in good time, and in excellent shape. As the work of Grant Smith & Co. on the elevator was shut down because of the foundation difficulties, it became necessary to release this contractor, so that on June 28, 1919, the contract was rescinded. The contractor was paid for work done, and material on hand, and a portion of the working equipment was also taken over. Since that time the Commission has carried on all the work on the elevator (including treatment of foundations) by day labor.

The completion of Pier 1 (embracing all of the enlargement over the original plan) and the construction of Pier 2 and the connecting viaduct were let in two contracts—the substructure to Elliott & Scoggin, and the superstructure to J. M. Dugan & Co., both of Portland.

All shore work in the general filling-in and other work over the terminal site, including construction of connecting railway tracks, was done by day labor.

On account of the enlargement of the terminal plan and because of rapid advances in cost of construction, more funds were needed, and in November, 1918, the voters authorized a further issue of $5,000,000. The entire cost of the project as outlined, when completed early in the spring of 1920, will probably amount to nearly $4,000,000.

The general design and construction of the St. Johns Terminal layout have been under general charge of G. B. Hegardt, the engineer of the Commission. The assistant engineer in immediate charge of most of the work has been George S. Edmonstone. Beginning with resumption of work after the foundation difficulties developed, the construction has been under supervision of George W. Boschke, a member of the commission of consulting engineers called in to report on the foundation difficulties. To the gentlemen named, the writer is indebted for data from which this article has been prepared.

Railway System of South America Needs New Links

Desirable Connections Include a Trunk Line for Colombia, a Bolivia-Brazil Line and a Brazilian Coast Line

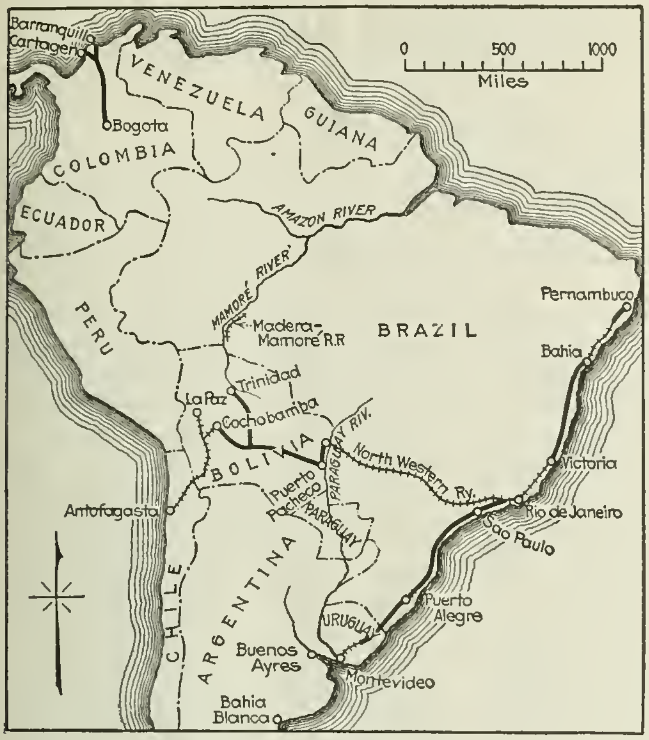
By F. B. Morris
General Drafting Co., New York City

Rapid and modern transportation being the great need for early development of South America's commerce and natural resources, the question arises as to what are the more important of the immediate requirements. Having spent the past 15 years on railroad exploration, reconnaissance and definite studies in six of the South American republics, I will mention three railroad lines, or systems, which in my estimation appear to be absolutely necessary. These are mentioned in the order of their importance.

Bolivia to the Paraguay River

The first of these lines is an extension from Cochabamba, Bolivia, east to the Paraguay River, connecting with the present Northwestern Railroad of Brazil, and having a branch line north through Santa Cruz to Trinidad or other port accessible to river navigation on the upper Mamore River. Cochabamba is the second city of Bolivia and has direct rail communication with La Paz, Bolivia, and Antofagasta, Chile.

This new trunk line, approximately 700 miles in length, would descend the Rio Grande to the vast plain known as the Gran Chaco at the eastern base of the Andes, about 280 miles. This stretch would be somewhat costly, but on the next stretch of 429 miles to the Paraguay River, the construction could be accomplished at remarkably low cost. In crossing the Gran Chaco, the line should hold to the north, in order to serve the rich agricultural district along the slopes of the mountain ranges known as Sierra Santiago and Sierra San Jose. Thence it should go diagonally across the Chaco,



MAP SHOWS THREE PROPOSED LINKS IN THE SOUTH AMERICAN RAILWAY SYSTEM

a fertile land suitable for the cattle, timber and agricultural industries, to Puerto Pacheco, which is a good and deep river port on the Paraguay River.

Puerto Pacheco, or Bahia Negra as it is known along the river, is in the possession of Paraguay and within the zone of territorial dispute between Bolivia and Paraguay. It is considered probable, however, that an early amicable settlement of this boundary dispute will permit Bolivian occupation of the port. Thence the line should follow up the river for about 100 miles to connect with the Northwestern Railroad of Brazil at its present terminus at Porto Esperanca, which is the logical point for crossing the river. The construction of this railroad would give a trans-continental line through the center of Bolivia and link the Paraguay river ports with the Brazilian ports on the Atlantic and the Chilean and Peruvian ports on the Pacific.

The branch should leave the trunk line at the point where it first reaches the Gran Chaco and run north to Santa Cruz, then follow the Rio Grande to the selected port, probably Trinidad, an approximate distance of 380 miles. This line can be constructed very cheaply. The northern Bolivian rubber would thus be shipped to either Atlantic or Pacific ports. This branch would also connect Bolivia with the ocean steamship service on the Amazon River by way of the upper Mamore River and the Madera-Mamore Railroad.

BOGOTA TO THE ATLANTIC

The second railroad is a line from Bogota, the capital of Colombia, north to the Atlantic port at Baranquilla or Cartagena, about 560 miles. This line is practically a necessity to the progress and development of Colombia. Under the most favorable conditions Bogota is sometimes reached from the coast in 10 to 15 days, though the voyage frequently requires 20 days.

The present railroad from Bogota to Nemocon, 37 miles, could be revised and utilized as a part of this line, by ascending from Nemocon to the Ubate Pass, thence on a reasonably light grade, down into the valley of the Magdalena, where the grade would be only that of the river. The only heavy construction would be encountered on the stretch from the Ubate Pass into the valley and would be facilitated by the present steamboat navigation on the Magdalena River.

This railroad would place Bogota within 20 hours of the Colombian ports on the Caribbean Sea and give an outlet to practically the entire settled portion of the republic. In addition it would offer inducement for connecting many of the existing short railways with this main line, as well as for the construction of other feeders. A point worthy of mention is the good grade of coal now being mined along the Bogota-Nemocon Railroad, which would probably solve the fuel problem, provide freight for the railroad and fuel for ships.

BRAZILIAN COAST LINE

The third projected railroad is a low-grade line along the Atlantic coast in Brazil. connecting Pernambuco with Montevideo, Uruguay, and passing through Rio de Janeiro. This is one of Brazil's greatest transportation needs and could be accomplished by connecting existing lines north of Rio de Janeiro and constructing a new line south of that city. These present lines are as a rule well constructed, and linking them into a trunk line would not necessitate prohibitively costly revisions. The existing lines which connect Rio with Montevideo cannot compete with ocean steamships on account of the excessive grades, curvature and distance. This new coast line, if properly constructed, would place Rio within 1275 miles (40 hours) of Pernambuco, and 1350 miles (43 hours) of Montevideo. It could afford to handle traffic at a rate that would assure the carrying of the greater part of the commerce, which in this instance is awaiting the completion of such a railroad, while the many existing lines reaching from the coast into the interior would form valuable feeder lines.

Railroad construction in South America has in many instances been governed by limited capital, the result being that after construction the lines could not compete successfully with river navigation, wagons and pack trains, because of the high cost of operation due to excessive grades and curvature and therefore necessarily high tariffs. In practically every instance where these excessive curves and grades have been used, both in the Andes regions and in the eastern Brazil district, they were considered necessary on account of the crossing of mountain ranges.

It is in these same mountain districts that the enormous undeveloped water power of the continent lies. In making future studies of railroads, it would appear advisable to attempt to place all of the steep grades in one section and seek adjacent water power for the hydro-electric operation of that particular section. This would be preferable to the use of switchbacks, racks or pusher engines. At the same time, this method would considerably reduce the length of line and cost of the construction.

Topeka, Not Kansas City

In the article, "Through Concrete Arch Bridge to Give Large Waterway," by F. W. Epps, published in ENGINEERING NEWS-RECORD, Dec. 11-18, page 994, an error was made in editing the manuscript in this office. Topeka, Kan., instead of Kansas City, Mo., should have been named as the site of the work.

What Is the Future of Inland Water Transportation?—*Part IV*

By Charles Whiting Baker
Consulting Editor, Engineering News-Record

France and Germany have gone further than any other countries in the development of inland waterways. They have kept water transportation alive by compelling the railways to charge considerably higher rates than the boat lines. Part of the success of water transport in Europe is due to conditions differing widely from those in the United States, but on the whole the waterways of the two countries cost the taxpayers more than the public gains in reduced cost of transport. As American railway rates are lower than European water transport rates, there is no reason for copying French or German waterway policy here.

An analysis of the cost of bulk-freight transport on American railways of heavy traffic shows that the cost for movement over the road alone, on such lines as compete with waterways, is less than two mills per ton-mile. Only under most favorable conditions can freight be moved by river or canal at a lower cost. Still more important is the fact that terminal expenses and not the cost of hauling between terminals is now the controlling element, and on most freight the terminal expenses are far less by rail than by water.

The fact that railway rates are lower where there was water competition has long been a stock argument of waterway advocates These rates are a survival from past conditions. The removal of this discrimination in favor of river and coast cities is now fought, not by the railways but by the cities themselves.

IX—Continued from page 144

Inland Water Transportation in Europe

"The United States should develop its inland waterways because the great industrial nations of Europe, especially France and Germany, have long followed this policy and now use inland water transportation to a far greater extent than the United States."

That is substantially the argument which has been used for many years in advocacy of Federal appropriations for waterway improvement; and it deserves fair consideration. It is easy to go to Europe and come back wonderfully impressed with the value and importance of inland water transportation there. We are all impressed with what we see on the surface. Few take the time and trouble to investigate underlying conditions.

It is not merely the casual traveler who comes back from Europe an enthusiast on inland water transportation. Men have gone on official trips of investigation and returned convinced that the United States ought to imitate the work of the European waterway engineers. In fact a good share of the work on canals and the improvement of navigable rivers which has been done in the United States has been copied from European practice.

Rail and Water Competition in Europe

In Europe as in the United States, the development of the railway during the last century brought about keen competition with the water transport lines; and in Europe as in the United States the railways at an early day rapidly got the better of the waterways. In Europe, however, the waterways were far more strongly intrenched than in the United States. The canals and navigable rivers of Europe were the chief means of inland transportation when the railway era began, and had been for centuries. Rivers had determined the location of cities and industries and commercial routes. Wars had been waged over the control of rivers; and rights to their use had been incorporated in international treaties.

Nevertheless the railways of continental Europe had by 1870 demonstrated their ability to compete successfully with the canals and rivers and the battle for supremacy began. Public sentiment was largely on the side of the waterway, as a road open to everyone and against the railway as essentially a monopoly. There was a general belief that the railways were superseding the waterways because the latter were too small for the traffic; and it was held that the Government should develop the water transport facilities.

Government Expenditures on Waterways

Both Germany and France embarked in the '70s on a broad policy of waterway improvement at public expense. France up to 1900 had spent on its rivers and canals, aggregating about 7500 miles in extent, \$300,000,000 for construction and improvement and nearly \$150,000,000 for maintenance and repairs. In Germany the state of Prussia alone had spent on the construction of waterways, by 1906, about \$200,000,000 besides contributing largely toward their maintenance and operation.

If one desires to compare the relative cost of railway and water transportation in France and Germany, therefore, he must take into consideration not merely the relative freight rates by rail and by water but the part of the cost by carriage which has been contributed by the taxpayers through the public treasury.

There is only one American investigator who has attempted this. Prof. Harold G. Moulton, now of the Economics Department of the University of Chicago, undertook in 1911 a study of the comparative economy of railway and waterway transportation; and he went to Europe to study conditions there. His book "Waterways vs. Railways," published in 1912, was awarded a prize of $1000 by a committee of eminent economists. It is the most thorough review of this subject that has ever appeared.

The facts and figures given by Prof. Moulton are closely parallel to those reported by another investigator, Mr. E. O. Merchant, in an appendix on European Waterways forming part of the report of the National Waterways Commission, issued in 1912.

RAILWAYS PREVENTED FROM LOWERING RATES

In both Germany and France the Government has prevented the boat lines from being driven out of business by railway competition by compelling the railways to maintain their rates considerably above the water transport rates. In France, the Government bears the entire expense of maintaining and operating the waterways, no tolls being charged. Prof. Moulton finds that the waterway system of France costs the taxpayers about $19,000,000 per year. This is made up of interest on $360,000,000 capital invested at 4% plus the annual expense of operation and maintenance, between $4,000,000 and $5,000,000. The total traffic on all French waterways in 1905 was 3,348,000,000 ton-miles. Hence the average cost to the taxpayers of the freight carried on French waterways was about 5.7 mills per ton-mile. The average freight rates charged by the barges are 4 mills per ton-mile, or a total of 9.7 mills per ton-mile. The average freight rate on all French railways in 1905 was about 13 mills per ton-mile. The waterways, however, handle chiefly low class freight on which the cost of handling by rail is much less than on the average freight carried. Were the arbitrary differential not maintained, therefore, the railways could carry the freight more cheaply than the waterways.

These are, however, comparisons merely by broad averages. When the situation is studied in detail it is found that the French waterways vary greatly in traffic importance. The Seine river, for example, is navigable from Paris to the sea by barges of 1100 tons capacity. Coal from Wales, foreign grain and other low grade freight, are brought to Paris from the seaboard in vast amounts. The Seine traffic is in fact nearly a third of the entire waterway traffic of France. Most of the French rivers and canals have a very light traffic. The Government outlay on their maintenance is closely parallel to the expenditure by the United States on inland rivers where navigation has practically ceased.

One of the best authorities in the world on the comparative economy of rail and water transportation is the eminent French engineer, M. Colson, General Inspector of Bridges and Highways in the French Department of Public Works. M. Colson has for many years opposed the French Government's outlay on waterways, especially those where the traffic is small. Prof. Moulton quotes M. Colson as declaring that the Government outlay on the waterways of central and southern France is "an absolute waste." The stock argument that waterways are necessary to relieve the railways from the burden of handling low grade bulk traffic M. Colson meets with the declaration that "There is absolutely no question as to the ability of the railways to care for all the traffic of the country. It is absurd to hold that the waterways are an indispensable aid to the railways."

No such direct comparison is possible of water and rail transport results in Germany as that just stated for France, for the German waterways are largely under control of the separate states. Further than this, certain of the German waterways are more favorably situated for traffic than those of any other country. The Rhine has the greatest traffic of any inland waterway in the world, aggregating before the war, 22,000,000 tons per annum. It extends from the great ocean port of Rotterdam southward nearly 400 miles through the most densely populated region on the globe. It is navigable for 2000-ton barges for 250 miles. Its flow is remarkably uniform throughout the year, as it is fed during the summer months by the melting glaciers in the Swiss mountains. Its average closure by ice is only 17 days in the year. It traverses the famous Westphalian coal fields. Vast industries have grown up all along its course, which use the river for transportation.

Of the total traffic on all the German waterways, 7582 miles in extent, 43% was moved on the 355 miles of the Rhine in German territory.

The Elbe river, which reaches from the great port of Hamburg inland 386 miles to the Austrian frontier, carries another 24% of the total German waterway traffic so that these two rivers carry two-thirds of all the water traffic of Germany. To lump the statistics of traffic on these large rivers with those of the smaller rivers and artificial canals to prove that the whole German waterway system is an economical transportation proposition is misleading.

THE DORTMUND-EMS CANAL

Prof. Moulton analyzes the traffic statistics of Germany's most important inland canal, the Dortmund-Ems, which gives an outlet for coal from Westphalia to the North Sea. This canal is 153 miles long and accommodates 600-ton barges. Its total cost to April 1, 1906, was $24,493,000. In 1905 it carried 1,518,000 tons and its deficit was $908,359, so that the cost to the taxpayers was about 60 cents per ton carried. The water freight rate plus the tolls and harbor dues added to this makes a total cost of $1.74 per ton, or about 1.4 cents per ton-mile for all freight carried on the canal. The German railway rate on coal is about 1 cent per ton-mile. Thus even under the German conditions, the railway transport is cheaper than the canal transport when all the items of cost are included. Of course, if the comparison were made with American railway rates on coal and similar low grade freight the fact that the waterway is a far more costly means of transport than the railway would be still more evident.

In the Kingdom of Prussia, a direct comparison is possible between the financial results from the state-owned and operated railways and the state-owned and operated waterways. Up to April 1, 1906, there had been expended on the improvement of Prussian waterways $198,420,000 covering 2324 miles of open rivers and 1508 miles of canals and canalized rivers. These cost the taxpayers in that year for interest on their cost at 3½%, sinking fund and deficit in operating expenses over earnings, the sum of $13,498,777, an average of $3523 per mile of waterway. In the same year the State railways of Prussia, 31,319 miles in extent, after paying interest and sinking fund charges on their bonded debt of $1,518,400,000 earned a net profit for the State of $56,900,000, which was 2.57% on the total capitalization after interest charges on the investment were paid, or an average profit, after paying interest on the cost, of $1814 per mile of railway.

It is a well known fact that the policy of the German Government for the past half century has been to promote in every possible way the use of waterways. The Government-owned railways have their rates so controlled as to divert traffic to the waterways. The Government stands the cost of maintaining all the rivers and canals, charges very small tolls on the canals, much less than the cost of maintenance and operation, and none at all on the canalized rivers. The Government also stands most of the cost of freight transfers between rail and water lines, and the wharfage dues charged by cities are usually much below the interest and maintenance cost on the municipal water terminals. Thus water transportation is heavily subsidized at the taxpayers' expense, while the railways return a large profit to the public treasury.

The "coördination of the railways and the waterways," which has been held up as an ideal for the United States, has been effectively carried out in Germany for many years; but that this "coördination" has operated to benefit the public remains to be proved. It would seem too obvious to require any argument that wherever the total cost of water transportation is greater than the cost of rail transportation the public is injured and not benefited if it is compelled to use the more costly route. German official literature is strangely silent, however, on this important point. In that country, as in the United States, the *assumption* that water transport is inherently cheaper than rail transport is the basis on which vast sums of the taxpayers' money are expended.

There is one isolated case, however, where the German propensity for investigation got the better of the Government policy. In 1909, Dr. Walter Rathenau and Prof. Wm. Cauer of Berlin, published the results of an investigation to determine whether freight could be carried more cheaply by the proposed Rhine-Elbe canal or by a railway. They found that the canal rates would have to be fully double the rail rates if they covered the cost of making and maintaining the waterway as well as the cost of haulage. They also found that the railway would have much greater traffic capacity than the 600-ton barge canal. It does not appear, however, that this investigation had any effect on the German Government's waterway policy.

THE KAISER AND GERMAN WATERWAYS

Half a dozen years ago it would have been considered sufficient proof of the soundness of an economic policy that the German Government had adopted it. The world has learned some lessons since then as to the infallibility of the German Government. It is, however, exceedingly interesting, in the light of present knowledge, to note what Prof. Moulton said in his book, published two years before the world war.

After demonstrating conclusively from official figures that a good share of the waterways of Germany are costing the taxpayers more than the benefit they confer in lowering the cost of freight transport, Prof. Moulton continues:

> Is it possible that the German waterway officials and the German people themselves can be unaware of the economic losses involved in waterway expenditure? Is there something back of the scenes, some dominating force which virtually compels the Government to continue the policy of subsidizing the waterways?

After a careful first hand study of German waterways, M. Colson asserts that Kaiser Wilhelm is the power behind the movement. The Kaiser, it is said, believed that Germany's future is dependent on the development of her sea power and he is "suffering from a delusion" that the development of inland navigation is an absolute essential to the expansion of ocean commerce. Now, it is well known that when the Kaiser's mind is made up—when he has received an "inspiration," as the Germans themselves say, it matters not if sound arguments are wanting. In 1890 the Kaiser dismissed 20 members of the Prussian upper house who had voted against the canal bills and appointed 20 men to take their places who were favorable to waterways development.

There is one fact of extreme importance which must be always borne in mind in any consideration of European water transport as a guide to our policy here. That is the low cost of railway transport of bulk freight in the United States compared with Europe. If the figures for cost of transportation per ton-mile on European waterways are examined, they will be found to be in most cases higher than American railway rates on low grade freight hauled an equal distance, and this notwithstanding the much lower labor cost in Europe.

European comparisons between railway and waterway transportation are not applicable to American conditions, for the evolution of the railway as an economic carrier of bulk freight has proceeded much farther in the United States than in any other country in the world. Even if the government policy of France and Germany toward their waterways were sound, it does not at all follow that it would be a wise policy for the United States to adopt.

In concluding this chapter, special emphasis deserves to be laid on the unreliable character of a good share of the engineering literature on water transportation, especially that coming from foreign sources, where the old traditions as to the value and importance of water transport die hard.

An extreme example was related by a member of the delegation of American engineers who were invited to France early in 1919 to advise on a reconstruction program. Among the projects submitted to them for approval and urged with great force and eloquence by a Colonel holding high rank in the French Department of Public Works was a proposed very costly waterway to reach a well known city now without water transport. The American engineers inquired what was the principal industry of the city and the reply was, "the manufacture of watches!"

X—The Cost of Rail Transport and Water Transport Compared

The sole justification for the expenditure by the Government on the improvement of inland waterways is the belief that water transportation is cheaper than rail transportation. If this is not the case—if on any particular waterway the total cost of transportation is greater than the cost of sending the goods by rail—it is evident that the waterway will not be used, and the money spent on its improvement for navigation will be wasted.

The time has come when this question must receive impartial investigation and answer. Hitherto the situation has been confused by the prevalent idea that the waterway was needed to protect the public from the railway "monopoly." The waterway advocates of half a century ago said: "The railway can charge us rates based on 'what the traffic will bear' and all that it will bear; and because it is a monopoly we are helpless. Give us a waterway and we have a road that is free for every man to use; one which no monopoly can control. We will then be protected from railway extortion."

That is really the foundation on which was based the campaign in favor of waterways and the expenditure of hundreds of millions on waterway development which has resulted.

This foundation has now been swept away. Experience has demonstrated, in the first place, that the individual boat owner on the river or lake is too small and too weak to survive in the competition with the big railway corporation. Experience has demonstrated, in the second place, that even where water transportation still survives, as on the Great Lakes, a few big strong concerns can absorb the small companies, and there is no possible way of preventing combinations between them, actual or tacit, to limit competition. Finally, experience has demonstrated that the railways at the present time, instead of charging extortionate rates for their service, are not charging enough to save themselves from bankruptcy. The long-standing argument that waterways are necessary to keep down railway rates is now demonstrated to be based on a fallacy.

The waterway is thus shown to be useless to protect the public against monopoly; and we can face fairly the question, Can the waterway actually transport goods cheaper than the railway?

WATERWAY COMPETITION ON LOW-GRADE FREIGHT

The first step in answering this question is to determine what sort of goods the waterway is best fitted to transport in competition with the railways. Most waterway advocates agree that it is only on low-grade bulk freight that the boat can compete with the railway. On all the inland waterways of the world where business still survives, the traffic carried is nearly all of this class: Coal, ore, stone, lumber, ice, brick, grain. On these and similar low-value commodities the water carrier must rely for its business.

It is easy to see why. On these commodities the cost of carriage is very large in proportion to their value, and if the waterway can make a saving over the railway it is of much importance; but on high-class goods the value per ton is so great that if any saving is made by shipping by boat it is so small that other matters overbalance it. The greater risk of loss by water carriage and the greater risk of delay are alone sufficient to route nearly all merchandise shipments by rail instead of by water, wherever there is a choice.

LARGE VOLUME OF BUSINESS NECESSARY

Furthermore, in order that water transport shall show a saving over the railway it must handle a great volume of business. Bulk freight of the classes indicated can only be handled economically by the provision of elaborate terminals and machinery for operating, and it takes a very large traffic to justify the investment in such terminals. It takes a huge traffic, also, to justify the expenditure on the waterway itself. The Ohio River improvements will represent a total investment by the Government of about $100,000 per mile. The Mississippi below St. Louis has absorbed as much. New York's new canal system has cost nearly $300,000 per mile.

The question narrows down, then, to the relative cost of rail and water transport for low-grade bulk freights handled in great volume. The railway of today handles such shipments in cars of 50-ton to 100-ton capacity. On railways paralleling water routes and having easy grades, such cars can be made up in trains carrying 2000 to 3000 tons or more of paying freight. What does it cost a railway to haul such freight over the road, apart from terminal expenses? For an accurate answer to this question, we should have to inquire into the special conditions in the particular road in question. The published official statistics, however, enable a general answer to be made.

The Hon. Robert W. Woolley of the Interstate Commerce Commission, in an elaborate statement submitted to a Senate committee Feb. 1, 1919, showed that the average cost of moving a railway freight car a mile over the road in 1916, including interest at 6% on the entire investment in the railway, but excluding the operating expenses at the railway terminals, was 11.37c. Of this amount about two-thirds was the cost of operation, the remaining one-third being interest on the investment and taxes. This reduces the cost of car movement to 7.58c. per mile, as an average of all traffic handled on all railways. It includes freight hauled over mountain railways with steep grades and the traffic carried on the many thousands of miles of branch-line railways where the traffic is not heavy enough to permit handling in large trains at low cost. This figure, then, is certainly higher than the average cost of hauling cars in full trains on roads of easy grades.

We are justified in assuming an average car loading as high as 40 tons, for though this is higher than the average car loading on all railways, it is lower than the loading where full trains of large-capacity cars are handled. At this rate, the average ton-mile operating expense on road haul alone, on all the railways of the United States, including all the expenditure on maintenance of way, was 1.89 mills per ton-mile in 1916.

ACTUAL COSTS ON 11 IMPORTANT RAILWAYS

Let us now compare this figure, representing the general average for the entire United States, with some figures taken from the official reports of individual railway companies which handle a heavy traffic.

The railways shown in the accompanying table have a comparatively small mileage of branches, so that the figures represent chiefly main-line operation. The second column in the table is the average freight charges per ton-mile on all freight moved over the railway in 1916. This includes, of course, high-class merchandise and less-than-carload freight, but on all the roads except the last (the Chicago & Alton) the great bulk of the traffic is in ore or coal.

The third column in the table shows the percentage the operating expense is of the gross earnings on the road named; the fourth column, obtained from the preceding two by computation, shows the railway's operating expenses per ton-mile. This computation leaves out of account the passenger business, and would be strictly correct only if the percentage of operating expenses to earnings were the same on passenger business as on freight. As a matter of fact, on most American railways the profits are earned on the freight business, and there is little money in carrying passengers. On most of the roads in the table, however, the passenger business is so small compared with the freight that the error in overstating the cost of haulage is not great.

The figures in column 4 include all the terminal expenses of the railways as well as the cost of hauling the freight over the road. Mr. R. W. Woolley, in the statement above referred to, says that an examination of the Interstate Commerce Commission's statistics shows that of the entire railway freight operating expenses on all the railways of the United States, one-third is assignable to expenses in operating terminals. Column 5 of the table has been computed on this assumption, and shows the actual operating cost of hauling a ton of freight over the road on the railways in question, including the cost of maintaining the roadway. These figures check very well with the general average of 1.89 mills per ton-mile obtained above from Mr. Woolley's figures.

TABLE SHOWING AVERAGE COST PER TON-MILE OF HAULING FREIGHT OVER HEAVY TRAFFIC RAILWAYS IN 1916

Name of Road	Miles Operated	Revenue per Ton-Mile, Mills	Per Cent. Operating Expenses to Earnings	Total Cost per Ton-Mile, Mills	Cost per Ton-Mile for Haul Over Road, Mills
Bessemer and Lake Erie	204	4.50	51.87	2.33	1.56
Western Maryland	688	5.01	64.40	3.22	2.08
Chicago & Erie	269	4.38	61.41	2.70	1.80
Hocking Valley	350	4.06	66.84	2.68	1.78
Toledo & Ohio Central	575	4.00	74.59	2.98	1.98
Kanawha & Michigan	176	3.82	62.77	2.39	1.60
Chesapeake & Ohio	2,385	3.80	65.90	2.50	1.66
Norfolk & Western	2,085	4.20	56.16	2.35	1.56
Virginian Ry	505	3.40	53.02	1.77	1.18
Carolina, Clinchfield & Ohio	283	5.82	49.80	2.90	1.98
Chicago & Alton	1,052	6.18	71.07	4.39	2.92

These very low cost figures of hauling bulk freight over railways with low grades and heavy traffic are based, it will be seen, on official records. They cannot be denied or explained away. Nor is there any reason to doubt their accuracy. A modern railway freight train enables a crew of six to eight men to transport a load of 3000 tons or more at a speed of 10 to 20 miles per hour. It is easy to see how small are the cost of labor and coal and all other expenses of conducting traffic compared with the great number of ton-miles of transportation accomplished per hour or per day.

Expenses of Barge Transport and Rail Transport Compared

We must accept, then, the figures of 1.60 to 2 mills per ton-mile as a fair average of the operating expenses in transporting low-grade bulk freights on railways of easy grades and heavy traffic. Can any inland water carrier transport bulk freights at lower cost than this? It cannot be done by the river steamboat. A glance at its payroll in comparison with its cost per ton and its load capacity shows this to be certain. Nowhere in the world, even in Europe, are low-grade bulk freights handled by river steamboats in any quantity.

The only type of vessel which can handle bulk freights on inland waters at low cost is the barge, moved in fleets by a single power boat. There are, however, no official statistics of the cost of barge transportation which can be compared with the preceding figures for the cost of haulage by rail. We must, therefore, resort to comparison of the various items that make up the total cost.

In waterway promotion literature, great emphasis is laid on the small resistance to motion of a barge floating in water compared with a car rolling on a track. This difference, however, is much less than is generally asserted, and has no such controlling influence. The cost of the power used in hauling by either water or rail is a small fraction of the total cost.

The cost of barge construction per ton capacity is somewhat less than the cost of railway cars; under price conditions prevailing before the war, cars for bulk freight cost $25 to $40 per ton, and barges for inland waters cost $10 to $25 per ton. The annual maintenance cost of the barge probably equals that of the car, and its depreciation is at least as great. The largest item in the operating expenses by either water or rail is labor. The crew for a fleet of barges on inland waters carrying a total load equal to a freight train on a heavy-traffic road will probably equal the train crew in number, but its hourly wage rate has been much lower.

On the other hand, the barge fleet on inland waters can make only 1½ to 3 miles per hour, while the railway freight train averages 10 miles. Of course it is true—and waterway advocates make a great point of this—that railway cars stand still a good share of the time. But, after allowance is made for this, the railway car and the railway freight trainman will make an annual average mileage two to four times as great as the river barge and its crew. Thus, the annual expense for interest, depreciation, wages, etc., on freight trains is distributed over a greater number of miles.

Finally, in any comparison of actual freight-rate charges by water carriers with rail rates, the advantage of the boat in having no expense for its roadway must be borne in mind. Fully 20% of railway operating expenses are assignable to maintenance of way; so if the barge carries freight at 80% of the railway rate it will have no lower total cost for haulage than the cost by rail, even when the cost of the waterway on which the boat operates and which the taxpayers build and maintain, amounts to no more than one-fourth the rate charged by the barge.

It is true that the figures for cost of railway transport which have been given above are for the year 1916 (the last for which the official statistics are available), and that since then a great advance has taken place in expenses. This does not materially affect the above comparisons, however, for the advances in labor, in fuel and all other materials have hit the water carrier harder than the railways. It is only the water carriers on the ocean, where railway competition is absent, that have prospered during the past four years.

No more detailed comparison than the above is necessary to prove that the common assumption that water transport is cheaper than rail transport is not justified. Where the conditions are most favorable for water transport, the difference between the two is so small that, to settle the question in a particular case, a careful estimate, which will take into account local conditions, must be made. Further than this, the very low cost of rail haulage above determined proves that even where barges are operated under most favorable conditions their saving over rail rates cannot be large. Where freight can be hauled by rail for 1.75 mills per ton mile, the utmost possible saving by substituting water transport can hardly exceed a mill per ton-mile, or 10c. for a distance of 100 miles.

But wherever population and traffic are dense enough to support a waterway in competition with a railway, terminal expenses are bound to be very large compared with the cost of haulage. Whether the waterway or the railway will be the cheaper carrier, therefore, will depend on the relative terminal expenses.

TERMINAL EXPENSES HAVE BECOME CONTROLLING

In order to get a correct view of the comparative merits of railway and water transport, the fact must be grasped that the terminal expenses have become today the chief factor in transportation cost everywhere save in very long distance shipments. The application of steam power to transportation has annihilated distance both on water and land. The mere loading or unloading to or from a car or boat by hand labor usually costs 30 to 50c. per ton, and haulage by trucks to or from the wharf or the railway station may cost 30c. to $1 or more per mile. These are the operating expenses alone. To them must be added the interest, depreciation and maintenance charges on the terminals and cargo-handling machinery. Either the railway or the waterway can usually haul the goods, when once loaded, at so low a figure that the difference in cost between the two methods of transport will usually be much less than the difference in terminal expenses.

Within recent years this fact has been to some extent grasped by the promoters of waterways, and it is common to hear it emphasized that "good terminals are as necessary to the success of water transport as good channels." But the question to be settled in any given case where water transport is under consideration is whether the total cost of transport, *including the charges on the necessary investment in channels and terminals*, will be less than the cost of rail transport, where the charges on the railway line and its terminals are necessarily included.

THE RAILWAY'S ADVANTAGE IN TERMINALS

It is obvious that only a very small proportion of the country's traffic originates on or near a navigable stream, or is delivered there. The railway, on the other hand, reaches every community of any size. In every important manufacturing or industrial plant (save those in a few very large cities, such as Boston, New York and San Francisco), railway spurs run directly into the works. A car once loaded with goods can travel across the continent, traversing perhaps a dozen different railway lines, until it reaches its destination. Breaking bulk en route to transfer from rail to water or vice versa is very costly, and involves, besides the direct cost of handling the freight, more or less delay and risk of loss by theft or damage.

It is in the cost of transfer from the railway to the waterway and back again that the greatest obstacle to extensive use of inland waterways is found. With even the most generous estimate of the saving per mile of water transport over rail transport, the cost of transferring freight between the railway car and the steamboat twice on the journey will offset the saving by use of the water route over a considerable distance, especially as it is on long-distance shipments that the railway can afford to make the lowest rates.

If this dominating fact is comprehended—that the cost of breaking bulk and of terminal handling is the big item in transportation costs today, while the cost of the actual transport per mile, by either rail or water, has sunk to an exceedingly small amount—it is then easy to understand why the field in which the waterway can compete with the railway is closely limited.

Here also is to be found one of the main reasons why inland water transportation in Europe has an importance that it has never attained here. Europe's cities and many of its industries were established long before the railway era, when the only cheap inland transportation was by water routes. Water transportation has been maintained in Europe because there was a large volume of business which could be handled from origin to destination without the use of the railway at all.

In the United States most cities and most industries have been built up with sole regard to the use of the railway. The inland waterways of the United States in many respects offer facilities for navigation far superior to the waterways of Europe; but few industries are located on such waterways.

Except at the seaboard, a waterside location for an industrial plant is generally inferior to a location inland. Foundation and drainage difficulties at a waterside location are apt to be such as to add materially to the cost of construction. A wharf or pier for water transport will usually cost several times as much as a railway spur track. More important still, in an industrial plant of large size, covering often a large area of ground, the railway tracks can be run directly into the warehouses or shops, thus saving largely in the transportation cost inside the works.

Especially is the waterside location unfavorable where a waterway is subject to great changes of level. Such changes exist on practically all natural waterways; on those connected with the ocean because of the tides, and on rivers because of alternate floods and droughts. The Ohio and Mississippi rivers, which are the most important inland navigable rivers of the country, have a variation of 20 to 70 ft. between high and low water at various points. As they flow for most of the distance through a broad alluvial valley, where good foundations are often very difficult and expensive, and where changes in the channel are frequent, the building of structures capable of handling river freight traffic economically is very costly and is attended with much risk of loss. Such works can only be profitable if a very large volume of freight is handled over them.

These facts are sufficient, probably, to explain why industrial plants in the Ohio valley are only located close to the river where topographical conditions compel such a location. The disastrous floods within the past dozen years have brought into special prominence the advantages of upland sites for industrial plants compared with sites on the flood plain of a river.

HANDICAPS OF WATER TRANSPORTATION

Any comparison of the ability of water transport lines to compete with the railway must not omit the inherent defects of the waterway as compared with the railway. Modern commerce has become adjusted to the regularity and reliability of railway service and takes it as a matter of course. By no art of the engineer can water-borne traffic be carried with equal safety and certainty, especially on inland rivers. The steamboat is subject to delay by fog, by low water and by flood; there is, besides, risk of accident several times as great as the risk on goods sent by rail. The railway is responsible to the shipper for the value of his goods, and its fixed property is a guarantee that this responsibility will not be evaded. The responsibility of the water carrier is in most cases an uncertain quantity. In order to be protected in the transport of goods, the shipper must go to the trouble of obtaining marine insurance to cover them.

Those who have sought to rehabilitate water transportation have generally overlooked the necessity that responsible concerns must engage in the steamboat business, or no great volume of traffic will go by water. New York placed on its statute book years ago a law limiting the capitalization of any concern engaging in traffic on the state canals. The framers of the law saw no further ahead than that the business must be kept open to free competition among the canal-boat captains, owning each a few barges and running them in the old-time way. To allow the canal traffic to be handled by large companies would result in combinations among them and with the railways to limit competition.

Such reasoning ignores the changed commercial conditions of the present day. It is no more possible for the old-time canal boat captain to be a serious competitor of the railway for freight business than it would be for the old-time stage coach to compete for passengers.

XI—Railway Competition, Past and Future

It will be evident from the facts cited in the previous chapter that the water carrier could very seldom compete with the rail carrier if, like the rail carrier, he had to bear the cost of the road which he uses. The cost of making and maintaining the waterways and even the cost of terminals, however, has been borne by the taxpayers. All the water carrier has to invest in is a boat. Under these conditions, what chance has the water carrier of competing successfully for business?

There is no doubt that the waterway advocates are correct in their assertion that if the railway is permitted freely to compete with the inland waterway, it will be impossible to reëstablish inland water transportation on any large scale. The railway can reduce its rates below cost if necessary to meet a boat's competition and can raise them again after the boat has been taken off. The railway need not necessarily lower its rates to do this. If a line of boats begins operating on a river, the railway can start a competing boat line and lose money on it, if necessary, long enough to put the other line of boats out of business.

Such things have been done in the past. They are less likely to be done today, because of the different public sentiment toward unfair methods of competition, because of legislation restricting the railways from controlling water lines, and because water competition is today too insignificant to make it important for railways to make great effort to oppose it. Nevertheless, the railways, if they are operated by competent managers, are certain to go after the business and take it away from the waterway, if it is worth taking.

Nor are the railway managers to be blamed for this. The law still recognizes competition as a factor in the railway business. It expects the railways to compete with one another and with other rival concerns, and even threatens them with pains and penalties if they attempt to avoid competition. Whether the railways are operated by private companies or by the Government, it is the duty of the railway managers to operate them as efficiently as possible. The well known rule of railway business is, "It is additional traffic that pays dividends." To permit traffic to be diverted from a railway means that the fixed charges for operating and maintenance will have to be borne by a smaller volume of business. The managers of railways, therefore, in endeavoring to prevent the diversion of business to waterways, are merely doing their duty toward the property for which they are responsible.

Rail Rates Lowered by Waterway Competition

Probably the greatest single influence in convincing the public that water transportation is cheaper than rail transportation is the long-established practice of making rail rates to points where water competition exists lower than to inland points. These rates date back to the time when the battle between the railway and the steamboat was active and bitter. The whole railway rate structure, in fact, is based on the competitive conditions which prevailed half a century ago, and survives after those conditions have ended.

The Interstate Commerce act of 1887 recognized this condition as one too firmly established in the country's business to be uprooted, and the Commission was expressly authorized to grant exceptions to the famous "long-and-short-haul" clause of the act. Under the authority of the Commission the railways have ever since continued to make freight rates to seacoast points and points on interior navigable rivers lower than to inland points.

There has now been before Congress for a year a bill to amend the Interstate Commerce law by making the long-and-short-haul clause absolute and taking away the authority of the Commission to grant exceptions to its operation. If this bill becomes a law, the power of the railways to make lower rates to meet water competition will be eliminated.

In the committee hearings on this bill in the last Congress the only opposition to the bill by any railway company was that offered by the Southern Pacific Co., probably because of its special location with respect to the Panama Canal. The fact that no more opposition came from the railways is an excellent illustration of the change in attitude of present-day railway managers toward water transport lines. The majority of them recognize, without doubt, that the present rate structure is filled with discriminations such as this which have long outlived the conditions under which they originated. Many of them are aware that the day when the river and canal could offer serious competition to the railway has passed.

Director General Hines, in a statement published April 10, 1919, declared that the Railroad Administration's policy was that water and rail competitive rates should be proportioned to the relative cost and desirability of the respective routes. In a case now before the Interstate Commerce Commission involving the discontinuance of the special rates made to Mississippi River points on account of water competition, the Railroad Administration has not opposed an order placing rates to river and interior points on a parity.

In the committee report on the above-mentioned bill to repeal exceptions to the long-and-short-haul clause of the Interstate Commerce law, General Charles Keller, of the Corps of Engineers, head of the Board of Engineers on Inland Waterways, testified, "No really successful river navigation can be established unless the present structure of rail rates is completely revised so as to take away from river communities the unjustly favorable rail rates that now exist."

Director General McAdoo in his official report at the close of his administration said, "I doubt if any of our rivers or canals will become active factors of transportation if the railroads are turned back to private control. The old methods of railway competition with the waterways doubtless would be revived."

CITIES OPPOSE REMOVAL OF DISCRIMINATION

It is not the railway companies which are the chief obstacle to the removal of the present rate discrimination in favor of the river and coast cities, but these cities themselves, and to a large extent the entire commercial community. Director General Hines well summed up the situation in his letter of April 10, 1919, when he said, "Whether the existing rate structure is altogether sound or not, the commercial and manufacturing interests have largely adjusted themselves to it, so that any general radical change of rate relationships would be exceedingly disturbing to business interests and to many communities."

Were the railways back under private control and were any such radical change undertaken as the elimination of the long-standing discrimination in favor of water competitive points, an outcry would go up that would compel public authorities to interfere and prevent the change.

In hearings before the Congressional committee which has in charge the pending bill to enforce the long-and-short-haul clause, there appeared in opposition on June 10, 1919, representatives of the Chicago Association of Commerce, the National Industrial Traffic League and the New York Merchants' Association. This is typical of the opposition that will have to be met and overcome before the bill can become law. The opposition to eliminating this long-standing discrimination, established originally in order to enable the railways more effectively to compete with the water routes, comes not from the railway managers but from the great commercial centers which have long been the beneficiaries of that discrimination.

The railways, if they are to be turned back to their private owners, face the absolute necessity of raising their rates if they are to remain solvent. It is to their interest that the necessary increase of revenue should be secured by raising rates to points which are now too low in proportion to the general rate level, rather than by a general increase to all sections.

The commercial organizations of the country have for years been active in the campaign for waterways. They have looked forward to the completion of these waterways and the establishment of traffic upon them. But the very advocates of these waterways declare there can be no traffic upon them unless the special railway rates established to meet their competition are eliminated, and these same commercial organizations are now fighting to retain these special rates.

By way of direct illustration, the Merchants' Association of New York City was a principal factor in the campaign twenty years ago to secure the construction of the New York Barge Canal. In the hearing on the pending long-and-short-haul bill before Congress, General Keller, of the Corps of Engineers, said, "We have looked into the possibility of putting to advantageous use the New York State Barge Canal. The condition there is much the same as in the Central Valleys. On the present basis of railroad rates, business cannot profitably be done by the canal."

Yet the Merchants' Association now fights the revision of railway rates without which the waterway, for which it is partly responsible, will remain unused!

One of the demands most insisted on by the waterway advocates is that the railways should be compelled to establish joint rates with water carriers, and it is alleged that the failure of the railways to make such rates is one of the methods they have used to drive the water carriers out of business. It is obvious, however, that the railways can only make joint rates with water carriers who are financially responsible and who will quote rates which will have some stability. As one step toward this, a bill now pending in Congress proposes to place water carriers under control of the Interstate Commerce Commission, and compel them to file published rates as do the railways.

This proposition has met the well nigh unanimous opposition of the water advocates. They urge that the boats cannot stand the burden of expense involved in filing and adhering to a regular rate and that they must be free to change their rates from day to day as they please. That the railways cannot quote joint rates with water carriers so operated and that shippers who entrusted freight to such irresponsible carriers would run risk of heavy losses is too obvious to require proof.

Lack of facilities for transfer between the railway and the waterway is, of course, a further obstacle to the making of joint rates. Who is to pay for such facilities? As has been already fully demonstrated, the cost of the transfer, even with such facilities provided, will generally exceed any saving made by using the water route. Certainly the railway cannot be expected to join in providing such facilities unless the water carrier which is to use them is a responsible concern likely to stay in the business and to handle sufficient traffic at stable rates to make the investment an attractive one.

In other words, if the water carrier is really to be an important competitor of the railway and be "coördinated" with it, its business must be as stable and reliable as that of the railway. Attempts to revive water transportation on the archaic lines of a generation ago are sure to fail.

(To Be Continued.)

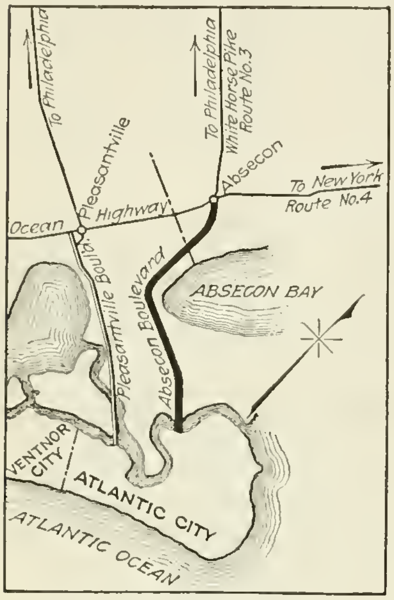
New Water Tank for Akron, Ohio

Three types of water-tank construction were submitted for bids recently by the Bureau of Water-Works Improvement at Akron, Ohio, the tank to have a capacity of 150,000 gal. These types were as follows: Monolithic reinforced-concrete tank and tower; steel tank and tower; elevated steel tank inclosed in concrete tower. No bids were offered on either type of concrete construction. As the tank is to be located in a residence district, it was intended to provide a structure of better appearance than the ordinary steel tank and tower, but on account of the advanced season and the need of improved service in the district it was decided to construct a steel tank which may later be inclosed in a masonry shell. G. Dale Dixon is chief engineer.

Hydraulic-Fill Highway Across Salt Marsh

Hydraulic Dredges Throw Up Embankment Between Retaining Walls of Salt Meadow Sod

HYDRAULIC dredges have recently completed nearly 250,000 yd. of embankment for the new road connecting Atlantic City, N. J., with the state highway system on the mainland. A 12-in. and a 16-in. dredge were used, as, owing to war conditions, these were the only machines which could be obtained, and both were too small to be economical for the volume of work to be performed.



NEW HIGHWAY CONNECTION WITH ATLANTIC CITY, N. J.

Material for the fill is largely fine sand, and was pumped from the bottom of Absecon Bay. The approximate length of the longest discharge was about one mile. To hold the fill, which was 5 to 6 ft. high in places, walls of salt meadow sod were built along each of the edges as the filling progressed. These walls stand on a surprisingly steep slope of about 1 horizontal to 4 vertical. The sod walls held the fill admirably. About 247,236 cu.yd. were placed at a cost of about 30c. per cubic yard. This fill is surfaced with 106,546 sq.yd. of gravel 8 in. thick which cost 40c. per sq.yd. The clear roadway between guard rails is 40 ft., and the crown is a parabolic curve with a slope of $\frac{3}{4}$ in. per ft. The total contract price for this work was $280,321, as let on March 10, 1916. It has been carried on by A. H. Nelson, engineer for Atlantic County. W. G. Thompson, state highway engineer, has had general supervision for the state, which contributed substantially towards the construction.

Hours of Labor and Wages in England

According to information from the office of the American Consul General at London, the British Ministry of Labor reports that wage increases effected during November, 1919, and applying to 1,900,000 people, represented a weekly increase of £480,000 ($2,335,900 at normal exchange), or about £25,000,000 annually. During the first eleven months of 1919, 5,250,000 workers secured increases aggregating not far short of £2,000,000 weekly, or practically £100,000,000 ($486,650,000) per annum. Seventeen groups of trades were represented in that increase. During November, 30,000 work people had their hours of labor reduced on an average of three hours each, or 90,000 hours for the month. Changes effected in this respect during the first eleven months of 1919 aggregate 36,211,000 fewer working hours, the number of working people affected being 5,479,000.

Impressions Here and There

Highway Work in Texas

TEXAS counties authorized a grand total of some $80,000,000 of bonds for highway improvements during the year 1919 by popular vote, but a constitutional amendment that would have authorized the legislature to provide for the issuance of $75,000,000 state highway bonds was defeated.

A pre-election canvass of engineering opinion in a number of Texas cities, combined with a careful reading of the daily press, showed considerable doubt as to the bonds carrying. In fact, their failure was confidently predicted by some. There were three main grounds for this prediction: (1) That the voters of Texas had acquired the habit of voting down constitutional amendments generally; (2) that the state aid being particularly needed by the poorer and more sparsely settled counties was a reason why the more prosperous and popular counties would vote against the proposition; (3) that the proposed constitutional amendment gave blanket authorization to the legislature to handle the proposed bond issue as it saw fit without throwing any safeguards around the expenditure of the money.

As to the first of these grounds, the election itself seemed to support the reasoning since of a half dozen amendments submitted at the same time all were defeated except two, one of these permitting an increase in the allowance to Confederate veterans of the Civil War by a cent or two a day, and the other simply authorizing Galveston County to vote on issuing more flood-protection bonds. Little evidence is available to show to what extent the adverse vote on highway bonds was influenced by a feeling of the more prosperous sections of the state that they did not want to contribute toward road improvement in the poorer districts, but it seems more likely that the chronic Texas objection to constitutional amendments and the distrust of the state legislature were the strongest factors in defeating the constitutional amendment in question.

It is worth noting that the legislative rather than the administrative branch of the State government seems to be held in question so far as this constitutional amendment and the powers it would bestow are concerned. A Forth Worth engineer long resident in Texas stated after the election that had he been at home he would have voted against the amendment because there was no safeguard provided for the expenditure of the money. He added that he would have voted yes could he have been assured that the present chief engineer of the State Highway Commission and the members of the Commission itself would be retained in office to expend the $75,000,000. It is significant that nowhere was criticism of the State Highway Commission heard and that as to the state highway engineer there was a great unanimity of engineering opinion favorable to the way he is conducting the affairs of his office. An engineer in Houston, while not criticising the State Highway Commission, did express himself strongly to the effect that it would be better if one of the members of the Commission were an engineer.

This same engineer, in talking of the carrying on of road work for counties, remarked that county organization in Texas is not conducive to good road engineering —either as regards the way the commissioners are selected or the resulting caliber of men. These courts of commissioners, as they are called in Texas, consist of five members. Four are elected by popular vote and the fifth is the county judge, who presides and casts the tie vote. These commissioners have large powers, but the viewpoint of some of them is illustrated, this engineer stated, by what happened in a county that voted $2,000,000 of road bonds. The commissioners did choose a good engineer but gave him a room in the basement of the court house, provided him with a table instead of a desk, and "could not see why he wanted a lot of instruments."

An engineer in Austin remarked that even in those counties of large population, where a majority of the voters are residents of cities, men of large caliber are seldom appointed as commissioners. Still another engineer, commenting on how the counties go at their road work wrong, spoke of a county where the people—presumably on the recommendation of the court of commissioners—voted $1,000,000 for temporary road improvement and $100,000 for permanent improvement, when, in his opinion, the sums should have been reversed.

Rollin J. Windrow, state highway engineer of Texas, stated that the county road bonds voted in Texas in 1919 were based on pre-war prices and that the promoters of these roads promised more mileage than the bonds will build. He added that some of the counties are bonded to the limit and that in some cases there is a strong desire to cheapen the work so the bonds will go further. He is taking the firm stand, in connection with such projects as come before him for approval, that he will not compromise on location, grade or drainage, but that the counties may in some cases be allowed to ease up for the present on surfacing.

In a pre-election statement Mr. Windrow said, in advocacy of the bond issues: "There is scarcely a county system which has been voted or is proposed in the State that is not under-financed. These counties come to the State Highway Department seeking aid, but except for the Federal funds this department is practically helpless. With the funds provided by the counties, some portion of road construction must be sacrificed. If the department had sufficient money to substantially aid counties, then it could demand a reduction of mileage and such an improved type of road that would give a permanent investment and permanent service over such roads as are built."

A few weeks after the election the State Highway Commission gave out a summary showing that $18,677,480 were available from state and Federal sources for road construction in Texas, $16,215.285 being Federal and only $2,462,195 being state-aid funds. With the small amount last stated, the Highway Department of Texas must do the best it can to supplement the deficiency in county appropriations. Since in some of the larger and more prosperous counties the bond issues run up to $5,000,000 or $6,000,000 it is evident that very little can be done in many other of the counties without extensive state aid if the Federal-aid appropriation is to be fully utilized.

More exact figures than have yet been cited as to county bond issues have been made available by Capt. J. D. Fauntleroy, district engineer in charge of Federal aid in Texas, Oklahoma, Arkansas and Louisiana. From Jan. 1 to Nov. 1, 1919, Texas counties voted a total of nearly $78,000,000 road bonds and there were then an additional $14,000,000 to be voted on before the close of the year. About 110 of the 257 counties in Texas were included in the $78,000,000 of road bonds named. The counties that had not voted highway bonds up to Nov. 1 were mostly in the Panhandle and in southwest Texas.

Inquiries in a number of cities disclosed a shortage of available road materials, besides great difficulties in getting them moved. State highway Engineer Windrow has a special division engaged in locating highway materials.

The foregoing notes, based on information gathered while visiting a half dozen cities in Texas, will serve to illustrate some of the road problems confronting state and county highway officials, engineers and contractors in that State. The people at large do not seem to appreciate the relative poorness of their county organization and the relative goodness of their state organization for road construction. They have voted large and small bond issues in more than 100 counties and have defeated the amendment authorizing extensive state aid.

It may be that had a comprehensive state highway improvement plan been worked out in Texas, and laid before the people for approval in connection with the constitutional amendment, the latter would have carried. Such a plan need not have been incorporated in the constitutional amendment, where it would, of course, have been out of place. The constitutional amendment might have merely authorized the legislature to issue bonds to the extent of $75,000,000, or any other sum named or unnamed, provided that a comprehensive plan for the improvement of the highways of the state should be worked out by the State Highway Commission and submitted to the voters for their approval in connection with a proposed bond issue.

Dec. 15, 1919. AUSTIN, TEXAS.

Railway Bridge Inspections and Records

Frequent bridge inspection is a highly important factor in the conservation of material which is now so important, as such inspection tends to insure both safety and full service from each structure. This is one of the conclusions of a report on railway-bridge inspection which was presented at the annual meeting of the American Railway Bridge and Building Association held recently at Cleveland, Ohio. Systematic and thorough inspection should be made, therefore, on every railway, at intervals of not more than 12 months and preferably every six months. Motor cars are recommended for inspection trips, as the use of regular or special trains involves too much loss of time.

Forms for field records of inspection should be complete, comprehensive and convenient, but although numerous forms were received by the committee it has found none that it can recommend for general adoption. Separate reports should be made for steel and timber structures. By making these field reports in manifold, much copying and office time may be saved. As it is difficult for the inspector to do his work and make his notes at the same time, he should be accompanied by such assistants as may be necessary to effect a rigid inspection. The inspector should record his recommendations as to repairs and renewals at the time when he makes the inspection, and should have authority to order immediate repairs where necessary.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Engineering and Adventure

Sir—"Incog," whose letter to the editor was published in your issue of Jan. 8, p. 98, likes Professor McDonald's paper, "Engineering and Adventure." That is perhaps of little importance. I do not like "Incog's" communication. That is, perhaps, of not much importance, but I want to say why I don't like it and possibly that may be of some interest to some reader, though not of great importance.

I don't like it because it breathes the spirit of warfare in business. He says, "We set out to get the scalp of the older organization." It seems to me that it makes no difference that the scalp was to be raised by doing a better job or giving a product more nearly meeting the demands of the field. They were after the scalp—that is the important point.

It would seem to be, at least, possible that the spirit of the whole concern was wrong and that this was responsible for what appeared to be the failure of a part of its personnel.

It seems to me that there is a fine text here for a good sermon which shall be a preachment on the ethics of business.

Inasmuch as the critic does not know who is being criticized, it is perhaps well that the criticized shall not know the critic. Therefore permit me to subscribe myself. INCOG. No. 2.

Sir—The letter by "Incog" in the issue of Jan. 8, p. 98, is interesting for its frankness, which is a quality that lends as much zest to life as does adventure. It is true that individualistic men who lack a sense of proportion catch the disease which W. L. Saunders diagnosed in engineers as megalomania—in other words, "swelled head." But individualism means properly that the individual develops also the power of self-criticism. The most successful men are naturally conceited, but they have learned to control what then appears to be only a commendable self-confidence, and they understand how to direct other men's conceits. Is it not better to develop men able to critize themselves than to deaden spontaneity and discourage the expression of natural talents? P. B. MCDONALD,

Assistant Professor of English.

New York University.

Dividing a Trapezoid Into Strips of Equal Area

Sir—The article of P. Arneson, on "Pile Foundations for Unequal Load Distribution" (*Engineernig News-Record*, Oct. 9, 1919, p. 698), suggests to me that simple formulas for dividing a trapezoid into any number of equal parts may be worth mention. Their general form, and the manner of using, will be apparent from the following example:

Take the pressure trapezoid represented in Mr. Arneson's article, 17 ft. wide, with a unit pressure $P_1 = 7.34$ tons on one side and $P_7 = 4.55$ tons on the other, having an area of 101.065 units. This trapezoid of equal size, each to contain 16.844 units. The unknown sides of the small trapezoids are represented by P_2, P_3, P_4, P_5, and P_6 in the accompanying diagram. Then

$$P_2 = \sqrt{\frac{5\,P_1^2 + P_7^2}{6}}; \qquad P_3 = \sqrt{\frac{4\,P_1^2 + 2\,P_7^2}{6}};$$

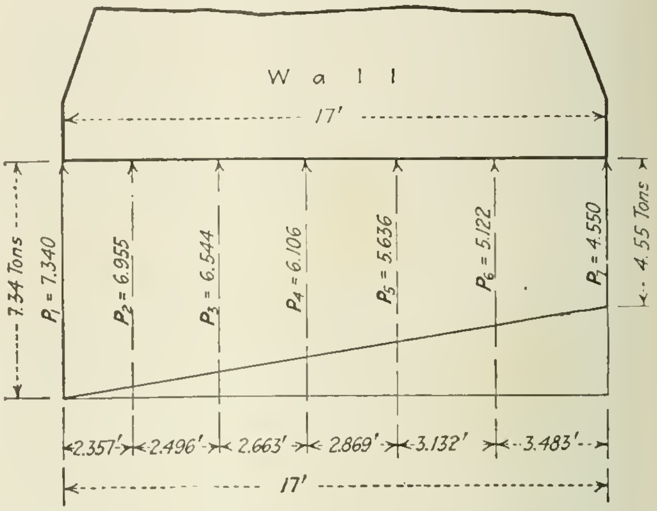
$$P_4 = \sqrt{\frac{3\,P_1^2 + 3\,P_7^2}{6}}; \qquad P_5 = \sqrt{\frac{2\,P_1^2 + 4\,P_7^2}{6}};$$

$$P_6 = \sqrt{\frac{P_1^2 + 5\,P_7^2}{6}}$$

Substituting the values of P_1^2 and P_7^2, we get $P_2 = 6.955$, $P_3 = 6.544$, $P_4 = 6.106$, $P_5 = 5.636$, and $P_6 = 5.122$ tons. With both sides and the area of each trapezoid of equal size, each to contain 16.844 units. This method combines simplicity with absolute accuracy, and requires no knowledge of mathematics other than arithmetic. R. B. MCWHORTER,

Ass't. Division Engineer, Miami Conservancy District.

Hamilton, Ohio.



Theory and Practical Rules in Detailing Building Steelwork

Sir—The letters in your issue of Nov. 27-Dec. 24, 1919, p. 961, and Jan. 8, 1920, p. 99, by Leonard C. Jordan, George Paaswell, C. L. Carman and W. M. Wilson, criticising my article on "Common Errors in Detailing Steelwork for Buildings" (Oct. 16, 1919, p. 730), gave opportunity for discussing a phase of engineering designing that, in my judgment, is of vital importance. These gentlemen have brought up some subjects upon which I have very strong convictions, based on experience of more than a quarter of a century of examination of plans and structure that are the work of other designers; and I should like in a future article to take up some space with what I believe to be constructive criticism of engineering education.

For the present I wish to define "practical designer" and "ultratheorist" as I have used the terms. By practical designer I do not mean the man who ignores theory and designs by guess and the rule of thumb; I refer simply to the class of men who are doing the practical designing, men who make it their business to design. In this class there are a few men who are up in all the intricacies of theory, but the average designer, while he understands the basic theories of design can follow the theorist so far, and then he loses the way. Rules of design for him must be predigested. If finespun theory is encountered in the way to the solution to a problem, he sidesteps it; and very frequently in his design, he simply ignores things that are of vital importance, because he sees the theoretical lion in the way. For this reason there is often a great hiatus in the work of the practical designer. It is to help this class to do better work that I am striving to induce the engineering profession to simplify their theory so as to eliminate superfluous matter, the presence or absence of which has no bearing whatever on the safety or economy of structures, unless it be that it adds greatly to engineering cost in the design.

The ultratheorist is the man who plays on an instrument with one theoretical string, and that is the perfect elasticity of steel. If the ultratheorist were inclined to take all facts and theories into his problem and weigh their relative merits, he would perhaps discard some of his intricate theories; for the solution of some problems, if every fact were considered, is so stupendous that the thing would fall from sheer weight. As an example of an ultratheorist, a certain author takes up pages of his book, in a most complex theory of earth pressures, to work out a retaining-wall formula on an assumption of properties that no earth on this planet possesses.

Horse sense is theory in oilskins and rubber boots. It is as much theory as the elasticity of steel. But it is the fag ends of theory that do not admit of nice mathematical solution. It is just as much a scientific fact that steel is tough as that steel is elastic. But the toughness of steel, while it saves the life of countless structures and men, is erratic and not subject to nice laws, such as an assumption of perfect elasticity. Hence, the ultratheorist prefers to work out his problem on the perfectly elastic theory.

To answer specifically some of the criticisms of my article: The statement that a condition of eccentric loading was repeated on all floors was not made to convey the idea that repetition produces greater stress on a column, but only that the error was multiplied and that the repetition ought to have called the designer's attention to it.

As to designing beams for distance between seats or connections and proportioning the columns for the bending moments, designers would be willing to take the license to shorten the spans of beams, but *they will not design columns for the resulting bending moments.* They do not do it where heavy loads are plainly eccentric either in steel or concrete designing. It is easy to enforce the rule for span length but a practical impossibility to introduce anything so fancy as bending moments on columns for usual or even unusual loading.

In Mr. Carman's Fig. 1 he runs the web of a girder through the column and claims that this could be figured as central loading, producing no moment on the column. This is an impractical detail, and it reduces the column section by cutting off the web. It is far from being as good as my detail Fig. 1 (a), for in this latter the rivet heads will easily take the tension due to the small calculated bending moment in the "girder" at the face of the column.

Mr. Carman will find that I recommended the method indicated in his Fig. 3. The approximate method was given to impress designers with the fact that an eccentric connection needs far more rivets than barely enough to take the end shear of the beam, and in the hope that some designers would adopt it as a rough and easy way to make an ample connection for an unusual case. As a rule such cases are not frequent, and a little extra metal will be found negligible.

Pittsburgh, Pa. EDWARD GODFREY.

Troubles With Blue Clay

Sir—The article on p. 989 of *Engineering News-Record*, Dec. 11-18, 1919, is of special interest as the large sewer referred to is yet to pass under twelve Michigan Central tracks, five of which are on a fill. The disturbance of substrata referred to in the article occurred but a short distance from the first of the tracks. I note that the writer of the excellent article states that the "blue clay" is chemically something else, but I am not sure that he defines it.

During the past summer four piers were put down to bedrock in Detroit for the Michigan Central. The Missouri Valley Bridge & Iron Co. did the work, using compressed air. The location was 2½ miles from the site of the sewer-construction troubles and the same "blue clay" was encountered down to hardpan, or about 10 ft. above bedrock. In one pier a hydrogen-sulphide gas gave considerable worry when the pier was almost landed on rock. This same thing occurred recently on a "free air" job at Chippawa on the project described on p. 1010 of the same issue of *Engineering News-Record* previously referred to. This canal passes under the Michigan Central at three points.

Another matter, largely of local interest, is the attempt made at the Ford blast furnace here last summer to put down a 6-ft. pier to rock by the Chicago method. The location is not far from the sewer job and the Michigan Central pier job, and I understand considerable trouble developed.

Detroit. L. B. ALEXANDER,
Assistant Bridge Engineer, Michigan Central R.R.

A Full Day's Work—Industry's Need

Sir—The writer respectfully submits a few thoughts in reply to the article on p. 813 of the *Engineering News-Record*, issue of Oct. 30-Nov. 7, entitled: "Construction Labor's Instability," in which W. P. Schmuck appeals to Congress to enact legislation permitting a greater influx of immigrants, in order to secure a sufficient supply of common labor.

It has been my observation that what we most need just now is an increased output by the labor we have with us. On several large road contracts in this territory, common labor is receiving practically double the wage of 1914, and is producing, or turning out, about 60 per cent as much as in 1914, making the results cost the contractors, not 100 per cent increase, but at least 150 per cent increase for the portion of his costs represented by labor, as compared with the condition that obtained in 1914. The work day here was a full 10 hours, until our Government took over certain local industries, for the duration of the war. The Government shortened the work day to eight hours, used three men on an average to do what two had been accustomed to do, and the results—we have with us now. Labor is surly, indifferent, quits for no apparent reason, work not more than three-fourths of the time, and produces as little as possible when working.

A sane campaign conducted by employers, aided by the daily newspapers, and other publications, calling on every true man to buckle down to business, render a full day's work each day, and not less than five and one-half days per week, would get us started on the right road once again. Employers take too little interest in their employees. Better talk with them at the noon hour, use one-half an hour each week, at the employer's expense if necessary, to give them a little friendly talk. Make them feel human, and let them know you are human, and reward industry, but stamp out indolence, and get their help in doing it. Now is the time to begin this kind of work.

I for one object to an influx of foreigners, and am heartily in favor of sending back many we now have with us. We do not need I.W.W.'s, Soviets or Anarchists, and should we let down the bars, we are sure to regret it bitterly later on.

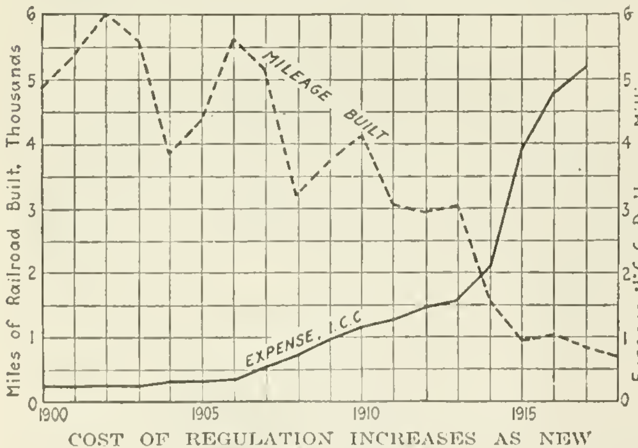
Machinery is fast showing the way to increased results, with less men, less effort, and a better job. Intensified labor is all we need, and inducing labor to see it that way will get the results. Your effort lies in securing labor's co-operation to that end.

F. S. Parrigin,
Panama City, Florida. Civil Engineer.

Railroad Regulation and New Mileage

Sir—I have prepared the accompanying diagram from official figures showing the cost in recent years of regulating American railroads through the National regulating body only (the Interstate Commerce Commission) and the mileage of new railroad built in the same years. This diagram shows pretty clearly, as I see it, that the more you "regulate" the more you check growth.

The diagram is, to my mind, self-explanatory, but I may call attention to the right- and left-hand ends of it. In 1900, when a quarter of a million dollars was spent regulating, the mileage built was 4,894 miles; in 1917, when 5 millions was spent for same purpose (regulating), the mileage built was 870. And between these points, while there are ups and downs, the general and unmistakable tendency is that at the slope of the "regulating" graph becomes steeper (rises), the slope of the "building" graph becomes more pronounced (falls).



COST OF REGULATION INCREASES AS NEW MILEAGE DECREASES

The "moral" to be drawn from this diagram, which is meant to be critical, is this: Do not handcuff the workman or servant whom you wish to do heavy work for you; he can do more if you leave his hands free.

Nashville, Tenn. John Wilkes.

Rigid Connections in Building Steelwork

Sir—Professor Wilson's letter, in your issue of Jan. 8, commenting upon Edward Godfrey's article on "Common Errors in Detailing Steelwork for Buildings," very properly points out that the rigid connection of girders to columns has the effect of increasing the bending stress in the columns over that induced by eccentric loads transferred through moment free connections of the girders.

It seems to me, however, that Professor Wilson's letter is apt to be interpreted in such a manner as if he had condemned, which I am sure was not his intention, rigid connections in steelwork for buildings in favor of the shear-connections designated as "bad" by Mr. Godfrey. I believe that Professor Wilson should have stated that the rigid connection, while increasing the bending moment in the column, operates very advantageously and economically in considerably reducing the moment in the girder, and that this is one of the many important reasons why the use of rigid connections should be recommended and encouraged.

Eugene E. Halmos,
New York City Designing Engineer.

Experience With Lugless Brick

Sir—I have read with interest your editorial comment under the heading "The Lugless Standard for Paving Brick," *Engineering News-Record*, Dec. 13-20, p. 845, on the action of the National Paving Brick Manufacturers' Association at their New Orleans convention.

There undoubtedly is a question as to the advisability of specifying lugless paving brick for use with all types of fillers. In June, 1918, about the time the war made necessary the curtailment of the paving brick output by 50 per cent, we were completing a paving job in Hays, Kan., on which the use of lug brick with asphalt filler was specified. The last eight or ten cars of brick shipped to us were of the lugless type. The brick were accepted and used only after considerable delay and after being advised by the brick manufacturers' association that only lugless brick were now being manufactured. The city came to the conclusion that it was a case of lugless brick or none, and so accepted them.

It was difficult to lay these brick so that they did not wedge together in such a way as to leave about 40 per cent of the joints open. However, owing to the heat of the season and the direct rays of the sun, the brick were hot enough so that little difficulty was experienced in filling the joints with asphalt. Under different seasonal conditions, from fall until late spring, is it advisable to use lugless brick with asphalt filler?

It is to be hoped that the National Paving Brick Manufacturers' Association will demonstrate the equality or superiority of lugless brick. Until then they should be experimented with cautiously.

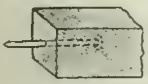
Willard C. Holmes,
Hays, Kan. County Engineer, Ellis County, Ky.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Nail Cast Into End Holds Form Spacer in Position

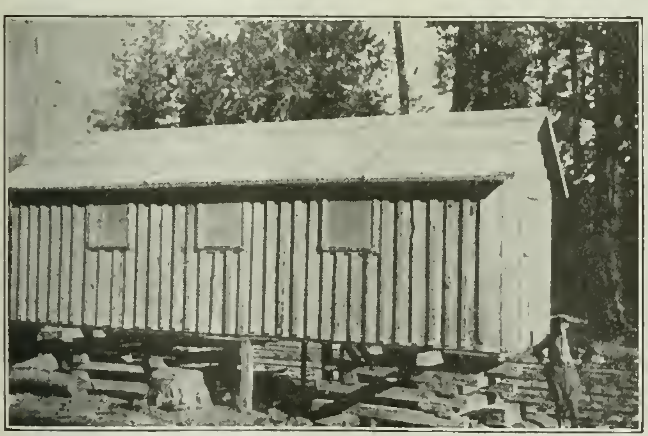
BY casting a small wire nail into the end of a precast concrete spacer for wall forms the spacer is "nailed" in position as the forms are erected, on a building operation at Jacksonville, Fla. Gang molds of job construction are used for casting the spacers, the nails being held in position to be cast into the spacers by inserting their pointed ends into gimlet holes in the mold partitions against which the ends of the spacers are molded. A 1:1 mortar is used for the spacers and the casting is allowed to harden two weeks before being used. In the forms the spacer is set so that its diagonal axis is vertical. These spacers are found exceptionally convenient, according to the December, 1919, issue of the *Contractors' Atlas* of the Atlas Portland Cement Co.



Standard Portable Bunkhouse on the Hetch Hetchy Project

THE City of San Francisco has adopted a standard design for bunkhouses on the Hetch Hetchy project. This is not only to simplify material billing and construction, but in order to fit in with the necessity for moving camp frequently. Because practically all parts of the work are reached by the city's 68-mile railroad, it is desirable to use bunkhouses that can be readily loaded on a flat car.

Two standard sizes are in use, a 10-ft. x 16-ft. house for eight men and a 10-ft. x 30-ft. house for sixteen men. Both use two tiers of bunks. The design calls for 2-in. x 4-in. studding, 4-in. x 4-in. corner posts and battons over the joints between the 1-in. sheathing. There is nothing unusual about the design except, perhaps, that the 4-in. x 6-in. floor plates are always used in full length pieces to afford a substantial "bottom" on which the house can be jacked up and skidded. The frame is well braced to withstand the racking incidental to moving, and a tar-paper roofing keeps the weight to a minimum. The lumber in the larger size structure totals only about 3,000 ft. b.m. Where a camp is to be maintained for a short time only, the custom is to skid the bunkhouse from flat car onto a crib built up alongside to suitable height and leave it there until the next move is in order.



BUNKHOUSE COMBINES STABILITY AND PORTABILITY

The work on the Hetch Hetchy project is under the direction of M. M. O'Shaughnessy, city engineer of San Francisco.

Close Regulation Makes Winter Concreting Safe

By G. A. STOCKHUS

Ross P. Beckstrom Construction Co., Rockford, Ill.

WORKMEN schooled in the methods followed and trained to leave nothing to chance make concrete construction in cold weather entirely safe. With the functioning of the human element thus assured, the mechanical equipment needed and the methods employed are so simple that they are within the means of any building contractor. They are the only means employed by the construction company with which the writer is connected, and it has never been compelled to stop work because of winter conditions.

An example of winter concreting procedure is furnished by the three-story concrete building, 156 x 66 ft., under construction at Rockford, Ill. In preparing to concrete a floor of this building, care is first taken to stock-pile all the aggregate required so that the heating apparatus may have from 24 to 36-hr. action on the material before any is used. There must be absolute certainty that no frosted material gets into the mixer, and long heating is necessary to give this assurance.

On this operation the steam boiler is large enough to run four steam lines into the sand and gravel and also a 1-in. service line to the floor to be concreted. This line is branched off into lines laid along the center of each bay and the full length of the building. These branch lines have connections for steam hose. With the hose, column and beam forms are steamed out just ahead of the pouring until there is no possibility of accumulated ice or snow remaining. The corrugated dome forms in particular are steamed carefully, as ice forms easily in the corrugations and, being transparent, is easily overlooked. It is the sole task of one man to do the steaming, keeping just ahead of the pouring operations.

Steam-operated mixers are, for safety, employed in all winter work. They are less liable to be shut down by winter conditions. The heated materials are mixed with boiling water so that the concrete virtually begins to set as soon as it is deposited. As fast as the slab is poured it is covered with a thin tarred paper on which is spread about 6 in. of wild slew hay. This slew hay holds the heat much better than tame hay or straw. Within 48 hr. after the floor is poured and protected as described the column forms for the next floor can be erected. As each story is ready it is closed in tightly by canvas side curtains. Great care is taken in placing these curtains to close every opening by which air enters. Salamanders keep the inclosed space warm.

The practice employed embodies no new methods or appliances, except in the one respect that every procedure is carefully watched and no single thing is left to chance. On this care, and in the training of the workmen, rests the success of winter concrete-building construction.

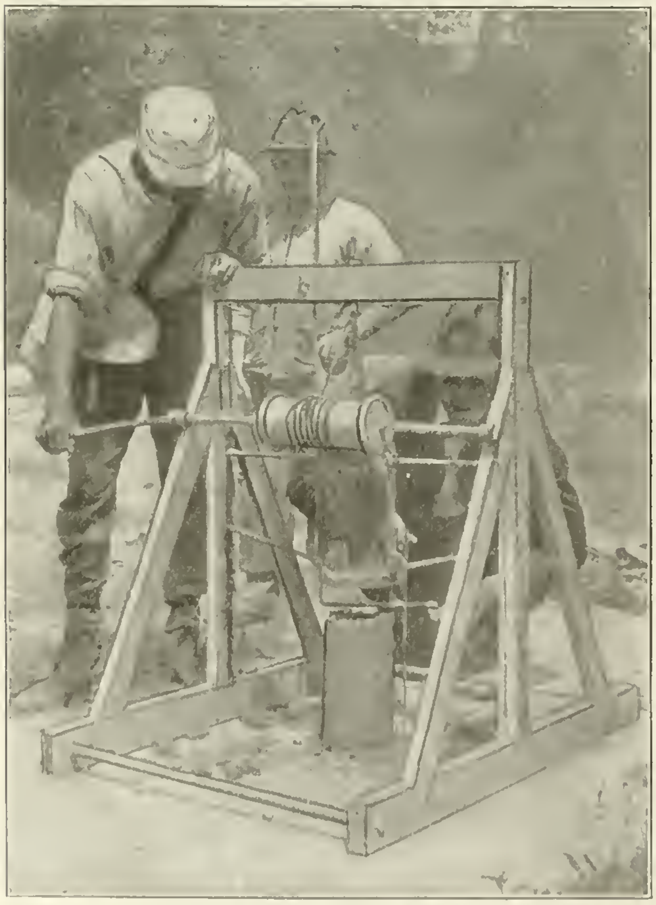
Crown of Concrete Base Checked by Chalk Line

By H. H. Sitterley
Bath, N. Y.

TROUBLE in maintaining the crown in a concrete base for pavement being laid by men new to the work, was overcome by fashioning a chalk line templet which was so light that its frequent and rapid use was possible. At the center, the quarter and the eighth points of the line, which reached from curb to curb, knots were tied and a loop of heavy wire was tied into each knot. The wire loops were of the proper length just to touch the planned curve of the crown when the line was stretched taut between curb tops. With this "templet" the untrained men could check their work every few feet and as a result a neat job was secured.

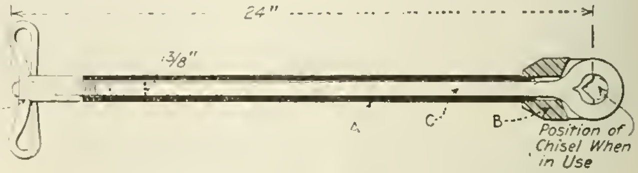
Slump Test Device for Field Use

SLUMP tests of concrete were accurately and quickly made for a 60,000-sq.yd. paving operation at Winnetka, Ill., using the windlass device shown by the illustration. In operation, the windlass was set on the sidewalk with a square of sheet metal under the cylinder to keep the walk clean. The concrete is well tamped into the cylinder, which is of metal and 6 x 12 in. in size, and then the windlass lifts the cylinder clear of the molded sample by a direct vertical pull. The illustration shows a satisfactory test, the concrete cylinder having retained its original shape almost perfectly. According to the specifications of the Illinois Division of Highways, concrete which is to be machine tamped is required to show a slump not exceeding 2 in., and concrete which is to be hand tamped is required to show a slump not exceeding 4 in. The contractor for the Winnetka paving was the Marquette Construction Co. Windes & Marsh, Winnetka, Ill., were the engineers.


PORTABLE WINDLASS FOR SLUMP TESTS

Chisel-Bar Holder Prevents Hammered Hands

A HOLDER which grips a chisel-bar tightly in any position, and can be quickly attached and removed, is illustrated by the accompanying drawing from the Rochester Railway & Light Co. A pipe sleeve *A* with a screwed on socket or head *B* is slipped onto a bar *C* threaded at one end and having an eye at the other end. By means of the hand-nut *D* the eye of the bar is moved in or out with respect to the head *B* so as to grip or let loose the chisel-bar. A rubber or leather bushing in the socket reduces the jar to the hands of the man holding the chisel.



CONVENIENT CHISEL-BAR HOLDER

Acetylene Torch Repairs Standing Steel Derrick-Mast

By J. C. Lamon
Maryville, Tenn.

BENT by a blow from a "high" boom, the trussed steel mast of a derrick employed on the Cheoah Dam at Alcoa, Tenn., was repaired standing by means of a gin pole and an acetylene torch. The mast was 110 ft. high and was held by ten guys. It was bent at about one-third its height from the bottom. The procedure was to erect a gin pole and by block and fall, hitched above the bend, to take the strain off the bent truss members. To accomplish this the guys leading off from the bent side were slacked. With the mast supported by the gin pole the bent members were cut out by means of an oxyacetylene torch; the mast was then pulled plumb and new members were inserted. These new pieces were well reinforced. The Cheoah Dam is a portion of the hydro-electric development of the Knoxville Power Co., on the Little Tennessee River.

Sanded Wood Block Not Slippery

New wood block pavement in Minneapolis, Minn., is spread with a thin layer of torpedo sand to prevent slipperiness. The sanding is the final construction operation prior to admitting traffic onto the pavement The sand is sprinkled with water to keep it from being blown off while the traffic is grinding it into the top fibers of the wood block.

NEWS OF THE WEEK

New York, January 22, 1920

Arthur Powell Davis Elected President, Am. Soc. C. E.

New Society Head Is Director U. S. Reclamation Service—In Government Work Since 1882

Arthur Powell Davis, whose election to the presidency of the American Society of Civil Engineers was announced at the annual meeting in New York City this week, is best known as the director and chief engineer of the U. S. Reclamation Service. Assuming office as the technical head of that organization in 1907, following the resignation of F. H. Newell. Mr. Davis brought to his new duties an experience of 25 years in irrigation hydrography, topography, steam-flow investigation and other subjects closely allied to those which were of such fundamental importance in the Federal program of developing vast areas of the arid West. The bulk of his professional work has been done for the Government, where

(*Concluded on page* 201)

ARTHUR P. DAVIS. PRESIDENT AM. SOC. C.E.

Civil Engineers in Annual Meeting Endorse Development Report

Debate and Approve Questionnaire and Refer It to Board of Direction to Be Sent Out to Letter Ballot

The sixty-seventh annual meeting of the American Society of Civil Engineers was held in New York, Jan. 21 and 22. As usual the reports of the Board of Direction, the secretary and the treasurer were received, technical committees made progress reports, and the new officers were declared elected and inducted into office. Chief interest at the meeting centered upon the report of the Committee on Development, the result being the adoption of a questionnaire on the chief points in the committee's report, which questionnaire, with, possibly, additional questions framed by the board through a committee of seven, is to be sent out to a letter ballot of the membership.

The consideration of the Development Committee's report was marked by much aimless discussion, by badly mixed up parliamentary procedure, and by interminable debate over inconsequential matters and parliamentary questions. The Board of Direction sent to the meeting resolutions which it had adopted, stating that it was "in sympathy with the objects sought in the report of its Development Committee, and with the view of its special committee [of which John W. Alvord was chairman] already approved as an alternative by the Development Committee, that Engineering Council should be made more representative of the engineering and allied technical profession, and that its functions should be broadened and more liberally supported financially," and that it was desirable that the main questions involved in the Development Committee's report should be submitted to the society for action by letter ballot "as soon as possible." The Board, therefore, recommended to the incoming Board of Direction that a committee of seven be appointed to prepare and submit to the membership "forthwith" a questionnaire covering the essential recommendations of the Development Committee and any recommendations and instructions of the Annual Meeting relating to the subject. It also recommended to the incoming Board that the necessary appropriations be made to meet the expenses of said committee of seven. In addition, the Board submitted for discussion by the Annual Meeting eight questions, covering important points in the Development Committee's report. These questions were:

1. Shall the Annual Meeting be supplemented by spring and fall meetings?
2. Shall the *Proceedings* be extended by including abstracts of important engineering articles?
3. Shall local sections be established to embrace the entire membership?
4. Shall the directors be nominated and elected by vote of the corporate members residing in the respective districts?
5. Shall a portion of the dues be allotted to sections?
6. Shall the officers at large be nominated by representatives of local sections in an annual conference?
7. Shall the present grades and requirements for membership be revised?
8. Shall the Board arrange for the establishment of civil engineering student membership?

The Board of Direction also referred for discussion by the Annual Meeting four questions, three on joint activities with other engineering societies and one on increase in dues, included in the report of the Alvord committee.

R. L. HUMPHREY'S RESOLUTION

Immediately upon the reading of these resolutions of the Board, Richard L. Humphrey proposed a lengthy resolution, setting forth the authority of and directions to the Committee on Development, providing for the approval of the fundamental recommendations of the committee and the submission of a questionnaire of nine questions to the membership for letter ballot. Upon motion it was decided to take up the Humphrey resolution rather than the questionnaire proposed for discussion by the board. That resolution was therefore made the first order of business upon reconvening after the luncheon recess.

Immediately upon reconvening, it was moved to take up first the questions included in the Humphrey resolution, and to pass on them one by one. Approval of the questions, it was pointed out would direct the Board to send out the questions without alteration to letter ballot.

QUESTION ONE

Question one was as follows: Shall the American Society of Civil Engineers adopt the principle of becoming an active national force in economic, industrial and civic affairs?

The propounding of the question was the signal for the start of dragging discussion which continued for two full hours. There was little direct discussion of the question. Objection was made to it by Gen. William M. Black on the score that it was so indefinite that the society might engage in activities far removed from its legitimate field. Several speakers replied that the engineer could no longer hold himself aloof from action on public questions of an engineering character. M. O. Leighton, in rather extended remarks endeavored to interpret the feeling of members in outlying districts, and declared that the demand was general for greater activity by the society. He said that if the society did not act, another society (referring to the American Association of Engineers) would. In this discussion the cleavage between the conservative and the progressive members became plain, the conservatives being fearful of an expansion of activities, the progressives being insistent that it was necessary.

The time consumed on this question, however, was due to the failure of the President to confine the discussion to the question before the house. In the midst of the debate, despite the fact that a motion was pending, and that the meeting had moved to take up the Humphrey resolution first and subsequently had voted to take up the questions of the Humphrey resolution one by one, he entertained a motion, made by Samuel Whinery, to approve the questionnaire of the Board of Direction. Points of order availed not, and apparently some members felt that the entertainment of the motion opened up every question pertaining to the report. In that view the President did not check them. The Alvord report came in for severe criticism as being a superficial study of the development report, and severe strictures were passed on the past inaction and management of the society. At times the remarks were acrid. Finally, the charge was made there had been suppressed a letter sent by the Development Committee to the Board with its report, suggesting that certain questions, included in the letter, be sent out for letter ballot at the time the report was distributed. The secretary stated that this letter had been received and read to the Board when the report was presented, but no explanation was made why the Board did not send out the questions with the report.

At length the patience of the members became exhausted by the delay and cries of "Question. Question," forced the President to put the question on the Whinery motion. It was lost by an overwhelming majority, indicating again what had become clear at the morning meeting that the majority of those present was overwhelmingly in favor of approval of the Development Committee's report, and would brook no procedure that would sidetrack it or that would allow any disposal of it by the conservatives.

The Whinery motion being defeated, the original motion, to approve question 1 was put, and carried practically unanimously.

REMAINING QUESTIONS

The following questions attended with more or less delay were then approved:

2. Shall the Society actively co-operate with other engineering and allied technical societies in promoting the welfare of the engineering profession?

3. Shall the Society co-operate in the formation of the comprehensive organization provided for in the Joint Conference Committee report?

4. Shall the recommendations of the committee regarding technical activities be approved?

5. Shall the Society be divided into sections to embrace all members?

6. Shall the directors in each geographical district be nominated and elected by vote of the corporate members resident therein?

7. Shall a portion of the Society dues be allotted to local sections?

8. Shall the present nominating committee be abolished and candidates for the offices of president, two vice-presidents and treasurer be nominated by representatives of local sections in annual conference?

9. Shall the dues of all non-resident members above the grade of junior be increased to provide for greater activities of the Society, said increase not to exceed $5 per annum?

Upon the approval of these questions the main resolution itself was brought up for action, said resolution directing the Board of Direction to submit the preamble, resolution and the questionnaire to a letter ballot of the corporate members. This was amended to require the Board to send out the questionnaire by Feb. 16 and to canvass the replies in not less than 50 nor more than 60 days thereafter. The resolution was passed.

A resolution was also passed authorizing the Board to add any questions that in its judgment were needful to develop the opinion of members.

During the debate the incoming president announced that the following members would be proposed to the incoming Board of Direction to prepare the questionnaire to be sent out for letter ballot: A. N. Talbot, Leonard Metcalf, M. S. Ketchum, Harry Hawgood, John C. Hoyt, H. S. Crocker and C. C. Elwell.

There was practically no discussion on the merits of the Development Committee's proposals; in other words, due to the loose conduct of the session, the annual meeting will contribute little or nothing toward helping the members vote intelligently on the questionnaire.

SUPPORT FOR "PROGRESSIVE" PLATFORM

President Davis, after being escorted to the platform at the morning session by Professors Talbot and Swain, elicited enthusiastic applause when he said: "I am in sympathy with the progressive movement in the Society." He referred also to the forces of "conservatism and backwardness" which had allowed other organizations to enter the field of effort which should have been occupied by the American Society of Civil Engineers. The work done by some of these outside bodies, Mr. Davis maintained, could have been better done by the American Society if the latter organization were progressive.

NEW OFFICERS ELECTED

The election of officers of the Society for the ensuing year brought out a total effective vote of 2,041 with the following results: President, Arthur Powell Davis, 2,029 votes; vice-presidents, R. A. Cummings, 2,033 votes, and F. L. Stuart, 2,018 votes; A. S. Tuttle, treasurer, 2,040 votes; directors, Carleton Greene and C. W. Hudson for District 1; J. A. O'Connor for District 3; J. C. Hoyt for District 5; Anson Marston for District 7; and D. C. Henny for District 12.

The annual report of the Board of Direction indicated a net increase in membership for the year of 475, as compared with 343 for the previous year. There were 90 losses by death during the year. Members in the naval and military service of the United States and the Allies numbered 1,823. Total deaths reported in service were 26. The total membership on Jan. 1, 1920 was 9,408.

A canvass of districts for nominations for new members of the nominating committee was reported and the following new members were elected by the meeting: First district, C. R. Hulsart; second district, C. R. Gow; fourth district, W. L. Stevenson; seventh district, L. P. Wolff; eighth district, Dabney H. Maury; ninth district, A. O. Cunningham; twelfth district, J. C. Stevens.

Arthur Powell Davis Elected President, Am. Soc. C. E.

(Concluded from page 199)

he began service in 1882 as assistant topographer with the U. S. Geological Survey. Because of the detailed knowledge, which he acquired in succeeding years, however, his advice has been sought on many special problems, involving trips to Russia, at the request of that Government, and to the Panama Canal, as member of a board of engineers named by President Roosevelt.

Mr. Davis was born in Decatur, Ill., Feb. 9, 1861. He graduated from the Kansas State Normal School and entered the U. S. Geological Survey in 1882 as an assistant topographer, in which capacity he was in charge of a leveling and barometric party in North Carolina and Tennessee until the end of the year. During 1883 he was in charge of a topographic party making a plane table contour map of Mount Taylor and vicinity in New Mexico. Promoted to the grade of topographer, his next year was spent in triangulation work in northeastern Arizona, Utah and New Mexico, and followed by three years as chief of the Topographic Section, Plateau Region. He had charge of a section of the Irrigation Survey in the years 1888, 1889 and 1890, after which he was transferred back to the Geological Survey where he was in charge of the Southwestern Topography Section until August, 1894. He was then assigned to the Division of Hydrography, and for the ensuing year traveled in the West, establishing stations, gaging rivers, and instructing assistants in hydrographic work, becoming in December, 1895, Expert Hydrographer in planning a system of irrigation for the Pima Indian Reservation, Ariz., where, for six months, he engaged in field work, which included experiments to determine amount of underflow, surveys of reservoir sites, and plans for two high dams. From May, 1896 to December, 1897 he was in charge of all stream measurements in the United States carried on by the Geological Survey, and during the succeeding two years was in charge of all hydrographic investigations connected with the surveys of the Nicaragua Canal route, afterward resuming his irrigation investigation work in Arizona. During the years, 1898 to 1901, inclusive, in addition to his other duties he was hydrographer of the Isthmian Canal Commission, and in charge of the Panama hydrographic surveys.

He succeeded F. H. Newell as Chief Engineer of the Reclamation Service in 1907, and as Director of the Service in 1915, and his work in those offices have won him an enviable international reputation in reclamation matters. In 1909 Mr. Davis was a member of a board of engineers which accompanied President-elect Taft to investigate conditions of the Panama Canal work and to report upon the feasibility and safety of the Gatun dam. As consulting engineer he has served the Isthmian Canal Commission, the Russian Government, and several large irrigation projects in the American colonies.

George Washington University conferred on Mr. Davis the degree of A.B. in 1888 and of Doctor of Science in 1917. He became an associate member of the American Society of Civil Engineers June 7, 1893 and a member October 4, 1899. He has just completed a term of service as director of the Society. He is also a member of the Washington Academy of Sciences, of which he was vice-president in 1908, and the Washington Society of Engineers, of which he was president in 1907. He is a member of the National Geographic Society and of the Cosmos Club.

Besides being a frequent contributor to the magazines on scientific subjects, Mr. Davis is the author of the following publications: "Elevation and Stadia Tables," 1893; "Progress of Stream Measurement," 1897; "Irrigation Near Phoenix, Arizona," 1897; "Irrigation Investigation in Arizona," 1898; "Hydrography of Nicaragua," 1899; "Hydrography of the American Isthmus," 1902; "Water Storage on Salt River, Arizona," 1903; "Irrigation Works Constructed by the United States Government," 1917.

Engineering Council Names Military Affairs Committee

At a meeting of the American Society of Civil Engineers on Oct. 15, 1919, in New York City, the subject of the relations of the engineer to the future military activities of the United States was discussed by a number of engineers from the Army and civil life, and a resolution was passed referring the matter to Engineering Council for action.

Engineering Council has appointed a Military Affairs Committee, which consists of the following: William Barclay Parsons, Harold W. Buck, Roger D. Black, George Gibbs, Fred J. Miller, T. Spencer Miller, F. A. Snyder, G. D. Snyder, Leonard Waldo, Paul G. Brown, Lincoln Bush, W. A. Starrett, H. S. Crocker and G. R. Solomon.

The committee organized Jan. 7, 1920, with Colonel Parsons as chairman, and Major Snyder as secretary. The committee will make a study of the problem of utilizing the technical resources of the nation, in both men and material, in the event of war, and desires the co-operation of the technical men of the country in the form of suggestions and information.

Iowa Divided into Road Districts

For administrative purposes Iowa has been divided into nine road districts. A district engineer is in charge in each district, those engineers being: District No. 1, W. F. Beard, Ames; district No. 2, Raymond Zack, Mason City; No. 3, E. W. Dunn, Sioux City; No. 4, L. W. Martin, Atlantic; No. 5, J. S. Morrison, Ottumwa; No. 6, W. M. Lee, Cedar Rapids; No. 7, J. W. Mercer, Waterloo; No. 8, John E. Reynolds, Storm Lake; and No. 9, W. O. Price, Chariton.

Col. L. H. Beach Nominated for Chief of Engineers

Choice of New Corps Head Is Surprise to Majority Who Expected Appointment of Langfitt, Abbot or Jervey

Nomination of Colonel Lansing H. Beach to be Chief of Engineers, U. S. Army, came as a surprise to those who had been watching the various campaigns being conducted by the friends of the several officers who came within the range of eligibility. In some quarters it was expected that the Secretary of War would recommend Colonel Frederick V. Abbot. Many felt sure that the honor would go to Colonel William C. Langfitt, who had General Pershing's recommendation. The Secretary of War himself had furnished some encouragement to those who were anxious to see Colonel Edward Burr fill the place. Colonel Henry Jervey also had powerful backing from the Chief of Staff. It may be said that practically all were agreed that Colonel Beach had little chance for the appointment. It had been recognized, however, that Colonel Beach had made a host of friends in the Mississippi Valley and that they were tireless in their activities in his behalf.

While Colonel Beach is best known for the work he has done in connection with Mississippi River projects he has had a long public works experience of the type commonly afforded engineer officers. He has done extensive engineering work on Great Lakes projects and was in charge of the important improvements of the harbors of Baltimore and Jacksonville. While District Engineer at New Orleans he had charge of a wide range of activities in Alabama, Mississippi, Louisiana and Texas. More recently he has been stationed at Cincinnati in charge of the construction of the system of locks and movable dams being constructed in the Ohio River.

As a member of the Mississippi River Commission and as a member of the Board of Engineers for Rivers and Harbors, and as an advisor to the Waterways Division of the Railroad Administration, Colonel Beach has been prominently identified with the development of inland waterways.

An account of Colonel Beach's advance in rank is given very briefly as follows:

Born in Iowa June 18, 1860 and appointed to the U. S. Military Academy from Iowa; became Cadet, M. A., July 1, 1878; 2nd Lieut., June 30, 1882; 1st Lieut., Jan. 10, 1884; Captain, Oct. 4, 1894; Major, Feb. 20, 1903; Lt. Col., Feb. 28, 1908; Colonel, Feb. 27, 1913.

His duties were as follows: Served with Battalion of Engineers at Willett's Point, N. Y., Oct. 21, 1882 to Oct. 31, 1884; Assistant to Major Mansfield to June 6, 1885; Member of Commission to mark boundary line between Indian Territory and State of Texas Sept. 1885, and Disbursing Officer of the Commission to Nov. 7, 1888, and Assistant to Lt. Col. Merrill to Aug. 1889; Instructor at Military Academy to Aug. 17, 1893; on River and Harbor work at Galveston, Texas, to Nov. 6, 1894; at Washington, D. C., as Assistant to Engineer Commissioner, to May 31, 1898, and Engineering Commissioner, to Nov., 1901; at Detroit, Mich., in charge River and Harbor work and 11th Lighthouse District to Aug. 17, 1905; Instructor of Engineering at Army Staff College, Ft. Leavenworth, Kan., to Aug. 23, 1907; in charge River and Harbor work at Jacksonville, Fla., to Aug. 3, 1908; on duty at New Orleans, La., as Engineer, Gulf Division, to Aug. 17, 1912; at Baltimore, Md., Baltimore Engineer District to July 31, 1915; Division Engineer, Central Division, and Engineer, 14th Lighthouse District at Cincinnati, O., to date.

Colonel Beach has been a member of a board consisting of one representative each from War, Navy and Treasury Departments to make recommendations to the Secretary of the Treasury concerning anchorage of vessels in United States Territorial waters since March 12, 1918; and in addition to other duties was detailed as Superintendent of Lighthouses in the 14th Lighthouse District to superintend the construction and repair of any aid to navigation authorized in that district.

The Senate's confirmation of Colonel Beach's appointment has not been announced yet, but it is regarded as certain.

Authorized Road Bond Issues Total Nearly $500,000,000

According to figures compiled by the Portland Cement Association of Chicago, $772,943,500 in road bonds have been proposed by the states and their constituent counties, and in addition $493,865,490 in bonds were authorized during the first nine months of 1919. Those figures include a few bond issues authorized late in 1918.

Analysis of the Portland Cement Association's figures indicates that the counties have made the largest appropriations in the past, but $215,000,000 of the amount authorized being state appropriation. However, of the 1920 schedule of proposed authorization totaling $772,943,500, $575,000,000 represents states' share. Included in this $575,000,000, however, is a bond issue of $75,000,000 proposed for the State of Texas, a measure which was defeated by a close vote in the November election.

It is interesting to note that during 1920 sixteen states will vote upon the proposition of bonding themselves for highway construction, the total of these sixteen proposed issues being exactly half a billion dollars. Eleven of the sixteen states will consider the bond issue question at the November, 1920, election, the total for these proposed bond issues being $369,000,000. Minnesota proposes the authorization of the largest issue—$100,000,000—the other states following as indicated: Kansas, $60,000,000; Missouri, $60,000,000; West Virginia, $50,000,000; Washington, $30,000,000; North Carolina, $25,000,000; Mississippi, $20,000,000; Montana, $15,000,000; Colorado, $5,000,000; and Idaho and New Mexico, each $2,000,000.

Other states that will consider bond issues at elections during 1920, and the amounts proposed are: Wisconsin, $50,000,000; Georgia, $40,000,000; Alabama, $25,000,000; Arkansas, $15,000,000; and Rhode Island, $1,000,000. Bond issues which were voted either late in 1918 or during 1919 and which will provide part money for road construction during 1920 include the following states with the amounts authorized: Illinois, $60,000,000; Michigan and Pennsylvania, each $50,000,000; California, $40,000,000; Oregon, $10,000,000; Wyoming, $2,800,000 and Nevada, $1,000,000.

Fuller Company Buys Shipyard From United States Shipping Board

On Jan. 1, the George A. Fuller Co., building contractors, took over and will operate the Shipping Board agency yard at Wilmington, N. C., operated during the past year by the Carolina Shipbuilding Corporation. The Fuller company has bought the yard from the Shipping Board, and intends to engage permanently in shipbuilding, with the following organization: Paul Starrett, president; L. C. Dilks, vice-president; Ralph Starrett, works manager; Henry Vogt, assistant secretary and treasurer; J. R. Preston, technical manager; E. G. Glass, supply manager. The Carolina corporation was a subsidiary of the Fuller company organized to carry out an agency contract with the Shipping Board for constructing the yard and building twelve 9600-ton steamers. Under this contract the yard was built and started up in 1918. It was the fourth (and last) agency yard authorized, and is the first to be sold.

The Fuller company will complete, for the Emergency Fleet Corporation, eight of the 12 ships of the original contract, and will build the other four for its own account. The yard, located three miles from Wilmington on the Cape Fear River, has four concrete shipways 450 ft. long.

Engineers Chosen for New Bridge at Springfield, Mass.

The firm of Fay, Spofford & Thorndike, consulting engineers of Boston, has been selected to supervise the construction of the new bridge over the Connecticut River at Springfield, Mass. The fee is to be 2½ per cent of the construction cost, the latter being estimated at $4,000,000. The plans for the structure were prepared by Fay, Spofford & Thorndike.

Water Power Bill Passes Senate

Now Goes to Conference Between House and Senate for Formulation of Compromise Bill

Passage in the Senate on Jan. 15 of the Water-Power Bill practically insures the final enactment of legislation which has been under consideration in Congress for more than ten years. The bill provides for a Federal Power Commission which is to have broad authority in issuing licenses for the use of water power. As passed by the Senate the bill is considerably more liberal to those who may undertake the developmen of water power than is the measure which passed the House some months ago. This attempted liberalization brought forth a determined fight by Senator Lenroot, the leader of the opposition, who sees in the conditions made by the Senate the probability that the licenses issued practically will be perpetual. On the other hand, the majority of the Senate was very firm in its belief that the liberalization is necessary in order to insure the investment of capital in power development. Senator Lenroot characterized the action of the Senate as giving away the last of the public's great resources, and predicted that the President will veto the measure if the Senate provisions should be held in the bill by the conferes. It is recognized that numerous changes will be made in the conference.

Among the amendments made in the Senate was the one authorizing the expenditure of $25,000,000 for the development of a power project at Great Falls on the Potomac River. Another amendment transfers to the Federal Power Commission the advisory powers granted some years ago to the Newlands Waterways Commission. That Commission was authorized to study reclamation, flood control and all uses of water, and to report its findings to Congress. It is regarded as likely that the Great Falls project and the Newlands Commission provision will be stricken out in conference. A third amendment provides that the secretary of the proposed Water Power Commission is to be a member of the Corps of Engineers, U. S. Army.

Newark Zoning Ordinance Adopted

After moving to take amendatory action establishing Broad St. as a business thoroughfare for its entire length south of Market St., the City Commission of Newark, N. J., passed the zoning ordinance Dec. 31. South Broad St. had been designated residential between Camp and Astor Sts., but owing to pressure brought to bear by a delegation of Broad St. residents, the amendatory action was proposed, so as not to prevent the final passage of the new code. Except for a few minor changes removing certain restrictions on "light industries," the zone ordinance is the same as published in *Engineering News-Record*, Dec. 25, p. 1045.

Dr. R. C. Maclaurin, Eminent Educator, Is Dead

President and Developer of Greater M. I. T. Was Stricken at Height of Brilliant Career

Dr. Richard Cockburn Maclaurin, since 1908 president of Massachusetts Institute of Technology, died at his home in Cambridge, Mass., Jan. 15. He succumbed to pneumonia in the prime of a remarkably constructive life devoted to higher education, being only fifty years old at the time of his death. That he had received the Cambridge University degrees of Sc.D. at the age of 28, LL.D. at 34, and become president of M. I. T. at 38 is evidence of his versatility and brilliance. His ability as an organizer, financier, and developer of educational institutions was no less remarkable than his attainments in science and law.

DR. RICHARD C. MACLAURIN

Richard Cockburn Maclaurin was born in Lindean, Scotland, in 1870. His early boyhood was spent in New Zealand, whence he returned to England to complete his preliminary education. In 1892 he entered the University of Cambridge, where he held a foundation scholarship in St. John's College. He took two degrees at Cambridge, B.A. and M.A., the thesis work for the latter being advanced mathematics. He received the Smith prize for excellence in mathematics, and upon graduation was elected Fellow of St. John's College.

Leaving Cambridge, Dr. Maclaurin next spent ten months in the United States and Canada (1896-97) studying and visiting educational institutions and spending much time at McGill (Toronto) and Leland Stanford universities. Returning to England he re-entered Cambridge, this time to study law, and was awarded the McMahon law studentship, the most highly valued of its kind in the University.

In 1898 Dr. Maclaurin was appointed professor of mathematics in the University of New Zealand, became a trustee of the University, and took an active part in the organization of technical education in that colony. He became dean of the faculty of law in the University in 1903 and continued in that capacity for the next four years. In 1898 Cambridge University honored him with the degree of Doctor of Science and again in 1904 with the degree of Doctor of Law.

He was invited to take the chair of mathematical physics at Columbia University, New York City, in 1907, and a year later was made head of the Department of Physics. Dr. Maclaurin was appointed president of Massachusetts Institute of Technology, Nov. 23, 1908, succeeding Henry S. Pritchett, who had retired to become chairman of the Carnegie Foundation. At that time Massachusetts Institute of Technology had reached the limit of its facilities and still fell far short of fully carrying out the plans of its founders. Its buildings, equipment and funds were only a fraction of its needs. Dr. Maclaurin undertook to make up the deficiencies.

First he unified the corporation and the faculty, and by his personality gained the confidence of the alumni and bound them as never before into a great force working for the benefit of their Alma Mater. One of the first fruits of his efforts was the gift of T. Coleman du Pont of half a million dollars toward the purchase of a new site for Technology at Cambridge. The corporation at the same time made up another quarter-million which completely paid for the land. Following this, with the aid of the alumni, he secured the passage of a Massachusetts act granting additional funds for the support of the school.

When the site question was settled it was necessary to procure enormous sums for the construction and maintenance of plant, and with the enthusiastic support of the alumni Dr. Maclaurin undertook to raise them. First came the gift of $2,500,000 from George Eastman, of Rochester, N. Y., which was closely followed by other gifts in sufficient measure to warrant the beginning of construction. Subsequent gifts from Mr. Eastman, made before 1919, amounted to $4,500,000, and finally, only a few months ago, was made his offer of $4,000,000 contingent upon the raising of an additional $8,000,000 for proper financing of the Institute. At an alumni dinner in Boston, Jan. 10, it was announced that the $8,000,000 had been made up, that Mr. Eastman had made good his $4,000,000 promise and that the Massachusetts Institute of Technology now has an additional endowment of $12,000,000.

Dr. Maclaurin must be directly credited with the creation of the organization and the spirit which made possible the surpassing facilities for technical education now possessed by the institution whose affairs he so ably guided.

Date for Annual Meeting of A. G. C. Changed

Owing to the fact that the executive board was confronted with so much detail in the preparation of plans for the annual meeting of the Associated General Contractors of America, the date has been advanced one month. It will be held in Chicago, Feb. 18 and 19.

The tentative program says that the morning session of the first day's meeting will be devoted to routine matters, and the afternoon session taken up with discussions of the lump-sum and cost-plus forms of contract, and industrial relations. A smoker will be held the evening of Feb. 18. The morning of the 19th will be devoted to routine matters, and in the afternoon session the conference will be divided into four divisions: Building contractors, highway contractors, railroad contractors, and public works contractors. The most important questions in each field will be discussed at these division conferences. The annual banquet will be held in the evening of the second day's conference.

Denver Water Rates and Home Rule

Notwithstanding the fact that Denver, Col., has a home-rule charter the rates charged by it for water supplied to outside municipalities are subject to regulation by the state utilities commission, according to a decision handed down by the State Supreme Court on Dec. 31 in Star Investment Co. of Aurora vs. the City and County of Denver.

H. T. Cory To Pass on Nile Irrigation Plans

H. T. Cory sailed this week for England, whence he will proceed to Egypt as one of three members of an international consulting commission to pass on plans for irrigation work in the Nile Valley. His fellow-members of the commission, whose names have not yet been received in this country, will be an English engineer and an engineer from India. So far no information has come indicating the reason for choosing Mr. Cory for this important position, but it may be assumed that his choice is the result of the international fame which he won by his success in closing the break in the Colorado River levee and diverting the stream from its flow into the Salton Sea, and by his subsequent work as chief engineer of the Imperial Valley Irrigation system. In addition, he has had a wide experience through the West on irrigation projects of varied types, and for the last two years has been acting as consulting engineer to the United States Reclamation Service, reporting upon the development of swamp and cutover lands, in connection with proposed soldier-settlement plans.

H. T. CORY.
On International Consulting Commission in Egypt

Mr. Cory was graduated from Purdue University in 1887 in mechanical engineering, at the age of seventeen, and subsequently received master's degrees in both civil and mechanical engineering from Cornell University. His early experience was in both railroad and city engineering work. In 1893 he became professor of civil engineering at the University of Missouri and remained there until 1898. For three years he was dean of the engineering department and professor of civil engineering at the University of Cincinnati, meanwhile engaging in consulting work for the Mexican Central, the Texas & Pacific, and the Southern Pacific railroads. For a year he was assistant to the general manager of the Southern Pacific, remaining in that capacity until he was called upon to do the herculean task of diverting the Colorado River to its original course. This accomplished, he became assistant to the president of the Associated Harriman lines in Arizona and of the Southern Pacific in Mexico, carrying on also, for a period of four years, the work of general manager and chief engineer of the California Development Co. and its associated corporation in Mexico, both together controlling the irrigation system of the Imperial Valley. Mr. Cory's work in the diversion of the Colorado River was so spectacular that it has been immortalized in two novels, "The Winning of Barbara Worth" and "The River."

Since the termination of his connection with the Imperial Valley irrigation system in 1910, Mr. Cory has engaged in consulting practice, which has led him into practically every state in the arid West.

Chicago Sanitary District Stops Proposed Road Work

As part of a policy of retrenchment the Sanitary District of Chicago has voted to postpone the construction of roads along the banks of the drainage canals. The total amount eliminated from the estimates is $3,305,000 and includes the following items: Road along main channel, $1,500,000; road along north shore channel, $800,000; stone-crushing plant for road work, $280,000; bridges and subways along proposed roads, $425,000; California Ave. bridge, $300,000.

Consulting Engineers Hold Annual Meeting

The annual meeting of the American Institute of Consulting Engineers was held in New York, Jan. 19, with an attendance of thirty-seven. Announcement was made of the election of three new members, Lieut. Col. G. D. Snyder, New York; Edwin Ludlow, Landsford, Pa., and Frank N. Waterman, New York, bringing the total membership to eighty-seven. The following members were elected to serve on the council of the institute for a period of three years: Alexander C. Humphreys, Dugald C. Jackson and George W. Fuller.

A resolution was adopted urging on Congress the passage of legislation, now pending, increasing the pay of officers of the Army and the Navy. Frank J. Sprague made a strong presentation of the case, pointing out that the pay has not been raised to meet the increase in cost of living, that skilled labor is getting wages equal to the pay of a Navy commander, that the number of resignations from the services is alarmingly large, and that, in consequence, the morale of the service has been seriously affected.

The topics set for discussion were: "The Future of the Consulting Engineer" and "The Consulting Engineer in the Field of Foreign Investment." There was general agreement that there is less call than formerly for the services of the consulting engineer, but that a wide future should be opening for the consultant to advise the banker on foreign investments. The circular sent to bankers by the institute in the autumn, pointing out the function of the consulting engineer in passing on projects had had, so the members reported, a favorable reception.

Jersey Engineers Study Future Traffic

An investigation is being made under the direction of the New Jersey State Association of County Engineers into the question of probable future traffic on county and state roads, with a view to planning for such traffic. J. C. Bauer, Elizabeth, chairman; A. H. Nelson, Atlantic City, secretary; J. J. Albertson, Camden; T. J. Wasser, Jersey City; J. M. Abbott, Toms River; F. A. Reimer, Newark, and Harry F. Harris, Trenton, have been appointed a committee to obtain information on the matter.

A questionnaire has been sent to all the state highway departments throughout the Union, members of automobile associations, and county engineers in New Jersey and many other states. It has been found that in many sections traffic has doubled during the past two or three years, and that some of the highways are inadequate to handle the traffic. It is said that some of the highways will be restricted to slow-moving vehicles and others to passenger cars. The questionnaires will afford deciding information.

Motor Transport Economics, Theme of Week's Conferences

As a climax to a series of conferences given in connection with the motor truck show at the 8th Coast Artillery armory, New York City, where every angle of the economics of highway transport received attention, the afternoon session on Saturday, Jan. 10, was given over to a discussion of the influence of so-called durable pavements upon motor truck haulage costs. During the week of conferences farmers, truck manufacturers and dealers, those connected with motor express companies and those interested in highway construction specifically and highway transport generally met and discussed methods determining wherein the field for highway transport lies, what its limitations are and to what extent highway departments can economically go in the construction of so-called "durable types" of pavement for the better accommodation of motor vehicle traffic.

That there is strong necessity for elaborate extension in motor express haulage was a fact generally enunciated, some speakers even predicting within a few years the "farm-to-housewife" truck with its burden of farm produce. A view of the immensity of the field for motor truck use was revealed in several discussions, notably that of Senator Arthur Capper, of Kansas. The afternoon sessions during the entire week were devoted to discussions of first interest to manufacturers and dealers in motor trucks. Evening sessions were given over to discussions upon all phases of highway transport.

In the closing session H. Eltinge Breed, consulting engineer, New York City, reviewed progress in road construction ending with a plea that the public insist, through pressure brought to bear on state legislatures, upon sufficient appropriation of funds for building bridges of adequate capacity. He asserted that bridges had lagged furthest in highway work because they were not considered an integral part of the highway system, and that frequently highways were designed to sustain heavier traffic than the bridges connecting them.

Interesting data were brought out in talks upon motor truck operating costs by Prof. Arthur H. Blanchard, head of the Highway Engineering Department of the University of Michigan, and M. O. Eldridge, director of roads, American Automobile Association Good Roads Board. Citing a recent survey conducted by the bureau of crop estimates indicating that the average cost of hauling by wagon in the United States over all classes of roads was about 33c. per ton-mile, while by motor truck it was about 15c. Mr. Eldridge came to the conclusion that if the main highways of the country over which the bulk of the traffic is carried were hard surfaced so as to permit of the economic operation of motor trucks, the highway transportation bill of the United States could be reduced by at least 50 per cent. He also suggested that figures compiled by the chief engineer of the Colorado State Highway Commission, made it appear that a saving of 10c. per ton-mile in the cost of hauling any class of freight would save in two years, for a road on which the traffic will average 150,000 ton-miles per year, sufficient money to pay the cost of construction at $30,000 a mile.

In speaking of the highway which the ever-increasing motor traffic will demand in the future, W. G. Thompson, state highway engineer of New Jersey, asserted that, whereas he was making no recommendation as to the type of paving that should be laid, the needs of the future should be the basis of construction of both highways and highway bridges. He asserted that the highway engineer was more or less in the dark concerning highway construction, that his position was not at all analogous to that of the automotive engineer, for the highway engineer has no precedent to guide his design and in his work there are no cross-sections constructed for specific loads. Mr. Thompson asserted that the type of pavement to be selected was always a matter of local determination. However, he did recommend a graded width of 30 ft. for four lines of traffic on main traveled highways; that particular attention should be paid to subsoil drainage and any expense in securing as near perfect drainage as possible was justified. His discussion ended with a plea that the general public educate itself to the specific problems before the highway engineer so that adequate legislation would result, so that highway departments would not be subjected to the vicissitudes of partisan politics, and that existing conditions would be changed so that public service would be more attractive to capable men.

Colorado Proposes Three State Railway Tunnels

Public financing of three long tunnels in Colorado to reduce present open-pass summit elevations of railways crossing the mountains is advocated by the State Railroad Commission in a report to Governor Shoup. The tunnels proposed are as follows: On the Denver & Salt Lake R.R. near James Peak, 6.4 mi. long, at an elevation of 9,100 ft.; near Marshall Pass, 6 mi. long, elevation 9,500 ft.; and a shorter tunnel near the Cumbres Pass. The present maximum grades of 3 per cent to 4 per cent could be reduced to 2 per cent.

In view of the time required in construction, the Commission recommends that work should be begun at once and prosecuted vigorously and without interruption. The railways concerned are in the hands of receivers and private financing seems improbable within the near future. It is recommended, therefore, that bonds should be issued to provide for the construction of these tunnels and that an amendment to the State constitution to provide for such a bond issue should be submitted to the voters at the next election.

Chamber of Commerce Referendum on U. S. Public Works Department

In response to a request of Engineering Council, the U. S. Chamber of Commerce has appointed a special committee to consider the advisability of submitting to referendum of the chambers of commerce throughout the country, the question of a National Public Works Department. The members of the Chamber's committee are: Charles Nagel, St. Louis, Mo.; William C. Redfield, New York, N. Y.; R. G. Rhett, Charleston, N. C.; Ira N. Hollis, Worcester, Mass.; J. Parke Channing, New York, N. Y.; L. S. Gillette, Minneapolis, Minn.; Morton G. Tuttle, Boston, Mass.; Walter S. Dickey, Kansas City, Mo.; F. A. Seiberling, Akron, Ohio.

This committee held a meeting Jan. 19, in the Washington offices of the National Chamber and to present to it arguments for a National Public Works Department, Engineering Council has appointed a special committee of engineers. The members of Council's committee are: Isham Randolph, Chicago, Ill.; D. Knickerbacker Boyd, Philadelphia, Pa.; Leonard Metcalf, Boston, Mass.; General R. C. Marshall, Washington, D. C.; M. O. Leighton, Washington, D. C.; L. W. Wallace, Baltimore, Md.

Reports from various parts of the country indicate that business men as well as engineers, architects and contractors, are taking an interest in the proposal to establish a National Public Works Department.

Engineering Council has been for some time a member of the United States Chamber of Commerce.

American Waterworks Association Nominations

The nominating committee of the American Waterworks Association has presented the following nominations: For president, Beekman C. Little, Rochester, N. Y.; for vice-president, Edward Bartow, Urbana, Ill.; treasurer, J. Walter Ackerman, Auburn, N. Y.; for trustees, District 2, Harry F. Huy, Buffalo, N. Y.; and District 5, Robert J. Harding, San Antonio, Tex. In accordance with the constitution, additional names may be placed in nomination on petition of 25 members, the final voting for officers to take place two months before the annual convention.

Bill for New Railroad in Quebec

A bill for the formation of the Quebec Colonization Railway Co. has been introduced in the legislature of Quebec. The company is seeking authority to construct a line from Mont Laurier to Maniwaki, and from Lake Expanse and Lac des Quinze to Temiskaming, from a point in Pontiac County to Nottaway and from Bell River to Lake Shabogame. At this writing the organizers of the company are not known.

Engineering Institute Will Hold Convention in Montreal

The annual business and professional meeting of the Engineering Institute of Canada, will be held at the Institute quarters, Montreal, Quebec, on Jan. 27, 28 and 29. Papers dealing with the existing commercial, industrial and financial problems of the province will be delivered, as well as with its water-powers, both developed and undeveloped, its highways, its forest products and a general survey of its commercial potentialities.

It has been felt that heretofore the work of the members of the engineering profession has not appeared before the public in its true perspective, and an endeavor is, therefore, to be made to acquaint the public with the scope and importance of the work done by engineers in developing the natural resources of the country. On the opening day the retiring president, Colonel Leonard of St. Catherines, Ont., will deliver his valedictory address. He will be followed by the in-coming president, R. A. Ross, who will formally address the members.

Among the technical papers are the following: "Quebec's Water-Power Policy and the Work of the Quebec Streams Commission," by Olivier Lafebvre, chief engineer Quebec Streams Commission; "The Operation of the Quebec Public Health Act," by Theo. J. Lafreniere, chief sanitary engineer to the Superior Board of Health of the Province of Quebec; "Quebec Highways," by Alex. Fraser, assistant chief engineer Quebec Department of Roads. In addition to these papers it is expected that there will be an address at the luncheon on Jan. 27 by E. W. James, assistant chief engineer Bureau of Public Roads, Washington, entitled, "Modern Highways Problem."

Limitation of Earnings Taken Up by Rail Conferes

With the ranks of the railway executives still split on the distribution and limitation of "excess earnings," the joint conference committee on the Cummins and Esch railroad bills last week began discussion of this feature, with testimony from members of the Interstate Commerce Commission, including Commissioners Clark, McChord and Hall.

Commissioner Clark favored the minimum return feature of the Cummins bill and accepted the excess income reduction feature as unavoidable, expressing confidence that the plan would be successful, in the main coinciding with Commissioner Hall's views. In the opinion of Commissioner McChord, the rate plan of the Cummins bill would seriously disturb present rate structures. The thought was expressed that this phase of the law would be the first taken into the courts. No vote on the question has been taken by the conferes up to this writing.

Previous to the testimony of members of the Interstate Commerce Commission an opinion was filed with the Conference Committee by Elihu Root, John G. Milburn, and others, as advisory counsel for the Security Holders Association in answer to statements made by T. De Witt Cuyler and A. P. Thom, chairman and counsel of the Association of Railway Executives, in regard to the provisions of the Cummins bill providing for the limitation and distribution of "excess" earnings. The opinion stated that the principle is not novel, but can be substantiated by legal precedent, and referred to a number of Supreme Court decisions. The division of opinion on this question in the Association of Railway Executives appears still to exist, although the representatives of the "strong" systems seem to control the situation.

Large Delegation at Washington Urges Reclamation Policy

Headed by seven governors and the personal representatives of several others a large delegation of Western and Southern officials and business men spent most of the week ended Jan. 17 in Washington, urging that a Federal reclamation policy be adopted.

Various hearings were arranged and every facility accorded the visitors to get their desires before the nation's law makers. The Western men are urging that $250,000,000 be made available by the present Congress for the completion and building of irrigation plants which have been examined and found feasible by the Reclamation Service. The Southern delegates are interested largely in the reclamation of swamp land.

It was pointed out that since the signing of the armistice we have loaned Europe $2,500,000,000. That action has the approval of the delegates but they see no reason why a small fraction of that sum cannot be loaned to Americans when the object is to add to the productivity and wealth of the nation.

In addition to making their desires known to a large number of individual members of the Senate and of the House of Representatives the delegates went to the heart of things by putting their demands squarely before the steering committees of each House. They received encouragement at every hand and while the probabilities are against their receiving all they ask, it is certain that the visit has given new stimulus to reclamation. The governors who accompanied the party were those of Arizona, New Mexico, Utah, Idaho, Washington, and Wyoming. Former Governor William Spry of Utah, Lieutenant Governor Stephan of Colorado and Lieutenant Governor McDowell of Montana, also were with the party. J. T. Whitehead of Nebraska, S. J. Rogers of Navada, W. A. Beard of California, R. F. Burges of Texas and Whitney Boise of Oregon were the personal representatives of the governors of those states. Thirteen members of the executive committee of the Western States Reclamation Association, picked because of their personal knowledge of irrigation, formed a part of the delegation.

Propose an Engineering Building for San Francisco

The Engineers' Club of San Francisco has appointed an engineering building committee which is preparing a report on the plan of getting "all the engineering interests of the city together under one roof." The investigation is to determine whether the engineering professions and trades have sufficient common interest in such a plan to warrant the committee in drawing up a definite proposition for prospective building owners.

General discussion of the idea at society and committee meetings has materialized into a suggestion that the building have 10 or 12 stories, the two top floors to be occupied by the engineers' club, the body of the building to be arranged for offices of engineers, the technical papers, and of merchants dealing in engineers' equipment, supplies and materials. The suggestions include providing an auditorium large enough for joint meetings of the engineering societies. The first action of the committee was to circularize all engineers of San Francisco asking for a statement as to whether they would be interested in rental space in such a building located in the vicinity of the Palace Hotel, what floor space each one occupied and what maximum price per square foot could be considered. When the returns from this letter have indicated the general sentiment, further plans will be discussed, and formulated accordingly.

Civil Service Examinations

New Jersey. Deputy chief engineer, Department of Streets and Public Improvements, $6,000 per year, Jan. 28. File application with State Civil Service Commission at Trenton.

California. Assistant state engineer, $3,000 per year (statutory), examination to be held Feb. 7 in Sacramento, San Francisco and Los Angeles. File application before Feb. 1.

United States

For United States civil service examination, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the Civil Service Commission, for form 1312.

Chief of Road Survey Party, $1,800 to $2,100 per year. File application before Feb. 10, 1920.

Transitman for road survey, $1,200 to $1,800 per year. File application before Feb. 10, 1920.

Highway draftsman, $1,200 to $1,800 per year. File application before Feb. 10, 1920.

Topographic and subsurface draftsman, Grade 1, $5.20 per day; Grade 2, $6 to $7.20 per day. File application before Jan. 27, 1920.

Ceramic assistant, to fill a vacancy at the Ceramic Experiment Station in the Bureau of Mines, Columbus, Ohio,

$1,200 to $1,800 per year, and to fill vacancies in positions requiring similar qualifications. File application before Feb. 10, 1920.

Canada

The Civil Service Commission of Canada will receive applications from residents of Canada, qualified to fill the following positions:

Shipyard superintendent, Sorel, P. Q., salary $3,000.

Foresters, salary $1,680.

Junior engineers, initial salary $1,680.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

ENGINEERING INSTITUTE OF CANADA; General Secretary, Fraser S. Keith, 176 Mansfield St., Montreal; Jan. 27-29, Montreal.

NATIONAL HIGHWAY TRAFFIC ASSOCIATION, 247 W. 54th St., New York City; Jan. 29, Chicago.

AMERICAN ROAD BUILDERS' ASSOCIATION, 150 Nassau St., New York City; Feb. 9-13, Louisville, Ky.

AMERICAN WOOD-PRESERVERS' ASSOCIATION; Secretary-Treasurer, F. J. Angier, Mt. Royal Station, Baltimore; Feb. 10-12, Chicago.

AMERICAN CONCRETE INSTITUTE; Secretary Harvey Whipple, New Telegraph Bldg., Detroit; Feb. 16, 17, 18, Chicago.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA; 111 W. Washington St., Chicago; Feb. 18-19, Chicago.

AMERICAN CONCRETE PIPE ASSOCIATION; 210 South La Salle St., Chicago; Feb. 20-21, Chicago.

AMERICAN RAILWAY ENGINEERING ASSOCIATION; 1426 Manhattan Bldg., Chicago; March 16-18, Chicago.

AMERICAN ASSOCIATION OF ENGINEERS; Secretary C. E. Drayer, 29 S. La Salle St., Chicago; May 10, 11, St. Louis, Mo.

The Northwestern Association of Members, Am. Soc. C. E., met Jan. 6 in St. Paul, Minn., to continue a discussion of the Development Committee's report. The findings and recommendations of the committee were approved with some slight changes, but the included report of the Joint Conference Committee on a comprehensive organization of the engineers of the country was not approved, and a delegate was appointed to attend the annual meeting and oppose the plan of representation in the National Organization as outlined therein, the prevailing opinion of those present being that the Joint Conference Committee's report would not be approved at the annual meeting. A committee of five, with Francis E. Shenehon as chairman, was appointed to draw up a substitute scheme for a national organization to handle non-technical and welfare activities, which scheme might be offered at the parent body's annual meeting.

The Minnesota Joint Engineering Board will hold its annual meeting and dinner for all engineers of the nine affiliated engineering societies in the state Feb. 21, 1920, in Minneapolis, Minn.

The Board of Direction of the Minnesota Engineers' and Surveyors' Society met in Minneapolis, Minn., Jan. 8, to plan the Society's annual meeting which will be held Feb. 19, 20 and 21 in that city. The first day of the session will be devoted to a discussion of the Babcock Good Roads amendment. All road engineers of the State Highway Commission, who will be called in to attend a school of road instruction on the 17th and 18th, will participate with the Society in this discussion. The mornings of the second and third days will be given over to meetings of the Drainage, the Municipal and the Railroad Divisions of the Society. The second afternoon session will be devoted to a discussion of the uniform license law for engineers and architects as reported by Engineering Council's Committee on Licensing Engineers, and of the proposed National Public Works Department.

The Engineers' Society of Milwaukee held its monthly meeting in Milwaukee Jan. 14. The feature of the meeting was an illustrated address by Max Rotter, consulting engineer for the Busch-Sulzer Bros. Diesel Engine Co. of St. Louis. His subject was "Diesel Engines With Particular Reference to Recent 2-Cycle Types."

The Engineers' Club of Trenton held its annual smoker in its club rooms in Trenton, N. J., Jan. 15. The function was marked by the inauguration speech of President-elect Alfred P. S. Bellis, and an address by the retiring president, Charles R. Fairchild.

The Rochester Engineering Society not only has a thorough appreciation of big national engineering issues but it has, as well, the faculty of getting behind and pushing. Following is the text strikingly displayed on a small card bearing a money-forwarding coupon and sent to all members of that society: "Rochester Engineering Society: Important! To the members who have not already contributed: The campaign for the establishment of a National Department of Public Works has 'caught on' to such an extent that a second convention has been called to meet in Washington, D. C. this month. The engineers and architects started this movement and we now have the bear by the tail. If we let go, the bear will turn on us and scratch our reputation as doers of things. Climb down from the grandstand and get into the game. Send in your dollar now to Louis J. Summerhays, treasurer, 1 Exchange St."

The Western Society of Engineers was, on Jan. 19, addressed in Chicago by M. J. Faherty, president of the Board of Local Improvements, on "Chicago Municipal Improvements," a paper concerning the cost and value of various street improvements. Coming meetings include papers as follows: By John F. Hayford, dean of the college of engineering, Northwestern University, Feb. 2, on "Development of the Civil Use of the Aëroplane"; by C. P. Winslow, director, on "The Work of the Forest Products Laboratory"; by Wharton Clay, commissioner of the Expanded Metal Manufacturers' Association, on "The Engineer in Trade Organization Work"; by J. S. Conway, deputy lighthouse commissioner, on "The U. S. Lighthouse Service," and by Grant Beebe on "Secondary Technical Education."

The American Association of Engineers has authorized the appointment of a committee on the salaries of engineers in teaching service. C. J. Tilden, professor of engineering mechanics at Yale University, has accepted the chairmanship.

The Ohio Engineering Society is holding its forty-first annual meeting in Columbus, Ohio, beginning Jan. 21 and ending on the 23rd. Seventeen papers or addresses are on the program.

PERSONAL NOTES

Col. F. B. Maltby, formerly Section Engineer, Base Section No. 1, under the Director of Construction and Forestry of the A. E. F. in France, was recently decorated with the cross of the Legion of Honor by General Goldet of the French high commission at Washington, in recognition of his services in port improvement, water supply and general construction. Colonel Maltby had his headquarters at St. Nazaire while in France; he recently secured his discharge from the Engineers, U. S. Army, and takes passage this month for Liberia, where he will make harbor works estimates for J. G. White & Co., of New York City.

Vernon H. Taggett of Morrison, Ill., for six years superintendent of highways of Whiteside County, Ill., will be the road building engineer for Emmet County, Mich., at a salary of $3,300 per year. He will report for duty Feb. 1.

William J. Carter, for several years engaged in the private practice of engineering and architecture in Cleveland, Ohio, has formed, with F. D. Richards and F. M. Griffith, the firm of Carter, Richards, Griffith Co. to conduct a similar and more extensive business in that city. Mr. Richards is a former city bridge engineer of Cleveland.

Wm. Claer Spiker, for ten years consulting engineer in reinforced concrete and structural steel work in Atlanta, Ga., has taken into a partnership Robert G. Lose, former engineering instructor in Carnegie Institute of

Technology and consulting engineer in Pittsburgh, Pa. Mr. Spiker was in charge of the design of several of the Government concrete ships and in part of that work Mr. Lose was his principal assistant and his successor upon his resignation.

Donald M. Hepburn, engineer in charge of extensive Government construction at Hog Island, was appointed, on Jan. 15, chief of the Philadelphia Bureau of Street Cleaning by John C. Winston, that city's Director of Public Works.

Prof. Robert C. Terrell, acting director of the department of civil and highway engineering at the University of Olkahoma, has been appointed State highway engineer of Oklahoma, to succeed Max L. Cunningham. The new appointment is effective Feb. 1. Prof. Terrell is a graduate of the University of Kentucky and was Commissioner of Public Roads of Kentucky from 1912 to 1916. Since 1916 he has been a member of the faculty of the University of Oklahoma.

C. H. Koyl, engineer of water service of the Great Northern R.R., has been appointed to a similar position with the Chicago, Milwaukee & St. Paul R.R.

C. A. Bingham, civil engineer, will assume his duties as city manager of Watertown, N. Y., Feb. 1, 1920. For the past five years Mr. Bingham held a similar office in Norwood, Mass.

Oliver T. Reedy, M. Am. Soc. C. E. and for seventeen years engineer on design and construction with the United States Reclamation Service, announces the opening of an office for service as consulting civil engineer in the Century Building, Denver, Col. His specialties will be irrigation, drainage, water supply, dams, tunnels, reinforced concrete, investigations, reports, designs.

A. M. Davidson has been promoted to be assistant division engineer of the Baltimore & Ohio Western Lines with headquarters at Cleveland, Ohio, according to an announcement of E. G. Lane, the Railroad Administration's chief engineer for those lines.

Bruce L. Cushing has resigned as designing engineer of the Acheson Graphite Co., Niagara Falls, N. Y., and become associated with Cundall, Powell & Mosher, Inc., consulting engineers of Buffalo.

George E. Chamberlin, for several years in charge of Stone & Webster's construction operations in the steel plant district of Ohio, and more recently in charge of that company's Chicago office, has been transferred to Cleveland where a new district office is to be located.

George R. Putnam, commissioner of lighthouses, and John C. Hoyt, of the U. S. Geological Survey, both of Washington, have been elected president and vice-president respectively of the Cosmos Club, Washington.

Trailer Industry Discussed in Annual Meeting

At the first annual meeting of the Trailer Manufacturers' Association of America, held in New York City, Jan. 8, new officers were elected and work of the past year was reviewed and it was decided to continue along the same lines in 1920. The desirability of standardizing the load rating of semi-trailers and pole trailers was agreed upon, and the association's general manager was instructed to secure the views of all members as to the best method. The Trailer Association voted to apply for membership in the Chamber of Commerce of the U. S., and in the Federal Highway Council.

Addresses on short-haul and terminal transportation, and on patent matters, were delivered by C. W. Reid of the Federal Highway Council, and R. A. Brannigan of the National Automobile Chamber of Commerce. There was also a paper on advertising by H. Colin Campbell of the Portland Cement Association.

BUSINESS NOTES

J. A. Grant and **James Gilchrist** have incorporated as J. A. Grant & Co., Ltd., with head offices at St. John, N. B., to take over the expanded engineering, contracting and shipbuilding business of Grant & Horne in the Canadian Maritime Provinces. Mr. Grant received his technical education and early training in England. From 1908 until 1916 he has been in charge of many large works in Canada. The last four years of his time have been spent in the business of Grant & Horne, and in consulting work at Toronto harbor. He is an associate member of both the Canadian, and American, Soc. C. E. Mr. Gilchrist is an associate member of the British Inst. C. E. He was educated as an engineer in Scotland, practiced his profession from 1899 to 1911 in Scotland, England and the Straits Settlements, principally in the design and supervision of large marine works. Since the latter year he has been in charge of harbor and ship construction.

Barclay Parsons & Klapp announce the change of the firm name to Parsons, Klapp, Brinckerhoff & Douglas, the personnel, William Barclay Parsons, Eugene Klapp, Henry M. Brinckerhoff and W. J. Douglas, remaining unchanged.

The Edmund T. Perkins Engineering Co., consulting and supervising engineers and specialists in land reclamation, announces the centralizing of all its branch offices at 1210-56 First National Bank Building, 38 So. Dearborn St., Chicago, Ill.

F. C. Huyck & Sons of Albany have contracted with the Massachusetts Institute of Technology for consulting advice in accord with the latter's plan for raising an educational endowment fund.

Ben Haislip, who for the past four years has been connected with the Chicago office of the U. S. Rubber Co. as sales engineer, has joined the sales organization of the Traylor Engineering & Mfg. Co. of Allentown, Pa., makers of the "Bulldog" jaw and gyratory crushers, Traylor heavy duty crushing rolls and cement mill and smelting plant equipment. Mr. Haislip, who from 1904 to 1905, was with the Allis-Chalmers Co., and from 1905 to 1916 with the Power & Mining Machinery Co., will be connected with the Chicago District Office of the Traylor Co. in the capacity of sales engineer and assistant to L. J. Hewes, district manager.

R. S. Dimock and **Chas. R. Goddard**, the latter formerly with the R. H. Howes Construction Co., New York City, and George Waterhouse of the George Waterhouse Co., Beaufort, S. C., announce that they have incorporated as the General Construction Co., with principal office at Savannah, Ga.

Convention of Material-Handling Machine Makers

What is intended to be a two-day "get together" for all manufacturers of machinery, accessories and equipment used in handling material is to occur in an open convention of the Material Handling Machinery Manufacturers' Association in New York City, Feb. 26 and 27.

In addition to its large membership the association is anxious to have present manufacturers from any part of the country who make cranes of any kind, hoists, winches, portable, gravity, and power conveyors, industrial trucks, tractors and trailers, bulk handling machinery, elevators, motors and electrical control apparatus, batteries, ball-bearings, wire and manilla rope used in the construction of mechanical handling machinery, hand lift trucks, etc. A blanket invitation has been issued for the attendance of representatives of all manufacturers who make machinery or equipment for machinery which handles raw products, parts in process and finished products, by mechanical movement rather than by manual physical labor.

Details of the program are being completed and arrangements have been made to hold a morning business session on Feb. 26, followed by a formal luncheon, with a prominent speaker, and an afternoon session in which short papers on mechanical handling will be read followed by open discussion and moving pictures. The morning of Feb. 27 will be devoted to an executive session of the membership and the afternoon will be a continuation of the papers and discussion on mechanical handling followed by a moving picture program of a number of the latest and largest installations.

A Consolidation of Engineering News and Engineering Record
McGraw-Hill Company, Inc.—JAMES H. MCGRAW, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN
Editor

Volume 84 NEW YORK, THURSDAY, JANUARY 29, 1920 Number 5

Once More the Architect

JUST as this issue goes to press comes the report, noted in the news pages, by the State Art Commission of Pennsylvania on the proposed Delaware River Bridge. Doubtless the strong engineering organization of Philadelphia will be able to take care of these ridiculous assertions and insinuations, but pending a complete reply it may be well to enter denial that "the great bridges of New York have all been planned by architects." This is as complete a perversion of fact as is the assumption in the report that architects, *per se*, are competent to answer the questions of "what" and "where" in the design of monumental bridge structures.

Parliamentary Procedure

AKNOWLEDGE of parliamentary procedure, we had always understood, should be part of the intellectual equipment of every educated man whose work led him into contact with the world about him. We are of the opinion that the recluse alone can afford to be without such knowledge. Yet at two large and important meetings of engineers last week there was displayed a lack of knowledge of parliamentary procedure that would have shamed a high-school debating society. Robert's Rules of Order can be bought for the price of a good lunch (New York price standards) and can be carried in the pocket. A word to the wise—.

Progress in Contractors' Organization

THE task of organizing contractors, nationally, has progressed to a point of success where unreserved support of the movement can be asked. On Feb. 18 and 19 the Associated General Contractors of America will meet in convention at Chicago. In a little more than a year this association has increased its membership 150 per cent; has formed four active sections and fourteen branches; has formulated a plan of service of wide scope, and has assembled a working organization. It is now in position, with the support of the business, to render actual service to contracting. Contractors in the greatest number possible should attend the Chicago convention.

Rotary Snowplows for City Work

LITTLE has yet been done in the application of power to the removal of snow from city streets. For that reason, particular interest attaches to a machine now employed by some Canadian cities, a description of which will be found elsewhere in this issue, together with figures of comparative cost which indicate the advantage of machine work in both economy and rapidity. It is worth noting that a rotary plow mounted in front of a motor truck was built as an experiment by the South Park Commission, in Chicago. The truck traveled in the cleared path and pushed the plow through the snow, while the Canadian machine as now built is adapted for hauling rather than pushing.

Charles Warren Hunt

THE coming retirement of Charles Warren Hunt as secretary of the American Society of Civil Engineers is an event of major importance to the society. He has been secretary for twenty-five years and in that time the society has grown from a membership of 1,808 to 9,408.

As is usually the case with men of decided convictions, Dr. Hunt has made strong friends and strong enemies. There are those with nothing but praise for his administration, and others who are willing to admit little, if any, good. The truth lies somewhere between.

Much of the criticism of the past has been due to a belief that the society should have been more active and to an impression that the secretary lacked sympathy with the desires of members living outside of District 1. To weigh these matters is out of place here, but it should be remembered that Dr. Hunt was not a sole agent, but that he worked always with boards of direction, which, in theory at least, were supposed, because of their geographic make-up, to know and to express the desires of the membership. To whatever extent criticisms of the society's management may be well founded, no one can assess the blame on individuals without an intimate inquiry into the history of the actions of the board.

But if it is difficult to evaluate the criticism, fortunately the achievements stand out boldly.

We would place as Dr. Hunt's greatest work for the society his influence for the preservation untarnished of its prestige. He had a clear grasp of the purpose of the society and with admirable persistence used his influence to shape all actions so as not to be out of conformity to that end. As we take it, he erected as his ideals the advancement of the profession and of the society through technical work, and the accumulation of membership only in so far as it would be worthy of the society. We look in vain for actions that would diminish the society's technical prestige. On the other hand, we see an ever more careful guarding of committee work, lest something unworthy be produced. We see a constant tightening of the qualifications for membership.

Some there are who would maintain that the society's prestige has been preserved and increased in spite of the administration. We do not believe it. Prestige is a delicate thing, difficult to gain, easy to lose. No loose policy could have maintained it. There are pitfalls in the way always, and only a clear conception of the society's purpose and of the proper means for accomplishing it, combined with a willingness to fight in season and out of season against cross-currents and wrong tendencies, could have kept the organization in its enviable position.

That prestige is the most valuable of the society's possessions. No achievement of any kind, whether of direct aid to the individual, or of brilliant record in furthering technical progress, or of influencing civic activities—nor the sum total of all such possible achievements—could have atoned for the loss of prestige. Indeed, we do not hesitate to say that if some thing or some things had to be neglected, the less important has suffered. The essential thing has been done: The society's course has been directed along sound lines. Its professional standing today is higher than it has ever been before.

That the profession appreciates this accomplishment is shown by action rather than words. Despite adverse criticism, its growth has been consistent. Members may have protested that they got no return from their membership, but *they nevertheless retained that membership.* Others stated that the only return was the prestige of wearing the pin—*but they continued to pay $15* (and at New York, $25) *per year for that privilege.* Prospective members must have heard the criticism, but they joined nevertheless; the honor of affiliation with the society was alone worth the initiation fee and the annual dues.

An example showing Dr. Hunt's consistent effort to prevent alien activities interfering with technical purposes is afforded by his attitude on the so-called welfare and civic activities. He conceived, as we interpret his course, that these would require, for effectiveness, a type of propaganda which he considered inconsistent with the technical and scientific point of view of the society. Accordingly he advocated the passing of these functions to a separate body. In so doing he did not maintain, if we have sensed correctly his attitude, that the American Society of Civil Engineers had no interest in them. On the contrary, the records of the society show various resolutions of the board on civic topics, while two reports of a committee on compensation and a joint report on licensing bear testimony to the society's recognition of its broad responsibility. What appeared to Dr. Hunt inconsistent with the society's ideals was not the consideration of these civic and welfare topics or action in a moderate way, such as appearance before a congressional committee, but that vigorous type of propaganda such as is being carried on by the National Department of Public Works Association.

In this position we believe Dr. Hunt now has the support of the profession. Much criticism once leveled at him for lack of action on these matters was due to a failure of the critics to see as clearly as he did. He maintained always that these problems needed action; in some cases he pointed out the means of prosecuting some of them before later ardent proponents advocated the measures, but he stoutly insisted that some other body should do the work.

That we have placed no undue stress on the maintenance of the society's prestige, we may advert to the fact that none of the other national engineering societies has an equal standing in the profession itself. It is hard to lay one's finger on the reason, but the extent to which commercial interests have been represented in the management of the other bodies is probably responsible for it. Commercial thinking has diluted the professional viewpoint. Notable examples of this weakening of the professional attitude are afforded by the commercial ventures of the American Society of Mechanical Engineers and the recent casting of their lot with a biased commercial investigating organization—the National Industrial Conference Board —*without question of the danger of the alliance being even so much as raised by the society's leaders,* as represented in its council.

In helping put the American Society of Civil Engineers on a sound financial basis, Dr. Hunt is equally deserving of commendation, and this is said with full realization of the financial difficulties of recent years. The building of the Fifty-seventh Street house and the complete retirement of its indebtedness was a real financial achievement. It was carried on, be it remembered, at a time when the work of the society generally met the demands of the membership; in other words, the building of the Fifty-seventh Street house and the retirement of its indebtedness were not allowed to interfere with the demands of the membership for technical activities. Recent stringency, made all the worse by the demands for increased activities, is to a considerable extent due to the remission of dues on the part of those engaged in the World War. It has been further increased through the great advance which has taken place in the cost of every activity in which the society is engaged.

In general, Dr. Hunt leaves to the society the greatest possible legacy—a heightened prestige and a record of scrupulous adherence to the sound course of professional advancement through high-grade technical work. Clap-trap and commercialism, alien ideas and methods, which have infected other technical societies, had no power with him. He was on sound ground. He knew whether the society should go and refused to allow his ideal of prestige through high-grade technical work and a high-grade membership to be changed. With those standards he measured whatever was proposed. If the plan could not advance the society by methods consistent with these standards he had the courage, no matter what man or group or society made the proposal, to stand out against it.

While, therefore, Dr. Hunt's regime has been subject to criticism, every reasonable man must admit that the society and the profession owes a great debt of gratitude to him. As the future removes us from the record of the past and adds perspective, whatever shortcomings there may have been will dissolve in the strength of the accomplishments. He has helped to bring the society to man's stature, strong in technical prestige, with a healthy, professional point of view. We can wish the next secretary no greater success than that, while removing the grounds for criticism, he may maintain the society's point of view with equal clarity and that he may lay down his charge, when his course is run, with its prestige as great and untarnished.

Every engineer of true professional instincts who abandons strict engineering work to engage in an allied or totally different pursuit makes the decision with grave doubts as to its correctness. In Dr. Hunt's case the event has proved the correctness of his decision of a quarter-century ago. He worked then, he has worked ever since, with men who have written their names large in engineering achievement. They, however, influenced practice in but one line. His influence has been a broader one. He has helped make every engineer prouder of the profession; he has helped every engineer upward through the higher standing that his influence has given to engineering. With this accomplishment the most ambitious might well be proud, and the consciousness of it should be to Dr. Hunt that greatest of rewards, satisfaction with work well done.

Federated and Engineering Societies

On another page is recorded in a brief article the most important step that has been taken in engineering society organization in this country—a definite move forward to effect a federation of all of the engineering societies, whether they be national, state, regional or local. The drift, of course, has been in this direction for many a year. Engineering Council was an evidence of that drift, and so was the tendency of specialized engineering societies and branches in various cities to form local societies and clubs.

For some time it has been clearly recognized that Engineering Council, with its membership limited to national bodies, could not perform the functions demanded of a large centralized organization of engineers. The Joint Conference Committee, therefore, proposed a comprehensive organization, resting on a democratic foundation. The committee's plan has now been endorsed in an informal meeting by the boards of direction of the five member societies of Engineering Council and they have asked the Joint Conference Committee to call a meeting at which the machinery for the comprehensive organization would be set in motion.

The conference at which this momentous decision was reached was of an informal character and obviously is not binding upon any of the societies. However, there was free opportunity for discussion and the resultant decision will undoubtedly be carried out. The civil engineers' representatives gave notice that the very question up for consideration at the conference was to be proposed to letter ballot of its members and that that ballot must necessarily be determinative of the society's course. However, the fact that the board of direction of the civil engineers has authorized its representatives to engage in the work of preparing for the organizing conference is evidence of the board's sympathy with the project.

The meeting was a remarkable exhibition of a willingness to compromise in order to get results. Even the most conservative had come there with a conviction that action was needed, and were willing to come to any reasonable compromise. Point by point they argued for the largest possible retention of the present characteristics of Engineering Council, but one by one gave way when the inability to maintain that type of organization and get results became apparent. Their concern, as we interpret it, was not to preserve an existing bit of machinery as such, but rather to insure against the turning of engineering influence over to an organization whose standards would be difficult to control and whose influence—and also reaction upon the engineering profession—might be questionable.

As good evidence that the men attending are fully awake to the type of work which, in part, must be done by the new organization, it is encouraging to note the implied approval at the meeting of the work done by the Public Works Department Association. No protest was made against the sums to be appropriated to that activity. That attitude is a guarantee that where virile action is needed, the solid men attending last Friday's meeting will back up plans for vigorous action.

It is unnecessary to remark, of course, that the mere formation of the federation is not a guarantee of success. It will be but a beginning, even though an auspicious one. The federation must be sympathetic with the views of the local bodies and must bend its major efforts to helping them do effective work. A strong headquarters organization will be needed, but the results are to be accomplished largely by proper direction of those on the firing line—the local engineering societies. Failure to catch that point of view will mean, in our judgment, the failure of the proposed body. Naturally, the association of local engineering societies in the federation will help to bring about the new conception. Nevertheless, a failure on the part of the representatives of the national bodies to appreciate the necessity of this attitude may delay very considerably the effective functioning of the new organization.

We believe, then, that the engineering profession in the United States has good reason to be satisfied with the events of last week. The action of the annual meeting of the American Society of Civil Engineers and the determination to go ahead with plans to form the comprehensive organization outlined in the Joint Conference Committee report are epoch-making in the history of the leading national engineering society and of the whole engineering life of the nation as well. We believe that both movements will have the hearty endorsement of the profession. Strong, broad leadership will get tremendous backing.

The Approval of the Development Report

Last week marked an epoch in the history of the American Society of Civil Engineers.

The annual meeting, by its endorsement of the fundamental recommendations of the development committee, took the critical step of starting the society forward on a more vigorous line of action. The vote of the meeting is not, of course, final. The recommendations must be approved by letter ballot of the members, but if the temper of the meeting was representative of the temper of the society at large, and we believe that it was, the letter ballot will endorse by a large majority the committee's proposals. The action of the meeting is all the more interesting because, while the registration has not yet been analyzed, the majority was probably from the New York Metropolitan District.

The meeting was overwhelmingly in favor of the report. Every vote that, directly or indirectly, favored it was carried by very large majorities, in many cases unanimously. The resolution not merely carried approval of the fundamental recommendations of the committee, but included nine questions which the board of direction was instructed to send out to the members for letter ballot. While the board may add other questions, possibly some that will amplify those approved, the issues raised by these nine are the critical ones. They go to the root of the committee's report. Their approval will mean the launching of the society upon the course of activity for which there has been agitation in recent years.

We pointed out editorially in our issue of Jan. 15 that favorable action would come at the annual meeting only if those who endorsed the report came out for it aggressively. There was nothing to be desired in that direction. If anything, the progressives were too aggressive. It was the first time in a score or more of years that a progressive note was heard; it showed that the membership had determined that the society's life henceforth should be more vigorous. In saying that we do not mean to imply that radicalism is in the saddle. Far from it. What is proposed is but a logical step beyond the past activities of the society, plus a compliance with the long existing demand that the Society be strengthened in its local and district organization and thus be brought close home to the members. The fundamental purposes remain unchanged.

The note of progressivism, tempered by common sense and the realization of the methods proper for a technical society, was made clearly evident by the remarks of the incoming president, Arthur P. Davis. In what was really a brief inaugural address, instead of a mere speech of acceptance, he declared himself in favor of a progressive policy, for action rather than inaction. If any felt that his words were open to the interpretation of too great a progressivism, his position was made clear at the afternoon meeting. Speaking to a motion, he distinguished between progressivism and radicalism. So far, therefore, as he can guide it, and the influence of a president is necessarily and properly large, the expansion program when approved by letter ballot will be developed along sound lines.

It is regrettable that so much time was wasted on parliamentary tangles and scattering discussion of the main resolution that the merits of the development committee's recommendations were not discussed. We do not believe that such discussion would have altered materially the action of the meeting, though there is a possibility that amendment of one or more of the questions carried by the resolution would have been suggested. What would have been accomplished, would have been to throw the recommendations into relief and bring out what solid objections there may be against them. Such a discussion would have furnished material that could be laid before the members to help them in deciding how to vote on the letter ballot. As we have previously indicated, we find only two objections to the main recommendations of the committee; we feel that the change that would require an applicant to become an associate member for two years before becoming a full member is inadvisable, and we believe that something is to be said against the allocation of all members to sections. The first of these is not covered by the questions approved by the meeting. The section matter is.

Undoubtedly we want to strengthen the sections. In the past they have not been a general success. In fact, only a few have more than a paper existence. To appropriate part of the dues to them on the basis of all the members who will be allocated to a section, even though they live a hundred miles or more from the section city, can be justified only if the sections become virile organizations and contribute to the advancement of the profession. Then there will be general benefit in which even the distant member will share. The experiment is worth trying, with the understanding that each section will be held to severe accountancy for results. In fact, if approved, the rules when adopted should vest in the board of direction discretionary power so that appropriations may be a means of insisting on truly meritorious work.

The society, then, it seems likely, will shortly be embarked, provided always that the needed funds are forthcoming, on an enlarged activity. With that there is, we believe, very genral sympathy. But we should not be so blind as not to realize the dangers of the situation. When one course has been held so long, there is danger that in taking the new one progress will be too fast—and that there will be regrets. We are going to attempt much in a short time—or rather, many will demand that much be done at once. Patience will be desirable—not tolerance of needless delay, but patience with those who will shoulder the load of working out details. The definite course has been set in the new direction. Let us travel along it only with speed consistent with a testing of the various steps. So only can the great traditions of the leader of American engineering societies be preserved and enhanced.

The Alvord Report

THERE was placed in the hands of those attending the annual meeting of the American Society of Civil Engineers last week copies of the report of the committee (of which John W. Alvord was chairman) appointed by the Board of Direction to study the report of the committee on development and report back its conclusions to the board. Obviously, there was not time at the meeting to study this rather lengthy document and consequently the comment on it was very brief, and confined to those members of the committee on development who had read advance copies. The report is devoted most largely to that section of the development report dealing with the proposed joint activities with other societies.

In its handling of that matter the Alvord report, in our judgment, fails entirely to sense the direction in which the development of engineering society activities in this country has been proceeding for the last decade. The outstanding objection which the Alvord report brings against the development committee's proposal is that it will not allow the national engineering societies to be the "dominating influence." In so putting the matter the Alvord committee fails to appreciate that the strength of the engineering profession in this country is to be developed by strengthening the local engineering societies, rather than in further concentrating influence at New York headquarters. In fact, the action of the annual meeting in approving the report of the committee on development was a compliance with the demand that the local sections and the districts be made strong factors in society affairs. The whole tendency in recent years has been to strengthen the locals, and to rely upon them for such action in civic and welfare matters as would accomplish results.

Essentially that which has been developing is a demand for a more democratic government of engineering societies, for a recognition of the purpose and usefulness of local bodies. The Alvord report distinctly recognizes the function of local units, but, turning its back on the movement of a decade, declares for autocratic organization, against which the Joint Conference report is, in its very essence, a protest. Reporting on a democratizing document, the Alvord report proposes autocracy.

The report, like so many other pleas to keep control of the country's engineering society activities in a body fashioned on the plan of the present Engineering Council, is based on the assumption that the leaders of locals are inimical to the national engineering societies. We do not believe that to be true. The leaders of local societies in all but rare cases are members of the national societies and proud of that membership. We do not believe that they would countenance any action harmful to the nationals.

The Alvord report, in our judgment, proceeds along the wrong lines. If it be fully understood we do not believe it will gain any material volume of sympathy.

Earth Foundations and Science

OLDEST of the building arts, foundation construction should be the most thoroughly developed. Before the earliest builder could erect his first structure he had to provide a base for it, and his first observations were concerned with the insufficiency of this or that form of footing. The builders of each succeeding age daily had to consider how to construct a foundation on earth, what form it should have, how deep it should be carried, and how large it must be to bear the intended load. Coming down to modern times, the development of scientific inquiry and analysis would naturally subject these experiences to the test of rational calculations; and so we have today—or should have—a most thoroughly developed engineering science of foundation construction.

The facts disagree sharply with this conclusion. Foundations are peculiarly a field for empiricism, in other words for judgment or guesswork. The master craftsmen in this field—and they are few and little esteemed—are artists rather than scientific workers. We have a foundation art, but we have no corresponding science. Not even a beginning has been made toward subjecting foundation work to the methods of measuring and weighing and subsequently bringing service and material into correspondence by which all the other constructional arts have been raised to that scientific level which is the boast of modern engineering.

So little progress has been made in the study of foundations (or should we say, so little study has been given to the subject?) that it is possible to state in a few sentences the essentials of what is known concerning the common type of foundations, thus: (1) We know that a footing which bears on the ground surface is insecure, not only because its initial resistance to settlement is uncertain, but primarily because it may be affected by many kinds of disturbance. In minor degree disturbances of various kinds affect footings at shallow depth also, of depths from 2 to 6 ft., or in river bottoms even 10 to 20 ft. (2) Except under very special conditions, foundations may be compared on the basis of average load per square foot of horizontal base area. (3) Safe intensities of loading range from ¼ to 10 or more tons per square foot, a range of possibly 1 to 50. (4) Some settlement or compression occurs in every case, but the amount that is allowable depends on circumstances. (5) Generally speaking, coarsely granular material is a stronger and more dependable foundation bed than fine-grained material, especially if the latter is of such nature as to be plastic when wet.

Whether or not this list of principles is complete, it is certain that a few general statements of similar character will cover all our underlying knowledge of the subject. It is to be remarked that this is all empirical knowledge. A single principle of scientific or theoretical nature is to be added, but this expresses a hypothesis rather than a known fact: that a foundation bed is elastic in such a way that compression and load are proportional. Utilizing this principle, we convert load distribution into stress distribution just as we do in computing the stresses in a block carrying a non-central load. This meager equipment of rough principle is all that our many centuries of experience has yielded; hardly a satisfactory foundation stratum for a practical science.

Part of the long experience record on foundations is an ample list of failures. Some arts suffer in development because failures are so infrequent that they do not furnish a sufficient check on current methods of planning, but this is not the case with foundations. If not actual collapse, at least undesired settlement has been and is extremely common. Very few earth foundations indeed maintain the structures that rest upon them in complete structural integrity. But the difficulty with the unlimited amount of experience on foundations is that the several items of experience remain individual and do not agglutinate, because of the very nature of the subject. This is the real reason why there has not come into being a broad solid substratum of consistent empirical practice on which scientific development might be based, and the reason why no science of foundation has been created.

Obviously, then, it will be necessary to attack the problem by way of laboratory investigation. Little research work of the kind has been done so far and that little is of vanishingly small significance at best. It must be the work of the future to initiate and carry out investigations on which a science of foundation construction can be built up.

Characteristic of the foundation-building art is the fact that we have a fairly good grasp of one-half of the problem, namely, the measurement of loads and the selection of tools. We possess a broad range of structural types of foundations, extending over piles, spread slab footings, and deep piers; and an even more notable list of construction methods ranging from open excavation and box and sheetpile cofferdams to pneumatic caissons. Having these ample resources it is the more striking that we know little beyond a few primitive facts concerning the other side of the problem, embracing measurements and definite valuation of the materials on which we must found.

Development of a science of foundation is wholly a matter of investigating foundation materials and studying the manner in which loads affect these materials. The distribution of stresses under foundations and the way in which these stresses affect different soils are subjects even more deeply involved in ignorance than soil classification and determination of soil resistance. Work has been done on the latter subject during the four or five years just past, most of it by a committee of the American Society of Civil Engineers. But this work, while of no inconsiderable amount, is chiefly important as showing what a vast quantity of effort must be put on the subject in the future if tangible results are to be reached.

Every encouragement ought to be given to this work and all other work that may be undertaken in the study of foundation problems. The spirit of determined scientific attack on practical problems that prevails today is such as to warrant a strong hope that the art of constructing foundations will not be left forever in its present crude state. Whether the road to an improved condition lies through research organized on a large scale, or through expansion of the present system of scattered individual study of particular questions, cannot safely be foretold. But the great first need is a more general and more aggressive appreciation of the complex problems that are contained in the subject.

Charles Warren Hunt Relieved From Active Duty as Secretary, Am.Soc.C.E.

After 28 Years of Continuous Service, 3 Years as Assistant Secretary and 25 Years as Organization's Executive Head, He Is Appointed to New Office of Secretary Emeritus

CHARLES WARREN HUNT, secretary of the American Society of Civil Engineers, after 28 years' continuous service—three years as assistant secretary and 25 as the association's executive head—has asked to be relieved from active duty. The Board of Direction, by resolution passed Jan. 21, continued him in office until his successor is appointed, and appointed him to the newly created office of Secretary Emeritus, such appointment to take effect upon the election of his successor. The full text of the resolution of the Board of Direction appears on the following page.

To Dr. Hunt's administrative ability, sound judgment in matters of business and finance, and constant vigilance in maintaining high professional standards the organization is largely indebted for its growth in membership and technical prestige. Throughout the texture of the society's history during the last two and one-half decades his influence is closely interwoven. A member of the Board of Direction, participating in the organization's councils, and notable as a man of exceptional mental alertness and positive opinion, the imprint of his strong personality stands out sharply in the policies and decisions by which the society has been governed. Even in the high office he occupied a less forceful character might easily have become merely a routine man — a chief clerk, concerned principally in the intricate office detail involved at the headquarters of an organization of 10,000 men. Not so Dr. Hunt. While he developed an efficient staff for handling the office routine, supervised its operations closely, and himself devised and introduced many improvements in the system of handling the ever-increasing volume of business of the secretary's office and the library, he never allowed himself to be diverted from the broader field of effort which his position offered to a man able to visualize its real scope. It is natural, after so long a term of office, to think of Dr. Hunt only in terms of the secretaryship of the American Society of Civil Engineers. He was, however, engaged for 16 years in the practice of engineering before he entered upon what was to be his life work. Born in New York City, May 19, 1858, he was graduated at the early age of 18 years, from New York University with the degrees of B.S. and C.E. in 1876. His professional experience from that time on until 1892, when he became assistant secretary of the American Society of Civil Engineers was varied, and included work on municipal docks, parks and water-works as well as railroads and elevated railways. At various periods he worked under the direction of the late Charles T. Brush, M.Am.Soc.C.E., and for a number of years served as assistant to the late J. James R. Croes, past-president, Am.Soc.C.E.

Secretary of American Society of Civil Engineers Whose Relief From Active Duty Terminates a Period of 25 Years' Service as Executive Head of the Organization

DR. CHARLES WARREN HUNT

While serving on the Brooklyn elevated railway under the late Othniel F. Nichols, then a member of the society's Board of Direction, Dr. Hunt was elected assistant secretary of the society, a newly created office. At that time the society could afford to offer a salary of only $2,500 a year, and although its acceptance meant a sacrifice of about $1,000 annually, Dr. Hunt, seeing an opportunity for service to the profession not then clearly visualized by the majority of its members, gave up his professional prospects and became assistant secretary on March 2, 1892.

Previous to 1894 the secretary was elected by popular vote, but during that year the constitution was changed and the election of the secretary was placed in the hands of the Board of Direction. At the end of that year Dr. Hunt had become thoroughly familiar with his duties and had so convincingly demonstrated his capacity that when the Board of Direction met at the annual meeting in 1895 he was elected to the office, to which he has been re-elected each year.

From the time of his election there has been no let-up in activity. The work, involving as it did a contact—and sometimes a clash—with other men in forming and carrying out the society's policies, an opportunity to raise the organization to new heights of usefulness, and the occasion for combatting influences which aimed at the use of the society for selfish ends, furnished to the new secretary the kind of occupation which appealed to him. He was young, energetic and had definitely formed ideas of how the society, under the stimulus of proper leadership, could be developed into a great national force. To the realization of these plans for the organization he devoted his entire effort.

A full historical account of the progress of the Society during these years was written by Dr. Hunt and may be found in the *Transactions*. He has been responsible for improved methods of handling the business of the Society, many of which have been followed by similar organizations. Among his achievements the following stand out conspicuously.

Resolutions Adopted by the Board of Direction

American Society of Civil Engineers, Jan. 21, 1920

WHEREAS, Dr. Charles Warren Hunt, after 25 years of devoted and efficient service as Secretary of the American Society of Civil Engineers, during which he has contributed to its upbuilding and prosperity to a degree which places the Society under lasting obligation to him, has indicated his desire to be relieved from active duty, and

WHEREAS, he possesses an intimate knowledge of the business of the Society and an extensive acquaintance with its membership which render his advice and assistance of the greatest value to the Society and its Board of Direction, the benefit of which they can ill afford to lose, therefore be it

RESOLVED, that Dr. Charles Warren Hunt be and is hereby appointed Secretary Emeritus of the American Society of Civil Engineers at a salary of $9,000 for the coming year, and a salary of $6,000 per annum thereafter with such duties as the Board of Direction may assign to him.

It was voted that the salary of the present Secretary be continued at $12,000 per annum until his successor is appointed; then to continue at $9,000.

It was unanimously voted that Secretary Charles Warren Hunt be granted leave of absence for six months owing to the condition of his health, and that his service as Secretary Emeritus begin when his successor takes office.

(1) The consummation of the project for the society house at 220 West 57th St., which served its purpose admirably for more than 20 years, and would have continued to do so for many years to come had it not been determined that for purposes of co-operation it was wise, even at great pecuniary sacrifice, to become one of the Founder Societies in the ownership of the Engineering Societies' Building.

(2) The improvement in the society publications in volume and in form, due to his careful editorial supervision.

(3) The International Engineering Congress held in St. Louis in 1904. For the whole work of this congress, the securing of international papers covering the entire field of engineering, then translating, editing and publishing them, the expenditure of the funds of the society for the purpose, all arrangements for the reception of foreign representation, including a large body of members of the Institution of Civil Engineers of Great Britain, Dr. Hunt was responsible. Resolutions of the Board of Direction adopted at that time show its appreciation and recognition of the work.

(4) The cataloging of the library of the society, begun in 1898 and finished two years later, which resulted in its greater usefulness and contributed to its growth from about 30,000 to 89,000 accessions. In this connection he was the pioneer in the making of "searches" for non-resident members, now so successfully carried out by the United Engineering Society Library.

During these years, in addition to the regular duties of his office, Dr. Hunt has been a member of many committees. He was active in the organization of the John Fritz Medal Board of Award and served as one of the representatives of the society for fifteen consecutive years. He was secretary of this board for the first 9 years of its existence, relinquishing that office at his own request and then, upon being elected as chairman, he has served as a representative of the society on many joint activities such as Engineering Foundation, United Engineering Society, Engineering Societies' Employment Bureau, and others.

It is generally felt among the membership that the society owes most to its secretary for his exceptionally able conduct of its finances. Under his management, and while other organizations were floundering helplessly, the affairs of the American Society of Civil Engineers were, from the very beginning of the Hunt regime, conducted on a sound business basis so that the organization enjoyed the prestige, practically unknown at that time, of being in a healthy position financially.

The secretary's work has brought him in contact with engineers throughout the country and, being by nature a keen observer of men, Dr. Hunt has formed very definite opinions as to the strength and the weakness of the engineer as a collective individual. To his friends Dr. Hunt has often expressed the belief that the chief obstacle in the way of the engineer's attainment of adequate recognition by the public and increased compensation is the lack of those things which are part of the make-up of an educated, cultured man. The engineer is a specialist and by the nature of his work allows himself to acquire a narrow viewpoint. Dr. Hunt is of the opinion that engineers, taken by and large, lack imagination, although no one is stronger than is he in endorsing their mental ability and their effectiveness in their special lines of work. Dr. Hunt is of the opinion that this broadening influence which he feels engineers need must be begun in our schools and continued, by the engineer himself, after graduation. This subject is one of the secretary's particular hobbies and on many occasions he has urged his point of view. "Engineers," said Dr. Hunt on one occasion, "are the best set of thinking men in the country; they can work effectively on almost any project except one that involves their own welfare." No man in this country has had a better opportunity to judge engineers than has Dr. Hunt. It is, therefore, significant that he places the lack of a broad education first in the defects in the engineer's qualifications for a bigger place in the world's work.

In an organization of nearly 10,000 men it would be an impossibility for a secretary so to conduct the affairs of the organization as to please everybody. Dr. Hunt, like all men of decisive character, has his enemies and his friends. Both groups are equally positive in their support or in their criticism of him. It is the universal belief, however, that his administration of the secretaryship has been efficient and untiring. The Society today occupies a position of financial stability and great potential influence and it is upon that foundation, in the building of which Dr. Hunt took so important a part, that the structure can be carried upward to new heights of service to its membership and to the nation.

Demountable Bodies for Motor Trucks

Owing to the increased use of motor trucks for freight transport in England, considerable attention has been given to the design of mechanical appliances for loading and unloading freight. Realizing that the time lost by a motor truck at its loading or unloading point in the transference of its freight represents idle capital, British mechanical engineers have co-operated with the automotive engineers in producing those aids that will cut the loading and unloading time to the minimum. At a meeting of the Institution of Mechanical Engineers in London, discussion was given the design of various types of loading and unloading devices.

The general discussion indicated that demountable bodies must be supplied to vehicles so that they may be adaptable for all sorts of haulage. However, discussion was centered upon providing a clearing house for the receipt, storage and distribution of motor-truck freight, and upon such means as would allow all freight-carrying vehicles to spend the least time possible at terminals.

Among the types discussed were those represented in Fig. 1. The first of these shows a demountable body used where no means exists for supporting the bodies when demounted, and consists in providing special legs with hinged feet which are turned up out of the way to give road clearance when traveling. The illustration shows such a body fitted to a two-ton electric vehicle. In loading gear is driven by a separate small electric motor which is arranged with an automatic cutoff to prevent overrunning. To provide for easy entrance of the chassis under the body the front legs of the latter are made to pull out to give additional clearance, and when pushed in to the normal position present no obstacles to traffic. The lifting gear of this description allows the driver to discharge a loaded body and take on another in a very few minutes.

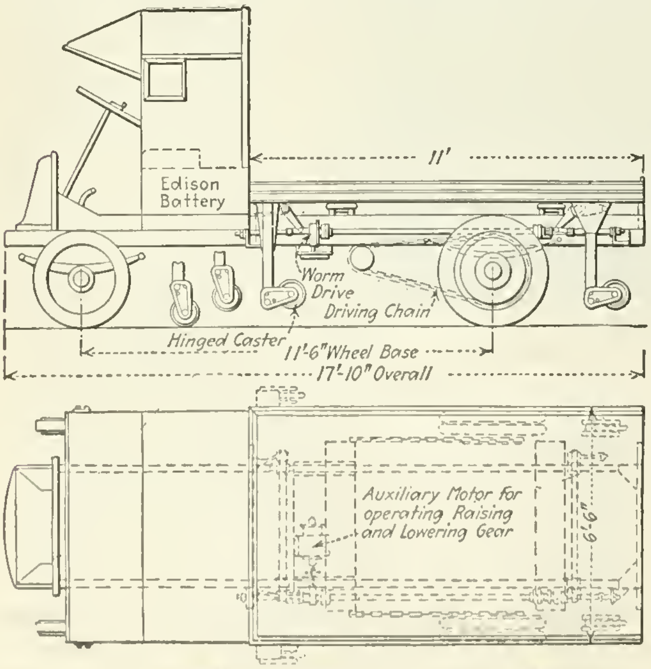


FIG. 1. DEMOUNTABLE BODY WITH LEGS

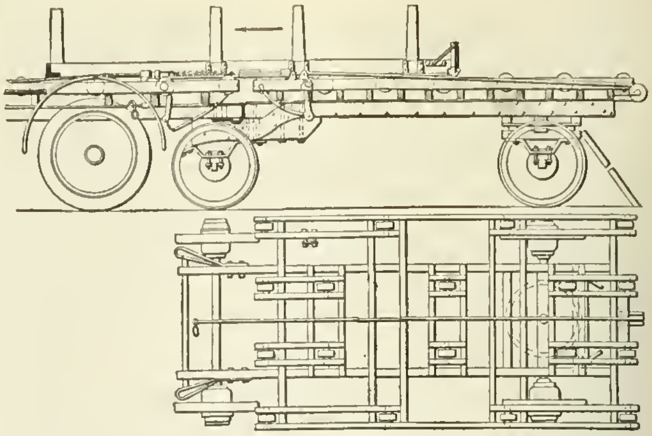


FIG. 2. BODY BEING TRANSFERRED FROM LOADING TAILER TO MOTOR TRUCK

The second type is one of a number of methods employing bodies which can be rolled off. Fig. 2 illustrates such a body which is known as the Stamper loading truck. In this system, at each end of a journey a trailer is provided onto which the body is transferred from the truck by means of a winch. The trailer is arranged with the standard type of forecarriage and draw-gear which enables it to be moved if desired. The trailer has no springs, so that the height remains constant, and consists of a framework provided on the top with a number of rollers, a similar set of rollers being fixed on the motor chassis. The tail end of the trailer is formed with sloping guide plates which engage with rubbing plates attached to the rear of the motor vehicle, so that when backed together their height and that of the two sets of rollers are the same. A certain amount of play is also allowed on the axle arms to facilitate centering. On the under side of the body four angle irons are fixed lengthwise, which act as runners and prevent side movement. The method of operation is, for the motor vehicle on its arrival at the loading point, to back up to the loading truck so that the foot irons enter the guides on the rear of the truck, and, further backing taking place, the foot irons slide up these, insuring that the two platforms are brought to the same height. By means of the winch on the motor the body can then be drawn across into position, where it is automatically locked as it passes over a pair of spring-operated bolts. The mechanical engineers also turned their attention to the discussion of trailers, the general opinion being that while under favorable circumstances a certain advantage was had in enabling a greater load to be hauled by the same power unit, the wholesale adoption of trailers behind ordinary vehicles carrying loads was not justified, as "a trailer takes power to haul it, reduces the speed of working, accelerates depreciation of the mechanism, and increases tire wear."

Low Pay of City and State Engineers Disclosed by Answers to Questionnaire

While Living Costs Mount 90 Per Cent Technical Men in Public Service Work Get Increases of Only 17 and 30 Per Cent—Many Views on Morale are Expressed

THE pay of engineers in the service of 35 different states and 66 different cities of the United States has been reported in detail to the State, County and Municipal Sections of Engineering Council's Committee on the Classification and Compensation of Engineers. The main features of the report, recently made public, are given below:

The total number of engineers covered by the returns are 2,222 in state service and 3,317 in city service. Of these engineers, 2,644 are in the grades classified by the committee under professional service and 2,895 are in the lower grades, designated "sub-professional" service. The committee believes that the engineers covered by its returns comprise a little over half the total number of engineers in state service and about two-thirds of those in the employ of cities of over 100,000 population.

The accompanying tables show the compensation received by these engineers. It will be seen that the 2,222 engineers in state service have received, since July 1, 1915, an average increase in pay of 30 per cent. The average increase to the 3,317 engineers in city service during the same time has been only 17 per cent. The increases have been chiefly to the men in the lower grades. Engineers in the higher grades have received very small increases in salary and in many cases none at all.

These figures for salary increases should be compared with the increase in the cost of living, which from Dec. 1, 1913, to Dec. 1, 1919, is fully 90 per cent, according to statistics presented in another appendix to the general committee's report.

The committee requested the heads of departments reporting to state what increase of salary they would recommend for the engineers in various grades. The average increases recommended over the salary rates of July 1, 1915, are, for the state service, 55 per cent, and for the municipal service, 40 per cent. The actual and recommended percentage of salary increases for both professional and sub-professional workers in both services are as follows:

	State Per Cent	Municipal Per Cent
Actual increase in compensation for all positions since July 1, 1915—Sub-professional..	30	18.5
Since July 1, 1915—Professional........	30	6.5
Since July 1, 1915—All Services........	30	11
Recommended increase in compensation for all positions as compared with compensation on July 1, 1915—Sub-professional.........	48	47
July 1, 1915—Professional.............	72	36
July 1, 1915—All Services.............	63	40

In the returns for the municipal service it appears that about 6 per cent of the increased compensation reported has been an incident growing out of a promotion to a higher grade. In the higher grades of professional municipal service, therefore, there has been practically no increase in the last four years to compensate for the decreased value of the dollar.

The false economy of perpetuating such conditions, and their seriously prejudicial effect upon the engineering service as a whole has been pointed out by the main committee. Correction of these difficulties constitutes a serious problem, for which a satisfactory solution must be found for the benefit, not only of the engineers but also of the services affected.

The accompanying tables show that the average age of men in all grades of the state service is very much lower than in the corresponding grades of municipal service. This is probably due in part to the fact that many of the state engineering departments have been organized at a very recent date. The tables show that the average present compensation for the higher professional grades in municipal service is very much above that in the state service, as is the compensation recommended, and that the present as well as the recommended rates for the lower grades are generally very much alike in both services.

It is probable that since the data were furnished to the committee, some progress has been made in the direction of bringing about increased compensation, but the only specific instance at hand is in New York City, where provision has been made in the 1920 budget for raising salaries of *all* employees receiving a salary of $2,600 or less per annum on the following basis:

Up to and including $1,200 per annum, 20 per cent with a minimum of $100 where any increase whatever is given, and a maximum of $200.

Between $1,201 and $1,900 per annum, 15 per cent where any increase is given, with a maximum of $200.

Between $1,901 and $2,600 per annum, 10 per cent with a minimum of $200 where any increase is given and a maximum of $250.

At the same time increases were granted to a few engineers in higher grades but this was the exception rather than the rule.

ENGINEERS' SALARIES BELOW LIVING WAGE

Considering the average present compensation reported for the various positions, it will be seen that in the sub-professional service and in the two lowest grades of the professional service, which together comprise 86 per cent of the total number of engineers, concerning whom data has been obtained, *the average compensation is less than $2,200,* which is the estimated bare cost of living for a moderately small family. The average compensation for even the highest grades is utterly incommensurate with what should be expected, particularly when compared with the pay generally received by engineers not in public service.

It is inconceivable that work so poorly paid can be other than expensive, for men thus circumstanced cannot be expected to perform their duties in other than a perfunctory manner or to produce more than a small fraction of what they otherwise might. It is safe to say that suitable compensation for high-grade engineering service is a real economy, and that the requirements of state and municipal work are invariably such as to demand the best.

WHY MEN STAY IN CITY SERVICE

The advanced age of men in the sub-professional grades and in the lower grades in the professional service reveals a condition which requires correction, especially in the municipal service. It is doubtless due to the fact that in normal times municipal service attracted young men about to enter upon their career as offering compensation greater than could be obtained elsewhere, and who did not appreciate the narrow field open for advancement until after they had been so long in the service that their usefulness in other fields was too limited to enable them to change without taking less money and assuming a risk as to permanent betterment.

An intervening increase in the number of dependents has probably added to their timidity as to the wisdom of making a change, with the result of creating a condition in public office which is usually described as "few die—none resign." The failure to provide room at the top naturally holds men in the same position, with their future prospects limited to the opening of new activities or the chance of occasional reward for continued service.

Under existing conditions, it would seem that men of courage and ability might be expected, when practicable, to seek other service, while the class that remains would naturally include not only the less independent and self-reliant, but also all those of lesser talent who depend upon the sheltering protection of civil service rules and regulations to continue in a job. If this is not the case, it seems difficult to understand why such a large proportion of municipal and state employees remain in service at a compensation less than that considered to be a living wage.

How to correct this condition is a problem for which the committee is not at this time prepared to offer a solution, but it seems clear that if public service is to be maintained on a high plane, it is necessary to continuously replenish its ranks with at least a substantial percentage of men having the enthusiasm which comes from incentive and to drop out those who might do better in other fields before they have settled down to a mental and professional condition of stagnation.

Some of the difficulties which must be met in bringing the state and municipal service to a higher degree of efficiency and, incidentally, in correcting existing conditions in such a way as to retain good men, are brought out in the report of the United States Civil Service Commission for the year ending June 30, 1919, from which the following quotations are made:

> This serious loss of valuable employees, who have acquired experience and become useful, is due to their leaving to go into outside employment, largely because of the lack of opportunity in the Government service. The higher positions, such as chiefs of bureaus, are rarely filled by promotions, not having been brought within the competitive system, and there is not sufficient inducement for the most capable men and women to enter the examinations, either in the salary immediately offered or in the prospects of a career. The service, therefore, tends to be regarded as a mere makeshift, and the tendency is for the most capable of those entering it to seek outside employment.
>
> Public office should not be regarded as a gratuity, but as an opportunity for service to the community by those most fitted to perform that service. To the extent that public office is an honor and a means of livelihood, all should enjoy equal opportunity to compete to gain such honor and livelihood. . . .
>
> The training of an efficient civil administrative officer is a long and expensive process, and unless the best possible material is available from which to make selections the result will be disastrous. The supply of efficient administrators is extremely limited at best. Too much emphasis cannot be laid upon the imperative necessity of highly trained administrators and the most highly trained clerical force from which to develop such administrators.
>
> Those familiar with the Federal service at Washington know that the service is now hampered by the retention of incompetents whose removal is rendered difficult by influences which are incompatible with the efficiency of the service. Preferences and exemptions increasingly clog the departments with persons who, no matter how inefficient are difficult to remove and whose retention tends to destroy the discipline of the service.

Effect of Meager Pay on Morale

In the questionnaire sent out, a request was made for information "as to present morale of the service reported upon." In 13 cases conditions were reported as satisfactory, in several others no comment was made, but that there is a spirit of general unrest and dissatisfaction is well evidenced by the following 44 quotations, which represent 44 per cent of the total responses:

> This whole matter is of vital importance to engineers. Many well qualified college graduates today are receiving far less for their services than mechanics without any mental training, and this condition is, of course, economically unsound.
>
> There is obviously a discrepancy here which should be removed either by raising the salaries of engineers and other professional men, or reducing the salaries of laborers, mechanics and artisans and thereby reducing the cost of living.
>
> The consensus of opinion seems to be that there will be no great reduction in the cost of living for some time to come, if ever, which leaves us only the alternative of increasing the salaries of professional men in proportion to the increase in the cost of living.
>
> While work is not unsatisfactory, efficiency is impaired by discontent due to insufficient compensation.

ANALYSIS OF RETURNS SHOWN BY 35 QUESTIONNAIRES RELATIVE TO STATE SERVICE IN 40 STATES

Character of Service	Position	Number of Persons Now in Position	Age—Years* Range	Age—Years* Average	Recommended Compensation per Annum * Dollars: Range Maximum	Range Minimum	Average Maximum‡	Average Minimum‡	Average Compensation per Annum *: July 1, 1915	July 1, 1919 Maximum‡	July 1, 1919 Minimum‡	July 1, 1919 Average	Recommended	* Per Cent Increase in Compensation Over July 1, 1915: Actual on July 1, 1919	Recommended
Professional	Consulting Engr.	....	....	.	....	.	....	....	....	....	....	....	....	..	..
Professional	Chief Engr.	31	30–70	41	3,600–25,000	3,600–10,000	8,104	6,144	3,743	4,481	4,481	4,481	7,124	20	90
Professional	Deputy Chief Engr.	19	30–51	38	2,400–10,000	2,400– 5,000	5,310	3,810	3,352	3,278	3,114	3,616†	4,477	8	34
Professional	Engineer	80	30–50	37	2,700–10,000	2,700– 5,000	4,750	3,815	2,530	3,124	2,980	3,019	3,934	19	56
Professional	Senior Ass't Engr.	111	30–50	32	2,000– 6,000	1,800– 5,000	3,781	3,312	1,981	2,529	2,351	2,429	3,222†	23	63
Professional	Assistant Engr.	396	27–42	33	1,750– 5,000	1,500– 4,200	3,126	2,488	1,657	2,213	1,921	2,140	2,758	29	66
Professional	Junior Ass't Engr.	529	21–36	27	1,500– 4,000	1,200– 2,400	2,395	1,853	1,130	1,777	1,517	1,595	2,100	41	86
Professional	Staff	1,166	21–70	..	....	....	.....	.....	1,590	.....	.....	2,070	2,730	30	72
Sub-Prof.	Senior Draftsman	29	25–40	31	1,500– 3,600	1,500– 3,600	2,493	2,250	1,508	1,891	1,851	1,868	2,327	24	54
Sub-Prof.	Draftsman	141	22–50	28	1,200– 2,400	1,200– 2,400	2,028	1,799	1,224	1,676	1,488	1,653	1,944	35	59
Sub-Prof.	Junior Draftsman	110	20–25	22	1,000– 2,000	900– 1,800	1,514	1,271	924	1,310	1,122	1,227	1,394	33	51
Sub-Prof.	Chief Instr'man	61	24–40	27	1,500– 2,400	1,500– 2,400	2,086	1,829	1,297	1,683	1,483	1,611	1,915	24	48
Sub-Prof.	Instrumentman	193	22–30	23	1,620– 2,100	1,200– 1,800	1,902	1,567	1,243	1,410	1,300	1,498†	1,773	21	43
Sub-Prof.	Rodman	522	18–26	20	800– 1,800	780– 1,200	1,291	1,061	791	1,055	951	1,057†	1,148	34	45
Sub-Prof.	Staff	1,056	18–50	..	....	....	.....	.	995	.....	.....	1,290	1,470	30	48
Entire service		2,222	18–70	..	....	....	.....	....	1,310	.....	.....	1,700	2,130	30	63

* Based on such returns as are complete. ‡ Arithmetrical mean. † Apparent discrepancy due to incomplete data and use of averages weighted according to number of persons occupying position.

Dec. 15, 1919.

Morale good, with exception of unrest in the way of insufficient salaries; interest of the men in their work has a great deal to do with the morale.

Morale good, except for wages. Have lost number of best men recently due to inflexibility of salary question.

Not up to standard on account of insufficient compensation.

While work is not unsatisfactory, efficiency is impaired by discontent due to insufficient compensation.

Some dissatisfaction because of existing inadequate salaries and the failure of the city authorities to increase same to reasonable figures.

Lowered considerably due to the fact that the present salaries are entirely inadequate to meet the present high cost of living.

Morale is very good but there is much restlessness because of the high prices and lack of appreciation of value of work.

Men are dissatisfied with present compensation. Suitable new men cannot be obtained at present salaries to fill vacancies caused by men leaving to accept better paying positions.

Dissatisfied with the service, due to the fact that they are unable to maintain previous standards of living on account of high costs. No advance in engineering salaries comparable to general advance in wages. Unable to fill present vacancies.

Very poor.

Morale very poor at this time. I have just lost by resignation three of my highest paid and valuable engineers.

While there have been salary increases in the past three years averaging about 40 per cent, there is a feeling of dissatisfaction among the members of the force over the present salaries, many thinking they are not comparable with similar positions in private corporations.

Increased compensation for practically all engineers in this department, excepting the head, has already been secured through effort of state, city and county combined.

The present morale is good, although the matter of increased compensation seems to be a popular one to discuss.

I have promise of 43 per cent raise for engineers at head of sub-departments next year and the men are feeling very good about it.

Men generally feel that their compensation is insufficient and inadequate under present costs of commodities.

Low on account of heavy work, low salaries and small forces, due to Legislature failing to take care of compensation in proper manner.

Constant growl about salaries.

Fair—probably better than for most engineering organizations in municipal service in this vicinity, as it has been possible to make several increases in salary since rise in living cost started.

Our organization is in a condition of unrest and change owing to small appropriation.

We have excellent service, but there is a feeling among these engineers that the service is not properly paid for.

The present morale of the service reported on is very gratifying to me for the compensation that is being paid. A substantial increase in wage would no doubt insure better efficiency.

Impossible to hold first-class men at these rates. Morale is generally good.

The chief engineer has recently resigned because of inadequate compensation. The new chief appointed in his place is expecting to resign shortly for the same reason. The present assistant engineer expects to work only a short time and that merely for the experience gained.

Morale would be improved if adequate salaries were allowed.

Practically all men are clamoring for more pay, but as our budget was fixed while the country was at war we are unable to secure the additional funds necessary to raise salaries further.

All want more money. Dissatisfied on account of low pay.

Our organization is in a condition of unrest and change owing to small appropriation.

Loyal enough generally, but dissatisfied with pay, and accept better offers readily. Difficult to fill their places at same rates.

Excellent, but all employees desire increase in compensation over that already granted. New men cannot be obtained at previous salaries.

Dissatisfied with present compensation.

Force depleted. Employees leaving to take positions at greater compensation. Men remaining uneasy and dissatisfied.

I thoroughly agree with the men in New York City who demand a flat raise of $500 yearly in all classes of the service.

There is a decided spirit of unrest and dissatisfaction, due to the fact that engineering salaries have not been increased in proportion to the advance in the cost of living, and to salaries and wages paid to non-professional men and skilled labor.

Rate of pay tends to drive men active and self-reliant younger men out of this service—lowering general average.

Majority of men feel they are underpaid.

Lack of consideration for services rendered has discouraged the force.

A general increase of $150 to $400, effective Sept. 16, 1919, has improved the morale of the force, which was affected both by a general reduction of force and the economic situation.

Increasing restlessness on the part of the entire force due to lack of proper salary increases to meet growing expenses.

While men for the most part do their work satisfactorily, there is a general feeling of unrest and discouragement as a result of what they consider failure to recognize their efforts.

Unsatisfactory and strongly tending to disintegrate the force.

ANALYSIS OF RETURNS SHOWN BY 66 QUESTIONNAIRES RELATIVE TO MUNICIPAL SERVICE IN 27 CITIES

Character of Service	Position	Number of Persons Now in Position	Age—Years*		Recommended Compensation per Annum * Dollars				Average Compensation per Annum *					* Per Cent. Increase in Compensation Over July 1, 1915	
					Range		Average			July 1, 1919					
			Range	Average	Maximum	Minimum	Maximum‡	Minimum‡	July 1, 1915	Maximum‡	Minimum‡	Average	Recommended	Actual on July 1, 1919	Recommended
Professional.	Consulting Engr.	8	39–70	55	7,200–15,000	5,000–12,000	9,130	7,560	5,457	6,897	6,897	6,410†	8,550	18	57
Professional.	Chief Engr.	64	30–64	44	3,000–20,000	3,000–20,000	7,860	7,245	5,424	5,500	5,460	5,467	7,465	1	38
Professional.	Deputy Chief Engr.	19	35–60	48	3,000–12,000	3,000– 9,000	6,062	5,754	4,624	4,625	4,301	4,901†	6,320†	6	37
Professional.	Engineer	165	30–68	46	2,700–10,000	2,400– 6,600	4,944	4,176	3,446	3,815	3,208	3,679	4,749	7	38
Professional.	Senior Ass't Engr.	265	30–64	41	2,400– 5,500	2,100– 5,500	3,575	3,020	2,428	2,734	2,329	2,616	3,293	8	36
Professional.	Assistant Engr.	505	27–53	40	1,800– 4,200	1,500– 3,500	2,875	2,430	1,902	2,287	1,972	1,999	2,613	5	37
Professional.	Junior Ass't Engr.	452	25–45	34	1,500– 3,000	1,200– 2,700	2,135	1,793	1,415	1,770	1,469	1,548	1,812	9	28
Professional.	Staff	1,478	25–70	..	....	....	.....	.....	2,230	.....	.....	2,370	3,020	6.5	36
Sub-Prof.	Senior Draftsman	100	28–53	42	1,800– 4,000	1,500– 3,000	2,482	2,275	1,777	1,994	1,942	1,982	2,356	12	33
Sub-Prof.	Draftsman	442	25–65	35	1,500– 3,000	1,200– 2,500	2,085	1,817	1,395	1,673	1,493	1,626	2,008	17	44
Sub-Prof.	Junior Draftsman	118	21–48	26	1,200– 2,200	1,080– 1,800	1,629	1,390	1,055	1,345	1,183	1,205	1,439	14	36
Sub-Prof.	Chief Instr'man	88	28–53	40	1,500– 3,000	1,500– 2,400	2,203	1,941	1,454	1,824	1,681	1,700	2,162	17	49
Sub-Prof.	Instrumentman	448	22–52	38	1,200– 2,500	1,200– 2,100	1,804	1,596	1,174	1,539	1,341	1,426	1,737	21	48
Sub-Prof.	Rodman	643	17–52	32	900– 1,800	780– 1,800	1,406	1,242	868	1,150	1,016	1,056	1,352	22	56
Sub-Prof.	Staff	1,839	17–65	..	....	....	.....	.....	1,160	.....	.....	1,370	1,700	18.5	47
Entire service		3,317	17–70	..	....	....	.....	.....	1,640	.....	.....	1,820	2,290	11	40

* Based on such returns as are complete. ‡ Arithmetrical mean. † Apparent discrepancy due to incomplete data and use of averages weighted according to number of persons occupying position.

Dec. 15, 1919

A request was also made in the questionnaire for "suggestions as to the course to be pursued in order to insure recognition of the results of this investigation," in reply to which 32 have been offered, as follows:

Newspaper publicity, articles in magazines, such as *The American Magazine* and *Saturday Evening Post.*

Recommend schedules and give plenty of publicity. It is considered unethical for architects to accept a commission for less than the minimum schedule fixed by the American Institute of Architects. Engineers should not accept less than the minimum schedule fixed by the Engineering Council.

An educational campaign with comparison of salaries paid bricklayers, plumbers, switchmen, brakemen, etc, and those paid the engineering profession, which requires a university education and constant study to keep pace with modern construction.

Get in behind the employing engineers, they are responsible more than any one else for low salaries.

Very difficult to get local authorities to notice general investigation figures.

A copy of the findings of your committee should be mailed to the Mayors of the various cities.

Recommendations should be sent to mayor and municipal council urging they take action.

Wide publicity and assistance from local engineering associations.

Send analysis of returns and recommendations to all those making reports, to the officers and boards having power to fix salaries, to civil service commissions, and to technical journals.

Amend the labor law to include Civil Service employees.

The attention of proper officials and boards should be persistently called to the low scale of salaries now in force.

I believe a certain amount of publicity with the various organizations interested in the city government, would indicate the importance of engineering investigation as compared with accountants and clerks, in advising executive action.

A just and concise statement of facts to a just and capable authority.

To actively co-operate with the various engineering societies in their efforts to secure, by legislation and otherwise, a greater recognition of the services of the engineer.

Prompt action, together with a definite recommendation for classification and salaries, is necessary to accomplish results. The report, in the case of cities, should be sent to the Mayor and legislative body of each city, uring its adoption. Where necessary, and when requested by the municipal engineering staff, the committee should appear before the city officials to explain and advocate the adoption of both salaries and classification.

Impress upon the mayor and members of council, the necessity of proper classification and salaries if the city is to secure and maintain a competent organization. Consideration of annual budget is now before the council.

Publicity and circulation of the results of the investigation among members of boards having authority to prepare the budgets and fix compensation in the various municipalities.

Presentation of suggestive schedule to city administration, urging conformity; also use of follow-up methods to secure results.

A published and well-distributed report of the investigation of your Council together with positive recommendations and the reasons therefor.

Join American Federation of Labor, or, in any event, organize for a complete Union of Engineers.

Upon completion of this work, I would respectfully suggest that impressive letters should be directed to the heads of the municipality, county or state as the case may be.

Make tabulation of recommended scales of various classes of cities. Send tabulation with a local scale comparison to officials of various municipalities.

The methods used by the American Association of Engineers.

(1) Closer union between technical men; (2) licensing of engineers; (3) publicity.

The maintenance of high professional standards among engineers. The passage of laws regulating the practice of engineering. Educate the public to appreciate first-class engineering service.

By producing the goods and by employers raising salary of engineers of merit. Picking good men and paying them much above the average.

Get some legislators with business sense.

The salaries shown under "Recommended" are those adopted in this department on Nov. 1, 1919. My recommendation is a further increase of 15 per cent at an early date.

Appoint committees to present proposition to state legislatures.

Wide publicity, organization, license and closer touch with legislative bodies.

Combine with all engineering bodies in the U. S., and then work as a unit on all public departments—private employers will follow.

To raise salaries of employees of state engineer's office requires the approval of the state legislature to an increased appropriation bill.

COMMITTEE'S RECOMMENDED SALARY SCALE

The work of the committee has now reached the stage of considering the scale of compensation which may be set up for the various grades. From the data obtained from the questionnaire, it would appear that the compensation recommended by the heads of the various services represents, in the cases where information is given, about 5 per cent of the value of the work supervised. The committee is investigating the percentage of cost of engineering work on large enterprises of various kinds under both public and private direction. It is hopeful that through the accumulation of data of this character a valuable foundation may be established on which to base engineering compensation.

The investigation made by the Federal Government Section of the committee as to compensation was largely confined to a compact territory where all the services affected could be readily reached. It has, therefore, naturally advanced at a much more rapid pace than was practicable in the state and municipal services. The Federal Section has tentatively offered a salary schedule built up on what is known as the "Macy Scale," and also a plan for advancing men in the various grades, which were described in the report of the main committee (*Engineering News-Record*, Jan. 15). Both of these clearly have much merit, and it would seem desirable to submit them tentatively to the representatives of the state and municipal services with a view of obtaining such criticism as might be offered, and with the suggestion that they be put into effect where practicable pending the working out of final conclusions.

Comparing the combined schedule of compensation for state and municipal service as of July 1, 1915, with the present compensation, with the compensation recommended by the heads of the various services from which reports have been received, and with the compensation now tentatively suggested by the committee, it will be found that the changes would be as follows:

Total increase in compensation granted since July 1, 1915, 18 per cent.

Total increase in compensation now recommended by service heads as compared with compensation of July 1, 1915, 48 per cent.

Total increase in compensation under schedule tentatively suggested by committee as compared with compensation of July 1, 1915, 83 per cent.

It will also be found that the aggregate increase over compensation as of July 1, 1919, as recommended by the heads of the various services would be 26 per cent, while that which would result under the tentative schedule would be about 56 per cent.

The money value of the increases in salary recommended by the service heads over the compensation of July 1, 1919, is about $2,500,000, while an additional amount of about $3,000,000 would be required if the tentative salary schedule of the committee was put into effect.

In this connection it should be noted that through the provision of adequate compensation and the consequent restoration of morale. efficiency would be increased to such an extent as to introduce a real economy. This would result from a decrease in force and from the securing of better results from the expenditures under engineering supervision.

To conform with the reasonable requirements of state, county and municipal service, it would probably be undesirable to fix either a minimum or maximum salary for the highest grade, and it may be found advisable to place the maximum for other grades substantially higher than the minimum for the next higher grade. It would also seem desirable to set up a condition that promotion should be withheld in the case of men who are shown to be temperamentally or professionally unsuited or least adapted to the service, thus encouraging the abler men to remain and removing an incentive to others to become permanent fixtures.

The State and Municipal Section of the committee is made up as follows: Arthur S. Tuttle, Deputy Chief Engineer, Board of Estimate and Apportionment, New York City; F. W. Cappelen, City Engineer Minneapolis; M. M. O'Shaughnessy, City Engineer, San Francisco.

Rotary Snowplows Clear Streets in Canadian Cities

Machine Hauled by Horses Has Gasoline Engine To Drive Cutters—More Economical and Rapid Than Hand Labor

A POWER-OPERATED rotary snowplow hauled by horses is a new development in machinery equipment for cities where removal of snow is a serious and annual problem. Such a machine is being used on streets, suburban roads and sidewalks in some Canadian cities with satisfactory results as to both efficiency and economy. The general design is shown in Fig. 1, while Fig. 2 is a rear view of the machine in use. In Fig. 3, the plow is shown working on a sidewalk in a residential district. Its weight is about three tons and its length is 18 ft. over all.

Swiveling sleds carry a steel frame 14½ ft. long, the team being hitched to the forward sled and the rear sled being steered by means of a handwheel. Upon the frame is mounted a 60-hp. gasoline engine, having its shaft placed longitudinally and geared to a cross shaft at the rear. This shaft has a sprocket wheel for chain drive to a shaft hung below the frame and carrying two rotary cutters. The cutter shaft can be raised and lowered in order to vary the depth of cut as may be required. The four-bladed cutters mounted on this shaft are 22 in. in diameter, 22 in. wide and 22 in. apart, a wedge-shaped plow being placed in front of the space between the two cutters so as to deliver the snow to them. Thus the total width of cut is 5½ ft. The nose plow is carried by the frame of the cutter shaft and is thus raised and lowered with it.

The cutters are driven at a speed of 500 r.p.m. and

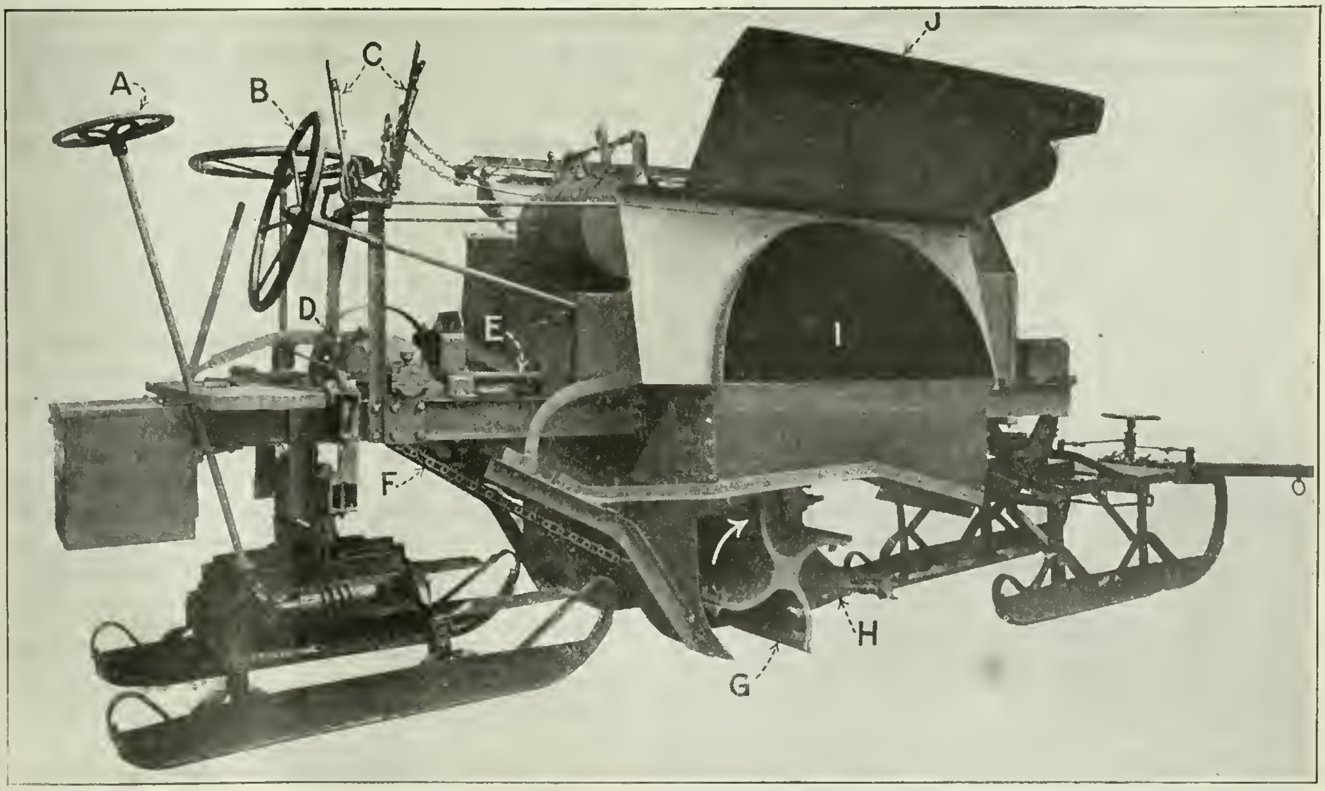


FIG. 1. ROTARY PLOW FOR STREETS AND ROADS IS MOUNTED ON SLEDS AND HAULED BY TEAMS
A—Handwheel for steering rear sled; B—Handwheel for regulating height of cutter shaft; C—Engine levers; D—Sprocket wheel; E—Engine shaft; F—Driving chain; G—22-in. cutter; H—Nose of wedge plow; I—Discharge opening; J—Snow deflector.

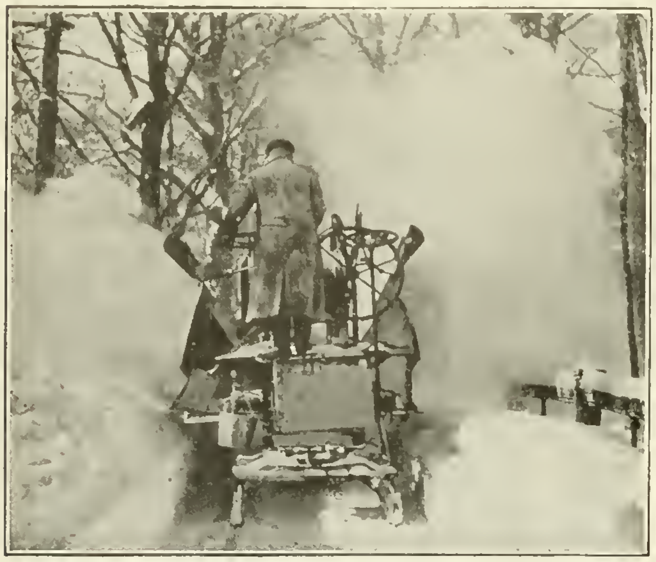


FIG. 2. REAR VIEW OF ROTARY PLOW MAKING A CUT

discharge the snow as a finely divided dust through deflecting hoods on one or both sides of the machine, the maximum width over these being 6½ ft. The deflectors are adjustable, to enable the snow to be delivered at about 3 or 4 ft. from the machine in streets or thrown to a distance of 40 to 50 ft. on suburban roads. Thus no snow is thrown against buildings or windows along the streets. In the suburban districts the residences are set back from the street, so that the snow from the roadway and sidewalks is thrown over the lawns. No objection is raised to this, as the snow is spread and does not form banks. In widening the first 5½-ft. cut, or in operating along street railway tracks, the machine is offset so as to be crowded into the solid snow while the horses travel in the cut already cleared.

Four or six horses are used, but the machine can be attached to a tractor or truck. The draft is not heavy, as only the forward sled has to break through the snow and this will go through a 36-in. depth without trouble, while the rear sled travels in the cleared path. The machine will work in snow up to 6 ft. deep, as in the case of drifts. It leaves a bed of snow beneath it so that sleigh traffic is not interfered with, this bed being usually 4 in. to 6 in. deep on municipal work.

In a test at Westmount, Que., under the direction of P. E. Jarman, city engineer, the work was to remove and distribute heavy compacted banks which had been formed by pressing back the snow from the middle of the roadway with the blade of a snow grader. Mr. Jarman gives the cost as $35.70 per 1,000 cu.yd. This included operating charges for four horses, two drivers, a mechanic, gasoline, oil, grease and repairs; also charges for depreciation, interest and insurance. Removal by hand shoveling would have cost $53.80 per 1,000 cu.yd. Further, Mr. Jarman points out that the men would have piled the snow in high banks while the machine spread it in a thin layer. As a result of the test and other experience the city purchased one of the rotary plows.

FIG. 3. SIDEWALKS ARE CLEARED BY ROTARY PLOW

At Outremont, Que., which also has a machine, careful study of the cost was made by J. Duchastel, city engineer, and E. Lacroix, assistant city engineer. In three days (23 working hours) the machine cleared a 10-ft. path in snow 21 in. deep for a distance of 6,775 ft. at a cost of 7.2c. per lin.yd., or 3.7c. per cu.yd. This included fixed charges of $14 per day for repairs, 7 per cent interest and 10 per cent depreciation; also gasoline, operator, two city teams and the cost of a grader and single plow used in connection with the work. In comparison with this was the removal of snow by hand shoveling into wagons on sleighs, on a stretch of 950 ft. of the same road, with the same depth and width of cut, at a cost of 23.7c. per lin.yd., or 12c. per cu.yd. This was done in a 10-hour day by 14 men at 25c. per hour, a foreman at 35c., a city double team at 65c., three hired double teams at 60c. and four hired single teams at 30c. Sidewalks made impassable by drifts were cleared by the machine at about 50 per cent of the cost of hand shoveling. Here, as at Westmount, the advantage was noted of distributing the snow evenly in a thin layer instead of forming banks.

Hand shoveling on a mile of road at Levis, Que., cost $1,979 during 35 days' work from Dec. 26, 1918, to March 12, 1919, with from 6 to 21 men. From the figures of the work at Outremont it was estimated by H. E. Weyman, superintendent of the Levis Street Railway, that this could have been done with the rotary plow at a cost of $396. On the basis of his investigation the railway company purchased a machine.

It was estimated that the machine could remove snow for a cut 5 ft. wide, 4 ft. deep and a mile long at a cost of $20.79, this being distributed as follows and being exclusive of interest and depreciation: four horses at $1.50, $6; two men at $3.50, $7; gasoline, $6; oil, $1; insurance, 79c. Hand work would require 24 men at $3 per day, which with an insurance charge of $8.13 would make a total of $80.13. On four miles of road at Levis, where the snow was shoveled back and not carted away, the cost of hand work last winter was $3,000. If the machine had been available the operating cost would have been about $750. Adding $810 for interest and depreciation the total would have been $1,560, or very little more than 50 per cent of the cost of hand labor, while the work would have been done in much less time.

This rotary snowplow is built by the Canadian Fairbanks-Morse Co., Montreal. It is the invention of W. L. Stadig, St. Francis, Me.

Much Highway Bridge Construction in Oregon

Over 150 bridges are under construction, or advertised for letting, by the Oregon State Highway Commission, at a total cost of about $1,500,000.

Resolutions of Pittsburgh Engineers On Bridge Design by Architects

On Jan. 20, 1920, the Engineers' Society of Western Pennsylvania took formal action to express its disapproval of the county commissioners' course in entrusting the design of important new bridges at Pittsburgh to architects. The concrete case at issue is that of the new Allegheny River bridges at Sixteenth and Forty-third Sts., discussed in *Engineering News-Record* of Oct. 9, 1919, p. 686. Some weeks ago the society referred the case of these bridges to a special committee headed by Morris Knowles, and it was the report of this committee that came before the meeting of Jan. 20. The following resolutions, proposed by the committee, were adopted by the Society:

Whereas, in the design and construction of bridges and similar structures safety to human life, economy in the expenditure of public funds and the traffic needs of the community require that the structural design, inspection of construction and erection and arrangement and development of approaches and street grades should be placed in the hands of competent and experienced engineers, especially skilled and trained for these classes of work; and

Whereas, to secure harmonious and artistic results the æsthetic treatment and decoration of such structures should be entrusted to skilled architects; and

Whereas, the best interests of the community are served by the co-operation on such work of engineers and architects, both responsible to the public officials in charge of the execution thereof; and

Whereas, the county commissioners of Allegheny County have retained architects to design and supervise construction of certain bridges; and

Whereas; although such architects have employed engineers to assist them in the structural design of such bridges, these engineers are not responsible to the county commissioners except through the architects by whom they are employed; and

Whereas, the county commissioners have in their employ as County Engineer a competent and experienced engineer with an organization skilled and trained in the consideration of bridges and their appurtenances; and

Whereas, Section 2 of the Act of May 8, 1919 (P. L. No. 108), requires that "The county engineer . . . shall prepare plans, specifications and estimates of all engineering work undertaken by such county, . . .") Therefore, be it

Resolved, that the Engineers' Society of Western Pennsylvania earnestly recommends to the county commissioners

First, that on all future structures of this kind, the structural design, the inspection of construction and erection and the arrangement and development of approaches and street grades be recognized, in accordance with the law, as the function of the County Engineer or of other engineers retained as his advisors, and that the æsthetic treatment and decoration be entrusted to skilled architects retained as consultants to the County Engineer; and

Second, that in cases where architects have already been retained, the county commissioners require the County Engineer, or else a competent consulting engineer retained as his advisor, to pass upon the safety and economy of all plans prepared by the engineers employed by such architects. And be it further

Resolved, that the Pittsburgh Chapter of the American Institute of Architects be invited to join with the society in impressing upon the commissioners and the public the importance of proper co-operation of the two professions on future work of this character.

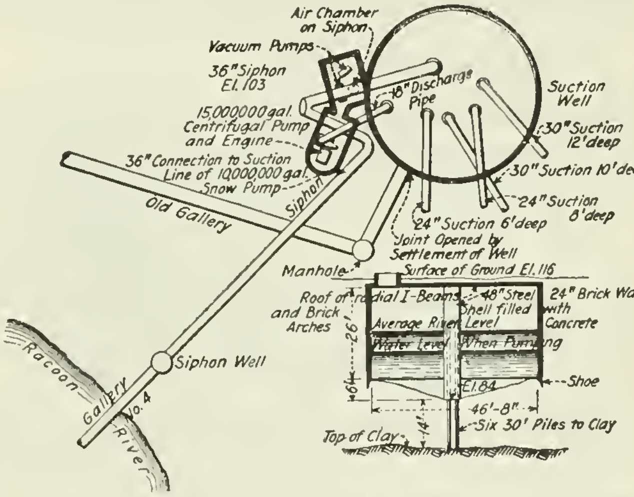
W. G. Wilkins,
Samuel E. Duff,
John A. Hunter,
Morris Knowles, Chairman.

Suction Well Settlement Curtails Des Moines Water Supply

Undermined Well and Pits and Opening of Siphon Cuts Supply for Six Days—Emergency Repairs Are Described

Interruption of the water supply of Des Moines, Iowa, for six days was caused recently by the settlement of a portion of the wall of the suction well at the pumping station. This well (see sketch) was sunk in 1882, its brick lining wall, resting on a cast-iron shoe, being sunk as a caisson through sand and gravel. On Jan. 3, 1920, a portion of the brick wall sank about a foot, opening a joint between it and a 4 x 5-ft. timbered collecting gallery. The wall adjacent to the gallery entrance is pierced by several suction pipes and did not settle. As clay is several feet below the cutting edge and there is no floor, sand and gravel could work under the shoe without difficulty, thus undermining the wall.

Infiltration galleries in a bed of clay and gravel along the Raccoon River valley form the source of the water supply. When the river is low the depth of water over the galleries may be increased by pumping from the deeper parts of the channel, as noted later. The night consumption is at an approximate rate of 6,000,000 gal. The day rate is from 13,000,000 to 14,000,000 gal., and to meet this a second pump is put in service early in the morning. When this was done on Jan. 3, the second pump started and then stopped suddenly, but the 10,000,000-gal. horizontal compound pump already in operation kept going, although it labored considerably.



PLAN AND SECTION OF DES MOINES SUCTION WELL AND PITS

Sand poured through the gap, filling the well above the suction openings of all the pumps except the one of 10,000,000-gal. capacity and burying the end of a 36-in. siphon, 600 ft. long, delivering water from another set of infiltration galleries, which yield the main supply to the well. The settlement opened the joints in the siphon line and disturbed the siphon vacuum pumps located in a pit adjacent to the suction well. The lining of this pit settled and caved. Another adjacent pit, housing a 15,000,000-gal. low-lift steam-driven centrifugal pump, was also undermined and settled badly, cracking the walls and floor. As a result of the accident, the water supply was reduced to a rate of 8,000,000 gal. daily, or about 57 per cent of the maximum. The higher portions of the city were without water except for a few hours at night.

The cause of the accident has not been determined definitely. When the leak in the siphon is located this will have an important bearing on the situation. One theory is that the 36-in. siphon lost its prime owing to a leak and that then the surge in the gallery due to starting the second pump without the full water supply coming into the well permitted the water in the suction well to be drawn down to an unusual depth so that the pressure of ground water, then at a considerably higher elevation outside of the well, forced a quantity of sand under the shoe and up into the well. If this was the case, the undermining may have been excessive on the side opposite the gallery, causing this side to sink and thereby loosen the joint between the end of the gallery structure and the wall of the well. An oak wedge from this joint was carried through with the sand and was found to be in an excellent state of preservation.

To repair the break, solid wood sheeting was driven to the gallery, 24 ft. below ground, and the gap between the gallery and the wall of the well was thus closed to exclude the further flow of sand into the well. The adjacent pits and machinery were shored up. The siphon was slung from timbers and recalked. The air pumps were removed to a safe distance and a blower of 50-cu.ft. capacity was installed to assist in getting a vacuum in the siphon.

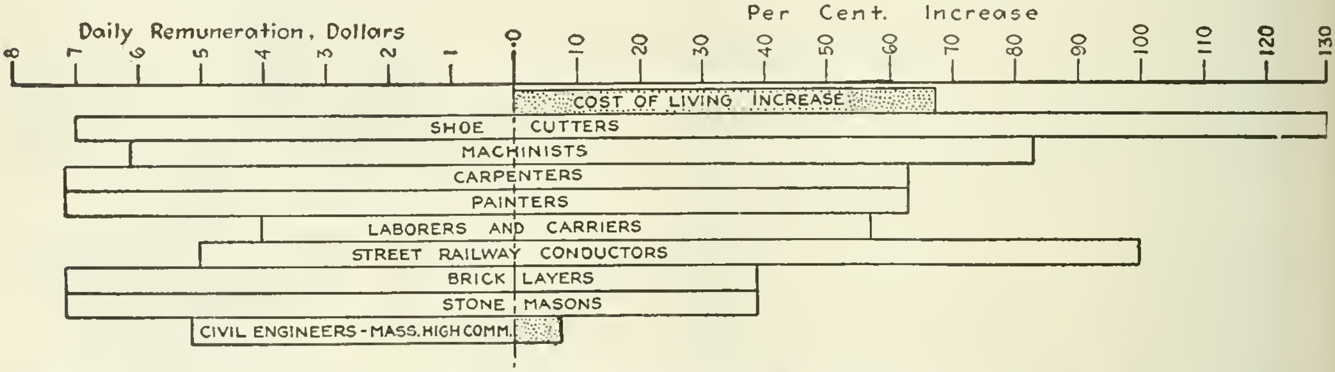
By Monday night, Jan. 5, the 10,000,000-gal. pump had sucked most of the gravel from the well and deposited it in the mains. On Tuesday night the siphon was started and on Wednesday it was possible to deliver water at a rate of 10,000,000 gal. daily, running the 10,000,000-gal. pump at full capacity. A second pump was put in service and a low stage in the well to help out the siphon was maintained all day. A 7-in. vacuum was all that could be maintained in the siphon, however, because all of the joints could not be reached for calking. A 10-in. vacuum is required for full operation. On Wednesday night a large duplex pump was added to the air equipment and removed all air that leaked into the line. It was then possible to fill the distribution system during the night, but a large residence area was unwatered each day.

Normal service was resumed on Sunday, Jan. 11, sufficient pump capacity having been installed temporarily to overcome the leak in the siphon and the ground-water level on the gallery system having been increased in the manner already mentioned, by the operation of the flooding pumps on the gallery. The work of locating the leak in the siphon was then progressing, but with the probability of requiring several days, as this line is at a depth of from 8 to 30 ft.

Damages will amount to several thousand dollars. The emergency work was done under the direction of A. T. Luce, superintendent of the Water Department. The construction of a new pumping station, planned by Alvord & Burdick, will be hastened by the accident and the old station, which it was intended to abandon in two or three years, will be repaired temporarily to give service until the new equipment can be placed.

Salaries of Engineers in the Service of the Massachusetts Highway Commission

AT THE meeting of the Boston Society of Civil Engineers on Oct. 29, one of the engineers of the Massachusetts Highway Commission presented the accompanying diagram, which was prepared to back up a recent appeal for an increase in compensation made by the engineers of the Massachusetts Highway Commission. The figures from which the diagram was plotted were obtained from the Massachusetts Bureau of Statistics and from the payrolls and records of the Massachusetts Highway Commission. Recent data published by the United States Bureau of Labor show a greater increase in the cost of living than that stated in the diagram, the Bureau's figures for July, 1919, at Boston, being about 73%. The figures for the daily earnings of artisans and laborers are based on an 8-hour day, although many of these workmen work overtime and are paid 50% additional for such overtime. The average salary of the civil engineers on the staff of the Massachusetts Highway Commission who had had three years' or more experience was, in July, 1914, $118 per month; July, 1919, it was $126.06. These engineers averaged 13½ years' experience in the profession.



FIVE YEARS INCREASE IN COMPENSATION OF ENGINEERS OF MASSACHUSETTS HIGHWAY COMMISSION COMPARED WITH INCREASE OF COST OF LIVING AND WAGE INCREASES OF ARTISANS AND LABORERS

Airplane for Mapping Forests

F. A. Elliott, Oregon state forester, has recommended that a complete airplane observation squadron, including photographic and radio sections, should be provided for that state this year for use in fire patrol and mapping service. Planes have been used this year with success in locating fires, and it is planned to continue the work next year.

Wood Piles Coated With Concrete Applied by Cement-Gun

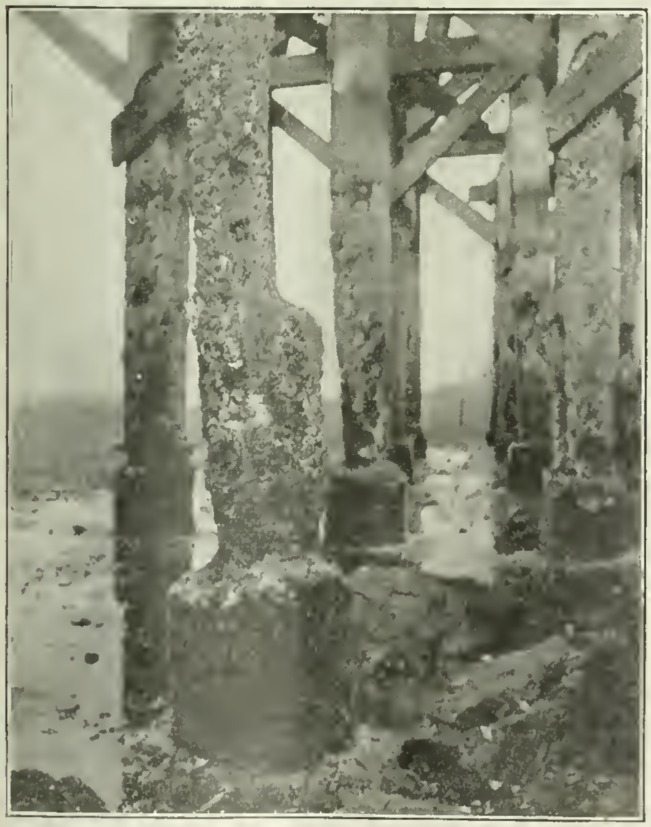
Porto Rico Pre-coated Piles in Good Shape Six Years After Driving—Western Railway Applies Gunite to Trestle

CONCRETE applied with the cement-gun, colloquially known as gunite, has been used in a number of places to protect wooden piles from the ravages of marine woodborers. Two such cases of different significance have just been reported. One is in Porto Rico, where piles coated with gunite before driving have now been in satisfactory service for six years; the other is on a Pacific Coast interburban railway, where the rapid destruction of an existing trestle has been stopped by coating the piles near their base.

The Porto Rico case is reported by the engineer of the Harbor Board of San Juan, through a local representative of the United States Corps of Engineers. This engineer writes "I have carefully inspected all of the concrete-coated timber piles which were placed in the San Juan bulkhead during the years 1913 and 1914 and find them to be in excellent condition as far as can be determined by external observation. The water was sufficiently clear to make examinations to a depth of 10 ft. and most of the piles were embedded in riprap at about this distance below the water. There is no indication that marine borers have attacked these piles.

Precoated Piles at Porto Rico

"In the construction of the San Juan Bulkhead, which is 2,453 ft. long, 1,016 coated piles were used and 327 concrete piles, all about 50 ft. in length. The reinforcement was a wire mesh and the mortar was placed by means of the cement-gun. In the later part of the work concrete piles were used in place of cement-coated timber piles for the reason that 184 coated piles were rejected on account of defects in the coating before driving and 180 additional coated piles had to be repaired after driving because of cracks or other defects which occurred during driving. Repairs had to be made by a diver at a large expense and were not considered satisfactory. Concrete piles were substituted at an additional cost of $20 each."



WOOD PILE WITH CONCRETE BASE PLACED OVER SECTION EATEN BY LIMMORIA

APPLYING THE CONCRETE WITH CEMENT-GUN TO PILES EATEN BY LIMMORIA

The piles were Southern pine, not first-class, some with much sap and crooked, so that about half the number, probably 200, were condemned. The condemned lot, most of them coated, lay on the ground for many months, and those exposed to the weather have considerably decayed.

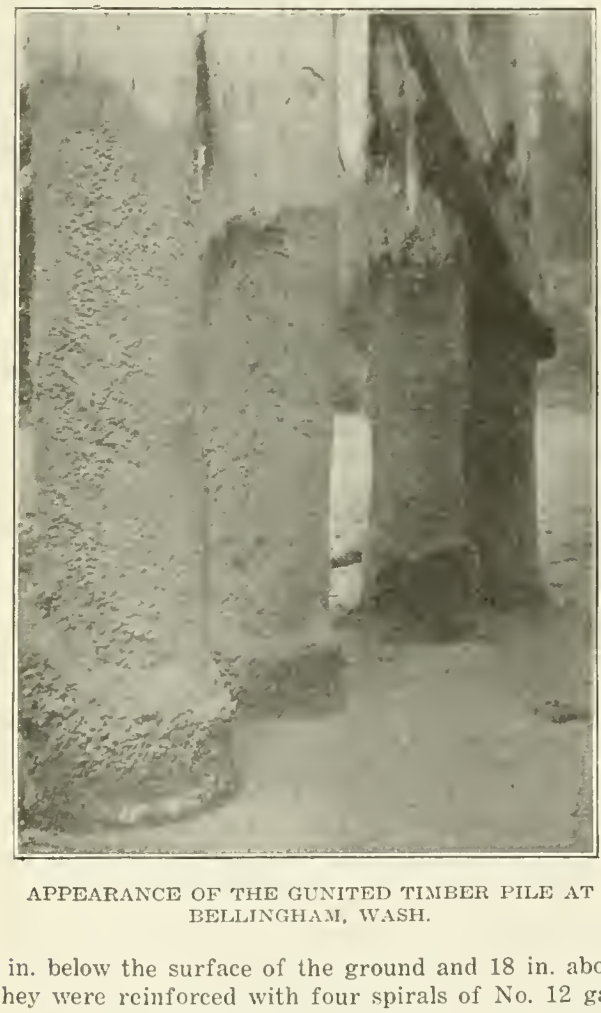
The specifications called for a 2½-in. covering, but it was found that about 75 per cent of the piles, which were left about 30 days to cure, showed fine cracks on the surface of the cement, undoubtedly caused by contraction. These cracks did not in many cases penetrate the whole of the coating, as verified by cutting carefully one pile in two with a saw. It was also assumed that the specified thickness of the coating could be reduced with advantage to 2 in., which was done afterward, the air cranks appearing thereafter to be less prominent.

The piles were driven about 2 ft. into hard bottom and were carefully inspected before being driven. Apprehending, however, that the driving might have augmented the sun cracks so as to open them further and deeper, each pile after being driven was subsequently inspected by a diver after about one-half of the lot had been driven, and if any large cracks were discovered a wooden form was placed around the particular spot and fresh concrete poured into it, in the water. This was used in about 200 cases. Generally the coating appeared to have stood the vibrations and shocks of the driving better than was expected, as evidenced in one case where a pile was drivin by 118 blows, fall of hammer about 15 ft., without any deleterious results being visible afterward.

The contractor who built the bulkhead in 1913 drove twelve similarly coated piles for a molasses company at San Juan. An examination made of them recently shows that the coating is still well preserved and adhering to the pile, but the exposed wooden heads have decayed so that they had to be covered with concrete.

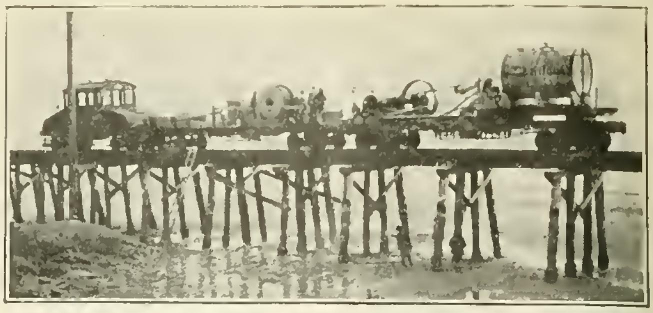
The information regarding the work on the trestle of the Pacific Northwest Traction Co., is from John Hickock, Superintendent of the Railway Department. The Northern Division of this interurban system operating between Bellingham, Wash., and Skagit County points, has approximately 4½ miles of trestle which was driven with heavy cedar piling in 1911. This trestle is over salt-water tide flats, the piles being submerged a greater part of the time. After the piles had been driven less than two years, it was noticed that limmoria had begun cutting away the piles immediately above the ground, as shown in one of the views. In 1915, or when the trestle was less than four years old, this action had become so great that the piles were fully 25 per cent cut off.

In order to put a stop to this destruction concrete bases were put around the piles. These bases extended 6 in. below the surface of the ground and 18 in. above. They were reinforced with four spirals of No. 12 gage iron wire, held in place by nails driven at sufficiently close intervals to place the reinforcement near the center of the material. The bases were 4 in. thick. This work has to be accomplished at low tide and was necessarily slow, as an average working day was only about six hours. By this method 5,363 piles were treated at an average cost of $1.36 per pile.



APPEARANCE OF THE GUNITED TIMBER PILE AT BELLINGHAM, WASH.

In 1917 it was found that the limmoria had extended their operations higher up on the piling and in some cases as high as the high-water mark. Cement paint, mixed one part cement and one part sand, was then tried as a protection. After adzing off the affected portions of the piles, the mixture was applied with 8-in. whitewash brushes. This was found to be quite satisfactory, but as only the affected portions were treated in this manner, the balance of the surface soon became affected and by the early part of 1919 the condition became very alarming. By this time a close examination showed that approximately 20 per cent of the bases put on in 1915 were failures due, according to Mr. Hickock, to the fact that hydrated lime had been used in the mixture. This apparently caused the concrete to disintegrate and shell off, for concrete made without the hydrated lime stood a test, and are as perfect today as when they were put in.



TRAIN CARRYING CEMENT-GUN WITH MIXER, COMPRESSOR, ETC., FOR GUNITING TIMBER PILES

During the early part of the present year it was noted that many of the piles had been eaten away until they were less than 5 in. in diameter. As painting piling with cement paint had stood the test of two years it was decided to use gunite. A cement-gun was accordingly purchased and mounted, as shown in the accompanying view, on two flat cars, together with a concrete mixer, air compressor tank for carrying supply of water, and bins for material. This train traveled along a trestle and the concrete protection was placed as required.

As the piles are submerged most of the time and the concrete has little chance to become dry, a condition which would probably cause the timber to shrink and the coating to crack, the greater portion was treated without the use of any reinforcement. The gunite was applied directly on the wood surface, and varies in thickness from a heavy coat of paint to 2 in. thickness. The greater part, however, carries a coating of about ½-in. thick. When the piles have been eaten away to such an extent that their strength is greatly reduced, 2-in. mesh chicken wire is used as reinforcement, and the piles built up to approximately their original size. A coating of gunite 6 to 8 in. thick was not uncommon when reinforcement was used.

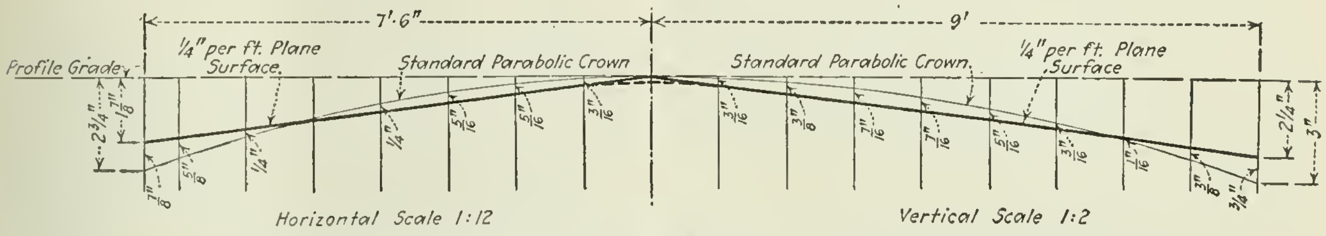
The mixture was often carried through the hose for a distance of 300 ft. The pressure carried in the material hose is 28 lb. per sq.in., while the pressure on the water hose is 45 lb. This permits a thorough mixing in a specially designed nozzle before application. The sharp sand is driven into the surface of the piles with considerable force, which, in the opinion of the operators, not only kills all animal life but causes the gunite to adhere to the surface. As the other particles of cement and sand are forced on top of those already placed, the gunite is driven still further with a certain rebounding action which causes a loss of about 25 per cent of the sand. Very little cement, however, is wasted, and the resulting mixture was approximately 1 part cement and 2 parts sand. While this work is more or less experimental it has the appearance of being very permanent.

Inclined Planes Instead of Curve Suggested for Highway Surfaces

At a recent meeting of engineers where highway paving was under discussion, the following comment on pavement crown was presented.

A study of conditions in the field shows that on nearly every road whose cross-section is a parabolic curve the central portion is too flat, and during the rainy season water often stands along the center portion. Of course this would not be true if the theoretical curve were followed absolutely, but, particularly after a little wear, the average road section is far from theoretically correct.

The parabolic camber gives a constantly increasing steepness to the outer edge so that when a vehicle starts to slide the slide will be increased toward the side of the road by the constantly increasing steepness. On a straight road there can be no reason for any crown at all except for drainage purposes. Two plane surfaces meeting at the center would take care of drainage more effectively because the central portion will be as well drained as that further toward the edges. The suggested revision is that the cross-section be made of two plane surfaces sloping away from the center line at the rate of ¼ in. to the foot, the peak being rounded by a curve, tangent a foot or two on either side of the center. A typical section of the type suggested is illustrated in the accompanying sketch in which the heavy line shows the proposed plane surfaces.



SUGGESTED CROSS-SECTION OF ROAD MADE UP OF TWO PLANE SURFACES

Another advantage of the cross-section shown in heavy lines is that when a vehicle keeps to one side of the road, broad tires would be given a bearing for their full width, which is not the case with the curved surface. In a western state last year 12- to 15-ton loads were hauled on a truck with 18-in. iron wheels. This truck cut into the concrete paving and damaged it seriously because only the inner edges of each tire secured a bearing on the curved surface of the road.

Railway Electrification Plans for South Africa

Increase Traffic Capacity by Electric Traction—Direct-Current System—Narrow Gage Governs Engine Design

Electrification as a means of effecting a 50 per cent increase in traffic capacity on the South African Government Railways, with greater economy than by the purchase of additional equipment and the physical improvement of the lines for steam traction, is the conclusion of a recent report made to the railway administration by Charles H. Merz and Wm. McLellan, consulting engineers, London, England.

The lines are mainly single track and the increase in traffic capacity would be effected by higher speeds and heavier train loads, with a reduction in total number of trains. As the speeds would be about the same for passenger and freight traffic, the present side-tracking of the slower trains would be reduced materially, while any increase in capacity with steam traction would require the construction of additional tracks and passing-sidings. Runs which now take about 2½, 2¾ and 8 hours would be reduced to 1¼, 2½ and 5¾ hours respectively.

Recommendations for electrification cover four heavy-traffic sections aggregating about 760 mi. of main line and 100 mi. of branches, including the suburban lines, with a total of nearly 1,200 mi. of track. Further, the report considers eventual extension of electric traction over the entire main line from Cape Town to Komati Poort, over 1,000 mi., and its 300-mile branch to the port of Durban on the east coast. From Komati Poort a 60-mi. railway extends across Portuguese territory to the port of Lourenco Marques.

The first section is from Cape Town northeast to Touws River, 160 mi., with suburban traffic around Cape Town and with a ruling grade of 2.5 per cent. This would have a power station at each end, so as not to rely entirely upon one station and a transmission line. The second section is from Komati Poort west to Witbank, 223 mi., with a circuitous location, numerous sharp curves and a ruling grade of 2 per cent, rising from an elevation of 600 ft. to 4,144 ft. above sea level. The main power station would be at the eastern end of the line.

Power Plant Projects

The third section is a continuation of the second, from Witbank to Randfontein, 131 mi., having a ruling grade of 1 per cent against the heavy coal traffic to Cape Town. A power station at the Great Olifants River would serve this section and supply some current for the adjacent section, while power might be obtained also from the private hydro-electric plant at the great Victoria Falls on the Zambesi River. The fourth section is from Durban, Natal, north to Glencoe, 249 mi., on the line extending to the Komati Poort and Randfontein section. There is a heavy coal traffic southbound. The ruling grade is 3.33 per cent and the line extends from sea level to a summit elevation of about 5,000 ft. A power station would be located at each end of the line.

Engine mileage being increased, fewer engines would be required, so that over 400 steam locomotives would be released for other service or for sale. On the other hand, a 50 per cent traffic increase with steam traction would necessitate the purchase of about 150 locomotives and 1,000 freight cars of 40 tons' capacity, according to the report. Freight train mileage on the four divisions, with electrification, is estimated at 6,890,600 mi.

per year, a reduction of 30 per cent over that required for equal service with steam traction. Operating expenses are estimated to show a large reduction.

For the electric installation the estimated cost is $58,350,000 (at the pre-war rate of exchange), of which $32,000,000 is for power stations and transmission lines. This covers an allowance of $25,000,000 for steam equipment released and for new equipment and line improvements which would be necessary to provide for a traffic increase of 50 per cent if steam traction should be retained.

ELECTRICAL EQUIPMENT PROPOSED

Operation by direct current at 3,000 volts, transformed at substations from three-phase 50-cycle alternating current on the transmission lines, is recommended, representing a relatively cheap installation with low cost of maintenance. The system provides also for variable speeds, so that it is adapted to the conditions of this case, which include both main line and suburban service, both with electric locomotives and motor cars. It requires a rather large number of substations, these being spaced at intervals of 25 to 30 miles.

Special designs of locomotives are made necessary by the fact that the lines have a gage of 3 ft. 6 in., which does not permit of placing the motors between the wheels. The driving wheels will be grouped in four-wheel trucks, each truck having two motors geared to a countershaft between the axles. Crank arms on the ends of this shaft carry horizontal coupling rods attached to corresponding crank arms on the ends of the axles. Each freight locomotive for heavy service would consist of two double-trunk units coupled to form a 16-wheel engine. The weight would be about 134 tons, with a tractive effort of 64,000 lb. maximum and 48,000 lb. sustained for one hour, this being sufficient for hauling a train of 1,800 tons on a grade of 1 per cent and to haul trains of 1,200 and 1,800 tons on the level at speeds of 40 and 30 m.p.h. respectively.

PASSENGER LOCOMOTIVES

Passenger locomotives would be of a similar type, but with four-wheel leading trucks, to insure safety at the higher speeds. These 80-ton engines would have a tractive effort of 38,000 lb. maximum or 13,000 lb. at one-hour rating. They could handle 600-ton trains at 55 m.p.h. on the level or 28 m.p.h. on grades of 1.67 per cent. These engines would have to operate on maximum grades of 2.5 per cent but as these are neither long nor numerous it was considered preferable to provide for the use of pusher engines at certain points. These engines are to be used only on the Cape Town section, the single or double-unit freight engines handling all trains on the other sections. For switching service there would be 66-ton eight-wheel double-truck engines having a tractive effort of 24,000 lb. maximum or 14,000 lb. at a speed of 12 m.p.h. Suburban trains would be made up of motor cars and trailers on the multiple-unit system. This system is expected to develop the suburban traffic considerably. The total equipment would include 262 locomotives and 136 motor cars.

In the district covered by the proposed electrification steam-power plants would be required, as no streams suitable for hydro-electric development are available, the flow being uncertain. Coal, however, is cheap and plentiful. Each power station would have from one to eight generating units of 8,000 k.w., except that the station at Komati Poort would have two of 5,000 kw. It is proposed that these should supply current to municipalities and industrial plants as well as to the railways. A catenary cable suspended from steel bridges would carry the trolley wire and engines and motor cars would be equipped with trolleys of the pantagraph type.

The Discharge of Smooth Wood-Stave Pipes and Wood Channels

Comparisons of Observed and Calculated Velocities in Large and Small Pipes and Open Conduits of Different Shapes

By ALFRED A. BARNES
Birmingham Water-Works, Ludlow, Salop, England

DURING the year 1913 the writer had occasion to develop a series of exponential formulas for the flow of water in pipes and channels constructed of different materials, and among the formulas adopted was one for "clean planed wood troughs or flumes and new smooth wood-stave pipes." The results of the investigation and the experiments on which the various formulas were based have been published in the writer's "Hydraulic Flow Reviewed," but the reason for the present note is that the formula for the case mentioned above has received remarkable confirmation by certain experiments which have been carried out or have come to the writer's knowledge since the date that the formula was devised.

The formula is

$$V = 223.3\, R^{0.660}\, S^{0.586}$$

or

$$H = 0.0000981\, \frac{LV^{1.707}}{R^{1.126}}$$

where in foot-second units V is the velocity, R is the hydraulic mean radius, S is the hydraulic slope, H is the heat absorbed in friction and L is the length of the pipe or channel.

To show the range covered by the original experiments on which the formula was based, abbreviated Table I is necessary; in this table the velocities calculated by the above formula are compared with those observed in the experiments.

It will be seen at once that the formula is very comprehensive since it covers an open rectangular channel only 4 in. wide, a semicircular channel 4 ft. 7 in. in diameter and a pipe under pressure of 72½ in. in diameter, and it is therefore not confined (as so many formulas have been) to pressure pipes only.

In the experiments given there occur: (1) a small channel having a fixed slope, S, of 1 in 66, with the value of R being changed; these experiments serve to test the index of R for small values of R. (2) A larger channel having a fixed slope, S, of 1 in 667 with changing values of R which serve to test the index of R in the larger values. (3) A pipe under pressure having a higher but fixed value of R with the slope S in this case being altered from 1 in 9,434 to 1 in 1,736. This last set checks the index of S for flat slopes, and when combined with the first two sets which have steep slopes proves that this index is correct.

Yet in spite of the range of conditions, sizes, slopes and velocities covered by the 30 experiments, and in

TABLE I. COMPARISON OF VELOCITIES OBSERVED IN EXPERIMENTS WITH THOSE CALCULATED

Barnes' Formula: $V = 223.3\ R^{0.660}\ S^{0.586}$

Pipe or Channel and Authority	Remarks	R Feet	S	V Observed Feet Per Second	V Calculated Feet per Second	Percentage Difference
Rectangular *open channel, 4 in. wide.* Darcy and Bazin, 1865	Carefully planed. Slope 1 in. 65.789 Values of *R* varied	0.030	0.0152	1.87	1.898	—1.5
		0.043	0.0152	2.30	2.407	—4.4
		0.053	0.0152	2.68	2.764	—3.0
		0.061	0.0152	3.00	3.032	—1.1
		0.074	0.0152	3.56	3.445	+3.3
					Av.:	—1.3%
Semicircular open channel. 4 ft. 7 in. diameter. Darcy and Bazin, 1865	Slope 1 in. 666-67 Values of *r* varied	0.390	0.0015	2.61	2.656	—1.7
		0.537	0.0015	3.23	3.280	—1.5
		0.632	0.0015	3.71	3.652	+1.6
		0.717	0.0015	4.04	3.969	+1.8
		0.796	0.0015	4.25	4.253	nil
		0.856	0.0015	4.51	4.462	+1.1
		0.921	0.0015	4.64	4.683	—0.9
		0.964	0.0015	4.87	4.826	+0.9
		1.015	0.0015	5.00	4.993	nil
		1.054	0.0015	5.18	5.118	+1.2
		1.096	0.0015	5.29	5.252	+0.7
		1.129	0.0015	5.45	5.356	+1.7
		1.148	0.0015	5.54	5.416	+1.9
					Av.:	+0.5%
Ogden Pipe Line, Utah. *72½ in. diameter.* Marx, Wing and Hoskins, 1897	New, made of Douglas fir. Length, 2,710 ft. Values of *S* varied from 1 in 1836 to 1 in 9434	1.5104	0.000106	1.332	1.374	—3.0
		1.5104	0.000181	1.876	1.880	nil
		1.5104	0.000211	2.058	2.057	nil
		1.5104	0.000235	2.218	2.191	+1.2
		1.5104	0.000300	2.536	2.527	+0.4
		1.5104	0.000331	2.689	2.677	+0.5
		1.5104	0.000361	2.783	2.817	—1.2
		1.5104	0.000452	3.149	3.214	—2.0
		1.5104	0.000517	3.453	3.477	nil
		1.5104	0.000566	3.568	3.666	—2.7
		1.5104	0.000547	3.627	3.594	+0.9
		1.5104	0.000576	3.645	3.704	—1.6
					Av.:	—0.6%

Total excess difference	+0.5%
Total deficiency difference	—1.9%
Net difference	—1.4%
For 3 sets: Average difference	—0.47%

spite of the fact that the formula comprises a true constant (223.3) throughout, there are only two of the individual experiments which disagree with the formula by more than 3 per cent.

Many other experimental results are given in the book referred to above, but those quoted will serve to illustrate the general applicability of the formula. It was felt, therefore, that not only must the indices of both *R* and *S* be right but that this constant (223.3) must also be correct, seeing that the product obtained by its use agreed with the experimental value so closely in each individual case.

The writer was not prepared, however, for such close agreement—outside the range of experiments used—as is shown by certain observations made by F. C. Scobey in 1914 and 1915. These were conducted upon very large wood-stave pipes 6½ ft. and 12 ft. in diameter (for full description, see Bulletin No. 376, U. S. Dept. of Agriculture).

Out of the nine experiments on the pipe 6½ ft. diameter two were made at velocities below 1 ft. per second, and the writer has neglected these, according to his usual practice, since they are probably in the region of the critical velocity. Of the remaining seven experiments on this pipe only one appears to be inconsistent with the others, so that probably an air-lock vitiated this test. We are therefore provided with six satisfactory experiments on this large pipe, and these are given in Table II.

On the other and still larger pipe, 12 ft. in diameter, ten experiments were carried out and only the first appears inconsistent with the others. Hence in this case Mr. Scobey has provided us with nine most satisfactory experiments on an exceptionally large pipe, and these are also given in Table II.

The agreement between these 15 experiments and the writer's original formula is shown by the percentages in the last column. It will be seen that for the pipe 78 in. in diameter the formula agrees to 0.333 per cent on the average, with a maximum individual difference of + 2.3 per cent; and for the pipe 144 in. in diameter the average difference is — 1½ per cent, with a maximum individual difference of — 3⅓ per cent.

It would seem that even if the formula had been devised to suit these few experiments only it could probably not have been made to do so much more closely, but when it is remembered that this formula was evolved without any knowledge of these experiments and that while agreeing with the 12-ft. pipe it also answers for the small open channel 4 in. wide, its applicability to all slopes and sizes seems undoubted.

In order to show that experiments on *small* wood-stave pipes also agree with the formula, three observations made by Moritz in 1910 on a pipe 6 in. in diameter are also given in Table II. The hydraulic slopes in this case are much steeper than those for the 78- and 144-in. pipes, and the index of *S* is again subjected to a severe test. Yet the formula agrees to + 0.7 per cent with the average of the observations on this pipe, the maximum individual difference being + 3.7 per cent.

In addition to the above, the experiments made by Noble on another large pipe, 54.19 in. in diameter, are

TABLE II. FURTHER COMPARISONS OF OBSERVED WITH CALCULATED VELOCITIES

Barnes Formula: $V = 223.3\ R^{0.660}\ S^{0.686}$

Pipe or Channel and Authority	Remarks	R Feet	S	V Observed Ft. per Sec.	V Calculated Ft. per Sec.	Percentage Difference
Sunnyside Project, U. S. Reclamation Service. *6 in. diameter.* E. A. Moritz, 1910	Jointed wood-stave pipe. In use 4 months. Water columns for gradients. Discharges by Cipolleti weir. Test lengths 1892 and 2021 ft.	0.125	0.001973	1.526	1.472	+3.7
		0.125	0.004295	2.327	2.321	+0.3
		0.125	0.006889	3.000	3.062	—2.0
					Av.:	+0.7%
Seattle Water - Works, Washington. *54.19 in. Diameter.* T. A. Noble, 1901	Continuous stave pipe made of Douglas fir. In use 10 months. Length, 2246.7 ft. Gradients and velocities very carefully taken	1.129	0.000342	2.276	2.252	+1.1
		1.129	0.000342	2.282	2.252	+1.3
		1.129	0.000436	2.650	2.597	+2.0
		1.129	0.000557	3.045	2.997	+1.6
		1.129	0.000558	3.067	3.001	+2.2
		1.129	0.000672	3.408	3.346	+1.8
		1.129	0.000783	3.724	3.659	+1.8
		1.129	0.000856	3.924	3.856	+1.8
		1.129	0.000983	4.215	4.181	+0.8
		1.129	0.001076	4.419	4.409	+0.2
		1.129	0.001162	4.688	4.612	+1.6
					Av.:	+1.5%
Ephrotoh Pipe Line, Mohawk Hydro-Electric Co., New York. *78 in. diameter.* F. C. Scobey, 1915	Continjous stave pipe. Made of Douglas fir. Test length, 2650 ft. Discharges by calibrated tail-race and color tests	1.625	0.000115	1.506	1.512	—0.4
		1.625	0.000194	2.063	2.055	+0.4
		1.625	0.000215	2.18	2.182	nil
		1.625	0.000244	2.33	2.350	—0.8
		1.625	0.000243	2.40	2.344	+2.4
		1.625	0.000287	2.59	2.585	nil
					Av.:	+0.3%
Altmar Pipe Line, Salmon River Power Co., New York. *144 in. diameter.* F. C. Scobey, 1914	Continuous stave pipe made of Douglas fir. Few months in use. Staves 4 in. thick. Test length 2169.3 ft. Discharges by calibrated submerged weir	3.000	0.000643	6.13	6.214	—1.3
		3.000	0.000615	6.19	6.054	+2.2
		3.000	0.000694	6.31	6.499	—2.9
		3.000	0.000724	6.44	6.662	—3.3
		3.000	0.000716	6.52	6.619	—1.5
		3.000	0.000770	6.69	6.907	—3.2
		3.000	0.000749	6.85	6.796	+0.8
		3.000	0.001061	8.22	8.334	—1.4
		3.000	0.001092	8.22	8.476	—3.0
					Av.:	—1.5%

Total excess difference	+2.5%
Total deficiency difference	—1.5%
Net difference	+1.0%
For 4 sets: Average difference	+0.25%

also given in Table II, since the writer was not aware of the existence of these when framing his formula. Here again the observed velocities conform very regularly to the calculated ones and the pipe is found to agree to + 1½ per cent with the formula.

On the average the four sets quoted in Table II agree with the formula to exactly 0.25 per cent, which happens to be even closer than the sets in Table II, upon which the formula was originally based.

The writer is aware that Mr. Scobey also experimented upon a still larger pipe, 162 in. in diameter, but the method of computing the velocity in this case is open to question. No discharges were taken but color was timed in one of the two parallel 9-ft. pipes into which the large pipe was divided, and seeing that the load on the second 9-ft. pipe was being varied, it is not safe to assume a constant velocity in the first pipe. The discharge of the 162-in. pipe appears in these experiments to be on the average 15½ per cent in excess of Mr. Scobey's own formula and 21½ per cent in excess of the Williams-Hazen formula. Hence the writer feels obliged for the present to regard these observations with suspicion, especially as the individual tests indicate a discrepancy of about 17 per cent among themselves.

Although outside the scope of the heading of these notes the writer must utter a word of warning to those who wish to design wood-stave pipes which shall discharge a given quantity. This warning is necessary because the conditions of flow in an unplaned or sawn wood pipe are entirely different from those in a smooth planed one. Any formula which attempts to combine these two classes into one is misleading, as the indices and constants are in fact quite dissimilar in the two cases, and one might just as well attempt to obtain a mean formula combining the flow in a concrete-lined conduit with that in one lined with dry masonry.

Those who are interested will find 123 experiments in the *unplaned* wood class given in the book previously referred to, together with a formula which agrees within 2 per cent with 93 of these.

Hence it is necessary before attempting to compute a discharge to determine definitely whether the wood of which the pipe line is to be constructed shall be planed or merely sawed. If the formula appropriate to the class be then employed, no disappointment with the result is likely to ensue.

Army Camp Garbage Prices for Two Years

By F. C. Bamman

Consulting Engineer, Washington, D. C.

THE accompanying table shows the garbage prices at Army camps for the years ending June 30, 1919, and June 30, 1920. It does not cover all camps but with the big decrease due to demobilization, camps not shown can almost be considered as producing no garbage.

This same decrease in the Army's size has rather a startling effect on the revenue received from the sale of garbage; in fact, were it not for other wastes taken care of by the same clerical force, the cost of keeping track of quantities, etc., would exceed the amount being received by the Government for this waste. This, of course, does not take into account the big saving in foodstuffs which resulted through holding down the per capita per day wasteage, and a large part of the present work is said to be justified by the lessened consumption resulting from keeping track of the waste per capita.

A glance at the prices given would indicate that less is being received for the various items of waste than last year. This would doubtless be the case were it not for the fact that as good separation is impossible with the lesser amount of material available. Bread, for example, is only valuable as bread when sufficient accumulates daily to amount to a reasonable total. Failing to reach this total, what does accumulate finds its way into "other garbage" and is sold under that head. The fact that "other garbage" prices are on the whole somewhat higher than last year makes me believe that the income per ton of garbage, total garbage, will be higher with this year's prices than would have been the case had the prices of last year continued.

COMPARISON OF GARBAGE DISPOSAL CONTRACTS AT ARMY CAMPS FOR FISCAL YEARS 1918–19 AND 1919–20 AND FISCAL YEAR 1920

Prices are per 100 lb., unless otherwise stated, and are for material collected and delivered by the Army to contractor at a transfer and sorting station

	Fiscal Year 1918–19						Fiscal Year 1919–20					
	Bread	Cooked Meats, Raw Fats and Meats, and Grease	Bones	Other Garbage	Dead Animals	Trap Grease	Bread	Cooked Meats, Raw Fats and Meats, and Grease	Bones	Other Garbage	Dead Animals	Trap Grease
Brass	No contract						$0.50	$0.80 & 1.00	$0.50	$0.12	$1 50	. . .
Custer	$1 00	$2 75	$0 60	$0.04	. . . .	$0.50	1 00	2.75	.60	.04	2 50	.20
Devens	.20	8.00	1.00	.05	2 50	. . . .	1 00	5.60	1.00	.11	5.00	. . . . .
Dix	4 33	4 96	.95	.05¼	1.50 & 3.00	. . .	Two-year contract					
Dodge	1 00	3 00	70	.05	3 00	.50	1.00	3.00	.70	.05	3.00	. . . .
Funston	1 50	2 50	.50	.18¾	2 00	8 00	Garbage given away for hauling					
Gordon	1.50	3 25	90	.12	2.00	. .	1.55	.40	.35	.15½	.50	. .
Grant	1.00	4 50	80	.05	3.00	.50	1 25	2.60	.80	.07½	6.00	. .
Jackson	1 50	3.25	.90	.10	2.00	.	Two-year contract					
Kearny	Contractor collects and pays $0.01 per man per month						Same contract as last year					
Knox	No contract						1.10	2 00	.55	.15	3 00	.50
Lee	3.00	4.50	75	.02½	1 00	3 00	.02½	3 00	.75	.02½	2.00	. . . . .
Lewis	50	.50	60	.15	1 00	.	1 25	1.00	.50	.18	. . . . .	. . . . .
Meade	4 33	5.01	.95	.05½	3.00	.	Government pays $9 50 & $11.50 for collection and removal, a ton					
Merritt	. .	4.00	.90	.05¼	1 50	. .	. .	3 00	.75	1.00 per yr.	1.00	. . .
Pike	2 00	4 50	.75	.06	1.50	2.00	Two-year contract					
Sherman	1 50	3.25	1 10	.13	2.50	. .	50	3.00	.25	.05	3 00	.50
Taylor	1 75	3.50	1.05	16	5.00 & 7.00	. . .	1 25	2.00	1 00	.10	7.00	. .
Travis	1 20	2 25	.75	.41	2 80	. . .	Two-year contract					
Upton	.25	4 00	.90	.05¼	1.50	.50	Two-year contract					

River Rhone Development Plans

The plans for the development of the river Rhone, says *The Engineer*, include the use in Paris of 200,000 kilowatts for trams, the underground railway and for sundry other purposes, while the P.L.M. will derive the power for the electrification of its railways from the same source. The French Government intends to spend 820 million francs on the hydraulic power, 610 millions for navigation, 200 on irrigation and 150 millions on transport.

Estimating Manhole Costs

Description of Method Whereby Two Men Can Price With High Accuracy, From Field Notes, 100 Manholes Per Hour

By E. E. George
Electrical Engineer, Chicago

Ordinarily, the pricing of underground manholes, for estimating or appraisal purposes, is done by classifying all kinds according to a few standard types whose costs may be calculated in detail. This article will develop a better method by which two men can price from the field notes 100 manholes an hour and come within 5% of theoretical accuracy. As the errors are equally distributed the probable error in the total of a group of 25 or more will be less than 1%—negligible as compared with the inaccuracies of the field measurements, and of the unit cost assumptions. The method devised by the writer was employed by A. L. Drum & Co., on the valuation of the Chicago surface lines, for appraising several thousand cable manholes, of four different shapes, three different materials, and with the width, length and depth varying independently from 2 to 12 ft.

The main feature of this method consists of expressing the costs of each of the component operations of construction in terms of the inside length, width and depth, and adding these costs, which gives a price equation in three variables. Such an equation is not adapted to rapid graphical solution, so one of the variables is removed by assuming a standard depth, and using a set of auxiliary correction curves to compensate for variations in depth. Lines of equal cost plotted against length and width as rectangular coördinates give nonrectangular hyperbolas for the basic curves. The depth correction curves are rectangular hyperbolas, symmetrical about the assumed depth, when plotted on the above chart, with the depth measured along the length scale.

To derive the equation, the following unit costs are assumed:

Brickwork, erected, per thousand	$40.00
Concrete, in place, per cubic yard	8.10
Reinforcing steel, erected, per pound	0.05
Form lumber, built, per square foot	0.20
Sheet piling lumber, in place, per square foot	0.05
Excavation, per cubic yard	1.00
Disposal, per cubic yard	1.25
Backfill per cubic yard	0.50
Frame and cover, in place, each	40.00

The following assumptions as to methods of construction are made:

Brick walls 8 in. or 0.67 ft. thick; reinforced concrete top 0.67 ft. thick; top of cover, 0.33 ft. above top of concrete; concrete floor, 0.50 ft. thick; excavation line, 0.67 ft. outside of wall; cover opening, 2 ft. x 2.50 ft.; bricks in place run 18 per cubic foot; reinforcing steel runs 8 lb. per sq.ft.; sheet piling is 5 ft. longer than inside depth.

A rectangular manhole will be used for illustration, but by the introduction of certain constants the formulas apply for all shapes, neglecting very slight inaccuracies due to the method of figuring cover areas.

Let C = number of covers on the manhole.
W = width of manhole inside in feet.
L = length of manhole inside in feet.
D = depth of manhole inside in feet.

The inside area of the manhole is $W \times L$. The area outside the walls is $(W+1.33) \times (L+1.33)$. The area of excavation is $(W+2.67) \times (L+2.67) = (W \times L) + 2.67\,(W+L) + 7.11$. The depth of excavation equals the assumed depth (5) plus roof thickness (.67) plus roof cover (0.33) plus floor thickness (.50), making a total of 6.50 feet.

$$\text{Volume of excavation} = \frac{6.50}{27} \times [(W \times L) + 2.67\,(W+L) + 7.11]$$
$$= .24\,(W \times L) + 0.64\,(W+L) + 1.71$$

Cost of excavation,
$$= 0.24\,(W \times L) + 0.64\,(W+L) + \$1.71$$

The area of disposal is $(W+1.33) + (L+1.33) = (W \times L) + 1.33\,(W+L) + 1.78$.

$$\text{Volume of disposal} \times \frac{6.50}{27} \times [(W \times L) + 1.33\,(W+L) + 1.78]$$
$$= 0.24\,(W \times L) + 0.32\,(W+L) + 0.43$$

Cost of disposal,
$$= 0.30\,(W \times L) + 0.40\,(W+L) + \$0.54$$

Volume of backfill = volume of excavation minus volume of disposal $= 0.32\,(W+L) + 1.28$.

Cost of backfill $= 0.16\,(W+L) + \$\,.64$.

Inside perimeter of brick wall equals $2\,(W+L)$.

Outside perimeter of brick wall equals $2\,(W+L)$. plus (8×0.67). Average perimeter $= 2\,(W+L) + (4 \times .67)$.
$$= 2\,(W+L) + 2.67$$

Volume of brick wall
$$= 5 \times 0.67 \times [2\,(W+L) + 2.67]$$
$$= 6.67\,(W+L) + 8.89$$

$$\text{Cost of brick} = \frac{40}{1000} \times 18 \times [6.67\,(W+L) + 8.89]$$
$$= 4.80\,(W+L) + \$6.40$$

Perimeter of sheet piling equals $2\,(W+L) + (8 \times 1.33) = 2\,(W+L) + 10.67$.

Area of sheet piling $= 10 \times [2\,(W+L) + 10.67]$

Cost of sheet piling $= 0.05 \times 10 \times [2\,(W+L) + 10.67]$
$$= (W+L) + \$5.33$$

Cost of frames and covers $= 40\,C$

Area of concrete floor $= (W+1.33) \times (L+1.33)$
$$= (W \times L) + 1.33\,(W+L) + 1.78$$

$$\text{Volume of concrete floor} = \frac{0.5}{27}\,[(W \times L) + 1.33\,(W+L) + 1.78]$$

$$\text{Cost of concrete floor} = \frac{8.10 \times 0.5}{27}\,[(W \times L) + 1.33\,(W+L) + 1.78]$$
$$= 0.15\,(W \times L) + 0.20\,(W+L) + 0.27$$

Area of concrete roof
$$= (W \times L) + 1.33\,(W+L) + 1.78 - (2 \times 2.50)\,C$$

$$\text{Cost of concrete roof} = \frac{8.10 \times 0.67}{27} \times [(W \times L) + 1.33\,(W+L) + 1.78 - 5\,C]$$
$$= 0.20\,(W \times L) + 0.27\,(W+L) + 0.35 - 1\,C$$

Area of reinforcing
$$= (W \times L) + 1.33\,(W+L) + 1.78 - 5\,C$$

Cost of reinforcing,
$$= 0.05 \times 8 \times [(W \times L) + 1.31\,(W+L) + 1.78 - 5\,C]$$
$$= 0.40\,(W \times L) + 0.54\,(W+L) + 0.70 - 2\,C$$

Area of forms
$$= (W \times L) + 1.13\,(W+L) + 1.78 - 5\,C$$

Cost of forms
$$= 0.20 \times [(W \times L) + 1.33\,(W+L) + 1.78 - 5\,C]$$
$$= 0.20\,(W \times L) + 0.27\,(W+L) + 0.35 - 1\,C$$

Paving is usually figured separately, so it will be omitted here.

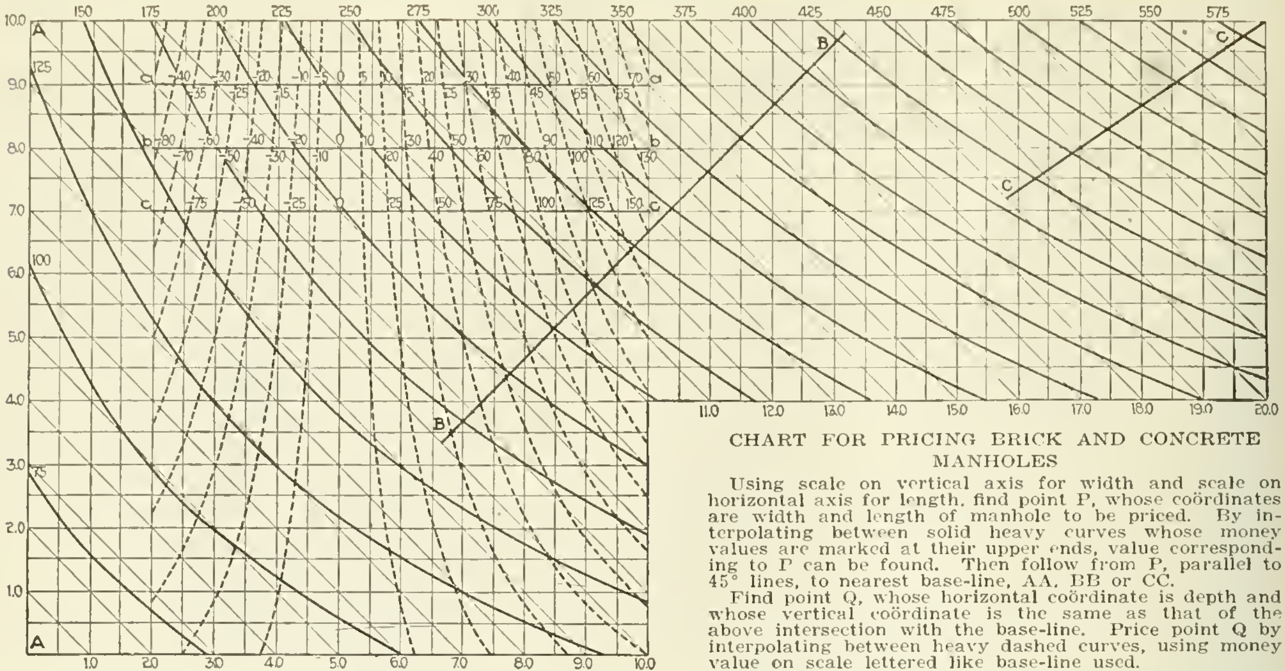


CHART FOR PRICING BRICK AND CONCRETE MANHOLES

Using scale on vertical axis for width and scale on horizontal axis for length, find point P, whose coördinates are width and length of manhole to be priced. By interpolating between solid heavy curves whose money values are marked at their upper ends, value corresponding to P can be found. Then follow from P, parallel to 45° lines, to nearest base-line, AA, BB or CC.

Find point Q, whose horizontal coördinate is depth and whose vertical coördinate is the same as that of the above intersection with the base-line. Price point Q by interpolating between heavy dashed curves, using money value on scale lettered like base-line used.

True costs equal P + Q, if over 5 ft. deep, or P — Q, if less than 5 ft. deep.

Example—Manhole 7.4 × 8.8 × 6.9 ft. Point P with coördinates 7.4 and 8.8 lies between $275, and $300 curves at about $280. Following from P parallel to 45° line to BB base-line, 6.4 is vertical coördinate and 6.9, the depth, is horizontal coördinate of Q. Q lies between $40 and $50 correction curves (using bb scale) at about $45. Cost = $280 + $45 = $325.

Summing up all of the above items of cost:

Excavation $= + 0.24\ (W \times L) + 0.64\ (W + L) + \$1.71$

Disposal $= + 0.30\ (W \times L) + 0.40\ (W + L) + .54$

Backfill $= + 0.16\ (W + L) + .64$

Wall brick $= + 4.80\ (W + L) + 6.40$

Sheet piling $+ (W + L) + 5.33$

Frames and covers $= + 40\ C$

Concrete floor $= + .15\ (W \times L) + 0.20\ (W + L) + 0.27$

Concrete roof $= +.20\ (W \times L) + .27\ (W + L) +.35 — C$

Steel reinforcing

$= + .40\ (W \times L) + .54\ (W + L) + .70 — 2\ C$

Reef forms $= + .20\ (W \times L) + .27\ (W + L) + .35 — C$

Total Cost— $1.49\ (W \times L) + 8.28\ (W + L) + \$16.29 + 36\ C$.

As there is usually but one cover to a manhole, C may be considered as unity in plotting the cost curves, and $36 may be added mentally to the final result when necessary to price a manhole with two covers. Thus, total cost $= 1.49\ (W \times L) + 8.28\ (W + L) + \$52.29$, for a manhole 5 ft. deep. Every foot variation in depth will change the excavation, disposal, backfill and wall brick by 20%. It may be assumed that the same piling lengths will be used everywhere on the job (the surplus being left above the ground), so variations in piling cost with depth may be neglected. The additional cost for any depth will be:

$(D — 5) \times 0.20 \times [.54\ (W \times L) + 6\ (W + L) + 9.29]$
$= (D — 5) \times [0.11\ (W \times L) + 1.20\ (W + L) + 1.86]$

As will be seen by plotting $[0.11\ (W \times L) + 1.20\ (W + L) + 1.86]$ against W and L, the resulting graphs are almost straight lines. The hyperbolic curvature due to the coefficient of $(W \times L)$ is so small that it is desirable to eliminate it. With the values of W and L used most frequently, $.11\ (W \times L)$ may be equal to, say, $0.30\ (W + L)$. Thus, the depth correction will be:

$$(D — 5) \times [1.50\ (W + L) + 1.86]$$

Several factors tend to minimize the error involved in the above approximation. First, the total correction for depth is a small part of the total cost. Second, if the average depth (5 ft. is used above) is properly chosen, so that the depth corrections may be about equally additions or subtractions, the plus and minus errors will nearly cancel. Third, if the average width and length are well chosen, the plus and minus errors will nearly cansel. The above correction equation is the product of two factors: D and $(W + L)$. If $(D — 5)$ is measured along the horizontal axis, and $(W + L)$ along the vertical axis, any value of the equation will be represented by a pair of rectangular hyperbolas, symmetrical about the vertical line $D = 5$, and asymptotic to the horizontal line $(W + L) = -\frac{1.86}{1.50}$. All points lying on a line at 135° with the horizontal axis have the same value of $(W + L)$, and this value may be read by the vertical scale of width at the intersection of the vertical axis and the slanting line. The correction curves may thus be plotted.

The curve chart herewith was not based on the above equations:

Cost $= 1.49\ (W \times L) + 8.28\ (W + L) + 52.29$,

Correction $= (D — 5) \times [1.50\ (W + L) + 1.86]$

but, due to different unit costs, on the equations:

Cost $= 1.53\ (W \times L) + 7.80\ (W + L) + 52$.

Correction $= (D — 5) \times [1.20\ (W + L) + 4$.

The method of calculating the points for the curves is shown below:

Cost $= 1.53\ (W \times L) + 7.80\ (W + L) + 52$.

To get the curve of $150 cost:

$150 — 52 = 98. = 1.53\ (W \times L) + 7.80\ (W + L)$

$98 = 1.53\ (W \times L) + 7.80\ W + 7.80\ L$

$98 — 7.80\ L = (1.53\ L + 7.80)\ W$

$$W = \frac{98 - 7.80\ L}{1.53\ L + 7.80}.$$

Substitute above: $L = 0$, $L = 0.5$, $L = 1.0$, $L = 1.5$, etc., on up to $L = 10$ (or larger) and find W. Plotting corresponding values will give the curve of $150 cost.

To get the curve of $175 cost:

$$175 - 52 = 123 = 1.53\ (W \times L) + 7.80\ (W + L)$$

$$W = \frac{123 - 7.80\ L}{1.53\ L + 7.80}.$$

With a Bruns-Vega or similar calculating machine (or even a repeating adding machine) the above calculations can be quickly made. It will be noticed that the curves are hyperbolas, and are equidistant horizontally and vertically. After two curves are found, the others can be stepped off with a pair of dividers, but it is imperative that one or more of the curves far from the starting point be plotted from calculated data, so that the divider setting can be checked and corrected, or the cumulative error may be very large. The accompanying curve chart was calculated, plotted and inked, on a 25 x 50 inch tracing, by one man, in less than a day, so it is evident that the original cost is not excessive. With cost curves $25 apart, interpolations can easily be made to $5, which is less than 5%. The depth corrections can be made even closer, but it is usually not necessary. With this degree of accuracy, the use of the graphical chart by two men is several times faster than the slide rule.

The correction curves are plotted in much the same way as the basic curves.

$$\text{Correction} = (D - 5.0) \times [1.20\ (W + L) + 4]$$

$$\frac{\text{Correction}}{(D - 5.0)\ (1.20)} = (W + L) + \frac{4}{1.20}$$

$$W + L = \frac{\text{Correction}}{1.20\ D - 6} - 3.33.$$

To get $10 curve:

$$W + L = \frac{10}{1.20\ D - 6} - 3.33.$$

Let D equal 0, 0.5, 1, 1.5, 2, etc., and find $(W+L)$. $(W+L)$ is measured along the vertical axis, and D along the horizontal. As $(W+L)$ runs off the chart, a new base line, *BB*, representing half its value (measured from —3.33, which is the real axis of the correction curves) is introduced, and the money scale is doubled. This process can be repeated as often as necessary, and it will keep the values of $(W+L)$ on the chart. Certain parts of the chart may be left blank if it is evident from the manhole sizes that such ranges will not be needed.

For oval manholes, the values of $(W \times L)$ and $(W+L)$ need only be multiplied by a constant (usually between $\frac{\pi}{4}$ and 1.00) to get the true inside areas and perimeters. As the constant term of the equation represents rectangular corner areas and perimeters, it should likewise be multiplied by the constant. Fortunately, the same constant applies to arcs and to perimeter, at least closely for shapes made up of straight lines and second degree curves (conic sections), so that the final cost need only be multiplied by this constant to be applicable to an oval manhole of the length and width used.

On one system it was found that this constant for oval manholes was 0.85. It is believed that this is a representative figure for all flat-ended curved-sided manholes. Perfect circles or ellipses would give .7854. In the above case, the constant, .85, was found by plotting true areas and perimeters, as determined by planimeter and curve-tracer, against apparent rectangular areas and perimeters, for several representative shapes.

The basic equation for oval manholes becomes: $[1.49\ (W \times L) + 8.28\ (W + L)\ 52.29] \times .85 = \text{Cost.}$

The correction equation, for oval manholes, becomes: $(D - 5) \times [1.50\ (W + L) + 1.86] \times .85 = \text{Correction.}$

Rather than plot the new equations, the simplest method is to multiply the corrected result, found in the usual way, by .85. In a few cases it might be desirable to use the exact shape in deriving the equations, if all the manholes of the system are built closely to a simple mathematical figure, such as the circle, oval or hexagon.

The general method of pricing herein outlined is applicable to a wide range of structures: Cable, steam-pipe, and gas-main manholes; cisterns, silos, tanks, open caissons, intake shafts, grain elevators, and other one-roomed buildings whose costs are directly proportional to surface and volume.

Financier Characterizes Contractor

IN A recent issue of one of the New York daily papers appears an article by Richard Deming, vice-president American Surety Co., New York City, in which an appeal is made for closer co-operation between owner and contractor. The following epigrammatic phrases are a fair resumé of Mr. Deming's article:

"There are more doubtful elements in a construction job than in any bill of goods. It requires either more 'nerve' to take chances or more 'gall' to cover chances.

"When a manufacturer sees that costs are running ahead of estimates, all he need do is to send out a little 'announcement to the trade,' which 'passes the buck' to the consumer. When a contractor finds himself on a losing job under the usual form of contract he can overdraw his bank account, mortgage his house or equipment, or call a meeting of the creditors.

"The contractor must be resourceful in meeting unforeseen and unforeseeable conditions—the trickiness of soil and sub-soil, of earth and the waters under the earth—and the weather.

"A contract does not have to be what it so often is—handcuffs and chains which the owner puts on the contractor, defying him to do his best.

"Specifications should be a practical set of scientific standards for a workmanlike job—not an anthology.

"The owner has nothing to lose by paying the contractor promptly.

"In the preparation of plans and specifications, the owner can do much to help or hinder the contractor—and himself.

"Unnecessary use of expensive material, or too much material, or complex and costly methods are frequent requirements which cause contractors gray hairs and owners high cost.

"A growing evil is 'scrap book' specifications, compiled with more diligence than judgment by young engineers who clip 'good clauses' from many sources and combine them into a crazy-quilt style of exasperating inconsistency and self-contradictions."

"In general," says Mr. Deming, "in the actual construction of a building or any other project, the contractor takes the risk. The more the risk the contractor is asked to take, and the less certain the probability of profit, the higher will be the cost of construction, and the greater will be the chances of failure. It is therefore up to the owner to reduce the hazards of the industry as far as is in his power—not only as an individual on his own particular work, but as a member of any organization of owners, to which he may belong."

What Is the Future of Inland Water Transportation?—*Part V*

By Charles Whiting Baker
Consulting Editor, Engineering News-Record

The Federal Government has invested nearly $15,000,000 in boats to operate on three inland waterways where prospects of commercial success are most favorable. The operating expenses alone of these boat lines from October, 1918, to July 1, 1919, exceeded their earnings by $543,000. This includes nothing whatever for interest, insurance and depreciation on the boats and other equipment used. This experiment, however, should be continued until it is fully demonstrated whether it is possible in the most favorable location to carry freight by water at lower cost than by rail.

A St. Lawrence River waterway from the Lakes to the Atlantic large enough for the Lake shipping offers greater prospect of commercial success than any other waterway project now proposed because it would cut out the entire terminal expense at the seaboard and allow vessels to carry freight without transfer all the way from the Lake cities to foreign ports.

In general, water transport has the best chance of success where long distances are covered and where railway terminal costs are very high. These conditions favor the proposed ship canal across New Jersey.

XII—Concluded from page 191

Government Operation of Boats on Inland Waterways

When the United States entered the war and the congestion of traffic on the railways became serious, there was a general belief that at last the opportunity for the inland waterways had come. Here were channels which the Government had spent millions to improve for navigation, and freight urgently needing to be moved which the railways were unable to handle.

The difficulty at once found was that there were not enough boats in existence on inland rivers to render any important service in handling long-distance traffic. The few boats still running were antiquated craft, used only for unimportant local traffic. It was hoped that private enterprise would seize the opportunity and build boats for inland transport, but the hope was unrealized. Most of the older generation of river steamboat men have passed away with their craft. Such as survive are unfamiliar with modern business methods.

Besides this, if anyone in 1917 could have brought together the capital and the steel and the lumber necessary to build a river steamboat, he would have done far better to build a craft for ocean traffic, where rates had gone up several hundred per cent, than a boat for river traffic to compete with railways, which had only raised their rates 25%. Under these conditions, the inducement to private capital to go into the river-steamboat business was conspicuous by its absence.

Vicissitudes of River Transportation

The pressure for transportation was such, however, that every navigable craft on the rivers was pressed into service, including even Government vessels ordinarily used on its works of channel construction and maintenance. Among these on the Mississippi was an experimental Government towboat, the "Nokomis."

A number of years ago it became obvious that something besides lack of navigable channels was responsible for the decline of water transport, and one theory which found favor was that the old-time stern-wheel river steamboat was antiquated. In 1910 Congress ordered an investigation to be made to determine whether more economical types of boats could not be used on the Mississippi River system. This investigation has been in progress ever since.

The "Nokomis" was one of the improved towboats under trial by the Engineer Department which were turned over in the summer of 1917 for commercial traffic. The story of her service of a few months, as related in the official report, is illuminating because it illustrates graphically the slowness and vicissitudes of river navigation which hamper it in competition for business.

The "Nokomis" left St. Louis, July 30, 1917, with six barges loaded with coal to be delivered at St. Paul. She started with a load of 2917 tons of coal. In the month and a half required for the voyage to St. Paul she burned about one-sixth of the coal under her boilers. She started back to S. Louis, Aug. 28, with 10 barges loaded with 3560 tons of iron ore; but because of low water and frequent groundings she did not reach St. Louis till Oct. 20.

The "Nokomis" was then put into use by the Army Quartermaster service, and undertook to tow 15 steel barges, taken from the St. Louis engineer district, to New Orleans. These barges were loaded with knocked-down railway cars which were to go to France. The "Nokomis" started from St. Louis, Nov. 27, with seven barges. She left them at Cairo and returned for the remainder, the plan being to assemble the whole tow at Cairo for movement southward. She again left St. Louis with seven bargeloads of railway cars and one of fuel on Dec. 27, but running ice and a heavy storm forced her to take refuge just below the city limits, where she was frozen in and had to stay. Of the seven barges tied up at Cairo, two listed so heavily as to dump their loads, and two broke away and were carried downstream.

The "Nokomis" again started south Feb. 26, 1918, when the river became clear of ice, picked up the other barges on the way down and reached New Orleans Mar.

11. She started back with the empty barges Mar. 23 and reached St. Louis Apr. 27. The lost cars were practically all recovered at the next low-water season by divers and an electro-magnetic derrick, and at the end of the year, the official report says, were being overhauled at Memphis for reshipment to New Orleans, notwithstanding the fact that the need for the cars in France had passed!

Railway Administration's Operation of Boats

After Government control of the railway lines was established, it was natural that control should be extended to the water transport lines. Director General McAdoo in his report at the close of 1918 said:

"It has seemed to me evident that by developing transportation on the waterways and coördinating and articulating them with a unified railway system, we shall bring about a correct solution of the rail-water controversy, which has been in progress for fifty years. This is possible with the railways under Federal control. I doubt if any of our rivers or canals will become active factors of transportation if the railways are turned back to private control."

In accordance with these ideas, Mr. McAdoo appointed a committee, in February, 1918, to prepare a plan for the increased use of the waterways to relieve the railway congestion. This committee reported in April and in the following month the New York Barge Canal section was organized. Its operations with about 200 old canal boats which it leased for use in 1918 were briefly described in Chapter VIII. Besides these old boats, contracts for new equipment to the value of about $4,500,000 for operation on the barge canal were authorized. Late in July, 1918, the Mississippi-Warrior River section of the Railway Administration was organized and about $9,680,000 was provided for the purchase of old boats and the building of new ones.

These three inland waterways were selected as offering the best opportunities for the development of a profitable traffic; and it was believed that if the Government could demonstrate the feasibility of operating boats on these channels at a profit, private capital would be induced to embark largely in the building and operation of boats.

The equipment purchased for the New York barge canal consists of four steel tugboats and three 550-ton wooden barges. The new equipment built to the Government order consists of 51 steel barges of 650 tons each, 21 concrete barges of 550 tons and 21 self-propelled barges of 400 hp. Of this equipment, there had been delivered, on Sept. 1, 1919, 48 steel barges and 18 concrete barges, and 6 of the self-propelled barges were to be delivered in October.

For operation on the lower Mississippi River the Government purchased from the Kansas City Missouri Navigation Co. 2 small steamers and 9 barges and leased from the Mississippi River Commission 3 steamers and 20 barges, and began operations in October, 1918. The new equipment ordered for this division consists of 6 towboats of 1800 hp. each and 40 cargo barges 230 x 45 x 11 ft. of 2000 tons capacity each.

For the Warrior River operations, 3 towboats, 3 colliers and 6 self-propelled barges and 23 cargo barges were purchased; and new equipment was ordered consisting of 3 towboats, 4 self-propelled barges and 20 cargo barges.

Of the total amount of $9,681,087 provided for purchase and construction of equipment for the Lower Mississippi and Warrior Rivers, $4,223,542 had been expended on Sept. 1.

Turning now to the financial results obtained in operating these boat lines, these were given by Director Tomlinson in a statement before the House Committee on Interstate and Foreign Commerce, on Sept. 18, 1919.

The results of operation on the New York barge canal from Jan. 1 to July 1, 1919 (the canals opened on May 15) were reported as follows:

Tonnage Handled:		Tons
Eastbound		20,454
Westbound		9,874
Total		30,328
Revenue		$93,089 22
Expenses:		
Overhead—		
Traffic	$8,710.88	
Operating	12,667.80	
General	17,797.35	
	$39,138.03	
Repairs	11,298 56	
Fuel	2,554.04	
Charters	20,442.24	
Towing	16,669 82	
Vessel and tug supplies	11,740.01	
Wages of crews	54,366.11	
Miscellaneous	7,064.22	
Depreciation	2,327.46	
Total		$165,600.49
Net operating income (loss)		$72,511.27

For July and August the tonnage and earnings of the New York Canal section were as follows:

	Tonnage	Revenue
July	30,240	$85,159
August	30,731	89,769

The profit earned in the month of July was $4,359.48.

The financial results of operation on the lower Mississippi and Warrior Rivers from the start in October, 1918, to the end of June, 1919 are given in the accompanying tables. It will be seen from these tables that the total losses incurred in the operation by the Government of these three boat lines to June 1, 1919, were as follows:

New York canal section	$72,511
Lower Mississippi section	411,168
Warrior River	58,414
Total	$542,093

The total freight handled during this period was 30,328 tons on the New York barge canal, 85,377 tons on the Lower Mississippi and 42,586 tons of coal on the Warrior River.

Thus the loss averaged $2.40 per ton of freight moved on the New York barge canal, $4.82 on the lower Mississippi and $1.40 per ton of coal carried on the Warrior River.

The operations of these Government boats have been widely advertised as rendering valuable service to shippers by carrying cargo at 80% of the railway rates; but the above figures show that even the full railway rate would not have nearly met the cost of moving the freight by water.

Even this is not the whole story, for the above figures cover only the direct operating expenses of the boats. To find the entire cost of carrying the freight by water there would have to be added the interest and depreciation on the boats used and also insurance on them to cover risk of loss, for the Government, it appears, according to Director Tomlinson's testimony, does not carry insurance. The effect of losses on the total cost of marine transport is well illustrated in the experience shown in the above report of the Mississippi River operations, where the sinking of a barge load of coffee added $85,000 to the operating expenses for April, 1919.

It is claimed of course that the operations thus far with old boats are no criterion of the results which will be obtained when the new equipment is all completed and in service. It is worth noting, however, that the "old boats" which are in use on the lower Mississippi include the very steamers and barges on which the Kansas City Navigation Co. expended a large amount in order to secure the most efficient and economical equipment possible. They include also the towboats which the Corps of Engineers built to represent the latest improvements in river navigation. If these vessels, built only half a dozen years ago, are now obsolete, then a very high rate for depreciation and obsolescence must be charged against investments in river craft.

It is of interest to turn, however, to the situation which the Government must meet in order to show a profit from next year's operations of its boats. Its investment in vessels of about $14,500,000 will be subject to an interest charge which at present prices of Government bonds can hardly be less than 5% and to depreciation which can surely be not less than another 5%. If then these Government boats are to demonstrate that inland water transportation is a profitable business, they will have to earn next year a profit above all operating expenses of at least $1,450,000, in order to cover their fixed charges alone. Director Tomlinson also submitted figures showing a total salary pay roll for the organization which operates these three waterways of $273,500 per annum. This does not include the daily labor pay roll nor the crews on floating equipment.

The probability at present appears to be that with the winding up of the Federal Railway administration this experiment in Government operation of waterways will be turned over either to the Shipping Board or the War Department. That the experiment must be carried through admits of no doubt. Unless the Government can demonstrate that there is a good profit in the inland water transport business, private capital will not engage in it.

The complete failure of the Inland Transportation Co. and the Kansas City Missouri Navigation Co., the only two important attempts for years to revive long distance inland water transportation, with the disappearance of profits in the coastwise transportation business, all operate as warnings to private capital to steer clear of such investments.

Of course it may be claimed that the Government's entering into this business acts to deter private capital from it; and the New York State authorities, in fact, have strongly opposed the operation of boats on the state barge canal by the Federal authorities.

Their opposition rests on no sound grounds however. New York's $150,000,000 barge canal lies almost unused, nor is there prospect of any great increase in its traffic unless the present Federal Government experiment proves successful enough to encourage private capital to enter the business on a large scale.

UNITED STATES RAILROAD ADMINISTRATION, DIRECTOR GENERAL OF RAILROADS

Report of operations, Mississippi-Warrior waterways, ten months ended June 30, 1919

WARRIOR RIVER SECTION

	October, 1918	November, 1918	December, 1918	January, 1919	February, 1919	March, 1919	April, 1919	May, 1919	June, 1919	Total
Operating Revenues										
Freight revenue	$1,763.50	$2,446.50	$3,210.93	$17,027.07	$11,754 54	$12,136.30	$9,488.79	$9,732.25	$16,013.31	$83,572.99
Miscellaneous	....	303.95	1,315.72	1,817.71	1,946.96	2,025.30	1,059.38	1,728.02	5,915.27	16,112.31
Total	$1,763 50	$2,750.25	$4,526.65	$18,844 78	$13,701.50	$14,161.60	$10,548.17	$11,460 27	$21,928 58	$99,685 30
Operating Expenses										
Maintenance	$1,370.42	$1,669.69	$3,543.09	$4,662 24	$4,723.79	$3,222.68	$5,428 37	$4,481.56	$9,130.54	$38,232.47
Transportation expenses	2,122.30	2,440.59	4,408.17	15,033.68	15,477.03	12,544.65	8,977.07	12,572.02	18,052.06	91,627.57
Overhead expenses:										
Traffic expenses	381 69	385.22	415.67	525.09	566.26	593.59	585.46	546.99	602.85	4,602.82
General expenses	1,151.87	1,021.83	958.89	1,626.68	1,411.78	1,356.65	1,536 06	1,654.55	1,506.14	12,224 45
Total	$5,026.28	$5,517.33	$9,325 82	$21,847.69	$22,178.86	$17,717.57	$16,526.96	$19,255.21	$29,291.59	$146,687 31
Operating income (loss in italics)	*$3,262.78*	*$2,767.08*	*$4,799 17*	*$3,002.91*	*$8,477.36*	*$3,555.97*	*$5,978 79*	*$7,794.94*	*$7,363.01*	*$47,002.01*
Other income (debts in italics)	465.87	*364 31*	*1,460 46*	*1,354 03*	*1,864.09*	*1,842 87*	*1,601.38*	*1,700.04*	*1,690.20*	*11,411.51*
	$2,796.91	*$3,131.39*	*$6,259 63*	*$4,356.94*	*$10,341.45*	*$5,398.84*	*$7,580.17*	*$9,494.98*	*$9,058.21*	*$58,418.52*

MISSISSIPPI RIVER SECTION

	October, 1918	November, 1918	December, 1918	January, 1919	February, 1919	March, 1919	April, 1919	May, 1919	June, 1919	Total
Operating Revenues										
Freight revenue	$27,305.41	$19,857.69	$24,516.35	$13,408.88	$25,436.58	$51,321.38	$39,616.35	$40,277.70	$35,259.12	$277,000.36
Miscellaneous	....	1.58	2.07	....	69 94	115 22	194.51	33 00	37.00	453 32
Total	$27,305 41	$19,859 27	$24,518.32	$13,408.88	$25,506 52	$51,436 60	$39,810.86	$40,310.70	$35,296.12	$277,453 68
Operating Expenses										
Maintenance	$7,534 86	$8,095.41	$14,410 60	$3,462.26	$5,579 17	$4,239 52	$10,868 07	$12,686 51	$13,436.98	$80,313 38
Transportation expenses	31,414.22	42,900 70	41,258.49	34,923.71	45,041 05	51,578 60	[1] 132 159.26	46,913 52	46,112.26	472,301 81
Charter expenses	7,608.55	8,063.26	9,136.68	8,940.40	8,048.88	8,911.26	9,995 47	9,686.26	9,373 80	79,764 56
Overhead expenses:										
Traffic expenses	1,898 19	1,634.87	1,725 64	5,881 36	3,385 97	3,681 50	4,964 30	3,439 55	3,891 90	30,503.28
General expenses	2,535 56	2,346 57	2,659 60	3,409 22	3,614 77	3,727.56	3,791 47	3,843.38	3,836 20	29,764 33
Total	$50,991.38	$63,040 81	$69,191 01	$56,616.95	$65,669.84	$72,138 44	$161,778 57	$76,569 22	$76,651 14	$692,647 36
Operating income (loss in *italics*)	*$23,685.97*	*$43,181 54*	*$44,672 69*	*$43,207 07*	*$40,163.32*	*$20,701 84*	[1]*$121,967 71*	*$36,258.52*	*$41,355 02*	*$415,193 68*
Other income (debts in *italics*)	1,247 60	627 34	781 95	356 74	218 18	23 78	100 39	*8 93*	676 84	3,023 89
Net income (loss in *italics*)	*$22,438 37*	*$42,554 20*	*$43,890.74*	*$42,850.38*	*$39,945 14*	*$20,678 06*	*$121,867.32*	*$36,267 45*	*$40,678 18*	*$411,169 79*

---

[1] This includes $85,000 account loss and damage to coffee, account submerging of barge 11 at Destrahan, La , Apr 29, 1919

XIII—The Most Promising Water Transportation Routes

The United States faces enormous demands upon the Federal Treasury for its transportation lines. To meet the deficits accumulated by the railways while under Government control, over a billion dollars is already needed. For the construction of highways, the Federal Treasury is already committeed to the extent of over $250,000,000, and demands are heard for sums far in excess of this.

Whatever may be said for or against Federal appropriations for these transportation routes, it is at least true that the railways and the highways are handling traffic in enormous volume. But the inland waterways on which the Government has already spent such great sums are, as has been shown above, carrying practically no traffic. Unless business can be restored to these waterways it will be as foolish to continue to spend public funds on them as it would be to aid a railway on which trains had ceased to run or a highway which the public had ceased to use.

In view of the facts recited in the previous chapters, it is surely time to deal with water transportation as a business proposition. It is time that the commercial organizations of the country should withdraw their support of the agitation for Government expenditure on waterways anywhere and everywhere, and to demand instead that only such waterways shall be maintained as will carry a traffic to justify the expenditure upon them.

It is time, too, that the stock arguments which have long deceived the public on the waterway question, and which were based on the commercial conditions of half a century ago, should be swept to one side. Water transportation must be measured by the conditions of today and of the future, not of the past.

What the public wants to know, and what the business community wants to know, is: Where can inland water transportation carry traffic more economically or advantageously than the railways? Unless the waterway can show a saving over the railway, its use will be inevitably confined to unimportant local traffic in regions where access to the railway is difficult. Unless the waterways can effect large savings in transportation costs and do business on a large scale, the country's commercial organizations are not interested in their maintenance.

NECESSITIES OF SUCCESSFUL WATER TRANSPORT

From the review of practical experience given in the preceding chapters, it is evident that the following conditions must be fulfilled if a water transportation route is to handle a large business:

1. The cost of handling at the terminals must compare favorably with the cost of handling at railway terminals in the same district.
2. The waterway itself must be sufficiently commodious and safe for economical navigation.
3. There must be a very large volume of business to be handled, because a large proportion of the traffic will go by rail anyway.
4. The waterway transport lines must have an organization capable of rendering reliable, responsible and economical service.
5. Railways competing with the waterways must not be permitted to reduce their rates below the total cost of service.

Taking up the first of these requirements, it is evident that the opportunity for waterways is best where railway terminal costs are highest, and also where waterway terminal conditions are most favorable. These conditions are best fulfilled along the Atlantic coast. In the large seaport cities of Boston, New York, Philadelphia and Baltimore the terminal costs of railways have become enormous, and the cost to shippers of handling freight to and from railway terminals have increased in equal proportion.

On the other hand, in these and other Atlantic seacoast cities terminals for water transport already exist. A very large volume of traffic can reach these water terminals without a rail haul. Thousands of business concerns can deliver by trucks to a pier on the waterfront as readily as they can to a railway station. A great volume of ocean shipping can deliver and receive freight more economically from barges alongside than from the pier.

Thus conditions 1 and 3, noted above, are fulfilled. The ocean, open and free for coastwise navigation, fulfills condition 2. Condition 4 is also fulfilled, so far as coastwise traffic is concerned, by the existence of long-established steamship lines. Reference has already been made to the financial difficulties of the coast lines. In order that condition 5 shall be fulfilled, there must be an advance in railway rates to the great seaport cities.

RAILWAY TERMINAL COSTS AT SEABOARD CITIES

Few even among railway officers appreciate the very heavy expense involved in the operation of railway terminals in a great city, when the capital charges on these terminals are included. Railway rates are still based primarily on distance, although the cost of the service rendered often varies far more with the relative cost of handling in different terminals than on variations in the distance hauled.

Furthermore, cost of service has been practically ignored in the railway rate structure. Railway accounting has paid little attention to the cost involved in handling various classes of traffic in various locations. The question has seldom arisen in a practical form in the making of railway rates.

In the situation here discussed, however, it becomes an intensely practical question. If a waterway can carry traffic on the whole more cheaply than the railway can, then it is in the public interest that the waterway should be maintained and operated. In order to settle this, the cost of handling railway traffic must be found. It is known that on the present scale of wages and prices the railways on the present scale of rates are falling short of earning a fair return on the capital invested. If railway wages and other expenses cannot be reduced, then railway rates must be increased, and Director General Hines has recently declared that an increase is inevitable. If a rate increase must be made, it should certainly be made where it is known already that the cost is heaviest, and that is on the traffic handled in great city terminals.

SEPARATE TERMINAL CHARGES ON RAILWAY FREIGHT

The Hon. Robert W. Woolley, of the Interstate Commerce Commission, has urged a reform in railway rates by which all rates would be determined by adding a flat rate per mile to a fixed terminal charge. Without inaugurating so sweeping a change as that proposed by Mr. Woolley, it should be possible to establish a separate terminal charge on railway freight to and from great cities where the terminal expenses are heaviest.

If such a terminal charge were made, sufficient to cover the cost to the railway company, it would be the first and most necessary step toward reëstablishing water transportation on the most favorable routes.

The difficulties in obtaining such an advance in railway rates are exceedingly great. The imposition of a special terminal charge to cover the actual cost to the railways of serving shippers at the ports of New York and Boston and Philadelphia and other Atlantic coast cities would be fought by the united commercial and political influence of all these cities. Such a measure ought to find friends and supporters among the commercial interests of other sections of the country which are now being unduly taxed in railway rates to make up the losses in operating the railway terminals in the great cities. But the public is so little informed on these technical questions of transportation cost that effective support for such a reform could not be counted on.

Much the same conditions exist with regard to the general proposition to raise railway rates to points where water competition was once effective. The cities and sections which have long had the commercial advantage of such rates will be vociferous in opposition. There is not a Chamber of Commerce which has gone on record in favor of Federal appropriations for waterways which would not promptly oppose an increase of the railway rates affecting its city.

This is the condition that confronts the proposal to revive traffic on inland waterways, when considered as a practical business proposition. If traffic by water is to be revived, there must be profits in sight sufficient to induce the investment of many millions of dollars of capital in the building of boats and terminals and in creating business organizations to use them. Even the little experiment in the operation of waterways which the Government through the Federal Railroad Administration is making has involved an investment of over $14,000,000.

Obviously, capital will not invest in boat lines on an inland waterway if competing railways are free to take business away from the boats when they begin operation. Nor do prospects of profit at present rates appear attractive. If the coastwise steamers, which are operating where conditions are most favorable for economical water transport, cannot make money, what prospect of profit has a transport enterprise on an inland waterway?

Let us assume, however, that the difficulties above recited are overcome—or, in other words, that a way is found and put in operation whereby railway rates to points served by waterways will not be reduced below the point which will make water competition impossible. Where are the prospects most favorable for the revival of water transportation?

Waterways Along the Atlantic Coast

We may turn again to the conditions along the Atlantic coast. In the strip of territory extending from Boston on the north to Norfolk on the south and lying within 20 miles of tidewater terminals on the coast, there is concentrated an enormous population and a very large proportion of the industrial plants of the country.

The possibilities of low-cost water transportation to serve this section are already demonstrated by the barges which carry coal from the tidewater terminals on Chesapeake and Delaware Bays to the ports of New York and New England. There is also an extensive and growing amount of local barge transportation carried on all along Long Island Sound and on Chesapeake and Delaware Bays. The completion of the Cape Cod Canal has already connected Buzzard's Bay, at the eastern end of Long Island Sound, with Massachusetts Bay, and has enabled mariners to avoid the dangerous navigation around Cape Cod. If a canal were made across New Jersey from Raritan Bay to the Delaware River at Bordentown, it would enable barges to pass through protected waters all the way from Massachusetts Bay on the north to Norfolk on the south, and thence through inland channels along the coast of the Carolinas as far south as Beaufort.

Barges can at present, it is true, make this voyage, but they must either take the outside route from New York to Philadelphia or use the old Delaware & Raritan Canal across New Jersey. This canal has 13 locks and cannot pass vessels of over 7-ft. draft, yet it still has a traffic of about 300,000 tons per annum.

Ten years ago surveys were made for a deep waterway at sea level across New Jersey, and the project has been studied at various times by boards of engineers. Alternative estimates have been made for a lock canal of 12-ft. depth and 90-ft. width, at an estimated cost of construction of $18,736,000, and a sea-level canal of 25-ft. depth and 125-ft. width, at a cost of $45,000,000. General Black, chief of engineers, on August 9, 1918, recommended the building of the lock canal with provision for its eventual future conversion to a sea-level canal. Secretary Redfield on Sept. 1, 1918, submitted a report to Congress advising the adoption of the sea-level plan. Military considerations have been urged in favor of such a canal, as a protected inland waterway for vessels engaged in coast defense, and this would favor the larger sea-level canal.

The same report by Secretary Redfield also favored the purchase by the Government of the Chesapeake & Delaware Canal, which now passes vessels of not more than 9-ft. draft, and its enlargement to a sea-level canal of 25-ft. depth at a total cost of about $13,000,000. Arrangements for its acquisition by the Government are practically completed. Included in the general project is also the purchase of the Cape Cod Canal and its enlargement to a depth of 30 ft. and a width of 200 ft. at a total cost of about $15,000,000.

It is unnecessary to discuss here the question what size and draft for these three waterways should be chosen to secure the greatest economy. The point to be here emphasized is that the provision of these links would offer increased facilities to a water-borne commerce already existing and for which terminals are already provided and in use.

It is probably true that the advocates of these Atlantic Coast waterways have magnified the dangers of the open ocean passage which these inland canals will avoid, and have underestimated the drawbacks to canal navigation. The Cape Cod Canal has been twice entirely blocked by the sinking of a coal-laden steamer in the channel, once for 12 days and the second time for three months.

Enough advantage has been demonstrated, nevertheless, for these canal routes to make it practically certain that they would command a large business when opened.

The Cape Cod Canal passed 3,800,000 tons of shipping in 1918. The proposed canal across New Jersey would shorten the distance between Philadelphia and New York from 274 miles, the present distance around Cape May, to 87 miles, and would be more advantageous to traffic than the Cape Cod Canal.

It has already been shown that the longer the water route the greater the saving over rail transport. The provision of the three canals above referred to would give continuous, protected navigation along the Atlantic Coast from Beaufort to Boston, a total distance of about 800 miles.

Whether the major traffic on this coastal waterway would be by large barges of 20-ft. or more draft or by smaller craft of 8-ft. to 12-ft. draft is by no means certain. The facts recited in the chapter on the New York Barge Canal, however, indicate that the craft of smaller size have many things in their favor, in actual commercial operation. Not the least of these is the extension of the area reached by water transport. Barges of 8- to 12-ft. draft can ascend the lower reaches of navigable rivers all along the coast to a much greater distance than barges drawing 18 to 20 ft. They can enter harbors and can reach landings which would be inaccessible to vessels of deeper draft, and they can handle freight to and from the smaller industries and towns, where the large vessel would be of too great capacity.

Connecting the Great Lakes and the Atlantic

For a quarter of a century and more, the project of joining the Great Lakes and the Atlantic by a ship canal has enticed engineers and commercial men. In the closing decade of the last century the navigation interests on the Great Lakes succeeded in having elaborate surveys made by the Government of various possible routes for such a canal. It has already been recited how the commercial interests of New York City and Buffalo took alarm at this and succeeded in committing the State of New York to the rival enterprise of a barge canal planned to be big enough to carry freight at very low cost between the terminals but unsuitable for navigation by boats fit to sail the lakes or the ocean.

The ignorance of practical transportation requirements by those who planned the New York Barge Canal is well illustrated by their failure to make any provision for terminals until work on the canal had been in progress for 10 years. Their greatest mistake, however, was in attempting to make a canal which would absolutely require transfer of freight at each end. Competent engineers called public attention to the blunder at the time, but without result.

Possibilities of the New York Barge Canal

There appears no prospect at the present time that the New York Barge Canal, standing by itself, can ever attract traffic enough to justify its cost. Its only prospect of success is in doing what its designers attempted to prevent—connecting the Great Lakes and the Atlantic. Whenever the canal is available for vessels of 10-ft. draft, we may expect to see through barge traffic between all points along the Atlantic Coast from Boston, along the Sound to New York and thence through the canal to Buffalo and to other points on Lake Erie and as far westward as Detroit, perhaps even to Chicago and Milwaukee and Duluth. If the Government opens a sea-level canal across New Jersey and enlarges the Chesapeake & Delaware Canal, then through barges can run between the Lake Erie ports and points on the coast as far south as Beaufort.

The low headroom of the fixed bridges over the New York Barge Canal is not an insurmountable obstacle. With geared turbines and forced draft, a lot of power can be put into a boat without requiring much headroom on board or height of funnels. Of course, it remains to be determined how much traffic could be developed between the southern Atlantic coast ports and the lake cities that would use so roundabout a water route in preference to the direct rail route. That it is practicable to build boats which will be capable of navigating safely the lower lakes, the New York Barge Canal and the Atlantic Coast protected waterways, there can be little doubt.

If such through navigation is established on a considerable scale, it will arouse anew the popular demand in the interior of the continent for direct connection between the Great Lakes and the ocean. That demand found expression a quarter century ago in the projects for a deep waterway to the Atlantic which were recommended by two successive Government boards. Unfortunately, the Mississippi valley interests succeeded in diverting the popular sentiment at Chicago to the support of that will-o'-the-wisp, the Lakes-to-the-Gulf deep waterway project. With the backing of Chicago withdrawn and the opposition of New York certain, it was useless to continue further the agitation for the Atlantic Coast outlet from the lakes.

The old traditions still exist. In the last Congress, a resolution which was adopted to have the International Waterways Commission report on a deep waterway from the lakes to the ocean by way of the St. Lawrence was opposed by the New York and New England delegations in Congress.

That opposition is based on prejudice and on ignorance of the commercial conditions of the present day. In the agitation of twenty years ago to secure the passage of the $101,000,000 bond law in the State of New York, to raise the money for the Barge Canal, the urgent plea was made that the canal was an absolute necessity to save New York City from the loss of its export business and the consequent decline of its commercial prosperity. A score of years have passed by, during which the old canals have lost all their commercial importance and the new canal is practically unused, yet New York and the industries of New England have grown as never before.

Lowering the cost of transportation between the Atlantic Coast and the interior cities on the lakes will benefit the Atlantic seaport cities ten times as much on domestic traffic as any loss of foreign business could injure them.

The St. Lawrence Water Route to the Sea

The experiences of the war, moreover, have been illuminating as to the gateway from the Great Lakes to the sea by way of the St. Lawrence. Lake shipyards contributed splendidly in response to the appeal for ships to win the war, and all their ships had to reach the sea through the St. Lawrence canals.

Except for the war, Canada would by this time have had the work far advanced on its enlargement of the Welland Canal between Lakes Erie and Ontario. This new waterway will have locks 800 ft. long and 80 ft.

wide, with 30 ft. depth of water over the miter sills. It will therefore pass any of the lake steamers and many ocean vessels, all that would be likely to attempt the voyage from the ocean inland to the lakes. This canal with its seven locks will overcome 327 ft. of the total descent from the level of Lake Erie to the ocean.

About one-third the work on this canal has been done. When it is completed, all that will be needed for the free passage of ocean vessels to the lake ports and of the lake shipping to the ocean will be the improvement for navigation of the St. Lawrence from Lake Ontario to Montreal. The total fall in this distance is about 240 ft., chiefly concentrated at a few rapids.

By building great dams across the river at various points, these rapids can be submerged, and the river converted into a series of deep pools connected by locks. The vast water-power created by these dams, in view of the constantly increasing demand for power in this section far removed from coal supplies, would be of enormous value. In fact, plans were made years ago to develop power by damming the river as a private enterprise. The plans failed of execution only because of difficulty in securing the requisite authority from the two Governments.

The Board of Engineers on Deep Waterways, as the result of its investigations twenty years ago, advocated the route across New York by way of the Oswego, Mohawk and Hudson Rivers in preference to the St. Lawrence route. This choice was made because of anticipated difficulties in obtaining joint action by the United States and Canada, with reference to the St. Lawrence route. With the experiences of the war behind us, these difficulties now appear small.

Moreover, much more is known now concerning water transportation than was known when the engineers studied this question a quarter of a century ago. It is very doubtful whether ocean vessels would navigate a deep waterway across the State of New York through such narrow channels as it would be practicable to make in the Mohawk and Oswego Rivers. But ocean vessels could safely and rapidly navigate the broad St. Lawrence from Lake Ontario to Montreal, if the river were converted into deep pools by a series of dams.

In order that the Atlantic Coast shall also benefit by this waterway, all that is needed is to take advantage of the natural route from the lower St. Lawrence to New York by way of Lake Champlain and the Hudson River. The New York Barge Canal will soon afford 12-ft. navigation on this route all the way from New York to Canada. The Government's surveys of twenty years ago showed the great advantage and low cost of this route for a ship canal deep enough for ocean vessels.

THROUGH VESSELS FROM LAKE PORTS TO EUROPE

It is not intended here, however, to discuss these projects in detail. What is desired is to emphasize the fact that, if money is to be spent for the benefit of water transportation, *it should be spent on channels which will be used when completed.* The governing condition of transportation has been demonstrated to be the cost of transfer at terminals. If the ocean steamer can deliver her cargo directly at a lake port and take on there a load of wheat or dressed meat or steel plates, she can save the cost of rail haul to the seaboard and of transfers of cargo there.

This is not a dream. It is already a reality. On June 25, 1919, the first ocean steamer to sail direct from Chicago to Liverpool left Chicago with a cargo of meat. The steamer is the "Lake Grandby," of 4100 tons, 261 ft. long and 43½-ft. beam. She is limited by the St. Lawrence canals to a draft of 14 ft., but takes on added cargo for her ocean voyage at Montreal.

This is the first of a fleet of 15 vessels under construction for this service by the United States Shipping Board, and it is stated that the rate for the shipment is only $1.25 per 100 lb. The railway rate on dressed beef to New York is 47.5c., and besides this the cost of transfer at New York from car to steamer is saved, with all the chances for delay and injury in this process.

The New York Barge Canal enterprise, on which $150,000,000 has been expended, originated in an engineering fallacy. The theory was propounded that the same vessel could not economically navigate the ocean and the lakes and the channels connecting them. The originator of that fallacy failed to understand how large are the terminal and transfer expenses compared with the cost of movement. If transfers in transit can be cut out, the saving is so great that a ship need not be the most economical for either ocean or lake service. The lake harbors and connecting channels limit the draft of vessels to 21½ ft., but a very capacious and seaworthy vessel can be built on this draft.

Again, the opening of such a waterway would permit lake vessels to pass out to the seaboard at the close of navigation and engage in ocean commerce. It is doubtless true that for the special ore and coal carriers on the lakes it would often be difficult to find profitable business during the winter on salt water; but this does not apply to other classes of boats, and there is good reason to believe that a compromise type of boat would be promptly developed, able to navigate either the lakes or the ocean economically.

Of course, if a large traffic is to be built up at the lake ports, either by through barges from the Atlantic Coast ports or by ocean steamers, a great deal must be done in the development of economical terminals available for the use of such vessels and with convenient facilities for railway transfer. The lake ports have the best facilities in the world for handling the ore and coal cargoes which form the great bulk of the lake traffic, but very little equipment for handling general cargo.

THE LAKES-TO-THE-GULF DEEP WATERWAY

A brief word in passing may be given to this project, which attracted so much attention a dozen years ago and even obtained some support from engineers. The distance from Chicago to the Gulf of Mexico by the Illinois and Mississippi Rivers is shorter than the distance to the Atlantic by way of the lakes and the St. Lawrence. The latter route, however, leads directly toward Europe while the other leads away from it.

Nature has made the water route by the St. Lawrence easy to improve for ocean shipping. The river from Lake Ontario to Montreal flows over a bed of Laurentian granite, an ideal foundation for the engineers' structures. The Great Lakes form the hugest fresh-water reservoir in the world, and make the discharge of the St. Lawrence nearly uniform throughout the year.

On the other hand, the water route by the Mississippi valley, while it can be improved with no great difficulty to be usable by vessels of 8-ft. draft, and is already available for such vessels over most of the distance, cannot be so improved as to be usable by deep-draft ocean freight vessels. If anyone doubts this, attention need only be directed to that portion of the river from Cairo to the sea. This is the ancient delta of the river. Rock lies at an unattainable depth. The slope down which the river flows is so steep that the river finds stability only by lengthening its course and flowing in a succession of sharp bends. When the river is in flood its depth would be sufficient at most points to float ocean steamers, but such vessels have not steering power to cope with the swift current and sharp bends.

During a large part of every year, dry weather prevails over the Mississippi basin, and the river shrinks away to proportions so small that only by the dredging of channels across the bars during the low-water season is the river made usable by steamboats of 8-ft. draft. By no practicable method known to engineers would it be possible to secure a sufficient depth for deep-draft ocean steamers in the Mississippi from Cairo to the sea during the low-water season.

WHAT CAN BE DONE ON 8-FOOT DRAFT?

The literature on waterways which has been poured forth so profusely for many years is so largely based on false assumptions and profound ignorance of practical commercial conditions that it is no wonder the general public, and even many engineers, have fantastic ideas on this subject.

One of the fallacies which has been most diligently spread abroad is that a "deep" waterway is necessary for economical inland navigation. It is worth while to consider this matter briefly.

For ocean navigation, depth of hull is essential to a large-size vessel; a long hull of small depth lacks the necessary strength as a girder to resist the stresses when wave crests far apart lift the hull.

For inland navigation in protected waters, large capacity may be given to a vessel by making the hull broad and shallow. Contrary to the general belief, such a vessel can transport cargo just as economically as the deep-draft ocean vessel, and in many cases at even lower cost. Such vessels are very cheap to build per ton of capacity compared with ocean vessels. Built as barges and propelled in fleets by a single power boat, they are cheaper to operate per ton-mile transported than is an ocean steamer.

Besides this, the shallow draft vessel can be loaded with general cargo or discharged at much less expense than a deep draft ocean vessel, given proper equipment in each case. The cargo in an ocean vessel must be carefully sorted, the heaviest articles at the bottom, the lightest on the top. The cargo must be dropped into or taken out of the hold by hoisting tackle and must be carefully placed, so that injury will not occur from piling goods on top of each other.

With the shallow-draft boat, on the other hand, the load is spread out over a large area, and no such expert work in sorting and stowing is necessary as in loading an ocean steamer.

Of course, a "deep" waterway is essential for channels which have to accommodate lake or ocean vessels built to stand rough weather. For use by barges which traverse waters where some seaworthiness is essential, reasonable depth is also desirable.

But where, as at New Orleans, a cargo must be transferred from an ocean steamer to another craft anyway if its journey is to be continued inland by water, it is doubtful whether there would be any material gain in economy by using a vessel of 14-ft. draft instead of one of 8 or 9 ft. There certainly would not be if the larger cost of making and maintaining the waterway which the boat of deeper draft would require were taken into consideration.

For years the "slogan" of the Lakes to the Gulf deep waterway advocates, when they realized that the project for a ship canal was chimerical, was, "Fourteen Feet Through the Valley." It is an excellent illustration of the slender basis of fact and knowledge on which the waterway agitation was conducted that nobody ever attempted to find out whether a river boat could handle traffic at materially lower cost on 14-ft. depth than on 8- or 9-ft. The mere theoretical supposition that the cost of water transport decreased with increase of depth was sufficient!

THE OHIO AND MISSISSIPPI NAVIGATION

The projects on the Atlantic Coast and between that coast and the lakes which have just been reviewed are all projects for linking up waterways already existing and largely used. Can anything be done to restore water transport on inland rivers? The United States will shortly have spent about $200,000,000 on the improvement for navigation of the lower Mississippi and the Ohio Rivers. It is no longer a question whether it is worth that sum to preserve navigation there. That investment is made anyway and is lost except as benefit may accrue through the use of these rivers for transportation. Their use by the old-time craft and old-time methods is gone, never to return. Can newer methods take their place?

Notwithstanding the disheartening experience of the Inland Transportation Co., reviewed in a previous chapter, and of the practical disappearance of the river as a competitive factor in transportation, there is a chance that the Mississippi may again become an important waterway—and perhaps the Ohio also—provided the task is undertaken with a clear knowledge of commercial requirements.

New Orleans is the most convenient seaport for the entry of goods from tropical America—bananas oranges, and other tropical fruits, coffee, cocoa, sugar, hides, etc. The ocean steamers which tie up along the riverfront at New Orleans can transfer their cargo to river barges lying alongside even more cheaply probably than they can to railway cars. These river barges, drawing, say, 8 ft. of water, can deliver such cargo at St. Louis in two to four weeks. The cost per ton of the transfer from steamer to barge at New Orleans should not exceed 50c. Where automatic machinery is used for handling it may be considerably less. The cost per ton-mile for transport up the Mississippi to St. Louis, if the traffic is handled in large volume, ought not to exceed one mill per ton mile.

It may be possible, therefore, by present channels and present craft, to bring an ocean vessel's cargo to St. Louis, far in the heart of the continent, for a cost of probably $1.50 per ton added to the ocean freight rate.

At St. Louis there is under construction the first large municipal river terminal undertaken on the Mississippi, a reinforced-concrete wharf extending along the river front for about 900 ft. The structure is 40 ft. in height, with its floor a little above high-water mark. At ordinary stages of the river, therefore, all cargo has to be hoisted 20 to 30 ft. to the pier floor. Cargo may be thus hoisted out with cranes, or inclined elevators may be run up the slope of the river bank. Railway tracks are provided for in the plan, and a belt line of railway has been recommended to enable cars loaded or discharged at the pier to pass to any railway entering the city.

If this terminal proves to be adapted to the work for which it is designed, the way will then be clear for a demonstration of what water transport on the Mississippi from New Orleans to St. Louis can accomplish in economical traffic movement.

The success of this experiment will depend not alone on the boats used and the transfer facilities at each end, but on the organization for carrying on the entire enterprise. In order to be successful, it must handle a large volume of traffic; only by so doing can it justify the investment the city has made in the terminal, to say nothing of the millions the Government has spent on the river and recently on the boats. As has already been pointed out, only by handling a large volume of traffic can an organization of terminal labor be maintained able to handle the cargo cheaply and efficiently.

To handle a large volume of traffic the river route must have the hearty coöperation of the railways and of the shippers. The prosperity of the boats depends largely on the return freight. The railways have great power to divert return freight to or from the boats and to obstruct the movement of freight brought by the boats, through their control of freight-car movements.

If the volume of traffic at St. Louis demonstrates the success of its river terminal, similar structures are likely to be erected by various cities along the Mississippi and Ohio Rivers. Caution is needed here, however. Few river cities can furnish or absorb a sufficient volume of traffic to justify the outlay for the costly terminal and the machinery required to handle freight from a river with 50-ft. to 70-ft. variation in level, or to furnish labor for the operation of such a terminal, ready to handle barge loads without delaying traffic. St. Louis is more favorably situated than are Ohio River cities, also, because interruption of traffic by ice in winter is very short and there are no locks to pass on the voyage.

It is hardly too much to say that the future of inland river transport in the United States depends on the results obtained by the water transport line which the Government has established between St. Louis and New Orleans. Until it is shown that business can be made profitable on this route, no more money should be spent on the improvement of waterways where the traffic possibilities are known to be far inferior.

WATER TRANSPORT FOR LOCAL USE

The fact hitherto emphasized, that movement by rail in and about large cities is extremely costly, brings prominently forward an advantage of water transport facilities which has been seldom mentioned. Take, for example, transportation in the vicinity of Pittsburgh. The congestion of the railway tracks in the Pittsburgh district makes transfer of freight by rail for even a few miles very costly. A river barge can transfer freight between a plant on the Monongahela and one on the Allegheny, if both have terminal facilities on the water front, more cheaply and often more promptly than the transfer can be made by rail.

Still more marked is the great advantage of the labyrinth of waterways which constitute the port of New York, in giving a means of direct shipment between any two points on the entire waterfront. An eminent engineer once compared this great extent of waterways to a railway switching yard, costing nothing to maintain, in which a car could be moved from any point to any other point directly, without the great labor and expense necessary where cars are sorted in a railway yard. Here is a case where the local water transportation is saving many millions of dollars annually in the transfer of goods over short distances compared with the cost of moving them on land, either through the streets or on railway tracks. It is very likely that the saving by this local water transportation exceeds the saving made by the water transport on all the inland rivers in the United States.

This is of course merely an extreme illustration of the point here repeatedly emphasized, that terminal conditions and not local conditions determine the cost of transport and the economical route.

A PLEA FOR A BROAD VIEW

In conclusion, let it be emphasized that the object of the preceding discussion is not in any sense to oppose water transportation, but to urge that the question should be dealt with on sound engineering and economic principles. The business of the engineer, according to a famous definition, is "to make a dollar earn the most interest." The public funds expended for the development of transportation should be spent on the route or system which will furnish the needed facilities at the least total cost, and that cost must include all the items —not only the cost of the route, of the terminals, and of the equipment, with interest and depreciation allowances, but the cost of operation and the costs incurred by shippers and receivers. Only by such a broad analysis of the problem can a correct solution of the problem of economic transportation be reached and great waste of public funds be avoided.

A Subway System for Marseilles

Since the armistice the population of the French port of Marseilles has increased to 800,000—about double that of thirty years ago—with the result that additional transportation facilities in the form of a system of underground railways have become imperative. The whole question, according to the engineering supplement of the London *Times*, both from an engineering and a financial point of view, has been considered by a special commission appointed by the city. The project contemplates the construction of two lines, with a combined length of about 7 miles, with provision for future extension. The deepest station will be about 80 ft. below the ground surface and will be served by elevators. The normal subway section, providing for two tracks, will have a minimum height of 13 ft. 1½ in. and a minimum width of 22 ft. 7½ in. The stations will be long enough to accommodate trains 236 ft. in length. The width of the subway section at stations will be about 40 ft., with an island platform between tracks, but at special sites the width at stations will be 52 ft. and there will be three platforms, one in the middle and two at the sides.

Variable Designs for County Highway Systems

Suit the Road to the Traffic Is the Advice From Monroe County, New York, Superintendent

IS IT a desirable general policy to permit bond issue legislation or appropriation bills to be so phrased that high-quality macadam-road construction is eliminated?

Is there any evidence that one type of road (say concrete) or that one general type of road (say rigid pavement) is the solution of the complex and exceedingly variable problem of State road design?

Is it wise by legislative action or otherwise to tie the hands of engineers so that they cannot develop a design suitable to each road in question?

Is it wise to ignore the assertions of many engineers based on experience that for the majority of state-county roads (built jointly by state and county) the interest of the community is best served by original construction of thick macadam which, if necessary, can later be surfaced with more permanent materials?

As a contribution to the answers to these questions the experience with macadam roads of Monroe County, New York, is narrated. For the sake of brevity the evidence is presented and the conclusions are stated with the least possible amount of collateral explanation. Both the evidence and the conclusions apply specifically to the county named, but it is believed that they are true in general of all localities in which the conditions are similar.

General Data and Considerations

Monroe County has an area of 62 sq.mi. and a population of 350,000 of which 280,000 are in the City of Rochester. Outside of the city and villages, the county has approximately 1,360 mi. of highway. Of this total 330 mi. are improved state and state-county roads, 700 mi. are improved town roads, and 330 mi. are unimproved roads. The traffic over these roads as determined in 1916 by the State Highway Department is shown by Table I. No increase in the total number of vehicles is shown by the traffic census of 1919, but the percentage of trucks and delivery vehicles has increased from 7 per cent in 1916 to 14 per cent in 1919.

As a rule the roads are so well improved that the use of automobiles and trucks is not handicapped. It is believed that not more than 130 mi. of proposed 430-mi. state and state-county road system will be required to sustain heavy truck traffic because (1) at present about 85 per cent of the trucks used in rural work have a rated capacity of 2 tons or less, and (2) automobile dealers assert that in their opinion ¾ to 1-ton trucks, with pneumatic tire and greater speed, are the coming type for rural use except for freight handling along natural main transportation routes. Large numbers of light trucks do not cause foundation failures of macadam of proper depth although they do necessitate surface oiling or bituminous penetration top courses and in some instances require eventually a topeka mix or a small brick surfacing, to reduce excessive surface maintenance.

Across-county traffic for the past two years of army truck transport trains has tested to the point of foundation destruction the various types of macadam roads in the county. A number of miles of road have failed under this unusual traffic stress. The significant facts, however, are that a very small mileage has failed; that old 6-in. macadam roads built for horse-hauled farm wagons of a gross load of about 5,000 lb., and which have been inadequately maintained, failed for short stretches but did not fail universally; that wherever a reasonable depth of 8 in. to 24 in. of macadam existed no foundation failures occurred, and that there was very little surface failure of penetration bituminous macadam. This experience is not presented to defend the use of macadam for heavy freight routes but it does demonstrate that macadam will serve economically for secondary state and state-county roads.

Experience since 1898 with macadam roads from 6 in. to 24 in. thick indicates that to insure against foundation failure the depths given in Table II are required. These depths permit the use of a moderate number of 5-ton trucks having a gross weight of about 20,000 lb. There is no economy in using less depths.

Local materials fit for macadam, or gravel roads, or for concrete base, are generally abundant. Materials required for concrete pavements must be largely imported and hauled a greater distance than the local supplies. Any hard and fast type, such as a uniform concrete road design, throws out, in many cases, the possibility of the reasonable use of local supplies; greatly increases the initial cost of improvements, and violates the fundamental principle of economic road design.

TABLE I. TEN-HOUR TRAFFIC CENSUS, MONROE COUNTY ROADS, MADE BY N. Y. STATE HIGHWAY DEPARTMENT

Main Traveled Roads: State and State-County					Lighter Traveled Roads: State-County				
	All Vehicles		Trucks and Buses			All Vehicles		Trucks and Buses	
Mileage	Maximum	Average	Maximum	Average	Mileage	Maximum	Average	Maximum	Average
130	2500	800	170	60	200	1100	400	70	20

TABLE II. RECOMMENDED DEPTHS IN INCHES OF MACADAM FOR DIFFERENT CONDITIONS

Subgrade Soil	Cut	Fills Less Than 1 Ft.	Fills 1 to 3 Ft.	Fills Over 3 Ft.
	Class I Traffic: Large volume of ordinary vehicle and heavy auto trucks			
Coarse sand and fine gravel	9	9	9	9
Clay loam	12 to 15	12 to 15	10 to 12	10
Heavy clay and quicksand	20 to 24	20 to 24	12 to 18	10
	Class II Traffic: Large volume ordinary traffic A few heavy trucks			
Sand and gravel	7 to 8	7 to 8	7 to 8	7 to 8
Loam	9 to 12	9 to 12	9	8
Clay and quicksand	15 to 22	15 to 22	12 to 15	9
	Class III Traffic: Moderate volume, ordinary farm loads. Very few heavy trucks			
Sand and gravel	5 to 8	5 to 8	5 to 8	5 to 8
Loam	8 to 12	8 to 12	8	7 to 8
Clay and quicksand	15 to 22	15 to 22	10 to 15	9

NOTE—Under Class III traffic it is better to use the depth recommended for Class II and reduce the width of metaling, if economy is desired, as all improved roads are bound at times to be subjected to the extreme loading produced by heavy trucks.

The figures given are based on the price conditions prevailing from 1910 to 1915 as the county data are compiled largely for that period. Present prices increase the amounts uniformly about 80 to 90 per cent, but do not change the conclusions in any way.

Thick, well-built waterbound macadam roads, with an asphaltic, oil or tar surface treatment, were maintained for approximately $500 per mile per annum, under a traffic not exceeding 2,000 vehicles per 10-hr. day with the percentage of trucks to total vehicles as shown by Table I. The life of the top course under such maintenance ranges from six to ten years, after which recapping is desirable. At that time the road can be recapped with the original type of surface, or a higher grade surface can be used.

Penetration bituminous macadam roads entail a yearly maintenance cost under similar conditions of about $350 per mile per annum, and show a length of life for the top course of from 8 to 12 years, when they can be recapped with the same type or with a higher type of surface.

No brick or concrete rural roads have been down long enough to determine a fair average life before resurfacing, but experience in other counties having a large mileage of older roads indicates that brick pavements will not give satisfactory service on the average for over 15 years without resurfacing. About the same length of life will apply to first-class concrete. The yearly maintenance of these types ran about $150 per mile, and consisted largely of work on shoulders, ditches, guard-rail and the repair of cracks.

Concrete roads will stand a much heavier unit of traffic than will macadam roads, but the maintenance and length of life are not greatly affected by the traffic; they are determined by the action of the elements. That is, the life of secondary roads is probably not much greater than that of primary roads, as they are destroyed largely by frost heave, by settlement of fills and by expansion and contraction. On this assumption, allowing for interest on first cost, maintenance and renewals of the road surfaces for a term of 50 years, the macadams have apparently the advantage for secondary roads in final cost as well as in initial cost.

In order to express the experience in the form of figures, using present prices for labor and materials, the following statement is submitted as a fair average:

Satisfactory macadam of the waterbound, oiled and penetration bituminous types, for secondary state-county roads, costs today for original construction, approximately $20,000 to $28,000 per mile, including excavation, culverts, pavement and all incidentals. Satisfactory rigid pavements cost from $35,000 to $45,000 per mile. The cost, including shoulders, of renewing top surfaces is about as follows:

Kind of Surface	Cost per Mile
Waterbound macadam, 16 ft. wide	$8,000
3-in. penetration bituminous, 16 ft. wide	12,000
3-in. topeka mix asphalt, 16 ft. wide	15,000
4-in. reinforced cement concrete, 16 ft. wide	20,000

If these costs are divided by the average life of the surfaces as given, it is seen that macadam is economical for secondary roads, and, in some instances, for main roads, but the fact should not be overlooked that on heavy-traffic roads the continual work required in patching is an "abomination of the Lord." On this score alone, the rigid pavement or topeka mix, or brick surface on old macadam, is desirable, and has been used.

Conclusions from Experience

1—We advocate the original construction of cross roads, in the state-county system of waterbound macadam maintained by surface oiling, utilizing local materials to their fullest extent, maintained by surface oiling.

2—We advocate the original construction of secondary radial roads, in the state-county system, of penetration bituminous macadam, utilizing local materials to their fullest extent, maintained by surface oiling.

3—We advocate the construction of main trunk line state route, heavy hauling roads of rigid pavements, using the best materials that can be obtained, but varying the type to secure, in each case, the cheapest first-cost pavement, always considering the possible use of local materials proper for the type of road in question. For these roads we have no choice between cement concrete, brick, sheet asphalt, asphalt block or stone block on concrete bases.

4—We advocate the gradual resurfacing of the heavier traffic macadam roads with topeka mix, small brick cubes, etc. We have successfully utilized this method in reducing high surface maintenance costs where the macadam foundation was solid enough for the traffic, and have adopted this method for a number of our roads. We have examples which have stood a 10-year test successfully.

5—We believe that the community has been better served by the policy of constructing 10 mi. of macadam instead of a possible 6 mi. of rigid pavement.

6—We believe that the county has been better served in the past and will be best served in the future by variable road designs using for the majority of the mileage modern macadam for the original construction, later modified, if necessary, by recapping with a lower-maintenance-cost surface. We advocate rigid pavements eventually for approximately 10 per cent of the total mileage of our roads and for approximately 35 per cent of our state and state-county system.

Economy of Low Grades for Heavy Railway Traffic

Grade Reduction to 0.2 per Cent. Instead of 0.3 per Cent. Found Advisable for Large-Unit Operations on Heavy Traffic Line

A STUDY to determine the comparative economy of two rates of grade for a low-grade line handling heavy traffic has been made by the Hocking Valley R. R., and shows a marked economic advantage for the lower grade, in spite of the higher cost necessary to obtain it. This study was made in connection with proposed grade reduction and double tracking, and was made with particular reference to the relative economy of ruling grades of 0.3% and 0.2% on the Toledo division, which extends from the Parsons Ave. yard at Columbus, Ohio, to Walbridge, near Toledo, a distance of 125 miles. The heavy traffic consists of northbound coal trains. Two rates of grade, three train speeds and two classes of engines were factors in the problem. The results of the investigation are summarized in the accompanying tables.

This study was made in 1916, prior to war conditions and Government operation, at which time the traffic density had reached approximately 20,000,000 tons per year, which was considered sufficient evidence of the need of a second track. Assuming a train speed of 15 miles per hour as desirable, the saving in cost of transportation per 1,000,000 tons of freight on a maximum grade of 0.2% as compared with 0.3% would be $12,250 with engines of the 2-10-2 and $10,920 with less powerful engines of the 2-8-2 type.

Improvements to obtain the proposed maximum grades of 0.3% and 0.2% would have cost $2,937,869 and $4,413,000, respectively, under the conditions existing in 1916. The additional amount necessary to obtain the lower grade would be $1,475,131, and 6% interest on this additional capital investment would be $88,508. With a minimum train speed of 15 miles per hour, the annual tonnage of northbound freight to produce a net gain equal to this additional interest charge would be 8,105,125 tons and 7,225,143 tons for the larger and smaller engines, respectively.

TABLE I. COST OF HAULING 1,000,000 TONS 250 MILES OVER MAXIMUM GRADES OF 0.2 PER CENT. AND 0.3 PER CENT.

Grade, Per Cent.	Speed Miles per Hour	Weight per Train Cars and Freight, Tons	Weight per Train Freight Only, Tons	Number of 50-Ton Cars per Train	Number of Trains per Million Tons	Total Train Miles	Total Cost of Transportation
		A. Engines of 2-10-2 Type					
0.2	10	8428	5900	118	170	42,500	$35,700
0.3	10	6691	4684	93	214	53,500	44,940
0.2	15	7229	5060	101	197	49,250	41,370
0.3	15	5740	4018	80	249	62,250	52,290
0.2	20	6022	4215	84	237	59,250	49,770
0.3	20	4767	3337	67	300	75,000	63,000
		B. Engines of 2-8-2 Type					
0.2	10	6200	4340	87	230	57,500	40,250
0.3	10	4921	3445	69	290	72,500	50,750
0.2	15	5334	3734	76	268	67,000	46,900
0.3	15	4228	2960	59	338	84,500	59,150
0.2	20	4467	3127	62	320	80,000	56,000
0.3	20	3533	2473	49	404	101,000	70,700

Table I shows the comparative cost of hauling 1,000,000 tons of freight northbound over a 125-mile line having maximum grades of the two rates noted, the cost including the return of empty cars over the division, thus making a total run of 250 miles. The train and engine cost per mile was taken at 84c. for the 2-10-2 engines of 83,000-lb. tractive power and 70c. for the 2-8-2 engines of 60,800-lb. tractive power.

Traffic conditions at that time (1916) indicated the economy of incurring the excess cost to obtain the lower grade, while since then the traffic has increased considerably. For the first half of the fiscal year which ended June 30, 1916, the northbound traffic in through freight trains alone was at the rate of 7,046,166 tons per year, or very nearly sufficient to realize the net amount of $88,508 interest on the higher cost. It was estimated, however, that within two years under normal conditions the northbound traffic would be at least 12,000,000 tons, and that in ten years it would approximate 20,000,000 tons. As a matter of fact, the total traffic for the calendar years 1917 and 1918 was 20,339,000 and 19,416,000 tons, respectively.

TABLE II. SAVING DUE TO LOWER GRADE AT 15 MILES PER HOUR

Tons Hauled	Excess Cost for Hauling Over 0.3 per Cent. as Against 0.2 per Cent. Engine 2-8-2	Engine 2-10-2	Per Cent. on Increased Capital Investment of $1,475,131 for 0.2 per Cent. Engine 2-8-2	Engine 2-10-2
10,000,000	$122,500	$109,200	8.30	7.40
12,000,000	147,000	131,040	9.97	8.88
15,000,000	183,750	163,800	12.45	11.10
20,000,000	245,000	218,400	16.60	14.80

NOTE: The columns of excess cost show the higher transportation cost for the steeper grade, based on the additional capital investment of $1,475,131 required to obtain the easier grade. The two percentage columns represent the same figures reduced to percentages, thus: $122,500 divided by $1,475,131 gives 8.3 per cent.

The higher cost for hauling different tonnage totals over the line with 0.3% grades as compared with that having 0.2% grades is shown in Table II.

Reduction of all heavy grades to the limit of 0.2% will not be completed for two or three years, but when it is completed there will be seven stretches of this maximum grade, aggregating a length of 38 miles. Meanwhile, the maximum grades against the heavy northbound traffic are two stretches of 0.5%, each one-half mile in length, one of these being through the yard at Columbus and the other being six miles north of that city. There are several places where 0.5% grades are encountered by southbound traffic, but this condition was not considered in the investigation, as southbound trains are rarely loaded to capacity.

With 50-ton coal cars the standard northbound trains consist of 80 cars, the length of the trains being governed at present by the lengths of passing tracks. Locomotives of the 2-8-2 type and 2-6-6-2 Mallet type are used exclusively in this service. Engines of the Mallet type were not included in the study, but would show a rating even better than that of the 2-10-2 engines given in the tables. The trains make the 125-mile trip without change of engines.

Double tracking is a part of the improvement project, and is to be extended eventually over the entire length of the division. At present it has 26.2 miles of double track, while on the single-track stretches there are passing tracks at intervals of about five miles. An 18-mile diversion or change of line is to be made between Columbus and Delaware, Ohio, but construction on this has not been commenced. With the exception of this diversion there will be no heavy earthwork, and few large structures will be required. No work is now in progress, and the latest stretch of the revision, extending 3½ miles south from Marion, was opened for traffic Oct. 1, 1919. Improvements of terminal facilities are being made at both Columbus and Toledo.

Information concerning the study of economic conditions and the improvement works has been furnished by W. Michel, chief engineer of the Hocking Valley R.R., under whose direction the investigation was made.

Long Cableway Supplied French Army Front

After the French had captured a small part of Alsace in the spring of 1915, they built to supply the army holding the front there an aerial cableway about 3.7 miles long, and with a difference in elevation between the highest point and the lowest of about 2500 ft. This section of the Vosges is very rugged, and was not provided with proper roads nor with many railroads, at least with none which were not endangered by the fire from the neighboring German guns. The army engineers, therefore, dismantled a nearby electric railway power station and built a cableway, which was run with the power so developed. The line is in three sections, 10,400, 4440, and 5120 ft. in length, respectively. At the two junctions of the three lines there were stations built for the transfer of the freight carried. The line was an endless single cable system with cars 40 x 27 x 34 in. in volume, suitable for carrying about 550 lb. of freight and spaced on the line every 280 ft. At the end stations the cables ran around horizontal wheels, permitting the free passage of the carriers. The grade of each line changed between intermediate towers of steel framing. The longest span was about 2520 ft. long. A notable feature was the summit station, where the line passed through a tunnel 590 ft. long and 16 ft. square section, so as to screen the operation of the cableway from the enemy guns. The cableway is described in "Le Genie Civil," Nov. 1, 1919.

Have Engineers "One-Track Minds"?

The following editorial is reprinted from the Dec. 26 issue of *The Engineer*, London:

Is there any more tiresome creature in the world than the man with but one idea? We used to know a youth whose single thought was canoes. He talked about canoes, he read about canoes, he dreamt about canoes. Canoes were the last subject in his mind at night and the first in the morning. He became unfit for the society of any other beings but those who also thought of canoes and nothing but canoes, and we believe their society at last cured him, for in the end he sickened of the subject as dipsomaniacs do of alcohol if they are given it in everything.

Specialists of all kinds are very apt to develop this failing, and it is unfortunately encouraged by temporary successes. We remember once at a meeting of the Honorable Society of Cogers—possibly the oldest and at one time certainly the most fascinating Bohemian debating society in London—hearing a brilliant speech on the subject of the hours of shop assistants. It was admirably conceived, delivered with a due regard to rhetoric, and convincing in its conclusions. Speaking of it in terms of the warmest admiration to "the Chair," we were surprised to meet with a cold response. "A good speech," he said, "but I have heard it too often. Mr. So-and-so is a single-speech man; he has no ideas."

Engineers, as everyone knows, are rather prone to talk shop in season and out of season. They are not much worse than the members of other professions—the stage, for example—but they are, we fear, grave offenders. The failing is, of course, to be corrected by wide reading, but particularly by intercourse with men of varied pursuits. We have Bacon's word for it that reading maketh a full man, and conference a ready man. He who combines the two qualities makes the best company.

Young engineers and young scientists generally are, if we may say so, just a little inclined to neglect the broadening of their minds. They allow themselves, too often under the encouragement of their elders, to become wholly absorbed in their work. At science colleges they meet other young men who think of just the things that they think of, and they gradually grow up seeing the world through a narrow slit. The concentration brings to a few great success, but to the many disappointment. It is a common experience that the least zealous students make frequently the most successful men. May it not be because having larger interests they have a readier sympathy with the affairs of others, and so more easily find their way through the world? Perhaps this is the reason, too, why the great universities turn out so much excellent material; the "conference" with many minds devoted to a diversity of subjects broadens the intelligence and develops companionableness.

Work on New York's Rapid-Transit System During 1919

New York City's rapid-transit facilities materially increased during the year 1919, according to a résumé, by Transit Construction Commissioner John H. Delaney, of the construction work under the dual-system contracts during 1919. Track mileage of the two operating companies increased 35.13 track miles during the year, and indications are, according to Commissioner Delaney's figures that 69½ track miles will be added during 1920. The Interborough facilities were increased by 15.77 track miles during 1919, and the New York Municipal (B. R. T.) system was expanded 19.36 track miles. Thirty-seven construction contracts, involving approximately $46,000,000, were under way Jan. 1, 1920 Upon them work amounting to about $10,000,000 was done during 1919. Approximately $10,000,000 worth of work remains to be done on these contracts.

LETTERS TO THE EDITOR

Comment on Matters of Interest
to Engineers and Contractors Will Be Welcome

"An Object of Suspicion"

Sir—In the Dec. 25, 1919, issue of *Engineering News-Record* a standpipe being built for the City of Chicopee was honored with considerable publicity. In justice to ourselves and to the City of Chicopee, we believe this letter should be printed in the columns of your journal, so that the general public may determine whether the standpipe or the man who wrote the articles recently printed by you is "an object of suspicion."

It is our understanding and general practice to be guided only by exact and accurate information in engineering calculations. It is our belief that an engineering paper of your established reputation should print articles only when you are assured the information contained therein is accurate and authentic

It is unfortunately true that our company is involved in a lawsuit with the firm of Andrews, Tower & Lavalle, not necessarily because they are engineers but because of their "malicious interference between contracting parties," in violation of a statute clearly defined in our Commonwealth of Massachusetts.

It is our understanding that when the designs and estimates of Mr. Andrews for a concrete standpipe were not accepted by the officials of the Water Department of the City of Chicopee, Mr. Andrews applied for the supervision of the proposed steel standpipe. When this request was not granted Mr. Andrews then took it upon himself to make as much trouble for the Water Department as possible, and it was only when inaccurate articles regarding our work appearing in the local papers began to affect our reputation and business, that we felt it necessary to take action. Because Mr. Andrews is an engineer, is it right to assume he is not human and cannot err? As a consequence, legal action was taken, and on the advice of our solicitors, no information of any kind was issued from our office. At our request, the City of Chicopee also withheld information from outside interfering parties, but any citizen of Chicopee was given information when he applied for it.

A few weeks ago a representative of your paper called at this office and requested information, so that he could write up an article for publication. We requested him not to do so on account of the impending suit, and promised him access to plans and specifications as soon as our suit was finished. He told us he would not wait, and evidently gathered his data from persons who had no authoritative knowledge of what they were talking about, and the result was a wonderful fund of misinformation and inaccurate data published by you in the two articles appearing in your Dec. 25, 1919, issue.

On p. 1039 you figure a shell tension of 21,000 lb. per sq.in., assuming a rivet efficiency of 70%. Therefore, your shell tension is only an assumption, and as such not worth the paper and ink to print it. On p. 1054 you state "Visitors are not permitted to go very close and exact measurements of the plates are of course impossible." You then continue, "An examination of the tank, however, showed that the lower plates are no thicker than the $1\frac{3}{16}$ in. specified in the original drawing, that the lower rings about 7 ft. high have butt joints, etc." If visitors are not permitted, how could you examine the tank and obtain the measurements printed which by the way, are not correct?

Again, you give absolutely wrong information regarding the foundation which is considered by engineers who have visited the site to be a fine piece of work, and properly designed to perform its functions.

For your information, full details and specifications have never been submitted to your representative or Mr. Andrews, so that all calculations made by them so far have been assumptions.

We, therefore, feel that your recent articles were not justified. These articles were reprinted in the local papers, and have so alarmed the residents of Chicopee, that families living in proximity to the standpipe are in fear of their lives. We therefore ask that you retract the statements made until more accurate information is available. W. J. WALSH,

Walsh's Holyoke Steam Boiler Works.

Jan. 14, 1920. Holyoke, Mass.

[In reply to the above communication *Engineering News-Record* has sent the following letter.—EDITOR.]

We have your letter of January 14, which we will print in our Letters to the Editor column as soon as possible.

You evidently misunderstand the purpose of the article and the editorial in the issue of Dec 25 of *Engineering News-Record* which discussed the standpipe at Chicopee, Mass. If you will read the article and the editorial carefully you will find that there is no statement therein which cannot be backed up by facts in our possession. The article was carefully written so as not to accuse you or the designers of the standpipe, if it was not designed in your office; of a dangerous design. It was written, however, to show that there was being built in the City of Chicopee a structure which, from all information which could be obtained, had potentialities of danger. It was not given as our opinion that the Chicopee standpipe would immediately collapse. We did not state that there was criminal negligence in the design or construction. We do hold, however, that it should be impossible in this country for a builder to erect a structure of the size and potential danger of the standpipe at Chicopee without due supervision by parties who have other than a commercial interest in the structure. Our criticism of your company, if any, was due to the secrecy with which you are conducting your operations at present.

Whether you would give us full information on the design at some future date is of no importance now. You would not give us information on it before the standpipe was put in service and subjected to a load which possibly might cause its failure. It should not be possible that a private controversy between a builder and someone not at all concerned with a public structure should so tie up the information regarding that structure as to make it impossible for a published record of its details to be made. The people of Chicopee cannot be concerned with any suit between you and Mr. Andrews, and *Engineering News-Record*, in its interest in engineering structures in general, cannot be so concerned. Had you even offered to let our representative go over the design, so as to satisfy himself as to its details, we might have been so impressed with the detailed design of the structure as to be willing to wait until some closely future time to publish those details. This you refused to do, taking the stand that this was a personal and private matter with which an engineering journal interested in the principles of good engineering could have no part.

You need not be assured again, as our representative assured Mr. Walsh, that our concern in the matter is entirely altruistic. We want to see good engineering design in the United States. From such information as we have—and that information, by the way, is not confined to the report by Mr. Andrews—we believe that the Chicopee standpipe is considerably bolder than would be permitted by good conservative engineering practice. We therefore reserve the right to criticise it when the full design appears, and we further cannot waive our right to have made the statements regarding it which we did in our issue of Dec. 25. We see nothing in those statements that we at this time have sufficient information to correct or retract.

The paragraphs in your letter which deny the correctness of our statements regarding dimensions and foundations of the standpipe can have no weight with thinking people. Unsupported denials get nowhere. If you wish to put your case before the engineering profession no other method will suffice but to give full publicity to the details. In doing this you have the full right to the columns of *Engineering News-Record*, and every effort to give you justice in the description will be made.

An Undergraduate on Engineers' Compensation

Sir—In your article on the "American Highway Problem," *Engineering News-Record*, Nov. 13-20, p. 856, one of the serious factors pointed out was the scarcity of engineers to complete the work. Why does this scarcity of engineers exist, we may ask? Why are engineering students and graduates leaving their original choice of profession to take up business? It is a simple financial problem and a great many men who come out of engineering school, immediately see a bigger future with less health-breaking exertion in the business field. The technologist of today is grossly underpaid. There will be a greater shortage of technically trained men in the engineering field as long as the payment of young engineers is below that of other professions demanding similar intelligence and training.

The only remedy is a union for engineers to protect their income and force the public to appreciate and to pay for the accomplishments of engineers. Individual and competitive bargaining for engineering positions is a great hold-back to the development of the profession. The day may come when the demand for engineers will not be met alone by those who work merely for the love of their work and not financial benefit. As a student graduating next year, I, with others, have decided that the future of an engineer is too uncertain to compete with other business offerings at hand.

New Haven, Conn. BRUCE M. LARRABEE.

More About Errors in Logarithm Tables

Sir—Seeing the references, in *Engineering News-Record*.. Nov. 27-Dec 4, 1919, p. 962 and Jan. 1, 1920, p. 53, to an error in tables in Searles' "Field Engineering" reminds me of getting into a mix-up a few years ago which ended in my assistant discovering that the log cos of 3°99′ in the tables I was using gave 0.*94*912 instead of 0*99*912. I was disgusted with my stupidity in not seeing the error at the start, it being so plainly evident. I should suppose that in the similar case referred to some one would have resorted to natural functions before quite so much trouble had accrued. My own case caused nothing more than an hour or two of lost time—and some temper possibly. The tables I was using were those of the Geological Survey, and I notice that the error has been corrected.

Rockland, Me. O. H. TRIPP.

HINTS FOR THE CONTRACTOR

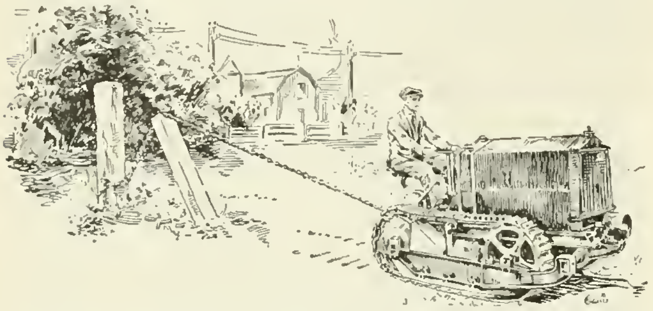
DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Tractor Pulls Fence Posts

By H. H. Sitterley

Bath, N. Y.

THREE men, with a farm tractor operated as indicated by the sketch, pulled fence posts at the rate of one a minute and at a cost of 2c. per post, in opening up a tract of fenced land as a city allotment. The chain, 8 ft. long, was double wrapped around the post close to the ground and passed over a 2½-ft. "brace," set on end, to the hitch on the tractor. One man handled the chain, another moved and set the brace and the third operated the tractor. Wages were 45c. per hour. This method proved less expensive than pulling with a lever and chain.



New Material Increases Cement Hardening Rate

CONSIDERABLE work has been done by the United States Bureau of Standards on a new material called "Cal," for increasing the rate of hardening concrete mixtures. As noted in the annual report of the director of the Bureau for the fiscal year ending June 30, 1919, this material is essentially an oxychloride of calcium in the form of a dry white powder. It is not deliquescent, as is calcium chloride, and can be packed in bags and handled in much the same manner as hydrated lime. It is added to concrete materials at the time of mixing and is quickly decomposed by the water into calcium chloride and calcium hydrate, the calcium chloride going into solution, while the calcium hydrate largely remains in solid but very finely divided form. Thus the beneficial effects of the calcium chloride as to workability and increasing rate of hardness of the concrete are obtained, together with the probable effects of calcium hydrate as to increase workability and decrease permeability. Tests of 2-in. mortar cubes indicate that the different cements react to "Cal" in different manners. The brand least affected gave a strength in 3½ days equal to the 7-day strength of the untreated mortar, the treated mortar containing an amount of the material equal to 5.5 per cent of the cement. These results were on test pieces stored in water. Test pieces stored in laboratory air gave more favorable results, which would indicate that "Cal" would be very effective in concrete construction exposed in any way to the drying-out action of the air or sun, and in places where it is difficult or impracticable to keep concrete continually wet during its early hardening.

Removable Flume Over Canal Permits Passage of Hydraulic Dredge

THE necessity of providing for the passage of a cleaning dredge through a low-level irrigation canal which passes under another canal led to the installation of a removal section of metal flume in the latter. This work was done for the Cameron County Water Improvement District No. 4 by H. B. Livingston, chief engineer of the Rio Grande Engineering Co., San Benito, Texas, who has described it in a recent issue of the *Highway Magazine*. The dredge has a 6-in. pump and makes a trip about once a year.

Concrete piers 20 ft. apart carry a pair of trussed 8 x 16-in. beams, each having two struts for the truss rod, and being fastened to anchor bolts embedded in the piers. Upon these beams rest the sides of the steel flume. The piers rest on an 18-in. reinforced-concrete slab supported on six round piles driven to 14-ft. penetration on account of quicksand. Shorter lengths of flume extend from the piers to the canal. The section is smaller than that of the canal, but by making a flaring inlet and outlet of concrete a flow of 220 sec.-ft. is passed through the flume with a loss of head of only 0.5 feet.

When it is necessary to remove the flume, the supporting rods are removed and the flume is taken out, a section at a time. The nuts on the anchor bolts are then removed and the beams lifted off. Three handy men can remove or replace the flume, regrouting the joints, in half a day.

Service Tracks Safely Shifted to Road Slab Five Days Old

AFTER the concrete had been laid five days on the 18-ft. concrete road from Cumberland to Amcelle, Md., the industrial railway for hauling dry batches was shifted onto the pavement slab. This five-day age inferred that all five days had been warm and thus the hardening of the concrete had been rapid. A 1:2:4 concrete was employed. The ties were 2-in. plank 6 x 10 in. wide, and were laid directly on the concrete. Commenting on this experience, J. N. Mackall, chief engineer, Maryland State Road Commission, states that "it could not be observed that any damage whatever had been done to the concrete." In cases where earth covering had been used it was necessary to remove this earth from under the ties so that they would rest firmly and evenly on the concrete surface. With ties of uniform thickness the load was uniform. Gasoline locomotives driven by an automobile motor were employed and were operated at a comparatively low speed further to reduce impact stresses. "Shifting the track onto the slab," states Mr. Mackall "very materially facilitates the delivery of material to the work." He says further "that if industrial railways are to be employed to the best advantage, it is highly essential that they be permitted to use the concrete surface at as early a date as is possible and it is believed that five days is not too short a period." The contractor for this work was R. G. Collins, Jr., Cumberland, Md.

NEWS OF THE WEEK

New York, January 29, 1920

Fifteen Firms Unite in Plant Display at Permanent Machinery Center

Exhibit of Non-Competing Products Designed to Serve Both the Foreign and Domestic Buyer—Group of Executive Offices Established

Service to the prospective buyer of construction plant was made available in a new and progressive form this week when the Allied Machinery Center, comprising a permanent exhibit of the products of fifteen non-competing manufacturers, was formally opened by the Allied Machinery Company of America in New York City. The new center, occupying 30,000 sq.ft. of exhibition and office space at Center and Walker Streets, is the first of its kind to be established as part of an educational and sales promotion plan in the field of heavy construction plant. It is comparable, in a way, to the department store idea of merchandizing dry-goods by assembling a variety of products in one building so that the buyer may supply his needs without the inconvenience of journeying to half a dozen stores.

But the idea behind the machinery center project is a broader one than merely making it easy for the machinery buyer to do his shopping. A fundamental aim of the enterprise is the education of the plant user in sound construction economics—in using the right machine and particularly, where the size of the job warrants, the right combination of equipment for doing the work with the maximum of economy and speed. This feature of the plan, it is pointed out, has a special significance at present when the cost of common labor has soared to heights not dreamed of half a dozen years ago.

The machinery center is designed to serve the needs of both the export buyer and the domestic purchaser. With respect to the former the great need abroad is generally conceded to be an appreciation of the results obtainable by American construction methods—which means, of course, the substitution where practicable of machinery for hand labor. This lesson is still to be learned, a fact not fully appreciated by anyone who has not actually been on foreign soil and studied conditions at first hand. As a supplement to the actual machines on exhibit at the center, therefore, there will be representatives qualified to analyze the construction problems of prospective purchasers and suggest the methods and plant equipment best adapted to the work contemplated. In addition a series of motion pictures has been prepared show-

(*Concluded on page* 251)

Research Council Is Endowed In 5-Million Carnegie Gift

The Carnegie Corporation of New York has announced its purpose to give $5,000,000 for the use of the National Academy of Sciences and the National Research Council. It is understood that a portion of the money will be used to erect in Washington a home of suitable architectural dignity for the two beneficiary organizations. The remainder will be placed in the hands of the Academy, to be used as a permanent endowment for the National Research Council.

The Council is a democratic organization based upon some forty of the great scientific and engineering societies of the country, which elect delegates to its constituent divisions. It intends if possible to achieve in a democracy and by democratic methods the great scientific results which the Germans achieved by autocratic methods in an autocracy while avoiding the obnoxious features of the autocratic regime.

Reorganized since the war on a peace-time footing, it is now attempting to stimulate and promote scientific research in agriculture, medicine and industry, and in every field of pure science.

Federation of Construction Industries Plan Annual Meeting

The first annual meeting of the National Federation of Construction Industries is to be held in Chicago at the Hotel Sherman, March 24 and 25. Among the subjects of interest up for discussion at the meeting are freight traffic as affecting the construction industry; freight rates, economical packing and handling, and the shipment of construction materials; standardization in the construction industry; foreign trade, financial relations, including the question of Federal home loans; exemption from taxation of certain of the income from mortgages on real estate, etc.; jurisdiction and awards, housing, and Americanization. The committee in charge of arrangements invite suggestions for other topics to be discussed at the annual meeting. John C. Frazee, executive secretary of the National Federation of Construction Industries, has his headquarters in the Drexel Building, Philadelphia.

Forestry Station for U. of Cal.

An appropriation of $25,000 for the establishment and maintenance of a forest experiment station in co-operation with University of California is provided in a bill which has been introduced in the Senate by Senator Johnson of California.

National Federation of Engineering Societies To Be Created

Governing Boards of National Societies Informally Approve Joint Conference Committee's Report and Request Call for Organization Meeting

Pursuant to a call by Engineering Council the governing boards of the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the American Institute of Mining and Metallurgical Engineers, and the American Society for Testing Materials, being the five members of the Engineering Council, met at New York on Jan. 23 to discuss the future work and financing of Engineering Council and any other subjects germane thereto. The principal result of the meeting was a unanimous endorsement by the governing boards of the recommendations of the Joint Conference Committee and the request that the committee call a conference to bring into existence the comprehensive organization proposed.

It was also decided to request action by the individual governing boards increasing the appropriation for the work of Engineering Council from $3,000 each to $5,000, except for the American Society for Testing Materials, which would be increased from $600 to $1,000. In addition it was suggested that each of the boards take under consideration the circularization of their members, except juniors and students, asking them to contribute $2 for the support of the council, the intention being to recoup the societies for their contribution to the council's work. If the contributions exceed the quota, the excess is to go to the council.

The morning session was opened by a statement of the accomplishments of Engineering Council. The immediate discussion looked to an expansion of the council's work, with the thought that the leadership of the national engineering societies therein should in no way be compromised. There was evident from the start, however, even on the part of the older members, a desire to make concessions—in fact, to do almost anything within reason to bring about an effective coalition of all the engineering society forces of the country.

As the discussion progressed, the impossibility of getting an effective organization and one that would appeal to engineers throughout the country, if the present lines of procedure were continued or only slightly changed, became more and more evident. Gradually the idea of standing by the past was dropped or modified, the tendency being consistently toward an appreciation that in the Joint Conference report all of the factors and elements had been considered and a good solution proposed.

Resolutions Proposed

Among the first suggestions, not embodied however in the shape of a resolution, was one made by Clemens Herschel that Engineering Council be empowered to elect other societies to its membership without referring the elections to the present member societies for approval. The first resolution, however, to get effective discussion was that proposed by Philip N. Moore, saying "that a committee or council should be established which would secure representation of all national and local engineering and allied technical societies along the general lines laid down by the Joint Conference report." This brought out the point of view of the more conservative members that Engineering Council should not be prepared to step out of the field, but should be the body from which all expansion should proceed. To this other members replied that it was the autocratic constitution of Engineering Council which made it mistrusted and that nothing could be successful other than a thorough democratization of the council, which meant the abandoning of present ideas and the throwing of the matter into the hands of representatives of all the engineering societies to work out along the lines of the Joint Conference report.

An element in this discussion was the proposal by Calvin W. Rice of a resolution to the effect that the conference would look with favor on Engineering Council reorganizing itself along the lines of the Joint Conference Committee's report. This resulted in further elaboration of the point of view entertained in the local societies, and was followed by the introduction by Dr. Ira N. Hollis of a resolution providing that a committee composed of representatives of the conference and of local engineering societies be appointed to formulate in detail the report of the Joint Conference Committee, which was to be approved in principle, and that a conference be called to put into effect the recommendations of this committee, the boards of direction of national and local engineering societies being invited to attend or to send representatives. The discussion of this resolution cleared the atmosphere and brought a unanimous feeling that the only way to get effective action was to throw the matter into the hands of the Joint Conference Committee and ask it to father a meeting that would proceed to organize in accordance with the recommendations of its report. Accordingly the Resolutions Committee was requested to take the matter in hand and in conformity with the sentiment of the meeting draft a brief resolution setting forth the matured conclusions of the conference. After a recess to allow the committee to draft the resolution, the body reconvened and, without discussion, adopted the following preamble and resolution:

"Whereas, This conference of national engineering societies has considered the recommendations of the Joint Conference Committee of the four founder societies, Therefore, be it

"Resolved, That the conference adopts in principle that report and requests the Joint Conference Committee to call without delay a conference of representatives of national, local, state and regional organizations to bring into existence the comprehensive organization proposed."

This resolution, it will be noted, makes no reference to Engineering Council. The matter is placed, through the medium of the Joint Conference Committee, entirely in the hands of the conference which is to be called.

During the discussion the representatives of the American Society of Civil Engineers explained that approval of the Joint Conference Committee's report had been referred to letter ballot of the society's members, and that such letter ballot would exceed in authority whatever informal approval the civil engineers board might give in this meeting.

Mississippi Valley States Will Discuss Concrete Roads

A joint conference on concrete road construction will be held on Feb. 3 and 4 in Chicago, under the direction of the Association of Mississippi Valley State Highway Departments. On Feb. 3, an evening meeting will be devoted to showing stereopticon and motion pictures of road structures, designs and plans and of current methods of constructing concrete roads. On Feb. 4, there will be an open discussion on the following topics: Methods of Letting and General Contracting; Methods and Arrangements; Who Shall Furnish the Materials; Payments for Materials Delivered on the Road; Unloading Aggregate from Cars; Producing Materials Locally by Portable Plants; Plants and Plant Layouts; Bulk Cement and Cement Storage; Various Hauling Methods; Stock Piles, When and Where; Preparing the Subgrade; The Forms; The Mixer; Finishing by Hand or by Machines; Curing, and Acceptance and Payments.

Langfitt's A. E. F. Report In Big Demand

The demand for the Historical Report of former Major General W. C. Langfitt, Chief Engineer of the American Expeditionary Forces, and of which a limited edition was printed recently, is so great that a request has been made to Congress that the report be published as a public document. At the Engineer Corps office, more than 1,000 requests for this book are on file. In addition to the demand from individual engineers, many requests for copies are coming from schools and colleges.

Wants Architects To Control Delaware Bridge

Art Commission Says Engineers Are Not Broad Enough To Decide "Where" and "What"

"Certain broader aspects" of the question of the proposed bridge across the Delaware River at Philadelphia have been called to the attention of Governor Sproul of Pennsylvania, by a letter from the State Art Commission. The main purport of the letter is that the engineer is too limited in his appreciation of the problems of art and bridge location to be entrusted with the control of the proposed structure, and that the architect "has the proper training," so the project "should be confided to such a person."

The letter is signed by the Secretary of the Commission. The main text, as published in the Philadelphia newspapers, is as follows:

> The State Art Commission has been giving serious consideration to its relation and duties to the furthering of the great project of the Delaware River bridge.
>
> While on the surface a bridge is a structural or engineering problem, for patently it must stand up and do its work, there are other underlying questions which must be answered before anything can be built We are convinced that the question of "where" and "what" are of greater importance, and more difficult to answer, than "how" to build it.
>
> The question "where," meaning location, can only be really answered after a complete study of the city plan has been made. This study will be undertaken by the City Planning Commission authorized by the new city charter. Should the location be determined without reference to such a study, the Delaware River bridge will become another of the given difficulties complicating such study.
>
> The question of "what" to build, meaning size and kind of structure, can really only be answered after a determination of the kind of service which the bridge will have to perform. As the bridge will be the principal link with that part of Philadelphia's metropolitan district which lies in New Jersey, the zoning or distribution of population, as it will be, must be considered. This will doubtless be done by Philadelphia's Zoning Commission or possibly by a commission of the metropolitan district which has been recommended. Should the bridge be designed without consideration of these matters, it will not be a success, however well built, or however beautiful.
>
> We believe that more of the success of the Delaware River Bridge project depends on the right answer to these questions than on the actual structural problem, of the "how," which is to our mind after all but a detail.
>
> We take the liberty of calling your attention to these aspects of the case as you have been good enough to entrust the duties of the Art Commission to us. It is our conviction that this problem demands the most careful study from every angle. We ask you to seriously consider the advisability of appointing as the head of the Commission on Design of the Delaware River Bridge, a man who by his training is competent to study the "where" and "what," rather than one eminently fitted as regards the "how."
>
> The great bridges of New York have all been planned by architects, though, of course, built by engineers. They are beautiful because they fulfill their purpose, and are fittingly designed, with due consideration to the "where" rather than only the "how." We have in Philadelphia over the Schuylkill for the Pennsylvania Railroad and the Rapid Transit Company, an assortment of bridges which, for pure cheapness we believe cannot be equalled. They exemplify the results of the "how" method perfectly.
>
> To avoid similar results is, of course, the wish and object of all. The type of mind that is trained to study and solve a problem from all its aspects, is the type most likely to steer this problem straight. An architect has the proper training to do this and we, therefore, urgently advise that the direction of the project be confided to such a person.

Fifteen Firms Unite in Plant Display at Permanent Machinery Center

(*Concluded from page* 249)

ing approved practice in the use of machinery in all of the representative types of construction work, such as roadbuilding, earth handling, concrete construction, etc. For the foreign buyer expecially this feature, it is believed, will prove highly desirable, for it will indicate to him that methods of construction in which the machines on exhibit are actually being employed, and which may be entirely unfamiliar to him, are not theories but real facts.

The machinery center consists of two parts. The main display of equipment is staged on the ground floor, while each of the companies forming the pool of exhibitors has an executive office on the second floor. The range of products covers concrete mixing and distributing equipment, mechanical loaders, steam shovel, trench excavator, road-roller, steam boiler, hoisting engine, saw mill, shovels, wheelbarrows, lighting devices for night work, steel forms, industrial track, locomotives, electric transfer trucks, gasoline motors, earth moving equipment including scrapers and cars.

The following firms are represented at the Machinery Center:

Austin Manufacturing Co.; Austin-Western Road Machinery Co.; Barber-Greene Co.; Carbic Manufacturing Co.; C. H. & E. Manufacturing Co., Inc., Clyde Iron Works; Cook Motor Co.; A. B. Farquhar Co., Ltd.; Hydraulic Pressed Steel Co.; Lakewood Engineering Co.; Parsons Co.; Sterling Wheelbarrow Co.; Thew Automatic Shovel Co.; Western Wheeled Scraper Co.; Wyoming Shovel Works.

At a luncheon given Jan. 27 to celebrate the opening of the Allied Machinery Center the speakers included Joshua W. Alexander, Secretary of Commerce, Senator Edge, W. L. Saunders, George Edward Smith, and former Secretary of Commerce W. C. Redfield.

That Government and business must begin at once to work in close co-operation if the opportunities of American industry, particularly as regards export trade, are to be fully realized, was the keynote sounded in the addresses of the several speakers. The chief problems touched upon by Secretary Alexander were those of providing adequately for an American merchant marine and of aiding foreign countries in their problems of reconstruction. With regard to the former, the Secretary of Commerce is a strong believer in the expansion of American shipping activities, but he declared emphatically against any policy which would keep such operations closely under Government management rather than instrust them to private initiative and control. Mr. Alexander also warned against the continuation of the practice of large foreign loans as a means of readjusting exchange rates.

This point was further discussed by Senator Edge. Stabilization of rates of exchange and the stimulation of foreign trade, he stated, can best be accomplished, not by loans, but by the general participation by the American public in the purchase of foreign securities. This means, he stated, offers the quickest and most practical solution to the problem of international co-operation in the work of reconstruction. Senator Edge is keenly aware of the burdens which weigh upon industry in the form of income taxes. In his opinion they must not be increased. He expressed himself forcibly in favor of elmination at the earliest possible date of the present taxes on excess profits.

Not only was the purchase of foreign securities endorsed by George Ed Smith, president of the Royal Typewriter Co., but a plan of wholesale advertising in the daily press, similar to that in the Liberty Loan drives, was sugested by him as the best way of accomplishing the results. He cited as one instance of the startling conditions created by the present abnormal conditions of shipping and rates of foreign exchange the fact that Italy was compelled to pay $33 a ton for coal received from this country. "We must create in this country," said Mr. Smith, "a market for the securities of France, Italy and our other allies. We can do so only by using American methods of selling the plan. That means a big program of advertising. The foreign securities must be taken up not only by the big banker and manufacturer but by the man in the street. This help can be obtained only by means of a widespread campaign of education in the daily press."

The meeting was presided over by Charles F. Lang, president of the Lakewood Engineering Co. and was attended by about 150 representatives of the firms participating in the exhibit at the Allied Machinery Center and their guests.

Philadelphia Mayor Supports Camden Bridge in Special Message

A special message was read by Mayor J. Hampton Moore of Philadelphia before the City Council on Jan. 13, advocating the immediate appropriation of $500,000 by the city for the projected Delaware River bridge to connect the city with Camden. With this appropriation the city's money contribution to the enterprise would equal that of the state, under an arrangement whereby state and city are to share half the cost of the structure and the land cost of the west approach. The mayor in his message strongly urged the desirability of carrying the bridge project through, saying, "We cannot afford to fall behind other great areas of population bisected by waterways, which have provided for expansion by bridge or tunnel construction. It is up to us to provide here for an expansion both of population and of industry which can result only in a greater Philadelphia."

Senate Opposition to Col. Beach's Confirmation as C. of E.

(*Washington Correspondence*)

Some opposition may develop in the Senate to the confirmation of Colonel Lansing H. Beach, as Chief of Engineers. It is anticipated, however, that this opposition will not be strong enough to prevent his confirmation. Some Senators who are interested in putting through the National Department of Public Works have heard that one of the reasons for the recommendation of Colonel Beach as head of the corps is the fact that he is known to favor strongly the retention of river and harbor work by the Engineer Corps. Those of the high officials of the War Department who are anxious to see civilian work retained by the Engineer Corps are said to have insisted on jumping those members of the corps who rather incline to confining the activities of the Engineer Corps to works of a military character. It is expected that the Senate Committee will inquire as to why the seniority rule was set aside in favor of a man who has no war record. Colonel Beach has not been with troops for more than twenty years.

Some are of the opinion that Colonel Edgar Jadwin will succeed Colonel Beach as District Engineer of the Central Division with headquarters at Cincinnati. It also is probable that he will succeed him as well as a member of the Mississippi River Commission.

Name Road Committees of National Research Council

At a meeting of the Engineering Division of the National Research Council in New York City, Jan. 22, a thorough program for research in the field of road construction and highway economics was inaugurated. The division, which operates under the chairmanship of Prof. C. A. Adams, prescribed the duties and appointed the chairmen of three highway research committees in accord with a plan proposed by Anson Marston, dean of engineering in Iowa State College.

Prof. Marston's program contemplates the naming of six committees, in all, for road study. He was placed in charge of the division's highway research and it is believed that he will name the remainder of the technical personnel necessary to complete committees planned.

Of the three committees already named by the Engineering Division, only the chairmen have been appointed. They are as follows: Committee on Economic Theory of Highway Improvement, Prof. T R. Agg, Iowa State College, chairman; Committee on the Structural Design of Roads, A. M. Goldbeck, engineer of tests, Federal Bureau of Public Roads, chairman; Tests and Properties of Road Materials, H. S. Mattimore, engineer of tests, Pennsylvania State Highway Department, chairman.

Routine Proceedings In Annual Meeting of Am. Soc. C. E.

The proceedings of the morning business session on the first day of the annual meeting of the American Society of Civil Engineers, held in New York City Jan. 21 and 22, were mostly routine matters, and because of lack of space were omitted from *Engineering News-Record's* account of the more important matters connected with the Development Committee's report, as given in detail last week. A summary of the reports and discussion, not previously covered, follows:

The year, financially, has not been so difficult for the Society as last year, according to the report of the Board. The deficit of $20,000 on last year's business has been paid in full and while a temporary loan had been negotiated last autumn for the payment of current bills, the amount was less than necessary for a similar purpose in 1918. Arrangements have been made, effective Feb. 1, 1920, for a reduction in the rate of interest on the $200,000 mortgage debt on the 57th St. Society house from 6 per cent to 5 per cent. Disbursements for the year totaled $218,337.73, including $20,545 for United Engineering Society activities and $36,829.88 for publications.

As a war measure it was decided that no volume of the *Transactions* should be issued in 1919, but it is expected that publication will be resumed this year, according to the report of the Board. The Year Book for 1920 will carry a single alphabetical list of members, without division as to grades of membership, in accordance with the vote of the Society. The Year Book will contain the Roll of Honor to provide a permanent record of those who took part in the war. During the year the Engineering Societies Employment Bureau interviewed more than 20,000 men, of whom 5,377 were registered with the Bureau and 1,256 known to have been placed. A continually increasing use of the Engineering Societies' Library is indicated by an annual attendance of 22,042 for 1919, and the work of the Library's Service Bureau has been considerably expanded.

Following the visit of the engineering delegation to France, a permanent Franco-American engineering committee has been formed of two members appointed by each of the four founder societies.

The following announcements were made of the award of prizes: Norman Medal to Colonel William Barclay Parsons for his paper, "The Cape Cod Canal"; Croes Medal to D. B. Steinman for his paper, "Stress Measurements on the Hell Gate Bridge"; Rowland Prize to O. H. Ammann for his paper, "The Hell Gate Arch Bridge"; Laurie Prize to F. W. Gardiner and A. Johannesson for their paper, "The Manhattan Elevated Railway Improvements," and the Collingwood Prize for Juniors to Floyd A. Nagler for his paper, "Obstructions of Bridge Piers."

A progress report was submitted by the Committee on Bearing Value of Soils for Foundations and it was voted that the work of the committee should be continued. The report pointed out that lack of existing information has made it practically impossible to coordinate results and, therefore, an entirely new start has been made based upon the recommendations of J. H. Griffith, engineer physicist of the United States Bureau of Standards. The committee submitted a tabulation of replies for allowable bearing value of soils in various cities, as well as a standard type of field testing apparatus. The committee made no expenditure in 1919, but it was stated that $3,000 could be used in the near future.

The Committee on Stresses in Railroad Track submitted its second progress report in the form of an extensive outline of tests conducted to determine stresses in rails and ties, with particular reference to speed and the effect of locomotives counter-balance weights. The tests indicated stress distribution in the roadbed. Professor A. N. Talbot, chairman of the committee, stated that the results "should lead to some modifications in railway practice." It was voted that the report be accepted and that the committee continue its work.

No report was presented by the Committee on the Regulation of Water Rights, and after some debate the meeting voted to refer authority to the Board of Direction to discharge the committee if such action should seem desirable after investigating its alleged inactivity.

The special committee on highway engineering was appointed by the Board during the year to keep in touch with the Government's plan for constructing highways and to advise the Society by periodic reports. Other committees in existence during the year were those on: Present practice on the bearing value of soils for foundations; regulation of water rights; stresses in railroad track, and the Committee on Development.

On motion of Lieutenant Colonel F. W. Scheidenhelm it was voted as the sense of the Society that there should be appointed a committee on Water Power Development.

Frank S. Sprague introduced a plea for an increase of pay for men in the military and naval services.

Wood Preservers Meet

The sixteenth annual meeting of the American Wood-Preservers' Association will be held at the Hotel Sherman, Chicago, Feb. 11 and 12. The Association announces that, to everyone interested in the economic position of treated wood, as a factor in conserving forest resources or in maintenance of transportation, the meeting offers unusual opportunity for profit. The program includes a great many technical reports and papers on the preservation of wood.

Contributions from the National Public Works Department Association

By M. O. Leighton, Chairman

PUBLISHER'S NOTE: *The space occupied under this caption is donated to serve as a means of frequent and intimate communication between the National Public Works Department Association and the members of the profession. The contributor takes full authority for the statements made.*

PUBLIC WORKS VS. PUBLIC WASTES, OPENING ADDRESS, PUBLIC WORKS CONVENTION, WASHINGTON, D C., JAN. 13, 1920

Ships always leak. The finest vessel afloat must occasionally operate its bilge pumps. It is a routine incident in ship operation, expected as a matter of course. Water is always coming into the ship, while it is afloat, but it causes no alarm among the passengers and hardly any comment among the crew. But let that leak increase in volume beyond a certain rate and it becomes the crucial feature of the ship's run. Those who are aware of it are greatly concerned.

In like manner all ships of State leak, but the direction of leakage is reversed. Money, for which there is no adequate return to the passengers and crew, weeps through the seams, even if it does not run out through open ports. No one takes a thought so long as this leakage is slow and well distributed. It is tolerated so long as the taxpayer is not pinched to make good the loss. But, as in the case of marine operation, there comes a time when the leakage becomes so great that the taxpayer takes thought of his improvident ways and begins to investigate and protest.

Our Government has always been wasteful in the conduct of its business. This has not been the result of any wrongful intent. Throughout a long period of years it has been accepted by the majority and the occasions have been sporadic when much though has been given to it. Wealth usually begets thoughtlessness as to small wastes. So long as our bank balance is large we are not likely to be vigilant as to the price we pay. A few cents more per pound, a few dollars more per yard are paid without thought or hardship. And this was particularly true with respect to Government expenditures when we lived under an indirect system of taxation. Waste of ten million dollars by the Government was hardly appreciable when spread over the price of 10 million pounds of sugar, 10 million pounds of wool and millions of pounds of everything else that we bought in the open market. But now our system of taxation is direct. Every individual of more than nominal earning capacity is presented by the Internal Revenue Office with a bill for his share. And when our annual peacetime budget runs up to $5,000,000,000, as presented by the Secretary of the Treasury a few days since, we begin to think about that leakage. We begin to look for open ports.

That five billion dollar estimate will be pruned—severely pruned. That means that we must go without some things that wise and prudent men think we need or that it would be to our advantage to have. Are we then so poor as all that? No one believes that we are, and yet our bill is so large that it pinches us to pay. The answer is that we are paying too much for what we get. The appropriations committees in Congress will spend the greater part of their time for the next three or four months in pruning those estimates —a laudable and necessary thing to do under the circumstances. But those hard-working men are saving at the spigot and wasting at the bung-hole. We here assembled are asking them to do the obvious thing. Give the Government a business-like organization. Co-ordinate the functions so that the processes of Government business shall dovetail. Cut out the wastes and the duplications. Abolish the rivalry between departments. We advocate a Department of Public Works not merely to secure technical symmetry in our Federal organization, desirable as that end may be. Our advocacy is, in its essential features, an attempt to close some of those open ports.

When this organization was set up at Chicago I think that none of us—certainly not the speaker—had an adequate idea of the scope of the movement. We saw a loose and inefficient public works organization, divided and sub-divided into many different provinces. As technical men we knew how organically wrong that was. Of the wastes and inefficiencies we were well aware. With the necessity for a co-ordinated structure, by virtue of which the technical and semi-technical fields of the Government could be rendered efficient and business-like, we were profoundly impressed. But that our effort, our idea, our legislative bill would become the cornerstone of a structure embodying efficiency in all departments of Government we could hardly foresee. As an organization our effort is still focused on a Department of Public Works and that alone. But we realize that with that principle established—that example set—reform in other provinces of Government business activity will occur by the mere logic of events. We are pioneers.

This is the reason why our project for a Department of Public Works strikes straight home to the business man, the manufacturer, the contractor and the merchant, all of whom are represented here today. The technical men who met at Chicago last April to set up this organization built better than they knew. While the project retains all the virtues that appealed to us when it was launched—of technical excellence, of rational government organization, of economy and efficiency, we now see that it reaches to national and to business prosperity, to the fiscal welfare of the nation, to the individual welfare of the productive business.

We may as well recognize and admit the fact that individual initiative in America will not continue to be that spontaneous thing that it has been in the past if the rewards are to be divided and a part of them are to be wasted in the support of a chaotic Government business organization. The burdens of every business organization in the country are magnified by Government business inefficiency. We want no good and proper thing to be withheld from our Government nor in turn by our Government. When the time comes for this country to be a $5,000,000,000 country we'll all turn out and pay the bill. But we want true consideration in return for our money. And in mild and respectful suggestion let me say to the political party leaders of the country that the voter who goes to the polls in the future will be thinking more about the size of that annual bill from the Internal Revenue Office and of what the country is getting for it than he will of almost any other national issue—a sordid impulse perhaps, but very human, and very certain and sure.

We are here to resurvey our premises, to review our efforts, and to plan our future course. We are here to expand our organization, to welcome new lines of membership and to establish our cause in the minds of those who doubt. This is a business meeting. We are here to work. Our program is sparsely embellished with social and oratorical periods. We have some very tangible things to work out. The future of this movement will be determined here.

Heretofore our work has been largely educational. Now it must become a positive legislative force. We need the participation of every individual here every minute of the allotted time. The thoroughness with which you do the things allotted to you will be the measure of our success now and in the future. Let us see to it that Washington shall harbor one convention in which the effort and attendance of every delegate is 100 per cent. And let us bear in mind that while we are advocating efficiency in Government performance it may be well for us to set a good example.

Newell on Chamber of Commerce Committee

In a news item published in *Engineering News-Record*, Jan. 22, the name of Prof. F. H. Newell, president of the A. A. E., was omitted from a list of members of a committee of the U. S. Chamber of Commerce, appointed to consider a local Chamber of Commerce referendum of the National Department of Public Works movement.

Drane of Florida, Not Davis

In a personal note published Jan. 15 the *Engineering News-Record* transmitted the misinformation that N. H. Davis of the University of Florida was retained by the Commissioners of Smith County, Tenn., as Engineer of Highways. It is Walter H. Drane, and not Prof. Davis, who was retained.

New York City Postpones Action on Interstate Port Control

By a vote of 14 to 2 the Board of Estimate of the City of New York on Jan. 24 voted to postpone action on the proposed treaty which would put control of New York harbor in the hands of an interstate body. The matter was brought before the board by a legislative committee from both New Jersey and New York which presented a revised version of the treaty prepared by the New York-New Jersey Port and Harbor Development Commission. The Board of Estimate did not debate the matter long but individually the members seemed to feel suspicious of the safeguarding of the city's rights and property under the proposed scheme. The resolution adopted agreed to postpone consideration of the matter until the joint port commission should be prepared to lay before the city a detailed comprehensive plan for the development of the port under the terms of the treaty. The future of the treaty is in the hands of the legislative committees which have not forecast their action.

Idaho Society Merges with A. A. E.

The Idaho Society of Engineers was reorganized as the Idaho chapter of the American Association of Engineers at the annual meeting held at Pocatello, Jan. 12. A charter granting state jurisdiction has been issued by national headquarters, but the constitution and bylaws adopted at the Pocatello meeting provide for the formation of local clubs having broad prerogatives as to their own activities. Every member of the Idaho Society of Engineers, who so desires, automatically becomes a member of the A. A. E. and every member of the latter in the state becomes a member of the Idaho chapter.

Officers were elected as follows: President, E. B. Darlington, chief engineer, North Side Land & Water Co., Jerome; first vice-presidents, Dr. C. N. Little, dean of engineering, State University; E. E. Mobley, bridge engineer, Oregon Short Line Railroad; secretary-treasurer, Capt. E. S. Ayers, State Highway Department, Boise; executive committee, J. H. Wilson, city engineer, Idaho Falls; Harry Dibble, project manager, U. S. Reclamation Service, Burley; Allen C. Merrit, Salmon City.

Papers on the program included "Testing Materials Used in Highway Construction," by Raymond Harsh; "Present and Future Problems Confronting Idaho," by William J. Hall, commissioner of public works; "Outline of Federal Highway Co-operation," by C. H. Purcell, Bureau of Public Roads; "Highway Structures," by J. E. Kirkham, structural engineer, S. Dak.

Salaries of Engineering Teachers

A committee on the salaries of engineers in teaching service has been appointed by the A. A. E. Prof. C. J. Tilden, Yale University, is chairman.

Engineers Receive Pay Increases

By passing the transit construction commissioner's budget for the first half of 1920, the Board of Estimate of New York City on Dec. 31 approved pay increases for the engineers of the transit construction staff. Except for men of $3,750 grade and upward, some of whom received an increase of $250, the increases ranged from $300 up. A bonus of $100 per year, which has been paid since last July to employees who have continued in the service since October, 1918, terminated with the new year, and is replaced by the salary increases.

This result is the outcome of the agitation of engineering organizations, led by the local chapter of the American Association of Engineers, and the Rapid Transit Engineers' Section of the Association, which latter now has about 200 members. L. B. Smith represented the A. A. E., C. W. Baker represented Engineering Council, H. C. Keith the Brooklyn Engineers' Club, and E. P. Doyle the Real Estate Board of New York. In spite of the presentment of facts made by these men, the Board of Estimate delayed action until the last moment. On Dec. 30, at its last regular meeting of the year, it failed to act on the budget, and at the board's adjournment there seemed to be the same situation as existed a year ago, when several hundred of the rapid transit engineers found themselves out of employment on Jan. 2 through failure of the Board of Estimate to make the necessary appropriation. This time, however, the engineers' representatives called the matter to the Board's attention at the moment of adjournment, and a special meeting was called for the following day, when the appropriation was voted.

Civil Service Examinations

United States

For United States civil service examination, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the Civil Service Commission, for form 1312.

Chief of Road Survey Party, $1,800 to $2,100 per year. File application before Feb. 10, 1920.

Transitman for road survey, $1,200 to $1,800 per year. File application before Feb. 10, 1920.

Highway draftsman, $1,200 to $1,800 per year. File application before Feb. 10, 1920.

Topographic and subsurface draftsman, Grade 1, $5.20 per day; Grade 2, $6 to $7.20 per day. File application before Jan. 27, 1920.

Ceramic assistant, to fill a vacancy at the Ceramic Experiment Station in the Bureau of Mines, Columbus, Ohio, $1,200 to $1,800 per year, and to fill vacancies in positions requiring similar qualifications. File application before Feb. 10, 1920.

Canada

The Civil Service Commission of Canada will receive applications from residents of Canada, qualified to fill the following positions:

Shipyard superintendent, Sorel, P. Q., salary $3,000.

Foresters, salary $1,680.

Junior engineers, initial salary $1,680.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

AMERICAN ROAD BUILDERS' ASSOCIATION, 150 Nassau St., New York City; Feb. 9-13, Louisville, Ky.

AMERICAN WOOD-PRESERVERS' ASSOCIATION; Secretary-Treasurer, F. J. Angier, Mt. Royal Station, Baltimore; Feb. 10-12, Chicago.

AMERICAN CONCRETE INSTITUTE; Secretary Harvey Whipple, New Telegraph Bldg., Detroit; Feb. 16, 17, 18, Chicago.

NATIONAL CONFERENCE ON CONCRETE HOUSE CONSTRUCTION; Secretary A. J. R. Curtis. 111 West Washington St., Chicago; Feb. 17, 18, 19, Chicago.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA; 111 W. Washington St., Chicago; Feb. 18-19, Chicago.

AMERICAN CONCRETE PIPE ASSOCIATION; 210 South La Salle St., Chicago; Feb. 20-21, Chicago.

AMERICAN RAILWAY ENGINEERING ASSOCIATION; 1426 Manhattan Bldg., Chicago; March 16-18, Chicago.

AMERICAN ASSOCIATION OF ENGINEERS; Secretary C. E. Drayer, 29 S. La Salle St., Chicago; May 10, 11, St. Louis, Mo.

The Detroit Engineering Society, in joint meeting with members of the American Institute of Electrical Engineers and members of the American Society of Mechanical Engineers on Jan. 9, in Detroit, was addressed by David Hall, designer and engineer for the Westinghouse Electric & Mfg. Co. The address, illustrated with lantern slides, was on the subject of design and application of electric propulsion equipment for submarines, special reference being made to a new double-armature motor designed for use in the latest types of submarines.

The Minneapolis Engineers' Club held its annual meeting in Minneapolis, Jan. 19, and elected A. C. Godward, president; H. J. Myer, vice-president, and Lewis Clousing, secretary-treasurer. The program of the evening was a symposium on city planning, led by Prof. F. H. Bass, University of Minnesota, and discussed by local architects, engineers and town planners.

This subject has become a vital question in Minneapolis. The mayor had appointed a city planning commission in accordance with a legislative act of the last legislature, but the Council had refused to confirm the appointment. One of the councilmen had said, "This Council is gradually delegating its powers to various boards; in a short time we will have nothing left to do. I move this matter be laid on the table," and this had been done.

The club passed a resolution upholding the mayor in his appointment of the commission and appointed a committee of five to appear personally before the Council and urge it to confirm the appointment as a vital necessity for the progress of the city.

The Engineers' Club of Trenton is arranging an industrial service program consisting of twelve lectures for the winter months.

The Northwestern Association of General Contractors will hold its annual convention at Minneapolis, Minn., Feb. 23 and 24.

The Rochester Engineering Society at its weekly luncheon, Jan. 20, was addressed by LeGrand Brown, deputy city engineer of Rochester, N. Y., on the subject of "Automatic Block Systems and Train Rule Instructions."

The Northwest Society of Highway Engineers, at its recent convention in Salem, Ore., elected G. V. Skelton, president; R. A. Klein, vice-president, C. G. Reiter, treasurer; C. B. McCullough, secretary, and C. H. Purcell and S. H. Probert, directors. Attendance at the convention totalled 115. The next meeting will be at Corvallis, Ore., March 13.

The Charleston Chapter, A. A. E., was organized Jan. 13, and at the same the members elected C. K. Harvey, president; G. E. Taylor, Wm. Brewster and C. M. McVey, first, second and third vice-presidents, respectively; C. B. Holchan, treasurer, and G. A. Cunningham, secretary.

The Maine Society of Civil Engineers will hold its annual meeting in Portland, Me., Feb. 4. Beside a business session, an excursion, a luncheon and a banquet the program will include the following papers: "City Charter of Auburn," by H. J. Cook, Street Commissioner of Auburn, Me.; "The Construction and Operation of Plant of the Portland Water District," by David Moulton, Attorney for Portland Water District; "Manufacture of the Warren Standard Printing Papers," by Joseph A. Warren, Mill Manager of the plant of S. D. Warren Co. at Cumberland Mills.

Knoxville Chapter, A. A. E., at a recent meeting, elected Prof. N. W. Dougherty, president; L. W. Frierson and W. W. Carson, Jr., vice-presidents; Campbell Wallace, treasurer, and E. S. Davis, secretary.

The American Concrete Institute's annual convention in Chicago, Feb. 16, 17 and 18, will have reports of a number of new committees on special concrete problems which have recently been organized by the Board of Direction. These comprise a Committee on Contractors' Plants, on the Standardizing of Specifications for Steel Bars for Concrete Reinforcement, on the Standardization of Units of Design, on the Determination of Proper Unit Values for Vertical Shear in Concrete, and on Different Types of Concrete Floor Finish. Already the Institute has sent out the report of the Committee on Shear and the revised report of the Committee on Concrete Surfaces, which contains a specification for stucco, changed in some slight ways only from the admirably recommended practice which was submitted on that same subject to the Institute last June. Another committee is working on concrete storage tanks and will present an important report in relation to tanks and the storage of fuel oil. Other committees which will report more than progress are those on building blocks and cement products, concrete roads and pavements, concrete aggregate, reinforced-concrete chimneys, concrete sewers, concrete industrial houses, and on fireproofing. The convention is to be held the same week as the National Conference on Concrete House Construction. Monday, Feb. 16, will be entirely devoted to Concrete Institute matters, and on the other two days the sessions will overlap those of the conference.

The Associated Engineers of Spokane have elected the following officers for the year 1920: L. K. Armstrong, president; J. E. E. Royer, E. G. Taber, R. S. Ord, vice-presidents and A. D. Butler, secretary and treasurer.

The Engineers' Club of St. Louis has elected W. E. Rolfe, president for 1920. By virtue of that office Mr. Rolfe will also assume the presidency of the Associated Engineering Societies of St. Louis, which includes the Engineers' Club and the local chapters of the national societies of engineers.

The Detroit Engineering Society held a meeting Jan. 23 at which Martin J. Kermer of the Cannon-Swenson Co., consulting and contracting engineers, delivered an address on "The American Beet Sugar Industry." At a meeting of the society to occur Feb. 6 Prof. Clyde T. Morris will give a talk on "Stress Measurements."

The Albany Society of Civil Engineers held its annual banquet in Albany, N. Y., Jan. 27.

PERSONAL NOTES

Rudolph J. Wig, S. C. Hollister and L. R. Ferguson have formed the firm of Wig, Hollister & Ferguson, engineers, with offices in the Widener Building, Philadelphia, Pa. Mr. Wig for a number of years was engineer-physicist in the United States Bureau of Standards, and at the beginning of the war was assigned to the investigation of concrete ships and later was made head of the Concrete Ship Section of the Emergency Fleet Corporation, which position he held until last fall, when he resigned to enter private practice. Mr. Hollister had his early experience with the Corrugated Bar Co., as an instructor in the University of Illinois, and in structural work on the Pacific Coast. He, too, was associated with the Concrete Ship Section of the Emergency Fleet Corporation, particularly with the design and construction of concrete barges. He was one of the contributing authors to Hool & Johnson's "Concrete Engineers Handbook." Mr. Ferguson, following some experience in engineering and contracting work, became assistant secretary of the Association of American Portland Cement Manufacturers and later was engaged in very extensive investigation work for its successor, the Portland Cement Association. About five years ago he and Mr. Wig made an extensive tour of the country in investigation of concrete in sea water and alkaline waters. The results of the former investigations have been reported in a series of papers on concrete in sea water which were published in *Engineering News*. During the war Mr. Ferguson was general manager of the Liberty Shipbuilding Co., which was building concrete ships for the Government at Wilmington, N. C.

Chas. Evan Fowler, bridge and consulting engineer of New York, has opened an office in Detroit as chief engineer in connection with a proposed suspension bridge across the Detroit River. Mr. Fowler is engaged on preliminary work in planning this bridge and also on a traffic survey. He has designed several large bridges throughout this country, Canada and Alaska, among them are the Niagara railway arch bridge and the San Francisco-Oakland cantilever. It is estimated that the Detroit-Windsor bridge would cost $28,000,000 and require four years for construction.

William S. Caruthers, formerly division engineer California Highway Commission, in charge of the division centering at Sacramento, has been granted a year's leave of absence and has undertaken the duties of Sacramento County Highway Engineer, succeeding R. M. Morton. George R. Winslow, who has been Principal Assistant Highway Engineer since the formation of the California State Highway Commission, has been appointed division engineer in the Sacramento division to succeed Mr. Caruthers. Mr. Winslow's appointment became effective as of Jan. 15.

Prof. R. B. Ketchum, dean of the department of civil engineering, University of Utah, has been granted a leave of absence to become the chief engineer of the Soldiers' and Sailors' Memorial bridge across Parleys Canyon on the Bonneville Highway. Howard L. Baldwin is active head of the department, with Clarence C. Jacob as associate. Details in the design of the bridge which will be 200 ft. high and 900 ft. long, will be made by Ware & Traganza, architects, and Frank M. Allen, engineer.

Sir William Hearst, formerly Premier of Ontario, has been appointed a member of the International Joint Commission on Waterways, to fill the vacancy caused by the resignation of P. B. Mignault, K. C.

Wencel L. Cukerski, landscape gardener of Grand Rapids, Mich., has been notified that he attained the highest grade in the recent civil service examination for Government recreational engineer, and his early appointment is expected. The duties of the position call for the supervision of utilities layouts in National parks and forests in order to secure the most pleasing scenic effects.

Carroll R. Thompson, formerly principal assistant engineer in the Department of Wharves, Docks and Ferries, Philadelphia, has been named Assistant Director of the Department. He succeeds Joseph F. Hasskarl.

Arthur Parker is the new city engineer of Cheyenne, Wyo.

Hale Holden, regional director, of the Central Western Region of the Railroad Administration's organization, has been elected president of the Chicago, Burlington & Quincy Railroad and the Colorado Southern Railroad, the election to be effective upon the termination of his connection with the Railroad Administration. At the request of the Director General, Mr. Holden has consented to continue as regional director for the present and will probably serve until the end of Federal control.

C. W. Beach by a decision of the Colorado Supreme Court has replaced E. R. Chew, as irrigation engineer for division No. 2, Colorado.

Prof. Robert W. Thoroughgood, of the Delaware State Highway Department, has been appointed head of the Civil Engineering Department in Delaware College to succeed Prof. Allan R. Cullimore, resigned.

Major Bjarne H. Graff has taken up his duties as division engineer of the first district of the Georgia State Highway Commission, with headquarters at Savannah.

George S. O'Dell is the new city engineer of South Charleston, W. Va.

E. H. McMillan has been appointed county road engineer for Gilmer County, W. Va.

James F. Platt has been appointed chief engineer of the Wyoming State Highway Department. Mr. Platt has been with the State Highway Department for almost a year, his work previous to that time being with the Chicago, Milwaukee & St. Paul, and the New York Central railroads.

W. Edwin Florence, former New Jersey State Senator, has been appointed a member of the New Jersey State Board of Conservation and Development, succeeding J. Kerney Rice.

Chauncey Wernecke, formerly designing engineer on port work in Seattle, has accepted the position of structural engineer on the Skagit River power project which is being planned for the City of Seattle. His work is being done under the direction of C. F. Uhden, the city's chief engineer on the project.

EDWARD M. BURD, former Captain, C. A., U. S. Army, and William C. Giffels, former First Lieutenant, have opened an engineering office in Grand Rapids, Mich., under the name of Burd & Giffels. Before they entered the service, Mr. Burd was for several years with Gardner S. Williams, the Turners Falls Power and Electric Co. and the Chicago Engineering Co., and Mr. Giffels was with the L. E. Myers Co., and the Chicago Engineering Co.

GLENVILLE A. COLLINS, former Northwest manager of the Welman-Seaver-Morgan Co., which position has been discontinued by the company, has opened an office for general practice in mining, civil and mechanical engineering, including material handling problems, in Seattle, Wash. He has also established branches in Portland, Ore., and in Tokio, Japan, and Shanghai, China.

ROBERT E. BARRETT has been elected second vice-president and treasurer of the Holyoke Water Power Co., at Holyoke, Mass., and has resigned his former position of construction engineer with the Turners Falls Power and Electric Co. and general manager of the Connecticut River Conservation Co. Mr. Barrett assumes his new duties Feb. 1.

DR. EDWARD ARDERN, F. I. C., formerly chief chemist, is now consulting chemist to the Rivers Committee of the Manchester Corporation, Manchester, England. He has joined S. E. Melling, F. I. C., consulting chemist to the Salford Corporation, and public analyst for the County of Cheshire, England, in practice as analytical and consulting chemist in Manchester.

J. H. SAWKINS, formerly designing engineer with the General Electric & Mfg. Co., at Schenectady, N. Y., has accepted a position as structural engineer with the High Explosive Division of the Government Ordnance Depot, Dover, N. J.

Tructractor Added to Road-Builder's Equipment

A new machine, called the "Tructractor" and used for conveying materials to and from concrete mixers, has been put on the market by the Clark Tructractor Co., Chicago. This machine has a capacity of 1 cu.yd. of dry mix or 18 cu.ft. of wet mix. It has an all-metal body of the hopper type and automatically spots and dumps its load in any desired place. It will take wet mix directly from the central mixing plant to the roadway or dry mix from storage piles to the mouth of portable mixer without rehandling. It is equipped with wide-face steel wheels to prevent cutting up the finished subgrade.

It has only three wheels instead of the usual four; the load is carried over the two front driving wheels in front of the driver, while the single rear wheel is used for steering. In the automatic dump-body model the driver controls the dumping and operates the machine without leaving his seat, with the load always in front of him.

The machine is propelled by a standard four-cylinder gasoline engine, operating at speeds varying from ½ to 12 mi. per hour, with an average gasoline consumption of 3 gal. per day. The engine is located over the single rear wheel. Gasoline is supplied from a 3-gal. welded steel fuel tank under the hood. The machine is constructed of metal throughout. Several loaded trailers may be hauled in addition to the full rated load. The machine is manufactured by the Clark Tructractor Co., 1136 S. Michigan Ave., Chicago.

TWO-THIRDS YARD WET-MIX CONCRETE CARRIER SPOTS AND DUMPS LOAD

BUSINESS NOTES

GEORGE E. MARTIN, professor of highway engineering at Purdue University, has accepted a position with the road department of the Barrett Co. with offices in New York. Professor Martin has been at Purdue since 1904 with the exception of two years' war service in France with the U. S. Engineer Corps.

HARRY C. McCLURE, former commissioner of engineering and construction for the City of Toledo, O., has resigned to accept a position with the Toledo Scale Company as engineer of maintenance and construction.

MAJOR. EZRA B. WHITMAN, consulting engineer of the firm of Norton, Bird & Whitman, Baltimore, and former Water Engineer of that city, has been appointed Baltimore resident agent for a $2,000,000 construction corporation, the papers for which were filed Jan. 16 with the Maryland Tax Commission. This concern is to be known as the Newark Beacon Corporation. Its incorporators are: Elmer M. Harper, Louis J. Jira and George J. Tinsley, all of Newark, N. J. Under its charter the corporation will have broad powers to construct buildings and conduct business enterprises of many kinds. It is understood its first project will be the construction at Newark, N. J., of a moving picture theater.

SERVICE ENGINEERING COMPANY, 25 Church Street, New York City, has been incorporated under the laws of the State of New York with capital stock of $50,000, to render general engineering service and to specialize in the design of tools, jigs, fixtures and methods for interchangeable manufacturing of motor cars, motor trucks, typewriters, adding machines and other products made in quantities. The officers of the new company are Albert A. Dowd, president; Donald A. Baker, vice-president; Fred E. Rogers, treasurer; Thomas P. Orchard, secretary. The company employs a force of about sixty men, and is prepared to give engineering service on short notice.

R. B. FISHER has been appointed as general sales manager of The Buda Co. in which capacity he will direct all domestic and foreign sales and advertising departments.

J. A. OWEN'S has been appointed resident engineer for the newly established Toronto (Ont.) office of the J. B. Nicholson Co., Ltd., engineers and contractors, of Hamilton, Ont. The company specializes in the design and erection of concrete tanks, storage bins and coal-handling plants.

A Consolidation of Engineering News and Engineering Record McGraw-Hill Company, Inc.—JAMES H. McGRAW, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN
Editor

Volume 84 NEW YORK, THURSDAY, FEBRUARY 5, 1920 Number 6

A Highway Number

AS IS customary the week preceding the annual convention of the American Road Builders' Association more than the usual amount of space in this issue is devoted to the subject of highways. The material covers a wide range, including articles on the bituminous, brick and concrete types of construction, in addition to other features dealing with cost-keeping methods and the operation of construction plant. Highway engineers and contractors will do well to study carefully the contents of this issue. They will face, this spring, a far larger task than has ever before been imposed upon them—that of putting through a construction program involving, according to present estimates, an expenditure of about $650,000,000. With this vast amount of work in prospect, every means of saving time, whether it be in the form of systematized office and field work or more efficient construction plant or methods, should immediately be put into practice. Engineers and contractors should be on the alert to apply to their work any idea that will help in the process of speeding up. That is why the technical journals now, as never before, should be closely scanned for constructive suggestions applicable to road construction.

Concrete Institute Waking Up

FOR fifteen years the American Concrete Institute has been leading a more or less precarious existence. Its value as a technical society has never been questioned and its proceedings have maintained a high standard of excellence. Nevertheless, it has never attracted the membership it deserved or impressed its standards on practice to the extent their undoubted authority warranted. Happily, a better day is in sight. The Board of Direction has realized that a good thing sometimes has to be pushed, that virtue deserves more than merely being its own reward. Accordingly, the Board has started a campaign of publicity and a drive for more members. Periodical letters are being sent to members to keep alive their interest between conventions. New committees have been appointed and are active in the study of some of the important questions in the concrete field. A live, active meeting is planned for Chicago in February, where these committees will report. Taken together, the prospects are very bright and every engineer, architect or contractor interested in concrete will soon have to decide whether he can afford to remain outside the membership.

New Start for Garbage Reduction

WHAT may prove to be a new start for garbage disposal by the reduction process is reported from Rochester, N. Y., which has just let a contract for a complete garbage-reduction plant. During and since the war no important garbage-reduction contracts appear to have been let, if, indeed, any whatever has been awarded. Meanwhile, several reduction plants have been shut down in the sweeping movement for garbage disposal by feeding to hogs. Perhaps the tide of hog feeding has now turned back and we may see a wave of disposal by reduction. Conditions at Rochester, however, pointed quite strongly toward reduction, particularly since the city not very long ago acquired a private reduction plant located in the center of the city. With a site for disposal by reduction already established, which also had the advantage of central location, and with past experiences to indicate opposition to the establishment of any system of garbage disposal, whether by feeding to hogs or otherwise, in outlying districts of the city, it is not surprising that Rochester decided to continue to dispose of its garbage by reduction. The matter has been gone into very carefully by the engineering department of the city and a plant of ample capacity, as it is thought, has been contracted for in the hope of avoiding some of the difficulties that appear to have arisen elsewhere through the operation of under-sized garbage-reduction plants.

Railroad Finance and "Value"

IN any discussion of a new rate rule and the distribution of "excess" earnings, either directly or by compulsory mergers, the great change taking place in the whole principle of railroad finance must be taken into consideration. Is not the principle changing from finance for profit to finance for security of investment? If we may assume that the change already has taken place, then the valuation finally to be fixed upon properties assumes proportions of importance greater than before. The outline of elements constituting "true value," which appears on p 271, may readily serve as a "basis for argument," to quote the author. The physical value of a strong road may be no more than that of a similar weak road, but the intangible value of the former, based on income-producing qualities and prospects of the future, may be very much greater. There appears no doubt that the strong systems will make a desperate fight against the limitation of "excess" earnings on the basis of physical value—a fight that can be settled only in the Supreme Court. Determination of intangible value at once becomes the center of the controversy. While not entirely in accord with Mr. Morse's outline in designating the ultimate elements of this value as cost of reproduction and allowable rate of return, we believe that such an analysis throws much light on the present difficulties of the Congressional conference committee engaged in drafting a final railroad measure.

Short Cuts in Estimating

SHORT CUTS in making up bidding figures are a necessity and also a danger of highway contracting. With a great mileage to plan, and ordinarily with a small force of planning engineers, highway officials, more often than not, are able to furnish the bidder with complete plans only a few days before the time set for receiving bids. Often in the past season's construction the bidder has had the full plans in his possession only 48 hours. In such instances, short cuts in computing bidding prices are essential if unit-price bids are to be based on estimates and not on guesses. Every experienced highway contractor has short-cut methods of making estimates. They differ widely in scope and accuracy. On page 261 of this issue is published a short-cut method of utility greater than ordinary, which one contractor has found helpful in estimating the cost of concrete paving. Help in computing costs is all that the best short cut can furnish. As the successful painter, to quote a famous remark, must mix his colors with brains, so the successful estimator of highway construction costs must mix his short-cut processes with practical knowledge of the conditions and circumstances which influence construction costs. Used with the discretion and the intuition begotten of experience, the charts which are published on page 261 will be found helpful. Used as the tyro may conclude he may use them, without being carefully "mixed with brains," these charts can be dangerous.

Has It Been Worth While?

IRRIGATION engineers deal so frequently with estimates and with prognostications that a retrospect of accomplishment measured in money as well as other things is needed to bring back to them a realization of their contribution to the world's welfare. Statistics of results obtained on the Minidoka Project of the United States Reclamation Service have recently been compiled, and are a surprise even to those most closely connected with the project. In 1904 the area was sagebrush desert. The expenditures have been $5,800,000, $1,000,000 of which has been repaid. The land, livestock and farm equipment values created exceed $30,000,000, while the crops produced in 1919 by the 110,000 acres of cropped land brought nearly $6,000,000. The cumulative figure of crops raised since 1909 is $25,000,000. More than 1,000 men were sent to war, and $2,000,000 were subscribed to Liberty Loans and other war activities. Over 11,000 of the 17,000 persons on the project have deposits in the 10 banks. Seven newspapers, 25 churches and 28 schools supply the educational needs. Among the industries which have sprung up are two sugar factories, five cheese factories, three flour mills, one brickyard, one potato-drying plant, two alfalfa mills, one mixed-feed mill and two feeder yards. Fifty-two miles of railroad have been built. The 10,000 hp. generated at the project power house pumps water for 52,000 acres, in addition to supplying all towns, factories and more than 800 farms. The work surely has been worth while.

Consulting Income and Costs

HOW one engineer is dealing with conditions incident to the shrunken dollar is a short story that recently came to our attention and will bear repeating for the possible benefit of other engineers. After listening to an address in which stress was laid upon the recent depreciation of the purchasing power of the dollar, this engineer went back to his office and started an investigation as to how his income had been running for some years past. He found that in the past dozen years, although his professional fees had been doubled and his working staff largely increased, his net income was about the same as at the beginning of the period. He thereupon decided to increase his professional fees by half. In relating this story, the engineer remarked that there seemed to be no reason why men in commercial life should make so much more money than engineers. He followed this statement immediately by the question, "What are engineers going to do about it?" He added, "There is one thing to be done—they must produce more or get better results from their work." That he had not overlooked the question of production efficiency in his own office is shown by the fact that from himself down there is kept for every person in the office a time report accounting for every hour of the day and allocating it to some particular piece of work. How many engineers have made similar studies of their income over a period of years and have acted upon the lessons that such a study, in the majority of cases, would probably bring out? How many keep time records such as that mentioned?

Do Shippers Want a Railroad Subsidy?

SURPRISING as it may seem, in the face of a serious shortage of transportation facilities, a large body of the country's shippers has presented a memorial to a Congressional conference committee advocating a return to the old Interstate Commerce Commission form of regulation—the very form of regulation as to rates and operating functions that has resulted in the present situation, through restriction of railroad credit. The National Industrial Traffic League, representing a majority of the large shippers, has gone on record opposing the two provisions of the Cummins bill designed particularly to restore credit and provide an adequate Federal regulation; namely, the establishment of a more definite rule of rate-making and the creation of a Federal Transportation Board charged with maintaining efficiency.

Experience has clearly shown that it is not enough merely to say that rates shall be "just and reasonable." More definite assurance of return on investment must be given to attract the billions of dollars in new capital necessary in the next few years to prevent a serious shortage of all railroad facilities. True, the more definitely fixed the minimum rate of net return, the greater will be the demand for restricting "excess" earnings, as the element of risk is eliminated. The Cummins bill would restrict "excess" earnings by so rapidly an increasing proportion as, in our judgment, to discourage efficiency of management and possibly to promote over-maintenance of prosperous systems. The recent split of the railway executives on the question indicates that some believe the fixed return feature is the best bargain obtainable in view of present public sentiment. Unfortunately, the division of opinion appears to be between the executives of the more prosperous as opposed to those of the less prosperous lines. But why should shippers, confronted with curtailment of production through a transportation shortage, oppose legislation designed to bring about the needed development?

The shippers—rather the representatives of a large body of them—also oppose the creation of a Transportation Board on the ground of conflicting authority with the Interstate Commerce Commission. It is the purpose of the Cummins bill that Government regulation be divided as to operating and judicial functions, recognizing the need of a better adjusted regulation after the failure of the Commission successfully to cope with operating matters. Lines of authority between the two bodies can be drawn as tightly by wise legislation as between departments of a private enterprise by a strong management.

When the joint conference committee of Congress renders its report we hope that the debate will clarify the position of the shipping interests. Surely shippers do not want a continued and more serious restriction of their production through lack of distributing facilities. Surely they recognize that huge sums in new capital must be furnished to relieve the situation. If adequate assurance is not given to justify the new investment, and if it is not encouraged, it will not be made except by Government subsidy. The recent proposals of the "National Shippers' Conference" point toward an attempt to force continuance of transportation at less than cost, with a broad hint at extending the subsidy considerably beyond the transition period following the return of the roads. Can it be that shippers in general actually favor such a policy—a policy that can have only the ultimate result of out and out Government ownership and operation, with a heavy burden upon the country's business through taxation or through higher and still higher rates?

Efficiency in the handling of traffic—which is to the ultimate benefit of the shipper—cannot be obtained unless the rates are such as to cause a flow of capital into railroad securities.

A Municipal Responsibility

A NEW element has made its appearance in the field of engineering thought within the year, as a result largely of the financial troubles that beset the street-railway services. Urban transportation, something that in the past took care of itself automatically (and we cared not how efficiently) came to need attention. It revealed itself as a problem of size and importance. Municipal engineers in many cities were compelled to deal with it, and in consequence they are now inclined to recognize it as their own problem. For a decade or more the trend of thought had been, unconsciously, toward this recognition, but now the movement is real and conscious. Cities and their engineers have had to grapple with questions of losing or maintaining long-established transportation services, of controlling the growth of bus lines, of providing terminal facilities—as at Los Angeles—of coördinating car and bus services for maximum use to the community. They have realized the new responsibilities quite concretely, and will not again abandon them. The subject is bound to be studied intensively, for urban passenger movement is an integral problem, including as separate parts all the various services from sidewalk to rapid-transit line and all detail problems from routing, capacity and schedules to service efficiency and cost. There is promise, to speak conservatively, that results of remarkable benefit to the community will flow from this study, for it will tend very directly to make our cities more efficient and less wasteful of space and energy in regard to business and living. Freight transportation awaits study thereafter, as a separate though closely related problem, and it is perhaps the more difficult of the two. Future developments of an importance that can hardly yet be estimated lie concealed in the present situation, in short. It may well be that, years from now, the line dividing 1919 from 1920 will prove to mark an epoch—the point at which urban transportation became a definite municipal responsibility.

M. I. T. and Consulting Work

AS PART of its recent campaign to raise an endowment fund of $8,000,000, the Massachusetts Institute of Technology made a strong drive to have industrial corporations contract with the Institute for consulting services. A bulletin sent out toward the close of the campaign stated that about forty corporations had signed contracts totaling about half a million dollars. The plan has been criticised by consulting engineers as a vigorous attempt to invade their field.

The contract under which this work is undertaken contains four chief provisions, as follows:

1. The company paying the retainer may use the library and files of the Institute and confer with its technical staff on problems pertaining to the business.
2. The Institute agrees to maintain a record of the qualifications, experience and special knowledge of its alumni, in order to assist the subscribing company to locate men equipped with special knowledge and experience.
3. The Institute agrees to maintain a list of its undergraduates and to advise the subscribing company with regard to the records and qualifications of these men.
4. The Institute agrees to advise the company where tests and research "can best be done, whether in Technology's laboratories by its own staff and students, or by some outside organization."

Whatever may have been said in the way of promotional publicity, the fact is that the above four items are the sole stipulation of the contract. It will be seen that the Institute legally binds itself to the doing of things which, in a more or less efficient way, are regularly done without charge by engineering colleges, and, as we see it, no one can properly criticise the Institute for doing them. The criticisms have been based not upon the provisions of the contract document, but on the flamboyant publicity which conveyed the impression that the Institute was embarking on a campaign to make itself the national consulting body of our whole industrial fabric. For example, we find this paragraph:

"Carried to its conclusion, the Technology Plan would make of M.I.T. the greatest consulting body in the world, since its range would cover practically every field of technical research, and it would follow that, since the great corporations of the country retained Technology as a consultant, the great experts of the country would ultimately be members of its instructing staff."

In some newspaper accounts it was stated that the Institute proposed to establish service bureaus in large cities to handle "the business the new idea has created."

The doing of research work for private parties by educational institutions is not new. The engineering experiment stations of Middle Western colleges and various engineering college laboratories in the East have done a considerable amount of such work. There has been no criticism of such activity, because the problems studied are generally of a character that cannot be handled successfully by private consultants or consulting laboratories. Held within these bounds—of taking only such work as private laboratories are unwilling to undertake—there is not likely to be sustained criticism of the plan. In fact, we feel that the criticisms so far made are due to the taking in full faith of the imaginative flights of the campaign's publicity agents.

Obviously, the plan could be handled in such a way as to interfere with the practice of private consultants, but we have too much faith in the sound sense of the Institute's directors and of Dr. W. H. Walker, who is in direct charge of the plan, to believe that there will be any flagrant transgression upon fields where the private consultant can do satisfactory work. It is to be noted that the campaign propaganda, though not the contract, placed emphasis upon the research feature of the retainers. Obviously, there are not and will not be many laboratories conducted for profit which will be competent to engage in research work, and the plan, if it should not go beyond the field of research, is likely to be stimulating to the employment of engineers rather than otherwise. It will awaken to the importance of research many industrial corporations that now have no interest therein.

We should say, then, that results of the new plan should be awaited before the criticism is made positive, but it is worth while for engineers who have fears of the ultimate result, whether they be graduates of Technology or not, to express their views frankly to the officers of the Institute.

Organized Steel Research and Specifications

AN UNDERTAKING of quite remarkable character is made known by a current announcement. It is a systematic research into the effects of sulphur and phosphorus on the quality of steel, organized on an impressively large scale. Since the early days of steel chemistry the two elements in question have been known as enemies of good steel. That sulphur makes steel red-short and that phosphorus makes it cold-short or generally treacherous are axioms of steel practice. Not only practical observation but a very large amount of skilled scientific study supports these beliefs. However, as the elimination of sulphur and phosphorus increases the cost and difficulty of making good steel, it is desired to learn whether the present low specification limits can safely be raised. Dissatisfied with the slow progress of normal scientific research, the interested parties have decided upon a concentrated attack on the problem.

Organized research of this kind is decidedly new. Its theory appears to be that by carrying out a campaign of tests according to a program fixed in advance, data on which reliable conclusions can be based will be obtained, provided the program is sufficiently broad. By this procedure, it is thought, tangible results can be obtained very much more quickly than through the means of sporadic voluntary investigation, hitherto relied on. Back of this hope lies the fact that the present situation is such as to make it important to get results quickly.

During war-time pressure for steel production fuel and ore conditions made it impossible to maintain the low sulphur and phosphorus limits of accepted American specifications regularly, and at the present time the old limits have been restored only in part. It has been expected that full restoration will be brought about during the coming summer. From one point of view, then, it would be desirable to have preliminary results before summer, so that restoring the old limits could be postponed beyond the current year. But the subject is so complex that no significant results can be hoped for in so short a time, and in fact any attempt to utilize the investigation as a reason for postponing the restoration of the specification limits is likely to provoke a sharp fight in the ranks of the steel men themselves. Restoration is an obligation of honor, since the relaxation was agreed to only in view of war emergencies, and these have passed.

Broad-gage co-operation made this bold investigational undertaking possible. It is fine testimony to the forward-looking spirit that animates our technological activities today. Co-operation is a potent force. But in the present case of searching for hidden truths the mere setting up of a great organization, even though co-operative, will not assure results, any more than organized prospecting will discover gold.

In any event it must not be expected that results can appear very soon. Exceptional difficulties have to be overcome. The field to be covered is very large indeed, and every factor and phenomenon encountered in it is variable; yet observations on a few test pieces, representing a few of the infinite varieties of steel, must be relied upon. And the conclusions, to be worth anything, must have general validity, since, after all, what we seek knowledge about is not the steel of the test pieces but other steels subsequently melted and rolled. Bridging the gap between the limited test data and the broad conclusions will require scientific insight and genius of the same high type that is decisive in unco-ordinated private research, and this can not be supplied by mere organization.

The essential difficulty may be stated thus: While nominally phosphorus and sulphur are on trial, the real culprits may be metallurgical conditions of which these two elements are only chance companions. Steels with abnormally high impurities have been made that passed excellent mechanical tests. There are men who hold that at bottom the study is not of phosphorus or sulphur limits but of good steelmaking. And steelmaking is an art of such vast dimensions that the problem of a comprehensive research is rather appalling; such an investigation might fairly be expected to extend over a good many years.

It should not be forgotten, moreover, that we use steel, not on account of the presence or absence of certain chemical elements, but on account of the mechanical properties it possesses. We could get along without setting chemical limits if our acceptance tests were really exhaustive. A great deal of steel is made without being governed by sulphur limits in the specifications. In each case, however, the mechanical acceptance tests are severe. American practice has tended steadily away from completeness of mechanical testing, so that for example toughness, ductility and shock resistance are rarely made objects of commercial acceptance testing. It seems probable that in the course of full study of sulphur and phosphorus we may, while abandoning some of our traditional faith in chemical limits for steel, revise our conceptions of the most desirable scope of mechanical testing, to the benefit of economy of production and excellence of product.

Charts Tell Cost of Concrete Paving

Bidding Prices Determined from Curves Covering Wide Range of Physical Conditions and Variations in Wages of Labor and Prices of Equipment

By F. J. Herlihy
Winston Bros. Co., General Contractors, Minneapolis, Minn.

QUICK estimates of bids for concrete paving are made possible by a series of curves prepared and employed by the writer and illustrated in the accompanying five charts. These curves are of general application for the type of construction plant considered. With different wages and costs than those assumed in plotting the curves, the values given by the curves require to be modified by the percentages which the actual figures bear to those on which the curves are based. The curves and their application are explained in detail by the notes following the captions for the charts and by the following description.

The type of plant analyzed comprises steel batch boxes with dump bottoms. each holding the ingredients for a three-sack batch of concrete, mounted on 24-in.-gage flat cars, two boxes to each car, drawn in trains by a six-ton gasoline locomotive from the charging bins at the material receiving point to the concrete mixer located just in advance of the paving.

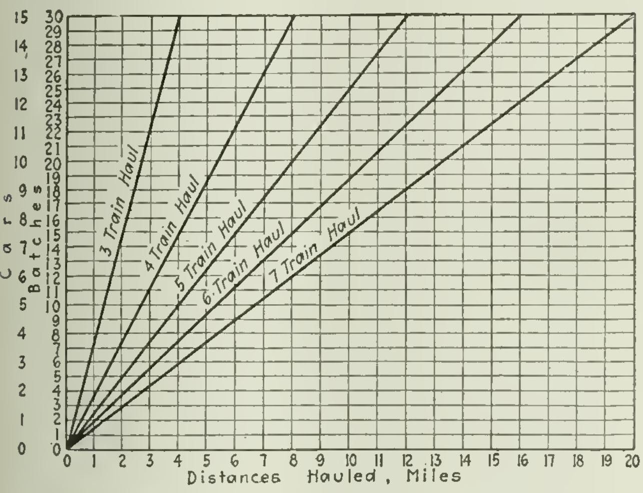


FIG. 1. NUMBER OF TRAINS REQUIRED TO HAUL ROAD MATERIALS

A 6-ton gasoline locomotive is used and a frictional resistance of 20-lb. per ton is assumed. Cars are 3-ton flats with brass journals. Each car carries two 24-cu.ft. batch boxes. The maximum train considered is 15 cars. Assumed loading time 2 minutes, and mixing time 2 minutes per batch. The loaded car weight is 3 tons. The average hauling speed is 8 miles per hour. The locomotive capacities are:

Grade, Per Cent	No. Cars	Grade Per Cent	No. Cars
Level	38	2½	10
1	18	3	8
1½	15	4	6
2	11	5	4

The unloading plant consists of a travelling stiff-leg derrick operating a 1-cu.yd. clamshell bucket, the power being furnished by a three-drum hoisting engine with a boom-slewing attachment. A travelling bin having a capacity of 30 cu.yd., 20 cu.yd. for stone and 10 cu.yd. for sand, is provided. so constructed that it will travel on the same track as, and just in advance of, the stiff-leg derrick. Both the bin and the derrick will travel parallel to the spur track on which the cars of material are received. The sand and stone will be unloaded by the clamshell outfit into the travelling bin or into a long storage pile parallel to the line of travel and within easy reach of the derrick The derrick will transfer the stored material to the bin when no material is available from cars. The bin is provided with four gates so located that the sand and stone may be spouted into four batch boxes simultaneously. A cement house, with large storage capacity, located contiguous and parallel to the material spur, is provided.

The concreting plant consists of a three-sack batch concrete mixer, a power tamping machine and the necessary pumps and pipe lines. The industrial track is composed of 20-lb. steel rail in sections, with steel ties and fastenings, laid on one shoulder of the roadway. At the material-receiving point this track is parallel to, and at the proper distance from, the charging bin to permit of spouting the sand and stone into the batch boxes, and passes through the center of the cement house. The mixer is provided with a derrick directly connected to it for picking batch boxes off the flat cars and dumping them into the elevating hopper on the mixer. All ingredients are placed in the batch boxes at the material-receiving point. A maximum of 15 cars per train with ingredients for 30 batches of concrete is considered.

Hauling Equipment Required—The ruling grade and the length of haul determines the number of trains required and the number of cars per train. The chart, Fig. 1, facilitates the computation.

This chart is constructed on the basis that it will require an average of 2 min. to mix and place each batch of concrete and that the same time will be consumed in placing the ingredients for each batch into the batch boxes. It naturally follows, then, that a minimum of three hauling trains will be required to keep the work going continuously. The horizontal lines in the chart indicate the number of cars and batches per train; the vertical lines represent the distances of the haul; and the diagonal lines show the number of trains from three to seven inclusive. The schedule following the caption of Fig. 1 indicates the number of loaded cars per train that can be hauled on grades varying from level to 5 per cent.

Knowing the maximum haul and the ruling grade, to find the hauling equipment required, pick out from the grade schedule opposite the grade corresponding to the ruling grade the number of loaded cars that can be hauled; next locate the horizontal line in the chart representing that number of cars; proceed along this line until it intersects the vertical line indicating the maximum distance of haul. The diagonal line immediately to the right of this point will indicate the number of hauling trains required. Where ruling grades are short and not too frequent, it will pay to use helper locomotives on these grades, in which case the next steepest grade to the helper grades should be used in applying the chart to find the number of cars per train and the number of trains required.

Plant Rental Charges—The chart, Fig. 2, shows the cost of plant rental per cubic yard of concrete for daily outputs of 100 cu.yd. to 200 cu.yd., in 25 yd. steps, for hauling plant, concrete plant and unloading plant. The

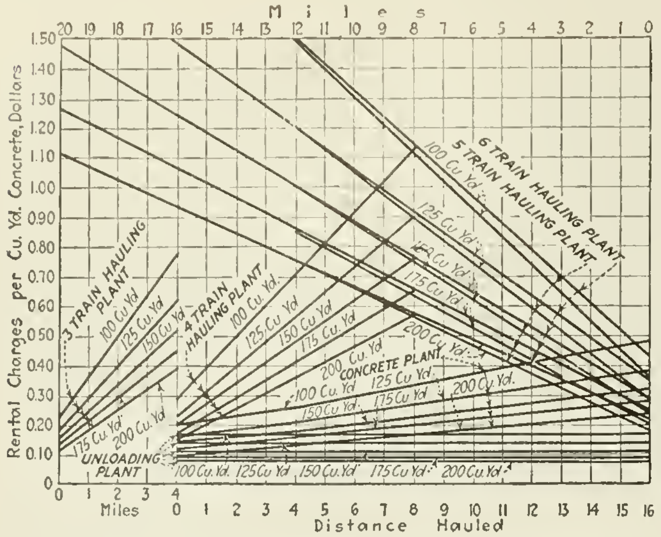


FIG. 2. PLANT CHARGES PER CUBIC YARD OF CONCRETE

Costs are shown for daily outputs of 100, 125, 150, 175 and 200 cu.yd., employing equipment indicated by Table 1 at the rental rates there given, and number and size of trains determined from the diagram, Fig. 1. An average train speed of 8 miles per hour is assumed. For each additional mile of pipe line add $1.50 per day, and for each additional 4 miles of pavement add $1.25 per day for booster pumps. Daily hauling equipment rental values are:

No. Trains	Minimum	Maximum
3	$21 99	$77 31
4	28 87	113 11
5	35 75	148 91
6	42.63	184 71

rental charges for equipment are based on the values per working day, including field and shop repairs, shown in Table I, and comprise only the units of plant which cannot be charged in their entirety against the job.

In the chart the vertical lines represent the distance or the length of the paving job from the material-receiving spur to the end of the pavement. On jobs where the material-receiving spur is located at some intermediate point, the distance between the material-receiving spur and the farthest end of the pavement should be used in applying the figures shown in the chart. The horizontal lines represent the values per cubic yard of concrete to be used in making rental charges and the heavy lines, both inclined and horizontal, show the daily output in cubic yards of concrete for the different plants.

Hauling charges are based on a fixed charge per day for gasoline locomotives, 900 lin.ft. of fixed tracks, and eight switches, to which is added the rental of cars, batch boxes, tracks, including passing tracks and switches, as their need increases in the length of the haul. The note to the caption of Fig. 2 shows the minimum and maximum charges respectively for each number of trains from three to six trains inclusive. The minimum simply includes charges for the fixed equipment, while the maximum includes charges for the total complement of cars, batch boxes, tracks, etc., for the maximum distances indicated for each haul.

Charges for concrete plant are based on a fixed charge per day for concrete mixer, derrick, tamping machine, steel forms, force pump and one-mile of 2-in. pipe line, to which is added the rental charges for additional pipe line and booster pumps, as the length of pavement increases and the need requires.

The unloading plant charge is a fixed quantity, comprising rental on the derrick, clamshell bucket, hoisting engine and boom-slewing engine, and varies only as the daily output of concrete varies.

To ascertain the plant charges per cubic yard of concrete, locate the vertical line on the chart, Fig. 2, representing the maximum distance of the end of the pavement from the material-receiving point, and follow this line until it intersects the line representing the estimated output per day for the plant charge required, and the value per cubic yard of concrete for the plant rental charge will be indicated by the nearest horizontal line to that intersection. The number of trains, as ascertained from Fig. 1, will be the key to the correct set of curves to use in ascertaining the hauling plant charge.

All plant charges, as indicated here, assume that enough equipment will be brought onto the work at the outset to take care of the maximum length of pavement. When the contractor has two jobs reasonably close together, these charges can be reduced by beginning one job at the point farthest from the material-receiving spur and the other at the nearest point, and transferring cars, track, etc., from the former to the latter as they are released. Where helper locomotives are used, a

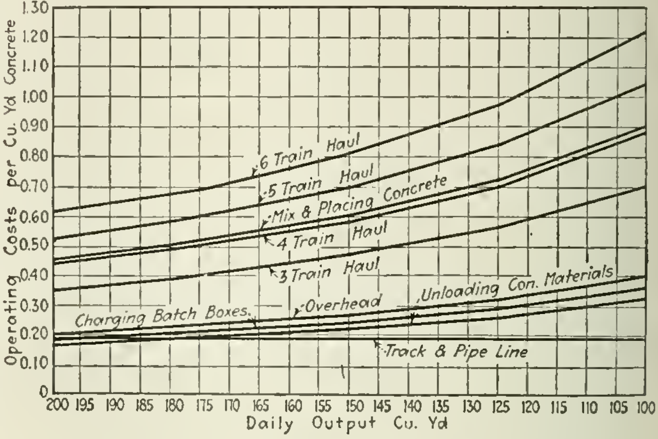


FIG. 3. OPERATING COSTS PER CUBIC YARD OF PAVEMENT

These diagrams are based on working force and wages computed as follows:

Charging Batch Boxes:	
1 foreman at $6	$6 00
6 laborers at $5	30 00
Total	$36.00
Mixing and Placing Concrete:	
1 foreman	$7.00
1 engineer	6.50
1 fireman	5.50
1 derrickman	5.50
4 spreaders at $5	20.00
1 tamper operator	6.00
2 foremen at $5.50	11.00
1 pumper	6.00
1 handyman	5.50
1 extra man	5.00
Total	$78.00
Fuel cost	9.00
Oil waste, packing, etc.	2.00
Total	$90.00
Haulage per Train:	
1 engineer	6.00
1 brakeman	5.25
12 gal. gas at 30c	3.60
Oil, etc	2.00
Total	$16.85
Add to train service for hauling cost four trackmen at $5 or $20 per day.	
Field Overhead:	
1 superintendent	$12.50
1 clerk	7.50
2 watchmen at $6.25	12.50
Miscellaneous expenses	7.50
Total	$40.00
Unloading Material:	
1 engineer	$7.50
2 laborers at $5	10 00
1¾ tons coal at $8	14 00
Oil, etc	1 00
Total	$32.50
Laying and Taking up Track and Pipe Line:	
Laying and taking up track per mile	$250.00
Laying and taking up pipe per mile	150.00
Total	$400.00
Cost per mile applied against 2,100 cu.yd. of concrete.	

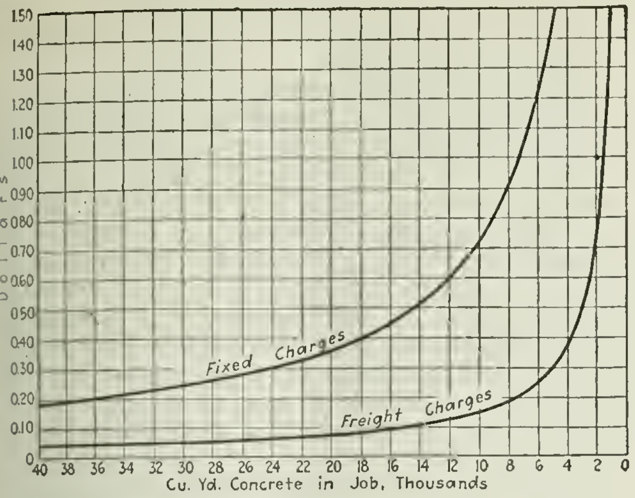


FIG. 4. FREIGHT ON PLANT AND FIXED CHARGES PER CUBIC YARD OF CONCRETE

A 24-In. Gage Outfit is Assumed with Common Labor Paid $5 per Day

Freight Charges

The basis of the curve is 1,500 cwt. at 10c. per hundred-weight. The 1,500 cwt. assumed will provide for a plant consisting of 5 hauling trains with 15 cars each and 10 mi. of track and pipe line. To arrive at the proper charge for freight multiply the cost per cubic yard taken from the curve by the percentage which the rate which applies bears to the 10c. rate platted and multiply this result by the percentage which the actual shipping weight of the outfit bears to the 1,500 cwt. platted in the curve. If freight both ways is to be charged against the job this final result should be doubled.

Fixed Charges

1 superintendent, 45 days at $12.50	$562 50
1 clerk, 45 days at $7.50	337.50
2 watchmen 45 days at $6.25	562.50
1 cement storage house	500.00
1 traveling bin	750 00
1 tool house	250 00
1 office and furniture	500 00
Small tools	1,250.00
Erect and dismantle plant	2,500.00
Total	$7,212.50

charge covering their rental value should be made in addition to the charges shown in the chart.

Operating Costs—In chart, Fig. 3, the different operating costs are divided under the heads: Charging batch boxes; mixing and placing concrete; hauling concrete materials; field overhead; unloading concrete materials, and laying and taking up track and pipe lines. The bases for these different operation costs are given in the note following the caption. A word here is necessary, however, to explain those operations for which the compass of the schedule is too limited to be self-explanatory.

In charging the batch boxes, the six laborers will place three sacks of cement in each batch box as it passes through the cement house. The train will then be spotted at the sand and stone bin, where four of the laborers will spout the sand and stone into the batch boxes. The other two laborers will remain in the cement-storage house and unload cement from cars into storage, and bale the empty sacks for return shipment to the cement mill. Cement will be taken from cars for the batch boxes whenever available and storage reserved for emergency. In the field overhead charge, the rate per day has been increased to cover lost time. In other words, the men included in this charge will receive wages whether the job is running or not, consequently their wages will be higher as applied against actual working days than would be indicated by the rate per day at which they are carried on the payroll. The track and pipe-laying charge presupposes that a mile of track and pipe will be laid and taken up for every mile of pavement laid.

To ascertain the cost of any of the different operations shown in the chart, trace the curve line, indicating the operation required, to its intersection with the vertical line indicating the estimated average output per day, and the cost per cubic yard of concrete will be indicated by the nearest horizontal line to that intersection. Should grades be encountered requiring helper locomotives, an addition should be made to the cost ascertained from the chart to cover the cost of wages of the trainmen and the cost of the fuel, etc., required in their operation.

Freight and Fixed Charges—On all contracts there are certain costs, such as freight on equipment; unloading, loading, assembling and dismantling plant; small tools, etc., that will generally be the same regardless of the size of the job. When the work is paid for on a unit-price basis, these costs must be pro-rated against the revenue producing work (in this case against the concrete pavement) and their cost per cubic yard of concrete will vary with the total yardage of concrete in the job. The curves in the chart, Fig. 4, show these costs per cubic yard of concrete for jobs containing up to 40,000 cu.yd. The basis of the charges is scheduled in the caption to the chart and is self-explanatory.

To ascertain the cost per cubic yard of concrete for the fixed charges, trace the curve line, representing the fixed charge, to its intersection with the vertical line, representing the total yardage of concrete in the job, and the nearest horizontal line to this intersection will indicate the cost per cubic yard of concrete. Of course, there will be some small variation, depending on the amount of track material, hauling equipment, etc., for

TABLE 1. RENTAL CHARGES FOR CONCRETE PAVING EQUIPMENT, ASSUMING 200 EARNING DAYS AND 160 WORKING DAYS PER YEAR

Class of Equipment	Original Capital Cost	Annual Accrued Charges Per Cent	Annual Charges	Rental per Earning Day	Shop Repairs per Earning Day	Field Repairs per Earning Day	Daily Field Rental Charge	Total Rental per Earning Day	Total Rental per Working Day
3-ton gasoline locomotive	$1,875	20	$375	$1 88	$0 62	$0 75	$2 50	$3 25	$4 06
6-ton gasoline locomotive	3,200	20	640	3.20	1 05	1 25	4.25	5.50	6.88
8-ton steam locomotive	5,000	20	1,000	5.00	2.00	2.00	7.00	9.00	11 25
3-ton flat car brass journals	100	20	20	.10	.10	.10	.20	.30	.38
24 cu.ft. steel blatch boxes	52	25	13	.07	.05	.08	.12	.20	.25
20-lb. rail for 1 mile track, incl. 300 ft. pass tr	1,860	15	279	1.40	.35	.00	1.75	1.75	2.19
20-lb. rail for 900 lin.ft. fixed track	300	15	45	.23	.07	.00	.30	.30	38
Steel ties and fastenings for 1 mi., 20 lb. tr., incl. pass tr.	1,200	15	180	.90	.35	.00	1.25	1.25	1 56
Steel ties and fastenings for 900 ft. fixed track	190	15	28	.14	.06	.00	.20	.20	.25
Switches complete for 20-lb. track	50	20	10	.05	.02	.00	.07	.07	09
3-sack batch con. paving mixer	5,000	20	1,000	5.00	1.25	1.25	6.25	7.50	9.38
Derrick for con. paving mixer	500	20	100	.50	.15	.15	.65	.80	1 00
Caterpillar traction for paving mixer	750	20	150	.75	.25	.25	1.00	1.25	1 56
Power tamping machine	1,250	20	250	1.25	.25	.25	1.50	1 75	2.19
1500 lin.ft. steel forms	1,620	20	324	1.62	.38	.40	2.00	2 40	3.00
5-ton traveling derrick	2,500	20	500	2.50	.75	.75	3.25	4.00	5.00
1 cu.yd. clamshell bucket	1,050	20	210	1 05	.30	.30	1.35	1 65	2 06
Three-drum hoisting eng. steam	4,000	20	800	4 00	1.25	1.25	5.25	6.50	8.12
Slewing engine steam	700	20	140	.70	.20	.90	.20	1.10	1.38
Gasolene force pump	600	20	120	.60	.20	.20	.80	1.00	1 25
1-mile 2-in. galv. pipe line	1,200	15	180	.90	.30	1 20	.00	1.20	1 50

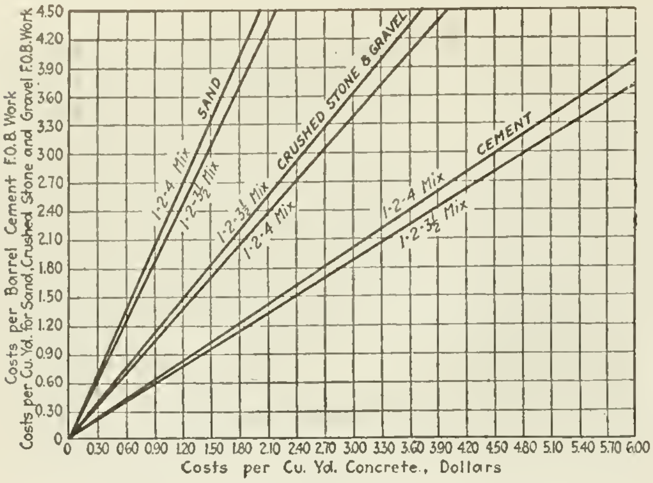


FIG 5. COST OF CONCRETE INGREDIENTS PER CUBIC YARD OF CONCRETE

Curves based on 45 per cent voids in sand and stone; one bag of cement considered 1 cu.ft.

the different work, but as this would only represent the cost of loading and unloading these items, the difference in unit cost is negligible. In ascertaining the charge to make for freight costs, proceed in the same manner as for fixed charges, but after ascertaining the result from the chart, multiply that quantity by the percentage the actual freight rate bears to the 10c. rate platted. Multiply the result by the percentage the actual shipping weight bears to the 15,000 cwt. platted. If freight is to be charged both ways, double this last amount.

TABLE II. ESTIMATE OF COST OF ASSUMED CONCRETE PAVEMENT

	Per Cu.Yd.
Chart Fig. 2—Plant Rental Costs:	
Hauling plant	$0.69
Concrete plant	.23
Unloading plant	.14
Total	$1.06
Chart Fig. 3—Operating Costs:	
Charging batch boxes	$0 29
Mixing and placing concrete	0 72
Hauling concrete materials	0 70
Field Overhead	0 32
Unloading concrete materials	0 26
Laying and removing track and pipe lines	0.19
Total	$2 48
Chart Fig. 4—Fixed Costs:	
Fixed charges	$0 35
Freight charges	.19
Total	$0 54
Chart Fig. 5—Concrete Material Cost:	
Broken stone	$2 15
Sand	.68
Cement	3.84
	$6.67
Grand total	$10.75
Liability insurance, 2.75% on $2.25	$0 06
Bond, 1½% on $12.58	.19
Total	$11 00
Add 4% for overhead and contingencies	44
Total cost	$11 44
Add 10% for profit	1.14
Bidding price	$12.58

Cost of Concrete Ingredients—The chart, Fig. 5, shows the cost per cubic yard of concrete for the different ingredients for 1:2:4 and 1:2:3½ mixtures based on 45 per cent voids in the sand and stone and on a sack of cement being considered as containing 1 cu.ft. The horizontal lines in the chart indicate prices per cubic yard for the sand and stone and per barrel for the cement all f.o.b. cars at the job. The diagonal lines indicate the ingredients for the different mixtures, and the vertical lines the values per cubic yard of concrete for the different ingredients.

Curves Show Costs Based on Cubic Content—All curves show the values of the different items in terms of cubic yards of concrete, which makes them applicable to pavements of variable dimensions. The item showing the cost of laying and taking up pipe lines, Fig. 3, however, is the exception. While this item shows the costs in terms of cubic yards, the values shown in the chart are only applicable to roadways containing 2,100 cu.yd. of concrete per mile. For roadways containing different quantities of concrete per mile, the values obtained from the chart must be multiplied by the percentage the cubic contents per mile in the roadway in question bears to the 2,100 cu.yd. per mile platted, to arrive at this element of cost.

Value of Plant and Rates for Labor—All labor costs shown in the chart are based on common labor at $5 per day, and on the values of equipment, indicated in Table I. For the cost of pavements, where the values of labor and equipment are different from that indicated, the curves may still be used to advantage by ascertaining the labor and rental charges for the rates and values used in the curves, and adjusting the results to fit the actual conditions by applying to them the percentages the actual rates of labor and values of plant bear to those used in the curves.

Application of Curves—Taking a concrete case; assume that the cost of paving with concrete a road 10 mi. long with pavement 18 ft. wide, 6½ in. thick at the curb and 7½ in. thick at the crown is to be estimated. Assume the quantity of concrete as 2,100 cu.yd. per mile, the small excess to take care of waste and irregularities in the subgrade. The spur for receiving materials is located contiguous to the pavement and 5½ mi. from the farthest end. The ruling grade with loads is 2 per cent. Water for concrete and sprinkling is available from a storage reservoir near the receiving spur without charge. The concrete mixture is to be 1:2:4, machine tamped. Freight on equipment is charged both ways and the freight rate is 20c. per hundred. The cost of crushed stone is $2.40 per cu.yd., sand $1.50 per cu.yd. and cement $2.55 per barrel net, all f.o.b. cars at the material-receiving spur. Assume the cost of common labor at $5 per day and the daily output as 125 cu.yd. of concrete. The total quantity of concrete to be placed is 21,000 cu.yd. The shipping weight of the plant is 10,000 cwt. Fig. 1 shows that eleven loaded cars can be hauled up the 2 per cent grade and that four hauling trains are required for the maximum haul of 5½ mi. Extracting the values of the different cost items from the charts, and tabulating them, we have the results given in Table II.

Reducing the bid to a price per square yard of pavement and assuming that one cubic yard will cover 5 sq.yd., we have $12.58 divided by 5 equals $2.52 per sq.yd. of pavement as the bidding price. Theoretically, 1 cu.yd. will cover a trifle more than 5 sq.yd., but practically there will be enough low spots in the subgrade and other waste to take up the small margin allowed. The above costs and prices only include the concrete masonry; where reinforcing steel, grading and other items are called for and included in the price bid for concrete pavement, their costs should be figured independently and the bid increased to cover the costs of, and the profits on, these items.

Developments in New York State Highway Maintenance

Two-Wheeled Carts for Cold Patching—Equipment Storehouses Provided—Army Trucks Remodeled for Road Work

MAINTENANCE equipment employed this year by the New York State Highway Department includes several devices in addition to those previously used, and described in *Engineering News-Record* of Nov. 28, 1918, p. 981. A beginning has been made toward a policy of establishing equipment storehouses of permanent construction and designed for their purpose. In particular, conspicuous success has been attained in converting fixed-body Army motor trucks into vehicles adapted to special maintenance operations.

For maintaining bituminous-macadam surfaces, the two-wheeled material carrier shown in Figs. 1 and 2 is reported to be especially useful. This cart is used, with the small concrete mixer, for hauling cold-patch bituminous mixtures for repairing small holes. The advantages of the device are that it is low so that the mixer can dump directly into it, and that it is easily propelled by two men. Since this kind of repair work generally is in small patches at varying distances apart, another advantage is that instead of delivering small amounts of material along the road adjacent to the patches it is feasible to dump materials and mix at a central point and to haul with the cart in each direction.

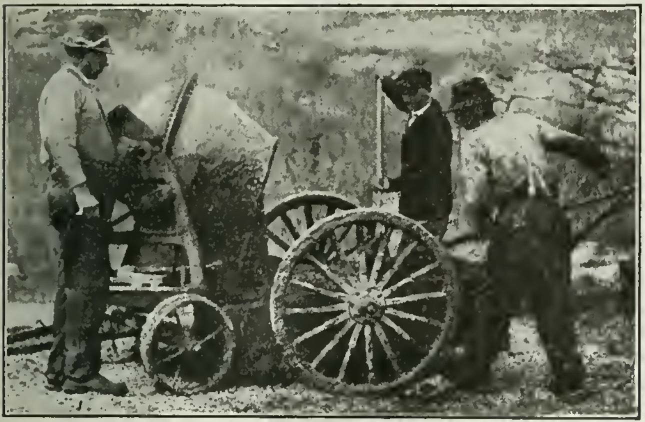


FIG. 1. MIXING COLD PATCH AT A CENTRAL POINT

Cold patching has been found to be very successful and is quite extensively used. It is now possible to get several different brands of asphaltic emulsions and cutback preparations. The small mixer shown in the illustration has been found particularly adapted to mixing these preparations without causing separation. Cold-patch material is also being used by the department for quite extensive resurfacing and widening. Several roads were completely resurfaced by this method during 1918, when bituminous materials were scarce, and, during the present year, Division No. 2 is doing extensive widening in Saratoga County.

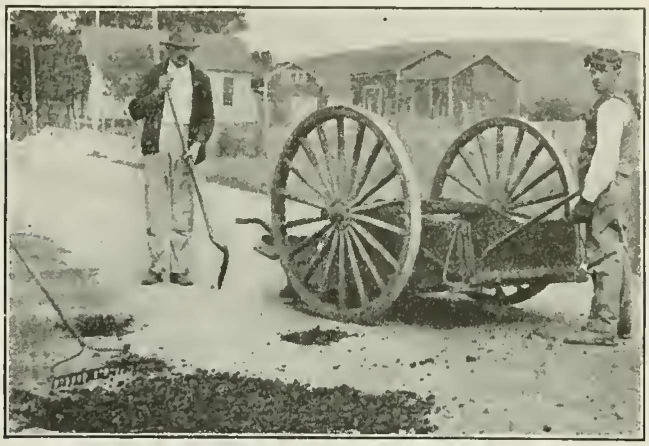


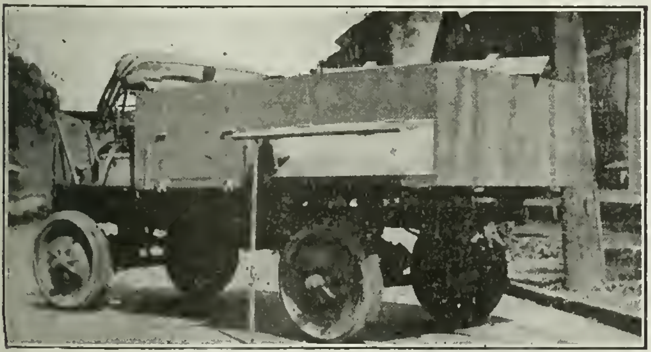
FIG. 2. PATCHING HOLES AT SOME DISTANCE FROM MIXER

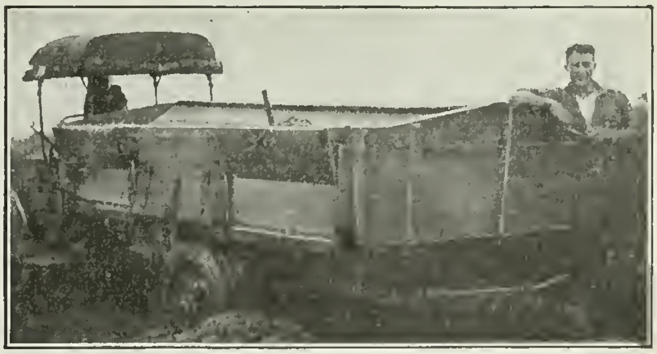
The method followed in widening is to dig trenches at the edges and lay a foundation course of field or crushed stone, 6 to 12 in. in depth, upon which is placed a 2- to 3-in. course of broken stone mixed with cold-patch bituminous material. It is found possible to make a uniform joint and surface of even appearance, without giving the road a surface treatment, as is customary. All new widths are made 18 feet.

Converted Army Motor Trucks

It has been a problem in many cases to determine what use can best be made of the motor trucks from the United States Government which highway departments throughout the country are receiving in large consignments. Practically all of these trucks are of the fixed-box type, while the requirements of highway work, generally speaking, call for dump boxes.

To utilize the trucks, it has been found necessary in many cases practically to remodel them by placing new dump boxes and dumping apparatus. Fig. 3 shows one of these trucks, of the Nash-Quad type, with ammunition box, which has been remodeled by building a





FIGS. 3 AND 4. ARMY TRUCKS REMODELED FOR STATE HIGHWAY MAINTENANCE WORK
Fig. 3—Truck with fixed box divided into compartments. Fig. 4—Truck with collapsible bottom for use as either a side-dump or straight box type

special fixed box for dumping stone and sand in small piles for patching and covering purposes. It was found that it would be too expensive to cut down and remodel the old boxes, so a new compartment box was built, each of the four compartments holding ¼ cu.yd. of stone. Upon being filled, the truck proceeds to the road and dumps the ¼-yd. batches at points where they are required for patching or for applying as covering stone for surface treatments. The box is built with a peaked bottom, and it is only necessary to open the trap-door fastenings and allow the material to slide out at the side of the road.

The entire box was built of wood instead of iron, as was the original ammunition box. It is arranged with staked sides so that the sides and peaked bottom can be removed in a few minutes by two men, leaving an ordinary platform truck for hauling barreled bituminous materials or other bulky packages or apparatus. The cost of the change from the old to the new box is stated to have been $250. This change was made by the maintenance engineer of Division No. 4 at Utica, N. Y. Another remodeled truck without separated compartments is shown in Fig. 4. It is claimed that this arrangement is much lighter than the one just described. The bottom consists merely of a frame upon which the two sections of the peaked bottom rest, and, when it is desired to utilize it as a platform truck the ridge simply collapses so as to lie flat on the truck. This arrangement also has the advantage that the peaked bottom is always with the truck, and the change can be made in a few minutes from one type to the other. With the arrangement described first, the bottom has to be removed entirely from the truck when it is being used as a platform truck. This second arrangement was developed by the maintenance engineer of Division No. 6 at Syracuse, N. Y.

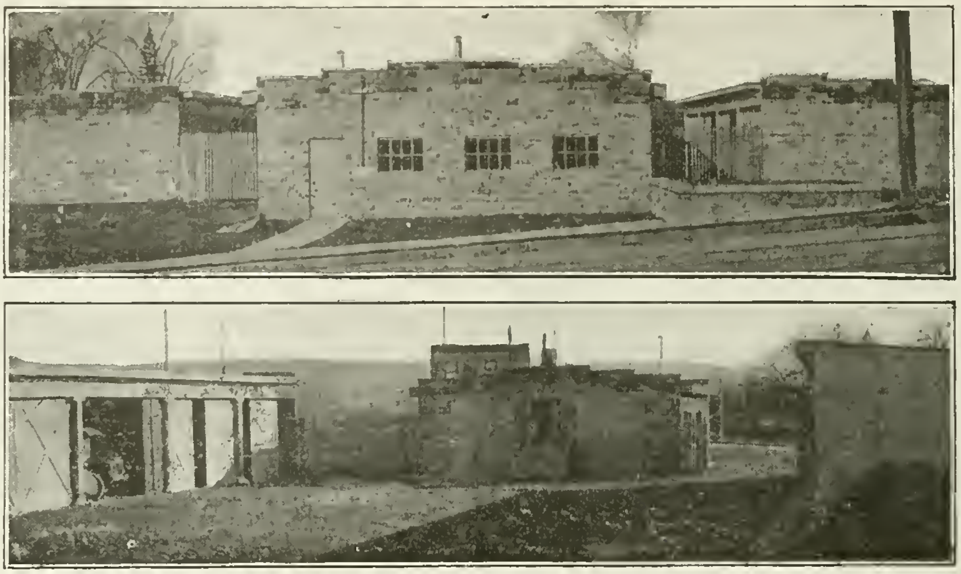


FIG. 5. EXTERIOR AND INTERIOR VIEWS OF PERMANENT MAINTENANCE STORAGE HOUSE

Permanent Equipment Storehouses

Heretofore the maintenance apparatus of the highway department has been cared for in a more or less haphazard manner. It has been the custom to rent several barns in each of the several counties which make up a division and store the equipment in the neighborhood where it is used in the summer. This has led to inefficiency in the care of machines, besides entailing extra expense due to superintendence and the hiring of a large amount of space which could not be utilized, as it was seldom that there was sufficient equipment in one locality to fill the quarters provided.

To overcome these defects, Division No. 2, of which Harvey O. Schemerhorn is division engineer, built a central storehouse at Waterford, N. Y. The substantial construction of the buildings is shown by Fig. 5. The arrangement consists of a repair shop at the center and front of the yard, with long storage sheds at either side. The buildings are constructed of cement blocks.

The repair and machine shop is used for overhauling trucks and other machinery. It contains a set of tools for completely overhauling and repairing all the machinery used by the department. Hoists are provided for removing and transferring bodies from one truck to another, and lathes and other tools for repairing broken parts. Stalls are also provided for the storage of cement, paint, bituminous and other materials.

One great advantage of this centralized storage is that the truck operators are kept on during the winter for the purpose of making repairs to their trucks, whereas it has been necessary heretofore to lay them off. It is understood that other divisions in the state are to construct similar central storehouses as soon as the necessary funds are made available. The views of the sheds show the open sliding doors with motor trucks, steam rollers, etc., stored for the winter.

Maintenance repair and reconstruction of the improved system of state and county highways in New York State is under the general supervision of Irving V. A. Huie, second deputy commissioner of highways.

Circular Meter Housing Cheaper Than Square

Circular meter housings instead of the square type have been tried out by the St. Louis Water Department, and found to be much cheaper in cost, according to the annual report of L. Chivvis, engineer in charge of the distribution section, to E. E. Wall, water commissioner. The meter is raised on two pipe uprights to within 18 in. of the surface, and is protected against frost by a double cover. Two hundred circular covers were purchased at a cost of $2.16 each, as compared with $14.90 for the old, square type, a set of steel forms for conical concrete housings was bought, and a score or more of the new installations were put in.

The round box takes up less room and requires less excavation, and is easier to handle. Its sole weakness is that it is not adaptable to granitoid sidewalks without running the risk of tearing out the granitoid to repair leaks on the supply pipe below the meter.

How House Building Costs Have Increased Since 1913

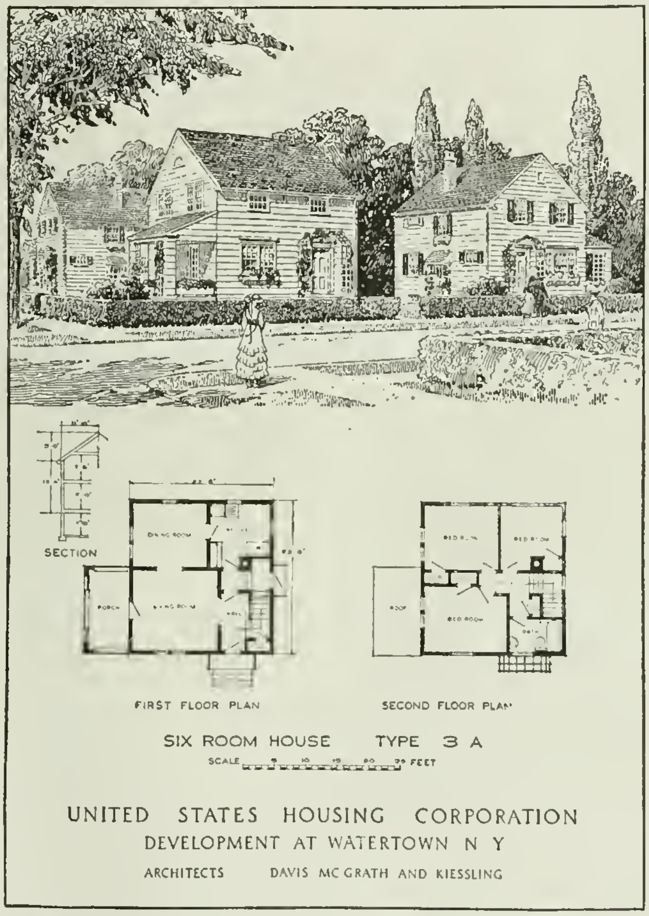
Figures Compiled by United States Housing Corporation Show That Small House Built for $4,117 in 1913 Would Have Cost $6,833 in Spring of 1919

By LeRoy K. Sherman
President, United States Housing Corporation, Washington, D. C.

BUILDING costs have advanced materially since before the war. That is an obvious observation, but exact figures based on close estimates of quantities and prices are rarely published. A useful purpose will doubtless be served by the compilation of such comparative figures recently made by the United States Housing Corporation for a small residence of the type which can well be used in an industrial housing development.

The corporation has completed the construction of some 6,000 houses and 64 dormitories. These houses are located in twenty-five different places in the United States, from Vallejo, Cal., to Bath, Maine. Most of this work was done during the period of the war emergency and at a time when efficiency meant speed rather than cheapness, so that the actual cost of these houses was greater than would be the case under normal conditions. However, with the experience of the builders and estimating and purchasing departments of the Corporation, it has been possible to compile comparative estimates under normal conditions.

For the purpose of comparing the cost of dwelling house construction there was selected a six-room frame dwelling house shown in the accompanying illustration. This house is a very common and popular type of dwelling and is described on p. 375, of vol. II of the Report of the United States Housing Corporation. It is two stories with basement, having the living room, dining room and kitchen on the first floor and three rooms with bath and toilet on the second floor. The outside dimensions of the floor plan are 22 ft. 8 in. by 23 ft. 8 in. The cubical contents is 14,900 cu.ft.


SECTION
FIRST FLOOR PLAN
SECOND FLOOR PLAN
SIX ROOM HOUSE TYPE 3 A
SCALE 0 5 10 15 20 25 FEET
UNITED STATES HOUSING CORPORATION
DEVELOPMENT AT WATERTOWN N Y
ARCHITECTS DAVIS MC GRATH AND KIESSLING

VIEW AND FLOOR PLAN OF SIX-ROOM HOUSE ON WHICH COST ESTIMATES ARE MADE

This house has a monolithic concrete substructure wall 8 in. thick, from footings to the bottom of first-story floor joists, and is plastered from grade to the top of wall with white cement plaster. The cellar is entirely paved with a 4-in. concrete floor. Subsoil drainage under cellar floor consists of 4-in. broken stone and a line of 4 in. diameter tile drain pipe placed around the inside face of footings. The walls of superstructure, both interior and exterior, are of 2 x 4 in. studs; sheathed, papered and weather-boarded on exterior and lathed and plastered, three coats—scratch, brown and hard white coat—on the interior walls. The roof is sheathed, papered and covered with a good quality slate. All flashings and counter-flashings of galvanized iron are painted with two coats of metallic paint.

Wood floors are doubled, with a layer of deadening felt between. The first and second floors are trimmed throughout with baseboard having shoe and cap moldings; all window and door openings are trimmed both sides, windows have stools and aprons and door openings have hardwood thresholds. All rooms, excepting kitchen, bath and closets have picture mold. A kitchen dresser is provided, and a medicine cabinet with mirror is placed in bathroom.

The woodwork throughout is B grade or better yellow pine. All exterior woodwork is painted three coats of lead and oil paint, and, with the exception of kitchen and bathroom, all interior woodwork is given two coats of varnish stain. The woodwork of kitchen is painted two coats of lead and oil paint and the bathroom woodwork three coats of enamel. All wood floors are given two coats of boiled linseed oil. All interior ceilings and walls, excepting walls of kitchen and bath, are painted two coats of cold-water paint. Walls of kitchen and bath are sized and painted two coats of oil paint.

A complete hot-air system is provided for the heating with a "Liberty Heater," a combination furnace and gas heater, complete with stove pipe, damper, damper regulator, check damper and a complete set of firing tools. The furnace has been tapped for the installation of hot water coils. All pipes and stacks are covered with 16-lb. paper asbestos. All registers are cast iron, black japanned, lattice design with iron borders.

The plumbing system is modern. Soils and vertical stacks are of "medium" cast iron, with all joints calked with oakum and leaded. Cleanout Y's with brass screw plugs are placed at foot of vertical risers. Floor drains have been provided in cellar floor and in the floor of side entry for refrigerator. Fixtures are supplied with both hot and cold water, hot water being supplied from a 24-gal. boiler connected to kitchen range, which is also

TABLE I. COMPARATIVE COST OF MODERN SIX-ROOM FRAME HOUSE FOR 1913 AND 1919

Unit prices used for each period were current in Boston, Mass. Unit prices for 1919 for both labor material were effective in May

	Items	1913								1919					
		Material Required		Labor Cost		Material Cost		Labor and Material Total	Remarks	Per cent increase	Labor Cost	Per cent increase	Material Cost	Labor and Material Total	Remarks
		Unit	Qnty.	Unit	Cost	Unit	Cost								
1	Excavations (general)	Cu.yd.	127	$0.50	$63.50		None	$63 50		100	$127 00		None	$127 00	Building laborers' wages increased from 25c. to 50c. per hour
2	Excavations (trench)	Cu.yd.	6	.75	4.50		None	4 50		100	9 00		None	9 00	Building laborers' wages increased from 25c to 50c. per hour.
3	Backfill and grading	Cu.yd.	130	.17	22 10		None	22 10		100	44 20		None	44 20	Building laborers' wages increased from 25c. to 50c. per hour.
4	Cinderfill under cellar floor	Cu.yd.	6	.40	2 40	1.00	$6.00	8 40	50c. for cinders plus 50c. for hauling	100	4 80	50	$9 00	13 80	Building laborers' wages increased as above. Material increased for hauling only.
5	Concrete foundation walls	Cu.yd.	23	1 25	28 75	3.50	80 50	109.25		100	57 50	100	161 00	218 50	Building laborers' wages increased as above. Cement, sand and stone up to 100%.
6	Forms for foundation walls	Sq.ft.	1,704	035	58 64	030	51.12	109 76		71	100.27	67	85 37	185.64	Carpenters' wages increased from 50c. to 75c—50%. Building laborers as above. Lumber up 67%.
7	Concrete floor in cellar	Cu.yd.	513 4	02 1 50	10 26 7 13	03 4 00	15.39 19.00	51 78	Top figures for finished top coat in sq.ft.	20 100	12 31 14 26	100	30 78 38 00	95 35	Cement finishers and finishers' helpers' wages increased from .625–75; .375–.50; material as Item 5.
8	Waterproof painting	Sq.ft.	565	005	2 83	015	8.48	11.31		100	5.66	50	12.72	18.38	Painting done by building laborers. Wages increased as above. Material up to 50%.
9	Drainage under cellar floor	Lin.ft.	93	05	4 65	05	4 65	9.30	Cinders included in cinder fill.	100	9.30	25	5 81	15 11	Building laborers' wages up to 100%. Material 25%.
10	Flue lining, 9-in. diameter	Lin.ft.	28	05	1 40	25	7 00	8 40		40	1.96	25	8 75	10 71	Bricklayers' waged increased from .625 to .875. Material up 25%.
					30 00		20 00			71	51.30	67	33 40		Plasterers' wages incressed from .625 to .875. Plasterers' laborers, from 30 to 50. Material as Item 5.
11	Plastering (interior)	Sq.yd.	432	20	86 40	11	47 52	183 92	Top figures for scaffold	46	126 14	100	95 04	305 88	
12	Lathing (wood lath)	Sq yd.	432	05	21 60	06	25 92	47 52		44	31 14	80	46.66	77 80	Lathers' wages increased from .565 to 81c. Lath up 80%.
13	Corner beads	Lin.ft.	82	02	1 64	03	2 46	4 10		44	2.36	67	4 11	6.47	Lathers' wages as above. Material up to 67%.
14	Plastering (exterior)	Sq.yd.	21	33	6 93	30	6 30	13.23		44	9 98	100	12.60	22 58	Plasterers and plasterers' laborers wages. Increased as above. Material as in Item 5.
15	Plaster board	Sq.ft.	100	02	2 00	05	5 00	7 00		50	3 00	67	8 35	11 35	Carpenters' wages increased as above. Material up 67%.
16	Miscellaneous iron, rough hdwre.						35 00	35.00				100	70 00	70 00	Material only: labor included in items. Material up 100%.
17	Lumber and carpentry				226.87		391 47	618.34		67	378 87	67	653 75	1,032 62	Carpenters and building laborers' wages increased as above. Lumber up 67%.
18	Exterior millwork				158 43		177 91	336 34		60	253.49	75	311.34	564 83	Carpenters and building laborers' wages as above. Lumber up 75%.
19	Interior millwork				146 28		210.81	357 09		60	234.05	75	368.92	602.97	Carpenters and building laborers' wages as above. Fin. lumber up to 75%.
20	Champion clothes dryer No. 2														
21	Roofing	100 sq.ft.	10	2.00	20.00	10.00	100.00	120 00		45	29.00	25	125 00	154.00	Slate roofers' wages increased 40%. Laborers' wage up as above; .625-.875; 25c. to 50c.
22	Sheet metal				12 00		24 00	36.00		50	18.00	100	48.00	66.00	Sheet metal workers' wages increased 50%; from 50 to 75c. per bour.
23	Painting				93.37		25 00 50 15	168 52	Top figures for ladders and scaffold	50	140 06	300	25 00 200.60	365.66	Painters' wages increased 50% from 50 to 75c. per hr. Linseed oil up 400%. W. lead 100%.
24	Plumbing				130.00		195 00	325 00	Including 20% for contrsctors' overhead, expenses and profit.	75	227 50		264.50	492 00	Plumbers' wages increased from 50c. to 75c. per bour.
25	Finished hardware						37 00	37.00				75	64.75	64 75	Material only. Labor included in millwork. Material up to 75%.
26	Electrical work	Outlets	11		18 00		42.00	60.00	Including fixtures	36	24 48		54 00	78 48	Inside wiremen and I. W. fixture hangers. Wages increased 36% and 50%.
27	Heating				37 00		148 00	185 00	Including 20% for contractors' overhead, expenses and profit.	50	55.50	50	222.00	277 50	Sheet metal workers' wages increased as above.
	Total cost of labor and material				$1,196 68		$1,735.68		Labor increase	65	$1,971 13		$2,959.45		71% Material increase
	Grand total							$2,932.36						$4,930.58	68% Total increase labor and mat'l

TABLE Ia. COSTS OF ALTERNATE MATERIALS AS APPLIED TO FIGURES IN TABLE I.

	Items	Material Required		1913 Labor Cost		1913 Material Cost		1913 Labor and Material Total	Remarks	1919 Per cent increase	1919 Labor Cost	1919 Per cent increase	1919 Material Cost	1919 Labor and Material Total	Remarks
		Unit	Qnty.	Unit	Cost	Unit	Cost								
	Alternates														Deductions and Additions for Alternates
1	Asphalt (ready) roofing	100 sq.ft.	10	.50	$5.00	3.00	$30.00	$35.00		75	$8.75	50	$45.00	$53.75	$100 25 Deduct for asphalt roofing
2	Wood shingles	100 sq.ft.	10	1.90	19.00	4.00	40.00	59.00		67	31.73	100	80.00	111.73	42 27 Deduct for wood shingles
3	Rubble masonry foundation walls	Sq.yd.	30	3.50	105.00	3.50	105.00	210.00		40	147.00	50	157.50	304.50	99.64 Deduct for rubble found'n
	Stucco on exterior walls	Cu.yd.	176	.69	121.44	.80	140.80	262.24	Including metal lath	46	177.30	100	281.60	458.90	333.44 Add for stucco exterior
....	Terra cotta block foundation walls	Cu.ft.	833	.15	124.95	.15	124.95	249.90		40	174.93	100	249.90	424.83	20.69 Add for T.C. block found'n

provided. With the exception of water closet and flushing tank, fixtures are of enameled iron. The two fixtures named are of porcelain.

The electrical work is B-X work, as per requirements of the National Board of Fire Underwriters. The fixtures consist of 1 light ceiling fixture, cast canopy 5 in. in diameter with translucent glass shade, for kitchen, first and second story halls, and bedrooms; dining and living rooms have 1 and 2 light fixtures with cast canopies and chains supporting, 12-in. opal glass bowl for semi-direct lighting in dining room and each of the two lights of living room fixtures. The fixtures throughout are of metal-brush-brass finish.

This house was built between October, 1918, and May, 1919, at Watertown, N. Y., by the U. S. Housing Corporation in connection with 114 other houses in the same vicinity, for the sum of $3,908. On the accompanying tabulation (Table I), the estimated cost of this house, if built in 1913, would have been $2,932, exclusive of overhead and profit excepting as noted. On the same tabulation, the estimated cost of this house constructed today (that is, on units as in force in May, 1919) would be $4,930, exclusive of contractor's profit and overhead, excepting as noted. The estimates show an increase in cost of building from 1913 to 1919 of 68 per cent, of which the labor increase is 65 per cent and the increase for materials is 71 per cent. The prevailing union scales of wages for laborers and mechanics in the building trades for the City of Boston in 1913 and 1919 were used in making this comparison. They were selected as they happened to represent to a fair degree the average increase in building trades wages.

Table II is an analysis of the unit prices for labor as given on the estimate sheets. How this table was used in the compilation may be explained by the following example:

Item 6, Labor, cost per bour 1913:

Carpenters	400 sq.ft. — 8 hrs.	@ 0.50	$4.00	÷ 400 sq.ft.	0 01	making forms
	400 sq.ft. — 8 hrs.	@ 0.50	$4.00	÷ 400 sq.ft.	0 01	placing and bracing
Laborers	400 sq.ft. — 8 hrs.	@ 0.25	$2.00	÷ 400 sq.ft.	0 005	placing and bracing
Laborers	400 sq.ft. —16 hrs.	@ 0.25	$4.00	÷ 400 sq.ft.	0 01	wreck, clean and pile
	40 hrs.				0 035	unit cost

400 sq.ft. ÷ 40 hrs., 10 sq.ft. per hr. 10 sq.ft. x 0.035 = 0.35 labor rate per hour
Labor cost 1913 —$14.00 10 ÷ 14 = 0.71 per cent labor increase for 1919
Labor cost 1919 —$24.00

COST OF MATERIALS AND WAGES

The unit prices used in the estimate for materials were obtained from the Department of Labor, Bureau of Labor Statistics, and from the published records in the various trade journals The fluctuation of prices of building materials were shown in the diagram reprinted in the *Engineering News-Record*, Oct. 30-Nov. 6, 1919, p. 799. The total percentage increase in cost of materials for the six room houses, which we have used for illustration, is 71 per cent.

The rate of wages per hour for the various building trades in 1913 and 1919 were obtained from a bulletin of the Bureau of Labor Statistics with the exception of 1919. The rates for that year are those contained in the report of the proceedings of the third annual convention of the American Federation of Labor under date of June 4-7, 1919. The increase in the wage scale of the various trades in eight cities of the United States is shown in *Engineering News-Record*, Oct 30-Nov. 6, 1919, p. 788. The percentage of increase in wages in 1919 over 1913 varies in the trades used in our estimate from 36 per cent to 100 per cent. The total percentage increase in the cost of labor in the six-room frame house, which we have used for illustration is 65 per cent. The total percentage of increase for both labor and material is 68 per cent.

It appears that there has been a material increase in the cost of building labor in 1919 over 1918, but this increase has only followed the corresponding increase in cost of building materials and other commodities. The cost of both building labor and material now appear fairly comparable with other increases in the cost of living.

HOLLOW TILE AND BRICK HOUSES

In addition to the estimate for the six-room frame house, estimates have been prepared for a similar house built of hollow tile and also one of brick. The comparison of the three is as follows:

COMPARISON OF COST OF SIX-ROOM DWELLING HOUSE

Type of House	1913	1919	Per Cent of Increase
Frame house	$2,932.36	$4,930 58	68
Hollow tile stuccoed	3,362.65	5,665 18	68
Brick	3,546.34	6,038.73	70

In the comparison of estimated costs as of 1913 and 1919, the same amount of materials and the same rates of output of labor are used in each case. The rates of output of building labor are, of course, subject to wide fluctuations. The rates assumed have been compiled and checked by the Estimating Division of the United States Housing Corporation and by builders of practical experience. The efficiency of labor in the comparison presented is taken as being the same in 1919 as in 1913. With the exception of a period in the spring of 1919, many building contractors maintain that the efficiency of building labor is not as high now as it was in 1913.

In compiling these tables the cost of labor and material were figured out for each item for the house built as of 1913. The 1919 costs were arrived at by applying the percentage of increase in labor and material (which was derived from the diagram showing fluctuations in cost of labor and material) to the 1913 figures. It should be borne in mind that this is an estimate based on average prices and average work under union labor. There is a wide variation in the cost of labor and the cost of materials in different parts of the country and this same house built under different conditions from those assumed here may easily vary in cost $500 or more.

The foregoing estimates do not include public utilities, contractor's profit and overhead or architect's fee.

From the report of the "Economics of the Construction Industry" by the United States Department of Labor, as well as from the Real Estate Division of the United States Housing Corporation, the indications are that there has been little increase in the value of land occupied by the ordinary dwelling house. For the purpose of further comparison, the total cost of the frame house with land, appurtenances and overhead, we will assume the following:

Cost of land ($1,000 per acre—7 lots per acre)	$143.00
Cost of public utilities per lot	400.00
Contractor's profit and overhead, per cent	15
Architect's fee—plans and supervision, per cent	6

Based upon the foregoing the comparison of the total cost of erection of houses in 1913 and 1919 is as follows:

SIX-ROOM FRAME HOUSE

	1913	1919
Net cost of building	$2,932.36	$4,930.58
Cost of land at $1,000 per acre	143.00	143.00
Cost of public utilities	400.00	680.00
Contractor's profit and overhead, 15 per cent	439.85	739.59
Architect's fee—plans and supervision, 6 per cent	202.33	340.21
	$4,117.54	$6,833.38

Increase of 66 per cent.

The housing shortage today is almost universal. It exists not only in the cities of the United States but in almost every other country. The housing shortage in this country due to war activities and the increased cost of construction has been estimated at 1,000,000.

The market value of a house differs from most commodities. In most commodities the consumption closely approximates the supply and the selling value follows and corresponds with the increase in cost. The selling value of dwelling houses as a commodity is governed largely by rentals which the house will bring. By far the greater part of the house rentals come, of course, from houses built during pre-war costs. The rent of these houses, as heretofore stated, has increased in general not over 20 per cent. This represents an increased income to the owner without an increased expenditure of capital.

An entirely different situation exists with respect to the owner renting a house built in 1919. A 20 per cent increase in rents based on 1913 costs will not bring the owner of a new building a rental sufficient to warrant him investing his money in dwellings for rental purposes. The new owner has to compete with the numerous owners of property built in pre-war times.

Of course, there are many cities where the housing shortage is so acute that new buildings are built and readily rented or sold at prices considerably in excess of the 1919 estimates which we have presented. Unquestionably, as the housing shortage becomes more acute and as the older houses become obsolete and go out of the market, all rentals and selling values of property will tend to approach the prices based on the cost of the new house.

During this transition period the wits of people have been sharpened in an effort to meet the problem. They are using some lessons learned from the Government's housing experience during the war and they are supplying construction and financial methods which will reduce the cost of the building to the occupants. The housing problem during the transition period is being solved by more efficient methods of construction and financing so that economies in production will tend to reduce the cost of new dwellings as a compromise to meet the rising values of the older property.

A large part of the new dwelling construction now being undertaken is handled by housing companies. The membership of these companies consists largely of pub-

TABLE II. ANALYSIS OF UNIT PRICES FOR LABOR, 1913-1919
Prepared by United States Housing Corporation, Washington, D. C.

No.	Item	Unit Quantity	Unit Cost	Quantity per Hour	1913 Labor Rate per Hour	1919 Labor Rate per Hour	Per Cent Increase
1	Excavation (general)	Cu.yd.	0.50	0.50	0.25	0.50	100
2	Excavation (trench)	Cu.yd	0.75	0.333	0.25	0.50	100
3	Backfill and grading	Cu.yd.	0.17	1.47	0.25	0.50	100
4	Cinder fill, no cement	Cu.yd.	0.40	0.625	0.25	0.50	100
5	Plain concrete	Cu.yd	1.25	0.20	0.25	0.50	100
6	Forms for concrete	Sq.ft.	0.035	10.00	0.35 {0.50 0.25	0.75 0.50	71
	Laborer's time 1½ carpenters						
7	Concrete floor, cellar	Cu.yd.	1.50	0.167	0.25	0.50	100
	Top dressing	Sq.ft.	0.02	31.25	0.625	0.75	20
8	Waterproof painting	Sq.ft.	0.005	50.00	0.25	0.50	100
9	Drainage cellar floor	Cu.ft.	0.05	5.00	0.25	0.50	100
10	Flue lining	Lin.ft.	0.05	12.50	0.625	0.875	40
11	Plastering (interior)	Sq.yd.	0.18	2.666	0.48 {0.625 0.315	0.875 0.50	46
	Laborer's time ¾ plasterers						
12	Lathing	Sq.yd.	0.05	11.3	0.565	0.81	44
13	Corner beads	Lin.ft.	0.02	28.3	0.565	0.81	44
14	Plastering (exterior)	Sq.yd.	0.313	1.693	0.53 {0.625 0.315	0.875 0.50	58
	Laborer's time ½ plasterers						
15	Plaster board	... ...	0.02	25.00	0.50	0.75	50
17	Lumber and carpentry	1000 b.m.	17.14	0.0219	0.375 {0.50 0.25	0.75 0.50	67
	Laborer's time equal carpenters						
18	Exterior millwork	Lump sum			0.417 {0.50	0.75	60
	Laborer's time ½ carpenters						
19	Interior millwork	Lump sum			0.25	0.50	
	Laborer's time ½ carpenters						
21	Roofing	100 sq ft.	2.00	2.75	0.55 {0.625 0.25	0.875 0.50	45
	Laborer's time ¼ roofers						
22	Sheet metal	Lump sum			0.50	0.75	50
23	Painting	Lump sum	100.00	0.50	0.50	0.75	50
24	Plumbing	Lump sum	..	....	0.50	0.875	75
26	Electrical work	Lump sum	....	.	0.55	0.75	36
27	Heating	Lump sum		.	0.50	0.75	50

lic spirited citizens, who are content to finance the construction of dwellings at a modest return on their investment and they realize the incidental value which will revert to their city and their local industries by adequate housing facilities. The economies which are obtained by these housing companies are accomplished by a reduction in the overhead cost which was mentioned in the estimate of the total cost of the dwelling to the occupant. These economies effected by a comprehensive plan, are as follows:

Reduction per house in the contractor's percentage or profits and the architect's and superintendent's fees by the construction of a hundred or more houses at one time under one contract.

The reduced cost of materials by purchase in carload lots for wholesale building.

The more efficient utilization of highly subdivided. and specialized labor by the ability to install a more efficient construction organization where a number of houses are built at one time.

The use of standards and uniform sizes in designs which do not, however, make the houses appear to be standardized.

The improvements in arrangement of utilities and conveniences in the house, as well as the artistic arrangement of the buildings, drives, trees and planting, so that the added attractiveness of the house will invite the occupant in spite of an increased rental or cost.

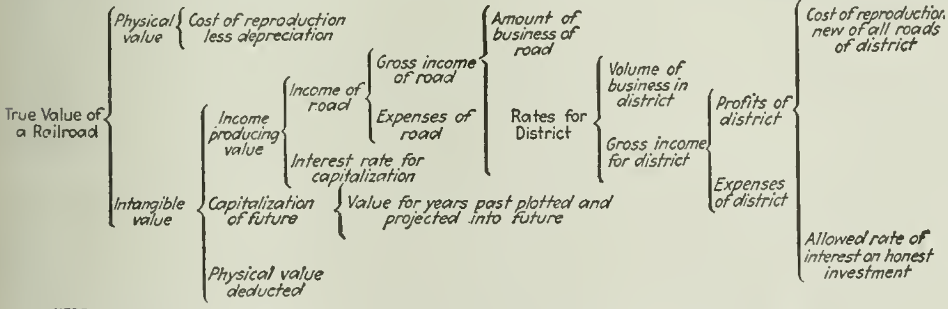
Elements of Value Graphically Shown

By Orlin R. Morse

Pilot Engineer, Missouri, Kansas & Texas R.R.
Formerly Senior Engineer, Bureau of Valuation, I. C. C.

THE outline shown herewith is intended as a definite basis for argument, drawing a distinction between physical and intangible value and analyzing the elements of the latter. The key to such a solution is the assumption that the owners of the railroads should receive a fair rate of return on money invested.

A district having uniform transportation conditions, such as cost of construction, volume of business and cost of operation, is considered as a unit, the income within the district paying for the investment. Should each road retain all of its earnings, the intangible value will accordingly be increased or diminished. For the small roads, a terminal charge plus a mileage charge for the haul would bring more income.


True Value of a Railroad
Physical value
Cost of reproduction less depreciation
Intangible value
Income producing value
Income of road
Gross income of road
Amount of business of road
Rates for District
Volume of business in district
Gross income for district
Profits of district
Expenses of district
Cost of reproduction new of all roads of district
Allowed rate of interest on honest investment
Expenses of road
Interest rate for capitalization
Capitalization of future
Value for years past plotted and projected into future
Physical value deducted

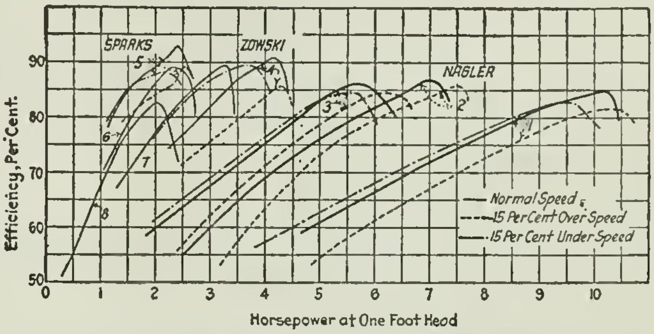
"INTANGIBLE" VALUE BASED ON INCOME-PRODUCING CHARACTERISTICS

In the analysis shown above the physical value of the individual railroad does not affect the true value. Intangible value as here outlined agrees with expert testimony given in the Kansas City Southern hearing, in which the railroad based claim for intangible value on income-producing qualities.

New Hydro-Turbine Runner Shows Epochal Development

Waterwheel Described in Paper by Designer Gives 140 Per Cent More Power and 50 Per Cent Greater Speed Than Previous Types

AFTER a half-century of hydraulic-turbine development when the most rapid advance, beginning in the 90's, was based on the mixed-flow reaction and the impulse type of runner, comes the startling announcement in a paper read before the American Society of Mechanical Engineers, Dec. 4, by the designer, Forrest Nagler, of a very simple, axial-flow type of runner, testing 140 per cent more power and a 50 per cent greater characteristic speed than any type previously available. In comparison with other types the new runner is claimed to be especially efficient in turbines operating under low head.



POWER-EFFICIENCY CURVES FOR WHEELS HAVING A NORMAL SPEED OF 50 R.P.M.

Mr. Nagler's paper describing and comparing his runner with others was based on a series of Holyoke tests and on various actual installations by the Allis-Chalmers Manufacturing Co. For comparison he used Professor Zowski's mixed-flow runner as the highest standard of previous development. Professor Zowski described his runner and the result of its Holyoke tests in an article in *Engineering Record*, Dec. 26, 1914, p. 689. This article was supplementary to his article on the same subject in the *Engineering Record*, Nov. 28, 1914, p. 585.

What follows is abstracted from Mr. Nagler's paper:

The success of the Nagler runner is due to its extraordinarily high speed under low-head conditions, or rather its surpassing characteristic speed, implying stipulated unit conditions. This speed is the result of two fundamental advantages afforded by the axial-flow principle: A minimum of wetted surface and a maximum of mechanical strength.

The entire design is based on the use of straight radial blades which offer little wetted surface for water friction, simple water passage, a minimum of centrifugal force, and a minimum of bending moment. Moreover, the high speed of water passage exerts an accelerating suction force on the back surface of the blades. This fact was demonstrated by an investigation of thrust and power which showed that the force

Variable Designs for County Highway Systems

THROUGH error the name of the author of the above-titled article, appearing in *Engineering News-Record*, Jan. 29, 1920, was omitted. The article was written by J. Y. McClintock, Superintendent of Highways, Monroe County, New York.

---

on each blade exceeds the product of blade area and total apparent head, which can only mean that there is less atmospheric pressure on the back side of the blade, aside from that due to the draft head.

It is difficult in practice to secure such high characteristic speed without correspondingly high velocities of water at the runner discharge. Such high exit velocities would incur tremendous efficiency losses were no draft tube or diffuser used. On low heads and large capacities a long, straight tube is usually uncommercial on account of the excessive excavation involved and some form of a radial-outward-flow type is practically necessary. White's "Hydraucone Regainer" has been adopted as the most perfect commercial solution of the Nagler runner's diffuser problem yet found for general conditions, and practically all Nagler installations to date have been furnished with this hydraucone built either of steel or concrete.

ONE OF THE FIRST COMMERCIAL APPLICATIONS OF THE NAGLER TYPE OF RUNNER

Referring to the curves in the accompanying cut, the highest speed ordinarily offered in commercial work is typified by curve No. 4 Contrasted to this are shown curves Nos. 1, 2 and 3, the second of which is deduced directly from Holyoke test data. The most definite indication of the field of application of the new form of runner is obtained from the curves on the following basis: Under any given conditions of head and with such minimum limit of speed as might be imposed by consideration of cost, efficiency and floor space, runner No. 1 will give 140 per cent and runner No. 2 will give 65 per cent more power than runner types previously available as typified by No. 4. Comparison on a speed basis using equal power would illustrate the application of the new type as follows: Under any given conditions of head and power, runner No. 1 will give over 50 per cent and runner No. 2 will give over 30 per cent more speed than runner types previously available as typified by No. 4.

Railway Improvements Under Government Control Total $470,000,000

IMPROVEMENT work carried out by the United States Railroad Administration during the first 21 months of the period of its control of the railway system represented a total cost of over $470,000,000, but the work and cost were considerably less than the amount authorized, as war and other conditions prevented carrying out the program in its entirety. Including the plans initiated under the Railroad Administration and the improvements which it approved, but which had been undertaken previously by the railway companies, the estimated cost of works authorized on existing railways by the Division of Capital Expenditures from Jan. 1, 1918, to Sept. 30, 1919, aggregated $676,684,763. To this must be added $47,576,573 for the construction of new lines, branches and extensions. Actual expenditures for such work during this period aggregated $448,040,911 for improvements and $25,928,064 for new lines, or 66 and 54 per cent respectively of the amounts authorized.

TABLE OF AUTHORIZED AND ACTUAL EXPENDITURES UNDER UNITED STATES RAILROAD ADMINISTRATION FOR IMPROVEMENTS AND BETTERMENTS FROM JAN. 1, 1918 TO SEPT. 30, 1919

(Existing Lines)	Estimated Cost of Work Authorized	Expenditures on Work Authorized
Widening cuts and fills, filling trestles, etc.	$11,517,932	$7,842,780
Ballasting	14,507,142	8.453,089
Rails and other track material	58,003,071	35,092,758
Bridges, trestles and culverts	59,767,770	37,405,197
Tunnel and subway improvements	3,097,594	1,897,962
Track elevation or depression	18,291,659	5,076,323
Elimination of grade crossings	15,841,464	7,026,734
Grade crossings and crossing signals	2,478,006	1,680,190
Additional main tracks	70,823,713	45,792,210
Additional yard tracks, sidings and industry tracks	143,371,775	91,847,951
Changes of grade or alignment	9,419,410	5,934,899
Signals and interlocking plants	16,724,038	12,129,011
Telegraph and telephone lines	6,944,179	5,173,086
Roadway machinery and tools	2,715,119	2,309,365
Section houses and other roadway buildings	4,638,487	3,428,475
Fences and snowsheds; right-of-way, snow or sand fences	2,652,105	1,588,864
Freight and passenger stations, office buildings and other station facilities	42,597,676	27,762,436
Hotels and restaurants	1,287,688	995,927
Fuel stations and appurtenances	10,679,445	8,185,994
Water stations and appurtenances	16,305,180	11,427,297
Shop buildings, engine houses and appurtenances	79,027,908	71,060,353
Shop machinery and tools	28,239,075	18,262,783
Electric power plants, substations, transmission and distribution lines	22,771,064	14,919,592
Wharves and docks	7,184,238	3,705,132
Coal and ore wharves	6,724,902	5,339,656
Grain elevators and storage warehouses	4,640,599	3,310,998
Real estate	793,641	467,097
Assessments for public improvements	3,407,992	2,398,998
All other improvements	12,241,891	7,525,754
Total (excluding equipment)	$676,684,763	$448,040,911
Construction of extensions, branches and other new lines	$47,576,573	$25,928,064

The classification of the work is shown in the accompanying table. The only large item in which performance approached the original program was that of "shop buildings, engine houses and appurtenances," the estimates and expenditures for which were $79,000,000 and $71,000,000 respectively.

Additional Water Supply for Manchester, England

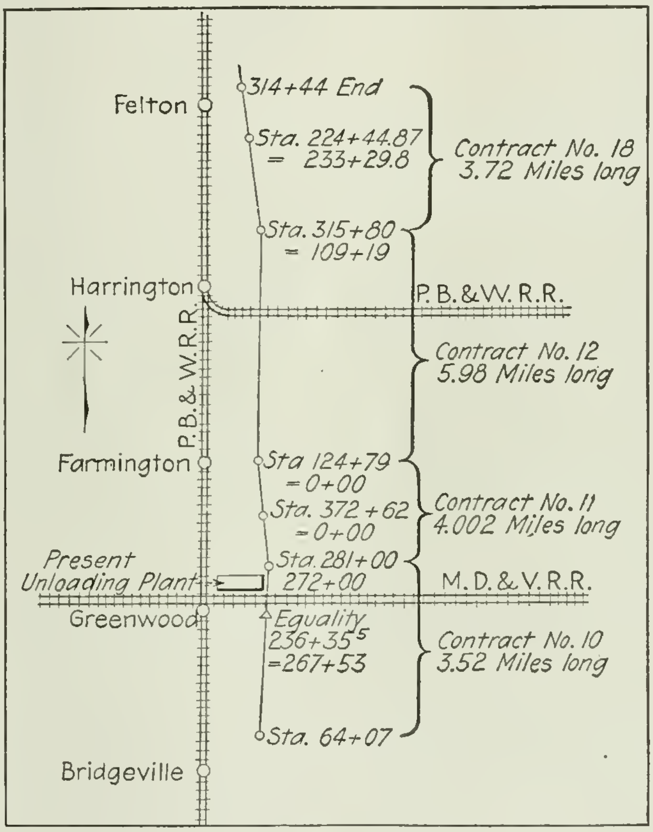
A dam 100 ft. high, at the eastern end of a lake known as Hawes Water, together with minor storage and diversion works and an aqueduct about 54 mi. long, were authorized by the British Parliament in 1919 to provide an additional water supply for Manchester, England. The completed scheme would supply about 1,000,000 U. S. gal. per day, would cost about £10,000,000 (at normal exchange about $48,650,000), and would be carried on through a long period of years.

Continuity of Operation Essential to Success In the Use of Industrial Railway

Factors Making for Success Are Ample Provision for Materials Delivery, Correct Routing, Uninterrupted Transit, Co-ordination of Plant Units, Upkeep of Machinery

By H. Eltinge Breed
Consulting Engineer, New York City

WE ARE close to the second season of the new era in highway building. We approach it with high hopes; though also with uneasiness. Will this year bring better results and greater rewards for highway work, or will it be, especially for the contractor, another period of dusky doubt and dissatisfaction? The temptation is strong to offer patent pills of advice: "Do this or that—use this or that machinery; follow this method or the other, and all will be well." Unfortunately it won't. Success is not so cheaply had. We can't coast to quick conclusions on the basis of what happened last year. Rather, we must try to make our plans now through careful consideration of specific jobs undertaken—why they succeeded; why they failed; how they could have been better.



POSITION OF THE FOUR McNICHOL CONTRACTS

The McNichol job in Delaware is significant because it contains three important factors in this new phase of highway work. They are the long contract, the large scale contractor coming into highway work from other fields of construction, and the extensive use of machinery. It is significant also because it illustrates two principles which I believe will largely determine the success of this year's work — continuity of operation, and executive ability. It suggests a number of ways in which both of these principles may be attained.

The road runs from Bridgeville to Felton, Del. It was let in three contracts so as to interest contractors who wanted small jobs as well as those who wanted big ones. The McNichol Paving & Construction Co., of Philadelphia, got all three and later an adjacent fourth. So they are building a road 17.22 mi. long, 16 ft. wide, of concrete pavement 1:2:4 mix, 8 in. thick at center, 6 in. at the side, with a circular crown. All the materials are imported. The accompanying sketch shows the layout of the four contracts, and the railroad facilities for getting in materials. The railroad intersects the highway at Sta. 272, where an unloading plant is located. There is a twenty-car siding, nine cars east, and eleven west, of the highway.

The unloading plant proper is on the west side of the highway. It contains a traveling derrick with a three-drum hoist, having an independent swing, of a 180-deg. radius, and carrying a ¾-yd. clamshell bucket which runs on a track of 13½-ft. gage, parallel to the railroad siding on the left. On the right of the crane is a tunnel 200 ft. in length, with traps spaced so that material can be poured precisely through into the batch boxes on industrial railway cars as they are run into the tunnel and spotted. The clamshell bucket sticks its open mouth into one of the freight cars of the siding, closes up on a load, swings around its boom and bucket, depositing the load on top of the tunnel. Thence the material drops through the traps into the industrial railway cars.

The capacity of the storage area around and over the tunnel is about 90 cars of material—30 of sand and 60 of stone. This area could easily be increased. It offers the tremendous advantage in these days of oversold material markets of having an ample reserve supply on hand. It also saves demurrage. The additional cost of rehandling involved is slight.

The tunnel is built with track at the ground level, on such a grade that trains twenty cars long can be snubbed through the tunnel over a niggerhead at the entrance. A depressed tunnel would have required less rehandling of materials. The cost of the tunnel approximated $10 per linear foot, in place complete.

Beyond, to the west, as shown in the sketch, is a cement house 20 x 120 ft. of 3,000 bbl. capacity. Industrial track to and through the tunnel is laid from the highway on to the cement shed. Another track from the cement shed is run north of the tunnel back to the main highway where it joins the main line of the industrial railroad. The track used is a 25-lb. rail riveted onto pressed steel ties, each section being 15 ft. long. It was laid with unusual care, and consequently there have been fewer derailments and less trouble than on any other piece of work of this kind that the writer has seen. The maximum grade on the line is 2½ per cent.

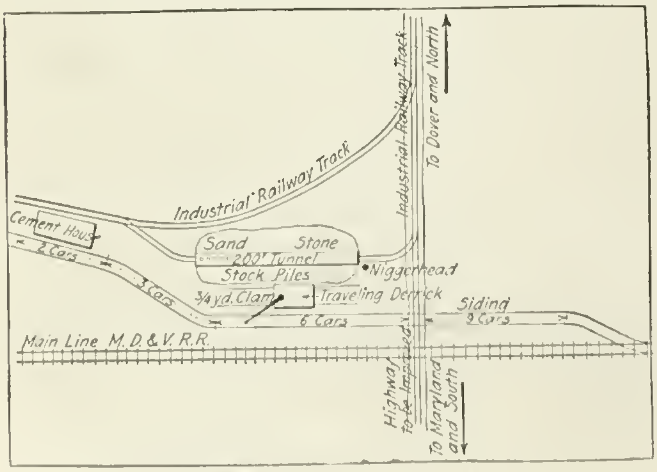
The rolling stock equipment consists of three 6-ton gasoline locomotives, each of which uses 16 gal. of gasoline and 1 qt. of oil in a 10-hr. day. Each of the three trains has 20 cars, and each car frame and running gear weighs 400 lb., on top of which sits a wooden batch box weighing about 700 lb. These batch boxes, which were made on the job by the contractor, are so partitioned that each one may carry cement. sand and stone up to a load of 2,800 lb. The boxes cost approximately $16 apiece to build.

They are shifted from the train to the concrete mixer by a small derrick attached to the mixer, which swings them around over the skip, where they are dumped by the batch transfer men. The mixers are of four-bag capacity with caterpillar traction. To surface the concrete a 10-in. channel iron templet weighing about 400 lb. is used. It has a narrow angle iron bolted along the inside center of the channel as a stiffener. Water for the work is furnished by pipe line and pump supplied from driven wells which cost approximately $50 each. Two miles of pipe were used on this work.

Average Output

With this equipment the average output, when running full, has been 430 ft. The best run as yet for a single hour is 25 batches. More men and equipment would have kept them both operating to full capacity, with a much greater output and resultant decrease in cost per unit for doing the work. The unloading plant has emptied nine freight cars a day—ten cars would be its utmost capacity. From the unloading plant to the day's final output the amount of work is estimated on the basis of a speed of 10 mi. an hour for empty cars and 8 mi. for loaded cars. This speed has been exceeded under good conditions. It would be greater on a job that provided for train passings by having through switches instead of stub switches. It would be decreased, however, in a country where there were grades. It is axiomatic that a decrease in speed necessitates an increase in rolling stock.

The Felton-Bridgeville section aptly illustrates special need for this kind of equipment. Team haul would have been out of the question on account of the character of the soil. It is a sand allowing only small loads of one ton or less to be drawn over the highways. Horses could ill have endured the strain. To make it sustain the weight of motor trucks, considerable planking would have had to be done at great expense. Industrial railway was the obvious solution. It would also be a feasible solution on any large jobs where considerable cross-country hauling away from highways is involved. It is advantageous in that it insures clean aggregates, prevents wastage of materials, and preserves the finished subgrade from the damage caused by hauling over it.



ARRANGEMENT OF PLANT LAYOUT

STOCKPILES, STONE BEING UNLOADED BY CLAMSHELL

To operate this equipment and secure the average day's output, men are needed with decidedly greater intelligence than that of the ordinary day laborer. The extensive use of machinery has at least three advantages: It is giving us better, more dependable results than hand labor; it is enabling us to carry through a program impossible without it, because the present supply of labor is entirely inadequate for its performance; and, most valuable of all, it is raising the whole standard of intelligence required in highway work. The faster we can eliminate the untrained, ignorant uninterested day laborers, and substitute for them machines operated by trained, efficient, interested men, the sooner will highway construction work win due social recognition and adequate pay. Furthermore, we shall be freeing the untrained laborers for less developed fields by work where they are sorely needed. And, beyond the scope of our immediate work and interests, we may have the satisfaction of knowing that we are in step with that progress that is raising the whole standard of intelligence in this country by lessening the demand for ignorant workers and increasing the demand for skilled workers. Human nature responds quickly to demands made upon it. All of us are influenced to advance or backslide by what our social group requires of us. The contractor is a big factor in the highway workers' group.

Character of Labor

What happens when the contractor substitutes machinery and skilled labor for the old unskilled labor was clearly indicated on this job. The men were the most alert, eager, interested lot that the writer has ever met on a highway job. They were not mere cogs in a machine, but they were the directing force behind machinery whose successful operation depended upon the skill and effort of each one of them.

To begin with, on this job, it took one foreman and eight men one day to lay ½ mi. of track; the same gang, in the same time, can rip up ¾ mi. Given mileage and wage scale, to estimate that cost is merely a matter of multiplication.

Five men are required in the cement house, two to clean up around cars, etc., and three at the tunnel with the engineer, the fireman and the foreman of the gang. A blacksmith and his helper are required to do the

A STRING OF "EMPTIES" BOUND FOR CEMENT HOUSE

necessary repairing of equipment. Each train has an engineer and a train man to run it. Six men have been steadily busy keeping up the track. Around the mixer there is one foreman, four batch transfer men, three spreading concrete, two at the templet, one at the chute, one at the charging skip, two curing, two on the belt, one engineer, one fireman.

It is obvious that every one of these men must bring a certain amount of skill and of personal enthusiasm to his work. The natural corollary to this is that the men in charge possess executive ability.

Before a contractor goes in for the extensive use of machinery he wants to have one of those searching interviews with himself that is so likely to be unpleasant. What are his financial resources? What is his mental capacity? How great his executive ability? How strong his power to pick and to lead men? If he can answer these questions satisfactorily he is fairly safe in going ahead. Even then, however, he may meet reverses through too bad weather conditions, through inadequacy in the machinery, or some error in planting the job.

In the McNichol job, part of the machinery was too light. That there should have been heavier running equipment is proved by the number of broken trucks that piled up in the yard. Of their own volition, the machinery manufacturers are replacing the breakage with heavier gear. And the weather was as bad as any contractor might hope to be spared—only 26 fair days fom early June to late September. These two factors have so far kept the work on this job away below expectations; there is still time, however, if all goes well, for it to terminate successfully. Under satisfactory conditions of management and plant, the industrial railway of course gives low ton-mile cost in hauling large quantities long distances.

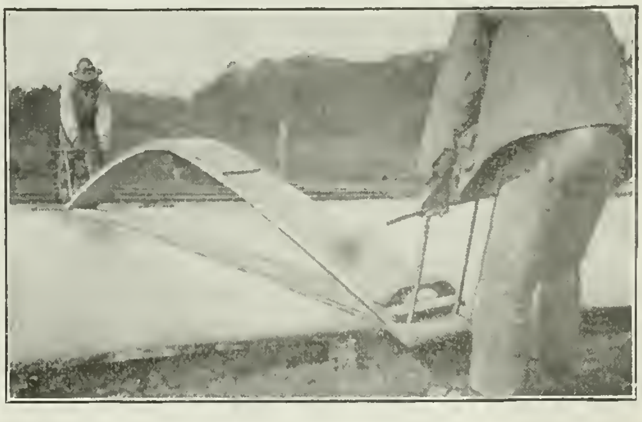
Success, in this job and in every other considerable highway job, depends upon one factor which includes every other factor that has been mentioned. Ample provision for delivery of materials, correct routing between unloading and destination, uninterrupted transit, co-ordination of plant units so that each one is working to capacity all the time, foresight in the management, skill in the workers, upkeep of the machinery, all these are directed to one end—continuity of operation. The structure of the concrete road requires it, the extensive use of machinery compels it.

The reason is apparent as soon as we realize what happens when continuity of operation fails. Let us assume that on the McNichol job there is $80,000 worth of plant. On this capital investment, interest, repairs and depreciation, by close estimate, amount to $162 a day, if we reckon 150 days for the working season; or $24,420 a year. Wages run to $240 a day. Estimating overhead expenses at $40 a day brings the total of fixed charges to $442 a day or $44.20 an hour.

So, on a job like the McNichol planted at $80,000, for every hour lost on work there is an approximate sum of $44 to be made up. Where there are defects in organization or equipment, lost hours here and there multiply rapidly. Soon the amount in arrears exceeds possible profits, and the job financially has failed. It has lacked continuity of operation. With it, it would have succeeded.

How is continuity of operation to be attained? Let us look again at the McNichol job as it will be run under favorable conditions during the coming season. The cement, sand and stone come in standard cars and are switched onto the railroad siding shown in the sketch. The bagged cement is unloaded by hand labor into the cement house. The sand and stone are unloaded, one car at a time, over the tunnel. The stone is unloaded over ⅔ of its length and the sand over the other ⅓. As each car is emptied the crane moves along to position for the next car, and when all those within reach are unloaded others are drawn into position. This part of the plant can work as long as there are cars to unload and a place to pile up the material.

The empty train of twenty cars is pushed into the tunnel and snubbed through by a rope over a niggerhead so that the cars are spotted with the stone compartments under the stone chutes. After these compartments have been filled with stone the train is moved along to position under the sand chutes and the sand compartments are filled. The tunnel is on a grade. As the train comes out from the lower end the locomotive couples on and pulls it on to the cement shed where it is loaded with the cement. When the journey to the mixer is started other trains along the line are passed on stub switches. Finally the mixer is reached. The bail at the end of the derrick cable is attached to the bucket, which is raised from its truck and swung over the charging skip into which the material is dumped. While the skip is being raised to charge the mixer drum, the empty box is returned to the truck and a loaded car moved into place. The materials after being mixed in the mixer drum 90 sec. with the addition of the proper amount of water are discharged as concrete onto the chute and thence onto the subgrade. There the concrete is spread and spaded between steel forms on which rides the channel templet operated



FINISHING WITH BOW BELT

by two men. Spading of the concrete is done in such a manner as to keep a uniform surplus amount ahead of the templet, which levels and strikes the concrete off to a uniform surface by moving it back and forth over the forms, advancing a little with each forward and backward motion. As soon as desirable a roller of 100-lb. weight is put on the green concrete. This rolls the water out. Soon a belt 8 in. or 10 in. wide is drawn back and forth over the concrete, advancing a little with each stroke. A second belting often adds to the smoothness. As soon as the belting is finished the curing commences, for which the concrete is covered with canvas tarpaulins on raised frames. When the concrete has hardened sufficiently an earth cover is put on to a depth of 2 in. The concrete is then sprinkled often enough each day to keep it continuously moist for a period of 10 days. After four days more the earth cover is removed and the completed section thrown open to traffic.

There are two other unique features on this work besides the steel channel templet described. One is the bow belt described in the *Engineering News-Record*, issue of July 3, 1919, p. 40. The other is the locking of the slabs together at the joint by the use of five ¾-in. steel bars 2 ft. long. One foot is encased in the last slab laid at night; the other foot projects toward tomorrow's work. Next day over these projecting rods cardboard tubes are snugly slipped, and they are encased in the new concrete. The advantage of this method is that the slabs can never rise above one another and the paper tube on the one end of the rod allows for contraction without breaking the slab.

This brief description makes obvious the interdependence of all the steps, from the arrival of the first supplies to the laying of the last square yard. When the chief is big-minded enough to direct all the essentials, when his subordinates capably execute all the details, when deliveries are prompt, and each plant unit plays its part, then you get continuity of operation and orderly, satisfactory progress.

Italy Authorizes Credit Corporation to Finance Public Works

An Italian royal decree has recently established a credit corporation through which funds are immediately available for carrying on public works, thereby providing employment for a large number of workers and discharged soldiers who are unemployed. This corporation, or "consortium," is composed of the Office of Deposits and Loans, the National Insurance Institute, the National Office of Social Insurance and the saving banks which make application for membership. It is an autonomous body, but is subject to the supervision of the Ministry of the Treasury. The initial capital of the consortium is 100,000,000 lire ($19,300,000, normal exchange), of which 60,000,000 lire will be subscribed by the Office of Deposits and Loans. As its membership increases, the capital may be increased to 150,000,000 lire.

In addition to lending its capital, bonds may be issued by the consortium, guaranteed by the annual payments due from State, which act as security for loans granted by the consortium. These bonds may be traded in by the stock exchanges, may be accepted as collateral by banks of issue, and may be purchased by banks and other institutions which are obliged to carry all or part of their funds in government securities. They are subject only to a small stamp tax and are exempt from all present and future taxation.

Besides the assignment of the annual payment due from the State, security is offered the consortium through the contributions made by provinces, comfrom the State, security is offered the consortium makes funds immediately available without delaying progress of the work until further payments from the government become due.

If, says a recent issue of *Commerce Reports*, the commencement of public work was forced to await the ability of the Italian Government to provide necessary funds, much valuable time would be lost, for the financial condition of the government is such that its expenditures must be reduced to the lowest possible limit.

Just the Same in the Antipodes

It WAS generally anticipated that costs of construction would rapidly drop after the signing of the armistice, and the majority of engineers anticipated that in about 12 months, with the release of labor and shipping and the return to normal conditions, prices and freights would drop to a reasonable percentage above pre-war costs. It was hoped that, with the labor-saving appliances and new machinery established in Great Britain during the war, the cost of a large number of items of machinery would have been even below pre-war rates.

In no respect have any of these anticipations been realized, as the following instances will indicate:

Freights have been up to five times pre-war rates, and the lowest recent figures have exceeded them three times. Electrical machinery, copper conductors, etc., are variously from one and a half to double pre-war rates. The large amount of transport equipment which we require exceeds 50 per cent on pre-war rates; while petrol has increased from 13s. 9d. per case in 1914 to 25s. per case in 1919. Steel varies from twice to three times pre-war rates; while chaff has been bought at rates varying from £7 10s. to £8 per ton, as against the cost a few years ago of £3 per ton, and the indications are that the price will still further increase.

In addition to our increased cost we have, perforce, to pay customs duty on the increase; and should, as has often happened, the selling price of machinery increase between the date of ordering and the date of supply, we have also to pay duty on the difference.

Unskilled labor is now receiving a wage 20 per cent higher than a few years ago, but one would not particularly emphasize this point if pre-war efficiency was being maintained. The fact remains, unfortunately, that the average efficiency of unskilled labor today is much below what it was when the first stage of our scheme was being constructed; in other words, the unit costs at present greatly exceed the unit costs in the old days. Tenders which have been received from time to time from contractors confirm that they anticipate the same results as we have secured, and unless some means can be devised to rectify this state of affairs, not only in connection with our departmental work, but generally, a very serious position will undoubtedly arise.—From the Annual Report, 1918-19, of J. H. Butters, chief engineer and general manager, Hydro-electric Department, Tasmania.

Asphaltic Concrete Laid on Gravel Base

Care in Laying Foundation and in Compacting Base Underlie Efficient Service — Type Recommended When Resources Preclude Use of Concrete Bases

By E. F. Petersen
Consulting Municipal and Highway Engineer, Texarkana, Ark.

PAVING Improvement District No. 20, of the City of Texarkana, Ark., was organized under the general laws of the state relating to improvement districts in cities and towns. As considerable objection existed at the time on the part of certain citizens to the formation of the district, its validity was contested by those opposed to it. The legal fight that followed resulted, however, in the validity of the district being sustained by the supreme court of the state, in consequence of which decision the commissioners at once proceeded to get the actual work of paving under way. Bonds in the amount of $150,000 were sold in May, 1916, and the following month the writer was retained as engineer to prepare the plans and specifications and supervise the construction of the improvements.

The street area in the district between curbs before the improvements were commenced was approximately 205,000 sq.yd. About 95 per cent of this area consisted of gravel streets, blue stone curbing and stone and brick guttering. The remaining streets within the boundaries of the district were practically unimproved except for occasional curb and gutter built by abutting property owners.

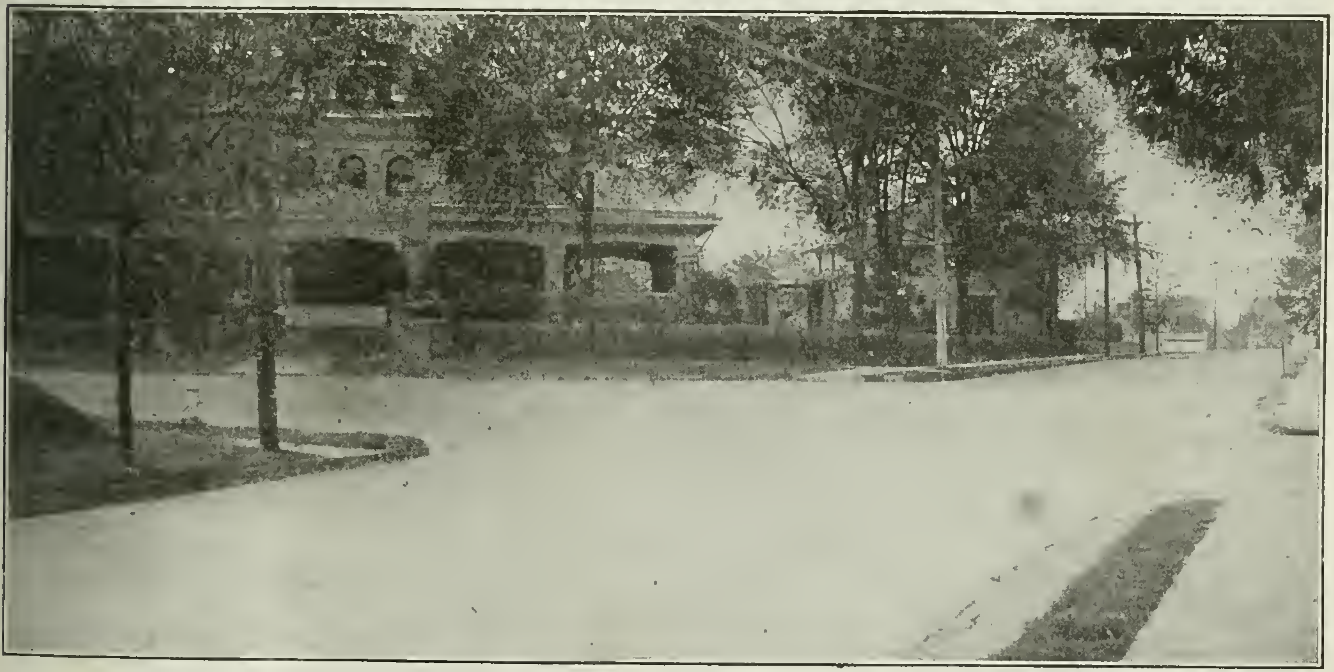
Of the 205,000 sq.yd. above referred to about 89 per cent consisted of streets averaging 52 ft. in width between curbs. The gravel upon these streets was all pit run and had been down for some time, during which period its maintenance had been very poor. These streets were therefore badly worn and tests made by the writer showed the thickness of the gravel varied from practically nothing in places to 6 in. and 7 in. near the gutters where the traffic had been light.

Previous to the writer's connection with the work the Board of Commissioners had an engineer investigate and report upon the question of improving the streets in the district. As a result, it was recommended that they be surfaced with 2½ in. of asphaltic macadam (penetration method) between the existing curbs, using the existing gravel for a base, after there had been added to it further gravel in a sufficient amount to secure the proper crown. On the ungraveled streets the same type of surfacing on a gravel base newly built for this purpose was to be laid.

The procedure just outlined was to be followed on all streets in the district, with the exception of several in the business section, which, it was recommended, should be surfaced with creosoted wood blocks laid on the existing gravel base, being first renovated, as described above. It was estimated that this method of procedure would permit the streets to be improved in a satisfactory manner, including adequate storm sewers, for the $150,000 provided.

Asphaltic Concrete Recommended

A thorough investigation by the writer of existing conditions and his previous experience with, and observation upon, the types of surfacing recommended, resulted in the conclusion on his part that neither type of surfacing under the conditions imposed would prove satisfactory or be justified. He therefore recommended that the wood block surfacing be entirely abandoned and a 3-in. vertical fiber brick pavement with cement grout filler be used on the more heavily traveled portion of the business section. A 2-in. asphaltic concrete wearing surface laid on a 6-in. or 7-in. gravel base (choice depending on subgrade and other conditions), was suggested for


THOUGH SUBJECTED TO HEAVIEST TRAFFIC FOR TWO YEARS, ASPHALTIC CONCRETE ON GRAVEL BASE HAS NOT FAILED OR DETERIORATED

certain other portions of the district and a 2½-in. asphaltic macadam wearing surface laid on a 6-in. or 7-in. gravel base was proposed for certain of the less traveled residence streets. It was further recommended that a concrete base be used on a certain number of the downtown streets for some of the asphaltic concrete wearing surface. The widths of all streets, with a few exceptions, were to be reduced to a maximum of 30 ft. and a minimum of 20 ft. All gravel base was to be entirely new, and laid in accordance with the requirements of specifications especially prepared for this purpose by the writer.

Owing to the limited amount of money available, the above recommendations seemed to offer the best solution of the problem presented. In general these recommendations were adopted by the commissioners and bids opened accordingly on Oct. 30, 1916.

A number of bids were received and their tabulation showed a great variation in prices for doing the work, especially for the gravel base, which constituted a separate item among many others on which unit prices were received. However, the contract for the entire work was finally awarded to the Burke Construction Co., of Fort Smith, Ark., under date of Nov. 29, 1916. The work has been in process of construction ever since, conditions resulting from the war, among other untoward circumstances, having prevented the completion on the contract within the prescribed time limit.

In awarding the contract, however, all types of construction were eliminated except the asphaltic concrete wearing surface and 3-in. vertical fiber brick, both to be laid on gravel base, except that a 4-in. concrete base was to be used in certain places if the money available for the work permitted. These conditions and restrictions were imposed by the commissioners, owing to the limited funds available, and because it was felt every street should be paved in fulfillment of pledges to property owners who made possible the formation of the district.

As the use of the gravel base presented, when adopted on such a large scale, an entirely new departure from established and recognized practice, the writer felt that much interest would attach to the work and, in event of its successful accomplishment, much benefit to other communities desirous of making paving improvements, but with such limited funds at their disposal that concrete or crushed stone base would be impossible on account of their cost.

CHARACTER OF SUBGRADE

The character of the underlying soil throughout the district is such, with a few exceptions, as to afford an excellent subgrade for any base laid upon it, and consists of a dense red and blue clay, containing in places a small amount of fine sand intermingled with it. The subgrade for the gravel base is prepared in the same manner as required by good practice for concrete base, except that the allowable variations from the theoretical finished cross section is not confined to such close limits as is usual with the former.

In view of the writer's experience with, and observation of, asphaltic concrete laid on a macadam or crushed stone base and the satisfactory results obtained by its use in writing the specifications for the gravel base to be used in this instance, it was endeavored to stimulate as much as possible that form of construction with the gravel available. It was therefore specified that the completed base would contain at least 70 per cent of coarse material or gravel particles, i.e. material retained on a ¼-in. screen, the grading of the coarse material ranging from the smallest to the largest particles, within reasonable limits, in such proportions that the minimum of voids would result. The base is laid in two courses, and the greatest diameter of the largest particles must not exceed 2½ in. The fine material or binder filling the voids in the coarse material must all pass a ¼-in. screen, and if ideal will consist of a uniformly graded sand containing a sufficient amount, evenly distributed, of clay to fill the voids in the sand. This sand and clay mixture or binder in the completed base should just a little more than fill the voids in the coarse material.

As is well known to those experienced in the use of gravel for road-making purposes, the material as taken from the pit varies in quality and proportion of fine and coarse material, in the same pit from place to pit, and in different pits, to such an extent that the mixture above described is very seldom found in nature. It therefore has to be artificially attained by the addition of the defaulting material, and by the proper manipulation of these ingredients in bringing them together. Material taken from inland gravel pits as distinguished from gravel secured from river beds, is usually deficient in the coarse material, and, where the binder as it occurs in the pit run material is satisfactory, therefore requires only the addition of screened gravel in the proper quantity to make up the deficiency.

METHOD OF LAYING BASE

The screened gravel for each course of the base is first spread uniformly to the proper depth and the pit-run material then laid over the screened gravel. These two materials are then thoroughly mixed together by harrowing with an ordinary spike harrow properly weighted, after which the mixture is thoroughly rolled with a ten-ton, or heavier, road roller. The amount of screened gravel required is determined by the result of the quantitative analysis of the fine and coarse materials in the pit-run gravel. A little experience with the materials being used will soon enable the engineer or inspector to recognize approximately by visual examination the relative amounts of the two materials necessary to secure the desired results. The harrowing is very important, quite inexpensive, must cease at the right time, and is the only means of effecting the proper and uniform incorporation of the various sized particles making up the base. If, when the rolling of the base is completed, the surface of the latter appears to have too much gravel in places, so that it is loose and will not remain in place, a thin layer of fine material (or what for convenience we call a "squeegee" coat should be spread over the surface. The thickness of this squeegee coat need not exceed a quarter of an inch and the material of which is is composed will quickly, under traffic, fill in the spaces between the loose gravel. Any excess above what is required for this purpose will be blown away, or carried away by the traffic. These operations having been completed, the base should be thrown open to traffic for a period sufficient to effect a thorough and uniform consolidation. The length of this period depends on the cementing quality of the materials used, the weather and the amount of traffic. With the material available in Texarkana the writer has laid the topping upon the base within two weeks after the latter was completed. In other instances the topping has not been laid until a year after the completion of the base, because of the shutting down of the asphalt plant and failure to start again before this period had elapsed. Observation of completed pavement laid under both circumstances has thus far shown no inferiority or superiority in either case.

The preparation of the base for the reception of the asphaltic concrete wearing surface just preceding the laying of the latter is an operation requiring extreme care and careful inspection. During the period the base has been open to traffic it will have become covered with dirt and extraneous matter of various kinds and amounts, and if laid on a grade, rains which have occurred in the interim will probably have caused washouts, particularly along the gutters. The latter are the source of considerable trouble, as the water has generally washed out the clay from the binder, leaving loose sand and gravel in deposits, which the contractor is generally anxious to cover up or use again in repairing the base. These washouts are first thoroughly cleaned out by removing all loose and foreign material and filling in to grade with suitable material of quality before described.

The whole top surface of the gravel base is now thoroughly swept with a horse-drawn rotary broom of the ordinary street-cleaning type. Matter adhering to the base which cannot thus be removed is then loosened with picks, after which the whole base is carefully swept by hand with ordinary stable brooms, with wire or stiff fiber bristles, the latter being preferred. If the base has been properly laid the whole surface, after being swept, will have a honeycombed appearance, the tops of the gravel particles being exposed to view, and thoroughly interlocked and held tightly in place.

Irregularities in Crown

Irregularities in the established crown cross-section not exceeding a half inch need not be corrected in the base, as an experienced raker will soon learn to do this by varying the thickness of the topping material accordingly, so that the surface of the finished pavement will present the same evenness and smoothness as if laid on a carefully prepared concrete base.

High spots are removed with picks after the base has been swept with the rotary broom. Depressions exceeding one-half inch in depth below the established crown cross-section, and not exceeding three inches, are readily brought to grade by the use of close binder thoroughly rolled or tamped in place. Where the base has been properly laid and not subjected to traffic for too long a time, or been washed by storm water, irregularities requiring correction in this manner, of course, will not occur.

It should also be stated in this connection that the filling up of depressions with asphaltic binder is an alternative allowed the contractor, instead of requiring him to repair the base with gravel. Except where the base is very badly damaged, its use is cheaper than would be the case were the base brought to the required crown by scarifying and adding the requisite amount of new gravel material and then compacting properly in place, as the asphalt plant, once started, interruptions to its continuous operation are expensive. The binder used is the same mix as specified for the wearing surface, except that no limestone dust or portland cement is required and the amount of asphalt cement used is about 1½ per cent less than for the surface mixture.

The gravel base having been prepared and swept thoroughly clean in the manner described, it is now ready for the reception of the asphaltic concrete topping or wearing surface. The wearing surface consists of a topeka mix, spread so as to have a thickness of 2 in. after compaction. It is prepared and hauled to the street in the usual manner, but instead of dumping the load directly onto the base it is loaded upon a sheet-iron dumping board about 14 ft. by 10 ft. laid upon the base. This board, from which the mixture is shoveled into place for the rakers, is pulled ahead of the spread material as fast as the progress of this branch of the work requires. As soon as the board is moved ahead, the surface of the base, just ahead of the material laid last, is swept again so that droppings from the shovels and any other loose or foreign matter due to the operations of unloading and spreading the mixture will be entirely removed. In all other respects the gravel base is similar to the practice employed when a concrete base is used. Extreme care must be used that the gravel base is thoroughly dry before the topping is laid upon it.

No Failure or Deterioration

To date about 55,000 sq.yd. of the pavement described have been laid in this paving district. Of this amount 26,000 sq.yd. have been down for a little over two years, the balance having been completed and opened to traffic for about fifteen months. During this time these streets have been subjected to more than the customary traffic in view of the fact that they are practically the only paved streets in the city. In spite of this, however, no failure or deterioration of any character has developed in the pavement due to any cause arising from the nature of its construction. Not one crack or roll in the wearing surface—so common in asphaltic pavements laid on concrete base—is to be found over this entire yardage. Construction joints, made as butt joints, and where last year's work joins that of the previous year, have in no instance pulled apart.

In several instances water and gas mains have sprung leaks, resulting in the destruction of the asphalt surface where the water or gas came in contact with same. This occurred quite shortly after the pavement was laid. These leaks were stopped promptly by digging up the street and repairing the defective joints. After they were repaired and the back filling had settled sufficiently, the pavement itself was patched in the following manner: The gravel base was cut through for its full depth over a sufficient area so that the sides of the hole thus made were as nearly vertical as the nature of the material permits. This hole was then filled with concrete to the level of the top of the gravel base. When the concrete had set properly the asphalt wearing surface of the street was cut back about eight inches entirely around the joint between the concrete and gravel base. The edges of the asphalt, where thus cut, were then painted with hot asphaltic cement, and the patch made in the usual manner. About fourteen of these patches have been made to date, all of them being at least a year old now, and necessitated by leaks in water or gas mains.

These patches are in perfect condition and to all practical purposes are an integral part of and cannot be detected from the rest of the surfacing. The writer has enforced a large number of maintenance contract bonds where the customary concrete base was the supporting agent for the asphalt surfacing, but has never in any instance succeeded in securing such satisfactory results on the concrete base as those just described in connection with the gravel base.

CONCLUSION

The writer has gone into the details given in this article because, as far as he is advised, the work described is the first piece of extensive asphaltic concrete paving construction laid on a new or specially prepared gravel base. As stated at the beginning of this article, owing to the limited funds available for paying for the work to be done, it was impossible to adhere to the standard practice by using a concrete or crushed-stone base.

The view accompanying this article is typical of the completed pavements and shows portions thereof laid in October, 1917. The view shown was taken October, 1919, and is of a street over which heavily loaded log wagons and trucks have been constantly passing for the past two years. This pavement, however, is in perfect condition.

Plans and specifications for the entire work were prepared under the direction of the writer and the work is being done under his supervision. About 65,000 sq.yd. still remain to be laid before the work contemplated is entirely completed.

Inspection and tests at the ashpalt plant have been in charge of the Pittsburgh Testing Laboratory, and all asphalt used is Texaco No. 54. Special credit is due the chairman of the Board of Commissioners, John P. Kline, former mayor of the city, as it was through his efforts, against a very bitter opposition, that the improvement was made possible. He was ably assisted in this connection by the two other members of the board, Paul Huckins and Milton Winham, and the attorney for the board, Frank Quinn.

Fast Roadbuilding With Concrete Hauled Four Miles

Six-Mile Road Concreted From Central Mixing Plant—Frequent Records of 500 Feet Daily With Two-Mile Haul

Wet concrete has been successfully hauled two miles, and will be hauled a maximum distance of four miles, in building a six-mile section of the Dixie Highway extending north and south from Grant Park, Ill. A speed of construction is being obtained, with this long-distance wet haulage, which compares well with the average shown by more common methods of placing concrete directly from the mixer, and the concrete is passing, with no difficulty, the most rigid inspection of the Illnois Division of Highways. The plant investment is comparatively moderate and the equipment is nearly all of a character suitable to construction operations other than roadbuilding.

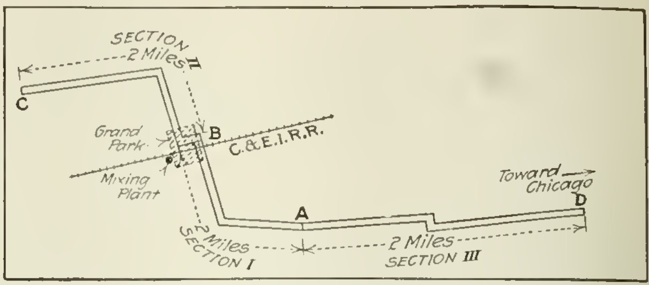


FIG. 1. SKETCH OF ROAD, SHOWING SEQUENCE OF OPERATIONS

The alignment of the main operation is approximately as indicated by the sketch Fig. 1. Grant Park, situated about two miles from the south end and served by the Chicago & Eastern Illinois R.R., is the main town on the route, and in the plan of construction was made headquarters of the operation. This plan was to place a permanent mixing plant at Grant Park and haul the mixed concrete to the road. First, the two-mile section from A to B was completed; then construction was begun at C and advanced toward B. Finally, with the two miles of concrete road from B to A ready for traffic, construction will start at D and proceed toward A. By this procedure the old macadam provided a hard road for hauling concrete the full length of each section, except the few hundred feet just ahead of the tamper where the subgrade was in preparation, and when the final two miles calling for maximum haul is placed under construction two miles of this haul will be over finished pavement, permitting fast travel of motor trucks.

At Grant Park the contractor found a fortunate condition in respect to railway accommodations. The switch and yard tracks of an old brick plant abandoned because of fire were in place in good condition and so located that little improvement could have been made had they been laid down new. On this existing track system the central concrete plant was laid down as indicated by the sketch Fig. 2.

Besides having at his hand a track system providing unusual car storage space, the contractor was fortunate in his location in respect to materials train service. The C. & E. I. R.R., being a coal road, with a preponderating tonnage of coal trains north to Chicago, and the crushed-stone supply being from the north, the railway was alert to the opportunity of obtaining loads for the cars normally running south empty to be loaded with

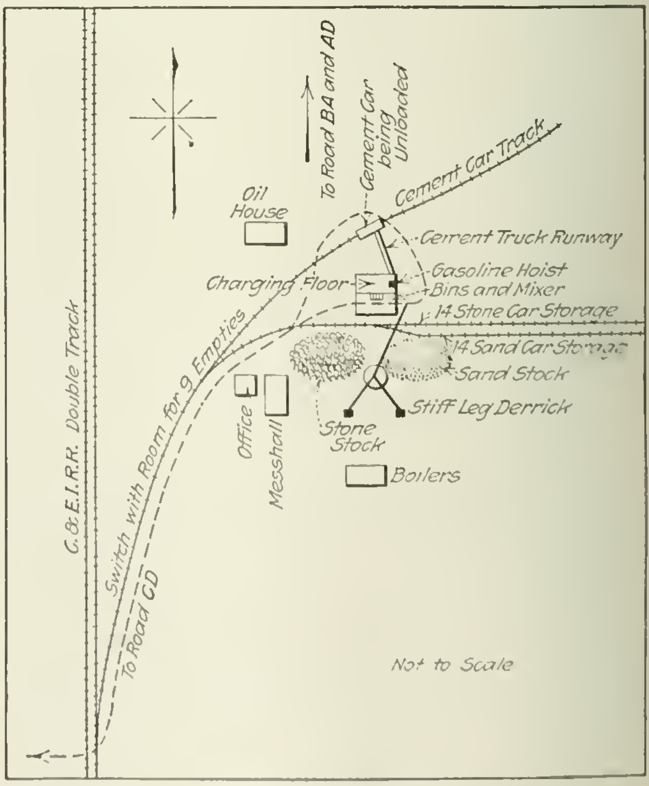


FIG. 2. SKETCH PLAN OF CENTRAL MIXING PLANT AND TRUCK SYSTEM

coal, and the contractor at no time lacked for materials Ample provisions, however, were made for storage, and stock piles for five days' operations were maintained.

The hub of the concrete plant is the bins and mixer house. A 50-cu.yd. stone bin and a 30-cu.yd. sand bin are elevated on a timber structure above a 1-cu.yd. mixer which is itself set high enough to discharge directly into the truck bodies. To the rear of the bins and just above the mixer is a charging platform housed in and connected with the cement-car track by an inclined runway on a trestle. The arrangement of the charging floor is indicated by the sketchs Fig. 3. Stone- and sand-measuring boxes on cars, charged from any of the bin gates, are run to the hopper and emptied, and the cement bags are untied and emptied directly from the truck car on which they are hauled from the cement car up the runway by a gasoline hoist. A stiff-leg derrick, Fig. 2, with a 1-cu.yd. bucket, keeps the bins filled from cars or stock piles.

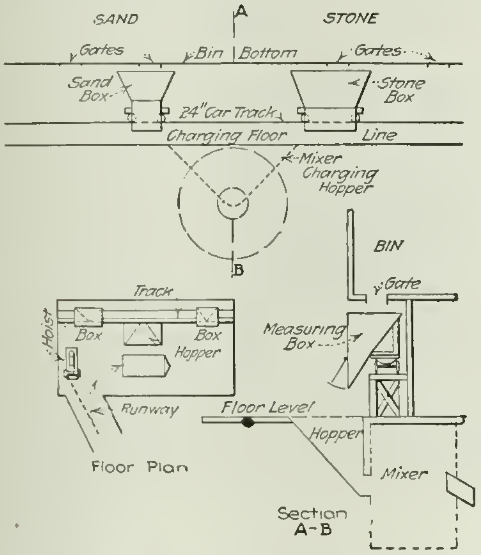


FIG. 3. SKETCHES OF CHARGING-FLOOR ARRANGEMENT AT MIXING PLANT

On the road the grading is kept about 1000 ft. ahead of the concreting. The old macadam is routed up by a heavy combination grader and scarifier hauled by a caterpillar tractor, Fig. 4, and is handled by wheeled scrapers, eight in number. A blade grader finishes the subgrade and a 10-ton roller compacts it. Hand work is reduced to a minimum. Hauling on the finished subgrade causes some rutting, and this makes repairing and rerolling necessary. A five-ton roller operated just ahead of the concreting performs this rerolling.

An 18-ft. concrete slab is being built according to the specifications of the Division of Highways of Illinois. The trucks back up to this slab and rear-dump as shown by Fig. 5. Men pull down the pile and rough-spread the concrete, which is then finished by a tamping machine. Truck haulage is the only unusual operation.

Wet-batch haulage on this job has demonstrated the practicability of making a round trip of four miles (two miles from mixer to road and return) in 30 min., and the practicability of constructing 532 ft. of 18-ft. road in nine hours, with eight trucks, each with a 2-cu.yd. batch, in operation. While hauling causes no segregation of the ingredients in concrete of the stiff consistency specified this year by the Illinois Highway Department, a tendency of the coarse aggregate to settle is noticeable in any batch that chances to be too wet. A thorough remixing is effected, however, by the process of dumping, spreading and tamping. The sticking of the concrete to the bottom of the dump body causes some delay, in picking and hoeing loose the clinging material. A remedy is being sought on this work by using a false bottom which will swing free and shake loose the bottom concrete when the body is tilted.

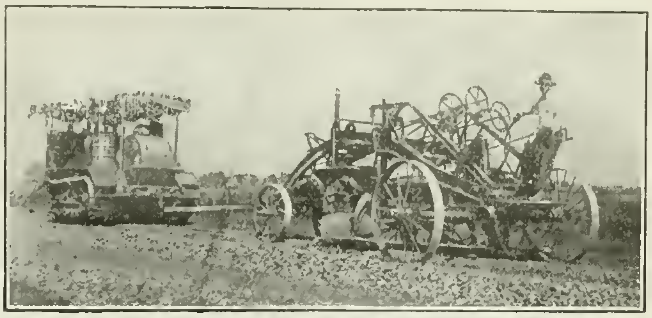


FIG. 4. TEARING UP OLD MACADAM ROAD

Accurate routing of the trucks is essential to steady and rapid construction. Eight trucks have been operated on the sections requiring a maximum haul of two miles, and this number has been barely sufficient to keep uniform and continuous the pace of the mixing plant and the paving gang. For the four-mile haul on the final section to be constructed, it is estimated that five additional trucks, or a total of 13 trucks, will keep the operation moving steadily. With the two-mile section of completed pavement over which to make speed, it is estimated that one round trip of four miles can be made in 45 minutes.

To maintain the rates of progress which have been mentioned, an operating force of 76 men, exclusive of superintendence and office help, has been required. This force is employed about as follows: Six men handling and unloading cars and filling bins; 5 men unloading and handling cement to mixer floor; 7 men, including foreman, charging and operating mixer; 2 men shaking and baling cement sacks; 10 men with eight trucks hauling concrete to road; 21 men, including foreman, grading and maintaining subgrade; 6 men setting and moving forms; 10 men, including foreman, spreading and finishing concrete; 9 men covering and watering slab.

The Embankment Co. of Joliet, Ill., has the contract for this road and all operations are in direct charge of James L. Bannon, president, and Robert J. Bannon, secretary of the company. Mr. R. B. Airey is superintendent for the contractor.

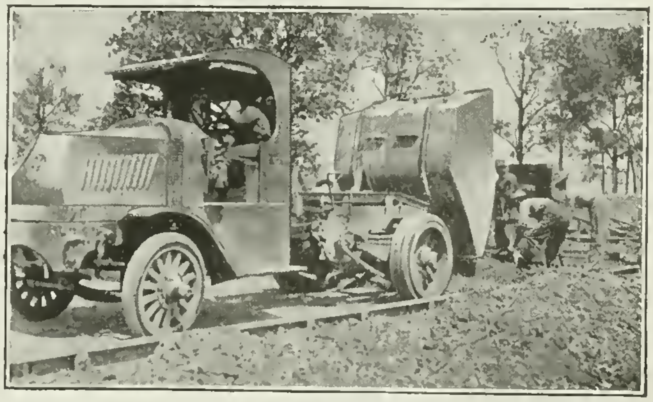


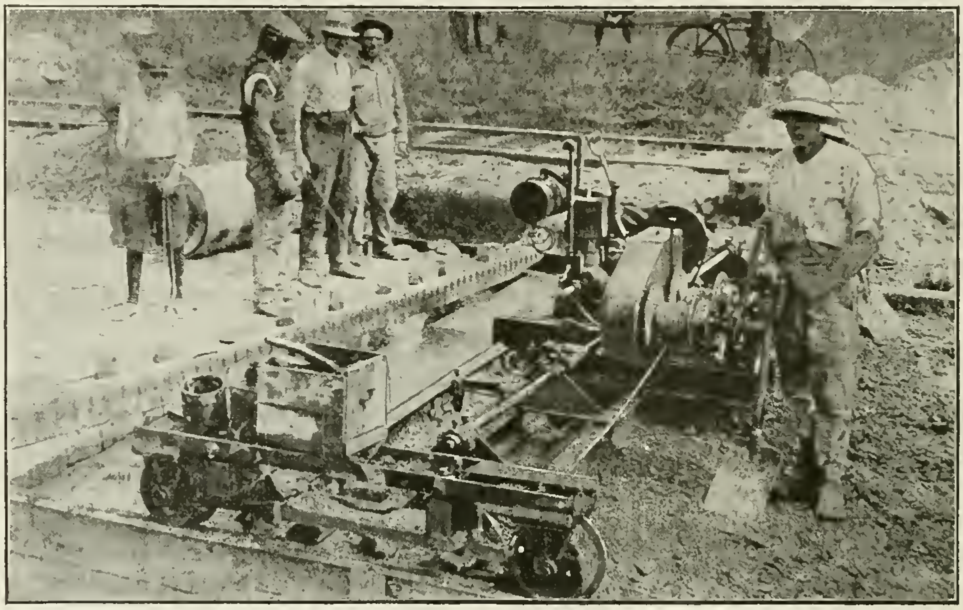
FIG. 5. TRUCK DUMPING CONCRETE ONTO SUBGRADE

Tamping Templet Expedites Brick-Road Construction

Twin Crews and Mechanical Outfits Build Twelve Miles in Three Months—Cost of Slab Analyzed

By F. A. Churchill
Dunn Wire-Cut-Lug Brick Co., Conneaut, Ohio

Twelve miles of monolithic brick road from Ashtabula to Conneaut, Ohio, were completed this season in 92 elapsed working days. Two outfits and two crews were employed. Mechanical operations were substituted for hand methods wherever practicable, and, with a full supply of brick hauled in and stacked during the winter and the prompt delivery of concrete materials by a parallel interurban railway, they were largely to be credited for the excellent progress. In particular, automatic tamping templets expedited the base construction. They reduced its cost, the contractor estimated, about 15c. per square yard.


AUTOMATIC TAMPING TEMPLET AND GANG FOR LAYING MONOLITHIC BRICK

The improvement is 11.92 miles on the main traffic route between Cleveland, Ohio, and Buffalo, N. Y., where the old highway was especially bad. A heavy automobile and motor-truck traffic demanded substantial design, and monolithic brick construction was decided upon.

A 16-ft. slab of 4-in. wire-cut-lug brick, with 1:1½ cement grout joints on a 6-in. base of 1:3:6 concrete, was the design adopted. This slab slopes uniformly to a shallow concrete gutter 2 ft. wide on the side adjacent to the parallel electric railway. Catch-basins at intervals receive the water from the gutter, and tile drains run directly under or near the gutter, with lateral drains to carry the water away from the slab. Being very shallow, the concrete gutter is virtually a 2-ft. addition to the width of the brick road slab.

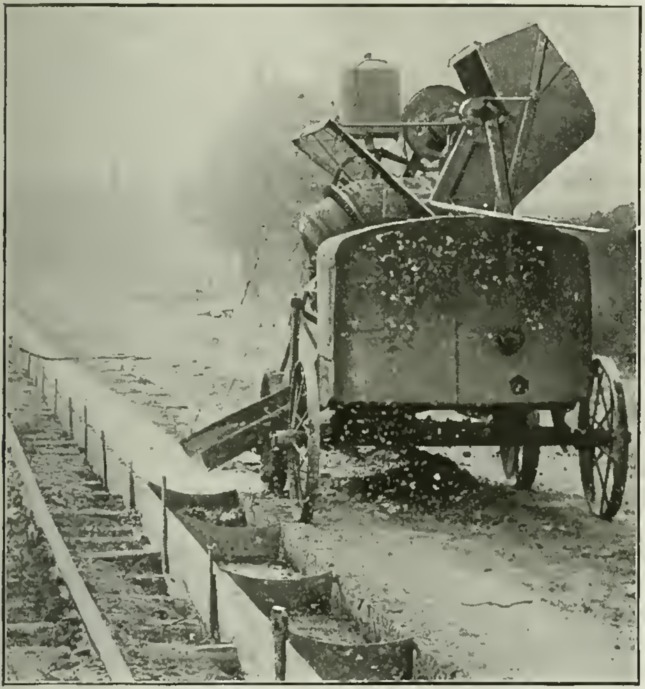
Construction preliminary to putting in the concrete base required no processes out of the ordinary. As soon in the autumn of 1918 as the contract was awarded, the contractor began the delivery and storage along the work of his full supply of about 4,500,000 brick. Motor trucks of all sizes, from one ton to five tons, were employed, and as many as could be operated continuously during the winter. The average haul was about two miles, and the cost of hauling, from siding to stock piles, averaged $4.20 per thousand, or 11c. per square yard of pavement. The average cost of brick piled on the job was $10.70 per thousand. Materials for concrete were hauled by the electric railway which paralleled the improvement. They were brought onto the work as needed after the subgrade preparations, and were dumped directly onto the subgrade.

To hasten construction, two outfits and two complete construction crews were planned. These crews began work at the center of the improvement and worked away from each other toward the ends. Each plant comprised a concrete mixer, a tamping templet, a roller conveyor for delivering bricks to the layers, two small mixers for building concrete gutter, and the necessary hand tools for concreting and grouting. Subgrade preparation followed the usual practice. As soon as it was completed, the steel side forms were set exactly to grade and width. While the templet has wide wheels to allow for inequalities in setting the forms, precision was considered essential to prevent the consumption of excess materials. The sequence of construction operations were then (1) mixing and depositing the concrete roughly to thickness; (2) tamping and finishing by the power templet; (3) brick-laying, rolling and grouting; (4) gutter construction.

Tamping, shaping and finishing the base slab with a templet of the Parrish type were the distinctive operations. This templet differs from others by its ability to tamp between the side forms and below their tops as well as flush with their tops. It operates and advances by its own power, always in a forward direction, just behind the concrete mixer, but in no way connected with the latter. The motor power is a gasoline engine, placed in the center of the framework and geared to the shaft, as shown in the accompanying illustration. Clutches and levers regulate the speed, and stop and start the machine. Small steel cables, winding around drums on the templet and carried ahead and anchored to steel stakes driven in the ground, draw it forward evenly and steadily, as the surface is finished. The clutches on the drums operate independently, so the templet can be adjusted to work on curves.

The tamping face of the templet is shaped to the true crown of the pavement, and the mechanism is so adjusted that it delivers 65 successive taps on each section of the foundation covered. These blows are light, but they are delivered rapidly, and the result is not only a perfect contour for the uniform bedding of the brick but a thoroughly compacted foundation of uniform consistency throughout. The tamping also brings to the surface, if desired, a matrix in which the bricks become embedded.

A description of the mechanism in general terms reads thus: It consists of a framework of I-beams, with crossbars to support the gasoline engine. The front I-beam acts as a cutting blade, set a trifle higher than the required height for the finished foundation. To the rear, and attached to rocker arms, is a U-shaped channel iron set with the edges downward. Supported by the opposite ends of the rocker arms, and to the rear of the channel, is an I-beam, 3½ in. wide on its face, which acts as a tamper, consolidating the concrete and finishing the surface. The function of the U-shaped channel-iron is to cut and spade the concrete, thus removing all air holes and voids. The completed surface ready for the bricklayer is thus perfectly smooth and of such firmness that it can be walked upon without injury.



SMALL MIXER AND METHOD OF LAYING CONCRETE GUTTER

Brick delivered by roller conveyors were placed immediately by hand upon this surface and rolled with a hand roller weighing about 800 lb. This roller was 30 in. wide and 24 in. high. Such a roller will be sufficient to roll the brick to a uniform surface in most cases, but, if desired, the weight may be increased by loading.

Cement grout for filling the brick was mixed by hand in a rocker box, and dumped and broomed into the joints immediately after the bricks had been rolled. The first coat was followed by a second of somewhat heavier consistency, which was mixed by hand in a box and put on with scoop shovels. As soon as the final application was completed, the pavement was covered with earth, and this protecting covering was wet down to prevent too rapid setting of the filler. This rapid sequence in operation produced a slab which was a one-piece construction.

Cost data and the distribution of the men on the concreting and bricklaying are shown in the accompanying table. The method of operation was to lay the concrete and brick with this entire gang and then use part of the gang for grouting and other work. In other words, part of the gang changed off on the work. The tabulation covers the distribution of the gang while laying the concrete and brick, but the total cost covers a day's work of concreting, bricklaying and grouting.

With this force the contractor was able to lay from 800 to 1236 sq.yd. of monolithic slab per day, which would give a manipulation cost between 18c. and 29c. per square yard, with a probable average of about 25c. The record for one gang for an eight-hour day was 630 lin.ft. of 16- and 18-ft. road, totaling 1236 sq.yd. The record made on this work would seem to indicate that a gang of this size should average about 900 sq.yd. per day. However, considerable time was lost on the templet, so that with faster delivery of concrete the work could be expedited.

After the forms were removed from the monolithic slab and the slab had set sufficiently to bear the small concrete mixer, the shallow concrete gutter was built along one side. With a mixer man and 18 laborers, this gutter was laid at the rate of 1200 lin.ft. per day. The contour was obtained by screeding over curved steel partition plates, as shown in the illustration. The cost per lineal foot was about 90 cents.

ITEMIZED MANIPULATION COST OF LAYING

Monolithic Brick Slab Complete, Covering One Day's Work of Eight Hours

Number of Men	Description	Amount
2	Foreman at $5.00 per day	$10.00
22	Shovelers and wheelers at $4.50 per day	99.00
5	Handling cement at $4.50 per day	22.50
4	Brick men at $5.00 per day	20.00
2	Laborers behind mixer at $5.00 per day	10.00
10	Laborers carrying brick at $4.50 per day	45.00
2	Mixer men at $5.00 per day	10.00
1	Roller-man at $5.00 per day	5.00
1	Foreman at $7.50 per day	7.50
	Total cost of gang for 8-hour day	$229.00

Those connected with this work, both in the State Highway Department and the contractor's organization, consider that the road was built in record time. From the start of grading to the completion of the slab, it took 92 working days to construct 11.92 miles. During this time weather conditions held up work a number of times. Aside from this, both the mixers did not work the entire 92 days. One worked only 57 days, so that on only 57 days did both work at the same time.

The contract for this work was let to Thomas P. Fitzgerald, Ashtabula, Ohio, at a total cost of $484,000, or $421,000 for the main road construction and $63,000 for the gutter, which was let in a separate contract. The construction was under the supervision of the State Highway Department through the county officials. E. C. Blasser was division engineer in charge for the state while Ray M. Case was county engineer and was directly in charge of the work on the road.

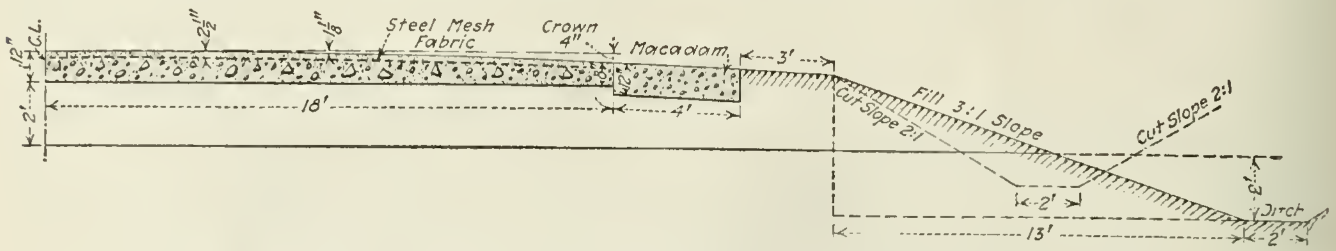
271,542 Tons of Engineer Property Returned

Statistics issued by the War Department Dec. 23 show that the tonnage of Engineer property returned from Europe to the United States by the Army was second in the list covering all of the staff corps or services. The Ordnance Department was first with 422,030 tons (short) or 51% of the total. Next came the Engineer Department, with 271,542 tons, or 32%. All other totals were comparatively small, the Quartermaster Department being third with 37,554 tons, or 5%. The total tonnage for all departments was 837.641.

Heavy Traffic Road Design Places Stress on Drainage

Chicago Sanitary District Seeks Ideal Structure in Fifty-Mile Four-Track Concrete Road—Side Parking Spaces

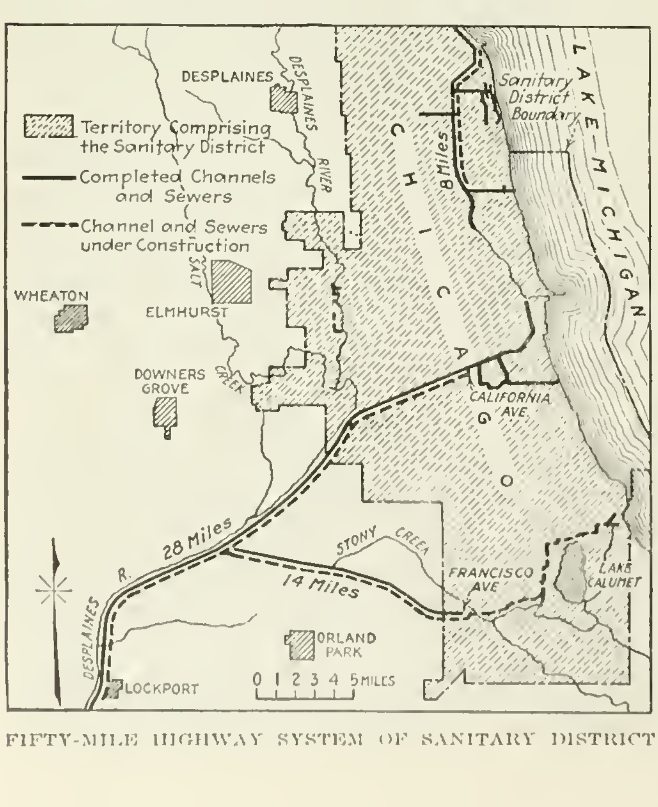
CONCRETE highways designed for motor-truck traffic of the heaviest character will be constructed practically the full length of the three channels of the Sanitary District of Chicago. Besides the 36-ft. concrete slab, provision is made for 4-ft. macadam and 3-ft. earth shoulders. The roads will thus be 50 ft. wide except in city streets, where an integral curb replaces the shoulders. The 36-ft. slab provides for four lines of traffic, and the shoulders are planned to give space on which trucks can be parked for roadside repairs without obstructing the regular traffic lines.



SECTION FOR HEAVY-TRAFFIC CONCRETE HIGHWAY, SANITARY DISTRICT OF CHICAGO

Slab and subgrade construction follows closely the requirements of the specifications of the Division of Highways of Illinois, as outlined in *Engineering News-Record* of Apr. 10, 1919, p. 735. With the dimensions illustrated, a plain concrete slab is calculated to have strength in proportion to the standard designs for 16- and 18-ft. roads of the Division of Highways, but, as insurance, reinforcement has been added. According to the bids received on the eight miles of North Shore Channel road (see map), this reinforcement represents about 4% of the cost.

Besides the care in subgrade preparation, exceptional attention has been given to drainage. The side ditches are large and of unusual depth below the surface of the subgrade. Culverts of reinforced concrete, or vitrified pipe in concrete, connect the side ditches at half-mile intervals. The concrete culverts have 3½ x 3½-ft. openings, and the pipes are 18 in. in diameter. With frequent outlets into the channels, this drainage system is expected to maintain a practically dry foundation for the road.



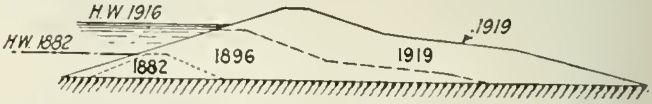
FIFTY-MILE HIGHWAY SYSTEM OF SANITARY DISTRICT

Bids on the first eight-mile section ranged from $811,431 to $1,130,989, the low bid being a little in excess of $100,000 per mile. Completion of this section by Aug. 1, 1920, is expected. The work will be under the direction of G. M. Wisner, chief engineer, and H. P. Ramey, division engineer, Sanitary District of Chicago.

Development of the Levee System on the Mississippi

Continuous Levees to Restrain Maximum Floods Constitute Present Policy — Design Conditions Are Described

IN THE history of levee protection in the Mississippi Valley, the year 1895 is important as marking the new policy of the Mississippi River Commission which provides for levees of such dimensions as to restrict all floods within the levee lines. Prior to that date the U. S. Government had confined its efforts to strengthening the existing levees. The St. Francis basin of 6000 square miles, in Missouri and Arkansas, had remained unprotected and acted as a reservoir which served to reduce flood heights, but while protection was thus afforded to the lower valley the floods were disastrous to the residents of the basins. Since then a substantial levee line has been constructed along the St. Francis front which will afford adequate protection when work now under contract is completed.



COMPARATIVE SECTIONS OF MISSISSIPPI RIVER LEVEES

This brief statement of the policy for flood control and protection in the Mississippi Valley was given by Col. C. McD. Townsend, Corps of Engineers, U. S. Army, president of the Mississippi River Commission, in an address at the annual meeting of the National Drainage Congress held at St. Louis in November. To illustrate the changed conditions, Col. Townsend exhibited a chart of the comparative cross-sections of the old and present levees at Lake Providence, in Louisiana, where levee construction has had the maximum effect on flood heights. These sections are shown in the accompanying drawing. The cross-sectional areas are 161 sq.

ft. for the levee section of 1882, 530 for that of 1896 and 2158 sq.ft. for that of 1919. The levee of 1882 was about 7 ft. high and contained about 6 cu.yd. per lin.ft. while that of the present standard will average 22 ft. in height and 80 cu.yd. per ft. The increase in flood height from 1882 to 1916 has been 10.4 ft., but while the original levee was below the flood height of 1882 the completed levees of the present standard will be more than 3 ft. above the flood height of 1916.

That the levee section differs materially from that of reservoir embankment was pointed out by Col. Townsend, who explained that this arises from the impracticability of finding in an alluvial valley a foundation impervious to water, which is an essential condition for reservoir construction. Further, material for a puddle core wall is not readily obtainable, nor would such a wall be of great value when resting on a permeable soil. However, the possible value of an impermeable core to prevent saturation of the levee and to keep boring animals from working through it was suggested by a writer in *Engineering News* of June 27, 1912, p. 1236.

In levee construction, the essential conditions are a mound of earth of such height that water cannot flow over its top; of such mass that surfaces of saturation cannot be formed through it on which the superincumbent material will slide, and of such width of base that the water flowing through the permeable foundation will not have sufficient force to remove any material. This mound of earth must be protected from the eroding action of rains and its river surface from erosion by river currents and waves during floods. The grade must be somewhat higher than the highest flood to afford protection against wave action during storms.

Experience with the soils of the Mississippi bottoms has developed certain forms which are of general application to its levees. A slope of 1 on 3, well sodded with Bermuda grass, has been found to resist the action of rain, river currents and minor waves. In localities exposed to the full force of waves through long reaches of river it is necessary either to employ some more permanent forms of revetment, or to adopt a gentler slope. In the Upper Yazoo district concrete has been extensively used for such revetment.

A crown width of 6 to 10 ft. is given generally, being interdependent with the slope on the land side. An 8-ft. crown affords convenient space for patrolling and for storing material to repair damage inflicted by storms. With such width, a land slope of 1 on 2 can be employed until the levee attains a height of 6 ft. In greater heights, unless the soil is specially adapted to levee construction, there is a tendency to form surfaces of saturation through the mass on which the upper portion may slide. Levees not exceeding 12 ft. require a land slope of 1 on 3. With greater heights trouble begins to be experienced with the foundation and still gentler slopes are necessary, or the same results may be attained by adding to the base a mound of earth termed a banquette which is generally 20 to 40 ft. in width, depending on the height of levee.

While these levee sections have resulted from practical experience rather than from theoretical considerations, it may be noted that the sections most generally employed in recent years insure an angle of repose of dry earth on wet clay of 14° when water is at the top of the levee. This is the limiting angle for such materials. European levees have in general a greater width of crown and steeper land slopes, with about the same width of base, but those levees are frequently used for roads.

A continuous levee line did not exist in any district on the Mississippi in 1882, due to the crevasses which had occurred. The total length was about 1000 miles, which had increased to 1680 miles in 1919. The area of the basins protected is 27,116 square miles, but at the lower ends of several of the basins the lands are subject to overflow by backwater flowing around the ends of the levee systems, the area thus flooded in 1916 being reported as 2566 square miles.

The levee line has now attained such dimensions as to afford reasonable security against all but the greatest floods, said Col. Townsend, and it offers a fighting chance of success even with such floods as those of 1912 and 1913. Eternal vigilance is necessary, as a muskrat or other burrowing animal can cause the destruction of the best embankment, if the damage done is not repaired promptly. In 1916, from Sunflower Landing to Natchez, 348 miles, the river rose to the greatest heights on record, but only one crevasse occurred in the levee line along the Mississippi River, which flooded an area of 818 square miles. Breaks, however, occurred in the levee line along the Arkansas river, which inundated about 2,250 square miles of the Upper Tensas basin by flowing around the head of the Mississippi levee system of that basin. These levees have been placed under the jurisdiction of the Mississippi River Commission.

Protecting Iron and Steel Standpipes From Corrosion*

By Charles W. Sherman
Of Metcalf & Eddy, Consulting Engineers, Boston, Mass.

THE proper maintenance of an iron or steel standpipe involves periodic painting to prevent corrosion. The protection of the exterior surface involves no particular problem. The interior surface is, however, difficult to protect, being constantly in contact with water. Moreover, it can be inspected only at intervals and with some difficulty, and it is often hard or impossible to leave the standpipe empty for a sufficiently long period to clean and paint the surface in the most desirable way.

In an attempt to bring together such information as may be obtainable, relative to actual experience with standpipe paints, Metcalf & Eddy sent inquiries to water-works in the Northern and Eastern parts of the United States, requesting information as to the dates of painting, kind of paint used, preparation of the surface for painting, and other significant data.

The data obtained are not susceptible of being summarized or averaged. In a few cases the standpipe has not been painted since erection. There are doubtless cases in which the quality of the water is such that it protects rather than corrodes the metal. Such cases are, however, rare, and experience seems to indicate that as a rule an iron or steel standpipe should be thoroughly cleaned and painted inside, at least as often as once in four or five years. Perhaps, however, if the cleaning were as thorough as would be accomplished by means of the sandblast, and if a protective coating were then properly applied, the interval between paintings could be materially extended.

---

*Abstract of paper read before New England Waterworks Association.

A. H. Kneen, of Philadelphia, painted two standpipes with vertical stripes of different kinds of paint, and observed the conditions after two or three years of service. The only paints which gave reasonably good service were a red oxide of iron paint, and red lead.

The engineers of the Metropolitan Water-Works have adopted the policy of cleaning the steel by sandblast, and applying three coats of red lead to the interior surface of their steel standpipes. The following quotation from the 15th annual report of the Metropolitan Water and Sewerage Board describes the cleaning and painting of the Bellevue Hill standpipe.

> On Mar. 25 the tank was taken out of service and drained, and the work of sandblasting and painting the steel was begun Mar. 30 by the W. L. Waples Co., Boston, subcontractor for this work. The plant used consisted at first of a 20-hp. gasoline engine driven air compressor, a compressed-air reservoir, two lines of air hose and two nozzles. Sandblasting was stopped in the latter part of the afternoon of each day, and the cleaned surfaces were painted before rusting commenced. The force employed included one foreman, two painters, who also did sandblasting, and one helper This force could sandblast and paint an area of about 330 sq.ft. per day. Later, in order to increase the rate of progress, a second compressor, operated by an automobile engine, was installed Apr. 19. The entire inside and outside surface of the tank, having an area of 35,650 sq.ft., was sandblasted and painted. Work was completed June 14, with the exception of the third coat on the outside, which has been deferred until after the masonry tower which incloses the tank is completed. All painting materials were furnished by the department, but were mixed by the contractor under the direction of the engineer. For the inside of the tank, National Lead Co.'s red lead in oil paste, litharge, and Spencer-Kellogg & Son's boiled linseed oil were used; the first coat natural color, the second and third coats tinted with lampblack in oil. For the outside of the tank, red-lead paste, raw linseed oil, and drier were used for the first coat, and for the second coat white lead, raw linseed oil, turpentine, and drier tinted with lampblack were used. One gallon of red-lead paint was sufficient to cover 700 sq.ft. of surface with one coat. The subcontractor's price for sandblasting and painting the tank was $1600. . . .

The writer inclines to the opinion that the method just quoted represents the best practice of the present time. He would put especial emphasis on the thorough cleaning of the metal, and the *immediate* application of the paint to the cleaned metal before the latter has cooled and moisture has condensed upon it.

With regard to the coating to be applied to the metal after cleaning, it appears probable that not only red lead, but several of the graphite and red oxide of iron paints, and perhaps certain enamel-like coatings, will give satisfactory protection. It has been used for many years for painting the bottoms of steel and iron ships, and has given the best satisfaction of any paint used for that purpose. No other substance has been put to such severe trial and shown so good results; but unfortunately the use on standpipes has been comparatively limited, probably because of a lurking though unfounded fear of lead poisoning if the water remains in contact with red-lead paint.

It is, obviously, unfortunate that the data available are so fragmentary and inconclusive. It is to be hoped that the superintendents having charge of iron and steel standpipes will realize the necessity for more definite information and will make careful record of all the conditions affecting the durability of standpipe coatings, and that at some future time it may be possible to bring the data together and draw positive conclusions.

Motor Trucks and the Postal Service

THAT the United States Postal Service can be utilized to advantage in the transportation of foodstuffs and farm produce from producing centers to consumption points is indicated in figures recently made public by James I. Blakslee, Fourth Assistant Postmaster General, in a bulletin published by the Highway Industries Association of Washington, D. C. Mr. Blakslee after urging greater production of foodstuffs, asserts that three obstacles, none of which is insurmountable, present themselves to the efficient transportation of farm produce with the aid of the Postal Service. These obstacles are the highways, the vehicle, and the postage or freight rate. There are 60,000 employees of the Postal Service who traverse 1,400,000 mi. of highways through producing territory in this country every day. Should each individual carrier transport 2,000 lb. the total transported would amount to 120,000,000 lb. daily, or, assuming the per capita consumption to be 2 lb. daily, enough for 60,000,000 people.

The condition of country highways at the present time makes it impossible, says Mr. Blakslee, to transport a load of one ton on those highways traversed by these employees except in fair weather, and then only with difficulty. Under the present system of compensation it is impossible for 43,000 of the 60,000 carriers to purchase and maintain the character of motor equipment necessary to convey 2,000 lb. of food daily, even for a portion of the year. Also at present the postage rate is too high in proportion to the selling value of many staple articles of food. However, he asserts, with certain obvious improvements the country can considerably reduce its living costs through extensive utilization of the Postal Service. The freight or postage rate could be changed, he says, and classified so that perishable food could be carried at one rate, semi-perishable food for another, and non-perishable at still another. Such rates would be largely governed by the celerity with which movement would have to be accomplished, and the value of the article conveyed.

Past experience offers proof of the immense saving in transporting farm produce by Postal Service, for Mr. Blakslee asserts that from Aug. 26 to the end of December, 1919, comparison of costs to the consumer of farm produce transported by motor truck with the aid of the Postal Service, and that obtained in local retail markets, showed more than 40 per cent saving to the consumer. The comparison was based upon 48 shipments, including potatoes, eggs, apples, honey, and canteloupes, and the average haul was 192 mi. On the 48 shipments of the various staple articles of foodstuffs, the postal revenue amounted to $1,687.76 and the direct cost of transportation was $1,725.54, indicating a loss in operation of $37.78. However, the consumers paid but $15,188.32 for the 48 shipments when the lowest market price on the same day shipments were delivered showed $21,800.64, or a net saving to the consumers of $6,612.32. As a specific instance, on Nov. 12, 86 crates of eggs—2,580 dozen—were shipped from Warsaw, Va., to Washington, D. C., a distance of 135 mi. The postal patrons or consumers paid $1,625.40 for this produce, which would have cost them at the lowest retail price prevailing in the city on that day $2,012.40, or a net saving of $367. The postal revenue was $54.18 and the postal expenditure $60.94. Thus a loss of approximately $6 to the Postal Service resulted in a net saving to the patrons of the service of $367.

Platte River Bridge Reconstruction, Rock Island Lines

Long Pile Trestle With Girder Channel Spans on Pile Piers With Concrete Caps—Jets Aid Piledriving—Traffic Detoured—Work Done by Railway Forces

IN the rebuilding of the trestle bridge carrying the Chicago, Rock Island & Pacific R.R. across the Platte River, in Nebraska, conditions called for special engineering expedients in both design and construction methods. Work is now actively under way. Diversion of traffic by connecting to the line of another railway makes it possible to carry on the operations economically and conveniently. Pile-bent piers with concrete caps to carry girder-spans, and sheathed pile bents fitted with ice breakers, are prominent features of the design. Very effective use is made of high-pressure water jets to facilitate the driving of piles in deep sand. All of the construction is being carried out by the force and equipment of the railway's bridge department.

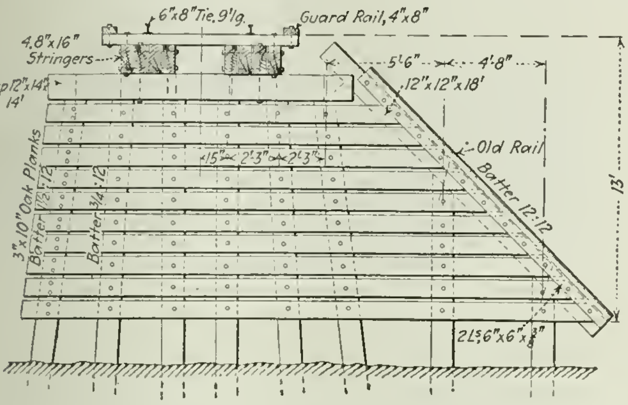


FIG. 1. TRESTLE BENTS ARE SHEATHED AND HAVE ICE BREAKERS

This structure is near South Bend, Neb., on the line between Omaha and Lincoln. It is about 3,000 ft. long and originally was a pile trestle for its entire length. As rebuilt, however, it will have 15 spans of 40-ft. plate girders over the main channel, near the middle of the bridge.

Diversion of traffic was decided on as much cheaper and more convenient under the favoring conditions of the location, than the construction of a temporary trestle. Near the west end of the bridge is a grade crossing of the Chicago, Burlington & Quincy R.R. and a few miles farther southeast this line crosses the Missouri Pacific R.R., which runs north and, in turn, crosses both the river and the Rock Island Lines. By putting in three junction connections a detour was obtained, very little longer than the direct main line. This arrangement was made the more easily from the fact that at the time all railways were under Government control, so that the three lines were practically parts of one system.

The river bed is in a sand formation of unknown depth, except that the middle hardpan is found at a depth of about 25 ft. The sand bed is not uniform but has numerous soft pockets, so that while in places it is hard to get the piles to the required depth, at other places care has to be exercised not to let them go too deep for the length of pile. In all cases, however, as soon as the disturbance due to the water jet is stopped the sand packs tightly around the pile. In fact, if jetting is stopped before the pile is well down it is hard to start the pile again, even by both driving and jetting.

Untreated white oak piles are used, about 45 ft. long and 18 to 20 in. in diameter at the butt, with an average penetration of 38 ft. Untreated Oregon fir is used for the caps and the trestle stringers on account of its cheapness and durability in this climate, together with the high cost and scarcity of large sizes of pine timber. The bents are spaced 15 ft. on centers and are driven between those of the old structure. The depth from rail level to river bed is from 15 to 20 ft. At the center of the river crossing the rail level is raised 3 ft. above that of the old structure so that the new girder spans will be clear of the high-water line, the rails being about 6 ft. above this line. As no change was practicable on the approaches, the elevation is run out by grades of 0.24 per cent and 0.3 per cent on the trestle portions.

Heavy ice conditions make it necessary to provide each bent with an ice breaker and to sheathe the bents with horizontal planks in order to keep ice or drift from lodging between the piles. A five-pile bent is used to support the cap and two additional piles carry the nose of the ice breaker, which is a 12 x 12 in. oak stick having a slope of 1 on 1. This is faced with an old 60-lb. rail fastened by screw spikes. The timber is further protected for its entire length by angles fitting over the edges and fastened by lagscrews on the sides. Typical bent construction is shown in Fig. 1.

For the deck, 9-ft. pine ties 6 x 8 in. are spaced 13 in. on centers and bolted to the stringers. Along the ends are guard timbers 4 x 8 in. laid flat, and not boxed out for the ties, while steel guard rails inside the track are set 8 in. from the track rails. Refuge platforms for watchmen are placed at intervals of 500 ft., being carried on long ties and utilized for the

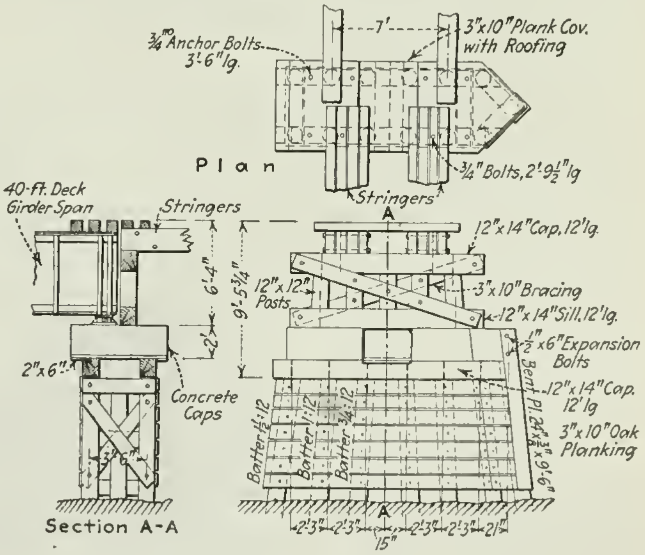


FIG. 2. PILE PIERS WITH CONCRETE CAPS CARRY GIRDER SPANS

usual water barrels provided for fire protection. The piers for the girder spans are concrete-capped double bents, with the two pile rows spaced 3½ ft. on centers; each row consists of six creosoted piles, as shown in Fig. 2. These are stiffened by diagonal bracing; they are sheathed on the outside and have a batter pile for the ice breaker. The nose of the ice breaker is protected by a bent plate which is spiked to the sheathing and pile and secured to the concrete cap by masonry expansion bolts.

Two precast concrete slabs 24 in. thick form the cap of each of these girder piers (Fig. 3). The slab for the upstream end has a triangular nose extending over the ice breaker, while that for the downstream end is rectangular. They rest directly on the timber caps of the two bents and are bolted to them. A nose slab weighs 9,000 lb., and a rectangular slab 6,000 lb. They were cast at a yard near the bridge, using wood forms and 1 : 2 : 4 gravel concrete.

The main reason for adopting the slab-cap construction was the desire to avoid a grillage cap, as would otherwise have been required; an auxiliary reason was the advantage of the slab as a means of fire protection. In first cost concrete and grillage caps are about equal, but the maintenance of the concrete caps is considerably less. On some structures where this construction has been in use for ten years there has been no maintenance cost. The concrete caps give a good seat for the spans, which rest on shoes anchored to the slab by bolts passing through 1-in. pipe sleeves.

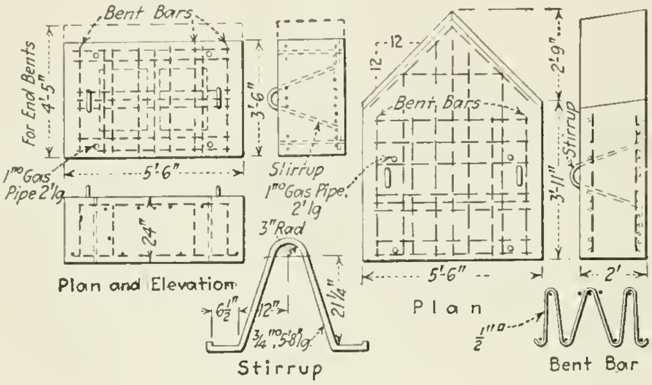


FIG. 3. CONCRETE SLAB PIER CAP

In pile-driving, two water jets are used for each pile. The jet is applied by way of a 50-ft. length of 2½-ft. pipe drawn down at the end to form a 2-in. nozzle. The pipe is attached to a 75-ft. length of 2½-in. hose coupled to an 8-in. main laid along the bridge. On each bank is a pumping plant with three steam pumps (one in reserve) to supply the main. At intervals of 60 ft. are fitted 3-in. tees each having a valve and two horizontal 2½-in. connections for the hose lines. A pressure of about 125 lb. is maintained at the jet or nozzle; the maximum distance from pumping station to piledriver is about 3,000 ft. A gage is placed on the nearest tee connection between the piledriver and the pumps, record being kept of the pressure for each pile.

The upper end of the jet pipe is bent into a loop or gooseneck, and is attached to a line running over the top of the leads and operated by a niggerhead on the piledriver engine. In this way the pipe is readily pulled up as the pile drops into the loosened sand. When the piledriver is run back for material the line is detached and the jet pipe left standing in the sand at the location of the next pile to be driven.

Ordinarily, piledriving is not done when the temperature is below 25 deg. F., as water is likely to freeze in the tee connections and valves. It has been done, however, at a temperature as low as 6 deg. In moderate weather each driver can average 15 piles per 10-hour day. The men are furnished with rubber suits and all pipe joints and connections are kept tight so as to avoid the discomfort of working in wet clothes. In very cold weather, the piledriver crews unload material at the yard.

Two self-propelling piledrivers are used, having swinging leads for driving the batter piles. One is a regular railway piledriver and the other a locomotive crane with leads suspended from the boom and braced to the frame. These machines work in opposite directions from the center of the bridge and Fig. 4 shows them commencing operations. They have a traveling speed of about 15 m.p.h. and are used to bring out the piles and timber, the piledriver crews keeping the carpenter crews supplied with material. The bents, including caps, are completed first, the deck being put on by a separate crew as fast as the bents are driven. All planks and timbers are bored by pneumatic augers operated from the portable compressor of a tracklaying outfit.

For each bent, the two nose piles are driven first and are cut off to carry a working platform for the carpenters who place the cap, ice breaker and sheathing. The carpenters also saw off the old piles about 9 ft. below the deck, the ends being then split up for use as posts. This cutting is done by crosscut saws, the men working on floats or scaffolds where necessary, but in many places the men can work on dry ground during low water. These white oak piles, 18

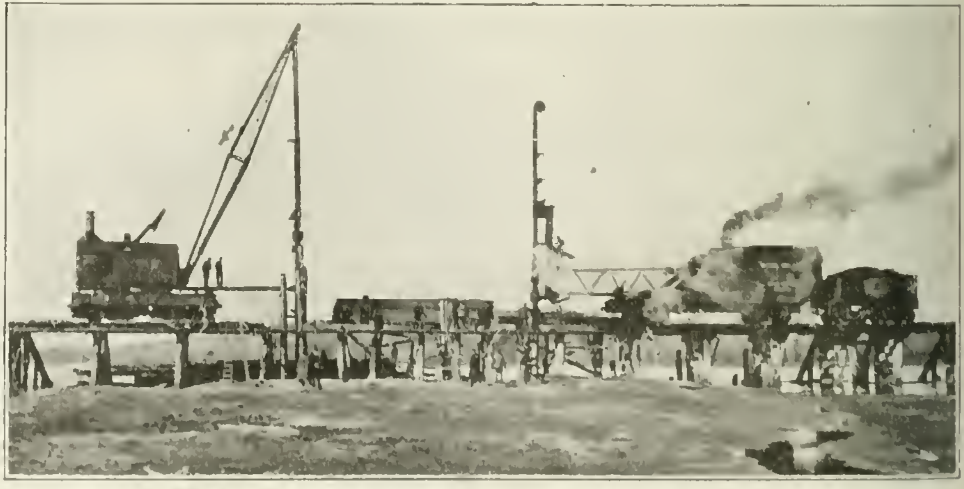


FIG. 4. PILEDRIVERS AT WORK ON PLATTE RIVER BRIDGE RECONSTRUCTION

years old, are perfectly sound except near the water line, where they are badly rotted.

In removing the old deck, the ties and stringers are picked up in bundles by the piledrivers or a locomotive crane and carried back to the material yards at each end of the bridge. The drift bolts are removed by jacks or claw bars to enable the caps to be pulled up. After the completion of the new bridge it is proposed to remove the lower parts of the old piles by the aid of the water jets.

Salvage of material from the old bridge is receiving special attention, in order to reduce to a minimum the loss which normally accompanies work of this kind. All timber and metalwork is accounted for and shipped to the store department. Orders are given that all washers, bolts and similar metal must be saved. While some loss is inevitable, the fact that account is kept of the salvage is sufficient to make a foreman careful to see that the loss is as small as possible. None of the old material is used on the new work, but all is sent to the store department, where it is worked over and supplied for other work on requisition. This department has a salvage plant where, among other things, bent bolts are straightened, headed and rethreaded, thus making them into practically new bolts at small expense.

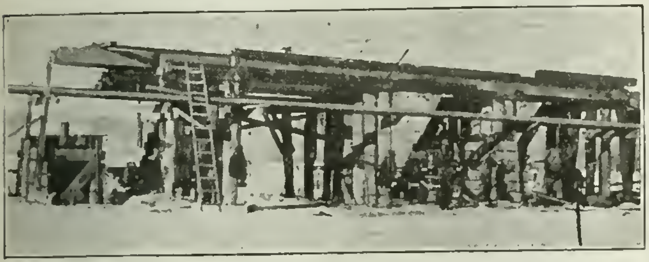


FIG. 5. WORKING FROM THE ICE IN SHEATHING ONE OF THE NEW BENTS

This reconstruction was commenced in October, 1919, and is expected to be completed by next May. It is being done by the bridge department of the railroad, with a force averaging 60 men who are housed at a camp near the material yard on the south side of the river. The work is in charge of T. A. Smith, resident engineer, and is under the direct supervision of I. L. Simmons, bridge engineer of the Rock Island Lines. C. A. Morse is chief engineer.

Water Supplies from the National Forests

About 1,300 municipalities obtain all or a part of their water supplies from drainage areas lying within the national forests, according to a letter from the Secretary of Agriculture to the House of Representatives, in connection with an inquiry as to expenditures pertaining to public health. The letter states that it is the practice of the Department to co-operate as far as possible with these municipalities in the protection of the sanitary quality of the water drawn from forest areas. In some cases the Department approves regulations of local health boards for the protection of water supplies, and the regular forest force co-operates in the enforcement of these regulations. Where special patrol forces are required they are provided and paid for by the municipalities benefited, but are under the general supervision of local forest officers.

Feeding Garbage to Hogs at St. Paul

GARBAGE disposal by feeding to hogs under three contracts for as many districts is being continued at St. Paul, Minn. On the whole, the contracts for service beginning Sept. 1, 1919, were not as favorable to the city as they were for the previous year.

In 1918-19 the city collectors were paid $130 per month, but they furnished teams and running gear and the city supplied metal wagon boxes. The collection cost the city $52,655 in 1918-19, according to the report for that year of M. N. Goss, commissioner of public works, but that figure included $6,000 for inspection service. The city had 30 teams on garbage collection in 1918-1919 and three on dead animals. In addition, there were 50 licensed collectors taking garbage from hotels, restaurants and apartments. These paid a license fee of $5 a year and were under city inspection. The garbage they collect is all fed to hogs, but what the collectors pay to hotel keepers for the garbage is not known by the city authorities.

During 1918 a total of 5,728 tons of garbage were collected by the city and approximately 9,432 by private collectors, or a total collection of 15,108 tons. The city received $11,147 for the garbage collected by it, $1,227 for hides and dead animals, and $250 for license fees from private collectors, making a total revenue of $12,624 for the year against $52,665 expense. The cost of collection includes repairs to the equipment owned by the city, but no interest or depreciation.

For a number of years garbage collected by the City of St. Paul was delivered to stock feeders just outside the city limits at their own prices, and it was claimed that there was difficulty in disposing of all the garbage collected in that way when 25c. per ton was the average price. In August, 1914, the function of collecting garbage was transferred from the Department of Health to the Department of Public Works (a charter provision under the new commission form of government) and arrangements were then made for disposing of the garbage on the following basis: District 1, with 17 teams collecting, delivery just north of the central part of the city, at 80c. per ton. District 2, with 7 teams collecting, 80c. per ton to be delivered just north of the north city limits, and District 3, with four teams collecting, 75c. per load to be delivered on the south band of the river. In 1917, new contracts were made with the same parties on a basis of $1 a ton. In 1918, some publicity was given by the city as to the garbage to be disposed of by advertising for bids. Nine bidders appeared and contracts were awarded as follows: District 1, $3.02 per ton; District 2, $3.27 per ton and District 3, $1.38 per load (approximately $2 per ton) with contracts running to Sept. 1, 1919. Contract prices for 1919-20 are: District 1, $1.75 per ton; District 2, $2.60 per ton and District 3, $3.25 per ton.

An interesting situation developed here in that the high bids received were as follows; District 1, $2.52; District 2, $3.60 and District 3, $3.25. On being awarded the contracts the high bidder of District 1 withdrew his bid and forfeited his bond of $250, claiming that his plans for disposing of the garbage had miscarried. This left the 1918 contractor the high bidder. The high bidder in District 2 then claimed he had made an error and that it should read $2.60 instead of $3.60 which still left him the high bidder. In the third district there were two bidders, the man who had it last year at $1.38 bid 95c. and the man who had the contract in 1917 bid $3.25 and took the contract.

According to local opinion, there is little question that there was a dummy bidder in District 1 to protect the situation for the existing contractor, and that in District 2 anticipated competition did not materialize, and that in District 3 the contractor is paying about what the garbage is really worth. On the whole these contracts are not quite as favorable as they were for the year 1918-19.

1920 Program Shows New York Highways 67½ Per Cent Concrete

EXAMINATION of the figures recently issued from the New York State Highway Department giving a tentative program for 1920 construction shows that, out of a total of 725 mi. to be laid this year, approximately 500 mi., or 67½ per cent of the total, are listed as concrete highways. Bituminous macadam is second with 139 mi. and 38 mi. are to be constructed of one or both of the foregoing types, though no final determination as to which type will be used has yet been made. As this 38 mi. comprises numerous short pieces of road it is presumed that about half will be constructed of each type.

The following table, containing a distribution of proposed construction classified as to length and type and county, is compiled from figures furnished by the State Highway Department, which figures are subject to change according to Commissioner Greene:

			Mileage and Type			
	County	Concrete	Bituminous Macadam	As Designed	Dual Type	Asphalt Block
1	Albany	12.79	......	.....	.....	.....
2	Allegheny	4.85	......	.....	.....	.....
3	Broome	17.28	6.00	.....	.....	.....
4	Cattaraugus	21.04	......	.....	.....	.....
5	Cayuga	8.30	......	.....	.....	.....
6	Chatauqua	21.24	......	.....	.....	.....
7	Chemung	4.55	......	.....	.....	.....
8	Chenango	......	9.92	.....	.....	.....
9	Clinton	5.50	9.20	.....	.....	.....
10	Columbia	11.62	......	.....	.....	.....
11	Cortland	6.54	2.50	.....	.....	.....
12	Delaware	13.50	6.00	.....	.....	.....
13	Dutchess	7.23	......	.....	.....	.....
14	Erie	23.77	......	.....	.....	.....
15	Essex	6.00	......	.....	.....	.....
16	Franklin	......	6.03	.....	.....	.....
17	Fulton	1.10	......	.....	.....	.....
18	Genesee	3.50	......	.....	.....	.....
19	Greene	......	6.06	.....	.....	.....
20	Hamilton	......	3.00	.....	.....	.....
21	Herkimer	8.86	......	.....	.....	.....
22	Jefferson	15.76	......	.....	.....	.....
23	Lewis	......	4.74	.....	.....	.....
24	Livingston	10.34	......	.....	.....	.....
25	Madison	6.85	......	.....	.....	.....
26	Monroe	7.69	......	.....	.....	.....
27	Montgomery	8.13	......	.....	.....	.....
28	Nassau	15.65	0.40	.....	.....	.....
29	Niagara	2.38	......	3.00	.....	.....
30	Oneida	9.20	......	.....	10.40	.....
31	Onondaga	0.22	6.55	.....	.....	.....
32	Ontario	7.80	......	.....	.....	.....
33	Orange	21.29	......	.....	.....	.....
34	Orleans	6.92	......	.....	.....	.....
35	Oswego	10.16	11.01	.....	.....	.....
36	Otsego	7.83	......	.....	.....	.....
37	Rensselaer	9.10	......	.....	.....	.....
38	Rockland	12.49	......	.....	.....	.....
39	St. Lawrence	8.24	11.16	.....	.....	.....
40	Saratoga	18.17	6.10	.....	.....	.....
41	Schenectady	3.90	......	.....	3.42	.....
42	Schoharie	10.50	10.82	.....	.....	.....
43	Schuyler	2.95	......	.....	.....	.....
44	Seneca	13.50	......	.....	.....	.....
45	Steuben	6.40	7.57	10.00	.....	.....
46	Suffolk	3.00	......	.....	.....	.....
47	Sullivan	5.69	......	.....	.....	.....
48	Tioga	13.35	......	5.50	.....	.....
49	Tompkins	5.10	......	.....	.....	.....
50	Ulster	22.25	14.33	.....	.....	.....
51	Warren	4.85	5.13	.....	.....	.....
52	Washington	13.20	......	6.98	.....	.....
53	Wayne	14.30	......	.....	.....	.....
54	Westchester	9.85	5.72	.....	.....	1.23
55	Wyoming	7.29		6.99	.....	.....
56	Yates		6.86	9.63	.....	.....
	Total	492.02	139.12	42.10	13.82	1.23

Utilizing Old Material for Bituminous-Pavement Repairs

DURING the past three years all asphalt and other bituminous pavement surfaces in Birmingham, Ala., have been maintained by cutting out bad spots, melting the material in a portable heater, painting the edges of the cut, then replacing, tamping and smoothing the heated material. The upright at the end of the heater shown in the view serves as a chimney for the firebox at the bottom of the wagon body. The 25% or so of material lost in the cutting and heating has been made up from the waste dumps at three privately owned asphalt plants.

HEATER FOR BITUMINOUS PAVEMENT REPAIRS

The same method is followed where cuts in the pavements are made for utility or other purposes. This kind of maintenance work was formerly left undone until it could be carried on by one of the paving companies. In round numbers, 1,000,000 yd. of bituminous pavements of all classes have been maintained by the method outlined. Julian W. Kendrick is city engineer of Birmingham.

Figures on French Reconstruction

The magnitude of the reconstruction task confronting the French Minister of the Liberated Regions is indicated in the following figures given out by M. Labbe, Director General of Technical Services, and published recently in *Commerce Reports*:

Building work alone would require 22,000,000 tons of material and the labor of 700,000 persons for one year; 100,000 houses are to be entirely rebuilt, requiring 5,000,000,000 bricks, 3,000,000 cu.m. of sand, 1,000,000 tons of lime, 13,000,000 sq.m. of tiles and 3,000,000 cu.m. of wood. Reconstruction of highways and railroads would require 3,000,000 tons of material and the labor of 15,000 men for one year. In addition, 20,000 trains and 5000 trucks would be required.

Sulphur and Phosphorus in Steel To Be Investigated

Large Committee Organized for Work — Project Due to Commercial Conditions and Doubt as to Present Restrictions

RESEARCH work on a large scale has just been started by a joint committee of steel-producing and steel-consuming interests, formed to investigate the effect of phosphorus and sulphur on the qualities of steel. Indirectly the work is the outcome of war conditions. Difficulties in adhering to the ordinary specified limitations on sulphur and phosphorus content, especially in the matter of sulphur, whose percentage is increased by the extensive use of coal as fuel in place of natural gas, led to a practical suspension of the normal specification limits on sulphur and phosphorus during the war. By action of the American Society for Testing Materials in 1918 the limit for sulphur in all steels and for phosphorus in acid steels was raised 0.01 per cent. In June, 1919, the original limits were restored for special steels, spring and forging steels, and the like, and it has been expected that the old limits for other steels would be restored in 1920. In the meantime, however, the society's steel committee came to the conclusion that definite test data as to the real extent of the presumed harmful influence of phosphorus and sulphur are lacking, and that such data should be obtained and made the basis of future specifying. Consultation with the U. S. Railroad Administration and with the Bureau of Standards then led to the organization of a joint committee to study the subject. This committee includes:

G. K. Burgess and H. L. Whittemore, Bureau of Standards; F. M. Waring and H. E. Smith, U. S. Railroad Administration; R. W. Hunt & Co. and T. D. Lynch, American Society for Testing Materials; F. P. Gilligan, Society of Automotive Engineers; E. F. Kenney and J. J. Shuman, Association of American Steel Manufacturers; J. E. McCauley, Steel Founders' Society of America; F. C. Langenberg, War Department; D. J. McAdam, Navy Department; Frank Gentles, Shipping Board; J. H. Hall, National Research Council. The committee is headed by Dr. George K. Burgess, of the Bureau of Standards. C. L. Warwick, secretary of the American Society for Testing Materials, is secretary.

While the influence of phosphorus and sulphur upon the quality of steel has been under observation in practice and under study in laboratories for many decades, strong differences of opinion have always existed as to the point at which these two ingredients become harmful to the material in different services and in different grades of hardness. For this reason, it has been concluded, a systematic attack on the question by tests of a large series of steels, in which only one factor is varied at a time, will throw entirely new light on the question.

Parts that have failed in service will be studied with respect to composition, so that if there is any recognizable systematic effect of sulphur and phosphorus percentage upon quality of material it may be discovered. Entirely separate from this, a program of tests on specially made samples of steels of various sulphur and phosphorus percentages will be carried out. This test campaign in itself will be in two parts, of which one includes material from very low up to moderate sulphur and phosphorus percentages, while the other includes steels of abnormally high percentages. For the former series the rule has been adopted that all sulphur must be "residual" sulphur, that is, sulphur present in the steel from the fuel or from the raw materials. The second part of the test program will cover steels of abnormally high sulphur, higher than can be obtained as "residual" sulphur.

Work is being begun on the soft steels of the first half of the program (Series A). According to present plans Series A will embrace the range of steels listed below:

SERIES A TESTS, SULPHUR AND PHOSPHORUS RESEARCH

Group No.	Material	Carbon	Manganese	Phosphorus*	Sulphur *
1	Rivet steel, tubes, etc.	6–12	35–40	2–3 4–5 6–7	3–4 5–6 7–8
2	Plates and structural shapes, including boiler plate	16–22	35–40	3–4 5–6 7–8	3–4 5–6 7–8
3	Forgings, such as car axles, treated and untreated	45–55	50–60	3–4 5–6 7–8	3–4 5–6 7–8
4	Wheel, tire and rail steel	65–75	60–70	3–4 5–6 7–8	3–4 5–6 7–8
5	Spring steels	95–105	35–45	2–3 4–5 6–7	3–4 5–6 7–8
6	Castings	Compositions to be considered later.			

Sulphur in all steels to be "residual sulphur."

All compositions are expressed in hundredths of per cents.

* With each of the specified ranges of phosphorus it is understood that the sulphur content is to be constant and equal to the usual value for that group of material; vice versa for sulphur.

Laboratory, fabricating and service tests will be carried out; in the laboratory, mechanical tests of various kinds will be applied, including impact and endurance tests where possible. The amount and kinds of gases present in the steels under test will be determined. Most of the testing is to be done at Watertown Arsenal, the Annapolis experiment station of the Navy, and the Bureau of Standards.

A number of tons of rivet steel have been manufactured for the tests. After grading, about a ton of material in each grade will be obtained, half to be subjected to test and the rest held in reserve for check. This material falls under Group 1 of the Series A tests. A beginning has been made in the Series B tests by arranging with a large steel company for the manufacture of three heats of steel, covering plate and structural, forging, and wheel, tire and rail grades. From each of these, eight ingots will be poured, to obtain sulphur content varying from 0.04 up to 0.15 per cent, by the addition of sulphur or pyrites in the pouring.

An unusual degree of co-operation has been realized in the undertaking. Steel manufacturers are heartily in accord with the aims of the committee, and will contribute material and assistance. Government departments, manufacturers and railroads have offered test facilities and materials. There is at present no expectation that it will be necessary to raise a separate fund for carrying on the work. The committee invites the support of all persons and organizations interested in the work, and will welcome any information that might prove of value in planning or carrying out the tests.

Department of Health for South Africa

A Department of Health for the Union of South Africa was created by legislative enactment in 1919 and Thomas Watt was appointed as Minister of Public Health. Of the nine chapters of the act, one relates to public water supplies, meat, milk and other articles of food, and another to sanitation and housing. Particulars regarding the act are given in a brief summary published in *Public Health Reports* (Washington, D. C.) for Jan. 9, 1920.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Engineering and Adventure

Sir—I was very much pleased with the article by Prof. P. B. McDonald, "Engineering and Adventure," which appeared in your issue of Jan. 1, p. 17. I have always held that the principal cause of low salaries and lack of appreciation of which engineers complain, were due primarily, to too great emphasis placed by engineers on the side of their work which dealt with materials, etc., and not enough value given to the human equation. In other words, they fail to appreciate that the "Greatest study of mankind is man." Our friends the lawyers, do not make this mistake and the general complaint is that *their* profession receives too much recognition.

T. FRANK QUILTY,
President Superior Stone Co.
Chicago.

Legislative Prospects Good For Public Works Department Bill

Sir—The technical men of the country will appreciate the report of the first convention of the Public Works Department Association contained in your issue of Jan. 22, 1920, and especially that portion relating to the necessity for financial support. It is suggested, however, that your comments do not give as favorable an impression of the legislative prospects as they deserve, and the writer submits for the information of the engineering profession a short statement in response to two sentences thereof. These sentences, beginning at the bottom of page 169, are as follows:

"It (the Jones-Reavis bill) apparently has not been seriously considered by either of the committees nor was there a definite prospect of hearings on it. One of the results of the convention—and particularly of the calls made by delegates on Congressmen—will probably be the resurrection of the bill from committee and early consideration through hearings."

Your representative did not take sufficient notice of that part of the report of the Executive Committee relating to the present status of the campaign, viz:

"The public works bill was introduced on June 25, 1919, many months before it could be expected to secure any consideration by Congress. The purpose of this early introduction was to give the measure an official status so that our work could be focused on a definite proposal embraced in an officially inscribed instrument. Immediately after the bill was introduced request was made to the chairman of the House and Senate committees to which the bill was referred, that it be not acted upon during the special session of Congress and that nothing be done with it until about Jan. 1, 1920. The chairmen of both committees have graciously complied with this request. We asked for this seven months' period of inaction to prosecute the campaign of education among our member organizations and others."

The writer is pleased to state that, so far, the progress of the public works bill conforms almost precisely to the campaign schedule originally set down by the Executive Committee of the Association. The engineers of the country will be interested to know that, a few days after our public works convention, one of the leaders of Congress stated that the legislative progress of the Jones-Reavis bill, its appeal to the members of Congress, and the rapidly growing sentiment in favor thereof, constitutes one of the most remarkable events in his extended Congressional experience.

The engineers of the country may be assured that while there is much to be desired concerning the financial features of the campaign, the legislative aspects are far more favorable at this date than was really expected by those who have been most conversant with the situation.

M. O. LEIGHTON,
Chairman National Public Works Department Assn.
Washington, D. C.

"They Soaked Us When They Had the Chance"

Sir—In his inland water transportation discussion, Mr. Baker says: "The railways at the present time, instead of charging extortionate rates for their service, are not charging enough to save themselves from bankruptcy," and "the railway can reduce its rates below cost, if necessary, to meet a boat's competition and can raise them again after the boat has been taken off. The railway need not necessarily lower its rates to do this. If a line of boats begins operating on a river, the railway can start a competing boat line and lose money on it, if necessary, long enough to put the other line of boats out of business. Such things have been done."

Does it never occur to financial kings, railway men and engineers to put the two facts together and thus learn the reason for the attitude of the public toward railways? They "soaked" us when they had the chance and now we are getting even. It is a great game if you don't weaken and at the present writing the public is going strong. It can be said that the public does not know what is good for it, but neither did the railroads know when they were well off.

R. H. BLAIN.
Easton, Md.

[The fact that some railroad managements have been high-handed is not good and sufficient reason to adopt a policy of general railroad "soaking," and it will be noted that Mr. Blain questions the desirability of such a policy for the public's good. If the railroads are so restricted that needed development cannot take place, business in general and the public will suffer as well.—EDITOR.]

Waterways and Railroads

Sir—In Mr. Baker's study of inland waterways he has discovered some interesting facts regarding the comparative costs of the New York Canal, and the New York Central Railroad which it parallels and competes with and also of the proposed Lake Erie and Ohio River Canal and the Pittsburgh, Youngstown and Ashtabula Railroad which that canal will practically parallel if it ever should be constructed.

According to the report of the State Comptroller for the year ending June 30, 1918, the cost of the New York Canal during the fourteen years from 1905, when the work on the new canal was begun, for bond interest, construction, maintenance, repairs and sinking fund charges, has been paid $250,504,684.52.

According to Poor's Railroad Manual for 1906, the cost of the entire 808.64 miles of the New York Central Railroad System in 1905, including equipment, was

$198,479,248, or an average cost per mile of $245,448. At this rate per mile the cost of the 296·5 miles from Albany to Buffalo would be $72,775,332, and for the 438.72 miles from New York to Buffalo, the cost would be $107,682,946.

These figures mean that the State of New York has constructed a canal, without providing any equipment for barges and towboats, that has cost the taxpayers since 1904 almost three and one-half times what the railroad it would compete with had cost for equipment from Albany to Buffalo, and almost two and one-half times the cost of the railroad from New York to Buffalo.

According to Poor's Manual for 1918, the 137.6 miles owned by the Pittsburgh, Youngstown and Ashtabula Railroad cost, including equipment $21,739,729, or $138,838 per mile, while the estimated cost of Lake Erie and Ohio River Canal, 101.5 miles in length, according to the Report of the Canal Board for 1917, without the Warren and New Castle branches, is $64,625,400, or $639,624 per mile, without any equipment, or over four and one-half times the average cost per mile, which it would practically parallel, including equipment, and with which it would compete.

In view of the figures given above, when it is considered that the canals will be open for operation, according to the experience with the old Erie Canal, not over seven months per year, the writer believes as an economic proposition, it would have paid the State of New York to have abandoned the Erie Canal entirely and to have invested the $250,504,684, which it has cost from 1905 to 1918 inclusive, in 4 per cent bonds, and to use the interest in paying the railroads for carrying the 10,000,000 tons which is the estimated capacity of the new and enlarged canal. If this had been done, the State would have assets that could have been converted into cash, at any time, instead of having on its hands a canal that will be a source of expense as long as freight is transported free of tolls.

With regard to the Lake Erie and Ohio River Canal which its advocates propose shall be built by the National Government at a cost over four and one-half times that of the railroad which it would parallel and compete with, the writer would be glad to have any advocate of water transportation show how, when taking into account interest on the cost, operating and maintenance charges, to say nothing as to sinking fund charges if the Government should build the canal from the sale of bonds, freight could be transported on it, at less cost than by a railroad which it would parallel, the cost of which including its equipment, was less than one fourth that of the canal without equipment.
W. G. WILKINS.
Pittsburgh.

Why Not Engineers on Industrial Committee?

Sir—I was very much interested in the letter of W. M. Butts in your issue of Jan. 1, p. 53, entitled "Why Not Engineers on Industrial Committee?" I recently wrote a Senator and Representative for both Kansas and Colorado on this subject. Extracts from their replies might be of interest:

> Of course you understand that practically all of these commissions are appointed by some member of the Cabinet under the direction of the President and it is, therefore, impossible for Congress to indicate specifically the personnel of such commissions. These positions are to some extent political in their nature and if technical work is required, such experts are generally employed by the commissioners.

> I think your suggestion that the service of engineers should be utilized in connection with the work of various commissions, etc., is good. I shall be glad to render any help I can looking to the extension of such recognition. I am glad to hear from you, and appreciate your calling my attention to the matter about which you wrote. I certainly agree with you that engineers should be recognized on these industrial commissions.
>
> The fact that for the numerous commissions which have been created mechanical and electrical engineers have not been considered had escaped my notice. Why this should be the case when industrial developments of all kinds require the services of this character of men I cannot understand, and why in the personnel of these commissions these engineers should not have consideration. I assure you I would be glad to have this in mind and should opportunity offer would be glad to aid in any way possible to have proper consideration in this connection for positions they would be so well qualified to fill.

According to these Congressmen the difficulty seems to be not in the ability of the engineer to serve but in the oversight of the "powers that be" in utilizing such ability.
J. B. MARCELLUS,
Boulder, Col. Civil Engineer.

What the New York State Barge Canal Has Cost the Taxpayers

Sir—In connection with Mr. Baker's article on the "Future of Inland Water Transportation," it would be interesting to know whether the cost of interest during construction has been included in the $155,000,000 spent by the State of New York on its canals during the last twenty years. Although it is not customary, I believe the true cost of this item should be found by compounding. In case of a project covering so long a time any other method results in a gross underestimate of the real cost.
EDWARD GRAY,
Richmond, Va. Chesapeake & Ohio Railroad.

[The interest was not included, although it should be, of course, to obtain the total cost. The figures quoted in the letter which follows show the size of the burden which the New York canals place upon its taxpayers.—EDITOR.]

Sir—I am very glad to see that you have taken up the question of water transportation in an unbiased study of the subject. I have already gone on record in published letters and pamphlets in relation to the proposed Lake Erie and Ohio River Canal, stating conclusions not only as regards that particular project, but on the general subject, which agree with the opinions expressed in your first article.

From the figures given in the "Report of the Comptroller of the State of New York on the Expenditures of the Canals for the year ending June 30th, 1918" some interesting deductions can be made with regard to the New York Barge Canal. The report contains two tabulations, one giving the yearly expenditures for the canals from 1817, when construction on the canal from Albany to Buffalo was begun, down to and including June 30th, 1918, and the other, the annual receipts during the same period.

The total expenditures have been $561,738,242, and after deducting operating receipts, interest on bank deposits, interest on investments, sales of land, etc., amounting to $163,328,450, the net cost to the taxpayers up to the above date has been $398,409,792.

If this last sum had been invested in bonds bearing only four per cent interest, the State would have received annually $15,936,391.38, but as it has been invested in the canals, on which no tolls are charged, it is indirectly costing the taxpayers the last mentioned amount every year.

This sum which the State might under the above conditions have received, would have been sufficient to have paid the railroads for transporting the ten million tons which the State Engineer says the canal could have carried in 1918.

The State would also have been relieved from paying the sums that it has cost every year, for construction, supervision, repairs and bond charges, which for the last twenty years have averaged over thirteen million dollars a year.

The State would also have had assets to the amount invested in the bonds, which could have been realized upon, instead of a canal system which has been, and probably always will be, a source of expense instead of revenue.

W. G. WILKINS,
The W. G. Wilkins Co.
Pittsburgh, Pa.

Engineering Fees Not Excessive in Government Housing

Sir—Fees for engineering service paid by the United States Housing Corporation have been criticised as excessive in a recent report made by the Senate Committee on Public Buildings and Grounds. Exception is made to the report of the former chief to the effect that the "Average fees and overhead allowance has been but 1 per cent on the cost of utilities involved." The report further states, "Of course, this sum includes field salaries and expenses. . . . but taken all in all, it is approximately 5 per cent of the contemplated work. . . . The usual commercial percentage for engineering service is but 5 per cent of the actual cost of executed work."

The 5 per cent in question is obtained by the committee from the ratio of total engineering expense of all kinds, including not only fees and overhead, but the cost of all field parties combined, to the total cost of all utilities. The inference conveyed by the Senate report is first, that the chief engineer misstated the percentage cost for engineering service, and second, that the amount paid for engineering service was twice that ordinarily paid.

The statement as issued and prepared by the Senate investigating committee, and which has gone into the Government records, should not be allowed to stand unchallenged. The engineers engaged for this service were over one hundred of the leading enginering firms of the United States. Scarcely a man who was called upon refused to give service or questioned the very low scale of fee proposed, but all agreed to accept the much reduced rate as a war duty, and the engineering press and all engineers should stand by and see that a true statement of these facts is given to the public.

In addition to the engineering work on the utilities such as sewers, water-supply, street work, etc., a very large part of the engineers' time was taken up with other matters such as original land surveys, topographical maps, executive negotiations with municipalities and utility companies, grades for lots and housing, plats for filing dedication, etc. The Senate committee has charged all this additional expense up to the one item of utility costs. Naturally their percentage of engineering costs is in excess of the actual amount.

It is found by actual comparison of the moneys paid out that the engineering fee and overhead as referred to in the report of the Housing Corporation of Dec. 3, 1918, amounts to about one-fifth of the expense of engineering on utilities so that the actual percentage of the engineers' fees and overhead, exclusive of field expense, is one-fifth of 4.2 per cent, or 0.84 per cent, or less than 1 per cent, which confirms the chief engineer's statement in the report.

When the representative of the investigating committee made his comparison in his report to the Senate investigating committee, he entirely omitted and failed to account for the three lines of the chief engineer's report which say, "In addition to which (meaning the 1 per cent) the project engineer receives actual cost for his assistants, traveling expenses, and such obvious expenses as can be readily checked," which, of course, means as their contracts fully set forth, all the field expenses of supervising work.

The following statement of percentage of engineering costs of June 30, 1919, as applied to the different housing projects which were completed, may be of interest. The first column is the percentage of engineering costs for engineering service on utilities alone; the second column is the percentage of all engineering costs to the value of all work performed by engineers. The percentage of fees and overhead for the engineer or engineering firm was less than 1 per cent of the cost of utilities.

Project	Utilities Per cent	Total all Engineering Costs Per cent
Aberdeen, Md	6.537	10.89
Alliance, O.	10.80	18.00
Bath, Me.	4.23	7.05
Bethlehem, Pa.	1.248	2.08
Bridgeport (*a*) Conn.	6.6	11
Bridgeport (*b*) Conn.	7.2	12
Charleston, W. Va.	7.2	12
Erie (East) Pa.	4.02	6.7
Erie (West) Pa.	3.114	5.19
Indian Head, Md.	2.4	4
Mare Island, Cal.	3.936	6.56
New Brunswick, N. J.	3.048	5.08
New London, Conn.	3.18	5.3
Newport, R. I.	2.028	3.38
Niagara Falls, N. Y.	3.39	5.65
Cradock, Va.	4.98	8.3
Truxtun, Va.	4.38	7.3
Philadelphia, Pa.	.006564	0.1094
Quincy, Mass.	2.616	4.36
Rock Island, Ill.	5.274	8.79
Moline, Ill.	3.054	5.09
Davenport, Iowa	2.268	3.78
Waterbury, Conn.	2.994	4.89
Watertown, N. Y.	3.33	5.55
Average	4.075	7.561

The former chief engineer of the Housing Corporation was criticised in the Senate's report in connection with the loan made by the Housing Corporation to one of the public utility companies. The only basis upon which such criticism could be made was by absolutely ignoring the evidence on page 723 of the hearings before the Senate committee. That evidence is that the securities in the vaults of the Housing Corporation today have a market value of over twice the amount of the loan in question.

CHARLES P. CHASE,
Manager Engineering-Construction Division,
U. S. Housing Corporation.
Washington, D. C.

Subdividing a Trapezoid

In R. B. McWhorter's letter giving formulas for use in dividing a trapezoid into strips of equal area, on p. 194 of the issue of Jan. 22, 1920, the first sentence of the right-hand column should read,

"This trapezoid is to be divided into six smaller trapezoids of equal size, each to contain 16.844 units."

The sentence beginning above the drawing should read,

"With both sides and the area of each trapezoid known, the widths are readily obtainable."

HINTS FOR THE CONTRACTOR

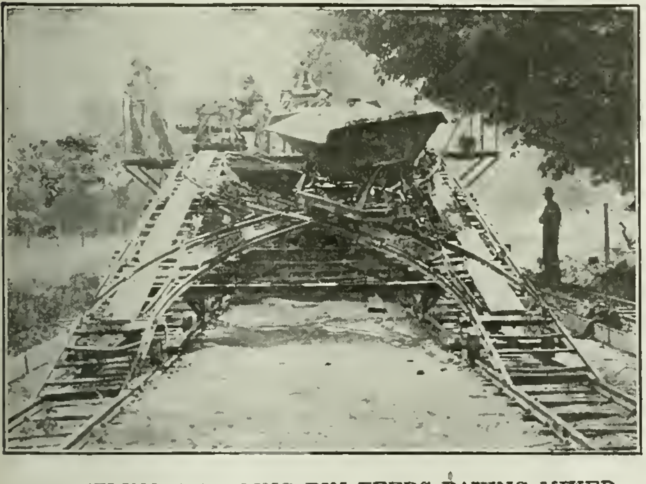
DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Portable Repair Plant for Dredges

FOR economy and convenience of repair work on a fleet of dredges operating at different points, a portable outfit is employed by the Yuba Consolidated Goldfields Co., California, as described in the *Engineering and Mining Journal* of Jan. 10, 1920, p. 86. A wagon-bed on four wheels has at the forward end an electric motor belted to an air-compressor mounted at the rear end and supplying power for pneumatic tools, while a portable electric welding apparatus is also carried on the machine. Forges and miscellaneous equipment can be hauled in trucks. Steel barges of 20 tons' capacity are used for transporting materials between the dredge and the temporary repair plant.

Traveling Bin Cuts Cost of Charging Paving Mixer

A MIXER charging machine, which comprises storage bins, a measuring cylinder and a track incline, all mounted on wheels, reduced the cost of handling materials to the mixer on two Wayne County, Michigan, concrete roads built in 1919. The structure is steel with the bins and measuring device at the forward end and the track incline arrangement shown by the accompanying view. The capacity is 8 cu.yd. of stone, sand and cement. Cars of stone and sand arriving at the top are discharged into the bins and then returned to the surface tracks. Cars carrying cement in bags are held at the top while the bags are untied as needed and emptied through a hopper and chute into the mixer charging hopper which, when lowered, extends under the overhanging platform on top of the bins.



TRAVELING CHARGING BIN FEEDS PAVING MIXER

Two 24-in. gage industrial tracks spaced 10 ft. apart on centers on the subgrade carry the apparatus. These tracks connect by switches with the industrial track on the shoulder of the road. A stiff coupling connects the structure with the mixer so that when the mixer moves ahead it pushes the bins along.

On the two road jobs on which this device was used in 1919, it had, according to Leroy C. Smith, engineer-manager Board of Road Commissioners, Wayne County, Michigan, the following advantages: (1) It insured clean aggregates, accurately proportioned by machine, free from dirt shoveled off the grade. (2) It saved the cost of seven shovelers and seven wheelers, amounting, at the wage scale in force, to $70 per day, or reduced the labor cost about 10c. per sq.yd. (3) It made it possible to operate immediately after a rainstorm, even if the subgrade was muddy, because no material had to be picked off the grade. (4) It saved material, as no material was dumped on the grade and the usual loss of about 10 per cent of pebbles and sand was eliminated. (5) The subgrade was not cut up after fine grading had been completed.

Pipe for Hydraulic Fill Turned Often To Equalize Wear

TO insure an even wear around the circumference of the 15-in. manganese-steel pipes employed on hydraulic-fill operations of the Miami Conservancy District the pipes are turned 120 deg. for each new run, according to H. S. McCurdy in a paper before the New England Waterworks Association. Observation showed that practically all of the solids flow within the lower third of the pipe, the upper two-thirds being filled with water bearing only the lightest particles. Consequently, for a given run it is the lower portion of the pipe only which is subjected to any considerable wear. No difficulty is experienced in practice in turning the pipe; one end of each length is numbered 1, 2 and 3, 120 deg. apart, and each time a line is relaid the pipes are revolved until the next number is uppermost.

The pipes are slip joint, with a slight bell on one end, and are held together by wire stretched over hook lugs. The thickness of shell is $\frac{11}{64}$ in. The pipes are in 16-ft. lengths and weigh 28.83 lb. per linear foot. None of these manganese-steel pipes has worn out. Riveted steel pipe, made from ordinary steel plate containing 0.10 to 0.20 carbon, proved very shortlived. Claim has been made that the manganese pipe will last ten to fifteen times as long as 0.15 carbon steel.

The High Cost of Labor

As an example of the way in which the labor cost has increased, the *Bulletin of the Associated General Contractors* cites the case of a Minneapolis contractor who has furnished figures that show a labor cost of $78,600 in 1918 for a six-story warehouse, while in 1915 the charge for labor on a similar structure was only $49,000. The total cost of the entire building increased from $136,100 in 1915 to $251,000 in 1918. Contractors say that it is not only the higher wages now being paid to workmen that is responsible for higher building costs, but that the greatly lessened production per man is also a big factor. Two men at $2.25 a day did about as much work in 1914 as three men, each drawing $4.84 a day, will do at the present time.

NEWS OF THE WEEK

New York, February 5, 1920

New Plan for Seattle's Cedar Lake Dam

Sealing Operations Would Be Abandoned, New Dam and Tunnel Built and Plant Capacity Tripled

In a report just presented to Seattle's City Council, J. D. Ross, Superintendent of Lighting, urges that an entire change of policy be made immediately in regard to the Cedar Falls reservoir and power plant. It will be remembered that sluicing operations have been under way for two years in an endeavor to seal the reservoir so that water might be stored in it (see *Engineering Record*, and *Engineering News*, both volumes of 1915).

The leakage which is twice the average normal flow of the stream seems not to have been lessened and a continuation of the sealing operations, Mr. Ross says, "will result only in financial disaster and should at once be abandoned in favor of a plan that is better, quicker and perfectly sure." The new plan which would require only 12 months' working time, comprises three divisions. (1) making a rock-fill dam at the site of the old timber dam (which is about 7,000 ft. upstream from the concrete dam), (2) driving an 11-ft. tunnel 8,500 ft. long from above the proposed dam to connect with the existing tunnel and penstock line and (3) enlarging the power plant from 6,000 kw. to 18,000 kw.

A rock quarry opened some years ago is available near the dam site. The structure could be brought up to the height of the temporary spillway of the masonry dam and paved with concrete on both sides for about $150,000. The tunnel would be entirely through solid rock and could be driven from several adits. The intake end would be in the face of a steep rock cliff. This would raise the present water level of the lake 45 ft., increasing the storage to 80,000 acre-feet. The storage necessary to regulate the runoff of this basin, for records covering 15 years, averages 72,000 acre-feet, which would supply the 18,000 kw. contemplated. This amount of storage is considerably greater than could result from sealing, even if the operations were carried successfully to the full height contemplated.

By eliminating the present temporary structures the yearly cost of operating the enlarged plant would be actually less than present costs, Mr. Ross says. On the plan proposed the total installation cost would be $313 per kw. as against the installation cost of $582 per kw. on the plant as it now stands.

This year the lighting department paid one quarter of its receipts for fuel oil. If power from the Skagit development is not available until 1923, at the present rate the city would then be paying $1,000,000 per annum for fuel. With the proposed enlargement at Cedar Falls plant serving the city, the fuel-oil bill could be cut $800,000 per annum and consumers now refused could be served.

With the report is a recommendation that a bond issue of $1,750,000 be considered at once to provide for carrying on the work. The estimated costs are as follows:

Bringing old Cedar Lake dam up to a height of 30 or 35 ft. by means of a rock fill..	$150,000
Driving 8,500 ft. of 11-ft. tunnel including head gates..	1,100,000
Transmission and substation labor, machinery and equipment	500,000
Total	$1,750,000

The report was presented to the Seattle City Council and has been placed on file without action.

Committee Control for M. I. T.

At a meeting of the executive committee of the corporation of the Massachusetts Institute of Technology, Jan. 27, it was decided that no acting president will be appointed to fill the vacancy caused by the death of Dr. Richard C. Maclaurin, and that the affairs of Technology will be controlled by a subcommittee of the executive committee and a committee of three of the faculty.

The corporation subcommittee, consisting of Everett Morse, chairman, Francis H. Hart, and Edwin S. Webster, will keep in intimate touch with the affairs of the Institute and will cooperate with the faculty and officers of administration. The faculty committee, named the Administrative Committee, consists of Dr. William H. Walker, director of the new Division of Industrial Co-operation and Research, chairman; Dr. Henry P. Talbot, chairman of the Faculty and head of the Department of Chemistry, and Prof. Edward F. Miller, head of the Department of Mechanical Engineering. The latter committee will be charged with those duties ordinarily performed by the president in relation to the educational affairs of the Institute.

President Signs Niagara River Bridge Bill

On Jan. 30, 1920, the President signed a bill appointing a commission to investigate and report to Congress on the project of constructing a bridge across the upper Niagara River at Buffalo.

Annual Meeting of Engineering Institute of Canada

Reports Show That Institute and Its Branches are in Flourishing Condition

The thirty-fourth annual meeting of the Engineering Institute of Canada was held in Montreal Jan. 27, and was followed on the two succeeding days by the sixth general professional meeting. There was a total registration, including guests, of 650, which exceeded the number at any previous meeting.

Summarizing the year, the council of the institute laid special stress on the new spirit of the organization. "Service to the individual member," its report said, "to the branches and to the engineering profession has been the constant aim of the council during the past year. The spirit of service has been one of evolution, spreading over a number of years until it is now fully recognized and firmly established as a basic principle underlying the policy of the institute. It has been exemplified in many ways in connection with the work of the institute during 1919, which, as far as real progress in coordinating the engineering profession and developing a professional spirit is concerned, is believed to be one of the most progressive in the history of the profession in this country."

During the year, the council reported, new branches were established at Sault Ste. Marie, on the Niagara Peninsula, in the Border Cities, along the Detroit River, and at Peterborough, and the Kingston branch has renewed its activities. Every one of the eighteen branches, the council reported, is in flourishing condition "so that the great strength of the national organization today is its local societies or branches, each one of which is becoming more and more a force and a factor in the community in which it is located."

The question of registration has occupied a prominent place in the activities of the institute during 1919. A special committee has drawn up a proposed act, the principle of which has been approved by the council, and which at the present moment is under active discussion in every province. In some instances, application for registration has already been presented to the local legislatures. Engineering classification and remuneration have also been sponsored by the institute. "These efforts," the report says, "although falling somewhat short of the results hoped for, have paved the way for a greater recognition of the value of engineering services."

The membership report showed a total of 3,657 at the close of 1919. The report of the library committee carried the recommendation that additional appropriation be made for increasing the size of the library. Brief reports of progress were received from the committees on steel railway bridges, on international affiliation, on the Canadian Engineering Standards Committee, and on uniform boiler specifications.

RECOMMEND DEVELOPMENT COMMITTEE

The Ontario Provincial Division report suggested that the council take under advisement the appointment of a committee on development, and favorable action on the report now brings the matter before the council. This committee, it was recommended, should consider and report on: (a) The technical activities; (b) the internal relations and local associations; (c) the relation with other national societies and related organizations, and (d) the relation to public affairs.

A constitutional amendment was approved which would place the Montreal branch on the same basis as other branches, that is to say, rebate to it a certain percentage of the dues and let it defray its own expenses. Hitherto the expenses of the Montreal meeting have been borne by the headquarters organization. The amendment must now go to letter ballot of the members.

MEDAL AWARD AND NEW OFFICERS

It was announced that the Gzowski Medal had been awarded to Phelps Johnson, George H. Duggan and George F. Porter for their paper on the "Design and Construction of the Quebec Bridge."

Election of officers for 1920 was announced as follows: President, R. A. Ross, of Montreal; vice-president, Brigadier-General C. H. Mitchell, Toronto, and W. G. Chace, Winnipeg; directors, F. B. Brown and Julian C. Smith, of Montreal; A. R. Decary, Quebec; F. A. Bowman, Halifax; J. B. Challies, Ottawa; E. R. Gray, Hamilton; Guy C. Dunn and B. S. McKenzie, Winnipeg; J. R. Macredie, Moose Jaw; George W. Craig, Calgary, and H. M. Burwell, Vancouver.

PROFESSIONAL MEETING

The professional meeting was divided into three sessions, the first of which was devoted to engineering education, and brought forth a very unusual review of the state of engineering education in Canada and the ideals under which it is going forward.

The third day's papers included a very important exposition of the water-power policy of the Province of Quebec and the work of the Quebec Streams Commission by Olivier Lefebvre, chief engineer of the Quebec Streams Commission, and papers upon the public health act of Quebec and the evolution of the public roads problem in the province.

[*Comment on the outstanding features of this meeting will be found next week in the column entitled "Impressions Here and There."*—EDITOR.]

Pennsylvania Prepares To Put Own Crews on Road Construction

During the 1920 construction season Pennsylvania will have its own crews at work building important stretches of the primary state highway system. Not only will the State Highway Department have its own construction equipment, but it will open its own quarries and sand banks. Department engineers have found suitable stone and sand deposits in many new localities; and with hundreds of leases already in effect will be able to secure these materials at reasonable prices without delay. A new branch has been created which, under the direction of Chief Engineer W. D. Uhler, will have charge of the new activities. The superintendent of this division will be Donald M. Hepburn of Philadelphia, recently selected chief of the Philadelphia Bureau of Street Cleaning, under Director of Public Works Winston.

Proposes Salaried Road Commission for New Jersey

Governor Edward I. Edwards, of New Jersey, has recommended in his annual message that the present New Jersey State Highway Commission be abolished and that three commissioners be selected in its place, who should receive adequate compensation. Governor Edwards has said that no board of eight unsalaried members can be expected to give the time necessary to deal promptly and efficiently with the intricate details involved in the expenditure of almost $10,000,000 per year, nor can such a board by meeting once a month properly dispose of the interlocking business of counties. The Governor says the commission should be in constant session.

California Faces Uncertainty in Prosecuting Road Program

As yet it is uncertain whether the ten-million-dollar construction program laid out for California highways in 1920 can be carried out. The uncertainty lies in the fact that there is not much demand for securities bearing as low a rate of interest as the 4½ per cent provided for in the $40,000,000 bond issue voted last year. The bond issue provides for about 1,650 miles of new construction not included in previous issues. In the past six months the engineering department of the Commission has been making surveys of these new routes.

If funds are available the first work will be the completion of the gaps in the trunk lines and the work on the county seat laterals. The coast route from San Francisco to the Mexican line and the valley route from San Francisco to Los Angeles, via Sacramento, are scheduled to be paved for their full length before the end of the year.

In commenting recently on the situation in California, A. B. Fletcher, chief engineer of the California Highway Commission, said, "The Commission has laid plans for road work in 1920 necessitating the expenditure of about $800,000 a month. But the bonds must be sold before the contracts may be advertised, and labor conditions must be stabilized, else the engineers cannot estimate, nor can the contractors bid, intelligently."

Governor Smith Asks Road Funds

Governor Smith, of New York, has recommended to the legislature the prompt release of the $10,000,000 unappropriated balance of the second $50,000,000 bond issue available for road construction purposes. Quick action in the matter is sought because practically all of the appropriated balances have been expended and little is available to carry on the 1920 construction program. The governor also recommended that the legislature appropriate enough funds to match Federal government moneys available, which must be met on or before June 20.

Governor Smith is disposed to favor the further construction of New York highways, after the present available moneys are expended, through the "pay as you go" plan, whereby all construction costs would be met by direct appropriations. His favoring such a plan results from his belief that it has not been demonstrated that the so-called durable types of pavement have actually outlived the life of the bonds that provided the money for their construction.

Road Data To Be Given Contractors Ahead of Bid Advertising

In order that contractors interested in road construction work may thoroughly study projects before they submit bids upon them, the state highway commission of Montana has undertaken the preparation and distribution of a bulletin covering the 1920 program giving such pertinent information as location of projects, character and extent of improvement and the physical conditions to be encountered on the work. With the dissemination of such information, the road contractor will be given justification for investigating possibilities of using his outfit on the type and character of work proposed. When it is known that the 1920 program contemplates the construction of approximately 1,000 mi. of gravel surface type alone, the desirability of having this information available to contractors is obvious.

Tentative Plans for Highway Contract Lettings in Illinois

Beginning Feb. 11, 1920, bids will be received for from 60 to 100 mi. of highway every week until March 17. After that date the schedule will depend upon the activity of contractors in seeking work, and upon the market conditions in other respects. Subject to change in detail, the Illinois Division of Highways will receive bids as follow:

Feb. 11—Marengo to Elgin, 12 mi., and perhaps an additional 13 mi.; Franklin Grove, 1 mi.; Ridge Farm to Marshall, 29 mi., and Decatur to Monticello, 28 mi.

Feb. 18—Chillicothe to Henry, 10 mi.; Monmouth to Galesburg, 7 mi.; east of Kankakee, 6 mi.; Springfield to Jacksonville, 10 mi.; south of Centralia, 18 mi.; Collinsville, 1 mi.

Feb. 25—At Dixon, 3 mi.; Rockford to Freeport, 21 mi.; Springfield to Jacksonville, 30 mi.; south of Centralia, 26 mi.; south of Du Quoin, 20 mi.

For March the schedule is not finally decided, but the mileages to be contracted will be: For March 3, 65 mi.; March 10, 20 mi. and March 17, 115 mi. The total of the figures given is 435 mi. planned to be contracted for by about the middle of March.

Building Officials' Conference in Chicago

The sixth annual meeting of the Building Officials' Conference will be held in Chicago Feb. 16, 17 and 18. Arrangements are being made to hold a joint session with the National Conference on Concrete House Construction. Pertinent discussions will include: Architect and design; community planning; financing homes; fire protection; monolithic houses; concrete block and unit-constructed houses.

Garbage-Reduction Contract Awarded by Rochester

A contract for a complete garbage-reduction plant on land owned by the city, the contract including all necessary buildings and equipment, was awarded by the City of Rochester, N. Y., on Jan. 26, to the C. O. Bartlett & Snow Co., Cleveland, Ohio, for $645,780. The plant has a nominal capacity of 128 tons a day and a maximum peak load capacity of 180 tons a day. According to reports of the commissioner of public works, the amount of garbage collected in Rochester in 1919 totaled a little over 30,000 tons. E. A. Fisher is consulting engineer to the City of Rochester and C. Arthur Poole is city engineer.

Union Depot Ordinance Lapses

Through refusal of the Pennsylvania R.R. to join in the enterprise for the construction of a union terminal station at Cleveland, to front on the Public Square, the ordinance passed by the City Council and subsequently confirmed by popular vote, permitting such construction, lapsed on Jan. 1, 1920. On Dec. 29 the City Council considered amending the ordinance so as to allow the railroads, other than the Pennsylvania, to proceed alone, but this vote failed to receive a majority. Planning is now in progress to revive the project on a slightly modified basis.

Illinois Contractors Discuss Highway Work

Discussion of combination bids, allowances for cement storage, time required between notification of work and receipt of bids, the contract letting schedule for 1920 and changes in highway specifications, brought out useful information at the open session on Jan. 15 of the annual meeting of the Illinois Association of Municipal Contractors.

Referring to the highway construction contemplated, Chief Highway Engineer Clifford Older, outlined the schedule of contract lettings for 1920 and stated that it was the purpose to have the plans ready and to announce the work three weeks ahead of the date of closing bids, but also stated that if contractors generally were satisfied with two weeks' notice this would be adopted. An informal vote of the contractors present indicated that preference was about equally divided between the two periods.

Query in regard to the proper allowance to be made to contractors for storing cement developed the conclusions that the cost was alike in no two cases and ranged from 10c. or 15c. a barrel, where storehouses were already available, to 40c. or more a barrel where storehouses had to be built. The State Highway Department has not yet decided what it will do except in the respects that the allowance will be figured on the peak storage prior to July 1, that the allowance will be a flat amount per barrel, and that the contractor will be responsible for damage in storage.

Changes in the specifications for 1920 highway contracts, said Mr. Older, provide first the adoption of a concrete slab uniformly 8 in. thick, on a crowned subgrade. This increases the volume of concrete by an amount represented by a ⅜-in. layer over the total width of the slab. Machine tamping will be required and hand tamping will not be allowed except by written order as an emergency operation in case of a tamping machine breakdown. Job slump tests last year proved impracticable because of the difficulty of pulling the cylinder without distorting the column of concrete. Experiments made with a frustum of a cone 12 in. high and 4 in. across at the top and 8 in. across at the bottom indicated that it could be used satisfactorily for field tests and it will be specified. A maximum slump of 1 in. will be specified. For grading, the 10-ton roller will not be required. Attention will be given to building up fill in layers and any light motor-roller will meet requirements.

Combined bids, as they are now handled, were criticized by a number of members as reducing the chances which the one-outfit contractor has of securing road work. The large contractor, it was asserted, in bidding on several sections, unbalanced his separate section prices, naming a very low price on the one or two sections for which the local small contractor could compete and boosting his price on the other sections to make his average price profitable. It was asked that the State Highway Department rule that wherever the one-section bid of the local contractor was less than the average price of all sections in the group-bid it should be considered the low bid. Speaking for the small contractor, one member stated that unless a change was made in the practice of handling combined bids, he saw the one-outfit contractor reduced to the necessity of sub-contracting at a less price if he wishes to construct roads.

Spirited Discussion of Contractors' Relations at Indiana Engineering Meeting

Highways, hydraulics of floods, relations with contractors, pumping by electricity, welfare and civic duty problems were subjects of interest to the civil engineer at the 40th annual meeting of the Indiana Society of Engineers held Jan. 23 and 24 in Indianapolis. About 60 engineers representing all of the local engineering organizations, A. S. M. E., A. I. E. E., A. A. E., and Scientech Club, participated in the evening session addressed by Prof. F. H. Newell on "Progress of the Bill for a National Department of Public Works," W. J. H. Strong on "Advertising for the Engineer," and Judge Raymond Springer on "Americanization and the American Legion." In addition to these welfare subjects, Daniel B. Luten outlined at another session the status of the combined engineers and architects license bill which has been twice before the Legislature and will be pushed again, and George B. Hubley spoke of a similar engineers and architects combined bill covering all classes of engineers, introduced into the Kentucky Assembly by the Engineers' and Architects' Club of Louisville. An opposition bill exempting the state highway engineer has also been introduced.

C. D. Franks started a lively discussion by his paper on "The Contractor and the Engineer—Their Relations," in which he quoted the appeal of R. G. Collins, Jr., in the *Engineering News-Record* of Jan. 15, p. 122. He added that the engineer should be a party to the get-together meeting proposed and extend his aid toward the removal of the contractor's hazards. Along this line he instanced the work of the uniform cost accounting committee appointed Dec. 2, 3 and 4 at a meeting of the Wisconsin Highway Commission with 200 representatives of the road building forces, including county engineers, contractors, machines and materials interests, which will collect data on the factors affecting costs and estimates so that the information may be available to all concerned. The committee consists of five men representing state and county interests, five the contractors and one each the machinery and material manufacturing interests. Mr. Franks divided the hazards into two classes; (1) those for which an accounting cannot easily be made, weather labor shortage and inadequate transportation; (2) those which can be definitely calculated, such as revision of freight rates. He believes that the hazard of the second class at least could be better and more economically assumed by the public. Not much favorable response was accorded Mr. Franks.

Daniel B. Luten felt that the contractor preferred the "thrills and romance" of assuming all the risks and Charles Brossman stated that his experience in attempting to assist the contractor much beyond his ordinarily prescribed field was vigorously resented. W. J. Titus held that the finances at the disposal of the engineers' department were usually so inadequate that more and better information could hardly be expected. Until salary rates were increased commensurate with responsibilities a higher grade of service for the contractor could not be expected.

R. C. Yeoman, in his paper on "Relation of Gravel Specifications to Production," indicated the difficulties the producers were under due to the numerous standards called for. However, various counties are, he said, adapting their specifications to meet local supplies and a co-operative movement was under way looking toward the adoption of a much smaller number of grades. Producers of the State, he reported, have increased their capacity from 50 to 100 per cent to meet the requirements of the Indiana road program which calls for expenditures three to four times normally made.

Lets Contract for Buildings in the Levant

The Standard Oil Co. has contracted with the Austin Co. of Cleveland for a number of the latter's standard factory units to be erected in the Levant. There will be two groups erected as distributing centers for the oil company in Turkey, one in Bulgaria and one in Greece.

The units ordered vary in size from 40 x 50 ft. to 100 x 500 ft. The largest single group will be in Greece. An erecting force of the Standard Oil Co. left New York City Feb. 1 for Constantinople, Turkey, where the first erecting will be done. Edward H. Beckert, construction engineer for the company, will direct the work which it is expected will last two years.

Madrid Subway Construction Resumed

The construction of the Madrid subway will be continued beginning in Jan. 1920, the representative of the *Engineering News-Record* in Madrid has been informed. The first three miles of this construction was completed last November, and is now operating from the northern part of the city to Puerta del Sol, the center of the business district. The new construction will carry the line to the station of the eastern and southern railways, Estación del Mediodia.

More London Underground Railways

Improvements and extensions of the electric underground railways of London, England, as decided upon by the several companies, are estimated to cost about $25,000,000. The Central London line will be connected to the suburban system of the London & Southwestern Ry. to open up an alternative route from the Hammersmith district into the city, while it will be extended parallel with the Great Western Ry. as far as the suburban district of Ealing. The old City & South London line, the first and smallest of the "tube" lines, is to be entirely rebuilt, its tunnel being enlarged to the same section as the other lines so as to accommodate the same rolling stock and permit the running of through trains. It will also be connected with the Hampstead line for through traffic between the northern and southern districts of London.

U. S. Firm To Build Hydro-Electric Plant in Japan

A contract for the design and construction of a large hydro-electric plant located on the Kiso River in the vicinity of Nagoya, Japan, has been awarded to Stone & Webster of Boston. The plant will be of reinforced-concrete type and will be planned to develop 30,000 hp. The operating head is to be about 110 ft. and it is expected that the power obtained will be distributed in the plant's locality for industrial use. H. B. Sawyer and C. F. Wallace will have charge of the work for the contracting firm. Y. Hatakayama is chief engineer for the owners, the Kiso Electric & Industrial Co., Ltd., Nagoya, Japan. The estimated cost is about $5,000,000.

Ontario Road Plans Made

The new Provincial Government of Ontario has come to a complete understanding with the Dominion Government as regards its good roads policy and is now in a position to avail itself of the full amount of the Dominion appropriation for road construction. On Jan. 14 F. C. Biggs, Provincial Minister of Public Works, held a conference with the Canadian Good Roads Commission and outlined the policy of the Government, which involves the taking over of 1,600 miles of county roads as provincial roads. The Provincial Government will pay 42 per cent of the cost of these roads, the federal grant will be 40 per cent, and the remaining 18 per cent will be borne by the municipalities.

The Province will also aid in the construction of township roads, of minor importance to those taken over, by paying to the townships 20 per cent of the cost, the work of construction to be done under Government supervision, the Government paying 40 per cent of the salaries of road superintendents. It is proposed also to abolish native labor. The proposals met with the entire approval of the Good Roads Commission and the Province will, during the next five years, receive $6,000,000 of the Dominion Government grant.

Passaic Valley Sewer Work To Be Investigated

At the initiative of the city authorities of Newark, N. J., an engineering investigation of the work of the Passaic Valley Sewerage Commission in building a joint outlet sewer for a group of municipalities is being carried out. Clyde Potts and C. C. Vermeule have been named as engineers in charge of the investigation in conjunction with engineers of the Department of Streets and Public Improvements of Newark.

Construction work on the sewer has been going on for nearly ten years and all predictions as to the expenditure necessary to complete it have been repeatedly surpassed. No part of the system is as yet in operation, and since the outfall portion is incomplete and work on it at present is in abeyance, pending the decision of a suit over the third contract for its construction, there is no fixed prospect as to when the sewer can be put into operation.

Tunnel Air Investigation Cancelled

In the appropriations committee of the House of Representatives last week the proposed experimental study of air conditions in vehicle tunnels on the part of the Bureau of Mines was killed, the scheduled appropriation of $100,000 asked by Director Manning being cancelled. It is reported that the committee believes such investigations are not the proper function of the Bureau.

Conferees on Rail Bill Reported Nearer Agreement

After several days without announcement of further progress in agreement between the House and Senate committees engaged in adjusting the differences of the two railroad bills, the conferees were reported, early this week, nearer agreement on the principal points at issue. At this writing, however, the deadlock appears still to exist on Section 6 of the Cummins bill, which provides for the distribution of "excess" earnings, giving part to the carrier, part to labor and part to the General Transportation Fund. According to the opinion of many in close touch with the situation, other points of conflict between the two bills will be adjusted without great difficulty as soon as agreement is reached on Section 6. Senator Cummins has denied absolutely that all but himself abandoned this section.

Consulting Engineers Elect New Officers

The Council of the American Institute of Consulting Engineers, Jan. 20, elected the following officers: Alexander C. Humphreys, president; S. Whinery, vice-president; F. A. Mollitor, secretary-treasurer.

Michigan Society Discusses Union with A. A. E.

With the exception of two papers on highways, the forty-first annual meeting of the Michigan Engineering Society, Jan. 28, 29 and 30 at Lansing, was devoted to organization, welfare and social-relations subjects.

Amalgamation with the American Association of Engineers will be effected if the expression of opinion by the unanimous vote (only one nay vote recorded) of members present is any indication of the letter ballot ordered. Since this will be the first of the large state societies having local clubs and chapters of their own to work out the state link with any national organization, a whole session was given up to an explanation of the plan which had been worked out by an affiliation committee in consultation with the executive committee of the American Association of Engineers. Briefly the arrangement provides that the Michigan Engineering Society retain its name and autonomy, that it handle all state questions and those involving districts within the State larger than the territory under the jurisdiction of a chapter. It will take charge of further organization of local clubs and chapters, which shall in turn be autonomous and retain practically the same amount of money as heretofore allowed American Association of Engineers' chapters. The several existing local clubs of the state society will be added to the two local chapters of the A. A. E.

Apportionment of the $10 dues tentatively decided upon is on a fifty-fifty basis between the State and national organization. For the first year the state society will get $2 and the local $3 as an incentive to get new members, thereafter the State will get $3 and local $2. Initiation fees also are to be halved. Last year the State society had 330 members and collected $5 dues which, added to the advertising in the proceedings, netted it $2,300. It is estimated that the state organization's share of the increased membership will enable it soon to afford a full-time secretary.

Indicative of the work the state organization proposes to take up are the names of the following committees the officers were asked to appoint: constitutional amendments; membership; internal relations; external relations with other states; legislation; registration law enforcement and amendment; practice; code of ethics and publicity; curricula of engineering schools.

The newly elected officers are as follows: president, W. W. Cox; vice-president, O. E. Eckert; treasurer, Prof. A. J. Decker; director, R. W. Roberts. J. H. Bateman, Ann Arbor, was appointed secretary by the executive council.

Zoning for Providence Urged

A city zoning plan for Providence, R. I., is urged in the recent report of the City Planning Commission.

Engineer Societies Resent Art Commission's Aspersion

Meeting for the first time in three and one-half years, more than 100 members of the Society of Municipal Engineers of Philadelphia on Jan. 29 unanimously passed a resolution refuting the statement attributed to the Pennsylvania State Art Commission to the effect that an architect rather than an engineer should design the proposed Philadelphia-Camden bridge. The statement concerned was a letter signed by the commission's secretary and published in these columns last week. A copy of the Society's resolution is to be sent to the governors of Pennsylvania and New Jersey.

Another organization, the Engineers' Society of Western Pennsylvania, at a recent meeting passed a resolution urging county commissioners to require the county engineer to pass upon the safety and economy of all bridge plans prepared by architects.

Sewage Works Contract Awarded at Cleveland, Ohio

The contract for building the Easterly sewage works at Cleveland, Ohio, for which bids were received the second time on Jan. 16, 1920, has been awarded to the American Construction Co. for $312,933. The contract for the Westerly sewage works was let some months ago, so that now the city of Cleveland has some 75 per cent of its sewage works program under contract, there remaining the Southerly plant which has been left for the last. Robert Hoffmann is chief engineer, Department of Public Service of Cleveland, and George B. Gascoigne is sanitary engineer in charge of sewers and sewage disposal.

Consolidation of Chicago's 24 Local Governments Urged

Consolidation of the 24 separate local governments in the City of Chicago is urged by the Chicago Bureau of Public Efficiency as an item in the revision of the State constitution. These governmental agencies comprise the city, Cook Co., the Sanitary District, the Board of Education, the Library Board, the Forest Preserve District, the municipal tuberculosis sanitarium, and no less than 17 park commissions.

"Pork Barrel" Bills Cut

As a result of the economy campaign which has been adopted by Congress, the River and Harbor Bill for which $43,000,000 was estimated has been cut to a lump sum approximation of $12,000,000. The Committee on Public Buildings and Grounds has reversed itself on the matter of a public buildings bill and it is now announced that there will be no appropriation authorized for the omnibus buildings bill which it was the intention of the committee to bring up.

Illinois Engineers See Necessity for Wider Activities

Backward conditions of sewerage and sewage disposal, land or property surveying as a branch distinct from engineering surveys, the proposed radical changes in specifications for brick paving and closer co-operation of engineering societies were the high points of the annual meeting of the Illinois Society of Engineers held at the University of Illinois Jan. 21 to 23.

Registration of surveyors in counties of over 250,000, it was brought out, is required by a new law, but as this applies only to Cook County and Chicago the State board has declined to take charge, so that the operation has been assigned to the county recorder. In this connection, M. L. Greeley, Chicago, disapproved of the proposed registration law of Engineering Council. Although this would apply to surveyors, he found that the committee had not consulted with surveyors and was not well informed as to laws dealing with their registration. The bill as drawn would give engineers and architects the right to make land surveys, but Mr. Greeley considered that it should require the establishment of property boundaries to be made by registered land surveyors. One objection urged against the Illinois law is that it seems to apply only to surveyors in private practice, so that assistants and employees of city and county departments cannot procure licenses.

Suggestions for co-operation and wider activities were presented, with explanation of the work of the general committee of Chicago technical societies. One proposal was to enlarge the scope of the society by including mechanical, electrical and mining engineers, the membership at present being confined mainly to civil engineers and surveyors. Plans were suggested for greater activity throughout the year.

Resolutions were passed in the following matters: Endorsing the co-operative work of the general committee of Chicago technical societies and urging that committee to arrange for representation at the State constitutional convention; recommending a study of the license laws of various states with a view to providing for reciprocity between the states, and recommending progress on the topographic maps of Illinois and the United States with a view to their completion by 1932. The officers for 1920 include the following: President, F. C. Lohmann, Champaign, Ill.; vice-president, S. A. Greeley, Chicago; secretary, E. E. R. Tratman, Wheaton, Ill. The next annual meeting will be held at Chicago in 1921.

Washington Office Opened by Reclamation Interests

Interests working for the adoption of the $250,000,000 Reclamation Bill have united in authorizing the opening of a Washington office from which their campaign will be directed.

Idaho Irrigation Congress

The third annual convention of the Idaho Irrigation Congress was held in Pocatello, Idaho, Jan. 12, 13 and 14. The first day's program was given over to the amalgamation of the Idaho Society of Engineers into a state chapter of the American Association of Engineers and a program devoted to highway subjects.

The officers elected for the ensuing year are A. V. Tallman, president; J. C. Wheelon and Chas. H. DeCamp, vice-presidents; and J. E. Badley, secretary-treasurer. Next year's convention will be held at Nampa, Idaho.

Contractor Awarded Extra Compensation on Tunnel Work

Patrick McGovern & Co., New York contractor, has been awarded $285,000 for extra work involved in a contract for the construction of a section of the Dorchester Tunnel, Boston, Mass. The case involved the construction of a portion of the tunnel under Fort Hill Channel. The final plans showed an all-earth cut, but after progress had been made on the project, rock was encountered. This fact was communicated to the Boston Transit Commission and the contractor was informed that extra compensation would be granted. This compensation was withheld at the conclusion of the contract. It was brought out in the case, heard before the U. S. District Court, that the Boston Transit Commission was aware of the existence of rock ledge, that borings had been made and records placed on file. On the final plans, prepared for carrying out the work, the presence of rock ledge was not noted. In the opinion of the court this fact was evidence of bad faith in that it amounted to concealment of material facts from the bidders. The contention of the Boston Transit Commission was that the probable occurrence of ledge was covered in a special clause of the contract agreement.

Wants $25,000,000 for Barge Canal

Edward F. Walsh, superintendent of public works of the State of New York, in a speech before the New York Civic Club last week said that the State of New York must appropriate something like $25,000,000 for the construction of canal terminals and elevators at New York, Buffalo and Oswego, or the New York State Barge Canal, on which there has already been spent about $155,000,000, would not be able to function. There is about $2,000,000 still unexpended of the money appropriated for the canal, but this is obligated by outstanding contracts. In the opinion of the superintendent, the canal will not be able to get business enough to make it worth while unless there are at its terminals state-owned grain elevators of considerable size.

U. S. Geological Survey To Map Haiti

At the request of the Republic of Haiti, a corps of engineers has been organized under the direction of Lieutenant Colonel Glenn S. Smith of the Geological Survey to make a comprehensive topographical survey of that country. Lieutenant Colonel Smith left Washington Jan. 18 for Haiti with E. L. McNair, who will be topographical engineer in charge of the work.

A bill is now pending in the Cuban Legislature providing for an appropriation of $1,000,000 to be expended over a period of ten years at the rate of $100,000 a year for a similar topographical study of Cuba. It is the opinion of Lieutenant Colonel Smith that that bill will become a law and that the Geological Survey will co-operate with the Cuban government in the same manner as it now is with the Dominican Republic.

Purchase of Water-Works of Spring Valley Water Co. Proposed

Purchase of the water-works of the Spring Valley Water Co., by the City of San Francisco is again proposed. The Board of Supervisors has passed a resolution authorizing the mayor and special water committee to ask the State Railroad Commission to value the property. The resolution also proposes that after the commission has named an "equitable price" a proposition to buy the work be submitted to popular vote. Purchase has twice been voted down.

Enlargement of Baltimore Water-Supply Recommended

Enlargement of the Baltimore (Md.) water-supply at a cost of $17,884,103 and purchase of the plants of nine private water companies for $3,900,897 is recommended in a preliminary report on the needs of the greater city by Nicholas S. Hill, Jr., and James H. Fuertes, consulting engineers, New York City.

Barrett Company Plans Road Lectures

A series of lectures upon highway work with special reference to the use of coal tar products have been arranged by the Barrett Co., 17 Battery Place, New York City. The lectures will be given upon application, to engineering societies as well as schools and colleges specializing in highway engineering. The series includes the following subjects: the chemistry, manufacture and control testing of refined tars; the laboratory tests to which road tars are subjected; construction of pavements with refined tar; city pavements of the block type; wood preservation; maintenance. The lectures are to be given by the members of the engineering department of the company.

Col. Beach as C. of E. Voted by Senate Military Affairs Committee

(Washington Correspondence)

By a unamious vote Feb. 3 the military affairs committee voted to recommend to the Senate the confirmation of Col. Lansing H. Beach who recently was nominated by the President to be Chief of Engineers, U. S. Army. Two meetings of the committee were necessary before a decision was reached.

Opposition to the confirmation was voiced by several senators on the ground that a man who had not been with troops for more than twenty years should not be placed at the head of a combatant corps. The opposition on this score was overcome, and while it may be raised again when the confirmation comes before the senate, there is no doubt in official circles as to the prompt confirmation of Colonel Beach.

Operating Contract for Street Railway Terminal Subways

A form of contract between the City of Cleveland and the local street railway company has been drafted by the city's transit commissioners, and this form was submitted to the city council last week as a proposed ordinance. It is understood to provide for payment of rental by the company to the amount of 60 per cent on the cost of track and appliances. Pending formulation and approval of this contract no further progress has been made toward securing referendum approval of the $15,000,000 bond issue required for construction of the terminal tunnels. The referendum vote is likely to be taken in April, it is now believed.

Detroit Subway Grade Crossings Obviated by New Lines

Consideration of the details of Detroit's proposed subway dips to relieve congestion of traffic on downtown streets, has been indefinitely postponed by the city council's vote to withdraw the so-called Castator plan which proposes subways for the street cars in the downtown section.

The necessity of spending $8,500,000 for subway dips is obviated by the several crosstown lines proposed by Mayor Couzens in his new street car plan. The mayor's plan, for which a bond issue will be voted on by the electors of Detroit, on April 5, provides for the construction of 100.75 miles of new line at an estimated cost of $70,000 per mile and taking over 34.75 miles of line built by the Detroit United Railway under existing agreements, and 21.25 miles of lines on which franchises have expired, all at an estimated cost of $40,000 per mile.

It is estimated that the remainder of the proposed $15,000,000 bond issue will provide finances for 400 motor cars and 150 trailers, with $1,000,000 allowed for providing car shops and miscellaneous equipment.

Spokane's Road Program

In July, 1919, Spokane Co., Washington, passed a bond issue of $3,250,000 for a trunk line road system. The interest and principal for this bond issue is to be taken care of by an additional one mill tax levy, which, in addition to retiring the bonds, will furnish $926,705 for additional construction.

The construction period is to end within the next five years. With the proposed bond issue and the Federal-aid offer, which it is proposed to take advantage of, and which, in turn, is estimated at $1,000,000, there will be made possible the construction of over 42 miles of graded roads, 93 miles of paved and 165 miles of macadam. H. T. Doolittle, formerly with the State Highway Department, has been chosen as construction engineer, and plans for this year's work are well under way.

It is estimated that this bond issue will make possible in five years' time the same amount of good roads that it would otherwise take forty years to build.

Urges Highway Department Buy Road Machinery

Legislation authorizing the purchase of road machinery by the State and the engagement of the State in highway construction directly is urged in the annual report of Frederick Stuart Greene, New York State Highway Commissioner, which was submitted to the Legislature Jan. 16. Commissioner Greene believes that through the State's buying its own road supplies and machinery and doing its own construction, an annual saving of $750,000 could be effected. Commissioner Greene's report indicates that during the eight and a half months he has been in office 260 contracts for constructing and improv- 1,479 miles of road, at a cost of $22,631,150, were awarded.

Boston Vehicular Tunnel Recommended

The report of the committee appointed to investigate the advisability of the construction of a vehicular tunnel under Boston Harbor has been submitted to the Massachusetts State Legislature. The commission recommended legislation for carrying through this project and requested extension of time for a more detailed study of the problem. The cost of this project will be about $11,000,000. John H. Cole, Commissioner of the Department of Public Utilities, is chairman of the committee.

New Federal Road District Formed

The United States Bureau of Public Roads has established a new district—District No. 11—comprising the states of Montana and Idaho. The new district, whose headquarters will be at Missoula, Mont., will be in charge of F. M. Keene who, as senior highway engineer, has been in charge of a former branch office at that place.

Town Civic Board Takes Up Railroad Problem

That others besides the numerous "lobbies" at Washington and parties immediately concerned are beginning to take an active interest in railroad legislative matters is indicated in the resolutions recently adopted by the Civic Board of Cranford, N. J., after considering the questions at issue. The resolutions follow:

> Resolved—First, That this Board earnestly favors private ownership and operation as contradistinguished from Government ownership and operation, and looks with approval upon the proclamation of the President returning the roads to their owners on March 1st, thus affording an opportunity for Congress, in the meantime, to enact proper protective legislation.
>
> Second, That Congress, in the proposed legislation, should provide for the protection of the railroads during the transition period by the continuance of the standard return until a proper rate structure can be established, and by proper funding for a definite period of, say, ten years, of the obligations incurred by the carriers during Federal control, at the instance, or with the approval of the Director General, for additions and betterments. No attempt should be made to strip the carriers of quick assets, in order to pay this capital indebtedness to the Government. It is in the interest of the public that the carriers should not be required to resume with empty treasuries their transportation duties, on the efficiency of which the public is absolutely dependent.
>
> Third, That a rule of rate making should be declared in the statute which will give assurance to prospective investors that the revenues under average conditions will be adequate to make their new investment safe. These revenues should be sufficient to provide for the expenses of operation, including taxes and the cost of labor, a fair return on the property already being used for the public service, and enough additional to give the roads proper credit to obtain the capital needed to keep their facilities and service up to the requirements of commerce.
>
> Fourth, That this Board unqualifiedly condemns the novel doctrine now suggested of depriving any carrier of a part of its earnings at lawful rates. It regards such a proposal as a menace to the security of all property, and as opening the door to a socialization of our Government. It earnestly protests against the adoption of this dangerous principle.

Members of the board and other citizens of Cranford have transmitted copies of the resolutions, with personal letters, to the Congressmen of the State.

Instruction for Water-Filter Operators in Texas

Beginning Feb. 2, the University of Texas and the Texas State Board of Health will offer a two-weeks' free course of instruction to water filter-plant operators. The course will be given at the University of Texas in accordance with a plan worked up by the Bureau of Sanitary Engineering and the State Board of Health. V. M. Ehlers is chief of the Bureau and L. O. Bernhagen is assistant state sanitary engineer. Dr. C. W. Goddard is state health officer.

Emergency Ponton Bridge To Be Built by Army Engineers

Owing to the destruction of a bridge at West Point, Ga., a ponton bridge will be erected by the Engineer Corps, U. S. Army, for temporary use, pending the construction of a permanent bridge by the local communities.

Four Months' Publicity Nets 4,155 Column-Inches

Publicity of engineers and engineering obtained in a four months' contest by the various chapters and clubs of the American Association of Engineers amounted to the equivalent of two complete editions of the *Chicago Tribune.* As noted in the *Engineering News-Record,* Nov. 27-Dec. 4, 1919, p. 959, strings of newspaper clippings sent in monthly had added inches of credit for the word engineer in the headlines. The Globe-Miami chapter won the contest with 438 column-inches, almost three solid pages, to its credit. Toledo got 430 in., and Baltimore 359 in. In September 16 chapters submitted 503 in.; in October 23 chapters, 1,222 in.; in November, 17 chapters, 978 in., and in December, 19 chapters, 1,452 in. A publicity display will be arranged for the St. Louis convention May 10 and 11.

Providence Water Board Expects To Limit Construction in 1920

In view of the probable condition of the labor and materials market in 1920 the Board of Water Supply of Providence, R. I., according to its annual report for 1919, "is of the opinion that it will probably be wise to limit its construction program for 1920 to work which can be completed within the year." This means that the construction of the Kent dam, estimated to take four years, will probably not be started during the year, but it is likely that $500,000 will be spent on such preliminary work as culverts, bridges and roads. Frank E. Winsor is chief engineer of the board.

Oregon Highway Engineers Named

The Oregon State Highway Commission has appointed the following division engineers: Maison and Linn Cos., J. L. McLeod; Clackamas Co., C. H. Whitmore; Wasco, Crook, Deschutes, Hood River and Jefferson Cos., O. C. Kelly; Baker, Harney, Grant and Malheur Cos., R. H. Blalock; Wheeler, Morrow, Umatilla, Union, Wallowa Cos., and the John Ray River Section in Grant County, M. O. Bennett.

Nominations to Vacancies in Coast and Geodetic Surveys

Nominations to fill vacancies in the Coast and Geodetic Survey have been sent to the Senate by the President as follows: To be Hydrographer and Geodetic Engineer, Ray Longfellow Schoppe of Vermont; to be Junior Hydrographers and Geodetic Engineers, Lowrie W. Burdette of South Carolina, William M. Schaife of South Carolina and Earl O. Heaton of New York; to be Aides, R. F. A. Studds of District of Columbia, L. M. Zeakind of Maryland, H. C. Warwick of West Virginia, J. S. Rosenthal of North Dakota and Morris Kogan of Massachusetts.

Illinois Waterway Authorized by War Department

permit for the construction of the waterway connecting the Chicago drainage canal at Lockport, Ill., with the Illinois River at Utica, Ill., has been issued by the Secretary of War. Plans prepared by the Illinois Department of Public Works and Buildings provide for a channel of 150 ft. minimum bottom width and 8 ft. depth of water, or 10 ft. in rock. The locks will be 600 x 110 ft., with 14 ft. of water on the sills to provide for a future 14-ft. channel, if necessary. These locks will enable barge fleets of 7,500 tons to be passed without separation.

Except for a short cut-off the work will follow the channel of the Desplaines River. Water-power development is a part of the project, but for this the state is required to obtain the permission of the Water-Power Commission recently authorized by Congress. A bond issue of $20,000,000 for the waterway has already been approved by public vote in Illinois.

Army Equipment for State Highways

Without waiting on pending legislation, the Director of Sales has issued instructions that a quantity of surplus industrial railway material is to be turned over without funds to the Bureau of Public Roads for division among the State Highway Departments. Included in this delvery of materal are locomitives, rails and cars.

ENGINEERING SOCIETIES

Baltimore Chapter, American Association of Engineers, in its semi-monthly meeting Jan. 16, discussed the planning of boulevards in Baltimore's new annex and went on record as being willing to take charge of this work in lending its professional assistance to the city.

The Nebraska Association of Members of the American Society of Civil Engineers, Jan. 10, at the annual meeting in Lincoln elected the following officers: President, Clark E. Mickey; vice-president, Rodman M. Brown and John L. Hershey; secretary-treasurer, Homer V. Knouse, Omaha. The Development Committee report was endorsed. Los Angeles was suggested as the next meeting place for the annual convention of the parent society. Appointment was made, by request, of A. C. Arend as engineering representative on the advisory committee of the Omaha Building Department. This association has assessed its members in addition to the regular $2 dues, $2 for increased activities, $1.50 for Engineering Council and $0.75 (for Omaha members only) for the Associtition's share in the expenses of an Omaha Conference Committee consisting of representatives of leading business, professional and civic bodies interested in upbuilding the city.

Calendar

Annual Meetings

AMERICAN ROAD BUILDERS' ASSOCIATION, 150 Nassau St., New York City; Feb. 9-13, Louisville, Ky.

AMERICAN WOOD-PRESERVERS' ASSOCIATION; Feb. 10-12, Chicago.

AMERICAN CONCRETE INSTITUTE; Feb. 16, 17, 18, Chicago.

NATIONAL CONFERENCE ON CONCRETE HOUSE CONSTRUCTION; Secretary A. J. R. Curtis, 111 West Washington St., Chicago; Feb. 17, 18, 19, Chicago.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA; 111 W. Washington St., Chicago; Feb. 18-19, Chicago.

AMERICAN CONCRETE PIPE ASSOCIATION; 210 South La Salle St., Chicago; Feb. 20-21, Chicago.

AMERICAN RAILWAY ENGINEERING ASSOCIATION; 1426 Manhattan Bldg., Chicago; March 16-18, Chicago.

AMERICAN ASSOCIATION OF ENGINEERS; 29 S. La Salle St., Chicago; May 10, 11, St. Louis, Mo.

The New Jersey State Association of County Road Supervisors held its annual meeting at Trenton recently and elected the following officers: President, James A. Ross, Mercer Co.; vice-president, Stewart E. MacFarland, Burlington Co.; secretary-treasurer, T. E. Gibson, of Somerset Co.

The Engineers Subdivision of the Chicago Association of Commerce has elected the following officers for 1920: Chairman, John W. Alvord; vice-chairman, C. O. Billow; other members of executive committee, L. J. Hotchkiss, W. T. Reeves and R. Tencher.

The Minnesota Joint Engineering Board will hold its annual meeting and dinner for all engineers of the nine affiliated engineering societies in the state Feb. 20, 1920, in Minneapolis, Minn., and not Feb. 21 as was announced in the issue of Jan. 22.

The New England Water Works Association will hold its monthly meeting at the Hotel Brunswick, Boston, Feb. 11. The papers to be read are: "The Creation of a National Department of Public Works" by Prof. George F. Swain, Howard University, and "Economy in Pipe Lines for Small Water Systems" by Edward D. Eldredge, water company superintendent of Onset, Mass.

The Western Society of Engineers will be addressed by Herbert C. Hoover on Feb. 28, at which time he will be presented with the Washington Award for his services in promoting the public welfare as chairman of the relief commission for Belgium and as food administrator for the United States.

The Kansas City Engineers' Club held its annual dinner in Kansas City, Mo., Jan. 27. The members voted 143 for, and 38 against, amalgamation with the A. A. E. Those attending were addressed by J. C. Nichols on the subject of city planning with special reference to local needs in that line. The following officers were elected: Clark R. Mandigo, president; F. F. Shauer and A. Penn Denton, vice-presidents; William Bugg, treasurer; Forest Kauffman, secretary.

The Oregon Chapter of the A. A. E. has obtained increases in the salaries of engineers employed by the Oregon state highway commission, which brings the salaries of these engineers up to the minimum salaries recommended by the Association. This result is said to be largely due to the efforts of R. W. Barnes, secretary of the chapter.

The Ohio Assembly of the A. A. E. was recently organized to correlate the activities of the Association in Ohio. F. D. Richards of Cleveland is temporary president, and the temporary secretary is W. L. Martoon of Columbus, Ohio. A meeting of the assembly will be held in Columbus Feb. 28 at which a constitution will be drafted.

PERSONAL NOTES

Carl Tombo, former principal assistant valuation engineer of the Philadelphia & Reading R.R. and the Central R.R. of New Jersey, with headquarters at Philadelphia, has resigned and taken up the private practice of engineering in the West, with headquarters at Placerville, Cal.

John G. Sullivan, former chief engineer of the Canadian Pacific Ry., has been elected to the Board of Aldermen of Winnipeg, Man. Mr. Sullivan was assistant engineer of construction on the Panama Canal and directed the construction of the Canaught Tunnel.

E. W. Fassett, A. M., Am. Soc. C.E., recently received his discharge as captain of engineers, U. S. A., and is now with the Midwest Refining Co., Casper, Wyo.

Nathaniel O. Gould, who was released from the Air Service, U. S. A., in June, 1919, has been appointed structural engineer for the firm of Aaron H. Gould & Son, architects and engineers, with offices in Detroit, Mich.

Albert L. Upham, recently honorably discharged from the 23rd Engineers, U. S. A., after fifteen months' service overseas, is now located at Hartford, Conn., as field engineer for Stone & Webster.

GREEN SLADE has been appointed highway engineer for the Tenth Congressional District, Georgia. He will make his headquarters in Augusta, that state.

C. W. WEST, of Buchanan, Va., was recently appointed county road engineer of the Houghton County Road Commission.

N. M. MCCLUSKEY, of Clovis, N. M., has been named as district highway engineer of the Clovis district, to take the place of D. W. Jones, who has resigned to accept a position with the local chamber of commerce.

SILAS W. MCCONNELL, recently appointed, has entered upon the duties of city engineer of Steubenville, O. He succeeds John Leech, who resigned some months ago.

ROBERT T. JACOBSEN has been appointed city engineer of Fargo, N. Dak., in which capacity he has been acting since June, 1919. He fills a vacancy created by the resignation of Frank L. Anders, who resigned last summer to engage in consulting practice.

GEORGE GARRETT, who has been employed during the greater part of the last seven years as an engineer in the Public Works Dept. of Salem, Ore., has been appointed city engineer of La Grange, Ore.

C. R. ANDREWS, former captain of engineers, has been admitted to the firm of Miller, Holbrook & Warren, Municipal consulting engineers of Decatur, Ill. Before the war Mr. Andrews was one of a force of sixty engineers doing government work in the Wheeling River district. His work in France had to do with the construction of docks at the ports.

ORION KOLLER AND HARRY CONRAD who have engaged in the practice of engineering in Wheeling, W. Va., under the firm name of Koller & Conrad, recently dissolved their partnership. Mr. Koller will continue the business, while Mr. Conrad will give all his time to his new appointment as city engineer of Wheeling.

WILLIAM WARING has been placed in charge of the office recently opened in Boston by the Lakewood Engineering Co., of Cleveland, O. Mr. Waring was for the past two years connected with the Philadelphia and Washington offices of the Lakewood Co.

HAROLD L. TILLSON has been appointed by the Portland Cement Association to the management of its activities in Iowa. Mr. Tillson, whose headquarters will be in Des Moines, Ia., has been connected with the Association for more than three years, and since December, 1917, has been identified with its Iowa work.

PROF. GEORGE C. WHIPPLE, professor of sanitary engineering at Harvard University and member of the firm of Hazen, Whipple & Fuller, New York City, sailed from New York Jan. 30 to take up his work at Geneva, Switzerland, as head of the Division of Sanitary Engineering of the Bureau of Hygiene and Public Health of the League of Red Cross Societies. He has already been preceded by Colonel F. F. Longley of the firm named. An outline of the work which will be headed by Messrs. Whipple and Longley appeared in *Engineering News-Record*, Oct. 23, 1919, page 777. Thus far 28 nations well distributed through the world are included in the League of Red Cross Societies. The League is provided for under paragraph 25 of the League of Nations covenant. Professor Whipple expects to return to Harvard in September.

OBITUARY

ARTHUR W. PETERSON, for the past three years in the employ of the Providence Water-Supply Board as engineer on the Scituate dam, died at the Homeopathic Hospital in Providence, R. I., Jan. 12, following an operation for appendicitis.

ROBERT HOLLISTER CHAPMAN, a leading topographical engineer, associated with the U. S. Geological Survey at Washington for nearly 40 years, died in New York City, Jan. 11, of pneumonia in his fifty-second year. As a boy his interest in geology set him to work for the survey at the age of 12. In 1919 he was sent to Ottawa to introduce American methods into the Canadian Geological Surveys. His many explorations and surveys included those of Vancouver Island and Death Valley with the adjacent deserts and high sierras of California. In 1912 he acted as superintendent of Glacier National Park. With the rank of Major in the Engineers Reserve Corps he was on active duty in the war as assistant to General Theodore Bingham.

EDWIN F. SMITH, who retired in 1911 after 50 years of service with the Reading R.R. Co., died at his home in Philadelphia Jan. 26. Mr. Smith graduated from Union College, and served through the civil war with the 26th Pennsylvania Volunteers. He served on the board of engineers appointed by the Aqueduct Commission of New York City in 1901 to report on items of construction relating to the Croton dam, on a board investigating the condition affecting the Castlewood dam in Colorado, and on a board making a general review of the location and plans for the Nicaragua ship canal. Mr. Smith was a member of the American Society of Civil Engineers, the Franklin Institute and the Engineers' Club of Philadelphia.

FRED CREELMAN, secretary-treasurer of the C. L. Hyde Construction Co. of San Diego, Cal., died at his home in that city on Jan. 27 after a brief illness. He was a native of Canada but had resided in California for the past ten years. The company with which he was connected had handled a number of large highway construction jobs in recent years, including some on the mountain roads connecting the coast and the great Imperial Valley in southern California.

HARRISON G. BREWER for many years chief hydrographer and chief of the division of chart construction of the Navy Department, died Jan. 23, in Washington. Mr. Brewer had been employed in the Navy Department for more than 30 years. He graduated in Architectural Engineering at Johns Hopkins University.

R. WINTHROP PRATT, consulting engineer of Cleveland, Ohio, died there of influenza Feb. 2. At the time of his death Mr. Pratt had attained professional eminence in the fields of water supply and sewerage. Mr. Pratt graduated from the Massachusetts Institute of Technology in 1898 and entered the engineering department of the Boston & Albany R.R. In June, 1899, became assistant engineer of the Massachusetts State Board of Health where he remained four years. He left Massachusetts in April, 1903, to become chief engineer of the Ohio State Board of Health. In that capacity he continued until October, 1911, except for one year's leave of absence in 1909-10, when he was retained as consulting sanitary engineer by the Cuban government. Mr. Pratt resigned his office with the State Board of Health in the latter part of 1911 to carry on a private consulting practice jointly with the duties of an appointment as special sanitary engineer for the City of Cleveland. In July, 1913, he also became consulting engineer for the water department of that city. During Mr. Pratt's service on the health board of Ohio he personally investigated and wrote reports on more than 400 water-supply and sewerage projects for municipalities and public institutions in the state. In Cuba he supervised the design of water-supply and sewerage systems for various of the island cities, including a mechanical filtration plant for Santiago de Cuba. The water-filtration plant of Cleveland was designed and its construction supervised by Mr. Pratt. He also had charge of the important series of experiments begun at the Cleveland sewage-testing station in 1913. Aside from his Cleveland work, Mr. Pratt was engineer for many water-works and sewerage systems in Ohio and elsewhere, including a number of water and sewage treatment plants. Water-treatment experiments at Detroit were conducted under his direction in 1917-18. Mr. Pratt was a member of the Am. Soc. C. E. He was joint author with the late Prof. L. P. Kinnicutt and Prof. C.-E. A. Winslow of "Sewage Disposal," published in 1910 and revised in 1918. He was a frequent contributor to *Engineering News*.

A Consolidation of Engineering News and Engineering Record McGraw-Hill Company, Inc.—JAMES H. McGRAW, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN
Editor

Volume 84 NEW YORK, THURSDAY, FEBRUARY 12, 1920 Number 7

The Obligation To Vote

THERE will be sent out shortly, from the headquarters of the American Society of Civil Engineers, the questionnaire-ballot on the fundamental recommendations of the Committee on Development. The results of the ballot are to determine for many a year the future of the American Society of Civil Engineers, and because of the society's influence, that future necessarily has a great bearing on the status of the engineering profession in this country. Every corporate member of the society, therefore, has a solemn duty: to give the questions his most serious consideration and to cast his ballot thereon. The Committee on Development was formed that it might help to build the society into an institution of greater usefulness. Whether for good or ill—and we think for good—the recommendations are now in, and it is in the hands of the membership to determine whether they shall be accepted or rejected. Apathy in this case is a serious dereliction of duty.

Railroad Facts for the Public

LATTERLY the Association of Railway Executives has begun the publication in the daily press of a series of advertisements which show the extent of the unfairness of the treatment accorded the railroads. A statement of fact such as the following, if repeated often enough, will get under the skin of even the unthinking: "A suit of clothes that sold for $30 before the war was carried 2,265 miles by rail from Chicago to Los Angeles for 16½c. Now the freight charge is 22c. and the suit sells for $50. *The cost of the suit has increased* $20; *the freight on it has increased only* 5½*c.*" Similar illustrations, our readers will remember, were presented by Charles Whiting Baker in his monograph on the railway situation published in these pages last autumn. It is regrettable that the railroad executives did not begin long ago to lay these facts before the public. The public wants to be fair, but unfortunately they have been misled by demagogues. We hope that the executives will keep up their present propaganda. Continued intensively, it will have favorable results.

Shortage of Railroad Facilities

THE Railroad Administration within the last two weeks has issued warnings regarding the serious shortage in railroad equipment, and the Director-General has asked the shippers for hearty co-operation in order to minimize the seriousness of the situation as far as possible. That which we are running into has long been foreseen by students of the railroad problem. Our readers know the situation well, and for those who desire to refresh their memories we would refer to the review of the financial and physical status of the railways published on p. 12 of the *Engineering News-Record* of Jan. 1, 1920. Unfortunately, however, the business community is only now beginning to awake to its seriousness. We have not by any means experienced the worst. Last year highway construction was curtailed and so was the shipment of coal. But, as our industries begin to get into something approximating pre-war production, we shall find shortage pressing from every side. There will come cries from the steel districts, from the miscellaneous manufacturing states of New England, from the lumber region; each week will bring its complaint of unsatisfied demand for railroad transportation. The public then will begin to awaken to that which has been done in the failure to keep up our railway systems. The relief will come, belated indeed, and only after there has been a severe setback to our industries. The worst of the situation is still before us.

Regulating the Largest Reservoir

HYDRAULICS on the grandest conceivable scale is involved in the Niagara regulating works proposed by the Chicago Sanitary District, and outlined by Mr. Shenehon elsewhere in this issue. To control the level of that stupendous natural reservoir known as the Great Lakes by man-made devices is engineering in its highest form. And yet it is something which has been proposed and even projected for many years. The present plan is novel only in the type of works proposed. Movable dams are common enough, but a removable dam is a new thing in engineering science and, for the size here designed, one which will have much opposition to overcome. It is true, as the designer says, that there is ample precedent for the floating into place of large structures to be sunk to a sub-aqueous foundation, but such structures once footed have remained in permanent location. The four large units of the Niagara butterfly-dam will have to be placed and removed every year, thus multiplying indefinitely the hazards of the operation. Nor is the drydock or lock floating-caisson precisely analogous, for they are placed and removed in still water, with all the accompanying security of lines to, and machinery on, nearby solid structures. However, the difficulties of the scheme have undoubtedly been considered by the proposers and it will be interesting to every engineer to watch the progress the plan makes.

Valuation and a New Rate Rule

ALTHOUGH neither of the railroad bills before Congress designates the basis of value that shall be used in building up a new rate structure, it is apparent that a definite statement as to what the basis shall be must eventually be made. The Valuation Act calls for determination of (a) original cost, (b) cost of reproduction, (c) cost of reproduction less depreciation and (d) other values and elements of value. But what value would be used as a basis for the new rate rules has not been made clear. It is probable that the strong systems will make a legal fight against the limitation of earnings on the grounds of confiscation of property. The "intangible" value of a property, indicated by income-producing qualities and entirely separate from physical value, will become a principal point at issue. In any event, it will be necessary to establish an interim arrangement until the valuations are in more complete form, with the possibility of the "standard return" being continued considerably beyond the transition period. But much may be left to the commission and to the courts that might well be determined in the law itself if Congress would indicate what basis of value is to be used in the new rate rule.

The Canadian Institute's Example

WE commend to the consideration of all members of the American Society of Civil Engineers a reading of the comments under "Impressions Here and There," on page 318 of this issue. The Canadian Society of Civil Engineers about three years ago went through much the same period as that which the American Society of Civil Engineers is now facing. The organization had proceeded along measured, conservative lines. Dissatisfaction had arisen and became so strong in the western provinces that there was talk of secession, culminating in a threat by the members in one of the provinces that an independent organization would be formed. The demand was for a type of organization that would make each member feel that he had a part in the work of the organization. The result of this agitation was the reorganization of the society, under the name of the Engineering Institute of Canada, based on the theory that strong branch and provincial organizations should be built up and that, in addition to the annual meeting, there should be one or more general meetings held away from the headquarters city, Montreal.

For about three years the organization has proceeded on the new lines. The result, as is evident from the spirit of the Montreal meeting and the testimony of individual members of the institute, has been good. The branches have become virile organizations, with the result that there is much greater activity, in both technical and general matters, than under the earlier form of organization. The membership, from being apathetic, is active and enthusiastic.

As we sense the situation in the United States, the criticisms made of the American Society of Civil Engineers are precisely those that were made regarding the Canadian body three years and more ago. The changes proposed by the Committee on Development follow along the very lines that have been pursued in Canada. The committee proposes a strengthening of branch and district organizations and the holding of additional professional meetings whereby a larger number of members may have an opportunity to attend gatherings of the society.

We have no doubt that the adoption of the recommendations of the Committee on Development will do for the American Society of Civil Engineers what the reorganization has done for the Engineering Institute of Canada. It is not mere coincidence that the demands in the two cases are similar. They spring from a fundamentally sound conception of methods of conducting a national body. The adoption of that fundamentally correct conception should have identical results in both cases.

If all members of the American Society of Civil Engineers could have attended the Montreal meeting of the Canadian Institute, could have queried the members and felt the enthusiasm, there would be no question as to a practically unanimous vote in favor of the fundamental recommendations of the Committee on Development. What Canada has done should be most encouraging to us.

Possibilities in Bridge Reinforcement

IT HAS been predicted more than once that in the coming development of engineering construction a place of special importance will be given to economy. The prediction may be realized soon in the field of bridge construction, if we can accept a conclusion that has been expressed by engineers of mature judgment. Certain noteworthy changes in the trend of bridge work are indicated, in which economy will be a prime factor.

The conclusion we refer to is that, in view of conditions both in the railway world and in the art of bridge building, railways must resort to reinforcement of existing bridges on a large scale during the next decade or two. The line of thought which leads to this belief may be applied also to highway bridges, and suggests that these too are likely to demand much reinforcement work. Thus we face the possibility that the little-developed art of bridge reinforcement will be called upon for extensive service in the near future. In that event many new technical problems will present themselves.

Changes in bridge conditions are responsible for bringing the subject to the front. A quarter century ago very few bridges were of a character to justify attempts at strengthening them or to make such work feasible. Modern railway bridges, on the other hand, are so well designed and built, with clearances and substructures so ample, that they offer attractive opportunities for reinforcement to suit heavier loading. Where reinforcement is at all practicable it will generally prove cheaper than rebuilding; and this economy is the crux of the matter. For, regardless of rate adjustments, the railways must for some years reckon with a limited income against an almost unlimited need for betterments and extensions.

There is occasional talk of a limit having been reached in railway loadings. But in view of the steady increase of loadings in the past it would seem inevitable that further increase must come about unless the development of transportation practice, with its progressive changes in cars, locomotives and track, comes to a stop. Even now many bridges of fairly modern design are loaded beyond their design capacity, and of course the condition of bridges over 15 years old is much less satisfactory. It is hardly subject to doubt that a great deal of work will have to be done sooner or later in order to bring all our railway bridges to full traffic capacity.

Somewhat similar considerations affect highway bridges, though there are still many ancient and virtually obsolete structures that must be renewed from the ground up. In one respect, however, load conditions affect the highway field less seriously. The heavy motor trucks of the present era increase the concentration rather than the total amount of the load to be carried, and thus attack the floor and bracing more than the trusses. If floor reconstruction will make a structure adequate for modern service, it would obviously be wasteful to scrap the whole bridge and erect a new one. With this in mind it seems certain that a large field for reinforcement operations will develop in highway bridge service. On the other hand, it is safe to say that the technical problems involved will be much less important than those of railway bridge reinforcement.

Some interesting cases of strengthening have already been recorded. Among them are the Michigan Central and Poughkeepsie cantilevers, the Marshall Ave. arch over the Mississippi, and most recently the Niagara Gorge arch of the Grand Trunk Ry. Other work of equal interest, such as the modernization of the Red Rock and Steubenville bridges, has escaped recording. But all these cases indicate plainly that a remarkable variety and complexity of problems will be encountered in reinforcement work. However, they constitute but a small body of precedent on which the future development of the art might be based. Essentially the art will have to start as the beginning.

It is certain that the work to be done will call for engineering ability of high order. The problems will be different in many ways from those of new construction. Up to now they have had little or no systematic study, and it would be well if they were soon to receive the attention of bridge engineers, in preparation for the activities of the future.

The engineering thought by which bridge reinforcement operations must be governed is by no means identical with the thought that has been crystallized in our conventional bridge specifications. This has been said before now, but its meaning does not appear to have been followed out in detail. A full comprehension of what is required must be reached by individual study of the several factors that combine to determine the strength of a bridge. In such consideration it will appear, for instance, that the stress limitations set up for new bridges are inapplicable in estimating the condition of an existing bridge or planning the means of improving that condition; what counts here is the greatest stress caused by a given load and the margin between this and the corresponding crippling stress. Again, impact allowances derived from a formula which broadly averages the facts of very many bridges under various conditions have no meaning for the purpose, but instead the actual stress excesses produced in the particular bridge to be dealt with should be considered. Principles of detailing which will make a member safe for service at current unit stresses are of little or no value when an existing structure is examined, and should be replaced by principles enabling us to gage the effect of an existing detail, let us say for example a long weak-kneed pin fork. In similar manner it will appear that nearly all the clauses of existing specifications fail of application. We need for the new service a new assembly of experience data, something that no one has yet attempted to compile, though much of the material for it exists, in distributed form, in our societies of bridge engineers.

Two matters that lie beyond the scope of any mere experience compilation are so vitally related to all reinforcement work that they should be called to mind at this time. The first is the matter of estimating the utilizable strength of an existing member, whether before or after reinforcement. It involves allowable unit stress—which will likely depend on reasoning quite different from that used in fixing ordinary design units—as well as suitable deduction for deficiencies in the structural condition of the member as found. This last element depends on observation of the behavior of the bridge in service. Methods of conducting such observations have not been much discussed hitherto. We believe that it would be of permanent value if a thorough discussion were brought about, with a view to developing best practice.

In fixing safe stresses the judgment of the engineer is bound to be the determinative factor, for it is not likely that limits can ever be set by general rule. It is easy to fall into the view that, since the physical properties of the material are reasonably constant, and since the generally accepted methods of calculation purport to express the service of the material in precise quantitative terms, a fixed allowable unit stress will apply to all cases. We do not believe that this view is tenable. Further, the total load-carrying capacity of a given member is still more difficult to estimate, for it is affected by internal structural conditions that cannot always be evaluated. In practice, an estimate of these internal conditions must be made, by applying trained judgment to the results of close observation. An almost abnormally careful physical examination will in fact be required for this purpose in every case where the capacity of a bridge or its adaptability to reinforcement is a question.

The other matter we wish to suggest is the probability that strain-gage measurements will prove to be highly valuable, indeed indispensable, in planning and in executing reinforcement work. There is still a tendency among bridge engineers to take a "practical" view of strain-gage work and to hold that it yields only some higher refinements whose working value is negligible. Whatever justification this view may have with respect to the construction of a new bridge—though we are not willing to concede this justification—it is certain that the case stands quite otherwise in reinforcement work. The question at every point is, What stresses exist? Calculations can furnish only a partial answer, but a full answer is obtainable by measurement with the strain-gage.

Today very few bridge engineers are familiar enough with the instrument to use it in their revision inspections. Ordinarily the first quantitative knowledge concerning the condition of a bridge is obtained only when incipient failure of some detail occurs. It would frequently be of great value to obtain such definite knowledge earlier, by measurements made while a margin of strength still exists. When local weakness develops, however, measurement becomes quite vital; reinforcement planning cannot be based on the facts of actual conditions unless these facts are precisely determined, unless the distribution of stress throughout the structure—in detail parts as well as integrally in several members of the bridge—is known dependently and quantitatively.

We conclude from considerations of this kind that a great development of strain-gage practice is bound to come about. In the meantime anything that tends to stimulate this development is to be considered as desirable and worth encouraging.

Plan To Regulate Great Lakes Level by Niagara Dam

Chicago Sanitary District's Proposition of Removable Dam in River Near Buffalo Would Permit Maintenance of Lake Levels Above Present Stages and Still Allow Depletion for Power and Storage

By Francis C. Shenehon
Consulting Hydraulic Engineer, Minneapolis, Minn.

Regulating the level of the Great Lakes by works at the head of the Niagara River is no new proposal. As long ago as 1895 the Board of Engineers on Deep Waterways made such a suggestion, which never got beyond the report stage. Now, the project is once more brought forward by the Chicago Sanitary District, which proposes to build in the Niagara River, near Buffalo, regulating works which are unique for such a purpose in that the main channel closure is to be made by a dam in sections, roughly of boat shape, which are to be floated out to place every spring and locked in place, and every winter loosened and towed back to storage. Thus ice difficulties are to be avoided, but the summer level of the Great Lakes maintained for proper ship draft, in spite of the depletion due to the power and drainage canals leading from the lakes.—Editor.]

In commenting on the proposal of the Board of Engineers on Deep Waterways to construct regulating works at the head of the Niagara River to raise the levels of Lakes Erie, St. Clair, Michigan and Huron, *Engineering News*, in 1895, made the following editorial statement: "The control of the levels of these great fresh-water seas, covering a hundred thousand square miles, would be indeed the most stupendous physical effect ever produced by man's agency, but from present appearances it would be carried out by methods entirely within the precedents of modern engineering, and at a cost quite inconsiderable in comparison with the benefits to be secured."

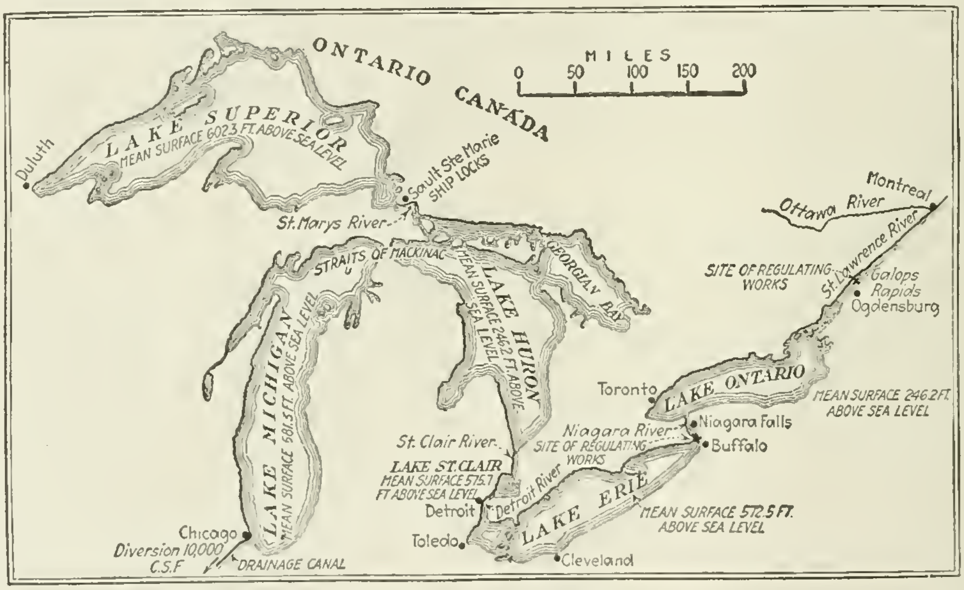


FIG. 1. MAP OF GREAT LAKES SHOWING LOCATION OF PROPOSED REGULATING WORKS NEAR BUFFALO

The vessel freight passing through the Detroit River at that time, 1895, was 20 million tons; in 1916 it was over 100 million. In 1895 freight passing the "Soo" locks was carried for ⅒c. per ton-mile; in 1914, prior to our entry into the war, the rate was 40 per cent less; and in 1917-18 only 20 per cent more. The same freight carried by rail would have cost five times as much. The value of the freight carried in 1917 was over 1¼ billion dollars; and the value of the vessels themselves over 250 million dollars. In July, 1918, a vessel passed through the Detroit River, on an average, every 10½ minutes, and each vessel carried an average of 3,300 tons of freight. This is a freight movement of over 300 tons per minute, with a freight value of over $3,400. As the average haul of the freight carried was over 800 miles, the significance of this continuous procession of loaded ships is apparent.

It is not purposed to confuse with too many statistics or figures the theme of this article, but the economic basis of the regulation of the Niagara River involves some citations. This water-transportation system is second in importance only to the high seas; and the vast volume of freight carried moves on waterways which, owing to limited vessel drafts, compare with the navigable ways of the ocean, as a narrow-gage railway compares with a standard-gage railway. It is necessary to inquire into vessel drafts on the Great Lakes, to point out the various impairments of these drafts, natural and artificial; and, as a guide to warranted expenditures for betterments, to reach an approximation of the money significance of a foot gain in loading capacity for the freight-carrying fleet. Up to the fall of 1895 drafts on through routes were mostly limited to 14 ft. The completion of the project of 1892 gave nominal 20-ft. drafts between Duluth, Chicago and Buffalo. The new third and fourth locks at the "Soo" have 24½ ft. over the mitor sills; the Welland Canal, between Lakes Erie and Ontario, is building for 30-ft. (ocean drafts) over the miter sills of the locks; and a channelization of the St. Lawrence for similar ocean drafts is a certainty.

A modern lake freighter will carry an additional 900 tons on each added foot of draft. The loading of such vessels in low-water periods is guided by telegraphic instructions as to the actual depths in the channels to be traversed. Every additional inch means 75 tons of cargo—and they load to the last available inch. The annual decreased carrying capacity of 350 vessels of the Great Lakes, capable of loading to 20-ft. drafts, but limited to 19-ft. drafts by shallow channel, is not less than five million ton-trips. With freight rates of one dollar per ton, this means decreased gross receipts of five milion dollars a year for this fleet, without anywhere near a proportionate decrease of operating expense. A net economic loss of not less than a quarter of a million dollars a year for each inch of loss of draft is clearly indicated.

Why, with this economic loss long apparent, are the Great Lakes often low, if a remedy is practicable? What depleting artificial influences are operative, which need artificial works to offset them? What natural cycles of dry years or dry seasons have we become accustomed to accept as necessary evils in limiting drafts? Perhaps the answer to the first question is that the amazing reach of effect claimed for simple remedial works at the head of the Niagara River aroused the incredulity, rather than the conviction, of hard-headed practical men. Perhaps the very vastness of these inland seas, their irresistible might in storm-time and fears of floods made men hesitate in tampering with their natural operation. Perhaps it was just simple inertia, rendered still more absolute by the fact that these waters are under the sovereignty of two nations, not one.

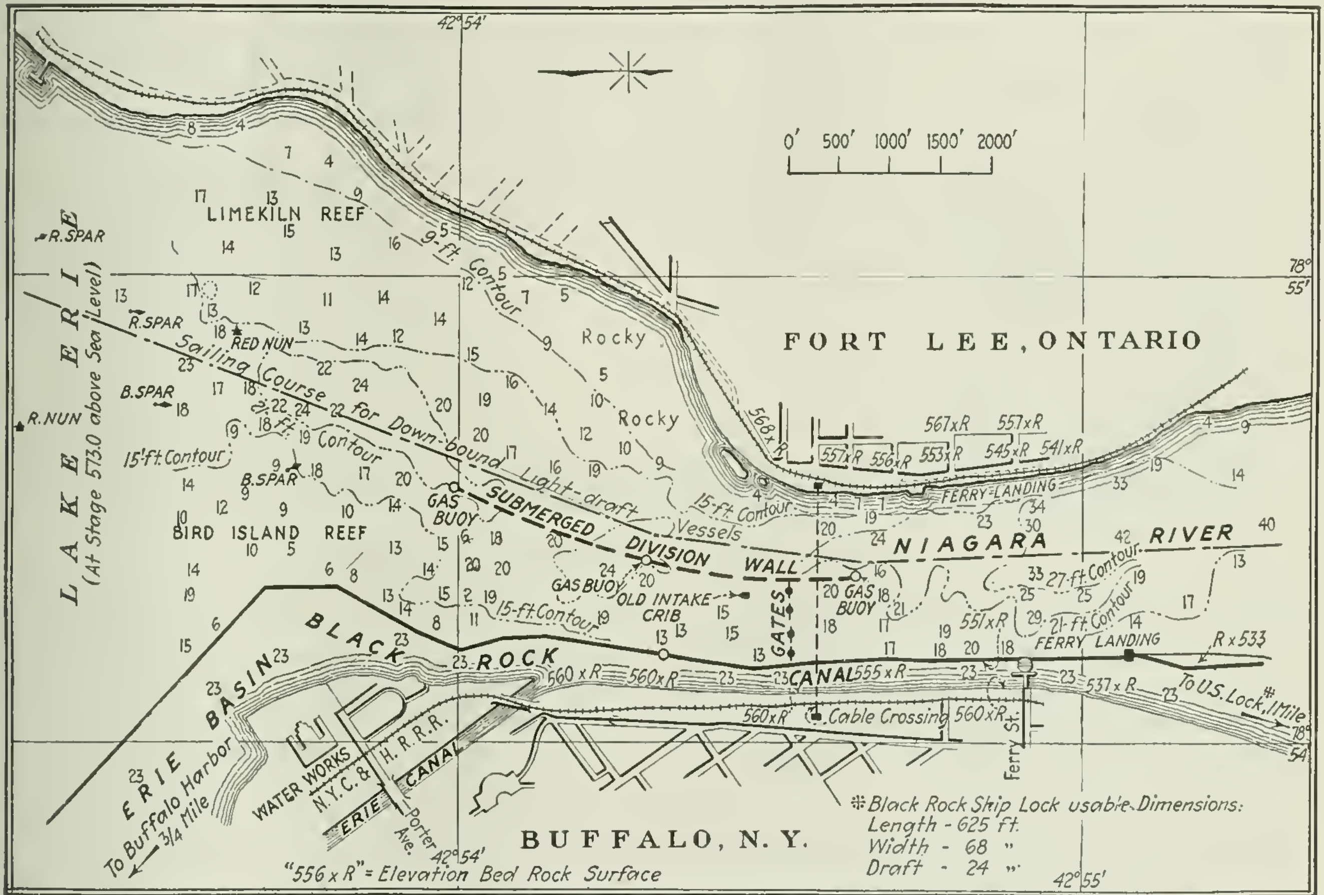


FIG. 2. NIAGARA RIVER NEAR BUFFALO WITH LAKE-REGULATING SUBMERGED AND REMOVABLE DAM

The natural causes which periodically give high lake stages with alternate low lake stages are of two kinds: the regular annual cycles of high June levels, with the draining down to low levels in December, as the fullness of the abundant supply of spring passes out to the ocean; then the cycles which are of years instead of months due to variations of rainfall. The normal November stage of Lake Erie is lower by 12½ in. than the normal June stage; the stage during the season of navigation in 1895 was 20 in. lower than that of the season of 1908. These higher stages are wholesome for navigation, the low stages damaging.

When all contemplated artificial causes of the lowering of Lake Erie now visible are fully in effect, this lake will have a surface level lower by 10 in. than in a state of nature. This artificial lowering will subtract 10 in. more from the drafts of the November lows, and from the lows of such years of meager rainfall as 1895. These anticipated lowerings will result from the following diversions: 10,000 cu.ft. per sec. at Chicago, 5½ in.; 2,100 cu.ft. per sec. in Erie and Welland Canals, 1 in.; 55,500 cu.ft. per sec. for water power above the Cataract Rapids at Niagara Falls. Each of these diversions serves some useful purpose, even though each is at times in conflict with navigation, scenic grandeur or water power.

Assuming the normal June stage of Lake Erie (573.2) to be a desirable stage for navigation, it is enlightening to note the conditions which will obtain with all these diversions effective, and with the meager supply conditions of 1895 returned again. Here are the causes and the measure of their effects.

	Inches Lowering
Unrestrained natural outflow with deficient precipitation	23
Chicago Drainage Canal	5½
Erie and Welland Canals	1
Water Power at Niagara	3½
Total	33

Nature stands out conspicuously as the chief offender. Obviously, the natural operation of the outflow rivers of the Great Lakes serves only the ancient purpose of rushing the waters to the ocean. Obviously, also, the direction of the forces of nature to the end that civilization may be better served, points to the retention of the surplus waters in their natural reservoirs, and their release under regulations, which will yield the largest benefits to navigation, water power and scenic repletion. That means regulating works and water release under a budget system.

Low-water depletion is the negative phase of lake levels. Opposed to this is the menace of stages too high for riparian welfare. In 1838 Lake Erie reached the record height of 575.1 ft. This is at least a foot higher than is now ever desirable; and any scheme of regulation must keep vividly in mind the return—once in a century perhaps—of such opulent supply that the lakes may be overfilled. The flood menace must be reckoned with, and leads to the establishment of the most vital principle of control: the outflow channels of the lakes must not be throttled by fixed works, but must retain their full natural outflow capacity. It is noteworthy that such diversions as those in the Welland, Erie and Chicago canals and at Niagara Falls are hurtful in low-water periods, but beneficial for flood relief in high-water times.

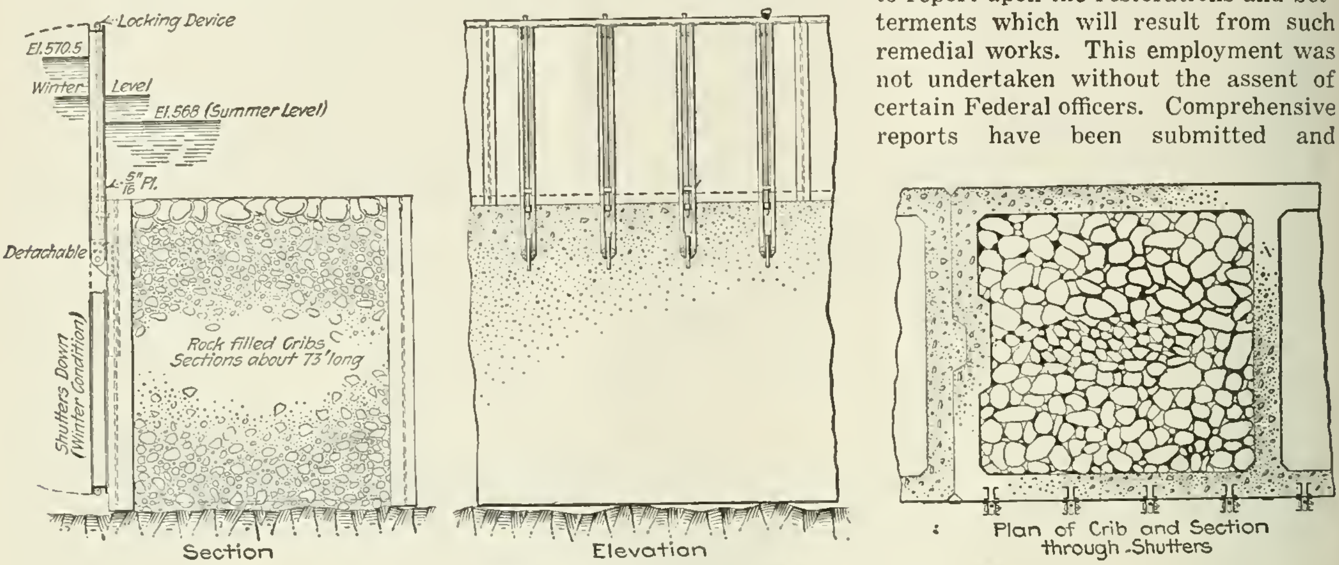

Locking Device
El. 570.5
Winter Level
El. 568 (Summer Level)
5/16" Pl.
Detachable
Shutters Down (Winter Condition)
Rock filled Cribs Sections about 73' long
Section
Elevation
Plan of Crib and Section through Shutters

FIG. 3. GENERAL DETAILS OF SUBMERGED CRIB DAM

The diversion of water from Lake Michigan by the Sanitary District of Chicago, has probably done more than any other one thing to intensify studies of the hydraulics and physics of the Great Lakes system. The Chicago Drainage Canal was designed to lead 10,000 cu.ft. per sec. of water through the Illinois and Mississippi Rivers to the Gulf of Mexico. The effect of this diversion is to deplete by the same volume the flow through the various lakes and rivers leading to the Gulf of St. Lawrence. Chicago proceeded with its immense project to dilute and dispose of its sewage and at the same time avoid contaminating its water supply, without taking all the preliminary steps which any less confident community might have taken to secure its right to appropriate a volume of water equivalent to nearly twice the ordinary flow of the Mississippi River at Minneapolis. At the present time the Sanitary District finds itself with a Federal permit for 4,167 cu.ft. per sec. and an existing diversion probably twice that volume, after a series of years in the Federal Court endeavoring to minimize or justify the effect of its diversion on the interstate and international navigable waters of the Great Lakes. The suit was a friendly one, fought on principles, not personalities, as becomes an issue of law between a state and the general government. No decision has yet been handed down.

Secretaries of War Taft and Stimson in declining to authorize a diversion of 10,000 cu.ft. per sec. have, in effect, stated that Congress alone should assume responsibility for such diversion. Federal attorneys have taken the same view. Chicago is now appealing to Congress to legitimatize a diversion of 10,000 cu.ft. per sec. and offers to pay the cost of regulating works in the Niagara and St. Lawrence Rivers. The writer, after serving the Federal Government through the years of litigation, has been retained by the Sanitary District to design regulating works for these two rivers, and to report upon the restorations and betterments which will result from such remedial works. This employment was not undertaken without the assent of certain Federal officers. Comprehensive reports have been submitted and printed. Copies of the reports may be secured by application to George M. Wisner, Chief Engineer, the Sanitary District, Karpen Building, Chicago. The reports utilize as substantially accurate the basic hydraulic and hydrometric data presented on the part of the United States in the legal controversy. This article deals with the Niagara regulation. The St. Lawrence regulation involves some additional elements and is another story.

The scale of a project sometimes brow-beats an engineer. (See Fig. 1.) In the case of the Great Lakes, however, the far-flung geographic reach and the vast commercial importance, are elements which contribute to confidence, not embarrassment. Their importance has meant the accumulation of records of exact water surface elevations of each of the lakes, over a period of sixty years, many of the readings daily, and all digested in monthly means. Measurements of the volumes of flow of the St. Clair and Niagara Rivers, have extended over many years and have included for each river several hundred individual precise current-meter gagings. The accepted volume of flow of the Niagara River for a given stage of Lake Erie at Buffalo is precise within 2 per cent; and the law of outflow is so definite, that the change in volume of flow for a rise of a foot in Lake Erie is precise within 5 per cent. The surface profiles of both the Niagara and St. Clair Rivers, and the changes of profile with varying volumes of flow are definitely known; and the river depths and bottom contours are revealed by multitudes of soundings. The great spread of the drainage basins (nearly 255,000 sq.mi. above the Niagara River) stabilizes the water supply, and eliminates the caprice of such rainfall centering as comes in little watersheds. The lakes themselves, with more than 87,000 sq.mi. (excluding Ontario) of water surface, are a series of great retarding basins—absorbing floods. The great storm of March, 1913, and its aftermath, which devasted the Miami Valley, raised Lake Erie little more than a foot. When Lake Erie is at an elevation of 573.0 ft. above sea level, the outflow in the Niagara River is 218,460 cu.ft. per sec.; and the volume of flow is 22,000 cu.ft. per sec. less for a foot lower lake surface. At the head of the Niagara River the outflow passes through a natural sluiceway 1,800 ft. wide and 18 ft. deep at fair stages. (Fig. 2.)

With the mass of adequate physical data available, the determination of the supply tributary to Lake Erie for any month is substantially accurate, and mean values are precise. The elements of supply are: inflow through St. Clair River, run-off from the St. Clair-Erie watersheds, precipitation on the lake surface and evaporation from the lake surface. While the supply itself as a resultant is definitely known, no one element—precipitation, run-off or evaporation—is segregated. The supply only as an algebraic sum needs to be used. This fact simplifies the problem. In the analyses made to determine the possibilities of the betterment of Lake Erie levels, the actual supply was computed for each month over two periods of ten years each, 1893 to 1902 and 1907 to 1916. Then this supply was budgeted by modifying the rates and times of discharge through the Niagara River. This gave a new series of lake level elevations, always on a higher plane. And these new surface levels show the betterment of drafts which would have prevailed had regulation been in effect.

The accompanying tabulation presents in compact form the results of the trial budgeting of the two ten-year periods selected for illustrative purposes.

COMPOSITE RESULTS OF TWO TEN-YEAR AVERAGES OF GREAT LAKE REGIMEN

Month	Erie Elevations Feet Con-trolled		Gain by Control		Supply	Outflow		Effect of Control	
	Con-trolled	Free	Feet	Inches	Thousands of Cubic Feet	Con-trolled	Free	Gain	Loss
a	b	c	d	e	f	g	h	k	l
	Decade 1893-1902—Low Supply								
January	572.23	570.86	1 37	16½	163	195	178	25	..
February	2.02	0 79	1 23	14¾	171	187	165	22	..
March	2 03	0 96	1 07	13	214	196	178	18	..
April	2.24	1 42	0 82	10	229	201	187	14	.
May	2 57	1 73	0 84	10	221	175	194	..	19
June	2 90	1 92	0.98	11¾	206	180	198	..	18
July	3 02	1 89	1 13	13½	187	182	197	..	15
August	2.99	1 76	1.23	14¾	171	182	194	..	12
September	2 83	1 48	1 35	16¼	157	181	188	..	7
October	2 60	1 18	1 42	17	154	180	182	..	2
November	2.40	0.98	1 42	17	164	180	178	2	..
December	572 36	570 92	1 44	17¼	174	167	176	..	9
Means	572 52	571 33	1 19	14¼	184	184	184	7	7
Range April-December	0 78	1 00		.	.	....	....	..	..
	Decade 1907-1916—Normal Supply								
January	572 60	571 60	1 00	12	185	203	185	18	..
February	2 47	1.55	0.92	11	184	197	182	15	..
March	2.53	1.64	0 89	10¾	235	207	192	15	..
April	2 85	2 27	0 58	7	260	214	206	8	
May	3.28	2 64	0 64	7¾	240	193	213		20
June	3 56	2.78	0 78	9⅓	217	200	217		17
July	3 65	2.66	0.99	12	197	196	214		18
August	3 58	2.48	1 10	13½	184	200	210		10
September	3 38	2.20	1 18	14¼	173	201	203	..	2
October	3 08	1.93	1.15	13¾	162	202	198	4	
November	2 74	1 57	1.17	14	165	202	190	2	.
December	572 60	571 44	1 16	14	184	176	187		9
Means	573 03	572 06	0 97	11¾	199	199+	200—	5	6
Range April-December	1 05	1.34							

In all the values used it has been assumed that Chicago had been continuously diverting 10,000 cu. ft. per sec.

In the low-supply decade the gain by control in drafts during the season of navigation is 14 in.; for the low-water year, 1895, 15 in.; and for November, 1895, 20 in. This raising of Lake Erie to a higher surface level is transmitted in part through the Detroit River to Lake St. Clair, through the St. Clair River to Lake Huron, through the St. Marys River to the ship locks at Sault Ste. Marie; and through the Straits of Mackinac to Lake Michigan and Chicago—a back-water reach of 900 miles. It was this magnificent axial distance and the radiation of benefits into every bay, inlet and harbor of these wide lakes that impressed the editor of 1895. Lake St. Clair's surface is 3.2 ft. above that of Lake Erie, and 5.6 ft. below that of Lakes Michigan and Huron, with deep connecting river channels favorable for back-water transmission. In passing, it should be observed that a rise created in a downstream terminal basin, is transmitted by back-water to an upper basin in a percentage which is not a function of the length of the connecting channel, but of the initial difference in elevation of the basins and of the depth of connecting river. The name Detroit is the French for strait. The back-water transmission through this strait-like leisurely-flowing river has a value of 75 per cent.

The trial results shown by the table indicates that by better budgeting the mean plane of Lake Erie may be maintained 16 in. above the plane resulting after a diversion of 10,000 cu.ft. per sec. at Chicago. This will mean an average of 10 in. better drafts than prevailed in a state of nature. A rise of 16 in. in Lake Erie will raise Lake St. Clair 12 in., and that will completely compensate Lakes Michigan and Huron and the St. Clair and St. Marys River for a diversion of 10,000 cu.ft. per sec. at Chicago.

The Great Lakes have been treated thus far as the right-of-way of a great transportation system with an annual traffic approximating 100 billion ton-miles. But two other interests are involved in the Niagara River flow and its artificial manipulation. A treaty exists with Great Britain to protect Niagara Falls, as one of the great scenic assets of the world, against depletion. Restriction of the river flow to maintain Lake Erie levels might violate the spirit of this treaty. Regulating works must be elastic enough to provide mill-pond water in large quantities during certain daylight hours for power uses, so that the natural river flow may pass over the Cataracts.

The fall in the Niagara River from the head of the Cataract Rapids to the foot of the Lower Rapids at Queenston and Lewiston is 316 ft., and the normal flow nearly 200,000 cu.ft. per sec. This means, under the high efficiencies obtained there, a potential six-million electrical horsepower. The treaty limits the diversion for power purposes to 55,500 cu.ft. per sec.—with a potential of 1⅝ million electrical horsepower. Regulation must not only not impair this power, but must serve to better its conditions. Two elements enter from this consideration: greater uniformity of flow, and a more liberal volume than nature provided in the ice-complicated months of January, February and March. It will be seen by reference to Column k of the table, that in such a low-supply period as the earlier decade illustrated, control adds nearly 22,000 cu.ft. per sec. to the volume of winter flow to offset the 10,000 abstracted at Chicago. Finally control must keep vividly in mind the well-being of Lake Ontario and the St. Lawrence.

The instrumentalities, the regulating works, through which control of the river flow may be effected are important. The works designed by the Deep Waterways Commission of 1895 (of which Alfred Noble, George Y. Wisner and Col. C. W. Raymond were members) would serve all the functions of control enumerated in this paper. These works consisted of a battery of 13 massive counterpoised Stoney gates with overhead trusses. The sluiceways were each 80 ft. wide, with total waterway length of 1,040 ft. The midstream sluiceway system was flanked by fixed weirs reaching to the river banks. The depth of water over these weirs would vary from 4 to 7 ft. The works were about a mile upstream from the location now proposed by the writer. These works during construction and operation would have been exposed to heavy wave action in Lake Erie storms. They would have blocked open-river navigation down the river. Perhaps the most serious objection to the building of these works was the fear of the people of Buffalo that they would serve to create ice jams.

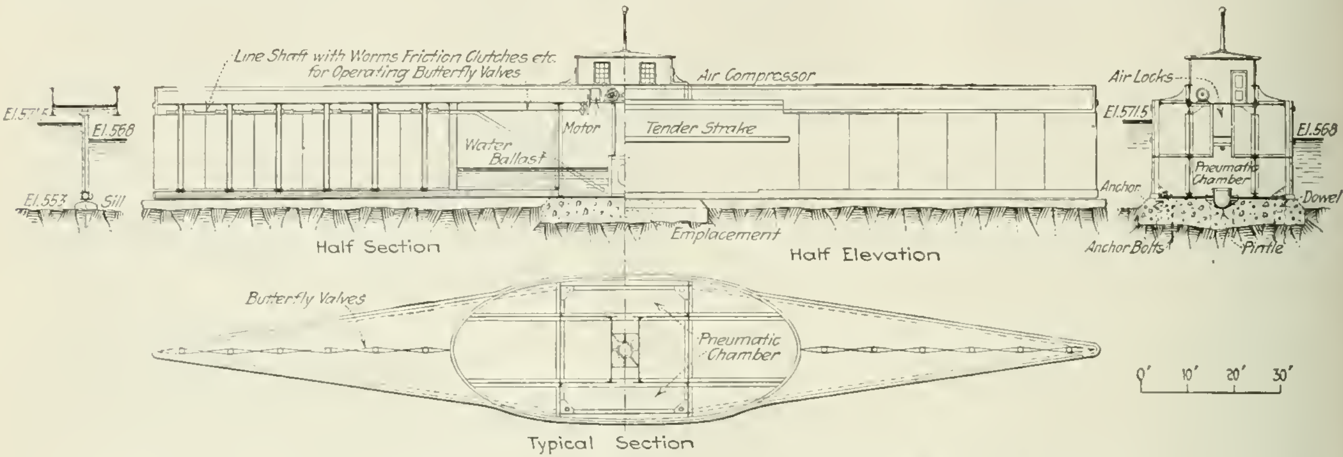


FIG. 4. GENERAL DETAILS OF BUTTERFLY DAM SECTION TO BE FLOATED TO AND FROM ITS SITE TWICE A YEAR

The writer in the selection of a site for works in the narrowest section at the head of the river, retreated far enough downstream to escape heavy wave action, but entered a stretch with a stiff current as an obstacle. This site is the reach at the head of the Niagara River opposite and above Fort Erie, Ontario. (Fig. 2.) It is a narrow constricted throat which serves as the natural regulating sluiceway which has created Lake Erie, and determined its elevations and outflow. The river is but 1,800 ft. wide here and 18 ft. deep. The bottom is of bedrock—Niagara limestone. While it is the downbound channel for light-draft vessels, its current is sufficiently swift to deter upbound travel. It is flanked by the Black Rock canal, with ship lock, for deep-draft navigation passing to and from the lower river docks. Any acceleration of current velocities will not scour the bottom, will not work any large inconvenience to vessel interests, or insurmountable damage to riparian owners. Engineering works constructed here will be founded on solid rock foundations; and the compactness of the cross-sectional area insures a corresponding compactness of regulating devices. Perhaps it is judicious for engineers in the modification of outflow conditions to take advantage of the very same river reach which geologic forces have fashioned for natural outflow control. Artificial works then serve simply to supplement natural works. The regulating gates will occupy 800 ft. of the river width. During periods of fully-closed gates, the west 1,000 ft. of the river will have the natural swift current velocity increased about 50 per cent. This width of the river will always be open for free vessel passage with relatively little impairment of drafts. The gates will not be exposed to heavy wave action.

Where the outflow of a river is through two natural sluiceways or channels with an island between, the problem of regulation is relatively simple. In the case of the Niagara River in the section chosen, the outflow is in a single sluiceway. By artificial means this single sluiceway must be divided into two sluiceways. Then reduced flow may be brought about in one sluiceway, while the other runs free. The division of the throat of the Niagara River, as proposed, is effected by the construction of a submerged division wall of rock-filled reinforced-concrete cribs. This wall follows the current direction in its alignment, is about 4,000 ft. long, and lies about 800 ft. out from the American river edge in the narrow section.

It forms, with its movable shutter-dam, a partition which permits damming the water on one side when throttling of the outflow is desirable. During the winter season, and in April when ice is running, the shutters hang reversed, well towards bottom; and the wall itself, with its top four to six feet below the water surface, permits such lateral movement of the floating ice as may be needed. (Fig. 3.) The cribs will be built on ways, and floated into place by the aid of pontoons. The sections are interlocking. The filling will be as far as practicable compact so as to minimize cross-leakage on the maximum head due to a difference in level of the two sluiceways of 3½ ft.

The functions of the regulating gates have been indicated. A rigid condition has been assumed as imposed. No piers may be placed in the river which will endanger creating an ice jam. This means that no piers at all reaching to, near or above the water surface are permissible. This condition immediately eliminates consideration of any battery of gates suspended from overhead bridge platforms. Two types of structures are therefore indicated as conforming to this condition: first, movable weirs which when lowered retreat into submerged subterranean pits, or else collapse and lie flat on the bottom; second, removable gates which are floated into place in May and are removed at the end of December. The inaccessibility of the moving parts of gates or weirs fixed to the bottom or sunk in pits, and the probability of sediment interference, eliminates the first type. The alternative type, the removable gate is recommended in this report, although in a structure of this magnitude and importance a departure from exact precedents is involved.

Precedents are many of great structures floated into place. The original 250-ft. trusses of the International Bridge, just below this proposed structure, were floated to their piers on scows—back in the seventies. The sections of the Detroit River tunnel were built in a shipyard, floated to the tunnel site, sunk crosswise of the current, and the several sections locked together. The floating concrete caissons used at Milwaukee under the direction of Col. Wm. V. Judson are familiar examples of the best practice in pier and breakwater construction. The only departure from ordinary practice recommended by me in this report consists in removing the structure at the end of the year, and floating it back to a safe winter berth.

Obviously, releasing the gates is simpler than placing them. Structures of less magnitude do have this cycle of placing and removal and replacing. A lightship and a gas buoy are portable lighthouses, set out in the spring to be taken back to the dock in December and set out again in April. Floating drydock gates are not unknown, and great floating drydocks themselves are in these days built in shipyards and towed from port to port. The drydock may come to the battleship, instead of the battleship going to the drydock. The gates proposed for the Niagara regulation, are specially designed for annual placing and releasing. A vessel hull forms a permanent part of the structure; and locking to the replacement and releasing are made easy by providing inclosed pneumatic chambers where the manipulations may be readily carried out dry.

The simplicity of the gate and the absence of any inaccessible mechanisms, guarantee its successful use. It has been named the Multiple Butterfly Gate, because each of the units is made up of twelve butterfly valve panels, occupying about 120 ft. of the 202-ft. gate. The hull, containing the buoyancy and pneumatic chambers and housing the valve-operating motor and air compressor, is about 80 ft. fore-and-aft with 21-ft. overall beam amidship. Fig. 4 illustrates this gate in sufficient detail to permit touching only lightly on its features here. Four units or sections of multiple gates make up the cross-stream works. Each when in place for throttling the flow lies at right angles to the river axis, and is locked by massive bolts to a flat-topped 36-ft. square reinforced-concrete emplacement footed in, and heavily bolted to, the Niagara bed limestone. The emplacement floor is about 2 ft. above the level of the clean rock bottom. Where hull and emplacement meet, contact is made elastic by timber cushioning on the hull bottom. In the May-time placing of the gates, each section will be brought down the river from the head of the Black Rock Canal by two tugs and definitely located over the emplacement by the aid of intersecting ranges, using side and head anchor lines for exact centering. The gate is then settled down on the emplacement by flooding the water-ballast chambers; the pivot is entered, and the gate is then self-operating for its rotary swing to a cross-current position, and the locking to the four corner anchor bolts.

The obvious use of the butterfly valves in the current operation of this maneuver needs no detailing. While swinging on the center pivot, the gate has been designed as excessively safe against any current forces tending to slide it off the emplacement or to overturn it. When in its fixed cross-stream position, with ballast tanks full, the gate is designed amply safe as a gravity dam for a 5-ft. head without tension anchorage to the emplacement. But in addition to its gravity stability its four corner anchorages give it an additional safety against overturning, as well as caring for unbalanced forces tending to rotate the gate on its pivot. When all anchorages are fast, the gate is abundantly safe against rotation with all butterfly valves open on one arm, and all closed on the other.

The design has fully considered torsional stiffness under all conditions; and when drydocking for painting or repairs, the gate may safely rest on keel blocks placed near the bow and stern. Butterfly valves and air compressors, for ejecting water from ballast tanks and pneumatic chambers, are electrically operated. The bringing of a gate to its emplacement and pivoting it, present no difficulties of navigation or of mechanism. It will be as easy and less hazardous than bringing an ocean liner into the port of New York and docking it. Two tugs and their crews, with the gate-operating gang, will place one gate in half a day. The reverse operation of releasing the gate in December, and towing it downstream to its winter slip, will be easier than the spring operation. Regarded as a vessel floating free, the gate is designed to have plenty of stability against tipping over. For its two days of navigation a year, each gate will have such facilities as are needed, and mooring and wintering will be made easy and safe.

When in position as gates, the four will form a continuous deck or platform reaching from a shore abutment for a distance of 810 ft. to the division wall. With all valves closed the throttling value will be 40,000 cu.ft. per sec.; and with all valves open, the obstructive value will not exceed 10,000 cu.ft. per sec. This permits a release of 30,000 cu. ft. per sec., when desirable, from day to day.

It is obvious that regulating structures of the kind recommended in this report, are capable of much variation in detail while embodying the same principles. The vital principles are: The removable feature of the cross-stream gate structure—to avoid ice obstruction; the easy operation of valves to release 30,000 cu.ft. per sec. at any time; and the division wall which parallels the current instead of being placed across the current—again to avoid ice obstruction. Adhering to these principles the wall and dam may differ in detail or form.

In estimating the cost of these regulating works the difficulties have been fully considered of those portions which need to be constructed or sunk in the swift current of this river section—such as the emplacements, the cross-sill and the division wall. On account of high labor and material costs all unit prices have been placed high. The estimated cost is $1,224,000. This cost does not include interest during construction or possible claims for damage by riparian property owners along the reach of the river front where the current velocity is increased. The cost of operation and maintenance, not including interest on investment or sinking fund, will be approximately $40,000 a year.

The report on the Niagara River Regulation, which this article epitomizes, was made to George M. Wisner, Chief Engineer of the Sanitary District of Chicago. Adolph F. Meyer, Member American Society of Civil Engineers, collaborated in the design of the gates and the division wall.

Mucking With Steam Shovels Speeds Up Tunnel Driving

Rivalry Stimulates Progress as Power Company in California Vies With Contractors in Working Out Speediest Methods

THE Kerckhoff power plant now being built by the San Joaquin Light and Power Co. about 40 miles east of Fresno, Cal., is to supply additional power for which there is urgent and immediate demand in the territory this company serves. In laying out the construction plan, every effort was made to speed up the work. About 3¼ miles of tunnel had to be built between dam and forebay, and as this part of the work would be the limiting factor in the time of completion, special study was devoted to the tunnel-driving methods to be employed.

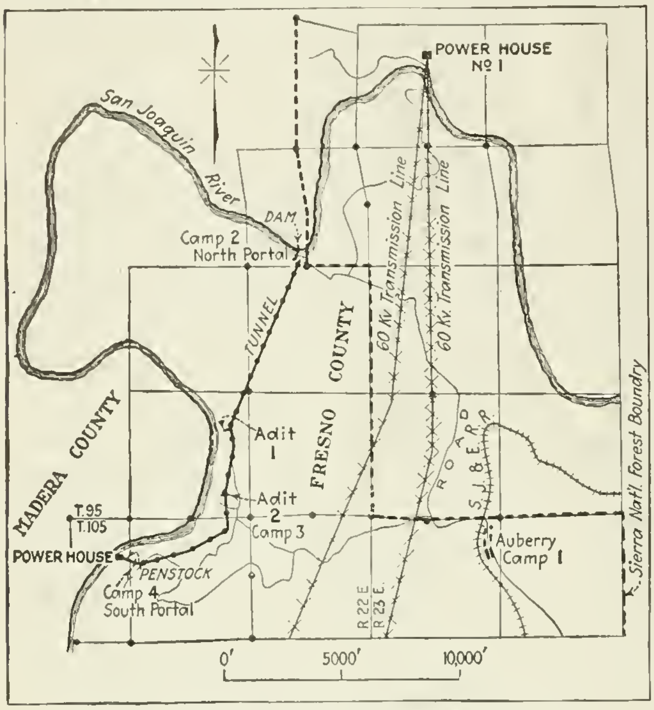


FIG. 1. TUNNEL LINE OF THE KERCKHOFF POWER PROJECT

From its upper end, the tunnel line first cuts across a bend in the river on an 8400-ft. tangent that can be driven only from two headings. Thereafter the line follows the valley, and was made accessible by adits at convenient points. A plan for prosecuting the work from a total of five headings was selected, this decision being influenced by the fact that as about 4000 ft. would have to be driven from each heading of the long tunnel there would be no advantage in completing other sections much earlier.

To gain any benefit there might be in trying out different methods of handling the work, to bring in organizations of men experienced in tunneling, and to foster a spirit of rivalry between crews at different points, contracts were let to three experienced tunnel drivers. One of the contractors works two headings. The fifth heading, which is one end of the long tangent, is being driven by company forces. The tunnel is to handle a flow of about 1600 sec.-ft., but it was thought worth while to make the cross-section somewhat larger than required by this capacity, in order to permit steam shovels to work at the headings. Accordingly, a section of 17 x 17 ft, was adopted, and steam shovels have been used for handling muck in all the headings.

Great rivalry has been developed between the tunnelmen by the posting in each camp at the first of each week of an announcement of the previous week's progress at each heading. Four methods of driving have been employed in the five headings.

At the north portal, worked by company forces, the top-headings-and-bench system is used. The heading, 8 ft. high, is carried about 7 ft. ahead of the bench. As soon as a round of shots has been fired, the steam-shovel crew begins loading out the muck. At the same time, the machine men and chuck tenders start on top of the muck pile, shoveling back the material remaining on the bench. By carrying a short bench, only a small amount of hand mucking is necessary. Thus, drilling in the face proceeds while the steam shovel handles the muck. Under this plan, three drilling crews are maintained, so that three 8-hour shifts can be worked. Shovel and train crews are on a "call-shift" basis, as it is not possible to lay down a definite daily program by which drilling and shooting can be carried out. In this heading the formation is a very blocky gneiss with a vertical grain. About 36 holes are placed in the face and 12 holes in the bench. The holes are 13 to 15 ft. deep, and the average round breaks 10 to 11 ft. A maximum progress of 12 ft. per day has been made, but the average rate has been only 9 ft. as progress has been materially affected by the large quantities of water encountered. In this heading the tunnel is being driven downgrade.

The same method as that just described is being used by contractor De Lucca at the south portal. The maximum progress here has been 86 ft. per week. The vertical-face as well as the heading-and-bench method is employed by Robinson & Tinkler, contractors, at adit 2, where two headings are being advanced. The best progress here has been 12 ft. per day.

At adit 1 contractor Iverson is using a drill carriage equipped with nine drills, working the entire face of the heading. The drill carriage is a car carrying a 17-ft. vertical column with a jack at each end and four crossbars on which the drills are mounted. With this equipment the method of operation is to drill and muck alternately, the mucking being completed before the drills go back to the heading. Under this plan both drilling and mucking crews have to be on a call-shift basis. At this heading the formation is a very hard, coarse-grained blue granite, absolutely seamless. It requires about 75 to 80 holes for each round and about 25 per cent more powder than the work at the north portal. The maximum progress at this heading has been 104 ft. per week. Results with this machine have been such that the company is building another one of similar design to try out at the heading being driven by company forces.

Under the terms of agreement with the contractors, the company supplies air, power, powder, drill steel and large equipment. The contractors furnish the small tools. Payment is made on a yardage basis, no overbreak being allowed. The section of the tunnel nets 10 cu.yd. per lin.ft.; the overbreak has ranged from 8 to 15 per cent. Labor and powder costs, according to the records on the heading driven by the company, have totaled about $43 per foot.

The following tabulation gives an analysis of the time consumed by the various operations at the heading, as conducted with the first drill carriage:

AVERAGE FOR FIFTEEN DAYS, OCT. 1-15, 1919

Footage	130 ft.
Rounds drilled and mucked	14
Drills used per round	8.7
Holes drilled	86
Holes drilled, average depth	10.4 ft.
Holes drilled per machine	9.7
Powder used per foot of tunnel	79 lb.
Moving in and setting up	1¾ hr.
Drilling time, per round	5⅜ hr.
Shooting time, per round	1⅝ hr.
Drilling one hole	0½ hr.
Mucking	10 hr.

The shovels used for mucking are operated by compressed air from the drill line. They are all equipped with specially constructed booms, 13 ft. long. With these booms the bucket can be swung around at right angles without striking the far wall, so long as the shovel body is kept close to one side of the tunnel. The shovel is run in on a standard-gage track, and when it is in position for mucking a tunnel jack on the front end and on the side away from the wall is used to give the shovel stability. About 250 ft. of the broad-gage track is left in place behind the shovel so it can move back from the face when shots are to be fired.

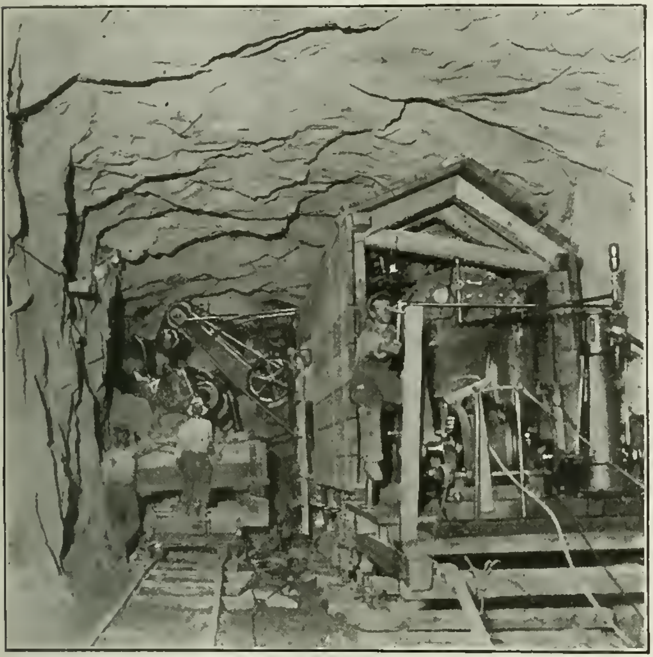


FIG. 2. HANDLING MUCK AT THE FACE BY AIR-OPERATED SHOVEL

The shovel uses a 21-cu.ft. bucket. Ordinarily a 150-yd. muck pile, such as is pulled down usually by a round of shots, is cleaned up within eight hours. Practically no bulldozing has been necessary. When pieces are found too large to be handled by the shovel in the ordinary way, a chain is slipped around the rock and looped over the teeth of the bucket.

At present, while the headings have not been advanced far from the portals, one muck car at a time is filled and hauled out. When the advance has been sufficient to warrant it, a siding will be put in, so that after a car is loaded it can be put in the clear and another empty put beside the shovel, with minimum delay.

On the whole, the company expresses entire satisfaction with the record made by the shovels. They have greatly reduced the number of muckers required, which is a particularly important advantage just now, and are doing the work, it is stated, in less time than would have been possible by hand methods.

The work is being carried out under the direction of R. C. Starr, construction engineer for the San Joaquin Light & Power Co., with W. A. Whitmire as general superintendent, E. H. Warner resident engineer and E. L. Fox general tunnel foreman.

Longest Spans of American Bridges

ADVANCE in bridge construction as represented by length of span of the various distinct types of bridge is recorded by Prof. H. S. Jacoby, in the *Cornell Civil Engineer*, by means of the table reproduced herewith. Prof. Jacoby points out, with reference to the dates given in the last column, that in nearly three-fourths of the classes which he lists an increase in maximum span length occurred during the present decade, most of them during the second half of the decade; and that only two bridges in the list date back of 1900.

In simple-truss spans marked advance has been made in both pin-connected and riveted types in recent years. Up to 1906 the longest pin-connected span was 546½ ft. (Louisville). This was exceeded by the Elizabethtown (Ohio) bridge of 586 ft., followed six years later by the 668-ft. span of the Municipal Bridge in St. Louis and in 1917 by the 720-ft. span of the Metropolis bridge. For riveted trusses the longest simple-truss span up to 1907 was 300 ft. 10 in. In 1908 the 412 ft. 8 in. span of the Canadian Pacific bridge over the French River was completed, and in 1911 the 425 ft. 6½ in. span of the Fratt bridge across the Missouri River in Kansas City. The long span of the Pennsylvania bridge at Louisville, 643 ft. 10½ in., represents an increase of 50 per cent in a single step.

The completion of three notable continuous truss bridges less than three years ago is a remarkable feature of bridge progress. Besides the Sciotoville bridge of two 775-ft. spans, given in the table, there are the Nelson River bridge of the Hudson Bay Ry. (400-ft. span) and the Allegheny River bridge of the Bessemer & Lake Erie R.R. (maximum span 520 ft. ½ in.).

Supplementing the record of concrete arches, represented by the Monroe St. and the Larmer Ave. bridges, noted in the table, the 400-ft. span of the Franklin Ave. bridge at Minneapolis, crossing the Mississippi River, is to be kept in mind. This bridge is now under construction.

No.	Class of Bridge	Span Ft.	Span In.	Location	Date of Completion
1	Simple plate-girder	130	6½	Grand Crossing, Ill., Nickel Plate R.R.	1916
2	Steel viaduct	100	0	Lethbridge, Alberta, Can. Pacific Ry	1909
3	Simple truss, riveted	643	10½	Louisville, Ky., Pennsylvania Lines	1919
4	Simple truss, pin	720	0	Metropolis, Ill., C. B. & Q. Ry. and N. C. & St. L. Ry	1917
5	Swing, plate-girder	236	0	Lachine Canal, Montreal, Can. Pac. Ry	1915
6	Swing, truss	521	0	Portland, Ore., Northern Pac. Ry.	1908
7	Vertical lift	296	0	N. Mondak, Mon., Gt. Nor. Ry	1914
8	Vertical lift, floor only	428	0	Kansas City, Mo., Terminal R. R.	1911
9	Bascule, single leaf	260	0	Chicago, St. Charles Air Line Ry.	1919
10	Bascule, double leaf	336	0	Sault Ste. Marie, Can. Pac. Ry.	1914
11	Serial ferry	393	9	Duluth, Minn., over Ship Channel	1905
12	Continuous truss	775	0	Sciotoville, O., Chesapeake & Ohio Northern Ry	1917
13	Cantilever	1800	0	Quebec, Natl. Transcontinental Ry	1917
14	Suspension	1600	0	New York, Williamsburgh Bridge	1904
15	Steel arch, three-hinged	592	0	Needles, Calif., Colorado River	1916
16	Steel arch, two-hinged	977	6	Hell Gate, N. Y. City., N. Y. Connecting Ry	1917
17	Steel arch, no-hinge	519	9¼	St. Louis, Pennsylvania Lines	1874
18	Stone arch	220	0	Cabin John Bridge, near Washington	1864
19	Plain concrete arch	281	0	Monroe St., Spokane, Wash	1911
20	Reinforced-concrete arch	300	4⅞	Larimer Ave., Pittsburgh, Pa	1912
21	Concrete viaduct	180	0	Nicholson, Penn., Lackawanna	1915

Loading Test of 18-ft. Circular Concrete Grain Bin

Bins Separated by Tie-Walls Investigated as to Behavior Under Outside Pressure from Grain in Interstices

By P. J. Hansen
Structural and Chief Engineer, Burrell Engineering & Construction Co., Chicago

Unusual load conditions in grain elevators having the interstitial spaces nearly as large as the circular bins led to tests to indicate the action of the circular walls under such loads. In general, the circular or cylindrical bins are built in clusters having contiguous walls so that the walls receive lateral pressure on both sides, the pressure on the convex side being about 25 per cent of that on the concave side. In several elevators designed and built by the Burrell Engineering & Construction Co., Chicago, the spread type of bins has been used, in which the cylindrical walls are not in contact with each other but are connected by tie-walls at the quarter points of the circles, as shown in Fig. 1. With this arrangement the interstices have about the same capacity as the bins, while the flat exterior wall is considered to give a better appearance than the corrugated wall formed by a series of bins.

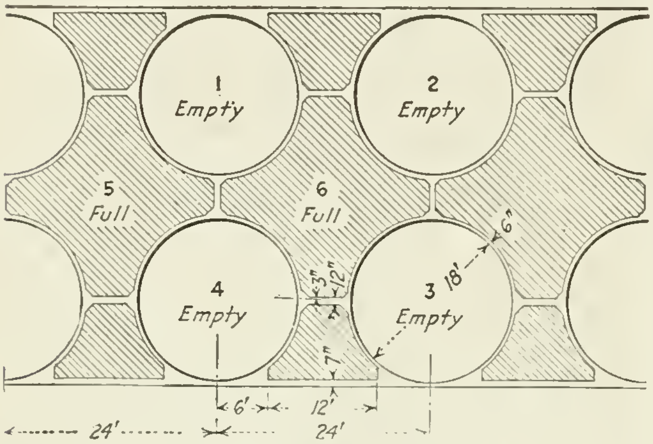
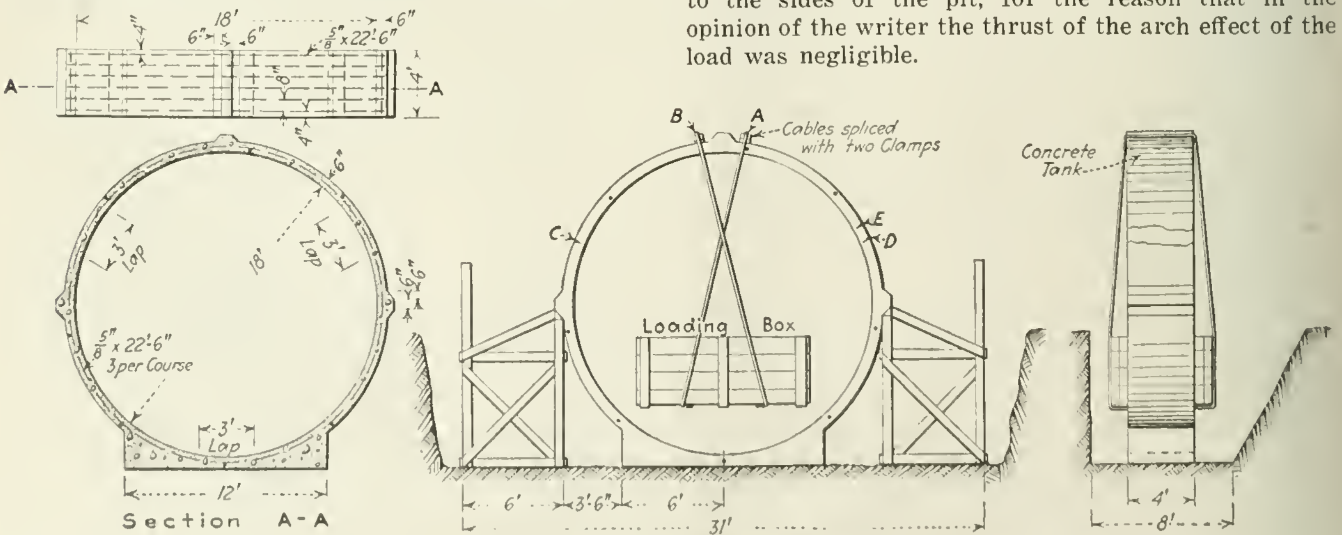


FIG. 1. TYPICAL ARRANGEMENT OF GRAIN ELEVATOR WITH SPREAD SYSTEM OF BINS

The spread type of construction was adopted for an elevator built by the Burrell company in 1919 at Minneapolis, for the Banner Grain Co. This design led to a discussion as to what would take the thrust of the quarter-circle arch when the bins 1, 2, 3 and 4, in Fig. 1, are empty and the compartments 5 and 6 are full. The bins were 18 ft. in diameter and 80 ft. high. Lateral pressure from the grain would be approximately 30 times the diameter, or 540 lb. per sq.ft. on the concave side. On the convex side this pressure would be only 410 lb., for although the compartment has a greater capacity it has also a greater perimeter than the circular bin.

The contention was that in the absence of tests it was unknown what a tank of this diameter would stand with a load on its convex side, and that the tie-walls were insufficient as abutments. While calculations showed that the walls, 6 in. thick, were ample in strength both as a quarter and a semi-circular arch, the writer proposed to build a test tank, or rather a ring, to determine as far as possible what the breaking load would be. This ring, 4 ft. high, was made a replica of the tanks; 18 ft. inside diameter, 6-in. wall, reinforced with hoops of ⅝-in. corrugated round rods spaced 8 in. on centers. In addition to the hoop reinforcement seven 1-in. plain round rods, which in actual construction are the jack rods used to raise the slip forms, were placed vertically about 8 ft. apart on the center of the wall, the hoops being on the outside or very nearly 2¼ in. from the convex side of the ring. The 1:2:4 mix consisted of portland cement, torpedo sand and gravel. The ring was built at the site of the operation under the supervision of an inspector of the building department.

The ring was two months old when tested. Two weeks before the test the ring had been raised from the position in which it was poured and lowered on its side into a pit, as shown in Fig. 2. The ring had a flat side on the exterior for a distance of 12 ft., a condition that afforded an excellent base and a bearing area of 48 sq.ft. At the crown of the ring was formed a contact 6 in. wide and 6 in. high with 6-in. fillets. This contact also occurred on the sides at the quarter point of the circle and provided a means of relieving the lower half of the ring when the upper half was loaded. For this purpose a wood box frame was constructed and tightly wedged under the contacts, but not braced to the sides of the pit, for the reason that in the opinion of the writer the thrust of the arch effect of the load was negligible.



End Elevation showing Falsework and Test Load in Place

FIG. 2. RING REPRESENTING GRAIN BIN IS TESTED TO DESTRUCTION

Originally it was proposed to load the upper half of the ring as a semi-circular arch with a uniform load of 550 lb. per square foot. As this was found impracticable, a concentrated load was applied by means of a wood box 6 x 10 ft. and 4 ft. high, weighing one ton and having a capacity of 8 cu.yd. of gravel, or 12 tons, this being suspended by $\frac{5}{8}$-in. wire cables crossed at the crown of the ring to prevent slipping, as shown in Fig. 2.

. Before any gravel was shovelled into the box, measurements showed a vertical deflection of $\frac{7}{8}$-in. and a total horizontal deflection of $\frac{5}{8}$ in. due to the dead load. When the load reached $1\frac{1}{2}$ tons, or one-eighth full load, a crack developed on the concave face of the crown directly under cable A and parallel with it, where a 1-in. jack rod had been placed within an inch of that face instead of in the middle of the wall as is done in actual construction. Corresponding cracks appeared on the reverse face at points D, E and C; or very nearly the third point of the quarter circle nearest the horizontal axis.

At half the load, or six tons of gravel, the vertical deflection was $1\frac{1}{4}$ in. and the total horizontal deflection $\frac{7}{8}$ in. At this stage of the test the concrete spalled off under the rod at A and the crack widened to $\frac{1}{16}$ in. and extended the full depth of the ring, or 4 ft. in length. Fine hair cracks appeared on the cross-section of the A-D quarter circle, showing that the strain was that of a cantilever with the load A at the end. It was apparent that the test would not be a fair one as far as the ring was concerned, the unsymmetrical deformation showing the effect of the unsymmetrical section due to the 1 in. jack rod under load A.

Fig. 3 is evidence of this. The section of the quarter circle B under the load was perfect, no crack being visible at cable B, where the wall was full 6 in. thick. But at A the jack rod served to reduce the section to $3\frac{3}{4}$ in. and the ring broke and dropped to the ground at ultimate failure due to bending and shear at this point. The failure was sudden and occurred as soon as box was full, the total superimposed load being 13 tons. The initial break was at A and was followed in the order named by breaks at D, C, F and G. There was a momentary pause in the collapse between breaks at F and G, the ring at G acting like a cantilever.

At no time during the test was the observed action of the ring that of an arch. There was no thrust to speak of, the wood support at D was simply pushed over at the collapse, while that at G remained standing. The action was more like that of a hoop and it must be admitted that the result was most satisfactory when due allowance is made for the unusual nature of the load. The test proved that, as some engineers have long contended, vertical reinforcing bars in grain bin walls, except such as are necessary for erection, are more detrimental than beneficial.

The writer has no hesitancy in drawing the conclusion that a circular tank designed for grain pressure will safely stand the same pressure on the convex side but that such a pressure per square foot should not exceed the pressure on the cancave side. The test was witnessed by engineers representing the Minneapolis Building Department and by G. A. Maney, in charge of the structural testing laboratory of the University of Minnesota.

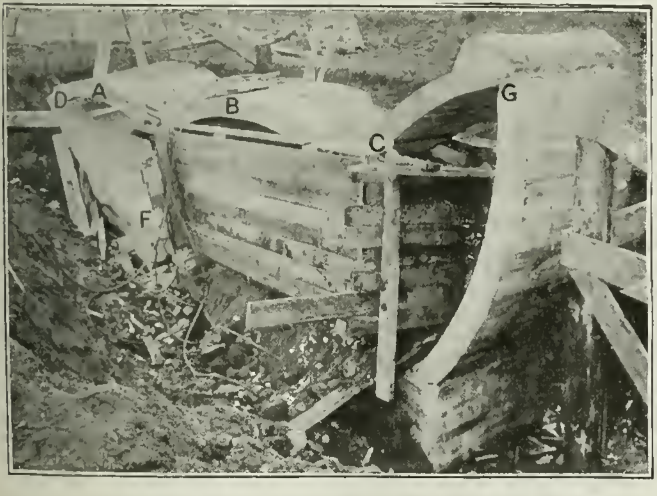
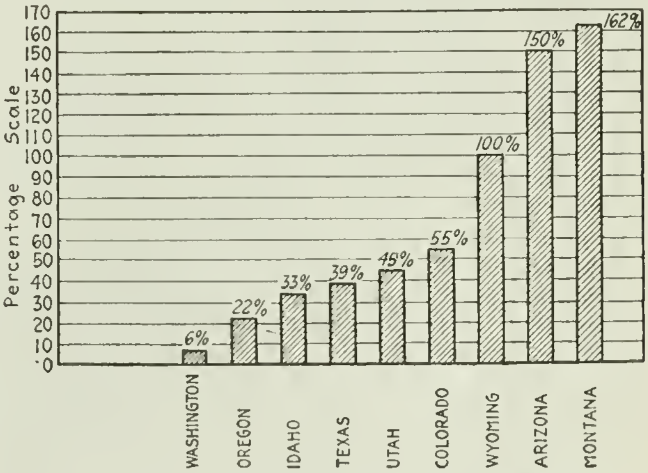


FIG. 3. CONCRETE RING AFTER TEST TO DESTRUCTION

How Western States Are Adding to Their Agricultural Areas

THE accompanying diagram shows the relative agricultural expansion that has taken place in Western states in the past decade. This comparison is of interest in connection with the proposed Columbia Basin project, a description of which appeared in the *Engineering News-Record* of Oct. 30-Nov. 6, 1919, p. 800, because it shows how far Washington is behind other Western states in which irrigation projects have increased the total cultivated land. The diagram was prepared by J. C. Ralston, consulting engineer, Spokane.



High Concrete Chimney Built on Steel Roof

Two concrete chimneys of an outside diameter of 15 ft. 6 in. at the bottom and 11 ft. at the top and a minimum inside diameter of 10 ft. have been built on the roof of the Montville power station of the Eastern Connecticut Power Co. at Montville, Conn. The chimneys are approximately 160 ft. high above the roof level, which is itself 90 ft. above the ground. Each chimney rests on an annular concrete mat 18 in. thick which is placed on an octagonal frame of steel girders, themselves supported on the main building columns. Steel rods $1\frac{1}{4}$ in. in diameter, spaced approximately 18 in. on center, anchor the lower sections of the chimneys secure to the girders. The chimneys were designed by the Harry M. Hope Engineering Co. of Boston, Mass, and are described in the January, 1920, number of *Contractors' Atlas*.

Impressions Here and There

THE CANADIAN ENGINEERS MEET

AFTER attending all the meetings and functions incident to the annaul meeting of the American Society of Civil Engineers it was an interesting experience the following week to attend the annual meeting of the Engineering Institute of Canada. One could not help contrast the two—and the contrast favors our Canadian brethren.

The differences are found in two respects; first, the institute has made a great success in developing its branches, and, second, our gathering had a funereal cast, contrasted with the enthusiasm and sociability of the Montreal events.

The fundamental difference between our business meeting and theirs lay in the evidence afforded by the reports of the branches and the Provincial divisions that the society is an active force in every part of the Dominion. That development is but three years old, dating from the reorganization of the society, when its name was changed from the Canadian Society of Civil Engineers to the Engineering Institute of Canada. Its course before reorganization had been a conservative, sober one, much like that of the American Society of Civil Engineers. This resulted in strong protest, culminating in a threat of secession on the part of the members in one of the western Provinces.

We have no doubt that the older conservatives felt, as do those in the American Society of Civil Engineers today, that the institute was headed for disaster. We took the trouble, therefore, of questioning many of those at Montreal whether the profession had lost by the change—and we questioned very particularly the older men, those who would appreciate that the most precious asset of the institute and of its predecessor, the Canadian Society of Civil Engineers, was its prestige, its professional standing. Without exception the answer was that the prestige had not been impaired and that the technical work had not suffered.

We believe that our own conservatives would have been heartened could they have been at Montreal, and measured the new strength that has come from the expansion of activity and interest, which, in turn, are due to the strengthening of the branches and the establishment of Provincial divisional organizations. We were told that before the reorganization the meetings were poorly attended and very stereotyped. The meeting this year was large, the largest in the institute's history (registration, including guests, 650) and more enthusiastic than any meeting of a professional body we have had the privilege of attending. If the Canadian experience is a criterion, the American Society of Civil Engineers will profit much by the strengthening of the sections and of the districts provided in the Development Committee's report.

Incidentally, the Canadians do not include in their branches every member of the society, as is proposed by our Development Committee. Only those are members of branches who reside within 25 miles of a branch headquarters or those at a greater distance who signify their desire to be members of a branch.

The Young Men—Quite in contrast with our experience, too, was the very evident interest and activity of the young men. We could not by lengthy discussion bring out the idea better than by stating that the Toronto Branch last year, out of its *fifteen* meetings, *held two expressly for the younger members*, one of them to give opportunity for the young men to express their views of what the institute could do to improve the status of the engineering profession in Canada, the other to get their views on the institute's proposed standard registration bill—enough said.

PAPERS AND ENTERTAINMENTS

The Montreal gathering differed from those of the American Society of Civil Engineers also in that, like the other national societies on this side of the international boundary, papers were read. In other words, there were technical as well as business sessions. We have no doubt that all present would agree that the meeting was all the better for it. Their minds met on large technical topics as well as on those professional and general topics which are the natural gist of conversation when engineers come together. In this respect, too, we are to follow our Canadian friends if the Development Committee's report is adopted.

As to the conduct of the meeting as a whole we can well take a leaf from our Canadian friends' book. From the convening of the business meeting on Tuesday morning, to the singing of "God Save the King" at the close of the concert-smoker Thursday night, the proceedings went with a snap that left nothing to be desired. The serious parts of the program were relieved by entertainment, both frequent and varied, resulting in a sustained interest and spirit that are difficult to describe without suspicion of exaggeration. There were luncheons Tuesday and Wednesday noon, a reception and dance Tuesday night, a banquet Wednesday night and the concert-smoker Thursday night.

The last event, the concert-smoker, we might particularly copy. The room was amply large, and, mercy of mercies, chairs were provided, gathered suggestively around tables. By contrast, we are still suffering from flat-foot from standing all evening at the Am. Soc. C. E. smoker. And on the tables were bottled goods that cheered—now banished from these arid states. The entertainers were first-class—both professionals and amateurs—led by Wilkie Bard, the famous English comedian, who was playing in the city at the time. Added to it all was a spirit of fellowship that made the company one—from the contingent of men of French descent who sang the praises of Laval to the last son of McGill or the University of Toronto or Queens who added his voice in the deafening volume of his university yell. We are sure that everyone went away with the feeling that the institute was a very real thing—something that helped him to come close to his brother engineer and to work with him for common objects.

Before we left we fished an invitation to come next year. We do not see how Toronto, where the next annual meeting is likely to be held, can possibly excel the hospitality and enthusiasm of Montreal, but the Toronto men somehow, we will wager, will do it as well. But whatever the program, if the good Lord spares us we mean to be there.

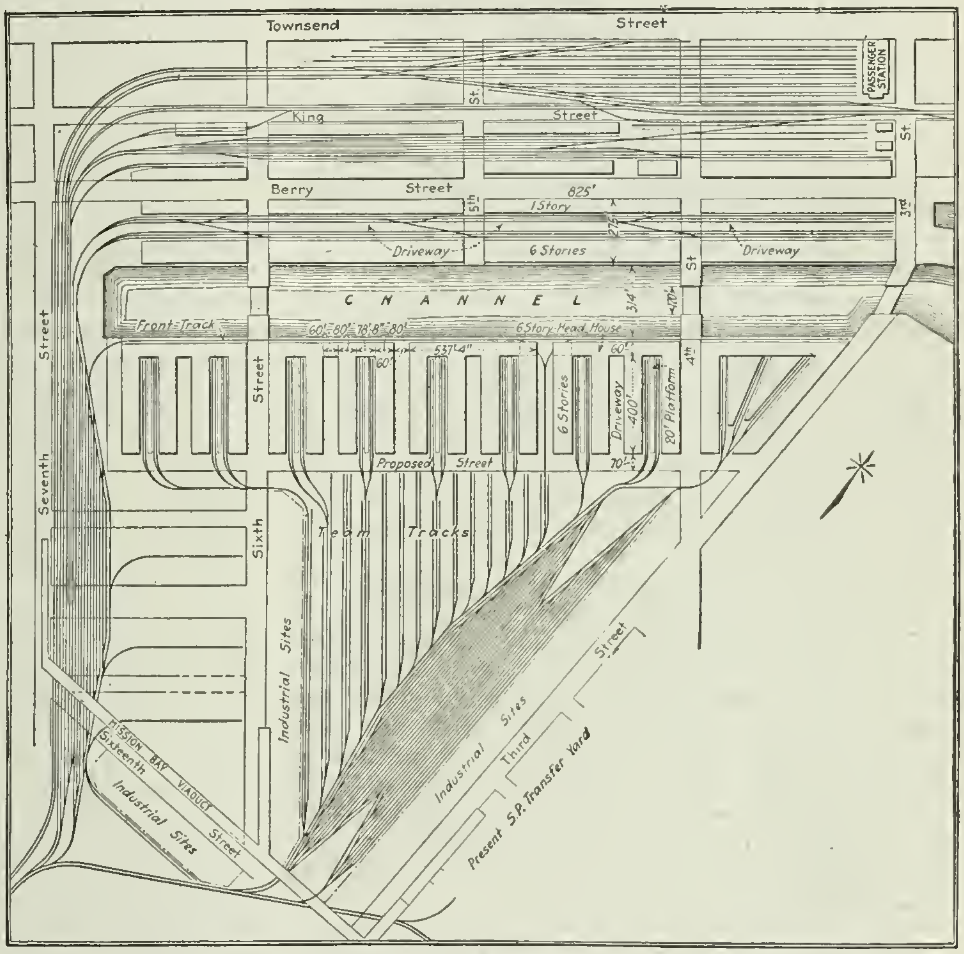
Montreal, Jan. 30, 1919.

New Industrial Development Planned at San Francisco

Southern Pacific Adopts Design for Rail and Deep-Water Terminal With Manufacturing Facilities on Channel Street Property

A PLAN for the extensive development of its Channel St. property at San Francisco, near the site of the present passenger terminal, has been adopted by the Southern Pacific Co. to convert the old channel into a deep-water harbor and to provide a rail terminal with manufacturing and warehouse facilities, in anticipation of the congestion which may follow the rapid growth of the city's industry with the opening of the Panama Canal. It is the present intention to call for bids for constructing the first unit of the development as soon as the detailed plans, now in course of preparation, are completed.

The general plan adopted, which is the result of several years' study of the situation, includes reinforced-concrete warehouses and facilities for light manufacturing, a freight storage yard, transfer platforms and elevators, switching and team tracks, driveways, freight sheds and industrial sites adjacent to the yards. The plant has been designed to operate both as a railroad and a ship terminal, to be used as either, as changes in conditions may require. As shown in the accompanying drawing, the site of the development is adjacent to the existing passenger terminal. With the exception of main-line tracks parallel to Seventh St., the only facilities now existing are those shown north of Berry St. The new development is planned to include all of the other facilities shown south of Berry St.



PLAN FOR INDUSTRIAL SITE COMBINES RAIL AND SHIP TERMINAL

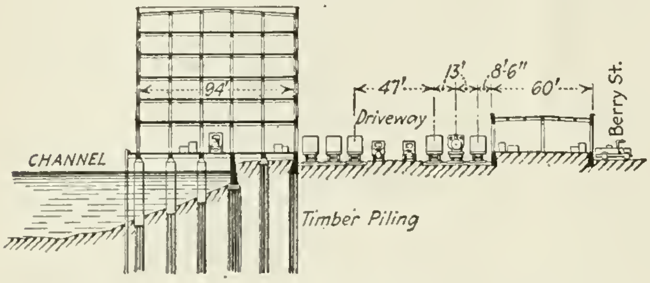
The six-story concrete warehouses, a typical section of which is indicated in the drawing, will be adapted for either storage or light manufacturing on both the north and south sides of the channel. The first floor of each warehouse is to be used as a transfer platform between railroad and ship, and under ordinary conditions will provide enough room for unloading to prevent demurrage of inbound freight cars. It will also be used as a place for the accumulation of freight, to minimize idle time of ships and cars.

The design for facilities on the north side of the channel was necessarily more complex than on the south side because of restricted area, and the fact that property is very valuable here on account of its proximity to the business center of San Francisco. The additional team-track space provided on the north side, together with the three inbound freight sheds, are intended to relieve the traffic congestion likely to occur nearest the center of business. On the south side of the channel, however, where considerably more area is available, it was practicable to incorporate in the plan the scheme which appeared to be best suited to traffic requirements. Headhouses, 537 ft. x 60 ft., are provided with six-story wings extending 400 ft. toward the south, between which lie alternately driveways and tracks. At the Galveston, Tex., terminal of the Southern Pacific Co. this scheme has proved especially suitable for inbound steamer freight, as cargo can be unloaded from the steamer; classified on the pier, and trucked directly to the cars. The number of available tracks will permit considerable classification of freight, obviating the necessity of providing more extensive classification-yard facilities and simplyfying their operation.

With the facilities offered for the rapid handling of freight, it is the purpose of the plan that a ship can be unloaded as rapidly as stevedores with the aid of modern machinery can perform the work, and then warped into another berth, loaded and sent to sea. It is also the purpose of the plan that freight cars shall be subject to as little delay. However, to provide flexibility of operation, the plan includes large storage yards with ample switching facilities to the warehouses and ships. Since some materials require a longer time to accumulate, and others may have to be stored before distribution, warehouse space is provided. The buildings are arranged for good lighting throughout for light manufacturing as well as storage. Driveways are located to give teams access to all of the facilities. To the south of the warehouses on the south side of the channel a street 70 ft. wide provides for the ingress of teams to driveways and team tracks for city delivery to and from the terminal.

Unusual Construction Problems

It is expected that unusual construction problems will be encountered in carrying out the development. For example, it is proposed to place a second-story clear balcony about 20 ft. wide for the entire waterfront side of all warehouses for delivery direct by steamship's tackle. The soft mud foundations will probably require very long timber piling and possibly cylinder piers down to mud line. The abutments of the present bascule bridge at Third St. were reinforced by steel struts after the San Francisco earthquake, and when the present channel is deepened to 33 ft. this steel will have to be removed and other provision made to support the concrete abutments. Connections with the front track along the south side of the channel will require heavy construction at two of the corners of the headhouses fronting the channel.



TYPICAL SECTION AT NORTH SIDE OF CHANNEL

Although the entire development is indicated in the plan, the design is such that the plant can be built in ten or more stages, each unit operating independently of the others, so that additional work may be undertaken as conditions determine. The railroad company has commissioned Bliss & Faville, architects, San Francisco, to prepare detailed plans for the first unit bounded by Fourth St., Berry St., Third St., and the channel. The cost of the first unit is expected to exceed $1,000,000. The plans and studies for the development were made under the direction of John D. Isaacs, consulting engineer Southern Pacific Co., New York.

New Brunswick Timber Surveys and Cruises

Locating and Marking Timber Block Lines—Cruising Parties—Methods for a Four Per Cent Cruise—Timber and Soil Maps

SURVEYS and timber-cruising operations as used in the administration of the New Brunswick forests are based on the system of allotting licenses by "timber blocks," areas of 1000 to 12,000 acres, averaging 4000 acres (about 200 chains square). G. H. Prince, provincial forester, described the methods recently before the Engineering Institute of Canada (see *Journal* of the Institute, October, 1919). The work involves running the block boundaries, then cruising (estimating the timber), and, finally, mapping.

In running the timber block lines, both retracing and the locating of new lines are involved. The law requires the work to be done by qualified Provincial Land Surveyors. Five crews have been employed during the present season, and some 700 miles of line has been run. The lines are being thoroughly blazed, stakes or trees being marked with chainage and block numbers every 20 chains; in addition, posts are set wherever the lines cross portages, streams, lakes, etc., and the posts are marked with their chainage from the nearest corner and proper block numbers. This enables the lumbermen's cruisers as well as the government rangers to locate themselves quickly wherever they encounter a post along a portage, by referring to their plans. All work is being done by compass. It is required that the lines close within a certain limit.

After this, the area is cruised. A cruising party usually consists of about 13 men, made up of chief, camp compiler, 3 cruisers, 3 compassmen, 3 calipermen, 1 teamster, 1 cook. The cruising is done by parties of 3 made up of a compassman, a cruiser and a caliperman. This cruising crew travels from one quarter-mile post across the block 200 chains to the post exactly opposite. The compassman directs the course and acts as head chainman. The caliperman acts as rear chainman and calipers the trees on one side of the chain for a distance of half a chain from it. The cruiser also calipers trees on the opposite side of the chain for the same distance and takes all the notes. No attempt is made to chain accurately on these so-called cruise lines, as the exact distance between the two block lines is known from the former survey. A cruising crew will cross a block twice, thus running five miles of cruise line a day, or recording the timber standing on a strip five miles long and one chain wide, or on 40 acres. The cruise lines are run parallel and 25 chains apart.

The types of timber (hardwood, softwood, burned land) are recorded. The cruiser also notes all topographical features—slopes, brooks, streams, rivers, roads, portages—with description of each. The notes, kept in loose-leaf metal folders, are turned in to the camp compiler each night and are plotted the following day, so that any errors or omissions may be properly detected.

The trees are calipered outside the bark 4½ ft. from the ground in order to avoid the swell of the root. They are recorded by species and diameter, so that a tally sheet will show so many spruce trees 8, 10, 12, 14, 16, 18 in. in diameter on the number of acres calipered. All visible defects that can be observed in the standing tree are allowed for when calipering the tree; hidden defects are covered by a deduction made from the estimate. The contents in board feet is arrived at by a volume table; the average per acre is applied to the total area of the same class of timber land. In this manner four acres out of every hundred are measured; or in other words, the survey is known as a 4% cruise. Check cruises are made after every cruiser twice a month, in addition to the above.

Notes are taken on the soil, rock and slope and other points affecting the possibility of using the land for agriculture. Small shovels are carried and the soil is examined to a depth of at least 12 in., or deeper if necessary to determine the nature of the soil and subsoil.

Two plans or maps are prepared, one showing all survey lines, posts, portages, lakes, etc., and the timber types, and one the soil conditions and topographical features. The plans are being prepared in blocks of 42,000 acres, each plan receiving a distinctive number. When the work is completed there will be 477 of these plans.

A Stone Beam Bridge in China Sixty Years Old

Solid Floor Highway Crossing With Deck of Stone Joists Supported on Thin Piers—Winter Bridges at Fords

By Donald F. McLeod
Tangshan Engineering College, Tangshan, North China

At TANGSHAN is found a bridge of a succession of stone girders, spanning about 10 ft. The bridge is remarkable both for its floor construction and for its piers. Two photographs of it are reproduced in the accompanying Figs. 1 and 2, and a sketch of its construction is given in Fig. 3. The structure throughout is built of a hard, tough limestone obtained from a nearby quarry.

Each span is supported by seven stone girders 23 x 16 in., laid close side by side, forming virtually a solid deck. These are covered with transverse stone slabs, and over all is a pavement of earth about 1 ft. deep. Thus there results a solid floor about 3 ft. deep, which gives no rumbling sound whatever under wheeled vehicles.

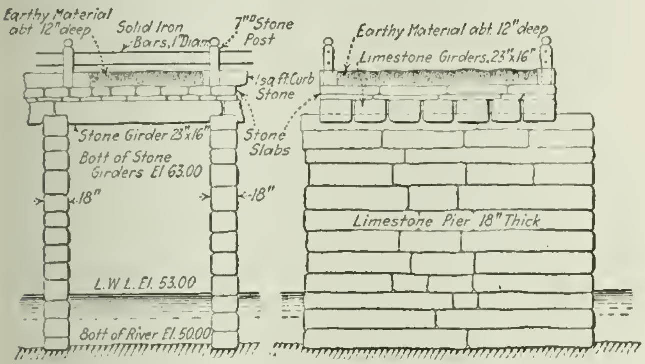

Earthy Material abt 12" deep
Solid Iron Bars, 1" Diam.
7"□ Stone Post
Earthy Material abt. 12" deep
Limestone Girders, 23"x16"
1 sq. ft. Curb Stone
Stone Girder 23"x16"
Stone Slabs
Bott of Stone Girders El 63.00
18"
18"
Limestone Pier 18" Thick
L.W.L. El. 53.00
Bott of River El. 50.00

FIG. 3. CONSTRUCTION DETAILS OF CHINESE STONE BEAM BRIDGE

From an American standpoint the railing is as unusual as the other parts of the bridge. It consists of solid 1-in. round iron bars, passing through holes in stone posts 7 in. square. The splices in these bars are made by flattening each bar to ½-in. thickness, lapping and riveting with a ½-in. rivet. Cemented-up holes about 4 x 6 in. in the posts indicate that the original rails were made of stone.

There is at least equal novelty in the pier construction, whose daring has been fully justified by the long life of the bridge. Each pier consists of only one thickness of stone, being 18 in. thick by 16 ft. long. The upstream end is cut to V shape, but the downstream end is left plain, the stones here projecting irregularly as determined by their jointing and lengths.

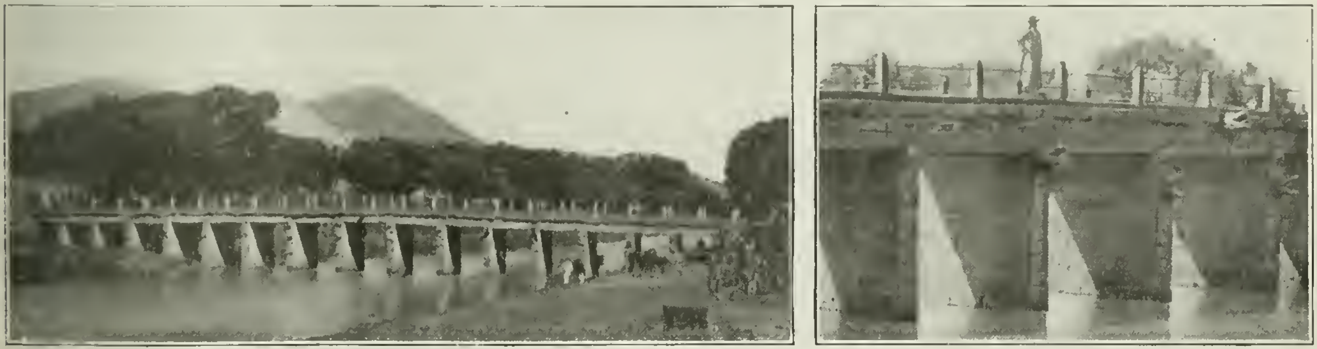
Apparently the piers are not widened out at the bottom in the form of footings, although the bearing pressure at the base is 14 tons per square foot, without allowing for live load on the bridge. There is no indication of rock in the vicinity of the site or probability of its occurrence at the depth to which the piers appear to be carried. One wonders how the Chinese engineer who designed the bridge decided that the soil would stand such high unit loads, and also by what means he decided on the proper length of span to give a minimum total cost for piers and stringers.

The writer is informed by a South China engineer that the above type of stone bridge is more common in China than the arch type, and that the maximum span for such beam structures is about 20 feet.

There is a pretty high factor of safety in this stone girder construction. With a load of 450 lb. per square foot and a live load of 100 lb., the maximum tension in the bottom of the beams, computed by the ordinary bending formulas, would be about 160 lb. per square inch, representing a factor of safety of nearly 8 on a modulus of rupture of 1200 lb. per square inch. Against shearing there is a very much greater margin.

One might conclude that the excessive number of piers leaves too little waterway. However, the unobstructed waterway amounts to about 470 sq.ft. in cross-section. The drainage area of the little river which flows under the bridge is 310 square miles. Assuming a velocity of flow of 7 to 10 ft. per second, a flood discharge of 40 to 50 cu.ft. per second per square mile would probably overtop the bridge and destroy it. However, there is no record of any flood great enough to fill the waterway, during the period of about 60 years since the bridge was built. The writer's measurements in the vicinity of the bridge for two winters gave a total precipitation, including melted snow, of about 1⅓ in. for December to May inclusive, and a total for the 12 months ending Aug. 31, 1919, of only 12½ in. The general conditions as observed by Americans resident here for the past eight years are that the ground is so dry after an autumn and winter practically devoid of moisture that the rains of spring and summer are almost entirely absorbed by the dry ground and thirsty vegetation.

Besides the ornamentation with dragon heads on piers and coping, as shown in the view Fig. 2, the bridge has carved panels in the walls of its approaches, some showing fruits and trees, others with inscriptions in the form of Chinese proverbs. Nearby is a huge



FIGS. 1 AND 2. STONE BEAM BRIDGE AT TANGSHAN, CHINA—10-FT. SPANS SUPPORTED ON 18-IN. CROSS-WALLS

tablet on which are carved the names of those who furnished the funds for the building of the bridge.

A different type of bridge is shown by the view Fig. 4, for the sake of contrast with the preceding. This is typical of bridges built at fords for about three months' winter service.

At many of the fords the bridges for the winter months are built only for pedestrians, wheeled vehicles having to go considerable distances to find bridges. These footbridges have a trestlelike structure, the bents consisting of a round cap with round posts mortised into it. The "floor" consists of a timber at each side, giving two 10-in. roadways about 5 ft. apart. Each timber is continuous over several bents and is connected to the adjoining ones at its ends by loose dovetail joints which will allow vertical motion. Often as the pedestrian approaches the end of the timber it suddenly sinks under him several inches. The Chinese, often carrying heavy loads, walk unconcernedly over these narrow, vibrating paths, when the penalty of slipping on the frosty or icy wood would be a 10-ft. plunge into deep, ice-incrusted water.

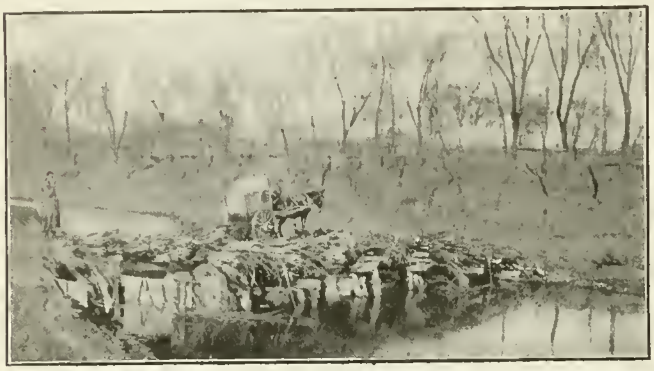


FIG. 4. TEMPORARY VEHICLE BRIDGE AT A FORD IN NORTH CHINA—FLOOR MADE OF SORGHUM STALKS

In the case of the vehicle bridge shown by Fig. 4, each bent consists of a round cap supported on a three-pile "dolphin" at each end, the dolphins being held together by sorghum stalks used as ropes. Sorghum stalks are largely used as a building material in North China; they have no sweet juice like the American variety, but furnish a cereal largely used by the Chinese. The flooring of the bridge here consists only of about 1 ft. in depth of the stalks, resting on round poles which form the stringers. However, as in the case of the stone bridge, the stringers really constitute the floor, as they almost touch one another and the stalks therefore span only a few inches across the gaps between the poles.

A decided camber is characteristic of all Chinese bridges. It may be seen in the stone-beam bridge as well as in the sorghum-floor bridge, and is found also in the footbridges built at the fords.

War Number of French Bibliography

To fill the war gap in the quarterly bibliography of French scientific and industrial works a special war number of *Les Noveaux Lives Scientifiques et Industrials*, covering the period from June 1, 1914, to Nov. 30, 1918, has been published (Dunod, Editeur, Quais des Gronds—Augustins, 47 et 49, Paris, France; 7½ francs). The bibliography fills 61 large pages, besides subject and author indexes.

Needed: A History of Engineering

By R. Fleming

American Bridge Co., New York City

An insistent, even if not loud, call has been made during the past few years for a "History of Engineering." Some thoughts of the writer on the subject may not be amiss.

In the first place, he suggests that the proposed history cover the fields represented by the four national societies: The American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers and the American Institute of Electrical Engineers. We will therefore have histories of civil, mining, mechanical and electrical engineering.

The term "History of Engineering," used throughout this article, will apply to any or all of these separate histories. The questions at once arise: What shall be the scope of the proposed history? What class of prospective readers shall be held mainly in mind? Under whose auspices shall the history be prepared? By whom shall it be written?

A monumental work in its scope is "A History of the Theory of Elasticity and of the Strength of Materials," by Todhunter and Pearson. The first volume was published in 1886. It was seven years later when the second volume was ready for the press, and even then Professor Pearson said in the preface: "To complete the work as I could have wished it completed would have needed the undivided energies, the fresh and undisturbed intellectual powers of several years' labor. As it is the editor has failed to fulfill the promise made on the title-page and bring the history down to the present time." But the hope of the editor has been realized—the work has taken its place as a standard work of reference, worthy alike of its authors and of the University which publishes it. The books are a series of treatises as well as a history. More than 300 pages are given to St. Venant, nearly 200 to Boussinesq, over 100 to Poisson, 77 each to Clebsch and Kirchoff. A history of engineering written on the same lines would be rather voluminous. However, two features can be especially recommended as a model for future historians: The painstaking care to verify all statements and the use throughout of a uniform terminology and notation.

Engineer Biographies

Books of a different kind are Smiles' "Lives of the Engineers." A great merit of Smiles' books is that they are written in an attractive style and are *readable.* The personalities of the early engineers, Brindley, Smeaton, Rennie, Telford, Watt, the Stephensons, pass vividly in review along with their struggles and accomplishments. Although they are interesting biographies and contain a great amount of historic fact they can hardly take the place of a history. For instance, Rennie's Southwark bridge over the Thames is described as consisting of three spans of cast-iron ribs, the center one "being not less than 240 ft." The weight of cast iron is given as 3,620 tons and of wrought iron 112 tons. The bridge engineer wishes to know more than this. How was a cast-iron arch designed a hundred years ago? What working stresses were used? The mechanical engineer will ask similar questions after reading Smiles' "Industrial Biography."

Another book of unusual merit is Thurston's "History of the Growth of the Steam Engine." (The third edition of the French translation is dated 1889.) The book is replete with details that we would not wish to see discarded. Opening it almost at random we come across the passage: "William Henry was a prominent citizen of the then little village of Lancaster, Pa., and was noted as an ingenious and successful mechanic. Mr. Henry was the first to make the 'rag' carpet, and was the inventor of the screw-auger. . . . About 1777, when Henry was engaged in making mathematical and philosophical instruments and the screw-auger, which at that time could only be obtained of him, Robert Fulton, then twelve years old, visited him to study the paintings of Benjamin West, who had long been a friend and protegé of Henry." Interesting as such details are, only a limited amount of room can be found for them in a history. If there is not room for both, personal details must give way to professional details, for the history should be an adequate work of reference for students, teachers and professional engineers.

The suggestion is made that a series of biographies be written along with the history. The material for both can be gathered at the same time. A text-book—something like Ball's "History of Mathematics"—could also be prepared from the combined history and biographies. It should always be kept in the forefront that the principal thing sought is the history. Monographs, biographies and textbooks should be byproducts of the making of the history. (Sometimes the byproduct has as great a value as the product.)

THE VALUE OF ACCURACY

An essential of a history is accuracy. This is especially true of an engineering history. To be "reasonably authentic" is not enough. It must be authentic. Dates must be verified, the development of processes traced through their different stages, and conflicting claims passed upon by the collecting of evidence.

It is highly important that data be obtained from original sources of information. Our printed engineering resources are enormous. In the published list of books in the John Crerar Library of Chicago on the History of Industry and Industrial Arts are 58 pages given to books and pamphlets relating to different branches of engineering. The Engineering Societies Library in New York City contains 145,000 books and pamphlets and receives regularly 1,100 publications. The Technology Department of the Public Library of the City of New York numbers over 60,000 volumes. Baltimore, Boston, New Haven, Pittsburgh and other cities have large technical libraries. The Congressional Library at Washington receives issues of all copyrighted books. Many manufacturing concerns possess important specialized collections. The publications of historical societies are sometimes of special interest to engineers; for instance: "A Lost Chapter in the History of the Steamboat," by J. H. R. Latrobe, published by the Maryland Historical Society, 1871. According to a writer in the *Canadian Engineer* the home of civil engineering is the headquarters of the Institution of Civil Engineers, London. In the reading room may be found copies of every engineering and scientific periodical published throughout the world. The library is said to contain copies of every book published on the subject of civil engineering.

The difficulty of selecting material from such an "embarrassment of riches" will be great. Carlyle says in his "Life of Frederick the Great": "Small use in a talent of writing, if there be not first of all the talent of discerning, of loyally recognizing, of discriminating what is to be written." A single case will be cited where discernment is needed:

TELFORD'S PROPOSED LONDON BRIDGE

Telford, in 1801, proposed a London bridge of a single cast-iron arch having an opening of 600 ft. with a versed sine of 65 ft. It was to consist of seven ribs and carry a roadway 45 ft. wide. Before any outlay was incurred in the construction, opinions as to its feasibility were obtained from the most eminent mathematicians and engineers of the day. A report embodying their opinions was prepared and submitted to Parliament. (The New York City Public Library has in its possession a copy of this report.) Parliament thought the project far too bold and the bridge was not erected. The report, of 85 pages, is especially interesting as showing the state of science at that time in England. The amount of space that should be given to this and similar reports will often be a problem to the historian. In the "Encyclopaedia of Civil Engineering, Historical, Theoretical and Practical," by Edward Cresy (1847) 18 of the 616 pages given to the "History of Engineering" are taken up with the report on Telford's proposed bridge. Strange to say, the Life of Telford, "written by himself" and published after his death makes no mention of the project.

Great patience will be a requisite in making use of our printed resources. To quote once more from Carlyle's "Frederick the Great": "Truth is, the Prussian Dryasdust, otherwise an honest fellow, and not afraid of labor, excels all other Dryasdusts yet known; I have often sorrowfully felt as if there were not in Nature, for darkness, dreariness, immethodic platitude, anything comparable to him. He writes big Books wanting in almost every quality; and does not even give an *Index* to them." In wading through long lists of patents or through books poorly indexed or not indexed at all, the historian will have a feeling of kinship with Carlyle.

ORIGINAL SOURCES OF INFORMATION

The process of searching for original sources of information is a slow one and not always fruitful. For instance, the idea of the "spread foundation" is attributed to Frederick Baumann, a Chicago architect. He described it in a pamphlet published in or about 1872. A reprint, *revised* by Powell, is printed as an Appendix to Powell's "Foundations," editions of 1879, 1884, 1889. But a reprint of an author's pamphlet revised by another is not the best historical evidence. The original is needed. The writer has failed to find this pamphlet in leading libraries of New York, Chicago and Washington. Another instance: No history of bridge engineering would be complete without a reference to the work of Unwin. In 1868 he delivered a series of lectures in which he recommended that definite working stresses be used instead of a "factor of safety," and higher working stresses be assigned to dead than to live loads. The following year these lectures were published in book form under the title "Wrought Iron Bridges and Roofs." The writer searched for the book in libraries for more than a year before finding two copies in an obscure second-hand book store. Systematized and concerted effort could do much in shortening the time spent in gathering necessary data.

The correct weighing of evidence and apportioning of credit will bring to deserved notice many unfamiliar names. Thurston, in his "History of the Steam Engine," says: " . . . but we shall see, as we examine the records of its history, that although James Watt was an inventor, and probably the greatest of the inventors of the steam-engine, he was still but one of the many men who have aided in perfecting it, and who have now made us so familiar with it, and its tremendous power . . . ." A similar statement may be made concerning other lines of invention as well as of engineering. Many worthy names are often forgotten in the pre-eminence of one. Biographers as a class are given too much to eulogy. In making heroes of their subjects they often fail to weigh evidence impartially and neglect to give credit where it is due.

Work on the proposed history should be begun soon. Smiles spent his spare time for years in gathering material for his biographies. "His works, therefore, have a historical value peculiarly their own. They are a storehouse of facts, gathered not so much from books as from intercourse with the living actors in the events which he chronicles, and from inquiry made on the scene of their labors. He has thus rescued from oblivion many incidents in the lives of the great engineers which would have been irretrievably lost but for his pious and enthusiastic care." When we think of the tremendous strides made in all branches of engineering in the past 50 years and then remember that some of the actors who have taken part are still living, the information which they can give should be obtained and recorded. It was only as far back as 1883 that the first skyscraper was built, a 10-story building in Chicago. The elevator came into existence with the skyscraper. In modern industrial buildings a great factor in the economic handling of material is the traveling crane. The first steam-driven traveling crane was built about 1850, a 20-ton electric traveler was built in France about 1883 and in 1889 the first three-motor crane was built by the Edward P. Allis Co., Milwaukee, Wis. The first high-tension line for the transmission of power in which steel towers were used exclusively was built in Mexico in 1903. These dates are not so far back but that complete and accurate information on high buildings, elevators, traveling cranes, transmission lines—and a score of other subjects as well—can largely be obtained from people now living.

Difficult to Find Publisher

Lack of incentive has probably been the reason why no adequate history of engineering has been written. It is doubtful if an author, after years of labor on such a work, would find a publisher. The purchases by engineers would be few because most engineers want only the latest information on the subjects in which they are interested. This is unfortunate, for no subject is thoroughly understood until its history is known. The sales of the history would therefore be limited almost entirely to libraries. For this reason the expense of bringing out the work would probably be greater than the receipts from sales.

Since it is hardly to be expected that an individual will donate sufficient funds to bring out a history of engineering it is suggested that it be done by the four national societies of engineers. By reason of its being the oldest the initiative belongs to the American Society of Civil Engineers. The field of this society is naturally the largest, covering as it does, bridges, canals, gas works, railroads, steel buildings and many other subjects. It may be seen from the *Proceedings* that the cost of its publications for the years 1913 to 1918 was $215,178.22 or deducting $21,005.81, the amount received from sales, the net expenditures by the society for its publication for five years was $194,172, an average of $38,834.40 per year. So the idea of spending money for publications is not new to this society. If it were to make an initial appropriation of $10,000 toward a history of civil engineering, and further appropriations as needed, and guarantee the publication of the volumes, there could be brought out at the end of five years a work that would be a monument to American scholarship and a standard of reference for years to come.

The same may be said of a history of any other branch of engineering prepared under the auspices of the society covering that particular field. A limit would of necessity be set upon the length of the work. This could best be done after the material was brought together. Perhaps 3 or 4 volumes, of 1,000 pages each, could adequately, but by no means exhaustively, cover the field of civil engineering. Biographies and monographs could be issued, if desired, before the completion of the entire work.

The actual work of writing and compiling would probably be done almost entirely by teachers of engineering. They not only have more time than practising engineers but are able to express themselves more clearly. Let it be remembered that history should be readable. Historians, like poets, are born, not made, and no man should undertake writing history unless he has what may be called the historical sense. He will also need to consult a wider range of books and papers than are found in the library of his own college. While his time would largely be a labor of love, he should be reimbursed for expenses incurred.

The decision as to the scope of the work, the appointment of an editor-in-chief, the assignment of subjects, the co-ordination of diverse opinions, and an endless amount of detail will involve a great deal of effort and labor by the societies taking part. But it is believed that in no other way can we have "A History of Engineering" worthy of the name.

Ohio River Sand Supply

Carl P. Leatherwood, of the Portland Cement Association, Parkersburg, W. Va., is responsible for the assertion that a well-known engineer in that city has compiled figures indicating that the Ohio River from Chester to Kenova, a distance of 273 mi., contains sufficient deposits of sand and gravel to build 45,000 mi. of concrete road, 18 ft. wide, 6 in. thick on the sides and 8 in. in the center. The engineer bases his conclusion on the following data:

Distance of Ohio River from Chester to Kenova, 273 mi.; average width of sand and gravel bars, 300 ft.; average depth of sand and gravel bars, 10 ft.

Assuming that 50 per cent of the length of the river bed is productive, there would be a yield of sand and pebbles of 80,080,000 cu.yd. While there is no way of checking the engineer's estimate, it is generally admitted, says Mr. Leatherwood, that the Ohio River can produce enough sand and gravel so that not a pound of fine or coarse aggregate need be imported to hard-surface every highway in the state.

About $9,000,000 Spent on Lincoln Highway in 1919

According to a careful compilation of the expenditures made by the various states and counties through which the Lincoln Highway passes, approximately $9,000,000 has been invested on its improvement in 1919, according to reports from the Lincoln Highway Association headquarters. The Lincoln Highway, which was at first largely a series of connecting county roads, has gradually become an integral portion of the several state-highway systems, through official action of the various states, with the result that the tabulation of expenditures provided direct to the Association by the state-highway departments of the eleven states traversed accurately indicate not only amounts expended but the mileage of improvement accomplished. In the majority of states Federal aid has largely augmented state and county appropriations, the route having been established as a Federal-aid road to be improved directly under the inspection of the Government for more than three-quarters of its total distance between New York and San Francisco.

Following is a statement of expenditures on the Lincoln Highway according to states, made during the season of 1919:

New Jersey	$1,383,572.00
Pennsylvania	1,418,169.28
Ohio	1,902,708.10
Indiana	742,218.30
Illinois	1,430,120.28
Iowa	256,899.29
Nebraska	613,025.00
Wyoming	127,009.94
Utah	225,528,54
Nevada	411,049.58
California	375,500.00
Total	$8,886,800.31

To that figure must be added some county construction and maintenance work and city paving for which it is impossible to get accurate figures. Conservative estimates resulting from actual inspection of such work in progress indicate that these unreported expenditures amount to over $500,000. The total expended during 1919 amounts to over $9,000,000. In addition, more than $2,000,000 has been provided for contracts let, but upon which final expenditures have not been reported.

In addition to maintaining at a considerable cost the Lincoln Highway during the 1919 season, 377.33 mi. of new permanent work have been accomplished, the new mileage being of the following types:

	Miles
Concrete	121.14
Brick	21.28
Bituminous macadam	17.61
Macadam	28.75
Gravel	69.25
Shale	2.00
Permanent earth grade	117.3
Total	377.33

The concrete and brick improvements were largely laid by Eastern States and California.

Owing to the sparsely settled regions west of the Missouri River on the route of the Lincoln Highway the improvement of the thoroughfare beyond the Missouri has been somewhat of a problem, and still is. It is considered that roadbuilding through these sparsely settled states must be considered a national problem and the Lincoln Highway, being a national highway, should therefore be constructed under Federal supervision and with funds partially derived from the United States Treasury. Some assistance has been given far Western States by the Association. Nevada was offered $125,000 should she raise a like amount, and as a result contracts were entered into in 1919 between the State of Nevada and the Lincoln Highway Association calling for the expenditure of over $425,000 of combined state, county and Federal funds in 1920. The Association did considerable work in Utah during 1919, for through the co-operation of the State Highway Department and the contribution of $125,000 by members of the Association, a mountain pass was opened and a cut-off constructed across the great American desert, which opens a route from Salt Lake City to the Pacific Coast.

During the past six years 1,060 mi. have been improved and the mileage has been shortened from 3,389 to 3,223. Something less than 1,000 mi. of highway still remain to be properly improved to an adequate standard, but for long sections the improvement has already been financed or is about to be financed, and the construction is but a question of the time needed to accomplish the work. Classification of the type of roadway along the 3,000-odd mi. is as follows:

	Miles
Concrete	294.84
Brick	212.58
Bituminous macadam	425.60
Macadam	286.65
Asphalt	78.00
Creosote block	5.90
Granite block	7.10
Graded gravel	770.75
Natural gravel	200.00
Shale	17.00
Graded dirt	817.57
Natural dirt	93.70
Sand	13.30
Total	3,223.00

Gas Holders Lawful Structures

Gas holders within city limits are lawful structures, according to the findings of the Massachusetts Board of Gas and Electric Light Commissioners, presented recently in a special report to the General Court at Boston. The investigation by the board was occasioned by the introduction last year of a House bill declaring unlawful the maintenance or operation of a gasometer "within 100 rods of a dwelling house in the City of Boston." The board, after discussing the general features of gas holders and the details of the North End holder of the Boston Consolidated Gas Co., which has a capacity of 2,500,000 cu.ft., a diameter of 160 ft. and rises to a height of 140 ft. above the foundation, submits the following conclusions:

"The gas holders now standing within the limits of the City of Boston, and particularly the North End holder, are lawful structures. A gas holder properly designed, constructed and operated is not *per se* a menace to the public safety and health, even though located in a thickly settled community such as the North End. The laws now in force requiring permits and prescribing safeguards for the structural safety of gas holders hereafter erected are ample. The use to which a holder is put is such as to involve little likelihood of developing structural weaknesses and possible danger to the public safety or health.

"So far as gas holders in use may become a nuisance or a menace to the public health, the board of health, as already indicated, has full power to deal with the situation, and in addition any party injured has his remedy at law for damages or in equity to enjoin the nuisance. A gas company cannot be deprived without compensation of the beneficial use of a gas holder merely on æsthetic grounds or for the improvement of the neighborhood in which it stands.

"In view of all the facts the Board deems that the proposed legislation is inexpedient."

Cost-Plus Contract Satisfactory on Boston Army Base

$25,000,000 Job Built Below Estimate at Unit Costs Slightly Above Similar Work Put Up Under Pre-War Conditions

BUILDING contracts during the war did not fairly represent normal conditions. It is doubtful if any but a cost-plus system could have been used in the rush of 1917 and 1918, certainly not on those jobs where construction progressed along with design. However, there has been much criticism of the cost-plus-fee contract, and allegations have been freely made that under it money was wasted shamefully on most of the war construction built under this form of contract. Regardless of the merits of such criticism in general, the operation of this form of contract on the Boston Army Supply Base is commended by the Constructing Quartermaster there, Lt. Col. Charles R. Gow, who before the war was a well-known engineer and contractor in Boston and who has now returned to private practice. It is Col. Gow's judgment that in spite of the unfavorable conditions as to labor and material under which the Base was built, the work was carried out as rapidly, as economically, and as well as any similar work under the lump-sum form of contract in pre-war times.

The Boston Army Supply Base, which was described in *Engineering News-Record*, Sept. 19, 1918, p. 522, consists of an enormous storehouse containing 1,600,000 sq.ft. of floor area, a three-story pier shed containing 500,000 sq.ft. of floor area, and a two-story wharf or cargo shed of approximately 325,000 sq.ft., in addition to minor buildings, such as power stations, electric supply stations, administration building, and the like. There were also involved the dredging of over 3,000,000 cu.yd. of material and the construction of 5,400 lin.ft. of concrete wharf, 18 miles of railroad track, water, sewerage, and drainage systems, and the many other factors which enter into the construction of a modern port terminal. Buildings were of the most modern up-to-date type of reinforced concrete, with every appointment and facility needed to produce an efficient shipping terminal for receiving, storing, and handling at the rate of 15,000 tons of supplies per day.

The estimated cost of this project was $28,043,000. The actual completed cost for the project—of practically the same scope as the one for which the estimate was made—was $23,250,000. The summary of costs is given in Table 1. It will be noted that there the summation gives a total of $23,800,829, or about $550,000 in excess of the final actual figures as noted above. The discrepancy is due to the fact that the cost figures in the table were made up last spring, whereas the final accounting was not completed until August, 1919. The difference is fairly well distributed among the various items, and is of no percentage importance in the summary.

The contract was let on the well-known Construction Division form, that is, cost plus a maximum fee. Work was begun on April 22, 1918. It was entirely completed in 13 months, but six months after it was started, the project was in partial use by the Government and it was used in its entirety within nine months, although minor features of construction work were made and completed until the ensuing four months had passed. This speed of construction is remarkable, regardless of cost, but it is a fact that the unit costs were not very much greater than for similar work during a normal period.

VIEW OF BUILDINGS OF THE BOSTON ARMY SUPPLY BASE

The work was undertaken during a time when war work was at its maximum. There was a great shortage in labor of all classes, and those obtainable were not on the average particularly efficient. Necessities of the case required continuous operation day and night, involving an enormous amount of overtime work for which bonus rates were paid in accordance with established union conditions in Boston, one of the strongest union cities in the United States. As a result, the average wage paid to the 7,000 men employed in the construction of this work was $7.59 per day. The forced conditions of progress made it necessary to maintain a maximum crew of men at all times in the several departments of the work, and prevented the application of the usual economic principle of transferring men from one employment to another, as the demand required.

Furthermore, the tremendous rise in values of materials and the difficulty of obtaining any sufficient quantities, and the necessity of purchasing large amounts of supplies from local retail stocks in order to maintain the continuity of output, would account for a very considerable increase in unit costs over normal times. On account of these conditions the Government anticipated costs approximately 50% in excess of pre-war times. The original estimates were based upon some such consideration.

It is, of course, difficult to make a direct comparison of the unit costs with any other work. The Boston Army Base buildings were of reinforced-concrete construction of a design much heavier than was ever used in the Boston district. The minimum floor design was for 300 lb. per sq.ft., and the maximum 600 lb. On account of the heavy type of construction and the completeness of equipment with which these buildings are provided, it is not possible to obtain exact comparisons between the unit costs and those of similar buildings in the same locality built before the war.

The cost of the main storehouse is shown in Table II, exclusive of so-called indirect and overhead charges. Table III shows the so-called indirect and overhead charges for the whole work. Some explanation should be made of the accounting. It will be noticed that the indirect and overhead charges amount to some 32.1% of the total cost of the work. They involve the general construction plant features applicable to the whole job, the contractors' and subcontractors' fees, the cost of the field office organization of the constructing quartermaster, not including the salaries of the army officers, which are in the aggregate so small as not to affect the total, the cost of the engineering, the field and office organization of the contractor, and the premiums on bonds and liability and workmen's compensation insurance.

A number of these features are very much larger than they would have been on normal work. The field and office organization of the contractor, for instance, was unusually large, because of the necessity for complying with Government requirements as to accounting procedure. The premiums on liability and compensation insurance, being based upon the payroll, are almost double for this work the amount which would have been paid under normal conditions and prices. There is likewise a considerable excess of cost in the miscellaneous indirect charges for temporary facilities due to the rush nature of the work, which made necessary the erection of extremely large storage buildings, an elaborate lighting plant for night work, and much duplication of equipment which could have been avoided under conditions of normal progress.

It will be noted that the contractor's and subcontractor's fees, as given in Table III under the head "Indirect Charges," amount to $625,000. Final accounting increased this amount to $638,486.46, distributed as follows:

General contractor	$250,000.00
Plumbing contractor	11,861.52
Heating contractor	35,000.00
Electrical contractor	25,526.42
Railroad, paving and underground contractor	87,500.00
Foundation contractor for storehouse	60,000.00
Foundation contractor for pier shed	68,598.52
Wharf work contractor	100,000.00
Total	$638,486.46

The combined fees paid and profits of the general contractor and all of the subcontractors amounted to 2⅔% of the cost of the project. The cost of engineering was about 2⅓%, including all salaries, supplies,

TABLE I. SUMMARY OF ALL COSTS ON BOSTON ARMY SUPPLY BASE

Structure	Total Cost			Size of Structures		Construction—Unit Costs —Square Foot Costs		Construction—Unit Costs —Cubic Foot Costs	
Item	Construction Costs (Not Including Indirect and Overhead Charges)	Indirect and Overhead Charges (Prorated)	Construction Costs (Including Indirect and Overhead Charges)	Gross Floor Area, Sq.Ft.	Gross Volume, Cu.Ft.	Not Including Indirect and Overhead Charges	Including Indirect and Overhead Charges	Not Including Indirect and Overhead Charges	Including Indirect and Overhead Charges
Clearing site	$29,704	$9,534	$39,238						
Dredging	1,444,000	463,453	1,907,453						
Railroads	612,230	196,496	808,726						
Streets	192,782	61,874	254,656						
Water supply	223,968	71,883	295,851						
Sanitary sewers	56,519	18,140	74,659						
Storm sewers	58,675	18,832	77,507						
Electrical distribution system	128,941	41,384	170,325						
Miscellaneous buildings	16,000	5,135	21,135						
Fence	10,100	3,242	13,342						
Granolithic sidewalks	3,304	1,060	4,364						
Cargo stages and gangways	8,200	2,632	10,832						
Administration building	237,759	76,309	314,068	33,350	417,000	$7.13	$9.42	$0.57	$0.75
Storehouse				1,689,000	24,000,000				
Foundations	1,266,588	406,512	1,673,100			.75	.99	.05	.07
Superstructure	5,232,252	1,679,296	6,911,548			3.10	4.09	.22	.29
Unloading platform and canopy	110,065	35,325	145,390	38,000		2.90	3.83		
Heating tunnel (under storehouse and to boiler house)	110,372	35,424	145,796						
Bridges from storehouse to wharf shed	55,184	17,711	72,895						
Wharves (including foundations for wharf shed)	1,522,218	488,557	2,010,775	389,100		3.91	5.17		
Wharf shed (above wharf deck)	1,485,276	476,700	1,961,971	327,600	9,100,000	4.53	5.99	.16	.22
Boiler house									
Building	182,279	58,503	240,782						
Equipment	263,979	84,724	348,703						
Electric sub-station									
Building	76,018	24,398	100,416		190,000			.40	.53
Equipment	116,000	37,230	153,230						
Fire station	11,364	3,647	15,011	2,675	34,400	4.25	5.61	.33	.44
Pier shed				562,200	10,400,000				
Bulkhead	321,895	103,312	425,207						
Sub-structure (including 1st floor)	939,384	301,496	1,240,880			1.67	2.21	.09	.12
Superstructure	2,049,748	657,868	2,707,616			3.66	4.83	.20	.26
Wharves at pier shed	255,750	82,083	337,833	63,000		4.06	5.36		
Total	$17,020,554	$5,462,760	$22,483,314						
Total indirect and overhead charges	5,462,760								
Total construction costs including above charges	$22,483,314								
Cost of land	1,317,515								
Total cost of project	$23,800,829								

Indirect and overhead charges equal 32.10% of the construction cost.

TABLE II COST OF STOREHOUSE, INCLUSIVE OF FOUNDATIONS, AND EXCLUSIVE OF INDIRECT AND OVERHEAD CHARGES, BOSTON ARMY BASE, JUNE, 1919

Description	Unit	Quantity	Material	Material Unit Cost	Labor	Labor Unit Cost	Total Cost	Total Unit Cost	Notes
Excavation and backfill		.	.	.	$408		$408	....	Partial cost of excavation of elevator pits.
Concrete cylinder piers	Number	577	$412,641	$715 10	853,947	$1,480.00	1,266,588	$2,195.10	(See detailed estimate sheet) Metal forms used on round columns only.
Forms—metal	Sq.ft	329,000	23,640	07					
Forms—wood.	Sq.ft Contact Surface	2,594,000	256,979	10	947,780	32	1,228,399	.42	
Reinforcing	Tons	7,000	674,433	96 35	180,950	25 84	855,383	122 19	Average cost of reinforcing rods $82.40 per ton, excl. of handl
Concrete mixing and placing	Cu.yd	84,412	673,000	7 96	184,802	2 19	857,802	10 15	Cement $2.17 per bbl.; sand $2.28 per cu.yd.; gravel $3.49 per cu.yd.
Miscellaneous iron	Tons	366	66,429	181 00	38,833	105 00	105,262	286 00	Includes col. guards, door sills stair-treads, railings, inserts building hardware, etc.
Brick work (sand lime)	Number M	2,902	56,367	19 42	56,871	19 53	113,238	38 95	Cost of bricks $10.50 per M lime $16 per ton.
Terra cotta partitions	Sq ft	33,542	4,757	14	3,354	10	8,111	24	Cost of 6-in. terra cotta blocks 10½c. per sq.ft
Rubbing and patching	Sq.ft.	340,000	1,473	004	67,000	20	68,473	20	
Plastering..	Sq.ft	65,725	1,737	03	9,202	14	10,939	17	
Cinder crickets	Sq ft	192,300	2,173	01	8,116	04	10,289	05	Material item includes cost of cement only. Cinders supplied from job.
Cement finish on roof	Sq ft	192,300	3,214	02	6,298	03	9,512	05	
Roofing.	Squares	2,158	22,120	10 25			22,120	10 25	Sub-contract.
Flashing, etc			4,365		481		4,846	..	Plastic slate flashing 13c. Metal flashing 30c per sq.ft.
Steel sash, glazing and painting sash	Sq ft	172,000	95,100	55	17,200	10	112,300	65	Labor item includes glazing and painting only. Sash furnished and erected at 22c. per sq.ft.
Picking concrete	Sq.ft	1,332,000			44,517	03	44,517	03	
Granolithic..	Sq ft	1,332,000	48,000	04	42,617	.03	90,617	07	
Wood block paving	Sq.yd	20,412	43,336	2 12	11,343	55	54,679	2 67	Cost of wood blocks $1.86 per sq.yd.
Painting (oil).			1,815		28,500		30,315		Used on iron, steel, piping doors, trim, etc.
Painting (cold water)	Squares	18,943	3,839	20	19,537	1 03	23,376	1 23	Used on walls, ceilings, columns etc. Brush work.
Steel doors.	Number	130	74,090	570 00	499	3.84	74,589	573 84	Kinnear vertical lift doors.
Wood doors	Number	78	821	10 52	16		837	10 75	Erection cost not included. Cost includes door frames.
Fire doors (tin clad)	Sq ft	19,314	17,350	88	15,780	81	33,130	1 69	This cost includes hardware.
Heating.	Sq.ft Radiation	76,839	130,869	1 70	47,815	62	178,684	2.32	This cost does not include any proportion of the general heating plant, nor of hot water sprinkler system.
Plumbing... ...	Number of fixtures	270	84,694		42,288		126,982		Includes rain water leaders.
Lighting.....	Number outlets	5,248	164,400		129,000		293,400		This cost does not include any proportion of the general electrical distribution plant
Elevators.......	Number	30	565,600		881		566,481		24 freight elevators at $21,110 each; 6 passenger elevators at $11,460 each. This price includes automatic hatchway doors, etc.
Sprinkler system and fire protection	Heads	16,680	298,000				298,000		Combination hot water sprinkler system and fire protection apparatus.
Miscellaneous equipment			6,364		3,299		9,563		Scales, trucks, etc.
			$3,737,606		$2,761,234		$6,498,840		
Loading platform and canopy	Sq.ft each	38,000	60,092		49,973		110,065		Exclusive of indirect and overhead charges.
Total storehouse (inclusive of foundations)			$3,797,698		$2,811,207		$6,608,905		

The storehouse is 1,638 ft. long by 126 ft. wide by 8 stories high. Gross square feet floor area 1,689,000 Gross cubic contents 24,000,000 cubic feet.

and expenses, except the salaries of the army officers. Reverting back to Table I, it will be seen that the direct cost above foundation of the main storehouse, a building with cubic contents of 24,000,000 cu.ft. and a floor area of 1,689,000 sq.ft., is 22c. per cu.ft., not including indirect and overhead charges. The indirect and overhead charges pro rated from Table III amount to 7c., so that the cost per cubic foot, including all indirect charges and excluding the foundation, which was extremely heavy, amounts to 29c.

An attempt was made by Col. Gow to compare the costs with previous work, on a fair basis. It is his conclusion that of the 7c. per cu.ft. included in the tabulation of indirect charges a certain percentage is necessarily large in comparison with more normal work, for the reasons set forth in the preceding paragraphs. He therefore assumed that 4c. would be a fair amount to charge for the indirect expenses in any comparison with pre-war construction. As nearly as he could ascertain from such inquiries as he made, buildings of a similar general type, but not nearly as substantial in character or equipment, were costing under competitive conditions in 1916-17 from 22 to 24c. per cu.ft. above the foundation. Deducting the 4c. for indirect charges would reduce this price to 18 or 20c. per cu.ft., which is to be compared with the 22c. of the Army Base storehouse figures. Under the same method of figuring, the pier shed cost 20c. per cu.ft. above the foundation and the wharf shed 16c. per cu.ft.

As a further comparison it may be stated that if the entire cost of the Army Base project, including the open wharves, open storage space, railroad yards and similar items, were put upon the cost of the buildings and the buildings were then rented on a basis which would yield to the Government 4½% income, the Government would be able to lease the three main buildings at an average rental of 43c. per sq.ft. per year.

This compares with 50 to 55c. now being charged in this locality for buildings of an inferior type having no water and scant railroad facilities. Buildings similar to the storehouse are now costing from 30 to 35c. per cu.ft. around Boston.

TABLE III. INDIRECT AND OVERHEAD CHARGES ON BOSTON ARMY SUPPLY BASE
(As of June, 1919)

Description				
Indirect Charges				
Unloading and loading plant		$290,000		
Towers and storage bins		156,500		
Operation of construction equipment not directly chargeable		400,000		
Repairs to construction equipment		237,000		
Cost of construction equipment worn out on the work		115,000		
Rental of construction equipment not directly chargeable		89,000		
Tools and reapirs to tools (including operation of blacksmith shop)		245,000		
Temporary lighting and power		213,000		
Temporary water supply		47,000		
Temporary buildings		360,000		
Temporary roads		160,000		
Temporary heat		23,000		
Maintenance of existing roads, off of site		600		
Temporary tracks		61,000		
Guards, watchmen and firemen		110,000		
Sanitation		26,000		
General cleaning up		84,000		
Contractor's and sub-contractor's fees		625,000		
Other indirect expenses (too small for separate account)		63,000		
Freight and express charges paid on materials not charged directly		23,000		
Purchase, operation, maintenance and rental of trucks, ambulance, fire apparatus, etc		33,000		
Team service		3,400		
				$3,364.500
Overhead Charges				
Field Office Organization of Constructing Quartermaster				
Salaries		$410,000		
Transportation and expenses		1,000		
Office furniture and fixtures		14,900		
Office supplies and expenses		33,000		
Purchase, operation, maintenance and rental of automobiles		6,200		
			$465,100	
Engineering				
Consulting engineers, fees and expenses	$65,000			
Salaries, assistants and inspectors	410,000	475,000		
Associate engineers on heating—fees, salaries and expenses		26,500		
Engineering supplies and miscellaneous expenses		90,500	592,000	
Field and Office Organization of Contractor				
Salaries		$501,150		
Transportation and expenses		11,000		
Office furniture and fixtures		21,500		
Office supplies and expenses		50,000		
Purchase, operation, maintenance and rental of automobiles		35,000		
			618,650	
Miscellaneous				
Premium on bonds		$2,510		
Premiums on liability and workmen's compensation insurance		420,000		
			422,510	2,098,260
Total				$5,462,760

The form of contract and its adaptation to Government work were the result of studies and examinations made by Brig. Gen. R. C. Marshall, Jr., Chief of the Construction Division. The work was let to W. F. Kearns Co., Boston, general contractor, and the engineers were Fay, Spofford & Thorndike, of Boston.

Accidents to Railroad Employees Decrease

Records compiled by the Safety Section of the Division of Operation, United States Railroad Administration, recently made public by the Director General, show that during the first ten months of 1919, 1,107 fewer employees were killed in accidents and 25,930 fewer employees were injured during the corresponding period of 1918. Since the Safety Section had only begun to function in January, 1919, these figures are considered evidence of the application of safety practices.

Tunneling Machines Successful on Detroit Sewers

Machines Drive 10 to 12 Ft. Bore 12 to 15 Ft. Per Day—Either Concrete or Brick Lining Practicable

MACHINES which bore a tunnel to full size in a single auger-like operation are demonstrating their economic success in the construction of the new outer-ring sewer system for the City of Detroit, Mich. Tunnels for sewers from 7 to 9½ ft., interior diameter, are being bored with equal success, and both concrete and brick sewer rings are being constructed behind the machines. An advance of 20 ft. a day is not uncommon, and an average progress of 12 to 15 ft. a day has been recorded over long periods. A homogeneous material which cuts smoothly and will stand unsupported for distances up to a day's advance is necessary for the best success of the machines. A material which contains boulders or unstable spots and in which roof support is necessary, complicates the problem of using the machines successfully.

Tunneling for circular sewers of the larger sizes has become virtually standard practice in Detroit. On the new outer-ring sewer system tunneling operations by hand, with shields and with tunnel boring machines are in progress. The city's remarkable subsoil conditions are the reasons for this general practice of tunneling. Under a 10 to 12-ft. crust of stiff, yellow clay there is a great depth of material which physically resembles a very smooth blue clay. Ordinarily, boulders or stones of any size are remarkably scarce. At points of the city area, sand in the form of pockets or strata is interspersed with the clay or is mingled with the clay and produces areas less stable than the clay. The clay contains some water but is quite impenetrable by water. In its best character it will stand unsupported in tunnel for considerable distances and periods of time. From this perfection of stability it varies in all degrees to material which must be closely braced. In a broad sense, Detroit clay may be classified as a stable material for tunnel construction.

Tunnel boring machines are not a device which is new with the construction of the new outer-ring sewer system. A machine of one of the two forms now being used was successfully employed as long ago as 1914. The other form of machine was first used in 1916. Since then both forms have been repeatedly employed and brought to greater perfection. Both machines are alike in the respect that each consists of a cutter head on a horizontal axial shaft operated by an electric motor and all mounted on a carriage.

BORING PROCESS

With the older machine, known locally as the Carpenter machine, the face is excavated, working outward from the center, in concentric ribbons. The earlier form of this machine and its operation were described in *Engineering News*, Oct. 29, 1914, p. 874. The strips cut from the face drop to the tunnel floor and are loaded by hand into buckets directly, in tunnels of small section, and, in tunnels of large section, onto a belt conveyor which extends back from the machine to cars on the tunnel service track. With the more recent machine, known as the Anderson machine, a thin sheet the full diameter of the face is removed at each revolution of the cutter head. Radial buckets catch the material and guide it to an axial screw which feeds onto a belt conveyor leading back to spoil cars.

In the Carpenter machine, there is provision for feeding forward the cutter head for 2 to 3 ft., independently of the carriage. When this advance has been completed the cutter head is drawn back and the carriage is run ahead for a new drive. The advance of the Anderson machine is continuous, it being mounted on multi-ped drivers. Both machines cut a true cylinder, quite smooth inside, ordinarily 3 in. larger in diameter than the outside diameter of the planned sewer section. Change of diameter is accomplished by contracting and expanding the cutter heads.

Linwood Ave. Operations Typical

Typical operation is represented by the work of contractors Jaynes & Affeld on Linwood Ave. Machine tunneling is here employed for three-ring brick sewers from 8 ft. 9 in. to 9 ft., to 9 ft. 3 in., to 9 ft. 6 in. in diameter. Shafts are sunk at 1,000-ft. intervals and machines are worked both ways from each shaft, giving continuous drives of 500 ft. for each machine. A 9-hr. day shift is operated—8 hr. boring and 1 hr. cleaning the machine for the next day's work. Average and maximum daily advances for a typical month are given in Table I. Spoil is handled from heading to shaft in boxes on cars and at the shafts is hoisted and dumped into wagons. Where timbering is required, it consists usually of roof cants to the quarter points, with their feet set into notches cut into the clay walls. These cants support blocking, which carries lagging plank.

TABLE I. TUNNELING MACHINE OUTPUT ON LINWOOD AVENUE SEWER FOR TYPICAL MONTH

Sec. I—Anderson Machine					Sec. II. Carpenter Machine				
Shaft No.	Size Ft.	Size In.	Aver. Ft.	Max. Ft.	Shaft No.	Size, Ft.	Size, In.	Aver. Ft.	Max. Ft.
1	9	6	12	16	1	9	0	11½	13
2	9	6	14½	19	2	9	0	11	14
3	9	3	15½	20	3	8	9	12	15
4	9	3	14	18½	...	...	...	...	..

During the night shift, the day shift drive is bricked up. Usually the procedure is about as follows: All the bricklayers, five or six, start behind one machine and complete the invert and erect the ribs for the arch centers. These ribs are steel channels. Then about half of the gang is shifted to the opposite heading to build invert while the other half remains in the first heading to construct the arch. Brick and mortar are brought from the shaft top in cars on the tunnel track.

As examples of typical gangs, one gang on 9 ft. 6 in. sewer and another on 8 ft. 9 in. sewer, are selected. These gangs are averaged for a month.

ANDERSON MACHINE

Day
1 foreman
4 muckers
8 wheelers
4 machine operators
6 teams on top
5 laborers on top
1 engineman
1 handy man

30—Total

Night
1 foreman
6 bricklayers
10 helpers
5 topmen
1 enginemen
1 night foreman

24—Total

On the 9 ft. 6 in. sewer, the average time worked was 8 hr. excavating and 10 hr. bricklaying per day. The sewer required about 550 brick per lineal foot. The force listed was divided between two headings or two tunneling machines.

On the 8 ft. 9 in. sewer the average time worked was 8 hr. excavating and 8 hr. bricklaying. The sewer required about 515 brick per lineal foot. As in the larger tunnel the men listed were divided between two headings.

CARPENTER MACHINE

Day
1 foreman
8 muckers
8 wheelers
4 machine operators
1 engineman
5 teams
1 handy man
2 dumpers
5 laborers on top

35—Total

Night
1 foreman in tunnel
4 bricklayers
6 helpers
2 mortar men
3 piling brick
1 engineman
1 night foreman

18—Total

To allow a more general average and to eliminate the personal equation in gang handling which may characterize records from the operations of one contractor the gang employed on a 9-ft. sewer by the J. Connelly Contracting Co. is given. On this contract the average daily advance per heading is 12 ft., the drives being short due to poor roof. The gang is divided between two headings, as in other examples given, and is as follows:

ANDERSON MACHINE

Day
1 foreman
2 machine operators
4 machine helpers
2 top men
2 dump men
4 teams
3 motor trucks
4 muckers
2 mules and drivers
2 elevator men

26—Total

Night
1 foreman
4 bricklayers
4 helpers
2 mules and drivers
1 elevator man
3 laborers below
2 mortar men
3 piling brick
1 engineman

21—Total

Based on the data given and on other data collected but not given the following general statements of experience with tunnel-boring machines in Detroit are possible.

For sewers of sizes in which competition between machine driving and hand driving is possible, the comparative daily progress per heading is 8 to 10 ft. for hand work and 12 to 15 ft. for machine work.

The bore made by machine is more smooth and more true to size than the bore made by hand. This is found to be an advantage in two particulars: (1) Less packing is required to fill voids outside the planned section; it is estimated that the reduction due to this cause is 3 to 4 per cent in the volume of brick used. (2) Compared with the gouged surface left by hand excavation the smooth cut of the machine forms an earth arch which has less tendency to scale and cave.

True alignment of the boring machine is necessary to develop these advantages, and reasonably careful checking is required to hold the bore true. Ordinarily, true center is given to the machine operators every two hours. The tendency of the machine is normally to "nose-up." This tendency is not counteracted too strongly, since if a rise or a dip is to occur it is better that it should be a rise; the extra excavation required to correct the bore is more easily accomplished in the invert than in the roof.

Horizontal curves are successfully turned. On 8½-ft. sewer two 50-ft. radius curves were turned and the average drive per day was 13 ft.

The space occupied in the heading is 12 ft. by the Anderson machine and 9 ft. by the Carpenter machine. These lengths of bore cannot be bricked up and this introduces in machine tunneling a constant length of roof which must stand unsupported by masonry for a considerable period. In uncertain ground this is a difficulty which complicates machine tunneling. If boulders or large stones are encountered the machines must be stopped and the obstruction be removed by hand.

Machine failures are rare with the latest improved designs. Most trouble is experienced with conveyor breakdowns. Machine improvements which have suggested themselves are provision for withdrawing the machine from the face back into the completed lining to permit lining to be carried close to the face or the face to be quickly got at for emergency bracing, and provision for boring and lining simultaneously, making the tunneling operation continuous.

The outer-ring sewer system on which the operations described are in progress is being constructed under the direction of City Engineer C. W. Hubbell, with J. R. Hendry as designing engineer and A. L. Sears as construction engineer.

Eccentric Loading in Rigid Frames

How the Fundamental Frame Formulas May Be Applied When Columns of Frame Have Loads Applied Eccentrically

By F. E. Richart
Illinois Engineering Experiment Station, Urbana, Ill.

In the design of rigid frames, particularly those of reinforced concrete, it is frequently desirable and sometimes necessary to introduce eccentric loads on the columns of the structure. Examples are to be found in crane brackets on the columns of factory buildings and in balcony or gallery cantilevers attached to the columns in theaters, gymnasiums, and similar buildings.

The stresses in eccentrically loaded columns have been analyzed by many writers, particularly for the special cases of hinged and fixed ends, and with the load applied at any point along the height of the column. It is the purpose of this article to discuss a general method of investigating the moment distribution in a rigid frame having eccentrically loaded columns, in which case the column ends are usually only partly restrained.

The frame shown in Fig. 1 may be studied by making use of the analysis of a frame similar to this one but having a horizontal load applied at the point E instead of the eccentric vertical load. Such an analysis is given in Bulletin 108, Engineering Experiment Station, University of Illinois, as an example of the use of the "slope-deflection" method. The expressions which are given for the moments at the corners of the frame are

$$M_{AB} = -\tfrac{1}{2}\left[C_{AD}\,n\left(\frac{n+2p}{\alpha}+\frac{3}{\beta}\right)+C_{DA}\,n\left(\frac{p}{\alpha}+\frac{3}{\beta}\right)-M_O\left(\frac{3n+p}{\beta}\right)\right] \quad (1)$$

$$M_{BC} = -\tfrac{1}{2}\left[C_{AD}\,n\left(\frac{n+2p}{\alpha}-\frac{3}{\beta}\right)+C_{DA}\,n\left(\frac{p}{\alpha}-\frac{3}{\beta}\right)+M_O\left(\frac{3n+p}{\beta}\right)\right] \quad (2)$$

$$M_{CD} = -\tfrac{1}{2}\left[C_{AD}\,n\left(\frac{1}{\alpha}-\frac{3}{\beta}\right)+C_{DA}\,n\left(\frac{n+2}{\alpha}-\frac{3}{\beta}\right)-M_O\left(\frac{3n+1}{\beta}\right)\right] \quad (3)$$

$$M_{DA} = -\tfrac{1}{2}\left[C_{AD}\,n\left(\frac{1}{\alpha}+\frac{3}{\beta}\right)+C_{DA}\,n\left(\frac{n+2}{\alpha}+\frac{3}{\beta}\right)+M_O\left(\frac{3n+1}{\beta}\right)\right] \quad (4)$$

in which $n = I_1h/I_0l$, $p = \frac{I_1}{I_3}$, $\alpha = n^2 + 2n + 2np + 3p$, and $\beta = 6n + p + 1$. The moments are considered positive when they tend to rotate the member in a clockwise direction.

The four terms, n, p, α and β are seen to be constant

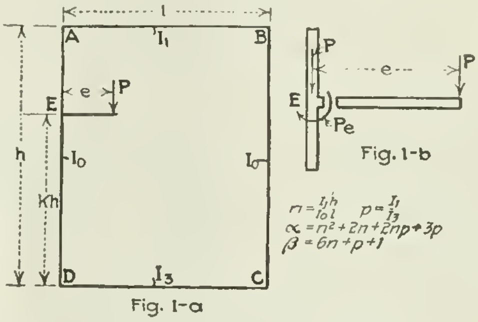


FIG. 1. DIMENSION AND MOMENT RELATIONS IN ECCENTRICALLY LOADED FRAME

for any given dimensions of the members of the frame, while the terms C_{AD}, C_{DA} and M_O depend upon the loading. C_{AD} and C_{DA} are the moments which would occur at A and D respectively, due to the given loading, if the ends at A and D were fixed. M_O is the moment of the external loads about the point D.

It has been noted that equations (1) to (4) have been derived by the use of the slope-deflection method, which consisted in writing an equation between moments, slopes and deflections for each of the component members of the frame, and solving for the unknown moments. The general form of the slope deflection equation, expressing the value of the moment at the end A of a member AB carrying transverse loads P_1, P_2, etc., is

$$M_{AB} = \frac{2EI}{l}\left(2\theta_A + \theta_B - 3\frac{d}{l}\right) \pm C_{AB}$$

where E is the modulus of elasticity of the material, I is the moment of inertia of the cross section (considered

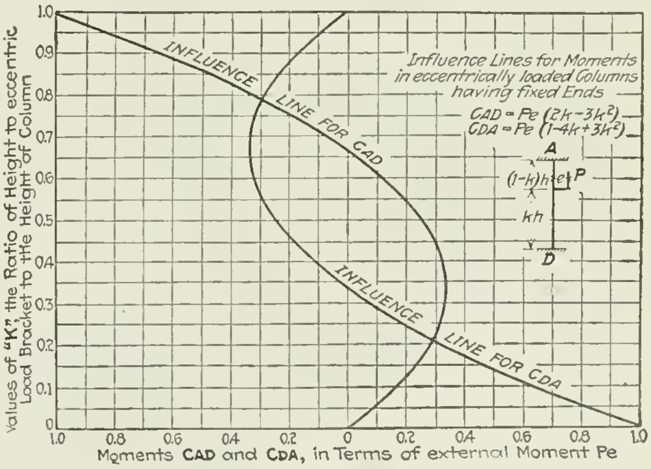


FIG. 2. END MOMENTS OF COLUMN AS AFFECTED BY POSITION OF BRACKET

constant throughout the length of a member), l is the length of the member AB, θ_A and θ_B are changes in slope from the initial position at A and B respectively, d is the deflection of one end with respect to the other, and C_{AB} is the moment which would occur at A if AB were a fixed beam and subjected to the same transverse loads P_1, P_2, etc. It is clear that if the loads P_1, P_2, etc., are replaced by a couple, the only result on the calculations will be to change the value of the quantity C_{AB} in the slope-deflection equation, and hence in the derived equations (1) to (4).

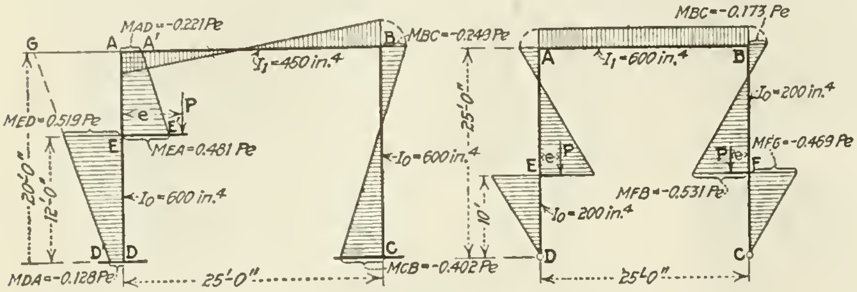


Fig. 3 Fig. 4

FIGS. 3 AND 4. TWO EXAMPLES FOR FRAME CALCULATION

From Fig. 1b it may be seen that the eccentric vertical load produces at E a couple Pe and a direct compressive force P in the column. The values of the three load terms due to this couple Pe now become

$$C_{AD} = Pe\ (2k - 3k^2)$$

$$C_{DA} = Pe\ (1 - 4k + 3k^2)$$

$$M_O = Pe$$

where k indicates the proportional height of the column at which the eccentric load acts. These values of C are given in various text-books; see, for example, Hool & Johnson's "Reinforced Concrete Handbook," p. 383. Fig. 2 shows influence lines for C_{AD} and C_{DA}, as the couple Pe is considered to act at successive points on the column.

It is to be noted that equations (1) to (4) will apply to a frame having the columns fixed at the bases if the term p is set equal to zero; that is, the member CD is made infinitely stiff and unyielding. On the other hand, the equations may be simplified so that they will apply to a frame having the columns hinged at the bases by making the member CD become infinitely flexible, so that the ratio I_1/I_3 approaches infinity; then all terms in the equations which do not contain the quantity p may be neglected.

TWO ILLUSTRATIVE EXAMPLES

A numerical example will serve to illustrate the foregoing statements, and to show the procedure in attacking this sort of problem. From the data given in Fig. 3, for a frame *fixed at base*, $n = 0.6$, $p = 0$, $\alpha = 1.56$ and $\beta = 4.6$. By reference to the influence lines of Fig. 2 it is seen that with the couple acting on the column at height 0.6, the moment $C_{AD} = 0.12\ Pe$ and $C_{DA} = -0.32\ Pe$. Hence the moments at the four corners of the frame are found by substituting these numerical terms in eq. (1) to (4). It is known that the shear in the column AD is constant; hence to determine the moment variation in this member, extend the line $A'A$ which represents the moment at A, to G, making $A'G$ equal to moment Pe. Then the line GD' bounds the moment diagram below the point E, and the parallel line $A'E'$ bounds the moment diagram above the point E. The moment diagram for the entire frame is shown in Fig. 3.

As a second example consider the frame of Fig. 4. Here equal eccentric loads are applied at similar places on both columns, so that the frame and loading are symmetrical about a vertical center line. Eq. (1) to (4) applied here give the following values for the closed rectangular frame with eccentric loads on both columns:

$$M_{AB} = M_{BC} = -\frac{n}{a}\Big(C_{AD}\ (n + 2p) + C_{DA}\ p\Big)$$

$$M_{CD} = M_{DA} = -\frac{n}{a}\Big(C_{AD} + C_{DA}\ (n + 2)\Big)$$

With hinges at C and D all terms not containing the quantity p are neglected, and the above expressions reduce to

$$M_{AB} = M_{BC} = -\frac{n}{2n+3}\Big(2\ C_{AD} + C_{DA}\Big)$$

$$M_{CD} = M_{DA} = 0.$$

For the dimensions given in Fig. 4, $n = 3$, $C_{DA} = -0.12\ Pe$ and $C_{AD} = 0.32\ Pe$. Hence the moment at A or B becomes $-0.173\ Pe$ and the moment diagram for the whole frame is as indicated in Fig. 4.

It is hoped that the analyses of these rather common types of frame here presented may be found useful; however, further than this it is desired to emphasize the fact that the analysis of any sort of frame or arch subjected to a single concentrated load may be readily extended to investigate the effect of applying a couple at the same point.

Imhoff Operation Simplified by Extra Drain —Unit Costs Given

IN THE circular Imhoff tank in a sewage plant recently completed for Montezuma, Iowa, operation is facilitated by the addition of a drain with the flow line at such an elevation that the sewage may be drawn readily below the slots in case it becomes necessary to work upon the walls of the settling chamber. The tank is 20 ft. in diameter and 29 ft. deep. Prof. J. H. Dunlap, of the State University of Iowa, designed the plant, and a description written by him appears in a recent issue of *The Transit*, published at the university. He states that in actual operation of tanks in towns of the size of Montezuma, about 1500, not infrequently the sedimentation chamber is allowed to become completely sludged up and thus transformed into a small septic tank. In order to clean out the sedimentation chamber it has been found necessary to lower the sewage below the slots and then force the sludge down through the slots, carefully squeegeeing the walls and aprons.

Some of the unit costs of the plant, based upon labor at \$4 per day and teams at \$7 per day of 10 hours (until late autumn, when the day was shortened to eight hours) are as given below. The haul of 1.3 miles was over a fair road, with no upgrades. The costs are as follows: Earth work by slip scrapers, 1060 yd. at 47c.; excavation for tank by hand before banks caved, 408 yd. at 82c., and after cave-in with bracing, same amount, \$2.70; sodding berms of filters, 20½c. per square yard. The total cost per yard of the filter sand in place was \$1.86 per ton, made up as follows: Cost, f.o.b. sand company's plants, 35.; freight, 90c.; unloading, mostly from box-cars, 6.3c.; hauling, 39c.; unloading from wagons, 2.2c.; leveling and spreading with a backfilling machine, 13.1c. The 1:2:4 concrete in place in the cylindrical walls of the tank cost \$14.65 per yard. The distribution is as follows: Cement, 6.4 sacks f.o.b. Montezuma, at \$2.28 per barrel, \$3.65; hauling, \$0.18; sand, 0.45 yd. at \$2.65, \$1.19; gravel, 0.9 yd. at \$3.59, \$3.23; reinforcement, \$1.49; setting forms and reinforcing, \$2.93; mixing and depositing, heating sand, gravel and water, \$1.98.

Field Manual for the Idaho State Highway Department

IN BUILDING up a state highway organization in Idaho to meet more nearly the conditions imposed by the participation of the state in the benefits of the Federal-aid road act, and also to co-ordinate the work of the various engineers and employees, a field manual of regulations and procedure was issued July, 1919. It is in loose-leaf form, 3¾ x 6¾ in., and is used as a guide only, being subject to change as conditions are altered. The plan adopted for the administration of the Bureau of Highways, which is under the commissioner of public works, consists in the division of the state into seven districts, with each division engineer having charge of 3 to 10 counties. District offices are in Pocatello, Idaho Falls, Shoshone, Boise, Challis, Lewiston and Coeur d'Alene. The Boise office administration staff consists of the following eight departments, under Col. D. P. Olson, director of highways: Consulting engineer, chief clerk and assistants, accountant and assistants; office and road engineer handling surveys, a chief draftsman and his assistants, maps and blueprints, construction and resident engineers, bridge engineer, under whom are structural draftsmen and structural resident engineers; maintenance engineers; transportation engineer having charge of motor transportation and shops; educational: Instructions or orders emanating from any of these departments to the various employees relative to work under that particular department's supervision are considered as having come from the director.

Instructions in the manual, which is similar to that of the Iowa State Highway Department, are based on the principle that the district engineer is the most important link in the organization, connecting the general office with the actual engineering work in the field and the people of the state. Final actions of the department are governed largely by the recommendations of the district engineer, but the commissioner of public works and the director of highways review the district engineer's reports and recommendations and take final action.

The eight topics covered in the manual are: Reconnaissance survey, traffic count, detailed road survey, detailed bridge and culvert surveys; preparation of plans, letting contracts, construction, payments. Most of these subjects follow the practice used elsewhere, but from the topic drainage, which is covered quite completely, the following may be quoted: "It is a well known fact that no road is better than its foundation; therefore, if all instructions relative to the use of tile were compiled into a single sentence, it would read, 'In case of doubt, specify tile.' "

Construction work on each project is under the direct charge of a resident engineer reporting to the district engineer, who in turn reports to the construction engineer at headquarters. A statement of duties of the resident engineer normal to the position is made, and in addition the duties are summed up in the following paragraph: "The resident engineer must always remember that he is the man on the job and that he is primarily responsible for the proper execution of the work. He must be the eyes and ears of the Bureau of Highways and its various employees. He must make friends with the local officials and local people with whom he comes in contact. His value to the Bureau of Highways depends on his ability to get good work and leave no sore spots."

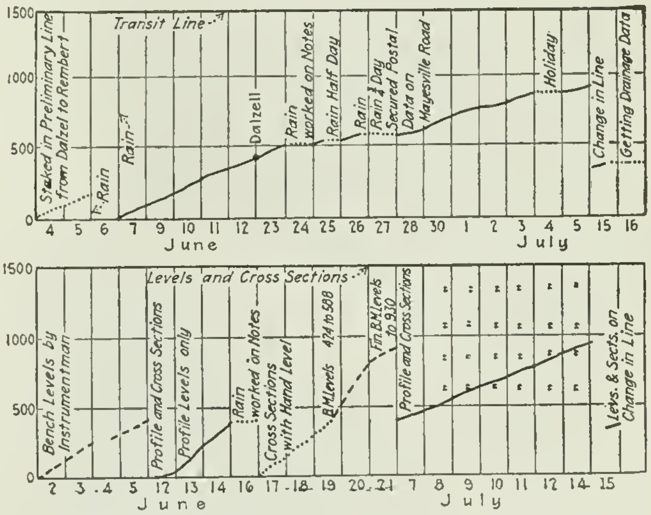
Under force account appears this statement: "Force-account work is one of the most fruitful sources of difficulty and disagreements between engineers and contractors. This disagreement can be largely avoided by keeping the records each day complete for that day's work. For this purpose a daily time report and a daily material report have been prepared. Each day the resident engineer or inspector will make out in duplicate the material and time reports for each force-account job separately. These sheets should be signed by both the resident engineer or inspector, and by the contractor or his representative, one copy being retained by each. Should the engineer's representative be unable to agree with the contractor on any point, notes stating the difference will be added on the reverse side of the sheet."

Graph Records Progress of Road-Survey Parties

By R. T. Brown

Chief of Surveys, South Carolina Highway Department, Columbia, S. C.

DAILY postcard reports sent in by chiefs of parties, and platted daily by an office clerk on the right-hand pages of a transit book, enable the chief of surveys of the South Carolina Department of Highways to check at a glance the progress of scattered survey parties. The postcards carry a printed form providing for the information wanted, so the data sent in by different parties are substantially the same in form and are easily deciphered for platting. On the transit-book plats, as shown by the accompanying example, each vertical space represents 100 stations, and each horizontal space represents one day. By means of these scales a fairly long survey can be platted on one sheet, and at the same time all the detail desired can be shown.



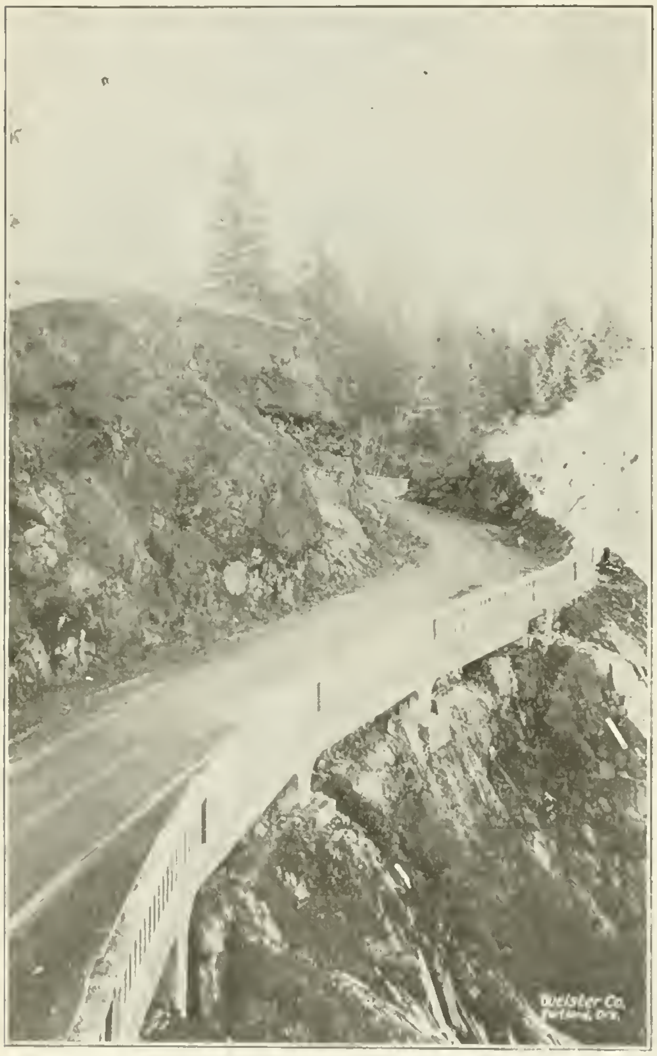
PROGRESS CHART OF ROAD SURVEY

The chart is helpful, not only in keeping in touch with the exact location of the party at any particular date, but also as an index to the ability of the party to do good work. An irregular graph with many breaks will often indicate a lack of familiarity on the part of the chief of party with the nature of the country, or poor judgment concerning desirable location.

The graphs are indexed and the cards are platted up each day by a girl in the office. The cards are filed in the desk of the chief of surveys, so that he may refer to the card for any day if the information on the graph is not sufficiently complete. After a use extending over many months, no need has been found for any more complex scheme of keeping up with the daily progress of the survey parties.

Concrete Structures Serve Double Purpose on Columbia Highway

THE Columbia Highway in Oregon for part of its length winds along the edge of cliffs of such nature that frequently some form of substantial guard rail is required. Bench cuts have to be made for the full width of roadbed desired; no advantage is gained from excavated material dumped at the outer edge because the slope is too steep to retain a filled shoulder.



HIGHWAY GUARD RAIL RETAINS FILL

As a result of these conditions two functions are occasionally combined in a single structure. The one shown in the illustration is typical. It consists of a "grasshopper" trestle carrying the outer 4 or 5 ft. of the roadway, thereby lessening the necessary width of cut by that amount, and at the same time its monolithic curbing, surmounted by a concrete balustrade, constitutes an effective and sightly guard rail.

Canada and United States Prepare St. Lawrence Development

Orders Are Issued to International Joint Commission To Make Study of Power and Navigation Possibilities of River

SURVEYS of the power and navigation possibilities of the St. Lawrence River between Lake Ontario and Montreal are to be begun immediately by the International Joint Commission by reference from the governments of the United States and Canada. Acting under instructions in last year's Rivers and Harbors Bill, the United States last year co-operated with the Canadian government in the study of the river to the extent of appointing Colonel C. Keller, Corps of Engineers, U. S. A., to act with W. J. Stewart, chief hydrographer of Canada, to prepare a set of questions which should be investigated before any definite steps toward development be taken. As a result of the joint work of these two engineers, the two governments have addressed a letter to the International Joint Commission asking it to take up the investigation of the project.

This letter, from Secretary of State Lansing, reads as follows:

I have the honor to inform you that the governments of the United States of America and of the Dominion of Canada, under the provisions of Article IX of the Treaty of the eleventh of January, 1909, between the governments of the United States and Great Britain, herewith refer certain questions, as set forth below involving the beneficial use of the waters of the St. Lawrence River, between Montreal and Lake Ontario, in the interests of both countries, and, in general, the rights, obligations, or interests of either in relation to the other, or to the inhabitants of the other along their common frontier.

It is desired that the said questions be made the basis of an investigation to be carried out by the International Joint Commission, to the end that the said commission may submit a report to the two countries covering the subject matter of this reference, together with such conclusions and recommendations as may be considered pertinent in the premises.

Question 1. What further improvement in the St. Lawrence River, between Montreal and Lake Ontario, is necessary to make the same navigable for deep draft vessels of either the lake or ocean-going type; what draft of water is recommended; and what is the estimated cost?

In answering this question the commission is requested to consider:

(a) Navigation interests alone, whether by the construction of locks and dams in the river; by side canals with the necessary locks; or by a combination of the two.

(b) The combination of navigation and power interests to obtain the greatest beneficial use of the waters of the river.

Question 2. Which of the schemes submitted by the Government or other engineers is preferred, and why?

Question 3. Under what general method of procedure and in what general order shall the various physical and administrative features of the improvement be carried out?

Question 4. Upon what basis shall the capital cost of the completed improvement be apportioned to each country?

Question 5. Upon what basis shall the costs of operation and maintenance be apportioned to each country?

Question 6. What method of control is recommended for the operation of the improved waterway to secure its most beneficial use?

Question 7. Will regulating Lake Ontario increase the low water flow in the St. Lawrence Ship Channel below Montreal? And if so, to what extent and at what additional cost?

Question 8. To what extent will the improvement develop the resources, commerce and industry of each country?

Question 9. What traffic, both incoming and outgoing, in kind and quantity, is likely to be carried upon the proposed route both at its inception and in the future? Consideration to be given not only to present conditions, but to probable changes therein resulting from the development of industrial activities due to availability of large quantities of hydraulic power?

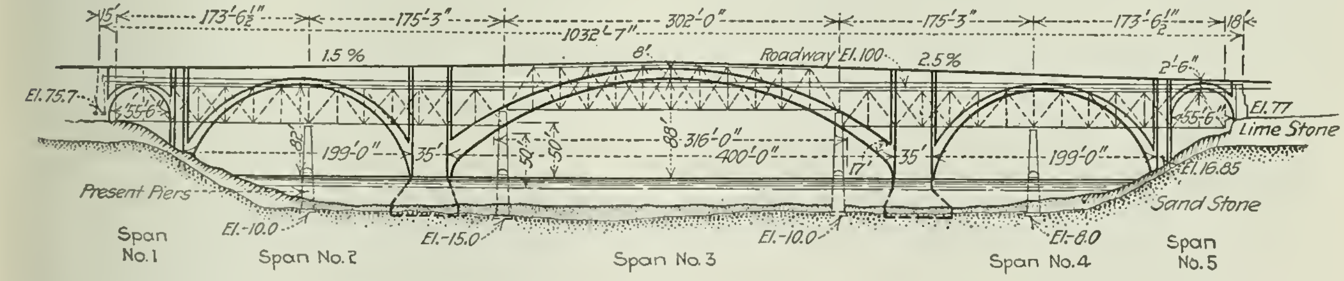
Pending the receipt of plans, estimates and other engineering data necessary for the final consideration of this reference, the commission is requested to hold such public hearings as may be considered necessary or advisable in order to obtain all information bearing, directly or indirectly, on the physical, commercial and economic feasibility of the project as a whole.

To facilitate the preparation of the desired report each government will, from its official engineering personnel, appoint an engineer with full authority to confer with a similar officer of the other government for the purpose: First, of acquiring, each in his own country, such data as may be found necessary to supplement the existing engineering data and surveys and, second, of preparing complete outline plans for and estimates of the cost of the proposed improvement, including the value of all property, easements, damages and rights connected therewith. These plans and estimates are to be submitted to the commission as soon as practicable but not later than one year from the date of appointment and the commission is requested to forward to the two governments its final report with recommendation not later than three months thereafter.

Longest Concrete Arch Span Being Built at Minneapolis

400-Foot Span of Franklin Avenue Bridge Across Mississippi Surpasses By 62 Feet the Record Risorgimento Arch Across Tiber at Rome

A 400-FOOT concrete arch, which will be the longest-span concrete arch in the world, is being built at Minneapolis, Minn., constituting the main portion of the Franklin Ave. bridge over the Mississippi. It will consist of two separate ribs of 400-ft. span between faces of piers, with a rise of 88 ft. above the springing line, at high-water level. The main arch is flanked at each end by one arch with a clear span of 199 ft. and one of 55½ ft., the total length of the bridge over abutments being 1032 ft. The piers will rest on the solid rock of the river bed. Each rib of the main arch will be 12 ft. wide, with a thickness of 17 ft. at the springing line and 8 ft. at the crown, carrying spandrel columns with cross-girders to support the concrete deck. The rib reinforcement consists of frames, 6 x 6 x ½-in. angles being used in the large span and smaller angles in the approach spans. The ribs are on either side of the present steel truss bridge, which thus affords facilities for the construction work. The 400-ft. span was necessary to give a clearance of 50 x 300 ft., as required by the United States Government for navigation purposes.



FRANKLIN AVENUE BRIDGE ACROSS THE MISSISSIPPI AT MINNEAPOLIS WITH 400-FOOT REINFORCED-CONCRETE CENTRAL ARCH

The present steel bridge is being used for traffic, as well as for construction purposes. Its roadway is 18 ft. wide, so that by the removal of the sidewalks the new arch ribs, placed 25 ft. apart, will clear the steel work, which will be removed when these ribs are completed, the floor for the 25-ft. space between them being placed after the removal of the old structure. This floor will be cast ashore and will be placed by a traveler from the completed floor over the arch ribs.

Work was commenced in June, 1919, on the work and concrete-mixing plant, located on the Chicago, Milwaukee & St. Paul R.R. tracks in southeast Minneapolis, about 2000 ft. from the east end of the bridge. The material will be handled by a conveyor system, and service between the bridge and the plant will be performed by two gasoline locomotives on a 36-in. track. This plant is nearly completed.

In July the cofferdam framing was commenced on a flat piece of river shore about one-half mile up the river from the bridge site. These frames were then floated down and placed in position for pier No. 1. This cofferdam will be 80 ft. up and down stream, and 64 ft. wide, divided into two compartments 40 x 64 ft., by 28-ft. 14-in. arched steel sheet piling, which also will surround the entire cofferdam. This pile driving has been completed for the downstream compartment. The piles are driven through boulders, gravel and limerock débris to and into the underlying sand rock. Excavation with a clamshell bucket was commenced before the pile driving was finished.

The general design of the bridge and the design of the great arch span were made by F. W. Cappelen, city engineer. The city is doing the construction by its own forces. Contracts have been let for the arch reinforcement. The construction of falsework for arch No. 2 has been commenced, and it is planned to work through the winter. It is expected that the bridge will be completed in 1921 at a cost of about $500,000.

Premixing No Benefit in Concrete

To determine the benefit of mixing cement and water for a long period (15 to 30 minutes), and then adding aggregates to produce a concrete instead of the ordinary method of mixing cement, aggregate and water together for one or two minutes, comparative tests were made last year by the United States Bureau of Standards. The strengths obtained were about the same with the same materials and conditions, indicating that there is no advantage in long premixing of cement and water.

Why Federal Aid Will Not Build a National Highway System

IN a recent address in Richmond, Va., H. G. Shirley, secretary Federal Highway Council, told his auditors that only through some such legislation as the National Highway Act now pending before Congress could the United States hope for a thoroughly national system of highways. He offered no disparagement to the operation of the Federal-aid Act, and he even encouraged its application wherever possible, but he asserted that it so operated that all Federal-aid money could easily be absorbed in the construction of widely separated road segments, and that even after years of construction of Federal-aid projects the states would be spotted with and not linked by Federally constructed highways. The most pertinent portions of his address follow:

"Let us review what is being done under the Federal-aid Act. In analyzing this work I do not want to be considered as criticising anyone, for I am a great believer in the good that this law has done and believe it should be continued for a decade, or at least until all the highway departments of this country have been put on a firm and substantial foundation with a sufficient appropriation to do the work necessary to be done in each state.

"After the passage of the Federal-aid Act the Secretary of Agriculture demanded that each state submit a map showing the system of roads selected to be improved under this act. Each state highway department compiled and submitted maps showing the systems for which it would ask aid and upon which it would submit projects to be approved. The system laid out in some of the states has been strictly adhered to and is being built in continuity, while in others the allotments have been divided up among the different counties of the states in the same ratio as it is apportioned by the National Government to the states. In one state I happen to recall that the allotment to one county, due to its small road mileage and population, amounted to only $4,000. Under the present rate of appropriations and high cost of improved roads, it will take something like 100 years or more to build one highway across this county, and this highway may be an important link in a national system. And yet we are told that a national highway system can be built in a shorter time under the existing Federal-aid law and agencies than under a Federal highway commission, who would concentrate all moneys appropriated under the National Highway bill on national highways.

"Let us now examine the distribution, the type, and character of the roads that are being built. We find in many states, as just above outlined, they are dropped around in the different counties where pressure is being brought on the state highway departments by the people of the different counties to have a piece of road, and they are compelled to bow to this great demand. As long as the county and state put up a portion of the money, just so long will they demand a voice in where this money shall be spent and upon the roads selected.

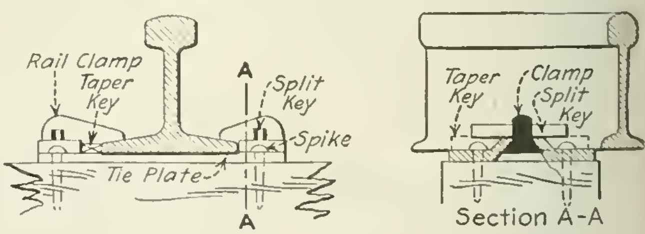
"Every man believes that the road running in front of his door or property is the most important road in the whole country, and to him I grant it is true. The records will also show that at least 66 per cent of the roads now being constructed under Federal aid are plain macadam or a lower type, and not of sufficient stability to meet the traffic needs of a national highway system. Many are only being graded and drained. I do not want to be understood as criticising, but I am only laying these facts before you so that you may determine in your own mind whether, under existing laws and conditions, this country can have constructed in the most expeditious and economical way, a national system of highways. I believe from an educational standpoint that the Federal-aid money has been of great value and it behooves you to see that in the future it is expended in the very best way and that it secures for you the very best results obtainable.

"The mileage on national systems is but a small part of the total mileage necessary in each state to take care of its transportation needs and to develop the state as a whole. Therefore, it is the duty of the state to provide ways and means for caring for a large mileage of state roads. Roughly speaking, that mileage should be between 4,000 and 5,000 mi. built into a state system, and at least 7,000 or 8,000 mi. built into an improved county system. A few national highways would form a backbone to which the state could connect and co-ordinate its system, with the county, connecting its system with the states and extending out into the farming communities like the spokes of a wheel, touching every farm. This is a general plan of roads and should be the ultimate aim of the nation, the states and the counties."

Clamp Fastening for Track Rails

A RAIL fastening now in experimental use employs clamps and keys to secure the rail to a tie-plate and maintain a tight grip. Spikes are used only to secure the plate to the tie, in order to avoid removal of spikes when rails are renewed or shifted to maintain gage.

As shown in the accompanying drawing, the tie-plate is slotted at each end, the sides of the slots being bent up at an angle to form hollow triangular ribs, between which the rail rests. On each side is fitted a clamp which projects over the rail base and has its lower part of triangular section to fit into the hollow rib of the plate. A split key driven through the clamp holds it in place, these keys projecting over the spike heads, thus preventing the spikes from working loose. The space between the ribs is wider than the rail base and a flat taper key is driven on one side to hold the rail laterally and also to prevent it from creeping. These keys are placed normally on the inside of the track, but as the gage is widened by rail wear the keys on one rail can be transferred to the outer side, to permit the rail being shifted inward to maintain gage.



RAIL SECURED TO TIE-PLATE BY CLAMPS

This device is made by the Railway Safety Tie Co., Milwaukee, Wis., and has been in use over 12 months on a few rail lengths of both the Chicago & Northwestern R.R. and the Chicago, Milwaukee & St. Paul R.R. Both locations are on curves, and the former road reports that the fastening has reduced the amount of maintenance work.

Construction Work on an Outlet Sewer in Soft Soil

EXCAVATION, followed closely by concreting and backfilling, together with pulling of the forms in 12 hours and an advance of 35 ft. of 8-ft. sewer in 24 hours, were characteristics of the construction of the combined outlet sewer and storm water conduit at Granite City, Ill. This is a concrete structure, 7 miles in length, having an internal diameter of 9 ft. to 4½ ft., while the exterior has a flat base and vertical sides up to the level of the springing line of the arch. Work was commenced at the 9-ft. outfall, which was in low swampy ground, where considerable quicksand was encountered and the bottom of the cut was in 2½ ft. of water, requiring heavy pumping. Farther back the excavation was in firm alluvial soil and sand overlaid by clay soil which stood at fairly steep slopes. The depth of cut ranged from 15 ft. to 22 ft. and at one point tunneling was employed in passing under a group of railway tracks on a fill.

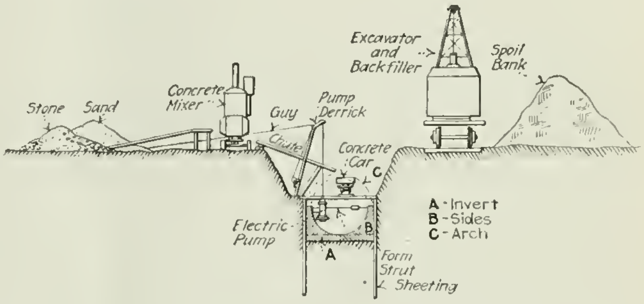
Both excavation and backfilling were done by a 1-yd. grab bucket handled by a 15-ton revolving locomotive crane having a 50-ft. boom and mounted on a pair of four-wheel trucks. This machine traveled on a standard-gage track laid parallel with the work Ordinarily the backfilling was done at night, but any spare time during the day was utilized for this work. Two dipper excavators mounted on a wide track of 12-ft. gage were used at first, but were replaced by the more powerful machine with grab bucket.

In good top ground only the lower part of the cut was sheeted, using a single line of 2 x 12-in. plank driven by hand hammers assisted by water jets and sunk to depths varying from 8 to 14 ft. according to the soil and ground-water conditions. Below the water line the joints were covered by batten strips 1 x 6 in. The waling timber on the side opposite the excavator served to support a mason's derrick from which a trench pump was extended. The head of the derrick was attached to guy cables led back to deadmen or other convenient anchors at the surface of the ground, while a bracket or gooseneck on the derrick extended the hoisting line so as to avoid lowering the derrick to an undesirable angle.

A steam pump was used at first, but was replaced by an electrically operated unit which was more convenient and eliminated the trouble of continually adjusting a suction pipe. This unit consisted of a centrifugal pump with 6-in. suction and having a vertical shaft carrying a 25-hp. motor, the whole being mounted in a steel frame about 6 ft. high, which was suspended from the derrick and could be raised and lowered by the hand hoist. The total weight of this unit was about 1500 lb.

In the sandy subsoil the bottom of the cut was leveled readily by two or three men with shovels as the water was removed, the elevation being checked by sounding with a level rod. The bottom level of concrete, however, was deposited without waiting for the base to be entirely dry. The work was done in lengths of 35 ft., the farther end being closed by a plank bulkhead with the top of the concrete floor.

A concrete mixer of the gravity type was used at the outfall. This had a batch capacity of ½-yd. and required a height of about 14 ft. but was practicable here on account of the depth of cut being about 16 ft. After the depth was reduced to about 13 ft. a ⅓-yd. steam-driven drum mixer was used, the frame carrying boiler and machine being mounted on traction wheels. This moved along the side of the cut opposite the excavator.



TYPICAL ARRANGEMENT OF CONSTRUCTION PLANT FOR OUTLET SEWER AT GRANITE CITY, ILL.

Cross timbers laid upon the waling timbers supported lengths of 2-ft. portable track made with rails and ties bolted together. This was at the middle of the trench and on it traveled a ⅓-yd. steel car with tilting and dump body, the body revolving on a turntable so as to dump in any direction. Concrete was spouted into this car from the mixer on top of the bank. Three men then ran it forward, dumped and returned it; a fourth man swept loose concrete off the track, shifted the dumping timber along the rails and held the level rod for checking the elevation of the concrete base. This process was repeated until the concrete reached the bulkhead at the end of the 35-ft. section.

The next step was to pull forward the 35 ft. length of the semicircular steel bottom form, sliding it on the concrete base. For this purpose the excavator was moved up to the head of the new section and secured to the track by clamps. Its bucket was removed and the hoisting cable was lowered into the trench, being passed around a snatch block hitched to a timber strut reinforced by horizontal kneebraces. The cable was led along the concrete floor and coupled to a pulling bridle a little distance back from the head of the form. The sides were loosened by drawing up the turnbuckles on the steel top struts of the form. With a steady pull on the cable, while men with bars raised the forward edge of the form, the 35-ft. length was started easily as a rule and was pulled forward for the next set up, the bottom elevation being then checked and the sides extended to the full diameter by the turnbuckles on the threaded struts.

Concreting of the sides, up to the springing line, was done with the equipment noted above, the car body being swung round so as to dump to either side. A wooden panel placed on the form struts to prevent concrete from being spilled inside the form was shifted ahead as the filling progressed. This concrete was stirred or rodded by two men with long bars, while a man with a hoe scraped the concrete from the splash panel.

The steel arch form of the completed section in the rear was then moved forward, but instead of being pulled bodily it was usually dismantled, the panels and ribs being removed and re-erected by hand. Although moved in about 12 hours after the concrete had been placed, there was no failure or sign of deflection on the arch.

Wood panels were used for outside form at the sides of the arch, the top being left open. Concrete was spouted into place from the mixer and spaded or rodded in the forms, while the top was finished almost flat. Rough spots caused by removal of the forms were plastered with cement mortar within an hour after such removal.

Stone concrete was used, 1:2½:5 made with 1½ in. coarse aggregate. Stone and sand were distributed by teams and wagons in stock piles along the line for a considerable distance ahead of the construction. As these materials were deposited on dry ground it is stated that the loss will be small and that the cost of planking for a base would have far exceeded the value in saving of material. In concreting, the skip was charged by wheelbarrows, the wheelers doing their own loading. This force averaged as follows: 1 man at skip hoist, 1 to supply water and dump the concrete, 1 or 2 men moving concrete down the chute with hoes, 4 supplying sand, 6 supplying stone, 1 emptying cement from sacks piled near the mixer.

At street crossings, traffic was diverted, but where there were car tracks a timber deck was placed, having stringers resting on mudsills and carrying the track ties. Excavation beneath this was then done by hand, the sides being sheeted to the top of the cut.

Work was carried on in two 10-hour shifts, but no concreting was done at night. Progress with the 8-ft. section has averaged a 35-ft. stretch of invert, sides and arch in 24 hours, this representing about 50 yd. of concrete. Electric current for lights and for the trench pump was taken from an adjacent overhead line, a portable substation being rigged up with two transformers mounted on a wagon. A switchboard for the pump was set upon the bank and moved ahead with the work. Portable carbic lights were also used.

The John T. Walbridge Engineering Co., Chicago, has the contract and the work is under the supervision of Mr. Walbridge or his superintendent, H. W. Costello. The engineers are Edmund Hall and W. W. Kerch of Granite City.

Kansas Intestinal Malady Probably Not Due to Water-Supply

THE recent outbreak of intestinal diseases in Kansas was not due to public water-supply, in the opinion of officials of the Kansas State Board of Health. The following summary and conclusions relating to the outbreak have been sent to *Engineering News-Record* by Chas. A. Haskins, engineer of the Division of Water and Sewage of the board:

A considerable number of cases of a strange malady diagnosed by many physicians as "winter cholera" has occurred in Kansas during the past three weeks. In some places the outbreak has been epidemic. In Topeka more than 1,000 cases were reported within three days to the health officer, but since it was not considered by physicians generally as influenza it was not handled as a reportable disease; consequently the State Board of Health records are by no means complete.

These cases occurred in cities and in the country where all sorts of sources of water-supply were in use, some of them known to be of good quality and others considered of doubtful quality. The Topeka water supply is not considered above suspicion, particularly in the few weeks preceding the epidemic, when a new connection to the Kansas River had been constructed with apparently inadequate means for its sterilization.

The disease was characterized as a gastro-intestinal disturbance and was accompanied by nausea, diarrhœa, pains in the stomach and similar symptoms, and was followed by aching joints and an extreme weariness and exhaustion. A careful study was made of feces, urine, and blood from a number of cases, but so far this has revealed no source of infection. No diagnosis has been offered by any competent person other than that of "winter cholera," although it has been called by many "intestinal influenza."

The opinion of the writer, which is also the opinion of the executive officer of the State Board of Health, is that this disease has not been proven to be waterborne, but it is believed that it may and probably is transmitted in this manner and also in other ways.

Favors Automatic Train Control on Heavy Traffic Lines

THE Automatic Control Committee of the United States Railroad Administration, in its report to the Director of the Division of Operation, recently made public, states that the use of train-control devices is desirable on lines of heavy traffic, fully equipped with automatic block signals, but that the relative merits of the various types of devices already tested cannot be conclusively determined until further tests have been made. The recommendation is also made that the work be continued under the direction of the American Railroad Association after the termination of Federal control.

The report points out that automatic devices will prevent only such accidents as are due to the failure of employees properly to observe signal indications, and that the limitations of such devices should be thoroughly understood. It is also stated that the cost of automatic train-control system is as yet unknown.

The train-control committee of the Railroad Administration was created in January, 1919, and has made detailed inspection of thirty-seven devices and examined plans for 300, of which but seventeen were found available for further tests. This followed the work of the Interstate Commerce Commission, which has continued since 1907, when an appropriation was made and investigation ordered by Congress.

Beet Pulp Disintegrates Concrete

Contact with beet pulp has a deleterious effect on concrete—this was shown recently in an examination made by a representative of *Engineering News-Record*. In Utah, near a beet-sugar factory, concrete roads over which pulp was hauled away by farmers showed severe pitting and wear. The spots, which were bunched toward the center of the road, had been tarred, and although the road was apparently fully repaired, close observation indicated that some action under the tar was still going on. It is possible that the spots examined may not have been thoroughly cleaned before the tar was applied. This was on the Ogden-Salt Lake road. Investigation was also made of a beet-pulp pit at Rupert, Idaho. Around the pit is a concrete curb from which a planked embankment rises. The edges of this curb have crumbled, and are rounded off to about 2-in. radius. The concrete was apparently of fair grade below that disintegrated.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Bridges and Gagings on the Rio Grande

Sir—Your attention is invited to a misstatement in an article by Alfred J. Henry, meteorologist, entitled "Floods in the Lower Rio Grande, in New Mexico and Texas," appearing in your issue of Dec. 11-18, 1919, p. 1001. The fifth paragraph says, in part: "There are no bridges across the Rio Grande below Laredo, and no permanent object on which to install a river gage, . . ."

The International Bridge across the Rio Grande at Brownsville, Tex., connecting Brownsville and Matamoros (Tamaulipas), was built in 1909-10 by the Gulf Coast Lines and National Railways of Mexico, jointly. It is located about 22 miles (in an air line) from the mouth of the Rio Grande and about ⅝ of a mile southwest of Brownsville. It is a combined highway and railway bridge, with a total length of about 620 ft., consisting of four Pratt trusses and two plate girders. The two center trusses are connected to form a swing bridge with two 125-ft. openings. The average height of the bridge is about 45 ft. above the river bottom, but the elevation of the latter varies as much as 10 ft. in flood seasons.

The Rio Grande Valley in the vicinity of Brownsville is subject to flood inundation every high water, and it would seem desirable to start continuous river gages at this point, if not already undertaken. The river channel, in the vicinity of the bridge, is confined to a fairly permanent location by a system of heavy brush mattresses weighted by flat concrete slabs of about 180 lb. each, and river gaging could be taken in such manner as to record the run-off very accurately.

BILLINGS WILSON,
Fort Sam Houston, Tex. Captain, Corps of Engineers.

[Mr. Henry's comments on Captain Wilson's letter follow.—EDITOR.]

Sir—The statement in my article in regard to bridges across the Rio Grande below Laredo had reference to that stretch of the river on which gagings would be helpful in predicting floods for the overflow region about Rio Grande City, Texas.

While gagings at Brownsville, made from the bridge mentioned by Captain Wilson, would be useful in many relations they would be of little value in the flood prediction work of the Weather Bureau for the region above-mentioned. ALFRED J. HENRY.

Washington, D. C.

Experiment Stations to Reduce City Risks

Sir—The recent discussions by engineers in *Engineering News-Record*, regarding the risks which cities should take with untried processes, are interesting in demonstrating the necessity for central testing stations, or possibly national evaluating committees, whose function should be the determination of the relative merits of suggested processes.

You will be interested in the discussion of the same problem abroad, which appeared in the inaugural address of Arthur J. Martin, president of the Association of Managers of Sewage Disposal Works. What he says on this subject is given in the last paragraph of his address. The entire address, entitled "Sewage Purification Problems," appeared in *The Surveyor and Municipal and County Engineer* for Dec. 19 and 26, 1919.

ABEL WOLMAN,
Division Engineer, Maryland Department of Health.
Baltimore, Md.

[Before quoting the above mentioned paragraph of Mr. Martin's address it may be said for the benefit of those who do not know that Mr. Martin is a member of the Institution of Civil Engineers and that he was one of the firm of Cameron, Commin & Martin, which promoted the Cameron septic tank in England. United States patents on the septic tank were issued to the three individuals composing the firm mentioned. The paragraph referred to reads:

> Under normal conditions, the amount of money spent every year on works of sewage disposal is very considerable. There are many available methods for the engineer to choose from. He needs reliable information to guide his choice. And when he has selected his process he requires reliable data upon which to design his works. There are, doubtless, some adventurous souls quite willing to experiment with new processes at the expense and risk of their clients. But the great body of engineers are conservative, and are not disposed to gamble with their clients' money and their own reputations by the adoption of methods with regard to which there is the least uncertainty. And so, in default of reliable information concerning new processes, large sums of money are spent on lines which are admittedly not up-to-date, but which have, at all events, stood the test of time. A central testing station, at which new processes, precipitants, filtering materials, distributors, and all the other paraphernalia of sewage disposal, may be judged on their merits is urgently needed. If for any reason the Ministry of Health do not see their way to take the matter up, the Engineering Standards Committee, which has rendered such valuable services in other directions, might fitly undertake the duty, in which case the Government should recognize the national importance of the work by aiding it with a substantial grant.

It may well be asked if the time has not come when the Federal Government should take up sewage treatment investigations on a larger and more continuous plan than has yet been attempted, and if so to what existing or new branch of the Government the work should be entrusted.—EDITOR.]

Paint Experiences

Sir—The criticism, by A. H. Rhett, of the report on painting of the American Railway Bridge and Building Association, in your issue of Dec. 25, 1919, p. 1072, seems to the writer to be undeserved. It is, however, true that it should not be necessary, even near the coast, to repaint every year; the Florida East Coast R.R. engineers use paint which they make for themselves, chiefly of white lead and chrome yellow, which does not need renewal for three to five (and sometimes more) years, and other Southern lines find equally good results from red lead and lampblack. The writer has studied the one-year trouble on the spot, and is persuaded that it comes from using a not-very-good paint, which stands well enough in the dry air of the northern arid regions; but it will be found on more carefully looking into the matter than is possible from your brief abstract, that it is chiefly the surface coat which must be frequently renewed.

Failure of bituminous coatings (which in practice include coal tar as well as asphalt) depends on what they are made of. There is no reason why a good asphaltic paint could not be made, but it would probably be too expensive per square foot, applied. Black is the common finishing color, because it doesn't show dirt; not a very good reason, truly; but it protects the film from the chemical action of light (so do yellow, brown and red).

The engineers of the late Metropolitan Water and Sewerage Board (of Massachusetts) believe that paint exposed to water is injured by hydrolysis of the oil in the film; they combat this in several ways, but partly by using boiled linseed oil, which itself resists such action somewhat. The writer is in favor of using at least half boiled oil in bridge painting in very moist localities.

We shall never be through discussing the painting of galvanized iron. Letting all the zinc rust off is extreme treatment; usually the iron will be full of holes before that happens. But I can not agree with Mr. Rhett in thinking it as simple a problem as he supposes. Zinc, aluminum and copper are all difficult to paint. Sometimes the paint sticks, but it is unwise to guarantee that it will. True, such guarantees are often given, but generally they have holes in them, and they peel off when the paint does.

A. H. Sabin,
Consulting Chemist National Lead Co.
New York City.

How Shall the Co-operation of All Engineers Be Effected?

Sir—A debatable question no longer exists as to whether engineers of the country should get together in furtherance of their non-technical interests. The attitude everywhere is not whether, but how shall this end be achieved? Some engineers evidently think that a sort of super-organization of the founder societies should be brought into existence, or perhaps a federation of all societies, but an increasing number are coming to the conclusion that the end will be best accomplished by using the well tried machinery at hand, designed for this purpose, namely, that of the American Association of Engineers.

A striking omission occurs in the report of the Joint Conference Committee of the older societies, one which by its absence attracts comment throughout the rank and file of the profession, namely, the neglect to refer to the fact that the work proposed to be done has already been undertaken and is well advanced by the American Association of Engineers, with a membership now larger than that of any other national society. From all parts of the United States is coming the question, "Why has the Joint Conference Committee's report been silent on this vital question?"

In answer to this question and in the firm belief that the rank and file of the profession are waiting for such an announcement, the Secretary of the American Association of Engineers on Dec. 20, 1919, addressed the following letter to the governing bodies of the founder societies:

> The development of the opinion in the founder societies in favor of giving attention to the non-technical side of the engineer's life has led several members of each to ask the American Association of Engineers to write simultaneously to the governing bodies of these societies offering its service in problems of public and professional welfare and asking their co-operation.
>
> We have read the report of the Joint Conference Committee and believe that the American Association of Engineers, a successful going organization, is capable of carrying forward the non-technical activities recommended in the report fully as well and perhaps better than the organization recommended by the conference report.
>
> The activities of A. A. E. are confined to social and economic problems such as legislation, employment, compensation, political and civic endeavor. A. A. E. takes in everyone of good character in the engineering profession and seeks to mobilize all engineers for joint action. It gets its support from the man back home without any intermediate representation so that it is able to do the things that lie close home and that make living as an engineer worth while.
>
> If the founder societies elect to co-operate with A. A. E. in the work it is doing and in similar non-technical activities, it would be our understanding that such support would not be financial and would in no way interfere with present prerogatives and privileges of the founder societies.
>
> This letter has been approved by our Executive Committee at its meeting Dec. 20, 1919. We are enclosing copy of our constitution for convenient reference.

Let us have full discussion. The great body of engineers who have given the matter thought evidently believe that the ends to be attained from the human side must be reached by a strong, well built and thoroughly democratic organization, devoted exclusively to these ends and organized for effective action in ways which the men of experience in human and political activities have found to be most effective. On the other hand, they feel that the purely scientific societies, organized for the investigation of natural phenomena and their application, which elect for their officers men distinguished by research and technical achievement, cannot by mere federation and delegation of power through complicated machinery achieve important results for the welfare of engineers as men and citizens.

Are you in favor of unity along the lines of the above letter? If so, write to the secretary of the national technical society of which you are a member, and to the secretary of the American Association of Engineers.

C. E. Drayer,
Secretary American Association of Engineers.
Chicago.

Should Engineers Pay To Improve Their Status?

Sir—For some time past I have been very much interested in your articles and letters on "What Will Engineers Pay to Improve Their Status?" Is it possible to improve one's status by "pay"? Why not let us be honest with ourselves and change the title to "Why don't engineers so conduct themselves that their status needs no improvement?"

Railroad trainmen jokingly say that locomotive firemen have to keep their heads in the fire boxes for so long before they are promoted to engine drivers that by the time they are running engines, they have no brains left. Is it not true that most young engineers spend so much time on mathematics and pure and applied science, that by the time they reach a position of responsibility, their outlook on life is anything but liberal? Lawyers, doctors and clergymen pay nothing to improve their status. Their work just naturally broadens them and they command respect because they conduct themselves so as to deserve it. I am sorry that I cannot say as much for all engineers. Let me give a specific illustration.

Recently a young civil engineer of my acquaintance accepted a position as structural designer in the construction department of the largest manufacturer of cheap automobiles in the United States. The construction work involved the expenditure of millions of dollars. On reporting for work he was given a badge, instructed how to punch a time clock, informed that working hours were 8 a.m. to 5 p.m. every weekday in the year and if one minute late, he would be "docked" fifteen minutes' pay, and that there would be no pay for sickness, holidays or vacation. The company ran a commissary. A dining room with table-cloths was used by the factory foremen, but the structural designer was conducted past this room to the cafeteria, where the laborers and general help dined. Having once been a private in the Army and being as democratic as the Salvation Army he enjoyed eating with the mob, but did not see how he could retain his self-respect and maintain the dignity of an engineer's position if he should continue to favor the cafeteria with his patronage—so he quit the same day he started. But the point is, he left a number of engineers on the job who were either too meek to demand better conditions or else didn't know any better.

The employing engineer in this case is an associate member of the American Society of Civil Engineers, so what is the use of talking of paying to improve the status of engineers when the employing engineers are seemingly indifferent to the conditions under which their men work, and who claim that for every man that leaves their employ they can find two others to take his place. It takes about a year to learn bricklaying and about ten years to master structural designing. A good bricklayer in Detroit can get $1.50 an hour or $12 per day. How many structural designers get $12 per day—Darn few!

High-sounding talk about "status" may be all right in its place, but "hand it" to the bricklayers for results.

Fordham, New York. M. Kincaid.

Method of Locating Split-Switch Turnouts

Sir—Referring to Mr. Scott's letter relative to laying out a split-switch turnout, in *Engineering News-Record*, Oct. 9, 1919, p. 711, I have the following comments to offer. As the degree of curve through the lead has no relation to a curve back of the heel of the frog, I can see no reason why, with a competent trackman, the engineer need pay much attention to any part of a common turnout except the location of the frog. In places where it is necessary to use lap-leads, or where a track crosses a turnout between the heel of the switch point and the toe of the frog, which is a common occurrence in terminals, it is absolutely necessary for the engineer to be able to determine the exact degree of curve of the turnout, in order to be able to figure the angles of the special frogs.

Since the curved part of the turnout is tangent to the heel of the switch point and the toe of the frog, it can readily be seen by the accompanying sketch that the exact degree of curve is determined from the six following dimensions: 1, thickness of the switch rail at the point, which is usually ¼ in.; 2, the length of the switch point; 3, the distance between gage lines at heel of switch point; 4, the gage of the track; 5, the length of the frog from theoretical point to toe; 6, the frog angle. A change in any one of these dimensions will change the degree of curve.

I find there are many engineers in railroad work who have never seen a solution of this problem and I give, therefore, the following, which is the one used in designing the special track work for the track elevation of the Indianapolis Union R.R. While there are other solutions, I believe this is as simple as any.

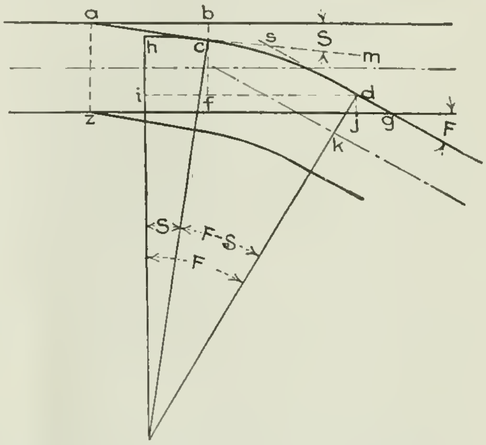


DIAGRAM FOR LOCATION OF TURNOUTS

G = Gage.
F = Frog angle.
S = Switch angle.
ac = Length of switch point.
bc = Distance between gage lines at heel of switch.
¼-in. = Width of point of switch rail.
dg = Length of frog from theoretical point to toe.
ek = Radius of center line of turnout.

To find *ek* and *zg*

With *ed* as a radius perpendicular to *dg* draw the arc *dc* tangent to *ac* at *c* and extend it to *h*, so that *eh* is perpendicular to the main track. Draw *ce*. Then *deh* equals *F*, the frog angle; and hec equals *S*, the switch angle. Then:

$$\frac{bc - \frac{1}{4}\text{ in.}}{ac} = \text{sin of switch angle or } \sin S$$

$$dg \sin F = dj$$

$$F - S = ced$$

$$= msd$$

$$G - (bc + dj) = cf$$

$$ed \cos S - ed \cos F = cf$$

$$cd = \frac{cf}{\cos S - \cos F}$$

$$ed - \frac{G}{2} = ek$$

$$= \text{radius of center line of turnout}$$

$$ed \sin F - ed \sin S + dg \cos F + ac \cos S = zg$$

$$= \text{length of turnout}$$

L. E. Ratcliff,
Indianapolis, Ind. Indianapolis Union R. R.

Co-operation in Highway Construction

Sir—No doubt the facts brought out by R. G. Collins, contracting engineer, Cumberland, Md., (in *Engineering News-Record*, Jan. 15, p. 122) will induce a sympathetic response from highway contractors. Highway engineering is not the most difficult of engineering practices, in consequence of which, perhaps, it has usually been an open field for the small as well as the big contractor. It appeals to some because the outlay for equipment is comparatively small. Other contractors who have recently entered the field have been attracted by the volume of work to be accomplished.

During the war the contracting field was rather barren of new projects and when this great volume of highway contracts developed, almost all contractors were very keen for new business and this great volume of proposed new construction proved very attractive.

It is true that a large number of contractors during the past year suffered losses due largely to weather conditions. This is where the element of chance enters the road-building game. The remedy cited by Mr. Collins, for shortage of labor and material, reduces to a minimum the loss in delays from tangible causes.

The inspection difficulties have always been an ever present cause of concern on almost all kinds of construction work. The effects are sometimes very disquieting, and this condition is attributable to the human element to a large extent. If there could be created a spirit of co-operation instead of antagonism between the states' representatives and the contractors' men the problem would be fairly well solved, and with this good purpose accomplished the benefit would accrue to the state and to the contractor. Should this state of affairs develop under private ownership work, the contractor would in a personal interview with his principal soon have the matter adjusted. Then, why not such relief in a public contract!

There are cases wherein contractors are operating at a loss due directly to the fact that, in computing costs, some essential and obvious features have been overlooked. In all contracts an investigation should be made of the local conditions which might affect the work—information as to permits, leases, rights of way, obstacles to be encountered, and remedies to be considered. Then, too, the complete plan of operation and layout must be well balanced and study made for proper and economical handling of the work.

If, however, a contractor has filed his proposal containing figures based upon an incomplete investigation of the proposed contract, there can be little relief from the results attending such optimism. On the other hand, if the results are adverse, due to conditions, abnormal beyond estimate, such as too rigid inspections and severe and impracticable detail requirements by the state department representatives, why not supply a remedy for this condition by instituting a clearing house for such contingencies? Let the contractors form a road contractors' association, with a definite purpose and method in view, and with proper representation at the seat of authority by one versed in the rights of the contractor and requirements of the state. There is little doubt that a measure of relief, substantially gratifying, would result. This is an occasion for initiative. Where are the contractors who feel it incumbent upon them! L. E. GASKINS,

Narberth, Pa. Cost Engineer.

Error of Approximate Method in Design of Eccentric Rivet Connections

Sir—I refer to the letter on "Eccentric Girder Connections" in your issue of Jan. 8, 1920, p. 99, and to the article on the same subject in your issue of Oct. 16, 1919, p. 730. In view of the disagreement of the two writers it is of interest to go further into the subject.

The following shows that the method offered by Mr. Godfrey is on the side of safety. It may properly be used when sufficient time is not available for more exact figures or where only a very small number of columns is involved. With a large number of columns the saving to be effected by the use of the more exact method is too great to be ignored.

For the extreme and simple case shown by Fig. 1 herewith, there can be no disagreement, and the stress on rivet *B*, as stated by Mr. Godfrey, is $S = Pb/a$. For the more usual case, shown by Fig. 2, it is clear that in order to carry the load there must be certain deformations of the rivets which will produce a very small rotation of the plate and bring the horizontal resistance of the rivets into play as well as their vertical resistance. For this reason the method offered by Mr. Carman is the correct and accurate one.

By Mr. Godfrey's method the stress for each of the eight rivets in the right-hand row is 5,000 lb. By the method of Mr. Carman the resultant stress on the two most highly stressed rivets, the top rivet and the bottom rivet in the right-hand row, is 3,330 lb. This shows that Mr. Godfrey's method, for this case, gives results 50 per cent above the true value, and that, if the allowable stress per rivet is 5,000 lb., the number of rivets and size of plate can be materially reduced. With six rivets per row spaced 3 in. center to center, the maximum resultant stress by the correct method will be so slightly over 5,000 lb. as to be acceptable. This means a saving in plate which is worth while if a large number of columns is involved.

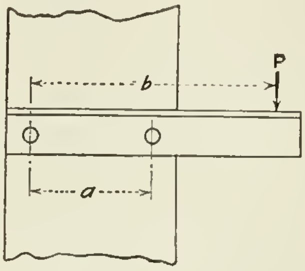


FIG. 1

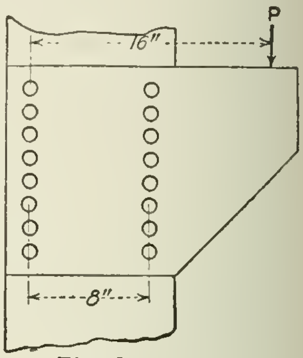


FIG. 2

If *a* be made 12 in. and *b* be made 24 in., the value obtained by Mr. Godfrey would still be 5,000 lb., while the exact method gives 4,040. It would be easy to suggest dimensions for which the error of Mr. Godfrey's method would be over 50 per cent.

Referring to Fig. 2 on page 99 of your issue of Jan. 8, 1920, and to the discussion: By Mr. Godfrey's method it would appear that the number of rivets in the left-hand row could be reduced without increasing the stress on the rivets in the right-hand row. This is not true. Using Mr. Godfrey's method for Fig. 2 herewith, the upward force on the left-hand row is $S = P\,(b - a)/a$, or 20,000 lb., requiring four rivets at 5,000 lb. each. But by the exact method, using the center of gravity of the rivet group, if the lower four rivets of the left-hand row are omitted, the most highly stressed rivet will receive a stress of 4,610 lb., as against 3,330 lb. as heretofore shown if the full number of eight rivets be retained. Since reducing the number of rivets in the left-hand row increases the labor of the calculations, the drafting expense and the shop expense, with an increase of rivet stress and only a small saving of scrap material, it is clear that the use of an equal number of rivets in each row is very much to be preferred.

WM. RUSSELL DAVIS,
Albany, N. Y. Consulting Engineer.

The Status of the Engineer

Sir—I was very much interested in the state of mind revealed in a letter written by J. L. Harrison appearing in *Engineering News-Record* of Dec. 25, p. 1070. It is just such thinking as he exhibited that was responsible for the needless coal strike, and the wasteful steel strike, and similar lack of vision will be responsible for a vast amount of unnecessary suffering in this country and elsewhere during the next few years.

Sooner or later the majority of thinking men will come to accept this principle: A man should be paid in proportion to his contribution to society. No pay for no work—more pay for more work—plenty of opportunity for all that care to work—these will solve much of our present industrial and social unrest. Most of us fail to realize that we all insist upon a living wage, and take it for granted that we earn what we get, whether we do or not. I know personally of one gang of men working for the Railroad Administration that is doing about two-thirds as much as before the war, and is receiving nearly three times as much in dollars. They are not earning what they are getting.

Mr. Harrison remarks that "a man must always use the tools with which he is familiar." We have penitentiaries established for men of a certain calling that get too familiar with the use of certain tools. This country recently sacrificed thousands of lives and billions of dollars because a Kaiser used the tools with which he was familiar. Neither a democracy, nor an autocracy, nor any other form of organization has by sole virtue of its methods of procedure the privilege to ride roughshod over the established rights of humanity. The union leader who demands a wage that is not earned is no less a plunderer than the thug with gun and blackjack. Both ask for what is not rightfully theirs to ask for, and are willing to use force to obtain it. That sort of spirit has bred terror and trouble throughout history.

What is vitally needed is recognition by each group of society, and each part of each group, of its relation to the rest of society. It must try, in a fair-minded, scientific fashion, in so far as this is possible, to discover what may rightfully be claimed as its share, and what must properly be given in exchange for that share. Unless the ideals of Justice, Co-operation, Energy, Economy and Service guide all of us in our efforts we shall eventually fail as surely as we must ever fail to change the fixed and immutable laws of Nature.

I do not wish to be misunderstood in regard to unionism. There are times and conditions under which unions serve a very useful and legitimate purpose. In the coal-mining industry the assurance of being able to express grievances, and the knowledge of having ample protection in regard to wages and conditions in all probability is worth many times to society the higher wage usually paid to union mine labor. There is very little question as to such lawful organization. On the other hand the shipyard workers' unions during the war, in hundreds of instances, developed an attitude of insatiable greed that approached outright treason. These are the extremes of unionism—the one unquestionably beneficent, the other positively dangerous. Where unions are beneficial to society they should be promoted, or the need for them removed. Where their action is harmful, they must be educated to change their ways, or be pitilessly crushed.

It remains to be seen whether the American Association of Engineers or the American Federation of Labor is to dominate the rank and file of the engineering profession. Unhesitatingly I cast my lot with the American Association of Engineers.

E. M. Goldstine,
Junior Member, Am. Soc. C. E.

Terre Haute, Ind.

Moment Transfer in Eccentric Connections

Sir—Edward Godfrey's article, "Common Errors in Detailing Steelwork for Buildings," in your issue of Oct. 16, 1919, p. 730, has elicited so much adverse criticism that I wish to call attention to the truth in the statement under contention. In speaking of eccentric loads Mr. Godfrey states:

"It is better and more economical, however, to make the details such that the bending moment is thrown into the girder instead of the column. It may sound odd, or even improper to some minds, to speak of shifting moments around in this manner by mere altering of details, but to the writer's mind this is one of the very important facts of structural detail designing."

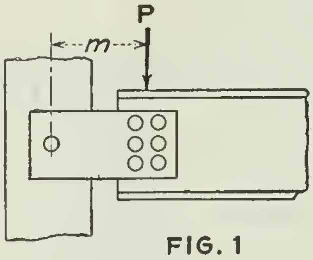


FIG. 1

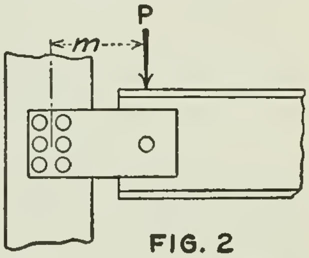


FIG. 2

These are facts which frequently have to be impressed upon the minds of draftsmen and the only fault in Mr. Godfrey's logic is the selection of an unfortunate example. Herewith is a sketch which illustrates the theory. In the detail Fig. 1, the moment Pm is carried by the six rivets and the load on the support is all vertical with no bending moment in the column. In Fig. 2 the moment Pm is carried by the six rivets with an equal moment Pm in the column. Manifestly Fig. 1 is more economical in the design of the column and the moment may be transferred from beam to column, which proves Mr. Godfrey's statement quoted above.

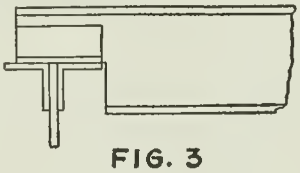


FIG. 3

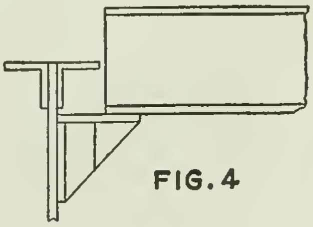


FIG. 4

To illustrate with a more practical example, two beam-seat details are shown in Figs. 3 and 4. The former is much superior to the latter, but such details as Fig. 4 are not at all unusual.

The truth which Mr. Godfrey has stated, but failed to prove, is hard enough to impress on the detailer's mind without being refuted by engineers of high standing. The critics should have been more careful to state that it was the example and not the theory to which they took exception.

T. S. Needels.

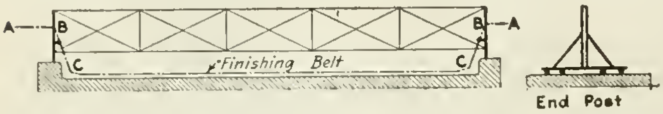
Cleveland, Ohio.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Home-Made Device for Operating Slab-Finishing Belt

TIME and labor have been reduced in belt-finishing concrete pavement at Marshalltown, Iowa, by using the truss device indicated. The truss is white pine and is made up of 6-ft. sections bolted together, the number of sections used depending upon the width of the pavement. It is supported by two end posts which ride on rollers on the curbs. To the end posts are hinged bent levers *A*, *B*, *C* to the ends *C* of which are fastened the belt. Two men operate the belt, by pumping up and down the lever end *A*, with considerably greater ease, it is stated, than they can drag the belt back and forth by grasping the ends. It is also stated that the belting is more nearly uniform. The contractors for the pavement are the Carlson Construction Co., Marshalltown, Iowa.



BELT OPERATED FROM TRUSS TRAVELING ON CURBS

Precautions in Grouting Tunnels and Shafts

PRECAUTIONS to be observed in placing grout as a means of backing up and filling spaces behind tunnel linings, cutting off flows of water into shafts and tunnels and solidifying dam foundations are set forth in a paper by James F. Sanborn, consulting engineer, New York City, and M. E. Zipser, of the New New York Board of Water Supply in a paper, "Grouting Operations, Catskill Water Supply," appearing on p. 3 of the January, 1920, *Proceedings* of the American Society of Civil Engineers. The grout on the Catskill work was generally injected by air pressure.

The experience in the grouting operations on the Catskill project, the authors state, showed that grouting is very effective for backing up and filling the spaces behind tunnel linings. A mixture consisting of 1 bag of cement, 1 bag of sand, and from 6 to 8 gal. of water, was found to be well adapted for this purpose. The air pressure should not be greater than is necessary to force the grout into place. An excess of air churns the mix, causing separation of the sand and cement. The pressure actually used varied from 30 to 90 lb. per square inch. To complete the filling of the voids between the tunnel lining and the rock, particularly in the high places in the roof adjacent to the vent pipes, air pressure up to 300 lb. per square inch and neat cement grout were used.

Good results were obtained in cutting off the leakage of water into the tunnels by grouting the water-bearing seams. For this purpose, it is essential to control the inflowing water by collecting it behind drip-pans or a steel shell, and draining it by pipes through which the grout is subsequently forced into the seams. Neat cement grout, about 6 gal. of water to 1 bag of cement, was found to be effective for this purpose. For fine openings a very thick mix must be used in order to obtain good results. The pressure should be sufficient to overcome the ground-water head and force the grout into the rock.

In sinking wet shafts, grouting was successful in cutting off leakage. The best results were obtained by alternately drilling and grouting, using holes about 10 to 15 ft. deep in the bottom of the shaft. The consistency of the grout should be adjusted to the size of the seams. In some cases, a little addition of bran, oats, etc., to the neat cement grout will aid in plugging the crevices in the rock.

The results obtained in treating the foundations of dams and in cutting off leakage underneath the dikes by drilling holes and grouting the rock seams under the dam structures were satisfactory. It is desirable in such cases to explore the rock under the dams thoroughly by diamond-drill borings for the purpose of locating weak zones and open seams. The location of the holes and method of grouting will depend on the natural conditions encountered.

The procedure to be adopted in any grouting operation must take into account all the factors that enter into the problem. No one method is applicable to all cases. The conditions encountered during the grouting may make it advisable to modify the procedure materially. Good judgment and skillful adaptation to meet varying conditions are essential to success.

To avoid the after-blast of air when grouting a space filled with water it was the usual practice to close the discharge valve before the hose "kicked," the latter requiring careful watching. A further precaution used to prevent the separation of the mix, where a large space filled with water was grouted, was to keep the grouting connection from 2 to 3 ft. below the top of the grout.

Tractor Aids in Cellar Excavation

By C. S. BENNETT

Dayton, Ohio

ON A RECENT housing project at Dayton, Ohio, a number of small one-story cottages were to be built, each with a cellar. The contractor, finding teams scarce at the time the work had to be done, and having a small gasoline farm tractor at hand, decided to try out the tractor as an excavator. The tractor was one of the caterpillar-tread type and one of the smallest on the market. An ordinary drag scraper was attached to the tractor, and after the first earth for each excavation was loosened with picks, the outfit went to work.

The dimensions of each excavation were about 20 x 20 x 5 ft., and the tractor operator had no difficulty in getting into and out of the pit. Two men in the pit kept the earth loosened with picks. Over twenty cellar excavations were made with this outfit on this job, and it was done at a considerable saving over the use of one or more teams. G. W. Schartzer & Co., Dayton, Ohio, were the contractors.

NEWS OF THE WEEK

New York, February 12, 1920

Virtual Agreement on Rail Bill Reported

Conferees Adopt Chief Features of House Bill But Senate Rate Rule Principle Is Retained

That a virtual agreement had been reached by the joint conference committee of Congress in formulating a report on the two railroad bills was indicated in reports from Washington last week. The main features of the Esch bill have evidently prevailed but the principle of the Senate rule for rate-making and the distribution of excess earnings was retained as a temporary arrangement for one or two years following the transition period. While the details of the agreement have not been made known up to this writing, it is expected that the report of the conference committee will go to Congress within a week.

Statements made by the conferees and reports from Washington indicate that the agreement embodies the features which are presented in the following paragraphs.

Return of properties to owners under supervision of Interstate Commerce Commission, with increased membership and broadened powers, but with no provision for a Transportation Board as provided in the Senate bill.

GUARANTEE 5½% NET

A rate rule that is a virtual guarantee of 5½ per cent net income on "value of property," with the length of time it shall remain in effect undecided. For six months following return of roads, present Government rental is guaranteed. The Commission may allow one-half of 1 per cent above 5½ per cent for additions and betterments not to be included in capital account.

The Commission is directed to prepare a new rate schedule sufficient to produce the 5½ per cent return and "excess" earnings are to be divided equally between the carriers and the Government instead of a larger proportion going to the Government, under certain conditions, as required in the Senate bill. For six months after the return of the roads state commissions will not be permitted to suspend intrastate rates previously fixed by the Railroad Administration.

The anti-strike provisions of the Senate bill requiring compulsory arbitration are dropped in favor of a plan for establishing regional boards and an appeal board of five members whose appointment is approved by the Senate. The only appeal from the board's findings is through a strike or lockout, but there are definite provisions for publicity and discussion.

Elected President Engineering Institute of Canada

R. A. Ross, member of the Administrative Commission of the City of Montreal, has been elected president of the Engineering Institute of Canada.

Mr. Ross was born at Woodstock, Ont., and was graduated from the University of Toronto with degrees in both mechanical and electrical engineering. His work, practically all of it in a consulting capacity, has been chiefly along electrical lines. He has been retained by such important interests as the Hydro-Electric Commission of Ontario, the Canadian Pacific Ry. and by some of the larger cities in eastern Canada. He has given courses at McGill University, and his lectures have also been put into book form under the title "Engineering Economics."

Elected President Engineering Institute of Canada

R. A. ROSS

Los Angeles Union Terminal

The Railroad Commission of California has just issued a report on its investigation of grade-crossings and a union terminal in Los Angeles. In the main its recommendations are that most of the grade-crossings be eliminated; that a union passenger terminal be built on what is known as the "Plaza" site; that a union freight yard be provided and that a subway and elevated line be built to the depot at Sixth and Main Streets.

No Blame Fixed in Montreal Water-Works Strike

Commission Takes Testimony on Walk-out of Union Plant Employees Which Cut Off City Supply

No responsibility for the strike of pumping station employees at the Montreal water-works on Jan. 1, 1920, is fixed in the report of the commission to investigate the subject appointed by the Provincial Government of Quebec. Instead the commission, in its report of Jan. 29, merely reviews the testimony brought out in the three-day hearing on the subject. The testimony of witnesses in the investigations brought out the history of a union labor strike which at midnight Dec. 31 left a city of 750,000 people, whose normal water consumption is 67,000,000 gal., to the prospective suffering and disaster contained in dead pumps and empty reservoirs.

With water low in the reservoir and pumping equipment in bad condition, fires were banked by the strikers at 10 p.m. Dec. 31 and at 12 o'clock the pumps were shut down and the men left their stations without having informed him of their intent, according to the testimony of E. R. Decary, chairman of the Provincial Administrative Commission, charged with the management of the water-supply system.

ENGINEERS HELP START PUMPS

Through the aid of the Harbor Commission, the Canadian Pacific Ry. and members of the Engineering Institute of Canada and other organizations, some of the city's nine pumps were gradually got back into service during New Year's Day. At 2 p.m. Jan. 1 the first pump, of 12,000,000-gal. capacity, was started and an hour and a half later the second pump of the same capacity was placed in operation. At 11:00 p.m. a 30,000,000 turbine pump had been repaired and placed in operation.

Other pumps were started later on and at the end of the second day of the strike the city mains were receiving water at the rate of between 62,000,000 and 65,000,000 gal., which approximates the normal consumption of the city. This, however, only supplied the mains from which it was drawn directly by the consumers, and the people on the higher levels were not supplied with water by the city plants for nearly a week. These elevated districts are served by two reservoirs, one considerably higher than the other. The water in the lower reservoir was 15 ft. deep Jan. 8, and pumping to the higher reservoir was commenced on that date. Thence the water situation returned to a normal status.

The strikers, who were members of Local 593, International Union of Steam and Operating Engineers, had been under a contract with the city governing wages and hours for the year 1919. In July, 1919, negotiations were begun for a 1920 contract. The men asked for an increase over the 1919 scale but no agreement was reached and the matter seems to have been dropped until November. Early in December the two sides agreed to obtain figures on the prevailing rate of wages in Montreal and later the matter was taken up for the city by officials and others who were engaged on a civil service plan. On Dec. 29 or 30, the exact date being in question, the two sides got together and the representatives of the city presented a wage scale said to be based on prevailing rates in Montreal and to be in advance of the 1919 schedule. The employees were not satisfied. E. R. Decary, chairman of the Administrative Commission, told the representatives of the employees that the wage experts for the city would submit their data to the men, and that the men might have the month of January to consider the scale and to submit data; and that if the men established, to the satisfaction of the commission, that higher wages should be paid than were offered then their schedule would be adopted, retroactive Jan. 1, 1920. The men said they would submit the proposition to their principals. On Dec. 31, the men came forward with two wage schedules of private concerns in Montreal, higher than what the city had offered but lower than what the men had demanded. The conference broke up without agreement on the afternoon of Dec. 31 and at midnight following the men went out.

Subsequent to the strike there was much local discussion as to which side was to blame, and some talk of mediation. The Administrative Commission had been created a year or two ago by the Provincial Government. The mayor and council, which had been left with but little power, have attributed the strike to the commission. Hence the Government investigation to fix the blame—and a report which merely summarizes the evidence.

Syracuse Sewage Works Report Goes to Consulting Engineers

Final recommendations for a sewage disposal plant for Syracuse, N. Y., have been made by Glenn D. Holmes, chief engineer Intercepting Sewer Board, and H. C. Allen, city engineer. They have been referred by the board to Metcalf & Eddy, consulting engineers, Boston, Mass., for opinion.

Army Tractors for State Roads

The Secretary of War is authorized, in his discretion, by a bill introduced by Senator Swanson of Virginia to loan to any state 5 and 10-ton artillery tractors for use in highway construction. The bill provides for state payment of repair and upkeep.

Canadian Government Outlines Good Roads Policy

Plans are being perfected for carrying out the good roads policy of the Canadian Government, involving the expenditure within five years of the grant of $20,000,000 voted by the Canadian Parliament. The grant is made, provided the provinces do their share by contributing 60 per cent of the total. The relative grants to the provinces, calculated on the basis of population and the amount which each will have to contribute to obtain the Dominion grant, are as follows:

	Federal Grant	Required of Province
Alberta	$1,477,810	$2,216,715
British Columbia	1,251,955	1,877,932
Manitoba	1,602,265	2,403,397
New Brunswick	1,168,845	1,745,767
Nova Scotia	1,468,720	2,203,080
Ontario	5,877,275	8,815,912
Quebec	4,748,420	7,122,630
Prince Edward Island	603,455	905,182
Saskatchewan	1,806,255	2,709,382

The Maritime Provinces and the Western Provinces have yet to be heard from. Preliminary plans are being received from Ontario and Quebec, those of the former including a highway from Windsor to the Quebec boundary with a branch from Prescott to Ottawa. The projected works of the Quebec government comprise roads from Hull to Montreal and from Montreal to Levis, Sherbrooke, Riviere du Loup and the New Brunswick border. The grants will be made and the work directed by the Department of Railways and Canals, with A. W. Campbell as highway commissioner. Regulations governing the expenditures have been drawn up by an honorary advisory commission.

Construction Service and Engineer Corps in Army Bill Draft

The Army Reorganization Bill drafted by the Committee on Military Affairs of the Senate has been reported to the Senate. The bill as reported by the subcommittee to the full committee contains this provision with regard to the construction service:

"There is hereby established a Construction Service which, under regulations to be established by the President and in accordance with the provisions of this Act, shall be charged with the construction, maintenance and repair of all buildings, structures (other than fortifications), and utilities, and the preparation of plans therefor in accordance with the requirements of the several arms, corps and services of the Army of the United States, and with the operation of such utilities as the President may direct, and with the acquirement of real estate and the issuance of licenses in connection with military reservations under the jurisdiction of the War Department.

"The permanent personnel of the Construction Service shall consist of one chief of construction, with the rank of Brigadier General, and two hundred officers, in grades from Second Lieutenant to Colonel, inclusive, and six thousand enlisted men in their appropriate grades, all of whom shall be detailed or assigned from the permanent personnel under the provisions of this Act. The reserve personnel of the Construction Service shall consist of all reserve officers and reservists assigned thereto as provided for in this Act."

In regard to the Corps of Engineers the bill contains the following:

"The permanent personnel of the Corps of Engineers shall consist of one chief of Engineers with the rank of Major General and 1,100 officers and 16,000 enlisted men, in their appropriate grades, all of whom shall be detailed or assigned from the permanent personnel as provided for in this Act. The reserve personnel shall consist of all reserve officers and reservists of the organized reserves and the National Guard of the United States assigned to Engineer Corps Units as provided for in this Act."

The reserve personnel is to include reserve officers, reservists and recruits. The reserve officers are to include all persons who on the date of the passage of the Act hold commissions or appointments in the Reserve Officers Corps or in the National Guard and such other persons who shall be commissioned or appointed as provided by the new measure.

The reservists are those liable to further military training who have completed their prescribed period of initial training, and all other persons liable to military service in time of war who are not liable to training under the provisions of the Act.

Course in Management Engineering at Columbia University

Carrying with it the degree of Management Engineer, a new three-year course has been made available at Columbia University, according to the annual report of Dean George B. Pegram of the School of Mines, Engineering and Chemistry.

The new course is designed for men who desire to follow the business or administrative side of industry rather than the technical. In addition to the purely fundamental engineering subjects there will be included organization, management, economics, finance and labor relations.

Progress Toward Purchasing Toll Bridges

Valuation of the toll bridges of the Delaware River between New York and Pennsylvania having been carried out, a bill has been introduced in the New York Legislature to appropriate $125,000 for the state's share in purchasing four bridges, one at Port Jervis, Callicoon, Barryville and Narrowsburg. This is the beginning of state acquisition of the whole series of bridges, of which at present only one is a public bridge.

Iowa Has Primary Road Fund of More Than $5,000,000

Iowa had a net balance in her primary road fund of $5,046,770.36 Jan. 1, 1920. The primary road fund is composed of the proceeds of automobile registration fees and the state allotment of Federal-aid funds. The last Iowa general assembly established a system of roads, selected by county officials and the State Highway Commission, as a state primary road system. It comprises 6,400 miles of the main highways of the state and connects up every county-seat and every market place of 1,000 inhabitants or over. The primary road fund is set aside for expenditure on this system. Estimates made by the State Highway Commission are that by July 1 of this year the proceeds of the automobile fees and the Federal-aid allotment becomes available will probably double the present balance of $5,000,000.

City Planning Commission Created for Kansas City, Mo.

A city planning commission of eight members has been appointed at Kansas City, Mo. Among the members are Louis R. Ash, of Howard, Harrington & Ash, consulting engineers. Mr. Ash was recently city manager of Wichita, Kan., and has been city engineer of Kansas City. The commission is authorized by ordinance to submit comprehensive plans for the development of the city, including street widening and extensions, river-front improvements and zoning. The ordinance under which the commission was appointed also provides for an advisory city planning board of ex-officio and other members, including the city engineer, now R. W. Waddell, and the landscape architect of the Park Department, now George W. Kessler, and in addition the members of the Board of Control of the Kansas City Railways Company.

Motion-Picture Publicity for Engineers

A co-operative arrangement has been made between the producers of several moving-picture weeklies and the American Association of Engineers, through which six screen weeklies will include engineering scenes or events likely to interest the public. The association is to furnish lists of timely engineering projects and works for this purpose, and asks the active assistance of engineers throughout the country toward making this arrangement work out successfully. Officials of corporations or construction companies who are doing or are having done construction work, or who have especially interesting machinery in process of installation, and all others having matter appropriate to this picture arrangement are requested to advise the office of the A. A. E., 63 E. Adams St., Chicago.

Gen. L. H. Beach Is New Chief of Engineers, U. S. A.

(Washington Correspondence)

Colonel Lansing H. Beach, Corps of Engineers became Major General, Chief of Engineers, U. S. Army, Feb. 4, 1920, when the Senate without delay confirmed his appointment by the President. The Senate's confirmation had been unanimously recommended by its Military Affairs Committee on the preceding day, as told in these columns last week.

By virtue of the appointment Colonel Beach automatically attains the rank of major general. He is commanding general of the Corps of Engineers and director of the Engineer Department. Major General Beach's military history was published in these columns Jan. 22, 1920.

Major General Lansing H. Beach Is Now Chief of Engineers U. S. Army

LANSING H. BEACH

The prompt confirmation of General Beach will have a decided bearing, it is believed, on the action of the Senate in connection with the River and Harbor Appropriation Bill. That bill was reduced far below the "irreducible minimum" fixed by Colonel Harry Taylor. Since General Beach is recognized as a river and harbor specialist, his opinion as to the action of the House in cutting the bill so drastically is expected to have important weight with the Senate committee.

Oregon Bill Aims at Patent Pavements

A bill has been introduced into the Oregon Senate making it unlawful for the state, any city or county, to pay royalties upon patent pavements, or patent pavement specification or design.

Chance for Success of $250,000,000 Reclamation Bond Issue Plea

(Washington Correspondence)

Despite opposition from some of the leaders in Congress to the proposed $250,000,000 bond issue for reclamation and irrigation projects in the West, there is a chance for the Westerners to succeed with their proposition. It is probable that the measure will have to be widened so as to include swamp and cut-over lands, but the fact that the West is now in the saddle in Congress and in addition occupies a strategic political position makes the chance for success good. The delegation from the West has succeeded in overturning a long-established precedence in resuming a hearing directly from the Steering Committee.

Already the Steering Committee has given decided encouragement to the proposed legislation, and, what is more, a vacancy on the Steering Committee probably will be filled by the appointment of Representative Nolan of California. This will give the West the control of that committee and its all-powerful influence for the bond-issue is regarded by many as certain. William Spry, former Governor of Utah and one of the Western delegation, pointed out to the Ways and Means Committee that the Reclamation Fund bond issue is a different proposition from appropriations for rivers and harbors. That money, as he stated, is not returned, while the bond money will be repaid with interest.

War Department Issues Commandeer Order for Rails

An order commandeering 72,500 tons of steel rails, for delivery by March 1 in addition to the 42,500 tons already contracted for by the Railroad Administration has been issued by the War Department, acting under war-time authority, at the request of the Railroad Administration. The order is to be filled by the Carnegie, Illinois, Bethlehem, and Tennessee Coal and Iron companies on the basis of productive capacity. The previous order of the Railroad Administration was given to the Lackawanna, Illinois, and Colorado Fuel and Iron companies.

It is reported that the War Department was asked to invoke its war-time powers and commandeer the rails because some of the so-called high cost steel companies were asking $57 or more for rails. The Railroad and War Departments are satisfied, it is said, that there can be no effective steps taken to prevent the War Department using its commandeering powers and then turn the rails over to the Railroad Administration unless it can be shown that the price finally offered by the War Department is unfair.

The new order is construed in some circles as a final act of the Railroad Administration toward making up the alleged serious deficiency in maintenance as to rail renewals.

Engineers of Three States Promote License Laws

Engineers in Kentucky, Ohio and West Virginia have recently taken action to bring much nearer the enactment of a license law in each of those states. The legislature of Kentucky is reported favorable to a license bill recently introduced under the auspices of A. A. E. members in Louisville. The bill is patterned after the Michigan law. At the recent meeting of the Ohio Engineering Society steps were taken to organize the engineers of the state to insure agreement among them on the desirability of a license law and to bring their influence on the next legislature.

The Ohio Engineering Society will appropriate a sum of money to start the campaign. The American Association of Engineers has agreed to appropriate an equal sum for license work in Ohio as soon as the Ohio Society announces the amount. The recently formed State Assembly of A. A. E. and the O. E. S. will co-operate fully in putting the license bill across. A joint committee of the two organizations will be appointed to map out a program and carry it through.

At a joint meeting of the West Virginia Engineers' Association and the Charleston Chapter of A. A. E. in Charleston, Jan. 23, licensing was discussed by Secretary Drayer of A. A. E., who recommended with minor changes the registration bill proposed by Engineering Council. After a lively discussion, a vote was taken showing the sentiment unanimous in favor of a license law in West Virginia. A motion was passed empowering the presidents of the West Virginia Engineers' Association and the Charleston Chapter to appoint a joint committee to prepare a bill for passage by the legislature which meets in 1921. A plan was outlined for interviewing every candidate for the legislature and for governor. Organization of the state will be by legislative districts.

Western Society Plans Work and Foresees Developments

Engineering development in its technical and broader social aspects was the theme of addresses at the annual dinner of the Western Society of Engineers, held in Chicago Jan. 28. In his address as retiring president A. S. Baldwin dealt with the relations of capital and labor in which the engineer is especially interested.

In the future, according to Mr. Baldwin, there will be a marked increase in the power of the great middle-class group in exercising control over the relatively small groups, capital and labor.

The society has trebled its membership by a campaign carried on in the great industrial center, Chicago, with over 6,000 engineers. Because of its large membership it was decided that the work of the directors must be decentralized and distributed more among the eight sections. Each of these, to a certain extent, is to become a self-contained society, but all co-operating as parts of the main body. If each section were the local branch of that national society with which most of its members are affiliated, and if each national body would in turn act as father of the section, it was considered that there would be a resultant strengthening of the sections, the Western Society of Engineers and the national societies.

Lines of future activity for the Society were traced by F. K. Copeland, the incoming president. Three such lines were given as technical development, civic development and social relations. In the second he included such matters as city planning, zoning and railway terminals, all of which he maintained can be handled most effectively by an engineering organization. While the Society's activities have hitherto been confined closely to technical matters and its work has been left largely to the officers, he intimated that the scope would be broadened and more of the work put upon the members.

Major-General Leonard Wood, U. S. A., spoke of the engineer as an aid in colonial development. Under his administration in Cuba an independent department of public works was formed and worked under a budget, which system he thought could be applied to advantage in this country. He emphasized the importance of the work of the engineer in the great war and advocated retaining the engineer officers' reserve corps as a factor in a program of preparedness for the future.

The officers for 1920 include the following: President, F. K. Copeland; vice presidents, C. F. W. Felt, J. L. Hecht and Linn White; treasurer, F. F. Fowle; secretary, Edgar Nethercut.

Expect Argentine to Bid on Entire Rail Surplus

It is understood that the Argentine Republic will bid on the entire amount of 32,000 tons of rail, declared surplus by the army, and soon to be offered for sale. That Argentina is contemplating considerable railway construction may be indicated by the fact that a New York firm is now carrying on negotiations with the office of the Director of Sales of the War Department looking to the purchase of the entire amount for that country. The quantity now held surplus includes 28,800 tons of 80-lb. drilled rails, smaller quantities of 100-lb. rails, 67½-lb. Russian rails and 30-lb. rails.

Canadian Construction Industries Favor Standard Contract

As a result of recommendations made at a recent session of the Association of Canadian Building and Construction Industries, the Royal Architectural Institute of Canada and the Engineering Institute of Canada will be asked to join the Association in drawing up a standard form of contract which may be used throughout the Dominion.

Mississippi Valley States Discuss Concrete Roads

Disapproval of any plans by which a Federal highway commission may build roads without state co-operation was registered by formal resolution at the annual meeting of the Association of Mississippi Valley State Highway Departments held in Chicago on Feb. 2-4, 1920. Annual appropriations of Federal funds for road building at the rate of $100,000,000, for four years, 1920-1923, were urged. A decided stand was taken against propaganda being "carried on by the American Automobile Association and other motor interests" to lower motor vehicle license fees, "regardless of circumstances existing in several states in regard to financing necessary highway improvements." Frank Rogers, state highway commissioner, Lansing, Mich., was elected president of the association for 1920 and Alex. W. Graham, state highway engineer, Jefferson City, Mo., was elected secretary.

Two full sessions of the meeting on the third day were thrown open to contractors, materials men and machinery men for a general discussion and exchange of opinion on concrete road construction. Out of the contradictory opinions voiced, the following conclusions appear to be justified: (1) Central mixing plants and wet haulage methods are increasing in favor; (2) heavy rolling of subgrade is a practice which is decreasing in favor; (3) bulk cement is successful where proper equipment is installed to handle it; (4) success in motor truck haulage is determined by road conditions; (5) heavy trucks are being replaced by light trucks with pneumatic tires; (6) aggregate storage practice leans toward tunnels or traveling bins; (7) generally greater weight and durability is necessary in road building equipment; (8) balanced plant requires more careful study.

Materials supply proved the most interesting subject of discussion. Of nine states represented in the association only one, Illinois, is furnishing any construction materials and that state furnishes cement only. The attitude of the contractors present was generally against state-furnished materials unless the states should also guarantee the contractors' losses due to interruption of work from lack of materials delivered. It was pointed out by the highway officials in their turn that unless better co-ordination could be secured between producers and contractors in keeping up the supply of materials for road construction, the states would as a measure of self-defense be compelled to assume entire control of the task. All states except one in the association plan this year to pay for materials delivered on the job, and properly stored for future work.

To Vote on $24,000,000 Bond Issue at St. Louis, Mo.

After a long period of deliberation during which the subject was considered by a special commission the city authorities of St. Louis, Mo., have formulated a $24,000,000 program of public works construction and have passed an ordinance calling for a bond election on May 11 to vote separately on each of these 18 propositions:

1.	Bridges and viaducts......	$905,000
2.	New parks and playgrounds	1,385,500
3.	Improvement of existing parks and playgrounds...	1,174,500
4.	Municipal auditorium and community center building	900,000
5.	Sewer construction	2,575,000
6.	Improvement of the River des Peres	9,000,000
7.	Municipal farm for the care of delinquents	400,000
8.	Farm for the treatment of the tubercular and insane	1,100,000
9.	Additional West Approach of Municipal Bridge	1,500,000
10.	Construction of Municipal Dock near Victor St., including construction of railroad yards	1,700,000
11.	City's share of opening and widening streets	1,250,000
12.	Fire engine houses and equipment	360,000
13.	New buildings in Bellefontaine Industrial Farm for Boys	156,000
14.	Additional jail cells.......	76,000
15.	Construction of new morgue	68,000
16.	Municipal garage	90,000
17.	Maintenance of streets as general thoroughfares ...	360,000
18.	Electric lighting system in streets and parks.......	1,000,000
	Total	$24,000,000

A two-thirds majority of all the votes cast is required to carry any of the items. If the bonds are voted considerable time will be required to issue them and to pass individual ordinances authorizing the letting of contracts, so it is unlikely that any of the money will be available for expenditure before September.

The Board of Estimate has announced that an advisory committee of citizens would be appointed to assist in passing on the character of the expenditures under this bond issue. This committee will consist of one representative each from the Chamber of Commerce, the Buildings Trades Council, Manufacturers' Association, St. Louis Bar Association, Central Trades and Labor Council, Real Estate Exchange, and Merchants Exchange. This committee is not mentioned in the ordinance and will have no official status, but has been suggested in order to give the citizens at large a more direct interest in the expenditure.

Potomac Key Bridge Provided for in Deficiency Bill

Only after prolonged discussion was it possible to include in the second deficiency bill the $150,000 appropriation to make possible the continuance of the work on the Key bridge over the Potomac at Washington. The item was challenged on the ground that it was not a deficiency, to which Chairman Good of the committee replied: "It is a deficiency. We already have appropriated the full amount of the authorized cost, $1,000,000; but the bridge has not been completed. One million dollars was authorized before the war. The Interstate and Foreign Commerce Committee has reported out a bill to increase the limit of cost to $2,100,000. A bill of that kind will have to pass. This small appropriation is made in anticipation of that bill passing, and in order to prevent cessation of work."

Philadelphia Asks Bids on Street Improvements

Work valued at approximately $952,000 has been advertised by the bureau of highways of the Philadelphia Department of Public Works. The work includes asphalt paving and repaving, redressed granite block repaving, wood block repaving, the improvement of Adams Ave., the improvement to certain country roads and curb and footway work.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

AMERICAN CONCRETE INSTITUTE; Feb. 16,.17, 18, Chicago.

NATIONAL CONFERENCE ON CONCRETE HOUSE CONSTRUCTION; Secretary A. J. R. Curtis, 111 West Washington St., Chicago; Feb. 17, 18, 19, Chicago.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA; 111 W. Washington St., Chicago; Feb. 18-19, Chicago.

AMERICAN CONCRETE PIPE ASSOCIATION; 210 South La Salle St., Chicago; Feb. 20-21, Chicago.

AMERICAN RAILWAY ENGINEERING ASSOCIATION; 1426 Manhattan Bldg., Chicago; March 16-18, Chicago.

AMERICAN ASSOCIATION OF ENGINEERS; 29 S. La Salle St., Chicago; May 10, 11, St. Louis, Mo.

The Richmond Chapter, A. A. E. met in Richmond, Va., Feb. 2. Many members from Norfolk and Lynchburg, Va., attended. The meeting was addressed by Representative Stuart of Virginia, who explained the Engineers' License Bill introduced by him in the state assembly. Following his talk the members passed a resolution indorsing his bill.

The Engineers' Club of Columbus (Ohio) at its meeting Jan. 30 was asked by the Mayor of Columbus to lend its assistance in civic affairs. The Mayor asked the co-operation of members in order to give the best possible service to the citizens.

The Engineers' Club of Seattle has elected for the ensuing year: J. Thomas Dovey, president; B. D. Dean, vice-president; A. L. Valentine, secretary; Amos Slater, treasurer.

The Cleveland Engineering Society, the Akron Engineering Society and the Cleveland Section of the Am. Soc., M. E. held a joint meeting in Akron, Ohio, Jan. 27. Many of that city's industrial plants were inspected during the meeting. A discussion of "Human Nature in Industry" was the feature of the session.

The Utah Chapter, A. A. E., recently elected: W. A. Richmond, president; W. A. Alexander, vice-president; Joseph Blickensderfer, secretary; G. A. McIntyre, treasurer.

The Iowa Engineering Society annual convention will be held Feb. 18 and 19 at Fort Dodge, Iowa. One of the main topics of discussion will be the consolidation of all of the engineering organizations in the State making the State Society a central body and the local sections its components. At a conference Jan. 8 a plan was outlined by representatives of several Iowa organizations by which greater service to the State, the profession and the individual engineer could be obtained. Districts would be established, according to the plan, and all members assigned thereto in accord with a method to be worked out after a study of the distribution of the engineering population.

The Vermont Society of Engineers will hold its next convention in Burlington, Vt., March 10, 1920.

The Engineering Society of Western Massachusetts met in Springfield, Mass., Jan. 20. The meeting included an inspection of the Springfield Gas Light Co.'s plant, a dinner and an evening session whereat two addresses on gas production were made.

The Rochester Engineering Society met Feb. 6 in Rochester, N. Y., and heard a paper on the commercial uses of tar by C. S. Reeve, formerly in the National Office of Public Roads.

The North Carolina Society of Civil Engineers held its annual meeting on Jan. 31. The members discussed a proposed amalgamation with the American Association of Engineers. R. C. Bailey, Washington, D. C., district secretary of the national organization, addressed the body.

The officers of the society are: Dr. W. C. Riddick, Raleigh, president, and Ira Mullins, of Monroe, secretary and treasurer.

The Connecticut Society of Engineers will hold its annual meeting in Hartford, Conn., Feb. 17 and 18. Papers on various subjects of state interest will be read by the following: Albert N. Turner, Dr. F. B. Jewett, James Handy, F. Irving Rudd, Frank Bachman, James E. MacElroy, and H. J. Hoard.

The Engineers' Society of Western Pennsylvania at its annual meeting in Pittsburgh, Jan 20, elected the following new officers: William Chauncey Hawley, president; Henry Duvall James, vice-president, and Arnold Stucki, treasurer. W. E. Fohl and J. H. Minton were chosen directors.

The Idaho Chapter, A. A. E., was organized Jan. 12 in Pocatello, Idaho. Following are the officers elected: E. D. Darlington, Jerome, president; Dr. C. N. Little, Moscow, first vice-president; E. S. Moberly, Pocatello, second vice-president; Capt. E. G. Ayres, Boise, secretary and treasurer. Those appointed to the executive committee are: J. H. Wilson, Idaho Falls; Barry Dibble, Burley, and Allen C. Merritt, Salmon.

The American Society of Civil Engineers held a regular business meeting Feb. 4 in the Engineering Societies Building, New York City. This was the society's first regular meeting since the annual meeting Jan. 21, 22. The speaker was James F. Sanborn and his subject, "Grouting Operations, Catskill Water Supply." Lantern slides were used in illustration of his talk.

The Engineers' Society of Northwestern Pennsylvania held its 23rd annual dinner meeting in Scranton, Pa., Feb. 4.

The Oil City Chapter of the A. A. E. elected the following officers for 1920 at its first annual meeting held in Pittsburgh Jan. 20: President, R. A. Harbaugh; first vice-president, B. B. Weber; second vice-president, C. L. Olmstead; secretary, A. C. Burwell; treasurer, S. L. Connell. Dr. F. H. Newell, president of the A.A.E., visited the Oil City Chapter on Jan. 2 and addressed a public meeting under the auspices of the chapter on "The Engineer and Good Roads." The chapter is said to be growing rapidly and now has more than fifty members. It has jurisdiction over five adjacent counties in northwestern Pennsylvania.

The Fairmont (W. Va.) Chapter, A. A. E., was organized Jan. 29, when the following temporary officers were elected: R. S. Quick, president; William Brassack, vice-president; H. F. Carr, secretary and treasurer.

The Connecticut Association of Members of the American Society of Civil Engineers held a luncheon meeting in Hartford, Conn., Jan. 30. C. E. Ewell addressed the gathering on "Water and Rail Transportation as Regulated by Public Utility Commissions." Another address was that of R. J. Ross, assistant city engineer of Hartford on "Assessments for Municipal Improvements." The program for future meetings, with speakers and subjects, is as follows:

Feb. 14, New Haven, S. E. Backes and C. J. Bennett, "Steam Railroads and River Navigation;" "Highways and Freight Carrying."

Feb. 28, Hartford, H. W. Griswold and R. N. Clark, "River Improvement and Navigation;" "Waterfront Improvement in Hartford."

March 13, Hartford, W. R. Dunham, Jr., "Relation of Electric Roads to Navigation."

March 27, New Haven, Charles R. Harte, "Different Forms of Contracts in Relation to Construction."

April 10, New Haven, R. J. Ross.

PERSONAL NOTES

KARL RIDDLE has been appointed resident engineer of the Federal aid road work in Dickinson Co., Kan., with headquarters at Abilene. He was formerly county engineer of Dickinson Co.

D. E. GILMER, president of the Southwestern Engineering Co., of Hutchinson Co., Kan., has been appointed county engineer of Reno Co., Kan., to succeed W. B. Harris who has resigned to go into private practice.

H. A. MARSHALL has been appointed first assistant engnieer of the Kansas State Highway Commission.

WILBUR L. FULTON, consulting engineer in structural steel and reinforced concrete, has opened an office for practice in Omaha, Neb.

E. W. BALDWIN has established a consulting office in Tulsa, Okla. Mr. Baldwin has practiced civil engineering in Michigan, Panama and Chile.

FRANK S. ALTMAN and G. W. BRANCH have been engaged by the Portland Cement Association and assigned territories in Kansas. Both were captains of Engineers in the A. E. F., Mr. Altman being in the 23rd Engineers and Mr. Branch with the 15th Engineers.

HJALMAR E. SKOUGOR has returned to private practice as consulting industrial engineer with office in New York City after severing his connection with Guggenheim Bros., Chile Exploration Co. and the Braden Copper Co. He had been designing engineer for those companies for the past seven years.

GILBERT H. PRATT has been appointed acting district sales representative of the Wallace & Tiernan Co. for New York, New England and northern New Jersey in the absence in Europe of A. M. E. Johnstone. After several years with the Massachusetts Health Department Mr. Pratt became chief of the Rhode Island State Department of Health and later chief chemist of the New York Continental Jewel Filtration Co.

A. L. MERCER has tendered his resignation from the position of assistant director of sales of the War Department in order to become president of the Needham Tire Co., Charles River, Mass. The company manufactures tires, soles and heels, and expects to manufacture a complete line of rubber goods for all purposes. Mr. Mercer took up his active duties as president of the company about Feb. 1.

HOWARD F. REED has reopened an office for the practice of engnieering in Phoenix in association with Sheldon K. Baker. Mr. Reed has only recently secured his release from the U. S. Army wherein he served as a Captain of Engineers.

LEWIS E. ASHBAUGH, hydraulic engineer with the J. G. White companies and clients for the past twelve years, has become connected with John R. Proctor, Inc., of Bayonne, N. J., and New York City. Mr. Ashbaugh is to be the sales-engineer at the New York office, in charge of installations of fuel-oil apparatus and other electrical equipment for power and lighting purposes.

H. S. MULLICAN recently resigned as county engineer of Davidson Co., N. C., to become consulting engineer on hard surface road construction and location revisions in that county. Mr. Mullican has been engaged in highway engineering in North Carolina for ten years.

W. R. HOLWAY has resigned as sanitary engineer in the Department of Water and Sewers at Tulsa, Okla., and has organized the Holway Engineering Co. in Tulsa. He is a graduate of the Massachusetts Institute of Technology. He has been assistant engineer for the Providence Water Supply Board, sanitary engineer for Alliance, Ohio, and for the past two years at Tulsa. The new company will specialize in water and sewerage work.

CHARLES R. WATERS has been promoted from the position of assistant engineer to that of chief clerk and engineering assistant in the New York State Engineer's Department at Albany. Mr. Waters, who has been employed in the department more than twelve years, has had wide experience in field construction, having been engineer-in-charge of some of the largest contracts on the New York Barge Canal. During 1918 Mr. Waters was private secretary to State Engineer Frank M. Williams, and since the promotion of R. G. Finch from chief clerk to deputy state engineer in January, 1919, Mr. Waters has been acting in the position to which he now receives permanent appointment.

GEORGE E. MARTIN, associate professor of highway engineering, Purdue University, has resigned, effective Feb. 1. Professor Martin graduated from the School of Civil Engineering, Purdue University, in 1909. In 1914 he returned to Purdue to take charge of the newly organized work in highway engineering and left again in October, 1917, to serve as a captain in the 23rd Engineers until July 2, 1919. He returned to the university in September, 1919. Professor Martin has become consulting highway engineer for the Barrett Co., with headquarters in Chicago.

CHARLES SAVILLE, civil engineer, has been made secretary of the Dallas, Tex., Chamber of Commerce.

T. McLEAN JASPER, engineer with J. L. Jacobs & Co., Chicago, has become assistant professor of mathematics, department of engineering, University of Wisconsin. He was captain in the British Royal Field Artillery for four years of the great war, acting successively as demolition officer, gun pit construction officer and battery officer in France. In England at the artillery officers' training school he was instructor in gunnery, demolitions and telephony, and later in London he was production officer in the fabrication of lmber non-explosive tanks. Prior to his service in the B. E. F. Mr. Jasper spent two years with Alvord & Burdick, consulting engineers, Chicago, and two years as secretary-engineer of the Chicago city water commission.

Leslie H. Belknap has been appointed chief engineer of the Michigan State Highway Department succeeding W. W. Cox who has become highway engineer of St. Clair County, as previously noted in these columns. Mr. Belknap has served as district and division engineer of the department for six years.

James L. Doyle is engaged as valuation engineer in the appraisal of buildings of the Penn Public Service Corp. and the Centre & Clearfield Ry. Co. with headquarters at Johnstown, Pa. Leaving an engineering position with the New York State Public Service Commission, Mr. Doyle served in France as First Lieutenant, 102nd Engineers.

James D. Scruggs has been appointed district manager and placed in charge of the new office opened in Birmingham, Ala., by the Richardson-Phenix Co., lubrication engineers and manufacturers, of Milwaukee, Wis.

J. H. Coley, for the past seven years employed by the Geo. D. Whitcomb Co., as sales manager, has severed that connection to consider other matters inviting his attention.

H. L. Hook, former assistant engineer for the Idaho Irrigation Co., has accepted a position with the National Carbon Co., Cleveland, Ohio.

H. C. Barnes, steel-treating expert, has joined the Allegheny Gear Works at Pittsburgh as superintendent of laboratory and metallurgical work.

John A. Stevens, whose engineering firm has headquarters at Lowell, Mass., and branches at Akron and Cleveland, Ohio, has established another branch in Fall River, Mass., to handle business in southern New England. Carl J. Sittinger will be in charge at Fall River. Besides handling power, power plants, and steam and electrical work for a large number of textile and other plants throughout the country, the firm has done a great deal of research work during the past ten years along the line of developing large and special boilers and assisting in developing turbines.

Frank T. Townsend, previously associate editor of *Engineering News-Record*, has become head of the department of civil engineering, Extension Division, United Y. M. C. A. Schools, New York City.

Harold Almert has been endorsed by the Chicago Chapter, A. A. E., as a candidate for the position of chief engineer of Chicago's traction commission.

L. B. Hitchcock, city engineer of Phoenix, Ariz., has been elected president of the Phoenix Chapter of the A. A. E. D. A. McClung, assistant county engineer, is secretary.

OBITUARY

Frederick Holbrook, president of the Grace-American International Corporation, of New York, died in Paris, France, on Feb. 6. Mr. Holbrook was best known as a member of the contracting firm of Holbrook, Cabot & Rollins, which he helped to found over 20 years ago. In 1916 he became a vice-president of the American International Corporation, in special charge of the Russian end of that company's business and was in Russia from September, 1916, to August, 1917. In March, 1918, he became president of the American International Shipbuilding Corporation which built and operated the famous Hog Island shipyard and remained in that position until 1919 when he became president of the Grace-American International Corporation, which was formed to do a Russian export business. Mr. Holbrook sailed for Russia in December, 1919, but never got beyond Paris. He was born in Lynn, Mass., July 20, 1861, and started in the contracting business through early training in railway engineering in the Far West where he was sent for his health when quite a young man.

Theodore B. Ford, former member of the Connecticut Public Utilities Commission, died at his home in Bridgeport, Feb. 2, at the age of 51 years.

D. C. Bard, consulting geologist, of Seattle, Wash., died in Butte, Mont., recently.

E. T. Walsh, former major Ordnance Corps, U. S. A., and associated, in various engineering capacities, with the Interborough Rapid Transit Co., of New York City; Frederick Waldron Co., Plainfield, N. J.; and the National Cash Register Co., died recently at his home in Plainfield.

George E. Blakeslee, member of the New Jersey State Highway Commission, died recently after a short illness.

John W. Wilcox, city engineer of Macon, Ga., for 16 years, died recently at Saluda, N. C. During his tenure of office which began in 1894 he undertook many improvements, notable among which was the sewer system, which has gained prominence because of the excellence of its construction.

R. H. Chapman, topographic engineer of Washington, D. C., died recently in New York City while attending a meeting of the American Alpine Club. He had done notable work while in the U. S. Geologic Survey. He was a member of various technical and social clubs of Washington.

George Weston, former city representative on the board of supervising engineers of Chicago street railways, and a traction pioneer, died suddenly in Philadelphia recently, aged 58 years.

E. F. Wood, consulting engineer, New York City, died recently at the age of 60 years. He was formerly connected with the Carnegie Steel Co. and the International Nickel Co.

Prof. Charles D. Bray, for 39 years in the mechanical and engineering departments of Tufts College, died recently of pneumonia. He was a member of several engineering societies and had served on various public commissions besides attending to his duties at Tufts.

BUSINESS NOTES

M. S. Roberts, Jr., J. C. Akers, F. E. Freeland, J. R. Currey, Jr., and W. H. Levine have incorporated in Tennessee the Freeland, Roberts Co., with a capital stock of $25,000, to engage in general contracting in Nashville, Tenn.

I. F. Baker of the Westinghouse Electric International Co., who has been located in the New York City office of that company for the past two years, is now on his way to Tokio, Japan, where he will act as a special representative of the company.

E. H. Peters has assumed the management of a new office in Chicago, opened for carrying on the business in that section of the Ideal Engine Co. and the Ideal Power Lawn Mower Co.

F. W. Probst has entered the service of the Kansas City branch of the Barrett Co., to take charge of the field work in the western part of Missouri.

J. B. Johnston, formerly manager of the ordnance department, Crucible Steel Co. of America, Harrison, N. J., has been appointed general manager of the Standard Scale & Supply Co., Pittsburgh, Pa., manufacturers of concrete mixers and other contractors' equipment.

The Sullivan Machinery Co. announces the following appointments made by the Board of Directors: Arthur E. Blackwood, formerly manager of the New York City office, to be vice-president in charge of finance and accounting; Howard T. Walsh, vice-president in charge of sales; Gilbert K. Wilson, assistant secretary in charge of cost accounting; Nathaniel H. Blatchford, Jr., assistant treasurer; Emil A. Krevis, general auditor; Frederick W. Copeland, manager of foreign sales; Louis R. Chadwick, formerly Spokane, Wash., office manager, New York City office manager; Robert T. Banks, for several years sales engineer in the company's office at El Paso, Tex., manager of the Spokane office.

L. **BASSETT**, **WILLIAM F. MURPHY** AND **H. J. O'KEEFE** have incorporated the Submarine Engineering & Construction Co. of Troy, N. Y. The purpose of the company is river improvements, and its capital stock is $50,000.

RICHARD F. JONES, **M. STEPHEN DONOHUE** AND **FRANCIS E. JONES** have incorporated in Connecticut the R. F. Jones Co. of Hartford, Conn., to engage in building erection. The company's capitalization is placed at $50,000.

F. H. MYERS, formerly an assistant secretary of the A. A. E., is now associated with the Certain-teed Products Corporation as sales engineer. Mr. Myers has spent almost two years at the national headquarters of the association, much of which time was devoted to building up the employment service. Prior to his connection with the A. A. E., Mr. Myers was with the Minneapolis & St. Louis Ry.

Spring Prices in New York

Brick and Lumber at Startling Levels—Concreting Materials Fairly Steady—Situation Complicated

By ALDEN W. WELCH

Prices of construction materials have been advancing since 1916, retarded only by the Government regulations, now removed. The advance continues and indicates higher prices in the coming spring. Herewith are two tabulations, the smaller showing the swift upward sweep of lumber prices, the larger giving the range of eleven materials in New York City. The figures are for April, May and June, 1913 to 1919, with the spring averages for each year and the prices quoted today.

BRICK, LUMBER AND CAST-IRON PIPE

The most startling jump was in common brick, lumber and cast-iron pipe. In the spring of 1914, brick sold for $5.50 per 1,000 alongside docks. This was an unusually low price, $6 to $7 being considered as fair. The price today, however, is $25 alongside dock, or $30.45 delivered in Manhattan. There are so many uncertainties in the trade that nobody is willing to hazard a guess as to the price of brick in the spring. In fact the companies are not quoting for future deliveries.

The following tells the story:

ROUGH YELLOW PINE, 20 FT. AND UNDER

	3x4@8x8	4x20@20x20
June, 1916	$27 50	$40 00
June, 1918	37 25	55 25
Feb., 1920	58 00	96 00

There is shortly to be a heavy demand for wooden piles. It is estimated that 75,000 will be required for pier work by New York City, the Cunard Steamship Co. and the Lehigh Valley R.R. Naturally a sharp price rise is expected.

Cast-iron pipe is another item that is particularly remarkable on account of its price altitude. In June, 1915, 6-in. cast-iron pipe cost $20 per ton; today $67.30 is quoted.

Cement has increased only 77 per cent since 1913. The present price is $2.80 at dock exclusive of bags, but it is quite possible that $3. will be reached within a few months. Lime has maintained its price throughout the year. Hydrated lime remains the same today as it was in 1919, but lump lime has been advanced and quotations are now given f.o.b. plant, instead of in the city. The present prices of lump lime per 300-lb. bbl. are $2.75 for finished, $2.55 for common. It is estimated that these prices will be advanced at least 25c. in the spring. As a single factor in this increase it may be mentioned that barrel staves cost $30 per thousand against $6.50 three years ago. Sand, gravel and crushed stone are quoted at a 25 per cent advance over the present official prices for spring deliveries and these quotations are for use in estimating rather than on sales.

Prophecy is always a difficult and often a dangerous calling. The construction situation is by no means simple. There are a number of factors that must be watched. First, although the recent labor agreement is intended to remain effective until Dec. 31, 1921, it is doubtful whether it can be regarded as being more than a truce. The labor agitation is too profound for prompt solution, living costs are increasing and the need for increased income is growing more imperative. Then, there is a shortage of materials in certain lines, besides continual difficulties in deliveries.

Unquestionably, also, the construction situation will be dependent in some measure on the money market conditions, as they will develop in the next two or three months. How far the efforts of the Federal Reserve Board to reduce the credit volume will extend cannot yet be foreseen. But in view of the relation between credit and price conditions, those who figure on future prices are bound to take this into account.

SPRING PRICES IN NEW YORK FOR THE LAST SEVEN YEARS—THEIR RISE

	Portland Cement (per bbl., with sacks)	Common Brick (per M)	Crushed Stone (per cu.yd.—¾ in.)	Sand (per cu.yd.)	Gravel (per cu.yd.—¾-in.)	C.-I. Pipe (6-inch—per ton)	Beams and Channels (3—15-inch per 100 lb.)	Plates per 100 lb.	Hollow Tile (6x12x12) per block	Linseed Oil (raw in barrels)	Freight to Pittsburgh on Steel (per 100 lb.)
April, 1913	$1 58	$7 00	$0 90	$0 50	$0 85	$24 00	$2 15	$1 61	$0 084	$0 48	$0 16
May, 1913	1 58	7 00	90	50	.85	23 50	2.15	1.61	084*	50	16
June, 1913	1 58	7 00	90	.50	85	23 00	2.15	1 61	.084*	48	16
Average	$1 58	$7 00	$0 90	$0 50	$0.85	$23.50	$2 15	$1 61	$0.084*	$0.49	$0 16
April, 1914	$1 58	$5 50	$0 95	$0 50	$0 90	$22 00	$1 85	$1 31	$0 084*	$0 54	$0 16
May, 1914	1 58	5 50	95	50	90	22 00	1 85	1 31	084*	54	16
June, 1914	1 58	5 60	95	50	90	20 50	1 85	1 31	084*	53	16
Average	$1 58	$5 55	$0 95	$0 50	$0 90	$21 50	$1 85	$1.31	$0.084*	$0.54	$0.16
April, 1915	$1 22	$5 50	$0 90	.	$0 85	$20 00	$1 90	$1 36	......	....	$0 169
May, 1915	1 22	5 75	1 05	...	.85	20 50	1 90	1 32	......	.....	.169
June, 1915	1 22	6 00	1 05	.	85	22 00	1 90	1 37	......	.....	.169
Average	$1 22	$5 75	$1 00	.	$0 85	$20 75	$1 90	$1 35	......	.....	$0.169
April, 1916	$1 72	$8 50	$0 95	$0 40	$0 80	$30 50	$2 50	$2 50	$0 08¾	$0 81	$0 169
May, 1916	1 72	7 25	95	40	85		2 50	2 65	08¾	.81	169
June, 1916	1 72	8 00	95	50	1 00		2 60	2 75	08¾		169
Average	$1 72	$7 90	$0 95	$0 45	$0 90		$2 55	$2 65	$0 08¾	$0 81	$0.169
April, 1917	$2 40	$9 50	$1 20	$0 50	$1 25	$47 50	$3 75	$5 00	$0 13	$1 04	$0 169
May, 1917	2 40	11 50	1 25	50	1 35	55 50	3 80	5 50	13	1 21	169
June, 1917	2 40	10 25	1 25	50	1 25	55 50	5 00	7 00	13	1 31	169
Average	$2 40	$10 40	$1 25	$0 50	$1 30	$51 70	$4 15	$5 80	$0 13	$1 19	$0 169
April, 1918	$2 59	$10 25	$1 75	$1 25	$2 00	$55 35	$4 20	$4 45	$0 14*	$1 55	$0 195
May, 1918	2 59	10 00	1 75	1 25	2.00	55 35	4 20	4 45	14*	1 55	195
June, 1918	2 59	10 25	1 75	1 25	2 00	61 35	4 20	4 45	14*	1 58	195
Average	$2 59	$10 15	$1 75	$1 25	$2 00	$57 35	$4 20	$4 45	$0 14*	$1 56	$0.195
April, 1919	3 05	15 00	1 75 1 85	1 25	2 00	57 70	3 47	3 67	159	1 55	.27
May, 1919	2 90	15 00	1 75 1 85	1 25	2 00	57 70	3 47	3 67	153	1 63	.27
June, 1919	2 90	15 00	1 75 1 85	1 25	2 00	52 70	3 47	3 67	153	1 76	27
Average	$2 95	$15 00	$1 80	$1 25	$2 00	$56 03	$3 47	$3 67	$0 155	$1 65	$0 27
General average	$2 01	$8 82	$1 23	$0 74	$1 26	$37 33	$2 89	$2 98	$1134	$1 04	$0 185
Feb., 1920	$2 80	$25 00	$1 85	$1 25	$2 00	$67 30	$3 47	$3 67	$0 2223	$1 80	$0 27

* These hollow-tile quotations f.o.b. works, Perth Amboy, N. Y.

A Consolidation of Engineering News and Engineering Record McGraw-Hill Company, Inc.—JAMES H. MCGRAW, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN
Editor

Volume 84 NEW YORK, THURSDAY, FEBRUARY 19, 1920 Number 8

High Cost of Highways

ENGINEERS are fully convinced that, under normal conditions, expenditures for good highways are an investment that yields satisfactory returns to the public, but when costs have risen abnormally the investor must consider alternative plans for accomplishing the desired result. Last year we had to acquire the habit of considering $40,000 per mile as the proper cost for a road that could have been built for half that sum before the war. This year, if the bids recently received by the State of Pennsylvania are a fair criterion, we must decide to pay $60,000 for the identical product. Against an annual interest and amortization charge of $2,233 (interest at 4½ per cent and amortization in fifteen years) we now have an annual charge of $6,700—three times as much. No highway engineer who has any sense of values and the significance of figures can fail to set against these annual charges the cost of maintaining a cheaper type of pavement, even though he knows in advance that maintenance costs, too, have gone up. Already there is much talk of serious curtailment of highway programs until costs come down to approximately their pre-war level and when the annual charge for the better type of road will again, with a given traffic, be equal to or less than that of maintaining a cheaper surface.

Pennsylvania Road Bids

APROPOS of the preceding comment, it is interesting to note that in recently awarding 12.15 miles of concrete road in Pennsylvania the average price was $59,000 per mile, a 7.19-mile contract going for $61,000 per mile, a 2.47-mile contract for $52,500 per mile, a 1.39-mile contract for $49,000 and a 0.39-mile contract for $91,500 per mile. These are prices that make one gasp.

Labor Conditions and Drink

PROHIBITION as a factor in railway maintenance and general construction work is being noted by engineers and contractors. In railway work, especially, work train and extra gangs have been recruited largely from casual floating labor, the common procedure being that a man, after working for a short time, would draw his pay and go off for a drinking spell. After wasting his money and health, he would go back to work, usually on another job, in an unfit and inefficient condition, only to repeat the process when he had again acquired money and strength. Under present conditions it is not easy to go off "on a drunk" and the men are spending more money on their comfort and clothing. They are more critical of working and living conditions. They demand much more meat and an immensely increased amount of sweets, so that managers of camps and boarding trains have had to revise their commissary arrangements. The old camp shanties and dilapidated cars for boarding trains are no longer acceptable, and if labor is to be retained and the turnover kept within bounds, both the food and the quarters must be kept at a higher standard. Of course, the demand for better conditions has been growing during recent years, but experience indicates that prohibition is giving it a great impetus.

Peanut Politics

GOVERNOR EDWARDS, of New Jersey, is endeavoring to carry parts of his pre-election program to a successful conclusion. A bill has been introduced into the Assembly proposing a reorganization of the State Highway Department. Two of the salient provisions are the replacement of the present eight-man, unsalaried commissions by one composed of three men of the governor's own choosing, each to draw $10,000 annually: and the appointment, by the commission, of a state highway engineer "who has been a resident of New Jersey for a period of not less than five years." We have no quarrel with Governor Edwards, on theory, because of his proposal to put highway administration in the hands of three men. The question of the relative efficiency as between numerically large and small public administrative bodies has always been a debatable one. But we do protest against the destruction of an efficient commission for purely political reasons. Moreover, we take issue with him in the matter of the residence restriction placed upon the engineer. Engineering societies and roadbuilders' organizations are endeavoring to uproot from highway administration that archaic restriction. It is an enemy of efficient highway administration and a tool of the politicians. Aside from its vicious purpose, it would force out of office in New Jersey the present incumbent, W. G. Thompson, who is restoring for New Jersey her once enviable, but long lost reputation, as a good-roads state. The bill is vicious. It is a product of "peanut politics." If New Jersey wants to disgrace herself among the roadbuilders of the country, she should pass the bill.

The Exchange Situation

EVEN those who normally pay no attention to the foreign exchange situation must have felt some concern recently for the low levels that have been reached. Sterling, with a normal par of $4.86½, dropped to $3.18 early this month but returned to about $3.40 by the end of last week. Francs, quoted normally at about five to the dollar, have dropped to about 14 to the dollar. To European countries, obliged to buy the necessaries of life in this market, the situation is very serious. On the other hand, America is a good place to sell whatever they can produce and can spare. Though international bankers and the foreign governments are concerned over the situation, they, in company with our former Secretary of the Treasury, Mr. Glass, draw the conclusion that the only remedy is for Europe to produce more of its own necessaries and also more exportable goods. Meanwhile, the situation is apt to prove favorable to us. As a result of the high cost to Europeans of buying in this market, our export trade is falling off. The goods are being thrown back upon the domestic market and the result should be a reduction in price here. If ours were a glutted market, this reduction in our export trade might be looked upon with alarm, but with our universal shortage there is no likelihood of serious disturbance. What price reduction there will be may probably come gradually.

Economics of Highway Location

ALL engineers interested in highway work will, we are sure, be fully in accord with Mr. Syme (see page 383) in his plea for some competent authority to give us a practical treatise on "The Theory and Practice of Highway Location." What is needed is another Wellington to do for the rising field of highway transportation what that great authority did for railway location in the seventies. Possibly it is too much to hope for a work of authority at this comparatively early date in motor-truck transportation. The experiences are not adequate enough, nor the data sufficiently complete. Railroading was nearing the status of a matured art when Wellington in the seventies wrote his great treatise on "The Economic Theory of Railway Location." We have not today even ten years' experience in the use of the motor truck for transportation over rural roads. Possibly we are too hopeful in wishing for a Wellington at this date, but eventually some one with his masterful mind must do for the highways what he did for the railways.

Engineering Education in Canada

ENGINEERS in this country will read with much interest the address by Brig.-Gen. C. H. Mitchell at his inauguration as Dean of the Faculty of Applied Science and Engineering at the University of Toronto last October, reprinted on page 369 of this issue. Not only will there be interest in the changes that he indicates in the relative importance of the branches of engineering in Canada, but also in the evidence that the thinking regarding engineering education there is following much the same lines as it is in the States. Here we long since passed the time when civil engineering was predominantly the leading specialty. More than twenty years ago the industrial courses came to the fore, responding to the demands which practice was making on the colleges. In Canada the transition is now under way. On the other topic—the broad consideration of engineering education—we recognize some of the ideas that have been stirring on this side of the international line—the need for training broadly cultured men and good citizens and the establishment of closer relations between the colleges and practical work. But while giving consideration to these pressing phases of engineering education, there is in Canada a solid standing upon the need for "thoroughly educated technologists." The progress on this broad subject at the University of Toronto, a progress backed by solid enthusiasm, will be followed with interest by our engineering educators here. The problem is so important that the progress in all quarters needs to be brought together and appraised for the benefit of the profession.

The Real Revolution

THE industrial revolution which was to have broken upon us by the rockets' red glare and bombs bursting in factories has limped its way into the limbo of catastrophies unfulfilled; but the real industrial revolution of the head and heart—not of the lungs and larynx—is quietly fulfilling the unprophesied.

It required the fear of fury to stir the imaginations of many employers sufficiently for them to reach out and grasp a few simple axiomatic truths—the obvious truths that underlie successful industrial relationships. Even some of the I-by-the-grace-of-God employers can be heard agreeing that certain things "pay." And the large body of decent employers who earnestly but misguidedly sought without their plants for some complex and mystical formulas to allay unrest, have quickly begun to translate the old and homely truths into terms of today's work. The recent conviction that "we must fight it to a finish," which was so assuasive when conscience crowded, is going also into the limbo of long-held lunacies. The industrial revolution is coming like a gentle sunrise rather than like a midnight thunder storm. So all real days dawn.

The truths that are making men free—free from shackling suspicions of each other—can be phrased in words of one syllable:

As ye sow, so shall ye reap.

Psychologists, philosophers and industrial doctors have produced volumes shot through with sonorous words to say just this. If you seek light, don't read them. Any man really seeking the light has the whole philosophy of management in these seven words:

A man's a man for a' that.

Shortcomings are the distinguishing mark of the species. The American man won't stand petty rules and paternal regulations. He wouldn't be much of a citizen if he did. He'd be a poor producer, too. A man's weak spot is his strength; all of us "fall" for decent treatment.

A man who stays with you is better than ten who leave.

Ask the manager who has reduced his turnover. Ask him, if you will, in terms of production. And then if you consider yourself a real manager, prove you are one by organizing to have men stay with you—or failing it, confess you are not a real manager. A real manager never hides behind alibis. He doesn't need to.

Hands and head and heart do ten times as much as hands.

The employer whose employees fail to put their whole effort into the job is getting a poor return from his floor space, equipment and pay roll. The whole effort can be gotten. It is being done. The manager who doesn't get it doesn't prove it can't be done; he merely proves that he can't do it. Management is the art of dealing successfully with men and their ways rather than with materials and their laws. By their fruits ye shall know managers.

But it all comes back to the first: *As ye sow, so shall ye reap.* The extent to which bolshevism grows in any land is probably in exact proportion to the preparation which the ground has had for that kind of seed. The winds that blow have little to do with it. Management which fails to take men as God made them into account is bound to reap a whirlwind, and that management is worse than bolshevistic which says, "After I get mine, let the whirlwind come!"

The proximity of the whirlwind has been a good thing. It is working a change in the souls of men. Being men they carry a bit of the old brag about still —and this proves that they are very human—to hide their conversion. But it is there. And it is the great industrial revolution—a revolution not of mighty manifestos, forced formulas, wrested agreements, and threatening tension, but the realization of the meaning of one sentence:

As ye sow, so shall ye reap.

A New Conception of the Snow Removal Problem Needed

NOT for many years has a storm tied up traffic in New York City so thoroughly as did the heavy fall of snow two weeks ago. Street car lines suspended operation for days, the elevated railways had difficulty in keeping trains moving, while the number of horse-drawn vehicles and motor trucks stalled in the deep drifts and ice "craters" brought back pictures of the traffic derelicts along the mired roads of France during the war. It takes a situation of this sort, where everything on wheels is either at a standstill or moving at a snail's pace, where one has to plod to work instead of riding in comfort to make the average man realize just what transportation means in the life of a great city. We are too apt to take our transit facilities for granted. But in spite of the jolt given to New York this month it is too much to expect that the real lesson of the storm will be learned. Neither the general public nor the present city administration has grasped the fact that snow removal is an engineering problem. Good progress toward a solution was made while an engineer, John T. Featherston, was street cleaning commissioner—but he was promptly deposed when the new city administration came into power after the defeat of Mayor Mitchel.

Snow removal is essentially *emergency* work. In New York a snowstorm may create critical traffic conditions only half a dozen times, or less, a year. The result is that the snow problem is slighted in favor of others of an all-the-year-round nature. Its solution is dependent upon preparedness for an emergency, and as such it has little or no appeal to the American public. It is difficult, when the thermometer registers 90 deg. in the shade, to get city officials to believe that a demand for money to insure adequate organization and mechanical equipment for handling snow is anything but an attempted raid on the city's strong box. Nevertheless, the one way in which the snow problem can be handled more effectively than at present is by advance planning and the wider use of machines instead of hand shoveling.

Of course, no city would provide a big outlay in plant which would be used for only a few days a year. There is, however, a field open for investigation in the adaptation of contractors' standard plant, such as mechanical loaders, and earth excavating and handling machinery —ordinarily idle during winter—to the needs of snow removal. With slight modifications in some of these machines it is reasonable to believe that a much greater yardage of snow could be handled than by present methods. The average city, however, is apt to look askance at any proposition involving the spending of money on experiments in speeding up snow removal. The attitude is one of waiting till the emergency has arrived and then making the best of it with whatever means may be at hand.

If the policy in force were one of progress and preparedness, the great labor employing agencies of the city, such as the general contractors, the express companies and the railways, might be mobilized. Mechanical equipment, in storage awaiting the opening of the construction season, could be pressed into service. With snow banked up in mounds 6 ft. high along every street in New York, steam shovels, locomotive cranes and buckets and other forms of contractors' plant could be used effectively in loading the material on wagons and motor trucks. The vital point is that the problem can be solved only if it is conceived of as a *real emergency.* It cannot be attacked effectively without bringing into play every means that can help. Nor can plans be made the day the storm arrives. The campaign must be worked out *months in advance,* so that when the crisis arrives the city will be prepared to tackle it in a big way.

The situation in New York City was due to a combination of three chief causes: (1) The snow, especially the first 6 or 7 in., was extremely dense—two and a half times the average—weighing probably 30 lb. per cubic foot as compared with a normal weight of about 12 lb. per cubic foot. It was of low temperature, hard and granular, instead of flaky, and readily packed down into a frozen mass or drifted into the underground-trolley slots, piling up in the duct space to such depths that the feeder rails were effectively put out of service. (2) Shortage of labor was, perhaps, the biggest factor in the situation. The Street Cleaning Department's regular forces are entirely inadequate in numbers for a real emergency. Dependence must be placed on outside help. The pay of 50c. an hour apparently was not sufficient to induce more than a small percentage of the men actually needed to report for work. (3) The Street Cleaning Department itself needs to adopt more progressive tactics. If the right sort of engineering personnel were available in the department the city might well provide funds for a thorough study of mechanical plant as a means of accelerating the removal of snow.

Certain it is that the department has failed utterly to measure up to the needs of the present situation. While due allowance must be made for the labor shortage and the unusual character of the storm, it is clear that the methods—or lack of methods—in use by the largest city of the United States today are woefully inadequate.

Big storms should be handled by the same system of priorities which the General Staff of our Army employed in France in distributing transportation and troops where they were most needed. For example, if an attack was contemplated in a certain sector everything else had to give way to the rushing of supplies and men to that locality. This action robbed other sectors of both personnel and motor trucks, but that was necessary at critical times.

If the city officials and the people of New York City could be induced to accept the principle of priorities when a big snowstorm occurs there would be little danger of the complete traffic paralysis which has just been witnessed. The acceptance of this principle would mean that every vehicle, every steam shovel or other machine applicable to the work, and every man that could be of service in removing snow would be detailed thereto. While this would mean a certain loss to the companies and the individuals entering upon the work, it is very probable that a substantial saving could be made in the end by keeping the streets clear. The present tie-up, the Merchants' Association estimates, has caused a loss of $5,000,000 per day—and the tie-up, twelve days after the storm, still continues.

Army methods and the intelligent use of mechanical plant would do the work. To put them successfully into effect would require a vast amount of *advance* planning on the part of the Street Cleaning Department. A strategical campaign and schedule of mobilization would have to be worked out in co-operation with the various public and private interests concerned. The first step, however, is the creation of an entirely new conception of the snow problem by city officials and by the public. Its planning and execution is a job for engineers.

A Highway Under the Hudson

WITH the decision of the chief engineer of the New York and New Jersey tunnel commissions in favor of the shield method of driving and cast-iron lining for the vehicular tubes under the Hudson River, as discussed in detail in the report on p. 357, clearness is brought into a matter that has been involved in much interesting speculation and divergence of expert opinion. Several prior projects for the tunnel involved untried elements, which, however interesting, would probably have weighed heavily against the chances of financing the enterprise readily. The present recommendation, made in anticipation of immediate construction, for whose conduct the engineering staff of the interstate commissions will be responsible, follows lines of practice thoroughly tried out by experience, and thereby carries with it a guarantee of success and freedom from unexpected checks.

Four or five years ago a board of engineers, studying the problem of building a large-capacity street tunnel under the Hudson for private interests, recommended the "trench" method of construction, in which sections of tunnel built on land were to be floated out into the river and sunk to place on a prepared foundation. According to their calculations, this method was the cheapest. Other engineers, however, believed that the estimate had not allowed adequately for the uncertainties involved, partly on the score of unsatisfactory subsoil for founding and anchoring the structure and partly on the score of interference with shipping. Indeed, later General Goethals, in studying the problem for the states of New Jersey and New York, condemned the method on the score of difficulties arising from the semi-liquid accumulations on the river bottom. His own recommendation, however, was no less novel, and, in the opinion of many experienced tunnel men, hazardous; he proposed a shield-driven tunnel of 42-ft. diameter, which is so far beyond precedent that there were grave doubts concerning its feasibility. Moreover, he abandoned the known and dependable iron lining in favor of concrete-block lining, of unknown characteristics as regards transverse and longitudinal resistance to the forces of attack in soft-ground subaqueous work. The present engineers' report states that an analysis of forces and resistances indicates the proposed concrete-block structure to be dangerously weak. Its capacity, too, is shown to be overestimated. After these radical projects the final recommendation is reassuring in its conservatism, even though the work of driving two 29-ft. tubes through the silt and rock bed of the Hudson is anything but easy routine work. If there were no other advantage in the decision reached, it would merit commendation because it makes the Hudson highway tunnel a definitely predictable reality, which will be giving service—a service very badly needed—in the shortest possible time.

Outranking all the discussion and analysis of tunnel types, the traffic studies on which the design is predicated have great engineering importance. They demonstrate with almost startling clearness the urgent necessity of providing better means for crossing the Hudson than the present ferries. When it is shown that the proposed tunnel will not only pay its keep, but will return its entire cost within a dozen years, there is no need for further evidence of the vital business importance of an efficient crossing, whether tunnel or bridge. The transportation or interchange facilities of the metropolitan group of communities are crippled by want of an indispensable link. For years past advocates of Hudson crossing projects talked to deaf ears; now their arguments find complete confirmation.

Not only will there be a large gain of time and of certainty of schedule to the present trans-Hudson traffic, but new traffic will be built up, which means increased efficiency of production and distribution. Ferry facilities for team traffic have long been overtaxed, and yet the traffic is growing at a remarkable rate. There is no room for expansion of ferry service, in competition with the claims of other waterfront activities. In short, the business of the densely crowded populations on opposite banks of the Hudson has simply outgrown the capacity of old-time machinery of inter-communication.

Not only does the dividend-earning power of the vehicular tunnel prove this, but also the fact that within ten or fifteen years there will be enough traffic to call for the construction of a second line of communication. The estimates of the tunnel commission's engineers—and they are unusually devoid of contingent speculations—set this forth in figures. But it should be apparent even without quantitative estimate that a business community of six million people, cut off from its outliers and from the whole country beyond by a broad shipping channel, has traffic needs that cannot be satisfied by a single four-way road across this channel. The situation is one in which traffic depends on facilities, not facilities on traffic.

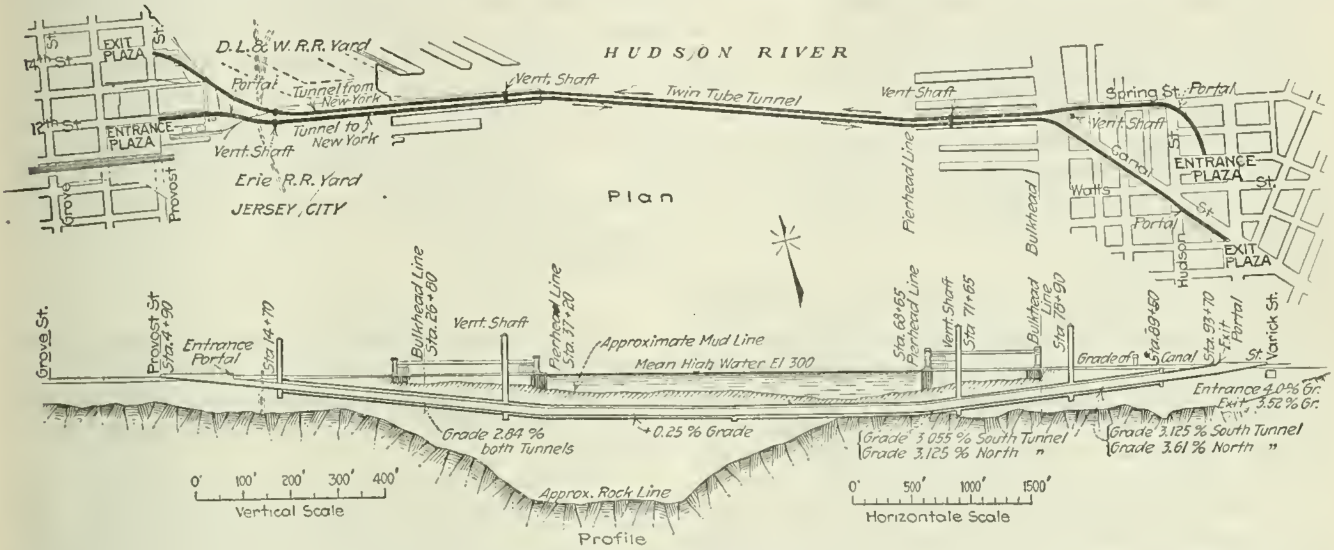
The total cost of the tunnel project, including construction, equipment and real estate, is estimated by the chief engineer at $28,669,000, of which amount $22,262,000 represents actual construction, figured at present prices for labor and materials, with an allowance for contractors, contingencies and profit. Lower cost estimates have been made for other types of crossing, but these are in most cases based on pre-war prices. Obviously they are useless as a measure of comparison with the present estimate and, in certain cases, are believed greatly to understate the expense of doing work by untried methods for which—unlike the case of the cast-iron tubes—there is no precedent to guide in the estimation of costs.

But the cost figures should not be considered alone, but in relation to the revenue which the tubes will produce. The figures show that the cost will be amortized in 11 years after the project is completed and that in 20 years a surplus of more than $66,000,000 will be divided between the States of New York and New Jersey. On this basis the soundness of the project is so obvious that steps should be taken to put the work under construction at the earliest possible date.

Largest American Shield Tunnel Designed to Carry Vehicular Traffic Under Hudson River

Twin Tubes of Cast Iron, 29 Ft. in Diameter, Recommended by Chief Engineer C. M. Holland for New York-New Jersey Connection—Project to Cost $28,669,000—Operating Revenues Expected to Amortize Cost in 11 Years and Produce Surplus of $66,500,000 in 20 Years—Many Special Problems, Such as Traffic and Ventilation, Studied

TWIN tubes of cast iron 29 ft. in external diameter, larger than any existing American subaqueous tunnel of the shield-driven type, and representing the first shield tunnel in the United States designed for the exclusive use of motor and horse-drawn vehicles, have been recommended for the interstate vehicular connection, under the Hudson River between New York and New Jersey. The mean length of the cast-iron ring section is 7,345 ft., while the distance between grade points of the tunnel—which includes the open-cut approaches—is 9,300 ft. The decision as to the type of tunnel and data covering the engineering and financial features of the project, the total cost of which is estimated at $28,669,000, are contained in a report by Clifford M. Holland, chief engineer of the New York State Bridge and Tunnel Commission and the New Jersey Interstate Bridge and Tunnel Commission, made public this week.



LOCATION PLAN, INDICATING ENTRANCE AND EXIT ARRANGEMENT, AND LONGITUDINAL SECTION SHOWING LINE OF RIVER BED AND ROCK

The design of the 29-ft., cast-iron shield type of structure, following closely well-established subaqueous tunnel practice, provides in each tube a 20-ft. roadway for two lines of traffic (both lines being in one direction in each tube) and was chosen in preference to a variety of other types proposed, including a double-deck concrete-block tunnel 42 ft. in diameter, a precast reinforced-concrete tunnel, a concrete tunnel with steel shell and an outer protection of concrete placed by the tremie method, and cast-iron tubes of diameters larger or smaller than the one adopted. Mr. Holland devotes considerable space in his report to a discussion of vehicular traffic with relation to tunnel design and carrying capacity and presents much new and valuable material based on observed traffic conditions at New York City's bridges and ferries. Much study has been given to the subject of entrance and exit design. Ventilation in the proposed tubes also is one of the important problems dealt with in the report, the special feature being the removal of the noxious exhaust gases from motor vehicles (particularly carbon monoxide), which will be the biggest users of the tunnel. Of great significance is that part of the document which deals with the project's finances. It is predicted that in 11 years after the tubes are completed they will have yielded in operating revenue a sum sufficient to amortize the construction cost, and that in 20 years a surplus of $66,500,000 will have been produced. It is estimated that the tunnel construction will require 3½ years to complete. The cost, as well as the revenue, will be shared equally by the States of New York and New Jersey. With decisions made on the important engineering features of the project the way is clear for placing the work under contract this summer if the State Legislatures take action on providing the funds for construction. The more important parts of Mr. Holland's report, which has been approved by a board of consulting engineers consisting of Col. W. J. Wilgus, J. A. Bensel, Wm. H. Burr, Edward A. Byrne and J. V. Davies, are given below in the form of abstract and direct quotation:

Location—The location of the tunnel, as shown in the accompanying drawing, was selected because, on the New York end, Canal St., a wide east and west thoroughfare, is approximately at the center of the downtown traffic over the Hudson River ferries and gives direct communication across Manhattan Island, connecting with the East River bridges and Brooklyn and with the Hudson River waterfront. The location has the advantage, also, of low surface elevation on both sides of the river, resulting in the shortest possible approaches. The Jersey end of the tubes is fixed at a point almost directly opposite Canal St., thus giving a tunnel of minimum length. The Jersey terminus is near the center of traffic and affords direct communication with Jersey City Heights and points beyond by means of the 13th St. viaduct, while the waterfront and railroad yards are easily accessible.

The north tube is to be used only for westbound traffic (from New York to New Jersey), while the south tube will be devoted entirely to vehicles moving in an easterly direction.

Entrances and Exits—The volume of traffic on the city streets in the vicinity of the tunnel portals is constantly increasing and will be greatly augmented at the time the tunnel is completed. In New York the entrance and exit are separated by locating one to the north and the other to the south of the through Canal St. traffic. They are so located as to be served by two main north and south avenues so that the tunnel traffic is afforded the best facilities obtainable for free movement, and at the same time the greatest possible separation is secured at a reasonable cost. In Jersey City the same principle has been adopted

Traffic conditions in the tunnel differ from those on city streets in that the only points where the continuity of traffic can be interrupted by cross traffic is at the entrances and exits. Consequently, these points are of vital importance as affecting the ultimate capacity of the tunnel. The separation of the tunnel entrance and exit traffic, the report points out, is a factor of the greatest importance in relieving congestion in the vicinity of the tunnel.

Provision is made for adequate plazas at the entrances which will serve to accommodate the waves of traffic as they approach the tunnel, thereby insuring continuity of movement through the tube. Furthermore, sufficient space must be provided for the increased number of lines of traffic which, during the collection of tolls, will move slowly. These additional lines will converge in the portal roadway into continuous lines of vehicles through the tunnel. At the exits the provision of adequate plaza space for free and continuous movement of traffic away from the tunnel is of equal importance.

Depth and Grades—One of the drawings shows a plan and longitudinal section of the tunnel under the river. War Department restrictions require the top of the tunnel, between pierhead lines, to be at least 50 ft. below mean low water. The tube, of course, will require a sufficient cover to protect it from damage by dredging, anchors of ships, or sunken vessels, and to resist upward movement of the tunnel.

SURVEYS AND BORINGS

The tunnel location is based upon records of borings made by the Public Service Commission of New Jersey in 1917, and upon additional boring data secured by the present interstate bridge and tunnel commissions at a cost of about $21,000. The approximate profile of the bed of the Hudson River and the rock line are shown on one of the drawings.

The character of the upper layer of material in the bed of the river was found to be a black deposit, the top of which is in a semi-fluid condition, and by chemical analysis is shown to be of organic origin, probably the sediment from sewage. This material is deepest near the shores, varying in depth from 5 to 20 ft. in the slips, but in the channel little or none is found. Underneath the upper layer of black mud is Hudson River silt, composed principally of clay, but containing a considerable percentage of very fine sand or quartz. The great mass of this formation lies in the center of the river filling up the old Hudson River gorge. Directly overlying the rock there is a layer of hardpan containing boulders, or in some cases a layer of coarse sand, both of which are probably of glacial origin. This layer of material, in places, is 15 ft. thick. On the New York shore the underlying rock is the typical Manhattan schist, while at the New Jersey shore serpentine is found, and farther west triassic sandstone.

The behavior of the Hudson River silt during dredging operations to any considerable depth, the report states, is problematical, but undoubtedly the upper layer of mud, which is almost a fluid, would wash into any trench dredged across the tidal currents.

During the borings samples of the ground-water and of the upper layer of black river mud were taken and analyzed to ascertain whether they contained anything injurious to the tunnel structure. No acid ground-water sufficiently concentrated to endanger the permanency of the completed structure was found. While the analysis of the river material, particularly that near the surface in the vicinity of the bulkheads, indicates a considerable quantity of sulphur compounds, the material at lower elevations is practically free from them. It would not be a difficult matter, if it should be considered advisable, to remove the surface deposit above the tunnel structure and replace it with non-injurious material.

TRAFFIC

As a basis for estimating the amount of traffic which would use the vehicular tunnel the information in the accompanying diagrams, based on counts at ferries and bridges, was collected and is discussed at some length as follows:

In summarizing and classifying the data, the ferries are divided into groups. The first group consists of the five ferries nearest the tunnel, from which the greater part of the tunnel traffic will be diverted. At the present time this group carries 11,100 of the 22,600 vehicles daily transported across the Hudson River or 49 per cent of the total. This group is referred to as the "Five Ferries," namely:

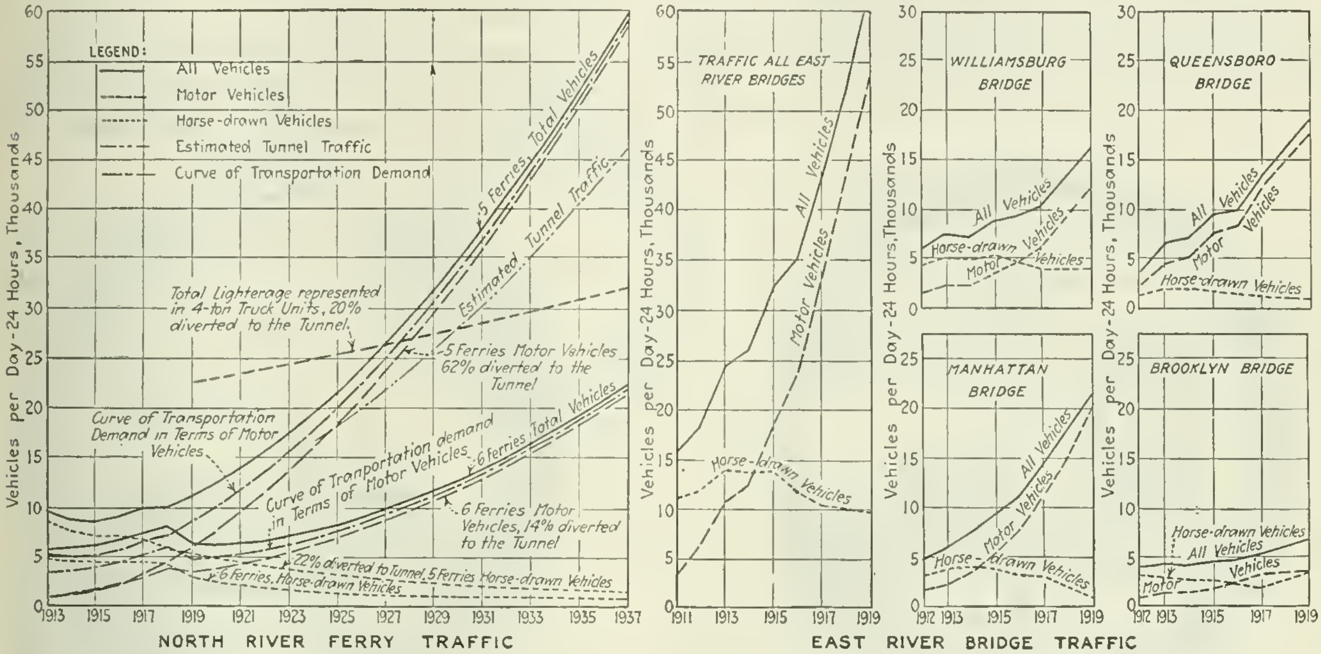
Pennsylvania R.R.	Desbrosses St.
Pennsylvania R.R.	Cortlandt St.
Erie R.R.	Chambers St.
D., L. & W. R.R.	Barclay St.
D., L. & W. R.R.	Christopher St.

The second group consists of six ferries farther from the tunnel and it is probable that their traffic will be less influenced by its opening. At present this group transports 6,200 vehicles daily or 27 per cent of the total ferry traffic. This group is referred to as the "Six Ferries," namely:

Central R.R. of N. J.	Liberty St.
Central R.R. of N. J.	W. 23rd St.
Erie R.R.	W. 23rd St.
D., L. & W. R.R.	W. 23rd St.
14th St. Hoboken	W. 23rd St.
West Shore R.R.	Cortlandt St.

The third group of ferries includes those at West 42nd St., New York, and all ferries north of this point. They are so far away from the tunnel, that while some traffic may be diverted from them, none has been included in estimating the tunnel traffic. Some traffic now reaching New Jersey by way of Staten Island may be diverted to the tunnel, but its volume is considered negligible.

Between the years 1913 and 1919 the daily traffic over the "Five Ferries" increased from 9,600 to 11,100 vehicles, an increase of 1,500 vehicles per day in 6 years. In analyzing this increase it is found that the motor-vehicle transportation has increased from 900 vehicles per day in 1913 to 5,900 vehicles per day in 1919, while the horse-drawn vehicles have decreased from 8,700 per day to 5,200 per day. Considering that the average motor truck has a capacity of at least two horse-drawn vehicles it is evident that in the decrease of the horse-drawn vehicles and their replacement by motor trucks, the growth in traffic tonnage has been greater than is indicated by the actual increase in the number of vehicles. In order to determine the real traffic increase during the past 6 years and to forecast properly the future increase, all of the traffic has been reduced to the basis of motor vehicles. In this reduction two horse-drawn vehicles are considered to have the same capacity as one motor-driven vehicle and a curve of transportation demand (see diagram) has been plotted, which shows a gain in 6 years from 5,200 to 8,500 vehicles, a 63 per cent increase as against 16 per cent when computed from the actual number of vehicles crossing the river. It is found that the increase from year to year is not constant but is slightly greater each succeeding year. This curve and a similar curve of transportation demand for the "Six Ferries" are used in estimating future traffic across the Hudson River south of 42nd St., New York. The rapid rise in the "Six Ferries" from 1916 to 1918, inclusive, was probably due to war-time activities at the Hoboken docks directly served by the D., L. & W. ferries. The count in 1919 was made in August and September after this activity had practically ceased.



NORTH RIVER FERRY TRAFFIC   EAST RIVER BRIDGE TRAFFIC

TRAFFIC CURVES SHOWING DATA ON EXISTING BRIDGE AND FERRIES AND PROBABLE TUNNEL TRAFFIC

If the motor-truck traffic curves are carried forward at the present rate of increase, they will practically parallel the curve of transportation demand within a few years, while if the number of horse-drawn vehicles continues to decrease at the present rate, within ten years their number will be comparatively small, although a considerable volume of horse-drawn traffic will still continue to seek passage across the river. The forecast of traffic increase for the "Five" and "Six Ferries" is of considerable magnitude, but it does not nearly equal the rate of traffic increase over the East River bridges in the past, which is as follows:

BRIDGE TRAFFIC, 1912-1919

	Daily 1912	Traffic 1919	Per Cent Increase in 7 Years
Brooklyn Bridge	4,000	6,700	67
Manhattan Bridge	4,800	21,400	345
Williamsburg Bridge	6,000	16,300	172
Queensboro Bridge	3,500	18,700	435

The rapid increase in traffic over the East River bridges, where an uninterrupted means of transportation is furnished, shows the tendency of traffic to increase with improved methods of communication. As shown on the curve of traffic over the "Five Ferries," it is estimated that the increase will be about 340 per cent in the next 15 years, while in the case of the "Six Ferries" it will be about 200 per cent; the combined increase of the two groups is about 280 per cent.

If the estimated increase in traffic across the Hudson River, as based on the growth of ferry traffic during the past 6 years, is compared with the growth of traffic over the East River bridges, as shown in the curves, it is apparent that the estimated increase is far less than that in the traffic over the bridges where, during the past 7 years, the growth for all the bridges has been about 250 per cent or nearly twice that estimated for the ferries.

In forecasting the tunnel traffic, according to the report, consideration must be given to the probable large increase in the use of motor trucks and to the use of the vehicle tunnel for transporting freight now carried across the Hudson River by lighters. The D., L. & W., Pennsylvania, and Erie railroads, at the present time, lighter daily across the Hudson in both directions approximately 60,000 tons of freight. The report continues:

> In the absence of reliable data one-fifth of this lightered freight traffic, with an allowance for its growth up to 1924, is assumed to be trucked through the tunnel, requiring 3,240 four-ton trucks for its movement. As it is necessary for the trucks to make a round trip, there would be a total daily traffic through the tunnel of 6,480 trucks, but it may be assumed that one-half of the trucks will be loaded in both directions, which would supply to the tunnel from this source 4,860 vehicles daily.
>
> The percentages of each class of vehicles which will cross the river by the tunnel are assumed as follows:

TRAFFIC FROM A DISTANCE—NEWARK-PATERSON

	Five Ferries, Per Cent	Six Ferries, Per Cent	Four Ferries
Pleasure cars	90	25	0
Motor trucks	75	10	0
Horse-drawn vehicles	40	0	0
NEARBY TRAFFIC—JERSEY CITY:			
Pleasure cars	75	20	0
Motor trucks	50	10	0
Horse-drawn vehicles	20	0	0

> The percentage in each case is based upon the total number of vehicles of its class in each ferry group. The above

varying percentages, each applied to its special class of traffic in the respective ferry groups, produce an average of 62 per cent for motor vehicles, and an average of 22 per cent for horse-drawn vehicles over the "Five Ferries," and an increase of 14 per cent for motor vehicles over the "Six Ferries."

Upon the above basis the estimate shown in the curves has been made.

The estimated yearly tunnel traffic (assumed to be equivalent to 340 times the average week-day traffic) in 1924 is approximately 5,610,000 vehicles, or about equal to the traffic over the Williamsburg bridge at the present time. In 1934 it is estimated that the traffic demand will reach 12,900,000 vehicles annually.

TRAFFIC CAPACITY OF TUNNEL

In determining the traffic capacity for which the tunnel should be planned the report states that the chief considerations are: (1) Volume and character of the vehicular traffic which will seek the tunnel. (2) Capacity of one, two and three lines of traffic in each direction. (3) Economical size of tunnel in relation to amount of traffic. (4) Limitation of capacity by street congestion in vicinity of tunnel entrances and exits.

It is estimated that the number of vehicles which would use the tunnel, is as follows:

1924	5,610,000	1937	15,700,000
1935	13,800,000	1943	22,300,000

Roadway Capacity—The capacity of one, two and three lines of traffic depends on the operating speed and spacing of vehicles in the various lines. The following capacities have been given in connection with previously proposed tunnels for the Hudson River crossings:

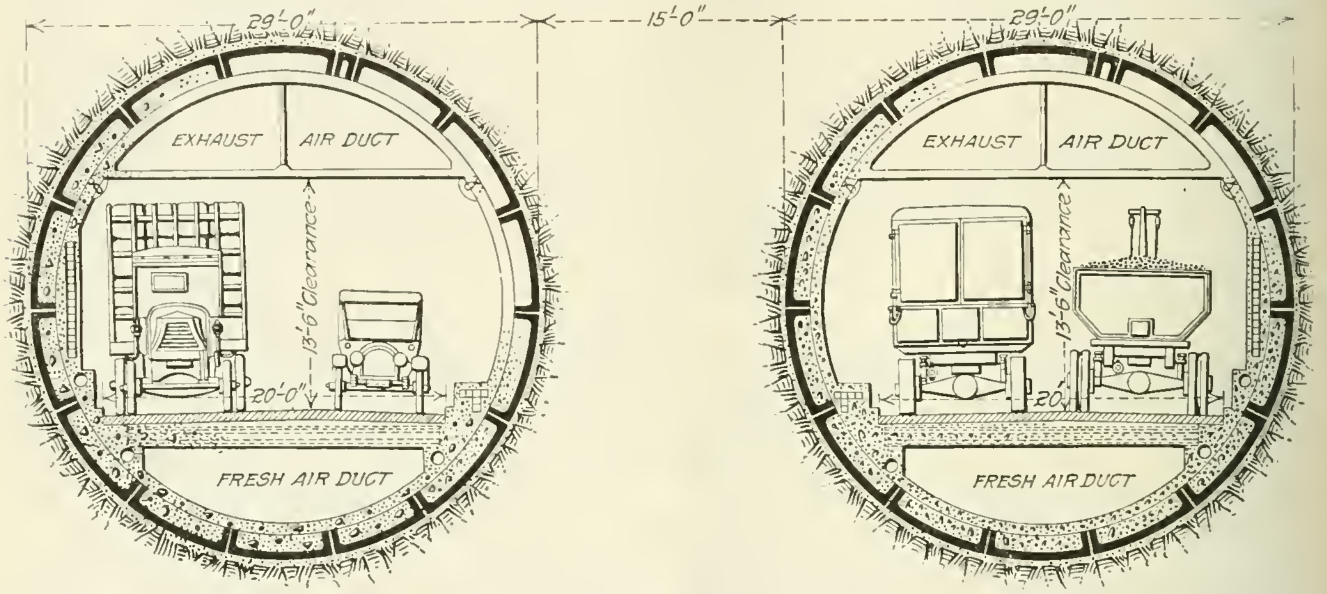
	Vehicles per Year
Jacobs & Davies—Two lines of vehicles in each direction	5,000,000
Burr, Modjeski & Moran—One line of vehicles in each direction	7,700,000
Goethals—Three lines of vehicles in each direction	36,500,000

It is apparent, according to the report, that these figures have not been made on a uniform basis and are, therefore, not a true comparison of the relative capacities of tunnels with one, two and three lines of traffic in each direction.

For a more rational comparison, a uniform basis for estimating the capacity was established from a study of the traffic conditions on the East River bridges. The grades in the tunnel will be practically the same as those on the bridges, so that these conditions are directly applicable to the tunnel. In applying the results of the speed and spacing counts made over the bridges to estimate tunnel capacity, the average or ordinary condition was used in making the computations. Upgrade movement determines the capacity of each line. The following were found to be representative figures for characteristic speed and spacing with continuous lines of vehicles operating on an upgrade for the various types of vehicles:

	Speed M.P.H.	Spacing. Feet, c. to c.	Capacity Vehicles per hour, one direction
(1) Line of horse-drawn vehicles and slow moving trucks	3.0	33	180
(2) Line of slow-moving trucks (no horses)	5.0	42	630
(3) Line of motor trucks and pleasure cars	9.5	45	1,120
(4) Line of fast-moving motor trucks and pleasure cars	12.0	50	1,270

The average daily traffic, based on 24-hour counts made on the ferries, was 12.2 times the maximum hourly traffic. The total yearly traffic is computed from data furnished by the ferry companies which show the yearly traffic to be 340 times the average week-day traffic. The estimated capacities are as follows:



PLAN IV—CROSS-SECTION OF TWIN TUBES RECOMMENDED AFTER STUDY OF ELEVEN PLANS

ESTIMATED TUNNEL CAPACITIES

	Vehicles per Hour	Vehicles per Day	Vehicles per Year
One-Line Tunnel*:			
With horse-drawn and slow motor vehicles	960	11,700	3,980,000
With motor trucks and passenger cars	1,260	15,400	5,210,000
Two-Line Tunnel†:			
With horse-drawn and slow motor vehicles in one line and fast motor trucks and passenger cars in second line	3,200	39,000	13,270,000
With all motor vehicles in both lines.	3,800	46,400	15,800,000
Three-Line Tunnel‡:			
With horse-drawn vehicles in one line and motor vehicles in two lines	5,250	64,000	21,800,000
With all motor vehicles in all three lines	6,040	73,600	25,000,000

*One line in each direction, i.e., two traffic streams.
†Two lines in each direction, i.e., four traffic streams.
‡Three lines in each direction, i.e., six traffic streams.

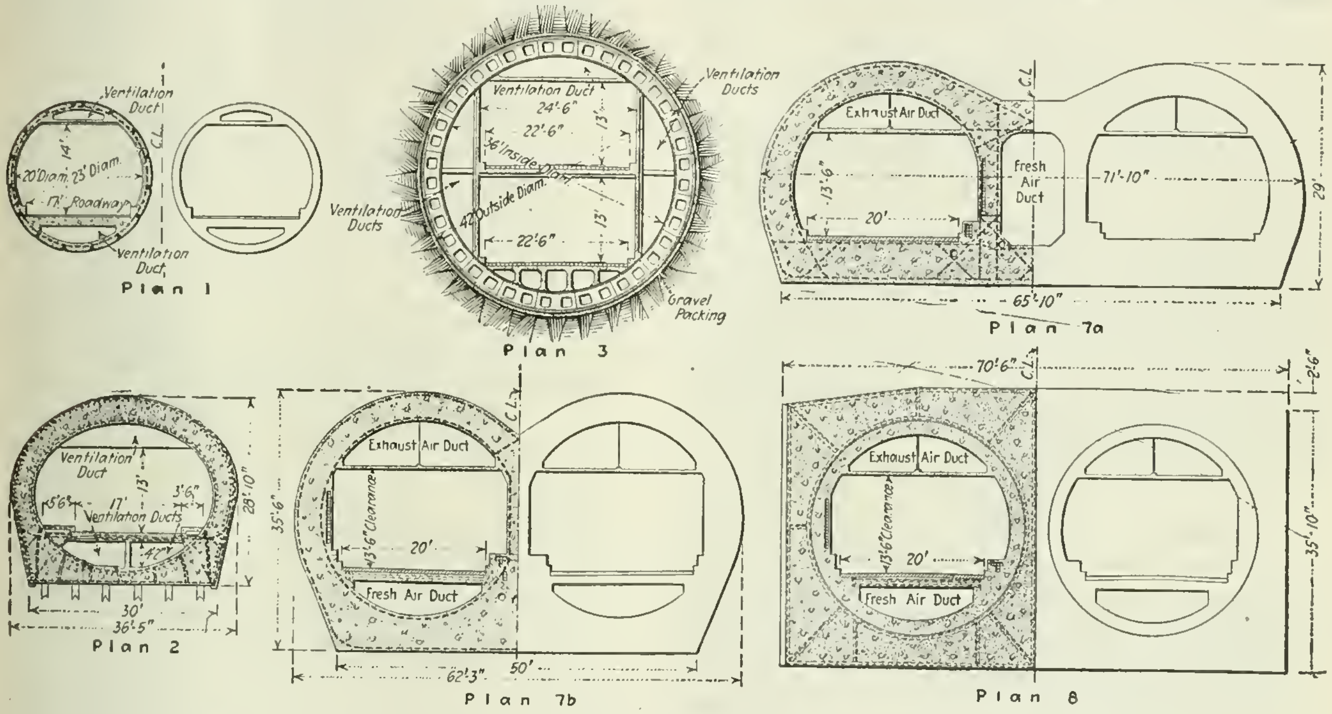
From the above figures it is seen that maximum hourly capacity of one tube of the recommended two-line tunnel (carrying a double line of traffic in one direction on a 20-ft. roadway) is 1,900 vehicles per hour.

The foregoing figures are for traffic in both directions and indicate that a one-line tunnel would have a capacity about equal to the traffic demand at the opening of the tunnel. A two-line tunnel would have sufficient capacity to accommodate all traffic of motor as well as horse-drawn vehicles up to 1935, and if horses were eliminated during rush hours its capacity would not be reached until 1937; with horse-drawn and motor vehicle traffic the capacity of the three-line tunnel would be reached in 1943, and with all motor operation, in 1945.

In the discussion of the relative merits of roadways accommodating one, two and three lines of traffic, it has been claimed that the capacity of the road varies as the square of the number of lines of traffic, based upon the increased speed of each additional line. It was found in the traffic counts on the bridges that after a speed of from 10 to 12 mi. per hour is reached, any additional speed necessitates increased spacing for safe operation and does not increase materially the capacity of the line.

Economical Size of Tunnel

It would be unwise, according to the report, to build a tunnel to accommodate only one line of traffic in each direction as such a tunnel would be operated to its maximum capacity when first opened to traffic, with no allowance for growth of traffic. The choice, is, therefore, between either a two-line or a three-line tunnel. The principal points to consider in making this decision are those of economy and of traffic congestion in the vicinity of the tunnel entrances.



THE MORE IMPORTANT OF THE TYPES OF TUNNEL STUDIED, BUT NOT RECOMMENDED

Considering economy, estimates of cost were prepared for both sizes of tunnels and it was found that the difference in cost between a three-line and a two-line tunnel, with interest, would be sufficient to pay for the construction of another two-line tunnel by the time the capacity of the two-line tunnel had been outgrown. In other words, if a three-line tunnel were built at the present time, "it would be overbuilding with a consequent spending of money for facilities which would not be utilized for a long period of time. The economic consideration is, therefore, decidedly in favor of a two-line tunnel."

The report also shows that the project for a three-line tunnel would create such extreme traffic congestion that it never could be operated to capacity. In other words, the three-line tunnel would be built and operated at a two-line capacity. The estimated capacity of the three-line tunnel, is 6,040 vehicles per hour in both directions, assuming that it can be "fed" with traffic. Taking half of this number and adding it to the 1,160 vehicles per hour at Canal and Varick Sts. in New York, gives a total of 4,180 vehicles per hour passing this point, *or nearly twice the number of vehicles on Fifth Ave. at the rush hour.* The congestion at the entrance of a three-line tunnel can best be visualized, the report states, by imagining all the East River bridges with their present traffic terminating in Manhattan *at one point.* No street in New York, the report concludes, could accommodate such a volume of traffic.

The construction of a tunnel of size and capacity greatly in excess of the requirements for the immediate future, the report continues, involving the expenditure of large sums of money, would be in direct violation of two of the main principles governing proper tunnel planning: (1) Distribution of traffic along the waterfront to avoid undue congestion and (2) the investment of capital for construction only as facilities are needed, without the necessity of making provision for the distant future. These points, it is stated, should not be lost sight of, as they are two of the most important features in which tunnel construction is superior to bridge construction in crossing wide navigable rivers.

The report, therefore, specifically recommends the construction of a two-line, instead of a three-line tunnel. The two-line tunnel, it is estimated, will have a capacity sufficient to accommodate traffic up to the year 1937.

Dimensions of Vehicles and Headroom

Measurements were taken of vehicles crossing the Hudson River on the ferries between New York and New Jersey and it was found that their height varied from 6 ft. 6 in. for passenger cars to a maximum of 13 ft. for large, loaded trucks, but that the number exceeding 12 ft. in height was only 1 per cent. It was also found that the width of motor vehicles varied from 6 ft. for passenger cars and light trucks to a maximum of 10 ft. 6 in. for army transport trucks. In the case of three-horse teams the outside dimension of the three horses abreast was found to be 9 ft., but the number of vehicles exceeding 8 ft. in width is only 3½ per cent.

Motor truck manufacturers, the report states, suggested 12 ft. 2 in. as the greatest distance between the road and the top of a truck body, and 8 ft. as the greatest width of the body. To provide for all contingencies, such as unevenness in the surface of the roadway, spring action of vehicles and allowances for jacking up in case of breakdown, the clear headroom of the tunnel was fixed at 13 ft. 6 in.

Width of Roadway

For a tunnel accommodating two lines of vehicles in the same direction on one roadway, the normal operating conditions may be considered to be that of one vehicle, 8 ft. wide, in the slow line and one, 6 ft. wide, in the fast line. It is to be expected, however, that at times there will be 8-ft. wide vehicles operating in both the slow line and the fast.

In the slow line of a two-line tunnel, vehicles operating at a speed from 3 to 6 mi. per hour should have a clearance of not less than 6 in. between the outside of the tire and the curb, while in the fast line, due to the greater speed, this clearance should be not less than 1 ft. If allowance is made for a minimum clearance between the moving vehicles of 1 ft. 9 in., the minimum width of roadway is 19 ft. For safe and convenient operation, however, a clearance between the moving vehicles of 2 ft. 9 in. should be provided, giving a 20-ft. width of roadway for two-line traffic, which is the width recommended.

Ventilation

The problem of ventilating the tunnel has been investigated under three main subdivisions: (1) Amount of composition of the exhaust gases from motor vehicles. (2) Dilution necessary to render these exhaust gases harmless. (3) Method and equipment necessary for adequate ventilation.

Investigation showed that there was comparatively little information available as to the percentage of carbon monoxide gas permissible in the atmosphere without injury to health. Air containing even minute quantities of carbon monoxide, if breathed for a long time, is highly injurious. With the co-operation of the U. S. Bureau of Mines tests were carried out to determine the amount and composition of exhaust gases from motor vehicles and the physiological effect of carbon monoxide on human beings and horses. The results, the report states, are to be made public at a later date.

The method of ventilation which appears best adapted to the Hudson vehicular tunnel is that of introducing fresh air through a number of openings leading from a fresh-air duct separated from the roadway (see cross-sectional drawing) and exhausting the vitiated air similarly through an exhaust duct. The proposed distance between ventilating shafts is 3,800 ft. The method proposed avoids excessive air velocities in the tunnel which would be caused by blowing fresh air from one portal to the other.

The question of the proper location of the fresh-air and exhaust ducts has been given consideration. Tests carried out by the Public Service Corporation of New Jersey in 1916, in a model tunnel section, showed that, with all doors and ventilator openings closed and no circulation of the atmosphere, the percentage of exhaust gases was greater at the floor, or near the plane of exhaust, than at the roof. However, when fresh air was introduced, the analyses showed that carbon monoxide was very much less in cases where the fresh air was introduced at the bottom and exhausted at the top than it was when this operation was reversed. The results appear to indicate, according to the report, that under conditions where the air in the inclosure is in motion, as would be the case in the tunnel, the exhaust gases tend to rise so rapidly that they cannot be exhausted as readily through openings at the roadway as through openings near the roof. Upon the basis of these tests the fresh-air duct has been located below the roadway and the exhaust duct above.

In discussing the cross-section of the air ducts, the report points out that the areas must be sufficient to insure low air velocities, thereby making possible an economical ventilating plant and not one required to operate at excessively high pressure, as would be the case if the ducts were small. The power required to ventilate the tunnel and consequently the operating costs vary inversely as the cube of the duct area.

Ventilating Shafts—The tunnel has been designed with four ventilating shafts, two of which (3,800 ft. apart) are located near the pierhead lines and the other two between these shafts and the portals. With this arrangement the cost of operation is reduced to about one-quarter of what it would be if the tunnel were provided with only two ventilating shafts at the bulkheads. All fans and motors are to be located in structures at the top of the ventilating shafts and will be of standard sizes.

The portion of the report dealing with ventilation concludes with the specific statement that in the opinion of the chief engineer, "there is absolutely no question as to the feasibility or practicability of ventilating the vehicular tunnel at a reasonable cost."

With a view to eliminating the need for artificial ventilation consideration was given to mechanical haulage of vehicles through the tunnel, including moving platforms, flat cars and hauling cables. All of the schemes, it was found, offered too many difficulties for practical application and all plans for mechanical haulage were rejected.

Types of Tunnel Considered

Before the 29-ft. twin-tube, cast-iron shield tunnel was recommended a detailed study was made of eleven different plans, proposed by various engineers since 1913, as follows:

Plan I—Twin cast-iron tubes (external diameter 23 ft.) to accommodate two lines of traffic in each direction with a 17-ft. roadway and no sidewalk and a clear headroom of 14 ft. A cross-section of this tunnel is shown, p. 361.

The maximum adverse grades were, east-bound 3.7 per cent, and west-bound 3 per cent. The estimated capacity of these tubes was 5,000,000 vehicles per annum, approximately the entire vehicular traffic crossing the Hudson River on the ferries at that time. The tubes were to be constructed with an outer lining of cast iron and an inner lining of concrete, similar to the Pennsylvania North River tunnels. The time required for construction was fixed at 3 years and the estimated cost was $11,000,000, which included the cost of easements, carrying charges, engineering and contingencies.

In recommending the construction of a pair of shield-driven tubes, 23 ft. in diameter, the engineers advocating it followed a plan of construction which has already been successfully completed and there was, therefore, nothing speculative as to the feasibility or the success of the undertaking. From an investigation it appears that:

1. The capacity of the tunnel was considerably underestimated, probably due to the fact that in 1913 the increased use of the motor vehicle of today was not anticipated, so that the capacity was based on a larger volume of horse-drawn vehicles than is now the case.

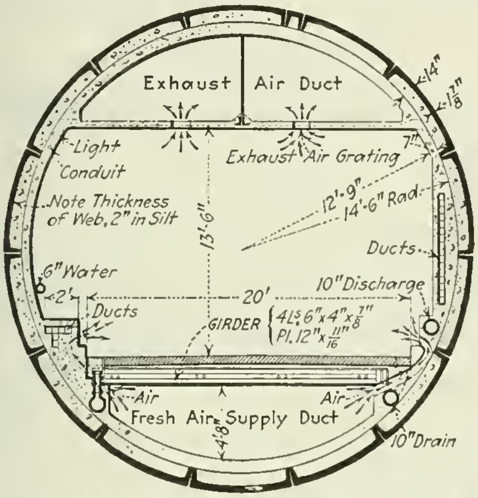
2. The width of roadway is not sufficient for two lines of traffic under present conditions.

3. The tunnel cross-section is not sufficient to provide adequate ventilation.

4. The estimate of cost at the time it was made was probably sufficient, but now is entirely too low.

This plan is not recommend for adoption.

Plan II—A single pre-cast reinforced-concrete tunnel, 36 ft. 6 in. wide and 29 ft. high (external dimensions) to accommodate one line of traffic in each direction with a 17-ft. roadway and two sidewalks, 5 ft. 6 in. and 3 ft. 6 in. wide respectively, and a clear headroom of 13 ft. A cross-section of this tunnel is shown, p. 361.



SECTION OF ONE OF THE TWIN TUBES RECOMMENDED SHOWING VENTILATING DETAILS

The maximum adverse grades were, east-bound 3.85 per cent and west-bound 4.55 per cent. The estimated capacity of this tunnel was 7,700,000 vehicles per annum.

It was recommended that this tunnel be constructed by the trench method and the plan of construction, although never before carried out, was considered by the engineers proposing it to be entirely feasible. The estimated cost of construction of the tunnel fully equipped with ventilating and electric lighting fixtures was $6,899,000, based on pre-war prices or $9,000,000 on prices prevailing in 1916, which included contractor's profit, engineering and contingencies. The time allowed for construction was 2 years. A study of this plan involved the consideration of several unknown factors and it was found that:

1. The capacity of the tunnel is inadequate to meet the present demands of traffic crossing the Hudson River.

2. The cross-section of the tunnel is sufficiently strong, but the difficulties of construction are dependent upon several unknown factors.

3. The estimated cost of construction is low and would have to be greatly increased under present-day conditions.

4. The time allowed for construction is less than would be required.

This plan is not recommended for adoption.

Plan III—A double-deck concrete block tunnel (external diameter 42 ft.), to accommodate three lines of traffic in each direction with two 22 ft. 6 in. roadways and no sidewalk and a clear headroom of 13 ft. A cross-section of this tunnel is shown, p. 361.

The maximum adverse grades were, east-bound 4.45 per cent and west-bound 4.13 per cent. The estimated capacity of this tunnel was 100,000 vehicles daily. The time required for construction was stated as 3 years and the cost was estimated to be $12,000,000 exclusive of land and easements.

The plan of construction as recommended differs radically from anything heretofore attempted by the shield method, not only in the great diameter of the tunnel but also in the type of lining. The departure from accepted practice was justified by the claim that it has great advantages over the methods heretofore employed. After a very careful investigation your engineer found that:

1. The capacity of the tunnel is overestimated, as the width of roadway is not sufficient for three lines of ordinary and usual traffic but is sufficient only for two lines of traffic and a 3-ft. sidewalk.

2. The lining of concrete blocks is not of sufficient strength to withstand the loads to which it would be subjected, and is not suited to Hudson River conditions.

3. The difficulties of construction would be enormously increased and the methods proposed to overcome them are undeveloped and do not insure the safe prosecution of the work.

4. The estimated cost of construction is too low.

5. The time for construction which was fixed at 3 years is very much less than would be required.

In view of the deficiencies and difficulties in this plan, without any apparent advantage over those which can be obtained by the construction of twin tunnels, your engineer recommends that it be not adopted.

Plan IV—Twin cast-iron tubes (external diameter 29 ft.) to accommodate two lines of traffic in each direction with a 20-ft. roadway and a 2-ft. sidewalk in each tube. The maximum adverse grade for west-bound traffic is 3.5 per cent and for east-bound traffic 3.52 per cent. A cross-section and location plan of this tunnel are shown, pp. 360 and 357.

The design of this tunnel follows closely that of the usual shield-driven subaqueous tunnel in that it consists of successive cast-iron rings bolted together with an inner lining of concrete. The experience obtained in driving other tunnels is applicable to this tunnel and it is certain that the methods heretofore used insure the successful completion of this plan of constructing.

This plan is recommended for adoption.

Plan V—Twin cast-iron tubes (external diameter 36 ft.) to accommodate three lines of traffic in each direction with a 27-ft. roadway and a 2-ft. sidewalk in each tube.

This plan is not recommended on account of the greatly increased cost and difficulties of construction as compared with the twin tubes 29 ft. in diameter.

Plans VIa, VIb, VIc—A pair of cast-iron tubes (external diameter 31 ft. 6 in.) with traffic facilities as follows:

(a) 22-ft. 6-in. roadway and a 2-ft. sidewalk.
(b) 24-ft. 6-in. roadway and no sidewalk.
(c) 20-ft. roadway and 4-ft. 6-in. sidewalk.

Plans VIa, VIb and VIc were studied in detail with a view to determining the greatest traffic facilities which could be provided in a tunnel 31 ft. 6 in. in external diameter. Plans VIa and VIb provide roadways which are too narrow for three lines of traffic and are wider than necessary for two lines of traffic, while Plan VIc provides for two lines of traffic and a 4-ft. 6-in. sidewalk.

It is recommended that none of these plans be adopted as the increased cost is at least 20 per cent more than that of Plan IV. This increase in cost is unwarranted in view of the slight increase in facilities provided.

Plans VIIa, VIIb—A pre-cast, reinforced-concrete tunnel with two 20-ft. roadways and sidewalks 2 ft. wide to accommodate two lines of traffic in each direction. Cross-sections of these tunnels are shown, p. 361.

The plans for construction follow closely those recommended to the Public Service Corporation in 1917, differing only in modifications deemed necessary to provide for greater traffic capacity. This method of construction has never been used on the large scale proposed, but it appears that under favorable conditions its adoption might effect a saving in cost.

Plan VIII—A concrete tunnel with a steel shell and an outer protection of concrete placed by the tremie method with two 20-ft. roadways and sidewalks 2 ft. wide to accommodate two lines of traffic in each direction. A cross-section of this tunnel is shown, p. 361.

The plans for construction follow closely those successfully used under the Harlem River in New York City, and under the Detroit River from Detroit, Michigan, to Windsor, Canada. The latter tunnel was successfully carried out and more nearly approaches in magnitude the Hudson tunnel.

PLAN RECOMMENDED

The 29-ft. cast-iron tubes recommended follow standard practice. They are to be constructed by bolting together successive rings of cast iron 2 ft. 6 in. wide. Each ring is made up of 14 segments, approximately 6 ft. long and a key 1 ft. long. In each ring there are 85 bolts on the circumferential joints and 75 bolts on the horizontal joints. The diameter of the bolts is 1¾ in. The weight of the cast-iron lining through sand and part earth and part rock excavation is 8 tons per linear foot, while through the silt, in order to increase the weight of the tunnels, it is 8½ tons per linear foot. Inside the cast-iron lining there is an inner lining of concrete 19 in. thick, extending to a point 7 in. beyond the flanges of the rings. The surface of the concrete is to be rubbed and painted so as to provide a smooth surface which can be kept clean. The use of glazed tile was considered but it is not recommended on account of its cost. Other details are shown in the drawings.

The estimated cost of the tunnel structure only is $22,262,000, divided equally between the two states, and the time required for completion is 3½ years.

EQUIPMENT

Fans—The method of ventilating the tunnel provides for the installation of blower and exhaust fans at each of the ventilating shafts. To ventilate the tunnel when operated at its maximum capacity 65 fans, including spare units, are required.

Drainage—Adequate drainage facilities will be provided by the construction of sumps at the portals and at the low points in the tunnel. The portal sump will take all storm-water, while the tunnel sumps will collect all water from cleaning and leakage. The water will be caught in catch basins and conveyed by drains to the sumps, so that no polluted water can reach the lower air duct. Special provision will be made for the removal of oil collecting in the sumps. It is planned to have the pumps, with a capacity of 600 to 750 gal. per minute respectively, installed at the portal and river sumps. The pumps are to be motor driven and automatically controlled.

The estimated cost of equipment, including ventilating machinery, lighting fixtures, pumps, cables and shaft superstructures above the level of the street or dock floor is $705,000.

ADMINISTRATION, MAINTENANCE AND OPERATION

The charges for administration, maintenance and operation of the tunnel after its completion includes general overhead and office expenses, the collection of tolls, policing, cleaning, depreciation and maintenance of the ventilation, lighting and pumping equipment, buildings and pavements, and supplies which vary from $254,000 per year at the time of opening to $314,000 per year at time of capacity of operation. These figures do not include the cost of power for lighting, pumping and ventilation, which varies from $31,000 at the time of opening of the tunnel to $301,000 per year when the tunnel is operated at full capacity with all motor vehicles.

For the purpose of arriving at an estimate of income, the revenue from ducts is fixed at $2,000 per duct per annum.

Traffic Rates—The amount of revenue from vehicular traffic over the ferries during the days on which traffic counts were made shows that the average fare for horse-drawn vehicles was 25c. and for motor vehicles, 41c. The average charge for motor vehicles in the immediate future will be at least 45c. and for horse-drawn vehicles, 20c. These rates have been adopted not only as the charge for traffic at the time of opening the tunnel, but also throughout the following 20 years. It is considered that an estimate of revenue based on the preceding rates will prove to be conservative.

FINANCIAL CONSIDERATIONS

The total estimated cost of the tunnel recommended, as defined in the contract between the states, is as follows:

ESTIMATE OF COST

Tunnel Construction, based on present-day prices for labor and materials, with an allowance for contractor's contingencies and profit	$22,262,000
Equipment	705,000
Engineering, in which is included design, supervision and inspection, estimated at 6 per cent of the cost of construction and equipment	1,378,000
Administration, including office rent, salaries and expenses of the clerical staff of the Commissions, estimated at 2 per cent of the cost of construction and equipment	459,000
Total	$24,804,000
Real Estate and Easements, net cost (refer to p. 47)	2,500,000
Total	$27,304,000
Contingencies, to provide for fluctuations in the cost of labor, materials, claims, accidents, etc., estimated at 5 per cent of above total	1,365,000
Total cost of project	$28,669,000

Each state's share of the estimated cost of the tunnel as given above amounts to $14,335,000, and in order to determine the probable time of amortizing the cost, a financial statement was prepared, covering a period of 20 years, which gives by years the estimated revenue, operating charges, net income, bonds retired in $50,000 lots on the basis of a serial bond issue and a surplus accruing to each state.

From the financial statement it appears that the cost of the tunnel would be amortized in 11 years and at the end of a 20-year period there would be a surplus to each state amounting to $33,635,000, in addition to having a tunnel without cost to the people.

In presenting the statement showing the financial soundness of the undertaking, the chief engineer emphasizes that this great public improvement, so necessary for the proper conduct and development of the business between the two states and in the Port of New York, can be constructed and maintained without question, on a self-supporting basis, with a very considerable surplus.

In conclusion Mr. Holland records his indebtedness for valuable services rendered by the members of his engineering staff, particularly Jesse B. Snow, principal assistant engineer; Milton H. Freeman, resident engineer, and Ole Singstad, designing engineer, and for the hearty co-operation and advice of the Board of Consulting Engineers.

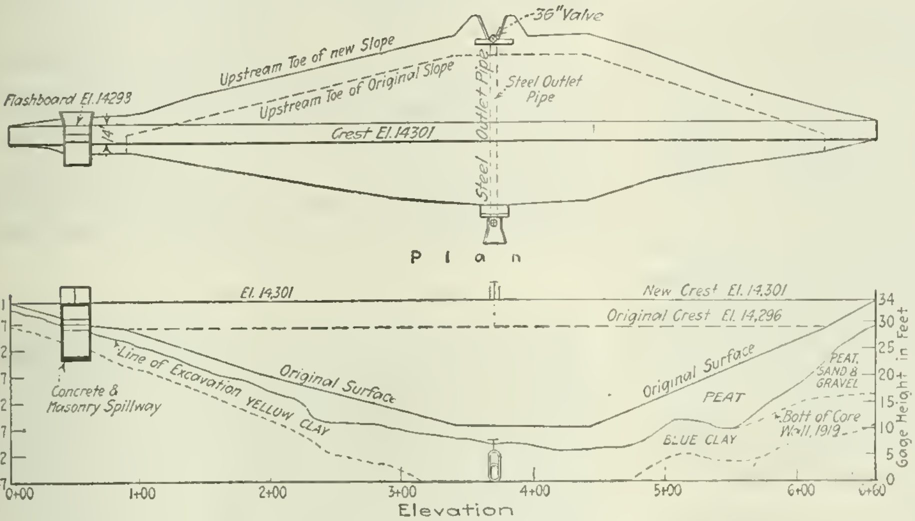
Clay Blanket Stops Leakage in Earth Dam

Covering Is Placed on Upstream Face of South American Earth Fill and Dam Raised 5 Ft. at Same Time

By B. E. Torpen
Resident Engineer, Cerro de Pasco Copper Corporation, Morococha, Peru

Leakage in a gravelly earth dam built by the Cerro de Pasco Corporation in the mountains of Peru was stopped last year by blanketing the entire face of the dam with clay to the thickness of about 3 ft. On account of the remoteness of the site and the type of labor the operations had some novelty.

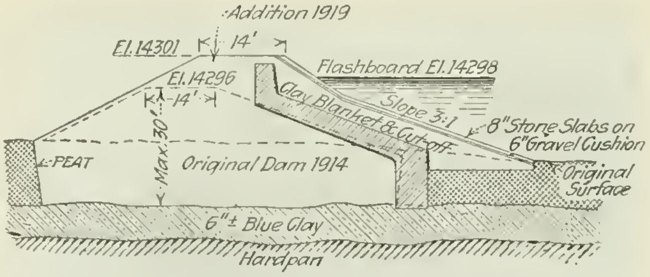
In 1913 the corporation built an earth dam at the outlet of Lake Huascacocha which raised the waters of the lake about 20-ft. and made available 6,400 acre-feet of storage for power purposes. This dam had an over-all length of 550 ft., a maximum height of 30 ft., a crest width of 14 ft. with upstream slope of 3: 1, covered with riprap, and a downstream slope of 2: 1.



PLAN AND ELEVATION OF PERUVIAN EARTH DAM

The material available was of a very gravelly nature and, although carefully built, the dam showed considerable leakage as the water raised in the reservoir and became wholly saturated below the water line. Three or four leaks as large as one's finger were developed and the north half of the dam settled 12 to 18 in. in five years. Being a menace to the safety of property below, it was decided to repair the dam by the addition of a clay blanket to the upstream face and to place in front of the clay an equal layer of earth to hold the clay in place. On this earth it was decided to place paving as before on a 3 to 1 slope. The crest of the dam was also to be raised 5 ft.

Lake Huascacocha is in an isolated region on the headwaters of the Amazon at an elevation of 14,300 ft. in the Andes Mountains, 80 miles inland from Lima. This necessitated the work being done by pick and shovel method. The native Indian laborers were paid S. 1.80 or 90c. per 8-hr. day. The clay was all delivered in wheelbarrows, but a 20-lb. narrow-gage with two 1½-yd. home-made cars, gravity operated, delivered earth from a borrow pit 500 ft. distant.



DETAILS OF SMALL PERUVIAN EARTH DAM BLANKETED AGAINST LEAKAGE

The work was begun about Dec. 1, 1918, at the end of the dry season, as then the reservoir was empty. First of all the riprap was removed and along the toe of the dam a cutoff trench 5 ft. wide, and varying in depth from 4 to 16 ft., was excavated through the peat overburden into the impervious clay underneath the dam. This was carefully backfilled with selected clay well rammed into place. Clay was also carried up the upstream slope, forming an impervious blanket about 3 ft. thick, thus insuring water-tightness. The sod and surface soil were excavated to the new slope lines and a layer of earth 3 to 4 ft. thick placed in front of the clay to hold it in place.

The new face was riprapped or paved with flat slabs of limestone of 1 to 10 sq.ft. area, 6 to 10 in. thick, placed on a 6-in. layer of gravel. The gravel was delivered to the job by llamas, from a pit 2 km. distant at a cost of 6c. gold per sq.yd.

Wheeling clay over soft ground in rainy weather

FILLING TOE CUT OFF TRENCH WITH CLAY

LLAMAS USED TO CARRY GRAVEL TO DAM

was doubly difficult, because the laborers wear crude sandals of cowhide and were constantly slipping. Their efficiency was practically doubled by laying on the soft ground a runway of 20-lb. rail, laid on the side and end to end so the wheel of the barrow traveled in the groove. In this manner the wheelbarrows could not jump the track and had a solid bearing throughout. The clay layer was placed in 3- or 4-in. layers wetted and thoroughly hand tamped. Being very soft, a good bond was secured throughout and the passage of water made practically impossible at the heads encountered. The earth front was of similar thickness and carefully placed. As the work progressed the water was raised in the reservoir to store the heavy run-off and the water level was always close to the work.

The dam crest was raised 5 ft. and when completed, May 1, 1919, the water stood 5 ft. higher than before and no leakage was apparent through the dam.

Field costs were as follows:

2,950 sq.yd. stone riprap cost $0.45 per sq.yd. incl. gravel.
3,000 cu.yd. clay fill cost $1.50 per cu.yd. in place.
4,500 cu.yd. earth fill cost $1.05 per cu.yd. in place.
1,800 cu.yd. excavation cost $0.80 per cu.yd.

The total expenditure on the work and the distribution of same were as follows:

		Per Cent
Labor	S. 27,389	83.3
Material and equipment	2,764	8.4
Engineering and superintendance	2,732	8.3
	S. 32,885 = $15,950 = $6.12 per acre-foot	

Aside from repairing the old dam and making it safe, this work provided for an additional 2,600 acre-feet of storage. Passing through two power plants with a total drop of 1,500 ft. this water has a yearly value of $3 per acre-foot, or $7,800 represents the yearly value of the job, which will pay for itself in two years.

F. G. Baum, San Francisco, Cal., is consulting hydro-electric engineer; E. S. Kalenborn, Oroya, Peru, is engineer and superintendent of power; and the writer was resident engineer in charge of construction.

Sludge Utilization at Kingston-on-Thames

Continuation by the town of Kingston-on-Thames, England, of the utilization of sewage sludge formerly carried on by a company was under consideration in January, 1920, according to the London *Surveyor*. For a number of years a private company produced "native guano" at the sewage works by means of the "A.B.C." process [precipitation of alum, blood, charcoal and clay.—EDITOR]. Since the original contract ended the works have been operated by the town, and the pressed sludge supplied to the company without charge.

Engineer's Responsibility in Social Problems

Extracts from the Presidential Address of Lieut.-Col. R. W. Leonard Before the Engineering Institute of Canada

"SOUND economic doctrine is just as much the foundation of the engineer's professional education as mathematics and physics."

This sentence may be taken as the key-note of the first half of the presidential address of Lieut.-Col. R. W. Leonard, retiring president of the Engineering Institute of Canada, before the annual meeting of the Institute at Montreal, Jan. 27. He went on to make an analysis of the causes of industrial unrest and pointed out that the engineer whose training and life work are devoted to the study and solving of practical problems is best fitted to find workable solutions.

The latter half of the address was devoted to a review of the work of the Engineering Institute of Canada during 1919 and to comment upon recent engineering developments both in Canada and abroad. This part of the address, on account of lack of space, is omitted here.

The following extracts are from that portion of Colonel Leonard's address which discusses the responsibility of the engineer in social problems:

FUNDAMENTALS OF OUR CIVILIZATION

A few years ago it would have been unnecessary to deal with the fundamentals of our civilization; they were so imbued in our beings that it was almost silly to formulate them into words. We rested securely in the belief that "Truth is might and will prevail." Of late, however, so much false teaching and distortion of fundamental truths has been disseminated, and accepted by so many, that downtrodden Truth would appear to need the assistance of some Minister of Propaganda if she is to hold her place and prevail before the structure of our civilization is badly shaken. Sound economic doctrine is just as much the foundation of the engineer's professional education as mathematics and physics.

We have the much-taught doctrine that "all men are born equal," which is an obvious fallacy. It is a self-evident fact that there is as great natural inequality—physically and mentally—in the different branches of the human race as in any other species of the animal kingdom. This difference, greatly increased by the moral and spiritual inequalities of the human race, is influenced again and emphasized by environment and education from the cradle to the grave. The very men who ignorantly preach that one man is as able as another and as well qualified to rule or hold office—that race and family count for naught—will spare no pains, in breeding his live stock to select parents having certain desired characteristics of disposition and physique.

G. F. Swain, late president of the American Society of Civil Engineers, in his address at their Ottawa Convention in 1913, made the following remarks:

"Equality of condition means pauperism or savagery; the inequality of man means the division of labor, progress and civilization.

"We should encourage the recognition and admiration of superiority.

"We should preach the gospel of content instead of discontent. 'Do violence to no man, neither exact anything wrongfully; and be content with your wages,' said John the Baptist. There are two kinds of discontent, one praiseworthy; one ignoble. The former springs from a laudable ambition, and a desire to perfect oneself so far as natural endowment will permit. The other springs from envy and the desire to reap the rewards of the industry of others. The former kind of discontent is to be encouraged; every man should be given an opportunity to develop himself and to be confirmed in the possession of the prizes which he may gain; but the discontent which springs from envy, which leads men to depend on Government help instead of self-help, which sanctions forms of unjust taxation which may be nothing less than legalized robbery, should, in every possible way, be repressed. The attention of men, instead of being concentrated on what they want, should be directed to a realization of what they have. In contrast with the conditions which existed one or two centuries ago, even the conditions of the poorest classes at the present time are immensely improved. Yet with all the reduction in working hours that has taken place in the last fifty years, and the other improvements in conditions, I doubt if there is any more real happiness and content among the poorer classes. Nor have I any doubt that the excessive talk about bettering the condition of the working classes blinds them to the opportunities for their own thrift and industry."

When I begin to quote Mr. Swain's very notable address I scarcely know where to stop. I commend it all to you as a splendid example of a well-reasoned statement of social conditions which does justice to the disciplined and trained mind of the educated engineer.

The value of such expedients as old age pensions, unemployment insurance, etc., may be overestimated, as they must tend to increase a spirit of irresponsibility and extravagance, to lessen the incentive to thrift, to encourage carelessness in quality of work performed, and to reduce the sense of filial responsibility. Such results do not tend to advance our civilization. "The hand of the diligent shall bear rule, but the slothful shall be under tribute."—Proverbs XIII, 24.

Rewards for Effort

A popular cry of the ignorant, uneducated "socialist" is: "Why should the many support the few?" All thinking men know that it is the few who have the energy, intelligence, courage and enterprise to overcome the great natural obstacles that frequently lie in the road to success—to explore the unknown wastes of the earth and make them accessible to man, and to delve into the hidden resources of nature, geographical, geological, physical and chemical, and force her to yield up her undiscovered secrets, and who, through their natural and acquired ability to develop and harness nature's great resources to serve the needs of man, are creating industry and the benefits of industry for the great masses of the people. We realize now in greater measure than ever before that the labor of the explorer, the inventor, the organizer, the manager and the skilled and unskilled workman is most urgently required to restore the world's wealth, wasted in war, and to build up again a well-balanced economic and social structure. Achievement along such lines is deserving of honor and distinction, and of the wealth which properly accrues from such accomplishments, for these rewards constitute the foundation stones of the arch of civilization, just as industry, integrity and thrift form the arch stones. It was the tearing out of these arch stones that was largely responsible for the fall of the ancient civilizations of Greece and Rome; it is the tearing away of the foundation stones that has caused the utter collapse of Russia, as we see her today. . . . .

The foundation stones may be popularly (though loosely and incorrectly) described as "Capital" and the arch stones as "Labor." Each is dependent on the other. I say "may be popularly described," because every man who possesses a constructive mind or owns one dollar's worth of any useful commodity or one dollar in money, is a capitalist; and every man who works, mentally or physically, is a laborer. But the man upon whose work of eight or ten hours per day depends the well-being of himself and those dependent upon him only, cannot be counted of the same value to society as the one upon whose enterprise, ability and industry depends the well-being of a factory full of employees and their families by maintaining the factory in continuous operation on a profitable basis. . . . .

Labor unrest is largely the result of failure or refusal to recognize such facts and conditions as fundamentally right. The workers are led, by observation of occasional large returns upon capital (always featured in our newspapers with sensational head-lines) to ignore the risk and more frequent losses incident to industry—(hidden in very small print, if mentioned at all). The taxation of excess profits has incited the worker to seek a share in these profits, while overlooking the logical conclusion that they would necessarily require also to share in the losses, as it is difficult to understand how partnership in industry can long exist without joint distribution of the risks as well as the rewards.

Occasionally one hears of apparent success in some scheme of profit-sharing, joint industrial councils or suggestion of "sweating the machinery instead of the men," and doubtless there are some industries to which such schemes can be adapted so long as the results of operation are profitable. In the event of losses, however (if only over a short period of time), I fear that the system would not long survive such treatment. I defy any engineer to tell me how to "sweat" a pick and shovel without some measure of perspiration on the part of the wielder thereof.

As ability to understand what, to him, are the intricacies of business as applied to profit-sharing, etc., is absolutely essential to the success of such schemes, and as practically the only education these men receive in this direction is such as is instilled into them by agitators who find fomenting industrial strife a much pleasanter occupation than working for a living, the prospects for the general successful adoption of these innovations is not bright.

If solutions are possible whereby the lot of the working man can be improved, the engineer—whose training and life-work are devoted to the solution of practical problems—is most capable of finding them.

Engineers know, as well as the intelligent workmen, how fictitious are most of the alleged grievances in many of the recent strikes. These workmen, perhaps, are not to be too severely criticized if they are content to accept any immediate advantage that may be secured by means of some temporary trouble. The frequent argument that "If all vote for a strike there won't be any" is very seductive.

Leadership

All mankind tends to crystallize into tribes or factions under a leader. Sometimes the employer, by his strength of character or fair dealings, commends himself to the employees as a leader, and in such cases there is seldom serious labor troubles. Lacking this condition the men select their own leaders and—as frequently in democracies—the selection is not always of the wisest or most moderate man. This leader in order to justify himself works day and night and Sundays to find trouble, in the solution of which he can demonstrate his fitness for the job.

Until the wise heads in the Unions get together, take control and educate the others along lines of duty and honest service to their fellowmen, there can be no industrial peace.

The present tendency appears to be toward the obtaining of special legislation and privileges for highly organized bodies of labor beyond its proportional value, which, if continued, must result in the eventual extinction of the particular union, trade or business involved, just as the trade guilds of the Middle Ages perished, and as the stone-cutter's trade dwindled when concrete took the place of cut stone. A striking example is the headway that the use of concrete is making for house-building in England as a result of the "ca-canny" of the Bricklayers' Unions, which is largely responsible for the increased cost, and, therefore, the rent, of the laborer's cottage.

W. R. Ingalls [formerly editor of *Engineering and Mining Journal*], in an admirable address before the Canadian Mining Institute in May last, cites the case very clearly, as follows:

"It was the theory of Karl Marx, from whose teachings are derived so many of the fallacies of the present time, that labor, in its narrowest sense, produces everything, and, therefore that labor should have all that it produces. That idea is frequently expressed now all over the world. We have already seen that labor gets almost all as it is, and what remains it would not get, for if profits for example are the reward of intelligence, the removal of intelligence would remove profits also. So long as the world was dependent upon mere man-power there was no very great advance in the wealth of nations beyond what was due to increase in population. There is no good reason to believe that an Englishmen in the reign of George V could carry any more weight per hour or for any more hours, or could exhibit any other superiority of physical power than an Englishman in the time of William the Conqueror. The great increase in production has happened during the last century and a quarter, and has not been because men have grown any stronger, but because mind has taught labor how to become more effective and has provided it with machines and with organization. It is the minds of the captains that have produced the great increase in wealth and to those captains might reasonably have accrued all that they earned, but the economic principle that labor is the residual claimant prevented any such result, even if it were desired. The income of England in 1801 was about £180,000,000. The income of the United Kingdom, at the same rate but allowing for the increase in population, in 1907, would have been about £900,000,000. Actually it was about £1,950,000,000, excluding the revenue from foreign investments. In the words of Mallock 'the mind of the larger employers was the primary producer of an income of some £1,050,600,000 added to an income that would otherwise have been £900,000,000 only.' Then he shows conclusively that of this increment the representatives of Mind got only about £250,000,000 for themselves, including both profits and the interest on industrial capital.

"I have shown I hope that there cannot be anything essentially wrong in the existing system of the distribution of the product of industry as between labor and capital. Labor cannot divide among itself any more than there is to divide, i.e., the total of what is produced. That is self-evident. It may attempt to seize the modest share of capital, but if it succeeds in doing so, that share dries up. If it confiscates capital itself it does not gain anything, for capital, without the directing minds to use it productively, ceases to be of advantage to anybody. The experiences in Mexico and Russia have shown what happens. The Bolshevists of other countries will lead to the same end if they have their way. Why is it that while socialists are shouting from soap-boxes, inflaming the populace with irritant poisons, while doctrinaires who hold professional chairs are issuing fallacies, while a motley crowd in Russia is performing the most cruel and disastrous experiment ever known, we cannot drive into the heads of people that even as things are under the capitalistic system they get all they can, that they can get no more than they produce, and that it is not the power of the mass but rather the minds of the few that have uplifted them to the stage of comfort that they enjoy today, which is vastly superior to what it was a century ago. If the Marxian doctrine has been true labor would be paid now what it was 100 years ago, no more.

"It is of profound importance to make the millions of workers see things correctly, for they are blindly approaching a time when adverse economic conditions are going to drive them, and no socialistic rantings or paternalistic policies by the Government are going to help them. The world has become so much poorer by the squandering of wealth and man-power during the war that no advance in the scale of living is to be expected from it. The prospect is just the reverse. The farmer does not lose his cattle and install improvements in his house because of his loss. The people of a city do not become profligate buyers of automobiles after a conflagration has swept away their houses. No more do nations become prosperous because war has consumed their substance. Instead of labor holding what it has gained during the war it is probable that it will suffer a relapse to a condition inferior to what it held just before the war, although the Unions will struggle bravely against it. Fortunately, we shall not see a loss of economic improvements, such as safety measures in industry, the provision of proper working quarters and conditions, because they are economic; but labor is in danger of losing the eight-hour day for the simple reason that it will have to work nine to ten hours in order to produce enough on which to live."

RESPONSIBILITIES IN A DEMOCRACY

During the progress of the war, in order to differentiate in a popular way the aims of the belligerents, the word "Democracy" became almost a war-cry, like "Remember the Maine" in the Spanish-American War. Both cries served their purpose. "Democracy" is defined as "the form of Government in which sovereignty of the State is vested in the people, or indirectly, by means of representative institutions."

It is the ideal form of Government where "the people" are intelligent and educated on sound principles. If, on the other hand, the majority of the voters—the ruling class—are ignorant, badly led or imbued with false political doctrines, it means the downfall of that State. Lenine is credited with stating that, of every one hundred of his followers, one is a Bolshevik, thirty-nine are criminals and sixty are fools. We see the result in Russia today—the most terrible famine and misery that a white nation has probably ever experienced, certainly since the Thirty Years' War.

The combinations of various classes of workmen into trades unions has undoubtedly been the means of bettering the living conditions and wages of the members, by bringing to the attention of the public the defects in those conditions. These successes have naturally led enthusiastic members to aspire to greater things, until the public who are neither employers or employees in the union sense feel that the limit has been passed, and that, in many cases, the power of the unions is being exercised unwisely and selfishly.

The hope for further progress in trade unions appears to depend on the ability of their leaders to recognize the necessity of instilling sound knowledge into their memberships, with a sense of their duties and responsibilities to the public as well as their rights. These duties include increasing efficiency with increasing pay and decreasing hours of labor. Otherwise, there is no limit to the high cost of living which, in the last analysis, depends largely on the high cost of loafing. Co-operation among all classes and nations there must be if we are to escape the downfall of civilization.

Water Power Shows Gain

The Division of Power Resources, United States Geological Survey, has published figures showing the production of electric power by the public-utility plants of the United States. The report, covering February, March, and April, 1919, was based on returns from about 3100 electric power plants engaged in public service and including central stations, electric railway and certain other plants whose output contributed to the public supply. The statistics show the relative output from plants operated by fuel and by water power. The total production of electric power, in thousands of kilowatt-hours, was as follows: February, 2,983,121; March, 3,150,166; April, 3,026,361. The average daily output, in thousands of kilowatt-hours, was as follows: February, 106,540; March, 101,620; April, 100,800. In February nearly 39% of the total was produced by water power; in March it had increased to 42%, and in April to 43%. The average monthly consumption of coal by public-service plants during the period was 2,815,000 tons, or 95,000 tons per day, an equivalent of 2100 carloads of 45 tons each per day. Of that coal consumption 39% was in New England, New York, New Jersey and Pennsylvania. In addition to the coal used to produce about 59% of all public-service electric power, there was also consumed a monthly average of 668.853 bbl. of petroleum or its derivatives and 1,703,788 cu.ft. of natural gas.

Canadian Demands in Engineering Education

Extracts From the Inaugural Address of Brig.-Gen. C. H. Mitchell as Dean of the Engineering Faculty of the University of Toronto

CANADIAN demand for engineers has changed in recent years, partly because of the war. While the number of civil engineering students formerly exceeded that in other engineering courses at the University of Toronto, that course, in numbers, now occupies third place. The specialties concerned with the industries have come to the front. These conditions were pointed out by Brig.-Gen. C. H. Mitchell, C.B., C.M.G., D.S.O., in his inaugural address as dean of the Faculty of Applied Science and Engineering at the University of Toronto last October. He discussed also the character of training which now must be given to young engineers, and outlined the extension of curricula planned at Toronto.

The following extracts are taken from his address:

CHANGES IN CANADIAN ENGINEERING

If we are to study for a few moments the trend of the great engineering activities of the country as they appeared firstly, before the war, compared with the period of the war; and secondly, during the war as compared with the future and its prospects of reconstruction activities, we find divergent differences. The activities have passed through various stages. It will be remembered that the prominent features of these activities before the war were connected mainly with the huge railway construction and extensions. Further activities included other features of transportation, of canals and terminals, then of hydro-electric power developments and a definite trend just previous to the war to comprehensive programs of large building construction connected with the expansion of manufacturing and commerce. This period too claimed a lengthy activity in mining and its allied industries.

The war changed all that; through the same sudden transition by which we passed from peace to war we almost as suddenly passed from the stages just described to the stages consequent upon the national mobilization of all our resources, and with that came an entirely different character of engineering activity. It resolved itself into the transformation of most of our great manufactories into munition works or works solely engaged upon war material, while the remainder, and many new ones, had perforce to continue in the work of carrying on the normal industries for the life of the country carried on with redoubled energy. Thus all the great public works of state or municipality were either hurriedly completed or abandoned for the time being.

In the same manner the sudden termination of the war from its greatest intensity to an unexpected armistice brought about a similar transition in the opposite direction. With the difference, however, that the great public works have not been resumed and if one may be bold to forecast, it is unlikely that they will be for some time to come in so far as railway construction is concerned.

But what does appear on the horizon, as the future of these great activities of the country indicates, is a large resumption of manufacturing and industrial work through the return to peaceful pursuits and the consequent readjustment of all that pertains to the life of a newly developed manufacturing country in which, as always, the agricultural industry is, and will be, the mainstay. But there is more than that; all those smaller public works and those smaller private enterprises which were arrested or dislocated during the war and which are not yet ready to be prosecuted or financed are still to be revived and within a few years will doubtless absorb the attention and services of many engineers, as well as the interest of the financiers of the country. This is all without any reference to the entirely new enterprises consequent upon the normal growth and development of the country such as was steadily proceeding previous to the war. Already there are signs of the resumption of this growth and it remains still to be seen whether this will take on the same form as previously in national or municipal public works, in mining and metallurgical progress, and in all those scattered activities where the services of the applied scientist and the engineer are called into use.

TREND OF ENGINEERING TRAINING

Translating these considerations into terms of the needful scientific education to meet the requirements, and analyzing these requirements in view of the necessary leadership which, as has already been said, the University must exercise, it is reasonably certain that a reversal of the requirements has taken place and should be provided for. In short, where before the war the various branches of civil engineering stood pre-eminently first in the requirements, its relative demand in Canada, for the immediate future at any rate, has apparently fallen to second or perhaps third place in the grouping. The industrial group of engineering has come to the front and hence we find electrical, mechanical and chemical engineering high up in the group. In fact it is a curious feature that of the present first year in this Faculty numbering about four hundred in all of the eight departments, practically one quarter are proceeding in chemical engineering; this is undoubtedly a direct outcome and influence of the war. The mining group, including metallurgy, appears likely to follow a normal expansion for some years to come, although the actual increase in activity in mining not only in Ontario but throughout Canada has been somewhat arrested by the war, except in those directions actually influenced by munition production. In the more aesthetic side of applied science—that of architecture, town planning, and the like—who can say what the future may bring? It is difficult to foretell and to foresee what course the educational requirements of the country may take, although after all much depends on the extent to which the university offers attractions in this much discussed branch of scientific and artistic education—in other words, it is for the university to offer influence and make the demand for architectural education and thus indirectly have an influence on the architecture of the country.

Having thus examined the course of the various branches of engineering and analyzed the tendencies and probabilities for the immediate future, it is necessary to see wherein the applied science and engineering education, as it has been and is now constituted in this country, is designed to meet the requirements of the times.

To appreciate properly the relation of the demand and supply of scientific education, if we may use such terms, it is necessary to first go back and consider the historic evolution of applied science and engineering in this and some of the other older universities on this continent. In doing so it is curious to find how, within limits, the university or college education has endeavored to meet the requirements of the particular period in the country's development. Forty years ago—and engineering in this University of Toronto under the old School of Practical Science dates back to that period—it was wholly civil engineering and was designed to meet a demand mainly for those public works which were necessary to the growth of the country at that time. Thirty years ago, a critical period in the development, a departure had been made, increasing or varying the courses to include mechanical and electrical engineering, architecture and chemistry.

In the intervening years a steady increase of the departments other than civil has taken place, and we now find that after various cycles of influences the industrial groups have come rapidly to the front and even dominate the whole Faculty. This is but a reflection of the normal development of the country, and is after all, what was to be expected.

General Mitchell then proceeded to discuss the phases through which the process of teaching applied science has passed, pointing out that in many schools there was a wave of specialization which carried too far. Now there is the inevitable readjustment and return to the sound basis of thorough teaching of mathematics, physics, chemistry and descriptive geometry before the teaching of applied science itself. He then continued:

REQUIREMENTS IN TECHNICAL EDUCATION

Reverting to the great fundamental principles of applied science education it must be accepted that the first requisite is, without question, a sound general education as a foundation. This principle has already been put into practical application in this university by the establishment of more comprehensive and more stringent requirements at matriculation, whereby not only a very high standard is required in mathematics (senior matriculation), but high standing is also necessary in English and languages. But that is only the start and does not by any means insure all those fundamentals which form the foundation for the proper education of the applied scientist or engineer.

Following this further and considering the entire education of the young engineer, there seems only one conclusion as to the necessity of today in this young country at its critical stages of development. For now-a-days we require not only technologists in the form of applied scientists or engineers, but we want men who are more, much more than that, we require to produce men who by their college education will be:

1. Broadly educated, cultured gentlemen.
2. Good citizens of Canada and leaders of influence within the community in which they may be placed.
3. Thoroughly educated technologists in whatever branch of applied science they may choose to enter.

How best to produce this type of rounded out graduate in the four short years in which he is under the influence of his professors and instructors is open to much discussion, and time does not permit to follow it through. It is obvious, however, that if a university education does nothing else, it ought to produce a broadly educated, well informed citizen, capable of thinking for himself on all public questions and taking his part in leadership and genuine public service—all this apart entirely from the necessary special education and the application of it to his gaining a livelihood in the practice of his chosen profession. If then in coming up to the university to obtain his education, he must devote himself to his professional course in applied science, that course and that Faculty must provide him with his education in its entirety and must, therefore, not limit itself solely to the technological side of it.

At the other end of the scale of his education the young engineer of today who is not to be overspecialized must learn to think in terms of subjects and educational values which may prove of the most use to him on going down from the university and entering his professional life. True, it has been said he must have been grounded in the fundamentals, and in the practical application of these to the varied problems in the many sided phases of applied science as it is today known and practiced. But there is a further distance he must go, especially in these days of materialism and of what is known in the work-a-day world as "practical results." He must learn to orient his technical education with the economics of the world into which he is about to enter, so that he may the more readily become the thinker, the leader, and the actor in the great effort of development and service in which he engages. Herein lies what, in a few years, will be found to be one of the governing factors in the more detailed and special education of the young engineer—his place in the economics of the community. It can easily be said that in the four years of a college course but little time can be given to this phase of education; that is agreed, but it is possible to instruct and to combine the types of work in such manner as to keep these principles of engineering economics clearly before the student in his later years.

All this leads up to the consideration of the curriculum and the manner and extent of instruction which is best suited for the country for the period in which we find ourselves and for the general type of student who comes to this university for his education. The curriculum throughout all engineering colleges, especially on this continent, is in the process of change for the reasons already referred to and a study of the tendencies in those changes reveals a degree of uniformity which in a measure applies to the particular requirements of this country and this university. During my visit the past spring to nine of the leading universities in Great Britain where applied science is prominent, I was struck by the efforts that were being made to transform and reconstruct the curriculum in accordance with the newer demands, efforts which were due to the same causes and tendencies in the national life with which we ourselves are now confronted.

If the signs and the tendencies can be sensibly interpreted—and this appears to be a universal opinion today among not only those engaged in engineering education but in practice as well—there are several radical changes in the curriculum which are now opportune, indeed are demanded. Among these are proposed:

(1) A rearrangement of subjects and economy of time by avoiding crowding the curriculum with less essential subjects and by judicious sequence, to limit the number of subjects simultaneously studied to less than is now usual although not decreasing the number of student hours per week; (2) the introduction of broader humanistic subjects in the first two years which may be termed the general educational portion of the course, including, in addition to all the mathematics and science, a further study of English with special reference to applied science, and the introduction of studies in economics, sociology, and possibly logic and psychology in a form applicable to this work. This is without reference to the continuation of the study of modern languages which are so essential in the technical world of today; (3) the inclusion in the last two years of some of the higher forms of these broad subjects but with special application to the work and the relationship of the graduate after he enters his professional life; these subjects may be such as finance, engineering law and jurisprudence, commercial engineering, industrial management, and engineering economics, and it may be of interest to note here that some of this work in its simpler form has been included in the curriculum of this faculty for some time past.

In addition to the foregoing there seem to be various other considerations. For instance, the student has great difficulty in his early years in orienting himself to the objects and processes of study in applied science, in discovering the relative value of the various subjects he is put to study and in realizing the application of these subjects to the real business of engineering practice.

Much stress is laid by British and American universities on the inclusion of what they call practical engineering work side by side with the theoretical work in the earlier years. This was clearly recognized in this university in the early curriculum of the School of Practical Science and has been a feature ever since—for instance, the laboratory work helps out the lectures in electricity and mechanics and surveying helps out the mathematics. In addition to this our curriculum here has always made it an essential that the student engage in some actual practical employment in the field and in engineering works during the summer holiday, lengthened specially for this purpose, and a new departure is now made by the establishment of a large rural camp or school about thirty miles north of Toronto for the purpose of carrying on instruction in surveying independent of that experience to be gained in the ordinary manner. The general tendency now, and one to be encouraged in connection with the education of the electrical, mechanical, or chemical engineer, is to participate in real industrial work, not only through the summer holiday period, but in some form of continuous co-operation with industries. Such work should be supervised to some extent by the college, and used as a source of problems and projects for scientific analysis and study and can be made mutually useful to the industry and the student. I appeal to the manufacturers of Toronto and the vicinity to meet the university in this regard, and I can assure them that in most cases whatever inconvenience they may be put to by such an arrangement will be reciprocated in some form to the advantage of their work in connection with study and research which may arise from it. . . .

To summarize the curriculum it will be observed that there are three main divisions, all of which are common to the various courses and department of civil, mechanical, electrical, mining and chemical engineering, and architecture: (1) The sciences, mathematics, physics, chemistry and mechanics; (2) the graphic and mechanical arts, drawing, design and practical field or shop work; (3) the humanities, English, economics, languages, and possibly philosophy.

VALUE OF THE BROAD CURRICULUM

It is not radical to make these and their subsidiary subjects common to all departments, for it is obvious that, for instance, the civil engineer must know something of electrical, steam, gas and other mechanical work; the electrical engineer of today must know something of hydraulics, masonry construction, railways, bridge building and even tunnelling, while the municipal and sanitary engineer must know considerable about electrical railways and pumps, steam engines and hydraulics in conjunction with the broad subjects of civics.

To pass further to these considerations and view them on a still broader horizon, the three main factors in the actual practice in which the graduate will engage may be resolved into scientific theory, the methods and practice in this application and the economic considerations. It has been said by some, with respect to the latter, that it is time enough when the graduate walks out into his professional life. Not so; if, when he is at the university, he has not been able to co-ordinate science and practice and obtain a sense of the economy of their application, he is going out into the world ill-fitted to take his place alongside the men who are already there; much less to attain to be a leader among them. More than this, the complex industrial conditions of today are understandable only by long, careful study by thinking men living in close contact with industry; how much better it is to give the student while at college his first acquaintance with these complexities and his basic principles of industrial management. The philosophy of values and costs, the psychology of labor and industrial problems and skill in expression in writing and speech are all subjects worthy of attention while the student is still at college. The practical academic process by which these can all be combined into one course of study in senior years seems reasonable when one considers how, for instance, a complete project from its inception may be followed through to its conclusion by a series of problems for class discussion, outside study in operating concerns, broad reading and an ultimate report of a comprehensive character.

In considering the problems of values and costs, of labor and industrial conditions and their relation to production which is now paramount in this country, it must be borne in mind that "the control of engineering lies in the hands of those who judge most accurately what enterprises men value sufficiently to be willing to assume the cost." Because engineering education has heretofore been confined mainly to technology, the engineer has seldom been placed on executive governmental commissions or other public boards—boards and commissions that must decide on how public funds shall be expended on enterprises that are essentially engineering in character. Why has it happened too frequently in the past that the engineer has been called in to do the technical work of design and construction only after a board comprised of lawyers, bankers, doctors, clergymen, merchants or politicians, has made a decision as to whether, from a standpoint of values and costs and other economic considerations the project under discussion shall in whole or in part go forward to construction? It is reassuring to know, however, that the idea is now developing that the public interest would be better served if the engineer had a greater voice in making such decisions.

Now to meet this new value which the public is beginning to place on the engineer, what are we going to do about his education? This is a distinct demand, if there ever was one, and the university should be the first to hasten to meet it. If the engineer and the applied scientist are to be prepared to take their proper places in the community they must be trained to appraise correctly what men consider to be worth while. . . .

As engineering and applied science expand into the new fields opening before them [quoting Dr. C. R. Mann] "the conception that character, judgment, efficiency, and understanding of men are no less necessary than technical knowledge and skill will become more and more impelling, and it will become more and more essential that engineering colleges pay greater attention to the effect of their work on the development of the students."

In discussing the papers on education at the annual meeting of the Engineering Institute of Canada, General Mitchell gave some additional figures regarding this year's registration at the University of Toronto. The total registration is 810, divided as follows: First year, 405; second year, 170; third year, 140; fourth year, 95. Electrical engineering leads in the number registered in the first year, 125; chemical engineering is second with 90, and civil engineering third with 70. General Mitchell expressed the view that the number registered in chemical engineering is an index of the change in point of view in the Dominion with regard to the future of its industries.

He also pointed out that the war had brought about in Canada a new liaison between industry and the colleges, and he hoped that that liaison would be strengthened. Already there is excellent co-operation between the colleges and the paper and pulp industry, while leaders in other industrial lines have indicated to General Mitchell their desire for close relations with the colleges. He suggested that the institute appoint a committee on co-operation between educational institutions and industry.

Proposed Salary Schedule for County Highway Engineers

DISCUSSION of the proposed salary schedule for county highway engineers, as prepared by the committee of the American Association of Engineers on salaries of engineers in public service, is requested in a recent circular issued by that committee. It is desired that the proposed schedule be submitted to the American Association of Engineers before winter closes, and the committee therefore requests that comments be in its hands prior to the middle of February. Communications should be addressed to A. N. Johnson, Chairman Committee on Salary of Engineers in Public Service, American Association of Engineers, 63 East Adams St., Chicago, Ill. Following is the proposed schedule:

ADMINISTRATIVE POSITIONS	
County Highway Engineer In charge of all county highway and bridge construction and maintenance.	$5,000-$12,000
Engineers of Construction Supervises all road construction and maintenance work, both contract and force account.	3,600- 6,000
Engineer of Bridges In charge of preparation of designs and specifications and construction of bridges.	3,600- 6,000
Office Engineer In charge of preparation of plans, specifications and estimates.	3,600- 6,000
SENIOR ENGINEERING POSITIONS	
Assistant Engineers Assigned to Office Engineer in preparation of plans and estimates computing and drafting, may act as chief draftsman.	$2,400- $4,000
Assistant Engineers In charge of tests and materials inspection.	2,400- 4,000
Assistant Engineers Assigned to Engineer of Construction or Engineer of Bridges acting as inspector of construction, also as chief of survey parties.	2,400- 3,000
JUNIOR ENGINEERING POSITIONS	
Draftsmen, Computers, Transitmen, Levelers	$1,800- $2,400
Rod and Chain Men, Tracers	1,200- 1,50

Asphalt Road Constructed on Macadam Base

State Prepares Old Macadam — Surfacing Performed by Contract — Selected Job Illustrates Construction

HOT haulage 15 miles by motor trucks from a stationary plant has been successfully employed in surfacing with asphalt a repaired bituminous-macadam road between Warnersville and Palmyra, Penn. This improvement is important as an example of the practice being resorted to by the Pennsylvania Highway Department to preserve the investment in macadam roads, of which the state has a large mileage. By successive coverings these roads have been built up to depths of 12 to 24 in., and in many instances have been reinforced with bituminous macadam. To preserve this original structure, when hard surfacing is undertaken, the old road is repaired by the department's maintenance forces, and is utilized as a base for the permanent surface, which is constructed by contract.

On the Warnersville-Palmyra road, 21 miles outside of the corporate limits of towns and villages along the route were planned for reconstruction. The specifications for the road call for a macadam base not less than 12 in. thick, with a tar application, covered by a sheet-asphalt surface 2½ in. thick, consisting of a 1½-in. binder course and a 1-in. top. No curbs are provided, but the edges are supported by 18-in. waterbound stone shoulders. The width of the surfacing is 18 feet.

PREPARATION OF MACADAM BASE

State maintenance forces were utilized to prepare the old macadam base. This preparation consisted of lightly scarifying the old surface; scraping it with a road machine to remove the oil and dirt to the outside of the shoulder; adding sufficient stone to make the base 12 in. thick; reconsolidating, and binding with water. To determine how much extra stone must be added, test holes are dug at intervals to ascertain the thickness and condition of the base. From 4 to 5 in. of 3½-in. stone is usually required. As soon as the surface has dried out, traffic is admitted and allowed to use the road for a time to wear down and loosen up the surplus screenings. The base is then swept clean and covered with an application of tar product at the rate of 0.3 gal. per sq.yd. This is allowed to dry, but no covering material is placed upon the tar. The prepared base, with 2½- x 8-in. strips spiked down at the side to hold the surfacing during compression, is shown by Fig. 2. Traffic is excluded only while the asphalt surface is actually being laid.

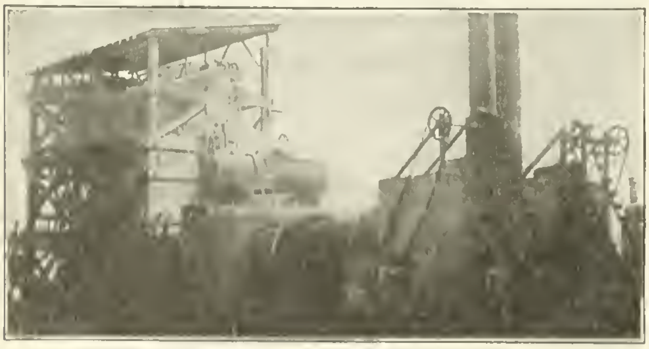


FIG. 1. ASPHALT PLANT AT CENTRALLY LOCATED STONE QUARRY

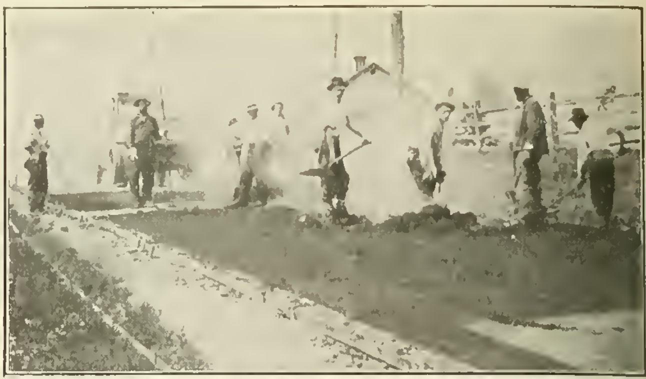


FIG. 2. SURFACING GANG PLACING ASPHALT DELIVERED BY MOTOR TRUCKS

The construction of the 21 miles of the sheet-asphalt surfacing is being conducted from one large, centrally located mixing plant. The maximum haul is somewhat over 15 miles. The plant is situated at a stone quarry, where the stone is crushed, dried, stored and mixed with the bituminous binder. No storage is provided for mixed material, which is immediately hauled onto the job.

A hard limestone is used for the binder, and is crushed upon the site. Sand is shipped in by rail and unloaded by a ⅝-yd. auto-crane. The sand and stone are dried by two 150-ton rotary dryers. Oil burners fed from four tanks with a total capacity of 13,500 gal. produce the necessary heat. The burners are placed at the outer end of the dryer cylinder, and the draft passes out through stacks at the inlet. The sand and stone are raised to a temperature of about 300° F. for mixing.

Prepared asphalt is delivered at the siding in tank cars, and is heated and unloaded into a large storage tank, where it is kept at a temperature of 300° F. by means of steam coils. The tanks are of concrete and have a capacity of 24,000 gal. When mixing is in progress the asphalt is pumped through a 5-in. main by a 15-hp. pump, and is kept heated in transit by means of a 1-in. heating line inside the 5-in. main. The specifications require a temperature of 300° F. at the mixer.

A general view of the drying and mixing plant is shown by Fig. 1. Two 80-ton storage bins are provided for heated sand and stone. The temperature of the stone and sand is maintained by the construction of the bins, which are of 3-in. plank and are lined with brick. A supply tank of heated asphalt, holding 5000 gal., is also situated at the mixing plant. Mixing is accomplished by a 15-cu.ft. mixer, giving a 1784-lb. batch of binder, and an 1830-lb. batch of topping. The specifications call for 4.7% of asphalt in the binder and 10½% in the topping.

LAYING THE SHEET-ASPHALT SURFACE

Motor trucks haul the mixed material from the plant to its position in the road. These are three- to five-ton trucks of the ordinary dump box type. The material is protected in transit by heavy tarpaulins. Upon arrival at the road, the binder is spread to a depth that will compress to 1½ in., and this compression is secured by means of a 10-ton roller. After completion of the binder course, the topping is spread to a depth which will compress to 1 in., and initial compression is secured with a 10-ton roller. After initial compression, the surface is rolled a second time with a five-ton roller. A closed binder is used for this work. The maximum day's work has been 3600 sq.yd. of binder and top in place; the average daily output is 3000 square yards.

After the completion of the 2½-in. surface, the planks along the edges are removed, and 18 in. of clean, crushed stone is placed on each side. After rolling with a 10-ton roller, this edge is covered with limestone screenings, wet down and puddled. Following this, the material, consisting of dirt, oil and stone, which was scraped off the surface after scarifying, is brought up against the stone edge to help complete the shoulder, which is finally finished with earth from the sides.

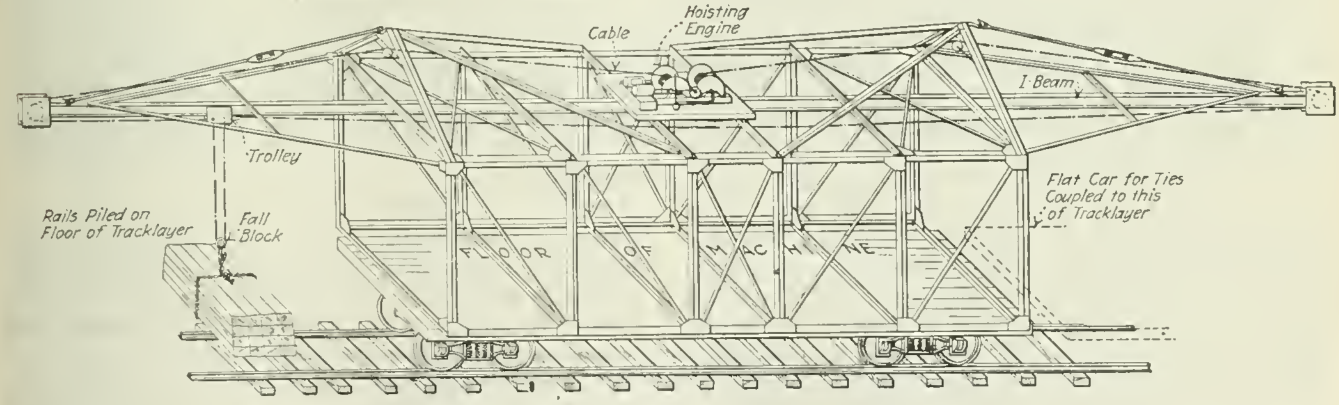
The contractor is the Union Paving Co., Philadelphia, Penn., and the contract price for the 2½-in. top was 91c. per sq.yd. J. F. Lourse is superintendent for the contractor. The work is done under the general supervision of the Pennsylvania State Highway Department, George H. Biles being deputy commissioner in charge of maintenance; W. D. Uhler is chief engineer of construction. Construction in Berks County is under W. R. Wolfinger, district engineer, and that in Lebanon County under C. W. Hardt, district engineer.

Tracklayer for Logging Railways

Machine Solves Labor Problem — Adapted to Handle Rails, Ties and Bridge Material on Ordinary Railways

A TRACK-LAYING and track-shifting machine consisting of a car with cantilever runway for a hoisting trolley has been developed for labor-saving purposes on logging railways and is now in use on a number of lines of that class, while it is considered adaptable to ordinary railway service in such work as rail renewals and other maintenance work as well as bridge construction and repair. This machine, which is shown in the accompanying drawing, was designed by J. E. Norby, Portland, Ore., and described by him in a paper read before the Pacific Logging Congress.

In logging work it is necessary to lay, remove and relay many miles of spur tracks, the removal involving hard and dirty work in picking up the ties from a wet and muddy roadbed and carrying them to the work train. Mr. Norby used gangs of 26 men when possible, but it has become difficult to obtain sufficient labor and many men refuse to handle this heavy work. One method suggested was the use of a locomotive crane to pick up sections of track, but this did not appear practicable on account of the numerous curves, as the sections from one location would not fit on another location. An emergency condition arose when only four men were available at a time when about 12 miles of spur tracks had to be taken up and shifted. This led Mr. Norby to the design of the first machine, which has been improved upon in the later construction represented by the drawing.


Hoisting Engine
Cable
I-Beam
Trolley
Rails Piled on Floor of Tracklayer
Fall Block
Flat Car for Ties Coupled to this of Tracklayer
FLOOR OF MACHINE

MACHINE PICKS UP AND DISTRIBUTES RAILS AND TIES

Upon a large flat car is erected a steel frame 12 ft. high and 10½ ft. wide, with an I-beam attached to the upper members and extending 26 ft. beyond each end of the car, these extensions being supported by tie rods from the end frames and braced laterally by diagonal struts from these frames. On this beam travels a four-wheel trolley with pulley for the hoisting cable. At the middle of the car and mounted on top of the steel framing is a double-drum hoisting engine, supplied with steam from a locomotive, a flat car being placed between the locomotive and the tracklayer. The first tracklayer was used in combination with a steam logging machine, the drums of which operated the cables, but the present arrangement is simpler and more effective.

From one drum of the engine, placed as shown in the drawing, the cable is led to a pulley on the end of the trolley track and then back to the trolley, where it is passed over the latter's pulley and then around a fall block, from which it returns to an attachment on the trolley. From the other drum the cable leads to the pulley on the opposite end of the trolley track and then back to an attachment on the end of the trolley.

Rails and track fastenings are carried on the machine, while ties are carried on the flat car in the rear. In taking up a spur track, the spikes are pulled and two rail tongs connected by a cross chain are attached to a pair of rails. The fall block is hooked to this chain. By hauling in on the forward cable and holding the rear cable by the brake on its drum the fall block is hoisted and lifts the rails. They are then run back with the trolley by continuing to haul on the forward cable while releasing the out-haul cable so as to allow the trolley to travel on the I-beam. The rails are then lowered to the floor of the machine and the trolley is again run out by the back-haul cable. While these rails are being handled the ties are thrown together in a pile and wrapped with a chain, to which the fall block is hooked. The bunch of ties is then raised and run back through the machine and over the flat car in the rear, where the ties are dropped. The machine then backs away for one rail length and the operations are repeated.

In laying track the operations are reversed. A bunch of ties is picked up from the rear car and deposited on the roadbed about half a rail length in advance so that no tie has to be carried more than about 15 ft. While the ties are being spaced, the trolley is run back and attached to the chain of the rail tongs, ready to carry forward a pair of rails as soon as the ties are in position. In rail renewals, the machine could pick up old rails and load them on the machine, and at the same time take new rails from a car in the rear and drop them in the track. Or it could distribute new rails outside of the track and pick up the old rails from the same position. Bridge timbers, girders, frogs and switches and other materials can be distributed and picked up the same way.

With this machine track can be lifted or laid by four men, in addition to the engine crew, but 10 to 12 men form the usual gang. In regular work, 12 men with a foreman, the machine and an engine crew have averaged 1800 ft. per day, either lifting or laying, while Mr. Norby estimates that with 26 men an advance of about a mile a day can be made. As the heavy and dirty manual labor is eliminated there is little trouble now in getting men for the work. With hand labor at war prices the labor cost was about $400 per mile, but with the machine this has been reduced to about $190, doing more work with fewer men. This machine is built by the Norby & Fox Co., Portland, Ore.

Simplicity of Classification in City Zoning Ordinances

Excerpt from a paper on "Residential and Industrial Zoning," delivered in December, 1919, by Herbert S. Swan, New York City, before the Citizens' Zoning Conference at Chicago.

THE simplicity or complexity of its classification will affect as no other factor the continued success of a plan, for, after all, zoning is almost entirely a matter of classification. If the classification is vague, ambiguous or needlessly involved, it is apt to prejudice the operation of the whole plan.

These facts do not seem to be generally appreciated. Some cities appear to think that the prime requisite in a good zoning scheme is elasticity. A certain amount of elasticity is, of course, wanted, but not at the expense of simplicity. The Minneapolis and Berkeley ordinances are both illustrations of instances where extreme consideration has been paid to elasticity. The Minneapolis ordinance subdivides trades and industries into 16 different classes; the Berkeley ordinance into 20 different classes. Taken in all their possible combinations, the building classes of the Minneapolis ordinance would permit 241 separate and distinct kinds of industrial use districts. The Berkeley ordinance would permit of 381 separate and distinct kinds of use districts. Such elasticity is bound to develop into a situation where ultimately each district will be just a little different from every other district, with the consequence that nobody will know what is allowed or disallowed in any district.

It may be urged that it is very unlikely that all of these combinations will ever be taken advantage of. This may be true, but their very possibility will lead to the development of unnecessary complications. That such minute refinements in the classification are bound to prove irksome, if not unworkable in practice, is evidenced by the fact that Berkeley, after less than two years' experience under its zoning ordinance, is contemplating its radical amendment by reducing the classes of industrial use districts to a maximum of five.

The classification is the substance of every district, the district merely bounds the classification. Once accepted, therefore, classification must be continued, as any vital modification in its provisions would practically necessitate a general rearrangement.

Classes of Use Districts

Although a zoning ordinance should have a simple classification, it should not sacrifice needed protection for simplicity. This seems to be the main characteristic of the Alameda and Los Angeles ordinances. These ordinances provide only two classes of districts. In the residence districts the businesses not especially excluded are permitted; in the industrial districts all kinds of business and industry are unrestrained. Neither of these ordinances protects residence streets from stores, nor business streets from large factories or nuisance uses.

The New York ordinance, in establishing these classes of districts, supplies both of these omissions. The residence districts exclude all kinds of business and industry; the business districts all kinds of large manufacturing establishments and nuisances. But the New York classification is weak in one respect, it does not afford sufficient protection to manufacturing. If a factory requires more than 25 per cent of the floor area in a building, or a floor area in excess of the lot area, whichever is the greater, it is forced into the unrestricted district containing all kinds of nuisances.

To put manufacturing establishments and nuisance uses into the same classification thus is apt to produce many unhappy compromises, as every unrestricted district will be the result more or less of a balance struck, on the one hand, between the just claims of the district for factory development, and, on the other hand, the protection demanded by neighboring residence and business districts against nuisances. In some cases nuisances will be allowed where they will do great harm, for no better reason than that the locality is naturally a manufacturing district; in other cases, factories will be prohibited on the ground not that their admission is undesirable, but because the nuisances that might slip into the district with them would prove a serious menace to adjoining districts. The Newark and St. Louis ordinances in creating four classes of districts—residence, business, manufacturing and nuisance—are in this respect a distinct improvement over the New York ordinance.

Exclusion of Residences

A special feature of the Newark ordinance is the exclusion of residences from the heavy industrial district. This plan has many distinct merits. The very reasons that make it desirable to exclude factories and nuisances from residence districts apply with equal, if not greater, force when it comes to prohibiting the erection of new dwellings in districts set aside for industrial devolpment. If it is unhealthful for people to live near a factory isolated in the residence district, it is all the more unhealthful for them to live in a home isolated in the industrial district. To permit residence buildings in factory districts, moreover, tends to increase the size of these districts beyond their natural requirements, as the area included in this classification must also make provision for the erection of a considerable number of dwellings.

Report on Development of Unused Lands

A Study of the Possibilities of Reclaiming Arid, Wet and Cut-Over Timber Lands, Made by U. S. Reclamation Service in the Latter Part of 1919

NUMEROUS projects for land reclamation, together with much interesting and suggestive general discussion of the subject as a whole, are presented in the "Report on the Development of the Unused Lands of the Country," made by the United States Reclamation Service in the latter part of 1919 and printed for the use of the Committee on Irrigation of Arid Lands, House of Representatives. The investigation was made under authority of a Congressional appropriation item of $100,000 which authorized the director of the Reclamation Service to make a study "of the reclamation by drainage of lands outside existing reclamation projects and of the reclamation and preparation for cultivation of cut-over timber lands in any of the states of the United States." The work was under the general charge of Arthur P. Davis, chief engineer and director U. S. Reclamation Service, and in direct charge of F. W. Hanna, H. T. Cory, and F. E. Weymouth.

The country was divided into three districts, with Mr. Hanna in charge of the Eastern States north of the Ohio River and of cut-over lands in the Northwest; Mr. Cory in charge of Southern States; while Mr. Weymouth conducted investigations of irrigation and drainage in the Western States. The report falls in three parts: The first being for the most part general and of unstated authorship, and the other two being by Mr. Cory and Mr. Hanna for the Southern and the Northwestern States, respectively. Part I contains specific suggestions for further irrigation development in the Western States.

Opportunity for Returned Soldiers and Sailors

Secretary Lane, in a letter transmitting the report, says of the investigation: "This work has been carried on in the prospect that Congress would see fit to give to our returned soldiers and sailors an opportunity to go upon these lands under proper guidance and convert them into home farms for themselves." It may be noted, however, that the general discussion as well as the various conclusions presented as to different projects are applicable to any scheme of land reclamation and settlement that recognizes the necessity for Federal or state aid and for some general community plan of development.

Writing of the financial feasibility of a large Federal land settlement scheme, Secretary Lane says in his letter of transmittal: "If the objection is raised that the Federal finances will not support the drain proposed, I beg to advise that I am authoritatively informed that there will be no difficulty in selling $500,000,000 in Government 3¾ per cent non-taxable bonds which would be sufficient to cover the expenditures contemplated under the Smoot-Mondell bill. This would be in the nature of a reimbursable fund, the whole being repaid over a long period by the farm owners."

Reservoir Sites Should Be Saved

That by no means all of the unused lands in various parts of the country are properly subject to reclamation for agricultural purposes is pointed out in Part I of the report. Some of the swamp and overflow lands would be far more useful as reservoir sites, for flood control, for river regulation or other purposes than agriculture. In like manner some of the cut-over areas might be of far more ultimate value to the country if the timber upon them were allowed to mature before these lands were cleared for agricultural purposes, and in some instances it might well be that these areas should be retained permanently for forest purposes. Some of the abandoned farms in New England, the report points out, are so hilly and rocky that they should never have been cleared. Two sentences may be quoted as summarizing this section of Part I: "By a wise and skillful discrimination we must select those areas requiring the least expenditure and least destruction to reduce them to cultivation, and must leave uninjured and adequately protected the areas needed for water storage and those most suitable for forest production. This still leaves an ample choice in the states mentioned for all of the reclamation that is likely to be carried out within the next generation, although the rules upon which selection is made must obviously be modified from time to time." (The words "states mentioned" refer to the Lake, Southern Atlantic and Gulf States.)

Reclamation by Fertilization and Correction of Acidity

Some of the states presenting little opportunity for the reclamation of either arid, wet or cut-over lands nevertheless afford chances for profitable reclamation, such as lands needing fertilization or else the correction of acidity by the addition of lime or by the use of other antidotes. There are certain areas that have deteriorated through occupancy and use by tenants rather than owners. "Where such areas can be acquired and cut up into homes," the report states, "they may be restored by proper tillage methods and the addition of nitrogen or other plant food until they are capable of constituting thickly settled and prosperous colonies."

Examples of land deterioration through tenantry are found in some of the Mississippi Valley states. Cut-over lands adaptable to agriculture are available in considerable areas in New York and Pennsylvania, these areas being in proximity to good markets and having good transportation facilities. There are also lands in New York needing drainage that would apparently "afford favorable locations for colonies."

The New England Problem

As an "extreme case of local need for agriculture," New England is cited in Part I. Agricultural production in that section is "but a fraction of what it was a quarter century ago, while the growth of population and of manufacturing industries makes a market which draws more and more for subsistence upon the Mississippi Valley and the Far West."

In general terms the decline of New England's agriculture has been due to "the demand of its growing manufactures for the necessary labor and the competition of cheap, fertile and extensive agricultural areas of the Mississippi Valley and the great West. These lands," the report continues, "are no longer cheap, and the growth of the Middle West is to a large extent absorbing the production of the Western farms so that New England must enter into active competition for its food supply under the handicap of costly transportation. This condition has reversed the influence which led to the decline of New England agriculture, and in providing for its rehabilitation the soldier settlement program affords the opportunity of doing this, and at the same time keeping at home the thousands of soldiers who enlisted from these centers of population." Taking up next the Southern division of the country, the report says that the largest areas open to colonization are cut-over lands. The merchantable timber has been removed from these lands by large companies, many of which are now anxious to sell the stripped land at low prices. In some cases drainage would be required, or improvements in existing drainage made. A few important sentences from this section of the report may be quoted:

Elimination of Mosquitoes Necessary

"In some of the richest localities where land can be had very cheaply, one of the principal drawbacks which must be overcome is the elimination of the swarms of mosquitoes, which will require careful surface drainage and elimination of stagnant water. Also the clearing of luxuriant vegetation which springs up after the timber is removed. Such areas can only be successfully colonized in tracts of considerable size as it is impracticable to carry out mosquito extermination on a small scale. In many of the Southern States, especially the border States, are to be found extensive areas which have been neglected since the Civil War and are of similar character to those described in New England. They can generally be purchased cheaply and rendered fertile by clearing and the addition of lime and nitrates."

As to the Western States, the report points out that the Dakotas, Nebraska, Kansas, Oklahoma and Texas "have considerable areas of humid lands in which drainage is frequently needed and irrigation is not needed. . . . Drainage can, in many cases, be provided at reasonable cost, and where clearing is necessary this is comparatively inexpensive. Farther west irrigation projects have been investigated in the past and numerous opportunities of feasible development of this character exist in most of the Western States." West of the 100th meridian there are many opportunities for reclamation by irrigation, by drainage, and the clearing of cut-over lands, chiefly in Montana, Idaho, Washington, Oregon and California. East of the mountain ranges the necessity for irrigation as well as clearing and leveling lands "is usually prohibitive even in the cases where irrigation is feasible at all, and in such cases it is usually best to encourage the reforestation of the lands by protecting the young growth from fire." On the Northern Pacific slope "are large areas of cut-over lands, where deep and excellent soil occurs, where the topography is suitable and where the rainfall is also sufficient for successful farming. Some areas in this region can be profitably and wisely devoted to agriculture, but in a large portion the cost of clearing, owing to the number, size and character of the stumps that are in the way, would, at present values of agricultural land, make the enterprise prohibitive, and the land can best be utilized by reforestation. This is true also, to some extent, in western Oregon and northwestern California. A large portion of the cut-over lands in the Northwest is, of course, unsuitable for agriculture on account of topography and rocky soil and can best be restored to forest condition."

Of the area of arid land west of the 100th meridian which is not too high, cold or rocky for agriculture "over 15,000,000 acres have already been placed under irrigation by private or public enterprise, and in carrying out this work of course the more favorable opportunities for such irrigation have been developed. It will still be possible to add many million acres to the irrigated area and perhaps to double the area now irrigated, but this must generally be done at high cost, as the cheap opportunities have long since been exhausted. There are remaining, however, many areas which can be irrigated within feasible costs and will develop values far in excess of necessary expenditures. They will furnish healthful homes for settlers and will supply agricultural products and food resources in proximity to great mining and grazing resources which will be made more valuable thereby. There is much room for wise and profitable activity in this line in most of the Western States, but the total areas that can be thus reclaimed are much less than those offering opportunities in the states farther east."

At this point seventeen pages of the report are devoted to outlining possible irrigation projects in nearly as many of the Western States.

Large-Scale Operations Would Be Required in South

In the Southern district, comprising Texas, Oklahoma, Arkansas, Kentucky, West Virginia, Maryland and Delaware, and all states to the south and east of those, sixteen in all, Mr. Cory states that most of the unused lands could be developed "only with enormous expenditure, or great length of time, or both." But there is much land in the Southern district that "can be completely cured for surprisingly low cost and in very short spaces of time *if done by operations on a very large scale.* [Italics ours.—Editor.] Two checks on productivity of land in the Southern division are mentioned by Mr. Cory as being depletion of fertility, which "can be restored at quite reasonable cost and in a relatively few years," and "locality 'backwardness.' " Mr. Cory continues:

> The ambitious have steadily gone out to more promising fields of human activity with the result that little and often negative progress has been made in local community life, while throughout the nation as a whole, in rural as well as industrial communities, advances in civilization have been very great.
>
> Thus it is that while "abandoned land" can be brought back often to high fertility much cheaper than raw lands in new sections can be subdued, or in progressive sections purchased, nevertheless its desirability and hence its sale price when renovated is often less than the necessary expenditures upon it. In other words, a fertile, revamped farm in the midst of a large area of abandoned land would have so much less real value than were it in the midst of a progressive region. Only part of the trouble can be removed by any individual. [Restoration of] the low fertility . . . . . will normally take a long time according to American standards.

A Clean Slate and a New Start Needed

> To do the job completely it is necessary to treat relatively large compact tracts as a whole, *and not only renovate the soil but also wipe off the existing developments to such an extent as to quite obliterate social institutions, folkways, standard of living, and habits of thought, and establish in place thereof modern communities.* [Italics ours.—Editor.] This, however, requires large amounts of money under one control—in other words, operations on a large scale.
>
> Similarly, the real value of a thoroughly up-to-date, completely developed farm in the midst of a great tract of cut-over land is quite low. The few inhabitants almost invariably have low standards of living and social interests, and the time normally required for the region as a whole

> to develop is too long to make the investment of money and nervous energy in producing a good farm attractive to the ambitious man. *But if really large tracts are taken and entire communities treated in one operation the total costs will be very well worth while—again a matter of operation upon a scale far beyond the reach of individuals, even though assembled together in co-operative organizations of a practicable size.* [Italics ours.—EDITOR.]
>
> . . . .
>
> In short, the way most economical, both in money and human struggling and tragedy, and often the only feasible way, to get into use or reclaim "unused lands" is by *large-scale operations and planned rural communities.* [Italics ours.—EDITOR.] The investigations which are the subject of this report disclosed the fact that there are enormous acreages of these lands, which can be profitably reclaimed and which would then be admirably adapted for agricultural purposes.

WESTWARD—NORTHWARD—SOUTHWARD

In an illuminating but very concise discussion of "Land Settlement in the South" Mr. Cory says:

> Whatever might have been the case 25 years ago, the conditions in the Southern district are now as favorable, all things considered, as in the North and West, provided—and only provided—the community settlements are of considerable size.
>
> The movement westward has resulted in making agricultural land values really higher in the Western States, everything considered, than elsewhere in the country. Then it turned north, and 1,600,000 Americans have gone over into Canada during the great settlement movement of the Canadian Northwest, begun a few years before the World War. There are a few sporadic instances indicating that the beginnings of a trend back and to the South are in evidence. Doubtless these will steadily but slowly increase. The plain facts are that something spectacular is necessary to break up the existing psychology, not only of the American people but of foreign immigrants to America, as to the relative opportunities in the South and in the West for securing agricultural homes.
>
> After careful examination of many data and numerous conferences with leading Southern public-spirited men, the only thing, that is at the same time practical and probably successful, to be thus far suggested, is for the United States Government as such to place its stamp of approval upon numerous sections throughout the South. Of course, this has in effect been done, in that one department has approved of its soil conditions; another department has investigated and published many data concerning its biological features; and a third has been giving publicity to crop adaptations, etc., but all of these facts go out independently and piecemeal—one might say, ooze out—and attract little attention.
>
> . . . .
>
> Summarizing, then, the success of soldier settlements upon the unused or partially used Southern lands should be great, due to: (1) Completeness of project as a planned rural community; (2) the relative advance in planned rural development over the existing local standards; (3) the far-reaching effect upon the whole southeastern part of the United States by numerous demonstrations of the country's natural resources as distinct from its agricultural development up to this time.

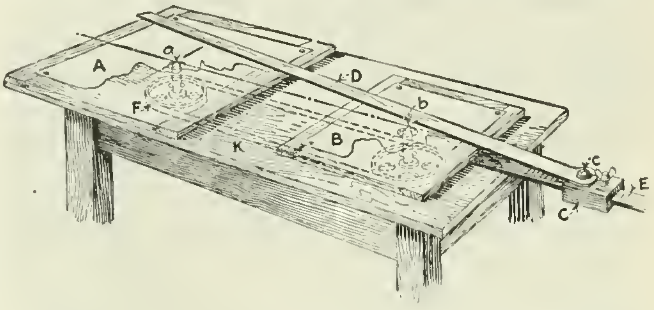
Mr. Cory then passes in review conditions and opportunities in the various Southern States.

In Mr. Hanna's report on the Northern division—which it should be remembered includes the consideration of land needing drainage and cut-over lands in all the New England, most of the North Atlantic, all of the North Central States besides Kansas, Nebraska, North and South Dakota, and in addition cut-over lands in California, Idaho, Montana, Oregon and Washington—he reviews broadly the swamp lands, lands subject to overflow and the cut-over timber lands and the adaptability of the various areas to cultivation and the means of reclamation that seem feasible. Cut-over lands alone, so far as disclosed by the investigation, are estimated to total an area of 22,483,000 acres, including 3,645,000 acres in the five far Western States already mentioned. This total does not include lands suitable for grazing. The portion apparently available for community settlement, and given consideration in the report, reaches 10,237,000 acres. The total estimated occupied area of cut-over lands in Mr. Hanna's section of the country is estimated at 74,605,000 acres. As to swamp and overflow lands in Mr. Hanna's division the total estimated present acreage is 22,866,000, of which 4,259,000 were investigated, and of this latter it is estimated that 1,176,000 acres are available for settlement. Somewhat similar figures for each of the states investigated are given by Mr. Hanna, together with many other data.

Drawings Reduced or Enlarged by Straight-Edge and Revolving Boards

BY GEORGE H. GILCHRIST
Ottawa, Can.

TWO rotating drafting boards A and B are carried on a fixed platform (table) K and rotate about their centers a and b in a horizontal plane. Each drafting board is attached to a large pulley. The pulley and drafting boards rotate together equally on the same shaft, being so connected. The two pulleys F and G are of equal diameter and are connected by a belt or any mechanism to give the same effect. Thus the two boards A and B rotate equally, always having the same orientation with respect to each other.



DESIGN OF DRAFTING BOARDS BASED UPON FUNCTIONS OF SIMILAR TRIANGLES

A movable block is adjustable along a track E and is held in position by a thumbscrew. A straight-edge D is pivoted on block C at point c and is free to move over surface of drafting boards about the point c.

Points a, b and c are in one straight line. To transfer a straight line on A to drafting board B, move the straight-edge and rotate the boards A and B until the edge of the straight-edge D is superimposed on line to be transferred. Then draw a line along the edge of the straight-edge on B.

The ends of the line may be transferred as a point is transferred. A point is transferred by transferring any two lines passing through that point. A circle is transferred by using its center and any point on the circumference and then employing a compass. An arc of a circle requires three points, its center and the ends of the arc. A curve is reproduced by means of sufficient points to sketch the curve in by joining up the points.

Relation between the two scales of the drawing is governed as follows:

$$\frac{\text{Scale of drawing on } A}{\text{Scale of drawing on } B} = \frac{ac}{bc}$$

An enlargement in scale is, of course, obtained by placing original on board B. No scales are required. A set square is required for hatching, etc.

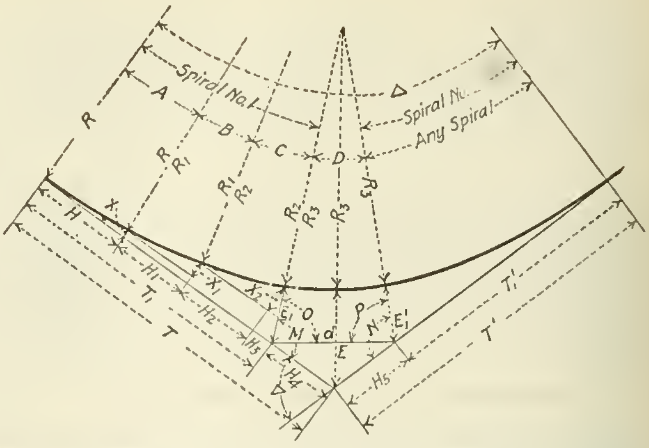
Simple Solutions of Compound Curve Problems

Time Saved New York State Railways Engineering Corps by Use of Short Methods in Its Instruction Book

SOLUTIONS of many problems met in laying out compound curves for track work have been simplified and standardized for the engineering staff of the New York State Railways, in a book of instructions prepared by L. R. Brown, office and field engineer of that company. Four of them are presented here.

A knowledge of trigonometry, of course, provides the means of solving any of the problems which occur in such work, but some of the possible solutions of each are so lengthy and involved that too much time is usually spent in working them out. That the use of the simple methods given in his systematic arrangement of instructions has been a big time-saver was stated by Mr. Brown in an article in the *Electric Railway Journal* briefly describing the accompanying illustrations from his book.

The first solution shown (upper right) is for finding the tangents and external of any compound curve when the radii and angles are given. In appearance this method seems rather long and somewhat laborious, but in the arrangement of the various formulas particular attention has been paid to the selection and arrangement of the equations so that they may be easily solved by logarithms. This solution gives co-ordinates for staking out the curves, and can be used with any combination of standard spiral when the total angle and the distances T and E of the spirals are known.



METHOD OF FINDING TANGENTS AND EXTERNAL WITH RADII AND ANGLES OF ANY COMPOUND CURVE GIVEN

$$X = R \text{ vers } A, \text{ or } = 2R \sin^2 \frac{A}{2}, \text{ or } = R \tan \frac{A}{2} \sin A$$

$$H = R \sin A$$

$$X_1 = 2R_1 \sin \frac{B}{2} \sin \left(A + \frac{B}{2}\right)$$

$$H_1 = 2R_1 \sin \frac{B}{2} \cos \left(A + \frac{B}{2}\right)$$

$$X_2 = 2R_2 \sin \frac{C}{2} \sin \left(A + B + \frac{C}{2}\right)$$

$$H_2 = 2R_2 \sin \frac{C}{2} \cos \left(A + B + \frac{C}{2}\right)$$

$$E_1 = (X + X_1 + X_2) \div \cos (A + B + C)$$

$$H_3 = (X + X_1 + X_2) \tan (A + B + C)$$

$$T_1 = H + H_1 + H_2 + H_3$$

Then use same solution for Spiral No. 2

$$\tfrac{1}{2}(O + P) = 90° - \tfrac{1}{2}D$$

$$\text{Tan } \tfrac{1}{2}(P - O) = \frac{(R_3 + E_1) - (R_3 + E'_1)}{(R_3 + E_1) + (R_3 + E'_1)} \tan \tfrac{1}{2}(P + O)$$

$$P = \tfrac{1}{2}(P + O) + \tfrac{1}{2}(P - O)$$

$$O = \tfrac{1}{2}(P + O) - \tfrac{1}{2}(P - O)$$

$$d = \frac{(R_3 + E_1) \sin D}{\sin P}$$

$N = 90° +$ angle of Spiral No. 2

$$M = 90° + A + B + C$$

$$H_4 = \frac{d \sin (N - P)}{\sin \Delta}$$

$$H_5 = \frac{d \sin (M - O)}{\sin \Delta}$$

$$R_3 + E = \sqrt{(R_3 + E_1)^2 + H_4^2 -}$$

$$\overline{2(R_3 + E_1) H_4 \cos M}\,*$$

$$T = T_1 + H_4$$

$$T' = T'_1 + H_5$$

$$E = (R_3 + E) - R_3$$

If Spiral No. 1 is the same as Spiral No. 2

Then

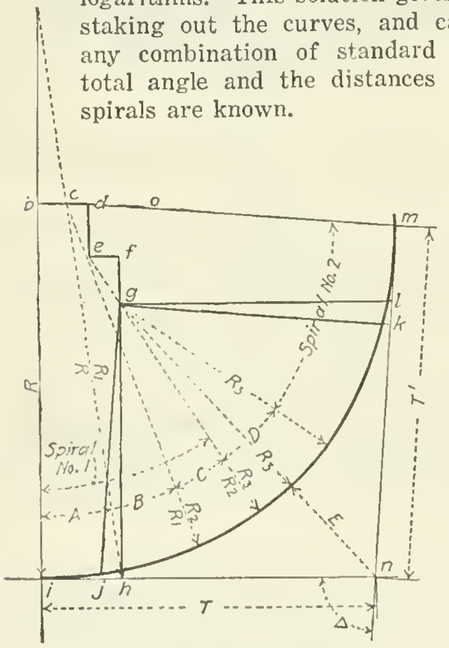
$$H_4 = \frac{\sin \frac{D}{2} (R_3 + E_1)}{\cos \left(A + B + C + \frac{D}{2}\right)}$$

$$R_3 + E = \frac{\cos (A + B + C) (R_3 + E_1)}{\cos \left(A + B + C + \frac{D}{2}\right)}$$

And $H_4 = H_5$

---

*Note that this is a continuation of the expression under the radical sign above.



Given radii and angles of any compound curve. Find tangents and external.

Draw bc, cd, ef and gl parallel to T, de, fg and gh parallel to R, gj parallel to T_1 and gk parallel to mo

$$bc = (R - R_1) \sin A,\ cd = (R_1 - R_2) \sin (A + B),\ ef = (R_2 - R_3) \sin (A + B + C)$$

$$ab = (R - R_1) \cos A,\ de = (R_1 - R_2) \cos (A + B),\ fg = (R_2 - R_3) \cos (A + B + C)$$

$$gh = R - (ab + de + fg),\ ih = bd + ef$$

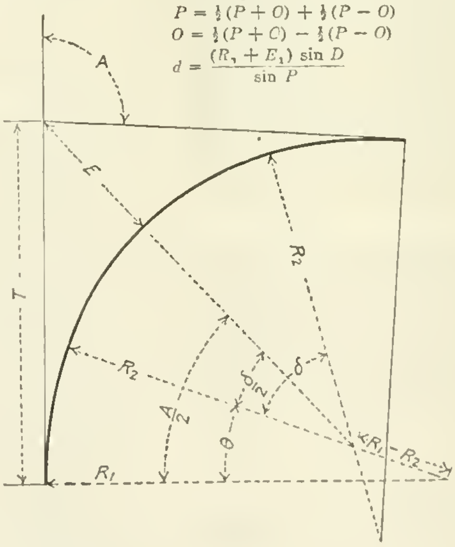
$$jh = gh \tan (90° - \Delta)$$

Similarily from Spiral No. 2 find gk and kl

$$T = gl + ih - jh$$

$$T' = jg + km - kl$$

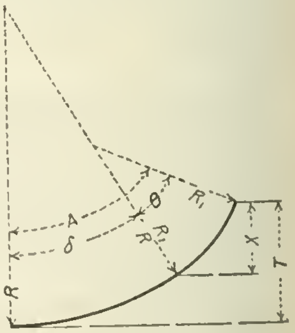
$$E = \sqrt{\overline{gh}^2 + \overline{hn}^2} - R_3$$



Given R_1, R_2, A, δ and θ. Find tangent and external

$$T = R_1 \tan \frac{A}{2} - \frac{\sin \frac{\delta}{2} (R_1 - R_2)}{\cos \frac{A}{2}} \qquad (1)$$

$$E = \left(\frac{T - (R_1 - R_2) \sin \theta}{\sin \frac{A}{2}}\right) - R_2 \qquad (2)$$



Given R, R_1, δ, X. Find θ

$$\text{Cos } (\delta + \theta) = \cos \delta - \frac{X}{R_1}.$$

$$\theta = (\delta + \theta) - \delta \qquad (1)$$

Given T, R, R_1 and A, find δ and θ

$$A = \delta + \theta$$

$$\text{Sin } \frac{\delta}{2} = \sqrt{\frac{T - 2R_1 \sin^2 \frac{A}{2}}{2R - 2R_1}}$$

$$A - \delta = \theta \qquad (2)$$

Given T, R, A, δ and θ, find R_1

$$R_1 = \frac{T - 2R \sin^2 \frac{\delta}{2}}{2 \sin^2 \frac{A}{2} - 2 \sin^2 \frac{\delta}{2}} \qquad (3)$$

SOLUTION OF SEVERAL COMPOUND CURVE PROBLEMS. LEFT—FIND TANGENTS AND EXTERNAL OF ANY COMPOUND CURVE WITH RADII AND ANGLES GIVEN. CENTER—GIVEN R_1, R_2, A, δ AND θ. FIND TANGENT AND EXTERNAL. RIGHT—GIVEN R, R_1, δ, X. FIND θ.

A much easier and quicker method of computing the tangent distances and external of a compound curve made up of several radii is shown in the illustration on the lower left. On the lower center is shown a more simplified solution of a symmetrical compound curve of three radii. The solution of another problem that frequently occurs in track work is shown on the lower right. This problem arises when the devil strip is changed at a branch-off, or when a switch and mate are changed for a pair of another radius.

In his article Mr. Brown offered to furnish trigonometric derivations of the various formulas shown to anyone who desired them.

County Highway Surfaced With City Pavements

By James Logan

County Engineer of Burlington County, N. J.

Though city pavements have never been extensively used in rural communities, even where the traffic would warrant them, some types can be advantageously utilized in certain localities on county highways. The type of pavement selected must not only meet the traffic conditions but must be of reasonable first cost and low maintenance cost. Burlington County, N. J., during the year 1916 constructed, upon a well-graded gravel road, a macadam road 18 ft. wide with a foundation 6 in. thick after being compacted. Upon this base in 1917 was placed a sheet asphalt surface composed of a 1-in. binder course and a 1½-in. topping. This road, extending from Mt. Holly northeasterly three miles toward Trenton, is now in use.

As Burlington County is the leading agricultural county in New Jersey and geographically situated so that its products may be carted by motor truck to the markets of New York and Philadelphia, it requires roadways that will support at all seasons of the year all types of traffic. The traffic on the above-mentioned road is very heavy during certain seasons of the year, as it leads from the center of the farming district to Trenton and New York, and it also has been used extensively by Government trucks going from Philadelphia to Camp Dix.

In building this highway the foundation of macadam was thrown open to the public as soon as it was completed. For a year prior to the surfacing extensive traffic moved over the road. During the surfacing, as soon as sections of the road were completed, they were thrown open to traffic. The road is two years old now and has had continuous heavy travel since construction. It has been subjected to the extremes of temperature—10 deg. below zero being recorded during one of these winters, and the following summer the thermometer registering a maximum of 106 deg. F., and during the hottest day 140 trucks, heavily laden and in one train passed over the road. No patching or maintenance of any kind has been necessary to date.

Practically all of the materials that went into the road were either of local origin or were obtained with short railroad haul. The county produces a good quality of sand useful for bituminous mixtures and not only has a sufficient supply for local uses, but ships a good deal to centers of population along the Atlantic seaboard for use in bituminous work. A good bank of sand is to be found at Mt. Holly, the western terminus of the road, and trap-rock of superior quality was obtained by a railroad haul of 34 mi.

As the soil in this county is a sandy loam, and in most places the top soil being underlaid with a stratum of sand, excellent natural drainage obviated extensive work in this connection. The road in question, having been previously improved with gravel, was satisfactory as to longitudinal and transverse grade, and the drainage could not be improved upon. The foundation was constructed of broken stone, the first course being spread upon the gravel subgrade after it was rolled and shaped. The bottom layer of stone was 2½ in. in size and the voids were filled with a road gravel containing a large percentage of clay. This was thoroughly compacted by rolling with a 10-ton roller. Upon this was placed the top course of 1½-in. broken stone which was bound together with some gravel and finished off with screenings. After the foundation had been subjected to heavy travel for a period of a year the sheet asphalt paving was laid. When the top was applied the foundation had worn to the 1½-in. stone with every stone showing. Specifications for the sheet asphalt surface required the following grading:

	Asphalt Cement	Surface Mixture	Binder
Penetration of A. C.	54		
Ductility	100 cms.		
	Per Cent		
Fixed carbon	17.9	...	...
Mineral matter	0.05	...	....
Organic insoluble	0.05	Per Cent	Per Cent
Bitumen	99.90	11.0	4.7
Passing 200 mesh	......	13.0	1.2
Passing 100 mesh	......	17.0	....
Passing 80 mesh	......	10.0	5.4
Passing 50 mesh	......	13.0	
Passing 40 mesh	......	11.0	..
Passing 30 mesh	......	4.0	8.0
Passing 20 mesh	......	8.0	..
Passing 10 mesh	......	12.0	4.1
Passing 4 mesh	......	1.0	3.4
Passing 2 mesh	......	....	11.3
Passing ¾ in. mesh	......	....	19.8
Passing 1 in. mesh	......	....	27.8
Passing 1½ in. mesh		...	14.2

The asphalt plant was located in the freight yard at Mt. Holly within 150 ft. of the sand dunes. Mt. Holly is four miles from the northeast terminus. The gravel pit was located along the road at its middle. The gravel cost 10c. per cubic yard in the pit. Materials were mixed at the plant in Mt. Holly and hauled in 5-ton trucks to the road. All materials were subjected to rigid tests. A chemist was stationed at the plant who inspected the mixing of the materials and an inspector was on the road supervising the placing and compressing of the mixtures. Labor at that time was receiving $3 per day of nine hours. The foundation cost $1 per square yard completed. The surface cost $1.32 per square yard, which included a gravel shoulder 6 ft. wide, compacted 2½ in. thick on each side.

During 1918 3 mi. of sheet asphalt were laid on 6 in. of concrete on the main road to Philadelphia which is called upon to support heavy travel. During 1919 20 mi. were contracted for and about 15 mi. have been completed. The county has a program for three years of 20 mi. a year. Together with modern pavements previously constructed, this county will have in 1922 a road system, composed principally of sheet asphalt, of 90 miles.

Alaska Free From Unrest

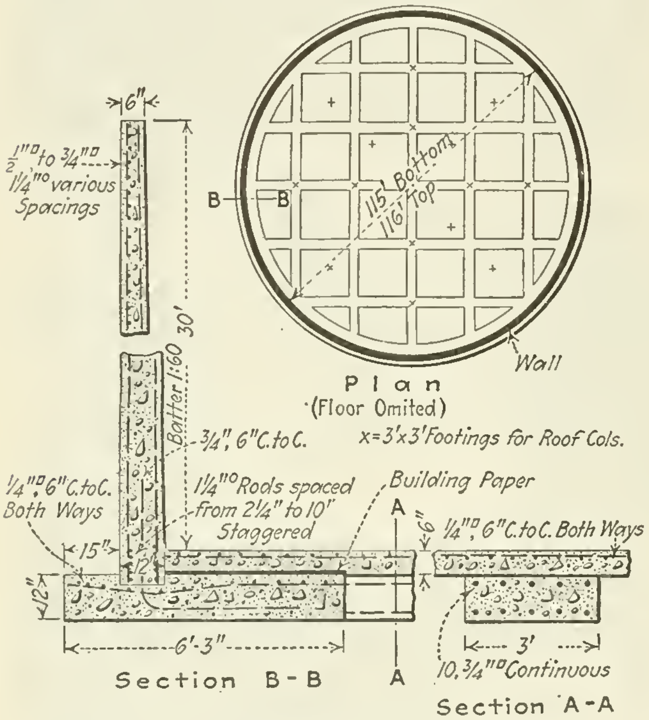
A recent letter from Juneau, Alaska, to a New York business man, contains the information that Alaskans are not troubled with conditions of unrest and that Bolshevism is not to be found there.

Large Concrete Oil Tank Built For Panama Canal

Shortage of Steel Led to New Use of Concrete for Isthmian Oil Storage—Tank Is 115 Ft. in Diameter and 30 Ft. Deep

By R. C. Hardman
Engineer-Designer the Building Division, Panama Canal

STEEL shortage during the war, together with the existence of a large supply of 1½-in. round bars which were purchased for another project and not used, determined the use of reinforced concrete for a 55,000 bbl. fuel-oil tank constructed in 1918 at the Mount Hope Oil Tank Farm, near the Atlantic terminus of the Panama Canal. As this farm contained a number of steel tanks of similar capacity, the same general dimensions were used for the concrete tank; i.e., 115 ft. in diameter and 30 ft. in height.



DETAILS OF CONCRETE FUEL-OIL TANK FOR PANAMA CANAL

The tank is located on a hill about 30 ft. above the surrounding country and rests upon a foundation of red clay. As a measure of protection against varying soil conditions the foundation consisted of a gridiron of ribs, as shown in the drawing, reinforced top and bottom, to enable them to take care of any uneven settlement at soft spots and prevent cracking of the floor slab. The tank walls being circumferential, the design was very simple. As the temperature changes on the Isthmus are small, no provision was made for temperature stresses. Elongation due to stress is provided for by sliding; it will be noted in the drawing that the wall is secured to the footing under it, the whole being independent of the floor slab and ribs. By this construction changes due to elongation can take place readily. Building paper was used between the floor slab and the wall footing. No special means of securing a tight joint between wall and wall footing were used. In two fuel-oil tanks designed by the writer for the Panama Gas Co. and the Colon Gas Co. a thin metal strip was imbedded in the footing and the walls built over it.

Footings for roof columns, 17 in number and 3 x 3 ft. in size, were provided at the center of the tank and at the third points of the radius with 45 deg. separation. The original design called for a wooden roof with tar and gravel covering, but was later changed to the ordinary steel-plate construction, as is customary on steel tanks, and is required of privately owned oil tanks on the Isthmus.

The tank is provided with an 8 in. swing-joint supply and discharge pipe, 30 ft. in length, so placed to draw off oil at any depth, and operated by means of a hand winch on the roof. The pipe enters the tank through a cast-iron sleeve with circumferential ribs on the inside for lead calking. Two cast-iron clean-out holes with blind flange covers are provided near the bottom of the tank, as well as a 3-in. drain for drawing off water which collects at the bottom of the oil. Entrance to the tank is by inside and outside ladders built into the wall, and a manhole in the roof.

Steel stresses of 16,000 lb. per sq.in. were used. Unit weight of oil was taken at 54 lb. cu.ft.

Forms for the tank were made in sections about 6 ft. in height and 10 ft. in length, bolted together circumferentially, the inside and outside forms being likewise held together by bolts. Lifts of 6 ft. of wall were poured, and the forms removed, raised and placed for the next lift, thin strips being placed between inside form sections at each operation to take care of the increased circumference due to batter.

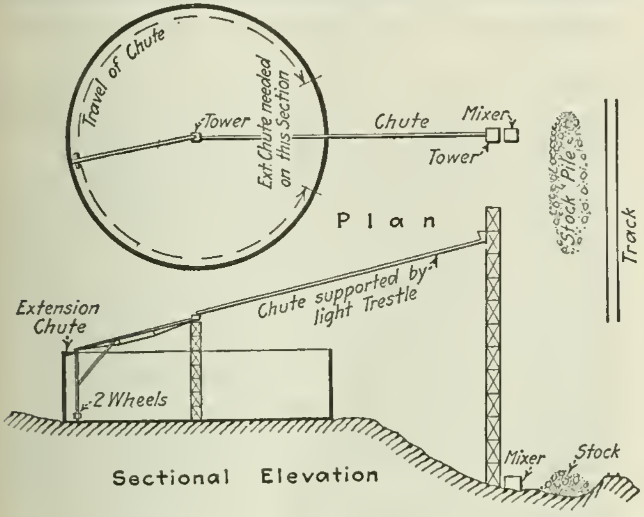
Immediately upon removal of the forms all suspicious looking spots were cleaned out and pointed up, and the whole exposed surface given a plaster coat of mortar with steel trowel finish on the inside and wooden float finish on the outside.

The concrete was placed circumferentially in layers about 12 in. in depth until the 6-ft. section was filled. The type of form used is not to be recommended, as in a thin section with such a large percentage of steel it is extremely difficult to secure good placing at the bottom of the deep form. In the construction of a similar tank by the writer in Colorado a few years ago the outside forms were built up complete, the inside studs and braces placed and the lagging nailed on immediately in advance of the pouring, so that there was never more than about 8 in. from the top of the form to the old concrete. The process can be made continuous by this method also.

The concrete was placed by means of a chute supported at its lower end by a ladder construction mounted upon a carriage having two wheels placed to travel circumferentially, and its upper end carried by a light tower placed in the center of the tank. The ladder construction enabled the chute to be carried at any desired elevation. This revolving chute was fed by a chute from a hoisting tower placed at the foot of the hill alongside a track from which material was handled. The skeleton sketch illustrates the plant sufficiently well.

The concrete was of approximately a 1:2:4 mix, the proportions used at the start of the walls being 1 cement, 2¼ sand and 3¾ crushed stone. These proportions were determined by G. C. Bunker, physiologist, as giving the densest mixture with the materials available. However, a trial proved that the mix was extremely difficult to properly place, owing to poor flowability into forms containing such a large percentage of steel, so changes were made and graded gravel used instead of crushed stone. The final mix adopted was 1 cement, 2 sand and 4 gravel, graded ¼ in. to 2 in. in size, mostly of the smaller sizes. Tests on this mix showed a crushing strength of from 1,971 to 2,246 lb. (3 sets) at 29 days and an average of 2,898 lb. at 28 days.

It was desired to use hydrated lime as a waterproofing and to insure better placing, but none was available on the Isthmus. Upon completion the tank was filled with water, which gave it an overload of about 16 per cent, and kept filled for about two weeks. For the first few days numerous minor leaks developed, mostly in the form of seepages, which finally entirely stopped. The tank was then emptied and thoroughly dried and given a treatment on the interior in accordance with the specifications of the Bureau of Yards and Docks, Navy Department, for concrete tanks containing fuel oil.



HOW CONCRETE WAS PLACED IN PANAMA OIL TANK

This consisted of a spray coat of a 7½ per cent solution of calcium fluo-silicate (1 gal. to 100 sq.ft.) for a height of 2 ft. up from the bottom. After 24 hours drying three coats of spar varnish with 20 per cent volatile mineral spirits (a hydrocarbon distillate) were sprayed on under a pressure of 60 lb. at intervals of 24 hours (1 gal. to 200 sq.ft. each coat).

Above the 2-ft. mark and to the top, the calcium fluosilicate was applied as above, followed at 24-hour intervals by two coats of glutrin painted on (1 gal. to 400 sq.ft. each coat). The tank was gradually filled with oil, with the development of a few minor leaks which quickly closed up.

The design and construction of the tank were carried out by the forces of the Building Division of the Panama Canal with Hartley Rowe, resident engineer; T. C. Morris, assistant engineer, and the writer as engineer-designer.

Will Need Men for Alaska Railroad

That 4,000 men will be wanted for work on Alaska railroad construction this summer is indicated in recent reports, following the appropriation of Congress. For the first time since construction began sufficient funds are available to undertake full operation of construction projects during the summer. The demand is particularly for experienced track, bridge and station-men. Application should be made through the Alaskan Engineering Commission, Bell Street Terminal, Seattle, Wash.

Prevention of the Red Water Plague

STUDIES of the corrosion of iron in its relation to the "red water plague," made at Pittsburgh, Pa., and at the Massachusetts Institute of Technology for a few years past, were summarized by Prof. William H. Walker, director Division of Industrial Co-operation and Research of the Massachusetts Institute of Technology, in a paper read before the New England Water Works Association recently.

Summarizing conclusions as to the causes of corrosion and their relation to house water pipes reached by studies at the Institute Professor Walker said:

"It was for many years thought that rust was formed by the direct union of the oxygen of the air, water and the iron. Now we know that such is not the case. In order to form rust the iron must actually go into solution in the water; if oxygen is present, it later unites with this dissolved iron separating as red rust. The formation of rust by the oxygen is thus the result of, not the cause, of the solution of the iron and its resultant corrosion. But careful study showed that the oxygen, which is normally dissolved in all water, plays a more direct and controlling part in this corrosion. Where iron dissolves in water, an equivalent or corresponding amount of hydrogen is set free from the water in the form of gas. This hydrogen covers the surface of the iron and protects it from further attack. But if oxygen be present, it unites with this hydrogen, destroys the protective covering and allows the solution of the iron to proceed. Speaking electro-chemically the hydrogen polarizes the surface of the iron, and the dissolved oxygen acts as a depolarizer. Where there is a complete absence of oxygen in a system, no appreciable corrosion of the iron will take place.

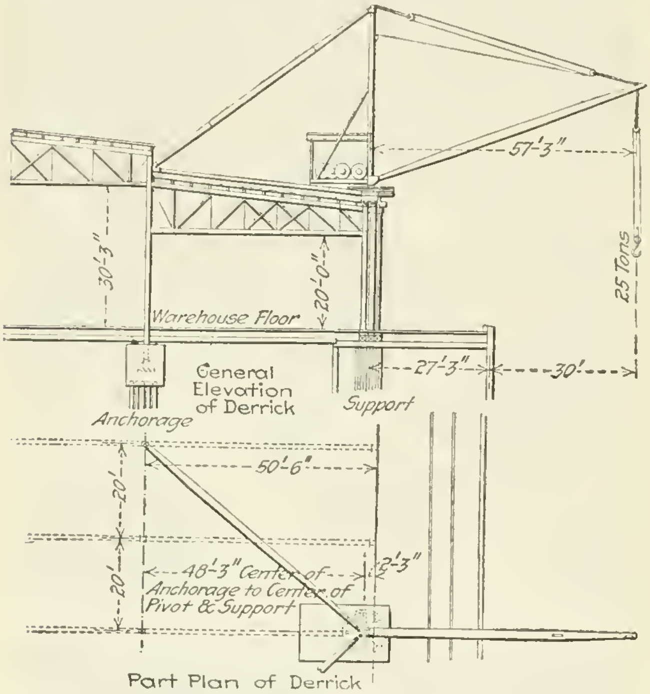
"The action of all the factors, causing corrosion, is greatly accelerated by rise in temperature. Hence a hot water supply system in which fresh (that is water fully charged with atmospheric oxygen) hot water is constantly passing through, is a most vulnerable structure. But since oxygen is consumed in the process of corroding iron and forming rust, it is obvious that if the water be held in contact with an iron surface it will soon lose all its dissolved oxygen and become inactive so far as further corrosion is concerned. Careful experiments have established the fact that the amount of corrosion, other factors being the same, is directly proportional to the free oxygen content of the water."

In the course of the paper brief reference was made to the "deactivators," for removing dissolved oxygen from water, which were first tested at Pittsburgh, Pa., four years ago and have also been tested in a Boston apartment house. In this apparatus the water from the street main, before reaching the house system, is passed through a heater that raises the temperature to 160 deg. F. and then through a storage tank containing iron sheets that have been chemically treated so as to cause rapid corrosion and finally through a filter. The oxygen in the water unites with the iron in the plates and such iron rust as is carried forward by the water is removed by the filter. By this means corrosion in house water pipes is prevented, the tests indicate. The expense of installing the Boston deactivator, Professor Walker informs *Engineering News-Record* was borne by the National Tube Co., of Pittsburgh, but the apparatus was operated and the conclusions regarding it were drawn by the Institute.

Stiff-leg Derrick with Wood Members Mounted on Pier Roof

Lack of Steel Resulted in Design of Terminal Freight-Handling Machine Out of Large Timbers and Use of Steam Winch Drive

TO AVOID the difficulty and the delay of getting structural steel in wartime, the Oregon-Washington Railroad and Navigation Co., used wood members entirely in building a 25-ton stiff-leg derrick on a pier shed roof at Seattle, Washington. No metal covering of any kind was put on the timbers, the only weather protection being heavy coats of paint and carbolineum or hot tar at joints. The base of the derrick is about 30 ft. above the level of the pier wharf and its weight is carried by the framed timbers of the pier shed structure, supplemented by such additional members and piling supports as were found necessary. The two stiff-legs of the derrick are 18 x 18-in. timbers, 72 ft. long. The mast is 20 x 20 in. in section and the two timbers lying on the shed roof, as well as the boom are 16 x 16 in. in cross-section. The stiff-leg members are reinforced with a 1-in. truss rod and the boom has four truss rods, 1 in. and 1⅛ in. diameter.



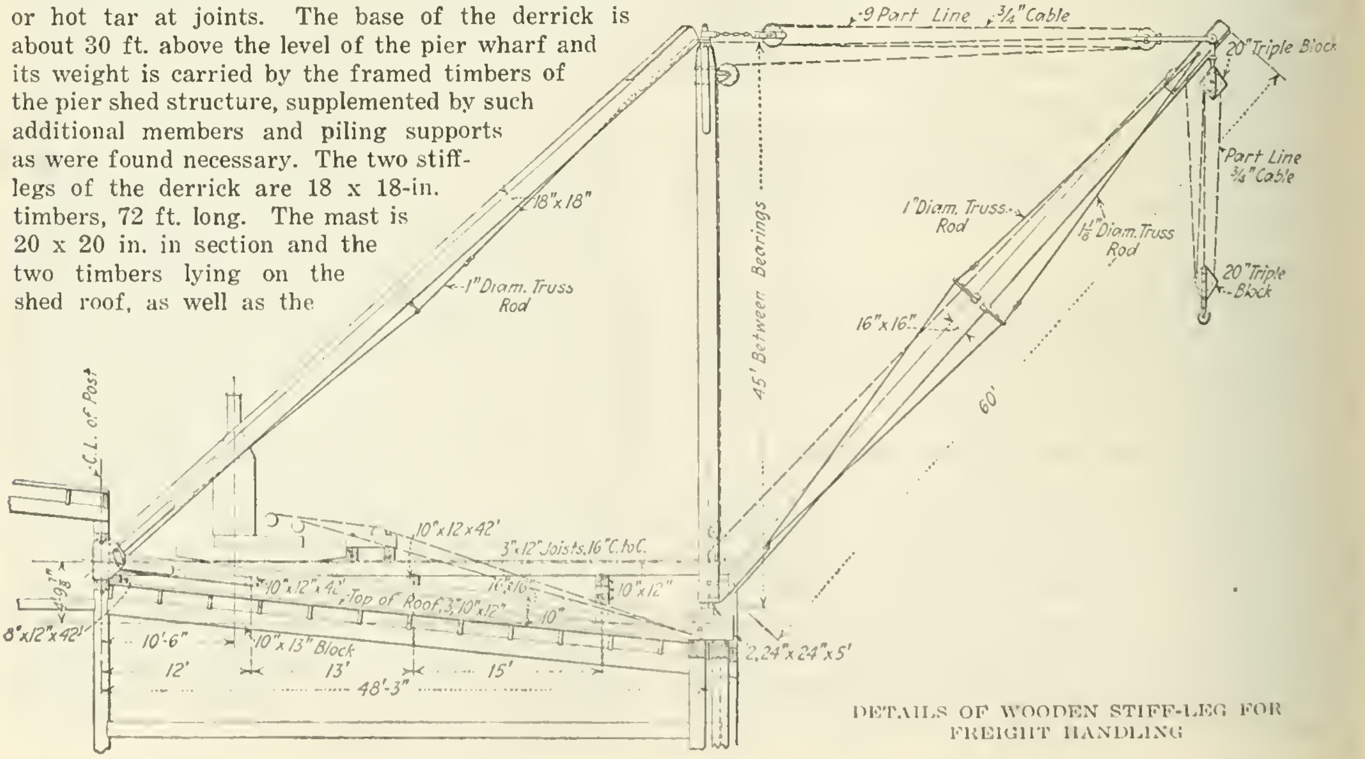
GENERAL OUTLINES OF DERRICK

WOODEN STIFF-LEG MOUNTED ON PIER AT SEATTLE

The derrick would not be used frequently enough to warrant high first cost of electrical operating equipment, it was believed, so a steam winch of the type known throughout the Northwest as a "logging donkey," was installed to operate it. The boiler of the engine normally works under a steam pressure of 125 lb. per sq.in. On one occasion, when a 32-ton load had to be moved, the pressure was increased to 175 lb., with which the load was handled successfully.

The heads of the piles were notched to give the concrete a good bond, and a footing attached to the structural steel posts was imbedded in the concrete so that any upward pull would be resisted by the weight of the concrete blocks as well as by the frictional resistance of the piling.

The derrick was designed under the direction of S. Murray, chief engineer of the Oregon-Washington Railroad and Navigation Co.



DETAILS OF WOODEN STIFF-LEG FOR FREIGHT HANDLING

Need for Economic Location of Highways

Let Highway Locators Follow Railroad Principle—"Make Cost Per Ton-Mile a Minimum," Is Engineer's Appeal

By George F. Syme
Supervising Engineer North Carolina State Highway Commission

THE development of the modern highway has never before received such impetus as it is now receiving. The day for instructing the public in the advantages of good roads is past, and vast sums are now available for constructing them. The advent of the motor vehicle is, of course, the chief cause of this development, and it has brought us face to face with unlimited possibilities for commercial highway transportation, the volume of which will expand and develop, just as it has done on our railways. Our problem, therefore, is the same as that of the railway—to transport a maximum tonnage at a minimum cost.

We have seen railway tonnage increase year after year, and we have seen huge sums of money expended for heavier rails, greater motive power, better roadbed, and for decreasing resistance by the elimination or reduction of curves, grades, and distance. The problem of the railroad has ever been to reduce the cost per ton-mile of hauling freight, and that issue was attacked in the only practical way—by increasing the tractive power of engines and by reducing the resistance to moving loads. Their achievements are due to the fact, primarily, that the capital invested in the lines was privately owned, and that it must earn dividends or it would be withdrawn from the enterprise.

Railroad Engineers Highest Type

With this fundamental fact constantly before them, the companies could be depended upon to develop a high state of efficiency in the design and operation of their lines. They procured the highest type of engineering talent available, and they demanded results. Their locating engineers were men of talent and experience who knew that they carried a heavy responsibility and that they had to get results or nothing. For instance, the locating engineer in carrying his low-grade line over a bridge, would not fail to investigate the lowest gap or saddle in that ridge, nor would he cross a stream at any old place, nor break his grade line at random to help him over some local and relatively small irregularity of the ground. He was very cautious in the use, choice and location of curves—and as for a grade crossing of another line, or even of a highway this was not to be considered, save as a last resort. He knew that the economic operation of the railway depended primarily upon the intelligent location of his line; and that the cost per ton-mile of moving freight varied for a given motive power, directly as his curvature, rate of grade, etc., varied. He knew his problem. It was an economic location which he sought, not just any kind of location which he thought would "get by."

His greatest difficulty was of course to keep down the first cost of construction and on this he lavishly expended time, patience and energy, but he never lost sight of his operating cost per ton-mile. He could figure just how much of his employers' money he would be justified in spending to reduce grade, to eliminate or flatten a certain curve, to avoid a grade crossing, or to shorten his line. More than this, he knew that when he had finished his work, it would not be quickly and blindly accepted by his superiors. It would be closely studied and criticized by other experts, each of whom in turn would report his findings to those higher up, until finally it would be passed upon by the board of directors who represent the investors themselves.

It is thus evident that an ideal economic location, improved motive power and rolling stock, better rails and roadbed and better methods in maintenance and operation are the direct results of the demands of those whose money goes into the enterprise. We may, therefore, say that the development of our railway transportation problems may be safely left to those who have a personal financial interest at stake. It is a natural result fostered largely by the competition of other lines, each striving to increase its earnings. But what about our highway development? It must follow precisely the general method pursued by the railways.

Motor Truck Development

The rapid growth of highway traffic has already produced the heavy high-powered truck, that heavier tonnage may be moved. Truck development is yet in its infancy. It will continue to develop because men put their money into truck manufacture and because they have competitors to meet in the field. Trucks, like locomotives, demand a continuously improving roadbed, or surface. Here again private enterprise meets the issue. The engineers and chemists, employed by the various manufacturers of paving material "deliver the goods." The product of each concern must be constantly improved, or it will be driven from the market by its competitors. These engineers and manufacturers have studied closely the problems relating to hard surface roads and road construction. It is their specialty. They must understand these problems in order that they may produce satisfactory paving or surfacing material, and keep abreast of their competitors. Their enthusiasm is contagious, and their studies are interesting and helpful. The highway engineers of the country at large have been interested by the enthusiasm, claims and counter claims of the manufacturers, and as a result they too have contributed largely to the development of the hard surface. We may, therefore, for the present, rest assured that the development of the motive power and of the surfacing material will be pretty well taken care of and kept up to date by private enterprise.

These two developments will go a long way toward increasing the tonnage which may be transported over our highways. However, there appears grave danger that the greatest fundamental principle of highway development—the economic location of the highways—will not keep pace with the development of motive power and surfacing because of lacking incentive, due to the fact that public funds are used for construction and that the layman himself cannot differentiate between an economic location and a cheap location. As a taxpayer, he desires the latter and nothing else, except to have it pass through his farm, if he possesses one.

The development of the highway and of the railway are absolutely synonymous, both being based upon the same underlying principles—to move maximum tonnage at minimum expense, with a minimum initial construction cost.

Since the engineer is without the necessary incentive, is not conscious of a public demand for a high-class location, and is handicapped on every side by having to contend with politicians, lawyers and county commissioners, it is no wonder that highway location has not kept pace with the highway accessories produced by private enterprise, or that it is not up to the present-day standard of railway location practice.

SITUATION NEEDS CAREFUL ATTENTION

However, this situation does not appear to be hopeless. Interest in this subject could be revived by a joint committee from the various organizations for the promotion of highways, co-operating with the United States Bureau of Public Roads and with the several state highway departments. The subject is strictly technical and demands close study. The general principles are similar to those applied to railway location and the ton-mile may well be adopted as the unit on which to base computations.

Commercial and other motor transportation is yet in its infancy, and our knowledge of the amount of tonnage to be hauled in the future over a given route is very vague. We know, however, that it will increase rapidly over a properly located and constructed road. It may be that data have been collected on some such roads already in existence. At any rate records could be kept showing this tonnage and its annual increase, from which a profile or curve could be plotted indicating future increase. Also, by a little research and effort, data could be collected and tabulated giving the cost per ton-mile for moving loads over various types of surfaces. With this information, even approximate, with our present knowledge of grade resistance, of the tractive power of motors, and the knowledge that curvature, rise and fall, grade crossings and distance have negative values which may be at least approximated, we would be in a position to locate our highways with more satisfaction and credit to ourselves and with the comforting knowledge that the public was getting value received for its expenditures.

Space does not permit reference to drainage, maintenance or construction details, nor is such reference necessary here, for fortunately these matters are already receiving a goodly amount of attention from the profession. Many of our highways, however, are so poorly located that proper drainage and maintenance are impossible.

It is the writer's belief that unless we make the necessary research, secure the data, correlate it and make it available for practical application, and unless we otherwise stimulate interest in highway location the resulting financial loss, due solely to poor location, which will become more and more apparent as the traffic increases, will reflect shame upon our profession. Are we not in duty bound to see to it that public funds invested in our highways and entrusted to us for proper expenditure should yield maximum returns to the public, just as we would have done had it been a private enterprise?

It is the writer's earnest hope that some competent authority in the very near future will give us a practical treatise on "The Theory and Practice of Highway Location," which will bear the same relation to our infant highway development that Wellington's great masterpiece bore to the early development of the railway, and the need for this is imminent, for we are building the highways now.

There is much food for thought and a wholesome lesson to be learned by studying the rapid growth and development of our railways. Their engineers had no precedent to guide them, but they solved their problems satisfactorily. They have shown us the way and we should either follow it intelligently or else devise a better one. How much more phenomenal has been the growth of highway transportation and to what limits will it reach!

Hudson Pier Encroachment Authorized by Secretary of War

ON DEC. 16 the Secretary of War approved the revision of the pierhead line in the Hudson River in in lower Manhattan, which straightens out a part of the line there, so as to encroach on the channel a maximum of 93 ft. The line revision extends from Pier 2 to Pier 9, in a district where at present the piers are too short to accommodate transoceanic steamers. Inasmuch as the present plan for the development of the harbor contemplates the removal to the East River of all the low-draft steamers now using the lower Hudson, thus making available more pier space for the deep-draft vessels which can only use the deeper Hudson, the Department of Docks of New York City asked the Harbor Line Board to establish the new line to permit the extension of the piers. This board recommended to the Chief of Engineers that the modification asked for be approved.

In reviewing the case, the Chief of Engineers continued the policy of the Corps of Engineers in the matter of pier extensions in New York City, and concluded that sufficient reasons to justify the change had not been presented. It was the Chief of Engineers' contention that while the proposed extension might not in itself be serious, it was a part of the history of New York Harbor that such extensions are only part or continuations of small encroachments which have resulted in the aggregate in the narrowing of the channel of the river to a fractional part of its original width, so that he felt in this present case that if the modification were approved it would be only a short time before there would be an application for the straightening of the harbor line from its present southerly limits to some point well to the northward, so as to eliminate the re-entrant angle caused by the proposed modification, and that the process would be repeated indefinitely.

In returning the case to the Chief of Engineers the Harbor Line Board amplified its previous recommendations by giving the reasons for its action. The board stated that it took full cognizance of the facts as advanced by the Chief of Engineers but that it felt that the imperative demand for longer piers in this part of the river was so great that it could not do other than to recommend the pier extension, inasmuch as it was impossible to extend the piers inland because of the expensive real estate located on the marginal streets, one of the structures being the well-known Whitehall Building, thirty stories in height. The board further thought that conditions were such that there would not be much danger of a continuance of the encroachment by straightening out angles in this section.

As the reasons for the change, with fuller details, were reviewed by the Chief of Engineers as ample justification for the modification, the papers were presented to the Secretary of War, with favorable recommendation on Dec. 13, and the change was approved by him on Dec. 16, 1919, without comment.

Is the Railway Employee Overpaid and Underworked?

By Charles Whiting Baker
Consulting Editor *Engineering News-Record*

It is well known that very large increases in wages have been made to railway employees; and that these large increases are chiefly responsible for the great falling off in railway net earnings. There is a general belief that the railway employee is drawing more pay than he is fairly entitled to and doing less work.

When the Plumb plan was presented to Congress last summer, the heads of the railway brotherhoods declared that "the cost of goods mounts faster than the wage level." This statement was promptly challenged by the American Institute of Consulting Engineers, in a protest against the Plumb plan, which the Institute forwarded to President Wilson (see *Engineering News-Record*, Aug. 228, 1919, p. 405). In that protest the Institute said:

"Our investigations show that railway wages have increased faster than the cost of living, which is contrary to the statement made by the brotherhoods. The cost of living from 1914 to March, 1919, has increased 61 per cent, whereas all railway wages have increased 92 per cent."

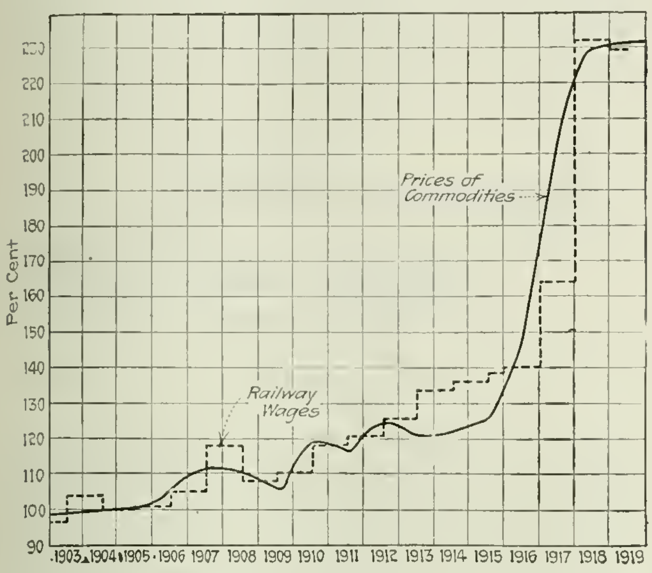


FIG. 1. INCREASE IN COST OF LIVING (R. G. DUN & CO.'S INDEX FIGURES) AND RAILWAY WAGES

(Percentage of increase for both prices and wages is the increase over the average of prices and wages for the three years, 1903 to 1905, which is taken as 100 per cent.)

If that statement is true, then the general public condemnation of the railway employee as a profiteer is, to a large extent at least, justified. If it is not true, then the error should be rectified so far as possible. The engineering profession aspires to aid in settling the controversies between capital and labor on a basis of justice to both. It can, of course, serve in that capacity only by dealing with absolute facts.

The statistics now available show that the increases in wages to railway employees since 1913 have not kept pace with the increased prices of goods. In 1916 and 1917, especially, prices mounted much faster than railway wages. It is true that in the two years since the Government took control of the railways very large wage increases have been made; yet these have been no more than sufficient to offset the decreased value of the dollar. The two accompanying diagrams show graphically the relations between the percentage of increase in railway wages and in wholesale market prices, one from 1913 to date, the other from 1903 to date. The figures for average railway wages are taken from the official reports of the Interstate Commerce Commission. The figures for wholesale prices are the "Index Numbers" published by R. G. Dun & Co. The Dun figures are adopted as coming from an organization wholly unbaised toward either capital or labor.

The Dun figures, it may be noted, are materially lower since 1916 than the Index figures for prices issued by the U. S. Bureau of Labor and used by the Association of Railroad Executives in a diagram comparing railway rates with increased living costs, published Dec. 15 in its bulletin, *American Railroads*.

It is fair to say that the error of the American Institute of Consulting Engineers was due, in part at least, to the use of statistics for the cost of living issued by the National Industrial Conference Board. This organization, as was shown editorially in *Engineering News-Record* Oct. 23, represents large employers of labor, and cannot be accepted as an impartial authority in determining the question of increased living costs on which wage adjustments now so much depend. Further than this, the Conference Board itself, in its later statistics, has greatly increased its figures for the cost of living. Its latest bulletin on Dec. 28 reports the increase in cost of living on Nov. 1 to be 82 per cent. It will be seen from the diagram above that this is just about equal to the increase in average railway wages since 1913.

And now, how about the absolute rate of pay? Is the average railway employee overpaid? The official records show that in 1903 the average railway employee earned $591 per annum or $49.25 per month. This includes, be it noted, all classes of employees, from railway presidents down to section men. Obviously, therefore, the wages of a large proportion of the employees are considerably less than this average. Fig. 1 shows that the increases in pay since that time have been no more than sufficient to offset the decreased buying power of the dollar. In other words, the average railway employee can buy no more and live no better now than he could 16 years ago, on a wage averaging $49.25 per month.

One of the best and fairest standards for judging of the wages of railways employees is the wage rate in

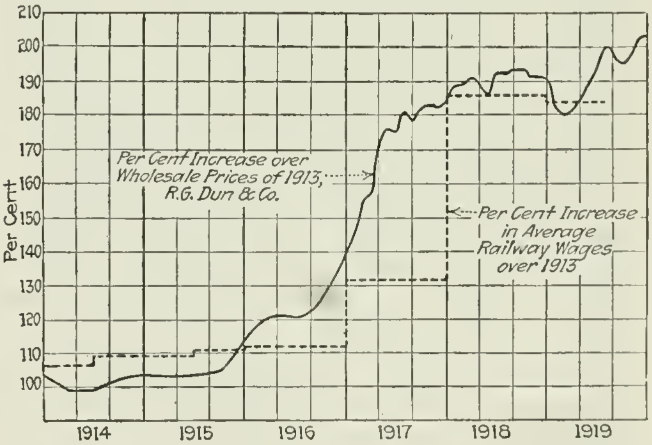


FIG. 2. PERCENTAGE OF INCREASE IN COST OF LIVING AND RAILWAY WAGES

other industries. The New York Bureau of Labor recently issued statistics showing that all factory employees in the state, a very large proportion of them girls and women, have had wage increases of 100 per cent since 1913 and are now earning $25 per week on the average. The average railway worker now has a wage of $27 per week and has had 83 per cent increase since 1913. There is no doubt that the skill, fidelity and responsibility required of the railway worker calls for a higher differential than $2 per week over the factory hand.

Finally, there is a widespread belief that railway employees under Federal administration have greatly slackened in industry and efficiency, and that the concessions granted to the workers have largely reduced the output per man. If this is true, then there must be a very large increase in the number of railway employees to take care of the enormous traffic the railways are now handling. The increase in the number of employees under Government control, however, has not been nearly proportionate to the increase in traffic. Seven years ago, in 1913, the railways had 1,815,000 employees and handled 301 billion ton-miles of freight traffic. In 1918 the railways had 1,821,000 employees and handled 409 billion ton-miles of traffic. In the first six months of 1919, the average number of employees was 1,852,000.

If there were serious deterioriation in morale and fidelity to duty among railway employees, an increase in the accident record would result. No such increase has been reported.

There are, without doubt, numerous cases where individuals and classes of employees are overpaid and underworked relatively to others; but these instances should not lead to unfair judgment toward railway employees as a whole.

Advise $18,000,000 Enlargement of Baltimore Water Supply

THE enlargement of the Baltimore water supply, recommended in the report by Nicholas S. Hill, Jr., and James H. Fuertes, consulting engineers, New York City, mentioned on p. 301 of *Engineering News-Record*, Feb. 5, 1920, includes the raising of the Loch Raven dam by 48 ft. at an estimated cost of $4,675,000, to give a total impounding capacity of 23,000,000 gal.; a new pumping station at Lake Montebello with a capacity of 185,000,000 to 200,000,000 gal. daily; the enlargement of the Montebello filtration plant by 52,000,000 gal. daily; the utilization and development of the Patapsco supply by making use of the present diverting dam of the Baltimore County Water & Electric Co. at Avalon and building new raw water basins, pumping machinery, filters and other equipment at that point; a new equalizing reservoir on high ground near Kenwood; a new high-service pumping station at Lake Ashburton, Walbrook; and various new supply mains, together with the reinforcement of the low, middle and high-service distribution systems. A water-waste survey, to be followed by the installation of meters, is also recommended. The estimated cost of all the improvements is $17,888,103, besides which the engineers estimate the cost of acquiring the properties of nine private water companies at $3,900,897.

In the report by the late F. P. Stearns and John R. Freeman (see *Engineering News*, April 21, 1910, p. 470) it was recommended that the Loch Raven dam be 97 ft. high, giving an impounding capacity of 21,000,000,000 gal. When constructed a foundation sufficient for a final height of 120 ft. was provided but construction was stopped at a height of 52 ft. (see *Engineering News*, Aug. 13, 1914, p. 331).

An outline of a report on water-works enlargements at Baltimore by Walter E. Lee, at the time water engineer, appeared in *Engineering News-Record*, Sept. 25, 1919, p. 631. At present William A. Megraw is water engineer, and J. W. Armstrong is filtration engineer of Baltimore. The Hill-Fuertes report has been referred by Mayor Broening to the New Annex Advisory Commission, Robert Garrett, chairman, for consideration. It should be understood that the report is a preliminary one and that the recommendations are subjected to change after more detailed study.

Impressions Here and There

A Senate Committee "Investigates" the Housing Corporation

CONGRESSIONAL committees in Washington are busy investigating the constructional activities of the war. At least the committees themselves call it investigating. The unprejudiced observer attending the sessions or reading the one report which has been issued finds more of the temper of the public prosecutor than of the unbiased investigator. In certain foreign courts procedure demands that the accused may be showered with abuse and contempt with the idea that innocence will rise superior to any slur. This method of discovering truth seems to appeal to legislative bodies.

Just now two of the engineering performances of the war are under trial: one, the whole activities of the Construction Division, the other, the design and construction of one part of the domestic war structure, the famous nitrate plant at Muscle Shoals. Doubtless these committees will be ready to crystallize the charges they have already formed, but until they do no comment on the unjust methods of their procedure is worth while. One other engineering activity, at least an activity in which engineers were largely concerned, has already been pilloried. That is the United States Housing Corporation and the report of the Senate Committee which conducted the court martial has been widely circulated. Unfortunately the protests of the accused have not gone quite so far nor has the unjustness of the accusations been exposed.

The charges of the committee are extensive and are incorporated in twenty-two separate findings. The findings overlap, however, and the charges can be reduced to much simpler terms. The committee indicts the corporation for building too elaborate and too costly houses and not the temporary type which, according to the committee, were ordered by the enabling act. It finds that construction was unduly slow so that very few of the houses were made available by the time the war ended. It criticises severely the tripartite method of design in which the architect, the engineer and the town planner jointly participated. It sees no reason why the supervising architect of the Treasury Department was not called in to do the architectural work on all of the buildings. It claims that the architect's fees were doubled by some sort of arrangement by which the architect received "100 per cent extra on all of the so-called overhead expenses.

The committee finds some minor instances of unearned payments, which the vulgar mind might call graft, and condemns a number of the construction extras as being extravagant. It sees no reason why the corporation did not shut down all work immediately at the end of the war, nor does it understand why the corporation planned ahead of its appropriation. It ridicules the system of contract awards by which a score card of points, including experience, reputation, plant required, etc., was built up for the selection of the contractor. It denounces the loaning of $500,000 to what it pleases to call a nearly bankrupt water company upon the recommendation of the chief engineer of the corporation, who according to the committee had twice been a paid expert for the company. Finally it states that the corporation's own report that the average overhead allowance to engineers was only 1 per cent of the cost of the utilities involved is distinctly in error and that in fact the engineering fees amount to 5 per cent of contemplated work, or since only one-half the work was executed, 10 per cent instead of 1 per cent.

Of interest to the readers of *Engineering News-Record* are mainly the last two points of criticism. The charge against the former engineer of the corporation, one of the leading men of the profession and a man of undoubted integrity and famous reputation, is particularly nasty. The gentleman in question was never permitted to offer any defense of himself nor asked to do so. His standing in the profession was not considered by the committee. Entirely aside from that, however, the facts in the case are that the water company has deposited in the treasury of the Housing Corporation securities which today have twice the market value of the loan made to the company. Of these facts the committee was well informed. It merely chose to ignore them.

As to engineer's fees, it was notorious during the war that the Housing Corporation was getting a good deal for its money from its engineers. Complaints were continually made that some reform should be made to guarantee that the engineers would get fees at least equal to those which they could get in private work. There seemed to be no reason why this particular profession should be called upon to contribute its livelihood for patriotic reasons when other professions were at least getting a fair return for their services. These facts, too, are set forth in the testimony before the committee and in the report of the corporation. They did not just fit in with the committee's idea of what charges it should make.

Most of the other charges carry their own reply. Practically every one whose memory is not obscured by partisanship knows the temper of the American workman during the war. It does not necessarily impugn his patriotism to say that he went where the working conditions were best. Bidding for labor was unrestrained. Labor turnover reached unprecedented figures. It was, therefore, in the stress of the wartime condition considered necessary that the workman be provided not with unduly elaborate housing but with conditions which were at least equal to what he would hope for in a permanent home before or after the war. Temporary shacks got men for the two or three months cantonment construction, but they did not even hold them during that period. For the prospective long-time war condition a sane planning could only consider permanent housing and Washington in 1917 did not foresee the significance of November, 1918. This, too, the committee chose to forget.

For the elaborate and complicated system of designing which the committee criticises, it is difficult to prepare a brief. During the war there were many who felt stronger than they expressed that there was in the housing operations a lot of high thinking which could be well dispensed with. The building of the industrial villages for war purposes was essentially an engineering job in that it required the rapid production of a succession of approximately duplicate units. Certainly construction would have been expedited had the control lay with the engineer with such architectural help as was needed for the detailed design of the individual house and with the properly subordinated assistance of the so-called town planner and social worker. And this can be said without in any way going over to the extreme left wing of reactionaries who would conduct all housing operations under the noisome methods of the real estate speculator. At any rate the co-ordinate responsibility of the three types of designers tended to delay and confusion, while the necessarily idealistic nature of the gentlemen who engage in landscape art and town planning hardly lent itself to co-ordinate thinking or acting with the engineer who had to get things done. In this particular charge the committee has about its only solid basis of facts.

The other charges are comparatively unimportant. They were dragged in to make a general case. Probably there was graft in all the Government work during the war. Human nature is human nature war or no war, and the hurried conditions of 1917-1918 permitted laxity beyond that in normal times. Such laxity should doubtless be condemned. Grafters, if there are such, should be prosecuted, and if the committee had confined itself merely to such cases of this sort as it could discover it would not have attacked the housing performances of the Government very much.

The contract system of the Housing Corporation was by no means perfect. As an emergency form, however, it bears comparison with any other emergency form which could have been devised. It resembles in its essential working the form since advocated by a number of prominent men in the construction field as a permanent institution, and it served very well to select suitable contractors for work which, from its very nature, could not be submitted for lump-sum bidding. That it lent itself to favoritism and to an excess of cost over estimate is a charge common to any of the cost-plus contract forms which numerous contractors' organization are promoting in these days of peace.

The United States Housing Corporation had its many faults; so did all of the war-time organizations. That they must be subjected to grilling seems inevitable under our form of government. But if the critics really want to expose evils or to insure the avoidance of future mistakes they can take the Senate Committee on Public Buildings and Grounds as a fine example of how not to go about their work.

Washington, D. C.

ENGINEERING LITERATURE

A REVIEW OF BOOKS AND A LISTING OF NEW PUBLICATIONS

We Resume Giving Prices of Books

For some months past the prices of books noted in these columns have been omitted, owing to a ruling of the Post Office Department that the mere giving of the price of a book constitutes advertising (see *Engineering News-Record*, Aug. 21, 1919, p. 379). Under this absurd ruling if the price of a book were given it became necessary for the review to be stamped "Advertisement" and a copy of the issue containing the review filed at the New York Post Office. In addition, an extra zone postage rate had to be paid on the pages so stamped. *Engineering News-Record* was not stopped from giving book prices by the petty matter of additional postage and various incidental inconveniences, but it went against the grain to stamp as "Advertisement" material printed in its reading pages which was in no sense whatever such. For the convenience of its readers, however, *Engineering News-Record* has concluded to swallow its pride and with this issue it resumes giving book prices—with the hope that before long the absurd ruling already noted, which has been made by the Post Office Department and not by Congress, will be revoked.

A Highway Construction Handbook

HIGHWAY INSPECTOR'S HANDBOOK—By Prevost Hubbard, Chemical Engineer, The Asphalt Association; Formerly Chief, Division of Road Material Tests and Research, Bureau of Public Roads, U. S. Department of Agriculture. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Flexible Fabrikoid; 4 x 7 in.; pp. 372; illustrated.

REVIEWED BY H. ELTINGE BREED
Consulting Engineer, New York City

Mr. Hubbard's "Handbook" is written for inspectors, engineers and contractors. To the last man of them who cares for his work it will be of value far beyond its cost. It tells the man on the job what to do and gives him a sufficient background of information to know how to do it.

The unusually clear type in which the book is set and a good system of cross-referencing according to the number of the topic enable a man to find what he wants quickly. If the style is at times a bit involved and difficult it will at least compel the close attention of the reader—an attention given because he is getting rock-bottom information in return for it. The frequent use of diagrams to replace the old tabular scheme of presenting figures—quantities, costs, etc.—makes vivid many computations and reduces the amount of arithmetic required on the job. The diagrams will release considerable time and energy for each inspector who uses them. For instance, in discussing "Volume Basis" Mr. Hubbard shows on a chart the varying gravity of rock with the corresponding varying weights per cubic yard for a given void content. Contractors will appreciate this because they can see, graphically presented, why it takes a larger tonnage of some kinds of stone to build a road than it does of others. The author says: "If a given weight of broken stone of 3.0 specific gravity will build 13 miles of road, the same weight of broken stone of 2.6 specific gravity will build 15 miles of road."

The book deals largely with inspection of pavements proper. After a description of earth, sand, clay, shell and gravel roads, it goes on to broken stone roads, telford and macadam. It unfortunately omits sub-base macadam. Much attention is paid to the various types of surfacing. Especially valuable are the sections on materials, which give illuminating geological data about the different stones used. Every little pebble has a history all its own that determines its qualifications for highway work. This Mr. Hubbard explains. With a few statements, however, some engineers might disagree. For instance, in Article 38, he says: "In cases of well known supply [of stone] from which the material has been tested and approved within one year, the preliminary sample may be omitted." But it should be noted that sometimes the quality of the stone varies so in the same quarry that where it is being extensively worked, as many as four samples a year, or even more, have been found necessary. Such differences of opinion of course arise in respect to the matter of any good textbook. No book can be swallowed whole, and no author would wish it to be.

The chapters on bituminous pavement are the best in the book. They omit only a few details—the desirability sometimes found in construction work of a difference in method in preparing the top course stone for the application of asphalt and of tar, the wisdom of putting down a paper lap at joints where the bitumen is poured with a pressure distributor, and the advisability of applying the bitumen to the stone fairly soon after it has been laid—and they contain a mass of material that the inspector will be glad to have at hand. Most valuable are Mr. Hubbard's statements, with the extensive material that he has here collected, upon the proportioning of materials. Anything approaching definiteness on this eluded subject is welcome.

The sections on brick and on cement concrete pavement are less ample than those on bituminous concrete. For instance, the author says that brick should be culled, but he doesn't explain the sprinkling method by which to detect the soft and porous ones. The sections in question indicate less practical experience with these than with other types of pavement, but the theory behind them is sound, and the information compact and helpful. Mr. Hubbard handles so successfully the material that he presents that it may be hoped that future editions will take up the inspection of drainage, curb and gutters, guard rails, riprap, leaching basins, laying of pipe, etc., that are likely often to cause difficulties to the people for whom this book has been written.

Blueprinting Practice

BLUEPRINTING—By John F. Friese, editorial assistant and draftsman, Manual Training Magazine. Peoria, Ill.: The Author. Cloth; 5 x 7 in.; pp. 56; illustrated.

Information on good and bad practice in blueprinting is contained in this book by Mr. Friese, which treats of a subject that is not frequently discussed in a popular fashion. Besides indicating what printing arrangements and equipment secure best results, the author has included valuable cost data in his volume.

Many-Sided Views on Great Problems

MODERN INDUSTRIAL MOVEMENTS (The Handbook Series): Selected Articles Compiled and Edited by Daniel Bloomfield, Author of "Labor Maintenance," Editor Handbook "Employment Management," etc.; With an Introduction by Meyer Bloomfield, Author of "Labor and Compensation," "Youth, School and Vocation," etc. New York: The H. W. Wilson Co. Cloth; 5 x 8 in.; pp. 377.

By using small but legible type the publishers have brought into a single handy volume a large number and variety of utterances on current industrial problems well selected and edited by Mr. Bloomfield. The main subjects represented are the Worker's Co-operative Movement; Syndicalism, Industrial Unionism and the I. W. W.; Shop Stewards; Scientific Management; Guild Socialism; Management Sharing; Bolshevism; Labor Parties; and Industrial Reconstruction Programs. A bibliography and an index have been provided.

The aim of the editor was to select his material so as to give all sides representation. In a number of cases he first gives a basic document—like the I. W. W. Preamble, the Constitution of the Russian Soviet Republic, and the International Charter of Labor—or else historical and expository summaries. Among the authors included are Bertrand Russell, R. F. Hoxie, Louis D. Brandeis, Nicolai Lenin, John Spargo, Maxim Gorky and Samuel Gompers.

The volume is well worth owning and reading by all who wish to have their eyes open as to the great industrial, social, and political movements of the day.

More Efficient State Government

NEBRASKA CIVIL ADMINISTRATIVE CODE: An Act Passed by the Legislature, 1919—Lincoln, Neb.: Secretary of State. Paper; 6 x 9 in.; pp. 461.

RETRENCHMENT AND REORGANIZATION IN THE STATE GOVERNMENT OF NEW YORK: Report of Reconstruction Commission to Governor Alfred E. Smith, Oct. 10, 1919—Albany: The Governor. Paper; 7 x 10 in.; pp. 419; two folding charts in pocket.

Nebraska has consolidated her state departments on functional lines and with an eye to simplicity and economy, all as laid down in the code noted above. Constitutional provisions, it appears from the second of the two volumes before us, leave some nine officers and boards outside the code, but the legislation of 1919 makes the governor the chief executive officer of the state, acting through these six administrative departments: (1) Finance, (2) agriculture, (3) labor, (4) trade and commerce, (5) welfare and (6) works. Each of these departments is in immediate charge of a single administrative head known as a secretary. The act provides for a budget, central purchasing, and a centralized uniform system of state accounting. The Department of Public Works takes the place of the State Board of Irrigation, Highways and Drainage and supervises state construction generally. The health work of the state is entrusted to the Department of Public Welfare.

The report of the New York Reconstruction Commission contains a plan for consolidating the present 187 offices, boards and commissions into 16 departments, mostly single headed. It also provides a budget scheme. Constitutional amendments needed to make possible some of the proposed changes are submitted. The departments of most interest to engineers are public works, conservation, health, and public service, the latter comprising the two utility commissions. The Department of Public Works would include the present state engineer, departments of public works, highways, and architecture, the canal board and various commissions.

Besides the reorganization plan submitted by the Construction Commission the report contains valuable reviews of consolidation of administrative departments and of budget activities in other states, a section on salaries and pensions of state employees and other data. There is also a brief report of an "Engineering Advisory Committee Appointed by Engineering Council," headed by George W. Fuller.

Both the volumes noted will repay close study by all interested in the improvement of our state governments, and which is a matter of deep concern to the large and growing number of engineers engaged in, and more or less directly affected by, state activities.

A Brief Survey of City Planning

NEW IDEALS IN THE PLANNING OF CITIES, TOWNS AND VILLAGES—John Nolen, Town and City Planner. New York: American City Bureau. Cloth; 5 x 8 in.; pp. 138, illustrated.

Mr. Nolen's brief, readable and inspiring outline of city planning is designed for the general reader, but deserves the attention of engineers and architects who wish an introduction to the subject. Some further idea of the character of the book may be gained from Mr. Nolen's statement that it was prepared for the Department of Citizenship, Army Educational Commission, for use overseas. Becoming unavailable for that purpose through the return of the A. E. F., the book was brought out by the publishers named above. At the close of each section well chosen references for the use of those who wish to go deeper into the subject are given.

Changes in "Compressed Air Magazine"

With its January number the *Compressed Air Magazine* appears in changed form, with Francis J. Tietsort succeeding W. L. Saunders as editor-in-chief, and Eugene P. McCorken, recently assistant editor of the *Engineering and Mining Journal*, as managing editor. Frank Richards continues as technical editor and Mr. Saunders is president of the Compressed Air Magazine Co., 11 Broadway, New York City.

PUBLICATIONS RECEIVED

[So far as possible the name of each publisher of books or pamphlets listed in these columns is given in each entry. If the book or pamphlet is for sale and the price is known by the editor the price is stated in each entry. Where no price is given it does not necessarily follow that the book or pamphlet can be obtained without cost. Many, but not all, of the pamphlets, however, can be obtained without cost, at least by inclosing postage. Persons who are in doubt as to the means to be pursued to obtain copies of the publications listed in these columns should apply for information to the stated publisher, or, in case of books or papers privately printed, then to the author or other persons indicated.]

AMERICAN SOCIETY FOR TESTING MATERIALS: Proceedings, 1919—Philadelphia, Penn.: The Society. Cloth; 6 x 9 in.; illustrated. Part I—Committee Reports: Tentative Standards. pp. 799. Part II—Technical Papers. pp. 802; illustrated.

ARCHITECTURAL DRAWING PLATES—By Franklin George Elwood, Head of Department of Architectural and Mechanical Drawing. Vocational School, Mooseheart, Ill.: Peoria, Ill.: The Manual Arts Press. Paper; 8 x 10 in.; pp. 15; illustrated.

Sample details for a house, followed by several floor plans and ending with an example showing how an elevation is drawn from a plan.

CENTRAL ELECTRIC STATIONS IN CANADA—Paper; 7 x 10 in. Part I—Statistics. Ottawa, Can.: Dominion Bureau of Statistics. Pp. 27; illustrated. Part II—Directory, 1919—By J. T. Johnston, C. E., Assistant Director of Water Power. Ottawa. Can.: Dominion Water Power Branch. Pp. 252; illustrated.

DELAWARE STATE HIGHWAYS, The Story of Roads in Delaware from the Days of the "Beasts of Burden" to "The Road to Tomorrow" Prepared and Published by the Clearing House of the Delaware State Program. Dover, Del. Paper; 7 x 10 in.; pp. 53; illustrated.

EXPERIMENT STATIONS OF THE BUREAU OF MINES—By Van. H. Manning. Washington, D. C.: Bureau of Mines. Paper;

6 x 9 in.; pp. 106; illustrated. 25c. from Superintendent of Documents.

HEALTH OF THE TROOPS IN THE UNITED STATES DURING 1918—By Major George A Soper, Sanitary Corps, United States Army. Reprinted from the *Military Surgeon* of October, 1919. Address the Author, 130 W. 57th St., New York City. Paper; 7 x 10 in.; pp. 22.

INDEX NUMBERS AND SCORING OF WATER SUPPLIES—By Abel Wolman. Reprinted from the Journal of The American Water Works Association, Vol. 6, No. 3, Sept., 1919. Baltimore, Md.: The Author, c/o State Board of Health. Paper: 6 x 9 in.: pp. 12; illustrated

INTERNATIONAL ASSOCIATION OF INDUSTRIAL ACCIDENT BOARDS AND COMMISSIONS: Proceedings, 1918—Washington, D. C.: Bureau of Labor Statistics. Paper; 6 x 9 in.; pp. 224. 15c. from Superintendent of Documents.

INTERNATIONAL BOUNDARY BETWEEN THE UNITED STATES AND CANADA: Joint report upon the Survey and Demarcation along the 141st Meridian from the Arctic Ocean to Mount St. Elias—Washington, D. C.: Coast and Geodetic Survey. Cloth; 9 x 12 in.: pp. 305; illustrated.

THE LABOR AUDIT: A Method of Industrial Investigation—Washington, D. C. Federal Board for Vocational Education. Paper; 6 x 9 in.; pp. 47.

The opening sentence states: "A labor audit offers a method for the diagnosis of an organization's labor maladjustments."

MANUFACTURE AND USE OF CEMENT CONCRETE BLOCKS FOR LINING LARGE LIQUID FUEL RESERVOIRS ON THE NORTH WESTERN RAILWAY—By N. Pearce, Assoc. M. Inst. C. E., Executive Engineer. Simla, India: The Railway Board. Paper; 8 x 13 in.; pp. 6; folding diagrams.

MATERIALS AND METHODS USED IN THE MANUFACTURE OF ENAMELED CAST-IRON WARES—By Homer F. Staley, Metallurgical Ceramist, Bureau of Standards. Washington, D. C.: The Bureau. Paper; 7 x 10 in.; pp. 158; illustrated. 20c. from Superintendent of Documents.

MINERAL PRODUCTION OF CANADA—Report, 1918—Ottawa, Can.: Department of Mines. Paper; 6 x 9 in.; pp. 80.

NEW YORK CONSERVATION COMMISSION: Report, 1918—Albany, N. Y.: The Commission. Cloth; 6 x 9 in.; pp. 426; illustrated.

NORMAL PRECIPITATION IN UTAH—By J. C. Alter. Reprinted from "Monthly Weather Review," Sept., 1919. Washington, D. C.: Weather Bureau. Paper; 9 x 12 in.: pp. 4; illustrated.

THE PRIMARY AND SECONDARY ROAD LAWS OF IOWA: Chapter I—Procedure by Board of Supervisors, Under Primary Road Law; Chapter II—Statement of Condition of Primary Road Fund, April 19, 1919—Ames, Iowa: State Highway Commission. Paper; 9 x 12 in.; pp. 79.

PRINCIPLES OF GOVERNMENT PURCHASING—By Arthur G. Thomas. New York and London; D. Appleton & Co. Cloth; 6 x 9 in.; pp. 273. $3.

THE PRODUCTION OF COAL AND COKE IN CANADA, 1818—By John McLeish, B.A., Chief of the Division of Mineral Resources and Statistics, Ottawa, Can.: Department of Mines. Paper; 6 x 9 in.: pp. 40.

PUBLIC HEALTH WORK IN INDIA—By Harry N. Jenks, B. S. Assistant Engineer, California State Board of Health. Reprinted from "American Journal of Public Health," Vol. IX, No. 11. Paper; 7 x 10 in.; pp. 16; illustrated.

The first of the papers reprinted is entitled "The Caste System and the Sanitary Problem," and the second "A Review of the Nature and Progress of Sanitation." Mr. Jenks was recently sanitary engineer for a mining company in India, and contributed articles on his work there to *Engineering News-Record* of Jan. 23, 1919.

A READING LIST ON INDUSTRIAL RESEARCH: Reprinted from "Special Libraries," Jan., 1920. Bibliographic Series No. 3. Arthur D. Little, Inc., Chemists and Engineers, Cambridge, Mass. Paper; 6 x 9 in.; pp. 10.

REPORT OF PROGRESS IN WARM-AIR FURNACE RESEARCH—By A. C. Willard (This Bulletin is the First of a Series on Warm-Air Furnace Research.) Urbana, Ill.: Engineering Experiment Station of the University of Illinois. Paper; 9 x 12 in., pp. 134; illustrated.

REPUBLIC OF CHINA: Statistics of Government Railways, 1918—Peking, China: The Ministry of Communications. Paper; 9 x 12 in.; pp. 134; illustrated.

STATE HIGHWAY COMMISSION OF NORTH CAROLINA: Biennial Report, 1917-18—Raleigh, N. C.: The Commission. Paper; 6 x 9 in.; pp. 86; illustrated.

STATISTICS OF CITIES AND TOWNS OF IOWA: Report on Municipal Finances for the Year Ending March 31, 1919—Frank S. Shaw, Auditor of State. Des Moines, Iowa: The Auditor. Cloth; 6 x 9 in.; pp. 270.

Contains a wide range of financial and physical statistics for all of the 105 cities and for 714 of the 788 incorporated towns of the State and the names of mayors, clerks and treasurers. Water-works and some other utilities are covered and salaries of the various officials are given.

TECHNISCHER LITERATUR-KALENDER, 1918—Mundhen, Berlin: Verlag von R. Oldenbourg. Cloth; 6 x 9 in.; pp. 610.

A well-arranged "Who's Who" of German authors and editors in the field of engineering and closely allied subjects.

UNION SCALE OF WAGES AND HOURS OF LABOR, MAY 15, 1918—Washington, D. C.: Bureau of Labor Statistics. Paper; 6 x 9 in.; pp. 295. 25c. from Superintendent of Documents.

Many figures are given for building and other trades in various cities and there are summaries comparing the 1918 figures with those of earlier years.

WHAT OF THE CITY?: America's Greatest Issue—City Planning, What It Is and How To Go About It To Achieve Success—By Walter D. Moody, Managing Director, Chicago Plan Commission. Author of "Wacker's Manual of the Plan of Chicago," etc. Chicago, Ill. A. C. McClurg & Co. Cloth; 5 x 8 in.; pp. 441; Illustrated. $2.50.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

A. A. E. Should Handle Non-Technical Work of Federated Engineering Societies, Says Secretary

Sir—A debatable question no longer exists as to whether engineers of the country should get together in furtherance of their non-technical interests. The attitude everywhere is not whether, but how shall this end be achieved? Some engineers evidently think that a sort of super-organization of the founder societies should be brought into existence, or perhaps a federation of all societies, but an increasing number are coming to the conclusion that the end will be best accomplished by using the well tried machinery at hand, designed for this purpose, namely that of the American Association of Engineers.

A striking omission occurs in the report of the Joint Conference Committee of the older societies, one which by its absence attracts comment throughout the rank and file of the profession; namely, the neglect to refer to the fact that the work proposed to be done has already been undertaken and is well advanced by the American Association of Engineers, with a membership now larger than that of any other national society. From all parts of the United States is coming the question, "Why has the Joint Conference Committee's report been silent on this vital question?"

In answer to this question and in the firm belief that the rank and file of the profession are waiting for such an announcement, the Secretary of the American Association of Engineers on Dec. 20, 1919, addressed the following letter to the governing bodies of the founder societies:

"The development of the opinion in the founder societies in favor of giving attention to the non-technical side of the engineer's life has led several members of each to ask the American Association of Engineers to write simultaneously to the governing bodies of these societies offering its service in problems of public and professional welfare and asking their co-operation.

"We have read the report of the Joint Conference Committee and believe that the American Association of Engineers, a successful going organization, is capable of carrying forward the non-technical activities recommended in the report fully as well and perhaps better than the organization recommended by the conference report.

"The activities of A. A. E. are confined to social and economic problems such as legislation, employment, compensation, political and civic endeavor. A. A. E. takes in everyone of good character in the engineering profession and seeks to mobilize all engineers for joint action. It gets its support from the man back home without any intermediate representation so that it is able to do the things that lie close home and that make living as an engineer worth while.

"If the founder societies elect to co-operate with A. A. E. in the work it is doing and in similar non-technical activities, it would be our understanding that such support would not be financial and would in no way interfere with present prerogatives and privileges of the founder societies.

"This letter has been approved by our Executive Committee at its meeting Dec. 20, 1919. We are enclosing copy of our constitution for convenient reference."

Let us have full discussion. The great body of engineers who have given the matter thought evidently believe that the ends to be attained from the human side must be reached by a strong, well built and thoroughly democratic organization, devoted exclusively to these ends and organized for effective action in ways which the men of experience in human and political activities have found to be most effective. On the other hand, they feel that the purely scientific societies, organized for the investigation of natural phenomena and their application, which elect for their officers men distinguished by research and technical achievement, cannot by mere federation and delegation of power through complicated machinery achieve important results for the welfare of engineers as men and citizens.

Are you in favor of unity along the lines of the above letter? If so, write the editor of this paper, sending copies to the Secretary of the national technical society of which you are a member, and to the Secretary of the American Association of Engineers.

C. E. Drayer,
Secretary American Association of Engineers,
Chicago.

Street Snow Removal Problems

Sir—In your issue of Jan. 29, p. 221, the article on "Rotary Snowplows Clear Streets in Canadian Cities" contains some interesting statistics regarding the cost of removing snow. It brings to my mind the importance of giving sufficient detail for an intelligent comparison of the costs of snow removal. Unlike other substances that require disposal by moving, snow varies widely in weight, and it is weight that is of first importance in comparing costs of snow disposal.

A common nomenclature for reporting snow precipitations should be adopted. I suggest the following method for reporting snow falls: Let a 6-in. snow fall, weighing say 8 lb. per cubic foot in its natural precipitated state, be reported as a 6-in.-8-lb. snowstorm. Shrinkages cannot be properly taken into account without a knowledge of the depth and weight. Temperatures preceding a storm and during the time of disposal should be recorded at frequent intervals.

As for the problem in general: There seems to be a misconception as to whether time or cost is the more important in any system or device for snow disposal. The value of time in dollars depends on local conditions, and is a much involved item. If all the money necessary for keeping a street free from snow is available, and it takes a week and in most cases longer to get to the street to clean it, the money spent there is small compared to the amount that would be justified if it were possible to clean the street within 24 hours.

For any snow-disposal system or device to be practical, it must embody absolute availability in time of need, without dependence on large numbers of laborers or mechanics; be quick in its action so as to save time, and economical, so as to justify the investment for its installation. Any system that falls short of these requirements does not justify its installation.

The probable availability of any system for snow disposal must be considered with due regard to the problems the system itself introduces. If the system depends upon its functioning on labor, skilled or unskilled, there must be assurance that it will be available in time of need. If the system depends upon fuel and labor, it must be certain that the fuel can be delivered during or following a storm, under the severe conditions the system is trying to remedy.

To have melting machines in numbers sufficient to handle a storm, without being able to distribute them in times of need, or not having labor or fuel to keep them going, would be a calamity, inasmuch as the dependence placed upon the machines precludes making other arrangements to handle the snow.

This vital problem is still the same old annual sore spot, except that it is more acute now than ever because of the labor shortage, and unless it is solved soon along lines where labor is not the predominating factor it promises to surpass the worst that has yet visited New York City.

L. Davidson,
Civil Engineer.
New York City.

[Observers of the U. S. Weather Bureau now report both the depth in inches and the water equivalent of freshly fallen snow, but surveys of snowfall in the streets are not made. Apparatus devised by the Weather Bureau for obtaining snow densities by direct reading was described, with historical notes on its development, by B. C. Kadel in the "Monthly Weather Review" for October, 1919. It appears that this apparatus has been used only now and then in cities, but for some years past it or similar devices have been employed in snow surveys over wide areas in the Far West. (See *Engineering News*, May 29, 1913, p. 1110, and *Engineering News-Record*, Oct. 23, 1919, p. 767). These samplers consist of a graduated sampling tube with a cutter on the lower end and a spring balance giving water equivalent depths. In the "Monthly Weather Review" article cited above, tubes with inner diameters of 1.5 to 5.94 in. are described, but Mr. Kadel's latest design shows a diameter of 2.655 in. The tube described in our issue of Oct. 19, 1919, p. 766, has a diameter of 1¾ in. with a 1½-in. cutter. In the Western surveys the density of compacted rather than newly fallen snow is desired and far greater depths are observed than would be encountered in city streets.

If officials concerned with snowfalls in cities were to unite in a request to the U. S. Weather Bureau for density measurements of freshly fallen snow it seems probable that they would be made and reported hereafter.—Editor.]

Some Fundamentals of Tainter Gate Design

Sir—The writer, in the few designs he has made for tainter gates, has been confronted by a lack of literature on the subject. If such data is existing or not, a discussion may help either to learn its whereabouts or to bring out new ideas.

In this connection, the writer is ready to start what he hopes will be a discussion by making some statements relative to his experience. They are as follows:

1. In most cases, the economical length of gate seems to be about 25 ft.

2. A very good radius (outside face of lagging to center line of pin) lies between 16 ft. and 18 ft.

3. The pin should be in the same horizontal plane as normal head water.

4. The timber lagging (or the steel skin plate, if timber is not used) should extend about 2 ft. above normal head water.

5. The gate arms should parallel the pier sides, the center line of arm being not more than 6 in. out from face of pier. (A notable instance to the contrary is at Badin, N. C., where the tainter gate arms are formed of a pencil of angles running from the pin at an angle with the pier face to about the quarter point of the gate span.)

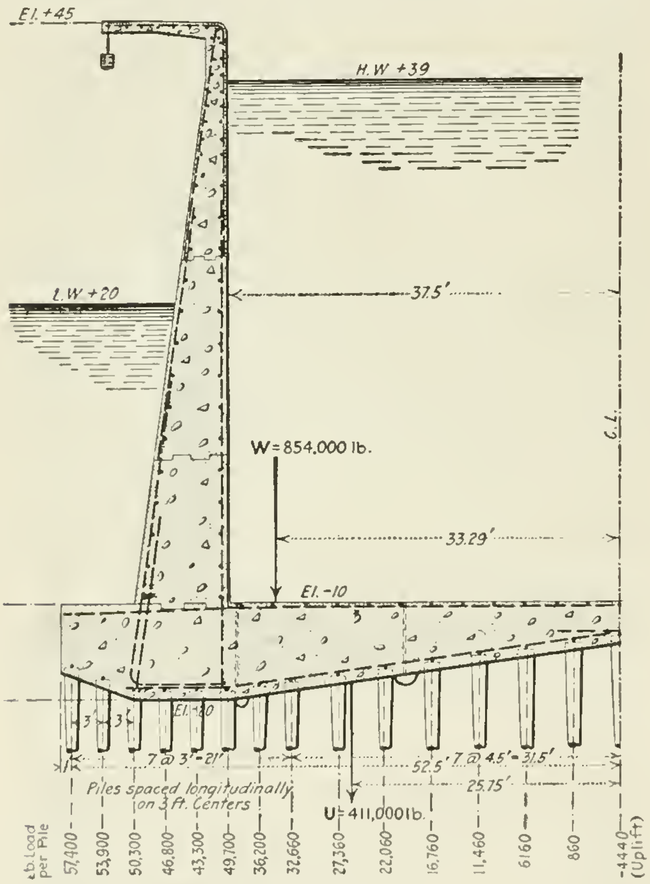
6. A very good seal between the spillway and the gate is formed by fastening a toothed plate onto the top of the timber which is embedded in and runs along the spillway crest. When the gate is closed, the teeth engage a timber attached to the bottom of the gate.

7. Between the gate and the pier sides, the usual seal of rubber belting pertains. **Austin H. Reeves.**

Charlotte, N. C.

Pile-Load Distributions Under a Lock

Sir—The problem of spacing piles to take care of eccentric loading, discussed in *Engineering News-Record,* Oct. 9, 1919, p. 698, by Edward P. Arneson, is similar in principle to one met in designing the base slab of different portions of the reinforced-concrete lock for the New Orleans Inner Harbor Navigation Canal. Here, however, the base was so wide and the number of cases of design gave enough variation in pile loads so that the spacing used was nearly uniform. The following method was used to insure against overloading the critical piles. The figures are taken from the design of the portion of the lock known as the light section.



DISTRIBUTION OF PILES UNDER HALF OF LOCK AT NEW ORLEANS

One-half of this structure is assumed to act independently, except that thrust meets thrust in the center at El. —12.0. Under this assumption, and assuming high water in lock, we have for 3 ft. length 53.5 ft. wide a weight of 854,000 lb., the resultant being located at a point 33.29 ft. from the center line of the lock. This force is met by 14½ piles, spaced as shown on the drawing. For greater convenience in computing, the outer pile, 52.5 ft. from the center, is taken as the reference pile, and its load is taken as *P* lb. A constant negative increment of *f* lb. per ft. for each pile is assumed as the second unknown, so that the load on a pile *n* feet distant from reference pile is *Pnf*. The moment computed about the reference pile is 19.21 × 854,000 or 16,405,000 ft.-lb. Deducting buoyancy, 53.5 × 3 × 40 × 64 or 411,000 lb. acting 25.75 ft. from this reference pile, we have remaining a force of 443,000 lb. and a moment of 5,921,000 ft.-lb. to be met by the piles alone.

Then by the arrangement of figures in the accompanying tabulation the equations of equilibrium are easily found. The first column contains the number of piles at each point; the second, this number times the distance from reference pile; the third, this number times the square of the distance.

1	0.0	0.0
1	3.0	9.0
1	6.0	36.0
1	9.0	81.0
1	12.0	144.0
1	15.0	225.0
1	18.0	325.0
1	21.0	441.0
1	25.5	650.25
1	30.0	900.0
1	34.5	1,190.25
1	39.0	1,521.0
1	43.5	1,892.0
1	48.0	2,304.0
½	26.25	1,378.12
Totals, 14.5	330.75	11,095.87

From these totals and the previously obtained load 443,000 lb. and moment 5,921,000 ft.-lb. we write the two equations:

$$14.5P - 330.75f = 443,000$$
$$330.75P - 11,095.87f = 5,921,000$$

Solving we have $P = 57,400$

$f = 1,178$

This gives pile loads starting at the left at 57,400 lb. and diminishing, as shown in the drawing, by decrements of 1,178 lb. per ft. to an uplift of 4,440 lb. at the center pile. **Marshall G. Findley,**

Asst. Designing Engineer Board of Commissioners of the Port of New Orleans.

Forest Snowfalls and Runoff

Sir—J. C. Stevens discusses in *Engineering News-Record,* Jan. 15, p. 150, the effect of forests upon watershed yield, stating that such areas dissipate a greater proportion of the snowfall than do open fields, this conclusion being based upon "snow densities" as given in your issue of Oct. 23, 1919.

Several reasons suggest themselves as to why snow from open fields might be found to have a greater water content than an equal depth of snow in a forest. That, however, can hardly be considered a reason for assuming that the evaporation from the forest area had been greater than the evaporation from the open field. Considerations other than the water content of the snow in the two areas, may have a decided effect upon this problem, as, for instance, the summer evaporation and the transpiration from grasses and trees, also the rate at which the snow gives up its moisture, either to the ground or to streams. **T. DeL Coffin,**

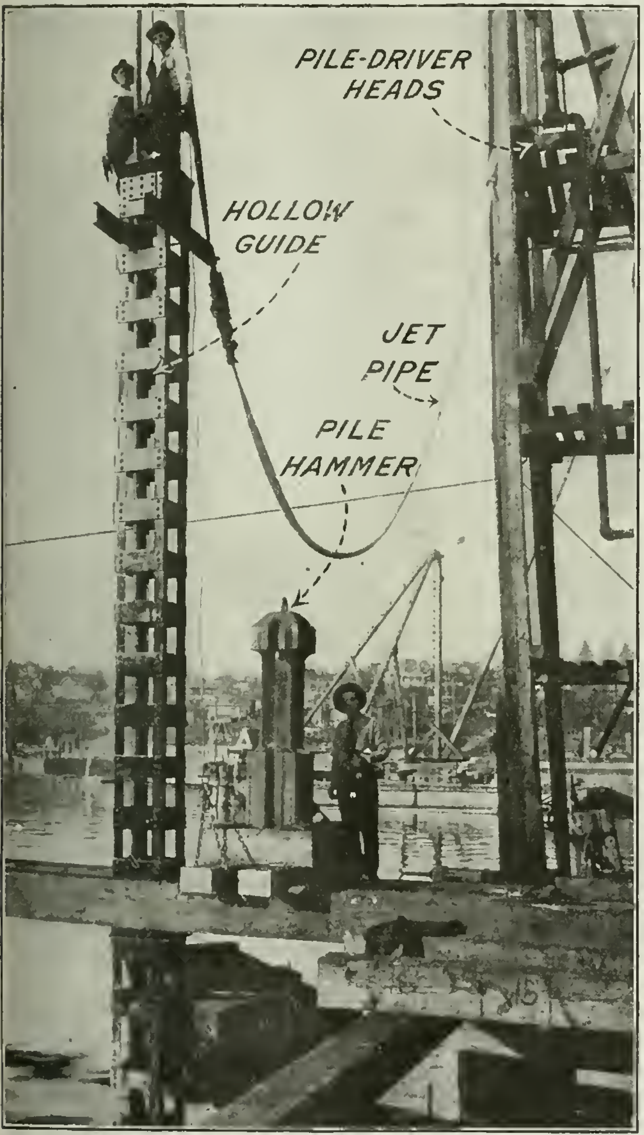
Katonah, N. Y. Civil and Sanitary Engineer.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Drop Hammer Works Under Water on Bridge Foundation Piles

IN DRIVING piles for the foundation of the bascule bridge carrying Eastlake Ave. over the Lake Washington canal at Seattle, Wash., the drop hammer was lowered under water instead of being kept above the surface by placing a follower upon the pile head. This method was adopted by the contractors as being less expensive than the use of a follower in deep water and the apparatus was similar to that which had been used in foundation work along the Atlantic coast.



DUMB-BELL PILE HAMMER IN HOLLOW GUIDE WORKS IN DEEP WATER

A hollow guide for the drop hammer was built up of four corner angles with bottom plates on the four sides, leaving about 60 per cent of the area open, as shown in the accompanying view. The 5,400-lb. hammer was made specially to fit in this hollow guide and was provided with grooves on the opposite sides to accommodate the jet pipes inside the guide. This hammer was dumb-bell shape, with an enlarged section at top and bottom connected by a smaller shank. The maximum depth of water over the pile heads when driven was 3.8 ft.

About 676 piles were driven in this way, ranging from 28 ft. to 62 ft. a length. After excavation of the site by a suction dredge it was enclosed by a line of piles with caps, on which were laid out intersecting range lines to indicate the location of the foundation piles. Timber stringers supported the piledriver, the hollow guide being held rigidly between these stringers with its lower end close to the bottom of the footing. This was done under the direction of A. H. Dimock, city engineer, and F. A. Rapp, city bridge engineer. The contractors were Booker, Kiehl & Whipple, Seattle.

Publicity for the Contractor

A NEW idea in publicity for construction work has been instituted in the building of an extension for Selfridge's, the large American department store in London. A gangway is laid across one end of the excavation and the public is invited to pass over and view the foundation work. To assist the non-technical man in comprehending what he sees, all the machinery is labelled conspicuously: "concrete mixer," "crane," etc. This is in decided contrast to the more usual practice of putting up a tight fence and leaving a more or less curious public to peep through occasional and unsatisfactory knot holes. The publicity idea has elements of value to the contractor and—in this case—to the owner also, who instituted it to advertise his store and its activities.

Night Road Work Successful with Artificial Light

CARBIDE lights set on posts 4 ft. high spaced about 100 ft. apart, enabled night construction at reduced cost on the Hancock-Dollar Bay highway in northern Michigan. Construction began July 23 and as after Aug. 1 in this latitude night frosts are frequent and the warm hours during the day when tarring is possible are few, it was determined to employ night shifts so as to complete the work before cold weather. The shifts arranged were 4 a.m. to 1 p.m., 1 p.m. to 10 p.m. and 10 p.m. to 4 a.m. There was darkness only during the night shift and then for only four hours when artificial lighting was necessary. The construction was penetration macadam, 15 ft. wide in a 3-in. excavation on a 24-ft. roadbed. The night shift was employed exclusively in handling stone by motor truck and spreading it, and the force consisted of three trucks and drivers and one man helping to dump and spreading. The trucks averaged about seven loads each per shift with a four-mile haul. The carbide lights arranged as stated were moved along as the stone laying progressed. There was no traffic to interrupt, and T. A. Coon, engineer, Houghton County, states that the efficiency of the men on the night shift was greater and the unit cost less than with daylight work. So successful was the night work that it will be employed during 1920 wherever the occasion arises.

NEWS OF THE WEEK

New York, February 19, 1920

Senate Committee Considers National D. P. W. Bill

Members Express Keen Interest in the Arguments Advanced by Prominent Engineers in Hearing

(Washington Correspondence)

Supporters of the Department of Public Works bill are greatly encouraged by the friendly attitude of members of the Senate Committee on Public Lands by whom they were given a hearing Feb. 11. At the outset the members of the committee were rather apathetic but the interest increased as the hearing progressed. At its close Senator Norris, who was presiding in place of Senator Smoot, the chairman, stated frankly that the proposition had aroused the keen interest of the committee. He spoke favorably of the spirit of the men who appeared before the committee and of their very evident self-sacrifice in their efforts to secure the legislation.

The committee seemed to be impressed with the character of the bill's proponents present, a list of whom is as follows: M. O. Leighton, chairman, National Public Works Department Association; J. Parke Channing, New York City, chairman, Engineering Council; Prof. G. F. Swain, member of faculty, Harvard University; F. L. Cranford, president, General Contractors' Association; F. M. Gunby, formerly Colonel, Construction Division, U. S. A.; Charles Whiting Baker, consulting editor, *Engineering News-Record;* Francis Blossom, formerly chairman, War Department Board of Review of Construction; Charles W. Whittaker, editor, *Journal*, American Institute of Architects; Dr. W. F. Willoughby, director, Institute for Government Research; Major C. T. Chenery, secretary, National Public Works Department Association; and Philip N. Moore, past-president, American Institute of Mining and Metallurgical Engineers.

MEANS OF REDUCING APPROPRIATIONS

Mr. Leighton made the introductory statement to the committee, reciting the well-known arguments for the creation of a National Department of Public Works. He emphasized the importance of such a creation in the interest of administrative economy. He named it as one of the most effective ways to reduce appropriations. Mr. Channing pointed out that public works are strictly technical in character and require the services of skilled personnel for their efficient construction and operation. Prof. Swain argued

(Concluded on page 396)

New York Snow-Bound

The pictures on the opposite page, taken a week after the first fall of snow, give an idea of how the recent storm in New York City paralyzed traffic. Shortage of emergency labor to supplement the regularly employed forces of the Department of Street Cleaning delayed the clearing of the streets and caused a complete shutdown of the street railway lines. Traffic difficulties were caused chiefly by the fact that the snow packed down and froze into a thick ice layer, which, under the influence of traffic and periodic thawing spells, developed pot-holes or craters such as those shown in Photo 11. Thousands of motor and horse-drawn vehicles were stalled when their wheels sank into these deep, icy pits.

A novel sight was presented by a traction excavator used by the Anoroc Engineering & Contracting Corporation for loading snow onto motor-trucks. Photo 8 shows this Keystone grading rig with ½-cu.yd. skimmer bucket at work on Broadway near 14th St. It handled the snow effectively, but was not supplied with enough trucks to enable it to work to capacity. Delays of half an hour between the departure of a loaded truck and the arrival of an empty were observed. The output was 272 cu.yd. on the first day; this was increased to a maximum of 439 cu.yd. on Feb. 14.

Great numbers of horse-drawn vehicles were on the streets after the storm. Many were pulled by four and some by six-horse teams.

The removal of snow from the streets proceeded very slowly. Sewers were employed to some extent for disposal, but the progress as a whole was not rapid enough to offer much relief to the almost complete traffic tie-up which extended over a period of many days.

Some phases of the traffic and snow problems are discussed in an editorial on another page.

Montreal Water-Works Strikers Return to Work

The union employees of the Montreal water-supply plant who went out on strike Jan. 1 have effected a reconciliation with the Administrative Commission of that city and returned to their posts at the several pumping stations. Each side made concessions. The men agreed to have their wages adjusted by a committee and to resume work pending the adjustment. The men are to be paid according to a scale of wages equaling that paid for similar work by private corporations.

Military Engineers' Society Is Being Organized

Association of Technical Men With Service in Any Branch of the Army Is Approved by Chief of Staff

A national association of present and former officers of engineers and civilian engineers who have served in any arm or branch of the U. S. Army—Engineers, Ordnance, Signal Corps, Infantry, Cavalry, Artillery, etc.—to be called the Society of American Military Engineers, is being organized by a committee in Washington, appointed by the Chief of Engineers. The society's objects are to promote the science of military engineering and to foster the co-operation of all arms and branches of the service, and of civilian engineers, in that science. The objects and a provisional constitution of the society have been approved by the Chief of Staff.

A board of engineers was appointed Nov. 1, 1919, by the Chief of Engineers to consider and report on the feasibility of a technical organization of officers and civilian engineers experienced or interested in military engineering. At the same time the Chief of Engineers required a letter-ballot for or against such an organization from all Corps of Engineers officers and temporary engineer officers then in the service. The vote was overwhelmingly in favor of the proposed society.

The board then resolved itself into a Committee on Organization. Its members are: Colonels F. V. Abbott, Charles Keller and G. A. Youngberg; Majors George B. Pillsbury, George R. Spalding, P. S. Bond, Max C. Tyler, John C. Kingman and David McCoach, and Captain Douglas L. Weart.

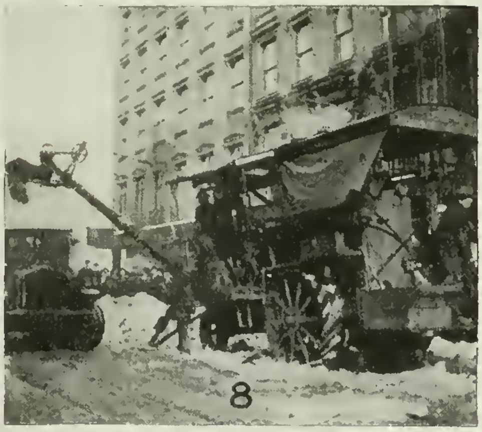
CONSTITUTION IS DRAFTED

Following a canvass of representative opinion which showed reserve officers and others who had been in the engineering service during the war to be strongly favorable to such an organization, the committee drafted a provisional constitution and created a temporary board of directors from its membership. This constitution is already being submitted for approval or comment to individuals who are known to be interested in the organization and eligible to membership; its more important features follow:

The annually elective officers are to be a president and first and second vice-presidents. The president is to be an officer of the Corps of Engineers on the active list. There is to be a secretary, an editor and a treasurer chosen by an executive committee, the first two from the Regular Army. A board

(Concluded on page 396)

The Aftermath of New York City's Big Snow Storm



1. Traffic Jam on West St., near Waterfront. 2 and 3. On Lower Broadway Four- and Six-Horse Teams were Needed to Move Trucks. 4, 5 and 6. Street Railway Slots, Choked with Ice, Had to Be Cleaned Before Abandoned Cars Could Be Operated. 7. Showing Thickness of Ice Layer. 8. Steam Shovel Loading Snow on Motor Truck on Broadway. 9. Truck Stalled by wheel in Crater. 10. Too Deep for Traffic. 11. The Reason Why Traffic Was Tied up. 12. Long Traffic Line Stalled in Lower Broadway.

Military Engineers' Society Is Being Organized

(Concluded from page 394)

of directors, to have eighteen members, is to be elected by the three divisions of active membership, as follows: six by the Regular army; six by the National Guard and reserve forces, and six from the membership, exclusive of the foregoing two groups. There is to be an executive committee consisting of the president, the two vice-presidents, and not to exceed three others, to be elected annually by the board of directors from its own members. Other standing committees are: Rules and Ethics; Auditing; Finance; Membership, Nominations and Necrology; Service Relations and Military Policies.

The annual meeting is to be held in Washington, and its date is fixed with reference to that of the American Society of Civil Engineers in order to make possible attendance of members at both meetings. The dues are fixed not to exceed $5 per year, those for the present year being $4.50.

The society is to publish bi-monthly a journal to be called *The Military Engineer*, which will supplant *Professional Memoirs*, heretofore published by the Corps of Engineers.

Further information regarding the society may be secured from Col. G. A. Youngberg, office Chief of Engineers, Washington, D. C.

Senate Committee Considers National D. P. W. Bill

(Concluded from page 394)

that the legislation being sought is in the interest of the public as a whole and that engineers, as such, will not be the chief beneficiaries. He made the point that, with the Government spending $788,000,000 on public works, such great activity along one line should be grouped under one head who, as the bill specifies, is to be a man of requisite training and experience. He stated that he is a great admirer of the Engineer Corps of the Army and in its own interest would like to see river and harbor work taken from it. Senator McNary of Oregon expressed the fear that the making over of the Interior Department into a strictly engineering activity would subordinate to an undesirable degree the department's administration of the public domain.

Mr. Cranford told the committee that the bill has practically the undivided support of all the contractors in the country. Much of the engineering work done by the Government at present, he said, shows a lack of foresight which he charged largely to the lack of co-ordination between the bureaus. This called forth an interjection on the part of Senator Norris to the effect that the present departmental grouping of bureaus seems to have been brought about by nature rather than by man. Mr. Cranford said that the head of the projected Public Works Department would have a bird's-eye view of all engineering plans and requirements and could conduct these important Governmental activities with the necessary vision. Arguments presented by Col. Gunby advocated the placing of such activities as are at present included in the Construction Division of the Army under the proposed new department.

INTERESTS OF ARMY ENGINEERS

Mr. Blossom read into the record a portion of his final report to the War Department, in which he urged the Secretary of War to support the Public Works Department idea. During Mr. Blossom's testimony Senator Kendrick suggested that the legislation could be obtained so much easier if the Interior Department could be divided into two divisions, one of the divisions to be a public works division. To this suggestion Mr. Leighton replied that there would be so little left for the other division as to give no advantage in such a separation while it would interfere with the plan for straight-line control of the engineering bureaus by a man who thoroughly understands engineering.

Mr. Baker called attention to the fact that the bill enables officers of the Corps of Engineers to be detailed to service in any bureau of the Department of Public Works. They would thereby receive a varied experience which, he asserted, would fit them far better for military service in time of war than does their present work on river and harbor improvement. It was recalled by Mr. Baker that when the army engineers were originally placed in charge of navigation works they were practically the only engineers available, for West Point was then the principal and almost the only engineering school in the United States. He went on to show that at the present time, however, there is a multitude of engineering colleges which give a far better training in engineering than does West Point. The United States should have the ablest engineers from these schools for its public works, he maintained, and should so utilize its military engineers that they may become best fitted to render useful service in time of war

Train Wrecks St. Louis Viaduct

A pullman car in a train running at a speed of 25 mi. per hour toward the Union Station in St. Louis, Mo., at 2 p.m., Feb. 12, was derailed at a switch when about to pass under the 14th Street viaduct and knocked out a column of the structure. The viaduct, bearing a street car with several passengers, dropped 10 ft. to the roofs of the cars on the tracks below and rested there. The structure is nearly 300 ft. long; the length of the sag was 110 ft. Eight persons in the street car and one in the pullman were slightly injured.

Wood Preservers Adopt Fir Paving Block Specifications

More than 200 engineers, officials of railroads and companies interested in the preservation of wood by chemical treatment attended the 16th annual meeting of the American Wood Preservers Association Feb. 10, 11 and 12 in Chicago. The necessity of financing a campaign of education on approved methods of laying wood-block paving was one of the most important items in the address of the president, J. B. Card. Only Minneapolis and a few other cities had changed over to specifications adopted by the association last year which call for a pitch-paint coat on top of the concrete base instead of sand or dry mortar. Mr. Card's opinion was that a fund of at least $25,000 can be raised for such educational work. Details are in the hands of the executive committee.

It was established that wood-block pavement can be constructed between street car tracks although its reputation for good practice has suffered much from lack of information on the part of the builders as to the requirements of rigid foundation and of laying on a thin bituminous cushion. A specification embodying these principles was presented for information only by the committee on wood-block flooring and paving.

The specifications presented and adopted for the treatment of Douglas fir blocks brought out a discussion of the difficulties encountered in St. Louis last summer due to excessive contraction during an unusual period of hot and dry weather. Dr. Herman Von Schrenk stated that the details would soon appear in a paper by W. W. Horner in *Engineering News-Record*. E. M. Blake, who acted as sponsor for the specifications, stated that they were adopted by the best informed experts and users on the Pacific Coast and the moral support of the national organization was desired to insure their acceptance by municipalities. Pertinent clauses call for the treatment of either seasoned or green wood, according to climatic conditions, by the vacuum boiling method. Some objection was made that the Association already had a standard "boiling" method with which this might conflict.

Other features of interest to engineers in the program were: The records of long-time service of piles in a wharf in San Francisco Bay; the progress obtained by the use of perforating machines in making uniform the penetration of treatment on Douglas fir; a discussion of the relative value of various methods of tie separation; the detrimental effect of an unusually hot and wet season on the extraordinarily large cut of sap pine ties in the Southwest; and a tie renewal record of the D., L. & W. R.R.

The Forest Products Laboratory has built up a mass of service test records of ties and a catalog of these tests showing the kinds of wood, preservation and absorption has been printed by the association. Details of any set of tests with results continually being brought down to date may be obtained from the laboratory.

Specifications adopted at annual meetings have always carried the proviso that the measure must go to letter-ballot for final official approval. By the constitution a two-thirds positive vote of the whole corporate membership is necessary. In consequence of this restriction no measure has yet been finally approved, although many have received much more than a majority. Amendments were adopted making final action contingent on a two-thirds affirmative vote of those voting.

The officers elected for the ensuing year are as follows: A. R. Joyce, president; C. M. Taylor and V. K. Hendricks, vice-presidents; F. J. Angier, Baltimore, secretary-treasurer. The 1921 meeting will be held in San Francisco.

Bills to Aid Assistant Engineers on River, Harbor Work

Two bills relating to the United States Assistant Engineers engaged on river and harbor work have been introduced in the House of Representatives. One provides for making these civilian assistants commissioned officers of the army; the other bill continues their civilian status but provides an increase in salaries and provision for retirement. There seems little prospect that either of these bills will be pressed for passage. There is no doubt whatever that the United States Assistant Engineers have for many years been paid wholly inadequate salaries and have held no standing proportionate to their responsibility. There is hope now of remedying this long standing evil, through the passage of the pending Jones-Reavis bill establishing a Department of Public Works, which would take over the work on rivers and harbors now under direction of the Corps of Engineers. These civilian assistants would doubtless be transferred to the new department. Their long experience would be utilized, and there is every reason to believe would be recognized by adequate compensation.

Illinois Drainage Conference

The third annual conference on land drainage, organized by the University of Illinois, will be held at the university on March 16-18, and is intended to bring together engineers, attorneys, contractors, landowners and others interested. It is planned to have specific sections of the State of Illinois dealt with at certain sessions in order to provide for the presentation of local problems. Among the general subjects to be considered are the straightening of river channels, the organization of drainage districts and the protection of bottom lands by levees. G. W. Pickels, Urbana, Ill., is chairman of the conference.

Resolution Against Architect as Bridge Designer

Additional engineering opinion concerning the Pennsylvania Art Commission's claim that an architect rather than an engineer should design the proposed Delaware River bridge at Philadelphia was expressed in a recent resolution of denial by the Philadelphia Association of Members of the American Society of Civil Engineers. It was further voted at the meeting to take up with the Engineers' Club of Philadelphia, and other engineering societies, the appointment of a committee to place before the proper authorities the desirability of appointing a competent civil engineer to design and build the bridge.

Without the preamble the association's resolution is quoted:

1. This association reiterates its judgment as expressed in a resolution adopted Nov. 24, 1919, that "safety to human life and the proper expenditure of public funds require that the design and erection of such structures be under the responsible charge of competent and experienced civil engineers, especially skilled and trained for that class of work."

2. This association desires to see full consideration given to the proper placing and the aesthetic treatment of the Delaware River bridge by a qualified architectural consultant, or consultants, preferably chosen by, but certainly responsible to the Chief Engineer, who alone can finally harmonize the claims of beauty and art with the primary necessities of structural safety and reasonable cost.

Denver Commerce Body To Study Water-Meter Proposal

A committee has been appointed by the Denver Civic and Commercial Association to investigate the merits of a proposal that water meters be installed by the Municipal Water Commission. So long as the water system was in private ownership the question was never brought up, although the company officials had exhaustive studies made of the effect which a restricted use of sprinkling would have on lawns. During the summer of 1919 Boy Scouts were employed to patrol certain sections and report consumers sprinkling outside of the restricted hours.

Believed Beach Will Support Big River, Harbor Appropriation

(*Washington Correspondence*)

General Lansing H. Beach, recently confirmed as Chief of Engineers, has arrived in Washington and has taken up the active discharge of his new duties. It is believed that General Beach will stand strongly behind Colonel Harry Taylor in insisting that $19,000,000 for improvements and $5,000,000 for maintenance constitute an irreducible minimum for river and harbor appropriations.

Road Builders Discuss Only Highway Fundamentals

Small Attendance at Annual Convention Most Concerned With Elementary Factors of Construction

Emphasis of the fundamentals of highway design and construction was the outstanding feature of the annual convention at Louisville, Ky., Feb. 9-13, of the American Road Builders' Association. In many of the papers presented, but more especially in the discussions from the floor, the elementary factors of alignment, width, gradient and permanent foundation construction with thorough drainage as the vital requirement, were given prominence. This lifting of essentials of good highway engineering into clearer view, above the fog of discussion about road surfaces, did much toward justifying a meeting which, in many respects, was a failure.

There was a small and unrepresentative attendance of highway engineers and contractors. Scarcely a hundred of both were present and from whole sections of the country there had not come a single highway official of first importance. Attendance at the sessions was small. Sometimes there were a hundred members and visitors in the convention hall, but more often only half of that number were present. A considerable percentage of the papers listed were not read, as their authors were not present. Many others were presented in incomplete form. Some had not been written and oral summaries were substituted by the authors. The equipment exhibition was representative, was fairly extensive, was attractively arranged and was displayed by skilled demonstrators. It had very few visitors.

Highway Fundamentals

Prompted by papers by H. G. Shirley and W. G. Thompson on the subject of fundamentals in modern highway construction there was an active discussion of line, width, grade, and foundation construction which led to the following conclusions: (1) Direct alignment and elimination of curves to the utmost extent consistent with sound engineering economics is an essential in heavy traffic road construction; (2) for main traffic roads pavement widths of 20 ft. and grade widths of 30 ft. are not too great to provide properly for future traffic developments; (3) foundation design must be based, not on state standards, but upon the soil and drainage conditions found to exist where the road is being built, and the thickness and the character of the foundation should differ as frequently as the influencing conditions of soil and drainage differ; (4) the design of foundations requires extension of the available knowledge concerning the moisture content of soils, the effectiveness of different methods of drainage, and the intensity and nature of the stress which modern motor-vehicle traffic brings upon the subgrade.

Premised upon these conclusions the speakers generally commended the work of the Bureau of Public Roads in testing road slabs for impact, for resistance to abrasion and for action under different conditions of saturation of the sub-base. The attitude of the Bureau in contending that the allotment of Federal-aid funds to permanent work in building up roadbed by improving alignment and grades, by widening and building up roadbed and by deepening and draining foundations, was commended for its influence in emphasizing highway fundamentals.

CONSTRUCTION PROBLEMS

Alterations in practice to make highway contracting more attractive to large construction organizations were summarized by R. G. Collins, Jr., of the Associated General Contractors of America, on about the lines of his article in *Engineering News-Record* Jan. 15, 1920, p. 122. Replying on behalf of highway engineers C. M. Upham summarized the six essentials to satisfactory co-operation as follows, presuming an honest contractor on one hand and an honest engineer on the other: (1) Substantial highway department administration and competent commonsense engineering; (2) reasonable constructive requirements definitely stated; (3) absolutely competent inspection; (4) adequate equipment to conduct construction; (5) sufficient funds to finance construction without delays; (6) skilled and competent construction management.

Sand and Gravel Producers Meet

Co-operation of industrial and technical associations as an effective means for promoting the interests of an industry was brought out in a report presented at the annual meeting of the National Association of Sand and Gravel Producers, held in Chicago on Feb. 11 to 13. One of the lines of its activity has been in securing the help and co-operation of several such associations as the American Society for Testing Materials, the American Concrete Institute, the Bureau of Standards, the U. S. Geological Survey, and the Portland Cement Association. Gravel concrete for roads and other purposes was one of the leading subjects of discussion in the meeting. A paper on "Tests of Sand and Gravel Concrete" was presented by Prof. W. K. Hatt of Purdue University, president of the American Concrete Institute. He dealt particularly with the relative wear of concrete of various mixes and aggregate sizes. Another paper was on standard sizing for sand and gravel by Prof. T. R. Agg, Iowa State College.

Cornell President Resigns

The announcement was made Feb. 14 of the resignation of Dr. Jacob Gould Schurman as president of Cornell University. His successor has not yet been chosen.

R. A. Ross, President of Engineering Institute of Canada

Supplementing the announcement, last week, of the election of R. A. Ross as president of the Engineering Institute of Canada, additional biographical data, received too late for the issue of Feb. 12, is now presented.

Born of Scotch ancestry in 1865, Robert Alexander Ross, after graduation from the public and high schools of his birthplace, Woodstock, Ont., was apprenticed to Robert Whitelaw, an engine builder of that place. Upon completion of his full time as apprentice machinist, he entered the School of Practical Science, University of Toronto, whence he graduated in 1890. During the three years subsequent to his graduation he was in charge of the engineering department of the Canadian General Electric Co. at Sherbrooke. In 1893 he was appointed chief electrical and mechanical engineer of the Royal Electric Co. of Montreal, having charge of all engineering work in station and shops.

Since 1896 Mr. Ross has been engaged in consulting practice and has been responsible for the designs of many important electrical and power installations including: The West Kootenay Power and Light plant at Bonnington Falls, B. C.; the Huronian Co.'s plant and that of the Canadian Copper Co. at Copper Cliff, Ont.; the Canadian Pacific Railway shops at Angus; the Westmount Electric plant; the West India Electric Co. plant in Jamaica; the Farnham power plant at Farnham, Que.; Convocation Hall, University of Toronto; and the Central Heat, Light and Power Co. plant at Montreal.

At various times Mr. Ross has acted as consultant to the Hydro-Electric Power Commission of Ontario, the Canadian Pacific Railway, and the great majority of the larger cities throughout the Dominion. In addition to his work in Canada, he has carried on engineering operations in China, India, Straits Settlements, Russia, Finland, Scotland, Australia, Jamaica and the United States. A few years ago when the City of Montreal became involved in what is known as the "aqueduct muddle" Mr. Ross took a leading part in organizing the rate-paying engineers of the city and directing their efforts in an educational campaign on the water-supply situation, which resulted in a saving of several million dollars to the city.

When the Honorary Advisory Council for Scientific and Industrial Research was established four years ago by the Dominion Government to promote and encourage research in connection with the development of the natural resources of Canada and to assist manufacturers with their problems, Mr. Ross was made a member of that body. He was chairman of the Lignite Utilization Board of the Council, and as such has carried on investigations which have arrived at a point where commercial lignite plants will be established in Western Canada very soon. Two years ago at the earnest solicitation of his friends Mr. Ross with an exceptional spirit of public service gave up his active engineering practice to become a member of the Administrative Commission of Montreal created by the Provincial Government to straighten out a chaotic condition said to have existed at that time in the city's affairs. In that capacity he served with distinction.

Track and Shop Workers' Strike Order Suspended

The order for a country-wide strike of railroad maintenance-of-way and shop employees, which was to have become effective Feb. 17, was suspended on the day following the conference between the unions' officials and President Wilson, Feb. 13.

The demands of the unions, together with the trainmen, had been refused by Director General of Railroads Walker D. Hines, and the labor leaders had rejected his counter proposals. Complete details of the negotiations were not made public. President Wilson's proposals include a plan for settling present differences in accord with the provisions of pending legislation and an alternative plan providing a commission or board to be appointed by the President. Officials of the unions appear to lean toward the latter plan.

Conferees Reach Final Agreement on Railroad Bill

Final agreement on a report to Congress of a new railroad law was reached by the House and Senate conferees Feb. 16. Aside from changes in text, the general features of the compromise bill follow the principles of the tentative agreement reported in *Engineering News-Record* last week, with the exception of the labor provision, which was modified so as to provide for a Federal appeal board appointed by the President and consisting of nine members equally divided between the employees, employers and the public. As previously agreed upon this board was to have been composed of five members.

The new labor provision results directly, according to Senator Cummins, chairman of the Senate conferees, from the threatened strike of maintenance-of-way employees.

W. S. E. Co-operates With Commerce Bodies on Water-Works

Immediate needs and future plans for the extension of the water system of Chicago are being considered by committees appointed at the invitation of the city engineer, P. S. Combs, from the membership of the Western Society of Engineers, the Chicago Association of Commerce, the Cook County and Chicago Real Estate Board and the Illinois Manufacturers' Association. Mr. Combs' idea is to bring the existing condition of the system, which he states is critical, to the attention of technical organizations as well as the business interests. A scheme has been laid out involving an immediate rehabilitation outlay of $2,500,000 and an ultimate expenditure of $61,000,000 by 1950. Detailed plans with financial statements for submission to a small working sub-committee of the above organizations are nearly completed by the city engineer's office.

For the Western Society of Engineers the committee is Charles B. Burdick, Dabney H. Maury, William Artingstall and W. W. DeBerard. John W. Alvord, chairman of the engineers' sub-division of the Chicago Association of Engineers, is the engineer representative of that body.

High Prices Postpone Water-Works Construction

Owing to the heavy increase in the prices of cast-iron pipe and fittings the city officials of Youngstown, Ohio, have temporarily abandoned the construction of a belt water main around the city. Bids for 5,800 tons of pipe received early in February were at the rate of $71.80 a ton, or $20 in excess of the prices paid a year ago. The City Council had authorized a bond issue of $600,000 for the first section of the belt line, the entire length of which was estimated to cost $1,500,000. Bids for this first section were $150,000 in excess of the estimate.

Texas Water-Works Association Organizes

Permanent organization of the Texas Water-Works Association was effected at a recent meeting of superintendents of water plants of Texas in Austin. E. L. Fulkerson, superintendent of the Waco plant and secretary of the Southwestern Water-Works Association, was elected president. V. M. Ehlers, sanitary engineer of the State Health Department, was selected as secretary, and R. G. Tyler of the University of Texas is the first vice-president.

Annual Meeting Material Handling Machine Makers

At the annual meeting of the Material Handling Machinery Manufacturers' Association in New York City Feb. 26 and 27, will be presented several addresses and papers on mechanical moving of materials.

The first morning session, on the 26th, will be devoted to the annual committee reports and the election of new members to the board of governors. The other sessions will be devoted to the papers scheduled for reading and discussion. Figures resulting from a survey made by the association will be presented to show that a greater use of handling machinery by the railroads would save them from $35,000,000 to $40,000,000 per year, while shipping terminals could save $10,000,000 to $20,000,000 annually.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

AMERICAN RAILWAY ENGINEERING ASSOCIATION; 1426 Manhattan Bldg., Chicago; March 16-18, Chicago.

AMERICAN ASSOCIATION OF ENGINEERS; 29 S. La Salle St., Chicago; May 10, 11, St. Louis, Mo.

The Colorado Association of Members of the American Society of Civil Engineers held its 109th regular meeting in Denver, Colo., Feb. 14. A report of a committee to secure data in connection with the proposed Continental Divide tunnels was made.

The Louisiana Engineering Society heard a paper on "Fabricated Steel Ship Construction as Developed by the Doullut & Williams Shipbuilding Co., Inc.," written and delivered by James P. Ewin, at its regular meeting in New Orleans, Feb. 9.

The Montreal Branch of The Engineering Institute of Canada at its regular weekly meeting of Feb. 12 was given an illustrated lecture on "Ice Formation" by John Murphy. The subject for the meeting of Feb. 19 is "Aerial Photography in War," to be covered by Lieut. C. C. Brooks, M. C.

The Brooklyn Engineers' Club heard a paper on the "Pressure and Resistance of Soils" by James C. Meem at the regular weekly meeting in Brooklyn, N. Y., Feb. 12. At the meeting of Feb. 19 John R. Rogers will deliver a paper on "History of the Linotype."

The Kansas Engineering Society in annual meeting Jan. 20 and 21 installed the following officers for the ensuing year: H. A. Rowland, president; Dean P. F. Walker of the College of Engineering, Kansas University, vice-president, and Lloyd B. Smith, secretary-treasurer.

The Engineering Society of Buffalo held a general meeting in Buffalo, N. Y., Feb. 10. The speaker was Dr. W. D. Bancroft, chairman of the Division of Chemistry and Chemical Technology, National Research Council. His subject was "The Chemical Work of the National Research Council."

The Milwaukee Chapter, A. A. E., has elected the following officers for 1920: A. E. Holcomb, president; N. Prakken, vice-president; C. S. Gruetzmacher, secretary, and Wm. Tubesing, treasurer.

The Duluth Engineers' Club held its regular monthly meeting for February on the 16th. Two addresses were made on chemical subjects.

The Engineers' Club of the Youngstown (Ohio) District, through its executive board, on Feb. 3 appointed the following committee chairmen for the year 1920: Fred Hubbard, public relations; F. C. Jenneaut, finance; L. H. Underwood, program and entertainment; S. G. Hobert, library; E. J. Kauffman, membership; H. D. Chase, house; A. E. Lasher, publicity and publication. The new chairmen have pledged themselves to make their club the headquarters for engineering activity in connection with all civic improvements and municipal welfare throughout the district.

The Albany Society of Civil Engineers now has 142 members. Its officers recently elected are: Frank H. Macy, president; Emory E. Brandow, first vice-president; Germain P. Graham, second vice-president; Thomas L. Watkins, third vice-president; John W. Carpenter, librarian; John W. Henry, secretary-treasurer.

The Indiana Sanitary and Water Supply Association will hold its next annual meeting at French Lick, Ind., March 8 and 9.

The Santa Fe Coast Lines Railroad Section of the A. A. E. held its first annual convention in Los Angeles on Jan. 10. Constitution and by-laws were ratified and committees appointed. Divisional representatives were also appointed and a banquet and dance was held in the evening. C. R. West is president and L. E. Smith is secretary.

The Portland (Ore.) Association of Members of the American Society of Civil Engineers at a dinner in Portland, Ore., Jan. 9, elected the following officers to serve during 1920: J. C. Stevens, president; M. E. Reed, first vice-president; F. M. Randlett, second vice-president; C. P. Keyser, secretary, and Chas. J. McGonigle, treasurer.

The Detroit Engineering Society and the Ann Arbor Section of the American Institute of Electrical Engineers in joint meeting at Detroit will be addressed by W. D'A. Ryan on the subject of general illumination. Mr. Ryan is director of the illumination engineering laboratory of the General Electric Co. He designed the illumination for the Panama-Pacific Exposition.

The Engineers' Club of Trenton met in Trenton, N. J., Feb. 12 to hear Charles Ferguson deliver an address on "The Relation of Financial Credit to the Labor Problem."

The Washington Irrigation Institute, at its annual meeting in Spokane, Wash., Jan. 8-9, 1920, elected the following officers for the ensuing year: E. F. Blaine, president; E. F. Banker, first vice-president; N. W. Moulton, second vice-president, and N. W. Durham and Ralph B. Williamson, directors.

The Minnesota Surveyors and Engineers' Society will hold its 25th annual meeting in Minneapolis, Minn., Feb. 19, 20 and 21, and the Minnesota Joint Engineering Board will give its annual banquet the evening of the 20th.

PERSONAL NOTES

THOMAS H. MACAULEY, who has been manager of the Municipal Railway of Calgary, Alberta, since 1909, has recently become general manager of the New Brunswick Power Co. at St. Johns, N. B.

PROF. O. W. SJOGREN, instructor in agricultural engineering in the University of Nebraska since 1909, has been appointed chairman of the University's Department of Agricultural Engineering. He succeeds Prof. L. W. Chase who has resigned to enter the manufacturing field.

EARL W. SAYLES, appointed city engineer of Watertown, N. Y., 11 years ago, has tendered his resignation to be effective April 1, 1920. It is reported that Mr. Sayles' present intention is to engage in private practice in the West.

NEWTON A. K. BUGBEE, president of the N. A. K. Bugbee Co., engineers, Trenton, N. J., has been reelected State Comptroller by the New Jersey legislature.

MICHAEL M. BURRIS has resigned as city forester of Trenton, N. J., to devote his entire time to the business of Black, Burris & Fiske, Inc., recently organized in Trenton to carry on a landscape service.

GEORGE E. TAYLOR has resigned as chief engineer of the West Virginia Public Service Commission and entered a consulting engineering partnership with J. K. Anderson whom he had succeeded in that office following the latter's resignation last summer. The new partnership will specialize in public utility valuations and rate cases.

COL. GABRIEL R. SOLOMON, recently with the Engineering Branch, Construction Division of the Army, has been discharged from the service and has resumed his engineering practice as vice-president of the Fuller Industrial Engineering Corp., New York City. Before entering the military service Colonel Solomon was a member of the Solomon-Norcross Co., consulting engineers of Atlanta, Ga.

JOHN N. CARLISLE, former New York State public service commissioner and commissioner of highways, has been appointed chairman of an Albany, N. Y., Chamber of Commerce committee to promote the industrial improvement of Albany's South End.

CHARLES BROSSMAN, consulting engineer of Indianapolis, Ind., has been retained by the Anderson, Ind., board of public works to make a survey and report recommending extensive improvements to the city's lighting plant.

PROF. T. P. BRANCH, dean of the department of civil engineering of Georgia School of Technology, has been elected president of the Affiliated Technical Societies of Atlanta, Ga.

M. O. BELLINGRODT, recently assistant engineer of the Georgia & Florida Ry., has been appointed bridge engineer in the Georgia State Highway Department.

E. D. MURPHEY, chief engineer of the Arkansas Actuarial Bureau, was recently appointed assistant manager of the bureau as well.

W. A. WINBURN has been elected president of both the Central of Georgia R.R. Co. and the Ocean Steamship Co.

GEORGE T. AUSTIN has been retained as city engineer of Effingham, Ill.

LEROY F. CLARK has tendered his resignation as city engineer of Batavia, N. Y., to take effect March 1. It is reported he will enter a partnership with Frank H. Homelius, architect of Batavia.

FRANK R. SHAW has filed his resignation as city sanitarian of Dallas, Tex., effective March 1. Mr. Shaw is leaving that city's service to engage in practice as consulting engineer.

C. R. STANHOPE has been appointed city engineer of Ashtabula, O., to succeed L. A. Amsden, who resigned after 21 years in that office. Mr. Stanhope had been the assistant city engineer for the past four years

GEORGE W. JACKSON, contractor and builder of many water tunnels in Chicago, and those of the Illinois Tunnel Co., has been employed by the latest Chicago traction commission to prepare estimates of cost of building subways in practically every street in the loop district.

W. A. SANDERS and **F. R. SWEENY** have announced their formation of the firm of Sanders & Sweeny to engage in consulting and constructing engineering with headquarters in Anderson, S. C.

New Industrial Truck Moves and Elevates Material

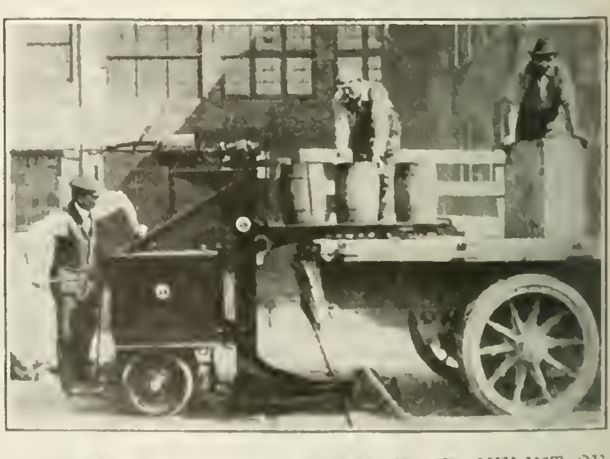
A new industrial truck has been developed which with its own power elevates its load to sufficient heights to put material in box cars, stock rooms or trucks without rehandling, and which performs all the functions of a tiering machine as well as those of a load-carrying, storage-battery truck.

The truck, a product of the Lakewood Engineering Co., and called the Tier-lift, is said to serve practically every purpose of a load-carrying industrial truck, and in its high-lift feature to more than double the field of usefulness of the ordinary load carrier. The Tier-lift will with its own power elevate a two-ton load to a maximum height of 76 in. or to any intermediate height.

Material heretofore moved by hand trucks or power-driven trucks which acted as carriers only, and elevated to piles, freight cars or trucks by man-lift or by separate equipment can now be moved and lifted to place by a single power unit. The economical height to which material can be piled is greatly increased and the storage capacity of a given floor space doubled or tripled by the high-lift feature. Storing material on skids so that re-handling of material in storeroom is entirely eliminated is made practical and when the material is such that it can bear the weight of loads above, loaded platforms can be piled on top of each other. Labor cost is thus reduced to a minimum, material can be handled more quickly and storage of the floor space is increased 200 per cent or more, it is claimed. The Tier-lift makes possible also a new method of storing which permits the selection of loads from specially designed racks. By the arrangement devised, any loaded platform in the racks may be removed without disturbing the other loads, thus giving greater flexibility to a storeroom.

The work drive is the same as that used in the Lakewood tractors and trucks. The 4-wheel steer permits turning in a circle of 92 in. radius. This allows easy turning in narrow aisles or congested parts of the plant, and gives easy entrance into box cars.

There are three speeds forward and three speeds reverse. The controller handle is conveniently located for operation for travel in either direction. The lifting mechanism is operated by means of a specially designed controller with one speed in either direction. The lifting is done by means of worm screws. A separate motor is used to raise the load. The load platform is carried by a cantilever type support and the load is balanced over the load carrying wheels. Ball bearings are used throughout and by a special design the friction losses in elevating and lowering the load platform are said to be practically eliminated.



MATERIAL MOVER ALSO ELEVATES TO HEIGHT OF RECEIVING PLATFORM

A Consolidation of Engineering News and Engineering Record
McGraw-Hill Company, Inc.—James H. McGraw, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. Mehren
Editor

Volume 84 NEW YORK, THURSDAY, FEBRUARY 26, 1920 Number 9

Hoover, President of Miners

THE profession is honored in having its leading citizen accept the presidency of one of its leading societies. Herbert Hoover last week became president of the American Institute of Mining and Metallurgical Engineers. If he puts into it but a small part of his strenuous energy and of his great vision the year should be a notable one in engineering annals.

We Talked, Canada Acted

FOR nearly ten years we have been talking about water-power legislation, legislation that would protect the public, but also encourage the development of powers running to waste. Only now have we progressed to the point of advancing a bill to Congressional conference. While we talked, Canada acted. In Ontario development proceeded apace. We may not approve the method—government ownership—but wasted waters were conserved. In Quebec, not only was development encouraged, but the Province went down into its own treasury and built headwater works to conserve the floods against the low-flow season. Mr. Lefebvre, on page 423, tells the whole story. The investment made by the Province is being amortized at a rapid rate. Before long there will be a cash surplus for the Province, in addition to the inevitable returns to government from stimulated industry. And—let's write it large so that all may read—while the government has made a wise investment the power producers are happy, and are extending their work. On this side of the international boundary we need less talk and more action.

A Neglected Feature

UNDOUBTEDLY the concrete housing conference at Chicago last week did a great deal of good. It brought together on the one hand a number of men who know how to build concrete houses of one type or another and to confer with them men who are acquainted with the necessities and difficulties of home financing. Each group can learn much that is needed from the other. There was left unsolved, however, the most critical element in the whole situation, that is, how to get the labor and material to carry out the building that is necessary. Admittedly the country is in crying need of houses. They are not being built, because, first, each one costs so much and, second, because there are difficulties in financing the small home owner. But even assuming that the deliberations of last week's conference solved these two difficulties, houses could not be built in sufficient number literally because there is not available in this country sufficient material. Cement mills will not be able to meet the demands for roads; there is no choice in sizes or quality of lumber; bricks, structural steel, everything that goes into a building, is slow or absent in delivery. Here is the real problem: How to speed up production. There may be solutions of it, but they are not found in any campaign to increase consumption.

Engineering Affiliation at Spokane

ON ANOTHER page J. C. Ralston tells about the workings of the five-year-old affiliation, known as the Associated Engineers of Spokane. This organization, contrary to the practice in most of the affiliations now in existence, is composed exclusively of sections of the national engineering societies. The sections themselves take care of their technical functions and the affiliation deals only with the broader interests. Through this plan young men who desire to be affiliated with the leading engineering organization of the city are encouraged to go into the nationals; in fact, they cannot have part with the federation unless they do. Mindful, however, that there will always be desirable men who cannot become members of the nationals, a plan is under contemplation to create a new class of member, to be called "Staff Member." We suggest the consideration of this plan to those local sections which desire to affiliate and restrict their voting membership to members of the nationals. Some provision must in such cases be made for the unattached member, and the Spokane plan commends itself as an effective method of accomplishing the result.

Withdraw From Employers' Alliance

IN OUR issue of Oct. 23 we commended the action of Morris L. Cooke in calling attention to the unfortunate action of the American Society of Mechanical Engineers in taking membership in the National Industrial Conference Board, an employers' organization which sponsored the employers' side in the first National Industrial Conference. The society, which obviously should be impartial, adhered to a partisan interest. We are glad to learn that it has now withdrawn its membership, following the report of a special committee appointed to look into the matter. The committee, however, did not discuss the stultifying nature of the alliance. Its conclusion was based on the inadvisability of diverting the society's funds to non-society purposes. It is unfortunate that the broader principle was not taken up squarely, for a fundamental statement would have been a guide for the future.

Water Conservation in California

URGENT need for immediate steps to conserve water for irrigation, city supply and hydro-electric power in California is indicated by the official announcement of low snowfall in the high Sierras, reported on p. 429 of this issue. Short as the time may be, efforts should be made to extend the use of meters on water supplies for irrigation as well as city use. Temporary works for storage and the addition of flashboards and the utilization of all other feasible means of raising the water level in existing storage reservoirs should be given consideration as possible means of relief. Inspection and educational campaigns against water waste would be of help in many cases. The general subject should not be dismissed without referring to the value of snow surveys to gain the earliest possible knowledge of summer water conditions in the far West. Such surveys have been carried on to some extent for years past, but it seems certain that their number and intensity should be increased. An article dealing with methods and results of these snow surveys appeared in *Engineering News-Record* of Oct. 19, 1919, p. 1110. It will bear close study at this time by all who are concerned with summer streamflow depending upon snowfall.

New York's Traffic Experiment

IN AN effort to relieve the rush-hour traffic congestion which has made Fifth Ave., New York, almost impassable for motor vehicles, a one-way traffic scheme is to be tried. Between 34th and 57th Sts. from 10 a.m. until 5 p.m., as explained in further detail in the article on p. 434, all traffic—six lines of vehicles—will proceed only in a southerly direction and will be controlled by a system of signal towers and lights. The experiment will be watched with much interest, for any improvement on present methods of handling traffic on congested streets will prove a great boon to both users of vehicles and pedestrians. The plan is to have the Fifth Ave. traffic move south for 1½-min. intervals, separated by 1-min. periods of rest, in order to allow east-and-west traffic to cross the avenue. The seriousness of the present situation is indicated by the fact that by actual test it has taken a vehicle as much as 40 min. to proceed from 57th to 34th Street, a distance of slightly more than one mile. Any scheme of traffic control which can reduce such intolerable delays will be welcomed and will find application in other congested portions of New York and in other large cities.

Concrete a Changing Science

ENGINEERS who think that concrete design is a finished book or that concrete practice is an established system would do well to consider the proceedings of last week's convention of the American Concrete Institute. At least five times at that meeting there came to the fore issues or actions which indicate the insufficiency of our knowledge or the changing standards of our practice; in fact, dissatisfaction with the narrow limits of what we know about concrete stands out as the feature of the convention. First, there was the initial announcement of the organization of the Joint Committee, starting once again to define and specify what its predecessor finally settled only three years ago. Then there was the elaborate, and somewhat radical, report on shear with its promise of still greater increases in the safe limits of that hitherto restricted stress value. Along the same path was the Slater and Zipprodt recommendation for a different compression unit measure which would utilize actual test strengths. In construction fields, the discussion on floor finish was informing, not that it helped much in telling how to get a good floor surface, but because it made quite clear that here is a feature of concrete construction where the experts confess, if not failure, at least ignorance of how to avoid failure. Finally there was the good start toward the hitherto non-existent standardization of structural shapes and sizes. All engineering science must of course move forward, but that particular branch relating to concrete seems just now to have an extraordinary acceleration.

Louisville Highway Convention

WEEK before last the American Road Builders' Association held its annual convention in Louisville. The meeting was a failure. The attendance was woefully small; the program was marred by the absence of a number of important speakers. The exhibit was excellent—but barren of visitors. Among the manufacturers there is more acrimonious criticism of the failure than among the engineers. The debacle is all the worse because the association is the only national technical organization in the highway field. Yet, should we call it *national?* For years it has been governed by a handful of eastern men who have never succeeded in bringing into active membership the live highway engineers and contractors of the great Middle West. As long as they remain in control, the organization will not prove equal to its opportunity. It will remain chiefly an eastern association. Reorganization must come this year or active spirits will demand and build a new organization—and one that will be truly national. In the most active field of engineering there should be a competent organization.

Adrift From Its Traditions?

THERE is being sent to the membership of the American Society of Civil Engineers a circular signed by 106 members of the society, entitled "A Word of Caution." The circular advises that there be a negative vote on question 3 of the questionnaire ballot now going to the membership. Question 3 asks whether the society shall join in the creation of a comprehensive organization as outlined in the Joint Conference Committee's report. As indicated in the reprint of the circular found elsewhere in this issue, the purport of the argument is that the new movement will cut the Society "entirely adrift from its traditions." We feel that the fears of the signers of the circular are unfounded. The society is to be left unmolested in its technical field. It will still be free to take what action it desires on civic and welfare matters that are of interest only to civil engineers. On questions, however, which are of interest to all engineers it would co-operate with societies throughout the country. This is certainly not cutting the society adrift from its traditions. Its traditions are left undisturbed. It does place the society in a new work, that of participating in active efforts to improve the status of the engineer and to discharge his civic responsibility—a new work that, we believe, is favored by the majority of members of the society. The circular does not go to the essential point of discussing whether or not this broadened work is necessary. Until its signers face that issue squarely and present an adequate plan for doing that work, if needed, their word of caution should go no further than to get each member of the society to weigh for himself carefully the need and method for joint activities of engineers before casting his vote. Words of caution are always wise and advisable but the "Word of Caution" in this case fails to meet the issue squarely.

Track and Locomotive

IT WILL be sincerely gratifying to every reader who has concern in the scientific development of engineering work to observe that the second report of the Track Stress Committee fully bears out the high promise of the first report, made two years ago. At that time it was recognized that the committee's monumental investigation surpassed all prior engineering researches, certainly those in the field of civil engineering, in respect to its magnitude, the difficulty and importance of the problem dealt with, the brilliancy of methods applied to its solution, and the success achieved. It seemed unlikely that the continuation of the work would maintain the same high level. But the second report merits appreciation fully equal to that due the earlier report. It definitely places civil engineering research on a new and higher plane, and will long be a fruitful inspiration to the study of other difficult problems presented by civil engineering works.

But it is necessary to turn away almost at once from thought on the excellence of the committee's work, to consider a matter of gravest import contained in the results made known by the present report. Briefly, the new measurements of rail stresses effectively destroy the assurances of security and of a satisfactory status of the railway-track subject which appeared to be given by the first report.

Two years ago it was shown that traffic loads, even the very great loads of modern locomotives, do not menace the integrity of track. This was decidedly welcome news, for engineers had long been engaged in dispute about whether rail stresses were conservative or excessive, and whether failures and wrecks were chargeable to overloading the rail. Now, however, it develops that the load stresses are only a small part of the matter. Imperfect balancing on the one hand, and a somewhat mysterious but very definitely measurable nonperiodic effect of speed, combine to multiply the static load stresses by two, three or even four. At once we are carried out of the region of safety into one of serious uncertainty, not to say danger. When we are told of rail stresses reaching 45,000 and 55,000 lb. per square inch, further increased by lateral effects and the like, the case begins to grow seriously uncomfortable.

Hitherto, track troubles have always been charged to railway construction and maintenance engineers; but at the present moment the situation is changed, and the indictment clearly lies against their colleagues of the motive-power department. Bad locomotive action is at fault, not inadequate track quality. And this bad action is not due to a single cause; imperfect balancing is the most important, but many other features of locomotive construction and maintenance are involved. On the facts presented it must be said that further progress in railway safety and economy depends on what the motive-power men will do to improve the action of their machinery.

Primarily, counterbalancing of locomotives is lamentably imperfect. Great pulsating forces are set up, which tend to pound the track to pieces. Even in normal, "well" balanced locomotives the moving parts, which of course are a very small part of the whole machine, act on the track as though they were a load equal to half the entire locomotive. But it seems to be little more than luck that the action is not much more severe. Locomotive builders, men with years of accumulated experience and presumably able to build well, occasionally turn out "badly balanced" machines, apparently without being aware of the fact; and in such machines the load effect of the small moving parts is sometimes over twice as great as the weight of the whole engine.

In the tests it was found possible to improve the balance by lightening some of the moving parts, which were needlessly clumsy and heavy. But it has been known for many decades that the whole engine-balancing problem depends on first making the reciprocating masses as light and efficient as possible. Locomotive builders heretofore appear to have found it simpler to ignore this fact—a matter that seems to be more or less one of neglect. Further, it develops that ordinary care in computing and placing weights is not always used, so that the division of load between the several drivers is often quite different from what it is believed to be. Worse yet, one side of a locomotive may be so different from the other (probably heavier) that it produces one-fifth greater stress in the rail.

That even the best balancing is imperfect arises simply from the fact that old-time engine practice has survived in locomotive building, namely, the practice of making the counterweight do duty for both rotating and reciprocating balance. It is not possible to accomplish this result, and the compromise leads to unbalance both vertically and horizontally. But even beyond this, the dictates of convenience are made superior to those of balance, and when one driver becomes too crowded with mechanism to accommodate enough counterweight conveniently the deficiency is put on an adjacent driver. Locomotive builders may learn, to their benefit, from the track-stress measurements, that this makes their engines actually worse than if no attempt at all were made to supply the deficiency.

One very good excuse for the locomotive situation exists in the fact that no criterion of satisfactory locomotive action has been available. Almost the only guide was frequency of derangement or high repair charges of the machine; and this of course would tend to bring about the construction of robust track-destroyers, engines that would not suffer injury themselves no matter how severe they were on the track. There is now made available, in the track stress committee's reports, so much information on track and locomotive relations that it may be described, perhaps a little optimistically, as opening the way for a radically new era in the locomotive field. One thing is certain in any event: the track-stress measurements constitute an irresistible demand for a changed attitude in motive-power matters. Heretofore locomotives have been built without regard to track. In future their builders must give first thought to track.

Safety is one reason. Economy is another. If certain traffic economies are secured by using engines that destroy more track value than their extra earnings can pay for, they are bad engines. Just at present the efficiency of our expensive track structures is cut in half by locomotive imperfection—and this is a very serious loss.

Many resources and possibilities are available in the field of locomotive construction, and it is now clear that they have not been drawn upon. There is plenty of room for improvement in detail, or else the lightening of reciprocating parts by which track stresses were reduced, in the committee's experiments, would not have been possible. But there are even wider opportunities for radical changes. The treatment of the trailer axles, as to position and load; the distribution of load over the wheelbase; the balancing of reciprocating parts separate from the rotating weights; these are among the more obvious ones—together, perhaps, with increased care of detail design and precision of construction. All possibilities need most careful restudy, under the spur of necessity made sensible by the track-stress studies. Indeed it may be said broadly that railway engineering has today no greater or more pressing problem than that of locomotive improvement.

Engineers for Snow Removal

BELATED recognition of the need for engineering advice on the problem of removing snow from the streets of New York City is indicated by the announcement made late last week that Mayor Hylan had appointed a committee of eleven representatives of city departments and bureaus to constitute a board on snow removal. Of this number six are engineers, including representatives of the Board of Estimate and Apportionment, the Department of Water Supply, the Department of Plant and Structures, and the consulting engineers to the presidents of the Boroughs of Manhattan, the Bronx and Brooklyn. In addition, there are members from the Fire Department, Police Department, Street Cleaning Department, Board of Standards and Appeals, and the Health Department.

Following the storm which so completely paralyzed traffic in the city for more than two weeks, the naming of this board is in the nature of locking the stable doors after the horse has been stolen. Nevertheless, the fact that engineering advice on this most critical question is being sought is encouraging and is in line with the plea made in our editorial last week. There the point was made—and should be re-emphasized—that snow removal is an engineering problem and one that must be provided for by careful advance planning. New York was treated to the spectacle of watching its Mayor endeavor to open up the stormbound streets by official proclamation. The job cannot possibly be handled by waiting until the streets have become impassable and then casting about for ways and means of clearing them. The utterly inefficient way in which the one steam shovel was utilized is an illuminating example of the lack of forethought on the part of those responsible for the work. The trouble was not with the machine itself, but with the lack of system which allowed it to wait often for more than a half an hour for empty trucks.

In addition to formulating plans to meet the administrative and organization questions which will arise with each big storm, the newly created board should study the possibilities for snow removal work of ordinary contractors' plant, which, in emergencies, might be quickly mobilized and operated on a rental basis. The street cleaning commissioner is directly charged with responsibility for snow removal, and yet the chief of the Fire Department has been selected as head of the snow-removal board. The failure of Mayor Hylan to name the commissioner of street cleaning as the chairman of the new body is a convincing acknowledgment of the incapacity exhibited in attempting to handle the recent storm.

With engineers mapping out a plan of attack for future storms and making provision well in advance for all contingencies, a repetition of the traffic conditions which have been a disgrace to the city should be avoided.

The Railroad Bill

WHEN the legislation covering the future status of the railroads was approached half a year ago, it was patent that three essential conditions had to be fulfilled: it had to be fair to the public, fair to the owners, fair to the employees. In addition, the new arrangement had to be such, if private ownership were to continue, that private capital would be attracted to the properties, that there be provision against loss during the transition period, and that there be Government loans until the new rates could again stimulate investment.

Now that the conferees have reported the bill and it has been passed by both the House and the Senate, it is gratifying to note that the essentials have been cared for.

The public is protected by retaining Government supervision and control of security issues, of consolidations, of the joint use of terminals and facilities, of the building of new lines and the abandonment of old, and, of course, of service and rates.

The owners are treated fairly in that there is set a definite rate of return, while efficiency is encouraged by allowing the carriers to share equally with the Government in the profits above the definite return. There is no guarantee by the Government, but it is ordered that the rates be fixed so as to produce, for the first year and a half at least, a 5½ per cent return.

Fairness to the employees it is hoped to secure by a standing board of arbitration, on which the employees, the carriers and the public will have representation. The creation of a standing board is a desirable departure, for there will be the inevitable result of building up a body of decisions having a logical relation to each other, with the result that the labor conditions on the railroads will tend to be stabilized. Strikes without fair notice will be probably avoided by the machinery proposed.

Finally, the guaranteed return of the war period is continued for six months, and a fund, inadequate it is true, is provided by the Government from which the railroads may borrow during the time when the new rate-structure is being fixed.

Considering the complexity of the problem and the pressure from diverse and conflicting interests put upon Congress, the bill is better than was to be expected. It meets the essential conditions and is better than either of the measures from which it was evolved.

Such commendation does not imply that the bill could not be improved in some particulars.

The greatest shortcoming, it is our belief, is in the failure to create a transportation board to have jurisdiction in operating and administrative matters, as distinct from the judicial province covered originally by the Interstate Commerce Commission. Despite the increase of membership of the commission from nine to eleven and the increase of its staff, it will be a body even more overburdened in the future than it has been in the past.

The commission must determine the rate of return after March 1, 1922, and the basis of "value" both now and after that date. Congress, therefore, has placed the entire future of the lines, except as checked by the courts and modified by future legislation, in the hands of the commission. In doing so, it has, fortunately, set a good precedent in fixing a definite rate of return and allowing the carriers to share in the profits created by their efficiency. Of course, controversy is to be expected over what constitutes "value" for rate-making, but the commission again has had a good example in the obvious desire of Congress to be fair.

The conference bill takes a flat half of "excess" earnings above 6 per cent from the carrier to be applied by the commission to the general transportation contingency fund, allowing the carrier to retain the remainder. The flat "take-off" of one-half, above 6 per cent; will probably not discourage efficient management.

Everything considered, we have reason for satisfaction at the outcome of this long-drawn-out controversy. If the President approves the bill, and the Interstate Commerce Commission carries out its obvious intent, the railroads can get down to hard work with the justified hope that their efficiency will be rewarded.

Coming Battle Over St. Lawrence Route to the Sea

THE first guns in what promises to be a long-drawn battle will be fired on March 1, when the International Joint Commission opens its hearings on the proposed development of the St. Lawrence River. The discussions will be acrimonious, and sectional animosities will run high. For some years we may expect arguments of the kind that preceded the beginning of the New York State Barge Canal and which seem to be inseparable from any proposed waterway project. It behooves engineers, therefore, who are, after all, the experts who should influence public opinion in matters of this sort, to approach this great public question with a clear idea of what it means.

The St. Lawrence River, from the foot of Lake Ontario to the head of ocean navigation at Montreal, drops 222 ft. in 183 miles, the upper 113 miles of which forms the international boundary. Through this valley, with its falls concentrated in comparatively short stretches, there is a mean flow of 241,000 sec.-ft. of water, with a variation from the mean of only 25 per cent. Around the falls and rapids there exists a shallow canal with short locks and one large power canal which diverts and develops about 95,000 hp., but the waterways are entirely inadequate for full-size lake or ocean shipping, and the power developed is only a fraction of that possible by the full use of head and flow. What is now before the International Joint Commission is the possibility of the international development of the river so that ships can be brought from the Great Lakes, for the present via the enlarged Welland Canal around Niagara, and so that the two riparian nations can jointly participate in the magnificent power the river permits.

On this side of the border, advocates of the scheme come from the great Northwest, which sees a cheap outlet to the sea in bottoms which can go from Montreal right to the lake cities; the opponents are those New Yorkers who fear for the prestige of the country's premier port and foresee the abandonment of the costly Barge Canal. Minor opposition may be expected from the coal interests who now sell northern New York and Canada and the trunk-line railways which tie the Atlantic seaboard to the Northwest. Finally, there will doubtless be those who would step warily in any international development which involves commerce and large expenditures of funds.

The arguments on both sides are too voluminous to record here, but certain fundamentals can be set down. Sooner or later the immense power of the St. Lawrence must be developed. So great a natural resource cannot much longer be neglected, because it happens to lie on an international boundary. If there are complications, diplomacy must overcome them. If there are prospective preponderances of benefits, engineering agreement must adjust them. Coal is getting every year more costly to bring to the districts removed from the mines. Hydro-electric power is every year becoming more an economic necessity. The people of the United States and Canada cannot afford not to use the St. Lawrence power.

The power necessities seem to us to be predominant, but navigation must be studied, too, because when power is being developed it is simpler to provide for navigation necessities than were they considered alone. This phase of the question must be studied nationally and not locally. The time has passed when one section of the United States can dictate national policy. There must be balanced, on one hand, the countrywide benefits which will unquestionably accrue from a cheap through transportation from the Great Lakes to the sea, and, on the other, the possible loss to the country through the diminution of the business of the State and more particularly the port of New York.

It would be against human nature to expect that the business men of New York would urge any scheme which would reduce the importance of their city, even though the nation might possibly benefit thereby. Future economic results are too intangible to weigh very heavily in any argument of general as against personal good. So the New York opposition must be overcome, not by pointing out how the country needs the St. Lawrence waterway, but by convincing the timid New Yorker of the impregnable position of his city and port provided that port is kept up to date. There is in the metropolis a curious combination of fear and reaction. There are always listeners to any Cassandra who sees competition destructive of the city's greatness, but these same credulous souls continue to stand fast against any improvement of port or transportation facilities which could forestall such competition. New York, a year-round port fed by the great railroad systems of the nation, blest by a magnificent basin of deep and still water at its very warehouse doors, has nothing to fear from a St. Lawrence waterway unless shortsightedness and self-interest manage to prevent the development of the port as a unit without regard to state or city boundaries.

Only preliminaries of the St. Lawrence project will be brought forward for some time. The history of such schemes shows that many years are necessary for the education of the interests involved, but throughout the promotion of the plan there must be kept in mind the two facts noted above—first, that transportation is a national, in fact, an international problem, and that neglect of our great water powers is becoming more and more an economic crime.

New Studies of Railway Track: Counterbalance Effect and Behavior of Tie and Ballast

Second Report of Track-Stress Committee—Locomotive Unbalance May Double or Triple the Static Rail Stresses—Tie Bending as Related to Tamping—Distribution of Ballast Pressures

FUNDAMENTALLY important additions to existing knowledge of railway-track mechanics were made in the second part of the work of the committee on Stresses in Railway Track, a joint committee of the American Society of Civil Engineers and the American Railway Engineering Association. They are detailed in the committee's second progress report, about to be issued. In connection with the first report (abstracted in *Engineering News-Record* of Mar. 14, 1918, pp. 517-522) it places the subject of track on a basis of measured fact and verified theory so far as vertical actions on the rail are concerned.

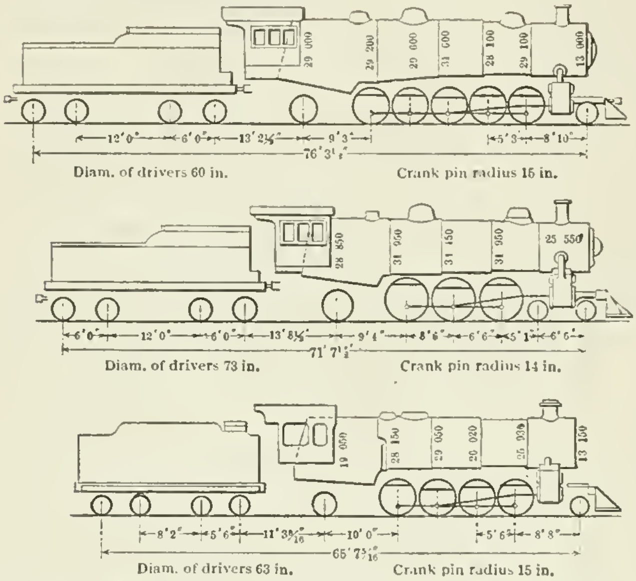


FIG. 1. SANTA FÉ, PACIFIC AND MIKADO LOCOMOTIVES USED IN TESTS OF COUNTERBALANCE EFFECT ON RAIL STRESS
(Figures over wheels give single wheel-loads in pounds)

With respect to the rail, rather serious conditions are revealed by the new investigations. The action of the driving-wheel counterbalance was found to multiply the static load stresses in the rail. With respect to the tie, the nature of the service given by the tie is —for the first time—defined by measurements of tie bending and distribution of the rail load to the ballast. Finally, how and in what proportions the ballast distributes the load to the subgrade is shown by the results of precise pressure measurements, satisfactorily correlated with the principles of ballast action.

It may be recalled that the first report led to important practical conclusions: The stress in the rail under a train or any other load is determined by the general track depression, with little regard to tie spacing. The roadbed acts as an elastic structure, except for a certain looseness or play absorbed in the first stage of the depression. Heavy rail, hard ballast (e.g., stone as compared with cinders), and deep ballast make stronger track, by reducing the track depression. Thorough tamping of track also reduces depression and rail stress. Besides these fundamental facts it was found that a train produces larger stresses when running at speed than when standing, and though the increase could not then be measured satisfactorily it was seen to be of considerable amount. Transverse bending of the rail was observed, arising from conditions not fully explained; in some cases the ratio of stress in outer flange of the rail base to stress in inner flange was greater than 3 to 1. While the effect of speed on track stresses was observed, the effect of counterbalancing could not be discerned; this remained for the subsequent studies.

The investigations covered by the second report indicate that:

1. The unbalanced rotating masses at the several drivers of a locomotive subject the rail to excess vertical forces, often larger than the computed effects. In some cases the excess stress chargeable to the unbalance is much more than the static rail stress. Measured total stresses in the rail base as high as 45,000 to 55,000 lb. per sq.in. point to the serious importance of the subject. Badly balanced locomotives may cause dangerous rail stresses.

2. There is a large speed effect, distinct from the counterbalance effect. It is roughly proportional to the speed, and may equal or exceed one-half the static stress. The counterbalance effect equals or exceeds the speed effect, even in well-balanced locomotives.

3. Trailing and leading wheels often show variation in rail stress during the revolution of the driving wheels. This seems to be due to the effect of the locomotive frame in transmitting counterbalance-effect impulses.

4. Wheel-loads are distributed to the several ties in the same ratios for large as for small loads. The depression of any tie is proportional to its load, except that there is an initial irregularity of deflection chargeable to soft bearing or to slight play between rail and

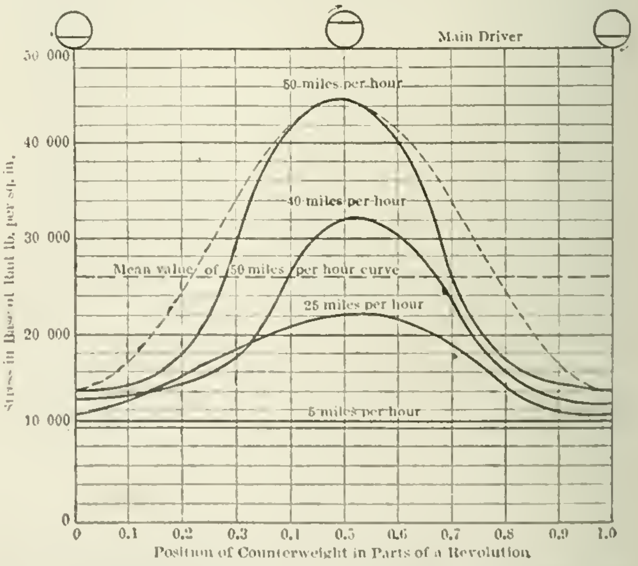


FIG. 2. STRESS VARIATION UNDER MAIN DRIVER DURING ONE REVOLUTION, SANTA FÉ LOCOMOTIVE
(Dotted line is line curve adjusted to high and low points of observed 50-mile curve)

ballast. The maximum tie-reaction under a four-wheel truck ranges from 13 to 16 per cent of the truck load, agreeing with theory.

5. Most track is distinctly centerbound before tamping. The endbound condition produced by tamping rapidly disappears. Yet the bending moment in the tie is greater directly under the rail than at midlength. The critical bending moments in the tie range from 2 to 6 pound-inches per pound of tie load, but should not exceed 2 to 2½ for first-class track well maintained.

6. Transmission of pressure in ballast follows laws deducible from theoretical considerations. At any level below the tie, the lateral distribution of load follows the "error curve." In this respect sand, gravel and broken-stone ballast behave alike. The pressure decreases downward according to an exponential or logarithmic law. The pressure of tie on ballast is greatest at the middle of the width of the tie and least at the edges, due to the friction between ballast and tie as the ballast tends to flow out laterally.

7. About 4 in. below the tie the ballast pressure is equal to or greater than that just at the tie. At 6-in. depth the load begins to spread, and at a depth equal to the tie spacing the pressure is nearly uniformly distributed.

Measurements of Counterbalance Effect

Three locomotives were used in the tests of counterbalance effect (Fig. 1.) The first, an engine of Santa Fé type, had caused considerable injury to the rail on the St. Louis-San Francisco R.R., presumably through extreme effect of bad counterbalance. In this locomotive it had not been found possible to put enough counterweight on the main driver, and therefore excess counterweight was put on the other drivers. The engine was practically balanced for rotating weight plus 60 per cent of reciprocating weight, except at the main driver where, even disregarding reciprocating weight, there was a deficiency of about 750 lb. For rotating weight alone the excesses and deficiencies of counterbalance required by rotating weight alone, were: +368 (first driver), +370, −746, +370, +368 lb. at crankpin circle; and if the fact that the counterbalance and the rotating parts to be balanced are not in the same vertical plane be considered, the deficiency of 746 lb. for the main driver becomes 1,042.

For the second engine, Pacific type, the unbalance with respect to rotating masses amounted to +423, +330, and +428 lb. for the several drivers. Considering the leverage due to the weights being in different planes, the main driver had an overbalance of only 76 lb. In the Mikado engine, used on the Illinois Central R.R., the counterweight excess at each wheel was 263 lb. at crank-pin circle; with allowance for the non-planar relation of the weights, the main driver showed an underbalance of 15 lb.

For each pound of overbalance or underbalance at crank-pin circle the equivalent vertical-weight effects for the three locomotives are: Santa Fé at speed of 50 mi. per hr., 33.4 lb.; Pacific at 60 mi. per hr., 30.3 lb.; Mikado at 45 mi. per hr., 24.5 lb.

Tests were made by use of the stremmatograph previously described (see reference cited). Four instruments were used simultaneously, usually three on one rail and one on the opposite rail, but sometimes all four on one rail; they were placed about one driver-diameter apart so that for each instrument the counter-

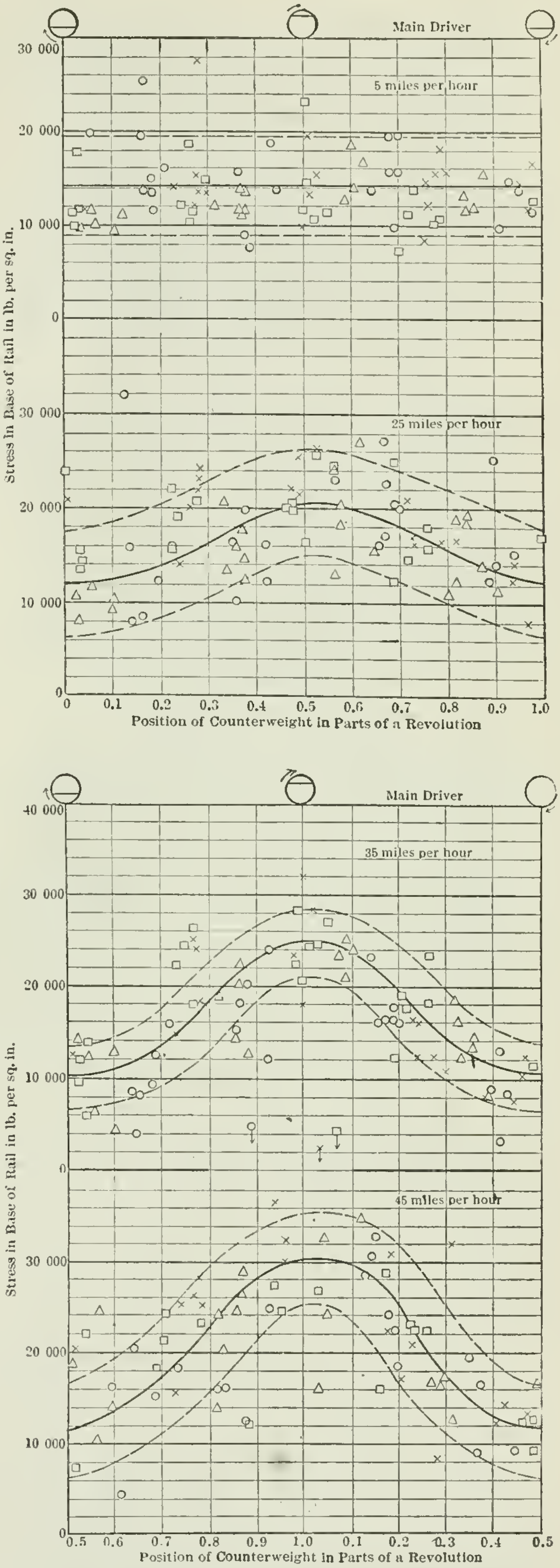


FIG. 3. STRESS VARIATION PLOTS FOR MAIN DRIVER OF MIKADO LOCOMOTIVE

(The symbols represent different stremmatographs)

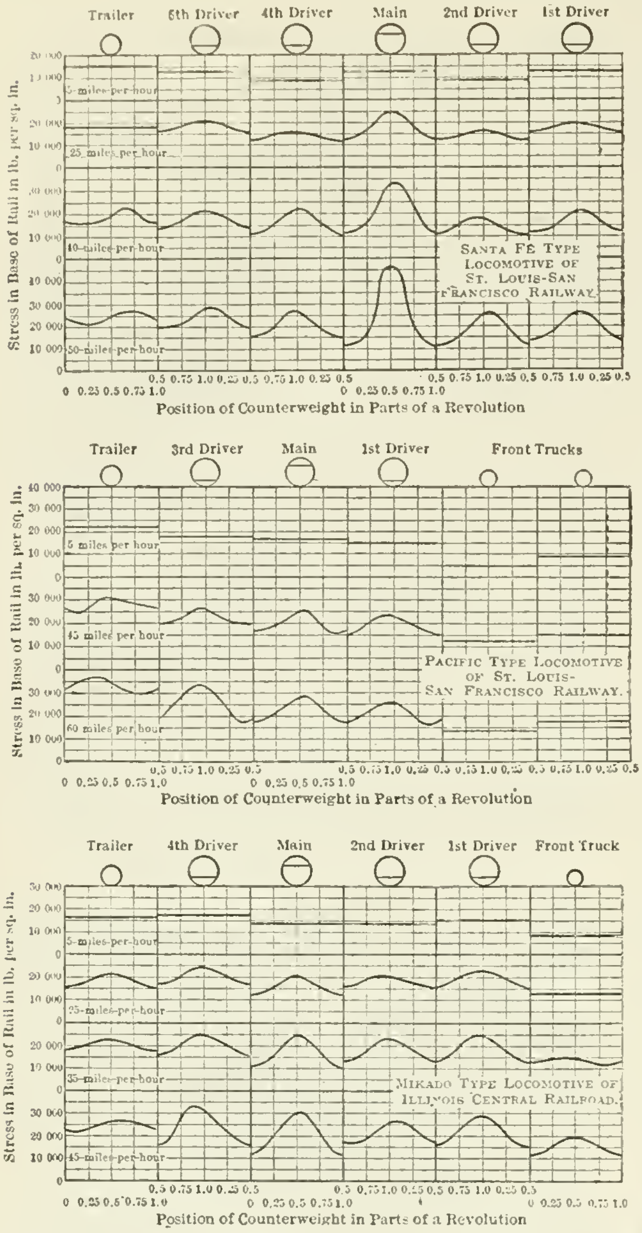


FIG. 4. SUMMARY CURVES OF RAIL-STRESS VARIATION FOR THREE TYPES OF LOCOMOTIVE

weight would have a different position. Its position with respect to one instrument was observed for each run. In all runs steam was shut off as the locomotive approached the test section. Speeds were read from a speedometer in the cab, connected with the tread of the trailer, checked by timing runs.

An immense amount of work was involved, as nearly 100,000 readings were made. The accuracy of the results is considered to be as good as that of the stress data previously reported.

All rail stresses given are those in the base of the rail; the head stress would be about 10 per cent greater (but the base stresses are determinative because here the lateral stresses are large).

The general nature of the results from all the tests is typified by the curves in Fig. 2, showing the measured variation of rail stress under the Santa Fé locomotive during one driver revolution, at several speeds. The rail stress is seen to remain constant at 5-mile speed while for higher speeds it varies during the revolution, approximately the theoretical sine-curve variation represented by the dotted line.

It is significant that the average rail stress for each of the curves is considerably above the static or 5-mile stress. A dashed line in the diagram represents the mean value of the 50-mile curve; the difference between this mean value and the 5-mile stress is the speed effect, while the difference between the maximum of the curve and the mean is considered as counterbalance effect. The ratio of the mean to the 5-mile stress is the "effect of speed" and the ratio of the difference between maximum and mean to the 5-mile stress is the "effect of counterbalance" tabulated in Tables I, II and III for the three engines tested.

Plots of individual test results for the Mikado engine, in Fig. 3, illustrate typically how the observations yield a well-defined sine-curve belt for each speed. The mean curve for each belt was obtained by averaging the values of the plotted points in groups for each twentieth of a revolution and drawing a curve through the resultant points.

Summary curves of rail-stress variation for all wheels of the three locomotives are given in Fig. 4. In the case of the Santa Fé engine, by far the greatest stress excess occurs under the main driver, due to the abnormal unbalance at these wheels. A remarkable feature of all three diagrams in Fig. 4 is that the trailer shows very considerable variations of stress during a revolution; since no unbalance of weight exists here, the variations must be due to variations of load transmitted by the frame and track. The track effect is taken account of in the "calculated" effect of counterbalance in the last line of Tables I, II and III. As these values do not agree well with the observed values, it seems probable that the influence of the locomotive frame is important.

The same is true of the stress variation under the front truck wheels of the Mikado at the higher speeds, though in the Pacific no such variation appears, even at 60 m.p.h.

How these effects vary with speed is shown in the upper diagram of Fig. 5, drawn for the Pacific engine. The speed and counterbalance effect here are separately plotted as ordinates, abscissas representing speed. It may be seen that both speed and counterbalance effect vary about in direct proportion to speed.

That the tender also exerts a very pronounced speed effect is indicated by the lower diagram of Fig. 5. The speed effect here clearly follows a linear law. The speed effects for drivers are "in general less than those for the tender wheels."

The committee concludes that "there is a decided advantage to the track in making the counterbalance of the several drivers differ but little from each other and from that condition which will give the best results, even though opposing conditions of counterbalance in the main driver and the adjoining drivers may have some neutralizing effect. An underbalance on one driver and on overbalance on an adjoining one will give a very undesirable cumulative effect." Further, "the uncertainty which may exist concerning exact conditions of counterbalance is a matter which warrants greater attention."

That the measured rail stresses were very high is shown by the following figures, taken from the high points of the mean curves: Santa Fé at speed of 50 m.p.h., trailer to leading truck, 27,000, 28,600, 26,500, 46,800, 25,500, 26,000, 15,600 lb. per sq.in. Pacific at speed of 60 m.p.h., 36,400, 34,800, 36,400, 26,000, 14,000, 18,700 lb. per sq.in. Mikado at speed of 45 m.p.h., 26,500, 32,800, 30,500, 26,500, 29,100, 19,000 lb. per sq.in. The committee points out that, because of the divergence of individual stress readings from the mean curves (see Fig. 3), values 6,000 to 8,000 lb. greater than these figures "may be expected not infrequently." And it further says, "The occurrence of stresses in base of rail (the average of the values at the two edges) as high as 52,000 lb. per sq.in. (and 10 per cent higher in head of rail), observed at high speeds in a number of cases where the records were well defined, shows that it is not strange that kinks and rail failures were produced in the regular service of these locomotives," of the Santa Fé type.

It was found by special tests that the Santa Fé engines produced stresses in the left-hand rail uniformly higher than those in the right-hand rail, by as much as 20 per cent. This was true at all speeds, and had no relation to either speed effect or counterbalance. No such differences occurred under the tender, however. Even previously, service results had indicated that injuries were more common in the rail on the left-hand side, under locomotives of this type on the St. Louis-San Francisco R.R. No reason for this one-sided condition is known, the committee states.

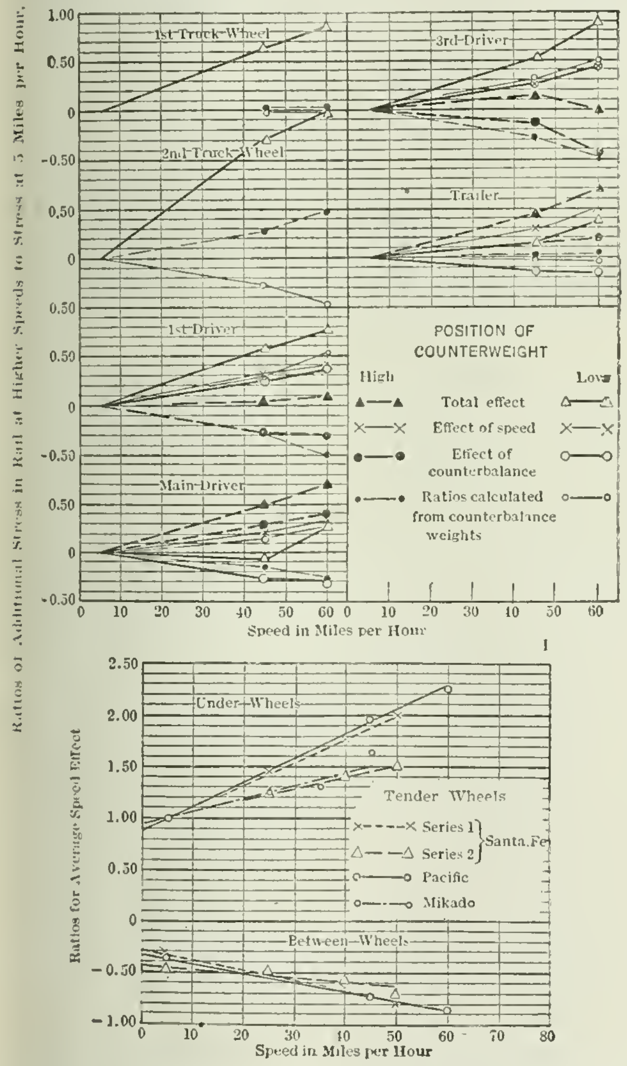


FIG. 5. RELATION OF ADDITIONAL STRESSES TO SPEED, PACIFIC LOCOMOTIVE AND THREE TENDERS

That lateral bending of the rail occurs under locomotives was reported two years ago. In subsequent study it was found that this effect is not related to counterweight position or to speed, but that the average of stresses at the outer edge of the rail base for all the wheels ranged 20 per cent to 50 per cent higher than the average at the inner edge, or 9 to 20 per cent higher than the near base stress (to which all other figures given refer). The effect occurs even under flangeless drivers. Thus, it is apparent that lateral bending moments, which in some cases range up to 8 per cent of the vertical bending moment, are active. No further investigation has been made to determine the cause. The factors just noted all act to increase considerably the mean stresses heretofore cited.

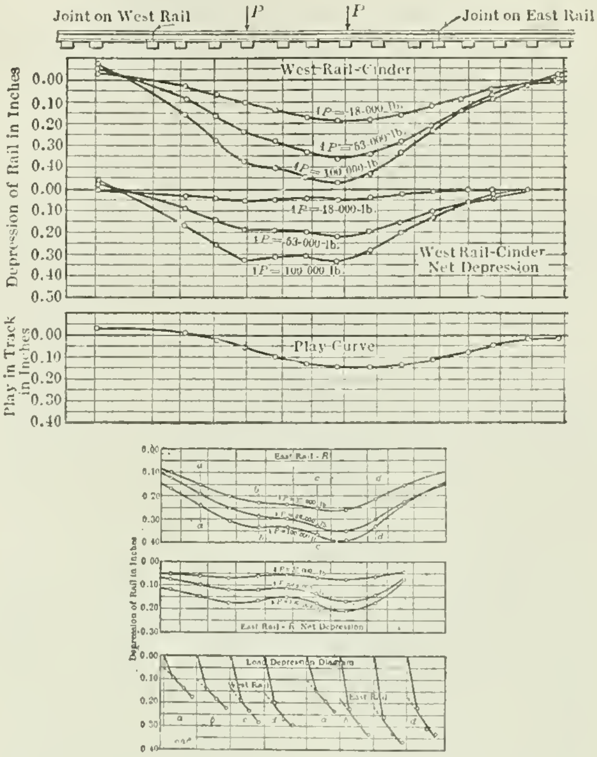


FIG. 6. TRACK DEPRESSIONS AT TWO LOCATIONS; INITIAL PLAY AND NET DEPRESSION
Cinder-Ballasted Track, Illinois Central R.R. Class B. Track, C. M. & St. P. Ry.

DISTRIBUTION OF LOAD TO TIES

New measurements of track depressions under known loads not only confirmed the prior deduction that track is elastic but also provided data for computing the load on the individual ties.

A leveling bar was used to measure the depressions, as described two years ago (see reference cited). Fig. 6 shows specimen plots of depressions under a four-wheel truck loaded to different total loads. When the depressions at any one point were plotted on a base of load, as in the lower part of Fig. 6, a straight line resulted, demonstrating elastic action; but in the early stage of the depressions there was a divergence from the straight line, indicating the equivalent of a slight looseness or play (0.02 to 0.18 in.) in the track before solid bearing was reached and elastic action began. Taking the amounts of play for different points along the track from these plots, a play curve was obtained (second diagram of Fig. 6). Deducting the amounts of play from the depressions, curves of net or elastic depression were obtained, one set of which is shown near the bottom of Fig. 6.

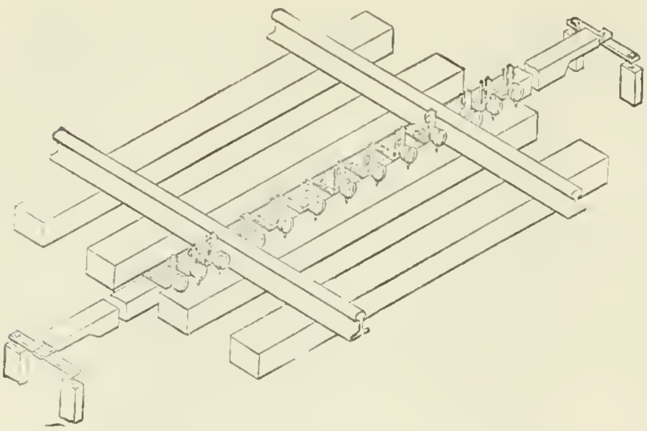


FIG. 7. BAR FOR MEASURING TIE-BENDING

From such net curves the depressions of all the ties affected were summed and equated to the total load. Simple division thus yielded the value of load required to depress one tie 1 in.; and this value multiplied by the depressions of the individual ties gave the loads borne by them.

Generally the load on a tie directly under an axle amounted to 13 to 16 per cent of the two-axle truck load; midway between wheels the tie reaction was as much as 1½ per cent more (see Table 4). Theory indicates 15 per cent under the wheel and 16 per cent midway between wheels for track of the properties of that tested.

Measurements of the flexure of the tie were considered the best means of studying tie action. A gage bar (Fig. 7) was supported on stakes at either side of the track, and thirteen Ames dials attached to the bar bore each on a track at the middle of the width of the tie. A two-axle truck (18,000 to 100,000 lb. load) was placed on the track so that the leading axle was directly over the tie under test; the heaviest load used gave

TABLES I AND III COUNTERBALANCE EFFECTS AND SPEED EFFECT FOR THREE LOCOMOTIVES

Ratios of rail stress under wheel at high speed to rail stress at 5 m.p.h.

Speed effect is ratio of mean stress during revolution at high speed to constant 5-mile stress. Counterbalance effect is ratio of difference between high-speed maximum (or minimum) stress and mean stress to 5-mile stress. The sum of the two is the total effect, or ratio of maximum rail-base stress at the given speed to the 5-mile stress.

TABLE I. SANTA FE ENGINE, SPEED 50 M.P.H.

		Driver					Truck
	Trailer	5	4	Main	2	1	Wheel
Calculated counterbalance stress in rail base at 50 m.p.h.; lb. per sq.in.	600	8,100	11,400	24,200	11,300	8,100	700
Effect of speed	1.58	1.82	1.98	1.92	1.83	1.53	
Effect of counterbalance:							
Counterweight up	+0.20	—0.30	—0.40	+1.83	—0.66	—0.45	1.97
Counterweight down	—0.20	+0.43	+0.79	—1.00	+0.77	+0.55	
Calculated counterbalance effect	0.03	0.51	0.91	1.74	1.01	0.48	0.08

TABLE II. PACIFIC ENGINE, SPEED 60 M.P.H.

		Driver			Truck	Wheel
	Trailer	3	Main	1	2	1
Calculated static stress in rail base; lb. per sq.in.	23,500	17,300	17,100	16,400	4,400	9,100
Calculated counterbalance stress at 60 m.p.h.; lb. per sq.in.	700	8,700	4,400	8,500	2,100	100
Effect of speed	1.50	1.44	1.32	1.41		
Effect of counterbalance:						
Counterweight up	+0.19	—0.45	+0.38	—0.31	2.48	1.85
Counterweight down	—0.15	+0.44	—0.30	+0.36		
Calculated counterbalance effect	0.03	0.50	0.26	0.52	0.48	0.01

TABLE III. MIKADO ENGINE, SPEED 45 M.P.H.

		Driver				Truck
	Trailer	4	Main	2	1	Wheel
Calculated static stress in rail base; lb. per sq.in.	16,300	18,200	15,300	12,500	16,500	9,600
Calculated counterbalance stress at 45 m.p.h.	200	4,300	3,200	3,200	4,300	400
Effect of speed	1.53	1.46	1.47	1.49	1.41	1.81
Effect of counterbalance:						
Counterweight up	+0.15	—0.51	+0.67	—0.34	—0.41	+0.48
Counterweight down	—1.18	+0.53	—0.55	+0.37	+0.45	—0.47
Calculated counterbalance effect	0.01	0.24	0.21	0.26	0.26	0.05

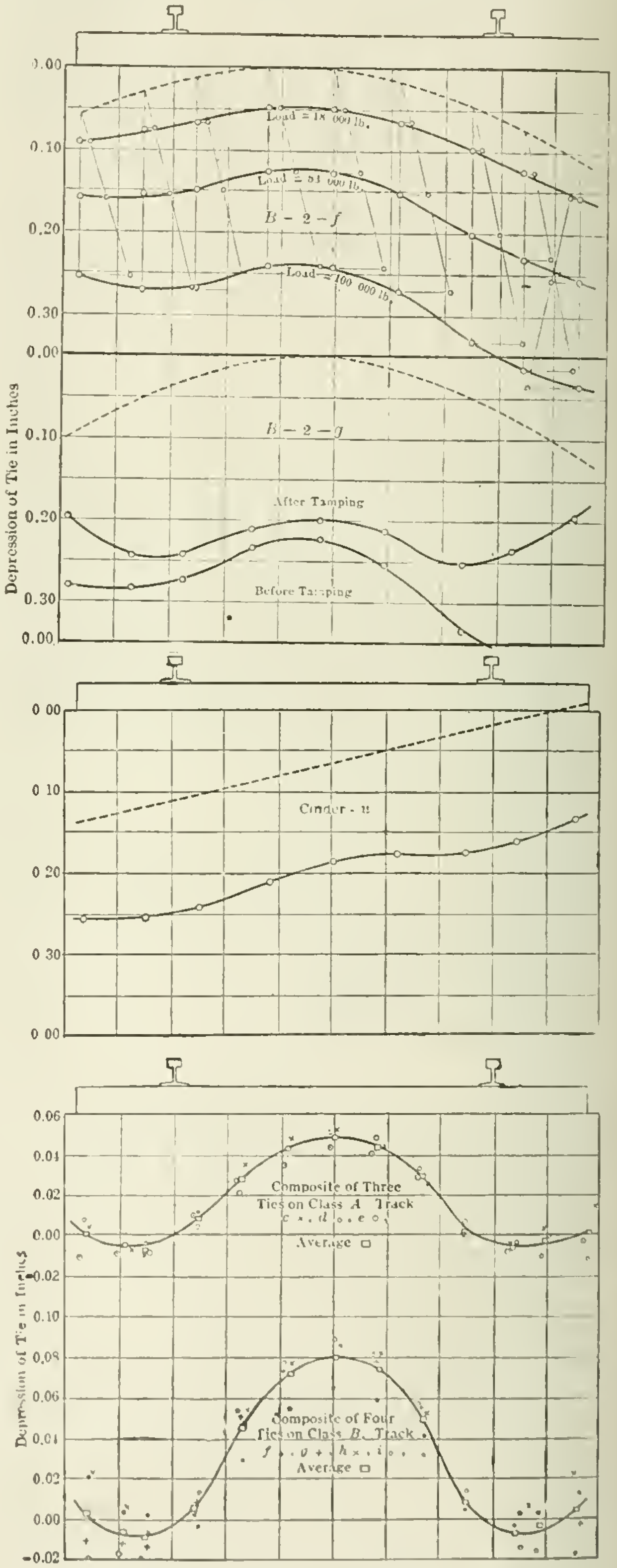


FIG. 8. TYPICAL TIE-FLEXURE DIAGRAMS

Upper: 85-lb. rail, 6 x 8-in. oak ties, 12-in. stone ballast; ties *f* and *g* located one tie apart.

Middle: 85-lb. rail, hewn oak ties, 12-in. cinder ballast; freight lead track.

Lower: Composite diagrams of net deflections.

a tie reaction "considerably less than that which would be caused at and between drivers by an ordinary Mikado or Santa Fé type locomotive." The ties sawed ranged from 7 x 8 in. x 8½ ft. to 6 x 8 in. x 8 ft.

Many curves of tie flexure were obtained, of which Fig. 8 gives examples. The upper part of the upper diagram shows how the several bending curves on any given tie were utilized for determining the "play" or looseness of the tie. At various points along the bending curve the loads for the respective curves were plotted as abscissas, with the deflections as ordinates, and load-deflection curves (just like those of Fig. 6) drawn as straight lines through the resulting points; the zero points of these load-deflection lines were taken to represent the initial solid bearing. By this means the dotted lines shown in Fig. 8 above the observed tie-flexure curves were obtained, these dotted lines representing in effect the profile of the tie at the moment it reached solid bearing.

TABLE IV. TIE REACTIONS IN TERMS OF LOAD ON FOUR-WHEEL TRUCK

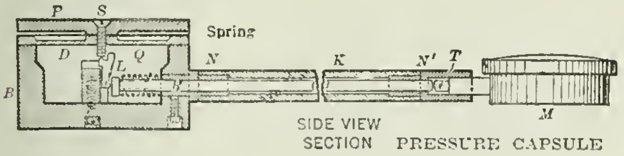
(Typical results of tests on C. M. & St. P. Ry., for 7x8-in. ties on 36-in. gravel ballast. First three lines refer to main-line track with 100-lb. rail; last two ines to branch-line track with 75-lb. rail.)

Tie 1	Tie 2	Tie 3	Tie 4 (Under Wheel)	Tie 5	Tie 6	Tie 7 (Under Wheel)	Tie 8	Tie 9	Tie 10
0 07	0.09	0.10	0.11	0.11	0 11	0.11	0.12	0.10	0.08
0 04	0.08	0.11	0.13	0 13	0.13	0 13	0.11	0.09	0.05
0.04	0.07	0 11	0.14	0.14	0.14	0.13	0 11	0.08	0.03
0 07	0 09	0 11	0.11	0.10	0.11	0.14	0.12	0.08	0.05
0.06	0.09	0.13	0.14	0.13	0.13	0.12	0.10	0.06	0.03

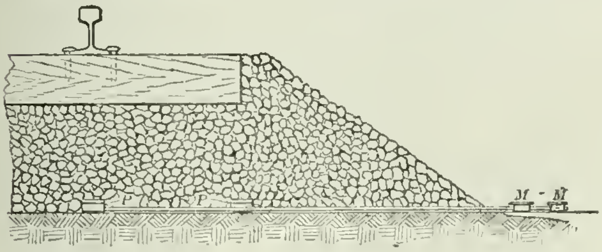
Net deflections, reckoned from the curves of solid bearing, were plotted in the two composite tie-flexure curves constituting the lower diagram of Fig. 8. These represent first-class track and second-class track on the Chicago, Milwaukee & St. Paul Ry. It will be seen that the net deflections showed fairly similar action in different ties, though the gross deflections varied greatly.

From the flexure curves, the bending moments in the ties were computed, based on average moduli of elasticity found by bending tests of ties in a testing machine (oak ties, 1,250,000 lb. per sq.in.; soft-wood ties, 800,000). Specimen results are given in Table V. The committee concluded that *in first-class track* a center moment of 2W and a reverse moment at the center of 1W is to be expected; and a moment under the rail of 2.5W. The observed values are greater, probably in part because of the crushing or excessive depression of the wood at the rail; but as this action weakens the tie under the rail, the higher values should be used for wood ties.

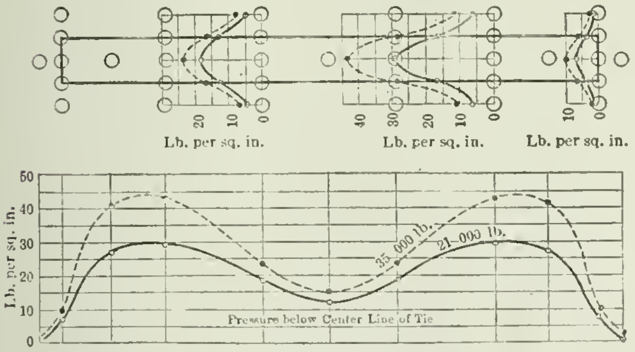
Comparing the bending moments with those that would result from various distributions of bearing pressure on the lower face of the tie, the committee con-



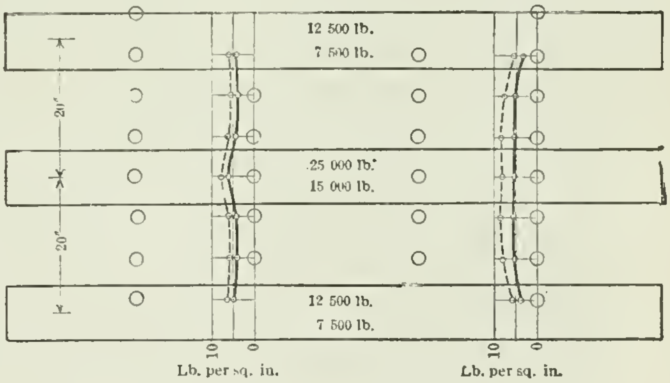
SIDE VIEW SECTION PRESSURE CAPSULE



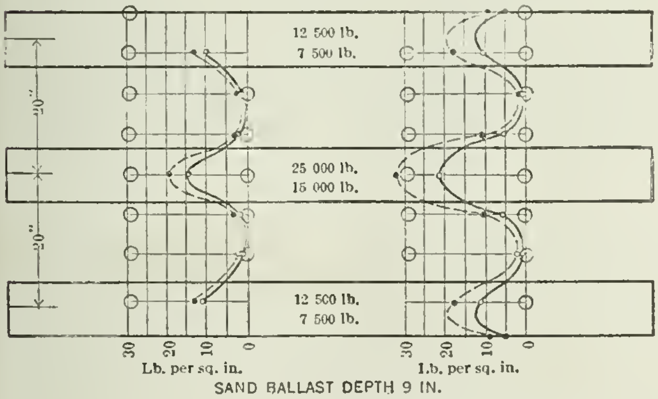
PRESSURE CAPSULE IN BALLAST.



SAND BALLAST DEPTH 12 IN.

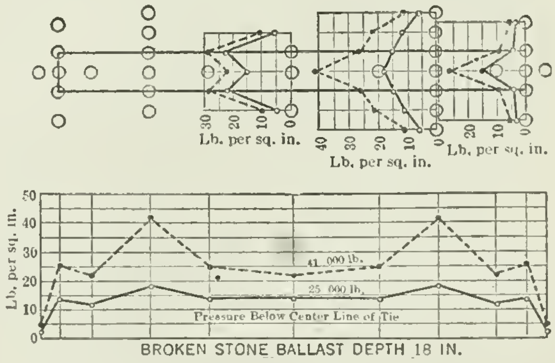


SAND BALLAST DEPTH 25 IN.



SAND BALLAST DEPTH 9 IN.

UNEQUAL LOADS ON TIES.



BROKEN STONE BALLAST DEPTH 18 IN.

FIG. 9. PRESSURE CAPSULE AND PLOTS OF BALLAST PRESSURES

First diagram shows pressures under single tie load through 12 in. of sand ballast. Second and third diagrams are for three-tie group, unequally loaded, through two depths of ballast. Fourth diagram is for single tie load on broken-stone ballast. Small circles show location of pressure capsules.

cludes that "the maximum bearing pressure per unit of length of tie, under static loading, will not ordinarily exceed twice the average bearing pressure over the length of the tie; and for track in good condition the maximum will be less than 1½ times the average."

PRESSURES IN BALLAST

To measure the pressures in the ballast at various depths below the tie, gages or "pressure capsules" as sketched in the upper part of Fig. 9 were constructed. In the gage, the deflection of a steel diaphragm plate protected by a faceplate is measured by a small lever whose motion is transmitted to the plunger of an indicating-dial micrometer. The faceplate has an exposed area of 5 sq.in. Friction tape wrapped around the case prevents sand and dirt from entering between the faceplate and the diaphragm; each capsule was calibrated after being taped.

The test rig consisted of a reinforced-concrete slab 16 x 19 ft., 12 in. thick, on which the ballast was carried, and over this slab a reaction frame anchored to the slab by the tie-rods, to serve as abutment for a jack by which loads could be applied to one or more ties resting on the ballast. The jack load was measured by a calibrated steel spring. Many pressure capsules were used in each test.

From theoretical consideration of the manner in which a load is transmitted down through a granular mass, where each grain bears on two or more grains below and distributes its load among them, the committee concluded that at any horizontal plane in the ballast the vertical pressures are distributed laterally in proportion to the ordinates of a probability or error curve, which curve spreads out wider and has a lower middle ordinate (lower maximum pressure) as the depth below the concentrated load is increased. This is true only for the distribution of a load in two opposite directions, not radially in all directions from a point; it applies approximately to the distribution of load through the ballast from a tie.

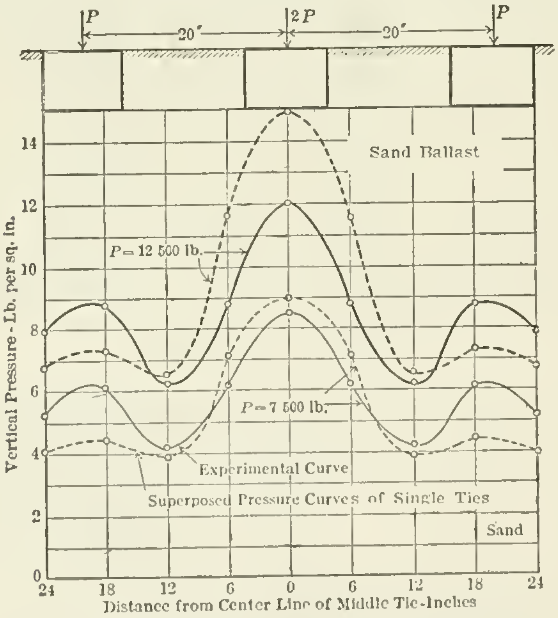


FIG. 10. DISTRIBUTION OF BALLAST PRESSURE UNDER THREE TIES, COMPARED WITH SUPERIMPOSED CURVES OF SINGLE-TIE RESULTS

Measured pressures obtained with the apparatus described confirm this deduction in very satisfactory manner. A number of pressure curves are grouped in Fig. 9, and from the single-tie test represented by the first of the diagrams it will be seen that the distribution of pressure laterally follows a law very similar to the probability law. Comparing the second and third diagrams of Fig. 9, it is also seen how the pressure distribution flattens out with increasing depths below tie. The effect of several ties whose zones of influence overlap is closely in agreement with a curve obtained by adding the separate effects of the individual ties (Fig. 10). In stone ballast the pressure distribution is somewhat less regular than in fine ballast (see last diagram in Fig. 9), but the same general laws are evidently effective. In one test the pressure directly at the bottom face of the tie was measured, by embedding the capsules in the lower face of the tie, with the pressure plate flush with bottom of tie. The results were similar to those measured at some depth below the tie.

TABLE V. BENDING MOMENTS IN TIES

(From tests on C. M. & St. P. Ry. values in pound-inches when W is total load carried by one tie, in pounds.)

	Moment at Center of Tie	Moment Under Rail
Class A Track:		
Maximum	—4 5W	+6 0W
Minimum	—0 8W	+3 2W
Average	—2.5W	+5.0W
Class B Track:		
Maximum	—2 1W	+3.7W
Minimum	—0 9W	+2.3W
Average	—1 5W	+3 3W

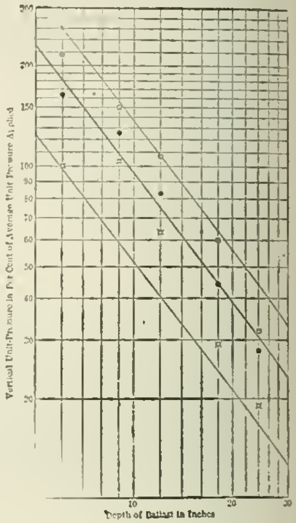


FIG. 11. VARIATION OF BALLAST PRESSURE WITH DEPTH

The committee concludes that "the laws of distribution of pressure through ballast (noncohesive granular material) are practically the same for the various kinds of ballast."

Variation of ballast pressure with depth is summarized in the logarithmic diagram Fig. 11, the points for which were taken from the averaged pressure curves of the experiments. Here the ordinates represent pressures at various depths below the center line of the tie, expressed as the percentage of the average pressure over the bottom of the tie; the abscissas represent depth of ballast. The maximum and minimum observed intensities of pressure have been plotted. A straight line whose equation is

$$p_c = \frac{16.8 p_a}{h^{1.25}}$$

fits the observations fairly well. Here p_a is the average pressure over the tie, and p_c is the pressure at depth h (in inches) directly below the center line of the tie. The data all apply to tests on ties 8 in. wide. Using the formula just quoted for maximum pressure at depth h, the lateral distribution at this depth is expressed by the formula

$$p = \frac{16.8 p_a}{h^{1.25}} 10^{-6.05 \times 2/h^{2.5}}$$

This formula, applying to depths from 4 in. to 30 in. below bottom of tie, agrees well with the test results.

From the test data contours of equal vertical unit pressures in ballast were drawn, as reproduced in Fig. 12. It is concluded from these that "in general the vertical pressures become nearly constant at a depth equal to the tie spacing." As to this point the third diagram in Fig. 9 is pertinent.

From reasoning based on the effect of friction between the bottom of the tie and the ballast tending to crowd out from under the tie while the latter is being forced down in the ballast by its load, it was concluded that "there is a concentration of pressure a short distance below the tie, say at 3 to 4 in., and the intensity of pressure in the ballast at such a depth is greater than exists at the bottom of the tie. For the tie of ordinary width the intensity of pressure at a depth of 6 in. and the distribution of vertical pressure over a horizontal plane at this depth do not differ greatly from those existing immediately under the tie. The directions of the pressures are not the same. At or below this depth the distribution of pressure laterally begins." Further, "for the ordinary width of tie the effect of the pressure transmitted from the adjacent tie to points midway between ties (overlapping lines of pressure) is noticeable at a depth equal to about half of the usual tie spacing. At a depth of three-fourths of the ordinary tie spacing the pressure immediately under the center of the tie is about 1½ times that resulting from a uniform distribution over the horizontal plane. At a depth equal to the ordinary tie spacing the lateral distribution has become such that the variation in intensity of pressure from tie to tie is small. The variation in intensity of pressure in the ballast lengthwise of the tie becomes less and less with increase in depth and it may be expected that the variations will be smoothed out at a depth equal to the ordinary tie spacing or a few inches below, where there will be a fairly uniform pressure over the horizontal plane."

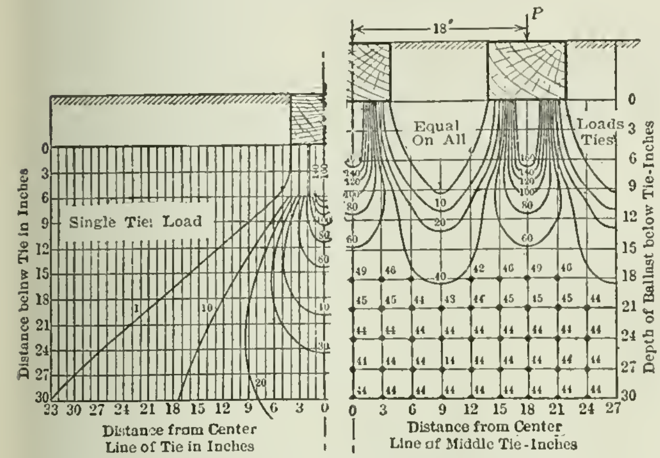


FIG. 12. LINES OF EQUAL VERTICAL PRESSURES IN BALLAST

(Curves drawn from measured pressures with help of theoretical formulas for distribution.)

However, the report observes, "it seems probable that the effect of the jarring action of the train loads will be to decrease the lateral distribution of pressure. It seems possible also that this tendency is counteracted in some degree by the cohesion which develops in ballast after it has been in place for some time." The committee also points out the favorable effect of ballast above the bottom of the tie, especially near the ends of the tie, increasing the ultimate carrying capacity of ballast under jarring and vibratory loads (but not under static lòads), especially at the end of the tie, where the whipping action on the tie more easily pushes the particles of ballast away.

Prof. A. N. Talbot, of the University of Illinois, heads the committee and has been in direct charge of the field and laboratory work and the interpretation of results. The principal men engaged in the tests were H. R. Thomas and N. E. Ensign, who conducted the field tests, Prof. M. L. Enger, who did the experimental work on transmission of pressure in ballast, and E. E. Cress.

The Road Problem in England

Regarding the road and traffic problem in England the Engineering Supplement of the *Times* (London) prints the following in its annual review number, January, 1920:

"Designers of motor and steam lorries are faced with the task of producing a mechanically propelled vehicle the weight of which in relation to carrying capacity shall be lower than of the types now in service, and which preferably shall take a large load. This raises questions as to permissible weights per axle, and introduces the road problem in a somewhat acute form. It implies not only the reconstruction of all existing first and second class roads to meet these traffic conditions, but the construction of a large mileage of new roads, specially designed for mechanically propelled traffic moving at speeds in excess of those whch are permissible on existing roads.

"The Ministry of Transport, which has established a Roads Department and placed it in charge of a road engineer of recognized ability, is giving attention to the subject, and is now engaged in the work of classifying roads as a preliminary to framing a comprehensive scheme of reconstruction and new roads. The recent conference of road authorities in London served to focus attention on all parts of the road problem, engineering, financial, and administrative, and an attempt was at the same time made to indicate the lines of progress in the design of road vehicles to meet the needs of the new transport era. The spirit of co-operation between road authorities, manufacturers of lorries, and road users which the conference aroused should materially aid the work which is being undertaken by the Ministry of Transport.

"The ability of the road motor to compete on equal terms with the railway for goods transport, even for short hauls—the economic limits of distance have yet to be definitely determined—depends in the last resort, even when the road and motor engineer have fulfilled their part of the work, on the price of fuel. That of solid fuels is increasing, and was partly responsible, in conjunction with wage demands, for the withdrawal of the steam omnibus from the London services. The price of liquid fuels used in the internal combustion engine also tends to rise. New fuels are being experimented with, and without accepting the exaggerated claims which are sometimes made in this connection, there is good ground for hope that the introduction of alternatives to gasoline or parafin may serve to steady the market for those oils and prevent an undue hanidcap from being placed on road transport."

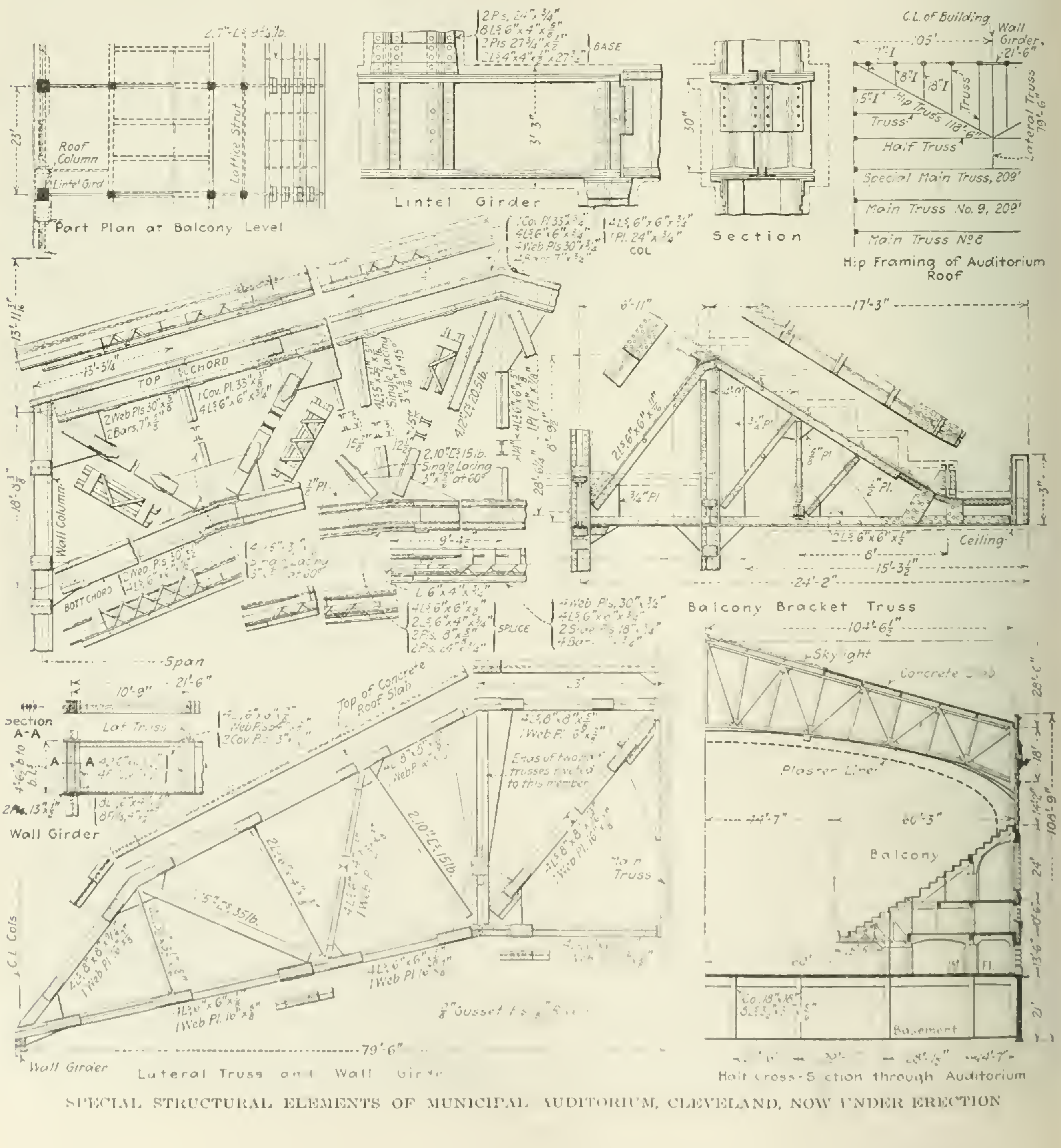
Steel Framing for Public Hall in Cleveland

Special Roof Design to Suit Architectural Plans—Lintels Carry Columns—Cantilever Trusses for Balcony

An unusual arrangement of steel trusses for hip-roof framing over an auditorium has been designed for the north end of the new Public Hall in Cleveland, Ohio, in order to avoid placing large columns at points where they would encroach upon the inclines which take the place of stairways between the floors, and at the same time to meet the roof lines chosen by the architect. The auditorium is very large, being capable of seating 12,000 (stage included), so that it necessitates heavy and costly roof framing. Its trusses are among the largest simple roof trusses on record. The arrangement of the trusses and roof bracing is shown on the accompanying plan.

Normally, the end lateral truss and diagonal hip trusses would be carried by the first main transverse truss. In the Cleveland building, however, the columns for this panel must be narrow enough to clear the inclines noted above, while in view of the extra load it was considered desirable to carry this load on columns extending directly to foundation footings. To meet these conditions, the plan adopted was to extend the lateral truss back to what ordinarily would be the second main truss, as this is supported by columns extending down to the foundations. The place of the first main truss is taken by two half trusses which are framed into the lateral truss, the two hip trusses being framed into the same connection.

In the general layout of the roof framing, the southern part of the building is spanned by ten trusses 213



SPECIAL STRUCTURAL ELEMENTS OF MUNICIPAL AUDITORIUM, CLEVELAND, NOW UNDER ERECTION ft. long over all or 209 ft. 1 in. between centers of supporting columns. These are spaced 23 ft. on centers. From the middle of the first truss, the 79½-ft. lateral truss extends to the north wall, where it is seated on a plate-girder of 21½-ft. span, carried by two of the wall columns. From the first panel point of the lateral truss two hip trusses 118½ ft. long extend diagonally to the corners of the building and two half trusses extend to the side walls, the ends of their chords being framed against the truss post.

The hip trusses carry short trusses having their outer ends riveted to columns in the side and end walls. Between the trusses is a framing of I-beams and channels to support the 5-in. concrete roof slab. Diagonal bracing of rods is used in some of the panels.

The last main 213-ft. truss at the north end, which carries the lateral truss, is of very reavy design, having deep double-web chords, with cover plates over the entire upper side of the top chord. The posts are of I-section, composed of four angles and single lacing and extending through the chords. Each of the heavier diagonals has a pair of I-section members composed of two channels riveted against a web plate, the two members being connected by batten plates and lacing. The lighter diagonals are pairs of channels, with lacing. The other main trusses are of similar but lighter design, with each chord composed of two T-shaped members having a web plate and two flange angles. The lateral truss is shown also, together with the wall girder which carries its outer end. The hip trusses have T-section chords with deep webs in the top chord panels where connections are made with the short trusses extending to the walls.

The wall columns, which have an essential relation to the lateral rigidity of the structure, are of box section, having two web plates and eight flange angles with batten plates over the flanges. They are carried up to the elevation of the top chords and the trusses are framed between them, thus making the substantial connection which is necessary for the lateral stiffness for the roof. Several of the wall columns are supported on lintels or wall girders 10 ft. 4 in. long, at the second-floor level. This is owing to the different spacing of the columns below, as governed by the architectural design. Each of these lintels is composed of a pair of 30-in. I-beams with top and bottom cover plates and is reinforced by stiffeners under the shoe of the upper column.

Cantilever trusses of triangular form, carried by two rows of interior columns, serve to extend the balconies about 15½ ft. over the main floor, as shown in the cross-section of the building. Shallow plate and lattice girders are used extensively in the floor framing, which supports a concrete slab. The column foundations are concrete footings extended down to soil of satisfactory bearing power.

The steelwork weighs 4050 tons, of which 1650 tons are in the roof framing. The total represents a weight of 101 lb. per square foot of the building and 0.95 lb. per cubic foot of the building. Including the ceiling weight, the dead load of the roof is 150 lb. per square foot; suspended loads also are provided for. The live load due to wind and snow is taken as 35 lb. per square foot. For the main portion of the first floor a live-load of 2550 lb. per square foot was taken, and for the upper floors a live-load of 80 lb. Unit stresses conforming to the city's building code were used in the design. The steelwork s left unpainted, as it is to be cased in concrete.

Construction work was stopped for a time during the war, but has been resumed. At the end of June, 1919, the erection of the structural steel for the stage section of the building had been practically completed, and the erector was moving northward in readiness to place the first of the 213-ft. roof trusses. These large trusses are being assembled, fitted and reamed at the shops in the same manner as railway bridge work is handled. The basement walls are progressing as fast as the steel erection. It is expected that the erection of structural steel will be completed by October. This will be followed by the contract for the reinforced-concrete work and the exterior walls, so it is hoped to have the building under cover by the end of 1920.

The cost of this municipal hall is estimated at $2,000,000, which sum has been provided for by a bond issue approved by public vote in 1916. It will be 590 x 213 ft. in all. The part now under construction, forming the central portion, has its main floor, 120 x 257 ft., at the street level, while on three sides are balconies 60 ft. wide extending from the walls and having a cantilever projection of 15½ ft. over the floor area. Offices, corridors and balcony entrances are arranged on two narrow upper floors beneath the sloping floor of the balcony.

This large municipal structure was designed by F. H. Betz, city architect, and F. R. Walker, consulting architect. The structural design was prepared by the Osborn Engineering Co., acting as consulting engineers. The contractor for the foundation work was the Hunkin-Conkey Construction Co., and the Cleveland Fireproof Construction Co. is at work on a contract for the basement walls. The King Bridge Co. has the contract for the steelwork, including erection.

Lead Substitute Experience in St. Louis

TRIAL of the lead substitute metalium for pipe joints on a 6-in. line with 96 joints are given in the annual report of the St. Louis Water Department as follows: The trench was left open for two weeks. The leakage immediately after filling amounted to 2½ gal. per minute, the average over the first 24 hours was 1⅓ gal. per minute, over the second 1.15 gal. per minute, which in the course of two weeks gradually diminished to an amount too small to be registered by the meter, although still making itself evident as a dampness around the joints.

The report states that although this material requires no calking there is not as great a saving as might be imagined, since the services of one man are required almost constantly at the melting pot due to the comparatively small range of pouring temperature as compared with lead. Considering this, together with the fact that a special unoiled jute at 16c. per pound is required for metalium joints as compared with standard jute at 8c. for lead, the cost per joint proved to be greater than the average cost of 6-in. lead joints, figuring lead at 5c. per pound. While greater familiarity with the material would undoubtedly lower the cost per joint, L. Chivvis, engineer in charge of distribution, concludes that it is problematical whether the margin would be great enough to justify abandoning a material with which the organization is exceptionally skillful and which is reliable beyond a doubt.

Proposed Concrete Incased Steel Arch of 340-Ft. Span

Oregon Highway Department Will Probably Use This Design as New Crossing of Willamette River

STUDIES now being made by the Oregon State Highway Department for a new bridge across the Willamette River at Oregon City contemplate the use of a central 340-ft. arch of steel incased in concrete. One of the preliminary sketches of the structure is given in the accompanying drawing.

The main channel span, which has a rise of 100 ft. is flanked by reinforced-concrete viaduct approaches, the entire structure being about 860 ft. in length. The roadway is half suspended and half supported and crosses the channel on a 5 per cent grade, this grade being unavoidable by reason of a street intersection on the lower end and a railroad crossing at the higher. It would be impossible at any reasonable cost to provide a subway crossing and even if this were done, navigation clearance requirements eliminate the possibility of materially lowering the grade at the center of span.

The main arch span consists of two ribs of the box-girder type, with two ½-in. web plates, eight 6 x 6 x ⅝-in. flange angles and four 14 x ⅜-in. cover plates. The box section is latticed top and bottom and stiffened at the center with a latticed diaphram; the ribs are 4 ft. wide, 7 ft. deep at the crown and 11½ ft. deep at the spring line, and all steelwork is entirely incased in concrete. In order to reduce the dead load, the concrete incasement is to be made hollow, and a study of light-weight concrete in this connection is being made by the department at the present time.

The water in the channel at this point is over 100 ft. deep, for which reason falsework is completely out of the question, and it is therefore planned to erect the steel ribs as three-hinged arches and suspend the falsework for the concrete incasement from the same.

The designs are being studied under the direction of C. B. McCullough, bridge engineer. Herbert Nunn is State Highway Engineer.

Summary of Contract Terms for Garbage Feeding at Three Cities

A COMPARISON of the terms of the contracts under which the groups of Baltimore, Md., Newark, N. J., and Buffalo, N. Y., is being disposed of by feeding to hogs is shown by the accompanying table. The table was included in the report of the Committee on Refuse Collection and Disposal submitted to the Sanitary Engineering Section of the American Public Health Association at New Orleans the last week in October, 1919. E. D. Rich, engineer Michigan State Board of Health, is chairman of the committee.

COMPARISON OF CONTRACTS FOR GARBAGE DISPOSAL BY FEEDING TO HOGS AT BALTIMORE, NEWARK AND BUFFALO

Location	Estimated Population	Area, Sq. Mi.	Contract Effective, 1919	Duration of Contract, Years	Price per Ton Paid by Contractor	Collection and Delivery	Separation	Material Included	Estimated Daily Collection, Tons	Estimated Number of Hogs	Housing of Hogs	Feeding Facilities	Reduction Considered (?)	Previous Arrangement
Baltimore, Md.	720,000	89.5	1919 May 1	4	3½ times top price per lb. live killing hogs at Chicago. Garbage drained before weighing.	City collects and delivers 16 miles by barges to piggery.	To be enforced.	Household garbage and animal market refuse	140 tons	15,000	Shaded yards, 70 ft. by 250 ft., 100 hogs each.	Concrete feeding floors. Garbage unloaded and spread by machinery each day.	Yes. Bids asked but none received.	Reduction cost $1.06 per ton. Temporary burial cost 85c. per ton.
Newark, N. J.	450,000	23	1919 July 3	5	8 times top price per lb. Chicago killing hogs	City collects and delivers to piggery.	To be enforced.	To be attempted.	100 tons	5000 in summer.	Unit buildings 100 ft. sq. 80 to 100 hogs each. Sawtooth roof. Windows, top and sides.	Double concrete driveway and feeding floor, 24 ft. wide through center each building. Gutters on each outer edge next to pens. Pens slope to gutters. Yard 50 ft. deep for each pen.	Yes, but cost too much. $750,000 exclusive of land	Combined refuse dumped. $3000 realized annually from salvage
Buffalo, N. Y.	. . .		1919 Oct. 1	5	Minimum, 50c. per ton; 6, 7, or 8 times Chicago hog price according to amount of garbage.	City collects and delivers to feeding platforms.	To be enforced.	....	100 tons	. . .	....	....	. .	Reduction.

Appeals Court Sustains Decision Against Luten Patents

Decision Scores Patentee for Methods in Promoting Concrete Bridge Patents Which Are Held Invalid

IN the United States Court of Appeals, Eighth Circuit, a decision was handed down on Jan. 15, 1920, sustaining the decision of the District Court of the United States for the District of Nebraska for its decision in the case of Daniel B. Luten vs. Wilson Reinforced Concrete Co., et al. This lower court decision held three of the Luten concrete bridge patents invalid and one other under suit not infringed. The upper court decision goes further and holds the fourth patent invalid. In addition, the decision, written by Judge Amidon, District Judge, and concurred in by Judge Hook, Circuit Judge, severely scores Mr. Luten for the methods used in promoting his patent. The decision is as follows:

This suit was brought by Daniel B. Luten against the Wilson Reinforced Concrete Co. and others, to restrain infringement of Letters Patent 853,202, 853,203, 818,386, 999,663. The case was heard upon elaborate proofs, and the bill dismissed on the ground that Patent 999,663 was not infringed, and that the others were void for want of invention (254 Fed. 107). The case was heard in this court at the same term as Luten vs. Young and Luten vs. Allen (opinion in which is concurrently filed). There is advantage in getting as many of the numerous patents issued to Mr. Luten as possible under examination at the same time. It would aid in determining the merits of each if the same court could see them all at a single view.

Insofar as we can discover, none of the Luten patents has ever been sustained in a contested case, and they have been frequently held to be invalid for want of patentability. Notwithstanding this experience these patents have been exploited by a skillful campaign of advertising in which it has been repeatedly asserted that no suit based on a Luten patent has ever been lost or dismissed. This work has been done through the agency of the National Bridge Co. of Indianapolis. The record in this case leaves no room for doubt that the entire scheme by which it has promoted these patents has been fraudulent. We shall call attention to a few of the more glaringly culpable of the representations, quoting in the main the exact language of the circulars.

1. "The National Bridge Company of Indianapolis, Ind., now owns seventeen Luten Patents on cost-saving devices in concrete bridges. Forty-seven other applications for Luten patents are still pending. Several of the above patents have been declared valid in the United States Circuit Courts with injunctions issued against infringers, and numerous other suits for infringement are being filed. No infringement suit based on a Luten patent has ever been lost or dismissed."

2. A skillfully printed advertisement headed, "Luten Patent Decrees," lists the patents, twenty-four in number, and states under each patent the court and title of the case in which a consent decree had been obtained, without disclosing that the decrees were by consent. By repeating the cases under the several patents involved, without calling attention to that fact, the impressiveness of the showing to a casual reader is greatly enhanced.

3. Another advertisement headed, "To Whom It May Concern," lists sixteen patents with date of issue and year of expiration. It states:

"The above sixteen patents contain two hundred ninety claims.

". . . If one of these claims be infringed, the owner of the patent may collect royalty and costs in a suit for an injunction. If it be shown that the infringement was knowingly made, punitive damages to the amount of three times the actual damages proved may be assessed by the court. . . .

"If a judgment cannot be collected from a municipality, county or town, as, for example, when a board refuses to settle for infringements by its predecessors in office, a judgment may be enforced against the individual officers who authorized the infringement and their private property sold on execution to satisfy the judgment.

"If two or more parties infringe in the same structure, as when a contractor builds for a municipality on designs furnished by an engineer, the owner of the patent may elect which of the three he shall prosecute, the engineer, or the municipality, or the contractor, and may sue any or all of them. . . .

"The validity of the patent does not depend on the state of the art at the time the patent was issued. It depends to some extent on the state of the art two years before the patent was applied for. Many of the above patents were under examination by the patent office for many years before they were issued. . . .

"If it be shown . . . that a single claim of a valid patent is being infringed, the court will issue an injunction forever restraining the continuance of the work and assessing costs and damages. An injunction to restrain future infringements may issue before or *after* the work is completed. . . .

"Such a suit is never tried before a jury. State Courts have no jurisdiction. Suit may be brought in any part of the United States without the employment of local attorneys. The principal items of expense in such cases are attorney fees, traveling expenses in taking depositions, printing the record which may amount to thousands of dollars in severely contested cases, and court costs."

The advertisement then calls attention to two specific cases in which the cost of the litigation amounted to from forty to fifty thousand dollars.

4. Another showing is a collection in separate documents of all the consent decrees.

5. Another advertisement sets forth that fifteen thousand designs for concrete bridges have been supplied under the Luten patents, and over six thousand of them have been actually erected.

The foregoing elements have been used in a brilliant campaign of promotion. The arts of the advertiser and the photographer have been brought to a perfection seldom equalled. All the above themes have been pressed with masterful skill in that form of argumentation which is peculiar to the patent lawyer and the patent expert—a union of science and logic. We call attention to only two of the most reprehensible features of this campaign of deception by the use of half truths. First, the use of consent decrees throughout the entire literature without disclosing that they are by consent, and not the result of litigation. Second, the threats of patent litigation. This has been practiced with a studied use of menacing arts that would have been blackmail on a vast scale if the threat had only been criminal instead of civil prosecution. In law this is a saving distinction, but not in ethics.

We have examined the patent here directly involved, and the others contained in the record, and the numerous patents of the plaintiff which have been described in the cases to which we have referred. We are convinced that they are all void for want of patentable invention. Not one of them has ever been sustained in a contested case. They ought not to be. The use of steel to reinforce concrete was more than a quarter of a century old when Mr. Luten entered the field in 1902. The history of the art is given by this court in Luten vs. Washburn, 253 Fed. 950, and the Court of Appeals of the Sixth Circuit in Luten vs. Whittier, 251 Fed. 590. He has added nothing that is patentable to the art. All he has done is to make such modifications, either in the arrangement of the rods or their form, as in his judgment would best meet the stress of the particular structure. That is the work of the engineer. There is nothing generic about any of his patents. Judging by his drawings and specifications, and the multitude of his patents and applications for patents, what he has done is to prepare drawings and specifications for a particular bridge, then put these in the form required by the patent law, and present them with the necessary fees to the Patent Office as an application for patent. When one considers the number of patents granted, and applications pending, he has met with an inexplicable success.

While Mr. Luten has made no invention, he has made a great discovery, namely, that not more than one city or county attorney, or attorney general in ten knows anything about patent law, or the proper interpretation of consent decrees in that field. It has resulted that cities, counties and states have been easy victims for the peculiar arts of the National Bridge Co., for they were without trustworthy legal advice. With the above elements to play upon, it has been easy to convince public authorities that the way of safety was the way of wisdom, and that this consisted in employing Mr. Luten as an engineer, or paying him ten per cent royalty for the use of his patented device.

Mr. Luten is entitled to all the advantages which belong to him as an engineer. That is the full measure of his right. He is entitled to nothing under the patent law. At a time when many of the states are appropriating tens of millions of dollars for good roads, and each of these appropriations is being duplicated by the federal government, and reinforced concrete bridges are indispensable factors in these great enterprises, a continuation of the Bridge Company's practices under these void patents would be a grave public wrong.

The decree is modified insofar as it holds patent No. 999,663 not infringed, so as to hold it also void for want of patentable invention, and as so modified the decree is affirmed.

This is one of the cases in which the State of Nebraska assumed a part of the defense of the suit. Mr. Luten was represented by Russell T. MacFall (F. H. Drury and F. M. Hall were with him on the brief) and the appellees by Wallace R. Lane (C. A. Davis and W. F. Moran were with him on the brief).

Women in British Industry

The Women's Industrial League, the main object of which is to secure equal opportunities for employment as between men and women in all occupations, sent out recently a circular letter to some 5,000 firms in Great Britain asking certain questions relative to the employment of women. Replies from 1,422 firms engaged in engineering and allied work were received, and a summary of these just published by the league shows that the firms in question employed 79,700 women at the end of May, 1919, as compared with 43,200 before the war and 245,300 during the war. The number of war workers who have been retained is rather striking, as the returns do not include women engaged as clerks, tracers, typists, canteen workers, and cleaners. In "general engineering" the returns of 587 firms show that 28,200 women were employed six months ago, as compared with 14,100 before the war and 134,600 during the war. In "foundry work," a trade of some interest at the present time, 279 firms replied, the number of women in the three categories being respectively 3,200, 950, and 19,400. Of the 764 firms who had employed women for the first time during the war, 228, or 30 per cent, propose to retain them and make no comment on the present labor situation. A further 97 firms would retain them if it were not for the opposition of the trade unions. The reasons given by the employers for not favoring employment of women are various, but will be generally familiar to engineers—the Home Office restrictions on night work, the unsuitable nature of the heavier work in shipyards, foundries, etc., the government regulation compelling girls of 18 years of age to be paid the full rate of wages, the increased supervision necessary when women are employed, and so on. [From the Engineering Supplement of the *Times*, London.]

Hoover—On Engineer's Interest in Public Questions

Discusses, Before Mining Engineers, Governmental Problems, the Railroads, Shipping and Industrial Relations

DECLARING that in their advocacy of various public measures now before Congress "engineers want nothing for themselves," Herbert C. Hoover, in his inaugural address as president of the American Institute of Mining and Metallurgical Engineers in New York, Feb. 17, reviewed broadly some public questions in which engineers have been taking a special interest. He devoted much time to the railroad and shipping problems, pointing out the inevitable inefficiency of Government operation and the very great complexity of the shipping situation. He endorsed the project for the establishment of a Department of Public Works and approved the engineers' commendation of a national budget system.

The following extracts from his address deal chiefly with the general aspects of our industrial situation and with the railroad and shipping problems:

POST-WAR SITUATION

We have in this country probably one hundred thousand professional engineers. The events of the past few years have greatly stirred their interest in national problems. This has taken practical form in the maintenance of joint committees for discussion of these problems and support to a free advisory bureau in Washington. The engineers want nothing for themselves from Congress. They want efficiency in government, and you contribute to the maintenance of this bureau out of sheer idealism. This organization for consideration of national problems has had many subjects before it, and I propose to touch on some of them this evening.

Even more than ever before is there necessity for your continued interest in this vast complex of problems that must be met by our Government. We are faced with a new orientation of our country to world problems. We face a Europe still at war; still amid social revolutions; some of its peoples still slacking on production; millions starving; and therefore the safety of its civilization is still hanging by a slender thread. Every wind that blows carries to our shores an infection of social disease from this great ferment; every convulsion there has an economic reaction upon our own people. If we needed further proof of the interdependence of the world, we have it today in the practical blockade of our export market. The world is asking us to ratify long-delayed peace in the hope that such confidence will be restored as will enable her to reconstruct her economic life. We are today contemplating maintenance of an enlarged Army and Navy in preparedness for further upheavals in the world and failing to even provide some insurance against war by a league to promote peace.

Out of the strain of war weaknesses have become even more evident in our administrative organization, in our legislative machinery. Our Federal Government is still overcentralized, for we have upon the hands of our Government enormous industrial activities which have yet to be demobilized. We are swamped with debt and burdened with taxation. Credit is woefully inflated; speculation and waste are rampant. Our own productivity is decreasing. Our industrial population is crying for remedies to the increasing cost of living and aspiring to better conditions of life and labor. But, beyond all this, great hopes and aspirations are abroad; great moral and social forces have been stimulated by the war and will not be quieted by the ratification of peace. These are but some part of the problems with which we must deal. I have no fear that our people will not find solutions; but progress is sometimes like the old-fashioned rail fence—some rails are perhaps mis-shapen, and all look to point the wrong way; but in the end, the fence progresses.

The war nationalization of railways and shipping are our two greatest problems in Government control awaiting demobilization. There are many fundamental objections to continuation of these experiments in socialism necessitated by the war. They lie chiefly in their destruction of initiative in our people and the dangers of political domination that can grow from governmental operation. Beyond this, the engineers will hold that the successful conduct of great industries is to a transcendent degree dependent upon the personal abilities and character of their employees and staff.

No scheme of political appointment has ever yet been devised that will replace competition in its selection of ability and character. Both shipping and railways have today the advantage of many skilled persons, sifted out in the hard school of competition, and even then the Government operation of these enterprises is not proving satisfactory. Therefore, the ultimate inefficiency that would arise from the deadening paralysis of bureaucracy has not yet had full opportunity for development. Already, we can show that no government, under pressure of ever-present political or sectional interests, can properly conduct the risks of extension and improvement, or can be free from local pressure to conduct unwarranted service in industrial enterprise. On the other hand, our people have long since recognized that we cannot turn monopoly over to unrestrained operation for profit nor that the human rights of employees can ever be dominated by dividends.

Our business is handicapped on every side by the failure of our transportation facilities to grow with the country. It is useless to talk about increased production to meet an increased standard of living in an increasing population without a greatly increased transport equipment. Moreover, there are very great social problems underlying our transport system. Today their contraction is forcing a congestion of our population around the great cities, with all that these overswollen settlements import. Even such great disturbances as the coal strike have a minor root in our inadequate transportation facilities and their responsibility for intermittent operation of the mines.

We are all hoping that Congress will find a solution to this problem that will be an advanced step toward the combined stimulation of the initiative of the owners, the efficiency of operation, the enlistment of the good will of the employees, and the protection of the public. The problem is easy to state. Its solution is almost overwhelming in complexity. It must develop with experience, step by step—toward a real working partnership of its three elements.

The return of the railways to the owners places predominant private operation upon its final trial. If instant energy, courage, and large vision in the owners should prove lacking in meeting the immediate situation we will be faced with a reaction that will drive the country to some other form of control. Energetic enlargement of equipment, better service, co-operation with employees, and the least possible advance in rates, together with freedom from political interest, will be the scales upon which the public will weigh these results.

Shipping Problem

Important phases of our shipping problem that have come before you should receive wider discussion by the country. As the result of war pressure, we will spend over $2,800,000,000 in the completion of a fleet of nineteen hundred ships, of a total of 11,000,000 tons—nearly one-quarter of the world's cargo shipping. We are proud of this great expansion of our marine, and we wish to retain it under the American flag. Our shipping problem has one large point of departure from the railway problem, for there is no element of natural monopoly. Anyone with a water-tight vehicle can enter upon the seas today, and our Government is now engaged upon the conduct of a nationalized industry in competition with our own people and all the world besides. While in the railways Government inefficiency could be passed on to the consumer, on the seas we will sooner or later find it translated to the national Treasury.

Until the present time, there has been a shortage in the world's shipping, but this is being rapidly overtaken, and we shall soon be met with fierce competition of private industry. If the Government continues in the shipping business, we shall be disappointed from the point of view of profits; for we shall be faced with the ability of private enterprise to make profits from the margins of higher cost of Government operation alone. Aside from those losses inherent in bureaucracy and political pressure, there are others special to this case. The largest successfully managed cargo fleet in the world comprises about one hundred and twenty ships, and yet we are attempting to manage nineteen hundred ships at the hands of a Government bureau. In normal times the question of profit or loss in a ship is measured by a few hundred tons of coal wasted, by a little extravagance in repairs, or by the four or five days on a round trip. Beyond this, private shipping has a free hand to set up such give-and-take relationships with merchants all over the world as will provide sufficient cargo for all legs of a voyage, and these arrangements of co-operation cannot be created by Government employees without charge or danger of favoritism. Government officials are unable to enter upon the detailed higgling in fixing rates required by every cargo and charter. Therefore, they must take refuge in rigid regulations and in fixed rates. In result, their competitors underbid by the smallest margins necessary to get the cargoes. The effect of our large fleet in the world's markets is thus to hold up rates, for so long as this great fleet, on one hand, holds a fixed rate others will only barely underbid. If we hold up rates an increasing number of our ships will be idle as the private fleet grows. On the other hand, if we reduce rates we shall be underbid until the Government margin of larger operation cost causes us to lose money.

We shall yet be faced with the question of demobilizing a considerable part of this fleet into private hands, or frankly acknowledging that we operate it for other reasons than interest on our investment. In this whole problem there are the most difficult considerations requiring the best business thought in the country. In the first instance, our national progress requires that we retain a large fleet under our flag to protect our national commercial expansion overseas. Secondly, we may find it desirable to hold a considerable Government fleet to build up trade routes in expansion of our trade, even at some loss in operation. Thirdly, in order to create this fleet, we have built up an enormous shipbuilding industry. Fifty per cent of the capacity of our shipyards will more than provide any necessary construction for American account. Therefore there is a need of obtaining foreign orders, or the reduction of capacity, or both. I believe, with most engineers, that, with our skill in repetition manufacture, we can compete with any shipbuilders in the world and maintain our American wage standards; but this repetition manufacture implies a constant flow of orders. It would seem highly desirable, in order to maintain the most efficient yards until they can establish themselves firmly in the world's industrial fabric, that the Government should continue to let some ship construction contracts to the lowest bidders. These contracts to supplement private building in such a way as to maintain the continuous operation of the most economical yards and the steady employment of our large number of skilled workers engaged therein.

When we consider giving orders for new ships, we must at the same time consider the sale of ships, as we cannot go on increasing this fleet. When we consider sale, we are confronted with the fact that our present ships were built under expensive conditions of war, costing from three to four times per ton the pre-war amount, and that already any merchant, subject to the long time of delivery, can build a ship for seventy-five per cent of their cost. It would at least seem good national policy to sell ships today for the price we can contract for delivery a year or two hence, thus making the Government a reservoir for continuous construction. We could thus stabilize building industry to some degree and also bring the American-owned fleet into better balance, if, as the Government sold three or four emergency-constructed cargo vessels, it gave an order for one ship of a better and faster type. This would make reduction in our shipbuilding steadier and would give the country the type of ships we need. . . .

I am daily impressed with the fact that there is but one way out [of our industrial-relations difficulties], and that is to again re-establish, through organized representation, that personal co-operation between employer and employee in production that was a binding force when our industries were smaller of unit and of less specialization. Through this, the sense of craftsmanship and the interest in production can be re-created and the proper establishment of conditions of labor and its participation in a more skilled administration can be worked out. The attitude of refusal to participate in collective bargaining with representatives of the employees' own choosing is the negation of this bridge to better relationship. On the other hand, a complete sense of obligation to bargains entered upon is fundamental to the process itself.

The interests of employee and employer are not necessarily antagonistic; they have a great common ground of mutuality, and if we could secure emphasis upon these common interests we would greatly mitigate conflict. Our Government can stimulate these forces, but the new relationship of employer and employee must be a matter of deliberate organization within industry itself. I am convinced that the vast majority of American labor fundamentally wishes to co-operate in production and that basis of good will can be organized and the vitality of production re-created.

Many of the questions of this industrial relationship involve large engineering problems, as an instance of which I know of no better example than the issue you plan for discussion tomorrow in connection with the soft-coal industry. Broadly, here is an industry functioning badly from an engineering and consequently from an economic and human standpoint. Owing to the intermittency of production, seasonal and local, this industry has been equipped to a peak load of 25 or 30 per cent over the average load. It has been provided with a 25 or 30 per cent larger labor complement than it would require if continuous operation could be brought about. I hope your discussion will throw some light on the possibilities of remedy. There lies in this intermittency not only a long train of human misery through intermittent employment, but the economic loss to the community of over a hundred thousand workers who could be applied to other production, and the cost of coal could be decreased to the consumer. This intermittency lies at the root of the last strike in the attempt of the employees to secure an equal division among themselves of this partial employment at a wage that could meet their view of a living return on full employment.

OUR OWN SOCIAL PHILOSOPHY

These are but few of the problems that confront us. But in the formulating of measures of solution, we need a constant adherence to national ideals and our own social philosophy.

In the discussion of these ideals and this social philosophy, we hear much of radicalism and of reaction. They are, in fact, not an academic state of mind but realize into real groups and real forces influencing the solution of economic problems in this community. In their present-day practical aspects, they represent on one hand roughly various degrees of exponents of socialism, who would directly or indirectly undermine the principle of private property and personal initiative, and, on the other hand, those exponents who in various degrees desire to dominate the community for profit and privilege. They both represent attempts to introduce or preserve class privilege, either a moneyed or a bureaucratic aristocracy. We have, however, in American democracy an ideal and a social philosophy that sympathizes neither with radicalism nor reaction as they are manifested today.

For generations the American people have been steadily developing a social philosophy as part of their own democracy—and in these ideals it differs from all other democracies. This philosophy has stood this period of test in the fire of common sense; it is, in substance, that there should be an equality of opportunity—an equal chance—to every citizen. This view that every individual should, within his lifetime, not be handicapped in securing that particular niche in the community to which his abilities and character entitle him, is itself the negation of class. Human beings are not equal in these qualities. But a society that is based upon a constant flux of individuals in the community, upon the basis of ability and character, is a moving, virile mass; it is not a stratification of classes. Its inspiration is individual initiative. Its stimulus is competition. Its safeguard is education. Its greatest mentor is free speech and voluntary organization for public good. Its expression in legislation is the common sense and common will of the majority. It is the essence of this democracy that progress of the mass must arise from progress of the individual. It does not permit the presence in the community of those who would not give full meed of service.

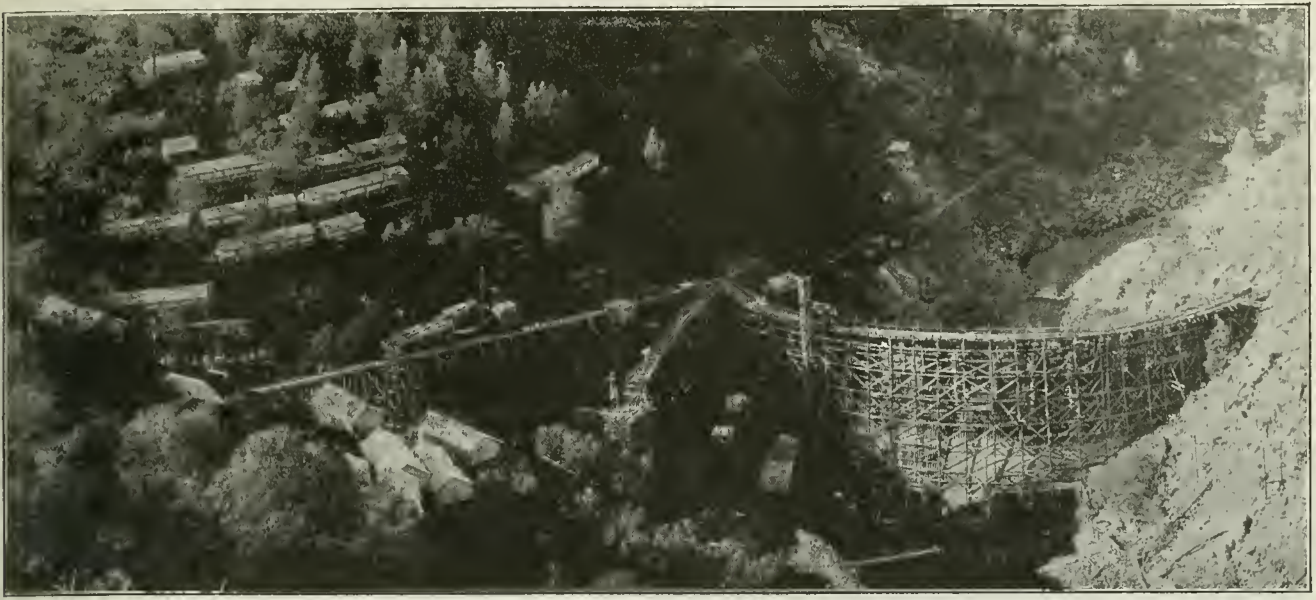
Its conception of the State is one that, representative of all the citizens, will in the region of economic activities apply itself mainly to the stimulation of knowledge, the undertaking only of works beyond the initiative of the individual or group, the prevention of economic domination of the few over the many, and the least entrance into commerce that Government functions necessitate.

If we cling to our national ideals it will mean the final isolation and the political abandonment of the minor groups who hope for domination of the Government, either by "interests" or by radical social theories through the control of our political machinery. I sometimes feel that lawful radicalism in politics is less dangerous than reaction, for radicalism is blatant and displays itself in the open. Unlawful radicalism can be handled by the police Reaction too often fools the people through subtle channels of obstruction and progressive platitudes. There is little danger of radicalism ever controlling a country with so large a farmer population, except in one contingency. That contingency is from a reflex of continued attempt to control this country by the "interests" and other forms of our domestic reactionaries.

The mighty upheaval following the World War has created turmoil and confusion in our own country no less than in all other lands. If America is to contribute to the advance of civilization, it must first solve its own problems, must first secure and maintain its own strength. The kind of problems that present themselves are more predominantly economic—national as well as international—than at any period in our history. They require quantitative and prospective thinking and a sense of organization. These are the sort of problems that your profession deals with as its daily toil. You have an obligation to continue the fine service you have initiated and to give it your united skill.

New York State Health Laboratory Building

To provide enlarged quarters for the Division of Laboratories and Research of the New York State Department of Health there has been built at Albany a fireproof brick and reinforced-concrete building 50 x 150 ft. in outside floor plan, with a basement and three stories. The first floor is devoted to administration offices, serum diagnostic laboratories, the preparation of bacterial media, specimen recording, preparation of outfits, and the general handling of supplies. On the second floor is the library, the director's office and private laboratory, and laboratories for bacterial diagnostic and research. The third floor is devoted to chemical laboratories, rooms for the preparation of serum, antitoxin, and bacterial vaccine, besides various special rooms. Ventilation is provided by means of exhaust fans driven by motors located at the top of the building. The laboratory as a whole, which contains a considerable number and variety of conveniences, is described in more detail than is here given in *Health News* for December, the monthly bulletin of the New York State Department of Health.



LOOKING DOWN ON THE NEARLY COMPLETED KERKHOFF DAM IN THE SAN JOAQUIN VALLEY, CAL.

Concrete Arch Dam Built From Superposed Trestle

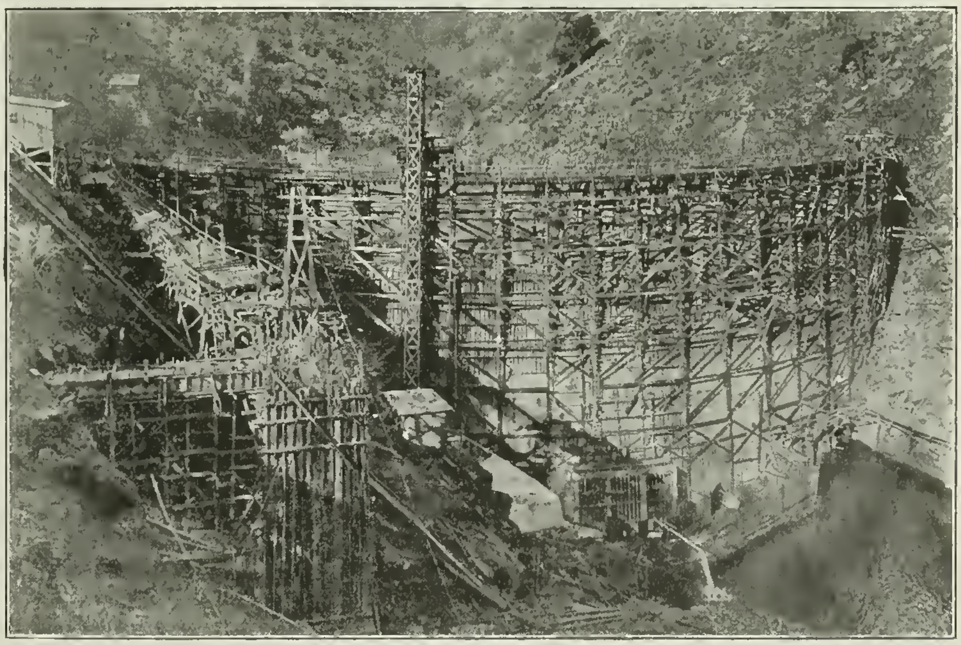
Framework Erected Complete Before Starting Dam—Concrete Elevated to Cars on Top and Dropped Through Chutes

POWER demands in the San Joaquin Valley in California have led to the construction by the San Joaquin Light and Power Co. of the Kerkhoff hydroelectric development about forty miles east of Fresno. The reservoir is created in a narrow, inaccessible canyon by the construction of a simple, constant-angle dam of concrete, with a radius of 205 ft. on the upstream face and a total height of 108 ft. The rapid construction of the dam, made necessary by the growing power shortage, was facilitated by the use of a wooden trestle, which served both as a backing for the concrete forms and as the main part of the concrete delivery system.

As soon as the foundation concrete was placed inside the cofferdam which shut off the river flow, the trestle shown in the accompanying views was erected immediately over the dam site and following in plan the curve of the arch, so that the trestle completely inclosed the prospective dam section. The concrete-mixing plant was located on the side hill just upstream of the dam and at such a height so that its discharge would be by gravity to the lower part of the dam section and its feed hopper be just below a track leading from the stone crusher some distance downstream of the dam. At the foot of the mixer was erected a concrete hoist tower dumping into hoppers on various levels of the trestle, on which were tracks on which run hopper cars hauled by gasoline motors. Between the rails of the tracks were openings leading into wood box chutes by which the concrete was fed to the dam.

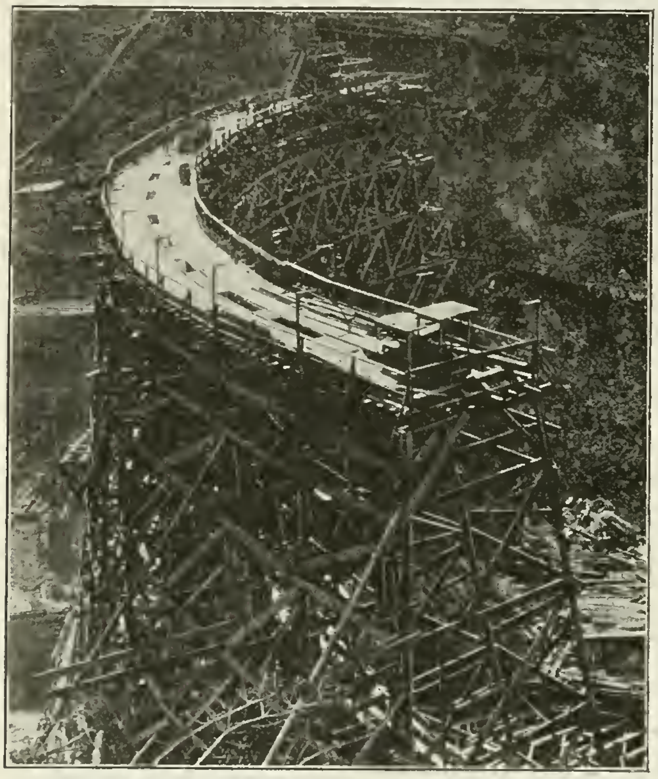
In concreting the upper part of the dam crushed stone aggregate was brought to the mixing plant by gravity on a railway laid from the quarry downstream and the cement slid down the adjoining hill, also by gravity. The concreting-car track was moved from one level to a higher one as the dam rose in construction, but the maximum depth of drop through the chutes was kept at about 50 ft. It is stated that there was no chance of separation of the elements of the mix and the impact had a decided tendency to consolidate the concrete in the forms.

It was also decided in building the trestle that time



UPSTREAM OF THE KERKHOFF DAM—CONCRETE-MIXING PLANT AND CONCRETE MATERIAL BROUGHT IN ON TRESTLE AT LEFT and expense would be saved if the batter posts of the trestle could be used as guides from which to locate the concrete forms, which have somewhat complicated location on account of the curve of the dam. Accordingly a batter was selected for each individual trestle bent which would bring the posts no nearer than 12 in. from the finished concrete at any point. The bents were located 15 ft. apart and the exact distance of each batter post from the face of the dam was calculated for every 10 ft. of its height. These called for bents with a maximum footing spread of 30 ft. and a width of 10 ft. at the top.

The trestle was built to full height at the outset as a single operation, thus affording a better opportunity to see that each batter post was secured in a carefully located position. The levels at which concrete was poured from the trestle, four in all, were floored over as they were needed and the flooring was removed when operations were moved to a higher level. As the level of concrete and forms reached successive braces these were removed. Occasionally sinker bolts were put in the concrete to provide means of steadying the trestle as the bracing system was taken away.



TOP OF CONCRETING TRESTLE ON KERKHOFF DAM

Working according to this plan it was unnecessary to take the transit onto the trestle itself. The instrument was set up only on the finished concrete where it could check the positions of the batter posts for, say, 25 ft. above. The checking did not need to be carried higher than the forms would be built before the next checking.

All the batter posts were marked conspicuously with numbers which corresponded to numbers on the plans. It was the duty of the general foreman of carpenters to take from the blueprints, under the supervision of the resident engineer, the distance of batter post to forms as calculated for each level and to see what these measurements were to be.

As will be noted from the views herewith, the dam site is in extremely rugged country. It was necessary to bring in all supplies down a 3,000-ft. incline, parts of which were as steep as 92.5 per cent. The canyon was also too narrow and steep to afford space on which materials could be stored, so platforms or warehouses were built as needed along the lower portion of the inclined track. Bunkhouses and camp structures generally had to be supported on stilts on the downhill side, and the men could move about the camp safely only on the trail graded for the purpose.

In spite of the topographical difficulties, work was carried out very rapidly. Authority to proceed was given on April 22, 1919. Fifteen days later diamond drills had been lowered down the steep hillside on skids and were at work on the foundation. On May 30 a 5-mi. wagon road had been built into the site and the inclined track leading down into the site was in operation. Meanwhile materials and equipment for a camp of 100 men had been brought in over a trail and lowered down the incline site on skids. Thus the camp was in full operation before there was time to build the incline. The first concrete in the river section of the dam was poured on Sept. 13 and the total of 25,000 cu.yd. was completed by Dec. 15, 1919.

The work is under the direction of R. C. Starr, construction engineer for the San Joaquin Light and Power Co. W. A. Whitmire is general superintendent and E. H. Warner, resident engineer.

Railroad Work in England

The Engineering Supplement of the London *Times*, in its annual review number, January, 1920, prints the following in regard to railroad activities in England:

"The new Ministry is giving consideration to the extension of co-ordinated working, to questions of standardization of equipment, additions to electrically operated railways, and the concentration of manufacturing resources. Few new lines are projected, the main work immediately ahead being that of bringing the existing tracks up to the old standard and of proceeding with widening schemes to facilitate the movement of traffic. The great increase in the present-day costs of carrying out railway works as compared with the prices at which contracts could have been placed in former years, has made it necessary to review all large works which were under consideration in 1914, with the object of determining whether they ought to be proceeded with under existing conditions. Nearly all railway companies have, however, a certain number of widening schemes in hand. During the past year the North-Eastern Railway carried out a good deal of work of this kind on the main lines between Newcastle and Tweedmouth and between Newcastle and Carlisle, thus providing improved running facilities for the exceptionally heavy traffic which passes over these sections. The proposal to electrify a large mileage of main line is referred to elsewhere. The Great Northern Railway has done a good deal of similar work and has brought into partial use the Enfield-Stevenage line, which provides an alternative route on the southern part of that system. The Midland, Great Western, South-Western, and London and North-Western Railways are giving attention to the same subject, and the last-named is pushing forward the completion of the electification of the Willesden-Euston section of its suburban line."

How the Province of Quebec Controls its Water Power

Through Quebec Streams Commission Provincial Government Rivers Are Regulated So As to Provide Uniform Flow and Rights to Power Are Leased to Private Interests to Financial Benefit of the Province

By Olivier Lefebvre
Chief Engineer Quebec Streams Commission, Montreal, Que.

Abstract of a paper read at the general professional meeting of the Engineering Institute of Canada, Montreal, Jan. 25, 1920.

UNDER the laws of Quebec navigable and floatable rivers and streams and their banks are considered as being dependencies of the crown domain. It follows that there are two classes of rivers: those that are navigable and floatable, and those that are not navigable and not floatable. The bed of the rivers in the first class is the property of the crown and, consequently, the water powers thereon located are public domain. The bed of the rivers of the second class is the property of the owners of their banks as far as the center of the stream, provided the ownership of the bank was acquired before June 1, 1884. Since the latter date, the sales and free grants of crown lands are and have been subjected to the reserve of a strip three chains wide in favor of the crown. Therefore the river bed is owned by the crown, except in that part of the province where shore lots have been sold before 1884.

Power sites in this province have been disposed of in various ways. From 1867 to 1897, no water powers have been sold as such, but mill sites were sold outright for a nominal sum. At that period, the transformation of water power into electricity was in its infancy, and no great importance was attached to the falls and rapids on our rivers.

From 1897 to 1907, when notable progress was made in the design of generators and the transmission of current, the sale of water powers was largely increased. They were sold outright for what was then considered high prices, and somewhat more severe conditions were imposed, such as the obligation of spending a large amount of capital within a few years. The Shawinigan Falls were sold under these conditions.

This policy was later the subject for much criticism. It was argued that such valuable resources as those represented by water powers should be kept for the people and not vested in private interests. However, in the opinion of the writer this policy was completely justified. The development of water power was to a certain extent an experiment, the waterwheel was far from having the efficiency which it has today, and the capitalists willing to invest money in such development deserved full encouragement. It is doubtful if they could have financed their power schemes had they not been assured that the improvements carried out would be on a property for which they had a clear title.

One danger of this policy was that as the value of the water powers increased, certain sites might be acquired without any development being proposed, but for the sake of holding the property for speculation purposes. This could be remedied and was, to a large extent, by stipulating that a certain amount had to be spent for development within a certain time.

From 1907 to the middle of 1910, some water powers were sold and others were leased. A sale took place in the case of small powers only. From the middle of 1910 to date, water powers have been leased for periods of seventy-five and ninety-nine years—in one case only the lease extending over a period of sixty-two years.

However, in the case of small powers not exceeding 200 hp., the government sells for a definite sum the bed of the river with the shore rights, and the water powers included. Prior to Law 7 George V, chapter 22, article 1636, it was not possible for the government to sell public land which was included in a territory licensed for timber cutting. Now this power is vested in the Lieutenant-Governor in Council when such land is necessary to the development of the leased water power. Since March 16, 1916, all concessions of river beds may be made only with the authorization of the Lieutenant-Governor in Council.

The administration of the water powers of the province is under the Department of Lands and Forests, more particularly through its hydraulic service branch.

Quebec's Water-Power Policy

The policy which prevails is the following:

1. Water powers are leased for a period of twenty-five to ninety-nine years, according to the importance of the power and the capital required for development.
2. For the land granted a payment is required of a fixed annual rental covering the term of the lease.
3. There is required a supplementary annual rental which may vary from 10 to 35c. per horsepower development, according to the facilities or difficulties of development. This supplementary rental may be revised every twenty-one years.
4. Two years is allowed within which to start development, and two more years to begin the production of power.
5. A deposit guarantee must be made.
6. The lessee must submit plans of the proposed works and report to the Department of Lands and Forests as to the amount of power developed in the plant.

In the case of rivers which are navigable and floatable, the lessee must submit his plans to the federal government which has to protect the interests of navigation.

All water powers which, at mean low water have a capacity of 200 hp. and over have been declared of public interest, and the owner of such water powers may proceed to the expropriation of adjacent lands required for the proper development of its property, but this expropriation cannot be exercised against an industry previously established, or waterworks supplying the whole or part of a municipality.

A law was passed in 1918 which stipulates that the plans and specifications for works proposed in streams of the province must be submitted to the Lieutenant-Governor in Council for approval. Before 1918 it was not possible to build dams for storage purposes unless authorized to this effect by a bill of the Legislature, but in 1918 a law was passed by which such works may now be carried out, provided the plans and specifications have been submitted to the Lieutenant-Governor in Council and approved.

Such is today the water-power policy of the province, and it is claimed that it affords safety for capital invested. It assures the public of a share in the value of these natural resources, and it prevents any speculation in that development being imposed within a definite period under penalty of the lease being cancelled and the deposit confiscated.

Amount of Power Developed

The amount of power there is available in Quebec has been estimated by Arthur Amos, Chief of the Hydraulic Service, as being five million horsepower, not including any territory above the fiftieth degree of latitude. As to the amount of power in the latter territory, no accurate estimate has been made.

A census of water powers developed in the Province of Quebec in 1918 was made by the Hydraulic Service. It was found that the amount of power installed was 832,274 hp. And this total does not include any station generating less than 1,000 hp. It is estimated that, should the smaller developments be included, the amount of hydro-power installed in the province must be 875,000 hp. Statistics prepared by the Dominion Bureau of Statistics, in collaboration with the Dominion Water Power Branch and the Hydraulic Service of Quebec, published recently, state that on the first of January, 1918, the primary power generated by water in this province was 575,551 hp., or 257 hp. per thousand of population. The statistics compiled by the province mention the capacity installed, while the dominion statistics mention primary power. The capital invested in the central electric stations in Quebec was at that time $130,000,000. The total revenue from the sale of power at these stations was $14,350,000, and new installations contemplated were estimated at about 200,000 hp.

Work of the Quebec Streams Commission

The Quebec Streams Commission has done a large amount of work which has made very important power sites considerably more valuable, both in the case of developed and undeveloped water powers. This Commission was appointed in the latter part of the year 1911. Among the duties it is called upon to perform, there are the following:

1. To devise just and practical rules respecting the flow, the drawing off, the disposal, the distribution, the storage and generally respecting the preservation and management of running waters in the Province of Quebec.

2. To consider whether it is expedient to have the rivers of the province classified as navigable and floatable rivers, and rivers which are not navigable nor floatable, classified by an administrative commission or otherwise, according to uniform rules, and to submit such rules, if it be advisable.

The Commission is formed of three members; one chairman and two commissioners, at this time both civil engineers.

The first work which the Quebec Streams Commission was called upon to make was an investigation of the characteristics of the rivers of this province and, in 1913, it submitted a report recommending that the said rivers be classed as being public or private property—according to the area of their watershed. It recommended that the expressions "navigable" and "floatable" be eliminated, and that all rivers having a drainage area of 300 sq.mi. or over should be public property, and that all rivers with an area less than 300 sq.mi. should be private property.

The most important work which the Commission has performed to date is the regulation of the flow of the St. Maurice River and that of the St. François River. In the case of the former river, a complete control of the water supplied by a drainage basin of 3,650 sq.mi. has been established near the head waters of the river.

St. Maurice River-Flow Regulation

The St. Maurice River flows into the St. Lawrence at Three Rivers, about half-way between Montreal and Quebec. Its drainage area is 17,000 sq.mi. and the river is about 365 mi. long. The difference in level between its head waters and its mouth is approximately 1,300 ft. This grade is distributed in a large number of rapids and some high falls.

Of these powers, full developments have been carried out at Shawinigan under a head of 150 ft., and at Grand Mère under a head of 75 ft. At the latter point, the natural fall is 40 ft., but by building a high dam the water is backed up about 25 mi. and small falls and rapids are flooded.

Under natural conditions, the minimum flow of the St. Maurice River at Shawinigan was 6,000 cu.ft. per sec. It reached the absolute minimum of 5,200 sec.-ft., but for a few days only during the period 1900-1912. Daily records of the flow of this river at Shawinigan have been kept by the Shawinigan Water and Power Co. from 1900 to date. As the demand for power was increasing largely the need of increasing the minimum flow was felt, and the St. Maurice Hydraulic Company, in 1910, built three small storage dams on the Manouane River—a tributary to the St. Maurice River into which it flows near the Indian post at Weymontachingue, about 188 mi. above Shawinigan. These small reservoirs paved the way of the regulation on a larger scale as carried out by the Commission, for they had proved that the water which was let out from these small dams in winter reached Shawinigan with comparatively little loss. This possibility had been doubted somewhat.

In 1912, the St. Maurice Hydraulic Co., Ltd., applied to the legislature for authorization to carry out a storage scheme in the upper St. Maurice. The government did not deem it advisable to grant the power demanded, but it decided the Quebec Streams Commission was the proper party to look into the question and carry out the scheme if it was thought desirable. After a thorough examination of the whole question, it was decided to build a dam at the foot of a large series of lakes at a point two miles above the falls called "La Loutre." The construction of the dam was started in 1915 and it was completed in the month of December, 1917. The cost of the total scheme, including the acquisition by the Commission of the three storage dams on the Manouane River, amounts to $2,500,000. (See *Engineering News*, May 11, 1916, p. 876.)

As a result of the control of the waters by this dam, which is now called "the Gouin Dam," the minimum flow of the river is kept at 12,000 sec.-ft. at Shawinigan. Thus the primary power capacity of the plants at Shawinigan and Grand Mère has been doubled

For the benefits derived from the storage, the power companies are paying to the government an annual sum amounting now to $191,000. This annual revenue will be largely increased when other water powers are developed.

The capacity of the reservoir created by the Gouin Dam is estimated to be one hundred and sixty billion cubic feet, and it is the largest power reservoir in the world—having about twice the capacity of the Assuan reservoir in Egypt. It is, however, exceeded by the Gatun reservoir built in connection with the Panama Canal—the capacity of which is one hundred and eighty-three billion feet—but it is only fair to say that part only of this water can be used for supplying part of the Panama Canal.

The area of the lakes and the rivers affected by the Gouin Dam is 209 sq.mi., and with the reservoir full the area of the lake will exceed 300 sq.mi. The water is backed up a distance of 135 mi. above the dam.

The amount of power due to the storage has been calculated by using the flow curve of the lowest year during the period of 1900-1912—that is, the year 1906—and the figures arrived at were 32,000 hp.-years in the case of Shawinigan, and 16,000 hp.-years in the case of Grand Mère. It is estimated that the low water power possibility of the St. Maurice River has been increased by about 400,000 hp.

The control of the head waters of the St. Maurice River is also beneficial to the lumbering trade in this valley. The flood waters in the spring are not so high and the minimum flow is very much increased. Therefore, the driving of logs down the river may be carried out under better conditions. Water may be supplied for the log drive at a time when it is not required by the power companies and when it is needed to destroy log jams which are formed in certain rapids. For example, this year (1919), early in July, about one million and a half logs were jammed and aground in the Rapid Blanc, about 35 mi. upstream from La Tuque. The Commission was asked to help the association out of this difficulty by giving a shot of water. The Gouin Dam was opened to discharge 13,600 sec.-ft. during twelve days, raising the water to nearly flood conditions. All of the jammed timber was brought out of the rapid and floated down to La Tuque in about two weeks.

RIVER ST. FRANCOIS REGULATION

The next storage scheme which the Commission was called upon to study was the partial regulation of the discharge of the St. François River, by a control of water supplied to Lake St. François and to Lake Aylmer, both near the head of the river.

Lake St. François is located six miles east from the town of Disraeli and about ten miles southwest from the town of Thetford Mines. River St. François has a drainage area of 4,100 sq.mi. and drains the largest part of the Eastern Townships. It flows into the St. Lawrence at the head of Lake St. Peter and runs through the towns of Disraeli, East Angus, Sherbrooke, Windsor Mills, Richmond and Drummondville. The distance between Lake St. François and Lake St. Pierre is about 120 mi., and the slope is practically 900 ft. This slope is distributed through numerous falls and rapids, making the river very desirable for power development.

By the construction of a dam at the outlet of Lake St. François, a complete control of the water running from a basin of 472 sq.mi. has been secured, and this water is being evenly distributed throughout the year at the rate of 600 cu.ft. per sec. The minimum flow from this lake, under natural conditions, has been measured as 100 sec.-ft. The minimum flow from this source has therefore been increased by 500 sec.-feet.

Lake Aylmer is located immediately below the town of Disraeli at an altitude of practically 100 ft. below that of Lake St. François. Its drainage area is 135 sq.mi., and its run-off is controlled by a dam at the outlet of the lake near the village of St. Gérard. It has been calculated that this lake will supply 150 sec.-ft. above its natural minimum flow.

The dam at Lake St. François can raise the water 27 ft. above natural low water, and the dam at St. Gérard can raise the water 112 ft. above natural low water. The storage capacity of the reservoir created by Lake St. François dam is 438 sq.mi., or 12.2 billion cu.ft. The reservoir is filled up in the spring.

The cost of the storage scheme on River St. François amount to $700,000. Of this capital cost, the power owners who reap benefits from the storage have been called upon to pay a yearly rental which covers the interest charges, the sinking fund within a period of thirty years, the cost of maintenance and repairs and a reasonable profit. The amount necessary to cover the above mentioned items is $59,000. The benefits to be derived by each company using the storage water could not be ascertained as no records of the flow of the river were available, and any figures as to additional power due to the storage could only be approximate. In the case of the St. Maurice River, it was different; our calculations were made from complete data. But in this case, to avoid any discussion or litigation as to the benefits derived, it was decided to divide the charges according to the head under which the water was used multiplied by the increase in the minimum discharge. This is called the "second-foot-head method." It is used by the Wisconsin Valley Improvement Co. to distribute the storage charges between the various power companies on the Wisconsin River. For example: the storage reservoir of Lake St. François supplies 500 sec.-ft. above the natural minimum flow. The water is used by the St. François Hydraulic Co. under a head of 40 ft. The charge of this company would be calculated as being 500 × 40 = 20,000 sec.-ft.-head. The companies which have their power plants located below Lake Aylmer receive an additional 150 sec.-ft. and, in the case of the Brompton Pulp and Paper Co., Ltd., which uses that water over a head of 85 ft., the proportion would be 650 × 85 = 55,250 sec.-ft.-head. The rate was therefore fixed at 50c. per sec.-ft.-head. Some of the plant owners have signed contracts and others have accepted the tariff just mentioned.

OTHER ACTIVITIES OF THE COMMISSION

A smaller storage scheme has also been carried out in the watershed of the River St. Anne de Beaupré, to increase the minimum flow at St. Ferréol, Seven Falls, where the Laurentian Power Co. operates a plant under a head of 410 ft. The minimum natural flow of the river at that point was 165 sec.-ft., and it is hoped to raise that minimum to 200 and over.

This storage is provided by a dam at the outlet of Lake Brulé and gives a control of the run-off from a watershed of 12 sq.mi. only. The Commission is contemplating additional storage on this river.

The other activities of the Quebec Streams Commission have been a complete study of the valley of the

Chaudiére River, in the Beauce district, where disastrous floods occur occasionally. On July 31, 1917, after very heavy rains, the water rose 32 ft. in less than twenty-four hours. The Commission has been called upon to make a full report on the possible prevention of such disasters, and this report is now being prepared.

The Commission has also made a complete study of the possibilities of Lake St. John as a storage reservoir. It was found that by a suitable control at the outlet of this lake, it was possible to keep the minimum flow of the Saguenay River at 22,000 sec.-ft. without causing any damage to lands, wharves, etc., around the lake. Such a storage would make possible the development of 600,000 hp. on the River Saguenay, about the town of Joncquières. Lake St. John has an area of 350 sq.mi., and drains a watershed of 30,000 sq.mi.

The Commission has also made a complete study of the possibilities of creating a storage reservoir in Lake Kenogami, west of the towns of Chicoutimi and Kenogami. This lake has an area of 12 sq.mi., and there is at present partial regulation under the control of the Chicoutimi Pulp Co. Lake Kenogami has two outlets; one into the River Chicoutimi which flows into the Saguenay at Chicoutimi about 10 mi. from Kenogami; the other outlet is through the River Aux Sables which flows into the Saguenay at Kenogami. Lake Kenogami is about 475 ft. above the level of the Saguenay River; its two outlets are well provided with falls and rapids. On the Chicoutimi River, water powers have been developed and are being used by the Chicoutimi Pulp Co. to operate their large pulp mills. On the River Aux Sables, Price Brothers, Ltd., have developed water powers for the operation of their pulp and paper mills at Kenogami. The cost of storage in Lake Kenogami was estimated at $1,800,000 in 1916 but, under present conditions, it is believed that its cost would be nearly $3,000,000. The question as to whether this work should be carried out or not is now under consideration.

Among the other activities of the Quebec Streams Commission, there is the study of a certain number of undeveloped water powers; namely, on the St. Maurice River, on the St. François River, on Bell and Harricana Rivers in the Abitibi district, and on the Manicouagan, Aux Outardes and Natashquan Rivers on the north shore of the St. Lawrence.

The Commission has also started systematic gagings of a certain number of rivers in the province. This field of investigation is being enlarged every year, and it is the aim of the Commission to extend it over the whole of the province.

Beneficial results have been already obtained through the water conservation policy inaugurated by the government. Very important industries have located in the St. Maurice valley; namely, at Shawinigan and Three Rivers, owing to the large increase in the power possibilities of this valley. On the River St. François, plants are now being constructed at Drummondville, Richmond and Sherbrooke, in which several million dollars must be invested and where two or three thousand hands will be given employment.

The money invested by the province in the conservation of water is a very profitable investment, not only through the charges which are made to the power companies using the water, but through the industrial prosperity which the policy will contribute largely to bring here.

"Boils" in Asphaltic Pavement Caused by Metals in Fill Beneath

WITHIN a few months after an asphalt pavement was put down in the City of Bakersfield, Cal., peculiar round swellings or "boils" began to appear at frequent intervals in one section of the work. The pavement seemed to be sound in every respect except for this stretch of about 1,000 ft. long, in which scores of the boils slowly but steadily rose. The boils grew until the larger ones were 2 or 3 in. high at the center and had disturbed the pavement within a circle about 2 ft. in diameter. The smaller ones were sharper. All of them showed central cracks, more or less radial. In fact, radial cracks usually appeared with the first perceptible swelling.

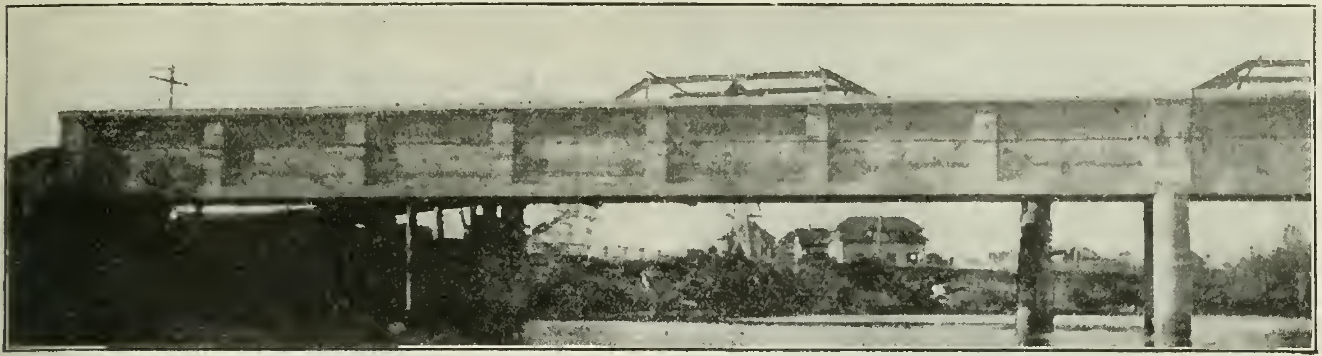
When one of the largest of the boils was opened a lens-shaped mass of copper sulphate crystals was found. In others were found crystal formations of various sizes and stages of development, some with a nucleus of copper or zinc still remaining in metallic form. After removing these causes of the disturbance and after patching the pavement there was no further trouble. Some of the boils which were not opened have since somewhat subsided. The pavement has now been down about 2 years.

The suggestion of a possible cause, as made by R. W. Whitaker, city engineer, is as follows: This particular stretch of the paving was laid on a fill 1 to 2 ft. deep placed over an old oiled surface. Material for the fill, the typical sandy formation of this part of the valley, was taken from a spot on which a garage, full of automobiles, burned to the ground about 10 years ago. Evidently metal scraps were left in the ground at the site of this fire. Before placing the paving on the fill the latter was well soaked and it may be that the old oiled surface below kept the moisture from escaping readily. Thus with impervious surfaces below and above and with the extreme heat of the sun's rays on black pavement, something was leached from the asphalt, perhaps a sulphur compound, which attacked the metal.

The pavement has a 4-in. asphaltic concrete base and a 1½-in. sheet asphalt top, the asphalt in both cases being 70-80 penetration, refined from California petroleum. The interesting question is: What attacked the metal?

Status of Railroad Compensation Contracts

The status of compensation contracts between the Government and the railroad corporations as of Jan. 1, 1920, is outlined in the recent report of the Division of Law of the Railroad Administration. Of the total annual rental of $917,000,000 paid by the Government to the companies, $717,153,182, or 7 per cent of the total annual rental, was covered in 232 contracts as of Jan. 1, including two with lump sum payments and the remainder providing for annual rentals. In addition there were reported 133 "'co-operative" contracts with short-line railroads. Claims for compensation have been filed by 124 railroad companies aggregating $92,318,789.39, and of these 35 claims have been allowed in part, totaling $7,493,618.53, 67 have been denied, eight have been withdrawn, leaving 14 claims pending, totaling $9,324,288.15. In seven cases boards of referees have been appointed and one decision had been made at the time of the report.

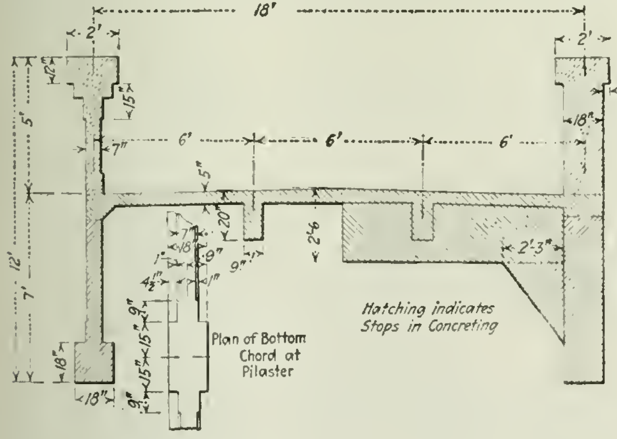


Longest Concrete Girder Bridge Is Built in California

Has Two 142-Ft. Spans and Is Designed To Carry One Fifteen-Ton Roller or Uniform Load of 70 Lb. per Sq.Ft.—Proves Cheaper Than Concrete Arch or Steel Trusses — Proximity to Sea Requires Protection Against Corrosion

TWO record-breaking concrete girder spans make up a new highway bridge across the Salt River in Humboldt County, Cal. Each span is 142 ft. between centers of supports, which is far in excess of the longest reinforced-concrete girders hitherto built. Investigation shows no previous bridge girder over 75 ft. span and few interior girders of even that length, though there is a record of roof girders in the Leonardt Warehouse in Los Angeles with spans of 102 ft. (see *Engineering News*, April 20, 1905, p. 422).

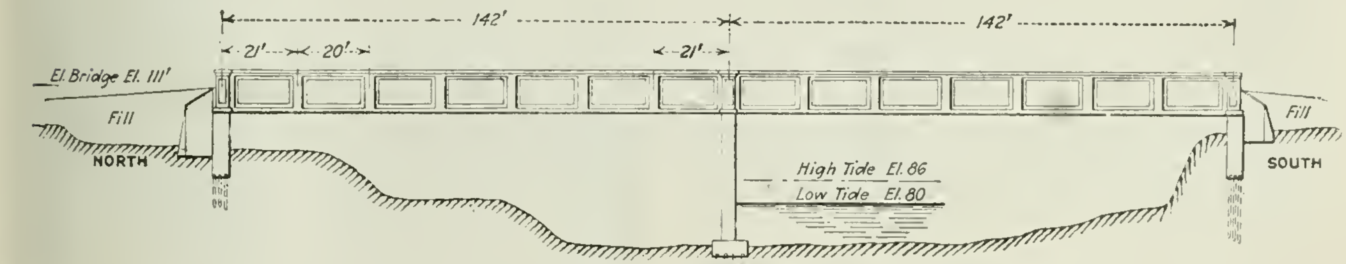
Reinforced-concrete girders were adopted for the Salt River bridge in preference to a concrete arch because of the greater clearance and lower cost of the girders. It was necessary on account of the location near the coast where salt fogs are common to have the steel protected against corrosion, so steel trusses were not considered in the design. It is stated that an arch bridge of the same length with solid rock abutments built under almost identical conditions in the same general location cost $160 per lin.ft. as against $135 per lin.ft. for the girder bridge.



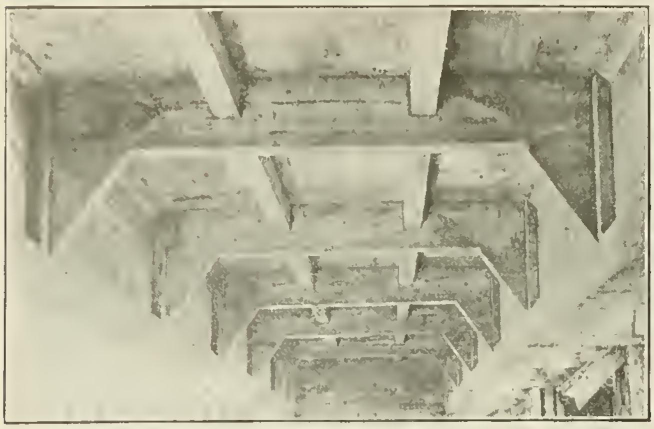
Sections at Center and through Pilaster

Views and drawings of the bridge accompany this article. The two spans are identical. Each consists of two concrete girders 12 ft. deep carrying at 20-ft. intervals (21-ft. spans at each end) floor beams between which the 5-in. concrete floor is carried on 9 x 20-in. reinforced-concrete stringers spaced at the third points of the floor beams. The main section of the girder is 7 in. thick, enlarging by steps to 24 in at the top and 18 in. at the bottom, and with pilasters opposite the floor beams stepping up to a maximum width of 30 in. and thickness of 18 in.

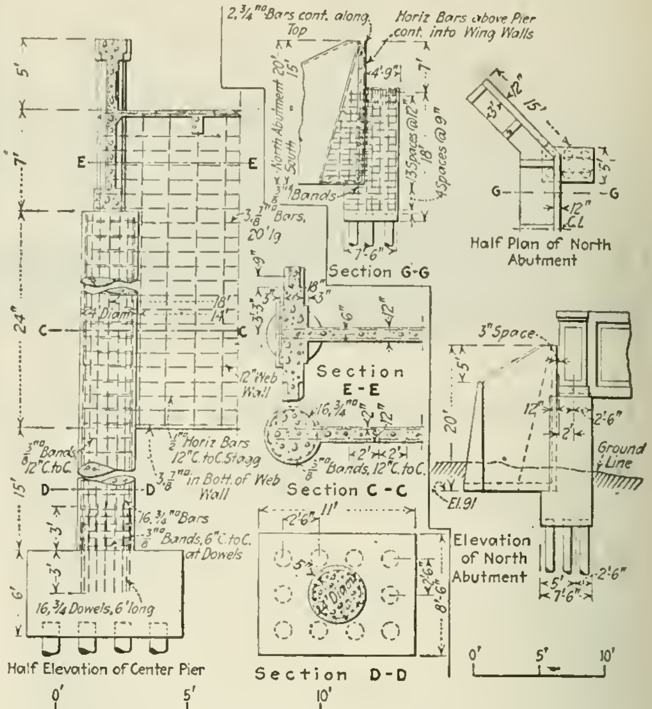
Each main girder is figured as a straight girder loaded for floor-beam reaction. The steel, however, is continuous over the center pier, no expansion joint being provided at this point. The design was made for a uniform live-load of 70 lb. per sq.ft. over the entire road surface or a 15-ton road roller in accordance with the theory and tabulation in Ketchum's "Design of Highway Bridges." As classified in that text, this bridge would be classed "E_2-ordinary county highway bridges." Calculation of stresses under dead- and live-load gives a maximum compression of 1,100 lb. per sq.in. and a maximum shear of 226 lb. per sq.in. in the main girders. Concrete is expected to carry only 60 lb. of the shear, steel being provided for the remainder. Calculated extreme fiber stresses of the steel in the girder range from 12,000 lb. in the top of the bottom flange to 16,000 lb. per sq.in. in the lowest bar. The 21-ft. stringers were stressed less than the main girders. Here the 15-ton road roller stresses govern, while in the design of the main girders the distributed load gave maximum stress. In the stringers the maximum fiber stress of the concrete is 350 lb. per sq.in. In the steel a maximum fiber stress of 16,000 lb. per



GENERAL DETAILS OF CONCRETE BRIDGE WITH 142-FT. SPANS ACROSS SALT RIVER IN HUMBOLDT COUNTY, CAL.



LOOKING UNDER THE SALT RIVER BRIDGE SHOWING A DETAIL OF FLOOR SYSTEM


2,¾"□ Bars cont. along Top
Horiz Bars above Pier cont. into Wing Walls
North Abutment 20' South 15'
⅜" Bands
⅜" Bars, 20' lg
13 Spaces @ 12"
4 Spaces @ 9"
Section G-G
Half Plan of North Abutment
E
E
C
C
D
D
12" Web Wall
Section E-E
Section C-C
⅜"□ Bands 12" C. to C.
⅜" Horiz Bars 12" C. to C. Stagg
⅜"□ in Bott. of Web Wall
16,¾"□ Bars
⅜" Bands, 6" C. to C. at Dowels
16,¾ Dowels, 6' long
Half Elevation of Center Pier
Section D-D
3" Space
Ground Line
El. 91
Elevation of North Abutment
0' 5' 10'

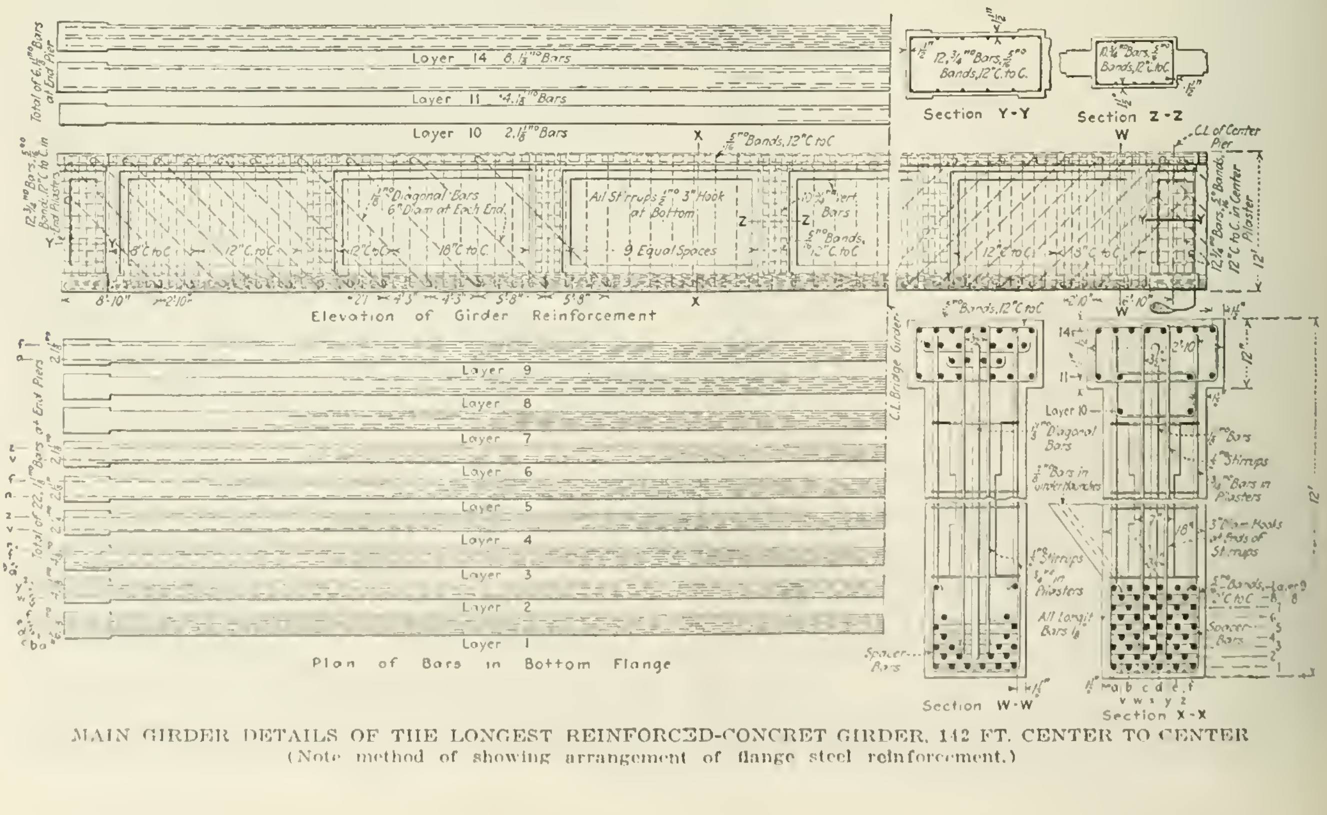
DETAILS OF ABUTMENTS AND CENTER PIER OF SALT RIVER BRIDGE

sq.in. was permitted and the shear is 145 lb. net section. Because of the likelihood of rusting and corrosion, too, it was decided not to use roller bearings to carry the expansion movement of the girders. Instead a thin sheet of asphalt was poured at each end and 4-in. latitude allowed for expansion and contraction.

The influence of concrete ship design and construction is noticeable in the layout of the reinforcement and in placing the concrete. Steel bars, it will be seen from the sections, have to be distributed closely through the flanges of the girders, and, as in the concrete ships, they are separated with spacers. Placing the concrete, too, was facilitated by the use of pneumatic hammer on the forms, as was done in the Government concrete ships.

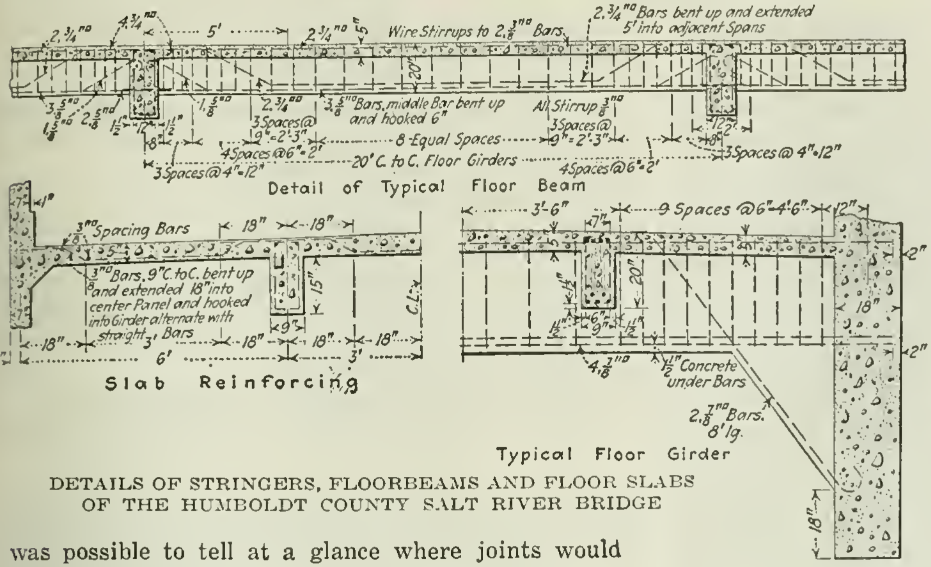
Reinforcement in the girder was built up to shape in the forms. An opening was left along the upper side of the bottom flange of the forms through which to place the bars below that level, and each layer was fastened as it was placed. The steel used in top and bottom flanges is all 1⅛-in. bars, plain rounds, which were delivered on the job in lengths up to 80 ft. In order to avoid the possibility of confusion in placing the steel and to insure a location of joints that would give a sufficient cross-section of continuous steel at any point, there was added to the blueprint an extra sheet on which was plotted the length and location of every longitudinal bar in top and bottom flanges.

A reproduction of this drawing is given in one of the drawings herewith. In the bottom flange, for example, there are nine layers of six and five bars each. Each layer was numbered and the successive runs of bars in each layer were lettered. By laying off the length of these bars to scale, one above another,


Total of 6,1⅛"□ Bars at End Pier
Layer 14 6,1⅛"□ Bars
Layer 11 4,1⅛"□ Bars
Layer 10 2,1⅛"□ Bars
12,¾"□ Bars, ⅝"□ Bands, 12" C. to C. in End Pilasters
⅜"□ Bands, 12" C. to C.
1⅛"□ Diagonal Bars 6" Diam at Each End
All Stirrups ⅝"□ 3" Hook at Bottom
9 Equal Spaces
¾"□ Vert. Bars
⅝"□ Bands, 12" C. to C.
Elevation of Girder Reinforcement
Section Y-Y
12,¾"□ Bars, ⅝"□ Bands, 12" C. to C.
Section Z-Z
C.L. of Center Pier
12,¾" Bars, ⅝" Bands, 12" C. to C. in Center Pilaster
Total of 22,1⅛"□ Bars at End Piers
Layer 9
Layer 8
Layer 7
Layer 6
Layer 5
Layer 4
Layer 3
Layer 2
Layer 1
Plan of Bars in Bottom Flange
C.L. Bridge Girder
Layer 10
1⅛"□ Diagonal Bars
Stirrups
Bars in Pilasters
All Longit Bars 1⅛"
Spacer Bars
3" Hooks at Ends of Stirrups
Section W-W
Section X-X

MAIN GIRDER DETAILS OF THE LONGEST REINFORCED-CONCRETE GIRDER, 142 FT. CENTER TO CENTER

(Note method of showing arrangement of flange steel reinforcement.)


2, ¾"ø
4 ¾"ø
5'
2 ¾"ø
5"
Wire Stirrups to 2, ⅜"ø Bars
2, ¾"ø Bars bent up and extended 5' into adjacent Spans
20"
3, ⅝"ø
1, ⅝"ø
2, ⅝"ø
1, ⅝"ø
2, ¾"ø
3, ⅝"ø Bars, middle Bar bent up and hooked 6"
All Stirrup ⅜"ø
3 Spaces @ 9" = 2'-3"
8 Equal Spaces
4 Spaces @ 6" = 2'
20' C. to C. Floor Girders
3 Spaces @ 4" = 12"
Detail of Typical Floor Beam
⅜"ø Spacing Bars
18"
⅜"ø Bars, 9" C. to C. bent up and extended 18" into center Panel and hooked into Girder alternate with straight ⅜" Bars
15"
9"
C.L.
6'
3'
Slab Reinforcing
3'-6"
9 Spaces @ 6" = 4'-6"
12"
7"
2"
18"
6"
9"
1½"
4, ⅞"ø
½" Concrete under Bars
2, ⅞"ø Bars, 8' lg.
Typical Floor Girder

DETAILS OF STRINGERS, FLOORBEAMS AND FLOOR SLABS OF THE HUMBOLDT COUNTY SALT RIVER BRIDGE

It was possible to tell at a glance where joints would come without interference, and conversely where to put the steel when the time came to sort it out and assemble it on the job. Thus on this special sheet not only was each run of steel identified by letter and number, but the exact length of each piece and its longitudinal position were also specified. In order to secure the necessary amount of steel in all cross-sections without lap joints, joints were broken at such intervals that such joints could be used in all runs and still maintain the required amount of steel in all sections.

As indicated on one of the cross-sections, the concrete was poured in five successive stages. The lower halves of the girders were poured first, then the floor system, and finally the upper halves. Under this plan suitable places for making joints could be reached at the end of each day's continuous pouring. Each half of each girder was poured in one day and the floor system was poured in four sections in one day each.

Two grades of concrete were used on the job, one for the girders and one for the floor slabs and floor system. In the girders there was used a 1:4 mix, with the aggregate consisting of 1½ parts sand and 2½ parts gravel, the gravel ranging from ¾ in. as a maximum down to ¼ in., and the sand from ¼ in. to fines. In the floor system a 1:1½:4½ mix was used with the gravel up to 1½ in. maximum size. The 1:1½:2½ mix was found to test from 2,800 to 4,200 lb. per sq.in. in 28 days.

The falsework consisted of ordinary driven pile bents with sway bracing such as is used on railroad trestles. Square timber caps were used and above the caps the supports were shored up on shims so that the forms could be accurately lined up just before pouring concrete. The unsupported length of piles varied from 10 to 25 ft. The operations were carried on from one end of the bridge instead of both ends as was originally planned. This was due to the failure of the old bridge nearby, which prevented the contractor from delivering materials on the far side of the stream.

ROADWAY OF THE SALT RIVER CONCRETE GIRDER BRIDGE

Using the design figures as stated before with a section modulus of 15, the center deflection of the girders for full load was calculated to be $2\frac{1}{16}$ in. Six weeks after the forms had been removed a deflection of 1¼ in. in the center of the span was reported. Specifications called for a 2-in. camber.

The bridge was designed by H. J. Brunnier, consulting engineer, San Francisco, and constructed by the Englehart Paving & Construction Co. of Eureka under a lump-sum contract of $25,250. A. J. Logan is county surveyor of Humboldt County.

Series of Dry Years Bring Serious Drought in California

CALIFORNIA faces one of the most serious situations in years through the shortage of water, according to statements by the California State Power Administrator and by the San Francisco Forecaster of the U. S. Weather Bureau. The following statements are extracted from recent bulletins from these two officials:

In the high Sierras where there should be 130 in. of snow at the 7,000-ft. level, there were only 23 in. on Feb. 11 and at the 5,000-ft. level no snow at all. Rivers and reservoirs which would normally be full are as low as after a hot, dry summer. Irrigationists who pump water will this year have to draw from a water table perhaps twice as far below the surface as normally and the increased amount of power which they will require for this purpose will cost more per unit because or the shortage which the hydro-electric companies face. Because of the extreme low water in the two large rivers of the State, salt water has found its way farther upstream and towns which took their water supplies from these rivers are being forced to seek other sources.

The power shortage which is now inevitable will become acute early in June and will not be relieved until the rains commence in the fall or winter of 1920. The steam reserve plants of the hydro-electric companies were all worked to capacity last year and it is not to be expected that they can produce much additional power this year. On the other hand, the hydro-electric power generated will be less and the demand is expected to be considerably greater than the 1919 demand.

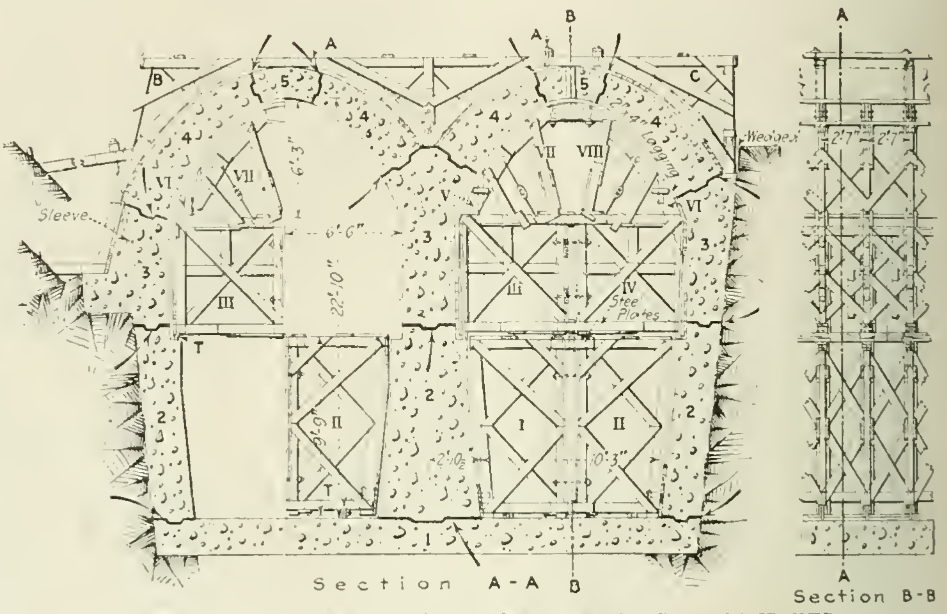
Already the power companies are refusing to take on load which may prove embarrassing during the shortage. This will necessarily retard industrial development in general, and will be a very serious setback to plans for new ventures such as the electrification of railroads.

Form Design for Miami Flood-Control Dam Conduits

End-Supported Timber Forms Trussed for Horizontal and Vertical Load on 30-Foot Span—Cost Less Than Steel

FORM design for the twin-outlet conduits of the detention dams of the Miami Valley flood protection works at Englewood and Germantown, Ohio, involved these principal factors: (1 Low cost of construction; (2) provision for quick shifting; (3) provision for collapsibility; (4) flexural rigidity with end supports only, and, (5) ability to endure repeated use. Timber construction best met the requirements, according to Walter B. Smith, designing engineer, who describes the forms in the October issue of the *Miami Conservancy Bulletin*. The drawing shows the design and construction adopted.

The construction plan on which the form design was based was that concreting should proceed in 30-ft. longitudinal sections and in cross-sectional units arranged as indicated by arabic numerals on the drawing. Division of the arches each into three sections and five joints was adopted to avoid high temperature stresses which would have occurred had fixed arches been used. These joints made the construction of the arches much slower and more expensive, but this additional cost was believed worth while in view of the added safety gained. The plan was also to concrete the two conduits of a pair simultaneously.



FORMS FOR GERMANTOWN AND ENGLEWOOD DAM CONDUITS, MIAMI CONSERVANCY DISTRICT

The number of forms to be provided was based on the estimate that one floor section could be placed every two days, one lower wall section every three days, and one upper side wall and arch section every six days One set of lower forms and two sets of upper forms were, therefore, provided. It was planned to set up one set of upper forms over the first completed section of the lower portion as soon as it had set two weeks, and to start a second set of upper forms when the lower forms, which began concreting at one end of the conduits, had passed the center line of the dam. By this schedule the upper and lower parts of the conduit would be finished about the same time. At first the schedule was realized, but afterwards the labor scarcity because of the war caused some lagging in the progress of the upper half of the conduit. The slower relative speed in building the arch sections was in part due to the several units in which the arch was concreted.

As indicated by the drawing, the lower forms were built in two sections and the upper forms in six sections. All sections were long enough to furnish end bearings and leave a clear length of 30 ft. for concreting. Having support only at the ends, sections I, II, III and IV were designed as trussed girders to sustain both horizontal and vertical load. The vertical spaces between I and II and between III and IV permitted the two sections of a pair to be pushed apart or pulled together by means of bolts and wedges and this collapsed and expanded for shifting and resetting. Carriage ahead was accomplished by placing truck wheels and casters as indicated at T and rolling the form along on the finished concrete.

Four separate segments made up the arch forms. Segments V and VI were rigidly fastened to sections III and IV and segments VII and VIII were hinged at the crown and supported on sections III and and IV by radial posts. The two crown segments were collapsed and expanded by means of wedges at the posts and by rods with turnbuckles.

Sections I and II complete weighed 10 tons. At Englewood dam these sections were set up and used 22 times in succession and at Germantown dam 18 times. Except that the lagging showed cuts caused by spading the concrete, the forms were in good condition when the work was finished. A 30-ft. section of the complete upper form weighed 15 tons. There being two sets of upper forms for each conduit tube, each set was used only about half as many times as was a set of lower forms.

The exterior arch forms were comparatively simple. They were built and handled in three sections A, B and C and were supported as shown by the drawings.

The cost of forms set in position for first pouring was 35c. per cubic yard of concrete placed against them, less than half, it is stated, what it would have been for steel forms. By taking more time and building all of the upper portions with one set of forms, the first cost could have been reduced below 25c. per cubic yard.

Reinforcing Bar Sizes To Be Restricted

Announcement has been made that on account of the need for speeding up the production of steel reinforcement for concrete, bar manufacturers will only roll for stock the following size bars:

Area Sq.In.	Equivalent Size	Area Sq.In	Equivalent Size
0.110	⅜ in. round	0.601	⅞ in. round
0.196	½ in. round	0.785	1 in. round
0.250	½ in. square	1.000	1 in. square
0.307	⅝ in. round	1.265	1⅛ in. square
0.440	¾ in. round	1.563	1¼ in. square

All other sizes will be considered special.

Emergency Engineering After a Georgia Flood

Two Bridges Connecting Parts of West Point Were Washed Out, But Crossing Later Made by Ferries

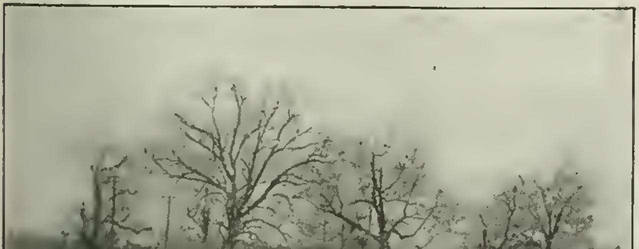
By Carl E. Wideberg
Auburn, Ala.

EXTRAORDINARY high water in the Chattahoochee River the second week in December, 1919, caused a great deal of damage in the City of West Point, Ga., which lies on both sides of the river. The two bridges connecting the two parts of the city were both washed away and traffic communication as well as water-supply was cut off. Immediate steps had to be taken to restore livable conditions.

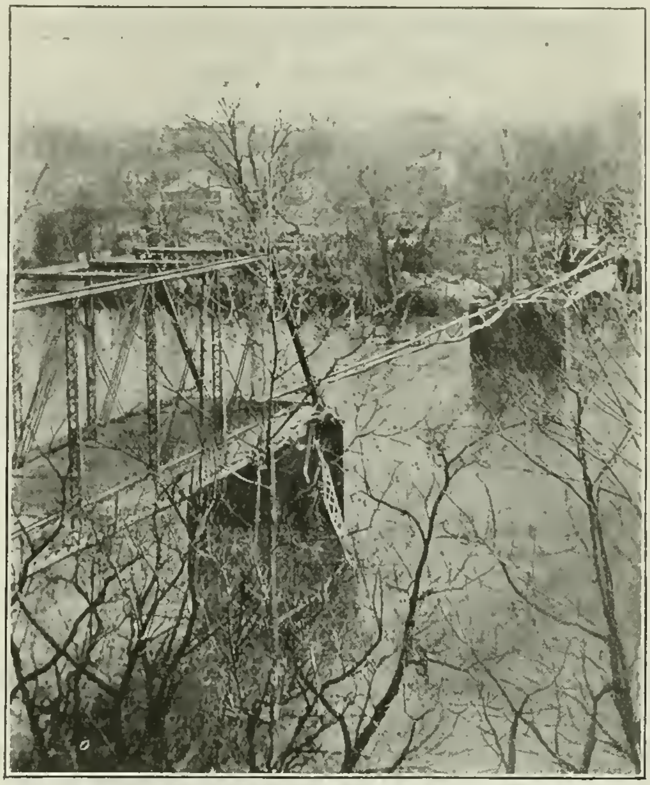
An 8-in. water main was carried on the steel highway bridges from the west side of the town, where the reservoir was situated, over the river to the eastern portion of the town. When the spans were washed away this cast-iron pipe also snapped, and before the flow of water was stopped, all the water in the reservoir had been drained out, thus leaving both parts of the town without water. The flood had crippled the pumping station so that no more water could be pumped into the reservoir. Drinking water, therefore, had to be distilled. The flood also put the electric light plant out of commission.

As soon as the water subsided it became evident that communication and means of transportation had to be established between the two parts of the town. A 4-in. water-main was connected to the 8-in. main on the western bank and carried across the river suspended from a wire cable and also resting on the piers of the bridge, which were still standing. An ærial boardwalk was also fastened to the cable, as can be seen in one of the views herewith.

The highway bridge had connected portions of the New York-New Orleans highway and carried a very heavy traffic. To accommodate this traffic two flatboats were immediately constructed for ferries at a cost of $1,500 apiece and put in commission. The current was used as a method of propulsion for these ferryboats, acocrding to the cableway method for such crossings.



EMERGENCY CURRENT-DRAWN FERRYBOAT USED AT WEST POINT, GA.



WATERMAIN AND FOOTWAY CARRIED ACROSS BRIDGE PIERS AFTER A FLOOD

In addition to these ferries, West Point is soon to have a military ponton bridge across the Chattahoochee. Through the efforts of Congressmen, the people have been able to get this from Congress. It is intended to have the eastbound and westbound traffic use the bridge alternately during periods of the day, as it will be impossible for both to cross at the same time. The bridge will be built by a detail from the 7th Engineers, U. S. A., now stationed at Camp Gordon, Ga.

Irrigation Projects in the Punjab

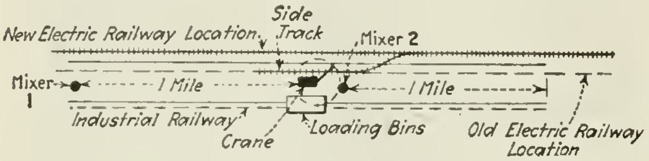
Five proposed irrigation schemes which will solve the problem of famine in the Punjab Province in the northern part of India involve the construction of the "highest" dam, a lake barrage, five weirs across formidable rivers and nine new main canals, as reported through commerce reports in the *Reclamation Record* for February. The cost is estimated at $110,000,000 for irrigating 6,000,000 acres.

The projected dam is 395 ft. high and is located on the Sutlej River in the Bhajra gorge, 40 miles above Rupar. It will impound 2,500,000 acre-feet of water which will be used for extensions and additions to existing works. Two weirs on the old Sutlej Valley project will enable four new canals to be taken off and supply 3,000,000 acres. A small scheme is the Wular Lake Barrage, in Kashmir, to store water from Jhelum River during the monsoon for use in winter. A fourth project would improve the semi-perrenial canals of the Sidhnai series and extend the acreage in the Jhanj district. The fifth new Punjab project is a revival of the old idea of a weir across the Indus at Kalabagh and a canal serving 2,000,000 acres of land between the rivers of Jhelum and Indus.

Two Miles a Month Averaged on Michigan Road

Co-ordination Main Factor in Fast Construction of Heavy-Traffic Highway—Central Loading Plant and Two Mixers Used

CONSTRUCTION averaged two miles a month and attained a rate of one mile in eight days on a 10-in., 24-ft. integral-curb asphalt pavement completed this season on the main highway between Detroit and Mount Clemens, Mich. Except that all operations were kept as completely mechanical as possible and at times, to insure progress, more equipment than was actually necessary was operated, the plant was unusual in no particular. Materials supply and plant operations were, however, kept very closely co-ordinated to secure full output of the mixing and placing outfits, two of which were operated from a central loading plant whose location was changed so as always to keep the haul not to exceed one mile.



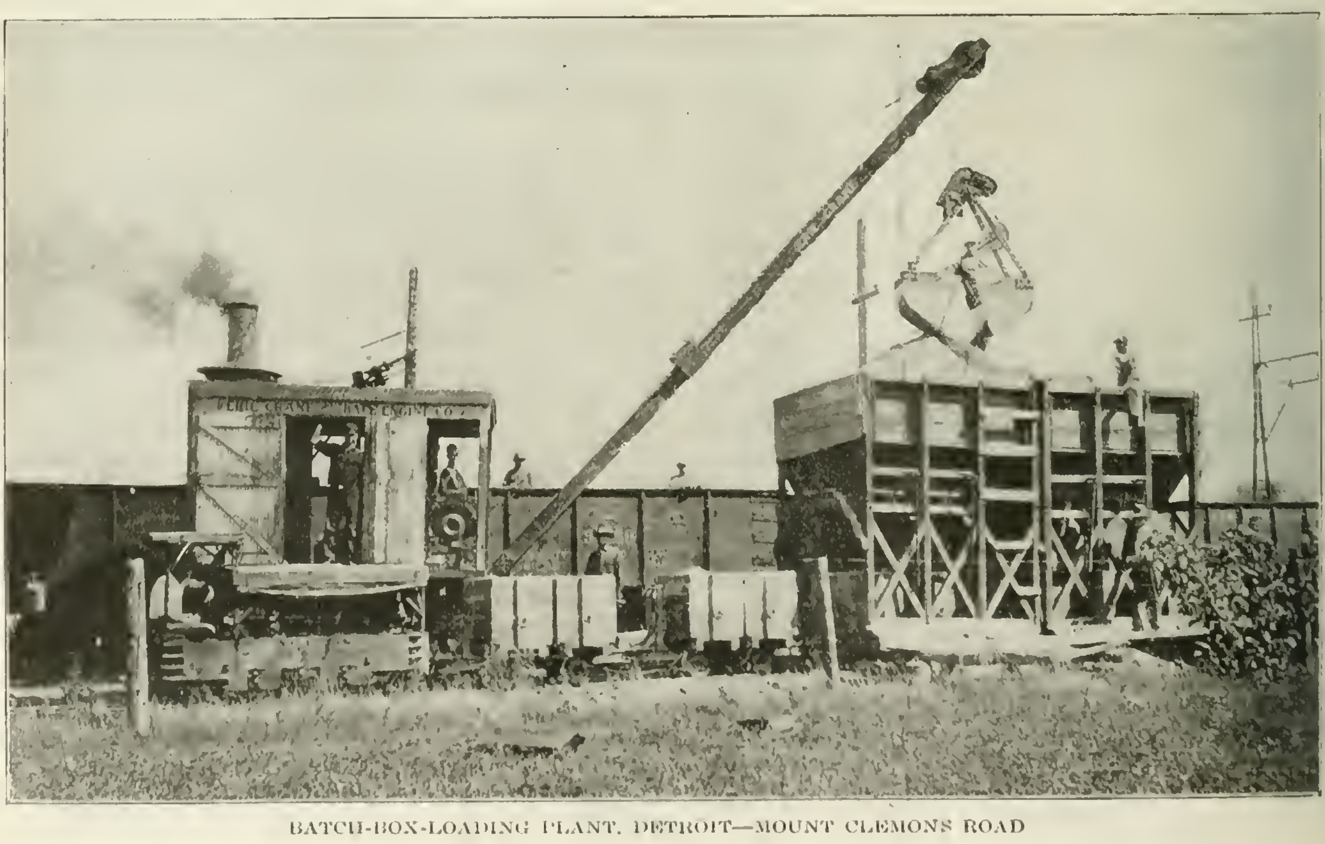
LOADING-PLANT AND INDUSTRIAL-RAILWAY LAYOUT

The contract, awarded early last spring to the Detroit Asphalt Paving Co., called for the construction of 10½ mi. of 24-ft. pavement consisting of a 7-in. concrete base, with a 3-in. integral curb and a 3-in. natural-lake asphalt wearing surface and having a 4-ft. shoulder on each side. Besides the heavy character of the work to be prepared for, the contractor had to meet a requirement for the completion of the road in one season. The governing operation was the construction of the concrete base running about $\frac{5}{9}$ cu.yd. a lineal foot.

Materials were received on the outer belt railway at Detroit, where an interchange track was constructed allowing cars to be placed on interurban electric line rails. The interurban line paralleled the new road for its entire length. Simultaneously with the road work, the interurban line was constructing new tracks along its new right-of-way and gradually removing the old tracks from the highway. Advantage was taken of this circumstance by the contractor. At intervals of two miles he established an unloading point, leaving in at these points enough of the old interurban tracks to accommodate the handling of 16 cars.

A proportioned gravel-and-sand mixture was purchased and delivered in gondola cars at the unloading point. Here were placed two locomotive cranes with $\frac{3}{4}$-cu.yd. clamshells which unloaded the cars into elevated bins of approximately 30 cu.yd. capacity. The unloading plant crew comprised 2 locomotive crane operators and 2 firemen; 2 men handling and loading cement; 2 men unloading from pockets into batch boxes, and 1 man caring for cement sacks and oiling cars. By careful management the contractor was able to maintain a regular daily shipment of materials and thus avoid the necessity for maintaining a stock pile on the job.

Trains of industrial cars carrying batch boxes transported the material from the loading plant to the mixers. The industrial track ran a mile each way from the loading plant. Two paving mixers with attached cranes for handling the batch boxes were operated. One mixer started at the end of one track a mile from the unloading plant and worked toward it, and the second mixer started at the unloading plant and worked away from it to the end of the track a mile away. By this arrangement the average haul to each mixer was one-half mile. For transporting water pipe and other materials beyond



BATCH-BOX-LOADING PLANT, DETROIT—MOUNT CLEMONS ROAD the industrial track a Ford tractor and a five-ton rubber-tire trailer were employed.

Four trains of eight cars were operated by four 3-ton gasoline locomotives. An extra train of eight cars was also always in service and under load on a passing track near the unloading plant. Each car carried two 18-cu.ft. batch boxes or a four-bag batch. The aggregate was run into the boxes directly from the overhead bins, and the cement in bags was placed on top of each box load. At the mixer the batch boxes are unloaded by the crane into the charging hopper and the bags of cement are untied and emptied by hand.

By the methods described the contractor was able to complete five miles by the middle of July, and as the work terminated at Clinton River, over which a reinforced-concrete bridge is being built, it was found feasible to discontinue one mixer and complete the last five miles with the second outfit. When operating two mixers a complete mile of pavement was constructed in eight days, but the average for the whole operation has been two miles of road a month.

All work was under the direction of Thomas E. Currie, Detroit, Mich.

Illinois Waterway to Connect the Lakes and the Mississippi

As THE construction by the State of Illinois of a waterway connecting the Chicago drainage canal with the Illinois River, to complete the link between the Great Lakes and the Mississippi, has been authorized by the U. S. War Department, there is interest in a brief review of the history of the project given at the recent annual meeting of the Illinois Society of Engineers, by M. G. Barnes, chief engineer of the waterways division of the State Department of Public Works and Buildings.

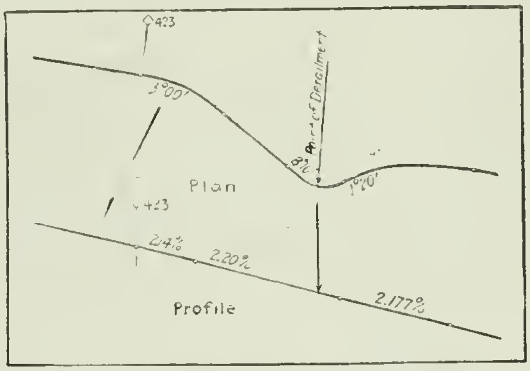
In 1908, the people of Illinois voted for an amendment to the State constitution to permit the expenditure of $20,000,000 for this waterway link of 65 miles. One of the first plans was for a canal having 14 ft. of water, with future development for 24 ft. draft and having several water-power plants, but the cost was prohibitive. A board of engineers appointed by Congress opposed a 14-ft. depth and a channel sufficient for lake and ocean vessels. (See *Engineering News*, March 2, 1911, p. 269). A later board of engineers appointed by Governor Dunne advocated an 8-ft. waterway with locks 250 x 45 ft. and in 1915 a bill appropriating $5,000,000 toward its construction was passed by the State legislature. The Secretary of War, however, at that time refused to grant a permit for the work in the Illinois River.

This was the state of affairs when Gov. Lowden came into office. After the reorganization of the State department of public works and the creation of a division of waterways as a branch of this department, Mr. Barnes was appointed to make further investigation. He arrived at the conclusion that greater advantage would result from a barge canal or waterway, since the cost of transportation would be less than with large steamers on inland waters and the barges could serve individual shippers. Further, the Mississippi river cannot accommodate deep-draft vessels. His plans provided also for water-power development.

On the basis of this report the legislature of 1919 passed a waterway act providing for locks 110 x 600 ft. with 14 ft. of water on the sills, while the connecting pools or channels were to have a minimum bottom width of 150 ft. and a depth of 8 ft. in earth and 10 ft. in rock. This arrangement provides for the possibility of a future 14-ft. channel, while the locks are large enough for fleets of barges having an aggregate capacity of 7500 tons. This act repealed the former act of 1915. No detailed plans have been made, but the route will utilize the Illinois river from Utica, Ill., and then up the Des Plaines river to the drainage canal at Lockport. There will be four or five dams and locks, as well as a short stretch of cut-off canal. The cost is estimated to come within the $20,000,000 bond issue authorized for this purpose in 1908.

Speed Too Great for Elevation of Outer Rail Caused Derailment

IN THE current report of the Bureau of Safety of the Interstate Commerce Commission on the derailment on the Southern Pacific R.R., near Vincent, Cal., on Oct. 29, 1919, the statement is made that the "accident was caused by excessive speed, the rate of speed permitted over that part of the road being too great for the existing elevation on the curve where derailment occurred." On the single-track line between Mojave and Augus, where trains are operated by time-table, train orders and automatic block signals, there is a 2 per cent grade descending eastward from Vincent to the point of accident, a distance of almost exactly three miles, where derailment occurred 500 ft. from the beginning of an 8 deg. 10 min. curve to the left, separated by 1,300 ft. of tangent from a 3 deg. curve to the right over which the train had passed. The track is laid with 90-lb. rails, 33 ft. in length, double spiked, with an average of 18 ties to the rail, fully tie-plated. The ballast is of gravel.



DERAILMENT OCCURRED AT MID-POINT OF 8° 10' CURVE ON 2.2% DOWNGRADE

The train, which consisted of two wooden baggage cars, five steel coaches, one tourist car, one dining car, and three Pullman sleeping cars, was operated under time-table rule to 30 miles an hour from Vincent for a distance of 1½ miles, but from that point to a distance approximately 3½ miles past the point of accident the time-table rule permitted passenger trains to run 40 miles an hour. The report of the Bureau of Safety says:

"It is believed that the track conditions existing at this point do not afford an adequate margin of safety for a speed of 40 miles an hour . . . . the track was in good alignment, surface and gage, the variations in gage and elevation being slight. The elevation, however, was insufficient for the maximum rate of speed permitted. According to the measurements of the division engineer the elevations are from 4 to 4⅛ in. According to the recommended practice of the American Railway Engineering Association, the theoretical elevation of the outer rail on an 8 deg. 10 min. curve, if trains are to be operated over it at a speed of 40 miles an hour, should be slightly over 8½ in." The testimony of employees, according to the report, indicates that the speed was about 35 miles an hour at the time of the derailment and "the statements of one of them indicated that it was in excess of that amount."

The locomotive was not overturned but came to rest in an upright position on the right side of the track about 270 ft. from the point of derailment and 40 ft. from the track, outside of the curve. The report states that "examination of the track disclosed that the first mark of the derailment was on the outside rail where a wheel, apparently one of the wheels of the engine, had mounted the rail. This mark extended diagonally across the rail a distance of 4 ft. This mark on the roadbed outside of the rail was 6 ft. beyond the point where the wheel left the ball of the rail and 12 in. from the gage side of the rail. This mark continued to lead off to the right and down the 10-ft. embankment on which the track was laid at this point. This mark on the ties between the rails was 35 ft. east of the point where the first mark appeared on the opposite rail, indicating that the wheels on the left side of the engine had been raised from the track and did not come down within that distance. Beginning 70 ft. beyond the first marks, the track was torn up for a distance of about 200 ft."

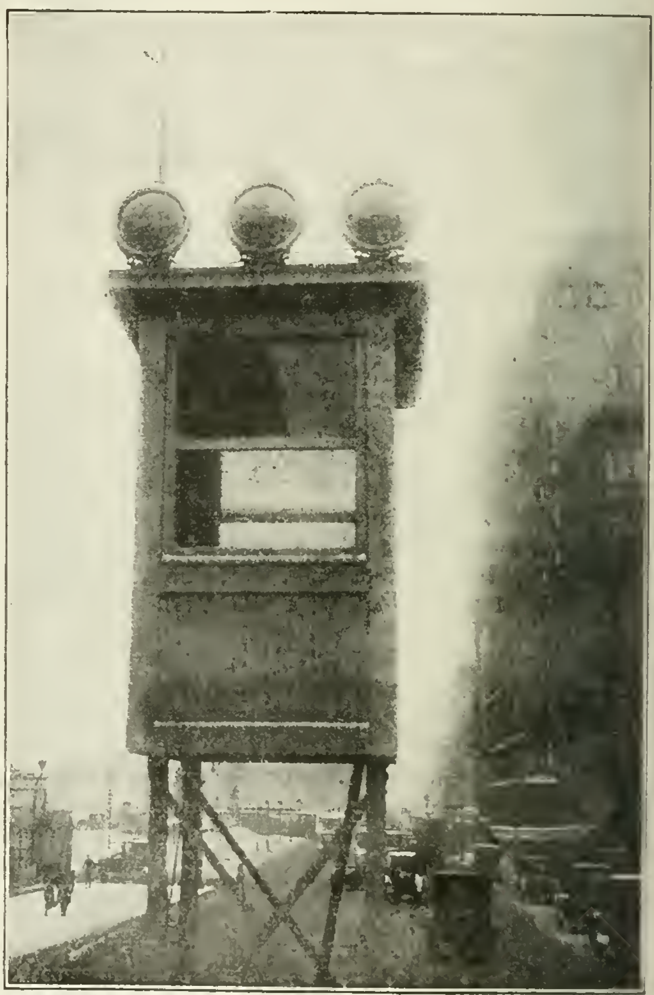
No evidence appears to have been found that the defects of equipment contributed to the accident. The statement is made that the "marks on the ties . . . . indicate that when the wheels of the engine first mounted the rail the engine was raised clear of the track on the left side and did not settle back until it had reached a point 35 ft. beyond the first marks. This indicates that the speed of the train was excessive at the time of derailment. . . . . With an elevation of 4 in. the maximum speed allowed should be only slightly over 27 miles an hour. While it is true that the overturning speed of a train on a curve of the degree and elevation here under consideration is much greater than 27 miles an hour, nevertheless overturning speeds are entirely matters of calculation and theory, whereas the speeds shown as safe speeds are more or less matters of common knowledge based on practical experience. The speed of a train seldom reaches the point where it actually overturns; long before such a speed is reached the speed is sufficient to cause the equipment to rock back and forth until finally the wheel climbs the rail and results in derailing the train. This was evidently the result . . . . . as none of the equipment overturned." The conclusion is drawn that "had the speed of the trains on this curve been restricted in accordance with the recommended practice of the American Railway Engineering Association for the existing elevation, this action would not have occurred."

The derailment resulted in the death of two employees, two trespassers and one passenger, and the injury of three employees, one trespasser and 158 passengers. The accident was investigated jointly by the Bureau of Safety of the Interstate Commerce Commission and the California State Railway Commission.

One-Way Traffic on 5th Ave. To Be Controlled by Signal Towers

Six Lines of Vehicles Will Move South Halting for 1 Minute at 1½ Minute Intervals

As SOON as snow from the recent severe storm is sufficiently cleared from the streets the Police Department of New York City will introduce an innovation in the regulation of street traffic on Fifth and Park Aves., between 34th and 57th Sts., which, it is expected by Special Deputy Police Commissioner John A. Harriss, in charge of traffic, will serve to relieve existing congestion. The plan is claimed to be the first of its kind to be put into effect on such an important thoroughfare, being the introduction there of one-way traffic which, heretofore, has been confined to narrow streets of much less travel. Fifth Ave. accommodates six lines of traffic. Beginning at 10 a.m. and continuing until 5 p.m., and between the cross streets mentioned, traffic will move south only on Fifth Ave. and north only on Park Ave., thus forming what may be termed a belt line of rotary traffic. Traffic on Madison Ave., which bisects the belt-line area, and on Sixth Ave. will be maintained as two-way traffic.


FIFTH AVE. TRAFFIC SIGNAL TOWER WITH RED, WHITE AND GREEN FLASHLIGHTS

Police signal towers have been erected at 57th St., 50th, 42d, 38th and 34th Sts., similar to signal towers on the railroads, from which the movement of traffic on Fifth Ave. and cross streets will be controlled by flashlights, telephone and push-button signals, operating between the towers and to be observed by the traffic officers also at the intersection semaphores.

The floor of each tower is 12 ft. above the roadway to afford a clear view for their occupants. The signals to be flashed from the towers up and down the avenue, day and night, will be as follows:

RED SIGNAL: Traffic shall move on Fifth Ave. and all cross traffic from the side streets shall stop behind the building lines, or white limit lines when marked on the roadway.

YELLOW SIGNAL: All traffic on Fifth Ave. as well as side streets shall stop behind the building lines, or limit lines when marked on the roadway, so as to give clear intersections.

GREEN SIGNAL: Traffic from all side streets shall proceed.

These signals, which will be in operation from 9 a.m. until 12 midnight, will regulate not only the movement of vehicular traffic but also apply to all pedestrians in crossing the roadways, which they must do at the crossing. Before 10 a.m. and after 5 p.m. traffic on Fifth and Park Aves. will be both ways, but on Fifth Ave. under control of the men in the towers and at the other street intersections where the signals will be maintained. The same signals (red, yellow and green) will be alternately flashed, always having the same signification as stated.

By actual test it was found to have taken as long as 40 min. for a vehicle to go on Fifth Ave. from 57th to 34th Sts., or the reverse way, at certain times of the day. By the new regulation it is estimated that this annoying and costly delay will be reduced by more than 60 per cent, or to less than 10 min. between the points mentioned. This great reduction in time, as well as saving of wear and tear upon vehicles and inconvenience to individuals, will be accomplished by the continuous movement of traffic between the towers for periods of 1½ min. succeeded in turn by periods of 1 min. for the procedure of cross traffic. By conservative estimates, allowing 1½ min. between towers and intervals of 1 min. for cross traffic, a vehicle may start from 57th St. and reach 34th St., unless some unusual circumstance prevents, in from 7½ to 10 min. Towers will not be erected on Park Ave. for the present. All vehicles may stop at the curb on either side of the roadway on both Fifth and Park Aves. between 57th and 34th Sts., headed south, of course, on Fifth Ave., and between 34th and 57th Sts., headed north on Park Ave.

Greater safety, convenience and comfort to all drivers of vehicles, as well as to pedestrians and shoppers on Fifth Ave., it is believed, will be brought about by these regulations.

Large Drydock for St. John, N. B.

In the past five years there have been a great number of drydocks built in all parts of the world to accommodate the largest vessels now afloat. This means that the dock must be well over 1,000 ft. in length and 40 ft. in depth. The latest of such docks to be reported is being built by the government of the Dominion of Canada at St. John, N. B. It will be 1,150 ft. long, 133 ft. wide at coping, and 42 ft. deep over the sill at high tide. Provision is made for an intermediate sill and caisson to use separate portions of the dock 650 ft. and 500 ft. in length.

Why Engineers Should Be Put in Charge of Big Bridges

Protest Against Art Commission's Suggestion That Delaware Bridge Should Be Under Supervision of Architect

RESOLUTIONS of remonstrance have been addressed to Governor Sproul, of Pennsylvania, by the Society of Municipal Engineers, City of Philadelphia, following the publication of the letter of the State Art Commission recommending the appointment of an architect to have supervision of the proposed Delaware River bridge between Camden and Philadelphia. An abstract of this earlier letter appeared in *Engineering News-Record*, Jan. 29, 1920, p. 250. The engineers' resolutions are as follows:

Whereas, the local press of Jan. 26, 1920, has published extracts from a letter stated to have been forwarded to the Governor of the State of Pennsylvania, by the Secretary of the Pennsylvania State Art Commission, in which it is urged that an architect be appointed to direct the design of the Delaware River bridge; and

Whereas, these extracts imply that the question "what to build, meaning size and kind of structure," and the question "where, meaning location," are architectural and not engineering problems; that the structural problems are "but a detail"; that the success of the East River bridges is due to the work of architects and not of engineers; and that engineering direction of design results necessarily in structures offensive to the eye, and

Whereas, fair dealing, the safety of human life and the wise expenditure of public funds require that such misstatements and such false implications shall not go unanswered, therefore

Be it resolved, by the Society of Municipal Engineers of the City of Philadelphia, at their regular meeting of Jan. 28, 1920, that this Society subscribes to and sets forth the following facts:

1. That problems of traffic growth and traffic handling, of the development of communications, of property values and land damages, and similar problems involved in the approaches to a great bridge, and in an estimate of the capacity and arrangement needed in the bridge are predominantly the problems of the civil engineer.

2. That engineers are as keenly aware as any class of citizens, of the need for taste and beauty in structures erected in public view.

3. That where certain structures erected by engineers have offended the eye as in the cited case of the Rapid Transit Co. bridge across the Schuylkill River, and in the case of others which admittedly exist, the fault is oftenest chargeable not to the will of the engineer but to the refusal of his employing corporation or client to have any ideal considered save that of economy.

4. That the architect is, on the other hand, oftenest called in by clients who wish to pay the necessary price for taste and beauty, hence has worked under no such handicap; yet there abound examples of work done by prominent and successful architects in their own distinctive sphere—that of buildings and monuments—that are just as trenchantly criticized and condemned as are the bridges cited.

5. That any engineer competent to direct the design of so great a structure as the Delaware River bridge, is certainly aware that this great monument must be beautiful in its proportions and in all its details, and that the best of architectural collaboration should be had.

6. That the structural problems involved in the foundations and superstructure of this bridge, apparently destined to be greater in span than any now built, are comprehensible only to an engineer and will be sources of grave and protracted concern to those responsible for the immense risk of life and expenditure involved; that it would be a rash individual who would assume initiative and responsibility for

this unprecedented structure without a background of long training in the fundamental engineering principles underlying its design, and large experience in their application.

7. That the fitting relationship of the engineer and the architect engaged on such a design is indicated not by the uninformed assertions of the Art Commission that "the structural problem is but a detail," but by this: that without an architect the engineers could build this bridge and build it safely and by its very greatness of proportion and their well-meaning efforts it would even possess much beauty; but that without an engineer the greatest of architects would be paralyzed after he had made his first charcoal sketch.

8. That we know of no precedent in history, from the Brooklyn Bridge of John A. Roebling, engineer, to the most recent East River bridge, for any other scheme of organization than the placing of the engineer in supreme charge of the design, with the architect in the very honorable rôle of consultant; and that there is nothing in the training of the professional architect to justify a reversal of this practice. And be it further

Resolved, that this Society hopes to see the initiative and responsibility for the design of this bridge vested in a chief engineer who shall be a Philadelphian of high professional standing and broad vision, conversant with the city's past development and future trend, and experienced in meeting the legal and legislative problems that must arise; this chief engineer to have recourse to, and a voice in selecting, the best of engineering and architectural consultants, to the end that the bridge may be judiciously placed, safely built at a proper cost, and of notable beauty in proportion and detail. And be it further

Resolved, that this Resolution shall be transmitted to the Governors of the States of Pennsylvania and of New Jersey, and to the Mayors of the Cities of Philadelphia and of Camden, and shall be brought to the attention of the public and of other technical associations.

How Engineers Are Affiliated at Spokane

By J. C. Ralston

M. Am. Soc. C. E., Consulting Engineer, Spokane, Wash.

MINDFUL of the possibility that some members of the American Society of Civil Engineers may be in a quandary over the working out of the new doctrine of external relations as proposed by the Committee on Development, the writer as a partial answer presents the following outline of the methods successfully pursued by the engineers of the Spokane district for the past five years.

The local chapters of the founder societies in their individual capacities adhere strictly to the purely technical activities approved or authorized by the parent bodies. Thus complete indentity and autonomy are preserved, and the original constitutional object for "the advancement of engineering knowledge and practice and the maintenance of a high professional standard among its members" is never waived or relaxed. Hence there is no departure from the high ethical standards on which the premier societies were founded. Indeed, it may be said that the Spokane locals have jealously guarded the ark of the covenant and have never suffered any infraction of its principles.

But being desirous of extending the influence of the engineer in his external relations, and hopeful of becoming an "active force in economic, industrial and civic affairs" (to use the phrasing of the writer's original resolution in the Committee on Development), the several local chapters came together at the suggestion of J. B. Fiskin, Fel. A. I. E. E., Spokane, pooled their respective non-technical common interests and formed the Associated Engineers of Spokane. This organization became the local engineering council or clearing house. Corporate membership is acquired only by first becoming a member of one of the regular national socities and the payment of $2 annual dues. The executive board of the Associated Engineers is composed of four members each from the several local chapters. Each society chapter, irrespective of numbers, has an equal voice in association affairs. The board elects its own officers and appoints committees either from itself or from the general membership. If the business in hand seems to warrant it, the committee may be chosen from whichever profession is likely to be the most effective. A broad catholicity prevails, leading to the most representative and greatest effort.

Now, the Associated Engineers, embodying exclusively the non-technical aspirations and activites of the local chapters, find many worthy and proper fields requiring attention—fields which are not nebulous, impractical or utopian. Some of this work has been that of helping unemployed members to positions; help or influence in securing increased wages for underpaid members; keeping the hand of fellowship from becoming atrophied; securing the appointment of engineer members on local, county or state boards on which engineers should be members; rescuing public works from the mal-administration of politicians; discouraging the meticulous and exposing the meretricious in public engineering projects; guiding and educating the public in the formation of public policies concerning proposed works where engineering may be involved; educating county commissioners throughout the state on the desirability and the economy of employing capable engineers, and at salaries commensurate with the importance of their work; protecting members from arbitraary discharge by politial officers for whom they may be working; laying the foundation for the growth of the national societies by encouraging the worthy young engineer and the engineering student to affiliate and replenish the membership as the older members disappear; and, finally, performing those broad welfare and citizenship duties to society, the city, and the state which engineers hertofore have shamefully and too generally shirked.

We are now considering the advisability of creating a new class of member, to be called "Staff Member," to be composed of draftsmen, instrumentmen et al, who are too old to be Juniors or who are not qualified to become members of the Nationals. This provision will take care of those who follow staff engineering in the office or field of any of the members of the Associated Engineers.

In closing, let it be remembered that this association has been in existence for five and one-third years, and has steadily grown in numbers, strength and enthusiasm. Its members see no field or necessity for any other similar organization here, and thus Spokane seems to be the only city of any considerable size in the Pacific Northwest where there is no A. A. E. organization.

L. K. Armstrong, Mem. A. I. M. E., is president, and A. D. Butler, Mem. Am. Soc. C. E., is secretary.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Good Work on Assay Building

Sir—Allow me to thank you for the way you presented my article on the Assay Building. As engineers occasionally have to read the riot act to contractors, I always think that when the opportunity arises which justifies the reverse action, they should take it. In this case the general contractor, Chas. T. Wills, Inc., and the sub-contractor, the Underpinning & Foundation Co., took infinite pains, regardless of expense, to give the Government a good job. T. KENNARD THOMSON.

New York City.

Work Faithfully—Work With Faith

Sir—In the past months we have noticed various letters, appearing in the columns of *Engineering News-Record*, from gentlemen well known in the engineering profession and from others not so well known, commenting on the intrinsic recompense of the engineer, particularly the civil engineer.

In reading these letters, one cannot help but regret the condition of affairs and consider what a sad commentary they are on the morale of the profession, that some of its members have felt themselves compelled to express their chagrin on the financial results of their labors in this manner. It certainly should be food for thought for all thoughtful men, especially those employing and requiring the advice of this class of labor.

To state what the exact causes are for these conditions, and to advance a general panacea that will make everybody happy would be foolhardy; but, I do believe if the engineer would give himself a strict examination to see if he can correct a few of his own personal faults, his existence would be more satisfactory and perhaps it would help swell his pay envelope.

The engineer, I am afraid, has been looking too much at what the other fellow has been receiving. This has befogged his vision and caused anxiety to many; in the consequent state of mind they have lost their poise. It would be better to cease drawing comparisons between their conditions and that of other workmen and quietly seek out means whereby their social, economic and professional standing will be enhanced in a manner commensurate with the high dignity of the engineering profession. From the viewpoint of the mechanical engineer, I agree that the average engineer receives a meager pittance, but to continually keep comparing his average salary with that of the bricklayer, plumber, carpenter, machinist, toolmaker, or any other tradesman, that the influence of organized labor has assisted in compelling the general public to pay, will not do the fraternity any good. To many engineers, especially those who have had any dealings with organized labor, this idea of organized labor in their midst, is distasteful to say the least. If I should venture to advance a plan, it would be a scheme to legalize the profession as a whole throughout the nation, in a manner similar to the medical and legal fraternities. This would include the licensing of draftsmen and other technical workers, that hardly could be called engineers. In order to accomplish these results, however, the engineer will have to get out of his shell and take more interest in practical politics than he has heretofore done.

With regard to the undergraduate, who has decided that the engineering field holds no laurels for his brow and has decided to enter other fields of endeavor, I am led to believe that some of these letters have had a pernicious effect on the impressive minds of our youth before they have had an opportunity to judge for themselves. It also confirms an opinion that I have long held, that young men deciding on a life work requiring a special technical training, should spend at least a few months in practical work, preliminary to their course, to satisfy themselves of actual conditions and their personal aptitude for the work. I think this would avoid many disappointments and the needless waste of time and money.

For the present moment the thing for the engineer to do is to work harder and with an ever-increasing diligence, for after all, good hard productive work is really the only available remedy for our present ills. No matter what ails you, work. Work faithfully—work with faith. WALTER W. HAGERTY,

New York City. Mechanical Engineer.

Combination Wood and Asphalt Bridge Floors

Sir—In *Engineering News-Record*, Nov. 13-20, 1919, p. 866, there appears an article on a "new" type of wood and asphalt bridge flooring. I have had a very wide experience in the design and construction of this identical type of flooring, having laid the first in 1897 on a steel pony truss. Since that time I have adapted this type of floor to bridges aggregating several hundred thousand square feet.

When properly laid the floor has proved to be a success. In cases where the timbers have not been properly spiked, the weakness has resulted in cracking of the surfacing, permitting the entrance of water to the timber, and consequent decay. The ordinary precautions in the prevention of decay must be observed, that is, free circulation of air beneath and at the ends of the timbers.

I note in particular that the timber on the Chicago bridges is laid transverse to the traffic. This would account for the undue deflection mentioned, in that the load was particularly concentrated. It has been my practice to lay the timber longitudinally, forming a continuous beam the entire length of the bridge and several spans. There are several advantages in this method, among them a more favorable distribution of the load under the wide wheels of the heavier vehicles, and the reduction of the effect of impact. The elimination of vibration, as noted in the article, is an obvious result of the construction, a smooth surface and resiliency. The feature of carrying a longitudinal continuous and homogeneous beam serves to cut down the effect of impact through distribution over several panels and is more effective in absorbing shock and vibration. The reduction in impact stresses more than compensates for any increase in weight over that of the ordinary timber floor, and the floor as a solid beam adds to the component strength of the structure.

As to the size and depth of the timber, the design is somewhat problematic on account of the unknown factor of the transverse distribution of stress. For ordinary highway bridges I have adopted the following sizes (Douglas fir) as having been proved adequate:

10 ft. between supports	2 x 8 in. and 2 x 6 in.
16 and 20 ft. between supports	2 x 10 in. and 2 x 8 in.
25 ft. between supports	2 x 12 in. and 2 x 10 in.
30 ft. between supports	2 x 11 in. and 2 x 12 in.

The timber should be so laid that there will be grooves or channels on top not less than 1 in. square. A heavier construction may be obtained through using, for example, 2 x 10-in. and 1 x 6-in., the 1 x 6-in. being a filler and not considered as adding materially to the strength.

Each run of timber is spiked to the other with not less than 40d nails (for 2-in. plank) spaced not more than 18-in. It is preferable not to spike the timber to the cross beams.

The wearing surface may be as described in any standard specifications for sheet asphalt pavement, preferably what is known as the Topeka mix, laid to a depth of 1½ or 2 in. above the timber. In certain localities, where it was difficult to obtain a proper asphaltic mix, I have used a concrete surfacing which has proved successful under heavy traffic.

A later development is the use of No. 6 or No. 8 wire or ¼ in. deformed bars laid acros the timbers and stapled. These rods give the surfacing a better grip, for both concrete and asphaltic surfaces. They add considerably to the transverse strength and eliminate the formation of surface cracks in preventing the possible separation of the timbers.

There are examples of this system of flooring under service for more than 15 years and in perfect condition.

J. G. McMILLAN,
Former County Engineer, Santa Clara County.
San Jose, Cal.

A Reclamation Service Invasion

Sir—This letter is written to call attention to the recent invasion of the U. S. Reclamation Service into private irrigation investigation and construction work. Instances in point are the preliminary investigations made on the Clark Fork of the Columbia River and the Judith River in Montana during the past season. This is proposed development, not to be built with Government funds.

In construction we have many irrigation districts, of which the Yuma Mesa Auxiliary is the latest. There were construction and operation reasons why fully and partially constructed districts should be taken over by the Reclamation Service, and the increased storage afforded many private projects could have been secured in no other way. Development such as this at Yuma, however, where the area and works are not necessarily related to any legitimate Reclamation Service development, bids fair to eliminate the private irrigation engineer.

To quote from the *Reclamation Record* of September, 1919, p. 398: "If the Yuma plan proves a success it is believed that it will pave the way for the development of large tracts of irrigable land on other projects, as it provides the means of obtaining the necessary funds for building the works without going to Congress for advances." Or again from the issue of December, 1919, p. 564: "The formation of irrigation districts will enable the land owners to finance the work, especially if it is known that the construction work is to be under the supervision of the Reclamation Service."

Attention is also called to Senate Bill 3477, introduced by Senator Reed Smoot, which "authorizes the Secretary of the Interior, through the Reclamation Service, to investigate and develop projects anywhere in the United States exclusively with private funds." (*Reclamation Record*, January, 1920, p. 30, gives the text of the bill.) Whatever work of this nature is done submits the engineer in private practice to unfair competition.

This question also arises: How much of this work can be undertaken without detriment to the legitimate reclamation projects which are, for the greater part, far from completion? If the answer to this is the employment of more men by the Service, then a monopoly of the irrigation work will result and no field be left for the private engineer. Any assumption that Reclamation Service development has been more successful than that of private enterprise is open to discussion and proof.

In this proposed work it is only fair to assume that the purchasing and testing of materials will be done by the Service; and that the legal requirements of these districts will be cared for by its legal advisors. Verily, in a few short years, if a man is not of the Service, he will be nowhere.

"WESTERN ENGINEER."

[To the foregoing letter A. P. Davis, director U. S. Reclamation Service, replied as follows.—EDITOR.]

Sir—The protest of "Western Engineer" is not entirely clear. Apparently he is of the opinion that the Reclamation Service has a proper field of action and his objection is limited to some recent developments. As examples he refers to three projects, the Clark's Fork, the Judith Basin, and the Yuma Mesa.

On the first two of these the Reclamation Service is doing investigational work such as it has done since its inception. Regarding the third, he says: "The area and works are not necessarily related to any legitimate Reclamation Service development." He does not state what he regards as legitimate, but the facts are that the Yuma Mesa is largely public land, so that here the United States is developing its own property; that all the irrigation water for the Mesa must be taken from the canals of the Yuma project and the power with which such water will be lifted to the Mesa will be developed by the same project, which has been under construction and operation by the Reclamation Service for many years, being one of the earliest undertaken by the Service.

Judging from the letter as a whole, I take it that what "Western Engineer" objects to is work by the Reclamation Service with private funds or on projects which it is expected will be developed by private funds. If this interpretation is correct, I think he is unduly alarmed. Though the Service has in part used private funds for many years, particularly where the United States co-operated with others in financing investigations, such work has come unsolicited and has amounted to a small portion of the total work of the Service. It is true that the experiment on the Yuma Mesa and the pending legislation referred to may enlarge such activity, but I think the fear is groundless that it will monopolize the field or injure the private engineer. The field is too broad for that, and I believe the work of the Service will stimulate private irrigation development rather than otherwise. That it has done so has frequently been stated by Western people interested in the reclamation of arid lands, but not connected with the Reclamation Service.

The policy of the Federal Government regarding irrigation as exemplified in the work of the Reclamation Service was set by Congress in 1902 and has been little modified since.

A. P. DAVIS,
Director U. S. Reclamation Service.
Washington, D. C

Democratic Representation in Proposed Society Federation

Sir—At the conference in New York City, on Jan. 23, of the members of the councils of the national organizations of civil, electrical, mechanical and mining engineers, the idea of one big national engineering society—presumably to include "everyone of good character in the engineering profession"—was enthusiastically endorsed. A further conference has been called to meet in Chicago on April 20, at which I understand it is planned to have present official delegates representing every organization of engineers in the country.

It has been clear for some time that there should be an all-inclusive organization of engineers corresponding to the American Bar Association and the American Medical Association, which could speak and act for the profession as a whole and also give attention to the non-technical phases of the engineer's life, such as compensation, ethics, employment, and direct public service. The demand for the organization of this American association of engineers has quite naturally, I believe, come very largely from the rank and file, and especially from the younger men. Perhaps this means, primarily, a desire on the part of the less conspicuous members of the profession to safeguard their breadwinning and personal professional interests. But in a larger and deeper sense it is a recognition of the fact that the average engineer can only be what he wants to be to his city, state and nation and to his time as he associates himself with others who are like-minded. The older engineers—especially those who have been successful—do not so much require co-operation, either in securing what they want for themselves or in rendering service. That the members of the councils of the older engineering societies have voted unanimously in favor of "one big society" means that all opposition to the idea has disappeared and that we are to have it.

There is one danger, however, that if not clearly recognized may postpone the full realization of the purpose that is in the minds of the great majority of American engineers. The so-called "Report of the Joint Conference Committee," representing the Founder Societies, and dated Sept. 17, 1919, is being used as a basis for discussion. The underlying purpose of this report is irreproachable. But in some respects it affords a *very inadequate* basis for discussion. For instance, it provides for an organization of engineers to be governed by a council elected, not directly by the members, but by the boards of the federated organizations. The board of approximately 30 members which will really direct the new organization, draft its bylaws, etc., will be chosen from the membership of the council, all the members of which are elected for a four-year term.

Some picture of the kind of super-organization this provides for will be gained by imagining the American Society of Civil Engineers without annual or semi-annual meetings and governed by a council, the members of which are elected for a four-year term and *not by the members* but by the boards of local societies of civil engineers located in different parts of the country. Obviously, the electorate has little control over such an organization and such as it has operates over too long a period to be really effective.

When this report was submitted to the annual meeting of the American Society of Mechanical Engineers in December the society voted to amend it so as to "provide for an annual gathering of delegates *elected directly by the membership* of the constituent or affiliated organizations, and that the terms of office of the members of the governing body is no longer than three years."

The demand for a national organization of engineers of all kinds and persuasions is so insistent that it may be easy to launch anything that gives even surface indications of filling the bill. But the U. S. A. is committed more definitely today than ever before to both the democratic program and the democratic method. Neither can come up out of an organization of engineers superimposed from the top. The national organization of engineers which will put the profession at the forefront will be one of words and acts of which voice the will and the ambitions of the rank and file, and the officers of which can easily be held directly accountable to those they represent. To promote at Chicago an organization of the type suggested by the Joint Conference report would simply mean that some other, perhaps less "efficient," organization will occupy the field and ultimately win out because it is more in touch with the current thought and the aspirations of the profession.

MORRIS LLEWELLYN COOKE,
Philadelphia, Pa. Consulting Engineer.

[Mr. Cooke has in this letter made a very important point. We believe that all engineers will agree with him in his position. Certainly the representatives of the various engineering societies which may join the proposed federation should be elected rather than be appointed by the councils or governing bodies of the societies. This point needs to be forcefully put and insisted upon at the organizing meeting of the federation.—EDITOR.]

Pennsylvania Leads in Highway Mileage Contracted For

Reports received by the Pennsylvania State Highway Department show that Pennsylvania led the nation in 1919 in the total mileage of contracts let for road construction. To Jan. 1, 1920, Pennsylvania awarded contracts for the building of 679.26 miles of durable highways. Its nearest competitor was Illinois, which contracted for 510.70 mi. Pennsylvania's 1920 program calls for the awarding of contracts for the construction of approximately 800 mi. of durable highways. In the table figures are given for twenty-four states, which report a total of 2,795.5 mi. contracted for in 1919.

States	Miles	State	Miles
Pennsylvania	679.26	Maryland	52.40
Illinois	510.70	Minnesota	33.00
Ohio	306.68	Rhode Island	26.00
California	173.00	Kentucky	20.00
Oregon	164.00	Maine	15.00
West Virginia	153.92	Nebraska	14.50
Washington	124.60	Colorado	10.50
Kansas	119.00	New Mexico	10.00
Massachusetts ..	116.00	Wyoming	9.10
Missouri	114.24	Iowa	7.00
Oklahoma	86.50	District of Columbia ...	4.80
Delaware	73.00	Nevada	3.00

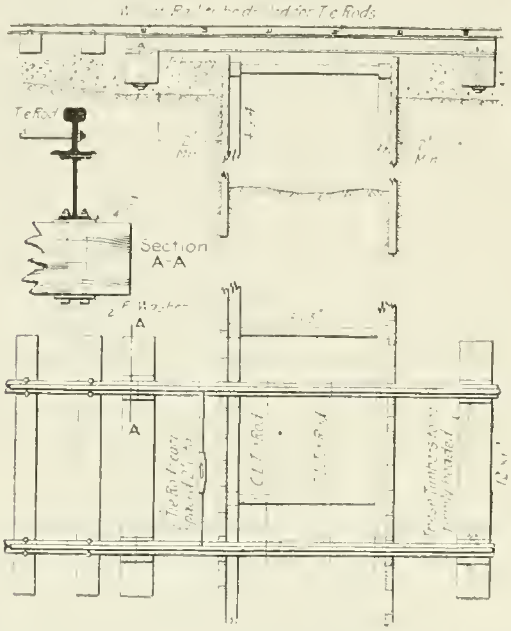
HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Method of Supporting Track Over Trench With Maximum Clearance

By John H. Sawkins
Dover, N. J.

WHILE the accompanying sketch in general does not show a new method of track support it provides maximum clearance in the trench itself, without posts or timber supports which are a part of the supporting scheme in the trench. This leaves the trench clear and free for a pipe line or whatever is to be constructed. The scheme suggests a maximum economy of material; i.e., two steel I-beams, two 12-in. x 12-in. timber sills, four ¾-in. x 9-in. x 12-in. plates, eight 1-in. x 16-in. machine bolts, four ½-in. plate washers, and a few 1-in. round tierods, provided with turnbuckles. Tierods are necessary to prevent spreading of rails, since they rest upon the top flanges of the I-beams.



I-BEAM SUPPORT FOR TRACK GIVES MAXIMUM CLEARANCE FOR TRENCH CONSTRUCTION

"Nail Template" for Pavement Thickness

TO AVOID the danger of getting concrete pavement too thick or too thin the California Highway Commission has adopted what is called a nail template with which the exact elevation of the subgrade is checked for its full width just before pouring. The template is made similar to a striking-off template.

The lower side of the nail template carries a row of nails spaced 4 or 5 in. apart and projecting downward, say an inch, for the full length of the template. The nails are carefully adjusted so that when the ends of the template rest on the header boards all nail ends are just ⅛ in. above the specified level of the subgrade.

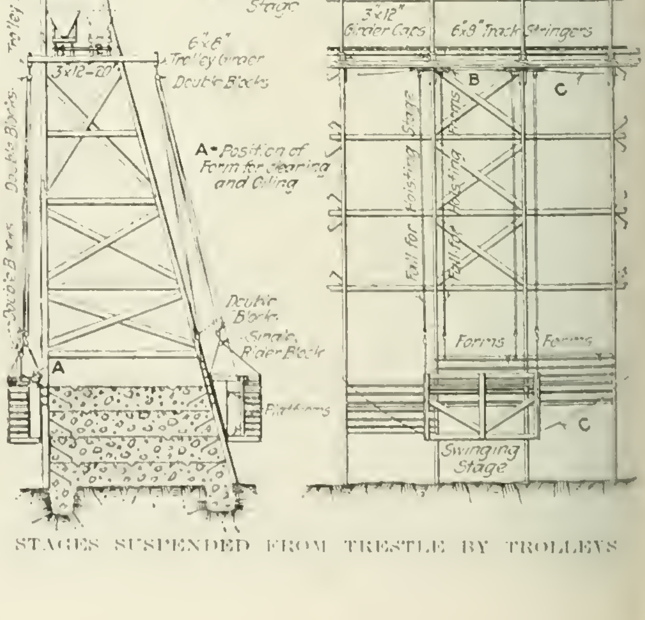
Thus, when the template is moved along the headers between concrete mixer and the end of the chute, if there are any high places in the subgrade they will be scratched, leaving marks which are readily noticed by the inspector. If the subgrade is too low the inspector notes the abnormal space below the nail points.

On state work in California the contractor is required by the specifications to lay paving not more than ½ in. less than the prescribed thickness, and all concrete in excess of a half inch more than prescribed thickness must be paid for by the contractor. It sometimes happens that the contractor finds it cheaper to pay this excess than to correct the subgrade.

Dam Forms Shifted by Swinging Stages

TO HANDLE the forms on the Warm Springs thin-arch dam of the Malheur Irrigation District, in Oregon, swinging stages were suspended from trolleys supported by cantilevers laid over the top of a trestle, acting in a double capacity as form ribs and as industrial track support for the concrete buckets.

Two stages were provided, rigged as shown in the drawing, that on the downstream side having a slanting face to maintain the platforms horizontal. A ½-in. wire rope sling was placed around each end with a single rider block, to which a double-block and fall was attached for hoisting the stage. The trolleys carrying these falls were spaced with ¾-in. tie bars 4½ ft. on centers from the trolleys carrying the falls for hoisting the forms. Similarly the two form trolleys were spaced 9 ft. apart by a tie bar, thus connecting the train of four trolleys. The stages consisted of a frame of 2 x 10-in. timbers 5 ft 3 in. x 18 ft. in plan and 10 ft. high



STAGES SUSPENDED FROM TRESTLE BY TROLLEYS

NEWS OF THE WEEK

New York, February 26, 1920

Concrete House Conference Well Attended

Three or four hundred men and women were in attendance on each of the seven sessions of the National Conference on Concrete House Construction in Chicago, Feb. 17-19, 1920. The presence in the city at the same time of several technical meetings, among them those of the American Concrete Institute, the Building Officials' Conference, the Concrete Products Association and the Associated General Contractors of America, undoubtedly swelled the attendance at the housing conference, but besides that there were many present who were more interested in housing problems than in the technic of house construction. The program was of more interest to this class than to the engineers and contractors.

General Contractors Perfect Organization

Members Underwrite Association for $200,000—New Constitution Adopted

Subscriptions exceeding a total of $200,000 for the organization work during the next two years were secured from the membership of the Associated General Contractors of America at its annual convention in Chicago, Feb. 18-19. Subscriptions to be secured from members not present are expected to increase this sum by a material amount. With the dues it is fair assumption that during 1920 and 1921 the funds available for association work will approximate $150,000 a year.

An improved constitution, new by-laws, and a plan of development were approved, while an increased membership campaign is expected during 1920 to increase the number to more than 1,000. Starting in November, 1918, with 97 members the association now has 445 members. The attendance at the convention numbered about 200 representing about 100 firms of general contractors from 36 cities.

STANDING COMMITTE WORK

Plans for an efficiency classification of contractors and for the inauguration of a formal code of ethical practices in contracting were undertaken. Substantial progress was recorded in the development of closer relations with labor and toward securing, in writing contracts and specifications, better coordination among contractor, engineer and owner. Important legislation affecting the interests of contractors has been influenced. A far-sighted publicity plan has been formulated and put into operation.

The main subjects considered by the twelve committees which reported and the committee action on each were as follows:

Membership: The committee took action creating organization members in addition to individual members. With the prospect of 1,000 members in the near future, it is hoped that the the committee can come to the annual convention of 1921 with a list of 2,500 members.

Publicity: A monthly bulletin and a weekly news letter have been created and regular publication established.

Labor: Formal approval is given to the general plan of industrial relations proposed in Referendum No. 27 by the United States Chamber of Commerce. The research division is investigating forms of contracts and bonus and profit sharing plans. Total restriction of immigration is objected to and the re-creation of the Federal Employment Service is approved and formal action has been taken in both instances to inform Congress of the association's attitude. The committee is participating with the American Institute of Architects, the Engineering Council, and the American Federation of Labor in the plan for a National Board of Jurisdictional Awards.

Legislation: A Washington office has been established and a local manager appointed. Besides taking active part in the drafting and enactment of bills for the relief of contractors who have sustained losses on Government work

(*Concluded on page* 445)

Railroad Bill Passed by Congress on Basis of Conference Committee Report

House and Senate Adopt Measure Placing Commission in Complete Control but Providing Definite Rate Rule

The conference committee report on railroad legislation, submitted by the joint committee to Congress last week, was passed by the House of Representatives, Feb. 21, by a vote of 250 to 150, and by the Senate, Feb. 23, by a vote of 47 to 17. Although the measure is strenuously opposed by the railroad unions and there is a question of the constitutional validity of the rule for limiting "excess" earnings, it is expected that it will be approved. However, the President has referred the bill to the Department of Justice for advice as to its constitutionality.

Wages established under the Railroad Administration will continue in effect until Sept. 1 and a return to the carriers equivalent to that earned during the "test period" is guaranteed until that time, under the new measure. The principal features of the bill are as follows:

A Transportation Board is not provided and all matters of regulation, both judicial and operating, are placed in the hands of the Interstate Commerce Commission, the power of which is increased.

Rates are to be adjusted by the Commission (which is to determine the rate districts) to yield the carriers a return of 5½ per cent upon the aggregate value of the properties in each district, with an additional one-half of 1 per cent to be allowed for improvements. This to remain in effect until March 1, 1922, after which the Commission is authorized to determine and publish, from time to time, what percentage constitutes a fair return on railway property. In effect, the 5½ per cent is fixed as a minimum and the 6 per cent as a maximum return on aggregate value for the next two years, the matter being left to the discretion of the Commission thereafter.

One-half of "excess" earnings above 6 per cent must be paid into a general railroad contingent fund administered by the Commission, to be used by the Commission for the development of transportation facilities, through loans to carriers. The remaining half of the "excess" is to be placed in a reserve fund of the carrier until such fund equals 5 per cent of the value of the carrier's property and thereafter may be used for any other lawful purpose.

Permissive consolidation of existing systems is provided for in accordance with a general consolidation plan to be prepared by the Commission. The compulsory feature of the Senate bill is dropped.

Appropriation of $500,000,000 is made, to be used as a revolving fund from which to make loans to carriers and pay claims growing out of Federal control.

Regarding the labor question, it is provided that all carriers and railroad employees exert "every reasonable effort" and adopt "every available means" to avoid interruption of service through disputes over wages or working conditions. Although compul-

(*Concluded on page* 445)

Oppose "Comprehensive Organization" of Engineers

Group in Am. Soc. C. E. Urges Defeat of One of Main Proposals of Development Committee

Asserting that "there is a movement to cut the society entirely adrift from its traditions and to carry it abruptly into untried fields," a statement dated Feb. 14, headed "A Word of Caution," and signed by 106 members has been sent out to the membership of the American Society of Civil Engineers. The statement urges the defeat of the proposal, submitted as part of the recent questionnaire based on the Development Committee report, to create a "comprehensive organization" for the conduct of civic and welfare work. The statement is published below in full:

A word of caution: To the membership of the American Society of Civil Engineers (relative to questionnaire authorized by annual meeting).

Some of the steps which this Society is now asked to take are highly questionable, if not dangerous.

The American Society of Civil Engineers was organized as and has never pretended to be anything else than a professional society. Its constitution provides that "Its object shall be the advancement of engineering knowledge and practice and the maintenance of a high professional standard among its members."

For fifty years its *Transactions* have contained papers that best reflect progress in engineering in America. It has done more to advance the science and art of engineering and to establish the prestige of the profession in America than any other agency.

There is a movement to cut the Society entirely adrift from its traditions and to carry it abruptly into untried fields. Our organization is constituted as a professional society. Its work as such is of pre-eminent importance. Our Society should do professional welfare work in any manner proper and practical, but should not commit itself as a body, financially or otherwise, to such an organization as proposed in Question 3.

A strong management of this Society is essential. If the present management is not sufficiently representative, and if the machinery for electing officers is not satisfactory, let us improve it promptly. Let us progress with other internal betterments just as rapidly as the vote of the membership indicates its intent.

This Society cannot stand still. It must go forward or backward. Let us drive it forward constructively and with reasonable deliberation.

In adjusting to new conditions let us maintain the high standards of the Society and equally strive to increase its usefulness. Let us not forget the great good that has been accomplished in the past. Let us reflect upon the Society's high ideals and its high standards, and remember that it has drawn to its membership nearly all civil engineers of adequate qualifications in this country and that applications are now and have recently been coming in more rapidly than ever before.

Question 3 proposes the formation of a new and untried organization reported by the Joint Conference Committee. Its use of funds of this Society, confessedly inadequate for enlarging our own professional activities as recommended by the Committee on Development, would weaken this Society. And yet on the basis reported the funds of the proposed new organization would be insufficient to produce adequate results.

It is impossible in our opinion to effect solidarity of the profession as a whole by proceeding as proposed in Question 3.

We recommend strongly that Question 3 receive a "No" vote.

Question 3 reads as follows:

"Shall the Society for the purposes set forth in Questions 1 and 2 actively co-operate in the creation of the comprehensive organization as outlined in the Joint Conference Committee Report? (Report, Division C, pp. 10-19)."

John W. Alvord
C. I. Anderson
W. G. Arn
Bion J. Arnold
A. S. Baldwin
Onward Bates
R. E. Belknap
J. A. Bensel
W. L. Breckenridge
H. Eltinge Breed
Paul G. Brown
D. J. Brumley
R. S. Buck
Ralph Budd
Walter Buehler
C. B. Burdick
Wm. H. Burr
H. J. Burt
F. W. Cappelen
W. T. Chevalier
George C. Clarke
T. L. Condron
J. A. Connelly
A. S. Crane
C. R. Dart
J. V. Davies
Geo. S. Davison
F. W. Dencer
S. L. F. Deyo
J. M. Farrin
H. B. Fleming
R. P. H. Ford
Geo. W. Fuller
W. E. Fuller
W. D. Gerber
George Gibbs
A. L. Golinkin
Paul E. Green
T. L. D. Hadwen
Wm. H. Hall
A. J. Hammond
R. J. Harding
J. N. Hatch
Allen Hazen
Eugene H. Heald
E. R. Hill
F. W. Hodgdon
John P. Hogan
C. M. Holland
Wm. Hood
E. T. Howson
L. R. Howson
C. R. Hulsart
A. C. Humphreys
F. R. Judd
W. V. Judson
C. H. Keefer
Frank M. Kerr
Geo. W. Kittredge
G. C. D. Lenth
Nelson P. Lewis
Chas. F. Loweth
Geo. L. Lucas
J. R. McClintock
Chas. Macdonald
D. H. Maxwell
D. E. McComb
J. C. Meem
L. J. Mensch
Thaddeus Merriman
R. Modjeski
R. Montfort
E. L. Mosley
C. H. Mottier
M. M. Murtaugh
A. W. Newton
F. C. Noble
Wm. Barclay Parsons
W. C. Pauli
W. H. Penfield
T. F. Quilty
Isham Randolph
R. I. Randolph
A. F. Reichmann
Robert Ridgway
C. H. Rust
H. R. Safford
James F. Sanborn
M. R. Sherrerd
S. T. Smetters
J. Waldo Smith
J. P. Snow
R. E. Spear
I. F. Stern
T. H. Strate
Chas. L. Strobel
R. H. Thomson
James L. Tighe
F. G. Vent
B. H. Wait
John F. Wallace
S. Whinery
W. J. Wilgus
C. B. Wing
Frank E. Winsor
A. W. Woodman

Camp Meade Builders Banquet

The Pittsburgh engineers who engaged in supervision of construction of Camp Meade, Md., held a victory banquet in Pittsburgh, Feb. 17. Leo Hudson, consulting engineer, was toastmaster and the principal addresses were delivered by Morris Knowles, supervising engineer of Camp Meade, and J. D. Stevenson, city bridge engineer.

Engineers Discuss Traffic and Type of Vehicle Tunnel

Public hearings were held at the Engineering Society's Building in New York City by the Interstate Bridge and Tunnel Commission of New Jersey and New York on Feb. 21 and 23 to gather opinions on the traffic and construction phases of the vehicle tunnel design recently recommended by the commission's chief engineer, and reported at length in last week's issue. The sessions were attended largely by engineers. Their general effect was to indicate almost unanimous approval of the traffic provisions made in the design, but in the matter of type and method of construction to show a considerable demand for securing comparisons of economy between the recommended design and several other tunnel types.

STATISTICS WERE PRESENTED

In the hearing of Feb. 21, devoted to traffic, traffic-count statistics were presented by F. S. Greene, Commissioner of Highways for New York, and by W. G. Clark, of the New Jersey Highway Commission, for that state. Increases in volume of vehicle traffic ranging from 300 per cent to 2,000 per cent in ten years (1909-1919) were reported, and the present overshadowing importance of motor vehicles was strikingly brought out. John F. O'Rourke questioned the computations of expected traffic through the tunnel, but George F. Pride and others, speaking for team and truck operators who now have daily experience with ferry conditions, predicted that no matter what traffic estimate be adopted, the inauguration of the tunnel will show the estimate to be exceeded three to ten times. Mr. Pride also asserted that the through traffic which the tunnel is expected to serve will not get a chance to use it, as railroad and warehouse freighting between New York and Jersey City will absorb its whole capacity and leave a surplus. W. G. Clark and T. J. Wasser, Hudson County Engineer, urged the importance of western approaches, *i.e.*, means for crossing the Bergen Hill, and mentioned the Newark Bay bridge, to connect Bayonne with the state highway system south of Newark, as an important approach line which will facilitate traffic to the west by passing it around Newark. Amos Schaeffer reported traffic-density figures on Manhattan streets, with a maximum of 0.97 vehicle per foot width per minute on the Park Ave. viaduct, and on the basis of these figures suggested restudy of the Manhattan approach to separate the two lines of traffic. R. C. Falconer, chief engineer of the Erie R.R., also urged this separation.

On width and height, the design figures of 20 ft. and 13 ft. 6 in. were approved, except that F. S. Greene suggested reducing the width between curbs to 18 ft., a suggestion that was strongly opposed by others. Wheel channels in the pavement and a barrier curb along the center line were proposed by several as essential aids in guiding vehicles and reducing the chance of accident.

At a second hearing on Feb. 23, on design and construction method, John F. O'Rourke spoke in advocacy of a 44-ft. single-tube shield-driven tunnel lined with 4-ft. concrete blocks, substantially as recommended by General Goethals as consulting engineer to the commission two years ago. He also offered plans for concrete-block tunnels to fit other capacities and roadway arrangements. T. K. Thomson advocated a tunnel to be built by the trench method, for safety and economy. J. C. Meem proposed three alternative construction methods. Lazarus White, St. John Clarke and others urged that the commission ask alternate bids on designs other than that recommended by the chief engineer.

Gen. Geo. W. Goethals asserted that while the recommended design is good, the tunnel can be put through at much less cost. Supporting his earlier recommendation for a large tunnel with concrete block lining, he stated that analysis by M. A. Howe's method, on the basis of hydrostatic pressure with material weighing 100 lb. per cu.ft., showed the line of pressure to be within the middle third of the shell throughout, and the greatest stress to be less than the compressive stress set up by the shield jacks. Paul G. Brown, in endorsing the recommended design and method, stated that the engineering board of the state reconstruction commission some time last year found no engineer with experience in Hudson River tunneling who considered a concrete block tunnel, or a 42-ft. tunnel, practicable in the Hudson silt.

CLAY UNDER HUDSON

In supporting the plan for a large-size tunnel with concrete-block lining, Mr. O'Rourke massed much evidence to show that Hudson silt is a firm clay which stands well when not demoralized. Parts of the old brick sections of the Haskin tunnel opposite Morton St., built in the '70s, are still in existence, at places with part of the ring cut away. Deforming pressures of the material are developed in ordinary shield work by the presence of water around shield and lining, he said, and this shell of water is eliminated if the void back of the shield tail is packed with gravel by the gravel-shooting method used by him in East River tunneling. Progress of 22½ ft. per day was made at Detroit regularly with concrete-block lining, he stated. Mr. O'Rourke argued for placing the tunnel at depth of 50 ft. instead of 60 ft. as recommended by the engineer, to reduce approach length. G. B. Snyder, supporting the recommended design, suggested that built steel segments might be found superior to cast iron for the lining. T. K. Thomson said that while it cannot be proved that a shield tunnel in the Hudson River will not last a thousand years, neither can it be proved that it will last as many minutes. As safest, best and cheapest he advocated a tunnel built by the trench method, and he requested opportunity to submit a bid in competition with the engineer's design.

St. John Clarke protested against the attempt to settle engineering questions in a public hearing, and proposed that discussion be deferred until bids are available. F. D. Leffingwell criticized the differential-pressure shield proposed for the 44-ft. tunnel, as being dangerous or impracticable in the coarse, soft-ground formations in the shore sections of the tunnel and probably unnecessary in the silt of the middle section.

Hoover Becomes Head of Mining and Metallurgical Engineers

At the annual meeting of the American Institute of Mining and Metallurgical Engineers, held in the Engineering Societies Building, New York City, Feb. 16 and 17, Herbert C. Hoover was inaugurated as the Institute's president for 1920. In his address, reproduced in part on another page, Mr. Hoover discussed the nation's industry, economics and politics.

More Water for Topeka

Two engineering firms and two engineers have been selected to investigate and report on the water supply problem of Topeka, Kan., as follows: Prof. W. C. Hoad, Ann Arbor, Mich.; Burns & McDonnell, Kansas City, Mo.; Black & Veatch, Kansas City, Mo.; and C. A. Haskins, Lawrence, Kan. The present supply from wells along the Kansas River is inadequate. The investigation will consider the advisability of extending the well system or of using a purified supply from the Kansas River or a combination of the two.

Atlanta City-Planning Board

A city-planning board of 25 members has been appointed at Atlanta, Ga., with John W. Grant as chairman, and Kendall Weisiger of the Southern Bell Telephone Co., as secretary. Tentative plans have been made for ten standing committees, including one on topography and hydrography, one on statistics, one on housing and public welfare, one on transportation and building control.

Engineering Extension Courses At University of California

The University of California Extension Division has added three night classes in engineering subjects to its extension courses. The new courses, in which the first class met Feb. 24, are in applied mechanics, in reinforced concrete, and a more advanced course in reinforced concrete. William S. Sullivan is instructor in the added courses.

American Concrete Institute Has Live Meeting

Emphasis Laid on Reports of Committees Standardizing Specifications And Perfecting Practice

For the first time in three years the American Concrete Institute returned this year to its regular practice of meeting in February. Taking advantage of the probable presence in Chicago of a number of attendants on the concrete housing conference, the convention was held in that city on Feb. 16 to 18. Whether due to the numerous collateral societies meeting at that time or not, the sessions were unusually well attended, comparing quite favorably in that respect to the old days when the cement show brought a number of visitors who would not otherwise have come. The tone of the meetings, too, was indicative of the awakened spirit in the institute and gave promise of a successful year ahead.

Special effort was made this year to emphasize the committee work. In consequence eighteen committees reported and time was left for only seven papers. The program in no wise suffered, however, because many of the reports had the controversial nature which provoked discussion. In addition to the regular standing committees, five special committees on live details of concrete practice, which had been appointed in the past six months, brought in reports promising valuable information on matters still far from being settled.

FIVE STANDARDS TO BALLOT

Five standards were adopted by the convention to be sent to letter ballot for adoption. These were: Recommended Practice for Portland Cement Stucco; Nomenclature Standards; Building Regulations for Concrete; Unit Values for Vertical Shear; and Specifications for Concrete Sewers. The recommended stucco practice is practically in the form in which it was submitted at the last convention, except that as presented it contains, in parallel columns, the specifications clauses and the comments thereon. As has been stated before in these columns, it is the best information available on how to produce stucco. Standard building regulations have been before the institute in some form for three years and have been revised from time to time by the committee. This year the changes mainly comprise the use of the provisions for shear proposed by the special committee on that subject. These provisions were also adopted by the convention for letter ballot; and the report of the committee was accepted for publication. Objections to the shear recommendations were submitted in writing by C. A. P. Turner and Edward Godfrey, the former attempting to show by mathematical analysis that the shear values assumed were not consistent and, in some cases, not large enough; the latter presented again his well-known objections to the stirrup as a shear member, though voicing approval of the unproved anchorage requirements.

The sewer specifications have also been before the institute for some years, but have never been approved, mainly because of references to the contractor and contract requirements. This year the committee removed these clauses, to the satisfaction of the convention. The standard specifications for roads and pavements, now in force three years, have been revised in minor respects by the committee, but because the changes had not been submitted to the members the requisite thirty days they had to go over for another year.

Committees Report Progress

Progress only was reported by the remaining standing committees. That on Concrete Aggregates indicated that it was conducting in a number of laboratories co-ordinate tests of various concrete proportioning theories proposed in the past two years, and reported that it favors the adoption of a new method of the determination of the unit weight of aggregate desired by C. M. Chapman. Specifications for its manipulation are to be presented next year. The committee on Sidewalks and Floors has been studying the matter of floor wear, and while not prepared to present recommendations is accumulating records of service and tests which it is hoped will prove valuable soon. They have found, for instance, that proper provisions for keeping the floor wet after laying will increase strength and wear protection at least 40 per cent.

The Committee on Fireproofing continued to devote its attention to the results of the tests. On fire resistance of concrete columns made at the Bureau of Standards by Walter A. Hull, who presented the latest results of these tests in a paper at the meeting. The most recent deduction from these tests, as reported by the committee, is that limestone aggregate is a decidedly superior ingredient of fire-resisting concrete and that siliceous aggregate, while still subject to spalling under fire, can be used if the protective coating of concrete made from it be reinforced with mesh.

A subcommittee on Tests of Reinforced Concrete Floors submitted a tentative report giving recommended practice in testing floors of reinforced-concrete buildings and the Committee on Concrete Storage Tanks a tentative recommendation governing the construction of concrete oil tanks. The Committee on Reinforced - Concrete Barges and Ships presented a résumé of the present status of knowledge on this subject, an abstract of which will appear in an early issue of this journal.

Of the five special committees four had very live reports. That on floor finish was not able to get its material together in time for the convention. The report on shear has already been noted. The remaining three were on contractor's plant, standardization of steel bars for reinforcement, and standardization of units of design.

The contractor's plant committee limited itself to a study of the plant required on a concrete building, feeling that for the present, at least, the more massive forms of construction were out of its field. It analyzes, in its report, the various factors which govern plant selection and gives in detail the governing considerations and final results in plant on one recent large building job. The report is merely preliminary of the real work of the committee, but indicates a most valuable addition to contractors' knowledge. The committee standardizing design units calls attention to the great economic loss now common in the undue use of many standards of detail in concrete construction. It recommends the establishment of a certain limited number of sizes of members and units, the use of which may require somewhat more material owing to the inability of the designer to meet so closely the requirements of stress, but which will save in the long run an account of the saving of forms and labor. The committee proposes next year to prepare some of these standards for submission to the Institute.

Somewhat akin to this intention is the work of the special committee on steel bar specifications. This committee states that the bar manufacturers have agreed to roll reinforcement only from the intermediate grade steel of the manufacturers' standards and only in certain fixed sizes (noted in the item on p. 430 of this issue). This stand has been taken in order to speed up bar rolling, which is falling behind the demand, so much so that there is a growing bar shortage and inability to fill orders. The committee recommended that the Institute approve this action. This was done in so far as the sizes are concerned, but the convention voted to amend the report so as to recommend to engineers to allow all possible leeway in steel specifications, provided the steel satisfied one of the A. S. T. M. specifications for reinforcement bars. In other words, the engineer is urged, in the interests of facilitating manufacture, not to insist on a soft, intermediate or hard grade, if one of the other grades is available.

In a paper entitled "Compressive Strength of Concrete in Flexure," W. M. Slater and R. R. Zipprodt advanced a plea for a different method of determining safe unit compression stresses in concrete beams. They pointed out that the straight-line formula for computing gives stresses below those which actually exist. Further, they show by tests that actual compression failure in beams, by the parabolic formula, is higher than compression failure of cylinders of the same concrete. By the present practice, safety in compression is judged by the relation of the straight-line compression of the beam to the actual breaking stress assumed in a cylinder of concrete of the same mix as the beam. The authors show that in certain tests it would have been safer to take 45 per cent of the actual breaking strength of cylinders than the 32½ per cent of the assumed strength of the concrete allowed by the Joint Committee. They suggest that with improved methods of manufacture and inspection, so that concrete strengths can be closely predicted, the assumption for safe compressive unit stress of 45 per cent of actual cylinder failure would be a proper provision.

Other papers which will permit of more extended abstract at a future time were those by Stanton Walker on "Examples of Application of Abrams' Water Ratio to Proportioning Concrete," by R. B. Crepps on "Wear and Strength Tests of Concrete," and by E. B. Smith on "The Pressure of Concrete Against Forms."

The Wason medal, for the most meritorious paper in the 1919 *Proceedings*, was awarded to W. A. Slater, of the Bureau of Standards, for his paper on "Structural Laboratory Investigations in Reinforced Concrete Made for the Concrete Ship Section, E. F. C."

The meeting was presided over by President W. K. Hatt, of Purdue University, who finished his third year in that position. He is succeeded by H. C Turner, of the Turner Construction Co., of New York. The Institute is in fair financial condition, but is planning an intensive campaign for new members and at the same time will extend its activities so as to make a more steady appeal to its members. The secretary is Harvey Whipple, New Telegraph Building, Detroit, Mich.

Program of Foreign Trade Convention Is Announced

The program for a comprehensive discussion of elements in the country's foreign trade problems at the seventh annual foreign trade-convention in San Francisco, May 12-15, was announced Feb. 23 by James A. Farrell, chairman of the National Foreign Trade Council. The main division of subjects for discussion is: Fundamentals of our foreign trade; foreign trade policies: imports and exports, and a national program for foreign trade.

Armour Institute Given $6,000,000

An additional gift of $6,000,000 to Armour Institute, Chicago, was made Feb. 21 by J. Ogden Armour. The institute has outgrown its present facilities, and the gift includes a new site of 80 acres which cost $1,000,000. The remainder of the six millions will be expended in the construction of new buildings. It is understood that the new location will make possible the introduction of additional engineering courses into the institute's curriculum.

Railroad Bill Passed by Congress on Basis of Conference Committee Report

(Concluded from page 441)

sory arbitration is not provided, it is the plan that decisions of a board of nine members appointed by the President, equally divided between employees, employers and the public, will be made binding through publicity of negotiations. However, it is provided that disputes shall be decided, if possible, by the railway boards of labor adjustment established by agreement between the carriers and their employees.

Determination of "value" for rate-making purposes is left to the Commission with the command that it shall give the property investment of the railroads only that consideration to which it is entitled under the law in establishing value for rate-making purposes.

The membership of the Commission is increased from nine to eleven members, with an increase of $10,000 to $12,000 in annual salary. The Commission's increased powers include: Establishment of minimum as well as maximum rates, supervision of car service in emergency, compulsory joint use of terminals, priorities and embargoes, approval of securities issues and new construction or abandonment of existing lines.

Complete control over railroad operations throughout the country in "case of war or threatened war" would be centered in the Commission which would have powers similar to those now exercised by the Railroad Administration.

Bids for Water-Works Improvements Wanted by Akron, Ohio

Bids for carrying on the extensive program of water-works improvements at Akron, Ohio, outlined in *Engineering News-Record,* Sept. 25. 1919, p. 608, are to be received March 5 and further contracts will be let a few weeks later. The principal items open to bids on March 5 are 3,300 tons of 4- to 20-in. cast-iron pipe and specials, 500 6- to 8-in. hydrants, 400 6- to 16-in. valves, a 500,000-gal. steel tank on a 70-ft. tower, and 30,000 cu.yd. of grading. Later in March or else in April bids will be asked for laying 32 mi. of 6- to 20-in. pipe, in six contracts of 3 to 8 miles each; a 20.000,000-gal. addition to the mechanical filter plant, in ten units; and a 3,000,000-gal. coagulating basin of either groined arch or flat slab design. The additions to the treatment works will require 23,000 cu.yd. of excavation, 5,000 cu.yd. of concrete and an 80 x 140-ft. one-story brick building. G. G. Dixon is chief engineer of the Bureau of Water-Works improvements and H. L. Newhall is principal assistant engineer. H. H. Frost is superintendent of water-works, and E. A. Zeisloft is director of public service.

Canadian Contractors and Material Dealers Organize

Formal organization of the Association of Canadian Building and Construction Industries, composed of general contractors, sub-contractors and material dealers, was recently effected at Montreal, Que. The following officers were elected by the eighty-six members present from all parts of the Dominion: President, J. P. Anglin, Anglin, Norcross, Ltd., Montreal; first vice-president, J. B. Carswell, Carswell Construction Co., Toronto; second vice-president, James Mackie, James Mackie Co., Ltd., Winnipeg; secretary, James Rhinnemore, painting contractor, Toronto; and treasurer, G. A. Cram, general contractor, Ottawa.

In connection with the conferences resulting from the formal organization of the association general contractors in attendance voted to incorporate as the Canadian General Contractors' Association. J. B. Carswell, Toronto, was elected president; W. H. Yates, Hamilton, vice-president; and Hugh Graham, Ottawa, secretary.

U.S. D.P.W. Support Urged in Engineering Mass Meeting

In response to a general call, members of the national engineering societies resident in New York City met in the auditorium of the Engineering Societies Building Feb. 19, to hear a plea for co-operation in promoting the establishment of a national public works department. M. O. Leighton, chairman of the National Public Works Department Association, was the principal speaker.

Ridgway Heads Newly Organized N. Y. Section, Am. Soc. C. E.

At a meeting Feb. 18 in the Engineering Societies Building a New York Section of the American Society of Civil Engineers was organized. Robert Ridgway was elected president, and May was chosen as the month of the annual meeting. Such an organization is in line with a policy approved at the recent annual meeting of the parent society—that it be divided into sections to embrace all members.

There were twenty New York City members of the American Society of Civil Engineers present at the meeting. J. Waldo Smith and Clifford M. Holland were chosen temporary president and secretary, respectively. The object of the meeting was explained and successive resolutions were passed declaring the section formed, adopting the form of constitution approved by the national society's Board of Direction Jan. 20, 1920, and authorizing a general call to members resident in District No. 1 of the national society to join the local section.

A nominating committee consisting of Walter E. Spear, Arthur S. Tuttle and George L. Lucas was appointed at the beginning of the meeting. After deliberation its report was presented and the following officers were elected to serve until the annual meeting in May: President, Robert Ridgway; first vice-president, J. Waldo Smith; second vice-president, Allen Hazen; secretary, Lewis D. Rights; treasurer, Frederick C. Noble; directors, Otis E. Hovey and R. S. Buck.

A motion of S. N. Castle was passed authorizing the president to appoint representatives to participate in a joint conference of representatives of other local sections of national engineering and technical societies and of local engineering societies The number of such representatives of the New York Section was fixed at three by a vote on a motion made by Mr. Hovey. Others in attendance who addressed the meeting were Daniel Bontecou, Arthur S. Tuttle, Herbert C. Keith, and Charles Hansel.

Case Against Chimney Constructors Disposed Of

Fines aggregating $18,250 were recently imposed in the Federal court for the Southern district of New York upon five chimney construction companies and 15 individuals connected with these concerns for violation of the Sherman anti-trust law. Not all of the defendants were fined. All had entered pleas of *nolo contendere.* As noted in the news columns of *Engineering News-Record* of Jan. 1, 1920, p. 59, a Federal grand jury indicted the Alphons Custodis Chimney Construction Co., the M. W. Kellogg Co., H. G. K. Heinicke, Inc., Bergen Lindeman, Inc.; and the Heine Chimney Co., together with 15 individuals, on the charge of having organized and operated a trust for the construction of radial brick chimneys.

General Contractors Perfect Organization

(Concluded from page 441)

personal representation has been made of the association's attitude on the legislation for a department of public works, on the disposition of the railways, on daylight saving, on income taxation and on Federal home loan banks and on a score of other acts affecting the construction industry.

Ethics: Careful study has been made of the codes of ethics of various professions and a statement has been drafted to serve as a basis for a code of ethical practices in contracting.

Methods: Payments for estimates and quantity surveys are being taken up with architects and engineers to determine an equitable and workable plan. Rental rates for equipment are being investigated. An extended analysis of construction methods is in progress.

Contracts: Contract provisions are being studied with the view of developing a standard form of contract. The Research Division has gathered 113 contracts of various firms—unit-price, lump-sum, cost-plus-percentage, cost-plus-fixed-fee, etc.—with comments on each form by engineers and contractors who are using them and this information will be used as a basis for a standard form to be developed.

Construction Development: Grouping of members into divisions is recommended for efficient action. Three divisions have been created: (1) Highway contractors, (2) Railway and public works contractors, (3) Building contractors.

Codes: The licensing of contractors has received attention. Closely related to this question is the registration and classification of all contractors, particularly those engaged on public work. The thought is that some definite plan of registering contractors according to their organization, equipment, past performance and financial responsibility should be drawn up for adoption by public works officials to eliminate irresponsible contractors.

MEMBERSHIP AND DUES

Dues are arranged on a sliding scale based on the volume of business. This scale is as follows:

Class	In Excess of	Less Than	Yearly Dues
A	$3,000,000	....	$500
B	2,000,000	$3,000,000	250
C	1,000,000	2,000,000	150
D	500,000	1,000,000	100
E	250,000	500,000	50
F	....	250,000	25

These are dues for individual members. The dues of Associated Organizations shall be 20 per cent of their annual income from dues with a minimum payment of $25 and a maximum payment of $100 for each one of their individual, firm or corporation members.

PRICES, PRODUCTION AND CONSTRUCTION

That little hope for lower prices or greater production or increased construction is offered by an analysis of present economic conditions was the conclusion of Prof. Herald H. Moulton whose address opened the session devoted to construction, contracts and industrial relations. The best conclusion to be based on available figures, was that measured in units of work accomplished—there was less construction in 1919 than in either 1914, 1915 or 1916. The vital factors limiting work were labor shortage, car shortage and lack of money. Immigration could not help the labor situation in 1920 or perhaps for some years, since with the reduced value of foreign money the sum required by our immigration laws for admission of immigrants had been multiplied from two to five fold. The shortening of the working day and the decrease in efficiency made some 2,500,000 to 4,000,000 more workers necessary to produce the same amount as previously. The car shortage would persist because few cars had been built and owing to the shorter working day and decreased efficiency cars were held a longer time out of service waiting for repairs. Finally our money reserve was approaching the point where money for construction could not be secured at reasonable rates. Professor Moulton considered that we might expect wages to advance, freight rates to increase and prices to increase.

HIGHWAY CONTRACTING PROBLEMS

The outstanding problem in highway contracting, according to A. R. Hirst, state highway engineer of Wisconsin, was the problem of improving contractors' methods and practices. Most contractors, he said, were not conducting their business nor keeping their records in such a manner that they were improving their service from one year to another. Through lack of co-operation and reluctance to disclose their costs the inefficiency of one year was being repeated the next year and highway construction was becoming a record of mistakes repeated indefinitely. Contractors, according to Mr. Hirst, were not meeting the situation by improving their practices but were asking that they be granted relief through higher and still higher prices, through less rigid specifications and through risk relieving forms of contracts. He called upon contractors to analyze and study costs and outputs with a view of improving their service and proving their claim to be experts in construction. Otherwise state highway officials would be fully warranted in taking the task of building highways away from contractors and into their own hands.

A national transportation system under government regulation was suggested in a lengthy paper by Richard Waterman, secretary of the railway committee of the Chamber of Commerce of the United States. He proposed a co-operation of six units: Railways, interurban lines, street railways, highways, waterways and aviation, all under control of the Interstate Commerce Commission. As to the proposed railway bill, he approved of permitting—but not compelling—consolidation of railways to form a few large systems. He thought the wage question is properly omitted, since it should be dealt with in a separate general labor law.

ELECTION OF OFFICERS

Count of the letter ballots showed the following officers elected: President, W. A. Rogers; first vice-president, T. T. Flagler; second vice-president, J. W. Cowper; third vice-president, W. O. Winston; advisory board, N. F. Hoggson, F. L. Cranford, F. J. MacIsaac.

Cincinnati and Washington Census Figures First Out

The first figures from the 1920 population count were announced by the Bureau of the Census Feb. 21. Washington, or strictly the District of Columbia, has 437,414 inhabitants (as of Jan. 1), which is an increase of 106,345 or 32.1 per cent over 1910. The corresponding figures for Cincinnati are 401,158, 37,567 and 10.3 per cent. The 1910 census was as of April 15.

Concrete Joint Committee Organizes

Representatives of the Five Societies Get Together for First Meeting and Plan Work

On the invitation of the American Society for Testing Materials, the four other societies which contributed to the Joint Committee on Concrete and Reinforced Concrete have again appointed each five members, who with the five members appointed by the A. S. T. M., will constitute a new Joint Committee to prepare rules and regulations for the design and construction of concrete and reinforced concrete. The members have met and effected an organization with Richard L. Humphrey as chairman, J. J. Yates as vice-chairman and Duff A. Abrams as secretary. They have further subdivided the work into the following committees: Materials (other than reinforcing); metal reinforcing; proportioning and mixing; forms and placing (including under water); design; details of construction (including fire-proofing); waterproofing and protective treatment; and surface finish. These committees will proceed immediately to formulate reports to the full committee for next June.

The personnel of the Joint Committee is as follows: *American Society for Testing Materials:* Richard L. Humphrey, chairman, Henry H. Quimby, L. S. Moisseiff, A. T. Goldbeck, E. E. Hughes; *American Society of Civil Engineers:* Rudolph P. Miller, chairman, W. K. Hatt, A. E. Lindau, W. A. Slater, Sanford E. Thompson; *American Railway Engineering Association:* J. J. Yates, chairman, G. E. Boyd, F. E. Schall, C. C. Westfall, H. T. Welty; *American Concrete Institute:* S. C. Hollister, chairman, R. W. Lesley, A. R. Lord, E. J. Moore, L. C. Wason; *Portland Cement Association:* F. W. Kelley, chairman, Ernest Ashton, J. H. Libberton, E. D. Boyer, D. A. Abrams.

Pittsburgh Transit Commissioner Removed by Mayor

E. K. Morse, transit commissioner of Pittsburgh, has been removed by Mayor E. V. Babcock. It is generally assumed that the reason for the action was Mr. Morse's opposition to the street-car loop subway project originated by the mayor, for which project a bond-issue of six millions was voted by the people last summer. Following the removal, the city council held a hearing at which Mr. Morse presented his views on rapid transit. He asserted that the loop subway would not help to solve the city's transportation difficulties or needs, that the downtown congestion is not due to street cars as these constitute only one fifth of the traffic, and that the loop is not able to carry more than half the street cars entering the business district. In view of these facts he urged that the bond issue be applied to true rapid-transit construction.

Iowa Engineers Combine Locals With State Society

Greatly extended society activities were provided for at the thirty-second annual meeting of the Iowa Engineering Society which met Feb. 17, 18 and 19 in Fort Dodge. Without much discussion a plan of reorganization was approved whereby all of the local clubs and local sections of national organizations are to be consolidated with the state society as a central body, the locals becoming centers of districts to be formed after a study of the distribution of the engineering population of the state. A central governing council made up of delegates from the locals would decide the policy of the state society in regard to publicity, legislation and any other improvement of engineering as a profession. A percentage of the dues will go to the state society. This scheme of organization has already been ratified in principle by local clubs in Des Moines, Waterloo, Davenport, Sioux City and Boone. New clubs in Ames and Cedar Rapids have been formed to go into the consolidation. The chapters of the American Association of Engineers at Davenport and Ames were asked to join in with the other locals. The plan has been fostered and practically carried through by the Iowa Association of Members of the American Society of Civil Engineers. An organization meeting of delegates of practically all of these bodies was held Feb. 20 to formulate a definite constitution upon which the societies might base the necessary changes in their respective constitutions.

Aside from the technical program, which was principally devoted to drainage, highways and pavements, there were vigorous discussions on costs, professional practice, the workings of the recently enacted registration law and engineering publicity.

A committee on professional practice, with T. R. Warriner as chairman, has investigated the salaries of engineers in colleges, state, county and municipal offices. The increases over 1915 ranged from 5 to 57.5 per cent, usually the advance being largest in the lower paid grades. The committee stated that the salaries were too low in 1915 and that they should now be increased 50 per cent above what they should have been in 1915. No plan was outlined as to how the advance might be obtained. As to fees and commissions for consultants the committee felt that the standards adopted by the society in 1918 were too low and should be increased by 50 per cent, also that no per diem fee under $35 should be accepted.

The society has had a large increase in membership, 73 being added, bringing the total to 324. J. H. Dunlap, secretary, attributed it largely to the registration law. The officers elected for the succeeding year are as follows: President H. H. Dean; vice-president, Clark Streetor; directors, J. G. Thorne and K. L. Patzig.

Wisconsin Engineers Meet

State highways, inspection of contract work and the proposed national department of public works were the prominent subjects at the twelfth annual meeting of the Engineering Society of Wisconsin, held at the University of Wisconsin, at Madison, on Feb. 20 and 21. As to the state highways, James Gillespie stated that present difficulties are not those of funds but of labor, material and transportation. For the 1920 program there is $18,000,000 available and it is planned to build about 400 miles of concrete road, 700 miles of gravel road and 600 miles of unsurfaced road. No bituminous macadam is included as it is considered best to step direct from gravel to concrete as traffic develops.

How to prepare engineers' reports to financiers and investors was an interesting topic included by Mr. Mead in an address on the general subject of land reclamation and development by drainage.

Knowles and Pratt Engineering Organizations Combined

Announcement of an amalgamation of the organization of the late R. Winthrop Pratt of Cleveland, Ohio, and that of Morris Knowles, Inc., of Pittsburgh, was made at the seventh annual dinner of 80 officers and employees of the latter firm in Pittsburgh, Feb. 14. The Pratt office in Cleveland will continue to be operated, but under the name of Morris Knowles, Inc., and will be under the direct supervision of R. F. McDowell and R. E. Garvin, who were continuously associated with Mr. Pratt for several years prior to the time of his death. The various branch offices established by each organization will be continued with the possibility of others being added.

Although both organizations have done work in connection with water supply and water purification projects, sewerage systems and drainage, Mr. Pratt's organization has had wide experience in garbage and sewage disposal plants, sewerage systems and waterworks, while Morris Knowles Inc., has developed departments of town planning, industrial housing, flood prevention, valuation and rate-making, and appraisals.

Human Element in Industry, Subject of Meeting

An illustrated description of the industrial relations obtaining in the Newburgh Shipyard, Newburgh, N. Y., was given members of the American Society of Civil Engineers at a regular meeting in New York City, Feb. 18, by Thomas C. Desmond, president of the Newburgh Shipyard, Inc. Mr. Desmond told of a condition in which the concern of the management was divided equally between the human and the technical phases of production.

Many methods were described which the yard management uses to promote the contentment, ambition and loyalty of the employees. The workers have several athletic teams and various community facilities, all of which are managed by the employees alone.

The operations of an efficiently functioning shop committee and of several plant schools conducted to train novices in the trades practiced in a shipyard were described.

International Road Association Resumes Bulletin

After an interruption lasting since June, 1914, the Permanent International Association of Road Congresses has resumed publication of its bulletin. One of the first questions raised in the first issue is as to the place where the fourth congress should be held. Both the United States and Italy have been suggested by members of the association, and the question will be submitted to the permanent international commission at the time of its next meeting, in the spring of this year.

The bulletin urges new and old members to remit their subscriptions at once. The subscriptions for individuals are 10 francs per year, 30 francs for a three-year period, and 125 francs for life membership. Subscriptions should be made payable to the Secretaire General de l'Association Internationale Permanente des Congres de la Route, 1 Avenue d'Iena (Trocadero Post Office), Paris.

Kentucky Bill to Prohibit Bridge Pooling

A bill introduced in the Kentucky House of Representatives prohibits combinations of bridge or other contractors "for pooling of prices of different competing contractors or to divide between them the aggregate or net proceeds . . . for fixing the price which any contractor shall bid."

ENGINEERING SOCIETIES

The Terre Haute Chapter of the A. A. E. recently installed the following officers: W. H. Durbin, president; N. A. Powell, vice-president, and George J. Stoner, secretary and treasurer.

The American Association of Engineers, according to a California report, has accorded membership to a second chapter in Los Angeles, Cal. The new chapter is composed of civil engineers employed on projects in Los Angeles Co. E. Earl Glass, of the Los Angeles County Flood Control District, has been elected president, and C. E. Weary, of the County Engineer's office, is the secretary.

The Albany Society of Civil Engineers held a regular meeting in Albany, N. Y., Feb. 24. Perley H. Brigham, district engineer of the Lakewood Engineering Co. of Cleveland, Ohio,

Calendar

Annual Meetings

AMERICAN RAILWAY ENGINEERING ASSOCIATION; 1426 Manhattan Bldg., Chicago; March 16-18, Chicago.

AMERICAN ASSOCIATION OF ENGINEERS; 63 E. Adams St., Chicago; May 10, 11, St. Louis, Mo.

delivered an address on "Modern Methods of Concrete Road Construction." Mr. Brigham, who was formerly an assistant engineer with the New York State Highway Department and a captain in the 23rd Engineers in France, illustrated his address with motion picture films.

The Mohawk Valley Engineers' Club was recently organized with 150 members. The policy to which the charter members of the club subscribed was that "the principal aim of this club will be to devote the talent of its members to the general good of the communities in its territory by discussion of the technical features of local and foreign engineering problems." Further elaboration of policy was presented in a report of the Committee on Constitution. The officers elected were: Byron E. White, president; Hubert E. Collins, first vice-president; Roy F. Hall second vice-president; Horace B. Sweet, third vice-president; Frederick E. Beck, secretary; Clifford Lewis, treasurer. Regular meetings of the new club will be held on the first Tuesday of each month.

The Rochester Engineering Society at its weekly luncheon Feb. 17 was addressed by J. P. Haftenkamp on the manufacture and characteristics of *bengas*, described as a substitute fuel for automobiles.

The Indianapolis Chapter, A. A. E., recently adopted unanimously a resolution calling upon the American Association of Engineers to appoint a committee to confer, advise and work with the platform committee of the National Convention of the leading political parties, to assist in the formulation of planks in national party platforms.

The Engineers' Club of Trenton (N. J.) held a special meeting in its club rooms Feb. 19 to hear an address by Hjalmar E. Skougor, consulting industrial engineer of New York City, on the development of the natural resources of the New Jersey waterfront and waterways.

The St. Louis Railway Club met Feb. 20, in St. Louis, Mo., to hear an address on "Scientific Methods in Employment Management." The speaker was Edgar James Swift, professor of psychology and education, Washington University.

The Yakima (Wash.) Engineers Club elected the following officers at its recent annual meeting: President, D. R Redman; vice-president, T. W. Macartney; secretary-treasurer, L. T. Jessup.

The Salt Lake Chapter of the A. A. E. has submitted to the Salt Lake, Utah, city commissioners a comparative salary schedule showing the difference in compensation received by the city and state engineers. It is maintained by the members of the chapter that the state engineers receive a much higher rate of pay than do the local engineers, and their efforts are being bent toward an equalization of compensation.

The Wyoming Engineering Society at a recent meeting in Thermopolis, Wyo., elected president, Prof. J. C. Fitterer, irrigation engineering instructor at the University of Wyoming; C. W. Zorn was elected vice-president and J. C. Chessington, secretary-treasurer. The society has 80 members.

PERSONAL NOTES

DR. WILLIAM T. SEDGWICK, senior professor of the Massachusetts Institute of Technology and head of the Department of Biology and Public Health, has been appointed first exchange professor from the Institute to the Universities of Cambridge and Leeds, England, in accordance with an understanding that grew out of a suggestion made by the late President Maclaurin of the Institute. Doctor and Mrs. Sedgwick will leave for England early in April. He will go into residence at the two unversities, dividing his time between them, and will return to this country in September. A sketch of Dr. Sedgwick's career up to his election as president of the New England Water Works Association appeared in *Engineering News*, Jan. 11, 1906, p. 31. Since then he has been president of the American Public Health Association and he is now, in addition to the position already mentioned, chairman of the Administrative Board of the Harvard-Technology School of Public Health, member of the Massachusetts Public Health Council and of the International Health Board of the Rockefeller Foundation.

HARRY R. HAYES, commissioner of public works of Utica, N. Y., for the past six years, has announced that he will return to private engineering practice as manager of the Hayes Engineering Service, Utica. He will specialize in the design and installation of municipal utilities and in city planning and valuation engineering.

ROSCOE K. EARLE, by a recent court decision has replaced Roscoe Earle Sawistowsky as city engineer of Davenport, Iowa, although there is no change of incumbent. An Iowa court recently granted Mr. Sawistowsky's petition to have his name legally changed to that of Roscoe K. Earle.

W. STEINBERGER has been appointed county engineer of Jackson County, W. Va.

GEORGE S. WEBSTER, whose term as Director of the Department of Wharves, Docks and Ferries, Philadelphia, recently expired, was immediately appointed chief engineer of that city's Bureau of Surveys, Department of Public Works. The duties of the latter office are not unfamiliar to Mr. Webster, as he held it for many years.

EDWARD P. LUPFER, Buffalo, N. Y., is one of the members appointed to the Buffalo Public Bridge Commission which was created by act of Congress to determine the possibility of building an international bridge over the Niagara River near Buffalo.

OBITUARY

CHARLES E. GREGORY, deputy chief engineer of the North Jersey Water Supply Commission, died of pneumonia at his home in East Orange, N. J., Feb. 21, at the age of forty-nine. Born in Stamford, N. Y., in 1871, Charles Emerson Gregory was educated in the public schools of Duchess Co. and prepared for entrance into Union College at the Poughkeepsie Military Institute. He received the C. E. degree from Union College in 1894, and with it the first honor prize of his class. His first engineering work was as resident engineer in charge of a $60,000 water-works construction at Coxsackie, N. Y., which he carried on from the time of his graduation until April, 1895. Until September, 1895, he engaged in contract construction of a canal at Middleport, N. Y., and extensions to the Coxsackie water-supply system. His next work was the direction of a $30,000 water-supply installation at Red Hook, N. Y. In 1896 he was appointed engineering inspector in the Department of Public Works, New York City, and in 1897, as transitman. was assigned to sewer work in what is now the Borough of the Bronx. He was appointed assistant engineer in 1898 and served in that capacity in the Bronx until 1906. During those years he designed the new system of sewers for the eastern portion of the Bronx which includes some of the most difficult and extensive work in New York City.

In 1906 Mr. Gregory was appointed designing engineer for the city's board of water supply, and assigned to drawing up the designs, specifications and some of the contracts for the Ashokan and Kensico reservoirs with their appurtenant bridges. Upon request of the president of the Borough of Manhattan he was transferred in 1912 to become deputy consulting engineer of that borough and in 1914 was appointed borough chief engineer of sewers. He left the employ of the City of New York in 1919 to become deputy chief engineer of the North Jersey District Water Supply Commission, which office he held until the time of his death.

A Consolidation of Engineering News and Engineering Record

McGraw-Hill Company, Inc.—JAMES H. MCGRAW, *Presiden..*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN
Editor

Volume 84 NEW YORK, THURSDAY, MARCH 4, 1920 Number 10

Roads in the Spring Break-Up

REPEATEDLY we have called attention to the need of legislation which would enable state highway departments to rule heavy vehicles off the roads during the period when the frost is coming out of the ground. No lengthy argument is necessary on the subject. All engineers and all intelligent users of the highway appreciate the need of this public power. What is demanded now is action. Many state legislatures are in session. Where the power to make these rules is not now vested in the state highway departments, the legislation should be forthcoming at once. Only so can we conserve the present highway investment.

International Road Congress

IN THE first bulletin of the Permanent International Association of Road Congresses published since 1914, the outbreak of the war, the question is raised as to where the next International Road Congress should be held. Members have suggested either Italy or the United States. With the tremendous progress we have been making in highway building and the intensity of interest displayed therein, America would very properly be the place to hold the next congress, in 1921. France, Belgium and England, successively, have entertained the Road Congress in their capital cities. We should certainly take pride in becoming the next host. Unfortunately, however, we are in an embarrassing position—and have been at the three previous International Road Congresses. Despite the fact that, among other countries, Belgium, Cuba, France, Great Britain, Italy, Japan, Mexico, Norway, Portugal, Spain, Sweden, Switzerland, are members of the association, the United States has never taken membership. Consequently, it has not been represented by delegates at the Congress, though engineers from the United States have been welcomed to the meetings as individual members. Our holding aloof is a reflection upon us and an indication of the insularity that, in the past at least, has marked our thinking. The rules of the congress and of the association provide that each government shall have a right to one representative for each 1,000 francs of annual subsidy, provided, however, that the number of representatives from any one government shall not exceed fifteen. In other words, for a paltry pittance of $3,000 the United States refrains from official participation in the work of this important organization. We would suggest that engineers in this country who believe that the United States should take membership would do well to express their views to Thomas H. McDonald, chief of the Bureau of Public Roads, for, though we have had no conference with Mr. McDonald on the subject, it would seem proper that he, as the director of the highway activities of the Federal Government, should be the medium through which the voice of the engineers of this country should be expressed. We have no doubt that if this matter be properly presented Congress will vote the necessary funds. Once a member of the association, we will be in a position to extend an invitation to have the next congress held in this country.

Task Ahead of Railroad Engineers

WHEN the American Railway Engineering Association met last year there was doubt and apprehension as to the future of the railroads. In less than two weeks it will meet again at Chicago to discuss many of the engineering problems that must be worked out, now that private enterprise is to prevail. In the transition there are changes in titles but fewer changes in duties. The opinion is almost unanimous that, while serving the Government, railroad engineers performed notable and conscientious service in maintaining the properties in as good condition as limited funds and materials permitted. But the roads must be brought back to prewar efficiency as to their physical condition. As soon as funds are available in ample amount the engineering forces will have to assume a tremendous burden. The realization of this will undoubtedly be in the background of all the proceedings at Chicago.

Back to Private Operation

A POINT in the history of the country's economic development was marked by the return of the railroads to private operation last Monday after more than two years of Federal control. The emergency step taken during the war thrust the advisibility of Government ownership and operation to the fore. The proposal has been rejected. The railroads have been returned under a law that gives hope of an era of successful private management and development. Although portions of the law have been widely misrepresented, it is clearly anything but a socialistic measure, but rather an expression of the country's opposition to Government ownership.

A Society of Military Engineers

A SOCIETY of American Military Engineers is being organized. Its membership is open to engineer officers and to civilian engineers formerly in the military service in any arm, branch or rank. "In the interests of the national defense to promote the efficiency of the military engineer service . . . and to foster relations of useful interest between the engineering profession in civil life and that in the military service"—this its provisional constitution declares to be one of its objects. The organization is more fully described in the news columns of the Feb. 19 issue. Based upon the latitude of eligibility and the objects cited, it is safe to predict a large membership. Certainly the attainment of those objects merits the support of all who are eligible; indeed their attainment is the common desire of all civilian engineers who have worn the uniform. None but has seen room for improvement in the engineer service—lots of it. Having the opportunity, each would contribute his best bit to such improvement. The new society might be the opportunity.

Soldier-Civilian Co-operation

ENGINEER support of our combatant arms in France has been praised more highly, perhaps, than that of any other service. Engineer service was ready when the need came. *But* the need did not come until a year after war was declared. It took the fighting arms that long to get ready; and it took the engineers that long. It will not take the former that long again, but it will take the engineers that long, relatively, unless the Corps of Engineers and civilian engineers of the type whose ability and training were found indispensable in war co-operate in time of peace to formulate engineer organization and policy for the eventualities of war. Had this been done before 1917 the engineer service could have been ready in half the time. It has been a lesson; let us assume it has been learned. Then, to co-operate. Through the Commissioned Reserve? No. The Reserve has essential uses, but it has not the machinery for the policy-forming co-operation of the soldier and the civilian engineers, due, among other things, to the differences in rank between members of the regular army and officers from civil life. The Society of American Military Engineers, if it is managed as a democratic organization in which rank is leveled and questions decided on their merits and not on the rank of their proposers, has possibilities.

Hoover on Railways and Shipping

HERBERT HOOVER'S discussion of the railway and shipping problems, in his inaugural address as president of the American Institute of Mining and Metallurgical Engineers, printed last week, is characterized by hard, common sense and a recognition of the many factors involved. He presents strongly the weakness of Government operation, but points out that with the railroads now returned to private ownership there will be demanded a high degree of efficiency in operation, the enlistment of the good will of the employees and protection of the public. He does not blink the fact that the railroad operators have a very difficult situation before them. On the shipping situation, we have not seen in so small a compass so excellent a presentation of the complexity of the problem. He emphasizes the difficult position of the Government in its inability to bargain over cargoes and traffic. On the other hand, he points out the inevitably bad consequence of inability so to conduct its shipping business. But that is only one side of the case. The other, the demobilization of the present shipping into private hands, is beset by difficulties involving price, the maintenance of a shipping industry, and the preservation of our shipbuilding organizations. All of these things, so clearly put, should stimulate the interest and the thinking of all citizens, particularly of engineers, to whom Mr. Hoover addressed himself in his remarks. If we could only say that the thinking illustrated by his address was representative of that of engineers at large, who could estimate what our influence would be in public affairs? There are few Hoovers but the Hoover mark is one to shoot at.

Our Own Social Philosophy

NOT less striking than Mr. Hoover's discussion of the railroad and shipping problems is the soundness and the sureness with which he approaches the problem of industrial relations and the fundamentals according to which we must solve our national problems. He goes to the core of the matter of industrial relationship when he says that we must re-establish "that personal co-operation between employer and employee that was a binding force when our industries were smaller." In his emphasis upon the need of solving our problems in accordance with our own national ideals and our own social philosophy, he will strike a kindred chord in the heart of every loyal citizen. Our philosophy is based upon the conviction that there should be equal opportunity for all. We may not have fully secured that equality of opportunity, but nevertheless the swings back and forth in the relations between capital and labor have been efforts to realize that ideal. In these sentences he interprets the kind of State we have been trying to develop: "A society that is based upon a constant flux of individuals in the community, upon the basis of ability and character, is a moving, virile mass; it is not a stratification of classes. Its inspiration is individual initiative. Its stimulus is competition. Its safeguard is education. Its greatest mentor is free speech and voluntary organization for public good. Its expression in legislation is the common sense and common will of the majority." The State, in the American conception, should step in to safeguard the interests of the many against the few, and should not do that which private initiative and organization are capable of accomplishing. Mr. Hoover rightfully concludes that if we cling to our national ideals "it will mean the final isolation and the political abondonment of the minor groups who hope for domination of the Government, either by 'interests' or by radical social theories.

Concrete Ships Still Experiments

EVEN in the crowded days of 1918 when the fate of the world seemed to hang on more ships and all possible materials and methods were being urged for the construction of the needed bottoms, no one proposed the concrete ship as anything more than an experiment. Today when emergency measures are no longer required and when five large concrete steamers are on the high seas and ten more are well along toward completion their experimental status still exists. That is the main deduction from the Concrete Institute report printed last week. Time only can prove whether concrete will become a fitting material for ship construction, but several things have been learned. There appear to be no difficulties in design and construction which cannot be overcome; and the big ships are seaworthy. So much is in favor of the concrete ship. On the other hand, there is no such saving in cost and speed of construction as was expected and the ratio of dead weight to carrying capacity, even with a light weight aggregate, is much higher than anticipated. Furthermore, there are dangers in the thin shells—thin, that is, for a concrete member—because of the ease of puncture or rupture by the unavoidable blows of other vessels or marine structures. Certainly experience has shown that the steel ship is in no danger of being supplanted, but, on the other hand, it has justified the enthusiasm which advanced the concrete ship in the emergency of war.

Mixing Cobbles in Concrete

LARGE-SIZE coarse aggregate mixed in the batch is not common in concrete practice but it has been used. In fact in mass work, for dams especially, there are several precedents for the 6-in. cobbles included in the concrete for the Warm Springs dam described on another page. The knowledge of such use, however, is not widespread nor the integrity or economy of the concrete so made established. According to Charles H. Paul, experiments on cobbles in the mixer were tried at the Arrowrock dam as far back as 1911 and proved so satisfactory that the method was used—and successfully—in practically all of the 600,000 cu.yd. of concrete for the dam. In *Engineering Record,* May 1, 1915, there is in article by E. O. Keator advocating the more extensive use of large size—even up to 8-in.—aggregate in the mixer and citing half-a-dozen instances of the satisfactory use of such stone. Nevertheless, most concrete men while not necessarily condemning such a practice would feel that in using it they were treading a pioneer path. There are some obvious advantages of including the admittedly useful plums in the mixer. There should be economy in placing and an insurance of complete coating by the mortar and apparently there is no difficulty in plant manipulation nor any undue wear on the equipment. For mass work, therefore, it deserves more attention than it has attracted.

"Hylan Swings a Pick"

SNOW removal was commented on extensively in this journal Feb. 19, and the extensive use of contractors' equipment was advocated. Equipment, though, unaccompanied by brains and the right point of view will be of no value. The streets may be cluttered with steam shovels, the avenues choked here and there or at the unloading stations with motor trucks—and nothing be accomplished. During the storm in New York which tied up traffic for nearly two weeks one steam shovel was employed, but between trucks it waited idle for twenty or thirty minutes. The trucks got into traffic jams on the way to the unloading station. Brains and the right point of view would have assigned certain streets for the trucks to travel over and kept all other traffic off those streets. Speaking of New York conditions, however, the last storm plainly demonstrated that both brains and point of view are missing. The mayor tried to clear the streets by proclamation. His efforts may be well epitomized in one of the newspaper headlines, "Hylan Swings a Pick." Compared with the magnitude of the task that action was symbolic of the helplessness of the city's snow cleaners.

Completing the Tunnel Enterprise

VERY properly the report of the New York-New Jersey Tunnel Commission has excited a great deal of interest in the metropolis and in the adjoining communities of New Jersey. If the interest be taken as an index of intent, one can expect action on the tunnel project within a reasonable time. It is, therefore, worth while putting on record and emphasizing that the trans-Hudson traffic question includes more than the river crossing. Only part of the interchange of persons and goods has its western terminus on the river flat occupied by Hoboken and Jersey City, and the requirements of the case are not fully met unless convenient means are provided for linking up the Hudson crossing with highways leading to Newark and farther on to Trenton and Philadelphia. A rock ridge several hundred feet high bounds the river flat on the west. As now planned the tunnel makes no provision for passing this barrier except by climbing over it on a steep-grade road. From the viewpoint of state or national interests—and we believe, even from a strictly local viewpoint—the Hudson crossing will be incomplete until it is extended to a terminus on the western side of the Palisades barrier and carried across the Hackensack meadows to a junction with the national road system at Newark. Now that the river problems are disposed of, this second part of the enterprise will shortly call for consideration.

Curtailed Highway Construction, Shall It Be Voluntary or Enforced?

THE post-season ambition of 1919 to carry through in 1920 a drive to complete enormous mileages of paved highway has been moderated. Few states now speak of building a much greater mileage in 1920 than they built in 1919, except the states which this year undertake hard surface construction for virtually the first time. Curtailment of the program until very recently has come from the growing realization that enough contractors were not available and that means of transportation for materials were lacking to make extraordinarily large mileages possible. Now the influence of high bids is also being contributed. One can foresee, from whatever viewpoint he takes, only the forced limitation of highway construction to very moderate mileages compared with the mileages for whose construction money is available.

An important question, then, is squarely before public-roads officials. Shall they persist with an extensive program which is certain to be curtailed in haphazard manner as conditions may dictate, or shall they abandon the present program and come to one less ambitious but curtailed in a logical and systematic manner? Briefly, shall the curtailment be voluntary or enforced? Theoretically, the choice of alternatives appears plain. Practically it is difficult to choose.

Many promises of highways to be improved promptly stand to the debit of highway officials. The public which has appropriated money in astounding amounts on the strength of these promises regards them jealously. The reaction of this public to an announcement that it must wait five years or longer for what it expected to get in three years or less is reasonably to be feared. To announce that mileages promised are to be redistributed involves even greater possibilities of wrath to come. Obviously it will be bad for all to challenge a reaction which will turn the public against highway improvement. The temptation is to drift. Highway officials are now drifting. Is it a wise policy?

Has the time not come for the highway officials of the country generally to announce the desirability of reconstructing our highway program? Is it not the part of wisdom for them to go back to the people frankly with an explanation of the conditions and a modified program of mileages, distribution and period of construction? Straightforward presentation of these facts and of the economic advantages of a reconstructed program are likely to strengthen rather than weaken highway engineers and the cause of improved roads with the public.

There should be a revised program of highway construction. Fundamentally it should provide first that the rate at which improvements are placed under contract be limited to the capacity of the available construction agencies with the maintenance of reasonable competition; second, that the economics of road types, including maintenance requirements, be reviewed in the light of present costs and a reselection be made according to the conclusions arrived at.

These are radical proposals *but the conditions warrant radical action.*

Present Attitude of Contractors

THERE is plainly a declaration of independence in the new attitude of contractors in discussing specifications. The substance of this change is sensed more clearly than it can be defined but its spirit challenges old practices so sharply that they must look to their defenses. The privilege, long ago appropriated by the engineer, of determining, without consulting him, the obligations of the contractor in building engineering works, is being squarely attacked.

Indicative of the new attitude of contractors is the fact that protests against requirements considered to be unfair and pleas to the engineer to give these protests charitable consideration, are being replaced by evidence of unfairness and by argument that through unfairness the financial interests of the owner suffer equally with the profits of the contractor. The article on p. 457 of this issue is an excellent example of this constructive discussion. Candid statements of facts like those of R. G. Collins, Jr., in the *Engineering News-Record* of Jan. 15, 1920, p. 122, are another method of attack. In effect the owner is being awakened by evidence and by an appeal to reason to the truth that he pays a high price for every unfair requirement in or interpretation of specifications.

Conditions which are plain to all discourage the notion that the present attitude is likely to be temporary. Contractors are becoming more thoroughly organized and the strength of organization is being reflected in increased courage in calling for reforms in contracting practices. Large contracting organizations, directed by business and construction experts and employing large amounts of capital, are becoming increasingly dominant in the construction industry and with their growth is growing the determination to enforce the consideration of just reforms. Even in smaller organizations the same determination is begotten of the increasing extent to which engineers are taking control of their technical management. Finally the determination to demand reforms is given power by conditions which are unique in engineering construction.

There is more construction pending than can be carried out by the contractors now in business. In highway work the condition is already acute. Large construction programs are certain to develop in the next two or three years on the railroads, in water power, buildings and public works. The shortage already apparent will be intensified.

A condition, therefore, is at hand which gives contractors power to choose the work which they will undertake. Naturally they will exercise this privilege by refusing contracts which are least to their liking.

Co-operation and not resistance by the owner is the wise attitude, and this the engineer should encourage. On the other hand, the contractors themselves face a danger. Apparently they now have the whip hand and can dictate the terms under which they will work. Will they be drunk with power and become unfair? If they do they will rue the day. Calling for fairness they must be fair. Only so will justice be done.

Then, too, they must recognize that much of the complaint about unfairness is due to interpretation—a matter not possible of certain correction in all cases. In other words, it is absolutely impossibble to define everything by specification—for engineering construction partakes of the nature of an art, not merely of a science. There is no use having contractors deceive themselves into believing that judgment of the man on the job can be eliminated. It can't be done.

Opportunity and Responsibility of Organized Contracting

THE guarantee of $200,000 for its expenses for 1920 and 1921, which the Associated General Contractors of America has secured from its members, as explained in our last issue, carries a greater significance than that the association has a liberal sum for expenditure in organization work. It goes far toward confounding the doubters who a year ago wagged wise heads in assertion that the attempt of contractors to organize nationally had been made before and had failed because contracting was a selfish business and contractors were a jealous class of men who never had learned to co-operate for broader purposes than the monetary object of the moment.

Organized on the broadest plans of mutual co-operation the Associated General Contractors, after a year, finds its members not only voting a schedule of yearly dues which few organizations could hope to impose on their members, but it finds these same members ready to go into their pockets for an additional financial guarantee amounting to an extra tax of $100,000 a year for two years. Truly a little elation is justified the contractors under the circumstances.

Large responsibilities come to the association with large means, and these, apparently, it is entirely willing to accept. The improvement of industrial relations which it plans is a large task. So will be the development of a fair form of contract, the molding of legislation and the correction of insurance evils, to all of which the association has put its hand.

All these are external objectives. It is not enough, however, to gaze only outward. Introspection is also necessary. And looking inward contractors may see required reforms quite as important as those which appear when looking outward. To three of these reforms the association has already decided to address itself: An efficiency classification of contractors; the formulation of a code of ethical practice, and the improvement of the efficiency of contracting work. If the contractors will seriously address themselves to these tasks, they will approach their relationships with engineers and owners in a strong position. Having cleaned their own house they will have a right to demand fair treatment from others—and there is evidence aplenty that with more work than contractors to do it, the constructors are going to demand a mitigation of practices which they believe are unfair.

To these tasks then, the Associated General Contractors can afford to bring their best talent and all the financial support that is needful. Such action, sincere, vigorous, and ultimately successful, is the only means by which there can be secured a wide adoption of a form of contract that takes the gamble out of contracting.

Anchor Pins of Cornwall Cantilever Bridge Bored Out and Renewed

Increased Loading and Twenty Years' Wear Make Renewal Necessary—Pins Freed of Load by Special Connections and Jacking—Hanger Pins of Suspended Span Reinforced by Sleeve Castings

By H. T. Welty
Engineer of Structures, New York Central R.R. Co., New York City

REPAIR work of a unique and precise nature has recently been successfully completed on the St. Lawrence River bridge of the Ottawa and New York Ry. leased by the New York Central R.R. Co.) The work involved the boring out of worn and weak pins and replacing them with new pins of a larger diameter. The work was accomplished without the use of supporting falsework under the bridge and with practically no interruption to traffic.

The bridge was built in 1898. It is of the cantilever type, single track, 841 ft. long between anchorage pins, as shown in Fig. 1 and in diagram in Fig. 4. The channel span is 420 ft.; each anchorage span is 210 ft. 6 in. in length. The design was based on Cooper's E35 loading, but since the bridge was built the traffic over it has increased considerably in both weight and volume. At the present time locomotives producing stresses practically equivalent to Cooper's E42 and trains made up of loaded coal cars weighing 160,000 lb. to 210,000 lb. are permitted to operate.

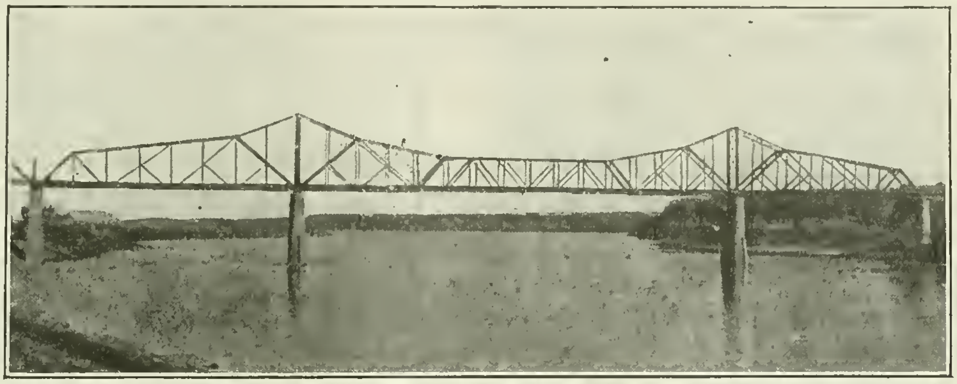


FIG. 1. ST. LAWRENCE RIVER BRIDGE, REPAIRED BY ANCHOR-PIN RENEWAL

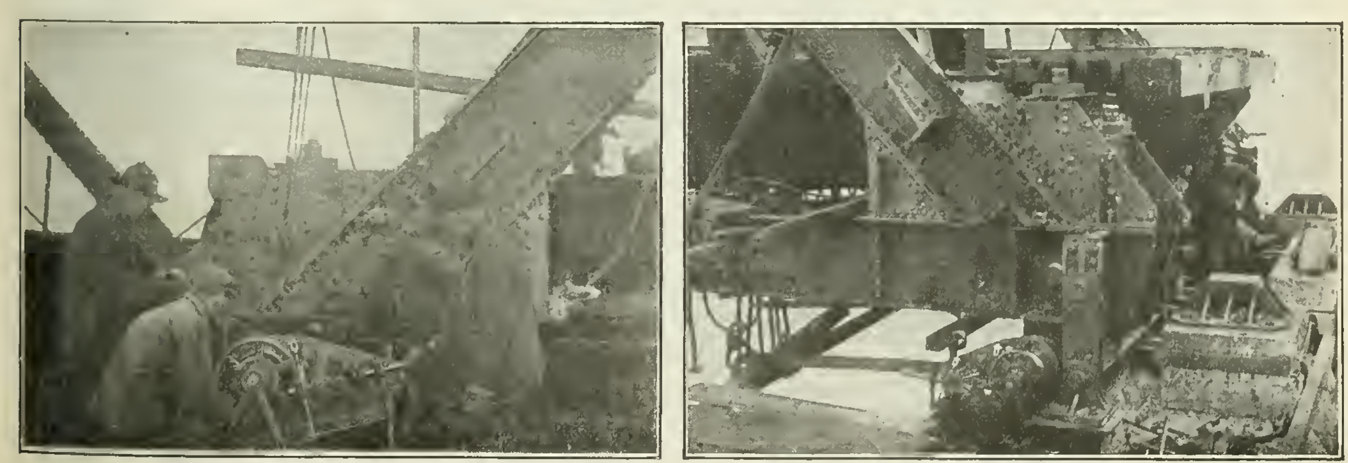
Two factors entered into the necessity for the repair work: (1) wear at the anchorage pins caused by reversal of stress, and (2) high stresses in the pins due to this wear and to the increase in train loads.

The anchorage at each truss end consists of two channels (see Fig. 4) riveted at the top to the truss shoe and with a pin attachment at the bottom bearing against two transverse girders embedded in the pier masonry. Links to permit longitudinal motion connect the end pins of the trusses with pins through the shoes and anchorage channels.

The work involved four main problems: (1) Design of an auxiliary supporting system strong and rigid enough to retain the bridge members in position under traffic so as to permit a boring tool to cut through these members with absolute accuracy; (2) provision in this supporting system of means for adjusting the bridge members meeting at each **pin** sufficiently to free the pin from load; (3) so designing the supporting system that while no movement of one bridge member relative to another would take place, the anchor span as a whole could move freely in a horizontal direction; (4) the design of a machine which would bore out the old pins, and would at the same time produce holes for the new pins through all members connected, in perfect alignment.

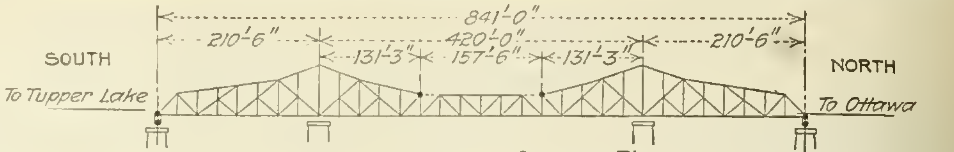
The supporting system, shown in Fig. 5, may be briefly described as follows:

Jacking brackets were bolted to the top flanges of the bottom chords and the webs of the end posts, against which 25-ton jacks were operated to free the upper pin from pressure of the end post. These may be seen in place in some of the views. Brackets connecting the end post and bottom chord, and serving to

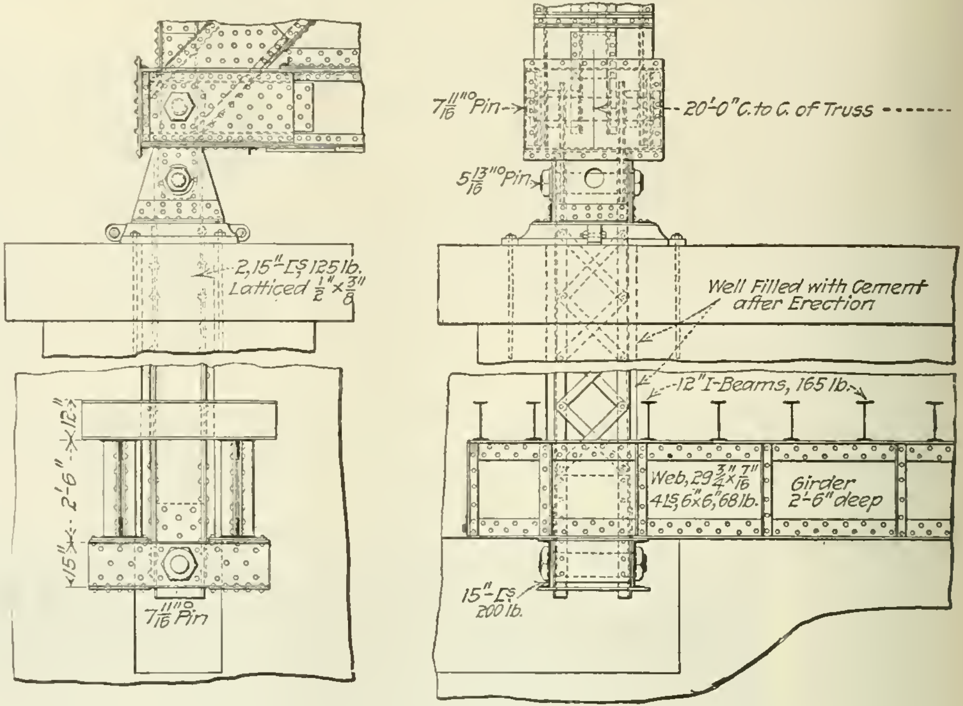


FIGS. 2 AND 3. BORING MACHINE AT WORK ON UPPER AND LOWER END PINS

carry the end-post stress to the upper pin through the bottom chord, were then securely bolted in place. The end brackets of this set were attached to a short cross-girder previously riveted to the end of the bottom chord. Castings bolted to the ends of the cross-girder engaged link bars capable of taking the positive or downward reaction. The link bars were supported through a shoe by a steel grillage anchored to the pier. The bars were designed with pin ends so as to provide for longitudinal movement of the anchor span. Bars were used instead of a stiff riveted member because of the limited space which was available.



Location Diagram of Worn Pins



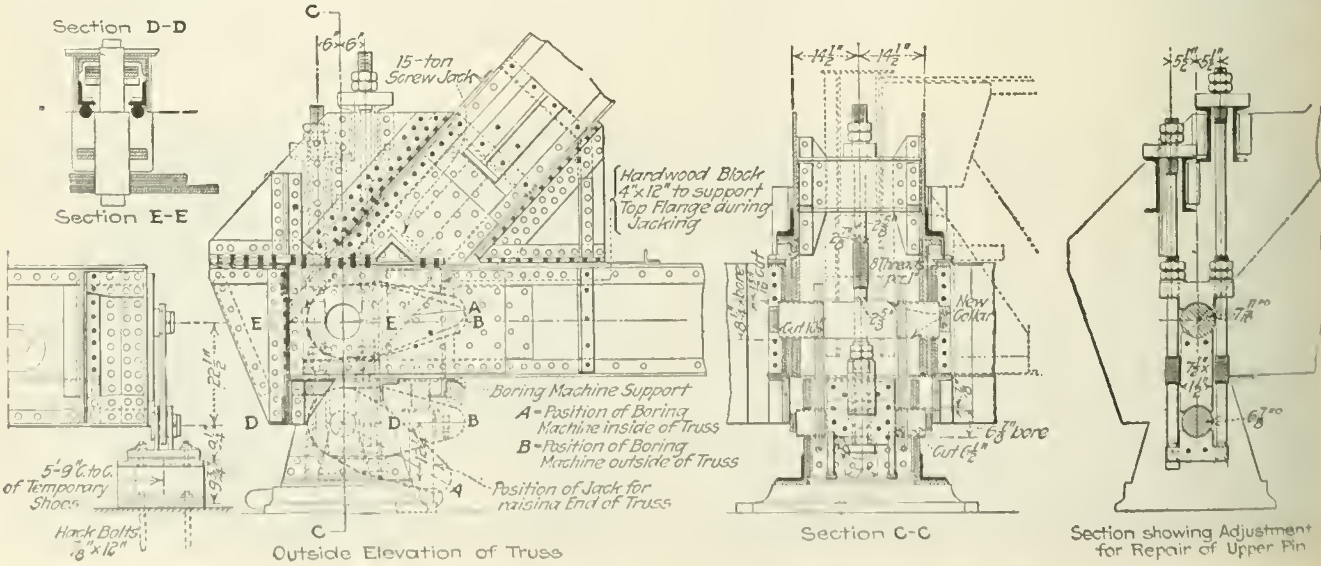
Detail of Anchorage

FIG. 4. PIN LOCATION SKETCH AND ANCHORAGE DETAILS

The bottom chord was next jacked sufficiently to relieve the upper pin of all positive load, and shims and wedges were driven under the supports of the gross-girder. The lower pin was, of course, relieved from positive load by the same operation. No traffic was permitted over the bridge during the jacking, but as soon as the temporary parts were firmly bolted and wedged in position, train operation was resumed.

Threaded rods bearing at the top on channel beams riveted between the temporary brackets, and at the bottom on angles riveted to the truss shoe, were provided to take the negative reaction or uplift. These rods also served to clamp saddle castings to the old pins for the purpose of holding them accurately centered during the boring operations (see Fig. 4). In order that the temporary support for positive reaction would not act to take uplift, the upper pin hole in the temporary link bars at the ends of the cross-girder was slightly elongated in the vertical direction. After the pins had been freed from load, trains were permitted to operate for a day or two in order that any yielding of the temporary parts might be corrected. At one or two points some further slight adjustment was necessary, but all pins were finally freed from load, and were maintained in this condition without serious difficulty. The maximum calculated positive reaction at each point is 512,000 lb. and the negative reaction is 270,000 lb.

The boring machine (Fig. 7), which was built at the company's West Albany shop, consisted of a spindle



Outside Elevation of Truss

Section C-C

Section showing Adjustment for Repair of Upper Pin

FIG. 5 TEMPORARY END CONNECTION TO FREE PINS OF LOAD

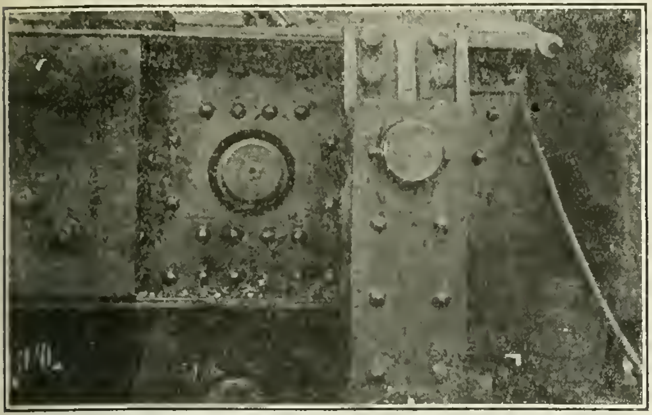


FIG. 6. UPPER PINHOLE BORED OUT AROUND OLD PIN

threaded at the end to screw on the pin to be bored out, a toolhead fitting over the spindle and equipped with cutting tools, and a train of gears operating the toolhead. By screwing the spindle on the pin, the cut was accurately centered. Both automatic and hand feed were provided. An electric motor was first tried as the motive power but was found to be unsatisfactory. A "Thor" air motor, Type N, capable of exerting about 2½ hp., was finally used and proved to be very satisfactory indeed. It was very light and easily handled and could be attached directly to the boring machine, which was impracticable with the electric motor. Thorough tests of the boring-machine equipment were made at the shop before the equipment was sent to the field.

Before the boring machine could be set up on the inside ends of the pins, it was necessary to remove the end floor beams, resting the stringers in the end panels on temporary supports.

The lower pin, $5\frac{13}{16}$ in. in diameter, was bored first. The pin having been freed from load and securely clamped, the anchorage links were wedged to avoid any movement laterally, and after the last train had passed at night, boring was started. The new hole was 6⅞ in. in diameter, and the distance bored at each end to get through the shoe and link was 6½ in. The average time required to bore each end of a lower pin was about three hours. About two hours' time was required to shift the machine from one end of the pin to the other.

After both ends had been bored the old pin was removed to permit calipering the new hole. It was then replaced and wedged securely in the new hole as a matter of precaution, and the new pin, which was provided somewhat greater in diameter than the finished hole, was taken immediately to a local machine shop and turned to the exact diameter required. This consumed about five hours. The new pin was then immediately inserted.

Practically the same procedure was followed in boring the upper pin hole, which was $7\frac{11}{16}$ in. in diameter and was bored to 8¼ in. This point, however, was more difficult to handle due to the fact that the pin passed through six separate members, necessitating boring a distance of 10 in. at each end, and because it was not so readily freed from load. The boring of the upper pins was always done on Saturday nights, as few trains were run on Sundays, thus giving a longer time in which to complete the work without serious traffic interruption.

Two pins were completed each week after boring was started, with the exception of one week taken to transfer the equipment from one end of the bridge to the other end. The bores were extremely accurate and the pins fit the holes in all parts to 0.012 in. In several cases the new pins were turned slightly larger than was intended and a driving fit was obtained.

The introduction of larger pins required the reduction of the net section of the anchorage links. Fortunately, however, there was some excess section in these links, and no reinforcement of them was necessary.

At the time the work was started, the maximum vertical movement due to reversal of reactions under passing trains was about ⅞ in., which was particularly objectionable at the north end, where the adjoining span over the Cornwall Canal is a swing span, equipped with sliding joint bars. After the completion of the work, the vertical movement was not noticeable and is probably less than $\frac{1}{16}$ in.

Guarding Against Interruptions

During the progress of the boring, some delay was occasioned by the formation of ice in the motor. This trouble was overcome by heating the air in the supply pipe and by heating the motor air exhausts with a kerosene torch. Steel shavings jamming between the toolhead and the bore proved another source of trouble. This was not in any way serious, however, except at one point, where it was necessary to replace the machine with another. Fortunately duplicate parts of all mechanical parts subject to breakage or other damage had been provided. The duplicate machines had been built so accurately that the second toolhead entered the hole with an absolutely perfect fit. While every precaution was taken to keep the shavings cleaned out, the space available in which to work was so limited that a thorough job in this respect was impossible.

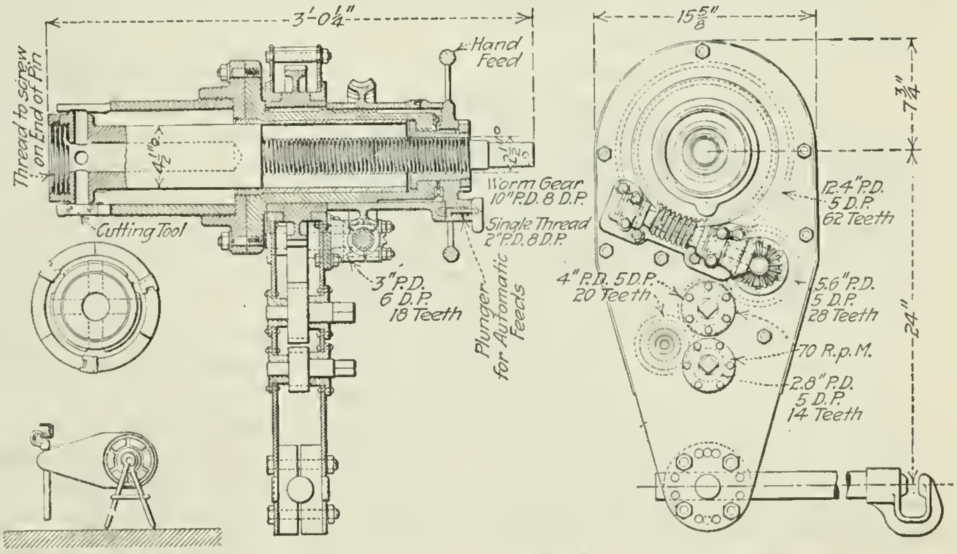

3'-0¼"
Thread to screw on End of Pin
4½"
Hand Feed
Cutting Tool
Worm Gear 10" P.D. 8 D.P.
Single Thread 2" P.D. 8 D.P.
3" P.D. 6 D.P. 18 Teeth
Plunger for Automatic Feeds
15⅝"
7¾"
24"
12.4" P.D. 5 D.P. 62 Teeth
4" P.D. 5 D.P. 20 Teeth
5.6" P.D. 5 D.P. 28 Teeth
70 R.p.M.
2.8" P.D. 5 D.P. 14 Teeth

FIG. 7. PIN-BORING MACHINE (SHOWN WITHOUT DRIVING MOTOR)

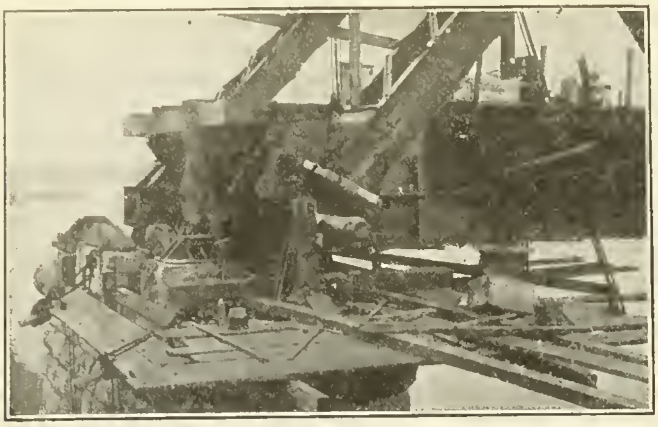


FIG. 8. REMOVING OLD AND DRIVING NEW PIN

The work on each pin was carried on continuously from the time boring operations started until the new pin was driven in place. This entailed severe physical effort on the part of the field engineers as well as the bridgemen, requiring continuous duty of thirty hours or more at times, and frequently in heavy rain storms.

Pin Wear at Ends of Suspended Span

Wear had occurred also in the pins at the ends of the cantilever arms, which support the suspended span, due to cutting from the top lateral struts, as they moved under expansion and contraction. These struts, which consist of two channels, were slotted through their webs, resting directly on the pins. It was impracticable to renew these pins, so cast-steel jackets extending the full length between the top-chord webs were clamped around each pin, and the slots in the lateral struts were enlarged to fit the castings. The castings serve the purpose of strengthening the pins and at the same time will take any further wear which may occur.

The work was planned in the writer's office under the direction of the Engineering Department, New York Central R.R., George W. Kittredge, chief engineer, and J. W. Pfau, engineer of construction. L. R. Manville, assistant engineer in the office of the engineer of structures, had charge of the detailed plans and supervised the operations in the field. W. S. McKinney, inspector, was in immediate charge of the field work, which was carried out by company forces.

Seattle To Build Skagit Railroad

The City of Seattle has definitely decided to build a railroad to the site of the Skagit Power Development. The line will be about 26 mi. long and will connect with the Great Northern R.R. at Rockport. Contract has been awarded for the first 8,000 ft. of roadbed. This section is in exceptionally heavy construction as almost all of it is solid rock. It was thought best to let the contract for this first so that the remainder of the work need not be held up when the final contract is let.

Packing in supplies and machinery at the present time costs so much, 3½ to 4c. per lb., that no large amount of construction is under way or will be undertaken until the railroad is completed. Despite this, however, it has been thought advisable to take in a small sawmill so that a supply of lumber could be stored for use at the site.

Main Features of Columbia Basin Irrigation Project, Washington

A CONCRETE canal carrying 20,000 sec.-ft. of water at a velocity of 12 ft. per sec., concrete-lined twin tunnels each 35 ft. in diameter, quadruple siphons 23 ft. in diameter and impounding and storage dams involving 6,500,000 cu.yd. of material, are main features of the Columbia Basin irrigation project thus far worked out in a preliminary way by the Columbia Basin Commission under the $100,000 appropriation item for surveys made by the Washington Legislature of 1919, according to an address by Prof. O. L. Waller, head of the Department of Civil Engineering of the State College of Washington at Pullman, and secretary of the Commission, delivered in January before the Washington Irrigation Institute. An outline of the project, with the names of the members and engineers of the Commission, appeared in *Engineering News-Record*, Oct. 30-Nov. 6, 1919, p. 800. Of some 3,000,000 acres of land in the basin, it is estimated that 1,700,000 are available for irrigation by gravity.

The project contemplates utilizing the storage of Flathead Lake in western Montana and the natural watercourse from that lake for some 200 mi. to Pend Oreille Lake in northern Idaho. The main-line canal, including tunnels and siphons and the use of natural lakes as watercourses, would have a total of 130 mi. in length and would terminate at Hillcrest in Washington. From this point two canals would extend, one running north of Ralston and Ruff toward Stratford through Adrian and other points, including Quincy; the other running south to Rattlesnake and on to territory south of the Saddle Mountains. The high velocity of 12 ft. per second has been adopted to lessen the amount of excavation and the various difficulties of construction that would be encountered if the ordinary velocities for earth canals were used, taking into account also the fact that at points on the line of the canal there is no good natural ground for supporting canals. Another and important reason for the high velocity is that over long stretches there are no streams large enough to carry the waters of the canal in case it were necessary to empty it. Consequently, storage lakes or waste reservoirs must be provided for the purpose. One of these will be 10.3 mi. long, while two combined will be 16.1 mi. long, besides which Professor Waller mentions three others 2.1, 4.3 and 5.5 mi. in length.

Of the 130 mi. of main-line canal, 53.7 will actually be canal; 40.3 will be lakes(all artificial, except 16.1 mi. supplied by Bonnie and Rock Lakes), and, as described by Professor Waller, there will be 2.1 mi. of "multiple tube steel siphons, each siphon containing four pipes of 23 ft. diameter." It is proposed to construct the main canal full size at once, but to build only one of the two twin tunnels at the outset.

Before the details of the project can be worked out, and for that matter before it becomes certain that it is practicable, state legislation must be secured in Montana and Idaho and an understanding must be reached with Canada.

The U. S. Reclamation Service has been co-operating in the studies made by the Columbia Basin Commission, having sent three or four representatives to go over parts of the project, including D. C. Henny, consulting engineer, Portland, Ore., and James Munn, of Spokane.

Contract Clauses Which Disregard the Square Deal

Service Without Reward Is Demanded If Plans Are Changed or Possession of Plans or Site Is Delayed—Modified Stipulations Suggested

By F. J. Herlihy
Winston Brothers Co., Minneapolis, Minn.

MAJOR requirements which are common to specifications for engineering construction and which are eminently unfair to contractors are: (1) Reservation of the privilege of changing plans without invalidating the prices bid or relieving the contractor from obligation to complete the work; (2) stipulation that instructions by the engineer must be obeyed, that his decision is final and that the progress and sequence of construction shall be as he directs; (3) provision that inconvenience or delay due to any cause shall not entitle the contractor to damages or extra compensation.

Exactly how these stipulations operate unfairly and the size of the penalty which they sometimes impose are facts which are not well understood. To clarify this understanding it is undertaken here (1) to explain the fundamentals of estimating sufficiently to show how the exercise of the privileges enumerated may invalidate an estimate; (2) to illustrate by actual example how changes in plans have changed the cost of construction; (3) to indicate in what manner these stipulations may be modified so as to eliminate their vicious character without injury to any of the interests concerned.

Fundamentals of Cost Estimates

As a hypothetical example an ordinary unit-price contract is assumed. The payment quantities consist of only the major items of work, such as earth and rock excavation and concrete masonry. A simple unit price is asked per cubic yard for each of these items, and this price includes all expenses incurred either directly or indirectly in the execution of the work.

To determine the method of attack and the size and kind of plant and organization required it is necessary to know: The volumes of the different classes of work; the balance between the expensive and inexpensive items; the availability of materials; the climatic conditions; the time allowed to perform the work; the date of effective possession of the site; the promptness with which plans and instructions may be expected; the wages and the supply of labor; the possibilities of contracting for materials ahead of construction; the volume of non-revenue-producing work which must be pro-rated against the revenue-producing items, and the sequence of construction.

Brief consideration discloses why this information is necessary and should be, as far as is possible, accurate and definitive. Construction to be performed economically must be begun at the proper point and proceed connectedly to a fixed objective. False moves are expensive. All operations must be concurrent and in logical sequence. Plant and organization must always be the minimum consistent with economical production and with the completion of the construction on time. They have to be planned so that they are available as needed for the different classes of work, and so balanced that the individual classes are prosecuted in such order that as much of the whole work as is practicable may be executed at the same time, and that all equipment and men are kept busy from the time they are placed at work until they are finally laid off.

Analysis of Expenses.—Construction costs are general or indirect and specific or direct. Indirect expenses, which must be pro-rated against the revenue-producing items, subdivide into overhead, installation and dismantling, and miscellaneous work. Direct expenses, which can be charged against the revenue-producing items, include plant rental, permanent materials and operating expenses.

It is important to have clearly in mind the nature of indirect expenses. Overhead charges are interest on the investment, liability insurance, superintendence, hire of clerks and watchmen, field and general office expenses, railway fares and incidentals. Installation and dismantling charges are all expenses incidental to installing plant and construction facilities in working condition and the dismantling and storing or shipping of this equipment when the work is completed. Miscellaneous charges include drainage, maintenance of public utilities and other expenses not chargeable to definite items.

Observe that all of the charges which made up indirect expenses are either fixed quantities or their amounts depend upon time. Any changes in the payment quantities of the various classes of work on which these charges are based, will affect their unit cost to the work and consequently produce conditions different from those anticipated at the outset and make the value of the contract work different from that intended by the original agreement.

Plant rental and operating expenses are particularly affected by change of plans, delays, etc. Whether rental charges are made directly against individual classes of work or are pro-rated, it is obvious that they will be a fixed quantity per day and any variation in the daily output will affect the unit plant rental charge to the work. If the work is delayed for any reason and the plant stands idle the daily costs will accrue and no extension of time nor any other concession, except to pay the contractor at the rental value for the equipment, will compensate him for the loss.

Operating expenses include all charges for labor and material, and supplies (explosives, fuel, etc.) and the freight charges thereon, incurred in excavating rock and earth and in constructing concrete masonry. The bulk of this expense, except explosives, will be a fixed quantity per unit of time. Therefore, any change in the periodical output of work will affect the unit charges against the work.

As average unit prices are asked for earth and rock excavation and concrete masonry, the price bid is based on the average value between the expensive and inexpensive elements of the different classes of work. Should the balance between this profitable and unprofitable work be disturbed, it is bound to affect this average value. In case the work is delayed the cost will not only be increased by the expense of holding the necessary nucleus of an organization under pay, but it will be still further increased by the reduced efficiency of a new organization, which will require some time to train. Should the sequence of the work be changed and the work prosecuted piecemeal instead of in economical sequence, both the plant rental and the operating charges will be affected, as false moves of plant and organization will then be necessary, and they are expensive.

Permanent material charges should not vary unless the work is so delayed that material dealers withdraw their protected prices, or unless the sequence of the work is such as to make the requirements spasmodic and beyond storage facilities or the output of the dealers who have contracted to fill the requirements, and force the contractor into the open market to procure the extra material required to keep going.

EXAMPLE OF ALTERED COSTS

Changes which can be brought about in the cost of construction by changing plans are clearly indicated by an actual occurrence in the writer's experience. The work was the widening of a canal. It called for the removal of a strip on each side by steam shovels and the excavation of a trench by hand in the remaining ledge for the foundation of a concrete wall. Average unit prices were called for, a single price per cubic yard being bid for rock work. The engineer, after altering the characteristics of the work to the extent indicated in Table I, ruled that the contractor must perform the work at the prices bid originally. The work was performed under protest and a claim for extra pay was submitted to arbitration. The decision was against the contractor.

By reference to Table I it will be seen that the engineer changed the character of the work by decreasing the inexpensive quantities and increasing the expensive quantities.

In the stipulation defining changes in plans the wording should be so amended that, while it still gives the proprietor, or his engineer, the right to make any changes he sees fit, if by the changes the characteristics of the work or the conditions governing its execution are changed to the extent of changing the value of the work, provision is made to change the contract price accordingly.

Provision should also be made in this stipulation to protect both parties when changes are made in the unit quantities. This can be done by bidding a lump sum for the work, based on the unit quantities scheduled in the call for bids, which quantities should be guaranteed by the proprietor and stating also a unit price for each item, this unit price to be used only in adding to or deducting from the lump sum bid, when changes in the quantities are made. In making up his bid under this arrangement, the contractor can make his lump sum to cover all costs and profits, including overhead and indirect charges based on the guaranteed quantities scheduled, and he will include in his unit prices only such charges and profits as are directly affected by the direct expenses. In this way the contractor will be sure of his general expenses and profits on the work actually done, no matter how much the quantities are reduced, and the proprietor will benefit, in case quantities are increased, by paying only the cost and profit for the extra work done. It is, of course, understood that this arrangement would only apply insofar as increases in quantities are concerned when the increase would not entail the bringing on of extra equipment to do the extra work, but that the increased work can be done with the equipment already on hand, by granting an extension of time or working extra time, such as double shift, or otherwise.

In contracts where unit prices only are stated, either one party or the other must suffer when quantities are changed. When the quantities on which the bids are based are reduced, the contractor will suffer to the extent of the overhead and other indirect expenses which he has charged against the work that has been eliminated, and if the payment quantities are increased, the proprietor will lose by having to pay for the increase at the same unit price as for the original contemplated quantities, against which latter the entire overhead and other indirect expenses are charged. As to the proprietor guaranteeing quantities, this is as it should be. This burden should not be placed upon the contractor, who has neither the time nor anything like the facilities which the engineer has for ascertaining this element of the contract.

The stipulation making the signed order of the engineer acknowledging claims for extra work a condition precedent to the contractor's making claim or receiving compensation for extra work should be stricken from all contracts because it is manifestly unjust.

This stipulation clothes the engineer with autocratic authority, which he does not need to maintain the rights of either party, and which can only be useful to an official who wishes to invade the rights of the other party and impose upon him conditions that were not intended by the original agreement. If the engineer assumes a position on any matter that is consistent with the in-

TABLE I. COMPARISON BETWEEN COST ESTIMATED ON ORIGINAL QUANTITIES AND ACTUAL COSTS INCURRED BY CHANGED QUANTITIES

A—According to contract and specifications.		
Machine work, 430,380 cu.yd at $0.611		$262,962 18
Hand work, 5,800 cu.yd. at $3 611		20,943 80
Total		$283,905 98
Cost per cu.yd., $283,905.98 : 436,180		.651
B—Cost of work actually done under altered conditions on above basis:		
Ordinary machine work, 268,168 cu.yd at $0.611		$163 850 65
Expensive deepening, 13,200 cu.yd. at $1 469	$19,390 80	
Hand work—ledge excavation, 34,500 cu.yd at $3 611	124,579 50	
Hand work—foundation excavation, 5,832 cu.yd at $3.611	21,059 35	
Hand work—miscellaneous excavation, 709 cu.yd at $3 611	2,560 20	
		167,589 85
Total		$331,440 50
Cost per cu.yd $331,440 50 ÷ 322,409		1 028
Cost per cu.yd. as per contract		651
Balance or loss per cu.yd		$0 377
Total loss to contractor = 322,409 × $0 377		$121,548.19

tent of the contract, his interpretation will prevail without the aid of this stipulation, but if his position is not consistent with the original agreement, he should be overruled.

The engineer should have the power to order performed any work that is necessary and the proprietor should be protected against imposition by having these orders written, but if that work is extra work, not contemplated under the true interpretation of the contract, the proprietor should pay for it. The engineer should also be master of the situation insofar as the interest of the work is concerned, but all differences of opinion as to the interpretation of the contract, regarding claims which either party may have which have not been adjusted at the time, should be submitted to arbitration at the close of the enterprise. There should be a stipulation in every contract whereby either party will have the right to have its differences arbitrated at the conclusion of the contract, and neither party to the contract should be its final arbiter.

A stipulation which gives the engineer the power to direct the sequence of the work should be eliminated from all contracts, except those in which the required sequence is clearly disclosed by the information given to the bidder at the outset.

Any change in the sequence of the work is bound to affect its value adversely to the contractor, as he will have chosen the most economical sequence in organizing the work. If the engineer has some particular sequence in mind, there is no reason why this information should not be disclosed beforehand, unless it is that he is uncertain of his ability to deliver the site, plans, etc., on time, in which case the risk should be with the one who controls the situation and not with the contractor.

The stipulation headed "inconvenience or delay" should be amended to place the whole responsibility for delays on the party who causes them.

The contractor should not be made to suffer the monetary loss incurred in holding plant and organization idle through the fault of the proprietor. He does more than his fair share when he assumes the monetary loss due to delays caused by climatic conditions, actions of the elements, labor and material troubles, and his own errors of judgment. As before stated, neither an extension of time nor any concession, except monetary compensation, will compensate the contractor for delays.

Public Water Supplies the Rule in Massachusetts

Cities and towns in Massachusetts provided with public water supplies numbered 214 at the close of the year 1919 and had a total population of 3,528,139 in 1915. The 140 towns without public water supplies had a combined population of only 165,171 at the same date. Under the Massachusetts classification of the minor several divisions of the State, cities and towns together comprise the entire area of the State. Of the 140 towns in the State without public water supplies, there were at the close of 1919 only 21 which in the year 1915 had a population in excess of 2,000. The largest of these was Tewksbury, with a population of 5,265. The 21 towns with populations in excess of 2,000 which still lack public water supplies had a combined population in 1915 of 59,162. The foregoing figures are taken from the annual report on the "Care of Inland Waters" made to the Massachusetts Legislature by the State Department of Health.

Designing Concrete Columns With Cast-Iron Core

Diagram May Be Used for Hooped Columns With Cast-Iron Cores or With Only Steel Vertical Reinforcement

By W. H. Roney, Jr.
Structural Engineer, St. Charles, Ill.

IN RECONSTRUCTING old buildings it frequently becomes necessary to strengthen cast-iron columns which are so located as to make their removal difficult. The most satisfactory way to do this is to incase them in concrete, adding such reinforcement in the form of steel hooping as will bring them up to the required strength. The diagram given herewith has been devised for the purpose of such design, but it can also be used for the design of reinforced-concrete hooped columns in which there is no cast-iron core but which have vertical steel.

The diagram is based on the Chicago building code, from which may be deduced the following equations, pursuing the same general line of computation followed by J. Norman Jensen in the article "Concrete Column Economics," *Engineering News*, June 6, 1912, p. 1070: Let

f = Average allowable unit compressive stress on concrete.
f_c = Allowable unit stress on concrete.
f'_s = Allowable unit compressive stress on steel.
f''_s = Allowable unit compressive stress on cast iron.
E_s = Modulus of elasticity of steel.
E_{ci} = Modulus of elasticity of cast iron.
E_c = Modulus of elasticity of concrete.

$$n = \frac{E_s}{E_c} \qquad n' = \frac{E_{ci}}{E_c}$$

P = Load.
A = Effective cross-sectional area out to out of hooping.
A_c = Area of concrete.
A_s = Area of vertical steel.
A'_s = Area of cast iron used as vertical reinforcement.
A_h = Area of hooping steel.

$$p = A_s \div A \qquad p' = A_h \div A \qquad p'' = A'_s \div A.$$

For reinforced-concrete hooped columns with both steel and cast-iron vertical reinforcement.

$$f = f_c[1 + 2.5\,np'][(1 - p') + (n - 1)p + (n' - 1)p''] \ldots\ldots (1)$$

For reinforced-concrete hooped columns with cast-iron vertical reinforcement only.

$$f = f_c[1 + 2.5\,np'][(1 - p') + (n' - 1)p''] \ldots (2)$$

For reinforced-concrete hooped columns with steel vertical reinforcement only. (The original equation deduced by J. Norman Jensen in the foregoing named article.)

$$f = f_c[1 + 2.5\,np'][(1 - p') + (n - 1)p] \ldots (3)$$

E_{ci} = 12,000,000 to 14,000,000 (Marks, "Mechanical Engineers' Hand Book").

E_s = 30,000,000 and E_c = 2,000,000 for 1:2:4 concrete,

therefore

n' = 6 to 7 and n = 15 for 1:2:4 concrete.

Eq. (2) may meet with the objection that it does not meet with the requirements of the code, providing for reinforcement on the outer perimeter of the column reinforcement, and further that cast iron has not the tensile resisting qualities of steel, but on the other hand may throw some light on the tests of reinforced hooped columns using only cast iron for vertical reinforcement, the tests of which have seemed to indicate that these columns have a strength less than that of the concrete considered as a column alone, plus the strength of the cast iron as a column. Since Eq. (2) is based upon the theory that the stresses in the concrete and vertical cast-iron reinforcement are proportionate to their respective moduli of elasticity, this formula is likely to give consistent results for this class of columns.

The chart accompanying this article will give values for the average stress in pounds per square inch (f) for either Eq. (1), (2) or (3), and may be used either to design by or to check with. A few illustrative examples will be given as follows:

Example 1—Find the average allowable stress f for a concrete column in which $p'' = 3$ per cent, $p = 4$ per cent and $p' = 1$ per cent.

Enter diagram at right-hand side on vertical line 3 per cent for p'', follow down to its intersection with diagonal line 4 per cent for p, next follow horizontal line, passing through this intersection, toward left-hand side of diagram to intersection with vertical line 1 per cent for p'; the answer is found on diagonal line passing through this intersection, to be $f = 1{,}170$ lb. per square inch.

Example 2—Find the average allowable stress f for concrete column in which $p'' = 5$ per cent, $p = 0$, $p' = \frac{3}{4}$ per cent.

In similar manner follow vertical line for $p'' = 5$ per cent down to diagonal line for $p = 0$, thence to left on horizontal line to vertical line for $p' = \frac{3}{4}$ per cent; read answer $f = 820$ lb. per square inch on diagonal line.

Example 3—Find average allowable unit stress f for concrete column in which $p'' = 0$, $p = 3$ per cent and $p' = 1\frac{1}{4}$ per cent.

Enter diagram at right-hand side on vertical line $p'' = 0$, follow down to intersection with diagonal line for $p = 3$ per cent, thence to right on horizontal line to intersection with vertical line for $p' = 1\frac{1}{4}$ per cent, and find answer $f = 1{,}020$ lb. per square inch on diagonal line.

Example 4—Find vertical steel percentage p to be used in a concrete column in which $f = 1{,}100$ lb. per square inch, $p' = 1$ per cent and $p'' = 5$ per cent.

Enter diagonal line on left-hand side for $f = 1{,}100$ lb. per square inch, find intersection with vertical line for $p' = 1$ per cent, thence follow horizontal line toward right to intersection with vertical line for $p'' = 5$ per cent, and read answer on intersecting diagonal line for $p = 2.4$ per cent.

Example 5—Find percentage of spiral hooping p' required for a concrete column in which $f = 1{,}300$ lb.

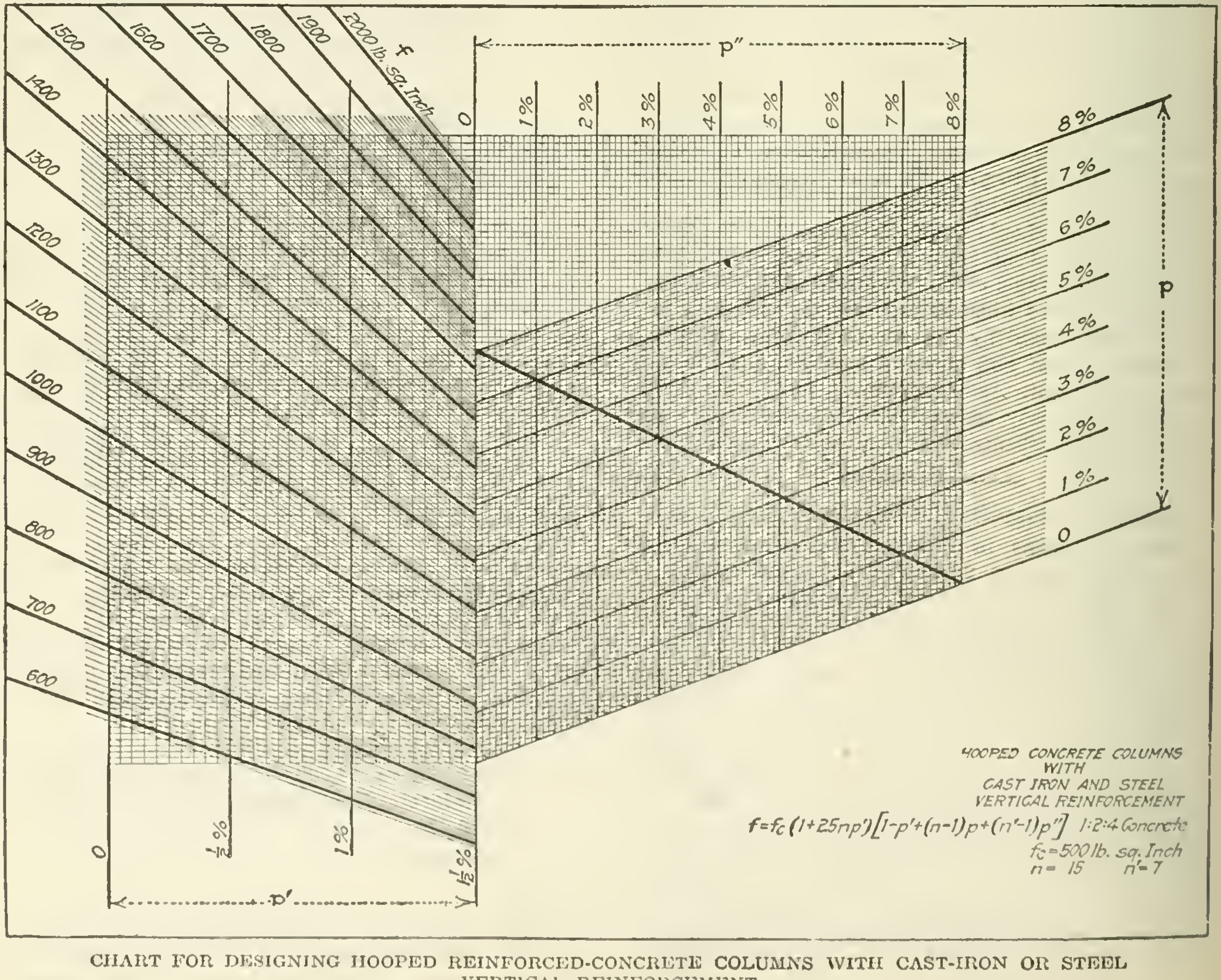


CHART FOR DESIGNING HOOPED REINFORCED-CONCRETE COLUMNS WITH CAST-IRON OR STEEL VERTICAL REINFORCEMENT per square inch, $p = 4\frac{1}{2}$ per cent and $p'' = 3$ per cent.

Enter diagram on right-hand side for $p'' = 3$ per cent; find intersection with diagonal line $p = 4\frac{1}{2}$ per cent; follow horizontal intersecting line toward right to intersection with diagonal line for $f = 1{,}300$ lb. per square inch. Answer is found on vertical line passing through intersection for $p' = 1.25$ per cent.

The above examples are all for 1:2:4 concrete and $n = 15$, $n' = 7$. They are enough to demonstrate the workings of the chart and to show that the allowable stress in pounds per square inch may be readily and quickly found where the percentages of vertical and spiral reinforcement are known or assumed or vice versa.

Note, however, that if values of vertical steel are used below the diagonal line passing through intersection points of $p'' = 8$ per cent, $p = 0$ and $p = 8$ per cent, $p'' = 0$, the total amount of vertical reinforcement will not exceed 8 per cent, also if values of p' are used between limits of $\frac{1}{2}$ per cent and $1\frac{1}{2}$ per cent, both inclusive, the ordinance is complied with in this respect.

Large Combined Outlet Sewer

LARGE area, scattered populaton and flood conditions were factors in the design of a 7-mi. concrete outlet sewer and storm-water conduit now being built at Granite City, Ill. The high relation of area to population is due to the holding of vacant tracts as investment or for industrial sites.

An 18-mi. combined sewerage system has its main sewers discharging into an open ditch leading to the levee, where a pumping station handles the flow during high water. The normal dry-weather sewage flow is about 1,300,000 gal. per 24 hr. and the new 7-mi. outlet sewer is designed to take care of a rainfall of 2 in. per hour. This sewer, serving a drainage area of 6 sq.mi., will provide more rapid removal of flood water besides keeping the ground-water level at a minimum and eliminating the present open ditch. Intercepters will connect the laterals with the main outlet sewer. The latter has a grade of 0.10 per cent to 0.06 per cent and is of circular section, 9 ft. to $4\frac{1}{2}$ ft. in diameter, but the exterior has a flat base with vertical sides to the springing line. The thickness is $8\frac{1}{2}$ to 11 in. for the arch and 10 to $12\frac{1}{2}$ in. for the invert.

During high water the flow will be raised 6 ft. by pumps and discharged into a 6-ft. culvert through the levee, this being closed automatically by a flap valve when the river rises above it. The pumping station has been in use for 17 years, handling the flow from the present open ditch. Its sump has been lowered about 5 ft., however, to the grade of the new outfall sewer and the discharge culvert raised 1 ft. to conform to the new flood-protection level. Three centrifugal pumps, each having an electric motor in its vertical shaft, have a combined capactiy of 12,700 gals. per minute.

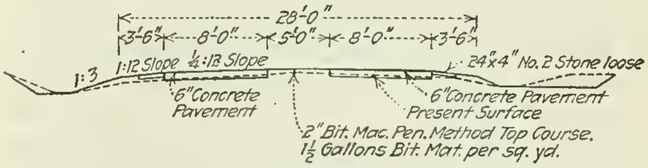
Plans were made in 1913 by Edmund Hall, city engineer, but as the entire city will be benefited, the assessments and court proceedings occupied so much time that the contract was not let until 1916. The cost was estimated then at $450,000, but changed conditions have raised this to $650,000, necessitating supplemental assessments. Work was stopped for about a year by war conditions and by efforts to compel the use of none but union labor. The John T. Walbridge Engineering Co., Chicago, has the contract. Edmund Hall and W. W. Kerch are the engineers for the city.

Utilizing Old Macadam To Increase Width of Concrete Road

Sixteen-Foot Surfacing Built in Two Strips With Bituminous Surface Between—Traffic Maintained—Labor Cost

RECONSTRUCTION of old macadam roads by building a concrete surface in two strips with the old surface left in the middle, has been resorted to in Division No. 7, New York State Highway Department. After the concrete has been constructed the macadam receives a bituminous surface. By this design, the old surfacing is utilized for foundation where it is good, an extra-wide road is obtained, and it is easy to keep roads, where there are no good detours, open to traffic during construction. While such construction is considerably more expensive than building in one piece, it is thought the benefits outweigh the extra expense. It is also believed that longitudinal cracking of the concrete will be eliminated.

New York State, like many other states, has a large mileage of macadam roads which have partially broken down under the heavy traffic of recent years, a traffic which they were never designed to carry. This failure has been chiefly along the edges, the central part being in fairly good condition. Designs are therefore being considered which will utilize the previous investment to the greatest extent possible. In some cases the old macadam is being used as a foundation for other surfacings, while in others an endeavor is being made to retain all or a part of the old work by giving it a new top or thin surface treatment in the center, with concrete strips on either side. This type of construction as used on Maryland roads was described in *Engineering News-Record* of Nov. 28, 1918, p. 990.



TYPICAL SECTION OF TWO-STRIP CONCRETE ROADS WITH BITUMINOUS CENTER

On repair contract No. 1206, Division No. 7 of the New York State Highway Department, which is between Geneseo and Mount Morris in Livingston County, this latter type of construction is being used. The section of road selected for trying it out is about one mile long and extends across a low flood plain of the Genesee River. Once or twice a year the road is covered with water to varying depths, and in one case, recently, it was deeply covered with ice, necessitating the chopping of a road through to accommodate traffic.

The nature of the country and the scarcity of roads made it not feasible to construct a side road or provide detours. Furthermore, it was necessary to keep the road open for traffic, as it is the main route between Rochester, Geneseo, Mount Morris, Danville and the southern part of the state. As the road had a fairly good macadam surface, it was decided to build of concrete and in two strips 8 ft. wide, with the central portion as mentioned above. The cross-section design is shown in an illustration. The center is 5 ft. wide and the concrete is built about 3 in. higher than the old surface, to provide for the addition of a penetration

ARRANGEMENT OF PLANT SHOWING CONGESTION DUE TO PILED MATERIAL

bituminous top. A 2-ft stone shoulder will be built on each side, making a surface 25 ft. wide.

The concrete strips are uniformly 6 in. thick and are constructed with a uniform slope from the inner to the outer edge. Premolded bituminous expansion joints were used every 30 ft. and are submerged 2 in. However, full-depth joints were used at points of stoppage and at the end of every day's run. Niagara River grit and Niagara limestone were used for the aggregates. This limestone is of a hard, flinty variety. The proportions specified were 1:1½:3, the coarse aggregate being graded so as to contain 30 per cent three-inch, 50 per cent two-inch and 20 per cent one-inch stone.

Regarding the 2-in. submerged expansion joints, the department engineers state that these are just as effective as those which are of less depth, such as 1¼ in., and do not have the disadvantages. In finishing over the joints submerged only ¼ in., it is hard to get a smooth surface on account of irregularities in placing the joint. Also, the concrete on each side of the shallow, submerged joint tends to break off in large, flat spall. This does not occur with the deep joints. While the line of cracking is sometimes not as regular as with the shallow depth, it occurs directly over the expansion, and no spalling occurs. No reinforcement was used in the slabs.

CONSTRUCTION

Grading—Inasmuch as the road had been improved with macadam and had an established grade, the macadam excavation quantities were comparatively light. As the concrete was placed 3 in. above the old surface and the macadam had a larger crown than the new construction, there was a maximum cut of about 3 in. at the inner edge, which decreased toward the outer edge. Added to this was the excavation necessary to form new ditches and shoulders, made necessary because of the additional width of road.

Work proceeded on one strip at a time, thus leaving the other half of the road open for traffic. The grading gang started at one end and graded one side, then returned to the same end and graded the other side. This procedure not only allowed the mixer always to work toward the source of materials, but also allowed for a cross-over of traffic from the concrete to the old macadam near the end which was finished first, while at the place of beginning the concrete had hardened enough to allow traffic, by the time the excavation of the other side started.

The old surface was first scarified in the usual manner, and the excess material was thrown over to the side for the purpose of widening the shoulder. It was aimed to use as much of this stone as possible in widening out the remaining stone base of the old macadam, so as to give a uniform foundation for the concrete surface. What was not required for this purpose was used upon the shoulder. At the same time, where a well defined shallow ditch line existed, the back slopes were graded out to form the new drainage, and the material was passed inward to widen the shoulders. After fine grading, the subgrade was thoroughly compacted with a 10-ton roller. The excavated material was not found sufficient to construct the shoulders properly, and it was necessary to use considerable borrow. It is of course impossible on such reconstruction where no readjustment of the grade is practicable to balance the excavation quantities.

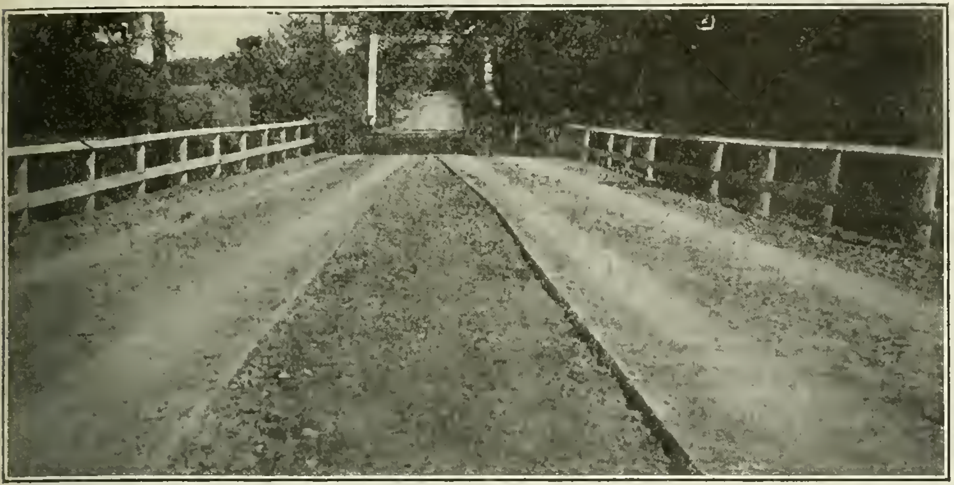
DELIVERY OF MATERIAL

Material was delivered by both motor trucks and teams and was deposited on the subgrade and central strip. The plan was to use the central strip for storing the crushed stone, and the outside of the subgrade and a portion of the shoulder for storing sand, leaving a space between to operate a mixer loader. In delivering the stone the contractor attempted to store sufficient coarse aggregate to build both strips of concrete. This, according to the engineer in charge, was a great mistake, as the 5-ft. strip was not wide enough for the purpose and considerable rehandling of material was necessary when grading the second strip. It was also hard to keep this extra stone clean. It is believed that the cost of manipulation would not have been so high if all the material for each strip had been delivered separately, as in the case of the fine aggregate. No cost data are available for the hauling and, according to the engineers, would be of little value on account of delays due to strikes and other causes.

ITEMIZED COST OF MANIPULATION IN BUILDING CONCRETE ROAD SLAB FOR TWO-STRIP CONSTRUCTION

9 shovelers at $3.60 per day (six on stone and three on sand)	$32.40
1 man on cement at $3.60	3.60
1 man on grading at $3.60	3.60
2 men spreading concrete at $3.60	7.20
2 finishers at $3.60	7.20
3 form builders at $3.60	10.80
1 mixer man at $4.00	4.00
1 fireman at $4.00	4.00
1 foreman at $5.00	5.00
Total cost per day	$77.80

The forms for the concrete were of wood. It will be noted that the form work is double that needed for single-type road, which is responsible for some of the higher cost of this type of construction. The plant used by the contractor for the construction of the concrete slabs consisted of a mixer, used in connection with a loader, as stated above, and as shown in an



CONCRETE COMPLETED, SHOWING METHOD OF NARROWING AT BRIDGE

illustration. The loader ran between the two piles of material, the men shoveling in from each side. The cement was also stored on the central strip and the congested conditions may be noted. The gang used for the operation of this outfit was as shown in the accompanying table. The men worked an eight-hour day, and common labor was paid 45c. per hour, or $3.60 per day. The usual arrangement of men before and behind the mixer was used.

This gang, with good running, turned out about 550 ft. of 8-ft. strip per day, 81.5 cu.yd. This gave a manipulation cost of about 95c. per cubic yard. To this should be added depreciation, superintendence and interest on the plant investment. The cost of excavation, covering, protecting the finished concrete, etc., was not available but is thought to be somewhat higher than in ordinary highway grading, on account of the narrow limits in which the work had to be done. The cost of the concrete slab was also more or less affected by extra travel of the mixer and the congestion caused by the delivery of all the stone at one time.

Placing the Five-foot Bituminous Center Strips

Upon completion of the two concrete strips, the shoulders were graded, the crushed stone edgings were added, and the penetration top was put over the old macadam center. The subgrade in the strip was first shaped and then rolled with a five-ton tandem roller. This was the only rolling that could be given, as the strip was not wide enough to permit the use of a 10-ton roller. After the stone was spread, two applications of bituminous material were given, one of 1.2 gal, and a second of $\frac{3}{10}$ gal. per square yard. The material was applied under a subcontract, at the rate of 5c. per gallon or 7½c. per square yard. Final compression was given by a 10-ton roller. This did not include the heating of the filler, which was done by the contractor. A view shows the two strips at the approach to a bridge ready for the laying of the central strip. Note the method of narrowing down to join the bridge floor.

Criticism of Two-Strip Type of Construction

Two-strip construction is stated by the engineer in charge to be more expensive than one-strip construction. It is believed that the central strip should be made more than 5 ft. wide, so as to be wider than the gage of ordinary vehicles. Not less than six, and probably eight feet is suggested as advisable by the engineers. It is probable that difficulty may be experienced in maintaining the edges of the central portion next to the concrete, as the transition from an extremely hard surface to a more pliable one will tend to make an uneven joint. It is expected that in the near future this center strip will be replaced by concrete, which on account of the type can be built without much inconvenience to traffic.

The work was done under the supervision of Charles M. Edwards, division engineer, New York State Highway Department. M. S. Smith was assistant engineer in charge, and the contractor was the R. W. S. Corporation of Syracuse, N. Y.

What Is the Present Status of the Concrete Ship?

Concrete Institute Committee Report Gives Résumé of Current Export Opinion on Type of Vessel Developed by War

Abstract of report read at convention of the American Concrete Institute at Chicago, Feb. 16-18, 1920, by H. C. Turner, chairman of the Committee on Reinforced Concrete Barges and Ships.

THE original concrete-ship program of the Emergency Fleet Corporation called for the construction of thirty-eight 7,500-ton vessels, three 3,500-ton vessels and one 3,000-ton vessel, making a total of 42 vessels. Immediately after the armistice, this program was reduced to eight 7,500-ton tankers, two 7,500-ton cargo vessels, three 3,500-ton cargo vessels and one 3,000-ton cargo vessel, or a total of 14 vessels. In October 1919, the two 7,500 ton cargo vessels were cancelled, leaving twelve vessels to be completed.

At this date, all of the four small cargo vessels are in service. They are the "Atlantus," 3,000 tons dead weight, and the "Polias," "Cape Fear" and "Sapona," each of 3,500 tons dead weight. [The "Polias" went ashore near Penobscot Bay, Maine, on Feb. 6, 1920. See article on p. 483 of this issue.—Editor.] Of the 7,500 ton tankers, three have been launched, the "Palo Alto" at San Francisco and the "Selma" and "Latham" at Mobile. The remaining five tankers are in various stages of completion. It is expected that all will be launched before April 1 and all will be in commission before June 1.

In addition to these vessels, twenty-one 500-ton canal barges were built by the Railroad Administration under the supervision of the Emergency Fleet Corporation. All of these barges are in service with the exception of one which was sunk in the Hudson river in the early part of December.

In general, it may be said that in carrying out the concrete ship program, no construction problems have been encountered that have not been successfully met. The original design of the 7,500-ton tankers has been modified to some extent, owing to the discovery of undesirable high stresses in some of the members under test and service conditions. While the revisions contemplated involved concrete construction seldom, if ever before, attempted, it is believed that the changes will remedy the undesirable conditions. The experience of the vessels in service thus far indicates that, so far as the cargo vessels are concerned, there is ample structural strength, and the barge is a much simpler problem.

The hope that reinforced concrete would provide a material from which hulls could be built with much greater speed than is possible in the case of steel has not been realized. The average time of constructing the concrete hull has been seven months. Outfitting and equipping the hull has taken on an average between three and four months. Undoubtedly with the experience gained, this time could be materially bettered.

The experience with the ships in service thus far indicates that they are good sea boats. In every case of which there is record, these ships have behaved admirably in heavy weather and have won considerable praise from officers and crews. There is generally very much less vibration in concrete ships than in corresponding steel ships. There is also a very considerable increase in the period of roll, which is quite desirable. The increase in the period of roll is undoubtedly due to the fact that these vessels have a relatively large moment of inertia around a longitudinal axis even when loaded with cargo. This is due to the mass of the concrete shell which is considerably greater than the mass of the shell in a steel ship. In none of the vessels in service has any leakage whatever been reported. A few shear cracks are noticeable in the shell and bulkheads in all the ships in service, but these cracks are unimportant and have no apparent effect upon the structural strength of the ship.

One characteristic of the concrete vessels built by the Emergency Fleet Corporation should be noted in this connection. Experience seems to indicate that these vessels are unable to successfully withstand severe concentrated blows on the shell without the shattering of the concrete. Impact which, in the case of the steel ship, would probably only cause indentation to the plates, in the case of the concrete ship is apt to cause a shattering of the concrete over the area adjacent to the point of impact. A number of instances of injury of this kind have been observed, particularly in the case of the barges constructed for the Railroad Administration. In the case of nearly every barge the shell has been injured in one way or another requiring repairs to the concrete. It has been found, however, that repairs are relatively simple and can be effected with little loss of time and at almost negligible cost. The barges in question have very little protection in the form of fenders. It is believed that where adequate fenders are provided, so that there is chance for the absorption of the work of a blow by means of some resilient material, such as an oak fender, this objectionable feature of the concrete barge may be obviated.

The figures noted above for the dead weight capacity of the several ships constructed by the Emergency Fleet Corporation are the nominal dead weight capacities contemplated by the design. In no case has the nominal dead capacity of the ship been realized. The average dead weight capacity of the 7500-ton tankers will be in the neighborhood of 6,800 tons. In the case of the Atlantus," nominally having a capacity of 3,000 tons, the actual dead weight capacity is 2,542 tons; the "Cape Fear" and "Sapona" nominally 3,500 tons, have deadweight capacities of 3,078 tons; the "Polias," nominally 3,500 tons, built of heavy gravel concrete, has a dead weight capacity of 2,460 tons. It was expected that the ratio of dead-weight capacity to displacement would run from 0.55 to 0.60. The actual ratio of dead-weight displacement will not average but little more than 0.50.

In making a comparison between the relative carrying capacities of steel and concrete ships, one important consideration should be kept in mind. Taking into consideration a steel ship and concrete ship, each having the same dead weight capacities, the concrete ship—because of the greater weight of the ship itself—must have greater dimensions than the steel ship and, in consequence, must have greater hold spaces. For heavy weight cargoes, such as steel, coal or oil, in which the dead-weight capacity is reached before the hold spaces are filled, it is apparent that steel has an advantage over concrete as a material of construction, assuming that the construction and operating costs are equal. For bulky cargoes, such as ordinary package goods, cotton, fruit or other materials for which the space required exceeds about 70 cu. ft. to the ton, the concrete ship will actually carry more dead weight than the steel ship for the reason that the hold spaces of the steel ship will be filled before dead-weight capacity is reached.

The cost of the small cargo vessels, leaving out of consideration the "Atlantus," which was the first vessel built, varies from $210- to $300-per dead-weight ton. The cost of the 7,500-ton tankers will vary between $200- to $250-per dead-weight ton. These figures are based upon the nominal dead-weight carrying capacity rather than the actual. These costs naturally include certain experimental work and other expenditures which could be reduced on future work, so that the above experience is not a sufficient basis on which to forecast the costs under peace conditions and skillful management.

No definite conclusions should be drawn as yet from the experiences with these vessels. It should be borne in mind that all of the vessels were under construction at approximately the same time and that there was little chance to profit by experience. When it is remembered that these were the first vessels ever attempted of this size, the showing is not discouraging. The only general conclusion that may be drawn from the experience of the ships constructed under the direction of the Emergency Fleet Corporation seems to be that it is possible to construct ships of concrete in about the same time and for approximately the same cost as the corresponding steel ships. This indicates that, after there has been more experience in the art, it will be possible to reduce both the cost and the time for construction.

There remains also the question of length of life of concrete ships. Only time can safely answer this question, although it should be stated that the brief experience of the "Faith" and the Emergency Fleet vessels has disclosed no serious inherent weakness to shorten the life of the concrete ship.

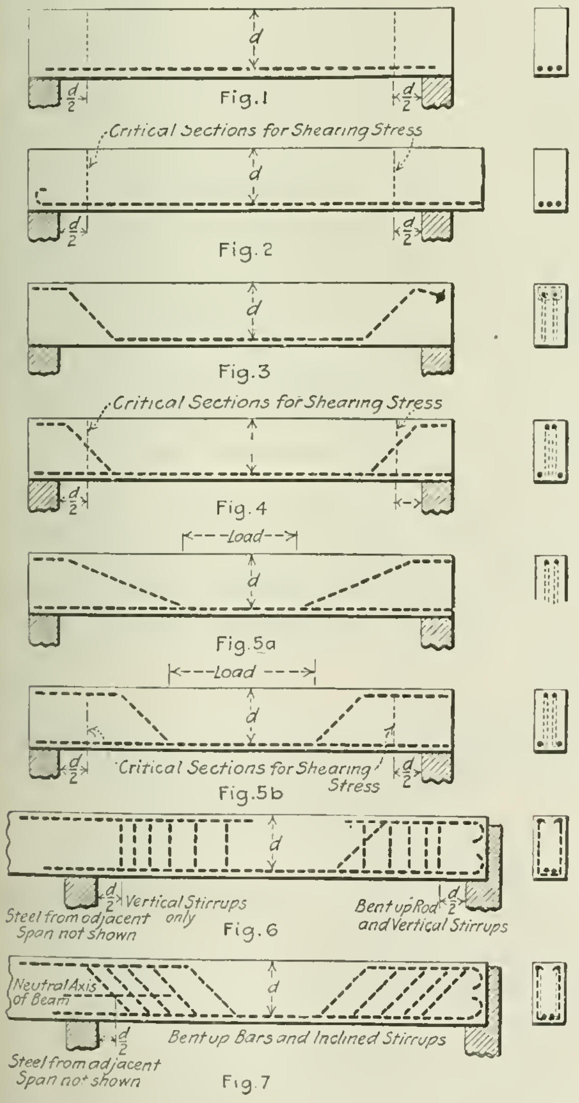
Barges and canal boats, in order to have a commercial future, must apparently overcome two objections—first, a reduction in cost as compared with wood, and this may come through experience in design and construction; and, second, the development of a method to offset the damage sustained to the hull from slight collisions with tugs or other boats or in docking.

Concrete Shear Values Proposed To Concrete Institute

Committee Report Establishes Unit Values and Standards of Design Based on Survey of Available Tests—Recommended Practice for Design Included

Abstract of a report of Committee on Unit Values for Vertical Shear of the American Concrete Institute. Presented to the Annual Convention, at Chicago, Feb. 16, 1920. The committee comprises W. P. Anderson, A. B. MacMillan, C. L. Post, H. A. Ward and A. R. Lord, Chairman. It was accepted and the recommendations at the end passed to letter ballot for adoption as Recommended Practice of the Institute.

THE committee has studied in detail the principal test data on shear in reinforced-concrete members as secured and published by American investigators. Only two European authorities have been consulted. In using the data of the pioneer tests, certain precautions are naturally required. Beams with vertical stirrups generally made a poor showing on account of the fact that the upper ends of the stirrups were not anchored, except by bond on a very short length of straight bar. In some tests considerable web reinforcement was present but it was so disposed as to permit of a failure in diagonal tension in portions of the web not reinforced.


d
d/2
Fig.1
Critical Sections for Shearing Stress
Fig.2
Fig.3
Critical Sections for Shearing Stress
Fig.4
Load
Fig.5a
Load
Critical Sections for Shearing Stress
Fig.5b
Vertical Stirrups only
Steel from adjacent Span not shown
Fig.6
Bent up Rod and Vertical Stirrups
Neutral Axis of Beam
Bent up Bars and Inclined Stirrups
Steel from adjacent Span not shown
Fig.7

FIGS. 1 TO 7. DIFFERENT TYPES OF SHEAR REINFORCEMENT IN BEAMS

In a number of tests, the diameter of the stirrup rod was too large in proportion to the depth of the beam. The importance of anchoring both the longitudinal and the web steel was not appreciated until after these tests had been made.

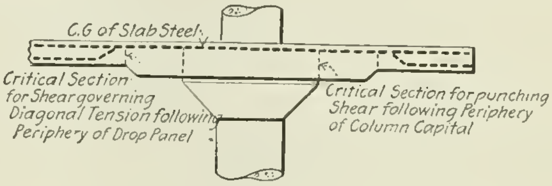

C.G of Slab Steel
Critical Section for Shear governing Diagonal Tension following Periphery of Drop Panel
Critical Section for punching Shear following Periphery of Column Capital

FIG. 8. SHEAR STANDARDS FOR FLAT SLABS

The notation used in this report is as follows:

V = Total vertical shear at any section.
V' = Vertical shear carried by the web reinforcement.
$v = V/bjd$ = Unit vertical shearing stress.
d = Depth from compressive face to c.g. of tensile steel in inches.
b = Breadth of beam.
b' = Breadth of stem of T-beam or web of I-beam.
A_s = Area of longitudinal steel.
A_v = Area of shear steel in section of beam considered.
j = Ratio of lever arm of resistance couple to depth d.
$p = A_s/bd$ = Longitudinal steel ratio.
$r = A_v/ba$ = Shear steel ratio.
a = Spacing of shear steel measured perpendicular to its direction.
f_c = Ultimate strength of concrete cylinders at 28 days (or at time of test in considering test data).
f_v = Tensile stress in web reinforcement.

Except where v is noted as the unit punching shearing stress, it is used as a shearing stress index governing the value of the diagonal tension in the web as is the present common practice.

BEAMS WITHOUT WEB REINFORCEMENT

Type I (Fig. 1) shows the ordinary test beam without web reinforcement and without any special attempt to anchor the longitudinal steel. Such beams have only a very limited use in building construction, mainly in the form of lintels over door or window openings. For this type of beam, the shear resistance depends, primarily, on the tensile strength of the concrete. The tests indicate that the ultimate value of $v = (V/bjd)$ computed on a section distant $\frac{1}{2}d$ from the face of the support varies from $0.04f'_c$ to $0.07f'_c$ and averages about $0.06f_c$. Where the longitudinal bars were anchored at the ends by mechanical contrivances or otherwise, higher values were obtained, as noted below.

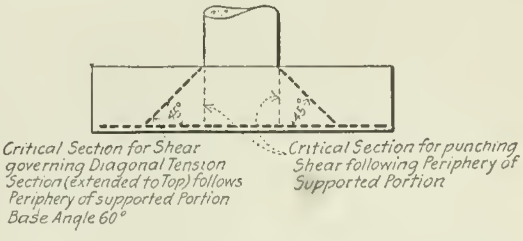

Critical Section for Shear governing Diagonal Tension Section (extended to Top) follows Periphery of supported Portion Base Angle 60°
Critical Section for punching Shear following Periphery of Supported Portion

FIG. 9. SHEAR STANDARDS FOR ISOLATED FOOTINGS

Type II. Where the longitudinal bars are anchored either by means of a half circular hook of adequate size, by nuts and washers or other auxiliary devices, or by bond on the bars over or beyond the support, a considerably increased shearing resistance is secured. See Fig. 2 for two examples of effective anchorage. The ultimate value of v from tests varies from $0.06f'_c$ to $0.10f'_c$ and averages about $0.08f'_c$. Certain tests in which half circular hooks were used showed very high values, up to $0.14f'_c$, but these exceptional results have not been included in the average.

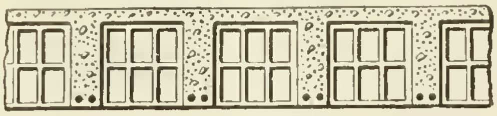


FIG. 10. TILE AND CONCRETE JOINT CONSTRUCTION

Beams With Web Reinforcement

Type III. When all the longitudinal bars are bent up to the top of the beam at the ends, no increased shear resistance is secured unless the ends are anchored. With anchored ends, values as high as $0.08f'_c$ were found, but in other tests no increase was found, and no increase in design stress would seem to be warranted. See Fig. 3.

Type IV. When half the longitudinal steel is carried through in the bottom and half bent up near the ends, additional shearing resistance is secured even though the ends are not specially anchored. For this condition, values of v vary from $0.07f'_c$ to $0.12f'_c$ with individual values as high as $0.18f'_c$. The average values and the bulk of the data is at about $0.11f'_c$. See Fig. 4.

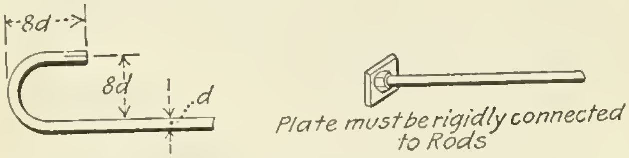


FIG. 11. MECHANICAL ANCHORAGE OF LONGITUDINAL RODS

Type V. When the bent-up bars of Type IV are inclined in a single plane at a very flat slope, extending from the bottom of the beam at the quarter or third point to the top of the beam over the support, the results are conflicting. See Fig. 5*a*. High values of v were obtained with this arrangement, and also some low values. The construction in which the bent-up bars reach the top of the slab at a considerable distance from the edge of the support were decidedly erratic. See Fig. 5*b*.

Type VI. When the web steel is properly designed to assist the concrete in carrying the shear and when both the web steel and the longitudinal steel are properly anchored at both ends of each rod and when the size of bars is not disproportionate to the span length and to the depth of the beam, very great increases in the value of v may be secured, depending on the amount of web steel employed. The highest value of r (ratio of web steel to web concrete) thus far reported in tests is 0.06. Ultimate values of v in excess of $0.4f'_c$ have been secured in several tests and the data is consistent. With the same value of r the same shearing resistance seems to result, regardless of the direction of the web steel—between the limits of the vertical and an angle of 60° with the vertical (the inclined bar being placed in the tension direction, of course). With large values of r, the quality of the concrete becomes relatively less important provided sufficient strength is present to resist the diagonal compression and the direct shearing stresses (as distinguished from the diagonal tension stresses). The diagonal compression is much higher where vertical stirrups are used than where inclined web bars are used.

Recent tests have brought out strikingly the importance of anchorage of both longitudinal and web reinforcement. In simple beams in which the longitudinals were anchored by means of half circular hooks at the ends, the tensile stress just inside the hook was measured to be over one-half of the stress at the point of maximum moment in some instances and generally as much as one-third. Without such hooks, failures would have occurred due to lack of adequate anchorage of longitudinal bars long before the web steel reached its yield point, and such failures would have closely resembled a true diagonal tension failure, due to overstress of the steel. The importance of mechanical anchorage of the stirrups is obvious. In no other reinforcing member do we attempt to develop a full working stress in so short an embedded length and the attempt is almost certainly doomed to failure unless the best anchorage is provided at each end. Recent tests show clearly that it is unsafe to use bars whose diameter exceeds 1/40 to 1/50 of the beam depth, for even with the stirrup anchored on other steel at each end such bars slipped in some cases before developing a yield point stress. A ¾-in. diameter bar was too large for a beam 36 in. deep when placed vertically and a 1-in. bar was too large for the same depth when placed on a 45° slope.

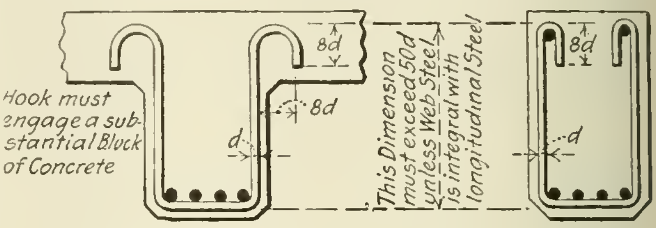

Hook must engage a substantial Block of Concrete
8d
8d
d
This Dimension must exceed 50d unless Web Steel is integral with longitudinal Steel
8d
d

FIG. 12. ANCHORAGE OF STIRRUPS

Recent tests of rectangular beams have shown that even when the web steel reaches the yield point the stress in this steel does not account for the entire web tension. A very considerable diagonal tension resistance is furnished by the concrete and longitudinal bars, and this would seem to be a satisfactory, practical foundation for the almost universal practice of allowing a unit shearing stress of from $0.02f'_c$ to $0.03f'_c$ to be carried by the web concrete and designing the web steel for the balance of the vertical shear.

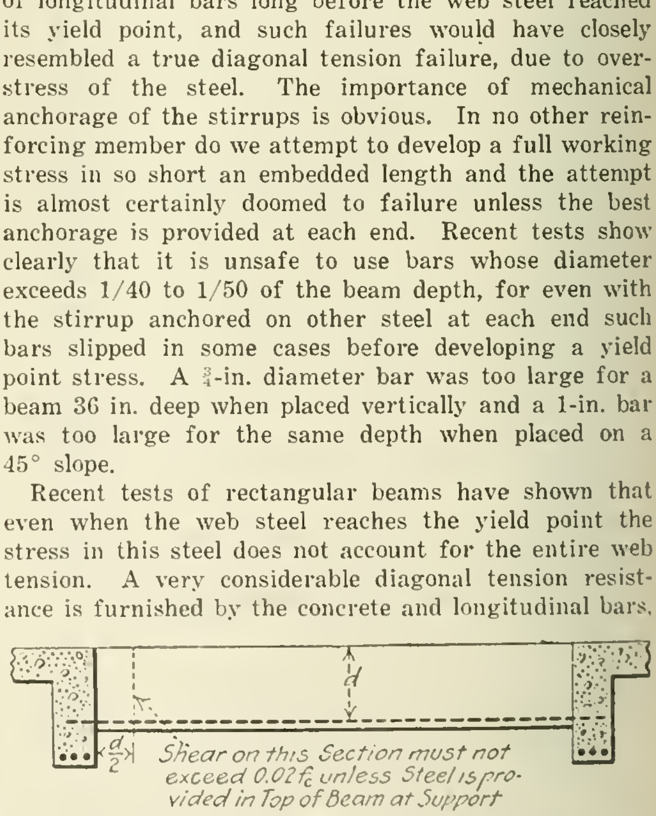

d
d/2
Shear on this Section must not exceed 0.02f'c unless Steel is provided in Top of Beam at Support

FIG. 13. BEAM FRAMED MONOLITHICALLY

Flat Slabs.—The ultimate diagonal tension resistance of flat slabs is not known. No flat slab construction has failed in shear, so far as the committee knows. The test of the Western Newspaper Union building, which was not carried to destruction and in which no meas-

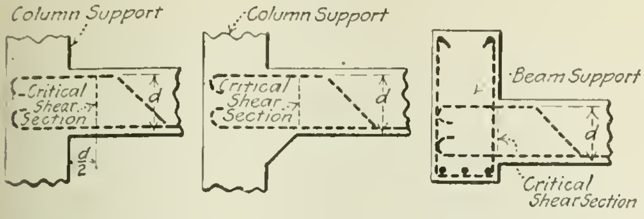


FIG. 14. LOCATION OF CRITICAL SHEAR SECTIONS

urement of the diagonal tension stress was attempted, showed a resistance of about 240 lb. per sq.in. as the maximum load, computed the jd depth on the surface of a frustum of a pyramid with 60° base angle and passing through the edge of the column capital. The University of Illinois tests of cantilever slab showed bond of tension failures, while the shear was much below this figure. The Chicago practice of allowing $0.03f'_c$ on the periphery of the drop would appear to be safe, provided the tension steel is adequately anchored beyond the edge of the drop. (See Fig. 8). The severe test required of all concrete buildings in Chicago is a further indication that an adequote factor of safety is provided.

Footings.—Tests by the University of Illinois, reported in Bulletin 67, indicate that the value of v (for diagonal tension) may be figured at a distance from the face of the pier equal to d and that on this section the resistance is equal to that of a beam without web reinforcement. The method contained in this report is in quite general use and is somewhat more conservative than the above.

Where foundation members are reinforced for diagonal tension, the values of v will depend on the conditions set forth under Type VI above.

Tile and Concrete Joist Construction.—Tests indicate positively that in this type, when the joints in adjacent rows of tile are staggered, the tile is very effective in taking shear. Test pieces, without web reinforcement and with no special anchorage of the longitudinal bars, show values of v fully comparable with values for beams of the same type, when the value of v is figured on the basis of all the available web area of both concrete and tile ribs. Figuring the available b as the width of the concrete joist plus the thickness of one tile rib, as is Chicago practice, gives values of v for this type of from $0.10f'_c$ to $0.13f'_c$ even though failure was not in diagonal tension. Figuring b as the breadth of the concrete joists the web thickness of alternate tiles, the values of v vary from $0.07f'_c$ to $0.09f'_c$ (failure occurring by direct tension). Fig. 10 shows the shear section considered effective in this report.

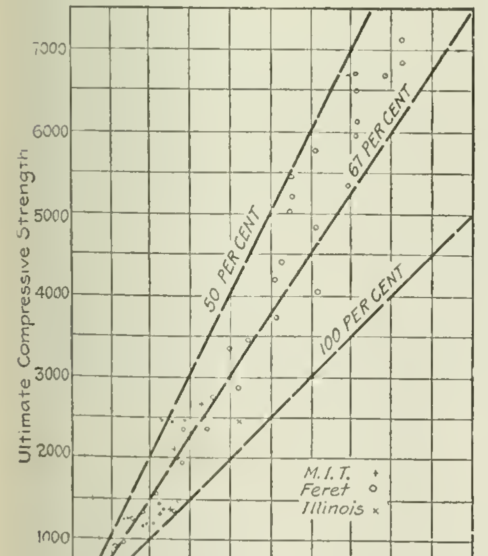


FIG. 15. DATA ON RESISTANCE OF CONCRETE TO (PUNCHING) SHEAR

Concrete joist floors without tile fillers should develop the same shear resistance as beams of the same types.

Punching Shear.—A study of tests show an ultimate resistance of concrete to punching shear which practically never falls below one-half of the ultimate crushing strength. For weaker concrete, the ratio of punching shear to compressive strength is higher. Test data is plotted in Fig. 15.

Recommended Practice for Design

All allowances for design unit shearing stresses in the following sections are predicated on proper design of the longitudinal reinforcement to effectively resist all positive and negative moments, as prescribed in the report on Standard Building Regulations for the Use of Reinforced Concrete as submitted by the American Concrete Institute Committee in February, 1920. Wherever web reinforcement is used it must be adequately anchored at both ends.

Members with Web Reinforcement—When adequate mechanical anchorage of both web and longitudinal rods is provided, the concrete may be figured to carry a unit vertical shearing stress equal to $0.025f'_c$ and the remainder of the shear shall be carried by web bars designed according to the formula

$$A_v = \frac{V'a}{f_v jd}$$

in which

A_v = Area of web member.
a = Spacing of web members perpendicular to their direction.
V' = Shear taken by steel.
f_v = Stress in web member.
jd = Lever arm of moment couple in beam.

Properly anchored bent-up longitudinal bars may be considered as web reinforcement. The maximum unit shearing stress shall not exceed $0.12f'_c$ in any case.

When adequate mechanical anchorage of the longitudinal rods as defined in the next paragraph is not provided, the maximum unit shearing stress shall not exceed $0.06f'_c$, of which $0.02f'_c$ may be considered to be taken by the concrete and the remainder of the shear taken by the web bars designed as above. Web rods must be adequately anchored in all cases.

Adequate mechanical anchorage of the bottom longitudinal steel for positive moments shall consist of carrying the reinforcement a sufficient distance beyond the point of inflection to develop the assumed tension in the reinforcement at the point of inflection by bond between the end of the bar and the point of inflection of the member (never to a less distance than one inch from the center of the support or in case of wide supports to not less than 12 in. of embedment in the support), or of bending the end of the bars over the support to a half circle of diameter not less than 8 times the diameter of the bar, or by any device that will transmit the tension on the bar to the concrete over the support at a compressive stress of not over $0.50f'_c$. The tension in the bar, at the point of inflection to be resisted by the anchorage, shall be taken for this computation as not less than one-third of the maximum safe tension in the bar. Reinforcement for negative moment shall be thoroughly anchored at the support and extend into the span a sufficient distance to adequately provide for negative tension by bond. Simply supported beams shall have the longitudinal steel anchored by hooks of diameter specified above or by an equivalent anchorage, the tensile stress at the edge of the support being taken as one-third of the maximum safe tension in the bar.

Anchorage of the web steel shall consist of continuity of the web member with the longitudinal member, or of carrying the web member about at least two sides of a longitudinal bar at both ends, or of carrying the web member about at least two sides of a longitudinal member at one end and making a half circular hook at the other end of a diameter not less than eight times the diameter of the web rod. In all cases, the bent ends of web bars shall extend at least eight diameters below or above the point of extreme height or depth of the bar. In case the end anchorage is not in bearing on other reinforcing steel, the anchorage shall be such as to engage an adequate amount of concrete to prevent the bar from pulling off a portion of the concrete. In all cases the stirrups shall be carried as close to the upper end lower surfaces as fireproofing requirements will permit. The size of web reinforcing bars which are not either a part of the longitudinal steel or welded thereto shall be such that not less than two-fifths of the maximum design tensile stress in the bar may be developed at design bond stresses in a length of rod equal to $0.4d$. This condition is satisfied for plain round stirrups when the diameter of the bar does not exceed $d/50$. The balance of the tensile stress in the bar may be considered as taken by adequate end anchorage as specified above.

Beams in which no longitudinal reinforcement is provided in the upper portion of the beam adjacent to the support and in which the ends of the beam are built monolithic with other parts of the concrete structure, shall not carry a unit shearing stress in excess of $0.02f'_c$, regardless of amount of web reinforcement provided.

When the shear reinforcement consists of bars bent up at an angle so as to reinforce all sections of the beam in which the unit shearing stress exceeds $0.02f'_c$ the design may be made as follows:

$$A_r f_r = V' \sec \alpha$$

Where A_r = Area of bent up shear bars.
f_r = Stress in bent up shear bars.
V' = Total shear at end of span as prescribed for moment less the shearing resistance of the concrete at a unit stress of $0.02f'_c$ over the area $b'jd$.
d = Angle between bent up rod and the vertical.

The maximum unit shearing stress shall not exceed $0.06f'_c$ with this arrangement of web steel and the longitudinal steel shall be adequately anchored as defined above in all cases.

In case the web reinforcement consists solely of inclined shear bars the first bent bar shall bend downward from the plane of the upper reinforcement directly over or within the edge of the support.

Beams Without Web Reinforcement—When the longitudinal steel is not fully anchored, as prescribed above, the unit shearing stress shall not exceed $0.02f'_c$. When the longitudinal steel is fully anchored, as prescribed above, the unit shearing stress shall not exceed $0.03f'_c$.

Critical Section for Shear in Beams—The critical section for shear as governing diagonal tension shall be taken at a distance not greater than one-half the effective depth of the beam ($\frac{1}{2}d$), from the end of the span as prescribed for moment, except that if the edge of the support be less than one-third deeper than the beam itself, the critical section shall be taken at the edge of the support. (See Fig. 13.)

The effective depth of the critical section for shear as governing diagonal tension shall be taken as the depth jd of the beam in the plane of the critical section.

The breadth of the critical section shall be the full breadth of rectangular beams or the breadth of the stem of T-beams or the thickness of the web in beams of I section.

Tile and Concrete Joist Construction—The shearing stresses in tile and concrete joist construction shall not exceed those in beams or slabs of similar reinforcement. The breadth of the effective section for shear, as governing diagonal tension, may be taken as the thickness of the concrete joist plus one-half the thickness of the vertical webs of the tile provided that the joints in one row come opposite the centers of tile in adjoining rows on either side.

Where the tile joints are not staggered, only the concrete joists may be considered effective in resisting shear.

Flat Slab Construction—In flat slab construction where a drop panel is used adjoining the column, the shearing stress, as governing diagonal tension, figured on the jd depth on a vertical section along the periphery of the drop, shall not exceed $0.03f'_c$. (See Fig. 8.)

In flat slab construction, with or without drop panels, the shearing stress as governing diagonal tension, figured between the compression face of the slab or drop and the level of the center of gravity of the reinforcing steel, on the surface of the frustum o fa cone or pyramid passing through the periphery of the column capital and having a base angle of 45°, shall not exceed $0.035f'_c$.

Footings—In footings carrying a single column or load, the shearing stress, as governing diagonal tension, figured between the level of the centroid of the compressive stresses and the level of the center of gravity of the reinforcing steel on the surface of the frustum of a cone or pyramid passing through the base of the supported column or loaded member and having a base angle of 45° the unit stresses shall not exceed those in beams without web reinforcement. Especial attention shall be given to bond in footings. The total vertical shear on this section shall be taken as the upward pressure on the area of the footing outside the base of this section.

If adequate anchorage is provided for the tensile steel and adequately anchored web reinforcement is also provided such web reinforcement may be figured in accordance with the formula given in section 1 above. Such calculations may be made for vertical sections concentric with the supported column.

For footings supporting two or more columns, the shearing stresses shall be figured as for beams or slabs.

Arrangement of Web Reinforcement—The spacing of web reinforcement as measured perpendicular to their direction shall not exceed $3d/4$ in any case where web reinforcement is necessary. Where vertical stirrups or web members inclined less than 30° to the vertical are used, the spacing shall not exceed $d/2$. When the unit shearing stress exceeds $0.06f'_c$ the spacing of the web reinforcement shall not exceed $d/2$ in any case, nor $d/3$ for vertical stirrups or web steel inclined less than 30° with the vertical.

The first vertical stirrup shall be placed not farther than $d/2$ from the face of the support in any case. The first inclined stirrup or bent-up rod shall reach the level of the upper longitudinal steel at a distance not greater than $d/2$ from the edge of the support if the bottom longitudinal steel is adequately anchored and at the edge of the web support if the longitudinal steel is not anchored. Web members may be placed at any angle between 0 and 60 degrees with the vertical, provided that, if inclined, they shall be inclined in the proper direction to take tension, rather than compression, in the web.

Punching Shear—Punching shear shall be figured on a vertical section through the periphery of the smaller member. The unit shearing stress in punching shear, figured on the full depth d to the center of gravity of the reinforcement, shall not exceed $0.1f'_c$.

When the depth of the supported or supporting member is less than one-fifteenth of the span in the case of beams or slabs, or less than one-third of the overhang in the case of cantilevers (including footings), the unit shearing stress in punching shear shall not exceed $0.06f'_c$.

More Light on Protecting Concrete Against Fire

Tests Show That Limestone Aggregate Is Highly Fire Resistant and That Mesh Helps Siliceous Aggregate

From the report of the Committee on Fireproofing, American Concrete Institute, presented at the annual convention, Chicago, Feb. 16-18, 1920.

IN FIRE tests of concrete columns made at the Bureau of Standards at Pittsburgh, extensive spalling has invariably taken place in the fire tests of hooped columns from highly siliceous gravels, made in the usual way. Most of the columns tested have had a thickness of 1½ in. of protective concrete over the steel. Two columns from Pittsburgh gravel, with 2½ in. of protective concrete, gave results that were distinctly better than those with protective concrete only 1½ in. thick, and yet so poor, in comparison to those shown by columns from more favorable aggregates, with 1½ in. of protective concrete, that the expedient of securing better protection in the case of columns from highly siliceous gravel, by providing an unusual thickness of protective concrete, does not seem worthy of recommendation. On the other hand, the two columns from Pittsburgh gravel, with a thickness of 1½ in. of protective concrete, reinforced by a light grade of expanded metal, of large mesh, to prevent the loss of protective concrete by spalling, gave fairly satisfactory results. While the results of the test of these columns were not as good as those from columns from limestone, traprock and blast furnace slag aggregates, the loss of strength in the four-hour fire test, as determined by loading to failure in the furnace while the column was still hot, was less than 60 per cent in both cases, which presents a strong contrast to the results from columns from the same aggregate, Pittsburgh gravel, without reinforcement in the protective concrete, which failed under the working load before the four-hour fire test was completed.

Columns from Pittsburgh gravel, with 2½ in. of protective concrete, with light expanded metal reinforcement in the outer concrete to prevent the loss of protective concrete by spalling, could not be loaded to failure in the furnace, at the end of the four-hour fire test, due to the fact that their strength exceeded the load limit of the furnace equipment, which is equivalent to a stress of approximately 3,480 lb. per square inch on the effective area of these columns. When tested cold, after fire test, in a testing machine of high capacity, these columns showed an ultimate strength only slightly lower than that of a similar column, which had not been subjected to fire test. Judging from these results, it would appear that if the protective concrete of columns from highly siliceous gravel aggregates were reinforced with expanded metal so as to prevent loss of protective concrete by spalling, they would be sufficiently protected by the thicknesses of protective concrete recommended fer different conditions in the last report of this committee. The expedient of providing such reinforcement in the protective concrete of columns made from highly siliceous gravels is accordingly included among the recommendations for columns.

Two gravel concrete columns, in which the aggregate was low in quartz content, have been fire-tested. Approximately 90 per cent of the gravel was made up of limestone pebbles and there was a high percentage of limestone in the land. The columns had 1½ in. of protective concrete with no expanded metal. These columns showed no tendency to spall in the fire test and gave comparatively good results in other respects. Neither of them failed under the maximum furnace load when tested hot at the end of the four-hour fire test. When tested cold, after the fire test, the ultimate strength was found, in both cases, to be more than 75 per cent of that of a similar column, which had not been submitted to fire test. These results indicate that gravels and sands that are very high in limestone content are suitable for use in fire-resistive concrete. It is probable that all gravels that are low in quartz may prove, on investigation, to be free from the spalling tendency. How high a proportion of quartz can be included in gravels without the resulting concretes spalling under fire test conditions cannot be determined from the tests thus far made. The evidence now available appears to be sufficient, however, to justify the recommendation that gravels high in limestone content be given a preference, for fire-resistive concrete, over highly siliceous gravels.

The recommendatons of this committee may be stated as follows:

1. That in concrete columns where four-hour protection is required, protective material not less than 2 in. in thickness shall be provided over the steel. In columns in which a high percentage of steel is used, increasing the importance of affording it ample protection, the thickness of protective material shall be 2½ in. for four-hour protection, and special care shall be given to the accurate placing of the steel in the forms, to avoid inadequate protection on any side.
2. That for fire-resistive construction, limestone, traprock, blast furnace slag, well burned clay and gravels composed largely of limestone pebbles be given a preference over highly siliceous gravels.
3. That where highly siliceous gravel aggregate is to be used, in columns without hooping, and with no special

safeguards, round columns be given a preference over rectangular ones.

4. That where highly siliceous gravel aggregate is to be used, all columns, but especially rectangular columns and round columns with spiral reinforcement, be safeguarded by means of one of the following expedients:

(*a*) Placing expanded metal or other high weight large mesh reinforcement in the outer concrete to prevent the loss of protective concrete by spalling.

(*b*) Giving columns additional protection of approximately 1 in. of cement plaster, either on metal lath or reinforced with light expanded metal or other suitable material.

Highway Paved for Only Half Its Width, Pending More Funds

ON THE theory that "half a loaf is better than no bread" a portion of the Siskiyou grade in southern Oregon was paved for half its width at a time when funds for paving the entire road were not available. The maintenance problem has long been more serious on this particular stretch than on any other part of the Pacific Highway which is the through route followed by Washington-California traffic. It is the only approach to the Siskiyou Pass (where the California line is crossed), includes some of the heaviest grades on the through route and lies in non-tributary territory.

OREGON HIGHWAY PAVED FOR HALF ITS WIDTH

The 8-ft. strip of 6-in. concrete was laid on the inside of the graded bench, the plan being to place another width beside this later on. By this expedient motorists traveled on pavement instead of a bad mountain road for a considerable period.

Motion Study of Side Launching of 6,000-Ton Vessel

Experimental Research for Fleet Corporation Gives Accurate Record of Positions and Immergence of Ship

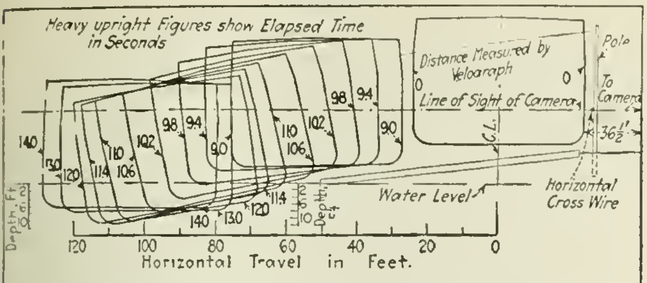
CAREFUL instrumental observations of the behavior of a 6,000-ton steel vessel during side launching were conducted by the research engineers of the Emergency Fleet Corporation recently, at the yard of the Merrill-Stevens Shipbuilding Corporation, Jacksonville, Fla. The vessel on which the observations were made was the steamship "Wekika," a hull of length 334 ft. 6 in. between perpendiculars, molded depth 27 ft. 6 in., molded beam 48 ft., and light draft 7 ft. 4 in. The ship, when completed, will weigh 2,400 tons, but its weight at launching was about 2,100 tons, and the draft at that time 4.55 ft. forward and 8.55 ft. aft. The primary reason for making the observations was to determine the maximum immergence of a vessel in side launching, as both at this yard and at some others much money and labor could be saved if the dredging for the slips could be limited to the minimum required.

The information given in the present article, together with the diagrams reproduced, was obtained from a full report (unpublished) of the tests, made to the Emergency Fleet Corporation by T. R. McMillan and H. R. Thomas, Research Engineers for the corporation.

The main instruments used for the observations were a modification of the "strainagraph" used by the same department in studies of stresses in ships, and the pitch-and-roll recorder used in connection with the same work; certain auxiliary instruments were also arranged, and very valuable use was made of a motion-picture camera. The modified strainagraphs were used as recording instruments to trace a record of the movement of the ship down the launching ways, as furnished by the revolutions of a wheel from which was unreeled a cord attached to a fixed point on the bank, the instruments being on the ship. A time scale was obtained by deflections of a separate pen on each recorder, actuated through electric contact made by a clock supplemented by auxiliary time-indication means.

Several recording pressure-gages, of the type devised for measuring the pressure of water at some particular point of the ship below the water line, which had been used in connection with studies of ship stresses as affected by wave action, were attached to points near the bilge of the ship in the hope of obtaining from them a true record of the vertical position of the ship with respect to water level during its plunge. The results were not altogether satisfactory, however; the best data for vertical position were derived from pictures made by a motion-picture camera set up on land, properly leveled, and directed at a large target of level-rod style painted on the side of the ship; a horizontal wire stretched in front of the camera gave a reference line by which this target could be read. Incidentally, these exposures of the target furnished an excellent check on the distance measurements, since the size of the target image in the successive pictures yielded, by computation, a value for the distance to the ship.

A graphical summary of all the essential data on the motion of the ship derived from the measurements is presented in the "launching diagram" Fig. 1, herewith In this are plotted successive positions of the 'midships



TABULATED DATA

Elapsec' Time-Seconds	9.0	9.4	9.8	10.2	10.6	11.0	11.4	12.0	13.0	14.0
Distance by Velograph-Ft.	52.0	59.1	67.3	75.5	83.7	91.5	95.5	97.4	100.7	104.6
Angle of Roll - Degrees	0° 0'	2°10'	7° 0'	11°20'	13° 0'	12°50'	11°30'	8° 0'	0°	-2°40'
Vert Drop by Camera-Ft.	5.7	5.9	5.9	7.0	8.8	11.4	12.7	15.7	18.3	18.5
Mean Draft - Feet	0	0	0	0.7	3.5	6.1	7.1	8.4	7.9	6.9

FIG. 1. MOTION OF STEAMER "WEKIKA" IN SIDE LAUNCHING AS DETERMINED BY MEASUREMENTS

cross-section of the vessel according to distance, height and slope data from the measurements. The ringed figures adjacent to the successive outline represent seconds from the moment of starting.

At 9.0 sec. after release, the hull was still level, but just about to leave the ways. At 9.4 sec. it had already begun to tip, the center-line portion of the cradle having gone off the ways. All the successive sections from 9.0 to 11.4 sec. in the diagram represent equal time intervals of 0.4 sec., so that the spaces between the successive outlines give a representation of the speed of motion of the hull. It will be seen that although the outboard bilge dipped into the water just before 9.8 sec., this immersion did not check the speed of the vessel, though it soon brought the tipping action to rest. From about 10.2 sec. to 11.4 sec., this latter being practically the time of maximum immergence, the outward inclination of the hull remained about constant, the vessel sliding steadily deeper into the water. In spite of this the speed appears to have increased, until very near to the time of maximum immergence, when a retarding effect seemed to develop quite suddenly, especially at about 11.4 sec., when the inboard bilge got well under water.

A quite different graphical record of the observation results is given in Fig. 2, which represents plotted values of velocity acceleration and coefficient of friction, on a base of time as well as on a base of distance. As will be seen, the maximum velocity of the hull reached nearly 20 ft. per sec.; the acceleration, which throughout most of the launching movement was quite constant, was a little over 2 ft. per sec. at the maximum; and the friction coefficient after the start was about 0.046.

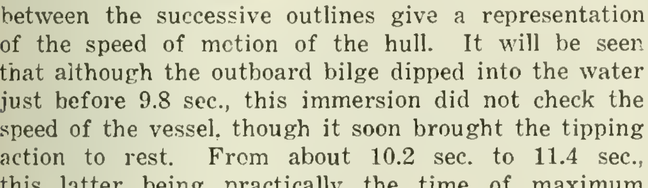


FIG. 2. VELOCITY, ACCELERATION AND FRICTION-COEFFICIENT LAUNCHING OF "WEKIKA"

One curious feature of the launching movement was that the hull left the end of the ways parallel to its initial position, although at an intermediate stage of the movement it was several feet out of line. The bow started considerably quicker than the stern, it appears, possibly due to slightly greater inclination of the ways near the bow. After a time, however, the stern portion caught up with the bow, and thereafter the movement was parallel to itself. The authors of the report concluded that the greater intensity of pressure under the cradles near the stern reduced the friction coefficient here considerably below that of the bow cradles, this fact accounting for the catching up of the stern. The average pressure of the ship on the grease was about 1.6 tons per sq.ft., though the precise values of pressure in the forward and after portions are not known. Just before the ship left the ways, the grease heated to the smoking point, and from the motion curves a material increase in friction on the after ways between 10 ft. and 35 ft. of travel was deduced. This possibly is chargeable to thinning out of the grease under pressure, with simultaneous heating.

Developing Water Storage on Two California Streams

Schedule Has Been Prepared for Construction of Storage Reservoirs on San Joaquin and Kern Rivers Covering Next Eight Years

COMPREHENSIVE plans for developing water power on the San Joaquin and Kern Rivers in Southern California have been laid out by the Southern California Edison Co. The schedule is arranged to fit the company's needs as nearly as may be predicted for the next seven or eight years. Estimates have been made for the necessary expenditures year by year and the dates have been set, approximately, on which the several plants are to add this power to the transmission network.

On the Big Creek watershed, which is tributary to the San Joaquin River, two plants, Nos. 1 and 2, are already in operation and seven more are contemplated.

On Kern River a similarly comprehensive schedule has been laid out with dates of completion set as far ahead as 1927. The two plants now operating on that stream are to be supplemented with five more so that ultimately a total of 643,000 kw. will be developed in all seven plants on Kern River. A comprehensive study here has lead to the decision that the use of maximum storage and head, calls for storing water in ten reservoirs. The total capacity of these will be 456,000 acre-feet. With the exception of the smallest, they will all be between 5,000 and 7,500 ft. elevation.

To develop the head for the several plants tunnel work as follows has been tentatively decided upon:

Capacity in sec.-ft....	125	200	300	400	500	600	850	1,000	2,000
Length in Miles......	5	2	6	18	2	30	2	19	11

In both Kern and Big Creek Basins the idea has been to lay out the entire series of plants in sufficient detail to make sure that the program adopted would secure the maximum power from the combination. Then the order of development is decided as the load on the company's lines increases and as the most economical construction plan dictates.

Sequence of Notes for and Calculation of Cross-Section

Orderly Arrangement of Notes Reduces Chances of Error—Generalized Rule Adapted to Other Than Railroad Sections

By O. G. Bunsen
Locating Engineer, Fort Worth and Mineral Wells Interurban Survey

PROPER sequence in field notes for railroad cross-sections greatly reduces the chances of error in computing complicated areas, and makes unnecessary the drawing of the sections. The generalization of the rules for arrangement of notes and computation also adapts them to other than the ordinary forms of railroad sections, thus enhancing their usefulness. The new rules are developments of a rule formulated by the author and published in *Engineering News* of Aug. 27, 1914, p. 457.

For reference in this article, the rule previously published and slightly more generalized will be called in this article Rule B, and a subsidiary rule since developed by the writer, respecting the form and recording of the field notes, will be called Rule A. The latter adopts Rule B to forms of sections or polygons other than the ordinary form of railroad cross-section, thereby enhancing the usefulness and scope of Rule B very materially.

Taking any point as the origin of measurement, and recording the field notes in the usual fractional form in which the denominator is the horizontal measurement, or the distance out from the origin, and the numerator is the vertical measurement, or the height (cut or fill), of the rod reading above or below the horizontal axis through the origin, then the subsidiary rule is as follows:

Rule A—Beginning at any summit of the polygon or section, measure and record its coördinates, and, following the perimeter of the polygon, successively measure and record the coördinates of all its summits, recording last the coördinates of the first summit again.

Then the generalized rule of calculation, Rule B of any section of area A, whether the origin be without, on, or within the perimeter of the section, is as follows:

Rule B—2 A = algebraic sum of the products obtained by multiplying each distance out by the difference of the adjacent heights either side of the distance out, *always* taking the height between the origin and the distance out as the minuend.

The evolution of the rule was as follows:

Fig. 1, of area A, is an ordinary railroad cross-section in cut; k is the height at the center, c, c_2, c_3 and c_4 are also called the end heights; d_1, d_2, d_3 and d_4 are the distance out, b is the half roadbed. O, the origin of measurement, is on the perimeter at the intersection of the center line and the grade line.

Then the usual practice is to write the field notes as shown within the bracket as follows:

$$\frac{o}{b}\left|\ \frac{c_4}{d_4}\ \frac{c_3}{d_3}\ \frac{k}{Sta.\ No.}\ \frac{c_1}{d_1}\ \frac{c_2}{d_2}\ \right|\frac{o}{b}$$

and the rule for calculation to fit this arrangement, as bequeathed to me, is stated:

2A = (sum of the end heights multiplied by one-half the roadbed plus the) algebraic sum of the products obtained by multiplying each distance out by the difference of the adjacent heights either side of the distance out, *always* taking the height between the center and the distance out as the minuend. However, by removing the brackets so as to include o/b at each end as part of the field notes, then all within the parentheses of the above rule is omitted and the rule becomes as printed in *Engineering News*. Again, by writing origin for center, it is the generalized Rule B. In other words the fractional forms o/b are the coördinates that complete the field notes by closing the two polygons into which the section is divided by the center height k. The origin o is the first summit of each polygon, the coördinates of which summit are o/o. It is worth noting that in some railroad sections, b on the left and b on the right are not the same, and including o/b in the field notes prevents overlooking a change in the half roadbed with the resulting error in area.

Case I—Origin outside the perimeter of the section or polygon; this is the most useful case for unusual forms.

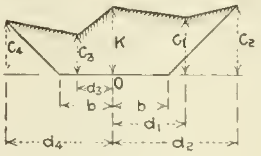


FIG. 1

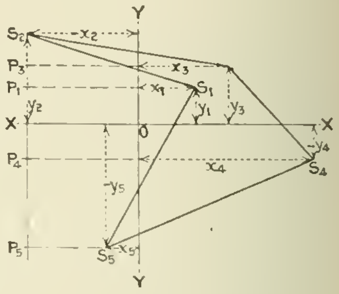


FIG. 2

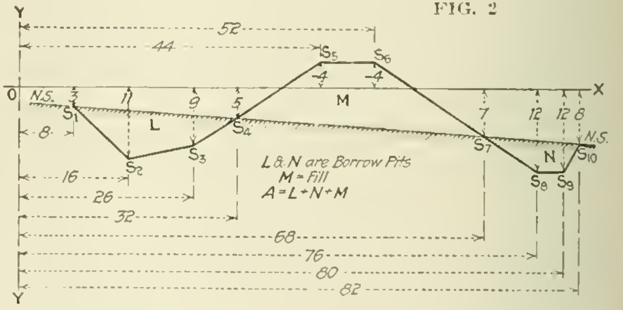


FIG. 3

Fig. 1—Ordinary section in cut. Fig. 2—Section with origin outside the perimeter. Fig. 3—General section showing adaptability of Rules A and B.

Following the conventinoal usage as to signs of coördinates, then, according to Rule A, the field notes for Fig. 2, measuring and recording the coördinates of the summits from S_1 to S_5 inclusive are

$$\frac{y_1}{x_1}\ \frac{y_2}{-x_2}\ \frac{y_3}{x_3}\ \frac{-y_4}{x_4}\ \frac{-y_5}{-x_5}\ \frac{y_1}{x_1}$$

and by Rule B

$$2A = -x_1 y_2 - x_2 (y_1 - y_3) + x_3 (y_2 - [-y_4]) + x_4 (y_3 - [-y_5]) - x_5 (-y_4 - x_1 y_5$$

simplifying

$$2A = -x_1 y_2 + x_2 (y_3 - y_1) + x_3 (y_2 + y_4) + x_4 (y_3 + y_5) + x_5 (y_1 + y_1) - x_1 y_5 \qquad (1)$$

Geometrically

$$2A = 2(s_2 s_3 p_3) + 2 (p_3 s_3 s_4 p_4) + 2 (p_4 s_4 s_5 p_5) - [2 (s_2 s_1 p_1) + 2 (p_1 s_1 s_5 p_5)]$$

or, using the coördinates

$$2A = (x_2 + x_3) (y_2 - y_3) + (2x_2 + x_3 + x_4) (y_3 + y_4) + (2x_2 + x_4 - x_5) (y_5 - y_4) - [(x_2 + x_1) - (y_2 - y_1) + (2x_2 + x_1 - x_5) (y_1 + y_5)]$$

performing the indicated operations and grouping like terms and adding

$$2A = \left\{ \begin{array}{l} x_2 y_2 - x_2 y_3 + x_3 y_2 - x_3 y_3 + 2x_2 y_4 + x_3 y_4 + \\ x_4 y_3 + x_4 y_4 + 2x_2 y_5 + x_4 y_5 - x_5 y_4 + \\ x_5 y_4 - x_2 y_1 - x_1 y_2 + x_1 y_1 - x_1 y_5 + x_5 y_1 - \\ x_2 y_2 + 2x_2 y_3 + x_3 y_3 - 2x_2 y_4 - x_4 y_4 - \\ 2x_2 y_5 + x_5 y_5 - x_1 y_1 \end{array} \right.$$

$$2A = x_2 y_3 + x_3 y_2 + x_3 y_4 + x_4 y_3 +$$
$$x_4 y_5 + x_5 y_4 - x_2 y_1 - x_1 y_2 - x_1 y_5 + x_5 y_1$$

Regrouping and combining

$$2A = - x_1 y_2 + x_2 (y_3 - y_1) + x_3 (y_2 + y_4) +$$
$$x_4 (y_3 + y_5) + x_5 (y_4 + y_1) - x_1 y_5 \qquad (2)$$

identical with Eq. (1) adduced from Rule B.

Cases with origin on and with origin within the perimeter are similarly developed.

In practice, resulting areas frequently show negative, due to the manner of taking the coördinates and the position of the section as regards the origin and axis *OX*, but the result is not invalidated. The example given in Fig. 3, besides illustrating this fact, shows the manner of using Rules A and B and their general adaptability and usefulness. In this figure *OX* is the line of sight (hand level or wye level), and it is natural to make the readings above *OX* (obtained with hand level) negative. The natural surface or N.S. is represented by the hatching

In Fig. 3, areas in cut L and N are positive and area in fill M is negative.

Then A = L + N + M and by Rule A

$$\overset{\textstyle L}{\left(\begin{array}{ccccc} S_1 & S_2 & S_3 & S_4 & S_1 \\ \frac{3}{8} & \frac{11}{16} & \frac{9}{26} & \frac{5}{32} & \frac{3}{8} \end{array} \right)} \overset{\textstyle M}{\left(\begin{array}{ccccc} S_4 & S_5 & S_6 & S_7 & S_4 \\ \frac{-5}{32} & \frac{-4}{44} & \frac{-4}{52} & \frac{-7}{68} & \frac{-5}{32} \end{array} \right)} \overset{\textstyle N}{\left(\begin{array}{ccccc} S_7 & S_8 & S_9 & S_{10} & S_7 \\ \frac{7}{68} & \frac{12}{76} & \frac{12}{80} & \frac{-8}{82} & \frac{-7}{68} \end{array} \right)};$$

then by Rule B.

$$A = L + N + M$$
$$2A = 2L + 2M + 2N$$

2L = (8 − × 11 + 16 × − 6 + 26 × 6 + 32 × 6 + 8 × 5) 2M = (32 × 4 + 44 × 9 + 52 × − 11 + 68 × − 9 + 32 × 7) 2N = (68 × − 12 + 76 × − 5 + 80 × 4 + 82 × 5 + 68 × 8)

$$2A = (- 88 - 96 + 156 + 192 + 40)$$
$$+ (+ 128 + 396 - 572 - 612 + 224)$$
$$+ (- 816 - 380 + 320 + 410 + 554)$$
$$2A = + 204 + (- 436) + 78$$

A = "L" "M" "N"

A = 102 + (− 218) + 39

A = cut of 141 + fill of 218.

Fig. 3 brings out the importance and manner of applying Rule A. In taking the notes in the field, it is likely that the coördinates to S_4 and S_7 will be overlooked, but they must be inserted in the notes to close the polygons L, M and N, either by plotting or by calculation, in order that Rule B may be used. The points S_4 and S_7 correspond to grade points in the ordinary railroad cross-section, but since in such a section the horizontal axis is the grade line and the center or origin is the first summit, the first coördinates are %, and the coördinates to a grade point close the polygon and therefore do not have to be repeated as in the more complex case of Fig. 3.

To sum up, the value of the combination of Rules A and B consists in this, that, having adhered to Rule A in recording the notes for a section of unusual form, or of one in which the position of the origin and the measurement to summits is out of the ordinary, one can be absolutely sure that Rule B will give the area of that section and that there is no need of worry or loss of time in drawing a diagram to satisfy oneself by solving triangles and trapezoids. Take, for example, a section that includes several tracks, borrowpits, spoilbanks, ditches etc.—such sections are ordinarily plotted on cross-section paper and measured with a planimeter, but if a little care in following Rule A is exercised in the field and such points as S_4 and S_7 of Fig. 3 are recorded and the names of the various areas of the section are properly noted, this extra, very considerable work and errors inherent in planimeter work can be avoided by using Rule B. Even where it is necessary or desirable to plot such sections for the purpose of studying the ground and the distribution of material, or for obtaining other information that such pictures give, the areas can still be expeditiously calculated by Rule B from the original field notes far more accurately than they can be measured with a planimeter operated under the usual conditions.

National, State and Municipal Forestry

A FORESTRY program for the United States that takes in states and municipalities as well as the Federal Government has been formulated by the Forest Service of the United States Department of Agriculture, which is issuing circulars dealing with the subject. The Forest Service states that there are in the United States today 100,000,000 acres of idle forest land and that in addition we are "throwing several million acres more of forest land into idleness every year by forest fires and by destructive methods of lumbering." Federal legislation suggested by the Forest Service includes provisions for an extension of Federal forest holdings; co-operation with states in fire protection and silviculture; an appropriation to enable the Secretary of Agriculture to investigate forest taxation practices and to co-operate with state agencies in bringing about improved methods of forest taxation; congressional legislation extending the existing farm loan systems "to include loads for a maximum period of six years for the purchase or improvement of forest land cut over or bearing immature growth"; co-operation with the states in determining what lands are suited to agriculture and to silviculture; and forest surveys and research carried on by the Federal and state governments co-operatively. State legislation is suggested to enable both states and cities to acquire forest lands, particularly cut over areas, and to begin systematic upbuilding of forests. The circular urges that emphasis should be placed upon the value of state and municipal forests for recreation purposes and for the protection of municipal water-supply gathering grounds.

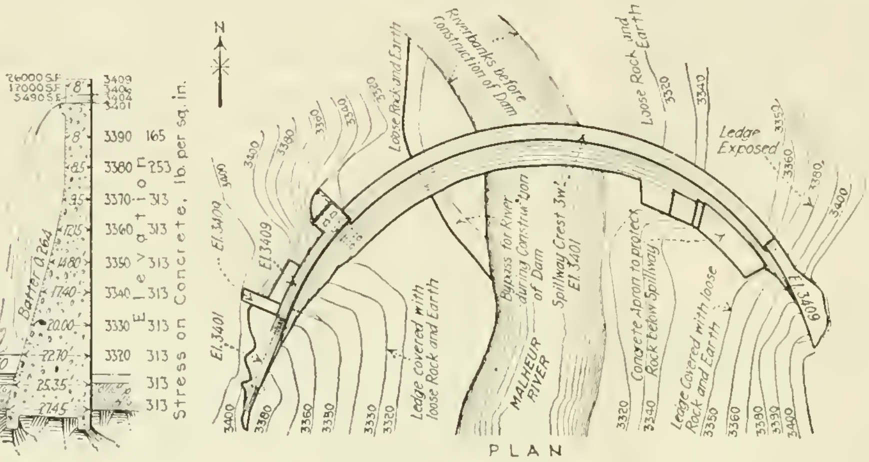
Premixing No Benefit in Concrete

To determine the benefit to strength due to mixing of cement and water for a long period (15 to 30 minutes), and then adding aggregates to produce a concrete instead of the ordinary method of mixing cement, aggregate, and water together for one or two minutes, comparative tests were made last year by the United States Bureau of Standards. The strengths obtained were about the same with the same materials and conditions, indicating that there is no advantage in long premixing of cement and water from the standpoint of strength.

Design Details and Field Methods on Thin Arch Dam

Straddling Trestle Method of Construction Used on Warm Springs Concrete Dam in Oregon—Cobbles Used in Aggregate—Contraction Joints and Drain Pipes Provided

ANOTHER concrete arch dam has been built in the Far West by the use of the straddling trestle such as was described in the Kerhoff dam, *Engineering News-Record*, Feb. 26, 1920, p. 421. This is the Warm Springs dam on the Malheur River in Eastern Oregon, six miles from Riverside. Other features of the structure, which is to impound 170,000 acre-feet of water for irrigating 40,000 acres in the vicinity of Vale and Ontario, are the methods of securing the forms to the struts, the experience with basalt as an aggregate, the use of large-size aggregate rather than plums and the provision for future grouting of the foundation.



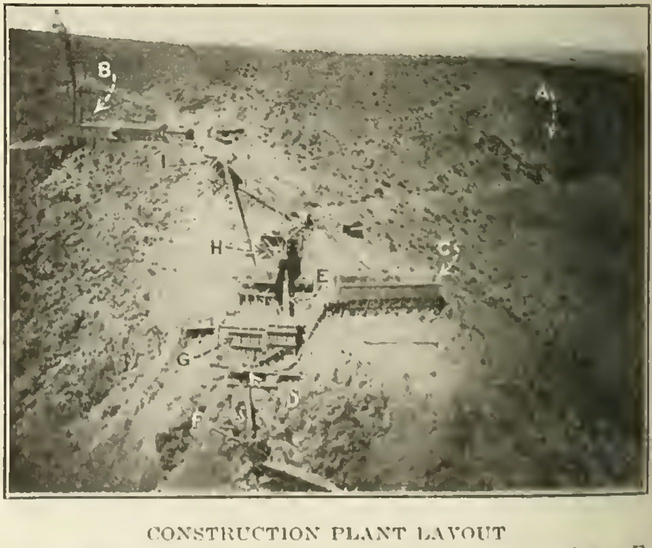
WARM SPRINGS DAM—PLAN AND SECTION SHOWING STRESSES

Completion of the structure insures water to 12,000 acres partially irrigated and 17,000 acres of new land. The remainder of the 40,000 acres is bench land west of Vale and must be supplied by pumping. An alternative plan is to sell this surplus water to the Harper Irrigation District, now being formed 30 mi. upstream from Vale. The reservoir supplements an average direct flow of 60,000 acre-feet from Malheur River. Runoff from the 800 sq.mi. of catchment areas is based on observations from 1914 to 1915. With net evaporation loss from the reservoir estimated at 4 ft. per year and seepage 6 ft. (none estimated to return to the river above the headgates), a yearly diversion of 110,000 acre-feet can be obtained from a capacity of 170,000 acre-feet storage. Had the reservoir been constructed in 1903 the mass diagrams indicate there would have been a shortage 3 years out of 14 for which records were available, the maximum shortage being 10 per cent. Duty of water adopted is 3 ft. in depth on the land during the irrigating season. Distribution losses are estimated at 20 per cent of the water taken out at heads of the main laterals. In main canals, seepage loss for earth sections was estimated at 1 ft. in depth per day over the wet area of canals, and for concrete-lined canals 1 in. in depth.

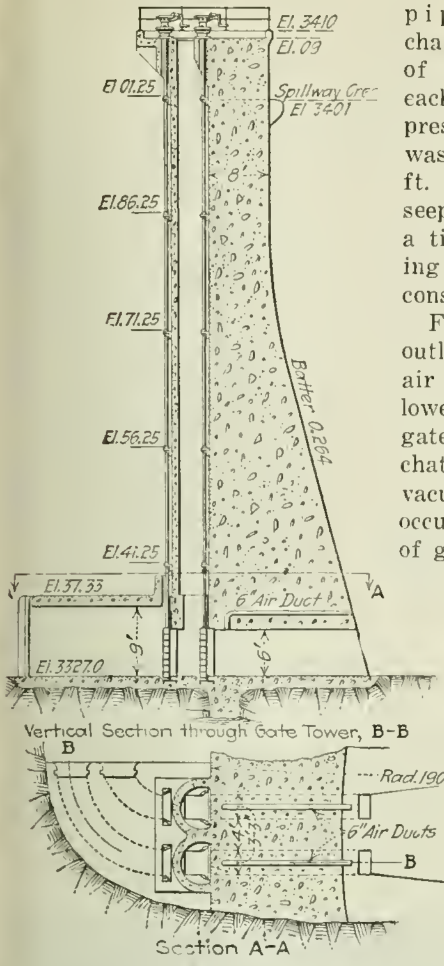
On top the dam is 549 ft. long, the curved portion being 469 ft., and at the bottom 200 ft. The width at top is 8 ft. and at bottom 27.24 ft. A spillway 324 ft. long, with a freeboard of 8 ft., provides for a runoff of 12,000 sec.-ft. with a depth of 5 ft., or more than double the maximum recorded flood, the highest runoff of record being 5,490 sec.-ft. The dam was designed according to the constant-angle arch theory as propounded by L. R. Jorgensen in the "Transactions" of the American Society of Civil Engineers, vol. LXXVIII, p. 685, 141° 25′ being adopted instead of the theoretical 133° 34′. Fitting this to the contours a maximum upstream radius at the top of 190 ft. is obtained, and as the site is U-shape rather than V-shape, this radius was kept for the upstream face. Transitions to the shorter radii at the bottom of the downstream face are barely noticeable. The shortest radius is 163 ft.

Choice of the arch type over a gravity dam was affected by the mounting cost of materials. In the report, in 1916, on the project by John T. Whistler and John H. Lewis under a co-operative agreement between the U. S. Reclamation Service and the State of Oregon, the cost of a single arch was estimated at 93 to 95 per cent of the cost of a gravity dam. As there was so little difference at that time, the gravity type was recommended. The advancing cost of material and labor, however, made a much greater saving in the use of a single arch. Caring for ice thrust over the whole face of the multiple-arch type was considered too difficult, although the cost in the report was estimated to be 85 to 87 per cent of the gravity type. Stresses in the concrete dam as constructed were held down to 22½ tons per sq.ft.; about 1 ton less than that in the Lake Spaulding dam and in the Salmon Creek dam, Alaska, reported in Mr. Jorgensen's paper.

Four contraction joints divide the dam into approximately five even sections. They are drained by 4-in.



CONSTRUCTION PLANT LAYOUT
A, quarry; B, power house; C, cement shed; D, mixer; E, cobble chute; F, concrete chute; G, sand and gravel bins; H, rock crusher; I, gravel chute; J, unloading platform.

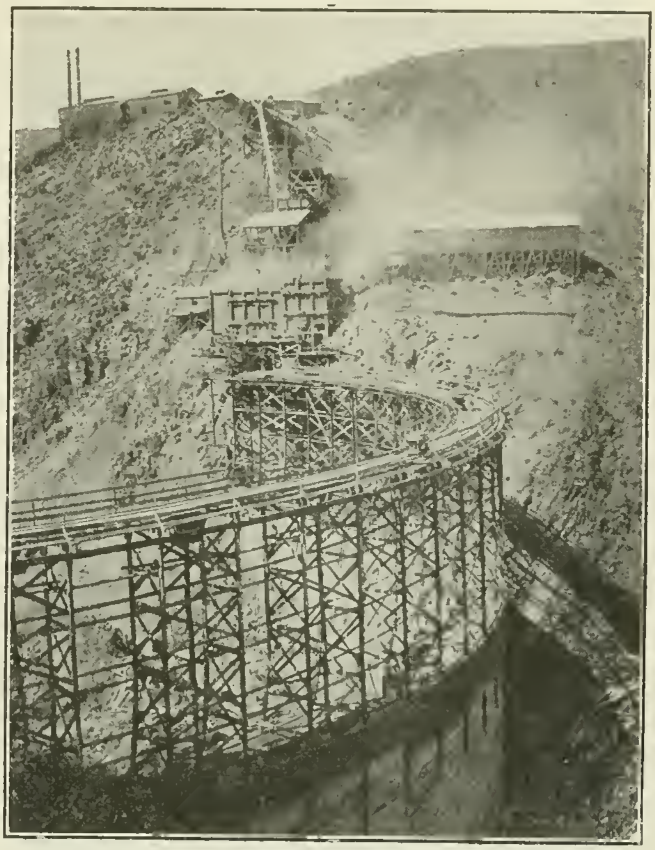


GATE TOWER SECTIONS

pipes which discharge at the base of the dam. Along each joint, a depression 6½ in. deep was constructed 2½ ft. wide to cut off seepage, and act as a tie to the adjoining section when constructed.

Features of the outlet works include air vents below the lower set of sluice gates to prevent chattering from any vacuum that might occur. The first set of gates will get air through the extension of the reinforced semicircular valve chamber in which the valve stems of the second set rise to the operating stands on top of the dam. Entrance of water to the gates is through a forebay structure, the stop-planked inlets to the latter being at right angles to the face of the dam, the water making a quarter turn so as to pass at right angles through the dam in two openings 3.25 ft. wide by 6 ft. high. This quarter turn brings the conduits through the dam near one end, where the dam is firmly imbedded in the solid rock.

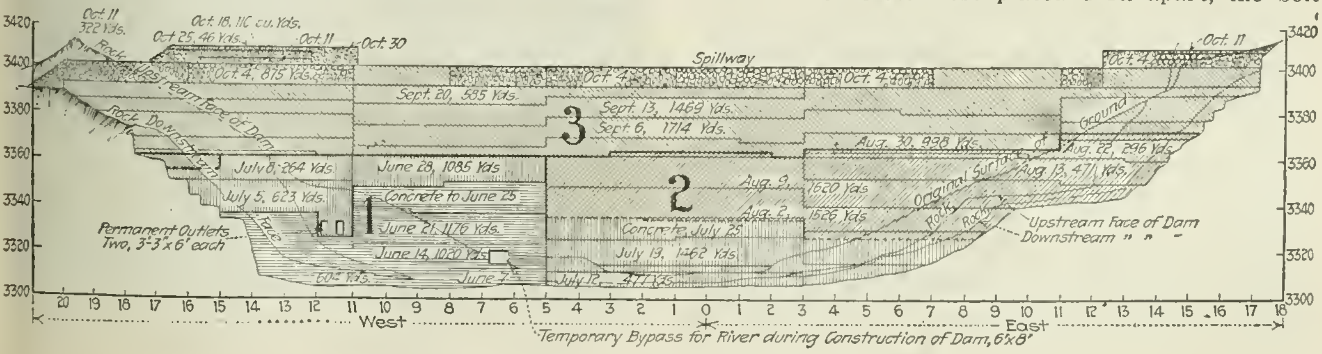
Clearing the foundation was a somewhat simpler process than anticipated, as the bedrock was closer to the surface than the original investigations indicated. This saving was accomplished by moving the dam a few feet above the original location, as indicated by preliminary excavation work. Bedrock consisted of a close-grained basalt with fine seams filled with putty-like clay. To insure tightness, should leakage develop, 2-in. pipes coming to the surface through which drilling may take place for grouting are spaced on 6-ft. centers the length of the dam on its downstream face. Water forced through a hollow bit and drill rods, when boring test holes, returned in all cases except one, and that was above bedrock, this indicating tight seams.



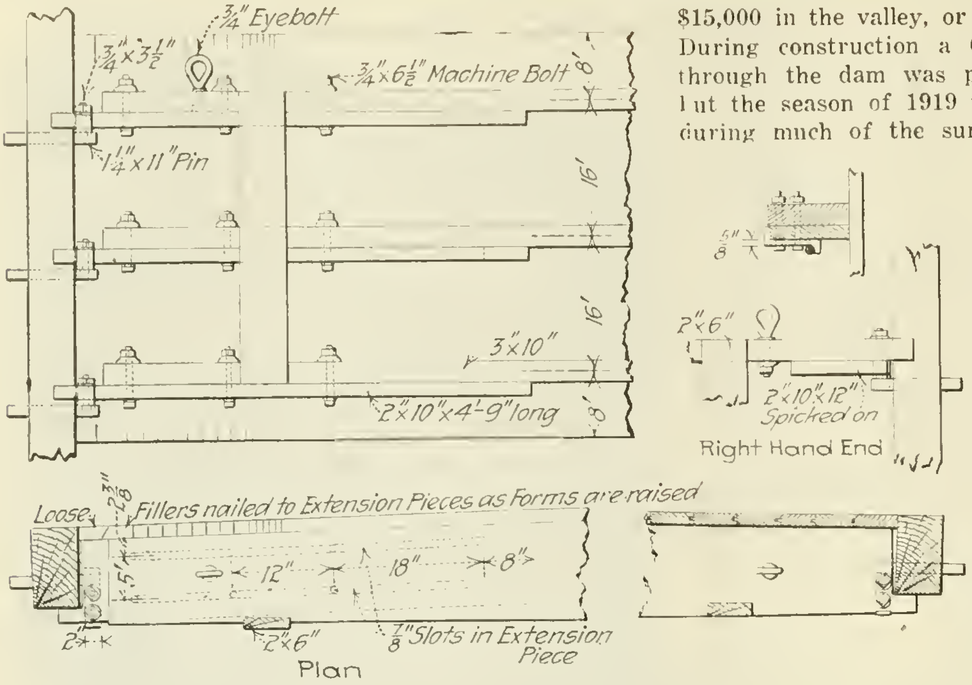
CONCRETING FROM THE FULL HEIGHT TRESTLE

Deposition of the concrete was from the top of a trestle spanning the dam section, mounted bottom-dump buckets discharging through an 8-in. flexible iron pipe. The trestle was built in two lifts, the concrete plant being located at one end sufficiently high so that the discharge from the 1-yd. mixer was directly into the buckets on the top level.

Form sheets 4 ft. high and 14 ft. long for the faces of the dam were fitted in place between the legs of the trestle and held there by dowels through the legs. Special forms had to be constructed only adjacent to the gate tower. The accompanying sketches illustrate the details of the manner in which the lugs were secured over the dowels, and how the length was made adjustable by an extension piece on the wales to fit the varying radii of the downstream face. The upstream face was of constant radius, so did not need an extension piece. Anchors holding the trestle legs to the finished concrete were placed 4 ft. apart, the bolt



PROGRESS PROFILE INDICATES ORDER OF WORK



DOWNSTREAM FACE FORMS—WARM SPRINGS DAM

through the trestle leg being secured over the anchor proper, the outer end of which came just to the concrete surface. Enough form sheets were provided to pour two full sections the length of the dam. They were handled from a platform swung from a trolley supported by cantilevers extending out either side from the top of the trestle. Each day's work of depositing concrete approximated 2 ft. in depth and was continuous in each section between expansion joints.

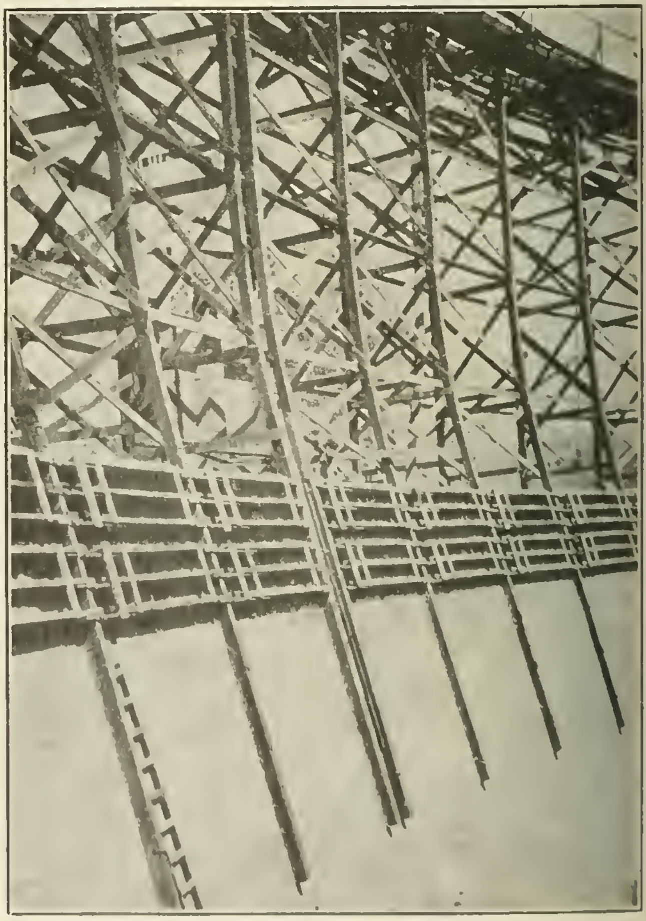
Cobbles Mixed in Concrete

Getting a fine aggregate was one of the largest problems. Crushing the basaltic rock, which was obtained from a ledge about 500 ft. upstream from the construction plant, by shooting it over a Swede trap, was not found to be a success, in that it would pulverize when put through the sand rolls. This verified trials with basalt at other construction plants in the lava country, but sand was so inaccessible, or was thought to be, that the experiment with the local rock was considered worth trying. As the amount the plant could produce was the "neck in the bottle," restricting the concrete to about one-fourth of that expected, diligent search made for river sand resulted in locating a bank of quartzite gravel 4,000 ft. away. This was run through a No. 3 crusher and the sand rolls, and by operating the crushing plant 18 hours per day enough aggregate was provided to run the concrete gang for 9 hours. The 19,412 cu.yd. of concrete were placed in 107 days, averaging 181 cu.yd. per day, with a maximum of 312 cu.yd. in 9 hours.

Aggregate up to 6 in. was used rather than plums, as it could be run through the mixer and did not require any extra equipment in placing. The mixture was 1 cement to 2½ sand to 5 crushed rock to 2½ cobbles up to 6 in. The heavy section of this dam contained about 30 to 35 per cent of these cobbles, while at Arrowrock it was 27 per cent. Throughout the whole construction period labor was hard to get and hold. The contractor, the Shattuck-Edinger Co., expended $11,000 for procuring labor at the dam and $15,000 in the valley, or a total of $26,000 to Oct. 25. During construction a 6 x 8-ft. temporary opening through the dam was provided to carry the runoff, but the season of 1919 was the dryest of record and during much of the summer and fall the river was practically dry. The order in which the work was carried on and the progress per week are shown in the progress profile. The area marked 1 being carried on first while the trestle for 2 was erected. This first section contained the bypass and was constructed while there was still some flow in the river. While 2 was being deposited, the trestle was erected up to the full height over the first runway.

By months the yardage deposited was as follows: June, 3,372; July, 4,656; August, 4,583; September, 5,120; October, 1,608; and November, 73.

The construction of the dam was carried on at the same time as the work on the distribution system, both being under the direct charge of John H. Lewis, engineer-manager of the Warm Springs Irrigation District. A. J. Wiley, Boise, Idaho, was consulting engineer.



TRESTLE LEGS AS RIBS AND FORM SHEETS ON CONCRETE ARCH DAM

Professional Plagiarism

—*An Indictment*

By P. B. McDonald
Assistant Professor of English, College of Engineering, New York University

AMONG professional men the most persistent plagiarists are college graduates, and the barest-faced offenders of all are university professors. Men who have attended college seem to have absorbed the idea that writing a professional paper means procuring books on the subject and copying promiscuously; sometimes acknowledgment is made of the source, often it is not—especially it is likely not to be made when a deep or subtle idea is purloined, an idea that the originator perhaps labored for years to develop.

Perhaps the system that produces "doctors' theses" in our universities is responsible for the readiness with which unimaginative but laborious scholars help themselves to extracts from original sources, and, having added ponderous, vapid comments, publish the "dissertation" or "disquisition" as a monument to their own perspicacity. Frequently there is not a single original idea in a "doctor's thesis."

A writer in *Engineering Education* recently labeled such thefts "unconscious plagiarism." This writer was too amiable. When a national and ethical law is violated stupidly, why call the offender "unconscious"—stupidity is usually unconscious, even if college professors are the offenders. One of the worst cases of plagiarism on record was committed by a clergyman. He wrote a book on mathematics in which page after page was produced exactly as they had originally appeared in a work by a well-known professor of Columbia University, and no acknowledgment of the source was made. That the offender was a minister of the gospel no more condones the act than does a college education; the offense only seems the worse.

Engineers should be particularly careful not to plagiarize. If engineering ethics apply to anything, they apply to the professional acknowledgment of new ideas. Unfortunately, the devising mind frequently belongs to a modest dreamer who gets elbowed out of his due reward by a pushful fellow who steals the idea and stands on the loud pedal. Who really gave the mining industry the knowledge that is saving thousands of tons of metals by oil-flotation? No one seems to know, but a very hoggish British corporation (which certainly did not supply all the knowledge) is collecting the large royalties. Who invented the "tanks" used by the Allies in the War? A dispute has arisen in London over that very question. Such cases certainly do not show that the standard of engineering ethics is very high; they indicate that many minor injustices are occurring constantly, and that engineers are no more averse to stealing ideas than are clergymen and college professors.

How Some Books are Written

Plagiarism in engineering books is by no means uncommon. When an engineer writes a book disclosing some new idea or method, it is usually not long before several imitators have on the market books that are as similar as possible to the original work without actually copying it verbatim. The offended author and publisher dislike to start an expensive law-suit; and not infrequently the imitating has been so camouflaged that, though the author sees exactly how it was done, he would have difficulty in explaining the technicalities of the case to a judge or jury. What is needed is a stricter sense of what is right and just among professional men. An originator or inventor should be acknowledged and rewarded wherever it is possible to do so, even though he be an unknown underling or an eccentric amateur, and no pompous shouter should be allowed to defraud the man who deserves the reward.

Engineering and scientific societies in every part of the world should make special efforts to see that justice is done in apportioning credit for original ideas, and they should volunteer their services and records to assist the Government in awarding patents and copyrights. That an inventor is not a member of the particular society should make no difference in the energy with which the organization fights for fair play and professional justice. Many inventors belong to no society and lack influential friends. It is surprising to reckon up how many world-changing ideas have been developed in obscure garrets and private workshops; and it is even more surprising to consider how many of the inventors were never rewarded for their extraordinary work.

An Old Case

Of course, professional plagiarism is not new. Students of the history of science will recall the famous case of Cardan and Tartaglia, two rival professors of mathematics in Italy during the sixteenth centry. Tartaglia (The Stammerer) had discovered a solution of cubic equations of the form $x^3 + qx^2 = r$. Cardan, an exceedingly clever but unscrupulous astrologer, succeeded in worming the secret from Tartaglia, after swearing a solemn oath not to reveal it; he then published the solution as his own in his *Ars Magna* of 1545. In those days it was customary to keep scientific discoveries secret. Today a more generous spirit is current, but the old tendency to plagiarize still lingers. In the time of Pythagoras, a stricter code of ethics prevailed. Thus "Hippasus (W. W. R. Ball: *A Short History of Mathematics*, p. 20) is said to have been drowned by his fellow Pythagoreans about 470 B. C. for violating his oath by publicly boasting that he had added the dodecahedron to the number of regular solids enumerated by Pythagoras."

While mentioning classical scientists, an ancient opinion on a professional attitude of mind might be quoted as an explanation of plagiarism in all ages. Of Apollonius, "the great geometrician" of the first Alexandrian school, Pappus said he was "vain, jealous of the reputation of others, and ready to seize every opportunity to depreciate them." Human nature remains much the same after two thousand years. Plagiarism may be due partly to carelessness, but without doubt it is partly the result of professional jealousy.

Steaming Ties Increases Absorption

By preliminary steaming in the treatment of air-seasoned ties, according to specifications of the United States Railroad Administration in the Burnetting (zinc) and Card (zinc-creosote) processes, the absorption was materially increased over that obtained in regular previous practice. In red oak ties the increase was 12.6 per cent and in sap pine ties 52.2 per cent, according to figures presented at the recent meeting of the American Wood Preservers' Association by S. S. Watkins of the Watkins Creosoting Co.

Impounding Reservoir for Water Supply of Oklahoma City

Masonry Dam and Embankments, With Feed and Flood-Control Works, Spillways and Wasteway — Intake Conduit Through Dam

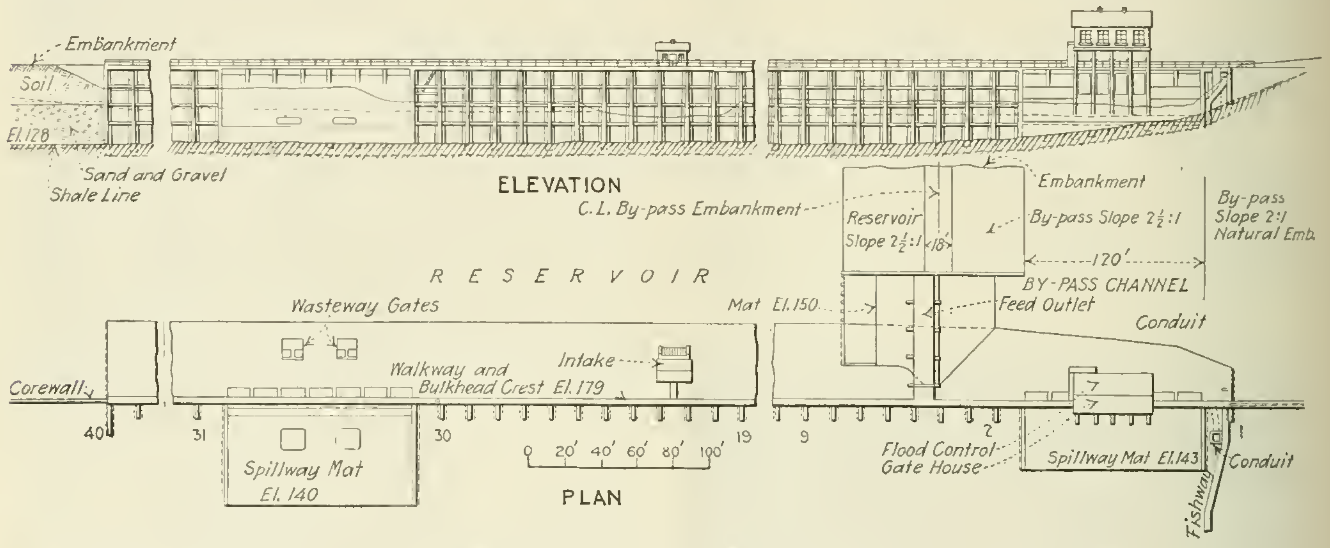
DEVELOPMENT of a natural basin as a storage reservoir, and provision of a channel to carry normal flow outside of this, but with automatic discharge of excess flood water through the reservoir, are the main elements in the design of the new works for a water-supply from the North Canadian River for Oklahoma City.

A dam closing the river channel forming the natural outlet of the basin creates a reservoir about 1½ x 2½ miles, covering 1700 acres, with from 8 to 26 ft. of water and having a capacity of about 7,000,000,000 gal. Above this and separated from it by the embankment built for an electric interurban railway is an extension of the basin having an area of about 800 acres and a capacity of 3,000,000,000 gal. From this basin a bypass channel extends parallel with the east side of the reservoir, being separated from it by an embankment and closed by the main dam, where gates are provided for regulating the flow. From the reservoir a 42-in. concrete conduit 7½ miles long, with a gravity flow of 21,000,000 gal. per day, extends to the filter plant just west of the city. This plant has a capacity of 8,000,000 gal. daily and includes a 20,000,000-gal. clear-water well from which the pumping engines take their supply. The conduit has elevations of 158 and 142.16 at the dam and filter plant, respectively.

Normally, the river flow will be through the bypass channel, at the end of which it will be diverted laterally into the lower end of the reservoir or discharged into a wasteway which enters the old river channel about 1200 ft. below the dam. In the upper end of the bypass embankment is a concrete dam serving as a spillway, so that in case of severe floods the water in the channel will flow over this emergency dam into the reservoir and escape over the spillway section of the main dam. As the winding condition of the river enables flood warning to be given two or three days before the flood reaches the reservoir, the gate operators would draw down the water in the reservoir by the wasteway culvert, if necessary, in advance of the flood.

The bypass channel, about 2½ miles long, has a bottom width of 120 ft., a depth of 20 ft. and a fall of 0.8 ft. per 5000 ft. Its upper end widens to 167 ft. at the intake, which is just above the railway embankment utilized as a diversion dam. This channel is separated from the reservoir by an earth embankment 18 ft. wide on top, with slopes of 1 on 5 for the reservoir side and 1 on 3½ for the channel side. At the upper end of this embankment is the emergency dam, which is a concrete structure 180 ft. long, built on a continuous mat or footing. In this is a gate 3 x 12 ft., with its longer side horizontal, the gate being made to open by lowering so that its upper edge forms the sill of the opening. This gate is provided mainly for the purpose of supplying water to the upper end of the reservoir, thus supplementing the main supply at the lower end and enabling circulation to be maintained.

The main feed gates from the channel to the reservoir are placed in a reinforced-concrete structure 100 ft. long, connected with and at right angles to the main dam and forming the end of the bypass embankment. In this are located four 4 x 6-ft. gates for regulating the supply to the reservoir.



LAYOUT OF NEW RESERVOIR AND CONTROLLING WORKS FOR WATER-SUPPLY OF OKLAHOMA CITY, OKLA.

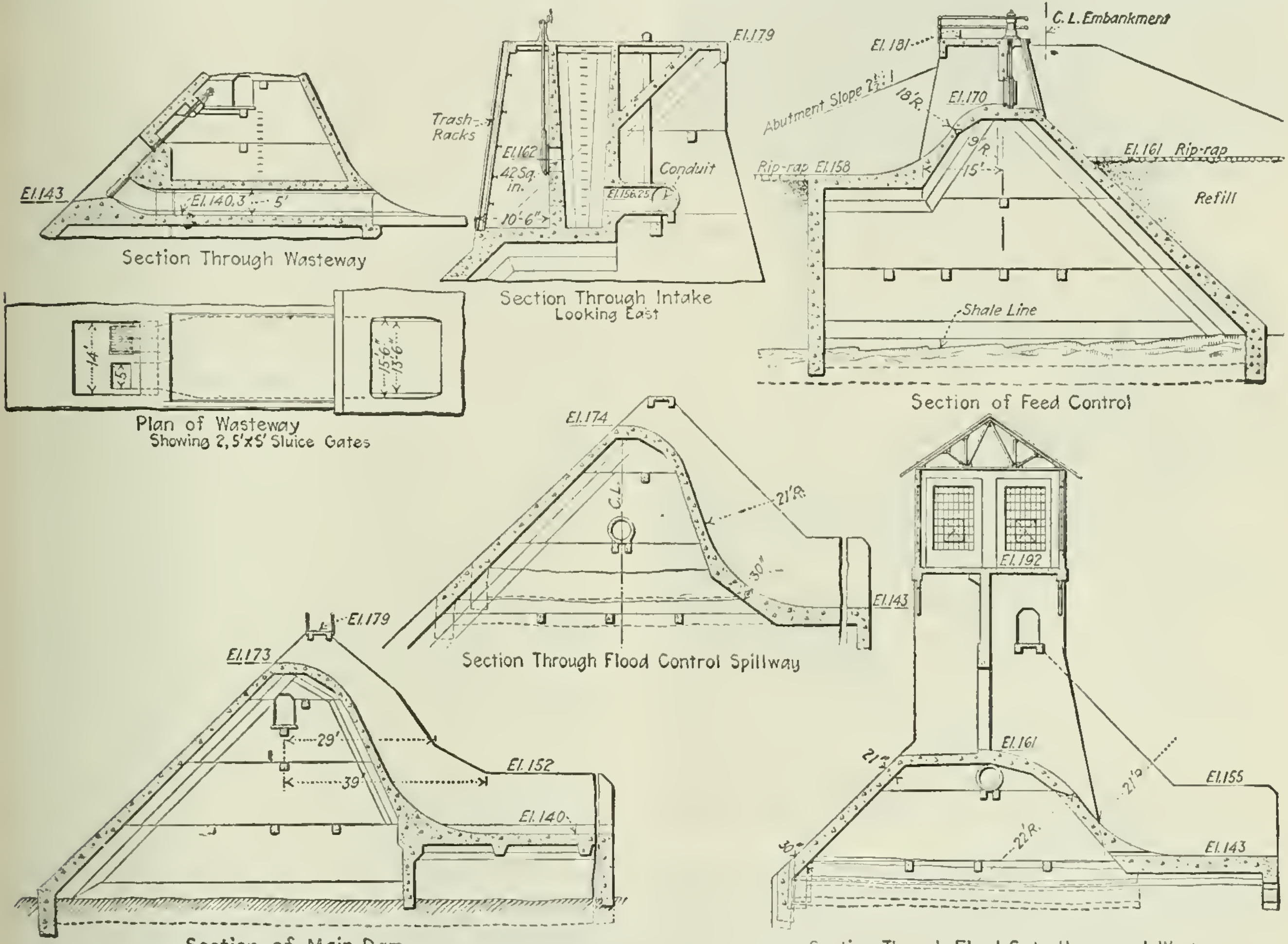
Originally the river flowed from the lower end of the natural basin through an opening about 1100 ft. wide between the bluffs, which converge at this point. This outlet has been closed by the main dam, a concrete structure of the Ambursen hollow type, 1100 ft. long and about 53 ft. high, with a base width of 52 ft. It is built on a solid bed of shale, with a deep cutoff wall under the upstream toe and the east end extended as a core wall into the solid shale of the natural ground.

Its east end, closing the bypass channel, has a middle portion for the gates, flanked by two spillway sections. Four 9 x 12-ft. floodgates regulate the waste discharge from the channel and regulate the height of water in the channel while the reservoir is being filled through the feed gates already mentioned. At about midlength of the dam is the intake well, with three 42 x 42-in. sluice-gates for taking water at different levels. A 42-in. outlet conduit extends longitudinally from the well through the dam to an inspection well beyond the east abutment, from which the 42-in. conduit extends to the city. Near the west end of the dam is a 120-ft spillway section, at the bottom of which are four 5 x 5-

ft. waste gates, provided mainly for sluicing out the silt, but they may be used to give additional discharge capacity.

The relations of these several parts may be seen from the following elevations: Crest of dam, 179 ft.; spillways at end of bypass, 174; spillway of main dam, 173; floodgate sills and bottom of bypass, 161; spillway on emergency dam, 176; crest of diversion dam, 185.

An earth embankment extends about 1000 ft. beyond the west end of the masonry dam. This has a concrete core wall with its top at the crest level and its bottom inclosing the top of a line of 30-ft. sheet piling driven 2 ft. into the shale, the surface of which is at about Elev. 128. The core wall is 18 in. thick at the top with a batter of 1 in 24 on both sides.



MAIN DAM WITH INTAKE, FLOOD CONTROL AND FEED CONTROL FROM BYPASS CHANNEL

Flood capacity of the new works is a highly important element, in view of flood damages sustained by the city in the past, and it is considered that ample protection has been provided. The maximum flood record of the North Canadian River is 5200 sec.-ft. The capacity of the bypass channel, with 18 ft. of water and no discharge over the emergency dam into the reservoir, is about 6000 sec.-ft. With depths of 3 ft. and 5 ft. on the 180-ft. emergency dam, the respective discharge would be 5000 and 7000 sec.-ft. The four floodgates at the end of the channel give a combined discharge capacity of 8000 sec.-ft., while the two spillways on either side increase this to about 10,700 sec.-ft. The reservoir spillway has a capacity of 5000 sec.-ft. while the four waste gates will discharge a total of 2700 sec.-ft. under 33-ft. head. Thus, the bypass and the reservoir have each a discharge capacity considerably in excess of the maximum flood records of the past.

Incidental works are a fishway at the east side of the bypass and an earth embankment on the south and west sides of the reservoir to raise the water to the desired elevation. The embankments are similar to that of the bypass channel.

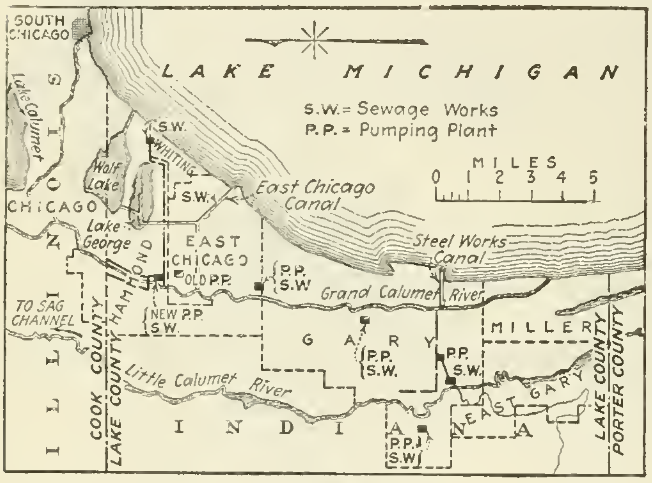
These works were designed in 1915 by the late Guy V. McClure, then city engineer, the design being based upon a report made several years ago by the late Andrew Rosewater. H. A. Pressey was consulting engineer and H. M. Nabstedt was resident engineer. In 1911 a bond issue for a similar proposition was defeated, largely due to strong but ill informed opposition on the part of the state health authorities, who feared sewage pollution from a town 100 miles upstream and advocated sewage treatment rather than water purification. In 1916 the bond issue of $1,500,000 was passed by a large, favorable vote. These conditions were noted in *Engineering News* of Mar. 2, 1911, p. 267, and June 22, 1916, p. 1198.

The dam and reservoir works and the conduit to the city were completed in 1919. The filtration plant was completed in 1909. The city has a population of about 110,000, with a daily water consumption of about 10,000,000 gal., or 90 gal. per capita. The new works are designed to provide 120 gal. per capita per day for a population of 175,000. The minimum record of annual flow in the river is 42,177,000,000 gal. for 1905.

Joint Sewage Disposal of Indiana Lake Cities

Calumet Sanitary District, Including Four Cities, Would Have Seven Treating Plants Under Unit Control

SEVEN sewage-works for Gary, Hammond, East Chicago and Whiting, Ind., together with the creation of a sanitary district to include these cities and to build and operate the sewage-works, constitute the best solution of the water-protection and sewage-disposal problems of this group of cities, according to the recent report of a board of engineers. The aggregate population is estimated at 166,200 for 1919 and 494,000 for 1940. The four cities are in the Calumet district on the Indiana-Illinois boundary, the topography being flat and the soil sandy. This district comprises the greater part of the drainage areas of the Grand Calumet and Little Calumet Rivers, both of which are connected with Lake Michigan. The former is a sluggish stream with a maximum flood flow of 1450 sec.-ft., while the latter varies from a dry-weather flow of 200 to a flood flow of over 13,000-sec.-ft.



MAP OF PROPOSED CALUMET SANITARY DISTRICT

Each of the four cities has its own sewerage system, of the combined type, discharging directly into the lake or the Grand Calumet River, without treatment. The Little Calumet receives only a small amount of sewage, but the Grand Calumet is so heavily polluted with domestic and industrial sewage as to be a serious nuisance, besides causing pollution of Lake Michigan, from which all of the cities take their water-supply. The supply of the City of Chicago is also affected through its 68th St. intake. The dangerous condition is indicated, says the report, by the fact that the typhoid-fever death rates are far in excess of the Chicago rate, while the Calumet section of Indiana is largely responsible for keeping alive the typhoid infection in northern Indiana and in Illinois. Industrial wastes will add to the pollution but are not covered by the report, which deals only with sewage.

Filtration alone might produce a safe drinking water, but still the water-supply would be subject to gross pollution by the storm discharge of the Grand Calumet River. To discharge all the sewage into the rivers would increase the nuisance and continue the danger of lake pollution in time of flood discharge. Dilution by discharge of the sewage into the Calumet-Sag channel, now being built by the Sanitary District of Chicago to connect the Little Calumet River with the Chicago Drainage Canal, is not practicable, since the entire flow of this channel will be required for diluting the sewage of the district. It is the conclusion of the engineers that the remedy must not only remove the local nuisance but must also greatly reduce the danger of lake pollution without imposing upon works in Illinois any burden for dilution. The treatment must produce a stable effluent which requires no dilution and contains sufficient oxygen for its own purification. The comparatively small volume of effluent could be cared for in the flow of the two rivers to the Calumet-Sag channel.

Two methods available to meet the requirements are: (1) the activated-sludge process and (2) Imhoff tanks and sprinkling filters, but the report states that the former is still somewhat experimental, although its principles are known to be correct. Its details require considerable development, particularly for such weak sewage as that produced by Whiting, East Chicago and Hammond. Only a careful estimate will show which is the cheaper, while the choice will be influenced also by the results obtained in plants now under way. Either of these processes will work successfully, says the report, but the activated-sludge process appears to furnish a better solution of the sludge problem and greater freedom from nuisance.

Creation of a sanitary district including the four cities is now practicable under a recent amendment to existing laws of Indiana. The district would plan, build and operate the works and keep them up to the requirements of the future growth of population. This is considered preferable to separate teratment by each city, especially as regards efficiency and economy of operation and administration. Tentative plans provide for seven plants having pumping stations and sewage-works, as shown on the accompanying plan. The construction cost to 1925 is estimated at $2,628,260 for partial treatment or $5,004,480 for complete treatment, with annual operating expenses of $340,000 and $526,440, respectively. The estimated aggregate valuation of the four cities for 1920 is $306,000,000. Under the present law a drainage district including these cities could raise $6,120,000 by bonds, or 2% of the assessed valuation, and make a tax levy of $765,000 for operating expenses, and interest.

The joint board of engineers that has reported on this project consists of William F. Bridge, city engineer of Hammond; W. M. Cottingham, city engineer of Gary; Lloyd Smith, city engineer of Whiting; Charles K. Wallace, city engineer of East Chicago; Langdon Pearse, sanitary engineer of the Sanitary District of Chicago, and G. M. Wisner, chief engineer of the Sanitary District of Chicago.

Bhakra Dam to Have Height of 395 Feet

The Bhakra Dam, which it is proposed to build across the Sutlej River, India, in the Bhakra Gorge, some 40 miles above Rupar, the headworks of the existing Sirhind Canal, will be, says the *Madras Mail*, 395 ft. high from foundation level to roadway, and will be the highest dam in the world. The depth of water in front of the dam will be about 375 ft., good rock for the foundation having been found near the surface. The length of the top of the dam will be 1,015 ft. The water to be stored by the dam in the month of August annually will be 2,500,000 acre-feet.

Heavy Construction on San Diego and Arizona Railway

Involved Twenty-One Tunnels Aggregating 15,000 Feet — Special Roads Built for Motor Trucking Equipment to Portals

HEAVY tunnel construction, for which roads through rough mountain country were especially built for hauling equipment by motor truck, was encountered in building the recently completed line of the San Diego & Arizona Railway Co. between San Diego, Cal., and El Centro in the Imperial Valley, connecting with the line of the Southern Pacific Co. There are 21 tunnels on the line, aggregating 15,207 ft., of which 17 are in the Carriso Gorge. A description of the location of the line appeared in *Engineering News-Record* of Aug. 22, 1918, p. 365.

The accompanying photograph, showing the grade of the line through Carriso Pass with a tunnel portal in the foreground, is characteristic of the type of construction encountered. The plank road, in the foreground, connecting the tunnel portals, was graded and built specially for delivering materials and equipment.

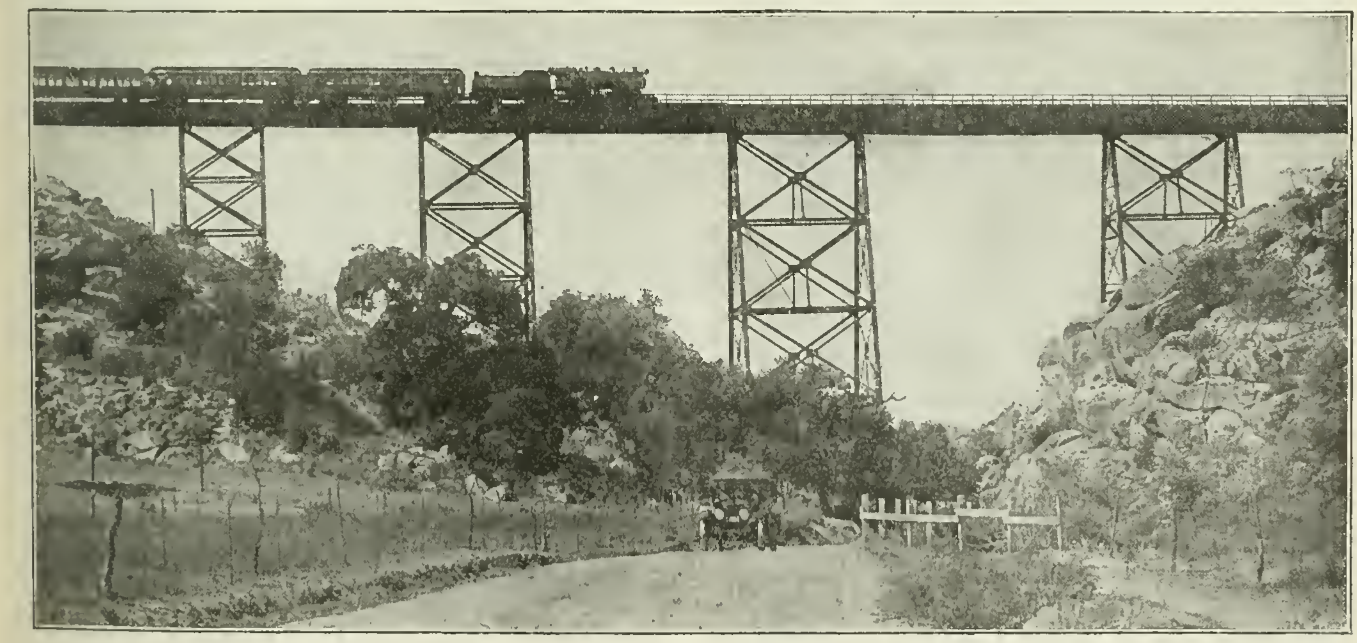
On the Mexican portion of the line tunnels were constructed with concrete portals with from 25 to 50 ft. of concrete lining at each end, the intermediate portion being lined with redwood timber where necessary. For most of the tunneling, which is in United States territory, timber portals an d timber lining were used exclusively. Typical construction is indicated in the photograph showing underheading in one of the shorter tunnels on Carriso Pass.

Wooden trestling on the line is principally of the ballast deck type, with asphalt covering, the structures consisting of five pile bents or five post frames resting on mud sills. In cases where there is possibility of washouts, which might make necessary a change of location, temporary framed or pile structures of the open-deck type of untreated pine are used.

The largesst structure on the line is the viaduct at Campo Creek, 580 ft. long and 175 ft. high, shown in the photograph. Considerable difficulty was experienced in placing the girders of this viaduct on account of the high winds in the Laguna range of mountains at this point. During the erection of the structure the wind blew almost continuously up the gorge in daylight hours, making it difficult to handle the steel and hindering all work that had to be done off the ground. This delay, chargeable to wind, trebled the construction period, according to railroad officials, who said that had it not been for the wind the job, which took six months could have been finished in sixty days.

TUNNEL CONSTRUCTION REQUIRED SPECIAL ROADS TO BE BUILT FOR HAULING EQUIPMENT

The most trouble was encountered in placing the long girders. The wind was strongest, of course, where the center girders were to be set. These were 100 ft. long and 9 ft. deep, and when swung free in the wind became almost unmanageable. They were handled by a locomotive crane rigged up temporarily with a 60-ft. boom, reinforced with cables. Tackles were attached to each end of the girders to hold them steady in the wind, but they could not be guided at all on some days, and there were many unsuccessful attempts before the two longest girders were satisfactorily set. When



VIADUCT AT CAMPO CREEK

UNDERHEADING IN TUNNEL NO. 9, CARRISO GORGE

they were finally in place three hundred hours' time had been charged against the locomotive serving the girder crane. Under favorable conditions, it is estimated, forty or fifty hours should have been sufficient for this item.

The line was constructed under the direction of D. W. Pontius, general manager, and E. J. Kallright, chief engineer.

Suggested Remedies for Some Ills of the Engineer

Apply Law of Supply and Demand—Private Practice in Groups of Specialists for All Corporation Work

By S. M. Swaab
Mem. Am. Soc. C. E., Philadelphia.

IN COMPARISON with the Lawyer and the Physician the Engineer feels that the public slights him because it apparently does not accord him the same high standing. Still I call on heaven to witness that our ethics are certainly as high as those of either and that our educational requirements to fill the larger positions are certainly on a parity with those of either. Being unacquainted with the tactics employed by those who successfully launch lawyers and physicians into fields which seem at all times more than crowded, I am at a loss to know just what instructions are given them, if any, to enable them apparently to discount the elements of the economic law heretofore cited. One thing, however, that we notice is that lawyers and physicians, after some competent authority has designated them as being able to perform certain functions for which there is a market, immediately hang out their shingles and wait for clients or patients. Then, encouraged by the fact that "there is always plenty of room at the top," they seemingly leave to fate the rest—professional success and commercial prosperity. Usually they have to wait a long time for success, if it ever comes; but when it does come, it is the result of efforts of the individual. Also all of the benefits of success go to the individual.

Now, what we must consider is whether or not a similar disposition of the services of the Engineer is possible. It is certainly a fact that if every engineer, at the beginning of his career, were to set himself up in business there would eventually be created a shortage of engineers and engineer-assistants hireable by the industrial and public service corporations. It might be an uphill job for the vast majority, and many of us might feel the pangs of hunger and some possibly might fall by the wayside before the object were attained; but eventually we would bring about the condition we are seeking—that the Engineer may be deemed "worthy of his hire."

It may be argued that the Engineer is unfitted at the start to practice independently, and doubtless this is true to a large extent. But it is likewise true of the Lawyer and the Physician, and in emulation, our case may properly resolve itself into a system of our indenturing ourselves to engineers of recognized standing for a given time, as was the custom many years ago in this country and in England Thence we could graduate into private practice. Such graduation could be timed by the date of recognized eligibility for membership of the associate grade in one of the four national societies. This would be comparable with the Lawyer's post-graduate service in the office of a law concern of standing and with the hospital internship of the Physician which enable them to secure some practical knowledge of their art before applying it on their own hook.

The work of the Lawyer, the Physician and the Engineer are, however, not entirely analogous. In the case of the first two they work, or can work, individually, while in the case of the last team-work is always required to accomplish anything. One individual can work up a case for trial and actually try the case in court. One man can, although it is not usual, diagnose a case, prepare the person for operation, administer the anesthetic, perform the operation and render the subsequent treatment. In the vast majority of cases requiring no operation the Physician usually does work single-handedly. But one man cannot make the surveys and all the multifarious designs for industrial and utility structures. This will require co-operation among engineers. They should form co-operative associations or combinations to handle work, the magnitude of which is too great for one man to do conveniently, efficiently or successfully. This would have a tendency to do away with the engineering departments of our industrial establishments wherein the greatest crimes of underpayment are perpetrated. It is there the young Engineer, usually working as a draftsman and in many instances subordinated to others who have little sympathy with him and his work, is relegated to the status of a machine, particularly after thorough standardization of the work is accomplished.

When the industries and others now employing engineers, who usually consider their engineering departments necessary evils, are required to go out into the market and have their work done in private offices, there will be a more substantial return for the services rendered. In any case an engineering organization of some kind doubtlessly would be retained by all of the corporations requiring engineering services. Still it is conceivable that a condition can be brought about whereby the preliminary outlining of a scheme or a roughing out of the general features of a given piece of work may be done in the office of the concern, and the actual design and subsequent construction carried out by engineers in private practice.

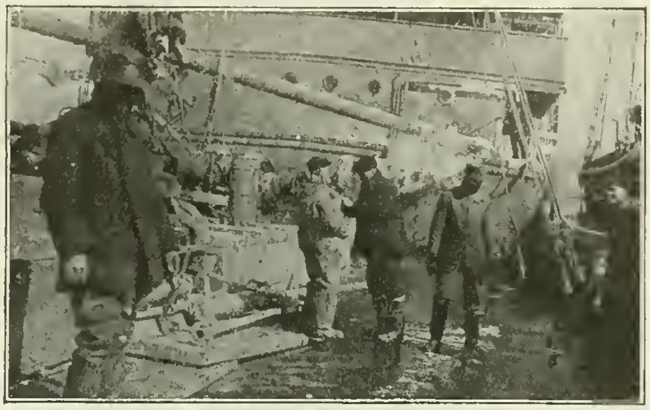
Concrete Ship "Polias" on Rocks Off Maine Coast

Hull Is Ripped Open on Side from Stem to Stern, But Frame Is Undamaged—Attempted Salvage Not Yet Decided

During the blizzard which raged in the northeastern part of the country the first week of February the concrete ship "Polias," built by the United States Emergency Fleet Corporation, went ashore on the rocks off the Maine coast about 20 miles southeast of Rockland. The ship lies at a relatively inaccessible place, about 5 miles from mainland and about 2 miles from a coast guard station on Burnt Island. It has not been possible up to now, therefore, to get any report on the condition of the boat, but representatives of the United States Shipping Board, after spending over a week at the coast guard station, have been able to get to the ship a sufficient number of times to make a thorough inspection. Their report in detail will be made to the Shipping Board, but from one of them, Lewis R. Ferguson, of the engineering firm of Wig, Hollister & Ferguson of Philadelphia, the following description of the ship's condition has been obtained. Mr. Ferguson was retained by the Government to inspect the condition of the ship structure. During the war he was general manager of the Liberty Shipbuilding Co., which built three concrete ships for the Government at Wilmington, N. C., and at Brunswick, Ga. He was not connected with the design or construction of the "Polias."

The "Polias" was built on Flushing Bay, Long Island, during the summer and fall of 1918. It was described in *Engineering News-Record*, Dec. 12, 1918, p. 1058, although at that time it had not received its name, so the word "Polias" does not appear in that article. The ship was built under the general superintendence of the Fougner Concrete Shipbuilding Co. after designs made by the company which were revised and approved by the Concrete Ship Section of the Emergency Fleet Corporation. It was launched May 22, 1919, and put into service late in the same year. It had made one or two trips up and down the Atlantic Coast.

CONCRETE SHIP "POLIAS" ON ROCKS OFF COAST OF MAINE

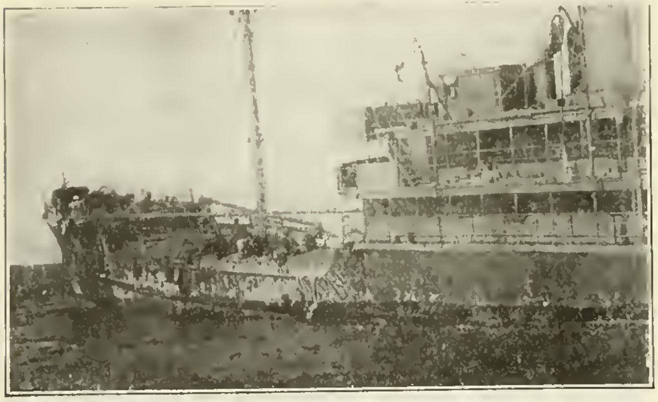


SHIP IS NOT MOVING; MEN CAN STAND AND WORK ON DECK

The ship had a designed dead-weight carrying capacity of 3,500 tons. The Emergency Fleet Corporation has recently reported that its actual deadweight carrying capacity is about 2,500 tons. It is 281 ft. 9 in. long, 46 ft. beam and 26½ ft. molded depth. It had heavy transverse frames spaced 4 ft. on centers, a center and two side keelsons, four bulkheads, one fore, one aft and two inclosing the engine and boiler room. The deck is carried by two continuous girders forming the hatch coamings and is supported by widely spaced concrete pillars made of heavy iron pipe with flanged heels and heads. In general the bottom and side shells are 5 in. thick and the side shell reinforcement consists of two layers of diagonally placed reinforcement of ½-in. and ⅝-in. square deformed bars. The deck varies somewhat with an average thickness of 4½ in. At 6 ft. above the water line a horizontal bilge girder is carried all around the ship, running flush with the tank top slab. The floorbeams and the frames are in general 8 in. thick, except in the tank top section where they are 5 to 6 in. The ship was built according to the usual methods of the Government in concrete ship work, using gravel aggregates. It was not possible at the time the concrete was poured to obtain the light weight aggregate used on the other Government ships. It was, however, different from the other ships in that the outside half-inch of the hull above the bilge curve was placed by cement gun after the main concrete shell had been poured in the usual manner.

Details regarding the wrecking of the ship are not altogether clear. The ship was southbound to Norfolk after having delivered a cargo of coal to one of the Maine ports. It was running light except for its own coal. Snow was falling on the afternoon of Feb. 6 when the boat was off Penobscot Bay and the captain was running by compass and charts. The rock, known as Cilley Ledge on which the ship grounded is charted, though not prominent enough to be easily seen in heavy weather. It seems probable at present that some miscalculation of the speed of the boat was made and that the course was not changed in time to avoid the rock. At the time the boat hit it was running at full speed somewhere between 9½ and 10 knots.

The ship ran on the rock about five o'clock in the afternoon. Eleven men, including three subofficers, against the direct orders of the captain left immediately in a light boat. They have never been heard from since



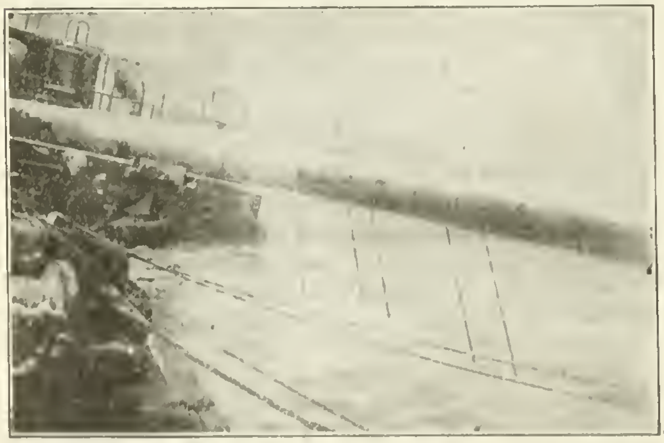
STERN OF "POLIAS" UP ON SHELVING ROCK IN 10 FT. OF WATER AND 11 FT. OF TIDE

nor has there been any trace of their boat or bodies. The remainder of the crew, some thirty men, stayed on the boat until the next day, when they were taken off by the coast guard from the nearby island. At that time the sea was calm enough so that the men were able to take with them all of their personal belongings. The ship at present, therefore, contains nothing except its own boiler coal.

The ship is lying stern on a shelving rock. At low water the stern is in about 11 ft. of water and the bow is nearly under water. There is about 10 ft. tide. The ship is canted at an angle of 7½ degrees from the vertical. On account of the depth of water in which the boat lies it is impossible to make an examination of her hull except by diver and the government party contained diving equipment and a man experienced in such work. It was possible, therefore, to make in one or two days of very still water a complete examination of the hull.

The ship apparently ran between a line of jagged rocks in grounding, for her hull is ripped open on both sides practically the whole length of the ship, the opening varying from 2 to 7 ft. In consequence the boat is entirely filled with water, except for the stern tank which is dry. Examination by the diver showed, however, that the break in the side is confined practically entirely to the shell, except where rods have torn a small part of the frames. The frames themselves in the main are intact. So far as examination goes, too, the keelsons and the bottom of the ship are not damaged.

A careful examination of the above water part of the ship shows no damage to the framework. The ship has not hogged nor sagged, as there are no cracks in the deck or the longitudinal frames that can be seen. The cement gun finish is in very good shape and in no place has left the concrete of the hull itself.



SEAS WASHING ABOARD AMIDSHIP AT HIGH TIDE

A remarkable thing about the wreck is that the ship apparently has not moved since it struck. There is absolutely no pounding going on at present. Small readily movable articles, such as medicine bottles on a table, left on the ship one day were found standing unmoved two or three days later after the ship has been subjected to a heavy storm. All evidence points to the fact that there is no racking going on.

No official statement is now available as to the prospects of salvaging the vessel. Several plans have been prepared which promise successful results, but they will have to be submitted to the Government before they can be made public. In the main, however, it is felt by those who examined the ship that it is in remarkable condition considering the severe shock which it received and that the chances for its recovery are fair.

Main Roads Must Be Designed for Freight Traffic

DIFFERENTIATION between light and heavy motor-truck traffic can no longer be safely practiced in designing highways, states W. G. Thompson, state highway engineer of New Jersey. In a paper presented Nov. 7, 1919, before the North Atlantic Division of the National Highway Traffic Association, Mr. Thompson announces it to be his conviction that except in isolated rural districts, no road should be designed with a view to its being used solely by light motor vehicles.

In the agricultural sections of New Jersey, five years ago, the farmers supplying the Philadelphia markets and the large canning industries in Camden were accustomed to load possibly one or two tons of produce into wagons in the afternoon, and start between midnight and 2 or 3 a.m., in order to deliver fresh produce to the city market each morning. The advent of the smooth, hard pavement and motor truck has brought about a radical change in transportation of this produce. Hundreds of farmers now load from two to four tons on trucks and make two or three trips in the same time formerly consumed in making one trip with one or two-ton loads.

Experience, and observation of conditions, lead to the conviction that no interurban highways should hereafter be built in the Middle and North Atlantic States between Norfolk, Va., and Portland, Maine, having less widths of hard pavement than 20 ft. for two lines of traffic. Graded widths for two lines of traffic should be not less than 30 ft. Rights of way on all main highways should be 60 ft. or more. Foundations should be of nothing but the best concrete obtainable, not less than 8 in. thick, if other types of surfacing are to be used. If concrete pavements are to be used, they should not be less than 8 in. thick.

Before any foundation is laid, painstaking care should be exercised to provide adequate and permanent sub-foundation drainage facilities. The greatest length of visibility possible should be obtained on curves. The tremendous increase in gasoline consumption makes it especially desirable and necessary to reduce grades to the minimum. Highway bridges should be designed for not less than 20-ton loading, assuming that 75 per cent of the load is carried on the rear axle.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Adrift From Its Traditions?

Sir—There are times when non-constructive criticism may be well warranted. The observation is prompted by your editorial of Feb. 26 on the circular, "A Word of Warning," recently sent to the membership of the American Society of Civil Engineers by one hundred and six of its members in various parts of the country.

Question 3 of the society's questionnaire, on which the circular strongly urges members to vote "no," calls for the acceptance or rejection, as a whole, of the joint conference committee's proposal for a general welfare council of engineering and allied technical associations, according to a scheme which many, after careful study, consider radically unsound. A vote "yes" or "no" is specifically required, without other option. No alternative plan is offered for voting. Before a better plan can be formulated and put to vote, this one must be defeated. Constructive criticism, which, if given opportunity, ought to result in bringing forward a satisfactory plan, finds no application at this juncture. The only useful present course, for those who recognize the dangers to the society in the proposed scheme, is to point out its unsafe features, and that is just what the circular is intended to do. FREDERICK C. NOBLE.

New York.

Sir—In its editorial on the circular, "A Word of Warning," *Engineering News-Record* states that the circular does not face the issue of whether it is necessary to participate in efforts to improve the status of the engineer.

We point out that the circular does record the view that the American Society of Civil Engineers should do professional welfare work in any manner proper and practical. Along non-technical lines the efforts of the engineers should be to effect solidarity of the profession as a whole. To this end there is required much more thorough-going preparatory work than that of the Joint Committee.

We should realize that the work of the American Association of Engineers has already assumed substantial proportions, and we should seek to find out what the future is likely to bring forth from this new organization, which proposes to spend for welfare work $10 per member per year as constrasted with $1.50 in the comprehensive organization proposed by the committee.

Real solidarity is needed and real progress will come more quickly if we face squarely the American Association of Engineers and other preparatory questions rather than allow to be railroaded into existence a program which is not as comprehensive as its name implies.

GEORGE W. FULLER.

Sir—Your editorial, "Adrift From Its Traditions," in the *Engineering News-Record* of Feb. 26 raises a question as to the position taken in a circular letter recently sent to the membership of the American Society of Civil Engineers.

The question as you present it is as to the discharge of his civic responsibility by the engineer. As an individual, the engineer does have a civic responsibility. He is bound to be a good citizen, and do all that a good citizen should do; and his special knowledge and skill give him increased opportunities, and with these he must accept increased responsibility.

But when it comes to a question of an engineering society taking action on public questions, that is another matter.

When it comes to maintaining an office or organization that is engaged in promoting, opposing or "supervising" proposed legislation, municipal, state and national, it is perfectly clear that a technical society cannot wisely do things of this kind. To do it is incompatible with the purpose of the society, and if such things are done, in my judgment it can only result in weakening, if it does not, in fact, destroy the technical work of the society. Even in the comparatively simple case of a local society taking part in the municipal problems of the city in which the local society is located, it is my observation that such action practically results in the substitution of the general view of the membership, which general view is essentially superficial and usually not well founded, for the sound professional consideration on which the discussion of important municipal problems should rest. It is my belief, based on observation, that when such local societies pass resolutions upon municipal problems, as a rule more harm than good results.

No doubt some things can be done, especially in seeing that competent engineers are employed to study important problems, but even in this, individual effort and individual protest would seem to be more fitting and, perhaps, also more effective than society action intended to bring pressure as a result of the combined influence of all the engineers.

In the case now before us we are voting on a proposition to divert 10 per cent of the society's income to be used by bodies not under control of the society, or its officers, and in whose procedure we have no voice beyond the slight proposed representation. And it is proposed that this money is to be used for the purpose of making us an active force in economic, industrial and civic affairs.

It is my opinion that we can make ourselves a force as individuals, but not as a society, or as a group of societies, and I object to lending support to projects of this kind to be undertaken by the society directly, and still more to the proposal to turn over 10 per cent of its income to an outside organization to be spent for no one knows what propaganda. ALLEN HAZEN.

New York.

Not Responsible for Elevator Foundations

Sir—At the close of the article "Foundation Troubles of Portland City Grain Elevator," in your issue of Jan. 22, 1920, p. 179, it is stated that the elevator was designed by Witherspoon-Englar & Co., elevator engineers, of Chicago.

We feel that this statement is misleading to the profession at large, as it can easily be assumed that we were responsible for the design and supervision of the construction of faulty pile foundations. This is not the case, however, as the pile foundations were designed by the Commission of Public Docks at Portland. The piling was driven under a separate contract according to the specifications prepared by the Commission of Public Docks and were specifically excluded on a statement of costs rendered by the commission on which we received compensation for engineering service. Furthermore, our commission for engineering services covered only design and we had no part in the engineering supervision of the driving of these piles.

A. M. CRAIN,

Chicago, Ill. Vice-President Witherspoon-Englar Co.

Conversion Table for Plotting Curves

Sir—The accompanying table was prepared to simplify the use of drafting curves used in plotting up track layouts, since the curves in common use are practically all of the 1 in. = 100 ft. scale, and in the use of other scales it is necessary to reduce a curve by calculation. Although this calculation is simple, there is a chance for errors and a certain loss of time is involved which has been found to amount to about 15 per cent of lost time.

As an illustration, the table is used as follows: To plot an 8 deg. curve on 1 in. = 30 ft. scale the draftsman will find the curve indicated in the column headed 1 in. = 30 ft. opposite 8 deg. in the column headed Degree of Curve and it will be found to be a 2 deg. and 24 min. curve, radius 2387.5 ft. If his templets are marked with degrees he will select the nearest curve to 2 deg. 24 min., which would be 2 deg. 30 min. If the templets are marked by numbers indicating radii, he will select the templet marked with the number 24, indicating that it is on a 24-in. radius and which, on a 100-ft. scale, would be equivalent to 2,400 ft., the nearest distance to the radius of 2387.5 ft.

J. G. WALSH,

Chief Field Engineer Tennessee Coal, Iron and Railroad Co.

Ensley, Ala.

Improper Drainage and Highway Failures

Sir—After being called an "arm-chair wonder" and many other things other than pleasant, implied by Mr. Hirst because of my article on highways, published in your issue of March 21, 1918, p. 543, it is rather pleasant to read the captions of highway articles appearing in your journal from time to time, particularly in the Feb. 5, 1920, number. A few of these captions are: "Iowa Has Thousands of Miles of Road Ready, Prepared for Hard Surfacing"; "Variable Designs for County Highway Systems"; "Care in Laying Foundation and in Compacting Base Underlie Efficient Service"; Heavy Traffic Road Design Places Stress on Drainage," etc.

If highway engineers will use the article mentioned as a textbook and keep a copy of it at their elbows they may find some more valuable directions anent road maintenance and building besides those covered by the above captions.

Not one word of favorable comment have I yet heard from a highway engineer, nor the intimation of a desire to discuss road matters, but "imitation is the sincerest form of flattery," so I must be content with watching the attempts at imitation.

A. A. YOUNG.

Jewett City, Conn.

Building Highways for Heavier Loads

Sir—In the Jan. 15 issue of *Engineering News-Record*, p. 149, George H. Pride, owner of the Heavy Haulage Co., calls attention to the abuse of the highways by overloading trucks, and offers a remedy for this through rigid loading laws. This suggestion coming as it does from a truck operator is surprising and certainly shows a commendable spirit of fairness on his part, but I do not believe the problem will ever be solved by such laws.

In the first place, it is contrary to the spirit and needs of the times. We are in the midst of an era of great transportation needs and anything which tends

TABLE FOR CONVERTING FROM SCALE OF 1 IN. = 100 FT. IN PLOTTING CURVES

1 In = 100 Ft.			1 In = 60 Ft.			1 In. = 50 Ft.			1 In. = 40 Ft.			1 In = 30 Ft.			1 In. = 20 Ft.			1 In. = 10 Ft.		
D.C.		R	D.C.		R.	D.C.		R.	D.C.		R.	D.C.		R	D.C.		R.	D.C.		R
Deg.	Deg.		Deg.	Min.		Deg.	Min.		Deg.	Min.		Deg.	Min.		Deg	Min.		Deg.	Min.	
1	1	5,729 6	0	36	9,549 3	0	30	11,459 2	0	24	14,323 6	0	18	19,098 6	0	12	28,647 8	0	06	57,295 8
2	2	2,864 9	1	12	4,774 7	1	0	5,729 6	0	48	7,162 0	0	36	9,549 3	0	24	14,323 6	0	12	28,647 8
3	3	1,910 0	1	48	3,183.2	1	30	3,819 8	1	12	4,774 7	0	54	6,366.3	0	36	9,549 3	0	18	19,098.6
4	4	1,432 6	2	24	2,387 5	2	0	2,864 9	1	36	3,581.1	1	12	4,774 7	0	48	7,162 0	0	24	14,323 6
5	5	1,146 3	3	0	1,910 1	2	30	2,292 0	2	0	2,864 9	1	30	3,819 8	1	0	5,729 6	0	30	11,459 2
6	6	955 4	3	36	1,591 8	3	0	1,910 1	2	24	2,387 5	1	48	3,183 2	1	12	4,774 7	0	36	9,549 3
7	7	819 0	4	12	1,364 5	3	30	1,637 3	2	48	2,046 5	2	06	2,728 5	1	24	4,092.7	0	42	8,185 2
8	8	716.7	4	48	1,194 0	4	0	1,432 7	3	12	1,790 7	2	24	2,387 5	1	36	3,581 1	0	48	7,162 0
9	9	637 3	5	24	1,061 4	4	30	1,273 6	3	36	1,591 8	2	42	2,122 3	1	48	3,183 2	0	54	6,366 3
10	10	573 6	6	0	955 4	5	0	1,146 3	4	0	1,432 6	3	0	1,910 1	2	0	2,864 9	1	0	5,729 6
11	11	521 6	6	36	868 6	5	30	1,042 1	4	24	1,302 5	3	18	1,736 5	2	12	2,604 5	1	06	5,208 8
12	12	478.3	7	12	796 3	6	0	955 4	4	48	1,194 0	3	36	1,591 8	2	24	2,387 5	1	12	4,774 7
13	13	441 6	7	48	735 1	6	30	881 9	5	12	1,102 2	3	54	1,469.4	2	36	2,203 9	1	18	4,407.5
14	14	410 3	8	24	682 7	7	0	819 0	5	36	1,023.6	4	12	1,364 5	2	48	2,046 5	1	24	4,092 7
15	15	383 1	9	0	637 3	7	30	764 7	6	0	955 4	4	30	1,273 6	3	0	1,910.1	1	30	3,819 8
16	16	359 3	9	36	597 5	8	0	716.8	6	24	895 7	4	48	1,194 0	3	12	1,790 7	1	36	3,581 1
17	17	338 3	10	12	562 4	8	30	674 7	6	48	843 1	5	06	1,123 8	3	24	1,685 4	1	42	3,370 5
18	18	319 6	10	48	531 3	9	0	637 3	7	12	796 3	5	24	1,061 4	3	36	1,591 8	1	48	3,183 2
19	19	302 9	11	24	503 4	9	30	603 8	7	36	754 4	5	42	1,005 6	3	48	1,508 1	1	54	3,015 7
20	20	287 9	12	0	478 3	10	0	573 7	8	0	716 7	6	0	955 4	4	60	1,437 7	2	0	2,864 9
21	21	274 4	12	36	455 6	10	30	546 4	8	24	682 7	6	18	909 5	4	12	1,364 5	2	06	2,728 5
22	22	262 0	13	12	435 0	11	0	521 7	8	48	651 7	6	36	868 6	4	24	1,302 5	2	12	2,604 5
23	23	250 8	13	48	416 2	11	30	499 1	9	12	623 5	6	54	830 8	4	36	1,246.0	2	18	2,491 3
24	24	240 5	14	24	398 9	12	0	478 3	9	36	597 5	7	12	796 3	4	48	1,194 0	2	24	2,387 5
25	25	231 0	15	0	383 1	12	30	459 3	10	0	573 6	7	30	764 5	5	0	1,146 3	2	30	2,292 0
26	26	222 3	15	36	368 4	13	0	441 7	10	24	551 7	7	48	735 1	5	12	1,102 2	2	36	2,203 9
27	27	214 2	16	12	354 9	13	30	425 4	10	48	531 3	8	06	707 9	5	24	1,061 4	2	42	2,122 3
28	28	206 7	16	48	342 3	14	0	410 3	11	12	512 4	8	24	682 7	5	36	1,023 6	2	48	2,046 5
29	29	199 7	17	24	330 6	14	30	396 2	11	36	494 8	8	42	659 2	5	48	988 3	2	54	1,975 9
30	30	193 2	18	0	319 6	15	0	383 1	12	0	478 3	9	0	637.3	6	0	955 4	3	0	1,910 1
31	31	187 1	18	36	309 4	15	30	370 8	12	24	463 0	9	18	616 8	6	12	924 6	3	06	1,848 5
32	32	181 4	19	12	299 8	16	0	359 3	12	48	448 6	9	36	597 5	6	24	895 7	3	12	1,790 7
33	33	176 1	19	48	290 8	16	30	348 5	13	12	435 0	9	54	579 5	6	36	868 6	3	18	1,736 5
34	34	171 1	20	24	283 3	17	0	338 3	13	36	422 3	10	12	562 4	6	48	843 1	3	24	1,685 4
35	35	166 4	21	0	274 4	17	30	328 7	14	0	410 3	10	30	546 4	7	0	819 0	3	30	1,637.5
36	36	161 9	21	36	266 0	18	0	319 6	14	24	398 9	10	48	531 3	7	12	796 3	3	36	1,591 8
37	37	157 6	22	12	258 1	18	30	311 1	14	48	388 2	11	06	517 0	7	24	774 8	3	42	1,548 8
38	38	153 7	22	48	252 9	19	0	302 9	15	12	378 11	11	24	503 4	7	36	754 4	3	48	1,508 1
39	39	149 8	23	24	246 6	19	30	295 2	15	36	368 4	11	42	490 6	7	48	735 1	3	54	1,469 4
40	40	146.2	24	0	240 5	20	0	287 9	16	0	359 3	12	0	478 3	8	0	716 8	4	0	1,432 7

to check development in transportation facilities is a retrograde movement and only means greater efforts to catch up in the future. The development of transportation has always been along the lines of heavier loads per unit, and there is no reason to believe that truck transportation will develop along any other lines. The mechanical development of the truck in the past few years makes it possible to transport greater loads just as soon as the highways are ready to carry them. In addition to this skilled labor situation, from which no immediate relief is offered makes it imperative that development be along the lines of heavier loads per unit. Just as soon as roads are built capable of carrying the loads, trucks of twice the size of those in service today will be built and put in use.

The demands of freight transportation compelled the railroads to increase the size and weight of cars and locomotives and also to increase the carrying capacity of their tracks and bridges. If our highways are to enter into the business of freight transportation—and surely no one will deny that they are to be used for this purpose—they must be built with the example and experience of the railroads as a guide.

The history of our highways shows that we have always been about two jumps behind the needs of the traffic. Highways have been built to carry the traffic of the times and long before the normal life of those highways has passed, new traffic with new demands has developed and the highways have been destroyed. The country has spent and will spend hundreds of millions of dollars building paved highways with a (hoped for) life of twenty or more years, but this life will not be realized if they are built with the idea of limiting the traffic which is to use them.

Let us, then, build highways—less miles if need be—not with the idea of holding back the economical development of truck transportation, but with the determination to provide means of carrying the commerce of the country in any sized packages that may be required.

H. C. BOYDEN.

Formerly Instructor, Engineer School, U. S. A.
Chicago.

The Inland Waterway Problem

Sir—I venture to suggest that *Engineering News-Record* could hardly do a better public service than to publish, in pamphlet form, Charles Whiting Baker's series of articles on the future of inland water transportation. The ancient and careless superstitions as to the economy of such transportation are widespread and hardy, almost proof against the logic of experience.

I should like to see Mr. Baker's article in the hands of every chamber of commerce. It might do some good.

Richmond, Va. E GRAY.

[Suggestions have come from quite a number of interested readers that Mr. Baker's monograph on the waterway problem be printed in pamphlet form. This is being done and a large distribution for it is planned. —EDITOR.]

As Ye Sow, So Shall Ye Reap

Sir—I was glad to see your recent editorial under the above caption, in which you remarked that bolshevism was manifesting itself only in proportion as governments or companies had gone too far in restricting the individuality of the workman by petty laws and parental control.

Another influence, it seems to me, in making for social unrest and economic discontent, has been the over-emphasis which newspapers, magazines, etc., have given to those sensational aphorisms that tell a man he can get anything by struggling hard enough for it—high wages, fame, happiness. A moment's thought will show that hard effort and perspiration, though usually commendable, cannot make a silk purse from a sow's ear. Despite Edison's saying that genius is mostly perspiration rather than inspiration, I feel very sure that, no matter how hard I worked I could never make myself a famous singer, nor a good salesman, nor a surgeon, nor many other performers. Yet evening newspapers print cartoons and snappy sentences stating that energy does everything; that a man has only to apply himself hard enough to move the earth; that output varies directly with input; etc. *Forbes Magazine* puts in: "Two-thirds of promotion is motion."

This campaign of "hustle" and "do it now" has been in progress for several years. As a result, men have hustled and toiled beyond their natural ability, often at duties for which they are not fitted, and now there is disappointment because proportionate rewards have not come. The American idea has been: "Succeed at what you are doing," rather than the French: "Is what you are doing worth while?"

Shouldn't we, as a nation, have more sense of proportion; and shouldn't energy be controlled by brains and a sense of fitness, rather than run wild? As Governor Coolidge recently said: "The curse of the present is the almost universal grasping for power in high places and in low . . . It is always well for men to walk humbly." Even the pious *Engineering and Mining Journal* reprinted this saying of Governor Coolidge!

P. B. MCDONALD,

Assistant Professor of English, College of Engineering, New York University.

The Problem of Handling the "External Relations" of Engineering Societies

Sir—After reading the report of the annual meeting of the American Society of Civil Engineers and the remarks of progressives and conservatives, I think I see something of what is in the air. It seems to be a question of how far professional engineers shall go in advancing their personal and professional interests, as well as public interests, by united work along promotion and salesmanship lines. The American Society of Civil Engineers has acted along these lines in the past, but in a very mild and inefficient manner—in view of possible results, it seems to me.

Thus, as far as "external relations" are concerned, it is a question if a member is satisfied with existing methods and results, or desires more aggressive action along new lines with the assistance of all engineers in the country. If a member does desire the expansion in "external relations," it is necessary to define the machinery and methods by which to accomplish the work. One way would be the formation of the "comprehensive organization" of all engineering societies in the country in a body of the National Chamber of Commerce type. This would make another organization for engineers to support. Another way would be for all professional engineers who desire to do so to unite with the American Association of Engineers, an organization now doing welfare and promotion work quite successfully, with a membership of over 10,000 and the support of many engineers of national standing. Membership in this latter association has no relationship to membership in any other national or founder society—an engineer uniting with either or both as he sees fit.

The new "comprehensive organization" now proposed in Question 3 would have some decided disadvantages in its results. The first disadvantage is the alienation of the support of some of the ablest members of the founder societies who lean to conservatism and could not support what would appear to them to be "commercialism" in society affairs. The second would be the formation of an entirely new machine in duplication of a machine (the American Association of Engineers) already well advanced.

The solution seems to me to be, first that the American Society of Civil Engineers adhere to its well-established practices in external relations; second, that all engineers who favor united professional participation in national affairs and who favor "welfare" work in general unite with the American Association of Engineers, keeping also their membership in the primarily technical organizations.

As to the internal changes suggested, I believe the proposed revisions would make the society a more truly national body and would increase the activities of the members.

FREDERICK T. LAWTON,
Assistant Engineer, Department N. Y. State Engineer and Surveyor, Assoc. M. Am. Soc. C. E., Mem. Am. Assoc. Engineers.

Flushing, N. Y.

Sir—The American Society of Civil Engineers has now before it the questionnaire adopted by the annual meeting, consisting of three items under external relations and six under internal relations to which latter has been added a seventh by the Board of Direction. It is here desired to discuss the third question on external relations, which reads:

"Shall the society for the purposes set forth in Questions 1 and 2 actively co-operate in the creation of the comprehensive organization as outlined in the Joint Conference Committee Report? (Report, Division C, page 10-19).

This question is the crux of that part of the questionnaire devoted to external relations, and the voter naturally inquires what is the comprehensive organization proposed? It seemed to the members of the Joint Conference and Development Committees that the report set forth the program with all necessary clearness, but since a committee of members of the Board of Direction have been willing to append their names to such a misinterpretation relating thereto as are contained in the report of the board's committee, it is evident that the clarity of the report was overestimated.

In further explanation it is to be said that it was the opinion of a large majority of the Development Committee that for so-called welfare work a comprehensive organization, embracing if possible all the engineers of the country, was most desirable. Some felt that it was unwise to burden a technical society with welfare work lest the latter should divert attention from the technical, and others felt that in no existing organization could all the engineers be assembled, and that what was wanted was the quickest method of bringing them together. Having had experience with several conventions on co-operation, and with the convention to consider a National Department of Public Works, it was concluded that the best way to get the profession together would be to ask every organization of engineers now existing to arrange to have itself represented in a national council, and in order to finance the project to ask the societies to contribute thereto on a *per capita* basis.

Accordingly it is proposed that an invitation be issued to all the engineering organizations of the country to be represented at such a convention, the date of which has been set for May next, when it is expected a formal organization will be created.

It does not seem to the writer that in sending delegates to such a convention or contributing to its support the society is doing anything different in principle than it has been doing for some years past, in appointing delegates to Engineering Council and appropriating money from its treasury for that council's use. It is not possible for the writer to understand how the proposed national organization can in anyway supersede, subvert, control or unduly influence the American Society of Civil Engineers, any more than the election of members of Congress by the same people that elect representatives in the state legislatures enables the former to supersede, subvert, control or unduly influence the state governments. Each organization will have its own field, one primarily and principally technical, the other entirely non-technical and purely welfare.

As to financial obligation, the committee on budget which investigated that subject and had the benefit of the counsel and advice of the late secretary of the society, reports that the total additional expense to the society for the proposed national council would be $8,500, and in view of the liberal pension granted to the retiring secretary it can hardly be said that this burden upon the resources of the society would be expected to seriously weaken it.

To be specific, the Joint Conference Committee unanimously, and the Development Committee by a vote of sixteen to four, recommend that representation in the national council be accorded to each national society of engineers having a membership of 200 or more, and to each local, state or regional society having a membership of 100 or more, provided that where a local society is affiliated with a state organization it cannot be represented as a local society and as a state society also; and further they recommend that national societies contribute annually $1.50 per member, and local, state and regional societies, $1 per member to the treasury of the national council; and that there be created from the national council an executive board of not to exceed thirty members, divided between national and other organizations in proportion to their membership. As a safeguard to the national societies it is provided that they shall select their own members of the executive board while the representatives of the other organizations thereon are to be elected by their members in the council. The council is to maintain a headquarters with a paid secretary and necessary assistants.

In the foregoing the term "welfare" has been used to indicate those activities relating to the public and the profession which are not purely technical.

GARDNER S. WILLIAMS,
Member of Development Committee, Am. Soc. C. E., and of Joint Conference Committee.

Ann Arbor, Mich.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Pipe Pusher Cuts Cost of Under-Pavement Cable Conduits

By C. A. Frankinhoff
Kansas City, Mo.

OVER 22c. a foot was saved as compared with cutting through the pavement by using a pipe pusher to install across-street, under-pavemnt pipe conduits for electric cable on recent work directed by Black & Veatch, engineers, of Kansas City, Mo. Complete records of the operations were kept and are summarized in the accompanying table. The notes to the table indicate the difficulties experienced in pushing the pipe. To start pushing, pits 8 ft. long, 20 in. wide and 20 to 36 in. deep had to be dug at one side of the street; these are the pits to which column nine of the table has reference.

TIME AND COST RECORDS OF INSTALLING UNDER-PAVEMENT CONDUIT WITH A PIPE PUSHER

Number	Size of Pipe, In.	Distance Pushed Ft.	Time to push, Hour	Time to Pull, Hour	Number Men on Machine	Pipe In. Below Curb, In.	Pipe Out Below Curb, In.	Dig and Back Fill Pit Hour	Crossing Cost per Ft.
1	¾	37	4½	1½	2	8	X	4	$0.129
2	1¼	44	3	1	2	18	16	5½	0.108
3	1¼	46	3½	1¼	2	18	22	5½	0.111
4	1¼	35	1¾	¾	2	18	6	5	0.107
5	1¼	44	4	1¼	2	12	48	7½	0.139
6	1¼	35	2	1	2	18	18	4¾	0.111
7	1¼	44	4½	1½	2	18	108	12¾	0.213
8	1¼	30	4	2	2	18	X	11	0.273
9	1¼	30	2	1	2	18	18	6	0.150
10	1¼	33	3½	1¼	2	18	18	5	0.151
11	1¼	33	4	1¼	2	18	8	4¼	0.159
12	1½	45	5	3	2	24	24	11	0.189
13	1¼	65	7	2	2	22	24	12	0.162
14	1¼	65	12	2	2	18	X	11	0.192
15	1¼	56	4½	1½	2	20	18	9	0.134
16	¾	70	12	3	2	22	18	11	0.186
17	¾	95	9	3	2	22	22	9	0.110
						below pavement			
18	1¼	38	6	2	2	18	24	5½	0.177
19	1¼	38	6	2	2	18	18	4	0.158

(1) Up through pavement. (2) Easy through. (3) Hit rock. (4) Easy through. (5) Hit rock; time lost in digging for pilot. (6) Easy through. (7) Deflected down and to left; time lost in hunting for pilot. (8) Came up through pavement. (9) Easy through; backfill slowed due to cold weather. (10) Easy through. (11) Broke machine; repairs on hand. (12) Veered to left; Tarvia to replace. (13) Ran into rock, had to repunch. (14) Ran into gas main at 50 ft., dug up pavement at main; set machine and pushed from main to complete crossing. (15) Ran easy all way; veered to right about 10 in. in push. (16) Time lost in cutting pipe for machine. (17) For this push and the one above hole was cut in pavement for machine setting; ran through easy and on exact line. (18) Veered to left 6 in.; pushed hard. (19) Ran true and pushed easy; men took it easy; last hole.

The machine purchased for this job cost $75.50 f.o.b. at the factory, with all appliances for 1¼-in. and ¾-in. pipe. The express on the complete outfit, weighing about 80 lb., amounted to $5.25. The repairs to the machine totaled $7.25 for a total push of about 1,000 ft. under bituminous pavement.

All labor used on the machine was paid at the rate of 50c. per hour. The average of the tabulated costs of crossing streets compared with the cost of crossing the same amount of Tarvia pavement by trenching are:

Cost per foot with pipe pushing machine..............	$0.157
Cost per foot by cutting through pavement............	0.380
Saving per foot	$0.223

This saving of $0.223 per ft. on 883 ft. of crossing amounted to $196.90. This amount less the cost of the machine express, and repairs gives an increased profit of $108.90, on this small job. The contractor still has the machine in as good a condition as when first used.

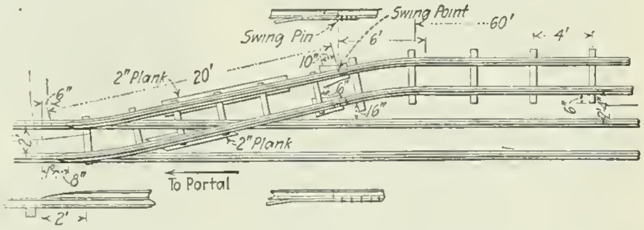
Frogless Switch Sidetracks Muck Cars at Tunnel Heading

By N. A. Eckert
Construction Engineer, Hetch Hetchy Project

CARS for hauling muck used in the tunnels of the Hetch Hetchy project have a capacity of 54 cu.ft., the bodies being 4 ft. in width and the gage 2 ft. They are ordinarily handled in trains of five cars by a storage battery locomotive. In order to avoid moving them an excessive distance by hand in making up the loaded train and to facilitate getting empty cars up to the face, the switch shown in the accompanying sketch was devised by the foreman in charge at Early Intake Tunnel.

The rails in the main tunnel track are 30-lb. A. S. C. E. section. The switch and siding are constructed of 20-lb. steel, the rails being tapered down at the points so as to give an easy run on to the main truck. Flat metal ties are used on the siding made of ⅜-in. iron, 3 in. wide and spaced 4 ft. center to center.

The entire switch and siding can be lifted bodily in one piece and moved ahead to a new location. Preparation for a new location is made merely by levelling the ground even with the top of the main tunnel rails. It takes only a few minutes to move the switch ahead after levelling up for it. If necessary it can be removed back before blasting and replaced afterward.



The device is hinged at the swing point as indicated on the sketch. The joint in the rail opposite the swing point opens when the switch is moved, which is done simply by lifting the points from the main track and swinging the whole switch.

The switch at the heading end is made somewhat lighter than that on the opposite end of the siding because on this work the former is operated about five times as often as the latter. The switch at the heading end handles only the empty muck cars while the electric locomotive must pass over the switch at the rear.

With this type of switch it is possible to store cars so close to the heading that they do not have to be moved more than about 50 ft. by hand. With the type of switch commonly used, involving the cutting in of a frog, the moving of which may require half a shift, it is not generally advisable to move the siding more often than once in two or three weeks. This sometimes requires that cars be handled a distance of three hundred feet by hand.

Of course the use of this type of switch would not be warranted where small cars are used which can be conveniently moved on a slick-sheet and kept right at the tunnel heading without the use of any switch.

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

NEWS OF THE WEEK

New York, March 4, 1920

Construction Division Auxiliary Meets and Organizes

The first annual meeting of the Construction Division Auxiliary was held in New York, Feb. 28, with Col. Peter Junkersfeld, of Boston, presiding. By-laws were adopted, officers elected and the place set for the next annual meeting. A dinner was held in the evening. Throughout, the proceedings partook of the nature not of a formal gathering but of a family or fraternity meeting.

The by-laws set forth as the objects of the association the perpetuation of the ideals and spirit of the Construction Division of the Army, and the furnishing of means whereby the relationships established during the war may be perpetuated. The annual meeting is to be held on the fourth Saturday of February. All officers and former officers of the Construction Division and such civilians as may be invited by the Auxiliary are eligible to membership. Management of the Auxiliary will be in the hands of a president, a vice president, a secretary, a treasurer and a board of forty-eight governors. Annual dues were fixed at $2 per annum.

Next Meeting in Chicago

Chicago was selected as the place for the next annual meeting. The chief item of business, outside of the work of organizing, consisted of the discussion and unanimous passage of a resolution pledging the Auxiliary as a body and the members as individuals as a reserve to be at the call of the Government in case of another emergency.

Secretary Baker, Assistant Secretary Crowell and Maj. Gen. I. W. Littel were elected honorary members.

At the dinner Secretary Baker and Brig. Gen. R. C. Marshall, Jr., head of the Construction Division, were the guests of honor. The only address was that of the Secretary, who gave unstinted praise to the work of the officers and men of the Construction Division, saying that future historians would characterize the building of the cantonments, of port structures and warehouses as an Aladdin-like achievement. He said that it was impossible to appraise with absolute sureness the various accomplishments auxiliary to the actual fighting, but he would be inclined to put second the cantonment construction, awarding first place to the ferrying of 2,000,000 men safely through submarine-infested waters.

Officers were elected for the ensuing year, Col. C. C. Wright, of Chicago, as president; Col. Joseph N. Wilcutt, of Boston, vice president; Major George Gibbs, of Washington, secretary, and Col. Warren Roberts, of Chicago, treasurer.

Gossip Regarding New York Section, Am. Soc. C. E.

Disappointment is being expressed among the younger members of the American Society of Civil Engineers at New York that in the election of officers of the new New York Local Association of Members recognition was not given to the younger element. All of the officers are from the older members, and the majority are looked on as being conservative or ultra-conservative.

It has also become known that at the organizing meeting it was proposed that the New York association should take a stand against the report of the Development Committee. That there may be broad discussion and assurance that there will be no unrepresentative action, there is talk of an effort to insure a large attendance of the younger members and those in sympathy with the Development Committee's report at the first general meeting of the association. Call for that meeting has not yet been issued.

Colonel Potter Heads Mississippi River Commission

Colonel Charles L. Potter, Corps of Engineers, has been confirmed by the Senate as president of the Mississippi River Commission. Lieutenant-Colonel Herbert Deakyne and Lieutenant-Colonel Harry Burgess have been designated as members of the commission. The new president succeeds Colonel Curtis McD. Townsend, who reached the retirement age early in February. Colonel Potter was born in Maine, Jan. 24, 1864. He entered the Military Academy in 1882. He served with the Cavalry until 1887, when he was transferred to the Engineer Corps. He was graduated from the Engineer School of Application in 1889.

Illinois Members Am. Soc. C. E. Discuss Questionnaire

At a meeting of the Illinois Association of the American Society of Civil Engineers, held in Chicago Feb. 25 to discuss the questionnaire on the future activities of the society, the main topic was the proposition for a separate joint organization to handle the welfare work for the several national societies. This proposition was approved in principle, although the affirmative vote did not endorse any particular plan. It was decided, therefore, to secure further information from the parent society and to discuss this subject at a later meeting before taking any final action that would commit the association to the support of a definite plan.

Goethals' Concrete Block Tunnel Declared To Be Impracticable

Brief of Chief Engineer Holland States Objections to Capacity, Shell Strength, and Cost

Specific objections to the 42-ft. concrete-block tunnel recommended for the Hudson River vehicular crossing by General George W. Goethals two years ago are presented in an engineering brief of C. M. Holland, chief engineer to the tunnel commissions, made public on March 1. This brief is the reply to a series of questions addressed to the commission by General Goethals after the publication of the engineer's report on tunnel plans, abstracted in *Engineering News-Record* of Feb. 19, 1920, p. 357. These questions asked for a statement of the reasons on which the criticisms of the large-size concrete-block tunnel in the report were founded; the traffic capacity had been declared over-estimated, the tunnel design condemned as too weak and not adapted to Hudson River conditions, and estimates of cost and time of construction rejected as too low.

Limited Traffic Capacity

As to traffic capacity, Mr. Holland's brief asserts that the two 22½-ft. roadways of the Goethals tunnel cannot carry three lines of vehicles. With two lines of trucks each 8 ft. wide and one line of passenger cars 6 ft. wide, a total clearance of only 6 in. is left; each of the roadways can therefore carry only two lines of traffic and the 42-ft. tunnel will carry only four lines (two on each deck) instead of six as estimated.

Discussing the matter of strength, the brief presents three stress-sheets to show the deficient stability of the block ring 36 in. thick (42 ft. outside diameter). In addition it asserts that tunnel experience shows strength and rigidity of tunnel shell to be necessary, especially in the cross joints, and that the block tunnel does not provide strength here. In the Hudson River, where soft ground of widely varying nature is encountered, great lateral strength must be provided and the shell must be maintained impervious, while the block tunnel is "the worst possible to meet these conditions" on account of its lack of rigid connection at the cross joints and the impossibility of maintaining these joints tight when not rigidly connected.

Many items of the cost estimate are attacked. Among these are: concrete blocks, estimated at $11, should be at least $33 per cu.yd.; cost of excavation is wrongly classified, is erroneous in amounts, and is too low in its units, and will total $9,700,000 instead of $3,730,000. Items such as ducts, sewer reconstruction, etc., are omitted; real estate is not included, and $2,500,000 should be added to cover it; plant cost will total over $2,600,000 instead of $1,435,000, and two shields must be used instead of one. The estimated time of three years for construction is questioned because it would require a rate of progress twice that attained in the best similar previous work, although being much larger the 42-ft. tunnel should progress more slowly.

In support of the chief engineer's brief, the Board of Consulting Engineers of the tunnel commission reports that the answers given in this brief to General Goethals' questions are conclusive and show "the impossibility of the serious consideration of the project as a matter of construction."

To Complete Aqueduct Enlargement for Water Supply Only

Completion of the Montreal aqueduct enlargement for water-supply purposes only, together with provision of additional pumps, filters and storage reservoirs is recommended by R. S. and W. S. Lea, consulting engineers, Montreal, in a report to the City Administrative Commission of which E. R. Decary is chairman. It is estimated that the completion of the adueduct enlargement along the original lines for combined water supply, electric light and power purposes would cost $10,000,000, whereas the modified plan recommended would cost $1,683,000.

The engineers advise installation of a new motor-driven pumping plant at a cost of $850,000; that the filter plant capacity be increased to a capacity of 144,000,000 U. S. gal. at a cost of $2,000,000; and that "additional elevated reservoir storage" sufficient to give "8-hr., stand-by storage over and above the capacity required for equalizing purposes" be provided.

A contract for enlarging the aqueduct was let in July, 1913. The enlargement work was stopped by the break of the closed conduit alongside it on Dec. 25, 1913, and was continued with interruptions until the autumn of 1917. On Dec. 26, 1917, the contract was cancelled by mutual consent and the claims of both sides referred to arbitration. The terms of the award were summarized in *Engineering News-Record*, Sept. 11, 1919, p. 534. The break in the "lateral conduit," as it was called locally, was described at length in *Engineering News*, Jan. 1, 1914, p. 54.

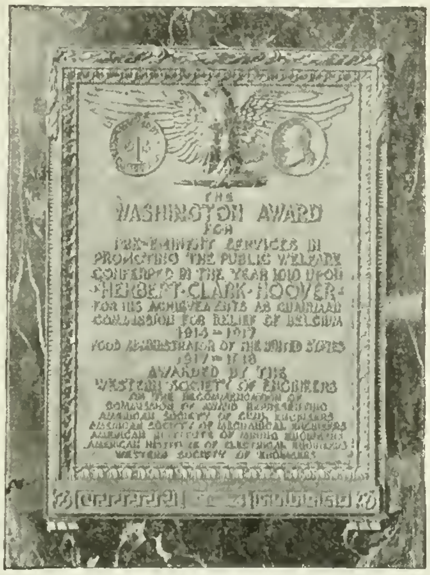
Suspended Army Contracts Are Nearing Settlement

The construction division of the Army has liquidated 99 per cent of the uncompleted portions of suspended contracts. Their aggregate value was $15,452,000. The Engineer Corps has liquidated 98 per cent of its suspended contracts, which totalled $173,964,000.

Herbert C. Hoover Receives Washington Award

Formal presentation of the Washington Award, founded in 1916 by John W. Alvord, to Herbert Clark Hoover was made Feb. 28 in Chicago. The occasion was a dinner arranged by the Western Society of Engineers to which is entrusted the handling of the award in conjunction with members of the Founder societies. In the words of the donor the award is to be presented "to a member of the engineering profession who has accomplished much for the world about him in vital, important, far-reaching ways, and whose services in general have been noteworthy for merit in promoting the public welfare."

Herbert C. Hoover Receives Washington Award


THE
WASHINGTON AWARD
FOR
PRE-EMINENT SERVICES IN
PROMOTING THE PUBLIC WELFARE
HERBERT·CLARK·HOOVER
FOR HIS ACHIEVEMENTS AS CHAIRMAN
COMMISSION FOR RELIEF OF BELGIUM
1914-1917
FOOD ADMINISTRATOR OF THE UNITED STATES
1917-1918
AWARDED BY THE
WESTERN SOCIETY OF ENGINEERS

THE TOKEN OF AWARD

Charles F. Loweth, chairman of the Washington Award Commission made the presentation speech recounting Mr. Hoover's attainments. Onward Bates spoke as a representative for the American Society of Civil Engineers, James R. Bibbins for the American Society of Mechanical Engineers, Bion J. Arnold for the American Institute of Electrical Engineers and Charles H. MacDowell for the American Institute of Mining and Metallurgical Engineers.

Mr. Hoover, in his address, stated that he never could have accepted the award except in a measure as homage to the 1000 engineers who—many with splendid personal sacrifice—had associated themselves with him. The subject of his address was "The Interrelationship of General Industry and Food Production and Distribution." His most startling statement was that within five years this country will be faced with the necessity of importing foodstuffs if our exports are developed as rapidly in the next five years as in the past five years. Farming must be made more attractive economically if a proper balance between it and industry is to continue, he asserted. In the line of practical remedies he discussed the weakness in our present railway situation in which the annual car shortages restrict the free flow of commodities. Besides increasing rail facilities he suggested improving the waterways from the Great Lakes to the Atlantic seaboard by way of the St. Lawrence.

A suggested second point of attack in reducing the cost of marketing was to remove every impediment to free trade in produce. He believes in regulation, rather than nationalization, of over-swollen units. The third factor in reducing marketing costs, he pointed out, was to reduce the number of persons engaged in the distribution of foodstuffs.

Despite a seven-hour delay in the arrival of Mr. Hoover's train, which prevented his appearance until nearly midnight, the 700 members of the Western Society of Engineers, the Founder societies and guests present at the dinner remained to do honor to him. A long list of speakers and community singing and other entertainment arranged in the emergency by the program committee kept the presentation audience intact and in a happy frame of mind for Mr. Hoover's delayed reception.

All Topographic Interests To Meet in Washington March 9

All interests concerned in United States topographic mapping have been invited to participate in a general discussion of the subject in Washington, March 9, with the Federal Board of Surveys and Maps created by the President on Dec. 30, 1919. The board, which recently met and effected its organization and adopted its by-laws, is composed of one representative from each of fourteen map making agencies of the Government executive departments.

At the coming meeting, which will be the first public session held by the board, an open letter of the chairman, O. C. Merrill, says it is desired to have all interested agencies represented in order to bring out a full knowledge of the needs for a general topographic map of the United States, and also the means by which its preparation can be expedited. The letter expresses the further desire of the board to hear all opinion on the general policies which the board should pursue in coordinating the work of the various agencies of the Federal Government, on the relations which should be maintained between the Board and non-Federal agencies, and on the practicability of maintaining these relations through a committee which would represent the several non-Federal agencies, and which could serve both as a means of correlating their activities and as a medium of co-operation between them and the board.

The purpose of the board, as incorporated in its by-laws, is "to co-ordinate and standardize all surveying and mapping activities of the Federal Government, and to harmonize these with similar non-Federal activities in the interests of economy and efficiency." The by-laws also declare it to be the policy of this board to invite full cooperation from any Federal or non-Federal map-making or map-using agency by the presentation of its views and by representation on committee having under consideration matters of interest to such agency.

The board will hold public meetings in Washington on the second Tuesday of January, March, May, September and November of each year. A central information office will be established in the U. S. Geological Survey for the purpose of collecting, classifying and furnishing to the public information concerning all map and survey data available in the several Government departments and some other sources.

At the meeting of March 9 the general discussion will be preceded by a talk by W. O. Hotchkiss, State Geologist of Wisconsin.

Testing Engineers Meet

As a further step toward standardizing methods and limits in testing materials for road construction work, a 5-day conference of the committee on tests of the American Association of State Highway Officials was held recently at the office of the Bureau of Public Roads, Washington, D. C. Testing engineers from 22 states were in attendance. The first day of meeting, the committee broke up into sub-committees for the consideration of test methods of bituminous materials, non-bituminous materials, concrete materials and test limits. Those attending the conference were, T. R. Agg, chairman, Iowa; R. L. Saunders, Connecticut; C. F. Purrington, New Hampshire; R. B. Gage, New Jersey; J. G. Bragg, New Jersey; N. H. Ulman, Pennsylvania; A. S. Rea, Ohio; F. L. Roman, Illinois; D. V. Terrell, Kentucky; J. F. Grimes, Kentucky; F. C. Lang, Minnesota; R. B. Dayton, West Virginia; M. O. Withey, Wisconsin; F. T. Maddocks, California; J. C. Cooper, Iowa; R. A. Seaton, Kansas; F. C. Rossel, Maryland; H. W. Leavitt, Maine; R. B. H. Begg, Virginia; W. F. Fallis, North Carolina; A. W. Dean, Massachusetts; W. D. Martin, Ohio; H. B. Henderlite, North Carolina; B. H. Hutchinson, Delaware. Recommendations of these engineers upon test methods and limits will soon be available.

Railway Engineers To Meet in Chicago

The American Engineering Association will hold its 21st annual convention in Chicago on March 16 to 18. Except for the annual dinner on the 17th the time will be occupied entirely with consideration of the numerous committee reports. The usual exhibition of railway appliances and machinery will be at the Coliseum, March 15 to 18.

Opinion of Consulting Institute on Pittsburgh Bridge Case

The council of the American Institute of Consulting Engineers has voted its condemnation of the practice current in Pennsylvania of entrusting the design of important engineering structures to architects.

The Pennsylvania tendency to use architects for engineering work in bridge design had its beginning in October, 1919, when the commissioners of Allegheny County, which includes Pittsburgh, turned over to firms of architects the design and construction supervision of two large bridges. Brief mention was made of the matter in *Engineering News-Record's* "Emergency Bulletin" of Oct. 23, 1919. It was again discussed editorially in this journal Oct. 9.

Additional architectural aggression in the field of engineering was contained in a letter to the Governor signed by the secretary of the Pennsylvania Art Commission urging the design by an architect of the proposed Delaware River Bridge at Philadelphia. The letter was published in *Engineering News-Record*, Jan. 29, 1920, p. 250. Several Pennsylvania engineering societies have sent resolutions of protest to the Governor.

ARCHITECTURAL ENCROACHMENT

Since it first became apparent the growing encroachment on engineering of the Pennsylvania architects has been under consideration by several of the nation's leading consulting engineers. The result is the following resolution recently passed by the council of the American Institute of Consulting Engineers:

Whereas, It is reported to the Council of the American Institute of Consulting Engineers that responsibility for the design and construction of certain important bridges has recently been entrusted to firms of architects; and

Whereas, In the construction of bridges of any type, and for any purpose, the engineering problems are of vital and first importance in providing safety, adaptibility and durability of the structures produced; and

Whereas, The external architectural treatment and decorative effect is secondary in importance to the engineering design; therefore be it

Resolved, That the Council of the American Institute of Consulting Engineers condemns and protests against public bodies entrusting the responsibility for the design or production of such important engineering structures to professional men whose training and practice is in a wholly different field, and who must, therefore, delegate to subordinates the solution of the fundamental problems of primary and vital importance. The Council condemns a division of the responsibility which will inevitably result by departing from ordinary procedure, and urges that no further work of the kind be entrusted to any except specialized engineers of acknowledged standing. The Council recommends, however, that in the case of monumental structures, the decorative effect secured by architectural treatment shall be considered by specialists engaged for that specific purpose.

First Issue of "The Military Engineer" Appears

Superseding *Professional Memoirs*, inaugurated eleven years ago by the Corps of Engineers, U. S. A., the first number of the new bi-monthly journal, *The Military Engineer*, official publication of the newly created Society of American Military Engineers, made its appearance this week. Compared with its predecessor it exhibits in its contents as well as in typography and general makeup a far keener appreciation of the possibilities of modern publication methods than did *Professional Memoirs*. The new journal is edited by Colonel P. S. Bond, former commandant of the Army Engineer School of the A. E. F. at Langres, France, and is designed as a medium by which members of the Corps of Engineers, the National Guard, ex-service men and engineers in civil practice may keep informed as to technical developments bearing upon national defence.

LEADING ARTICLE ON CONSTRUCTION

The leading article in the January-February number, "Engineer Construction in France," is by Colonel J. A. Woodruff, formerly deputy director of construction and forestry, A. E. F. Colonel R. R. Ralston discusses engineer duties in the field of war and there are two contributions on the use of the airplane in surveying and mapping. "Soldiers First!" is the title of an article by Colonel J. C. H. Lee, former chief of staff, 89th Division. A revolt against excessive paper-work, letter-writing and report-making is embodied in the remarks of Colonel Ernest Graves, formerly section engineer, advance section, S. O. S., A. E. F.

Articles dealing with civilian work are those on Lock D, Cumberland River, by R. F. Pafford, senior engineer; Key Bridge cofferdams, by J. T. Talman, assistant engineer; river and harbor improvements, by Major J. R. Slattery, and surges in Gaillard cut, by Major R. Z. Kirkpatrick. There are several pages of editorials and general news items.

National Federation Construction Industries To Meet

The first annual meeting of the National Federation of Construction Industries will be held at the Hotel Sherman, Chicago, March 24-25. The chief business of the meeting will be consideration of several important proposed changes in the by-laws of the organization. Through changes in the by-laws, it is proposed to increase the number of vice-presidents, create an advisory board, provide for a staff council and take measures to develop district organization.

President Wilson Signs District of Columbia Zoning Bill

A Congressional act creating a zoning commission for the District of Columbia with directions to the commission to establish, within six months from the passage of the act, height, area and use districts, and necessary regulations therefor, was signed by President Wilson on March 2. The intent of the act is "to protect the public health, secure the public safety, and to protect the property of the District of Columbia." The commission is an ex officio body of six, consisting of the Commissioners of the District of Columbia, the Officer in charge of Public Buildings and Grounds of the District, and the Superintendent of the U. S. Capitol Building and Grounds.

Public Hearings Provided

Before the expiration of 6 months after the act become effective public hearings must be held on the proposed districts and on the regulations governing the same. The bill provides for changes in districts on petition of property owners. After the districts are created no new buildings or old buildings made over or otherwise changed can be used until "a certificate of occupancy" has been obtained from the zoning commission. Buildings "erected, altered or raised, or converted in violation" of the provisions of the act or of orders and regulations thereunder are declared by the act to be "common nuisances" and the owners or persons in charge of maintaining such buildings, upon conviction of maintaining such nuisances, are to be liable to a fine of not more than $100 a day for every day the nuisance is permitted to continue, besides being subject to abatement of the nuisance by court order. The enforcement of the provisions of the act and of orders and resolutions adopted by the zoning commission is vested in the Commissioners of the District of Columbia. An appropriation not to exceed $5,000 for the expenses of the Zoning Commission is authorized.

Members of New Jersey Sewage Works Association Meet

At a meeting of the New Jersey Sewage Works Association held at Trenton, N. J., Feb. 25, C. G. Wigley, formerly chief of the Bureau of Engineering of the New Jersey State Department of Health and now with Clyde Potts, consulting engineer, New York City, was elected president and Frederick T. Parker, of the Atlantic City Sewerage Co., Atlantic City, N. J., was re-elected secretary and treasurer. It was voted to have two meetings during the coming year for purposes of inspection visits to sewage works and it was also decided that a special committee should be appointed by the president to take into consideration the desirability of enlarging the scope of the association to include operators of water purification works, the committee to report at the next meeting.

Confirms Contract for a Part of the Detroit Belle Isle Bridge

The Detroit City Council recently confirmed the contract with the Candler Dock & Dredge Co., of Detroit for the construction of the subway for street traffic under Jefferson Ave. at the approach of the proposed Belle Isle bridge. Although the amount of the contract, $360,190 was about 20 per cent in excess of the engineers' original estimate, it was considerably less than the one bid which was received and rejected when proposals were asked for in January; also the present contract was recommended by the City Department of Public Works and by Esselstyn, Murphy & Hanford, the engineers in charge of the complete Belle Isle bridge project.

This is part of the $3,000,000 Belle Isle bridge job for which bonds have been voted. As originally planned the subway approach was to be a steel structure but plans were later changed specifying a structure of reinforced concrete. Work will proceed on the main approaches and the bridge proper as soon as word is received that President Wilson has signed the special bill providing for a closed span bridge to be constructed across the river on the American side of Belle Isle.

Handling Machinery Men Meet

On Feb. 26 and 27 there was held in New York City the annual meeting of the Material Handling Machinery Manufacturers Association. An appreciable step was made toward the intergration of the industry of making material-handling machinery of all sorts. Several papers descriptive of modern handling equipment and installations were read but the main value of the sessions was the reiteration of the importance of acting as a unit in the development of the idea of handling by machinery rather than by man power.

Higher Price for Water Denied

The right to charge a higher price for water sold in bulk to the City of Hoboken for distribution by the city to consumers has been denied by the New Jersey Public Utility Commission. The company supplies water under a 25-year contract which it claims is now unprofitable. The commission adheres to its ruling of a few years ago in the Wildwood case to the effect that a company must fulfill its contract even though it proves to be at a loss, so long as the loss doen not threaten to jeopardize the service rendered to the public.

Engineers Predominate on Snow Removal Board

To study the problem of snow removal and devise means of preventing a great traffic tie-up such as was created by the snow storms last month the Mayor of New York recently appointed a snow-removal board of representatives of various municipal bureaus and departments. In the total membership of eleven on the board there are six engineers. The board consists of the following:

John Kenlon, Fire Department, chairman; Inspector Alfred W. Thor, Police Department; Nelson P. Lewis, Board of Estimate; Captain John P. Leo, Board of Standards and Appeals; Merritt H. Smith, Water Department; Edward Bryne, Department of Plant and Structures; Arnold B. MacStay, Street Cleaning Commissioner; John P. Binzen, engineer, Bronx Borough President's office; Philip Farley, engineer, Brooklyn Borough President's office; Amos Schaeffer, engineer, Manhattan Borough President's office; Dr. Royal S. Copeland, Health Commissioner.

Idaho Engineering License Exams To Be Given March 9

The second semi-annual examinations under the state engineering license law of Idaho will be given in Boise March 9, it has been announced by Paul Davis, director of the State Bureau of Licenses. The license law applies only to civil engineers, and it defines civil engineering as any engineering practice that is not mining, metallurgical or military. The license fee is $10 for residents of Idaho and $25 for those licensed or registered elsewhere.

Alabama Votes Road Bonds

At an election held recently Alabama voted to amend its constitution so that road bonds amounting to $25,000,000 could be issued. The vote to amend was overwhelming. The same day the state voted its bonds Jefferson Co., authorized a $5,000,000 issue; also for roads.

House Votes Increased Speedway Hospital Appropriation

The much discussed appropriation for the speedway hospital at Chicago was practically settled when the House on Feb. 28 voted to increase the appropriation for its completion from $3,000,000 to $3,400,000. The House conferees had been unable to agree on the amount. The Senate had increased the appropriation to $4,000,000, but it is believed that the Senate conferees will accept the figure voted upon in the House.

The House amendment provides that no part of the appropriation is to be used to pay any profit to either the owners of the land or the owners of the uncompleted buildings, or to the contractor for the completion of the work.

Army Bill Places Construction Division in Q. M. Corps

(Washington Correspondence)

As was anticipated the Army Reorganization bill places the Construction Division of the Army in the Quartermaster Corps and the Quartermaster General is charged with "the direction of all work pertaining to the construction, maintenance and repair of buildings, structures and utilities connected with housing the officers and enlisted men of the Army." The Military Affairs Committee receded, however, from its former position in regard to the Chemical Warfare Service, and the bill, as does the Senate measure, gives that service a separate entity.

In providing 600 officers for the Engineer Corps the bill upsets the proportion of officers and enlisted men to such an extent that its provisions would be very hard to carry into practice. It is anticipated, however, that the fault in that respect will be remedied by an amendment during the legislative course of the measure. The 12,000 enlisted men assigned to the corps, to be properly officered, would require 640 officers. In addition the Engineer Corps requires, more than do most of the military divisions, a large number of officers for staff operations and to handle the civil work.

In France it was found that there must be one engineer regiment for each nine regiments in other branches. This was considered the irreducible minimum. A relationship of one to six was held to be much more desirable. Despite these well-known facts, the House bill makes the proportion 1 to 20.

Calendar

Annual Meetings

AMERICAN RAILWAY ENGINEERING ASSOCIATION; 1426 Manhattan Bldg., Chicago; March 16-18, Chicago.

NATIONAL FEDERATION OF CONSTRUCTION INDUSTRIES, Drexel Bldg., Philadelphia; Chicago, Mar. 24, 25.

NATIONAL FIRE PROTECTION ASSOCIATION, 87 Milk St., Boston; May 4-6; Chicago.

AMERICAN ASSOCIATION OF ENGINEERS; 63 E. Adams St., Chicago; May 10, 11, St. Louis, Mo.

AMERICAN WATER WORKS ASSOCIATION, New York City; Montreal, June 21-26.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; Asbury Park, N. J., June 22-25.

AMERICAN PUBLIC HEALTH ASSOCIATION, Boston; San Francisco, Aug. 30-Sept. 3.

ENGINEERING SOCIETIES

The Engineers' Club of Toronto (Ont.) has just closed its twentieth year. The club's board of direction at a recent meeting decided to double the entrance fee as the membership has almost reached the accommodation limit of the club's present quarters. The following officers have been elected for 1920: President, Melville P. White; first vice-president, Tracy D. Le May; second vice-president, J. B Carswell; third vice-president, W. R. McRae; secretary-treasurer, R. B. Wolsey. The directors for the ensuing year are: J. R. W. Ambrose, A. M. Cooper, E. G. Hewson, Charles H. Hays, Arthur H. Hull, J. H. McKnight, L. V. Rorke, J. R. W. Wainwright, Walter F. Wright, Maj. E. W. Wright, T. S. Young.

The Engineers and Architects' Club of Louisville, Ky., was addressed at a recent meeting by Lucien J. Beckner, consulting geologist of Winchester, Ky. His subject was the natural resources of Kentucky. A report on pending good roads legislation in the state was presented by the club's Good Roads Committee. The club intends to back any good legislation pertaining to roads with all its power and to discourage anything therein which may not meet its approval.

The Seattle Chapter, A. A. E., held its annual meeting Feb. 9 and elected John L. Hall, president; Maj. Carl H. Reeves, vice-president; and Capt. Bertram Bean, secretary-treasurer.

The Cleveland Chapter, A. A. E., has announced that a bill relative to the limited employment of county draftsmen in Ohio, and amending a section of the Ohio general code, has passed both branches of the state legislature and is awaiting the governor's signature. W. A. Stinchcomb, county surveyor of Cuyahoga County, Ohio, was active in originating the bill. He secured for it the support of the Cleveland Chapter, A. A. E.. and through the latter the endorsement of other engineering societies throughout the state. Also through the efforts of Mr. Stinchcomb the bill was introduced and actively pushed through the state senate and house. The bill removes the limitations on the number and salaries of draftsmen that may be employed by county surveyors who maintain drafting rooms. Under the present law, county surveyors are limited to four men at a maximum of $1,500 per year.

The Engineers' Society of St. Paul (Minn.) at its recent annual meeting elected president, E. V. Willard, commissioner of drainage and waters for the State of Minnesota. Mr. Willard is an associate member of the American Society of Civil Engineers. John E. Mullin, chief engineer, State Highway Commission of Minnesota, was elected vice-president; E. A. Goetz, chief engineer, St. Paul Foundry Co., was elected secretary, and G. L. Mason, landscape architect, was elected treasurer.

The Colorado Society of Engineers at its recent annual meeting and dinner in Denver, Colo., elected R. G. Hosea, president; F. C. Dreher, vice-president; C. B. Daniels, secretary-treasurer. The theme of the evening was "1920—What Progress for Colorado?" The prominent speakers were the Hon. Delph Carpenter of Colorado, John E. Field, former state engineer of Colorado, and J. G. McMurray, general attorney of

The North Carolina Society of Engineers has adopted a constition that provides for amalgamation with the American Association of Engineers. The principal speaker in favor of the amalgamation was Doctor W. C. Riddick, president of the North Carolina State College and president of the society. R. C. Bailey addressed the convention and advised the members of financial arrangements which the association would make upon amalgamation. New officers were not elected.

PERSONAL NOTES

P. C. PAINTER, paving specialist and late captain, Engineers, U. S. Army, has joined the engineering staff of the Eastern Paving Brick Manufacturers' Association as a district engineer. For several years before the war Mr. Painter was connected with the Paving Commission of the City of Baltimore and while in the military service in France was in charge of a portion of the road construction and maintenance there.

COLONEL CHARLES KELLER, Corps of Engineers, was decorated with the Distinguished Service Medal by the Secretary of War in the latter's office in Washington Feb. 20, 1920 The medal had been previously awarded to Colonel Keller for his distinguished services in France as Deputy Chief Engineer, A. E. F., and as Assistant to the Chief Engineer, A. E. F., at general headquarters.

H. D. BRUNING has resigned as chief engineer of the Ohio State Highway Department to enter the employ of the Ohio Paving Brick Manufacturers' Association.

R. M. NORTON, county engineer of Sacramento Co., Cal., has resigned to become county engineer of San Diego Co., Cal. W. S. Caruthers has secured a year's leave of absence as division engineer of Division 3, California State Highway Commission, to fill Mr. Norton's former position with Sacramento Co., while G. R. Winslow, first assistant engineer of the California State Highway Commission, replaces Mr. Caruthers as division engineer, Division 3.

R. M. WHITE, formerly division engineer of the Delaware, Lackawanna & Western R.R. at Buffalo, and later superintendent of the Bangor & Portland Division, has been appointed superintendent of the Morris & Essex Division of the same road, with office in Hoboken. During the war Mr. White was lieutenant-colonel in charge of Section C of the Construction Division.

WILLIAM N. BOYD has been appointed chief engineer of the Detroit, Bay City & Western and the Port Huron Southern railroads with head quarters at Bay City, Mich.

JOHN C. HOYT, chief of the division of surface waters of the U. S. Geological Survey, sails early in March for Honolulu where he will confer with the district engineers in Hawaii regarding the surface waters investigations being conducted there. The divisions of surface waters and ground waters of the Geological Survey have been co-operating with the Hawaiian government in producing an adequate and pure water supply.

Aubrey G. Haven of Brooklyn, N. Y., has been appointed as real estate engineer in charge of the valuation of real estate and right-of-way for the Gulf, Mobile & Northern R.R. For many years past Mr. Haven has been engaged in similar work for the B. & O. R.R., the Atlantic Coast Line R.R., the Canadian-Pacific Ry., the Lehigh Valley R.R., and the New York Central & Hudson River R.R.

Benjamin F. Wood, formerly chief engineer of the electrical division of the Pennsylvania R.R., and more recently head of B. F. Wood, Engineers, Inc., announces a change in the name of the latter firm to Wood, Hulse, Yates Co., Inc. Other members of the firm are William S. Hulse and Eugene A. Yates.

W. E. Herring, water-power engineer of the United States Forestry Service in the district of Washington, Oregon and Alaska, and later industrial manager for the Puget Sound Traction, Light & Power Co., has joined the engineering staff of Stone & Webster.

Austin H. Reeves has opened an office for practice as consulting civil engineer at Charlotte, N. C.

H. C. Compton, formerly county roadmaster, Clackamas County, Oregon, has been appointed District Highway Engineer with headquarters at Boring, Oregon. H. A. Rand succeeds Mr. Compton as county roadmaster.

F. M. Lane has been appointed engineer in charge of the Woodland, Wash., diking district, Cowlitz County, with headquarters at Woodland.

J. F. Buckley of Oakland, Cal., has been chosen to represent the Port of Portland Commission of Portland, Oregon, on a trade mission to the Orient.

Roswell D. Trimble has announced his resignation from Winston & Co. of Richmond, Va., and New York City, and the organization of R. D. Trimble & Co. of Richmond. The new firm will carry on a general consulting and constructing engineering practice.

Howard H. Barnett, for the past three years city engineer of Pontiac, Mich., has resigned to resume private practice as a consulting engineer. Mr. Barnett not only executed a very large construction program for Pontiac during his retention by that city, but he laid out $2,000,000 worth of work to be done during this year and next. His successor as city engineer is L. J. Lenhardt recently in the engineering department of Detroit, and assistant engineer with Clarence H. Hubbell, consulting engineer of that city.

P. M. Lau has resigned as highway engineer, Oakland Co., Mich., to enter the contracting field in highway work.

Frank M. Clark, engineering superintendent in charge of paving for the Barrett Co., Ltd., in the Maritime Provinces of Canada, has resigned to assume the duties of his appointment as assistant chief engineer of the Nova Scotia Highway Department in charge of highway construction. His headquarters are now at Halifax, N. S. J. W. Roland is chief engineer of the department.

H. H. Wadsworth, who has been with the Engineer Department, U. S. A., since 1897 and since 1905 chief assistant engineer of the California Debris Commission, has severed his Government connection and opened an office in San Francisco for consulting and general engineering practice. He will specialize in works for the utilization of water and for flood protection. During the war Mr. Wadsworth held the rank of Major. For two and one-half years he was connected with the advisory board of engineers appointed by the President to advise the Secretary of the Interior on San Francisco's plans for developing a source of water supply.

OBITUARY

Andrew C. Hansen, city engineer of Los Angeles, Cal., died at his home there on Feb. 9, 1920, of pneumonia. Andrew Christian Hansen was born in Denmark in 1880. He came to this country with his parents when eleven months of age. The family took up residence in Sanger, Cal., and the boy worked his way through the University of California, graduating in 1902. His professional work as an engineer began with the United States Reclamation Service on the Klamath Falls and Yuma projects. In 1906 he was put in charge of the outfall sewer, then being built for the City of Los Angeles, whereon difficulties had been encountered and the work abandoned by the contractors. He carried this work through to a successful conclusion, and from there was transferred to the Los Angeles aqueduct, having charge of the Jawbone and Mojave divisions, the most difficult pieces of construction on the work. Next he became inspector of Public Works in the City of Los Angeles, and in 1913 was made chief deputy city engineer, being appointed city engineer in 1917 to fill a vacancy. Mr. Hansen was a member of the Am. Soc. C. E., and the A. A. E., and the Engineers and Architects Association and University Club of Los Angeles.

Walter Shepard, formerly consulting engineer for the Boston & Albany R.R., died at his home in Dorchester, Mass., Feb. 8, 1920. Mr. Shepard was for forty years an engineer for the Boston & Albany R.R., retiring from that service in April, 1919. He was born in Dorchester in 1849, and graduated from Harvard University in the class of 1870. He then took a course in civil engineering at Massachusetts Institute of Technology, graduating in 1872. Upon graduation he entered the employ of the Boston & Albany, and rose through the various stages in the engineering department to that of principal assistant engineer. He was in charge of the construction of the South Station of Boston, for which he had made an exhaustive study of terminal problems, both in this country and abroad.

Robert Murdoch Walker, civil engineer and builder, died Feb. 7 at his home in Atlanta, Ga., at the age of fifty-six years. Mr. Walker was born in Columbia, S. C., in 1864. He was head of a large construction company with headquarters in Atlanta, which has built many of the principal edifices of that city.

Arthur Tufts of Atlanta, Ga., one of the leading engineers and contractors of the South, died Feb. 23, at his Atlanta home at the age of 40. Influenza was the cause of his death. Mr. Tufts, who had resided in Atlanta most of his life, was the owner of the building and contracting business conducted there under his name. One of Mr. Tufts' most important undertakings was the construction of Camp Gordon for the government.

Paul Paradis, civil engineer of the Montreal Tramways Commission, died in Montreal, Que., Feb. 10. Mr. Paradis had for many years held important government positions in Western Canada.

Orlando W. Norcross, well known as a member of the contracting firm of Norcross Bros. of Worcester and Boston, died suddenly at his home in Worcester, Mass., Feb. 27, 1920. Mr. Norcross was identified with the construction in some of the largest contracts for buildings in the East.

Robert Wakefield who died recently at his home in Portland, Ore., at the age of 74, was one of the Pacific Coast's pioneer contractors and engineers. He constructed many large municipal projects including a bridge across the Willamette River and a great part of the Portland water-supply system.

George Romaine Olney, civil engineer, died this week at his home in New York City. He was 77 years old and was born in Windham, N. Y. He took up law after graduation from college, but after practising for some time in Catskill studied civil engineering. He was engaged in construction work of the West Shore R.R. and later in the construction of New York city's aqueduct.

James Gayley, first vice-president of the United States Steel Corporation from 1901 to 1908 and distinguished among the great steel men of the country for his knowledge of metallurgy, died Feb. 25 after an illness of several weeks in New York City.

J. W. Kaerth, for many years county surveyor of Colusa Co., Cal., and prominently identified with irrigation and reclamation work in the Sacramento Valley of California for the past 25 years, died on Feb. 12, at Colusa, aged 54 years.

JOHN LESTER MILLER, former resident engineer, Norfolk & Western R.R., county engineer, Ross Co., Ohio, city engineer Chillicothe, Ohio, died Feb. 14, 1920, from injury resulting from a fall. Mr. Miller, who was in charge of a $1,000,000 construction for the Meade Paper & Pulp Co. of Chillicothe when he died, was 33 years of age, and a graduate in civil engineering, University of Virginia.

LOREN R. MANVILLE, assistant engineer in the office of the engineer of structures, U. S. Railroad Administration, died in St. John's Riverside Hospital, Yonkers, N. Y., Feb. 12, after an illness of about six weeks, due to complications following an operation for appendicitis. Mr. Manville was born in Mason City, Iowa, on Jan. 31, 1886. He was graduated from the University of Michigan in 1912, receiving the degree of Civil Engineer in 1918. Upon the completion of his college course he went to New York and entered the employ of the New York Central as a bridge designer. On account of his exceptional ability he was rapidly promoted and soon became an assistant engineer in charge of working out the details and design of some of the most important bridges. Conspicuous among these bridges were two projects: the repair of the Harlem River drawbridge and the bridge carrying the New York and Ottawa over the St. Lawrence River at Cornwall, Quebec. The work at both of these bridges involved the repair or renewal of pins and presented problems of unusual difficulty which required special methods that were practically without precedent. The latter is described in the present issue of *Engineering News-Record.* He was greatly interested in engineering research, his most notable undertaking along this line being an investigation of the strength of timber beams, whose result was published in an article by him in *Engineering News-Record.* Others of his articles had been published previously in *Engineering News* prior to its consolidation with *Engineering Record.*

New Concrete Pressure Pipe Joint

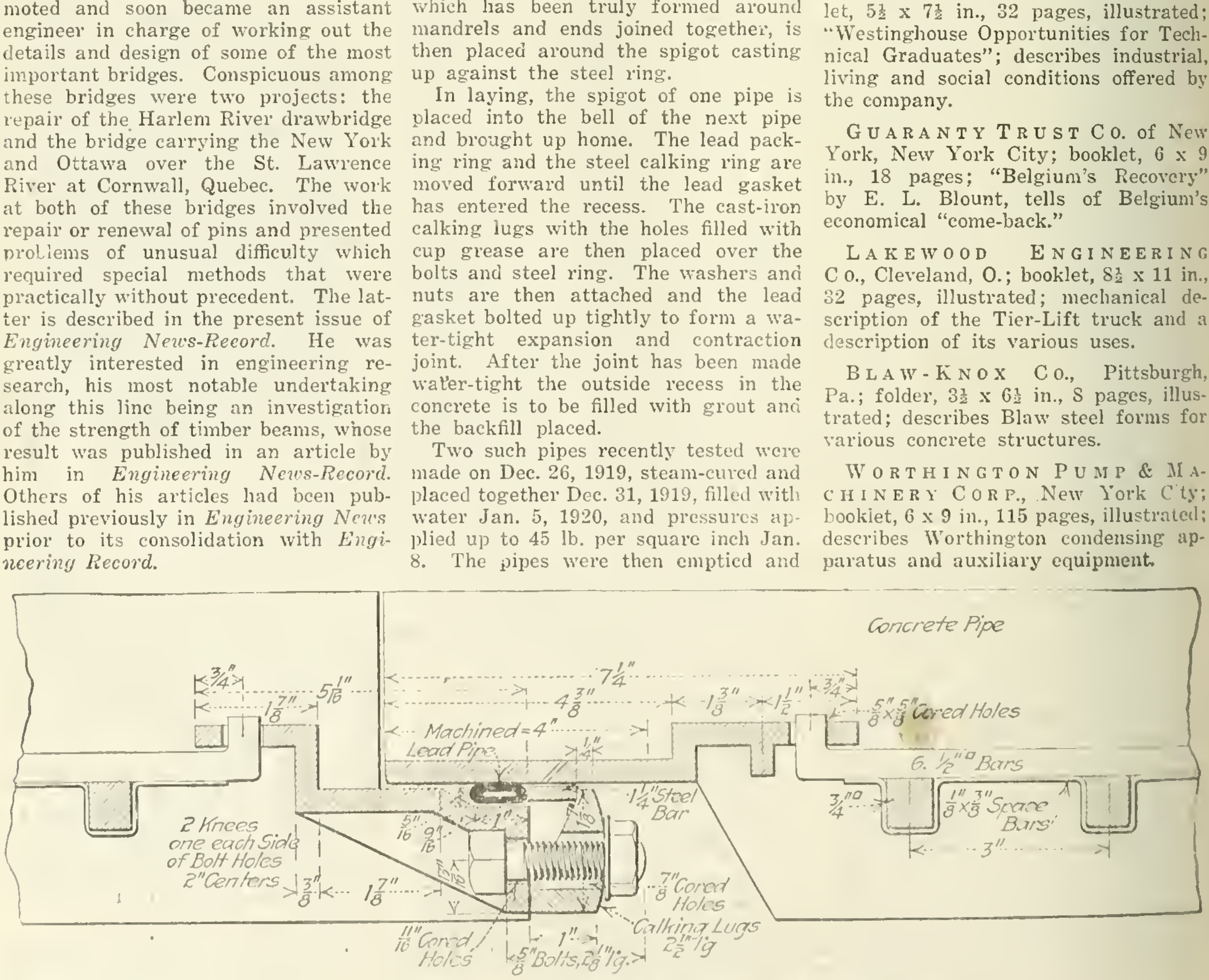
A tight joint for concrete pressure pipe has been devised by Coleman Meriwether, Indianapolis, Ind., and will shortly be put on the market. The details of the joint are shown in the accompanying drawing. It consists of bell and spigot castings fastened to the reinforcement of the pipe, and beveled and machined so as to permit the introduction of a lead gasket which is driven home by a circumferential steel ring forced into place by bolts.

The bell casting is formed with a right-angle flange on the end with cored holes in the flange to receive the bolts. The recess in the bell casting to receive the lead pipe-calking gasket is cylindrical to 1 in. from its outer end and beveled for the rest of the depth at an angle of 30°. The spigot casting is machined to 4 in. from its outer end to allow expansion and contraction in contact with the lead pipe gasket.

When the pipe have been sufficiently cured to be laid, the steel ring welded at the ends is placed around the machined part of the spigot casting, and forced back nearly to the concrete. After the ring has been placed on the spigot casting, the lead pipe gasket which has been truly formed around mandrels and ends joined together, is then placed around the spigot casting up against the steel ring.

In laying, the spigot of one pipe is placed into the bell of the next pipe and brought up home. The lead packing ring and the steel calking ring are moved forward until the lead gasket has entered the recess. The cast-iron calking lugs with the holes filled with cup grease are then placed over the bolts and steel ring. The washers and nuts are then attached and the lead gasket bolted up tightly to form a water-tight expansion and contraction joint. After the joint has been made water-tight the outside recess in the concrete is to be filled with grout and the backfill placed.

Two such pipes recently tested were made on Dec. 26, 1919, steam-cured and placed together Dec. 31, 1919, filled with water Jan. 5, 1920, and pressures applied up to 45 lb. per square inch Jan. 8. The pipes were then emptied and again filled Jan. 26, and kept full until Jan. 31, when the pressure was gradually applied up to 115 lb. per square inch which was maintained for 15 minutes with no signs of leakage in the joint or the concrete.


Concrete Pipe
$\frac{3}{4}''$
$5\frac{1}{16}''$
$1\frac{7}{8}''$
$7\frac{1}{4}''$
$4\frac{3}{8}''$
$1\frac{3}{8}''$
$1\frac{1}{2}''$
$\frac{3}{4}''$
$\frac{5}{8}'' \times \frac{5}{8}''$ Cored Holes
Machined = 4"
Lead Pipe
$\frac{1}{4}''$
6. $\frac{1}{2}''$ ☐ Bars
$1\frac{1}{4}''$ Steel Bar
$\frac{3}{4}''$ ☐
$\frac{1}{8}'' \times \frac{3}{8}''$ Space Bars
3"
2 Knees one each Side of Bolt Holes 2" Centers
$\frac{5}{16}''$
$\frac{9}{16}''$
1"
$\frac{3}{8}''$
$1\frac{7}{8}''$
$\frac{7}{8}''$ Cored Holes
Calking Lugs $2\frac{1}{2}''$ lg
$\frac{11}{16}''$ Cored Holes
1"
$\frac{5}{8}''$ Bolts, $2\frac{1}{8}''$ lg.

SPECIAL JOINT FOR CONCRETE PRESSURE PIPE

TRADE PUBLICATIONS

The following companies have issued trade publications:

MEAD-MORRISON MANUFACTURING CO., East Boston, Mass., and Welland, Canada; catalog, 7½ x 10 in., 165 pages, illustrated; descriptive of a large line of hoisting machinery and accessories.

GRINNELL CO., Providence, R. I.; book, 8 x 10 in., 16 pages, illustrated; descriptive of the company's plants and services in the field of fire prevention, including descriptions of automatic sprinklers, industrial piping, heating and power equipment, fittings, pipes and valves.

WESTINGHOUSE ELECTRIC & MFG. CO., Pittsburgh, Pa.; booklet, 5½ x 7½ in., 32 pages, illustrated; "Westinghouse Opportunities for Technical Graduates"; describes industrial, living and social conditions offered by the company.

GUARANTY TRUST CO. of New York, New York City; booklet, 6 x 9 in., 18 pages; "Belgium's Recovery" by E. L. Blount, tells of Belgium's economical "come-back."

LAKEWOOD ENGINEERING CO., Cleveland, O.; booklet, 8½ x 11 in., 32 pages, illustrated; mechanical description of the Tier-Lift truck and a description of its various uses.

BLAW-KNOX CO., Pittsburgh, Pa.; folder, 3½ x 6½ in., 8 pages, illustrated; describes Blaw steel forms for various concrete structures.

WORTHINGTON PUMP & MACHINERY CORP., New York City; booklet, 6 x 9 in., 115 pages, illustrated; describes Worthington condensing apparatus and auxiliary equipment.

A Consolidation of Engineering News and Engineering Record McGraw-Hill Company, Inc.—JAMES H. MCGRAW, *Presiden*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN
Editor

Volume 84 NEW YORK, THURSDAY, MARCH 11, 1920 Number 11

An Issue for Transportation Engineers

FOLLOWING almost on the heels of the event which marks a new epoch in railway administration—the return of the carriers from Government to private control—this year's annual convention of the American Railway Engineering Association, which opens in Chicago next week, is one to which more than the usual significance will attach. The pall of despondency which has stifled initiative in matters of transportation for the past year or so has been lifted and new hopes have been born. The changed conditions induce progressive thinking. Much must be done and railway engineers, relieved from the monotony of marking time, are now looking forward to a period of action. At such a time the experiences of others can be studied with more than ordinary profit and it is for this reason that a large amount of space in this issue has been devoted to the problems of the transportation engineer. Mr. Voorhees tells of the railway reconstruction necessitated by the building of New York's Barge Canal while Mr. Chase describes how the Poughkeepsie bridge has been enlarged and strengthened for the second time to meet the demands of heavy traffic. Other subjects, less spectacular, perhaps, but equally important, are dealt with. Among them are an analysis of 20 years' experience with concrete ties and a new engine terminal and coaling station, designed to meet special conditions. The railway engineer of today cannot afford to neglect the development which is taking place in the field of highway transport. There have been included in this issue, therefore, articles relating to highway traffic both in England and in the United States, and the transfer of local freight by motor truck as an aid in the solution of a terminal problem in Cincinnati. To the man with eyes to see the experiences of others are always valuable, for they can be used sometimes directly or sometimes in modified form on his own work; they may suggest new and better ways of doing things. In the railway field there is now promise that initiative and effort will not be without their rewards.

Bridge Loadings and Poughkeepsie Reconstruction

IT IS well worth while for railway bridge engineers who insist on providing for nothing beyond loads actually in sight to reflect on the history of the Poughkeepsie bridge, with its two elaborate reconstructions within thirty-five years. The money spent in strengthening and rearranging this structure to enable heavier engines to cross it in safety would have warranted a largely increased original expenditure for a stronger bridge than seemed necessary at that time. And the losses and indirect cost of traffic interferences, and other results of having to operate an inadequate bridge, also need to be considered. However, it has ever been a prime article of faith in railway circles that traffic loadings would not increase much, if at all, and that in consequence no expenditure would be justified in providing for load increases that seem perhaps remotely possible but certainly not probable. Decade after decade the facts have proved this view wrong, and so our railway bridge history has been a continuous record of bridges outgrown by the traffic being either scrapped or, very rarely, reinforced. With this record in mind, may we not fairly conclude that bridges of today should be designed for loads well beyond those now in existence? Railway engineers are still as reluctant as in past decades to make provision for future increase of weights, and they are about to adopt a new specification establishing as standard a loading already equaled and in a few cases somewhat exceeded. The lesson of fifty years' railway history suggests strongly that this reluctant attitude may be worth modifying. Better support of the bridge department by executive and financial officials of the railway would help to bring this about.

Originality in Reinforcement Work

SOME weeks ago we suggested in these columns that reinforcement of bridges makes a call on the best ingenuity and skill of the structural engineer. Two features of the Poughkeepsie work are very much to the point in this respect: the rigid-floorbeam method of making the three trusses of the river spans co-operate at full efficiency in carrying the load of a single track, and the use of heating to compel the tensile reinforcing material to share in the dead-load stress. As to the former, it will be enough to say that the choice of this method evoked active technical discussion before contracts were let and work started. The compelling logic of making the three trusses work at the same unit-stress by subjecting them to equal deflection through the means of a stiff continuous floorbeam won the day, however, and subsequent stress measurements gave a check on the working success of the method. Its great simplicity increases rather than diminishes the credit due the engineer. Equal simplicity and effectiveness is apparent in the expedient of riveting the reinforcing material in place while stretched by slight heating, a method that promises to be applicable in much future work. The resourcefulness involved in devising and successfully executing such special expedients is hardly matched by the kind of thinking that has to be done in building a new bridge. With the growth of reinforcement operations that may be expected, structural originality and ingenuity will therefore be even more needed than heretofore.

The Steel Decision

IT MAY be rash for the non-legal mind to attempt a comment within the compass of a few sentences on the decision of the Supreme Court in the Steel Corporation case. To us the decision is but confirmatory of the general view that has run through previous trust decisions—that corporations are criminals not because of mere size, but because that size has been used to make effective restraints of trade or practices that have worked adversely to the public. In other words, the potentiality of wrong doing does not make a corporation criminal. This certainly is a logical rule. If size were to be made the criterion of legitimacy, the course we have been pursuing in integrating industries would have to be abandoned.

Hetch Hetchy Delay Threatened

WORK on the Hetch Hetchy project, which is to provide San Francisco with a mountain water supply, will have to be suspended, according to City Engineer O'Shaughnessy, unless more Hetch Hetchy bonds can be sold. The work has in fact been going on for several years on a narrow margin financially, and from year to year there has been barely sufficient money to keep the work in progress on an economical basis. Counting this as one of the many difficulties that have attended this work, the city's engineering department has for a long time made every effort to sell enough of the bonds to keep going. The plan of selling them to the contractor at par, allowing him to absorb the discount in his bid, has been the most successful plan, and this seems to be the only salvation in the present crisis. At least it would avoid the closing down of the work with the attendant loss of the organization—a very serious thing in these days—and would prevent delaying the date of completion. Continued progress is desirable, not only to provide San Francisco with an unsurpassed water supply, but because a portion of the associated power project could soon be completed so the city could begin to realize on its investment.

Power Unification and Power Retailing

A PROPOSAL discussed by the American Institute of Electrical Engineers recently contemplates the virtual consolidation of all power generation in a great area extending from Boston to Washington, by means of a high-voltage tie line to connect all power stations in that area. If carried out, the scheme would bring into being a gigantic power source exceeding anything we now have; it would have influence over a remarkably great number of people, and stand in a vital relation to their physical existence. That so large and complex an enterprise should also engage in retail distribution of electric current is hard to conceive or to recognize as commercially desirable. In fact, it seems quite likely that so soon as such a huge, distributed power source is created, there would come about a complete separation of the business of distributing and selling electric power from that of generating and transmitting. How would the business be divided? In the event that the present electrical interests retain the generating business, it might perhaps become necessary for municipalities themselves to conduct the intramural service of distribution and sale, as they do now in the case of water. With this in mind, municipal engineers should find the tie-line proposal worthy of their study. True, for the present the consummation of the project is still in the vague distance, the more so because of the federal Department of Interior's undertaking to promote it by a Congressional appropriation for study of the situation. Coming at a time when Congress is of necessity paring down departmental demands, and in view of the uncertainty as to how a sum of a quarter million would be applied to such an investigation, the matter is rather far in the speculative future.

Terminal Congestion and Motor Transfer

CONFRONTED with problems of terminal congestion, railroad engineers will be interested in the article on p. 508, describing the less-than-carload transfers system in use at Cincinnati. A perplexing problem is, apparently, under way toward solution by using motor trucks with demountable bodies in conjunction with existing facilities. The motor truck is being used not to compete with but to supplement railroad facilities and to bring out their greater usefulness.

Briefly, it was the purpose to effect a more rapid interline and substation movement of less-than-carload freight, at the same time practically eliminating the use of station transfer or "trap" cars, and reducing the movement of interline cars. Through the substitution of an efficient system of motor trucking and mechanical handling of demountable bodies, this purpose appears to have been accomplished. It might seem that the greatest economies would accrue from interline transfer, but it is significent that the first installation was for a single railroad to connect its main and substations.

Possibilities for economy by efficient motor transfer, through increasing the utility of existing facilities, may serve as a basis for many future traffic studies. For most large industrial centers, such a system suggests greater flexibility of freight handling through an increase in car capacity and effective track and platform capacity. The release of cars from transfer to main line service speaks for itself in the present shortage. An increase of one-fifth in effective track capacity, as reported at Cincinnati, gives promise of relieving congestion of storage and classification trackage. The decrease, by one-half, of necessary station platform space is a measure of the greater concentration of loading and speed of handling possible with more efficient mechanical equipment.

Recollection of the industrial expansion of a typical American city is important in considering the possible advantages to shippers. Railroads first concentrated their main freight stations at the industrial center and as industries were obliged to locate in outlying districts, substations were established to afford better shipping service. As this expansion progressed, it was naturally accompanied by an increasing demand for interline and station transfer, with the necessity, in most cases, of consolidating shipments at the old main stations. Now the possibility of establishing mechanically operated motor-transfer stations without rail connection is suggested to permit industrial expansion with less regard to location on railroad lines. With an efficient system of handling and dispatching, as installed at Cincinnati, this suggestion gives promise of success. The shipper may locate on cheap property and reduce his own truck hauls—or eliminate them by installing a substation at his own plant to be served by trucks of the centralized system. Similarly it is suggested that the electric interurban lines could be better adapted for short haul business by establishing substation service, with some such arrangement as that shown in the photograph of the Baltimore & Ohio station at Norwood. In any such development on a large scale, the layout should be made by engineers, with careful consideration of possible future traffic congestion of city streets.

To the engineer naturally accustomed to thinking in terms of railroad units, the transfer of freight by motor truck on a large scale may seem so revolutionary as to be generally impracticable. At many other centers conditions probably would not warrant such radical treatment, but the results so far obtained should be carefully considered by railroad engineers charged with the responsibility for relieving similar conditions and of planning future terminal development.

New Rate Rule Not a Guarantee

SO MANY misstatements are being made regarding the rate rule of the new Interstate Commerce law that there is widespread belief that it guarantees a fixed return to the carriers. Such is not the case. The law merely sets up a basis of ratemaking designed to bring a fair return to the roads of average earning capacity.

Consider, for example, three systems in the same rate group: A prosperous line which, through strategic position, is capable of earning a far greater return, with the same rates, than most of the other lines in the rate district; a poorly located line, which can barely meet the interest on legitimate bond issues, and an average line which, with fair rates, can earn only a reasonable return on its investment. Under the terms of the law the rates are to be fixed to produce, as nearly as may be, a definitely stated rate of return on the aggregate value of all the lines in the rate group. When rates are so fixed, the "poor" road will have difficulty, even with economy and skilful management, to pay dividends approaching anything like the supposedly fixed rate of return. It will probably earn considerably less. The "average" road, if the mandate of the law is successfully carried out, should earn the so-called fixed return. The prosperous road, unless it is mismanaged and the accounts manipulated, should earn more than the fixed rate, but one-half of the "excess" above 6 per cent must be paid to the Interstate Commerce Commission.

The effect of the valuation of a single road on its income will not be great except in the case of prosperous systems. Large value placed on the property of the poor road will affect its earning power, through rates, only as it increases the aggregate value of all properties in the rate district. Only in exceptional cases will the effect be appreciable. Practically the same may be said of the average road. But the effect of the valuation placed on the property of the prosperous road may be pronounced, since its earnings are limited only above a fixed percentage of its "value." It is conceivable to imagine such a system being allowed a sufficiently high value, based on income producing qualities, to nullify the effect of limiting earnings above a fixed percentage of ascribed value. In this event all other companies in the district would also benefit in earning power, but only in proportion to the effect of the prosperous road's value on the aggregate of all.

In the uses made of the transportation contingency fund to be administered by the commission—and the fund may become large—the effect on individual earning capacity can at best be a matter of conjecture at this time. But it is likely that the building up and judicious expenditure of such a fund will tend ultimately to reduce unit costs of transportation by providing additional facilities for more traffic without greatly increased charges for capital.

Of greatest importance for the present is the probable effect of the rate rule in attracting private capital into railroad development. This development must necessarily take place slowly. So much lies in the hands of the Interstate Commerce Commission that its attitude will largely determine the course of private investors. In the present state of the market a $5\frac{1}{2}$ per cent return will be no great inducement. But with assurance of a definite basis of ratemaking, much development held in abeyance should go forward with promise of returns more than enough barely to justify the investment.

In spite of the statements that have been made by parties at interest, the new rate rule does not embody a guarantee of earnings. While the law recognizes the principle of finance for security and interest, rather than finance for profit, it does not provide a subsidy for unfortunate investment.

Status of the Reinforced-Concrete Tie

WILL the reinforced-concrete tie become a practical substitute for the wood tie? This question will occur to every reader of the review of concrete ties and their service on p. 522. The review indicates many failures but it may well be that after passing through a stage of haphazard design and trial the concrete tie now presents an opportunity for engineering skill in design. Further large-scale trials are warranted.

Few of the thirty-five designs, representing some 20,000 ties which have been given trial, are based on scientific principles and many trials have been made in numbers insufficient to warrant definite conclusions, except in cases of complete failure. While the tests reported were made under various conditions (some of them not exactly), it is of interest to note that the Tie Committee of the American Railway Engineering Association, in 1912, reported that no single design of substitute tie, whether of steel or of concrete, can be expected to meet all conditions, and recommended that there be at least two types, one for heavy and one for light service. It appears that much experimental work was inconclusive because of inadequate traffic records.

Fracture under load, disintegration of concrete and destruction of bond between the concrete and steel are the principal types of failure that have been noted. Of these, the second appears to be the least serious, since good concrete has withstood vibration and shocks of track service better than might be expected. The two types which are commended in the review are not the reinforced-concrete beam type, but rather that consisting of two rail-bearing blocks connected by a light member. Further development in design to resist failure may well be founded on work of the joint A. R. E. A. and A. S. C. E. committee on stresses in railroad track, abstracted at length in *Engineering News-Record* of Feb. 26, 1920.

To compete with the wood tie—especially with the treated tie—the concrete tie must compare favorably in true annual cost and also in other practical respects, as maintenance and rail attachments. Little data on initial costs are available because the experimental ties have not been produced on a commercial and competitive basis. Figures of life are not conclusive, owing to the small number given trial and relatively short service. The handling of concrete ties may demand special attention, owing to their relatively great weight.

It appears that further development might well follow along the two independent lines of heavy and of light service and that trials should be undertaken with more accurate observation, more definite objective and a broader consideration of engineering principles.

New York Central Railroad Accommodates Itself to Construction of Barge Canal

Contiguity of New State Waterway With Chief Rail Route Necessitated New Bridges, Rebuilding of Crossings and Relocations—Construction Details—Negotiations With the State

By B. S. Voorhees
District Engineer, New York Central Railroad
(Formerly Engineer of Grade and Barge Canal Crossings)

When the New York Central R. R. turns traffic over the new bascule bridge across the westerly terminus of the New York State Barge Canal, at Tonawanda, N. Y., and removes its old bridge, as it expects to do this spring, the program of accommodating itself to the construction of the canal will be complete, with the exception of legal settlements. The completion of the Barge Canal as a great public enterprise, at a cost of $154.000,000, is a remarkable engineering achievement with its movable dams, locks, steel guard gates and reservoir dams. But prominence should be given the solution of the engineering problems created by building the canal, which were necessary to preserve the railroads adjacent to it. The work involved the construction and alteration of 38 railroad bridges and the relocation of four portions of railroad alignments; of the former 24, and of the latter 3, were on the New York Central R.R. Other effects of the Barge Canal construction on the railroads were the necessary appropriation of railroad property, elimination of certain grade crossings and abandonment of old structures. It is the purpose of this article to record the reconstruction work which the railroad had to carry out as the result of the construction of the Barge Canal as well as its other effects on the railroads.

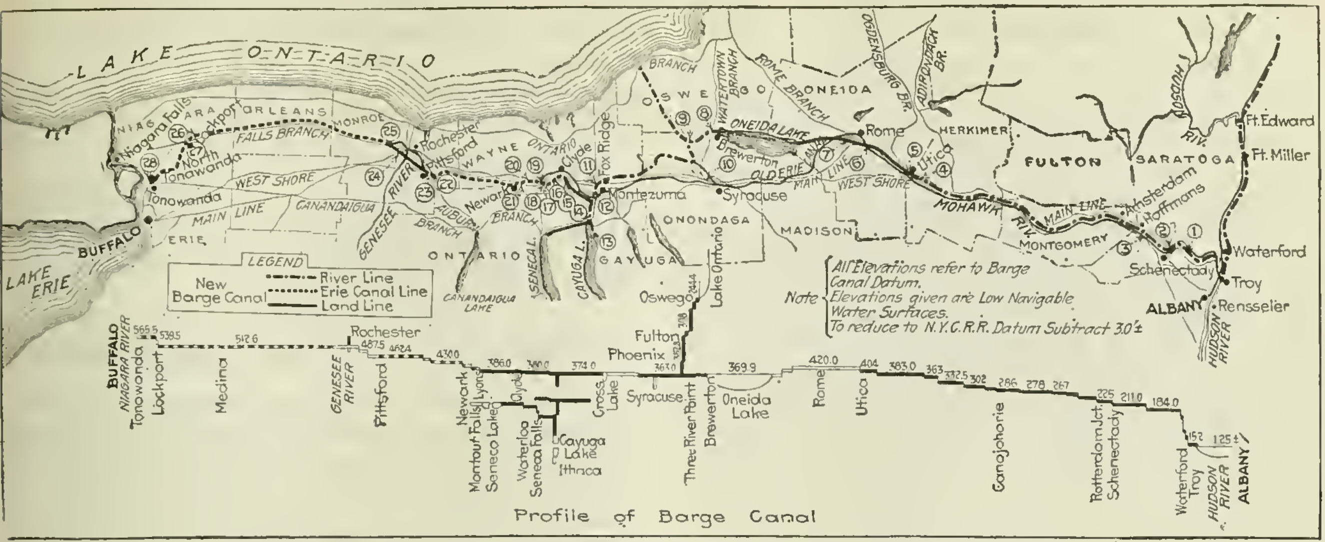
There has been considerable speculation as to the usefulness of the canal and justification of the tremendous expenditure involved in its construction. On account of their greater speed of transportation and flexibility, railroads have to a large extent overcome the competition of canals, as between the canals of New York State and the railroads which parallel them. But it is not too much to hope for a new era in transportation when the United States will have felt the full effect of a great industrial development that will require both means of transport.

The problem between the New York Central R.R. and the canal lies in their geographic locations, both having sought to share not only the most economical routes through the natural valleys of the State, but also the direct path of dense traffic movement forming the great highway of commerce between the central part of the United States and the sea. Before considering in detail the problems involved, a glance at the history of the two routes is interesting.

Before the advent of either canals or railways commerce was carried on over substantially the same route, along the rivers and lakes, with three wagon carries between New York and the Great Lakes. The building of three portions of canal, in about 1800, to handle the old land carries, was followed in 1817 by the beginning of the Erie Canal which was opened in 1825 for 75-ton boats of 4-ft. depth and a bottom width of 28 ft. Since then the canal has undergone two enlargements, previous to the Barge Canal development, which was commenced in 1903, to provide for boats of 2,000 tons with a depth of 12 ft. and a bottom width of 75 ft.

The first railroad in New York State, and the second in operation in the United States, was the Mohawk & Hudson—now a part of the New York Central—chartered in 1826 and opened from Albany to Schenectady in 1831. It is significant that the six-ton locomotive first operated on this line was named the "De Witt Clinton" after the Governor of the State, who was the master spirit of the Erie Canal. From this small beginning grew the New York Central R.R. System. But difficulties were encountered from fear of the State that the railroad would become a dangerous competitor of the canal and in 1831 the Legislature refused to grant a charter for a railroad from Schenectady to Buffalo. When the line was extended to Utica, in 1836, it was not allowed to carry anything but passengers and their ordinary baggage. A road was opened from Rochester to Batavia in 1837; one from Utica to Syracuse in 1839; from Auburn to Rochester in 1841; from Batavia to Buffalo in 1842, and in 1843 all gaps were closed to com-

NEW CROSSING WORK UNDER WAY AT FOX RIDGE. TRAFFIC IS DETOURED DURING CONSTRUCTION



MAP OF BARGE CANAL SHOWING NEW YORK CENTRAL CROSSINGS

plete a line from Albany to Buffalo. In 1853 the ten separate companies consolidated into one corporation under the name of the "New York Central Railroad." Thirteen years later this road was merged with the Hudson River R.R. In 1881 a consolidation of several lines was completed to form the West Shore R.R., which six years later was leased by the New York Central. While the waterway grew in size from a capacity for 17-ton to 2,000-ton boats, the railway likewise grew from single and double track to six-track lines (including the West Shore) and from the "De Witt Clinton" engine of 12,000 lb. to the newest Mallets with 466,000 lb. on the drivers.

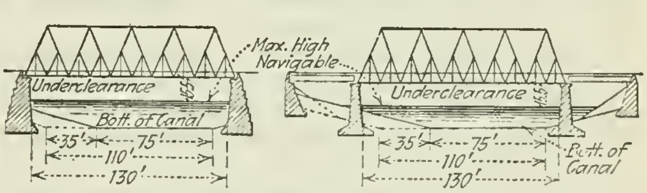
BARGE CANAL CROSSINGS OF THE NEW YORK CENTRAL RAILROAD

	Location	Branch	Crossing	Type of Structure	Track Raise
1	Niskayuna	T. & S.		Change of line	2..6+
2	Schenectady	Maine line	Mohawk River	Reconstruction of piers	None
3	Hoffmans	Hoff's Conn.	Mohawk River	Not changed	......
4	Utica 6.0 mi. E. of	Main line	Land	New bridge	1.2±
5	Utica 1.7 mi. N. of	Ogdensburg	Land	New bridge	9.8±
6 7	Rome	Main line, Industrial, Rome, Conn.	Land	Change of line and Two new bridg's	....
8	Brewerton	Watertown	Oneida River	Reconstruction	9.4±
9	Three River Point	Phoenix	Oneida River	Underpinning	3.3±
10	Syracuse	Syracuse Jct.	Land-Harbor	New bridge	9.0±
11	Fox Ridge	Main line	Land	New bridge	9.1±
12	Montezuma	West Shore	Land	New bridge	4.6±
13	Cayuga 0.2 mi. W. of	Auburn	Land-Lake	New bridge	12.4±
14	Cayuga 2.9 mi. W. of	Auburn	Seneca River and canal	Reconstruction	None
15	Clyde 2.0 mi. E. of	West Shore	Clyde River	Not changed	......
16	Clyde 4.0 mi. W. of	West Shore	Land	New bridge	4.2±
17	Lyons 2.0 mi. S. of	Lyons, Newberry	Clyde River	Underpinning	2.9±
18	Lyons 1.0 mi. E. of	West Shore	Clyde River	Underpinning	None
19	Lyons 0.6 mi. E. of	Main line	Land	New bridge	1.2±
20	Newark 1.9 mi. E. of	Main line	Erie Canal	Underpinning	None
21	Newark 0.6 mi. E. of	West Shore	Erie Canal	Underpinning	0.5±
22	Pittsford	Auburn	Erie Canal	Reconstruction	3.9±
23	Pittsford	West Shore	Erie Canal	Reconstruction	3.6±
24	Rochester 3.0 mi. W. of	Main line	Land	New bridge	0.6±
25	Rochester 3.5 mi. W. of	Falls	Land	New bridge	1.9±
26	Lockport	Lowertown	Erie Canal	Reconstruction	4.9±
27	Lockport	Falls	Erie Canal	Not changed	......
28	Tonawanda	Niagara Towanda	Tonawanda Creek	New Bascule Bridge one combined crossing	......

During the construction and growth of both the State's water and rail routes, each has accommodated itself to the requirements of the other, with the railroad yielding the more because of its greater flexibility. So, when the State launched the project of building the Barge Canal, plans were soon commenced to alter the railroad to meet the construction requirements of the larger waterway.

As indicated in the accompanying map, the new Barge Canal is located about 20 per cent on a new line, formed by excavating a channel across country designated as "Land Line"; about 50 per cent in existing navigable rivers designated as "River Line"; and about 30 per cent in the location of the old Erie Canal. The bridge crossings with the New York Central, indicated on the map and in the accompanying table by corresponding numbers, are naturally divided into two general groups: (I) New crossings and (II) reconstruction of existing river and canal crossings.

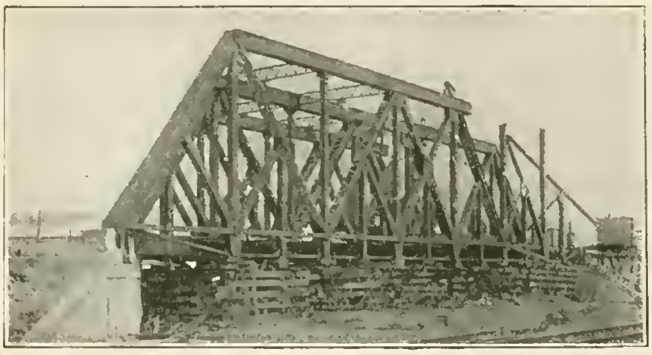
Nine new crossings were built at the points indicated in the table. As shown by the typical sketch, these bridges were built generally either of one through truss span supported by concrete gravity abutments on timber piles or, where the subsoil was swampy and yielding, of three spans; one truss and two plate girder approach spans supported on concrete piers and stub abutments.



TYPICAL NEW CROSSINGS—MASS ABUTMENTS, PIERS AND APPROACH SPANS

An opening of 130 ft. clear width at right angles to the line of the canal was provided, the neat line of the abutment or piers being set 10 ft. from the bottom angle of the canal prism to allow a bottom width of 75 ft. and a future expansion of 35 ft. of additional bottom width. In like manner future expansion was provided for the railroad by constructing the substructure for one additional track, in the case of a single track line, and for two additional tracks in the case of a double or four track line. The depth of water from canal pool elevation to canal bottom is 12 ft. and the vertical under clearance is required to be 15.5 ft. from maximum high navigable water elevation, which is several feet above the pool level. To obtain this clearance it was necessary to elevate the tracks from one foot, at some locations, to as much as 12 ft. at others. Since the heaviest traffic is eastward, the runoff grades on the main line were made 0.25 per cent against eastbound traffic and 0.50 per cent against westbound traffic. On the branch lines the runoffs were made 1 per cent. In all cases grades were compensated for curvature. Traffic was carried on temporary detours of earth embankments around the bridge sites during construction.

Typical New Crossing.—The bridge built on the main line at Fox Ridge was typical of new crossing work. One of the photographs shows the work just after it was well under way with the various equipment, such as piledrivers, excavators and pumps. It also indicates the location of excavation for the west abutment and for the cofferdam framing at the east abutment. The magnitude of the work is indicated, with main line traffic making a wide detour on both the north and the south sides of the new bridge. The other picture shows the pin-connected through truss nearing completion. Since the angle between the canal and the railroad is 45 deg. at this crossing, an unusually long span, namely, of 210 ft., was required. The approximate quantities involved, indicating the extent of the work at this and most of the other new crossings, were: About 100,000 cu.yd. of new railroad embankment, 10,000 lin. ft. of four-track roadbed rebuilt, with the necessary changes in telegraph lines, fences and signaling, 6,300 cu.yd. of concrete masonry, 30,000 lin.ft. of piling, 35 ft. long, and 1,400 tons of new steel superstructure.



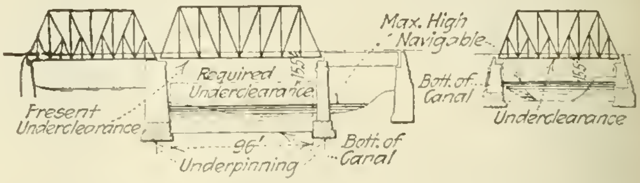
TYPICAL NEW CROSSING NEARING COMPLETION

The new bridge crossings were the first to be undertaken, as the negotiations with the State involved in them were the least complicated. Negotiations with the State are outlined in subsequent paragraphs. This work was commenced on Nov. 28, 1906, the date when the contractor commenced operations at the Barge Canal crossing on the Falls Road, 3½ miles east of Rochester.

Alterations of River and Canal Crossings.—Alterations of existing river and canal crossings involved bridges at thirteen locations, at six of which was required the reconstruction of the structures and at seven, underpinning or reinforcing of existing substructures.

Reconstructing of existing bridges, carried out at the locations indicated in the table and map, involved work similar to that performed at new crossings except that, instead of substituting a new bridge structure for an earth embankment, there was substituted a new bridge structure for an existing structure which did not provide an opening large enough to meet the Barge Canal clearance requirements. In some cases it was found advisable, in the interest of economy, to utilize an existing span, reconstructing the substructure and adding a second span to provide the greater lateral clearance required by the Barge Canal, as indicated in the typical sketch.

A typical case involved an old single-span structure of 120 ft., weighing 83 tons, for which was substituted a two-span through truss bridge weighing 420 tons. Three methods were adopted for handling traffic during construction: First, by supporting existing bridges in original locations on timber falsework; second, by carrying the tracks on a temporary detour with timber falsework across the old channel, and third, by building a new bridge on a new alignment to one side of the original track, maintaining traffic over the old structure during construction. After the work was completed traffic was turned over the new line. In one case work was started with the intention of using a portion of the old substructure, substituting a through truss span for two deck girder spans, but as the work progressed it was discovered that, due to the condition of the old masonry and expense of maintaining uninterrupted traffic over the construction, it would cost no more to construct a new substructure on a new alignment to one side of the old alignment. An agreement was made with the contractor to carry out the work under the changed plan at the same cost as the original plan.



UNDERPINNING AT RIVER AND CANAL CROSSINGS

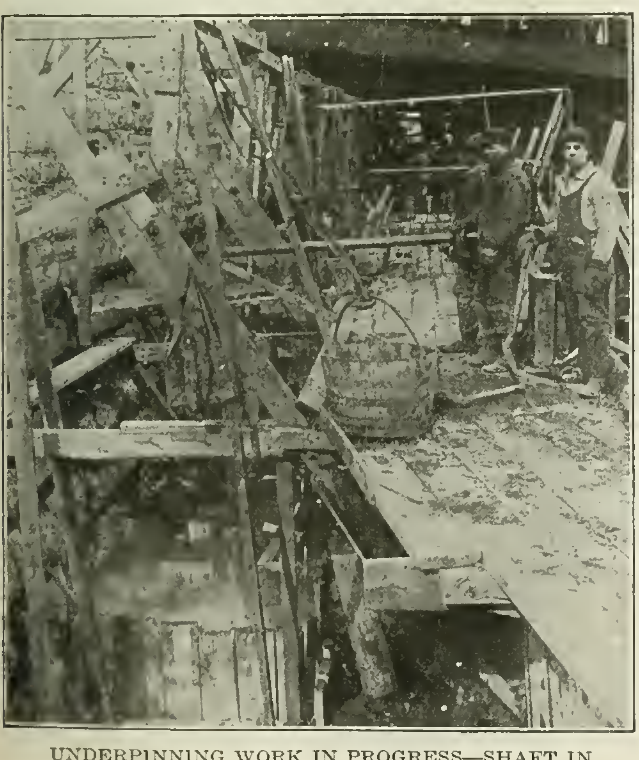
Where the Auburn Branch crosses the southerly end of Cayuga Lake there was an old lift bridge, providing about a 20-ft. opening, near the easterly shore of the lake. Two plans were studied to provide a new crossing: One, to substitute a new lift bridge substantially at the location of the old bridge, providing a wider opening; the other, to elevate the track about 12 ft. and construct a new opening with a fixed bridge about 500 ft. west of the old structure so that runoff grade could be made without disturbing the layout through the village near the passenger station. Taking into consideration the expense involved in perpetual operation of a lift bridge, as well as the difficulty of building a substructure of a lift bridge that would safely carry the concentrated weight of the lift span on yielding and swampy subsoil, the latter plan was found to be the more economical and was adopted.

UNDERPINNING BRIDGE PIERS AND ABUTMENTS

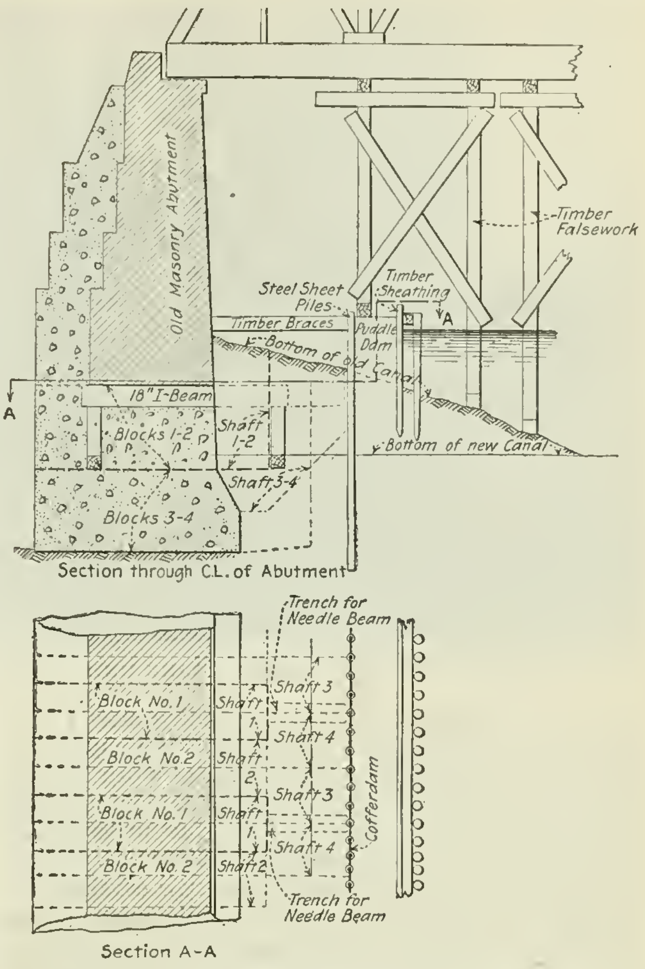
The work of underpinning and reinforcing the substructures of existing bridges to provide a deeper waterway, where there was sufficient lateral clearance not to require the reconstruction of the entire bridge, was carried out at six locations, as indicated in the table.

When plans were first discussed to provide proper barge canal clearances at these locations, the first thought was to build new bridges, as the difficulties of underpinning the substructures, while maintaining traffic on the railroad, with the interference of water, were considered too great. However, in view of the large expense that was found to be involved in the new bridge work, some of which had already been completed, it was decided in the interest of economy to attempt underpinning the old substructures. Overcoming the difficulties attending this underpinning work was probably the most interesting single feature of the barge canal crossing work. For this reason a sketch is shown to indicate the general method adopted. Each location had its peculiar features, but the sketch and photograph are fairly representative of what was involved.

The first step was to construct timber false work to carry the existing superstructure and traffic and thus to relieve the substructure of this load. Then the substructure was surrounded by a puddle coffer dam with a row of heavy Lackawanna steel sheet piling on the side of the coffer dam nearest to the masonry and braced against the old masonry. Shafts were dug down in front of the old masonry and far enough apart to leave undisturbed a portion of the earth foundation as a support for the old masonry. It was not considered safe to dig these shafts all the way down to the new bottom; therefore, carrying the foundations down was made in two lifts. After the shafts, designated as number one, were dug, the masonry was undermined opposite and concrete placed in the portions undermined, designated as block number one on the sketch. After these blocks had set new shafts were dug alternately between the first shafts. Then the masonry opposite these second shafts was undermined and concrete placed in the undermined portions, designated as block number two. While these blocks were being placed the masonry was supported on the first concrete underpinning blocks. In some cases conditions were found so secure that the arch action of the old masonry between the supported portions could be relied upon to carry the masonry over the undermined portion. In other cases it was found necessary to drive 18-in. needle beams under the uncovered portion of the old masonry. The needle beams were supported on timber just beyond the limits of the old masonry and were concreted in and burnt off with torches at the neat lines.



UNDERPINNING WORK IN PROGRESS—SHAFT IN FOREGROUND



METHOD OF UNDERPINNING—COFFERDAMMING AND SHAFTING

After the blocks were constructed so that the new concrete underpinning was continuous for the first lift, a new series of shafts was constructed outside and adjacent to the first series of shafts extending down to the new bottom of the foundations. The work of undermining the concrete was carried on in the same manner as for the first lift, the location of the shafts being indicated as shafts number three and the concrete underpinning as blocks number three. This series of shafts and underpinning blocks were placed to break joints with the first set of shafts and blocks and in that way insured against a settlement of the underpinning already placed. One of the photographs shows a general view of the work and the timber false work support carrying the bridge superstructure during construction. The other shows one of the first set of shafts with a platform runway on top of the cofferdam to handle the material. As the placing of the concrete approached the under side of the old masonry, it was necessary, in order to get a good contact of the old and new masonry, to shoot this portion of the concrete in place by pipe and jet. In addition to the work of underpinning, the old abutments were strengthened by uncovering the backs of them and constructing a few feet of thickness of concrete carried to tie in with the underpinning, in order to increase the thickness of the abutment to the dimension theoretically required to conform to the increase in its depth. In some instances it was necessary to raise the superstructure a few feet in order to obtain the required vertical under clearance. This was accomplished either by putting new concrete bridge exten-

SUPPORTING SUPERSTRUCTURE DURING UNDERPINNING OF SUBSTRUCTURE

sions on the substructure or by installing steel I beam grillages at the bearing points of the steel superstructure on the old masonry. The amount of work involved is indicated at the main line bridge crossing the old canal near Newark, illustrated by the underpinning photographs, where there was about 5,000 cu.yd. of foundation excavation and 2,700 cu.yd. of new concrete.

At three points changes in railroad alignments proved necessary or desirable to accommodate the new Barge Canal: At Niskayuna on the Troy & Schenectady Branch; at Rome on the main line, and at Tonawanda on the Niagara and Tonawanda branches.

Change of Line at Niskayuna.—The state found it necessary to appropriate a stretch of single-track roadbed on the Troy & Schenectady Branch at Niskayuna, about 2,300 ft. long due to the impounding of the waters of the Mohawk River by the construction of a dam at the so-called "Vischers' Ferry" and the consequential flooding of the adjoining land upon which the track was located. This made it necessary to construct a new alignment of about 8,700 ft. at a location about 350 ft. south of and at an elevation about 22½ ft. higher than the old line, involving also changes in the track approaches to the new location and elevation which extended 15,200 ft. on the east and 1,700 ft. on the west, making a total length of new single track construction of about 5½ mi. This work did not involve the construction of any structures of importance, being practically no more than a fairly heavy steam-shovel grading job. While only the single track was reproduced on the new alignment, the roadbed was graded for a large part of the distance for future double tracking.

Change of Line at Rome.—The relocation of the main-line tracks at Rome avoided the construction of two four-track bridges of almost prohibitive skews; eliminated eight dangerous grade crossings; improved railroad alignment by the elimination of a sharp curve and by shortening the alignment about 1,700 ft. This was done by relocating the new railroad alignment on the south side and parallel to the new barge canal, which was along the south side of the city just removed from the business center. The railroad bed was constructed on a new earth embankment at an elevation high enough to cross the streets, the tracks being carried over some waterways on reinforced concrete arches. There was involved a relocation of about 20,000 ft. of main line and the construction of a modern brick station with island platforms, passenger subway and baggage lift; construction of six reinforced-concrete arch structures; three minor short span steel bridges and two double-track through truss bridges carrying branch railroad connections over the new barge canal; and about 2,500,000 cubic yards of embankment which was excavated from the new barge canal prism by a hydraulic dredge. This improvement was described in detail in the number of the *Engineering Record* of Feb. 21, 1914.

Change of Line at the Tonawandas.—The only work incidental to changing the New York Central Railroad to accommodate the barge canal that remains to be completed is the change of line at the Tonawandas. There is being constructed a new line about 10,300 ft. long as a new location for the combined Niagara and Tonawanda Branches through the cities of Tonawanda and North Tonawanda in order to cross the canalized creek by one bridge instead of rebuilding the two existing bridges and at the same time accomplishing a very desirable elimination of 13 grade crossings and the lengthwise occupation of the cities' principal business streets. This improvement requires the construction of a new double track, elevated roadbed on earth embankment carrying the tracks across the streets on 11 bridges, across the canalized Ellicott Creek on a through truss fixed bridge and over the canalized Tonawanda Creek on a single leaf Strauss heel runnion bascule bridge as well as the location and arrangement of the passenger station and freight station facilities. The work involved about 500,000 cu.yds. of earth embankment; 3,500 ft. of new street and about 3,000 ft. of concrete retaining walls, besides the bridge structures, four of which were reinforced-concrete arches where a sufficient elevation for them could be secured. The new line is complete in Tonawanda and the new bascule bridge is complete and in service for the Tonawanda Branch while the work in North Tonawanda, consisting of the construction of two street under crossings and new station and freight facilities, remains to be done. It is planned to turn all traffic over the new line this spring by making some temporary changes in North Tonawanda and in this way securing the use of the new construction at the earliest possible date and realizing the advantage of the abandonment of the old line in the city streets. This improvement was described in detail in an article by the author in *Engineering News-Record*, Nov. 14, 1918.

There are several other interesting phases of the effect of the barge canal improvement on the New York Central R.R.:

First—The state found it necessary to appropriate about 100 parcels of railroad property adjoining the barge canal other than that required for the crossings in order to obtain the required channel width and terminal facilities. There was considerable engineering work involved in negotiating with the State Special Examiner and Appraiser for a settlement of the damages arising out of the appropriation of this property. In each case an investigation on the ground was necessary to determine the location of the parcel of property with respect to the existing railroad facilities. Then plans and estimates had to be made with a view of ascertaining what would be the interference to existing railroad facilities and the impairment to future expansion. Frequently such an investigation would reveal another way of taking care of the state's need that would not require as large an appropriation of railroad property as was first anticipated.

Second.—The elimination of grade crossings at four locations, other than at changes of track alignment, resulted on account of the proximity of the new barge canal to the railroad. These eliminations were carried out at Palmyra, Galloways Highway, Port Gibson, Palmers Road, Fairport, Knapps Highway, Clyde, Sodus, Glasgow, Waterloo and Mill Street. Because the new barge canal was located parallel to and only a short distance away from the railroad at these points and because the highway or street crossed both the canal and the railroad (the latter had to be elevated to obtain the required vertical clearance of 15½ ft. over the canal) it was advisable and in some cases necessary to carry the highway or street on a structure over the tracks and accomplish the elimination of dangerous grade crossings. Such cases were carried out under mutual agreement between the State and the railroad, under which the state would construct and pay for that portion of the viaduct over the canal and the approaches, while the railroad built and paid for that portion of the viaduct spanning its tracks and right-of-way.

Third.—There is a very important effect upon the railroad due to the abandonment of those portions of the old canal which were no longer necessary upon the completion of the new barge canal. There are about thirteen of these crossings which may be abandoned, making it desirable to dismantle the old bridge structures and substitute for them earth embankments, thus doing away with the necessity of maintenance and renewal. Two of these bridges, which were located on the West Shore R.R., across the old Erie Canal, have already been dismantled and portions of the steel superstructures utilized in the new barge canal crossing work. A question is involved in relation to these bridges, because of a provision in the barge canal law which contemplates compensation being paid to the state by the railroad on account of possible saving that may be realized in the abandonment of old bridges, represented by capitalized cost of maintenance and renewal. As against this saving consideration must be given of the cost of taking down the bridges and substituting the earth embankments, and some times remodeling the substructure on account of providing for an opening for a highway.

Fourth.—The state authorities having control of Barge Canal matters have commenced negotiating with the various railroads looking to rail connections at some of the more important Barge Canal Terminals. There are some legal difficulties involved and the location of some of the terminals does not lend itself very readily to feasible rail connection. Nevertheless these matters are being given the necessary study looking to a solution of the problems involved.

Furthermore the state has provided means for the disposal, by sale, of the lands in the abandoned portions of the old canal which will be no longer necessary for canal purposes and because the railroad occupies and adjoins considerable portions of these lands. Steps are being taken to acquire these portions of the old canal lands which are needed on account of present occupancy and to provide for future extension of railroad facilities. For a long stretch along the southerly side of the Mohawk Valley the West Shore R.R. adjoins the old Erie Canal and considerable engineering study is required to determine how the old canal lands in this location can best be utilized for railroad purposes. When the West Shore R.R. was constructed in 1881 it was necessary to adopt a rather undesirable location for the railroad alignment in some places, on account of the Erie Canal being in a somewhat restricted valley between the Mohawk River on the north and the hills on the south. It may be possible some time in the future to correct the location of the railroad here and thereby utilizing some of the old canal lands.

NEGOTIATIONS WITH THE STATE

In the negotiations with the state for the settlement of cost of new crossing work, it was clearly established that, because the state required an opening through the roadbed and therefore the substitution of a bridge for an existing earth embankment, the damage to the railroad should be measured by the cost involved in building the new structure and in the capitalized increased cost of maintaining and renewing the bridge. In agreeing on the first cost of building the new structures, competitive bids were taken from various contractors and the low bid was used as a basis of settlement. The amount representing capitalized cost of maintenance and renewal was established by agreement, basing it upon past experience of various railroads and assuming a life of ten years for bridge decks and thirty years for bridge superstructures. The state in each case appropriated that portion of the railroad's right-of-way required for the construction of the bridge and the Barge Canal channel.

An interesting question arose in the negotiations leading to the carrying out of river and canal crossing work. The State had rather hoped that it would not be required to include the cost of this work in the cost of the construction of the canal, feeling that, where the canal was to be formed by deepening and widening of streams and rivers already navigable, such streams and rivers were public highways. There was also the opinion that, in some cases, the title to the bed of the streams was vested in the state, the bridges having been constructed over state property acquired under the old Dutch law. Naturally the railroad company, which had been operating over these bridges for many years under charter rights, contended that it should not be required to bear the burden of the expense of making the necessary alterations. It was finally decided that the railroad would go ahead and make the changes under plans and methods of execution to be agreed upon with the state engineer, after the state had appropriated whatever property right or easement the railroad had in the bridge structure as was required by the state to effect the deepening of the channel, agreeing to submit to the Court of Claims the questions as to who should be obliged to bear the expense of the work. While the work is now complete, the question is still pending as to the settlement. However, it is interesting to note that there have been some court decisions, one being handed down by the Court of Appeals, bearing out the contention of the railroad that the expense of changing the various bridge structures to provide for the greater clearance should be included in the cost of the project as a whole, because the railroad bridges had been allowed to exist for a long time and such existence had not obstructed the kind of navigation that had been carried on. Furthermore, it was found that it was the intention of the Legislature to include the cost of this kind of work as a part of the Barge Canal project.

The negotiations arising out of the relation of the new Barge Canal construction to the New York Central R.R. were complicated, and at times the problems that arose were so complex and so difficult of solution that mutual agreement in regard to them seemed almost impossible. It was only because of the most cordial co-operation and patient efforts on the part of both the State and the railroad officials that construction work, without legal delays, was made possible. These negotiations were conducted by, and the construction work carried out under, the supervision of J. W. Pfau, engineer of construction, under the general direction of George W. Kittredge, chief engineer, New York Central & Hudson River R.R.

Traffic on Connecticut Roads

FIGURES were compiled during October and November indicating the average and extreme traffic certain Connecticut roads are called upon to bear. The figures of Nov. 5, 6 and 7 in the accompanying chart are self-explanatory, though those taken on Nov. 15 include all vehicles. The Nov. 15 figures are extremely heavy owing to the fact that they were taken upon roads leading into New Haven on the day of the Yale-Princeton football game. Traffic, of course, covers the passage of vehicles in both directions, though even with that consideration it is seen that the Washington bridge along the Milford-Stratford Roard carried an average of fifteen vehicles a minute from seven o'clock in the morning to six o'clock in the evening.

November 5, 1919		7 A.M. to 6 P.M.
Hartford-Winsted Road	168	Passenger Autos
	32	Trucks
November 6, 1919		
Torrington-Waterbury Road	385	Passenger Autos
	168	Trucks
November 7, 1919		
Winsted-Torrington Road	219	Passenger Autos
	104	Trucks
Berlin Turnpike	631	Passenger Autos
	136	Trucks
November 15, 1919		
Washington Bridge (Milford-Stratford)	9712	
Derby Ave	6258	
East Haven	3544	
Woodbridge	1872	
Hamden	1788	
Berlin Turnpike	1697	
Durham Road, Middletown	748	
October 1, 1917 to September 30, 1918		
Saybrook-Lyme Bridge	88,408	Conn. cars
	32,906	Foreign cars
October 1, 1918 to September 30, 1919		
Saybrook-Lyme Bridge	115,691	Conn. Cars
	42,082	Foreign cars

Some idea of the yearly increase in the amount of traffic which highways will be called upon to bear in the future is had from the figures of the amount of traffic across the Saybrook-Lyme bridge over the Connecticut River from Oct. 1, 1917, to Sept. 30, 1918, and from Oct. 1, 1918, to Sept. 30, 1919. Both in the increase in the number of Connecticut cars and in foreign cars an approximate 30 per cent is noted. A yearly census over the Saybrook-Lyme bridge was possible because it is a toll bridge.

Reports Government Operation of Inland Waterways

A REPORT on the operation of boats on inland waterways by the Federal Railroad Administration during 1919 was made public just before the boats were turned over to the War Department, which took place on March 1, in accordance with the law ending Federal control of the railways. The report, made by D. A. Tomlinson, Director of the Inland Waterways, states that operations were carried on with unsatisfactory equipment, so that no fair test of the commercial possibilities of the fleets has yet been made.

On the New York Barge Canal no figures are given for financial results of operation, but it is stated that "the results of operations for this season substantiate the assumption that as soon as modern power barges now under construction are placed in service the operation of the waterway will become profitable." The Delaware & Raritan Canal carried 248,640 tons of freight both ways. The Government operated the canal and collected tolls but operated no boats. The receipts from tolls were $133,548 and the cost of operating the canal was $221,587, leaving a deficit of $133,548.

On the lower Mississippi, heavy losses in operation are assigned to a variety of causes. Five towboats and 29 barges began plying between New Orleans and St. Louis on Sept. 28, 1918, with the intention of rendering a weekly service, but defective power prevented success. A deficit occurred of $582,471.43; during what period is not stated. The underlying causes given for this result are (1) grossly defective power and (2) inadequate terminal capacity and facilities. The barges were delayed so long in port at each end of the voyage that only 44.3 per cent of their time was spent in transit. The cost of repairs alone to the equipment to June 30, 1919, amounted to over $65,000. The cost of handling freight at St. Louis and New Orleans respectively, not including the cost of rehandling freight transferred between cars and boats, was 96c. per ton at New Orleans and $1 per ton at St. Louis.

From April 30 to Sept. 30, 1919, the "interline" freight handled amounted to 12,893 tons carried at an average charge of $4.70 per ton. The local freight carried was 96,325 tons, on which the average charge was $3.54 per ton.

On the Warrior River, 124,648 tons of freight were moved between December, 1918, and Oct. 31, 1919—almost entirely coal. The deficit from operation to Oct. 31, 1919, was $136,635.91. The full capacity of the fleet provided, estimated at 300,000 tons, was not available until July, 1919. To develop a northbound traffic, 20 steel cargo retainers of 10-ton capacity each and terminal derricks are being installed at Cordova and

New Orleans. The fleet is to be supplemented with four self-propelled barges and three tow boats.

Director-General Hines, in submitting the report, said: "The results of operation of these waterways have all been during a period of partial initial development and hence the results cannot be taken as indicating what can reasonably be expected from these operations until a reasonable period of development shall have elapsed. I believe it highly important in the public interest that there shall be a thorough-going experiment with these waterways, and I shall be surprised and disappointed if that experiment does not show a complete economic justification of this method of transportation."

The British Ministry of Transport

RECENT events in England, and the increasing demands made upon our own transportation facilities, have quickened American interest in the British Ministry of Transport, created last fall by Act of Parliament, and a piece of legislation which gives to the Minister of Transport practically dictatorial powers over all means of transportation.

The act was introduced into the House of Commons in March, 1919 by the Home Secretary, Mr. Shortt, and was first entitled, The Ministry of Ways and Communication Bill. The bill had its inception in the conviction of the government that extensive and greatly needed economies could be secured through centralization of control of all means of transportation. Therefore, in its initial draft the bill proposed to centralize in a single government department all powers and duties of any government department in relation to railways, light railways, tramways, canals, waterways, inland navigation, roads, bridges, and ferries, and vehicles and traffic thereon, harbor, docks and piers; and the supply of electricity.

In addition to the Minister of Transport becoming the general director of all means of transport in England, the officers and employees of any of the services under his control were to obey his directions as to (1) rates, fares, tolls and tariffs; (2) salaries, wages, conditions of employment; (3) operation of any or all of the services under his control; (4) maintenance-of-way, rolling stock, motive power, plant appliances; (5) carrying out alterations considered necessary in the interests of public safety; (6) common use of facilities, rolling stock, equipment; (7) affording interchange of running powers over competing systems; and (8) furnishing statistical reports and reviews, and accounting statements such as the Minister might prescribe with the consent of the Treasury.

The act was introduced, as Sir Eric Geddes, the present Minister of Transport, asserted at the time of its introduction, "with a view to affording time for the consideration and formulation of the policy to be pursued as to the future position of the undertaking." As first introduced, the act therefore transferred to the Ministry of Transport from the Board of Trade the power of railway control, possession of which had been taken under Regulation of Forces Act, 1871, giving the railways the guarantee of the 1913 net receipts. In addition to the powers already described, the Minister was empowered to take possession of the whole or any part of any other railway, tramway, canal, inland navigation, harbor, dock or pier undertaking, and of the rolling stock of any private owner and of any barges, tugs and other crafts required for use on any canal, possession of which had already been taken. Giving such complete powers to some authority raised considerable adverse criticism among those enterprises involved, though the greatest point of attack upon the bill was its provision that any time within the two-year life of the act the railroads and other means of transportation could be nationalized through Orders in Council proceedings. So great was the pressure against this provision in the bill that the Minister-Designate of Transport, Sir Eric Geddes, withdrew the provision before the second reading of the bill in the House of Commons.

Panel of Experts Provided

After having been referred to committee and reported back in the House of Commons for its third reading in July, 1919, the act contained several new provisions, among which was an amendment to the effect that the Minister of Transport should set up a panel of experts from which to draw committees that would act in advisory capacity upon questions in which each service of transport was intimately concerned. Each committee was appointed from nominees, after consultation with the various enterprises and interests concerned, and of labor, trading interests, local authorities, and so forth. Also, through amendment the autonomy of the various docks boards, which had proved such strong organizations during the war, and before, was not disturbed. Considerable adverse criticism was directed toward the act for the inclusion under the Minister's management of roads, bridges, and ferries, on the ground that it was inexpedient to give one managerial head control over more or less competing lines of communication. However, this criticism availed little, and roads, bridges and ferries were included in the final draft of the bill. However, popular pressure did avail something, and the supply of electricity, originally given to the Minister of Transport, became the subject of a separate bill.

After its third reading before the House of Commons, it was sent to the House of Lords, where it went through its first and second reading with considerable discussion, was referred to committee, then referred back to the House of Lords and passed its third and final reading Aug. 12, 1919. The Act was, during its committee stage in the House of Lords, renamed the Ministry of Transport Act. It received royal assent Aug. 15.

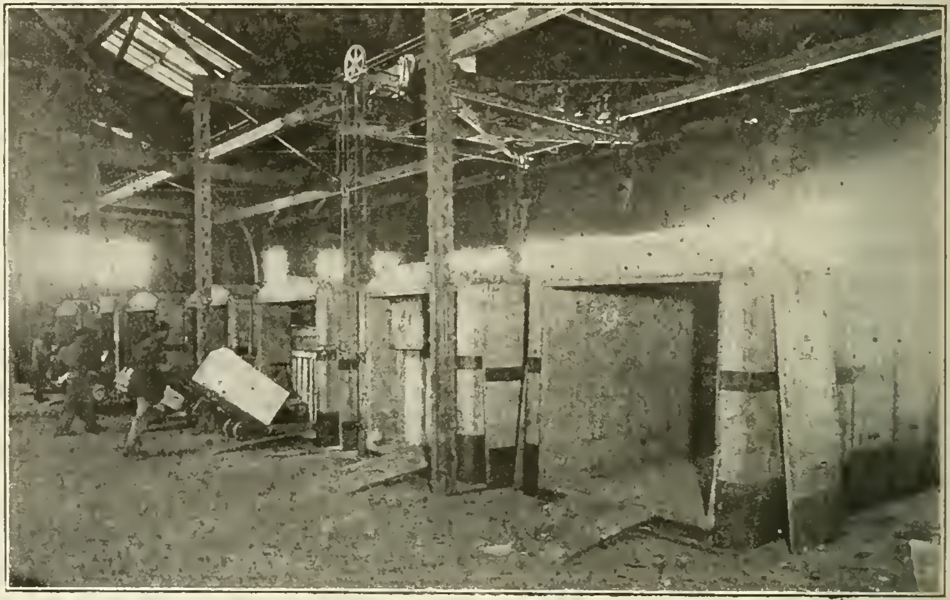
In its final form the Ministry of Transport Act conferred upon the Minister of Transport certain more or less absolute powers with regard to all questions of transportation. Although no system of transportation was longer capable of being nationalized by an Order in Council, the Minister was allowed to establish certain transport services and to work them either himself or through others, and was also allowed to acquire such land or easements as were necessary, either by agreement or compulsorily. However, in the exercise of such functions he was first to allow existing services to make such changes in transportation as he contemplated, and he was to submit an estimate of the capital expenditure involved which was to be approved by the Treasury. Details of his plan were to accompany such proposals, and if the estimates exceeded half a million pounds, or in case compulsory acquisition of land and easements was necessary, an order in council was requisite, a draft of which had to be passed by a resolution of both Houses of Parliament.

Motorized Freight Transfer Cuts Terminal Costs

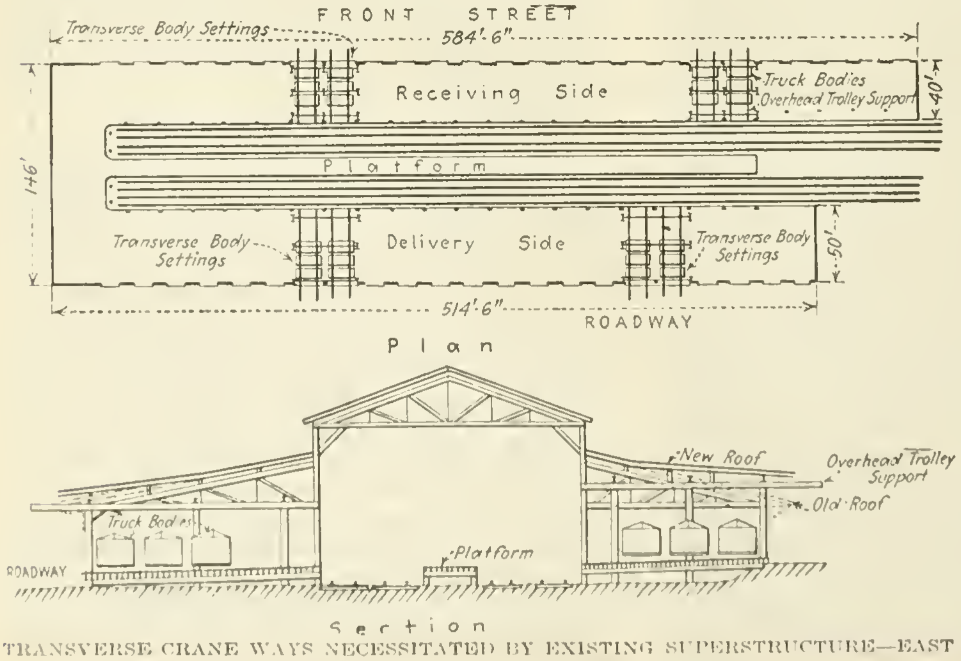
Installation for Railroads at Cincinnati Provides Mechanical Handling of Demountable Truck Bodies—Use of Station Trap Cars Practically Eliminated—Operating Results

AN ADVANCE movement of transfer freight of 52 hr. with a saving in cost per ton, as well as ther economies, has been accomplished in Cincinnati by installing a system of motor trucking less-than-carload-lots in demountable bodies handled by electric hoists and cranes on overhead rails at main and substations, serving the seven railroads entering the city. All installations were made by adapting existing structures to the requirements of the system without erecting new buildings. Under the previous system, by trap car between terminals and horsedrawn drays, the average time of transfer was 2.6 days and this has been reduced to current movement, or an advance movement of 52 hr., with a saving in cost per ton of 35c., and an increase in available floor space and car-storage space, releasing cars for main-line service previously used as trap cars between stations. The operation of the system and the study which led to its adoption was described briefly in a paper before the annual meeting of the Material Handling Machinery Manufacturers Association in New York City, Feb. 26, by B. F. Fitch, president Motor Terminals Co., New York and Cleveland, which has the contract for handling the present motorized freight transfer business in Cincinnati.

It was estimated that about 65 per cent of the less-than-carload tonnage at the Cincinnati terminal was for transfer to connecting lines or substations. In 1917 this traffic exceeded the capacity of the company operating horsedrawn drays, and forced the use of additional trap cars for interline less-than-carload business, to handle the overflow and relieve congestion of floor space. In May of that year the Cleveland, Cincinnati, Chicago & St. Louis Ry. made a test installation between its five main and substations, and after a study of results by a committee of other railroads contracts were made in 1919 for installing the system to serve all of the main and substations in the city. Although the terminal is not yet fully equipped, the new system of transfer by motor truck in demountable bodies is now serving all of the roads entering Cincinnati. The system of operation requires an empty body for each movement between freight stations. Incoming freight is unloaded directly into empty demountable bodies, on the floor of inbound station platforms. At the larger stations, a typical example of which is shown in the plan herewith of the Vine St. Station of the Southern Ry., several locations for body setting are provided to cut down average trucking distance from cars. In this case, by having four body settings and by trucking to the nearest one with a body carded for connecting line or substation, the average trucking distance is reduced to about one-quarter of that under the old system. The method of loading into bodies is shown in the accompanying photograph.

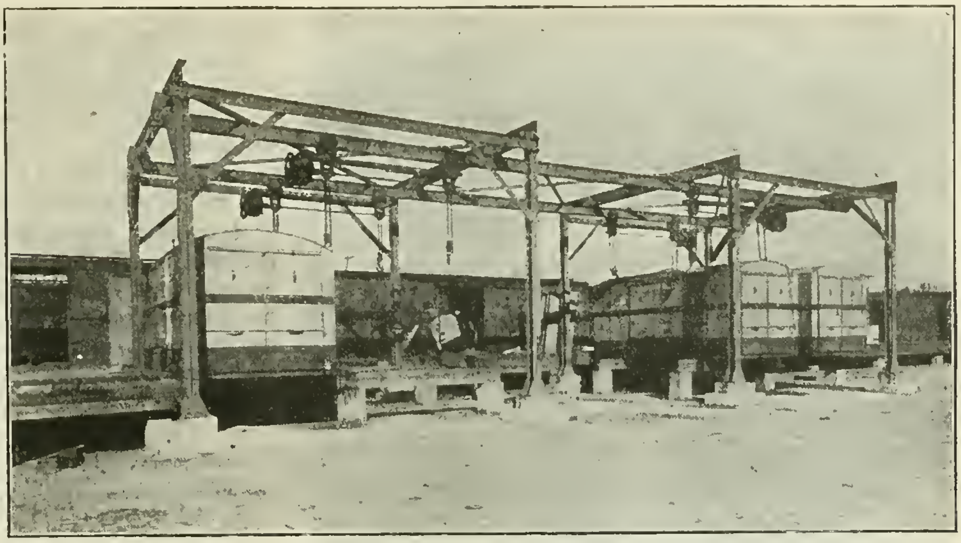


DIRECT LOADING OF FREIGHT FROM CARS TO A SERIES OF BODIES



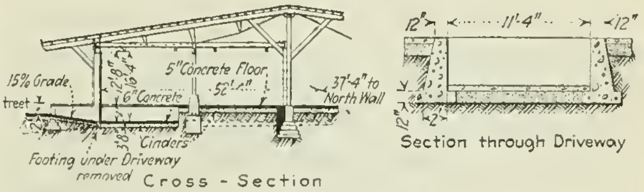
TRANSVERSE CRANE WAYS NECESSITATED BY EXISTING SUPERSTRUCTURE—EAST END FREIGHT HOUSE OF LOUISVILLE & NASHVILLE R.R.

The loaded bodies are sealed; trolleyed to position and loaded on a truck, under telephone order of a dispatcher employed by the railroad. This operation is shown in the photograph. On arrival at the outbound platform of the connecting line the body is electrically hoisted from the truck and trolleyed into position. An empty body is then similarly loaded onto the truck chassis for delivery to the inbound platform of the same freight house, from which point the operation of unloading and reloading it with freight and delivering to another receiving station is repeated.


FRONT SUPERSTRUCTURE VIEW, BALTIMORE & OHIO SUBSTATION AT NORWOOD

At substations an outbound load remains on the platform until the dispatcher is advised by the agent that a return load is available. Then the loaded body is forwarded and exchanged for the previously reported load of outbound freight to be delivered at the main station, where it is consolidated with other city freight in line cars.

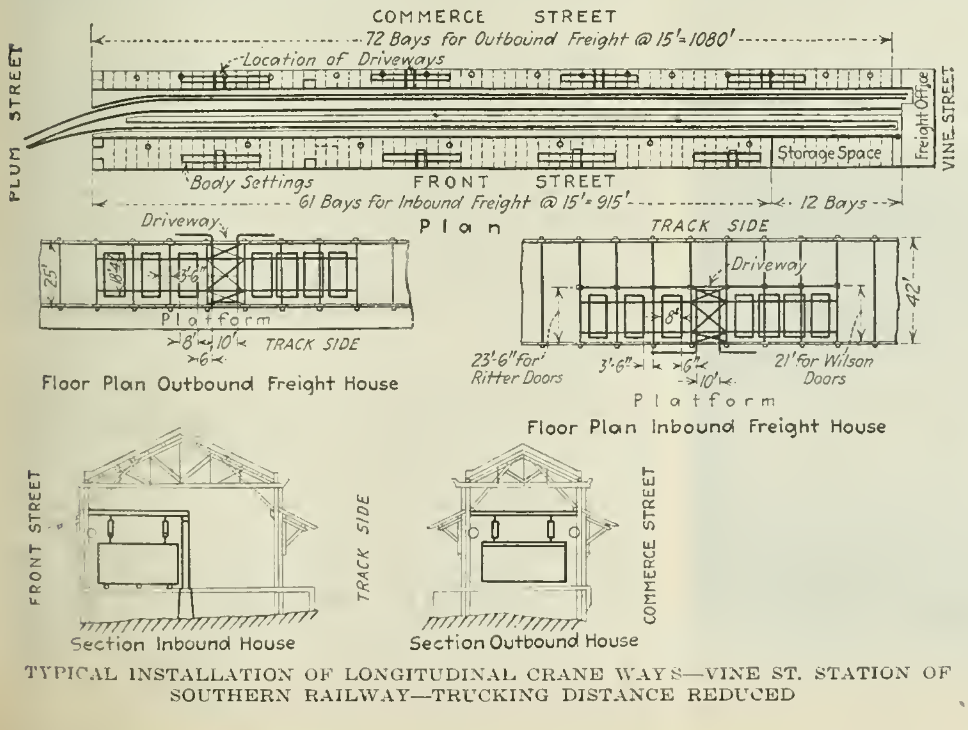
In making the installations at the various stations and substations in the city, it was necessary to adapt them to individual requirements and varying restrictions imposed by existing buildings. No buildings were erected specially for the purpose. It was necessary to make some building alterations for superstructures and to depress driveways to provide roof clearance for hoists and truck body trolleying. The accompanying drawing of the East End freight house of the Louisville & Nashville R. R. is a typical example of adapting the installation to existing requirements. Here it was necessary to arrange the crane ways transversely between roof trusses, instead of adopting the preferable longitudinal arrangement as at the Vine St. Station of the Southern Ry. It was also necessary to provide greater clearance for unloading bodies by changing the slopes of the roof as shown. Another example of adaptation was the Front St. installation for the Big Four, a section of which is shown in the cut. On account of the expense involved in providing more clearance by raising the roof, the driveways were depressed below street grade, with a 15 per cent approach grade leading from the pit to street level.



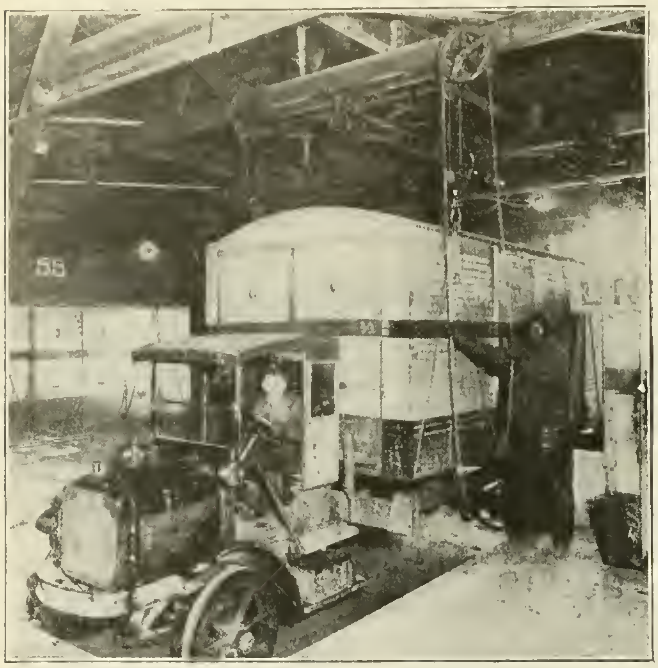
STREET LEVEL AND ROOF CLEARANCE AT BIG FOUR INSTALLATION REQUIRED SUNKEN DRIVEWAYS

The motor trucks used are of five-ton capacity with demountable bodies of steel and wood construction and inside dimensions of 7 ft. high, 8 ft. wide and 17 ft. 6 in. long. Electric hoists, consisting of special bridge frames with a patented weaving device (for aligning body with truck chassis) suspended on the superstructure, are provided to handle the bodies. The bridge frame is mounted as a traveling crane on ways supported by the superstructure. An automatic device is now being developed to connect the links of the hoist with the hooks on top of the bodies in loading or unloading. This is now done by hand, the two links on each side being held by a bar so that both may be connected to hooks at once by one man.

The Cincinnati Motor Terminals Co., the local operating organization, under the terms

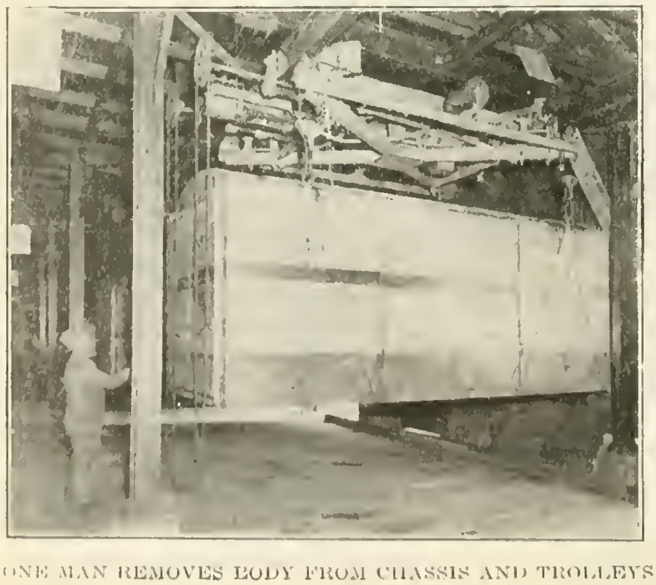


TYPICAL INSTALLATION OF LONGITUDINAL CRANE WAYS—VINE ST. STATION OF SOUTHERN RAILWAY—TRUCKING DISTANCE REDUCED



BODY TROLLEYED TO POSITION FOR LOADING ON CHASSIS—FRONT ENTRANCE PIT

of the contract with the railroads, has equipped all freight houses with demountable bodies to comply with movement and tonnage demands, electric hoists for the handling of the bodies and motor trucks. The company maintains and operates all of this equipment, which is utilized by the railroads under direction of a joint dispatcher, but without liability of operating contingencies. The Motor Terminals Co. is responsible for loss or damage of freight while in transit. The railroads purchase the service at rates ranging from 80c., for connecting-line transfers, to the maximum of $1.25 per ton for the longest haul of 10 mi. to any substation. There is no shipment minimum, but it was agreed that no body containing less than a two-ton tariff load would be dispatched by railroad, and if loads lighter than this were moved, the railroads would pay the two-ton minimum tariff. The railroads have installed a system of direct telephone communication from each superstructure point to a dispatch switchboard installed in the offices of the Motor Terminals Co. This gives the railroads direct supervision of the entire operation.



ONE MAN REMOVES BODY FROM CHASSIS AND TROLLEYS IT TO POSITION FOR UNLOADING

A statement of operating results furnished by the Motor Terminals Co. indicates that, in addition to a saving of 35c. per ton of freight moved and an advance movement of 52 hr., available floor space and track storage space are increased, cars are released for main-line service, through elimination of their use as trap cars, and a labor saving of approximately 30 per cent is effected in freight handling. The company reports that it has not had a single claim for loss or damage of goods. Operating cost figures furnished by the company, established during 100 days' operation, are as follows:

	Trap Car and Team Haulage		Motor Truck	
	Amount	Per Ton	Amount	Per Tor
Cost of transporting freight between connecting lines by trap cars	$92,685 07	$1.563		
Cost of transporting freight between Main and Sub-stations by trap cars	20.588.45	1.437		
Cost of transporting freight between connecting lines by Transfer Co	92,506.03	2.006		
Total cost of transporting all freight (119,799 tons)	$205,779.55	$1.718		
Labor cost chargeable to Motor Truck Transporting Cost				
A—Unloading freight from truck bodies			$51,321.89	$0.4284
B—Handling of removable truck bodies			2,525.36	0 021
Interest on superstructure investment			1,833.00	0.0153
Fund for retirement of superstructure investment			3,055.10	0 0255
Maintenance or repairs to superstructures, 1½ per cent per annum			458.24	0 0038
Labor cost for dispatching of motor trucks			2,400.00	0 02
Contract cost as submitted by the Motor Terminals Co			102,068.75	0 858
	$205,779.55	$1.718	$163,662.34	$1 36

Present railroad cost per ton	$1.718
Proposed contract cost, per ton	1.336
Saving, per ton	$0.352

A summary of other economies established by 100 days of operation, as reported by the company, follows:

1. Net economy of $0.352 per ton an item of $42,169.25 or $126,507.75 per annum.

2. Will advance movement of all freight from existing 62.4 hours by trap car between connecting lines, 55.2 hours by trap car between main and substations and 72 hours by Transfer Co., the average being 62.4 hours, to daily service (10 hours), of which 98 per cent will reach destination in time for current loading into main-line cars or for consignee's delivery at substations. This means an advance movement of freight 52.4 hours.

3. Continuous movement of freight by motor truck and system will only occupy 47,047 sq.ft., inbound house floor area transporting 100 per cent of freight, as compared to 94,923 sq.,ft. now occupied. This is an item of 47,876 sq.,ft. or 50.4 per cent platform area saved and equivalent to increasing platform tonnage capacity 498.4 tons daily.

Based on the total inbound house area of all main stations (324.261 sq.ft.) the increase of station platforms will be 14.8 per cent.

Outbound house floor area is a matter of station operation. Motor truck body area is 144 sq.ft. and loads average 4.55 tons; hence, if but one body is handled through a location daily, the square-foot-per-ton floor area occupancy cannot exceed 32 sq.ft. per ton, as established by test. If two bodies are unloaded in a location the occupancy is reduced to 16 sq.ft. per ton. if 4 bodies 8 sq.ft. per ton, etc. C., C., C. & St. L. Ry., practice 21 sq.ft. per ton.

4. Eliminating 154.25 trap cars daily releases station rails for car settings of equal number of line cars. 40.4 lineal ft. being the average rail space occupied per car, it shows trap cars require 6,232 lineal ft. based on the total main station rail space (29,042 lineal ft.) available for all house car settings, connecting line and sub-station trap cars occupy 21.4 per cent. Taking such cars out of service is equivalent to increasing station trackage 21.4 per cent.

Main station trackage (6,232 lineal ft.) occupied by trap cars and conceding 12 ft. center to center of rails, is equivalent to increasing station realty 74,784 sq.ft. or 21.4 per cent of all available (248,504 sq.ft.) main station trackage realty.

5. Trap cars released for main-line service 22,287.5 an item of 66,862.5 cars, per annum. The earning capacity of these cars is creditable to motor-truck operation. No authentic record available.

6. The extension of present available labor through elimination of freight rehandled (86,976 tons) amounts to 30.4 per cent of total tons (285,790) handled at time of loading and unloading cars. This percentage of labor diverted to direct run of freight will tend to decrease the demand for freight house labor.

7. Elimination of 86,976 tons of freight rehandled lessens liability of loss and damage.

The system of truck transfer so developed by the Motor Terminals Co. now serves the following railroads entering Cincinnati: Cleveland, Cincinnati, Chicago & St. Louis R. R.; Pennsylvania R. R.; Norfolk & Western R. R.; Louisville & Nashville R. R.; Cincinnati, New Orleans & Texas Pacific R. R.; Chesapeake & Ohio R. R., and the Cincinnati, Lebanon & Northern R. R.

Fine Screen Specifications for Activated Sludge Plant at Milwaukee

To give all makers of sewage screens a chance to bid on the large installation of fine screens for the Milwaukee activated-sludge plant, the Sewerage Commission has adopted general specifications prepared by T. Chalkley Hatton, its chief engineer. Bids will be received on April 8. Each bidder must submit detailed plans and specifications, subject to the approval of the chief engineer. Contracts will cover screens, brushes, conveyors and liming mechanism only. The specifications in part are as follows:

The work to be done by the screens is the passing through them of an average dry-weather flow of sewage of 130,000,000 gal. per day of 24 hr., containing from 225 to 300 p.p.m. of suspended matters in the raw sewage with a loss of head not exceeding 4 in. and an additional storm-water flow of 190,000,000 gal. per day with a loss of head not exceeding 12 inches.

The number of screens installed shall be such that the above named quantities of liquor may be satisfactorily passed without using one screen, which shall be installed as a spare unit and which shall have a capacity equal to any other single unit installed.

Every type of screen considered shall be composed of a manganese bronze, brass or copper plate, built in sections with the two faces of the plates on parallel plans, sections accurately fitted, and securely and rigidly supported by a steel or semi-steel frame of ample strength, to which they shall be attached by means of non-corrosive screw bolts or in some other manner satisfactory to the Chief Engineer.

The screen plates shall not be less than 3/16-in. thick and shall have slots cut in them 3/32-inch minimum width by from 2 to 2½ in. long. These slots shall be reamed on the under side to an angle satisfactory to the Chief Engineer and both faces of plates shall be free from burs or any other defect. The slotted or effective area of plate shall not be less than 26 per centum of the plate area.

If the type known as the Riensch-Wurl screen is used, no unit shall exceed 26 ft. diameter. If the belt screen is used, no unit shall have an effective screen width of over 6½ ft. and an inclination of not less than 18 nor more than 20 degrees from the horizontal. If a cylindrical screen is used, the effective length of screen surface shall not exceed 10 ft.

Every type of screen submitted should provide for removing the screenings by means of brushes mechanically operated synchronously with the screen, and shall be so installed as to deliver the screenings from all screens to a common belt conveyor. The brushes shall be of a material satisfactory to the Chief Engineer, provided with satisfactory adjustments with bearings of the best type and workmanship, and so arranged that when operating the screenings will not be swept through the slots of the screen.

Belt screens should be provided with facilities for adjustment in taking up slack.

Each screen shall be driven by a separate motor to be furnished and installed by the Contractor and should be supported upon the framework of the screen. There shall be inserted at some convenient point in the driving mechanism, a shearing pin or other suitable device for breaking power, should the screen be subjected to any undue strain.

The motors shall be of a type satisfactory to the Chief Engineer for A.C. 60-cycle, 3-phase, 220- or 440-volt, of a speed not exceeding 1,200 r.p.m. and of sufficient capacity to provide easily for starting torque. The make of motor shall be designated by the Chief Engineer to correspond, as near as possible, with the make to be used in other parts of the disposal plant.

The Contractor shall furnish and set up, where directed by the Chief Engineer, switchboard. . . .

The Contractor will be required to file a bond with his contract for one-half the amount of the contract to guarantee, for a period of two years after acceptance, that he will replace, without cost to the City of Milwaukee, any part or appliance furnished by him in installing the plant which shows within that period defective workmanship or material or that it is not adapted to the purpose for which it was furnished.

It should be understood that no opportunity may be afforded for supplying the plant with sufficient normal sewage to test its operation for one year after its completion, and the period of guarantee is placed at two years; but if the progress of the sewage disposal construction is such that one full year's operation of the screens can be obtained in less than two years after completion of screens, the guarantee period will end after the one year's operation.

Before acceptance of the final plant, and final payment is made, each screen unit shall be operated by the Contractor under the Chief Engineer's direction to test out its mechanical operation. This test shall continue as long as the Chief Engineer deems necessary for him to determine whether each of its parts is in satisfactory operating condition, provided such period does not exceed ten (10) days for any one unit. . . .

Payments for the installation will be made as follows: 50 per cent of the total contract price upon delivery upon the ground of the materials comprising the installation; 25 per cent when, in the opinion of the Chief Engineer, the plant is 75 per cent completed, and the balance within 30 days after its final acceptance.

Service Tests of Treated Ties on the Lackawanna Railroad

Results of a ten-year service test of treated ties on 76 mi. of main, third, fourth and side tracks of the 28-mi. line of the Delaware, Lackawanna & Western R.R. in New Jersey were reported by a committee on tie-service tests at the recent meeting of the American Wood Preservers' Association. Creosoting by the Lowry empty cell process is employed, with an average retention of 2½ and 3½ gal. per tie for 6-in. and 7-in. ties respectively. Of 200,000 treated ties laid in 1910 and 1911 only 64 had been removed up to the end of 1913 on account of failure, while 146 had been removed on account of damage by derailment. All ties are adzed and bored at the plant before being treated. Tie plates are used, but the committee does not consider the present protection against wear sufficient to enable ties on sharp curves to give the full life due to treatment.

Traffic and Prospects of the New York Barge Canal

THE business and prospects of New York's canal system are described in the annual report of Edward S. Walsh, Superintendent of Public Works. The total tonnage carried on all the canals last season was 1,238,844 tons, an increase of 7 per cent over the business of the previous year. This is the first time for many years that an increase of traffic has occurred. During the last decade, traffic on New York canals has been declining at an average rate of about 15 per cent per annum.

Of the total above recorded, 842,164 tons were carried in the Erie Canal; and two-thirds of this freight was local. The total through freight over the Erie Canal was 198,507 tons eastward and 80,627 tons westward. About two-thirds of all the canal business is low-grade freight, classed as "products of the ground," 591,106 tons, and "products of the forest," 194,807 tons. The total of manufactures and farm products shipped on all the canals was about 430,000 tons.

In 1880 the Erie Canal carried over 30,000,000 bushels of wheat eastward from Buffalo. Last year the total receipts of grain by lake at Buffalo were below 1,000,000 tons. Mr. Walsh ascribes this to the Government control over the grain business and the railways, and the decision to move it by all-rail routes instead of by water. In 1880 over 10,000 boats were in operation on the canal and were largely engaged in carrying grain. Last year there were 727 barges of all descriptions in operation, of which 415 navigated the Champlain division, leaving only 312 boats in use on the Erie Canal and its collateral branches. Except for a few new type barges—most of them built by the Federal Government—these boats are the old 240-ton Erie canalboats. These canalboats made 1,728 trips loaded and 970 trips light, and their average movement for the season was 1,706 mi. Their average run per day when on a voyage was 27.1 mi.

Of the business done on the canals, a large part is still in the hands of inedpendent boatmen. Mr. Walsh declares, however, that this system is archaic and does not meet the demands of shippers. "No appreciable success in the development of canal traffic can be had as long as the situation is controlled by the individual operator." Mr. Walsh condemns the Federal Government operators on the Erie Canal in unquailfied terms. Last season, the Government placed in service 57 steel barges, 3 concrete barges and 3 wooden barges of the 150-ft. or so-called 750-ton type. It chartered tugs to tow these barges, but the tugs had not sufficient power to handle these large boats, and in several instances the barges got out of the channel and enadngered the canal structures. Concrete barges are considered a failure for this service. They draw over 4 ft. empty, which is over a foot more than steel or wooden boats of the same displacement. This mean a great deduction in carrying capacity and eliminates the concrete barge from commercial use.

These Government-operated barges carried 194,352 tons last season or less than 16 per cent of the total canal traffic. The Government boats, however, were operated exclusively in the through traffic between Buffalo and New York, and of this traffic about 70 per cent was carried on the Government boats. The Government agreed not to influence the movement of grain traffic and permitted independent boat owners to compete for cargoes on the same terms as the Government. Mr. Walsh believes, however, that private enterprises will not build boats to compete with a Government service which can operate without regard to cost.

Discussing the prospects for revival of business on the canal, Mr. Walsh says, "The formation of carriers for the new waterway falls short of reasonable expectations." He believes that large shippers of freight will have to take a financial interest in boat lines if business is to be restored to the canal.

The total expenditures during the year in the ordinary maintenance and operation of the canals was $1,774,116. In addition $598,437 was spent under various special appropriations, including about $150,000 to tow the boats of independent owners at less than cost. About $4,000,000 was expended in further construction work at the canals and over $2,000,000 on the canal terminals, making a grand total outlay on canal works by the state in 1919 of $8,496,747. Superintendent Walsh urges that the State should undertake the construction of grain elevators for canal-barge use at New York City and at Oswego, and should either buy or build one at Buffalo.

A Knellogy

By Percy G. Smith
Civil Engineer, Wells River, Vt.

The sunset tells the knoll of parting day,
The chainman carelessly winds up the tape,
The transitman now homeward plods his way,
A threatened thunder shower to escape.

The axeman swears as barb wire tears his pants,
A clumsy rodman falls and breaks the rod,
The levelman now does a Spanish dance,
On stirring up some wasps beneath the sod.

Back yonder in that wooded swamp and bog
Is our external secant and P. I.
The chief had shown while looking up his log,
That sort of humor not described as dry.

The stakes across that meadow were left out,
A sign, "No Trespassing," was up to warn,
An irate farmer put us all to rout
Because he thought the line went through his barn.

Some tales of engineers the senses thrill,
Of burying a dead-man in the street,
Of making streams of water run up hill,
Or how a chainman dropped a hundred feet.

A railroad survey stirs the country-side,
The man in boots and corduroys adored,
His right of way is four or five rods wide,
And when he leaves, forgets to pay his board.

Some future time when estimates are read,
While standing on this very spot—right here,
Some contractor or other will have said:
"Here lied a most uncivil engineer."

Correction in Lake Huron Elevation

In the article by F. P. Shenehon entitled "Plan to Regulate Great Lakes Level by Niagara Dam," *Engineering News-Record*, Feb. 12, 1920, in the map on p. 308 the elevation of Lake Huron is given as 246.2 ft. above sea level. This is a draftsman's error. The proper elevation is 581.3 ft. above sea level.

Early Days in the North Country

By Henry K. Wicksteed
Chief Locating Engineer, Canadian National Railways, Toronto

FEW people who ride over the Canadian Pacific Railway or the Canadian National Railways to the north of Lake Superior, in these days of comfort and luxury, and view the rough broken country from the windows of a sleeping or dining car, have much idea of the rough life and patient plodding toil and thought that was put into the early surveys and explorations.

That there were few casualties and little illness shows that the strenuous life and constant exposure of the North country life is not unhealthy, nor does it break a man down and prematurely age him, provided he is well fed and suitably clothed. The native Indian, it is true, is dying out—but as a result of his contact with civilization, not the want of it. His diseases are all civilized, the most fatal of all being consumption, of which he knew nothing before his acquaintance and partial adoption of the White Man's modes of life, and unfortunately of his vices.

The Indian

The native Indian, as I knew him 40 years ago, was nearly always respectable, often most estimable in character, and physically he was a marvel. Generally slight, seldom above the middle height, he could carry a load on his back such as would make most men gape in astonishment. Two hundred and fifty pounds to three hundred was only a fair load; five hundred was common on a short portage, and I have seen seven hundred carried for a short distance. Not only his strength, but his endurance, was wonderful. He would travel for days at a time, thirty or forty miles a day, and perhaps would turn up at the White Man's camp and sit quietly down in a corner smoking his pipe. After (not before) being offered a meal, he would tell you that he had eaten nothing for 48 hours. He would sleep in a bush camp with only a single blanket, and the thermometer at minus 30°, and forget to mention it as a matter of interest. He would haul a toboggan as heavy as himself all day long without a murmur.

As to honesty, the Indian set an example to the White Man in those days, and generally, not always, the latter lived up to it. Locks and keys were unknown outside of the Hudson Bay Company's posts, and the trapper's cabin was always open to visitors, whether the owner was there or not. Property of almost any kind could be left almost anywhere with the practical certainty of its being untouched, provided it was left in such shape that the owner's intention to return was evident.

A traveller, for instance, would be overtaken by winter frost, and have to abandon his canoe. He would turn the canoe upside down, cover it with brush, and leave it with the practical certainty of finding it untouched in spring. Similarly with food. I have known a railway commissariat officer with heavily loaded canoes (confronted by low water conditions with shallow rapids and log jams) to leave a couple of tons of flour on an island in Lake Wabigoon. It was not carefully cached, and a much respected friend of mine, Koggiwaosh by name, happening to pass by, noticed that damp moss and field mice were doing it lots of damage. He straightway cut poles, made a proper cache, and left his two boys to watch it, but took nothing away. Such occurrences were common in the North woods, but I regret to say *Nous avons changé tout cela.* No cache can be left now without a man in charge, and the pathos of the thing is that our church bodies have spent thousands and tens of thousands in missionary work since then. Koggiwaosh was a pagan Indian, but not, it will be admitted, a bad specimen of a Man.

Some of the younger men on the railway surveys emulated the Indian, and became fairly proficient as axemen, packers and canoemen. To some of them, the woods life seemed the natural and desirable one. Some of them joined the Northwest Mounted Police, and became the most efficient of the force. Many of them never got back to fully civilized life in its entirety, except for an occasional spree in the nearest city. Few of them are left alive now, but if you meet any of them you will find them interesting to talk to, although not given to continuous talking. Always they are kindhearted, and always intelligent; the North woods is no place for the stupid man.

There were many adventures in those days, and a few tragedies. The most numerous deaths were caused by bush fires, and fire is still the most terrible enemy to be met with in all the North country. One single bush fire accounted for eight victims out of a single party. Several more were drowned, but not so many considering the vastness of the lakes, the turbulence of the rapids, and the fragility of the craft used. To a man who spends part of every day in a canoe, it becomes like a bicycle to an expert—the balancing is unconscious and automatic. A man's equilibrium is unstable even when he is standing on his own feet, but it is hard to knock him down unless you take him unawares.

Through Thin Ice

Lake Superior was among the most dangerous of our navigation routes, but not because it was big and "treacherous," or at least only indirectly so. Lake Superior is so big that it never freezes entirely and is navigable all the year round in some parts, but there is danger in the navigation in winter because the smaller harbors freeze over, and in days of storm and stress, it is hard to make a landing. However, up to the end of January, we used our boats constantly, and took to them again in March, but we had to watch the weather closely. On still cold nights, a light skimming of ice invariably forms along the shore. When the sun gets up, a breeze, sometimes a very fresh one, starts to blow from the shore. This skim of ice starts for the open lake, thickening as it goes. If a boat gets outside of a sheet like this, it may drive him miles out to sea before the swell following breaks it up, and if one attempts to break through it, it is astonishing how soon it will cut through one's boat or canoe. Many fishermen and travellers have been cut off in this way, and their boats sunk, before they could get back to land. The writer got very badly caught in a similar way by having the wind drop while he was crossing a wide bay. The ice began forming immediately. To row on meant that in ten minutes or so, the planking would be cut through, and we should sink in deep water. To stop meant that we should have to wait at least 24 hours for the ice to get strong enough to walk on, and should freeze to death. There was a second alternative which we tried successfully. Everything was moved aft until the bow was out of water. Luckily, the load was not too great to admit of this; and then we paddled gently forward, bearing the ice down as we went. The sharp edge merely chafed the planking, but did not cut it. It took an hour or more to reach the shore, and the boat was badly damaged, but still floated.

Of course, the wind is not always offshore—only on bright sunny days. Often the thermometer rises during the night, and a storm with snow comes in from the southeast, accompanied by a heavy swell which breaks this young ice into slush, and throws it high on the rocks. There is no traveling to be done on those days, and nothing to do but hunt up a well-sheltered spot, and make as comfortable a camp as possible. It was one of these changes that got us into a still more sensational predicament, although not perhaps any more dangerous.

Jumping Ice Cakes

Two Indians and the writer had coasted along the north shore very successfully for some sixty miles, to the end of Nipigon Bay, toward the middle of January. Here we found landlocked water and, as we expected, solid ice. So we laid up our boat and packed our stuff on a toboggan, which we obtained at a nearby Indian camp, and after spending the night with them, we started out. The two Indians pulled in front, I pushed behind with a pole. A few miles ahead was a bold point reaching far into the bay, and opposite to it was a channel out to the main lake. We had been warned by the Indians that the ice was new here, and that we had better take a portage over the point, which was several hundred feet high. But this meant a very arduous climb with the heavy toboggan, and we concluded to risk the ice.

All went merrily for some time. The new ice was reached, black and hard, and quite bare, and fully four inches thick. "What timid creatures those Indians were, anyway, trying to get us to lose time, and use up our energy hauling a toboggan up 500 feet, only to go down the other side."

We rounded the point and struck across the adjacent bay for some four miles. We got halfway across it, and still everything went well. Then I detected a slight swaying motion, and thought I must be bilious, but presently the swaying became unmistakably real, and the ice began to undulate. The wind had changed outside, and the swell was coming in from the big lake! We pulled a little harder, but felt no alarm; but the undulation got more and more pronounced, and presently, so steep that the ice could bend no more, and c-r-r-ick!!! a big fissure opened! We jumped it and pushed on. Crack! Crack! Crack! in every direction. And soon we were jumping from one cake of ice to another. The shore was still a mile away—the water commenced coming over the ice—and the toboggan very hard to pull. Wood runs very easily on dry ice, but not on wet. Not only did the cracks open everywhere, but they closed again with a bang, and we had to look sharp to keep our feet from being crushed or nipped off.

Presently the pack strap by which one man was pulling broke. He looked around for a moment, and then started off on the jump. The cakes were now so small that they would not bear our weight, and we had to run on them like a lumberman across a band of saw logs. The other Indian pulled for a few seconds longer, and then he broke for the shore, now only a few yards away, and I followed. Luckily for us, the little wind there was, blew on shore, and the ice crowded up closer and closer and doubled up—the edge of one cake under that of the next. The toboggan was partially submerged, but still floated.

In half an hour the packing of the ice was sufficient to carry us, and we went out gingerly and brought the toboggan ashore. As it was getting late, and everything was wet, we made camp in the woods nearby. The night turned bitterly cold, blankets froze like boards, and there was no sleep for us that night. The wind came out of the northwest again, and the ice we had traversed the night before was all gone in the morning, but we had reached the land-locked part of the bay, and there was solid ice with snow on it for the 30-mile tug to Nipigon Village, which we reached late at night.

I don't think any of us ever ventured again on young ice exposed to the swell from the open lake.

New Engine Terminal for Lehigh Valley Railroad

Built by Forces of Company at Ashmore, Pa., Nearing Completion—Engine House, Coaling Station and Ash Pit Details

BUILT in emergency by the forces of the railroad company, a new engine terminal for the Lehigh Valley R.R. is nearing completion at Ashmore, Pa. Previous to the middle of 1918, when construction started, the need for additional engine facilities became apparent on the Mahanoy & Hazleton Division, serving the coal-mining district west of Penn Haven Junction on the main line. Existing facilities were located at Hazleton, four miles west, and Weatherly, five miles east of Ashmore. It was decided to locate the new terminal at the junction at Ashmore, about three miles east of Hazleton, equipped for light repairs, coaling, ashing, and storage.

Since property was not available at Hazleton to expand existing roundhouse facilities the location of the new plant was determined as south of the Y at Ashmore, where property was available and existing structures would not prevent free design. As shown in the accompanying drawing, the new terminal comprises receiving yard, engine house, machine shop, transfer table, coaling, water and sand stations, ash pits, service

GANTRY AT PITS TO HANDLE ASHES INTO CARS ON CENTER TRACK

ENGINE HOUSE LOOKING TOWARD COALING STATION DURING CONSTRUCTION

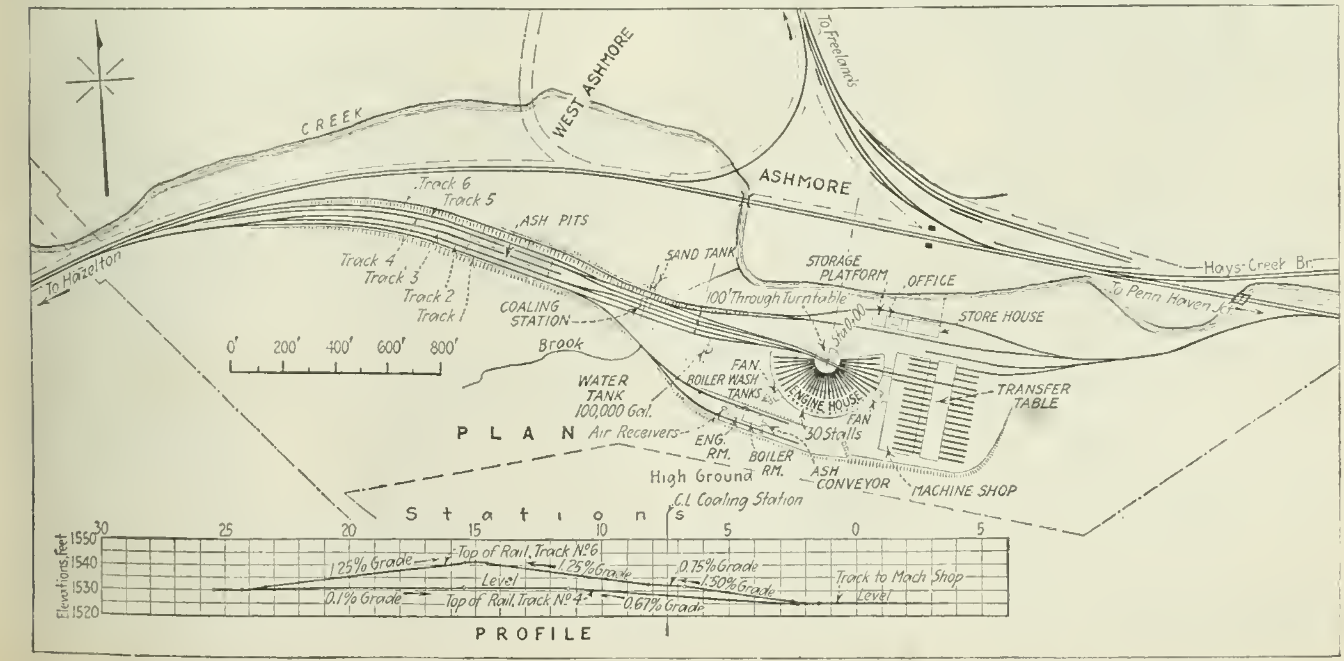
INTERIOR OF ENGINE HOUSE SHOWING SMOKE-JACK CONSTRUCTION

building and power plant. After the approximate layout had been determined it was "fitted" to a contour map, shifted and revised in order to minimize excavation, which was largely in solid rock.

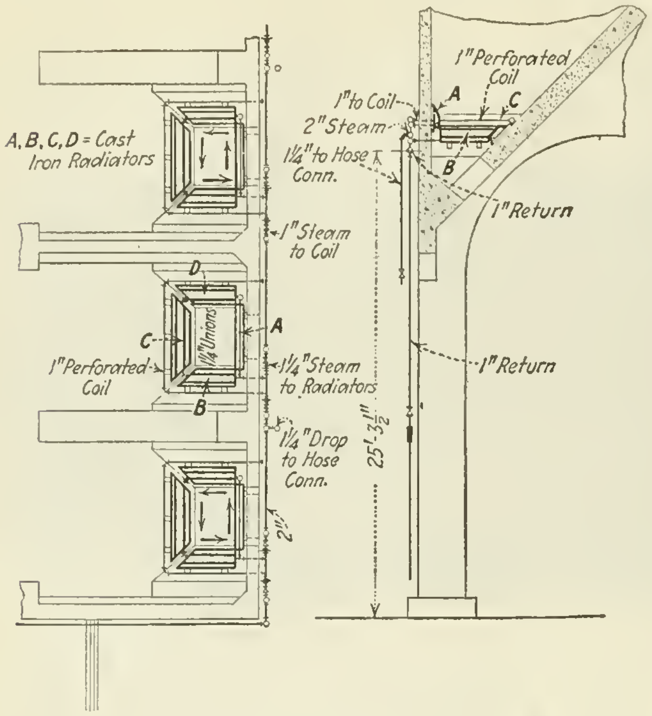
For ashing, engines are received on tracks 4 and 2, from which they may coal and take water or proceed direct to the engine house. Track 5 is used for storage and track 1 for direct connection with engine house or power-house coaling track. It is planned that the through track from engine house to transfer table will be used almost entirely, rather than the emergency track connecting from the east end to the transfer table, in taking dead engines into the machine shop for light repairs. These facilities, together with those already existing, will provide for about 500 locomotives operated on the division.

All of the buildings are of reinforced-concrete construction. The engine house has thirty stalls, served by a 100-ft. through turntable. It is of reinforced-concrete throughout, including columns and roof. To save expense and to provide a rigid structure, the lower portion of the smoke-jacks, including the hood, were cast integral with the roof. Details of the construction are shown in the accompanying drawing. The upper portion or stack was cast separately and fitted with mortar after the roof was complete. The walls of the hood, or lower portion, which is 12 ft. long at the bottom, are only 2 in. thick. Their appearance from the interior of the engine house is shown in the photograph.

The coaling station is of the reinforced-concrete type. Since considerable difficulty has been experienced by the company in the freezing of coal just above the gates, it is planned to equip them with a system of cast-iron steam radiators and perforated steam coils, details of which are shown in the drawing. Previously, when freezing occurred in very cold weather, it was the prac-



ENGINE TERMINAL FOR LEHIGH VALLEY R.R. AT ASHMORE, PA., BUILT BY COMPANY'S FORCES

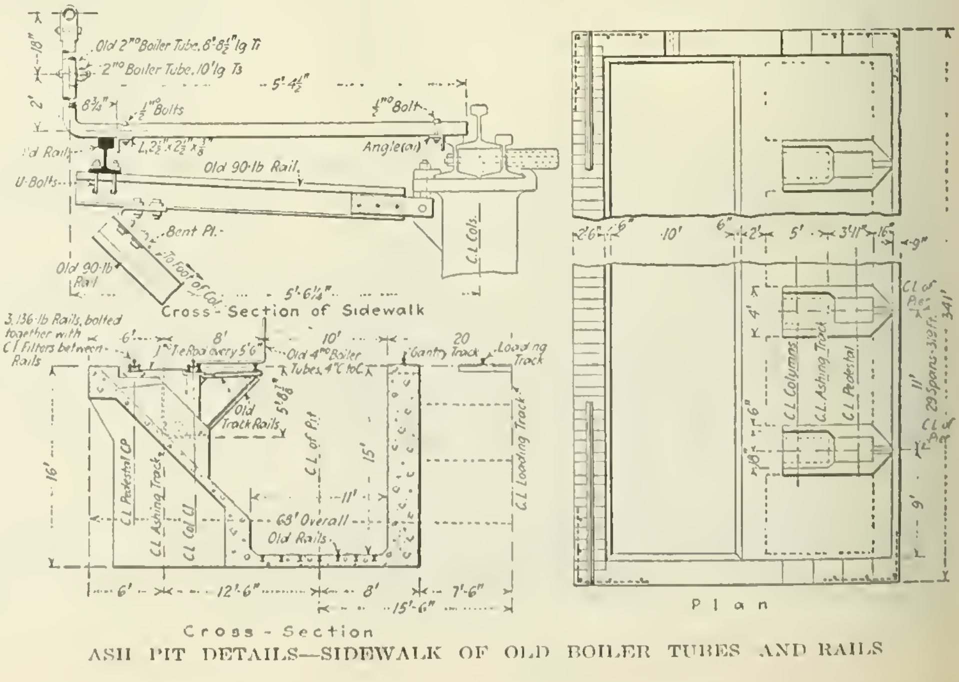


CAST-IRON RADIATORS AS THAWING EQUIPMENT FOR COALING GATES

tice to inject live steam upward through the gates. While this would thaw out the frozen mass, it would often be followed by more serious freezing up from the condensed steam. It is thought that the system of steam radiators which will be installed will prevent the necessity of using live steam even from the perforated coils which are intended to be used only in case of emergency. Steam will be kept in the radiators throughout the winter months.

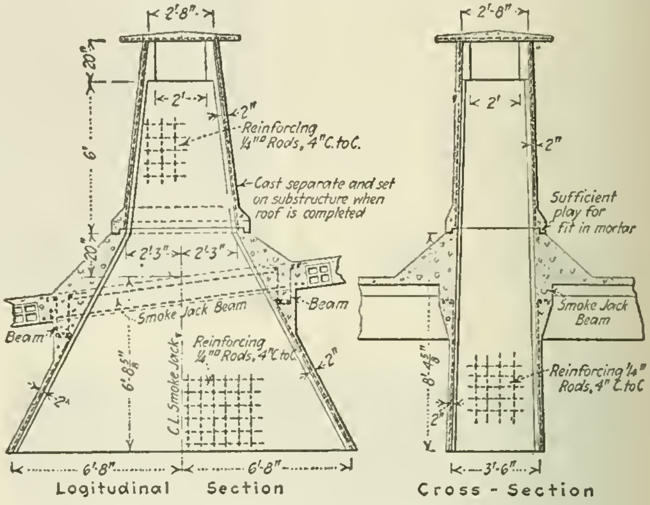
Ash Pit Details

Some of the heaviest construction experienced in building the terminal was encountered in excavation for the ash pits. It was necessary to excavate in solid rock over an area approximately 70 x 350 ft. to a depth of from 18 to 20 ft. in addition to grading for adjacent tracks, the character of which is indicated in the accompanying photograph showing the ash-pit gantry crane. A drawing of the pits, which are of the water type, together with details, is shown herewith. The gantry operates on a track of 17-ft. 6-in. gage, loading from the pits with a grab bucket into cars on the center track. A feature of the ash-pit design is the use made of the materials which were cheapest and most readily available. As indicated in the drawing, the sidewalks and railings consist of old boiler tubes supported on a frame of 90-ft. steel rails connected with angle irons. The sidewalk is 5 ft. wide, extending over the pit from the inner rail of the ashing track, provided with a railing also built up of boiler tubes, 3½ ft. high. Old rails were used also for the reinforcement of the floor of the pits. Ashing tracks are carried on girders built up of three 136-lb. rails bolted together and separated with cast-iron fillers, with a span of 11 ft. between pedestals and cast-iron columns. There are 29 such spans in each pit, with rail girders supported on cast-iron columns.



ASH PIT DETAILS—SIDEWALK OF OLD BOILER TUBES AND RAILS

Work on the engine terminal has been carried out by forces of the railroad company, which originally were organized on short notice specially for the purpose. Ground was broken about the middle of 1918 and the terminal is now nearing completion. The design and construction were carried out under the direction of G. T. Hand, chief engineer, who organized the special forces of the railroad company for the work. Construction was at first in charge of A. B. C. Scull, resident engineer, who was temporarily relieved by O. H. Kellogg, resident engineer, during his absence in military service. Designs were carried out under the immediate direction of J. J. McCleece, architect, office of chief engineer.


2'-8"
20"
6'
2'
2"
Reinforcing ¼" Rods, 4" C. to C.
Cast separate and set on substructure when roof is completed
2'3"
2'3"
Beam
Smoke Jack Beam
Beam
6'-8½"
C.L. Smoke Jack
Reinforcing ¼" Rods, 4" C. to C.
2"
6'-8"
6'-8"
Logitudinal Section
2'-8"
2'
2"
Sufficient play for fit in mortar
Smoke Jack Beam
8'-4½"
Reinforcing ¼" Rods, 4" C. to C.
3'-6"
Cross-Section

DETAILS OF REINFORCED-CONCRETE SMOKE-JACK AND HOOD CAST WITH ROOF

A Leaf From Lenin's Policy on Manpower

By Frances A. Kellor

Associate Managing Director of the Inter-Racial Council, New York

A BOLSHEVIST reign in Russia is for the moment assured. Lenin's formulation of ideas plus his ability to put them into operation promise some interesting experiments in handling manpower problems. American business men will do well to set their denunciatory powers aside and to develop their analytical and critical faculties to the utmost, to understand the economic changes taking place in that country and to so profit by the lesson that similar changes may not occur in America by identical methods.

The responsibility for checking Bolshevism rests with industrial leaders, not with political leaders. The economic bulwarking of the present system of production, not the passage of laws, is the answer to Bolshevist propaganda.

Throughout the world, we have to deal with materialism—to think first of food, shelter, clothing, rewards, profits, surplus, investments, and securities. Lenin personifies the height of materialism. His program is wholly economic. He relies upon dictatorship and force to make it effective. America is not less in the grip of materialism—even though riot and bloodshed are for the time being absent. Everywhere the question is "What can I get out of it?" and "Whom can I boss?"

The question confronting industrial leadership in America is: By peaceful methods, through a genuine co-operation of men, and with the aid of science, can the various elements of human power be united on a common basis of production—a *manpower* as inclusive of management as of men? Can there be formulated the kind of manpower engineering which will compass the field and train the new leaders whom the economic world needs?

Certain as men may be that Lenin's materialism and use of force will fail, he has at his command for his experiment the greatest single supply of raw manpower ever placed under one central domination.

Lenin's Labor Rules

Franklin got electricity from the storm of the heavens and paved the way for Edison; Lenin may get from riot and bloodshed the principles that mean his own destruction—but the truth of a new science to be established under new leadership.

Lenin has laid down the principle that eight hours of work is the standard; and that during that time *nothing that is not conducive to production and cannot be measured in terms of production shall be permitted in the industry.* It is the first clear, relentless application of manpower to production on a large scale that the world has ever seen. At one stroke it abolishes both welfare measures and strikes. The introduction of any welfare or human measures, of any recreation or other social features, not necessitated solely by production will not be tolerated. He holds that the plant is no place for civics, education or semi-industrial expression. For these most ample provision should be made outside of working hours and should be assiduously encouraged.

Lenin sees more clearly the line of demarcation between the application of manpower to production and manpower running idle than is evidenced anywhere else in the world.

"Iron discipline" during work hours is the method by which he hopes to make it succeed. If it does not come voluntarily from the men, then bayonets or penalties will do as well. Lenin's own statement can hardly be improved upon:

"Economic improvement depends on higher discipline of the toilers, on higher skill, efficiency and *intensity* of labor and its better organization. Material production requires an absolute and strict unity of the will. How can we secure a strict unity of will? By subjecting the will of thousands to the will of one. This subjection of the participants in the common work, who are ideally conscientious and disciplined, may resemble the mild leading of an orchestra; or it may take the acute form of a dictatorship. But at any rate, complete submission to a single will during work is absolutely necessary for the success of processes of work which is organized on the type of large machine industry. We must learn to combine the strong energetic breaking of all restraint on the part of the toiling masses *with iron discipline during work*, with absolute submission to the will of one person during work."

Now contrast with this the freedom of manpower Lenin recommends when it is running idle outside of the shop. The workers are to be attracted to active participation in political life, they are to have meetings and recreation without stint. Lenin says:

"Our aim is to attract every member of the poor classes to practical participation in general management [political] and the different steps leading toward this end (the more diverse the better) should be carefully registered, studied, systematized, verified on broader experience and legalized. It is our object to obtain the free performance of state obligations of every toiler after he is through with the eight-hour session of productive work."

The Situation in America

What is the lesson in this experiment to America? Despite the fact that America is the greatest machine-producing country in the world, and has tremendous industrial genius for organization, it is very far from handling its manpower in an orderly, economic way. Industrial leaders are groping for a uniting principle, and for standards and methods of operation, in this whole field.

Production is struggling in a morass. Men are at variance over what words to use in referring to workmen and to management. Some employers think it makes a difference if their men are called employees or workers, or workingmen. Capital and labor organized in different camps find it increasingly difficult to keep their separate identity, when workmen are so fast becoming investors and small land owners and stockholders. Socialists have to resort to extreme measures to keep the bitterness in class consciousness and to hold workers and management apart. The Communist understands and forgives the member who shrinks at throwing a bomb, but distrusts and expels the member who discusses industrial betterment in company with a capitalist.

Indications are fast multiplying that "welfare work" and "scientific management" are alike doomed, with nothing as yet to take their places. Each corporation, according to the whim of its directors, experiments with the Leitch plan or the Whitely plan or the works council, and centers its hopes in such solitary panaceas.

More and more the industrial engineer is being called upon; plants are flooded with "service" schemes from aspiring Croesuses. These cover everything from plant posters to the educational spy sitting on the job alongside of the men whom he aims to educate.

While this confusion of mind and sterility of effort prevail, the waste of power goes on unchecked. It is estimated that it costs American production $30,000,000 a year just to exchange men with each other. The labor market is unorganized, each employer competing with another for the new supply of men. It is apparently no concern of industry that millions of unskilled immigrant workmen are going back home, and that laws are to be passed forbidding their return. They read with complacency about the hunting of "Reds," not realizing that every man caught in the net who is not guilty and his countrymen who are not Bolshevists and hate injustice, retaliate by striking on the job, resulting in a low morale which makes poor quality and output low.

Employers realize that something must be done, but instead of getting together and finding a way which will work for all industry, each goes off in his own little corner of the world and experiments and wastes power, proving the success or failure of what at most can be but temporary panaceas.

ENGINEER HOLDS SOLUTION

Now is the time to bring law and order out of this confused vision and disordered effort. Nothing but science has ever been able to understand power of any kind. Engineering is the only method that holds out any promise of ultimate success. Increasingly the engineer, untrained in manpower, but having the essential ground work, is becoming the manager of men. In the next quarter of a century he will be the chief director of manpower. He is the man that will defeat Lenin, by reducing his ideas to law and order, without revolution.

The war has revealed to men that they are not anywhere near their capacity for output. It has created a demand for comforts among all men which the capacity of men will be taxed to meet. This is the problem of production. If this problem is not solved under the system of capitalism, it will be solved under some other system. It cannot be evaded.

The present concentration of labor into one group and of management into another cannot go on and get us anywhere. Already the lines are hopelessly confused and radicals and reactionaries are splitting the ranks of each wide open. Laws have proven useless as stimulants to production.

The application of manpower to production in its essence is the province of science to solve—just as much as the application of heat power and electric power to production was the province of science to solve.

The general acceptance of this idea has been delayed by the usual fumbling in any new field. The efficiency engineer conceived of it in terms of saving lost motion. The industrial engineer conceived of it in terms of patchwork—a fixing up of industrial relations. The welfare man is a kind of compromise of the employer with his conscience who thinks something should be done but not too thoroughly.

Scientific management was an imposition of theories; it was a juxtaposition of words without scientific basis or credence and was distrusted from the beginning. The trade union is a kind of armed camp from which men skirmish for advantage and position with little relation to the principles of production, and the employers' association is little better.

Long before the uniting principles in heat, power, or electrical power were found, so much as man could discover and use was applied to increase production and to secure comforts. It was a long way from the discovery to the formulation of the science.

There is similarly to be a long line of discoveries and of experiments in manpower, which parallel, though they are not identical with, those of other kinds of power. Marx believed the final answer to be Socialism. Lenin thinks he has found it in Communism. Gompers thinks it is in the trades unions. These are but passing movements which will eventually contribute their share to give the world a science of manpower.

The American inventive mind does not tolerate chaos and waste in other forms of power. The best minds and knowledge of engineering would be put to work in laboratories and shops to find a remedy for leaks in steam and electrical power. They would be the subject of scientific inquiry and of discussion.

Not so with manpower. The subject is approached from the position of capital or of labor. Men's minds are impelled toward it to right wrongs or to earn rewards—or to propound theories and to ride hobbies.

When we speak of the civil or the mechanical or electrical or chemical engineer we know he has had certain preliminary training and that there is a language in which we can talk to him which we both understand. He knows certain preliminary things that we do not have to bother about. When an engineer is engaged to design and build a bridge, the contractor has certain definite things to rely upon, and the engineer's reputation is the application of his knowledge, experience and initiative in a highly competitive world which stimulates him into perfection in his occupation.

Varied as are the courses for engineers, there are certain uniform fundamentals that give them mental integrity and an operation of mind highly essential to handling his subject matter.

What of the men who handle manpower? Call them together and see what is to be found in any miscellaneous group. Here is the engineer with training; beside him is the foreman promoted because he got results—often with his fists. Across the room is the secretary loaned by an organization interested in saving souls and his neighbor is an efficiency engineer. From whatever walks of life they finally arrive at handling manpower, their training is incongruous; it is everything from the grammar school to the medical college, plus industrial experience or minus it, as the case may be.

Not less interesting than the equipment of "personnel" men, are their duties. It is anywhere from the simple one of running a lunch room or conducting a class in English to handling all of the functions of an up-to-date employment department or a works council. The scope of his duties may be governed by an enlightened general manager or a foreman opposed to all changes.

The problems of power are the same, whether it is to be extracted from men or from materials. How to get power units requires knowledge and organization. With manpower it is men; with heat and electricity it is materials. How to use power requiring management, how to increase power from existing units, requires research and experiment. Not so many years ago, the problems of electrical power and its application seemed not more difficult and variable than are those of manpower today. Scientists obtained the secret and put it to practical use and reduced their findings to engineering terms. Scientists will find the secret of manpower just as soon as they set about it in the spirit of attaining knowledge and its practical application.

How to get power units is the problem of the labor market, and its organization. There must be fundamental principles which can be discovered and laws that can be applied; their discovery and formulation is but a matter of time. How to use this power concerns itself with the treatment of men and the conditions of work. There are as definite principles and methods that govern this field as exist in any other field of power, but we do not know them yet. How to increase manpower from existing units concerns itself with incentive. rewards, and participation in management.

Lenin hopes to discover these secrets by the use of force through communistic organization. The country that makes the discoveries and reduces them to operating terms by the use of science through a democracy in which all men—hand and brain workers alike are recognized—will be the master of production.

An analysis of any one hundred American plants struggling with shortage of labor, leaks in power, and losses in power that defy methods being installed to produce power, shows no agreement in theory or operation upon the elemental factors, which may be put as follows:

1. *Certainty of employment,* which gives the stability of power.
2. *Incentives and rewards,* which give the volume of power.
3. *Treatment and working conditions,* which give the intensity of power.
4. *Participation in management,* which releases unused and undeveloped forms of power.

Not only is there no agreement on the theory or method of operation of these elemental factors, but we have failed even to use our discoveries. In the rush of the war, the varying grades of productivity in plants was found to be a detterent in winning the war. The crude method of distributing skilled workers in plants of low output was adopted and caused the delusion of labor. With the close of the war, much of the co-operative elements incident to the war disappeared, and with it even glimmers of the intelligent handling of manpower. We are back where we started, fighting along class lines.

THE REMEDY

What is the remedy?

First of all, it is a slow one—which will not appeal greatly to the impatient American producer.

Second, it is not an emergency measure, and cannot be handled as a campaign or a drive, or a panacea.

Third, it is not a lot of disjointed efforts into which men may be stampeded through a fear of Bolshevism or of anything else.

Fourth, it is not a defensive negative remedy, but a constructive positive remedy.

Fifth, manpower is no longer to be regarded as an individual-plant problem to be dealt with according to local plant ideas any more than is electric or heat power to be applied irrespective of governing principles and methods.

Sixth, manpower is not to be fully handled by the setting up of elaborate government machinery to deal with its outbursts and disagreements.

There is required *first of all* a scientific inquiry into the application of manpower to production, which shall be free of all imputation of bias toward either capital or labor. Analysis must replace propaganda. Such an inquiry as a basis for the adoption of principles and standards and formulations must precede the introduction of any courses for the training of men and must cover as essentials certainty of employment, incentives and rewards, treatment and working conditions, and participation in management.

With such data in hand, we can begin to see what things belong in the plant as 8-hour production measures and what belong to the community as 16 hours free time. Nothing is more important to the plant than that there should be clear governing principles upon plant matters as distinguished from community matters.

To go on making recreation and hospitals, and lunch rooms and lectures and dances, and baseball teams and concerts, plant activities without definite relation to production, is to write disaster. It invites it because their introduction causes suspicion and resentment, sarcasm and misunderstanding.

To go on saddling the community with obligations which are the result of misapplication of manpower in production is to invite legislation and investigation and inspection and other outside interferences, which hamper the determination of scientific principles and methods in the application of manpower.

To continue in plants outside uplift agencies, knowing little or nothing about production, and to introduce temporary expedients—not an organized part of industrial organization—is certain to be disastrous.

ORGANIZATION OF DATA

There is data in abundance; there are experiments in profusion. The present method of collating them is for an investigator to make a study and write a book or deliver a lecture. There is an endless procession of books and lectures. This procession is now being succeeded by an endless variety of industrial and human engineers. Not any one line of data, not any one set of experiments or of theories of the various engineers is submitted to the tests required of any other form of power before it is applied. A manpower experiment tried out in one plant is no more ready for general recommendation as fundamentally sound for all industry to adopt than is an experiment in the field of mechanical power. Perfection, secured by a variety of tests, is as important in one field as in the other.

There is an almost complete absence of any such conception of manpower and its application.

What one incentive or record can be counted on to produce maximum power in every plant where it is applied?

Do any two employers agree upon the amount of power produced by profit-sharing, and what type gets most power?

Do any two plants follow the same system of assuring certainty of employment and is there any one accepted method which keeps the human equipment up to a given percentage of perfection?

What part do ventilation and heat and light play in working conditions to intensify power, and are they standardized in marketable shape so other plants can adopt them?

Conference after conference, congress after congress, meets to discuss markets, raw materials, prices, etc., and are silent on manpower—the application of which to production is the biggest single unsolved scientific problem in the world today.

There are many treatises on the subject of labor, but who knows whether they are any good? Someone makes a discovery in electricity. It is immediately reduced to operating terms or it is discarded. Someone writes a book on civil engineering. Ten thousand engineers pounce upon it, read it, apply their experience and knowledge and it becomes a textbook, or a general reference book, or it is soon covered with dust. The point is, these engineers are interested in maintaining the standing of their profession, of protecting the integrity of their science, of establishing standards of learning and of efficiency.

With manpower it is different. Someone gives a thrilling account of the works council. Without finding out about it or its principles of operation, or its relation to the whole scheme of handling men, hundreds of plants install it and then wait for the millennium. One plant has success with a profit-sharing scheme and then another plant, adding here and there a little individual touch to satisfy its local pride, initiates something that gets a poor return on its investment. Result, the idea of profit sharing becomes the subject of controversy in which few facts and fewer tests appear and each defends his own pet scheme.

These pages could be filled with illustrations of haphazard schemes installed in such disjointed ways. There is no central authority—because there is no science and no professional pride to preserve it, to which the industrial leader desirous of measuring up to his obligations can turn for enlightenment and be sure he is getting disinterested information and tested experiments. Why should not the Works Council or the bonus system or any other form of generator be subjected to as rigid tests as a new design of steam engine? Both are designed for one purpose—power generators to increase production. Defective co-operative management is likely to prove much more destructive than a defective steam engine. In the one case we permit any theorist, with little training and less reputation, to submit a design which is often adopted untested; in the other case, we ask for a guarantee unless the trade mark constitutes one.

HOW GET THE DATA

Shall we get the science or the engineer first? Once industrial leaders are convinced that manpower is an engineering job and that the efficiency of the present system of production depends largely upon the engineer, they will come together, and begin to work out the fundamental principles and methods of operation and will begin to ask for trained men.

The engineering colleges are awakening to the coming demand, but they, too, are doing patchwork and have not grasped the idea that the application of manpower to production is a science and that they may take a big lead in its formulation and ultimate operation. Most of the courses are still couched in terms of management rather than in terms of manpower.

Coincident, therefore, with analysis of a collation and rigid existing data there should go an analysis of existing training courses and the formulation of manpower engineering courses that will meet the growing demand for trained men.

America senses but dimly as yet the demand that will be made upon its engineers by foreign countries. They will be called upon to handle manpower and to settle finance questions for which they have little preliminary training or basic judgment. American industries will be hard put to find substitutes for these men. The answer is the manpower engineer trained as thoroughly and as fast as American institutions can do it. The country that produces this kind of engineer will control the resources of the world.

Let us have the engineer, through the Engineering Council and the Engineering Division of the National Research Council undertake a thorough scientific research of the problems of manpower.

Let us follow this article by formulation of the essentials of the science and by a definition of its operations.

Let us have a manpower research center as free from self-interested control as any physical laboratory in America.

Let us outline practical courses in engineering colleges to meet the demand for trained men.

Let us take a leaf out of Lenin's policy of applying manpower eight hours a day relentlessly to the job, cutting out the camouflage and fog, and make Bolshevism impossible in America through revolution because American industrial leadership has believed in and solved the problem through evolution.

Shallow Pit Coaling Station for the Chesapeake & Ohio R.R.

Ground Water at 12 Ft. Below Subgrade Was a Governing Factor in Design—Operation of Loader Mechanism

GROUND water in large quantities at about 12 ft. below subgrade level was a governing factor in the selection of the type of coaling station built recently for the Chesapeake & Ohio R.R. at Handley, W. Va. For the usual gravity feed from a track hopper to the elevator a track pit about 26 ft. deep is required, which in this case would have involved costly wet excavation and a continual operating expense for pumping. In the adopted design the pit is only 12 ft. deep, the coal being fed to a mechanical loader which charges the 2½-ton elevator bucket. The roadbed will be widened for a third track on the right outside of the columns of the coal bin.

Figs. 1 and 2 show the general design of the coaling station and details of loader mechanism.

The shallow track pit is divided into two sections, the upper being the hopper to receive coal dumped from cars and the lower one containing the loader machinery. A steel discharge chute in the bottom of the hopper is closed normally by a gate which travels on wheels on an inclined track and is held in the closed position by a chain and counterweight. A truck or loader of 2½ tons capacity travels on another inclined track and is operated by an endless chain. When the empty loader runs down its incline it drives back the rolling gate, so that coal flows through the chute until

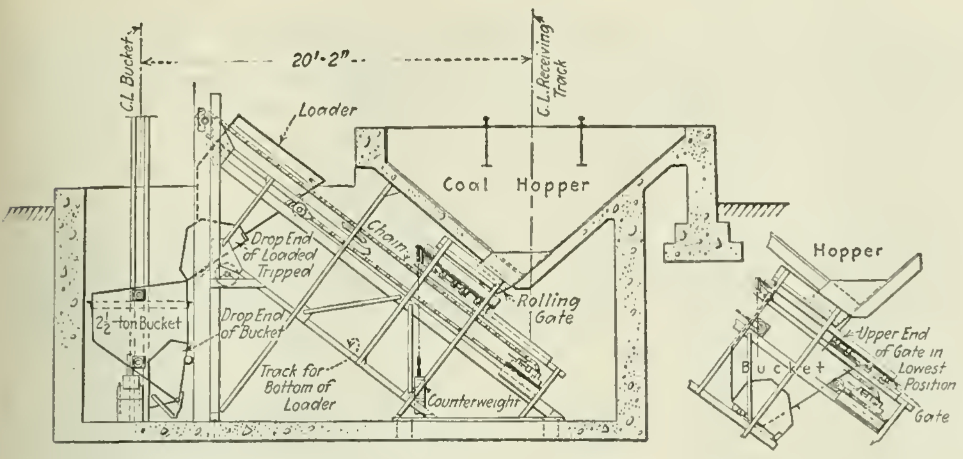


FIG. 1. COAL-LOADING DEVICE REQUIRES TRACK PIT ONLY 12 FT. DEEP

the loader is full. At this instant the driving chain is started and moves the loader forward, while the gate follows it and closes the chute.

As the loader reaches the head of the incline its bottom section is tripped and falls forward to form a chute through which the coal flows into the elevator bucket. This bucket is then raised to the top of the steel tower, where its bottom gate is tripped, discharging the coal into a chute which enters the roof of the elevated bin. The bucket makes a round trip in about 1½ min. An electric motor of 22 hp. operates both the loader and the bucket, the two sets of mechanism being cut in and out automatically to provide for the series of intermittent movements of both devices. As the loader is connected to the hoist by spur gears the timing of the operations remains constant. This plant has a capacity for handling 75 tons of coal per hour. For a capacity up to 150 tons similar plants have two balanced buckets and two loaders.

A 500-ton bin of reinforced concrete spans the engine tracks and has its bottom sloped 40 deg. from the center to the sides. Provision is made for side spouts to serve a third engine track on the right, as shown in the plan. To supply two grades of coal, the bin is divided into two compartments, one for 333 tons of screened coal for road engines having mechanical stokers and the other for 167 tons of run-of-mine coal for road and yard engines. The chute from the head of the elevator tower has a forked end and is fitted with a gate to divert the coal to either of the compartments, as desired.

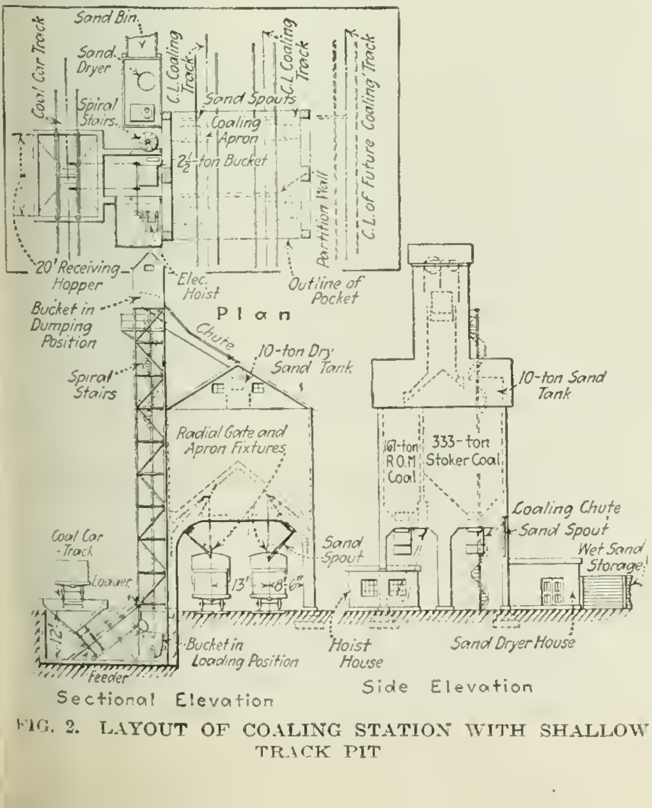


FIG. 2. LAYOUT OF COALING STATION WITH SHALLOW TRACK PIT

Adjacent to the coaling station is a sand-drying house and 100-ton sand bin. Dried sand is delivered to a drum, from which it is blown by compressed air through 3-in. pipes to a 10-ton tank under the roof of the coal bin. From this tank, the dry sand flows by gravity through 3½-in. pipes to hinged spouts which may be lowered to the engines. The pipes are fitted with moisture-proof undercut sand valves.

From 40 to 50 engines are coaled daily at this point. This coaling station was designed and built in 1919 by the Roberts & Schaefer Co., Chicago. The work was under the direction of F. I. Cabell, chief engineer of the Chesapeake & Ohio R.R., with H. L. Vandament as resident engineer in charge.

Wyoming Seeks Co-operation from Road Contractors

In a circular letter to Wyoming contractors D. C. McCalman, superintendent Wyoming State Highway Department, seeks co-operation by announcing that:

Every contractor as soon as he is awarded a contract by the State Highway Commission should be considered a unit in our organization. Many engineers in charge of construction work are inclined to be antagonistic to contractors doing work and possibly some members of our engineering department have in the past taken this attitude. They are now, however, instructed that contractors doing work for Wyoming are to be considered a unit in the organization, and they are to endeavor at all times to help complete the work promptly, economically, and in accordance with plans and specifications.

The phrase "according to plans" is not, however, to be a hard and fast rule and contractors should not hesitate to take up with district engineers any change in plans considered advisable. All contractors were recently requested to furnish this department certain information we desire to file in the shape of card index, so that in awarding contracts we may give due consideration to past performance and financial responsibility as well as the unit prices bid. In this connection contractors will be required on future awards to show they have a cash working capital in the amount of 20 per cent of the total contract. Effective at once contracts will be drawn so that contractors will be allowed on monthly estimates the value of materials delivered in advance of time required. Also contractors will be allowed on monthly estimates the premium paid for surety bonds as evidenced by receipt for same.

Twenty Years of Reinforced-Concrete Railway Ties*

Review of Experiments and Experience in the United States and Foreign Countries — Results Largely Inconclusive and Unfavorable — Tests Continue — Principal Types

By Cyril H. Wakefield
Assistant Engineer, Office of Consulting Engineer, Southern Pacific Co., New York

Reinforced-concrete ties for railroad track cannot be said to have progressed beyond an experimental stage, since they are used only to a very limited extent, and in order to compare economically with wooden ties they will have to show a life of at least 30 years. Except for a statement of doubtful authenticity that such ties have been used in Mexico for 31 years, the records indicate that the first experiments were made in Germany 22 years ago and have been continued on a small scale. Italy, however, has been the real leader, having laid over 300,000 ties during nineteen years. The French railways in Indo-China started experiments twenty years ago and had about a million ties in use at the end of ten years. France has been conducting experiments for nineteen years; England for eleven years, Switzerland and Sweden for about ten years and Denmark for eight years.

Experiments in the United States began 20 years ago and about 20,000 ties have been placed in service. Their results are of greater value to the railroads of this country than are those of the foreign experiments, for European wheel loads are considerable lighter than those of American railways and traffic conditions are less severe. Unfortunately, however, many of the records are far from complete. Since 1907 the American Railway Engineering Association has obtained much valuable information on the subject, but many of the reports are incomplete.

It is the purpose of this article to present in compact form the available information on the subject of reinforced-concrete ties as regards their design, their use and the practical results obtained. It is based upon an extensive report prepared by the writer for John D. Isaacs, consulting engineer Southern Pacific Co.

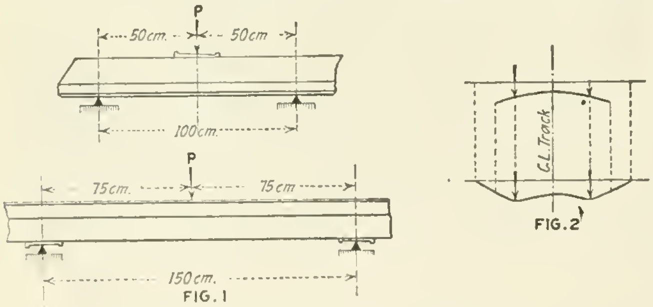


FIG. 1

FIG. 2

Fig. 1—Relation of length of tie to deflection under load.
Fig. 2—Loading tests for Italian ties

Experience has shown that the design of a satisfactory reinforced-concrete tie is a problem requiring considerable thought and study. As concrete has not the resilience of wood, it is essential that all the elements affecting the elastic action of a transverse tie shall be given consideration in designing a suitable substitute for the wood tie.

The elasticity of a tie depends upon its length, its stiffness and the nature of the ballast. A tie which is too short shows its maximum curvature at the center, while a tie of correct length becomes most bent under the rails. This is shown in Fig. 1. A flexible tie bends and gives high pressures on the ballast directly under the rails, while a stiff tie shows less bending and distributes the pressure more uniformly upon the ballast. Hence, ties made of material which possesses comparatively little flexibility, such as reinforced concrete, should be made as stiff as possible. In other words, they should have a large moment of inertia.

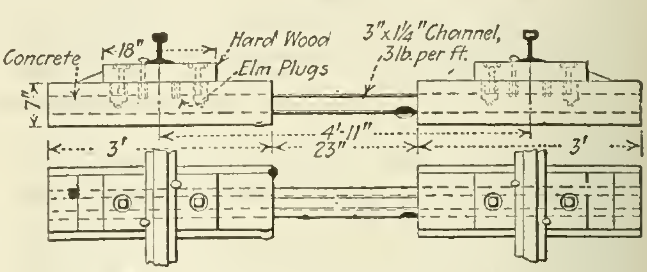


FIG. 3. KIMBALL TIE IS COMPOSED OF TWO CONCRETE BLOCKS CONNECTED BY STEEL CHANNELS

It has been pointed out by G. H. Kimball, the inventor of a divided tie, that in ordinary track construction the pressure on ties is eccentric. The ties extend about 18 in. outside of and 30 in. inside of the center of each rail, and as they present more bearing surface inside of the rail they tend to settle unequally. In other words, the center of pressure and the center of figure of the bearing surface do not coincide. For this reason the ends of the ties are more or less loose in the ballast, except when under load. A reinforced-concrete tie should be designed to act as a cantilever beam and thus withstand the severe shocks occasioned by the sinking of the ends of the tie under passing loads on a center-bound track.

It is essential that reinforcement be placed near the surface of all parts subjected to tensile stresses under various conditions of loading. With ties of the correct length tension will occur in the top at the middle, and in the bottom beneath the rails. Outside of the rails there may be tension in either top or bottom, depending upon roadbed conditions. Reinforcement in the center of the cross-section is useless, for it does not aid in resisting any tensile stresses. In general, the design of a satisfactory reinforced-concrete tie should meet the following requirements, which are based upon theory and the results of practical experience:

1. Sufficient area of bearing surface upon the ballast to transmit safely to the roadbed the weight and impact of the applied loads.

2. Sufficient frictional resistance in the ballast to prevent lateral movement of the track.

3. Sufficient strength, elasticity and endurance to render satisfactory service under traffic conditions, including ability to withstand derailments.

4. Ability to maintain gage of rails and to hold them in a position perpendicular to the plane of the track.

5. A section such that the ties may be placed sufficiently close together to prevent any appreciable deflection of the rails between supports.

---

*Based upon an extensive report, prepared by the author for J. D. Isaacs, consulting engineer Southern Pacific Co., New York.

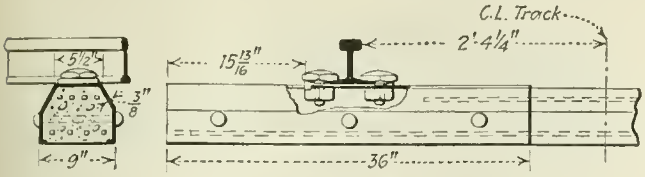


FIG. 4. ATWOOD TIE HAS TWO STEEL BOXES EMBEDDED IN CONCRETE

6. An efficient method of fastening the rails, the attachments being simple and accessible for adjustment or repair.

7. Provision for proper insulation. Concrete is almost an insulating material, but care must be taken to prevent contact through the metal reinforcement. A non-insulated tie should be capable of being insulated without having to be removed from the track.

8. Cushion blocks, if used, should be removable.

9. For facility of maintenance, the tie should be of such form and section as will permit the ballast to be properly tamped beneath it, thereby aiding in preserving the alignment and surface of the track.

Application of Engineering Knowledge

Although little reliable information is available as to the behavior of the Maciachini (Italian) ties in actual practice, it is interesting to note the sequence of five designs. The results obtained led to a continual increase in the moment of inertia, first by strengthening the reinforcement and then by increasing the cross-sectional area of the concrete. It was found to be more advantageous to replace the many small roads, which were at first distributed over the entire cross-section, by a less number of larger rods placed nearer the boundary of the cross-section.

It was found necessary to test the strength of every tie, without exception, before putting it in service, the most essential test being that which dealt with the negative bending moment at the middle of the tie. The strength tests proposed by Mr. Maciachini, as shown in Fig. 2, represent the forces acting upon the tie when in use: (1) A load of 2,000 kg. (4,410 lb.) applied at the rail seat; (2) a load of 1,200 kg. (2,645 lb.) applied midway between the rail seats, with the tie inverted and supported as shown.

In this country, Mr. Kimball was the first to recognize the importance of making provision for the tensile stresses in the top of the tie between the rails, and he met the situation in a novel way. Instead of making a full-length tie he used a pair of concrete blocks, each about 3 ft. long, connected by a piece of scrap rail or a pair of light steel channels. The blocks are placed symmetrically under each rail so that the center of pressure and the center of figure of the ties coincide and thus the most destructive stress in the tie is eliminated. A number of later ties have been patterned along similar lines, with good results, in most cases, as compared with those shown by full-length ties.

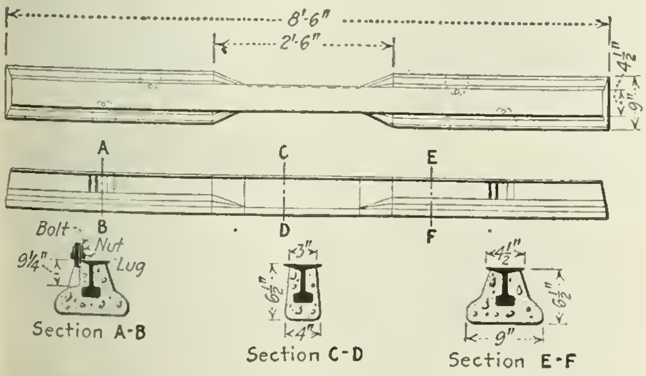


FIG. 5. BUHRER TIE RELIES ON OLD RAIL FOR STRENGTH

In various ties, especially of the earlier types, some of the essential principles in design were disregarded. The Percival tie, which tapers to a wedge shape in the middle in order to give stability, has insufficient bearing area; the Affleck, Campbell, Hickey and Leopoldina Ry. ties have the reinforcement in the middle of the cross-section; the Bowman and the Ulster & Delaware R.R. ties have no reinforcement at the bottom beneath the rails, while in the MacMartin tie this is lacking at the top between the rails.

On the other hand, the Indestructible, MacDonald and Stoneback ties in America, the Hall and the Jagger ties in England, the Asbeston and the Voiron-St. Beron Ry. ties in France, the Asbeston and the Dyckerhoff-Widmann ties in Germany and the Maciachini (type 4) tie in Italy, are all examples of full-length ties in which the reinforcement has been arranged with due regard for the location of tensile stresses.

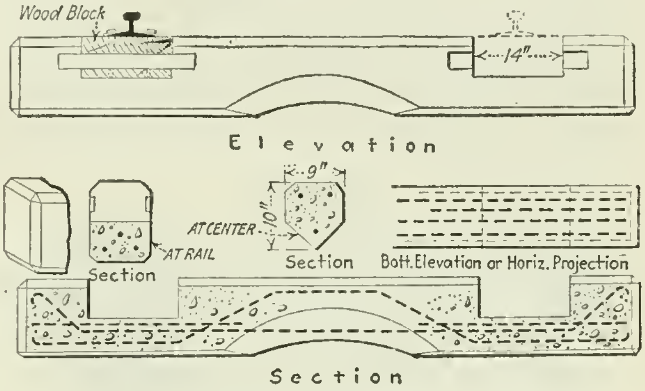


FIG. 6. THE "INDESTRUCTIBLE" TIE IS A REINFORCED-CONCRETE BEAM

Classification of Concrete Ties

Space will not permit of detailed descriptions of the various designs. Some of the more notable have been described, as follows: *Engineering News*: April 3 and Aug. 28, 1902 Kimball; July 7, 1904, Voiron-St. Beron Ry; Oct. 6, 1904, Ulster & Delaware R.R.; Aug. 17, 1905, Buhrer; Oct. 5, 1905, Campbell and Percival; Sept. 30, 1909, Jagger and Chenoweth; Feb. 17, 1910, Reigler; March 15, 1917, Wolf. *Engineering Record*: Aug. 19, 1905 (supp.), Percival; Nov. 25, 1905 (supp.), Chenoweth. (See also the published volumes of "Index to Engineering News.") There are about seventy designs, half of which are of American origin. In general they may be classified under the following four main types:

1. A divided tie consisting of a pair of blocks connected by some form of steel bar or truss.

2. A full-length tie in which the steel withstands practically all of the stress, the concrete being more or less incidental and serving either as a filler for the metal portion of the tie or as a means of distributing the load over a sufficient area of ballast.

3. A full-length tie wherein the reinforcement is wholly surrounded by concrete and is so distributed as

to assist materially in resisting tension in those parts of the concrete subject to tensile stresses.

4. A hollow or cored tie consisting of a shell of concrete reinforced to resist tensile stresses.

DESCRIPTION OF CONCRETE TIES

The Kimball tie, the Atwood tie (or the Buhrer tie), the Indestructible tie and the Wolf tie are representative of these four main types respectively, and may be described a little more in detail.

Kimball Tie—This consists of two concrete blocks 9 in. wide, 7 in. deep and 3 ft. long, the sides being convex. These are connected by a pair of 3-in. steel channels set back to back and extending under the rails to within 1 in. of the ends of the blocks. The exposed surface of the channels is protected by two coats of portland cement mortar and the space between them is filled with concrete. Hardwood cushion blocks, 3 x 9 x 18 in., are secured by ½-in. tap bolts screwed into anchors embedded in the concrete. The rails are held by ordinary track spikes driven through the wood blocks into hollow elm spiking embedded in the concrete. Each concrete block has a lug across the top to afford lateral support for the cushion. With stone concrete, the proportions are 6: 11: 3, using 1½-in. broken stone. Gravel concrete is a 2: 1: 3 mix, using ¾-in. clean bank gravel. The weight of the tie complete is 436 lb.

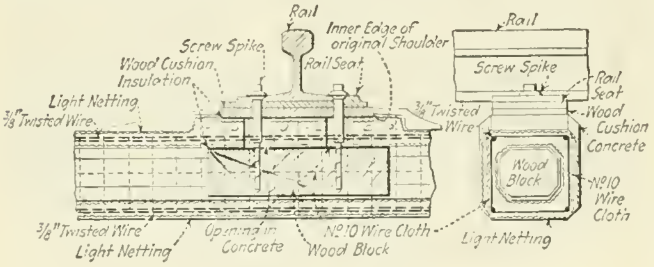


FIG. 7. WOLF TIE IS A HOLLOW BEAM

Atwood Tie—This consists of two steel boxes of ⅜-in. metal, each centrally located under a rail, the boxes being 5½ in. wide at the top, 9 in. at the bottom, 8 in. deep and 3½ ft. long. They are filled with and connected by reinforced concrete, the total length of the tie being about 8 ft. 5 in. The reinforcement consists of four square steel bars in the top and four in the bottom. The concrete is not required to act as a beam, as the two steel boxes are of sufficient strength to support the wheel loads, but it gives ample load-distributing surface to the ballast. The tie is insulated, as the top reinforcing bars do not extend under the rails, thus eliminating any contact between the bars and the 1⅛-in. bolts which hold the rails.

Buhrer Tie—In this design a piece of 65-lb. or 80-lb. scrap rail is used, inverted, with its head and web embedded in concrete. The concrete is massed toward the ends of the tie, which is 8 ft. 6 in. long at the bottom, so as to give a supporting base 8 in. to 9 in. wide for 3 ft. from each end. At the center the base is 3 in. to 4 in. wide, while the depth of the tie is 6½ in. throughout. The flange of the inverted rail forms a seat for the track rail and an attachment for the fastening, which consists of a clamp, a nut and a ¾-in. bolt. Some ties are of gravel concrete, 1 to 4. Others have one part cement, one part fine washed limestone and three parts ½-in. washed limestone. The weight of the tie with an 80-lb. rail is 460 lb.

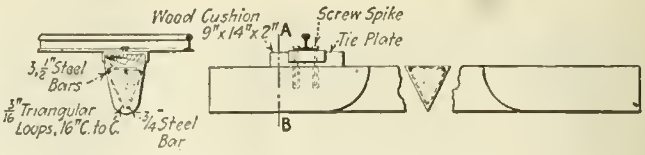


FIG. 8. PERCIVAL TIE

Indestructible Tie—This is 9 in. wide, 12 in. deep and 8 ft. long, with all edges and corners bevelled. At the center, the bottom is hollowed out for a depth of 2 in. and the sides are sloped down to a wedge shape, thus providing a grip in the ballast. The reinforcement consists of five steel rods located as follows: One long ½-in. round rod 4¼ in. from the bottom of the tie, except that at the ends it is bent up and hooked; two long ⅜-in. round rods, hooked up at the ends, placed 2 in. from the bottom of the tie underneath the rails but bent up to a like distance from the top of the tie at its middle; a short straight ⅜-in. round rod at each end, 4½ in. from the bottom. Beneath each rail the tie is recessed to receive a wood block 6 x 8 x 14 in. on each side of which is a steel plate ⅜ x 2¼ x 21 in. The plates fit into grooves in the concrete and are secured by two ⅜-in. bolts. The rail rests upon the wood and is held by clips or screws. The concrete is made with gravel and the weight of the tie complete is 660 lb.

Wolf Tie—This is a hollow tie 8 in. wide, 7 in. deep and 8 ft. 6 in. long, the outward shape being similar to that of a wood tie. The walls are 1½ in. thick, increased to 2 in. under the rail seats, although some ties have a 2-in. wall throughout. The reinforcement consists of four longitudinal ⅜-in. twisted steel rods, one near each corner, around which is wrapped No. 10 wire cloth having a mesh 2 x 4 in. In addition, light netting of 1½-in. mesh is placed near the outer and inner surfaces. The rail rests upon a steel plate on a spruce cushion block 1 x 8 x 12 in., abutting against a 1-in. shoulder on the tie. The rail fastenings are free from the tie structure, the screw spikes passing through openings in the rail seats into a wood block 18 in. long inserted loosely within the tie. The average concrete mixture is 1: 2: 3 and the weight of the tie is 320 lb.

A classification, under the four main types already described, of the various designs of reinforced-concrete ties, is given in the accompanying list, the weights being given when known.

Type 1. American. Bates (450 lb.); Corell, Kimball (436 lb.); K. C. & H.; Western.
Danish. Jensen & Schumacher.
English. Green & Moore; Meyrick; Northeastern Ry. (Plans B, D, D^a); R.-P. & T.; Victoria; Yokeblock.

Type 2. American. Atwood; Buhrer (460 lb.); Champion (600 lb.); Mershon (400 lb.); Riegler (800 to 850 lb.); Simplex (350 to 370 lb.); United States.

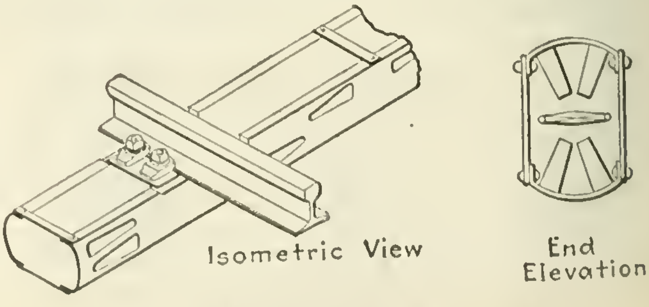


FIG. 9. RIEGLER TIE HAS STEEL SHELL

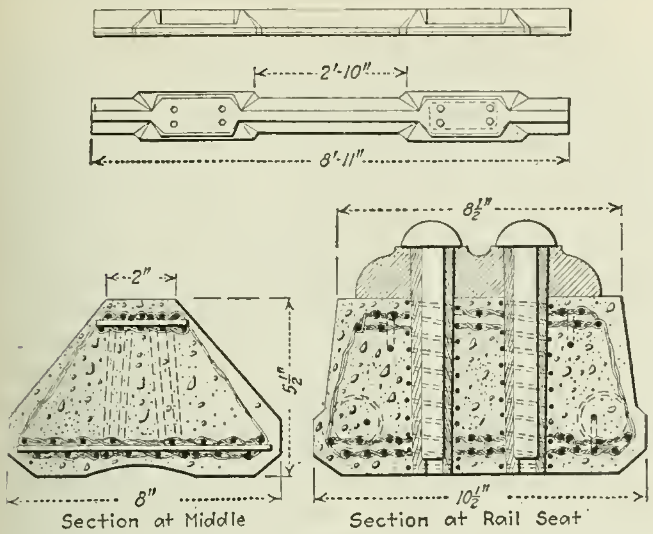


FIG. 10. JAGGER TIE IS REINFORCED BY WIRE MESH AND SMALL RODS

Type 3. American. Affleck; Bowman; Brukner (345 lb.); Brunson; Burbank; Campbell (356 lb.); Chenoweth (300 lb.); Colorado & Southern; Harrell (300 lb.); Hickey; Indestructible (660 lb.); Keefer; MacMartin; McDonald; Percival (445 lb.); Stoneback (580 lb.); Ulster & Delaware R.R. (450 lb.); Waples (1,000 lb.); Weber.
Brazilian. Leopoldina Ry. (267 lb.).
English. A. P. C. Co.; Hall; Jagger; Northeastern Ry. (Plan C) (365 lb.).
French. Asbeston; Indo-China; Sardar (308 lb.); Voiron-St. Baron Ry. (232 lb.).
German. Asbeston (397 lb.); Bavarian; Dyckerhoff & Widman (386 lb.); State Ry.
Italian. Maciachini (type 1) 287 lb.); types 2, 3, 4, 5).
Swiss. Hintermann.

Type 4. American. Leonard (600 lb.); Wolf (320 lb.).
English. Auden; Marriott; Northeastern Ry. (Plan A); Rings.

Bolts and clips, screw spikes and ordinary drive spikes are the most common means of fastening the rails to the ties, the bolts in most cases being inserted from the bottom. Spikes are driven either into wood blocks or through the blocks and into wood or soft metal dowels embedded in the concrete. In the Asbeston tie, the concrete at the rail seat is made with asbestos and can be bored like wood for the screw spikes.

Clips of various forms have been introduced in combination with bolts, screws or spikes. They show a tendency to work loose, while the heads of bolts sometimes turn so as to prevent tightening of the nuts. Spiking appears to be the most effective form of fastening.

Portland cement is used in practically all the American ties. The fine aggregate consists of sand usually, while the coarse aggregate may be either crushed gravel or crushed stone (limestone being recommended in a number of the designs), although slab has been used in a few instances. In general, the size of the coarse aggregate ranges between ½ in. and ¾ in., but 1-in. and 1½-in. stone are used in the Percival and the Kimball ties respectively. The usual proportions are 1 part cement to 4 or 5 parts aggregate, a 1:2:3 mixture being quite common. With concrete properly mixed and set, its composition does not seem to have any appreciable effect upon the strength and durability of the tie.

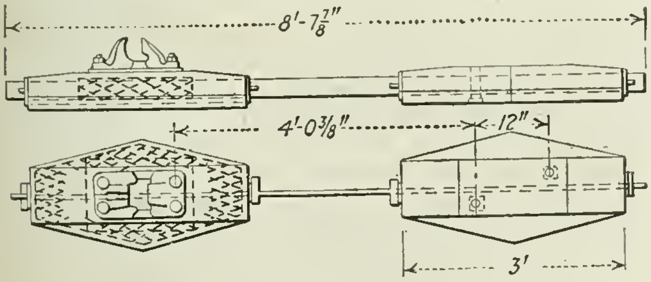


FIG. 11. CONCRETE TIE OF NORTHEASTERN RAILWAY (ENGLAND)

While space does not permit a tabulation of the records of service upon which subsequent conclusions are based, it may be said that many of the records are incomplete. It is apparent that trials of ties in small lots (a dozen ties or less) are not likely to give results of much value, but it is doubtful if the general average would be greatly affected by such experiments.

The records show that about 19,000 ties have been laid in track in this country. Italy has installed 303,000 ties; Sweden more than 2,000; England more than 400, and France more than 300 ties. The Danish, German, Swiss and Mexican records are too incomplete to permit of even approximating the numbers.

About 18 per cent of the American ties are reported to have been removed because of failure, but this figure would be increased considerably if complete records could be obtained. The relative character of failure may be represented by the following proportions: Completely broken, 14.5 per cent; disintegrated, 2.5 per cent; cracked, rail cut and minor injuries, 1 per cent. The failures of foreign ties are proportionately lower than in this country, due largely to the lighter wheel loads.

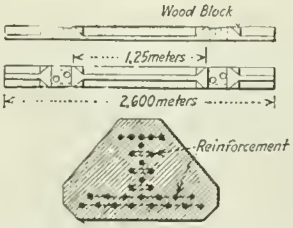


FIG. 12. MACIACHINI TIE

The most promising results have been obtained from ties of the Atwood or Buhrer tppe, in which the steel component is in itself sufficiently rigid to withstand the wear and tear; or from those of the Kimball type in which concrete blocks are tied together by a comparatively light member.

Judging from results thus far obtained it is evident that a truly successful reinforced-concrete tie is yet to be obtained. Suitable rail fastenings are as essential as the design of the tie. The load on the average track is not transmitted over the whole tie but is confined to an area extending about 15 in. on either side of each rail, while often there is an upward thrust at the center of the tie. As the ballast yields and may not provide uniformity of support, there is a tendency to flexing. This can be withstood very well by wood, but in the case of reinforced concrete it will result eventually in the concrete breaking away from the metal. Results have shown that it is extremely difficult to obtain sufficient bonding between the concrete and the steel to withstand severe service under heavy traffic.

In 1908, the tie committee of the American Railway Engineering Association took up the matter of metal and composite ties. Its report for 1909 stated that no form of reinforced-concrete tie suitable for heavy and high-speed traffic had been devised, but that such tie, with suitable fastenings, might be economical under low-speed traffic and where conditions are particularly adverse to the life of wood or metal ties. In 1912 the committee reported that it was neither desirable nor economical to attempt to meet all the conditions with a single design, but that there should be at least two designs or types, one for heavy traffic and the other for light traffic, both insulated or non-insulated as desired.

Impressions Here and There

Intelligence in Buying—Not being a resident of Chicago, we do not know Joe Beeson, but from an advertisement that he published in the Chicago *Tribune* recently we should say that he is a man of much common sense. Incidentally, his advertisement talks about a clothing business conducted under the name of the Joe Beeson Co., but that in which we are interested are his views on the present era of high prices. Among the nuggets which one finds in his advertisement are the following:

"Put on the brakes."

"Get out of the habit of thinking, 'I must pay more and more every day.' "

"A philosopher once said, 'Human beings can get used to any situation within two weeks.' Maybe that is what is wrong with us."

If our observation is not amiss, too, Joe's fellow citizens of Chicago particularly need talking to in this strain. Extravagance is rife—yes, terrifying—in every part of the country, but in our travels east of the Mississippi we have struck no city where the evidences of extravagance showed more on the surface than in Chicago.

While all prices are higher than they were before the war, we believe Joe is right in saying that we have gotten used to the high prices, and have acquired the habit of thinking that we must pay more every day. If more of us had a fighting instinct and instead of paying $17 for the first pair of shoes the salesman showed us, would insist upon his bringing out the $10 variety, the merchant would soon begin to change his point of view and send orders back to the factory for a larger stock of $10 goods. We know some men, with nerve equal to that of any retail clerk, who have gone into the high-priced shops on Fifth Ave., New York, and walked out with goods that the salesmen at first protested they did not have in stock.

We are acquiescing too easily to high prices. If we will fight, if we will "put on the brakes," if we will let the merchants know that we will buy none but more reasonably priced goods, a change for the better will set in.

This is not engineering subject—but our observation is that the subject has some interest for the engineer. Let's be intelligent, not acquiescent, buyers.

Romance of Advertisement—Has anyone observed what a full history of engineering may be found in the advertisement pages of old technical newspapers? There we may read of the birth and growth of inventions, and divine the period of their decay and death; there we may watch the coming of new men, witness their progress and wonder why, of a sudden, their names disappear and are no more seen. Or, again, we may study the life history of companies, noting their little beginnings, their advance to maturity and their alliances, finding pleasure in pondering upon the changes in their styles and titles, now picturing the festivities when the eldest son is welcomed by his father and his father's friends to partnership, and now recalling, with mellowed regret, the passing of an old familiar name, swept aside in the triumphal march of the Goddess Progress, who knows neither sentiment nor pity. . . . The editorial pages have less intimate history in them. They are full of first chapters, odd leaves here and there from later chapters, and sometimes—as when a Maudslays' passes—the last page of all. They record the birth of a new invention, and they tell of the successive improvements it undergoes, but of the little, familiar, everyday affairs and episodes of its life they say nothing, and they pass over its decay and death in silence and indifference. You must look to the advertisement pages for such memoirs. They will tell you when the invention first reached the market, and with what favour it was received, how long it held its place against competition, what changes and chances befell it in its life, and, finally, "last scene of all"—a blank: the pages that had known it know it no more; the sale has stopped, the invention is dead, or has been absorbed into that great Nirvana of inventions when, by the lapse of patents, they become the common property of the world with nothing left to identify them but their names, fallen, like departed saints, to be the common drudges of all men in their hours of need. . . . And as of mechanical things so of men. What a history of the condition of the country might be written with no more material than, week by week, the "small advertisements" in *The Engineer!* If to future ages there be nothing left but these, how much may they teach of the one-time history of our land! All the pitiful story of the Great War is written, for those who can read it, in those narrow columns, and week by week the later history is being inscribed in the same cryptograph. No man writes there his little needs but adds one more letter to the story. Here one may trace the troubles and anxiety of the ex-officer in a glutted market, and here the worries of the employer seeking men who are not to be found. Here is the sanguine inventor who needs but a little financial support to make a fortune for himself and others, here the merchant seeking agencies and the manufacturer seeking capital. It is a little stage; a convex mirror to the world of engineering in which scene after scene is enacted before those whose feet are within the magic circle.—*The Engineer*, London.

Dyckman Street Sewage Screening Results

Owing to a typographical error, a wholly superfluous "not" crept in to the article on "Operating Results of Dyckman Street Sewage Screening Plant" in *Engineering News-Record*, Jan. 22, 1920, p. 172. In the next to the last paragraph of the article the word "not" in the following reference to the test results of the Riensch-Wurl screens should not have appeared: "That it does not remove from each million gallons of sewage from 1,200 to 1,500 lb. of sludge." Both the table in the article and the wording of the phrase quoted seem to make the error an obvious one, but a correction is published to avoid any possibility of anyone being misled.

Old Rails With High Internal Strains Contained No Fissures

SIGNIFICANT studies of old rails were carried out recently to test the theory that transverse fissures in rails are produced by permanent strains set up by the distortion of the metal in service under rolling loads. As detailed by W. C. Cushing, chief engineer of maintenance, Pennsylvania Lines West of Pittsburgh, in a report (No. 84) to the rail committee of the American Railway Engineering Association, a number of old rails were taken out of the track and examined for structure, internal strains, segregation, and existence of transverse fissures.

Rails that had been in service from 10 to 45 years were examined; some of the oldest were of wrought-iron, others rolled from iron and steel pile, while those 10 to 25 years old were of bessemer steel. All of them "were carefully examined for transverse fissure defects, but none were found." Nevertheless their internal strains were very high according to 10-in. strain-gage measurements which were made on various strips ½ x ½-in. cut from different parts of the rails.

In the old wrought-iron rails, head strains corresponding to 24,000 to 27,000 lb. per sq in. in compression were found, which appeared the more serious because the material had a low elastic limit, 26,670 to 48,760 lb. per sq.in. The piled rails showed maximum head strains of 24,000 lb. per sq.in., and the elastic limit of the material ranged from 33,700 to 53,830 lb. per sq.in. Still higher internal strains, however, were found in steel rails that had been in service 20 to 25 years, several measurements of 36,000 and 33,000 lb. per sq.in. being made, as against elastic limits of 46,500 to 58,450 lb. per sq.in. These high values of permanent strain were measured at the surface of the head and on the side opposite the gauge side, in nearly every case. One abnormal result was a reading of 57,000 lb. per sq.in., tensile stress, in the flange of an 85-lb. rail that had been in service from 1898 to 1917; Mr. Cushing calls this "extraordinary and inexplicable."

CAUSE IN PROCESS OF MANUFACTURE

Segregation was rather high, particularly in the rails exhibiting the highest internal strains, and at the same time these rails showed low elastic-limit load in the quick-bend test (though not in tests in direct tension). Mr. Cushing concludes:

"If severity of service, especially by exceedingly heavy wheel loads, be the sole cause of the defect known as transverse fissure, these rails, after their unusually long service, and in some of the cases under the heaviest wheel loads in use, would be sure to be filled with transverse fissures. That such was proved by careful examination not to be the fact, that rails adjacent to and undergoing precisely the same conditions of service as those in which transverse fissures have been found do not have any, and that rails never put into service as well as those which have been in service have been shown by Waring and Wickhorst to contain microscopical cracks, seems to prove beyond a doubt that the cause, the real cause of transverse fissures must be sought in the process of manufacture."

The Niagara Falls Zoning Ordinance

A ZONING ordinance dividing the City of Niagara Falls, N. Y., into eight use districts and placing limits upon the height and bulk of buildings hereafter erected in the various districts and upon the areas of yards, courts and other open spaces for buildings hereafter erected was adopted by the City Council on Jan. 10 and amended a few days later. The ordinance creates four residence districts besides an apartment, a business, an industrial, and an unrestricted district. In the first and second residence districts all buildings hereafter erected shall be used exclusively for single families, except as regards professional offices and garages accessory to the residences and also as regards churches and educational institutions.

The third and fourth residence districts are restricted to dwelling purposes, but besides single-family detached houses these may include semi-detached houses, two-family houses and group houses made up of single-family units. There may also be located in the third and fourth residence districts churches, clubs, hospitals, sanitariums, semi-public institutions that are of a philanthropic nature, together with accessory offices and garages. There will also be permitted in the third and fourth residence districts farming, truck gardening, nurseries or greenhouses.

In the apartment district there may be erected dwellings, apartments, tenements, hotels, lodging or boarding houses with accessory offices and private garages.

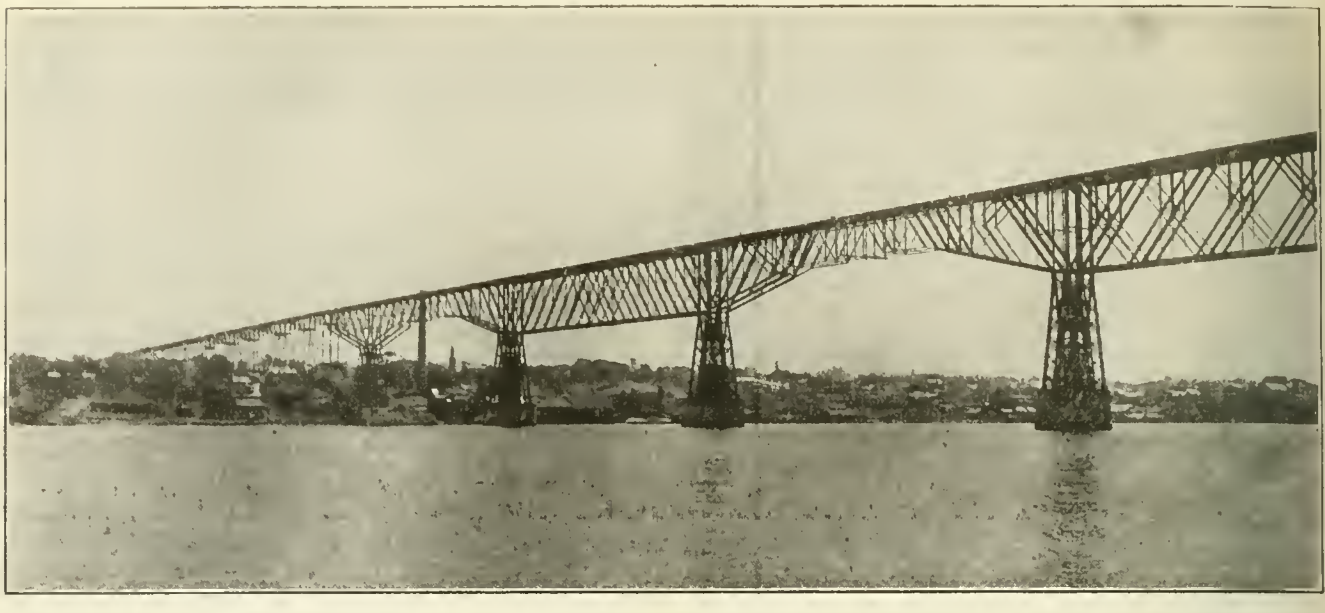
The business, industrial and unrestricted districts follow in a general way what might be expected from the terms, but there is a long list of specified trades and industries which hereafter may not be established in the industrial district but must instead be put in the unrestricted district.

The ordinance contains somewhat detailed provisions regarding the heights of buildings and the areas of lots to be built upon, but goes into more detail as regards areas than heights.

Alterations of old buildings and rebuilding operations in the case of fire are limited to 75 per cent of the assessed valuation of the building, but in the case of such alterations or reconstructions no change can be made in the use of the buildings.

The ordinance provides for the appointment by the City Council of a zoning commission of five members to serve wtihout pay for terms of four years. The duty of the commission will be to investigate all matters pertaining to the division of Niagara Falls into districts as provided for in the ordinance and in general to see that the terms of the ordinance are carried out. Provision is made for amending or repealing provisions of the zoning ordinance, but all propositions of the kind must go to the zoning commission, be reported upon by it and also be acted upon by the City Council within thirty days in each case, and no amendment to the zoning ordinance shall be adopted by the Council contrary to the recommendation of the zoning commission except by unanimous vote of the Council.

Violations of the zoning ordinance are made misdemeanors, subject to fine or imprisonment, or both, and either the City of Niagara Falls or any resident property owner may maintain an action to restrain by injunction the violation of any of the provisions of the ordinance. E. J. Fort is city manager of Niagara Falls.



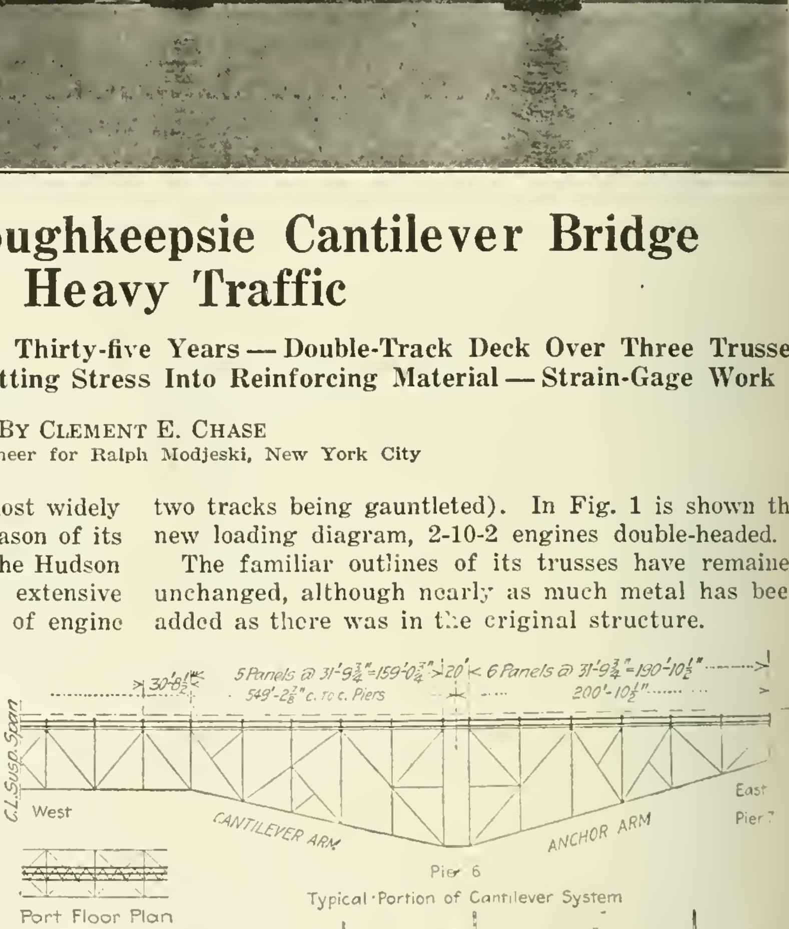
Reconstructing Poughkeepsie Cantilever Bridge for Heavy Traffic

Second Revision of Notable Structure in Thirty-five Years — Double-Track Deck Over Three Trusses Changed to Gauntlet-Track Deck — Putting Stress Into Reinforcing Material — Strain-Gage Work

By Clement E. Chase
Resident Engineer for Ralph Modjeski, New York City

THE Poughkeepsie Bridge, one of the most widely known structures in the country, by reason of its height and conspicuous location above the Hudson River, has recently undergone its second extensive reconstruction to keep pace with the growth of engine and train loadings since its completion in 1882. Designed for a train load of 3,000 lb. per ft. on each of two tracks, with engine axle weights of 24,000 lb. each, it was first strengthened in 1907 to accommodate a double-track loading of 3,600 and 45,000 lb. and then in 1918 remodeled to permit the use of a single-track loading of 6,000 lb. with 60,000-lb. concentrations (the two tracks being gauntleted). In Fig. 1 is shown the new loading diagram, 2-10-2 engines double-headed.

The familiar outlines of its trusses have remained unchanged, although nearly as much metal has been added as there was in the original structure.



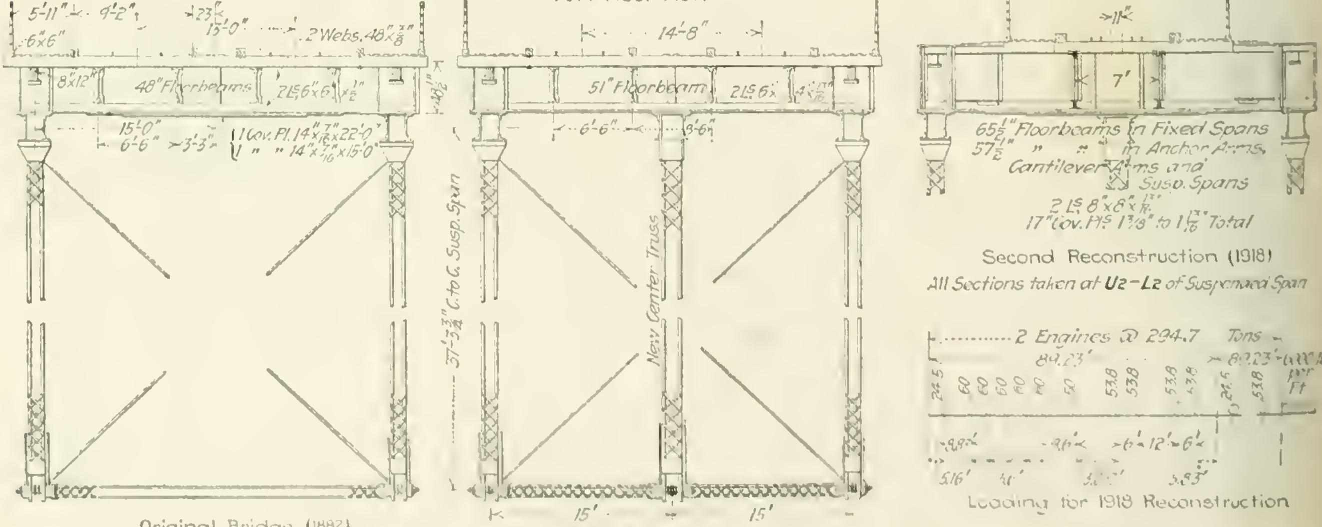


FIG. 1. POUGHKEEPSIE BRIDGE. THREE DIFFERENT TYPES OF CONSTRUCTION USED AS LOADS INCREASED

The bridge has the distinction of being the only one across the Hudson River south of Albany, and the Central New England R.R., subsidiary of the New York, New Haven & Hartford R.R., which operates over it, is the most direct route from both the bituminous and the anthracite coal fields to the New England manufacturing centers. With its approach viaducts, the structure is 6,767 ft. 3 in. long over all. The main spans over the Hudson constitute a deck cantilever system with two fixed spans 525 ft. long, three cantilever spans 546 and 548 ft. long, and two anchor arms 200 ft. 10½ in. long.

The first reconstruction was necessary after twenty years, and at this time a central truss was added to the original two trusses (middle sketch in Fig. 1) throughout the river portion, the added truss being similar in profile and web dimensions to the old ones but 50 per cent heavier. This third truss was practically an independent bridge, being supported by its own steel towers resting on steel cylinder piles driven through the old pier core to foundation. The erection of this steelwork, a very difficult and dangerous undertaking, was completed in 1907. Ten years later, in January, 1917, a contract was signed for the second remodeling, which nearly doubled the weight of train and engine that could be safely carried, by utilizing all three trusses of the main spans to carry a single-track load. The traffic density on this line is not yet great enough to make this short stretch of single track a factor in limiting movements, and on the other hand the powerful Santa Fé engines which the bridge can now carry give notable operating advantages.

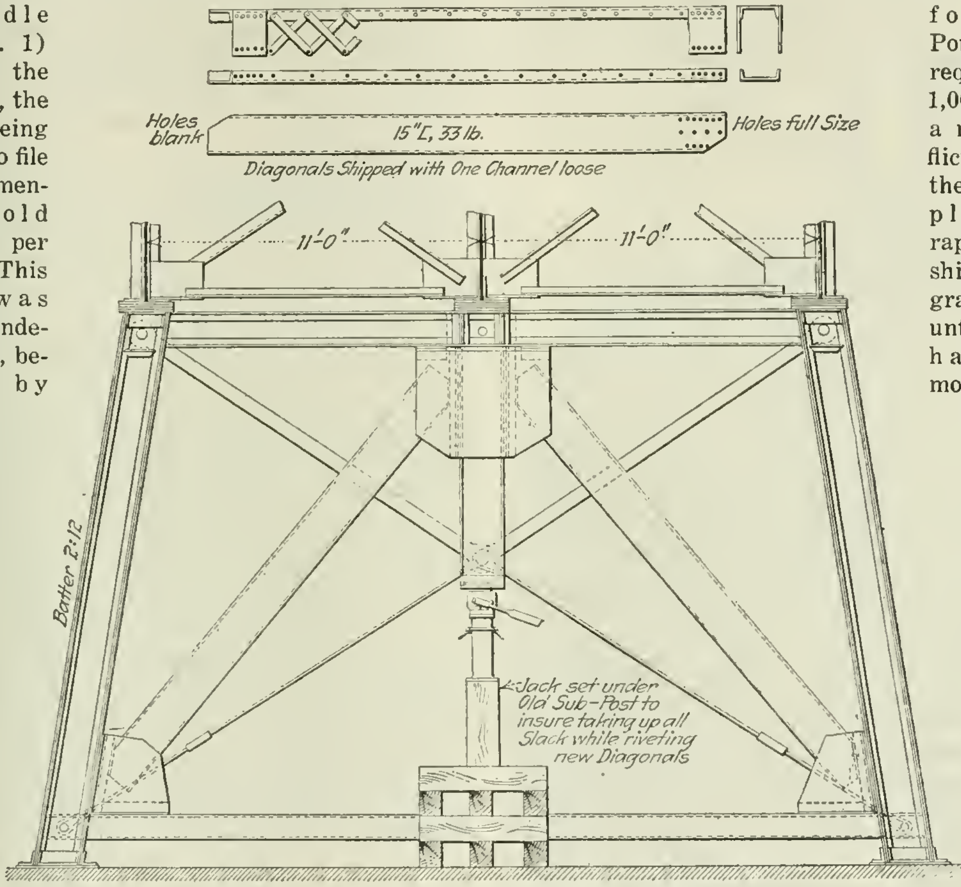

Holes blank
15"[, 33 lb.
Holes full Size
Diagonals Shipped with One Channel loose
11'-0"
11'-0"
Batter 2:12
Jack set under Old Sub-Post to insure taking up all Slack while riveting new Diagonals

FIG. 2. NEW DIAGONAL POSTS IN APPROACH

This solution of the problem of making the structure equal to its proposed new burdens was arrived at after thorough study by the consulting engineer of three alternative possibilities: (1) Distributing single-track loading over the three trusses, as finally decided upon, (2) reinforcing the trusses for double-track heavy loading, and (3) rebuilding the bridge. The most economical and effective method of securing the distribution of the single-track load over all three trusses was next investigated. A stiff floor beam, as a means of equalizing truss deflections, was preferred to the alternative of an articulated system of load distribution. Consideration was given to splicing and reinforcing the existing floor beams, to a combination of new floor beams and reinforced old stringers, and finally to the adopted course of renewing the entire floor, designing it for use in the proposed future two-truss two-track bridge but placing only two lines of stringers for the present. For the approaches, reinforcing and singletracking were each resorted to, in different sections.

Mill orders for material were placed in February and March, 1917, for delivery in time to complete shop work by early summer. War came, and all peace-time mill schedules were forgotten. The Poughkeepsie work required nearly 1,000 tons of plates, a need which conflicted directly with the demand for plates for the rapidly growing shipbuilding program. It was not until the rollings had dragged for months and it was appreciated that the delay would have a serious effect on New England traffic that the necessary priorities were granted. Fabrication of 1,600 tons of metalwork was completed in two months after steel was delivered at the shop, and erection was pushed at Poughkeepsie during the bitter winter of 1917-18. The first of the new engines passed over the bridge May 16. 1918, but as every feature of the work not directly connected with getting one track safe throughout the length of the bridge had been set aside to that end, the contract was not completed until Aug. 3, 1918.

On both approaches double-track was retained for the most part, and therefore the work to be done was of less unusual kind with respect to the handling of traffic than on the main bridge. It was also first in point of time. Work began at the east end of the east approach in July, 1917.

The scheme of reinforcement applied to the viaduct bents of about one-third of the east approach and 600 ft. of the west is indicated in the sketch Fig. 2. The main viaduct girders had replaced the original lattice trusses in 1907 and were adequate, with slight changes, for the proposed loading. In the bent itself, however,

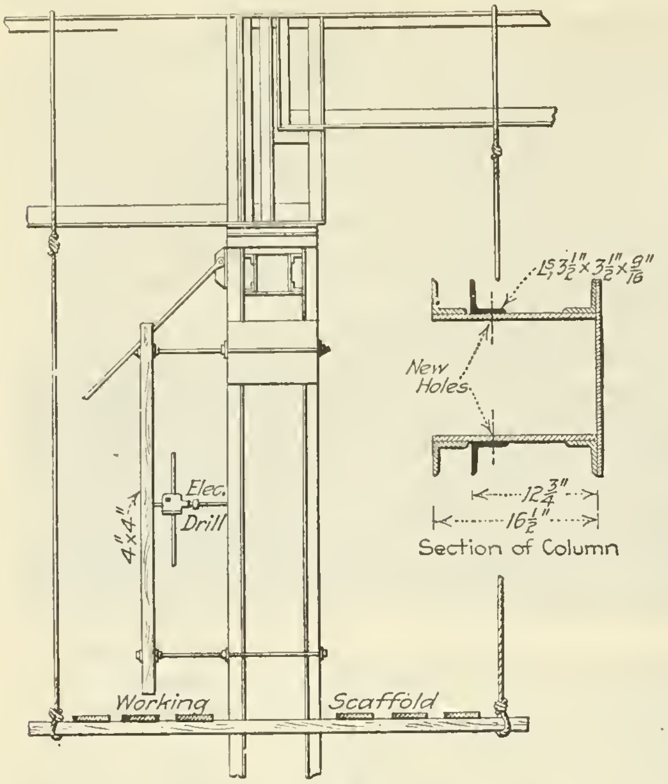


FIG. 3. ANGLE REINFORCEMENT, OUTER COLUMNS, IN PART OF APPROACH

both the king-post truss and the columns would be overloaded, so that the stiff diagonals shown were added to relieve both, by taking the center-girder reactions which the truss had formerly carried to the columns. The diagonals were shipped in two parts, so that they could be erected around the existing bracing, and before their connections were riveted slack was introduced into the old truss by jacking up the center post, as shown.

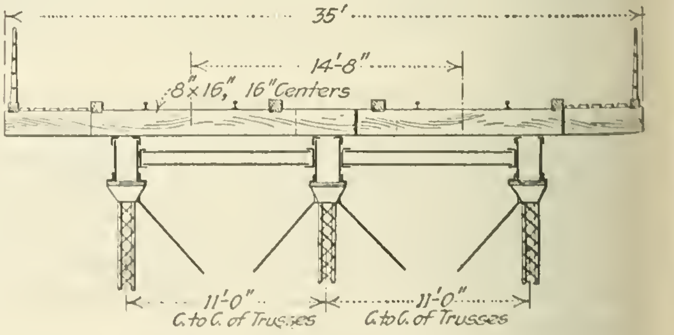
In the westerly two-thirds of the east approach a center line of columns had been added in 1907, and here the only deficiency in strength was in the outside columns, which, therefore, were reinforced by the addition of two angles riveted to the webs of the outside columns, offset toward the open side of the section so as to improve its balance (Fig. 3). The placing of this reinforcement was a tedious operation, as swinging scaffolds had to be lowered the full height of the towers, step by step, for drilling the holes in the column webs and again for riveting.

In the portions of the east and west approaches containing truss spans, more elaborate methods of strengthening had to be applied, as shown in Figs. 4 and 5. To have retained the existing track spacing of 14 ft. 8 in. on the two 145-ft. deck truss spans of the west approach would have necessitated strengthening all three trusses. By moving the tracks closer together, to 13 ft. centers, the load on the outside trusses was reduced so that they were adequate after the U_3-L_4 diagonals were stiffened, and all other work was confined to the center truss. This was very extensively reinforced (Fig. 5) with side plates on the top chord and stiff diagonals, loop rods on the tension members U_1L_2 and a complete riveted tension system built around the bottom chord. At the towers the center girder was removed and replaced with a new girder, the girder seats between the column webs were strengthened, and side plates were added to the center columns throughout their full height. In only one stage of this west-approach work was it necessary to interfere with the unrestricted operation of trains. This was in placing the new center tower girders (see the views Figs. 7 and 8). Temporary crossovers were placed so that all traffic could be diverted to the north side of the bridge, and the south track and timber deck was removed over the towers. Lateral and sway-brace rivets were removed and replaced by bolts. Following the passage of an important train, rails were cut on this remaining track and the entire 30-ft. section of decking picked up by locomotive crane and shifted bodily 18 in. north. The old center girder was then removed, the new one placed, decking set back and rails connected. The track was broken 1 to 1½ hours.

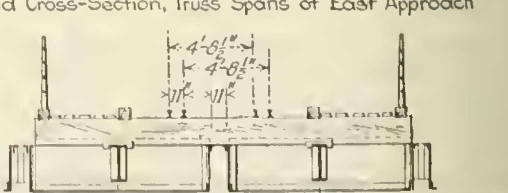
The design contemplated forcing initial stress into the new tension material of the approach trusses, Fig. 5, so that the dead-load stresses in old and new steel should be equal. For this purpose the following method was prescribed:

The gusset plates at field splices had full-size holes, while one end of each member connecting to them was blank. After pulling the new steel firmly into contact against the old pins, and with the drilled end well driftpinned and bolted, the holes in the blank end were to be laid off through the holes in the connecting plates. These centers were then to be offset so as to shorten the distance between the end connections of the members by an amount slightly greater than the elongation desired. After these holes were drilled the connecting plates were to be drawn up into contact, by undersize bolts, and several driftpins then entered in the slightly offset holes and driven home by blows in succession on one pin after another (to avoid stretching the holes by putting too great a strain on any one).

This method was followed in adjusting the loop rods U_1L_2. The actual elongation of the reinforcement was measured by an extensometer, Fig. 6, devised in the field and constructed in a local motorcycle repair shop. The instrument measured the stretch in a gage length of 57 in., multiplied 8.77 times by the lever arm of the movable-gage point and read between the jaws of an ordinary micrometer caliper, so that the reading of the micrometer divided by 500 gave the deformation

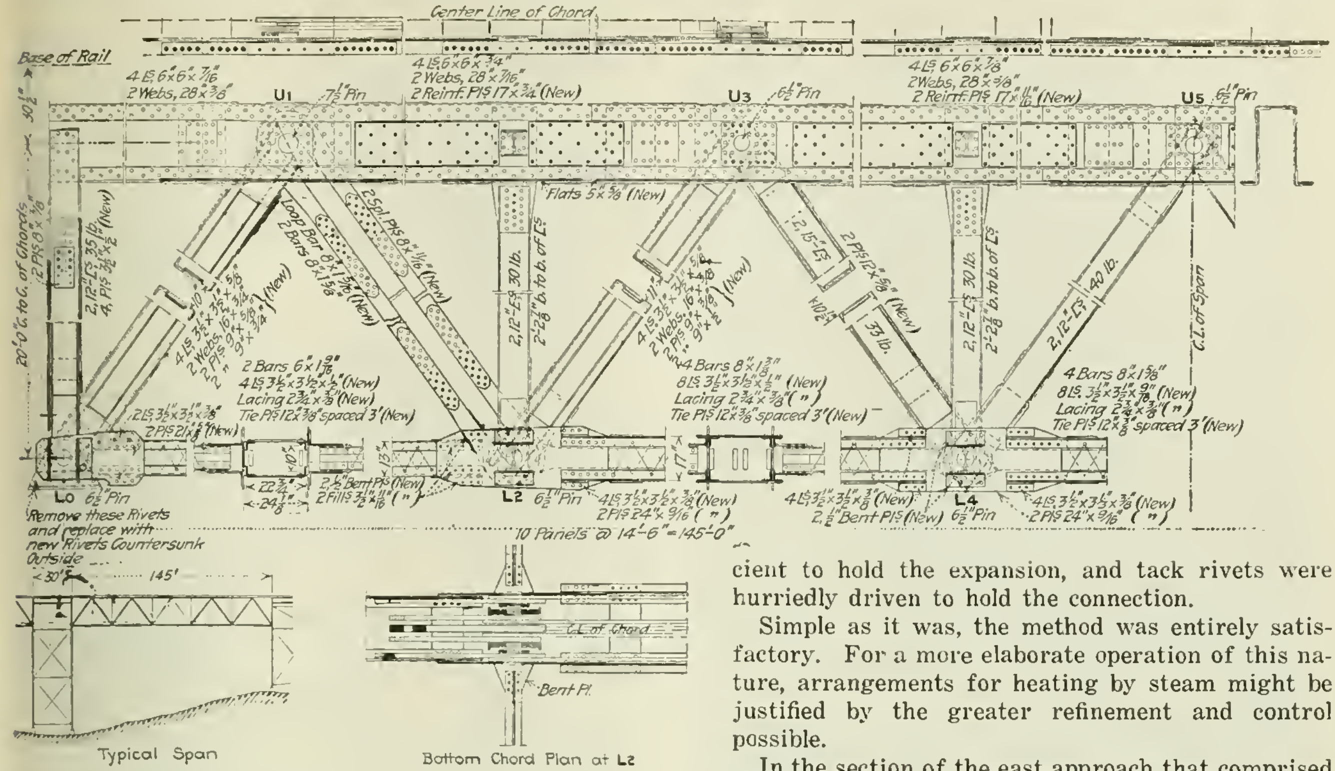


Old Cross-Section, Truss Spans of East Approach



New Cross-Section, Floor of Truss Spans, East Approach

FIG 4. NEW FLOOR SYSTEM OF EAST APPROACH TRUSSES



Typical Span

Bottom Chord Plan at L2

FIG. 5. STRENGTHENING CENTER TRUSS OF WEST APPROACH SPANS

in an inch. With this instrument clamped to the member and the gage points set in small drilled holes, very satisfactory readings of the gradually applied stress could be obtained. The instrument was too flexible to give accurate results if removed and replaced between readings. Further, if a considerable length of time were required to introduce the stress into the member, temperature variation would be confusing, as the instrument would not expand with the member.

For the bottom-chord reinforcement this same method of introducing initial stress could not be successfully carried out, as one end of each panel-length of reinforcement had been riveted to the connecting gusset. After the latter had been erected over the bottom-chord pin, the member could not be shifted to drill holes properly offset. The expedient of stretching the reinforcement by heating was then resorted to.

Adjustment was started at the center panel of the bottom chord, as the load was here a maximum and the bearing of pin holes against pins would not be subsequently disturbed by the work in adjacent panels. The dead-load stress in the 29-ft. panel was to be uniformly distributed over 52 sq.in. of old section and 22.2 sq.in. of reinforcement, corresponding to a resultant elongation of about 0.04 in. The same elongation would be caused by a uniform rise of temperature of 17° F.; therefore, if heat were applied uniformly over most of the length of the member, the required expansion would be obtained long before there could be any danger of damage to the steel.

In applying this principle the connection was lightly bolted up and two sharp chisel marks about $\frac{1}{16}$ in. apart were made across the edges of the reinforcing angle and the plate to which it connected. Small fires fed by chips from the creosoted deck timber were then built along practically the entire length of the reinforcement. As soon as the angles lengthened the desired amount, the fires were reduced to an amount just sufficient to hold the expansion, and tack rivets were hurriedly driven to hold the connection.

Simple as it was, the method was entirely satisfactory. For a more elaborate operation of this nature, arrangements for heating by steam might be justified by the greater refinement and control possible.

In the section of the east approach that comprised similar deck truss spans to those of the west approach a different solution was used. Instead of retaining the double track and making extensive truss reinforcements, it was possible to continue the gauntlet track of the main spans east over the 800 ft. of truss-span viaduct. The loads were distributed to the three trusses in proper proportion by a steel floor system, Fig. 4, framed in between the top chords. The old timber deck had rested on the top chords of the trusses.

In the new main-span floor system the floor beams were designed to carry double-track loading when spanning the 30-ft. width of a proposed future two-truss bridge. Only the inside stringers of the two future pairs are placed for use with the gauntlet-track arrangement, but connections have been provided in the floor-beam webs for future outside stringers.

Levels taken across the old structure at all floor-beam bearings, preliminary to design, had shown the top-chord profile to be very irregular, following in a reduced scale the rise and fall of the bottom chord. Transversely, also, the bearing points had different levels for each truss, at each panel point. To make up these differences in level and give bearing on all three trusses, five different depths of floor beam were used, and various fillers or bolsters provided. With the profile of the new floor-beam bearing surfaces corresponding to the difference in level of the three bearings

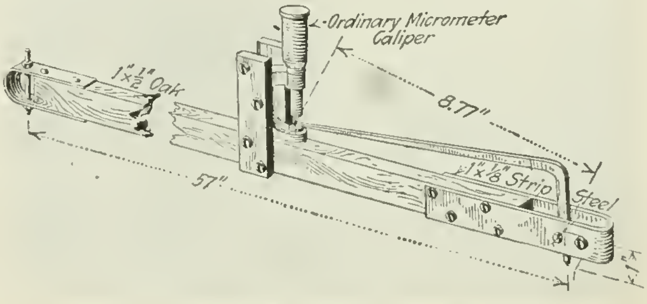


FIG. 6. EXTENSOMETER USED IN STRESSING REINFORCEMENT

in the old trusses, the relative elevation of the trusses at each panel point would not be changed by the placing of the new floor system. This meant that the distribution of stresses from dead load would remain the same.

Used thus with the three-truss structure, the heavy floor beams act as rigid cross-girders which compel the three trusses to deflect equally under live load, save for the influence of the slight deformation of the cross-girders themselves. In their present use the floor beams are stressed up to only about one-third their working strength and their deflections are correspondingly small, in general less than $\frac{1}{16}$ in. Because of the relatively great deflections of the structure itself, the difference, then, between calculations of stress in the trusses with beams assumed inelastic and with the beams assumed elastic was very small. The latter case resulted in an average decrease of stress in the outside trusses of 1.3 per cent and a corresponding increase in stress in the center truss. The only case where a materially greater difference than this occurred was in the vertical posts over the pier towers, where it amounted to from 12 to 16 per cent, but with a maximum stress much below their allowable working strength.

Looking at the case broadly, the existing bridge had been found adequate (under usual design specifications) for E35 loading on both tracks or for E70 on a central track if this latter loading could be ideally distributed. As it was being remodeled to carry approximately E60 loading, each truss would only get six-sevenths of its capacity stress if proportionately loaded. The difference between six-sevenths and unity represented a margin ample to cover the effects of girder deflection and imperfect bearings for the trusses as a whole.

In December, 1917, the situation was that, although there was still work to be done in strengthening the east and west approaches, there would be no difficulty in completing this work by any date at which it would be possible to have the main-span floor system changed. The latter therefore became the controlling factor in getting the bridge ready for the passage of the heavy power and the erection was planned accordingly.

The method of change from old to new floor system had to provide, first, for no interruption to traffic except during working periods of not more than three hours; second, for a shift from double track to gauntlet track; and third, for an 8-in. change of track-level —all in addition to the requirements of safety, speed and economy.

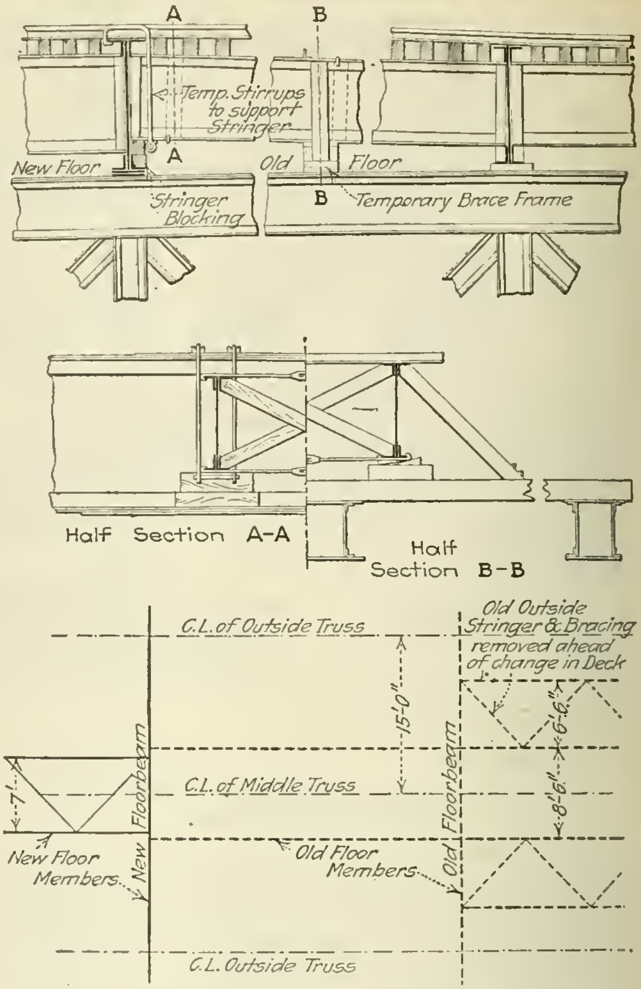


FIG. 9. ERECTION OF NEW FLOOR OF MAIN SPANS; CONNECTION TO OLD FLOOR

It was evident that if the traffic could be shifted to its final position, on center-line track, entirely across the bridge in advance of the operation of changing the steel, a considerable economy of time would result. Investigation developed that the 8 x 10 in. ties provided for the new deck would, when spaced 16 in. on centers, safely carry the maximum axle concentrations in use on the line at the time, when spanning 8 ft. 6 in. between the inside stringers of the old floor system. Accordingly, one of the existing tracks was removed, half the old deck stripped, the new ties laid in approximate center-track position (which could be done without disturbing traffic on the remaining track), and the central track laid.

Erection was begun at the east end of the main

FIGS. 7 AND 8. SETTING NEW CENTER GIRDERS OF TOWERS OF WEST APPROACH AFTER SHIFTING TRACK

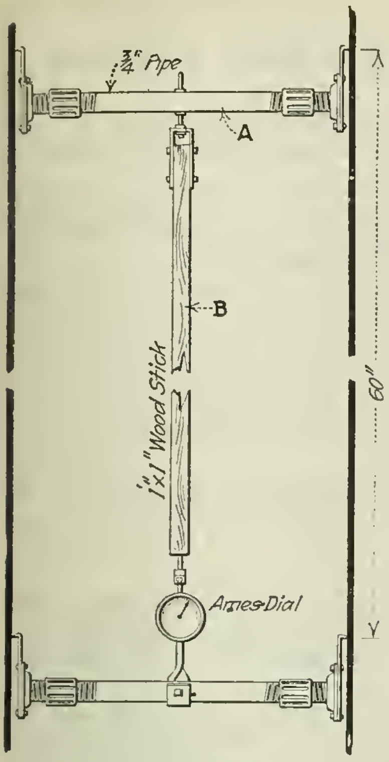


FIG. 10. EXTENSOMETER FOR CHECKING LIVE-LOAD DISTRIBUTION

spans, and the end floor beam was changed first, as an operation by itself. Thereafter the changes were all in full panels—two stringers and one floor beam—or multiples thereof, so that the connection between old and new steel always came at a new floor beam. The method of carrying traffic over the junction is shown in Fig. 9. The new stringers are 7 ft. apart, while the two inside lines of stringers of the old floor were spaced 8 ft. 6 in. Half of the holes in the connection of the new stringers to the new floor beam were obstructed by the end angles of the old stringers, but sufficient bolts and pins could be placed in the open holes to take care of the end shear of the new stringers safely under the limited loads. To support the near ends of the old stringers a yoke or double hanger device made in the field was used, supplemented by blocking to the floor-beam flange below. In addition, it was possible to place one or two bolts or pins in holes in the old connection angles that happened to coincide with holes in the new stringer connections, to give lateral stability. The bottom flange of the floor beam was very heavy and the blocking between it and the bottom flange of the stringers was effective in carrying a large part of the end reaction. The center of the old stringer span was stayed laterally by the temporarily cross-frame and inclined timber struts shown in the sketch. This was necessary after the removal of the outside stringers, as the stringer laterals were between the outer pairs.

Actual floor replacement was done in working periods which were usually limited to three hours. The first panel was changed out in 3 hr. 42 min., the second (the following day) in 2 hr. 52 min., the third in 2 hr. 31 min., the fourth in 1 hr. 51 min. As soon as the work had been systematized and the men become familiar with their duties at each step, it was undertaken to change two panels in the working period. This was first done in 2 hr. 55 min. As it took a certain time, practically independent of the number of panels placed, to break track and later connect the old and new steel and close track, it was very desirable to complete as many panels as possible in one three-hour period. The number of panels was raised to three, but it was not found possible to maintain this speed all the way across the river, because of shortage of ironworkers. There was much preliminary work necessary before the working periods, which could not be kept up to the pace that could be maintained by the erection gang alone. The best record made was the removal and replacing of three panels in 2 hr. 45 min. from the time track was broken until it was connected.

The work of changing this main-span deck was carried out during the very severe weather of the winter of 1917-18, and the men were exposed to the full sweep of wind along the Hudson River valley. Handling the girders and stringers, with their large area catching these winds, was at times difficult and dangerous. As a safety precaution the sidewalk planking from the old deck was laid across the top chords as a working platform. The entire contract was carried through without a fatality or a serious injury.

At the time the floor beams were first erected, no effort was made to bring them to bearing on the three supports. The unsymmetrical loading from the partially stripped old deck made the relative deflections of the three trusses entirely different from what they would be later, with the new floor entirely in place. For the time being, the newly erected cross-girders bore at random on two of the three supports, which was sufficient for engine service during erection. Later, as the trusses came more nearly to their final elevations under the load of the complete new floor system, the additional shims that had been provided for the purpose were placed as required, to bring each floor beam to bearing on the three trusses. After the shims were in place, the holes for bolts connecting the floor beams to the trusses were drilled.

After erection was completed and the remodeled structure was carrying the heavy engines, a few check stress measurements were made for comparison of actual with theoretical distribution of loads to the three trusses. A vertical member over one of the piers, one near the center of the suspended span, and a top-chord member of the suspended span, were drilled on the neutral axis of each web for readings with an 8-in. Berry strain-gage. Measurements of these gage lines under dead load only were made before and after each set of live-load readings. These determined the rate of change of length due to temperature variation. A corresponding correction was made to the indicated changes of length under the engine load. The measurements were made under static live load, with the engine spotted to give maximum stress in the member.

The readings with the Berry gage were later checked by another series made with an apparatus constructed by the writer. This device, shown in Fig. 10, registered the deformation of a 60-in. length of the member on an

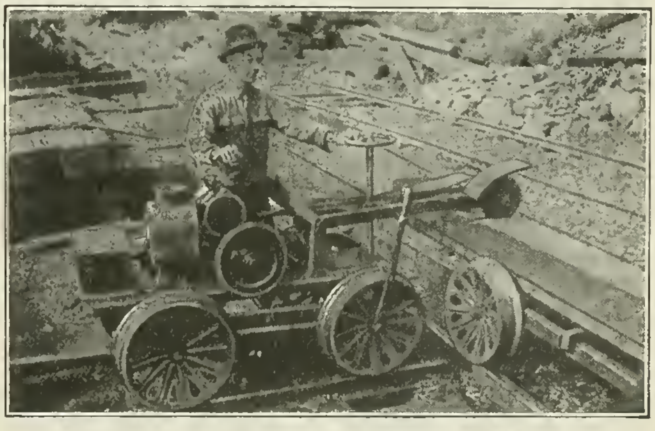


FIG. 11. GASOLINE-DRIVEN DAPPING MACHINE FOR FLOOR TIMBERS

Ames dial. The crosspieces *A* were of $\frac{3}{4}$-in. pipe. By means of the right-and-left-threaded couplings the spring grips were forced against the webs to give secure knife-edge contact. The wooden rods *B* were adjustable by the bolt at the top to any desired initial reading of the Ames dials. The dials were clamped in place after the remainder of the apparatus was in position, and were removed whenever the observer left the bridge. The device was particularly well adapted to the rapid determination of the load taken by the whole member (which was the point of interest in this investigation) as the instrument itself averaged the deformation of the elements which would be measured separately by other types of gage. In actual operation it was not necessary to stop an engine longer than five minutes to get a checked set of readings by one observer.

The results obtained with the 60-in. gage checked quite closely those previously obtained with the Berry gage. Both sets showed that the assumptions as to load distribution made in the design were borne out by the action of the remodeled structure. Two of the three sets of members tested showed interesting individual variations from the ideal distribution, but the resulting total stresses were well within safe limits.

At the tower vertical, the outside posts showed greater live-load stress than the center post, whereas theoretically, with the slight deflection of the cross-girder, the opposite would be expected. Examination of the bearing of the cross-girder on the three posts disclosed the reason. At the center bearing, owing to the warping of the filler plates in shearing, there was a certain amount of play, less than $\frac{1}{16}$-in.; this had to be squeezed out before the center post commenced to take its live load. The difference in actual stress was small, and was amply within the allowance that had been made to cover the difference between ideal and actual conditions of fabricated steelwork and erection. The posts were 75 ft. long down to the tops of the massive A-frames of the towers; a stress of 900 lb. per sq.in. on the two outside posts was enough to compress them sufficiently, together with the deflection of the girder, to bring the center bearing firmly into contact. For the succeeding increments of live load the center post took its full share.

The top chords of the suspended span, which were considered as representative of the principal truss members, showed approximately equal increments of stress under the maximum engine load. The post U_2L_2, which took only direct engine load, showed a greater stress in the center truss than in the outside trusses, the difference being equivalent to that caused by a floor-beam deflection of $\frac{1}{32}$ in. The deflection directly under the engine would be taken up partly by compression of this one member, rather than by the deflection of the truss as a whole, as any tendency for the center truss to deflect more than the others would be resisted by the rigid floor beams at adjacent panel points.

Edward Gagel is chief engineer of the Central New England R.R., which owns and operates over the bridge. The design and supervision of the work of reconstruction was in the hands of Ralph Modjeski, consulting engineer. The writer was resident engineer for Mr. Modjeski, and Charles Kahn was assistant resident engineer. The steel was fabricated for the Strobel Steel Construction Co. by the Fort Pitt Bridge Works. The former company handled the erection with its own forces, under William McAley as superintendent.

LETTERS TO THE EDITOR

Comment on Matters of Interest
to Engineers and Contractors Will Be Welcome

The Problem of Handling the "External Relations" of Engineering Societies

Sir—On p. 488 of your issue of March 4, 1920, there appears a communication signed Gardner S. Williams, whose title as signed thereto, as well as the fact that he has served for five years on the Board of Direction of the American Society of Civil Engineers, may lead those interested to believe that he knows what he is writing about.

Mr. Williams has indicated that in some way the undersigned is responsible for the report of "the committee on budget;" and I desire to say that this is not in any sense correct.

I wish also to point out to Mr. Williams that, in the interest of accuracy of statement, a "late secretary" should not be referred to, especially in the same sentence, as "retiring."

I feel impelled also, no matter how much anyone's feelings may be hurt, to state without fear of contradiction, or of possible "misinterpretation," that, although my health is not good I am still alive, and that I can still write after my name "Secretary, American Society of Civil Engineers."

New York. CHAS. WARREN HUNT.

Sir—The letter of C. E. Drayer in your issue of Feb. 12, under the caption of "How Shall the Co-operation of All Engineers Be Effected" and offering a solution to this momentous question, seems to my mind to raise another question: "Why should engineers who belong to already well established national engineering societies let the settlement of co-operation rest with the comparatively new-born society, the American Association of Engineers?"

With all due respect and appreciation of the purpose and ideas of the American Association of Engineers and with no derogatory intention on my part, I am not in favor of resigning the settlement of this question to that association. The situation here seems to me to be somewhat like the case of a young engineer just out of college who is full of theory about pile-driving and tries to tell the foreman of the pile-driving team, who has spent all his life in this work, how best to drive piles.

The founder societies, which are all of early origin and stand foremost in the advancement of the engineering professions, composed of men with long experience and sound judgment, are, in my opinion, the means to this end. Even if the American Association of Engineers has for its purpose activity in social, economic problems, etc., why should this association be more capable of carrying out the non-technical activities recommended in the Joint Conference Committee's report than a combined effort of the founder societies? It is my opinion that this was in the minds of the Joint Conference Committee and the reason why reference was not made to the American Association of Engineers.

I do not wish to convey the idea that I am in favor entirely of the plans as outlined by the committee. In their zeal to make co-operation between the societies a reality they have overshot the mark in certain respects, for instance, the formation of an entirely new "national engineering organization" as outlined in their report. If such a plan were carried out, the individuality and effective influence upon society that each society now possesses, to my mind, would be entirely swallowed up. This creation would set each society adrift from its traditions, high ideals and standards. It would stifle the individual efforts of each society to promote the engineering profession in its particular branch. In other words, the effective influence upon Society would be forever lost. This plan should never be accepted and to my mind should be voted against by all societies.

Why could not a national committee with one representative from each society, irrespective of size and membership, be formed to act only upon co-operative matters and to express, when necessary, a unified opinion upon national questions? CARL W. WOOD

Assoc. M. Am. Soc. C. E., Am. Int. Shipbuilding Corp.
Hog Island, Pa.

Sir—The rank and file of the engineering profession may rejoice with good reason on learning that the governing boards of the founder societies and the American Society for Testing Materials at their joint conference of Jan. 23 adopted in principle the Development Committee's report. Yet, for many, the pleasure this news will create is largely in the realization that many of the more conservative members of the profession have seen the light beyond. They have recognized that there is need for attention to matters of general moment to the profession which have been generally regarded as being outside the sphere of primary activities of technical engineering societies. But further, these conservative ones see the necessity for a great national organization whose activities shall be toward the solution of those problems, non-technical in character, in which all engineers have a common interest—an organization which may speak for the great mass of the profession.

The form of organization proposed in the development report is virtually a federation of existing local, state and national societies. The history of federations in general is a record of inefficiency; of groups seeking to gain advantage over groups; of distrust, discord, and comprise. The jealousies of the individual groups sooner or later lead to practices which either render useless the federation or cause its complete collapse. Of course it is possible in the present instance that the usual difficulties will not be encountered, yet on the whole there is no reason why history should not repeat itself. For this reason not a few of the thinking men of the profession, members of the founder societies as well as non-members, regard the formation of an organization along the lines proposed as a questionable, if not a dangerous, experiment—an experiment which will neither lead to the solidarity of the profession nor to an increase in the present usefulness of any of the professional societies of which it would be composed. As one holding membership in one of the founder societies I may say that I feel that it would be a mistake for my society—which has served so well the technical needs of its special branch of engineering, has done so much to advance our knowledge of the forces of nature and of the use and behavior of materials, and has in other ways sought to make and made engineering a learned profession—to "adopt the principle of becoming an active national force in economic, industrial and civic affairs" or to actively co-operate in the creation of the federation proposed in the development report.

Rather I feel that these societies should restrict their primary activities to such matters as have held their attention in the past and that *as societies* they should co-operate in the furthering of this movement for an all-inclusive welfare organization of engineers only to the extent of endorsing the general form and activities of such an association, leaving the financial support to their individual members.

In consideration of the clear recognition by the great mass of the profession that there is need of a truly representative, all-inclusive engineering association to look after our non-technical interests, and of the fact of its being most evident that there are advantages in such an association's being composed of individuals rather than of groups, and truly democratic in character, inviting the confidence of the rank and file of the profession, it seems to me both logical and fair to inquire as to whether there be not in existence some living society whose avowed objects and activities are harmonic with those proposed in the development report.

I believe in giving credit where credit is due, and I believe in using existing machinery rather than trust to untried devices when such is possible. However, much any of us may belittle the early history of the American Association of Engineers, we can not but admit that it has been a vital factor in awakening the older national societies to the need for action along the lines it is pursuing. Also, during the past year, it has established records, not only in increases in membership and in attracting the thinking men of the profession to its ranks, but in welfare activities which stand preëminent in the history of society achievements. Its form of organization seems to be almost ideal, and it is democratic to the core. And a few would venture to say that it does not command the confidence of the rank and file of the profession.

I can see no logical reason why this association should not form the nucleus of a larger, more truly representative, more powerful, more efficient and more enduring welfare organization than that proposed in the development report. I believe that a joint conference of the governing boards of this association and the founder societies might be productive of an exchange of ideas which would, at no distant date, bring about the founder societies' endorsing the objects and methods of the American Association of Engineers, the founder societies being relieved of all direct support in the movement except for the maintenance of advisory committees. It is conceivable that, by such procedure and the active support of individuals of the older societies, the growth of the American Association of Engineers would be nothing short of marvelous and that within a very short time we should have the thing sought without duplication of effort and without interfering with the primary activities of the older national societies. And I can not see how such procedure can either weaken the prestige of the founder societies or fail to affect a closer unity in the profession.

RAYMOND E. DAVIS,
Associate Professor of Civil Engineering, University of Nebraska.

Shall the Am. Soc. C. E. Enter the Field of Civic and Economic Affairs?

Sir—Shall the American Society of Civil Engineers adopt the principle of becoming an active national force in economic, industrial and civic affairs? In reply, the first impulse is emphatically, *yes*; second thought brings the query—why not? Because it never has, is no reason why the society should not make a radical departure. It has made a success in purely technical, non-human lines—in the problems of economic combination and use of wood, stone, steel and cement, of water and of fire. Why not now venture, with hopes of equal success, in the wide fields of human affairs, and do its part as a national force in the problems of economics, such as railroad operation and maintenance, and the pay of railroad engineers and mechanics; in industrial affairs, to promote higher efficiency, better management, improved relations with labor; and particularly in civic affairs, going into the duties of the members in their relations to national policies and politics?

"Politics makes strange bed-fellows," and the mention of civic affairs at once brings up the question as to who are to be our associates in this venture. If the field were open, and we had the undoubted leadership, there would be little cause for hesitation; but the American Society of Civil Engineers is not the only, nor is it the largest, body in this field of human affairs. While influential in purely technical relations, relatively it must be quite insignificant as a national force in economic, industrial and civic affairs. To be of influence it must unite with others and be content "to play second fiddle." It must also divert from technical study and publication considerable sums of money, as well as the energy of its officers; or rather, for success, it must put the control of affairs in the hands of men selected, not because of their pre-eminent ability as technicians, but rather as able economists and politicians. Can this be done without sacrifice?

Five years ago, the American Society of Civil Engineers had the lead, but declined or neglected to co-operate with lesser organizations. Thus because of lack of sympathy and support, many of the younger engineers, men who should have been attracted and held, formed an association of their own, incorporated and designed to be an active national force in economic, industrial and civic affairs. After slow growth and many disappointments, this organization, the American Association of Engineers, has spread; it has aroused the enthusiasm of active men, and now, as a great ground swell, is sweeping onward, bringing in local and state engineering societies, and going into the highways and byways for membership, as well as into the crowded centers. It now has the lead, in numbers, in energy, in youth, and in enthusiasm.

In going into any field of endeavor, in economic, industrial or civic affairs, the older, slower-moving American Society of Civil Engineers must be prepared as a minority to follow the younger but larger, more democratic, association. As opposed to this view, some persons have brought forward the probability that the civil engineers could combine with the three other older technical or specialized societies, covering the related branches of mechanical, electrical and mining engineering, and by such combination maintain a control. In this event, however, the American Society of Civil Engineers must still play a minor part; its associates may at any time form new combinations, in which it must pay its share of the expenses.

In short, the question resolves itself into the query: Should the American Society of Civil Engineers, with relatively small membership and with experience and traditions averse to dabbling in economic, industrial and civic affairs, try to enter the field of a larger, more active group, one which is spending practically all its money and energies on these lines? If the answer is *yes*, then will the American Society of Civil Engineers be content to pay its share and follow the lead of the larger group? F. H. NEWELL,

Member Am. Soc. C. E. and A. A. E.

Gossip Regarding the New York Section of the Am. Soc. C. E.

Sir—In behalf of the recently formed New York Section of the American Society of Civil Engineers, the undersigned officers of the Section desire to make the following statement in regard to its purpose and organization. Such a statement seems to be called for by your news item of March 4, very appropriately headed "Gossip Regarding the New York Section, Am. Sec. C. E.", but representing as facts certain things not really such. If, however, the article helps to bring into the Section those who have not hitherto joined, and particularly if it brings in more of the younger element, whether or not they favor the program of the Development Committee, and thus aids in making the Section a large and representative one, a useful purpose—one of the main ones for which the Section was formed—will have been served. To this extent we are grateful for the opportunity for a reply and hasten to grasp it.

In order to form the Section it was necessary, under the rules of the Society, for a certain number of members to request from its governing board authority to form it. It was not so easy as might be expected to secure the necessary number of signers to the request. Some of our most ultra-conservative members are opposed to local sections in any form. Others were doubtful as to the material return. Finally, twenty-seven adventurous spirits in the local membership—but varied in respect to age—signed the request, which was granted, paid in their money, and the Section thereupon became an accomplished fact. After having participated in so radical a proceeding as that above described, the officers and other pioneer members of the Section may well feel disturbed and puzzled at being classed as ultra conservative. However, the present officers are to serve only until the annual meeting May 12, which meeting marks the beginning of a new term.

There is no truth in the statement that at the organization meeting of the Section the proposal was made that the Section should combat the recommendations of the Committee on Development.

The constitution of the Section provides that any member of the Society may join the Section merely by registering with the Secretary of the Section and paying the current dues of $5. There is no bar to admission on account of age, color, creed, or previous condition of servitude. Moreover, there is no initiation fee. It is hoped that many will join before the next meeting.

The next meeting of the Section is set down for 8.30 P.M., Wednesday, March 31, at the Engineering Societies Building, 29 West 39th St. All members resident in District No. 1 of the Society are to be invited to qualify for membership so that they may attend as members of the Section. The subject of discussion has not been announced but will be appropriate to the occasion.

The New York Section of the American Society of Civil Engineers has a promising field of usefulness before it. It is a wonder that it was not formed before. It should serve as the organized means of expression for the resident membership on all matters of common interest, to the benefit of the Society as a whole. Its formation and purpose have no necessary relation to the program proposed by the Committee on Development, but if that program is put into effect the Section will become the agency through which all local activities will be conducted, and will be on the ground, ready to carry on.

ROBT. RIDGEWAY,
President.
LOUIS D. RIGHTS,
Secretary, New York Section, Am. Soc. C. E.
New York City.

Internal Affairs in the Questionnaire of the Am. Soc. C. E.

Sir—Although the writer has very decided convictions that affirmative answers to the questions on internal affairs, submitted to the members of the American Society of Civil Engineers are the only ones that a broad-minded well wisher of the society can conscientiously make, it nevertheless seems to him much more important that the questions be intelligently answered than that they be answered either "Yes" or "No."

In the hope of rendering a service to those who feel in doubt as to the meaning of the questions asked, the following explanations are submitted:

> *Question B-1.* Shall the recommendations of the Committee on Development as to technical activities be adopted? (Report, Division A, Sections 1-5, pp. 4-6.)

The recommendations referred to are essentially:

1. That local associations hold at least four meetings annually:
2. That the fortnightly New York meetings be abandoned;
3. That semi-annual meetings, in spring and fall, be added to the present general meetings of the society, and that technical matters be made a part of the program of these meetings and of the annual convention;
4. That papers be solicited along special lines, in accord with a prearranged program, in addition to voluntary contributions as at present, and that they should be the subject of simultaneous discussion in the various local sections;
5. That the monthly *Proceedings* be extended to include abstracts and reviews of important engineering articles;
6. That advisory standing committees of the Board of Direction be created to promote the study of important engineering problems and to co-ordinate the work of the local sections;
7. That co-operation with other specialized engineering and allied technical societies be fostered and an active program of research work be encouraged.

The foregoing does not contemplate, as has been by some assumed, any restriction upon the distribution or discussion of technical papers which would then be presented when of interest to the local sections and there discussed orally, rather than as now, perfunctorily read in abstract to an indifferent assemblage in New York.

> *Question B-2.* Shall local sections be created to embrace the entire membership of the Society? (Report Division B, Section 1, paragraphs a, b, c and h, p. 6.)

If, as is later proposed, the directors are to be nominated and elected by the districts which they represent, it becomes necessary to create an organization in each district to carry out that purpose, and no more satisfactory way of doing so has yet been suggested than that of assigning every member to a local section.

> *Question B-3.* Shall the directors in each geographical district be nominated and elected by vote of the corporate members resident therein? (Report, Division B, Section 1, paragraphs e, f and g, p. 6.)

If memory serves the writer correctly this question was answered overwhelmingly in the affirmative in a previous questionnaire, but the then Board of Direction did not see fit to embody the idea in the proposed revised constitution.

> *Question B-4.* Shall a portion of the Society dues be allotted to local sections? (Report, Division B, Section 1, paragraph i, p. 6.)

If the work of nomination and election of directors be carried out as proposed in Question B-3, funds must be provided to cover the necessary expenses. It is not contemplated that the allotment to the local sections will exceed the amount needed for this work, which has been estimated at less than $2 per member.

> *Question B-5.* Shall the present Nominating Committee be abolished and candidates for the offices of president, two vice-presidents and treasurer be nominated by representatives of local sections in annual conference? (Report, Division B, Section 1, paragraphs j and k, pp. 6-7.)

It is proposed that representatives of the local sections shall gather in conference at the annual convention to discuss matters of society and section welfare and nominate the officers to be elected at large.

> *Question B-6.* Shall the dues of all non-resident members above the grade of Junior be increased to provide for greater activities of the society, said increase not to exceed $5 per annum?

This question requires no explanation. Further money seems needed to carry out the work of the society in any event, but it is the belief of the writer that with an improved administration at headquarters, the maximum amount provided under this question will be sufficient for all contemplated needs.

> *Question B-7.* In case it should be found that the activities brought about by the movement to expand both the internal and the external work of the society would require more funds than would result from the increase in dues contemplated in Question 6 of Internal Relations, would you favor increasing the dues of all non-resident members, above the grade of Junior, by an amount greater than $5 but not greater than $10 per annum?

Question B-7 was added by the Board of Direction and no comment will be made thereon.

GARDNER S. WILLIAMS,
Member of Development Committee, Am. Soc. C. E.,
and of Joint Conference Committee.
Ann Arbor, Mich.

Cement-Concrete and Bituminous Concrete in Highway Foundations

Sir—The article in your issue of Jan. 8, p. 96, "Sheet Asphalt—Ideas On Suitability of Varying Bases —Costs," by Captain F. S. Besson, giving Washington's half century of experience with pavements, is most timely and instructive. The low maintenance cost of these pavements up to 25 yr., and even longer, taken in conjunction with the low first cost, should be borne in mind by engineers who are searching for durable pavements for permanent highways. Owing to the fact that all sheet asphalt pavements in Washington have been laid under scientific supervision since 1876 and that there are full records of the composition of every pavement laid since 1894 and complete records of maintenance dating back to the early nineties, that city offers exceptional opportunities for the study of the great possibilities of this type of pavement.

The writer, however, cannot see wherein Captain Besson has proved, with the data presented, the superiority of cement concrete over bituminous concrete as a foundation for continuous bituminous surfaces. He says: "Ten years after the first period, or about 1888, determined efforts were made to obtain a base at less cost than the standard, and recourse was once more had to bituminous mixtures, using standard asphalt top for wearing surface." The so called bituminous base used at this time was not a bituminous mixture, but merely clean broken stone well rolled and then lightly sprinkled with melted coal-tar pitch. The specifications for this so-called bituminous base as given in the report of the operation of the Engineer Department of the District of Columbia for the fiscal year ending June 30, 1891, are as follows: Under "Combination Asphalt Pavement On Bituminous Base," Sub-heading "Base"—"The Base will be composed of clean broken stone that will pass through a 3-in. ring, well rammed and rolled with a steam roller, weighing not less than 5 tons to a depth of 4 in. The rolling will be continued until the stone ceases to creep before the roller and until it is evident the final compression has been reached. It will then be thoroughly coated with No. 4 coal-tar paving cement or its equivalent, asphalt cement, in the proportion of about 1 gal. to the square yard of base." Substantially these same requirements for this so called bituminous base are found in standard specifications back as far as 1887, and were likely used several years previous to this and the writer personally knows that they were used in some types of construction for several years after 1894.

This base, as actually constructed, was made with one size broken stone. Not only was no attention paid to the character and quality of the coal-tar pitch, but it was applied in the most crude manner by hand, and in such small quantities that there was often not enough to cover the surface stones. A foundation, such as this, is not as good as macadam and is far inferior to a bituminous concrete which is made by mechanically mixing graded broken stone and sand with asphalt cement.

There are, however, a number of cases in Washington where old coarse-aggregate bituminous pavements made by the mixing method have been utilized as foundations for the standard sheet asphalt wearing surface and binder. Such foundations are true bituminous concretes and it would be interesting to know how these pavements compare with pavements of sheet asphalt on cement concrete foundation. I believe the maintenance cost would be in favor of the bituminous concrete base. Two pavements of this type that the writer recalls are: Vermont Ave. between H and I Streets laid in 1878 and Massachusetts Ave. between 14th and 16th Streets, laid about 1903. The first pavement, 42 yr. old, is in excellent shape today and has cost exceptionally little for repairs and I believe the maintenance cost on the latter is very low.

There has been little or no bituminous concrete used for foundations for bituminous sheet pavement in the East, owing to the fact that it has been more expensive than cement concrete. In California and some western states where good asphalt can be obtained cheaply, it has been used very extensively and with good results. As to relative merits of portland cement concrete and bituminous concrete foundations, it is hardly fair to either to compare results obtained in any one city or locality.

There is no doubt but that under pavements laid over poor subsoils or where sub-drainage is bad, the cement concrete foundation is the better, but even then they are liable to fail and invariably develop cracks, which in many cases cause similar cracks in the asphalt wearing surface. With good subsoil and drainage conditions bituminous concrete is as good, and in many respects better, than cement concrete foundations. Especially is this true when the asphalt wearing surface contains a large mineral aggregate, for large stones are less liable to crush under traffic on a resilient bituminous concrete foundation than on a rigid cement concrete base. The bituminous concrete does not develop contraction cracks and it unites with the binder and wearing surface into a monolithic mass. This close union prevents the wearing surface from shoving on the bituminous base under excessive traffic as it is liable to do on the cement concrete base.

Captain Besson says at the top of p. 97: "In the first concrete bases, imported and American natural cements with very lean proportions, about 1 : 4 : 10, were used under the primitive method of 35 years ago." If any imported cement was used in cement concrete base in the early days, it was only in one or two exceptional cases. American natural cements were used exclusively until about the year 1900 (not 1893), when portland cement was substituted for use in concrete base for sheet asphalt pavements. The proportions used in the natural cement concrete base from the early days down to the time its use was abandoned was, 1 of cement, 2 of sand and about 5 of broken stone or brick. As Congress had established a low limit on the price which the District of Columbia was permitted to pay for sheet asphalt on 6-in. concrete base, it was necessary at the time of changing from natural cement concrete to portland cement concrete to have the price of the latter base about on a par with that of the former. It was found that portland cement concrete of 1 :4 :10 met this requirement and this mixture was adopted and used as a pavement foundation on all but heavy traffic streets for 6 years or more. The aggregate used in this lean concrete was either graded stone, such as run of the crusher, or a mixture of 5 parts gravel and 5 parts stone. There was just sufficient water in it to make a wet concrete, but still not sloppy. After placing, it required but little tamping to bring free mortar to the surface and, in fact, at times the surface of the concrete was smoother than desirable, showing that there was more than enough mortar to fill the voids.

No failures have ever occurred in one of these foundations and samples taken out in making service cuts through the pavement, showed the concrete to be free from voids and as strong as the average concrete base. They also showed fewer cracks than are found in rich concrete foundations. The excellent results obtained with 6-in. foundations made with this lean portland cement concrete are worthy of note, especially so, in view of the fact that some engineers are recommending concrete for pavement foundations mixed 1 cement, 2 sand, 4 aggregate and even richer.

Now, the writer does not wish to recommend the use of a 1 : 4 : 10 concrete, unless the engineer is certain that he can get a well graded coarse aggregate and be reasonably sure of getting the correct proportioning of materials.

He does however, wish to emphasize the fact that concretes 1 : 2 : 5 and richer are not only unnecssarily expensive but are undesirable for bituminous pavement foundations. It is well recognized that rich concretes are much more liable to crack than lean concretes and these cracks, not only weaken the foundations, but often cause corresponding cracks in the wearing surface. Concretes of the proportions of 1 : 3 : 6 or 1 : 3 : 7 are as rich as should be used and make the most desirable foundations. If greater strength is desired, the thickness of the foundation should be increased or suitable reinforcing used.

A. W. Dow,
New York City. Consulting Paving Engineer.

[Mr. Dow was formerly inspector of asphalt and cement for the District of Columbia.—Editor.]

Sir—1. It is apparently difficult to get the gist of what is advocated in the foregoing article relative to bases for sheet asphalt pavements. Experience has led the City of Washington to adopt as its standard a six-in. base of 1 : 3 : 7 portland cement-concrete, with gravel as the coarse aggregate. This standard is adopted because a rigid base is thus obtained as compared with a flexible one obtained by the use of macadam or bituminous macadam.

2. No attempt has been made to compare bituminous concrete with portland cement-concrete, the excessive cost of the former in a base of sufficient thickness to support properly a sheet asphalt pavement makes a comparison unnecessary.

3. Of the original surface of Massachusetts Ave. as quoted by Mr. Dow, practically none remains today. Vermont Ave. on the other hand is still giving excellent service, the reason being that the base of eight to ten in. of rich bituminous concrete underlaid with six in. of sand and gravel has formed a rigid support for the asphaltic surface. For the same reason—rigidity—hydraulic cement-concrete bases are excellent. While Vermont Ave. with its bituminous concrete base is an isolated instance, numerous pavements with hydraulic cement-concrete bases may be cited as examples, pavements comparable with Vermont Ave. as to age and traffic and averaging less than 2c. per sq.yd. per year maintenance during the past decade.

4. Through a telford or any old macadam pavement with sufficient rigidity may be an excellent base for an asphalt pavement, hydraulic cement-concrete, if for any reason it fails to provide sufficient rigidity, may prove to be a poor base. During the past working season in Washington Twenty-third St., E. to Virginia Ave., and Florida Ave., Q to R Sts., were resurfaced. When the asphalt was stripped from the base it was readily seen that the relatively poor service given by these two pavements was due to the non-rigidity of their bases. The concrete base on Twenty-third St. was laid in 1900 using a natural hydraulic cement. Florida Ave. was laid in 1895 likewise using a natural cement. The specifications covering this latter base is interesting:

"The mortar shall be composed of 300 lb. of cement and two bbl. of loose sand. To the mortar, broken stone, or equal parts of broken stone and gravel, shall be added in such proportions that the resulting concrete shall contain for every 300 lb. of cement and two bbl. of loose sand such proportion of broken stone as to give a slight surplus of mortar when rammed."

Today it is impossible to learn just what proportions were used. Of course, the concrete was mixed by hand. During the resurfacing work, one base was taken out with a horse and plow and a steam shovel ripped out the other with ease. The bases were replaced with the standard 1 : 3 : 7 portland cement gravel concrete.

5. As now laid Washington concrete bases are expected to have an indefinite life. On an average of 25 years service they will be resurfaced with a new 3-in. sheet asphalt pavement. The ease with which worn-out pavements may be stripped from the base is an advantage in favor of portland cement-concrete, and the adherence of the sheet asphalt to the bituminous base is one of the disadvantages of the latter. Years ago in resurfacing pavements with bituminous bases the new pavement was laid directly on the top of the old. This has proven unsatisfactory and during the past 15 years worn-out sheet asphalt pavements with bituminous bases have always been taken out entirely and replaced by portland cement-concrete bases and a 3-in. sheet asphalt surface.

6. A richer mix than the 1 : 3 : 7 standard would undoubtedly give better service but not to such an extent as to warrant the difference in cost. Washington one-course concrete pavements, 1 : 2 : 3 mix, now being laid, are placed at such a grade that they may be at some future date surfaced with a sheet asphalt pavement. Given a base of sufficient rigidity the pushing and cracking of the sheet asphalt surface is due either to faulty surface mix or construction. By proper methods it is possible to obtain a pavement that will neither push nor crack. It is the aim of the Highway Division of Washington to average 500 patches per day in its sheet asphalt maintenance work during the next few months. By following the patching gangs in this work it may become evident to any one that cracks and other defects in the sheet asphalt surface have absolutely no relation to so-called expansion or construction cracks in the portland cement-concrete base.

F. E. Besson,
Captain, Corps of Engineers, U.S.A.
Washington, D. C.

Railway Employees' Wages and the Cost of Living

Sir—In an interesting article appearing in your issue of Feb. 19, p. 385, Charles Whiting Baker questions the statements made by the American Institute of Consulting Engineers in its communication to the president, dated Aug. 19, 1919. Indeed, he even goes further and states that we were led into an error in respect to the cost of living because we used the figures of the National Industrial Conference Board. Coming from a gentleman so well informed and so well known as Mr. Baker I am required to defend our statistics. It is seldom if ever that I am in disagreement with Mr. Baker's conclusions, but in this particular instance I maintain that we used, as a basis of the cost of living, less debatable figures than Mr. Baker has.

When the startling statements of the Railroad Brotherhoods appeared in the public press of Aug. 3, 1919, our executive committee felt that the voice of at least one unit of the profession should be immediately heard in answer to these statements. In preparing our statement or memoranda to the president the latest available figures as to the increase in the average compensation received by railroad employees were as of January, 1919, and March, 1919, respectively. The authority for the figures for the average monthly wages per man of all railroad labor was obtained from the Operating Statistics Section of the United States Railroad Administration for the years 1917 and 1918 and from the published reports of the Interstate Commerce Commission for the years 1914 and 1917. These figures showed an increase in the monthly wages between 1914 and 1919 of 92 per cent. Since the issuance of our statement later figures from the Director General of Railways show the average monthly earnings of all railroad employees to July, 1919, as $121.50 or 4 per cent less than in January of the same year. The monthly wage for a summer month would naturally be lower than the average for the year, owing to the employment during the summer period of a relatively greater amount of cheaper labor.

For the cost of living, we had before us the figures of Dun's "Index Numbers," the Department of Labor and the National Industrial Conference Board. It was found that Dun's figures showed the wholesale cost of 200 commodities and evidently did not take into consideration the consumption of the items, nor did it completely take into consideration shelter and some sundries. The figures of the Department of Labor were found to be the average between 18 "shipbuilding centers" and for cities and towns other than these centers, the average increase being obtained by dividing the two. On the other hand, it was found that the statistics of the National Industrial Conference Board covered a wide range of cities, completely included the family budget, and in our opinion was more representative of the cost of living than the other two authorities. We, therefore, accepted such as the best evidence of the increase in the cost of living. This showed that for March, 1919, the cost of living had increased 61 per cent.

In October the figures for July, 1919, were obtainable from both the National Industrial Conference Board and the Department of Labor which showed increases of 70.8 per cent and 75.2 per cent, respectively. The latest bulletin of the Industrial Conference Board shows, as Mr. Baker states, that the cost of living had increased to 82 per cent on Nov. 1, 1919, and the increases shown by the National Industrial Conference Board practically parallel the figures of the Department of Labor. The result of the latest comparable figures, namely, those of July, 1919, shows that the railroad wages had still increased more than the cost of living. It is undoubtedly true, however, that the curve is showing that the increase in the cost of living is now approaching the increase in the average monthly wages of all railroad employees. Personally, I doubt that the former will cross the latter because some increases have recently been granted railroad labor, and if we may trust our public officers in Washington, the cost of living has reached its peak.

F. A. Molitor,
Secretary American Institute of Consulting Engineers.
New York.

The above letter has been submitted to Mr. Baker, who replies as follows:

"The cost of goods mounts faster than the wage level," was the statement made by the Railway Brotherhood heads which the Institute of Consulting Engineers declared to be false.

As for the relation of the Dun index number of wholesale prices to the cost of living, it is true that the commodity list does not include the items of house rent and service; but these amount, in the living expenses of the man earning $116 a month (the average earnings of all railway employees in the first six months of 1919) to only about one-fourth of the total family expenses; and rents as well as prices of goods were raised all over the country in 1919. The index number of wholesale prices, moreover, takes no account of the heavy burden on railway employees and all the rest of us due to the raising of retail prices farther and faster than wholesale prices.

Dun's index numbers of wholesale prices are based on the quotations in the wholesale market of about 300 staple commodities. In making up the index number these are weighted on a per capita consumption basis. The Dun numbers show a considerably lower and more regular curve than the similar index numbers issued by Bradstreets and by the Bureau of Labor.

The Institute of Consulting Engineers issued its diagram purporting to show the relation between increase in railway wages and increase in cost of living August, 1919. It was unfortunate to use at that time figures for the cost of living in March, as that was the month when prices were at the lowest in the lull of business following the armistice and by August, prices had risen to a height exceeding the highest level of the war. Further than that, prices have gone on climbing ever since. The following are the Dun index numbers of wholesale prices for the past 12 months:

1919	March 1, ...	$217,037	1919	Sept. 1, ...	$238,342
	April 1, ...	219,973		Oct. 1, ...	235,867
	May 1, ...	222,193		Nov. 1, ...	238,573
	June 1, ...	222,973		Dec. 1, ...	244,639
	July 1, ...	233,707	1920	Jan. 1, ...	247,394
	Aug. 1, ...	241,650		Feb. 1, ...	253,748

The average for the year 1913 of the Dun index numbers was $120.90; hence the wholesale prices of commodities on Feb. 1 had increased 109 per cent over the average of 1913. The very rapid increase in rents during the past twelve months in all parts of the country is well known. Fortunately present appearances indicate that the summit has at last been reached and that a considerable drop in prices may be expected during the current year.

It is only fair to add that railway employees' wages were not advanced during 1919 to correspond to the increase in living costs. Such wage increases as were made were comparatively small.

The report of Director-General Hines just made public, with the official figures, bears out well the position taken by the writer in the article discussed by Mr. Molitor. Charles Whiting Baker.

A Single National Engineering Society With Locals and Special Sections

Sir—With the great growth of the American Society of Civil Engineers and the other large technical organizations generally classed as "Engineering," come problems not readily solved, nor to be easily separated into two classes, "Conservative" and "Radical," as some would try to do. In the mad rush to make money, and the perfectly justifiable desire to secure a scale of remuneration commensurate with worth of service, too many are seemingly ready to throw overboard the high standards which underlie the four avocations, usually called professions: Theology, Medicine, Law and Engineering, the application of the respective God-given principles to human betterment.

The engineer should occupy a far bigger field in world affairs, and he will in spite often of too much modesty, and his organizations, technical as well as others, must reflect and stand for such participation, but labor unionism, useful as that is when properly controlled, must not be permitted to dominate the activities of the great technical societies which should stand for dissemination of knowledge, approval of the sound and rejection of the false.

For well over 30 years the writer has been in the American Society of Civil Engineers, passing through its various grades. While generally resident in New York, he has had occasion to be more or less familiar with engineering conditions in many parts of the United States and in other lands, and has maintained a keen interest in the society throughout. Rightly or wrongly, in the past ten or fifteen years, there has grown up an unmistakable sentiment that that society had developed into a huge local organization, not entirely local in membership, but actually local in interest.

Under date of Jan. 22, 1912, following a very successful annual meeting, the writer sent a letter to the Board of Direction, raising the point for discussion at the next annual meeting of thereafter abandoning them as such and the formation, at once, of more local societies throughout the country, from which delegates could be sent to general business conferences. The argument was largely based upon the proportions of resident and non-resident members in attendance at annual meetings for several years previous. The secretary of the society took issue with the point, and it went no further, until recently an almost identical policy has been promulgated, and carried even further than had been in the writer's mind in 1912.

The local societies have not been used to best advantage; even the growth of a few of the larger ones has not conduced to the prestige and welfare of the national organization. There should be no Boston Society of Civil Engineers, or Western Pennsylvania, or Western Society in Chicago, as separate incorporations, but these and others should be locals of what might soon become an international society in fact, if perchance not in name. There should be no separate water works association, or societies for testing materials, or those for municipal improvements.

Let the local societies fill the fields, discuss papers, from which these worthy of full publication could be selected for issue by the main society. Let the locals participate in civic affairs, not in an undignified way, but with the broad power of trained men, to help. Then, for acquaintance sake, hold conferences at various places through the country, as the annual conventions have been held hitherto, combining delegated business and social intercourse, not simply a golf match or a card party and dance, pleasant and appropriate though they may be as adjuncts. The President, as one of his duties, should visit the locals, not alone for a social call but to gather data as to their problems, operating and technical, so that at the meetings of the Board of Direction and the annual assembly or convention, intelligent consideration could be given, with first-hand knowledge.

Some day we may achieve the ideal of one great Engineering Society, with working locals, subdivided into special sections, giving greater economy of time. as well as very largely of expense, not perhaps honoring so many big and little presidents, directors and secretaries, but making membership worth while. The topic is a fruitful one for rambling comment, but space in a technical journal is not unlimited.

Let us advocate growth, expansion, development of the highest possible engineering, but not throw away the high professional standing which has attracted membership in spite of some resentment of what may be called ultra-conservatism. LOUIS L. TRIBUS.

Member, Am. Soc. C. E., and too many other organizations.
New York

Longer River Distance Important in Comparing Freight Rates

Sir—I wish to call attention to one fact of importance in studying waterway transportation, which was not clearly stated in Charles Whiting Baker's series of articles in your January issues. In the Jan. 29 article, p. 241, in estimating the possibilities of economical transportation on the Mississippi River from New Orleans to St. Louis, he puts the probable cost of such movement at one mill per ton-mile, which is near enough correct to be allowed to pass unchallenged. However, he fails to call attention just here to the fact that the mileage by river is 1,200 mi. as compared with 700 mi. by railroad, so that the rate of one mill per ton-mile by river would be equal to 1.7 mills per ton-mile by rail, which, as he shows in another place is a rate that has already been equalled by the railroads.. There is, besides, the disadvantage of 50c. per ton for the transfer at St. Louis from river to rail. Furthermore, the population of St. Louis is only about one million (maybe less) whereas the territory that could be reached by railroads in Mississippi and Ohio river valleys without transfer, and at no greater distance from New Orleans than St. Louis must be several millions.

The importance of conserving capital at this time, when so much of the world is at point of starvation, makes it worth while to criticise every proposed plan that is vulnerable if the amount to be spent on it is considerable. Those backing this project should give reason for the faith that is in them and show clearly where it will be cheaper than transportation by railroad.

JOHN WILKES,
Civil Engineer.
Nashville, Tenn.

Water Consumption at Washington, D. C.

The average daily per capita water consumption of the District of Columbia has been reduced from 175 gal. for the fiscal year 1911-12 to 156 gal. for 1918-19. It fell to 145 gal. in 1915-16 and has risen steadily since. The 1918-19 consumption is figured on an estimated population of 417,405.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Temporary Power Station Aids in Hydro-Electric Development

By Thomas C. Higgins,
Norfolk, Va.

THE accompanying photograph shows the plant used to furnish power for reconstruction purposes on a hydro-electric development in Maine. The site was so situated that current could be obtained only at considerable expense, and the distance from a railroad made the cost of coal high. To furnish power for construction it was decided to install temporarily a waterwheel and penstock that were to be used later in a small neighboring development. This plant was installed on the stream in such a way as not to interfere with the main development. Water was carried to the wheel in a wooden flume 250 ft. long and a wooden penstock 200 ft. long. A head of 30 ft. was secured and enough power developed to run the mixer, derricks, cableway, etc. The entire plant was operated with little expense and worked very successfully.

TEMPORARY WATER WHEEL INSTALLED TO FURNISH POWER FOR CONSTRUCTION

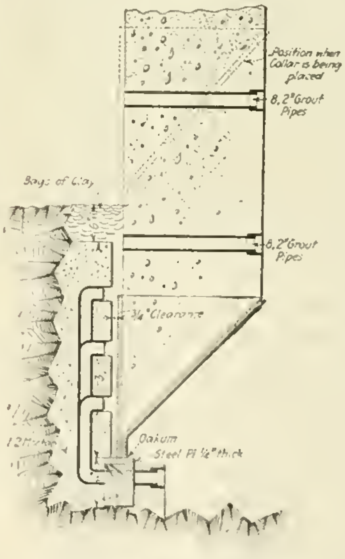
Drilling Holes in Frozen Ground

By L. G. Hall
Construction Engineer, N. Y. City

A GREAT deal of grading during the cold weather had to be done for the new automobile factory which the Willys Corporation is building at Elizabeth, N. J. The surface of the ground had been covered with a frozen crust too thick to be broken by the steam shovel, and which had to be broken up by blasting before it could be taken away. This brought up the question of drilling the blasting holes through the 18-inch frozen crust. A simple, yet very effective method of doing this was by heating steel bars to a low red heat in an ordinary salamander, and driving them into the frozen ground with hammers. A number of bars were kept in the fire at a time, so that there was no delay while waiting for them to heat. Usually a bar would penetrate 10 or 12 in. under 20 or 25 blows with a light sledge, before cooling. Then a second hot bar would be inserted and the hole completed. A piece of gunny-sacking was laid around the bar on the ground before driving, to confine the sputtering when the red hot bar came into contact with the ice. Some time was also saved when cold weather was foreseen, by driving holes into the then soft earth with an ordinary bar, and plugging them up with straw. When it came time to blast in frozen weather, any water in the holes was melted out by a hot bar without hammering, and the charge inserted. While this method of driving holes in frozen ground is by no means new, it is not nearly as frequently resorted to as could be done with advantage.

Concrete Caisson Seat in Rock Grouted Water-Tight

WATER-TIGHT seats were secured by grout injection into prepared channels in sinking caissons through earth to a seat in ledge rock when constructing shafts for the City Tunnel through the Catskill water supply for New York, N. Y. When the caisson had reached rock level, as indicated by the dotted lines in the drawing, it was held while the excavation was continued into the ledge to sound rock. On the rock bottom 6 x 6-in. wood blocks, capped with steel plates, were set to level at 4-ft. intervals around the perimeter. A mortar collar, with an imbedded pipe system, was then molded in place behind circular forms. Inside surface grooves were formed by nailing half-round strips to the forms. Besides the horizontal grooves indicated, there were vertical grooves every 6 ft. around the ring. Six pipes, arranged around the ring end embedded in the collar, opened two into each horizontal groove. With the collar completed, a 5-in. cushion of oakum was attached to the cutting edge and the caisson was dropped inside the collar onto the concrete seat. Finally grout was forced in, filling the grooves and pipes and all spaces between the collar and the caisson. This seal was successful. The leakage at the deepest shaft, where the head was 100 ft., was only 7 gal. per minute and subsequent grouting stopped this inflow. The grout pipes through the caisson above the collar were designed for injecting grouting into the sand above the rock. It was found that only slight consolidation of the sand above could be effected by grouting. This description is taken from a paper, "Grouting Operations, Catskill Water Supply," by James F. Sanborn and M. E. Zipser, in *Proceedings*, American Society of Civil Engineers, January, 1920, p. 3.



GROUT SEALING CAISSON IN EARTH TO ROCK

NEWS OF THE WEEK

New York, March 11, 1920

Six Lines of Traffic Demanded for Hudson Tunnel

Provision of width adequate for three lines of traffic in each direction was demanded by New Jersey interests at the third public hearing on the plans for the Hudson River vehicle tunnel (*Engineering News-Record*, Feb. 19, 1920), held at Newark, N. J., on March 4. Morris R. Sherrerd, city engineer of Newark, and H. C. Eustice, of the Newark Traffic Club, advocated the increased width. E. A. Byrne of New York, member of the Board of Consulting Engineers for the tunnel, presented a minority report disapproving several stipulations of the official plan for two 29-ft. cast-iron tunnels, among them being its capacity. He urged that the capacity of the accepted design has been overestimated and that a pair of three-line tunnels would approximate the traffic-capacity which the engineering studies showed to be desirable.

On the matter of type of tunnel, important statements were read by General George W. Goethals and Colonel William J. Wilgus, the latter officially representing the Board of Consulting Engineers. General Goethals' statement was said to have no reference to the criticisms of his 1917 recommendation in favor of a 42-ft. concrete block tunnel, contained in a report of Chief Engineer Holland (see *Engineering News-Record*, March 4, 1920, p. 490).

The general stated that concrete is a more economical structural material than cast iron, that the single tunnel is more economical than two, and that no reason is apparent why the air pressure in a shield cannot be varied to suit the face pressure, as proposed for the 42-ft. tunnel. He cited evidence tending to show that the Hudson silt is a relatively stable material, and that a brick tunnel has existed in it for many years. Also the history of this same tunnel shows that shield work is more costly than air work without shield. Finally, General Goethals argued against too close a following of precedent, saying that followers are in the great majority, while leaders are few. The promised saving of over ten million dollars by concrete in place of cast-iron tunnel construction is too great to be ignored.

Colonel Wilgus declared that the material to be encountered in the Hudson is among the softest clays of the entire region. Citing stress analyses made under specified assumptions, he gave the greatest compression and tension in the Goethals concrete tunnel lining (3 ft. thick) as 1,000 lb. and 400 lb. per sq.in., respectively, and the lug shear as 1,192 lb. per sq.in. He

(*Concluded on page* 544)

To Control Power During California Drought

Sixteen Companies and City of Los Angeles To Operate Under Rules of Railroad Commission

By Telegraph from Engineering News-Record's Pacific Coast Editor.

Sixteen California power companies and the City of Los Angeles have signed an agreement requesting the Railroad Commission to make and pledge themselves to abide by rules of service for the distribution of electrical energy during the emergency created by a season of unprecedented drought following two very dry years. (See *Engineering News-Record*, Feb. 26, p. 429, for some details of the water shortage.) The diminution or refusal of service and the exchange of energy between power companies will be covered by the rules as well as co-operative plans for preventing waste. Under the auspices of the Railroad Commission there has been formed an emergency water conservation conference composed of Federal and state officials who have expert knowledge of the water resources of California and of the extent of the present menace.

This conference includes the following members, all acting in their official capacities: W. F. McClure, state engineer; Frank Adams, California Branch, Irrigation Investigations, U. S. Department of Agriculture; E. H. Heck, Director State Department of Agriculture; C. H. Lee, State Water Commissioner; H. D. McGlashan, U. S. Geological Survey; H. D. Butler, State Power Administrator; Lt.-Col. L. H. Rand, Corps of Engineers, U. S. A.; H. D. Loveland, Chief Hydraulic Engineer, State Railroad Commission.

The purpose of the conference, which is headed by E. O. Edgerton, president of the Railroad Commission, is "to secure for the power and water users of the state the greatest benefits from the available water and power and to reduce to a minimum the damage resulting from the water scarcity." A list of suggestions addressed to all large users of power or water for irrigation has been sent out and plans for the greatest care in inspection and fair apportionment of all waters are under way. A series of meetings in various cities of the state has been scheduled. Weather Bureau observers report that the ground water level is the lowest ever recorded and that the past January was the dryest in seventy years.

Coming—An Important Railroad and Earthwork Article

Space limitations prevented the use in this issue of an article on the construction of a heavy industrial railway, involving unusual experiences with earth pressures over a 50-ft. arch culvert. Railroad engineers and all interested in heavy earthwork will do well to look for the article, which will appear in *Engineering News-Record* March 25.

Cohoes Bridge Fails as Wood Flooring Burns

Failure of the Cohoes-Lansingburgh bridge over the Hudson River a few miles north of Albany, N. Y., a wrought-iron structure of five spans having a total length of about 700 ft., occurred March 4 as the result of a fire in the creosoted wood block floor system caused, it is believed, by a short circuit on the trolley car line which the bridge carried. Weakened by the heat of the burning floor system three spans collapsed and fell into the river, forming an obstruction which, it is feared, may cause an ice jam.

Referendum on Public Works Bill Being Taken

The National Federation of Construction Industries, through its legislation and financial operation committees, is taking a referendum vote on two measures now being considered by Congress; the Jones-Reavis Bill, proposing the establishment of a Federal Department of Public Works, and the proposed amendment to the Federal Reserve Act. The Advisory Board of the National Federation of Construction Industries, composed of 153 members representing all sections of the United States and all lines of construction and allied business, has displayed a sentiment favorable to the establishment of a National Department of Public Works.

Mechanical Engineers To Have Professional Sections

The Council of the American Society of Mechanical Engineers has authorized the establishment of professional sections in the society, and steps are being taken to organize sections in aeronautics, cement, fuel, gas power, industrial engineering, machine shops, ordnance, power, railroad, and textiles. It is intended that the sections formed of mechanical engineers in the foregoing several fields will form the nucleus for further sectionalizing of the society along the lines in which any interested group of specialists may become interested and make application.

The society is now balloting upon an amendment to its constitution which would provide a standing committee on professional sections. The differentiation between local sections and professional sections is the same as that between community interest and professional specialty. There is to be no additional assessment on members for participation in the professional sections.

Six Lines of Traffic Demanded for Hudson Tunnel

(*Concluded from page* 543)

criticized the absence of connection between voussoirs of the block lining rings as a fatal defect. On the score of cost, he offered figures to show that under the best conditions the operation of the Goethals tunnel would represent an excess capitalized cost of over thirty million dollars.

J. F. O'Rourke submitted cost estimates for a pair of 31-ft. concrete tunnels, in comparison with estimates on the official plan, the former being about half the latter. W. C. Parmley argued for the practicability of concrete-block construction, basing on 15 years of experience with concrete block tunnels. St. John Clarke offered to bid on an alternate plan which he claimed would save several million dollars and a year of time. J. C. Meem proposed three alternative methods by which a large tunnel could be constructed, and estimated a year's saving of time as compared with requirements of the official plan.

Edward Wegmann, P. G. Brown and others supported the official plan and argued against alternative bids. J. K. Thomson and others advocated trench-tunnel construction.

Contracts Let for Six Staten Island Piers

Work is to be started within a month on the New Staten Island terminal pier development planned by the City of New York. Contracts for the construction of six of the twelve piers planned were let on March 5 and the Board of Estimate on the same day approved plans and the form of contract for the remaining six the same day. The piers are located on the northeast shore of Staten Island, inside the Narrows in the Upper Bay and between Tompkinsville and Clifton. They are between 1,050 and 1,120 ft. long, and ten of them are 125 ft. wide, while two are to be built 209 ft. wide to carry freight-handling machinery outside the sheds, a design demanded by the lessee. The current contracts are: Dredging, Morris & Cumings Dredging Co., $628,800; piers and substructures, Terry & Tench, $3,252,570; superstructure, Bethlehem Steel Bridge Corporation, $2,577,950.

Pittsburgh Civils Say Architects Should Not Design Bridges

In accord with the action of several other Pennsylvania engineering societies, the Pittsburgh Association of Members of the American Society of Civil Engineers, at a recent meeting, unanimously adopted a resolution prepared by J. N. Chester, W. M. Judd and N. S. Sprague, condemning the employment of architects to design large bridge structures, as was done in the case of Allegheny County, Pa. (see *Engineering News-Record*, Oct. 9, 1919). The resolution follows:

Whereas, The commissioners of Allegheny Co., Pa., have awarded contracts to certain architects for the design and supervision of construction of certain bridges over the Allegheny River, and

Whereas, The work involved in these contracts is primarily engineering with respect to both cost and design, and

Whereas, undesirable precedent is being established for the guidance of various public authorities in awarding contracts for the design and supervision of the construction of bridges to architects, and

Whereas, The continuance of such practice will subordinate the engineering profession, thereby rendering the safety of the public, economy of design and the utility of structures secondary in importance to aesthetic features, and

Whereas, It appears desirable that the extent of the work and responsibility of both the engineering and architectural professions be clearly defined, therefore be it

Resolved:

(1) That the Pittsburgh Association of the American Society of Civil Engineers direct the attention of the county commissioners to the above facts and dangers;

(2) That for the bridges yet to be built care shall be exercised to put the responsibility for the design and supervision of construction in the hands of competent engineers as advisors to the county engineer;

(3) That the latter be directed by the county commissioners to exercise full authority for the inspection of construction for the two bridges now being designed and about to be erected;

(4) That architects and engineers shall collaborate to the end that art and aesthetic taste shall receive consideration at all times in the treatment of design and construction;

(5) That a copy of these resolutions be transmitted to the commissioners of Allegheny Co., the Board of Public Buildings and Grounds at Harrisburg, to the Philadelphia Section of the American Society of Civil Engineers, to the Philadelphia Engineers' Club and to the Engineers' Society of Pennsylvania at Harrisburg;

(6) That the Pittsburgh Association of the American Society of Civil Engineers is of the opinion that a policy should be determined between the American Institute of Architects and the American Society of Civil Engineers, defining and classifying the character and nature of architectural and engineering work, upon which architects or engineers or both should be engaged;

(7) That the Pittsburgh Association of the American Society of Civil Engineers request the Board of Direction of the Society to consider these resolutions in the light of the best interests of the engineering profession, and to request Engineering Council to confer with the American Institute of Architects to the end that such a definition be formulated and incorporated in the code of ethics of both societies.

Government Waterway Operation Under General Hines

Announcement has been made by the War Department that the inland waterways operated the last two years by the Railroad Administration will be now in charge of Brigadier General F. T. Hines, chief of transportation service, U. S. A. The order reads as follows:

"Under the terms of the Railroad Bill approved by the President Feb. 28, 1920, all boats, barges, tugs and other transportation facilities on the inland, canal and coastwise waterways acquired by the United States during the period of Federal control of transportation facilities were transferred to the Secretary of War, who was required to cause them to be operated and to assume and carry on all contracts in relation thereto. The Secretary of War has assigned the duty of the operation of the vessels noted to Brig. Gen. Frank T. Hines, now charged with the operation of all water, rail and animal-drawn transportation of the War Department.

"The facilities turned over are divided into two divisions: One division consists of tug boats and canal boats which operate between Buffalo, N. Y., and New York City, and Long Island Sound via the New York State Canal and Hudson River. This division is not operated during the winter months due to the waterways being closed by ice. It will probably be open for navigation in May. The other division consists of tug boats and canal boats which operate on the Mississippi River from St. Louis to New Orleans and to the Warrior River, near Birmingham, Ala. This division operates throughout the year. The control of terminal facilities for these two divisions is also provided for under War Department operation. No property pertaining to the canal proper has been taken over by the War Department; it controls only the equipment acquired during the time transportation facilities were under the control of the Federal Government.

"The control of these transportation facilities was taken over at 12:01 a.m., March 1, 1920, preliminary arrangements having been made with the office of the Railroad Administration which has been handling this feature of the work. For the present, the personnel which was employed by the Railroad Administration will be continued on the same work, no changes being contemplated until the matter has been gone into thoroughly by the War Department. The only officer under the Secretary of War who is now directly connected with these inland waterways is General Hines."

New York Central Wins Suit for Shorter Span Across Hudson

Through a decision in the New York State Court of Appeals, on March 2, the New York Central R.R. was sustained in its contention that it not be required to use a 1,000-ft. clear span in its plan to detour traffic by crossing the Hudson River at Castleton, N. Y. The court held that the Federal Government, which had already authorized the construction of a bridge with maximum span of 600 ft., has authority superior to that of the State governing the use of lands under navigable waters. The effects of the State law requiring the construction of a bridge with a 1,000-ft. clear span were outlined in an article showing the location and general design of structures under the two plans in *Engineering News-Record* of May 30, 1918, p. 1033.

The State law against a bridge of only 600-ft. maximum span followed objections of interests in the City of Albany, based on the claim that a pier in the river would be an obstacle to navigation, but this plea was rejected by the Secretary of War after it was shown that the design proposed by the railroad company would not impair the channel.

While it is not expected that the case will be carried to the United States Supreme Court, there is pointed out the possibility of a writ being granted permitting such an appeal by the State

Power Unit of Government Picric Acid Plant Sold

The power unit of the Government picric acid plant at Little Rock, Ark., has been sold to the Arkansas Power & Light Company by whom, it is understood, power will be made available for the irrigation of 1,000 sq.mi.

The power plant was sold separately from the other units by E. C. Morse, Government director of sales, after he had rejected a $500,000 high bid on the entire plant. The cost to the Government of the whole was $6,700,000. The remaining units will be sold in parcels according to purchasers' requirements in order to realize a maximum price on the whole.

In negotiating the purchase H. C. Couch, president of the acquiring company, agreed to supply the power needs of all purchasers of the great plant's remaining units. In addition the company expects to have surplus power for pumping plants to irrigate more than 600,000 acres of rice.

Lt. Col. Deakyne Member Mississippi River Commission

Lieutenant Colonel Herbert Deakyne, one of the new members of the Mississippi River Commission, has a distinguished record of service as an engineer officer in the United States, the Philippines and in France.

Having graduated at West Point in 1890, Lieutenant Colonel Deakyne has served on the California Debris Commission and on fortification work and river and harbor improvements in Florida, Pennsylvania, Delaware and the Philippines. He has been in charge of the Fourth Lighthouse District, U. S., and of the lighthouse work in the Philippines. As a capitain he commanded the First Battalion of Engineers in 1904-5. In 1909 he became a member of the board of engineers for rivers and harbors.

LIEUT. COL. HERBERT DEAKYNE

In command of the 19th Engineers and as colonel, National Army, he landed in France Aug. 30, 1917. Colonel Deakyne was later commissioned a Brigadier General, U. S. Army. He served in France as director of the Department of Light Railways and Roads, as a corps chief engineer and as chief engineer, Second Army.

Milwaukee Opens Electric Operation on New Division

On March 5, the Olympian Limited left Seattle as the first electrically operated train over the 265 miles of the new Othello-Seattle-Tacoma Cascade electric zone of the Chicago, Milwaukee & St. Paul Ry. A brief illustrated description of the large electric passenger locomotives for this service appeared in *Engineering News-Record* of Dec. 11-18, 1919, p. 1034. The locomotives described were built by the General Electric Co. and others have been built by the Westinghouse Electric Co.

No Appropriation Made for Barge Lines Operation

In view of the fact that the new railroad law specifically instructs the War Department to continue the operation of the Government's barge lines on the Erie Canal and the Mississippi and Warrior Rivers, the Department will borrow from its funds such money as may be necessary for these operations until Congress supplies the necessary appropriation. The railroad act authorized no appropriation for the operation of these barges.

The War Department's activities in connection with these transportation lines will be under the direction of General Frank T. Hines, the assigning order being quoted elsewhere in these columns. General Hines has not worked out a plan of administration as yet. For the present the same form of organization as employed by the Railroad Administration will be continued. Requests have been made by those interested in barge lines that their immediate direction be placed in the hands of civilian transportation specialists.

Commerce Commission Calls Value and Rates Hearing

The Interstate Commerce Commission, March 4, issued an order citing the rate-making provisions of the new Interstate Commerce Act and calling for a hearing on March 22. The questions for discussion, as outlined by the Commission, are: Whether, for purposes of rate-making, the carriers of the country shall be considered as a whole or divided in groups; what methods should now be employed for determining "aggregate value," whether as a whole or grouped.

Milwaukee Harbor Plans Accepted

Plans for a $5,000,000 water and rail terminal in the city of Milwaukee have been accepted by the City Harbor Commission. These plans have been prepared by H. McL. Harding, consulting engineer to the commission. They call for the improvement of the lake front from Wisconsin St. south to the harbor entrance, and of sewage disposal south of Wilcox St. Both the inner and outer sides of Jones Island will be improved.

Technology Clubs Associated To Meet in Philadelphia

The Technology Clubs Associated will hold its annual meeting at the Drexel Institute, Philadelphia, March 26, 27, 1920. The association was formed, with the approval of the officers of Massachusetts Institute of Technology, by graduates' clubs to promote closer co-ordination of engineering education with industry. Among the speakers are: Hollis Godfrey, Louis F. Musil, Samuel P. Capen, B. A. Franklin, Henry M. Waite and G. R. Wales.

Conferees Agree on Bill Transferring War Supplies

Final agreement by the Senate and House conferees on the bill, specifically directing the Secretary of War to transfer certain surplus property to the Bureau of Public Roads, for distribution among the state highway departments, will make available much additional road building material for transfer. The legislation will not have a decided effect on the transfer of motor vehicles as the War Department, for some time, has been making these deliveries as rapidly as circumstances would permit.

The bill, as agreed to in conference, contains an amendment providing that any state highway department may rent assigned equipment to any state agency or municipal corporation for road construction or maintenance at a "fair rental which shall not be less than the cost of maintenance and repair of said vehicles and equipment." The Bureau of Roads has no objection to these vehicles being made available for use on projects other than those receiving Federal aid.

While the present legislation makes available industrial railway equipment, donkey engines, concrete mixers, clam shell buckets, cranes, and much other machinery and supplies, Thomas H. McDonald, the Chief of the Bureau of Public Roads, feels that the list of materials could, with benefit, be expanded to include machine shop units, motor-mounted, locomotive cranes and TNT.

Hearing on St. Lawrence River Development

About 40 delegates from all sections of the Middle West and Eastern Canadian provinces, attending the first public hearing at Buffalo, March 1 and 2, before the International Joint Commission on the proposed development of the St. Lawrence River, made a much greater impression in favor of the scheme than did the opposition to the project offered by delegates from the western section of New York State. The expected opposition by the coal interests who sell Northern New York and Canada and the trunk line railways which tie the Atlantic seaboard to the Northwest did not develop openly. If such opposition was offered the interests were represented by New York State delegates, who opposed the plan principally on the grounds that the Barge Canal would become obsolete and that Buffalo, Boston, Baltimore, New York and Philadelphia shipping interests would suffer. However, there were no accredited representatives from the places mentioned with the exception of Buffalo, which opposes the project bitterly.

One of the typical arguments in favor of the navigation development of the Canadian waterways was about as follows: "We are facing a transportation emergency in the West. Crops are rotting because we cannot ship them and the West is not one-quarter developed. Development of the St. Lawrence River will release 40,000,000 tons of coal which is burned today in generating electric power, 40,000 miners to other industry and line the banks of the Erie Barge Canal with industries. One-half of the cost of transporting a bushel of grain from Duluth to Liverpool is spent between the time the boat docks at Buffalo and leaves the dock at New York." The Western delegates came from Detroit, Chicago, Ashtabula, Superior, Akron and several other West and Middle West cities.

The opposing delegates from Buffalo, Rochester, Utica and other Western New York points, declared that the project, if put through, would cost the United States $100,000,000 and that it would necessitate the dredging of Lake Erie and all canals in the Great Lakes system. They claimed that a special type boat would be necessary and that grain and ore could not be carried to economic advantage.

The meeting opened March 1 and closed the afternoon of March 2. The full joint commission was present. The Canadian section included: C. A. McGrath, chairman, H. A. Powell, P. Mignault, Sir William Hearst and Lawrence J. Burpee. The American section included: Obadiah Gardner, chairman, R. B. Glenn, Clarence D. Clark and Whitehead Kluttz.

Kansas City Southern Case Decided in Favor of Railroad

A decision in favor of the railroad was handed down by the Supreme Court of the United States, March 8, in the Kansas City Southern R.R. mandamus proceeding to compel the Interstate Commerce Commission to admit evidence showing elements of land values not allowed by the commission. The proceedings before the Supreme Court were held Dec. 10, 1919, a report of which appeared in *Engineering News-Record* of Dec. 11-18, 1919, p. 1030.

The decision indicates that the valuations of all of the railroads may be increased. At this writing copies of the decision are not available. Some doubt is felt as to the accuracy of newspaper reports stating that the decision will compel the commission to use current prices and values in the final determination.

Railway Conference of A. A. E.

The second annual railway conference of the American Association of Engineers will be held in Chicago, March 15, for the presentation of reports of railway sections and discussion of the railway work of the association. Addresses on the classification and compensation of engineers will be given at the evening session by A. S. Tuttle, New York City; Colonel B. J. Arnold, Chicago, and O. C. Merrill, Washington. The aims and ideals of the association will be reviewed by the president, Dr. F. H. Newell.

To Co-ordinate Work of Federal Mapping Agencies

(Washington Correspondence)

That a milestone in governmental efficiency has been passed in the creation of the interdepartmental board of surveys and maps was the general opinion of those who gathered at the board's hearing in Washington March 9. O. C. Merrill, chairman of the board, assured the representatives of the non-federal mapping interests that the board is willing to co-operate in every way.

Judging from the developments at the Washington meeting the board will not sidestep the task of taking decisive action to co-ordinate departmental operation. The case of the non-federal agencies was presented by M. O. Leighton. The following recommendations were approved:

1. That the board of surveys and maps adopt a policy that shall direct itself exclusively to the best interests of the Government as a whole, disregarding, whenever necessary, departmental and bureau precedents, pride or authority or official prerogatives; that the mapping activities of the Government be centralized, and for the present that the U. S. Coast and Geodetic Survey continue its functions of fundamental control, while the Geological Survey or some outgrowth or reorganization thereof becomes the general and the final mapmaking agency.
2. That the board of surveys and maps formulate a consecutive plan based on the idea of centralized mapmaking activity, which shall cover the mapping work of the government and unite the organizations now constituting the board into a co-operative effort to secure Congressional approval, which plan shall provide for the completion of the standard topographic map of the United States within a specified time.

Mr. Leighton appeared for the following organizations: Engineering Council, American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers, American Institute of Electrical Engineers, American Association of State Geologists, American Association of State Highway Officials, National Research Council, Association of American Geographers, American Geographical Society, Geological Society of America.

Public Roads Bureau To Classify Roads

Co-ordination of the various interested agencies is being secured by Thomas H. MacDonald, chief of the Bureau of Public Roads, in the classification of highways into systems based upon different classes of traffic; determination of the relative importance of the classes of highways as to state, county, local and national needs; the correlation and adjustment of systems between contiguous states and localities, and the distribution of the costs of improvement of the various systems As the head of the agency that is charged with the distribution of millions of Federal funds Mr. MacDonald has long realized the need for the application of "big business" methods to his work.

Realization that not only the state and the bureau are interested in what highways are to be improved with Federal assistance, but other agencies as well, Mr. MacDonald has been holding a series of conferences with the War Plans Division of the General Staff of the War Department, with a view to determining what highways in all the states are important from a military standpoint. In addition, the bureau is co-operating with all state highway departments in road classification. Then, too, it has collaborated with the Geological Survey in the production of uniform state road maps, and several Geological Survey employees, threatened with discharge because of lack of funds, are to be transferred to the Bureau of Public Roads so that their map-making efforts may not be disturbed.

Big Lumber Association Formed

With wholesale lumber dealers in all large American cities comprising its membership, the American Lumber Association, declared to be the largest similar organization, has been formed according to its announcement issued March 6. L. Germain of Pittsburg is president.

At its headquarters in Chicago, the organization expects to begin operations the latter part of this month. Its object is stated to be the promotion of ethics, systematization of distribution, conservation of wood, but not to include price fixing.

Bonds for Chicago Public Works

A public vote on bond issues totaling $34,200,000 is to be taken at Chicago, in April, according to the plans of the council's finance committee. They include $15,000,000 for rehabilitating the lighting system, with a distribution of $3,000,000 per year for five years; $9,200,000 for ten bridges; $5,000,000 for a memorial convention hall, and $5,000,000 for parks, public playgrounds and bathing beaches.

A. A. E. Has 13,081 Members

The membership of the American Association of Engineers at the end of February was 13,081. At that time 5,635 applications for membership were pending.

Sale of Bonds Assures Road Work

Highway construction in California this year was assured by the sale, on Feb. 28, of $3,000,000 worth of the $40,000,000 highway bond issue. The bonds were sold on the market to bear interest at a little more than 5 per cent. The stated interest of the bonds is 4½ per cent, and the difference was made up by diverting certain federal appropriations to highway purposes.

Civil Service Examination

United States

For United States civil service examination, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the Civil Service Commission, for form indicated.

Assistant specification engineer, $1,200 to $2,000 per year. File application before April 14, 1920.

Inspector of structural steel erection, $8.80 per diem and higher or lower rates of pay. File application before April 6, 1920.

Junior construction engineer, $1,800 to $2,400 per year. File application before March 30, 1920.

Junior designing engineer, $1,800 to $2,400 per year. File application before March 30, 1920.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

AMERICAN RAILWAY ENGINEERING ASSOCIATION; 1426 Manhattan Bldg., Chicago; March 16-18, Chicago.

NATIONAL FEDERATION OF CONSTRUCTION INDUSTRIES, Drexel Bldg., Philadelphia; Chicago, Mar. 24, 25.

NATIONAL FIRE PROTECTION ASSOCIATION, 87 Milk St., Boston; May 4-6; Chicago.

AMERICAN ASSOCIATION OF ENGINEERS; 63 E. Adams St., Chicago; May 10, 11, St. Louis, Mo.

AMERICAN WATER WORKS ASSOCIATION, New York City; Montreal, June 21-26.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; Asbury Park, N. J., June 22-25.

AMERICAN PUBLIC HEALTH ASSOCIATION, Boston; San Francisco, Aug. 30-Sept. 3.

The Little Rock (Ark.) Engineers' Club has been organized with the purpose of securing more co-operation between the engineers and the board of commerce of that city. A number of committees have been appointed to give attention to important matters confronting the city, such as a solution of the problem of city lot surveying. Membership includes all engineers and architects, and the dues are $1 a year. A. M. Lund has been elected president, Fred I. Brown, vice-president and Edwin M. Williams secretary-treasurer.

The Engineers' Club of San Francisco listened to a luncheon talk by Colonel E. E. Winslow, Corps of Engineers, U. S. A., Feb. 20, whose topic was "River and Harbor Problems of the Pacific."

The Illinois Section of the American Water Works Association will hold its annual meeting Mar. 25 and 26 at Urbana. G. C. Habermeyer, Urbana, secretary.

The Colorado Association of Members, Am. Soc. C. E., will hold its 110th regular meeting at the Denver Athletic Club, Mar. 15. The meeting will be preceded by an informal dinner. Robert Follansbee, district engineer of the U. S. Geological Survey, will address the meeting on "Some Characteristics of Run-off in the Rocky Mountain Region."

The Seattle Association of Members, Am. Soc. C. E., has recently elected the following officers: President, J. L. Hall; vice-president, Major Carl B. Reeves; secretary-treasurer, Captain B. D. Dean.

The Southern California Association of Members, Am. Soc. C. E., held a special meeting, Jan. 8, in Los Angeles, which was attended by 30 members and 15 guests. Details of the new City Business Tax Ordnance were explained by City Attorney Charles S. Burnell. A communication from state water commissioner C. H. Lee, advising of proposed curtailment of funds available for the U. S. Geological Survey in California was then read, and after discussion it was ordered that vigorous action be taken to continue the work of the survey without interruption in California. Los Angeles was chosen for the 1920 convention. Major Charles T. Leeds presented a paper, "Channel Improvement as a Factor in Flood Control." A committee of five was appointed to handle all matters on city planning and to make a report at the next meeting of the association.

The Montana Irrigation and Drainage Institute was recently organized, with headquarters at Bozeman, Mont., with the following objects: "To advance knowledge pertaining to irrigation and drainage, to encourage improvement in irrigation practices, to encourage advancement in scientific and economic location, construction, operation, maintenance, and colonization of irrigated and drained lands, to promote the general welfare of settlers, to encourage scientific investigations on the better use of the state's water resources, to assist in securing adequate legislation and to encourage development of legitimate irrigation and drainage enterprises." The institute will hold annual meetings and will publish the proceedings of the meetings.

The Engineering Society of Wisconsin, at its annual meeting at Madison, Wis., Feb. 20-21, elected officers as follows: President, W. P. Hirschberg, Milwaukee; vice-president, Prof. C. I. Corp, Madison; trustees, John G. D. Mack, Madison, and F. W. Ullius, Milwaukee; secretary, Leonard S. Smith, Madison.

The Engineering Society of Western Massachusetts held a meeting, Feb. 24, at Springfield, Mass. W. E. Hodge, deputy in charge of street lighting of Springfield, gave an illustrated talk on "Street Lighting as an Engineering

Problem." John L. Harper, vice-president and chief engineer of the Niagara Falls Power Co., spoke on "Niagara Falls Power Developments," also illustrated.

The Ottawa Branch of the Engineering Institute of Canada met, Mar. 4, to hear an address on "The Development of the Canadian Mercantile Marine," delivered by Alex. Johnston, deputy minister of the Marine Department.

The Connecticut Society of Civil Engineers, at its recent annual meeting, elected the following officers: President, Thomas A. Scott, New London; first vice-president, J. Frederick Jackson, New Haven; second vice-president, Robert J. Ross, Hartford; secretary-treasurer, Henry J. Kellogg, New Haven. F. L. Ford, city engineer of New Haven, was also elected a member of the board of directors.

The Engineers' Club of Baltimore announces the following program of meetings for discussion of public improvements: Mar. 18—Harbor and Dock Development, by W. Watters Pagon, consulting engineer; Mar. 25—Extension of the Conduit System, by P. G. Ligon, chief engineer of the Electrical Commission; Apr. 1—Park Development, by Wm. S. Manning, landscape architect; Apr. 8—Health and Sanitation, by Dr. C. Hampson Jones, commissioner of health; Apr. 15—Extension of Storm Water and Sanitary Sewerage Systems, by Geo. F. Weighardt, highway engineer; Apr. 15—Extension of Street Paving System, by R. Keith Compton, chairman of Paving Commission.

PERSONAL NOTES

WILLIAM T. BARNES, M. Am. Soc. C. E., has withdrawn from the firm of Metcalf & Eddy, Consulting Engineers of Boston, to become chief engineer of the Spring Brook Water Supply Co., which supplies Wilkes-Barre, Pa., and vicinity. Mr. Barnes was graduted from the Massachusetts Institute of Technology in 1893 and after a few years on railroad work in Indiana and on water-works construction with Rice & Evans, entered the employ of Leonard Metcalf, with whom and his successor, the firm of Metcalf & Eddy, he has been ever since. In 1913 Mr. Barnes was admitted as a partner and he was for about seven years in charge of the Chicago office of the firm. In his new position Mr. Barnes will have charge of the design and construction of new works and of the technical maintenance and operation of those existing, which furnish water to a population in excess of 300,000, including besides Wilkes-Barre, the cities and towns of Pittston, Plymouth, Kingston and Nanticoke, and a number of other smaller communities.

H. A. STRINGFELLOW, assistant engineer in charge of the Detroit office for the late R. W. Pratt, consulting engineer, Cleveland, has become associated with Muller & Phipps, foreign sales agents, New York. Mr. Stringfellow will leave shortly for Asia to handle the sale of machinery and engineering supplies.

WILLIAM GOLDSMITH has resigned his position as construction engineer with the City of New York to become president and general manager of the Riverdale Construction Co. of New York City. While in the employ of the City of New York Mr. Goldsmith was charged with the layout and construction of the city's New Hampton Farms Boys' Reformatory and the Greycourt Women's Farm Colony. He was also superintendent of the Manhattan municipal asphalt plant in which position he introduced a tractor and trailer scheme of transportation which is said to have saved the city $200,000 in the first year of its operation. It is understood that it was his experiments that made possible the use of New York City sewers for the disposal of snow on the city streets in the recent snow blockade. From 1907 to 1910 Mr. Goldsmith was U. S. district engineer in the Philippine Islands. The company of which he is now directing head is doing housing development work in New York City and vicinity.

WILLIAM T. HUBER has resigned his position in charge of the western New York territory for the Portland Cement Association to enter the firm of Green & Lanctot House-wrecking Co., Inc., general contractors of Buffalo, N. Y., in the capacity of general manager and engineer. Mr. Huber, who is an associate member, American Society of Civil Engineers, served as captain in the 212th Engineers, U. S. Army.

H. E. BINGAMAN has resigned from the Pennsylvania State Highway Department to become associated with the Morgan Engineering Co. at Memphis, Tenn.

JOSEPH H. MILLER has become associated with C. E. Shearer of Memphis. The firm, under the name Shearer-Miller, will conduct a structural engineering business, with offices in the Randolph Building, that city.

P. H. FREARK, until recently in the employ of the Missouri State Highway Department, is now with the Morgan Engineering Co., Memphis, Tenn.

GANNETT, SEELYE & FLEMING, consulting engineers, Harrisburg, Pa., have opened a Southern office in the Randolph Building, Memphis, Tenn. Mr. Seelye will have charge of the office.

EUGENE B. BADINELLI, recently honorably discharged from the Corps of Engineers, U. S. A., has re-entered the employ of the Morgan Engineering Co., Memphis, Tenn.

ALBERT W. DILLING, assistant engineer in the promotion bureau of the Universal Portland Cement Co., has been appointed engineering assistant to D. R. Francis, commissioner of public works, Chicago. Previous to his two years' experience with the cement company he was for 5½ years in the engineering department of the Chicago, Milwaukee & St. Paul, Ry. Co., designing, checking and detailing structures. While in railroad employ Mr. Dilling completed a law course and was admitted to the Illinois Bar in July, 1917. He has been an active member of the entertainment committee of the Western Society of Engineers, and at the recent annual elections was made chairman of the bridge and structural section.

G. P. STOWITTS, district engineer, Eastern District, New York Central & Hudson River R.R., has resigned to become chief engineer, Lord Dry Dock Co., at West New York, N. J. Mr. Stowitts graduated from Rensselaer Polytechnic Institute in 1900 and had been in the Engineering Department of the New York Central continuously since that time as draftsman, assistant supervisor on track and assistant engineer, office of engineer maintenance of way. In 1909 he became assistant designing engineer and afterwards chief draftsman in charge of general designing. Subsequently he was appointed district engineer of the Eastern District.

THOMAS C. ATWOOD, formerly district plant engineer of the Emergency Fleet Corporation for the Middle Atlantic District, has resigned to become chief engineer of the Durham (N. C.) Hosiery Mills.

COLONEL MARK L. IRELAND, of the Motor Transport Corps, U. S. A., has been appointed a member of the National Research Council's Committee on Economic Theory of Highway Improvement, of which Prof. T. R. Agg, of Iowa College, is chairman.

EUGENE I. CRANCH, city sanitary engineer of Port Arthur, Tex., has been appointed assistant engineer of the Kansas State Board of Health. Mr. Cranch graduated in sanitary engineering at the University of Michigan in 1917, and served through the war as second lieutenant in the Sanitary Corps.

G. L. CAMPBELL, formerly assistant county engineer of Saline County, Kan., has been appointed division engineer of the Kansas State Highway Commission, with headquarters at Salina, Kan.

I. E. CARMEL has been appointed superintendent of building inspection for the City of Montreal. Mr. Carmel was formerly in the employ of J. Emile Vanier. He was recently made arbitrator on the LaSalle bridge question, and also drew the plans for the St. Denis tunnel.

GUY WILFRID HAYLER, who was formerly in the service of the chief engineer of the South Park Commissioners of Chicago, and more recently engaged on city planning in San Francisco, Minneapolis and St. Paul, has joined the staff of John Nolen, city planner, of Boston. Mr. Hayler's headquarters will be at Cambridge, Mass.

Clarence Goldsmith, who has been on the engineering staff of the National Board of Fire Underwriters in New York City for the past twelve years, and who served during the war as major in the Construction Division, U. S. Army, has been placed in charge of the recently established engineering office of the board in Chicago.

C. A. Holmquist, with the Sanitary Engineering Division of the New York State Board of Health for eleven years, has been appointed principal assistant engineer of the division, to succeed H. B. Cleveland, resigned.

J. W. Frazier, J. W. Ellms and R. E. Sheal have opened offices in Cleveland, to engage in a ganeral engineering business in the design and construction of water-works, pumping and power plants, water purification and sewage disposal plants, sewer and drainage systems and buildings. The firm is also prepared to handle engineering investigations, compile reports and make appraisals.

L. P. Scott, division engineer of the Kansas State Highway Commission, at Salina, has been appointed division engineer for southeastern Kansas, with headquarters at Fort Scott.

V. K. Woods, well known among contractors and engineers of the Pacific Northwest, and who has made a specialty of building logging flumes, has become assistant manager of the White Spruce Lumber Co.'s operations at Fernie, B. C. The development work of the company will require the building of a 5-mi. flume.

F. C. Frear has been appointed county engineer of Douglas County, Ore., with offices at Roseburg. He succeeds the late M. B. Germond.

William B. Fuller, formerly of the firm of Johnson & Fuller, consulting engineers, New York City, has joined the engineering staff of the Engineering Service Co. of Los Angeles, as hydraulic and sanitary expert.

James C. Boyd, first vice-president of Westinghouse, Church, Kerr & Co., Inc., will retire April 1 to engage in private practice. Mr. Boyd has been connected with the abovenamed corporation for eighteen years, holding successively the positions of consulting and chief engineer and executive vice-president.

L. A. Downs, assistant general manager in the engineering department of the Illinois Central R.R., has been made vice-president and general manager of the Central of Georgia R.R., with offices at Savannah.

Prof. P. B. McDonald, assistant professor of English in the College of Engineering, New York University, has been engaged by the Western Electric Co. to give a series of twenty-four evening talks to engineers on the use of English.

Charles H. Stein, recently assistant general manager of the Central R.R. of New Jersey and the Philadelphia & Reading Ry., has been appointed assistant to the president of the Central of New Jersey. Mr. Stein was born at Baltimore. His first railroad work was with the Western Maryland as rodman, and while with that road he was, successively, transitman, assistant engineer on preliminary surveys and construction, and assistant roadmaster. In 1905 he became assistant supervisor of the Philadelphia & Reading and then supervisor of that road. He entered the service of the Central of New Jersey as engineer of maintenance of way, later was appointed superintendent, and in 1918 he became assistant general manager of the Central of New Jersey and the Philadelphia & Reading.

George W. Hand, since 1918 corporate chief engineer of the Chicago & North Western Ry., has been promoted to assistant to the president, with headquarters at Chicago. Mr. Hand was born at Huntertown, Ind., in 1882. He entered the service of the Chicago & North Western in 1903 and was, successively, tapeman, rodman, instrumentman on location and construction work and on surveys, and assistant engineer on track elevation work. In 1910 he was assigned to specific investigations and state valuation work, later being appointed valuation engineer and a member of the valuation committee of that railroad and of the Chicago, St. Paul, Minneapolis & Omaha, which duties he handled until his appointment as corporate chief engineer.

J. C. Patterson has been promoted from principal assistant engineer of the Erie Railroad to regional engineer, New York region, with office in Jersey City. Mr. Patterson was employed as chief draftsman by the Erie in 1913, was made assistant valuation engineer in 1916 and the next year was made office engineer, which position he held until his appointment as principal assistant engineer.

OBITUARY

Alexander McClure Luper, chief engineer of the Spokane, Portland & Seattle R.R., Spokane & Inland Empire R.R. and Oregon Trunk and Oregon Electric railways, died at Portland, Ore., Feb. 3, from pneumonia. Mr. Lupfer was born in Blaine, Pa., in 1855, and graduated from Lafayette College. During his career he served as assistant engineer of the Great Northern and the Northern Pacific, with the latter on its line in Washington, including the work through Yakima Canyon; as resident engineer of the Chicago, St. Paul & Kansas City R.R.; for several years with the James J. Hill interests as reconnaisance and location engineer of the Great Northern through Washington and Montana, and from 1905 to 1911 as chief engineer of the Spokane & Inland Empire. In 1913 he was elected to the position which he held until the time of his death.

George Barker Burbank, civil and consulting engineer, died of pneumonia Feb. 29, at his home in New York. He was born in Kentucky 75 years ago and was a Civil War Veteran. At the close of the war he directed the building of a section of the Baltimore & Ohio R.R. in West Virginia and later handled similar work on the Denver & Rio Grande. For many years also he was interested in Alaskan railroad construction. As chief engineer of the Cataract Construction Co., Niagara Falls, he was in charge of the construction of the third power plant at the falls. He was more recently in the employ of the City of New York as an engineer on the Ashokan dam work of the Catskill water supply.

Guy Carleton Simpson, a member of the consulting engineering firm of W. E. Simpson Co., of San Antonio, Tex., died in that city after a short illness, Feb. 16. He was born in San Antonio, July 10, 1885.

Thomas H. Loomis, better known as "Colonel" Loomis, died at Steubenville, Ohio, Feb. 11, from heart trouble. He was born at Meriden, Conn., July 6, 1850. He was engineer of construction on the Wabash R.R. through Ohio.

Capt. Felix R. Smith, a Civil War veteran, formerly assistant city engineer of Nashville, Tenn., died at the age of 82, at his home in that city, Feb. 12, from influenza.

William van Schoonhoven Thorne, a well known railroad director and financier of this country, died from pneumonia at his home in New York City, Feb. 6. Mr. Thorne was born at Millbrook, N. Y., in 1865. He graduated from Sheffield Scientific School in 1885, and entered the employ of the Great Northern Ry. as an assistant engineer. He became vice-president of the Erie & Wyoming Valley Ry. and later president of the Delaware Valley & Kingston Ry., from which office he resigned when those properties were bought by the Erie R.R. He was also associated with E. H. Harriman on the Southern Pacific Co., and Union Pacific System.

William Shannon Beattie, 32 years old, city engineer of Charles City, Iowa, died in that city, from influenza, Feb. 7.

John W. Shepherd, managing engineer of the Gem Irrigation district, died at Homedale, near Caldwell, Idaho, Feb. 12, after a brief illness.

William Archibald Duff died in Montreal, Que., on Feb. 23 after several months illness at the age of 46. He received a science degree at McGill University in 1894, and afterwards took up post-graduate work at Columbia

University, New York City, receiving the degree of M.Sc. in 1898. After spending some years in the electrochemistry department of the Ottawa Carbide Co., he took a position with the Westinghouse Electric and Manufacturing Co. at Pittsburgh. He was subsequently placed in charge of the latter's office at Montreal, and in 1907 he was given charge of their business at Winnipeg, where he remained until compelled to retire on account of failing health.

R. L. CALDWELL, construction engineer of the Georgia Railway & Power Co., died recently at his home in Tallulah Falls, Ga., following a short illness. Mr. Caldwell had charge of the construction of the recently installed power plant at Tallulah Falls and of the reservoir below the falls. He had just entered upon the work of the Tugaloo development project of the company.

E. E. DYSARD, president of the Dysard Construction Co., Atlanta, Ga., died at his home in that city recently. For several years previous to the organization of the above named company, Mr. Dysard was superintendent of construction of the Southern Bell Telephone & Telegraph Co.

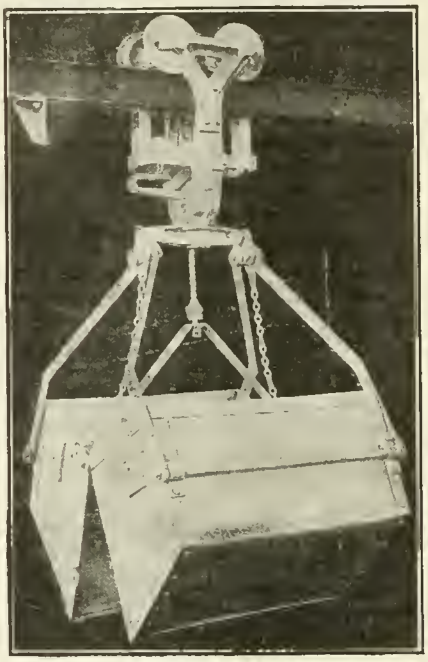
REAR-ADMIRAL ROBERT EDWIN PEARY, Arctic explorer and discoverer of the North Pole, died at his home in Washington, D. C., Feb. 20. He was born at Cresson, Penn., May 6, 1856, and was a graduate of Bowdoin College and Tufts College. He entered the United States Navy in 1881 as a civil engineer, and during 1884-5 was assistant engineer on the proposed route of the Nicaragua Canal. He began his Arctic expeditions in 1886, and in all made eight trips to the northern regions before reaching the North Pole on April 6, 1909.

HENNEN JENNINGS, noted mining engineer, died of heart disease at his home in Washington, D. C., March 5. He was born at Hawesville, Ky., in 1854. After graduation in civil engineering from the Lawrence Scientific School, Harvard University, he went West as an accountant in a California mine. He became interested in mining engineering, and quickly gained a position of eminence in that profession as the result of extensive experience in the United States, Venezuela and South Africa. He was the first president of the South African Association of Engineers and Architects. During the Pan-American Scientific Congress he was chairman of the sections of mining, metallurgy, economic geology and applied chemistry, and during the war he was attached to the Bureau of Mines as voluntary consulting engineer.

J. S. BERRY, superintendent of bridges and buildings of the St. Louis Southwestern Ry. at Tyler, Tex., died at Fort Worth, Feb. 9, from pneumonia. Mr. Berry had been in the service of the St. Louis Southwestern for more than twenty-five years.

One Trip of Paver Bucket Takes Full Batch

A new bottom dump bucket for boom and bucket distribution of concrete in paving has the combination of controlled discharge, a full swiveling motion and automatic opening and closing action. The mechanism controlling the opening and closing action is contained in the trolley frame above the swivel and out of the way of accident. Trips on the boom actuate the mechanism. Due to its full swiveling motion the bucket can be filled evenly, without pyramiding the batch, and can be discharged with the axis of the opening in any position with respect to the slab. The control chains make it possible to limit the opening so as to spread the batch or to throw it wide for quick discharge. All buckets are made to carry the full batch in one trip. They are standard equipment on the new cube paving mixer of the F. C. Austin Co., Inc., Chicago, Ill.


SWIVEL AUTOMATIC DUMP BUCKET FOR PAVING MIXER

BUSINESS NOTES

THE BLAW-KNOX CO., Pittsburgh, and the C. D. PRUDEN CO., Baltimore, have reached an agreement for the joint operation of the two companies. Neither concern will absorb the other, it is reported. More property is to be purchased and enlargements made at the Baltimore plant, including the erection of a new standardized type of steel buildings. Albert C. Lehman, president of Blaw-Knox, is president, and Clarence D. Pruden, president of the Pruden Co., vice-president, of the new combination.

THE RANSOME CONCRETE MACHINERY CO., Dunellen, N. J., has placed its New York office in charge of Lemuel Smith, Jr., F. G. MacDonald and James H. Fitzgerald. Mr. Smith has formerly been assistant sales manager, Mr. MacDonald has been selling Ransome mixers in the New York territory and Mr. Fitzgerald has been in charge of the company's pneumatic mixer department.

TURNER CONSTRUCTION CO. has established an office in the Chamber of Commerce Building, Atlanta, Ga. R. A. Wilson, contract manager, will be in charge.

A. T. SHURICK, for several years a member of the editorial staff of *Coal Age*, from which journal he resigned to serve in the war as Captain of the 209th Engineers, and since his discharge associated with the *Coal Trade Journal*, first as editor and later business manager, has been elected vice-president of F. C. Thornley & Co., Inc., New York City. The company designs, constructs and organizes for operation installations for the mechanical handling of any material on a large or small scale. It also handles in a consulting capacity the valuation and appraisal of properties, preparation of engineering reports, etc.

THE NORWOOD ENGINEERING CO. OF CANADA, LTD., main office and factory, Florence, Mass., has recently transferred its Canadian office from Cowansville, P. Q., to 71A St. James St., Montreal. The contracting firm of Archambault & LeClair, Montreal, will hereafter represent the Norwood Co. in the Province of Quebec.

THE UNITED STATES CAST-IRON PIPE & FOUNDRY CO., Burlington, N. J., announces the opening of a new office in the Scollard Bldg., Dallas, Tex., in charge of T. W. Hanlon, southwestern sales agent.

R. G. STOWELL, formerly with the engineering department of the C., M. & St. P. Ry., has entered the employ of the Carter Bloxonend Flooring Co. and Marsh & Truman Lumber Co.'s Chicago office, as sales engineer.

WILLIAM WARING, who is in charge of the Lakewood Engineering Co.'s new Boston office, as recently announced in these columns, will direct the sales and other service of the company in its industrial products only. Waldo Bros. & Bond, Boston, will continue to handle the Lakewood construction equipment.

THE CHICAGO PNEUMATIC TOOL CO., announces the appointments of Edward A. Woodworth, formerly secretary of the Committee on Standards, U. S. Railroad Administration, and C. E. Laverenz, formerly inspector in the Ordnance Department, U. S. Navy, as special railroad representatives attached to the staff of the manager of Western railroad sales, with headquarters in the Fisher Bldg., Chicago.

A Consolidation of Engineering News and Engineering Record. McGraw-Hill Company, Inc.—James H. McGraw, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. Mehren
Editor

Volume 84 NEW YORK, THURSDAY, MARCH 18, 1920 Number 12

No Bolshevism in France

WE HAVE had evidence in this country that, while reforms will continue to be demanded, our people want an evolutionary, not a revolutionary, procedure. There has been fear, though, that those nearer Russia would be more prone to the Bolshevistic method of accomplishing social reform. It is gratifying to note, therefore, that the breakdown week before last of the French railroad strike was due to the refusal of the French people to countenance a procedure which was generally regarded as a demonstration of a revolutionary movement. Incidentally, in the preceding week the Socialist Congress at Strasbourg refused by a vote of 2 to 1 to submit to the dictation of the Moscow radicals and disavowed Lenin and Trotsky. With further return to normal, both in Europe and here, the example of Bolshevism will become less and less potent. That will come not only through the removal of abnormal conditions, but through wider recognition that the communism of theory has not been translated into fact even under the Bolshevistic régime.

England and Direct Action

FOLLOWING the demonstration in France that the people would have nothing to do with Bolshevism came a test in England on the same issue. And the result there duplicated the French action. The miners voted, provided the unions generally would agree, to attempt to force the nationalization of the mines by direct action, that is, by a general strike. The proposal, laid before a specially convened Trades Union Congress, was voted down, the congress declaring in favor of political action—the use of the ballot. The vote was 1,050,000 for the general strike and 3,370,000 against it. On the other hand, by a vote of 3,732,000 to 1,015,000, the congress favored intensive propaganda on nationalization in preparation for a general election. While there is no doubt, then, of the strength of the sentiment for nationalization, English labor wants to bring it about by orderly means.

How Build Roads This Year?

WE commented recently on the high prices being bid for highway work. Not less noteworthy is the fact that very few bidders are appearing. In New York, Pennsylvania and Ohio some contracts have failed to attract any bidders. Facing this condition, State highway departments are asking how they can get even the vitally necessary roads built this season for, despite high costs, there are admittedly some roads that must be rebuilt—those that cannot be maintained with their inadequate surfacing under present traffic. There are but three answers to the question: Unit price contracts must be let at figures so abnormal that the contractor will be protected within wide limits of cost advances, the States must be willing to allow the contractor the actual increases in cost of materials, freight and labor, or the work must be done by force account. Of the three methods, the second is preferable. It permits of competitive bids on a unit-price basis. In practically all States the law, however, will not permit this form of contract. With legislatures in session in some States it is advisable to attempt to secure legislation permitting this form of contract to be used.

England and Foreign Trade

WE commented recently on the effect of adverse exchange rates in curtailing our foreign trade. Comment then was directed chiefly to the possible effect on domestic prices. Another effect, though, should also occupy our thoughts—that the trade which we will lose will go to other countries. They will be building up their foreign trade at the expense of ours. Of course more favorable exchange rates will be only one factor; Britain, particularly, will take the far-sighted view of extending liberal credits, a thing we have not learned to do. If one wants commentary on the probable future course of trade, he needs merely to reflect that the proposal to renew trade relations with Russia was an English suggestion, while the recent discussion of extension of credits to Germany in the Supreme Council of the Peace Conference is attributed, both as to origin and chief support, to Lloyd George. The rank and file in this country persist in considering the British Empire as a political entity. It is, in fact, a commercial entity. Just now, too, it seems to have more of a business administration than usual. Incidentally, the new British Ambassador to the United States was formerly head of the Board of Trade and bears the reputation in England of being thoroughly awake to all business problems, whether national or international. Here is ample food for thought, particularly as the appropriations committee of the House has just cut the appropriation for the work of our Bureau of Foreign and Domestic Commerce from $1,658,000 to $490,000.

Motor Transport in California

TO what extent the long-haul transportation of passengers and freight by buses or trucks in southern California has developed into an important *business*—not merely a jitney service—is indicated in Mr. Volk's article appearing elsewhere in this issue. The significant fact disclosed by his data is that these motor carriers are competing successfully with the steam and electric railway lines on fairly long hauls, and have, in fact, established a union terminal in Los Angeles for handling their passenger business. It is important in arriving at an estimate of the probable growth of motor transport in other localities, based on the California results, to keep clearly in mind two points which have a determining influence on the financial prospects for this form of service: In the first place, the climate in California makes it possible to operate the motor bus lines the year round, and, secondly, the roads used—concrete with a thin wearing surface of asphaltic oil and screenings—are well adapted to motor traffic. In other colder regions, where snow and ice would interfere not only with the movement of vehicles, but also, in all probability, with the traveller's desire to make a long trip by motor car, the financial returns from an investment in motor vehicles and terminals might not prove attractive. Nevertheless, the results reported are additional evidence of the increasingly important place of the highway in the future development of the country. For the civil engineer the interest lies in the fact that he must build and maintain the track for this traffic.

Codifying Construction Management

CONSTRUCTION engineering is made up of a number of elements. First is the construction technic, that is the knowledge of how actually to reproduce in the structure the ideas conceived by the designer. This is the most common part of construction; it is possessed in increasing degree by the workman, the foreman, the superintendent and the master constructing mind. As the work increases in complication and magnitude the more important thing becomes the science of management, which includes cost control and the disposition of materials and labor so that there is a sufficient flow of both to insure a steady and economical progress of the job. This latter has, of course, been part of the equipment of every successful constructor, but the war, with its monster construction operations, developed the science materially, and what is more required a definite codification of what had been before more or less vague practice. Of such nature was the system of progress planning and recording used at the Philadelphia Army Base and described by Mr. Penrose on another page. This particular system has been criticized as being too elaborate, and indeed any brief description of it would give that impression. But it worked, and it required only a few men and cost relatively little, so that it is probably like many other complicated things—familiarity makes them simple.

Hoover for President

THIS is not the place for political discussion, but we may be pardoned for commenting on a presidential possibility when he happens to be an engineer—the first engineer, so far as we know, to be pressed for that exalted office, since George Washington, surveyor and soldier, was made President. Naturally the serious consideration of Mr. Hoover for the presidency is gratifying to all engineers, even to those who after a weighing of all factors, find they could not support his candidacy. If Mr. Hoover could go into the White House on his own terms and run the affairs of government untrammeled, as he did the Belgian Relief, or relatively untrammeled, as he did the Food Administration, he would give the country's administration a much-needed toning up. But it is the rare man who can go into the White House without heavy advance obligations. Not knowing Mr. Hoover's political affiliations, then, we can wish that Mr. Hoover, or a Hoover, could become President through a popular support so strong as to frustrate the machinations of the politicians. We think we would have little to fear but very, very much to gain through the leadership of a man who not only made monumental successes of the Belgian Relief and the Food Administration, but who in the year following the signing of the armistice helped put half a dozen embryonic governments on their feet. If demonstrated capacity to administer governmental affairs, grasp of the international situation and of fundamentals are criteria of presidential caliber, Hoover is the strongest man today.

Concrete Blocks and the Hudson Tunnel

A CONTROVERSY that was growing to be acute and personal has been quieted by the commission charged with building the Hudson River vehicle tunnel, through its decision against the much-discussed 42-ft. concrete-block tunnel plan. With regard to the technical questions involved, the decision is to be commended because it is favorable to progress, and in this particular enterprise nothing is so badly needed as prompt and rapid progress. Urgent necessity demands that a direct, short-cut crossing of the Hudson be provided at once. The ferries are congested; already their effect in throttling traffic and commerce is very serious, and it will become greater by the time the tunnel is ready to take traffic. The earliest possible inauguration of the tunnel connection, then, should be the present objective. But tunnels are not built by controversy.

With almost startling clearness the studies and discussions of the last few months established a fact that should have been self-evident yet had been all but universally ignored, namely, that there is the same need for highway connection of New York City with the New Jersey mainland as for connection of Manhattan with Brooklyn. Four great East River bridges constitute the Brooklyn connection, but there is no bridge across the Hudson. Here vehicle traffic must depend on ferries, and their capacity and speed limit the traffic. Direct street connection will at once increase this traffic in proportion to the improvement in facilities.

To show the earnings of the tunnel, its engineers estimated conservatively. Calculating on the basis of present traffic over the ferries, they found that the tunnel will be a gold mine. It will not only earn its keep but refund its entire cost in less than a dozen years. Yet only a short time ago anyone could have obtained charters and authorization to build this tunnel as a private money-earning venture!

Since the earning capacity of the tunnel was demonstrated, men engaged in freight haulage have asserted with strongest conviction that the actual traffic through the tunnel will vastly exceed the estimates. They predict that the four roadways of the tunnel will be fully taxed from the very day it starts operation; and this means that both the profits of the enterprise and the benefits it confers on the community will far surpass present expectations. Under such conditions it is certain that more highways across the Hudson must be constructed in a very short time; that the Canal Street tunnel will be but the first of a number of crossings.

Future tunnels can be built with clearer vision than the first one; the first step is notoriously the hardest, and we may be sure that the second and third Hudson River vehicle tunnels will encounter less opposition from apathy and from New York's well-known provincialism, and will not lag so far behind the demand, as does the present enterprise. In their construction, then, more leisure will be available for considering various rival designs and procedures, and it will be more easily practicable to depart from engineering precedent in deciding on their method of construction.

To summarize the situation in blunt terms, we may say that it is not of first importance what the technical details of the Canal Street tunnel project are, so long as they are sound and so long as they assure uninterrupted and reasonably rapid progress. Further, it is unimportant what traffic capacity is provided. There has been much dispute as to whether two lines of traffic in each direction should be accommodated, or three, and in opposition to the tunnel engineers the advocates of three lines seem to have the better of the argument so far. But *Engineering News-Record* believes that all parties interested will gain much more by avoiding further loss of time in starting work than by seeking to attain the nicest adjustment of capacity at the cost of quarreling and delay.

If the commission's decision is commendable as being helpful to progress, it is also to be welcomed as a contribution to the adjustment of technical questions involved in the enterprise. The engineering reports so far published have not made clear just what constructional features of various proposals were objected to, except that the project recommended by General Goethals was condemned in its entirety. So far as could be judged, the chief engineer and the board of consulting engineers did not condemn a 42-ft. tunnel as such, nor a concrete-block tunnel shell, nor a structure of double-deck arrangement, but the combination of these elements, located and arranged as set out on particular drawings. It is a decided relief from the resulting uncertainty to learn through the commission's resolution that the essential objection is to concrete-block tunnel-shell construction in the Hudson River bottom, regardless of diameter and any other element.

Many strong reasons are advanced by the chief engineer and the board for their disapproval of concrete-block construction in the Hudson silt. Among the reasons is the claim of deficient strength. So far as this claim is a statement of expert practical judgment it carries great weight, although in view of the fact that tunnel structures have all been developed by the trial-and-failure method it would seem that a conclusive decision for or against concrete blocks would need to be based on actual trial or experiment. But in so far as the claim is based on stress calculations, the case made out is highly questionable.

So little is known about the stability of subaqueous soils surrounding a tunnel shell that figures of the kind cited by the board at a public hearing two weeks ago (for example, a shear of 1,192 pounds per square inch in the interlock of the blocks) cannot have much meaning, and runs risk of being actually misleading. Indeed, the calculations which yielded these figures, used by the board to condemn concrete-block construction, would equally condemn the tunnel recommended by the chief engineer and the board, and perhaps any other subaqueous tunnel.

In fact, we find ourselves here in a field of most remarkable technical uncertainty. The loading on soft-ground tunnels, and, worse still, on tunnels whose lower portion may in places bear on rock while the upper part is surrounded by soft material, is a thing of which we know very little, so a few pressure measurements (unpublished) are a feeble start toward supplying the required data. What may develop in the near future in the field of tunnel strength calculations is going to be well worth attention. In the meantime it may be hoped that the analytical studies made by the engineers of the tunnel commissions will soon be placed before the profession, in order further to develop this subject.

A Step Forward in Valuation

THROUGH a decision favorable to the railroad company, in the mandamus action of the Kansas City Southern R.R. to compel the Interstate Commerce Commission to admit evidence supporting costs of acquisition in determining land values, the Supreme Court of the United States, on March 8, pointed out the Commission's duty in carrying out the commands of Congress embodied in the Valuation Act. While the decision, as such, does not compel the application of current prices in fixing the "value" to serve as the basis of ratemaking under the new Interstate Commerce law (as many current newspaper reports indicated), it not only orders the admission of evidence in support of this contention but also commands that the terms of the act be carried out as to finding and reporting elements of cost which the Commission had refused to admit in connection with cost of reproduction. A step forward has been made in clearing the way to a final determination.

As indicated in the decision, printed in full on p. 563 the Court was not required to decide "a controversy growing out of duty performed under the statute" but "one solely involving an alleged refusal to discharge duties which the statute exacts." The railroad company had protested against the findings of the Commission in the tentative valuation, basing its complaint on grounds that "present cost of condemnation and damages or of purchase in excess of such original cost or present value" were not considered or included. The Commission then refused to admit additional evidence in support of the company's argument, citing its findings in the Texas Midland case which alleged the impossibility of carrying out the terms of the act in this respect, and which, in turn, referred to the Supreme Court decision in the Minnesota Rate Case as sustaining this viewpoint. Now the Court renders its opinion that the Minnesota finding was for a different purpose and should not affect the present case, particularly as it preceded the Valuation Act.

While the act calls for separate determination of (a) original cost, (b) cost of reproduction, (c) cost of reproduction less depreciation, and (d) other values and elements of value, the new railroad law does not prescribe what basis shall be used in building up the new rate structure. The possibilities of the decision, as regards a basis for rates, are so various that conjecture as to the outcome seems futile. Nevertheless, the importance of the decision is suggested by that portion of the Valuation Act itself which states that "final valuations by the Commission and the classification thereof . . . . shall be prima facie evidence of the value of the property in all proceedings under the act to regulate commerce . . . . and the various acts amendatory thereof, and in all judicial proceedings brought to enjoin, set aside, annul or suspend, in whole or in part, any order of the Interstate Commerce Commission."

Apparently an indictment of overzealous acts and improper assumption of authority by the Commission, the decision in the Kansas City Southern case clearly points out the Commission's duty. It marks a step in definite progress toward a final report on railroad properties.

Planning and Progress on a Big Construction Job—I

How Records Were Kept at Philadelphia Army Base in Order to Plan and Schedule the Work, to Follow the Progress of Construction, and to Control Future Operations

By Charles Penrose
Progress Engineer, Day & Zimmermann, Inc., Engineers, Philadelphia, Pa.

Materials, Labor and Administrative Charts

IN the administrative work related to progress of construction at the Army Supply Base at Philadelphia, there was developed a system of schedules and progress charts, by means of which, and along the lines of executive control of the project, the progress of the work was planned out and followed up from day to day and from week to week. All matters pertaining to progress were delegated to a department created for the purpose—the so-called Progress Department. The department was located in the field and was composed of a force of engineers and assistants forming part of the field staff of the Supervising Engineers.

It is the purpose of this article to describe the methods by which the problems presented were attacked, and to give some detailed description of the system of construction schedules and progress charts, and also, to explain the scheme that was worked out for reporting data of considerably varied nature and from a considerable number of sources. Attempt was made wherever possible to standardize this planning and progress work in a way which would be applicable to other large construction projects; and, within limits, it will be seen to be applicable also to some kinds of industrial enterprise. On the other hand, there is a tendency often to overdo such work as that about to be described and this should be guarded against; furthermore, it must be borne in mind that the scale of the project must be so large as to warrant extensive work of this character.

The first part of the present article treats of the Materials Charts, the Labor Charts and the Administrative Charts, and of the mechanism by means of which the Progress Department was run. In a succeeding issue there will be described those charts and schedules which had to do with the physical progress of the work and with the engineering data at the project.

Of the requirements in military construction work during time of war there stands out one requisite above all else—the requirement for speed. Of the necessities on any large construction project at any time and under all circumstances, a requisite is economy. Speed and economy were the objectives that led to the establishment of the Progress Department at the Philadelphia Base. Then, too, the territorial extent of the work demanded that the major divisions of the construction be formally planned and scheduled, and that careful report of progress be kept for executive information. The aid which systematic co-ordination could bring was perhaps increased by the fact that the project has been carried through by three organizations: the field staff of the Construction Division of the Army, under whose direction the Base was built, the field organization of the General Contractors, the Snare & Triest Co., and that of the Supervising Engineers, Day & Zimmermann, Inc.

At the outset of the construction, that is, in the midsummer of 1918, the Progress Department was established and at once began its work. The idea of such progress work in general was initiated by the Army, and throughout at the Philadelphia Base this work was developed and carried on in the closest touch with Lieut.-Col. E. B. Morden, U. S. A., the Constructing Quartermaster in charge of the construction of the project. It was largely Colonel Morden's constant encouragement and co-operation that lent impetus to the work, and it may be noted that the weekly charts were the form of report by the Constructing Quartermaster to the Construction Division of the Army, at the headquarters in Washington.

What the Philadelphia Base Comprises

Located on the Delaware River at Greenwich Point, the U. S. Army Supply Base at Philadelphia is one of the seven big port terminal developments along the Atlantic seaboard and the Gulf of Mexico put through by the Construction Division of the United States Army.

The project comprises deep-water docks, piers and massive 3-story warehouses; with utilities equipment, railroad facilities, a power plant, and an electrical substation. Its total cost has been about $13,500,000. Nearly 7,000 ft. of wharfage provide berthing space for loading or unloading twelve 500-ft. cargo-carrying vessels, or seventeen of the Hog Island type "A" ships. All slips are 35 ft. deep at mean low tide. With the two main piers respectively 1,500 ft. and 1,320 ft. long, the warehouse capacity at the Philadelphia Base as built is 145,000 tons of cargo, or the equivalent of 7,300 loaded box cars, assuming average loading of 40,000 lb. for each car; in other words, the contents of a freight train 55 miles long. This is exclusive of a railroad deck pier, designed for handling heavy ordnance pieces directly from cars into the holds of vessels.

During the period of construction, a Government Reservation was established at Greenwich Point that covered an area roughly twelve city blocks wide by twenty city blocks long.

The Philadelphia development, while it entailed construction work included under a considerable variety of phases of engineering, was essentially a civil engineering project. The predominating constructional operations were those of dredging, piledriving, wharf work, and reinforced-concrete warehouse construction—all on a large scale. Each of these operations is rather readily adapted to production scheduling and progress charting.

All of these operations were included in the Progress Engineer's charts of physical or work progress to be later described, especially as they related to the engineering data on the project. But there were other and readily apparent factors that entered into the construction organism. There was the material situation to be controlled, in itself at the time a complex situation; there was the human equation represented in the requirements for labor, its estimated capacity for construction accomplishment, its probable "turn-over" rate, the co-ordination of labor classifications and payroll rates, the necessary supervisory force, and other factors entering into labor supply and demand; there were administrative features such as the status of routine work in the purchasing division, the equipment division, the transportation division, the auditing division, and in other departments of an administrative nature at the project; and, finally, there was the important item of unit costs of construction in the field.

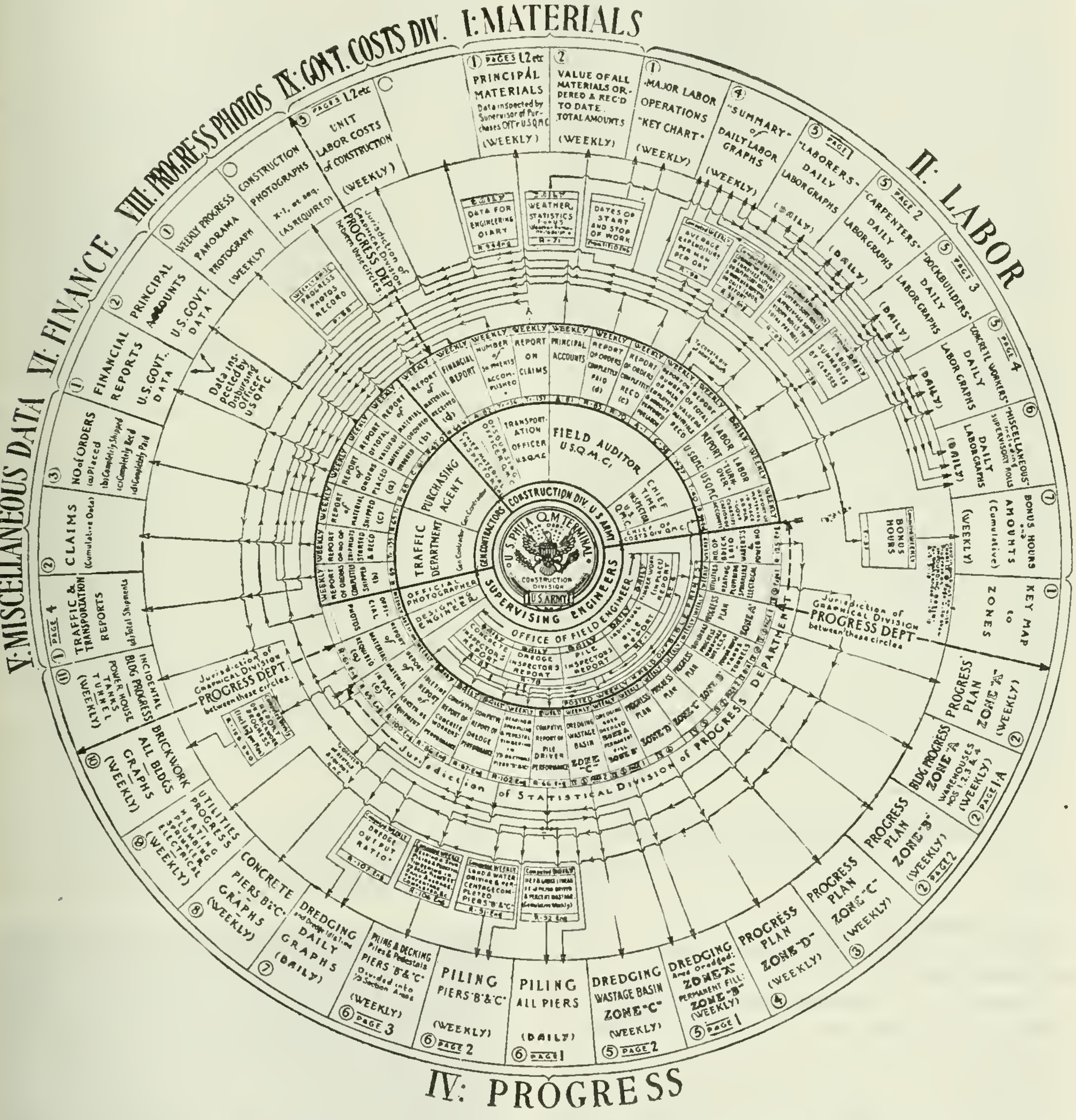

I: MATERIALS
II: LABOR
IV: PROGRESS
V: MISCELLANEOUS DATA
VI: FINANCE
VIII: PROGRESS PHOTOS
IX: GOV'T. COSTS DIV.
PRINCIPAL MATERIALS
(WEEKLY)
VALUE OF ALL MATERIALS ORDERED & REC'D TO DATE. TOTAL AMOUNTS
(WEEKLY)
MAJOR LABOR OPERATIONS "KEY CHART"
(WEEKLY)
"SUMMARY" DAILY LABOR GRAPHS
(WEEKLY)
"LABORERS" DAILY LABOR GRAPHS
(DAILY)
"CARPENTERS" DAILY LABOR GRAPHS
(DAILY)
"DOCKBUILDERS" DAILY LABOR GRAPHS
(DAILY)
"CONCRETE WORKERS" DAILY LABOR GRAPHS
(DAILY)
"MISCELLANEOUS" DAILY LABOR GRAPHS
(DAILY)
BONUS HOURS AMOUNTS (Cumulative)
(WEEKLY)
KEY MAP to ZONES
PROGRESS PLAN ZONE "A"
(WEEKLY)
BLDG PROGRESS ZONE "A" WAREHOUSES
(WEEKLY)
PROGRESS PLAN ZONE "B"
(WEEKLY)
PROGRESS PLAN ZONE "C"
(WEEKLY)
PROGRESS PLAN ZONE "D"
(WEEKLY)
DREDGING ZONE "A" PERMANENT FILL ZONE "B"
(WEEKLY)
DREDGING WASTAGE BASIN ZONE "C"
(WEEKLY)
PILING ALL PIERS
(DAILY)
PILING PIERS "B" & "C"
(WEEKLY)
PILING & DECKING PIERS "B" & "C"
(WEEKLY)
DREDGING DAILY GRAPHS
(DAILY)
CONCRETE PIERS B & C GRAPHS
(WEEKLY)
UTILITIES PROGRESS
(WEEKLY)
BRICKWORK ALL BLDGS GRAPHS
(WEEKLY)
INCIDENTAL BLDG PROGRESS POWER HOUSE TANKS TUNNEL
(WEEKLY)
TRAFFIC & TRANSPORTATION REPORTS
CLAIMS
NO. of ORDERS
FINANCIAL REPORTS U.S. GOVT. DATA
PRINCIPAL AMOUNTS U.S. GOVT. DATA
Data inspected by Disbursing Officer U.S.Q.M.C.
WEEKLY PROGRESS PANORAMA PHOTOGRAPH
(WEEKLY)
CONSTRUCTION PHOTOGRAPHS
(AS REQUIRED)
UNIT LABOR COSTS of CONSTRUCTION
(WEEKLY)
Jurisdiction of Graphical Division PROGRESS DEPT. between these circles
DATA FOR ENGINEERING DIARY
WEATHER STATISTICS
DATES OF START AND STOP OF WORK
BONUS HOURS
FIELD AUDITOR U.S.Q.M.C.
TRANSPORTATION OFFICER U.S.Q.M.C.
PURCHASING AGENT
TRAFFIC DEPARTMENT
CHIEF TIME KEEPER
OFFICIAL PHOTOGRAPHER
DESIGNING ENGINEER
GEN. CONTRACTORS
CONSTRUCTION DIV. U.S. ARMY
U.S. PHILA. Q.M. TERMINAL
CONSTRUCTION DIVISION
U.S. ARMY
SUPERVISING ENGINEERS
OFFICE OF FIELD ENGINEER
PROGRESS DEPARTMENT
Jurisdiction of STATISTICAL DIVISION of PROGRESS DEPARTMENT

FIG. 1. GENERIC DIAGRAM OF THE WORK OF THE PROGRESS DEPARTMENT ON THE PHILADELPHIA ARMY BASE

All subjects were divided according to the following index: I, Materials; II, Labor; III, Construction Equipment; IV, Work Progress; V, Miscellaneous Data; VI, Financial; VII, Index, etc.; VIII, Progress Photos; IX, Government Costs Division.

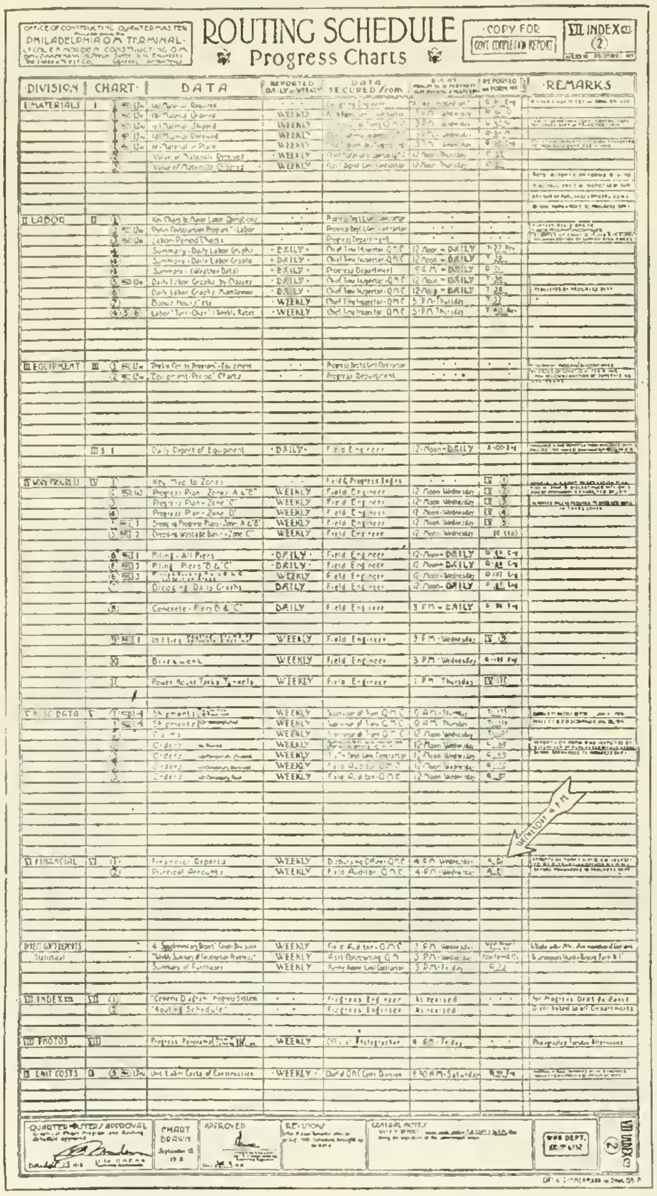
In view of the above, and after analysis, the following phases were selected as those with which the planning and progress work would deal, and each constituted a section in the reports:

The Principal Materials entering into the permanent construction: namely, graphical information was to be assembled on the estimated required quantities of materials, and the quantities respectively ordered, shipped received and "in place." Some *forty materials* entering into the construction were taken to be "principal materials."

Labor—The estimated labor requirements and actual labor supply, wage rates and expenditures, "man days," labor "turn-over," "bonus hours" or overtime pay, overhead supervisory force, etc.

Construction Equipment—This section comprised reports on equipment in service and idle, such as dredges, piledrivers, rolling stock, concrete-mixing plants, etc., both rented and Government owned. Idle time for any equipment was particularly called to attention.

Shipments, Claims, Orders, etc.—Data were graph-



OFFICE OF CONSTRUCTING QUARTERMASTER
PHILADELPHIA Q.M. TERMINAL

ROUTING SCHEDULE
Progress Charts

COPY FOR GOV'T COMPLETION REPORT

VII INDEX (2)

DIVISION	CHART	DATA	REPORTED DAILY or WEEKLY	DATA SECURED from	[illegible]	REPORTED on FORM No.	REMARKS
I MATERIALS	I	(a) Material Required	· · ·	[illegible]	[illegible]	[illegible]	[illegible]
		(b) Material Ordered	WEEKLY	[illegible]	[illegible]	[illegible]	
		(c) Material Shipped	WEEKLY	[illegible]	[illegible]	[illegible]	[illegible]
		(d) Material Received	WEEKLY	[illegible]	[illegible]	[illegible]	
		(e) Material in Place	WEEKLY	[illegible]	[illegible]	[illegible]	[illegible]
		Value of Materials Received	WEEKLY	[illegible]	12 Noon Thursday	[illegible]	
		Value of Materials Ordered	WEEKLY	[illegible]	12 Noon Thursday	[illegible]	
II LABOR	II	Key Chart to Labor Graphs	· · ·	Progress Dept. & Gen. Contractor	· · ·	·	
		Labor Construction Program – Labor	· · ·	Progress Dept. & Gen. Contractor	· · ·	·	[illegible]
		Labor-Period Charts	·	Progress Department	· ·	· · ·	[illegible]
		Summary – Daily Labor Graphs	DAILY	Chief Time Inspector Q.M.C.	12 Noon – DAILY	[illegible]	
		Summary – Daily Labor Graphs	DAILY	Chief Time Inspector Q.M.C.	12 Noon – DAILY	[illegible]	
		Summary – (Weather Data)	DAILY	Progress Department	9 A.M. – DAILY	[illegible]	
		Daily Labor Graphs by Classes	DAILY	Chief Time Inspector Q.M.C.	12 Noon – DAILY	[illegible]	
		Daily Labor Graphs [illegible]	DAILY	Chief Time Inspector Q.M.C.	12 Noon – DAILY	[illegible]	[illegible]
		Bonus Hours, etc.	WEEKLY	Chief Time Inspector Q.M.C.	5 P.M. Thursday	[illegible]	
		Labor "Turn-Over" (Weekly Rates)	WEEKLY	Chief Time Inspector Q.M.C.	5 P.M. Thursday	[illegible]	
III EQUIPMENT	III	[illegible] – Equipment	· · ·	Progress Dept. & Gen. Contractor	· · ·	· ·	[illegible]
		Equipment-Progress Charts	· · ·	Progress Department	· · · ·	·	
	III S 1	Daily Report of Equipment	DAILY	Field Engineer	12 Noon – DAILY	[illegible]	[illegible]
IV WORK PROGRESS	IV	Key Map to Zones	· · ·	Field & Progress Engrs.	· · · ·	IV (1)	[illegible]
		Progress Plan – Zones "A & B"	WEEKLY	Field Engineer	12 Noon Wednesday	IV (2)	
		Progress Plan – Zone "C"	WEEKLY	Field Engineer	12 Noon Wednesday	IV (3)	[illegible]
		Progress Plan – Zone "D"	WEEKLY	Field Engineer	12 Noon Wednesday	IV (4)	
		Dredging Progress Plans – Zone "A & B"	WEEKLY	Field Engineer	12 Noon Wednesday	IV (5)	
		Dredging Wastage Basin – Zone "C"	WEEKLY	Field Engineer	12 Noon Wednesday	[illegible]	
		Piling – All Piers	DAILY	Field Engineer	12 Noon – DAILY	[illegible]	
		Piling – Piers "B & C"	DAILY	Field Engineer	12 Noon – DAILY	[illegible]	
		[illegible]	WEEKLY	Field Engineer	12 Noon Wednesday	[illegible]	
		Dredging Daily Graphs	DAILY	Field Engineer	12 Noon – DAILY	[illegible]	
		Concrete – Piers "B & C"	DAILY	Field Engineer	3 P.M. – DAILY	[illegible]	
		[illegible]	WEEKLY	Field Engineer	3 P.M. Wednesday	IV (9)	
		Brickwork	WEEKLY	Field Engineer	3 P.M. Wednesday	[illegible]	
		Power House Tanks Tunnels	WEEKLY	Field Engineer	3 P.M. Thursday	IV (11)	
V MISC. DATA	V	Shipments [illegible]	WEEKLY	[illegible] Q.M.C.	9 A.M. Thursday	[illegible]	[illegible]
		Shipments [illegible]	WEEKLY	[illegible] Q.M.C.	9 A.M. Thursday	[illegible]	[illegible]
		Claims	WEEKLY	[illegible]	12 Noon Wednesday	[illegible]	
		Orders [illegible]	WEEKLY	[illegible]	12 Noon Wednesday	[illegible]	[illegible]
		Orders [illegible]	WEEKLY	[illegible]	12 Noon Wednesday	[illegible]	[illegible]
		Orders [illegible]	WEEKLY	[illegible]	12 Noon Wednesday	[illegible]	
		Orders [illegible]	WEEKLY	Field Auditor Q.M.C.	12 Noon Wednesday	[illegible]	
VI FINANCIAL	VI	Financial Reports	WEEKLY	Disbursing Officer Q.M.C.	4 P.M. Wednesday	[illegible]	[illegible]
		Principal Accounts	WEEKLY	Field Auditor Q.M.C.	4 P.M. Wednesday	[illegible]	
DIRECT GOV'T REPORTS Statistical		[illegible]	WEEKLY	Field Auditor Q.M.C.	3 P.M. Wednesday	[illegible]	[illegible]
		"Weekly Summary of Construction Progress"	WEEKLY	Asst. Constructing Q.M.	3 P.M. Wednesday	[illegible]	[illegible]
		Summary of Purchases	WEEKLY	[illegible]	3 P.M. Friday	[illegible]	
VII INDEX	VII	"Generic Diagram" Progress System	· · ·	Progress Engineer	As revised	· · ·	For Progress Dept. [illegible]
		"Routing Schedule"	· · ·	Progress Engineer	As revised		Distributed to all Departments
VIII PHOTOS	VIII	Progress Panoramas [illegible]	WEEKLY	Official Photographer	4 P.M. Friday	· ·	Photographs Tuesday Afternoons
IX UNIT COSTS	IX	Unit Labor Costs of Construction	WEEKLY	[illegible] Q.M.C. Cost Division	9.30 A.M. Saturday	[illegible]	[illegible]

QUARTERMASTER'S APPROVAL

CHART DRAWN

APPROVED

REVISIONS

GENERAL NOTES

WAR DEPT.

VII INDEX (2)

FIG. 2. FACSIMILE OF ROUTING SCHEDULE WHICH CONTROLLED PROGRESS AND PLANNING

Original size, 24 x 45 in. One of these large blueprints was posted in each department making reports to the Progress Department.

ically shown which would give the status of routine work in the respective administrative divisions handling these phases.

Financial Data—This section covered Government allotments or appropriations for the project, funds, liabilities, payments, etc.

Government Costs — Unit labor costs were shown graphically from data compiled by the Government Costs Division that was maintained in the field.

Progress of Work—Schedules and progress charts on a production basis were prepared for all of the major construction operations, and *progress plans* of the general condition of the project were reported by zones.

Progress Photographs were taken weekly from an established camera station.

In other words, the Progress Department, in addition to its function of planning, was to be made a clearing house for information pertaining to the engineering and physical progress of the work, as well as for information relating to the status of the whole administrative mechanism necessary to a project of the size. And as matters turned out, the department did become just such a clearing house.

The Progress Reports themselves as worked out were of two classes: *the graphical charts* and *the statistical reports*, and were compiled daily or weekly, according to the particular report. In every instance the form of graphical chart was preferred over that of statistical tabulations, because the graph by its use of curves and other symbols shows the rate of change and growth, as well as the present status, and moreover, permits the conditions to be visualized.

All graphical charts, that is, charts in which curves and progress symbols were employed, were made to standard dimensions and on tracing cloth, from which the necessary blue prints were secured. In those charts where color was used to advantage, the colors were added to the completed blueprints. All of this detail work was done by chart plotters and draftsmen.

Having determined upon the scope of the work and upon the character of report, the next step in organization was to work out a system whereby data which as already seen was of widely varied nature and from a considerably large number of sources, would be reported regularly to the Progress Department.

How extensive a system was necessary, is told in the chart called "Generic Diagram," reproduced in Fig. 1. The number of report forms required, by use of which the several sources reported data to the department, was upwards of two score! Referring to Fig. 1, it is seen that the Progress Charts themselves are grouped at the periphery of the circular diagram, each being embraced under its respective section designated by the roman numerals, such as "I: Materials," etc.; these several sections are listed in the "Index," also on the original drawing but here shown only in the caption. Obviously, the sections correspond with the divisions that have been briefly described already.

The *sources reporting data* for each Progress Chart, and the intermediate steps, are shown in order as one starts at the center of the diagram and works outward. In other words, the reader will observe that the 360 deg. of circumference immediately about the central emblem are divided into the three organizations in the field; namely, Construction Division of U. S. Army, General Contractors, and Supervising Engineers. Each

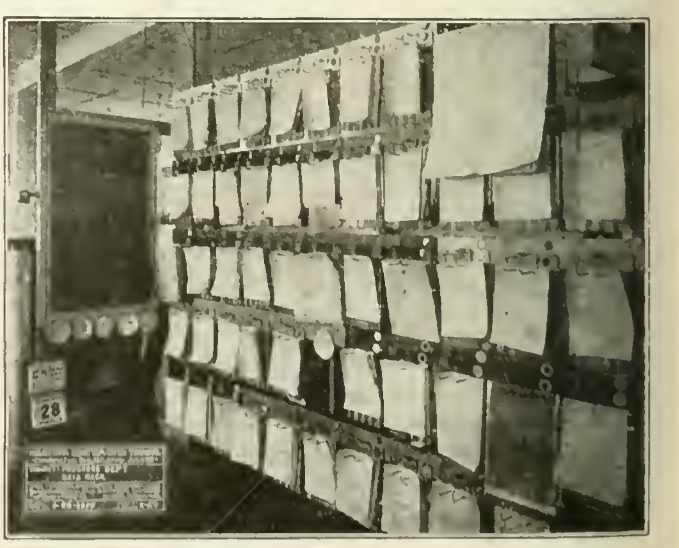


FIG. 3. DATA RACK IN THE PROGRESS DEPARTMENT

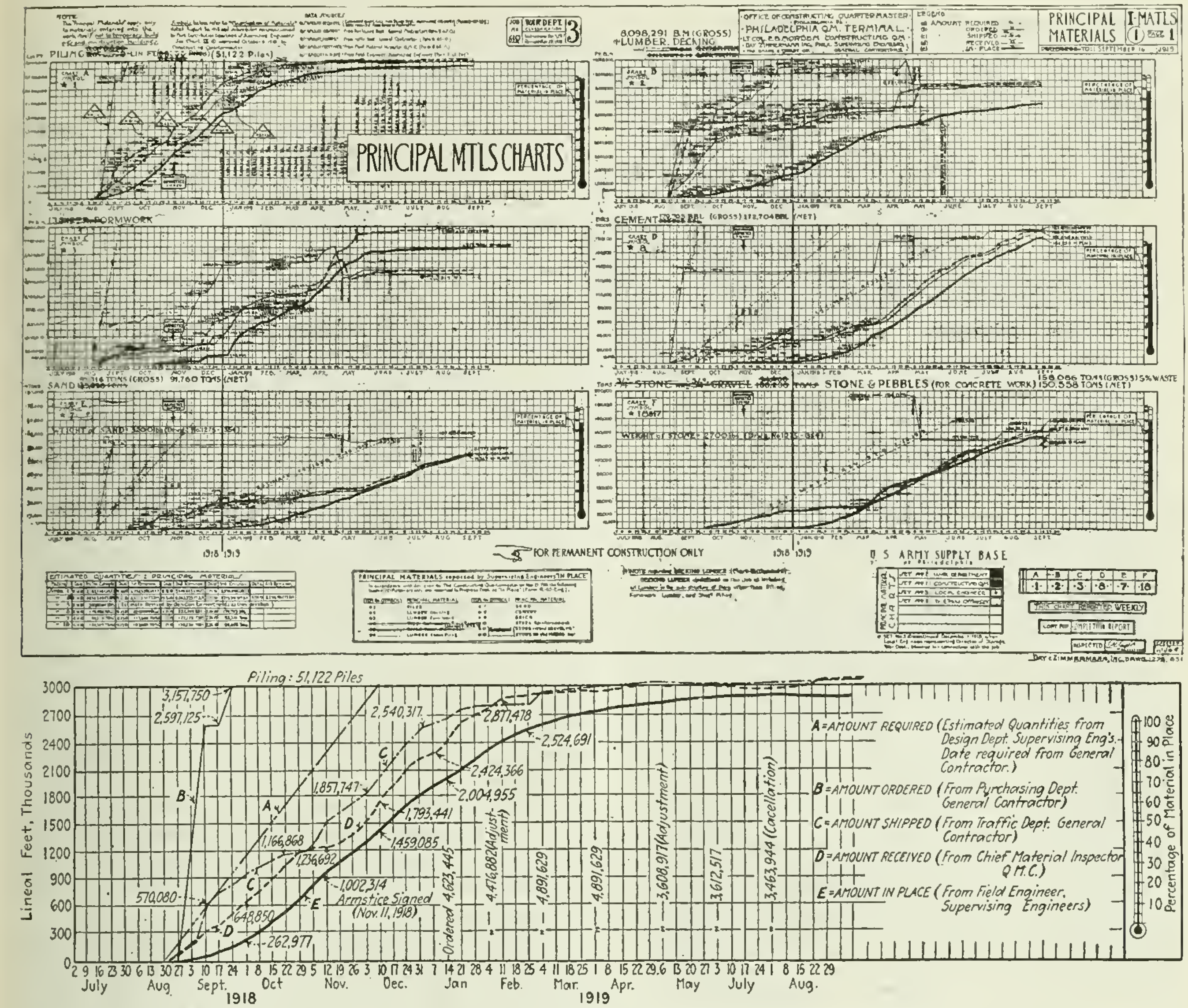


FIG. 4 (ABOVE). FACSIMILE OF 24 x 45-IN. MATERIAL CHART AND (BELOW) DETAILS OF PILING REPORTS SHOWN IN UPPER LEFT OF FACSIMILE

of these three divisions will be seen to be subdivided in the diagram into their several departments or engineering sections as the case may be.

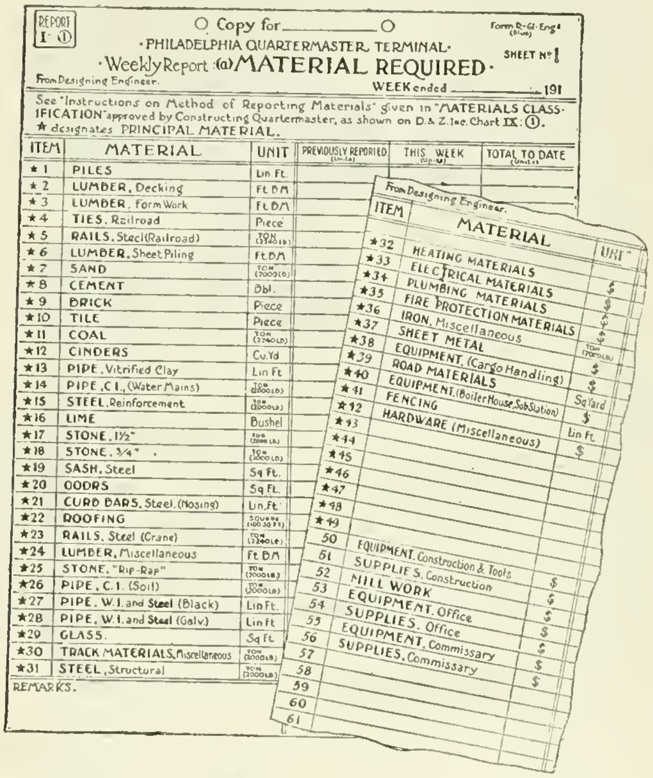
Next in order, still referring to the diagram and proceeding outward, the name and form number of the various printed or mimeographed forms for reporting statistical data to the Progress Department are indicated, and also the fact whether a daily or weekly report. Directional lines with arrow heads show the routing of the form, either directly to a chart, where the data is shown graphically, or through an intermediate "computation" form necessary for digest by Progress Department or for calculations of averages, percentages, etc., by them. The jurisdictions of the two divisions of the Progress Department—that is, the Statistical Division and the Graphical Division — are also outlined. Their work was of considerably different character.

This diagram may appear involved. It is a fact, however, that the establishment of this definite routine for reports, and the general distribution and rigorous enforcement of a "Routing Schedule" which is about to be described, resulted in the whole progress work at the Philadelphia Base being rendered practically automatic in its routine operation. It also allowed the number of men on this part of the administrative work to be materially reduced after the development work of the department was completed.

The Routing Schedule referred to above is given in the table reproduced as Fig. 2. The schedule was designed to give both the "how" and particularly the "when" of making reports. It was drawn up on a 24 x 45 in. tracing, in poster form, from which blueprints were made and prominently posted in every office and department that was to make reports. Those reports which were expected from each, were called attention to in a way that could not be missed by large red cardboard arrows pasted on the blueprint and pointing to the particular form numbers, given in column headed "Reported on Form No." On each red arrow in large white lettering were given the day of the week and hour when due at Progress Department.

Regarding several details of handling information: Immediately upon arrival of these statistical information reports at Progress Department, a clerk stamped them in with time of receipt and filed them on the *data rack* illustrated in Fig. 3. The rack was made up in terms of the roman numerals previously given in the generic diagram (Fig. 1), and each section of files and the corresponding section of supporting rack were painted in designating colors, in such a way that any file out of place would at once be evident. Actual postings of the progress chart tracings, or computations, etc., were made from the data to be found on the data rack. The rack cut down the number of men necessary for routine work.

When one stops to consider what 50,000 wooden piles, for instance, mean as a quantity of construction material —an equivalent of 2,700 railroad cars loaded with piling —and when this material is needed urgently on the basis of war necessity, he can see the executive value of centralized exact information as to the quantities of material "required," "ordered," "shipped," "received," and finally "in place" in the permanent structure, at the time. As a matter of fact, the aid actually given in controlling the material situation was immediate.



REPORT I ①

○ Copy for ________ ○

Form R-G-Eng (Blue)

·PHILADELPHIA QUARTERMASTER TERMINAL·

SHEET Nº 1

·Weekly Report :(a) MATERIAL REQUIRED·

From Designing Engineer.

WEEK ended ________ 191

See "Instructions on Method of Reporting Materials" given in "MATERIALS CLASSIFICATION" approved by Constructing Quartermaster, as shown on D. & Z. Inc. Chart IX: ①.

★ designates PRINCIPAL MATERIAL.

ITEM	MATERIAL	UNIT	PREVIOUSLY REPORTED (Units)	THIS WEEK (Units)	TOTAL TO DATE (Units)
★1	PILES	Lin Ft.			
★2	LUMBER, Decking	Ft BM			
★3	LUMBER, Form Work	Ft BM			
★4	TIES, Railroad	Piece			
★5	RAILS, Steel (Railroad)	TON (2240 lb)			
★6	LUMBER, Sheet Piling	Ft BM			
★7	SAND	TON (2000 lb)			
★8	CEMENT	Bbl.			
★9	BRICK	Piece			
★10	TILE	Piece			
★11	COAL	TON (2240 LB)			
★12	CINDERS	Cu. Yd			
★13	PIPE, Vitrified Clay	Lin Ft			
★14	PIPE, C.I., (Water Mains)	TON (2000 LB)			
★15	STEEL, Reinforcement	TON (2000 LB)			
★16	LIME	Bushel			
★17	STONE, 1½"	TON (2000 LB)			
★18	STONE, ¾"	TON (2000 LB)			
★19	SASH, Steel	Sq Ft.			
★20	OODRS	Sq Ft.			
★21	CURD BARS, Steel, (Nosing)	Lin Ft.			
★22	ROOFING	SQUARE (100 SQ FT)			
★23	RAILS, Steel (Crane)	TON (2240 LB)			
★24	LUMBER, Miscellaneous	Ft BM			
★25	STONE, "Rip-Rap"	TON (2000 LB)			
★26	PIPE, C.I. (Soil)	TON (2000 LB)			
★27	PIPE, W.I. and Steel (Black)	Lin Ft.			
★28	PIPE, W.I. and Steel (Galv.)	Lin Ft			
★29	GLASS.	Sq Ft			
★30	TRACK MATERIALS, Miscellaneous	TON (2000 LB)			
★31	STEEL, Structural	TON (2000 LB)			

REMARKS.

From Designing Engineer.

ITEM	MATERIAL	UNIT
★32	HEATING MATERIALS	$
★33	ELECTRICAL MATERIALS	$
★34	PLUMBING MATERIALS	$
★35	FIRE PROTECTION MATERIALS	$
★36	IRON, Miscellaneous	TON (2000 LB)
★37	SHEET METAL	$
★38	EQUIPMENT, (Cargo Handling)	$
★39	ROAD MATERIALS	Sq Yard
★40	EQUIPMENT, (Boiler House, Sub Station)	$
★41	FENCING	Lin Ft
★12	HARDWARE (Miscellaneous)	$
★43		
★44		
★45		
★46		
★47		
★48		
★49		
50	EQUIPMENT, Construction & Tools	$
51	SUPPLIES, Construction	$
52	MILL WORK	$
53	EQUIPMENT, Office	$
54	SUPPLIES, Office	$
55	EQUIPMENT, Commissary	$
56	SUPPLIES, Commissary	$
57		
58		
59		
60		
61		

FIG. 5. FACSIMILE OF "MATERIAL REQUIRED" WEEKLY REPORT

Original in 8½ x 10¾-in. sheets

But 50,000 piles were only one item of the forty-odd "principal materials" entering into the make-up of the Philadelphia Base and reported in this section of the Progress Charts—construction material which came from all parts of the country, and some of which could only be secured from the Pacific Coast.

Fig. 4 shows the method employed in the weekly reporting of materials on one of the so-called "materials charts." The sheet containing these diagrams is 24 x 46 in. and contains curves for six of the principal materials. There is also shown a close-up of the piling diagram at the left upper part of the chart. Data graphed in these curves were reported to the Progress Department by five different divisions; namely, "material required" was reported by the designing engineer in the supervising engineers' organization; "material ordered," by the purchasing agent of the general contractors; "material shipped," by the Traffic Department of the general contractors; "material received," by the Government's material inspectors; and material "in place," by the field engineer in the supervising engineers' organization.

The way in which certain of these curves change in slope after the signing of the Armistice is interesting, and it, of course, denotes a corresponding change in rate of construction progress. Take, for instance, the heavy solid curve which shows quantity of piling "in-place": It will be observed as shown by the steep upward slope of the curve, that right at Nov. 11, 1918, the rate of progress in this part of the work had reached a maximum, and furthermore that the rate of progress fell off immediately thereafter, not again to be counterparted. So marked was this effect of the signing of the armistice upon various features of the work as a whole, that the date of cessation of hostilities was specially indicated throughout the Progress Charts, as will be seen.

The small "thermometer" scale in each materials chart gives the equivalent *percentage* of the material "in place," and is based upon the data which the corresponding curve gives in terms of unit of quantity. These thermometer scales likewise were found useful to be employed throughout the charts.

Two tabular sheets are shown in Fig. 5, which together comprise one of the statistical report forms, by which materials data were reported weekly by the various sources, and from which the corresponding curves were plotted. The units used were printed on each form.

Other data relating to materials were found necessary to be regularly reported and made part of the progress work, but space permits discussion here only of such charts as are felt to have more or less general application.

What were the estimated labor requirements for the project? Or, stated more precisely, how many workmen were to be necessary at different times and in different parts of the work during the construction, in order to complete the project on time? This was the first problem in the labor section of the progress work—a *labor program* had to be prepared.

Until the signing of the armistice, work at the Philadelphia Base was pushed on a war rush basis looking to the completion of the construction in eight months' time—a comprehensive schedule for a port terminal of its magnitude, under the conditions of labor supply which then existed. The work had been organized throughout on this war basis, administrative body and construction equipment and facilities provided, and the whole weight of the three organizations in the field thrown into the effort to better even the schedule that had been set.

After the signing of the armistice, the war basis of utmost speed gave place logically to a peace basis of greatest economy. By governmental direction all overtime work with its accompanying bonus pay was immediately cut out; and schedules were rearranged. On this peace basis the work was carried through to completion, but with some curtailment of the extensiveness of the original plans.

A graphical chart of the Preliminary Labor Program on a war basis is given in Fig. 6. The curve of estimated number of men required is shown in broken line, and of actual number of men at work in solid line.

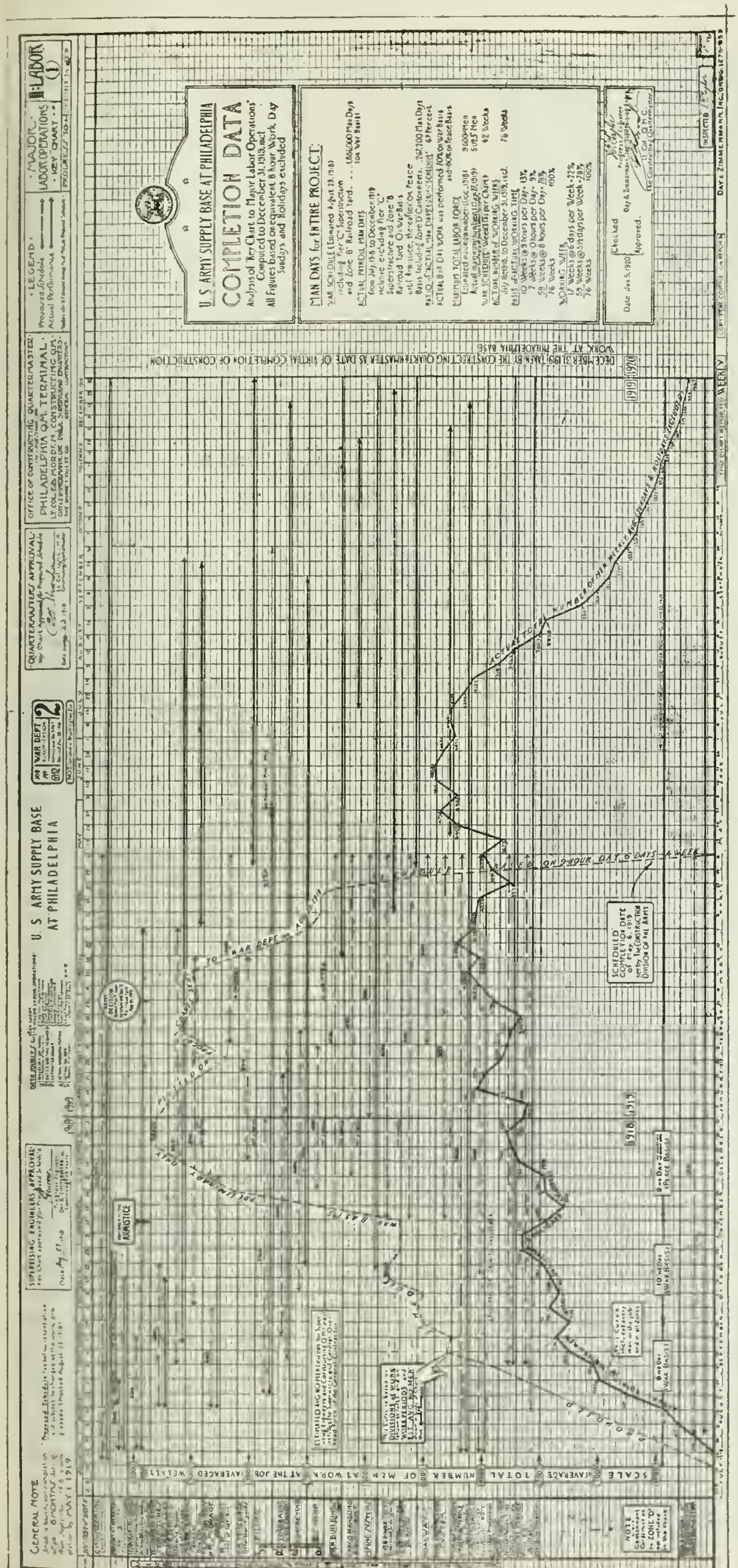


FIG. 6. GRAPHICAL CHART OF PRELIMINARY LABOR PROGRAM MADE BY PROGRESS DEPARTMENT ON PHILADELPHIA ARMY BASE

The conditions of labor scarcity during the wartime period are clearly indicated in the diagram by the amounts by which the actual number of men fall short of the required numbers. The shortage had its effect upon the general rate of progress, and consequently upon the program.

Referring still to Fig. 6, it should be explained that in the preparation of this preliminary program the main constructional operations first were analyzed and tabulated, and then their sequence, the expected dates of start and completion, and the estimated number of men required for each operation, were set down in conference between the Constructing Quartermaster, the general contractors and the supervising engineers. The results only of these analyses of labor requirements are given in the program chart.

In the various other charts in the labor section—and the generic diagram has shown how many there were—the data reported are of so varied natures and of such extensiveness that only the general plan can be explained here and one typical chart reproduced in Fig. 7, termed "Summary of Daily Labor Graphs."

The general plan was this: All labor at the Philadelphia Base was classified in a wage schedule which gave symbols (and rates) to some one hundred and twenty different classifications of wage earners. These one hundred and twenty classifications were grouped into the relatively few main divisions of labor on the work, namely: common labor, carpenters, dockbuilders, concrete workers, etc., and miscellaneous. Progress data were arranged to be reported in a separate chart for each group, together with the summary chart covering all groups and the supervisory and administrative forces in the three organizations in the field. In all of this, the use of the labor symbols, rather than the classifications themselves, speeded up the routine of what otherwise would have been a cumbersome reporting.

In the "Summary of Daily Labor Graphs," reproduced in Fig. 7, the general character will be seen of those Progress Charts which relate to labor, and examples will be found of the

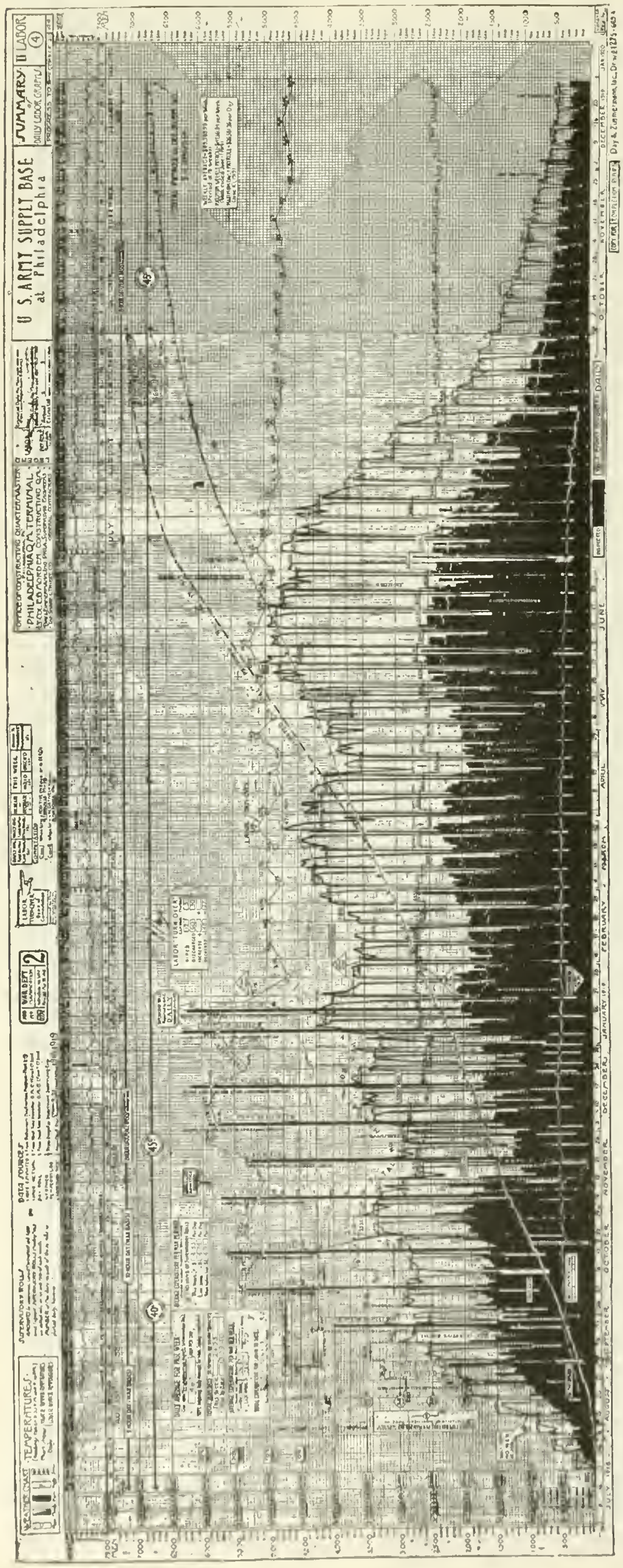


FIG. 7. SUMMARY OF DAILY LABOR GRAPHS AT THE PHILADELPHIA ARMY BASE

This Progress Chart, plotted daily but reported weekly, gave a summary of the labor supply in terms of the total number of men at work at the project each day (in heavy jagged line); gave the daily payroll (in vertical shaded ordinates); gave the total payroll expenditure to date (in light line curve, designated by dollar marks); gave the estimated total payroll expenditure necessary to complete the project (in heavy dash and dot line); gave the average expenditure per workman per day (in step by step curve, averaged weekly; for examples, see average of $7.36 pay per man per day, for week of Oct. 22-29, 1918, and $5.44 pay per man per day, for week after signing of Armistice); gave the "Labor Turn-Over" for the job in terms of weekly percentage rate, averaged over all trades (in light jagged curve in upper half of chart); and finally, gave a record of daily weather and temperature conditions (shown along top of chart). In addition, certain averages and other data for the current week were shown statistically in the blocked out rectangles found at left-hand side of chart.

Maximum figures are read from the chart as follows: Maximum number of men any date, 5,023 men on May 27, 1919; maximum daily payroll any date, $26,500 on June 10, 1919; maximum weekly "turn-over" rate, 28.1 per cent for week ended Nov. 26, 1918; maximum average expenditure per workman per day, $7.36 pay, for week ended Oct. 29, 1918. During the height of wartime construction, the chart shows that a half million dollars was expended about every 28 calendar days for labor payroll at the Philadelphia Base.

following data, graphically expressed:

Number of men a work—daily fluctuations and weekly averages. "Man days" for the week, and total "man days" to date of report. Daily payroll. Labor expenditures to date (cumulative totals). Estimated total labor expenditures, to end of job. Average labor expenditures per workman per day (averaged weekly). Weekly percentage rate of "turn-over" (or replacement in working force). Number of men in administrative and general supervisory forces (daily). Administrative and general supervisory payrolls expressed as percentage of total payroll (weekly and cumulative computations). Fluctuations in basic labor rate. Normal workday (8-hour day, 9-hour day, etc.). Weather and temperatures, as affecting the work performed by labor.

Not shown in this particular chart, but of more than passing interest, is the curve of weekly "turn-over" for common labor, which on one occasion reached the surprising value of 99.2 per cent for the week. In other words, there was the equivalent of nearly one hundred per cent replacement of workers under the classification of common labor, during a period of six working days. Nor was any strike on.

"Bonus" hours, as is well understood, are those hours which are credited to a worker because of overtime that he has made, and are granted according to the overtime rate. The overtime situation at the Philadelphia Base was closely watched and was made the subject of a Progress Chart, although not reproduced here. When overtime work was eliminated, or practically eliminated, directly after the signing of the armistice, the dollars and cents paid because of "bonus" hours dropped from 17.9 per cent of the total payroll for the week preceding Nov 11, 1918, to *three-tenths of one per cent* for the week following! The war basis of utmost possible speed had been supplanted by the peace looking toward greatest possible economy.

Under the section, Administrative Charts, were included charts on the financial status of the project, on unit labor costs of construction as compiled by the Government Costs Division maintained in the field, and on the status of routine work in the administrative offices, such as relating to traffic and transportation, claims, equipment, purchases, accounting, etc. The scheme of reporting data from these sources to the Progress Department was that already described. The charts included in this section are not reproduced here, but gave the means of knowing readily from week to week what the project was costing and whether the various administrative offices were up in their work.

In the above have been described the Materials Charts, the Labor Charts and a reference made to the Administrative Charts at the Philadelphia Base, and some explanation given of the mechanism by means of which the Progress Department was run. In Part II, to appear in a succeeding issue, will be described the charts and schedules which had to do with physical progress of construction and with the engineering features and data at this project.

A New Salary Schedule Urged for Engineers in Federal Service

A JOINT Congressional Commission, known as the Reclassification Commission, has been for more than a year investigating the readjustment of salaries of Federal Government employees of all classes and is to make a report this month. To protect the interests of engineers before this commission, an advisory committee, representing the various classes of engineers in Government service and also architects and naval architects, has been at work for some time and recently presented a brief summarizing its arguments for a material advance in the salaries of engineers in Federal service. Extracts from this brief follow:

SALARY SCHEDULE PROPOSED BY ADVISORY COMMITTEE FOR ENGINEERING SERVICES

Grade	Minimum	Maximum
Senior	$8,400	$12,000
Professional	5,820	7,920
Associate	4,260	5,460
Assistant	2,880	4,080
Junior	1,860	2,580
Aid	1,860	2,700
Junior Aid	1,320	1,680

The engineering services submit herewith a salary scale for application to all engineering services under the Government. This schedule represents the minimum which the general engineering services could endorse and it has been approved by unanimous vote of their representatives. If any lower schedule were proposed, it would become necessary for a number of the engineering services to ask for differentials, which if adopted would defeat one of the primary objects of the reclassification by establishing different schedules for similar responsibilities. Further, the adoption of a uniform scale throughout the engineering services will eliminate competition between different government bureaus for men of essentially the same qualifications.

A higher salary scale is necessary to attract competent men to the engineering services of the Government. Under present conditions it is not possible to secure a sufficient number of eligibles by Civil Service examinations from which to make selections for the engineering services in either the lower or the higher grades. It is improbable that there will be an early return to pre-war economic conditions; therefore the present dearth of eligibles for the higher positions will continue and tend to increase rather than decrease.

Turnover in the engineering service is of vastly greater importance than in other services, because of the greater length of time required to train men to perform the highly technical duties of their offices. One group of laborers can be exchanged for another with very little interruption of the work or reduction of efficiency. This is not possible in the case of the technical services, in which continuous service in a given connection is always accompanied by an increase of efficiency over a period of years.

We regard a reasonable turnover of perhaps 10% or so as desirable and perhaps essential to the maintenance of a healthy state in the services. The actual turnover which exists in the engineering services at the present time is, however, so far in excess of this healthy figure as to constitute a very grave situation. Many still remain in the service in the hope that the reclassification will bring about a revision of salaries that will meet the exigencies of the situation. Should this hope not be realized there is certain to be a very large exodus of the most competent men from the services within the coming year.

Five main lines of evidence are used to show salaries paid in the industries:

1. *Data Gathered by Reclassification Commission*—The Commission has gathered a considerable amount of data as to the salaries being paid in a number of industrial concerns located principally in the northeastern section of the country. This information has been summarized and used as one of the bases of our proposed salary scale. We understand, however, that this summary is subject to revision by the Commission. A composite scale showing the average salaries in all groups is given in Column 1 of Table I.

TABLE I. SALARY SCHEDULES PREPARED BY VARIOUS UTILITIES. SCALE PROPOSED BY ADVISORY COMMITTEE

	1	2	3	4	5	Maximum 6	Minimum 7	Est. Average 8	9
Senior	$8,400	$15,500	$8,910	$10,400	$10,600	$12,000	$8,400	$9,600	$10,760
Engineer	5,100	7,515	6,580	6,410	6,600	7,920	5,820	6,500	6,400
Associate	3,100	4,350	4,100	4,330	4,880	5,460	4,260	4,660	4,190
Assistant	2,350	3,130	3,590	2,770	3,400	4,080	2,880	3,280	3,050
Junior	1,800	2,320	2,320	1,960	2,470	2,580	1,860	2,100	2,135
Aid		1,600	1,880		1,960	2,700	1,860	2,140	
Junior Aid		1,170	1,740			1,680	1,320	1,440	

Column 1. Salary Schedule shown by Reclassification Commission Data.
Column 2. Salary Schedule shown by Engineers' Committee Data.
Column 3. Salary Schedule received by Government Engineers immediately after leaving service.
Column 4. Salary Schedule proposed by Engineering Institute of Canada.
Column 5. Composite salary schedule of representative concerns operating under the "Macy" scale.
Columns 6, 7 and 8. Base Salary Schedule proposed by Scientific and Technical Services.
Column 9. Composite Schedule, average of columns 1 to 5 inclusive.

NOTE: In computing the average salaries shown in column 8, we have uniformly added to the mimimum of each grade an amount equal to one-third of the range in that grade. Column 4 has similarly been reduced from specified minimum values by increasing each minimum by the same percentage as in the case of column 8.

2. *Data Gathered Directly from the Industries by this Committee*—In view of the fact that practically the entire country competes for the services of the government's engineering personnel, we have deemed it proper to gather additional data as to the salaries paid in other sections of the country. Definite salary schedules for substantially all grades of engineers were obtained directly from eleven large private concerns. These included several large public utility corporations, consulting engineering firms and one large manufacturing company. The names of these companies are given in Table II, together with schedules paid by each company. From these data a weighted average salary scale has been determined which is shown in Column 2 of Table I.

3. *Salaries Received by Engineers on Leaving the Government Service*—Data obtained by the Commission from the various bureaus showing salaries received by technical men on leaving the Government service were made available to the engineering committee. The data as supplied by the Commission were grouped by services and it was not possible in that form to interpret correctly its significance. We have accordingly regrouped and summarized it by grades in accordance with the Commission's proposed reclassification. A few additional cases known to the committee have been added to the senior grade only. Since these figures are the averages over a long period of years they are obviously too low to represent existing industrial salaries. This should be borne in mind in making comparisons. The salary scale thus prepared is given in Column 3 of Table I.

4. *Salary Schedules Proposed by the Engineering Institute of Canada*—The Engineering Institute of Canada has recently proposed standard classifications and salary scales for engineers. The schedule classifies engineers employed by railways, municipalities, industrial firms, large public utilities, and the public works department of Canada, and states the minimum salary which should be paid in each case. A composite scale representing the average compensation proposed for engineers equivalent in responsibility as measured by minimum experience requirements, to the grades proposed by the Reclassification Commission, has been prepared and is tabulated in Column 4 of Table I.

5. *Salary Schedule of the War Labor Adjustment Board*—In Column 5 appears a composite salary scale of three representative concerns operating under the "Macy" scale. The data for this shedule were collected by the committee, but it is understood that they are in substantial agreement with that collected by the Commission. It is believed that the Naval Architectural Service in the commercial field has more nearly reached post war stabilization than any other of the engineering services. For this reason special weight should be accorded this schedule.

Salary Schedule Proposed—In Columns 6, 7 and 8 of Table I is given the salary schedule proposed to the Commission by this committee. This schedule is the one referred to at the beginning of this brief and is proposed as a general schedule for all engineering services.

The data presented above affords substantial support to the proposed salary scale. Summarizing the data presented in Table I, it will be seen that the average proposed salary scale shown in Column 8 is somewhat above the salary scale shown in Column 1 compiled from industrial concerns. The salary schedule shown in Column 3, compiled from figures representing the salary received by technical men on leaving the Government service is in substantial agreement with the proposed scale. It should be taken into account, however, that these figures represent salaries received by men who have left the service during a long period of years and, in many cases, go back to the time when general salary schedules were much lower than those prevailing at the present time, so that this scale cannot be regarded as representing salaries equal to what men of the same qualifications could secure at the present time.

In case of the other two salary schedules, namely, those given in Columns 2, 4 and 5 of Table I, the figures are in general somewhat in excess of the base scale proposed by this committee. Individual figures range both above and below the proposed scale. A composite schedule comprising the average of the salaries shown for the professional grades in Columns 1 to 5 inclusive has been calculated and is shown in Column 9. This composite schedule is slightly in excess of the proposed schedule in some grades and below it in others, but on the whole there is substantial agreement between the two.

Professional salaries paid in the industries are now being revised upward. In order to form a proper judgment of the merits of the proposed salary scale it is necessary to take into account this upward trend. Statements made by large private employers of engineers show that the readjustment of engineering salaries to meet present economical conditions is just getting well under way and may be expected to continue for an indefinite period. Unless this is taken into account by the Commission in fixing a salary scale, such scale may become antiquated almost by the time it can be put into effect. Because of this fact any scale proposed now should be somewhat in excess of the average salaries paid in the industries.

The proposed scale is therefore substantially what is now required to place the Government's engineering services on a competitive basis. Should there occur further material increases in industrial salaries a differential would have to be added in order to maintain the necessary competitive relation. The proposed scale represents therefore the minimum that can logically be considered at the present time.

TABLE II. SALARY SCHEDULES IN FORCE IN ELEVEN PRIVATE ENGINEERING CONCERNS.

	1	2	3	4	5	6	7	8	9	10	11
1	$22,000	$30,000	...	....	$12,500	$10,000	$15,000	$20,000	$10,000	$12,000	$8,000
2	8,100	3,700	$4,800	$9,000	8,750	8,000	6,000	15,000	5,200	6,000	....
3	3,750	3,180	3,300	5,400	6,000	5,000	4,500	4.000	3,700	4,300	4,800
4	..	2,150	2,265	3,800	3,900	3,500	3,200	3,300	2,560	3,350	3,300
5	2,700	1,690	1,980	2,400	2,700	2,700	1,950	2,400	2,400	......	..
6	1,250	1,280	1,650	1,800	2,000	1,800	..	1,500	1,500	.....	...
7	......	900	1,440	1,200	1,300	1,200	1,200	1,200	920	....	...

The schedules shown above were obtained from the following firms. We are not free to state which scale applies to each firm: Great Western Power Co.; Southern California Edison Co.; Westinghouse Electric and Mfg. Co.; J. G. White & Co.; Hugh L. Cooper & Co.; Sanderson & Porter; Dwight P. Robinson, Inc.; a large New York structural company; three of the country's largest shipyards.

Decision Favors Railroad in Land Valuation Case

Supreme Court Sustains Kansas City Southern in Action Against Commission To Find Costs of Acquisition

THE Supreme Court of the United States, on Dec. 8, handed down a decision favoring the railroad company in the mandamus action of the Kansas City Southern R.R. to compel the Interstate Commerce Commission to admit evidence in proof of costs of acquisition for determining land values, in connection with the provisions of the Valuation Act, as cited below in the decision. The court not only ordered such admission of evidence, but directed the Commission to carry out the commands of Congress as embodied in the Act, particularly as regards finding the cost of reproduction and, separately, cost of acquisition.

The opinion of the court, which was delivered by Mr. Justice White, is printed below in full:

The Act of Congress of March 1, 1913 (37 Stat. 701), amending the "Act to regulate commerce," imposed the duty upon the Interstate Commerce Commission (section 19a) to "investigate, ascertain, and report the value of all property owned or used by every common carrier subject to the provisions of this Act." Specifying the steps to be taken in the performance of the general duties thus imposed, the same section commanded as follows:

"First. In such investigation said Commission shall ascertain and report in detail as to each piece of property owned or used by said carrier for its purposes as a common carrier . . . the cost of reproduction new, the cost or reproduction less depreciation, and an analysis of the methods by which these several costs are obtained and the reasons for their differences, if any . . .

"Second. Such investigation and report shall state in detail and separately from improvements the original cost of all lands, rights of way, and terminals owned or used for the purposes of a common carrier, and ascertained as of the day of dedication to public use, and the present value of the same, and separately the original and present cost of condemnation and damages or of purchase in excess of such original cost or present value.

* * * * * * *

"Fifth. . . . (8th par.) Whenever the Commission shall have completed the tentative valuation of the property of any common carrier, as herein directed, and before such valuation shall become final, the Commission shall give notice by registered letter to the said carrier, . . . stating the valuation placed upon the several classes of property of said carrier, and shall allow thirty days in which to file a protest of the same with the Commission. . . .

"If notice of protest is filed the Commission shall fix a time for hearing the same, and shall proceed as promptly as may be to hear and consider any matter relative and material thereto . . . All final valuations by the commission and the classification thereof shall be published and shall be prima facie evidence of the value of the property in all proceedings under the Act to regulate commerce as of the date of the fixing thereof, and in all judicial proceedings for the enforcement of the Act approved February 4th, 1887, commonly known as 'the Act to regulate commerce,' and the various Acts amendatory thereof, and in all judicial proceedings brought to enjoin, set aside, annul or suspend, in whole or in part, any order of the Interstate Commerce Commission."

Pursuant to these requirements the Commission proceeded to investigate and report the value of the property of the Kansas City Southern Railway Company. Upon completing a tentative valuation, the Commission gave the notice required by the statute to the Railway Company, which thereupon filed a protest against such valuation on the ground that in making it the Commission had failed to consider and include the "present cost of condemnation and damages or of purchase in excess of such original cost or present value." Upon the subject of the protest, the Railway Company took a large amount of testimony and much was also taken by the Commission, both parties having incurred considerable expense in the matter.

Pending this situation, in order that the excessive expense of taking each individual parcel and showing what it would cost to acquire it or a right of way over it by purchase or condemnation might be avoided, an agreement was entered into between the Director of the Bureau of Valuation of the Commission, C. A. Prouty, and the Railway Company, that in the event the Commission should decide that evidence upon the cost of acquiring land by purchase or condemnation would be received by it, the Bureau of Valuation would recommend to the Commission the percentage or multiplier of the naked value of the land, to be used for the purpose of reaching the railway cost of acquiring the same.

At that time there was also pending a protest concerning a tentative valuation made by the Commission as to the property of the Texas Midland Railroad Company, raising the same question as to error committed in failing to carry out the provisions of the statute concerning the present cost of condemnation, etc., in which case the Commission overruled the protest, holding that the provision of the statute in question was not susceptible of being enforced or acted upon for reasons stated by the Commission in part as follows (I. C. C. Val. Rep. 1, p. 54 *et seq.*):

"However, the direction in paragraph 'Second' for the ascertainment of the present cost of condemnation and damages or of purchase in effect calls for a finding as to the cost of reproduction of these lands. Must this be done, and can this be done? It seems elementary that the cost of reproduction can be estimated only by assuming that the thing in question is to be produced again, and that if it is to be produced again, it is to be taken as not existent. It seems sophistry to contend that the lands of the railroad can be produced again at a cost to the railroad without first making the assumption that they are no longer lands of the railroad; and this necessary assumption carries with it the mental obliteration of the railroad itself.

"Considerable testimony was produced to the effect that in the acquisition of a railroad right of way it is necessary for the carrier to pay sums in excess of the value of the land if measured by the present or market value of similar contiguous lands, and this because of the elements which have been enumerated and embraced in the protest, such as cost of acquisition, damages to the severed property, cost of buildings and other improvements, accrued taxes and various incidental rights.

* * * * * * *

"We are unable to distinguish between what is suggested by the carrier in this record and nominally required by the act and what was condemned by the court (in the *Minnesota Rate Cases*) as beyond the possibility of rational determination; nor is there any essential difference in the actual methods there employed and those now urged upon us. Before we can report figures as ascertained, we must have a reasonable foundation for our estimate, and when, as here, if the estimate can be made only upon inadmissible assumptions, and upon impossible hypotheses, such as those pointed out by the Supreme Court in the opinion quoted, our duty to abstain from reporting as an ascertained fact that which is incapable of rational ascertainment, is clear.

* * * * * * *

"Because of the impossibility of making the self-contradictory assumptions which the theory requires when applied to the carrier's lands, we are unable to report the reproduction cost of such lands or its equivalent, the present cost of acquisition and damages, or of purchase in excess of present value. The present value of lands as found by us appears in the final valuation, appended hereto."

Applying the ruling thus made to the protest which was pending in this case, the Commission gave notice to the Railway that the agreement made with the Director of the Bureau of Valuation concerning the method of proof would be treated as not further operative; and thereafter when an offer was made by the Railway before an examiner of the Commission of further testimony concerning the subject in hand, it was excluded because in conflict with the ruling announced in the *Midland* case. The Commission sustained this action of the examiner on the ground that that officer had rightly held that the ruling in the *Midland* case was controlling; and the Commission therefore decided that no further testimony on the particular subject would be heard in this case, and that it would make no report concerning that subject.

This suit was then brought to obtain a mandamus to compel the Commission to hear the proof and act upon it under the statute. The amended petition, after reciting the facts as we have outlined them and making the appropriate formal averments to justify resort to mandamus, alleged:

> "That the refusal of respondent to investigate and find such present cost of condemnation and damages or of purchase in excess of original cost or present value of relator's lands will result in great wrong and injury to relator; by way of illustration, such refusal will result in a finding by respondent of a value of but $60,000 with respect to parcels of land acquired by relator by judicial award in condemnation proceedings during four years immediately preceding such valuation at an actual cost to relator of $180,000; and in the aggregate will result in a finding with respect to said lands at least $5,000,000 less than the value so directed by the Act of Congress above mentioned to be found."

It was further averred, with considerable elaboration, that the petitioner stood ready to produce proof to meet the requirements of the statute which was neither speculative nor impossible to be acted upon, since it would conform to the character of proof usually received in judicial proceedings involving the exercise of eminent domain.

The Commission in its answer, either stating or conceding the history of the case as we have recited it, and summarily reiterating the grounds for the refusal by the Commission to receive the proof or report concerning it, challenged the right to the relief sought. A demurrer to the answer as stating no defense was overruled by the trial court, which denied relief without opinion. In the Court of Appeals, two judges sitting, the judgment of the trial court was affirmed by a divided court, also without opinion, and the case is here on writ of error to review that judgment.

It is obvious from the statement we have made, as well as from the character of the remedy invoked, mandamus, that we are required to decide, not a controversy growing out of duty performed under the statute, but on solely involving an alleged refusal to discharge duties which the statute exacts. Admonishing, as this does, that the issue before us is confined to a consideration of the face of the statute and the non-action of the Commission in a matter purely ministerial, it serves also to furnish a ready solution of the question to be decided, since it brings out in bold contrast the direct and express command of the statute to the Commission, to act concerning the subject in hand, and the Commission's unequivocal refusal to obey such command.

It is true that the Commission held that its non-action was caused by the fact that the command of the statute involved a consideration by it of matters "beyond the possibility of rational determination," and called for "inadmissible assumptions," and the indulging in "impossible hypotheses" as to subjects "incapable of rational ascertainment," and that such conclusions were the necessary consequence of the *Minnesota Rate Cases.* (230 U. S., 352.)

We are of opinion, however, that, considering the face of the statue and the reasoning of the Commission, it results that the conclusion of the Commission was erroneous, an error which was exclusively caused by a mistaken conception by the Commission of its relation to the subject, resulting in an unconscious disregard on its part of the power of Congress and an unwitting assumption by the Commission of authority which it did not possess. And the significance which the Commission attributed to the ruling in the *Minnesota Rate Cases,* even upon the assumption that its view of the ruling in those cases was not a mistaken one, but illustrates in a different form the disregard of the power of Congress which we have just pointed out, since, as Congress indisputably had the authority to impose upon the Commission the duty in question, it is impossible to conceive how the *Minnesota Rate* ruling could furnish ground for refusing to carry out the commands of Congress, the cogency of which consideration is made particularly manifest when it is borne in mind that the *Minnesota Rates Cases* were decided prior to the passage of the Act in question.

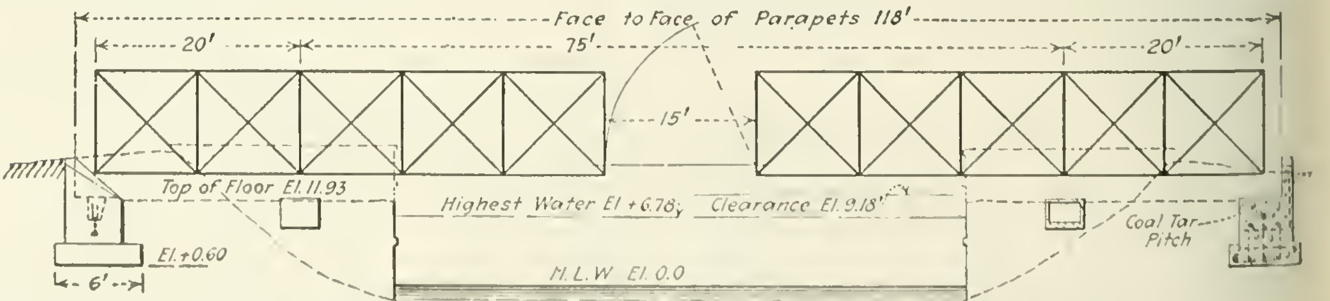
Finally, even if it be further conceded that the subject-matter of the valuations in question which the Act of Congress expressly directed to be made necessarily opened a wide range of proof and called for the exercise of close scrutiny and of scrupulous analysis in its consideration and application, such assumption, we are of opinion, affords no basis for refusing to enforce the Act of Congress, or what is equivalent thereto, of exerting the general power which the Act of Congress gave, and at the same time disregarding the essential condition imposed by Congress upon its exercise.

The judgment of the Court of Appeals is therefore reversed with directions to reverse that of the Supreme Court, and direct the Supreme Court to grant a writ of mandamus in conformity with this opinion.

[Many current newspaper reports following the decision apparently led to widespread belief that it ordered recognition of present prices in the basis of value to be used under the rate-rule of the new Interstate Commerce Law. Editorial comment appears on p. 552.—Editor.]

Bascule Lift Span Between Cantilevers

FOR reasons of simplicity and economy, a remarkable type of structure was adopted when it became necessary to build a bridge with draw span across a narrow strait between the Islands of Bohol and Panglao, Philippine Islands, last year. Frequent passage of sailing craft through the strait made it necessary to provide the movable span. The Bureau of Public Works, Philippine Islands, designed the structure of timber on account of the excessive cost of steel. "A unique scheme was conceived for providing the required opening," states C. E. Gordon, chief designing engineer, in the *Quarterly Bulletin, Bureau of Public Works,* "by throwing two timber cantilever spans out from each bank and completing the connection by a hinged counterweighted lift section. The lift section is provided with a hand-power windlass, and the span can be opened at any time by the two attendants." The sketch herewith pictures the arrangement. Each arm of the bridge cantilevers 20 ft. to the bascule opening.

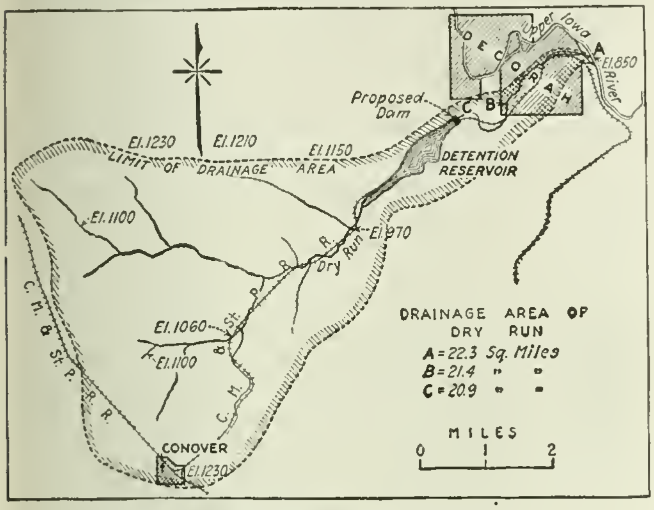


TIMBER BRIDGE WITH DRAWSPAN BETWEEN CANTILEVERS

Flood-Protection Reservoir for Decorah, Iowa

Dam and Retarding Basin Recommended for Flashy Stream Which Floods City of 4200—Storm Records

APPLICATION of the detention-basin system of flood control for the protection of a small city has been recommended in a report on flood relief for Decorah, Iowa, made by Alvord & Burdick, consulting engineers, Chicago. The present population is about 4200, but as the flooded area contains 33% of the population the condition is serious, while the extent of the flood damage is considered by the engineers to justify an expenditure as high as $250,000 for protection, although their proposed works would cost only $120,000.



PLAN OF FLOOD-PROTECTION RESERVOIR AT DECORAH, IOWA

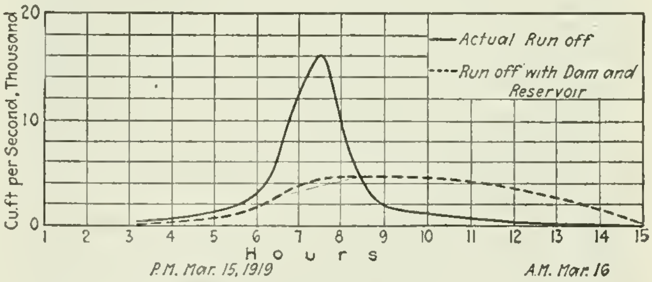
A small stream known as Dry Run, flowing diagonally across the residence district to the Upper Iowa River, has a steep slope of 30 to 50 ft. per mile, largely in rock, and normally it carries a small flow or is dry. Its drainage area is funnel-shaped, with the neck in the city. It covers only 20 square miles, and is characterized by steep slopes and impervious surfaces, with numerous ravines, the average surface slope being about 40 ft. per mile. Thus the rainfall is delivered rapidly to the creek, even when the soil is not frozen or saturated, so that the run-off follows close after the rainfall. Even floodwater confined within the banks has a velocity of 30 to 50 ft. per minute in a channel having a cross-section of not over 500 square feet. Such a condition tends to result in severe scouring of the channel.

The great flows have resulted from short storms of high intensity, with the flood crest following the rainfall at an interval of only about an hour. In 1902, 1916 and 1919 the stream flooded an area several hundred feet in width, causing much damage and some loss of life. These three floods were of about equal intensity, with a peak run-off of about 16,000 cubic feet per second, but on the basis of other storms in this locality it is thought reasonable to expect and provide for future run-offs 60% greater, or about 26,000 cubic feet per second.

Four principal methods of relief were considered: (1) Raising the houses above flood level; (2) building a dam across Dry Run and an outfall tunnel to the river; (3) enlarging and straightening the channel to carry off the floodwater, and (4) building a dam to form a storage or detention basin which will hold back the peak flow and will have outlets giving a gradual discharge after the storm. High cost or inadequate protection led to the elimination of the first three methods.

According to the general plan recommended, an earth dam would be built across the stream about two miles above the city, with concrete conduits having an aggregate discharge capacity of 5000 cubic feet per second. Its crest would be 40 ft. above the bed of the creek, with a spillway 100 ft. long at an elevation of 30 ft. This would provide for floods of the intensity so far experienced, without any overflow of the existing channel. It would give a 2½-ft. freeboard even for the heavier storm considered as a possibility, although during such a storm the flow below the dam would exceed the capacity of the present channel. Diversion of the Chicago, Milwaukee & St. Paul R.R. would be necessary for about one-half mile on each side of the dam.

Storms of high intensity rather than of long duration cause the floods at Decorah. Rainfall in this district in May averages 4⅓ in., but in May, 1902, it reached 11.62 in., with a record of 3.35 in. for May 21, the day of the flood. As the soil had been saturated by previous rains, the run-off was unusually rapid and destructive. On June 1, 1916, a storm from 5:30 to 7 p.m. gave a total rainfall of 3.21 in., with flood results approximately the same as in 1902. On Mar. 15, 1919, the main storm lasted only 45 min. but gave a total precipitation of 2.18 in. The stream was out of its banks for only about two hours, while in eight hours the run-off had returned to normal conditions. The maximum rate of flow is computed to have been 16,000 cubic feet per second. In the accompanying diagram are shown the rate of flow for this storm and its probable rate if the proposed dam had existed. This shows that the peak of a two-hour flow outside the banks would have been spread over several hours of low flow confined within the channel of the creek.



STORM RUN-OFF WITH AND WITHOUT RETARDING RESERVOIR

Heavy rains of long duration are the conditions on most streams where flood-protection works have been necessary, the nearest approach to the Decorah condition, according to the report, having been the Mill Creek flood at Erie, Penn., Aug. 3, 1915. This came about five hours after a four-hour storm giving a total rainfall of 4.31 in. on a drainage area of 13 square miles. Reference is made by the report, however, to the storm of Aug. 8, 1906, at Madison, Wis., with a rainfall of 3.6 in. in one hour and 5 in. in two hours. As this is in the same storm belt as Decorah, it has a direct bearing upon the possibilities of future storms at that place, and consequently upon the plans for protection works.

After the storm of March, 1919, the Decorah city authorities engaged Alvord & Burdick, consulting engineers, Chicago, to investigate and report upon flood protection works. Surveys in connection with this were made by A. R. Coffeen, city engineer. The report of Alvord & Burdick was submitted in September, and from it the above information has been compiled. The engineer's estimate includes the following main items: Earth dam, $42,000; outlets and drift barriers, $25,000; railway relocation, $20,000; land, $2500; channel improvement and bridge changes, $15,240; total, $120,000.

Experiences in Water-Waste Reduction

An experience meeting devoted to water-waste reduction was held on Feb. 18 by the New York Section of the American Water Works Association. D. W. French, superintendent Hackensack Water Co., Hoboken, N. J., outlined the successful use of the aquaphone in detecting leaks in mains and services. In a district now having 116 mi. of water main the water accounted for twenty years ago was 55 per cent of the total supplied to the section, whereas in 1919 it was 74 per cent.

George C. Andrews, water commissioner, Buffalo, N. Y., said that in a two-year campaign against water waste the average daily pumpage had been reduced from 250,000,000 to 200,000,000 gal. a day, and the daily per capita consumption from 330 to 260 gal. A proposition to install a larger number of meters was turned down by the governing authorities of the city two years ago, but within a few weeks an appropriation for 10,000 meters was voted without a dissenting vote.

A. W. Cuddeback, engineer and superintendent, Passaic Water Co., Paterson, N. J., said that following the extreme cold weather and the high consumption of the winter of 1917 the use of meters was increased. To this is attributed the fact that the winter consumption peak this year is lower than it has been for five years past. This is in the Paterson district where 85 per cent of the services are now metered and where the consumption in 1919 averaged 61 gal. per capita per day—but this does not include 6,000,000 gal. of raw water daily supplied to six or seven silk mills. In the Montclair district some twelve years ago, with 100 per cent of the services metered, only 45 per cent of the water was accounted for, but the meters had not been very well looked after. Since then by better inspection of meters and by the use of the aquaphone the accounted-for water has been increased to 68 per cent.

William W. Brush, deputy chief engineer, Department of Water Supply, New York City, stated that water waste control in New York had been spotty. The Board of Aldermen has the say as to whether meters shall be installed on anything but business houses. For two or three years past no effort has been made to get the consent of the Board to the extension of the meter system. Mr. Brush was of the opinion that the authorities of New York City could make or permit water consumption to be whatever they chose from a daily per capita average of 100 gal. Continuing the story as to attempts at water waste reduction in New York, George B. Nelson, assistant engineer, said that for the last few years it had been necessary to restrict water-waste reduction work to emergency measures, such as dealing with obvious leaks. About 25 per cent of the 390,000 taps are metered and about 25 per cent of the consumption. The latter leaves some 400,000,000 gal. of water consumption a day unguarded.

Value of Top Soil as Base for Modern Highways

Recommendations Made That Earth's Crust Be Unmolested and That Side Ditching Be Avoided

By D. S. Humphrey

Member Highway Advisory Board of Ohio

[Mr. Humphrey's recommendations will be read with interest by that part of the engineering profession most concerned with highway work. What he advocates is more or less startling; it should form the basis of lively discussion.—Editor.]

Information necessary for successful road building under present conditions cannot be found in any road literature. In my investigations I have found that a very limited portion of the top soil, the crust of the earth, has been preparing, through the ages, a road bed —a road foundation. Wherever possible, this natural foundation must be conserved. This crust contains the centuries' accumulation of decayed organic matter. I want to state emphatically that this crust is the salvation of most soils used either for dirt roads or as foundations for artificial surfaces. Besides the decayed organic matter, which has great binding qualities, the top earth nearly always contains a large per cent of sand, gravel and other inorganic minerals. It is unquestionably best for the wearing surface of earth roads and is of incalculable value in the foundation of any artificial surface. Road builders, ignorant of its value, and in an effort to avoid all grades, ofttimes, and for no conceivable reason, have failed to account for this natural foundation, this material right at hand.

Don't Remove Top Soil

The almost universal practice has been and is, to remove this crust by grading it off, even when the ground is comparatively level. This practice has resulted, not only in Ohio, but all over the United States, and especially in sections subjected to heavy frost, in putting the improved surface on jelly-like subsoils that have of themselves no carrying qualities. The roadbeds are placed so low in nearly all cases that the water cannot be drained off through the natural channels—which is vitally important—but must be carried long distances along the road to soak and undermine it.

If there is one thing more than another that I have full conviction of, it is that *it must be the universal policy never to run water in open ditches along the roadside, where it is possible to drain into the fields.*

Although much research has been done in analyzing and classifying soils for agricultural and manufacturing purposes, and volumes have been written, yet no one has ever classified soils in relation to road building. I believe if a thorough research is made and the results put into practical form for road builders' use, it will eliminate the most of the difficulties now experienced in making roads that will live.

All the works that we have seen on highway construction advise getting rid of soils containing organic matter, while any observing person can find abundant proof that any road, anywhere, holds best where the top soil has been utilized for a bed. The most substantial roads we have in Ohio are on the Black Lands in the northwestern section of the state, where there is a very large proportion of decayed vegetable matter in the soil.

On Main Market Road No. 1, running across the northern edge of Ohio, a common earth road in a tenacious clay section, improved several years previously by the application of 6 to 8 in. of limestone 8 or 9 ft. wide, without grading the old road off, was able to support the heavily loaded Government war truck trains. These roads, I believe, cost around $3,000 a mile. They needed very little repair, while exactly the same traffic was very destructive to roads that cost ten to twenty times as much, where grading had removed all of the old road bed, an unnecessary procedure since through this section the land is just rolling enough for practical drainage.

EXPERIENCE JUSTIFIES THEORIES

A 12-ft. concrete road near Norwalk, only a little more than 4 in. thick, down 8 or 9 yr., held up under this traffic because it was put on top of the old earth road. If a few inches of the old roadbed had been graded off, a bad clay soil would have ruined the chance for its holding up. The first 6 to 12 in. of the surface is most valuable, but without doubt this bearing up quality usually extends deeper—on rises less than on lower ground. A very light cut in a rise often gets into the most unstable clay or quicksand. "Grading down to a good foundation" is absolutely erroneous reasoning.

Clay is really a fluid—has no stability as substance. When the least bit moist it is always moving, slipping and flattening out. Cuts in clay, together with deep side ditches, afford the ideal conditions of instability. On the Cleveland-Akron Road, thick non-skid chains on heavily loaded trucks helped jar and churn the clay into a soft jelly-like mass. The inadequate improved surface could not withstand the strain. A $40,000 per mile stretch in Cuyahoga Co., of 8-in. and 7-in. concrete base, and 2-in. bituminous top 18 ft. wide, with brick gutters 5 ft. from the curb and tile drains under the brick surface gutters, broke up with this pounding traffic. The road had been completed only six months. It is very significant that it did not break where there was very little or no grading.

During the war when truck traffic was general in Ohio, and when the roads were failing, I took nearly 300 photographs across the State, and they certainly testify to all that I have said.

The State Maintenance Department has expended over $200,000 on the Cleveland-Akron Road. This road has received the great war through traffic, also the enormous local hauling between Cleveland and Akron, and in every case where the pavement has given out and has been reconstructed the old roadbed had been removed—cuts through these very moderate grades had removed all the top soil. In places where the improved surface was put on the old earth roadbed, the pavement still stands.

DRAINAGE

If possible, the finished surface of an improved road should be about on a level with, or a little above, the surrounding land. This allows drainage into all the natural water courses without deep side ditches. In the near future I hope to see sewer pipe laid in all cases where deep side drainage seems to be necessary, and all dangerous conditions done away with.

Draining the water away from the road is logical drainage. You can't get the water away from the road too soon for the good of the road. Deep side ditches are a menace to travel and mean draining the farms into the roads and running the water on by natural water courses. In cities, pavements are set low with curbing backed up by sidewalks or lawns which hold pavements in place, all the water being drawn into sewers under the streets. The exact opposite must be the rule for country roads. Follow the contour of the road, if possible. Keep the roads on top of the ground; employ very shallow side ditches; and keep every natural water course open.

The berms will be stable if the ditches are shallow. The report of the maintenance department shows that it costs much more to maintain the berms of the state roads of Ohio than it does to keep the improved surfaces in repair. Deep side ditches, carrying the water along the roads, and unfertile soil from deep ditches used in the berms, cause all the trouble. The berms should be grassed over—fertile soil is needed.

EARTH ROAD EXPERIENCE

For more than 30 yr. my father and I maintained an earth road alongside our big farm in Huron Co., during which time nothing was ever done to the surface except to keep the road smooth and see that every natural water course was kept open away from the road. This road was something over 2 mi. in length, in a very level clay country. There were almost no side ditches, and a good crop of hay was cut every year on each side of the road. In order to avoid carrying the water alongside the road, there were many small culverts across the road within this section. The surface of this road became absolutely flat in cross section, and the grass edges so high that the water could not leave the road at the sides, but had to follow lengthwise until reaching the low spots in the road where it was immediately ditched into the fields. There were no grades of more than 1 to 2 per cent in this 2 mi. of roads. The road surface was quite wide, averaging perhaps 24 ft. After every considerable rain storm, we dragged the road. This road was passable more than 10 mo. of the year and it was a road that received more traffic than many roads that were bad all the time, and concerning which practice had prescribed grading and side ditching. It will be borne in mind that this road bed contained only the top-soil. In the early history of this road it had been corduroyed, because it was so difficult to drain.

If we persist in making deep side ditches and disregarding soil conditions we may expect everything but good results. I seem to get the impression that road makers think that engineering means doing some physical thing. Is it not possible that letting things alone may mean good engineering? The demand and necessity for passable roads is so great that many old macadam and gravel roads should be maintained. In order to bring roads to railroad grades I have seen good stone and gravel roads steam shoveled up and hauled to the dump—a high cost road made on an unstable surface that will not hold. In this connection, it must be borne in mind that it often takes 5 to 8 yr. to prove whether roads will stand our modern traffic. Rarely do roads give out soon after completion.

Our chief engineer Mr. Bruning has stated that he has mailed a letter to all resident and district engineers to abandon the railroad grading idea. I sincerely hope that this instruction will be heeded, and also that a change will be brought about in handling soils and drainage, along the lines that have been outlined in this paper.

Passengers and Freight Carried More Cheaply by Motor Transport Than by Railway

Good Roads and Favorable Climate in California Are Being Capitalized by Large Numbers of Stage Companies Operating Interurban Lines—Joint Terminal in Los Angeles

By Kenneth Q. Volk
Associated with J. B. Lippincott, Consulting Engineer, Los Angeles

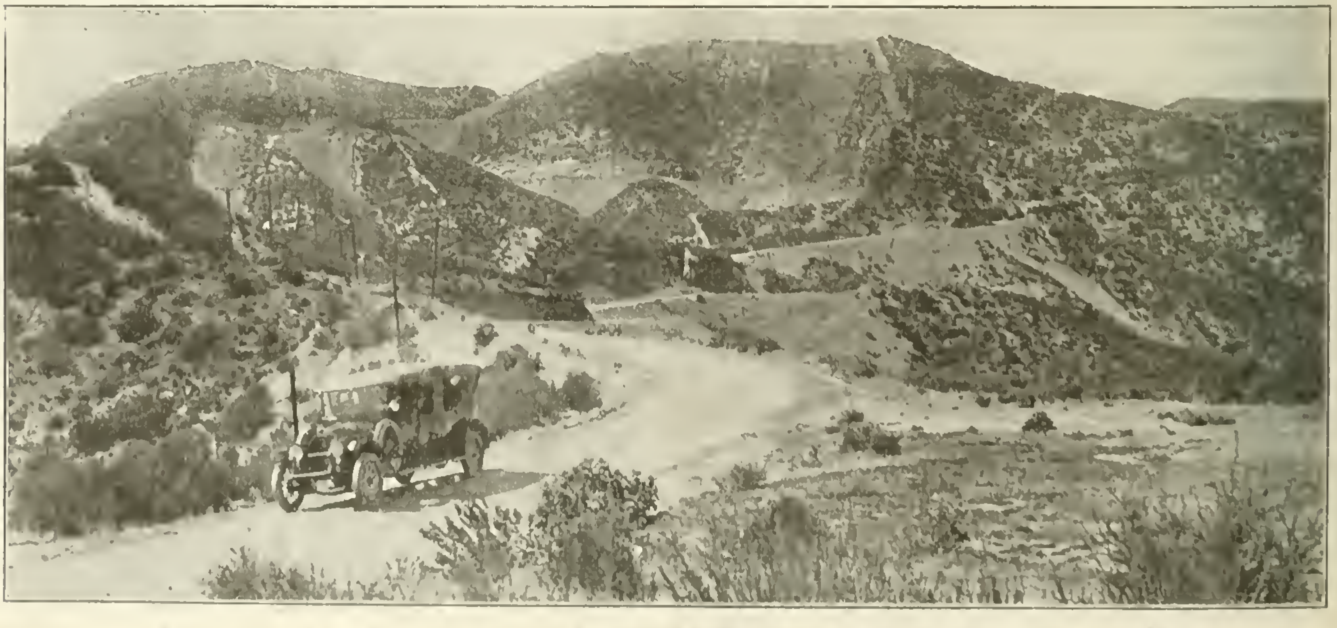
DURING the past few years there has been such a marked increase in the number of people and the volume of freight carried by automobile in southern California that companies organized for that purpose have been able to offer passenger and freight rates lower than competing steam and electric railways. The increase can be attributed to favorable climatic and topographic conditions, backed by the splendid system of paved roads. It is possible for automobiles to operate every day in the year and to cover the same distances during wet and dry weather, although in southern California the wet season is of short duration. Hundreds of towns, not accessible by rail, have been reached by a network of paved highways, and have been put in touch with centers of industry and commerce by freight and passenger motor lines.

The question of competition between interurban stages and steam and electric lines is serious. All interurban stages are giving more frequent and quicker service at a lower rate than the steam and electric lines. There is considerable difference between the rates charged for one-way and round-trip fares in the cases of the buses and the electric lines. This difference also applies to 30-ride books. The manager of one transportation company stated that his organization was carrying from one of the smaller cities six passengers to the electric company's one.

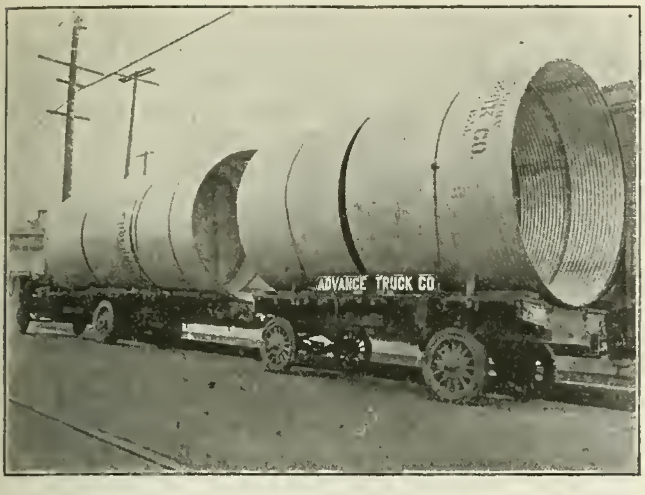
The larger bus companies maintain their own waiting rooms for passengers. A number of stage companies united in the building of a joint terminal in the heart of the business district of Los Angeles for the accommodation of their patrons. The managers of various interurban stages state that their cars are operating continuously with an average load factor of from 75 to 85 per cent. The Eldorado Stage Co., operating between Los Angeles and Bakersfield during 1918, transported 36,505 passengers. The United Stages, between Los Angeles and Santa Barbara for the same period, carried 23,286 passengers. The Valley Stage Line to Anaheim, carried 112,187 passengers.

The California State Railroad Commission, under Chap. 213 of the Laws of 1917, was given jurisdiction over motor vehicles engaged in the transportation of persons and property for compensation over the public highways in the state between fixed termini, one or both of which are outside the incorporated limits of a city or town. The Railroad Commission has jurisdiction to fix rates, classifications and rules, and to regulate the accounts, service and safety of such transportation companies, which jurisdiction shall supersede any conflicting jurisdiction exercised by municipal or county authorities.

This act, amended in 1919, further provides that anyone desiring to engage in stage or truck transportation between fixed termini must obtain a certificate of public convenience and necessity from the Railroad Commission. The applicant, in order to secure such a certificate, must state the places and intermediate points between which he desires to operate, the proposed fares to be charged for service, rules and regulations covering service, copy of his proposed time schedule, a description of the equipment to be operated, name of the company and the various officials interested in it, the name of the stage or trucking line, steam railways and electric railways operating between the points which he proposes to serve, and the conditions on which the applicant relies as justification for being granted a certificate of public convenience and necessity.



REBUILT PASSENGER CARS USED AS STAGES BETWEEN LOS ANGELES AND BAKERSFIELD



TRUCK AND TRAILER TRANSPORT LARGE DIAMETER CORRUGATED TANKS

Holders of certificates are not restricted as to the sum they may borrow to develop business, nor does the state limit the lives of certificates, the only restriction in that connection being named in franchises secured from counties and towns through which line pass. The state does not require any license fee for commercial motor carriers other than the annual registration fee demanded for all automobiles and trucks.

The license fees charged by counties and municipalities in southern California vary widely. Some charge nothing, while others have a flat yearly charge for each car operated. In most cases a lower rate is allowed for additional cars operated by the same companies, while others base their rates on seating capacity. The City of Ontario charges interurban bus lines $200 a year for the first vehicle and $25 a year for each additional car. The City of Riverside charges at the rate of $12.50 per annum per seat. The City of Los Angeles charges the following quarterly rate for interurban stages based on seating capacity:

QUARTERLY CHARGES BY CITY OF LOS ANGELES, BASED ON SEATING CAPACITY OF STAGES

5 to 7 passengers	$6.75	16 to 20 passengers	$13.50
8 to 10 passengers	9.00	21 to 25 passengers	15.00
11 to 15 passengers	11.50	26 to 30 passengers	17.00

A quarterly rate of $1.50 per ton or fraction thereof is charged for motor trucks operating as common carriers. The annual license fee for operating a ticket office is $120.

Los Angeles County has adopted the following annual charge for each interurban stage and freight truck operating between fixed termini:

COUNTY CHARGES FOR STAGES AND TRUCKS

Interurban Stages:	
Seating capacity 5 or less	$18
Seating capacity 5 to 12	24
Seating capacity 12 to 20	30
Seatiog capacity over 20	36
Freight Trucks:	
Capacity, 1 ton or less	$6
Capacity 1 to 2 tons	9
Capacity 2 to 3 tons	12
Capacity over 3 tons	15

In addition to the license fee, there is an almost uniform regulation in cities and counties requiring automobile stage companies to file an indemnity bond of $10,000 for each vehicle operated. The recovery under such a bond is usually limited to $5,000 for the injury or death of one person; $10,000 for the injury or death of two or more persons in the same accident; and $1,000 for injury of, or destruction to property. The rates for liability insurance on interurban stages varies from $12.50 to $18 a month, depending on seating capacity.

So far as the author has been able to learn, no money collected from licenses for interurban stages or freight trucks by the various cities and counties is returned to a road fund.

The annual registration fee for gasoline pleasure cars is at the rate of 40c. per horsepower, while electric automobiles pay a flat rate of $5. Gasoline and electric trucks, not equipped with pneumatic tires, in addition to the above fee, pay $5 for a truck having a total weight of 4,000 lb., unladen; $10 for trucks weighing from 4,000 to 6,000 lb., unladen; $15 for trucks weighing from 6,000 to 10,000 lb., unladen, and $20 for all trucks in excess of 10,000 lb., unladen.

A maximum speed of 30 mi. per hour is allowed for cars equipped with pneumatic tires. In the daytime when the driver has an uninterrupted view of the highway for at least 400 ft., the maximum speed limit may be increased to 35 mi. per hour. The allowable speed in closely built up sections is 20 mi. per hour, and in business districts, 15 mi. per hour. The speed limit for trucks varies according to the loads and the class of tires. Trucks using pneumatic tires are allowed the same speed as pleasure cars, and trucks with solid rubber tires carrying a total load of from 9,000 to 12,000 lb., including the weight of the vehicle, are limited to 25 mi. per hour; from 12,000 to 24,000 lb., 15 mi. per hour and over 24,000 lb., 10 mi. per hour.

Trucks or trailers equipped with wheels wholly or partly of metal are limited to 6 mi. per hour; however, if equipped with springs and the rear wheels not less than 46 in. in diameter with a bearing surface of 18 in., the rate of speed may be increased to 10 mi. per hour. The number of trailers is limited to two, and all four-wheel commercial trailers are required to be equipped with adequate brakes. A maximum total load of 30,000 lb. may be carried on a four-wheel truck provided the weight limit of 800 lb. per in. width of rubber tire, or 600 lb. per in. width of metal tire, is not exceeded. The maximum width of tread is placed at 112 in. and the maximum width of bed or load not to exceed 102 in. Loaded hay wagons may have an extreme width of 10 ft. Severe regulations are imposed on vehicles having ridges, cleats, etc., on the circumference of their wheels. Pleasure cars and stages are allowed to carry baggage on the side, provided it does not extend more than 12 in. beyond the left side of the machine.

All money received from license fees for motor vehi-

TABLE 1. TRAFFIC CENSUS ON THREE PAVED HIGHWAYS LOS ANGELES COUNTY, CALIFORNIA

Average Daily Number of Vehicles Traveliog

	Average Traffic in Tons per 24 Hrs.*	Horse Vehicles	Motor-Cycles	Automo-biles	Motor Trucks
Long Beach Boulevard:					
November, 1914	1,933.68	69	76	1,109	121
April, 1916	3,213.83	24	93	1,630	206
June, 1917	2,913.31	25	85	1,966	163
July, 1918	5,176.25	28	93	3,483	267
Harbor Boulevard:					
April, 1916	2,857.41	237	124	910	216
August, 1917	2,977.66	77	110	1,265	274
April, 1918	4,376.12	83	118	2,598	283
April, 1919	5,439.83	39	167	3,542	331
El Monte, Pomona Road:					
June, 1915	3,031.62	244	149	1,561	193
August, 1916	3,620 82	221	123	1,869	201
May, 1918	4,464 17	59	56	2,626	333

Long Beach Boulevard—Length 12.47 miles; in operation since March 11, 1911.
Harbor Boulevard—Length 11.33 miles; in operation since Marcb, 1912.
El Monte-Pomona Road—Length 19.39 miles; in operation since August, 1913.
* NOTE—Traffic census over 24 br. period for 7 consecutive daya.

SPECIALLY DESIGNED TRUCK FOR CARRYING 50-TON LOADS TO SAN PEDRO SHIPYARDS

cles is placed in a state motor-vehicle fund. One-half of the balance of this fund left after paying all salaries and expenses, incident to the administration and enforcement of the act, are paid to the respective counties from which they were originally collected. The money so returned to the counties must be expended exclusively in the construction and maintenance of roads.

Interurban automobile passenger transportation has become highly organized in southern California, though many of the companies were not a financial success in the beginning, owing to the developing of a field for patrons, competition with electric, steam roads and parallel stage lines, and their failure to purchase standard equipment.

It has been found that on routes up to 60 mi. in length, cars having a seating capacity of from 16 to 25 passengers have proved the most satisfactory. Whether the 16 passenger or the 25 passenger are the best has not yet been determined. For the longer runs, such as San Diego, Bakersfield, Santa Barbara and San Francisco, cars with a seating capacity of from 9 to 12 have proven the most popular. Practically all of the late stages on the long distance runs are 12 passenger. These cars are mostly standard second-hand 7-passenger cars which have been rebuilt and lengthened so as to accommodate 12 passengers.

Truck traffic radiating from Los Angeles has been steadily increasing. Many of the merchants and commercial concerns are able to establish daily delivery by their own trucks to customers within a radius of 50 miles of the city. Coastwise vessels landing at San Pedro can be unloaded directly to trucks and the freight transported to the large wholesale houses without being stored.

Freight trucking is not as highly developed as the passenger service, due to the facts that most freight carrying companies have been operating a shorter length of time; that they are not as large; and their equipment is not nearly as well standardized. The rates charged by the different companies, for the same haul and class of commodities, vary considerably. However, their rates are generally less than those charged by the railroad, and they are endeavoring to co-operate so as to have their charges uniform.

The 77 commercial trucking companies operating out of Los Angeles own 171 trucks, five of which are ¾-ton, twenty-three 1-ton, fifty-four 1½-ton, forty-six 2-ton, thirteen 2½-ton, eleven 3-ton, eight 3½-ton, nine 4-ton and two 5-ton.

It must be borne in mind that this list includes only the trucks which operate between fixed termini and which are subject to the jurisdiction of the railroad commission and cities and counties, and does not include the great number of trucks owned by lumber companies,

TABLE II. SHOWING PRINCIPAL STAGE COMPANIES OPERATING OUT OF LOS ANGELES, EQUIPMENT, DISTANCES AND COMPARISON OF RATES

		Equipment			Stage Fare*				Railroad or Electric Fare	
Los Angeles To	Company	No. Cars	Seating Capacity	Destination	Mileage	One-way	Round Trip	Mileage	One-way	Round Trip
Bakersfield and San Francisco	Eldorado Stage Co.	11	8	Bakersfield	125	5.40	None	171	5.56	None
		6	12	Taft	162	6.48	None	216	7.61	None
				San Francisco	416	14.04	27.00	484	15.34	None
Santa Barbara	Pickwick Stages	2	12	Santa Barbara	103	3.24	5.94	104	3.40	5 67
San Francisco	Nor. Division	23	8	San Luis Obispo	221	7.29	13.50	223	.....	...
				San Francisco	458	14.04	27.00	475	15.34	None
	United Stages	4	8	Santa Barbara	103	3.24	5.94	171	5.56	None
San Diego	Pickwick Stages	12	8	San Diego	135	3.24	5.59	126	4.09	6 75
	So. Division	.	.	San Diego	185†	4 32	8.10	....	....	.
	United Stages	10	8	San Diego	135	3.24	5.94	126	4.09	6 75
	A. R. G. Bus Line	23	8	San Diego	135	3.24	5.94	126	4.09	6 75
Ontario Riverside San Bernardino Redlands	A. R. G. Bus Line	19	20	Ontario	39	.92	1 35	40	1.09	1 85
				San Bernardino	59	1.35	2.16	60	1.74	2.92
				Riverside	56	1.35	2.54	63	1.89	3 16
				Redlands	66	1.57	2.54	65	2.21	None
Ontario	....	..		Ontario	39	.92	1.35	40	1.09	1 85
San Bernardino	White Bus Co.	14	16	San Bernardino	59	1.35	2.16	58	1.74	2 92
		2	25	....	...	....	....	....	....	....
San Bernardino	Golden State Tours Corp.	3	7	Gilman & Hot Springs	112	3.24	5.40	95	3.51	None
Anaheim	White Bus Line	12	16	Whittier	13	.30	.49	17.5	.41	75
		5	22	Anaheim	28	.81	1.35	27	.86	None
		2	25	... .	...	....	....	....	....	
	Valley Stage Line	8	16	Same	Same	Same	Same	Same	Same	Same
	A. R. G. Bus Line	6	20	Same	Same	Same	Same	Same	Same	Same
San Fernando	Original Stage Co.	7	15	San Fernando	23	54	97	28	.78	1 32
Santa Paula	United Stages	3	8	Santa Paula	68	2 00	None	65	2 21	None
Lancaster	Golden State Tours Corp	2	7	Lancaster	85	2 60	4 86	78	2 60	4 86

* All Rates include War Tax.
† Inland Route via Riverside

large wholesale concerns, etc., who deliver their own commodities and do not operate between fixed termini. Practically all of these commercial trucking companies make daily trips. The motor carrier freight terminals in this city have been makeshift and are getting pretty well congested, and a concerted effort is being made to interest companies in terminal facilities which will be more in keeping with the business handled.

The work of the commercial trucks at present consists largely in collecting loads from the various merchants, and transporting the same direct to destinations without storage. This not only reduces the terminal cost, but decreases the length of time required to deliver freight from Los Angeles to the outlying districts. It is possible for this service to become so improved that retail merchants in the surrounding cities will not be required to carry as large a stock as they would otherwise, due to the delayed shipments over the railroad, thereby allowing them to turn their stock more frequently.

TRANSPORTATION ASSOCIATION ORGANIZED

The California Highway Transportation Association was organized late in 1918. Its purpose is to advance the use of motor vehicles as carriers of passengers and property for compensation, to aid in the establishment of new business, to advise members as to proper development and expansion, to assist in securing adequate rates, to aid and assist the governing bodies in framing proper state laws so that motor carriers should have an equal standing with other common carriers. Cost of membership is $10 a year for the first car and $3 for each additional car. The association has no capital stock and it is not operated for profit.

Most paved roads which have been constructed by the California Highway Commission have a width of 15 ft. and a concrete base varying in thickness from 4 to 4½ in. Where necessary, the roadway is widened by adding a 3-ft. macadam shoulder, giving a hard surface roadway of 21 ft. A top dressing, ½ in. thick, composed of a heavy asphaltic road oil and screenings, is added as a wearing surface.

The California State Highway Commission in its annual report of 1918, stated that this thin wearing surface proved satisfactory in protecting the concrete pavement from wear except under very heavy traffic conditions, and that the thin concrete bases have given admirable service and have proved their economy under California conditions of climate and traffic, where the subgrade is well compacted. Los Angeles County, in its concrete highway construction, is using a base 20 ft. wide, a minimum thickness of 5 in., and macadam shoulders 5 ft. wide; at present a bituminous wearing surface is omitted.

Pennsylvania Registers Many Motor Vehicles

According to reports recently received from the State Highway Department of Pennsylvania, more solid-tired vehicles have been registered in that state so far this year than were registered during the entire year of 1919. The number of pneumatic tired vehicles registered, has passed the 275,000 mark, an increase of 25,000 over the same period of last year. The receipts from all sources, such as automobile tax, drivers licenses, dealers licenses, taxes upon transfer, duplications, and so forth, promise to surpass greatly the $5,000,000 mark of last year.

May Condemn for Residential District

ST. PAUL, Minneapolis and Duluth may condemn property for the establishment of restricted residence districts and exclude apartment houses from those districts. Such is a State Supreme Court decision handed down Jan. 23, 1920. The Minnesota laws of 1915 provide for a restricted residence district in cities of the first class, to be established by the exercise of the power of eminent domain, and apartment houses, among other classes of buildings, are prohibited therein. In March, 1918, the Minneapolis City Council passed a resolution creating a restricted residence district. The Twin City Building Investment Co. asked for a permit for a three-story apartment building costing approximately $50,000 in this district. The permit was refused. The company then mandamused James G. Houghton, inspector of buildings, and in due time the case was tried. The opinion of the State Supreme Court, in part, is as follows:

> The only question is whether the legislature may authorize a common council to establish by condemnation a restricted residence district which shall exclude apartment buildings and that question is whether there is a public use in such restriction.
>
> That the public gets no physical use of the premises condemned is clear. It cannot travel upon or occupy them. The use acquired, so far as the general public is concerned is, that its sense of the appropriate and harmonious will not be offended by the erection in the condemned district of prescribed buildings. . . . The notion of what is public use changes from time to time. Public use expands with new needs created by the advance of civilization and the present tendency of people to crowd into large cities . . . The term, public use, is flexible and cannot be limited to the public use known at the time of forming the constitution . . . What constitutes a public use at the time it is sought to exercise the power of eminent domain is the test . . . The constitution of this state nowhere attempts to define what may be a public use nor does it prohibit the legislature from determining what shall be deemed such a use . . . In comparatively recent times it was questioned whether a public use extended so far as to justify the condemnation of property for public parks, public baths, libraries and museums. Now condemnation and expenditure for these or similar purposes is recognized as lawful. . . .
>
> Many reasons might be suggested as sufficient for the adoption of this statute. It must be admitted that holders of land in cities have of late through selfish and unworthy motives put the land to such use that serious inconvenince and loss results to other land holders in the neighborhood. In cities where lots are necessarily of minimum size it is readily seen that when a home is built and thereafter three-story apartments extending to the lot line are constructed on both sides of a home, it becomes almost unlivable and its value utterly destroyed. Not only that but the construction of such apartments in a territory of individual homes depreciates very much the values in the whole territory. The loss is not only to the owners, but to the city and municipality by reason of the diminished taxes resulting from diminished values. It is time that the courts recognized the esthetic as a factor in life. Beauty and fitness enhance values in public and private structures, and it is not sufficient that the building is fit and proper standing alone; it should also fit in with surrounding structures. People are beginning to realize this and are calling for city planning by which individual homes may be segregated from industrial and mercantile districts and also from hotel and apartment districts. The act in question responds to this call and should be deemed to provide for a taking for a public use. . . . We think there is a public use served by the taking authorized by the laws of 1915. It does not seem to impinge any inhibition of the state or federal constitution.

Water for Shipyard Drinking Fountains Treated by Violet Rays

Filtered Through Quartz, Then Through Bone Black—High Water Consumption and Waste Fall as Temperature Lowers

By Walter L. Decker
Construction Engineer, The American Shipbuilding Company, Cleveland, Ohio

In *Engineering News-Record* of Feb. 27, 1919, p. 422, appears an abstract of an address by Col. Philip S. Doane, director of the department of health and sanitation of the United States Shipping Board, on protecting the health of shipyard workers. In this, Colonel Doane speaks of the city water-supply of Wyandotte, Mich., as being diluted sewage. It may be interesting to your readers to know what steps were taken at the Wyandotte plant of the American Ship Building Co. to rectify this condition.

Prior to October, 1918, the plant had been using for its drinking water that which was furnished by the City of Wyandotte. This water was treated with hypochlorite and, on account of the excessive amount which had to be used, the water almost continually smelt and tasted of chlorine. The men seriously objected, and frequently drank the raw water from the river in preference.

As the force at the plant at that time was being increased 50%, it was necessary for steps to be taken at once to provide this increased force with a safe, adequate and attractive drinking water.

After considering the various suggestions that were made, and inquiry into the various systems that were being used, the writer decided upon ultra-violet-ray sterilization as the most convenient and simple for a plant of this description. What was desired was some system that, without supervision, so to speak, would day and night continue to function without any changes or alterations whether the incoming water contained 100 or 100,000 bacteria per cubic centimeter.

Fig. 1 shows graphically the operation of the system during September. Although the bacteria in the raw water, which is taken directly from the Detroit River, varied from 44,000 to 320,000 per cubic centimeter, at all times water free from pathogenic germs was delivered for consumption, as indicated by the straight-line sterilized-water curve, which is the fourth curve from the top of the figure.

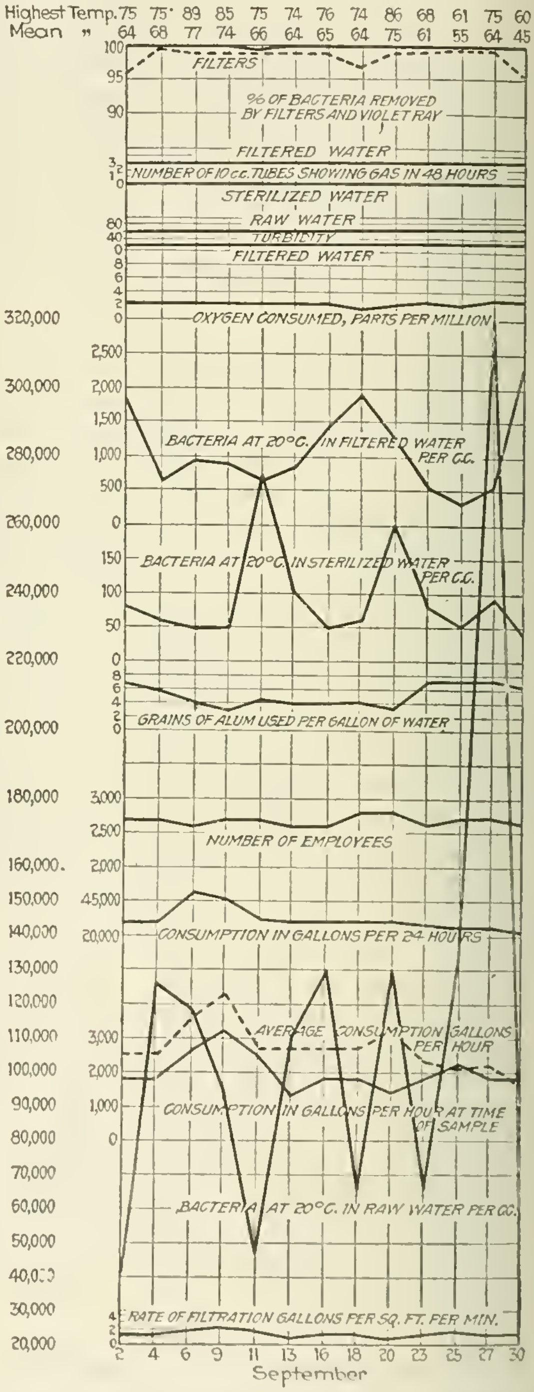
The bacteria remaining in the water after passing the filters varied from 300 to 2500 per cubic centimeter and during the entire month showed the presence of pathogenic germs, but after passing in turn through the violet-ray sterilizer they were reduced in number from 275 to 30, with the attendant elimination of all harmful germs, as those remaining were of the spore variety which are not inimical to one's health.

The system consists of one 60-in. quartz filter, two 30-in. bone-black filters, which are connected in parallel to take the water after passing the quartz filter, then two ultra-violet-ray sterilizers connected in series, for final treatment of the water after passing charcoal filters.

Since the plant was increased in capacity, seven months ago, on only three days was there any doubt of the purity of the water, and this was undoubtedly due to the combination of circumstances of a sudden, high bacterial increase in the raw water with the system operating 50% above its rated capacity.

The one uncertainty in the initial design of the plant was the amount of water per employee that the system should be designed for. As the system of drinking-water mains is entirely distinct from any domestic water lines, there is no occasion for this water to be used except for drinking.

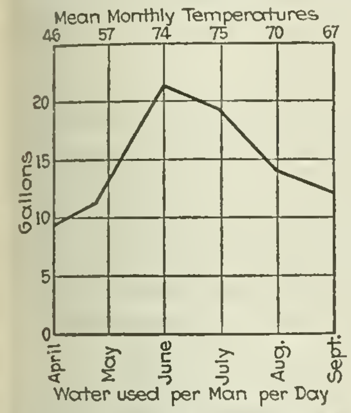
As we were unable to find any record of the amount of water used per man, in the use of drinking fountains, in the initial design we estimated liberally the amount of water that would be consumed per man during the hottest days of summer, and multiplied this by a factor of 2. Results have proved that our factor should have been 4 instead of 2. Fig. 2 shows the amount of water used per man during the past six months.



FILTRATION AND ULTRA-VIOLET-RAY RESULTS AT WYANDOTTE SHIPYARDS

Needless to say, this is not the amount of water consumed, but it does represent the amount the system was called upon to furnish at this particular plant. The result includes all wastage, all leakage at bubblers, and breaks now and then in a supply line.

The system consists of approximately 50 drinking fountains scattered throughout the buildings and ship-building berths, and it is the outside foundations along the berths that are subject to injury and abuse. The principal loss of water is perhaps due to the length of time that a bubbler, with self-closing faucet, is held open during the time when a man is washing the tobacco out of his mouth and surveying the scenery.



WATER CONSUMPTION FROM SHIPYARD BUBBLERS

Again, if the ice in the boxes ran low the men—or more perhaps, the boys—were inclined to tie a string to or prop open the valve with a piece of wood, allowing water to run continuously, with the idea in view of obtaining colder water by this procedure. The curve shows plainly that with decreasing temperature the amount of water used per man descends rapidly to a more rational basis.

Deep Etching and Rail Defects

Further light is thrown on the discovery by H. S. Rawdon that rail fissure defects originate from internal cracks, as recently reported to the American Railway Engineering Association, as well as on the effect of the interesting new research method called "deep etching" by facts reported from the Bureau of Standards by H. S. Rawdon and S. Epstein (Technological Paper 156, Bureau of Standards). This etching is done by means of hot concentrated hydrochloric acid, allowed to act for several hours. Its effect depends upon the condition of the metal.

Steel that is heterogeneous in its chemical composition shows a characteristic roughened surface when etched. Highly stressed steel is apt to crack in the etching treatment. Hardened steel balls, for example, which contain high internal stresses due to the mechanical and thermal treatment in their manufacture, frequently crack under the acid treatment due to the progressive release of internal stresses. The behavior of the metal in this respect is identical with the well-known corrosion cracking of brasses and bronzes after cold working. Discontinuities in the metal in the form of internal fractures, however, are revealed by the deep etching as short cracks or gashes "which appear to bear a definite relation in their arrangement to the direction of the stresses to which the piece had previously been subjected." The fact that the original defect is a crack has been fully demonstrated by covering the surface of the metal with iron filings and subjecting it to magnetic action, as already reported, and also by opening up the cracks by means of wedging, after they had been located by the magnetic method. It appears therefore that the rapid solvent action developed in deep etching supplies an important new method of examining steel.

All Sand Aggregate for Concrete In Middle Western Roads

By T. L. Brockway
City Engineer, Wichita, Kansas

Abstract of a paper read before the American Society of Municipal Improvement at New Orleans, November, 1919, under title, "Sand Concrete." This paper was a "volunteer" one; that is, it was not on the program and for that reason it did not receive much discussion. —Editor.

MATERIAL, price, and labor embargoes during the war made it practically impossible in certain parts of the Middle West to secure any gravel or broken stone of the size generally used in concrete as concrete aggregate. Roads had to be built, and particularly those which were torn up had to be repaired, so the expedient was hit upon in certain parts of Kansas of using a concrete with an aggregate made up entirely of sand, most of which passes a ¼-in. sieve. Tests of the concrete so made and observations of the road foundations and surfaces in place seem to show that the method is quite satisfactory.

A large territory in the western slope of the Mississippi River Basin is practically without rock which is at all suitable for use in concrete pavement, and barely possible even in the construction of concrete base. French coefficients of 1.6 to 5 in various ledges of quarries which formed the only available source within a reasonable distance are not uncommon. For this reason soft, chalky limestone of this lack of toughness has been extensively used in making concrete base for pavements. The usual mix has been 1:3:6, the crusher run of stone passing a 1½-in. sieve and retained on ¼-in. The depth of such base varied from 4 to 6 in.

Partially offsetting the lack of rock is an abundance of sand carried by the rivers, past and present, flowing down from the Rocky Mountains. Bank sand of good quality is found in many places. River sand is inexhaustible in the Missouri, Platte, Kaw and Arkansas Rivers and many of their tributaries. Pumps and dredges are in common use on these streams. Not all the sand is good, depending on conditions of flow under which it is deposited, but good sand is available in all of them.

In the early winter of 1917, oil was discovered near Wichita, Kan. Road improvements were demanded by the residents and approved by Federal authorities because of the necessities for growth caused by the oil developments, but stone aggregate was impossible to get. At this juncture a study of sand concrete was made.

The city of Wichita is located at the mouth of the Little Arkansas River at its junction with the Arkansas River. The Little River sand runs coarse. A pump operating about five miles from the mouth regularly furnished sand, of which 15 to 20 per cent is retained on a ¼-in. screen. This gravel is nearly all granite, some shale and quartz. It is subject to the same objection as rock, so far as the city pavements are concerned, that of car shipments, and is furthermore sandwiched with clay seams which develop tough balls under the action of a pump.

For a mile above the mouth of the Little River the Big River runs nearly due east after making a right angle turn from a south direction of flow. The prevailing winds during the season when the river is dry are from the south and southwest. These winds have piled high dunes of "blow sand" on the east bank of the north and south portion of the river. This fine sand is remarkably clean and sharp. About 35 per cent passes an 80-mesh screen and practically all passes 40 mesh. Large numbers of similar dunes lie along the river where wind conditions have been favorable.

Sand in this locality which is easily available has the following screen analysis:

Through	Retained	Per Cent
	On ¼ in.	6.25
¼ in.	No. 6	5.0
No. 6	No. 20	38.75
No. 20	No. 30	20.0
No. 30	No. 40	10.0
No. 40	No. 50	15.0
No. 50		5.0

The percentage of voids of this sand is found by a number of tests to be very close to 28 per cent.

Calculations to determine the amount of cement possible to use with this sand without making concrete more expensive than by using rock at local prices are as follows:

	1:3:6 Rock Mixture	Sand and Cement
Rock on track	$2.24	....
Delivering rock	1.25	
Sand delivered	.68	1.50
Cement delivered	2.50	5.37
Labor mixing and placing	1.40	1.20
Total	$8.07	$8.07

At $2.50 per bbl. of cement, $5.37 will buy 2.15 bbl. cement or 8.6 cu.ft.; 8.6 cu.ft. per cu.yd. allows one part cement to 3½ sand, not allowing for any increase in volume of the sand on account of addition of cement. Because of the surplus of cement in this mixture over that necessary to fill the voids in the sand and because of the practical difficulty in obtaining a mixture of sand of this odd small fraction, a cement-sand mixture of 1:3½ was selected for experimentation.

With this revision the cement necessary per cu.yd. of concrete becomes 1.93 bbl., worth $4.83, or a total cost of $7.52 per cu.yd. for concrete in place. This cost has been proved very nearly correct for good working conditions on 6-in. base by actual experience this season and to be about 20c. per cu.yd. too low on an average where 5-in. base is laid.

Small beams were then made of identical size under identical conditions by the same person. They were cured in a room where the temperature was about 80 deg. F., being kept covered with sacks which were thoroughly wet daily. Stone and sand were taken from stock piles. Cement was the same in all cases, being a standard brand passing standard tests with a good margin. The beams were broken at the ages specified below, over the same support, by loading with paving brick which were so stacked as to prevent arching action. The result of the tests follow:

COMPARATIVE TEST OF STONE AND SAND CONCRETE

Beams 6 in. wide.
Depth of 1:3½ and 1:3:6 mixes = 5 in.
Depth of 1:4 mix = 6 in.
Distance between supports 4 ft. 10 in.
Distance between loads 1 ft.
Loads equal and spaced equidistant from center.

Mixture	Age	Extreme Fiber Stress, Lb. Sq. In.
1:3½	34 days	182
1:4	34 days	152
1:3:6 rock	34 days	188
1:3½	60 days	212
1:4	60 days	180
1:3:6	60 days	190
1:3½	90 days	220
1:4	90 days	178
1:3:6 broke in handling		

A very noticeable difference was the character of the fracture. In each case of the sand mixture the break was clean and sharp, while the rock mixture shelled badly. Several individual pieces of rock were so thickly coated with dust that there was practically no adhesion of the mortar matrix. This is to be expected of that part of the ledge in the quarry having a coefficient in the neighborhood of 2.

No tests were made of crushing strength because that is not the governing factor in any failure of paving base which has been observed. Failures have been practically always from unequal settlement of old fills or over open spaces caused by settlement of ditches or undermining by leaky water mains. In all of these the beam action of the base has been called into play. Other failures have been that of cracking under tension caused by soil shrinkage under conditions of extreme drouth.

SPECIFICATIONS FOR USE OF SAND

With these tests and local conditions of materials available, together with the desire to insure continuity of supply, the following clause was added to the specifications for concrete base:

> The concrete base may be mixed with sand and cement or a mixture of gravel and cement instead of the mixture of sand, cement and stone, under the following conditions: Little River sand free from loam, clay or other impurities, or coarse sand from other sources of which approximately 5 per cent is retained on a ¼-in. mesh sieve and not over 6 per cent passes a 50-mesh sieve and whose voids do not exceed 30 per cent, may be used in making concrete, using one part cement to three and one-half parts sand, volume measurement.
>
> The percentage of cement may be reduced for sand containing more than 10 per cent of particles retained on a ¼-in. mesh sieve in such proportions that the ratio of cement to the sand which passes a ¼-in. sieve is not less than one part cement to three parts sand.
>
> Well graded gravel, 95 per cent of which is retained on a ¼-in. screen and which is of good, hard, sound material may be substituted for rock and used under the same proportions as provided for rock concrete.

As a result, the sand mixture has been used in all of the paving construction. Four hundred thousand yards of pavement have been contracted for this year, and practically all of the base will be laid by the close of the season. Had it been deemed necessary to use rock it would not have been possible to lay more than half of this amount because of the car situation and uncertainties of labor. In support of this statement, it might be well to state that a contract was let for the construction of a concrete highway in May of this year amounting to 75,000 sq.yd. Stone requiring a haul of about 250 mi. was purchased for the work. Approximately 10,000 sq.yd. will be completed this season. Not all the delay was caused by lack of stone, or even cars to ship it in. The construction of a plant to handle the stone consumed considerable time. The lack of labor at critical times has consumed more.

As to the quality of the base, made with a 1:3½ mix of cement and sand, a great many cuts have been made in various places and in every case it has been tougher and harder to cut and break than base made with the chalky limestone available within a reasonable distance. One place in particular was observed in which a new sewer ditch was inadvertently covered before being flushed. The base was broken through within two weeks to remedy this defect and was found to be carrying heavily loaded trucks from adjacent flour mills without support for 6 ft. in width and about 40 ft. in length of the ditch. It required repeated heavy blows of a 16-lb. sledge to break small pieces along the edge of the base after it was opened. The impact produced a ringing sound similar to that of striking flinty stone.

These observations, together with the behavior of crossings and gutter, made of the same material, under traffic, led to the construction of a block of concrete pavement in the fall of 1918. This was mixed one part cement to three parts sand, laid six inches thick and finished with roller and belt.

Cross expansion joints of creosoted wood were placed 30 ft. apart and precast asphalt joints ½-in. thick placed against each gutter. This pavement was laid on a street 36 ft. wide between gutters with a construction joint down the center. A three months' period this season, in which less than 2 in. of rain fell, produced such enormous soil shrinkage that a longitudinal crack has appeared near each quarter of the street for about two-thirds of its length. Otherwise the pavement is in perfect condition and has been the means of bringing in petitions for 75,000 sq.yd. more during the present season.

The mixture was specified as follows:

> The mixture shall consist of one part cement to three parts clean, sharp sand which contains not less than 5 per cent of material retained on a ¼-in. mesh screen. Sand which contains more than 15 per cent of material retained on a ¼-in. mesh screen may be mixed with cement in such proportions that the sand passing a ¼-in. mesh screen will be 2½ times the amount of cement used. The total amount of gravel retained on the screen shall not exceed the amount passing it in the mixture of the two.

Contracts have been awarded at $1.90 to $2.00 per square yard, exclusive of excavation.

In construction it was discovered that if the mixture was made as dry as is now commonly specified, it was impossible to prevent deep shrinkage cracks from developing within a few minutes after depositing the mixture. During the extreme dry weather the subgrade was flooded thoroughly just ahead of the concrete and checking was only stopped by using all the water the mixture would carry without separating and then spraying water over it within 15 min. from the time it was laid. This liberal use of water prevented all checking except the usual setting shrinkage cracks which occur transversely about every 30 ft. from a week to ten days after the concrete is laid.

Paper Gate Replaces Clay in Jointing Cast-Iron Pipe

For jointing pipe with metalium an oiled kraft paper gate has been invented which reduces the amount of clay putty to that used about the bottom of the gate. A high gate is essential in pouring this material and in many localities the proper clay is not readily available. In addition the workmen, especially in cold weather, lost much time in working up to the proper consistency the large quantity required.

For jointing pipe having a diameter of 8 in. or less, the paper gate is 10 in. high and fits over a No. 30 gate peg 2 in. in diameter at the bottom and 2¾ in. at the top. The peg is slipped into the paper tube flush with the bottom edge and then set up as usual with only enough clay around the bottom to prevent the escape of the hot metalium.

Resurveys of Old Railway Lines

Lack of Records of Original Construction and Subequent Revisions Necessitate Surveys for Alignment, Profile and Property Lines

By J. G. Wetherell
Assistant Engineer Chicago, Milwaukee & St. Paul R.R.

RESURVEYS to determine alignment, profile and property lines are necessary on many railway systems composed extensively of lines first built as small independent railways. This is true of the Chicago, Milwaukee & St. Paul R.R., and the writer was in charge of such resurvey work during the fall and winter of 1918. In many cases the original construction notes had been lost. Where original maps and profiles exist it has been found that these were not followed exactly during construction and since then there have been a number of minor revisions not recorded.

For valuation purposes it was decided that the Southern Minnesota Division, the Dubuque Division and the Chippewa Valley branches of the River Division should be among those resurveyed. The writer was instructed to organize a party and work out the method of precedure. This survey was not to be a pre-inventory, as the Federal valuation parties were taking or had already taken off quantities on these lines. The railway company had competent men with each Government cross-section party and recorder party, whose duty it was to see that nothing was overlooked. It was decided, therefore, that the resurvey party would consider as correct the grading and track material quantities of the previous parties.

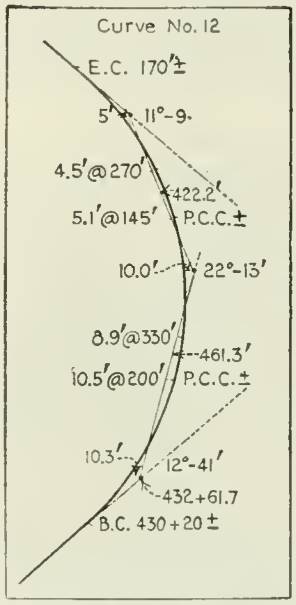


FIG. 1. FIELD NOTES OF CURVES IN RAILWAY RESURVEY

The resurvey party was to consist of one assistant engineer in charge, one instrumentman, one levelman, two draftsmen, three rodmen and two chainmen. However, men were scarce in 1918 and it was only during the last six weeks of the work, when men were released from the valuation parties, that the resurvey party was complete.

Three box cars, fitted out for the purpose, formed the office and camp equipment. One car was used for an office and was fitted with extra long windows and two drafting boards. An old coach with the seats removed and a stove installed in the center would have been better for an office car and less expensive, but on account of troop movements, no coach could be spared. A gasoline motor car was used for going back and forth. This was light enough to be handled easily by one man and it had considerable speed and power, but there were times when a larger car would have been better.

Field work was divided by the writer into the following five classes: Survey, alignment, profile, original ground line and land ties. The office work consisted of

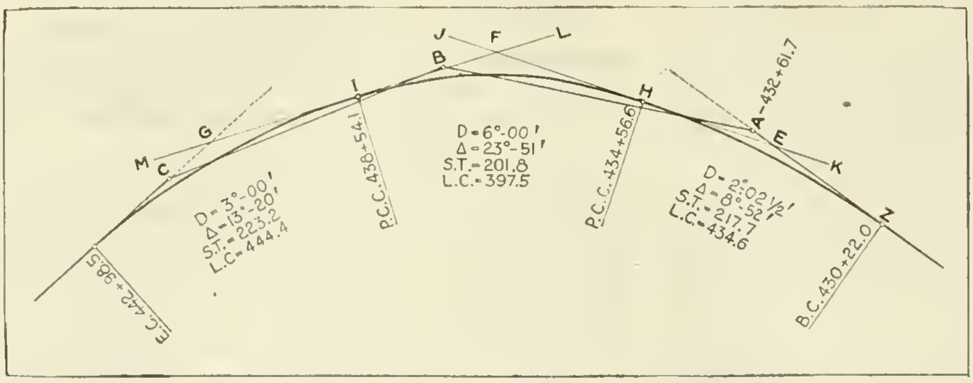


FIG. 2. PLOTTING TRAVERSE OF CURVES

making the profile tracing and right-of-way detail, besides doing miscellaneous figuring and checking.

The survey work consisted of main-line chaining and ordinary station-ground surveys at and between towns. The beginning of the division was taken as Sta. 0, and stationing was carried through, thus eliminating all equations, etc., in the original surveys. The party of three men covered, on an average, 8 or 9 mi. a day for each day worked.

Alignment and Curves

The alignment work, which consisted in determining the degrees of the curves and their stationing, was the most interesting part of the resurvey. All curves were intersected when possible, angles and externals being measured. There were a number of long curves, also a number of compound curves that could not be intersected. These were traversed, a sample of the field notes being shown in Fig. 1. Where the curves are long and compounded (as many as five times in some instances) this method is better than the deflection method.

Each curve was sketched in the field, one curve to each page in the notebook, care being taken to sketch curves to right or left as they were on the ground. When curves were close together it was found that two transits could be used to excellent advantage. This eliminated all backward movements for intersections, etc., everyone working ahead all the time. In using two transits, it was found advantageous to have sights set at each end of the tangents. This was generally done the previous afternoon, using the motor car. Sights were made of ten-penny nails and scrap detail paper cut into pieces about 2 x 3 in. Where tangents were long the party generally used the motor car to get from one curve to the next.

True bearing was established by sighting on polaris. This was checked often to see that no errors had been made in the angles. The regular alignment party consisted of an instrumentman, a rodman and two chainmen, all of whom were particularly good men. The best day's work with one transit was on the Dubuque Division when 27 curves were run.

For the profile, the work consisted simply of running a profile of the base of rail, U. S. sea-level datum being used. All existing Government bench marks were checked on, but these were found only on the Dubuque Division, along the Mississippi River. Bench marks were established near each station and also at intervals of about a half mile. No monuments were set, but existing features were used and well described. This was the only part of the resurvey that was not liable to be slowed up by curvature, towns, etc., and eight miles was the average day's work.

The original ground line was obtained generally by the levelman on days when he was not running profile. By using a hand level the cuts or fills at the sides were determined and interpolated for center line. On sidehill cuts, where it was impossible to determine original ground, the amount of cut was taken from the old profile. It will be hard for anyone to prove it is wrong. Land ties were generally taken by the alignment party as they came to them. This work consisted in turning angles to fence lines and measuring to the section corners; or, in the towns and cities, of turning angles to important street lines and measuring to street corners.

Profiles were plotted on standard profile tracing cloth, in 20-mi. sections. Standard conventions were used. One draftsman did all profile work, and could about keep even with the field forces when they were making average progress.

Determining the degrees of curves and their stationing from the notes taken in the field by the alignment party was an important part of the work. The necessary equipment consisted of a large paper protractor, a 36-in. straight edge, a prick point, a scale and a table of natural tangents, and curve data. A typical example is explained in the following, using field notes as shown in Fig. 1.

Plotting of Curves

The traverse is plotted very carefully on a scale 1 in. to 50 ft. Tenths of a foot can be plotted on this scale. This is shown at A, B, C in Fig. 2. The ties to the curve are then plotted and curve templates applied, care and judgment being used to see that there is no excessive "throw" and that the curves as drawn, to best fit the points, are tangent to each other and to the main tangents at each end. In Fig. 2 it is found that a 2-deg., a 6-deg. and a 3-deg. curve fit the best and that they are tangent to each other at about H and I. The line JK is drawn, a common tangent to the 2-deg., and the 6-deg. curves, and the line LM tangent each to the 6-deg. and the 3-deg. curves. These two tangents intersect each other at F. Other intersections are at E and G.

It is better to work each way from the center; so establish the center curve as a 6-deg. Scale angle HFL for the 6-deg. curve, which is found to be 23 deg. 51 ft. The tangent distance and the length of curve are figured and found to be 201.8 ft. and 397.5 ft. Points H and I are then scaled as 201.8 ft. from F and are the P. C. Cs. Angles HEA and CGM are scaled, also distances EG and IG. These are respectively the intersection angles and the tangent distances of the curves at the right and left.

Having these two conditions fixed, the degree of the curves is found to be 2 deg. 02½ ft. and 3 deg. The lengths of curves are then figured and we have all curve data except the stationing. EA is scaled as 22 ft. This added to 217.7 ft., the tangent distance of the curve at this end, gives 239.7 ft., equal to AN. This distance subtracted from Sta. 432 + 61.7 gives Sta. 430 + 22 as the B. C. of the curve. The stationing of the points of compound curves and the end of the curve is then found by adding the curve lengths.

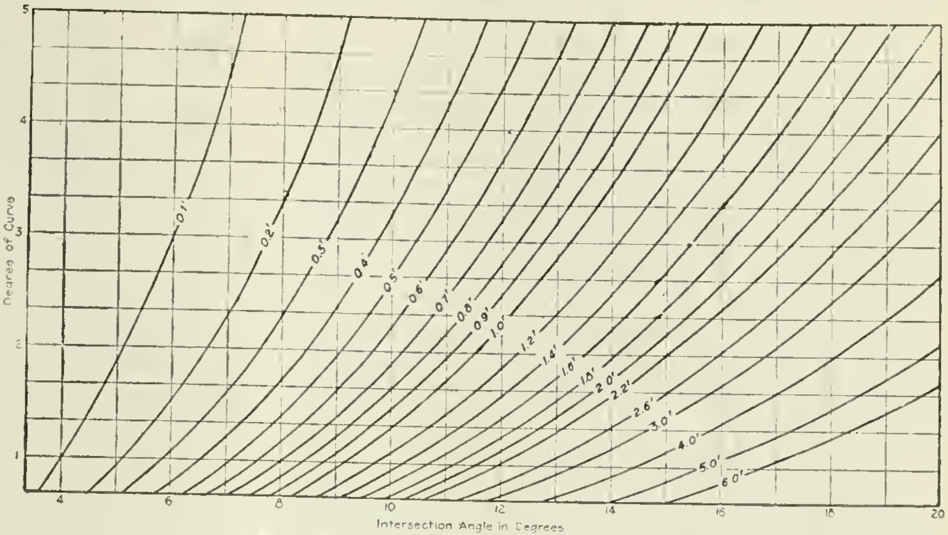


FIG. 3. CHART SHOWS AMOUNTS TO BE ADDED TO HALF LENGTH OF CURVE TO OBTAIN TANGENT DISTANCES

There may be some criticism of the above on account of excessive scaling. The writer does not claim that this method would necessarily give the best alignment for staking curves for lining track. It is, however, close and sufficient for map purposes. A party staking a compound curve for track lining could easily spend a day at it, and the next day an equally good party might stake it differently.

The right-of-way detail was made on a scale of 1 in. to 400 ft., using standard conventions, etc. The center line was plotted by co-ordinates, the point of intersection of each curve being plotted and the sub-tangents scaled each way. This is the same method used in railway location work. The laborious task of figuring the latitudes and departures was simplified by the use of a Gurnsey traverse table, one man calling out of the book and another tabulating. Every party on location or resurvey work should have a traverse table.

At the end of each division there was a thorough checking of profiles. This included checking bridges and culverts against existing bridge books, curve data, bench marks, elevation lines, mile-posts, stationing, etc. Among the things checked was the labeling of the grade line "base of rail" every 4 mi. In too many cases a profile fails to show whether the grade line was subgrade, base of rail or top of rail. As a rule there were found some things that were indefinite and needed a better checking. These were all listed in order and three men went back over the line on the motor car to get them, while the rest of the party moved to the new division. From 75 to 100 mi. could be checked thus in a day.

CHART FOR TANGENT DISTANCES

Of great assistance in this resurvey work was a chart devised by the writer for determining the degree of curvature, having given the intersection angle and the external. This chart was described in *Engineering News-Record* of Sept. 11, 1919, p. 506.

A chart for determining tangent distances, shown in Fig. 3, was devised by C. E. Sandstedt, assistant engineer on the resurvey work. Degrees of curves are plotted vertically on standard cross-section paper on a scale of 1 deg. to 3 in. and intersection angles plotted horizontally on a scale of 1 deg. to 2 in. Graphs show the amounts to be added to half the length of curve, to obtain tangent distance. This chart should be a time-saver, as it is not a small task to figure the tangent distances of a number of curves by ordinary methods, especially if the degree of curves happen to have odd minutes.

All resurvey work was done under the general supervision of T. H. Strate, valuation engineer, and C. F. Loweth, chief engineer of the Chicago, Milwaukee & St. Paul R.R. C. E. Sandstedt was assistant engineer in direct charge while the writer was temporarily assigned to other work.

Gen. Leonard Wood's Views on the Engineer

Candidate for Republican Presidential Nomination Reviews Engineer's Part in Colonial Affairs and in War — Favors Permanent Engineer Reserve

SPEAKING before the Western Society of Engineers at its recent annual meeting General Leonard Wood, U.S.A., candidate for the Republican presidential nomination, presented his views regarding the work engineers have done and the position they should occupy in the conduct of our national affairs. An abstract of his remarks follows:

"In colonial development, the administrator, the sanitary engineer and the constructing engineer seem to go together. In Cuba I had to turn to the engineer when we had the problem of creating a republic out of some two million people of a war-worn Spanish colony, absolutely without government and with everything in wretched condition. We had to begin with building and rebuilding roads, piers, public buildings and harbor works. The sanitary engineer went along with the constructing engineer and their work was a great and helpful force. We organized a cabinet in preparation for the president who was to come. In this we had a secretary of public works in charge of a department of public works, all of the work of which was done under a budget system, twenty years ago. I have often thought it would be a good thing for this country, with its enormous amount of public works, to have such a department with some responsible person at the head.

"The Panama Canal was built on the foundation laid by the sanitary engineer. It was founded on the work of Walter Reid, in Cuba, who was the directing mind in the discovery of the means of transmitting yellow fever and consequently the means of controlling it. While General Ludlow, the distinguished engineer, was Governor of Havana, and I was Governor of the eastern end of the Island, yellow fever one year swept away a third of my staff in six weeks and the next year it took a fourth of them in three weeks. Then came Reid with his remarkable discovery, and Willimar, Lazarre and Carroll laid down principles and lines of action which enabled us to wipe out yellow fever. The French were good engineers, but they had not been able to go on with the Panama Canal work because the death rate was so heavy. It takes nothing from the honor of the constructing engineer to give due credit to the medical man and the sanitary engineer who made the work possible.

In the Philippines, the engineer again became our right-hand man and was the principal agency of the colonial administration in building bridges and making other developments.

The Engineer Reserve Corps

When the great war came and some of us were trying to interest the people in preparedness, we built up the Engineer Reserve Corps, which came next after the organization of the Medical Reserve Corps. At that time I had command of the Atlantic coast, Panama and Porto Rico and had to lay lines of defense around the great cities. It occurred to me that we should have engineers available in all these cities, as in building the defenses what better men could we have than those who live there and know the contractors, the resources of the city and the sources of supply. It impressed me that there was a chance to make immediate and valuable use of the engineer. So one day, at a meeting of the Engineers Club in New York, we organized the Engineer Reserve Corps, which has been of wonderful use and ought to be kept up permanently. In case of sudden emergency it would be of the utmost value to have these engineers, who could take the plans and carry out the work with the greatest rapidity. To keep alive the reserve corps is your big part in the scheme of national defenses.

"As to the great war, there has never been a war in which the engineer and the sanitarian played so large a part; in destructive and constructive work, and the development of railways and ports. We went through this war in most extraordinary fashion. By the work of the sanitary engineer our men were kept healthy, though living under conditions which would have meant death a few years ago.

"An alliance between engineers and architects in evolving some general policy of building construction in our great cities is desirable. We have sanitary regulations but no regulations to prevent monstrosities from being inflicted upon the public, while we should have our works of utility built so that they will be works of beauty."

Reports 82 Per Cent Price Rise

An increase of 82.2 per cent in the cost of living for American wage earners between July, 1914, and November, 1919, is shown in a statement issued Dec. 28 by the National Industrial Conference Board, based upon its most recent investigations. This represents an advance of 10.4 per cent since November, 1918, 13.5 per cent since March, 1919, when prices dropped temporarily, and 5.8 per cent since last July. The increase in the cost of the five major items in the family budget since July, 1914, was: Food 92 per cent, shelter 38 per cent; clothing 135 per cent; fuel, heat and light 48 per cent, and sundries 75 per cent.

Decay of Factory Roofs Checked by Proper Heating

Artificial Humidity and Ineffective Arrangement of Heater Pipes Conduc to Rapid Decay of Wooden Roofs

DECAY of timber roofs of industrial buildings in which a humid atmosphere is maintained can be checked by proper arrangement of heating pipes under the roof, according to a pamphlet prepared as a reprint of a paper read before the American Society of Heating and Ventilating Engineers by F. J. Hoxie, engineer and special inspector of the Associated Factory Mutual Insurance Cos., Boston, Mass. Such arrangement will also reduce the trouble due to water dripping from the ceiling in cold weather.

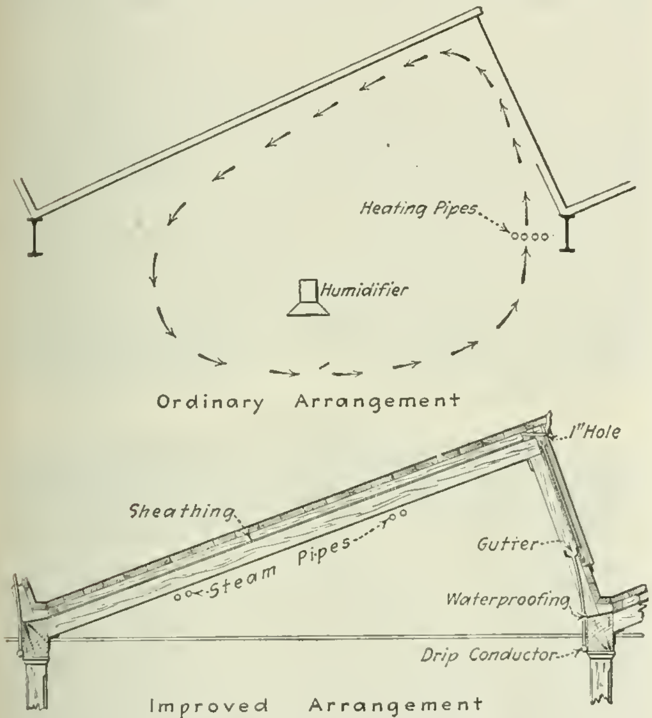
Destruction of sawtooth roofs of weaving sheds by decay is stated to have progressed to an alarming extent within the past few years. The primary cause is the artificially humidified air with a relative humidity of 70 to 80% at 70° F., which means that 1 cu.ft. of air will contain about 6 grains of moisture and the dew-point will be 62° F. A drop in temperature of 10° will cause precipitation of drops of water. Modern weaving buildings have large roof and window areas exposed to the cold in winter, the result being that the part of the roof plank which is at or below the temperature of the dew-point of the interior air absorbs sufficient water to come within the requirements of some of the wood-rotting fungi. Mr. Hoxie considers that the location and extent of the heating pipes will generally be found to have a direct bearing on the location of the parts most rapidly destroyed.

In a weaving shed where a heating coil extended half the length of a bay, the part of the roof over this coil has been in place 18 years and is still in service, while the remainder of it has had to be replaced. The center sawtooth in a shed 500 x 350 ft. has the main steam pipe at its base and extending three-quarters the length of the building, while the circulation pipes are in the customary location under the windows. This sawtooth is apparently in a good state of preservation as far as the steam pipe extends, fungous growths commencing directly at the end of this pipe, while the remainder of the roof has been replaced after nine years' service. It appears that better results can be obtained by locating part of the steampipes at the back of the sawtooth, farthest from the windows. In one case where the pipes were located three on each side of the bay, the roof is still in service at the end of 17 years, although other parts of this same roof, where all the pipes are under the windows, have rotted and have been replaced.

Metal ventilators, metal roof drains, skylights and windows which radiate more heat than other parts of the roof and thereby keep the air in the vicinity cooler than in other parts of the building, will accelerate the destruction. The cure, as suggested by Mr. Hoxie, is to prevent the escape of heat by increasing the insulation; using steampipe covering for drain pipes and heavy plank for ventilator openings. Double roofing will increase the insulation, but a layer of tarred paper should be mopped on between the two thicknesses of plank so as to prevent the interior moisture from passing through and saturating the outer portions, thereby decreasing the insulating power and starting rot in the outer or center part of the plank, which is very common.

It may be more convenient to increase the amount of heat than to reduce the loss by increased insulation. Either method will produce the same effect if care is taken to prevent the moisture from penetrating the roof plank and condensing on the outer side. This is particularly important if absorbent felts have been used on the outside of the roof for insulation, in which case the moisture will reduce the insulation and also encourage fungous growths.

Sheathing the inside of roofs to form an air space has been used in several cases to increase the heat insulation and prevent sweating, and is generally regarded as an efficient remedy, but Mr. Hoxie considers that the air space is of little value as a heat insulator and makes an excellent place for the propagation of fungi. Moisture can pass through the sheathing and become pocketed under the roof planks, which space is colder than the room and generally below the dew-point, with the result that an abundant growth of destructive fungi occurs. In a case where rotting had started in a comparatively new mill, holes were bored to the outside air and covered with a strip to keep out the weather and at the same time to allow the moisture to escape and dry outer air to enter, the heat of the room keeping the space between the roof plank and sheathing above the dew-point of this drier air from outside. Moist air of the room is carefully excluded from this space.



ORDINARY AND IMPROVED ARRANGEMENTS OF HEATER PIPES AT SAWTOOTH ROOFS

Moisture carried by air currents set up by the heating pipes is next in importance to the dew-point of the air in causing rot in roofs. The arrangement of heating pipes commonly found in sawtooth roofs, as shown in the drawing, causes a circulation of air as shown by the arrows, so that moisture from the humidifiers will be carried up and deposited on the cooled windows and roof, not only rotting the woodwork but causing dripping. The arrangement of heating coils shown in the lower part of the drawing should reduce the air circulation by keeping the highest part of the roof at the highest temperature, thereby preventing the air from carrying moisture to the roof planks.

Paper mills and finishing works, says Mr. Hoxie, can be improved by more ventilation, as the problem there is to get rid of the moisture. Where large quantities of moisture are to be disposed of, this will require a large amount of air, and provision should be made not only to remove this air but to admit and heat sufficient air to meet the requirements of the exhausting system without running part of the air circulation system backwards, as is frequently done. That is, the exhaust ventilators, instead of carrying away the moisture-laden air, are admitting cold air in one part of the room, owing to a considerably higher temperature under the ventilators in another part. This occurs when ventilation is produced only by differences in temperature.

If fans are used and no provision is made to introduce dry, warm air in sufficient quantities to replace that removed, cold air will be drawn in around windows or doors and will cause precipitation and rotting of the wood thus kept moist. An opening near the floor is advisable, with suitable steam coils for warming the incoming air and supplying it in sufficient quantities to keep the air of the room at a reasonable moisture content, which, to avoid rotting, should be not over 6 grains of water per cubic foot. In a large paper mill or finishing works (sometimes evaporating more than 50 tons of water per day) this will require a large amount of air. Mr. Hoxie believes it may be possible to increase the economy of this ventilation by returning some of the latent heat of evaporation of the outgoing moisture to the incoming air by use of an air condenser in the ventilators, but he has never heard of this being done.

Rotting in moist basements can be stopped more frequently by sufficient radiated heat to keep the contained air above the dew-point than by ventilation, as it is generally difficult to control the temperature of outside air used for ventilation. The introduction of cold air into a warm, moist basement will cause rotting rather than prevent it, as it will reduce the temperature and precipitate moisture, while the introduction of a small amount of heat into such a basement will raise the temperature above the dew-point and thereby stop the rotting. Several cases have been found where steampipes near the ceiling of a basment had prevented rotting even when the ground underneath was covered with water. The water, being colder than the ceiling, assisted in preventing precipitation by regulating the amount of moisture in the air.

Hetch Hetchy Tunnels Completed for $65 Per Foot

The following is extracted from a statement made on Feb. 23 by M. M. O'Shaughnessy, city engineer of San Francisco:

"The City Engineer's department has already excavated 2 mi. of tunnel on the Hetch Hetchy project at $40 per lineal foot, and has figured out that it can do the concrete lining at $20 per lineal foot, with an allowance of $5 for extras. Total, $65 per lineal foot. The lowest bid the city got for this tunneling construction was $93 a lineal foot for a tunnel of more than 10 ft. in diameter excavated, cement-lined and finished. The saving works out at nearly $150,000 per mile of tunnel."

ENGINEERING LITERATURE

A REVIEW OF BOOKS AND A LISTING OF NEW PUBLICATIONS

Correspondence

Sir—The article by Mr. Fleming in your issue of Feb. 12, p. 322, recommending the publication of a history of engineering, is the first public expression I have seen that any one else has realized the great necessity for such a work, and is certainly encouraging to those of us who have spent much time and labor toward the realization of this desideratum. Many years ago I recognized the necessity of such a work and plunged directly into the weighty undertaking. By reading over the classics and other ancient books, by ransacking libraries, I collected numberless notes, which, arranged in chronological and technical order, were finally condensed into three volumes under the title "The Engineering Works of the Ancients and of the American Indians."

I passed through the experience foreseen by Mr. Fleming that no editor would undertake the risk of publication of such a work. The most prominent editors of the country have refused to accept a work for which there is so limited a market, and the technical publishers claim that engineers are too busily engaged in the progress of the profession, always looking after the most up-to-date methods, that they have not the time to inform themselves about what has been done in the past—and that they do not care to do so.

I firmly believe that a history of engineering would be very useful to both scholars and engineers. It would prevent the student from misstatements and anachronisms. For instance, in the latest edition of the Brittanica the invention of locks is credited to the two brothers from Viterbo who built a lock at Stra in 1481; and yet Leon Battista Alberti in his "De Re Aedificatoria," published in 1450, describes locks in chapter xii. Even the most up-to-date engineer may find it advantageous to know the works of the Ancients. William Willcocks, intrusted with the drainage and irrigation of the delta of the Euphrates and Tigris, after a careful examination of the topographical and physical conditions of the locality, suggested the rebuilding of the works constructed by the ancient Chaldeans some thousand years before the Christian Era. After the British occupation of Egypt engineers were appointed to extend the benefit of irrigation to land not directly reached by the annual floods of the Nile. It was proposed to store the high waters in a large reservoir to be constructed either at Assouan or at the locality of the ancient Lake Moeris. The Moeris was visited and described by Herodotus, who says: "For many months the water of the river enters the lake, and for many more the water from the lake enters the river." At the last moment the Assouan dam was decided upon, and the flooding of the Island of Philae, threatening the destruction of the best monuments of the Ptolemaic period, justifies the preference of the ancients for the Moeris, a work which, according to the Arab tradition, is credited to the Patriarch Joseph mentioned in the Bible. The ruins of the Etruscan cities and necropolis encountered in the swampy places infested by malaria where no human being can now live, indicate that the lands were drained either by the Etruscans or their predecessors. These drainage works consisted of a network of cuniculi extending in every direction and for thousands of miles in length which later engineers have been unable to re-establish or duplicate. If professional men were better acquainted with the works of the Romans or those of the Peruvian engineers in pre-Columbian time, the world would have had reinforced concrete centuries before it came into modern practical use.

These few examples taken at random will show how useful would be a history of engineering to the profession. A thorough history of engineering should be composed of three separate parts, the first devoted exclusively to the engineering of ancient and medieval times, and I have prepared such a manuscript. The second part should be devoted to modern engineering, each branch of the profession being treated by a specialist, and finally the third part should consist of a dictionary giving a biographical sketch of all the prominent engineers, their works and contributions toward the advancement of the profession. CHARLES PRELINI.

New York City.

American Engineers' Handbook Revised

AMERICAN CIVIL ENGINEERS' HANDBOOK—Editor-In-Chief Mansfield Merriman. Fourth Edition, Thoroughly Revised and Enlarged. New York: John Wiley & Sons, Inc., London: Chapman & Hall, Ltd. Flexible Cover; 4 x 7 in.; pp. 1955; illustrated. $6.

Only a page by page comparison would reveal the exact changes in this latest edition of a book which has become a standard reference—and as the third edition had 1,580 pp. and the present or fourth edition has 1,955 pp. that task has not been attempted. Suffice it to say that two new sections—on Electric Railroads (55 pp.) by William A. Del Mar and on Irrigation and Drainage (63 pp.) by Horace W. King—have been added; that Searle's useful mathematical tables have been interleaved on colored paper; and that many revisions and additions have been made by both old and new authors in the effort to bring the book up to 1919, when the fourth edition closed. Also the volume is no longer a "pocketbook," which it never was except by title, but is now a "handbook."

Scattering examination shows some unevenness as to completeness of revision. In the treatment of concrete as a material, for instance, none of the recent studies into proportioning, aggregate or water content are noticed; the matter seems not to have been revised since the second or possibly the first edition. On the other hand the freight handling and port terminal section contains matter—such as the design of the 350-ton fitting-out crane at Philadelphia—which has not yet been made public, so recent in design and construction are they. Looking again at the other side of the ledger we find that although the article on Disposal of City Refuse has been expanded by a third it fills only two pages. This seems out of proportion to the space given to other subjects, besides which the information given is not strictly up to date. Such unevennesses and deficiencies as have been mentioned are to be expected where so many men go to make up a book of such wide field as to preclude one man knowing all the subjects covered. At the same time there is no doubt that this multiple-control, so to speak, is eminently satisfactory in producing so many sided a book, which improves with every edition.

The staff of associate editors now numbers 18, the two new men already mentioned having been added. There have been three other changes in associate editors, Walter L. Webb, Ruldolph P. Miller and Frank P. McKibben having withdrawn and their places having been filled by Fred A. Barnes, Herbert F. Moore and Frank A. Constant. The corresponding sections are on Steam Railroads, Materials of Construction and Steel Structures.

Those interested in the art of book reviewing may wish to study two types of reviews followed in the case of the first edition of the "pocket book," the exhaustive and the summary. The notice in *Engineering News* (Feb. 11, 1911) filled ten columns, of which two were general comment and characterization and eight were a detailed examination of the contents of the volume, all by the editorial staff. The *Engineering Record* notice, only two days later, was a column and a half long, with a critical middle paragraph in the form of an editorial composite of opinions from six unnamed engineers to whom the book had been sent for report on designated sections.

Building the Pacific Railway

BUILDING THE PACIFIC RAILWAY: The Construction-Story of America's First Iron Thoroughfare Between the Missouri River and California, etc.—By Edwin L. Sabin. Philadelphia and London: J. B. Lippincott Co. Cloth; 5 x 8 in.; pp. 317; illustrated. $2.

How the first railway to the Pacific was located and built and how the conflict between North and South determined against the Southern route, although engineers had reported it to be the more economical, is told by Mr. Sabin in this book. The volume records the financial and engineering history of the Union Pacific and Central Pacific Lines, which met at Promontory Point, on the Great Salt Lake in 1869, completing railroad connection with the Pacific Coast in six years instead of the fourteen years allotted by the Congressional land grants. The foresight of engineers Judah and Dodge, and the remarkable location work carried on by their forces are shown throughout the book.

Since about 1830 routes had been proposed on locations which now approximate the lines of the Northern Pacific, the Santa Fe, the Southern Pacific, and the Union Pacific from Omaha westward, up the valley of the North Platte. Previous to the passage of the Pacific railroad "Act of 1862," granting bond issues and lands to construct a line from the Missouri River to the Pacific Coast, reconnaissance surveys had been made by Grenville M. Dodge, later chief engineer of the Union Pacific, and by Theodore D. Judah, later chief engineer of the Central Pacific. Construction of the Central Pacific, striking eastward toward the crossing of the Sierras by the Dutch Flat and Truckee route, and construction of the Union Pacific westward from Omaha both started in December, 1863. Mr. Sabin tells how construction was rushed by both companies, spurred by land grants and the prospects of the business of the valley of the Great Salt Lake. There is recorded the grading and track-laying records made by Charles Crocker of the Central Pacific and "Champion Track-Layer" Jack Casement of the Union Pacific, until the lines finally met at Promontory Point, Utah, May 10, 1869.

Legislation, financial history, and organization are dealt with at length in telling of the work of Stanford, Huntington, Durant, Dillon, Oakes Ames, the principal promoters and organizers of the two companies. While the volume contains much of interest to engineers, it is not an engineering book and unfortunately has some obvious errors, such as reference to grades of 40 per cent. However, the author recognizes the remarkable location work, carried out under great pressure from headquarters and most disadvantageous conditions after construction had started. He says: "There was little opportunity for revision or back-tracking. It is remarkable that such work has stood the test of time, but it has been little altered."

Hints for Forming and Using Libraries

THE BUSINESS LIBRARY: What It Is and What It Does—By Louise B. Krause, Librarian, H. M. Byllesby & Co. San Francisco, Cal.: Technical Publishing Co. Cloth; 5 x 7 in.; pp. 116; illustrated.

Engineers, manufacturers and business houses who have or ought to have a library, even though it be small, would profit by this concise little book. After chapters on what the business library is or may be the author takes up periodicals, public documents, trade catalogs, classification and cataloging, mechanical equipment of the library, reference books and last, but by no means least, qualifications essential to the business librarian. The small list of general reference works and the brief reference lists at chapter ends are useful.

Research and Invention

THE OUTLOOK FOR RESEARCH AND INVENTION: With an Appendix of Problems Awaiting Solution—By Nevil Monroe Hopkins, M. Sc., Ph. D., Experimental and Research Engineer, etc. New York: D. Van Nostrand Co. Cloth; 5 x 8 in.; pp. 241; illustrated. $2.50.

Research workers, inventors, educators, manufacturers and certain government officials and legislators of the higher type will find stimulus and suggestion in this readable volume. There are chapters on the spirit of Research, Men of Research and Their Development, Indifference of the Past, American War Research, The Education for Research, Some Borderline Limits, Research in the Factory, The Making and Protecting of Inventions and a List of Practical Problems Awaiting Solution. Most of the book is written from the viewpoint of the chemist and physicist rather than of the engineer and nearly all the research problems listed are in the two fields named, but the author writes with knowledge and appreciation of engineering.

Water Powers of British Columbia

WATER POWERS OF BRITISH COLUMBIA: Including a Review of Water Power Legislation Relating Thereto and a Discussion of Various Matters Respecting the Utilization and Conservation of Inland Waters—By Arthur V. White, Consulting Engineer, Commission of Conservation; Assisted by Charles J. Vick. Ottawa, Can.: Commission of Conservation. Cloth; 7 x 10 in.; pp. 644; illustrated; folding maps in pocket.

Besides the general discussions and summaries to be expected in so comprehensive a survey this volume contains many data on power plants, built or proposed, references to undeveloped water powers, topographical information by main river basins and both stream flow and meteorlogical records—the last two including many figures for the United States thought likely to be of value in British Columbia. The publication of the volume has been delayed—presumably by the war—but just how long is not stated. Data at least as recent as 1916 are included. Well selected engravings add to the interest of the volume, which is highly creditable to all concerned with its production.

For Designers and Users of Motor Vehicles

MOTOR TRUCK DESIGN AND CONSTRUCTION—By C. T. Schaefer, Consulting Engineer, Member Society of Automotive Engineers. New York: D. Van Nostrand Co. Cloth; 6 x 9 in., pp. 318; illustrated. $2.50

MOTOR VEHICLES AND THEIR ENGINES: A Practical Handbook on the Care, Repair and Management of Motor Trucks and Automobiles for Owners, Chauffeurs, Garagemen and Schools—By Edward S. Fraser, American Bosch Magneto Corporation; and Ralph B. Jones, Willys Overland Co. New York: D. Van Nostrand Co. Cloth; 6 x 9 in.; pp. 344; illustrated. $2.

The first of these books was written (or as the author says "compiled") for engineers engaged in the design and construction of motor vehicles, but "at the same time," the author states, "a general outline of the underlying principles is given for the student, commercial vehicle owner and operator who may desire to familiarize himself with the construction of the various units that make up the complete vehicle." The author frankly describes the book as a compilation, but it contains a considerable amount of explanatory and critical comment. The second book, as its sub-title says, is for owners, chauffeurs, garagemen and schools. Each book takes up a variety of types and makes of motor vehicle parts, and seems well designed to serve the needs of a large and growing class of possible users.

To Promote the Metric System

Under date of Jan. 15 the first issue of *The Weekly Metergram* appeared. It is published by the World Trade Club of San Francisco, which is promoting the adoption of the metric system in this country.

Maximum Rainfall at Boston

The larger part of the February *Journal* of the Boston Society of Civil Engineers (Tremont Temple, Boston; 50c. per copy) is devoted to a paper by Harrison P. Eddy on "Maximum Rates of Precipitation at Boston for Various Frequencies of Occurrence." The study covers records at Chestnut Hill beginning in 1879 and at the Weather Bureau gage beginning with 1891 and ending in both cases with 1916. Tables and diagrams accompany the text.

Census of Special Libraries

For the purpose of locating the various special libraries of the country and ascertaining the lines which each covers, data on the subject are being collected by William F. Jacob, chairman, Library Census Committee, Special Libraries Association, General Electric Co., Schenectady, N. Y. The committee desires information under the following seven heads: (1) Name of institution. (2) Name by which library is known. (3) Name of librarian or custodian. (4) Can it be classified as any of the following: financial, business, legal, engineering or technical; institutional, municipal, reference, agricultural? (5) If not, how can it be classified? (6) Does it serve a special clientele? (7) Would your librarian be willing to assist other special libraries to a reasonable extent?

A New Technical College Paper

Under the title *The Tech Engineering News* there was started in February at the Massachusetts Institute of Technology a "Professional Journal of the Alumni and Undergraduates" of the institution named. It will be issued monthly from Cambridge (10c. per copy; $1.00 a year).

PUBLICATIONS RECEIVED

[So far as possible the name of each publisher of books or pamphlets listed in these columns is given in each entry. If the book or pamphlet is for sale and the price is known by the editor the price is stated in each entry. Where no price is given it does not necessarily follow that the book or pamphlet can be obtained without cost. Many, but not all, of the pamphlets, however, can be obtained without cost, at least by inclosing postage. Persons who are in doubt as to the means to be pursued to obtain copies of the publications listed in these columns should apply for information to the stated publisher, or, in case of books or papers privately printed, then to the author or other persons indicated.]

THE ALL-AMERICAN CANAL: Report of the Canal Board, Dr. Elwood Mead, W. W. Schlecht, C. E. Grunsky, on A Canal Located Entirely Within the United States from the Colorado River at Laguna Dam into the Imperial Valley, California; Together with the Report of the Engineer in Charge of Surveys and Examinations, Porter J. Preston—Washington, D. C., Department of the Interior. Paper; 6 x 9 in.; pp. 98; folding maps.

THE ARTESIAN WELLS OF MONTREAL—By C. L. Cumming. Ottawa, Can.; Geological Survey. Paper; 6 x 9 in.; pp. 153; illustrated.

COEFFICIENTS OF DISCHARGE OF SEWAGE-SPRINKLER NOZZLES—By Frederick W. Greve, Jr., Assistant Professor of Hydraulics, School of Civil Engineering, Purdue University, and W. E. Stanley, Recently Instructor in Hydraulics, School of Civil Engineering, Purdue University, Lafayette, Ind.; Engineering Experiment Station, Purdue University. Paper; 6 x 9 in.; pp. 28; illustrated.

COTTON WAREHOUSE CONSTRUCTION—By Robert L. Nixon, Assistant in Cotton Marketing. Washington, D. C.: United States Department of Agriculture. Paper; 6 x 9 in.; pp. 38; illustrated.

THE EFFICACY OF EXISTING MEASURES FOR THE PREVENTION OF DISEASE—BY George A. Soper, Ph.D. Reprinted from "Journal American Medical Association." New York City: The Author, 130 W. 57th St., New York City. Paper; 6 x 9 in.; pp. 14.

Notable among other things for its definition of sanitation and its classification of 17 specific measures for combating disease, of which 4 come under sanitation, 7 under board of health work and 6 under personal precautions.

EFFICIENT BOILER MANAGEMENT: With Notes on the Operation of Reheating Furnaces—By Chas. F. Wade, A. M. I. E. E., Boiler and Fuel Economy Specialist. New York and London: Longmans, Green and Co. Cloth; 6 x 9 in.; pp. 266; illustrated. $4.50 net.

British boiler room equipment and practice is outlined from the viewpoint of efficiency. Save for two pages at the end, coal is the fuel considered. The book throughout seems to be within the ken of the average boiler room superintendent, and much of it could be read with profit by any intelligent boiler room man.

EXPERIMENT STATIONS OF THE BUREAU OF MINES—By Van H. Manning. Washington, D. C.; Bureau of Standards. Paper; 6 x 9 in.; pp. 106; illustrated. 25c. from Superintendent of Documents.

THE HOUSING SITUATION IN ENGLAND AND THE UNITED STATES—By F. T. Miller, President F. W. Dodge Company, New York. Paper; 6 x 9 in.; pp. 30.

MODERN PRACTICE IN THE CONSTRUCTION AND MAINTENANCE OF RAIL JOINTS AND BONDS IN ELECTRIC RAILWAYS—By E. R. Shepard, Associate Electrical Engineer, Bureau of Standards. Washington, D. C.: The Bureau. Paper; 7 x 10 in.; pp. 131; illustrated.

MODERN ROADS—By H. Percy Boulnois, M. Inst., C.E., F.R. San. Inst., F. San. Inst., Etc. London, Eng.: Edward Arnold. Cloth; 6 x 9 in.; pp. 302; illustrated.

MORTALITY STATISTICS, 1918—Washington, D. C.: Bureau of the Census. Paper; 9 x 12 in.; pp. 92.

Made up wholly of tabular matter giving "some of the most important" mortality figures for the registration area, which in 1918 included 77.8 per cent of the estimated population of the United States.

NEW YORK INDUSTRIAL COMMISSION, Report, 1918—Albany, N. Y.: New York State Department of Labor—Cloth; 6 x 9 in.; pp. 261.

OFFICIAL YEAR BOOK OF THE COMMONWEALTH OF AUSTRALIA: Containing Authoritative Statistics for the Period 1901-1917, etc.—By G. H. Knibbs, C.M.G., Commonwealth Statistician, etc. Cloth; 6 x 9 in.; pp. 1246; illustrated.

ONTARIO PROVINCIAL BOARD OF HEALTH: Report, 1918—Toronto, Can.: The Board. Cloth; 7 x 10 in.; pp. 210; illustrated.

POPULAR OIL GEOLOGY—By Victor Ziegler, Professor of Geology and Mineralogy, Colorado School of Mines. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Flexible Cover; 5 x 7 in.; pp. 149; illustrated. $2.50.

Contractors or "Large" Contractors For Highway Work?

By Dana W. Robbins
Utica, N. Y.

This article presents the "other side" of the highway contracting case.

Opinion has recently favored the letting of contracts in long stretches to induce large contracting organizations to enter the highway field. "Engineering News-Record" itself has taken that view.

Both Mr. Robbins and this journal would welcome discussion on the points discussed in the article.—Editor.

During the early months of 1919 it was frequently asserted, in effect, that highway construction was about to be revolutionized. Large construction firms were entering the field and were to put "model" costly plants on the work—plants capable of building roads at the rate of a mile a week, etc. There was, and still is, an agitation for very long contracts, for it was evident that with the progress expected a five- or six-mile job would be only a small part of a season's work. These assertions were often accompanied by a few allusions to the delinquency and general unfitness of the "old-timers" who to date have built all the roads the country has.

These "old-timers" had generally reached the conclusion that highway construction was a "small-contractor" proposition; and by "small" is meant not necessarily a contractor who can finance only a small job, but a contractor who takes only work to which he can give his own personal attention and supervision. They believed this for a very simple reason, viz., that each piece of work required constant, resourceful supervision of a kind they were unable to hire. The work was seasonal work and the keeping of high-priced men on the payroll during winter months ate up much of the profits that close competition allowed. The contractors themselves could supervise only a very limited number of jobs. In fact any increase over one contract meant less attention.

There had been in New York State one very pretentious effort to do road work on a large scale, and there had been two or more efforts at large expansion by firms already successful on a smaller scale. All these ended very disastrously, principally for the reason given. However, with great impetus given to road-building with post-war conditions, and highway estimates of $30,000 to $50,000 and more per mile, these contractors were confronted with so many new problems that they were entirely willing to be shown, and were half inclined to think they would be.

The results of the past season's efforts would seem to be somewhat reassuring to them. The "model" plants were not models and showed little if any more work than was customary during a season. The large contractors made little if any more progress than that averaged heretofore. It is rumored that profits were not up to expectations, even at the greatly increased prices.

Is the problem of increased construction organization to meet increased demands—if there be such a problem—best relieved by offering inducements to large construction firms which other contractors would be unable to accept? Or is it best relieved by removing all unfair, one-sided clauses from specifications, and then leaving it an open game where the greatest number can compete on terms of equality?

Roadbuilding Plant

There seems to be an intimation in the discussion of recent months that contractors previously engaged in highway work have not been properly equipped. Considered in general, such an idea is so far astray as to be absurd. They have bought lavishly, have paid for all the machinery, manufacturers' experiments, and have gone on the rocks more frequently as the result of plant rather than the want of it. They may be depended on in the future to buy any equipment offered, provided they are reasonably satisfied of real economy in so doing.

Considerable stress has been laid of late on elaborate "co-ordinated" plants—which, evidently, during the past season did not always co-ordinate. There is no part of these plants that is especially new other than some new labor-saving devices such as finishing machines, sub-graders, etc. It would be a great mistake, however, to assume that because industrial railway, for example, is not found on every job, the contractor is ignorant of its merits or unable to get it. He probably knows all about it.

In vast areas of the country suitable materials can be crushed along the road at various points, excavation is frequently in rock, grades are high, and conditions in general are such that plant must be an assembly of whatever units appear to be desirable, as many as possible from the contractor's stock, and it will be the task of the superintendent to keep them moving whether they co-ordinate at all times or not.

Just what is new about this co-ordination, and who discovered it so recently? It has been suspected among road contractors for some time that if a mixer is capable of handling a certain amount of material daily it cannot be run to capacity unless some agency gets the material there at the necessary speed. Also that it would be necessary for the crusher to turn out that much material, or more, daily, and that the quarry would have to keep the crusher supplied. If anybody has discovered how to keep these things all moving properly, put culverts in, prepare the grade and do many other things, then he has made a real contribution to highway construction. It happens occasionally, but if things are not co-ordinating don't assume that the contractor had overlooked a few links in the chain. They may be twisted, but he knows they are, and that some day the other fellow's chain will kink, no matter who he is.

Finances

No contractor or firm should undertake any more than can be financed properly. If a contractor confines his efforts to work that he can finance properly he is just as well equipped, financially, for that work as anybody could be. He could extend his operations and do more work if, by a general revision of one-sided contracts, public officials would reassure the banks and business men of the country who have lost confidence in highway work as a business proposition. There are today many banks that will not lend a dollar to a highway contractor because they are convinced that the work is very hazardous and that the question of profit is dependent not only on the contractor's ability, weather conditions, etc., but also on the decisions of the engineer or inspector, to whom the contract as customarily drawn gives almost unlimited power. A start in dispelling this impression could be made by removing from all contracts clauses which courts have already held are inequitable. The contractor—and especially the small contractor—needs his money promptly, and he can use the money by prosecuting the work more rapidly or by extending his operations.

SUPERVISION

It is a mistake to assume that the matter of supervision can be solved by having a very large contract and a correspondingly high-priced man to oversee it. A very long contract can progress properly only by having a number of outfits at work, and each outfit will require just as good a man as a separate piece of work would. There is no other line of construction work requiring more constant attention and rearrangement of forces than road work, especially in rough country where many items of work are progressing. Rainy days and other troubles disarrange all schedules and delay progress, yet frequently work of some sort must be provided to keep labor contented. It is at such times that resourceful supervision counts, and it counts only if it is right there at starting time in the morning.

It is very doubtful if, on the whole, the large contractor can secure supervision that will excel, or even equal, that given by the smaller contractor who is spending his own money and reaping the rewards or paying for failures. There is nothing very technical about road work, and a natural ability and resourcefulness, and money-making instinct are worth much more than an engineering education. In fact highway engineers who have become road contractors have not been successful, as a rule, in New York State.

It is very probable that in spite of labor conditions and of last season's experience road contractors can make greater progress than that hitherto averaged, in just the proportion that they are paid for doing so and in much the same way that speed was secured in war enterprises. If cost is still a consideration, however, it would seem to be good judgment to ask any firm to demonstrate that it is a permanent feature of the enterprise before taking any steps that would result in shutting out the competition of those already in the business. There should be no difficulty at the present time in any firm's securing contracts up to $300,000 or $400,000 each. A contract of this size should be ample to demonstrate any economy of methods or increase in speed. Any plant investment on a job of this size could hardly equal, in proportion, that made by any "old-timer" in the past, and there is no business in the United States today where the outlook is more favorable for the continued use of plant than in road work.

Several states have either organized construction forces or are considering doing so. It is difficult to see just how this plan is to increase either rate of construction or efficiency. Rate of construction depends largely just now on the supply of "floating" labor which can be secured without raising the price to unreasonable limits. The state as a contender for this limited labor would not increase its efficiency, judging by past standards.

There appears to be a country-wide demand, coming from everybody except labor interests, for less government activity and the return of business to private control. If the arguments advanced are sound in regard to the railroads, steamship lines, shipbuilding, lumber operations, etc., why not in regard to the construction of roads? The attitude of labor in this matter should be pondered by officials who are contemplating any such move.

The contract system under which public work is largely carried on at present has withstood all assaults and will continue to do so until some substitute better than anything advanced to date has been devised. It has done so because of its obvious merits which far outweigh its defects. The greatest of these merits are the facts that it is based on open, competitive, bidding and that the success of any man is more largely dependent on his own ability and efforts than on any other factor.

That being the case, any action which will curtail, to any degree, this open feature of the work will, in the end, only bring discredit on the system. There have been and will be those entering the business who are not fitted in some essential way for the work. Likewise they can be depended upon to drop out in due time. To argue that any special line of action is necessary to guard large construction firms against this evil is to contend that the eminently fit must be protected from the competition of the unfit—which is an absurd proposition entirely opposed to the spirit in which the contract system was built up and upon which it stands. To this extent highway officials should disregard entirely the statement recently submitted by the Associated General Contractors of America and proceed on surer ground.

Abnormal Death Rate in 1918 Due to Influenza

Nearly 18 deaths per 1,000 population (actually 17.97) occurred in the registration area of the United States in 1918, according to the Bureau of the Census. This is the highest death rate on record since the Census Bureau began the compilation of annual mortality statistics. The high figure is due to the pandemic of influenza which together, with all forms of pneumonia, caused 32.4 per cent of all the deaths recorded in the registration area in 1918. The total number of deaths in the registration area was 1,471,367. The typhoid deaths in the registration area totaled 10,210, or 12.5 per 100,000. The corresponding rate in 1910 was 34.9. The death registration area in 1918 included a population of 81,868,104, or 77.8 per cent of the estimated population of the United States. More detailed figures for influenza and pneumonia, as given out by the Census Bureau are: "Of the total deaths 477,467, or over 32 per cent were due to influenza and pneumonia (all forms), 380,996 having occurred in the last four months of the year during the influenza pandemic. The rate for influenza and pneumonia (all forms) is 583.2 per 100,000. Influenza caused 244,681 deaths and pneumonia (all forms) 232,786, showing rates of 298.9 and 284.3 per 100,000, respectively, these being the highest rates which have ever appeared for these causes. The rate in 1917 for influenza was 17.2 and for pneumonia (all forms) was 149.8. In fact the difference (416.2 per 100,000 population) between the 1917 and 1918 rates corresponds with the excess mortality which occurred in the last four months of the year from the influenza pandemic."

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

"A Word of Caution"

[The situation is the one dealt with in the news section of the Feb. 26 issue, p. 442, where was reprinted the "Word of Caution," a pamphlet distributed to the American Society of Civil Engineers, urging the defeat of the "comprehensive organization" recommended in the Joint Conference Committee's report.]

Sir—I believe that the proposed warning to the members of the society is most timely. It would certainly detract from the dignity of the society to embark on a political field, such as is proposed in the questions which are to be submitted to members. The whole movement seems to me to be of a hysterical nature and it is hoped that all of the conservative members will see the danger as well as you and your friends have seen it. Our society certainly does not wish to become a lobbying body instead of the great technical society which it is now and has been heretofore.

RALPH MODJESKI,
New York. Consulting Engineer.

Professional Plagiarism

Sir—In the article on "Professional Plagiarism" in your issue of March 4, p. 477, the author finds fault with the use of books in writing papers, etc. It is all done very nicely and apparently is very convincing. There is one question, however, which I wish to ask. Where did he get the information for the paragraph on the cubic equation of Tartaglia? Is it possible that he had before him Ball's "History of Mathematics," or perhaps Cajori's "History of Elementary Mathematics," p. 225, and there found the source of inspiration for the article?

We are all dependent upon books, some people more so than others, and it seems to me that the best of us ought to be careful how we find fault with the worst of us.

EDWARD CAMPBELL.
Swedesboro, N. J.

The Decadence of Inland Water Transport

Sir—I have read with interest the series of articles on the future of inland water transportation, for I was 21 years with the Government upon river and harbor work and formulated a number of projects for both inland waterway development and cost ports.

One statement that you have probably observed in the official reports made by the District Engineers to the Chief of Engineers, U. S. Army, is that freight rates have been lowered such and such a per cent due to inland waterway improvements. This percentage is quoted year after year in the reports, but if the statement be analyzed it will be found in most cases that this change took effect many years ago when certain localities or cities, by their location, were favored with a special port rate. In my opinion, there are very few cases where freight rate reductions have been made due to waterway improvements since authority was given to the Interstate Commerce Commission.

I heartily indorse the statements and opinions of your articles on water transport. For many years before retiring from the U. S. Engineer Department I could only half-heartedly become interested in certain problems which were given me to work out upon improvements on inland rivers, for I realized all the time the great change from what formerly existed, and the decadence of water transportation upon the shallow rivers and canals.

E. R. CONANT,
Brunswick, Ga. Consulting Engineer.

Microscopic Composition of Earth Dam Cores

Sir—In reading the article "Study of Pressures in Hydraulic Dam Cores," in your issue of Dec. 25, 1919, p. 1040, I have wondered if a microscopic examination of the core material might not throw considerable light on its tendency to slide.

I am led to make this suggestion from a casual observation of many vertical cut banks in this state which are stationary, as compared with many hills of low slope which are sliding. Neither the nature of the material nor its water content appears to account for the slides, hence I am led to believe that the physical form of the particles and the position in which they are deposited out of the water may have a good deal to do with the drainage of the core and also the tendency of the material to slide.

Great Falls, Mont. J. C. DOW.

Engineers To Design Industrial Buildings

Sir—The writer has been very much impressed by your comment on the statement of the State Art Commission of Pennsylvania, on the proposed Delaware River bridge, in the Jan. 29 issue of *Engineering News-Record*. Every engineer who takes pride in his profession, every engineer who does not believe in being a wage slave, but who looks forward to the happy times when he will be able to practice his chosen profession independently, must do his best to overcome the ever-growing menace to the profession. Architects are designing reinforced-concrete buildings with "cement floors as per code." Now bridge designing is being usurped from the good-natured engineer.

Architects are organizing everywhere and their influence is being felt. The public is educated to look to the architect to design anything that is to stand up on the ground, no matter for what purpose. That architects are constantly bringing forward the absurd statement that an engineer is not trained to design, but merely figure out stresses.

It is true that an engineering graduate is not so qualified. But does a professional man's training start and stop at the college gates? Is not the engineer, who makes structures his specialty, with his broad knowledge of mechanical principles, better equipped to study and master the demands of serviceability and utility of an industrial building than an architect?

Engineers are clamoring for a better standing before public opinion. It is time, then, that the engineer should consider his solemn duty to do something more conspicuous than figuring. The interest of the public will be better served if an engineer is charged with the design of industrial building with architectural assistants, rather than that an architect be charged with the design, having engineers as assistants. But how are we to overcome the prejudice of the public?

Architects are working towards their end with organization and mighty effort. We can only uphold our end with organization and counter effort. The architects are constantly spreading the malicious propaganda that nobody but an architect is qualified to design a building of any kind, and they are succeeding in putting restrictions as to who shall be called architect. What are we going to do about it?

New York, N. Y. MISSAC THOMPSON.

Economy of Temporary Structures

Sir—Your editorial of Feb. 12, 1920, speaking of the special importance likely to be given to economy in bridge construction in the future, brings to mind a feature in present-day practice in highway bridges which in many cases seems to be the very opposite of economy and good business principle. I refer to the present tendency in many instances to build expensive permanent bridge structures in isolated localities apparently for no other reason than to satisfy the ambition to always build the best.

We do not in any sense advocate the building of cheap or temporary structures where conditions will warrant good permanent construction, but we think there are many cases where, if those who pay the bills would make a few simple calculations of interest on investment and the like they would at once see that it would be better business to build a wooden bridge having a life of 10 to 15 years and renew it periodically rather than spend four to ten times as much on a handsome permanent structure that must always "blush unseen," like the famous flower in Gray's elegy.

With interest rates at 5 per cent it is easily shown that we would be warranted in expending one third the cost of a permanent structure on a temporary structure that would last 9 years; about one-half the cost of a permanent structure on a temporary structure having a life of 14 years. I believe there are many cases in sparsely settled towns struggling with the bridge problem where a little light given them on the possibilities of wood construction would be an agreeable surprise.

Below is a table I worked out for my own use, showing how much per $100 cost of permanent structure may properly be spent on a temporary structure of a given life to make the two propositions equal on a strictly investment basis.

PERMISSIBLE EXPENDITURE FOR TEMPORARY STRUCTURES

For various lengths of life of temporary structure. Amounts given per $100 of cost of permanent structure.

Life in Years of Temporary Structure	Interest Rates 4 Per Cent	5 Per Cent	6 Per Cent
3	$11 10	$13 62	$16 04
4	14 52	17 73	20 77
5	17 81	21 65	25 26
6	20 97	25 37	29 48
7	24 01	28 93	33 48
8	26.94	32 30	37 27
9	29 75	35 54	40 79
10	32 45	38 61	44 14
11	35 03	41 52	47 35
12	37 50	44 31	50 30
13	39 91	46 95	53 12
14	42 20	49 50	55 77
15	44 48	51 90	58 30

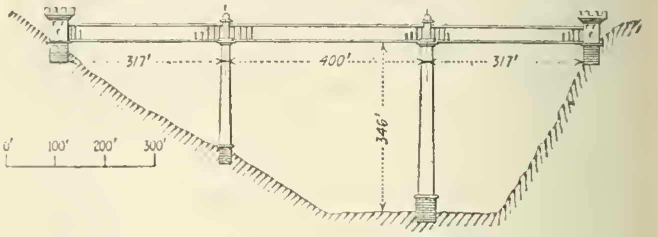
I am aware that there may be many elements enter a given case that will render impracticable the strict application of the interest and investment theory, but when each is given its proper study I believe there will be found many instances where the small wooden bridge should be given prominence.

Skowhegan, Maine. E. E. GREENWOOD.

Needed: A History of Engineering

Sir—Referring to the article by R. Fleming on the need for a history of engineering, published in the *Engineering News-Record*, Feb. 12, p. 322, and the item "Telford's Proposed London Bridge," the following information relative to a proposed high level bridge on the Mexican Railway, which was surveyed, located and built by Captain Andrew Talcott, an eminent American railroad civil engineer, may be of interest.

One of the difficulties encountered in the survey of this railroad was the crossing of the deep *barranca*, between Cordoba and Orizaba, formed by the Rio de Metlac, the chasm being 1,085 ft. wide at the grade line, which was 346 ft. above the stream.



PROPOSED MEXICAN RAILWAY BRIDGE

An estimate of cost for a single-track, tubular bridge 1,034 ft. long was submitted under date of Manchester, England, Nov. 26, 1858, by William Fairbairn, the well-known English engineer, who proposed a central span of 400 ft., and two side spans, each 317 ft. long.

The cost of the iron work delivered in Liverpool was estimated as follows:

One 400-ft. span, 1,250 tons at $106........	$132,500
Two 317-ft. spans, 1,433 tons at $107.........	153,333
Cast-iron towers, 1,666 tons at $45...........	75,000
Total	$360,833

Captain Talcott's estimate for the completed bridge was $1,200,000, so that a large allowance must have been made for the transportation and erection of the iron work, as well as for the necessary masonry foundations and ornamental towers.

The bridge was never built, but a few years ago its erection was seriously considered, but has been deferred indefinitely, due to the fact that, after long deliberation, it was considered that a bridge of such magnitude would be very easily destroyed, with, of course, disastrous consequences.

Buffalo, N. Y. EMILE LOW.

Track and Locomotive

Sir—The editorial on this subject in *Engineering News-Record* of Feb. 26, p. 403, seems to give the impression that the serious relation of locomotive counterbalancing to track troubles is a new discovery set forth in the report of the Track Stress Committee. This no doubt is unintentional, for as a matter of fact this relation has been the subject of investigation and discussion by civil and mechanical railway engineers during the past twenty years or more. In spite of all this, it has been as difficult to get well balanced locomotives as to get well made steel rails.

Prominent in the experimental investigations was the work of Dr. W. F. M. Goss in passing copper wire under the driving wheels of a locomotive on a testing plant and noting the varying compressions or reduction in area due to the varying load during the revolution of the wheels. Rails damaged by badly counterbalanced engines have been a track trouble for many years.

One step toward improvement in this direction was the introduction of four-cylinder balanced compound locomotives. These were much in vogue at one time, but are not much used on American railways in these days. They were, and probably are, more common on European railways. In regard to the weight of reciprocating parts, the relative lightness of such parts in European locomotive design has been commented upon many times.

While the evil effects of defective counterbalancing have been known for a long time, comparatively little has been done to ensure good counterbalancing. It is to be hoped that the report of the Track Stress Committee may lead to some definite improvement in this direction.

Chicago, Ill. "RAILWAY."

A Layman's Viewpoint of the Proposed Hudson Vehicular Tunnels

Sir—The vehicular tunnels under the Hudson River (see *Engineering News-Record*, Feb. 19, p. 357), having been talked of for many years, now seem to be approaching the construction stage. It is perhaps presumptuous for one who is not directly identified with the civil engineering profession to make remarks not entirely of a congratulatory character upon reading the reports and attending the public hearing of an enterprise which presumably requires the utmost exertions of the most talented civil engineers of the country. Enterprises involving huge expenditures of public funds are now becoming so great in number, that the layman, being the source of supply of these funds, is becoming very alert as to how, when and where these funds shall be spent. So, therefore, you gentlemen of the civil engineering profession can perhaps anticipate that the general public will exhibit a much greater interest in your efforts than has previously been the case. Broadly speaking, it is presumable that this increased public interest will be very helpful in many instances, and very irritating in others.

The average layman with any sense of proportion realizes that a profession as theoretical and empirical as civil engineering frequently produces diverse opinions in the minds of the most competent exponents of this profession. So, therefore, if he is wise he will not pay much attention to disagreements between the members of the profession as to the technical details of construction of such an enterprise as the vehicular tunnels. His real interest, however, is directed toward two things: First, will the tunnels be beneficial when they are built; and, second, how much will these tunnels cost? When information is furnished on these two points, it naturally leads him to the most important inquiry, which is: "Will the service rendered by these tunnels, as designed, be most productive for the number of dollars invested in the building of them?"

It is reasonable to assume that the layman will be very severely criticized and impatiently treated if he injects his opinions into technical details, but it is also perfectly patent that the exponents of the civil engineering profession who designed such apparatus will receive short shrift from the public if in its mind the results of the engineers are not adequate either from the economic or economical standpoint. It is believed that the general public as a whole holds the civil engineering profession in high esteem, but in my own humble opinion the attitude of the general public will change with the utmost rapidity to the other direction, should the profession show itself weak, and as the layman knows comparatively little of the technical details of such an enterprise, he is very prone to judge the ability of the persons responsible for this technical detail by the conclusion he reaches on the things which he, as a layman, is very familiar with, in such an enterprise.

The writer assumes that the engineering talent which has been associated with the tunnel enterprise for the last three years has among its members some of the best known civil engineers in the country, and that there is a strong contradiction of opinion between these gentlemen as to how the tunnels shall be built, but the outstanding point to the layman (or rather that portion of the general public which will directly utilize these vehicular tunnels, and by that I mean not only the transportation interests but also the merchants whose freight will move back and forth through these tunnels), is, despite all this brilliant talent working with monumental effort through several years, that none of it seems to have adequately grasped the very potent, elementary, essential feature, and that is, the volume of traffic which will go through these tunnels.

If the volume of traffic was exceedingly small, the huge cost of these tunnels would make it obviously undesirable to build them, and conversely, if the volume of traffic is very large, the revenue derived therefrom will justify a very large expenditure of money for construction purposes. The engineers went painfully and carefully into minute details in an endeavor to find out what the present traffic was across the river, and, using that as a basis, estimate that these two-line tunnels will reach their maximum capacity 17 years from now.

To one who is familiar with the freight situation in the Port of New York such a statement can, under the most generous impulses, be considered as the result only of mental exhaustion, senility or a foresight limited to such an extent that no faith or confidence could be reposed in persons reaching such a conclusion. This statement is a bitter one, but what a dreadful thing to contemplate that all these talented engineers, striving to accomplish good, should so far underestimate the absolute essentials of the traffic of the Port of New York. As a matter of fact, it could be very easily shown by inquiry of the traffic departments of the various large industrials and merchants in New York City, that if the vehicular tunnels were available the volume of freight which would then be handled from the Jersey terminals rather than over the piers in New York City, would furnish a sufficient amount of traffic to more than utilize the maximum capacity of these tunenls in less than six months' time from the date of their opening.

It is perfectly apparent to any observer that the largest proportion of freight which is received in the City of New York comes from the railroads which terminate on the Jersey side of the Hudson, and anybody who is familiar with freight handling knows that, provided adequate means of getting across the river could be furnished for vehicles which would permit their passage in a few moments, an enormous amount of freight which is now handled from the New York City piers after having been lightered from Jersey, would be handled direct from Jersey, because of the greater expedition and actually decreased cost of transportation through the elimination of waiting time at the piers.

The writer has no knowledge of the cost of the three-line tunnels, but unless the cost is utterly disproportionate, by all means we should have the three-line traffic and even it would reach its maximum in a year's time. The validity of this statement can easily be determined by a short investigation conducted among the traffic managers of the merchants and manufacturers situated in New York City, finding out their present tonnage, and how much of it would come through these tunnels if they were available now, without even taking into account the enormous increase in tonnage which occurs every year in the Port of New York.

The writer has made a very bitter statement as to his opinion of the engineers responsible for the information that the two-line tunnels would reach their capacity in 17 years from now, but he did so with the belief that anybody who perpetrated such an outrageous error after many years of training and experience should pay very severely for his fault.

The point which next arises is: If these gentlemen have so dreadfully miscalculated the traffic which will utilize the tunnels, how much confidence may we place upon their technical decision as to how the tunnels are to be built? This matter is of such great importance that the writer hopes that through your efforts a movement will be started to investigate what the traffic possibility will be for these tunnels by the time they are ready, and if it develops that the engineers are radically wrong in their conclusions of volume of traffic which will be offered for these tunnels when they are opened, undoubtedly the general public will take steps to see that such mistakes will not be duplicated in other portions of this enterprise.

New York City. **George H. Pride.**

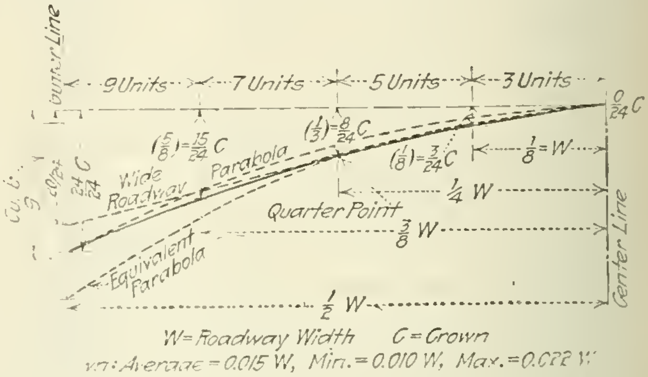
Cross-Sections of Roads and Streets

Sir—A suggested cross-section of road made up of two plane surfaces appears in *Engineering News-Record* of Jan. 29, 1920, p. 227. Theoretically the suggestion is good in that it provides for increased drainage near the middle of the roadway and decreases the slope of the surface near the outer quarters of the roadway. In practice the curved surface proves to be more satisfactory. The arcs of circles on the parabolic form of curve are not the best types of surfaces for modern traffic. A modified form of curve is better.

The traffic tends to keep to the center of the road, because of the more comfortable (vertical) position of the vehicle, greater safety and usually cleaner conditions. After a light snowfall one may observe how little the traffic uses other than the middle strip of roadway. To accommodate the traffic which persists in doing this, the middle 6 ft. should be as flat (or horizontal) as possible in order to eliminate excessive wear (or cutting) occasioned by the inside edge of the vehicle tires. The gradual substitution of rubber tires reduces this wear to some extent. The middle traffic is always the fast-moving traffic and should be provided with a nearly level surface.

The side traffic is either stationary or slow moving and can travel on an inclined slope. The curved surface, because of its flatter slope near the center and its increased slope near the sides, facilitates drainage and tends to carry all debris to the gutter or roadway edge.

A modified form of curved surface, shown on the accompanying drawing, has been developed by the writer and adopted for pavements in the city of Chicago. It will be seen that the desirable flat surface along the middle is retained but the excessive slope at the outer quarters is very much reduced. Drainage is satisfactory because of the increasing slope toward the gutter or edge. The full crown is reduced 25 per cent. over the usual parabolic form. This form increases safety to traffic and increases width of "available" roadway, thus distributing traffic and increasing the life of the pavement.



NEW FORM OF STREET SECTION ADOPTED IN CHICAGO

The crown is easy to "lay out," the quarter point being one-third the crown below the center line grade. There is another practical reason for the popularity of the curved crown. Since traffic concentrates along the middle strip, this part receives the greatest wear. The lines of maximum wear are approximately two to three feet on each side of the center line of the road. By laying a straight-edge below the curved crown shown in the drawing it will be apparent that considerable wear will have taken place to even reduce the surface to a plane and still further wear to interfere with surface drainage. The form of curve shown is used for roadways up to about 50 ft. Wider roadways may have the outer quarters on a plane surface from the quarter point to the roadway edge or gutter, as indicated on the drawing. **H. J. Fixmer,**

Paving Engineer, Board of Local Improvements. Chicago.

Designing Columns for Bending Moment

Sir—One of the time-consuming problems in structural design is the selecting of column sections for columns carrying combined direct load and bending. Recently in selecting a large number of such columns the writer used the following method, which is believed to be simpler than that ordinarily used. Starting with the usual formula $f = \frac{P}{A} + \frac{Mc}{I}$, change was made to the form

$$fA = P + \frac{Mc}{r^2}$$

It will at once be seen that fA is the allowable load on a column for various lengths and is the quantity given in column tables. If, then, Mc/r^2 is computed and added to the direct load, the column tables in common use can be used for the case of combined direct load and bending. For use in practice the term c/r^2 is computed and tabulated in the margin of the table giving the properties of column sections. (This quotient is the same as area divided by section modulus.)

A practical application of the above may be illustrated as follows: Let it be assumed that inspection indicates the desirability of using a 10-in. Bethlehem H-column at a point where a bending moment of 150,000 in.-lb. in the direction of the plane of the web must be provided for in addition to the direct load. The accompanying table will show the effect of the moment in a few such columns.

Column	c/r^2	Mc/r^2
10 H 49	0.270	40,500
10 H 54	0.268	40,200
10 H 59.5	0.267	40,000

Experience with the use of this method soon indicates the column which will probably be used for a given case, and Mc/r^2 is computed using the value of c/r^2 for this assumed section. If, however, a wrong section has been assumed the table shows that the value of Mc/r^2 given by the wrong section may still be used, as c/r^2 changes very slowly in a series of related columns. After computing and tabulating c/r^2 for all columns which are likely to be used, the design of columns carrying bending becomes as simple as the design of those carrying direct load only.

Cambridge, Mass. H. L. BOWMAN.

Advertise Engineering Service as Commodity

Sir—There are many engineers who do not receive adequate returns for their service, and there are some who cannot sell their service at all, for the simple reason that there is no demand for the product they have to sell. This lack of a demand for a product is peculiar not only to the engineering profession, but has been encountered in the sale of other products; and the lack of demand has been very successfully overcome.

For example, the California raisin growers found they were producing more raisins than there was any demand for. Some growers were not able to sell their products and the others were not getting a good price for what they sold. Raisins were a luxury; their greatest use was at the Christmas holiday season. How did these farmers overcome their difficulties? They co-operated as a body to meet conditions. Each year in their co-operative organization a certain amount of the returns from the sale of their products was pooled into a big advertising fund. Did they advertise that certain growers were experts, sincere in their work and could deliver a good product? No. They recognized that their difficulty was a lack of demand for what they well knew was a good product and they used this advertising fund to educate the public into demanding what they had to sell. They told the public how to use raisins—use them in bread, desserts, etc., to get them at local grocery stores and to use them daily as a food and not as a luxury. As a result of this advertising and in spite of the fact that they are continually growing more raisins each year, they are selling all of their product and selling it at a better price.

There are many other examples of an enormous demand for a product being thus created where formerly but a small demand had existed. Farmers have shown us that by co-operatively advertising on a big scale a demand can thus be created for what was once considered a luxury. Engineering service was never a luxury. Almost always it is used only as a necessity —when there is no way to avoid its use. Certainly a much greater demand can be created for it, so that the entire product of engineers could be sold, and at a much better price than now exists. By proper advertising on a big scale the public can be told, not that certain engineers are experts, sincere in their work and capable of delivering a good product, but of the benefits of engineering service.

The farmers had numerous local associations, but such associations, individually, were unable to finance the advertising necessary to create a demand. The engineers have numerous associations. By these associations pooling a part of their dues, and by a big percentage of individual engineers pooling a small part of their profits all for one big properly directed advertising fund, a real demand can be created for engineering service in general. Consequently all individual engineers will be able to sell their service and sell it at a better profit.

It is rightly unethical for engineers as individuals to advertise their service in competition with other individual engineers, but it certainly is ethical for all engineers to co-operatively advertise engineering service as a commodity and to co-operatively secure the benefits of an increased demand for this commodity. It is good business and numerous examples can be found of the remarkable results than can be obtained by such advertising. Engineering service is a commodity that can well be more widely used, but advertising is needed to create a wider demand for it.

Seattle, Wash. HORACE M. HOLMES.

Highway Location—A Fine Art

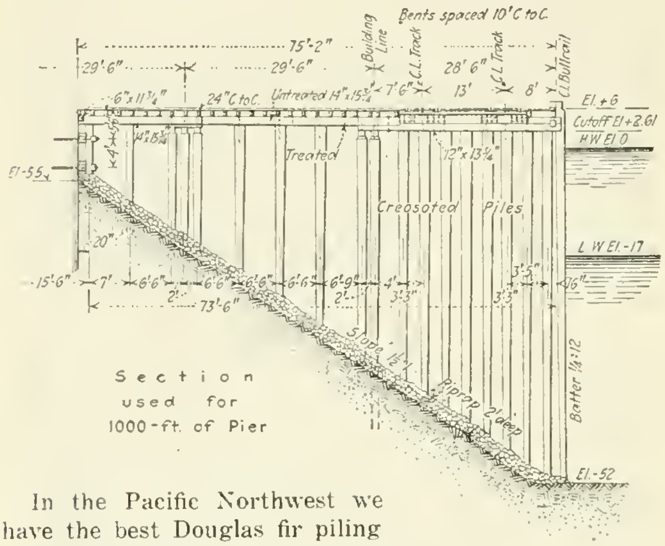
Sir—Mr. Syme's article, "Need for Economic Location of Highways," *Engineering News-Record*, Feb. 19, 1920, p. 383, is most timely. It expresses the wish of many highway locators. Highway location has been a special study of the writer for some years, and in an effort to collect a little data within the past two months he has had interesting experiences. Letters were addressed to several Western colleges having engineering courses, requesting available facts regarding local traffic records, etc., also regarding experiments made to determine cost of operation of 3-ton trucks on grades from 1 to 8 per cent. All replied that they had no traffic records or cost data. This would indicate that engineering schools are interested in the construction, and not the operation, of highways. There is little indication that trucks will be rated on a strictly ton-mile basis. The financing and operating conditions of motor trucks are vastly different from the railroads. The main highways are generally satisfactory; the trouble comes within city limits, motor truck garages and terminals. There is no available data to write a book on the economic location of highways, but conditions are now favorable for extensive experiments covering all types of motor vehicles and trailers. Any articles giving operating costs over different types of roads and varying rates of grade will fill a pressing need.

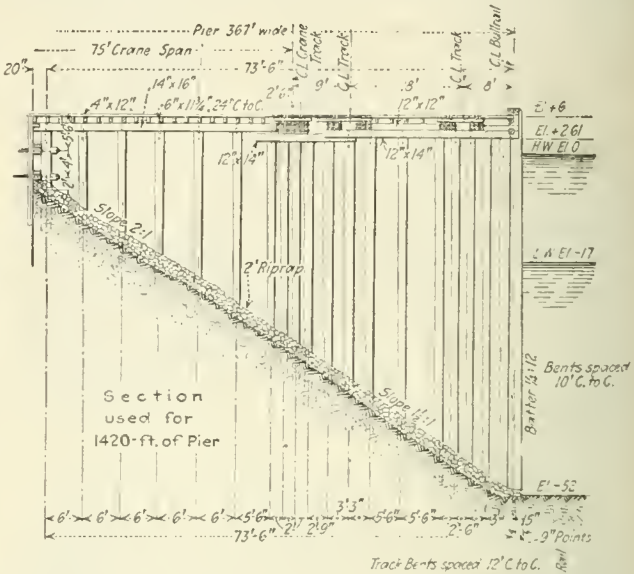
Railroad location due to rigid conditions is a science; highway location is a fine art.

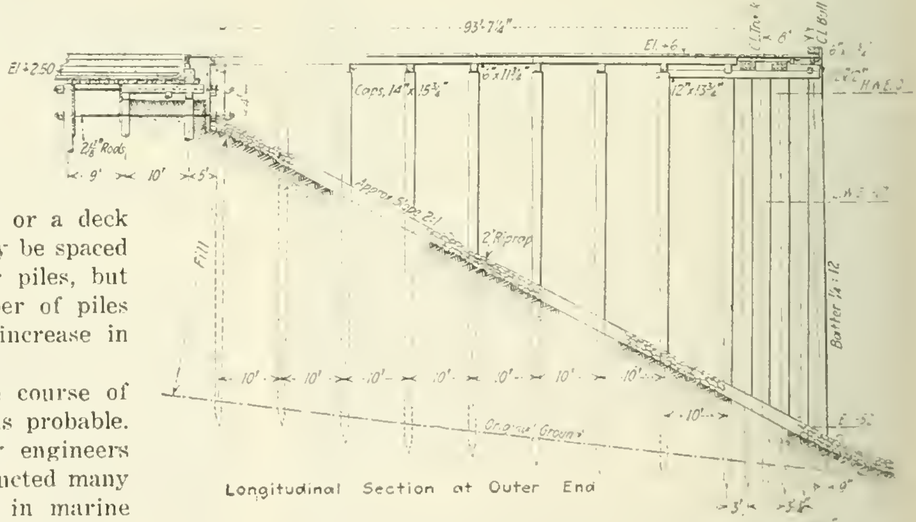
Olympia, Wash. FRANK W. HARRIS.

What Will Long Piles Carry?

Sir—The condition outlined in this letter should be of interest to all structural engineers, who have heretofore met the common pile as a long column. Engineering practice is always changing, standardization to the contrary notwithstanding; generally progressing but occasionally retrogressing for a short time. In the case of a retrogression, a harking back to an old story is in order. A warning ten years ago does not necessarily mean that it is not needed today.







SECTIONS OF NEW PIERS, PORT OF SEATTLE, ILLUSTRATING USE OF LONG PILES

In the Pacific Northwest we have the best Douglas fir piling grown, the busiest teredo, and the largest drift logs. As a result a practice has developed which makes our column formulas sit by with envy. We have creosoted Douglas fir piles from 40 to 60 ft. in unsupported length, without bracing, asked to carry Cooper's E50 track loading, or a deck load of 650 lb. per sq.ft. They may be spaced closer than in the case of shorter piles, but in any case the increase in number of piles is not in the same ratio as the increase in loading.

I have endeavored to trace the course of this practice. The following seems probable. A score of years ago the railway engineers in the Puget Sound district constructed many pile trestles and timber wharves in marine locations. These trestles, wharves and piers were thoroughly braced according to standard practice. Piles were creosoted. The load on piers was limited to 400 lb. per sq.ft. and never exceeded 500 lb. per sq.ft. These piers were so short that a yard engine was scarcely ever seen upon them.

A few years later the same railway engineers discovered that the bracing was no end of trouble, teredo would enter the holes bored for bolts, driftlogs became entangled and with the help of wave and tide pulled the bracing off, and finally the maintenance foreman howled his head off when bracing had to be removed in order to replace a damaged pile. Hence bracing is now out of style in marine locations. Batter piles have taken its place to some extent, but batter piles also have already been discarded by some engineers. This practice is no doubt justified for relatively light loads or shorter piles, and for trestles which are soon to be filled in.

But today the increased length of piers, now a half mile in length, makes it necessary to use switch engines of the heaviest type on the piers. Locomotive cranes with their heavy concentrations are a common sight, and increased deck loadings combine to create a changed condition. The change is extensive enough to reopen the old question of how much will a pile carry when its slenderness ratio is large, say, 40 to 60. The practice of going ahead, constructing large structures and allowing increasing loads, without increasing our knowledge of long piles as columns, may lead to discredit of engineers. There have been failures due to the weakness of long piles. Two cases were reported in *Engineering News* of July 2, 1908. A similar case was the failure of the White Star Dock in Seattle harbor, about 1902.

For a column whose slenderness ratio is 60, about a dozen well known column formulas give safe loads varying from 0 to 17½ tons. This is assuming a round column substantially the size of a pile and a factor of safety twice as great as ordinarily used in building construction. Confronted with this disagreement of formulas, the need to provide for heavier loads and the practice of omitting bracing in marine locations, is it not time that tests be made approximating actual conditions?

The accompanying drawing gives three half sections of a pier now under construction by the Port of Seattle. This brings clearly before the eye the slenderness of piling often used, especially in the absence of bracing or brace piling. CHAUNCEY WERNECKE.

Seattle, Wash.

Frost Action and Roadbuilding

Sir—The first editorial in the March 4, 1920, issue of your magazine is timely and good; the suggestion contained therein is the only way of saving the apologies we now have, called "highways." The question arises, though, what explanations are commissioners going to offer for curtailing or discontinuing heavy traffic on a particular highway when only a small part of that highway fails when the frost is coming out of the ground? If 75 per cent of a certain stretch of road stands up under the traffic, why should not the other 25 per cent be put in the same shape as the 75 per cent? What excuse can commissioners offer for letting 25 per cent, or even 10 per cent or 5 per cent, of a road hinder traffic year after year while the frost is coming out, and not making even an effort to change conditions for the better?

I am so familiar with the annual break-up of a certain five-mile stretch of state road in this state that I can mark off on the map of that road the places of break-up to within 20 ft. of the ends of the breaks. Notwithstanding this regularity of break-up, not an effort has been made to correct any of the troubles during the six years the road has been in use.

What is the answer?

Jewett City, Conn. A. A. YOUNG.

Vote of "No" Urged on All Proposals in Am. Soc. C. E. Questionnaire

Sir—The referendum that is now before the membership of the American Society of Civil Engineers gives rise to much speculation as to the real reason for the present state of affairs in the society. Certainly they may be described as at least most confusing and there does not appear to be any possibility of getting from the governing body of the society any adequate explanation that would enable one to pass judgment satisfactorily on the issues that are drawn by the present so-called Questionnaire Ballot.

It seems to the writer that the question that might have been put to the membership, and put in English, is: Do you want a strong society of civil engineers to represent the profession and to operate along lines as the membership may direct from time to time? or, Do you want to enter into a mystical union with an as yet unknown body for purposes that can be understood, perhaps, but are not capable of expression?

To my mind the report of the Committee on Development is an incomplete and ambiguous document and I have vainly tried to find out from its pages what becomes of the American Society of Civil Engineers after the locals are formed.

The special committee of the Board of Directors appointed Oct. 14, 1919, to study the report and report its conclusions has evidently had some difficulty in understanding the report, but they call attention to one and, to my mind, the most vital defect in the plan of change where they state: "The plan commits the welfare of the engineering profession to a new and untried organization without history, precedent or experience."

In an effort to try and arrive at an understanding of the present state of affairs one naturally turns to the resolution authorizing the creation of the Committee on Development and here one certainly wonders if "sociological and economic conditions are in a state of flux and are leading to new alignments of the elements of society." The Committee on Development does not explain why a state of flux is good for the American Society of Civil Engineers and why it should fling away all experience and tradition and seek to become a more effective agent either for the engineer or the profession by losing its identity both by division into locals and absorption into an affiliation.

To the writer it seems as though the American Society of Civil Engineers would be best served by a vote of *no* on all of the propositions in the questionnaire, looking forward to the future when the society can be definitely directed along any desired course with a full knowledge of what the changes mean.

J. A. BENSEL,

New York City. Consulting Engineer.

Harder Work Not the Solution

Sir—Mr. Hagerty's letter in your issue of Feb. 26, p. 437, is written in a kindly strain, but on the subject of compensation, civil engineers are not befogged, nor have they lost their poise.

The American desires to improve his position and in order to accomplish that end, many followed civil engineering. To the young man this profession is especially alluring as it combines the mental and the physical. It is congenial to the genius of this country.

Desires and hopes do not create jobs, and the great overcrowding has forced down wages below what will sustain a good standard of living.

The union wages of the tinker, tailor, bricklayer, etc., fix the price of the commodities which the civil engineer must buy. And when he sees himself as the ultimate consumer earning less than the producer, he knows that he is certainly out of luck.

Mr. Hagerty's advice is for the engineer to work harder. Did Mr. Hagerty ever work in a railroad location party in a sage brush country—or set slope stakes —or later on work all day with a party and prospect line after supper? Those who have been through the mill are worked out. Through force of circumstances, and ignorance, the profession is overcrowded. Consequently the engineer, to earn a living, must take radical measures. Engineers do not want unions, but the success of the A. A. E. has demonstrated that engineers have more brains than the old-timers give them credit for. F. W. HARRIS.

Olympia, Wash.

Teach Kiln Drying by Mail

Effective seasoning of wood by kiln drying depends largely upon the operator of the kiln, as noted in *Engineering News-Record* of Nov. 13-20, 1919, p. 853. Following along this line a course of instruction by mail in the art of kiln drying has been worked out by the department of correspondence study of the University of Wisconsin, in conjunction with Arthur Koehler of the U. S. Forest Products Laboratory. This course, which is intended specially for operators, will cover the purpose and difficulties of kiln drying, the wood structure and conditions, the moisture and other factors in seasoning, and the operation of kilns.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Blasting Concrete in Congested Districts

DESPITE the nearness of shopgirls, and the necessity for guarding against destruction of plate-glass and other frail property, dynamite was recently used in New York City in the demolition of a brick and concrete vault formerly occupied by a bank. The walls were 20 in. thick, and the vault 14 ft. long, 12 ft. wide and 7½ ft. high. The roof, supported by six 12-in. I-beams, was 2½ ft. thick. The whole constituted a ton of steel and 49 tons of brick and concrete. The first hole was drilled 13 in. into the wall near the door and loaded with one-third of a cartridge of 40-per cent dynamite. This gave an idea of the size of succeeding charges that could be loaded. Three other holes were then drilled 18 in. apart about 18 in. from the end of the wall and fired with a blasting machine. The job was completed in 14 days at a net profit of $150.

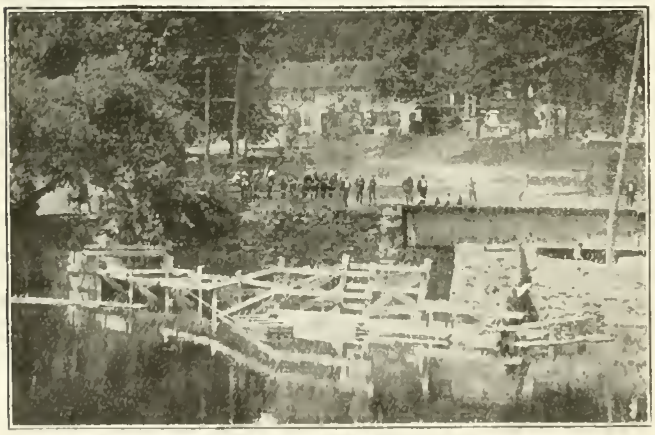
Five plate glass windows 40 ft. from the scene of the blasting were protected by a canvas screen hung from the ceiling and windows in the vicinity were boarded over. Five feet from the wall on one side with but a thin brick wall intervening were girls selling drygoods.

An Economical Cofferdam

By E. H. Sweet

With John A. Stevens, Lowell, Mass.

DURING the construction of a hydro-electric plant for the Jackson Mills at Nashua, N. H., the forebay site was closed off from the river by an economical type of cofferdam, consisting of a skeleton framework of 6 x 6-in. wales, 2 x 10-in. uprights, and ¾-in. tie rods. The wales were spaced about 1 ft. apart vertically with the uprights and tie rods 5 ft. apart.



HOW COFFERDAM FRAMEWORK WAS ERECTED ON RAFT AND DELIVERED TO PLACE

By using 16-ft. wales and making diagonal lap joints every third tie rod became a hinge, thus making the skeleton continuous and flexible. The framework was erected on a raft and as each section was finished the raft was pushed out from under. The cofferdam was filled with material taken from the power house excavation. This material was sand and gravel and was used as found with the exception that any large stones were thrown out. The side sheeting was simply placed in the framework after it was launched and lightly nailed to the wales just ahead of the fill. Motor trucks filled the whole cofferdam by forming a ramp at the shore end and backing out over the finished fill.

The finished cofferdam is 142 ft. long, 10 ft. wide and 8 to 12 ft. high. The depth of water varied from 3 ft. at the ends to 8 ft. along the major portion of its length.

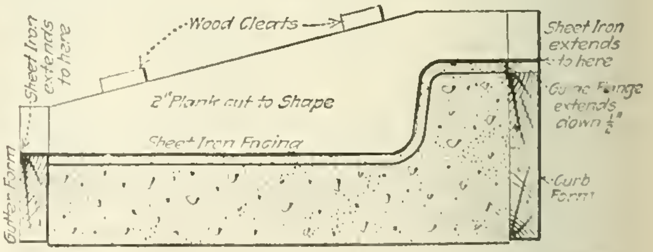
The cost of labor and materials exclusive of any overhead or contractor's profit, for erecting was $12.50 per linear foot. As the fill was taken from the power house excavation the cost of filling was not charged to the cofferdam.

The filling cost $4.50 per linear foot. The cost of removal has not yet been determined.

N. J. Beisel, superintendent for the Raymond Concrete Pile Co., devised the type of cofferdam. The work is being prosecuted in accordance with the plans and under the supervision of John A. Stevens, engineer, Lowell, Mass.

Home-Made Curb and Gutter Finisher

SUCCESSFUL use has been made of a timber sled riding on the side forms to finish concrete combined curb and gutter at Worthington, Minn. The device consists of three ribs cut to the shape of the curb and gutter and held together by two end strips and two cleats as indicated by the sketch. The bottom is sheeted with iron fashioned to the ribs. After the curb and gutter have been molded in the usual manner the face form is removed and the surface is plastered. Then the sled is set on the side forms and is pushed along smoothing the plaster coat to exact profile. No floating and very little troweling are required to complete the finishing operation. This finisher, according to the *Contractors' Atlas*, was devised by Hanlon & Okes, contractors, of Worthington, Minn.


Wood Cleats
Sheet Iron extends to here
2" Plank cut to Shape
Sheet Iron Facing
Sheet Iron extends to here
Curb Flange extends down ½"
Gutter Form
Curb Form

SLED RIDING ON SIDE FORMS FINISHES CURB AND GUTTER

How an Engineer Got Rich

We have just learned of an engineer who started poor 20 years ago and has retired with the comfortable fortune of $50,000. This money was acquired through industry, economy, conscientious efforts to give full value, indomitable perserverance and the death of an uncle who left the engineer $49,999.50.—[*Official Bulletin, Colorado Society of Engineers.*]

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

NEWS OF THE WEEK

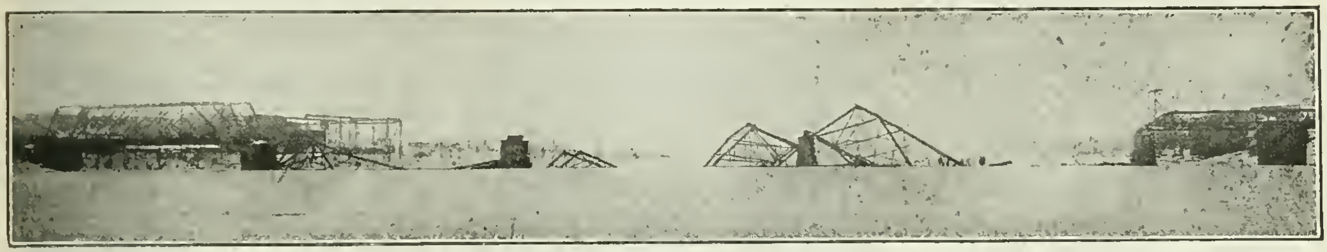
New York, March 18, 1920

Failure of Cohoes-Troy Bridge To Be Investigated

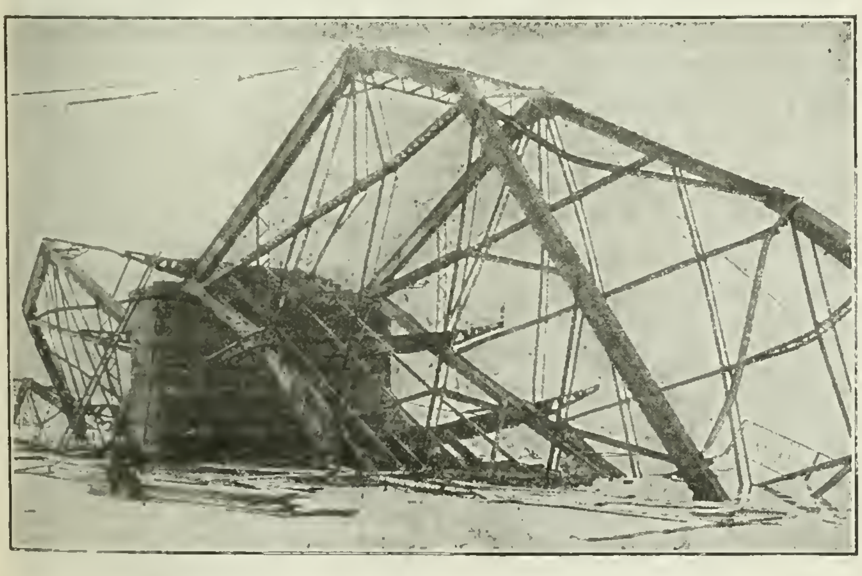
On the evening of March 4 the floor system of the wrought-iron bridge over the Hudson River between Cohoes and Troy, N. Y., caught fire and resulted in the destruction of three intermediate spans and the partial destruction of the westerly span, as reported in the news section last week. The easterly span is not damaged to any extent. The bridge consisted of four fixed spans and a draw span at the Troy end of the bridge. The three intermediate spans were each 175 ft. in length and the easterly and westerly spans were 128 ft. and 158 ft. respectively. The bridge was constructed some forty years ago and was acquired by the State of New York in 1914 at a cost of aproximately $200,000, one-half of which was paid by the State and the remainder by the Counties of Rensselaer and Albany.

A new floor system consisting of creosoted paving block on 3-in. flooring resting on 12-in. stringers was installed in 1918 at a cost of $50,000. The cause of the fire has not been determined and the State and county officials will have a hearing during the coming week to try and determine the cause. The bridge connected 12th St. in Troy with Ontario St. in Cohoes and carried a double-track trolley line.

The lower cords undoubtedly failed by reason of the heat and are completely under water, but on all the upper cords the failure took place at the panel about 10 ft. from the ends of the spans. An examination of the bridge shows on the easterly end of the draw two leads of cables extending from the rails to the northerly end of the drawspan. This cable is not grounded with the trusses. The three spans are now in the river and no information as to the grounding of the rails can be obtained. If the rails were not grounded with the trusses and the superstructure became charged this might have completed a circuit with the rails which would set fire to the stringers upon which rested the rails. It is expected this matter will be taken up at the hearing to be held soon.



THREE SPANS OF COHOES-TROY BRIDGE, WEAKENED BY HEAT FROM BURNING FLOOR, FELL INTO RIVER



VIEW OF STEEL TRUSSES AT ONE OF THE RIVER PIERS

Mississippi Valley Waterways

The Mississippi Valley Waterways Association will hold its annual convention at the Statler Hotel, St. Louis, Mo., on April 19.

Oppose Two-Line Hudson Vehicle Tunnel

National Highway Traffic Association Passes Resolution Favoring Tubes of Larger Capacity Than Those Recommended

Opposition to the two-line, cast-iron vehicular tunnels under the Hudson River, recommended by the chief engineer and endorsed by the board of consulting engineers of the tunnel commissions of New York and New Jersey, developed at a public meeting held March 11 in New York City under the auspices of the National Highway Traffic Association, and culminated in the passage of a resolution calling upon the Governors of the States of New York and New Jersey to withhold approval of the two line tunnel, as at present recommended, and to have made investigations of a larger tunnel than the one now contemplated. The resolution also contained the statement that the traffic capacity of the two-line tunnel was inadequate. The resolution, approved at the open meeting by a mere handful of the organization's membership, will be referred for action to the association's executive committee, but inasmuch as a majority of that Committee was present at the meeting and voted in favor of the resolution there is little doubt as to approval.

The meeting, at which about 75 were present, was opened by the reading of two letters, the first from Stuyvesant Fish, advocating moving platforms for conveying vehicles in the tubes instead of having them operate under their own power, and the other from Edward A. Byrne, of the board of consulting engineers, who had failed to concur in the conculsions of the majority of the board, and who advocated a three-line tunnel, stating that the adoption of a two-line route could be a retrograde step.

After Chief Engineer Clifford M. Holland had outlined the scope of the traffic studies that had formed the basis for designing the tunnels and had showed that the controlling factor governing capacity was not the clear width of roadway but rather the design and location of entrances and exits so as to prevent traffic congestion in the streets and at the same time assure a steady flow of vehicles to the tubes, the meeting was thrown open for general discussion.

T. Kennard Thomson characterized the capacity of the proposed twin cast-iron tubes as inadequate and offered as a substitute a tunnel containing six 25-ft. passageways, measuring 177 ft. in total width and planned to be built by the trench method. The cost of this tunnel, Mr. Thomson stated, was estimated at $20,000,000, a figure which, in the opinion of John F. O'Rourke, was far too low.

Auto Interests for Three-Line Tubes

Practically all of the representatives of automobile and truck interests objected to the two-line tunnel on the ground of its alleged inadequate traffic carrying capacity. The opinion of the automobile men was strongly in favor of a three-line tunnel. George H. Pride, of the Heavy Haulage Co., predicted that with twin tubes carrying two lines of traffic capacity would be reached almost on the day the route was opened. He took exception to the traffic estimates of the chief engineer of the commission asserting that they were entirely too low. Mr. Holland said, in reply, that a three-line tunnel had been considered by the commissions' engineers and rejected on the ground that it would create at its terminals conditions of street congestion which would prevent the use of the three-line tubes at anything approaching their estimated carrying capacity.

Several objections to the two-line tubes were made on the ground that such a tunnel would be blocked by the breakdown or stalling of motor trucks on grades under the river. John F. O'Rourke, in advocating a double-deck concrete block tunnel to carry three lines of traffic in each direction objected to the high cost of cast-iron for the proposed cast-iron lined tunnels and estimated that the concrete block type of construction would effect a saving of something like $10,000,000 as compared with the construction advocated by the chief engineer of the tunnel commissions.

In making traffic estimates on highways, E. J. Mehren pointed out, it has been the experience of state highway departments that improved hard-surfaced roadways attract traffic from twice to four times greater in volume than that which previously used the road.

Traffic on the existing ferries, it was held by the automobile representatives, is no criterion of the amount of traffic which the tunnels will be called upon to carry. W. P. Eno asserted that a three-line roadway has a traffic capacity at least 60 or 70 per cent greater than a two-line route. The suggestion for an elliptical cast-iron tunnel to carry three lines of traffic each way was answered by Mr. Holland, who stated that such a cross-section would provide inadequate space for the necessary ventilating ducts.

The two-line tunnels were endorsed by Amos L. Schaeffer, consulting engineer to the Borough President of Manhattan, who made the point that it is not conceivable that all traffic desiring to cross the Hudson River can ever be taken care of by a single river crossing. The tunnel capacity, he pointed out, is absolutely dependent upon the ability to handle traffic on the streets at the entrances and exits and it is this consideration which really controls the size of the tunnel rather than its ability to carry two or three lines of traffic, once that traffic has gotten inside the tubes. On the basis of New York experience, Mr. Schaeffer stated, traffic intensity reaches its limit and requires relief when the counts show 0.6 of a vehicle per foot of roadway per minute.

Col. W. J. Wilgus, chairman of the commissions' board of consulting engineers, answered the minority report of Mr. Byrne whose endorsement of a 24 ft. 6 in. width for carrying three lines of vehicles was shown by Colonel Wilgus to be entirely inadequate, allowing only 6 in. of clearance as a total between curbs. Mr. Byrne had originally favored a 23-ft. roadway for three lines of traffic and at a later date revised his figures to 24 ft. 6 in. Colonel Wilgus held that the minimum width for three lines of traffic must be 28 ft. Mr. Byrne's estimate of saving in cost by the three-line tunnel recommended by him was shown to be in error, involving actually an increased cost of $6,000,000 or 21 per cent more than that of the two-line tunnel instead of a 14 per cent increase, as estimated by Mr. Byrne. Mr. Byrne's minority report, according to Colonel Wilgus, contained recommendations which, if carried out, would result in impossible conditions of traffic congestion at the entrances and exits.

Colonel Wilgus asserted that the tunnel commissions had recommended the cast-iron type of construction on the gounds of safety, durability, and economy, involving a minimum of uncertainty of construction within the estimated cost. He pointed out, however, that a study of other types of lining will be continued and that the commissions will ask for bids on other types of tunnel than cast-iron if investigations prove them to be safe.

The Jersey City Hearing

Strong support was given to the proposal for providing three lines of traffic in each direction at the final public hearing of the joint tunnel commissions, held at Jersey City on March 16. Representatives of various New Jersey interests argued that the requirements of traffic will not be met by two-line roadways, and claimed that excessive traffic concentration at the New York end can be dealt with by proper distribution through a better planned approach. Other reasons were urged against the New Jersey approach, which it was said is inadequate in that the roads leading to the tunnel entrance cannot carry the traffic. Among the improvements asked for to relieve this condition are a viaduct from the low ground to the top of Bergen Hill along Twelfth St., and widening of Henderson St. to 100 ft. Jersey City will not be able to make these improvements and take care of the extensive repaving which the tunnel traffic will make necessary.

Technical discussion of tunnel types was continued at this meeting with sharp exchanges of opinion between the engineers of the tunnel and J. F. O'Rourke. Chief Engineer Holland presented a statement giving reasons for the engineers' condemnation of concrete block construction. He made a strong point of the lack of permanency of such a structure because of the destructive effect of percolation of salt water through the joints between blocks, especially as these are filled with grout with much laitance necessarily forming. Cost estimates were also discussed, and on the part of the consulting board the possibility of building a concrete-block tunnel at lower cost than the official design (called "Plan A") was denied. Mr. O'Rourke asserted that if concrete blocks were substituted for the cast-iron lining of the official design they could be made 9 ft. thick without exceeding the cost of the tunnel as designed by the engineers. Gen. Goethals was not present at the hearing, but sent word that he is preparing a full reply to criticisms of his recommendations.

Hudson Tunnel Commission Kills Concrete Block Project

A resolution declaring that concrete-block tunnel construction shall be given no further consideration for the Hudson River vehicle tunnel was adopted by the joint commissions of New York and New Jersey under whose direction the tunnel plans are being developed. The resolution was adopted at the instance of the Board of Consulting Engineers, it is stated, with a view to avoiding delay in starting tunnel construction through further discussion between the adherents of Gen. Geo. W. Goethals, former consulting engineer to the commission, and the present engineers. The resolution declares that, as the chief engineer and consulting engineers have advised against the type of tunnel proposed by Gen. Goethals and its patentee, J. F. O'Rourke, no further time shall be devoted by the engineering staff to consideration of this type

Gen. Goethals' recommendation was for a single tunnel of 42 ft. exterior diameter, with 36-in. shell made of precast concrete blocks laid up inside a face shield; the tunnel to contain two decks, each providing a 22½-ft. roadway intended to accommodate three lines of vehicles. The present action of the commission specifically condemns this tunnel, but it is interpreted as barring any use of precast concrete blocks for the Hudson River vehicle tunnel.

Joint Congressional Committee on Compensation Reports

After the most thorough investigation ever made of Government employees' compensation and classification, a joint Congressional committee has submitted to Congress a detailed report recommending substantial increases in pay for nearly every class of Government worker. A feature in the recommendations is that providing for a sliding scale of pay conforming with the increasing or decreasing efficiency of the employee.

Senator Jones of New Mexico, chairman of the committee, said the investigation had discovered that, while the present pay for clerical and the lower grades of other services is reasonable and perhaps higher than that for similar work in private employ, the compensation of the technical branches is grossly inadequate. He asserted that the committee had accomplished a work for which there has been a crying need, as the lack of system in Government employment and compensation has done little to prompt efficiency and literally nothing to insure a maintenance of effort. He strongly endorsed the sliding scale feature as the remedy.

All civil engineers in the Government service will participate in the class and compensation revision advised by the report, which will be discussed more fully in next week's issue.

California Engineers Favor Hoover for President

As a result of the action early in January of the San Francisco Joint Council of Engineering Societies in inaugurating a "Hoover-for-President" campaign among engineers, and in circircularizing several hundred engineering societies of the country, a large number of letters from societies in all parts of the country have been received at headquarters in San Francisco. While the more conservative societies were unwilling to touch "anything of a political nature" there was a much greater number who showed interest in varying degrees, and on the whole it is the sentiment in San Francisco that the campaign has at least been a factor in drawing engineers together on another common ground. It has been the California purpose to foster preliminary discussion of the matter among engineers in such way as to facilitate more definite organization in case Mr. Hoover becomes a candidate.

Action in San Francisco culminated on March 5 when, in a general meeting at the Engineers' Club, there was formed the "Hoover Republican Club of San Francisco Engineers." C. H. Snyder is chairman of the club and A. H. Halloran is secretary.

In Los Angeles a committee representative of the various technical societies formed the Hoover Technical League of Southern California and sent literature to the 1,400 individual members of their organizations.

New President American Railway Engineering Association

Harry R. Safford, the newly elected president of the American Railway Engineering Association, is assistant to the president of the Chicago, Burlington & Quincy R.R.

Mr. Safford was born at Madison, Ind., and was educated at Purdue University, where he received the master degree of civil engineer. His professional career began in 1895, when he entered the engineering service of the Illinois Central R.R., with which road he was connected for fifteen years. After passing through the positions of rodman, instrumentman and assistant engineer of construction, as well as several general office assignments, he was made division roadmaster in charge of maintenance in 1900. In 1903 he became principal assistant engineer, in 1905 assistant chief engineer and in 1907 chief engineer of maintenance-of-way.

HARRY R. SAFFORD

He went in 1910 to the Edgar Allen American Manganese Steel Co., as assistant to the president, but returned to railway work in 1911, when he was appointed chief engineer of the Grand Trunk Railway System, which position he held for seven years. In 1918, when the railways were taken over by the Government for the period of the war, he was appointed by the United States Railroad Administration as engineering assistant to the regional director of the central western region. This position he retained until the government returned the railways to private ownership, when he became assistant to the president of the Chicago, Burlington & Quincy R.R. Besides his membership in the American Railway Engineering Association, he is a member of the American Society of Civil Engineers, and until recently a member of its committee on development.

Urge Completion of U. S. Topographic Map

Conference of Federal and Other Mapping Agencies at Washington Opens Way for Co-operative Effort

The map-making conference held in Washington March 9, involving the inter-departmental Board of Surveys and Maps and the non-federal agencies interested in mapping, as outlined in these columns last week, gave evidence of co-operation between Federal bureaus and outside bodies. A similar board for the co-ordination of construction activities already is being discussed. An extract from the opening remarks of O. C. Merrill, chairman of the Board of Surveys and Maps, follows:

"The preparation of a general topographic base map of the United States is proceeding at a rate far too slow to meet either Governmental or private needs. There has been too little consideration given to the adaptation of the special needs of various Government organizations to the general needs of the Government as a whole or to the general requirements of the map-using public. There has been little or no opportunity to secure a general program either for execution by the several departments or for submission to Congress."

In presenting the topographic program of the U. S. Geological Survey, Director Smith stated that the aim to complete the topographic map of the United States for the use of this generation is based upon the fact that only 42½ per cent of the area has been at all adequately mapped and some of it will require resurvey or revision. Nine states are 100 per cent mapped while the others range from 4 per cent, in the case of Mississippi, to 91 per cent for New York.

$40,500,000 To Complete U. S. Map

The cost to complete the map and make the necessary revision is estimated at $40,500,000. In 15 states this mapping program involves an expenditure in excess of $1,000,000, and in three states, Michigan, Minnesota and Texas, the required amount is nearer $2,000,000 each. The plan of increasing expenditures began with $700,000 for the present year, then $1,000,000 for the next fiscal year, and increasing by $500,000 each year to a maximum of $4,500,000 in 1927, the plan being to finish in 1932. The slogan of the Survey's program is "The completed map for this generation."

The estimates as already submitted to Congress for next year include $600,000 for this work by the Geological Survey, and under an Army item it is intended to allot $100,000 to the Geological Survey for mapping of special areas needed for military purposes. It is hoped that the co-operating states may add $400,000, which is twice the amount of this year's co-operation, and thus bring next year's activities up to the scale provided in the projected plan.

Captain P. St. J. Wilson, chief engineer of the Bureau of Public Roads, representing Thomas H. McDonald, chief of the Bureau, said in part:

"The use of these maps in highway construction is invaluable. A great many of the states are entering, or have just entered, upon a program of laying out and establishing state highway systems. Many of them have no maps, and, unfortunately, from that point of view the states which are farther behind with their road programs are also farther behind with the Geological Survey sheets. This is natural, because the more densely populated states are the first in which the Geological Survey began to work. At the same time, those states have been more progressive in their road programs.

"The question was considered so important at the meeting of the State Highway Officials last December at Louisville that they passed a resolution unanimously urging that steps be taken to expedite the making of the maps."

Open Competition for Delaware River Bridge Suggested

In a recent letter sent out in Philadelphia, Clarence W. Brazer, a member of the State Board of Examiners of Architects of Pennsylvania, suggests impartial and open competition in the consideration of plans for the proposed Delaware River bridge. These plans he thinks should then be submitted to a jury of engineers and architects and they in turn should select the bridge site.

"One of the best ways to obtain and consider such plans," writes Mr. Brazer, "is by an impartial and open competition conducted on a well established and equitable program which would furnish each competitor with full information as to the requirements and as to all terrain within the extremes considered available for such location. With the plans submitted in such a competition weighed by a jury on which are both engineers and architects of town planning experience, good judgement and broad vision, the best design should be selected. This would automatically determine whether an engineer or an architect should control the design."

British Roads Advisory Committee Appointed

According to the *Engineer*, London, the Roads Advisory Committee provided for in the Transport Act, has been appointed by the British Minister of Transport. It consists of eleven members, five being representatives of highway authorities, five users of horse and mechanical traction, and one of labor. The first work of the committee will be road classification, a task that has already been begun by the Ministry of Transport. Problems which will come before the advisory committee include those upon engineering, financial and legal questions.

House Votes Separate Army Construction Corps

Representatives Disagree 133 to 74 With Military Affairs Committee to Include in Q. M. Corps

(Washington Correspondence)

A decisive over-ruling of the Committee on Military Affairs came when the House of Representatives, as in Committee of the Whole, on March 12, voted overwhelmingly for a separate construction department in the War Department. The bill reported out by the committee placed the Construction Division in the Quartermaster Corps. The amendment providing for the separate construction department was introduced by Representative Sanford of New York. Over the protest of the committee and in spite of allegations of lobbying and questionable methods in the attempt to secure the passage of the amendment, it was adopted 133 to 74. The Sanford amendment reads as follows:

"Sec. 8a. Construction service: The construction service shall consist of one chief of construction with the rank of brigadier general, 250 officers of the grades from colonel to captain, inclusive, and 8,000 enlisted men. The chief of construction, under the authority of the Secretary of War, shall be charged with construction, maintenance, and repair of buildings, structures (other than fortifications) and utilities, and the preparation of plans therefor, in accordance with the requirements of the several arms, corps, bureaus, and services of the Army of the United States, and with the operation of utilities in connection therewith and with acquirement of real estate and issuance of licenses in connection with the military reservations under the jurisdiction of the War Department."

Representative Madden of Illinois, was particularly bitter in his denunciation of the methods which he claimed were being used to secure the passage of the Sanford amendment. "Judging from the number of contractors and material men," he declared on the floor of the House, "who had contracts under this organization during the war, it is the most popular organization in the United States. It does not speak well for an organization to be so popular in the minds of those who are performing contracts under their jurisdiction. I know a lobby is not organized unless there is an interest. If there is an interest, what is it? What interest would you assume the contractors, who made millions under the cost-plus contracts, directed by these men, have in their effort to make a separate organization in the Army, to be known as the Construction Corps?"

Mr. Madden introduced as a portion of his remarks a letter from the Secretary of War in which he expressed the opinion that the Construction Division should be placed under the Chief of Engineers. Mr. Sanford, however, called attention to the fact that the Secretary of War, in view of the very evident disinclination on the part of the House to put the Construction Service in the Engineer Corps, had recommended a separate construction department.

Mr. Madden's reflections on the Construction Service brought down upon his head stinging criticism from fellow members. Representative Reavis, of Nebraska, declared that he had seen no evidence of a lobby but that he never had been afraid to co-operate with bad men to accomplish a good purpose. The question is not whether lobbyists are connected with the matter, he said, but whether it is a meritorious proposition. He expressed the opinion that the pressure was not being exerted in the lobbys but was coming from the people back home.

Most of the speakers in favor of the Sanford amendment set forth arguments showing that the construction corps should be permanently separate from the other divisions of the War Department so that it will be able to expand quickly, without reorganization, in an emergency. The arguments against the separate corps were based largely upon a plea for economy, which could be affected by eliminating many of the officers now on its administrative staff and by reducing its clerical personnel.

The debate in this connection, however, was called to the attention of the Secretary of War who, the day following, wrote to the Chairman of Military Affairs Committee to the effect that his recommendation of the separate Construction Service was made through inadvertence and that he still stands by his recommendation that the Construction Service should go to the Engineer Corps.

Cape Cod Canal Shut Down Pending Ownership Decision

An interesting accompaniment to the return of the railways on March 1 was the temporary shutting down of the Cape Cod Canal. The canal was taken over by the Government during the war and has been operated by the Railroad Administration. Under the recent railway act it presumably was returned to its owner. The owner, however, refused to acknowledge title because during the war Congress ordered the condemnation of the canal appropriating money for its purchase. A jury hearing the condemnation proceedings fixed the value of the canal at $16,801,000. The Government, however, only offered $8,250,000 and when this was refused by the owning company the verdict was appealed. The company now disavows ownership, claiming that the title passed to the Government as a jury verdict. The Government has refused to pay the price fixed by the jury. Meanwhile, the canal on the first of March ceased operation because of no apparent jurisdiction. It is stated, however, that the management and the employees will maintain the canal in operation even though they have no apparent source from which to draw wages.

New York Again Demands Extension of Piers Into Hudson

New York City has made application to the Federal Government for the modification of the pierhead line on the Manhattan side of the North River so as to make a permanent extension of 100 ft. into the river between Pier 47 (Christopher St.) and 22d St., the districts now containing the majority of the trans-atlantic shipping piers. Hearings on the subject are being held by the Harbor Line Board.

The present application is to make permanent an order of 1911, whereby three piers in the Chelsea district were permitted to be extended 100 ft. temporarily. This order was made by the then Secretary of War, after a long controversy in which the Harbor Line Board refused to permit an extension, and was issued as temporary with the expectation that provision would soon be made to care for the long steamships elsewhere than in the most congested part of the river. The permission, however, has been renewed from year to year.

As stated in some detail in *Engineering News*, March 9, 1911, p. 300, encroachments on the fairway of the Hudson and North Rivers have been continuous since 1855 when lines were established. Every five or six years applications have been made, and generally after years of persistent manouvering granted, to move the pierhead line farther and farther into the river. The latest of these was noted in *Engineering News-Record*, Feb. 19, 1920, p. 384, when a re-entrant angle in the lower river was cut across by a new line farther out in the fairway. In 1911, however, the temporary permit was granted only after the Federal Government insisted that this should be the end of encroachment in the upper river, where the New Jersey shore comes closest. Nevertheless, following its consistent policy, New York City now comes forward with the demand that the extension shall not only be made permanent but be made to cover a much longer stretch of shore.

Illinois Abandons Its 1920 Highway Program

Abandonment of its 1920 program of highway construction has been announced by the Division of Highways of the Illinois Department of Public Works. High prices, car shortage and a poor bond market are given as the reasons for the decision. All bids received, except those for 29 miles on the Dixie Highway and 9½ miles on the Chicago-Springfield road, will be rejected. These are Federal aid projects. No roads calling for funds from the $60,000,000 bond issue will be constructed. The bond market is such that a discount of 6 to 7 per cent must be taken if road bonds are sold. At present prices this discount amounts to about $2,500 per mile of concrete road.

Concerning prices the highway officials state that the bids opened on Feb. 11, averaged $42,000 a mile for about 60 miles; the bids opened on Feb. 25, averaged in excess of $47,000 a mile for more than 98 miles; the bids opened on March 3, averaged $44,000 a mile for about 60 miles. On many of the sections there was received only one bid. These prices are exclusive of cement, which is furnished by the state.

Herrold Heads City Planning Board at St. Paul

George H. Herrold, office engineer, Department of Public Works, St. Paul, Minn., has been appointed managing director and engineer of the St. Paul City Planning Board, effective March 15. This is a newly created position brought about by ordinances providing for a study of the physical conditions of the city and the preparation of a comprehensive plan for its future development.

The board has been in existence about a year and during that time has created a public sentiment which has resulted in securing an appropriation of $50,000 to be expended during the next two years for surveys and a plan.

W. B. Greeley to Succeed H. S. Graves as Chief Forester

Colonel W. B. Greeley, assistant forester in the U. S. Forest Service has been appointed chief forester by the Secretary of Agriculture to succeed Colonel Henry S. Graves whose resignation from that office becomes effective May 1.

Colonel Greeley is from California, a graduate of the University of California and the Yale Forest School, and has been in the Forest Service continuously since 1904 except for two years of military service with the American Expeditionary Forces. He is 40 years old. In the Forest Service he has had long and varied administrative experience, advancing through all the technical grades from the lowest to his present position as assistant forester.

To prepare the way for American operations in the French forests, the chief forester, Colonel Graves, was sent to France in 1917. He sent for Colonel Greeley to aid in the work. Colonel Greeley finally became chief of the American Forestry section in charge of 21,000 forestry troops and 95 sawmills.

Colonel Graves' letter of resignation to the Secretary of Agriculture contained the following statement:

"Since the pecuniary return afforded professional and scientific men in the Government service inadequately provides against the exhaustion of their working powers which must inevitably take place in time, and entail sacrifices from which employment elsewhere is free, the only course consistent alike with self respect and a regard for the public interest seems to me to be retirement from office before efficiency has been impaired."

Albert F. Potter, the associate forester tendered his resignation at the same time and for the same reason.

To Spend $1,500,000 on Municipal Work in Pontiac

A series of bond issues is on the voting calendar of Pontiac, Mich., to provide funds for an extensive 1920 program of municipal improvement. Counting one issue for $250,000, voted in January, the combined bond issues will approximate $1,500,000 according to Lloyd W. Fall, assistant city engineer. The money will be spent on concrete and brick paving, sanitary and storm sewers, extensions to the city's water works and an addition to the city hospital. It is also reported that railroad, industrial, business and housing interests in Pontiac are planning the expenditure of more than $7,750,000 in improvements during the year.

Pay Raise for Cornell Faculty

A salary increase of 25 per cent for the faculty of Cornell University has been announced. The increase, which is retroactive to the beginning of the present semester, is the first one of any size granted Cornell instructors in 20 years. It was made possible by the receipt of about one-third of the $10,000,000 endowment fund which the university is campaigning for.

Bethlehem Bridge Bid Rejected

The single bid of T. L. Eyre, of West Chester, Pa., for the construction of the reinforced concrete bridge at Bethlehem, Pa., amounting to $4,871,437, has been rejected by the Pennsylvania Public Service Commission. Mr. Eyre's was the only bid submitted, and is more than $2,500,000 in excess of the engineer's estimate, and approximately 60 per cent more than the amount of money that could be reasonably raised at the present time. For that reason the construction of the bridge will be forgotten temporarily.

U. S. Contractor To Erect Office Buildings in Tokio

Requisitions for equipment for the construction of two modern American steel-frame office buildings in Tokio, Japan, have been received from its Orient branch by the George A. Fuller Co. of New York. Work on the two contracts, which are the first of several which the contracting concern has in prospect in Japan and China, is to start as soon as equipment and materials can be shipped from this country.

The nucleus of the company's Far Eastern branch is a staff of nine who left the United States, Jan. 28 under Henry A. Harris, general manager of operations in the Orient. William Oehrle is manager of the Oriental department of the company's executive office in New York City. With headquarters in Tokio the engineering staff and the skilled labor force is to be increased as fast as the need arises. Several additions to the advance party are now en route.

The two office buildings already contracted for erection in Tokio are each to be of seven stories and of steel, stone, brick and terra cotta construction with all up-to-date American installations. One of them is for the Japan Steamship Co. (N.Y.K.) and the other for the Japan Oil Co.

Because of indications to its officials that extensive municipal and industrial improvements in both Japan and China are being planned, it is understood the George A. Fuller Co. anticipates contracts for additional construction in that field. This work, it was stated at the New York office, will include public buildings, banks, office buildings, sewers, street improvements and industrial plants.

Memphis To Have New System of Garbage Disposal

A new system of garbage disposal for Memphis, Tenn., is being worked out by City Commissioner Thomas H. Allen whereby the refuse of the city will be divided into garbage, ashes, and rubbish. Each householder will be required to have three receptacles, one for each of the three classes of waste, the garbage holder being required to have a tight lid. A regular schedule for the collection of each kind of refuse is being arranged, this schedule changing somewhat with the seasons. In the summer, garbage will be collected more often than the other two materials. In winter, ashes will have preference. The present mule-drawn carts will be used in addition to autotruck trailers and tractors to collect the refuse.

A contract will be made to sell the garbage to a private concern to feed to hogs. The city will not contract the collection, however, as it is believed that under contract collections there is a tendency to carelessness collecting those wastes which cannot be fed to hogs.

Commissioner Allen is an engineer and was recently elected to office on the commission of the city of Memphis.

Engineering Council for Universal Military Training and Reserve

Engineering Council has adopted unanimously a resolution of its Military Affairs Committee, which declares to be of vital national importance the enactment of legislation for universal military training and the selective organization and training of reserve units. The resolution says also that the careful selection and training of reservists as members of reserve technical service units is essential to the proper preparedness of engineers to discharge their constitutional obligations. The committee is composed of nineteen members of the founder societies, of whom fourteen are former engineer officers, U. S. Army.

Special Libraries Census

All those in charge of special libraries are requested to communicate with William F. Jacob, General Electric Co., Schenectady, N. Y., regarding a special census. Details are given on p. 582 of this issue.

Engineering Societies

Calendar

Annual Meetings

NATIONAL FEDERATION OF CONSTRUCTION INDUSTRIES, Drexel Bldg., Philadelphia; Chicago, Mar. 24, 25.

NATIONAL FIRE PROTECTION ASSOCIATION, 87 Milk St., Boston; May 4-6; Chicago.

AMERICAN ASSOCIATION OF ENGINEERS; 63 E. Adams St., Chicago; May 10, 11, St. Louis, Mo.

AMERICAN WATER WORKS ASSOCIATION, New York City; Montreal, June 21-26.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; Asbury Park, N. J., June 22-25.

AMERICAN PUBLIC HEALTH ASSOCIATION, Boston; San Francisco, Aug. 30-Sept. 3.

The Cincinnati Association, Am. Soc. C. E., held its first meeting in 22 years, Feb. 26. It was decided to revive the society and to take an active part in civic affairs. Ward Baldwin was elected president and A. M. Westenhoff, secretary and treasurer. Richard L. Humphrey, consulting engineer, Philadelphia, addressed the association on "Enlarging the Activities of the National Society to Take an Active Part in the Economic and Civic Problems of the Country." A committee was appointed to consider the question of affiliation of the society with the Engineers' Club of Cincinnati.

The Milwaukee Chapter, A. A. E., held a meeting, Feb. 24, at which Isham Randolph, Chicago, in an address, advocated the organization of engineers for the promotion of their economic interests as opposed to unions. Secretary C. E. Drayer spoke of the result so far accomplished by the association, outlining the work of the service department and of the railroad department, which has obtained substantial increases for a great majority of the railroad professional engineers of the United States. Over 700 members from Milwaukee, Racine and Kenosha, were in attendance.

The Engineers' Club of Philadelphia makes the following announcement of meetings and luncheons for the coming month: March 19—Illuminating Engineering Society: "Development of the R. L. M. Standards for Industrial Lighting" (illustrated) by Ward Harrison; "Residence Lighting" (illustrated) by M. Luckiesch (Meeting will be held at Cosmos Club, Washington, D. C. March 22—Philadelphia Safety Council. March 23—Tuesday luncheon address: "Merchant Marine Development" by P. H. W. Ross. American Society Mechanical Engineers: "Safeguards in Industrial Plants" by Commander H. A. Richardson, U. S. N. March 26—American Society of Steel Treaters: "Heating Treatment and Furnaces for Heating Treatment" by Henry Voltman. March 30—Tuesday luncheon address: "The Progress of Engineering Council's Work" by Alfred D. Flinn. April 1—Worcester Technology Club. April 3—Association of Iron and Steel Electrical Engineers: "Welding, Electricity Versus Gas" by James E. Wison. April 5—American Society of Civil Engineers. April 6—Renssalaer Polytechnic Club. Tuesday luncheon address. April 7—Technology Club. April 8—American Society of Heating and Ventilating Engineers: "Economizers" (illustrated) by M. C. Sherman. April 12—American Institute of Electrical Engineers: "Electric Welding as Applied to Ship Building" by Comfort A. Adams.

The Portland (Ore.) Association of Members, Am. Soc. C. E., held a meeting in that city March 1. It was reported that at a meeting, Feb. 20, of a committee on the formation of a local technical council, composed of representatives of the American Society of Civil Engineers, American Institute of Electrical Engineers, American Society of Mechanical Engineers, American Institute of Architects, Northwest Association of Highway Engineers and National Electric Light Association, the Oregon Technical Council was organized and constitution adopted. The board of directors of the association was thereupon authorized to appoint representatives in the council. J. P. Newell, president City Planning Commission, gave an interesting talk on zoning as worked out for the City of Portland and the pending zoning ordinance. The association went on record as favoring the zoning ordinance as it stood and urging its immediate passage by the city council.

The District of Columbia Association of Members, Am. Soc. C. E. held a special meeting at the Cosmos Club Hall, Washington, D. C., Feb. 27, for the purpose of discussing the questionnaire ballot on development now being voted on by the corporate members of the American Society of Civil Engineers. Arthur P. Davis, president of the society, addressed the meeting, and discussed in turn each question to be voted on.

The Southern California Association of Members, Am. Soc. C. E., at its regular meeting, Feb. 11, listened to a paper by Roy V. Reppy, chief counsel of the Southern California Edison Co., on "Political and Legal Aspects of Flood Control in Los Angeles County." W. H. Code delivered a paper on "Financial Features and Executive Organizations Provided in the California Conservancy Act." Among the business matters transacted was the appointment of a committee to consider the voluminous report of the California Railroad Commission on the grade crossing and the union terminal railroad problem in Los Angeles.

The Detroit Engineering Society will be addressed by Prof. Clyde T. Morris, of Ohio State University, on "Stress Measurements," at its meeting of April 2.

PERSONAL NOTES

RUSSELL V. BLACK, recently on the staff of John Nolen, city planner, Cambridge, Mass., has been appointed assistant engineer to the City Planning Commission of Akron, Ohio.

F. M. PERCIVAL has been appointed engineer of Aransas County, Tex.

ARTHUR MAGUIRE, formerly engineer of maintenance-of-way, Los Angeles & Salt Lake R.R., has been appointed chief engineer, with office in Los Angeles, as heretofore.

H. O. KELLEY, formerly assistant engineer, Wabash R.R., St. Louis, has been appointed division engineer, with the same headquarters. He succeeds D. C. Bowman, resigned.

B. H. BRYSON, first engineer, at Fraser, Iowa, Fort Dodge, Des Moines & Southern R.R., has been made chief engineer of that railroad.

B. S. VOORHEES, engineer of grade crossings, New York Central & Hudson River R.R., has been appointed district engineer of the Eastern District (comprising the Hudson River, Harlem, Putnam and Pennsylvania divisions), succeeding G. P. Stowitts, resigned to become chief engineer of the Lord Dry Dock Co., as noted elsewhere. Mr. Voorhees was graduated from Yale University in 1907 and entered the employ of the New York, New Haven & Hartford R.R. A year and a half later he began his service with the New York Central in the maintenance-of-way department at Albany, and soon afterwards entered the Engineering Department as inspector at Watertown, N. Y. Three years later he returned to Albany as assistant engineer, where he remained only a few months, coming to the office of the engineer of grade crossings in New York. He became assistant engineer and in April, 1916, was appointed engineer of grade crossings succeeding N. F. Thompson.

H. D. PARIZEAU, superintendent of hydrographic survey work on Lake Superior for the Department of the Naval Service, Ottawa, has been transferred to the British Columbia district, replacing Captain Burgrave, deceased. (credit Surtees)

R. H. FISH has been appointed general superintendent of eastern lines, Grand Trunk Railway Co., replacing W. R. Davidson, transferred to the western division. Mr. Fish was formerly superintendent of the Stratford, Ont., division. The Ottawa division of the Grand Trunk is under his jurisdiction.

R. J. FRASER, assistant to the superintendent of hydrographic survey work on Lake Superior for the Department of the Naval Service, Ottawa, has been promoted to superintendent replacing H. D. Parizeau, transferred to the British Columbia district.

M. A. STAINER has been appointed engineer of maintenance-of-way, Fort Worth & Denver City Ry. and Wichita Valley R.R.

R. C. GOWDY has been appointed chief engineer, and W. H. Hess valuation engineer, Colorado & Southern Ry., Wichita Valley Ry. and Fort Worth & Denver City Ry.

ALBERT W. NEWTON has been appointed chief engineer of Chicago, Burlington & Quincy R.R., of which he was corporate engineer while it was under Government control.

W. G. CALDWELL, formerly captain, Engineers, U. S. A., has been appointed highway engineer of Waukesha County, Wis., with offices in Waukesha.

R. H. PENNARTZ, formerly on the engineering staff of the Kansas State Highway Commission, has been appointed resident engineer on Federal-aid road work in Shawnee County, Kan.

R. N. KELLOG, Enterprise, Ore., has been appointed highway engineer of Wallowa County, Ore. He will make preliminary plans, specifications and estimates to be used as a basis for extensions and appropriations on work to be done jointly by county and state.

WILLIAM STEEBERGEN, Point Pleasant, W. Va., has been elected road engineer of Jackson County, W. Va. Several miles of concrete road are to be constructed under his supervision this spring.

C. L. NELSON has resigned as city engineer of Muskegon, Mich., to take charge, it is understood, of some of the engineering work on a new plant to be erected in that city by the Campbell, Wyant & Cannot Foundry Co.

ROY F. HALL, Utica, N. Y., has been appointed division engineer, at Watertown, of the New York State Highway Commission. He will be succeeded by L. D. Brownell, who is in temporary charge of the Watertown office.

R. D. KEYES, lieutenant, U. S. Navy, recently discharged, has been appointed engineer on the California State Highway Commission. He has been assigned to new construction work in San Diego County.

BRUCE L. DRAY, attached to the surveyor-general's office, Sacramento, Cal., for the past two years, has been appointed assistant surveyor-general, succeeding Donald Shields, resigned.

EDWIN P. DEWEY, deputy city engineer, Pasadena, Cal., has been made city engineer to succeed R. V. Orbison, who has resigned to become city manager of South Pasadena.

C. M. BUTTS, formerly road engineer of northern California, has been appointed chief assistant to Martin C. Polk, engineer of Butte County, Cal. Mr. Butts will assist in laying out the new county highway provided for under a recent $1,800,000 bond issue.

G. A. NOREN, assistant engineer, New York Central & Hudson River R.R., has been appointed engineer of grade crossings, succeeding B. S. Voorhees, promoted to district engineer, Eastern District, as noted elsewhere. Mr. Noren graduated from the University of Pennsylvania in civil engineering in 1910 and entered the Engineering Department of the Pennsylvania R.R. Soon afterward he became assistant engineer for the Electric Railway, Light & Power Co., Monterey, Mexico. After a brief period of private practice at Monterey, he entered the Engineering Department of the New York Central, where he has served continuously since that time.

D. B. THOMPSON, special assistant contracting engineer, New York Central & Hudson River R.R., has been appointed assistant district engineer of the Eastern District.

HUNTINGTON CHOATE ATWATER, plant engineer, Empire Engineering Co., Inc., New York, has resigned to become vice-president of the Reading Engineering Co., Inc., New York. Mr. Atwater has been engaged for many years on heavy construction work, recently stationed at the Kensico dam as resident engineer for the contractor.

J. P. SPOONER, JR., has been appointed assistant engineer of San Joaquin County, Cal., in charge of highway maintenance.

MAXIMILIAN TOCH, industrial chemist, has been appointed adjunct professor of industrial chemistry of Cooper Union, New York City. Mr. Toch will co-operate in the development of a new four-year day course in industrial chemistry to be started next September by the institution. The course will train men as analysts, research chemists, foremen and superintendents in manufacturing plants.

R. H. FIFIELD, for eight years manager, U. S. Reclamation project, Huntley, Mont., has resigned to take a position with the Billing Land & Irrigation Co., Billings, Mont.

RODERIC PEARSON has been transferred from the Portland, Ore., office to the Missoula, Mont., office, U. S. Bureau of Public Roads, as bridge engineer.

H. J. HEMSTREET, highway engineer, U. S. Bureau of Public Roads, Portland, Ore., has been transferred to the bureau's office at Missoula, Mont.

GEORGE F. TURNER, formerly assistant county surveyor of Mahoming County, has been appointed city engineer of Youngstown, Ohio. For five years previous to his recent employment he was engaged on grade elimination projects for the Pennsylvania Lines. He succeeds Frank M. Lillie, who takes the newly created position of consulting engineer to the City of Youngstown.

J. R. Shields, formerly with the Emergency Fleet Corporation at Ookland, Cal., has been appointed special assistant engineer of the Commission of Public Works of Sacramento. He will have charge of the inspection of materials to be employed in the construction of the new filtration plant for that city.

Marcel Pequegnat, who for several years has been actively engaged in the municipal affairs of Kitchener, Ont., as resident engineer of the Kitchener Water Commission and assistant city engineer, has been made superintendent and engineer of the commission.

T. R. Deacon, of the Manitoba Bridge & Iron Works, has recently been elected vice-president of the Manitoba Branch of the Deep Waterways Association.

Prof. J. J. Traill, assistant professor in hydraulics of the University of Toronto, with which institution he has been associated for fourteen years, has resigned to enter the hydraulics department of the Hydro-Electric Power Commission of Ontario.

Blum, Weldin & Co., of Pittsburgh, have been appointed consulting engineers to the comptroller of Allegheny County, Pa., under whose jurisdiction is the approval of all contracts and payment under contracts for county work. The above-mentioned firm has been selected to advise him on all technical matters involved.

Spencer Logan, of Cherryvale, Kan., has been appointed city engineer of Coffeyville, Kan., for which city extensive municipal improvements are planned in the way of a new sewerage system and street paving.

D. H. Tomlinson, assistant secretary, American Association of Engineers, in charge of the railroad sections at headquarters in Chicago, has become identified with the Portland Cement Association. Mr. Tomlinson, who was assistant engineer on the Chicago & Western Indiana Ry. previous to his service as captain and instructor in the Field Artillery, U. S. A., at Fort Monroe, has held the difficult position of taking up the compensation question of the railroad engineers with the regional directors.

Langdon Pearse and Samuel A. Greeley announce that Paul Hansen, recently chief sanitary engineer, Illinois State Department of Health, has become a member of their organization. The firm name will be Pearce, Greeley & Hansen, with offices in Chicago. The new firm will continue the general practice of hydraulic and sanitary engineering, Mr. Greeley and Captain Hansen as active partners and Mr. Pearse as special consultant.

J. B. Early has been made resident engineer of Foard County, Tex. He was formerly office engineer for W. M. Foshee, engineer of Lamar County, Tex.

Obituary

H. T. Ruhl, formerly an engineer on the Canadian Pacific Railway and the Canadian Government Railways, died of pneumonia, at Albany, N. Y., Feb. 18. Mr. Ruhl, an American by birth, spent a large part of his life in Canada, chiefly with the Canadian Government Railways, as divisional engineer, at Moncton. He was associated with F. P. Gutelius on the Canadian Pacific, and the Government Railways. Later he was engineer of maintenance-of-way of the Delaware & Hudson, with headquarters at Albany, which position he held up to the time of his death.

Daniel Decker Martling, one of the builders of the Atlantic Ave. tunnel, Brooklyn, and at one time superintendent of the old Culver steam railroad, between Brooklyn and Coney Island, which he helped to build, died at his home in that city, of heart failure, Feb. 6.

Daniel Bernard McCarthy, eastern sales manager, Neptune Meter Co., New York, died from bronchial pneumonia at his home in that city, Mar. 6. He was born in Weavertown, N. Y., in 1871. Following a course in the Troy Business College, Mr. McCarthy was in charge for about a year of the Watervliet, N. Y., waterworks plant. He then moved to Waterford and became superintendent of the Waterford Water Co., continuing in that capacity for nearly twenty-one years. During his management of the Waterford plant, he became associated with the Neptune Meter Co. and represented that concern as a traveling representative for seventeen years. In 1014 he was made eastern sales manager of the company, in direct charge of sales for a large portion of the country.

James Rogers, railroad contractor, died at his home in Montreal, March 1. He was born at River Beaudette, Que., in 1837. Mr. Rogers started his career as subcontractor in the construction of the Canadian Pacific R.R. on Lake Superior. At a later date he constructed part of the Sudbury & Canadian Pacific R.R. lines, and was superintendent of construction in the building of the Canadian Pacific R.R. west of Port Arthur, and also built a portion of the Baie des Chaleurs Railway running from Metapedia Junction. He built a section of the Intercolonial Railway, near Newcastle and Chatham, N. B., double tracked the Grand Trunk from Hamilton to Niagara Falls and from St. Lambert to St. Johns, Que. Other public works which he undertook were the construction of the Atwater Ave. bridge over the Lachine Canal, in which the first extensive use of reinforced concrete was made; also the New York Central R.R. from Valleyfield to Malone, N. Y., and Fort Covington to Massena Springs, N. Y. Mr. Rogers was also at one time a government inspector of construction in the building of the North Shore R.R. between Montreal and Quebec.

Business Notes

Lowell Wrench Co., Worcester, Mass.; catalog, 6 x 9 in., 20 pages, illustrated; "Reversible Ratchet Wrenches," describes ratchet equipment for drills, taps and dies, all thread connections, and for vises.

K. R. Wilson, Buffalo, N. Y.; catalog, 3 x 9 in., 20 pages, illustrated; "Wilson's Special Tools for Ford Repair Shops," describing a line of shop equipment especially adapted to Ford car repairing.

Electro Bleaching Gas Co., Niagara Falls, N. Y.; booklet, 5 x 8 in., 18 pages, illustrated; "Liquid Chlorine," describing the various uses of liquid chlorine and the company's service in its supply.

The Easton Car & Construction Co., Easton, Pa., has opened a branch office at 400 Penobscot Bldg., Detroit, in charge of H. H. Siff, district sales engineer. With this new branch office, the company states, industrial railway users may secure quick, accurate and dependable engineering service and the solution of difficult problems in special equipment.

The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., announces the following promotions among its East Pittsburgh officials: Alexander Taylor, from manager of works, to assistant to vice-president in general charge in all plants of production, stocks and stores; R. L. Wilson, from general superintendent, to works manager, East Pittsburgh works; E. R. Norris as director of works equipment, in charge of machinery, tools and methods in the various plants.

The General Electric Co., Schenectady, N. Y., announces the establishment of business training course for college graduates without a technical education. The course is also being extended to include the graduates of technical colleges employed in the company's testing department, with the idea of giving the prospective engineer a broad business background for his future work. Students taking this course will be paid by the company. The company now employs in its technical department from four to five hundred college graduates every year. There are included in this enrollment students representing twenty foreign countries. The International General Electric Co., Inc., a separate organization recently formed to handle the foreign business of the parent concern, also expects to establish a similar course of training for students who will represent it in foreign countries.

A Consolidation of Engineering News and Engineering Record — McGraw-Hill Company, Inc.—JAMES H. McGRAW, President

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN
Editor

Volume 84 — NEW YORK, THURSDAY, MARCH 25, 1920 — Number 13

Registration in England

THERE has been noted in these columns the proposed effort of the Institution of Civil Engineers, of Great Britain, to have passed by Parliament a law requiring the registration of engineers. It is the understanding in England that the law will cover all engineering practice, the term "civil engineer" to be used in its broad sense, as including all engineering other than military. Rumor has it, also, that the bill will likely provide that the control of the registration shall be vested in the Institution of Civil Engineers. To this possible method of control vigorous protest has been voiced. The Executive Committee of the Society of Engineers, has set forth that the broad interpretation of the term "civil engineer" is no longer justified and that the institution "though a competent authority as regards its own members, has no mandate from the the engineering profession as a whole to act on its behalf." Protest has also been made by B. Wyand, secretary of the Institution of Municipal Engineers, his protest being much along the lines of that of the society mentioned. It is important, however, to note that neither the Society of Engineers nor Mr. Wyand takes exception to the proposal of registration, but merely to the extent to which the Institution of Civil Engineers shall be the governing or administrative body. In fact, Mr. Wyand says very explicity that civil engineering will sooner or later become a "close" profession. We take it, therefore, that the engineers of Great Britain favor registration—a fact that is of interest in view of the discussion over licensing in this country.

New York's Local Freight Problem

GEORGE H. PRIDE, the well-known New York operator of motor trucks, and president of the Heavy Haulage Co., in a Letter to the Editor in last week's issue criticised severely the engineers of the proposed Hudson River vehicular tunnel for not providing for three traffic lines in each direction. With Mr. Pride's argument on the immediate need for three-way traffic we do not now propose to deal, but want to point out the erroneous assumption on which his whole thought seems to be based—that we should look for the solution of New York's freight-handling problem to vehicular tunnels and motor trucks. When thus presented in its baldness, Mr. Pride, himself, will probably deny that he entertains any such view, yet a careful reading of his letter shows that that thought runs through his letter. The controlling factor in freight distribution in New York City with present methods of distribution is the capacity of the city streets. Already the congestion everywhere south of Fifty-ninth Street is serious; it usually shows itself at intersections. To bring more freight across the river on motor trucks will not, at first thought, seem to add to the congestion, for the same freight must be delivered whether direct from the Jersey Yards or with the aid of lighters. However, there will be added truck mileage due to distribution from a few points—the tunnel portals on Manhattan Island—rather than from many lighterage piers. But even if there were no added traffic now, the increase in the port's business would add it in the future. Indefinite increase of traffic on New York's streets is, of course, out of the question. Therefore, we should not delude ourselves with the error that the vehicular connection with New Jersey will solve New York's local freight-handling problem. Only by approaching this question in a broad way can we hope to solve it. Rail connection with New Jersey for freight, and subsurface distribution, combined with either a subsurface or elevated belt—along these lines must we work to handle New York's freight.

If Question 3 Should Fail?

WHAT will happen if in the questionnaire ballot being taken by the American Society of Civil Engineers the vote should be adverse to Question 3, relating to the organization proposed by the Joint Conference Committee? The members of the society's board of direction were parties to a meeting, informal of course, at which approval was given of steps to organize the comprehensive organization proposed. Notice was given at that time that the society's view would not be known until the questionnaire ballot was canvassed; and the clearly implied reservation undoubtedly applies, as well, to the subsequent action in directing the society's representatives to participate in arranging for the organizing meeting. All of which indicates that it would not be improper for the society, in case of an adverse vote, to refrain from participation in the proposed organization. But, in the words of the song, "Where do we go from here?" Without a doubt, even if the civil engineers' society should refuse to participate, the other societies would proceed with the organization—and should proceed with it. The situation would be similar to that which obtained when the other national societies accepted the Carnegie gift and established a common home—with the civil engineers left out. The other societies successfully worked out a difficult problem and changed the engineering center of the country from Fifty-seventh Street to Thirty-ninth Street, New York. Then, belated, the civil engineers came into the building. So, too, it would probably be with the comprehensive organization. After the other societies had solved the problems, the civil engineers would feel it their duty to come in. We believe they should be in at the start. Their counsel, their ideals are needed, particularly in the preliminary stages. It will be a calamity if the civil engineers should fail to participate. There are those, on the contrary, who believe that it will be a calamity *for the society* if it does participate. These are the men who feel that the society, directly or indirectly, should have only technical activities. We are heartily in agreement with them in wanting to guard jealously the technical ideals which have made society the leading engineering organization, but we do not believe that participation in a welfare organization will be detrimental. We have such faith in the mass of engineers that we believe that the work of the comprehensive organization will not be unworthy of or detrimental to the profession. Democracies have their dangers, it is true, but we are willing to trust them somewhat more than many of the opponents of the Joint Committee's proposal.

New Factors in Planning Railway Improvements

RADICAL changes in rules governing railway location and relocation and in plans for other improvements are likely to be introduced, owing to the changed operating conditions which will result from the new scales of wages and overtime for employees in freight-train service. Low grades, in particular, will be a much less important factor than formerly in both location and revision, while measures for insuring uninterrupted movement will be of greater importance than those providing for very heavy trains. These views are expressed by the American Railway Engineering Association's committee on economics of railway location and will be noted with interest by all railway engineers.

For years freight-traffic economics have been gained by steadily increasing the weight of trains. These heavy trains, in fact, are characteristic of American railway practice. Great sums have been spent in reducing grades to a profile favorable for the operation of such trains. Speed necessarily is slow and the trains are difficult to handle, so that delay and loss of time occur when movement is interrupted by stops or switching to keep out of the way of faster or opposing trains.

Two methods are available to avoid excessive labor cost under the new wage scales. Either the divisions must be shortened to enable the present heavy and slow trains to make their trips without overtime charges, or traffic must be handled in a greater number of lighter and faster trains. The former alternative would require the moving of terminal facilities, while the latter would involve the construction of additional running tracks. In the opinion of the committee the change in character of trains will be the more economical method by far, although it is a direct reversal of the present system of handling freight traffic.

To attain this economy, however, it will be necessary to avoid intermediate stops, such as for clearing other trains and taking water. For this reason the provision of track tanks and additional running tracks may be of greater economic importance than the revision of line to secure low grades and easy curvature. It will mean, also, the double tracking of many single-track lines and additional tracks for busy double-track lines, since the handling of heavy traffic on such lines involves frequent sidetracking to allow the passage of other trains.

Electrification of railways will have an additional value under the new conditions, according to the report, while an appendix by E. H. McHenry points out that electric traction will seriously affect the economic values heretofore assumed for the items of distance, rise and fall, curvature and rate of grade.

On the whole, it appears evident that in future the engineer locating new lines or planning improvements of old lines will be governed by considerations differing considerably from those of the past.

A Sane Study of Column Strength

MOST engineers, we think, will welcome the news that a straight-line column formula was finally settled upon by the American Railway Engineering Association for use in the design of steel bridges. Both the Gordon and the straight-line types of formula have extensive following, whereas the parabolic formula proposed to the association a year ago has only few scattered adherents. As between a Gordon and a straight-line formula devised for corresponding service there is little to choose; each has its advantages and its defects and each will produce good results. The straight-line formula, however, is distinctly the more popular.

Even more important than the decision in favor of a straight-line formula, however, is the study and discussion of the column subject on which the decision was based. Prof. F. E. Turneaure, who carried out this study, has contributed a report of singular lucidity to the confused mass of literature on column strength that has accumulated during the past few years. For one thing, his analysis of the several series of experiments on record, together with his application of each of them to the question of a working stress formula, is of fundamental value. Further, his incidental reference to the fact that square-end tests and square-end formulas have no immediate application to bridge design, but must be transformed to a round-end basis, is most helpful. There are, in fact, two separate kinds of misunderstanding on this point that have been not uncommon: the first one, that many compression members in bridges are actually square-ended or restrained, whereas the fact is that apparently fixed ends are either free to rotate (as in compression chords) or free to shift laterally (as in portal posts); the second, that square-end and hinged-end column action are substantially identical, a belief opposed to both theory and test results. Professor Turneaure's report disposes of both these misunderstandings.

Dealing with a phase of detail design he again succeeds in destroying a widespread error. There has long been a rule of design that a composite column, built of separate ribs connected by lattice or other bracing, should be so proportioned that the length-ratio of a rib segment is not greater than the length-ratio of the whole column. Much mischief has been done by this rule. It bases on a wholehearted misappreciation of column resistance, and so long as this prevailed no sound thinking on column detailing could develop. A single paragraph of Professor Turneaure's report deals with lattice spacing, but this one paragraph is of a kind to form a lasting contribution to the literature of column design.

There is one point of the report, however, whose relation to broad problems in structural design is so direct as to warrant our marking it as easily the most important. This point is the statement and proof of the fact that when a straight-line formula is shifted to a higher or lower register, so to say, the same factor must not be applied to both terms. When a high-strength steel is used, for example, and the base stress of the column formula is to be raised from 15,000 per sq.in. to 30,000, it is not correct to merely double the subtraction term. Unless this term is increased in greater ratio than 2:1, the formula will be falsified in its higher ranges, where it is related to buckling action and the Euler formula. The modulus of elasticity of the steel controls buckling, and this quantity is no greater for high-strength than for ordinary steel.

What lies at the bottom of the question thus raised, however, is not mere mathematics but the highly empirical (and highly important) question of factors of safety. This needs far more study and reflection than it has yet received. Is it proper engineering that the same safety-factor against ultimate failure (i.e., testing-machine failure) be provided in three columns of length-ratios 40, 100 and 175? We think it is not, and we believe that every engineer in a case of practical designing of columns does in effect apply different safety factors. But the question—which has not yet been subjected to discussion—needs to be answered more specifically. Upon the answer will depend not only the manner of transforming a formula when applying it to high-strength steel, but also the whole question as to what is the best column formula for use in designing practice.

In bringing such matters as this to the front, the present report on a study of column strength performs most valuable service. Its healthful influence in developing sound and progressive habits of thinking on steel-column practice is certain to be felt for a long time.

Progress in Bridge Thought

MANY months of hard work and diligent discussion preceded the final formulation of the new bridge specification adopted by the American Railway Engineering Association last week. In the form of preliminary draft, presented at the meeting of a year ago, this specification had certain obvious defects and encountered very strong opposition, with the result that many revisions were made during the past year's work. There are still differences of opinion, but the vote of adoption means that the final document is workable and meets prevailing views on good construction in the field of steel bridges. Inasmuch as it differs from its predecessor, the 1910 specification, in many important requirements, and also is of widely different form, the change is certain to have distinct influence on bridge thought. In fact, it may initiate a new period of development of structural ideas.

There was an attractiveness in the rugged simplicity of the earlier specification that the new one lacks. Detail clauses have been inserted in large numbers. In a sense the two documents represent opposite views of a bridge specification: the older one, that specification requirements are best held down to a minimum in number and stringency; the new one, that elaborate detail clauses and limitation of freedom in designing are desirable. The work of the detailer will probably be simplified by the new document. On the other hand the designer may receive less help from it than from the old one.

In view of the wide currency which the older specification won for itself, we may fairly emphasize the fact that it produced excellent bridges. It was safe; and while it could be used either economically or wastefully, and could even be applied in such a way as to produce unsatisfactory construction, these characteristics do not necessarily form grounds for proper criticism. It remains to be learned whether a specification can be made so comprehensive and detailed as to assure good design and sound detailing in every point. Or, if it is found that this can be done, whether the specification would not then prove too restrictive for most flexible and efficient service.

When the first draft of the new specification was presented, a year ago, some surprise was occasioned by the committee's limiting its application to spans not exceeding 300 ft. in length. This limitation has been retained in the revision. Its justification is that in the case of a long span special considerations are apt to assume dominant importance, while below 300 ft. span length the rules of design and construction may be standardized. Perhaps the matter may be stated in another way: The bridge designer needs freedom in developing his general conception and in working out the specific designing problems, if his work is to be efficient and economical; but for spans of moderate length it is considered permissible to deprive him of this freedom.

Since the days when the first engineering specifications to control the designing and detailing of steel bridges came into use, no equally weighty admission of the impossibility of circumscribing engineering design by specifications has come to notice. The 300-ft. limitation is, in fact, a most valuable reminder of the essential difference between specifying for material and specifying for engineering design—the latter ever involving the danger of defeating its own purpose and tending to replace responsible engineering thought by routine processes of copying and piecing together elements of design created by others for prior uses.

In considering the limitation of size to which the new specification is to be applied, one is inevitably led to the reflection that, after all, principles of good design apply with precisely the same force to a large structure as to one of lesser magnitude. Conversely, what is a bad detail or bad arrangement in a small structure is very likely to be similarly defective when applied to a large structure, if the nature of its shortcomings of service is correctly understood—if, for example, it is appreciated that the objection to suspended floorbeams depends upon the relation between traffic loads and the dead weight of the suspended parts. It must, therefore, be possible to set down controlling principles that have an application unrestricted by span length.

At this very point lies a question which the new specification for the first time brings up, and at the same time answers. The question is whether an engineering specification (*not* one that is to govern construction or contract work) should go farther than to state general principles; in this case whether a sound bridge specification can or ought go beyond the line of principles applicable to *all* steel railway bridge construction, regardless of limitations of size. With the adoption of the new document railway bridge engineers throughout the country have answered this question in the affirmative. But the final answer can come only from the test of time and service.

Location and Structures of a Heavy Industrial Railway

Clairton Branch of Monongahela Southern — Tunnel Through Old Coal Workings — Deep Rock Cuts — Retaining Wall Sixty Feet High—Large Arch Culverts Under High Fills—Special Bridge Floors

AN IMPORTANT step forward in the organization of steel production is represented by two costly undertakings recently carried out by the Carnegie Steel Co.: A byproduct coke plant at Clairton, 20 mi. south of Pittsburgh, and a new railroad to serve as direct supply route for distributing the coke made at this plant to the company's blast furnaces in the Monongahela Valley. The latter enterprise, a branch of the Monongahela Southern R.R., operated by the Union R.R. Co., is a piece of railway engineering remarkable alike in its conception and in the line-location and construction involved. The railroad, 5 mi. long, is just approaching completion, though temporary single-track operation started in April, 1919.

While the railroad will carry a very heavy traffic, it has grades of 1.25 per cent in one direction and 1.43 per cent in the other, a fact sufficient to indicate that the conditions governing the location were decidedly unusual. Further, though the line is double-tracked, it has at one end a quarter-mile length of single track, complicated by several spur-track crossings, another result of the severe limitations imposed by local conditions. Correspondingly, the difficulties met in design and construction were of a kind to make the line highly interesting to engineers. An 1,800-ft. tunnel, rock cuts up to 100 ft. deep, and a number of structures of quite remarkable proportions, including road culverts under high fills, a retaining wall 60 ft. high, and several difficult bridges were necessary. There were many interesting detail problems of engineering, a number of which are dealt with in the present article.

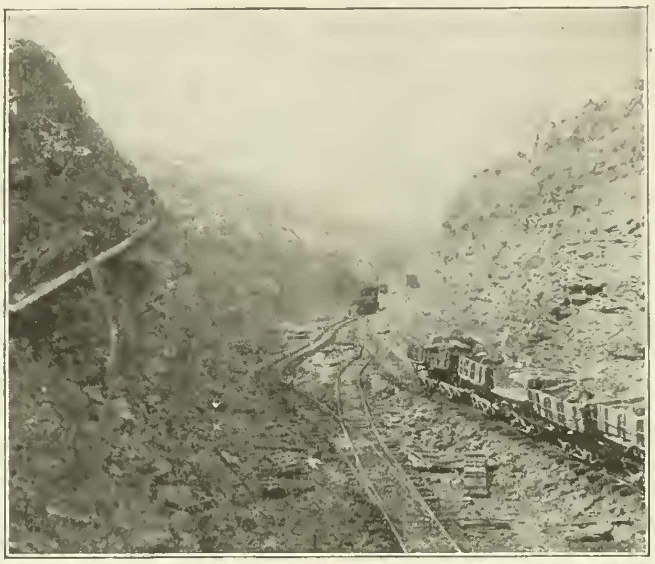


FIG. 1. A HEAVY ROCK CUT OF THE CLAIRTON BRANCH
North from Coal Valley Bridge—Temporary operating track 4 to 10 ft. above final grade.

Coke Transportation and the Railroad Situation

Though carried out as a war enterprise, the new railroad bases on purely peace-time plans of development. A central byproduct coke plant in the Pittsburgh district had been projected by the Carnegie Steel Co. some years ago, to serve its various works, and on search for a location the Clairton site was fixed upon. A river flat adjoining the Clairton steel plant, previously acquired by the company, gave ample room for the coke ovens, and the hillside afforded room for expansion of the town associated with the works. The critical importance of benzol in munitions production hastened the execution of the project, construction of the coke works being begun in August, 1916. The railroad connection, necessary to serve the plant more efficiently, was started soon after. The contract was let in September of the following year, and the work was pushed to completion in about two years, and to the point of operation in eighteen months, despite extreme difficulties of material and labor supply and the absence of priority orders from the Government.

To make the situation intelligible, the railroad conditions must be reviewed, in brief. The Union R.R. is the interplant supply artery of the Carnegie Steel Co. in the Monongahela Valley; it distributes all material moving into or out of the several manufacturing plants from and to the several railroads of the district. In Fig. 2, a small-scale railroad map of the southern part of the Pittsburgh district, the Union R.R. is seen to be a short stem with various spur ends, or branches, connecting to the principal plants of the company and to all the railroads of the district. It includes two bridges over the Monongahela River, at Homestead (to the Carrie furnaces) and at Port Perry, leading northward to the Bessemer & Lake Erie R.R.

When the Carnegie Steel Co. decided to supplement the transportation of its ore supply between Lake Erie and the Pittsburgh district it acquired a controlling interest in the Pittsburgh, Shenango & Lake Erie R.R., a cheaply constructed and poorly equipped line between Conneaut Harbor on Lake Erie and Butler, Pa., about 42 mi. north of the Monongahela River at Bessemer. In the spring of 1896 a new line, the Butler & Pittsburgh R.R., was located between Butler and Bessemer, and this road was ready for operation in the fall of 1897. Meantime, the Butler & Pittsburgh R.R. and the Pittsburgh, Shenango & Lake Erie R.R. had been consolidated as the Pittsburgh, Bessemer & Lake Erie R.R. The southern operating terminus was established at North Bessemer, 4 mi. south of the Allegheny River, while the 8 mi. through the divide and south to Bessemer on the Monongahela were leased to and are operated by the Union R.R.

Development of System

In 1901-2 the Bessemer & Lake Erie R.R. was located and built to provide a better location for a part of the Pittsburgh, Bessemer & Lake Erie R.R. near Greenville, Pa., and the latter was leased and has since been operated by the Bessemer & Lake Erie R.R. Co., which accounts for the change in name. This line is a means for bringing ore from the Lakes to Pittsburgh and taking coal to the Lakes, besides handling a large miscellaneous tonnage. Over this line Lake Superior ore reaches the company's 27 furnaces in the Monongahela Valley, at Braddock, Homestead, Duquesne and Clairton.

Following the establishing of direct connection to Lake Erie, another line was projected and located in 1897-8 to provide direct connection with the coal territory to the south. This is the Monongahela Southern, which is a subsidiary of the Union R.R., from which it starts near Duquesne. Although the line was located as above stated, and some right-of-way secured, none of the line was constructed and put into operation until 1906, when 7 mi. of the line from near Duquesne to Mifflin Junction were completed, and connection made with a branch of the Pittsburgh & West Virginia R.R. (formerly Wabash Pittsburgh Terminal) and through it to the West Side Belt R.R., and later the Montour R.R., all three of these lines having developed from a rather intricate series of railroad projects involving several groups of interest. All of these lines deliver coal for Lake Erie to the Bessemer & Lake Erie R.R. through the Union R.R.

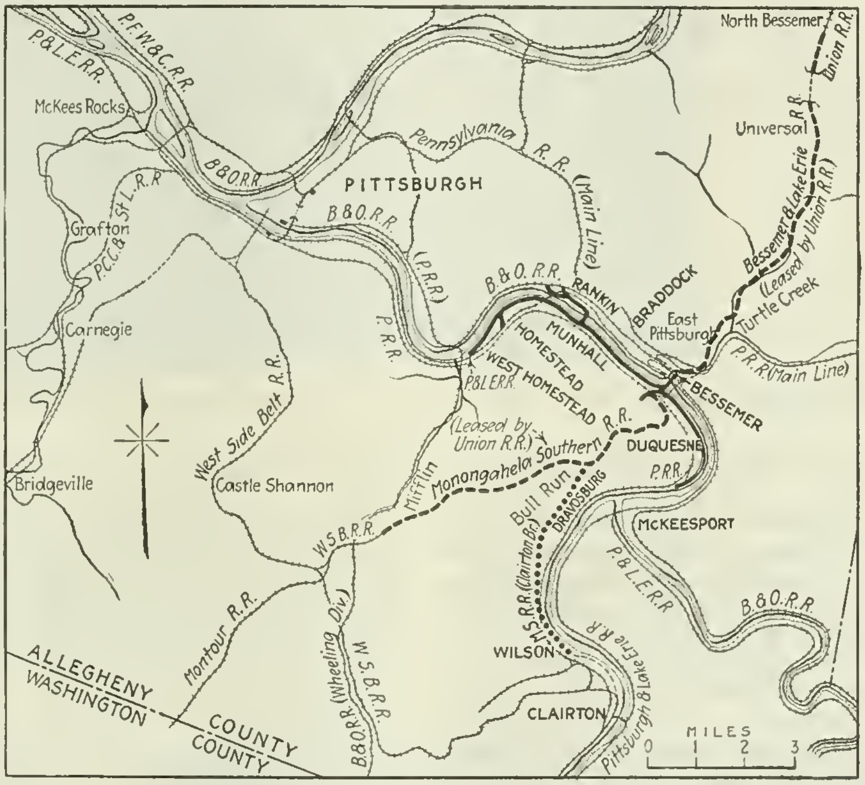


FIG. 2. RELATION OF UNION R.R. TO ORE AND COAL SUPPLY LINES AND STEEL PLANTS

The Monongahela Southern R.R. does not now, and never did, operate trains or own equipment. Under its charter it has located, built and made ready for operation approximately 7 mi. of railroad to Mifflin Junction, and is now completing the Clairton Branch, about 5 mi. long. As soon as built its lines are taken over under long lease by the Union R.R., and from an operating point of view it becomes an integral part of the Union R.R.

By way of Mifflin Junction and the West Side Belt R.R., a round-about route connecting the Union R,R with Clairton was available, but at the cost of a 450-ft. summit climb and 1.6 per cent grade, in addition to more than double the length of haul. Although there existed two riverbank railroads, parts of important trunk lines, these were compelled to make district rates which, for Clairton coke, were so high as to neutralize largely the essential advantages of the entire project. Further, with the coke plant in full operation, enough new traffic will be imposed on the Clairton-Duquesne section to account for almost the full capacity of two tracks, so that the additional carrying capacity of the new line was logically called for.

When the problem of distributing the Clairton coke was first studied, transportation by river received consideration, but met the objection of excessive breakage. Moreover, the traffic other than coke is of a complex character, for which the river would not altogether serve. Coke, the important commodity outbound from Clairton, and ore and limestone inbound, will be supplemented by large amounts of slag and waste or refuse material. The total of these wastes from the plants along the line of the Union R.R. amounts to over 4,000,000 tons per year. There is no longer any space for disposing of this material along the river banks, and it must be carried to the hill-top valleys, where provision for its disposal has been made. The new line will participate in the disposal service. Considering its short length and the comparatively not unusual quantities, the construction of the line has been accomplished only at what might be considered excessive cost. Several factors aside from the results of war conditions combined to make this so. By reference to the profile it will be observed that practically all the excavated material north of the center of the tunnel had to be disposed of as waste, and was in this case transported several miles by standard-gage facilities. Also the excessive length and amount of material in the south approach to the tunnel and the unusual features connected with its disposition at the Curry Hollow fill, to be referred to later, added to this unusual expense. Possibly the most important of all, however, was the large mass of heavy rock excavation necessary to be removed at Coal Valley Cut in close proximity and above the elevation of the Pennsylvania R.R., in such way as to safeguard its operations. These made necessary the use of special devices, including cable inclines and subsequently switch backs and temporary trestles involving crossing over the Pennsylvania R.R. and the highway at Coal Valley for the deposit of a large proportion of this excavated material in the fill approaching the Coal Valley bridge from the South. The total excavation on the line amounted to approximately a million and a half cubic yards. The material excavated was largely the weak shale in the Pittsburgh district, although much of it in the larger cuts was a hard and tough rock interspersed with softer layers, making breakage very uncertain, resulting in frequent delays. The property for the right-of-way cost upward of $200,000, which is considered a reasonable amount in view of the land values generally obtaining in the district.

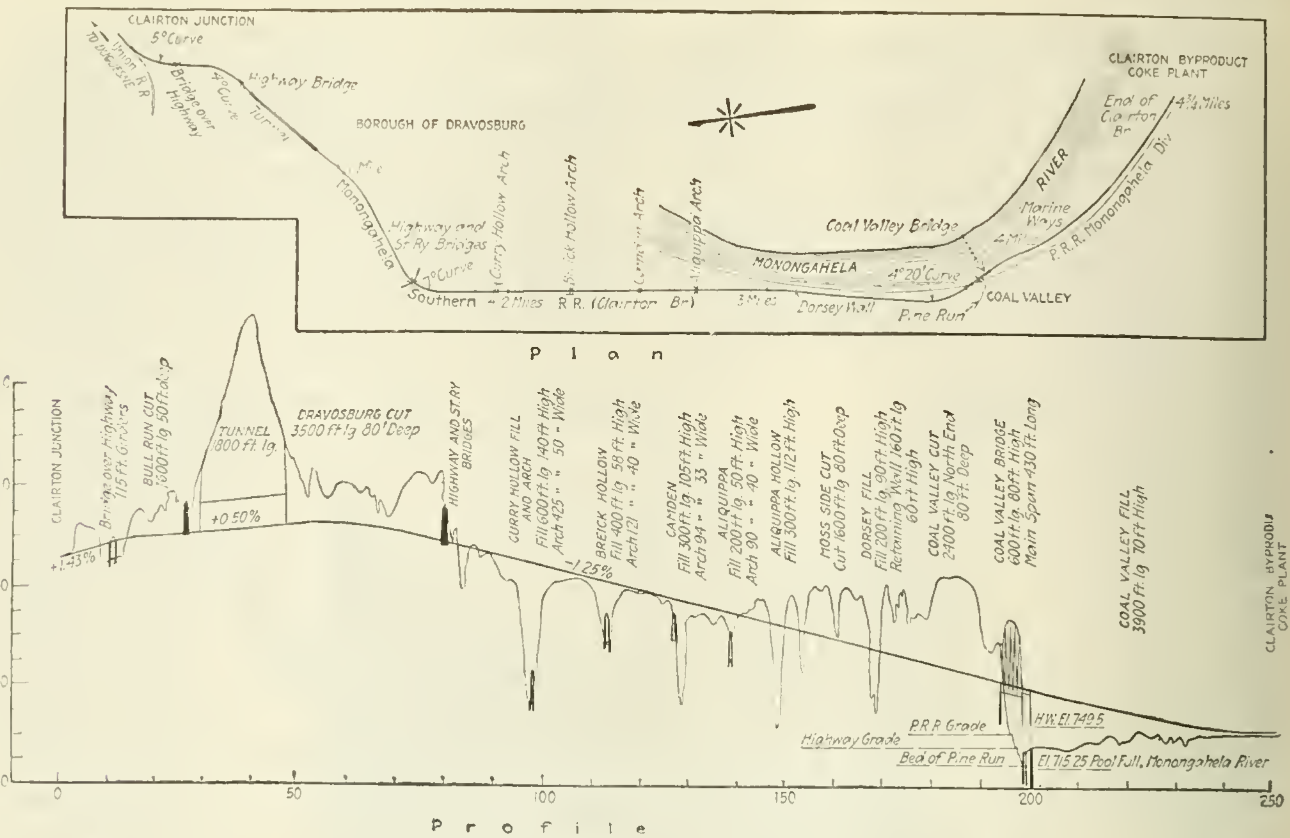

CLAIRTON JUNCTION
5°Curve
Union R.R.
To Duquesne
Bridge over Highway
4° Curve
Highway Bridge
Tunnel
BOROUGH OF DRAVOSBURG
Mile
Monongahela
Highway and St. Ry Bridges
7° Curve
Curry Hollow Arch
Breick Hollow Arch
Camden Arch
Aliquippa Arch
Southern – 2 Miles R.R. (Clairton Br.)
3 Miles
Dorsey Wall
Pine Run
MONONGAHELA
4°20' Curve
Coal Valley Bridge
RIVER
Marine Ways
4 Miles
COAL VALLEY
P.R.R. Monongahela Div.
End of Clairton Br.
4¾ Miles
CLAIRTON BYPRODUCT COKE PLANT
Plan
1100
1000
900
800
700
CLAIRTON JUNCTION
+1.43%
Bridge over Highway 115 ft. Girders
BULL RUN CUT 1600 ft lg 50 ft deep
TUNNEL 1800 ft. lg.
+0.50%
DRAVOSBURG CUT 3500 ft lg 80' Deep
HIGHWAY AND ST. RY BRIDGES
CURRY HOLLOW FILL AND ARCH Fill 600 ft. lg 140 ft High Arch 425 " " 50 " Wide
-1.25%
BREICK HOLLOW Fill 400 ft lg 58 ft. High Arch 121 " " 40 " Wide
CAMDEN Fill 300 ft. lg. 105 ft. High Arch 94 " " 33 " Wide
ALIQUIPPA Fill 200 ft lg. 50 ft. High Arch 90 " " 40 " Wide
ALIQUIPPA HOLLOW Fill 300 ft. lg. 112 ft. High
MOSS SIDE CUT Cut 1600 ft. lg 80 ft. Deep
DORSEY FILL Fill 200 ft lg. 90 ft. High Retaining Wall 160 ft. lg 60 ft High
COAL VALLEY CUT 2400 ft. lg. North End 80 ft. Deep
COAL VALLEY BRIDGE 600 ft. lg. 80 ft. High Main Span 430 ft. Long
COAL VALLEY FILL 3900 ft. lg 70 ft High
CLAIRTON BYPRODUCT COKE PLANT
P.R.R. Grade
Highway Grade
Bed of Pine Run
H.W. El. 749.5
El. 715.25 Pool Full, Monongahela River
0
50
100
150
200
250
Profile

FIG. 3. ALIGNMENT AND PROFILE OF THE CLAIRTON BRANCH, MONONGAHELA SOUTHERN R.R.

In determining upon the most feasible means of connecting the Clairton operations of the company with its other plants lower down the Monongahela Valley through the medium of the Union R.R., at least three alternative routes were to be considered:

(a) A low-grade line paralleling the Pennsylvania R.R. along its upper side, since there was no room much of the way on the lower or river side from Clairton to Duquesne. This would have involved difficult hillside construction for the entire length immediately above the existing railroad and through the quite densely built-up portions of Dravosburg and of the City of Duquesne, it being out of the question to pass this traffic over a line constructed through the manufacturing property of the company at Duquesne. Also such a route presented little or no opportunities for the development of yards or other necessary facilities of like nature. These difficulties seemed to make this line prohibitive.

(b) An open-cut route paralleling the West Side Belt for a short distance, thence by Lewis Run to Mifflin Summit, the present terminus of the Monongahela Southern. This involved grades to overcome the summit of at least 1.6 per cent in both directions and an excessive summit elevation amounting to some 250 ft. over and above the line which was adopted. This also

FIG. 4. STEAM SHOVEL MUCKING BENCH EXCAVATION IN SUMMIT TUNNEL; LINE IN OPERATION THREE MONTHS LATER

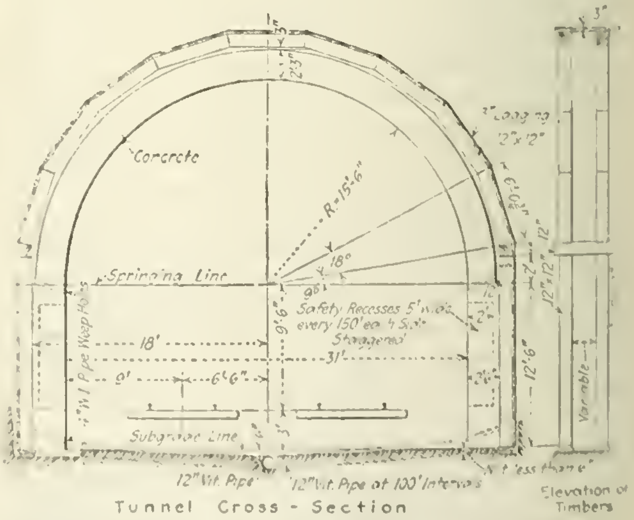


FIG. 5 TUNNEL CROSS-SECTION AND TIMBERING

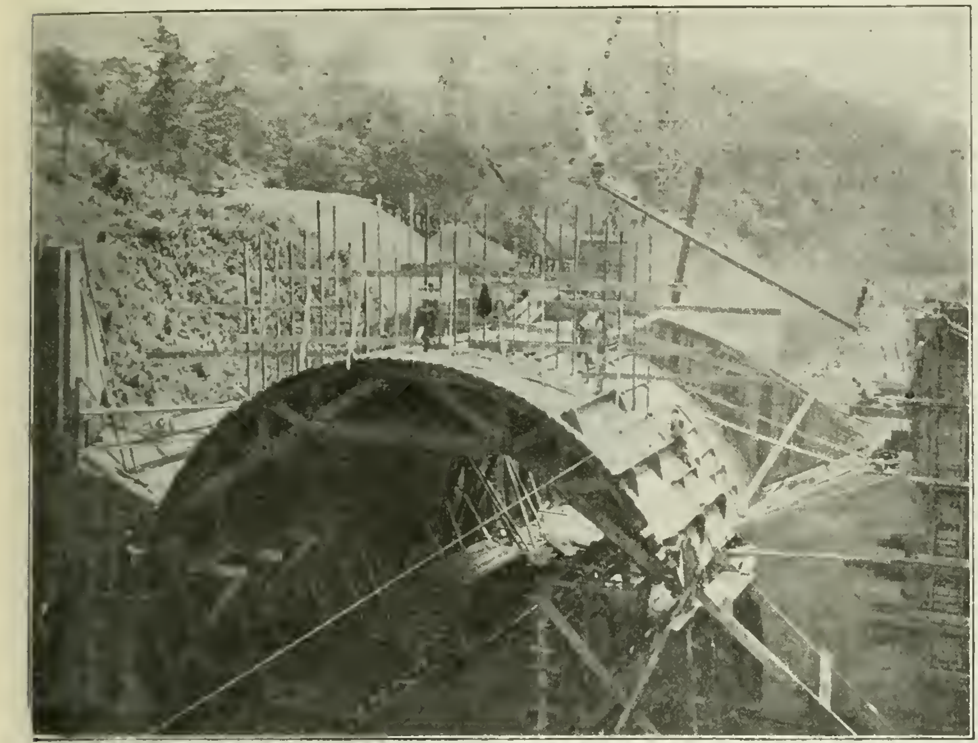


FIG. 6. FORMS IN PLACE FOR CURRY HOLLOW CULVERT ARCH

would have added about 5 mi. to the length of the haul.

(c) An intermediate line necessitating the tunneling of the ridge between the valley followed by the old line and the river. This alternative was adopted, and the route selected afforded the shortest possible length of new line with a controlling grade not in excess of other ruling grades already existing on the Union R.R.

In order to improve the alignment further in the neighborhood of the tunnel and to avoid a cemetery, the line through the ridge was fixed at an angle of about 45 per cent with the axis of the ridge, which resulted in lengthening the tunnel from an originally proposed 1,400 ft. to 1,800 ft. as constructed. From near the tunnel summit the line, therefore, drops on a 1½ per cent gradiant to the river flat at the Clairton plant. Its alignment and profile are given in Fig. 3.

Details of location were fixed by judgment. A general consideration was that it was preferred to keep the railroad cuts just far enough in from the hillside, at the spurs, to avoid risk of interfering with the Pennsylvania R.R. tracks and the highway below. Considerable increase in excavation was necessary to do this, but it served to avoid much risk of damage, both during construction and in subsequent operation. Subject to this controlling idea and the desire to keep the profile unbroken in order to limit the ruling grade, the character of the line was dictated by the topography, which made it necessary to cross sharp gullies and cut through spurs on account of the impracticability of running around them. At hollows, fills were chosen in preference to trestles, in order to reduce maintenance costs, and to equalize quantities.

A high rate of grade compensation for curvature was used; namely, 0.04 per cent per degree. The roadbed was built 40 ft. wide. The track is constructed with oak ties, tie-plates, and 100-lb. rails, except on the north approach grade to the tunnel, where 130-lb. rail is used. It was desired to have ballasted track on all bridges, but an undercrossing near the north end of the line was so limited in floor depth as to make ballasting impossible. However, concrete-slab floor construction was vital, as hot slag will be transported, and possibly at some time ladles of molten iron.

In connection with this construction it should be said that the power used now on the line is relatively light, locomotives being limited to 125 tons on four driving axles, just as used twenty years ago. The restriction is due to the limited floor capacity of the Monongahela River bridge at Port Perry. However, it is believed

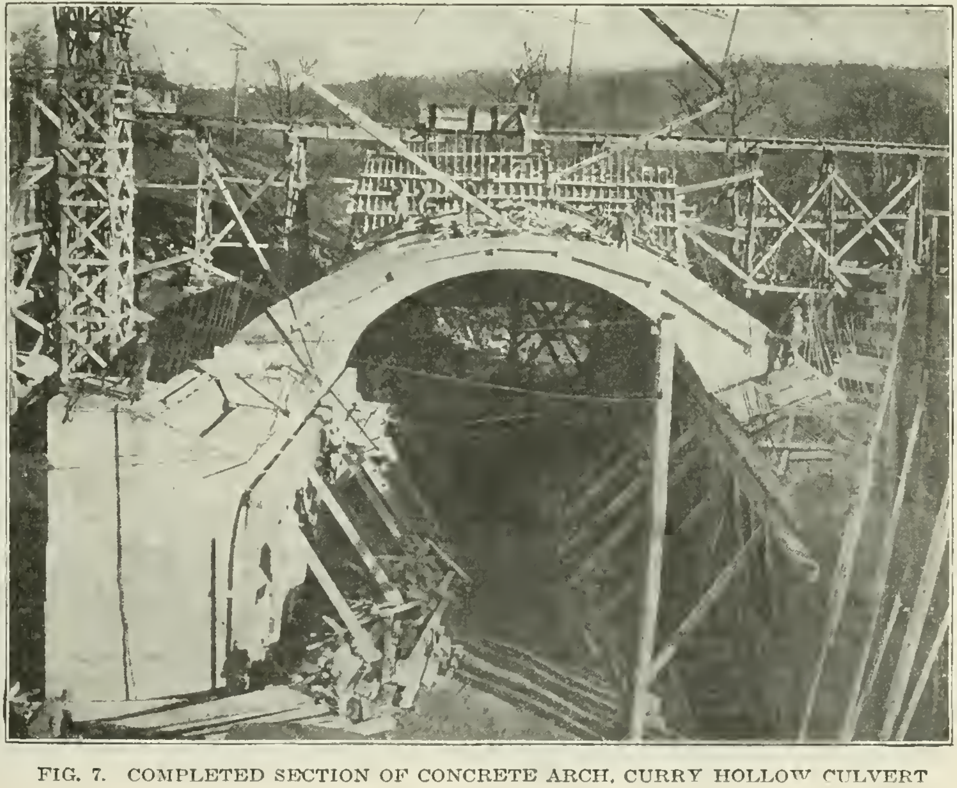


FIG. 7. COMPLETED SECTION OF CONCRETE ARCH, CURRY HOLLOW CULVERT

that much heavier power will be used in future, after reconstruction of that river crossing, and the new line has been planned with maximum locomotives in mind. Correspondingly, the bridges are proportioned for E60 train loading.

While the shale encountered in the tunnel and the approach cuts was soft, frequently thinly laminated and much broken, it would have offered no difficulties worthy of note in driving except for the fact that it was cut by a great many old coal-mine workings. These were located chiefly at or below springing-line level of the arch. The workings having been abandoned long ago and being poorly supported, extensive subsidence had taken place over them, and the process continued during the tunnel work. One result was that at two points, for a distance of 12 or 15 ft. in each case, the arch pieces of the timbering were forced down a maximum of about 12 in., so that they had to be cut out when the concrete lining was being placed, in order not to weaken the ring.

Large amounts of water draining from the mine workings made unusual attention to drainage necessary in the tunnel. This drainage is all taken by weep-

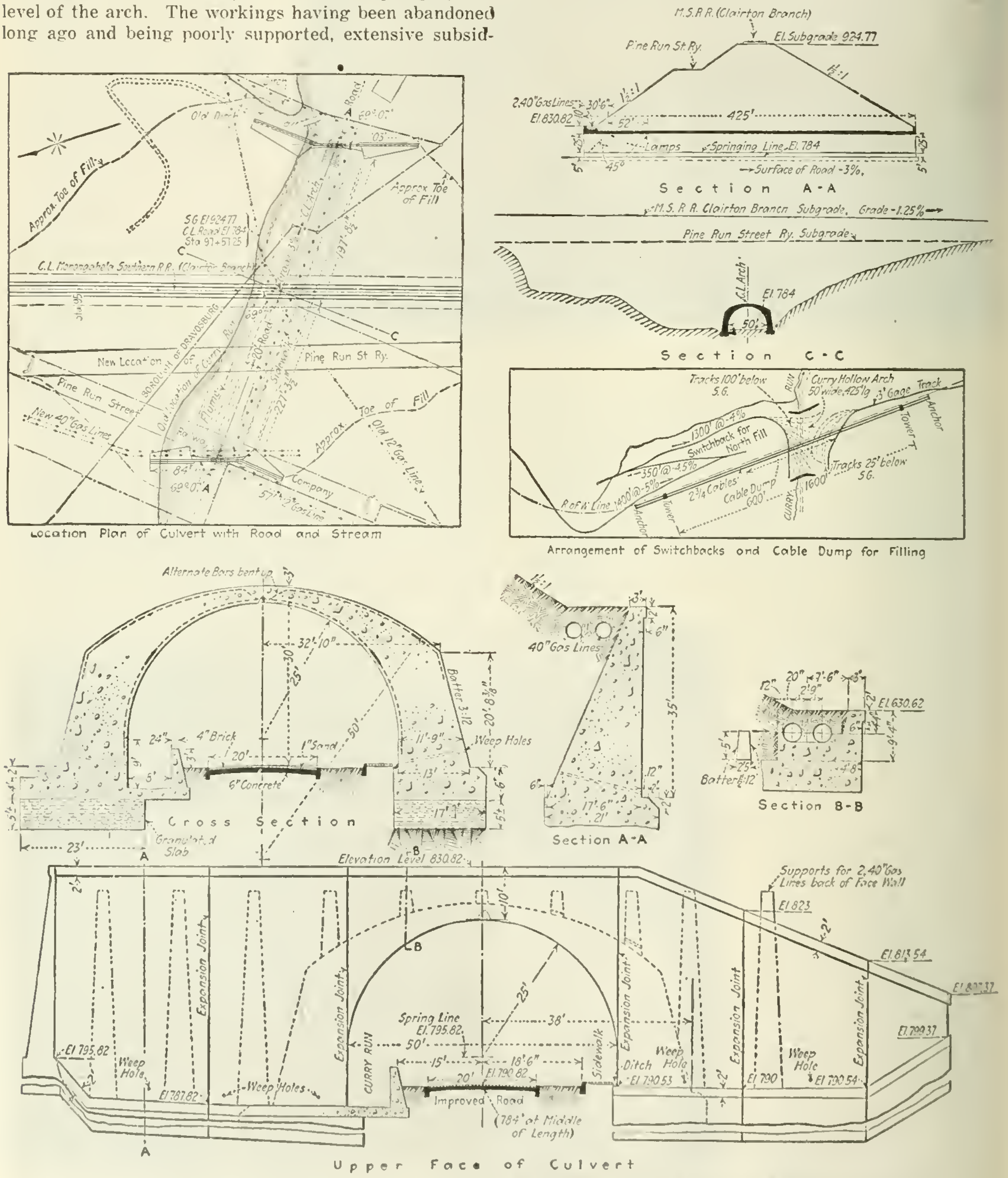


FIG. 8. CURRY HOLLOW ARCH AND FILL, WITH SKETCH OF SWITCHBACK AND SUSPENSION-BRIDGE FILLING SYSTEM

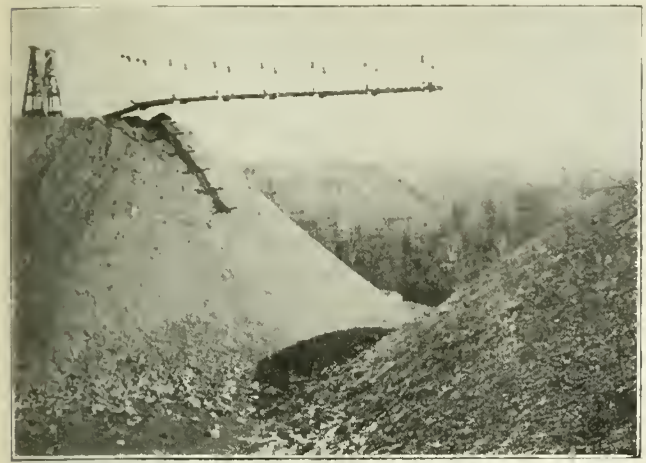


FIG. 9. PROGRESS OF FILLING FROM SUSPENSION BRIDGE, CURRY HOLLOW ARCH; TOES OF NORTH AND SOUTH FILLS MEETING

holes, the lower set located just above floor line. To avoid letting the water get into the tunnel roadbed and thereby keeping this in water-logged condition, all weepers that have more than a drip of water coming from them are piped to 12-in. tile drains laid below subgrade along either wall.

The tunnel was driven by top heading. The greater part of the bench was removed by steam shovel, operated by compressed air (Fig. 4). On account of the length of time that was required for the approach cuts, bench excavation was not started until the heading was holed through. The arch timbering in the heading was supported on a continuous wall plate, and in taking out the bench this wall plate was either underpinned by plumb posts or (where the shelf of rock under it was sound enough) allowed to rest on undisturbed rock. The arch was lagged throughout, and through a large part of the tunnel the posts were lagged also. The tunnel section is given by Fig. 5.

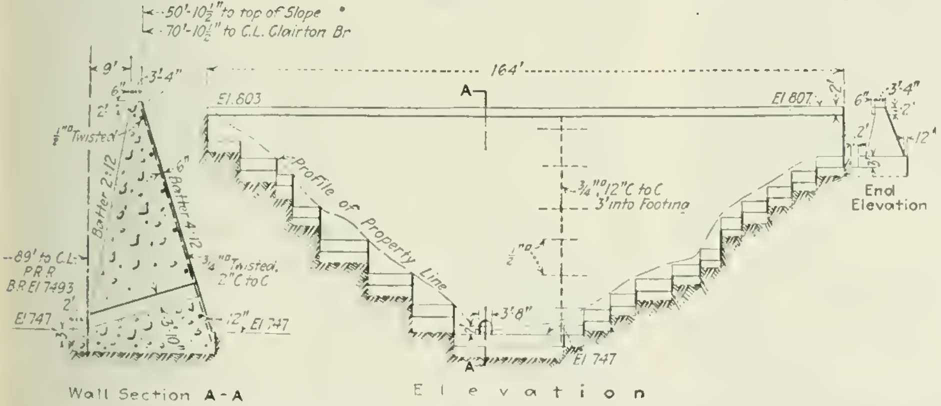
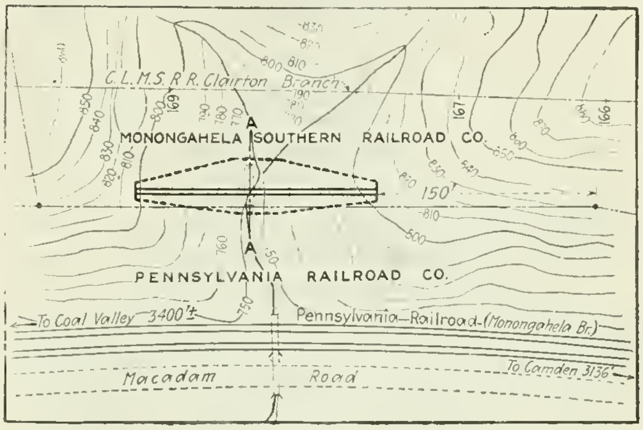


FIG. 11. PLAN AND SECTION OF DORSEY WALL

Most interesting among the items of the tunnel construction was the concreting, which was done by a traveling form equipped in an unusual way. A cross-traveling crane supported just underneath the arch of the form hoisted the concrete buckets brought in on cars from the mixing plant at the mouth of the tunnel, and dumped the buckets into the side form either on the side of the supply track, or, after cross-traveling, on the other side over the operating track. This arrangement was used because, as the lining work was carried on while one track of the railway was already in operation, only one side of the form was accessible for direct hoisting of buckets. Remarkably regular and rapid progress was made with this plant. For months at a time, 90 ft. of lining—three 30-ft. sections—was completed weekly. This includes both ends, two traveling forms having been provided in order to hasten the work to completion. Records of 4,300 cu.yd. placed per month were made. The addition of the cross-traveler to the form was suggested by James A. Hart, president of the contracting firm that carried out the line construction, Gillespie-Hart Co.; the form was built by the Blaw-Knox Co.

In the approach cuts to the tunnel, old mine workings a short distance above subgrade level, also caused trouble, chiefly in making the breakage more irregular and in requiring the provision of ample slopes of the overburden to avoid caving due to subsidence.



As it was expected from the beginning that a considerable amount of rock of uncertain character would be found in the cuts, the slope stakes were set for side slopes of 1:1, starting from the roadside ditches. During con-

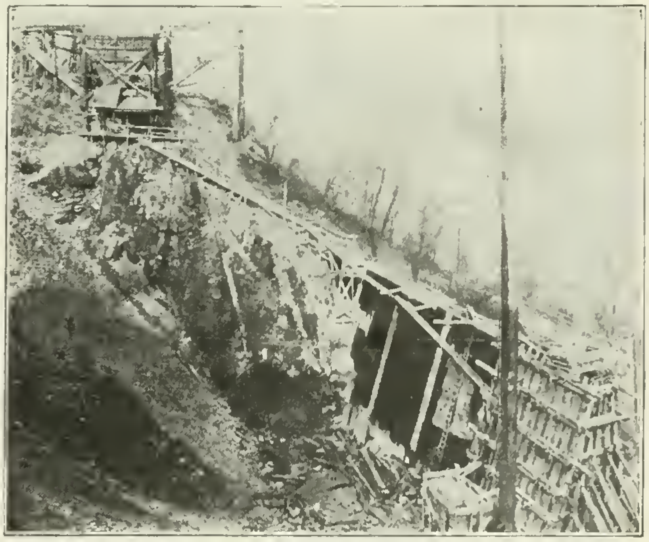


FIG. 10. DORSEY RETAINING WALL, 60 FT. HIGH, UNDER CONSTRUCTION

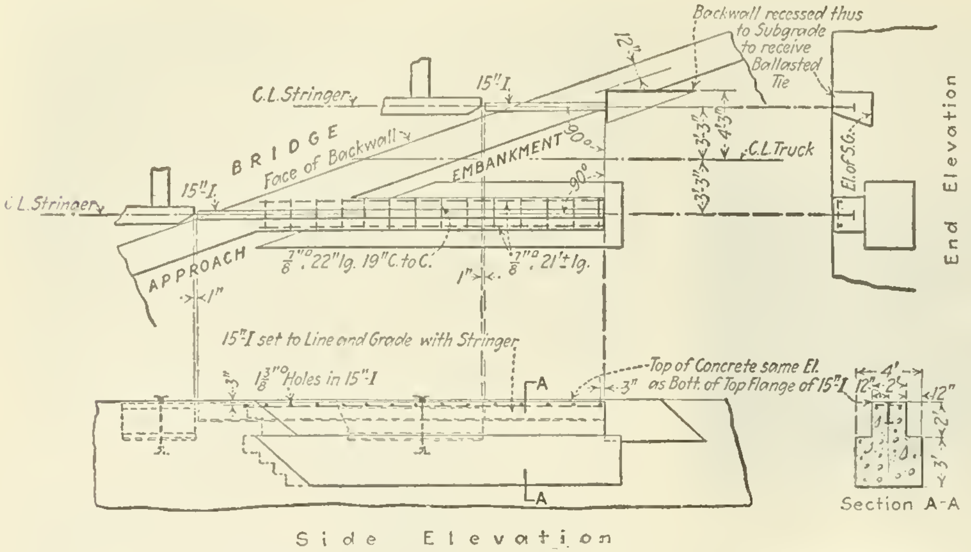


FIG. 13. RAIL-SUPPORT EXTENSION OF CLAIRTON JUNCTION UNDERCROSSING

struction the earth overlying the rock was taken out to these slope stakes, and subsequently the rock was excavated and allowed to stand on whatever contour proved stable. This left a berm on top of the rock which proved convenient as a bench for the spoil track and which also tends to safeguard the earth slope against caving due to movements of the rock.

An unusual structure, at the crossing of Curry Hollow, just south of Dravosburg, developed a history of considerable interest. This hollow is about 600 ft. wide at approximately 40 ft. below subgrade level, and is of sharp V-shape, carrying a road and a brook 140 ft. below. To pass the road and brook through the railroad fill, a concrete arch culvert 50 ft. wide in the clear and 425 ft. long was built, of uniform cross-section (shown in Fig. 8; see also the views in Figs. 6 and 7) conforming to prior heavy railroad tunnel and underpass work. The section of the culvert was developed from experience, and was assumed to be adequate for carrying an overburden of practically indefinite height, and therefore calculations of earth pressures and stresses were not attempted. In making the fill approaching the arch from the north, the suspension-bridge method of end-dump deposition was followed, as used for several large fills on the Hopatcong and Summit cutoffs of the Lackawanna R.R. ten years ago (see *Engineering Record*, April 17, 1909, p. 54; *Engineering News*, April 22, 1909, p. 423, and Aug. 28, 1913, p. 410). In advance of this end-dump filling, a depth of 10 ft. of fill was deposited over the arch by cars operating on a switchback track benched into the hillside (shown in Fig. 8), in order to form a cushion sufficient to equilibrate any unbalanced loading on the structure caused by the slowly advancing fill (see Fig. 9).

The north fill was started first. When its toe approached within 40 or 50 ft. of the north abutment wall, movements in the first or lower filling near the arch were observed; the advancing high fill settled into the lower fill, already in place, and plowed it up into a ridge ahead of the toe. This ridge became more pronounced as the fill moved forward, so much so that it became evident that the distortion would probably extend to the arch structure if allowed to continue.

A small steam shovel was therefore used to cut off the toe of the upper fill and dump it ahead, so as to place additional loading on the lower fill. In addition, the switchback was put into service again, and the lower fill was raised 8 or 10 ft. higher, before work on the upper fill was advanced further. In the meantime the fill south of the arch was being made by dumping from a track, in the usual manner; this dump track, about 20 ft. below subgrade and approximately parallel to the center line of the arch, was moved forward as the fill advanced north.

As the toes of the two fills approached the respective abutment walls of the culvert, the concentrated pressure of the high fill produced some distortion in the concrete structure. The extreme pressure did not occur at points directly opposite each other, on account of the skew of the culvert and the different filling methods used on the north and south sides. Slight cracks in the concrete showed in the intrados at the haunch, at the points where the fill was farthest advanced.

From the earliest indication of unbalanced pressure in the fill a rigid daily survey system was instituted, and this continued until the fill was completed and stability assured. By accurate levels and horizontal measurements, record of the effects of the filling work on the arch was kept, and the distribution of filling was regulated accordingly. With the precautions above described the fill was carried to completion with no further damage than the small cracks mentioned, and these were repaired later to restore the unbroken surface. While direct vertical settlement of the high fills continued after they met, the concentrated slope pressures ceased and there was no further evidence of unequal pressure on the arch.

In connection with this movement, it is important to refer to the foundations of the arch, which are not shown in Fig. 8. The south abutment was carried to rock, about 10 ft. below ground surface. At the north abutment, however, rock lay about 20 ft. deeper; the time required to go down to rock here was a critical consideration, as it became evident that Curry Hollow fill would be the determining section of the whole line as to date of completion and any loss of time here would delay the beginning of traffic operation correspondingly. The soil found at 10-ft. depth was firm, and appeared in every way adequate as a foundation material, so that it was decided to carry the abutment on this soil after widening the foundation to increase the bearing area.

The arch was built in sections 30 ft. long, with expansion joints continuous through footings, bench walls and arch ring, so that the structure was made up of a series of independent arches. The wingwalls were also built in independent sections.

However, with the south abutment on rock even with the north abutment foundation spread over a much larger but more compressible bearing surface some differential settlement was expected. Nevertheless, considerable dependence was placed in the steel reinforcement of the arch to care for the stresses that might thus result, and from the known cementitious property of granulated slag it was thought that a selected foundation layer of this material wetted and well rammed in place would practically reach its limit of compressibility under the load of the arch itself before the key was cast and would tend to reduce the possible unequal stresses and gradually set up hard before full load was applied without undue settlement of the completed arch. Accordingly, a layer of this material was carefully placed and compacted in the foundation pits, but contrary to expectations a most remarkable degree of settlement occurred under the application of the full load upon the arch.

During the entire filling operation the culvert settled under the increasing load placed upon it, the movement always being greatest near midlength of the structure. There were many irregularities in this movement, but it was always in general accord with the distribution of load. The final figures, after completion of the entire fill, were 9 in. settlement for the south abutment, 11½ in. for the north abutment, and about 10 in. for the crown; all these figures being at the point of maximum settlement, virtually at midlength of the culvert. The abutment figures refer to points established on the sidewalls at springing line, 5 ft. above the floor. In addition, it should be said that in the zones of initial cracking of the inner face of the arch barrel, a system of branching cracks, chiefly longitudinal, still existed after completion of the work, the worst cracks being open ¼ to ½ in.

When the fill was completed, the cracks and a number of small loose sections were cut out and filled with mortar. Similar patching, somewhat more extensive, was required at the south wing of the west face wall of the culvert, which wing, being founded directly on rock, tore loose from the arch barrel during the settlement. In general, no attempt was made to level up the offsets that developed at the transverse construction joints of the culvert due to the 30-ft. sections settling as individual units and cracking chips at some points from the keys in the joint faces (shown in the view Fig. 7).

From observations during this filling work, Mr. Brown states, the correctness of well-established good practice was abundantly confirmed; namely, that any end-dumping method of filling for loading large culverts with high embankment overburden is attended by grave danger to the underpass structure, and should generally be avoided.

Three other arch culverts, carrying fills of heights from 40 to 60 ft., a short distance south of the Curry Hollow fill, gave no difficulties of any kind during construction. The largest of these structures is 40 ft. in span; all of them are founded on rock, and all filling was dumped from trestles and deposited symmetrically with respect to the arches.

Near the south end of the line, just before emerging on the neck of the Clairton flat, the line crosses the junction point of two narrow gullies which slope sharply down toward the river bank. To carry the railroad fill across, a retaining wall 60 ft. high from rock foundation to top was built, carrying a surcharge of 40-ft. height of railroad embankment above its top (Fig. 10).

The effect of the funnel shape of the gully was not definitely known; it was thought that, while the convergence might tend to relieve the earth pressure on the wall, it might possibly increase this pressure by concentration. The analysis of the earth pressure conditions was therefore carried on with particular care, and unusually liberal proportions were adopted for the wall, the more readily as the wall is not long and the extra yardage involved was therefore small. A face batter of 2 in 12 and a back batter of 4 in 12 were chosen (Fig. 11), making the thickness of the wall at any section something more than half the height above that point. Vertical reinforcing rods were placed in the back, partly as a precaution against shrinkage and partly to protect against possible shear failure on a weak seam through the concrete. The back of the wall was waterproofed with bituminous paint, as were also the backs of all the arch culverts on the line.

Stepped Drop Flume for Brook

Another concrete structure on the line representing rather unusual design is a drop flume carrying the upper end of a small creek, Bull Run, near the north approach to the tunnel. Here the railroad cuts across a road and the old bed of the stream alongside; the road is carried across the cut on a bridge, while the brook is taken into a concrete-lined ditch at one side of the railway roadbed and carried along to a point where it could be delivered to its original discharge channel below railway level. For bringing the stream down the 20-ft. descent of the bank from its upper

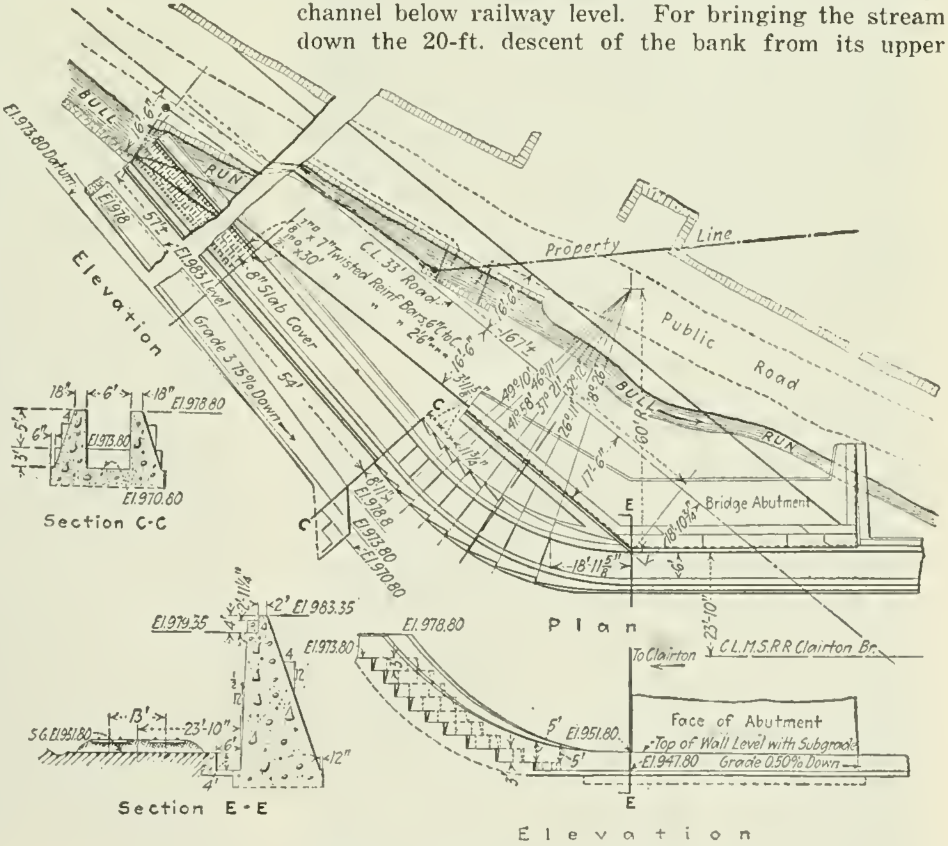


FIG. 12. STEPPED DROP FLUME OF BULL RUN

course to the railway ditch, the stepped channel (Fig. 12) was built. The principle used is one familiar in Western irrigation canal practice. The development of the details of the sidewalks is such as to bring the general contour of the structure in the slope of the earth and shale bank of the cut.

BRIDGE-FLOOR PROBLEMS

The line contains only two bridges, but circumstances make both of these very unusual structures. Most notable by far is the 430-ft. through-truss span across Coal Valley near the south end of the line, crossing a road, the double-track (and possibly in future four-track) line of the Pennsylvania R.R., and the channel of Pine Run. The structure itself was described in *Engineering News-Record* of Oct. 2, 1919, p. 656.

At the north end of the bridge the face of the rock cliff is sharply oblique to the railway center line, but it was desired to have the end of the bridge square. The cliff was therefore cut back in a long triangular bench to take the bridge seats. In consequence, nearly two panel-lengths of the west truss of the bridge extend over bedrock. The south end of the span, however, is supported on a concrete pier founded on rock 30 ft. below valley bottom, so that the pier is about 85 ft. high from foundation to bridge seat.

The end of the approach embankment south of the bridge is not retained, but its slope is spanned by two 85-ft. plate-girder spans. The abutment, at the shoulder of the embankment, is in appearance a simple dwarf abutment block seated in the fill, but in reality it is a pier penetrating the full depth of the fill and 45 ft. into the natural ground below, with roughly 105 ft. total height, including backwall. The wisdom of going to great care in providing a reliable foundation at this point was shown, during the filling of the approach embankment, by a remarkable slump or subsidence of a 400-ft. length of the embankment immediately south of the abutment. Without warning, the embankment dropped vertically 20 to 25 ft., apparently by breaking through the upper crust of the river flat and squeezing out of place a subaqueous stratum of soft clay or mud.

Solid concrete-slab construction is used for the deck of the truss and girder spans, and curbs about 12 in. high are carried around the openings where the web members of the truss pass through this floor, and also along the outer edge of the slab (edge of footwalk). The purpose is to make the floor suitable for taking drip and splash from slag or steel ladles.

While the large truss span and its approaches carry a ballasted floor, a tie floor had to be used on a span crossing a highway near the north end of the line, in order to reduce floor depth to a minimum and avoid increasing a grade that already was the maximum of the line. The location of this highway was one of the most troublesome factors in the location of the line near its northerly end. Because of the probable delay and other difficulties, no attempt was made to shift the highway for better adjustment of the crossing, and the heavy grade of 1.43 per cent was accepted in preference.

The crossing being on a skew of 19° 50′, half-through girders 115 ft. long center to center of bearings were required. To reduce the floor depth a center girder was used; this girder is remarkably heavy, weighing 90 tons. The floor is a simple arrangement of floorbeams and stringers, but is 50 in. deep on account of the heavy floorbeams used. On the stringers rest steel ties made of 8-in. 25½-lb. I-beams, spaced 19 in. on centers. Drip protection is provided by a reinforced-concrete slab 4½ to 5½ in. thick, drained to a trough at one end of the ties, which discharges longitudinally to a downspout at the downgrade end of the bridge. The sides of the slab are raised in order to form curbs.

On account of the sharp skew, special difficulty was apprehended in the way of roughness of track if one end of a tie were carried on the approach fill and the other end on the bridge. To equalize the rigidity of support the concrete extension bearings shown in Fig. 13 were put in. A concrete block is molded under the prolongation of the short rail, and in its top is embedded a 15-in. I-beam, with flange exposed, on which the steel ties are to rest. All expansion requirements are taken care of by the sliding of the ties on the top of this I-beam. The opposite rail is carried across the width of the abutment backwall by a similar I-beam embedded in the concrete. The transition from the last tie supported on these two I-beams to the first tie supported on the approach fill (these latter are wooden ties, while the bridge has steel ties) is square to the line of the track.

While such extremely rigid construction as is obtained through placing steel ties in concrete slab laid directly on steel bridge stringers may not be advisable for high-speed traffic, it is expected to prove satisfactory for the very heavy, slow traffic that will be handled over this bridge.

E. C. Brown of the Carnegie Steel Co. acted as chief engineer; H. L. Gordon was engineer of construction, being succeeded by W. F. Purdy in April, 1919; and the Gillespie-Hart Co. of New York and Pittsburgh was the contractor.

Retarding Jetties Stop Bank Erosion

Jetties which check the current without diverting it or causing destructive eddies are being used for protection against the cutting of banks along the Missouri River. They are composed of concrete piles sunk in the river and carrying wire cables to which are attached trees and brush or A-frames faced with wire netting on the upstream side. In this way the current velocity is so reduced that material in suspension will be deposited and thus build up a bar or shoal where erosion has occurred or is threatened. For this work the Bignell water-jet pile is used (see *Engineering News*, Oct. 8, 1914, p. 726 and May 6, 1915, p. 912). The pile is 20 to 40 ft. long and 16 or 14 in. square, with a central 4-in. pipe extending nearly to the point and having ½-in. laterals 30 in. apart, ending in elbows turned upward along the sides of the pipe. A 2-in. pipe with separate hose connection extends through to the point. In a later design, the 2-in. pipe is omitted and the 4-in. pipe is extended to the point, ending in a 2-in. nozzle. Thus, in addition to the boring jet, there are streams of water flowing upward along the sides of the pile. Some of this work has been done by the Chicago, Burlington & Quincy R.R. near Omaha, Neb., and a number of the jetties have been built at different places by the Woods Brothers Construction Co., Lincoln, Neb.

In principle this construction is similar to the Kellner retarding jetties built of cables and steel spider frames, as described in *Engineering News-Record* of Aug. 28, 1919, p. 410.

Railway Engineering Association Has Active Technical Discussions at Annual Convention

Loading and Impact Features of Bridge Report Questioned, Preceding Adoption — Rail Specifications Approved After Debate — Wider Use of Standards Commended

Definite progress in important technical railroad matters was made at the annual convention of the American Railway Engineering Association at Chicago last week, particularly in the adoption of the new bridge specifications, with only minor changes, and in the adoption of the rail specifications, as recommended. Last year the bridge specifications were referred back to the committee, while the rail specifications have been under consideration since 1915. Chief among other committee reports presented and acted upon were those on track, location, operation, yards and terminals and standardization. While all but the track report represented progress only, the importance of the other committees' studies was emphasized in the discussions, which appeared to indicate the active interest of the association's membership.

A news report of the convention appears on page 643; a summary of the more important technical discussions follows:

Iron and Steel Structures

Adoption of the new bridge specifications was one of the important actions taken, as these have been under consideration for more than two years. The chairman, O. E. Selby (C., C. C. & St. L. Ry.) explained the desirability of final action at this time and the meeting evidently agreed with him, as few important changes were sugested and a number of motions for minor changes either received no support or were voted down. Specifications for erection were not included, and specifications for movable bridges will receive the committee's attention this year.

A 16-ft. width for the clearance diagram was objected to by several speakers, but was adopted after a motion to change this to 15 ft. had been defeated. The committee agreed, however, to include a note explaining that 16 ft. would not be required in new bridges built on old masonry that would not admit of this width without extensive reconstruction.

The E-50 loading as an alternative for E-60 was suggested by E. A. Frink (Seaboard Air Line), but the chairman pointed out that provision is made for lighter loading, while B. R. Leffler (New York Central Lines) pointed to the steady increase in engine and car loads and predicted the general use of heavy engines on low-grade lines as well as on those having heavy grades. Favorable operation of such engines with heavy trains on grades of less than 1 per cent was mentioned by A. F. Robinson (A. T. & S. F. Ry.). That the proposed specifications with provision for E-50 loading would take care of all future requirements was the opinion expressed by A. O. Cunningham (Wabash R.R.), on the ground that it would be impossible to build a locomotive that such a bridge could not carry, owing to the distribution of load over a greater length. Mr. Frink's motion to include the E-50 loading was lost.

Impact loads were discussed by H. T. Welty (New York Central R.R.), particularly as to multiple-track bridges. The specifications provide 90, 80 and 75 per cent of the live load, including impact, for two, three and four tracks loaded, respectively. These figures he proposed to raise to 95, 85 and 80 per cent, but the motion was lost after Prof. F. E. Turneaure (University of Wisconsin) had pointed out the improbability of getting the absolute maximum load on all four tracks simultaneously.

Increase of clear spacing of ties from 4 in. to 6 in. was proposed by F. E. Schall (Lehigh Valley R.R.), but Hunter McDonald (N., C. & St. L. R.R.) pointed out that the 4-in. spacing was to provide for softwood ties on account of the shortage of hardwood. This motion was lost, as was one by W. H. Courtenay (L. & N. R.R.) to strike out the clause requiring rounded ends for through-plate girders. Mr. Leffler (New York Central) pointed out the importance of this construction in the case of derailment of cars. Inclusion of horizontal diagonal bracing in viaduct towers and elimination of specific permission for the welding of minor defects in castings were adopted, on motion of Mr. Courtenay.

In addition to the specifications, the committee's report included a new column formula of the straight line type, as a substitute for that of the parabolic type submitted last year. It has the advantage of being applicable to more higher values of l/R. Another appendix dealt with the reasons for continuing the use of the Cooper system of live loading instead of some specific modern engine loading.

Rules for inspection of bridges, trestles and culverts were submitted by the committe on rules and organization and were adopted after some discussion. Such detailed reports were unnecessary in the opinion of Hunter McDonald (N., C. & St. L. R.R.), and might result in loading down the employees with the perfunctory filling in of a number of forms, but it was explained that this filling in of blank spaces was required only to show defects. The committee reported progress in the preparation of rules for the organization of field parties.

New Rail Specifications Adopted

New specifications for rails and recommendations for the location of bolt holes for splices were submitted by the rail committee and were adopted after some discussion. Criticisms of the specifications were submitted by C. W. Gennett, Jr., of Robert W. Hunt & Co. He stated that there was no provision for restricting the production of split heads, although the provisions against "interior defects" would tend to minimize head failures. Since small differences in the carbon content might be greatly overshadowed by later treatment of the steel, he considered it desirable to have one standard carbon requirement for all railroads, to avoid confusion at the mills, and suggested an amount from 0.58 per cent to 0.76 per cent, as this would reconcile the chief differences now existing in a number of specifications without apparent detriment. "The most radical departure from present practice made by this specification," said Mr. Gennet, "is with respect to physical test. Rails are to be accepted on the basis of elongation only, regardless of the number of test pieces that may be broken under the drop, subject, of course, to the appearance of interior defects. Naturally this annuls the test for brittleness that the impact of the drop has been considered to cover for many years past." He urged modification of the section providing that rails shall be straight in line and surface, stating that slight sweeps were not objectionable and that their acceptance would reduce the gagging materially.

Exception was taken by F. E. Abbott, inspecting engineer of the Lackawanna Steel Co., to the contents of the specification subject to "special agreement." He stated that it might be better to put some of these clauses in another portion of the specification so that there would be no question of whether or not they were binding. If the specification was attached to the contract it would become a part of it and too great power might rest with the inspector. The question of possible additional cost of rail under the new specifications was raised from several quarters and the committee replied that it did not consider this question within its jurisdiction, but that it had been in conference with the steel mills. J. L. Campbell, chief engineer, El Paso & Southwestern R.R., said it had been the experience that rails purchased under the old A. E. R. A. specifications had been subject to somewhat higher price.

FOR WIDER USE OF A. R. E. A. STANDARDS

The committee on standardization stated that it was the purpose, through standardization, to reduce cost and to make materials more readily available as needed, as well as to promote cheapness and facility of manufacture. C. A. Morse, chief engineer, Chicago, Rock Island & Pacific R.R., questioned whether general standardization would result in as great development in improvement of designs, as by offering greater opportunity for competition. Mr. Morse said that the most important step for the present would be the general adoption of standard rail sections. It was stated by A. S. Baldwin, vice-president Illinois Central R.R., that more force should be brought to bear on the railroads to adopt the A. R. E. A. standards, and in his opinion, conferences of a railroad company's engineers would find that only very small compromises would be necessary for their adoption, even on large systems. It was suggested by C. W. Baldridge (Santa Fe Ry.) that if the use of these standards was to become general, their adoption should be made only by a vote much greater than a majority. The chairman of the committee replied that it was the purpose of the board of direction not to transmit any specifications or plans until adopted on a sufficient mileage of railroad and until manufacturers had agreed to their use. It was the opinion of Mr. Morse, of the Rock Island, that the new relation of the American Railway Engineering Association with the American Railway Association would probably lead to more definite procedure in the general adoption of A. R. E. A. standards. It was pointed out by Edwin F. Wendt, Interstate Commerce Commission, that consolidations of railroad companies under the new Interstate Commerce law would probably lead to more general standardization.

CONCRETE ROADBED—BALLAST—TIES

Experience with concrete slabs under the ballast on soft roadbed where traffic is heavy indicates that they will give successful result at reasonable expense, according to a resolution submitted by the committee on ballast and adopted without discussion. The report showed that such construction has been in use for several years. R. H. Ford (Rock Island Lines) criticised the definition of ballast in not including its purpose for drainage. Further, he doubted the value of blank forms used by the committee for time study and cost data of ballast work. Specifications for stone ballast were adopted and the committee is preparing plans for the standardization of ballast tools. Comparatively few railways own or operate their own stone-crushing or gravel-washing plants, but the committee listed some recommendations for the design of such plants, including the combined production of material for ballast and for commercial use in order to warrant the installation of a plant of economical size. These recommendations were adopted.

Recommendation of the tie committee for continuance of the tie specifications formulated by the U. S. Railroad Administration led to a sharp discussion, but this was based more on dissatisfaction with the supply obtained than upon the provisions of the specifications themselves. After a careful explanation of the situation by John Foley (Pennsylvania R.R.) the committee's recommendation was adopted. Zinc-treated ties should be allowed to season for from two to six months before being placed in track where track circuits are used, while the number installed annually in any circuit should not exceed 15 per cent of the total number of ties in that circuit. The wood preservation committee also proposed to limit the use of such ties to territory west of a line following approximately the 100-deg. line of latitude, creosoted ties being used east of that limit on account of the greater humidity which is liable to cause leaching of the zinc salts.

As to substitute ties, the tie committee considers that no design suitable for high-speed heavy traffic service has been fully developed, but that some such designs warrant further trial while several would be justified for light traffic lines whenever the relative prices of wood and substitute ties will permit.

DISCUSSIONS ON TRACK MATERIALS

Active discussion and controversy marked the consideration of the track committee's report. A design for cut spikes was submitted but was criticised by both engineers and manufacturers, the latter claiming that it could not be manufactured by automatic spike machines. Although the chairman stated that such spikes are in use, it was voted, on motion of W. C. Cushing (Pennsylvania Lines) to refer the design back to the committee for further consideration. Similar dispute arose over the specifications for steel tie-plates. F. E. Abbott (Lackawanna Steel Co.) urged that these would exclude soft steel which is easy to punch and is suitable for the purpose, but W. P. Wiltsee (N. & W. R.R.) took the position that the tendency is to require the use of a higher grade of steel.

Designs for clamp frogs led to still further argument, the committee presenting these as information, while several speakers endorsed this type of frog and urged adoption of the designs as recommended practice for inclusion in the "Manual." As the committee wished to give the designs more consideration it objected to their adoption at this time and was sustained by vote of the meeting.

Screw spikes were considered at some length by the tie ommittee, which suggested that careful watch be kept of such installations on account of their relation to the life of ties by spike killing. Varying results have been found on different installations aggregating 230 miles of track, unsatisfactory results being due largely to the practice of driving the spike with a hammer before starting to screw it into the tie.

Reinforcing Bars for Concrete

Specific prohibition for twisted bars for the reinforcement of concrete, as provided in the masonry committee's specifications, met with some objection. Hot twisted bars are dangerous, according to T. L. Condron, while Mr. Condron and Prof. A. N. Talbot agreed that cold twisted bars give no advantage over plain or deformed bars commensurate with the extra cost of the twisted bar. A suggestion that the twisting is in itself a test of the good quality of the steel was characterized by Mr. Condron as "salesman's talk." A proposal to limit the probition to hot twisted bars was voted down.

Another proposal, by E. A. Frink, to require reinforcing steel to conform to the specifications for structural steel was defeated, the committee pointing out that many engineers prefer the harder steel for reinforcement. The committee was sustained on some other points and its specifications were adopted.

Copper-plated bars, copper-alloy bars and a rough enamel coating for bars were suggested by the committee on electricity for use in reinforcing concrete subject to electrolytic action. This was accepted as information without discussion. It was pointed out that in reinforced concrete ships protection has been based upon density and richness of concrete, and high quality of materials and workmanship, while experiments have been made with non-metallic waterproofing paints.

Wages an Element in Railway Improvement

Controversy over the effect of the new wage scale appeared imminent, owing to opposing views presented both by majority and by minority reports of the committee on railway location, but for some reason this point was not touched on in the brief discussion. The majority report predicted a change from slow freight trains of enormous weight to lighter and faster trains, so that grade reductions would be of less importance than the provision of additional running tracks. The minority report pointed out that the railways have contended that even with an eight-hour day and 1½-time pay for overtime it would be more economical to continue present methods than to introduce higher speeds in freight service.

A system of training for young engineers in railway service was outlined by the committee on economics of railway labor, this including a rotation of service to cover field and office work, construction, maintenance, drafting and designing. Appreciation of this work of the committee in the interests of the young engineers was expressed by Prof. S. N. Williams. Educational work of this kind can be divided into development of skill and development of morale of the individual and the forces, according to J. L. Campbell (El Paso & Southwestern Ry.), who considered that the latter is becoming by far the more important in railway engineering service.

The desirability of wider information as to where waters suitable for drinking and boiler purposes may be obtained and how they should be treated was urged by H. T. Douglas (Chicago & Alton R.R.), who emphasized the serious results following the use of bad feed waters in boilers. The water service committee's proposal to withdraw from the "Manual" the matter on water treatment, as not in accord with present conditions, was accepted. Its specifications for wood tanks and wrought iron tank hoops were accepted, but with some amendments by E. A. Frink (Seaboard Air Line), who proposed galvanized hoops as an alternative and pointed out the danger of over-tightening the hoops during construction. The committee's proposed organization for railway water departments was adopted.

Rules for electric lighting for passenger stations were submitted by the committee on buildings. Flood lighting for platforms is rarely desirable. Permanent or portable chemical closets and urinals were recommended for stations where water supply and sewers are not available. The report stated that a number of such devices are in use and that some of them are proving satisfactory both in cost and in the elimination of odor and pollution.

Ashpits of the water type should have sidewalks on the outer side of the tracks and transverse bars between the track rails so that men can walk on the engines without danger of falling into the water. In the committee's opinion the use of floats or rafts over the pits is of questionable value.

Wood Preservation

Additional and revised specifications for creosote oil and the treatment of timber by creosote and zinc processes were submitted by the committee on wood preservation and were adopted. The trial of sodium fluoride was recommended for railways interested in water soluble preservatives. As to tests of treated ties by laying them at any point in the track or in special test sections under careful supervision, the latter is considered preferable. Further, while tabulated records of ties on various roads have been given formerly by the committee, it now proposes to give more detailed records of results on individual roads. In this connection it submitted records of results on the Delaware, Lackawanna & Western R.R.

Management and operation of railway plants for timber treatment came in for severe criticism by the committee, as in many cases they are in the hands of departments which do not comprehend the engineering features and whose main object is quantity production. Reference was made to creosoted piles that have given 29 years' service in the infested waters of San Francisco Bay and are still in good condition. In this connection, lantern slides were exhibited by Lowry Smith (Northern Pacific Ry.) showing the destruction of piles by borers.

That shrinkage of earth fills averages 10 per cent, on a comparison of excavation and fill, while subsidence of the original ground under fills averages 1 per cent per foot of height of fill and is much more extensive than is generally supposed, were the conclusions of the roadway committee. As to the latter, the chairman, Mr. Ambrose, stated in the discussion that the committee had been surprised to find how little engineers appreciated its extent. In this discussion there was evidence of considerable doubt as to whether shrinkage percentages do or do not include subsidence and whether they are based upon excavation quantities or fill quantities.

Practically the only discussion on the report of the committee on electricity was regarding the proposed loading of 5,000 lb. for wooden poles supporting transmission, telephone and telegraph line crossings of railroad right-of-way. F. D. Hall, electrical engineer, Boston & Maine R.R., questioned this loading in view of the difficulty of getting power, telegraph and telephone companies to conform to it. Edwin B. Katte, chief engineer of electric traction, New York Central R.R. and chairman of the committee, stated that the specifications for crossings, as proposed, conform to those of the American Electric Railway Association. The portions of the report on electrolysis, water power and electrical interference of high-tension lines, were approved and accepted as information. The committee called particular attention to that portion of the water power report describing the power limiting and indicating features of the Rocky Mountain electrification of the Chicago, Milwaukee & St. Paul R.R., a portion of which was inspected by members of the committee last summer. To limit peak load requirements it is necessary to dispatch trains, if possible, so that no more than one heavy train is ascending a heavy grade at the same time.

CONSERVATION OF MATERIALS AND HUMAN ENERGY

In the presentation of the report on conservation of natural resources, the committee emphasized the importance of the reclamation of old materials shown by its study of the subject. Careful consideration of that portion of the report concerning the conservation of human energy, with particular reference to the engineering forces of railroads, was commended to the association by S. N. Williams, professor emeritus of civil engineering, Cornell College, Iowa.

METRIC SYSTEM OPPOSED

Warning as to propaganda to influence Congress to pass a bill making the use of the metric system compulsory and prohibiting the use of the American system under penalty of fine and imprisonment, was given in an address by W. M. Wilson, representing the American Institute of Weights and Measures. He pointed out that the use of the metric system is already legal, and outlined the consequences which its enforced introduction would have on railway departments and manufacturing industries. A resolution was adopted, as presented by W. H. Courtenay (L. & N. R.R.) opposing the forced introduction of the metric system and the exclusion of the American system.

Activated-Sludge Process Considered at London

Authority to visit Manchester, Sheffield and Worcester for the purpose of studying biological methods of sewage treatment, apparently with particular reference to the activated-sludge process, has been requested by the Main Drainage Committee of the London County Council. Studies of the process named were started in the laboratories of the County Council before the war. The committee's report states that since the adoption of chemical precipitation in 1887, the volume of sewage discharged at the two London outfalls has increased from 216,000,000 to 348,000,000 U. S. gal. a day. The pressed sludge conveyed to sea for disposal amounts to about 2,000,000 long tons yearly. The sludge has 92 per cent of moisture and is estimated to contain about 15,000 long tons annually of solid matter.

Timber Clearing in Drainage Districts

IN land drainage development there has been no lack of private money to finance meritorious projects, but if the confidence of the investing public is to be maintained it will be necessary to develop the land in drainage districts as rapidly as it is reclaimed, for an undeveloped district is certain to have difficulty in meeting payments on bonds. This was the view expressed at the annual meeting of the National Drainage Congress by Lewis A. Jones, senior drainage engineer of the U. S. Department of Agriculture. His further discussion, which is given in abstract below, deals with matters which must be considered by engineers for drainage projects, the clearing of timbered land especially being obstacle to rapid development.

On districts having a total area of 5,000,000 acres, it was found that many had less than 10 per cent of the land in cultivation, although drainage improvements had been completed for a number of years. It is questionable if some of these districts will be able to meet their obligations as they become due. The only districts having financial difficulties were those requiring colonization. For all those where the land was owned by abutting property owners the finances were in sound condition.

When drainage was first attempted on a large scale the projects were located in a prairie country where the land was available for cultivation as soon as drained. Where the timber is heavy the clearing is expensive and usually costs more than the drainage. It is slow and laborious work, especially where wet lands must be cleared before field drains can be constructed. The time and cost of clearing have made the rate of development slow. If the settler has not the means to purchase the necessary machinery and hire labor he must develop the land slowly, and it will be some time before he has available for cultivation sufficient land to afford him a living and pay his drainage taxes.

In some drainage districts an attempt has been made to clear the lands before they were sold, but the price usually is so high that these lands are not attractive to settlers with small capital. Promoters of other districts have offered to clear the land for the purchaser for a certain sum per acre or on a percentage basis. In some instances this has proved satisfactory, but there is need for some plan by which the work can be carried on by an organization. One method would be to broaden the powers of the drainage district so that it could clear land for settlers, or a separate organization could be provided for the purpose. In either case the cost should be charged to the land benefited.

Stump and land-clearing districts were provided for in recent bills in Alabama and Minnesota, but both bills failed. The great advantage in such an organization would be that it could purchase powerful machinery that the individual farmer could not afford. The salvage in ties, posts, poles, logs, pulpwood, firewood, etc., would be available in large quantities and machinery for working up this salvage economically might be provided. Experience with drainage districts indicates that when once clearing operations are undertaken on a large scale instead of piecemeal, there will be a great reduction in the cost of the work. If the settler could pay for this work in installments spread over a number of years and drawing a low rate of interest, his prospects would be improved and his lands more attractive.

Strengthening a County Bridge to Carry Motor-Truck Traffic

By Morris Goodkind

Bridge Engineer for Mercer County, New Brunswick, N. J.

INTERESTING problems in bridge design have been encountered in connection with county highway work in Mercer County, N. J., especially in the strengthening of existing bridges. Recently two bridges required strengthening under somewhat unusual circumstances, and the facts of the work may be of interest in a suggestive way to highway and bridge engineers elsewhere.

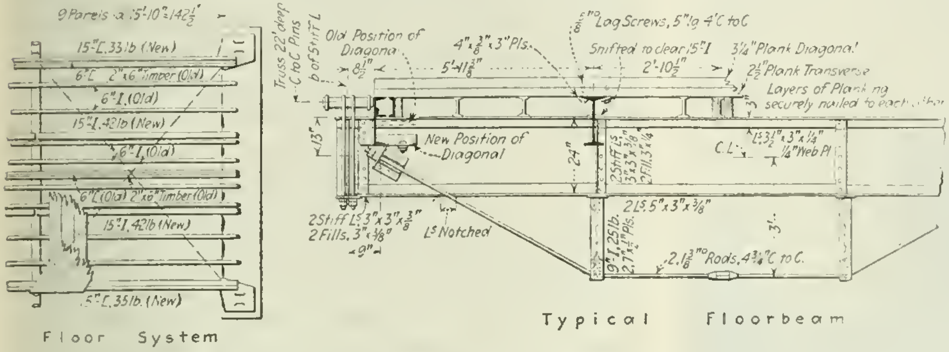


FIG. 1. REINFORCEMENT OF FLOOR BEAMS, STRINGERS AND PLANKING OF COUNTY HIGHWAY BRIDGE TO CARRY MAIN-ROUTE TRAFFIC OF MOTOR TRUCKS

Mercer County has some 1,500 bridges and culverts. These, of course, were built to provide for horse-drawn farm vehicles only, and today, with the advent of the motor truck, any one of these bridges may suddenly be subjected to a gross load of 18 tons.

The almost miraculous development of motor-truck traffic has created a state of extreme anxiety among highway officials. One can readily appreciate that this anxiety is well founded when one realizes the sudden and marked change of loading upon bridges, and the utter recklessness of motor-truck drivers in hitting obviously weak structures at full speed, in spite of cautionary signals. The situation has been fully appreciated in this county, and despite the handicap of limited funds, the problem has been attacked as actively as possible. Many new bridges are built, but money limitations make it necessary to resort to repairing and reinforcing when this will satisfy conditions for the time being.

A few months ago the main artery of motor-truck traffic between New York and Trenton and Philadelphia was cut off by the beginning of state road improvement between Hightstown and Windsor, and the main-route traffic had to be detoured over the Brunswick Pike. Two bridges on this road, near the Mercer-Middlesex County line, had capacities of only four and five tons, respectively. It was necessary to strengthen them in the shortest possible time, without interference to traffic and at the least possible cost. The object was to enable them to carry for a short time an almost continuous traffic of loaded trucks.

On examination it was found that the stringers were stressed well beyond the elastic limit, and that a good many of them had already taken a permanent set. One of the two bridges, of 52-ft. span, had 5-in. I-beam stringers on a 13-ft. panel, while the other, a 142½-ft. span had 6in. I's on a 15-ft.-10-in. panel length. The floor beams also were highly overstressed, and, due to the lack of stiffener angles, they deflected laterally to so great an extent that the web in some cases was 1½ in. out of plumb. The floor, consisting of two layers of white-oak plank totaling 5½ in. in thickness, was in good condition. The trusses were in good condition, and if allowed a unit stress of 23,000 per square inch were capable of carrying a uniform loading of 90 lb. per square foot of floor. The writer considered this unit stress justifiable, because the excessive loading that was to come on the bridge would continue only until the state highway was completed. In the circumstances, the problem was to strengthen the floor framing and maintain traffic at the same time. This was done by the several various changes indicated on the drawing Fig. 1, herewith.

The stringers were replaced by two outside lines of 15-in. channels and two interior lines of 15-in. I-beams, as indicated. The old shallow stringers were left in place, chiefly because their value for further use elsewhere did not warrant incurring the cost of removing and hauling them. They have all taken on a permanent set, and are not counted on as taking load. The two layers of planking were securely spiked to each other so as to act as a single layer, and were fastened to the

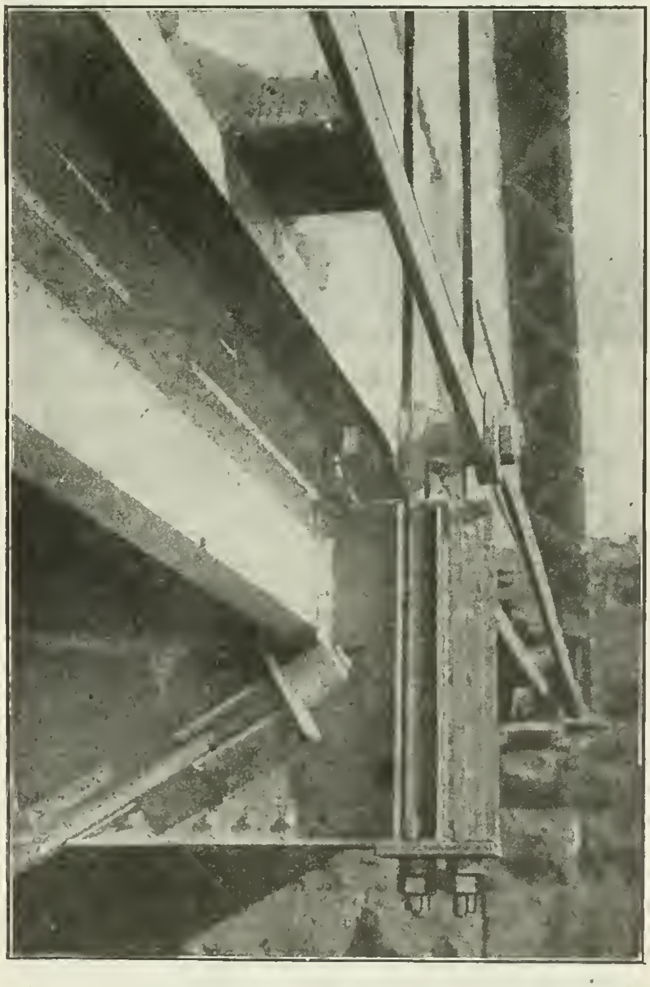


FIG. 2. ATTACHMENT OF TRUSS RODS TO FLOORBEAM AND CONNECTION OF NEW OUTER STRINGER

15-in. stringers by ⅝-in. lagscrews and clips. The planking is thereby made continuous over supports, which brings it up to the capacity of the stringers.

Reinforcement of the floor beams required the use of truss rods. Two 1⅝-in. rods with sleeve nuts form the tension element of the floor-beam trusses; they pass over 9-in. I-beam posts and are connected to the floor-beam and near the ends by clips (see view, Fig. 2).

Tightly fitting stiffener angles were applied to the floor beams in order to correct the twist of the web.

All this work was carried on without interference to traffic. As strengthened, both bridges have a capacity of 12 tons at 16,000 lb. unit stress.

At the time when the long-span bridge was first examined, the writer noticed a transverse deflection in the eyebars of one panel, amounting to almost 2½ in. (see Fig. 3). It was found on examination that the bridge was set so that it could not expand. There was ample clearance between shoes and abutment backwalls, but the four anchor-bolts of the expansion shoe were tight up against the ends of the slotted holes in the shoe plate on warm days. This condition was corrected by lengthening the slotted holes.

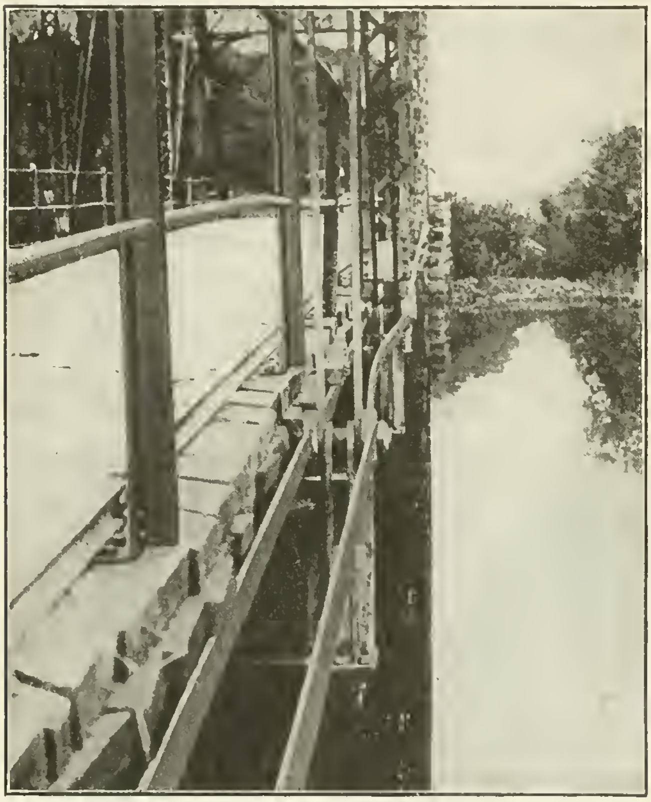


FIG. 3. BUCKLED LOWER-CHORD EYEBAR, 142½-FT. SPAN

It might be mentioned that numerous instances of restrained expansion are found in highway bridges; the lower-chord eyebars frequently fail to perform their function in warm weather. In some instances this is due to blocking up of the space back of the expansion shoes, by dirt or by concrete placed to incase the shoes. In the present case the shoes were clear, however. The fact that only the outer bar buckled is probably attributable to some slight error of setting.

The effect of the reinforcement is quite noticeable. Formerly the passing of even the lightest vehicles produced annoying rattling, but now the heaviest truck traffic goes over the bridge without appreciable noise.

Lug or Lugless Brick?

—General Engineer Opinion

THE National Paving Brick Manufacturers Association, at the New Orleans session of the American Society of Municipal Improvements, introduced, before the brick committee, its proposed new specifications. The two new proposals that appear as the most radical departures are the manufacture of the standard lugless brick and the employment of a plain sand cushion when bituminous fillers are used. *Engineering News-Record* indicated its stand as to the specifications in an editorial published Nov. 13-20, p. 845. A number of letters were sent to secure general engineering opinion upon the new specifications, and answers to these letters follow.

P. K. De Voe

City Engineer, Creston, Iowa.

While we have had only a small amount of experience with the lugless type of brick, our experience has been very unsatisfactory and the type of paving resulting from its use equally unsatisfactory. The chief complaint we have experienced has been the inability to pour the brick joints with the liquid filler without what we would term "skim plugging." If an attempt is made to open space these lugless bricks it results both in irregular spacing and crooked courses. Also there is a considerable tendency for the brick to rock and to work the cushion sand up between the courses, especially where the sand is wet. We have had a considerable amount of very satisfactory experience both with the wire cut lug and with the pressed lug brick and find that none of the above objections are present in their construction.

I can hardly imagine what might be the motive of standardizing the brick specifications to one type of brick only, unless that motive is selfish, and personally, I have always believed in open competition.

M. W. Watson

State Highway Engineer, Kansas.

It has been my observation that bituminous filled brick pavements have been successfully constructed in this section of the country by the use of lugless brick, and at the present time we are permitting its use on this type of work, but for grout filled or monolithic construction I cannot concede that the lugless type will prove satisfactory. We are at the present time requiring the use of the lugs which shall not exceed in area one-third of the surface of one side of each brick. I have examined several pieces of pavement construction with grout filler and lugless brick and I found that the grout has not completely filled the space between bricks, and, unquestionably, trouble will be encountered from work of this character. This change is like a great many other things that are advanced without sufficient investigation and experience. The manufacturer sees that by the omission of the lug he can more readily dispose of his culls and thereby reap a greater profit, but as in the case of most other materials, decrease of production cost does not seem to affect the actual price to the ultimate consumer.

In regard to the use of a plain sand cushion, I feel that for bituminous filler in the ordinary case a sand cushion is satisfactory. There are, however, places where the soil is of such a nature that the base will crack and the sand escape, thus allowing the brick surface to become irregular, in which case the use of a sand cement cushion or a bituminous cushion may be advisable.

We have performed a few experiments on bitumens and sand for cushion and have found that about 5 per cent of Tarvia B or Tarvia K.P. will hold the sand together sufficient to keep it from flowing.

HENRY MAETZEL

Chief Engineer, Dept. Public Service, Columbus, Ohio

I beg to say that with a square-edged, wire-cut lugless brick, the use of a pitch filler appeals to me as very desirable. However, with a repressed lugless block, which we have used in many instances, we have found them so smooth and regular in surface, that, when laid, the spaces between the bricks are insufficient for any but pitch filler, and we think the wire cut lugless brick would present practically the same difficulty. With mastic or grout filler, as well as asphalt, we have found the lug brick desirable since the proper spacing was insured.

As far as the suggested reduction in size of brick is concerned, i.e., changing from 3½ x 4 x 8½ to 3 x 4 x 8½, I am heartily in favor of it, since I think this reduction in *width* will greatly tend to insure more perfect vitrification and produce a better brick. I do not especially approve of this change with the idea in mind of laying brick on the 4 in. concrete surface on light traffic streets or alleys with the 4 in. face exposed to traffic.

Our practice has been, especially during the present high cost of paving, to pave alleys with one course concrete pavements, and I find, in checking up, this style of pavement has cost about 10 per cent less than the suggested brick pavements would, and has in every respect proved satisfactory. In conclusion I might say that we would be glad to specify the changes suggested if same prove satisfactory and feasible in cities where they will be tried, but at present we feel that the claims are not justified, except for pitch filler, and the change in size in so far as greater uniformity and more thorough vitrification will result.

ELLIS R. DUTTON

Assistant City Engineer, Minneapolis, Minn.

The first and principal recommendation for a standard size, lugless, square edge, wire-cut brick, seems to me to be reasonable, proper and one that tends to a reduction of costs in brick paving. There can be no argument as to the standardization of size, as any make of brick can be used interchangeably in the construction and repair of brick pavement. The only question that occurred to me when their use was suggested was whether the filler would penetrate the joint spaces, and prevent a movement of the brick. I investigated this phase before attempting to use such brick and found no difficulty in use of the filler. After use in our own work I am satisfied that the filler can be properly applied. In the use of sand cushion and bituminous filler we have had good results. We have never used any other construction except perhaps a sand filler and sand cushion. As to the reduction of the depth of the concrete base, that is a question entirely aside from the brick, as it would apply equally as well for any top. I do not however, believe in a reduction of the base, but rather in an increase. There are streets of medium or light travel where a reduction in depth of brick could be made without materialy affecting the quality of the pavement. By the use of this standardized brick it can be readily accomplished by laying the brick flat, thereby reducing the cost of the brick approximately 25 per cent.

Summarizing the use of the standardized paving brick will result in: (1) Uniformity, for all manufacturers will make the same size, and thus permit the use of any make of brick, interchangeably. (2) Suitability, permitting the laying of a paving of a depth to suit the traffic needs. (3) Economy, in the manufacturing end, by eliminating many sizes. In use, requiring less filler because of the closer laying of the brick.

There are other reasons for a standardized brick, but the above are some of the principal ones.

GEORGE C. DIEHL

County Engineer, Erie Co., N. Y.

I believe that the best results are obtained when brick with lugs are used. Also, that cement sand-cushion should be used in all cases, and that a brick 3 in. deep is practicable and would greatly decrease the cost of this type of construction.

R. KEITH COMPTON

Chairman and Consulting Engineer, Baltimore Paving Commission

Lugs are absolutely necessary for the proper flow, no matter what filler is used, otherwise improper penetration will follow. More brick pavements in this country have failed due to the use of plain sand cushion than from any other cause. A cement sand bed should be used, no matter what filler, in order to maintain uniform surface. Both of the recommendations of the brick manufacturers' association are, in my judgment, unsound.

W. W. HORNER

Chief of Division of Sewers and Paving, St. Louis, Mo.

I have found the proposed specifications of the paving brick manufacturers objectionable in that they propose the use of a 3 x 4 in. square-edged brick. This means a lugless brick, and therefore a brick of very small spaces of joints for filling. All of our experience has indicated that one of the greatest defects in brick paving has been incomplete joint filling, and this has been particularly true of the cement grouted pavement. In the writer's experience most of the pavements in which the grouted joints have broken have been found to be only partially grouted. The incomplete grouting has been due to either a filling of the bottom of the joints with sand from the sand cushion during rolling, or from the failure of the grout to penetrate to the bottom of the open spaces because of its bridging over the small joints.

That this experience is quite general has been indicated by the increasing use of lugs, and employment of other methods for providing a wide, free space for grout penetration. Most of the development of paving brick in the last 10 yr. has been along this line. That this development has been in the right direction has been indicated clearly by the superior grouting of the modern pavements. For the old flat bricks good grouting was sometimes secured, and many satisfactory pavements resulted, but with the modern lug brick, and especially the wire-cut lug, good grouting is easy to secure and good results are becoming general.

The writer seriously objects to the proposed specifications on the ground that they are ignoring all the advantges of recent development along this line, and are reverting to a now obsolete standard of paving brick, solely to secure a reduction in the manufacturing costs.

Possibly realizing the difficulty of securing good grouting with the proposed brick, the manufacturers proceed to relegate the cement grout pavement to the position of an alternate specification, and present a preferred specification for the use of an asphalt filler. But then immediately proceed to decrease the probability of securing a good pavement under these specifications by advocating the sand cushion, a thing which has been found to be equally responsible, with poor grouting, for the failure of many of our brick pavements. The writer finds this specification objectionable, as it ties the profession down to one type of paving brick construction, that type involving the use of two factors which have, between them, done more than anything else to create defective pavement. These are the lugless brick and the sand cushion.

In many localities the use of the lug brick and the cement grout and mortar bed has been so satisfactory that no one would consider the adoption of the new proposal, and its advocacy in the face of the results obtained appeals to the writer as being extremely ill-conceived.

The writer appreciates that when a large organization like the National Paving Brick Manufacturers Association agrees to manufacture a brick of this type and promote its use under the specifications, there will undoubtedly develop a demand for this material, particularly in those communities where facilities for study and experiment along these lines are not ample. He does not believe, however, that the larger cities with ample engineering staffs, or even the city engineers of the smaller communities, who have been able to devote any considerable time to this subject, will agree to these specifications, and is quite certain that the lugless brick and the sand cushion will continue to be considered as serious obstacles in the way of successful brick pavements. Aside from the purely technical aspects of the specifications the writer cannot help but question the propriety of the presentation of a reactionary specification of this type by the manufacturers at a time when the engineers generally are thinking more than ever along technical lines. The presentation seems to come not in response to any demand from the engineers, or the consumers, but purely on their own initiative, and as a phase of manufacturing detail.

The writer is even rather inclined to question the applicability of the reasons given for the change; for instance, even though twelve standards of paving brick may be excessive, is it necessary to go so far as to reduce to one? The increased percentage of No. 1 brick of a 3 x 4 in. size is not universal. In some localities the percentage of the No. 1 type of the 3-inch brick has already been found to be less than the block. While the matter seems to have arisen out of the internal conditions of the brick industry, there is a reasonable doubt whther the remedy is satisfactory, even from the manufacturing view point, to all the manufacturers.

CLYDE L. HUFF

City and Hydraulic Engineer, Logan, Iowa

I wish to say in this connection that I do not consider that as good a pavement can be constructed with lugless brick as with the lug brick, owing to the fact that it is practically impossible to get a positive joint between the brick by using the lugless brick. This, in my opinion, applies especially to the monolithic type of construction. I have heard some comment about this matter and it seems to me that the brick manufacturers are losing sight of the fact that paving brick are made for use in constructing brick pavement. Their contention is that they cannot sell their seconds and that as a result they must charge more for the lug brick than for the other. They do not back their statement with any proof as to whether they will make as good pavement, and it is the opinion of many engineers that lugless brick will not make as good pavement as the lug brick, which is the result we are all looking for.

The sand cushion, with a good even base and a thin layer of sand, makes a very good pavement.

Art and Science in Engineering

THE parts that art and science play in the various branches of engineering was briefly put by Arthur Surveyer in a discussion on engineering education before the recent annual meeting of the Engineering Institute of Canada. Mr. Surveyer, who, in addition to his consulting practice, is a member of the board of directors of the Ecole Polytechnique de Montreal, called attention to the fact also that the Ecole is the only engineering school in North America where tuition is given in French. He thus states the case of art and science in the various branches of engineering:

> Engineers can be divided into two great classes, according to the relative importance of the part played by art and science in the exercise of their profession. The building engineers and administrators of certain classes of utilities constitute the first group. This class includes the architectural engineer, the structural engineer, the public-works engineer and the engineer builder or operator of canals, harbors, railways and tramways. These technicians apply, in their practice, some of the principles of science, but they also—and this probably to a greater extent—apply empirical rules based upon the experience of others and constituting the art of the preceding generations.
>
> The second group is composed of the industrial or manufacturing engineers. Their field of action is very wide; it includes the fabrication of all engines and machinery, all the applications of chemistry, such as metallurgy, electrochemistry, electro-metallurgy and the series of industries dealing with the transformation of materials, such as dye works, pulp and paper manufactures, tanneries, sugar refineries, glass works, potteries, gas plants, etc. It also embraces all the applications of physics to the compressed-gas, cold and liquid-air industries and the ever-increasing number of applications of electricity to the construction of electrical machinery and wireless telegraphy. This group of engineers utilizes science to a greater extent than art, and their formation requires more laboratory work and less *ex cathedra* teaching.

Thermit Weld Used on Ore-Dock Tie Rods

Side walls of a concrete ore dock of the Algoma Steel Corporation, Ltd., at Sault Ste. Marie, Can., are of such a distance apart as to require tie rods 185 ft. long. Each of the 13 rods, of 3¼ in. square steel sections, had to be welded in three places in order to get this length, making a total of 39 welds required. Electric welds were tried at first but in tests gave a strength only about 27 per cent of the original bar. Accordingly thermit welds were resorted to, with resulting tests of over 85 per cent of the original bar. There was some difficulty in doing the work because the rod elevations were below high water. but by picking the proper time the 39 welds were made by seven men in nine days.

Ocean Pier to Be Scrapped Because of Concrete Disintegration

Concrete in Santa Monica, Cal., Structure Has Been Succumbing to Sea-Water Attack Since Erection Ten Years Ago

DISINTEGRATION of the concrete in the municipal pier at Santa Monica, Cal., has become so severe and extended that the structure was closed to public use in November, 1919, and steps are being taken to rebuild another pier. A board of consulting engineers has inspected the pier and investigated the design and the conditions surrounding its construction. It has reported that the failure is due to the gradual decomposing action of the sea water on a concrete which was not of the high standard now known to be required of concrete to be attacked by seawater.

The municipal pier at Santa Monica was built in 1908-09 to carry an outfall sewer and to serve for a pleasure pier. It was described in some detail in *Engineering News*, Dec. 9, 1909, p. 632. It is 1,600 ft. long and 35 ft. 8 in. wide at the deck line, with three platform spaces 89 ft. wide at intermediate points and at the end of the pier. The floor is concrete on timber stringers which span concrete floorbeams on concrete bents of posts cast in place on concrete piles sunk by jetting. The bents are spaced 20 ft. c. to c. and the piles are in three rows with 13 ft. 6 in. spacing. Deck elevation varies from 21 to 50 ft. above ocean bottom, but the piles were not braced together, either transversely or longitudinally, below the floorbeam level.

Piles were precast on shore and sunk into place by jetting. They were round and provided with a bulb bottom, shown in the drawing, and were cast at an angle of 40° to the vertical. Outside of those two features their construction and placing were normal. Details regarding them, as given in the article noted above, are as follows:

> The structure is divided into three approximately equal sections. In section 1 [nearest the shore] the piles are 14-in. diameter, reinforced with six ¾-in. rods and have a jacketing of No. 10 steel 22-in. diameter extending from 2 ft. above high water to 2 ft. 6 in. below ground line; the space between the pile and the jacket is filled with concrete. In sections 2 and 3 the piles are 18 and 22-in. diameter, respectively, reinforced with eight ¾-in. rods in the 18-in. and eight ⅞-in. rods in the 22-in. piles. It was the intention to protect the piles in sections 2 and 3 with a jacket of the same diameter as the piles, extending 3 ft. above and below the tidal range, but the prompt covering of the wet surfaces by marine mollusks rendered other protection unnecessary. All concrete was a 1:2:4 mixture with stone limited in size to 1 and 2 in. in piles and substructure, respectively.

The pier apparently suffered no deterioration for some years. In 1912 Rudolph J. Wig and Lewis R. Ferguson, in their tour of inspection of various seawater concrete structures in the United States, inspected the pier and found no trouble. In 1916, however, disintegration had started. A statement by Mr. Wig reads as follows:

> An examination made in 1912, four years after the structure had been built, showed the pier to be in excellent condition. For about the first 200 ft. of the pier at the inshore end, the piles were carefully examined and they showed no cracking or indications of spalling or disintegration. The piles at the outshore end were only examined as they could be viewed from the pier deck and they appeared to be in excellnt condition. This pier as a whole was found to be in better condition than any similar structure on the Pacific Coast.
>
> A later and more careful examination was made in 1916. The records show that, during the original construction of the pier in 1908, thirteen of the piles were broken by storm after being set in place and had to be removed. Prior to 1916, a number of piles had failed on the outboard end supposedly having been damaged by floating debris. These were repaired by using steel shells of 10- and 12-gage metal, the shells having a diameter of approximately 8 in. greater than the diameter of the old pile. In repairing these piles, it was found in a number of cases that the concrete of the damaged or broken pile was quite soft and more or less disintegrated. In fact, it was stated, it was so soft it could easily be cut away with a knife. The failure usually occurred above low water and the steel shells or jackets were only placed around the piles from a point near low water to a point above high water. No examination had been made by a diver of the condition of the outboard piles

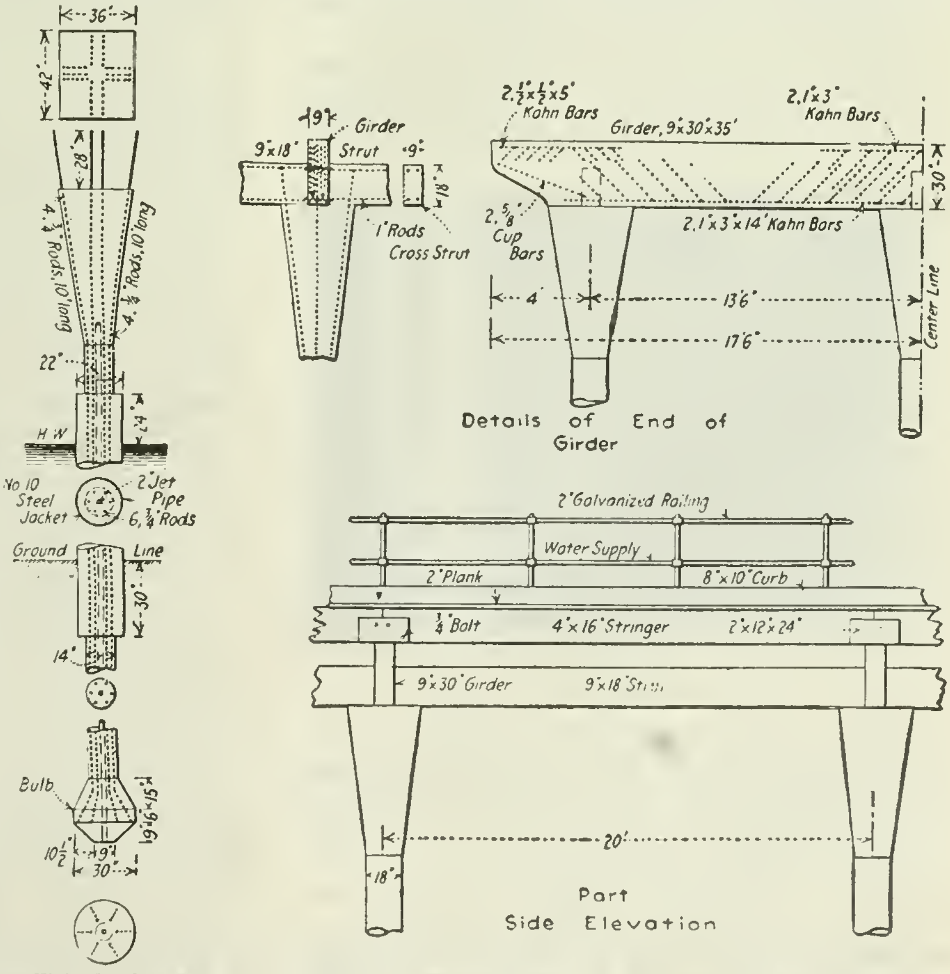


FIG. 1. DETAILS OF CONCRETE MUNICIPAL PIER AT SANTA MONICA, CAL.
(Reproduced from *Engineering News*, Dec. 9, 1909, p. 632.)

below low water. They were covered with a very heavy marine growth and therefore could not be readily examined.

An analysis of the disintegrated concrete was made in July, 1915, by R. G. Osborne of Los Angeles and it was found to have the following composition:

Silica	53.56
Iron and Alumina	11.88
CaO	8.28
MgO	2.88
$MgSO_4$	8.63

The high percentage of magnesia in this sample shows that disintegration of the cement had been going on for some time. Many of the piles at the inboard end which could be examined showed cracking and spalling.

The cracks for the most part were vertical and above the elevation of mean tide. They appeared to be located over the vertical reinforcement. Some of these piles were appreciably eroded. It is of special interest to know that no disintegration was apparent in 1914, after the structure had been exposed to seawater for four years, while during the subsequent four years deterioration was quite rapid. Some of the piles had the appearance of failing by compression at the point where they were badly cracked. The concrete beams which carry the deck were also cracked, many of them for the entire length, both top and bottom of the beam at points which appeared directly over the reinforcement.

It appears that for some of the piles beach sand was used which contained some particles of black shale. Such particles of shale which were embedded in the concrete within ¼ or ½ in. of the surface oxidized and caused spalling of small particles. This defect was not very extensive, however, although it may be a contributing factor. It was quite apparent that joints had been made in some of the concrete piles at a point such that when the pile was driven the joint was located at about the elevation of mean tide.

The trouble indicated in the foregoing report continued through the years 1917 to 1919 until last August, a settlement of the outboard end when the pier was crowded with people led the city commission to engage a board of engineers to report on the condition of the structure. The main part of this report dated Nov. 5, 1919, and signed by Quinton, Code V. Hill, represented by J. H. Quinton; Olmsted & Gillelen, represented by Frank H. Olmsted; and Leeds V. Barnard; represented by W. K. Barnard, is as follows:

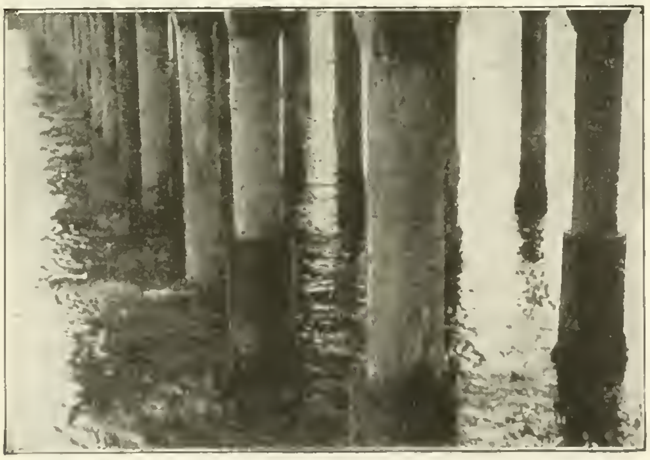


FIG. 2. UNBRACED CONCRETE PILES UNDER SANTA MONICA PIER

In a detailed examination of every part of the concrete substructure the following conditions were discovered:

Of 42 bents containing originally a total of 150 piles examined by diver, the condition was found to be as follows:

Under low-water mark—3 piles were gone completely; 3 piles were practically gone; 60 piles were rusted so badly as to show that oxidation of the steel had set in; 30 piles were cracked showing that disruption was in an advanced condition; 54 piles were apparently still serviceable, as most of these were cased with iron and concrete.

Above low-water mark—3 piles were gone completely; 3 piles were practically gone or useless as bearing piles; 91 piles were cracked in two or more places; 33 piles showed one crack; 20 piles showed no visible sign of deterioration.

It was not considered necessary to spend any more money on examination of the piles under water, as the above enumerated defects show plainly to our satisfaction that the piles are so badly deteriorated that the pier as a whole should be condemned.

In addition to the above 42 bents which were examined under water by diver, and above water by ourselves personally by means of boats, the following 16 bents, at the shore end, containing 48 piles, have been examined by us at time of low water and the following defects noted:

Forty-six piles were cracked in two or more places; 1 pile showed one crack; 1 pile showed no visible sign of deterioration.

As the entire structure rests on piles alone, the failure of the piles means the failure of the pier. Considered as a whole, the pier is in a very dangerous condition, and any great winter storm is liable to wreck it wholly or in part. On no account should the public be allowed to use it further, as many parts of it are liable to fail at any moment.

Cause of Present Condition

The underlying cause of the present condition of the pier was, in our opinion, porous and permeable concrete. Because of this permeability, the salt water has penetrated the concrete, producing two results; the chemical disintegration of the concrete itself and the mechanical fracture of the same as a consequence of the expansion of the reinforcing steel due to its corrosion. The final result of this disintegration and fracture of the concrete is, of course, such a destruction of the strength of the piles and other parts of the structure as to render them unable to bear their proper loads.

Our examination revealed that while the chemical disintegration of the concrete itself took place, in general, under water, or between high and low tide, the cracking of the concrete along the lines of reinforcement took place almost entirely in the caps and struts and above high water in the piles. The cracking, as though the result of a wedgelike action at the reinforcing rods, is so general throughout the structure above water that it points to general corrosion of the metal due to one or both of two causes—permeable concrete, as indicated above, or electrolysis.

The appearance of some of the piles would indicate the electrolysis may have taken place in the earlier life of the pier. A careful examination during October, 1919, with a millivoltmeter showed that there was a very slight difference of potential between the sewer discharge line on the pier and the reinforcing steel in the piles. This difference fluctuated synchronously with the stopping and starting of cars on the Pacific Electric tracks nearby. No electric current which would cause electrolysis, however, could be detected in the sewer discharge line. Whether the electrical machinery in the pumping and treatment plant at the shore end of the pier was running or not, the results were the same, irrespective of movement of street cars. Any electrolysis, if it did occur, has now almost, if not entirely, ceased, and probably for two reasons—first, the adoption of improved bonding methods by the electric railway, since the pier was built, to prevent electrolysis, and second, the corrosion of the steel increasing to such an extent as to form an insulation of oxidized metal about the reinforcement. Although the nature and the degree of the corrosion, and the even yet detectable difference of potential, might furnish slight reason for thinking that electrolysis had something to do with the initial fracture of the concrete, we are of the opinion that the most potent cause of the corrosion was the porous, permeable concrete which allowed the salt sea air to penetrate to the steel.

An examination of many examples of concrete work from

Santa Monica to Redondo shows that in many instances the same destructive action is taking place where there is no reason to expect to find electrolysis and where the concrete is not directly in contact with salt water. Many porous concrete works such as lamp posts and railings are found to be failing solely as the result of their exposure to salt sea air. Dry mixed concrete, such as is commonly used in such "artificial stone" lamp posts and railings, is quite as porous and permeable as concrete mixed too wet.

It is clear from the above that the cause of the present condition of the pier was permeable concrete. This permeability can result from several causes, any or all of which may arise in the absence of the most rigid and competent inspection and careful and conscientious workmanship, or from improper design.

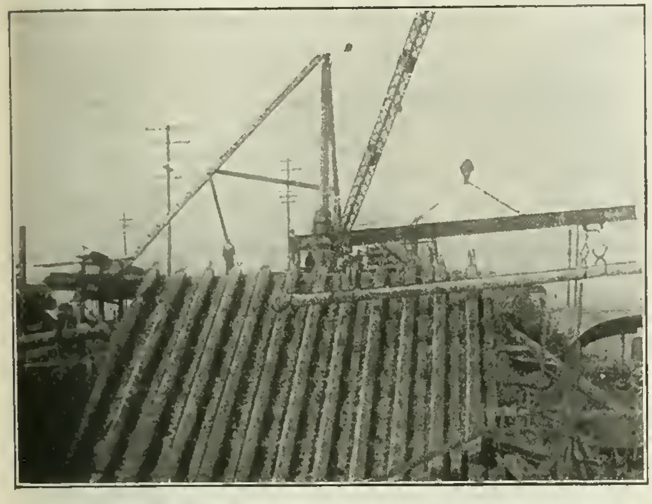


FIG. 3. CASTING THE SANTA MONICA PILES IN 1908

In the light of the present-day knowledge, permeable concrete may result from the use either of too much or too little water. Numerous experiments have demonstrated this. The concrete may be so placed in the forms that there is a separation of materials and consequent alternating dense structure and rock pockets with a large percentage of voids. Forms may be so poorly designed as to be leaky and so allow the loss of the cement, leaving an unfilled mass of aggregate. Reinforcing steel may be placed too close to the surface to permit of its being adequately covered even with the most dense concrete obtainable. Forms may be removed so awkwardly and piles may be handled so roughly that the "skin" of lime carbonate is broken and so access is given to the interior concrete for the salt water.

Many if not all of these facts have become known as the result of the experience and experiments of the last few years and were not available to the designers of marine concrete construction a decade ago.

In the light of our present information it is realized that the reinforcement should have been more deeply imbedded, but at the time the pier was designed any engineer would have said it was quite sufficiently covered.

The diary of the inspector records that beach sand and gravel were used in the concrete. This we believe to be an unsafe practice in reinforced-concrete construction, for the salt contained therein facilitates the corrosion of the metal reinforcement. Moreover, because of the sorting process of nature in the formation and deposit of beach sand, a very uniform, ungraded product results, which requires the use of an excessive amount of cement to prevent getting a very lean, porous mixture. Clean sand and gravel or crushed rock should be used and so graded that, with the cement and a proper amount of water the least volume of concrete will be produced with a given quantity of ingredients. This will produce a dense impermeable concrete.

It should be needless to say that any skimping of the cement required for a properly proportioned mixture would result in a poor and permeable concrete.

From the inspector's diary, it appears that, at least at first and perhaps throughout the course of the construction, some difficulty was experienced in getting satisfactory materials and tight forms and that the workmanship and manner of handling of the piles left something to be desired.

The chemical analyses established very conclusively the fact that the disintegrated concrete lost 23 per cent more lime than the good concrete and gained over 9.5 per cent of magnesia, in the form of magnesium hydroxide. The absorption test on pieces of concrete taken from the pier where chemical disintegration had not taken place, but where piles had been fractured by the corrosion of the metal reinforcement, showed an absorption of water by weight of from 6 per cent to 7 per cent of the original weight of the specimen. A single test made on a more porous piece of concrete showed an absorption of 12% by weight.

We have tested some pieces of the concrete taken from the pier in some places where failure had occurred, and found that the concrete absorbed water to the extent of between 20 and 25 per cent of its volume. This absorption is about the same as that of common brick. Such concrete could not be said to be dense, and unless perfectly protected by an impermeable coating of rich mortar, would naturally allow sufficient absorption of seawater to reach the steel.

CONCLUSIONS

In consideration of all of the above facts and observations we believe we are fully justified in concluding that the prime cause of the failure of the pier was the permeable concrete resulting from unskilled or poor workmanship and improper selection and use of materials. A possible contributing cause was the occurrence of two quite severe storms during construction, which cracked many members of the structure, rendering them still more liable to attack by the salt water and air. Electrolysis may have accelerated the corrosion of the reinforcement in the earlier days, but we do not find evidence of its present operation.

It must be born in mind that much of our knowledge of the way to make concrete which will resist the action of seawater has been gained since this pier was built, and it is far from our intention to cast reflections on any one in connection with its construction, for we believe that it was well designed and constructed under considerable difficulties. Our only finding is that the materials of the concrete appear to have been not well selected, and not combined in the proper portion with proper amount of water to make a sufficiently dense concrete to prevent the seawater from reaching the imbedded steel.

In consideration of the above facts and having in mind the difficulties attending the making of a structure impervious to moisture, particularly in replacing the present piles and other concrete substructure without removing the deck, we are of the opinion that it is inadvisable for the City of Santa Monica to attempt to reconstruct the Municipal Pier in reinforced concrete.

Regarding the claim that more might have been done to keep the pier in proper condition we have to say that in our opinion every reasonable effort has been made to maintain the pier in a safe and usable condition and that nothing could have been done at any time since the structure was built to have prevented its present conditions or appreciably prolonged its life.

Claims that the building of the wooden structure to the south of the pier had anything to do with the present condition of the pier are, in our opinion, without foundation.

In conclusion we would recommend that the further use of the Municipal Pier be prohibited and that steps be immediately taken looking to the replacement of the present concrete piles, caps and struts by creosoted wood piles and timber caps and struts, retaining the present deck structure. Such a substructure should have a life approximately equal to the remaining life of the existing deck structure. and so the greatest possible use of the original investment consistent with public safety will be made.

As a result of this report the City Commission ordered the discontinuance of the Municipal Pier by the public. A new creosoted pile pier will be built.

Controversy Over Concrete-Block Tunnel Construction

SHARPLY divergent views on subaqueous tunneling practice were brought out during the past few weeks in the course of public hearings on the Hudson River vehicle tunnel project, intended to provide a highway connection between New York City and Jersey City as a joint state enterprise of New Jersey and New York. There has been keen interest in these hearings among engineers generally, most largely in the controversy between the advocates of cast-iron and concrete tunnel shell construction. Several documents bearing on this controversy, which were made public at the hearings, are reproduced in condensed form herewith.

After the chief engineer of the joint commissions, C. M. Holland, had reported upon the preliminary engineering studies and recommended a plan and design, as abstracted in *Engineering News-Record* of Feb. 19, 1920, p. 357, a series of public hearings was arranged, to collect opinions on questions of traffic capacity and on type of structure. As reported in our news columns, much of the discussion at these hearings centered around the 42-ft. tunnel to be built of precast concrete blocks laid up behind a shield, and to contain two levels each with a 22½-ft. roadway (intended for three lines of traffic), recommended three years ago by Gen. George W. Goethals, then consulting engineer to the commissions. The present chief engineer and board of consulting engineers rejected this recommendation and condemned the proposed tunnel, in spite of the claims of low cost made for it. The pair of 29-ft. cast-iron tunnels recommended by the chief engineer, providing two 20-ft. roadways each to carry two lines of vehicles, would cost $22,262,000 net (or $28,669,000 with real estate, engineering, contingencies and equipment), as against estimates of twelve to fifteen millions claimed for the single large concrete-block tunnel. The chief engineer reports that these latter figures are far too low.

Mr. Holland and Col. W. J. Wilgus of the consulting board presented statements at the public hearings, giving the reasons for condemning the concrete-block tunnel on the score of safety and practicability. Parts of these statements are reproduced below.

STATEMENT OF CHIEF ENGINEER HOLLAND

Five questions were addressed to the tunnel commissions by General Goethals recently asking for the technical basis for the rejection of the concrete-block tunnel plan. A reply to these questions was prepared by the chief engineer, under date of Feb. 28, 1920, with the full endorsement of the consulting board. The substance of this reply follows:

Item 1.—"The data showing how the conclusion is arrived at that the capacity of the tunnel is greatly overestimated."

The tunnel in question is shown with a roadway width of 22 ft. 6 in., which it is claimed will carry three lines of vehicles. A study of motor truck growth shows the absolute necessity of providing for a great volume of trucks 8 ft. in width and for touring cars 6 ft. in width, making the combined width of two trucks and one touring car 22 ft. This leaves a total of 6 in. for all operating clearances, from which it is manifest that such a roadway cannot carry three lines of traffic. Therefore any estimate of more than two lines of traffic is an over-estimate.

Item 2.—"The analysis which shows that the rings or blocks are not sufficient to withstand the external load."

I transmit herewith the analysis [not reproduced—EDITOR] which has been prepared on the basis of the presence of ideal conditions which are never met with in practice in tunnel construction. They are merely supplemental to the studies based upon actual tunnel experience which show that the concrete-block tunnel is fundamentally defective in that it does not provide for strength in those details where tunnel experience has proved that strength must be provided; especially, in the cross-joints where it has been found necessary to increase the rigidity of the connections between adjacent segments in order to strengthen the ring and prevent its failure through distortion.

Item 3.—"Why the concrete tunnel is not suited to Hudson River conditions."

The varying nature of the materials in which the proposed tunnel is to be built (silt, sand, gravel, boulders, and ledge rock) requires a lining that possesses great lateral strength, and it must be so impervious to the penetration of outside water as to prevent leakage with resulting disintegration. The type of construction proposed in the plan under consideration is the worst possible to meet these conditions, formed as it is of concrete blocks without rigid connection at the cross-joints, which experience through thirty years of subaqueous tunnel construction has shown to be an absolute prerequisite of successful construction under the conditions found under the Hudson River. The introduction of tens of thousands of joints between abutting concrete surfaces without rigid connection makes the matter of obtaining a water-tight tunnel an absolute impossibility. The result would be that if such a tunnel could conceivably be built, it would present from its very nature an untold number of points of attack by the natural forces of disintegration which would seriously endanger its permanency.

Item 4.—"The data on which the statement is made that the estimates are too low."

1. The concrete blocks are estimated at $11 per cu.yd. in place. At the current price the cost of materials forming the blocks would be $9.32; this leaves a balance of $1.68 to cover the following items of expense: providing a plant, transporting raw materials to the plant, fabrication of the blocks, transporting blocks from plant to the storage yards for seasoning, storage, transportations of the seasoned blocks from the storage yard to the tunnel shafts and into the tunnel heading through compressed air, erection of the blocks behind the shield, breakage during fabrication, transportation and erection, making these blocks water-tight, and finishing. The cost of these blocks figured on present-day prices for labor and materials shows that they cannot be fabricated and erected for less than $33 per cu.yd., which is three times the cost set forth in the estimate. In this connection it might be mentioned that the estimate in question fixes the price for concrete in the tunnel approaches under normal atmospheric pressure, a much cheaper form of construction, at $20 per cu.yd., which figure more nearly corresponds to present-day costs for that type of less expensive work.

Another element of the unit prices as considered in the estimate is the cost of excavation, which is classified under two items: tunnel excavation in silt, 342,500 cu.yd., at $8, amounting to $2,740,000, and tunnel excavation in rock, 45,000 cu.yd., at $22, amounting to $990,000, a total allowance for the cost of tunnel excavation of $3,730,000. In the first place the classification of the materials is incorrect for the borings demonstrated that the materials through which the tunnel must pass are mud, silt, sand, gravel, boulders and ledge rock, which should be properly classified as tunnel excavation in silt, tunnel excavation wholly in earth other than silt, and tunnel excavation in part earth and part rock. Assuming that the tunnel were to be built in accordance with the permit of the Secretary of War, with a protective blanket 10 ft. in thickness, which experience has shown is necessary for the safe construction, maintenance and operation of a subaqueous tunnel, the quantities for excavation under the above conditions should be: excavation in silt, 177,500 cu.yd.; excavation in sand, gravel and boulders (wholly in earth), 100,800 cu.yd., and excavation in part earth and part rock, 70,500 cu.yd. A fair average estimated price for the excavation of materials under the above classification is $27.72 per cu.yd., making a total cost of the above estimated quantities for tunnel excavation $9,700,000, which again is approximately three times the total as estimated for tunnel excavation for the concrete block tunnel.

2. The estimated quantities are insufficient in that such items as waterproofing, tunnel ducts and the reconstruction of sewers, water and gas pipes and other subsurface structures are entirely omitted from the estimate, while the quantities of such items as steel and pavement are too low.

3. The allowance for plant in the estimate under consideration is $1,435,000, which is based upon the use of only one shield, an expensive and slow method of construction. The plant estimate is absolutely inadequate for the purposes intended, and the cost of the plant required for the economical prosecution of the work in question would amount to $2,658,000.

4. No amount is given in the estimate for the necessary real estate. This is a serious omission as in any event it cannot be less than the amount submitted to the commissions in the chief engineer's report, namely $2,500,000, which should be added to any estimate made for this work.

Item 5.—"The data in support of the statement that the tunnel cannot be built within a period of three years."

The concrete block tunnel 42 ft. in diameter is without precedent and no tunnel approaching its size has ever been driven under the Hudson River or any other river. The progress which could be maintained during the construction of this tunnel is a matter of conjecture. The one thing certain is that the larger the tunnel, the greater will be the uncertainties and difficulties of construction, and the slower will be the progress. In the estimated cost of $12,000,000, submitted to the commissions, provision is made for only one shield. In order to build this tunnel in a period of three years, it would require an average daily progress of more than double that attained in driving the Pennsylvania tunnels under the Hudson and East rivers or the recent rapid-transit tunnels under the East River—an impossible supposition.

Summary.—As designed, the tunnel would float if it could be built as shown upon the plan.

As designed, the tunnel would be placed with its top even with the government improvement plane and would therefore be without any protective covering and consequently unsafe.

With the unprecedented diameter proposed for the tunnel in question, if built as shown, the vehicular capacity would be that of two lines of traffic or the same as that of the cast-iron twin tunnel approved by the commissions.

The proposal to build a tunnel of unprecedented diameter, of untried materials, abandons all that experience in tunnel building has taught in the gradual development to the present state of knowledge and enters upon a new field of uncertainty.

It is useless to discuss seriously the details of the cost of a structure that experience shows cannot be built, but the errors shown in the estimate of cost of the proposed structure point to no possible economy in the kind of construction proposed.

C. M. HOLLAND, Chief Engineer.

STRENGTH OF CONCRETE BLOCK TUNNEL PROJECT REVIEWED BY W. J. WILGUS

Subsequent to the reply to Chief Engineer Holland, a further statement on the subject was presented for the Board of Consulting Engineers by William J. Wilgus, chairman, at a public hearing on the tunnel held in Newark, March 4, 1920. Of this statement, portions criticize the location of the New York approach of the Goethals tunnel, the inadequacy of roadway width provided (22½ ft.) if three lines of traffic are to be carried, the high cost of ventilation on account of providing only two shafts between portals, the insufficiency of the estimated cost, and the operating costs. It deals with the subject of tunnel design substantially as follows:

Nature of Material:

Views have been expressed by the patentee of the pre-cast concrete lining and differential pressure shield, to the effect that the material through which the tunnel is to pass is stiff clay of sufficient hardness to prevent the distortion of the tunnel, provided the annular space between the exterior of the tunnel and the surrounding material is filled with a gravel-grout as the shield progresses.

Apart from the opinion of members of the Board of Consulting Engineers, whose experience with this material leads them to disagree with the patentee, there are high authorities who have placed on record their observations which are contrary to those expressed by him.

At the Detroit River Tunnel, in the general region where the patentee states that he has recently constructed a tunnel lined with his blocks, the stiff blue clay weights 135 lb. per cu.ft. and carries from 15 to 18 per cent of moisture. Ordinary soft clays which would be more plastic and hence less firm than the material claimed by the patentee to underlie the North River, will average 120 lb. per cu.ft. Prof. G. H. Cook in 1874 determined the specific gravity of a large series of clays from New Jersey and gave their maximum weight as 135 lb. per cu.ft., their average weight 114 lb. and their minimum weight 96 lb.

What do we find from actual experience are the characteristics of the material through which it is proposed the tunnel shall be built? In the report made by General Raymond on the North River tunnels of the Pennsylvania R.R., many references to this subject by himself and his associates are to the effect that this material is "fluid silt" weighing from 78 to 80 lb. per cu.ft. at the bottom of the river and increasing to about 100 lb. at the depth of 40 ft.; also, that experiments show that this silt, weighing up to 98 lb. per cut.ft., causes objects lighter than it to rise immediately, though very slowly. Other observations reported by him were to the effect that the weights of the material surrounding the Pennsylvania R.R. North River tunnels would average 108 lb. per cu.ft. Mr. Charles M. Jacobs describes the material through which the Hudson River tunnels of the Hudson & Manhattan R.R., were built as a silt containing about 30 per cent water, weighing 103 lb. per cu.ft. and being in its natural state "very soft." Those interested in checking up the statements of the patentee and of General Goethals as to the nature of material encountered at the original Hudson River tunnel, should read the account thereof in Drinker's authoritative work on "Tunneling," pp. 961 *et seq.*

It will thus be seen that engineers of the highest reputation, who had charge of the building of the existing tunnels beneath the North River, describe the material in question, not as a hard or firm clay having high specific gravity and a comparatively small percentage of moisture, but as a silt having a specific gravity and a percentage of moisture that class it among the softest clays of the region.

Hence, it is evident that unbalanced pressures are to be anticipated through the river silt. Even in a greater degree unequal loads are to be anticipated inshore from the bulkhead lines where the material is less homogeneous.

Stresses:

As the material through which the tunnel is to pass is shown to be of an unstable nature, and unequal pressures therefore are to be encountered, the design must be such that the tunnel will safely resist such stresses without sufficient deformation to cause the joints of the blocks to open. With a 1 on 5 (11 deg. 19 min.) slope of the surrounding material, basing the forces on Rankine's theory of earth pressures, ignoring any reactive pressures and assuming that the concrete ring is a true elastic circle (an assumption which is more favorable than conceivably would be true), it is found that the tunnel stresses are as follows: Maximum compression in the ring 1,000 lb. per sq.in.; maximum tension in the ring 400 lb. per sq.in.; shear in the lugs, assuming uniform distribution of the load, 1,192 lb. per sq.in. As permissible stresses in concrete, under the building code of New York, are 500 lb. in compression, zero in tension and 40 lb. in shear, it is apparent that the stresses found to be present in this design are grossly excessive.

It should be realized that the perfect fit of the blocks assumed in making these calculations is not obtainable in practice, and that unescapable irregularities and the non-elastic deformation of the circle due to the unbalanced pressures would bring even greater stresses into play. However, the stresses shown are far in excess of those permitted in approved practice and in fact are such that the tunnel, if constructed, would collapse.

Durability of Structure:

Experience has shown that concrete structures suffer disintegration when exposed to the infiltration of acid-bearing waters. The underground waters on the New Jersey side of the North River are known to be thus affected and it is possible, if not probable, that the vehicular tunnel will be exposed to this destructive agency, which a concrete block structure with its thousands of vulnerable joints would be peculiarly unadapted to resist.

Proposed Type of Shield:

With the 42-ft. diameter tunnel it is proposed to use a shield having four horizontal compartments carrying differential air pressures, on the theory that by setting the face of each compartment 3 ft. back of the one below, the higher air pressure in the latter will pass vertically through the ground without a backward movement against the face above. This theory ignores the presence of cracks in the material which follow each shove of the shield; also the presence of obstructions such as piles, large boulders, sunken vessels, etc., which offer channels for the air from the lower faces to the upper ones in such manner as to equalize the air pressure on the entire face. In practice, therefore, this device would become an ordinary single-pressure shield in which the air pressure necessary to exclude the entry of water at the bottom of the shield would be greatly in excess of that required at the top, with resultant blowouts. Moreover, the differential-pressure shield has serious disadvantages, such as the need of successive sawing off of piles and other obstructions as the shield advances, because of the projection of the lower stages of the shield beyond the upper ones. Also, experience has shown that shields rotate, which means that the floors of the compartments instead of remaining horizontal, would gradually tip in such manner as to become unworkable and also bring about the equalizing of the air pressures which this design is proposed to obviate. There are other practical objections to this type of shield, the most important of which are the danger to the men in the working chambers in case of an inrush of water and the practical certainty that many blocks, with their unavoidable slight irregularities, would be broken under the enormous jack pressures.

O'ROURKE ON TUNNEL COSTS

To bring out the cost comparison of concrete-block and cast-iron lining directly, J. F. O'Rourke presented at the hearing of March 4, 1920, estimates for a pair of 31-ft. tunnels with 33-in. concrete-block lining, and corresponding estimates for the pair of 29-ft. cast-iron tunnels of the official plan. These estimates follow.

In both, the tunnels are assumed each to be 9,000 ft. long of full cross-section, thereby allowing for the cost of approaches. Different types of ventilating shaft are estimated in the two cases, a steel caisson of full shaft size for the cast-iron tunnels, and an open shaft surrounded by a concrete caisson cofferdam for the concrete-block tunnels. The price of the former is computed in 1915 (pre-war) basis from the unit-prices paid for the steel caissons of the 14th St. rapid-transit tunnel, in New York ($49.30 and $51.40 per cu.yd. gross). The open-shafts are estimated as: 12,000 cu. yd. concrete caissons at $30; 2,000 cu. yd. walls and floors at $25, and 20,000 cu.yd. general excavation at $2; a total of $450,000 for two shafts.

CHIEF ENGINEER'S TWIN CAST-IRON TUNNELS

Areas:	Sq.ft.	
30 ft. dia	706.86	
29 ft. dia	660.52	
25 ft. 6 in. dia	510.70	concrete
28 ft. 2 in. dia	623.10	

Quantities per Lineal Foot:
26.2 cu.yd. excavation.
Cast-iron lining, 8 tons.
4.16 cu.yd. concrete.

Cost per Lineal Foot:		
26.2 cu.yd. excavation	@$10.00	$262.00
4.16 cu.yd. lining concrete	15.25	63.44
2½ cu.yd. interior concrete	15.25	38.12
8 tons cast-iron lining	73.25	586.00
640 lb. bolts	0.10	64.00
500 lb. steel beams	0.05	25.00
Sundries		50.00
		$1,098.56

General Items:	
Power houses	$800,000
Power	400,000
60,000 cu.yd. shafts @$50	3,000,000
8 ventilating plants	400,000
8 shields	800,000
	$5,400,000
Cost of Tunnel:	
1,100 x 18,000 =	$19,800,000
	$25,200,000
20 per cent	5,040,000
Total estimated cost	$30,240,000
Chief Engineer's estimate	22,262,000
Difference of estimates for cast-iron tunnels	$7,978,000

TWIN TUNNELS WITH CONCRETE BLOCKS

Areas:	Sq.ft.	
32 ft. dia	804.25	
25 ft. 6 in. dia	510.71	concrete
31 ft. dia	754.77	

Quantities per Lineal Foot:
29.80 cu.yd. excavation.
9.04 cu.yd. concrete lining.

Cost per Lineal Foot:		
29.8 cu.yd. excavation	@$10.00	$298.00
9.04 cu.yd. concrete lining	15.00	135.60
2½ cu.yd interior concrete	15.25	38.12
560 lb. steel rods and washers	0.10	56.00
500 lb. steel beams	0.05	25.00
Sundries		50.00
		$602.72

General Items:	
Power houses	$800,000
Power	350,000
2 shafts	450,000
2 ventilating plants	150,000
4 shields	400,000
	$2,150,000
Cost of Tunnel:	
600 x 18,000 =	$10,800,000
	$12,950,000
20 per cent	2,590,000
Estimated total cost with concrete blocks	$15,540,000
Estimated total cost with cast-iron lining	30,240,000
Estimated saving with concrete blocks	$14,700,000

Planning and Progress on a Big Construction Job—II

How Charts Kept During the Building of the Philadelphia Army Base Showed Performance in Various Details of the Engineering Work

By Charles Penrose
Progress Engineer Day & Zimmermann, Inc., Engineers, Philadelphia, Pa.

In THE preceding section of this article were described the Materials Charts, the Labor Charts and a reference made to the Administrative Charts which were developed by the Progress Department, so called, at the Army Supply Base at Philadelphia, and some explanation was given of the mechanism by means of which the progress work was carried on. In this succeeding part of the article will be described the Charts of Work Progress and Engineering Data, and some explanation given of the planning of the work, from week to week, during the process of construction.

Reporting of Physical Progress

The reporting of physical progress in the field at the Philadelphia port terminal development was obviously the backbone of the Progress Department's work, and it was made to embrace all of the major constructional operations, such as dredging, pile-driving and wharf work, concreting, bricklaying and other building construction, power-plant erection, etc.

As a first step, the Government reservation was divided off into zones. A *progress plan for each zone* was drawn up, and these were reported from postings made each week directly in the field. Such a plan, for the zone in which are located the large piers and warehouses at the Base (Fig. 8), exhibited the physical progress in that zone to the date of report, in terms of a legend of progress symbols also given. By using colors, progress made during the week immediately preceding the date of report was distinguished from progress made previously. It was found convenient also to indicate the location of all temporary buildings, and these were numbered and tabulated in a roster on the respective zone plan.

Complementary to the *progress plan* were the *longitudinal sections of the warehouse buildings*, reported weekly also in color. Similarly, these were brought up to date by postings made directly in the field.

In the other zones of the Government reservation, the same general method of reporting was employed; namely, by *progress plans*. However, these, while they gave complete general information to the date of report, and in a sense gave a "bird's-eye view" of the work, did not and were not intended to give analyses of the component operations, nor could they indicate the rate of progress.

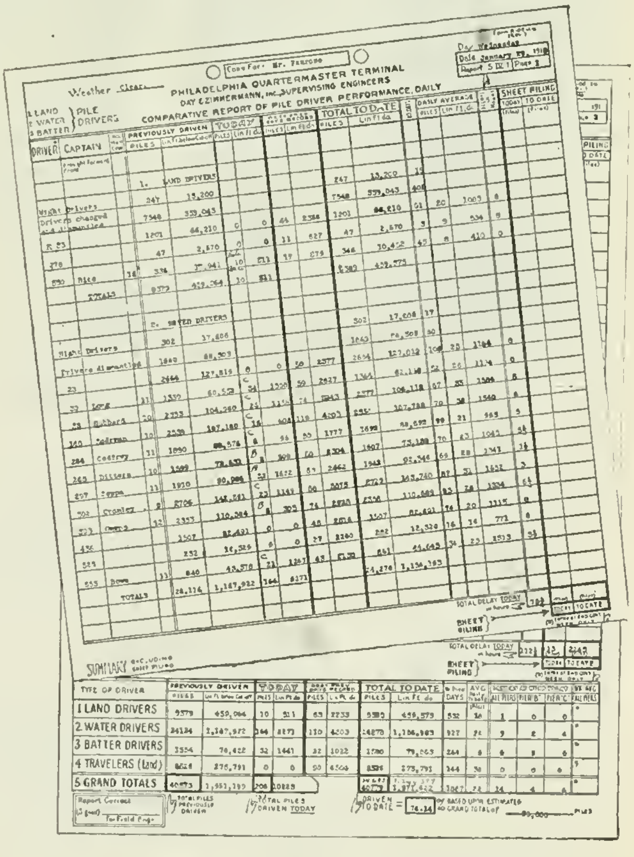
Analyses of construction progress, the work schedules, and where and how the various parts of the project either were going ahead of or falling behind the Government program, were given in the *graphical charts*. These graphical charts, to be later described, included the major operations of dredging, pile-driving, etc.

For a basis for the graphical curves, as well as a means to keep in immediate touch with all work, comprehensive *daily reports were compiled in statistical form*, adapted to analysis. The form of report for daily performance of piledrivers is reproduced in Fig. 9, that for dredges in Fig. 11, and that for concrete mixing plants in Fig. 14. All are reproductions of actual reports, and in each case the date is indicated.

In all of these operations, the various crews engaged in the same kind of work were pitted against one another in good-natured competition, and the daily performances, best records and averages, as given in the reports were publicly posted by the Constructing Quartermaster every 24 hours.

Referring to the piledriver form in Fig. 9, the report is observed to have been made up in terms both of number of piles driven per crew and equivalent linear feet of piling measured below the point of "cut-off" of the pile. What had been driven previous to date of report, what was driven that day, and the total to date and the number of days at work, were shown *by crews;* as well as each crew's best previous day's record, and particularly the daily average performance of each to date. It was an easy matter to classify these statistics according to type of piledriver, whether land drivers, water drivers (floating machines), batter or spur piledrivers and land traveling rigs. This was done in the summary which appears in lower portion of the report, and gave opportunity for better comparison of the results of the day's work with past performances.

In all three of the forms reproduced here the emphasis is apparent as laid on *daily average performance* of piledriver crews, or of dredges, or of concrete-mixer plants, rather than especial importance being attached to sporadic day's "records." Averages rather than record performances tell the true story.



PHILADELPHIA QUARTERMASTER TERMINAL
DAY & ZIMMERMANN, INC., SUPERVISING ENGINEERS
COMPARATIVE REPORT OF PILE DRIVER PERFORMANCE, DAILY

Weather Clear

1 LAND
2 WATER
3 BATTER } PILE DRIVERS

FIG. 9. REPORT FORM FOR DAILY PILEDRIVER PERFORMANCE

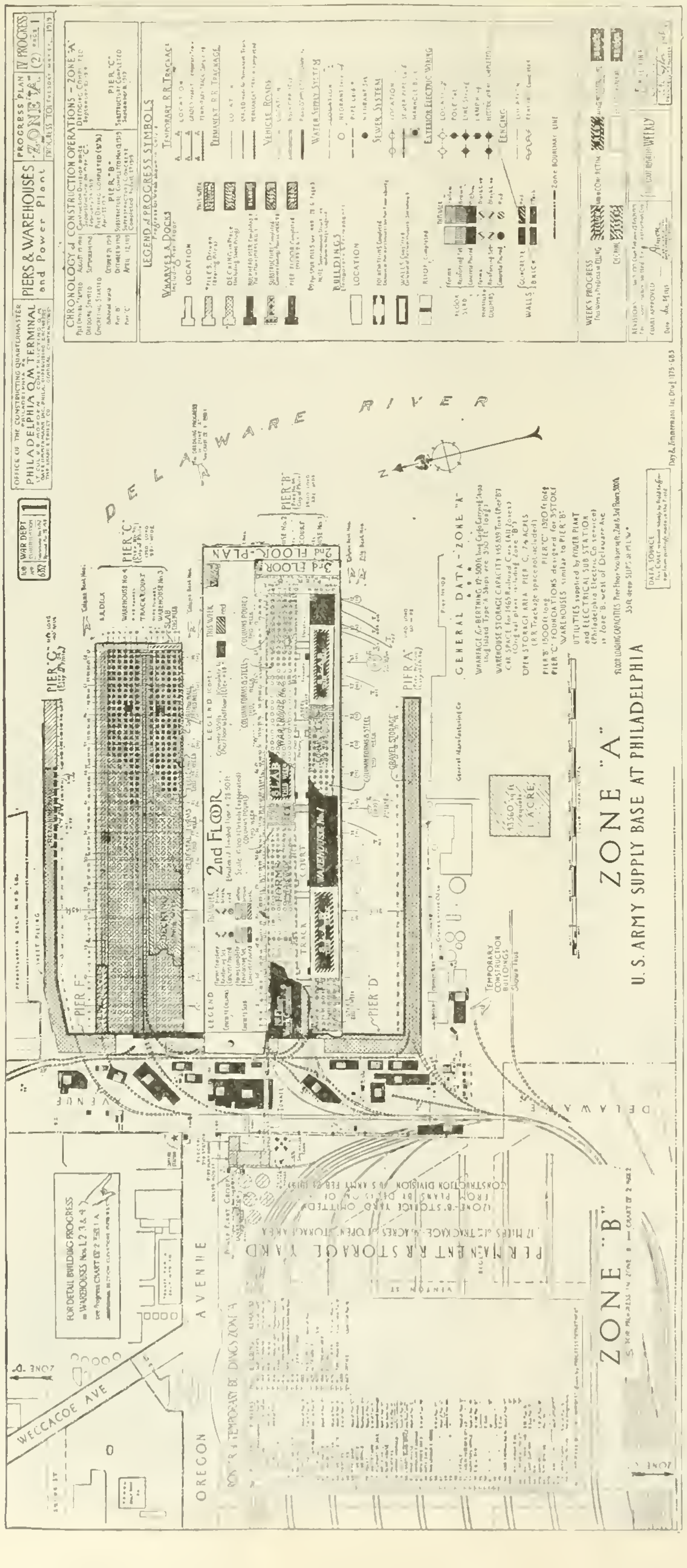


FIG. 8. WEEKLY PROGRESS PLAN FOR ZONE "A" AT PHILADELPHIA ARMY BASE

Showing status of construction at close of Government week ended May 27, 1919. Progress shown graphically by symbols given in legends. Colored portions (indicated in this reproduction by heavy cross-hatch on black background) denoted progress during the week immediately preceding the date of report, as distinguished from progress made previously. By use of "overlay" blue-printed sheets as shown, progress was indicated on each of the three floor elevations of the two Pier "B" warehouse structures. For example: In warehouse No. 1 the third-floor plan indicates that the section of floor slab (shown black) from river-end of structure to Column Bent 72 had been previously completed and that the slab (cross-hatch) between Bents 72 and 59 was poured *this week*. Other stages in warehouse construction and elsewhere in this zone can be interpreted. The chart also indicates how the reinforced-concrete work was commenced at the river-end of each structure, and proceeded *inshore*. **The above reproduction is about *one-seventh* the size of the original blueprint.**

In the daily report for dredges (Fig. 11), made up in terms of yardage and dredge-hours, particular attention was given to the important feature of idle time of equipment, analyzed as to causes and whether the Government's liability or the contractors' liability.

On the other hand, in the daily report for concrete-mixing plants (Fig. 14), the classification of work done was according to location of pour and part of structure, because this allowed the percentage completion of the several structures to be shown on the basis of yardage. In the report the designations "F-1," "F-2," etc., found in column headed "Mach. No.," denote the *floating* concrete-mixer plants employed on this project. These consisted of material bins, mixer plants and gravity distributing towers all erected on floating barges.

As mentioned already, the statistical daily reports just referred to formed the basis for the *graphical charts of work progress*, and four of them will be described: those of pile driving, dredging, concrete work, and utilities progress.

The graphical chart of pile driving is shown in Fig. 10. A glance will admit that here little tracing cloth has been left blank—to go to waste. However, all of the data have a significance and these particular curves were among the closest watched.

For the reader that cares to go into further details, the chart will show a considerable number of features affecting the every-day performance of the driving of wooden piles, as well as over-all factors which, at the Greenwich Point project, largely governed progress and economy.

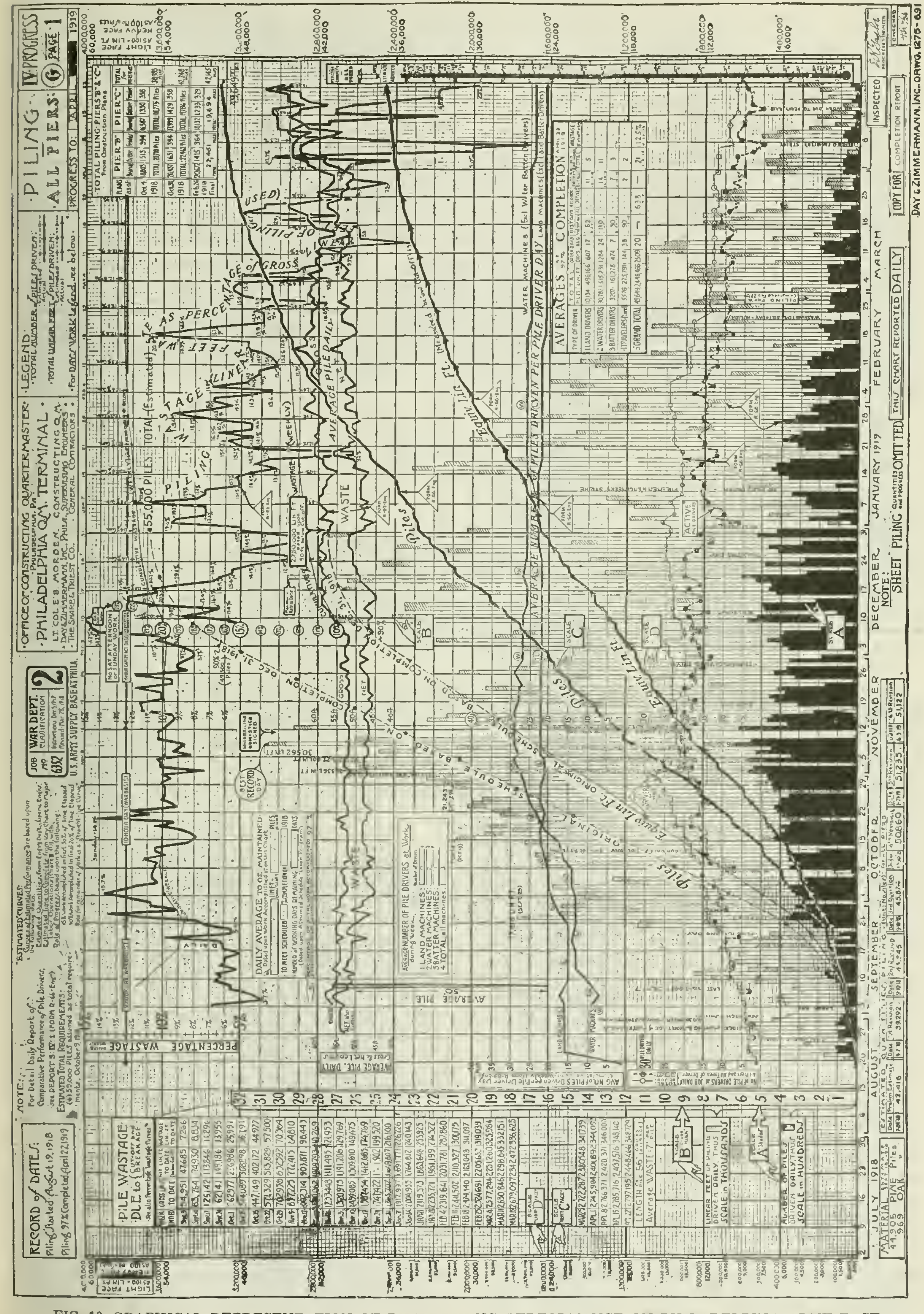
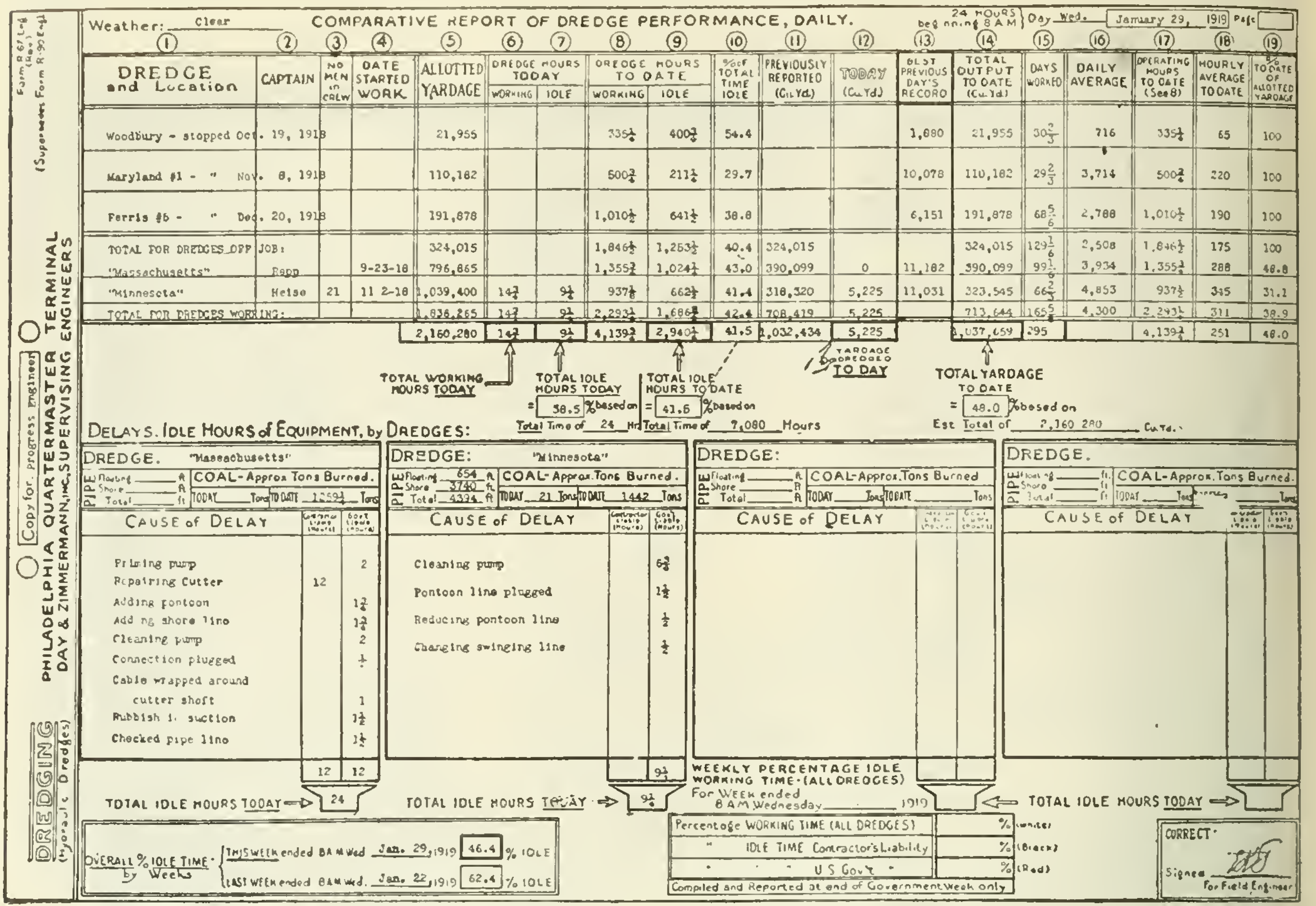


FIG. 10. GRAPHICAL REPRESENTATION OF PILE-DRIVING PERFORMANCE ON PHILADELPHIA ARMY BASE



Form R 67 L-4 (Rev.)
(Supersedes Form R-90 E-4)

Copy for Progress Engineer

PHILADELPHIA QUARTERMASTER TERMINAL
DAY & ZIMMERMANN, INC., SUPERVISING ENGINEERS

DREDGING
(Hydraulic Dredges)

Weather: Clear

COMPARATIVE REPORT OF DREDGE PERFORMANCE, DAILY.

24 HOURS beginning 8 A.M. } Day Wed. January 29, 1919 Page

①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲
DREDGE and Location	CAPTAIN	NO MEN in CREW	DATE STARTED WORK	ALLOTTED YARDAGE	DREDGE HOURS TODAY WORKING	DREDGE HOURS TODAY IDLE	DREDGE HOURS TO DATE WORKING	DREDGE HOURS TO DATE IDLE	% of TOTAL TIME IDLE	PREVIOUSLY REPORTED (Cu.Yd.)	TODAY (Cu.Yd.)	BEST PREVIOUS DAY'S RECORD	TOTAL OUTPUT TO DATE (Cu.Yd.)	DAYS WORKED	DAILY AVERAGE	OPERATING HOURS TO DATE (See 8)	HOURLY AVERAGE TO DATE	% TO DATE OF ALLOTTED YARDAGE
Woodbury - stopped Oct. 19, 1918				21,955			$335\frac{1}{4}$	$400\frac{3}{4}$	54.4			1,880	21,955	$30\frac{2}{3}$	716	$335\frac{1}{4}$	65	100
Maryland #1 - " Nov. 8, 1918				110,182			$500\frac{3}{4}$	$211\frac{1}{4}$	29.7			10,078	110,182	$29\frac{2}{3}$	3,714	$500\frac{3}{4}$	220	100
Ferris #6 - " Dec. 20, 1918				191,878			$1,010\frac{1}{2}$	$641\frac{1}{2}$	38.8			6,151	191,878	$68\frac{5}{6}$	2,788	$1,010\frac{1}{2}$	190	100
TOTAL FOR DREDGES OFF JOB:				324,015			$1,846\frac{1}{2}$	$1,253\frac{1}{2}$	40.4	324,015			324,015	$129\frac{1}{6}$	2,508	$1,846\frac{1}{2}$	175	100
"Massachusetts"	Rapp		9-23-18	796,865			$1,355\frac{3}{4}$	$1,024\frac{1}{4}$	43.0	390,099	0	11,182	390,099	$99\frac{1}{6}$	3,934	$1,355\frac{3}{4}$	288	48.8
"Minnesota"	Heise	21	11 2-18	1,039,400	$14\frac{3}{4}$	$9\frac{1}{4}$	$937\frac{1}{8}$	$662\frac{1}{2}$	41.4	318,320	5,225	11,031	323,545	$66\frac{2}{3}$	4,853	$937\frac{1}{2}$	345	31.1
TOTAL FOR DREDGES WORKING:				1,836,265	$14\frac{3}{4}$	$9\frac{1}{4}$	$2,293\frac{1}{4}$	$1,686\frac{3}{4}$	42.4	708,419	5,225		713,644	$165\frac{5}{6}$	4,300	$2,293\frac{1}{4}$	311	38.9
				2,160,280	$14\frac{3}{4}$	$9\frac{1}{4}$	$4,139\frac{3}{4}$	$2,940\frac{1}{4}$	41.5	1,032,434	5,225		1,037,659	295		$4,139\frac{3}{4}$	251	48.0

TOTAL WORKING HOURS TODAY

TOTAL IDLE HOURS TODAY = 38.5 % based on Total Time of 24 Hr.

TOTAL IDLE HOURS TO DATE = 41.6 % based on Total Time of 7,080 Hours

YARDAGE DREDGED TO DAY

TOTAL YARDAGE TO DATE = 48.0 % based on Est. Total of 2,160 280 Cu.Yd.

DELAYS. IDLE HOURS of EQUIPMENT, by DREDGES:

DREDGE. "Massachusetts"

PIPE Floating ____ ft. Shore ____ ft. Total ____ ft.

COAL-Approx. Tons Burned. TODAY ____ Tons TO DATE $1259\frac{1}{4}$ Tons

CAUSE of DELAY	Contractor Liable (Hours)	Govt. Liable (Hours)
Priming pump		2
Repairing Cutter	12	
Adding pontoon		$1\frac{3}{4}$
Adding shore line		$1\frac{3}{4}$
Cleaning pump		2
Connection plugged		$\frac{1}{4}$
Cable wrapped around cutter shaft		1
Rubbish in suction		$1\frac{1}{2}$
Checked pipe line		$1\frac{1}{2}$
	12	12

TOTAL IDLE HOURS TODAY ⇒ 24

DREDGE: "Minnesota"

PIPE Floating 654 ft. Shore 3740 ft. Total 4394 ft.

COAL-Approx. Tons Burned. TODAY 21 Tons TO DATE 1442 Tons

CAUSE of DELAY	Contractor Liable (Hours)	Govt. Liable (Hours)
Cleaning pump		$6\frac{3}{4}$
Pontoon line plugged		$1\frac{1}{2}$
Reducing pontoon line		$\frac{1}{2}$
Changing swinging line		$\frac{1}{2}$
		$9\frac{1}{4}$

TOTAL IDLE HOURS TODAY ⇒ $9\frac{1}{4}$

DREDGE:

PIPE Floating ____ ft. Shore ____ ft. Total ____ ft.

COAL-Approx. Tons Burned TODAY ____ Tons TO DATE ____ Tons

CAUSE of DELAY	Contractor Liable (Hours)	Govt. Liable (Hours)

DREDGE.

PIPE Floating ____ ft. Shore ____ ft. Total ____ ft.

COAL-Approx. Tons Burned. TODAY ____ Tons TO DATE ____ Tons

CAUSE of DELAY	Contractor Liable (Hours)	Govt. Liable (Hours)

⇐ TOTAL IDLE HOURS TODAY ⇒

WEEKLY PERCENTAGE IDLE WORKING TIME-(ALL DREDGES)
For Week ended 8 A.M. Wednesday ____ 1919

Percentage WORKING TIME (ALL DREDGES)	%	(White)
" IDLE TIME Contractor's Liability	%	(Black)
" " " U S Gov't "	%	(Red)
Compiled and Reported at end of Government Week only		

OVERALL % IDLE TIME-by Weeks { THIS WEEK ended 8 A.M. Wed. Jan. 29, 1919 46.4 % IDLE
LAST WEEK ended 8 A.M. Wed. Jan. 22, 1919 62.4 % IDLE

CORRECT:
Signed ____
For Field Engineer

FIG. 11. REPORT FORM FOR DAILY DREDGE PERFORMANCE

The data shown graphically in Fig. 10 represents progress day by day over a period of eight months, in the driving of some 50,000 wooden piles in the piers and the warehouse foundations at the Philadelphia Base. As is seen, with a maximum of 27 piledrivers of all classes at the work simultaneously, somewhat over 2,500 piledriver days were consumed, giving an over-all average of 20 piles driven per day per crew, and a maximum of 638 piles driven in any one day by all crews. On this work of driving piles and its closely related dockbuilding, up to 1,300 men were engaged at one time. The chart shows both the schedule curves and the actual performance curves; in the former, the general formula for scheduled rate of progress was: 15 per cent of the work to be accomplished in the first 30 per cent of time elapsed, 10 per cent of the work to be accomplished in the final 20 per cent of time elapsed, and the rate of progress for remainder of work was to be along a "straight-line curve." How the shape of the actual curves approximated the schedule formula can be observed.

In addition are shown: Daily and average performances of pile driving (as distinguished from cumulative totals), average pile length, percentage wastage due to "cut-off" of pile, and data on number of machines at the job, both active and idle. Certain tabular data complete the chart.

A commentary of engineering interest may be made on the performance of certain large *traveling piledriver rigs* which were arranged for driving land piles from tracks that permitted travel of the driver for 25 ft. in one direction and 100 ft. in the lateral direction. These large machines mounted on trucks could drive some 160 piles without a new set-up of the long 100-ft. tracks, yet their *average* performance over the period during which they were employed was only 38 piles driven per day, their best performance being 90 piles per day. It was to show exactly what conditions were in such facts as these that the Progress Department fulfilled one of its functions in respect to work progress.

CHARTS OF DREDGING

The operation of dredging for the deep-water docks at the Base entailed the removal of close upon 2,000,000 cu.yd. of material, and required that two cuts be made because of the depth of final dredging plane. The operation was carried through with as many as four hydraulic dredges at work at one time in the Delaware River, discharging into 300 acres of impounding basins.

In the graphical chart in Fig. 12, is given the daily record of about a year's work of dredging. The two prominent curves are those of yardage dredged daily—a heavy jagged curve, and of total yardage dredged to date. The smooth curve or original schedule on a war basis may be observed, and subsequent schedule revisions. Also, there is the light jagged curve of daily average performance, by weeks.

At the bottom of the chart are recorded also, by weeks, the percentages of working and idle time for all dredges. This resolved itself into *three percentages* which are shown by rectangular areas. These are: Dredge working time; idle time for which the contractor was liable; and idle time for which the Government was liable. A curve of percentage of total idle time for all dredges, taken cumulatively, is seen superimposed upon the three sets of areas just described.

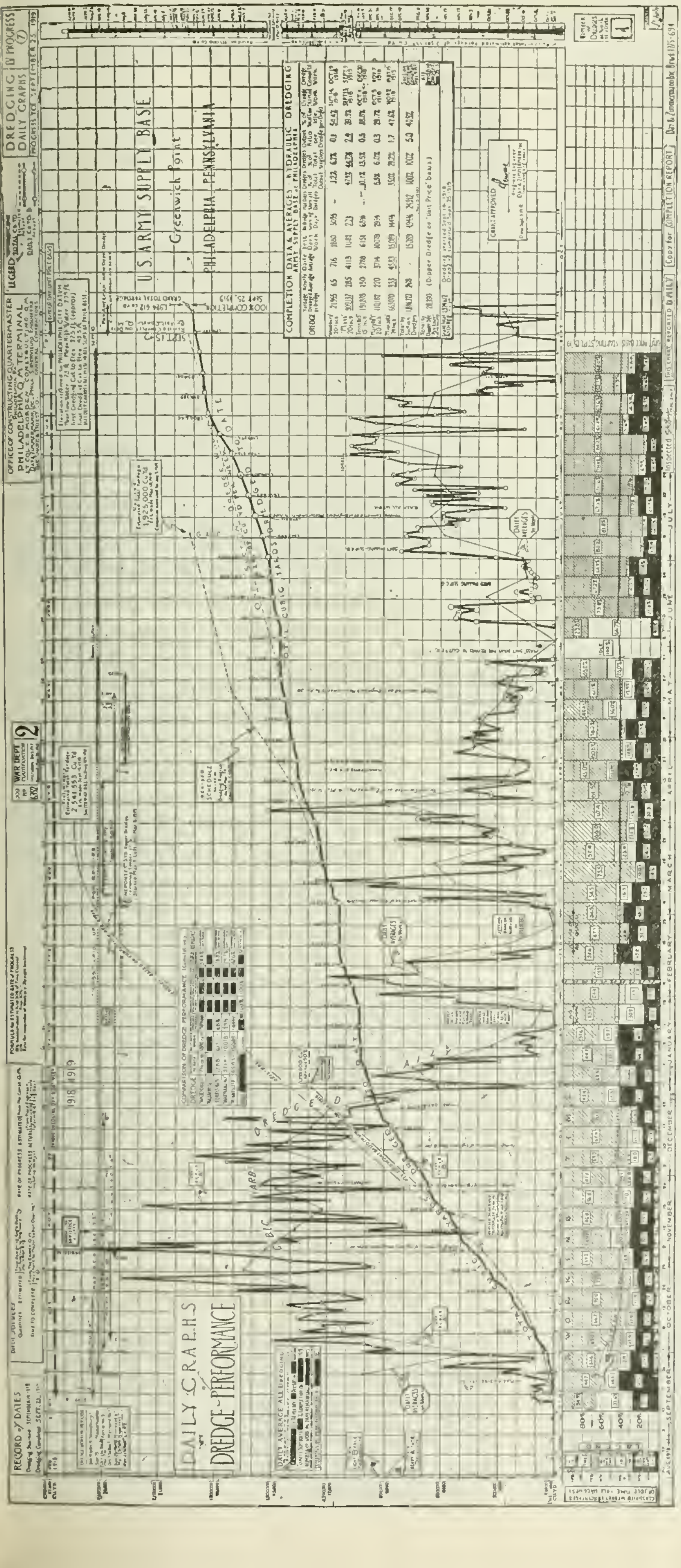


FIG. 12. GRAPHICAL REPRESENTATION OF DREDGING PERFORMANCE ON PHILADELPHIA ARMY BASE

It is of interest to note some of the final averages shown in the table in right of chart: Hourly average, per dredge 268 cu.yd.; best day's work, any dredge 15,089 cu.yd.; number dredge working days 494; maximum day's work, all dredges 24,912 cu.yd.; percentage of total idle time, all dredges 40.9 per cent.

In addition to the graphical chart just described, the Progress Department compiled *progress plans of dredging.* These showed, by means of washes in color, the extent and depth of the cut and the extent and level of the fill. The same plans gave the progress of diking around impounding basins ashore, and of laying pipe lines, often a mile long.

CONCRETE WORK

In order to schedule and follow up the mixing and placing of some 120,000 cu.yd. of concrete in the project as curtailed to the needs of peace, the curves given in Fig. 13 were made use of. The curves for the 1,500-ft. pier "B" show a division into the quantity of concrete placed in the substructure or pier, and the quantity placed in the 3-story superstructure or warehouses. The curves for the 1,320-ft. Pier "C" show the substructure only, because these warehouses were omitted after the signing of the armistice.

As indicated earlier in this article, two kinds of gravity mixing and placing plants were used: Floating plants, and stationary plants ashore. Plant performance curves in terms of yardages poured each week, are given in the lower portion of Fig. 13. Over-all figures at completion occupy the tables that are shown.

To follow up the installation of the heating system, the plumbing system, the fire sprinkler system, and the electrical wiring system, a utilities chart (not shown here) was developed. It expresses in percentages the respective amounts of materials in place in the various sections of the two warehouses, each divided into 300-ft. sections between firewalls, and taken by floors. Over-all percentage completion is indicated in thermometer scales. Actual lengths in place, to scale, are shown directly below the diagram of each warehouse building. Diagrammatic plans of the several system layouts complete the chart.

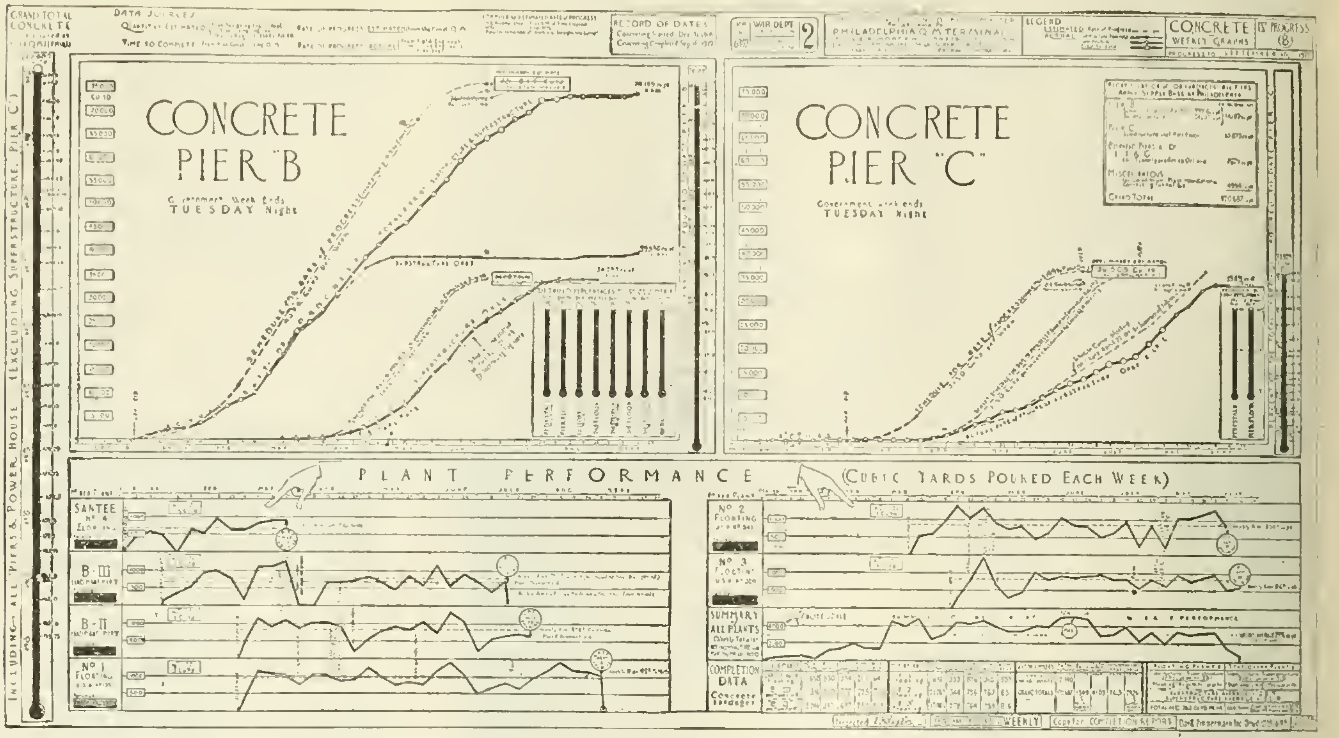
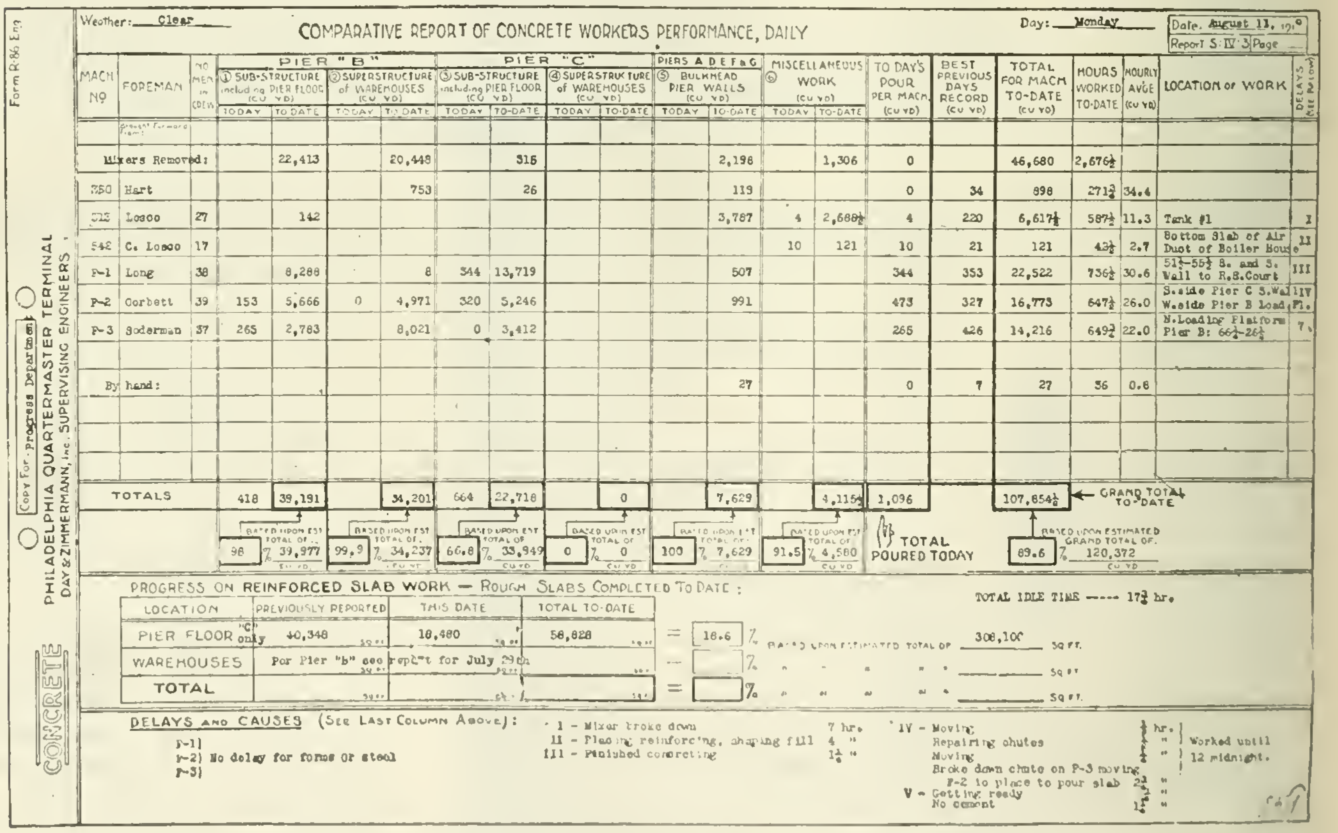


FIG. 13. GRAPHICAL REPRESENTATION OF CONCRETING PERFORMANCE ON PHILADELPHIA ARMY BASE


Form R-86 Eng

Copy For Progress Department

PHILADELPHIA QUARTERMASTER TERMINAL
DAY & ZIMMERMANN, Inc. SUPERVISING ENGINEERS

CONCRETE

Weather: Clear

COMPARATIVE REPORT OF CONCRETE WORKERS PERFORMANCE, DAILY

Day: Monday

Date. August 11, 1919

Report S-IV-3 Page

MACH No	FOREMAN	No MEN in CREW	PIER "B" ① SUB-STRUCTURE including PIER FLOOR (CU YD) TODAY	PIER "B" ① TO DATE	PIER "B" ② SUPERSTRUCTURE of WAREHOUSES (CU YD) TODAY	PIER "B" ② TO DATE	PIER "C" ③ SUB-STRUCTURE including PIER FLOOR (CU YD) TODAY	PIER "C" ③ TO-DATE	PIER "C" ④ SUPERSTRUKTURE of WAREHOUSES (CU YD) TODAY	PIER "C" ④ TO-DATE	PIERS A D E F & G ⑤ BULKHEAD PIER WALLS (CU YD) TODAY	⑤ TO-DATE	⑥ MISCELLANEOUS WORK (CU YD) TODAY	⑥ TO-DATE	TO DAY'S POUR PER MACH (CU YD)	BEST PREVIOUS DAYS RECORD (CU YD)	TOTAL FOR MACH TO-DATE (CU YD)	HOURS WORKED TO-DATE	HOURLY AVGE (CU YD)	LOCATION OF WORK	DELAYS (SEE BELOW)
	Brought Forward From:																				
Mixers Removed:				22,413		20,448		315				2,198		1,306	0		46,680	2,676½			
350	Hart					753		26				119			0	34	898	271¾	34.4		
313	Losco	27		142								3,787	4	2,688½	4	220	6,617½	587½	11.3	Tank #1	I
542	C. Losco	17											10	121	10	21	121	43½	2.7	Bottom Slab of Air Duct of Boiler House	II
P-1	Long	38		8,288		8	344	13,719				507			344	353	22,522	736½	30.6	51½-55½ S. and S. Wall to R.S.Court	III
P-2	Corbett	39	153	5,666	0	4,971	320	5,246				991			473	327	16,773	647½	26.0	S.side Pier C S.Wall W.side Pier B Load.Pl.	IV
P-3	Soderman	37	265	2,783		8,021	0	3,412							265	426	14,216	649¾	22.0	N.Loading Platform Pier B: 66½-26½	V
By hand:												27			0	7	27	36	0.8		
TOTALS			418	39,191		34,201	664	22,718		0		7,629		4,115½	1,096		107,854½				
			98 %	BASED UPON EST TOTAL OF 39,977 CU YD	99.9 %	BASED UPON EST TOTAL OF 34,237 CU YD	66.8 %	BASED UPON EST TOTAL OF 33,949 CU YD	0 %	BASED UPON EST TOTAL OF 0 CU YD	100 %	BASED UPON EST TOTAL OF 7,629 CU YD	91.5 %	BASED UPON EST TOTAL OF 4,580 CU YD	TOTAL POURED TODAY		89.6 % BASED UPON ESTIMATED GRAND TOTAL OF 120,372 CU YD				

← GRAND TOTAL TO-DATE

PROGRESS ON REINFORCED SLAB WORK — ROUGH SLABS COMPLETED TO DATE:

TOTAL IDLE TIME ---- 17¾ hr.

LOCATION	PREVIOUSLY REPORTED	THIS DATE	TOTAL TO-DATE		
PIER FLOOR "C" only	40,348 SQ FT	18,480 SQ FT	58,828 SQ FT	= 18.6 %	BASED UPON ESTIMATED TOTAL OF 308,100 SQ FT
WAREHOUSES	For Pier "b" see report for July 29th SQ FT	SQ FT	SQ FT	= %	" " " " " SQ FT
TOTAL	SQ FT	SQ FT	SQ FT	= %	" " " " " SQ FT

DELAYS AND CAUSES (SEE LAST COLUMN ABOVE):

P-1)
P-2) No delay for forms or steel
P-3)

I - Mixer broke down 7 hr.
II - Placing reinforcing, shaping fill 4 "
III - Finished concreting 1¼ "

IV - Moving ¼ hr.
Repairing chutes ¼ "
Moving ¼ " Worked until 12 midnight.
Broke down chute on P-3 moving P-2 to place to pour slab 2½ "
V - Getting ready ½ "
No cement 1¼ "

FIG. 14. REPORT FORM FOR DAILY CONCRETING PERFORMANCE

The detail planning necessary to prepare and revise schedules has not been more than touched upon in this article; and adequate description would entail elaboration on many factors and local conditions. Some of the factors considered were: Material situation, labor supply, unit production both of construction equipment and labor gangs, expected weather conditions (based on records of the Weather Bureau at Philadelphia during the past 35 years), degree of protection to some parts of the work against low temperature, special features of construction, working hours, general plant organization, etc. —and always, the analysis made not only of the work as a whole, but of the component parts and their correlation. Conference on these matters between members of the three organizations in the field served well to co-ordinate effort.

The results only, of all of this, are given in the various schedule curves and were found in many detail working schedules not shown.

* * *

Progress work on anything like the scale to which it was carried out at the Philadelphia Base is desirable only to be applied to construction projects of magnitudes that compare with this port terminal development. In the particular case, the gain secured in co-ordination warranted the extensiveness of the report system, and the Progress Charts served as guides alike for the Constructing Quartermaster, the executive heads of the two other organizations in the field, and the headquarters in Washington of the Construction Division of the Army. The charts were made the subject of study in conference at the project.

The reader may have observed that all of the classes of Progress Reports have not been discussed nor reproduced in this article, for reasons which are obvious. And, indeed, permission on the part of the Construction Division of the Army to include those of the charts which have been described is cordially appreciated, and the writer personally wishes especially to make acknowledgment of the Constructing Quartermaster, through whom permission was secured.

More might be written descriptive of the progress work in general at the Supply Base at Philadelphia; it was a work of evolution that required some degree of study of changing conditions at a time when actually every day counted in the stress of military preparation against the Hun. But while more might be set down, it is felt that the charts can best speak for themselves—as the permanent records of an Army construction job which ranks among the big U. S. war projects.

Railway Engineers of A. A. E. Hold Second Conference

Employment, Compensation, Efficiency and Economy in Railway and Public Service Discussed at Chicago Meeting

Fifty railway chapters established in the first year's work is the record of the railway campaign of the American Association of Engineers, as explained at its second railway conference held in Chicago March 15. Engineers' compensation and their opportunities under the new railway law were the main topics of the discussion. Provisions of the law relative to compensation and classification were outlined by the secretary, C. E. Drayer, and a telegram was sent to Washington urging the appointment of C. E. Lindsay as an engineer member of the Labor Board created to deal with matters of compensation.

Relations between railway engineers and railway managements were dealt with in a paper by Major Hill, who stated that the failure to assign proper authority to the engineer has worked against the interests of both the engineers and the railways. Proper relations between the operating officials and the engineering department, it was pointed out, depend upon the following factors: Organization, with the lines of executives and technical supervision clearly drawn; adequate engineering staff and its proper distribution, and assignment of authority and responsibility to the engineer.

In discussing the future railway work of the association, G. W. Hand, Chicago & Northwestern Ry., suggested that the sections should procure and discuss the operating and other statistics of their roads in order to broaden the ideas of the younger men and beginners, showing them how the engineering department is related to the wider phases of railway service. Managements should realize the advantages of changing the department organization as little as possible, so that men may see opportunities of permanent employment and of advancement. This same view of permanency of employment was presented by F. E. Morrow, Chicago & Western Indiana R.R., while J. B. Jenks, Baltimore & Ohio R.R., stated that with such a permanent system the various positions must be graded and qualifications established for each grade.

Classification and Compensation

Classification and compensation of engineers in general was reviewed by a committee from Engineering Council composed of Arthur S. Tuttle, New York; Col. Bion J. Arnold, Chicago; and Oscar C. Merrill, Washington, D. C. Mr. Tuttle presented the classification of professional service adopted in December, 1919, by Engineering Council. He predicted an active period of railway work, with proper financial reward for the engineers. Co-operation between the American Association of Engineers and Engineering Council was the theme of Colonel Arnold's argument.

The serious losses of the government departments by continually increasing resignations of technical men, due to inadequate pay, were touched upon by Mr. Merrill. He suggested that every position ought to pay not only a living wage but also "the amount necessary to secure and retain employees having the training, experience and personal qualities requisite for the effective performance of the duties of the position."

Problems confronting the railways on their return to private control were discussed by S. M. Felton, president of the Chicago Great Western R.R. Inadequacy of railway facilities is the most important circumstance now affecting transportation. During the past 4½ years freight and passenger traffic has increased 45 per cent, while rolling stock and other facilities have increased only 2 per cent.

Plans for future work in the railway field, according to J. R. Leighty, Missouri Pacific R.R., must provide for increasing the value of the engineer's services, selling that valuable service at the highest price and guaranteeing that the employer will get the service for which he pays this high price.

New York's Highway Bridges

In an address before the highway transport conferences given in connection with the National Motor Truck Show in New York City, H. Eltinge Breed asserted that "bridges have lagged furthest behind in improvement, because they are not regarded as an integral part of the highway system. In long roads that are bearing 14-ton loads you constantly meet bridges designed for only 10-ton loads. Mr. Breed asserted that in New York State there are 33,775 bridges, and of a total of 251 on three main traveled routes from the Pennsylvania State line to New York City but 115 are built for 15 tons or over; seventeen and one half per cent of them are built for less than a 5-ton load, and 23 of them would stand less than 3 tons.

Concrete-Beam Diagram with Top and Bottom Steel

Though Mainly for Both Tension and Compression Reinforcement Can Be Used With Tensile Steel Only

By Arthur G. Hayden
Office of State Engineer and Surveyor, Albany, N. Y.

COMMON methods of concrete-beam diagram construction require a set of several diagrams for the complete analysis of concrete beams which are reinforced for both tension and compression. For example, the arm of the resisting couple being a function of three independent variables, (1) the tensile steel ratio, (2) the compressive steel ratio and (3) the ratio of the distance of the compressive steel from the compression face of the beam to the total depth, a diagram for *each* of several values of one of the variables, say (3), is usually given for determining the arm of the resisting couple in terms of the other two variables. For intermediate values of the third variable interpolation is necessary.

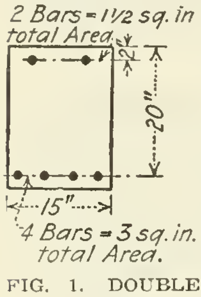


FIG. 1. DOUBLE-REINFORCED BEAM

The accompanying pair of diagrams is so constructed that the following properties of concrete beams with any percentage of tensile reinforcement and any percentage of compressive reinforcement, however located with respect to the compressive face of the beam, may be obtained, viz.:

1. The ratio of the unit stress in the steel to the unit stress in the concrete.
2. The ratio of the distance of the neutral axis from the compressive face of the beam to the total affective depth of the beam.
3. The ratio of the arm of the resisting couple to the total effective depth of the beam.

The stress in the concrete is assumed to follow the linear law and tension in the concrete is neglected. The ratio of the modulus of elasticity of steel to the modulus of elasticity of the concrete is taken as 15.

In the following discussion, standard notation, as indicated on the diagrams, is used. The use of the diagrams is best illustrated by examples.

Required the carrying capacity of a beam, as shown in Fig. 1, in which the tensile steel ratio p is 0.01, and the compressive steel ratio p' is 0.005, the compressive steel being so located that $d'/d = 0.1$.

Values of p are plotted on the left-hand vertical ordinate and values of p' in the right-hand vertical ordinate of each diagram. Pass a straight-edge through the points $p = 0.01$ and $p' = 0.005$ of the upper diagram. At the intersection of the straight-edge with the line $d'/d = 0.1$ read off, on the lines radiating from the point $p' = 0$, $r (= f_s/f_c) = 24.5$. In like manner obtain from the lower diagram $j = 0.88$. The moment

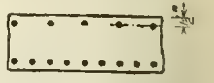


FIG. 2. DOUBLE-REINFORCED SLAB

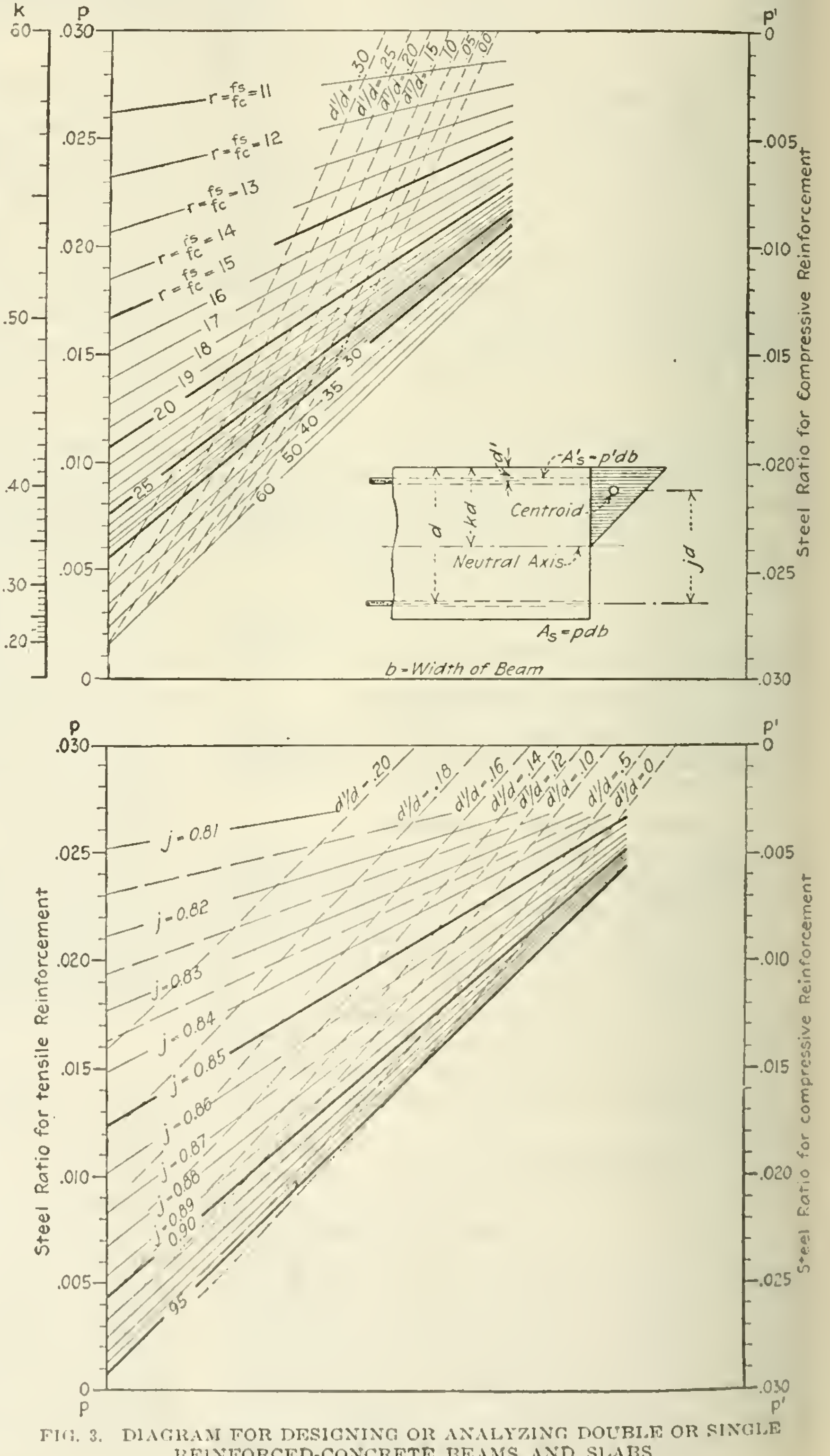


FIG. 3. DIAGRAM FOR DESIGNING OR ANALYZING DOUBLE OR SINGLE REINFORCED-CONCRETE BEAMS AND SLABS

value of the beam, as determined by the tensile steel, at 16,000 lb. per square inch = 0.88 × 20 × 3 × 16,000 = 845,000 in.-lb.

The corresponding unit stress in the concrete = $\frac{16000}{r} = \frac{16000}{24.5} = 640$ lb. per square inch. If the allowable unit stress in the concrete were to be limited to 600 lb. per square inch or $\frac{1}{27}$ of the stress in the steel, the moment value of the beam, as determined by the concrete, would be expressed as $\frac{24.5}{27} \times 0.88 \times 20 \times 16{,}000 = 775{,}000$ in.-lb.

If the value of k is desired it may be found from the upper diagram as follows:

From the intersection of the straight-edge with the proper line of d'/d follow the direction of the r lines (radiating from the point $p' = 0$), to the left-hand vertical ordinate, thence horizontally to the vertical scale for k, from which its value may be read off. For $p = 0.01$, $p' = 0.005$ and $d'/d = 0.1$. k is found to be $= 0.38$.

As a converse problem, suppose a floor slab subjected to an external bending moment of 12,000 in.-lb. per inch width of slab. Design the slab so that the unit stress in the steel will not exceed 16,000 lb. per square inch nor the stress in the concrete exceed 600 lb. per square inch. That is, if $r (= f_s/f_c)$, as found by means of the upper diagram, is less than $\frac{16000}{600} = 27$, the strength of the slab will be limited by the concrete; if more than 27, the strength will be limited by the tension steel.

The general details of the slab are to be as shown in Fig. 2. Use reinforcement as follows: $p = 0.01$, $p' = 0.005$. Assume tentatively $d'/d = 0.15$ Find, from the upper diagram, $r (= (f_s/f_c) = 24$, hence the unit stress in the tension steel must not exceed $\frac{24}{27} \times 16{,}000$ to give 600 in the concrete.

From the lower diagram $j = 0.866$

$$\frac{24}{27} \times 16000 \times 0.01d \times 0.866d = 12000$$

or $d = \sqrt{97}$ = say 10-in.

Actual $\frac{d'}{d} = \frac{1.5}{10} = 0.15$ as assumed hence no correction to the computation is required.

The upper diagram for obtaining k and $r (= f_s/f_c)$ is constructed mathematically and involves no approximation. A mathematically constructed diagram for obtaining j in terms of p, p' and d'/d is more complicated in form and not so simply operated. A slight approximation was therefore made in constructing the diagram to bring it into the convenient form here shown. The resulting error in the value of j, obtained from the diagram, will not, however, amount to more than 0.001 or 0.002, and that only for unusual proportions of reinforcement.

The Population of the Berlin District

The census of the metropolitan district of Berlin, Germany, begun Oct. 9, 1919, showed a population of 3,801,235. A decrease of 54,000 males and an increase of 125,000 females in Greater Berlin is attributed to the war.

Highway Classification Undertaken By Bureau Public Roads

Co-operation of War Department, State Highway Departments and Local Interests Sought in Work

A SYSTEMATIC program of highway development has been outlined by Thomas H. MacDonald, chief of the U. S. Bureau of Public Roads. Since taking over the direction of this bureau, nearly a year ago, Mr. MacDonald has made a careful study of the situation from a national point of view. As the head of the agency which is directing the expenditure of millions of dollars on Federal-aid projects he occupies a position of vantage which attaches particular importance to his conclusions. Some of his views are expressed below:

For the past several months it has become increasingly apparent that a comprehensive study should be inaugurated by the Bureau of Public Roads of the functions served by improved highways, that a proper program of highway development may be planned, which involves the following features:

First, the classification of highways into systems based primarily upon the different classes of traffic, present or prospective, to be carried.

Second, the relative importance of the various classes of highways as to the national, state, county and local needs as modifying the sequence and rate of improvement.

Third, the correlation and adjustment of highway systems between contiguous localities and states.

Fourth, the distribution of the costs of improvement of the several systems.

The importance of such a study has been emphasized by the contact which has been brought about by the co-operative work already done by the bureau and the state highway departments of the several states. It is already well established that the rate of highway improvement, because of economic factors which are not within the control of either state of Federal agencies, will be much slower than the public is now demanding. Regardless of the amount of funds made available for use in building roads the rate of road production will be determined by the resources, transportation, materials, labor, contractors, equipment and engineer forces that be placed on this work and devoted to this purpose without disrupting other vitally necessary economic demands for the same resources. There must come a realization that only a percentage of the resources demanded for increasing the rate of road production can be provided for this purpose, and so the production of roads must be studied and programs determined the same as for any large industrial undertaking, and in order that the roads which meet the greatest economic needs will receive first consideration.

CO-OPERATION OF ALL AGENCIES NEEDED

Roads are fundamentally of local concern, and inevitably if left to local demands an orderly program of highway improvement cannot be developed. It is, therefore, one of the functions of the state and national departments to formulate programs and determine the sequence of construction in order that this work of highway improvement may proceed in an orderly manner and those needs which are of greatest economic importance shall be first fulfilled. In order to do this there must be co-operation between the following agencies—the Bureau of Public Roads, the War Department, the several state highway departments, and other similar agencies representative respectively of the National, state and local needs. Up to the present time considerable initial progress has been made, particularly in establishing co-operation with the War Department and also with the Geological Survey Department of the Interior.

Early in August, 1919, the first of a series of conferences was held with the officers of the War Plans Division of the General Staff of the War Department relative to a study of the highways of the United States with reference to their importance from a military standpoint. At the first conference a preliminary agreement was reached covering the following points:

(a) The roads which must be constructed for commerce and national development will in general be identical with those required for military purposes.

(b) The roads which serve mainly military purposes are comparatively few in number. Such roads as are required to serve the local needs of military posts, cantonments, supply depots, arsenals, etc., should be taken care of by the War Department.

(c) The Bureau of Public Roads will prepare and furnish the War Plans Division, to be used in connection with the study to be made, copies of the latest available state road maps.

(d) The Bureau of Public Roads will also prepare and furnish the War Plans Division a copy of the district organization of the bureau, giving the location and names of local district engineers with whom the Department General Staff sections may confer concerning the development of roads within the department.

(e) These district engineers will be given instructions by the Chief of the Bureau of Public Roads to assist the Department General Staff sections in every possible way in the preparation of the department road projects.

(f) To assist the Department Commanders in the preparation of the department road projects, the War Plans Division will furnish each Department Commander with a copy of the state road map, furnished by the Bureau of Public Roads, which pertain to his department.

(g) The Chief of the Bureau of Public Roads is willing to confer with the Chief of Engineers as to the classification of roads for military purposes, and co-operate with him in determining types of construction, loadings, culverts, bridges, etc., to meet military requirements.

(h) Upon the completion of the study by the War Plans Division and its approval by the Chief of Staff, the War Department will furnish the Secretary of Agriculture an outline of the system of roads which it is desired to have developed for military purposes. The district engineers of the Bureau of Public Roads, using the War Department project as a basis, will then promote in each state, as a part of the general project of road development, and by co-operation with the local highway commissions, the construction of those roads indicated by priority in the War Department project.

In accordance with this preliminary agreement the latest available state road maps were secured from the state highway departments and furnished to the General Staff of the War Department. In asking the state highway departments for the maps a brief outline of the co-operation arrangement with the War Department was given. Replies from the states indicate a willingness and desire to co-operate in the improvement of such highways as may be selected because of their possible future military importance.

Map Preparation Undertaken

Up to date, road maps have been secured from all the states except Arizona, Florida and North Carolina, and it is expected that these maps will be received soon. Also several conferences have been held with officers of the Corps of Engineers, War Department, on classification of highways and specifications necessary to meet military requirements.

At the outset it was discovered that considerable difficulty would be met by the General Staff in making the study because of the great lack of uniformity of the best available maps. It was found that the maps varied in scale and amount of detail shown from a very complete map of one state, on which all roads, classed as primary, secondary and local were shown on a scale of 6 mi. to the inch, to a small, no-scale, blueprint map of another state showing only the primary highways.

Steps have been taken to provide a set of state road maps which will show the present state and county or primary and secondary roads. The U. S. Geological Survey has prepared base maps on a scale of 1 to 500,000 for all but 13 states. It is expected that within a year these base maps will be available for all the states. By using an overprint on the existing base maps a very satisfactory road map can be produced at a comparatively low cost. It is proposed to prepare these state road maps through a co-operative arrangement with the U. S. Geological Survey. Satisfactory tentative arrangements have been made with the Geological Survey covering this proposed work. Under this tentative arrangement the work is to be done under the immediate supervision of the Geological Survey experts but will be under our general supervision. This appears to be the logical and efficient way to carry this work on.

Owing to the lack of funds the Geological Survey was obliged on March 15 to discharge certain of the personnel needed on this map work. In order that the preparation of these maps may not be delayed, and trained personnel lost, recommendations have been made for the transfer of seven Geological Survey employees to the Bureau of Public Roads, for the period of 4 months, effective March 1.

Concentrate on National Highway

While the maps prepared under the foregoing arrangement will not be available in time to be of use in connection with the study being made by the General Staff of the War Department, they will serve many other useful purposes and are urgently needed, particularly in connection with the administration of the Federal-aid act.

At the convention held in Louisville, Dec. 8 to 11, 1919, by the American Association of State Highway Officials, a resolution was passed urging the continuation of Federal co-operation in road building under the terms of the existing law which contained this clause: "That we favor an adequate national highway system upon which the Federal-aid funds will be concentrated. This system shall be selected by the various states in co-operation with the Bureau of Public Roads, and connected at the state lines by the Federal departments in cases where connections are not made by the adjoining states."

It is proposed to inaugurate a comprehensive study of the highways of the United States in co-operation with each state highway department for the purpose of determining a proper classification of all roads into groups of equal or like importance and of correlating the systems of one state which are of more than local importance with systems of equal importance in the adjoining states. With the completion of the proposed uniform scale maps a tentative selection of a national system of highways will be made on which it may be desirable to give preferential consideration in the allocation of Federal aid. No recommendations have as yet been received from the War Department relative to the roads important from a military standpoint. These will be received in due time, however, and will be given very careful consideration in connection with the selection of the system as proposed by the Louisville resolution.

Law of Supply and Demand as Applied to Engineering Service

The general policies under which the accomplishments of the American Association of Engineers in the railroad field have been obtained (estimated at $5,000,000 increase annually) are based on the law of supply and demand. D. A. Tomlinson, secretary of the railroad department, defined the policies and gave the results before the Second Railroad Conference of the Association as follows:

" 'To promote the economic and social welfare of engineers' means, in the final analysis, to secure higher salaries for engineers. Primarily those salaries are controlled by the law of supply and demand, whose action is inevitable. A combination of forces can postpone but cannot prevent its application. But its application varies with conditions, and those conditions can be influenced by proper methods so as ultimately to benefit the men or the organization using them. Engineers are familiar with the law of supply and demand and with its application, but they seldom appreciate the conditions on which its application is based or the factors that influence those conditions. Those conditions and those factors are appreciated and are well understood by the sales and advertising departments of large corporations and in the railroad campaign A. A. E. adopted the methods used by such concerns.

"To limit the supply of engineers would force salaries up but to do so would be difficult. Furthermore, such action would be fundamentally wrong and would irretrievably injure the engineering profession. To increase the demand for engineers is a difficult proposition but it is fundamentally sound. Good engineering service is of great value and a greater use of good engineering talent will benefit the entire country. Therefore, the question is, 'How can the demand for engineering service be increased?' or in other words 'How can the market for engineers be broadened?' For an answer, turn to the sales campaign of any large corporation: for instance how was the market for the Gillette Safety Razor developed to its present proportions? By a campaign to educate the jobbers, the dealers and the public to an appreciation of the advantages of a safety razor. Advertising leaflets, newspaper stories, lecturers and salesmen were all employed. Similarly, a campaign of education conducted along proper lines will develop the market for engineers. That campaign must be directed so as to reach the proper men, and its fundamental sincerity and worth must appeal to them."

The following is an estimate of the average monthly salary increases obtained: Northwestern Region, $40; Central Western Region, $30; Southwestern Region, $40; Southern Region, $5; Pocohontas Region, $20; Allegheny Region, $15; Eastern Region, $10.

"There are approximately 20,000 railroad professional engineers in the United States. Their average increase in salary as a result of A. A. E.'s work is estimated at $20 a month, or a total increase of $5,000,000 a year. The total cost of this work to A. A. E. has been somewhat over $7,000. Thus an investment of $7,000 collected through organized effort and expended wisely, is paying dividends of $5,000,000 a year to railroad engineers. That appears to be a rather profitable investment. Based on statistics presented to Congress by the Director General the average pay of assistant engineers and draftsmen in 1917 was $95.40 a month, and in July, 1919, before the application of the increases secured by A. A. E., $138.96 a month, an increase of 44 per cent. These new increases secured by A. A. E. bring the estimated average pay in December, 1919, up to $160 a month, or an increase of 68 per cent over 1917 salaries."

Tests of Earth Subsidence Under Fills

(Abstract of Committee Report, American Railway Engineering Association.)

Subsidence of soil under the weight of railway fills appears to be a general condition, existing to some extent under all such fills, according to the report of the roadway committee of the American Railway Engineering Association, whose conclusion is based upon an investigation covering several hundred miles of line. Not only was grading material found. but also quantities of cribbing, mattress work and timbers. The subsidence appears to average one per cent per foot of height of fill.

In determining the amount of subsidence, trenches are made only through light fills and at the toes of larger fills. Auger borings are made where the material is such that the auger will bring it up. A protective pipe or casing is driven usually through the loose material, the auger being operated through this. Wash borings are made when the depth is too great or the material is unsuitable for auger borings.

Cross-sections are taken at such intervals as are considered necessary in view of the character of the surface, there being usually test holes at the center and on the slopes, and possibly in the middle of the fill. From these tests the surface of the original ground is located, while from the notes taken a cross-section is plotted and the yardage calculated in the usual way. After the subsidence is calculated, a percentage should be added for shrinkage, which the committee has found average ten per cent. The testing party consists usually of an engineer, a foreman and three helpers. It is given usually a boarding car outfit, which is moved from place to place in local freight trains.

In the cost of such tests there should be included equipment, material, labor, personal expenses, transportation and overhead, but none of the roads reporting gave the cost of transportation. The costs given ranged from 33c. to 55c. per foot of hole bored. The committee calls attention to the importance of due consideration being given to the matter of subsidence when revaluation surveys are made.

HINTS FOR THE CONTRACTOR

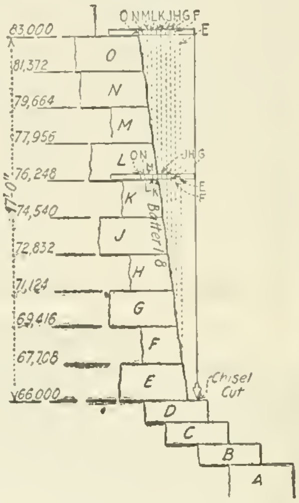
DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Device Maintains True Batter in Masonry Wall

By H. D. Hurley

Assistant Engineer, Massachusetts Department of Public Works

THE apparatus shown in the accompanying sketch was used in the construction of the drydock recently completed at Boston by the Massachusetts Department of Public Works, Division of Waterways and Public Lands. The walls of the drydock are concrete faced with granite masonry. The first rise was built as indicated, the length of wall of this type being approximately 2,000 ft., built in sections about 60 ft. long. The apparatus shown consisted of a stick of light wood 2 in. x 3 in. x 4 ft., with the four sides smooth. It was notched at the horizontal projection of the batter of each course from the toe of the wall, plus 6 in., and notched on the top to hold a plumb-bob string. The chisel cut was placed by the line and level party every 60-ft. section



To use the device the stick was placed on top of the stone to be laid with the mark for that course on the batter line. The stone would then be in its correct position when the plumb bob was directly above the chisel cut. A line stone was set for each course at the ends of every 60-ft. section, intermediate stones being set by eye.

Two Sets of Plans for Contractor

By Edward W. Bush

Hartford, Conn.

THE practice has become quite general of requiring the contractor to make a payment or deposit before obtaining a set of the plans and contract form, and I suggest that it will be of great advantage to all concerned if engineers furnish the contractor with two sets of the contract and plans instead of one for the same fee or deposit, and to so specify in advertisement for bids.

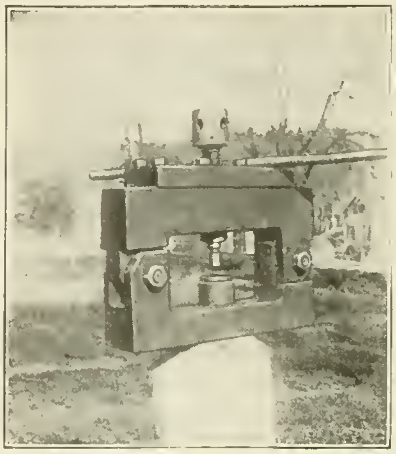
In nearly every case, contractors are arranging with their bonding company to write the bond, providing they are successful bidders, at the same time that they are making up their bid. It is often of considerable advantage to the contractor if he can forward the plans and contract to the surety, as he is always interested in knowing what the obligations are as well as the character of the work to be performed, etc. Especially is this true when large contracts are let, or when the contractor already has a considerable volume of work under way for the size of his organization or the amount of net quick assets shown in his financial statement. Anything that helps a worthy contractor to make up his bid and arrange for his bond with a strong surety company, helps the business of construction.

Quick Field Punch for Bridge Work

By C. J. Bennett

State Highway Commissioner, Hartford, Conn.

THE illustration shows a casting hinged in the middle by the use of two bolts which can quickly be removed, allowing the casting to be slipped over an I-beam, channel, or other structural shape. In the lower part of the casting is placed a die for a punch and to the upper part is bolted a ball-bearing screw device holding a punch to fit the die. This device has been used in Connecticut and proved of value in getting quick action in punching holes in structural shapes. The illustration shows plainly the operation of the machine by a capstan-head screw actuated by a long bar. The device was developed by A. R. Doe, bridge supervisor in the Connecticut Highway Department. In order that it might be photographed, it was placed on top of a post.



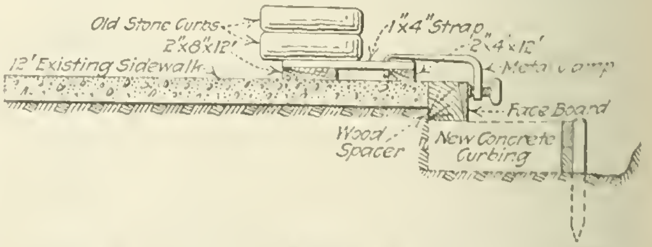
HAND-POWER PUNCH USED FOR BRIDGE STEEL IN WORK

Hanging Forms for Curb Work

By D. H. Fleming

Town Engineer, Owen Sound, Ont.

ON a recent contract for concrete curbing work the contractor was required to remove an old flagstone curb joining a 12-ft. sidewalk, making it impossible to stake the back forms. He therefore laid a plank along the sidewalk near the edge and weighted it with the old flagstones. The forms were clamped to this strip as shown in the sketch. The method proved very convenient and economical as the back form was not then required and the flagstone weights were close at hand.



SECTION, SHOWING METHOD OF HOLDING FORMS

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Society of American Military Engineers

Sir—Your editorial "Soldier-Civilian Co-operation" in *Engineering News-Record* of March 4, p. 450, goes to the very heart of the purpose underlying the organization of The Society of American Military Engineers. This organization is devoted to the formulation of a rational policy of military preparedness, and it seeks to bring under one roof all engineers and others of suitable technical qualifications who have served at any time in any capacity—military or civilian—in any arm, department or service of the military forces of the United States.

Your editorial makes reference to the need of a democratic organization of engineers; this the society aims to be. Eligibility to membership is as comprehensive as the engineering profession itself, and the basis of the government of the society is as democratic as is the obligation on every citizen to actively assist in the national defense. There are no distinctions based on military rank or on civilian reputation; the "buck private" and the general officer have equal rights and privileges with the civilian, neither more nor less, and these rights and privileges are guaranteed by the constitution and by-laws.

The provisional constitution mentioned in your news column Feb. 19 has been recast and active membership is now open to all technical engineers—civil, electrical, mechanical, mining and others—in the military service, whether in a uniformed or a civilian capacity. The government of the society is vested in a Board of Directors consisting of a president, two vice-presidents and eighteen others, all of whom are elected by direct vote of the active members. The three officers first named serve for one year only, and none of them is eligible immediately to succeed himself in office. There are no restrictions as to eligibility for office other than that six directors must be chosen from the Regular Army (Corps of Engineers, Ordnance, Signal Corps, and other technical services); six from the other military forces of the United States subject to active duty, and six from the membership at large exclusive of the foregoing two groups. The term of office for all directors is three years but the usual arrangements obtain whereby the term of office of two directors of each group of six expires each year.

There is no society of engineers known to the writer whose basic organization is more democratic or more responsive to the will of its members than is the Society of American Military Engineers. In the interests of democracy the dues ($4.50 for the current year) are merely nominal, and so low as to prevent no person from joining who is eligible to membership. The only restriction that now obtains in the organization of the society is that the secretary and the editor of the *Journal* shall be officers of the Corps of Engineers. This is a provision of the by-laws, and it is in the interests of the society that these two positions shall be filled by professional military engineers.

Due to the fact that the officers are not paid but must conduct the affairs of the society in their spare time and due also to the fact that funds are limited, it has not been possible up to date to give the formation of this society the publicity which its principles merit. However, requests for information and applications for membership are being received in numbers which indicate that the citizen-soldier-engineers believe this organization has a distinct field of usefulness, and that it can be of real service in the scheme of national defense.

The acting secretary, Major P. S. Bond, Corps of Engineers, Washington Barracks, D. C., or the undersigned will gladly answer inquiries concerning this society.

G. A. YOUNGBERG,
Colonel of Engineers,
Room 2701 Munitions Bldg.
Washington, D. C.

A Grade Engineer

Sir—Among the many applications that have been filed with we for positions since our state decided to build $25,000,000 worth of roads is the following. It was so amusing to me that I thought perhaps you might like to publish it.

"Mr. W. S. Kellers, Montgomery, Ala. Dear sir I am asking you if you can give a man a job on the Civil Engineer Forces on the Public Roads. I can run an instrument the same as any one. I have got some fine grades laid down on the public roads out here. I hope to hear from you. Say if you can please tell me what you pay Civil Engineers per day, for work on the road with their instruments. Thanking you in advance."

W. S. KELLER,
Engineer, Alabama Highway Dept.
Montgomery, Ala.

Highway Foundations and Drainage

Sir—I consider I. W. Patterson's methods of road construction, as explained in *Engineering News-Record*, Dec. 11-18, 1919, to be the best I have ever read, especially since they have actually been applied. I am certain that no matter what kind of material is contemplated being used as a wearing surface, the preparation of the foundation upon which it is to rest deserves the same careful consideration that Mr. Patterson has applied to the construction of Rhode Island's macadam roads.

I have been engaged in engineering work for the past 19 years, most of which time has been spent in the heart of the brick industry, and I have been a keen observer of the methods used in the construction of roads in this and other sections. Going back to the time when it was a hard job to get the consent of the property owners to build improved roads the question of cost was certainly an extremely important one. There is where some of our poor road construction got its start, because at that time there was such keen competition between manufacturers of surfacing materials that the one showing the least possible cost usually got the business. In endeavoring to show as small a cost as possible these manufacturers employed engineers to design roads according to their own ideas. I think in a great many cases the officials, whether county or state, in their desire to get these roads under way, accepted and used these different designs in the construction of roads with but little investigation.

The worst of it is that since public opinion has changed with respect to improved roads and the people are demanding improved roads regardless of cost, some of the designs of roads which have proven very unsatisfactory are still being used, instead of each new road job being given its deserving individual study and attention.

In this state we have miles and miles of all kinds of improved roads of a standard design, no special attention having been given to the various subsoils and drainage.

Mr. Patterson's article, and especially the feature of foundation and drainage of any type of improved road, cannot be given too much study and attention for the time is surely here when the present methods of road construction are in need of a complete change.

Canton, Ohio. L. K. ZERBE.

Computations for Track Turnouts

Sir—The method for computing split-switch turnouts given by Mr. Ratcliff in *Engineering News-Record*, Feb. 12, p. 341, is in general accordance with modern practice, but certain modifications will result in a more accurate solution.

(1) Computation of radius of outside lead curve:

$$ed = \frac{cf}{\cos S - \cos F} = \frac{cf}{2 \sin \frac{1}{2}(F+S) \sin \frac{1}{2}(F-S)}$$

If the ordinary five-place tables of natural functions are used, the first formula, involving the expression *cos S–F* often results in a value of *ed*, which is not within several feet of the correct value. Computation by the second method, using logarithms, involves very little more work and insures a correct result.

(2) Computation of lead distance from actual switch point to theoretical frog point:

$$zg = ed \sin F - ed \sin S + dg \cos F + ac \cos S$$

This formula, given in Mr. Ratcliff's letter, requires the use of the radius *ed* of the outside rail. As shown in (1), the value of *ed* may be in error (if *cos S–cos F* is used) and the value of the expression *ed sin F–ed sin S* may therefore be incorrect by an inch or more. The use of the term *ac cos S* is an unnecessary refinement, since its value is practically the same as *ac* for all ordinary turnouts; the maximum difference is ⅛-in. for turnouts, the plans of the American Railway Engineering Association.

In order to eliminate the necessity of using the radius *ed* in computing the lead, the following solution is suggested:

Theoretical lead $zg = ab + jg + fd$

$ab = ac \cos S = ac$ (approx.) $jg = dg \cos F$

$$fd = \frac{cf}{\tan cdf} = \frac{G - (bc + dj)}{\tan \frac{1}{2}(F+S)} = \frac{G - bc - dg \sin F}{\tan \frac{1}{2}(F+S)}$$

Then $zg = ac + dg \cos F + \dfrac{G - bc - dg \sin F}{\tan \frac{1}{2}(F+S)}$

Actual lead equals $zg + nb$, in which n is the frog number and b the thickness of the frog point (generally ½-in.).

I agree with Mr. Ratcliff that the engineer need pay little attention to the turnout details in the field. A track foreman should be able to construct a turnout from the standard turnout plans, after the engineer has located the frog.

The discussion opened by Mr. Scott's letter in *Engineering News-Record*, Oct. 9, 1919, p. 711, as to the degree of curve to be used beyond the heel of frog is of interest. Unquestionably there is no *requirement* that the radius beyond the heel of the frog should be the same as that of the lead curve (either for stub or split switches). There are many cases, however, in which simplicity may be attained by choosing the degree of curve beyond the heel of the frog with some reference to the turnout. If the curve beyond the frog leads to a ladder track or siding, its length is often not great and the exact radius is relatively unimportant. In such a case the most satisfactory curve to use is the one which involves the least computation and fieldwork.

Where great accuracy is not required the stub switch curve is convenient. This method involves the assumption that the curve starts at the frog point instead of at the heel of the frog. The computation of track layouts involving curved ladder tracks and similar problems becomes very complex unless reasonable approximations are made. Considerable ingenuity may be displayed in the choice of proper curves, so that the solution may be kept simple.

In many railroad offices, trackwork is designed by "rule-of-thumb" methods, with constant use of the drawing board when the computations get too complicated. To avoid the maze of figures which often appears in computations of this sort, the designer should understand the fundamental principles of curves and switches so clearly that he may safely apply the slight approximations which simplify the work without impairing the accuracy of the result.

J. B. BABCOCK,
Assistant Professor of Railway Engineering,
Cambridge, Mass. Mass. Inst. of Technology.

"Brass-Band" Bond Voting

Sir—Having followed municipal engineering for a number of years prior to engaging in the municipal bond business I have been more or less in direct touch with construction costs of all classes of public improvements for twenty years, and I have been very much interested in the splendid discussion of this subject by your subscribers. I will then take the liberty of addressing you upon this subject which is in my opinion the most vital we are facing today.

Recently I negotiated for the purchase of a large bond issue for drainage and the reclamation of seeped lands in Utah. The engineers had very wisely made liberal estimates knowing that the lowest bid to be expected would cover the many possibilities of advances in material and labor. The work was offered to competitive bids and the lowest was within the estimates. But the commissioners refused to make the award, basing the refusal on the theory that if the work was let on any such extravagant basis, the contractor could afford to pay extraordinarily high prices for labor and the prices he offered would become the standard for the community, thereby either robbing the farmers of the possibility of securing labor, or driving them to meet the prices set by the drainage contractor. It seems to me this simple case will fully cover the entire scope of inflated prices not only for labor but also for material. The contractor who is getting a high price for his work can outbid the contractor who has taken work at a moderate figure.

There is but one solution, and that is to issue fewer bonds for improvements, reduce the amount of public work to conform to the available labor and material supply. The law of supply and demand must govern in this as well as in every other line. The prices being paid for road work not only do an injustice to the taxpayer in giving him about one-half justly due him, but when the work is awarded to the contractor at those prices he raises the prices for labor and materials, disrupts the general scheme of things, reduces farm production, and the farmers' income generally.

Restrict the bond issues to those absolutely necessary for city and civic needs. Place the franchise in the hands of those who pay the taxes. Abolish this brass-band policy of voting debt for roads where no provision is made for the maintenance of expensive highways.

Kansas City, Mo. W. P. BULLOCK.

Economics of Highway Transport

Sir—The article on highway economics, your issue of Feb. 19, p. 383, by George F. Syme, supervising engineer for the North Carolina State Highway Commission, is so apropos that the writer cannot refrain from calling further attention to it and to your editorial comments thereon. Those interested in better highways who have neglected reading it should turn to the aforesaid number of the *News-Record* and catch the point of view that Mr. Syme has so effectively presented. This article should be placed in the hands of every highway engineer, highway commissioner, road promoter, and official of the various highway and kindred associations; because many have yet to realize that a good pavement does not necessarily make a good road, and that poor alignment and a saw-tooth profile do not promote economic transportation. The present-day need for an economic theory of highway transportation is so urgent that construction work might better be held in abeyance than that time be lost in developing and perfecting such a theory. Without an economic theory for a guide we are today groping our way while spending millions of dollars annually for improvements that will, in varying degrees, fall short of giving the desirable maximum economy.

The development of an economic theory for highway transportation follows certain well-defined lines and is similar in its general aspects to the development of an economic theory for any other human activity. The program for procedure would follow four basic steps, viz.:

1. Forming a complete and definite concept of the object to be attained.
2. Determining and classifying the various factors which produce or in any way affect the objective.
3. Determining the quantitative relation between each factor and the desired result, or objective.
4. Determining from the aforesaid relation, one or more interrelations among the factors, such that maximum economy will result.

It is these interrelations, or criteria, that form the economic theory.

The first and second steps can be accomplished quite readily at this time. The third step requires more data than now is available, while the fourth step requires the analytical turn of mind with vision and imagination to perceive relations and to associate ideas. There are many such in the engineering profession. The thing most needed today is research work to secure missing data.

Some of the sought for relations pertaining to the third step can be formulated now. Others are not so obvious. There are at least 9 independent variable factors which affect one or more of the 21 cost items which compose the unit cost of transportation. The writer has so far tabulated 54 relations, or functions, which need to be formulated. Some of these are readily discerned, while others need experimental data for their development. Some of the latter are:

1. Relation between the cost of maintaining power plant and vehicle, and the amount of mechanical work which the truck does on the highway per annum.
2. Relation between rate of wear of road surface and the number of passages of standard wheel load at standard speed.
3. Relation between other wheel loads and speeds to the aforesaid standard wheel load and speed.
4. Relation between cost of maintenance and curvature.
5. Relation between cost of maintenance and tractive resistance.

To secure the needed data, a research program should be prepared by a joint committee representing the various associations interested in highway development. The work involved in executing such a program should be distributed among such agencies as are equipped to carry on the desired investigation and experimental work.

While the results of such research would primarily be for the use of the joint committee in furthering the development of an economic theory, yet the data should be made available as rapidly as possible to the engineering profession, in order to stimulate interest in the goal to be attained and to induce others also to undertake the work of analysis and deduction. This would provide a valuable independent check, and would eliminate quickly faulty conclusions, thus leaving an unassailable residue of criteria.

With a huge road program facing this country, what would it be worth to have such economic criteria available now? Would any private corporation undertake an investment of that magnitude upon as an inadequate basis as highway construction is now conducted?

Kansas City, Mo. ROBERT C. BARNETT,
Economic Engineer.

"Let It Be a Technical Society—Nothing Else"

Sir—Since I resigned from a salaried position in 1915, I have been giving a part of my energies, without compensation, to public affairs, welfare work, etc.

I desire through your columns to say to the membership of the American Society of Civil Engineers which honored me by electing me a vice-president of the society, that from the experience so gained I believe that the American Society of Civil Engineers cannot effectively be "butcher, baker and candle-stick maker." It is a technical society, and as such has honor and weight. Let it be a technical society and nothing else—the best of its kind.

In my opinion the willingness which every ablebodied engineer should have, to give time and service for the betterment of civic affairs and human relations, can achieve definable action and can be made more effective by support of the Engineering Council in civic affairs, as at present, and by taking an active interest in the American Association of Engineers, a going association, principally concerned in welfare work, and the interest of all professional men will best be served by leaving the American Society of Civil Engineers to continue to gain honor for the profession in its own proper sphere.

Vote "NO" on all questions, in order that the Society may be unhampered in any internal betterments which may be needed. Francis Lee Stuart,

New York City. Consulting Engineer.

Against Participation by Am. Soc. C. E. in Non-Technical Activities

Sir—During the recent weeks the undersigned have been trying, through a study of the several reports on the subject, through the editorial expression of your paper and through the letters that you have published, to arrive at some definite conclusion concerning the controversy that now prevails in the American Society of Civil Engineers between those who believe in an extension of the society's functions and those who would adhere to the ideals and principles of the society as expressed in its present constitution. The advocates of the proposed changes seem to base their argument on an assumption that it is possible for the society to undertake these new activities without prejudice to the purposes it has fulfilled heretofore and to which it owes its present position. We believe this assumption to be entirely unwarranted and impossible.

Since its foundation in 1852 the American Society of Civil Engineers has striven to make real the conception of its purpose as expressed in its constitution. The society is pledged to the "maintenance of a high professional standard among its members." It has thereby assumed a responsibility to the outside world for the professional standing of its members. It is out of that policy that its strength has grown; to its adherence to that principle it owes its unique and enviable position in the eyes of the world. That this viewpoint and this principle still mean something to the young engineer is demonstrated by the fact that last year witnessed the largest number of new applications for membership in the history of the society.

"A high professional standard among its members." When the founders struck that note they were not thinking of the material things they were going to get out of the Society. Far from it. They were thinking rather of the responsibilities they were to assume; of the service they were to render, not only to their calling, but also to the public. They were seeking to set up ideals that should elevate their calling to the dignity of a profession. Since that day these ideals have governed the doings of the society.

The activities in which it is now proposed that the society shall engage are not in harmony with those conceptions. They are so different, indeed, that it is our conviction that they can never exist simultaneously in any one society. The two ideals will never mix.

The first is to "maintain a high professional standard"; the spirit is one of responsibility and of service. The second is to foster the welfare, and look after the non-technical interests of the engineer. The two motives are born of diametrically opposite instincts, both natural and both necessary, but still as far apart as the poles in spirit and in practice.

If the society shall try to advance under such a dual standard and with so divided and discordant purposes, it must fail miserably. One or the other will prevail. If it is to stand before the world as the champion and guardian of the material welfare of a class it must abandon its traditional prestige as the unselfish exponent of professional standing and responsibility. If, on the contrary, it is to retain that prestige, it can only do so by the sacrifice of every selfish and material ambition, *as a society*.

Let us not be understood as denying the worth or usefulness of these new purposes now urged upon engineers. Let us admit that it is desirable that engineers shall organize for more effective participation in public affairs and for the advancement of the non-technical interests of the individual engineer. But there exists an organization created for exactly that purpose. It is already large and is still growing. To-day it is larger than the American Society of Civil Engineers or any other national Engineering Society. It represents engineers of every branch. Its energy and resources are to be devoted mainly, if not exclusively, to the very purposes now urged as so desirable. It is a going concern, and what is still more important, it will continue to go.

We can conceive of no proposition so unsound economically as that the American Society of Civil Engineers shall enter this new field of activity in competition with that organization, either alone or in federation with other societies. We can see not the slightest promise of success in duplicating, or attempting to duplicate, in the loosely co-ordinated fashion now proposed, with the divided and half-hearted interest that would surely prevail, and with the trifling resources now in sight, the work of a closely knit organization more than 13,000 strong, devoting its entire resources and energies to a single purpose.

To sum up, we believe that the creation and growth of the American Society of Civil Engineers has proved the need for its existence as a strictly technical and professional organization. It should not be forced, therefore, into new and untried fields of activity, the purposes of which are diametrically opposed to the purposes underlying its foundation and its life, and the work of which is already in other hands.

We believe that the only safe course open to the member who has at heart the future welfare and prosperity of the society, is to vote "No" to question 3 of the Questionnaire and we so urge.

The purpose of some of the other questions proposed in that document are not clear to us, but they are not so fundamental as those above considered, and therefore have not been discussed in this letter.

Ralph Smillie,
Orrin L. Brodie,
O. Singstad,
Milton H. Freeman,
Jesse B. Snow,
John A. O'Connor,
Dwight B. La Du,
J. A. Bensel,
S. Whinery,
J. P. Hogan,
J. J. Yates,
Holton D. Robinson,
H. R. Wheeler,
C. M. Holland,
A. G. Chapman,
J. S. Swindells,
W. H. Yates,
W. T. Chevalier,
Francis S. Crowell,
M. E. Fuller,
C. R. Hulsart,
Paul G. Brown,
Royal C. Finck.

NEWS OF THE WEEK

New York, March 25, 1920

Threatened Water-Works Strike at Philadelphia Called Off

Water Bureau Ready for Emergency but International President Wired Local Union to Desist

After some months of agitation and a few days of keen anxiety and strenuous effort a threatened strike of Philadelphia water-works employees was called off a few hours after it was to have gone into effect on March 16. The Bureau of Water, of which Carleton E. Davis is chief, was ready for the emergency with loyal employees and outside help when the president of the international organization of the principal local union involved wired to the union to desist.

During the war the majority of employees of the Philadelphia Water Bureau were organized into unions affiliated with the American Federation of Labor. Various locals comprised unions of firemen, oilers and laborers; operating engineers; machinists; boilermakers, blacksmiths, patternmakers, bricklayers, etc. The first mentioned was the largest and has been most active through a paid representative, not an employee of the city.

From time to time various demands for increased wages have been presented to the City Council. These have not been met in full, but increases have been made ranging from slightly more than 50 per cent for the engineers up to 80 per cent for the laborers. In the preparation of the budget for 1920 the city authorities were confronted with certain definite demands, coupled with a threat of resignations to be submitted in a body on Jan. 2 if all demands were not met. An appeal to the common sense and sound judgment of the employees resulted in a postponement of the date set for the walkout with a view of taking up the matter with the incoming administration.

Shortly after the inauguration of J. Hampton Moore as mayor on Jan. 5, a committee of employees with their paid outside representative waited upon the mayor and presented their demands. Mr. Moore took the position that he had no objection to organization, but that he absolutely reserved to himself the right to deal with city employees first hand. Following this meeting there was a lull in agitation coincident with the absence in Washington at the railroad employees' conference of the paid representative of the union.

Upon the recent return of the latter to the city, agitation was renewed and

(*Continued on p. 646*)

American Railway Engineering Association Has Record-Breaking Annual Convention

Attendance and Volume of Work Handled Greater Than at Any Previous Meeting—New Bridge and Rail Specifications Adopted

Measured by attendance and volume of important committee work passed upon, the twenty-first annual convention of the American Railway Engineering Association, held at the Congress Hotel, Chicago, March 16-18, 1920, surpassed the record of any previous convention. Reports of twenty-two standing committees and two special committees were presented and the new specifications for iron and steel structures and for steel rail were adopted. The attendance exceeded by over 100 any other convention of the association, and on the last day was reported as 561.

President's Address

The meeting was opened March 16 by the president of the association, Earl Stimson, chief engineer maintenance, Baltimore & Ohio R.R. "The problems immediately ahead of us," said Mr. Stimson, "are those of maintenance, rather than those of construction." He said that the item of labor was greater than all other items of maintenance expense and that the engineer should seek to make the work attractive to the worker. More accurate cost accounting and unit measures of performance are needed on account of increased cost of both labor and materials in maintenance. The apparent shunning of railroad service by young engineers is a matter of concern and it should be the duty of members of the association to promote the possibilities of railroad engineering service and to help the younger men in every possible way toward their realization.

President Stimson also explained in detail the new relation of the American Railway Engineering Association to the American Railroad Association, and pointed out that fears of absorption by the body of executives were groundless. "At first it was proposed that the organization of this association be taken over by the American Railroad Association to become a part of its engineering section," said Mr. Stimson. "The propostion was voted down by this association by a large majority. The offer of this association to act as a division of the engineering section was finally accepted. The engineering section is presided over by a general committee of eleven members, six from the construction and maintenance division, three from the signal division, and two from the electrical division. This gives this association a majority of membership on the general committee. The president of this association is chairman of the general committee of the section and the secretary acts for both of

Prominent Hydraulic Engineer Enters Consulting Field

W. S. Lee, vice-president and chief engineer of the Southern Power Co. since its formation, will henceforth, in addition to those duties, engage in general consulting practice, chiefly along hydro-electric lines. He will maintain offices both in Charlotte, N. C., and in New York City. Mr. Lee has been responsible for the entire technical development of the organization with which his name is prominently identified, that development including the design and supervision of construction of no less than eight hydro-electric developments, with capacities ranging from 6,600 kw. to 70,000 kw. each, 2,050 miles of transmission line, and 200 substations. An idea of the service which this company renders can be gained from the fact that it supplies power to more than 200 cotton mills, 50 cities and towns, 150 miles of railway, nine street railway systems, a dozen cotton oil manufacturing plants, and the endless

WILLIAM STATES LEE

(*Continued on p. 646*)

these organizations." Now, the members of the A. R. E. A. committees act as members of like committees of the engineering section of the A. R. A. At the meeting of the American Railroad Association last November, the engineering section recommended approval of subjects adopted at the 1919 convention of the A. R. E. A., which were approved and now bear the endorsement of the A. R. A.

President Stimson reported a net gain in membership of 190 and a total membership of 1,639. The report of the secretary showed a present cash balance on hand of $43,774, with total annual receipts of $31,187, and disbursements of $24,702.

Bridge and Rail Specifications Adopted

After lengthy discussion, the convention adopted the new bridge specifications, with only minor changes, and the new specifications for steel rail as recommended by the committee without change. A report of the more important technical discussions of the convention appears on page 612. The convention adopted the report of the committee on track embodying new plans for frogs and switches. The committees on railway location and railway operation submitted reports including important studies of the probable effect of the new punitive overtime rates of pay for trainmen and enginemen. The report of the committee on yards and terminals, embodying important studies on unit operation of terminals, was adopted as a progress report. Specifications for truck-scales, as recommended by the committee on yards and terminals, were adopted. The convention accepted the second progress report of the special joint committee with the Am. Soc. C. E. on stresses in railroad track, with practically no discussion.

All specifications and plans, adopted by the convention, will be included in the new *Manual* to be issued during the year. While supplements to the *Manual* have been issued from time to time, a new volume has not appeared since 1915.

Following the presentation of the report of the special committee on standardization, a general sentiment was expressed for adopting more vigorous and postive methods to bring about a much wider use of the A. R. E. A. standards.

President Stimson presided as toastmaster at the annual dinner held on the evening of March 17 at the Congress Hotel. The Hon. and Rev. Henry J. Cody, member of the Legislature of Ontario, and former Minister of Education, spoke on "Education as a Factor in Reconstruction." Dr. Cody told of how the war had demonstrated the value of the trained man in industry and, now, in problems of reconstruction. Dr. Winthrop Ellesworth Stone, president, Purdue University, spoke on "The College and the Industries," emphasizing the need of closer contact of industry, including the railroads, with the universities in outlining programs of technical education. Dr. Stone called attention to the danger of the present tendency of engineering graduates to enter commercial fields rather than professional work, being attracted by prospects of so much greater compensation. University attendance, however, is increasing rapidly and a serious problem in providing for it has been created.

Election of Officers

New officers elected for the ensuing year are as follows: President, H. R. Safford, assistant to president, Chicago, Burlington & Quincy R.R.; vice-president, L. A. Downs, vice-president and general manager, Central of Georgia R.R.; treasurer, G. H. Bremner, district engineer, Bureau of Valuation, Interstate Commerce Commission, Chicago; and secretary, E. H. Fritch, Chicago. Three new directors were elected as follows: Edwin B. Katte, chief engineer of electric traction, New York Central R.R.; J. M. R. Fairbairn, chief engineer, Canadian Pacific Ry., and F. E. Turneaure, dean of the College of Engineering, University of Wisconsin.

The convention closed with the installation of new officers, and a brief address by Mr. Safford, in which he spoke of the new problems which lay before the association in subjects of economics and restoring morale in railroad service.

Belle Isle Bridge, Detroit, Can Now Go Ahead

Formal approval of the Belle Isle bridge, Detroit, Mich., without a draw span has been given by the War Department through Major General L. H. Beach, chief of engineers, U. S. Army. Due to opposition to a bridge without a draw a special act had to be passed by Congress. This bill was recently signed by the President. General plans were proposed in 1917 by a bridge commission headed by M. E. Cooley, so that working plans only remain to be completed. The detail work, which is being handled by Esselstyn, Murphy & Hanford, is estimated to require two months. After approval of the City Council separate bids will be asked on foundations and superstructure which are estimated to cost $3,000,000. Work is now under way on the subway approach to carry traffic under Jefferson Avenue at the north end of the bridge. The type of the bridge, cantilevers of concrete sprung from the piers with suspended links, was described in the *Engineering News-Record*, Aug. 2, 1917, p. 224

Asphalt Association Moves

Permanent headquarters for the Asphalt Association have been established in the new National Association Bldg., 25 W. 43rd St., New York City.

Road Construction Discussed in Various Aspects

Contradictory opinions as to the economy of building roads at no matter what cost were voiced at the regular bi-weekly meeting of the American Society of Civil Engineers, March 17. Out of the two-hour discussion participated in by half a dozen road engineers and others vitally connected with road construction work came the common admission that shortages in labor, materials and transportation would in the end automatically curtail the enormous 1920 program outlined.

Shirley Outlines Problem

H. G. Shirley, secretary of the Federal Highway Council, indicated what road engineers of the country were up against in providing improved roads for the 7,000,000 motor vehicles now licensed in the United States. He asserted that this year's program called for the construction of 5,000 mi. of hard surfacing and the needs of the present traffic call for a program at least four times as great and continuing for four years. Mr. Shirley stated that nothing should stand in the way of the prosecution of this year's program as he considered "we are just as able to build highways today as we ever were." However, in prosecuting this program he pointed out the dangers of building without a careful study of the subsoil, for, though considerable was known about the materials which constituted surfacing, "we know nothing of the subsoils," he added.

E. J. Mehren, editor of *Engineering News-Record*, took issue, on theory, with Mr. Shirley, asserting that in general new highways should not be built in which the carrying cost greatly exceeded the annual maintenance charges laid to the existing surface. Such procedure, Mr. Mehren asserted, was demanded of a public official in the efficient expenditure of the people's money. However, he was willing to admit that decrease in haulage charges due to road improvement might allow the expenditure of almost any figure upon road improvement. In general he stamped as economically unsound any plan that was liable at the present time to "bull" the material and labor markets.

Highways at $200,000 a Mile

Speaking on what extent money could be expended upon road improvement owing to decrease in haulage charges, G. H. Pride, of the Heavy Haulage Co., New York City, asserted that in the case where excessive commercial traffic passed over certain highways, an initial expenditure of $200,000 a mile was economic. Admitting the passage of 500 tons of freight over a certain highway in 24 hr., Mr. Pride asserted that the hard surfacing of such a highway would result in a daily saving of approximately $62. Multiplying this by 300 would save approximately $19,000 per mile per year, and in the life of ordinary hard surfacing pavement would save approximately $200,000, justifying the excessive first cost. He also asserted that good roads meant the saving of at least $100 a year in gasoline, tires and oil to pleasure automobiles, and if there were 7,000,000 of these in the United States this meant an annual saving of $700,000,000, a great deal more than was even available this year in the United States for road construction.

Connecting Road Links Necessary

H. E. Hilts, principal assistant engineer, Pennsylvania State Highway Department, asserted that economic necessity demanded the construction of certain portions of highways at even most excessive prices. Where an unimproved portion was a connecting link in an all-the-year arterial highway, Mr. Hilts asserted that no financial appraisal of its usefulness could be set upon it.

As means of facilitating road construction work he recommended free use of daily and technical press, the clarification of specifications, the development of local material supplies, the selection of responsible contractors, the extensive use of industrial equipment, and the general co-operation of all parties to any road contract.

Motor Trucks and Railroads

R. S. Parsons, chief engineer, Erie R.R., pointed out several reasons in which the motor truck could be of inestimable value to the railroad in the movement of freight—in supplanting existing branch line railroads; in taking the place of branch lines that railroads would have to build to take care of a small amount of local freight; in taking care of short-haul freight in congested districts; in supplanting waterways in certain sections; in taking care of special problems of New York transportation. It was his assertion that a great opportunity was ahead of the motor truck in the elimination of the extra handling caused through trans-shipment by railroad, and in the development of truck terminals.

Mr. Parsons quoted some interesting figures to indicate why railroads could, with considerable profit, discontinue the handling of short-haul freight, asserting that less-than-carload freight could be shipped at $2 per ton less by motor truck from Jersey City to Paterson, N. J., the extra expense in railroad transportation coming from extra handling at termini, such fixed charges being the same for short or long hauls. He asserted that the railroads could be benefited by the general public ceasing to ship freight by railroad within a radius of 30 mi.

H. Eltinge Breed, a consulting highway engineer, New York City, made a plea for adequate maintenance grants, and W. G. Thompson, chief engineer, New Jersey State Highway Commission, gave an historical sketch of road building methods.

House Votes No Separate Construction Corps

Quartermaster General and Chief of Engineers Favor Construction by Corps of Engineers

Active work on the part of Representative Mondell, the majority leader in the House of Representatives, quite unexpectedly defeated, temporarily at least, the plan for a separate construction corps in the reorganized army. After the House in a committee of the whole had agreed by a seemingly safe majority to the Sanford amendment providing for a separate construction corps, as related in these columns last week, a separate vote on the amendment was demanded in the House proper, which resulted in the defeat of the proposal by a vote of 170 to 158. The reversing vote occurred too late for inclusion in the news of last week's issue. The vote in no way followed party lines, both parties being well represented on each side of the question. It is still possible that the Senate may insist upon a separate construction corps.

The general question involved in the handling of construction in the army was the subject of the following correspondence between Generals Beach and Rogers:

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Wednesday, March 17, 1920.

Maj. Gen. HARRY L. ROGERS,
Quartermaster General,
Director of Purchase and Storage,
United States Army,
Washington, D. C.

MY DEAR GENERAL: 1. As you know, the Secretary of War has recently reiterated his previous recommendations that all construction work for the Army should be turned over to the Corps of Engineers in the reorganization bills now under consideration by Congress. Your views are requested for presentation to the military committees of the Senate and House upon this matter.

2. It is regarded as advisable to have this work of construction and the major maintenance work invloving important alterations of structures placed under the Corps of Engineers, in order to prevent overlapping and duplication of construction activities in peace and war, and to furnish this most valuable means of training for our Engineer officers in peace for their construction duties in war. It is believed that this work should be turned over to the Corps of Engineers and the operation of utilities left with the various services principally concerned therein; for instance, the utilities within the arsenals by commanding officers thereof, those within the posts, such as bakeries, fire protection, laundries, and so on, by the Post Quartermaster, as was done previous to the war.

3. I am firmly convinced that the consolidation of the various activities of Transportation, Motor Transport, Finance, and operation of utilities at posts under the Quartermaster will be far more advantageous and economical than the present multiplicity of agencies with their unnecessary overhead and expense.

Yours, respectfully,
LANSING H. BEACH,
Major General, Chief of Engineers.

MARCH 17, 1920.

Maj. Gen. LANSING H. BEACH,
Chief of Engineers, United States Army,
Washington, D. C.

MY DEAR GENERAL: I am pleased to acknowledge receipt of your letter of the 17th instant, in which you voice the opinion that the consolidation of the various activities of transportation, motor transport, finance, and the operation of utilities at

(*Continued on p.* 647.)

Machinery for Settling Labor Disputes

The President's Industrial Conference, generally known as the Second Industrial Conference, made its report March 20. In general it follows the lines of the preliminary statement sent out for discussion in December. It provides permanent machinery for settling industrial disputes. One of the interesting suggestions of the report is that, since many engineers go into executive positions, engineering schools should provide courses in which the "pyschological and industrial background for human relations" will be developed. It will be remembered that Herbert Hoover is vice-chairman of the conference.

The report states that the conference first agreed that as industrial problems vary not only with each industry but in each establishment, the strategic place to begin battle with misunderstanding was within the industrial plant itself. If the joint organization of management and employees in the plant or industry failed to reach a collective agreement, the conference proposed a system of settlement under governmental encouragement.

This system of settlement consists of a plan, nation-wide in scope, with a national industrial board, provided for by Congress, which shall have headquarters in Washington and be composed of nine members appointed by the President and confirmed by the Senate, and also local regional conferences and boards of inquiry.

The parties to the dispute may voluntarily submit their differences to a board known as the regional adjustment conference, composed of four representatives selected by the parties and four others in their industry chosen by them. The board would be presided over by a trained Government official, who would act as conciliator. If unanimous agreement were reached it would result in a collective bargain, having the same effect as if reached by joint organization in the shop.

If the regional conference failed to agree the matter would go to the National Industrial Board unless the parties preferred the decision of an umpire selected by them.

Voluntary submission of a dispute to the regional adjustment conference would carry an agreement by both parties that there should be no interference with production pending the process of adjustment.

If the parties, or either of them, refused to submit the dispute to adjustment, a regional board of inquiry would be formed by the regional chairman, of two employers and two employees from the industry and not parties to the dispute.

This board of inquiry would have the right to subpoena witnesses and records, and must publish its findings as a guide to public opinion. The weight of public opinion as guided by these findings, it is believed, would bring about justice in the last analysis.

Either side to a controversy would be permitted to submit its contentions to a regional adjustment conference of this kind if so desired.

The National Industrial Board at Washington would have general oversight of the plan.

War Department Asks Bids on Light-Weight Rails

Through the director of sales the Corps of Engineers is offering for sale by informal bids a quantity of special-size rail and track materials, stored at different parts of the country, bids for which will be received until 4:30 o'clock on the afternoon of March 29, 1920, by the Chief of Engineers, Room 2706, Munitions Building, Washington, D. C.

Included in the materials offered are: 1,333 gross tons of 67.53-lb. Russian rail in standard lengths, stored at Norfolk, Va., and Kearney, N. J.; 1,091 gross tons of 35-lb. A. S. C. E. rail in 15-foot lengths, undrilled, located at Norfolk, Va., Kearny, N. J., Port Newark, N. J., and Philadelphia; 1,101 gross tons of 30-lb., A. S. C. E. rail in 26-foot lengths, drilled, located at Kearney, N. J.; 2,946 gross tons of 25-lb. A. S. C. E. rail in 8, 10 and 12-ft. lengths, undrilled, located at Norfolk, Va., Kearney, N. J.; Port Newark, N. J., New Cumberland, Pa., and Philadelphia. Bolts, connections and track material are also offered.

Lee Enters Consulting Field

(Continued from p. 643.)

variety of factories in the industrial territory which has been built up since the introduction of hydro-electric power in North and in South Carolina.

While Mr. Lee's designated function was the technical development, he has been an important factor in the molding of the broad policies which have resulted in developing the Southern Power Co. from a small beginning, the nucleus of which was the 6,600-hp. plant of the Catawba Power Co. to the present gigantic system.

Mr. Lee was born at Lancaster, S. C., and took up his engineering work at The Citadel Military College of South Carolina. Immediately upon graduation, in 1894, he began work with the Pickens Railway Co. His entrance into hydraulic work was with the Anderson Water, Light & Power Co., for which, as resident engineer, he had charge of the construction of a hydro-electric plant at Portman Shoals on the Seneca River. He here installed the first 11,000-volt generator in service in America. Subsequently he was engaged upon the construction of coast defenses for the United States Government at Charleston Harbor, and then returned to hydraulic work, as resident engineer for the Columbus Power Co., Columbus, Ga., his initial employment being on the reconstruction of a dam on the Chattahoochee River. This stream had an ill reputation. Its floods rose quickly and often exceeded fifty times the normal flow. Soon after the completion of the original dam it was damaged by flood, and it was Mr. Lee's first work to repair the damage. The structure was modified in design and raised in height, and on being completed in 1902 was the first large dam built in the South.

As a result of his successful work on this structure, the Catawba Power Co., then struggling under conditions similar to those encountered by Mr. Lee on the Chattahoochee, prevailed upon him to become their chief engineer. Owing to the persistent floods, three contractors had failed to effect the construction of the company's dam and plant at India Hook Shoals, near Rock Hill, S. C. Mr. Lee went in and brought them to completion in 1904, together with transmission lines to Rock Hill and Charlotte. This company formed the nucleus of the Southern Power Co. Purchases were soon made of water-power rights on the Catawba and Broad Rivers and the larger organization effected in 1905, with Mr. Lee as vice-president and chief engineer.

Previous to the formation of the Southern Power Co., hydro-electric development in the South had been local in scope having for its object the supply of power to a few cotton mills in the immediate neighborhood of the power plant or at a comparatively short distance therefrom. The plans of the Southern, however, were laid on a broad scale and the vision of the promoter, J. B. Duke, ably seconded by Mr. Lee and other associates, has been more than realized.

In connection with his hydro-electric work, Mr. Lee has made a very thorough study of the distribution of rainfall over the Piedmont district. Often there were great disparities in the flow of streams not far apart so that while one power company would have a surplus of power, another would be short of its requirements. To relieve the situation Mr. Lee evolved the plan of tying up the various plants on the same stream, then those on different streams, and finally connecting all the plants in the same general region. A connection on the east with the Carolina Light & Power Co., between Durham and Raleigh, N. C., and with the Georgia Railway & Power Co. on the south, at Tallulah Falls, Ga., made it possible to have rains in one part of the country contribute to those sections where there was a dearth of flow. To enumerate all of his achievements in hydro-electric practice is out of the question in a brief article, but the summary given above of the extent of the system which has been developed under his technical guidance is sufficient to indicate that a tremendous amount of technical development work of a high order was necessary.

Mr. Lee is a member of the principal engineering societies of electrical, mechanical, and civil engineers, and also of the Canadian Society of Civil Engineers.

Two License Bills in New York State Legislature

Licensing bills were introduced in the state legislature of New York on March 17 by a committee of the American Association of Engineers and by Albany engineers. The former is understood to be similar to a bill that was before the legislature in 1913. It is expected that the two bills will be consolidated while under consideration by the legislative committees.

Urban Transport Study

A resolution has been introduced in the Massachusetts Legislative Assembly authorizing the Department of Public Utilities to direct an immediate investigation of the comparative safety and cost of service of transportation over highways and street railways. A report is called for which will present briefly comparative figures on the operation of rail and non-rail, common passenger carriers utilized in London, Paris and Berlin during 1913.

Chicago Building-Height Limit Raised Sixty Feet

The Chicago City Council voted, March 18, to remove the limit of building-height, which had been held at 200 ft. for the past six years, and establish a new limit of 260 ft. Many very large projects which have been held in abeyance for some time on account of the former low limit are expected to begin building soon.

Threatened Water-Works Strike

(Continued from p. 643)

at a meeting under his control on Sunday, March 14, it was voted that the entire body of employees affiliated with the union would walk out on Tuesday, March 16, at 7 a.m. Notice to this effect was received by the Bureau officials on Monday the fifteenth.

Notice was at once given to all employees that those who left the service under such conditions would not be reemployed. Loyal employees were already known and a skeleton organization was ready to operate the pumping stations in case of emergency. Outside help was drawn upon and everything was in readiness for a show-down Tuesday morning, March 16. On the preceding evening a telegram was received from the international president of the Brotherhood of Firemen, Oilers and Laborers calling off the strike. It is understood that this president has subsequently been in Philadelphia, has discharged the paid representative of the union and has taken the sound position that the American Federation of Labor will in no way countenance any movement which will interfere with an essential municipal activity.

It is reported on good authority that the majority of Water Bureau employees are many months in arrears in their dues to the union and it is alleged that the union is substantially dead in so far as the Bureau of Water is concerned.

Los Angeles Aqueduct Power Plant Nearing Completion

San Francisquito power house number two on the Los Angeles aqueduct is well along toward completion and is expected to be ready for service by June 1. Work on the power house proper and on the two penstock lines is in progress and part of the water wheel equipment, which is being supplied by the Wellman-Seaver-Morgan Co., is now on the way west. This plant, which will utilize the drop next below plant number one, will have at the outset two 17,500 kva. units driven by reaction turbines under a 530-ft. head. Only one mile of transmission line is required to tie it in with the 110,000-volt line now delivering power to Los Angeles from plant one.

Separate Construction Corps

(*Continued from p. 645*)

posts, under the Quartermaster Corps, will be far more advantageous and economical to the Government than would be the separation of these activities, with the consequent unnecessary overhead expense.

I have carefully considered the suggestion contained in the second paragraph of your letter, and in view of the recent recommendation of the Secretary of War, I am of the opinion that the interests of the service will be as well served if all original and new projects of construction work formerly carried on by the Quartermaster Corps and lately by the construction division were turned over to the Engineer Corps. This would leave with the Quartermaster Corps the handling of all utilities and maintenance at Army posts, and depots and other activities of the Quartermaster Corps.

For the sake of economy and the utilization of supplies and personnel already available in the Quartermaster Corps at Army posts, depots, and other activities of the Quartermaster Corps, it is deemed essential that maintenance and repairs and utilities at such places should be, as heretofore, included in the duties of the Quartermaster Corps.

The necessity for the operation of utilities being left with the bureau or service responsible for the activity is beyond argument. The functions which have been recently ascribed to utilities officers of the construction division are absolutely essential at both arsenals of the Ordnance Department and depots of the Quartermaster Corps, as part of the responsibility of the commanding officers thereof in the economical and efficient management of their plants.

Yours, respectfully,
H. L. Rogers,
Quartermaster General, United States Army.

Representative Reavis Speaks for Separate Construction Corps

In advocating a separate War Department Construction Division on the floor of the House recently Representative Reavis of Nebraska admitted that creation of such an organization might serve as an opening wedge for his Public Works Department bill, which, if passed, he said, would save the Government more money than could anything else he knew of.

"The bill I have introduced, and on which I hope the House will give me an opportunity to speak before long," said Mr. Reavis, "will take the same Construction Corps by detail out to the several States to assist in building those roads that are being constructed with Federal aid, and we will make these officers serviceable, not only in peace time, but, by so doing, will equip them for service in time of war."

Bill Regulates Motor Truck Sizes and Loading

A bill designed to limit the size of motor trucks and the weight of their loads, and introduced by Senator M. Y. Ferris, Republican, has passed the New York State Senate. The bill limits trucks to 8 ft. in width and 12½ ft. in height, and 25,000 lb. for weight of truck and load.

Robinson and W.-C.-K. Firms Merged

By vote of the stockholders, announced last week, the firm of Westinghouse, Church, Kerr, Inc., engineers and constructors, has been merged with that of Dwight P. Robinson & Co., Inc., construction engineers, under the name of the latter organization.

Propose Ohio River Bridge at Louisville

Discussion of the project of a highway bridge across the Ohio at Louisville is reported. The idea is credited to Mayor Smith of Louisville; officials of New Albany and Jeffersonville, across from Louisville, have expressed themselves in its favor.

C. P. R. Orders $15,000,000 Equipment

The Canadian Pacific Railway has placed equipment orders totaling $15,000,000. They include 2,500 sixty-ton box cars, 500 refrigerator cars, 500 automobile cars, 67 ore cars, 12 dining cars, 53 sleepers, 13 compartment cars, and 24 baggage cars.

Virginia Passes Engineers Certification Bill

Examination and certification of professional engineers, architects and land surveyors is provided for in a bill recently passed by the State Legislature of Virginia. While the bill in its present form is considerably different from the one originally introduced it is considered a step in the right direction. As drawn it is optional whether an engineer, architect or land surveyor secures such a certificate, but he must do so "to be known as a certified professional engineer, certified architect or as a certified land surveyor."

Salient points in the law are as follows: The Governor appoints the board which is made up of three of each kind, a majority of whom pass on their specialty as in the Engineering Council bill. Board members receive $10 per day for the time spent. Examinations cost $20. Surplus money over $500 annually goes into the library fund of the State. Engineers and architects having previously practiced for six years and land surveyors for two years are to be granted a certificate without examination upon payment of a $5 fee. Prerequisites of candidates for examination are citizenship or intention, age 21 years, good character, four years' practical experience (two years if surveying), or graduation from a recognized college. As in the Engineering Council bill engineers may practice architecture and architects engineering. The bill is operative within six months and the penalty for assuming the titles without certification is deemed a misdemeanor punishable by a fine of not to exceed $100. Revocation follows proof of fraud or deceit in professional practice, conviction of felony, gross incompetency or recklessness in the planning or construction of work, habitual drunkenness or addiction to morphine, opium or cocaine. Reciprocity with other states is provided for.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

NATIONAL FIRE PROTECTION ASSOCIATION, 87 Milk St., Boston; May 4-6; Chicago.

AMERICAN ASSOCIATION OF ENGINEERS; 63 E. Adams St., Chicago; May 10, 11, St. Louis, Mo.

AMERICAN WATER WORKS ASSOCIATION, New York City; Montreal, June 21-26.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; Asbury Park, N. J., June 22-25.

AMERICAN PUBLIC HEALTH ASSOCIATION, Boston; San Francisco, Aug. 30-Sept. 3.

The Seattle Association of Members, Am. Soc. C. E., held its regular monthly meeting March 2. Extracts from correspondence concerning the annual meeting of the society in New York, and particularly on the report of the Development Committee, were read. It was agreed that the president should prepare and send a circular to all members of the Seattle association urging them to vote on the questionnaire, and at as early a date as possible. President John L. Hall was re-elected, and T. E. Phipps elected, representatives to the Joint Council of the Associated Engineering Societies. The association went on record as advocating that the new mayor of Seattle appoint an engineer to fill any vacancy occurring on the Board of Public Works, and the president was authorized to appoint a committee to present the views of the association to the mayor regarding such appointive offices.

The Technical Club of Dallas (Tex.), the membership of which includes engineers of all branches, has endorsed the Jones-Reavis bill, now pending in Congress, and has made an assessment of one dollar on each of its 107 members as a contribution to the fund maintained by the National Public Works Department Association to promote the interests of the bill.

The Mohawk Valley Engineers' Club (New York State), at its meeting held at Utica, N. Y., March 18, was addressed by Edwin S. Carman, president, Cleveland Engineering Society, who gave a review of the industrial situation in the United States and Europe. Prof. W. H. Kenerson, Brown University, Providence, R. I., also spoke on the world industrial situation, and C. A. Booth, Buffalo Engineering Society, delivered a few remarks on local sections.

PERSONAL NOTES

Arthur E. Morgan, chief engineer of the Miami Conservancy District, is the author of an article on "New Light on Lincoln's Boyhood," which appeared in the *Atlantic Monthly* for February. Mr. Morgan picked up the information from relatives of Lincoln whom he found in a very remote section of Arkansas.

F. T. Crowe has resigned his position as Project Manager of the Flathead irrigation project effective as of March 1, 1920. He will be associated with Rich & Markhus, contractors of Prosser, Wash. Mr. Crowe entered the reclamation service in 1904 and was connected with the Yellowstone & Minidoka projects and with the construction of the Jackson Lake dam in Wyoming and the Arrowrock dam in Idaho.

Colonel George A. Johnson of the Construction Division of the Army has resigned his commission to assume his duties as the directing head of the engineering firm, Johnson & Benham, whose formation was announced in these columns some time ago. Hitherto, Major Webster L. Benham has been directing the affairs of the firm which has offices in New York City and in Kansas City, Mo. The specialty of the organization whose general direction Colonel Johnson will assume is the design, construction supervision and management of water supply and sewerage plants and other public utilities.

Max L. Cunningham, formerly of the Oklahoma Highway Department, whose resignation became effective recently, has become vice-president and chief engineer, Municipal Excavator Co., Oklahoma City, Okla.

Andrew H. Harkness, formerly with Harkness & Oxley, Thos. R. Loudon and C. S. L. Hertzberg, formerly with James Loudon & Hertzberg, Ltd., have opened offices in the Confederation Life Bldg., Toronto, and will practice as consulting engineers and architects under the firm name of Harkness, Loudon & Hertzberg.

A. McDowell, consulting engineer, Owen Sound, Ont., has been appointed engineer of Grey County.

E. M. Bourke has been appointed city engineer of North Bay, Ont.

John H. Wilson, city engineer of Honolulu, T. H., has been appointed mayor of that city, succeeding the late Joseph J. Fern. Fred Ohrt will take Mr. Wilson's position as city engineer. Mr. Wilson was born in Honolulu in 1871. He studied engineering at Leland Stanford University and returned to Honolulu in 1896; since then he has been constantly engaged on municipal and county improvement work, particularly the construction of the Pali road and more recently the round-the-island thoroughfare known as the Kamehameha highway.

C. P. Prann, formerly assistant city engineer, New Haven, Conn., has been appointed city engineer, Meriden, Conn.

Captain Billings Wilson, Corps of Engineers, U. S. Army, has resigned from the service, effective April 1, to take a position with Francis Lee Stuart, consulting engineer, New York City.

Ernest Drinkwater, for the past eight years prominently identified with contracting work and municipal improvement at St. Lambert, P. Q., has been appointed city engineer.

C. F. Lewis has resigned his position with the U. S. Bureau of Public Roads to open offices in Greensboro, N. C., under the firm name of Spoon & Lewis, consulting engineers. The firm will render general consulting service, giving particular attention to highway and municipal work.

Major Robert C. Wheeler, chief of water supply section, Construction Division, U. S. Army, recently discharged, and at the time of leaving associated with Captain Harry Barker, New York City, in the general practice of engineering, sailed March 16 for Athens, Greece, with a party of engineers organized by Ford, Bacon & Davis to prepare plans and estimates for the water supply and sewerage of Athens. Mayor Wheeler will be in charge of the work on water distribution, sewage collection in that city and methods of sewage disposal. The work will require about six months and on its completion he will return to New York and resume active participation in the work of his firm.

M. E. Crouch, Sudbury, Ont., has been appointed town engineer, Paris, Ont.

C. W. Tarr, vice-president and general manager, Morris Knowles, Ltd., Windsor, Ont., Canadian branch of Morris Knowles, Inc., Pittsburgh, has resigned to become resident engineer for the same firm on the construction of a water filtration plant at Elyria, Ohio.

John Hanson, assistant state engineer, North Dakota Highway Commission, has resigned to engage in private engineering practice. It is reported that he will be affiliated with a Hebron concern. Thomas Lough, of the commission, has been selected to fill Mr. Hanson's place.

Lieutenant Joseph A. Murray, Jr., recently assistant engineer in charge of sewage disposal, has been appointed principal assistant engineer, bureau of engineering, Albany, N. Y.

H. F. Ferguson, assistant to Paul Hansen, chief, division of sanitation, Illinois Department of Public Health, who recently resigned to join the firm of Pearse, Greeley & Hansen, will become acting chief engineer of the division pending a permanent appointment. M. C. Sjoblom, assistant to Captain Hansen, will become principal assistant engineer.

H. E. Barlow, assistant engineer, Chicago, St. Paul, Minneapolis & Omaha Ry., since 1902, has been appointed chief engineer, with office at St. Paul, Minn. He succeeds H. Rettinghouse, who has retired, to enter other business.

H. P. Padley, principal assistant engineer, Chicago, St. Paul, Minneapolis & Omaha Ry., has been appointed assistant chief engineer.

LeRoy Kissam, recently engineering draftsman, plant department, Bayles Shipyard, Inc., Port Jefferson, N. Y., has entered the design division, engineering department, E. I. Du Pont de Nemours Co., Wilmington, Del.

Rudolph P. Miller, New York, has been nominated for chairman, executive committee, National Fire Protection Association. The nomination will be voted upon at the annual meeting of the association to be held May 4-6, in Chicago.

R. C. Hamm has been appointed engineer of Ford County, Kan., with headquarters in Dodge City. He succeeds T. J. Shall.

L. B. Caruthers, Jr., has resigned from the engineering department, American Rio Grande Land & Irrigation Co. of Mercedes, Tex., to become associated with W. W. Vann and Charles McKercher under the firm name of Vann, Caruthers & McKercher, civil engineers. The firm will have its headquarters in Mercedes, and will give special attention to the design and construction of irrigation systems and reinforced concrete structures throughout the Lower Rio Grande Valley.

Sir Adam Beck, chairman, Ontario Hydro-Electric Power Commission, who has been absent for several months in England, has returned to Canada and resumed his duties.

C. I. Burgraff has resigned from the Illinois State Highway Department to accept a position as bridge engineer with the Morgan Engineering Co., Memphis.

J. O. Butterfield has entered the employ of the Morgan Engineering Co., Memphis. He will be stationed near Greenville, Miss., on the construction of a drainage pumping plant. Mr. Butterfield was formerly with Central Romana, La Romana, Dominican Republic.

A Consolidation of Engineering News and Engineering Record — McGraw-Hill Company, Inc.—JAMES H. McGRAW, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN
Editor

Volume 84 — NEW YORK, THURSDAY, APRIL 1, 1920 — Number 14

Last Call for Votes

THE questionnaire ballot of the American Society of Civil Engineers is to be canvassed April 16. Those who have not yet voted should do so at once. Despite the fact that the questions at issue have been before the members more or less actively for many years, the number of votes cast up to March 29 was only 2,359, about 25 per cent of the membership. The present ballot, which will determine the course of the society for many a year, should bring out an overwhelming expression. Shall it be that the society's course will be determined in a ballot in which less than one-third of the members vote? We hold it to be a solemn duty of every member to play his part in determining the society's future.

A Final Word

WE HAVE been glad while the questionnaire ballot has been under consideration to afford a free forum in our Letters' column for the discussion of the issues. If the communications are an index of the thinking of the membership at large, there is only one doubtful point—whether the society should join with the other national bodies in effecting a comprehensive organization of the profession. The internal changes proposed by the committee on development seem to be generally approved. With reference to Question 3, most of the letters' pertinent thereto which we have printed have opposed the comprehensive-organization plan. If this were a correct index of the society's thinking, it would indicate the defeat of the proposal. Reference to Mr. Humphrey's letter in the News Section of this issue, though, will show that outside of New York sentiment is strongly in favor of the joint committee's proposal. No less than twenty of the local groups of members have approved the proposal. The letters we have published have come chiefly from New York—the traditional home of society conservatism. That should be carefully remembered by those who would weigh the significance of the opposition to Question 3.

Enforcing Codes of Ethics

WE HEAR so often the view that codes of ethics cannot be enforced that it is a distinct pleasure to read the article on the disciplinary procedure of the American Institute of Architects on p. 677 of this issue. The architects not only have a code, but they have machinery for its enforcement and penalties for its violation. Further, they use the machinery and they impose the penalties. We hope that every civil engineer will read Mr. Sellers' article carefully, and that it will be brought to the attention of the profession generally. Representatives of the American Society of Mechanical Engineers in the Joint Committee conferences enunciated heretical views regarding codes of ethics. Apparently, they would say to the enforcement procedure of the architects, "There ain't no such animal." But the architects have enforced their code. Shall the engineers continue to let theirs remain unapplied?

Schwab on Success in Life

WHILE Charles M. Schwab's recent address on success in life, delivered to the undergraduates of Princeton, was essentially a message to young men and has been reproduced in large part in this issue (p. 681) mainly for the benefit of the young engineer, it contains so many valuable hints on organization and on the handling of men that every engineer will profit by giving it a careful reading. Two characteristics of Mr. Schwab stand out in almost every paragraph: he understands men and he is an optimist. We feel, after reading his words, that he is the type of man we would like to work with. This type of executive, unfortunately, is not as common among technically trained men as one would wish. If there were more engineers of that type, there would be less complaint about inadequacy of compensation or lack of appreciation by the public.

Co-operation of Highway Agencies

LARGE possibilities are latent in the practice which the highway officials of a number of states have inaugurated of calling annual conferences of the agencies concerned in the construction of improved highways. The task of standardizing cost-estimating which has been undertaken in Wisconsin is an example. At the call of the state highway engineer a conference, participated in by nearly 300 engineers, contractors, materials producers and equipment manufacturers, was held in November, 1919. The standardizing committee grew from this conference. This is but one of the many kinds of co-operative work that may profitably be undertaken. The plan should be followed in every state. The task ahead is stupendous and conferences will help develop a confidence that will be of immeasurable value.

New Plans for Hetch Hetchy

IN INVITING contractors to bid on the 18-mile tunnel on the Hetch Hetchy project, San Francisco has resorted to what seems the only logical course under present financial conditions. The bond situation was commented on in an editorial appearing in our March 11 issue, page 498. When the city called for bids on this work, in 1917, the lowest bid for concrete-lined tunnel was $95 per lineal foot. This was so far above the engineers' estimate of $63 per foot that all bids were rejected and the city undertook to do the work on the day-labor plan. The *Engineering News-Record* at the time expressed doubt that the work could be done for this figure, but the city engineer, M. M. O'Shaughnessy, after driving two miles of tunnel, has stated that the cost has been $40 per foot, exclusive of the lining, which he estimates can be done for $20 per foot. Allowing $5 for contingencies, the total would be $65 per foot, only $2 above the original estimate. With five headings open and two miles of tunnel driven, there are data available on which contractors should be able to make a much more accurate estimate of cost than at the first bidding, particularly as they can figure on using the equipment and, to a large extent, the organization now on the job. In other words, the number of uncertain elements involved has been reduced. The fluctuations in the money market and the labor situation, however, continue to be factors on which no assurance of future conditions can be had, and it is likely that at the present bond-discount rate the financing may add $20 per foot to the cost.

Hetch Hetchy Power

SIMULTANEOUSLY with the decision to call for bids on the Hetch Hetchy tunnel work comes a suggestion that the surplus power should be sold, when ready, to private power companies. There is much criticism in California against building the Hetch Hetchy aqueduct now, when the purpose seems to be to develop power rather than to secure a municipal water supply. Objections are made by irrigation interests, and also by those who fear the competition between the municipality and public-utility companies. The latter objection is removed by the fact that the city has already received offers from private parties for the purchase of the surplus energy from the aqueduct. As to the rights of the irrigationists, they are already protected by the law. With successive years of drought in California, the increasing price of oil and the rapidly growing demand for electrical energy, there seems no reason why the city, with this water placed at its disposal by the Government, should not help the power situation. and at the same time help itself to pay for the building of the aqueduct, which, all agree, will eventually be needed for the city's water supply. Legal objections are also raised, but the city has sold surplus power from its construction plant for a year or more, while Los Angeles has found it possible to sell aqueduct power. Even though the water may not be needed for city supply for some time to come, conditions in California warrant the pushing of the Hetch Hetchy work.

Highway Classification

COINCIDENT with the announcement of the plan undertaken by the Bureau of Public Roads for the classification of highways, comes the word from England that the Director General of Roads, under the Ministry of Transport and with the collaboration of the Roads Advisory Committee, is undertaking similar work there. Though the basis of classification in either country—the relative importance of various highways for general traffic purposes is the same, England must, of necessity, proceed in greater detail. Traffic censuses at all strategic points on all highways are to assist in the British classification. The most careful analysis of expenditures and receipts is demanded to assist the Ministry of Transport in determining what the percentage of maintenance grants shall be. However more in detail the British classification goes, the principle underlying either classification is the same—the determination of local, regional, and national value as a means of regulating county, state and Federal appropriation for highway construction and maintenance.

Cost Analysis of Road Work

IMPORTANT work has been done by the highway engineers and contractors of Wisconsin in standardizing cost-estimating practices. The immediate value of this work lies in the lists of cost items which are published on p. 663. These lists may be used in preparing, or for checking, cost estimates without regard to their further development. Necessarily, there will be further benefit as the procedures are perfected and the use of the methods becomes general. As an example, more precise computation and distribution of costs will follow. Bidding prices will, in consequence, be based on facts and not on assumptions. Finally, engineers and contractors will learn to think along parallel instead of divergent lines on questions of cost. This is the purpose sought by the co-operative work now being carried on.

More Reclamation Needed

SOONER or later enabling legislation will permit the engineer to provide this country with more farms. Economic necessity will force it. A large grist of bills has been presented to Congress in the past year but none seems to have had more than educational effect. The engineer, who is inclined to support some one of these bills, may fortify his own enthusiasm by emphasizing Herbert Hoover's recent statement before the Western Society of Engineers that we would be importing food within five years. Moreover, D. W. Ross, in a statement in relation to the Fletcher-Smith land reclamation bill, S. 3942 and H. R. 12549, gave statistics as to our needs. The farmers are increasing at the rate of 700,000 per year. They need 100,000 new farms or 6,000,000 acres. Only 2,000,000 acres have been put under irrigation by the Reclamation Service and with present funds only 2,500,000 acres more will be available—not, however, within the next year, but in the next 25 years. The great proportion of the 10,000,000 persons representing the natural increase in the farming population since the Reclamation Act became operative has found economic independence easier to obtain in other industries. The difficulty of obtaining a foothold upon the soil is due chiefly to the $30,000,000,000 advance in the price of farm land in this 18-year period. The events of the past five years, which have developed a fierce competition for man-power gave this cityward movement a further impetus. In another 10 years the total increase in population will be 20,000,000; the increase from the farm population will be 6,000,000. How to divert a small portion back to the land or to retard the movement to the cities so that all of us may eat is a serious problem to which the engineer may well lend his help.

Ambitious Legislation

THE Fletcher-Smith bill noted above is an ambitious all-inclusive $350,000,000 reclamation measure introduced by the southern interests, to which western support has been given because it is a modification of the Smith-Chamberlain bill which has been before Congress for several sessions. The financial scheme, accomplished through the medium of the district, is along the lines suggested by the western interests but the projects would be placed on an interest-paying basis. The essential features are based upon the joint credit of the Government and the states, the investing public furnishing the funds. Like the Federal Farm Loan System it would lay no burden upon the taxpayer. In its favor are the utilization of the present U. S. Reclamation Service, the small beginning and the interest-paying feature.

Budgeting Construction to Available Labor and Materials Supply

NEWS reports from England indicate that the Ministry of Health is about to place restrictions upon so-called luxury construction. The proposed regulations will allow local authorities to determine within their respective areas whether any proposed building will delay housing and to indicate priority, when necessary, in building construction. It is probable that these provisions will become effective immediately.

Such restrictions as England proposes and such regulation of construction as is outlined are a needed step toward the correction of a condition which four years of war has created—lack of housing. It is a condition which has made itself keenly felt in this country as well. Cannot we find in the British proposal enough merit to warrant our taking similar action in order that we may in part, at least, correct a very serious condition—one that very properly should give us national concern?

Architects, engineers, and contractors are now engaged in large numbers on three classes of work: industrial plants, highways and general construction. The amount of industrial construction undertaken is large and there is little doubt that such construction is not for immediate need, but is undertaken because funds are available that would otherwise go to the Government as excess profits taxes. In any event, industrial construction is in large volume and to a large extent is controlling the materials and labor markets.

The roadbuilding program must be curtailed. With a restriction of industrial construction to the necessary, and a considerable reduction in the road program, there would be released for general construction, and particularly for housing, a nearly normal supply of material and labor. In the City of New York alone it is estimated that 40,000 apartments per year are needed to care for the increasing population. At the minimum it is two years behind in its housing construction. It is also estimated that in New York City there is available from $50,000,000 to $100,000,000 worth of credit for housing schemes. But private owners are unwilling in a short market to compete with large industries.

Happily or unhappily there exists in these United States no agency which is the conterpart of the Ministry of Health in England to assume charge of construction administration. Doubtless there are many in this country who recoil from so "social" a program as the Ministry of Health is engaging upon. There are many among us who would fight any attempt to curb individual effort or to restrict the expenditure of private funds. But whether it smacks of socialism or not, what the Ministry of Health proposes to do is corrective. If we have no agency analogous to the Ministry of Health we can at least engage the attention and perhaps sympathies of those agencies which combine to turn capital into construction. We need a budget that will prorate construction to the available supply of materials and labor, taking care, first of all, of such enterprises as will relieve the living conditions of hundreds of thousands of our metropolitan population. Such co-ordination will mean the yielding a little of all agencies concerned; the contractor who has upon his books large amounts of industrial contracts, the manufacturer whose excessive profits are turned into construction, the material dealers, organized labor, the banks who furnish credit, the real estate brokers,—in short, every agency concerned.

Inasmuch as it ruffles the average American to suggest restriction or regulation from any outside agency, this budgeting of construction to available supply of materials and labor must be a product of private co-operation. The Government or the U. S. Chamber of Commerce should take the initiative.

Broadminded business judgment requires such action. If voluntary co-operation fails we may soon have to censent to compulsory restriction. The housing situation is critical.

An Engineer for the Hall of Fame

WHAT are engineers doing to secure a place in the Hall of Fame? The fifth quinquennial election takes place this year. Any one may send nominations to the Hall of Fame, New York University, New York City, up to May 1, for reference to the electors who make the final choice. Among the electors this year is Gen. George W. Goethals. The nominees are divided into 15 classes, including scientists, physicians and sugeons, engineers and architects, inventors, and business men. Thus far, the scientists and the inventors have four representatives each in the Hall of Fame, but there are none for engineers and architects, physicians and surgeons, or business men. The only engineer who has received a large number of votes—only to fail of choice by the electors—is James B. Eads.

Surely at least one of the many great engineers of the country, now ten years deceased, comes within the definition of fame that guides the electors, that is: "The condition of being much talked about, chiefly in a good sense; or reputation from good achievements." Engineers individually and every national, state and local engineering society should bestir themselves in this matter without a moment's delay—not merely to ensure proper consideration of the claims of engineers for recognition, but also because the great aim of the Hall of Fame is educational and inspirational. A special effort is being made to interest the schools and colleges of the country, a significant fact for the engineering schools.

Should it prove to be too late to get effective action at the 1920 election then the subject might well be kept before the engineers and engineering societies of the country during the next five years. It should be remembered that normally only ten new tablets are put up once in five years, of which two are for women. Obviously much needs to be done to bring the claims of worthy engineers to such wide popular recognition as they reserve, and at the same time to crystallize and center, first engineering, then public opinion upon a small enough number of engineers to ensure the election of one. To get results prompt action is needed.

Construction and Maintenance of the Ashokan Highways

Deep Frost Penetration Causes Curling of Edges and Transverse and Longitudinal Cracks — Elasticity of Slab Allows Automatic Healing When Ground Thaws

By George G. Honness
Department Engineer Board of Water Supply, City of New York

THE Ashokan reservoir, located in the foothills of the Catskill Mountains, and the principal impounding reservoir for New York's Catskill water supply, is the largest reservoir for potable water in the world. Its creation necessitated the construction of about 40 mi. of new highways as substitutes for highways included within the reservoir area. There were about 68 mi. of these old roads and they were mainly ordinary dirt roads with little provision for drainage, and practically no protection in the way of guard rails. The new highways are relocated for their entire lengths, generally through an extremely rough country. The location was practically limited to a strip of country 500 ft. wide, as the rule was laid down that in general the highways should not approach the reservoir shore line nearer than 500 ft. nor depart from it more than 1,000 ft. With the final location made, a strip of land varying in width from 66 to 100 ft. was set aside for highway purposes. In a few places, because of topographical conditions, it was impractical to follow the above outlined plan, but such places aggregated a small part of the entire highway system.

An attempt was made to limit the maximum grade to 5 per cent, and how well this was accomplished is shown by the fact that there was only a little more than 3,000 ft. of grade in excess of 5 per cent, and of 5 per cent grade only about 2½ mi. These roads were located in 1906, before the use of automobiles had become so geenral, and for that reason not as much attention was given to alignment as would be given today. At a number of places there are curves of a too short radius, and a slight increase in cost for grading would have improved the conditions materially.

In order that embankments should be given an opportunity to reach final settlement, the grading was undertaken several years in advance of the time of surfacing; this also gave opportunity to note conditions of high groundwater and deep frost penetration, and advantage was taken of this opportunity during at least three spring seasons before surfacing was undertaken. The drainage problem was thereby simplified and advance knowledge was gained of the portions of the road needing special treatment.

Grading

The roadway was 28 ft. wide in cuts and 24 ft. wide on embankments, guard rails being set so as to give an unobstructed roadway 22 ft. wide. The rock of this region is of the Hudson River series of sandstones and shales, and the earth is glacial drift, much of it a heavy clay soil, which continues to absorb moisture until it runs like a heavy molasses and admits of an unusually deep frost penetration. In this mountain country there are frequently summer days when the temperature approaches 100 deg. F. and in the winter it is not unusual to have temperatures of 20 deg. F. below zero. Frost has been known to penetrate in excess of 5 ft. Ordinarily there are heavy falls of snow which prevent the deep frost penetration, but occasionally this is not the case and the effect on the roads in the spring is very severe and will be commented upon later in this article.

The average yardage of excavation was 2.41 cu. yd. per linear foot, of which 22.8 per cent was rock. This quantity varied from 2.12 cu. yd. to 3.67 cu. yd. per linear foot and the percentage of rock from 0.3 per cent to 41.6 per cent. About 10 mi. of the highway was in rock cut or fills, but the balance was in the heavy, tough clay already described.

The average contract cost for grading wass $13,931.54 per mile.

A court order fixed the widths of the surfacing at 16 ft. on the north side and 14 ft. on the south side of the reservoir and required that the surface of the new roads be "equal in every respect to those constructed by the State of New York in the County of Ulster." On previous work done by the City of New York in upstate counties it has been the practice to award the various towns a lump sum for maintaining the new highways. This is a capital sum, the interest from which is supposed to represent the difference in yearly cost of maintenance of the old and new highways. The city has no control over the expenditure of this money. The alternative is for the city to maintain the roads forever. In this instance, the corporation counsel decided upon the latter course.

Extensive studies were made of the relative merits of various types of surfacing. With the condition of perpetual maintenance in mind, it was decided that a vitrified-brick pavement on a concrete foundation would be most suitable. A contract was prepared and bids received in 1913, but objections were raised by the finance department and the Board of Estimate and Apportionment to this seeming extravagance, so that in May, 1913, all bids for brick paving were rejected. The Board of Estimate's committee of consulting engineers recommended that the majority of the roads be surfaced with a mixed bituminous concrete on a foundation course of crushed stone, and a contract was prepared and let in August, 1913.

For highways carried over dams and dikes of the reservoir, vitrified brick on a concrete foundation was used. A short mileage of waterbound macadam, which was later given a surface treatment with hot tar applied with a pressure distributor, was used where traffic was light. Some bridges were paved with asphalt blocks. The relative mileage is as follows:

	Miles
Mixed bituminous concrete	32.11
Vitrified brick on concrete foundation	4.27
Waterbound macadam	2.92
Asphalt blocks	0.71
Total	40.01

As the major portion of the highways are surfaced with mixed bituminous concrete, this article will be limited to a description of the construction and maintenance of that type of pavement.

The contract for the bituminous surfacing was let in August, 1913, and construction completed in the fall

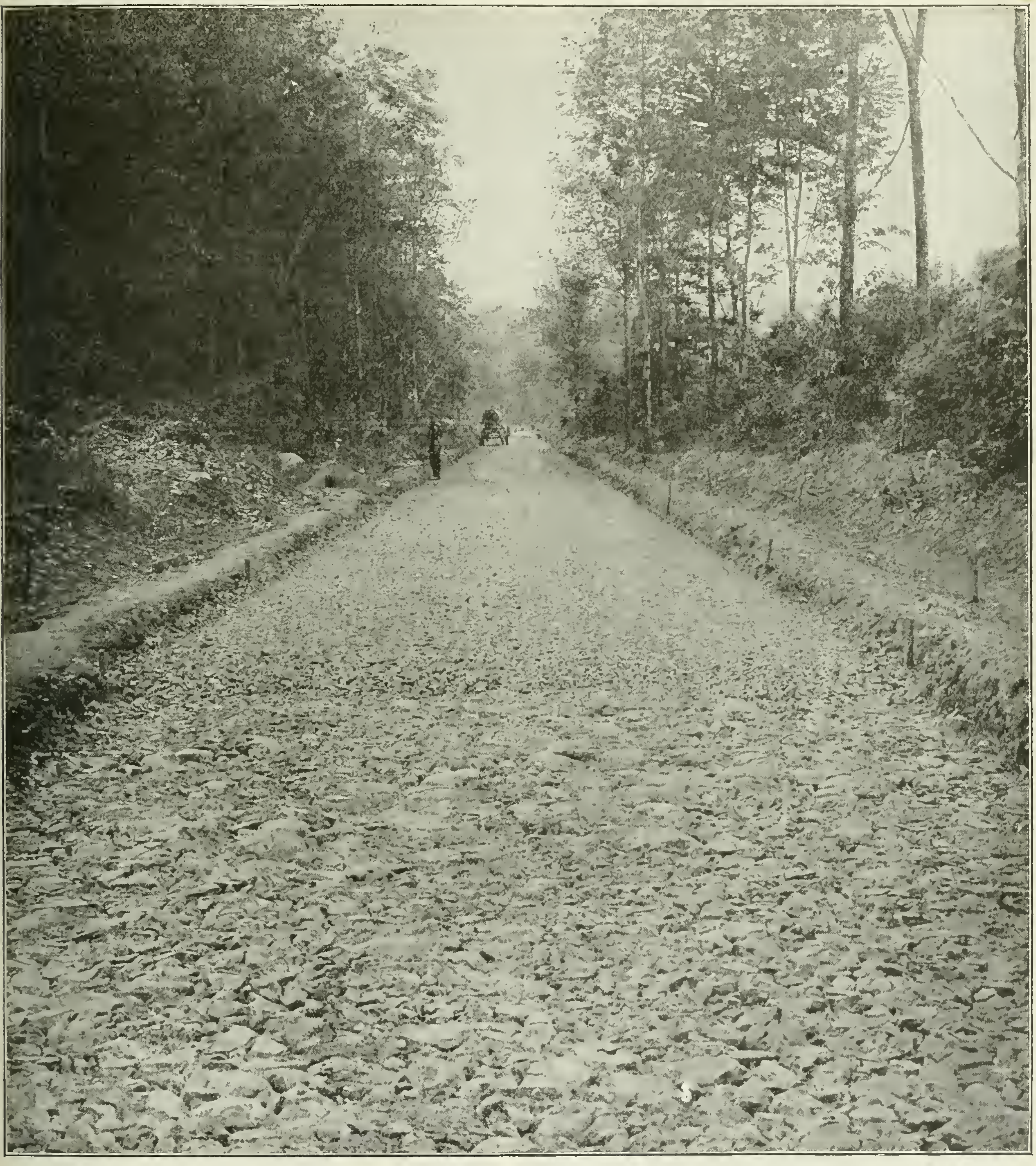


FIG. 1. FOUNDATION AND BASE UNDERLYING 2-IN. ASPHALTIC TOPPING

of 1915, the bulk of the work being done in the season of 1914. The principal items of work were: 24,577 cu. yd. of broken stone for drainage course; 50,015 cu. yd. of broken stone for foundation course; 275,803 sq. yd. of bituminous surfacing; and 2,648 tons of bitumen in asphalt cement. This contract also included items for the maintenance of the surfacing and shoulders for a period of three years beginning Oct. 1 of the season in which the pavement was completed.

It is generally conceded that the success of any pavement is dependent upon the drainage of the subgrade. As previously stated, at least three spring seasons were used to determine the extent to which special treatment was necessary. This record was used when surfacing was undertaken and it was found necessary to modify the previously determined method of construction only to a slight extent. How thoroughly the drainage problem was cared for is evidenced by the following facts: About 10 mi. of this highway were in rock cuts or on fills; about 13 mi. were provided with a properly drained sub-base 8 in. thick, making a total thickness of 16 in., including the 2-in. wearing surface; and about 6¾ mi. of 4-in. tile pipe were used, being laid in a trench 4 ft. below crown grade, the trench being filled with graded crushed stone, where high ground water conditions made this necessary.

To make the subgrade drainage certainly effective, it is essential that the tile drains and drainage course should be free drainage, and this is by no means easy of accomplishment in a climate such as is prevalent in the region in which these roads were built. Ice and hard packed snow frequently close the openings and cause water to back up into the drains and drainage course; therefore, any money expended in gaining a free outlet for ground water is well warranted.

Laying of Drainage Course

A drainage course was used in practically all earth cuts and on some embankments. It was laid on a well prepared subgrade which was carefully trimmed and rolled. Where the drainage course could be drained into side ditches on both sides, the subgrade was made parallel to the finished surface; where this was not practical, it was given a transverse slope toward the side on which drainage was obtainable. A blind outlet was provided at intervals of about 100 ft.

In placing the drainage course, the largest field or quarry stones available were laid on the subgrade with the flat side down. The subgrade was entirely covered with these large flat stones, laid so that they had a solid bearing and did not wave or rock or bridge over from one stone to another. The drainage course was built up with smaller stones and usually topped off with tailings from the crushers, and when ready for rolling had a thickness of about 10 in. which rolled to a thickness of about 8 in. when properly compacted. The rolling was very thoroughly done, as it prevented the stone of the standard foundation course from being rolled into the sub-base.

When the drainage course was not used or required, the foundation course consisted of two layers each 3 in. thick after rolling. The sizes of stone and methods of construction for the standard foundation course were specified as follows:

> The screening plant or plants for supplying broken stone for Items 4, 5 and 6 shall be equipped with revolving screens, 0 to 12 ft. long and from 30 to 36 in. in diameter, having perforations as follows: First section, ½-in. holes; second section, 1½-in. holes; third section, 3-in. holes. The sections of screen shall be of acceptable lengths. A dust jacket having ¼-in. circular perforations or composed of a 4-in. mesh screen shall surround the first section; it shall be 6 to 9 in. shorter than the ½-in. screen and about 6 in. greater in diameter. The products of the crushing and screening plants shall be clean and of suitable quality for the purposes intended. Broken stone shall be so handled and transported as to prevent segregation.
>
> Waterbound macadam surfacing shall be constructed as follows: After the subgrade shall have been acceptably prepared, a layer of 3-in. stone shall be spread for the bottom course to such depth that it shall have, when rolled, a thickness of about 5 in. at the center of the road. It shall be thoroughly rolled with a 10- to 12-ton roller, beginning at the edges, until it does not creep or wave ahead of the roller, and shall be carefully constructed to conform to the ordered grade, crown and section. A dry filler of screenings shall then be swept in with brooms, thoroughly sprinkled and rolled, this process being continued until the voids are completely filled. Irregularities or depressions that develop shall be made good. In general, more rolling will be necessary where the foundation is earth than where it is rock. A layer of 1½-in. stone shall then be evenly spread for the top course to such depth that when rolled it will be about 3 in. thick. After thorough rolling, screenings shall be swept in dry, sprinkled and rolled, until a grout shall have been formed that fills all the voids. The finished surface shall be true to the required shape. A thin layer of screenings shall be spread over the road to form a top dressing.
>
> The bottom course of the bituminous pavement shall be constructed as specified in the first part of Section 4.7 for the bottom course of macadam, except that it shall be laid in two layers of about 3 in. each after rolling, each layer to be thoroughly rolled and the voids filled with screenings to the extent directed. When completed, ready for the bituminous wearing course, the surface of the bottom course shall be true to shape, clean, firm and with no loose stones and no excess of screenings. If the surface is not slightly rough so as to afford sufficient bond for the bituminous course it shall be broomed. The bottom course shall not be laid more than 1,000 ft. in advance of the wearing course specified in Item 6.

A very exceptional foundation course was obtained and, after sweeping clean prior to the placing of the wearing surface, was equal in quality to a well-constructed waterbound macadam. This quality, the fact that traffic was apparently beneficial, and the impossibility of maintaining the required progress, made it possible to waive the contract requirement that the foundation course should not be kept more than 1,000 ft. in advance of the wearing surface.

The crown of the finished pavement as shown on the contract drawings was ¼ in. per ft., being 2 in. for a 16-ft. width and 1¾ in. for a 14-ft. width. It was found, shortly after the work started, that this small crowning was hard to obtain and it was increased to ⅜ in. per foot. This increase in crown is not sufficient to lead to concentration of traffic to the center of the pavement and provides better drainage and is easier to attain.

The type of plant used for furnishing the stone for the foundation course and stone for the wearing surface was the typical portable crusher with screens and bins commonly used for highway construction. These plants were set up at intervals of about 1½ mi. and provided sufficient 3-in. stone for the foundation course and, in addition, the 1½-in. stone and chips for the wearing surface and seal coat, although there was some shortage of dust and chips, which made it necessary to operate the crusher for a portion of the time with close set jaws. In order to increase the amount of fine material in the 1½-in. product used for the wearing surface, the lengths of screen were adjusted so that the length of screen having ½-in. holes was 21 in. long and that having 1½-in. holes was 36 in. long, the balance of the screen having 3-inch holes. This type of plant provided sufficient stone to complete 143 lin. ft. of 14-ft. road or 123 ft. of 16-ft. road per day.

Wearing Surface

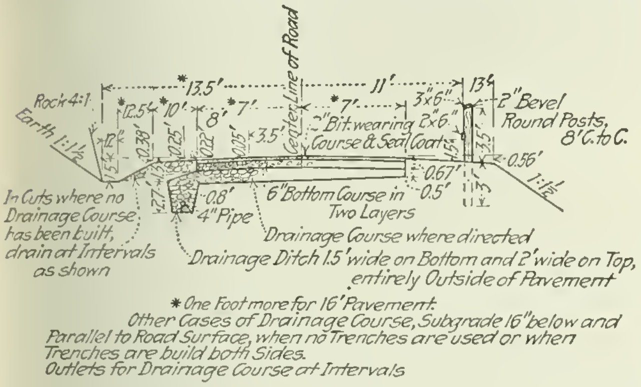
The bituminous concrete was mixed so that the resulting mixture contained, by weight, 6¼ per cent of asphaltic cement, the stone ranging in size from ½-in. to 1½ in. The temperature of the stone, after drying and heating, was fixed at a maximum of 225 deg. F. and the asphalt ranged from 275 deg. F. to 300 deg. F., as it was found that these temperatures reduced the leakage from the wagons to a minimum.

The detailed specifications for wearing surface follow:

> The broken stone for the wearing course shall be heated, before entering the mixer, to between 225 deg. F. and 300 deg. F. in revolving dryers of an approved type, in which no flame shall be permitted to come in contact with the stone. The stone shall be continuously agitated during the heating.

The asphalt cement furnished . . . for the wearing course and the seal coat shall be heated separately from the broken stone in approved receptacles, so designed as to admit of an even heating of the entire mass, with an efficient and positive control of the heat at all times. It shall be heated to the temperature directed from time to time, between 275 deg. F. and 350 deg. F. If any portion of a batch of asphalt cement is heated beyond 350 deg. F., either before or after mixing with the broken stone, the entire batch shall be rejected.

When thoroughly heated to the proper temperatures the asphalt cement and the broken stone for the wearing course shall be mixed, as directed from time to time, generally so that the resulting mixture shall contain between 5 and 7½ per cent, by weight, of bitumen. The contractor shall provide approved means for accurately proportioning the mixture. Excess of asphalt cement shall be prevented; and any such excess shall be cause for rejection of the surfacing unless satisfactorily corrected previous to laying. A mixer shall be used, of satisfactory design, having revolving blades, and efficient means for keeping the temperature at the desired point without burning the asphalt. The mixing shall continue until every particle of the broken stone is thoroughly coated with the asphalt cement and a uniform mixture has been obtained, which when discharged shall have a temperature not more than 300 deg. F. and not less than 225 deg. F. The use of batteries of small batch mixers will not be allowed.


Center Line of Road
Rock 4:1
Earth 1:1½
*13.5'
11'
13"
*12.5'
*10'
8'
*7'
*7'
3"x6"
2"x6"
2" Bevel
Round Posts, 8' C. to C.
2" Bit. wearing Course & Seal Coats
3.5'
12"
1.5'
0.38'
0.25'
0.22'
0.05'
3.5'
1.5'
0.56'
0.67'
0.5'
2.7'
0.8'
4" Pipe
6" Bottom Course in Two Layers
1:1½
In Cuts where no Drainage Course has been built, drain at Intervals as shown
Drainage Course where directed
Drainage Ditch 1.5' wide on Bottom and 2' wide on Top, entirely Outside of Pavement

* One Foot more for 16' Pavement.

Other Cases of Drainage Course, Subgrade 16" below and Parallel to Road Surface, when no Trenches are used or when Trenches are build both Sides.

Outlets for Drainage Course at Intervals

FIG. 2 COMPOSITE CROSS-SECTION COVERS SPECIFICATIONS FOR ALL SECTIONS

The bituminous mixture, thus heated and prepared, shall be delivered from the mixer to the point of deposition in the pavement, if at a considerable distance, in suitable trucks or wagons, provided with canvas covers for retaining the heat. To prevent undue compacting on long hauls, partitions may be required for large truck loads. As delivered, the mixture shall have a temperature of at least 150 deg. F. Material having a lower temperature than this shall not be laid in the pavement. The mixture shall be immediately spread over the foundation course by men experienced in such work, so that when rolled it shall have a thickness at no place less than 2 in. and shall be free from surface depressions and irregularities. The paving shall be done as continuously as practicable, to reduce to a minimum the number of joints between hot and cold materials. Such joints shall be constructed in an approved manner. The hot paving mixture shall not be dumped in large masses on the bottom course. It shall be dumped onto platforms and shoveled with hot shovels into position in the pavement.

The wearing course . . . shall be rolled at once, while the material is still warm and pliable, beginning at the edges and working toward the center. Acceptable means shall be provided to prevent the asphalt sticking to the roller. Rolling shall continue without interruption until all roller marks disappear and the surface shows no further compressibility. Places which the roller cannot effectively reach shall be compressed with hot iron tampers.

As soon as possible after the completion of the wearing course, when the surface is clean and dry, a seal coat of hot asphalt cement shall be evenly spread over the wearing course with squeegees or by other acceptable method. The asphalt cement shall be applied at a temperature not less than 275 deg. F., nor more than 350 deg. F., at a rate of ½ to ¾ gal. per square yard, as directed. A liberal and uniform layer of dry, clean stone chips shall be immediately spread over the asphalt cement by machines or skilled workmen, sufficient to more than take up all excess of asphalt cement. The spreading of the stone chips shall not lag more than 20 ft. behind the placing of the asphalt coating. The pavement shall be again thoroughly rolled, No stone chips shall be put on the wearing course before the asphalt cement of the seal coat is applied. The surface of the wearing course shall be kept scrupulously clean until the seal coat is applied. The contractor shall not permit any hauling over the wearing surface before the completion of the seal coat.

Before placing the seal coat, the pavement shall be tested with a 2-ft. straight edge laid parallel with the center line of the pavement, and any depression exceeding ½ in. shall be satisfactorily eliminated or the pavement relaid.

Rollers used for the bituminous wearing course and the seal coat shall be well balanced, self-propelled, tandem rollers of satisfactory design, weighing between 8 and 10 tons each. Each shall give a compression under the rear roller of between 200 and 300 lb. per linear inch of roll, and shall be provided with an ash pan, which shall prevent ashes from dropping onto the pavement.

No bituminous surfacing shall be mixed or placed between Oct. 1 and May 15, except by written permission, and no bituminous material shall be mixed or placed when the air temperature in the shade is below 50 deg. F., or when the foundation is damp or otherwise unsatisfactory. The shoulders of the road and adjacent grounds shall be sufficiently sprinkled during the placing of bituminous material wherever there would otherwise be danger of clouds of dust blowing over the pavement.

The "hot stuff" was hauled to the place of laying in bottom-dump wagons which were lined with asbestos and provided with canvas covers, and was dumped onto platforms consisting of planks placed loosely side by side a few feet in advance of the laying. From these it was shoveled into place and spread with rakes to the requisite thickness to secure the required 2-in. thickness after rolling. It was found that the compression due to rolling with an 8-ton tandem roller was generally ⅝ in. to ¾ in. After rolling, a seal coat, not to exceed 1 gal. per square yard, was spread and covered with stone chips. The dry stone chips were spread in two operations. The first spreading was very light, and the rolling resulted in forcing the chips into the seal coat between the interstices of the coated stones of the wearing surface. After a thorough rolling, a more liberal coating of stone chips was spread and rolled.

The asphalt cement was paid for separately and was based on the percentage of bitumen in the cement, and no asphalt was accepted which contained less than 99.7 per cent bitumen. The amount of asphaltic cement, including seal coat, averaged 19.2 lb. or 2.3 gal. per square yard of road surfaced.

CONSTRUCTION COSTS

The asphalt plants consisted of dryers for stone, kettles for heating asphalt, and mixers, with boiler and engine for power. The contractor used a specially designed plant which could be moved a distance of 2 mi. and set up ready for operation in about three days. Two plants of less satisfactory design were in use but did not compare favorably with the two specially designed plants. The average output per plant was 600 sq. yd. per day, although under favorable working conditions 1,500 sq. yd. was attained.

The contract cost for the various types of construction used, and which includes the excavation, grading, and preparation of the subgrade follows:

Standard Section—(6-in. Foundation Course and 2-in. Wearing Surface)

	Cost per Mi.	Cost per Sq.Yd.
No side drains	$14,708	$1.68
Side drains on one side	19,698	2.20
Side drains on both sides	23,139	2.61

Drainage Section—(Sub-base 8 in. Thick, 6-in. Foundation Course, and 2-in. Wearing Surface)

	Cost per Mi.	Cost per Sq.Yd.
No side drains	$18,759	$2.26
Side drains on one side	24,939	2.75
Side drains on both sides	26,297	3.20

As previously mentioned, the contract provided for the maintenance for a period of three years from Oct. 1 of the season during which the pavement was completed. The maintenance was paid for as a separate item at 12c. per square yard, which covers labor and plant; the necessary broken stone and asphalt being paid for in addition. The specifications for maintenance follow:

> To keep the pavements in satisfactory condition, the contractor shall employ three or more patrolmen experienced in bituminous road work, who shall be on duty on different parts of the work with horse and wagon continuously between March 1 and Dec. 1 of each season, and at such other times as is necessary or desirable, until the expiration of the maintenance period. It shall be the duty of the patrolmen and their assistants to keep the surfaces of the pavements smooth and true, free from "bleeding" spots, cracks, bunches, depressions, spots where disintegration or ravelling has begun, and other defects. They shall also maintain the earth shoulders of the pavements in compact and satisfactory condition, fully up to grade. All ruts or depressions on the surface of the pavement shall be immediately repaired by cutting out and replacing the wearing course and the seal coat. The seal coat shall be renewed wherever there are signs of its wearing through, disintegrating or becoming otherwise unsatisfactory. The pavements shall be repaired as many times as necessary to have them in continuously acceptable condition.
>
> The contractor shall have, at or near the site of the work during the maintenance period, sufficient and satisfactory equipment and tools for making the necessary repairs quickly and acceptably. This equipment shall include an acceptable road roller weighting between 8 and 10 tons, suitable asphalt heaters and mixers and such other apparatus and tools as are necessary or desirable.
>
> Asphalt cement for use in maintenance . . . shall be of acceptable and uniform quality and brand, of same or closely similar characteristics to that specified under Item 7. Before being used, it shall be sampled and tested by the Engineer. It shall be mixed and applied only when the weather is suitable. . . . Road surfaces shall be dry, swept clean and free from dust before any bituminous materials for maintenance purposes are applied thereto.

The bulk of the work of maintenance was in keeping the earth shoulders in condition, but little work was necessary to maintain the wearing surface. In the entire 3-year period, a total yardage of 4,414 sq. yd. was removed and replaced. This required the use of 32.8 tons of asphalt cement. The area of patches made was only 1.6 per cent of the total area surfaced. Slight depressions, weak places in the surface of the pavement, were repaired, applying a seal coat of asphalt and chips; where the surfaces of the stones in the wearing surface were exposed, a small amount of asphalt was applied with a brush and dusted with portland cement; the total amount of asphalt used for this purpose was 44.5 tons. The total amount used for patches and seal coat for the entire maintenance period being 77.3 tons. The contract cost for maintenance, including the crushed stone and asphalt used in repairing the surface and all other work, plant and materials required under the specifications, was $0.0458 per square yard per year. Since 1917 practically no expenditure has been made in maintaining the surfacing, the maintenance being limited to keeping the earth shoulders in condition. For this purpose, four or five men are employed from the middle of May to about Oct. 1. Each fall a road scraper, pulled by motor truck or tandem roller, has been used to remove the growth of grass and weeds from the shoulders and thereby assure transverse drainage from the road surface. No segregation of cost of this work has been made but it has amounted approximately to 1c. per square yard per year.

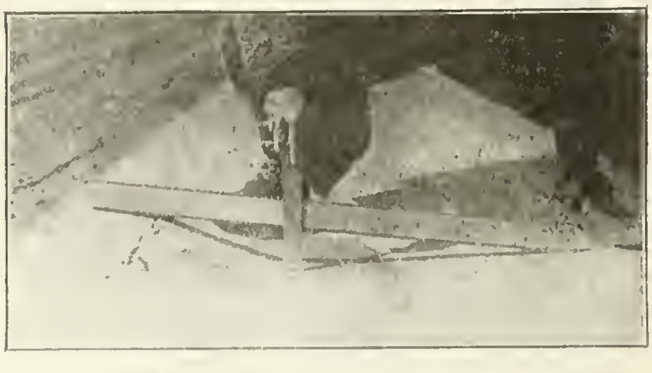


FIG. 3. THREE-INCH DEPRESSION CAUSED BY FROST ACTION ON PAVEMENT EDGE

The major part of the surfacing was done in 1914 so that the larger portion of the pavement passed from maintenance in 1917, and in that year the bulk of repairs to surfacing was made; in fact no repairs to the wearing surface were made in 1918.

Traffic over these roads is largely tourist and has grown rapidly since the completion of the highways, as the beauties of the Ashokan reservoir attract the public from miles around. Tourists passing up and down the Hudson River Valley who stop at Kingston are invariably urged to take an opportunity to see the great artificial lake in its setting of rugged mountains and to ride around it on the excellent roads. A traffic census was kept after completion of the surfacing to show the variation in different seasons. The north-side roads are on the main gateway to the Catskill Mountains and consequently there is a far greater traffic over them. The amount of traffic on Sundays is largely in excess of weekdays, as may be seen by the following tabulation which covers a 12-hr. period:

	North Side		South Side	
Kind of Vehicle	Sunday July 25, 1915	Wednesday Aug. 18, 1915	Sunday July 25, 1915	Wednesday Aug. 18, 1915
Motor-Driven:				
Cycle	50	8	8	3
Runabout	70	32	18	8
Touring car	710	391	322	122
Truck	4	8	11	3
Total motor vehicles	834	439	359	136
Horse-Drawn:				
Single	51	94	32	24
Double	13	97	8	3
Work wagons	4	27	4	5
Total horse-drawn vehicles	68	218	44	32

This census was taken during the season in which the surfacing was completed and none have been taken since, but the drive around the reservoir has grown in popularity and the assertion can safely be made that traffic is normally 25 per cent greater than the above figures indicate.

Each spring, distortions in the surface and curling

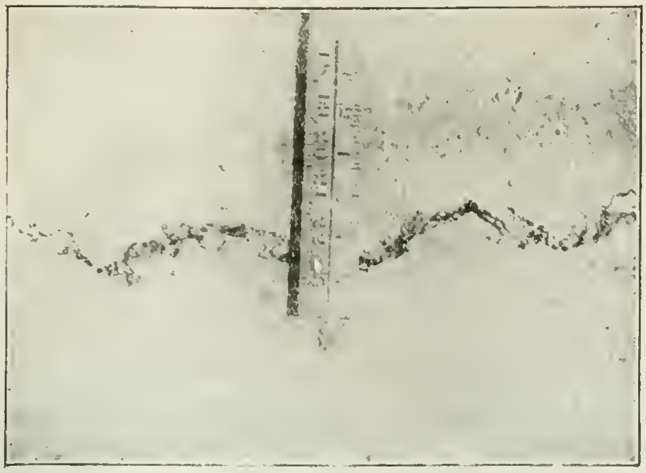


FIG. 4. TRANSVERSE CRACK THAT COMPLETELY "HEALED" AFTER FIRST WARM DAYS

up of the edges were noted, and here and there cracks in the surface, but as soon as the frost had left the ground these distortions flattened out and the cracks healed so that they could not be detected. The winter of 1916-1917 was one of uniformly low temperatures with but little snowfall, so that frost penetrated to more than the usual depth. It was noted early in the season that many culverts which were close to the subgrade had been raised by the frost, that there were many bumps and depressions, and that curling along the edges was common. These depressions and bumps varied from 1 in. to 6 in. and seemed to be more common at the junctions between cut and fill, while irregularity in surface was more common on fills. Both longitudinal and transverse cracks were not uncommon.

Perhaps the most unusual circumstance was isolated bumps which could not be accounted for until the surface was cut through, when it was found that these bumps were caused by boulders being raised by frost action. These boulders were generally below subgrade when it was prepared, although in a few cases firmly embedded boulders had been permitted to remain where drainage course was used, as it was considered better policy than to remove them and have an improperly compacted area in the subgrade. The bumps caused by displaced boulders seemed to be as common where the total thickness of the pavement was 16 in. as where only an 8-in. thickness was used, and were located where the heavy tough clay was favorable to deep frost penetration.

The surface and foundation was removed and the boulders were excavated by means of barring and wedging, but in a few cases light charges of powder were used. It was found that these boulders varied in size from a few cubic feet to over 7 cu. yd. Notwithstanding this unusual distortion, the bulk of it ironed out soon after the frost left the ground. When it is noted that only 1.6 per cent of the total area surfaced was replaced, the superior character of the pavement is demonstrated.

The winter of 1917-1918 was one of much lower temperature but with snow in quantity to provide a blanket sufficient to prevent deep frost penetration and the pavement passed through the season with practically no damage, although the distortion previously observed occurred, but to a lesser degree, and disappeared with the advent of warm weather. The oldest pavement has now been in use for six years, passing through six winter seasons, and is in excellent condition, as anyone who has had the privilege of riding around the Ashokan reservoir can testify.

The grading of these highways was done by the C. P. Bower Construction Co., of Philadelphia, Pa.; the surfacing by the State Highway Construction Co., of Beacon, N. Y., with the Continental Public Works Co., of New York City, acting as superintendent in placing the bituminous surfacing. J. Waldo Smith is chief engineer for the Board of Water Supply, under whose direction the work was done.

Special Training for Engineers in Railway Service

(Abstract of Committee Report, American Railway Engineering Association.)

THE training and education of railway engineers in the practical and economic features of their work is without method on most railways, with the result that the development of the individual is almost wholly that which comes from his being thrown upon his own resources. Systematic training and organization methods which will put the young engineer in close touch with the practical and financial relations of his work are necessary for the production of an efficient engineering staff. The above is the gist of the report of the American Railway Engineering Association's committee on economics of railway labor, an abstract of which is given below:

Where work is not well done fault may be found, but besides errors of commission, the man whose training has not been rounded out can be charged with many errors of omission. His error of omission, his failure to avail himself of opportunity, is less likely to be brought to notice, and without corrective guidance the young engineer who errs in this direction is likely to stagnate. Even the division engineer, who is the mentor of the young engineer, does not, as a rule, direct his own attention to the question of economics as fully as he should. Sometimes this neglect is chargeable to the man and his temperamental deficiencies, but generally speaking, especially on the larger systems, the engineer's sense of the importance and proper value of statistical information with respect to the economical performance of work under his direction is dwarfed, largely because of the length of time that elapses between the completion of a particular job and the time when data as to the cost of the work are available. The stores department charges out the material and the auditing department compiles the accounting.

The engineer cannot be brought to a realization of responsibility for consequences unless the man in charge is placed in a position where not only will he direct labor in the application of material, but will be in touch with all of the elements of cost as the work is in progress. Certainly, the cumbersome system of accounting with respect to maintenance-of-way and such construction of minor character as is usually delegated to a division engineer, does not make for efficiency. It is hopeless to attempt to make an economist by admonition alone. To tell a man about the cost of a job six weeks or more after it is completed will not help at all, so far as that particular work is concerned.

In the engineering department of a large railway there should be a man well fitted by practical experience and technical training to conduct a program of development. Such a man would collect statistics, make an analysis of work accomplished and direct a campaign involving regular meetings composed of the members of the engineering force from the various divisions as well as from the general office. Papers should be prepared on subjects assigned to individuals and reports made on matters referred to committees whose membership should include beginners as well as those advanced to higher positions in the service. At such meetings, constructive criticism should be advanced as to work subject to comment, either as to methods of prosecution or economy. The exchange of views would be beneficial to the service and educational to the men.

It is hopeless for any official in charge of various projects, the completion of which continually demands his attention, to expect to singly accomplish much in educating the young engineer, even though every opportunity is seized as incidents occur. Such incidents are usually examples of errors of commission, and what is needed is to educate the men to think in a broad way. When we speak of economy it must not be summed up in the idea of parsimony, for the most important economies sometimes require the greatest outlays. The interest of engineering organizations will be served best by developing men to think wisely in large matters as well as in small.

Training the Young Engineer

In the training of young engineers the essential feature is to teach them properly to gage productive effort. Probably one of the best methods is to establish a system by which a certain percentage of the positions of supervisor or roadmaster may be filled from the engineer corps. This system affords the engineer an intimate detailed knowledge of the methods of applying material; it enables him fairly to gage the reasonable product of labor, and brings him in direct contact with the foreman and the men. This last feature is of immense value to him when he has been promoted to division engineer or some higher position. Not only will he know many of his employees, but his experience as supervisor will better enable him to get the viewpoint of the men and increase his usefulness as administrator because of his ability to maintain relations understandingly with the rank and file. By this training he will be enabled to direct working forces, to properly proportion gangs to the work, and to pass fair judgment on the efficient performance of the men under him. One of the requirements for appointment to the position of division engineer, or engineer of maintenance-of-way, should be at least two years' experience as supervisor.

Another step in the education of the young engineer should be a requirement that he have not less than one year's service in the office of the chief engineer. This will impress upon him the theories which have been acquired at school and give opportunity for applying them in practice. Serving in such capacity, he will learn more thoroughly to appreciate some of the niceties of engineering and the necessity and proper manner of furnishing information and carrying out the details of work which later on in his career he will be called upon to do. Lack of designing ability among maintenance engineers, from the division engineer down, is greatly to be deplored. Too much attention is paid to the tamping of ties and construction of sidetracks, to the exclusion of the fundamentals of engineering design. Service in the general office will in a measure cure this condition, which shortcoming is not due to faulty education but to lack of opportunity to apply in practice the things learned at school.

Summary

To summarize its ideas as to the training of the engineering forces, the committee suggests the following methods: Employ in the engineering corps men of sufficient technical training to be useful in solving the ordinary engineering problems. Carry on an educational campaign through regular and periodical meetings, the members to exchange views through papers, reports and discussion. Fill a certain percentage of the positions of supervisor of track, supervisor of bridges and buildings, supervisor of signals and inspector from the engineering corps on an equal footing with other applicants. Establish systematic rotation of service for the members of the engineering corps, to include surveying and field work, inspection, supervision of maintenance and construction and work in drafting and designing.

Launching a 10-Inch Undersea Pipe Line for Oil

By Harry Leonard
Engineer Cortez Oil Corporation, Tampico, Mexico

Most of the recent oil production of Mexico, south of Tampico, is being pumped to the Mexican Gulf coast, and there loaded on tankers. Shallow sand bars on the coast do not permit the building of loading docks, so that tankers must be loaded by undersea pipe lines extending as far as 2 mi. on the bottom of the sea. The sea end of the pipe line is connected with the tankers by means of flexible, rubber-metallic hose. The Cortez Oil Corporation of Mexico on May 2, 1919, successfully launched or pulled out to sea a 7,500-ft. line 10-in. in diameter. The work was done at their terminal station, Port Lobos, on the Mexican Gulf Coast, about 70 mi. south of Tampico.

There is much preparation to the pulling of these sea lines. It is first necessary to build on shore perpendicular to the coast, a level, straight railroad as long as the sea line. The full 7,500 ft. of pipe is connected on shore and mounted on trucks 30 ft. apart. At the sea end, the railroad curves to one side and runs about 400 ft. down the beach, this section being used to store the cars after they have cleared from the pipe. An elevated platform 4 ft. high, floored with sheet metal, over which the pipe slides, clears the cars as they approach with the pipe line. The cars are then pushed in the clear down the siding. To protect the pipe from corroding, it is painted with asphalt. Six heavy cast-iron clamps, called river clamps, weighing 850 lb. each, are bolted to the first six joints, and 100 ft. from the other end six more are bolted on to keep the line on the sea bottom after it has been pulled out. If more clamps were bolted on the line it would drag too heavily on the bottom. By means of clamps, a bridle arrangement is bolted to the end of the pipe, to which is made fast the hawser from the ship from which the hauling is done. The bridle is composed of two eye-bolts, 1½-in. steel, 24 ft. long, and was made fast to the end of the pipe by means of two collars, bolted behind the couplings.

To keep the end of the pipe line from digging in on the bottom of the sea a wooden sled was built around its end. A bull-plug is flanged on the end, making the line air-tight, so that it almost floats in water. After leaving the track the pipe line slides out with little friction.

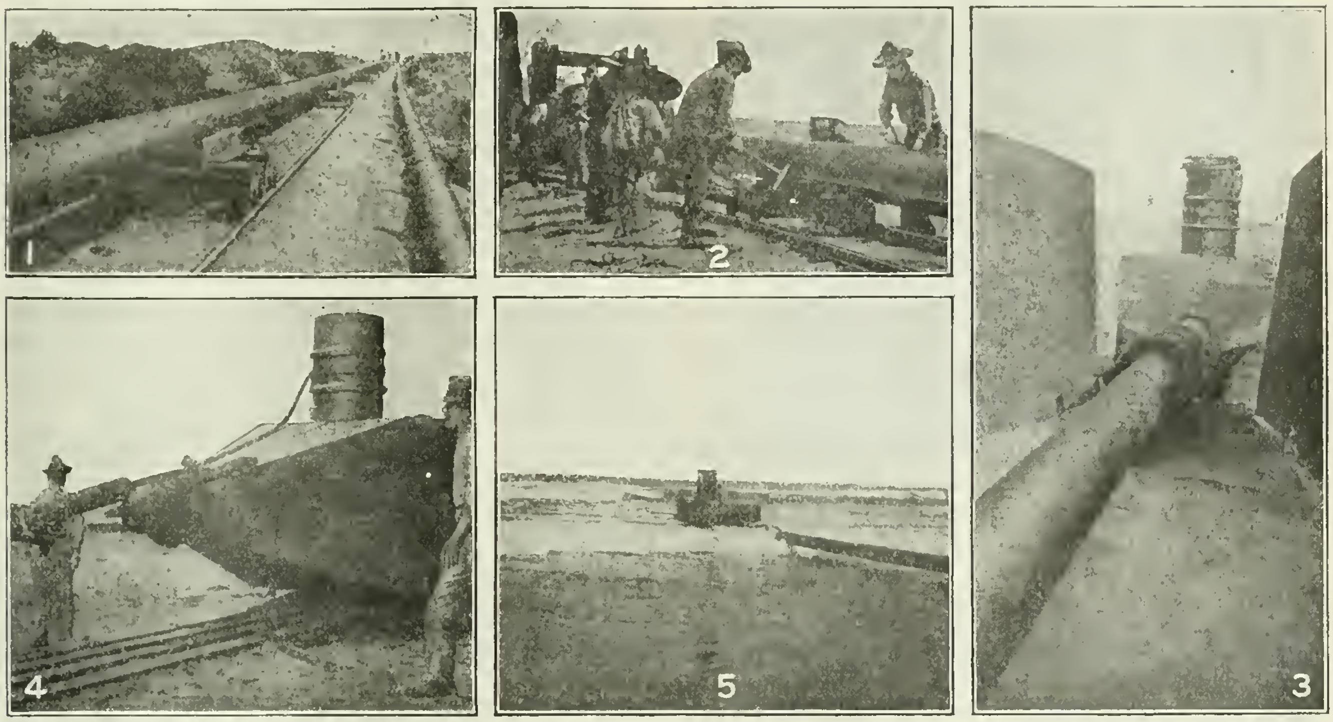


FIG. 1. PIPE LINE, TRACK AND CARS READY FOR HAULING. FIG. 2. CARS CLEARING PIPE AS THEY APPROACH PLATFORM. FIG. 3. METAL-LINED PLATFORM. FIG. 4. SLED AT LAUNCHING END OF PIPE. FIG. 5. SLED PARTIALLY SUBMERGED, SHOWING BARREL FLOAT ON TOP TO MARK END OF PIPE

The tanker steamer "Herbert L. Pratt," assisted by the Texas Company tug "Central America," pulled the pipe line out to sea. The steamer approached within one-quarter of a mile of the shore and a 2-in. line from her was carried ashore by means of launches. With this 2-in. line a gasoline winch pulled the 12-in. (circumference) hawser ashore, which was made fast to the bridle at the end of the pipe line. The ship then very slowly pulled the pipe line out to sea, being guided by beacons on shore and buoys anchored in the water. The tug had a line attached to the bow of the tanker and assisted in pulling and keeping her in line. A simple system of signals, operated on shore, controlled the starting, stopping and speed of the vessels.

The time required to pull out the entire sea line was 80 min., the average speed being approximately 2 ft. per second. After the line was in place, a diver was sent down to remove the bull-plug, allowing the line to fill with water and settle on the sea bottom. The divers then flanged about 150 ft. of flexible rubber-metallic hose to the end. A buoy at the end of the hose marks its position. After connections are made on shore, line is ready to load.

The loading capacity of such a 10-in. line is approximately 4,000 bbl. per hour.

Street Sweepers' Wages

It was stated by the city surveyor at the last meeting of the Exeter (England) City Council that the corporation road sweepers were now paid from 7s. 4d. to 7s. 6d. per day, according to age, for a 47-hr. week.—*The Surveyor*, London.

British Views Upon Operation of Ministry of Transport

TWO important developments in the operation of the Ministry of Transport Act are noted in recent advices from England. The first of these is the first meeting of the Roads Advisory Committee, and the second, the undertaking of classification of British roads. In the appointment of the Roads Advisory Committee and in beginning a classification of highways, the British Minister of Transport is discharging two of the important functions conferred upon him by the Ministry of Transport Act passed at the 1919 session of Parliament. Recent news dispatches are to the effect that the road classification has been actively undertaken by the Ministry of Transport in conjunction with the Roads Advisory Committee. Upon undertaking its duties in the classification of highways the Roads Advisory Committee was presented with the proposals of the Minister of Transport with regard to this classification. The following general principles have been observed by the Committee: The roads of the country are to be divided into three classes: (1) first; (2) second, and (3) all other roads. Then the classification is to be made on the basis of the relative importance of the various highways for traffic purposes. In deciding whether a road should be included in Class (1) or Class (2), the following considerations should be taken into account: Whether the road was an important route for through traffic or possessed more than local importance; the size and importance of the centers of population connected and, in particular, whether the cost of maintenance was considered to be materially affected, owing to through traffic forming a substantial percentage of the total traffic on the road.

In addition to this work outlined above for the Roads Advisory Committee, the announcement has been made of the establishment of an Institute of Transport, with Sir Eric Geddes, Minister of Transport, as its first president. The declared object of the new Institute is "to promote and encourage a knowledge of traffic science and the art of transport in all its branches, and the means and appliances connected therewith."

After several months' operation of the Ministry of Transport Act, the British roadbuilding public, judging from editorial comment and reported discussion before technical societies, still is inclined to look askance at a Ministry predisposed toward railroad superiority in transport. Road and road transport men, still mistrusting slightly the ability of a man to administer successfully rival means of transport, do, however, admit that the bill has brought great assistance to the individual engineer and has made for greater flexibility in the administration of government funds toward road construction and maintenance. The county borough surveyor feels a definite security of tenure, now, and his financial status is being improved.

Much has been said in the English technical press recently concerning the act and its operation. The chief points in these discussions seem to be speculation as to whether the Minister himself will be able to administer fairly the business of competing means of transportation; what success the Roads Advisory Committee will have in co-operating with the Ministry of Transport in carrying out certain provisions of the act, chief among them being road classification; the classification of the roads themselves; and minor considerations.

During the early operation of the act, Sir Eric Geddes was the object of considerable editorial attention because of his fancied or real inability to administer the business of highway construction, maintenance and operation as successfully and as impartially as that of the railroads. His training and experience as a railway official made many persons suspicious that the roads were to be sacrificed to the railway interests, and the agitation which was apparent in both houses of Parliament was only partially appeased by the appointment of Brig. Gen. Sir Henry Maybury as director general of the Roads Department.

THE TRANSPORTATION "CZAR"

Aside from the fact that Sir Eric Geddes was looked upon as a strongly pro-railway man, there was vigorous agitation against the vesting of such enormous power in the hands of one man. Even though he is admittedly a splendid organizer and is looked upon as a superman, as Minister of Transport he is given very wide powers and control over railways, canals, roads, harbors, and until the author compelled the Government to withdraw it from the bill, over the supply of electricity.

The appointment of Sir Henry Maybury as head of the Road Department, besides appeasing to a certain extent a public disposed to mistrust Sir Eric Geddes, has given to the country surveyors particularly a feeling of a certain security of tenure. Through the activity of deputation from the Institution of Municipal and County Engineers and the Institution of Municipal Engineers a clause was written into the bill requiring the approval by the Road Department of the appointment or dismissal of a road surveyor.

Inasmuch as the capacity of the Roads Committee is merely an advisory one, considerable speculation has been indulged in as to the possibility of complete co-operation between the Ministry of Transport and the Roads Advisory Committee. Speaking along those lines in discussion the utility of the Roads Committee, W. Rees Jeffreys, former Secretary of the Roads Board and Deputy Chairman of the Motor Legislation Committee, asserted that successful service on the part of the Committee would be dependent upon three factors: First, the attitude of the Minister and his department toward the Committee; second, the constitution of the Committee; and, third, the capacity of the man elected chairman of the Committee. "It would be quite possible," says Mr. Jeffreys, "for the Minister to freeze out the Committee if he so desired by the simple expedient of leaving it to its own devices. If he does, papers relating to current business will not be placed before it. Information which must be in its possession if its deliberations are to be of any value, will be withheld, or will be extracted only from the Ministry by application and after delay." Mr. Jeffreys also explained that because of diverse interests which would be represented upon the Roads Committee, it would be rather difficult to secure co-operation even among the members. Therefore, he pleaded that technical societies undertake the responsibility of doing their utmost to make the Roads Committee a success by bringing all influences to bear with the object of subverting minor and sectional interests to the broad and statesman-like consideration of road problems and road transport as a whole.

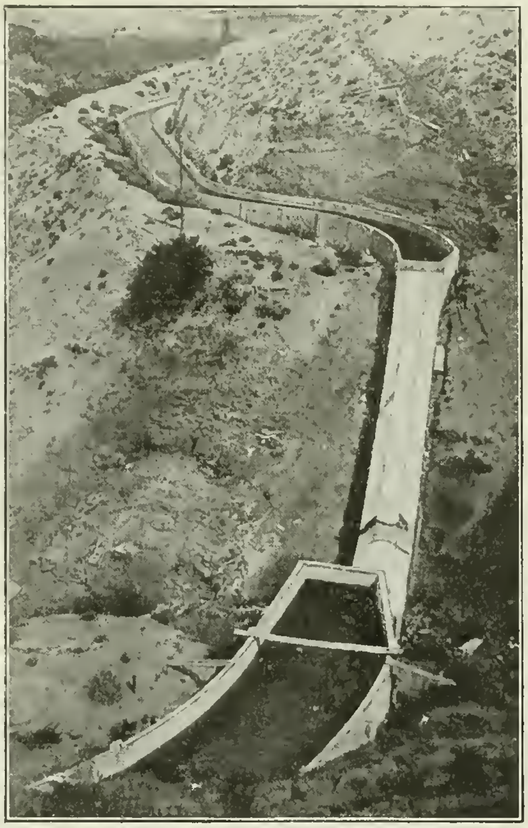
ROAD CLASSIFICATION

Considerable comment has also been had in the technical press as to what the system of road classification will be. The Minister is free to adopt any system of classification and distribution he may think fit. However, he is subject to one limitation—the amount of money which the treasury is willing to give him for that purpose. Just what that classification is to be is merely a matter of opinion, but it is the judgment of Mr. Jeffreys that it would be preferable to adopt a classification whereby a fair distribution is made of the maintenance grant to a large percentage of the total amount of roads. It is his statement that the Treasury will fix a figure which the first year it will be prepared to exceed, having regard to other claims on the Imperial exchequer. The Minister of Transport will therefore have to make his classification and prepare a scheme so that his liabilities will not exceed that amount.

One other consideration has been receiving some attention in the technical press and society discussions, and that concerns new construction of arterial highways. It seems to be the popular opinion that for the present little moneys will be available from the Imperial exchequer for the construction of new arterial highways, most of the money being used in maintenance grants. However, there exists an alternative in the Town Planning Act by which it is possible to lay down lines of new roads and conserve the land until such time as financial considerations permit construction. However, inasmuch as the Town Planning Act was executed through the Ministry of Health, the co-operation of technical societies is urged so that greater co-operation may be had between the Ministries of Transport and Health in facilitating road work. As a practical method of procedure, Mr. Jeffreys recommended that the public influence induce the two departments to act together so that the Ministry of Transport, working through the Ministry of Health, might give financial assistance to local authorities in joint planning schemes.

Reconstruction of the King Hill Siphon and Flumes

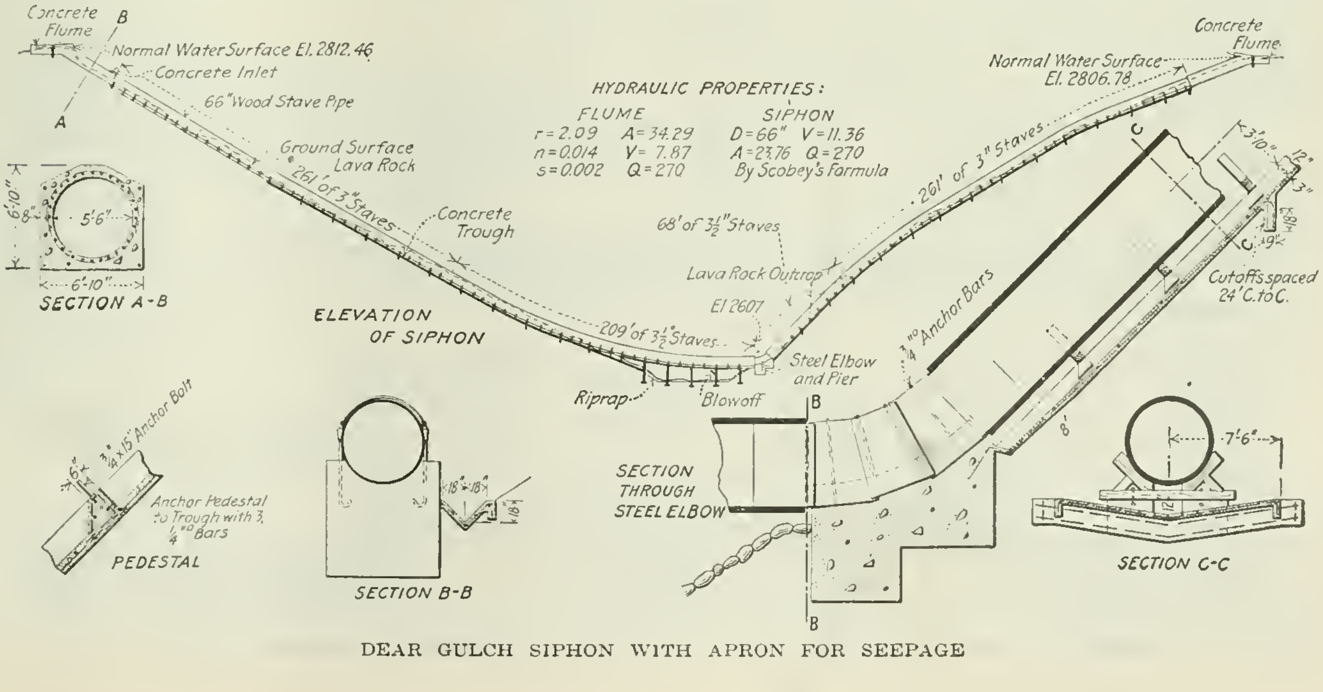
Irrigation Flumes Were Constructed as Monoliths With Gunite, With Precast Slabs and Various Combinations



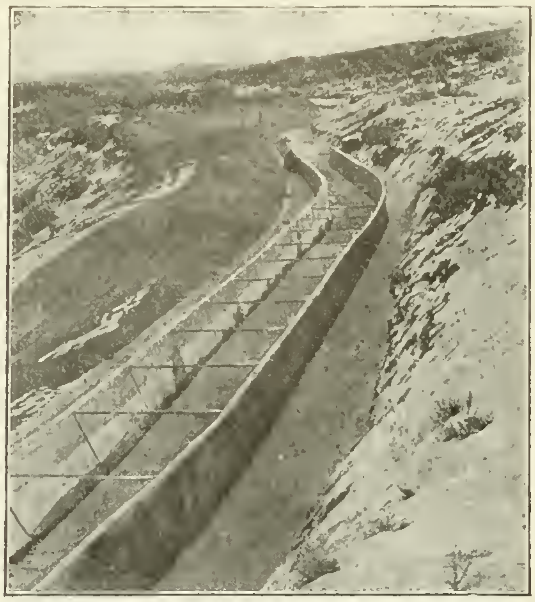
MONOLITHIC FLUME AND SIPHON
(NOTE: Seepage through horizontal joint at bottom of siphon shows a black band.)

SINCE ten years is the approximate life of the many timber structures on the canal system of the King Hill project of the U. S. Reclamation Service in Idaho, where replacements are now being made, an excellent opportunity exists to observe many moot questions as to design, construction and behavior in service of various types of flumes and siphons. This 17,000-acre project was started eleven years ago with a 300-sec.-ft. water right from the Malad River, the supply to be delivered to a narrow strip of land lying along the Snake River Canyon through a 52-mi. canal, 26.4 per cent of which consisted of wood-stave siphons and timber flumes, now giving away completely. The State took over the project in 1916 but, finally, the U. S. Reclamation Service agreed to spend $1,000,000 on the reconstruction. The operation and maintenance remains in the hands of the irrigation district. There are four river crossings, numerous inverted siphons and trestles across ravines, the whole course of the canal being extremely tortuous. Five miles of wood flumes are being replaced with concrete flumes and siphons. Three wood siphons are being replaced with wood. One additional wood siphon is being built to replace ¾-mi. of wood flume, thereby reducing the length by ½ mi. Two of the new siphons are of concrete, and one old wood-stave siphon has been replaced by the same material. Features in this reconstruction work are the provision for a concrete drainage apron or trough under the new wood-stave siphons, and the various types of concrete flumes. Contraction joints have about given way to thin, continuous slabs which are allowed to crack slightly at short intervals, particularly in the gunite sections. A combination precast and cast-in-place flume is being pitted against a combined gunite and cast-in-place type for cost and speed of erection, the trying conditions of long transportation, inaccessibility and varying necessities for a leak-proof flume. It will be several months before full data are available on all of these points, but enough can be given to assist irrigation engineers who had to solve in 1919 more leakage problems than ever before, because of the extremly dry season, and the insistent demand for water due to the high values for farm products.

Failures occurred in the original high timber trestles from blowing down, as well as from the rapid rotting of the timber due to the alternate wet and dry condi-



DEAR GULCH SIPHON WITH APRON FOR SEEPAGE



GUNITE TYPE WITH TIE RODS

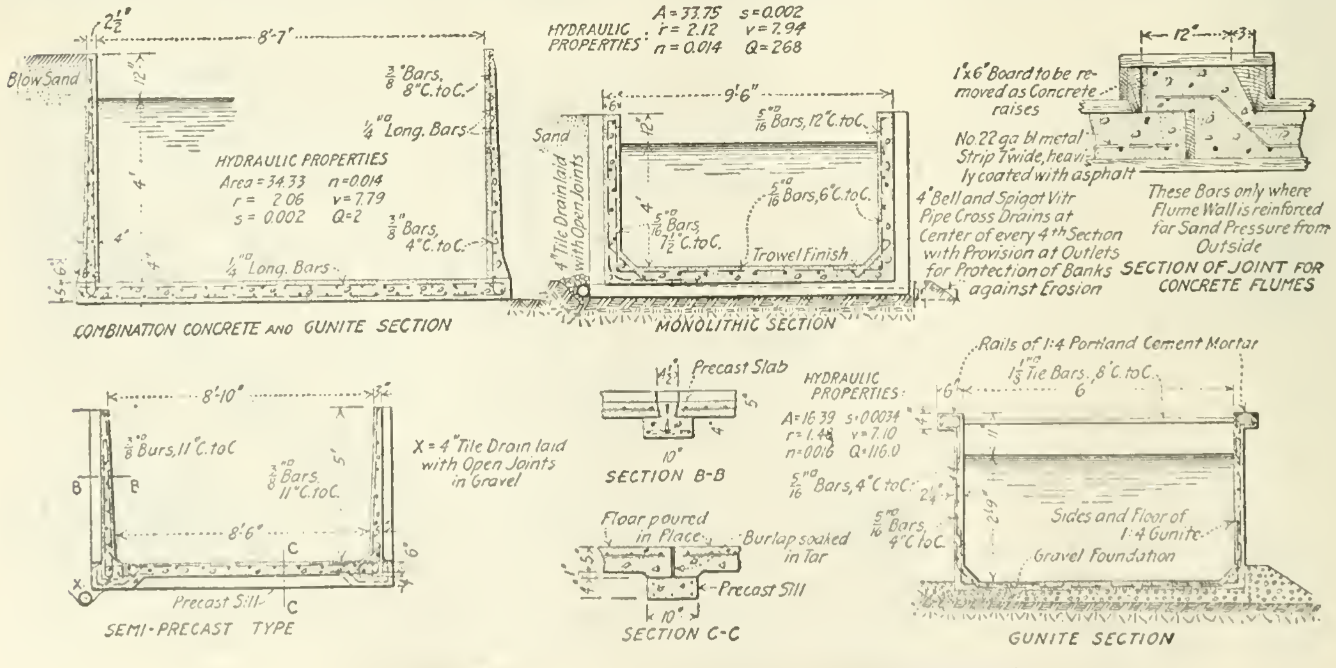
tion. Wood siphons collapsed usually from small leaks undermining the foundations. Flume timbers at the base and in trestles usually give way permitting enough sag in the flume to open large seams. With unequal loading, wind pressure usually was the final factor in the collapse. For bench flumes on the side-hill surfaces leaks undermined the whole foundation. Supporting rails and side posts rotted out due to contact with the earth. The nails pulled through this decayed wood, allowing the side of the flume to collapse.

In the Big Pilgrim wood-stave siphon, which replaces a wood siphon on a trestle 100 ft. high, and the Dear Gulch wood-stave siphon to replace a timber flume on a trestle 120 ft. high, the new construction has a thin concrete slab or apron under the pipe to carry off any leakage which may develop and cut out a stratum of sugar-like clay which is eaten away rapidly by a small stream.

Of the new concrete siphons the Little Pilgrim 6-ft. diameter concrete structure is under a 90-ft. head and has few features beyond an experience in making joints, gained during construction and subsequent operation. No expansion joints were used, only enough longitudinal steel being employed to force hair cracks at short intervals, but at the end of a day's work construction joints were kept vertical. There was no leakage of any kind, but the laitance in the horizontal joints of another siphon near the head of the canal permitted a perceptible leakage. On account of this, in subsequent work joints at the end of a day's work were placed vertically or perpendicular to the center line of the pipe and eliminated this difficulty completely, reinforcing being placed across the joint.

Typical sections of the flumes are shown in the drawings and the photographs. Of the gunite section with the tie-bars and rail there is a length of 3,300 ft. which is on a clay foundation, easily eroded, where no leakage was permissible. An examination by a representative of the *Engineering News-Record*, after use during practically two whole irrigation seasons, disclosed at a very few points moisture which evaporated as fast as it appeared. Cracks just visible were spaced at intervals of 10 in. Experience so far indicates that the tie-bars are unnecessary, but the thickness of the side walls will be increased from 2½ to 3 in. The gunite floor is rough and increases the friction so that a 10½-ft. width in a cast-in-place flume must be increased to 12½ ft. to carry the same volume in a gunite flume, the depth of each being 5 ft. 2½ in. Difficulties with the cement-gun equipment led to experiments by which it was determined that the 50-lb. pressure recommended as being sufficient at the compressor, giving 35 lb. at the nozzle, must be increased to give 50 lb. at the nozzle. A critical point in the mixture to make all of the material stick had to be discovered by trial. An excess of sand was gradually reduced until only a sufficient percentage flew off. The amount is different with different sizes of sand. So much time was consumed in learning the limitations that cost and progress figures were not considered representative.

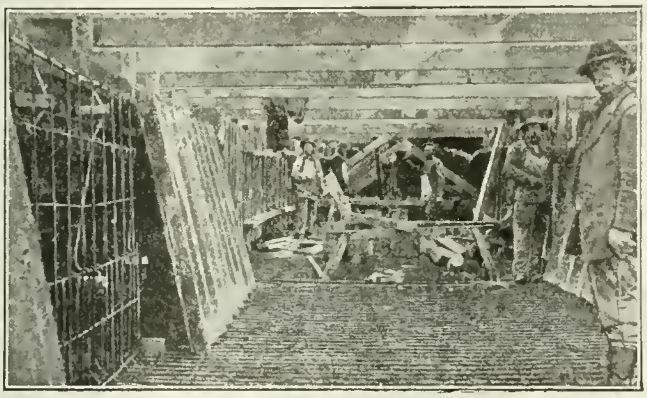
Where there would be no difficulty if small leaks did


2½"
8'-7"
Blow Sand
12"
⅜" Bars, 8" C. to C.
¼" Long. Bars
HYDRAULIC PROPERTIES
Area = 34.33 n = 0.014
r = 2.06 v = 7.79
s = 0.002 Q = 2
4'
⅜" Bars, 4" C. to C.
¼" Long. Bars
5-6"
COMBINATION CONCRETE AND GUNITE SECTION
HYDRAULIC PROPERTIES: A = 33.75 s = 0.002 r = 2.12 v = 7.94 n = 0.014 Q = 268
9'6"
6"
Sand
12"
5/16" Bars, 12" C. to C.
4" Tile Drain laid with Open Joints
5/16" Bars, 6" C. to C.
5/16" Bars, 7½" C. to C.
Trowel Finish
4'
MONOLITHIC SECTION
12" 3"
1"x6" Board to be removed as Concrete raises
No. 22 ga. bl metal Strip 7" wide, heavily coated with asphalt
4" Bell and Spigot Vitr Pipe Cross Drains at Center of every 4th Section with Provision at Outlets for Protection of Banks against Erosion
These Bars only where Flume Wall is reinforced for Sand Pressure from Outside
SECTION OF JOINT FOR CONCRETE FLUMES
8'-10"
3"
⅜" Burs, 11" C. to C
⅜" Bars, 11" C. to C.
5'
B
B
8'-6"
C
C
6"
X
Precast Sill
SEMI-PRECAST TYPE
X = 4" Tile Drain laid with Open Joints in Gravel
1½"
Precast Slab
10"
SECTION B-B
Floor poured in Place
Burlap soaked in Tar
Precast Sill
10"
SECTION C-C
HYDRAULIC PROPERTIES:
A = 16.39 s = 0.0034
r = 1.48 v = 7.10
n = 0.016 Q = 116.0
5/16" Bars, 4" C. to C.
5/16" Bars, 4" C. to C.
2¼"
Rails of 1:4 Portland Cement Mortar
1⅛" Tie Bars, 8" C. to C.
6"
6
2'9"
Sides and Floor of 1:4 Gunite
Gravel Foundation
GUNITE SECTION

VARIOUS TYPES OF FLUMES USED ON KING HILL IRRIGATION PROJECT, IDAHO occur, as on a lava foundation, a monolithic section has been constructed with bell-and-spigot joints 22 to 24 ft. apart. Two types of joint have been used. One type used in 1,800 ft. of the Four-Mile flume has a 1x6-in. board left embedded at the butt end of the spigot and an asphalt-covered metal strip placed between the sliding surfaces. A length of 2,100 ft. has the bell end coated with hot asphalt and two layers of burlap dipped in hot asphaltum. In cold weather, pockets form in the burlap which later permit leakage. The difficulty with the board is that when saturated during the irrigation season, it has a tendency to swell and break the concrete. Leaky joints may be silted up by pumping clay into the canal, but the remedy is effective only so long as water is kept in the canal. When new water is turned in former leaks persist.

In erecting forms, those on the outside are placed first and the separation blocks are secured to a rope to minimize the likelihood of their being left in place. Sections with a bell on each end were built first.

Still another type of flume is the combined concrete and gunite section, the side walls being shot into place after the floor has been placed as a monolith with a troweled surface to reduce the friction head. No tie-bar or contraction joints are used, steel being placed to make the fine hair cracks come about 3 ft. apart. An inside form only is erected and gunite shot against it to give a smooth interior.


ERECTING THE INSIDE FORMS

So much difficulty was experienced in getting material on the ground and in moving the mixer that the semi-precast type of flume has been developed. Sides and sills are precast in a permanent plant, then hauled to place over the flume bench and erected, ready for the small amount of concrete in the monolithic floor. The slabs are 12 ft. in length and weigh 3,660 lb. Sills weigh 458 lb. A single layer of burlap soaked in tar, which is not as stiff as asphalt when cold, constitutes the joint material.

A plant for the construction of the precast parts was set up on a mesa 350 ft. above the river bank, from which gravel is raised to a crusher and screen by an inclined railway. The incline is on a 1 to 1 slope part of the way, the distance to the pit being about 1,000 ft. The slab yard is about 2[illegible]0 ft. in elevation above the level of the flume bench. Another inclined railway is used to lower the slabs to the flume bench, from which level the slabs and batches of concrete for the floor are transported to place over an industrial track.

Access to the Four-Mile flume during original construction was on the flume bench. Timber-repair parts carry on the work expeditiously so that the flume would have had to be dragged up piece by piece from a road near the river's edge. To handle the material and to be out of commission only during the non-irrigating winter season, a road 11 mi. long, costing $38,900, has been built paralleling the flume. The slab plant is located on this road near the center of the flume work, making a 12-mi. haul to the nearest railroad station. Curves of 50-ft. radius were used, the minimum for motor trucks, also 8 per cent maximum grades against the traffic and 13 per cent with it.

The construction work of the King Hill project is under the direct supervision of Walter Ward, project manager. Most of the designs have been prepared in the Denver office of the U. S. Reclamation Service, under the direction of F. E. Weymouth, construction engineer.

Wisconsin Standardizes Highway Cost Estimates

Cost Items Listed and Classified by Contractors and Road Officials — Depreciation Charges Adopted

A UNIFORM practice in estimating costs of highway construction is being developed in Wisconsin. There has been drafted a standard bidder's estimate form which is to be used by both the state highway engineers in estimating the cost of improvements and by contractors in preparing bidding prices for construction. The form now in use is tentative and is undergoing constant revision, as experience develops faults or contributes new information, at the hands of a standing committee representing engineers, contractors, materials producers and machinery manufacturers. Trial in actual practice has been limited, but it has furnished evidence that, with alterations, particularly toward securing greater simplicity, the plan promises a high degree of success.

Items Which Enter Into Road Costs

The object in mind in preparing the forms was: (1) To list, or at least, suggest, every item which might be considered a proper cost charge in any of the operations which are likely to occur in road and bridge construction; (2) to group these items according to the class of the construction operation, and (3) to distribute properly the estimated cost between paving, grading and bridges and culverts.

Determination and classification of cost items was the chief task of the committee. While additions will doubtless be made as the committee work continues it is considered that the list is more comprehensive than those to which engineers and contractors, generally, have worked. The accepted list of items and their classification are given in Table I. Distribution of costs according to the nature of the expense as for moving equipment, for cement, for fine aggregate, etc., is clearly indicated by the tabulation. Further distribution according to the three broad divisions of road construction, namely, (1) paving; (2) grading; and (3) bridges and culverts, is provided for on the original bidders' estimate sheets.

Besides a complete schedule of cost items the cost estimate form provides for a complete distribution of expenses. This is the striking departure from common road contracting practice. For example, in the past

Item	Original Cost	Rate % per Day	No. Operating Days	Paving	Grading	Culverts and Bridges	Misc.

FIG. 1. EQUIPMENT DEPRECIATION-SHEET HEADINGS

it has been common, in the case of grading work, for a contractor to estimate the work at a certain cost per cubic yard, which included all such items as moving machinery, depreciation, upkeep, labor, teams and lost time, and to apply a certain percentage of profit on this and offer it as the bid price. With this form of cost estimate he cannot do this. He must put his moving costs under the item of "Moving Equipment," and all of the other costs in their proper places, putting under the heading "Cost of Excavation" only the cost of men and teams. Furthermore, the parts of each class of cost which are involved for paving, for grading and for bridges and culverts must be entered separately.

Two classes of costs only, overhead and depreciation, call for particular explanation. Under the item "Overhead, 12" it is indicated that certain percentages of salaries, expenses, rentals, etc., are to be charged. This means that if the job is a full year's work a full year's salary, expenses and rentals will be charged, but otherwise only the proper percentages of the yearly costs.

To determine the final item, depreciation, in Table I, a separate estimating sheet has been prepared with the column headings shown by Fig. 1. Table II gives the schedule of equipment items and the suggested per cent per mile depreciation to be charged off. In arriving at these percentages the amounts were determined on the basis of an outfit capable of building 6 mi. of 18-ft. concrete pavement per year. The amounts also include not only what is ordinarily called depreciation, but also all repairs to the machinery, interest on investment in machinery, insurance, storage, etc. For outfits which would build either a more or less mileage, certain of the percentages would change slightly, but they would agree substantially with the amounts shown.

The percentages were arrived at after considering all of the available information on the subject, but there was so little information of actual value that these can be taken only as an approximation of actual conditions.

TABLE I. ITEMS ENTERING INTO COST OF HIGHWAY CONSTRUCTION TO BE CONSIDERED IN ESTIMATING BUILDING PRICES

(1) *Moving Equipment*

Hauling from shed to cars
Loading
Freight charges
Cost of unloading
Moving to job
Lost time of equipment
Erection of camp including water supply
Transporting teams or trucks
Return of above

(2) *Cost of Rental of R.R. Siding*

(3) *Cement*, Cost per Bbl., f.o.b. cars at

No. of barrels
Unloading and storing
Hauling and covering
Fire insurance on cement and empty sacks
Sack loss 2% to 5%
Freight return of empty sacks
Demurrage

(4) *Fine Aggregate*

No. of cubic yards, including waste
Average price per cu.yd., f.o.b. pit or quarry
Freight and demurrage
Labor—unloading
Hauling to job
(Labor and horses)
Spotting on job
Rehandling from stock pile

(5) *Coarse Aggregate*

No. of cubic yards, including waste
Average price per cu.yd. f.o.b. pit or quarry
Freight and demurrage
Labor—unloading
Hauling to job
(Labor and horses)
Spotting on job
Rehandling from stock pile

(6) *Surfacing*

Rolling subgrade
Joint material delivered on the job
Labor mixing and placing concrete (including engineer, firemen, form setters, fine graders, wheelers, shovelers, cement men, puddlers, baling and sorting sacks, curing, covering and uncovering, finishers, water boy, watchmen, barricade and lights)
Foreman days @
men days @
men days @
men days @
men days @

Pumping and Water Supply

(Labor, connecting pipe, setting pump, operator, fuel, disconnecting pipe and drilling well)
Gasoline, coal, oil, etc.
Hiring, shipping in men and loss in running camp
Purchase of hardware, lumber, boots, etc.
Rent of water, buildings, warehouse, grounds, etc.
Building cross-overs

(7) *Breaking and Moving Dirt and Rock*

Staking
Keeping road open to travel
Clearing
Grubbing
Excavating earth, light,
Men and teams only
Excavating earth, heavy
Men and teams only
Excavating rock, loose
Men and teams, only
Excavating rock, solid
Men and teams only
Dynamite
Sloping
Trimming
Shoulders
Ditching
Moving, enter under No. 1
Equipment, etc., enter under No. 1

(8) *Culverts and Bridges*

No. cu.yd. in job
Moving equipment enter under No. 1
Labor enter under No. 6
Material enter under Nos. 3, 4 and 5
Labor excavating, removing of old structures; building forms, removing forms, placing concrete
Detours or temporary bridges
Piling
Cofferdams
Expansion joints
Waterproofing
Drains
Steel
Lumber

(9) *Guard Rails*

Posts
Lumber
Paint
Hardware
Creosote
Labor
Hauling

(10) *Unforeseen Difficulties*

Delays due to R.R. embargoes, strikes at pit or jobs, material plant breakdown, breakdown of machinery, failure of water supply, bad weather, pipe line breaks and freezing,

(11) *Compensation and Public Liability Insurances* (labor only)

(12) *Overhead*

Per cent of manager's yearly salary
Per cent of yearly salary of stenographer and clerk
Per cent of yearly salary of material man and timekeeper
Per cent of yearly expense of manager
Auto miles at 12c.
(Railroad fare, hotel, meals)
Bidding costs, conventions, associations
Per cent of yearly office rent
Per cent of yearly office telephone and telegrams.
Per cent of office supplies, miscel.
Corporation insurance
Interest on borrowed money

(13) *Bond Cost* (personal or surety)

(14) *Total Net Cost of Job*

(15) *Profit* for each Class of Work, as paving, grading, etc.

(16) *Depreciation* on Equipment as listed in Table II.

TABLE II. ESTIMATED DEPRECIATION OF MACHINERY AND EQUIPMENT PER CENT PER MILE OF ROAD

	Per Cent
Road rollers	2–4
Mixers	6
Finishing machine	7
Sectional storage bins (erecting cost No. 1)	7
Special storage bins	..
Material and labor (charge full cost)	...
Clamshell crane	4
Stiffleg derrick (erecting cost at No. 1)	4
2 pumps	6
Pipe line — miles (include laying cost at No. 6)	6
Side forms—ft. (steel), material only	12
Side form — ft. (wood), material only	27
Iron stakes, material only	15
Ford cars (1 camp car, including operating costs)	16
One service car (including operating costs)	16
Canvas	10
Hose	16
Wheelbarrows	10
Locomotive	6
Cars	6
Track	2
Batch boxes	10
Concrete roller	20
Strike-off board (charge full cost to job)	...
Mixer loaders (belt conveyer)	12
Wagon loaders (erecting cost at No. 1)	7
Camp equipment (stoves, bedding, bunks, camp on trucks, etc.)	8
Small tools (charge full cost to job)	16
Wagons (plain)	[illegible]
Wagons (dump)	[illegible]
Trucks	[illegible]
Wheel-scrapers	[illegible]
Fresnoes	[illegible]
Slushers	[illegible]
Graders (heavy)	[illegible]
Graders (light)	[illegible]
Plows	.
Rooter	.
Medium	...
Light	...
Heavy	...
Steam-shovel, including fuel, oil, etc	...
Elevating grader	[illegible]
Maney wheel-scrapers	[illegible]
Steam drill	[illegible]
Compressor	[illegible]
Tractors	

Pressure of Concrete on Forms Measured in Tests

Diaphragm Cell Placed in Bottom and Sides of Test Boxes and Actual Forms—Formula for Pressure Devised

By E. B. Smith
Senior Assistant Testing Engineer, U. S. Bureau of Public Roads, Washington, D. C.

Abstract of a paper presented to the Convention of the American Concrete Institute, Chicago, Feb. 15-18, 1920.

THE tests presented in this paper were carried out by W. E. Rosengarten in the laboratory of the research section of the Bureau of Public Roads located at the Arlington Experimental Farm, near Washington. The field tests were made during the construction of the walls and columns of a reinforced-concrete building.

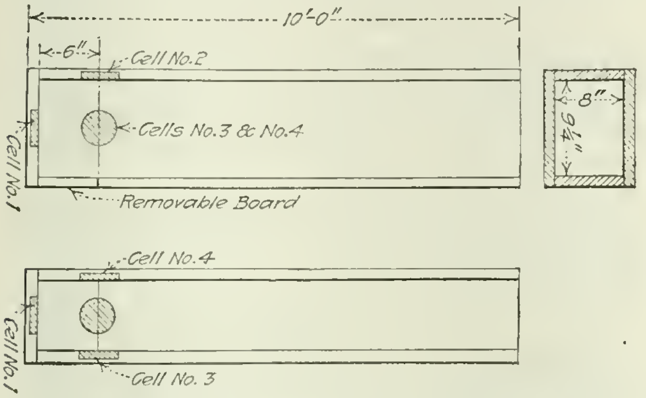


FIG. 1. FORM USED IN TESTS OF PRESSURE OF CONCRETE

The apparatus used to measure the concrete pressures were cells and gages similar to those described in the *Proceedings* of the American Society for Testing Materials, 1917, p. 641, and used for the past few years by this laboratory in measuring earth pressures behind retaining walls and under fills. The instrument, devised by A. T. Goldbeck, was described in *Engineering News-Record*.. It consists essentially of an air-tight metal cell having a circular weighing face 10 sq.in. in area. The concrete pressures against the face of the cell are balanced by admitting compressed air to the inside of the cell. When the pressures are balanced an electrical contact is broken which extinguishes a light and indicates that the pressures shown on the gage connected with the air pipes is equal to the pressure of the concrete. Tests on these cells have shown them to be accurate considerably beyond that necessary for these tests, and that the movement of the face is less than one ten-thousandth of an inch to break contact, thus making the cell admirably suited for tests on pressures exerted by granular materials, soils, mud and concrete.

Several other experimenters have attempted to obtain such data, but some have been greatly handicapped by not having a suitable apparatus for determining the concrete pressures. Any scheme for determining the pressure values that depends upon a movement of the concrete at the time of making the readings is evidently not reliable. The values desired are the static pressures of concrete against an immovable surface, and not the pressures necessary to stop a moving mass of concrete, nor to start a movement of the mass. And any scheme requiring first the disturbance or movement of the mass before making the pressure readings is also undesirable.

The arrangement of the pressure cells and the concrete form used during the laboratory tests is shown in Figs. 1 and 2. The form was built of 2-in. planks giving an inside horizontal cross-section of 7.8 in. by 9.4 in., and a height of 10 ft. Four cells were placed in the form, with the weighing face flush with the inside of the forms. Cell 1 was placed in the center of the base and indicated the vertical pressure. Cell 2 was set in the center of the rear wall of the form. Cells 3 and 4 were placed in the center of the right and left side walls of the forms respectively. The centers of these cells for obtaining the lateral presure were all 6 in. above the base. Air control pipes leading from all cells were arranged in order, with connections and nipples conveniently located for taking the readings on the four cells very quickly.

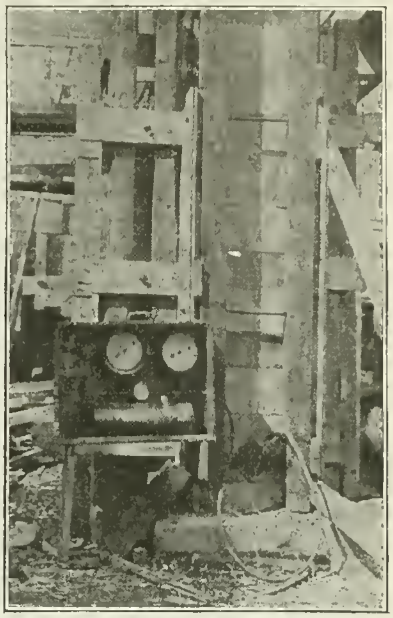


FIG. 3. PRESSURE GAGES APPLIED TO COLUMN FORM IN BUILDING

The materials for the concrete used in the tests were carefully weighed and mixed by hand. Immediately upon completing the mixing the concrete was shoveled into buckets and dumped into the top of the forms. The mixing floor and the wood forms were well wetted before the test was begun. The concrete was tamped on top by the use of a long stick having a 2 x 6 in. foot on the lower end. The outside of the forms were also vibrated by striking with a heavy hammer. The height to which the concrete stood in the column form was then measured, and the pressures on the bottom and three side cells were immediately read and recorded. The batches were varied in size so that when a new batch was added each 10 min. the head of concrete

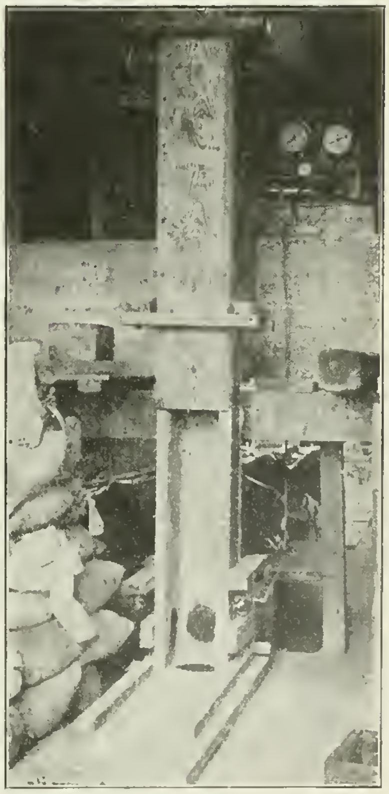


FIG. 2. VIEW OF TEST FORM IN LABORATORY

in the form would increase at the rate desired. Readings were taken on the pressure cells immediately after placing the concrete, and again about 5 min. later or shortly before placing the next batch of concrete.

The air and the mixing water temperatures were recorded each day tests were run. Slump tests of the concrete were made to determine the consistency used in each test; and are recorded as inches slump, or where very wet as inches diameter of the mass. Fresh batches of concrete were added every 10 minutes until after the pressures on the cells had passed a maximum and indicated a decided decrease in pressure. The tabulated data and results of a typical one of these laboratory tests are shown in Fig. 4.

Several field tests were run in addition to the laboratory tests described above during the construction of a reinforced-concrete building at the Arlington Farm. The pressure cells were inserted in the wall and column forms as shown in Fig. 3 and pressure readings taken at the time the concrete was being poured. The concrete was machine mixed, raised in an elevator and directed into the forms through a system of chutes. It was then spaded or tamped with a stick having a small blade on the end. The concrete was a 1:2:4 mix, river gravel being used for the coarse aggregate, and the consistency rather sloppy, flowing readily around the steel reinforcing. The results from these field tests conform favorably with those obtained from the laboratory; typical results are shown in Fig. 5.

The results shown by these experiments indicate that the fundamental pressure of concrete against the form is about 1 lb. per square inch for the first one foot of head. However, this is by no means all that should be said. A study of the results reported by others, and those obtained from this series of tests show that the following factors have an influence upon the pressure, namely: (1) rate of filling the forms; (2) cross-sectional area of the forms; (3) consistency of the concrete; (4) amount of cement in the concrete; (5) temperature of the concrete and the time of set of the cement; and (6) character of the fine and the coarse aggregate.

Sufficient data is not yet available to make final statements as to the law by which each of these factors influence the pressure of the concrete against the form. The results do show that the initial pressure under small heads is equal to the hydrostatic pressure of a liquid having the approximate density or weight of the concrete; that is, approximately one pound per sq. in., or 144 lb. per square foot for the first foot head. As pouring is continued this pressure, however, soon falls below the straight line hydrostatic pressure and the amount of this deviation depends upon one or more of the factors mentioned above.

1 : 2¼ : 3¾ Mix. Grav. Agg.

Curves	Pouring Rate, Ft./Hr.	Time to Max. Press. Min.		Air Temperature	Total No. Batches
		Lat.	Vert.		
A	1.5	90	90	74° F.	9
B	2.7	61	78	80° F	10
C	3.3	44	49		14

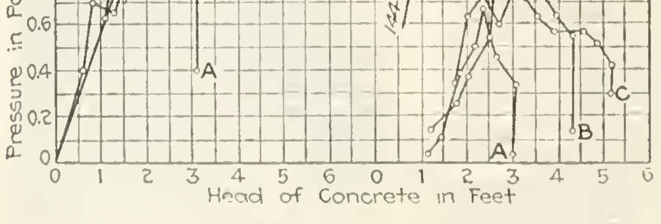


FIG. 5. CURVES OF PRESSURE OF 1 : 2¼ : 3¾ CONCRETE IN FIELD TESTS

It is important to notice that the results prove that if filling is continued indefinitely the lateral pressures near the base of the form finally reach a maximum value and then decrease gradually to zero, regardless of the fact that fresh concrete is continually added above. The vertical pressures are in all cases greater than the lateral pressures—they decrease in value after a maximum has been attained, but not to zero. The total weight of the concrete mass in ordinary construction is not supported entirely upon the bottom of the form, but because of the roughness and friction against the sides the planking takes part of the weight or vertical pressure. Of course, for wide and shallow masses of concrete such as floor slabs the vertical pressure is equal to the weight of the concrete.

A summary of the data at hand seems to lead to the following conclusions regarding the effect of the various influencing factors:

1. The maximum pressure exerted upon the forms increases as the rate of filling increases. At a slow rate of about one foot per hour the pressure is approximately 1 lb. per square inch but as the rate increases beyond this value the pressure increases approximately as the 0.3 power of the rate.

2. Field tests which are made in places where the distance between the form walls differed indicate that the maximum pressures obtained increase slightly with the mass of the concrete when the consistency is wet and sloppy. This conclusion probably does not hold in the case of dry mixes. Reinforcing just inside the form tends to slightly decrease the pressures, but probably this effect would be neglected in determining the final pressures for use in design.

3. The results show in general that the maximum pressure was increased as the consistency of the concrete was made drier within the limit of workability. This is probably different from what might be expected but the tests show it to be the case. It is probably due to the fact that under the usual conditions of placing dry concrete, it requires more tamping, which, because of its dryness, seems to develop a permanent wedging action between the particles. In the case of wet or sloppy concrete this wedging action does not exist, as we have approximately a static fluid pressure. For low heads the dry concrete (when tamped as usual) will give the greater lateral pressure, but for heads of four feet or more and within the time when initial set becomes an influencing factor the sloppy mixtures give the greater pressure. The average increase of pressure due to the effect of dry mixtures seems to be 0.3 lb. per square inch for each inch decrease in the standard slump test less than a 5-in. slump.

4. The richness of the mix also affects the maximum pressures obtained. The richer the mix the greater the maximum pressure. The average increase being

0.12 lb. per square inch for each per cent increase in the ratio of the cement to the aggregate beyond 12%.

5. A decrease in the temperature of the concrete retards the set of the cement, and it is natural to suppose that this is the limiting factor in the maximum pressure obtained, since the pressure increases with the head until the cement takes a sufficient set to begin to support the overlying concrete. Therefore, as the temperature is reduced and the time of the set of the cement is increased, the height of fill may be increased and thus produce or make possible a higher total pressure. Since the cement begins to set and stiffen in about thirty minutes, the maximum pressure is attained under whatever head of concrete may exist at this time. The value for H, the head of concrete, to be used in the formula given below should not be greater than one-half the rate of fill; except where agitation is vigorous and continuous in a sloppy mix, then, this ratio may be taken up to three-fourths.

Formula for Pressures

An empirical formula giving the lateral pressures required for use in the design or the investigation of the strength of concrete forms, and taking into account the above numerical factors, is

$$P = H^{0.2}RO^{0.3} + 0.12C - 0.3S$$

P being the resultant lateral pressure in pounds per sq.in.; R, the rate of fill in feet per hour; H, the head of concrete fill; C, the per cent by volume of cement to the combined fine and coarse aggregate; and S, the consistency in inches of slump.

The vertical pressure is obtained by adding $0.25H$ to the value of P as found above. Except when the inside distance between the vertical sides of the form is greater than one-half the depth of fill, then the value should be taken as equal to the weight of the concrete.

In the practical application of this formula, as with all formulas there is abundant opportunity for the exercise of common sense and good judgment. The formula will give pressures somewhat higher than exact values. It shows the effect of continuous and vigorous agitation of the concrete mass only as this is introduced through good judgment in selecting the value for the head of concrete, H. For usual conditions H may be taken as not greater than one-half of R. For ordinary cement in cold weather, or when continuously and well agitated, H may be three-fourths of R, when the filling is continuous beyond one hour. A second pouring on top of concrete that has been in place for 45 min. or more does not add to the pressures already existing at the bottom of the fill.

The values for C may be taken as the next higher whole number in the per cent of cement by volume, as the required accuracy does not justify fractional per cents. Values for S may also be taken as whole numbers, since the slump test is not accurate closer than 1 in.

The value of P obtained by the formula is the lateral pressure against the form at the lowest point of the fill. Since the pressures are not uniform from top to bottom, but very approximately as the ordinates of a parabola, the center of pressure or point of resultant pressure may be taken at 0.6 of the height of fill, H, from the top.

The following examples may serve to show the use of the above formula

1:1½:3 Mix. Gravel Agg

Curves	Pouring Rate. Ft/Hr	Time to Max Press Min.		Air Temperature	Total No Batches	Consistency
		Lat.	Vert.			
A	18	75.	75	62°F	11	15½" Diam 3" Slump
B	76	38	38	64°F	7	14" Diam 8½" Slump
C	1.8	106	106	70°F.	15	——
D	3.8	66	66	68°F.	11	12" Diam.
E	7.5	60	60	64°F	8	13" Diam

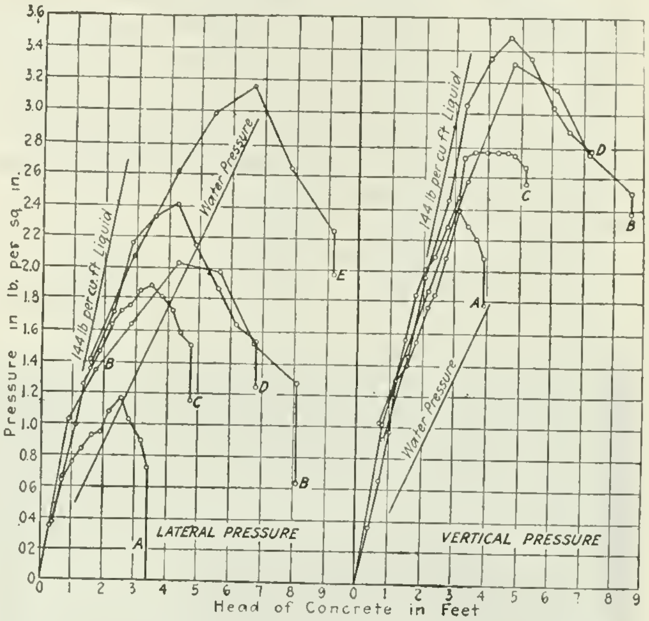


FIG. 4. CURVES OF PRESSURE OF 1:1½:3 CONCRETE IN LABORATORY TESTS

Example I. For reinforced mass concrete. Mix to be 1:3:5; consistency rather sloppy, or 9-in. slump; the rate of fill R to be 8 ft. per hour. The total height of concrete filled within one hour, 7 ft. Since this concrete is placed from a chute in a large form, and men are continually walking around in it, the value to be chosen for H is 6, or three-fourths of R. Then, substituting in the formula:

$$P = 6^{0.2}8^{0.3} + (0.12 \times 13) - (0.3 \times 9)$$

$P = 1.53$ *lb. per square inch*

The vertical pressure = 3 *lbs. per sq.in.*

Example II. For reinforced-concrete column. Mix to be 1:2:4; consistency 8-in. slump; rate of fill to be 24 ft. per hour. Total height of column and final fill 11 ft, made in one pouring; since this is done in less than thirty minutes the value for H is 11. Substituting

$$P = 11^{0.2}24^{0.3} + (0.12 \times 17) - (0.3 \times 8)$$

$P = 3.83$ *lb. per square inch*

Vertical pressure = $P + 0.25H = 6.58$ *lb. per square inch.*

Example III. For thin curtain walls and reinforced bulkheads. Mortar mix 1:5; consistency 8-in. slump; rate of fill 20 ft. per hour. Total height of fill in one pouring, 14 ft.; the value to be selected for H should be 10, since that is the height of fill at 30 minutes when the effect of stiffening and set begins. Substituting:

$$P = 10^{0.2}20^{0.3} + (0.12 \times 20) - (0.3 \times 8)$$

$P = 3.89$ *lb. per sq.in.*

Vertical pressure = $P + 0.25H = 6.39$ *lb. per sq.in.*

Example IV. For dry mix, mass concrete. Mix to be 1:3:6; consistency, 3-in. slump; rate of fill, 6 ft. per hour; distance between sides of form, 3 ft; total height of fill within 30 minutes, 4 ft. Then,

$$P = 4^{0.2}6^{0.3} + (0.12 \times 11) - (0.3 \times 3)$$

$P = 2.68$ *lb. per sq.in.*

Vertical pressure = 4 *lb. per sq.in.*

Tests Reveal Relative Values of Pneumatic and Solid Tires

By Alfred F. Masury
Chief Engineer, International Motor Co.

WHILE engineers are agreed that pneumatic tires reduce road impact and resultant shock to the chassis and that the effect of light unsprung weight is similar, it was not until recently that actual tests were conducted to give physical proof of these assumptions. Such tests have been made by the International Motor Co., employing a novel type of motion picture for the close study of the motion of the parts while negotiating obstructions and striking the earth.

In these tests results were recorded photographically by a new type of motion picture camera making 160 exposures per second and which when projected, "slowed down" the action to one-tenth the normal speed. The results which have recently been announced were so convincing that one tire manufacturer has already begun similar tests to compare the impact effect of pneumatic and solid tire equipment on motor trucks.

THREE-TON TRUCK ON THE REBOUND, SHOWING LOAD BOUNCING IN BODY

The purpose of the tests was to subject various types and sizes to shocks in excess of anything likely to be encountered in actual service and to make careful observations of the effect of road impact on spring and tire equipment as well as the effect of unsprung weight upon road impact. The trucks were run at speeds from 15 to 18 mi. per hour along a straight-away and over an incline rising 1½ ft. in a distance of 6 ft. In each case the speed of the truck was determined by having it make a flying start, and timing it with a stop watch over a measured course of 100 ft. from the base of the incline.

The time of flight through the air of each axle, the time of deflection of each spring and tire, the time of rebound of each spring and tire, and similar details of the tests were determined by several means to check the data for accuracy. An Eastman kodak timer was used to show seconds on the motion picture films that were taken to record the tests. An ordinary hand sewing machine with a white card fitted on the plunger was set on the table in back of the incline, and so adjusted that the card rose and fell three times with each revolution of the crank. This was operated by a man with a stop watch who turned the crank three times per second. A phonograph motor and turntable mounted in a box was placed on the stone buttress at the near side of the incline, the turntable carrying a cardboard cylinder marked off in four sections in black and white, the first, solid black, the second white on top and black at the bottom, the third, solid white, and the fourth black on top and white at the bottom. The governor of the motor was set for 60 r.p.m., so that the pattern on the cylinder showed quarter-seconds. All of these instruments were put into action simultaneously with the running of each truck over the incline and recorded together both by still and motion pictures.

The horizontal distance which the trucks jumped was measured by a curbing along the back of the runway marked off in feet. A large blackboard near the incline, marked off in feet both vertically and horizontally, showed the vertical rise of the different portions of the truck. The rise of the tires, one spoke on each wheel and the hub-caps were pained white, as a guide to revolutions made. A strip of sheet metal, extending down from the lip of the fender, was marked off in black and white at 3-in. intervals to show the rise and fall of the hub. The tire deflection was measured by means of the white rims and the white spoke enabled the revolutions of the wheel in the air to be counted.

Motion Pictures Permit Analysis

In addition to numerous still pictures with different forms of cameras, motion pictures of the two kinds were taken to permit analysis in the laboratory. One of these was the standard motion picture machine taking 16 exposures per second and the other a novograph, a new type of camera which takes pictures nine times as fast as the normal projector. Each jump was photographed simultaneously by both cameras and a composite film made up in which each jump was shown first at normal speed and then "slowed down" by the novograph. This film was then projected at normal speed, whereby each jump was shown twice, the first time, as it actually appeared and then at one-ninth normal speed, which allowed the human eye to trace the intricate movements of the different parts as the flight through the air was made. These films were studied both running and still, accurate measurements and calculations made and conclusions definitely arrived at.

The trucks tested comprised the following: One standard Mack AB 1¼-tonner having pneumatic tires on front and solids on the rear, and an experimental gear-driven axle; an AB 2-tonner with pneumatic tires all around and the same type of rear axle; an experimental 3-ton truck; a 3½-ton chain-driven AC model; and a 5½-ton AC with an experimental chain drive. These were numbered as follows: E-8, E-17, E-15, E-22, and E-18.

The conclusions drawn from the tests showed that the impact of a truck striking the ground after bounding over an obstruction is increased approximately as the square of the speed and as the weight; but inversely as the resiliency of the springs and tires.

It will be seen that two of the trucks were of very similar design, one having solid rear tires and the other pneumatics all around. A comparison of the results shown by these two gives startling conclusions. The one with solid rear tires weighed 9,330 lb. and the one on pneumatic tires 10,200 lb. The lighter one had 6,400 lb. on the rear tres and the other 7,100 lb. The former had 1,000 lb. spring deflection per inch and the latter 1,183 lb. Going over the jump at 17$\frac{1}{16}$ mi. per hour this lighter truck jumped 17 ft. 3 in., the other 17 ft. 7 in. Thus they jumped about the same distance at the same speed. Their weight was similar and they had about the same proportion of sprung to unsprung weight. Their springs were also similar, and yet when the forces set up by the shock of landing were figured an astonishing difference was found which could only be accounted for by the difference in tire deflection between the solid and pneumatic tires. The solid-tired truck showed a spring deflection 3¼ in. and a tire deflection of 1 in. The pneumatic-tired truck showed a 5½-in. spring deflection and 4½ in. of tire deflection, all of these figures being taken on the rear wheels only. The force with which the unsprung portions of the solid-tired truck struck the ground was 14,336 lb. as against but 4,624 lb. on the pneumatic-tired unit. Those on the sprung portions of the solid-tired truck were 13,014 as against 9,282 on the pneumatic-tired one.

From this we see that whereas the pneumatic-tired truck had 620 lb. more weight on the rear axle, it went over the same jump at the same speed as the solid-tired one, but owing to the greater deflection of the pneumatic tires, 450 per cent greater than the solids, it hit the ground less than two-thirds as hard. In other words its unsprung impact on the ground was 9,712 lb. or 68 per cent less than that of the solid-tired truck. This was not directly due entirely to tire deflection, of course, for we have seen that there was greater spring deflection, but this is all the more remarkable, for we have that these springs were 183 lb. each, or 366 lb. for both rear springs, stiffer than those of the solid-tired truck. The only way it can be accounted for is that the deflection of the pneumatic tires served so to lessen the rebound of the unsprung portion of the truck as to give the effect of lighter unsprung weight and consequently to lessen the resistance of the axle to the deflection of the spring. This represents the effect of impact on the road. The forces acting through the sprung portions of the truck represent the reaction of the blow on the vehicle itself. The sprung force was 3,732 lb. or 29 per cent less on the pneumatic-tired truck than on the solid-tired one, which is natural, considering that less impact of the unsprung portions of the road would produce less reactive thrust on the frame.

GENERAL LAYOUT SHOWING TAKE-OFF TURNING AND MEASURING DEVICES, ETC.

The pneumatic therefore saved the road two-thirds the "grief" and the vehicle itself one-fourth. Following the thought to its logical conclusion, it would seem obvious that a 7½-ton truck on pneumatic tires would do less damage to the road than a 5-tonner on solid tires, operating over the same route and at the same speeds.

The summarized results of the tests as compiled by the Mack engineers are as follows:

Comparison of Distances Jumped by Each—Trucks and Miles Per Hour at Which the Trucks Took-Off

	Miles Per Hour			Distance in Feet		
	1st Jump	2nd Jump	3rd Jump	1st Jump	2nd Jump	3rd Jump
E-8 ..	16.8	13.6	17.1	14′ 6″	15′ 0″	17′ 3″
E-15 ..	13.6	15.1	9.6	11 1	15 7	7 0
E-17 ..	11.3	16.8	17.1	6 6½	14 7	17 1
E-18 ..	15.1			9 2		
E-22 ..	13.6	14.3		13 5	15 0	

The following is a table of the weights on the front and rear of the various trucks:

Truck No.	Front	Rear	Total
E-8	3,250	6,480	9,730
E-15	3,453	8,417	11,870
E-17	3,100	7,100	10,200
E-18	5,480	13,500	18,980
E-22	5,850	14,650	20,500

The weights on the rears are as follows:

Truck No.	Unsprung	Sprung
E-8	1,716	4,764
E-15	2,140	6,277
E-17	1,754	5,346
E-18	3,136	10,364
E-22	2,446	12,204

The energy exerted by a falling body is equal to the energy required to raise it to the height from which it fell. If the vertical velocity and weight are known the energy equals the weight times the vertical velocity squared, divided by twice the acceleration due to gravity, or:

$$E = \frac{WV^2}{2G} = \frac{WV^2}{64.32}$$

W = Weight in lbs.
V = Vertical velocity in ft. per sec.

In the case of a motor truck driven over an upward inclined plane, the vertical velocity can be obtained from the speed of the truck and the angle of the incline, or:

$$V = \frac{S \times 88T}{60} = \frac{22ST}{15}$$

S = Speed in miles per hr.
T = Tangent of angle or incline.

The average force of a blow equals the energy of a moving body in foot-pounds divided by the distance of feet required to stop it, plus the weight of the body, or:

$$F = \frac{E}{D} + W$$

D = Distance to stop in ft.

Combining 1, 2 and 3

$$F = \frac{W\left(\frac{22ST}{15}\right)^2}{64.32D} + W$$

This formula can be applied to the unsprung weight of a motor truck by taking the deflection in the tires and ground, add to the sprung weight by taking the spring and tire deflection.

Applying this formula to the trucks jumping, we get the following results:

Truck No.	Speed	V^2	Rear Unsprung	Rear Sprung	Tire Deflection	Spring & Tire Deflection
E- 8..	17.1	29.4	1,716	4,764	0.083	0.354
E-15..	15.1	30.6	2,040	6,277	0.083	0.666
E-17..	17.1	39.4	1,754	5,346	0.375	0.833
E-18..	15.1	30.6	3,136	10,364	0.083	0.264
E-22..	14.3	27.4	2,446	12,204	0.083	

	Unsprung Force	Sprung Force	Sprung Force From Spring Deflection
E-8	14,336	13,014	3,250
E-15	13,890	10,757	
E-17	4,624	9,286	6,800
E-18	21,076	29,004	4,100
E-22	14,866		

The deflection per inch of each rear spring:

Truck No.	Measured Deflection Per Inch	Part No.	Calculated	
E- 8		13AB226	3,250 in 3¼ "	1,000
E-15		13AD25		
E-17	1,233 lb.	13AB227	3,700 in 3⅛ "	1,183
E-18	1,883 lb.	13AC29D	6,400 in 3$\frac{3}{16}$"	2,000
E-22	1,700 lb.	13AC29C	6,400 in 3¾ "	1,750

Deflection of rear springs and tires is measured from the photographs in inches:

Truck No.	Spring Deflection	Extension	Tire Deflection
E-8	3¼	4	1
E-15	7	1¼	1
E-17	5½	1⅞	4½
E-18	2$\frac{3}{16}$	1⅝	1
E-22			1

The force of the blow on the ground from the unsprung and sprung weight can be figured by this formula. These forces should not be added together, for they do not occur at the same time.

Ethics Case Decided by Institute of Consulting Engineers

Case No. 13 in professional practice and ethics concerning the retention of a consulting engineer as expert witness against his client has been decided by the American Institute of Consulting Engineers. The case is as follows:

Statement: A consulting engineer has a client, A, for whom he is making certain important investigations, pending which an attorney, B, asks the engineer to accept a retainer as expert witness in a suit at law against A. The matter on which the engineer's testimony is wanted by B is totally unrelated to the matter being investigated for A.

Questions: (1) Is it proper for the engineer to accept the retainer from B?

(2) If the engineer may properly accept the retainer from B, should A be advised of the acceptance of the retainer from B?

Answers: (1) While there is room for difference of opinion, from the trictly ethical point of view, the acceptance of B's retainer, under the conditions named, should be regarded as so questionable as to be unwise and improper.

(2) In any event, assuming that, as stated, the matters in regard to which the engineer is employed by A and sought to be retained by B have no connection with, relation to, or bearing up each other, the engineer should not accept B's retainer without the full knowledge and consent of both A and B.

More Reminiscences of Early Days in the North

By Henry K. Wicksteed

Chief Locating Engineer, Canadian National Railways, Toronto

TO THE north of the St. Lawrence, the Ottawa, and the Great Lakes, lies a country of almost unique characteristics, which occupies a very considerable portion of Canada in the temperate zone, and is generally referred to as the Laurentian range of mountains or hills—"mountains" is rather a misnomer, for there are few elevations of more than 2,500 feet above the sea, or more than one-half that above the adjacent valleys. Hills there are in plenty in the southern portion, and they make up in number what they lack in elevation. This southern portion is extraordinarily rough and broken, and presents a very bold front to the more hospitable country which borders it, and especially to the Lower St. Lawrence, the Saguenay and Lake Superior. This bold front is somewhat forbidding and awe-inspiring, but if we penetrate into it by some of the numerous rivers, we find that it is not so bad as it looks from the outside, nor so inhospitable.

Great Natural Resources

There is a great wealth of timber in this country. For some centuries it was Canada's principal source of wealth on this account, not merely because of the direct value of the timber itself, although this was enormous, but because these forests sheltered the fur-bearing animals, the marten, the mink, the fisher, the otter, the wolf, and more important than all, the beaver, the one-time emblem of Canada, and more than any one thing in the animal, vegetable or mineral world, responsible for Canada's early settlement and development.

Among these rugged hills are fertile valleys, and pushing on up the streams which occupied these valleys, the early explorer found that after he had surmounted the first swift ascent by a series of arduous portages, the rapids became less numerous and formidable; lake expansions became more numerous and larger, and the hills relatively lower and less rugged. Instead of being brought up finally by a range of mountains and having to abandon his canoe, these lakes and their connecting streams brought him to a great plain through which the streams meandered with sluggish current, and the lakes stretched often beyond the horizon. Pushing onward, still northward, sometimes without a portage, he found the current reversed and discovered that he was being carried forward toward the great bay of the north. The streams combined to form rivers, and the rivers grew larger and larger, and swifter and more turbulent, until he debouched at last by one of such estuaries as that of the Moose or the Albany into salt water. To Moose Factory from Montreal by the Ottawa and the Abittibi, or to Rupert's House from Quebec by the Saguenay and the East Main, was a long journey in the early days of Canada, but it was not too long for Iberville to conduct a successful war party to the shores of the bay, living on the country as they travelled, nor for the Jesuits on their evangelizing missions to the Indians.

Necessity for New Railroads

When the great plains of Central Canada were opened up to agriculture, and the several colonies were combined as the Dominion of Canada, railways became a necessity, and the ragged outcrop of the great northern plateau became somewhat of a hindrance and deterrent. It has been designated the Great Barrier. But this was true only of the southern outcrop, which, being nearest to the older settlements and commercial routes, and affording, on the map at any rate, the shortest route, was naturally that first essayed. The more recent lines of the Canadian National, striking boldly north have found it much less of a barrier. On the contrary, they have opened up a country with considerable natural resources in timber and minerals, and which will perhaps be, in the future, as it has in the past, much more of a factor in the industrial development of Canada than the prairies themselves.

Greatest among the industries which have grown up are the nickel mines of the Sudbury district. Next come the silver and gold of Cobalt and Porcupine, and simultaneously there has gone on the agricultural development of the "clay belt" and its outlying oases. Much less talked about has been the increasing output of the forest—railway ties, pulpwood, piles, and sawn lumber. Complementary to these industries has been and will be still more in the future, the development of the waterpowers. A good deal has already been done on the Wahnapitae, the Spanish, and the Mattagami, the St. Maurice and the Chicoutimi. More is in progress on the Nipigon; but this is only a beginning, and some of the most important, besides an enormous number of secondary powers, have scarcely been considered at all. They are waiting their chance to be made useful, and with the advent of population and capital they will soon get it.

So far from this northern country being a barrier, it will probably become one of the busiest and richest districts of the Dominion, as it is the greatest in area. The agricultural plains of Central Canada will drop into a secondary position as food producers for the industrial population east and west, as have the corresponding districts in the United States. So far, too, from being a barrier, the National Railways lines through this country have actually cost less per mile than through much of that east and west—less than through the canyons of British Columbia, or even between Montreal, Toronto and North Bay, while from the point of view of economical operation, they are equal in standard to any in the world.

It is in this north country that much of the writer's life has been spent. Forty years ago it was almost unknown and unmapped. The Geological Survey had traversed some of the main canoe routes, and the early surveys of the Canadian Pacific had fixed the position. But only the Indian names of some of the great rivers and lakes were mentioned from time to time as existing somewhere in this mysterious northern district, and it has fallen to the writer's lot to do much of the exploration and mapping. The exploration took time and patience, and led to some hardship and privation, and a little danger at times. Always it was hard work. But hard work in conjunction with youth, good health and appetite is rather pleasant than otherwise, and the explorer's lot is not altogether an unhappy one, although there is variety in this respect.

One sunny day about the middle of June in the year 1884, there might have been seen entering the mouth of one of the northern affluents of Lake Superior, a Peterboro canoe manned by three men. Technically, one of these, the steersman, was a white man, another in the bow was red, the third was a halfbreed—between the two both in position and color. But, practically, they all looked the same. The bowman's name was Louis, a nice, quiet boy and a good worker, albeit he had been implicated in the killing of a relative not long before. Paul was the midshipman, a merry, light-hearted fellow, with a neck like a bull, and tremendously powerful, and in character reckless and headstrong, more white than Indian. Modesty forbids any description of the steersman.

We say "might have been seen" advisedly, but as the north shore at that time was one of the loneliest places in the world, it is extremely unlikely that any one did see them. Indians there were and still are, in this country, but they do not affect the shores or waters of the Great Lake, except at one or two established trading posts. The shores are so terribly rough and broken, and the vegetation so scant and subarctic, that game and fur-bearing animals are scarce. Only the waters teem with fish life. But this is equally true of the kindlier country inland, studded as it is with lakes of all shapes and sizes, which are better suited to navigation by the aboriginal bark canoe.

Capsized in the Eddies

The Little Pic was high, and was pouring a heavy brown flood into the lake over a bar at its mouth, over which the lake swells broke angrily. For three or four miles the current was very swift, and taxed the energies of the paddlers, dodging from eddy to eddy. Towering bluffs of granite rose 500 or 600 feet on the left from the water's edge, and others gradually closed in from the right, until the valley became a canyon, and over its boulder-strewn bottom the river poured in a turbulent rapid. Then our troubles commenced. There were signs of an old overgrown portage along the talus slope, but to carry a heavy canoe and a full cargo over such a portage is a work of time and labor, and we concluded to "track" as far as possible. A long light line was got out forward, and Louis sent ahead as far as it would reach. Paul held on to the canoe until he had braced himself for a pull, and the writer hovered between, ready to "fend off" from the rocks. When all was ready, Paul pushed the canoe out of its protecting eddy, Louis pulled, and the third party fended. The bow of the canoe rose gallantly against the rush of water, and slowly advanced up stream until she rested in another eddy at Louis' feet. The process was repeated time after time, and the upper end of the rapid came into sight, but then Paul became overconfident and reckless, and pushed out before Louis had a strain on his line, the canoe sheered out into the current, nearly broadside on. Louis hung on, instead of easing off and gradually getting her nose upstream, the strain on the line became terrific, and she gradually heeled over to it, and the water poured in over the gunwale. Then the deckload, consisting of a side of bacon and a flint-lock musket, slid overboard, and the canoe righted, but full of water. A bag of flour and a pack of blankets floated off. Then the canoe came ashore in a shamefaced sort of way, and was quickly emptied, and we started after the missing articles. The blankets soon became saturated and lagged in the eddies, and were easily caught, but the flour sailed away down those rapids at a surprising pace, and was nearly at the mouth of the river before being caught. Flour in a bag does not seem to the uninitiated as if it should be a very buoyant material and one would expect it to become semi-fluid and quickly dissipated, but as a matter of fact, when tightly packed and fastened, it soaks up very little water, and an impervious paste forms next the bag, so that very little is lost, and heavy as it seems to a man standing underneath it, it is much lighter than an equal quantity of water, and floats quite high, so that we were not greatly concerned over the wetting. Our sugar, however, was a complete loss, and the tea almost so.

A Night With the Black Flies

The second time we tackled the canyon rapid we got up with comparative ease, and then for several miles above met only a very strong current. But about ten miles up, we came to a point where a clay bank 75 feet high had been undermined by the flood, and had slipped bodily into the river, carrying trees and bushes with it. The clay had been mostly carried away, but the trees were badly jammed and tangled, and it required an hour or two of work to cut our way through and start the jam moving.

Another few miles brought us to a fall and a short portage, and a short distance above, we camped for the night. This was June, and the latitude 49°, and it was the first warm spell of weather of the summer, and the trees in full leaf. With the leaves come the black flies, unusually hungry and fierce on account of the lateness of the spring breakup. The sun set somewhere about 8 and rose at 4 next morning, and the twilight lasted hours longer, in fact there was practically no darkness, and while the blackfly is supposed to be a gentleman and go to bed at night, he took very little rest that night, and we got even less. And we were glad to get afloat again and reduce the number of the tormenters, although on the now narrow stream it was impossible to leave them altogether behind.

We passed a large branch from the north, and the stream narrowed still more. An hour later passed another. Here the stream not only narrowed, but became clear and brown, showing that we had left the clay country behind. A strong rapid appeared ahead, and a much overgrown portage led from its foot. The writer took the axe and started ahead clearing the growth as he went. A few hundred yards brought him to the river again, above the turbulent water. A tree projected over the water, blocking the landing. The steersman put his foot on it, and swung the axe aloft. A twig caught it and deflected it enough to strike the foot instead of the tree trunk, and a great gash appeared across the toe of his mocassin. In a few minutes the mocassin changed in color from yellow to dark red.

Evidently the game was up for this trip, so he reluctantly hobbled back, launched the canoe again, and started for Lake Superior. Feeling a little faint, and the downstream work being comparatively easy, the steersman took the center of the canoe, and handed over the steering paddle to Paul. The current was very swift, and rounding a bend, a snag appeared ahead. Paul as usual overdid the steering, and brought the canoe broadside onto it. A very sudden capsize ensued, and in a few seconds the writer was pulling the canoe ashore with one hand, while the other and the uninjured foot had to do the propulsion, and the two Indians stood on the bank. Truly, misfortunes never come singly. This time the axe, frying pan and kettle were all gone, and only the blankets and flour remained. One paddle drifted away, but was caught lower down.

With the decreased quantity of impedimenta, getting started again was a very short job, and as the boys began to see hunger ahead of them, it did not need much urging to get them to paddle hard. With the swift current under us, we made great speed. An hour or two brought us to the portage past the fall. As the cut foot had stopped bleeding, and was now stiff and sore, getting across the portage was a painful piece of work. But it was still early in the day when we launched again.

Then came a long stretch of easy going. The day was warm and bright, and the black flies did not bother much on the wide river. I believe I dozed a little, but woke up to find the canoe nearing the canyon, and the sun getting low. The Indians ran the canoe ashore; got out, and looked inquiringly at me. But I wanted no more portages, and before they could protest I had braced my good foot against the thwart ahead of me, my back against another, and shoved out into the stream. Two strokes straightened the canoe out, and in a moment she was whirling down the half-mile rapid, grazing boulders by fractions of an inch and shipping water over both gunwales in the surges. But a few seconds did the trick, and I was floating in an eddy at the foot of the rapid before the boys started to scramble through the brush.

Half an hour later we floated out on the broad expanse of Superior, and headed for a sandy beach. The sun was nearly down now, and it was a glorious evening. But we were very hungry indeed, and it did not seem to me that the chances for supper were bright. However, the Indians met the emergency. Axe we had none, but there was lots of driftwood, and we had some dry matches; frying pan was gone, but the flour was still with us, and they made dough; rolled it out very thin; wrapped it around little sticks, and set the sticks up in the sand. In a few moments it was cooked in a way, and to a hungry man, eatable. And then we lay down on the sand, and as the icy chill off the lake kept the flies away, we slept, and slept soundly.

Home At Last

In the morning we were off betimes, and found a dead calm and a brilliant sun. Our luck seemed to have turned at last, and by 2 p.m. we had covered the 25 miles to the Pic River, and were crossing the bar into the river. Kind hearts had the Spences of the H. B. C. post, and in a few moments we were at home. Warm water and sharp scissors got the mocassin away from the foot without taking the toes with it, but one was nearly severed, and another badly nicked. There was no doctor, but we were semi-savages, and for such, savage remedies are sometimes best. An old squaw of ripe experience, and even riper odor, bound the toes up in some kind of shape, overlaid the cut with the castor of the beaver, and left the Lord to do the rest. In three days I was in good enough shape to steer a boat and look after supplies, and in ten I was walking with the aid of a stick. But perhaps if I had not been out all the previous winter, and living on bread and tea and fresh air, my mutilated foot would not have healed so promptly.

It was rather a tough trip anyway, and while I have had harder, and been for some days without even warm dough to eat, I don't remember ever meeting with such a succession of petty mishaps, which might have resulted in tragedy.

Present Position of Engineering

(The following extract from the inaugural address of Burnard Green, president of the Society of Engineers, Great Britain, shows that some of the lines of thought on the status of the engineer in England are being paralleled in this country. Apparently the conditions surrounding the profession there and here are much alike.—EDITOR.*)*

In considering the calling pursued by an engineer it is impossible to say definitely that he is following either a business or a profession. Uncertainty upon this point is in itself a great handicap, and has in the past given rise to a great deal of ill-directed training. An engineer is not following a profession in the same manner as a doctor or a barrister, while he is not protected by a corresponding organization to that which protects and watches over the interests of the members of the accepted professions. If an engineer is to make good in the great world of affairs some business training should be an integral part of his experience, to which as much importance should be attached as to the acquisition of some of that technical knowledge which he acquires, often at great pains, believing that it will be sufficient to enable him to earn a living.

It is remarkable that there are numbers of men, highly skilled technically, and of considerable mental attainments, who do not command that feeling of confidence that others with less technical skill and greater knowledge of the world's affairs do command, and it is merely human nature that the commission does not always fall into the hands of the person most highly skilled technically. It does not follow that the most highly skilled technical advice is the most valuable in all circumstances. A nicely balanced knowledge of the world's affairs is often of greater value than higher technical knowledge in dealing with problems put before the engineer today.

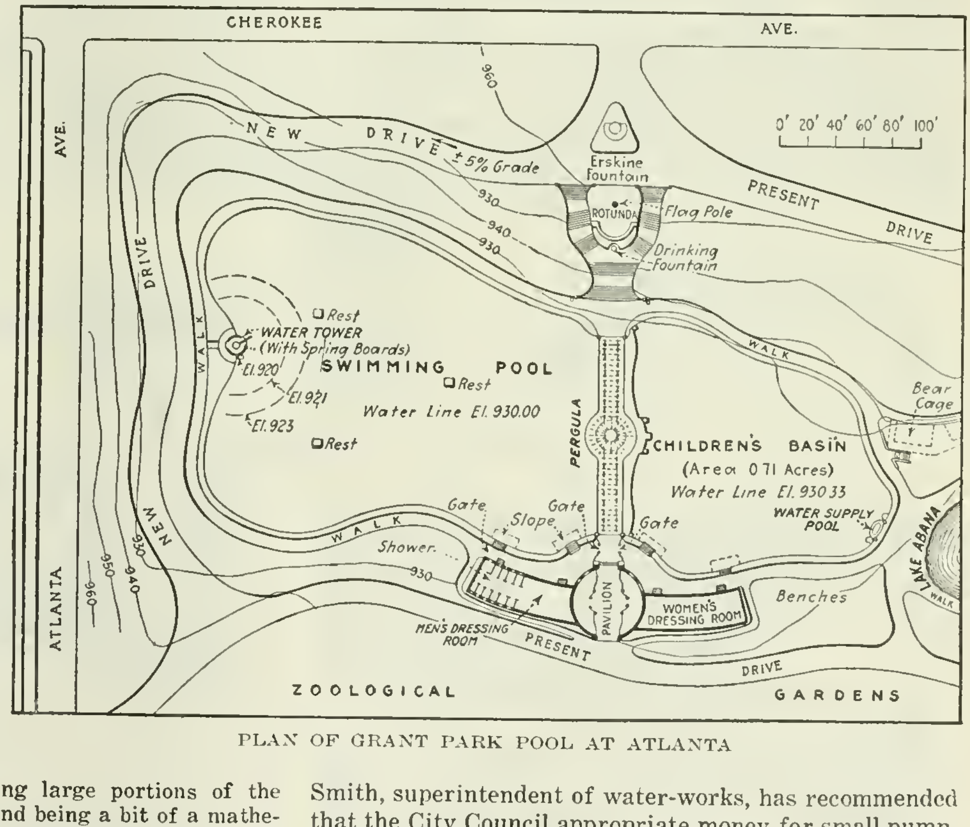
In considering the benefits resulting from the labors of our many-sided profession, it is important to bear in mind that, though civilization has developed in a particular manner and direction as the result of it, development would, nevertheless, have taken place without it, but probably on other lines. There are, in fact, no good grounds for thinking that the world would have been less civilized. Though the world at large is more indebted to the labors of engineers for the progress of civilization than to those of any other profession, it is perhaps true that our profession meets with less popular appreciation and material rewards than any other. It is not an uncommon belief, among large portions of the community, that an engineer, beyond being a bit of a mathematician, is little else; and there is reason to think that this idea has been nourished, if not created, by the dislike which many engineers openly show for certain matters accurately pertaining to their professional work, but not perhaps of the most interesting kind to some natures.

I am speaking especially of commercial consideration in connection with engineering schemes, and I am of opinion that it would be of great advantage if the future training of our young engineers made definite provision for obtaining the necessary experience and knowledge of this kind, without which it is extremely unlikely that they will ever succeed in the world of commerce in which the engineer occupies an important position. An elementary knowledge of accountancy and modern commercial methods cultivates a sense of proportion of values of engineering work, and it is an essential possession which can be cultivated. The extent to which this is of assistance can only be apreciated by one who has taken the trouble to attain it; and when a man has taken the trouble to attain it, it is safe to say that he will be kept wondering how he ever managed to get on without it.

The ability to value work accurately is the result of wide experience, and can only be obtained as years go by; but it is within the power of every young engineer to start his professional life with a fair idea of monetary values, and it is a branch of his work which should never, under any circumstances, be neglected. For good engineering design one must pay attention not only to the sufficiency of the design in the engineering sense, but must at the same time provide this with the minimum expenditure of money spread over the life of the structure.

New Open-Air Swimming and Wading Pools, Atlanta, Georgia

OUTDOOR swimming pools built and maintained by the City of Atlanta, Ga., will be five in number when the one under construction in Grant Park is completed. These pools are supplied with filtered water from the city water-works, on the constant-renewal plan. One of the pools takes 500,000 gal. a day. W. Z. Smith, superintendent of water-works, has recommended that the City Council appropriate money for small pumping and filter plants to treat the swimming-pool water.



PLAN OF GRANT PARK POOL AT ATLANTA

The Grant Park pool, as shown by the accompanying map, is set in a hilly park, and has a curved outline and various accessory features designed to add to its attractiveness. The swimming pool proper is from 5 to 10 ft. deep and the children's basin or wading pool is considerably shallower. The work is being done under H. L. Collier, chief of construction, Atlanta, Ga., after plans prepared by C. E. Kauffmann, engineer of bridges and estimates.

Salt Lake's Five-Year Sewerage Program is Completed

Electric Pumps Discharge Sewage from Interceptor Into Canal Leading to Lake—Sewage Flow Closes Small Leaks

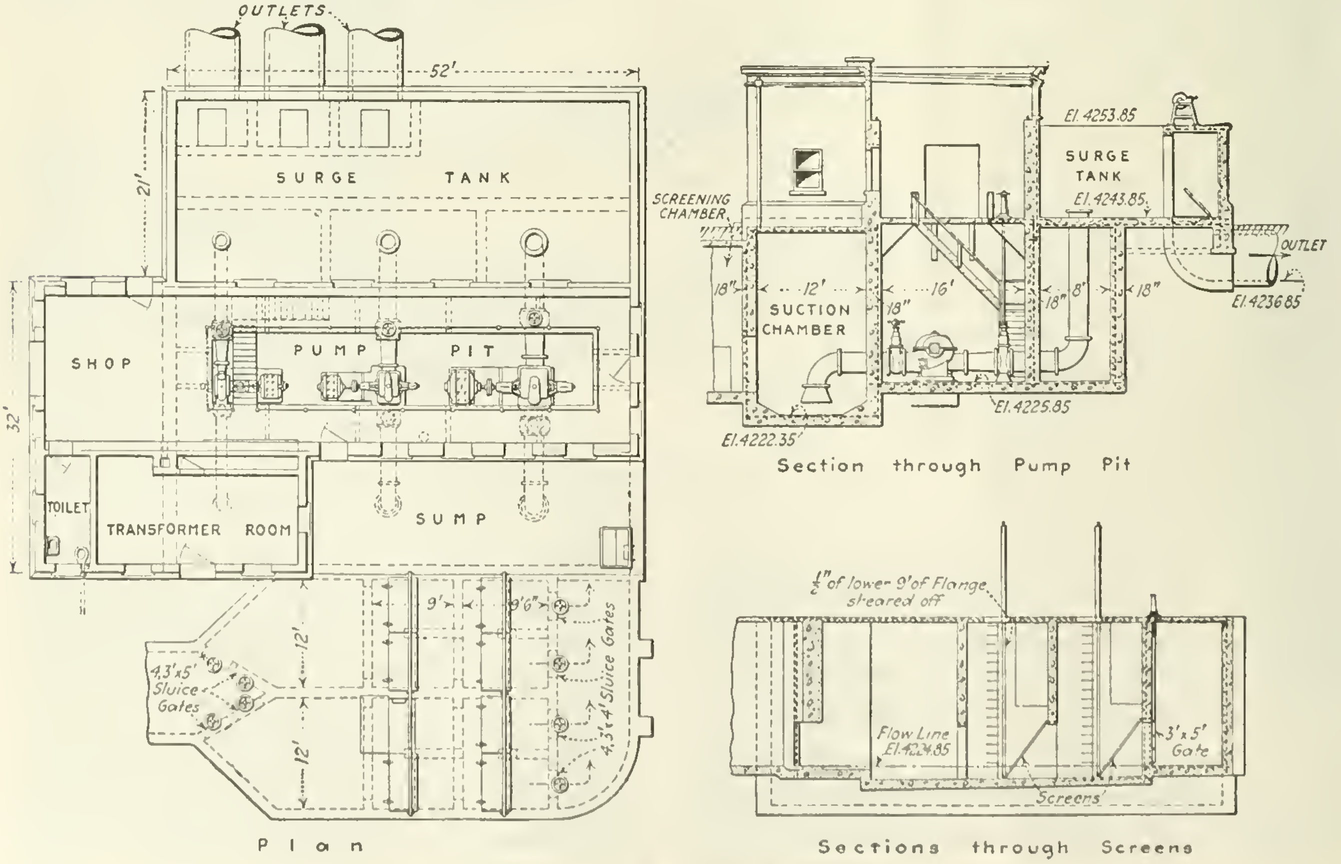
RECENT completion and acceptance of the 16,000-ft. reinforced-concrete siphon outlet of the sewerage system of Salt Lake City, Utah, marks the end of a five-year program which makes provision for 500,000 persons, four times the present population. The salient features in the system are a 78-in. intercepting trunk sewer handling about one-third of the lower level area, the upper portions already being cared for by a gravity system; a pumping station to which the trunk sewer leads, and a 60-in. outfall siphon discharging into a canal emptying into Great Salt Lake.

At the time the improvements were undertaken the major portion of the sewage was being discharged through the gravity sewer into a high-level canal and thence into Great Salt Lake. This flow was augmented by a small flow collected in the lower, growing part of the city and pumped into the gravity line. The interceptor making this collection was badly overloaded. In the five-year period 96 miles of sewers, or about one-third of the total length throughout the city, have been added to the system.

The change in the pumping station was found to be advantageous because the head required could be reduced from 50 to 20 ft. Then, too, by putting in units of 12-, 15- and 25-sec.-ft. capacity, constant instead of intermittent operation would cut down the penalty for maximum demand on the electric power used. Construction of the discharge outlet siphon made the head economy possible and obviated complaints of owners of the land through which an open canal following contours would flow.

In the design of the interceptor, which has a maximum capacity of 130 sec.-ft., provisions were made for the sewage of 500,000 persons and for infiltration from the total area to be served. Storm water is cared for in separate systems, following roughly the old natural watercourses. Measurements made in 1915 indicated that the 4.8 square miles under the gravity sewer gave a maximum flow of 17 sec.-ft. and that from 2.7 square miles under the old interceptor was 9.6 sec.-ft. The area to be drained by the new system was 18 square miles. With an estimated population of 300,000, the 75-sec.-ft. capacity allowed would permit 160 gal. per capita daily to be discharged, checking fairly well with the measured discharge under the two old systems. For infiltration data the Fifth East St. sewer, 4270 ft. long, was measured before any houses were connected. This gave 1.6-sec.-ft. total, or 35-sec.-ft. per day per square mile of street area. As 14 square miles were subject to infiltration, 50-sec.-ft. groundwater was added to the 75-sec.-ft. sanitary sewage. The line is 23,000 ft. long and varies from 60 to 78 in. in diameter, providing a maximum outlet capacity of 130 sec.-ft. for all of the western and southern portions of the city that cannot drain to the gravity sewer. The grades vary from 0.1044 to 0.045 per cent.

Construction of the interceptor was completed in 1917, but householders were not encouraged to connect with it until recently, for temporary discharge into the Jordan River was provided which it was desirable to keep as small in amount as possible, the river flow at this point being low, particularly during the irrigation season.



Plan

Section through Pump Pit

Sections through Screens

PLAN OF PUMPING-STATION, SCREEN CHAMBER AND SURGE TANK—CONNECTIONS TO PUMP ARE ALL EASILY ACCESSIBLE

The pumping station includes double screen chambers, a large suction chamber, a narrow pump pit. and a surge tank into the bottom of which the pumps discharge. Wooden bar screens of 2 x 4-in. timbers with 2-in. vertical openings have replaced steel screens having ¼-in. bars spaced to give 2-in. square openings because of the difficulty of operating the heavier metal screens.

The pumps are in a pit depressed sufficiently to give a gravity head on the suctions at all times. The 12- and 15-sec.-ft. units are driven by 75-h.p. motors and the 25-sec.-ft. unit has a 125-hp. motor. Space is available to bring the capacity up to that of the interceptor. The static head varies from 14.8 ft. to 25.3 ft. At present, operation is required only about 20 hours per day, the long interceptor acting as a storage reservoir. From 12 to 15 sec.-ft. is the average flow, and in August, when inspected by a representative of *Engineering News-Record*, the sewage was fresh at the pumping station but septic at the end of the 16,000-ft. outlet. The power consumption has been regulated so that it is always below the 752,000 kw.hr. per year free current allowed under the city's franchise agreement with the Utah Light & Power Co. Formerly the old station consumed about $90 worth of power per month at 1c. per kilowatt-hour over and above the free allowance. About 90% of this free power is consumed at the station, and the current consumption is approximately half that formerly used.

Use of the outlet, the delay in the completion of which has held up the operation of the interceptor and the station for more than a year and a half, was not made until February of this year, although construction was completed in September, 1918. The line is built of reinforced-concrete pipe, and the head at the lowest part of the siphon is 20 ft., due to elevation, and about 5 ft. to additional head necessary to overcome friction. Very fine cracks in the joints under 20-ft. head permitted leaks showing 3500 gal. per minute under tests. In spite of extended repair of these leaks, the contractor could not reduce the leakage materially, and finally the city made an arrangement with him to take over the line, with the hope that the sewage might seal the cracks. Satisfactory results were obtained, the last tests made in February indicating a leakage unmeasurable by the weirs used at inlet and outlet. The normal capacity is 50 sec.-ft., and a second line is to be installed to meet the trunk-line capacity at a future date not yet definitely fixed.

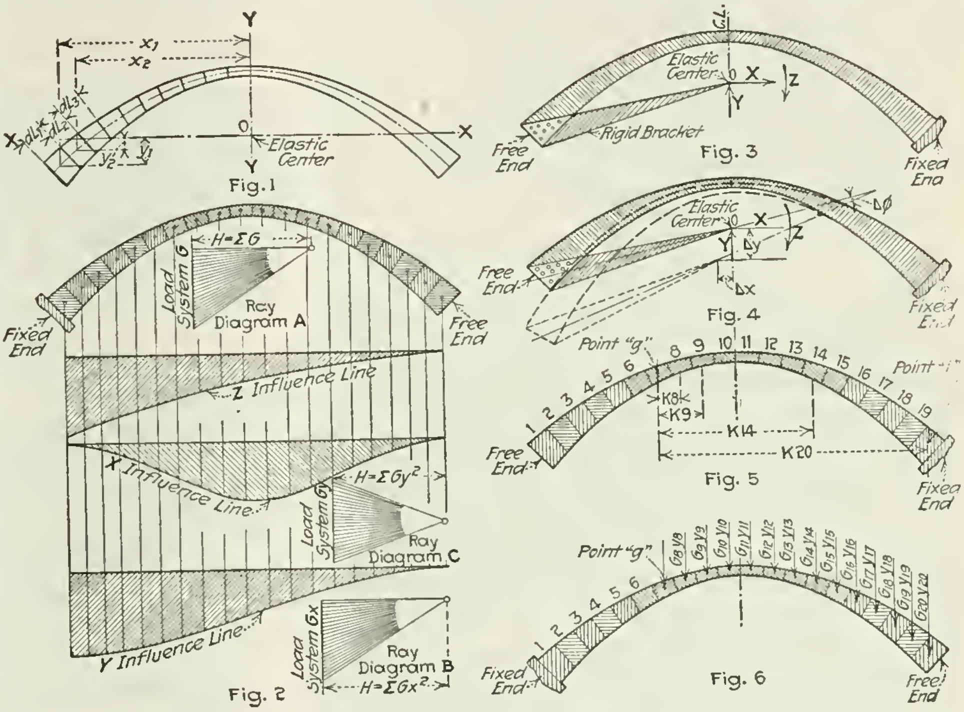
Gibbons Bros. and Reed & Roche were contractors for the main trunk sewer; the Lynch-Cannon Engineering Co. built the pumping station, and J. W. Mellen had the contract for the discharge outlet. The design and the construction were handled under the direct supervision of S. Q. Cannon, city engineer.

Arch Reaction Influence Lines by Deflection Diagrams

Dividing Arch Center Line Equally, "Elastic Weights" Are Used in Connection With Elastic Center for Graphical Solution

By C. B. McCullough
Bride Engineer, Oregon State Highway Commission, Salem, Ore.

Applying the fundamental principle that the influence line for any reaction is identical with the deflection diagram produced by unit displacement at the point of application of that reaction (see *Engineering Record* of Nov. 25, 1916, p. 648), the bridge department of the Oregon State Highway Commission has been standardizing methods of analysis of indeterminate structures. The following analysis for fixed-end arches has been developed. It is analogous to that described by C. S. Whitney in *Engineering Record* of Sept. 11, 1915, p. 324, but differs in the use of variable "elastic weights" or "rotation loads" and in the treatment of the unknowns.



FIGS. 1 TO 6. DIAGRAMS AND NOTATION FOR FINDING ARCH REACTIONS BY INFLUENCE LINES

Briefly, the method is as follows:

1. The half arch rib is first divided into not less than ten equal divisions d*L* and for each segment the quantity d*L*/*I* is computed. The term *I* represents the moment of inertia of the cross-section of the rib at the midpoint of the linear segment d*L*, including the reinforcing steel. This term d*L*/*I*, the "*rotation load*" or "elastic weight," will be designated by the letter G.

2. Having these rotation loads computed, the center of gravity of the same is next determined, which point may be called the *elastic center* O of the arch system.

3. Through the elastic center thus determined, construct two coördinate axes, *X* — *X* horizontal and *Y* — *Y* vertical Fig. 1. Carefully scale and tabulate the terms Gx, Gy, Gx^2, Gy^2 for each section, calling y positive above axis *Y* — *Y*. Also determine the summations ΣG, ΣGx^2, and ΣGy^2 for the entire arch.

4. Next consider the arch as a cantilever fixed at the *left end* as shown in Fig. 2 and construct the following three equilibrium polygons: (1) Polygon A with loads G and pole distance ΣG; (2) polygon B with loads Gx and pole distance ΣGx^2; (3) polygon C with loads Gy and pole distance ΣGy^2.

Now consider the arch as a cantilever fixed at the *right end* and conceive a rigid bracket fastened to the free end and terminating at the elastic center O. Also conceive three forces, X horizontal, Y vertical and a moment couple Z acting at O as shown in Fig. 3.

It can easily be proved that polygon A is the influence line for the moment couple Z. Also that polygon B is the influence line for the force Y and polygon C the influence line for the force X. From these three influence lines the influence lines for thrust and for bending moment at any point on the arch rib are easily drawn. Thus, the bending moment due to the left reactions would be

$$M^P = Z - (Yx + Xy)$$

A rise in temperature induces a reaction X_t but, for symmetrical spans, no reaction Y or moment couple Z. For a rise of t degrees in concrete arch spans

$$X_t = \frac{12tL}{\Sigma Gy^2}$$

UNDERLYING THEORY

The theory underlying the above method is demonstrated as follows:

Consider the support at the left end removed and the rigid bracket fastened to the terminal section as shown in Fig. 4. Since the supports are known to be rigid and unyielding, the forces X, Y and the moment couple Z applied to the bracket must be sufficient to counteract the indicated deflections Δ_x, Δ_y, and $\Delta\phi$, and therefore must be proportional to these displacements. It is apparent therefore, that an influence line constructed for the displacement Δ_x is also the influence line for the force X applied at O.

In a similar manner, the influence line for the displacement Δ_y is also the influence line for the force Y, and that for the rotation $\Delta\phi$ is the influence line for the moment couple Z.

Let m_x be the moment at any section due to a unit load applied at O along the line of action of the redundant X; m_y be the moment at any section due to a unit load at O acting along the line of action of Y and m_z the moment due to a unit couple at O acting in the direction Z. Obviously,

$$m_x = y;\ m_y = x;\ m_z = 1.0$$

From the theory of deflections

$$\Delta_x = \Sigma\frac{Mm_x dL}{EI} = \Sigma\frac{My dL}{EI} = \frac{I}{E}\Sigma MGy$$

For a unit load at any point, say point g (Fig. 5) ΣM becomes $\Sigma^t{}_g K$, whence

$$\Delta_x = \frac{I}{E}\Sigma^t{}_g KGy$$

But this last expression is equal to $1/E$ times the bending moment obtained at point g, were the catilever to be considered as fixed at the *left support* and loaded with the rotation load system Gy, Fig. 6.

The moment diagram for the load system Gy is therefore an influence line for the redundant x.

The scale of this influence line may be determined from the following consideration: A unit load applied horizontally at O will cause a displacement represented by the term

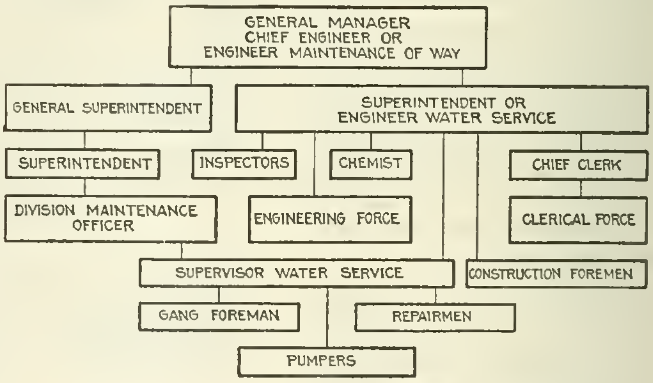
$$\Delta'_x = \Sigma\frac{m_x^2 dL}{EI} = \frac{I}{E}\Sigma Gy^2$$

Now, since the reaction X is proportional to the displacement Δx, $X : 1 :: \Delta x : \Delta x'$. Whence $X = \Delta x/\Delta' x$. Since E cancels out and the summation term for Δx equals the intercept in polygon C times pole distance, if the pole distance be made ΣGy^2, the summation term for $\Delta' x$, the intercepts will truly represent the reactions X.

Therefore polygon C constructed with the load system Gy and the pole distance ΣGy^2 is the *true* influence line for the redundant X, to the same scale as the beam diagram. In a similar manner the relationship stated for polygons A and B can be demonstrated.

Railway Water Service Organization

A water service organization suitable for large railways, but capable of being modified for application to smaller roads, submitted with the report of the committee on water service, was adopted at the annual meeting, last month, of the American Railway Engineering Association. This was planned by C. R. Knowles, Illinois Central R.R., and is shown on the accompanying diagram. It does not involve material change in the division or local forces but aims at placing the duties in the hands of men trained in particular lines, relieving local or other officers of duties which may be foreign to their departments. Where the nucleus of an organization exists, as is the case on many railways, the principal change would be a more clear definition of duties and responsibilities.



ORGANIZATION FOR A RAILWAY WATER SERVICE DEPARTMENT

Efficient organization and the economical development, construction, maintenance and operation of water stations supplying water for locomotives and other railway purposes, are the objects of the proposed plan. The superintendent or engineer of water service is in general charge and acts in an advisory capacity to the division forces. He would approve city water bills, requisitions for materials and agreements relating to water supply. The chemist has supervision of water treatment and the analysis and examination of water, checking the results of treatment and the effect of treated water on the performance and maintenance of boilers. Inspectors are to inspect both water stations and construction work. The supervisor of water service is responsible for pumping machinery, tanks, fire pumps, pipe lines and other facilities in his territory.

Disciplinary Procedure of the American Institute of Architects

By Horace Wells Sellers
Fellow, American Institute of Architects, Philadelphia

THE reconsideration of the principles or professional ideals that should govern the relations of the engineer to his fellow practitioners and to the public, and the disciplinary procedure whereby these principles may be enforced within the membership of the engineering societies, has directed attention to the standards of practice promulgated by the American Institute of Architects.

While personal and professional standing as well as technical ability is expected of candidates for membership in the institute, at the same time under the influences of circumstance and environment, a practitioner may be lead away from the principles or ideals of his profession.

To maintain its principles of professional conduct so far as possible without petty interference with the rights of the individual, the constitution of the institute provides that it shall from time to time adopt a code or codes which shall be standards of good practice, and as these are embodied in the by-laws to which all candidates for membership must subscribe, it is necessary to provide a disciplinary procedure whereby these principles shall be maintained.

Circular of Advice

The attitude of the American Institute of Architects on this question is clearly expressed in "A Circular of Advice Relative to Principles of Professional Practice and Canons of Ethics." In it a distinction is made between the general principles of practice which should govern the architect in his several relations but which are conceded to be largely matters of self-discipline in maintaining the ordinary standards of professional practice, and the Canons of Ethics, which, on the other hand, are mandatory obligations of membership and infractions of which are therefore subject to the disciplinary procedure established under the constitution and by-laws.

The Circular of Advice is a statement of principles covering such matters as the architect's relation to his client, charges, payments, duties to the contractor, acceptance of commissions or favors, gratuitous service, advertising and publicity, competitions, undertaking the work of others and duties to the public and to building authorities. The Canons of Ethics enumerates briefly certain unprofessional practices. Both are given in full in appendix A.

The circular is distributed periodically to the members of the institute in order that these principles may be familiar to all and especially that they may be helpful to those whose environment places them in a great degree under the influence of the larger body of practitioners outside of the institute membership and the public they serve, and perhaps less generally actuated by the institutes' professional ideals and standards of practice.

To enforce the mandatory principles embodied in the Canons of Ethics, violation of which constitutes unprofessional conduct, the constitution and by-laws provide for a disciplinary procedure as follows:

Art. VII, Sec. 3 of the constitution:

All questions of discipline of a member shall be submitted to the Board of Directors, which shall decide finally and without recourse any questions of action conflicting with the constitution or by-laws of the institute or of the member's chapter, non-payment of dues to institute or chapter, or questions of unprofessional conduct; and acting under this section the Board may suspend a member, pass a vote of censure upon him, drop his name from the roll of members, or expel him; but no such action shall be taken until the accused shall have had an opportunity to be heard in his own defense.

Art. IV, Sec. 2 of the by-laws:

All questions of discipline of a member shall be determined in accordance with the following procedure:

It shall be competent for and shall be the duty of any member or committee of the Institute or of any chapter to bring to the attention of the Committee on Practice any alleged unprofessional conduct on the part of any member without being deemed to have entered a formal complaint against such member. The Committee on Practice shall, when its attention is drawn to any such matter, conduct a preliminary examination into the facts, and if a prima facie case shall appear against a member, it shall so report to the Judiciary Committee. The Judiciary Committee shall hear and adjudge every case so reported to it and shall give the member an opportunity to be heard in his own defense. Its findings shall be conclusive in regard to all questions of fact involved in the evidence submitted.

The Judiciary Committee shall report its findings to the Board of Directors. If the findings are adverse to a member, the Board of Directors shall take such action thereon as it shall see fit according to the constitution. A member may appeal in writing to the Board of Directors on questions of professional or ethical policy.

Any member may appeal to the Committee on Practice from any action of a Chapter Executive Committee regarding alleged unprofessional conduct. In such case the procedure shall be as provided above in this section, but no decision of the Committee on Practice or the Judiciary Committee reversing the previous action of the Chapter Executive Committee shall be effective unless ratified by the Board of Directors. The action of the Board of Directors shall supersede the action of the Chapter Executive Committee.

If in any case pending before either the Committee on Practice or the Judiciary Committee, any oral testimony has actually been given, such committee shall have the power to continue and conclude its work on that particular case, notwithstanding the expiration of the term of office of any or all of its members.

The Board of Directors shall, from time to time, establish rules of procedure for the guidance of the Committee on Practice and the Judiciary Committee.

It may be stated here, that the institute is an association organized locally into chapters which may be incorporated under the laws of the respective states in which they are established and which, while having their own individual organization, are governed by the by-laws of the institute so far as the national body is concerned. At present every member elected to a chapter becomes a member of the institute, or vice versa, although they may still have associate members who have not qualified for membership in the institute. These chapters exercise disciplinary control over their members and dispose of cases which do not involve the suspension or expulsion except in instances where the offender is a member of the chapter only.

The institute as the national body, in the exercise of its disciplinary function under its constitution and by-laws as cited, has formulated rules for the guidance of its two disciplinary committees, namely, the Committee on Practice and the Judiciary Committee. These rules are largely an amplification of the procedure set forth in Art. IV, Sec. 2, of the by-laws, and are distributed periodically to the members, or as occasion may require, in the presentation of charges against a member.

At present the Board of Directors has under consideration a revision of these rules, not with a view to modifying the basic principles or standards or to moderate the penalties, but rather with a view to shortening the period now required in which to dispose of a case, and also to give the accused member a hearing before the board at the meeting at which the report of the Judiciary Committee on his case is presented for final action.

Pending this revision the rules now in force are not unreservedly recommended, but are presented in abstract (see Appendix B) to indicate the general procedure, and it is expected that the new rules will be available for distribution after May 15.

ENFORCEMENT

Under this procedure, violations of the principles and canons of the institute which constitute unprofessional conduct subject the offender to discipline varying, according to the gravity of his offense, from censure to suspension and expulsion.

"The qualifications for membership in the Institute have so far tended to bring into association practitioners who are generally in accord with the professional ideals on which these qualifications rest, and in consequence the cases that call for disciplinary action are comparatively few and rarely call for extreme penalties. This is borne out by the fact that during the last five years, for example, there were but 21 cases acted upon by the disciplinary committees of the institute and disposed of as follows, according to the gravity of the offense: Expulsions 1, suspensions 3, censured 13, acquittals 4.

"To illustrate the procedure, specific applications of the disciplinary rules have been selected with the assistance of E. C. Kemper, executive secretary of the institute, as applying to cases of unregulated competition, false claim of authorship and where a member has offered to divide commissions."

As already pointed out every applicant for membership in the American Institute of Architects agrees in writing to be bound by its constitution and by-laws and its "Principles of Professional Practice and the Canons of Ethics" and thereby fulfill his obligations of membership and honorably maintain the institute's ideals in all of his professional relations. These obligations, as well as the privileges of membership, being thus made clearly known from the outset and accepted and supported by common consent, it so happens that where penalties have been imposed, they have been generally accepted as just, and in no single case has the offending member carried an appeal to the civil courts. In a few instances threats of such an intention have been made, but they have never resulted in such action.

While the institute represents but a relatively small proportion of the practicing architects of the country, the standards of membership that it has aimed to maintain and the influence of its members in their respective communities, has done much to widen public appreciation of sound professional ideals which are for the benefit of the client as well as the architect. This right understanding of professional relations was fostered in no small degree under the original organization of the chapters which in their several grades of membership, were steps leading toward final qualification for membership in the institute, and by upholding its standards of personal and technical qualifications for membership the institute has done much for the advancement of architecture as a profession.

Appendix A—Circular of Advice

1. On the Architect's Status.—The architect's relation to his client is primarily that of professional adviser; this relation continues throughout the entire course of his service. When, however, a contract has been executed between his client and a contractor by the terms of which the architect becomes the official interpreter of its conditions and the judge of its performance, an additional relation is created under which it is incumbent upon the architect to side neither with client nor contractor, but to use his powers under the contract to enforce its faithful performance by both parties. The fact that the architect's payment comes from the client does not invalidate his obligation to act with impartiality to both parties.

2. On Preliminary Drawings and Estimates.—The architect at the outset should impress upon the client the importance of sufficient time for the preparation of drawings and specifications. It is the duty of the architect to make or secure preliminary estimates when requested, but he should acquaint the client with their conditional character and inform him that complete and final figures can be had only from complete and final drawings and specifications. If an unconditional limit of cost be imposed before such drawings are made and estimated, the architect must be free to make such adjustments as seem to him necessary. Since the architect should assume no responsibility that may prevent him from giving his client disinterested advice, he should not, by bond or otherwise, guarantee any estimate or contract.

3. On Superintendence and Expert Services.—On all work except the simplest, it is to the interest of the owner to employ a superintendent or clerk of the works. In many engineering problems and in certain specialized esthetic problems, it is to his interest to have the services of special experts and the architect should so inform him. The experience and special knowledge of the architect make it to the advantage of the owner that these persons, although paid by the owner, should be selected by the architect under whose direction they are to work.

4. On the Architect's Charges.—The Schedule of Charges of the American Institute of Architects is recognized as a proper minimum of payment. The locality or the nature of the work, the quality of services to be rendered, the skill of the practitioner or other circumstances frequently justify a higher charge than that indicated by the Schedule.

5. On Payment for Expert Service.—The architect, when retained as an expert, whether in connection with competitions or otherwise, should receive a compensation proportionate to the responsibility and difficulty of the service. No duty of the architect is more exacting than such service, and the honor of the professior is involved in it. Under no circumstances should experts knowingly name prices in competition with each other.

6. On Selection of Bidders or Contractors.—The architect should advise the client in the selection of bidders and in the award of the contract. In advising that none but trustworthy bidders be invited and that the award be made only to contractors who are reliable and competent, the architect protects the interests of his client.

7. On Duties to the Contractor.—As the architect decides whether or not the intent of his plans and specifications is properly carried out, he should take special care to see that these drawings and specifications are complete and accurate, and he should never call upon the contractor to make good oversights or errors in them nor attempt to shirk responsibility by indefinite clauses in the contract or specifications.

8. On Engaging in the Building Trades.—The architect should not directly or indirectly engage in any of the building trades. If he has any financial interest in any building material or device, he should not specify or use it without the knowledge and approval of his client.

9. On Accepting Commissions or Favors.—The architect should not receive any commission or any substantial service from a contractor or from any interested person other than his client.

10. On Encouraging Good Workmanship.—The large powers with which the architect is invested should be used with judgment. While he must condemn bad work, he should commend good work. Intelligent initiative on the part of craftsmen and workmen should be recognized and encouraged and the architect should make evident his appreciation of the dignity of the artisan's function.

11. On Offering Services Gratuitously.—The seeking out of a possible client and the offering to him of professional services on approval and without compensation, unless warranted by personal or previous business relations, tends to lower the dignity and standing of the profession, and is to be condemned.

12. On Advertising.—Publicity of the standards, aims and progress of the profession, both in general and as exemplified by individual achievement, is essential. Advertising of the individual, meaning self-laudatory publicity procured by the person advertised or with his consent, tends to defeat its own ends as to the individual as well as to lower the dignity of the profession, and is to be deplored.

13. On Signing Buildings and Use of Titles.—The unobtrusive signature of buildings after completion is desirable.

The placing of the architect's name on a building during construction serves a legitimate purpose for public information, but is to be deplored if done obtrusively for individual publicity.

The use of initials designating membership in the Institute is desirable in all professional relationships, in order to promote a general understanding of the Institute and its standards through a knowledge of its members and their professional activities.

Upon the members devolves the responsibility to associate the symbols of the Institute with acts representative of the highest standards of professional practice.

14. On Competitions.—An architect should not take part in a competition as a competitor or juror unless the competition is to be conducted according to the best practice and usage of the profession, as evidenced by its having received the approval of the Institute, nor should he continue to act as professional adviser after it has been determined that the program cannot be so drawn as to receive such approval. When an architect has been authorized to submit sketches for a given project, no other architect should submit sketches for it until the owner has taken definite action on the first sketches, since, as far as the second architect is concerned, a competition is thus established. Except as an authorized competitor, an architect may not attempt to secure work for which a competition has been instituted. He may not attempt to influence the award in a competition in which he has submitted drawings. He may not accept the commission to do the work for which a competition has been instituted if he has acted in an advisory capacity either in drawing the program or in making the award.

15. On Injuring Others.—An architect should not falsely or maliciously injure, directly or indirectly, the professional reputation, prospects or business of a fellow architect.

16. On Undertaking the Work of Others.—An architect should not undertake a commission while the claim for compensation or damages, or both, of an architect previously employed and whose employment has been terminated remains unsatisfied, unless such claim has been referred to arbitration or issue has been joined at law; or unless the architect previously employed neglects to press his claim legally; nor should he attempt to supplant a fellow architect after definite steps have been taken toward his employment.

17. On Duties to Students and Draughtsmen.—The architect should advise and assist those who intend making architecture their career. If the beginner must get his training solely in the office of an architect, the latter should assist him to the best of his ability by instruction and advice. An architect should urge his draughtsmen to avail themselves of educational opportunities. He should, as far as practicable, give encouragement to all worthy agencies and institutions for architectural education. While a thorough technical preparation is essential for the practice of architecture, architects cannot too strongly insist that it should rest upon a broad foundation of general culture.

18. On Duties to the Public and to Building Authorities.—An architect should be mindful of the public welfare and should participate in those movements for public betterment in which his special training and experience qualify him to act. He should not, even under his client's instructions, engage in or encourage any practices contrary to law or hostile to the public interest; for as he is not obliged to accept a given piece of work, he cannot, by urging that he has but followed his client's instructions, escape the condemnation attaching to his acts. An architect should support all public officials who have charge of building in the rightful performance of their legal duties. He should carefully comply with all building laws and regulations, and if any such appear to him unwise or unfair, he should endeavor to have them altered.

19. On Professional Qualifications.—The public has the right to expect that he who bears the title of architect has the knowledge and ability needed for the property invention, illustration, and supervision of all building operations which he may undertake. Such qualifications alone justify the assumption of the title of architect.

Appendix B—Canons of Ethics

The following Canons are adopted by the American Institute of Architects as a general guide, yet the enumeration of particular duties should not be construed as a denial of the existence of others equally important although not specially mentioned. It should also be noted that the several sections indicate offenses of greatly varying degrees of gravity.

It is unprofessional for an architect—

1. To engage directly or indirectly in any of the building or decorative trades.

2. To guarantee an estimate or contract by bond or otherwise.

3. To accept any commission or substantial service from a contractor or from any interested party other than the owner.

4. To take part in any competition which has not received the approval of the Institute or to continue to act as professional adviser after it has been determined that the program cannot be so drawn as to receive such approval.

5. To attempt in any way, except as a duly authorized competitor, to secure work for which a competition is in progress.

6. To attempt to influence, either directly or indirectly, the award of a competition in which he is a competitor.

7. To accept the commission to do the work for which a competition has been instituted if he has acted in an advisory capacity, either in drawing the program or in making the award.

8. To injure falsely or maliciously, directly or indirectly, the professional reputation, prospects or business of a fellow architect.

9. To undertake a commission while the claim for compensation, or damages, or both, of an architect previously employed and whose employment has been terminated remains unsatisfied, until such claim had been referred to arbitration or issue has been joined at law, or unless the architect previously employed neglects to press his claim legally.

10. To attempt to supplant a fellow architect after definite steps have been taken toward his employment, *e. g.*, by submitting sketches for a project for which another architect has been authorized to submit sketches.

11. To compete knowingly with a fellow architect for employment on the basis of professional charges.

Adopted December 14-16, 1909.
Revised December 10-12, 1912.
Revised April 26, 1918.

Appendix C—Rules for Committees

On account of space limitations rules for the guidance of Committee on Practice and the Judiciary Committee are presented in abstract only.

Rule 1.—When alleged unprofessional conduct is brought to the attention of the Committee on Practice the accused is notified if a *prima facie* case has been made out. The findings include a statement of the case and rule or principle violated.

Rule 2.—The accused may obtain copies of the evidence prior to his hearing before the Judiciary Committee.

Rule 3.—The procedure of carrying the case from the Committee on Practice to the Judiciary Committee which hears the case unless the accused accepts the findings of the Committee on Practice and waives the formal hearing. The latter committee presents the evidence in the case and may call witnesses.

Rule 4.—Absence of the accused does not stop proceedings.

Rule 5.—Accused shall answer questions and failure to do so is considered a violation of the objects of the Institute and is so reported to the Board of Direction by the Judiciary Committee. The board deals with the failure as a violation.

Rule 6.—The Judiciary Committee is the sole judge of the admissibility of evidence as well as its value. Members may be requested to present papers or letters involved.

Rule 7.—Findings of the Judiciary Committee are reported to the accused and Board of Directors, which shall take such action as it may see fit. Before disciplinary measures shall be put into effect the accused is given a chance to appear before the Board on his request within 30 days after notification.

Rule 8.—Appeal from the findings of the Judiciary Committee to the Board may be made within 10 days after receiving notice of the findings. Similarly the Committee on Practice may appeal to the Board.

Rule 9.—All members of the Institute get reports of the findings in the case.

Appendix D—Examples of Discipline

Case 1. False Claim of Authorship.—The Committee on Practice found a *prima facie* case of unprofessional conduct against a member upon charges brought by a chapter of which he was a member. The offense charged is that the firm of which the accused was a member caused to be published in a trade paper a large number of illustrations of work executed by other architects, all attributed to the firm of the accused. While the accused and his partner had worked on some of the buildings in the office of the real architects nothing in the terms of their contract authorized them to claim any degree of authorship. Their work was not such as to justify any such claims. By claiming authorship the accused obtained commissions. No proof in contravention was made, his defense being that the improper publication was an error on the part of the publisher and without the consent of the accused. Against this it was stated that this publication was used by the accused before a church building committee and was the means of supplanting a fellow architect then at work on the plans for the church. The publishers categorically denied the statements of the accused. The Judiciary Committee, after a careful review of the testimony, the accused having failed to appear at the hearing, found him guilty as charged. The Board of Direction expelled him. (May, 1918.)

Case 2. Unprofessional Conduct in Offering to Divide Commissions.—The Committee on Practice found the accused guilty of unprofessional conduct in that he wrote to a party in a certain association requesting aid in procuring business, and offering as pay part of any commission received. He was also found guilty by the same committee of an infraction of the spirit of the Canon of Ethics in that his conduct was prejudicial to the interests of the profession at large. The Judiciary Committee upheld these findings. Appeal on the unprofessional conduct charge was made by the accused explaining that the offer was simply an expression of willingness to pay for service, and that he was in duty called upon to make some suggestion of payment to a man he did not know. Furthermore he was really looking for a business representative and while the letter was thoughtlessly written he believed too much importance had been given to the form of an offer which he thought to be a legitimate endeavor to increase his business. The Board of Directors approved the findings of the Judiciary Committee and suspended the accused for one year. (January, 1918.)

Case 3. Unauthorized Competition.—Charges that the accused had entered into competition for a building, the program for which had not been approved by the Institute's Committee on Competitions. He replied that he did so through inadvertence and carelessness; and expressed his regret for the participation. He also promised to see that the offense was not repeated. The charge was sustained. The Judiciary Committee left the question to the Board of Directors as to how far the statements in defense should be considered in mitigation. The Board censured the accused. (February, 1916.)

Water Power Development Booming in Oregon

Renewed interest in hydro-electric power is manifesting itself in the State of Oregon. Since Jan. 1 twenty-one applications for permits to appropriate water for power development have been received by State Engineer B. A. Cupper. Under these permits it is proposed to develop 600,631 hp., which is about three and one-half times as much power as is now developed in the State. In comparison only eleven applications for power development were received during the whole year of 1919. No doubt the present activity is partly due to the prospect of a Federal water power bill and the supposition that there will be a continuation of the present agreement between the State and Federal Government whereby each party agrees to give the other an opportunity to pass upon the desirability of approving the development before water rights are granted by either the State or the Federal Government.

Strain Gage Measurements on Large Floating Crane

A new 150-ton revolving floating crane, recently built for the Navy Department for use at the Norfolk Navy Yard, was subjected to an elaborate set of strain-gage measurements under load, after its completion last year. According to a report of the test results made by L. J. Larsen and R. L. Templin in "Technologic Paper 151" of the Bureau of Standards, just published, the measurements were satisfactory with respect to accuracy and showed that all stresses in the various members tested are within safe limits. As the structure is statically indeterminate the conclusion had particular meaning. Measurements were made on the deck of the pontoon, on the pintle-tower posts and on various members of the superstructure. A 10-in. Berry strain-gage was used, direct-reading to 0.0002 in. The maximum stresses in the outer edge of the tower legs were found to be 17,000 lb. per sq.in. in compression and 13,500 lb. per sq.in. in tension. A maximum compression of 18,000 lb. per sq.in. was found in the pintle posts. The deck stresses were found to be low and those in the superstructure and in the luffing screws not excessive.

For the Young Engineer—

Straight Talk on Success in Life

Extracts from an address delivered at Princeton University, March 16, at the invitation of the Senior Council. The italics are ours.—Editor.

—By Charles M. Schwab

You young men, next year or within a few years at least, will be ready to start out upon an active life of usefulness in this country, and you want to hear from one who has been through the turmoil and strife of industry for many years about what are the qualifications, what are the things that attract attention and what are the things that will lead to your greater and better success in life.

I know that it is very difficult to convince the great majority of people that men who are in active pursuit of life have any other object in view than the making of money. Well, now, boys, that is a great mistake. The real leaders of industry and the real men in life and the real successes in life are not always the men who have made lots of money or a great fortune.

My idea of the successful life is a man who has successfully accomplished the objects for which he set out, to do something that is worthy of a real American man. *Money is often a matter of chance or good fortune and is not the mark of a successful life.* And while I have some money—not much since I paid my taxes, boys—it is not the thing that brings a throb of pleasure or a thrill into my life. And I would not pose as a successful man if that was to be the measure. But when I look about me and see the multitude of friends that I have after forty years of business association with men, when I see the great lines of smoking stacks and blazing furnaces that have come into being because of my interests and activity in life, and when I see a work that I set out to do successfully accomplished and meeting the approval of my fellow-men, then a real thrill comes into my heart and I feel that I have done something worth while. The money one doesn't think about as long as you have enough to pay your bills and keep your business going.

> We are reprinting a large part of Mr. Schwab's address because we believe that his message, directed primarily to the young man beginning life's work, will carry inspiration to both young and old. For engineers, especially, is there an invaluable lesson in the remarks of the builder of the great steel industry of Bethlehem.
>
> His views on industrial organization and the management of men, and his manner of expressing them, indicate the possession of a thing which engineers, as a class lack, and for the lack of which they do not become the really big influence in the world's work to which they should aspire. That something, if we are correct in our interpretation, is a broad, human, sympathetic understanding of men. For engineers, young and old, a mere reading of the words that Mr. Schwab spoke is not enough. Our suggestion is this: Picture what manner of a man it was who uttered them. Then spend a few minutes in subjective meditation.
>
> For the man with eyes to see there is no riddle in the rise of the maker of the great Bethlehem works.—*Editor.*

Value of Vision

I was not able to place the quotation myself, but your honored president here, a doctor of philosophy, told me this evening the name of the philosopher who said it, and that was that *there is little that the human mind can conceive that is not possible of accomplishment.* Now, the thing you want to do is to make up your mind what you are going to drive for, and let nothing stand in the way of its ultimate accomplishment. Why, boys, one of the greatest pleasures in life to me is to have the recognition from such a body of young men as you are here tonight to have you say, "We would like to hear something from the man that we think has been successful in some things in life." I had rather have it than millions. It brings more pleasure and more satisfaction.

Now, in my long experience in business life and association with men there are some fundamental things that must not be overlooked. If I were asked to say the most important things that lead to a successful life I should say that first of all was integrity—unimpeachable integrity. No man can ever do anything of any great value in life and have the confidence and approval of his fellow-men or be successful in his undertakings with other business men if he doesn't have the reputation of being a man of honor and integrity; and I don't mean by that that a man shall be so high in the moral and social state of life that he is incapable of any action that might not be regarded as always right, but I have the highest regard for a man who, when he has done something wrong, manfully admits it and constantly sticks to the truth of integrity, however much it may seem to hurt.

I am going to speak of a young man that I regard as the most successful young man I have ever known. And if I did not regard him as the most successful young man that I know, he would not be the President of the Bethlehem Steel Company. I am going to speak of a young man that I have known since he was a man of your age. I refer to Eugene Grace. You may have heard of him—and you baseball fans undoubtedly did—because he came down and played baseball at Princeton many years. He came from Lehigh University. When I first knew him, he was a shoveler of coal with an electric crane.

Whatever may be said of Mr. Grace, you could always depend upon it absolutely that when Mr. Grace said a thing you would know the absolute facts, good, bad or indifferent. And today Mr. Grace stands among the great business men of New York and this country, with the reputation of being a man with absolute integrity and a man upon whom everybody can place the greatest possible confidence.

A Choice of Two Alternatives

Now, boys, that is the very foundation of a successful life. With this to start upon, then the other is going to be easy going and easy following. *You can make up your mind to do one of two things: You can have a good time in life or you can have a successful life, but you can't have both.* You have got to make up your mind at the start which of the two you are going to have. There is no royal road to a successful life, as there is no royal road to learning. It has got to be hard knocks, morning, noon and night, and fixity of purpose. Never has there been a time in the history of the wrold when so much opportunity offers for the leading of a successful life as today. What would I not give to be one of your age again and have the opportunity of starting life afresh! *You think the opportunities of the past will not be the opportunities of the future. In that, boys, you make a mistake.*

When I first started in the steel business the whole United States produced only 1,000,000 tons of steel in a year. That was about 1880. In 1890 we had got to 8,000,000, in 1900 to 12,000,000 and in 1920 we have got to 45,000,000 tons of steel annually. Now, we thought twenty years ago that the steel business had reached its zenith. We are just as far from the zenith today during your normal lifetime as we were from the zenith twenty years ago.

I don't say you shall become manufacturers or business men or professional men—I don't know what you are going to be. But this I do know: That *any man who goes into anything in life and does it better than the average will have a successful life.* If he does it worse than the average his life will not be successful. And no business can exist in which success cannot be won on that basis. If it did exist and nobody could make a proper success or get a proper return from it in life, the business would tend to go out until it would reach a basis on which it could be profitable.

LOYALTY

Another important thing is loyalty. Now, that is what you boys in universities and colleges learn. You learn loyalty to your alma mater. You learn loyalty to your fellow-students. You learn loyalty to the friendships that are going to follow you through life. The one thing that you are distinctively in the university is that you are loyal men. Be loyal.

Boys, did you ever stop to think that *a great man in life who has won great acclaim and great reputation is the very man who is willing to share and give the honor to others in the doing of the things that made him great?* The man that will selfishly stand alone and proclaim that he is the man who has done these things never is the man who really did them. My own experience is that there is no real effort in life that is not done better under encouragement and approval of your fellow-men. A man goes along then with greater confidence. *You must learn to let others share with you in that which you are doing, and honor and credit will be reflected upon you for so doing.*

Marshal Foch, the great commander, said to me a short time ago, when I congratulated him upon the wonderful work of the war: "This great military staff is like an orchestra, and each one fills his place. Each is equally important in the functioning of the whole. If the baton is in my hands it is merely a matter of chance, but we shall see to it that each man in this staff gets recognition for that which is due." *You never heard a great man say: "I did this"* or *"I will do that."*

In the management of my great enterprises I have yet to ever find fault with any man. *If a man is of the character that you must find fault with him to get the best out of him he is not a man to be desired in an organization.* Show me the man that will do his best under approval and I will show you the man that has within him the elements for successful going ahead.

Boys, there are other things in life than the mere work. *I believe an appreciation of the finer things in life,* the learning to know the *beauties of literature and art and music, will help any man in his career.* A man to carry on a successful business must have imagination. *He must see things as in a vision, a dream of the whole thing. You can cultivate this faculty only by an appreciation of the finer things in life.* No active business life, whether it is manufacturing or something else, can prevent you from enjoying the beauties of life. These finer things will contribute to your success.

MAKE FRIENDS

Be friends with everybody. When you have friends you will know there is somebody who will stand by you. You know the old saying that if you have a single enemy you will find him everywhere. It doesn't pay to make enemies. Lead the life that will make you kindly and friendly to every one about you, and you will be surprised at what a happy life you will live.

I said coming down in the carriage, "What would I not give to be your age again!" I have not a single regret in life. The hardships that have come to me in life have but made me the keener enjoyer of the good things in life. I tell a story of a German workman I had years ago, and a saying of his that I adopted as a motto in life. We were having labor difficulties at the mill. He was a loyal fellow. The workmen picked him up and threw him into the river one day because he had reported for work. He came into my office all covered with mud and water, to tell me what had happened. I asked him what he said. He said, "I yust laughed." That's the thing to do—"yust laugh."

I am going to tell you a little more—I am not lecturing tonight, but just talking as if you were in my drawing room. I would just like to say to you what I feel just as if you were my own sons.

I want to tell you a little more about this man Grace, because one often sees the points in a successful life best by analyzing a single individual. I told you of his great faculty of making good, no matter in what position he was placed. This boy went on and on. Above all, he worked hard with that brain of his which had been trained in the university to think and concentrate upon the subject that he was thinking about until he had reached a satisfactory conclusion. Now, that is the great point, to concentrate and think upon the problem in mind until you have reached a satisfactory conclusion in your own mind, and then finally go ahead. If you have made a mistake, all right. *Never find fault with a man because he has made a mistake. It is only a fool that makes the same mistake the second time.* I tell a story of my own experience with Mr. Carnegie as showing what this might mean.

DON'T MAKE SAME MISTAKE TWICE

As chief engineer of the works I had just built a converting mill. I went to him and said to him: "If you will give me the money to build this mill I can save 50 cents a ton." Of course he provided the money, and the mill was built. He came out to see it. I walked around with him. He saw the look of disappointment in my face and said: "Charlie, there is something wrong here. What is it?" I said: "It is exactly what I told you, and it is better than I told you. We save more than I said. But I don't mind saying that if I had to do the whole thing over again I would do it so and so. I made a mistake in that particular." He said: "Can you change it?" I said: "No." He said: "What does it mean?" I said: "It means tearing it down and doing it over again." He said: "Go ahead and do it. Don't make the same mistake a second time." *Do you suppose if he had been a fault-finding man I ever would have told him? Not at all. He brought out the best within me.* When that mill was torn down and a second one took its place it was as great a success over the first as the first had been over the old one.

Mr. Carnegie had my confidence, and I had his confidence. He believed in everything I had told him. If I had told him something that was wrong and not admitted my mistake he would never have allowed me to progress, and his works and his great establishment would never have progressed as they did.

MANAGERS ARE BUSINESS PARTNERS

Now, in my own establishment you will be interested to know something about how we do things. You boys will all, of course, have to start to work upon a salary. But the quicker you get out of working for a salary the better for all concerned. In our works at Bethlehem and San Francisco and all over the United States I adopted this system: *I pay the managers of our works practically no salary. I make them partners in the business, only I don't let them share in the efforts of any other men.* For example, if a man is a manager of a blast furnace department he makes profit out of the successful conduct of his department, but I don't allow him to share in the prosperity of some other able man in some other department of the establishment. I give him a percentage of what he saves or makes in the department immediately under his own control and management. For example, if it takes a dollar a ton to make pig iron, and it takes him a dollar a ton to make pig iron, I say to him:

"Well, you are no better than the average manager over the country. Therefore you are entitled to only the usual wages. But if you can make pig iron at 90 cents a ton you are entitled to share with me in a large part of the profits. And if you make it for 40 or 50 cents a ton you share to a very large degree."

Therefore, I don't care how much a man earns. The more he earns the better I like him. And I pay in what I call bonuses to the various superintendents and managers of the different establishments more money for their suc-

cessful management than I pay the stockholders of the concern in dividends. And it will surprise you to know the great sums of money that some of these men make. I would be afraid to tell you for fear of discouraging you in your start in life. But I don't mind saying that forty, fifty, sixty, a hundred thousand dollars a year for these men is not infrequent. And in the case of men like Mr. Grace, well, many, many times that.

It is a matter of common knowledge and it is a matter that has been published. And I am grad to tell you that in the carrying out of this principle Mr. Grace has earned considerably more than $1,000,000 a year.

Now, I do the same with the working people. I say that a good workman is entitled to more pay than a poor workman. And, therefore, wherever it is possible *we have our workmen paid for the amount of work they do.* I know that is contrary to the general rules of trade unionism, but it is the proper economic basis that a man shall be paid for the work he does and proportionately to the work that he does. And so I carry this principle through every establishment I have. The Bethlehem business is now the second largest business in the United States. It was exceeded only by the Steel Corporation last year. Other than that, it was the largest business in the United States, and I give it no more thought or no more attention and not as much as I have to my coming to be a guest of you boys here this evening.

In writing the organization for our establishment I say *the president shall have no duties, and shall keep his mind free to survey and direct the whole affair, so as to have it go in harmony.* I am so confident of the organization we have got that *I find that they do better when the old man is away. I have never yet seen a record broken in any department when I was at all attending to business.* It has always been broken when I have been away, when a man has been put upon his own mettle to show what he can do. But I am no boss. I let younger men run these great establishments, notwithstanding the fact that I own the greater part of them. The younger fellows get to learn that if they are successful they can run the old man around. After all, there is nothing so scarce in the world as competent and successful men in the management of a business. There is nothing we are so constantly looking for as that.

Influence a Poor Start in Life

Now, to be more practical: A lot of you fellows are going out into life. Let me give you a bit of advice. *If you have any influence in the world to get you a start in life, don't use it.* The worst thing than can happen to a man is to start life with influence. He has got to do twice as well as the fellow that starts upon his own merits, because, after all, it depends on the general opinion of all those around you as to how competent and successful you are, and when everybody says that you do well because of the influence back of you, then you have got to do twice as well as otherwise. If you are going into any manufacturing establishment, don't go there by reason of any influence you may have. Start upon your own merits, and start in some lowly position, no matter what it is. Be a laborer, if you will. I don't know but that is the best way to start.

A man educated in a great university like Princeton is ten times the man who has not been educated in a university, if he will only learn that education in a university is not different from education in a workshop. You cannot be aristocrats unless you earn the right to aristocracy. And *the aristocracy in the future is not one of wealth or university education, but the aristocracy of the men who have done something for themselves and their fellow-men.* And that is what will make the real man. That is the lesson that you have got to learn, and that is the lesson that so many of our college boys don't learn. They go into a great industrial or other establishment, and they imagine because they have a diploma from Princeton or Lehigh or Lafayette or some other college or university that they are in a different plane from the other men. Boys, unless you get that out of your heads you are going to learn the sorriest lesson you ever learned, because it won't succeed.

This great war has taught us many things. The one thing it has taught us above everything else is that the true life is the life of modern democracy and simplicity, that it is not one of show or of extravagance; that we are men because we are men and because we have the true instincts of men, and we are not men because we are rich or because we occupy a high social position or because we have influence. Now, that's the thing that boys from universities have got to learn. And they are learning it fast, and this war has taught us more than anything else that it is now the fashion, and it is in the most liberal sense the fashion, to be simple and to be democratic; that the real man is the man that will live in that way and derive more genuine pleasure and satisfaction in the doing of it than he imagined before.

Opinions on Assets Differ

Now, boys, I have a great house in New York. I have a great country estate. About the only pleasure I get out of it is the fact that I have to pay its taxes and have enough money in bank to do it with. I don't own the estate and I don't own the house. They own me. My secretary made me up one day a list of my assets and liabilities. I am not going to tell you what they were. But he had this great estate and house on the side of my personal assets. I said: "You are wrong; they are not an asset, they are a liability. Put them on the other side." So it is, boys.

As I grow to be older I find that I want to have simpler things about me, the truest of old friends. And, boys, if you could know the joy of the long association and companionship with men such as I have known you would realize that you yet are to have such a compensation for old age as you have no idea of and you are to enjoy the truest thrills that come to the life of any man.

Now, boys, I have talked to you a long time. I have talked because I love to talk to you, and I see how interested you look. Just one thing more. Go at your work. You may not find yourself the first year. You may start at work that you think will not be agreeable to you. Do not hesitate to change. If you find that it is not according to your tastes and ultimate ambitions, then change and go into something that is more pleasant. *No man can be successful at work if he doesn't find the work he has to do pleasant.* No man can ever do a thing well that he is not interested in. You boys will find in your classes that you do best in the things you like to do. When you start in life if you find you are wrongly placed don't hesitate to change, but don't change because troubles come up and difficulties arise. You must meet and overcome and conquer them. And in meeting and overcoming and conquering them you will make yourself stronger for the future.

Then go on and select your work. Let us suppose you become a craneman. Suppose you become a clerk in a lawyer's office. Give the best that is in you. Let nothing stand in the way of your going on.

"Watch That Young Man!"

I am going to tell you the story of a man that came to see me in New York, Charles W. Baker, the president of the American Zinc Co., a very good friend of mine. Thirty years ago as manager of the Homestead Mills I went to Cleveland to see some plates that were being made. I got there at 6 o'clock in the morning. I had telegraphed the superintendent that I would be there that morning. He was in the office. But, being early in the morning, I went right out to the works, thinking I might see something out there that would guide me in the making of these plates. When I got to the works I found this young man Baker, a stenographer and employee of the office, who had not been directed to go out there, but who thought when the works manager arrived out there he might want somebody to be on hand to meet him, and he was there, the only one that was there. And when I went back I said to the superintendent: "Watch that young man. When you have a chance give him a chance, because he is in earnest." It wasn't long before Baker got to be his assistant. Later he was agent. Later I made him the general agent of the whole Carnegie company. Later I made him a partner. Today he is many times a millionaire and the president of the great American Zinc Co. in New York. That is the story. That one little thing helped him forward.

But don't believe, boys, that you can make opportunities for things like this. That will always fail. They must come naturally, and the only way that they can come naturally is to give your whole heart, give your whole soul, give your every thought, give your every act to the accomplishment of what you are going to undertake. *If you will but make up your mind and determination to go through with what you undertake, you will have done more toward a successful life than you will have done in graduating from this great university,* and you will do that which will bring you more genuine pleasure, satisfaction and comfort in life than anything else you will ever do.

Determination, loyalty, integrity and stick-to-it-iveness to the bitter end, happiness and prosperity to you all! May you have the same joys of life that I have had. I could wish nobody anything greater, not because of money made, but because I am surrounded by appreciative friends, because I am the guest of you boys here tonight.

A Case of Mistaken Identity

Many years ago I was coming home from a mill of which I was manager—and if there is anybody who is well known about the town it is the manager of the mill. I was met at the station by a colored boy with a buggy. As we drove down the street we passed a workman's wife and a little girl. The workman's wife said to the child: "Look, dear, that is Mr. Schwab in the buggy." The little girl quickly said: "Which one, mamma?"

I tell another story that may amuse you boys. Many people when I make a talk like this introduce me with a lot of flattering things that are not true. I tell this story to bring myself to a proper frame of mind. I met a soldier over in Europe. He was decorated with medals from one shoulder to the other. I said: "There is really a distinguished man." So I go up and say to the fellow: "Do you mind telling me why you have received all these wonderful medals and things?" He said: "I will tell you with great pleasure. *The first large medal you see on my left, I got that by mistake. And I have all the others because I got that one first.*"

Boys, I am sure you have never had any one make you such a rambling, such a disjointed speech. I hope your professor of English is not here. A short time ago in Europe I met a lot of foreigners. I had to make a little speech, and I did it and then turned to my friend, Mr. Vickers: "You speak all these languages. Interpret this to all the people." He turned to the others and said: "I have been asked to interpret Mr. Schwab's speech into the various languages, and take pleasure in doing so. I will first render it into English."

I don't know just what I ought to say to you boys tonight. What would I not give to be one of you, as I said before? What would I not give to have the pleasure of coming to this splendid old hall with the traditions that surround the place, with your distinguished president here at the head of this great university! As is the leader so will be the boys. If any word of mine may give you fresh courage or confidence, then I am a thousandfold repaid for the effort—and I assure you it has not been really an effort—in saying these words to you.

Good cheer, success, loyalty, friendship, integrity, goodfellowship, honesty—and a happy life to all of you!

Minnesota Studies Stream Pollution

With a view to establishing standards of stream pollution in Minnesota the State Board of Health has begun an investigation in co-operation with the U. S. Public Health Service on the present condition of the Mississippi River within the state. This is being done as a basis for an intensive survey later on which will provide a basis for intelligent legislation restricting excessive pollution of all streams.

Letters to the Editor

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Advertising Engineering Service as Commodity

Sir—In his letter appearing in the issue of March 18, p. 589, Horace M. Holmes suggests that the remedy for conditions prevailing among engineers will be found in intensive advertising on a large scale. Just as by this method sales of a particular brand of merchandise can be increased largely, so can a demand for engineering service be created, says Mr. Holmes.

If engineering services were all under central control, or handled by a few firms, who were thus in a position to charge for such, according to the ability of the engineers whose skill was supplied, or in accordance with the type of service rendered to the clients, it would be possible to view the situation more in the light of a mercantile proposition. There would be employment for no more engineers than such firms would require for the business they could secure through advertising or other methods. It would be useless for colleges and training schools to create an oversupply, for there would be no demand for the graduates. Under such conditions it is easily conceivable that engineering service advertised as other commodities have been exploited could be brought more pointedly before the public, and a higher price could be obtained, because of standardization and through the control of the supply as related to the demand.

However, no such status obtains or is likely to be created. Except where legislation for licensing the engineer has been enacted, there is nothing to prevent anyone from claiming proficiency in the art. There is no curb to the addition of new recruits to the ranks—demand and supply cause no delicate reaction upon each other. Without a strict organization there can therefore be nothing like a predetermined system of rates for compensation, which would be substantially the same in all parts of the country. Each engineer is in keen competition with his fellows and the employer takes advantage of this situation, especially when, as at present, there is decidedly no dearth of engineers.

The mere accomplishment of national advertising setting forth the excellence of engineering as an art would have no appreciable tendency to create a demand for good roads or adequate water supplies merely because the public had been informed that engineers know how to design and build such improvements. A local campaign instituted to stimulate public interest in a proposed improvement, a campaign financed by engineers in order to secure employment for them, would be more to the point, but this is a different proposition entirely.

A glance through the "Positions Wanted" columns in *Engineering News-Record* will show the wide divergence of opinion as to estimates of value which engineers place upon their services. Some with from 8½ to 19 years of experience ask $300 per month; others with from 10 to 20 years require $333 per month; still others state that salary is no object. These and other discrepancies, together with the fact that engineering service is now so highly specialized, indicate the impractical side of attempting to treat it as an article of commerce. Although the advertising would educate the public, just as the A. A. E. is doing in its publicity work, the beneficial effects would not be proportional to the great cost involved, without complete and effective organization among engineers, without a weeding out of the unfit, just as the California raisin grower, mentioned by Mr. Holmes, rejects the culls from his product, and without the establishment of such relationship as would insure only a reasonable supply of service available to meet the demand. Even though such conditions were entirely desirable, we are as yet a long way off from their attainment.

Philadelphia, Pa. P. M. FOGG.

[Mr. Fogg forgets that there are literally hundreds of engineering positions held by men who are not members of the profession. There are county engineers and state engineers in all too many parts of the country who hold their positions because of political election thereto. The qualifications are usually restricted to citizenship and residence. Advertising will wake up the general public to the point of requiring engineers to fill engineering positions. The doctors have the public sufficiently well educated so that one of their number is always and without question chosen as the head of a hospital. Inevitably the law of supply and demand will work as it is working just at present. What else than that induces the corporations to pay $100 or more per month for recent graduates and has broken the former $125 dead-line in the railroads? The world needs more of its work done by engineers, not for the sake of the engineer, but because they will better serve the world's requirements.—EDITOR.]

Designing Columns for Bending Moment

Sir—In your issue of March 18, Mr. H. L. Bowman gives a method of designing members of a structure subject to direct load and bending. This method is not new, but it has been very sadly neglected by writers. W. F. Gronan showed it to me more than 25 years ago, and I have used it many times. The quantity "*Md* over *r* square" or, as Mr. Bowman has it, "*Mc* over *r* square" may be called an equivalent direct load, to be added to the direct tension or compresison of the tentatively designed member in order to adjust the area to suit the unit stress allowed.

Engineering science is much better served by emphasis on simple rules of design such as this than by reams of high theory that only the elect can follow.

Pittsburgh, Pa. EDWARD GODFREY.

"Professional Plagiarism"

Sir—Professor McDonald's article "Professional Plagiarism" in your issue of March 4, p. 477, tells a long story in a few lines. Cases of plagiarism ranging from bold piracy to unconscious imitation are fairly numerous. Yet the frequency of their occurrence makes them none the less objectionable. Of all authors, the author of technical books probably receives the least reward for the amount of toil and time he puts in, and he surely is entitled to all the credit due him for new ideas he develops. Acknowledgement of the source is the least reward a writer can give to the originator of a new idea.

A striking case of apparent imitation without acknowledgement of source has recently come to my attention. In his latest book "Structural Drafting and the Design of Details," Professor Carlton Thomas Bishop publishes a series of diagrams headed "Graphic Resultants." With but few and relatively unimportant variations these diagrams are exact reproductions of those for the "Graphic Solution of a Right Triangle," copyrighted in 1912 and 1914 by Constantine K. Smoley, and printed in his well-known book, "Smoley's Tables." As a structural and concrete man, I had numerous occasions to use those diagrams and have always admired the simple and yet clever idea embodied in them.

On the other hand, there is much to be said in praise of the integrity and fairness exhibited by many authors of engineering books, some of which also abound in original ideas. "Structural Detailing and Elementary Design," by Charles D. Conklin, to my mind, may serve as a typical example of fairness, lucidity and originality in presentation of the same subject of structural drafting. Professor Bishop apparently drew a good deal of inspiration from that book.

Scranton, Pa. SAMUEL BAKER.

Sir—Commenting on my article on plagiarism (March 4), Edward Campbell suggests (March 18) that, since I cited Tartaglia's cubic equation as an historic example of plagiarism, I should be careful in my accusations. Mr. Campbell explains that I obtained my information about happenings in the 16th century from a book on the history of mathematics and that I did not acknowledge the source—intimating that such procedure is very close to plagiarism.

Obviously we obtained our knowledge of history from books, and anyone citing an historical fact is indebted to books. The rivalry between Tartaglia and Cardan, however, is well known to students of the history of science (as I intimated in my article), and there would have been little point in mentioning any of the dozen references to such books that I might have mentioned, especially as I named Ball's history of mathematics in the same paragraph.

I tried to make clear in the article that a judgment on plagiarism may be difficult to arrive at, and that a sense of proportion is necessary to decide whether or not a writer has plagiarized. What I especially urged was the development among engineers of this sense of proportion. P. B. MCDONALD.

Assistant Professor of English, College of Engineering,
New York University.

New York.

Engineer's and Client's Rights in Tracings

Sir—I should like to have your opinion, and that of your readers as to the ownership of tracings under the following conditions.

The county commissioners, desiring to build a new bridge, and having no salaried county engineer, turned the engineering work over to an engineer in private practice. The fee was to be a percentage of the cost of the work. The engineer prepared plans, specifications and estimate of cost, and the commissioners advertised and let the contract, using blueprints furnished by the engineer. Before the bridge was completed a difference of opinion arose between the engineer and the commissioners over another matter, and the engineer in order to "get back" at the commissioners refused either to furnish or sell additional blueprints to them or to turn the tracings over to them. As he had been paid in full for his work, the commissioners had no means of compelling him to accede to their wishes unless they took the matter into court, which they did not desire to do.

Is the engineer justified in his stand? If more prints were needed to complete the work, could he claim that he had already furnished a sufficient number, and that the deficiency was due to carelessness on the part of the county officials? Are the plans his property or that of the county? Would it make any difference if he had been paid on a different basis? These are questions which should interest many engineers, and I believe a full discussion of the matter would be helpful to many of them. "ENGINEER."

Errors of Approximate Rules for I-Beam Capacities

Sir—Two letters in your issue of Aug. 21, 1919, p. 388, discussed the subject of strength of I-beams. The authors, G. S. Burrell and W. H. Cullers, gave approximate methods for determining the strength quickly. These methods as stated are, to put it mildly, misleading, not to say dangerous. The tabulation below shows that there are a few cases where they may be applied, but these are only in some of the lighter sections. Outside of this range the variation from the correct figures is marked.

Elyria, Ohio. EDGAR PIERCY.

TWO APPROXIMATE METHODS FOR STRENGTH OF I-BEAMS COMPARED WITH CORRECT FIGURES

	Method of G. S. Burrell				Method of W. H. Cullers	
Depth of Beam, In.	Section Modulus G. S. Burrell, In.^{3}	Tabular Section Modulus, In.^{3}	Weight per Ft., Lb.	Span, Ft.	Safe Load W. H. Cullers, Lb.	Safe Load, Actual Lb.
24	240.0	198.4	100	24	100,000	88,200
24	192.0	174.0	80	24	80,000	77,300
20	200.0	165.6	100	20	100,000	88,300
20	130.0	117.0	65	20	65,000	62,400
18	126.0	102.4	70	18	70,000	60,700
18	99.0	88.4	55	18	55,000	52,400
15	150.0	120.1	100	15	100,000	85,400
15	63.0	58.9	42	15	42,000	41,900
12	66.0	53.5	55	12	55,000	47,500
12	37.8	36.0	31.5	12	31,500	32,000
10	40.0	31.7	40	10	40,000	33,800
10	25.0	24.4	25	10	25,000	26,200
9	31.5	24.8	35	9	35,000	29,400
9	18.9	18.9	21	9	21,000	22,400
8	20.4	17.1	25.5	8	25,500	22,800
8	14.4	14.2	18	8	18,000	18,900
7	14.0	12.1	20	7	20,000	18,400
7	10.5	10.4	15	7	15,000	15,800
6	10.35	8.7	17.25	6	17,250	15,500
6	7.35	7.3	12.25	6	12,250	13,000
5	7.375	6.1	14.75	5	14,750	13,000
5	4.875	4.8	9.75	5	9,750	10,200

Why Vote "No" on External Questions of the A. S. C. E. Ballot

Sir—Let us take the time to think over the questionnaire sent out by the American Society of Civil Engineers. The members should realize that they have until April 14 to file their answers, and that new blanks can be obtained now if they have lost the ones originally sent out. Replies should be sent in by every member, after careful consideration of each question separately.

Consider for a moment that we have before us all of the reports submitted by the various committees, the current discussions, the records of the work of the Engineering Council, the reports of conferences with the Founder Societies and the data regarding the American Association of Engineers. What is the large meaning of the accumulation? To me it means that our Society, among others, with its years of merited distinction in the advancement of science has, of late, found itself inflexible to the call of the times for social betterment and civic activity. We have criticised and have knocked and have finally succeeded in opening wide the whole subject of our reason for being. It also means that during the time that has been occupied in this process a new organization has sprung up having for its purpose the very thing that now demands our attention. In a Questionnaire of this length it is to be regretted that there should have been no direct recognition of the existence and activities of the American Association of Engineers, a Society which already outnumbers ours and which will doubtless outnumber, before long, the combined membership of the Founder Societies and which has for its object "to raise the standards of ethics of the engineering profession and to promote the economic and social welfare of engineers." While I am a member of that Society I consider it eminently fitted to take up problems of the kind proposed to Questions 1 and 3.

There is no technical society of a higher recognized standing than that of the American Society of Civil Engineers. It can maintain that standing by continued and systematized effort in the advancement of engineering science, meanwhile safeguarding its membership. To a great extent its members represent the employer and have individually in their charge the determination of salaries and working conditions for a large part of the engineering world. As a Society we now have, without constitutional amendment, the privilege of expressing our opinion and lending our strength wherever and whenever we see fit to do so.

Can we not pause long enough to realize that our real progress just now must be with regard to internal efforts rather than external? Doubtless we are going to give greater influence to the local sections thus securing better co-operation of the entire membership and greater interest. We are going to have new methods of representative nominations, and I believe that the directing officers so chosen can build far better on old foundations than they can on revolutionary changes in the constitution affecting the object of the Society. The object, as now expressed in the constitution, is "The advancement of engineering knowledge and practice, and the maintenance of a high professional standard among its members." When we cast a vote let the attainment of that object be the criterion.

I, therefore, expect to vote "no" on Questions 1 and 3; that is, I do not believe that the American Society of Civil Engineers should adopt the principles as a society of becoming an active national force in economic affairs, and I am of the opinion that another organization in addition to all of those already at work would tend to disperse our efforts.

Just what is the most effective way to secure an immediate and complete co-operation with other engineering and allied associations referred to in Question 2? *Why not develop a plan whereby every member of every Founder Society, unless they personally object, becomes a member of the American Association of Engineers?* Let that body be universal in the engineering field, becoming more powerful in civil and economic affairs than any committee or conference could be. Our individual strength will still have its influence in that body. The fact that A. S. C. E. would have only a small minority influence in any organization such as proposed by Question No. 3 has already been brought out before the Society. The plan above outlined appears to overcome many of the objections which have been brought up. We would have every advantage of co-operation on external problems, and of independence in the handling of our own affairs and the attainment of our own objects.

There is rightly a marked difference in the qualifications to the two societies, which permits all who look upon engineering as their life work to join the A. A. E. while responsible technical experience is necessary for membership in the A. S. C. E. Membership in the A. A. E. eventually will be a stepping stone to membership in the higher technical bodies.

I believe that a uniform annual dues of $25 of which say $5 would go to the A. A. E. would be feasible and would make possible the greatest accomplishment by both societies. Membership in local sections of the A. S. C. E. should also be covered by the annual dues paid the present society.

This may not be a new suggestion, but if not it has escaped my attention and it appears to offer a reasonable solution. I would be pleased to hear from the members with the view of submitting the question to the secretary of the A. S. C. E. W. E. BELCHER.

New York City.

Dividing a Trapezoid Into Equal Parts

Sir—The letter on division of a trapezoid into strips of equal area given by R. B. McWhorter in your issue of Jan. 22, 1920, p. 194, would have been more complete if he had incorporated a general formula for dividing the trapezoid into any number of strips. Using Mr. McWhorter's notation, the following general formula may be written:

$$P_{x+1} = \sqrt{\frac{(n-x)\,P_1^2 + x\,P_{n+1}^2}{n}}$$

Where P_{x+1} is the length of the farther side of the x strip. This formula will be found applicable to the example given by him. H. B. PERRY.

New London, Conn.

[The same formula is sent by another reader, who also gives a formula for the distances to the successive division lines:]

It is believed that an expression giving the distance from the initial side of the trapezoid to any division line will often be found better than that giving the length of the division line. Calling the distance to the far side of the x the strip l_x, the expression is

$$l_x = \frac{L}{P_1 - P_{n+1}}\left[P_1 - \sqrt{\frac{(n-x)P_1^2 + x\,P_{n+1}^2}{n}}\right]$$

Chicago, Ill. H. H. FRENZEL.

Dr. Waddell on Bridge Construction

Sir—On page 564 of your issue of March 18 I note a "unique" scheme in cantilever construction adopted last year for a small bridge built in the Philippines. In 1884 I saw the same device in a Japanese bridge, located, if I remember correctly, in the city of Osaka. Again, of late years in several as-yet-tentative designs I have used the same idea of combining cantilevers and lift spans (both vertical-lift and bascule) for long-span bridges.

In re the discussion by Mr. Fleming *et al* of a history of engineering, I would point out that as long ago as 1903 I made a formal suggestion to the Society for the Promotion of Engineering Education that it undertake the preparation of such a work, the task of writing it to be divided among the members. The idea was well received, but nothing was done. A little later Dean Anson Marston of Iowa State College started writing a history of engineering, but his progress on it has been slow. However, I understood that he is still working on the MS.

In reference to your editorial of Feb. 12, 1920, speaking of the special importance likely to be given to economy in bridge construction in the future, I would state that, soon after the issue of "Bridge Engineering" in the summer of 1916, I started an extensive series of investigations on bridge economics with the intention of solving the last then-unsolved major economic problem in bridgework, of which I listed eight all told. Seven of these have since been solved, the eighth being still under investigation; and three having already been published in the proceedings of two engineering societies.

Based upon the results of this series of studies and the numerous other investigations on economics in bridge designing that I have made during the last three or four decades, the results of most of which have been recorded in my technical books and papers, I am now preparing, as a sequel to "Bridge Engineering," an exhaustive treatise entitled "Economics of Bridgework." As the MS. thereof is three-quarters finished, I ought to finish the task within a twelvemonth, unless something unforeseen occurs to prevent. It is to be my final contribution in book form to engineering literature; and, consequently, I am trying to make it as complete as possible. J. A. L. WADDELL,

New York City. Consulting Engineer.

Snow Conditions in Toronto's Streets

Sir—New York readers, in view of their recent experience with snow in the streets, may be interested in conditions in Canada. We people who live in the northern cities are accustomed to having 6 to 12 in. of snow, and with the exception of a couple of hours of disorganization, very rarely is the transportation system put out of business. The method of handling the snow generally consists of street sweepers and plows operated by the street railways, and on the main streets the excess snow is carted away.

At the present time in Toronto on the side streets there is easily from 9 to 12 in. of packed snow, which is nearly solid ice.

The street railway tracks are 6 in. or more below the ice level of the streets. In fact this level is maintained by the steps of the street cars scraping the surface of the ice. While it is rather rough going at times on some of the streets, motor traffic is continued throughout the entire winter and we hear very little complaint about snow removal, perhaps because the people do not expect it. The main effort of the city authorities is to keep the gutters and catch basins open so that in case of sudden thaw the water will have a chance to get away. The only machinery used is horse-drawn road scrapers, occasionally plows and street sweepers.

E. M. PROCTOR,
The E. A. James Co., Ltd.,
Toronto. Consulting Engineers.

HINTS FOR THE CONTRACTOR

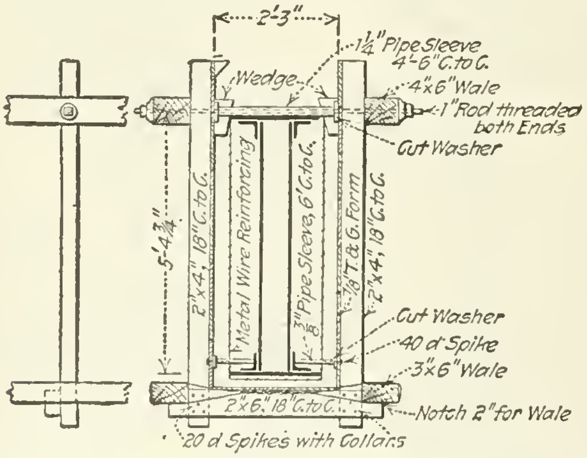
DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Self-Sustaining Forms for Concrete Casing of Steel Girders

By C. A. Peck
The H. Wales Lines Co., Winnipaugh, Conn.

FOR the incasing in concrete of the main girders of several 40-ft. and one 60-ft. plate-girder steel bridges the selfsustaining forms shown in the accompanying drawing have proved satisfactory.

According to the design the steel was to have 4 in. of concrete all around with the exception of the top, which was to be brought up to floor level. Sides and bottoms of the forms were built in 20-ft. panels with 2 x 6-in. crossbars at the bottom offset enough so that they would fit snugly against 2 x 4-in. vertical ribs. These were spiked together as shown and kept at a proper distance away from the girder by $\frac{3}{8}$-in. pipe sleeves held in place by 40-d. spikes driven through the sheathing. Heavy form wire twisted around the bottom wales held the lower part of the form rigid. At the top a $1\frac{1}{4}$-in. pipe sleeve with a 1-in. rod through going wall and every third stud acted as spreader and tie and also served to carry the form on the girder. Holes for the rods were carefully spotted to insure keeping the bottom of the form level, and cut washers were used to keep the pipes away from the forms. These were dug out when the forms were stripped and the holes grouted. Wooden wedges, which were removed when concrete was up even with the top flange of the girder, were used to line the top of the forms.

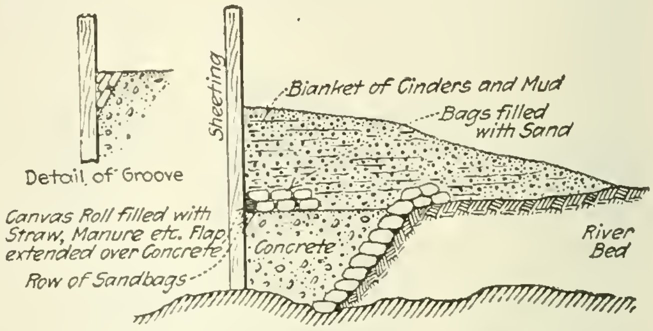


DETAIL OF SELF-SUSTAINING FORMS USED IN INCASING PLATE GIRDERS WITH CONCRETE

In setting, the side forms were first swung into place and held by the 1-in. rods. The top wales were then put on and bolted and next the $\frac{3}{8}$-in. pipes were placed. Then the bottom panel was hauled up and spiked to the studs as shown, nail collars being used to facilitate stripping, for the forms were reused. The last operation was driving the wedges between the top flange and the side form to bring it up to the required line. Work on the under side of the forms was done from a scaffold suspended from the top wales.

Concrete Seals Cofferdams on Rough-Rock Bottom

Cofferdams consisting of timber frames enveloped with steel channel and I-beam sheeting for the Key Bridge across the Potomac River at Washington, D. C., are being successfully sealed to a rough-rock bottom by the construction indicated by the accompanying sketch. The frames were sunk into dredged pits and then the sheeting was driven to contact with the rock. The sides of the pit, which was larger than the cofferdam, were then slope-paved with bags filled with sand and the trench between pit sides and sheeting, all around the structure, was cleaned to rock by means of a sand ejector. Triangular forms bearing against the sheeting were next suspended from the sheeting at the level of the top of the trench, which was then filled with concrete by means of a tremie. Removal of the forms left a V-shaped groove in the concrete and next to the sheeting, and into this groove were packed sand bags. On top of the sand bags and against the sheeting were placed rolls of straw and manure encased in canvas and with the canvas flap spread back over the surface of the concrete and flap and roll weighted down with bags of sand. The object of this pliable wedge was to fill in any space resulting from the inward give of the sheeting due to outside pressure when the cofferdam was pumped out. Finally after the seal had been proven intact by laying dry the cofferdam it was covered with mud and cinders as indicated by the sketch. As soon as the dams were dewatered an inner seal of concrete was deposited against the sheeting. It has been found practicable to pull the steel sheeting and in other respects the concrete seal has operated satisfactorily. The Key Bridge is being constructed by force account under the direction of Col. W. L. Fisk, Corps of Engineers, U. S. A. The data here given are taken from an article in *The Military Engineer* by John T. Talman, assistant engineer.


Sheeting
Detail of Groove
Blanket of Cinders and Mud
Bags filled with Sand
Canvas Roll filled with Straw, Manure etc. Flap extended over Concrete
Concrete
Row of Sandbags
River Bed

CONCRETE SEAL FOR KEY BRIDGE COFFERDAM

American Shipbuilding in 1919

According to the Bureau of Navigation, Department of Commerce, private American shipyards built 2,338 merchant vessels of 4,213,891 gross tons during 1919.

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

NEWS OF THE WEEK

New York, April 1, 1920

Construction Industries Complete Federation

Subjects Discussed at Chicago Convention Included Industrial Relations and Standardized Building Materials

Reorganization on more definite lines of local administration was completed at the annual convention in Chicago March 24-25, of the National Federation of Construction Industries. Prominent among the changes made were: A revision of association membership dues, the admission to suffrage of individual members, an increase in the number of directors and regional vice-presidents, the creation of an advisory board and a staff council and the development of district organizations. A financial budget was adopted which provides for the expenditure in 1920 of $100,000 for federation work.

The attendance was smaller than was anticipated. With an excellent program, speakers of national prominence often addressed an audience of less than a hundred delegates. A too great number of speakers crowded the program and several were compelled to curtail their remarks and pass hastily over important subjects. In the majority of cases, fortunately, the addresses passed over were prepared and can be published for future distribution.

Industrial Relations

In five years all jurisdictional disputes leading to strikes will be settled without a strike, was the prophecy of E. J. Russell, chairman, National Board of Jurisdictional Awards. The creation of this court of determination, he stated, had the complete support of organized labor and had already in its brief existence proved its efficiency by disputes satisfactorily adjudicated.

Governor Henry J. Allen of Kansas explained the new anti-strike legislation of that state, which developed out of the coal strike of last fall, as a court of justice for employer, workman and general public. This court held no brief for or against organized labor or capital. Its purpose was to establish absolute justice in any dispute between employer and employee and to enforce action to insure justice while protecting the general public during adjudication by making illegal and punishable a strike in any industry affecting the necessities of fuel, clothing and food. Kansas, he stated, was now a state without strikes. Disputes were being successfully adjudicated in all the industries within the jurisdiction of the court and already, in the industries outside of court jurisdiction, requests were

(Continued on p. 690.)

To Hold Immigration Conference

A national immigration conference will be held April 7 in New York City in the Engineering Societies Building, 29 West 39th Street. National leaders in American industry and finance will discuss the shortage of foreign-born labor and the loss of production due to unrest among the workers. Measures will be taken for united action to relieve this condition.

Invitations to attend this conference have been issued by The Inter-racial Council to more than a thousand of the directors of industrial concerns. All industrial executives are invited to be present. Further details may be secured by addressing Coleman du Pont, Chairman of the Board, The Inter-racial Council, 120 Broadway, New York City.

Board of Surveys and Maps To Have Advisory Board

Prof. E. B. Matthews, National Research Council, and M. O. Leighton, National Service committee representative of Engineering Council, have been authorized by the recently created Board of Surveys and Maps, to organize an advisory council to the board consisting of representatives of engineering, geographic and other organizations, which shall represent the public and the professions in the presentation and discussion of unofficial demands and needs in connection with the mapping work of the United States.

Ohio River Bridge To Be Rebuilt

Reconstruction of the Ohio River bridge of the Cincinnati Southern Ry. at Cincinnati, Ohio, is the latest project for the rebuilding of notable structures which have become inadequate for modern conditions of loading. This bridge was completed in 1877, or 43 years ago, its river spans and piers being designed by J. H. Linville and built by the Keystone Bridge Co. At the north or Ohio end are two truss spans of 300 ft., followed by a channel span of 519 ft., a swing span of 370 ft. and a 110-ft. truss span to the high ground of the Kentucky shore. Low ground on the Ohio side requires an approach with six truss spans of 113 ft. to 190 ft. There is a single track 106 ft. above low water level. The river piers were built in open cofferdams and carried down to rock. The bridge was described in *Engineering News* of Nov. 24, 1877, Jan. 15, 1881, and Feb. 20, 1902. Plans for erecting a new superstructure on the present piers were prepared some years ago and bids for the work are now being asked by Ralph Modjeski, consulting engineer.

Local Section Action on Questionnaire Ballot

Twenty Sections Recommend Favorable Vote — Nationals Approve Joint Conference Committee's Program

[*This communication was received too late to be printed with the other "Letters to the Editor" in this issue.*—EDITOR.]

Sir—At this time when there are in circulation words of caution and various other letters and communications containing general statements, unsupported by arguments of a constructive character, bearing upon the report of the Committee on Development of the American Society of Civil Engineers and the report of the Joint Conference Committee of the four Founder Societies, a few facts may be helpful to the members of the American Society of Civil Engineers in enabling them to reach a correct decision in voting upon the questionnaire.

The resolutions, adopted by the Annual Meeting of the American Society of Civil Engineers by a very large majority, included the following:

"Therefore, be it Resolved that the Sixty-seventh Annual Meeting of the American Society of Civil Engineers hereby approves the fundamental recommedations contained in the report of its Committee on Development."

At meetings of local groups of members of the American Society of Civil Engineers, at which were discussed:

(a) The report of the Committee on Development, Am. Soc. C. E.,

(b) The so-called "Alvord Report" by the Committee of the Board of Direction, Am. Soc. C. E.,

(c) "A Word of Caution" signed by 106 members of the American Society of Civil Engineers, and

(d) The questionnaire issued by the Board of Direction under the instructions of the Annual Meeting of the American Society of Civil Engineers,

it was voted, in all instances by an overwhelming majority and in nearly every instance unanimously, that it was the sense of the meeting that the members of the society should vote YES on questions 1 to 3, inclusive, under A, External Relations, and YES on questions 1 to 6, inclusive, under B, Internal Relations, contained in the questionnaire, on which the members of the society are now voting. These local groups are:

Philadelphia
Boston
Connecticut
Baltimore
District of Columbia
Pittsburgh
Cleveland
Columbus
Cincinnati
Detroit
St. Louis
Texas
Iowa
Spokane
Duluth
Colorado
Seattle
Portland, Ore.
San Francisco
So. California

(Continued on p. 692.)

Illinois Water Works Men Talk of Service and Treatment

The interlocking relations of the public, the public utility corporations and the public service commissions received a good share of attention at the annual meeting of the Illinois section of the American Water Works Association, held at the University of Illinois on March 25 and 26. Dow R. Gwinn (Terre Haute Water Co.) in discussing the high cost of money to public utilities pointed out that good service is as important to the public as is a reasonable rate for service, and that rates should be such as to permit the corporation to give adequate service. Public service commissions, however, have been inclined to aim only at low rates and to overlook the matter of service.

Present and pre-war reproduction cost of waterworks was the subject of a paper by L. R. Howson (Chicago), giving tabulated prices of material and labor for a term of years and showing that the present cost of plants complete is from 63 to 89 per cent above pre-war cost. Mr. Gwinn urged that valuations of plants should be based on these high prices, although some public service commissions refuse to consider this. The unsatisfactory operation of municipal water works plants under political control was noted by L. A. Fritze (Peoria) who advocated an Illinois law similar to one established recently in Iowa which takes the water department out of politics. Under this law the administration of the water department is comparable with that of a private company, being in the hands of a board of trustees appointed by the mayor for a term of years and the management being put in the hands of a competent waterworks man instead of one selected for political reasons.

An outline of the benefit of chemistry in the operation of waterworks plants, presented by Kenneth Holaday, chemical engineer for the Central Illinois Public Service Co., led to the remark that the company was to be congratulated on realizing the advantages of the application of chemistry to small as well as large plants. The value of bacterial tests was presented in a paper by M. F. Stein (Chicago). An outbreak of dysentery and typhoid at Bloomington, due to cross connection with an impure supply at the railway shops, was described by M. C. Sjoblom (State Board of Health); Dr. Edward Bartow (State Water Survey) called attention to the fact that most of such outbreaks in Illinois have been due to similar cross connections. Dr. Bartow also described an investigation as to odor and taste in water at Mt. Vernon, which traced the cause to organisms in the water at one of the reservoirs, and treatment with copper sulphate removed the trouble.

Location of leaks in water mains by telephone, water hammer and hydraulic gradient study was described by Prof. H. E. Babbitt, and some members spoke of trouble with apparatus for the first method. Development of a shallow ground water supply was explained by W. D. P. Warren (Decatur). Other subjects included stream pollution, by Langdon Pearse (Chicago Sanitary District); purification of sewage as protection for water supply, by D. P. Hommon (U. S. Public Health Service), and the purification of water and sewage, by W. J. Allen (North Shore Sanitary District). The officers for 1920 are as follows: President, F. C. Amsbary, manager of the Champaign & Urbana Water Co., Champaign, Ill.; vice-president, L. A. Fritze, Peoria, Ill.; secretary, G. C. Habermeyer, State Water Supply, Urbana, Ill.

Construction Industries

(Concluded from p. 689.)

frequent, by the agreement of both parties, that the court undertake a settlement.

Under the title of "Americanization" Frances A. Kellor, associate managing director, Inter-Racial Council, outlined the part that industry had to play in stabilizing industrial relations. The argument was in essentials that presented by Miss Kellor in *Engineering News-Record*, March 11, 1920, p. 517.

Transportation

Revolutionary improvement in railway service cannot be expected to follow the realease of the railways from government operation. The arrears in physical means for improved service and in morale and efficiency are too great to be paid up immediately. An improvement will come soon and will be more pronounced as the months pass and the managerial and financial machinery is adjusted to the provisions of the Esch-Cummings railroad bill. Means are being provided through the remodeled American Railway Association for a closer co-ordination between shipper and railway and, with the cooperation of the shippers, these means promise to relieve much of the trouble now existing. To these statements the three principal speakers A. G. Gutheim, American Railway Association; E. G. Sutton, business manager, National Association Sand and Gravel Producers, and Robert C. Wright, general traffic manager, Pennsylvania Railroad Co. agreed.

Standardization

Standardization in the construction industries was the business of one full session. E. S. Hall, speaking as a member of the American Institute of Architects, called upon the construction industries to curtail by standardization the varieties of building materials. He classified building as 25 per cent special and 75 per cent standard and stated that under competent designers the larger percentage could be standardized with vast savings in cost and no loss in beauty. The functions and the operations of the various organizations having the task of developing standards were outlined by S. W. Stratton, director, U. S. Bureau of Standards; C. L. Warwick, secretary-treasurer, American Society for Testing Materials; A. A. Stevenson, chairman American Engineering Standards Committee, and C. C. Adams, chairman division of engineering, National Research Council.

Administration

Under the new organization, the administration of the Federation will be by a president, and by vice-presidents and directors chosen equally from Federal districts corresponding to the Federal Reserve Districts. These officers will be assisted by an advisory board and a staff council. In the staff council composed of the specialist employees of the members will rest largely the initiative in developing constructive action in legislation, industrial relations, standardization, etc.

Ernest T. Trigg was re-elected president and the executive officers continue at Philadelphia, Pa., with John C. Frazee as executive secretary.

I. C. C. Designates A. A. E. Official Representative of Engineers

As a result of the representations of the American Association of Engineers before the Interstate Commerce Commission hearing on March 15 and 16 regarding the classification of professional engineers in railroad service with reference to representation on the Railroad Labor Board, provided by the Transportation Act, the commission has conceded the justness of the claims made by the association and has declared that professional engineers in railroad service below the grade of chief engineer, engineer of maintenance of way and division engineer, and "other engineers who are not vested with authority to employ, discipline or dismiss subordinates" are subordinate officials.

The commission has classified professional engineers as "engineers of mechanics." This class includes civil engineers, draftsmen and "other engineers of mechanics." The American Association of Engineers is designated as the official representative of engineers of mechanics, and in common with six other groups of employees (claim agents, foremen of mechanics, supervisors of signals, yardmasters, train dispatchers and storekeepers) has been made the basis of a fourth group of employees to make nominations for members of the Labor Board.

The credited representatives of these seven organizations and those of a few additional labor organizations not affiliated with the American Federation of Labor which have been placed in fourth class are to make nominations for appointment to the Labor Board. Such nominations must be transmitted direct to the President not later than March 29. It has not yet been decided whether or not the American Association of Engineers will make a separate nomination, or whether it will agree with one or more of the other organizations of subordinate officials on a joint nomination.

Road Classification Undertaken in England

An elaborate system of traffic census taking; a detailed form for determining expenditure and receipts from different classes of highways, and the sources from which various maintenance grants come; and a careful survey of engineer compensation, are the salient features noticed in the work of British road classification. A circular letter has rerecently been sent out by Sir Henry P. Maybury, Director General of Roads, to all local authorities informing them that the Ministry of Transport has decided upon the classification of roads within administrative counties of England and Wales.

As one means of determining the relative value of roads, a census of traffic is to be taken for sixteen hours a day—from 6 a.m. to 10 p.m.—on seven consecutive days; the road department to notify the highway authorities as to the time and place at which the census is to be taken. A list of traffic census points is to be submitted to the roads department. Such points on rural roads need average only one per 10 miles of road, and in urban districts are to be confined to roads which are continuations of roads carrying a substantial percentage of through traffic.

With a view to determining what the expense of Imperial grant should be for maintenance and construction, an elaborate analysis of receipts and expenditure is to be made, for the years ending March 1, 1914, and March 31, 1920. In the expenditure columns are to be given costs of scavenging, watering, repairs and maintenance of carriageways and footways, improvement of carriageways and footways, guide posts, direction posts, and milestones. Information is also required as to the total remuneration of county surveyors for the year ending March 31, 1920. Such information includes salary for all duties, allowances and extras. The seeking of such detailed information upon compensation is taken as an indication that the surveyor's financial status is to be materially bettered.

Disagree on Valuation Basis in Argument Before I. C. C.

Disagreement as to the basis of value to be used in building up a new rate structure, after Sept. 1 under the new railroad law, was indicated in arguments before the Interstate Commerce Commission in Washington, D. C., March 22-24, in respect to grouping in rate districts and methods of fixing temporary valuations. Shippers, state railroad commissioners, the railroad executives, the railroad security holders, and railroad employees were represented.

The use of the present property investment accounts of the railroads as a temporary basis of valuation was attacked by John E. Benton, general solicitor, National Association of Railway and Utilities Commissioners, who said that the accounts were undependable and should not be used in lieu of more exact data on physical value being collected by the Interstate Commerce Commission. However, where the Commission could not obtain more definite data for the present it would have to take the property investment accounts after checking them up, according to Mr. Benton. Shipping interests as well as representatives of the railroad executives and security owners favored the temporary use of property investment accounts as the basis of valuation pending a final report under the Valuation Act.

General sentiment was expressed favoring division of the country into the same three rate groups now existing, with the exception that a proposal was made by some of the southwestern carriers that a separate group in their territory be made.

Progress on Standard Water Meter Specifications

The committees on standard specifications for water meters appointed by the New England and the American Water Works associations have recently held two joint meetings. It is expected that a progress report including tentative specifications will be completed early enough to be printed and sent to the members of the two associations about June 1, giving ample time for consideration by the members before the Montreal meeting of the American Association in June and the September meeting of the New England Association. The basis of the committee work now in progress is specifications outlined by the meter manufacturers. Charles W. Sherman, of Metcalf & Eddy, 14 Beacon St., Boston, Mass., is chairman of the New England committee, and Caleb M. Saville, director and chief engineer of the Water Board of Hartford, Conn., is chairman of the New England committee.

Board of Zionist Engineers for Palestine Development

Plans for the immediate reconstruction needs and industrial development of Palestine will be worked out by a technical board of the Zionist Society of Engineers and Agriculturists, James H. Haines, secretary of the society, announced March 31, in making public the names of the directors of the board. The board will consist of Dr. L. C. Lowenstein, General Electric Co., to direct the establishment of public utilities; Dr. Ferdinand Sonneborn, L. Sonneborn Sons, Inc., to be in charge of industrial engineering; Lazarus White, president, Spencer, White & Prentis, Inc., to direct construction development, and Joseph A. Rosen, vice-president, Youroveta Home and Foreign Trade Co., to be in charge of agricultural development.

Drainage Association in Illinois

The Illinois Drainage and River Improvement Association was organized at the drainage conference held recently at the University of Illinois. There are to be 12 directors located in the principal river valleys, each being chairman of a local committee. The president is A. L. Maxwell, Lawrenceville, Ill.; vice-president, S. E. Prather, Springfield, Ill.; secretary, G. W. Pickels, University of Illinois, Urbana, Ill.

Utah Engineers Endorse Water Supply Bond Issue

Salt Lake City needs an additional water supply, and a bond issue of about $2,600,000 will be voted upon at the Spring election for the program. It is hoped to make available by storage and conduit all of the water flowing into the valley from City Creek, Emigration, Mill, Parleys and Big Cottonwood canyons. Rights will be secured in Little Cottonwood canyon.

The Utah Society of Engineers has indorsed the improvement program, and the aggressiveness with which the Society has undertaken to see that the vote is carried has "put the Society on the map," writes one of its members. The committee which investigated the program was headed by Richard R. Lyman, professor of civil engineering in the University of Utah until he became one of the twelve apostles of the Mormon Church, an honor held for the first time by an engineer. The Society arranged to have its report published in full in the Saturday night and Sunday morning papers.

Protest Against Classification of Railroad Engineers

L. K. Sherman, representing the American Association of Engineers, presented arguments at the recent hearing before the Interstate Commerce Commission at Washington, D. C., in favor of a separate grouping for subordinate technical engineers. He pointed out that there are 20,000 technical engineers in the employ of the railroads of the country and that only 5 per cent of that number come within the category of executives. He declared that no other class of employees of the railroads have a more trusted relationship with the companies than do the subordinate civil engineers, assistant engineers, architects, rodmen, chainmen, and draftsmen. His contention was that the chief engineer, the division engineer, and the engineer of maintenance of way are not subordinate engineers but that all other technical engineers are subordinate. Since this class of railway employees has not had the standing of officials nor has it had representation among the organization of employees, Mr. Sherman held that they have been neither fish, flesh, nor fowl, and as a result have not had the salary considerations to which they are entitled.

Move Made to Improve Status of Canadian Engineers

At its meeting held March 4 the Toronto branch of the Engineering Institute of Canada passed a resolution calling upon the parent body to request all branches to appoint committees to investigate and report on methods of improving the economic status of the engineer. The resolution follows:

"Whereas, By reason of inadequate compensation, salaried engineers are now working under exceptionally trying economic conditions, which in some cases amount to hardship; and

"Whereas, Many engineers in the Toronto district are convinced that these conditions can be ameliorated only by direct organized effort and that immediate remedial measures are imperative; and

"Whereas, The Engineering Institute of Canada must either promptly face the issue and grapple with it, or stand aside and permit newer and perhaps foreign associations to press the claims of the engineers of this country for economic consideration; therefore, be it

"Resolved, That this branch urge headquarters of the Institute to forthwith request all branches to appoint committees, of not less than five members, with power to add to their numbers to thoroughly investigate and report through the various branches to headquarters upon the structure and constitution of an organization designed to bring into operation direct and concerted effort toward the improvement of the economic status of engineers; and that if practicable headquarters defray the expenses of these committees in the matter of holding hearings and obtaining stenographic reports of evidence."

Am. Soc. C. E. Members Urged To Aid Patent Legislation

An appeal has been issued to the membership of the American Society of Civil Engineers, at the request of Engineering Council, to urge their respective senators to vote for the Nolan Bill, H.R. 11,984. The U. S. Patent Office has long been handicapped in its work, the appeal states, by the insufficient compensation of its employees. The bill introduced by the Hon. John I. Nolan, chairman of the patent committee, House of Representatives, proposes increasing the salaries of the employees and staff of the Patent Office, which have not been changed for many years, except by one raise of 10 per cent. The salaries of the principal examiners are increased by the bill from $2,750 to $3,900. It also authorizes the courts to assess general damages under certain conditions in infringement suits, and makes other changes. The bill has been passed by the House of Representatives and is now before the committee on patents in the Senate. Senator George W. Norris is chairman of the committee on patents.

Albany Engineers' Attitude on Am. Soc. C. E. Questionnaire

[*The following statement has been received from members of the American Society of Civil Engineers residing in Albany, N. Y., and vicinity.—Editor.*]

Notwithstanding the criticism of the management of the American Society of Civil Engineers, particularly with reference to welfare work, the undersigned believe that better and more prompt results in improving the welfare of the civil engineer can be obtained by reforming the existing society internally than to attempt the improvement of the welfare through a new organization as proposed.

The undersigned recommend "No" to Question No. 3 of questionnaire to be canvassed April 14, 1920: Frank M. Williams, William B. Landreth, F. P. Williams, E. A. Lamb, Thomas S. Bailey, C. H. Wood, H. W. Benedict, William Russell Davis, E. D. Hendricks, H. O. Schermerhorn, F. H. Macy, George H. Burgess, W. H. Mansfield, G. F. Stickney, H. D. Alexander, R. E. Phillips, James A. Galvin, John P. Newton, O. F. Bellows, C. H. MacCulloch, Noble E. Whitford, A. W. Conner, John A. O'Connor, Alexander Rice McKim, James P. McAvoy, W. J. H. Manning.

Section Action on Questionnaire

(*Concluded from p. 689.*)

Engineering Council at its meeting on Oct. 16, 1919, "expressed approval of the general principles underlying the proposal formulated by the Joint Conference Committee for the establishment of means for providing on a larger scale the functions which Engineering Council has since the summer of 1917 been performing for its Founder Societies."

The board of directors of the American Institute of Electrical Engineers has "Voted: that the report [of Joint Conference Committee] be endorsed and referred back to the institute's three representatives on the Joint Conference Committee for such action, in cooperation with the representatives of such other societies as endorse the report, as may be necessary to put the recommendations into effect."

The council of the American Society of Mechanical Engineers acting under the authority given it by the Annual Meeting of the society held in December, 1919, "Voted: that the council of this society approves and adopts the report of the Joint Conference Committee and instructs its representatives to immediately start work to carry out the recommendations."

The Annual Meeting of the American Institute of Mining and Metallurgical Engineers, held Feb. 17, 1920, unanimously adopted the following resolutions: "Resolved, that the American Institute of Mining and Metallurgical Engineers, assembled at its annual meeting approves in principle the report of the Joint Conference Committee and authorizes its representatives on that committee to act with that committee in calling a meeting for the organization of the representative engineering body provided for in said report."

At a joint meeting of the governing bodies of the member-societies of Engineering Council (American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers, American Institute of Electrical Engineers, and American Society for Testing Materials), the trustees of the United Engineering Society and the members of Engineering Council, held in the Engineering Societies Building, Jan. 23, 1920, the following resolution was unanimously adopted:

"WHEREAS, This conference of national engineering societies has considered the recommendations of the Joint Conference Committee of the four Founder Societies, therefore be it

"RESOLVED: That the conference adopts in principle that report and requests the Joint Conference Committee to call, without delay, a conference of representatives of national, local, state and regional engineering organizations to bring into existence the comprehensive organization proposed."

The Joint Conference Committee met in Philadelphia on March 12 and 13, 1920, and arranged to call an organizing conference in Washington, D. C., June 3-4, 1920.

The following local engineering organizations have taken favorable action on the Joint Conference Committee Report:

Engineers Club of Philadelphia, with its eleven affiliated organizations.

The Washington Society of Engineers.

The Cleveland Engineering Societies.

The Associated Engineering Societies of St. Louis.

The Engineers Club of Columbus.

The fundamentals, covered by the questions on which the members of the American Society of Civil Engineers are now voting, have a vital bearing on the future of the society.

It is, therefore, the imperative *duty* of each member of the society to vote.

Any member of the American Society of Civil Engineers who has misplaced his ballot or desires to change his vote may obtain another ballot on application to the secretary of the society. This ballot closes, 12 o'clock noon, April 14, 1920.

RICHARD L. HUMPHREY,
Chairman, Joint Conference Committee of the four Founder Societies; Chairman, Conference Committee of the American Society of Civil Engineers; Member of Committee on Development of the American Society of Civil Engineers.

Philadelphia, March 29, 1920.

A. A. E. Has 14,620 Members

The American Association of Engineers had 14,620 members and 4,820 applications pending on March 24.

Washington Briefs

Colonels Thomas Rees and William Kelly have been nominated to be members of the California Debris Commission. The Military Affairs Committee has reported unanimously in favor of their confirmation.

The Senate has confirmed the promotion of the following officers of the Corps of Engineers: Herbert Deakyne to be Colonel; Spencer Cosby to be Colonel; George B. Pillsbury to be Lieutenant-Colonel; Gustave R. Lukesh to be Lieutenant-Colonel.

As reported to the Senate, the Agricultural appropriation bill carries $450,000 for the construction and maintenance of roads, trails, bridges, fire lanes, telephone lines, and other improvements necessary for the protection and development of national forests. This is an increase of $50,000 over the amount allowed in the bill which passed the House.

A total of $540,220 is allowed the Bureau of Public Roads in the Agricultural appropriation bill as reported to the Senate from its Committee on Agriculture. This is $49,600 more than was carried by the bill recently passed by the House.

Panama Slide Delays Ships

A recent report of Governor Harding of the Canal Zone to the War Department states that a movement of the Cucaracha slide in the canal, which occurred March 12, will cause intermittent obstruction to shipping for several weeks to come. The slide on the night of March 12 held up six ships of more than 25 ft. draft, but permitted the passage of six other ships drawing 22½ ft., and less. Further slides were anticipated in the Governor's report. The Cucaracha slide is on the east side of the canal, immediately south of Gold Hill.

Labor Proposes Broad Economic Program

In a recent issue of the *American Federationist* Samuel Gompers sets down in detail the broad economic program that the American Federation of Labor is setting for itself. It proposes to attain its end through active efforts to send to Congress and other legislative bodies men who are favorable to the program.

The program is long and comprehensive. It includes Federal licensing and control of all corporations organized for profit, legislation that would force into use agricultural land now uncultivated or cultivated by others than the owner, "organization and use of credit to serve production needs, and not to increase the incomes and holdings of financiers, control over credit capital taken from financiers and vested in a public agency able to administer this power as a public trust in the interests of all the people," Government operation of all wharves and docks connected with public harbors, and Government ownership and operation of all water powers over which they have jurisdiction.

Toronto Contractors Won't Submit Checks on Private Work

The General Contractors Association, operating as a section of The Builders Exchange of the City of Toronto, has adopted the following resolutions which have been forwarded to all architects and engineers in the city:

"(a) The members of this association decline to submit competitive bulk tenders on work for which the architect or engineer is at the same time taking separate tenders by trades.

"(b) The members of this association refuse to supply certified checks when tendering on private competitive work.

"(c) The members of this association decline to furnish detailed unit prices or subsidized estimates on new work until they have been informed that, providing such subdivisions and units are satisfactory, the work in question will be awarded to them."

The association also drew attention to the advisability of getting as much new work as possible under way before spring, since there would undoubtedly be an extensive building program this summer and since prices of material are still steadily rising.

Portland, Ore., Considering Waterfront Improvement

As to the result of a report on waterfront conditions submitted to the commissioner of public works by the city waterfront committee, the city council of Portland, Oregon, has authorized the preparation of plans for improving 5,300 ft. of the west side of the Willamette River and relieving traffic congestion in the waterfront district. The work will be in the hands of O. Laurgaard, city engineer, who is to work in conjunction with the county commissioners and the dock commission.

The report on which this action was based proposed that the city acquire the water front from Glisan to Jefferson Streets, build a sea wall and fill, raise bridge piers and approaches and improve the waterfront thus gained in a comprehensive way. The cost of land and improvements is estimated at $10,000,000. Structures on about 70 per cent of this frontage, the report states, have been condemned, recommended for condemnation or are in process of being wrecked.

The proposed improvements would include a terminal for passenger steamers, a terminal for interurban electric railways, the widening and improvement of the street along the waterfront, grade separation and street rearrangement on bridge approaches, and a public market. A feature of the proposed passenger steamer terminal would be space where about 5,000 automobiles could be stored by business and professional men, the purpose being to relieve street congestion.

Chamber of Commerce, U. S. A., Annual Meeting April 27-29

The eighth annual meeting of the Chamber of Commerce of the United States will be held in Atlantic City, N. J., April 27-29. According to announcement it will be a convention devoted entirely to the subject of increased production, which will be discussed in the following subdivisions: governmental relations, transportation, internal finance, agriculture, labor.

North Dakota Engineers Elect Woman as President

The election of a woman as president and discussion of highways, A. A. E. amalgamation, the Jones-Reavis bill and the division of authority in sanitary work, featured the twelfth annual meeting of the North Dakota Society of Engineers, held at Grand Forks, N. D., on March 10 and 11. Esther M. Jack, city engineer of Williston, is the new head of the organization. Engineers of the state highway commission and the Federal Bureau of good roads, contractors and representatives of material firms took part in the roads discussion. Recent instructions of the State Board of Health, construed as meaning to require the board's approval of details in design and construction of all water supply and sewerage systems had caused some friction in their implying a transfer of all responsibility and authority from the engineers to the board. A resolution was passed providing for a committee of engineers to confer with the State Board of Health in order to secure a revision of the rules.

Amalgamation with A. A. E. Proposed

Amalgamation of the society with the American Association of Engineers received extended consideration, only the absence of definite plans for the preservation of the present society's identity prevented a favorable decision. Accordingly, the society voted a resolution recommending that the society keep its organization intact, but that individual members who wish to should join the American association individually.

A resolution was passed approving the general idea of the Jones-Reavis bill for a national department of public works so far as it pertains to the bringing together of all the engineering and public works functions of the government, but recommending that the Bureau of Education be made a separate department, as provided in the Smith-Towner bill, rather than that it be transferred to the Department of Labor.

The officers elected were as follows: Miss Esther M. Jack, city engineer of Williston; vice-presidents, R. M. Stee and E. Ray Griffin; secretary and treasurer, Prof. E. F. Chandler, University, N. D. The next annual meeting will be held at Jamestown, N. D.

Extensive Engineering Projects in Uruguay Are Reported

A report just issued by the U. S. Bureau of Foreign and Domestic Commerce tells of many engineering projects now under consideration by the government and private interests of Uruguay for the development of natural resources and improvement of sanitary conditions. The biggest single project is an international power plant to be installed on the Uruguay River by Argentina, Brazil and Uruguay jointly, with guarantees for the equitable distribution of power to the three countries concerned. It is estimated that 2,500,000,000 kw.-hr. per annum could be developed by a hydro-electric plant on the site now being considered. The development contemplates the construction of two dams giving a total head of 77 ft. It is estimated that 419 miles of river, which is now inaccessible, could be opened to navigation and adjoining fertile zones irrigated.

Other projects for the development of water power are being considered. An official commission has prepared a plan for the irrigation of a 37,000-acre tract not far from Montevideo to serve as an experiment and an example. The potential water power in the water courses of Uruguay has been virtually untouched.

Fifteen cities of Uruguay, according to the report, are to install water supply and sewerage plants within the next few years. The pre-war estimates for this work totaled about $15,000,000. In 1916 the American engineers contracted for the installation of water and sewerage systems in three of the largest cities in Uruguay, at a cost of $5,000,000. That work was completed a year before the contract date, and the bonds have now been retired by the Uruguayan government. The City of Montevideo needs at the present time a large number of workmen's houses, ten new business structures, a hotel, an opera house, cold-storage facilities, and a number of factories. It has been estimated that the foregoing construction will total $16,300,000. The report goes on to say that within the next few years the Uruguayan government will need new and modern edifices to the value of $23,000,000.

The chief imports for such work will necessarily be steel and finishing materials.

Garford Has Transportation Bureau

The Garford Motor Truck Co. of Lima, O., has established a new department known as the transportation engineering department, the duties of which will be to gather authoritative information on motor truck operation. Investigation will be made of details entering into the operation and maintenance of trucks in use, including problems in loading and routing, method of delivery, housing, repairing and driving.

Detroit Contracts for 4 Miles of Steel Water Mains

An innovation in the method of providing watermain extensions in Detroit has been made by the Board of Water Commissioners by awarding the contract for furnishing material and constructing about four miles of 48-in. lockbar steel pipe with riveted end joints. This is a departure from the general practice of the Water Board and its engineers which has been to purchase cast iron water pipe and make extensions by day labor.

The pipe line for which contract has just been awarded is 20,930 ft. long. Constructed of sheet steel one-half inch in thickness and to be laid in a trench 6 ft. wide and from 9 to 13 ft. deep, it will be Detroit's first steel pipe of large dimensions. The contract price awarded is $31.94 per lineal foot, amounting to $668,504.20.

Los Angeles Municipal Cement Mill Will Make Potash

Some months ago the City of Los Angeles put on the market the cement mill at Monolith which it had built for making the cement used in the Los Angeles Aqueduct. However, it has been unable to sell or lease the plant for cement-making purposes, and the Board of Public Service has now leased it for a term of five years to be used for the production of potash. The city is to receive $22,500 per year rent, which is about 5 per cent of the minimum price placed on the plant by the city board.

Contract for Hartford-New London Trunk Line Let

C. W. Blakeslee & Sons, New Haven, Conn., was recently awarded the contract for the construction of 32.2 mi. of 18-ft. concrete highway on the Hartford-New London trunk line. The total contract price was $1,392,385.34, an average of a little better than $43,000 per mile. For bidding purposes the work was divided into four sections of approximately 8 mi. each, and but two bidders bid upon all four sections, the next highest to the successful bidder contracting to do the work for $1,818,582.96.

General Electric Co. Leases Remington War Plant

On March 17, 1920, the General Electric Co. leased, with option to purchase, the forty acre war plant of the Remington Arms Company at Bridgeport, Conn. The transaction involves about $7,000,000.

The plant was built in 1915-16. The space covered by the buildings is about 900,000 sq.ft., and the floor area in them is 1,555,257 sq.ft. The plant is expected to be in full operation by April 15, when the General Electric Co. will employ many thousand people, all of whom can be easily housed, as the facilities already exist. It is not yet known just what products will be manufactured in the new plant.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

TWELFTH NATIONAL CONFERENCE ON CITY PLANNING, 60 State St., Boston; Cincinnati, April 19-22.

NATIONAL FIRE PROTECTION ASSOCIATION, 87 Milk St., Boston; May 4-6; Chicago.

AMERICAN ASSOCIATION OF ENGINEERS; 63 E. Adams St., Chicago; May 10, 11, St. Louis, Mo.

AMERICAN WATER WORKS ASSOCIATION, New York City; Montreal, June 21-26.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; Asbury Park, N. J., June 22-25.

AMERICAN PUBLIC HEALTH ASSOCIATION, Boston; San Francisco, Aug. 30-Sept. 3.

The Twelfth National Conference on City Planning will be held at Hotel Sinton, Cincinnati, April 19-22. The opening luncheon will be at noon, April 19. The first session will be held in the afternoon, devoted to reports of progress in city planning by Chicago, St. Louis, Pittsburgh, Detroit, Newark, Rochester, Dallas, Reading, Pa., and Flint, Mich. An evening session will take up Cincinnati's problems. At the morning session, April 20, railroad terminal problems will be reported upon. An automobile tour of the city is scheduled for the afternoon, and in the evening the presidential address will be delivered by Nelson P. Lewis, chief engineer, Board of Estimate and Apportionment, New York City. On April 21, there will be a morning session, on regional planning, followed by a civic luncheon; an afternoon session, on zoning, and the annual dinner at night, at which Dean Herman Schneider of the College of Engineering, University of Cincinnati, will be toastmaster. A business meeting will be held Thursday morning, April 22, after which the conference will be adjourned. Further information can be secured from the secretary, Flavel Shurtleff, 60 State St., Boston, Mass.

The Ontario (Can.) Good Roads Association has elected, for 1920, the following officers, all of Ontario: President, L. E. Allen, Belleville; honorary presidents, K. W. McKay, St. Thomas, and C. R. Wheelock, Orangeville; vice-presidents, T. J. Mahoney, Hamilton, and W. H. Brown, Chesley; secretary-treasurer, Hon. Geo. S. Henry, Todmorden; directors, F. A. Senecal, Plantagenet; J. A. Sanderson, Oxford Station; William Nugent, Belleville; W. H. Pugsley, Richmond Hill; T. L. Kennedy, Dixie; J. E. Jamieson, Singhampton; J. Currie, Strathroy; J. E. Waters, Niagara-on-the-Lake; and S. L. Squire, Toronto.

The Leonard Wood Engineers Club of Chicago has been organized for the purpose of furthering the candidacy for the Republican presidential nomination of Major-General Leonard Wood. The officers elected are: President, Harold Almert; secretary, H. J. Gonden.

The Cornell Society of Civil Engineers will hold its regular spring meeting Friday evening, April 9, at 8 o'clock, in the fifth-floor assembly room, Engineering Societies Building, 29 West 39th St., New York City. Dexter S. Kimball, professor of machine design and industrial engineering at Sibley College, Cornell University, will be the guest of the evening. Prof. Kimball, who will become dean of the combined engineering colleges at Cornell beginning with the fall term of 1920, will speak on the future hopes and needs of the college. All of the mechanical and electrical engineers, and Cornell architects, are invited to meet with the civil engineers on this occasion. Refreshments will be served.

Personal Notes

J. S. Broyles is now with W. S. Schulz, consulting engineer, Memphis, engaged on river terminal work there.

Daniel W. Mead, consulting engineer, Madison, Wis., has been engaged by the Grand River Drainage District of Livingston County, Mo., to act as consulting engineer in connection with the flood prevention plans worked out for the Grand River valley by the Morgan Engineering Co., Memphis.

E. W. Lane has secured a leave of absence from the Miami Conservancy District for a few months, during which time he will act as drainage census taker for Louisiana and other southern states. Mr. Lane is planning to leave for China in the early fall to study flood problems there, and also to deliver a course of lectures at Chinese universities.

Colonel C. H. Crawford, manager, Baldwin Locomotive Works, Rio de Janeiro, has been appointed South American representative of the American Association of Engineers. One of Colonel Crawford's functions will be to report on how the association can best serve Latin-American engineers.

William L. Lance, engineer, Spring Brook Water Supply Co., Wilkes-Barre, Pa., has resigned to become associated with John H. Lance, consulting hydraulic engineer, of that city.

Edward M. Burd and William C. Giffels, formerly with the Consumers Power Co. of Michigan, have opened an office at Grand Rapids to engage in the practice of civil engineering.

T. S. Brindle, Ashland County, Ohio, has been appointed chief engineer, Ohio State Highway Department. He succeeds H. D. Bruning, resigned.

L. G. Lenhart, civil engineer, formerly employed in the office of C. W. Hubbell, consulting engineer, Detroit, and on the investigations of the International Joint Commission, has been appointed city engineer of Pontiac, Mich.

Frank L. Weaver, formerly professor of civil engineering at Johns Hopkins University, and who served as captain of the 305th Engineers, has become associated with C. W. Hubbell, consulting engineer, Detroit, Mich.

C. Perry Prann, assistant in the city engineer's office, New Haven, Conn., has been appointed city engineer of New Britain, Conn.

D. Q. McComb, recently highway engineer, U. S. Bureau of Public Roads, has resigned to accept an appointment as division engineer, Tennessee Highway Department.

J. J. Gault has resigned as assistant engineer, maintenance - of - way, Chicago & Alton R.R., to take a position as engineer with Frank Lewin, builder, Chicago.

Prof. Walter Edward McCourt, head of department of geology, Washington University, has been appointed dean of the schools of engineering and architecture of the university. He succeeds Alexander Suss Langsdorf, formerly dean of the scientific schools, who will leave the university in June to become production manager of the Crunden-Martin Mfg. Co.

E. S. Chase, assistant sanitary engineer, New York State Department of Health, has resigned to accept a position with Metcalf & Eddy, consulting engineers, Boston, Mass.

Shelton Dawson has been appointed city engineer, Charles City, Iowa, succeeding the late W. S. Beattie.

Clifford Page, recently assistant city engineer, Grand Rapids, Mich., who has been in Mexico for several months, has returned as acting city engineer. Mr. Page assumes the duties of city engineer in the absence of G. J. Wagner, at present on an indefinite leave of absence.

J. T. Hurd, engineer, Chippewa Falls, Wis., has been appointed city engineer, Eau Claire, Wis., succeeding Mr. Garnock. Mr. Hurd will continue to act as consulting engineer for Chippewa Falls until another appointment is made.

G. M. Jowers has been appointed engineer of Val Verde County, Tex.

Ross J. Buck, assistant city engineer, Indianapolis, has been engaged as city engineer, Muskegon, Mich. He succeeds C. L. Nelson.

E. M. Hastings, formerly resident engineer, Richmond, Fredericksburg & Potomac R.R. Co., has been appointed principal assistant engineer of that railroad.

A. Travers Elwell, consulting engineer, after spending ten years in South America, engaged in engineering work, has returned to this country and opened an office at 61 Broadway, New York, specializing as consulting engineer on South American engineering projects.

Frederick J. Bastable, assistant superintendent, Department of Public Works, Rochester, N. Y., died at his home in that city, Feb. 19 at sixty-two years of age. Mr. Bastable had been connected with the department for the past fifteen years.

R. F. Ragland, recently discharged from the Army as captain of Engineers, has opened an office in Livingston, Park Co., Mont., where he will engage in a general engineering and contracting business.

George Grupe, formerly superintendent of water-works at Cleburne, Tex., has been appointed city manager of Brownsville, Tex.

Theodore G. Kitchen, city surveyor of Lambertville, N. J., has resigned his position in order to engage in private engineering work.

J. Russell Ellis, recently first assistant engineer, Missouri State Highway Department, has joined the staff of Winston Lee Winters, civil and hydraulic engineer, Fort Smith, Ark., as principal assistant engineer.

H. Eltinge Breed, consulting highway engineer, New York City, has been placed in charge of the courses in highway engineering at the School of Applied Science, New York University. Mr. Breed served several years on road and canal work in New York State, was chief engineer of the Coleman du Pont road in Delaware, and more recently was first deputy highway commissioner of New York State.

Col. F. M. Gunby, formerly associated with Charles T. Main, of Boston, and during the war head of the Engineering Branch of the Construction Division of the Army, has renewed his connection with the above-named firm as engineering manager.

Emory E. Brandow, formerly bridge engineer, New York State Highway Department, has been appointed bridge engineer of the Pennsylvania State Highway Department.

Major Curtis W. Otwell, formerly of the 319th Engineers, U. S. Army, has been transferred from Vicksburg, Miss., to Wheeling, W. Va., where he will be in charge of the local U. S. Engineer office. He succeeds Lieutenant-Colonel George P. Howell, recently assigned to the department of the southeast, with headquarters at Charleston, S. C.

Charles H. Restall, civil engineer in charge of construction for the F. F. Johnsberg Co., Boston, has been appointed chief engineer of the department of streets and engineering of that city.

R. P. Forsberg, formerly assistant engineer, Pittsburgh & Lake Erie

R.R., has been appointed principal assistant engineer of that road, with headquarters at Pittsburgh.

Major John A. Griffin, who was with the 316th Engineers in France, has been elected city engineer by the Board of Public Works of Los Angeles, Cal., to succeed the late A. C. Hansen. In 1903 he joined the staff of the city engineer of Los Angeles, and, except for the period of his service in the Army, has been employed there since that time.

Clifford Richardson, consulting engineer, New York City, will deliver a paper on dust prevention at a congress to be held this month at Monaco.

Colonel Wm. Kelly, formerly with the 117th Engineers, A. E. F., has arrived in San Francisco, where he succeeds Lieutenant-Colonel L. H. Rand in charge of inland waterways, U. S. Engineer Office.

OBITUARY

A. L. Ormay, chief of the illustration department of the McGraw-Hill Co., died in Brooklyn, on March 23. He was born in Kassa, Austria-Hungary, in 1881. In 1907, he entered the drafting department of *Engineering News*, then in charge of Charles W. Reinhardt, where he remained for three years. During that time, although handicapped by lack of knowledge of English, he made such progress that when the late John A. Hill, president of the Hill Publishing Co., decided, in 1910, to install a drafting department for his publications, he asked Mr. Ormay to assume charge of it. When the McGraw and the Hill publishing companies consolidated, in 1917, his responsibility was doubled, and he took charge of the preparation of the line and half-tone illustrations used in the ten McGraw-Hill papers. Mr. Ormay was the originator of what is known as the "Ormay Process," a combination of line work with screen shadings extensively used in making illustrations of machine tools. For the past two and a half years, in addition to his supervision of the McGraw-Hill illustrations, he had taught mechanical drawing at the Mechanics' Institute. Although Mr. Ormay's artistic and executive qualifications had developed to a degree well-recognized by both the readers and staffs of the McGraw-Hill publications, yet his modesty grew apace, and he will remain in the memory of those who knew him as one of the strong, though unpretentious, workers in the upbuilding of the McGraw-Hill Co.

J. B. Davis, professor emeritus of geodesy and surveying at the University of Michigan, died at Bradentown, Fla., on March 10. He went to the university as instructor in engineering in 1872. He was later made assistant professor of engineering, and in 1891 became professor of geodesy and surveying, from which chair he retired, in 1910, as professor emeritus. He was born in Westport, Mass., in 1845.

Irving Marshall Atkinson, recently assistant division engineer of the California State Highway Commission, died, in San Francisco, March 1.

Thomas P. Strack, general contractor, engaged in municipal work in Cincinnati, and other cities in the Middle West, died recently in that city. In his twenty-five years as a contractor Mr. Strack handled numerous large contracts in Cincinnati, Dayton and other cities, among the more noteworthy of which was the building of the Ludlow Avenue viaduct in Cincinnati, the dredging of the Miami and Erie Canal from Miamisburg to Middletown, and the construction of the sewerage system in Cleveland. He was also at one time connected with the State Highway Commissioner's office at Columbus, Ohio.

F. A. Martin, assistant engineer of Shawnee County, Kansas, died, Jan. 29, in Waukesha, Wis., at the age of 32.

Albert Kleinschmidt, a pioneer builder of Helena, Mont., and widely known in that state and Washington as the originator of the irrigation projects of those states, died at Berkeley, Cal., March 3. He was 76 years of age, and a native of Prussia. Mr. Kleinschmidt built the three largest irrigation canals in Montana, and fonded the Yakima project.

BUSINESS NOTES

The F. C. Austin Machinery Co., Chicago, has been incorporated to take over the business of the F. C. Austin Co., and the Municipal Engineering & Contracting Co., of Chicago, and the Linderman Steel & Machine Co., of Muskegon, Mich. It will retain the staffs of both companies and will have a greatly increased capacity for the manufacture of the Austin earth-loading and cement-working machinery. F. C. Austin retires from the active management, and B. A. Linderman assumes full control. The offices will be maintained in the Railway Exchange Bldg., Chicago.

The St. Louis Structural Steel Co, St. Louis, has assumed all of the assets and liabilities of the East St. Louis Bridge Co., East St. Louis, Ill., and all of the equipment of the Structural Steel Co., St. Louis. The plant and equipment of the East St. Louis Bridge Co. will be operated by the new company. George Stupp is chairman, board of directors; L. R. Gifford, vice-president and general manager, and J. G. Stupp, chief engineer.

The Portland Cement Association, Chicago, announces the following changes concerning several of its district engineers: C. N. Reitze, district engineer, Seattle office, appointed district manager, Pacific Coast offices at Seattle, Portland, San Francisco and Los Angeles; A. P. Denton, district engineer, Dallas office, assumes charge of San Francisco office as district engineer; Charles A. Clark appointed district engineer, Dallas office, to succeed Mr. Denton; H. E. Frech assumes charge of St. Louis office as district engineer.

The Dorr Co., engineers, New York City, has organized a sanitary engineering department to handle all matters, including engineering service, pertaining to the treatment of domestic sewage, waste waters of tanneries, glue, gelatine, milk products and corn products factories, cotton, silk and textile dyeing and finishing mills, canneries, brass, steel and rolling mills, paper mills. Colonel I. L. Reeves, C.E., formerly president of Norwich University, and more recently president of the A. E. F. University, in France, has resigned from the army to accept the management of the department. C. Lee Peck, industrial engineer, continues in charge of the research and development work, while R. H. Eagles, also of the Dorr Co. staff, will assume charge of the information and extension division.

Horace D. Kerr, engineer in charge, western technical and western service departments, Atlas Portland Cement Co., New York, has resigned to join the staff of the Nichols-Moore Co., general advertising agents, Cleveland.

James Stewart & Co., Inc., contractors, New York, branch offices Washington, Chicago, St. Louis, Houston and Salt Lake City, have established an office in the Buhl Block, Detroit, Mich., for the handling of construction work covering office buildings, railway buildings, manufacturing plants, grain elevators, heavy masonry, reinforced concrete, dredging and dock works. D. H. Sawyer, manager, Detroit office.

The John T. Scully Foundation Co., Cambridge, Mass., announces that, due to development and scope of the company's business, the corporate name has been changed to The Scully Co. The personnel remains the same.

The Whiting Foundry Equipment Co., Harvey, Ill., announces that, after several years in its estimating and sales departments, C. H. Martin and Gustav Schirmer have been transferred, respectively, to the company's Pittsburgh and Detroit offices, to take up the duties of sales engineers.

A Consolidation of Engineering News and Engineering Record McGraw-Hill Company, Inc.—JAMES H. McGRAW, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN
Editor

Volume 84 NEW YORK, THURSDAY, APRIL 8, 1920 Number 15

Local Legislation on Housing

WE INTIMATED last week, in an editorial advocating the budgeting of construction, that, unless construction industries voluntarily took steps to prevent senseless bidding for labor and materials, there might be compulsory restriction. An indication that this was not unfounded surmise is shown by the passage by the New York State Legislature last week of twelve bills, not, it is true, to regulate construction, but to prevent profiteering by landlords and the imposition by them, through radical rent raises, of hardships upon the community. Several cities in New Jersey have under consideration similar measures. It is but a short step from regulation of existing housing facilities to the regulation of prospective housing. Moreover, any one who gives fair consideration to the seriousness of the housing situation must admit that it has got beyond a matter for purely private consideration and is properly a subject of public concern. The State, whether it will it or not, is forced by its duty to take steps to protect the public. We may fume as much as we wish against public interference, but public interference at times is a public duty.

Incompetence and New York's Port

IT HAS frequently been said that the City of New York has no port policy. In general that is true. The succeeding administrations, of opposing political faiths and varying practices, start afresh every four years on schemes of their own making. Thus we have planned a pier here, a group of piers there, a magnificent dream of a Jamaica Bay one year and some ineffective and unconnected piersheds at Staten Island some years later —all designed and built with a view to the immediate return, political or financial. One idea, however, has been tenaciously held through all other changes: foot by foot additional pier and slip space must be gained from the fairway of the Hudson River. The process has been going on for many years, with a persistence worthy of a better cause. Re-entrant angles are cut off with the claim that no channel damage can be possibly done, and a few years later the angles made by the new lines are in turn flattened out with further inroads into the usable channel. On the plea of imperative commercial necessity and with the absolute promise of early withdrawal, the Federal Government grants permits for temporary pier extensions, only to be met a few years later with demands that the permit be extended in scope and made permanent. There is no use wasting paper in denouncing this encroachment or in pointing out how shortsighted it is even for the city itself, which is only one of the interests concerned with the preservation of the lower Hudson as a waterway. But the revived demand for pier elongation does serve to show how incompetent are the city authorities, and the commercial influences behind them, to plan the future of this national asset, the Port of New York.

"Mistakes Year After Year"

CONCEALED among the illuminating statements of General Goethals on tunnel construction—to which we hope to come back at a later date—there is an incidental remark too interesting to ignore. He speaks of "the same mistakes that have been made year after year in engineering matters in dealing with the transportation of the public in Manhattan and vicinity in that the structures would be taxed to their capacity almost at once upon their completion and going into service." This is a plain charge of lack of foresight. It is impossible to avoid the sting of the charge, for all engineers familiar with New York conditions will concede its substantial truth. Nor is lack of foresight, or perhaps we should say breadth and clearness of vision, confined to transportation. As we have just remarked, the same lack appears in port development and other essential affairs of the country's metropolis. It is much open to question, of course, whether engineers or the public's legislative and political representatives were lacking in foresight. The latter must bear the chief blame, in our opinion. But though this may serve as excuse for the happenings of the past, when the engineering profession notoriously was without influence on public affairs, no such excuse can hold in future. In the more influential position in the world for which engineers are now striving, it will be their responsibility to prevent the continuance of lack of foresight such as that of which General Goethals complains.

Reducing the Black Area

NO BETTER index to the progress of public health and sanitation is afforded than vital statistics. So backward has the United States been in this matter that in tables compiled to show comparative vital statistics for the principal countries of the world the United States has been absent or else such figures as were given have been accompanied by footnotes explaining that they were incomplete. This has been largely due to the fact that each of our commonwealths is a law unto itself as regards vital statistics, with no central control of the matter by the Federal Government. Our Census Bureau serves merely as a compiler for the Government of the United States of such figures for the several states as are sufficiently reliable to be admitted into comparative data. The states and cities so admtted are known as registration and those not yet admitted as non-registraton states. One by one our commonwealths have come into the registration area. The progress has been quite rapid of late, but there still remain 15 states in solid black representing the non-registration area on the map shown on p. 732 of ths issue. Nine others are shown shaded on the map to indicate that death registration only has thus far been attained. In the white area or full registration states 24 states appear—greatly to their credit. The engineer is more directly concerned with death than with birth registration statistics, but for some studies entered upon by sanitary engineers birth statistics are useful. Health officers cannot do their work properly without both. This is an off year for state legislatures. It is none too soon to lay effective plans for increasing the registration area of 1921. Doubtless some of the states need no further legislation to make it possibble for them to gain admission to the registration area. If birth and death registration cannot come together, death registration should come first.

Progress of the Co-operative System

IT IS gratifying to note that another important institution has adopted the co-operative principle in engineering education. Harvard announces that its junior year may henceforth be taken on the co-operative plan. The details differ from the method as applied by Dean Schneider at Cincinnati, notably in that the alternations are by two-month rather than by two-week periods. Gradually the Cincinnati plan is making headway—a progress that has the hearty approval of practitioners.

Stubborn Criticism

IT IS curious to note the stubbornness in some quarters of the criticism of the co-operative system of education. By some it is never discussed in moderation, but always with a certain savagery, as if the proponents of the co-operative plan had personally affronted those who adhere to the usual method. And then there are those who, impressed by the sound features of a co-operative relationship but not ready to introduce it, declare that the idea is applied in their schools because their students do practical work during vacations. The second group, particularly, arouses protest. The attempt to square their traditional policy with a new idea—to camouflage their unwillingness or inability to inaugurate a truly co-operative course, in part at least—deceives no one but themselves. To contend that the unsupervised, uncoordinated work of summer vacations produces the same results as the planned, coordinated industrial work of the co-operative course is evidence of either ignorance or mental blindness.

New York is Progressive

IN THE past the members of the American Society of Civil Engineers have rightfully held New York to be the center of society conservatism. The first clear indication that the majority in District 1 might no longer be ultra-conservative appeared at the Annual Meeting in January, but even then there was doubt. There was present the largest representation, numerically and proportionally, of non-resident members in recent society history; they were not alone sufficient to account for the overwhelming progressive vote, but how the New Yorkers divided was not definitely ascertained. Last week, though, there was an out and out test of sentiment—at the first regular meeting of the New York Section. There were only 100 present out of a section membership of 192 and a district membership of about 1,800. But the gathering seemed representative. There were the older men—the confessed and recognized conservatives—a goodly group of quite young men and a large number of men between the ages of 35 and 45. On a test vote the progressives won, while four out of the five members chosen for the section nominating committee are known to advocate a progressive regime. But the really significant indication followed a brief address by the president of the society, Arthur P. Davis. With no mincing words he criticised the past inactivity of the society, concluding with the statement that those who were responsible for that inactivity were the ones who today are opposing the expansion of the society's work, through a broadening of the Engineering Council idea along the lines proposed in the Joint Conference Committee's report. His conclusion was greeted with thunderous and long-continued applause. It was not courtesy applause, nor did it come from a strenuous minority. It was clearly a full endorsement by a large majority of the president's views. * * * *. We had feared an adverse vote in District 1 on Question 3. We have less fear now. New York *is* progressive. The showing last week will put heart in those New Yorkers who have been indifferent to the society's activities because they had despaired of stirring the conservatives into action.

New York Section's Opportunity

THE New York section of the American Society of Civil Engineers has a remarkable opportunity. It will draw from the largest district in the society, containing about 1,800 members. Its dues are relatively high—five dollars a year. With a reasonable proportion of the eligible members joining, there will be revenue sufficient for a wide variety of activities. New York should become the leading section in the country, but it will realize its opportunity only if the management is progressive, if it have energy, if it will refuse to be tied by the conservative traditions of the past and will attract a large membership and energize it through a broad and active program. Happily, the meeting last week indicated that a majority can be mustered for a progressive management. That obtained, the New York section will not only do credit to itself, but will be of material benefit in setting an example for the society. On top of the ten dollars' extra dues paid to the society itself by so-called "resident" members, the imposition of another five dollars in dues for the New York section will require sacrifice on the part of many. But the sacrifice should be made willingly, for the returns, with a progressive management, will certainly justify the expenditure. Particularly will the fee cause some hesitancy on the part of the young men, and even of those in middle life, but these are just the men whose sacrifices and participation in the work of the New York section will make it really worth while.

Will Rivets Have to Go?

FOR quite a few years various men have dreamed of a transformed art of steel construction, in which there would be no rivet connections but, instead, some other means of joining parts, perhaps welding. No progress toward the realization of such dreams could be discerned until the period of the war, when shipbuilding called for the aid of welding. A committee of experts on such work, formed to aid shipbuilders, unfortunately produced few if any results. Hopes that the problem of making fusion-weld connections to carry definite stresses would be solved were disappointed. An independent attack on the problem, by practical trial, is now being made, as recorded in this issue. Under the circumstances the undertaking is invested with all the interest of pioneering, and the men back of the experiment—for it must be regarded as such—are entitled to praise for their courage and faith. Many difficulties of a metallurgical and practical kind stand in the way of a wholly satisfactory rating of the welding process as concerns reliability of strength, and therefore service data need to be accumulated. Probably the most significant information on this point will come from ship service. In the shipyards fusion welding is already widely used for calking seams, and is being tried out on strength seams, such as those of the shell plating. Because of the many interrelated joints and the constant flux of stress under wave action, a ship's structure can give a much quicker and less hazardous proof test of the jointing method than could be obtained from a building frame or a bridge span. On the questions of economy and increased convenience of construction, however, such trials as that in the Brooklyn building can prove most valuable in outlining the field to which welding properly belongs.

New Labor Thinking

WHEN the American Federation of Labor some months ago issued its so-called "Bill of Rights," we called attention to the new economic note found in several paragraphs. The document, otherwise, was in typical Federation style. That we were right in taking these paragraphs as significant, is shown by the economic program outlined by Mr. Gompers in his statement of March 21. The chief features of the program were given in a news item in our last issue.

Apparently, the day of the loud mouth and the unused brain is to pass, and we are to see here something that will eventually approximate the leadership which has played an important part in English labor circles.

Undoubtedly we may lay this to the war. Gompers and some of his ablest lieutenants were in England during the war, while British labor leaders and labor delegations were here. Our men must have seen the inherently greater strength of the British position, and a broader program was to be expected.

Now we have the program—and it is not to be regarded lightly. Most of the proposals are old; the significance lies in the fact that labor has adopted them. Most of them have what we have been accustomed to describe as a "socialistic flavor." All but two, which aim to protect labor specifically, are socialistic in the general sense that they are aimed to redound to the common welfare as against that of any class. We will not all be in agreement with labor that the proposed measures will, without exception, be of benefit to the public, but the intent is evident.

Some of the proposals are of a nature to cause thoughtful people to do a deal of thinking. For example, while we experience somewhat of a shock at the proposal to supervise Federally the issuance of capital stock of all corporations, one need not have more than average intelligence to realize that such control has some justification. The stock-jobbing that has taken millions from the public and put them into the pockets of clever manipulators is decidedly unpopular. Skillful leadership can easily make corporation-stock control an issue that will attract country-wide attention and extensive support.

It will be more difficult to popularize the plank declaring that control of credit should be a public function, administered in the interest of the community instead of the bankers, but once it begins to sink in, it too can be made a strong and popular issue.

In some quarters there will be grave misgivings over the entry of labor on an economic program. How can labor be expected to think soundly on economics? Is there not certainty that the thinking will be wrong and misleading? Such will be the queries. Without a doubt there will be experiments in economic thought, there will be proposals subversive of what now passes without general challenge. But among intelligent people who are also fairminded we believe a broader thinking will be hailed as a step forward. Certainly the real leaders of the British labor party enjoy a general confidence not shared by labor here. A sounder grasp always makes for saner conclusions.

The Soviets at Work

UNDER the title, "The Soviets at Work," Lenin has recently made a statement that, like some of the statements quoted in Miss Kellor's article in our issue of March 11, should be brought to the attention of every American workingman. It deserves quotation in full:

"The Bolshevists have destroyed capitalism, nationalized industry and formed workers' soviets. But Russia is still far from communism and a socialistic Soviet republic.

"What the Bolshevists have done so far was the easiest part. It was the destructive part. It required only force and decrees. The hardest part is still before them. Bolshevism will fail unless it can rebuild Russian industries and get maximum production.

"This cannot be accomplished under the original plan of Bolshevism. The workers' soviets don't know how to run the factories and keep order. And the workers aren't yet willing to work for the same rate of pay for different kinds of work. The machine worker still wants more than the man with a pick; and the brain worker still wants more than the machine worker. Russia will not have communism until human nature is changed and each man is willing to work for the good of all instead of for personal gain.

"It will take years to change human nature by education and to teach workers to run factories by soviet methods. But in the meantime industry must be recognized and maximum output by both factory and the individual worker maintained.

"The only course before the Bolshevist leaders is to take a step backward from the Soviet state—to return to the old order. They must call in bourgeois experts at large salaries to run the factories. They must adopt the factory methods of capitalistic America.

"And the Bolshevist leaders must go back still further. They must place the workers under iron discipline. They must make the hundreds and thousands of workers in each factory subject to the will of one man—the bourgeois manager. The workers must be compelled to work their hardest."

Thinking men by the thousands have said that with an ideal human family socialism would be a most desirable system. Lenin, the proponent of Russia communism, from the depths of his terrible experience, approves those views. If we could get a knowledge of what is transpiring in Russia into the minds of our loose-thinking elements it would lead them to improve what we have rather than advocate the Russian system —and to court the inevitable Russian chaos.

Topographic Survey of the City of Flint, Michigan

Plane Table Progress 28 Acres per Day, Traverse Three Miles per Day—For Accuracy Test Profiles Plotted from Completed Maps Compared with Profile Made in Field—Area Sixty Square Miles

By C. S. Elicker
ngineer in Charge for R. H. Randall & Co.
Toledo, Ohio

A TOPOGRAPHIC survey of the city of Flint, Mich., has been undertaken on account of the rapid growth of the city, the population of which has been doubled during the past six years by its industrial developments. It has been impracticable to carry out municipal improvements to keep pace with this growth, so that extensive works are now necessary, and as a preliminary to the design of sewerage systems for outlying districts, which are being developed for industrial purposes and some of which extend beyond the city limits, the city authorities decided to have made a topographic map, to be so complete as to form a basis for the planning of other public works. In the making of this topograpical survey the average progress was three miles per day on the traverses and 28 acres per day of topography with the plane table. Trial test profiles formed the basis of the final acceptance of the maps which have been produced in three colors.

FIG. 1. PLANE TABLE PARTY ON TOPOGRAPHIC SURVEY

Ten years ago Flint was an unpretentious city with a population of about 39,000, but its population now is over 100,000 and the city is overflowing with the influx of people required by the growing industries. The spread of the city is being guided according to a well thought out plan, and to the city engineering department falls the execution of a major portion of this city planning. During 1919 about $950,000 was disbursed through this department, which employes 800 men and has only about 10 per cent of its construction work done by contract (see *Engineering News-Record*, March 13, 1919, p. 524). The 1919 program included 18 miles of sewers, 7½ miles of street paving, 15 miles of sidewalk paving, two new bridges, a new asphalt plant and extensive park improvements.

The city's boundaries are being pushed outward to accommodate its rapidly increasing population, a condition which necessitates a large amount of detailed planning, especially in the design of new sewers, interceptors, disposal works and river improvement. In all such municipal works the contour of the ground is a primary consideration, and for this reason modern practice demands a topographical map as a basis for all such planning. The topographic features in and around Flint are such that the selected scale of 1 in. to 200 ft. with a contour interval of one foot will give a map having the widest range of usefulness and providing effectively for street and boulevard layouts, preliminary grading schedules, park developments and sewerage and drainage plans.

The present area of the city will soon be increased to include 30 sq.mi., while the expected area for 1960, as used in planning the sewerage system, is considerably greater. Sewer designing is a drainage area proposition and should not be limited by any established boundaries of a city. It follows that information must be obtained on the drainage above the area to be served. In a few cases, therefore, the mapping will be extended beyond beyond the expected 1960 city limits, so that the area finally to be mapped will approximate 60 sq.mi.

Prior to any field work this area was divided into sections one mile in length and three-quarters of a mile in width to conform to the standard plane table sheet. Upon this layout the traverse and level control were planned to adequately control each section.

Due to the slight amount of relief and the fact that this survey is for the sole purpose of constructing a topographic map, primary traverse of a high order is sufficient for the horizontal control. Accurately measured traverse lines are run over the principal streets and highways to form a network of base lines. Measures of direction are made to 30 sec. of arc and measures of distance to hundredths of a foot.

Points are set and their positions witnessed at intervals averaging 1,000 ft. along the line traversed. The usual length of traversed line for one day with a party of four was three miles. The traverse circuits are computed by latitudes and departures, and the delicate adjustments made according to the varying conditions that govern. From these figures the rectangular coordinate distances for each point in the traverse net are computed.

Representative traverse circuits are shown in Table I, in which the circuit closures represent the work done by an experienced party, using no unusual methods of refinement and progressing at the rate of three miles per day. Traversing is done with a 100-ft. steel tape. Where the slope is more than two feet in a chain length the tape is held horizontal and a plumb bob is used to locate the point. Sights do not exceed 2,500 ft. and are made on the ordinary sighting rod and the edge of a stadia board. Angles are read with an instrument graduated to 80 sec. of arc.

The vertical control is supplied from permanent, precise bench marks that were set prior to this survey and referred to mean sea level datum. As these cover only a small part of the area to be surveyed, level lines are run to the outlying areas and temporary bench marks established. Such precautions are taken as are necessary to obtain a closing error within the limits of $0.05\sqrt{M}$, in which M is the distance between bench marks.

TABLE 1. REPRESENTATIVE TRAVERSE CIRCUITS ON THE SURVEY AT FLINT, MICH.

Diatance Around Circuit, Feet	Error in Latitude	Error in Departure	Error of Closure
31,717.83	1.44	2.64	1:10,550
23,682.10	0.93	0.40	1:23,400
44,695.95	0.84	0.95	1:35,025
29,104.60	0.45	1.48	1:18,825
11,837.20	0.51	0.01	1:23,175
27,478.24	0.85	0.07	1:32,225
27,478.24	0.85	0.07	1:32,225
36,211.05	0.57	1.72	1:19,975
17,260.00	0.14	0.51	1:32,625
16,110.70	0.18	0.62	1:24,950
11,915.35	0.88	0.59	1:20,675
Average	...	..	1:24,150

All mapping is done in the field by the plane table method.

Before any map sheets are taken into the field they have the traverse control plotted and the stations numbered in the office. The topographer is supplied with descriptions of all the traverse stations and bench marks in the section to which he is assigned. A plane table party consists of a topographer, a recorder and one or more rodmen. The rod used is constructed by tacking a flexible rod face, divided into tenths and hundredths of a foot, to a light board 12 ft. long. Fig. 1 shows the equipment of a party at work.

The secondary control for mapping is the graphic traverse run by plane table, stadia and magnetic needle, except where local attraction occurs. In such instances the needle is useless and orientation by backsights is the only alternative. Distances are read by stadia to the nearest foot and rod readings are made to the nearest tenth of a foot on side shots. In the extension of the controlling traverse, elevations are determined to hundredths of a foot. The recorder makes a record of all readings and immediately computes the plotting distance and elevation.

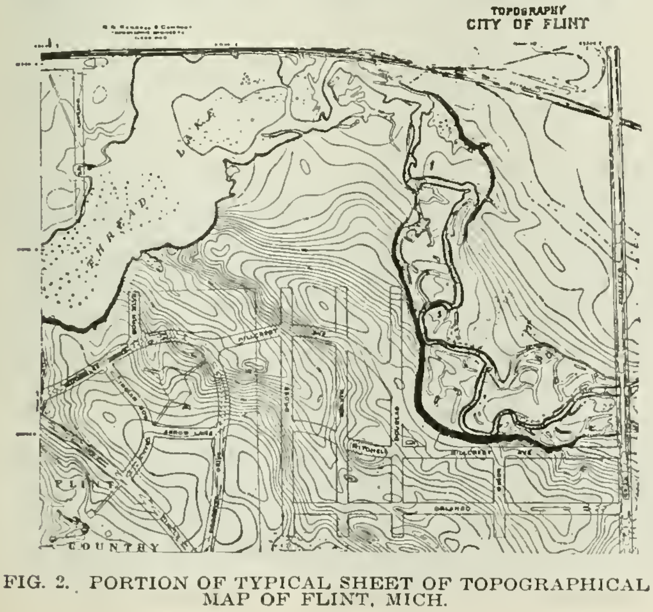
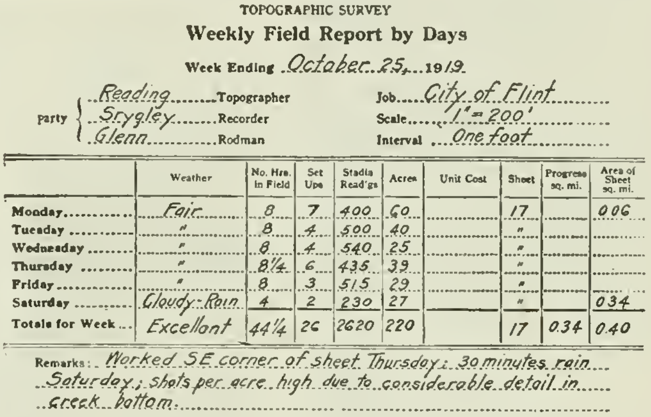


FIG. 2. PORTION OF TYPICAL SHEET OF TOPOGRAPHICAL MAP OF FLINT, MICH.

All streets and highways, public and semi-public buildings, electric and steam railroads are accurately located in addition to the land features. As the contours are sketched by the topographer while he is upon the ground the field map is as complete at any time as the existing information will permit.

Flint is located upon a small river and its topography varies from drift plains to rapidly undulating glacial deposits and a rugged river valley. The topography shown in Fig. 2 is representative of the area mapped to date. This cut is from a photograph of an original 24 x 30 in. sheet with 19.8 x 26.4 in. inside dimensions. An average day's work of mapping topography of this nature amounted to 28 acres.

To control the sketch of an acre of topography an average of 123 ft. of plane table traverse and ten locations was used. The average length of sight on this traverse was 400 ft. The closing errors in elevation averaged 0.04 ft., and the error of position easily falls within the maximum allowable of two feet for the first 1,000 ft. traversed and one foot for each additional thousand feet.



TOPOGRAPHIC SURVEY

Weekly Field Report by Days

Week Ending October 25, 1919

Party { Reading Topographer
Srygley Recorder
Glenn Rodman }

Job City of Flint
Scale 1" = 200'
Interval One foot

	Weather	No. Hrs. in Field	Set Ups	Stadia Read'gs	Acres	Unit Cost	Sheet	Progress sq. mi.	Area of Sheet sq. mi.
Monday	Fair	8	7	400	60		17		0.06
Tuesday	"	8	4	500	40		"		
Wednesday	"	8	4	540	25		"		
Thursday	"	8¼	6	435	39		"		
Friday	"	8	3	515	29		"		
Saturday	Cloudy-Rain	4	2	230	27		"		0.34
Totals for Week	Excellent	44¼	26	2620	220		17	0.34	0.40

Remarks: Worked SE corner of sheet Thursday; 30 minutes rain Saturday; shots per acre high due to considerable detail in creek bottom.

FIG. 3. FORM OF REPORT OF SURVEY PARTY

The recorder of each party keeps a daily record of the hours worked in the field, the number of set-ups, the number of stadia readings and the acres mapped. These daily records are assembled into a weekly report similar to that shown in Fig. 3, the size of sheet being 6 x 4 in.

Before any drafting in ink is done, the sheet is subjected to a careful verification of block dimensions and street widths placed on the field sheet by comparison with the dimensions shown on the original recorded plats. Any material difference is decided by a second observation on the ground.

For purposes of legibility each class of cartographic features is shown by a special color. The surface relief is done in brown, the culture and lettering in black and the hydrography in blue. After all lines have been traced in their proper colors and suitable lettering supplied, the sheet is thoroughly inspected for any errors of interpretation that may have occured during the process of inking.

The survey has not progressed sufficiently as yet to permit of the reproduction of any map sheets. However, as soon as the original sheets are completed, reproduction in quantity will follow. This is to be effected by engraving the hypsographic, hydrographic and cultural features upon separate plates of stone or metal. From these plates prints are made in three colors. This method provides a copy fully as accurate and intelligible as the original and easier to work from. Such reproductions of the original secure for the maps a wider field of usefulness and provide against possible loss of any part of the survey.

After every precaution is exercised to insure a map that is as accurate as the scale will permit, no measure of its accuracy can be obtained other than by trial. This is best done by test profiles. A satisfactory result by this method is the condition to the acceptance of any field sheet as complete. The resultant profile of such a test for accuracy, applied to the sheet reproduced in Fig. 2, is shown in Fig. 4, together with a portion of the sheet over which the profile was run.

The profile was obtained by running plane table stadia traverse by magnetic needle orientation, starting from and closing upon the primary traverse as a base. Rod readings were taken at every change of grade along the line of sight, and at every opportunity, turning points that were set in the operation of mapping were made a part of the profile circuit. The circuit, 6,423 ft. in length, was plotted to a scale of one inch to 200 feet. The closing error of position measured less than three feet. Elevations carried throughout the circuit by level, top and bottom thread and angle readings showed an error of 0.17 ft. in closing.

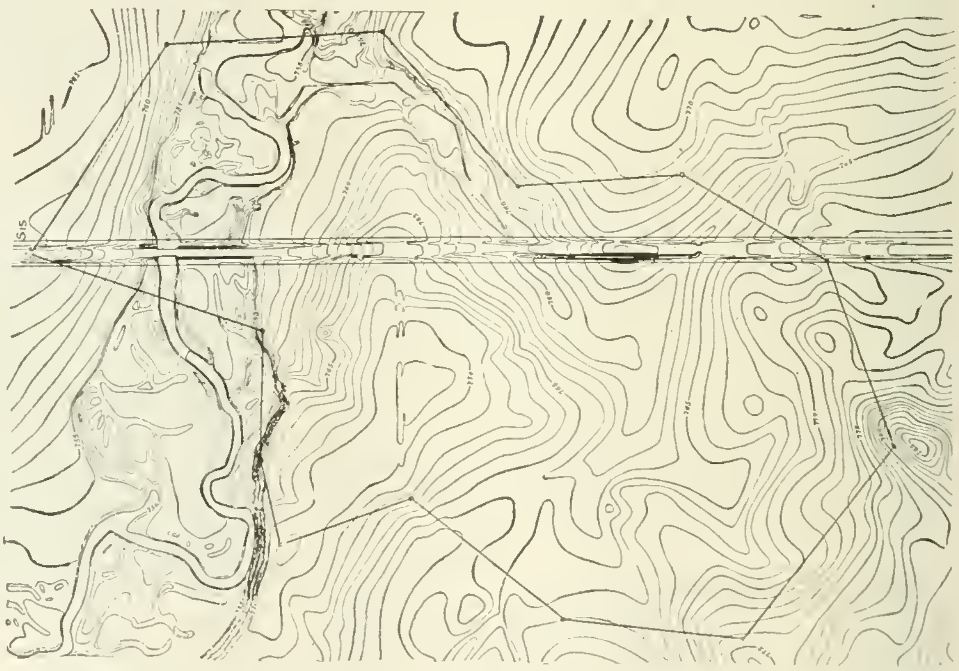
After carefully adjusting these errors among the points of the circuit the probable error of any one point was easily less than the accuracy required for test purposes. The test profile was transferred to correct position upon the topographic map sheet and a second profile secured from the contour crossings. With the two profiles superimposed upon a large scale of one inch to 100 feet horizontal and one inch to four feet vertical there was an excellent opportunity for study and comparison. The areas of the sections formed by the crossing and recrossing of the contour profile over the test profile give a measurement of the topographer's sketching consistency and the accuracy of the resulting map.

In the topographical maps accompanying this article it has been impossible, because of space limitations, to reproduce the full sheets. Enough is given, however, to indicate the general character of the Flint maps.

TABLE 11. ACCURACY OF TOPOGRAPHIC SURVEYS
(Comparative study based upon test profiles)

	Dayton	Jackson	Flint
Length of test profile	3,162 feet	3,150 feet	6,423 feet
Number of test points	50	52	130
Extreme relief	51 feet	38 feet	30 feet
Total plus areas	591 sq.ft.	1,048 sq.ft.	896 sq.ft.
Total minus areas	1,002 sq.ft.	628 sq.ft.	792 sq.ft.
Average uncompensated area	0.134 sq.ft.	0.188 sq.ft.	0.016 sq.ft.
Average error of each test point	0.55 feet	0.53 feet	0.26 feet
Test points that disagree with contours: By more than 0.5 feet	35%	37%	22%
By more than 1.0 foot	15%	11%	0.03%
By more than 1.5 feet	7%	4%	None

NOTE—Scale of map in each of the above surveys is 1 in 2,400, with a contour frequency of one foot. The results for the Dayton and Jackson surveys are obtained from a number of tests. Only one test profile on the Flint survey was available when this table was prepared.



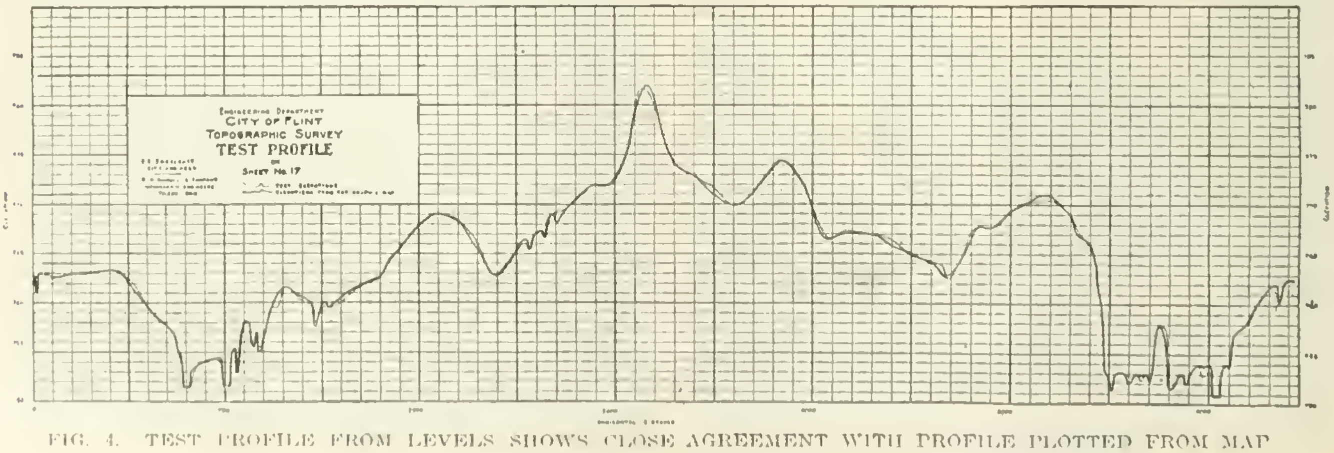


FIG. 4. TEST PROFILE FROM LEVELS SHOWS CLOSE AGREEMENT WITH PROFILE PLOTTED FROM MAP

How Lower Highway Building Costs?

By R. G. Collins, Jr.
Contracting Engineer, Baltimore, Md.

THE construction of highways with the greatest speed possible is admittedly an economic necessity. In view of the enormous mileage required in the United States and the great expenditure involved, consideration should be given to any possibility of lowering the cost of construction. Under the present abnormal conditions there is no excuse for failure, on the part of those charged by the public with the business of building these highways, to take advantage of every means of lowering the cost of construction and minimizing prevailing abnormal increases.

The reasons for the increased prices now being bid by contractors for highway construction are not at all hard to find; they are simply the result of the present system of contracts, which saddles upon the contractor the cost of every uncertainty which may arise though few of them are within his control or power to measure. He is merely waking up to the possibilities and trying to protect himself against not only loss of compensation for his own time and investment, but actual loss of money as well.

I believe that a study of the factors which go to make up a contractor's cost will show not only that he is not making unreasonable bids, but that it is comparatively simple to eliminate much of the uncertainty against which he bids, thus directly lowering the cost to the public of building the highways. The factors referred to are:

(1), Cost of materials; (2), payroll expense in actually supervising and performing the work; (3), investment in machinery; (4), expense of moving machinery to the site of the work and from it; (5), expense in maintaining machinery; (6), charging off a certain amount each year to pay for its depreciation; (7), cost of bond, compensation and public insurance; (8), loss of small tools; (9), supplies such as coal, gasoline, oil, etc.; (10), securing, maintaining and housing labor; (11), cost of sidings, trestle and temporary buildings or sheds; (12), general expense; (13), main office expenses; (14), interest on money required to operate the contract. These items are all tangible and can be measured with a considerable degree of accuracy when the contractor makes up his bid. He can also, to a great degree, control the expenditure under each head during the life of the contract.

Then comes the question, as to how much time he will lose between the time of finishing one contract and securing and starting another, during which he must carry his plant charges and a large portion of his specially trained organization. It is not merely the interest charge, etc., which is involved but the fact that his plant is not producing during this lost time. He really has no assurance that, having made an investment of thousands of dollars in machinery for a contract, he will ever get another contract.

Long-Life Contracts Needed

But if a contractor can see two to three years' work ahead of him in one section of a state, he can bid very much lower than if he has but one year's work in prospect and if, in addition, he does not have to take the gamble on increases in freight rates and costs of materials. If the state lets 1-yr. contracts it has to pay for these rises anyway and if it saddles them on the contractor to get the obvious advantages of letting work in 2- or 3-year sections it must and should pay them; and as no one knows what they may amount to it must pay enough so that the contractor will be safe no matter what they amount to when they come.

Therefore, if the public wants to lower the cost of highway construction to a degree that in a 3-yr. program will be almost unbelievable, let the contracts wherever possible in such amounts that a contracting organization will have from two to three years' work assured. There will always be enough contracts of necessarily small sizes to furnish work for the smaller contractors. Have the contractor, when he is awarded the contract, furnish a schedule of material and freight rates, on which he is basing his bids, the state checking these to see that they are really the market prices at the time, and then have the state stand any increases in such costs and get the benefit of any reductions—the contractor buying his materials, but the state to have access to invoices when a change in cost occurs.

Before allowing a contractor to bid on such sections, he should be required to show his experience in highway building, his financial backing, and his equipment on hand or just where he can secure such equipment promptly. This is necesary before he can be called "responsible," as required by law. In fairness to the contractor, the test should be applied before he goes to the trouble and expense of bidding, not afterward.

Do not let a contract to a contractor who qualifies as above, if his bid be *too* low, even though he may be able to secure a bond, because the public will pay in the end when a contractor has a losing job. In determining whether a bid is too low, the average of the bids received is almost always a fair measure of what the work is worth, with profit to the contractor, and a bid more than 10 per cent under this average is pretty sure to be below the actual cost of doing the work without profit. This is another test of his "responsibility."

Give Contractor Square Deal

Consider the contractor as honest and well intentioned and human, until he shows himself otherwise; if it be found that he cannot be dealt with on that basis, as H. G. Shirley said at the Road Builders' convention in Louisville recently, kick him out and brand him as dishonest. Do not try to get the contractor to do something without profit—it is expensive to the public in the end.

Cut out some of the fads, such as the cylinder or cone test for determining whether concrete is too wet or not. What does the average inexperienced engineer or inspector know about the interpretation of such a test!

Don't leave anything to the interpretation of the field engineer or inspector, who is usually conscientious but inexperienced, which may put him in a position to delay and harass the contractor by an unreasonable and generally incorrect interpretation.

Let the state make prompt allowance on the monthly estimates for the cost of aggregate material and of unloading and piling it as received at the site, permitting the contractor to accumulate large stock-piles at fixed points along the projected work. This will also permit the producer of the aggregates to work more efficiently and therefore more economically.

Let the state limit the amount of money retained to a reasonable amount, and as soon as sections of highway are completed and turned over for public use make a final estimate on that section. This will lower the cost of financing the work.

Eliminate from the specifications while common labor is so scarce and expensive as much of the hand labor in sloping and ditching as is possible.

Assure the contractor that the state engineer will not be unreasonably technical in interpreting such items of the specifications as require interpretation by him.

In short, establish and insist on a co-operative basis as between the engineering and the contracting organizations; by this I mean require it from the contractor's organization as well as toward it.

At the recent meeting of highway contractors at the annual meeting of the Associated General Contractors in Chicago, it was apparent that the contractors are trying to cover each and every one of the above items in their bids, and as each and every one of them cost them money why should they not charge for them?

Therefore, if the public wants cheaper highways, without sacrificing the type of construction, suppose we give some consideration to the facts in the case and get started on a business basis?

Operation of Trains as Affected By New Wage Schedules

Will It Be Economical To Operate Heavy Freight Trains as at Present or To Run Lighter and Faster Trains?

(Abstract of Committee Report, American Railway Engineering Association)

WHETHER railway improvement plans and operating methods will or will not be affected by changed operating conditions resulting from the new wage scale of train crews is a matter on which conflicting opinions exist in the American Railway Engineering Association's committee on railway location. That radical changes will be made in methods of handling freight in lighter and faster trains and in providing additional running tracks rather than reduced grades was the opinion expressed in the majority report of the committee, reviewed in *Engineering News-Record* of March 25, p. 602.

In a subsequent minority report by one member of the committee the above opinion is combated, on the ground that it magnifies the importance of speed and minimizes the importance of tonnage and grades. It is pointed out that three years ago the railways contended that even with an eight-hour day and 1½-time pay for overtime it would be economical to continue present methods of operation. In other words it would be better to handle freight traffic in the enormously heavy but slow trains now operated rather than to increase speed by such expedients as reducing train loads, increasing track facilities or increasing power.

That marked reductions in train loads will not be necessary to meet the new wage conditions is the opinion also of G. D. Brooke, superintendent of transportation of the Baltimore & Ohio R.R., as expressed in a paper appended to the report of the same association's committee on economics of railway operation.

It is pointed out that different conditions affect the speed of different classes of freight trains. The speed of quick dispatch or preference trains is governed by the traffic or service conditions. Local or way freight trains and other trains having a great deal of switching and other work at stations have to move rapidly between stations in order to maintain schedules and to prevent the total time on the road from becoming excessive. In reducing the hours of service of the crews of such trains it is necessary to deal with other features of operation than the speed between stations.

With slow or high tonnage freight trains the time of moving on the road forms a large percentage of the total time, and the speed of the trains has an important bearing on the tonnage hauled and consequently on the cost per ton mile of the transportation. The speed of such trains in ascending the ruling grades of the engine district is a governing factor in fixing the tonnage rating of the engine. Conversely, the tonnage rating assigned to the engine governs the speed of the train on the ruling grade. And the speed on the ruling grade determines to a greater or less extent, depending on the number or lengths of ruling grades, the average speed of the train over the district and the number of hours required to make the run.

Mr. Brooke states that while conditions on engine districts vary widely, the principles involved will be the same. By small reductions of the train load on the ruling grade trains will be enabled to start more quickly; sidings can be entered and left more promptly; the engine and train crew will have more confidence in their ability to move with precision and will be better able to take advantage of any situation to advance the movement when opposing or following trains are involved.

On the other hand, high speeds on ruling grades will require such reductions in trainload that the number of trains will be greatly increased, with resulting interference. Aggregate train hours required to handle the tonnage will remain high and the cost per ton mile will be increased.

For these reasons Mr. Brooke advocates small reductions in tonnage rating where any are necessary, while he considers that proposals for large reductions in trainload should be scrutinized with care and adopted only after exhaustive study permits of a positive conclusion that they are warranted.

Resistance of Greenheart to Marine Borers

Greenheart timbers placed in the Gulf of Mexico six years ago in waters infested with pholas, xylotra and limnoria were recently examined to determine the extent of injury by these marine borers. Limoria attached slightly one specimen on the sapwood. Xylotra did not gain entrance, but all timbers were severely attacked by pholas. The surfaces were covered with burrows from ¾ to ½ in. deep. How far the burrows will extend with continued exposure remains to be seen, but the experts of the Forest Products Laboratories, who placed the specimens, do not expect they will extend beyond 2 in. Pholas have not been found to bore very deep in wood. Piles of greenheart should be made large enough to allow for a reduction in size of pholas attack.

Other information which has been collected by the laboratory in various localities is given in an article by A. K. Armstrong in *Engineering Record*, Feb. 5, 1916, p. 180.

Add Interior Braces and Stirrups to Concrete Tankers

Weaknesses Revealed by Test of Government Ships Corrected by Strengthening Hull After Concrete Had Been Placed—New Struts Added to Permit Center Docking—Eight Ships Affected

CERTAIN structural weaknesses, discovered in tests and confirmed by analytical computations, have led to some changes in the framing of the 7,500-ton concrete oil tankers now being built in four yards by the United States Shipping Board. The corrections are mainly by way of adding more shear steel in the outer main frames, though at the same time additional interior bracing is being placed in order to make possible the docking of the ships on the center keelson, a load condition for which they were not originally designed. The work has been going on for some months and is now nearly complete. It is interesting from more than a shipbuilding viewpoint because of the possibility of the extension of the method of strengthening to any reinforced-concrete structure.

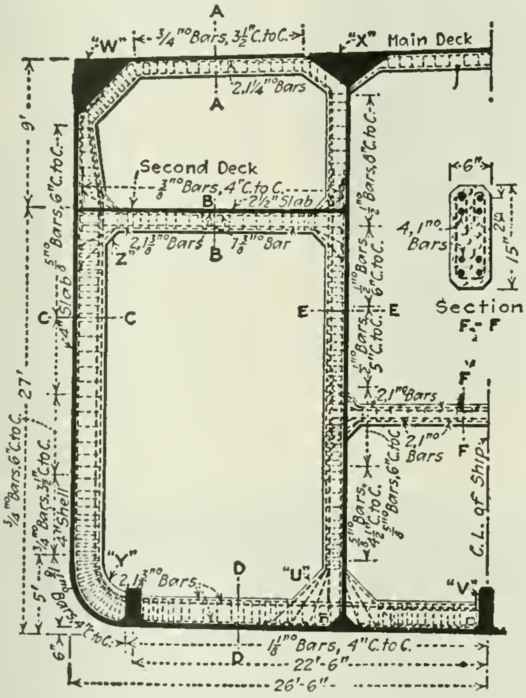


FIG. 1. CROSS-SECTION OF 7,500 TANKER AS ORIGINALLY DESIGNED

Reproduced from *Engineering News-Record*, Nov. 28, 1918

The government concrete oil tanker was designed in the Concrete Ship Section of the Emergency Fleet Corporation in the summer of 1918, and work was started on the two tankers in each of the four government yards, at Oakland, Cal.; San Diego, Cal.; Mobile, Ala., and Jacksonville, Fla. The original contracts called for ten of the tankers, but this was subsequently reduced to the eight noted. Work progressed on the vessels favorably and on May 29, 1919, one of them, at Oakland, was launched. Soon after, some of the tanks were tested under hydraulic head, with a resulting failure in three tanks. Following this a complete restudy of the design was made, with special reference to the conditions of construction as recorded in photographs or in the memory of those connected with the ship. As a result the revisions and repairs now being made were decided upon. Inasmuch as all of the hulls had by this time been completed, it was necessary to repeat the revisions on all of the remaining seven ships, as well as on the one in which the original failure occurred.

The 7,500-ton oil tanker is the largest concrete vessel ever attempted. It is 420 ft. long between perpendiculars, with a length overall of 434 ft. 3 in.; its molded depth at the side is 36 ft., its beam 54 ft., and its design loaded draft, 26 ft. Simplified ship lines are used in the design of the hull. About 50 per cent of the midlength of the boat is practically rectangular in section, the only divergence from rectangularity being the 6-in. dead rise, the 10-in. deck camber, and the circular bilge curve. A typical section is shown in Fig. 1.

Except for the boiler-room space amidships the hull is divided by cross bulkheads about every 30 ft. and two longitudinal bulkheads about on the third point into oil tanks, and in addition fore and aft bulkheads form peak tanks at bow and stern. The main frames are spaced every 4 ft. 3 in. and with decks, shell and bulkhead slabs form a monolithic structure as the typical section shows. A cross-brace holds the two longitudinal bulkheads at about one-third their height on the line of the frame and an intermediate deck separates the outer line of tanks into the summer and deep tanks. For longitudinal bracing there are two bilge keelsons and one center keelson, together with four longitudinal deck beams as shown.

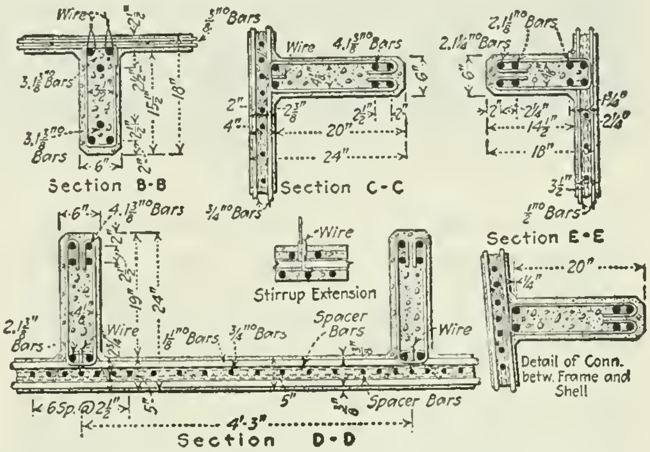


FIG. 2. FACSIMILE REPRODUCTION OF THE SHELL AND SLAB DETAIL CONNECTION AS DESIGNED

It was the practice of the Concrete Ship Section to design the reinforcement for the ships in the head office at Philadelphia, but to permit each of the yards to alter or revise these details as they saw fit provided the general principles laid down in the original drawing was adhered to. To guarantee this all prospective revisions of detail had to be approved in the home office. In consequence of this practice details of reinforcement differed in the four yards and all differed in some respects from the original design, which was outlined in *Engineering News-Record*, Nov. 28, 1918, p. 986. In general, however, the difficulties in the design were involved in the original design of the frames and their connection to the shell or bulkhead slabs. These difficulties are reflected in insufficient or improperly placed stirrups in the frames.

It was the original intention in the design of the tanker to prefabricate the main frame steel, which was made up of 1⅜-in. rods in the original design, with four such rods at the free side and two rods at the shell or slab side of the frame. Both on the ground of economy and speed of erection it was decided not to attempt to thread these large rods singly into the frame fabric, but to make them up outside the ship and to swing them complete into place, a practice being successfully followed at that time on some of the smaller concrete barges. This decision, however, made necessary the peculiar frame and slab connection detail shown in Fig. 2. While this particular detail is the connection between frame and side shell, it is repeated in different sizes and arrangement in all parts of the ship where a frame and a slab come together. In this detail the frame steel, consisting of four inner and two outer longitudinal rods circled by a stirrup, is quite independent of the shell with which it has concrete attachment; in fact the outer two bars are on the frame side of the shell and about at the neutral axis of the frame and shell if they acted as a T-beam. In order to make some connections there is shown a secondary stirrup hook looping over the frame bars and underneath the outer row of shell steel. This hook was shown in the details of the bottom and side shell, but not in the deck detail where the normal load comes on the slab down onto the beam, as in a floor, but where under some conditions of tank loading there would be an upward pressure tending to force the deck slab away from the beam. In the bulkhead frame it was evidently not considered possible to pre-fabricate the frame for here the longitudinal frame steel nearest the slab is shown inside the slab steel.

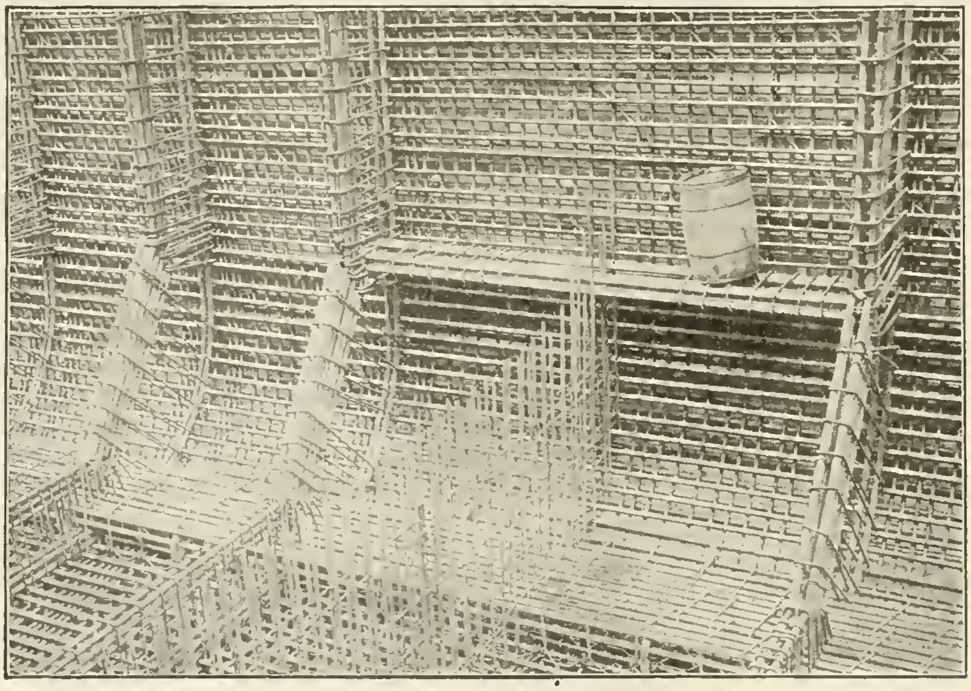


FIG. 3. FRAME AND SHELL STEEL IN PLACE IN TANKER AT SAN DIEGO YARD

In construction, this detail was soon found impracticable. In fact no pre-fabrication of complete frames was attempted. Furthermore, in most instances the weakness in the detail connection between slab and beam was recognized and a detail was placed which corrected the weakness. It was not possible, however, to thread the heavy longitudinal frame steel, although in some yards this had been changed to three 1-in. rods instead of the two 1⅜-in. rods. In consequence the tie or connection between the frame and slab steel consisted in extending the stirrups around some of the shell steel as shown in one of the typical methods in Fig. 3.

The location of this steel and its sufficiency became serious matters after the blowout of the tank in the San Francisco tests. Two failures occurred here in the first ship, one in the forepeak tank outer shell, the other in an intermediate oil tank inside bulkhead. The former was under a head 2½ ft. above the main deck, the latter under a head of 33 ft. above the bottom of the ship. In both cases the shell or slab was pushed away from the frame in a progressive failure which extended over several frames.

Investigation showed that at the forepeak tanks the frame steel was free from the shell steel, as shown in the design details, but that the small hook shown in those details was not included. In fact, so far as can be found out such a hook was never used in any of the ships any place. In addition to this, however, it was found after the forepeak tank failure that there were no stirrups either shown on drawings or placed in the structure connecting the frame to the shell at the intersection of a crossbrace beam with the frame. This apparently was an oversight in design which was not corrected in construction. In the mid tank which failed apparently the stirrup connection to slab steel was inadequate.

Investigation showed, therefore, that under the outward pressure of the tank's hydraulic load there was nothing to resist the pushing off of the shell from the frame but the tension of the concrete at the head of the frame. The stresses here are somewhat indeterminate, but it has been figured that the unit tension in the concrete across this frame head was about 150 lb. per square inch. Tests on the concrete in the ship gave breaking tension of about 400 lb. per square inch. It should be noted, however, that if one part of the concrete fell below the breaking unit stress and failure occurred there, load and stress conditions would immediately become unbalanced and a continuation of the break might readily take place. This failure led to a complete study of the design and construction of the tanker, and in addition to an investigation of the shear resisting provision in the frames. After a thorough investigation, which was hampered somewhat by the absence from the files of the Concrete Ship Section of certain fundamentals of the design, it was decided that the original and designing analysis of shear in the frames must have been made for loads of less intensity than those for which the ship was tested or which, at this later date at least, it was decided should be governing. A new analysis was made on two new basic assumptions; the first, which is the underwriters test load, was for a hydraulic head of water in the tanks of 8 ft. above the deck, with the ship on the ways; the second, a working load, was for the tanks full of oil and the ships in 12 ft. of water. The former was based on tension in the steel of 24,000 lb. per square inch with correspondingly high figures in other stresses; the latter on design stresses, that is 16,000 ft. per square inch in steel, etc. The new analysis showed that in the frame stirrups as detailed the governing stresses of the alternative loads were much greater than safety permitted. Meanwhile a similar forepeak tank test had been started on the other ship at the Oakland yard, with practically the same results which had taken place in the first test. It was decided that in order to bring the stresses down to a safe limit immediate revision of the structural frame of all the tankers be undertaken.

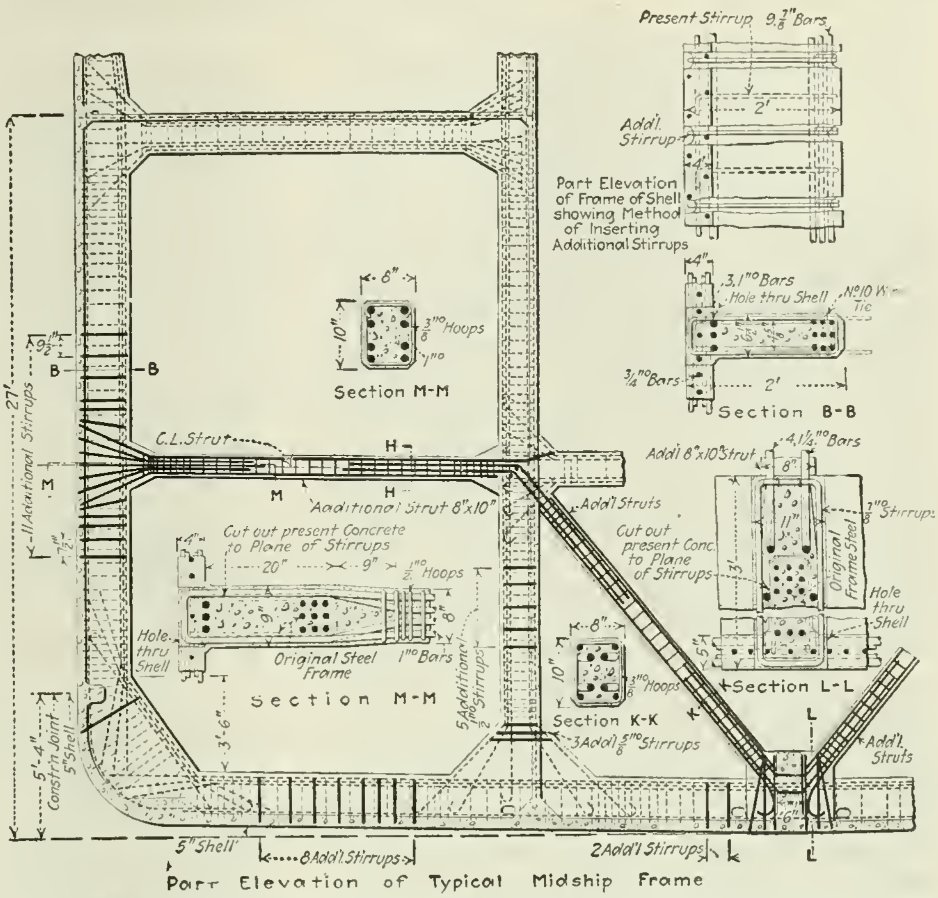


FIG. 4. METHOD OF CORRECTING FRAME OF THE CONCRETE OIL TANKERS AS ADOPTED AT OAKLAND YARD, EMERGENCY FLEET CORPORATION

General method of making these corrections were prescribed by Emergency Fleet Corporation's home office at Philadelphia, but the details were made for each yard at the yard's designing office.

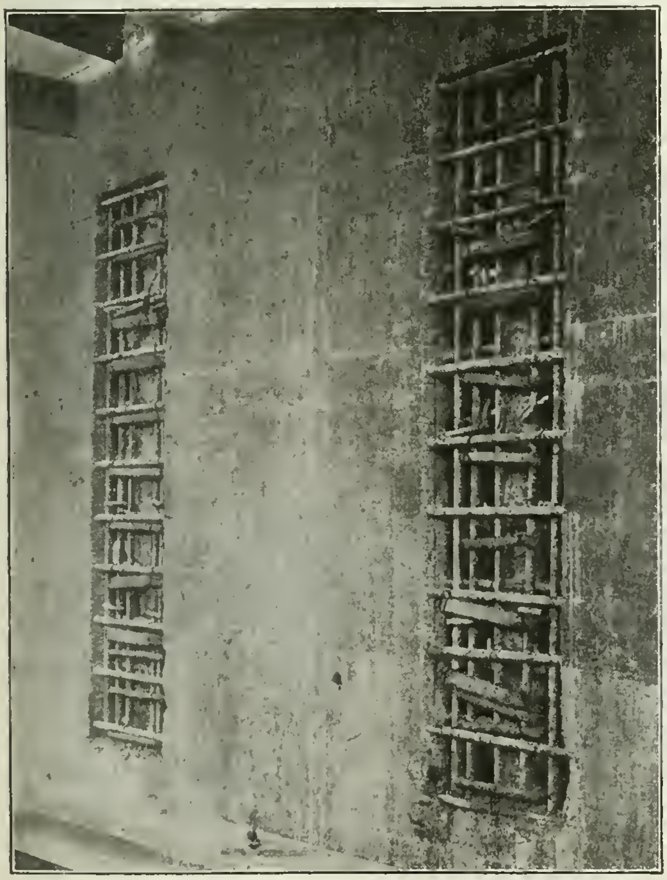


FIG. 5. CUTS OPPOSITE EACH FRAME AT NEW MID BRACE IN SHELL OF CONCRETE OIL TANKER

In brief, these revisions consist of the insertion in each side tank opposite the center tank brace of an extra brace which could cut down the span length of the side frame and thus reduce the shear everywhere, except on each side of the brace. The extra shear here is to be taken care of by placing extra stirrups, in the method described hereinafter, but in addition a sufficient number of new stirrups are placed along the frames and bulkhead beams so as to provide full resistance to the new shear stresses as figured for the full test load of the latest investigation. This latter meant that the actual shear rod distribution had to be gone over in the light of the new shear stress diagram and wherever deficiencies of steel were found an additional stirrup is placed.

In determining upon the location of these new stirrups photographs of the existing work were used extensively. These photographs have been taken in each of the yards in great profusion, so that the location of practically all of the steel in the shell could be ascertained by study of such photographs as the one shown in Fig. 3. In the cases where the frame steel could not be located by photographs, record plans or by the memory of the men in charge of the work, cuts were made into the concrete along the edges of the frames to locate stirrups.

Further repairs were also made in the way of provision for center keelson docking. Naval design, which governed in the early days of the Concrete Ship Section, provides that ships are to be supported in docks by blocking under the longitudinal bulkheads and each ship is furnished with a docking diagram which is followed to keep docking stresses within safe limits. It is a fact, however, that most floating dry docks will not take heavy concentrated loads off the center line on account of the arrangement of their underframing. Nevertheless floating docks must be used for most merchant ships, such as the oil tankers, which as designed cannot be docked safely under the center keelson. To remedy this defect, then, the diagonal struts shown in Fig. 4 rising from the center keelson were added at every frame of the hull of the tanker. These struts merely serve to transmit docking stresses up into the bulkhead frames and are not required for any other purpose.

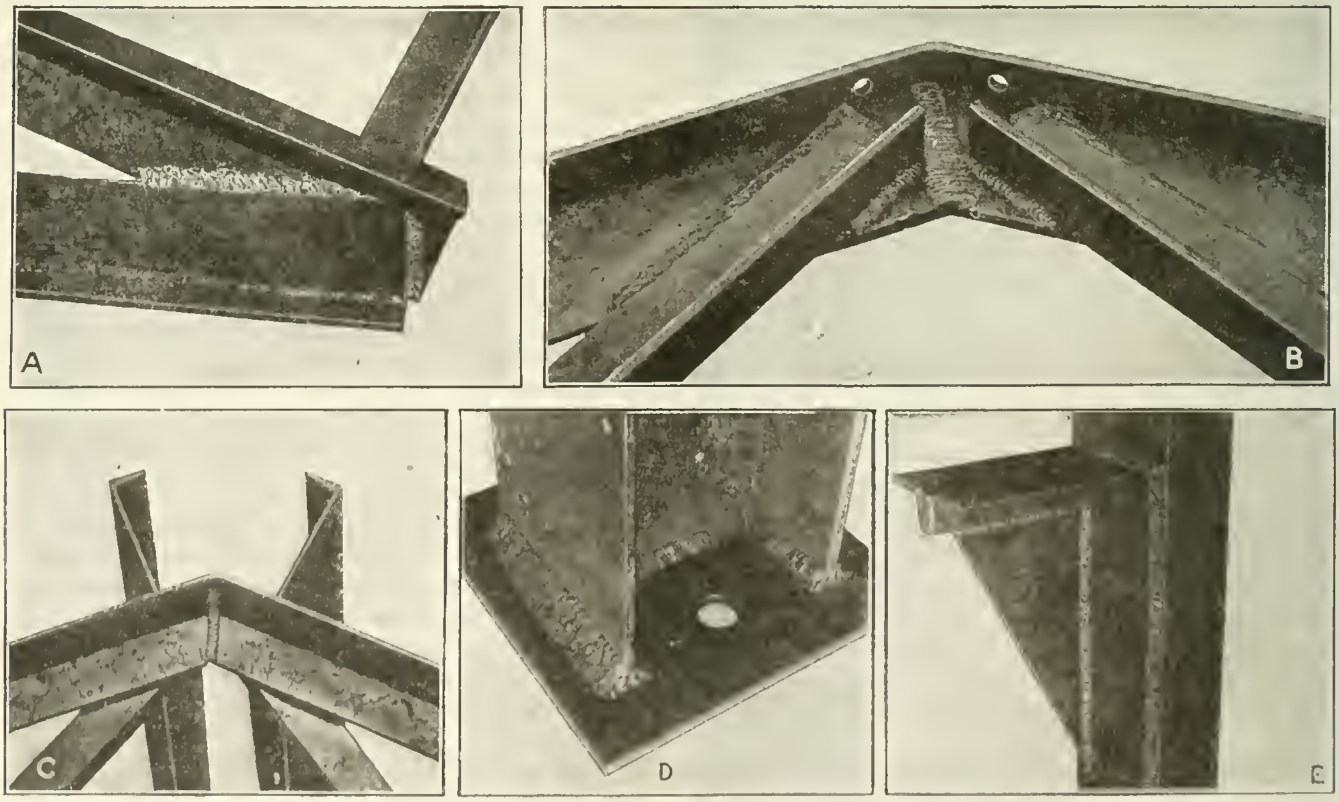
The new construction, therefore, consisted in pouring new braces in struts as shown, joining such members integrally to the existing concrete and placing new stirrups as required. The difficult and novel feature is the juncture of the new to the old concrete. In the case of the new stirrups this was done by first cutting with an air chisel in the frame a channel wide enough to carry the ½-in. stirrup and deep enough to reach down to the embedded longitudinal frame steel. Then a hole was cut in the shell or slab and a channel cut deep enough to insure complete embedment of the stirrup. The stirrup bent in a U was then inserted through the hole of the shell and its end, protruding beyond the end of the frame, heated by a torch and bent down and wired tight around the frame steel. The groove and hole were then filled tight with concrete mortar applied with the cement gun.

The juncture of the new crossbrace of the shell was made in the same general manner. As shown in Fig. 4, this joint is strengthened by fanning out the main rods of the brace to tie into the vertical steel of the shell. In one of the yards at each frame a clean cut was made in the shell concrete, as shown in Fig. 5, exposing all of the shell steel opposite the frame. The heavy horizontal rods hooking over the vertical rods are for the reinforcement of the new crossbrace shown in Fig. 4. Vertical rods shown in the view were designed to be spaced 2½ in. center to center. The new brace reinforcement was hooked around this steel and extended back into the forms for the brace. Concrete was then poured against forms placed flat against the opening. The shells and slabs which failed under test are being completely replaced, with additional steel to insure the tying of the slab to the frame. Concrete is removed well back of the line of visible fracture and the replaced concrete poured inside forms, just as was the original structure.

In other yards holes were drilled through the shell and the new rods run through in the same manner as for the additional stirrups, there being no large opening cut as in the view in Fig. 5.

Electrically Welded Mill Building Under Erection in Brooklyn

Following a successful load test carried out two weeks ago under the supervision of the Department of Buildings of Borough of Brooklyn, New York City, a small mill building in which all parts of the steelwork are welded with the electric arc instead of being riveted, is being erected in Brooklyn for the Electric Welding Co. of America, by T. Leonard MacBean, engineer and contractor. The structure is about 60 x 40 ft., and has four roof trusses of 40-ft. span supported on 8-in. H-beam columns fitted with brackets for a five-ton traveling crane. In its general arrangement the structure follows regular practice, but the detailing is such



CLOSE-UP VIEWS OF DETAILS IN ALL WELDED MILL BUILDING

A—Heel joint of 40-ft. truss. B and C—Peak joint of truss, front and back sides. D—Colum base. E—Crane bracket, made by first welding parts togther and later welding complete bracket to column.

as to suit the use of welding, and all connections throughout are made by this process. A considerable advantage in cost and time is claimed for the welded connections, but in the present instance the determinative feature was not cost economy so much as the fact that the fabricated work could be obtained more quickly by buying the plain steel members and cutting and welding them at the site instead of waiting for bridge shop deliveries.

The roof was designed for a total load of 45 lb. per sq.ft., of which about 30 lb. represents live load. Each truss weighs 1,400 lb. The chords are 4 x 5 x $\frac{3}{8}$-in. tees, while the web members are single 3 x 2 x $\frac{3}{8}$-in. angles. On the trusses rest 10-in. 15-lb. channel purlins spanning the 20-ft. width of bay. The columns are 8 x 8-in. H-beams, 19 ft. high, and the crane bracket on the inner face of the column is build up of a pair of rear connection angles, a pair of girder seat angles, and a triangular web plate, as one of the views herewith shows. Base and cap of the columns are made by simple plates.

All material was received on the job cut to length. A wooden platform large enough to take a whole truss was built as a working floor, the the chord members were laid down on it in proper relative position to form a truss when connected. The top chord was made of a single length of tee, bent at the peak point after a triangular piece was cut out of the stem. At the heel points of the truss the stem of the top-chord tee was lapped past the stem of the bottom chord tee, and when the two members were clamped together the contact seams were welded; the seam of the stem at the peak was also welded shut. Then the web members were placed in position and clamped, and their connections to the chord welded. All this welding was done with the usual steel-wire electrode passed slowly along the seam to be welded, depositing there sufficient metal to fuse with the seam edges heated by the arc, and at the same time to form fillets giving strength to the joints. The photographic detail views shown herewith bring out the nature of the resulting connections quite clearly.

Loading Tests

When the plans for the building were submitted to the Department of Buildings, Borough of Brooklyn, the proposal to weld the connections was approved only with the stipulation of a successful load test before erection. This test was carried out March 20. Two trusses were set up at 20-ft. spacing and braced together, purlins were bolted in place, and by means of bags of gravel a load of 48 tons was applied. This was sufficient to load the trusses approximately to their elastic limit. No straining or other change was observable at the joints, and the test was considered in every respect successful. The deflection of the peak, 0.0425 ft., did not change during 48 hours, and upon removal of the load at the end of that period a set of less than 0.01 ft. was measured.

Following the test, erection of the building was begun by Mr. MacBean as contractor for the structure. The connections of trusses to columns and of purlins and bracing to trusses are being made by welding just as were the truss panel-point connections, so that the building when completed will be free from bolt or nut connections and will be strictly all-welded. The welding is being carried out by the Electric Welding Co. of America.

Methods of Supervising Tie Renewals

(Abstract of Committee Report, American Railway Engineering Association)

TWO general methods of annual field inspection for maintaining control of tie renewals, so that ties will remain in service for their full life but will be removed at the proper time, are recommended by the tie committee of the American Railway Engineering Association, as follows: 1, By section foremen or their immediate superiors, or others directly responsible for the safety of the track; 2, By special inspectors chosen for their experience and knowledge of the requirements of their territory and not generally connected with or responsible for the track or territory inspected.

The first method has a tendency to provide adequate renewals, thereby assuring safety within the limits of available resources. It also provides a basic knowledge of local conditions, which no other method can cover. On the other hand, there will undoubtedly be a lack of uniformity under similar conditions on various territories and the possibility of excessive and uneconomical renewals.

The second method provides for training a small number of selected men to a predetermined standard of tie renewals and consequent conservation of ties. It presents difficulties, however, in possible inadequate renewals at certain points, inability to obtain sufficient men and difficulty in finding employment for them outside of the renewal season. Conditions on various railway systems are so different that no one method can be established, but the committee points out that consideration must be given to the local conditions in determining which method is best for any particular road.

Whichever method is used, the spotting or marking of each tie to be removed is advisable. The section foremen, however, should be allowed some latitude for removing ties, independent of the spotting, which are broken or damaged or otherwise injured. A check of ties removed from time to time is considered essential. The use of statistics for approximate determination of tie requirements in advance of field inspection will be found desirable. When the number of ties available is less than the final inspection requirements indicate as being needed, the supply should be prorated, making due allowance for local conditions of traffic, curvature, grade and roadbed.

Concrete Worms

Microbes that fed on steel rails were discovered periodically and reported in the columns of the *Engineering News* and *Engineering Record*. Now comes the first of the "Concrete Worm" stories emanating from western Nebraska where, it is suspected that sales competition is not unmixed with pleasure by rival material representatives. Approaching a wealthy taxpayer with the idea of divulging the latest information on the merits of concrete a Portland Cement Association field agent was rebuffed with the statement that concrete worms had eaten into the underside of the town's 6-in. cement walk to such an extent that a mere 1-in. surface crust remained. Further details credited the worms with an equipment of chisel teeth and miniature rock crushers for reducing the cement, which was preferred to the aggregate, to dust before complete digestion.

The Herschel Weir for Gaging in Open Channels

A Circular Hollow Crested Weir Giving a Straight-Line Formula Q = 5.50 d, Based on Differences in Pressure Above and at Crest, the First Corrected Automatically for Velocity of Approach

Abstract of a Paper by Clemens Herschel, Consulting Engineer New York City, to be presented at the Spring Meeting of the American Society of Mechanical Engineers, St. Louis, Mo., May 24 to 27, 1920. The first four paragraphs represent some rearrangement and condensation of statements in order to bring together certain historical and related statements.—EDITOR.

EXPERIMENTS on a new form of weir made by the writer at the hydraulic laboratory of the Massachusetts Institute of Technology in September and October, 1919, on behalf of the Power Test Code Committee of the American Society of Mechanical Engineers, with funds provided by Engineering Foundation, indicate that the type of weir suggested by the author more than twenty years ago gives a discharge represented by a straight-line formula, from 0 up to 9.55 cu.ft. per sec. per ft. in length of weir, and thus continuing, presumably, indefinitely beyond that quantity. Its equation is $Q = 5.50\ d$; d being the difference of two observations of water height or pressure; the one taken just upstream from the weir (taken so as to be automatically corrected for "velocity of approach," if one pleases, or corrected by computation before being used in the above formula, if preferred), and the other taken at the crest. In both cases d is obtained by measuring the elevation of a water surface in a pail by means of a hook gage, or otherwise as desired. This *difference* of pressures may also be obtained by means of one of the many apparatus already invented and on the market for measuring differences of pressure, in which case the register may indicate mechanically the quantity passing at any moment, sum it up for any given period of time, portray it graphically on a chart, or simultaneously do all three of these recording operations.

And the reason it does all this is because it is carried out with a weir that is not a "sharp-edged weir," the type that has rested like the incubus of an evil spirit upon the minds of all hydraulicians for full 200 years, ever since the Marchese G. Poleni first wrote about weirs in De Motu Aquae Mixto, Patavii, 1717.

In its general outlines, the new weir was described in *Engineering News*, Nov. 10, 1898. More particularly was it forecast in *Transactions* American Society of Civil Engineers, 1918, in a discussion by the writer of a paper by Floyd A. Nagler. So here was a case of an invention, or vision, if one pleases, in practical hydraulics, that had to wait twenty years in the brain of the engineer, for lack of public or private facilities to test it. An attempt to experiment as has now been done, was made some ten years ago, but was frustrated by the writer being informed by the manager of a richly endowed institution that its funds were available only for research in sciences that had no practical applications.

A United States patent has been applied for covering the weir construction herein described.

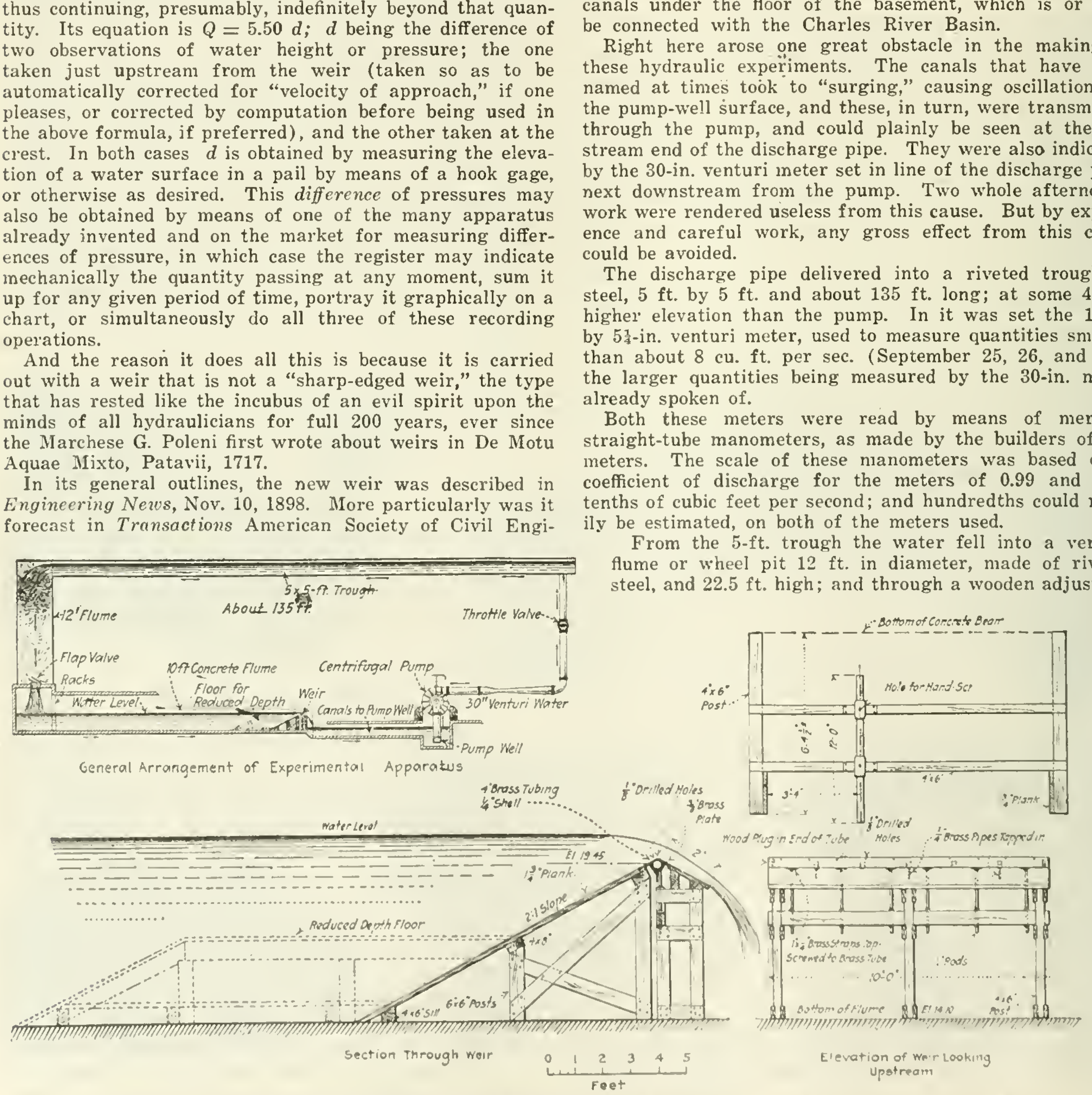
The apparatus used in the present experiments consisted of a 350-hp. Ball angle-compound engine, 240 r.p.m., direct-connected to a 30-in. Worthington centrifugal pump, having some 48 cu.ft. per sec. maximum capacity, at 40 to 45 ft. lift. This pump takes its suction from a system of canals under the floor of the basement, which is or may be connected with the Charles River Basin.

Right here arose one great obstacle in the making of these hydraulic experiments. The canals that have been named at times took to "surging," causing oscillations of the pump-well surface, and these, in turn, were transmitted through the pump, and could plainly be seen at the upstream end of the discharge pipe. They were also indicated by the 30-in. venturi meter set in line of the discharge pipe, next downstream from the pump. Two whole afternoons' work were rendered useless from this cause. But by experience and careful work, any gross effect from this cause could be avoided.

The discharge pipe delivered into a riveted trough of steel, 5 ft. by 5 ft. and about 135 ft. long; at some 40 ft. higher elevation than the pump. In it was set the 16-in. by 5¼-in. venturi meter, used to measure quantities smaller than about 8 cu. ft. per sec. (September 25, 26, and 29), the larger quantities being measured by the 30-in. meter already spoken of.

Both these meters were read by means of mercury straight-tube manometers, as made by the builders of the meters. The scale of these manometers was based on a coefficient of discharge for the meters of 0.99 and read tenths of cubic feet per second; and hundredths could readily be estimated, on both of the meters used.

From the 5-ft. trough the water fell into a vertical flume or wheel pit 12 ft. in diameter, made of riveted steel, and 22.5 ft. high; and through a wooden adjustable



General Arrangement of Experimental Apparatus

Section Through Weir

Elevation of Weir Looking Upstream

(1) Details of Herschel Weir and General Arrangement of Testing Apparatus. The surface curve of the water discharging over the weir is drawn from measurement

CLEMENS HERSCHEL

flap valve in the floor of this flume, fell into a concrete tailrace pit, which, through racks and gridiron-valve gates, discharged into the concrete channel about 72 ft. long that led to the weir to be tested. The discharge of the weir fell back into the system of canals which fed the centrifugal pump, thus completing the cycle actuated by the Ball engine and pump.

To vary the discharge, the pump operating at a uniform speed as governed by a flywheel governor, and the boiler pressure also being fairly constant, a throttle valve in line of the pump discharge pipe was used. When the small 16-in. meter set in the 5-ft. trough was in action, the quantity and constancy of the flow leading to the meter and the efficient action of the pump, in spite of the small quantities lifted, could be regulated by opening a waste-valve out of the pump discharge pipe. To a minute extent, certainly sufficient to remove all air from the pump discharge pipe before it reached the 30-in. meter, the same office was performed by keeping in action a 2-in. steam siphon, set at the extreme upstream end of the pump discharge pipe and ordinarily used to exhaust air from the pump before starting it.

The concrete channel above referred to was nominally and almost exactly 10 ft. wide, and had at its downstream end a sharp-crested weir whose crest was about 5.35 ft. above the bottom of the channel. The new form of weir was so designed that it could be built over and around the old weir, and again removed without injury or displacement of what was found on the premises, and with its crest at nearly the same elevation above the bottom of the concrete flume.

The fundamental idea followed in the design of the new weir was to have the water to be measured conducted over the weir in a gentle manner, and so as to have it flow smoothly and regularly from the time it first encounters the weir construction until it leaves it. Instead of allowing the body of water to impinge with more or less violence, according to the velocity with which it approaches the weir against a perpendicular wall in its path (the upstream face of the ordinary weir) it is gently led to the crest by a 2:1 slope. Instead of striking or being torn over a sharp edge at the crest, the crest is made in the form of the arc of a circle; and instead of bothering about air under the nappe, the nappe is supported on another 2:1 slope downstream from the crest. Moreover, the crest is made hollow, so that observations of the pressure, or lack of full pressure, whichever the water may elect to exercise, can be taken *at* the crest, not at a distance upstream from the crest varying according to the fancy of the experimenter.

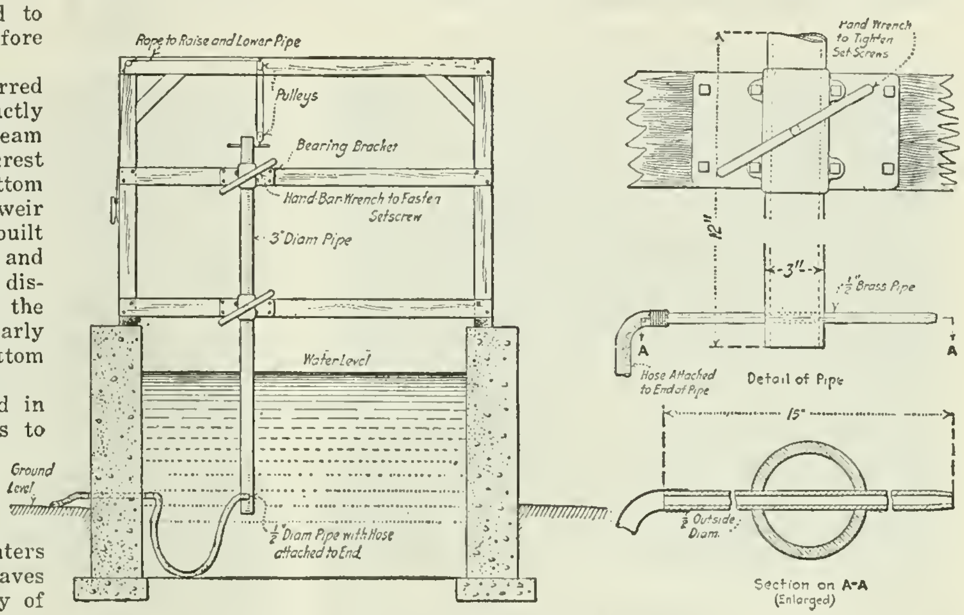
If the quantity passing the weir turn out to be a function of this observed pressure, well and good. If not, we will see what virtue there is in the *difference* of water elevations or pressures, the one taken upstream from the weir and the other taken by means of the hollow weir test. The difference referred to proved to be the sought-for solution of the problem at hand, and hereafter it alone will be closely considered. A United States patent has been applied for, covering the weir construction herein described.

The orifice in the side of the concrete flume conducting water to the hook-gage pail for measuring water elevations upstream from the weir was made flush with the flume side, at a point 13.9 ft. upstream from the weir crest center, and 1.68 ft. below it in elevation.

Furthermore, to connect the water passing over the weir with the hollow of the weir crest, a series of $\frac{1}{8}$-in. holes were carefully bored through into the latter. This was done by first tapping in a solid brass plug, and then boring a hole $\frac{1}{8}$ in. in diameter through this plug. A natural inclination would be to bore these holes at right angles to the surface of the water, but as this varies with the quantity passing the weir, such an inclination is impracticable. There are only two other natural directions for such piezometer holes—either vertical, or at right angles to the upstream slope of the weir; and if the latter, naturally at the line of tangency of that upstream slope and the arc of the weir crest. The vertical holes are called "Orifices No. 1" and those perpendicular to the 2:1 slope "Orifices No. 2." The original intention of the writer had been to make the crest tube so that it could be revolved around its horizontal axis, and thus find the best position of the piezometer orifices, but a cumbersome and unduly expensive experiment like this was at once abandoned, and in view of the success already attained, may now be disregarded by engineers.

Both kinds of piezometric orifices were tried, and the last named proved much the superior for general use.

To vary the velocity of approach a false bottom was put into the channel for some of the experiments. These will be designated as having been made with "reduced depth," and others with "full depth."


Rope to Raise and Lower Pipe
Pulleys
Bearing Bracket
Hand-Bar-Wrench to Fasten Setscrew
3" Diam Pipe
Water Level
Ground Level
½" Diam Pipe with Hose attached to End
Hand Wrench to Tighten Set Screws
12"
3"
½" Brass Pipe
A
A
Hose Attached to End of Pipe
Detail of Pipe
15"
½" Outside Diam.
Section on A-A (Enlarged)

(2) Apparatus to Observe Upstream Water Elevation. Automatically Corrected for Velocity of Approach.

To increase the quantity per foot in length of weir, the available capacity of the pump was in many of the experiments made to pass over only about 3.3 ft. of the length of the weir, while other series of the experiments used a weir about 10 ft. long.

As these experiments had a practically useful end and aim,—the establishing of a commendable method of weir measurements,—end contractions were ruled out from the very beginning. They are of no use ordinarily and only complicate the situation.

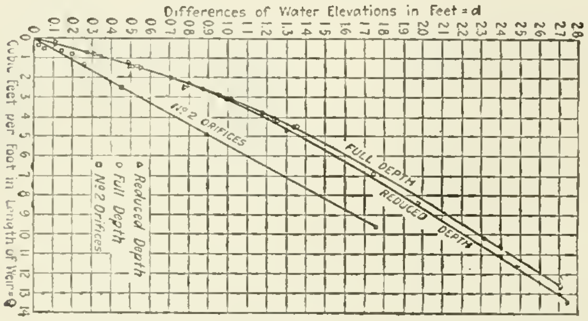
A vertical brass pipe dipping into the water was intended as a means of observing the water elevation upstream from any part of the weir, automatically corrected for velocity of approach by taking in the water pressure through a pitot orifice pointing upstream and transmitting it to a hook-gage pail in the usual manner from out of the downstream side of the vertical tube. A pointer above water, parallel to the pitot tubular orifice, which should point upstream, insures its correct position. Our experience leads us to advise that the vertical tube be not used as a reservoir, but only as a support for the pitot orifice.

The tube is held in its guides by two clamp screws, and may readily be set, so as to bring the pitot orifice in the locus of mean velocity as it may be judged or found. In these experiments it was set at 0.6 depth of water, and $\frac{1}{3}$ the width of the channel from either side. A scale of feet and tenths on the tube, reading up from zero at the pitot orifice, and aided by another scale or gage painted on the side of the concrete flume, reading up from zero at the flume bottom, readily permitted this. The apparatus is mounted on two beams crossing the water channel.

This apparatus exists as yet only in theory and should be experimented with at the first favorable opportunity, because on drawing the water out of the flume at the close of our experiments, a broken and leaky joint was discovered in pipe that carried the water pressure from the vertical tube to the hook-gage pail, so that the readings taken proved of no record value whatever.

Our weir crest had a radius of 0.198 ft., and the outside surface was hard and smooth oil paint. No doubt the radius of the weir crest is a factor in the application of the formula found for weirs of the construction shown in this article, but it remains for other sets of experiments to reveal the limits and detailed effects of this radius. This illustrates the need there is for a hydraulic observatory, to be conducted on similar lines to those followed for so many centuries.

With these preliminary statements, the record of the 40 experiments made is given in the accompanying table. Four of them have been marked doubtful on account of actual or supposedly defective observations and all those made Sept. 9 and 30, also part of those on Sept. 25, had to be rejected as worthless on account of the previously mentioned violent "surging" of the water discharged by the pump.



(3) Diagram Showing Results of the 40 Experiments.

A separate set of gagings was made Oct. 3 to compare the indications of the Institute's sharp-edged weir with the Institute's 30-in. venturi meter. Owing to the fact that this meter is set in line of the pump discharge pipe, only 12 ft. distant from the pump, it had been a question whether at that short range it would meter accurately, and the experiments of Oct. 3 were made for the purpose of answering this question. The system available for observing head on the weir, was that known as the Fteley and Stearns method. A metal plate was set in the side of the concrete flume, flush with it, and an orifice in this plate, in the present instance, was situated 6.8 ft. upstream from the crest and 1.68 ft. below it in elevation, connected with a hook-gage pail in the usual manner.

Record

Pump started about 12:30 p.m., discharging 30 cu.ft. per sec. at 1 p.m. All quantities corrected for velocity of approach.

		Weir Cu.Ft.	Meter per Sec.
Oct 3, 1919,	2.05 to 2.10 p.m., both inclusive	38.13	38.30
	2.50 to 2.55 p.m., both inclusive.	30.33	31.25
	3.50 to 3.55 p.m., both inclusive . . .	17.91	18.80
	4.40 to 4.45 p.m., both inclusive	11.73	11.00

Having in mind the imperfections of the whole test apparatus from the canals in the basement, through the pump, riser, 5-ft. trough, 12-ft. vertical flume, wooden flap valve, into the 10-ft. concrete flume, and over the weir (as already mentioned), it is quite possible that 38.13, 30.33, 17.91, and 11.73 cu.ft. per sec. were passing the weir on the average for 5 min., while 38.30, 31.25, 18.80, and 11.00 cu.ft. per sec. were being discharged by the pump on the average, during the same 5 min. The difference could very well represent rise or fall in the mean elevations of the water in either the 5-ft. trough, the 12-ft. vertical flume, or in the 10-ft. concrete flume, or in two or more of these containers simultaneously.

LOG EXPERIMENTS WITH THE HERSCHEL WEIR

Date, 1919	Length of Run, P.M.	Velocity of Approach, Ft. per Sec.	Depression = Piezometer d = Height (Corrected for Velocity of Approach) Less Weir Indication: As Measured	Corrected for v. of a.	Q = Quantity per Ft. of Weir Length, Cu. Ft. per Sec.
Sept. 10[1]	2.45-2.50	0.70	1.332	1.340	4.53
	4.00-4.05	0.58	1.182	1.187	3.82
	4.30-4.35	0.48	0.991	0.995	3.06
	4.55-5.00	0.33	0.700	0.702	2.03
Sept. 11[1]	1.50-1.55	0.24	0.522	0.522	1.49
	2.20-2.25	....	0.347	0.347	0.95
	2.50-2.55	....	0.279	0.279	0.75
	3.20-3.25	0.24	0.508	0.508	1.47
	3.55-4.00	0.45	0.962	0.965	2.87
	4.45-4.50	0.62	1.240	1.246	4.07
Sept. 15[2]	2.15-2.20	1.24	1.319	1.349	4.48
	3.00-3.05	0.92	1.001	1.014	3.14
	3.50-3.55	0.72	0.790	0.798	2.34
	4.25-4.30	0.50	0.529	0.533	1.53
	4.55-5.00	0.30	0.305	0.307	0.85
Sept. 17[3]	2.30-2.35	1.62	2.683	2.723	12.53
	3.05-3.10	1.39	2.279	2.309	10.18
	3.40-3.45	1.00	1.725	1.741	6.87?
	4.20-4.25	0.63	1.229	1.237	4.15?
	4.50-4.55	0.40	0.864	0.868	2.57
Sept. 18[4]	1.55-2.00	2.87	2.603	2.733	13.38
	2.30-2.34	2.60	2.374	2.484	11.53
	3.05-3.10	2.01	1.915	1.977	8.31
	3.50-3.55	1.28	1.269	1.294	4.63
	4.35-4.40	0.75	0.773	0.782	2.45
Sept. 25[4]	3.10-3.15	0.40	0.478	0.482	1.33
Sept. 26[4]	1.43-1.45	0.47	0.491	0.495	1.42
	3.05-3.10	0.25	0.265	0.265	0.71
	4.10-4.15	0.13	0.120	0.120	0.36?
	4.40-4.45	...	0.101	0.101	0.24?
Sept. 29[5]	3.15-3.20	0.42	0.249	0.253	1.30
	3.55-4.00	0.29	0.194	0.195	0.87
	4.25-4.30	0.18	0.149	0.149	0.51
	4.45-4.50	0.18	0.042	0.042	0.49
	5.05-5.10	0.08	0.022	0.022	0.21
Oct. 1[5]	1.30-1.35	2.22	1.658	1.738	9.55
	2.10-2.15	1.90	1.189	1.249	6.91
	3.10-3.15	1.34	0.865	0.895	4.93
	3.45-3.50	0.92	0.581	0.593	3.14
	4.20-4.25	0.73	0.438	0.447	2.42

[1] Long weir, full depth.
[2] Long weir, reduced depth.
[3] Short weir, full depth.
[4] Short weir, reduced depth.
[5] Short weir, reduced depth, No. 2 orifices

The comparison which was made, taken by itself, does not argue for a superior exactness of gaging, by either the weir or the meter—that must be determined by tank tests made with the two separately. It only showed that neither was materially inexact. And we know from data that have been given above that the venturi meter gives water measurements closely approximating the exactness of tank tests. And with the result placed in evidence, that No. 2 orifices act according to the straight-line equation—

$$Q = 5.50d \text{ in English units,}$$
$$Q = 1.67d \text{ in metric units,}$$

this paper might fitly close.

One word more, however, the writer allows himself in relation to formulas for weir discharge. It had been his intention not to evolve any formula, but to present the result of his experiments in the form of a table, arranged somewhat as are tables of logarithms, so that quantities could always be read at a glance from the data observed. No one cares for the formulas by means of which logarithms are computed; their use would not be furthered by a study of them. No more need a Power Test Code contain formulas for weir discharge; a table would answer its purposes more fittingly.

But the exceeding simplicity of the weir formula appurtenant to the form of weir herein presented upset this plan. Such a weir does not need so much as a table to look up or to compute its discharge. All one has to do is to measure the length of the weir and multiply by 5.5 and the difference in head.

Studies of Maintenance Work on Drainage Ditches

Conclusion Reached That Channels Should Be Cleaned Every Year—Banks at Three to Five Year Intervals

By H. M. Lynde
Senior Drainage Engineer, U. S. Bureau of Public Roads, Washington, D. C.

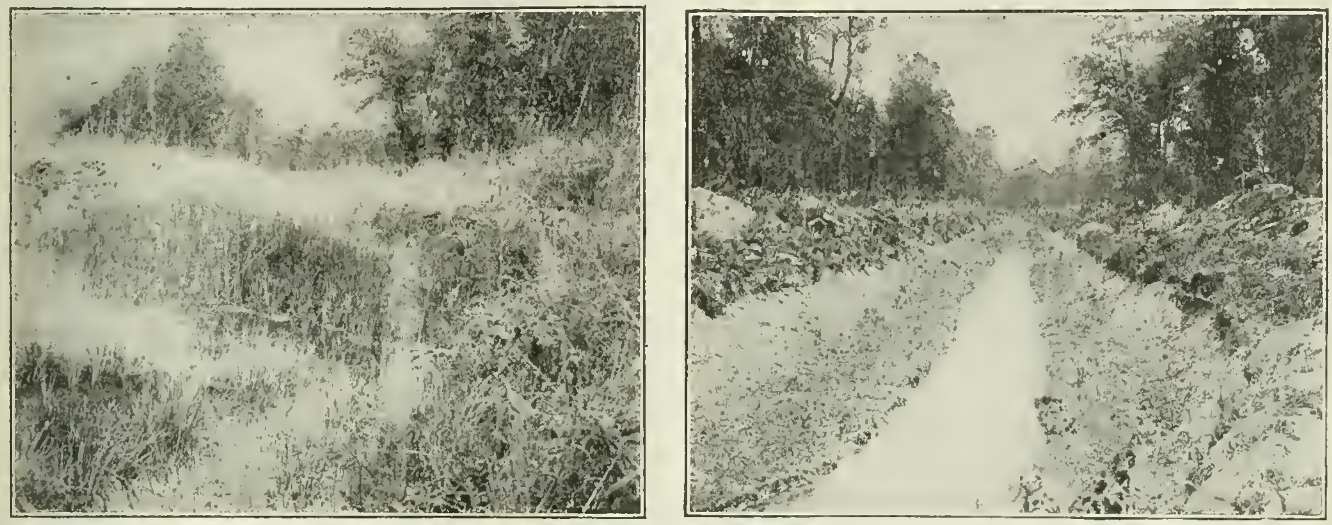
THAT the channels of drainage ditches need to be cleaned annually to insure proper flow capacity and sanitary conditions, but that the banks need be cleared only at intervals of from three to five years, are conclusions based on experiments described below.

In many drainage districts in the flat, coastal plain section of North Carolina the flow in the main ditches is so slight during a large portion of the year that the water follows a winding course over the wide bottom of the ditch, allowing vegetation to spring up on the uncovered portions and where the water is stagnant. This growth furnishes lodgment for silt, so that after a few seasons the channel may become almost completely choked. Practically no maintenance work has been done in this region, but the removal annually of sand bars, logs, trees, stumps, tree tops, drift, fences, foot logs and débris becomes a necessity if the ditch section is to keep its original efficiency. The opening up of new land requires attention to the outlets of field ditches emptying into the main waterway in order to reduce the discharge of dirt which tends to form bars in the channel.

To determine the best methods of maintenance and the cost of this work, a typical section of dredged ditch about two miles long through Jacob Swamp, in Robeson County, was selected for experimental purposes by the Division of Drainage Investigations, Bureau of Public Roads, U. S. Department of Agriculture. The clearing was done in April and May, 1917, and suspended in 1918 on account of the war, but was renewed in May and June, 1919, and is to be continued. It may be classified under the following heads: (1) Clearing banks; (2) clearing ditch of plant growth and débris; (3) removal of sand bars; (4) excavation of low water channel; (5) construction of outlets for field ditches.

The work was done by force account and complete records of details and cost have been kept, from which it is hoped to establish a basis for reasonable prices for letting work of this character. Labor consisted of whites, Croatan Indians and negroes, working 8 hr. a day. In 1919 the foreman was paid $5 and common labor $2.50 per day; two of the men were paid $2.75 and finally $5 per day. Labor was scarce and the force averaged only five men and the foreman. The men furnished their own tools, but rubber boots were supplied. In 1917 the foreman was paid $2.50 and common labor $1.50 per day, with two skilled men at $1.75, while the force averaged about ten men and the foreman.

Jacob Swamp is flat, heavily timbered and varies in width from 150 to 800 ft., while its drainage area also is flat and contains 9,980 acres. The 9-mile ditch has side slopes of ½ to 1 and 14- to 16-ft. bottom width. For the upper 7.2 miles the fall is 2.64 ft. to the mile and for the lower end 3.70 ft. per mile. Its average depth is 6.5 ft., and it is capable of removing a run-off of over ¾ in. in 24 hours, when flowing with 5.5 ft. of water.



JACOB SWAMP DRAINAGE DITCH BEFORE AND AFTER CLEANING
(Views taken from the same point)

For the maintenance work a section was selected where the grade is 2.64 ft. per mile. The bottom is in sand, solid under foot. The excavated material is sand, sometimes mixed with clay. Very little of the land along the ditch is under cultivation.

This ditch was constructed in 1913, and by 1917 it was choked with a heavy growth of plants, principally cat-tails, rushes, sedges and willows. The banks also sustained a heavy growth, mainly sedge, dog fennel, willows and briars. A few trees and stumps have fallen into the channel and at places foot logs have been thrown across near the water level. Sandbars have formed in the main waterway, at the outlets to many of the farm ditches. The ditch in general, however, has not filled appreciably, and there has been very little deterioration in the banks.

In 1919, the plant growth was as dense as in 1917, but there was a noticeable absence of woody growth like willows. Cat-tails were abundant, and stretches of 100 to 200 ft. were solid with this plant, taller than a man. The other growth in the channel was largely rushes and sedges. The growth on the banks was not as heavy as in 1917.

The Jacob Swamp ditch, like many others in the state, is large for the amount of water it carries, normally. At certain times of the year there is little, if any, flow. Its condition as compared with that of Back Swamp ditch in the same district, but having a considerable flow of water throughout the year, is striking. On Back Swamp there is practically no growth in the channel, at least at its lower end. It is true that its fall is 3.43 ft. to the mile, as compared to 2.64 ft. on the Jacob Swamp ditch, but this is not thought to be the cause of the difference in condition.

METHOD OF CLEARING THE DITCH

Brush hooks, machetes and axes were used for clearing the banks. Burning was employed in 1917, but only on a limited scale in 1919, owing to the dry weather and the danger of fire getting into the woods. In cultivated land, burning is recommended as the best means of clearing the banks after the brush has been cut and piled; also for getting rid of sedge. All overhonging stumps and trees on the edges of the banks were removed, and if not too large were rolled to the outer side of the waste bank. One man averaged about 310 ft. of bank clearing per day in 1917, and about 600 ft. in 1919, but the banks were not cleaned as neatly in 1919. Piling and burning averaged about one mile a day for the entire force in 1917.

Clearing the channel of plant growth, logs and other débris is the heaviest and most important part of the maintenance work. This was done entirely by hand, using hoes and rakes, pitchforks, brush hooks, machetes and axes. In ordinary going the principal tools were hoes or rakes and pitchforks. Work proceeded upstream.

When the force for cleaning the channel was sufficient, four or five men worked ahead and cut out all growth by the roots with hoes or rakes (the potato fork was found to be an efficient tool), allowing it to lie flat on the surface of the water which averaged about 10 in. deep. Two or three men followed to throw this débris out on the banks with pitchforks. At the beginning of the day's work a log was thrown across the surface of the water to catch any drift which passed the men. At the end of the day the drift that had accumulated was removed and the log was moved ahead next morning.

Willows and large growth generally were pulled out by the roots by hand and thrown on the bank. Where specially heavy growth was encountered some of the men went ahead and cleared it out with axes and brush hooks. Cat-tails generally were pulled by hand. Logs, tree tops and stumps were taken out at the same time the plant growth was removed, or were left for a return trip.

Progress depended upon the density of the growth and the force. In 1917 it ranged from 300 to 1,400 ft. per day, with an average of about 725 ft. In 1919 the range was 300 to 1,150 ft., with an average of about 530 ft., the force being much smaller and perhaps not as efficient. After the entire section had been cleared it was found advisable to work back downstream, to remove straggling plants and clean out a little more carefully along the edge of the ditch at the bottom of the banks. Generally this could be done at the rate of about a mile a day.

Six field ditches entered the ditch in 1917, which number had increased to 13 in 1919. Although the six ditches had been protected in 1917 by outlet structures, the sand bars in 1919 were as bad in front of these as at the outlets to the new ditches which had no protection. The material seemed to come from far up in the fields and not from the caving of the waste banks of the canal. These bars were not entirely removed in all cases. Generally a low-water channel 6 ft. wide was excavated through them and the material thrown out against the side of the ditch at the foot of the bank. No excavation of the low-water channel was done in 1919, and it is doubtful if this is necessary where the channel has filled less than one foot. The principal harm comes from the formation of sand bars. If these are removed, probably no low-water channel need be dug.

A uniform grade was given in 1917 by the excavation of a low-water channel 6 ft. wide, with an average cut of 0.34 ft. This work proceeded downstream. The tools used were long-handled round-pointed shovels, the white sand excavated being thrown against the side of the ditch at the foot of the bank. Progress depended upon the depth of excavation, the maximum being 1,700 ft. in one day, with an average of about 850 ft. After the channel had been excavated it was swept with brooms, this taking only about a day for the entire length.

Outlet structures to prevent the carrying of sand into the main waterway, due to the caving of the waste banks, are of doubtful efficacy, as noted above. They should be built of sound cypress or juniper logs and poles, if available, ranging from 3 to 8 in. in diameter. The bottom should be lined with short transverse logs, these being 3-in. logs or 8-in. logs split in half and laid with the flat side up. The walls should be of poles laid lengthwise, with upright posts placed 3 ft. to 4 ft. apart and braced at the top with poles. Grass or other material should be used to close the openings between the logs of the walls to prevent dirt sifting through.

This protection should extend from the edge of the ditch to a point beyond the outer or land toe of the waste bank. Where ditches enter above the level of the bottom of the ditch, drops should be made either of logs or lumber. Structures built of lumber are costly and are no more effective than are those built of logs. Whether they are any more permanent remains to be seen. Sand traps are not satisfactory unless made very large and watertight. If not large they soon fill, and if they leak the water will undermine the floor and walls of the flume.

COST OF CLEARING

The cost of the different items of work for 1917 and 1919 are shown in the accompanying table, to which must be added miscellaneous expenses, such as spikes and nails. It will be noted that the cost per unit of length (including both banks) for clearing the banks was practically the same in 1919 and in 1917, although

COST OF CLEARING DRAINAGE DITCH IN NORTH CAROLINA

	Total Hours		Total Cost		Cost per 100 Ft	
	1917	1919	1917	1919	1917	1919
Clearing banks............	569	310	$112.97	$120.62	$1 08	$1 09
Clearing ditch	844	1,052	173 54	377.57	1.58	3.43
Excav. sand bars	84	102	17.15	36.25	.....	
Excav. low water channel.	1,030		233 50	....	2.12	. .
Outlets of side ditches.....	376		104 99	.....	Av. $21 each	
Total	2,903	1,464	$642 15	$534 44	.....	

Note—Cost of outlets ranged from $7 50 to $40.46. The higher price included $22.46 for lumber, but all other outlets were of logs obtained along the ditch free of cost.

the cost of labor was higher in 1919. While the growth was not quite as thick in 1919, the width cleared was less and the material was not burned.

Clearing the ditch of plant growth and other obstructions cost nearly two and one-quarter times as much in 1919. The plant growth was somewhat more dense than in 1917, while the crew averaged only five or six men (constantly changing) and a crew of this size is not as efficient as is one of 10 or 12 men to one foreman. Moreover, wages were considerably higher in 1919, as shown already. Several more sand bars were excavated in 1919, which, together with the increased unit cost of labor, explains in part the increased cost of this item in 1919.

If the waste banks, berms and ditch banks were sodded with Bermuda or other suitable grass and pastured very little clearing would be required except to remove the aquatic plants from the bottom of the ditch, while pasture of considerable value would be provided. Farmers object to Bermuda grass, however, and no attempt has been made to introduce it. As cattle prefer this to the local grasses there should be no trouble in keeping the ditch banks pastured, even in communities where there is little stock. The cost of clearing banks has been about 20 per cent of the total, as shown in the table, if the cost of the outlets is excepted. Pasturing would tend also to reduce the amount of clearing in the ditch.

Plant Growth and Its Removal

That the eradication and control of aquatic plants .. a difficult problem is indicated by the experiments. The growth can be removed temporarily, but conditions will be as bad in a year or two. Apparently the cost (if the price of labor remains constant) does not diminish from year to year, and about the same amount of money and labor needs to be expended in the second year as in the first. Woody growth like willows, etc., does not appear to come back readily.

Roots are difficult to remove, and most of them are perennial. Cat-tails, in particular, have a long root system extending horizontally from which spring up many stalks. Experience indicates that to get the best results, the plants should be removed when they have about reached their maximum growth, but before they have begun to seed or the sap has started down into the root system, as the plant is thus weakened for starting growth the following year. From the middle of June to August would be perhaps the best time, while there would be more labor available after the first of July, when the cotton is laid by and the curing of tobacco is well advanced. Experiments on a short section of ditch with plants in full growth above and below it cannot give reliable results, as seeds are carried by both wind and water to the cleared section and start a vigorous growth at once. Cat-tails and rushes are not very common in eastern North Carolina, and how they got their start in this ditch is a question for botanists. In building new ditches all cat-tail ponds should be drained and ploughed.

Is it necessary or justifiable for a drainage district to spend money each year in clearing plant growth from the ditches? This is a question which drainage commissioners are sure to ask, particularly if the amount of cultivated land along the ditches is small. Where such growth flourishes the cause is to be found usually in the fact that the channel sections are too large and so do not operate at maximum efficiency. In general, plant growth tends to reduce the potential discharge capacity, but where the flow is never very large it is a question whether the usefulness of the ditch for drainage is impaired seriously by such growth, provided there is sufficient depth. At times of freshets the plants lie flat and the water passes over them. From a sanitary standpoint, however, there is no doubt that plant growth should be removed each year, as there is more or less stagnant water which breeds mosquitos and thus causes malaria.

Sand bars in front of the outlets to field ditches are not caused to a large extent by caving of the waste banks, but by materials brought from far up in the fields at times of heavy rains. Probably the only method to prevent this deposition is to build sand traps in the field ditches a short distance back from their outlets. These would need to be of considerable size and might be made by deepening the ditch for a distance of about 100 ft. and protecting the bank by piling. They would need to be cleaned out after every heavy rain. The prevention of sand deposit from the field ditches is an important phase of maintenance work and one difficult to control. In the Jacob Swamp ditch the sand bars form even when the canal is clear of growth, the velocity of the water not being sufficient to carry off the sand. Sand bars, therefore, require attention at least once each year.

For maintenance of ditches in similar districts the following suggestions are offered: The banks of new ditches seem to become stable after they have passed through three growing seasons. Then plant growth, trees, logs and other débris should be removed from the channel, while the banks should be shrubbed and low-water channels opened through the sand bars. After that the plant growth should be removed from the channel about once in every three or five years. The growth during such a period should not seriously impair the drainage efficiency of the canal, and the cost would not be materially greater than that of removing one year's growth. The banks should be gone over each year and kept shrubbed as far back as the waste bank. Also all logs, trees, stumps, as well as woody growth like willows, should be removed annually from the channel, and low-water channels should be opened through the sand bars.

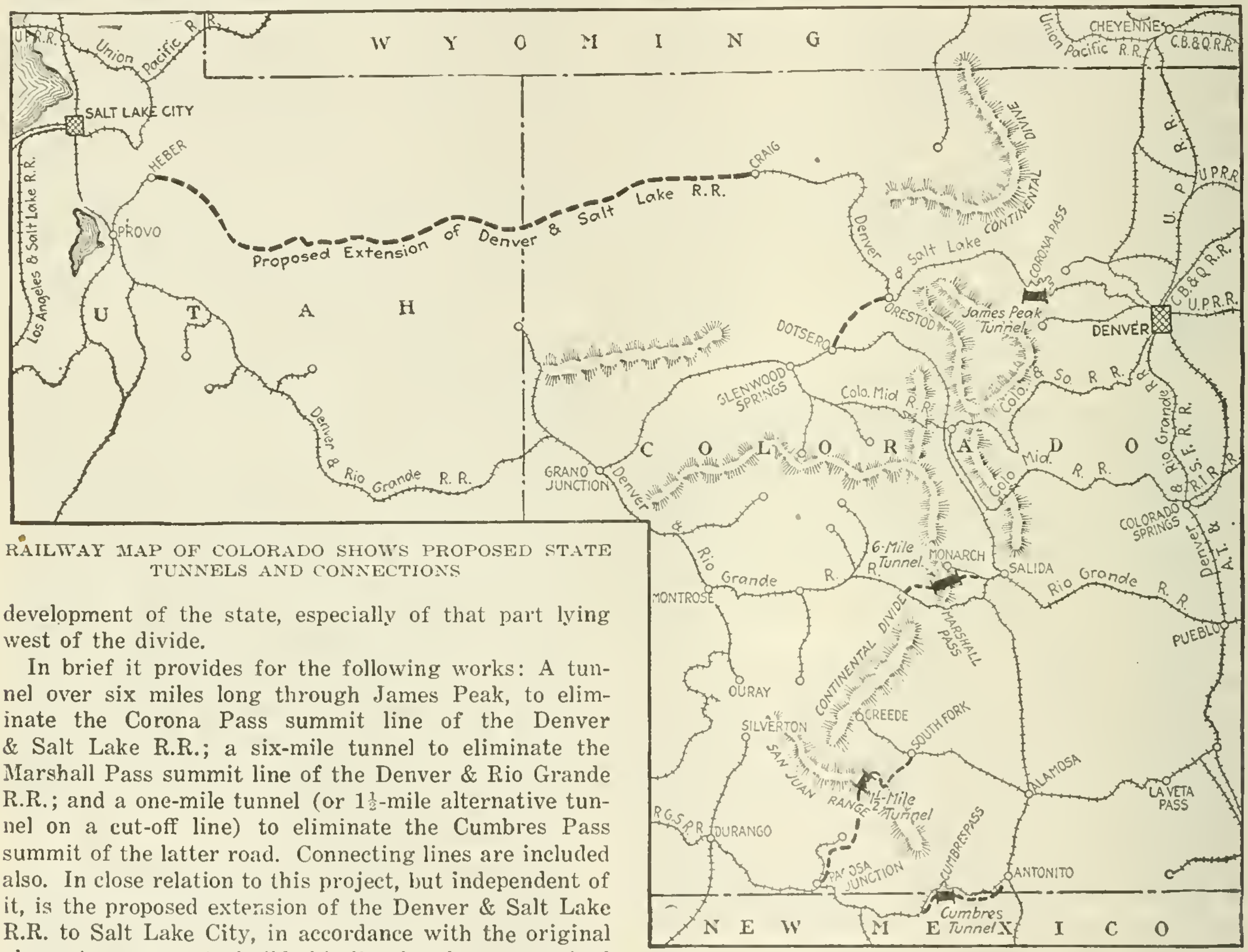
Report on Pollution of the Charles River

By direction of the Masachusetts Legislature the Department of Health of that State has submitted a report upon the sanitary condition of the Charles River above the Charles River dam. The finding is that the river is badly polluted in its upper reaches by sewage and manufacturing wastes from Milford and other towns; that there are objectionable sources of pollution in Newton, Wellesley and Waltham; and that the worst pollution is due to the occasional overflow of storm or combined sewers in Boston and Cambridge. The State Department of Health submits a draft of an act authorizing the Department to prohibit the discharge of sewage into any part of the Charles River or its tributaries. The report contains data regarding existing sources of pollution within various towns and municipalities, together with a number of analyses, some of the latter covering a series of years. Dr. Eugene R. Kelley is commissioner and X. H. Goodnough is chief engineer of the Massachusetts State Department of Health.

State of Colorado Proposes Three Railway Tunnels

Piercing Continental Divide To Increase Traffic Capacities—Finance Project by Bond Issue — Engineers' Report

ONE of the most ambitious railway projects now in view is the proposed construction of three long railway tunnels—aggregating nearly 14 miles—through the continental divide, to be financed by a bond issue of the State of Colorado. Its object is to reduce grades and lower summit elevations and by increasing capacity and service to promote the agricultural and commercial development of the state, especially of that part lying west of the divide.



RAILWAY MAP OF COLORADO SHOWS PROPOSED STATE TUNNELS AND CONNECTIONS

In brief it provides for the following works: A tunnel over six miles long through James Peak, to eliminate the Corona Pass summit line of the Denver & Salt Lake R.R.; a six-mile tunnel to eliminate the Marshall Pass summit line of the Denver & Rio Grande R.R.; and a one-mile tunnel (or 1½-mile alternative tunnel on a cut-off line) to eliminate the Cumbres Pass summit of the latter road. Connecting lines are included also. In close relation to this project, but independent of it, is the proposed extension of the Denver & Salt Lake R.R. to Salt Lake City, in accordance with the original plan. A company to build this line has been organized in Utah with the backing of Governor Bamberger. These proposed works are shown on the accompanying map.

According to the State Railroad Commission in its first report to the Governor, heavy grades and high elevations on all the railways crossing the continental divide in Colorado result in making transportation so slow and expensive that much traffic follows easier lines north and south of that state. The commission, which was appointed to investigate means of improving these conditions, advocates piercing the main range by the three tunnels mentioned. The maximum grades on the main east and west routes would be then only 2 per cent instead of 3 to 4 per cent, as at present. It is held that the cost even at this time will not be excessive and that construction should be begun at once and pushed vigorously to completion. A four-year period is considered sufficient for the longer tunnels.

Public credit of the state must be employed to finance this great project, in the opinion of the Commission, as conditions make it improbable that either private financing or Federal aid can be obtained at this time. It is recommended, therefore, that construction be undertaken by the state, after securing "enforceable contracts" from the railways for their use of the tunnels on terms remunerative to the state. While it is true that these railways are in the hands of receivers, it is considered that receivers' certificates might be issued. The advantages of the tunnels to the railways as well as to the community are such that terms can be made which will pay interest on the cost and provide a sinking fund to retire the bonds within a reasonable period.

As a first step the commission recommends that an amendment to the state constitution be submitted to public vote at the next general election, authorizing the commission to build the tunnels and providing for a bond issue to defray the cost. The act of 1918, under which this commission was appointed, provided for such a vote on a constitutional amendment to authorize an issue of 30-year 4½-per cent bonds to pay for the condemnation of the Denver & Salt Lake R.R. and for the construction and equipment of a tunnel under James Peak for the use of this railway. The present recommendation is based upon an opinion from counsel of the commission, to the effect that this act gives authority to initiate other amendments for similar purposes.

In the report of L. D. Blauvelt, consulting engineer to the commission, it is pointed out that three separate sections of the state, west of the divide, would benefit by the three tunnels and their railway connections. This western portion is served now by four railway lines, two of which are of narrow gage. All have grades of 3 per cent and over, while three have grades of 4 per cent. No summit elevation is less than 10,000 ft. and the highest is 11,660 ft. above sea level. Climatic conditions at these altitudes are the cause of delay and expense in transportation, but these conditions would be eliminated by the tunnels at elevations of 9,100 to 9,500 ft.

Estimates of cost are not given, since further engineering investigations are necessary. Mr. Blauvelt states it as his conclusion, however, that if the construction is undertaken now, for completion within about 3½ years, "the cost would not be excessive as compared with what it would have been five years ago." No difficult obstacles are foreseen and the locations are adjacent to railways affording transportation for labor, plant and supplies. Machinery and powder are manufactured in Colorado, the latter being one of the largest items in the cost of tunnel construction. It is suggested in his report that the heavy expense frequently incidental to government construction may be avoided if the work is let by contract, after advertising widely for bids. Under this plan, the railways could make bids and thus guarantee themselves against excessive cost.

Particulars of the three tunnel routes as given below are abstracted from Mr. Blauvelt's report.

JAMES PEAK TUNNEL: D. & S. L. R.R.

In addition to improving through transportation the James Peak tunnel would benefit the northwest section of the state west of the divide. The Denver & Salt Lake R.R., which was intended to form a link in a transcontinental system, was planned originally with limits of 2 per cent for grades and 10 degrees for curves, with a low summit elevation in a long tunnel through the divide. Pending the construction of this tunnel an open line was carried over the divide by 4 per cent grades and 16-degree curves, with a summit elevation of 11,660 ft. in the Corona Pass. This open line has practically reached the limit of its traffic capacity.

Extensive surveys for a low-level tunnel to improve operating conditions have been made at different times, resulting in a location for a tunnel 6.4 miles long at an elevation of 9,100 ft., which is said to be the lowest summit elevation practicable directly west of Denver and for many miles north or south of the railway. This tunnel would eliminate all the 4 per cent grades and 16-degree curves, whiel it would save 23½ miles in distance, 8,000 degrees of curvature and 2,500 ft. of rise and fall. It would keep the railway well below the timber line and avoid severe snow conditions.

As an auxiliary project, Mr. Blauvelt proposes a 42-mile connection between the Denver & Salt Lake R.R. at Orestod and the main line of the Denver & Rio Grande R.R. at Dotsero. This connection shown on the map, would give a direct line of 169 miles from Dotsero to Denver, with a saving of 174 miles as compared with 343 miles by the present route. The map shows also the projected extension of the Denver & Salt Lake R.R. for 254 miles from its present terminus at Craig, Colo., to Heber, Utah, where it would connect with an existing 70-mile line to Salt Lake City. The distance from Denver to Craig is 254 miles, or 230 miles by the tunnel, making a direct line of 554 miles (by the tunnel) between Denver and Salt Lake City.

Two lines of the Denver & Rio Grande R. R. serve the middle-western section of Colorado west of the divide. One of these is the main standard-gage line between Denver and Salt Lake City, while the other is the narrow-gage line extending from Salida to Grand Junction, both of which are points on the main line. This narrow-gage route, with 4 per cent. grades and sharp curves, crosses the divide at Marshall Pass, at an elevation of 10,680 ft. Grade reduction and double tracking over the pass have been proposed at different times to facilitate traffic on this route.

The proposed tunnel is on a new connecting line utilizing the Monarch branch, as shown by the map. It would be at an elevation of 9,500 ft., with a length of not more than six miles. This tunnel and connection would give maximum grades of 2 per cent and curves of 10 degrees, instead of 4 per cent grades and 25-degree curves, while it would save 1,300 ft. of rise and fall and avoid the serious snow conditions of operating over Marshall Pass.

CUMBRES TUNNEL: D. & R. G. R.R.

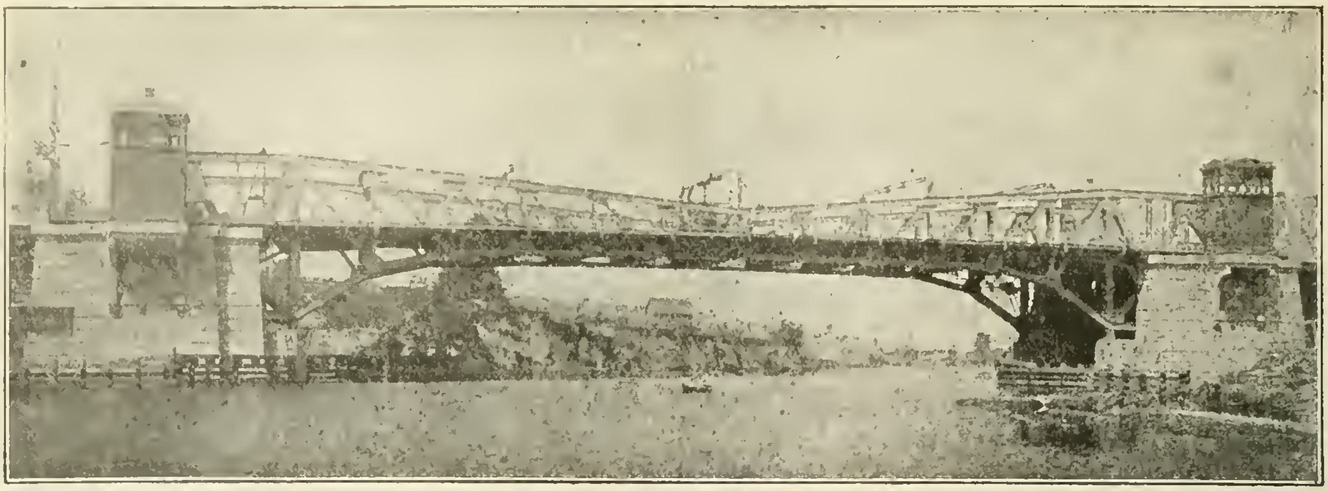
Transportation in the southwestern section of Colorado, west of the divide, together with the adjacent northern part of New Mexico, is dependent upon a line of the Denver & Rio Grande R. R. This is standard gage from Denver to Antonito, thence narrow gage over the divide to Durango and Silverton, with a standard-gage branch south from Durango. The narrow-gage Rio Grande Southern R.R. serves the country northwest of Durango. The present narrow-gage line over the divide, with grades of 4 per cent and curves of 20 degrees, reaches an elevation of 10,015 ft. at the Cumbres Pass. The tunnel would be about a mile long and its connections would have maximum grades of 2 per cent, except for about 24 miles of 2½ and 3 per cent grades approaching the La Veta Pass. In connection with this work the line between Antonito and Durango would be changed to standard gage.

An alternative tunnel location is on a proposed connection from South Fork, on the standard-gage Creede branch, to Pagosa Junction on the narrow-gage line to Durango. This would avoid the Cumbres Pass and would require a tunnel about 1½ miles long. Further investigations are necessary to determine the relative construction cost and operating advantages.

Use of these mountain tunnels for automobile traffic has been suggested, the highway system being extended to the tunnel portals where provision would be made for loading the automobiles on flat cars for passage through the tunnel.

Testing Wear Resistance of Sole Leather

An accelerated-wear test machine for sole leather developed by the Bureau of Standards, in which 12 samples on the periphery of a 15-in. wheel grind against the face of a carborundum disk and turn it against the resistance of a brake, yields in one day a result corresponding to 40 miles of walking. Comparative tests described in Technologic Paper No. 147, just issued, show that service (walking) results are closely paralleled by those obtained with the machine. They also confirm what has been known from experience, that the parts of the hide near the backbone and over the kidneys have highest wear-resistance.



Three Double-Leaf Bascule Bridges at Seattle, Wash.

Spans Have Live-Load Bearings Beyond the Trunnions—Main Pinions Engage Concave Racks—Trusses Assembled Short—Erected in Horizontal Position

By F. A. Rapp
City Bridge Engineer, Seattle, Wash.

THREE bascule highway bridges built across the Puget Sound and Lake Washington Canal by the City of Seattle, Wash., embody a special arrangement of the supports at the trunnion piers by which the counterweight is made to do double duty, and a saving in material is realized. The bridges, which are two-leaf structures of simple trunnion type, have a live-load bearing near the river edge of each trunnion pier, 13 ft. in front of the trunnion, and in closed position each leaf pivots on this bearing instead of on the trunnion. As a result, the counterweight acts with longer lever-arm than it does in the open position of the bridge, and the uplift at the tail of the leaf is much decreased. This arrangement and certain other matters of engineering importance in the design and construction of the three bridges are dealt with in the present article. Conditions stiuplated by the U. S. Government in assuming a share of the cost of the canal controlled the general proportions of the bridges. It was required that the structures should be of a permanent character and should give a clear channel width of 200 ft. with a clearance height of 30 ft. above the lake level for a width of 150 ft. Their spans are 218 to 242 ft. and the clearance heights are greater than that specified; the height from water line to curb is 37 ft. for the bridge at Fremont Ave. and 52 ft. for those at 15th Ave. N. W. and Eastlake Ave. This enables small craft to pass and minimizes the opening of bridges. Figs. 1 and 3 show the design of the Eastlake Ave. bridge, while the photo above shows the completed bridge at Fremont Ave.

Double-leaf trunnion bascules were adopted, following the general design developed in 1898 by the Chicago Department of Public Works, under John Ericson as city engineer, for the city's bridges over the Chicago River (see *Engineering News* of Jan. 31, 1901, p. 76, and Jan. 19, 1905, p. 65.) They are of half-through type, with trusses having horizontal top chords and curved bottom chords. Each carries a double-track street railway. The canal is crossed at angles of 57° to 66°. At Fremont Ave. the span is 242 ft. between centers of trunnions and the leaves are cantilevered 108 ft. beyond supports on the piers, while the tail

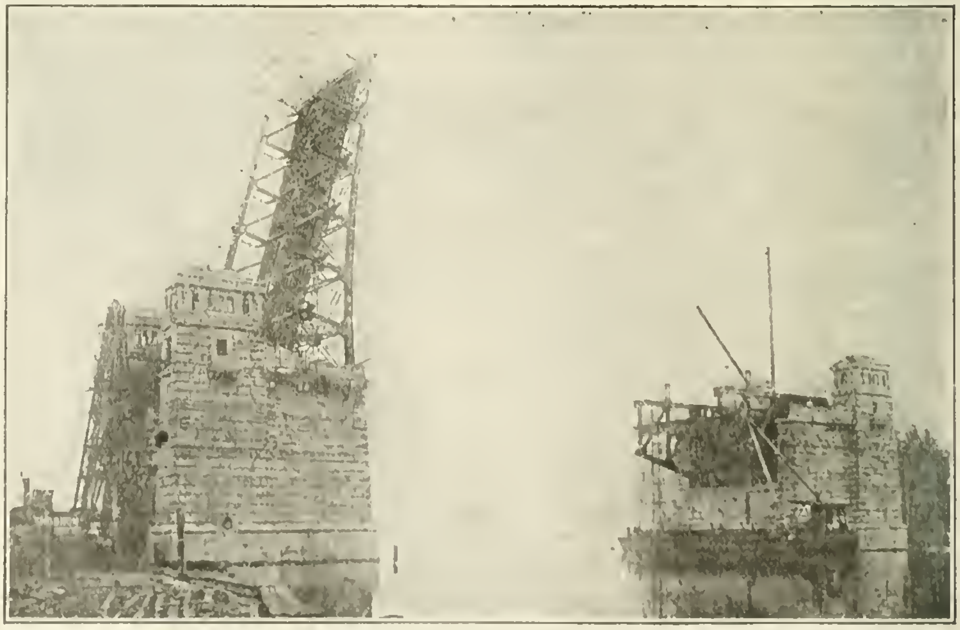


FIG. 1. ERECTION OF 218-FT. BASCULE BRIDGE OVER LAKE WASHINGTON CANAL AT EASTLAKE AVE., SEATTLE, WASH.
(Leaves are erected in horizontal position)

length, from trunnions to anchor brackets, is 38½ ft. A depth of 13 ft. is required for the counterweight pits. In the Eastlake Ave. and 15th Ave. bridges, the span is 218 ft. and the leaves are cantilevered 96 ft., while owing to the greater height and shorter span there are no counterweight pits.

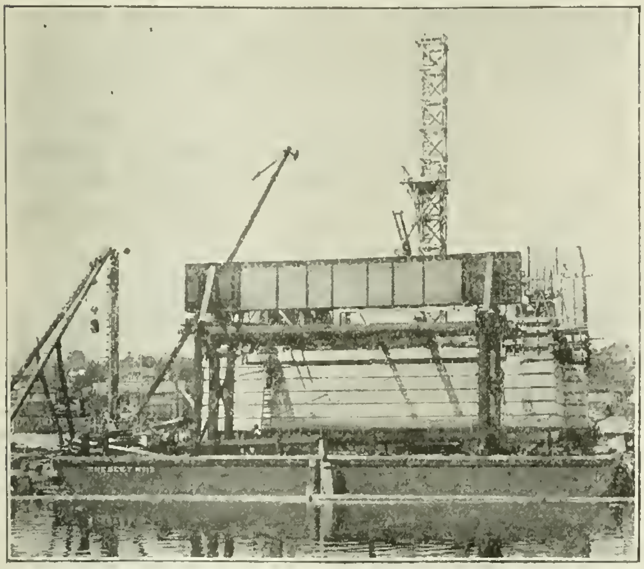


FIG. 2. TRUNNION GIRDER IS SKIDDED ONTO PIER FROM FALSEWORK ON BARGE

Support of the leaves on live-load bearings in advance of the trunnions reduces the live-load heel uplift and the live-load stresses in the tail. It may be explained that the dead-load stresses, with the bridge in its closed position, are computed on the assumption that the bridge is balanced on the trunnions, while the combined dead- and live-load stresses are figured on the assumption that the bridge is pivoted on the forward or live-load supports. This gives, for dead and live load combined, an anchor arm 13 ft. longer than for dead load only, and thereby makes a portion of the weight of the counterweight effective in anchoring the live load. To accomplish this result a small opening, depending on the stiffness of the anchor arm, is left between the anchor-arm bumper and the anchorage when the bridge is seated on the forward supports. The amount of this opening was determined by experiment and in these bridges is ⅛ in.

The trunnion bearings of each leaf are mounted on a heavy transverse box girder which is supported directly by a pair of masonry piers, instead of being carried by longitudinal girders extending from the channel pier to the anchor pier, as in some of the Chicago bridges. Fig. 2 shows one of these cross-girders being set in place. The live-load uplift of the anchor arm is taken directly by a steel column embedded in a pier at each truss. A description of the piers and foundations of the Eastlake Ave. bridge will be given in a later issue.

A single longitudinal footing on each side of the bridge, at each end, carries the anchor pier and the trunnion pier, as well as the extension of the latter which forms a support for the bottom chord when the bridge is closed, as noted above. To equalize the toe and heel pressures, the footings are trapezoidal in plan, with the wider end at the trunnion pier. The footings are designed for dead plus live load. The dead load on the footings is practically uniform and the maximum pressure is about six thousand pounds per square foot.

The live-load assumption for the floor system provides, on each track, a 60-ton street car with 50-ton trailer, each 47½ ft. long and having two trucks of 6-ft. wheelbase spaced 33½ ft. c. to c. For the roadway, the load is a 24-ton motor truck having a 7 x 16-ft. wheelbase with 15 tons on the rear axle, or as alternative a load of 100 lb. per square foot. Any combination or position of the above loads that would give maximum stresses was used to determine the sections. A wind load, not increased for impact, of 450 lb. per lineal foot of bridge is distributed as 150 lb. each on the upper chord, the lower chord and the floor, these loads being considered as moving. With the bridge open, it is designed to resist a wind load of 15 lb. per square foot acting in any direction.

To provide for impact, the live-load stresses are increased 50 per cent on floorbeams and 60 per cent on stringers, except that at stringers and floorbeams adjacent to the breaks in the floor the increase is 100 per cent. The specifications provided originally for the application of the formula recommended by a committee of the American Railway Engineering Associa-

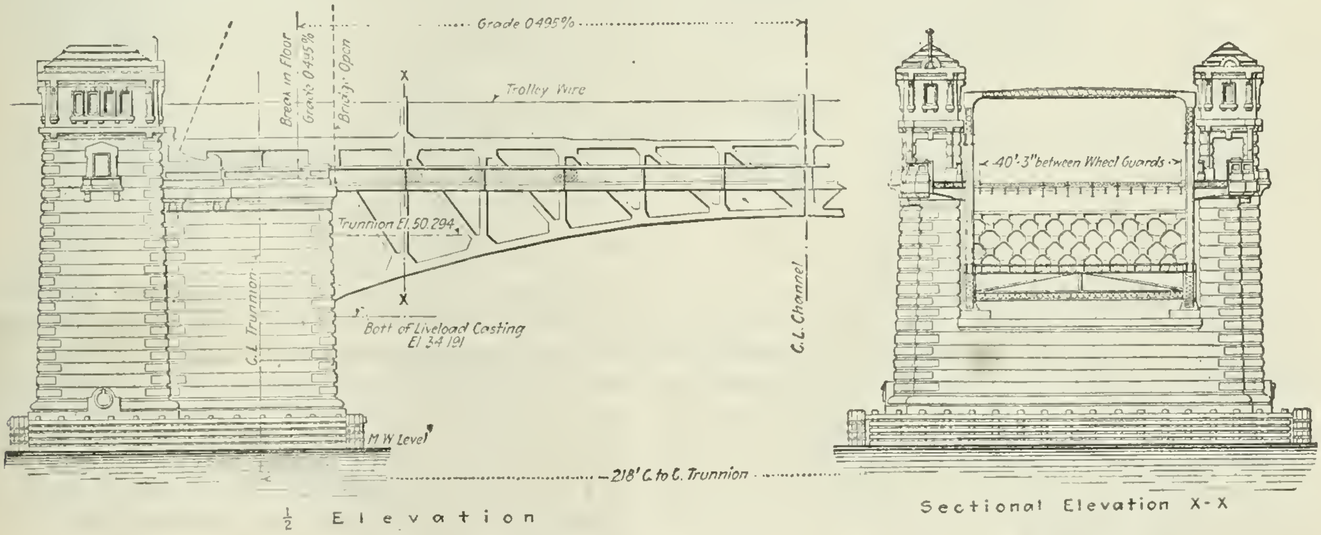


FIG. 3. GENERAL DESIGN OF EASTLAKE AVE. BRIDGE AND PIERS, SEATTLE, WASH.

tion in 1910, except for the modification of taking only half the result, the formula thus modified being

$$I = \frac{100}{1 + \frac{L^2}{20,000}} \times 0.5$$

The factor 0.5 was introduced because it was believed that the elimination of unbalanced driving wheels and the reduced speed of electric cars would reduce the impact by this amount. A. Munster, of Seattle, was consulted and recommended an impact allowance of 70 per cent for stringers, 50 per cent for floor beams and 15 per cent for all members of the trusses. His conclusions were based on the American Railway Engineering Association's tests, modified to meet electric-railway and truck traffic. His report gave the arguments but no figures except his results, but his figures for the floor system corresponded quite closely to the results of the modified formula.

In respect to the trusses, Mr. Munster reasoned that as the maximum stresses were obtained by full live load on the bridge a flat allowance was proper, and that such a dense loading eliminated much of the element of speed of application of the load. The sizes of floorbeams, stringers and certain truss members were then computed, using the city's impact allowance, Mr. Munster's recommendations and those of three other sets of specifications, the final impact allowances arrived at being considered as giving a fair average of the results obtained by all these methods. Details of the heel end of the trusses are shown in Fig. 4, while Fig. 5 shows the arrangement of the operating machinery. Concave racks forming an internal gear are a feature of the operating mechanism, this construction having been devised and patented by Alexander Von Babo, engineer of bridge design in the Department of Public Works, Chicago. The gear trains drive operating pinions engaging the inner faces of the racks, which are built into the counterweight arms of the trusses, as shown. Each leaf is operated by two direct-current motors of 100-hp. capacity at 550 volts, the motors being fitted with solenoid brakes capable of holding the bridge against a 15-lb. wind. Hand brakes are provided also. One operator controls both leaves.

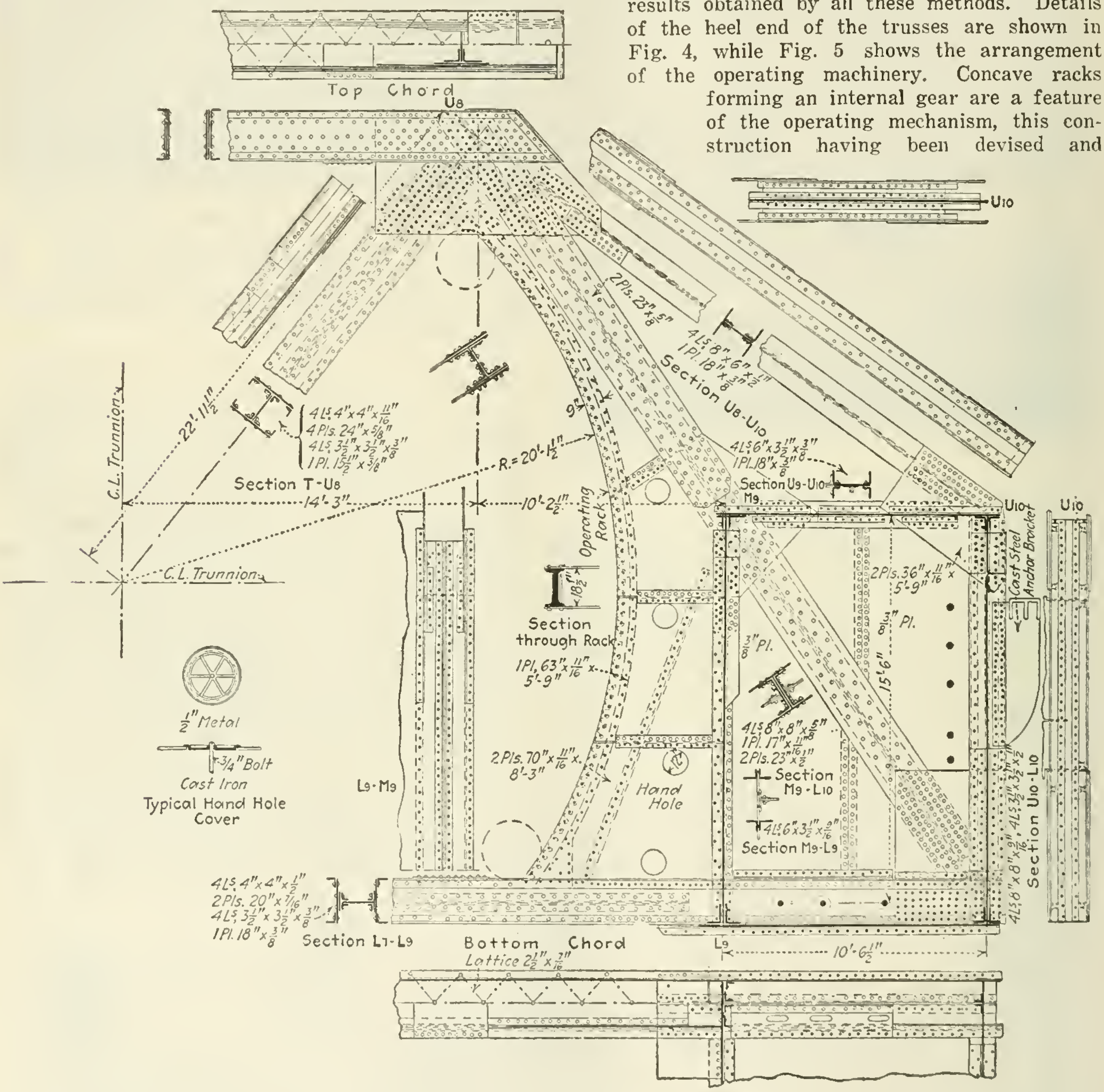


FIG. 4. DETAILS OF HEEL OF TRUSS, WITH OPERATING RACK

An emergency hand operating connection, with four-arm capstan operated from the deck of the approach, can open the bridge in six hours. This is not an unusual period for hand operation of a bridge of this size and weight, but such provision is made against complete failure of the power apparatus that the necessity of using the hand operating mechanism is extremely remote. Each leaf can be operated independently and either of its two motors is powerful enough to operate it. In addition, a set of spare parts for one motor and solenoid brake is kept at each bridge. During construction it was found that the six-hour period for hand operations could be reduced to two hours by attaching a small automobile to the arm and running it around.

The machinery is designed to hold the bridge against a wind pressure of 15 lb. per square foot on the surface of the floor of the moving leaf to operate in a 10-lb wind pressure without exceeding working stresses as follows: From 20,000 lb. to 5,000 lb. for tooth speeds of 100 to 1,800 ft. per minute at 15 lb.; from 15,000 to 3,750 lb. for the same tooth speeds at 10-lb. pressure. All gears are of cast steel, with machine-cut teeth of 20° involute pattern, except that the racks have molded teeth. The main pinions are of forged steel with teeth cut from the solid.

For the operation of the center locks, shown in Fig. 7, there is a line shaft extending across the bridge and driven by a 3¾-hp. motor at one end. Experience shows, however, the advisability of placing the motor or turning mechanism at the middle of the shaft, so as to eliminate any tendency of one lock pin to lag relative to the other. It is found that the lock pin at the far end of the shaft lags ⅜ in. behind the pin at the motor end, with no extraordinary resistance to overcome. If the rebound of a careless landing puts the leaves in bad alignment the lag is greater.

It has happened that the twisting of the shaft was enough to interfere with the electrical contact that indicates by a light in the operator's house that the center locks are thrown, and at the same time releases power to the hoisting motors. This contact is made with an arm fastened to the shaft, and any angular deflection is multiplied at the contact at the extremity of the arm. This difficulty was obviated by putting the contactor at the end of the shaft next the motor. In addition to the center lock pins, a set of rail locks was originally operated by this shaft, but it was found necessary to disconnect the rail locks permanently. If the motor was in the middle of the shaft the deflection at the ends of the shaft would be reduced one-half and the rail locks would be operated with a very short length of shaft.

A bank of signal lights shows the operator the positions of the leaves while they are moving. The mechanism consists simply of a revolving drum switch with a number of contacts on its surface wired to lamps in a slate board mounted in front of the operator, the lamps being set for definite positions in the angular movement of the leaf. The drum is geared to the main trunnion, so that the contacts on the drum are made or broken as the bridge moves, and the lights are switched in or out correspondingly.

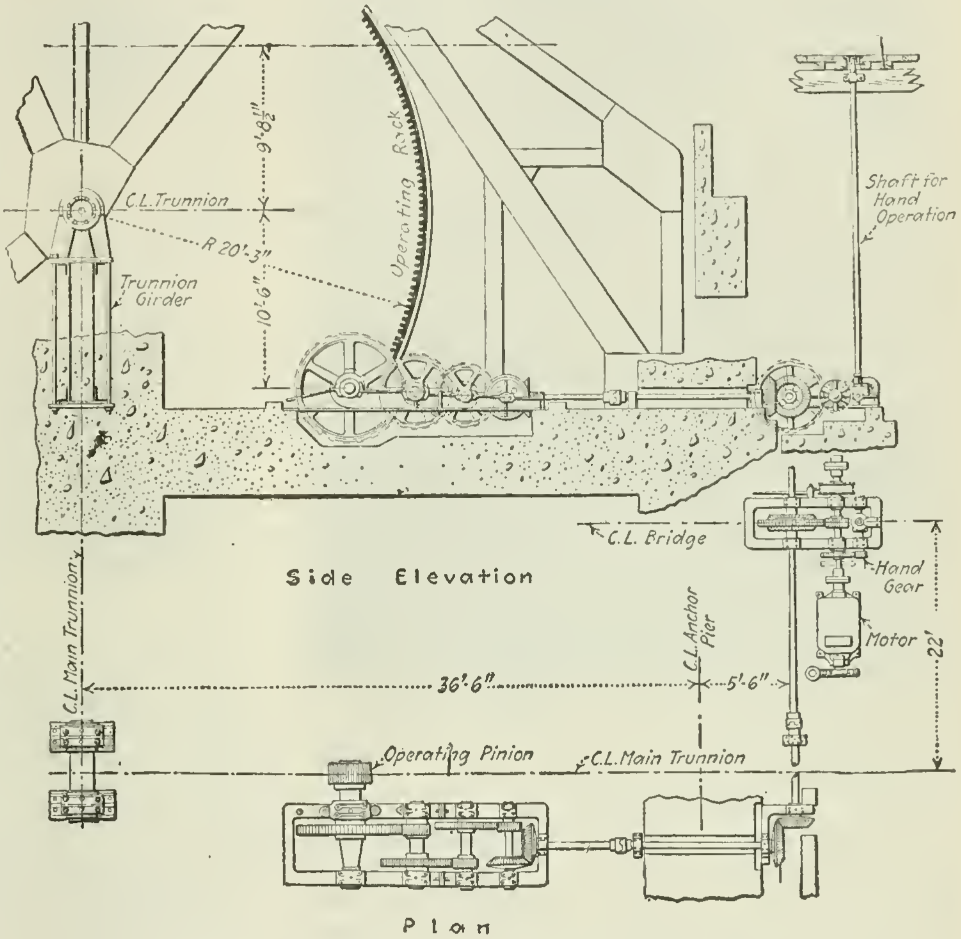


FIG. 5. OPERATING MACHINERY HAS PINIONS ENGAGING CONCAVE RACKS

Swinging gate arms and an audible signal are placed at both approaches, but in spite of the latter the gates are occasionally smashed by speeding automobiles.

The counterweights are composed of a mixture of gravel concrete and cinder concrete filled into steel boxes built into the rear of the trusses, below the deck. Two pockets aggregating about 3 per cent of the volume of the box are formed in the concrete, to provide for cast blocks used in adjusting the weight for wet and dry seasons. To insure the proper position of the center of gravity of the counterweight, all the sand and gravel was passed over a platform scale on its way to the mixer. Each day the position of the center of gravity was computed, and any variation from the designed position corrected by varying the mixture.

Creosoted fir blocks 3¼ in. thick for the roadway paving of the leaves are laid on a deck composed of a bottom layer of 4-in. transverse planks and an upper layer of 2-in. longitudinal planks, covered with two layers of one-ply roofing felt mopped in place with tar. Each block was dipped about one-fourth its depth in hot asphalt and when pushed into place was toenailed with an 8-penny wire nail. At intervals of eight rows transverse angles 1½ x 1½ x ⅛ in. were screwed to the deck to prevent shifting of the blocks due to the operation of the bridge. Hot asphalt was spread with squeegees to fill the joints for half their depth, and hot sand filled in to the surface.

All truss connections were assembled and reamed at the shop. The operating racks also were assembled, and holes then drilled in the solid for the turned bolts, which have a light driving fit. All gears and shafting were mounted in their frames at the shop and there operated to insure accurate assembly.

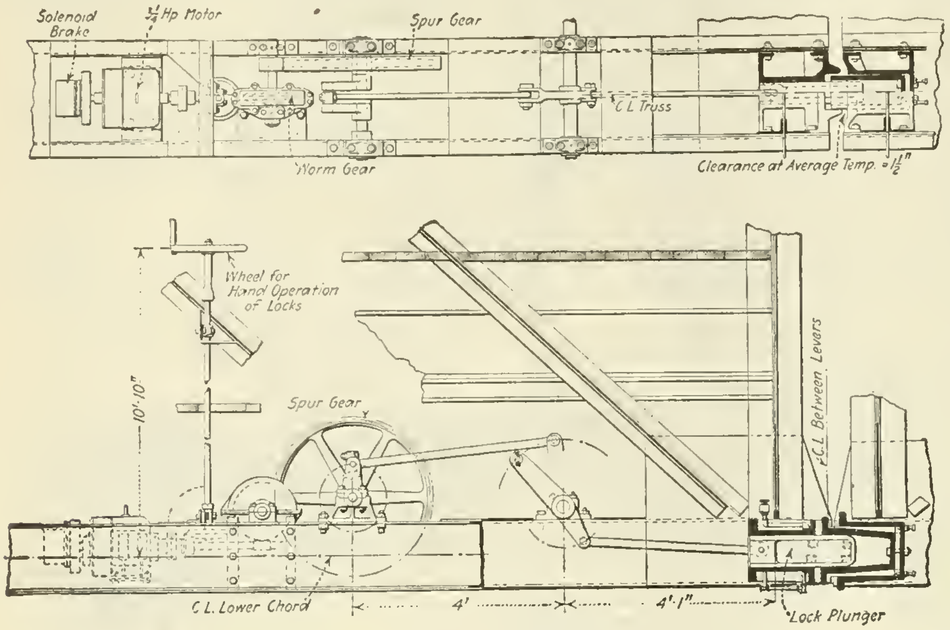


FIG. 6. MOTOR-OPERATED END LOCKS FOR BASCULE BRIDGES

Erection was done with the leaves in horizontal position, blocked against the anchorage. One leaf was completed and raised to the vertical position before starting the opposite leaf, thus leaving at least half the channel width unobstructed. This method of erection is the most natural and economical where shipping can get along with the restricted opening, and these bridges provide so much vertical clearance that a large proportion of traffic passes under them. With the bridge in the closed position and blocked against the anchorage there is no necessity for keeping the bridge balanced by adding counterweight as the erection proceeds, the counterweight being poured in finally in a continuous operation, thus securing better results. The handling of the steel is more economically done by this method, as it avoids the increasing lift and consequent raising of the derrick as the work proceeds.

On the Eastlake Ave. bridge the procedure was as follows: The main cross-girders for the trunnion bearings were brought to the site on a barge, this barge having falsework of such height that the girder could be skidded into place on the piers, as shown in Fig. 4. After this, the platform of the fixed parts was raised by a ginpole footed on the foundation cofferdam. A large guyed derrick was then set up on this platform and handled the heavy members of the anchor arm and counterweight box. The cantilever arms were erected by a stiff-leg derrick which moved out on the floor system as the erection proceeded, the pieces being taken from a barge beneath. The heaviest parts were about 50 tons in weight and 54 ft. long.

The heavy cross-girders were loaded on the barges at the Smith Cove terminal of the Port of Seattle Commission, by means of a 50-ton crane with a reach over a railway track at the edge of the wharf. The rest of the material was lightered from the railway terminal to a storage yard near the bridge site. One difficulty experienced was that the trusses assembled ¾ in. to 1 in. short in each leaf, thus leaving a wider central gap than had been intended and making it necessary to set the center locks at their full limit. There was trouble also with the bearing plates on top of the main cross-girders under the trunnion bearings, which were planed on a bevel to counteract the deflection of the girders, so that the bore of the bearings would be level. The shortness of the trusses was due to the shopwork. A careful survey showed each panel of the overhanging arm to be short from ⅛ in. to ¼ in., while the panel between the forward pier support and the trunnions was short ⅜ in. in one truss, but as yet no explanation has been obtained from the fabricators.

Two of the bridges were commenced in 1915 and completed in 1917. For the one at Fifteenth Ave. N. W., there were 1,104 tons of structural steel and 118 tons of machinery; the cost was $109,862 for the substructure and $141,605 for the superstructure. The Fremont Ave. bridge required 1,176 tons of structural steel and 132 tons of machinery; its cost was $114,773 for the substructure and $161,017 for the superstructure. The Eastlake Ave. bridge was delayed by failure of the first contractor for the substructure and was not completed until April, 1919. Its cost was $233,877 for the substructure and $192,220 for the superstructure, this increase over the other bridges being due largely to piling and concrete foundation and to reletting portions of the work at wartime prices.

Under the direction of A. H. Dimock, city engineer, design and erection of these bridges were in charge of the writer, as city bridge engineer, while the architectural treatment of the piers was designed by D. R. Huntington, city architect. The city's superintendents of construction were J. Charles Rathbun for the bridge at Fifteenth Ave. N. W., J. A. Dunford for the Fremont Ave. bridge, and E. K. Triol for the Eastlake Ave. bridge. The contractors were as follows, all being of Seattle: Fifteenth Ave. N. W., substructure and superstructure, Hans Pederson; Fremont Ave., substructure, Pacific States Construction Co.; superstructure, United States Steel Products Co., Eastlake Ave.; substructure, Booker, Kiehl & Whipple; superstructure, United States Steel Products Co.

Studying the Effect of Impact and Wear on Road Surfaces

HAVING obtained data on the impact exerted by motor trucks, the Bureau of Public Roads is now studying the effect of impact on different types of road pavement. The earlier tests were described in *Engineering News-Record*, Sept. 18, 1919, p. 573. The new tests are not yet completed, but it is the hope of the bureau that they will furnish data of value to the highway designer.

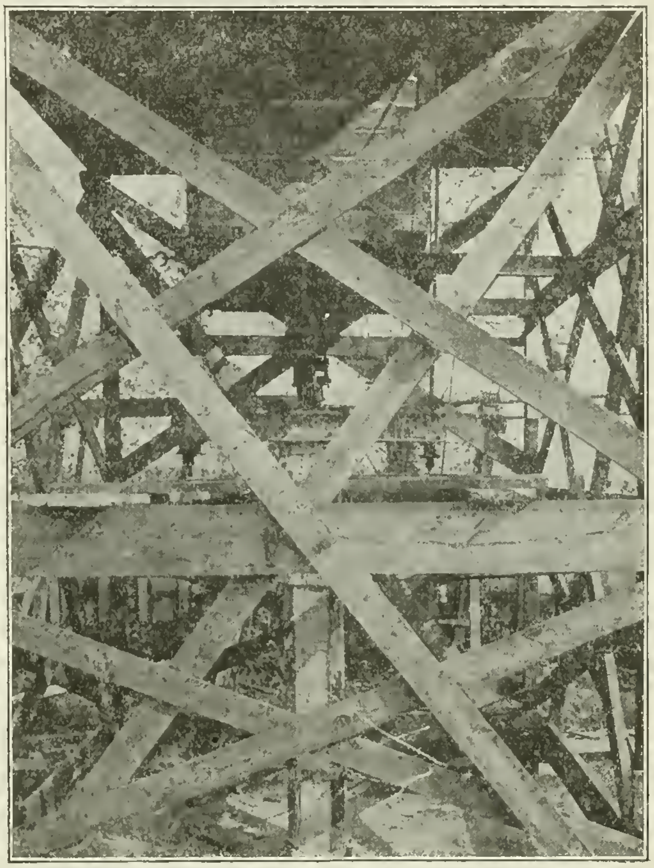
Two different classes of tests are being carried on: direct determination of impact effect and (2) comparative resistance to wear of varying types of surfaces on different types of bases.

For the first class of tests a number of slabs, 7 ft. square, have been laid directly on the subgrade. Half of these sections have been laid upon a subgrade that is purposely kept wet and the others are upon well drained subgrade. Sections thus far constructed include concrete in depths varying from 2 to 10 in. and brick constructed on varying thicknesses of concrete bases. Various kinds of brick have been used, including repressed wire-cut lug and vertical-fibre brick. Monolithic, semi-monolithic and sand cushion construction have been used and portland cement grout and bituminous mastic fillers have been employed. In other sections the brick have been laid directly on the subgrade and in others on a prepared macadam base.

Slabs are tested by means of an impact machine designed to represent the conditions existing on the rear wheel of a truck. This machine has an unsprung weight of 3,000 lb. and will carry a sprung weight of 9,000 lb., weights which correspond approximately to those existing on the rear wheel of a 7½-ton truck. The lower end of the sprung weight is shoed with a solid rubber tire and the whole weight is raised to such a height that, when allowed to fall, the impact delivered will be one that might be delivered by a 7½-ton truck. Observations will consist in noting the behavior of slabs when subjected to repeated impacts of the machine, and in measuring deflections of the surface. A cam, driven by a gasoline motor mounted on a scaffold, allows, with the aid of a walking beam, the sprung weight to deliver repeated blows to the road surface.

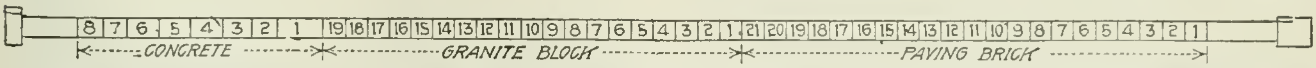
The tests are being carried on under the supervision of A. T. Goldbeck, engineer of tests, Bureau of Public Roads, though the actual tests are being made by E. T. Smith and J. T. Pauls. Regarding the tests Mr. Goldbeck has this to say:

"With the completion of these tests it is hoped that sufficient data will have been accumulated to place the design of roads on a much sounder basis than at present, and it is hoped that the results combined with the results of still other investigations will finally lead to a method suitable for determining with certainty road types and cross sections for definite subgrade and load conditions."



MACHINE FOR TESTING IMPACT ON ROAD SLABS

When these tests have been completed it is planned



Sec.	Aggregate		Section		
No.	Kind	Size	Thick	Length	Laid
1	Trap Rock	2"-¾"	6"	16.5	8-6
2	Limestone	¼"-2½"	6"	9.0'	8-6
3	Sandstone	½"-2½"	6"	10.5'	8-6
4	Gravel	¼"-1½"	6"	11.2'	8-6
5	Slag	¼"-¾"	6"	11.1'	8-7
6	Gravel	¼"-1½"	6"	12.0'	8-7
7	Slag	¼"-2½"	6"	7.2'	8-7
8	Gneiss	1½"-¼"	6"	12.5'	8-7

Sec.	Granite Block	Cushion		Section		Joint Filler	
No.	Source	Material	Thick	Length	Laid	Material	Poured
1	Vinal Haven (Leopold)	S.C. 4:1	1"	8'	7-16	C.S. 1:1	7-16
2	Rockport	S.C. 4:1	1"	8'	7-16	C.S. 1:1	7-16
3	Mt. Airy	S.C. 4:1	1"	8'	7-16	C.S. 1:1	7-16
4	Chelmsford	S.C. 4:1	1"	8'	7-16	C.S. 1:1	7-16
5	Concord (Swenson)	S.C. 4:1	1"	8'	7-16	C.S. 1:1	7-16
6	Cape Anne	S.C. 4:1	1"	8'	7-16	C.S. 1:1	7-16
7	Lithonia	S.C. 4:1	1"	8'	8-25	C.S. 1:1	8-25
8	Lithonia	S.C. 4:1	1"	8'	8-25	A	8-25
9	Vinal Haven (Leopold)	S.C. 4:1	1"	8'	7-17	A	7-17
10	Rockport	S.C. 4:1	1"	8'	7-17	A	7-17
11	Mt. Airy	S.C. 4:1	1"	8'	7-17	A	7-17
12	Vinal Haven (Booth)	S.C. 4:1	1"	8'	7-17	A.S.	7-17
13	Chelmsford	S.C. 4:1	1"	8'	7-17	A.S.	7-17
14	Concord (N.E.Gr.)	S.C. 4:1	1"	8'	7-17	A.S.	7-17
15	Somes Sound	S.	1"	8'	7-17	A	7-17
16	Long Cove	A.S.	1"	8'	7-17	A.S.	7-17
17	Vinal Haven (Booth)	S.C. 4:1	1"	8'	8-25	T.S.	8-25
18	Somes Sound	S.	1"	8'	8-25	T	8-25
19	Long Cove	T.S.	1"	8'	8-25	T.S.	8-25

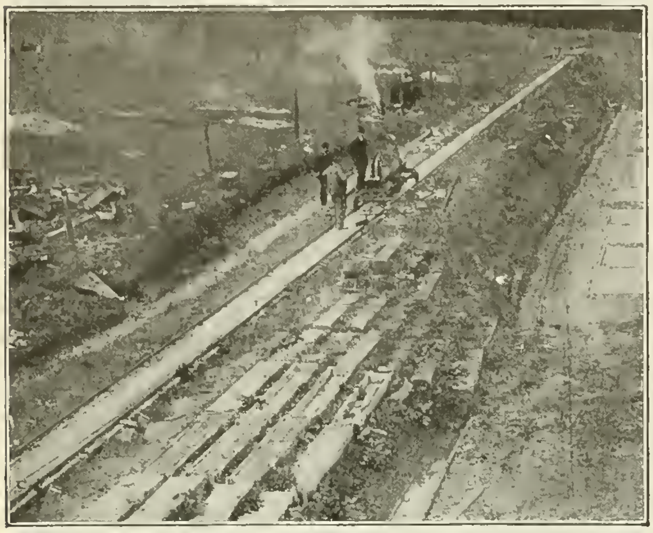
Sec.	Brick		Cushion		Section		Joint Filler	
No.	Type	%Wear	Material	Thick	Length	Laid	Material	Laid
1	Rep.	16	S.C. 4:1	1"	8'	7-5	C.S. 1:1	7-5
2	W.C.L.	16	S.C. 4:1	1"	8'	7-7	C.S. 1:1	7-7
3	Rep.	19	S.C. 4:1	1"	8'	7-7	C.S. 1:1	7-7
4	W.C.L.	19	S.C. 4:1	1"	8'	7-7	C.S. 1:1	7-7
5	Rep.	24	S.C. 4:1	1"	8'	7-7	C.S. 1:1	7-7
6	W.C.L.	24	S.C. 4:1	1"	8'	7-7	C.S. 1:1	7-7
7	Rep.	16	S.C. 4:1	1"	8'	7-8	A	8-25
8	W.C.L.	16	S.C. 4:1	1"	8'	7-8	A	8-25
9	Rep.	19	S.C. 4:1	1"	8'	7-8	A	8-25
10	W.C.L.	19	S.C. 4:1	1"	8'	7-8	A	8-25
11	Rep.	24	S.C. 4:1	1"	8'	7-8	A	8-25
12	W.C.L.	24	S.C. 4:1	1"	8'	7-8	A	8-25
13	V.F.	18.8	S.C. 4:1	1"	8'	7-9	A	8-25
14	V.F.	18.8	S	1"	8'	7-9	A	8-25
15	3"W.C.L.	17.7	S	1"	8'	7-9	A	8-25
16	3"W.C.L.	17.7	S	1"	8'	7-9	A.S. 1:1	8-25
17	3"W.C.L.	17.7	S	1"	8'	7-11	T	7-14
18	3"W.C.L.	17.7	S	1"	8'	7-11	T.S. 1:1	7-14
19	3"W.C.L.	17.7	S	1"	8'	7-11	C.S. 1:1	7-14
20	W.C.L.	16	S	1"	8'	7-11	T	7-14
21	V.F.	18.8	S.C. 4:1	1"	8'	7-11	C.S. 1:1	7-14

KEY

W.C.L. = *4" Wire cut lug Brick*
V.F. = *4" Vertical Fiber Brick*
Rep. = *4" Repressed Brick*
3"W.C.L. = *3" Wire cut lug Brick*
S = *Sand*
S.C. = *Sand Cement Cushion, Dry Mix.*
R. = *Screening Cushion*
A. = *Asphalt Filler*
C.S. = *Grout Filler*
Mac. = *Macadam*
C = *Cement*
K = *Concrete*
T.S. = *Tar Mastic*
T = *Tar*
A.S. = *Asphalt Mastic*

PLAN OF RUNWAY, AND DATA CONCERNING THE CONSTRUCTION OF EACH OF 49 TEST SECTIONS to carry on similar ones upon bituminous surfaces laid on concrete bases using a 1:3:6 as well as a 1:1½:3 mixture. In addition broken stone will be used under bituminous surfaces.

The other tests are being made with the aid of a pavement-wear test machine designed and built in the Bureau of Public Roads. It consists essentially of five cast-iron wheels each 48 in. in diameter and 2 in. wide and weighing 1,000 lb. mounted inside of a structural steel frame so as to operate independently of each other. The frame itself is mounted upon trucks and the whole is operated over a 30-in. gage track, being propelled backward and forward by an endless cable and automatic reversing grips. The rails are supported on 6-in. x 30-in. reinforced-concrete curbs, between which are laid the various test sections of road. This test strip is 400 ft. in length and 24 in. wide and contains 49 different types of pavement, divided into three main groups—vitrified paving brick, granite block and portland cement concrete. The machine travels at approximately 5 miles per hour.



PAVEMENT WEARING TEST MACHINE OPERATING OVER 400-FT. RUNWAY

All block sections are laid upon an 8-in. 1:3:6 concrete base which in turn rests upon 18 in. of compacted cinder fill. Every effort was made in the laying of these various test specimens to secure as perfect drainage as possible so that whatever disintegration occurs will be due either to the wear or breaking up of the surface of the pavement and not to any failure of the foundation.

The test machine to date has made approximately 1,000 trips and considerable wear is reported on several of the sections. Although the wheels roll up and down the roadway in exactly the same path and the action is thereby greatly accelerated, it is considered that the resulting conditions approximate very fairly what would result from the action of steel-tired city traffic, which was the desired end when the machine was constructed.

Combined Asbestos and Cement Pipe Made in Italy

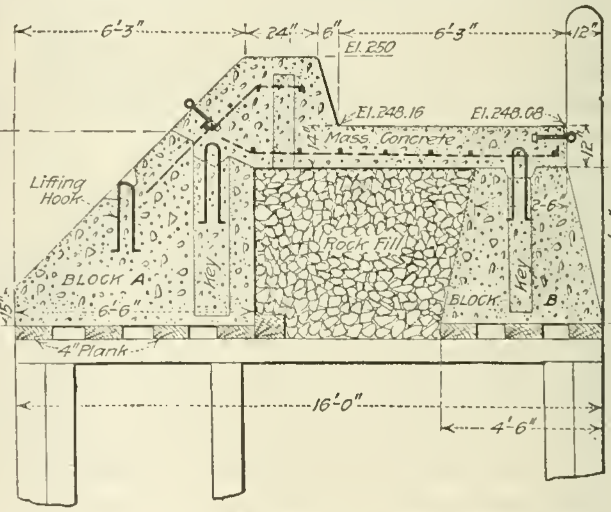
An asbestos shingle company, in Italy, has recently begun the manufacture of pipe made of 85 per cent portland cement and 15 per cent asbestos fibre of shingle stock grade. The pipe is made 4 to 12 in. in diameter, varying in thickness from ½ to 15/16 in. respectively.

Progress on Toronto Harbor Works

Although New Works Lagged During War They Are Now Going Ahead—Use Shows Value of Proposed Development

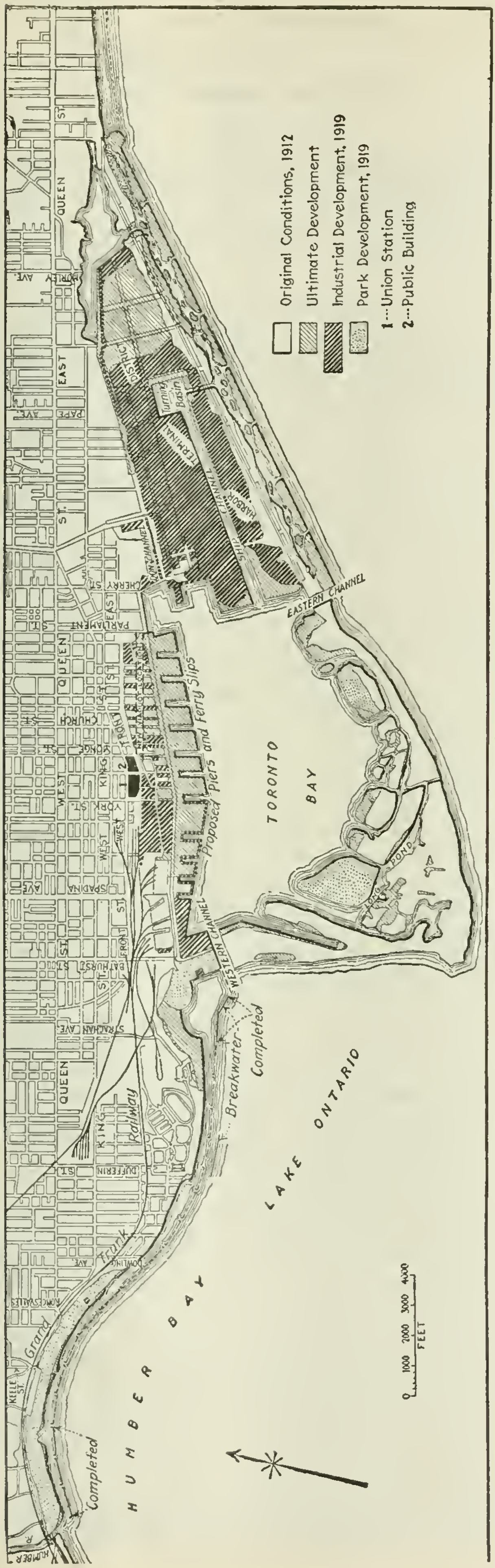
SEVEN years ago work was started on an ambitious harbor scheme for the City of Toronto, Ont., with an estimated total cost of about $20,000,000, and an expectation of completion in 1920. Just as the work was well under way the great war came and slowed down all construction and raised all costs. As a result it is probable that the cost will run much higher than the estimate, while it is certain that the work cannot be completed this year. Nevertheless, much was done before the war, and some little during the war, particularly such as was necessary to provide for war factories on reclaimed land. During last summer the construction was again speeded up, so that today the development has made sufficient progress to make it worth recording.

The waterfront of the center part of the City of Toronto is protected from Lake Ontario by a natural island curving crescent-shape in front of the shore. The development proposed in 1912 was divided into three parts. To the west of this island the lake front was to be protected by a paralleling breakwater and the shore developed, mainly for park, amusement and residential purposes. The bay front is that section of the city facing the waters inclosed by the island, and was to be developed in wide piers and intervening slips, with industrial plants on the piers. The island itself was to be filled in, in certain places, with dredgings from the bay, which was to be excavated to give a depth of 30 ft. Probably the most important part of this development is the reclamation of the land between the island front and the city at the west part of the city. Here was originally a marshy area known as Ashbridge's Bay. This is to be filled in and developed for industrial purposes with a ship channel 400 ft. wide leading to a 1100-ft. square turning basin in the center of the district. Boulevards were to be continued around the island from one part of the city to the other, and the west end of the island is separated from the lake by small lagoons in such fashion as to make it available for summer residences.



DETAILS OF BREAKWATER AT WEST END OF HARBOR

The accompanying map indicates the condition of the progress at the end of last season. At the western



STATUS OF THE TORONTO HARBOR DEVELOPMENT AT THE END OF WORKING SEASON, 1919

section of the work the shore line, outside of the tracks of the Grand Trunk Ry., has been reclaimed practically to the full extent of the original intention, and the protecting breakwater started at the far western end. It is the intention in the coming season to spend a considerable part of the current appropriation in the further development of this section by building dancing pavilions, bathing beaches and restaurants, all to be conducted under the direction of the Toronto Harbor Commissioners. The breakwater is being built by the Federal Government. It is made up of reinforced-concrete precast blocks resting on a timber pile and timber cap support, shown in the detail herewith. In that detail block A and block B are precast, and are set on the timber base, to be filled in between with a rock fill and capped with a mass concrete top as shown. At the eastern end of the western section there still remains a small area to be reclaimed.

In the central section, the beginnings of the pier and slip development show. Just inside the western channel, across which a proposed bascule bridge has not yet been built, is an extensive area reclaimed during the war and utilized as a shipyard for the Canadian Shipbuilding Co., Ltd. Extending east from this plant the bulkhead wall is now being continued to the foot of York St. The construction at this point consists of precast blocks on a timber frame, somewhat similar to the breakwater design, with a dredged fill pumped in behind to form the new land.

It is the intention in this section to develop a marginal street at Queens Quay, with a warehouse and factory construction on the ground between the slips. The development hinges a good deal upon a new viaduct which will carry the tracks of all the railroads into the city across the streets entering the harbor industrial development here. At present these tracks spread at the old union station and pass along parallel to the present shore line on grade. A new union station is about completed, fronting on Front St. and between York St. and Bay St., and according to an agreement made five years ago between the railways concerned, the city, and the Toronto Harbor Commissioners, a new viaduct will carry all the tracks over these entering streets from the union station east to Parliament St. An effort is now being made by the railways to have the agreement changed, but it is thought that neither the city nor the Harbor Commissioners will agree to this.

It is also the intention to bring along the marginal street the lines of the so-called "radial" interurban electric lines which are to be built by the Province of Ontario, so as to form along the waterfront, between York St. and Yonge St., a transportation center for out-of-town traffic. Practically all the urban railway lines deliver their passengers farther uptown, so that it is thought there will not be any congestion by delivering the out-of-town interurban and steam railway passengers here. As soon as the viaduct carrying the through tracks of the steam lines is built, spur lines on grade will be brought in from west and east to the center slip to serve the warehouses between the various slips. These lines will not cross the two center piers of the development but will be stub-ended, leaving an open space to permit the free surface travel to the two center piers, which will probably be utilized for lake ships and ferry lines to the island, which latter carry very heavy traffic in the summer.

In the eastern part of the development, work is progressing very favorably. The so-called Don channel, which carries the Don River out into Toronto Bay, has been completed by the building of a concrete wall along both sides, and is now utilized for industrial development, with a bascule bridge at the foot of Cherry St. The ship channel farther out in the old Ashbridge's Bay district is completed, and work is proceeding on the walls forming the turning basin. These walls are similar in construction to the breakwater, except that they are of mass concrete on timber frames based on wood piles and with a sheet-pile facing wall, and tied back to anchor piles. Filling is going on in the area from hydraulic dredging in the main bay. During the war a large area was utilized here for the British Forgings, Ltd., where various war materials were manufactured. This represents the largest utilization of the hitherto unused ground in the whole development. Five years ago, where the British Forgings, Ltd., plant was built was part marsh and part water. Now it is a flourishing plant, connected by tracks to the main rail system. While the plant is of no further use for the purpose for which it was built, it is being taken over by English steel interests and will be further enlarged at an early date. Leases have also been written for a considerable part of the remaining reclaimed ground, so the commissioners feel very hopeful of the future prosperity of the scheme.

Nothing has been done toward the boulevard drive location or in the development of the lake side of the island, though as shown on the map some little work has been done in reclaiming land on the bay side.

All the work is under the direction of the Toronto Harbor Commission, of which E. L. Cousins is chief engineer and manager. The commission is made up of five members, three of whom are appointed by the city, one is the representative of the Dominion Government and one is appointed by the Government on the nomination of the Toronto Board of Trade. The city, the Dominion and the commission share the cost. Articles describing the original plans for the development appeared in *Engineering News* of May 24, 1913, p. 1115, and *Engineering Record* of Sept. 19, 1914, p. 326.

For the coming season the Dominion Government has appropriated $1,500,000 which will nearly complete the west breakwater and the commission will spend about $4,000,000 in extending the central pier district, completing the turning basin and in providing recreational facilities at the west end.

A Ferry-Boat Swing Bridge

On narrow, navigable streams with small tidal variation in Harris County, Texas, a flatboat, similar to the ferry boats used in that district, is made to serve as a swing bridge. The boa, with aprons at each end raised or lowered by a winch, reaches between either timber or concrete bulkheads built at each bank of the stream. A boat 60 ft. long, with an 11-ft. apron at each end, was completed early in September. It is of ordinary flatboat construction, 10 ft. in width. The boat is anchored by cables. When it is necessary to allow river traffic to pass, the bridge is swung up or down stream according to the direction of the tide, and subsequently pulled back into place. Howe Wise, Houston, Tex., are highway engineers for Harris County.

Notes from Foreign Fields

Through the Panama Canal

By S. T. Henry

An American engineer locking through the Panama Canal for the first time will more than likely get these general impressions:

1. The Canal is a much bigger project than it usually is visualized from descriptions in the technical press.
2. The job has been well done, from every angle.
3. The slides are still a serious problem, and are likely to continue to cause trouble for a long time. There is an evident confidence everywhere in the Zone, however, that the slides are licked and that they will rarely, if ever again, seriously hamper the passage of ships.
4. All operations appear to synchronize perfectly.
5. The volume of traffic is much heavier than is generally sensed from statistics.
6. Every American engineer should visit the Canal for the inspiration that he is sure to get from a week or ten days in the Zone.

There are, of course, other impressions that will come to different engineers according to the breadth and depth of their technical training and experience. But the general impressions mentioned appeared to be the consensus of the opinions of a group of engineers from the States who recently made their initial passage through the Canal en route to South America.

Our ship came in sight of the irregular mountainous Panamanian shore late in the afternoon, six days out from New York. Shortly afterward we could see the superstructure of the great Colon coaling station, then the two long breakwaters that make such a wonderful harbor of Limon Bay. In passing through the entrance to the harbor between the breakwaters one is impressed with the similarity to the entrance to the harbors at Milwaukee and Cleveland. The background is, of course, entirely different.

We pulled alongside the coaling dock early in the evening to refill our fuel oil tanks. Although this required only four hours, we could not get away until daybreak, because the night operation of the Canal has not yet been undertaken. Everything is in readiness for operating at night. It has been deemed inadvisable, however, to attempt this until necessary.

At Colon the predominant feature is the coaling station. It is so tremendous that no description of it can give an adequate idea. Talks with officers of ships that bring the fuel to the station and of ships which refuel there frequently bore out the evident efficiency of the entire plant.

A few hours in a launch around Limon Bay, afoot and in the inevitable one-horse shays in Colon and Cristobal are filled with much of consuming interest. One is struck especially with the great concrete wharves and warehouses. Ships of all flags were loading and unloading. With the present traffic through the Canal, Colon has already become one of the world's great cargo transfer points.

Leaving Colon at daybreak, our ship backed out into the harbor and headed into the canal. The first stretch is a wide, straight cut through low swampy ground. The flight of three locks at Gatun loom up in the distance immediately.

Arriving at the approach to the first lock our ship was quickly under the control of the electric touring locomotives. With three locomotives on each side, one just ahead, one amidships and one just aft, the ship moved forward slowly with every evidence of the capacity of the locomotives to meet emergencies. Then the great gates swung into place, the water began to boil up in astonishing volume from the numerous inlets. The lock was filled and the ship lifted 32 ft. in about 9 minutes. Then the gates ahead swung open and we moved forward into the next lock.

And so on through that lock and the third lock. No one seemed to hurry, there was no shouting, everything seemed to operate just right at the right time. Every man evidently knew his job and did it without haste or concern. It was teamwork to a fine degree.

At the same time, one got the feeling that every move was so absolutely under control that a slip anywhere would be caught and checked instantly. And then there were all the safety and emergency gates if real trouble came. But one felt that serious trouble could scarcely occur.

As the ship rose in the third lock Gatun Dam lay to the right—a long, low middle west ridge in the midst of the irregular volcanic hills of the vicinity. In the near distance was the Gatun Spillway and just below in the roof of the power house where the energy to operate the canal is generated. Before us lay Gatun Lake. How much greater expanse it covers than one had expected! What a tremendous volume of water it must contain! The statistics have told us all this over and over again. But there was the lake itself, and it seemed so much bigger than dry figures ever could have enabled us to realize.

Thousands of times the questions have arisen: What would happen if an accident swept away the lock gates? What if the dam gave way? They would arise naturally in one's mind if he had never heard of the Canal before. But, at the same time, one gets from what he can merely see a confidence that such emergencies scarcely can happen.

Our ship steamed out, as all ships do, and sailed away at a fair pace on this huge man-made lake 85 ft. above the sea. The course through the lake appeared more tortuous than had been expected. But the wide, easy turns seemed to offer no handicap to our progress. We were soon through the lake and entering the cut section.

Any engineer who has studied the Canal only from descriptions in the technical press, cannot suppress a thrill as he approaches Culebra Cut. It is interesting to pass through the locks and the lake—but the Cut! During the construction it came to be the controlling feature of the job, at least in the minds of outside engineers. Now it appears to them to be the one big problem that is still in process of solution. The men who have been on the job may feel that this or that or another feature of the project is of greater importance. The casual observer will hold, however, to his impressions of the Cut.

As the ship approached the Cut there were the slides. They are bigger and more vicious looking than any one in the party, who knew only ordinary construction job troubles, had expected. The materials that are moving are a very much mixed-up mess. The slides also appear to have moved in various cross currents to the main movement. They appear likely to continue to move irregularly. But as the ship went slowly between them there came to all of us who had seen the slides for the first time a conviction that the channel could be kept open, regardless of what happened. On the other hand, they apparently will be taking out material in large quantities for a long time to come.

When the Cut was passed, with its dredges at work and in reserve, the Pedro Miguel locks were soon reached. By this time most of the party were authorities on lock operation. We knew just what was going to happen and where it was going to happen. But a child can safely state that the hands of the clock will turn a certain way.

Passage through the Pedro Miguel lock, the Miraflores basin and the Miraflores locks took too little time to get more than a passing glance at the work which had been done there so thoroughly and so well. What could be seen heightened the impressions of the bigness of the job and the perfect synchronizing of the operation.

Beyond the last lock at Miraflores is a short stretch of straight channel cut through low swampy ground. At the end of this is the small harbor at Balboa. Here we were surprised to see an old German vessel of 8,000 to 9,000 tons being completely overhauled and refitted. Several others vessels also were undergoing repairs. When the shipyard whistle blew at quitting time, there were the same crowds of workmen pouring out that are to be seen at various shipyards along both our Coasts. And as we moved along there was the big dry dock hidden behind the yard buildings, but looming up with the masts of a ship just visible over its rim.

Now we headed out into the Pacific. In about seven hours we had gone through the Canal from ocean to ocean. We had seen a big job well done. We had seen an example of a wonderful organization handling a big operating problem smoothly, and without evidence of strain, or friction, or undue haste.

Every American engineer may well be proud of the Canal. It is an American job done by American engineers in American fashion. Probably there were mistakes here and there in the design. Probably there were mistakes here and there in the execution. Probably the operation could be improved. But the Canal is working smoothly and satisfactorily. It is giving to the world all the advantages it was expected to secure for commerce and for civilization generally. These things have been said so often that one hesitates to repeat them. But few American engineers have grasped what the Canal is and what it means to the United States and to the world.

Every American engineer who has a real pride in his profession can get so much from a trip to the Canal that he should plan the next vacation there. And a trip to Panama fits in well for engineers. December and January are the best months to go. That also is the time when most engineers can best take their vacations. It is a good time to be away from our northern states. The weather along the Canal is not unpleasant then. The sea voyage down and back and the experience in the Canal will make an ideal vacation.

Impressions Here and There

MIDDLE WEST MEMBER ATTENDS AM. SOC. C. E. MEETING IN NEW YORK

NOT having had the opportunity of attending a regular meeting of the American Society of Civil Engineers for 10 years a member from the Middle West naturally looked forward with pleasure to resuming the practice. The occasion was the highway meeting of March 17, referred to afterward as "one of the best in some months." Frankly the experience was not up to expectations.

Most of the technical societies of the Middle and Far West have either undergone in 10 years a change for the better in the matter of program-building that is decidedly noticeable, or else they have gone out of existence. There are extremely few of the latter class. Rather has there been a revivification and assumption of grave responsibility to members that is hard to believe unless one has maintained constant touch with them. Sometimes the changes have been gradual, as with the Iowa and Michigan State organizations, and again it has been rapid, as with the city societies, at Cleveland and Kansas City.

How, then, has the national society developed? Would a comparison with the Western Society of Engineers made ten years ago still hold? J. H. Warder, the secretary of the latter, was then in his prime and kept things moving. No one went to sleep at meetings. At least three people would introduce themselves to you and the experience usually proved so exhilarating that you easily got into the habit yourself, without apparent loss of modesty. Programs were studied beforehand. Those which were on timely topics and would produce the greatest amount of discussion were preferred. Since then many changes have taken place in the W. S. E. Controversies have taken place over its alleged non-progressiveness. Its shortcomings have been dissected, diagnosed and rightly or wrongly prescribed for. Early in this 10-year period it voted to have its meetings on Monday, because the majority wanted them on that night rather than on Wednesday, which psychologists argue is the most likely of any night in the week to draw a crowd. Meetings begin at 7 sharp and stop at 9 sharp. No one goes home after work, so why squander any more time for supper? An engineer's wife appreciates his getting home early and some attention must be paid to her opinion if the society expects to claim full attendance of the younger married men, who need its advantages most. Always the program committee has kept in mind, at least sub-consciously, that participants in the discussion at least will have had a "pleasant and valuable" evening and therefore the more members of the audience express themselves the more successful will the meeting be. The same thing holds true of community singing and it is utilized to advantage in more than one society of the Middle West.

Now, to go back to the A. S. C. E. meeting. It was a surprise to find that the 1,248 members in District 1 and the few from outside are content to be served with semi-monthly meetings and none in the summer; barely 20 a year. Why own a hall? Renting would be far cheaper. With all the ramifications into which civil engineering has extended, 20 meetings a year would seem scarcely enough to give each branch an evening. A water-works engineer is not interested primarily in the steel framing of a sky scraper, a highway engineer in sewage disposal, nor a reinforced-concrete building expert in railroad transportation problems, which means that the same 150 men do not come to all of the meetings.

The second surprise was an 8:40 p.m. start. Do New Yorkers go home for dinner? They do not work long after 5 p.m., and a 2-hour cafe dinner can hardly be indulged in at present prices. Perhaps a dozen men were in the reading room at 8. Distances are long, but transportation is excellent in New York. Thirty minutes will carry one far. Why, then, the late start?

With a background of several years' experience in program building the writer was anxious to observe how the program for this meeting was put together and how it would work out. The subject was "The Nation-Wide Demand for Improved Highways." One had a right to expect from the greatest technical society real constructive help for the most perplexed engineers of our profession today. The highway problem is the greatest civil engineering problem, exceeding even that of our railroads.

What did the program propose—and, remember, an 8:40 p.m. start? Four separate subjects, one of which was subdivided into four parts. Program? Yes, enough for a convention. Nearly every topic could and should have been developed and expanded to occupy the major portion of an evening if the discussion of those in the audience were added. Impressions on the presentation of the separate subjects are hardly germane, but think of the incongruity of placing on the same program (beginning at 8:40) a historical review, the relation of highways to railroads, the economics of road building as related to truck haulage and to maintenance and the construction problems of 1920 on which state highway engineers have labored incessantly for six months.

It was 11 p.m. when the program-mill stopped grinding. Discussion was confined to questions. Two were asked. Great is the vitality of the New Yorker. Groups gathered about these speakers who had been so vigorous as to arouse opposing opinions. A genial Uncle Tom served the collation (New Yorkers for "refreshments") while spirited conversation rapidly relieved the pent-up restlessness of the last hour. One requires energy, and plenty of it, to make new acquaintances at 11 p.m. Infliction of fagged brain on old friends seemed out of place; in consequence an early departure was inevitable.

An observer of audiences soon finds that 40 min. is as long as the average individual can retain interest in a given subject at a meeting. Why then expect any discussion? From 8:40 to 11 is 3½ times 40 min. and an audience of engineers is not that many times more enduring as to receptivity than the average gathering.

Arranging a program is no sinecure and these impressions are written not without knowledge of the task. Few constructive criticisms, or destructive for that matter, ever reached committees on which the writer has served, but he has often thought of the value they would have been had the reaction of even a small portion of the audience been available 12 or 24 hours after the meeting. That's why this is written.

MIDDLE WEST.

Hudson Vehicle Tunnel Discussed By Gen. Goethals

Traffic Capacity and Structural Design in the Light of Criticisms of the Concrete-Block Plan by the Tunnel Commission's Engineers—Calculations of Shell Strength Compared With Practice

Replying to sharp criticisms directed at the concrete-block plan for the Hudson River vehicle tunnel, Gen. George W. Goethals makes an instructive contribution to the literature of subaqueous tunneling in a memorandum addressed to the joint tunnel commissions of New York and New Jersey under date of April 2, 1920. He reasserts and upholds his recommendations of three years ago in favor of a tunnel accommodating three lines of traffic in each direction, and defends the choice of a 22½-ft. roadway width for three-line service. To provide greater freedom of movement, however, he suggests that 25-ft. roadways may be preferred, and in that event he would place such roadways in separate tubes. Dealing with the question of tunnel type and strength of shell, he strongly restates his advocacy of concrete-block construction, and gives calculations of strength to justify this position. The calculations made by the commission engineers, quoted in some detail in *Engineering News-Record* of March 25, p. 624, are attacked as fundamentally unsound.

In form, Gen. Goethals' memorandum concerns itself with the five questions addressed by him to the commission on Feb. 18, and the replies thereto made by Clifford M. Holland, chief engineer to the commissions, and Col. William J. Wilgus, chairman of the board of advisory engineers. These questions and the replies were cited in the reference given above (p. 624). Introducing his discussion, however, he gives a clear statement of his attitude toward trench-method tunnel construction for the present enterprise, and of the genesis of the 42-ft. concrete-block "Goethals plan" tunnel.

Trench Tunnel Construction

Prior to 1917 the tunnel commissions of New York and New Jersey had been giving close study to the problem of constructing a tunnel for vehicular traffic between the cities of New York and Jersey City. Certain engineers had reported advocating two single-way cast-iron-ring tunnels, similar in type to the existing Pennsylvania R.R. tubes. Other engineers had reported advocating reinforced-concrete tunnels constructed in sections on shore, floated and sunk to place below the bed of the North River in a deep trench excavated for this purpose.

In 1917 I was requested by the commission to examine the different plans proposed for the vehicular tunnel and make a definite recommendation. A thorough study of the proposed plans and all physical data which had been gathered was made. It seemed obvious that whatever type of tunnel was to be adopted, it should of necessity have greater cross-sectional dimensions than had been heretofore constructed. The reinforced-concrete type, laid under cut-and-cover conditions, most readily met this fundamental requirement of size and would, in all probability, be the least costly, provided the character of the river bed was such as to make reasonably practical the cutting and maintaining of the deep trench from shore to shore.

Very careful study was given to the character of the bottom of the river at the proposed location. This was possible in great detail, not only from borings and soundings which had been made, but from the published and printed records of the actual construction conditions in the Pennsylvania R.R. and McAdoo tunnels. This was further supplemented by conferences with some of the men who were in actual charge under the river of these tunnels during their construction. The result of these studies convinced me, having in mind previous experience with similar material, that it would be exceedingly doubtful if such a trench could be maintained except at an enormous expense, and consequently I was reluctantly compelled to decide against this type of construction and passed to the study of the most economical and feasible types of driven tunnels.

Shield-Driven Tunnel Preferred

Tunnels of this latter type had been constructed using both cast-iron lining and precast concrete blocks. Under the North River the cast iron had been used exclusively, except in the case of the 2,000-ft. portion in the north Christopher McAdoo tunnel, which had been built of brick in the early eighties without the use of the shield.

The feasibility of constructing cast-iron-lined tunnels 30 ft. in diameter and upwards I considered possible even though such size had not been actually attempted before. An investigation of the probable cost of such a type at once disclosed the very great cost for material, due to war prices for cast iron then prevailing. Further, at the time it was highly problematical whether the iron could be obtained when needed, having in mind the uncertainty of the length of duration of the war.

Economy of Concrete-Block Shell

A preliminary study of tunnel costs, using precast concrete blocks in place of cast iron for the tunnel ring, immediately disclosed the great saving in cost that would be effected if that type of construction was feasible for the North River conditions. At this point I took the matter up with the head of a firm of contracting engineers who had done more actual tunnel work in the North and East Rivers than any other concern, covering years of experience. I found him an advocate of the block tunnel for the North River, based on his experience with block tunnels of smaller diameters, his experience in the North River and the methods of driving which he had adopted as a result of such experience.

The closest study was given to these details, and stress analysis were made of different-size tunnels with concrete-block rings. As a result of this work and studies of design, I recommended the 36 ft. inside diameter tunnel with two levels, each having a roadway with 24 ft. 6 in. clear width between walls, or 22 ft. 6 in. between curbs.

From this point are discussed the five or more specific statements of your commission [see *Engineering News-Record*, March 25, 1920, p. 624.—Editor] which form the basis of your decision to the effect that the block type of tunnel is impractical to build, structurally defective and unsuited generally for the purpose intended.

Capacity and Roadway Width

Previous to my report of Nov. 24, 1917, there was no advocacy as far as I was aware of the desirability and necessity of providing for more than two lines of traffic in each direction. In fact, provision for single-line traffic only was being strongly urged by certain engineers.

Studies of volume, character and yearly increase of the vehicular traffic using North River ferries and East River bridges seemed to present some basis for estimating future traffic through the proposed tunnel. I decided, however, that to follow such a basis blindly would not take into consideration an increment beyond the apparent normal yearly increase under existing conditions. The yearly increasing congestion at the ferries throttles the development that would otherwise result were facilities for crossing the river made simpler and easier, as would obtain through tunnel crossings. To ignore this fact in laying out a project of this character would result in the same mistakes which have been made year after year in engineering matters dealing with the transportation of the public in Manhattan and vicinity, in that the structures would be taxed to their capacity almost at once upon their completion and going into service.

I accordingly decided that a vehicular tunnel providing for less than three lines of traffic would be a mistake. It then remained to decide the minimum width of roadway on which three lines of miscellaneous types of vehicles could travel and at the same time confine the extreme dimensions of the tunnel within practicable construction limits.

This was worked out on a basis of 24 ft. 6 in. clear distance between walls and 22 ft. 6 in. between curbs. Such widths would permit one line of trucks on one side and two parallel lines of pleasure vehicles having maximum width of 6 ft., leaving 14 in. clearance between vehicles. Probably 90 per cent of the traffic would have greater clearance than this, as the dimensions used above are maximum.

Arrangement of Three Lines of Traffic

It was not considered necessary to provide space for two lines of trucks of maximum width moving abreast, with a pleasure car of maximum width alongside. The period of time during which the two trucks of maximum size were abreast would be that required for one truck to pass ahead of one directly in front.

For conditions, therefore, of maximum service in the tunnel, there would result a series of cars moving three abreast and others moving two abreast. The question of maximum capacity of the tunnel then becomes one of average speed and average distance between cars. Under actual operating conditions, traffic in a tunnel of this road width would move in two streams, with cars constantly swinging out and passing ahead into line. For this service, road widths of 22 ft. 6 in. and 23 ft. provide sufficient room at speeds to be permitted. To say that such a roadway is not a three-line road and can only be estimated on the basis of a two-line roadway, where there is not room to pass between parallel cars, is erroneous and misleading.

It is obvious that a 24-ft. width of roadway will give greater traffic capacity, and, notwithstanding loud criticisms heretofore voiced by certain engineers against the unnecessarily large capacity of the 22 ft. 6 in. roadway, I am now of the opinion that your commission may well consider the advisability of increasing to 25 ft. If such a width was adopted, the roadways should be placed in two single tunnels constructed of concrete blocks. Studies and estimates of such size tunnels have been made.

Structural Strength

In approaching the analysis of stresses in a tunnel to be driven through the Hudson River material, first there should be taken into consideration the method to be followed in opening the hole within which is to be placed the tunnel structure. If a hole is to be opened which is larger than the structure to be placed within it, the loadings that will be brought to bear upon the structure during construction will be different from those which will result if the structure to be built entirely fills the hole continuously and supports the surrounding material.

Effect of Void Back of Shield

Under the conditions of the hole being larger than the structure to be built, the surrounding material is left unsupported, and will break up and move in until it comes in contact with the exterior of the structure. Under these conditions we have to consider forces that act against the structure in varying degrees of inclination from the horizontal and in varying intensities. After the material has broken up and moved into contact with the structure throughout its exterior area, then the forces can be computed and the direction of their action approximately known.

In the construction of the Pennsylvania tubes and in the construction of any tube by the shield method, where provision is not made to bring the structure in full contact with the surrounding material before movement, we would have to design the structure to have sufficient strength to resist the forces of unknown magnitude brought to bear upon the structure by reason of the moving in of the surrounding material and its being brought to rest by the structure. The bringing to rest of this material involves a structure having sufficient strength to resist the unknown kinetic energy of the moving material.

Distortion and Breaking of Shell

In the construction of the Pennsylvania tubes of cast iron, the method of construction was such as to permit this breaking up of the surrounding material and its movement through a considerable space into contact with the exterior of the rings. This force distorted the ring, and made it necessary to support the interior by means of vertical timbering or horizontal tension members. Notwithstanding this provision the forces were sufficient to break the cast-iron rings at different times. As the material came to rest around the exterior of the rings, the ring returned approximately to its circular form, indicating forces that act normally to the ring. Pressure readings of these forces, taken over a period of eight months when applied to the analysis of the ring, bear out the assumptions that these forces do act normally to the ring.

If then a tunnel can be built which completely fills the excavated hole, so that the material is not allowed to move inward, you would have the approximate condition that existed in the Pennsylvania tubes after construction, as indicated by the recorded pressure readings.

Load on Tunnel Shell

The assumptions used in analyzing the block tunnel by your engineers are based on a theory that assumes the material to be perfectly fluid, except as influenced by the friction of the individual particles of the material, and ignores the existence of cohesion; in other words, a perfectly granular material. These assumptions applied to a block tunnel for a material having a stiffness expressed by an angle of repose of 13° leads to results that indicate the unsafeness and structural defectiveness of the block tunnel. If, however, these same assumptions are used in the analysis of the cast-iron tunnel during construction, either for the existing Pennsylvania tunnels before the interior concrete was placed, or for your engineers' proposed cast-iron tunnel before concrete is placed, the forces are of such magnitude and of such direction that they give an unsafe condition for the cast-iron rings, in that the tension in the cast iron rises upwards of 9,800 lb. per sq.in. This is an unsafe stress for cast iron, and does not allow for an increased tensile stress developed, of unknown magnitude, resulting from the kinetic energy of the material moving through the exterior space until it comes in contact and is brought to rest by the ring.

Preventing Movement of Surrounding Soil

The construction of the proposed concrete-block tunnel involves methods that result in a tunnel being built of the actual outside diameter created by the shield in its travel forward, so that the surrounding material is not allowed to move and is constantly supported as the shield moves forward. The pressure diagrams of the Pennsylvania tubes show the forces such a tunnel has to resist.

In support of the recognition of the existence of cohesion, it may be pointed out that before any readings on the gages could be obtained in the Pennsylvania tubes it was necessary to destroy the cohesion of the material immediately in contact with the ring, by stirring up the material with a bar passed out into the surrounding material. This fact is further borne out by the fact that segments of the tunnels have been removed and the material stands unsupported until broken down by a flow of water destroying its cohesion.

Method of Load Calculation

In analyzing the forces acting on a tunnel built in such a way as to completely fill the annular area immediately in the rear of the tail of the shield, whereby no motion is permitted to be set up in the surrounding material, we take the total weight of the water and the overlying material, consisting of silt and clay, or a combination of both, at the top of the ring. We also assume that the sum of the downward forces must be equal to the sum of the upward forces, provided the tunnel can be proven not to be at the point of floating. The pressures from the top of the tunnel to the bottom of the tunnel increase uniformly with each foot of depth and act approximately normal to the ring. These assumptions, if applied to the existing Pennsylvania tubes, will give pressures following very closely the pressures actually read in these tunnels, and do not diverge from such actually observed pressures by more than 8 per cent to 10 per cent.

During the construction of North and East River tunnels, and prior to 1915, it was the practice to fill the exterior annular space left by the shield tail with grout. This material being a fluid did not prevent slumping of the top and sides of the excavation, so distortion of the cast-iron ring together with broken segments continued to result.

It was not until the methods of forcing fine dry gravel under high pressure into the annular space were perfected that distortion troubles with unsafe stresses were eliminated. The use of this gravel packing is not the result of theorizing, but one of hardheaded practical experience and amply demonstrated as to its effectiveness through continued use by practical tunnel builders.

In very soft overlying material, the continued application of pressure gravel can be used if desired and necessary to actually displace all the overlying material, leaving the tunnel roof in solid gravel. Such a result has actually been obtained in one tunnel under the East River recently built.

Will the Tunnel Float?

Passing to the question of flotation. If you will examine the stress sheets prepared by your engineers, you will find that even under their granular theory, the proposed block tunnel is structurally sound for materials having angles of repose under 6°. They state, however, that in material of 3° angle of repose the concrete-block tunnel would float. Provided the material has no cohesion, it is true theoretically the block tunnel would float as stated by your engineers. But why conveniently apply this condition only to the concrete tunnel? The same reasoning shows that not only would your proposed 29 ft. cast-iron tunnel float during construction, but likewise the existing Pennsylvania R.R. tunnels would have floated.

Disintegration in Joints

Further criticism of the block tunnel has been made on the basis that the proposed construction involves a multiplicity of a great number of small joints, resulting in a tunnel which longitudinally has very little strength and is subject to opening for slight deformations.

The individual voussoir blocks making up the concrete tunnel ring are bolted one to the other throughout the length of the tunnel. These bolts perform the same function as do the bolts used in bolting up the rings of the cast-iron tunnel.

An investigation of the relative strength longitudinally of the block and cast-iron tunnels shows the block type to have greater longitudinal strength and resisting moment than either the 29-ft. cast-iron tunnel or the Pennsylvania R.R. tubes.

Referring again to the criticism of the multiplicity of small joints. You are aware, of course, that approximately 2,000 ft. of the north Christopher St. tunnel of the McAdoo tube system is constructed of brick laid in Rosendale cement mortar, and, although this was built 35 to 40 years ago without the use of a shield, trains are operating through it today.

Summarizing, the above statements as to structural strength may be covered as follow:

i. Theory of granular material, used by your engineers, is incorrectly applied to this material, as shown by: (a) Great amount of cohesion; (b) Absence of large active horizontal forces in material as shown in existing Pennsylvania R.R. tunnels.

ii. We have applied theory based on following assumptions: (a) Vertical pressure at top of tunnel equal to weight of material; (b) Algebraic sum of vertical forces equal to zero; (c) All pressures normal to surface of tunnel; (d) Pressures increase at a rate uniform for each foot of depth (determined for our computations by above assumptions). These assumptions are based on the use of gravel packing back of the shield.

iii. Comparison with pressure readings taken in Pennsylvania tubes shows variation of less than 10 per cent from results of our normal pressure formulas.

iv. Your engineers have applied their assumption of granular material having an angle of repose of 13° to the large two-level block tunnel, and we have checked their figures very closely. We have applied these assumptions to a smaller block tunnel having a single roadway 25 ft. between curbs, to the cast-iron tunnel 29 ft. in diameter recommended by your engineers, and to the Pennsylvania tubes, 23 ft. in outside diameter, cast iron. I believe these assumptions incorrect, but the results are:

	Max. Compression per sq.in.	Max. Tension per sq.in.
42-ft. block tunnel—two level..	976 lb.	475 lb.
36½-ft. block tunnel (one 25-ft. roadway)	794 lb.	377 lb.
29-ft. cast-iron tunnel.........	12,967 lb.	9,846 lb.
23-ft. Pennsylvania tunnel.....	14,175 lb.	11,430 lb.

v. We have applied our normal pressure formulas as checked by Pennsylvania pressure diagrams to the above; the results are:

	Max. Compression per sq.in.	
42-ft. tunnel	310	No tension
36½-ft. tunnel	270	No tension
29-ft. cast-iron tunnel......	1,840	No tension
23-ft. Pennsylvania tubes...	1,645	No tension

vi. The presence of cohesion acts in two ways, first in the reduction of active pressures which have been considered in the above formulas; second, in the increase of passive resistance which is not included in our theory. This latter is an added factor of safety, existing only when packing is used.

In order to break, the ring must deform; in order to deform the ring must move against the material at some point; in order to move it must overcome large passive forces.

vii. As to flotation, the following data are at hand, all assuming no cohesion and granular material:

42 -ft. tunnel.........angle of equilibrium, 3° 50′
36½-ft. tunnel.........angle of equilibrium, 3° 12′
Pennsylvania tubes....angle of equilibrium, 3° 14′
29-ft. tunnel..........angle of equilibrium, 4° 00′

That is, the 29-ft. tunnel is the most liable to float of these four tunnels, and all will float in 3° material, if these assumptions of material with no cohesion were correct.

viii. *As to longitudinal strength:* In resistance to tension, the 29-ft. cast-iron tunnel has less than 54 per cent of the strength of the 42-ft. tunnel, and the Pennsylvania tubes less than 32%. In resistance to moment the 29-ft. cast-iron tunnel has less than 38% of the strength of the 42-ft. block tunnel, and the Pennsylvania tubes, less than 18 per cent.

Safety of Tunnels Demonstrated

It is obvious that the question of the safety of the proposed vehicular tunnels, of any design, in so far as the engineering analyses of these tunnels are concerned, is based on the assumptions of how the material acts. Your engineers have taken such assumptions, which applied in a mathematical analysis of the tunnel give results that permit them to state that the block tunnel is unsafe. They very conveniently, however, fail to apply the same assumptions to the cast-iron tunnel. If they had, they would have found these tunnels likewise unsafe, as we have demonstrated above.

The assumptions of loadings which we have used are, in our opinion, more reasonable, sound and correct than those used by your engineers, and fortunately we have actual pressure readings on the present Pennsylvania tubes, which, when applied to the proposed vehicular tunnel, give us practically the same results as the results obtained from the application of our theories of the forces to be brought to bear upon these tunnels. As demonstrated above, these results are conclusive in showing that either the block tunnels as proposed or the cast-iron tunnels, built or proposed, are safe.

SUITABILITY OF CONCRETE FOR THE NORTH RIVER

Your engineers state that the block tunnels cannot be made water-tight and that any resulting leakage will result in disintegration.

All joints between blocks of the concrete tunnel are so designed that they can be readily filled with cement under pressure throughout the area of their faces. To say this tunnel cannot be made water-tight is to ignore the actual accomplishments of the result in tunnels of this character built and building.

Disintegration of concrete in sea water may result when reinforcing steel is placed too close to the surface and when proper and intelligent care is not given to secure concrete of proper mixture. We are not dealing with reinforced concrete in this instance and, further, the precast blocks are most easily moulded with the densest and most uniform materials possible.

Disintegration of concrete may take place through electrolysis in the presence of direct-current circuits when current leakage is not provided against. This condition will not obtain in the vehicular tunnel.

A statement that seepage of water through the ring of the proposed tunnel will disintegrate the concrete and endanger the permanency of the structure under the conditions that will obtain is so fallacious that it should not be given serious consideration. To accept such a statement would be to condemn some of the most important of the world's concrete structures, many of which have been standing for decades.

ESTIMATE OF COSTS

The estimates of cost of the 36-ft. block tunnel were based on prices of 1917, and on the experience of the O'Rourke Engineering Construction Co. in work of this character.

My communications to the joint commissions on this matter have stated always that the figure of $12,000,000 was exclusive of property and right-of-way. I was not asked or expected to pass on the valuation of property that might be required.

The controversy and criticisms on costs that have been raging from the beginning lead nowhere. Over a year ago I recommended a program to the joint commission under which definite data as to costs could be obtained and immediately thereafter the type of tunnel settled and construction commenced.

Cost Comparison From Bids

My recommendation was to invite definite bids from the three or more large engineering construction concerns experienced in tunnel construction. These bids were to be limited only to tunnels having a certain width of roadway, and for the location Canal St. to 11th St. The type of construction, single or twin tunnels, was to be left open, and the bidder was to be invited to submit *bona fide* bids on concrete block, cast iron and open trench types, and time required to build. The bidder would be required to submit detailed plans on which his bids were based, for which actual cost of preparation would be paid upon rejection. The bids would be based on general specifications only, and the bidder was to be required to furnish ample bonded security to protect the commissions and place full responsibility on the prospective contractor.

With such bids before the commission the question of costs would not be at issue, and it would only remain for the commission's engineers to pass on the desirability of the different plans submitted, taking into consideration all phases of economy and engineering.

This recommendation was not followed, and the vehicular tunnel project is no nearer consummation today than it was a year or more ago, with the further result that costs have unquestionably risen in the meantime.

The estimate of three years was based on the statements of a prospective bidder of experience. Here again the program outlined above if followed would have made unnecessary this part of the controversy.

CONCLUSIONS

A vehicular tunnel providing for less than three lines of traffic in each direction, if adopted, I consider would be a mistake in judgment and a lack of vision on the part of those responsible as to future demands of the continued growth of the cities of New York and Jersey.

Concrete, as a material, unassisted by cast iron, is preeminently suitable for tunnel construction and the proposed concrete-block type is sound in engineering principle, practicable to build, structurally safe, will not float or sink, and finally is far more economical than cast iron.

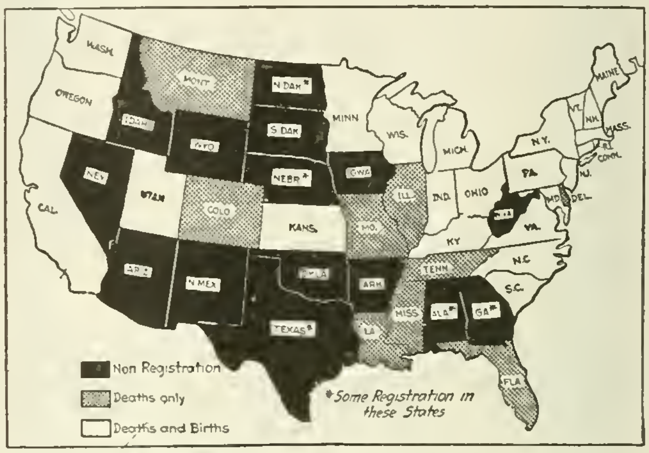
The paramount questions still remains: Will your commission, simply because fearful of attempting something which heretofore has not been tried out in its entirety, recommend the expenditure of 26 to 30 millions to create facilities for vehicular crossing of the North River, when 10 to 12 millions less than this amount will accomplish the desired end.

Respectfully,

New York, April 2, 1920. GEO. W. GOETHALS.

Birth and Death Registration Areas

THIRTY-THREE States, the District of Columbia and Hawaii were included in the death registration area of the United States on Jan. 1, 1920, and twenty-three States and the District of Columbia were in the birth registration area on that date. The percentages of total estimated population in the two areas were 80.4 in the death area and 58.4 in the birth area. There were also 17 death registration cities in non-registration States on Jan. 1, 1920. Further details are given in the accompanying table and a graphical exhibit for the whole country is shown by a map. It may be explained that the admission of States and cities to the registration area is conditioned on their maintaining a reasonably complete registration of births and deaths. The information here given is based on the records of the Bureau of the Census, a transcript of which was supplied to *Engineering News-Record* on request by Dr. William H. Davis, chief statistician for vital statistics.



SKETCH MAP OF BIRTH AND DEATH REGISTRATION AREAS OF THE UNITED STATES ON JAN. 1, 1920

According to the Division of Vital Sstatistics, Bureau of the Census the non-registration states starred (*) have one or more registration cities, as given in the table.

THE REGISTRATION AREA OF THE UNITED STATES
DECEMBER 1, 1919

From the Bureau of the Census

State	Year Admitted Death Area	Year Admitted Birth Area
California	1906	1919
Colorado	1906	....
Connecticut	1890	1915
Delaware	1919	....
Florida	1919	....
Illinois	1918	...
Indiana	1900	1917
Kansas	1914	1917
Kentucky	1911	1917
Louisiana	1918	...
Maine	1900	1915
Maryland	1906	1916
Massachusetts	1880	1915
Michigan	1900	1915
Minnesota	1910	1915
Mississippi	1919	....
Missouri	1911	....
Montana	1910	...
New Hampshire	1890	1915
New Jersey	1880	...
New York	1890	1915
North Carolina	1916	1917
Ohio	1909	1917
Oregon	1918	1919
Pennsylvania	1906	1915
Rhode Island	1890	1915
South Carolina	1916	1919
Tennessee	1917	...
Utah	1910	1917
Vermont	1890	1915
Virginia	1918	1917
Washington	1908	1917
Wisconsin	1908	1917
Total states	33	24
District of Columbia	1880	1915
Territory of Hawaii	1917	....

CITIES IN NON-REGISTRATION AREA

Alabama: Birmingham, Mobile, Montgomery. *Georgia:* Atlanta, Brunswick and Savannah. *Nebraska:* Lincoln and Omaha. *North Dakota:* Fargo. *Texas:* Beaumont, Cleburne, Dallas, El Paso. Galveston, Houston and San Antonio. *West Virginia:* Wheeling.

Success of Screw Spikes Depends Largely on Placing

Recommended Methods Designed to Prevent Damage to Wood by Spikes and Tie Plates and Increase Life of Ties

(Abstract of Committee Report, American Railway Engineering Association)

A STUDY of several installation of screw spikes on some 230 miles of track leads the tie committee of the American Railway Engineering Association to the conclusion that conditions of line and surface of track and stability of roadbed have an important effect upon the holding power of the spike. Chief among rules and methods recommended by the committee in the design and construction of track with screw spikes is a provision for maintaining a clearance between the spike head and base of rail in order to free the spike from stresses due to wave motion in the rails. As the railways get longer life from ties by danger that spike killing, or damage to the wood will be a limiting factor in their life.

Some installations made in 1908, in good treated ties, were found to be thoroughly satisfactory and capable of many more years' life. Other installations, made at later dates, have not been so successful. The defects which seem to the committee to cause overstrain of the wooden threads of the tie which hold the screw spike include improper design of fastenings, wood and methods of installation.

DAMAGE TO TIES BY SCREW SPIKES

The threads in the wood were found injured where the screw spike did not have an accurate and uniform pitch and diameter of core. The first placing of the spike injured a portion of the fiber, and further damage was done where the screw spike had been changed in connection with replacing a rail or tie-plate. The wood fibers at the top of the hole were found destroyed where the screw spike used had no pilot or small point on the end to permit its being screwed into place after being set in with a light tap of the hammer. That is, the holding power of the timber was destroyed for whatever distance the spike had to be driven in the hole. Therefore, the lighter the tap required to set the screw spike ready for being turned, the less the fiber of the tie was injured.

Distortion of the fiber of the wood was found where the head of the screw spike rested directly on the top of the base of the rail, this damage apparently depending on how much wave movement there was in the rail as trains passed over it. Spikes were found forced out of position, so as to injure the timber, where the following conditions existed: Tie-plates of insufficient size and thickness; no shoulder tie-plate used so that the spikes were placed against the outside edge of the base of rail and acted directly to hold the gage; no support or bearing to hold the head of the screw spike a prescribed distance above the base of the rail and provide a freeway for movement of rail without stressing the holding power of the spike; holes in the tie-plates unnecessarily larger in diameter than the screw spike.

Some soft wood ties were found which were not strong enough to hold the thread under the stress produced by the heavy traffic and axle loads carried.

The most common cause of destruction of the wood threads in the tie was found to be due to the driving of the screw spike with a hammer in starting. The committee has seen screw spikes hammer driven for one-fourth to one-third of the length of the threaded portion. This results in destruction of one-fourth to one-third of the holding power and in enlargement of the top of the hole, the latter permitting water to accumulate and causing further destruction of the wooden threads as well as corrosion of the spike.

Decay was found in ties where spike holes were bored after the tie was treated and no preservative put in the holes before applying the spike. Where the hole in the tie had not been bored deep enough to permit setting spikes down as the tie-plate embeds itself, the wood threads were stripped in an attempt to tighten the spike. A rather general condition of bent and partly pulled screw spikes was found at rail joints, due to creeping rail, the spikes being placed in slots at the joints. This resulted in the destruction of the wood threads of the tie. In a few cases these threads were found stripped where the spike had been turned too many times with a power machine.

RECOMMENDED METHODS

The condition of line and surface and the stability of the roadbed were found to have an important effect on the holding power of the spike, the over-straining apparently beginning when there was more movement of the rail on the tie than could be provided by freeway space.

Based on the varying methods and results observed, the committee has stated the conditions it believes necessary for the protection of the tie in connection with a screw-spike installation.

The timber should be adequate in strength for the tonnage and maximum axle loads carried. For heavy traffic, hardwoods are considered preferable; such as white oak, various species of red oak, gum, beach, maple, birch and dense grade needle-leaf woods. Those woods belonging to the treatment class should be so treated.

Ties should be bored and adzed, and treatment applied afterward. The holes for screw spikes should be bored completely through the ties, except that special consideration should be given to this question where there is a heavy electric current in the track rail which might become grounded by this means. These holes should have the same diameter as the shank of the screw spike.

A shoulder tie-plate should be used, so designed that the spike does not in itself maintain gage, but holds the plate securely to the tie, thereby enabling the shoulder to maintain proper track gage without putting the spike in contact with the rail base. This will reduce spike cutting and mechanical tie destruction to a minimum.

Additional shoulders should be provided on which the spike head will bear, these being so made that the plate will be held securely to the tie while clearance will be provided between the spike head and the rail base sufficient to take care of the rail deflection due to loading and track surface conditions. This clearance will vary with the character of the subgrade maintained and weight of rail, but ⅛-in. is recommended as good practice for 100-lb. rail with average high-speed conditions. This may be decreased to $\frac{1}{16}$-in. on track of specially substantial construction where the speed is low, or raised to 3/16-in. where the flexibility of the track is greater.

When the screw spikes are placed in slots of the angle bars, the rails should be anchored so that there is not an undue stress on the screw spikes from rails creeping. If the rail has to be allowed to run freely, as on bridge decks or trestles, the spikes should not be set in the slots of the angle bars.

The screw spike should have an exactly uniform pitch and size of core, with the diameter of its lower part decreased so that the beginning of the thread is slightly less than the diameter of the hole bored in the tie. It is essential that the spike be screwed in the wood without destroying the fiber of the wood. In order to accomplish this the spike must be started with a very light tap, just sufficient to get holding power in the threads to permit its being turned in the tie. For this purpose the form of screw spike adopted by the Association is considered essential. The committee urges that the present injurious practice of starting by driving the spike should be discontinued.

Full benefit of a screw-spike installation cannot be obtained unless the standard of maintenance of line and surface is fairly high as compared with the tonnage and character of ballast; this contemplates well-tamped track, fair line and surface and a foundation which is not too yielding. It is difficult to measure the damage done to a tie by a screw spike until some of the modern installations have had longer service. Conclusive figures will not be available until the life of these installations can be determined.

Wanaque Dam Contract Provides for Variable Labor Costs

IN ADVERTISING for bids for the construction of the Wanaque Dam, Passaic County, N. J., the North Jersey District Water Supply Commission specifies in the contract a wage scale upon which contractors may base their estimates, and agrees to pay an increase as great as 10 per cent in the labor costs after this year, in the event that the then prevailing wages are generally that much higher than the base scale named in the contract. In case wages decrease generally the stipulation is also made that the commission shall profit by a 10 per cent decrease. The clause in the contract referring to that special wage agreement follows:

> If it shall be shown by the said record, to the satisfaction of the commission, that a rate of wages more than 10 per cent in excess of the rate stipulated in the base scale has been paid for any of the herein listed trades employed on this contract after Dec. 31, 1920, and if said rates in excess of the base scale shall have been first determined by the commission not to be unduly in excess of the then prevailing rates of pay on similar work, and are approved by the commission, then the commission shall pay to the contractor, in addition to the regular monthly estmate . . . a sum of money equal to the total amount of any such excesses of wages as have been actually incurred and paid after Dec. 31, 1920, by the contractor over said 10 per cent in excess of the base scale.
>
> If on the contrary it shall be shown by the said record, to the satisfaction of the commission, that a rate of wages 10 per cent or more below the base scale has been incurred and paid in any of the listed trades during the period after Dec. 31, 1920, then the commission shall deduct from the net regular monthly estimates a sum of money equal to the total amount of any such difference between the rate actually paid to the contractor and a rate 10 per cent below the base scale, or, if the commission by its own investigation, after affording the contractor an opportunity to be heard, shall find that the prevailing rates of pay on similar work for any of the listed trades are more than 10 per cent below the base scale, then the commission may establish a new scale of wages predicated upon such prevailing rate and when such new scale is so established and copy thereof served upon the contractor shall deduct from the succeeding monthly estimate, beginning thirty days thereafter, such sums of money as shall be equal to the difference between the rate 10 per cent below the base scale stated in the contract and the rate in said established new scale.

The base rate specified in the contract follows:

Steam shovelman	$250 per month (26 days)
Craneman	50 per week (six 8-hr. days)
Carpenter	8 per day (8 hr.)
Mason	9 per day
Mason's helper	5.60 per day
Concrete finisher	9 per day
Plumber	9 per day
Drill runner	7 per day
Tool sharpener	7 per day
Tool sharpener with pneumatic tools	7.50 per day
Pipe fitter	8 per day
Pipe fitter's helper	6 per day
Engineman or engineer	46 per week (48 hr.)
Fireman	$150 per month
Rigger	8 per day
Machinist	1 per hour
Piledriver operator	50 per week
Electrical worker (including lineman)	8 per day
Electrical worker's helper	4 per day
Autotruck driver, five tons and up	35 per week
Autotruck driver, below five tons	30 per week
Teamster	35 per week
Labor, first class (including working foreman, handyman, mechanic's helper not listed above)	65c. per hour
Laborer	50c. per hour

The contractor must file with the Commission in such a form and for such periods as the Commission shall stipulate, a record showing the name of all employees and the hours worked, the wages paid to each and such other information as may be required. Time and a half is allowed for overtime, and double time for Sundays and holidays, except when otherwise stipulated, for monthly and weekly pay.

There are several other special provisions in the contract. For instance, in the excavation for the core wall the contractor is to have recourse first to methods described within the contract. If such methods fail to complete the core-wall excavation, and if other methods are used and their cost and that of all the work previously done exceeds the price which would be paid under the respective appropriate items of the contract, then upon the determination in writing of the Commission to that effect, the work of completing the excavation of the core-wall trench will be regarded as not susceptible of classification under certain specified items of the contract, and payment will be made by issuance by the Commission of an order to the contractor for such work and materials, although they are neither specified nor shown on the contract drawings. The contractor is also allowed partial estimates upon materials delivered to the site though not actually at the time of the issuance of the estimate being incorporated in any of the construction. Such materials and the prices allowed are as follows:

Portland cement, at the rate of $2.50 per bbl.
Miscellaneous iron and steel for reinforcing concrete, at the rate of 5c. per lb.
Steel sheet piling, at the rate of $1 per sq.ft.
Sluice gates and stands, complete, the lump sum of $1,000 each.

Except through the approval of the engineer and the establishment by the Commission of a new base scale to cover them, no trades or occupations not listed above will be allowed extra compensation. Any new scale so created is valid only for the calendar year in which established.

LETTERS TO THE EDITOR

Vote on Am. Soc. C. E. Questionnaire!

Sir—The attention of the corporate members of the American Society of Civil Engineers should be called to the fact that only about one-third of the membership have thus far voted on the very vital matters, affecting the future of the Society, contained in the questionnaire, votes on which will be counted April 14, 1920.

It is not possible that any member interested in the Society should neglect to vote.

Those members who desire the progressive development of the Society along conservative lines will vote in the affirmative.

Attention should be called to the fact that it is only votes and not good intentions that will be counted.

RICHARD L. HUMPHREY.

Washington, D. C.

Past-President, Am. Soc. C. E., Endorses Program of Development Committee

Sir—Your editorial of Feb. 26 called forth by a circular sent out by certain members of the American Society of Civil Engineers, entitled, "A Word of Caution," has already borne good fruit in bringing out discussion of society matters through the columns of the technical journals, a practice which has been pronounced unethical and unprofessional. The publications of the society and the method of communication by circular are inadequate for occasions like the present. The successful use of circulars requires a corrected mailing list.

It is a good omen that the most prompt and sensible means of communicating with society members is being adopted without restraint. With several shining examples already preceding me, I feel that I may with entire propriety discuss the circular above referred to and other matters connected with the report of the Committee on Development.

The quotation from the constitution of the American Society of Civil Engineers, viz: "Its object shall be the advancement of engineering knowledge and practice, and the maintenance of a high professional standard among *its members*," (italics mine) brings clearly into view the question of whether the society should cling any longer to such selfish objects. Engineering should unquestionably be a profession. No group of engineers should or can monopolize it. It is the duty of the true engineer to promote the profession and not the interests of any group. One need only look around him to discover that there are thousands of qualified engineers who are not members of any society and it is not the fault of these engineers. How can "a high professional standard" be "maintained" unless all reputable and qualified members of the profession join together in a movement to do so?

The potent influence of the American Society of Civil Engineers in establishing the prestige of the profession is admitted, but the point was reached long ago when its eyes should have been opened to the fact that its self-centered conservatism was resulting in the growth of new societies in a field of which it had, and might have kept, full possession, and a consequent tendency to lower the standard of professional ethics, which it cherishes so greatly. It is vain to grieve over lost opportunities and we should now set about to make the very best that is possible out of a bad situation.

I think there is a misconception of the meaning of "welfare work." If used at all in connection with a movement to make engineering a profession, it should not be understood to embrace only the boosting of compensation. I do not conceive it to be the duty or best interest of the professional engineer to undertake to secure for any person who engages in work connected with engineering, financial reward greater than their service is worth, but it is their duty and interest to see to it that competent engineers are protected in the practice of their profession, whether employed or not, and no matter to what society they may or may not belong.

The report of the Committee on Development was the work of a representative committee of well selected members. No doubt there are many who will disagree with some of its recommendations. All of them are not entirely to my liking. However, the report points a way for the representative men of the profession to unite in impressing upon the public the fact that good engineering is necessary to good government. The American Society of Civil Engineers has already joined with other societies through Engineering Council in advocating wise public policies in matters where engineering is involved. The machinery for doing so is not sufficient. The report of the Development Committee and the Conference Committee point the way toward perfection of this machinery. The way may not appear smooth and straight, but engineers either know or can find out how to take out any kinks that may be found to exist.

We have sat still and contemplated our self-sufficiency too long already. I think the time is at hand when it is better to act with the possibility of some mistakes being made, which can be corrected, than to remain inactive until others prepare a royal road for us.

I hope the membership of the society will not permit the questions now before them to be lost by default and am convinced that if a representative vote is cast it will approve the recommendations of the Development Committee.

HUNTER MCDONALD.

Past President, American Society of Civil Engineers.

Proposed Increase in Am. Soc. C. E. Non-Resident Membership Dues

Sir:—The undersigned five corporate members of the American Society of Civil Engineers have forwarded to the secretary a proposed amendment to the constitution of the society, relating to "Article IV, Dues.," to the effect that the annual dues of all corporate members, whether resident or non-resident, shall be $25.

Question 6 of the questionnaire relating to the report of the Development Committee limits the increase in dues of the non-resident members to $5 and it has seemed that this increase will not provide adequate funds. The prices of printing and publication are probably more than double what they were a few years ago, and with credit inflation salaries must be advanced and there will be a general increase in the expense of the society. Unless something is speedily done, the society will be unable to carry on the publications and the activities recommended by the Development Committee.

The proposal to advance the dues of non-resident members seems a fair one, in view of the fact that there are now some 1,700 resident members who probably pay to the society some $16,000 over and above what is paid by the non-resident members. The cost of the semi-monthly meetings held at the United Engineering Societies Building probably does not amount to more than $3,000 or $4,000, so that it would pay the resident members, as a business proposition, to assume the expense of the society meetings and thereby save some $12,000.

Argument has been advanced that the resident members have the benefit of the engineering societies library. As a matter of fact membership in the society is entirely unnecessary for such privilege, since the library is free to any person who desires to make use of it.

PERCIVAL CLOW,
WILLIAM J. HEISER,
WALTER S. ST. JOHN,
ALFRED W. A. EDEN,
C. E. HAYWOOD.

New York City.

Economy of Low Grades for Heavy Traffic

Sir—A summary of economics of a grade of 0.2 per cent proposed for the Hocking Valley Railway is given in *Engineering News-Record*, Jan. 29, 1920, p. 244. It has generally been accepted that a gradient of 0.3 per cent was about the economic limit of reduction, whereas this revision contemplates the expenditure of nearly $1,500,000 for a further reduction to 0.2 per cent. Discussion of the following points would be interesting:

1. Is a train of from 6,000 to 8,000 tons a practicable operating unit even on a level track?

2. The horsepower required here for a trip is proportioned to the resistance (distance and rise) and tonnage irrespective of the gradient. The horsepower in this case, assuming the rise and distance unchanged, will be about 25 per cent greater for the theoretical 0.2 per cent loading than for the 0.3 per cent. Will not the cost and running time of the train for 0.2 per cent grade be greater than for the lighter train for 0.3 per cent, taking the division as a whole?

3. The engineer plants the seed for an improvement, the investor waters it with his capital, but after the labor unions and the public have helped themselves little of the harvest is left for the investor and none for the engineer. From an investor's standpoint is any expenditure for improvement justified until the investor has a chance to realize a just share of the saving due to his investment?

A. C. DENNIS,
Consulting Engineer.

Seattle, Wash.

[The comments in the above letter were submitted to Mr. Michel, chief engineer, Hocking Valley Railway, from whom we have the following reply.—EDITOR.]

Sir—In relation to the comments upon the study of grade reduction on the Toledo Division of the Hocking Valley Ry., I do not know how generally a gradient of 0.3 per cent has been accepted as the economic limit of grade reduction. It appears to me that no limit should be accepted which lies well within the zone of economic possibilities. As long as net earnings due to improvements show a fair return on the investment, the proposition warrants the expenditure of funds necessary to install the facility.

As to the first question: "Is a train of from 6,000 to 8,000 tons a practical operating unit?" The tendency to increase capacity of freight cars will eventually minimize the objection to great length of train and at the same time tend to increase the possible tonnage of each train. Since ton-miles hauled is the thing which is to be obtained, it becomes necessary to increase train tonnage. Shorter working days for train crews require certain speed and time limit between terminals. Reduction in speed is generally the result of ruling gradient. To maintain speed with a maximum tonnage, it becomes necessary to have minimum grades.

Labor shortage frequently enters into the problem, requiring the greatest efficiency possible in accomplishing the aim sought, which is ton-miles hauled per train. Lack of sufficient motive power frequently adds to the burden of the railroad. This can be greatly relieved by increasing the tonnage per train. To do this successfully, ruling gradients must be reduced to a minimum so that speed may be maintained throughout the trip, and overtime avoided whenever possible. Freight trains of large tonnage are frequently resorted to by the use of helper engines at heavy grades. Such units are considered practical, and the tendency is to increase tonnage wherever this is possible.

In the above letter it is stated that: "The theoretical horsepower required for a trip is proportional to the resistance (distance and rise) and tonnage, irrespective of the gradient." The reduction in ruling gradient, however, makes it possible to increase tonnage per train, which is the thing sought. It is admitted that the horsepower per train required to haul the heavier tonnage is increased in proportion to the increase in tonnage per train. This increases the fuel and water consumption per train for the proportion of the line on which opposing grades are encountered. On descending grades, no additional power is required.

To offset the additional cost of fuel and water per train, we have the revenues derived from a 25 per cent increase in train loading for a grade reduction from 0.3 per cent to 0.2 per cent. This is equivalent to approximately 1,000 net tons per train for the 2-10-2 type engines, which is accomplished with little if any increase in cost of labor of train crews or motive power.

Revenue per ton over the division being known, it is simply a matter of comparison of revenue and expenses. This consists of revenue due to increased loading as against cost of additional fuel and water, and interest on additional investment of capital for construction of a grade of 0.2 per cent over one of 0.3 per cent. The running time required between terminals will not be increased on account of reduction of gradient.

Further, the question is asked: "From an investor's standpoint is the expenditure for improvement justified?" If the net earnings of the improvement show a fair return on the money invested, the proposition is a profitable investment. Such an investment should be made from an economic standpoint. What inures to the profits of the investor in railway facilities and improvements benefits the public in general. Other things being equal, the road having the lower cost of operation has a decided advantage over the one not so favorably situated.

I am convinced that the proposition is a profitable investment as far as it applies to the Hocking Valley Ry. When the entire division is double tracked, there will be few occasions to stop loaded trains except for fuel and water. These necessary stops are so located that they will not be on ruling gradients. This will minimize the damage frequently occurring to equipment when starting a train.

W. MICHEL,
Chief Engineer, Hocking Valley Ry. Co.

Columbus, Ohio.

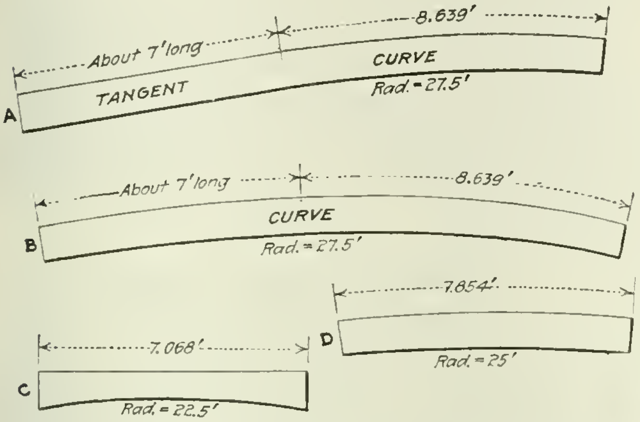
HINTS FOR THE CONTRACTOR

Curves Lined Accurately to Templet in Sewer Tunnels

By A. L. Sears

Engineer in Charge of Sewer Construction, Detroit, Mich.

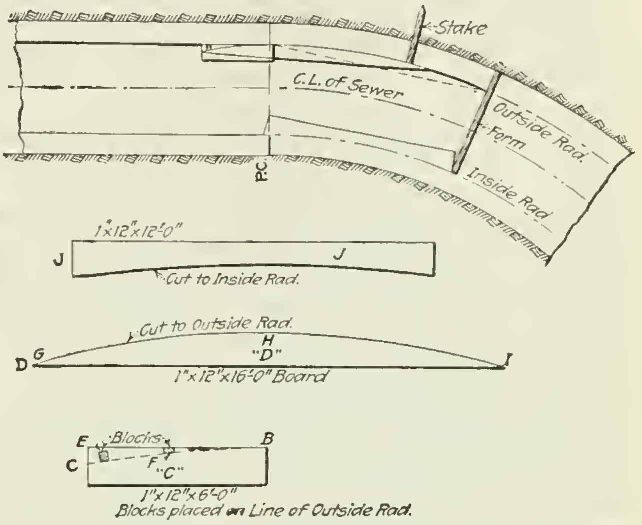
VERY accurate and smooth workmanship has been secured in Detroit, Mich., in placing brick lining on curves of sewer constructed in tunnel, by the templet method illustrated in Figs. 1 and 2. The second method is now used more than the first, over which it has some advantages. The first method has been used longer than the second, however, and both are efficient. The two are described to permit the contractor to exercise choice if for any reason either method appears preferable under the conditions.



Method I.—Assume that a 25-ft. radius curve with an angle of 90 deg. is to be lined with two rings of brick for a 5-ft. circular sewer. The length of curve outside is 43.197 ft., and inside it is 35.343 ft. It is to be lined in five equal drives. The arc lengths for each drive are 43.197 ÷ 5 = 8.639 ft. outside, and 35.343 ÷ 5 = 7.068 ft. inside. Four templets, *A*, *B*, *C*, and *D*, are cut from 1 in. pine boards of 12 x 16 ft. An easy way is to lay out tangents and curve on an asphalt street intersection and then cut the templets to the lines.

With the tangent lined up to the point of curve, templet *A* is used for the first drive by placing the 7-ft. tangent portion against the completed lining and laying the first drive of the curve to the projecting curved portion. Then templet *B* is used in a similar manner for drives 2, 3, 4 and 5. Finally, templet *A* is used reversel, to start the tangent. Templet *C* is used only as a guide by which to lay brick on the inside arc and templet *D* is used as a guide for laying the center row when starting each drive. Accuracy is controlled by templets *A* and *B*.

Method II.—Three templets, as shown by Fig. 2, are employed. With the tangent lined up to the point of curve templet *C* is placed as indicated by the curve diagram with corner *B* at the point of curve. On *C* are nailed two blocks *E* and *F* with their edges and the corner *B* tangent to the arc of the curve to be lined. Then templet *D* is used by placing the curved edge *G H I* against the blocks *E* and *F* on templet *C* and sliding *D* ahead any distance desired to line in the first drive of the curve. Templet *D* is used to the point of tangent when templet *C*, reversed, is again used to line the tangent. Templet *J* is used to guide bricklaying on the inside arc as indicated by the diagram.



This templet method of lining in curves was originally used by the writer and has been improved by W. D. Edgecomb, assistant engineer.

Keeping Track of Progress on General Motors Building Excavation

THE Durant building in Detroit which the General Motors Co. is erecting to house offices and general laboratories for all of its related companies is one of the largest area office structures yet built. It covers a city block, 522 ft. long and 364 ft. wide on Grand Boulevard between Cass and Second Avenues and extends west to Milwaukee Avenue. A bonus was given the subcontractor for removing material in excess of 1,500 cu.yd. per day, and the general contractor's progress staff kept records in perhaps more than usual detail. These records were added to the regular profile charts daily and every week a sketch of the site indicating the location of the progress was prepared. It is not practicable to reproduce all of the notes on the progress profiles, which contain a complete record of the weather, delays, loads, yardage and number of trucks for both day and night shifts.

Three steam shovels and 35 trucks working 20 hours per day removed nearly 100,000 cu.yd. of clay in 89 days from the site. Good management, utilizing ordinary equipment, but doubling up on the time it was used, enabled the contractor to carry on the job at a remarkably fast rate when he was able to work, considering that all of the material had to be hauled through the city streets.

The contract was to be completed in 60 days from June, 1919, but rain, delays due to the progress in removing the buildings and the ordinary minor delays for repairs, etc., prolonged the time to 89 days, although 97 per cent had been removed two weeks previously. Counting out 14 Sundays and holidays and 6 days for rain when no work was possible, 6 days in getting started and 13 days at the end cleaning up after 97 per cent had been taken out, leaves 51 days for the actual working time, during which the average rate was 1,900 yd. daily. The maximum day was July 25 when the day crew registered 296 loads with 47 trucks and the night crew 300 with 41, a total of 2,556 cu.yd. Even at that there was a delay of 3¾ hours with one of the shovels in the day time and 1 hour at night from blasting. Night work did not start until June 12, but it produced the first bonus day. For at least 14 times the record indicates delay on account of shortage of trucks and 15 times the trucks waited on the shovels.

Uniformly the material was typical Detroit blue clay easily handled when dry but sticky and slippery when wet, necessitating plank roads for the trucks.

An average of thirty-five 4-ton trucks were used but the number varied from 30 to 40, being paid for by the load by the sub-contractor. The dump was 4 miles away on property being filled in. Two inclines were used with slopes of 30 deg. Loaded, the trucks could not negotiate this grade and a hoist with cable attached to the front axle pulled them out of the excavation.

The site was occupied originally by the 4-story Hyatt Roller Bearing reinforced-concrete building, a long row of flats and several dwellings. These are mentioned because their removal dictated to a certain extent the excavating procedure. The Hyatt building was moved to a new location across the Cass Avenue end of the site and across Milwaukee Avenue. The other buildings were demolished but housing conditions in Detroit were so congested, many hundreds of people living on vacant lots in tents at the time, that the occupants insisted on remaining to the termination of their leases. This accounts for the irregular progress of the steam shovels, shown graphically by the series of progress charts.

The area marked "1" within the area bounded by the alley was excavated to the finished 16-ft. depth first, using an incline to Second Avenue. Before this was completed an 8-ft. cut was taken from the Cass Avenue end (left hand in the charts) so that the Hyatt building might be moved over it without jacking up the building to place the shores. By this time most of the buildings on Grand Boulevard side (bottom in the charts) had been demolished and excavation proceeded across the alley. Before this latter corner was taken out completely the Hyatt building had been moved and excavation proceeded behind it to the full 16-ft. depth.

The Durant building is being constructed for the General Motors Co. by the Thompson-Starrett Co. The William Hayes Co. was the sub-contractor on the excavation. Albert Kahn is architect.

Diagram Checks Completion Small Details

DIFFICULTY in checking the completion of details in large building work is reduced by using the simple check sheet indicated by the diagrams. This particular sheet of which only the top portion is shown was used on work for the National Cloak & Suit Co. at Kansas City, an 11-story warehouse of 690,000 sq.ft. of floor, which was occupied with a full force on Jan. 26, while considerable work remained to be done. The owners desired the quickest possible cleaning up in order to avoid constant hindrance to efficient operation.

The sheet covers the item of "toilets" which always require considerable watching. At the left are itemized the details, and across the top are column headings 11-A, 10-A, 9-A, etc., representing floors in A and B building, and the N and S refer to north toilet and south toilet, respectively. In each column a vertical heavy line indicates the work completed, a check mark indicates absence of that detail in that particular toilet and a blank shows work yet to be done. Colored pencils may be used to show progress as between weeks, black for the initial week of the record and a new color for each succeeding period.

When the general superintendent demands records of this sort from the superintendent and the superintendent on the job follows these sheets for daily execution, there is nothing left to memory and if there is blame for non-execution it can be put on the right shoulders. The contractors for the building were Wells Brithers Construction Co., Chicago, and the check sheet is regularly used on their work.

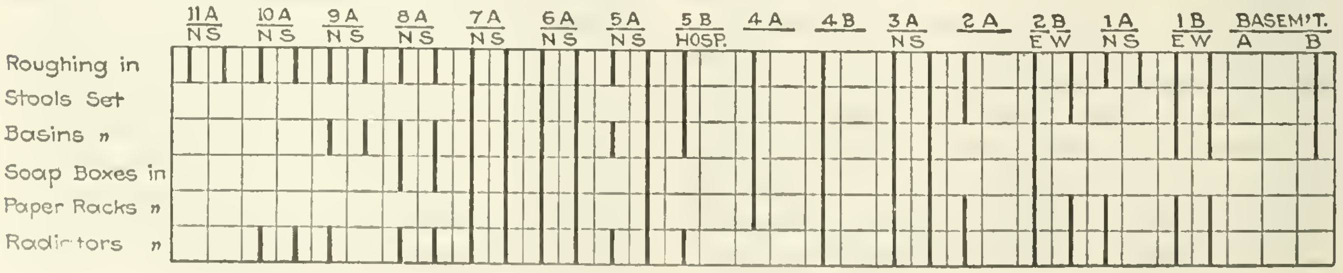
Drilling in Frozen Ground

By Thomas Tremblay,

City Engineer, Sherbrook, Quebec

IN your issue on March 11, p. 542, my attention was drawn to an article written by L. G. Hall, construction engineer, New York City, on the means of excavating frozen ground by the use of heated steel bars for the making of blasting holes. My experience, this past winter, has proved to me that the best and quickest means of drilling these holes is by the use of steam. We carried on our work of constructing a trunk sewer all through last winter. When we came across places where the frost was more than 4 ft. deep, we used ½-in. iron pipe connected to a steam hose with a pressure of 80 to 100 lb. This pipe was directed into the ground where we wished to do the blasting and bags were placed around the pipe to keep the steam down. Then, with the steam turned on, the pipe was pressed into the ground. It took two or three minutes to make a hole 4 ft. deep. When we wished to thaw the ground without blasting, the holes were sunk closer together and the steam kept on for a longer period, according to the nature of the frozen ground.

I have found that the use of steam for cutting trenches in frozen ground, makes trenching very easy and saves considerably on the cost compared with the old methods.



SAMPLE DETAIL CHECK SHEETS

NEWS OF THE WEEK

New York, April 8, 1920

Engineering Council To Confer With Members of Congress

Engineering Council will meet in Washington April 15. In addition to discussing various business matters, the members of Council are to confer with a number of the Senate leaders in the office of the Vice-President. At that time a formal offer will be made by Engineering Council to act in an advisory capacity on any public engineering matter. It will be pointed out that the engineers of the country are anxious to be of assistance to Congress in promoting the public welfare. A similar meeting with House leaders is being planned to take place in the office of the Speaker.

In the evening the members of Council will entertain a number of the Congressional leaders and executive officials at a dinner to be given at the Chevy Chase Club.

Personnel of New Dwight P. Robinson Co.

Reorganization of Dwight P. Robinson & Co., Inc., and Westinghouse, Church, Kerr, Inc., announced in these columns March 25, 1920, p. 647, is expected to be complete by May 1. The new merged company will be known as Dwight P. Robinson & Co., Inc., and will have the following principal officers, the letters in parenthesis indicating the respective previous affiliation in one of the two merging companies: President, Dwight P. Robinson (D.P.R.); vice-presidents, T. N. Gilmore (W.C.K.), I. W. McConnell (D.P.R.), R. N. Henderson (D.P.R.), A. K. Wood (W.C.K.) and D. H. Bean. The new company has engaged the ninth floor of the Grand Central Palace, 45th St. and Lexington Ave., New York City, and will open offices there about May 1. It will continue the business carried on by its two predecessors as an engineering company, designing, building and managing industrial and engineering projects.

Delay in Highway Construction Urged in Ohio

A halting of road construction in Ohio until there is a readjustment of economic conditions is indicated in a letter sent recently by A. V. Donahey, state auditor, Ohio, to A. R. Taylor, highway commissioner. Supporting such a contention he shows that the first six contracts let in January and February, 1920, for 15½ mi. of roads, built of waterbound macadam, bituminous macadam, brick, plain concrete and warrenite, will cost on an average for the six contracts $35,893 per mile. On March 25 thirteen contracts involving 44 mi. were offered, and but two bids received.

Joint Port Control of New York Now Before Legislatures

Bills have been introduced in both the New York and the New Jersey legislatures to authorize the establishment of an interstate Port Authority to control the port of New York. The procedure to be followed if the bills become law would be for the two states to rewrite their long-standing agreement fixing their rights and obligations in the waters between them. The new agreement provides for the establishment of a Port Authority to be composed of three members from each state, which authority shall have control of the port. The area embraced by the port extends from near Yonkers out into New Jersey near Paterson, Caldwell, Summit, New Brunswick and out into Long Island as far as Jamaica. Two of the New York representatives must come from New York City and two from the port section of New Jersey. An important sentence in the compact reads: "No city within the Port District shall be bound by the comprehensive plan unless and until it has approved of the same." This "comprehensive plan" has been under consideration by the New York-New Jersey Port and Harbor Development Commission for nearly two years and it states that it will be made public before July 1.

Transfer of More War Equipment for Road Building Proposed

A bill directing the Secretary of War to transfer to the Department of Agriculture, for distribution among the states, certain additional surplus equipment, to be used for road building purposes, has been introduced by Representative Reavis. The bill specifies 500 10-ton caterpillar tractors complete with spare parts; 200 mobile machine shop units, complete with spare parts; shop machinery and machine tools and equipment suitable for repair and rebuilding shops for motor propelled vehicles. The state receiving the property is to pay 20 per cent of the estimated value of the property. From this sum, however, the state may deduct freight charges.

Society for Municipal Improvements To Meet in St. Louis

The next convention of the American Society for Municipal Improvements will be held at the Planters' Hotel, St. Louis, Oct. 12-15. *Engineering News-Record* is informed by Charles C. Brown, secretary, Valparaiso, Ind., that the local committees have all been appointed and are busy and that they promise a comprehensive view of the public works of St. Louis, and the co-operation of other engineering societies.

Harvard Adopts Co-operative Plan of Training Engineer Students

For 16-Month Period Classes Will Alternate at 2-Month Intervals Between Class Room and Industrial Work

The Harvard Engineering School will inaugurate next June a new plan of engineering training including co-operation with the industries. The first two years of the program are substantially as in other schools, except that there is no differentiation between mechanical, civil and electrical engineers and that the students are not segregated either in their classes or in their social relations from the undergraduates in Harvard College and thereby escape the narrowing influence of an exclusive association with other engineering students. They must take certain courses in mathematics and in pure science, but have the opportunity of obtaining as broad an education as college students of their class. The work of the senior year is also carried out along the usual lines.

The combined engineering study and work in the industries starts in June of the sophomore year and lasts until the October at the beginning of the senior year. During the sixteen months the class is divided into two equal sections, which alternate from study to industrial experience at two-month intervals, with one vacation period for which the ambitious student may substitute industrial work. Those students who take the regular offering get eight months of study (which is the actual study time at present) and six months of experience in the industries; those who so desire may have eight months in the industries. There will be a continuous supply of students to the industries and continuous instruction in the school. Courses given within this period will have to be duplicated.

The scheme outlined above is optional, but the present indications are that it will be elected by practically all students in the school. It adapts itself well to graduates in arts or sciences from Harvard or other colleges who enter the third year of the engineering school, even if they enter in August or as late as October.

The co-operation with the industries will be under a director who will arrange with the industries for placing the students at such work as will give them the best opportunities for experience. The students will receive the same pay as other workmen doing similar work and will be treated by the industries like other workmen except that the director of co-operation will have freedom of access to each student at any time and will be permitted to arrange the general character of his work. The director will meet groups of the students in the evenings during their industrial period to discuss with them their problems and experience.

Each student will be given a syllabus of questions relating to the type of work which he is doing, the answering of which will require him to observe closely, not only the technical processes which he himself is carrying out, but also the whole system of management of the factory and such general technical details as he may have opportunity to observe. The syllabus will also require him to apply to his observations that body of engineering theory which he has acquired during his studies.

Announces Valuation Methods for Spring Valley Properties

E. O. Edgerton, president of the California Railroad Commission, in written instructions to Richard Sachse, chief engineer of the commission, directs him to proceed with the valuation of the Spring Valley Water System as an aid in the purchase of that system by the city of San Francisco, and calls for investigation and report on the following:

(A) Cost to produce the specified properties, using current prices for labor and materials as of a reasonable construction period ending March 1, 1920, applying these prices as of the times when labor would be employed and materials purchased under the construction program.

(B) Condition per cent, as of March 1, 1920, of the specified properties. This will necessitate an estimate of actual depreciation existing in the properties on March 1, 1920.

(C) Cost of acquisition of lands, to be obtained by ascertaining the market prices as of March 1, 1920.

(D) For such purposes as may hereafter be determined upon, price for Spring Valley properties placed before the voters of San Francisco in 1914; this price to be analyzed as closely as possible and added to cost of additions and betterments found to exist March 1, 1920, and specified by the city, with consideration to depreciation.

(E) Other facts which may assist the commission in giving proper weights to the items under A, B, C and D.

Extend Jurisdiction of California Power Administrator

As a result of investigation and conferences on the water shortage in California, announcement of which appeared on page 543 of *Engineering News-Record*, March 11, 1920, the California Railroad Commission has issued an order extending the jurisdiction of Power Administrator H. G. Butler. The new order empowers him "to exercise jurisdiction over the electric power supply of all the electric utilities throughout the state of California," and authorizes him, with the approval of the commission, to take such action as may "effectuate the purposes in the commission's opinion set forth in the matter of electric power control and administration." The new order, which is effective March 31, also gives the power administrator jurisdiction over rates charged for electrical energy supplied by one company to another.

Northwestern Members Act on Am. Soc. C. E. Questionnaire

The Northwestern Association of Members of the American Society of Civil Engineers, at its bimonthly meeting held in Minneapolis, March 12, endorsed an affirmative vote on the questions contained in Section A (External Relations) of the questionnaire. On the Development Committee's report, now before the membership of the society for vote, an affirmative vote was unanimously recommended on questions 1 to 6, inclusive, of Section B (Internal Relations).

Morris Knowles, Inc., Staff Dinner

A dinner was given in Cleveland March 13 for Morris Knowles and engineers of the Pittsburgh staff of Morris Knowles, Inc., by the Cleveland division of that engineering corporation. The Cleveland division, now in charge of R. F. MacDowell and R. E. Garvin, was formerly the organization of the late R. Winthrop Pratt, consulting sanitary engineer of that city.

The purpose of the dinner was the furtherance of personal relations between the engineers of the Pittsburgh and Cleveland offices of the organization. In addressing the members of his staff, Mr. Knowles announced that industrial housing, rate making and valuation work would be added to the Cleveland office's former specialties of water supply and sewerage.

Engineers for Railway Labor Board Named

The American Association of Engineers has conferred with the other groups of subordinate officials established by the recent order of the Interstate Commerce Commission, and has nominated W. F. Milligan and W. J. Potts for members of the Railway Labor Board provided by the Transportation Act of 1920.

Forest Laboratory To Celebrate

The tenth anniversary of the U. S. Forest Products Laboratory, at Madison, Wis., is to be celebrated in June by a two-day meeting at which there will be addresses and a dinner, together with an inspection of the laboratory and its work.

Would Relieve Contractors of War Cost Increases

In the United States Senate a bill has been introduced by Senator Stanley, of Kentucky, which provides for the relief of river and harbor contractors who have suffered losses as a result of the increased costs brought about by the war. The bill covers contracts for river and harbor work, which were entered into prior to April 6, 1917, but which had not been completed on that date. The bill also provides for the relief of contractors and their bondsmen in cases where contracts were cancelled.

Labor Problems and City Contracts at St. Louis, Mo.

Under the terms of an ordinance passed by the Board of Aldermen of St. Louis, Mo., which it was expected at latest accounts would be signed by the mayor, the city or contractors for the city when engaged in the construction of public works must give preference to the employment of (1) citizens of St. Louis, (2) other citizens of the United States when citizens of St. Louis are not availiable and (3) may employ aliens only when (1) and (2) are not available. This applies to foremen, mechanics and laborers of every kind. The ordinance also provides that all employees on public works must be paid not less than the prevailing rate of wages as fixed by city ordinance.

It is reported that the ordinance is causing a great deal of agitation in St. Louis construction circles for two reasons: First, because of the provision barring aliens from employment, which a great many consider to be unconstitutional, and yet which if not strictly carried out might offer ground for contest of special tax bills issued against public work; and, second, because practically a union scale is established by the ordinance on all work.

Sewerage and paving work has heretofore been non-union and paving work has generally been manned by negro labor which throughout the last season was paid from 35 to 45c. an hour. Under the new scale wheelbarrow men handling concrete from the mixer and the laborer placing concrete will be paid 80c. Sewer work has generally been manned by alien laborers, Austrians or Italians, which were paid 45 to 50c. and not over 55c. in the fall of 1920. These laborers are now scarce and would probably demand more, but under the terms of the ordinance they cannot be employed if Americans can be shown to be available, no matter how poorly qualified the American laborers may be.

It is felt by men in St. Louis that the ordinance may prove to be a last straw and that with sewers and paving on minor residence streets costing the property owners $11 and $12 a front foot before the ordinance becomes effective, the city is very close to the point where public improvements should be stopped.

To Resume Welland Canal Work

Work on the new Welland Canal, which will provide a 25-ft. waterway between Lakes Erie and Ontario, is apparently to be resumed by the Canadian government. During the war all operations on the canal practically ceased and last year an effort was made to get together machinery and to clean up preparatory to resumption. It is now announced that $5,500,000 has been spent in the Dominion estimates for the current year, which means that it is the intention of the government to go ahead with construction.

$47,000,000 Deficit for Canadian National Railways

That the total operating deficit, including fixed and interest charges, of the Canadian National Railway system was $47,000,000 last year was indicated in the statement made before the House of Commons of the Dominion, March 30, by Hon. J. D. Reid, Canadian Minister of Railways and Canals. The report includes the Grand Trunk Pacific which is in the hands of a government receiver. The items of the deficit are as follows:

Operating loss, Canadian Northern Ry.	$6,500,000
Operating loss, Intercolonial and Transcontinental Rys.	7,500,000
Interest and fixed charges, Canadian Northern Ry. and Intercolonial and Transcontinental Rys.	19,000,000
Operating loss, Grand Trunk Pacific Ry.	5,500,000
Fixed charges, Grand Trunk Pacific Ry.	8,500,000

The Minister said he considered the Grand Trunk Pacific Ry. and the Transcontinental as colonization lines and did not think it would be possible for them to make expenses for many years.

St. Louis Garbage Contract Renewed

The contract for garbage disposal by feeding to hogs made about a year ago between the city of St. Louis, Mo., and Guy Caron, has been renewed for another year on almost the same terms as before (see *Engineering News-Record*, Feb. 20, 1919, p. 400.)

Relief Promised to Contractors on Naval Structures

Through a resolution recently introduced into the House of Representatives the Secretary of the Navy is authorized to receive and investigate claims from contractors, sub-contractors and material dealers looking to reimbursement for actual losses sustained on war contracts. Recovery is to be allowed on losses "brought about by the action of Government agencies after the date upon which such contracts were entered into and which have arisen under contracts made between April 6, 1917, and Nov. 11, 1918, or under contracts which were due for completion after April 6, 1917." Applicants must file claims within 60 days of the passage of the act and in the case of contracts uncompleted at the act's passage, preliminary claims must be filed within 60 days.

Claimants must file an affidavit that in all work undertaken for the Navy Department no greater net profit than 6 per cent was realized. The Secretary of the Navy is also authorized to waive damages collectible from delays in completion of contracts where the delay is due to the action of Government agencies. The bill has been referred to the committee on Naval affairs.

A. A. E. Has 15,104 Members

The membership of the American Association of Engineers at the close of business on March 31 was 15,104. Almost three times as many applications were received this March as in the corresponding month last year.

Japan Commission to Study Tunnel Construction Problems

A Japanese commission, according to press reports, is being formed to make a study of American and European tunnel-construction practice with a view to throwing light on the cost and main construction problems in the proposed 10-mile tunnel under Shimonoseki Strait. This tunnel would connect the main island of the Japanese group with the island to the south on which the City of Nagasaki is located and where large industrial development has taken place.

New Road Institute to Furnish Material Prices to Members

After a two-day meeting recently held under the auspices of the three South Carolina state colleges and the State Highway Department, the road builders of South Carolina organized themselves as "The South Carolina Good Roads Institute." Officers were elected and a secretary appointed. A part of this secretary's duties is to keep the members of the institute informed as to current prices of cement, pipe culvert, structural and reinforcing steel, stone, and unit prices of construction work.

Four Texas Counties Vote Total of $450,000 for Roads

During February four Texas counties voted a total of $450,000 in bonds for road improvements. The counties were Aransas, Calhoun, Jeff Davis and Houston. Aransas Co. voted 5 to 1 to issue $100,000 worth, a measure that was defeated less than two months previous to the successful election Feb. 10.

Survey of Memphis Water Works

The engineering firm, Chester & Fleming, Pittsburg, has just completed a survey of the water department of Memphis, Tenn., on which it has been engaged for several months. The report shows that about a million dollars will be required to carry out the improvements necessary to meet the present and immediate future demands of the city. The present system involves the use of pumps which force the artesian supply through the system. The source of the supply is reported to be adequate, but in order to put the works in good condition, the report recommends overhauling much of the present machinery and making new installations in certain cases. A reservoir is also recommended to be built. At the present time, the system has no reservoir or other means of reserve supply. The Memphis survey was carried out under J. N. Chester, who personally conducted the investigations.

Large City Planning Commission for Los Angeles

A city planning commission of 51 members has been created by an ordinance passed by the City Council of Los Angeles, Cal., on March 5. The members of the commission are to serve without pay and "shall be persons of recognized ability and conversant with such matters as come within the scope of city planning." The City Council will select from the 51 members of the city planning commission an executive committee of nine members. This committee will have such powers and duties as may be conferred upon it by a future ordinance of the council. The officers of the commission will be chosen from the membership of the executive committee. The authority is given the commission to appoint a secretary and technical employees and assistants. A quorum will consist of fifteen members, but a majority of the commission is required for such matters as demand votes of record. The ordinance provides that the commission shall be a consulting body to the Mayor and Council in various city planning matters, having to do "with the orderly and consistent physical developement of the city." It will be the duty of the commission to prepare plans and to collect plans and suggestions prepared by the various city departments bearing upon the present physical conditions and future growth and development of the city, and to classify and co-ordinate them.

Public Roads Get Appropriations

The expenditure of $490,620 in roads investigations by the Bureau of Public Roads is provided in the agricultural appropriation bill as it passed the House. Some of the items entering into that total are as follows: Salaries, $117,900; for inquiries, in regard to systems of road management, $36,200; investigations of methods of road making, $102,300; investigations of chemical and physical character of road materials, $77,020; investigation of farm irrigation, $62,440; investigation of farm drainage, $53,760; investigation of domestic water supply on farms, $25,000.

Engineer Sues for $57,897 Additional Compensation

Bernard Enright, formerly director of the Eastern Testing Laboratories, Allentown, Pa., has started action in the U. S. Eastern Pennsylvania District Court against Fuller-Lehigh Co., Fuller Engineering Co., Lehigh Stoker Co., Allentown Portland Cement Co. and J. W. Fuller for $57,897.50 alleged balance due for salary and a share of the profits of the laboratories agreed upon when he assumed their direction.

The parties concerned are all well known in the cement industry. Mr. Enright, a member of the American Society for Testing Materials, is now practicing as consulting chemist and cement expert in Camden, N. J.

Civil Service Examinations United States

For United States civil service examination, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local Office of the Civil Service Commission, for form indicated.

Senior structural engineer, grade I, $3,000 to $4,000 per year. Applications may be filed until further notice.

Senior structural engineer, grade II, $1,800 to $2,700 per year. Applications may be filed until further notice.

Assistant appraisal engineer, $1,800 to $3,300 per year. File applications by Aug. 2.

Appraisal engineer, $3,600 to $4,800 per year. File applications by Aug. 2.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

TWELFTH NATIONAL CONFERENCE ON CITY PLANNING, 60 State St., Boston; Cincinnati, April 19-22.

NATIONAL FIRE PROTECTION ASSOCIATION, 87 Milk St., Boston; May 4-6; Chicago.

AMERICAN ASSOCIATION OF ENGINEERS; 63 E. Adams St., Chicago; May 10, 11, St. Louis, Mo.

AMERICAN WATER WORKS ASSOCIATION, New York City; Montreal, June 21-26.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; Asbury Park, N. J., June 22-25.

AMERICAN PUBLIC HEALTH ASSOCIATION, Boston; San Francisco, Aug. 30-Sept. 3.

The Vermont Society of Engineers held its eighth Annual Meeting, which was conducted as a joint meeting with the Aero Club of Vermont, at Hotel Vermont, Burlington, Mar. 10. At the close of the morning session, the following officers of the society were elected: President, J. W. Votey, dean of Engineering College, University of Vermont, Burlington; first vice-president, F. W. Denison, assistant engineer, Central Vermont R.R., St. Albans; second vice-president, G. R. Varnum, superintendent of quarries, Bontwell, Milne & Varnum Co., Barre; secretary, G. A. Reed, assistant state engineer, Montpelier; treasurer, T. W. Dix, professor of highway engineering, University of Vermont, Burlington.

The Engineering Institute of Canada's Toronto Branch has arranged, through its chairman, R. O. Wynne-Roberts, for the presentation of the following papers every Thursday evening during April and the first week of May, at the Engineers' Club, Toronto: Apr. 8—"Chemistry and Engineering," T. Linsay Crossley; Apr. 15—"Sarnia Intake," F. W. Thorold, "Reinforced Concrete Pipes," H. W. Heywood; Apr. 22—"Application of the Venturi Principles," E. Dean Wilks; Apr. 29—"Dredging," W. E. M. Bonn; May 6—"Ontario Highway Policy," W. A. McLean.

The American Association of Engineers, Chicago, announces the formation of the following new chapters: Newark (N. J.). Officers elected: President, Frederick A. Reimer, county engineer of Essex County; first vice-president, Robert A. Meeker, state highway engineer of New Jersey; second vice-president, Morris R. Sherrord, city engineer of Newark; third vice-president, David C. Boswell; fourth vice-president, Thos. J. Wasser, county engineer of Hudson County. Albany (N. Y.) Chapter. Officers elected: President, O. F. Rowland; secretary, R. N. Barrett; treasurer, R. E. Hartmann. Six vice-presidents were also elected. Bismarck (N. Dak.) Chapter. Officers elected: President, J. E. Kaulfuss, assistant chief engineer, North Dakota Highway Commission; vice-president, B. H. Long; secretary, G. F. Ludvigsen, assistant engineer, North Dakota Highway Commission; treasurer, W. T. Stratton, consulting engineer, North Dakota Railroad Commission. Trenton (N. J.) Chapter, officers elected: President, H. D. Robbins, division engineer, State Highway Department; vice-president, G. R. Moore, assistant division engineer, State Highway Department; secretary, R. R. Pope, resident engineer, State Highway Department; treasurer, A. G. Nicolaysen, State Board of Taxes and Assessments.

Chapter charters have been granted by the association in Carson City, Nev.; New Haven, Conn.; Warren, Ariz.; Delaware College, Newark, Del.; Ogden, Utah; Atlanta, Ga.; Carnegie Institute of Technology; and club certificates to petitioners from Santa Fe, New Mex. and Utica, N. Y. The board of directors has also approved the amalgamation with the Michigan Engineering Society and constitution which, after adoption by the State, will provide for the establishment of the Michigan Engineering Society as a state assembly of the association. The plan of amalgamation with the North Carolina Society, which recently voted to enter the association, was also approved on a similar basis. The Swarthmore College Engineers Club has affiliated with the association as a student chapter. At present there are about thirty members. The officers are as follows: President, Edmund P. Smith; vice-president, Howard Jenkins; secretary and treasurer, Edmund E. Bartleson. The club was founded in 1914. The Ohio State Assembly of the A. A. E., composed of the eight chapters and two clubs of the association in that state, adopted a constitution in Columbus, Feb. 28. Officers were elected as follows: President, C. R. Rood, Toledo; first vice-president, J. E. Root, Akron; second vice-president, E. K. Ruth, Cincinnati; secretary-treasurer, W. L. Mattoon, Columbus. Newly elected officers for various other chapters follow: Philadelphia Chapter: President, Edmund J. Fitzmaurice, Ballinger & Perrott; first vice president, J. J. Crowe; second vice president, Jos. Chapin; third vice president, E. E. Keller; recording secretary, H. H. Cramer; treasurer, Jesse R. Henderson; executive secretary, H. F. Kuzen. Ogden (Utah) Chapter: President, W. F. Turner; vice-president, H. J. Craven; secretary, E. H. Kidder; assistant secretary, B. W. Matteson; treasurer, W. S. Craven. Lincoln (Neb.) Chapter: President, Geo. W. Bates; vice-president, R. E. Davis; secretary, Geo. K. Leonard; treasurer, H. H. Wheeler. South Dakota Chapter: President, Frank S. Peck, state highway engineer; secretary, C. J. Loomer, assistant highway engineer.

North Central Division, National Highway Traffic Association, will hold a meeting at Detroit, on Thursday evening, April 15. George W. Walters, deputy commissioner of the Detroit Police Department, will speak on "One-Way and Segregated Traffic Streets." The discussion will be opened by Glen Phillips, of the Detroit City Planning Commission. Horatio S. Earle, of Detroit, will deliver a paper entitled "Pavements Required for Economic Highway Transport," the discussion of which will be opened by Arthur H. Blanchard, professor in charge of highway engineering and highway transport, University of Michigan.

PERSONAL NOTES

Major-General William C. Gorgas, former Surgeon-General of the U. S. Army and chief sanitary officer of the Panama Canal Zone, has accepted a five-year contract with the Peruvian Government to direct an extensive sanitation program there. He was scheduled to sail from Peru on April 1 for New York, Belgium and West Africa, and to return to that country the beginning of next year. During his absence his assistant, Colonel Wrightson, will be in charge of the new work.

Alfred Mullikin, formerly first lieutenant, Sanitary Corps, in command of the 82nd Sanitary Squad, 86th Division, A.E.F., has been appointed assistant sanitary engineer, New York State Department of Health.

Edward D. Very, formerly engineer, New York City Street Cleaning Department, and more recently engaged in consulting engineering work, has been provisionally appointed first assistant engineer, Bureau of Street Cleaning, Philadelphia, succeeding Dudley T. Corning, resigned.

William Collins, formerly assistant consulting engineer of Decatur, Ill., has been appointed city engineer.

James A. Toner, formerly assistant city engineer of Meriden, Conn., has been appointed superintendent of public works.

Major-General W. L. Sibert, formerly a member of the Isthmian Canal Commission and division engineer of the Atlantic division, and recently in command of Camp Gordon, Georgia, has retired from the Army. He has announced his intention to engage in engineering work.

J. H. Knowles has resigned as chief engineer of the Western Pacific R.R., headquarters San Francisco, to enter private practice. Mr. Knowles served the Western Pacific for ten years.

C. S. Heidel, state hydrographer of Montana, has been appointed state engineer, succeeding A. M. Mahon, who recently resigned to go into private business.

George M. Shepard has become associated with Louis P. Wolff, consulting engineer, St. Paul, Minn., in the practice of municipal and sanitary engineering. Previous to discharge from the Army, in January, 1919, Mr. Shepard was captain of Engineers on duty with the 3rd U. S. Engineers at Schofield Barracks, Hawaii.

Albert Givan has been appointed assistant state engineer of California. He was formerly city engineer of Sacramento, and for the past few years has been engaged in private engineering practice in that city.

E. P. Palmer, formerly resident engineer of the Rapid Transit Subway Construction Co., has become associated with Warren, Moore & Co., New York City, as engineer directing the company's contracts in the New York territory. As captain of Engineers he served in France in Transportation Department, A. E. F.

Charles E. Denny, who, under Government control, was assistant Federal manager of the New York, Chicago & St. Louis R.R., has been appointed vice-president and general manager, with headquarters at Cleveland.

E. W. Hammond, acting engineer of maintenance-of-way, Buffalo, Rochester & Pittsburgh R.R., has been appointed engineer of maintenance-of-way, with headquarters at Rochester, N. Y.

F. S. Schwinn, engineer on the valuation committee, International & Great Northern R.R., at Houston, Tex., has been appointed chief engineer.

Harry E. Barlow, since 1902 assistant engineer of the Chicago, St. Paul, Minneapolis & Omaha R.R., has been promoted to the position of chief engineer, with headquarters at St. Paul.

William H. Hoyt, for the past fifteen years assistant chief engineer of the Duluth, Missabe & Northern R.R., has been appointed chief engineer. with headquarters at Duluth.

Harold Knight, during Government control assistant superintendent of maintenance, Erie R.R., with headquarters at New York City, has been appointed regional engineer of the Ohio region, with office at Youngstown.

Herman Rettinghouse, chief engineer of the Chicago, St. Paul, Minneapolis & Omaha R.R., has retired after thirty years in railroad service. Mr. Rettinghouse began his career as a rodman on construction work on the St. Paul extension of the Wisconsin Central in 1883. Soon afterward he took a position with the Milwaukee, Lake Shore & Western, serving, successively, as leveler, instrument man and assistant engineer in charge of location, construction and maintenonce. In 1893 he left that road to engage in general engineering practice at Ashland, Wis., where he served as city engineer for three years. Later he returned to the Milwaukee, Lake Shore & Western, now a part of the Chicago & North Western, as assistant engineer in charge of construction and maintenance, and in 1900 was made superintendent of bridges and buildings of the Ashland division. In 1905 he became division engineer of the Southern division of the Wisconsin Central, and resigned from that position, in 1907, to become division engineer in charge of maintenance of the Chicago & North Western. He was promoted, in 1912, to the position of superintendent of the Iowa & Minnesota division, and, in 1913, received his appointment as chief engineer of the Chicago, St. Paul, Minneapolis & Omaha.

T. A. Spratt has been appointed temporary superintendent in charge of all roads taken over by the Ottawa Suburban Roads Commission.

A. M. West has resigned as city engineer of North Vancouver, B. C., to engage in private business.

David Hanna has resigned as chief of surveys and drafting in the roadways department of Toronto, to become superintendent of water-works at Windsor, Ont.

M. J. Butler, formerly president of the Engineering Institute of Canada, and, until his recent retirement, managing director of Armstrong-Whitworth Co., Ltd., has been appointed a member of the Housing Commission of Oakville, Ont.

John H. Ryckman, recently of the bridge engineering staff of the Toronto Works Department, is now designing engineer for the Department of Public Works, Chicago.

Laurence A. Ball, consulting engineer, has formed a partnership with Howard H. Snyder, under the firm name of Ball & Snyder, with offices in New York City. They will engage in general consulting engineering practice.

Henry Harvie has resigned as assistant to hydraulic engineer of design, Hydro-Electric Power Commission of Ontario, to become associated with the Canadian Ingersoll-Rand Co., Montreal, as hydraulic engineer.

Pierce J. McAuliffe, formerly manager of ship construction for the Emergency Fleet Corporation, has established consulting engineering offices in New York City. Although he retains his connection with ship construction, Mr. McAuliffe is devoting his attention particularly to engineering and industrial problems in connection with the pumping of solid materials.

R. V. Meikle, engineer of the Turlock irrigation district, California, has been appointed chief engineer in charge of the construction of the $6,000,000 Don Pedro dam and power plant for the Turlock and Modesto districts. Percy F. Jones, engineer of the Modesto district, has been appointed assistant to Mr. Meikle.

C. J. Parker, formerly of Watertown, N. Y., and for the past 18 years principal assistant engineer to the chief engineer of the New York Central R.R., with office in Grand Central Terminal, New York City, has been advanced to the position of chief fire protection engineer of the New York Central.

OBITUARY

Frank L. Fuller, civil engineer of Boston, well known throughout a considerable part of New England, died recently. In addition to his engineering practice in Boston, Mr. Fuller was for a number of years chairman of the Water Board, Wellesley, Mass., his home town.

G. Reid Munro, civil engineer of Peterboro, Ont., died from influenza, March 1. He had been in the employ of the William Hamilton Mfg. Co., Peterboro, for many years. Mr. Munro was a member of the Peterboro Branch, Engineering Institute of Canada.

Harry Osborne, of Montreal, formerly works manager of the Angus shops, Canadian Pacific Ry., died March 17, at the age of 61 years. He was born in Kent, England, and came to Montreal forty years ago, entering the service of the Canadian Pacific Ry. shortly after the formation of the company and working his way up to the position of works manager, which he resigned about a year ago.

William Watson Coe, general manager, Pocahontas Coal & Coke Co., Roanoke, Va., died at Charlestown, W. Va., March 31. He was formerly chief engineer of construction of the Shenandoah Valley R.R., and later chief engineer of the Norfolk & Western R.R. He was born at Winsted, Conn., in 1846.

James Henry Deicker, formerly connected with the construction of the Panama Canal, died at Lafayette, Ind., March 29. He was born at Watertown, N. Y., in 1882, and was a graduate of Purdue University.

Francis W. Throop was drowned at Chosica, near Lima, Peru, March 25. He was engaged in hydro-electric development work in the Andes Mountains for W. R. Grace & Co., New York City. Reports state that he was thrown by his horse into a mountain stream. He went to South America in 1918 for Grace & Co. Prior to that time he was for about twelve years superintendent of the Dominion Power & Transmission Co., at St. Catharines, Ont. Mr. Throop was born in Ontario County, N. Y., 52 years ago.

John J. Miller, retired contractor and builder of docks and bridges, died at his home in Brooklyn, Feb. 26, of paralysis, at seventy-seven years of age.

Orlando W. Norcross, president, Norcross Brothers Co., Worcester, Mass., died from heart failure, at eighty-one years of age, Feb. 27, at his home in that city. Among the important works carried out by Mr. Norcross were the remodeling of the White House, in 1902; the building of the New York Public Library; the construction, under exceptional difficulty, of the pneumatic caisson foundations for the new Boston Custom House, and the removal of the ledge in the channel at the Kittery Navy Yard.

Dr. Augustus Valentine Salph, consulting civil engineer, San Francisco, Cal., died at his home in Berkeley, from influenza, Feb. 13. He was born in San José, Cal., in 1871. He graduated from the College of Civil Engineering, University of California, in 1894; reutrned the next year and received the M.S. degree, and then continued his studies at Cornell University, graduating from there with degree of Ph.D. in 1897. The year following Mr. Salph returned to the University of California as instructor in drawing and civil engineering. Five years later he was placed in charge of the drafting room as structural engineer for the U. S. Reclamation Service at Hazen, Nev., on the Truckee-Carson project, having charge of the design of the wooden bridges, concrete structures and all other structures in connection with the project. In 1906 he became associated with John B. Leonard, consulting structural engineer, as engineer, on the design of steel and concrete bridges and buildings. Later he was assistant engineer for the City and County of San Francisco Department of Engineering and assistant state engineer in charge of the engineering work along the San Francisco waterfront under the Board of State Harbor Commissioners. Upon leaving the Harbor Commission, Mr. Saph became engineer of the Spring Valley Water Co., San Francisco, and had charge of the design of the water tower for the Calaveras Dam. In 1914 he began his private practice as consulting engineer, specializing on steel and concrete.

William E. Woods, accounting engineer for the past fifteen years of the Atlanta & West Point R.R., died at his home in Atlanta, Ga., March 13. He was born in Philadelphia and was educated at the U. S. Military Academy, West Point. In 1905 he went to Atlanta as engineer in charge of the construction of the Atlanta & Carolina Ry., which project was abandoned. Soon afterwards he entered the service of the Atlanta & West Point. He was also engineer in charge of the construction of the Produce Row Bldg., Atlanta, and the Georgia railroad yards. Mr. Woods was 59 years old.

Business Notes

The Southwestern Engineering Co., Hutchinson, Kan., has opened a branch office at Fort Worth, Tex., with Harvey R. Rankin in charge.

The Clarksburg (W. Va.) Engineering Co., whose offices in that city have been closed during the past year on account of the absence in Government service of W. S. Baver and C. P. Collins, has reopened under the firm name of the Clarksburg Engineering Co., Inc. Mr. Collins will assume the duties of manager.

Baldwin & Welcomer, general contractors, handling building construction, industrial and utilities work, who have maintained offices at Jersey City, N. J., Union City, Pa., and Niles, Ohio, have opened an office at Warren, Ohio, in the Western Reserve Bank Bldg., which will be the main office for their work in the Mahoning Valley.

John F. Reagan, Jr., has been appointed Eastern sales manager, Neptune Meter Co., New York, to succeed the late Daniel B. McCarthy. Mr. Reagan has been with the Neptune Co. for nearly ten years, representing them as a salesman in several Eastern states. Prior to his connection with the company, he was general manager of the Consolidated Water Co., Utica, N. Y.

G. E. Warren has resigned as assistant manager, service bureau, Universal Portland Cement Co., Chicago, to continue his duties as manager, American Concrete Pipe Association. Mr. Warren has been with the Universal Co.'s service bureau for five years, the last year acting also as secretary-treasurer, American Concrete Pipe Association. The association has recently been reorganized and will have an office in Chicago. J. W. Lowell, eastern manager, Universal service bureau, will assume the duties of assistant manager of that department at Chicago.

The Holt Manufacturing Co., Inc., Peoria, Ill., has been holding a series of schools in order to educate prospective buyers, distributors and users of caterpillar tractors in the fine points of the care, operation, and maintenance of these machines. Under the leadership of F. L. Peterson, service engineer, schools have been held in Lincoln, Neb.; Fargo, N. D.; Atlanta, Ga.; and Richmond, Va.

Mace Moulton, Jr., for six years New England sales manager of the United States Asphalt Refining Co., New York and Baltimore, has formed the firm of Mace Moulton, Jr., Inc., to handle the sale of bituminous road materials and pavement. The company offices are at 6 Beacon St., Boston.

The Conradson Machine Tool Co., has been incorporated at Green Bay, Wis., and will be associated with Joseph T. Ryerson & Son, Chicago, who will handle the sales of the output of the new plant. C. M. Conradson is president of the new concern.

The Bush, Roberts & Schaefer Co., has been organized with offices at 1 Madison Ave., New York and McCormick Bldg., Chicago, by the directors of the Roberts & Schaefer Co., Chicago, and Colonel Lincoln Bush, formerly chief engineer of the D., L. & W. R.R. The company will act as engineers and contractors for reinforced concrete bridges and viaducts, track elevation work, piers, docks, terminal facilities and general engineering and construction work. The Roberts & Schaefer Co. will continue its present lines of engineering construction.

D. H. Brillhart and G. R. Brothers, formerly manager of the fabrication department, and of the sales department, respectively, of the Bethlehem Fabricators Co., Inc., have incorporated the firm of Brillhart-Brothers Co., Inc., to engage in a general contracting and engineering business. The company headquarters will be in Bethlehem, Pa.

The Hydraulic Pressed Steel Co. announces the consolidation of all of its interests under the name of the Hydraulic Steel Co. of Cleveland.

The John F. Byers Machine Co., Ravenna, O., announces the opening of its new Chicago district office, 20 West Jackson Boulevard, in charge of E. L. Kelzer.

George C. Kaucher, of the contracting firm of Kaucher & Hodges, Memphis, was recently elected president of the Memphis Builders' Exchange.

O. A. Olstad, formerly of the New York office of Blaw-Knox Co., has been made manager of the New England territory, with office in the Little Bldg., Boston. He succeeds A. W. Ransome, recently appointed manager of the Pacific coast territory, with office at 754 Monadnock Bldg., San Francisco.

T. L. Lawry has been appointed manager of the steel buildings division of the Liberty Steel Products Co., Inc., Pittsburgh. Mr. Lawry was formerly manager of the Pittsburgh district of the company. In addition to handling the steel building division, he will act as manager of the industrial department of the Chicago district.

A Consolidation of Engineering News and Engineering Record — McGraw-Hill Company, Inc.—JAMES H. MCGRAW, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN
Editor

Volume 84 — NEW YORK, THURSDAY, APRIL 15, 1920 — Number 16

New Am. Soc. C. E. Year Book

FOR years there has been good-natured criticism of the segregation in the annual Year Book of the American Society of Civil Engineers of the different grades of members, which necessitated the use of two lists if one did not happen to know the grade of the member whose initials or address was sought. In the new year book, just out, a single alphabetical list contains the names of members in all grades. This will be a great convenience.

City Engineers Should Go

ATTENDANCE of city engineers is especially desired at the National Conference on City Planning to be held in Cincinnati, April 20 to 22. City planning is a field in which city engineers should be leaders but thus far relatively few have given attention to more than a single element of the subject at one time, and even that has been without recognition of its broader aspects. The small band of engineers who have had city-planning vision should be heavily reinforced and a large attendance at the Cincinnati conference would be a good beginning. Besides the presidential address by Nelson P. Lewis, chief engineer of the Board of Estimate, New York City, three other engineers are on the Cincinnati program and the toastmaster at the annual dinner on April 21 will be Herman Schneider, dean of the College of Engineering, University of Cincinnati. City engineers should go to Cincinnati in force.

The Railroad Strike

ALTHOUGH a few railroad officers more than a month ago privately predicted a general railroad tie-up before the first of May, the unauthorized strike which has apparently become nation-wide over night comes almost as a complete surprise. At this writing, the situation is so veiled in mystery that any attempt at thorough analysis is futile. But one thing appears certain: The radical forces of the "one big union" idea have laid a groundwork to destroy the old unions through secret local organization and intimidation—minority methods of controlling the majority. Secrecy has been the characteristic of the radical organizer's operations and he has struck at the most vulnerable point—the roughest class of railroad workers and therefore the most susceptible to syndicalist methods. From the switchmen, the strike, unauthorized and opposed by the recognized unions, has spread into the ranks of enginemen and trainmen—either through intimidation or the hysteria of discontent over wage-settlement delays in Washington. In spite of strong opposition to the strike movement already manifest in some locals of the recognized unions, the situation is menacing. Unaccompanied by any definite statement of aims and demands, the secret strike orders generally seem to have been abjectly obeyed. Previously, this journal has favored the passage of a Federal law against strikes without warning and without a period of discussion. Such a law, as in Canada, might have gone far to forestall what now threatens to become the most destructive of American strikes. A sharp issue has been drawn between the interests of the public and those of a special class—and the method used is anarchic. There have been tests already of the public temper; there is no room to doubt what the attitude of the public will be. With the people against them, no matter how great the inconvenience or the temporary victory, the strikers must eventually lose. Victory for them would be a blow against Government.

Construction Industries Create Staff Council

THE success as a constructive agency of the National Federation of Construction Industries, whose organization, as noted April 1, p. 689, was completed in Chicago on March 24-26, will depend upon how efficiently the staff council can be made to function. Composed of the staff experts of the member firms and associations this council is virtually the production department of the Federation. Its task will be to plan and execute the improvements in legislation, transportation, industrial relations and standardization to which the Federation will chiefly devote its energies. To undertake this task a very definite and purposeful organization of the staff council is essential. At the meeting in Chicago such organization was well begun, but it was only begun. Between now and the next meeting it must be completed. With this work well done, the Federation will be prepared for creative work.

Another Vote on Shear

RADICAL increases in the safe unit stress in shear in reinforced concrete were proposed by the special committee on shear at the annual meeting of the American Concrete Institute in February. These proposals were discussed at the sessions and were incorporated in the proposed Standard Building Regulations of the institute and as such sent out to letter ballot, to be canvased April 17. Unfortunately, however, the request for a vote did not include a reprint of the shear provisions which, indeed, in the form adopted were never before the membership in general. Any vote on this letter ballot, therefore, will be anything but authoritative, nor can it reasonably add any weight to the conclusions of the committee which, though composed of engineers of the greatest competence in this matter of shear, is opposed in some of its contentions by other engineers of equal competence. If its constitution permits, the institute should at once submit the complete "Building Regulations" to its membership and should not stand on the vote of April 17 as an approval of the provisions of those regulations.

Salaries and Service at Worcester

PENNY wise and pound foolish is the policy of those cities that are refusing to pay the members of their engineering staffs salaries commensurate with the value of their service. A striking case in point has arisen at Worcester, Mass., where F. A. McClure, after serving the city 43 years, during 28 of which he has been city engineer, is now paid only $4,000 a year. The Mayor has recently denied Mr. McClure an increase of as little as $1,000 a year, having vetoed this and other salary increases voted by the City Council on recommendation of its finance committee. The Mayor bases his veto on the ground "that the taxpayers do not approve of such large and wholesale increases"—as though he were closer to the people than are the members of the City Council.

In a newspaper interview, Mr. McClure states that his $4,000 salary is no more than equivalent to half the sum a few years ago; that besides his other work he has in hand the designing of $2,000,000 of sewage-works improvements which no reputable engineer in private practice would undertake to put through in the year available to him for less than $50,000, but that notwithstanding this he is about to lose his assistant on the sewage-works design, Earle W. Greene, because the mayor refuses to permit an increase of $400 a year ($2,600 to $3,000) to this assistant.

There is no question whatever as to Mr. McClure's faithfulness and ability, nor of politics at issue—unless the Mayor's opposition to any material increase in salaries is politics.

The sole question in Mr. McClure's case is, shall a man who has served a prosperous city for nearly three decades as city engineer and for over four decades altogether, who knows the city like a book, be allowed to resign in discouragement for lack of a reasonable increase in salary?

The case put up to the people of Worcester is one of justice and gratitude, combined with good business. Moreover, Mr. McClure would gain financially if he left Worcester, as a California city has offered him an important engineering position at double his Worcester salary. But after so long and faithful service as Mr. McClure has rendered, it would be a sting to him and a reproach to Worcester if he were permitted to go to other employ, either public or private, when a small increase of salary, to provide a mere living wage for a professional man, would retain his services and affection for his home city and prevent an uprooting that will be painful to him and his friends within and without the city service.

An official and citizen like Mr. McClure is an asset to any city that cannot be measured in mere dollars. Fortunately, the Chamber of Commerce and many leading business men of Worcester realize this and are determined not to lose Mr. McClure. The least the City Council can do in the way of justice and good business is to override the mayor's veto of the salary increase for Mr. McClure—and of other well-deserved increases also. Skimping salaries of able city officials may possibly save a few drops at the spigot but it is certain to waste bucketsful at the bunghole. This is especially true when a city is launching extensive improvements to works with which an engineer has been long connected, as is the case with the Worcester sewage-works and City Engineer McClure.

The Canadian Railroad Deficit

COMPARED to the huge loss sustained by the Government of the United States for two years of Federal railroad operation, the deficit of $47,000,000 recently reported to the Canadian Parliament as the year's loss on the National Railways does not seem great, though it is nearly double our rate of loss per mile operated. But its significance is such as to have brought down a storm of criticism of the government's railroad policy, due largely to the permanent rather than the temporary nature of the situation. In spite of the reassuring tone of the report of the Minister of Railways and Canals, from which figures were briefly abstracted in our News Section last week, Canada's government-owned and operated railways are likely for some time to have troublesome financial problems.

Following a period of ill-advised and hysterical railroad building, backed by government guarantee, the Canadian Government found on its doorstep and was compelled to take over and operate a great railroad system comprising the lines of the National Transcontinental, the Canadian Northern, and more recently the Grand Trunk Pacific. By exchange of private for government securities, the Dominion acquired not only control but also ownership of about half the trackage in the country, so that the situation is anything but temporary. In competition with the Canadian National Railways, a losing venture for the present at least, is the strong privately owned and operated Canadian Pacific Railway earning a substantial dividend while charging the same rates.

Apparently an entirely different situation from that in this country, there is at least one point of striking similarity. The same fear exists in Canada that, by raising rates to make the losing lines self-supporting, the strong system may earn too great a dividend, since it must be allowed the same rates. While the National Railways have sustained a deficit of $47,000,000, it is estimated that the total cost to the people of raising rates to make the National lines self-supporting would be some $88,000,000, the difference being represented largely by increased net earnings of the Canadian Pacific through higher rates.

In this country there has been established by the new Transportation Act the principle of the "take-off" above a fixed percentage of property "value," to offset the fear of big dividends accruing to the strong companies. In Canada it is proposed by some to raise rates and then tax the increased profits out of Canadian Pacific earnings. At best such procedure would be of doubtful success and propriety. Means might well be found to evade the taxation and there would be the criticism of the Government's using its strategic position to tax an earned dividend out of a competitor.

As stated previously by this journal, the acquisition of losing lines by the Canadian Government was the inevitable result of a period of overbuilding, aggravated by the war conditions which followed. It is true that much of this extension was justified for purposes of colonization and therefore a loss on some of the lines for several years to come may be considered legitimate. Cognizance is also taken in Canada of the fact that the establishment of new rates in this country will largely determine the course taken in Canada, as was the case in applying the McAdoo wage increases to the Canadian railways. It appears likely that the readjustment may embody a compromise measure providing for a raise in rates which, while sufficient to increase Canadian Pacific earnings substantially, will not be great enough to offset the entire loss on the National Railways. On the whole such a course now appears most desirable, but the financial outlook for government ownership in Canada is certainly troubled.

Engineers, Contractors, and a Sane Immigration Policy

THERE was held in New York last week probably the first adequate conference on immigration that the country has known. The conferees were representatives of racial groups, manufacturers, farmers and educators. The approach was from the economic, not from the sentimental, side. It was brought out, among other things, that, due to the European war and the operations of the literacy test, we are short 5,000,000 immigrants; that, while emigration and immigration now nearly balance, 75 per cent of the emigrants, but only 25 per cent of the immigrants, are unskilled workers; that, due to the educative efforts during the war a larger than normal number of unskilled were turned into skilled workers and that the vacuum has not been, and is not being, filled; that the barriers against the mental and physically diseased and against the agitators should not be let down, but that, on the contrary, the literacy test should be repealed, since it gives no index whatsoever of the immigrant's desirability—Lenine and Trotzky could pass it with flying colors; that an intelligent immigration policy requires not merely laws covering admission, but administrative machinery which will protect the new arrivals from sharpers, see to their distribution and give them fatherly protection and counsel until they are settled

We need not discuss these points in detail. We believe that they will appeal strongly to the readers of *Engineering News-Record.* Two of them will warrant brief restatement since they demand the active sympathy and support of engineers and contractors—for surely no line of endeavor is suffering more through the cutting off of immigration than the building of civil engineering works.

The literacy test, we all know, is a device of organized labor to create and maintain a labor shortage—and the public suffers. No one wants to see unemployment; on the other hand, no one, except the immediate beneficiaries, wants to see so acute a labor shortage as that which today is largely responsible for high prices. The effect of the literacy test is to keep out those of willing hand, but little book learning, whose co-operation is essential to all civil engineering enterprise.

It serves no sound purpose. The rogues, the communists, the socialists, the anarchists are not found among the ignorant—though when here they furnish fine subjects for propaganda for the native and the foreign-born book-taught agitators. Engineers and contractors, individually and in their organizations, should stand for the repeal of the literacy test. Incidentally, they will be in good company. Cleveland and Taft and Wilson vetoed such tests; the present statute was passed over the presidential veto.

The other point we want to emphasize is the need for a sensible immigration policy. Now we let the immigrant in, and at the very gateway turn him over to the tender mercies of scoundrels and sharpers. Defrauded right and left, robbed, even after he has been here for years, of his savings in private banks, he develops a justified hatred and cynicism. Canada and other countries do it differently. They do not relax their care till the immigrant is settled in his new home; in some cases they give him land, in others make loans at reasonable terms; but always they recognize their obligation to protect and help him. On this point, too, engineers and contractors should voice an opinion.

Obviously we do not want unrestricted immigration. On the other hand it must not be needlessly—or viciously—restrictive. We do not want the incompetent or the unfit. We do want the willing, industrious, frugal, quiet living, decent, healthy and moral men and women, from the European countries at least.

Prohibition and the Foreign Born

WE commented some months ago on the favorable effect which prohibition had had in the stabilizing of railroad maintenance labor. Another side of the case, though, was brought out at the Immigration Conference in New York last week. It has been found that prohibition is a material factor in promoting emigration and that it is being laid before prospective immigrants as one of the reasons why they should go to some other American country than the United States. It will not do to pooh-pooh the situation if we regard our labor shortage as serious. The facts have been ascertained by various investigators, while the probable effect of our prohibition laws is one of the favorite topics in European newspapers. An example of the discussion is afforded by the following extract of a letter in the London *Times* of March 23 from no less a man than Stephen B. Leacock, the distinguished economist of McGill University, Montreal:

"The argument is advanced that prohibition is destined to render the United States a formidable industrial competitor. It is deplorable to note that this reasoning has recently been voiced in no less a place than the House of Commons. There is nothing in it. The United States is a formidable industrial competitor in any case. The fact arises from its vast territory and resources, the energy of its people, and from its economic relation to the great war. It was not reared to industrial greatness on the milk-pap of prohibition. The Puritans drank rum. George Washington took his wine, and the iron and steel industry grew up on the beer of St. Louis and Milwaukee. The industrial greatness of American did not wait for Jan. 16, 1920. Indeed, the contrary is true. Under prohibition the workers are restless and discontented. They have been robbed of the simplest comforts of life at the dictates of a fanatical minority. Prohibition plays straight into the hands of the agitator and the Bolshevist.

"The most serious warning is needed for decent British people of any class who think of migrating to the United States and to the dry provinces of Canada. They will reap nothing but bitter regret. Let them come instead to the spacious and hospitable province of Quebec."

This will be bitter reading for those prohibitionists who regard the taking of a drop of liquor as a deadly sin, but while we are considering the need of immigration we had better, as a mere problem in economics, inquire calmly into the advisability of altering this, too, of the factors that are deterring immigration.

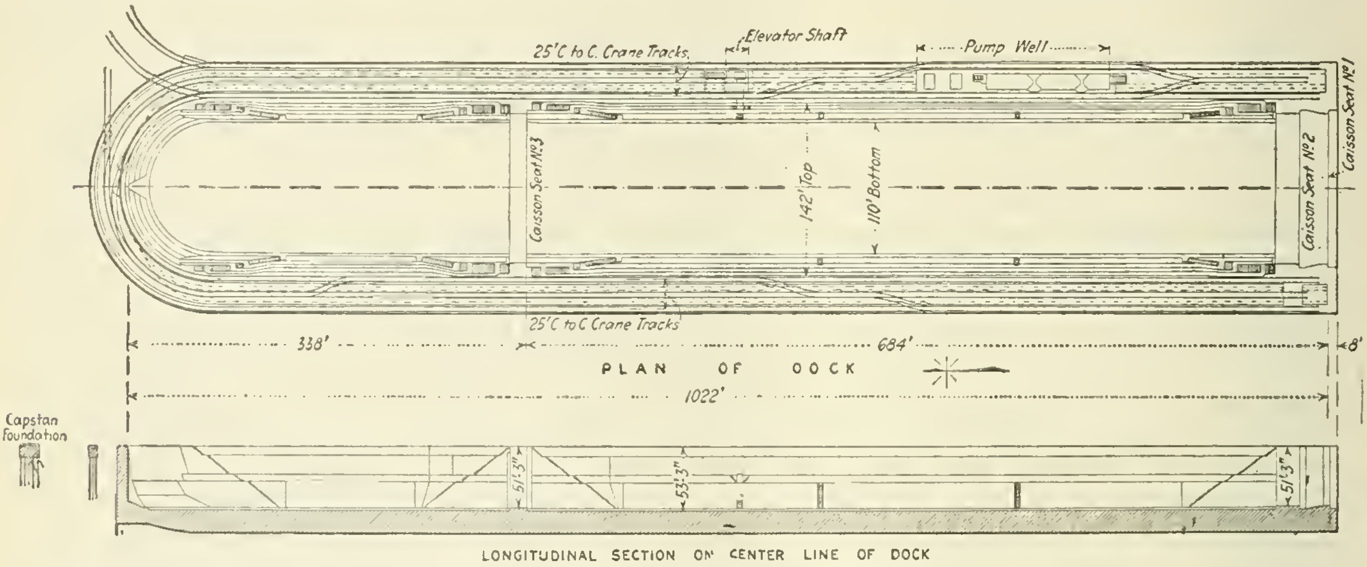
Soft Ground Complicates Dry-Dock Construction

Excavation for Navy Graving Dock at Philadelphia Opened Water-Bearing Material, Which Led to Dividing Area into Number of Small Cofferdams

By Charles A. Lee

Lieutenant Commander, Corps of Civil Engineers, United States Navy, Navy Yard, Philadelphia, Pa.

WATER-BEARING strata, not indicated by a fairly extensive set of preliminary borings, made necessary some decided changes in the construction of the Navy's big graving dock now being built at the Philadelphia Navy Yard. Instead of simple suction dredging for the main excavation, it has become necessary to divide the whole area into a number of sheet-pile cofferdams some of which have been extremely difficult to hold, and to revise the design of the dock walls from a cellular section to a solid one with a relieving wing base. The foundation work is now well along toward completion.



PLAN AND SECTIONAL ELEVATION OF UNITED STATES NAVY DRY DOCK NO. 3, PHILADELPHIA NAVY YARD

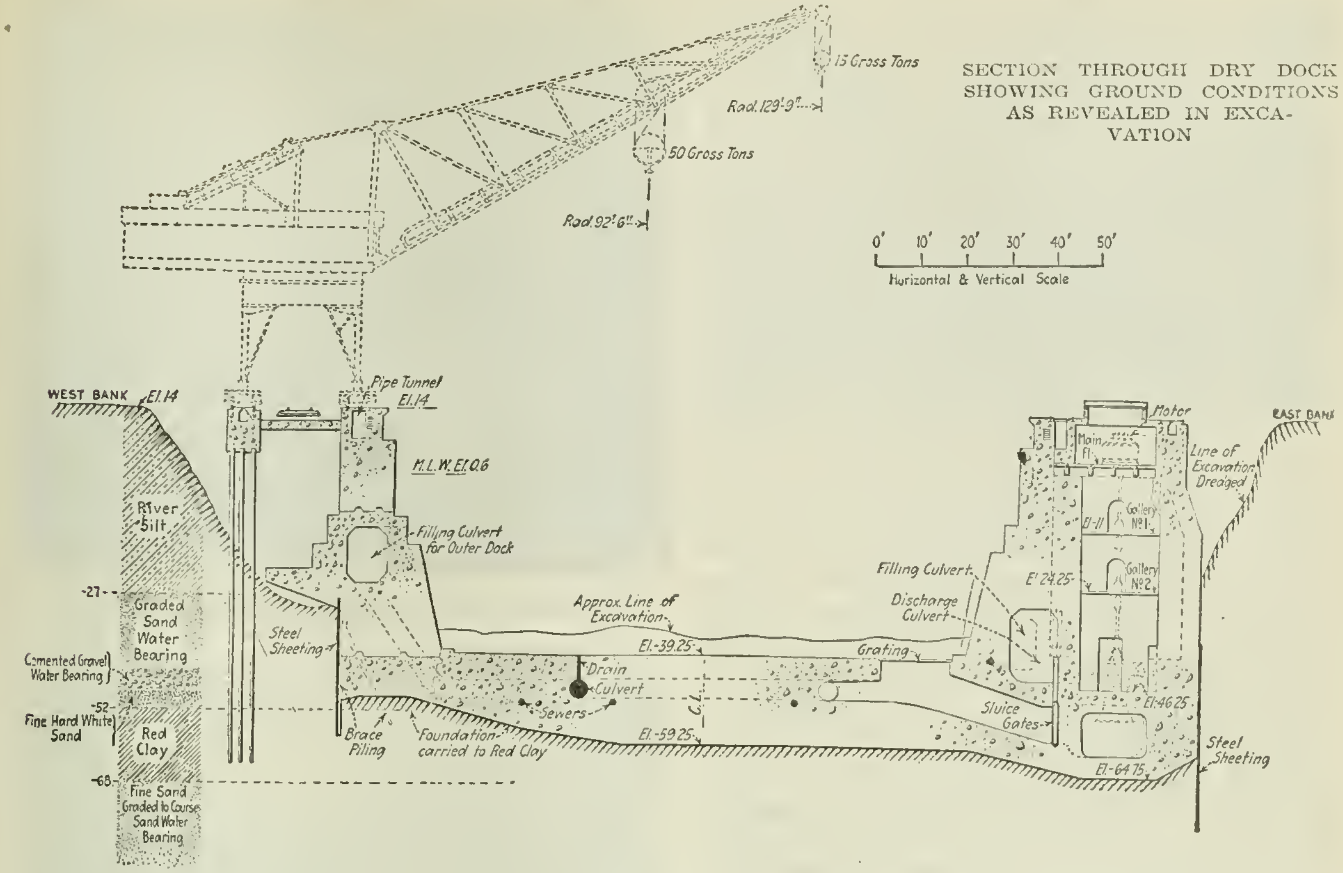
The dock, known as Dry Dock No. 3, will be, when completed, one of the largest in the world. The size is the same as that of the one recently completed at the United States Navy Yard at Portsmouth, Va., described in *Engineering News-Record*, of Sept. 11, 1919, p. 494. The length is 1,022 ft., between the head of the dock and the outer caisson seat, the width at the floor is 110 ft. and at the coping 144 ft. The depth from the coping level to the floor is 53 ft. 3 in. and over the sill at the entrance 51 ft. 3 in. At mean low tide the depth of water over the entrance sill will be 37 feet 10 inches.

It is designed to accommodate the large battleships and battle cruisers now authorized to be built, but the limit of size has been determined by the capacity of the Panama Canal locks, the maximum size of ships it is possible to dock being slightly over 1,000 ft. long with a beam of 110 feet.

The construction of this project started early in 1917. The original scheme was to remove practically the entire amount of excavation by means of a suction dredge working behind the earth cofferdam built across the dock entrance. About 460,000 cu.yd. of material was removed in this manner, and the bottom of the entire excavation was brought down to elevation about — 27 to — 30. It was found practically impossible to dredge more deeply than this, as the banks slid in as fast as more bottom excavation was removed, and it was impossible to maintain any reasonable side slopes. At this time the dredge was removed, the cofferdam completed and the excavation pumped out. It was found that after the dredge had cut through a heavy deposit of river silt the cutter had entered a deep stratum of water-bearing sand. When it was attempted to excavate into this, the water naturally washed it out and allowed the banks to drop.

These conditions made it impossible to follow out the original plan for building the dock, and it became necessary to modify the design, as well as the method of construction. The original design was similar to that of the Portsmouth dock, with solid floor and cellular side walls, but in the revised design the side walls are solid and designed as retaining walls. The general design is as shown in the sketch of the typical cross-section herewith.

Before the construction was started, numerous borings had been made at the site to determine the nature of the underlying material. These borings developed the fact that the entire site was underlaid by a heavy stratum of tough red clay, which insured a good foundation. These borings, however, did not furnish sufficient information to make it possible to foresee the difficulties due to excavating through the sand and gravel overlying the clay. After the dredge had finished excavating, another set of core borings was taken to check the first ones. Conditions varied slightly in different parts of the site, but a typical cross-section of subsurface conditions is shown on the accompanying drawing.



SECTION THROUGH DRY DOCK SHOWING GROUND CONDITIONS AS REVEALED IN EXCAVATION

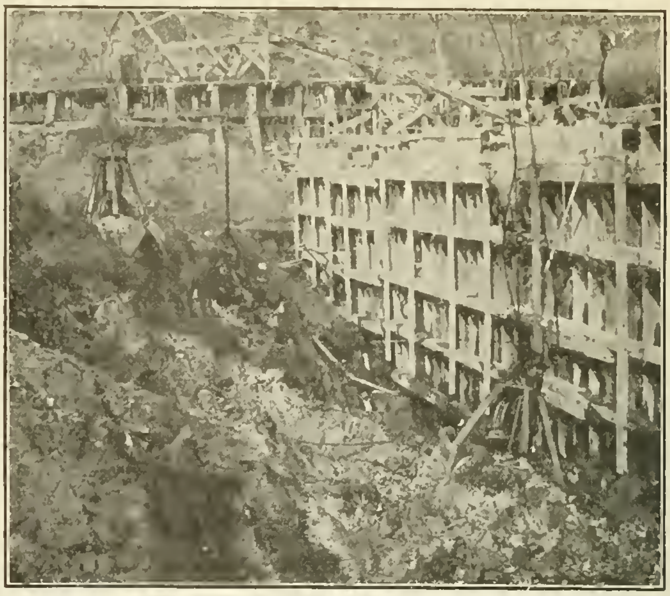
The last set of borings proved that the red-clay stratum formed a continuous blanket under the entire site, with an average thickness of over 18 ft. Below the clay is a layer of very fine and tightly compacted sand of varying thickness. This sand becomes coarser as the depth increases. When the test holes had been sunk to about elevation — 75 or — 80, water flowed freely from the tops of the casings at elevation about — 30, and at 5 ft. greater depth it spouted from the casings. Pressure gages were applied, and showed 10.5 lb. per square inch, or approximately equivalent to the head of water in the Delaware River, indicating that the sand stratum has direct connection with the river bottom at some point near the site. This fact made it necessary to exercise great care, in order to avoid breaking through the clay, and before proceeding with the work it was determined that the clay was deep enough to leave ample thickness below the deepest parts of the excavation. It was also considered advisable not to open up any large area of bottom excavation at one time, but to place the concrete floor as the bottom was dug out.

In order to carry the excavation to the required depth to allow for placing the floor and the deepest portions of the pump well, it was decided to surround completely the bottom excavation with a cofferdam of steel sheeting driven well into the red clay, and braced on the inside with plumb and batter piles on 5-ft. centers. The length of the sheeting varies from 26 ft. where the clay is nearest the surface to 44 ft. in the deepest parts of the dock. Lines of sheeting were driven 81 ft. on either side of the dock center line, and completely surround the head end. This gives sufficient width for the floor and for the foundations for two side walls. Fourteen-in. Lackawanna sheeting was used having a weight of 40.8 lb. per ft. Nearly 75,000 lin. ft. of sheeting was driven, having a total weight of about 3,100,000 lb. Great difficulty was experienced in driving a large part of the sheetings, on account of the very hard stratum of cemented gravel and hard white sand through which it must be driven before penetrating into the red clay. In spite of the fact that the type of sheeting used is the strongest and heaviest procurable, much of it was found to be badly bent and torn apart, when the material was finally excavated. In order to minimize the amount of water to be pumped from the bottom as the excavation proceeded, the cofferdam was divided into sections 300 to 400 ft. long, by driving crosswebs of sheeting between the side walls at suitable intervals.

Both steam and drop hammers were used in driving sheeting, as many as seven drivers being in operation at one time. Although the heaviest steam hammer procurable (No. 0 Vulcan) was used, a heavy drop hammer of from 3200- to 4200-lb. weight proved more satisfactory than the steam hammers. The heavy solid blow had more effect than the quicker, lighter blows of the steam hammer, which only resulted in bending and battering over the heads of the sheetings.

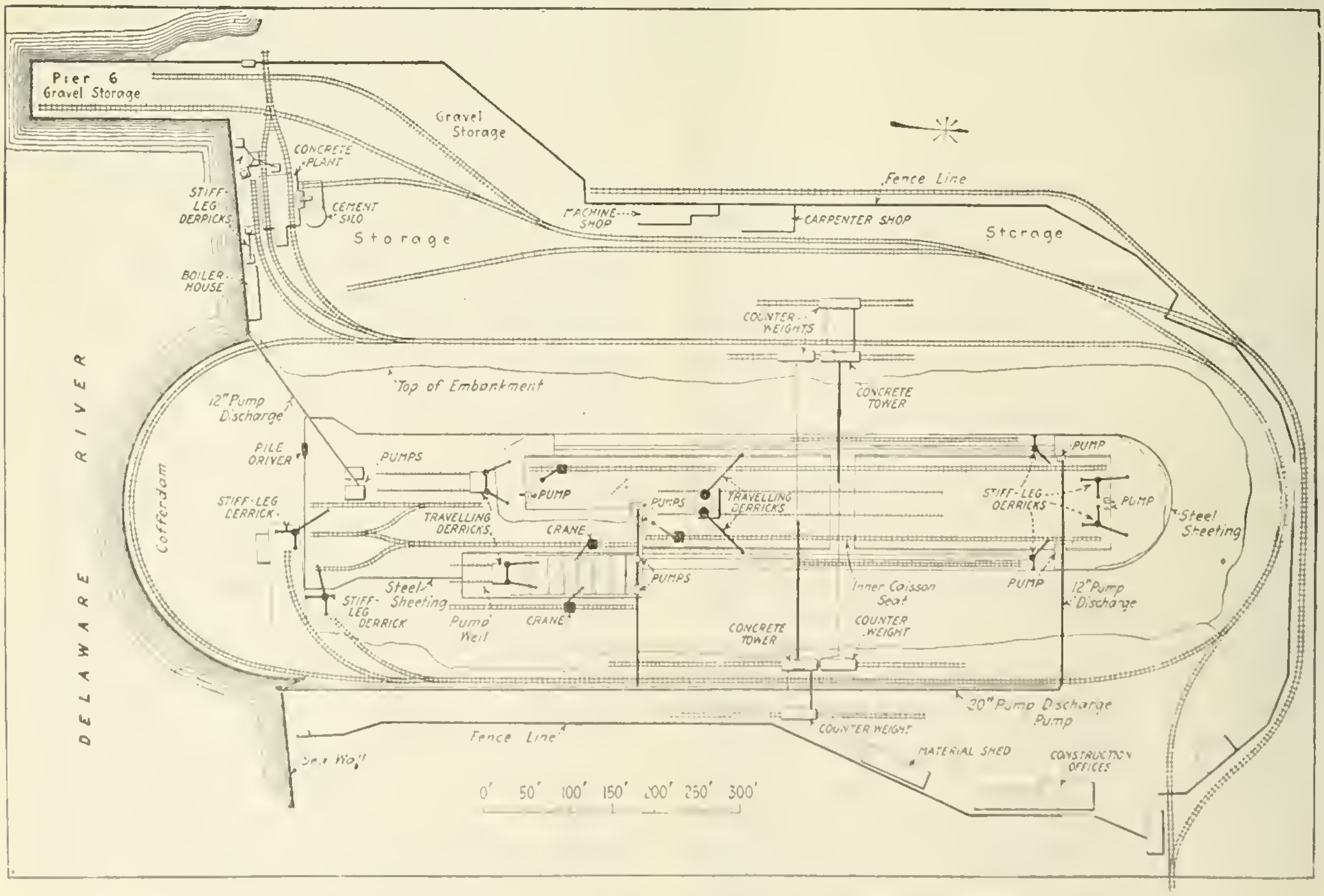
The bottom excavation was handled by two 20-ton traveling derricks, placed side by side in the bottom of the excavation and moving back ahead of the floor. These derricks operated heavy orange-peel buckets, which dumped the excavated material into skips placed on standard flat-cars. The skips were raised from the excavation by means of derricks at the north end, and the material was spoiled over the cofferdam or used as backfill behind the completed portions of the side walls, after the work had progressed thus far. Only sufficient bottom excavation was opened up at a time to permit the placing of one section of floor between the side-wall foundations, as much material as possible being left inside the sheeting to support the brace piles and to prevent the sheeting from being forced in by the outside earth pressure. The floor was concreted in sections 10 ft. to 30 ft. long and the full width of the dock (116 ft.). As soon as the concrete was set, 12 x 12-in. braces were placed between the concrete and the wales at the top of the sheeting, and the brace piles were removed. The material between the floor and the sheeting was then removed, and the side-wall foundations were concreted, the sheeting being left in.

All the work in the bottom of the excavation has been accomplished only under serious difficulties. Great care had to be exercised to brace securely all of the sheeting to prevent the earth pressure from forcing it in and this naturally interfered, to a considerable extent, with the progress. On account of the hard stratum of cemented gravel and the sand overlying the clay, much of the sheeting was badly deformed when driving. In numerous instances the locking devices failed, and the sheeting would split apart. In other instances, large boulders would deflect the steel and cause it to curl up like a shaving. Wherever these breaks occurred, troublesome leaks developed. The ground outside the sheeting is completely saturated with water, and it was practically impossible to stop the leaks, for if one was plugged the head would build up and a leak break out in a new place. At times as many as six 6-in. centrifugal pumps were necessary to hold the water down in the bottom excavation. Under these conditions the removal of material was very difficult, as well as the placing of the concrete after the excavation was finished.



EXCAVATING DRY DOCK BOTTOM AHEAD OF HEAVY FLOOR FORMS

It is estimated that the amount pumped has varied from 5,000 to over 8,000 gal. per min. One 15-in. one 10-in. and two 8-in. centrifugal pumps have been used for raising the water from the main sumps in the excavation to the surface. Numerous smaller pumps from 6- to 3-in. are used for lifting the water from the deepest portions of the excavation to the main sumps. All of the pumps, from 4- up to 15-in. are motor-driven centrifugals. The 3-in. pumps are driven by gasolene engines and can be quickly moved around from place to place. A 12-in. steam engine driven centrifugal is installed as spare in case of failure of electric power.

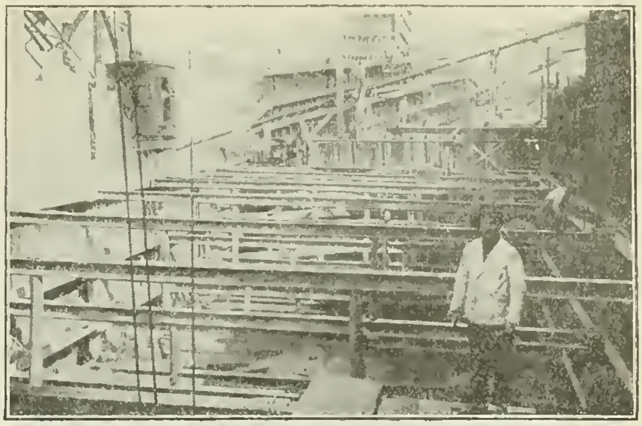


LAYOUT OF CONSTRUCTION PLANT ON PHILADELPHIA NAVY DRY DOCK

The pumpwell of the dock is built integral with it and located in the east side wall several hundred feet in from the entrance. The pumps are located 3 ft. below the floor level, so that they are self-priming, and the motors are placed on the floor at the top of the pumpwell, at elevation — 4.5. On account of the suction chamber underneath the pumps, the deepest portion of the dock foundation is under the pumpwell. This work is being carried on inside of a separate steel sheet cofferdam 214 ft. long and 50 ft. wide. Steel bracing is used inside of this pumpwell to support the sides, the bracing being placed as the excavation proceeds.

The concrete for the floor and walls is mixed in a central mixing plant, located on the river front immediately west of the dock entrance. Gravel and sand are unloaded from barges by two derricks, operating clamshell buckets, and stored in bins directly over the mixer. The bins have capacity for 1300 cu.yd. of gravel and 525 cu.yd. of sand. Gravel and sand are also stored in piles near the mixer plant. The mixing equipment is located directly under the gravel and sand bins, and consists of two 2-yd. motor-driven mixers. The cement is received in bulk and is unloaded from the box cars by means of a power-operated shovel or drag, and stored in a silo having a capacity of 2750 bbl. A 775-bbl. cement hopper located above the mixer is kept filled from the silo by means of a belt-and-bucket conveyor. The mixers are placed at a sufficient height to allow for dumping into 2-yd. hoppers, four of which are placed on standard flat cars, and hauled by 20-ton dinky locomotives. Three concrete cars are so equipped. The concrete tracks completely surround the dock excavation, so that concrete can be placed in any portion of the dock without interference. The concrete is chuted into the lower portions of the dock structure from hoppers placed on the banks just inside of the concrete track. In the higher portions of the dock, concrete is chuted from towers. Two towers are in use, one on each side of the dock, and each consists of a tower built on a standard flat car, and two counterweight cars, with cable supporting the chutes spanning the dock excavation. The tower plants run on tracks parallel to the dock, and can be moved along the dock as required.

SIDE WALLS AND BOTTOM PLACED NEAR SHORE END END OF DRY DOCK

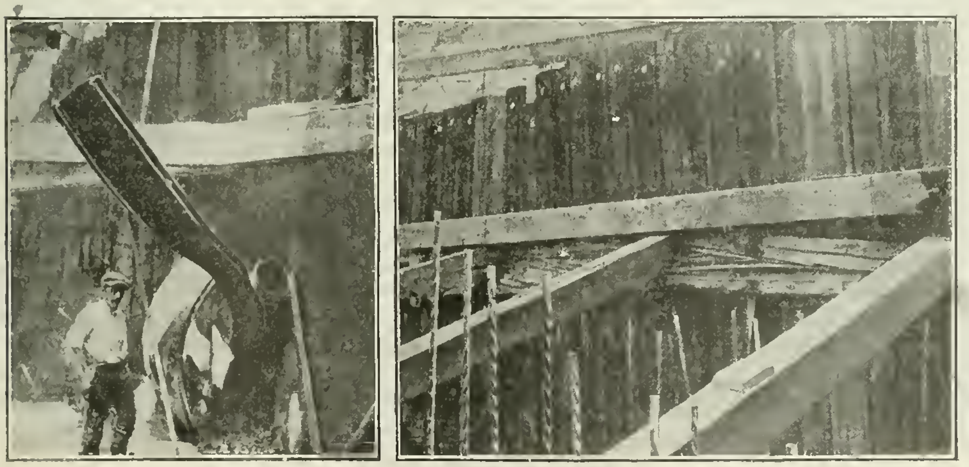


STRUCTURAL STEEL CROSSBRACING IN PUMP WELL COFFERDAM

As noted above, the floor was placed in large sections 10 to 30 ft. long and usually the full width of the floor, the yardage varying from under 1,000 to slightly over 2,000 cu.yd. per section. The side walls are concreted in 50-ft. lengths, the four lifts varying in depth according to the location of the tunnels in the side walls. The yardage of the side-wall sections varies from 350 in the smallest to about 1300 in the largest section.

The forms are made of wood, with no metal linings. They are constructed in panels of suitable size to be handled by derricks, and are used over and over. The finish of the side walls is obtained by removing the forms when the concrete is still green and rubbing down the surface with carborundum bricks. This gives a very pleasing effect.

After the dredge was removed from the excavation in the early part of 1918, practically no construction work was done for nearly a year, until the revised plans of the dock were submitted by the bureau and the new method of construction was approved. Late in December, 1918, work was resumed under the revised plans, and has continued without interruption since that date. The first concrete was poured in March, 1919, and at the end of August a total of 83,495 cu.yd. was in place. This is an average of nearly 14,000 yd. per month.



WHAT THE HEAVY PRESSURE DOES TO THE SHEETING

The concrete record by months is as follows:

March	6,773 cu.yd.
April	10,924 cu.yd.
May	16,764 cu.yd.
June	20,139 cu.yd.
July	15,744 cu.yd.
August	13,151 cu.yd.

The falling off during the months of July and August was due to the serious troubles with the water and also to the spell of rainy weather which prevailed over this portion of the country during late July and early August. The total amount of concrete to be placed in the dock is approximately 205,000 cubic yards.

The work of placing concrete is continuous throughout the 24 hours of the day; that is, when the concreting of a section is once started the work is carried on continuously until it is finished. The best single day's run has been 1700 cu.yd. April 17, with two mixers and two concrete trains in operation. The speed of placing the concrete is limited by the hauling capacity rather than by the mixing capacity.

The plant for handling this work is unusually complete and includes the following principal items: Three 2-yd. mixers, one as spare; two complete towers for chuting concrete; three 20-ton double-boom traveling derricks; eight stiff-leg derricks, of 15- to 25-ton capacity; seven complete pile-driver leads, with engines; three steam pile hammers; seven locomotive cranes; seven steam locomotives, from 20- to 40-ton weight; one gasoline locomotive, and numerous standard flat cars, and 6-yd. side-dump cars. It is only through the efficient use of the construction plant that such favorable progress has been made on the work.

The entire work of construction of the dry dock is being handled by the Maryland Dredging and Contracting Co. of Baltimore, Md., under the direction of D. L. Taylor, general manager, with J. V. Hogan as resident engineer and D. W. Armstrong as construction superintendent. The contract is being carried out under the supervision of the Bureau of Yards and Docks, of the Navy Department, Rear Admiral C. W. Parks, chief of bureau. Commander A. L. Parsons is the public works officer at the yard, and the writer has direct charge of the work.

Traffic Data On New York State Highways

Evidence of the great increase in motor traffic on New York State Highways during the past 10 yr. was presented at one of the recent public hearings on the New York-New Jersey vehicular tunnel by Frederick Stuart Greene, State Highway Commissioner of New York. Figures covering the period from 1909 to 1919 show motor traffic increases as high as 2,710 per cent in the case of the Albany Post Road at Peekskill, and 2,688 per cent on the same route near Albany. Data were also presented for motor trucks, indicating a maximum increase of 387 per cent in the 3-yr. period from 1916 to 1919, that maximum being noted on the Boston Post Road from Mamaroneck to New Rochelle. Traffic figures were all taken on week days during August, which would indicate that the number of pleasure vehicles tabulated would not be the maximum. The table given above summarizes the information on traffic as observed at six places.

TRAFFIC DATA—N. Y. HIGHWAYS
AUGUST—WEEK DAY—7 A.M. TO 7 P.M.

Location of Highway	Kind of Traffic	Year 1909	Year 1914	Year 1919	Per Cent Increase (+) or Decrease (—)	Motor Trucks 1916	Motor Trucks 1919	Motor Trucks Per Cent Increase (+) or Decrease (—)
Westchester County Albany Post Road Peekskill	Horse	36	.....	34	— 5.5			
	Motor	99	.....	2,782	+2,710.0			
	Total	135	.....	2,816	+1,986.0	106	126	+ 18.9
Boston Post Road Mamaroneck New Rochelle	Horse	...	362	85	— 76.0			
	Motor	...	2,884	8,121	+ 182.0			
	Total	.....	3,246	8,206	+ 153.0	404	1,968	+387.0
Nassau County Little Neck Old Westbury	Horse	.....	44	25	— 43.2			
	Motor	.....	143	919	+ 543.0			
	Total	.....	187	944	+ 405.0	43	162	+277.0
Suffolk County Amityville Babylon	Horse	327	.....	27	— 91.7			
	Motor	611	.....	1,910	+ 213.0			
	Total	938	.....	1,937	+ 107.0	80	192	+140.0
Rensselaer Co. Albany Post Road near Albany	Horse	322	....	56	— 82.6			
	Motor	125	.....	3,486	+2,688.0			
	Total	477	.....	3,542	+ 643.0	62	232	+274.0
Eight Up-State Roads	Horse	1,360	.....	493	— 63.8			
	Motor	584	.....	11,559	+1,879.0			
	Total	1,944	...	12,052	+ 520.0	299	986	+230.0

Irrigation in Mesopotamia

The remodeling of irrigation works in Mesopotamia serving some 3,000,000 acres is recommended by A. Burton Buckley, inspector of irrigation in Egypt, in a report entitled "Mesopotamia as a Country for Future Development." Mr. Buckley estimates that the remodeling work would cost about £10 per acre, or a total of £30,000,000, besides which he proposes flood protection works estimated to cost £1,050,000. It is suggested that the expenditure should be spread over a period of some fifty years. The report, which together with a map on a large scale, is reproduced in the London *Engineer* for Feb. 6, 1920, is the outcome of instructions of the British Army Council, issued in December, 1918, to Sir John Hewett, who was directed to go to Mesopotamia and make an examination of expenditures being made in that country by the British Army. Mr. Buckley was selected to make the investigation covered by the report mentioned. (*Cairo:* The Government Press. Price P T 5.)

Brush Coat Should Follow Trimming of Treated Timber

By George M. Hunt
In Charge of Wood Preservation, Forest Products Laboratory.

THE necessity of protecting treated timber after trimming is demonstrated in the three accompanying photographs of a treated pile end, upon which two fruiting bodies of the fungus *Lenzites sepiaria* are growing. This fungus is one of the most serious enemies of coniferous structural timber in the United States and is responsible for a great deal of the decay which takes place in pine timbers.

At first glance, it would appear that the creosote treatment had failed to prevent decay. An examination of Figs. 2 and 3, however, will explain the apparent paradox. In Fig. 2 a slice has been sawed from one-half of the face of the section to show clearly the dividing line between treated and untreated wood. This indicates that a good penetration of oil was secured, but that the center of the pile is untreated. It is quite evident from this photograph that the fungus is growing within the untreated area. In Fig. 3 the section has been split between the two fruiting bodies, to show more clearly that they are growing on the untreated area. The wood immediately beneath the fungus was noticeably decayed and discolored.

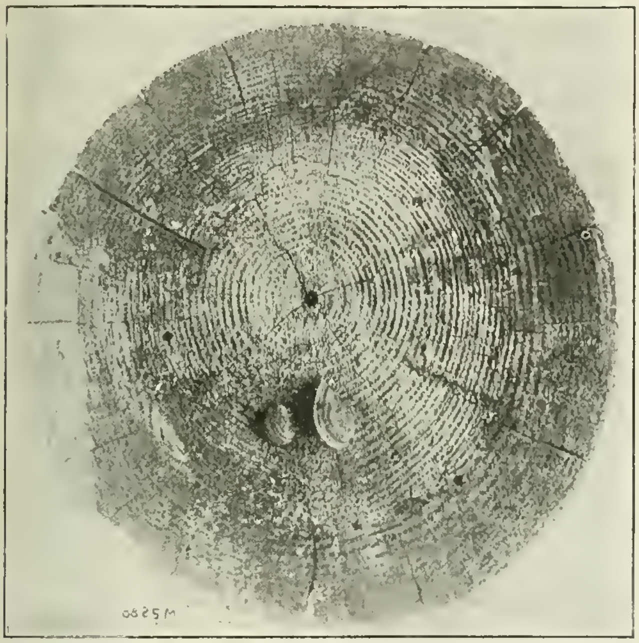


FIG. 1. END OF PILE, SHOWING FRUITING BODIES OF FUNGUS

The pile originally received a good treatment. Subsequently a section was cut off the end of the pile inside the area of complete penetration which is found at the end of a treated stick, thus exposing untreated wood. The pile was then exposed to the weather for some time. During this weathering period the end of the pile became disclosed, and the fungus developed. It is possible that there was slight decay in the pile before it was treated and that cutting off the end merely allowed the fungus to fruit. It is also possible that the timber was perfectly sound in the beginning and that the fungus got into it after the untreated wood was exposed. In either case, after the end of the pile was trimmed, it should have been given two or three thorough coats of hot creosote. This treatment would probably have retarded the growth of the fungus if it were already in the wood, but it could not have been depended upon to kill it entirely. If the wood were sound when cut, the coating would have prevented subsequent infection.

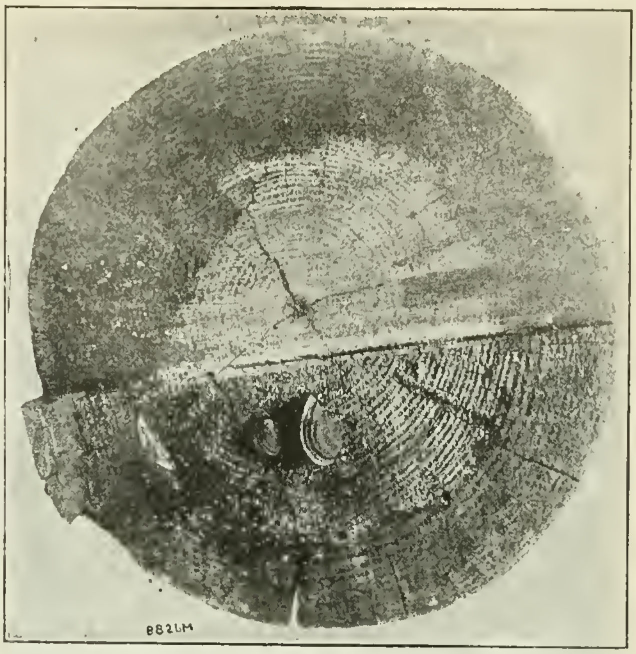


FIG. 2. A SLICE HAS BEEN CUT FROM ONE-HALF THE SECTION TO SHOW THE UNTREATED AREA

It is axiomatic in wood preservation that the untreated parts of a creosoted stick which have been exposed by cutting after treatment should be protected at once by brushing thoroughly with preservative, that treating wood which contains decay cannot be relied upon to stop the decay.

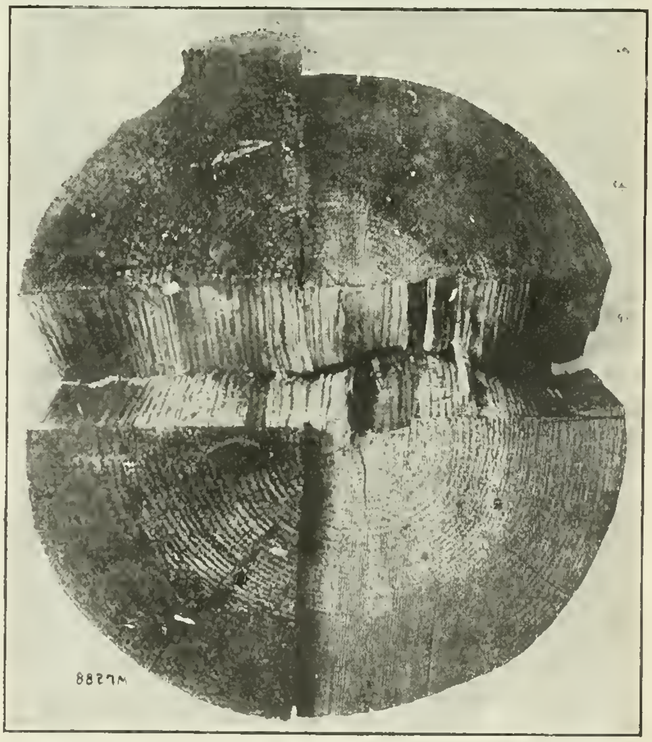


FIG. 3. BLOCK SPLIT TO SHOW THE FUNGUS WELL WITHIN THE UNTREATED AREA

Treating Three Million Feet of Lumber on the Job

High Bids for Creosoting Rejected—Open-Tank Methods Employed on Pier at Seattle, Wash.

A new pier, known as Pier B, is being constructed by the Port of Seattle in Smith's Cove. It is 2,560 ft. long by 365 ft. wide, and exclusive of sheds, requires in its construction 9,500,000 ft. b.m. of lumber. Of this total, 3,000,000 ft. will be subject to dry rot, and it was decided to give this timber some form of preservative treatment. The best figure submitted by creosoting companies was $56 per 1,000 ft. b.m. Since this quotation was considered excessive by the port officials, arrangements were made with the general contractor to treat the timber after it came on the job. The treatment has been carried out satisfactorily at a cost of $16 per 1,000 ft. b.m.

WEIGHTS ARE USED TO KEEP THE LUMBER SUBMERGED

It was decided to use "Carbosota" creosote oil at temperatures between 245 and 360 deg. Fahr. A sheet-iron tank 3 ft. deep, 4 ft. wide and 50 ft. long was placed so that it could be served conveniently by a stiff-leg derrick. The tank was heated by steam coils. Temperatures were taken by a thermometer fastened to a rod which the foreman thrust into the tank occasionally.

The lumber was piled with strips between layers, so that it would season as much as possible before treatment. When ready for treatment piles of suitable size were laid under the derrick boom and swung into the tank. Concrete blocks were used to keep the piles submerged as shown in the illustration.

The time of submersion was varied according to the size of the timbers and the amount of seasoning. For 3 x 12-in. sheet piling the submersion was 20 to 30 minutes. For some of the larger comparatively green timbers submersion as long as two hours occasionally was given. The length of time in the tank was determined by an inspector representing the Port of Seattle. Both timber and lumber were framed before treatment. Where there was abrasion or other damage to pieces after treatment, the contractor was required to paint these places with two coats of hot creosote oil.

The timber and lumber which specifications required to be treated included ties, bulkhead lagging, pile caps, floor sleepers, waling, bracing and all timbers used in the piers below the floor level except floor planking, floor stringers and piles. The piles were treated before coming on the job. In addition to treatment of entire pieces, two coats of the hot creosote oil were applied to all surfaces where wood rested against wood. Tests with a boring machine to determine penetration indicated a range in depth of from $\frac{1}{16}$ to $\frac{1}{8}$ in. The absorption per thousand feet board measure in timber was 11 gal. and in lumber 17 gal. After submersion the lumber was suspended above the tank for draining.

G. F. Nicholson is chief engineer of the Port of Seattle. The general contract on Pier B is held by the Harrington-Peters Co. of Seattle.

Federal Engineers' Salary Increases as Reported Out to Congress

Proposed salary increases for engineers in government service have been reported out to Congress by a joint Congressional Committee of which Senator Jones of New Mexico is chairman. After a thorough investigation of the salary classification the committee recommended substantial increases as follows, a range being given in each case with four or five increments:

Assistant highway engineer	$2400 to $3000
Associate highway engineer	3240 to 3840
Highway engineer	4140 to 5040
Assistant hydraulic engineer	2400 to 3000
Associate hydraulic engineer	3240 to 3840
Hydraulic engineer	4140 to 5040
Assistant hydrographic and geodetic engineer	2400 to 3000
Associate hydrographic and geodetic engineer	3240 to 3840
Hydrographic and geodetic engineer	4140 to 5040
Landscape draftsman	1200 to 1800
Junior landscape architect	1800 to 2160
Assistant landscape architect	2400 to 3000
Associate landscape architect	3240 to 3840
Landscape architect	4140 to 5040
Assistant structural engineer	2400 to 3000
Associate structural engineer	3240 to 3840
Structural engineer	4140 to 5040
Assistant topographic engineer	2400 to 3000
Associate topographic engineer	3240 to 3840
Topographic engineer	4140 to 5040
Civil engineering draftsman and civil engineering aid	1200 to 1800
Junior civil engineer	1800 to 2160
Assistant civil engineer	2400 to 3000
Associate civil engineer	3240 to 3840
Civil engineer	4140 to 5040
Cartographic draftsman	1200 to 1800
Assistant cartographic engineer	2400 to 3000
Associate cartographic engineer	3240 to 3840
Cartographic engineer	4140 to 5040

For most of the higher positions the rate is to be recommended to Congress by the Civil Service Commission after consultation with heads of departments or independent establishments concerned.

Filtros Plates Successfully Cleaned

Operations for the removal of iron rust from filtros plates in one of the activated-sludge plants for the treatment of the sewage of Houston, Texas, have proved successful. We learn from G. L. Fugate, principal assistant city engineer in charge of sewage treatment, that up to March 9 about 2,100 plates had been cleaned by immersing them in hydrochloric acid at 98 deg. C. (See *Engineering News-Record*, Dec. 11-18, 1919, p. 1003).

Dilution Requirements of Sewage and Sewage Effluents

By C. B. Hoover and C. D. McGuire
Chemist in Charge Assistant Chemist
Division of Sewage Disposal Columbus, Ohio

It has long been recognized that any determination of what constitutes a permissible pollution of a stream should be based on the present and probable future uses of the stream below the point of discharge, the present and probable future values of riparian land values below the point of discharge, the present and probable density of population adjacent to the stream below the point of discharge, and the stream flow and temperature factors, especially during the summer months of the year. The economic, esthetic, and health problems involved in stream pollution ordinarily do not exist separately, although any one of the three phases may be dominant in particular cases. The economic and esthetic phases of this problem are dominant in the problem at Columbus, Ohio, and during the year 1919 laboratory studies have been conducted with the idea of getting an approximate estimate of the dilution requirements of our untreated sewage and of the effluents from two-story tanks and sprinkling filters.

CHARACTERISTICS AND DILUTION REQUIREMENTS OF SEWAGE AND EFFLUENTS, COLUMBUS, OHIO
Based on 150 daily composite samples of crude sewage, two-story tank effluent and sprinkling filter effluent collected during 1919

CHARACTERISTICS OF COMPOSITE SAMPLES

	Total Suspended Matter P.P.M.			Dissolved Oxygen Consumed After 24 Hrs., at 37° C., P.P.M.			Stability Values			Diluting Water Required for Stability, Sec.-Ft., per 1,000 Population		
	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean
Crude sewage	500	80	221	288	48	181	10.0	2.5	7.2	6.04	1.39	2.000
Two-story tank effluent	190	35	94	240	48	135	17.8	5.0	9.6	2.94	0.72	1.460
Sprinkler effluent	220	15	72	68	12	27	100	39	73	0.24	0.00	0.057

The stability test, when conducted in bottles with tightly fitting glass stoppers, is an exacting determination of the dilution requirements inasmuch as no opportunity exists for the absorption of oxygen from the air and in this respect it differs from the condition existing in a stream where the replenishing of used streamwater oxygen takes place by absorption of oxygen from the air. Dilution requirements determined in this way may be regarded as conservative. If the stability test, properly conducted, is not a reliable index of the dilution requirements of untreated and treated sewage, then these results are of little value and the use of this test by sewage-works operators is a waste of time. We believe that the stability test will give a reliable approximation of dilution requirements *when properly conducted.*

The characteristics of the sewage and of the effluents from the tanks and the filters are shown by the accompanying table, as are also the percentage results obtained by the tanks and the filters, and the dilution requirements for crude sewage, tank and filter effluents.

Selecting the value 98.7 per cent in column A of the stability section of the table, interpolating in column B to get the same value, and taking the given value of 98.7 per cent in column C, we find that the diluting water required in second-feet per thousand population, and with which 98.7 per cent of the samples were stable, is as follows: For untreated sewage, 5; tank effluent, 2.70; sprinkler effluent, 0.20. Whether the dilution should be fixed at a value which would ensure stability for 100 per cent of the samples, or in other words which would ensure stability for the sewage of maximum strength, or, whether a somewhat lower dilution value should be selected, is a matter of judgment with whomever has such a decision to make.

The practical agreement in percentages of reduction of oxygen demand and dilution requirement by tank treatment is due to the fact that there are negligible quantities of nitrites and nitrates in the crude sewage and tank effluents and consequently only dissolved oxygen is available for stabilizing the samples. The disagreement between the reduction in oxygen demand and dilution requirement by the sprinkler treatment is due to the fact that the nitrites and nitrates present in the sprinkler effluents are sources of oxygen and that this oxygen supply is not drawn upon in the oxygen demand test, but is drawn upon in the methylene blue test. In the oxygen demand test the depletion of oxygen is not carried to the point where the oxygen supply of the nitrites and nitrates is drawn upon. This test runs for a period of 24 hours and only approximately 50 per cent of the dissolved oxygen is consumed and with a good supply of dissolved oxygen available the reduction of the nitrites and nitrates does not take place.

PERCENTAGES OF REDUCTION

	Suspended Solids	Oxygen Demand	Dilution Requirement
By two-story tank treatment	57.5	25.4	27.0
By aprinkling filter treatment	23.4	80.0	96.1
By both treatments	67.4	85.1	97.1

DILUTION REQUIREMENTS

Diluting Water, Sec.-Ft. per 1,000 Population	Equivalent Stability Values	Per Cent of 150 Samples That Were Stable After Incubation 9 Days at 37° C.		
		A. Crude Sewage	B. Two-story Tank Effluent	C. Sprinkler Effluent
6.0	2.5	100.0	100.0	100.0
5.0	3.0	98.7	100.0	100.0
4.0	3.7	92.7	100.0	100.0
3.0	4.9	76.7	100.0	100.0
2.0	7.2	52.0	87.3	100.0
1.5	9.4	38.7	72.0	100.0
1.0	13.3	0.0†	2.0†	100.0
0.5	24.0	..	.	100.0
0.4	28.0	.....	.....	100.0
0.3	34.0	.....	.....	100.0
0.2	44.0	....	.....	98.7
0.1	61.0	....	.....	59.3†

† The table at these points is weak because in many cases the lowest dilution was stable, thus leaving in doubt the exact stability value of the sample.

Should Juniors Vote?

Question has been raised by the Philadelphia Section of the American Society of Mechanical Engineers as the right of the Juniors in that society to vote. It has passed resolutions calling upon the society to change its constitution so that Juniors would be allowed to vote and to hold office. The reason apparently is that in our political life men become of age and are allowed to participate in all of the privileges and must bear all of the responsibilities of citizenship at the age of twenty-one. It is pointed out, too, that in medicine, law, and architecture, practitioners are allowed to assume all of the obligations under the law at that age.

Half a Century of Constructive Engineering Service

An Appreciation of John D. Isaacs

FOR half a century John D. Isaacs, consulting engineer of the Southern Pacific Company, has been engaged in a broad field of engineering work requiring unusual versatility. He is pre-eminently a constructive critic and as such has exerted his greatest influence on the development of railroad engineering in this country. Affiliated with the builders of the Southern Pacific since the days of its infancy he achieved success through unqualified loyalty to the company and untiring energy in carrying out the great programs of standardization instituted by its general officers. He has not confined his talents to any single field of activity, but has successfully applied himself to the solution of a vast number of the perplexing engineering problems which were encountered during the building of a great railroad system, from the days when scarcity of finished materials imposed extraordinary difficulties in design and construction. As an inventor, a resourceful experimenter, an accomplished structural designer and architect, and an expert on track and maintenance of way, he has made many notable contributions to the advancement of railroad engineering, reflected not only in their direct results, but also in their influence upon other men. Not a few of the present officers of the Southern Pacific received their early training under Mr. Isaacs, and many have remarked upon his eagerness to give due credit to his subordinates. Keeping personal considerations ever in the background, his primary purpose has always been to seek out the best talent for the company.

Consulting Engineer of Southern Pacific in Service of Company for Forty-Five Years

JOHN D. ISAACS

It seems appropriate at this time to record a few of his contributions to science and engineering. Among the inventions in which he shared may be mentioned the portable wood-preserving plant, the taper rail, the rifled oil pipe line, and the first apparatus which successfully produced what were, in effect, motion pictures. In research and experimentation, his work is notable particularly in the study of steel rails and in wood preserving. His brilliant contributions to the studies of tonnage rating and traction have had a profound effect on the development of successful operation of freight trains of large units. Mr. Isaacs was born Oct. 6, 1848, at Richmond, Va. He was educated at the University of Virginia, in the scientific course, which in those days was closely associated with the Department of Liberal Arts. His early practical training was as a machinist apprentice in Baltimore, Md., and Wilmington, Del. In 1875 he went to San Francisco and entered the service of the lines now comprising the Southern Pacific Railroad, as a draftsman in the maintenance of way department. His progress was rapid, and it was not long before he was made chief draftsman and later assistant superintendent of bridges and buildings. In 1890 he became acting superintendent of bridges and buildings and a year later, assistant engineer maintenance of way of the Pacific System of the Southern Pacific Co. and Lines in Oregon. Immediately following the launching of the project, by J. Kruttschnitt (then director of Maintenance and Operation, Southern Pacific Company and Union Pacific System) to establish standards common to all the Associated Railroads—"Common Standards"—at the Chicago meeting of the Harriman engineers in 1905, Mr. Isaacs was appointed consulting engineer of Southern Pacific Co. and the Union Pacific System, becoming the consulting engineer for all of the Harriman Lines and their subsidiaries. After the dissolution of the Harriman property in 1913, he was retained as consulting engineer of the Southern Pacific Co., and still occupies that position.

In the early seventies the late Senator Stanford, who was one of Mr. Isaacs' closest friends and who often sought his advice in mechanical problems, made a bet of $25,000 with James W. Keene that a trotter at one period of the stride had all four feet off the earth at once. Historically, this bet marked the birth of the motion picture. It was decided to use a number of cameras, set side by side, to make an accurate photographic record of a trotting horse. After several devices for mechanically operating the shutters of the cameras had failed, Mr. Isaacs was called in and finally devised a simple electromagnetic release, which successfully recorded a series of photographs, settling the bet in favor of Senator Stanford. A considerable sum of money was spent on these experiments and it was not until 1878 that they were concluded.

INVENTIONS

The steady drain on the great timber resources of the Pacific Coast threatened eventually to denude the forests and attention was turned to the study of wood-preservation. Being one of the foremost designers of wooden structures, and having worked out plans making possible the construction of wooden trusses and drawbridges of long span, it was quite natural that Mr. Isaacs should become prominent in the study of wood preservation. His appointment to complete charge of the wood preservation work of the Southern Pacific was one of his first assignments as consulting engineer. He is generally recognized as one of the ablest authorities on wood preservation in the United States, having won this distinction by his active work in the practical development of the creosoting and Burnettizing processes, now so extensively used. His joint invention with W. G. Curtis of the portable wood preserving plant, immediately after he was appointed second assistant engineer maintenance of way in 1892, marks one of the greatest advances in the industry. One has only to examine the maintenance records of the railroads which treat ties to realize the importance of this work.

The Taper Rail devised by Mr. Isaacs to connect two abutting rails of different section has been very widely used. This simple device, now well known to all track men, consists merely of a piece of rail from 8 to 16 feet long so forged that the ends correspond respectively to the two sections to be joined, permitting the use of ordinary joint bars without the annoyance experienced in the connection of rail by so-called compromise joints.

The Rifled Pipe Line, invented jointly by Mr. Isaacs and J. B. Speed in 1905, afforded a temporary solution for what seemed at first to be impossible. Some of the heavy California oils could not be transported in pipes without expensive preheating, on account of the frictional losses in head. Mr. Isaacs and his assistant conceived the idea of rifling the pipe like a gun bore, to give the oil a whirling motion. Then, when pressure was applied water (introduced as a lubricant) mixed with the oil and being somewhat heavier would be thrown by centrifugal force against the pipe surface and maintained there as a thin film, thus permitting much easier passage for long-distance pumping. This use of water as a lubricant appeared to make it impossible for a crude oil to stick to the pipe and impede its progress. After exhaustive preliminary tests, an experimental rifled pipe line was constructed between Delano and Volcan, a distance of 31 miles. The results were good enough to warrant the laying of the 282-mi. line of 8-in. rifled pipe from Delano in the Kern River oil fields to tidewater at Port Costa.

In 1899 J. Kruttschnitt, then general manager of the Southern Pacific Company, appointed committees of engineering officers of the maintenance and mechanical departments to prepare a uniform and consistent system of locomotive tonnage rating on all disivions of the company's lines. The paper on tonnage rating, written by W. G. Curtis, engineer maintenance of way, with the able assistance of Mr. Isaacs, is an outgrowth of this work which has attracted wide attention. After the study of detailed line profiles and extensive mathematical analyses, here was developed a theoretical basis for rating the tonnage to be handled over a division by a given class of locomotives at the required speed according to the time tables for the trains—a matter of the greatest importance on a busy section of single track. In 1909 the first paper was supplemented by another—"Most Efficient Speed for Freight Trains," prepared jointly by Mr. Isaacs and his assistant, E. E. Adams, now consulting engineer of the Union Pacific System.

THE HARRIMAN "COMMON STANDARDS"

Immediately before his appointment as consulting engineer, Mr. Isaacs attended a Chicago meeting of Union and Southern Pacific engineers, which was called in 1905 by Mr. Kruttschnitt to establish standards for way and structures common to all of these lines. He had with him plans of the standards then in force on the Pacific System of the Southern Pacific Company, and was thoroughly familiar with all their advantages, having been in charge of the actual preparation of many of the drawings. He presented them in a forceful way and they were adopted as "Common Standards." Not only was this a great personal triumph; the adoption by the company of the policy to establish "Common Standards" was successfully worked out by Mr. Isaacs in collaboration with the other engineers of the Maintenance of Way Department of the Union and Southern Pacific Systems, and has contributed to the splendid appearance and systematic neatness of the properties for thousands of miles. These results were obtained through the scientific standardization of track and structures and the rigid policing of right of way and structures by operating and maintenance forces.

The classic series of Common Standard Bridges from 30 ft. to 200 ft. span, varying by 10 ft., both single and double track, were designed by Mr. Isaacs and have stood the test of 16 years of service and have been rewarded by generous praise of bridge manufacturers. There has been a considerable saving on the cost price of every standard bridge ordered, accounted for by the saving in drawings and templets. Fully as great, perhaps, as the monetary saving is the avoidance of untold discussion by this definite bridge policy. There are no arguments necessary regarding the type, depth and the many petty details which ordinarily harass the management on every new bridge project.

Among the first of a long series of important designs made by Mr. Isaacs, was the large car transfer steamer Solano, operated for many years across the Straits of Carquinez, between Benicia and Port Costa, Cal., where the great rise and fall in tide necessitated the use of unusually long ferry aprons. When he was chief draftsman in 1876, Mr. Isaacs designed and drafted, himself, the plans for all the timber trussing for the Solano, as well as the 100-ft. span aprons and machinery, including hinges and pontoons to carry the rolling trainloads from the shore to the steamer deck. This was considered a remarkable accomplishment at the time, as there was no precedent for aprons of such span and loading.

IMPORTANT BRIDGES AND STATIONS

Important structures built under Mr. Isaacs' direction are too numerous to mention and only a few of the most notable can be recorded here. The double deck and track Sacramento River drawbridge is said to be one of the heaviest ever built. Other examples of his work are the Coos Bay drawbridge, 458 ft. long; the reinforcement of the Pecos River viaduct, 1,516 ft. long and 320 ft. above the river bed, with practically no interruption to traffic; the lift bridge over the Willamette River, Portland, Ore., and the Berwick drawbridge over the Atchafalaya River, La., involving the deepest caisson work ever attempted for bridge piers. His work has been notable in the design of general layouts for passenger terminals, freight car classification yards, and railroad shops. More recent work of this character includes the Galveston Freight Terminal and Grain Elevator; Marine Ways at Alameda, Cal.; Empalme Shops, Mexico; and the Pacific Electric Shops and Yards at Torrance, Cal. He has a fine sense of the esthetic features of design and is a proficient student in the architectural forms. Many have remarked upon the characteristic beauty of his passenger stations, and he should be accorded full credit for those at San Antonio, Tex., and Spokane, Wash.

Mr. Isaacs has always favored experiments to try out the value of new devices, with the result that the Southern Pacific has been a leader in the use of many important improvements. He is keen to observe flaws in bad schemes, but is always willing to accept for trial any device which appears to have merit. He played an important role in the experiments which led to the installation, by the management,, of the large mileage of automatic block signals on the Southern Pacific Lines. The lessons to be drawn from train accidents have been thoroughly appreciated by Mr. Isaacs and he has displayed great acuteness in the analysis of causes, recommending revision or improvement of that part of track or rolling stock which appeared to contribute directly or indirectly to the accident.

Probably his most important work in the promotion of greater safety in railroad practice has been in the study of steel rail, and the resulting revision of specifications and inspection methods. Recognizing his intimate knowledge of the practical side of the perplexing rail situation, the American Railway Engineering Association conferred upon Mr. Isaacs the honor of the chairmanship of its Rail Committee for many years. Taking up this important subject in 1906 he started a vigorous campaign to reduce the number of rail failures on the Associated Lines.

This work, so vital to safety, with the high speeds and tremendous moving masses attending modern railroad operation, has been rewarded with most gratifying results. In a recent annual report of the Southern Pacific Company there appears the following statement by J. Kruttschnitt, chairman of the Executive Committee "By the exercising of greater care in inspecting and purchasing, the failures of rails per 100 miles of track, equated as to traffic borne, have fallen 85 per cent in eight years and in number are but one-fourth as many as those on all railroads in the United States and Canada, based on the latest available data." This may generally be attributed to the policy of the management and to Mr. Isaacs' work in bringing about changes in section and specifications, and to the establishment of a special system of inspection, and his ingenious and original work in the compilation of statistics, including each rail failure on the entire system. The standard A. R. A., Series A, and R. E. Sections of the American Railway Engineering Association, which have come into such general use, were suggested by Mr. Isaacs and he supported them with conclusions drawn from the Southern Pacific failed rail statistics, which are considered by many the most comprehensive data on this subject in existence.

The diversity of work herein recorded emphasizes the fact that Mr. Isaacs has not confined himself entirely to the field of civil engineering. On many occasions his advice has been sought in the design of rolling stock and in mechanical problems. In the preparation and revision of the designs of the Southern Pacific standard equipment, Mr. Isaacs has worked jointly with F. W. Mahl, director of purchases and mechanical engineer, and with him worked up the design which was the basis for the Southern Pacific's suggestions for a standard single-sheathed box car, recently submitted to the American Railroad Association, though at the present writing it has not been adopted. The retention of a 200-lb. boiler pressure for superheated steam locomotives, a much disputed point, was recommended by Mr. Isaacs and finally ordered.

For the past seven years he has had charge of the centralized plan of inspection, established by the Harriman Lines in 1912. This system, under which $10,000,000 worth of materials annually were subjected to inspection, was instituted by Mr. Isaacs and has resulted in considerable economies as well as a marked improvement in uniformity of materials.

AN ARBITER OF CONTRACT DISPUTES

As a committee of one on arbitration of disputes between contractors and the Company, Mr. Isaacs enjoys an enviable reputation. The story is told of a contractor who once refused to pay a claim for repairs to a recently finished job. Litigation was threatened, but the contractor finally said: "Let us lay the whole matter before Mr. Isaacs; whatever he decides I am sure will be fair and right, and as far as we are concerned will be final." This is but an incident illustrative of the esteem in which he is held by large contractors who have been engaged in work for the railroad company.

Up to the time of Federal control, the Southern Pacific made contracts covering its larger requirements of certain standard materials, which were in the form of agreements between the Director of Purchases and the manufacturer. There were some contracts in which Mr. Isaacs was named as sole authority in cases of dispute as to the classification of materials, and there are no complaints on record of his ever using this absolute authority to impose unfair burdens.

Though a man of high professional attainment, Mr. Isaacs' life has been one of simplicity. Naturally of a retiring disposition, he has never sought the public eye. Always preferring the quiet satisfaction of a small circle of friends to the excitement of public gatherings, it has never been his custom regularly to attend the meetings of technical societies, except when his influence might be needed for the success of some important measure.

Design and Operation of Modern Car-Dump Coal Pier

Development of Plans by Jersey Central Railroad—Steep Run-Off Grades Successful—Reinforced Concrete Girder Trestles Found More Economical Than Steel

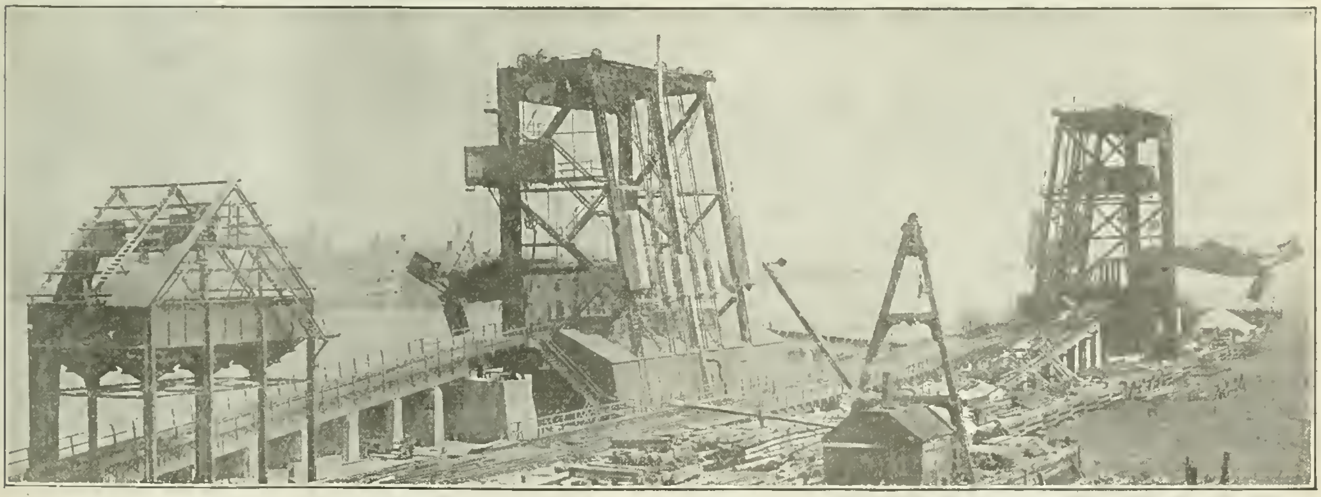
BUILT to handle 400 cars per day, the recently completed coal pier of the Central Railroad of New Jersey at the Jersey City terminal, equipped with two independently operated car-dumpers, is the result of an exhaustive study of several general plans and careful analysis of special conditions which were met by a radical revision of a detailed plan. Consideration of gravity type wooden and steel piers preceded the adoption of the final plan for car-dumpers, and steel trestle construction was abandoned in favor of reinforced concrete after study of design and costs. The run-off grades, among the steepest ever used, were determined upon to facilitate operation and somewhat by restricted space. The design finally adopted is thought to represent the most modern of any similar installation yet constructed.

A series of yards a mile long, two reinforced-concrete thawing sheds with separate gravity yards, a power plant of 2,000-hp. capacity, in addition to the pier and dumper units, were built to form the complete plant, which will be the largest water-front coaling station in New York Harbor when twenty-one pairs of circular tug coaling pockets of reinforced concrete, extending from the present end of the pier, are built. The yard layout consists of a receiving yard, a classification yard divided into two parallel units (due to restriction of space) and a loaded advance yard to serve two gravity yards, each of which independently serves a dumping unit including thawing shed. The power house, including an electric substation, is located on the shore adjacent to the pier at the south side and supplies steam power, compressed air and electric current for operating dumpers and thawing houses. Electric power is brought in from the railroad company's main power plant at Communipaw, about a mile distant from the new coaling plant, on a 2200-volt a.c. transmission line.

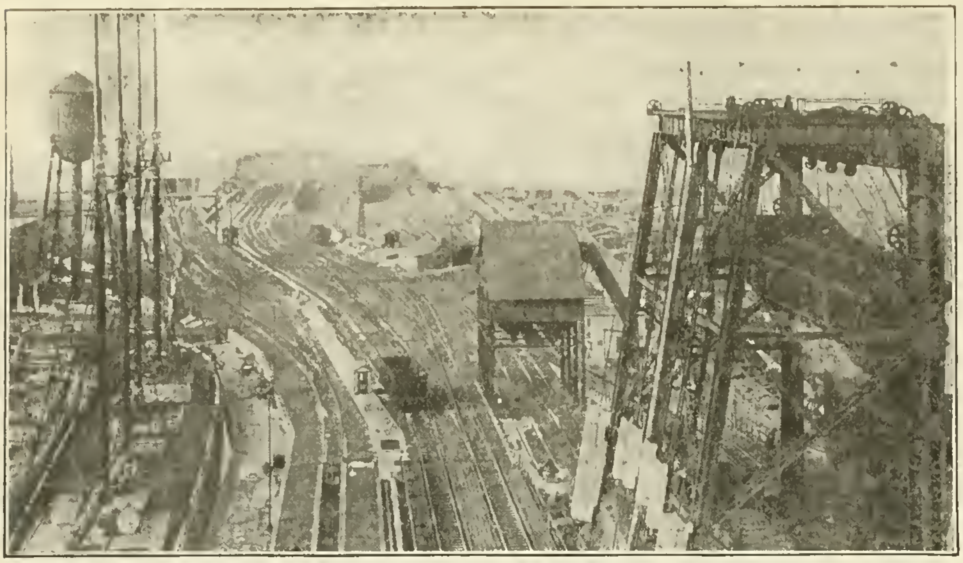
Side elevations and a plan of the pier, together with details of reinforced concrete girder trestle construction, are shown in the accompanying inset. A general view of the pier and the two dumpers, when nearing completion, is shown below. A view of the thawing sheds with depressed return tracks between the north and south gravity yards, as seen from the top of the outshore dumping tower, appears on the next page. The new pier was built to handle new business together with that previously cared for by two old wooden gravity piers, which were also used for tug coaling.

Selecting the Type of Plant. When the need for additional facilities became apparent, two new wooden gravity piers were at first considered. After brief consideration this plan was abandoned in favor of a single wooden or steel gravity pier of much larger size and capacity. Later, a direct dumper type of pier was finally adopted for the following reasons: (a) Minimum cost per ton of coal handled; (b) maximum capacity per foot of water front used; (c) practical elimination of fire risk; (d) economy in labor; (e) permitted of maximum development of area available for approach and classification yards, which was limited; (f) less breakage of coal due to handling in bulk and also due to adjustable height of discharge; (g) type of cars used not restricted to hopper bottom cars; (h) concentration of loading operations at a fixed point on the piers requires the minimum of classification of cars in the yard.

Development of General Design. After it was decided to use two car dumpers, the layout of tracks and trestles on the pier was largely determined by the desire to secure the narrowest pier width consistent with proper limits of clearance, curvature and grades. The length of the pier, which will be 1,584 ft. from bulkhead line when the tug coaling pockets are completed, was determined by the War Department's pierhead limits with respect to the Jersey shore and Ellis Island. Minimum width of pier was determined by width required for dumpers plus necessary clearances of parallel return tracks and dumper towers. Additional space for handling boats in the slip at the north of the pier site made it possible to locate dumper No. 1 only 300 ft. from the bulkhead line, while it was necessary to locate dumper No. 2 further outshore, since it was not practicable to construct a slip on the south



NEW COAL PIER OF CENTRAL RAILROAD OF NEW JERSEY HAS TWO INDEPENDENT CAR DUMPERS



THAWING SHEDS FROM TOP OF NO. 2 DUMPER—DEPRESSED RETURN TRACKS PASS UNDER SOUTH GRAVITY YARD APPROACH

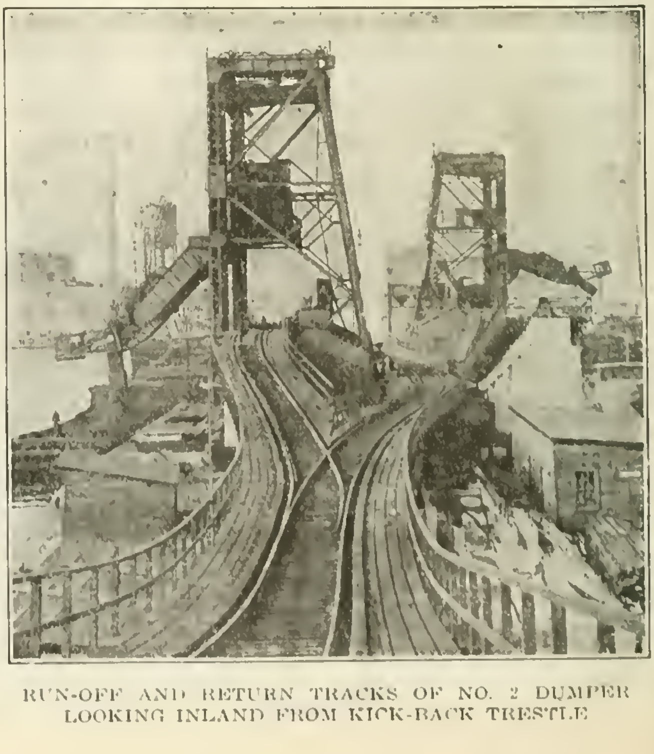
side. The exact distance between the dumpers was determined as the minimum distance with 12°30′ curves and 13-ft. centers between parallel return tracks, adopted to obtain minimum pier width. Since height of tracks at dumpers was practically fixed, lengths of run-off and kick-back trestles were determined largely by elevation of and distance to return tracks at bulkhead line, as well as desired grades to facilitate operation.

From an operating standpoint a run-off grade of at least 8 per cent was considered desirable, and this was adopted for No. 2 dumper. To simplify the construction of trestle piers it was almost imperative that the return-track grade from kick-back, No. 1 dumper, should reach the same elevation as return track for No. 2 dumper, between stations 5 and 6, as shown in profile included in the accompanying inset. To reach this level in the shorter distance, a grade of 11 per cent was required for the run-off track of dumper No. 1. The danger of cars "getting away" on such a steep grade was considered, but it has been successfully operated without accident. Grades of 12 per cent are used on the approaches (under operation by haulage car); for kick-back tracks, grades of 18 per cent, and for return tracks, a grade of 1.5 per cent. Grades of 1½ per cent from the gravity yard are reduced to 1 per cent as they near the approach tracks and haulage car pits.

Concrete vs. Steel Trestle Girders. The original design for the structure supporting the run-off, kick-back and return tracks called for reinforced concrete piers, steel I-beam spans and creosoted yellow pine decking. A typical portion of the detailed design actually worked out for steel I-beam spans is shown in the drawing. Prices quoted on the steel called for by this design were unusually high and delivery was uncertain due to the enormous demand at that time. Therefore, an investigation of costs, advantages and disadvantages of substituting all concrete construction was made, which led to the adoption of present concrete girder spans, with the following considerations: (1) Excessive cost of form work for building monolithic concrete girders excluded this type of construction; (2) concrete track slab at shore end of pier offered ideal site for a casting yard to reduce handling charges to minimum; (3) preliminary design of precast concrete girder, together with estimate of cost, indicated that initial cost of concrete construction would be less than that for steel, and (4) it was unnecessary to figure and compare annual costs since concrete construction obviously would involve no maintenance charges, whereas steel-work would be subject to more than the normal maintenance and depreciation due to the action of coal dust and salt water.

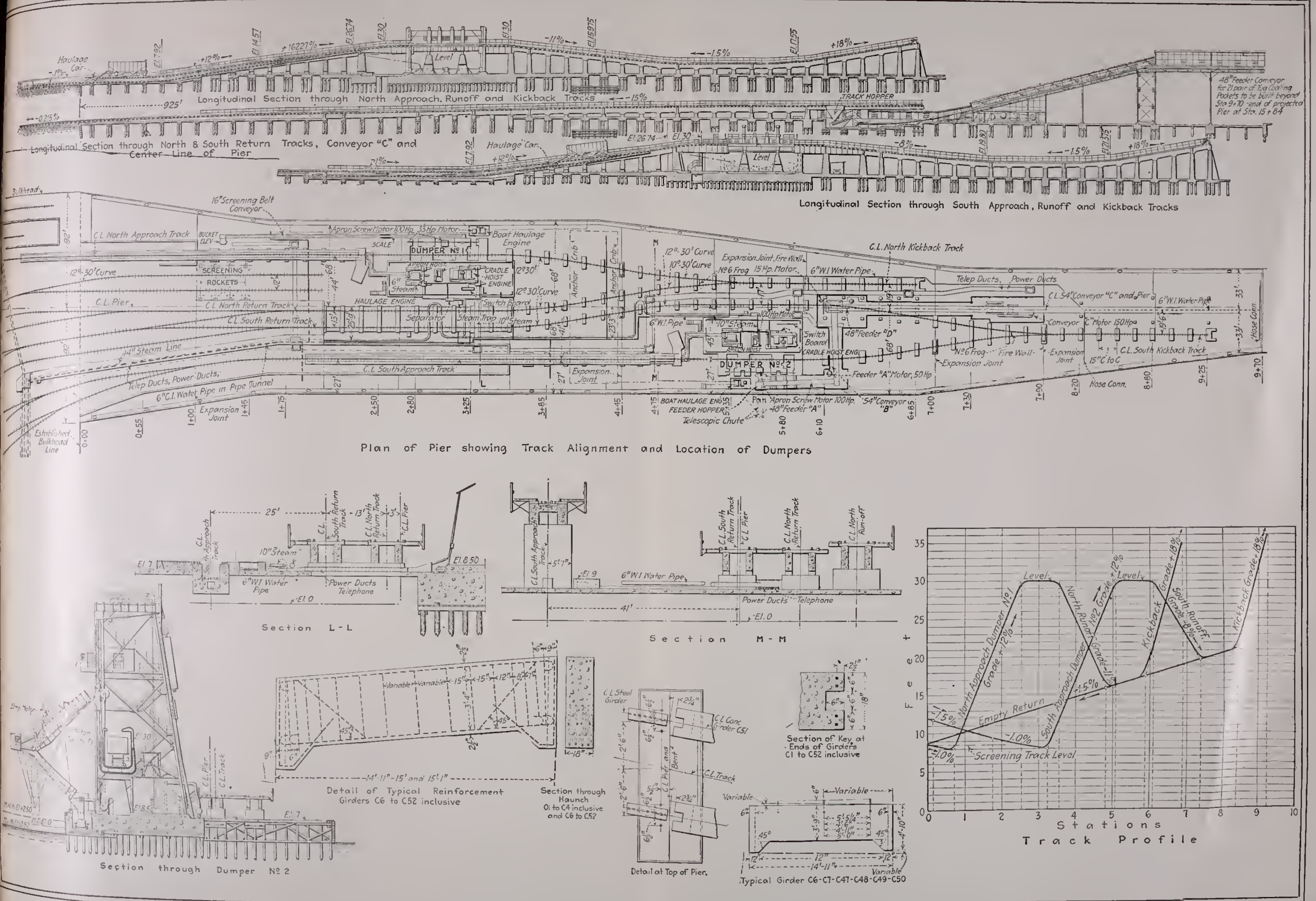
Therefore, the unusual conditions in the steel market which developed after the original design for steel girders was completed caused the steel design to be abandoned in favor of pre-cast concrete. New detailed plans of reinforced concrete girders of the pre-cast type were made. A record of unit costs kept during construction indicated a net saving of 10 per cent in first cost in favor of concrete. In addition to the saving in original cost, maintenance and depreciation, the type of girder adopted resulted in a decrease of about 2 ft. 8 in. in the necessary height of all supporting concrete piers, one foot being gained by building girders with haunches at the ends. Also, the actual cost of concrete work was subject to increases in prices of materials and labor, and the comparison of first cost was made on the basis of an old price on steel which has increased.

Design of Reinforced Concrete Girders. In the design of concrete girders, details of which are shown in the inset, it was necessary to give special consider-



RUN-OFF AND RETURN TRACKS OF NO. 2 DUMPER LOOKING INLAND FROM KICK-BACK TRESTLE

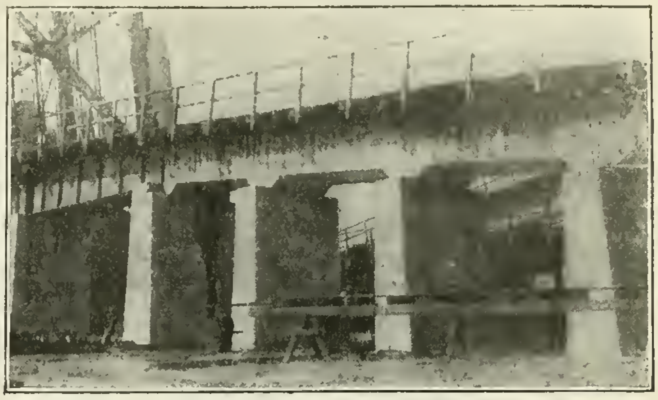
Accompanying article on Design and Operation of Coal Pier, Central Railroad of New Jersey, Jersey, City, N. J., *Engineering News-Record*, April 15, 1920.



COAL PIER OF CENTRAL RAILROAD OF NEW JERSEY HAS TWO INDEPENDENT CAR DUMPERS—DESIGNED TO HANDLE 400 CARS PER DAY—TRESTLES OF REINFORCED CONCRETE GIRDERS—STEEP RUN-OFF GRADES ation to the fact that the short spans, subject to rolling loads, had high flexural stresses at points of high shearing stresses. This condition was the determining factor in the design of reinforcement. The amount of steel required at the points where rods were bent up to take their proportionate share of shearing stress governed the number of rods required in the bottom of the girders. The track layout determined upon embodied such a wide variation of alignment and grades that the detailing of the girders involved many features not ordinarily found in the design of pre-cast members. It was necessary to provide for numerous variations and at the same time secure a simple and workable unit. A principal consideration was to obtain unit members having as many identical and similar factors as possible to simplify form work.

Under these general conditions, the final design of girders embodies the following features: (1) Both ends of all girders truly vertical and of uniform height, except where special conditions of general layout required a modification; (2) bearing area of all girders truly horizontal and of uniform dimensions; (3) central section of all girders of constant width and height, making bottom plane of girder parallel to top except at ends; (4) angle between bottom plane of girder and sloping plane of haunch at ends uniformly maintained at 45°, and (5) sizes and arrangement of reinforcing bars uniform. Variable dimensions are indicated in the inset, the principal one of which is the slope of the beam, or in other words the angle between the plane of the vertical ends and the plane of the top of the girder. This variation was readily taken care of in the formwork at slight expense.

Partial lateral stability of girders was secured by notching all ties over them and securing every third tie by bolts previously cast in the concrete, while intermediate ties were secured from movement parallel to the length of the girder by the usual timber guard dapped over the top of the ties. Lateral rigidity at ends of the girders was obtained by 1¼-in. rods cast in all piers and extending upwards for practically the full height of the girders, so located as to fit in the keyways provided at the ends. When the girders were placed, these openings were filled with concrete after two layers of tar paper were placed on the surfaces, to insure holding them rigid against lateral thrust but allowing vertical movement in case of settlement at any individual pier. Additional provision for lateral stability was obtained by casting concrete diaphragms between girders at points about three spans apart, bonded to the pier and also to the girders by rods previously cast in both members.



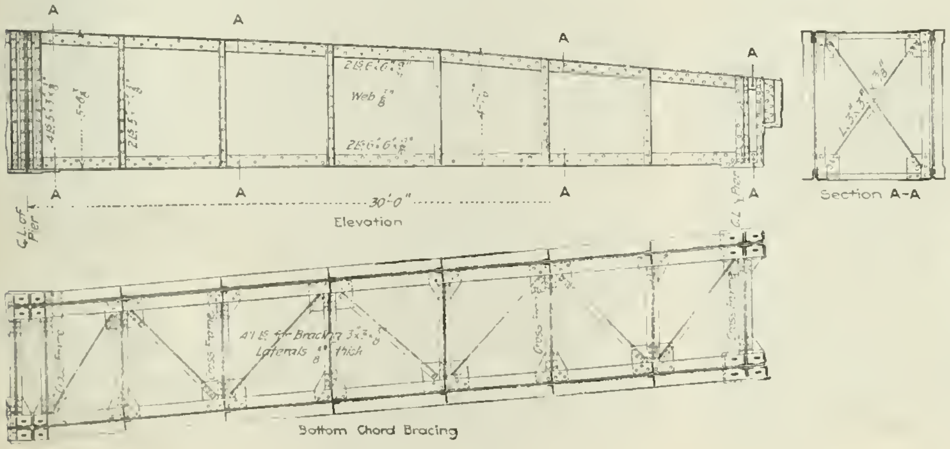
CONCRETE GIRDERS IN PLACE—RUN-OFF TRESTLE

Method of Pre-Casting. All girders were cast flat side down on a wooden platform supported on the concrete track slab at the shore end of the pier. By this method the total height of cast was only 18 in. and stresses in formwork were reduced to a minimum, insuring a plane surface on top of the finished girder, essential for the fit of ties. This system was also found readily adaptable to the numerous variations in slope and other variable dimensions.

After the girders were cured and the forms removed, a 6 x 6-in. timber was secured to the top of the girder by means of bolts previously cast in the concrete for fastening the ties. This timber was provided with an I-bolt at its center for lifting so that the girders could be placed in a vertical position (corresponding to final position in trestles) on the deck by means of a locomotive crane. A yoke made up of a 6 x 8 in. x 3-ft. yellow pine head block with an I-bolt at its center and fitted with two vertical side rods spaced to clear the sides was used for erection purposes, as it was not considered entirely safe to carry the full weight of the girders on the bolts previously cast.

The pier as now constructed (without the off-shore tug coaling pockets) is about 970 ft. long, with a maximum normal width of 136 ft., tapering toward the end to 66 ft. and flaring to 184 ft. at the bulkhead line for convenience of track layout. The pier is built on creosoted pine piles of about 70-ft. length, of which over 4,000 were used. The deck is of reinforced concrete and heavy concrete foundations are provided for the dumpers and dumper-engines.

Operation of the Coaling Station. The two car-dumpers, which operate independently together with gravity yards, are practically identical. Cars are delivered to the dumpers from the gravity yards (including thawing houses, a view of which is shown in the photograph.



DESIGN OF STEEL I-BEAM SPANS ABANDONED FOR REINFORCED CONCRETE

Either of the two gravity yards can be served by either of the classification yard units, but the north gravity yard and the north dumper operate independently of the south gravity yard and the south dumper. To facilitate operation and to make the most economical use of space available, the return yard between the thawing houses is depressed and the lead track connecting with the empty advance yard track passes under the approach of the south gravity yard. The capacity of each of the thawing sheds is 24 cars, or a thawing capacity of about 75 cars per day each. Since many of the grades of coal handled do not require thawing, even in the coldest weather, this total capacity of 150 cars a day has been found adequate.

OPERATION OF DUMPERS

After a car is released from either of the gravity yards by its "rider" (who remains with it until it is returned to the empty yard), it is located over the haulage pit and then pulled up the approach grade to the dumper by the haulage car operated by steel cables. When the car reaches the dumper it pushes the car which has just been emptied down the run-off grade. After the car is delivered on the platum of the cradle it is shifted horizontally towards the wooden buffers at the side and then lifted vertically until the clamps, which hold the car in place, are actuated by a contact with them. The car is then raised and the contents dumped into the pan, which has a capacity of 100 tons. It is then brought back to its original position in the cradle; displaced by another car; started down the run-off grade and returned by the kick-back to the empty yard.

To facilitate unloading contents of pan, elaborate provision is made for boat haulage by cables controlled by drums and electric motors. The pan is provided with a telescopic chute that can be set at the desired angle, and is electrically operated. For barge loading the pan may be placed in a lower position, but for very high steamers its position will require that the car be elevated as much as 30 ft. before it is turned over. Provision is also made for raising and lowering the outer end of the pan to clear masts of vessels while being moved and to change its inclination to the minimum degree for handling various grades of coal.

The cradle is 50 ft. long, 15 ft. wide and 15 ft. high, and is designed to handle the various sizes and types of coal cars of widths up to 11 ft. 6 in., heights of 6 ft. 6 in. to 13 ft. and length over couplers of 54 ft. 4½ in. and a maximum weight of 280,000 lb., including weight of coal and tare of car. Counterbalancing of the cradle is accomplished by two concrete weights of 25 tons each and the clamping mechanism is operated through cables by four concrete weights of 10 tons each. Steam power is used to operate the cradle and the haulage car and electric power to operate the pan, chute, screenings conveyor and boat haulage. Dumper No. 2, on the south side of the pier, is equipped with a hopper for handling coal by conveyor to the tug-coaling pockets. Coal may be loaded from the pan either into the boats or discharged into the hopper, from which it is conveyed by means of a series of belt feeders to the main overhead conveyor, which will load the circular concrete bins for tug coaling. In order to provide for a supply to the tug coaling pockets in case of a break-down at dumper No. 2 a hopper is provided in the south return track, feeding directly from cars into the main conveyor. The location of this hopper is shown in the accompanying plan.

The car-dumping equipment, including towers and machinery, was designed and furnished by the McMyler-Interstate Co., Cleveland. The entire plant, including pier, yards and power house, was designed and constructed under the direction of the engineering department of the railroad, of which A. E. Owen is chief engineer, and A. M. Zabriskie, principal assistant engineer.

Worcester Water-Works Reservoirs Drawn Down Against Spring Floods

By George W. Batchelder

Water Commissioner, Worcester, Mass.

As a SAFEGUARD against spring floods in the Blackstone River the water-works reservoirs of Worcester, Mass., were systematically drawn down during the past winter. An outline of the governing conditions and of the method used follows.

The storm water and sewage of the City of Worcester drain into the Blackstone River, which is ordinarily a small stream that makes its way through a valley of that name and discharges into Narragansett Bay. Along the banks of this stream, beginning within Worcester, are located many mills which use the waters in part, at least, for power. It was said in 1895 when this city took Kettle Brook, that the Blackstone River power was more highly developed than any stream in the world.

Very unusual conditions existed here in the winter of 1919-20. The city reservoirs were practically filled and the ground saturated with water at the time freezing began in the late fall of 1919. The reservoirs remained full during the winter and meanwhile there piled up on the water sheds between 4 and 5 ft. of snow, forming in all a precipitation of over eight inches.

MELTING OF SNOW ANTICIPATED

During the latter part of February, and with the reservoirs still full with one exception, a study of the situation developed the belief that it was good business to anticipate the melting of the snow by reducing the stored water in the reservoirs, especially as they were bound to fill later, and by so doing, temporarily, at least, hold back the run-off from our sheds until the snows lower down had melted and run away. Consequently, on Feb. 18, orders were given to open the waste gate on the Tatnuck Brook system and waste water until the storage was reduced about 300,000,000 gal. or 30 per cent of the total storage. Later, orders were given to open the waste gate on the Kettle Brook system.

We believe it sound judgment to thus regulate in a measure the run off from our water sheds, thereby reducing somewhat the later flows of the stream.

I do not know of any previous time when action of this sort was necessary, though, of course, there have been times when our waste gates have been opened to prevent too high water levels in our reservoirs.

I am informed that E. R. B. Allardice, superintendent of the Wachusett reservoir, of the Boston Metropolitan Water-Works, has drawn down that reservoir, not wasting the water exactly, neither using it for ordinary purposes, but rather for generating electric power only.

Experiences and Prospects of Inland Waterway Transportation

Following the publication of the series of articles entitled "What Is the Future of Inland Water Transportation?" by Charles Whiting Baker, in the issues of "Engineering News-Record" for January, a number of comments were received. Those favorable to the views expressed therein were for the most part merely commendatory and short. Those correspondents who differed from Mr. Baker generally expressed their criticisms in some detail. The communications printed below all fall in that class except the one by Maj. Bond, which, though written without knowledge of the other letters, is a fair answer to many of the criticisms in them, particularly those which assume that a low ton-mile cost on the waterway itself means low freight carrying charges.—EDITOR.

In Defense of the Inland Waterway

By J. A. Ockerson
Member, Mississippi River Commission, St. Louis, Mo.

HAVING been in close personal touch for many years with matters relating to the engineering side of inland water transportation, both in this country and Europe, the writer finds himself unable to agree in many of the statements and conclusions reached in Mr. Baker's extended article. Answer in detail will not be attempted but a few facts that have come under the writer's personal observation or are of authentic record in official reports, will be presented.

Some years ago the writer devoted considerable time to gathering statistics relating to transportation on the Mississippi, covering the period 1865 to 1900. The tabulated results show that river tonnage at St. Louis reached its maximum in 1880 to 1882, eleven years later than stated in the article quoted. In 1881 the grain traffic by river from St. Louis reached 37.9 per cent of the total St. Louis grain traffic. It further shows that while freight rates were constantly decreasing by both river and rail the former always lead the decline by a wide margin.

Rates on grain from St. Louis to Liverpool via New Orleans and the river and via New York by rail to same destination, covering the period 1883 to 1900, gives an average differential in favor of the river route of 6.85c. per bushel of wheat with a minimum differential of 3.77c. per bushel, although the distance via New Orleans, all water route, is over 1,000 miles longer than via the Atlantic seaboard. In 1880 the export of grain from St. Louis by water was 15,762,664 bushels. Today the rate on grain St. Louis to New Orleans by river is 14c. and by rail 17½c. per hundred pounds.

The records of tonnage transported by the St. Louis and Mississippi Valley Transportation Co. show that for the five years 1893-97 inclusive this company carried an annual average of 6,667,145 bushels of export grain, and a large amount of package freight although in four out of the five years the fleet was idle during the months of October and November on account of low water. The average freight rate on wheat, 1896-1900, St. Louis to New Orleans, including transfer to ship for export, was 4.62c. per bushel, a ton mile rate of 1.3 mills.

Note, too, the types of stern wheel towboats then in use. Steamer "John Gilmore," 1,200 i.hp., 7 barges loaded with grain in bulk and fuel barge, 10,810 tons. "Future City," 1,600 i.hp., 8 barges of grain and fuel barge, 11,240 tons. The "upstream load" of less than half this tonnage was composed of lumber and miscellaneous freight. The average time required for the round trip, St. Louis to New Orleans and return, was 20 days. It should be remembered that all this was done prior to the beginning of Government channel maintenance and when depths of 4 ft. were sometimes encountered even on the river below Cairo.

Conditions Better Today

It is quite different now; a navigable channel 8 ft. or more in depth at all stages of river except when closed by ice, has been maintained from St. Louis to the sea for more than 15 years. For about 8 months in the year the lower Mississippi has a navigable depth of about 12 ft.

The Anchor Line, handling package freight and passengers, had a line of several side-wheel boats of 1,000 to 1,200 tons' capacity which had a regular schedule of 7 days between St. Louis and New Orleans. Both this company and the St. Louis and Mississippi Valley Transportation Co. were highly prosperous and operated well into the early years of the twentieth century until their equipment was worn out in the service. During the period stated the railroads had reached the stage of maximum efficiency.

The coal tows out of the Ohio and down the Lower Mississippi are famous for their large cargoes. The writer accompanied one tow of the "Joseph Williams" from Cairo down, carrying 52,000 tons of coal or over 1,000 car loads and at least 30 trainloads. This was delivered without accident; in fact losses on such trips are the exception rather than the rule.

The purpose of citing what has been accomplished in river transportation under adverse river conditions is to prove that a very large tonnage can be profitably carried now under the greatly improved river conditions. Mr. Baker seems to question this. He also lays stress on the cost of channel maintenance.

A recent circular of the U. S. Railroad Administration covering statistics of one of the most prosperous railroad systems of the Mississippi Valley for 1919 shows annual cost of "maintenance of way and structures" at $2.577 per mile of road, which is doubtless less than the normal cost since maintenance of way has nearly 50 per cent of the loaded freight car miles. Coal been sadly neglected for the past two years. This is at least four times the annual cost of channel maintenance from St. Louis to New Orleans. In the lower Mississippi from Cairo to the Gulf of Mexico, 1,065 miles, there are about 35 sand bars with a maximum aggregate length of 35 miles which may become obstructions to navigation at low water. Only about one-third of these become obstructions during any one low water season lasting about four months and channels through them are easily opened and maintained. Over a thousand miles of the total distance is a natural channel of ample depth.

Maintenance of equipment of the railroad quoted is given at $3,215 per mile or road per annum, which far exceeds the cost of maintenance of river equipment for the same tonnage.

Again Mr. Baker alludes to limited upstream traffic as a serious handicap. Quoting from the statistics of the same road, the empty freight car miles are equal to nearly 50 per cent of the loaded freight car miles. Coal roads run practically empty trains one way. So, however desirable it may be to have full loads both ways, the lack thereof does not apply with special significance to waterways.

He refers to delays on waterways as being of very serious moment, when as a matter of fact delays due to channel defects need be little or no greater than washouts and other interruptions on railways. As to relative rate of movement on river or by rail it has been found that the time required to deliver freight from St. Louis by river to ships at the seaboard is not materially greater and sometimes even less than by mixed freight to the ships at the Atlantic seaboard. This of course takes into account the switching at both ends of the line and delays at intermediate points and does not include fast freights. As a recent example, a small towboat with 7 barges carried 20,400 sacks of rice which averaged 220 miles per day.

Mr. Baker says the railroads have been built by private capital while the improvement of inland waterways have been made at the expense of the people. He forgets that 158,293,736 acres of land was granted to aid in the construction of 21,510 miles of railroad, 7,359 acres per mile, much of which mileage lies in the Mississippi Valley (see statement by the General Land Office in "Congressional Record" of Jan. 14, 1920, p. 1635) In addition to that, huge blocks of railway bonds were guaranteed by the Federal Government.

Aside from that consideration, .however, there are many things done at the expense of the Federal Government for the general good and it must be so. Lighthouses, fortifications, battleships are built, armies and navies are equipped and maintained, the postal service and other functions of the general government are all for the general good. The Federal Government, that is to say the people, own the inland waterways and if the people see fit to spend their own money for the improvement of their own waterways for the general good, why should they be censured therefor?

Transportation by water on a large scale must have such capital behind it as will fully safeguard the interests of the shippers and inspire the confidence of the public, as Mr. Baker says. Just now there is crying need for such transportation. Railways cannot meet the demands for cars and their managers proclaim that it will require the expenditure of billions of dollars to put their lines in such condition as to satisfactorily handle the traffic of the country which is increasing much faster than railway betterments.

RAILWAYS FAILED UNDER GOVERNMENT, TOO

Mr. Baker's analysis of what he is pleased to term failures in water transportation if applied to railway traffic for the same period would show general failure there as well, both being under the Federal Railroad Administration where the earnings during the two years and two months' operations are said to be $850,000,000 less than the expenses. In the case of the "Mississippi River Section" where a poor equipment illy adapted to the work, was brought together from various sources and overhauled at great expense in order to begin doing something, no one acquainted with river transportation looked for an immediate profit in its operation. The major portion of the fleet came from the Mississippi River Commission working plant and did not "represent the latest improvements in river navigation," as Mr. Baker says, and besides that it was not well adapted to the service in which it was placed. For instance the "Nokomis" was not "one of the improved towboats" but on the contrary was some 20 years old. Furthermore, it must be recognized that developing new routes of transportation or changing old methods, requires time to educate the public as to the existence of such routes and the means of using them so as to reach and build up the best markets.

Taking these things into account it seems absurd to insist that "if these Government boats are to demonstrate that inland water transportation is a profitable business, they will have to earn *next year* a profit above all operating expenses of at least $1,450,000."

Mr. Baker says that "transport on American railways of heavy traffic shows that for movement of the road alone, on such lines as compete with waterways, is less than two mills per ton-mile. Only under most favorable conditions can freight be moved by river or canal at a lower cost." Specific cases of the movement of grain on the Mississippi month in and month out, have already been cited where including transfer from barge to ship and overhead charges the rate was 1.3 mills per ton-mile. In the case of shipments of coal the rate was about fifty per cent less. Let the railways meet such rate and the public would doubtless rejoice.

Neither does the writer agree "that low-grade bulk freight is the only class of freight on which the waterways can hope to compete with railways." A refrigerator barge line for export meats and dairy products to the southern states with return of tropical fruits could probably be developed into a paying business.

He cites figures to show "the absolute impotence of the waterways to supplement the railways at that crucial time" (1917-18) but he fails to recognize the real cause. First, there was great dearth of river boats, and second, there were no ships in the port of New Orleans to receive even the limited amount of river freight, and in spite of the cry of no cars, freight was transferred from river steamers to cars, there to be hauled across country to some congested Atlantic seaport. The City of New Orleans, with its miles of empty wharves, appealed in vain for ships. No wonder river traffic was light under such conditions.

He ridicules the idea of regarding the transportation by water of sand, gravel and stone, as legitimate tonnage. This is a favorite theme with opponents of waterway development. It is true that the value per ton of these items is small, but without them, concrete, which has come into such general use in construction work, would cease to be. These materials are often transported several hundred miles by water. If handled by rail, with either long or short haul, they immediateely figure in reports of tonnage and traffic and are duly charged for and properly so.

The writer agrees that the question of inland water transportation should be dealt with as a business proposition and where it can carry traffic more economically than by other means it should be fostered and supported.

It has been demonstrated on the Mississippi and its great tributaries that traffic can be handled cheaper by water than by any other means. While recognizing that the great volume of freight must be handled by rail, because it can be reached in no other way, still the waterway is needed and can be made useful in carrying a very large tonnage to the decided advantage of shippers and with profit to the carrier.

It has been aptly said that the Mississippi Valley is the "cream jug of the continent" and its chief "commercial problem" has been and always will be, how best to reach the markets of the world with its surplus products. In this matter its waterways to the seaboard will always be the controlling factor in the cost of transportation. From St. Louis to the Gulf at least, the channel maintenance is ample to meet the demands of a very large volume of traffic; adequate equipment adapted to the work required, both as to efficiency and capacity, must be provided and operated in such way as to convince shippers and the public that it has come to stay. Then full cargoes may be looked for, which will result in profit to the carrier as well as to the public. Inland waterway traffic will again be established as an essential permanent and important element in the general transportation problem of the country which after all is the controlling feature in business.

Some Criticisms From a Steamboat Operator

By R. A. Hiscano
General Manager, Catskill Evening Line, New York City

It seems to the writer who has been in the railroad, steamship and steamboat business for a number of years, that many of the statements in Mr. Baker's articles are misleading and unfair to inland water transportation. A detailed examination of some of these statements may be worth while.

In the Jan. 1 article, on p. 19, the statement is made that traffic on nearly all inland waterways has all but disappeared and that with a few exceptions the competititon of the waterways with the railways is no longer of any consequence and that furthermore Government control has demonstrated the fallacy of waterways keeping to a lower level the rail freight rates. Traffic has not all but disappeared from out inland waterways. It is a fact that such streams as the Hudson River, Long Island Sound, Newark Bay, Delaware River, Ohio River and other large waterways are still handling a considerable tonnage. Again, competition between waterways and railways up to the period of Federal control was keen and there is no reason to doubt but what a certain amount of competition will be resumed, now the roads have passed back to their private owners. Government control has not demonstrated that it is a fallacy to suppose that waterways keep down rail rates. While it is true that increased rates were and are necessary on the part of the railroads, a good deal of these increases have been caused by the surrender on the part of the Government to the demand of the railroad unions.

Lake Conditions Can Be Duplicated

Mr. Baker also states in the Jan. 1 article that the success of water transportation on the Great Lakes cannot be duplicated elsewhere and that the low freight costs on the Great Lakes is due to the vast volume of bulk tonnage which is shipped on the Lakes. Now I believe that within certain limits the cost of carrying freight on the Great Lakes can be maintained on such other streams as the Hudson River, Long Island Sound, Delaware River and Ohio River, and while it is true that the bulk tonnage of the Great Lakes has produced some low operating costs, there are also a number of highly successful and profitable merchandise freight lines now operating on the Lakes, companies whose entire tonnage is practically of a merchandise character.

Again in this first article Mr. Baker states that under normal conditions the railways are able to handle all the business of the country and that during the blockade of 1917-1918, although needed, the waterways remained unused. Now this is not so. Railroads, particularly in the more densely populated sections of the country, east of the Mississippi and north of the Ohio River, cannot handle all of the country's tonnage. One illustration near home may be cited. The bulk of the Hudson River Valley fruit crop is shipped each season via the various boat lines operaing on that river, and last summer when one of the lines was offered an unusual quantity of fruit and was unable to handle it promptly a good many of the growers temporarily diverted their fruit to the rail lines, with the result that it took anywhere from three to six days to get the goods to the New York terminals by rail, although the boat lines make an overnight delivery. Thousands of dollars were lost on the rail movement because of the delay. Even though cars were iced, in many instances the fruit perished and was a total loss. The writer knows that not only is this incident true of the Hudson River territory, but it is also true of the producing section south of Baltimore on the Delaware peninsula, also in other sections of the country.

Waterways Did Relieve Freight Blocking

As to the waterways not having been able to relieve the blockade of 1917-1918, the water lines which were in existence did help to meet this situation and relieved the railroads of thousands of tons of freight which it was impossible for the shippers to forward by rail. Right here in the eastern section of the country shippers hired motor trucks and sent them as far as 50 mi. to the waterway terminals in order to get their goods to destination, and were it not for the assistance of the existing boat lines at that time the confusion and delay and loss would have been much more. As a matter of fact it was the fault of the railroads themselves that the waterlines could not handle more tonnage, inasmuch as there were no through routes or through rates in effect via joint rail and water lines to and from a good many sections and the time was too short to establish these rates and routes, even if the railroads had been killing, and as a consequence many shippers held their goods back rather than pay the excessive freight charges which it would have cost them by reason of the absence of these through rates.

Mr. Baker states on p. 26 of his Jan. 1 article that no boat can afford to carry deckhands so as to unload freight at various stops en route. He must surely be unaware of the fact that practically all freight on the Hudson River and, to a great extent, on the Long Island Sound is handled by the deckhands who are carried on the steamers. It is only when there is an abnormal quantity of freight moving that extra longshoremen have to be added to take care of the loading and unloading.

In the Jan. 8 article, on p. 86, Mr. Baker cites the history of the Inland Navigation Co. as proof of the fact that it is not profitable to operate waterway service on the Mississippi River and part of his proof consists of the statement of the revenues and expenses of this company. It is just such fallacies as this which make Mr. Baker's articles so misleading. Merely because an extravagantly managed line could not make a success of the business is not positive proof that with sound business methods a line could not be operated profitably. A steamboat company whose terminal expenses average $2.45 on a ton on a river run cannot hope to succeed. There are boat lines in the east here whose terminal expenses, by which we mean rent, labor, etc., do not exceed $1.00 per ton. Furthermore, the general administration expenses of the above mentioned company for the brief period of its existence amounted to $116,362. This, of course, is entirely out of proportion to the business and should not exceed 45 cents a ton, excluding interest on the investment and depreciation on the marine equipment. Of course this is for purely freight operations and might be slightly different where passenger traffic is also involved. In fact, without going into all the details of the Inland Navigation Company's operations to point out why they could not hope to succeed, I would say that for a purely freight line the steamer expenses ought not to exceed 40 per cent of the revenue, and terminal expense 27 per cent of the revenue, and the overhead, excluding interest and depreciation, 11 per cent of the revenue.

In the Jan. 15 article, on p. 141, Mr. Baker after pointing out that the improved New York State Barge Canal was expected to handle principally the movement of grain tonnage, states that in 1917 only 18,000 tons of grain were moved, ignoring the record of 1918 which shows that 81,091 tons of grain, flour, barley and oats were carried on the canal and that the slight movement of 1917 was caused more by action of the Grain Corporation in diverting the tonnage to the rail lines than it was because of any fault of the canal. It is also interesting to note that in 1919 144,971 tons of coal were carried on the canal and that were it not for railroad opposition this movement of coal could probably be increased ten times, thereby reducing the cost of coal tremendously for the people of New York State. The Superintendent of Public Works, who has charge of the operation of the Barge Canal, has pointed out very ably that the coal fields of Pennsylvania are within a short rail haul of the Barge Canal, and that if proportional rates were established to the banks of the canal the freight rate via rail and water would be considerably lower than the all-rail rate, and that, furthermore, a good many thousand less freight cars would be needed each year to move the tonnage, thereby releasing these cars for use in other sections of the country.

There is one more word about the movement of coal. Mr. Baker, in touching on the Ohio River situation, discounts the use of this stream and does not believe it holds much hope in the future. I would like to refer him to the report of the United States Army Engineers, p. 1378, year 1919, in which it is stated that in the season 1917-1918, 558,000 tons of coal were shipped by water, from Kanawha River fields to Cincinnati, thereby relieving great suffering and avoiding economical loss and that had it not been for the Ohio River being navigable and boats available this coal could not have been shipped as the rail lines were badly congested.

In the Jan. 22 issue, on p. 188, Mr. Baker goes into the question of handling freight by rail and after using a set of average figures inquires whether any water line can afford to operate at as low a cost as 1.60 to 2 mills per ton per mile. Now, I submit that this is not a fair comparison for the reason that there is involved movements of tonnage which are not near navigable streams and have no bearing on this subject. I think a more correct way of getting at the comparison would be to get the average rates per ton per mile from the ports of competing water lines to the destination ports and then see how the figures compare and if this is done I am quite sure that it will be found that the water line operating costs are lower than the rail costs for this service.

Haulage Costs Not High on Mississippi

By C. McD. Townsend

Colonel, Corps of Engineers, U. S. A., retired; Formerly President, Mississippi River Commission, St. Louis, Mo.

The writer has been greatly surprised at the conclusions Mr. Baker has derived from his premises. The gist of the earlier articles is a statement of the utter failure as commercial enterprises of recent attempts to navigate the lower Mississippi and Missouri rivers, of those to tow iron and coal on the upper Mississippi River, and of those of the Railroad Administration to establish a paying line between St. Louis and New Orleans. An effort was made to demonstrate the impracticability of river navigation competing with railroads, yet in the issue of Jan. 29, 1920, it is stated that, notwithstanding the disheartening experience of the Inland Navigation Co. and of the practical disappearance of the river as a competitive factor in transportation, there is a chance that the Mississippi may again become an important waterway, and perhaps the Ohio also.

To justify any expenditure for the improvement of the navigability of our Western rivers it is necessary to supplement such damning praise with a clear demonstration that "if this task is undertaken with a clear knowledge of commercial requirements" there is a reasonable probability of success; i.e., it is necessary to analyze the various failures in transportation on our western rivers, to determine the causes of these failures, and to ascertain how, by proper management, these causes may be eliminated.

The writer, during the past thirty years, has discussed many of the points raised by Mr. Baker before various river conventions and committees of Congress and in a paper on "The Utilization of the Navigation of Large but Shallow Rivers," presented to the XII International Congress of Navigation, held in Philadelphia in 1912, he analyzed the performances of railroads and waterways in carrying freight, and suggested certain indices for determining the relative efficiency of various means of transportation. As a measure of the efficiency of the propelling machinery he used the pounds of coal expended in transporting one ton of freight one mile. For determining the general efficiency of the system he selected the number of men employed per 100,000 ton-miles of freight moved.

Cost of Carrying Freight

He was furnished data for the preparation of this paper by the Chief Engineers of the Michigan Central R.R., Lake Shore & Michigan Southern Ry., Pennsylvania Lines west of Pittsburgh, the President of the

Lake Carriers Association, and the managers of many of the steamboat lines on the Mississippi, Ohio, and Monongahela rivers.

From the paper is abstracted the following data:

Railroad or Boat	Termini	Distance Miles	Freight Transported Tons	Pounds of Fuel per Ton Mile	Days Labor per 100,000 Ton Miles
Michigan Central..	Windsor to St. Thomas ...	107	3,300	0.066	1.5
Pennsylvania lines.	Pittsburgh to Ashtabula...	125	2,160	0.124	2.5
"G. W. Perkins"....	Duluth to Conneaut.......	889	10,518	0.029	0.926
"Sprague"........	Louisville to New Orleans	1,330	48,000	0.021	1.31
"Titan"..........	Monongahela River	54	3,500	0.217	5.2
Mississippi Packet.	Mississippi River....	510	440	1.129	65.64

This table is worthy of careful consideration. The track of the Michigan Central R.R. from Windsor to St. Thomas was selected on account of its being exceptionally free from grades and curves, and the performance of the "Geo. W. Perkins" demonstrates that a railway under ideal conditions can not compete with the existing freighters on the Great Lakes. The Mississippi River packet, however, makes a deplorable showing in comparison, but it should be borne in mind that few, if any, railroads in the United States have the ideal conditions selected as a standard, nor can 3,300 tons be hauled by a single locomotive on the ordinary track. (The average load of all freight trains in the United States in 1909 was 356 tons.) Nor does the average freight train travel long distances at the rate of 100 miles per crew day.

If it be assumed that a train crew of five men is employed in transporting 356 tons 50 miles, the index of efficiency is changed from 1.5 per 100,000 ton-miles to 28, and it is probable that a poorly managed railroad in a country with low density of traffic would not make a much better showing than the river packet.

TOWBOAT INVESTIGATION

By authority of Congress, a Board on Experimental Towboats was appointed by the Chief of Engineers, U. S. A., which submitted a report on the proper type of boats and barges to be used for towing on non-tidal rivers, and a reorganized board has been appointed which at the outbreak of the war was engaged in determining, by suitable experiments, with different types of boats, the practical applicability of the conclusions of the original board. For this purpose the board selected the steamer "Nokomis," not, as stated by Mr. Baker, because it represented the latest improvement in river navigation, but on the contrary because, though of the general dimensions of the boat recommended by the original board, it was over twenty years old and had many of the defects that it was desired to correct.

The scheme of the board was first to determine the performances of the old type of Mississippi River towboat, when running without cargo, and then with tows of six, four, and two loaded barges, and afterward to determine what economies could be successively obtained by changing the diameter of her wheel, substituting a feathering wheel for the old type of radial wheel, substituting compound condensing engines for the old high pressure type, and replacing the old Mississippi boilers by those advertised as having greater efficiency.

These experiments were to have been supplemented by others on the "Wm. R. King" and the "Inspector." The experiments were being vigorously prosecuted when the war occurred. The Senior Member and the Recorder of the board were ordered to France; the work was suspended; and the boats transferred to the various agencies which have since been operating them with the result that even the partial data that the board collected has not been utilized.

A comparison of the performance of the "Nokomis," while being employed experimentally by the Towboat Board, with the results, while she was regularly running in the service of the Railroad Administration, is quite illuminating. Under the Towboat Board, with a fixed radial wheel, she towed six barges with a load of 3,189 tons from St. Louis to Cairo and returned with a cargo of 3,039 tons, with the following results:

	Distance, Miles	Freight, Tons	Pounds of Coal per Ton-Mile	Days Labor per 100,000 Ton-Miles	
Downstream....	173	3,189	0.150	3.32 }	—9.29
Upstream......	167	3,039	0.739	15.96 }	

When towing downstream the results are comparable with those of the Pennsylvania R.R., given in the first table, but the tests upstream show that the boat, with her old high-pressure engines, has not sufficient power to economically tow such a load. During the six months, January to July, 1919, while the boat was under the Railroad Administration, the "Nokomis" has a record of 13,254,301 ton-miles, with an average consumption of 0.531 lb. of oil per ton-mile, and a labor charge of 32.46 per 100,000 ton-miles. Assuming that 1 lb. of oil is equivalent to 1.7 lb. of Mississippi River coal, the coal consumption per ton-mile is 0.902 lb. The tests made by the Towboat Board were straight runs, while the records of the Railroad Administration include not only the time in transit but the delays incident to repairs to machinery, time lost by fog and grounding, and time spent in port waiting for the formation of a tow, etc. The following shows the general percentage of operating efficiency during the six months:

	Per Cent
Bunkering oil..................................	1.4
Way Landing	1.6
Machinery delay................................	7.9
Channel delay..................................	0.2
Fogs and night.................................	4.3
Terminal delay.................................	28.4
Running time...................................	56.2
	100.0

REASONS FOR DELAY

A delay of only 0.2 per cent from grounding is indicative of a channel of ample depth, a delay of but 4.3 per cent during nights and fogs demonstrates that the channel has been efficiently bouyed and lighted. While a loss of 7.9 per cent of the time in repairs to machinery merits careful investigation, the item which is financially disastrous to the enterprise is the loss of 28.4 per cent at St. Louis and New Orleans waiting for freight. On the Great Lakes, during the past eight years, the average time spent in port during the season of navigation at both the Lake Superior and Lake Erie harbors during a round trip has been about 30 hours. With the Railroad Administration the time lost at St. Louis and New Orleans per round trip is about eleven days, or one-half the running time. The cause is not difficult to determine. There have been in operation five or six towboats and 29 barges. The experiments of the Towboat Board indicate that with a tow of six barges, averaging about 3,000 tons downstream and returning half loaded, the "Nokomis," even with high-pressure engines, can be operated economically; but this necessitates that on her arrival at port there will be six loaded barges ready for the return trip. With five towboats it was impossible to make such a combination; there were not enough barges for the purpose; and it was necessary to wait in port until the barges could be loaded by antiquated methods.

Another disastrous consequence also resulted from this storage of barges. It was noted that the pay of the crew while the boat remained in port was largely increasing the cost of operation, so the boats were started on their trips without waiting for an economic cargo. The figures stated above would indicate that the average tow of the "Nokomis" was less than 1,000 tons. The experiments of the Towboat Board showed that a reduction of freight towed from 3,000 to 2,000 tons doubled the number of days labor per 100,000 ton-miles. Economical towing has been sacrificed for promptness of delivery.

A similar analysis of the efficiency of the "Scott" when operating in the Missouri River in 1914 shows the following:

	Per Cent
Bunkering oil	1.8
Way landings	
Machinery delay	6.3
Channel delay	10.2
Darkness and fog	37.9
Terminal delays	17.3
Running time	26.4
	99.9

As a large percentage of machinery delays were due to damage to propeller and rudder from grounding, the failure on this river may justly be ascribed to the shallowness of the channel.

The abortive attempt to navigate a 4½-ft. channel in the Upper Mississippi River with cargoes of iron ore drawing over 5 ft., should not be ascribed to a faulty river channel but to the personal equation of the individual who conceived such an idea. Since the signing of the armistice, iron ore has been shipped from St. Paul to St. Louis over the same channel; but in boats drawing 3½ ft. A considerable amount of printers ink has been expended on both experiments, but a demonstration that the depth of channel limits the draft of boats adds little to the advancement of scientific knowledge.

The Towboat Board has, however, ascertained that in deep channels the old type of barge offered a resistance of 2.8 lb. per ton of displacement when towed at a speed of 5 mi. per hour, as in the first experiment, while the new barges employed in the second experiment under similar conditions, had a resistance of but 1.7 lb., a fact which if corroborated by experiments with a draft of 6 ft., will lead to a revolution in barge construction on the Mississippi River.

Nor should too much weight be given to the fact that the "Nokomis" and a number of barges were transferred from the Experimental Towboat Board to a contractor inexperienced in river navigation who permitted the War Department to overload the barges and then attempted to navigate the Mississippi River at a time when ice is ordinarily encountered. The expected happened, and an ice floe overturned two that were exceptionally topheavy The fiasco should be attributed not to the river channel but to the condition of the public mind at the outbreak of the war.

The navigation of the Mississippi was undertaken not as an economic proposition but as a means of supplementing the railroads in getting supplies to France without anyone stopping to consider that there were neither boats nor barges suitable for the purpose. An enthusiastic desire to do things without any considerations of cost swept over the country.

The overhead charge of $272,000 for salaries, quoted from Director Tomlinson, can be ascribed to a desire on the part of the Railroad Administration to demonstrate to the people and Congress that things were being done on a large scale, untrammeled by petty financial considerations.

The writer is not prepared to criticize the Railroad Administration for assuming such a position. In establishing a new industry, judicious advertisement is sound policy, and during the war economical methods were ignored in all Governmental transactions. But our war intoxication is subsiding, and the morning after has arrived with a debt of over twenty-one billions of dollars and annual taxes of six billions. There is danger unless we quickly return to the fundamental principles of economic administration, that the future of inland water transportation will be wrecked.

Why So Many Water Transportation Projects Fail

By P. S. Bond,

Major, Corps of Engineers, U. S. A., Washington, D. C.

Charles Whiting Baker's articles on inland water transport in the United States are of particular interest and value, just at this time, because he looks at the problem from its most important, but hitherto most neglected side—that of economics. He is absolutely correct in his statement that the lack of intelligent planning is the cause of the waste. If those responsible for waterway construction had to earn dividends on their projects, show returns or else stand discredited, there would be a mighty reduction in the waste.

The actual construction work has been well done—too well done in many instances, for the better the work the greater the waste, if the project is economically unsound. What is lacking to success, as Mr. Baker says, is someone with intelligence enough and authority enough to determine which works are worthy and which are not.

The Corps of Engineers of the Army, by virtue of its long experience in waterway construction, has the intelligence, but it certainly has not the authority. Congress has the authority, but it certainly has not the necessary knowledge, based on study and experience. And there is the rub. We cannot create in this country any power superior to Congress, which is the supreme authority in the prosecution of the public works. Congress has never seen fit to delegate its powers in this matter to the Corps of Engineers, nor could it legally delegate such powers to the Corps, or to any other body which Congress itself might create. Congress itself can never acquire the necessary expert knowledge on all subjects, though individuals frequently do become experts along certain lines—as did Theodore E. Burton, for many years chairman of the House Committee on Rivers and Harbors.

The Corps of Engineers is limited by law to reporting only upon the individual and usually unrelated projects which Congress names. It has never been directed or permitted to prepare and make public a broad, comprehensive scheme of inland waterway improvement. Nevertheless such a scheme is the very first step necessary to promote efficiency and eliminate waste. It is very difficult, in fact impossible, to determine whether a certain waterway is worthy of improvement when its relation to other waterways is not definitely determined, when it is not known what the scheme as a whole includes, nor what other waterways will be built. Under such conditions it was to be expected that mistakes, sometimes very expensive mistakes, would be made.

Congress is not bound to follow any such comprehensive scheme, whether evolved by the Corps of Engineers or any other body, whose recommendations would accordingly be purely advisory. Nevertheless, they would furnish Congress with a guide which it has hitherto lacked, and if given wide publicity would cause public opinion to be exerted to influence appropriations of money.

The Chief of Engineers makes public each year figures whose study would clearly show just which projects are earning fair returns on their investments and which are not. But the public cannot readily interpret these figures, which are not presented primarily as economic studies. The public does not realize that they are stockholders in this waterway enterprise, because the profit or loss does not directly affect them as the profit or loss of a corporation affects its stockholders. The average small stockholder takes little interest in the annual statement of his company, but he is instantly alive if a dividend is omitted or an extra dividend declared. This important feature is lacking in governmental projects, and there is the chief difficulty, which cannot be entirely removed.

The success or failure of a private enterprise is determined and known to all solely by the dividends it pays or fails to pay to its stockholders. If it fails to pay, the stockholders demand a new management and new policy. It is very difficult to provide any kind of a substitute for all this in government procedure. Nevertheless we must do the best we can under admittedly difficult conditions.

How Waterways Should Be Managed

The first step, undoubtedly, is for Congress to call for a comprehensive scheme to be prepared and kept up to date by a permanent advisory board, commission, bureau or department. And Congress should then refuse to appropriate funds for any project not recommended by this body. Based on the amount of money Congress deems it wise to expend for the purpose, this advisory body should prepare a program for the most effective expenditure of available funds. Whether this advisory control be exercised by the Corps of Engineers or by a new Department of Public Works, in either case the results would be better. The Corps of Engineers, whose officers hold permanent commissions, are less subject to political influences than any body of civilians. Having nothing to gain and nothing to lose by their support or opposition to any project, their recommendations should, generally speaking, be free from personal or political motives to a greater extent than could be expected if they held office by virtue of political appointment.

The writer has been connected with many waterway projects, and very early came to the conclusion that the economic problems involved were usually more important and more difficult than the engineering problems. He thoroughly believes that these economic problems should receive more consideration than they usually have received. The following are a few of the general economic considerations that are applicable to all projects for inland waterways:

Considerations That Should Govern

1. That the fact that a ton of goods may be moved one mile by water (considering cost of movement only) more cheaply than by rail, which is the favorite argument of the waterway enthusiasts, does not mean that water transportation is always, or even usually cheaper than rail transport. There are many other elements which enter the problem.

2. That in the field of inland transportation, unlike ocean transportation, the waterways and railways are in competition. That railroad transport is the most generally applicable. That an inland waterway to be an economic success must enjoy certain favorable natural conditions, which are few in number and comparatively easy to perceive, although generally overlooked, either through ignorance or intent. That if all these conditions exist in any case (as on the Great Lakes, the waterway is practically certain to be a success; that if one or more of them exist it *may* be a success, but should be carefully investigated; and that if *none* of them exist, as is the case in perhaps the majority of our inland waterway projects, it is a foregone conclusion that the waterway will be an economic failure.

3. That many of the most important items in the economic prospects of proposed waterways have generally been overlooked by their advocates. Chief amongst these oversights have been the following:

(a) Failure to include the cost of the government subsidy as a part of the true cost of transportation. This subsidy includes not only interest on the first cost, but operating expenses, repairs, new capital, and a number of lesser charges.

(b) Failure to accurately predict the traffic possibilities, the rate at which traffic will be built up, and the effects of these on the government subsidy. If the actual traffic should be, for example, only one-tenth that which has been predicted, the government subsidy per ton-mile may be nearly or quite ten times as great as if the predicted traffic had been realized. This is the most important consideration in connection with waterway projects, while at the same time the one which has received the least attention and study. As a consequence the predicted traffic has often failed to materialize and a project which looked promising on paper has proved actually an expensive failure.

(c) Failure to accurately estimate the true cost of carriage on the waterway, as affecting the rates that commercial carriers would charge, and their influence on the growth of traffic. This is closely related to (b) and has been similarly neglected. There is a vast number of items which enter into this cost of carriage, which have frequently been guessed at or entirely overlooked, in the most cavalier fashion by some of our too ardent waterway enthusiasts. It is necessary to follow an assumed shipment through its origin to its destination, carefully estimating all the charges that may be laid against it, such as collection and distribution by rail, terminal and transshipment charges, the influence of vessel types, insurance, delays of all kinds, etc.

(d) Failure to make allowance for the great difference that always exists between the *average* and the *maximum* in all human performances. Because a certain lock has been able to pass a vessel in 15 minutes, it has been estimated that there would be at that lock 4 lockages per hour, for 24 hours and 365 days each year, and traffic predictions actually based on this assumption. Because a vessel will carry 3,000 tons when fully loaded, it is assumed that it will transport 6,000 tons on every round trip. Because a vessel can make 6 miles an hour in a canal, the time of passage is determined by dividing the length of the canal by six. If a vessel has once made a round trip in a week it is assumed that *every* vessel will make 52 round trips, fully loaded in both directions, year in and year out. Such assumptions naturally lead to expensive mistakes. No system of transportation operates like a belt conveyor, yet it has often been assumed that it would.

4. Failure to study the performances of existing waterways, their traffic conditions and the reasons for their success or failure. If the New York State Barge Canal is an economic failure, and there is every indication that it is and will continue to be, that should be a powerful deterrent on the construction of *similar* waterways in other localities, where the prospects are even less promising than they were in New York.

Channel Improvement for Upper Passaic River

A new proposal for reduction of flood losses in the Passaic River valley has been made by Henry B. Kummel, state geologist of New Jersey, in a report to the state's Department of Conservation and Development, just published. Unusual topographical conditions control the problem. The Great Falls at Paterson and a smaller break in profile at Little Falls, at both of which there are now power dams, regulate the discharge to the lower river. The 773 sq.mi. of drainage area above Little Falls include a large extent of marshy bottom lands, of which over 13,000 acres are flooded annually, while in the greatest flood on record (October, 1903) 22,323 acres were flooded. Because of the great storage effect of this marsh area and its value for the protection of the river valley below Paterson the elimination of floods in the marshes is undesirable. Following the 1903 flood a project for permanently ponding the water over the marsh area by a dam at Little Falls was worked out, but this as well as a modified project for ponding only the tributary Pompton River by means of a dam at Mountain View failed to receive approval. Mr. Kummel now proposes channel enlargement from Little Falls upstream to Two Bridges for a capacity of 8,000 cu.ft. per sec., and a somewhat lesser enlargement from Two Bridges upstream to the mouth of the Rockaway River, distances of three miles and ten miles respectively. This improvement, he concludes, would not increase floods from the lower river but would reduce the overflow period of the marshes from an average of twenty-nine to about four days per year. In addition to improving the agricultural condition of the Upper Passaic basin, this would reduce the mosquito crop of the marshes very greatly, he believes. The cost of the project would not be over one-twentieth that of the reservoir.

Composite Distribution System for Small Water-Works

DISTRIBUTION SYSTEMS consisting of cast-iron water mains so located as to supply fire hydrants and of small cement-lined, wrought-iron pipe to serve for domestic supply on minor streets were suggested by E. D. Eldredge, superintendent Onset Water Co., Onset, Mass., in a brief paper read before the New England Water Works Association Feb. 11. The author had in mind places with "a small and variable population in a relatively large area of irregular layout of streets" like the "average summer resort or oldtime village," more particularly in New England.

Mr. Eldredge suggested that the first thing to do in designing such a distribution system would be to locate the fire hydrants. These should be on mains never less than 6 in. in diameter. For street mains on which no hydrants were to be located branches of "wrought-iron threaded pipe, 2-in., 1½-in., or 1¼-in., cement lined, will not only do the work but will do it decidedly better than a larger cast-iron main," Mr. Eldredge stated, "as it is not subject to internal corrosion or tuberculation, and does not produce red water. The author based the foregoing statement on twenty years of personal experience.

What the author described as "the favorite method" of making connections between the cast-iron and the cement-lined pipe is a "tapped tee in the main or a tapped plug in a cast-iron tee or cross. If the branch is to be connected to a main not provided with such a tee, two or more ordinary corporations may be put in, connected by means of a manifold, having all the iron parts cement lined. Iron body gate valves are used, also cement lined, except, of course, the brass working parts."

He also suggested that the best practice would be to have the cement lining of the smaller pipe done by the water-works force, employing for that purpose the same men as lay the pipe. This would afford winter work for the water-works employees.

Would Line Service Pipes Also

House service pipes connected with the cast-iron fire main would in all cases be cement lined also. "For ordinary house services ¾-in. pipe is sufficient," Mr. Eldredge says, "the pressure being about 45 lb. Where the soil is good, particularly if it is sandy, a rigid connection between this sort of service and the cast-iron main is satisfactory." Mr. Eldredge adds: "Not one such connection has failed out of nearly nine hundred. The corporations are tapped level in the side of the main."

In providing for prospective service connections to cement-lined street mains Mr. Eldredge states: "Tees with ¾- or 1-in. plugged branches were introduced at desired intervals as the pipe was laid. The tees were cemented integral with a nipple about 4 in. long. This nipple with the tee combined was screwed into the coupling on the main, thus avoiding the removal of a coupling, and an imperfect joint."

For convenience in handling and inspection it is suggested that a standard length of 2-in. wrought-iron pipe be cut in half before being lined. The shorter length gives better chances for location of tees. Pieces of pipe 4 or 5 ft. in length are kept in stock, "all the couplings well screwed on before lining."

Some Forces in Engineering Education

By Homer A. Watt, Ph.D.
Assistant Professor of English, College of Engineering, New York University

THE various forces operating to direct the current of engineering education may be classified roughly into two divisions, the internal and the external. The first is mainly academic; it is the force created by the pedagogical creeds and special interests of teachers, and its operation tends to result either in a curriculum that represents the co-operative and collective judgment of the different departments of the technical school or in one that shows clearly their relative strength and diplomatic skill. It is not to be supposed that this force ever operates alone or uninfluenced by other forces; nevertheless, it is powerful in its effects for the reason that the men who create it are the ones who determine the content and emphasis of the curriculum. It is important, therefore, to note the center of their interests as contrasted with that of the representatives of the external forces of which I shall speak later. The central interest of most university teachers is in the subjects taught and the methods of instruction, and in the students as students rather than as prospective professional men. Few teachers take into account the service to the community which their engineering students will be expected to render five or ten years after graduation.

> The central interest of most teachers is in the students, as students, rather than as prospective professional men.
>
> ---
>
> The demands of the manufacturing industries tend toward a quantity production of craftsmen by technical schools, while engineers call for quality production of professional men.
>
> ---
>
> The engineer cannot play his part by the side of educated professional men without a broader training in history, English and the social sciences.

Are Industry's Needs Ignored?

The external forces created by the demands of manufacturing industries and the engineering profession have been exhaustively studied by Dr. Mann in the early chapters of his recent report on engineering education. (See *Engineering News-Record*, Oct. 24, 1918, p. 742.) Their strength lies in the fact that their representatives absorb the product of the technical schools. The schools are the factories; the students are the raw material; the industries and the profession are the market—they test the goods that the schools produce and accept or reject them. No technical school that makes any claim to serve the community by training young men can afford, therefore, to ignore the market. Few do so entirely, but it is possible for a school to become so afflicted with ingrowing self-interest that it tends to create a curriculum which does not take sufficiently into account the end for which the institution exists.

Upon such a tendency there is at present no adequate check, for the weakness of the external forces lies in the circumstance that they *are* external; their representatives have no direct voice in determining the content or emphases of the curriculum. It is true that they have some indirect influence, but it is indirect. While the gifts of equipment from manufacturing industries to technical departments of the engineering school may advertise the givers and pave a path from school to factory, they do not entitle the donors to a vote at faculty meetings. Also the engineering profession, keen as is its interest in problems of engineering education, must still rely upon the indirect methods of addresses and special articles, and Mann reports to make its voice heard in the councils.

Perhaps it is not to be expected that this situation can be made radically different, for, after all, problems of instruction are mainly for teachers to solve. I believe, however, that a clearer understanding on the part of teachers of engineering students of what the industries and the profession want is highly desirable, if for no other reason than that the center of interest of the representatives of these outside forces is quite different from that of most of the teachers. The teachers, it has been said, are concerned primarily with the raw material and the process of manufacture, and the outsiders with the finished product. When the teacher has the outside as well as the inside point of view, who can deny that his judgment in planning and teaching will be sounder, broader and better balanced?

Quality vs. Quantity in Schools' Products

Even when teachers become willing to broaden their vision by studying the outside demands they will not find that all difficulties have vanished. They will find, I believe, that the industries and the profession, alike in their interest in the finished product rather than in the raw material and the process of manufacture, are by no means alike in their definition of what the finished product should be. Indeed, the two demands are to a large extent opposite. The demands of the manufacturing industries tend, I believe, to influence the technical schools to a quantity production of craftsmen; the demands of the profession tend, on the contrary, to create a quality production of professional men. I will try to trace these tendencies to their sources, and show also why I think that the second is likely to prevail in its influence upon degree-granting technical schools. It should be understood that I am writing only of general tendencies and not of exceptional cases.

The evidence presented in Dr. Mann's report (pp. 19-20) does not indicate that the manufacturing industries have an overwhelming preference for engineering-school graduates over practically trained men. In fact one-third of the manufacturers questioned for that evidence preferred practical men, and one-sixth had no preference. Evidence which I have gathered in interviews with employers seems to indicate that they do not care where their apprentices are trained provided the young men have certain fundamental qualifications. One employer wanted his employees to possess "analytical power"; another insisted on "intelligence, energy, and judgment"; a third thought that candidates should show "capacity and the probability of being of service to us." No one thinks, of course, that these qualities are the exclusive product of the technical schools. The point of view of the average employer is probably well expressed by the phrase of the last one whom I have quoted; "they must be *of service to us.*"

However philanthropic the employer may be, his chief interest is in his business, and he can no more be expected to retain permanently and after fair trial an inefficient employee than he can be to keep in his shops an antequated and wasteful tool. Hence it is that the various apprentice courses through which new employees are put, though modified, no doubt, by a human interest in the boys, are designed primarily to benefit the employer by making the employees more efficient. If new employees could be put immediately into staff positions this situation would not exist, but, as it is, almost all—engineering-school graduates included—begin in the line and work up, and only a very few get to the top. The manufacturers will welcome, therefore, any process that will shorten the necessary training period and insure enough men for the line positions. For this reason—their busness demands that they be concerned more immediately with the many needed in the line than with the few needed ultimately on the staff—I believe that their influence upon technical schools tends to create a quantity production of craftsmen. And I believe, too, that the pressure for a two-year course almost exclusively technical, a course that would tend to make industrial schools of our engineering colleges, will come from the needs of the industries.

> Manufacturers must not skim the cream of graduating classes to secure mere craftsmen
>
> Engineers and teachers of engineering must see more of each other.
>
> The engineering college which neglects the cultural elements in its curriculum will find itself, in a few years, only an industrial school.

The Professional Point of View

The concern of the engineer as a professional man with the engineering-school graduate is quite different from that of the manufacturer. It is not a business but a professional concern; the engineer sees the technical-school graduate as a new member of the profession. Dr. Mann has pointed out in his report (pp. 18-19) the growing professional consciousness of engineers and their eager desire to define their profession and mark out high standards for it. Just as reputable physicians resent the claims of quack doctors and reputable lawyers those of shysters, so leading engineers object to sharing their hard-won titles and prerogatives with unprincipled and unqualified claimants.

In the 1910 Census Report 208,996 persons reported their occupation as that of "engineer." "Probably not more than 80,000 of these engineers," said Dr. Mann, "could qualify for membership in any of the professional societies mentioned." Engineers who are college graduates with degrees that represent years of arduous and successful study and training do not want to have their honors cheapened by the false claims of craftsmen who, whatever their skill, have nothing of the constructive imagination and scientific equipment of the qualified professional man. In defining and defending their profession, engineers must resist that human desire to get honors cheaply which leads the barber to daub "tonsorial artist" on his shop window, the janitor to prefer the title of "curator," the *masseur* to claim the dignity of the physician and surgeon, and the student to seek a short and soft road to a degree. Engineers, in other words, are at that point in their definition of their profession where the surgeons were when they petitioned George II for a separation from the barber-surgeons.

One definite step which engineers—real engineers—are certain to take in their growing efforts to defend the respectability and define the standards of their profession is to protect the world from a flood of cheaply trained men claiming qualifications which they do not possess. All engineers are not "licensed" or admitted to the bar" as are doctors and lawyers; other means must be taken to protest the profession. Qualification for membership in the engineering associations is one means of protection; another is protection of the engineering degrees. Any cheapening of the engineering degrees is certain to depreciate the value of all technical degrees current; any stiffening of the requirements for the engineering degrees will, on the other hand, increase the value of those held by men already in the profession.

Every influence of the engineers as professional men is bound, accordingly, to be directed toward broadening the curriculum of the technical schools and making engineering degrees more difficult of attainment. Engineers are professionally jealous; they resent the claims of lawyers and doctors to higher places in the service of the world. It will not be found, therefore, that they will favor in the technical schools a short course on the S. A. T. C. Division B model designed for the quick production of a cheaper brand of engineer, a variety like the barber-surgeons.

This professional jealousy of the engineer and his attitude toward engineering education was brought home very vividly to me at a joint meeting of several of the great engineering societies which I attended in New York City, in March, 1919. Several engineers of national reputation spoke on the general subject of the relation of the engineer to society and government. In all the addresses two propositions kept recurring: (1) The engineer has moved out of the hired-man class and is entitled to rank professionally with doctors and lawyers; but (2) he cannot play his part richly and fully by the side of "educated" professional men, without a broader training in history, English, and the social sciences than the engineering schools have heretofore given him. I have heard engineers express these same ideas repeatedly; thy are reflected in the Mann report, and are the frequent subject of articles in the technical journals. A recent example is the article "Engineering Education and Life" by Cyrus Townsend Brady, Jr., in *Engineering News-Record*, Jan. 1, 1920. p. 31.

It would seem, therefore, that the influence of engineers as a profession upon engineering education is as likely to be in the direction of creating a quality production of broadly trained engineers as that of the manufacturers is likely to tend toward creating a quantity production of less qualified men. To these hypotheses I should like to add briefly my reasons for thinking that the professional influence will be stronger than the industrial.

In the first place engineers, as a profession, are more concerned with the technical-school training than are the manufacturers who, as has been pointed out, show no decided preference for college graduates as employees. Even though engineers tend to judge the training given by the results as shown in the graduates, the keenness of their general interest in engineering education is shown by the part played by their societies in the preparation of the Mann report. Moreover, this interest is growing, rather than diminishing, and the examination of the qualifications of technical-school graduates will be increasingly sharp. This means that the profession is much more likely to hold the engineering schools to a strict accountability for its products than are the manufacturers.

Finally, if the analogy between doctors, lawyers, and engineers—which engineers are fond of making—is sound, it is reasonable to suppose that the same evolution which has added elements of a cultural education to the professional training of the doctors and lawyers will repeat itself in the education of engineers. This does not mean, necessarily, that the course will be lengthened; the demand of society for engineers may prevent such an immediate development. It does mean, however, that the broadening of the engineering course by the addition of some of the so-called cultural elements is so inevitable that the engineering college that resists the pressure will find itself within a very few years no longer an engineering college but only a high-grade industrial school granting degrees that cannot compete with those given by technical schools that have higher aims.

Combination of the Three Forces

In conclusion, how should the forces of which I have been writing co-operate to produce professional men of the highest type—cultured and technically qualified engineers.

The technical-school teachers cannot, as I have said, be longer indifferent to the product which they are manufacturing. Self-sufficiency and ignorance of outside demands, and a higher concern for their subjects and their methods than for the qualifications of the graduate to take his place in the world are certain to result in misdirection and even paralysis of their efforts. Nor can they afford to disagree among themselves; while the doctors quarrel, the patient gets sicker. The teachers of technical subjects who assume a contemptuous attitude toward so-called cultural subjects have as much to answer for to the engineers who are demanding a broader training, as have the teachers of cultural subjects who adopt a supercilious attitude toward the indispensable basic technical courses. The only sanity and safety lie in mutual willingness to study the goal of all efforts and bury professional jealousies in the general problem of producing that type of engineering graduate which the experience of leaders of the profession shows to be best.

The manufacturers, for their part, should be willing to do what many are already doing—recruit their line men from high schools and industrial schools and from among those students who have failed to secure their engineering degrees because of fundamental deficiencies of intellect and character likely to keep them from becoming leaders of their profession. They should not skim the cream of each graduating class for the purpose of securing mere craftsmen. Where such men are put through apprentice courses, it should be done with the deliberate intention of developing them for the higher uses of their profession and not of training them for immediate service in one company. By such sacrifice of immediate returns the manufacturers will be doing their part toward the creation and maintenance of high professional standards. If, in addition, they insist upon the possession by engineering-school graduates of such fundamental qualities as reliability, integrity, industry, and accuracy, they will exert upon the schools an influence of undeniable value.

The profession has already done much for engineering education and is prepared to do more. Any machinery which the engineering societies can create for defining the elements that should enter into the training of a young engineer and for bringing their definitions vigorously before engineering school faculties will be of undoubted service.

Engineers and teachers of engineering students must see more of each other. It is true that many teachers of the so-called "engineering subjects" are members of the engineering societies and rub elbows at occasional meetings with engineers—to the mutual benefit, I believe, of both groups. But it is just as necessary that the teachers of cultural subjects who are called upon to train engineering students should know something of the aims and ideals of the great profession. The absence of their names from the rolls of the Society for the Promotion of Engineering Education is but one indication of their lack of interest in the profession for which they are training young men. The line between the inside and the outside must be broken down; it is only by the mutual understanding and co-operation of the internal and external agents that the best type of engineer can be produced and the high standards and ideals of the profession be maintained.

Clays and Shales of Minnesota Inventoried

In order to establish the extent of the presence in Minnesota of clay suitable for the manufacture of brick, a survey of the clays and shales was recently made. The results are given in a full report just published by the United States Geological Survey. The geologic formations of the state and their clay deposits are briefly described, the general distribution of the several types of clay is shown, and the detailed distributions of the clays of the state are described by counties. The motive for the survey was to ascertain the extent of certain deposits that are now utilized at only a few places, to find new deposits, to determine the supply of brick clay available for every town of 1000 or more inhabitants in the state and for every county, and to determine the qualities of the clays in the deposits and of certain mixtures in order to find whether it is possible to make from them refractory wares, pottery, paving brick and other high-grade products. The work was done by Frank F. Grout, author of the report, and other members of the Minnesota Geological Survey, in coöperation with the U. S. Geological Survey.

Heavy Foundation Work for Bascule Bridge at Seattle

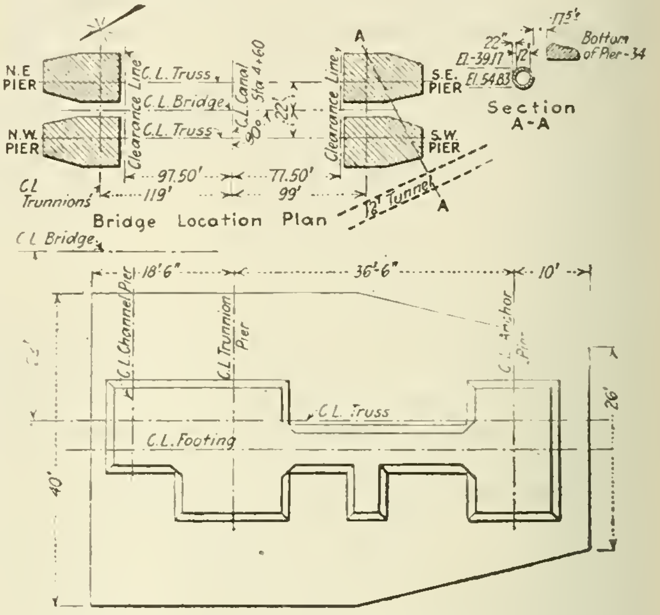
Deep Pile Foundations and Hard Ground Carry Pier Footings — Piles Driven Below Water Without Follower—Tremies Place Concrete in Caissons

By F. A. Rapp
City Bridge Engineer, Seattle, Wash.

TWIN massive concrete blocks about 65 x 40 ft. in horizontal dimensions and over 20 ft. thick constitute the substructure of each of the two piers of a trunnion bascule bridge at Seattle, Wash. A special feature of the work is that deep pile foundations were required one side of the channel, while on the other side the foundation concrete rests directly upon firm material. A view of the foundation work is shown in Fig. 1. This bridge, carrying Eastlake Ave. over the Lake Washington Canal, is of the double-leaf type, with a span of 218 ft. between centers of trunnions. Its superstructure formed the subject of a separate article in the April 8 issue.

It will be seen by the plan, Fig. 2, that the substructure on each side of the canal consists of the two concrete blocks mentioned, each surmounted by a footing parallel with the axis of the bridge. Each footing carries a trunnion pier at the channel end and an anchor pier at the shore end. Deep transverse girders of reinforced concrete between these piers give lateral stability to the structure. Upon the two channel piers rests the steel cross-girder carrying the trunnion bearings, while built into each anchor pier is a structural steel column which takes the uplift of the tail of the bascule leaf. In section, the trunnion piers are 17 x 13 ft. at the footings and 8 x 9 ft. at the top, while the anchor piers are 17 x 10 ft. and 7 x 5½ ft. at bottom and top respectively. The height above footings is 80 ft.

These piers are inclosed and masked by a concrete structure of architectural treatment which resembles a massive bridge pier or abutment. The design of the south pier is shown in Fig. 3. This is in soft material and sand, through which piles were driven by the aid of water jets to reach a bed of hard clay at depths of 40 to 65 ft. below the bed of the canal or 77 to 102 ft. below the water level. The construction on the north side is similar, except that here the concrete foundations rest on hard material at an elevation of about 45 feet below datum or 53 feet below the water line. This material is coarse gravel cemented with clay which affords



Enlarged Foundation Plan of One Pier

FIG 2. LOCATION PLAN OF BRIDGE PIER FOOTINGS AND WATER TUNNEL

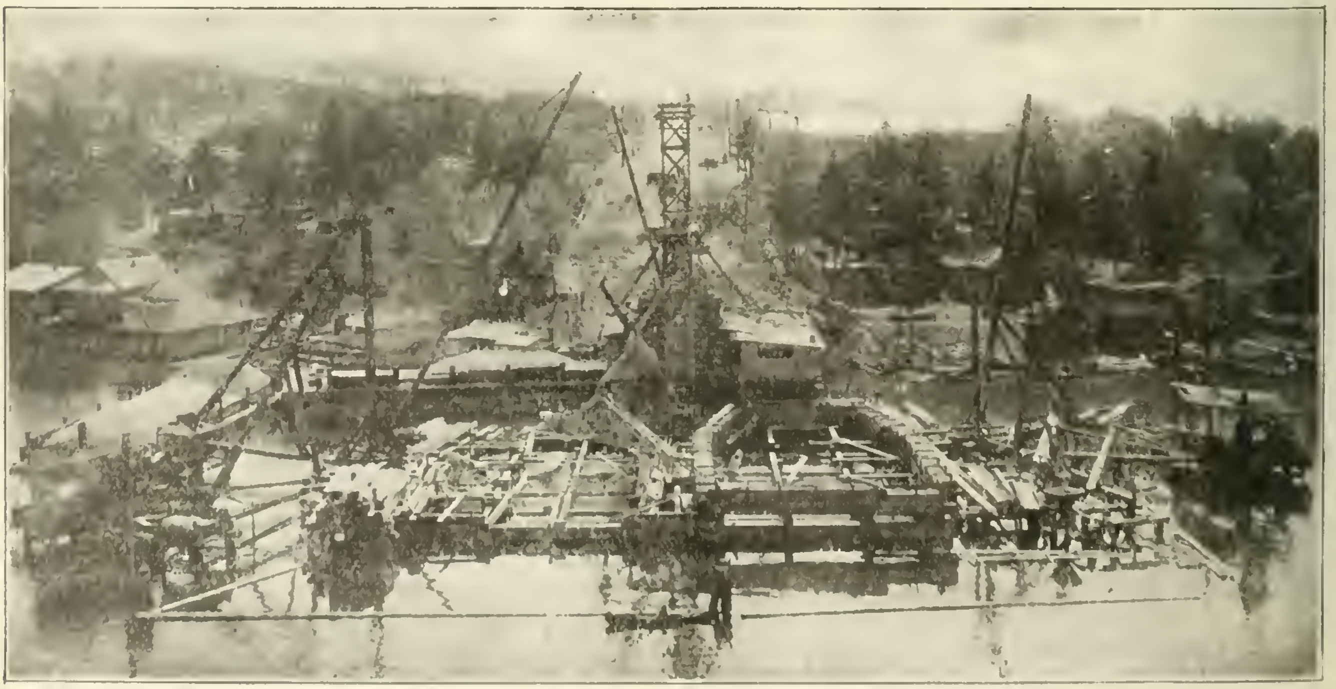


FIG. 1. CONSTRUCTING TWIN FOUNDATIONS FOR PIER OF BASCULE BRIDGE AT SEATTLE, WASH.

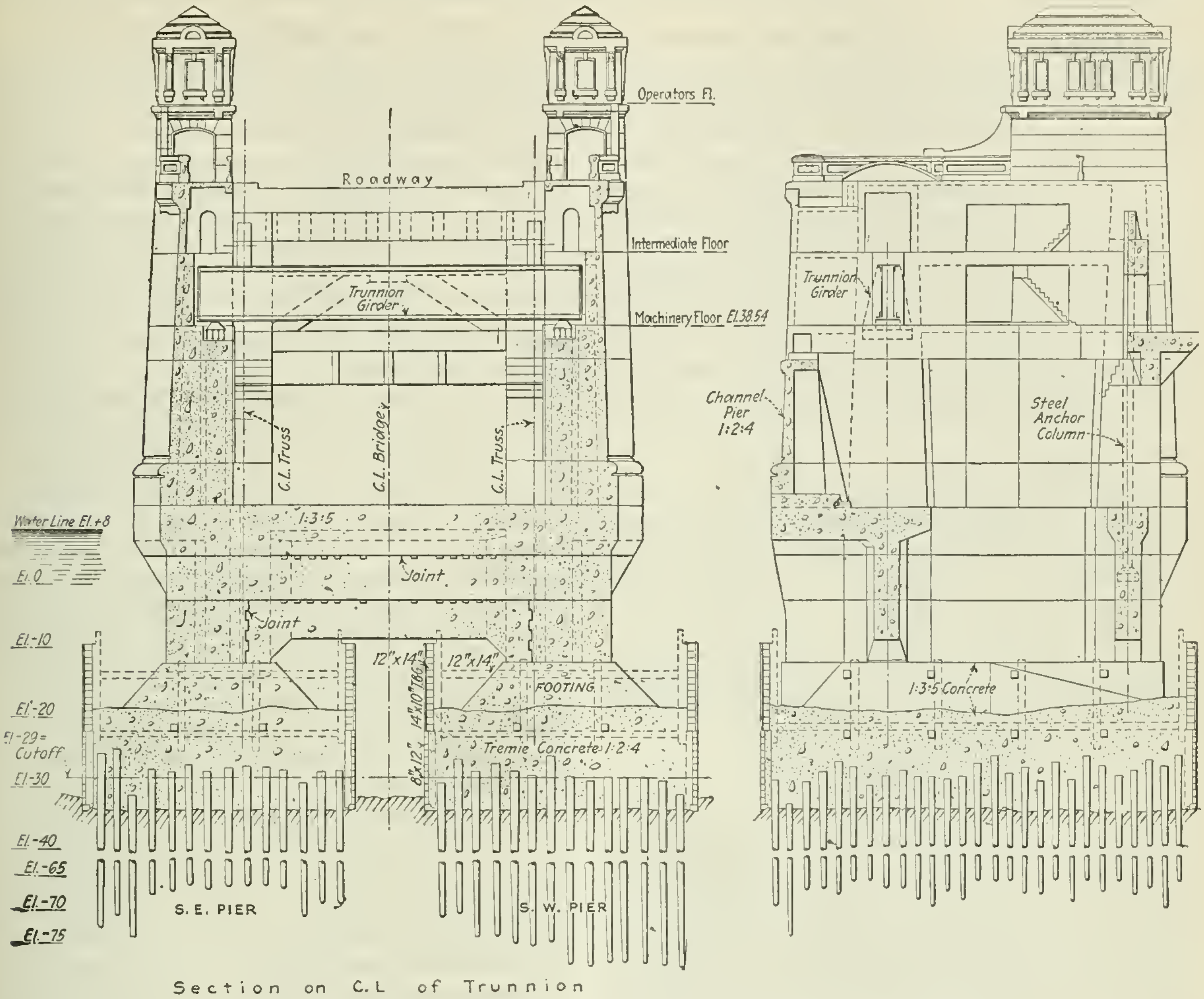


FIG. 3. PIER AND FOUNDATIONS FOR EASTLAKE AVE. BASCULE BRIDGE

ample bearing strength. Loading tests were made on three test piles driven in the foundation area. The first of these had a penetration of 44.4 ft., of which 17 ft. was in a light (almost floating) deposit of vegetable material, leaving a net penetration of 27.4 ft. in solid material. A test load of 54 tons was applied. Settlement during loading amounted to 0.057 ft., with a further settlement of 0.015 ft. in 55 days, as follows: 0.008 ft. first 52 hours; 0.006 ft. next 48 hours, with no additional settlement for 18 days. Some time during the next 23 days a further settlement of 0.001 ft. took place, after which no more settlement was found during 10 days. If the elastic deformation of the unburied portion of the pile is deducted, there is left a net settlement of 0.042 ft. This pile was driven by jetting and hammering, the jet penetrating to about the tip of the pile.

Test pile No. 2 was driven in a similar manner, except that the jet penetrated 1.5 ft. further than the pile and softened the material. The total penetration was 47 ft., with 9 ft. in the soft vegetable matter, leaving a net penetration in solid material of 38 ft. The applied load was 52.1 tons. Settlement during loading, 0.027 ft.; this remained constant for seven days, when an additional settlement of 0.001 ft. was observed on the tenth day after loading. No further settlement was measured in the next 46 days. The elastic deformation on this pile, figured similarly to the preceding, was 0.024 ft., leaving a net settlement of 0.003 ft. On the assumption that this pile is supported by skin friction on the area of the surface of the pile embedded in solid material there results a load of 840 lb. per square foot of such surface.

Test pile No. 3 was driven and jetted like the others, the jet in this case penetrating 5 ft. below the lowest point of pile so that the material was much worked. Total penetration 41 ft., all in solid material. Under the load of 52.1 tons the total settlement two days after loading was 0.015 ft.; this increased to 0.017 ft. after five more days, when it remained constant for 13 days. It showed a total of 0.018 ft. in 43 days after loading, with no increase up to 56 days. Figuring the elastic deformation in the same manner as before at 0.014, leaves a settlement of 0.004 ft. Calculating the skin friction under total load, this amounts to 720 lb. per square foot.

A water-supply tunnel of circular section, with an outside diameter of 15 ft. 8 in., crosses the lake at this point and has its top 5 ft. below the bottom of the footings, as shown in Fig. 2. It makes an angle of about 25° with the axis of the bridge and at the nearest point is 17.5 ft. from the south pier. Transit sights were placed and levels taken, but continuous observations made during the progress of the piledriving showed no measurable displacement of the tunnel.

Foundation piles were placed by driving and jetting, the piledriver being mounted on a timber framework. Instead of using a follower, the drophammer was worked under water, moving in a guide tube which enclosed the pile. Excavation to the approximate level of the footings was done by a hydraulic dredge and then each of the piers was enclosed with a line of piles capped by a 12 x 12-in. timber. On these caps was laid out a system of longitudinal and transverse range lines whose intersections indicated the location of the foundation piles. The piledriver was mounted on stringers on this framework.

In all, 676 piles, ranging in length from 28 ft. to 62 ft., were driven to the desired depth in 45 days. The length of each pile was obtained by sinking a water jet to the hard stratum and making a measurement of the penetration. The piles were so accurately driven that the cribs or open caissons were sunk in place without striking any piles, although the centers of the outer piles were within 20 in. of the outer edge of the footing. The piles were delivered on the lake in rafts and handled to the driver by a stiff-leg derrick mounted on piles at one side of the foundation.

Caisson Construction

Construction of the caissons for each pier was started at a wharf on the north shore of Lake Union, which served as a framing yard. Material was handled from the wharf to the caissons in the water by a stiff-leg derrick mounted on piles driven alongside the location of the north piers. This derrick was designed and located also for use in handling concrete materials, etc., in the later stages of the work. The lower portions of the caissons were floated into approximate position at each pier site, finished in place, and sunk into final position by weighting with gravel disposed in boxes around the upper rim of the caisson.

These caissons follow the usual type of construction. The sides of the lower portion containing the seal are made up of 8 x 12-in. timbers on edge with 12 x 12-in. interior braces placed about 6 ft. apart vertically and about 13 ft. horizontally. The lower portions of the walls of the unwatered portion are made up of 12 x 14-in. timbers laid close on the 14-in. sides, with the interior braces about 4 ft. apart on centers vertically. This latter distance gradually increased to about 6 ft. near the water surface, where the side-wall timbers are reduced to 12 x 12-in. That portion of the caissons above a line about 6 ft. below the top of the seals was covered with 4 x 10-in. tongue-and-grooved sheathing. Above a line about 20 ft. below the water surface this sheathing forms the side walls of the caissons, backed by 12 x 12-in. wall timbers about 4 ft. apart on centers, increasing to about 6 ft. at the water surface.

After the caissons were sunk into position it was found that about 2 ft. of fine clay had slipped into the foundation of the north piers and 3 or 4 in. of silt in the south pier excavation. This was removed in both cases by means of a sand pump manipulated on the bottom by a diver.

Concrete placed under water by means of tremies was used to seal the caissons, the seal at the north piers being about 23 ft. thick, with bottom of footing 54.5 below the surface of the water. At the south pier caissons the seal was 15 ft. thick, with the bottom of footing 43 ft. below the surface of the water. All tremie work was done in a continuous operation, except for a few temporary breakdowns. A total of 6,493 cu.yd. of 1:2:4 concrete was deposited in 261 hours gross time by means of two 1-yd. mixers discharging by spouts to a 10-in. tremie, giving an average rate of deposition of 25 cu.yd. per hour. It was found that concrete that would flow readily in metal spouts inclined 1 on 3 would flatten out and flow for a distance of 30 ft. at a slope 1 on 6.5 under water.

During the placing of tremie concrete careful soundings were taken every few hours to ascertain if the concrete was flowing over and around the bracing timbers which it was necessary to leave in the lower portions of the caissons. It was necessary on this account, from time to time, to lift the tremie and place it in another pocket. This was done, however, before the concrete in that pocket had reached its initial set. Some laitance was always found at the foot of the slope, and it was the endeavor to keep the foot of the slope at the sides of the caisson and carry the laitance up with the work by keeping the tremie always well buried in the concrete. Examination after the caissons were unwatered disclosed hard, dense concrete without any lamination except in some small spots and on the toe of the southwest pier.

The caissons were usually unwatered about two weeks after the placing of the seals. Three days after unwatering the southwest pier the north end of the caisson lifted, opening a joint of about 1 in. at the line of junction between the lower 8 x 12-in. uncalked timbers and the 12 x 14-in. calked timbers. A small amount of the seal concrete was lifted over a joint that marked the deposition of concrete to level up the seal on top of some concrete that had apparently reached an initial set. Drill holes were put down all over this area and grout forced in through pipes until the joint was filled satisfactorily.

Concrete material was delivered on barges to the side of the plant, whence it was handled by a grab bucket swung from the derrick in rear of plant to hoppers over the mixers. From these hoppers the sand and gravel descended by gravity to the measuring hoppers, one for each mixer, on each side of the hoisting tower. The cement was passed in and added on this level, water being added as the materials were dropped into the mixers immediately back of the hoisting tower.

Both mixers discharged into a common central chute emptying into a self-dumping hoisting bucket in the tower. The concrete was deposited at any point of each pair of piers by a chute from the tower hopper into which the hoisting bucket emptied. This hopper was adjustable for height to accommodate the rise in the plane of deposition as the work progressed, and to secure the necessary slope of the chute to reach all parts of the work.

This substructure work for the Eastlake Ave. bridge was completed in 1918. It was in charge of the writer, under the direction of A. H. Dimock, city engineer. The architectural design was worked out by D. R. Huntington, city architect. The firm of Booker, Kiehl & Whipple, Seattle, Wash., was the contractor.

Hudson Vehicle Tunnel Designs and Bidding Methods

Chief Engineer Holland, in Sharp Rejoinder to General Goethals, Condemns Latter's Reasoning on Comparative Strengths of Different Designs—Bids on General Specification of Size and Location Not Competitive

IMPORTANT questions of engineering and construction methods raised by the recent memorandum of General George W. Goethals on the Hudson River vehicle tunnel (*Engineering News-Record*, April 8, 1920, p. 729) are treated in a reply to that memorandum prepared by C. M. Holland, chief engineer to the Joint Interstate Tunnel Commissions, under date of April 5. This reply, which bears the endorsement of four members of the Board of Consulting Engineers (Colonel W. J. Wilgus, J. A. Bensel, Wm. H. Burr, J. V. Davies), is reprinted herewith in slightly condensed form.

Dealing with the subject of shell strength, the reply lays emphasis on the stresses produced by excess ground pressures during construction when only part of the material is taken in during the advance of the shield. It condemns gravel packing for filling the space back of the shield tail, as unworkable under Hudson River conditions. It criticizes General Goethal's method of computing tunnel stresses; tunnels which proved weak in practice would by this method be shown to be safe. With respect to flotation, the risk of disintegration of the mortar in the joints between the concrete blocks, and cost of construction, it reasserts the position taken in the chief engineer's report on tunnel plan (*Engineering News-Record,* Feb. 19, 1920, p. 357), and in the statements of Mr. Holland and Colonel Wilgus on the Goethal's plan (March 25, 1920, p. 624).

A new point is brought up in comment on the proposal that bids be asked on general plans of capacity and location only, so as to secure contractors' bid figures on various types of tunnel. This proposed method is declared to be impossible, and to fail to produce comparable and competitive bids; it "would only lead up to hopeless confusion without any possibility of making an award."

Two-Level Tunnel Abandoned for Twin Tubes

The outstanding features of the communication from General Goethals are the abandonment by him of the plan he has heretofore advocated of a single, two-level tunnel, 42 ft. in diameter with 22-ft. 6-in. roadways, which has been under discussion, and the proposal to undertake the construction of the tunnel by unusual methods, with the elimination of engineers and the substitution of contractors, with a further proposal in regard to the choice of bids which is impossible of execution under the law.

It is now proposed by the communication in question to substitute twin tubes, 36 ft. 6 in. in diameter, with a 25-ft. roadway in each tube. The change of plan providing twin tubes 36 ft. 6 in. in diameter is accompanied by the same statements of great savings with which the single-bore 42-ft. tunnel was originally submitted, and no detailed information is now submitted which in any way changes the opinions which have already been given to you in regard to the defects of the plan of construction which is still adhered to, namely, the use of the loose concrete blocks for the tunnel envelope, the severing of Watts St., the pocketing of traffic in Canal St., the occupation of valuable waterfront property, and the exposure of the top of the tunnel at the 50-ft. U. S. improvement plane.

The complete absence of detailed information as to how the estimate of cost for the twin tubes is arrived at leaves the question of cost as indeterminate as it was before, but I submit that, even if the loose concrete-block tunnel could be built, twin concrete-block tubes, 36 ft. 6 in. in diameter would certainly cost more than the twin cast-iron tubes, 29 ft. in diameter, as recommended to the commissions in my report of Dec. 31, 1919.

In the communication in question, General Goethals has referred to a certain type of brick tunnel built a number of years ago and now forming a part of the Hudson tubes. It may be said in relation to this, without going into detailed explanation, that whatever this method of building tunnels was, it has been abandoned, and the fact remains that it was not succesfsul either as regards a structure or as a method of tunneling, and the completion of the tunnel was dependent upon execution of the same by the shield, with a cast-iron lining.

General Goethals, in the communication in question, still adheres to the necessity for three lines of travel in each direction. He has, however, changed the width of roadway from 22 ft. 6 in. to 25 ft., which latter width is still insufficient for three lines of traffic. He neglects, as heretofore, to show how three lines of travel can be accommodated in the street systems serving the tunnel.

Pressures During Tunnel Construction

General Goethals, in discussing the loads coming upon the tunnel, is not properly informed as to the conditions attending tunneling operations under the Hudson and East Rivers. He talks about the distortion which took place in the Pennsylvania tubes and will take place in any other shield-driven tunnel unless provision is made for the use of a filling material in the annular space around the tunnel as being due to the kinetic energy of the moving materials. The distortion could not be overcome by the ejection of gravel behind the shield. The distortion of the Pennsylvania tunnels and other tunnels built under similar conditions is mainly due to the pressures set up in the river bed itself when the shield is shoving without taking in the full amount of material. This is proved by the fact that the maximum distortion of the tunnel does not take place immediately upon leaving the tail of the shield but a considerable time thereafter. As another evidence of General Goethals' complete ignorance of conditions to be met in driving the tunnel, he states that this distortion has made it necessary to support the interior of the tunnel by vertical timbering and horizontal tension members. The method of support which he proposes instead of helping would greatly increase the distortion.

Gravel Packing Behind Shield

General Goethals states that the safe construction of the proposed concrete-block tunnel involves improved methods that result in the tunnel being built to the actual outside diameter created by the shield in its travel forward so that the surrounding material is not allowed to move and is constantly supported as the shield moves forward. By these methods, he probably refers to the proposed ejection of gravel, which experience has shown would not be workable under Hudson River conditions; so, as far as this feature is concerned, the method of construction for the concrete-block tunnel would necessarily have to be the same as that heretofore used for the cast-iron tunnels. If the pressure diagrams of the Pennsylvania tubes taken months after their construction give the forces which it would be expected would come upon the concrete-block tunnel, it would be essential to excavate all the material instead of displacing it, a method of construction which increases progress and thereby reduces the cost. Unless this is done, the disturbance of the material pushed aside would cause greatly increased pressures on the tunnel ring.

It is distinctly interesting to have General Goethals try to tell about the great advantages to be obtained by forcing gravel under high pressure into the annular space left by the shield, with the statement that, "The use of this gravel packing is not the result of theorizing, but one of hardheaded practical experience and amply demonstrated as to its effectiveness through continued use by practical tunnel builders." This method was introduced and used in connection with the construction of the land portions of the East River tunnels. (It was not used under the river, as has been erroneously stated.) These tunnels were constructed under the direction of your chief engineer while Tunnel Engineer for the Public Service Commission and it was under the direction of the engineers of his staff that the methods were made practicable and workable. The advantage to be obtained by this method may therefore be assumed to be equally well, if not better, known to your engineers as to General Goethals.

TUNNEL SHELL STRESSES

General Goethals states that we have applied assumptions to the concrete-block tunnel in analyzing the stresses in it, which will also show unsafe stresses in the cast-iron tunnel if applied to it similarly. He further states that, "these assumptions applied to a block tunnel for a material having a stiffness expressed by an angle of repose of 13°, leads to results that indicate the unsafeness and structural defectiveness of the block tunnel." Also, he states that for this same condition of loading he calculates the tension in the cast iron to be 9,800 lb. per sq.in. This stress is far within the modulus of rupture of the cast iron used in tunnel lining, and therefore, in accordance with his own analyses, the concrete-block tunnel is not comparable with the cast-iron lining under the same conditions of loading. His analyses check the results of those made in this office, in that the active forces represented by the materials show that under the most ideal assumptions for the perfect fitting of the block and shape of the ring the concrete-block ring would be utterly destroyed by such forces, while the cast-iron ring would be heavily stressed, but far from the point of failure.

It is not contended by your engineer that the analyses, based on the assumptions, give definite stresses but that they only afford comparable studies under assumed ideal conditions which are never realized in practice and which even General Goethals admits are indeterminate.

General Goethals states that "The individual voussoir blocks making up the concrete tunnel ring are bolted one to the other throughout the length of the tunnel. These bolts perform the same function as do the bolts used in bolting up the rings of the cast-iron tunnels." This statement is not true, as the bolting provided in the concrete-block construction serves only to tie adjacent rings together, without any bolting between individual blocks in the same ring, as is provided in the cast-iron ring recommended by your engineers. The fundamental difference between the concrete-block ring construction and the cast-iron ring construction is that one ring of blocks cannot stand up without the support of the adjacent rings of blocks, whereas each cast-iron ring is self-supporting.

General Goethals states that he has applied the normal pressure formulas as checked by Pennsylvania pressure diagrams to the 42-ft. concrete-block tunnel, the 29-ft. cast-iron tunnel and the Pennsylvania tubes and he gives the stresses obtained in the various tunnels by this method, which he claims is the proper method for analyzing the strength of the tunnel ring and on which basis he finds that the 42-ft. concrete-block tunnel ring is safe. If this method of analysis were applied to tunnels which experience has shown to be insufficient to withstand the pressures under the Hudson River, he would most certainly find these tunnels safe. The old Hudson River tunnels, which proved inadequate to stand the strains imposed upon them, would figure safe under this assumption; the Pennsylvania R.R. "light iron" tunnels would figure safe under this assumption. This light-iron tunnel of the Pennsylvania R.R., however, was by actual experience found to be insufficient in strength and a heavier lining was substituted and used for the entire length of the North River tunnel through the silt. These tunnels were completed in 1907 and as late as 1911, after all the experience gained in driving these tunnels was perfectly digested and understood, General Charles W. Raymond, Chairman of the Board of Engineers of the Pennsylvania Railroad Tunnels, made this statement: "The main reason, however, for increasing the thickness of the lining was, if my memory is correct, to strengthen it to resist the strains to which it would be subjected during construction. In view of the fact that a number of plates were cracked during construction this now appears to have been a very wise precaution."

WHICH TUNNELS WOULD FLOAT

Discussing flotation, General Goethals states that "Provided the material had no cohesion, it is true theoretically that the block tunnel would float as stated by your engineers. But why conveniently apply this condition only to the concrete tunnel? The same reasoning shows that not only would your proposed 29-ft. cast-iron tunnel float during construction, but likewise the existing Pennsylvania R.R. tunnels would have floated." Special precautions can be taken to hold a tunnel down during construction, but it is the permanent condition of the tunnel which is a matter of concern. Comparing the completed structures of the 42-ft. tunnel, the Pennsylvania R.R. 23-ft. tunnel and the 29-ft. tunnel recommended by your engineers, it is found that, for the condition where the 42-ft. tunnel would float, at 3° 50′ as well as for any other condition, the Pennsylvania tubes and the 29-ft. tunnel have a much less tendency for flotation than the 42-ft. tunnel. * * * * The concrete-block tunnel 42 ft. in diameter weighs 71,740 lb. per lin.ft., while it displaces 88,670 lb. of water, and when it is remembered that the silt is in almost a fluid condition at the bottom of the river, it should be apparent to any ordinary man that the tunnel would be in serious danger of flotation. The 29-ft. cast-iron tunnel, completed with its lining, is actually heavier than the water it displaces.

GROUTED JOINTS NOT WATERTIGHT

General Goethals states "All joints between blocks of the concrete tunnel are so designed that they can be readily filled with cement under pressure throughout the area of their faces. To say that this tunnel cannot be made watertight is to ignore the actual accomplishment of the result in tunnels of this character built and building." General Goethals apparently has not studied the photographs of the tunnels to which he refers, for if he had it should be apparent that watertightness has not been secured, although the materials through which the tunnels have been built are not in any sense comparable to the water-bearing ground under the Hudson River. *Watertight joints cannot be obtained by the grouting methods which General Goethals proposes.*

General Goethals states that he bases his estimate of $12,000,000 for the 42-ft. concrete-block tunnel, which he has now abandoned, upon the experience of the O'Rourke Engineering Construction Co. in work of this character, who report such figures from the imagined cost of their patented type of construction, for which there is no basis as it has never been tried under conditions similar to those to be met with under the Hudson River. This estimate differs from all the figures in regard to construction cost for tunnels already built, and the Chief Engineer and the Board of Consulting Engineers have reported the cost to the commissions based on detailed analyses of costs derived from actual experience in building existing tunnels in this locality.

PROPOSED METHOD OF BIDDING IMPOSSIBLE

General Goethals criticises the commissions for not having followed his recommendation, and states that, had his recommendations been followed, definite data as to costs could have been obtained over a year ago, and immediately thereafter the type of tunnel settled and construction commenced. General Goethals must know that the method he recommends is absolutely impossible. He states, "My recommendation was to invite definite bids from the three or more large engineering construction concerns experienced in tunnel construction." Such a procedure would be entirely improper in letting public work, for the commissions cannot select bidders. He further proposes that "these bids be limited only to tunnels having a certain width of roadway, and for the location Canal St. to 11th St. The type of construction, single or twin tunnels, was to be left open and the bidder was to be invited to submit *bona fide* bids on concrete-block, cast-iron and open-trench types, and time required to build." This would be impossible of procedure as it would not afford comparative bids, and would not be competitive bidding as required by law. In fact, all the commissions would obtain would be the assertions of contractors, without any possibility of a determination of the relative merits of the different bids.

Next he proposed that "The bidder would be required to submit detail plans on which his bids were based, and for which actual cost of preparation would be paid upon rejection." This would be an entirely unexampled procedure of paying contractors for the submission of their designs, and would land nowhere.

Again, he proposed that "The bids would be based on general specifications only, and the bidder was to be required to furnish ample bonded security to protect the commissions and place full responsibility on the prospective contractor." Bids based on general specifications would not be on a comparable basis.

Taken altogether, the recommendation of General Goethals as to method of procedure shows an absolute lack of knowledge in regard to what is required in the public letting of contracts, which in brief require a sufficiently developed plan so that bids may be compared based on that plan. In other words, every plan on which bids are asked must be developed to the extent of making it possible for the engineers of the commissions to make a comparative estimate, from which the low bidder may be determined, and any departure from this plan would only lead up to hopeless confusion, without any possibility of making an award.

The law requires that you should have a competitive bid. The only way that you can have a competitive bid is by a request to have a bid on a definite plan of construction. General Goethals' scheme involves the abandonment of this procedure and is not worthy of any consideration whatever.

Alleged Saving of Cost

General Goethals in conclusion states that, "The paramount question still remains: Will your commissions, simply because fearful of attempting something which heretofore has not been tried out in its entirety, recommend the expenditure of 26 to 30 millions to create facilities for vehicular crossing of the North River, when 10 to 12 millions less than this amount will accomplish the desired end?"

On one side the commissions have before them a carefully prepared plan and estimate, and on the other side, a statement from General Goethals which he confesses is based on assertions of cost given by a contractor for a method of construction which has never been used under conditions similar to those which are to be encountered in building a tunnel under the Hudson River. No basis has ever been submitted to the commissions by which they could judge in any way of the adequacy of the figures which have been given. There can be no fact, no assurance, because the methods proposed are entirely unknown and have never been used under conditions governing the construction proposed, and are altogether in a field of conjecture and outside of any definite experience in subaqueous tunnel construction; and the assertion that the proposed methods of construction would save 10 to 12 millions can be accepted, if it is desired, but a study of what has been submitted leads your engineers to maintain that, not only would 10 to 12 millions not be saved, but that whatever money was expended in this experiment would simply be wasted, and the whole undertaking would end in disaster.

Respectfully submitted,
C. M. Holland,
Chief Engineer.

Approved:
W. J. Wilgus,
Chairman, Consulting Board;
J. A. Bensel,
W H. Burr,
J. V. Davies

Fires in Treated Bridge Floors

INVESTIGATION of three bridge-floor fires has been made by a committee reporting at the recent annual meeting in Chicago of the American Wood Preservers Association. The object was to determine whether the use of treated timber had increased the fire hazard

The Belle Isle bridge in Detroit was destroyed May 1, 1915. The floor was of 3½-in. creosoted blocks laid on 4-in. plank, supported by 4 x 14-in. joists, all creosoted. The commonly accepted theory of the origin of the fire is that a strong wind carried sparks from a municipal asphalt-repair wagon to dry, untreated and partially decayed sidewalk timbers where they were finally fanned into flames. The wind rapidly communicated the flames to the creosoted timber substructure from which it spread without hindrance.

Sparks from an engine passing under the Missouri River bridge of the Union Depot Bridge & Terminal R.R. at Kansas City in August, 1919, set fire to a large bird's nest of straw on the under side of the bridge. The fire was communicated to the creosoted ties and 2-in. longitudinal planking laid on the ties to form a motor-way for automobiles. There is no water line on the bridge and it was 45 min. before sufficient hose could be laid from the city mains to reach the fire. By not allowing the firemen to tear up the planking, thereby creating a draft, the fire was kept in a smoldering condition underneath the planking, and easily put out in 15 min. by playing the fire streams from below. Surface charring of the timbers was caused by the burning of the creosote. The replacement of a few planks along the edges was the only repair work done.

Several years ago a fire of unknown origin on the same bridge but not near the undercrossings gained great headway because the firemen tore up the planking ahead of the fire in an attempt to cut it off. This created a draft and increased the spread of the fire causing a loss of 600 ft. of bridge flooring and such severe twisting of the rails and steel floor beams as to require their renewal.

At Portland, Ore., on July 30, 1913, 430 ft. of the upper deck of a bridge belonging to the O. R. R. & N. Co. was burned, entailing a loss of $45,000 to $50,000. With the exception of the planking in the two sidewalks the entire floor system in the upper deck was made up of creosoted Douglas fir. The fire is supposed to have started on some untreated lumber located on the bottom chord of the lift span. In replacing that portion of the floor which was destroyed by fire, the railroad sheathed the under side of the timber in the upper deck with galvanized iron for the purpose of minimizing the possibility of another fire. The railroad subsequently placed asbestos boards on the under side of all timber in the upper deck not covered by galvanized iron.

Warm Springs Dam Not Constant-Angle Type

In the description of the Warm Springs dam in the *Engineering News-Record*, March 4, 1920, p. 474, it is erroneously stated that the structure was designed according to the constant-angle arch theory as propounded by L. R. Jorgensen. A. J. Wiley, consulting engineer for the Warm Springs Irrigation District, states that the dam is the ordinary type of constant-radius arch dam.

Federal Engineers Classified As To Duties and Pay

Keating Commission Submits Report to Congress Covering All Government Employees at Washington

DEFINITE recommendations governing the reclassification and compensation of Federal Government employees at Washington, D. C., including those in the various engineering and scientific branches of the service, are contained in the report of the Keating Commission, which was recently presented to Congress and which represents the results of about a year's investigation. The commission was formed by legislative act in 1919 to study the rates of compensation paid to civilian employees in the various government departments in the District of Columbia and to draft a bill providing for carrying out such changes in classification and compensation as might be recommended. In all, 107,000 employees have been classified at an estimated cost of $275,000; of this number about 2,600 are engineers.

The report specifies 1,700 classes of service, presents figures covering maximum and minimum compensation in each class, and contains recommendations as to promotions, both within classes and from one class to another.

The portion of the report dealing with the Engineering Service follows:

Engineering Service

This service includes classes of positions, the duties of which are to supervise or to perform work involving the application of the principles of science to the design, construction, operation, maintenance and valuation of public works; to the generation, distribution and utilization of electrical energy; to the design and construction of ships and aircraft; to the design and construction, maintenance and operation of prime motors and machinery; to the extraction of minerals and petroleum from the earth and their conversion to industrial use; to the conservation and development of forest resources and wood products, or to other specialized lines of engineering activity.

Aeronautical engineering
Automotive engineering
Cadastral engineering
Cartographic engineering
Ceramic engineering
Civil engineering
Classes common to all engineering series
Electrical engineering
Forestry
Highway engineering
Hydraulic engineering
Hydrographic and geodetic engineering
Landscape architecture
Marine engineering
Materials engineering
Mechanical engineering
Mining engineering
Nautical engineering
Naval architecture
Ordnance engineering
Petroleum engineering
Radio engineering
Structural engineering
Topographic engineering

Note: The commission has not placed architects and chemists under the engineering service. Each group, such as aeronautical engineering, automotive engineering, etc., is divided into classes. Some of the groups, such as cadastral engineering, do not contain the full number of classes found under civil engineering. The group specifications, lines of promotion, and compensation for civil engineering are given below.

CIVIL ENGINEERING

Title of Class:
CIVIL ENGINEERING DRAFTSMAN

Specifications of Class

Duties: To perform, under immediate supervision, routine drafting work in connection with the preparation of plans for civil engineering projects; and to perform related work as required.

Examples: Making tracings from original drawings; making drawings of minor importance; filing and indexing drawings; lettering, computing and revising.

Qualifications: Training equivalent to that represented by graduation from high school; not less than two years' experience in engineering drafting work; and ability to letter and to make simple calculations.

Principal Lines of Promotion

From: Copyist draftsman.
To: Junior civil engineer.

Compensation for Class, $1,200-1,800.

Title of Class:
CIVIL ENGINEERING AID

Specifications of Class

Duties: To perform, under immediate supervision, minor technical work in any branch of civil engineering; and to perform related work as required.

Examples: Making measurements and estimates in the field; acting as recorder or computer in laboratory, field, or office; operating and caring for surveying instruments; computing data for reports or records; plotting notes and maps; preparing working drawings where design is furnished.

Qualifications: Training equivalent to that represented by graduation from high school; not less than two years' experience in engineering work; familiarity with the use of the slide rule; and ability to do lettering and drafting and to make simple engineering computations.

Principal Lines of Promotion

From: Junior engineering aid.
To: Junior civil engineer.

Compensation for Class, $1,200-1,800.

Title of Class:
JUNIOR CIVIL ENGINEER

Specifications of Class

Duties: Under immediate supervision, to perform routine surveying, computing, drafting, and inspecting, on survey, construction, or valuation work; and to perform related work as required.

Examples: Surveying with transit or level; using measuring devices for stream gauging; inspecting structures during construction and after completion; assisting in laboratory tests of structural materials; preparing charts for statistical and engineering data; laying down lines for building foundations; drawings and tracing plans; making plane table surveys; developing and drawing details of maps and charts; lettering; giving line and grades for highway construction; keeping cost data serving as boat officer or as assistant in hydrographic, geodetic, and astronomic parties.

Qualifications: Training equivalent to that represented by graduation with a degree from an institution of recognized standing, with major work in engineering, preferably in civil engineering.

Principal Lines of Promotion

From: Civil engineering aid; civil engineering draftsman; cartographic draftsman.
To: Assistant civil engineer; assistant topograph engr.; assisant highway engr.; asst. hydraulic engr.; asst. hydrographic and geodetic engr.; asst. structural engr.; asst. cartographic engr.

Compensation for Class, $1,800-2,160.

Title of Class:
ASSISTANT CIVIL ENGINEER

Specifications of Class

Duties: Under specific administrative and technical direcection, to be responsible for the conduct of the work of a minor subdivision of a civil engineering organization; to collect and compile data for specific items of civil engineering organization; to collect and compile data for specific items of civil engineering studies; to take immediate charge of field survey projects in, or of the design, inspection and construction of minor civil engineering work; to lay out and develop work from specifications and to supervise the work of a drafting or computing force; to conduct specific tests or investigations of apparatus, material, or processes; and to perform related work as required.

Examples: Directing field parties on construction, valuation, or surveys; superintending and inspecting construction work; performing the work of an office engineer; assisting the superintendent of an aqueduct or important water supply structure; testing materials, as steel or cement; preparing technical material for publication; investigating water-proofing of structures; compiling statistical data; compiling and analyzing costs of railroad materials and construction.

Qualifications: Training equivalent to that represented by graduation with a degree from an institution of recognized standing, with major work in engineering, preferably in civil engineering; not less than two years' experience in civil engineering work in field or office; proven technical knowledge and proficiency.

Principal Lines of Promotion

From: Junior civil engineer.
To: Associate civil engineer.

Compensation for Class, $2,400-3,000.

Title of Class:
ASSOCIATE CIVIL ENGINEER

Specifications of Class

Duties: To perform one or more of the following functions under general administrative and technical direction: (1) To be in responsible charge of an intermediate subdivision of a civil engineering organization. (2) To exercise independent engineering judgment and assume responsibilities in studies and computations necessary for the preparation of reports, estimates, designs, or valuations. (3) To have immediate charge of the construction, maintenance, or operation of important civil engineering works or projects. (4) To conduct or direct important lines of civil engineering research. To perform other related work.

Examples: Having immediate charge of the construction of water mains, sewers, streets, and other municipal work; testing engineering materials; making cost studies; supervising surveys of areas and acquisitioning of lands; laying out of railroad terminals, yards, and storage bases; estimating and expediting construction work and design.

Qualifications: Training equivalent to that represented by graduation with a degree from an institution of recognized standing with major work in engineering, preferably civil engineering; not less than five years' general engineering experience, of which at least one year shall have been in the direction or performance of important civil engineering work and supervisory or administrative ability, or a high degree of technical skill.

Principal Lines of Promotion

From: Assistant civil engineer.
To: Civil engineer.

Compensation for Class, $3,240-3,840.

Title of Class:
CIVIL ENGINEER

Specifications of Class

Duties: To perform one or more of the following functions under general direction: (1) To have responsible charge of, and to initiate and determine policies for a major subdivision of a civil engineering organization. (2) To prepare for final executive action, reports, estimates, designs, specifications, and valuation studies and data. (3) To have charge of the construction, inspection, maintenance, and operation of municipal or other civil engineering works of major importance. (4) To conduct or to direct major lines of civil engineering research. (5) To furnish for executive action, expert or critical advice on civil engineering works, projects, or policies; to act as advisor or consulting specialist on civil engineering problems. To perform other related work.

Qualifications: Training equivalent to that represented by graduation with a degree from an institution of recognized standing, with major work in engineering, preferably in civil engineering; not less than eight years' general engineering experience, of which at least four years shall have been in the direction or performance of important civil engineering work; large capacity and proven administrative ability.

Principal Lines of Promotion

From: Associate civil engineer.
To: Senior civil engineer.

Compensation for Class, $4,140-5,040.

Title of Class:
SENIOR CIVIL ENGINEER

Specifications of Class

Duties: To perform one or more of the following functions: (1) To have administrative charge of a civil engineering organization of a main division thereof, and to determine or execute general policies under the limitations imposed by law, regulations, or other fixed requirements. (2) To be responsible for reports, estimates, designs, specifications, and data, or for the construction, maintenance, and operation of large civil engineering works or projects. (3) To have full charge of the collection and presentation of data for, and the conduct of valuation proceedings. (4) To direct or to perform the most comprehensive research in civil engineering. (5) To act as consulting specialist on important civil engineering projects, policies, or valuations. To perform other related work.

Qualifications: Training equivalent to that represented by graduation with a degree from an institution of recognized standing, with major work in engineering, preferably in civil engineering; and not less than 12 years' general engineering experience, of which at least 8 years shall have been in the direction or performance of important projects in civil engineering work of a character to give substantial evidence of engineering knowledge and ability, or executive capacity of the highest order.

Principal Lines of Promotion

From: Civil engineer.
To: Commissioner of lighthouses; chief valuation engineer, Interstate Commerce Commission; supervisor of land appraisals, Interstate Commerce Commission; director and chief engineer, Reclamation Service.

Compensation for Class (Asterisk indicates Civil Service Commission will recommend).*

CLASSES COMMON TO ALL ENGINEERING SERVICES

Title of Class:
JUNIOR ENGINEERING AID

Specifications of Class

Duties: Under immediate supervision, to perform miscellaneous subordinate work in the laboratory, office or field, in any branch of engineering.

Examples: Setting up apparatus; making simple engineering computations; compiling field data or laboratory notes; filing and indexing maps; plans and notebooks; preparing samples; caring for instruments in the field or laboratory; working as rodman, chainman, or tracer; making blue prints.

Qualifications: Common-school education; good health.

Principal Lines of Promotion

To: Ceramic engineering aid; civil engineering aid; electrical engineering aid; materials engineering aid; mechanical engineering aid; mining engineering aid; materials aid.

Compensation for Class, $840-1,200.

Title of Class:
COPYIST DRAFTSMAN

Specifications of Class

Duties: Under immediate supervision, to make tracings from original drawings prepared by others; and to perform miscellaneous routine work in a drafting room.

Examples: Making simple tracings; copying data; filing and indexing under supervision; lettering; making simple drawings and diagrams; making hand corrections on printed charts.

Qualifications: Training equivalent to that represented by graduation from high school; knowledge of the use of drawing instruments, and ability to use them neatly.

Principal Lines of Promotion

To: Civil engineering draftsman; cartographic draftsman; electrical engineering draftsman; mechanical engineering draftsman; marine engineering draftsman; ship draftsman; aeronautical draftsman; automotive tracer; landscape draftsman.

Compensation for Class, $1,080-1,260.

ENGINEERING LITERATURE

A REVIEW OF BOOKS AND A LISTING OF NEW PUBLICATIONS

Correspondence

Sir—I wish to express my sincere appreciation of the noteworthy article by R. Fleming upon the need of a history of engineering which appeared in your issue of Feb. 12, 1920, p. 322. What a splendid book that would be to place in the hands of graduate students, especially those who devote more than one year to graduate work!

It may be taken for granted that every teacher in any subdivision of engineering would be profited by reading such a history, since there is a natural tendency to over-estimate one subject in comparison with another. Would it be equally serviceable to engineers in practice?

It would doubtless be a difficult task to make a wise selection from the great mass of available material so as to keep the size of the book within reasonable limits, and also to retain elements of sufficient interest in the text to attract the younger engineers. The best results would very likely be secured by the co-operation of a number of authors.

While the demand for a history of engineering would be small, and would not therefore attract the attention of any publisher, the real need of it should enlist the active interest of the national engineering societies.

Ithaca, N. Y. HENRY S. JACOBY.

An Indian Engineer on Dam Design

THE DESIGN OF MASONRY WEIRS—By S. V. Kanagasabai Pillai, Sub-Engineer, P.W.D., Madras. Address the Author, 1, Office Venkatachala Mudaly St., Triplicane, Madras, S. E. Cloth; 6 x 9 in.; pp. 201; illustrated. Rs. 4.

REVIEWED BY F. TEICHMAN

Consulting and Designing Engineer, Wollaston, Mass.

In India English engineers have developed the type of canal structure on sandy soil in which the head due to the difference of upstream and downstream water levels may be neutralized by the resistance to percolation. Such percolation is harmless if by proper length of structure it is reduced in rate to such a value that where the percolating current returns into the canal, the particles of the exit stratum are not carried away. W. G. Bligh, the nestor in this field of engineering, has given the profession two valued books dealing with the subject and now there is made a worthy addition to this literature in the form of "The Design of Masonry Weirs" by an Indian engineer, S. V. Kasagasabai Pillai. These three books by no means limit their discussion to weirs or dams on sandy soil, but they are of particular interest to the American engineer who has to build a weir or dam on pervious soil. Our own literature contains papers and discussions on this subject recorded in the *Transactions* of the American Society of Civil Engineers ("Action of Water Under Dams," by J. B. T. Coleman; "Designing an Earth Dam Having a Gravel Foundation," by J. B. Hays). The principle of neutralizing head by proper length of creep is generally accepted by the engineering profession but there are not many structures in America that are designed on that principle. The only data available to us as to the proper gradient (head to length of creep) for the design of a structure on pervious soil are those furnished by Mr. Bligh and merely repeated by Mr. Pillai. It is very desirable that the Indian and Egyptian engineers, when giving what they consider the proper gradient for the various grades of sandy soil, specify more closely the characteristics of the sand by stating the specific gravity, the voids, the effective size of the sand grain and the uniformity of coefficient. The writer feels that if such data were available to him his designs for the canal structures of a 130,000-acre drainage district in Florida could be made with more satisfactory results as to economy as well as safety.

Mr. Pillai has given much careful thought to his subject. He has developed formulas, tables and diagrams relating to weirs of triangular, rectangular, trapezoidal and pentagonal section, first without uplift then with uplift (reducing specific gravity of weir by one), and under various depths of overtopping water and of tail water. The formulas and tables give the required width of base with resultant at edge of middle third, and the location of resultant for a given section, and the incline of the resultant to the vertical. The author then establishes workable expressions and tables for that particular flood condition which will produce the maximum moment on the weir structure, assuming, to that end, values for the width, slope and roughness of the canal downstream from the structure. His method of analysis is applied to existing weirs and interesting diagrams visualize conditions. The practicable minimum sections of weirs are given and the method of determining the weir section by calculating the successive courses downward is illustrated. This is followed by an examination of existing weirs and by short chapters on hydrostatics and earth pressure.

The Indian weirs do not generally exceed a height of 20 ft. and the discussion does not enter upon the question of aeration under the jet or of adaptation of weir outline to the lower curve of the jet.

The book will be of value to the student and will be read with interest by the designer. However, after profiting by the presentation of the subject by Mr. Pillai, it is likely that the designer will prefer to make, in his own way, the determination as to that state of possible flood which will create the maximum stress on the structure, introducing the specific hydraulic conditions that surround his problem. After having established the critical forces, including the uplift suited to the condition and the specific gravity of the masonry, the designer is likely to determine the required section graphically or by calculating the successive courses, following the established procedure.

Concrete Building Estimates

ESTIMATING CONCRETE BUILDINGS.—By Clayton W. Mayers. Boston, Mass.: Aberthaw Construction Co. Cloth; 6 x 9 in. pp. 51; illustrated. $1.

This is a complete though condensed exposition of a method of estimating the quantities in a reinforced-concrete building, with examples carried out for a typical structure. It should be very much worth while to those who are not fully informed as to such practice.

It is announced that while a price has been put on the book, the Aberthaw Construction Co. will provide free copies to architects and engineers and to technical schools that may wish to adopt it for class room purposes.

An Intensive Commissioner-Manager Study

CITY MANAGER IN DAYTON: Four Years of Commission-Manager Government, 1914-17; and Comparisons with Four Preceding Years Under the Mayor-Council Plan, 1910-13—By Chester E. Rightor, B.A., Detroit Bureau of Governmental Research, etc.; in Collaboration with Don C. Sowers, Ph.D., Director, Akron Bureau of Municipal Research, etc., and Walter Matacheck, M.A., Secretary, Civics Department, Chamber of Commerce, Kansas City. New York: The Macmillan Co. Cloth; 5 x 8 in.; pp. 271; illustrated. $2.50.

Contrary to general understanding, "the favorable vote" for the Dayton commission-manager charter that went into effect on Jan. 1, 1914, "was not a consequence of the flood of 1913—it was merely subsequent to it." Thus do the authors open their interesting and useful discussion.

The book is an intensive study of the commission-manager plan, and especially of the city manager, in the city which is its leading exponent. The study has been made by men who were for some time on the scene and occupied vantage points, as the heading above indicates. That the authors desire to be impartial, their discussion shows, and that they are open-minded as to possible advances in city government may be inferred from the lines by Lowell at the head of their Preface:

> New times demand new measures and new men:
> The world advances, and in time outgrows
> The laws that in our fathers' day were best:
> And doubtless, after us, some purer scheme
> Will be shaped out by wiser men than we,
> Made wiser by the steady growth of truth.

What the next step forward—the "purer scheme"—in the framework of municipal government will be cannot well be discussed here, but a careful study of this volume would doubtless yield suggestions. Perhaps further improvement will come less from changes in the scheme of government than in its applications, both mental and moral.

The opening chapter, on "How Dayton Got Good Government," gives credit to John H. Paterson and other men of vision, to various civic and commercial organizations and committees and to the Charter Commission made possible by the Home Rule Amendment to the Ohio Constitution, adopted in 1912. A later chapter, on The City Manager at Work, brings out clearly how much the success of the plan at Dayton—and for that matter elsewhere—was due to Henry M. Waite, the engineer who served as city manager until he joined the American Expeditionary Force in France. But lest we unintentionally misrepresent the viewpoint of the authors, as well as the methods and spirit of Mr. Waite and the underlying principles of city managership, a paragraph from the book will be introduced:

> The success of City Manager Waite in Dayton was due not so much to the fact that he is a trained engineer, as he used his engineering knowledge but little—since he had trained engineers under him, and employed experts whenever occasion necessitated and justified,—but it was due to the fact that he appreciated and understood the public and was a master in the art of stimulating and controlling men. It was because he marched out with the baseball boys on opening day and pitched the first ball across; because he talked to small groups in various sections of the town on their pet hobby; because in his interviews with citizens who came to his office, he was able to send them away with a smile even though there may have been harsh words spoken in the conferences.

The idea suggested by the last sentence of the quotation is the subject of a chapter on Humanizing City Government, which shows how much and how well Mr. Waite did in that generally neglected field. Other chapters deal with Protecting Life and Property, Municipal Housekeeping, Purchasing for a City. In a chapter on Public Opinion attention is given to the opposition which the commission-manager plan has met in Dayton, particularly from the Socialists. Here there is some frank writing, and while much of it scores the Socialists for ignoring and misrepresenting facts some of it is on the other side—at least to the extent of stating that the opponents of the Socialists went too far in the 1917 election in making national affairs an issue. This chapter brings out the fact that although the Socialists polled 43 per cent of the votes cast for councilmen in 1917, and were defeated by a bare majority, they still continue to remain unrepresented in the Council—which is held to be an argument for some more truly representative form of election.

The volume closes with sample pages from the Dayton budget, including a detailed classification of accounting items, a consolidated balance sheet, and annual appropriations and expenditures by organization units.

Similar studies of a dozen each of (1) other commission-manager cities; (2) commission cities without managers; and (3) mayor-and-council cities, divided equally between those with and those without a fairly clear separation of legislative and executive functions, would be most welcome; but we fear that a program calling, as it would, for nearly two-score volumes, prepared by specialists with intimate knowledge of the respective cities yet so circumstanced as to be judges rather than partisans, would overtax investigators and publishers alike. To be more practical, therefore, we suggest two or three books in each class, or even one only in the two classes not yet covered.

Iron Bacteria and Water Supplies

IRON BACTERIA—By David Ellis, D. Sc., Ph.D., F. R. S. E., Royal Technical College, Glasgow. London, Eng.: Methuen & Co., Ltd. Cloth; 6 x 9 in.; pp. 176; illustrated. 10/6 net.

Life histories and the practical aspects of a half dozen classes of organisms that abstract iron from water and store it on or within themselves as ferric hydroxide are given in this interesting volume. The author states in his introduction:

> From the practical standpoint, a study of the habits and peculiarities of the iron bacteria is one which cannot be ignored by those engineers and chemists whose work lies in the supervision of water reservoirs. Some of the iron bacteria occasionally multiply to an extraordinary degree in the course of a few weeks and altogether change the character of the water in which this multiplication takes place. Others again multiply in attachment to iron pipes and accelerate the formation of incrustations, necessitating the installation of new pipes or a thorough cleaning of the affected ones. In other ways also they show characteristics which make it incumbent to know at any rate the leading features in their life histories, and also the general principles which should guide all plans for the minimizing of their activities.

Besides the life histories already mentioned, the author points out in the six first chapters the importance of the organisms described to engineers. In addition, there is a chapter on Iron Bacteria in Relation to Water Reservoirs and Corrosion of Conduit Pipes in which slimy streamers, incrustation and tuberculation are discussed and a chapter on Treatment of Water Infected by Iron Bacteria. Still other chapters deal with the artificial cultivation of iron bacteria, their physiology and their relation to rock formation.

Although the designedly practical portions of the book form only a small portion of the whole and are limited mostly to general principles yet they, combined with the description of the organisms, promise to be of considerable value, as they certainly are of much interest, to the studious and progressive water-works superintendent, engineer, chemist and biologist.

Centralized Government Purchasing

PRINCIPLES OF GOVERNMENT PURCHASING—By Arthur G. Thomas. New York and London: D. Appleton & Co. Cloth; 6 x 9 in.; pp. 273. $3.

THE COMING OF CENTRALIZED PURCHASING IN STATE GOVERNMENTS: Supplement to the National Municipal Review, Feb., 1920—By A. E. Buck, New York Bureau of Municipal Research. Philadelphia, Penn.: National Municipal League. Paper; 7 x 10 in.; pp. 18; 25c.

The inefficiency of public as compared with private business administration is perhaps nowhere more evident than in the purchase of government supplies. Progress in that field is shown by the appearance of Mr. Thomas' pioneer book on government purchasing, based in part upon actual practice. Thus, the author states that "he made a personal study of the purchasing systems of thirty or more large corporations and ten important cities." Reference is also made to the work of the General Supply Committee of the Federal Government. Little is said about central purchasing by states but the author has information showing that of 113 cities canvassed "64 have centralized their purchasing in greater or less degree."

The volume has two main parts, one on Basic Problems of Government Purchasing, and the other on Purchasing Methods. Specifications, bids and inspection are among the subjects treated in Part II, but the discussion is brief. Appendixes contain outlines of the purchasing systems of the General Electric Co. and the New York Central Railroad, Eastern Division. Other private purchasing systems and those of a few cities are outlined earlier in the book.

Without any intention of belittling the volume, it should be noted that it is written from the viewpoint of the investigator rather than that of the man actually engaged in purchasing, and that the viewpoint is still more remote from that of the department staffs that use the supplies bought. This is generally true of pioneer books, but the volume is nevertheless a valuable addition to the literature of government administration.

Since the publication of Mr. Thomas' book there has appeared the brief review by Mr. Buck of central purchasing in a dozen American states, noted at the head of this article. The governing statute of each of the states, purchasing methods and procedure, and operating results are summarized, and conclusions are drawn.

Ex-Mayor Hanson's Message to Americans

AMERICANISM VERSUS BOLSHEVISM—By Ole Hanson, Former Mayor of Seattle. Garden City, N. Y.: Doubleday, Page & Co. Cloth; 5½ x 7½ in.; pp. 299; frontispiece portrait of author; $1.75.

Not the least interesting part of this book is the portion that tells of the inception, occurrence and swift ending of the general strike at Seattle on Feb. 6, 1919. This strike, according to ex-Mayor Hanson and reports current at the time, was designed to start a revolution in America that would speedily put all industry in control of councils of soldiers, sailors and workmen. The credit for the swift suppression of the strike, which if successful would have set aside the duly constituted government of the city, was due to the prompt uncompromising action of Mr. Hanson, backed by the sturdy citizenship and patriotism of the mass of the people of Seattle. The larger part of the book deals with the broad subject indicated by its title. In it are set forth something of the history, aims and results of revolutionary labor movements in Europe and America—all designed to elucidate Bolshevism and I. W. W.-ism on the one hand and Americanism on the other. With some readers the book would be more effective if it were materially condensed, but perhaps the many repetitions of the same ideas, often with little essential verbal change, are justified in a book of popular appeal designed to combat Bolshevism.

An English Engineer on Road Building

MODERN ROADS—By H. Percy Boulnois, M.Inst.C.E., F. R. San. Inst., etc. Late City Engineer of Liverpool; Late Deputy Chief Engineering Inspector of the Local Government Board; Chairman of the Council of the Roads Improvement Association. London: Edward Arnold. Cloth; 6 x 9 in.; pp. 302; illustrated. 16 shillings; $5.75 in United States.

Mr. Boulnois prefaces his work with the assertion that he has "endeavored to deal with the subject of roads in as comprehensive a manner as possible, bearing in mind the constant improvements in methods of modern road construction that are now taking place." But he has done more than that. He has not only given details concerning the best practice in constructing roads of various types, as well as city paving, but he has paid particular attention to those questions which determine the economics of building one or another type of hard surfacing. He has cited some most interesting figures of highway traffic, and he indicates the practice among certain engineers in England of what types shall be selected for varying traffic. Minute are Mr. Boulnois' various specifications for the construction of waterbound macadam roads. His treatment of the subject of the construction of asphaltic types is thorough, and he includes definitions of, and specifications for, using numerous modern types of bituminous mixtures, many of which are unknown to American road builders. There is a chapter n "Waves and Corrugation" and a part of another chapter treats of "Slippery Streets." In discussing modern road construction the author gives both British and Continental experience. American practice is frequently mentioned. Appendixes gives resolutions adopted by the Conference of Road Users on Traffic Regulations and the traffic rules of the Royal Automobile Club.

Mr. Boulnois' volume is unique in that it contains neither cost data or reproductions of highway photographs. The former are excluded owing to the present fluctuation in material and labor costs, and the latter because "they are of little practical value." Although there are no halftone views of roads the volume contains a number of plates showing various construction plants. Four of these show the Teddington road-testing machine and one is an interesting view of the "Liverpool System of 'Hand' Concrete Mixing" in which, as here shown, there are five two-compartment mixing boxes, each double box supplied with water from a bucket-filled tank having two outlets and each box having a separate measuring box just back of it.

Although of primary importance to English road engineers and contractors, Mr. Boulnois' book has a broad appeal to American engineers as well.

Tests of Protection From Sand Blast Dust

Twenty pages of *Public Health Reports* for March 5, 1920 (Washington, D. C., Superintendent of Documents; 5c.) are devoted to a report on studies of "The Efficiency of Certain Devices Used for the Protection of Sand Blasters Against the Dust Hazard," by Prof. C.-E. A. Winslow, Yale School of Medicine, Leonard Greenburg and E. H. Reeves. The general problem and earlier studies are reviewed briefly before detailing and summarizing the studies forming the subject of this report, which has to do with a sand blast cabinet in an automobile factory. The installation tested proved to be satisfactory, in the opinion of the authors.

Pocket Specifications for City Work

To the loose-leaf specifications used by a number of cities the Engineering Department of the City of Rochester, N. Y., has added another feature, that of reducing the size to fit an ordinary 4¼ x 7½-in. note book. With this same idea of compactness blue prints are furnished from 6 x 8-in. photographic plates of tracings of standard paving sections, curb and gutter details, sewer trenches, manholes, frames and covers, sidewalk intersections, water pipe trenches, hydrant drips, gate valve boxes and covers, and monuments. These also are in loose-leaf form. The Department of Public Works of Seattle, Wash., although not using the loose-leaf form, has gone a step beyond—or remained a step behind Rochester, depending upon personal preference—in that standard plans and specifications are combined in a single 4¾ x 7½-in. book of 208 p., including an index.

PUBLICATIONS RECEIVED

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS: Transactions, Vol. XI, 1918—New York: D. Van Nostrand Co. Cloth; 6 x 9 in.; pp. 430. $6.

BRITISH INDUSTRIAL RECONSTRUCTION AND COMMERCIAL POLICIES—By Fred W. Powell, Trade Commissioner. Washington, D. C.: Department of Commerce. Paper; 6 x 9 in.; pp. 88. 10c. from Superintendent of Documents.

CHANGES IN THE COST OF LIVING, July, 1914 to November, 1919—Boston, Mass.; National Industrial Board, 15 Beacon St. Paper; 6 x 9 in.; pp. 24. 75c.

CONGRES de L'HABITATION: Premier, 1919—Preface de M. Edouard Herriot, Depute, Maire de Lyon, Ancien Ministre—Lyon, France: Imprimerie Noirclerc & Fenetrier. Paper; 7 x 10 in.; pp. 284; illustrated.

Housing shortage is world wide and the problems of France are the problems of this country, accentuated by the terrible losses in the devastated region. This volume is the record of the French analogue of the recent housing conference held in Chicago, and is interesting only as it indicates how the French engineer and social worker is approaching the problem.

ENGINEERING PRACTICE: The J. E. Aldred Lectures at the Johns Hopkins University, 1918-19—Baltimore, Md.: The Johns Hopkins Press. Paper; 6 x 9 in.; pp. 235; illustrated. $1.

Contains nine lectures equally divided between civil, electrical and mining engineering, among which are: "The Human Element in the Machine Shop," by James Hartness; "Berthing and Repair Docks for Shipping," by Rear Admiral F. R. Harris, U. S. N., "The Duties of the Young Engineer on the Construction of a Hydro-Electric Plant," by H. S. Slocum, of Viele, Blackwell & Buck; and "Ore Docks on the Great Lakes," by John E. Greiner.

EXAMPLES IN HEAT AND HEAT ENGINES—By T. Peel, M. A., Fellow and Lecturer of Magdalene College, Cambridge University Demonstrator in Engineeering. New York: G. P. Putnam's Sons. London: Cambridge University Press. Paper; 5 x 8 in.; pp. 104; illustrated. $1.50.

Questions taken chiefly from papers set for the courses of lectures at the Cambridge Engineering Laboratory, and from the A and B papers of the Engineering Tripos.

FREE-FLOWING, TIGHT SEWAGE TANKS AS DEVELOPED IN NEW HAMPSHIRE: Special Bulletin of the State Board of Health—By Robert Fletcher, D. Sc., C. E., President of the State Board of Health. Concord, N. H.: The Board. Paper; 6 x 9 in.; pp. 19; illustrated.

Professor Fletcher's earlier story of what might be termed the "septic cesspool" is here brought up to date, with line cuts and text telling how to construct the tanks.

HOW TO MAKE AND USE GRAPHIC CHARTS—By Allan C. Haskell, B. S., Principal Assistant Engineer, Construction Service Co.; with an Introduction by Richard T. Dana, Consulting Engineer. New York: Codex Book Co., Inc. Cloth; 6 x 9 in.; pp. 539; illustrated. $6.

HYDRAULIC TURBINES: With a Chapter on Centrifugal Pumps—By R. L. Daugherty, A. B., M. E., Professor of Mechanical and Hydraulic Engineering, California Institute of Technology; Formerly Professor of Hydraulic Engineering, Rensselaer Polytechnic Institute. Third Edition, Revised, Enlarged and Reset. New York and London: McGraw-Hill Book Co., Inc. Cloth; 6 x 9 in.; pp. 281; illustrated. $3.

HYDROMETRIC SURVEYS In the Provinces of Alberta and Saskatchewan, 1918—Prepared under the direction of F. H. Peters, D. L. S., M. E. I. C., Commission of Irrigation, by P. M. Sauder, D. L. S., M. E. I. C., Chief-Hydrometric Engineer; assisted by G. R. Elliott, D. L. S., A. M. E. I. C., and V. A. Newhall, A. M. E. I. C., Divisional Hydrometric Engineers—Ottawa, Can.: Department of the Interior. Paper; 7 x 10 in.; pp. 341.

IRRIGATION SURVEYS AND INSPECTIONS, Report, 1918-19—Ottawa, Can.: Department of the Interior. Paper; 7 x 10 in.; pp. 67; illustrated.

LANDSCAPE ARCHITECTURE: A Comprehensive Classification Scheme for Books, Plans, Photographs, Notes and Other Collected Material—By Henry Vincent Hubbard, Assistant Professor of Landscape Architecture at Harvard University, and Theodora Kimball, Librarian of the School of Landscape Architecture at Harvard University. Cambridge, Mass.: Harvard University Press. Paper; 7 x 10 in; pp. 131.

LOAD STRAIN—GAGE TEST OF 150-TON FLOATING CRANE FOR THE BUREAU OF YARDS AND DOCKS, U. S. NAVY DEPARTMENT—By Louis J. Larson, Assistant Engineer Physicist and Richard L. Templin, Assistant Engineer Physicist, Bureau of Standards. Washington, D. C.: Department of Commerce. Paper; 7 x 10 in.; pp. 34; illustrated. 10c. from Superintendent of Documents.

MECHANICAL WORLD YEAR BOOK. 1920—Manchester, England: Emmott & Co., Ltd. Cloth; 4 x 5 in.; pp. 317; illustrated. 2s.

A somewhat enlarged edition of this British annual. The preface calls attention to new matter on "water and hydraulic work" and on "heating and evaporating liquids," besides additions to material on compressed air and on screw threads.

THE MODEL T FORD CAR: Truck and Tractor Conversion Sets; Also Fordson Farm Tractor and F. A. Lighting and Starting System Construction, Operation and Repair—By Victor W. Page, M.S.A.E., Author of "The Modern Gasoline Automobile," etc. New York: The Norman W. Henley Publishing Co. Cloth; 5 x 7 in.; pp. 410; illustrated. $1.50.

THE QUEBEC BRIDGE Over the St. Lawrence River, Near the City of Quebec, On the Line of the Canadian National Railways—Ottawa, Ont.: Department of Railways and Canals—Cloth; 15 x 12 in. Vol. I—Substructure, Superstructure; Report of the Government Board of Engineers, 1908-18; pp. 259; illustrated. Vol. II—111 Plates to Accompany Vol. I. $6.

RETAINING WALLS: THEIR DESIGN AND CONSTRUCTION—By George Paaswell, C. E. New York and London: McGraw-Hill Book. Cloth; 6 x 9 in.; pp. 275; 9 plates and 133 figures in the text; $4.

SELLING YOUR SERVICES—By George Conover Pearson. New York: Jordan-Goodwin Corporation. Cloth; 5 x 8 in.; pp. 237. $2.

Appears to be an enlarged edition of a book with the same title, favorably noted in *Engineering News-Record,* June 21, 1917.

STRUCTURAL DRAFTING AND THE DESIGN OF DETAILS—By Carlton Thomas Bishop, C. E., Assistant Professor of Structural Engineering, Sheffield Scientific School of Yale University, etc. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 10 x 8 in.; pp. 352; illustrated, $5.50.

TELEPHONES: Census of Electrical Industries: 1917—Washington, D. C. Department of Commerce. Paper; 9 x 12 in.; pp. 52.

TOPOGRAPHIC MAPS AND SKETCH MAPPING—By J. K. Finch, C. E., A. M., Associate Professor of Civil Engineering and Resident Director of the Summer School of Surveying, Columbia University. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 6 x 9 in.; pp. 175; illustrated. $2.50.

TRANSPORTATION BY WATER, 1916—Washington, D. C.; Bureau of the Census. Cloth: 9 x 12 in.: pp. 230; 6 halftone plates and 29 figures in the text. 75c. from Superintendent of Documents.

Data for 1916, gathered in 1917, transmitted Oct. 9, 1919, for publication, and published in 1920. Divided into United States as a whole, Atlantic Coast and Gulf of Mexico, Pacific Coast, Great Lakes and St. Lawrence River, Mississippi River and Tributaries, Canals and other Inland Waters. Comparisons between 1906 and 1916 are made.

THE TURNPIKES OF NEW ENGLAND: Evolution of the Same Through England, Virginia, and Maryland—By Frederic J. Wood, M. Am. Soc. C. E., etc., Boston, Mass.: Marshall Jones Co. Cloth; 8 x 11 in.; pp. 461; illustrated. $10.

UNITED STATES BITUMINOUS COAL COMMISSION: Majority and Minority Reports to the President from Henry M. Robinson, Chairman, and John P. White and Rembrandt Peale, Commissioners, 1920—Washington, D. C.: The Commission. Paper; 6 x 9 in.; pp. 120.

WHAT IS THE EVENTUAL STREET CLEANING METHOD: A Review of the Methods that are now Being Used and Developed—Pointing Out the Advantages that Would Substantiate a Claim by Any System to the Possibility of Its Being Eventually Considered the Standard Method—By George C. Dodge. Flushing, N. Y.: Case, the Printer. Paper; 6 x 9 in.; pp. 56; illustrated. $1.

A readable, suggestive brief on the various methods of street cleaning that leads up to motor-driven combination machines (sprinklers with either frames or squeegees) and points to vacuum cleaners as the ideal end. The author states that he has been on the commercial side of street cleaning for the past five years.

LETTERS TO THE EDITOR

"Professional Plagiarism"

Sir—In your issue of April 1, p. 685, appears a letter from Samuel Baker in which he charges Professor Carlton T. Bishop with plagiarism in the preparation of a book entitled "Structural Drafting and the Design of Details." The specific charge is that Professor Bishop has reproduced diagrams for the "graphic solution of a right triangle" which appear in "Smoley's Tables," and an implied charge is that Professor Bishop "apparently drew a good deal of inspiration" for his book from Charles D. Conklin's book on "Structural Detailing and Elementary Design."

Mr. Bishop developed the diagrams in question and showed them to me some years before similar designs appeared in Mr. Smoley's book in 1914. I have just learned, moreover, that diagrams exactly the same in principle were used in the office of the McClintic-Marshall Company as early as 1905, at least nine years before they appeared in Mr. Smoley's book. Thus, it is evident that these diagrams were developed independently by Mr. Bishop, Mr. Smoley and others.

The insinuation that Mr. Bishop "drew a good deal of inspiration" from Mr. Conklin's book implies too much to be ignored, especially as I can disprove the charge from my own knowledge of the facts. Mr. Bishop's book was completely outlined and largely written several years before Mr. Conklin's excellent work appeared—I know, for I had read Mr. Bishop's manuscript. Both books are published by the same firm, and in view of the fact that Mr. Bishop's book had already been accepted and was so nearly completed, the manuscript of Mr. Conklin's book was submitted to Mr. Bishop and myself for criticism. It was only upon our assurance that the contents and methods of presentation were quite different in the two books that Mr. Conklin's book was accepted by the publishers.

Mr. Bishop's book is the natural fruit of long experience in practical work as well as in teaching. The war delayed the completion of the book, but for many years previous Mr. Bishop had devoted all of his spare time to the work. A charge of plagiarism is a poor return for the real service which Mr. Bishop has rendered the profession, and I am sure had Mr. Baker known the facts, as Mr. Bishop's colleagues know them, he would not have made the charge.

The serious aspect of this whole matter, aside from the injustice to Mr. Bishop, is that no member of our engineering profession should charge another member with stealing without first investigating the facts, and the facts in this case could have been easily ascertained. No engineering periodical, moreover, should publish such a charge without first submitting it to the person likely to be injured.

JOHN C. TRACY,
Professor of Civil Engineering, Yale University.
New Haven, Conn.

Railroad and Highway Location

Sir—In the several letters which have appeared lately pointing out the need of an "Economic Theory of Highway Location" there seems to be a general assumption that there is in existence a well defined "Economic Theory of Railway Location." This, however, is far from the truth. Many years ago when 30-ton cars and 90- and 100-ton locomotives were generally used; when electric traction was almost unknown, and when complications (such as the 8-hr. law, etc.) affecting the operation of modern transportation systems, unsuspected, Mr. Wellington developed his "theory." His work was pioneering and epoch making. As general theory, many of his ideas can be used today. but even *his* theories are not wholly applicable now, and the data to which he applied his theories are practically out of date.

Several engineers, acting independently, have worked out some modifications of parts of the theory to suit modern conditions. The American Railway Engineering Association has had a Committee on Economics of Railway Location, for a number of years. This committee, or individual members of it have done some good work, but it is all fragmentary, and it is probable that nothing really substantial and complete will be formulated until a fair size appropriation is made and full co-operation of the railroads is obtained, and a technical staff appointed to make the necessary experiments and obtain data on which to base a theory fitted to modern conditions. The problem is so complex today that no individual, even with the ability of a Wellington, could hope to work it out.

One of your recent correspondents made the statement that "railroad location, due to rigid conditions, is a science." I can hardly imagine either a science or an art with more variables or where individual judgment and experience count for more, except possibly highway location. The theoretically correct highway engineer will have to strike a nice balance between political exigency, local prejudice, vested interests, conditions under which state, and county funds, etc., can properly be applied to providing free roadbeds for foreign vehicles, as well as questions of gradients, curvature, first cost and cost of maintenance.

So long as we have recognized the fact that the public has a definite interest in the well being of the railroads and must pay in some form or other for their maintenance in first class condition, it will necessarily be but a comparatively short time before the people realize that there is a limit to the taxation which they can afford to impose on themselves as a community to provide routes for heavy motor trucks to traverse. All these questions open up vast vistas for profitable investigation, but it must necessarily be nation wide, and supported by ample funds to be of any real value.

F. LAVIS,
New York City. American International Corporation.

Tests Reveal Relative Values of Pneumatic and Solid Tires

Sir—I read with much interest the article on "Tests Reveal Relative Values of Pneumatic and Solid Tires," p. 668, in your issue of April 1. My particular object in reading it was to see whether I could obtain any information on impact for use in bridge designing. The article did not help me much in that respect, but I noticed that the equation used to compute the force with which the wheels struck the ground took no account of the height through which the truck dropped.

It was stated that "the energy exerted by a falling body is equal to the energy required to raise it to the height from which it fell," but the simple method of computing this energy by multiplying the weight by the height of fall was not used. In fact the method used was to apply the well known formula for kinetic energy, $WV^2/2g$, and then to use for the velocity v the vertical component of the horizontal speed of the truck due to the slope of the take-off, entirely neglecting the vertical component due to the acceleration of gravity. The formula given in the article

$$F = \frac{W\left(\frac{22\,S\,T}{15}\right)^2}{64.32\,D} + W$$

apparently attempts to give the vertical force with which the truck strikes the ground but it contains no quantity involving the height through which the truck falls, and therefore it would apparently strike the ground with a force depending wholly upon the angle which the take-off platform makes with the ground. The result would be the same whether the distance through which it fell were 1½ ft. (as in the experiments) or 1½ miles. If the truck ran off of a level platform it would, according to the formula, ($T=0$), strike the ground with a force only equal to its own weight. Obviously there is either some element involved here which is not given in the article, or else the formula given is in error.

It would appear that the average force with which the unsprung weight strikes the ground can be determined by multiplying it by its height of fall, (including the compression of the tire) and dividing by compression of tire.

The average force exerted by the sprung weight on the axle can be determined by multiplying this weight by its total fall (including the distance the spring compresses) and dividing by the distance which the spring compresses. As pointed out in the article, it may be incorrect to add these two to get the total force on the roadway as they occur in different, though somewhat overlapping, intervals of time.

Applying the above to the unsprung weights of trucks E8 (solid tire) and E17 (pneumatic tire) gives the following:

$$\text{E8} \qquad \frac{1716 \times (1.5 + .083)}{.083} = \frac{1716 \times 1.583}{.083} = 32800 \text{ lb.}$$

$$\text{E17} \qquad \frac{1754 \times (1.5 + .375)}{.375} = \frac{1754 \times 1.875}{.375} = 8770 \text{ lb.}$$

The figures given for the same cases in the article referred to are 14,336 and 4,624 lb. respectively, or about half what they apparently should be.

It is suggested that if the trucks had been run over bumps on to the platform of some type of recording scale the forces exerted on the roadway would have been quite closely given by the scale. LEWIS E. MOORE,

Bridge and Signal Engineer, Massachusetts Department of Public Utilities, Boston.

The Menace of the "Man-Power Engineer"

Sir—On p. 517 of your issue of March 11 there is an article by Frances A. Kellor dealing with the question of training engineers for the purpose of handling men. There are two premises which I take to be erroneous: First, that the management of human beings can be reduced to an exact science; second, that the engineer is the only man who can solve the problem.

Nature's laws are fixed; human nature also is, in the aggregate, pretty much the same in all places and at all times. However, while nature's laws recognize no evolution and no environment, the systems used in handling men must vary according to the locality and to the type of men for which the system is designed.

There are two variables which will always control in the management of men and forever make it impossible to reduce management of men to an exact science, namely, the changing ideas of the men being handled and of the men doing the handling. What we are contented with in one locality will breed discontent in another. Consequently there can never be a "Science of Man Power" in the sense that there is a Science of Physics or a Science of Chemistry.

Of course, this does not mean that there are not certain fundamental principles which, in all cases, apply to the problem of management and direction of human beings. Neither does it preclude the necessity of determining what these fundamental principles are. But are we making progress when we condemn all present conscientious efforts which are being made to solve the problem, just because there still are things to be desired? If recreations, hospitals, lunch rooms, etc., tend to make contented employees—and employers—have we not accomplished a part of what really is to be desired, at least for the time being? If a man "interested in saving souls" can have a part in making contented employees, should we condemn his work and turn him out for a trained scientist whose theories do not permit of tampering with men's souls because such action will not fit in with his ideas of what is necessary during the eight-hour productive period?

And, Miss Kellor to the contrary, is not man power largely an individual plant problem? Of course there are fundamental principles which are applicable in all places, but will the time ever come when the same system can be applied in the steel mills of the East, as in the lumber mills of the Northwest, or in the cotton mills of the South?

Getting down to what is really more vital to the engineering profession, at least in so far as it reflects on the engineer's ability and good judgment, does the profession want to subscribe to the idea that the engineer is a superman, that he alone is qualified to handle men? The writer is an engineer and hence more or less prejudiced in favor of the profession, but he holds that statements such as contained in the article under discussion do the profession a lot of damage, especially the younger members thereof.

There has been a very pronounced tendency in past years to give young engineers, especially college graduates, the idea that the engineer belongs to the elect, thereby hampering him in his business until such time as he realizes that this idea is erroneous.

So it will be with the "man-power engineer." If he thinks a college education along the lines of management of men will qualify him to handle men to the exclusion of those who have no theoretical ideas, except what they have gained by long contact with human beings, he is due for a very forcible awakening. Are we not flattering ourselves in a ludicrous fashion when we admit we "will be called upon to handle man power and to settle financial questions for which we have little preliminary training or basic judgment?" There is undoubtedly a growing demand for men with qualifications for handling man power on a large scale; but will men be employed simply because they call themselves engineers?

The only reason why engineers are more successful than others in handling certain problems of management is because they are trained to go deeply into matters, to seek facts and to analyze conditions. If a man possesses an analytical mind, is he to be denied the privilege of using his abilities in certain fields simply because he does not have an engineering education or degree?

And will the engineering colleges be successful in turning out men qualified to direct and manage men? Would it not be better to base our hopes on developing managers of men, such as Miss Kellor has in mind, as we develop executives, by the process of hard knocks and elimination? Certain fundamental principles can be taught in the colleges to very good advantage, but a college degree alone will never make a manager. We, as engineers, should consider the field of management a very promising one and should be governed by no sense of mock modesty in maintaining that engineers, as a class, are best qualified for this line of work. However, we should show charity toward men outside the profession, realizing that results, and not men or methods, is the final test.

May a guiding Providence preserve us from the man-power engineer. D. E. GELWIX,

Division Engineer, St. Louis & San Francisco R.R.
Springfield, Mo.

Dyckman Street Screening Results

Sir—On p. 526 of your journal of March 11, attention is called to a typographical error in the article on "Operating Results of Dyckman Street Sewage Screening Plant," published Jan. 20, 1920, p. 171. In Table I the following errors also require correction:

June 10, 2:15 a.m. to 6:15 a.m.

Screenings removed by $\frac{3}{64}$-in. screen should be 37.0 instead of 3.7 ppm.

Removal of suspended matter should be 92.5 instead of 9.25 per cent.

Removal of settleable solids should be 92.5 instead of 9.25 per cent.

Summary of results of 24-hr. test, Screen No. 2:

Removal of suspended matter should be 16.4 instead of 16.6 per cent.

Removal of settleable solids should be 25.6 instead of 19.4 per cent.

The abnormally high removal noted in one test between 2:15 and 6:15 a.m. of 92.5 per cent was probably due to absence of domestic wastes with a preponderance of ground water at that time and should not be regarded as significant in judging operating efficiency. It may be of interest to add that the weighted average removal of suspended matter when operating on day sewage was computed at 20.6 per cent with $\frac{3}{64}$-in. slots and 14.6 per cent with $\frac{1}{16}$-in. slots. KENNETH ALLEN,

Sanitary Engineer, Board of Estimate
New York City. and Apportionment.

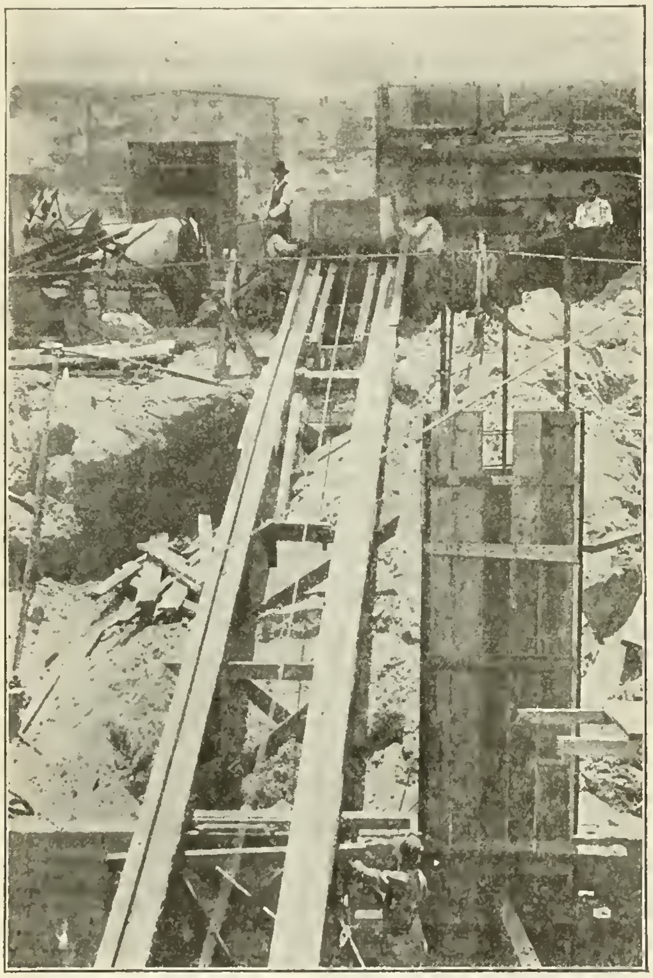
HINTS FOR THE CONTRACTOR

Timber Track Takes Spoil from Basement

By C. W. Geiger

San Francisco, Cal.

THE job-built incline elevator shown by the illustration met a construction emergency successfully enough to deserve record. After the concrete foundations had been completed for one of the six-story buildings of the Los Angeles Warehouse, one of the tenants decided that it was necessary to install a boiler room in the building which he was to occupy. As a result it was necessary to remove a number of the reinforced-concrete column foundations. Air drills were used in cutting holes in the concrete foundations, which were broken up by dynamite.



INCLINE HOIST LOADS DUMP WAGONS

It was also necessary to extend the foundation several feet lower, thereby necessitating additional excavation. In order to elevate this material an incline track was built from the point of excavation to the street, and a dump box was equipped with wheels for running up and down on the incline. The hoist that was used in operating the concrete elevator was connected to the dump box, which, on being raised to the top of the incline, automatically dumped the excavated material in dump bottom wagons. A tail line enabled the box to be pulled back by hand.

Chutes to Mixer Serve as Measuring Boxes

IN the concrete mixing plant used on the construction of the Gibraltar dam near Santa Barbara, Cal., the chutes leading from sand and gravel bins into the mixer hopper were used as measuring boxes. The chutes were of rectangular cross-section with covers made of light wood strips placed longitudinally and held together by cross pieces. These covers were hinged at the upper, or bin end, so that when the material from the bins entered a chute and backed up behind the closed gate at the bottom, the chute cover would be forced upward until stopped by pegs placed in the sides for that purpose. The cover prevented overflowing and when the chute was full the flow from the bunker was automatically stopped by the choked gate opening. The bunker gate was provided with a knife edge so it could be closed when the gateway was choked in this manner.

When the proportions of the mix had to be varied the pegs in the chute sides were moved to holes above or below according to whether greater or less quantities were required. A full chute constituted just a charge for the mixer. Thus the single action of opening the doors at the chute bottom dropped the right charges of sand and gravel into the mixer hopper. W. A.' Kraner, of San Francisco, is the contractor to be credited with this device.

Military Pile Driving With Motor Truck

DURING the military operations on the Salonika front, according to *The Engineer*, it was necessary to construct a bridge across the Selimb River. The work required the driving of forty-eight piles about 40-ft. long and 12-in. square to a depth of 24-ft. in gravel, clay, and quicksand. A pile-driver with 30-ft. leads and a 1,200-lb. hammer was employed and a 4-ton motor truck used to raise the weight. The truck was set up on the bank, the left-hand rear wheel was jacked up and blocked 10-in. from the ground, and the other three wheels were snubbed and staked to the ground. The lead rope was given a turn on the brake drum inside the wheel, one man operating the loose end. The distribution of labor was as follows: One motor driver, one signalman, one on the lead rope, three on the pile-driver, and two sharpening and putting on pile rings. Work was continuous in three 8-hour shifts, and the bridge was completed for traffic in 12 days.

Belt Conveyor Assists Excavation

A portable belt conveyor to remove excavated material and load it into wagons was used by the Lincoln Gas & Electric Co. in the excavation for three 110,000-gal. oil storage reservoirs at Lincoln, Neb. The belt travels on a steel truss boom pivoted to a wagon bed which carries a gasoline engine, the ends of the boom being guyed from a gallows frame seated on the wagon bed. With the machine placed on top of the bank the boom is inclined with one end in the pit, where men shovel the material onto the belt, while the other end is high enough for wagons to drive under it to receive the material. The machine was shifted around the pit as excavation progressed.

NEWS OF THE WEEK

New York, April 15, 1920

Truck Weight Limit Reduced To Save Soft Roads

Owing to the bad condition of some of the Connecticut state highways a temporary order was put in effect April 8 limiting the amount of load allowed on the highways to 10 tons. In some places near Hartford the "blowing up" of short stretches has resulted in the roads being reduced to quagmires under the heavy truck traffic. C. J. Bennett, State Highway Commissioner, believes the condition of the roads to be generally worse now than at any time in his experience. As soon as possible the statute provision of 12½ tons, truck and load, will prevail again.

Commissioner Bennett is keeping close watch on the truck operators and when a truck is suspected of loading beyond the statute provision it is weighed. Several arrests have recently been made and on April 5 a driver from a neighboring state was fined $150 for driving while intoxicated and for carrying a load well above 12½ tons.

In the opinion of W. L. Ulrich, State Superintendent of Repair, the raising of the water level in the soil through the heavy rains of last fall is responsible for the condition of the roads.

Expel Union Draftsman From Pittsburgh Chapter, A. A. E.

At its regular business meeting the Pittsburgh Chapter of the American Association of Engineers, by an overwhelming majority, voted to expel one of its members because of his connection with the Draftsman's Union.

The attitude taken was that while the Pittsburgh Chapter of the American Association of Engineers had no quarrel with the labor unions, as such, its members could not possibly live up to the ideals of the association, which believes in co-operation between labor and employer, and at the same time uphold the ideas of trade unionism.

Advisory Council for Map Board Being Formed

An Advisory Council to function with the U. S. Board of Surveys and Maps is being formed. A number of organizations such as the American Society of Civil Engineers, the American Association of State Highway Officials, etc., have been asked to appoint a representative on the Advisory Council. In addition five commercial map-making houses have been asked to join in designating one joint representative.

Advises Universal Metering

Water meters for all consumers in Halifax, N. S., have been recommended.

Vote on Am. Soc. C. E. Questionnaire

At noon, April 14, the day on which the polls closed, there had been received at the office of the Secretary of the American Society of Civil Engineers 3,871 votes on the Questionnaire covering proposed changes in the Society's internal and external relations, as discussed in the report of the Committee on Development.

Harding Retired With Rank of Brigadier General

Colonel Chester Harding, Corps of Engineers, U. S. Army, has been retired from active service with the rank of brigadier general. He will continue as Governor at Panama.

BRIGADIER GENERAL CHESTER HARDING, RETIRED

General Harding was born in Mississippi, Dec. 31, 1866. He was appointed to the Military Academy from Alabama in 1885. He was graduated in 1889 and has served throughout his military career with the Corps of Engineers. He was graduated from the Engineer School of Application in 1892.

Bid Date for Fine Sewage Screens at Milwaukee Advanced

To afford bidders for fine sewage screens more time to prepare complete and comprehensive proposals the Sewerage Commission of Milwaukee, Wis., has extended the time for submitting bids from April 8 to April 22. The specifications for these screens were published nearly in full in *Engineering News-Record,* March 11, 1920, p. 511.

New York Section, Am. Soc. C. E., Approves Licensing

By a vote of 36 to 23 the newly-formed New York section of the American Society of Civil Engineers, March 31, approved an engineers' license bill pending in the New York State Legislature after full discussion of Senate Bill 1248.

C. M. Holland explained that the bill was based on that recommended by Engineering Council with minor modifications mainly to meet New York statutory requirements. While not ideal, in his opinion, he favored its support because he felt that it would set minimum standards for engineers and give the profession a standing.

John A. Bensel, reporting on the progress of the bill, indicated that its passage seemed assured. Representatives of the Albany Society of Engineers and the New York Chapter of the American Association of Engineers, he said, had in conference with the judiciary committee, stricken out a clause which restricted the practice to citizens and changed the date when the bill would go into effect to two years from date of passage. As the reciprocity clause now reads, engineers qualified to practice in their home states or countries would be permitted to practice in New York State.

Allen Hazen asserted that the bill was the most innocent of any yet proposed, but he was decidedly opposed to the principle of licensing. He felt that there would be a retaliation against American engineers who attempted to obtain foreign engagements if restrictions were made at home. F. Lavis expressed doubt as to this point, since most foreign countries already have similar laws, and the interests which employ the engineer simply consider arrangements for the engagement of registered or licensed engineers as one more necessary formality.

President Davis a Progressive

An address urging full acceptance of the Joint Conference report was made by A. P. Davis, president of the parent society, and was enthusiastically received. He said the society "would not be embarking upon uncharted seas", for it had the experience of Engineering Council as a guide. The latter had done remarkably good work, in his opinion, considering the restrictions under which it was placed. To the conservative element in the society he attributed the failure to live up to its technical obligations. Had the American Society of Civil Engineers been more progressive, said Mr. Davis, the American Society of Testing Material would never have been formed, nor the American Railway Engineering Association. Work done in these organizations and many others is performed in large measure by Am. Soc. C. E. members. It could have been carried out better, and would have had more standing, but, said Mr. Davis, "we stayed in our shell and did nothing." The same conservative element, he asserted, is now opposing another proposed expansion of the society's activities.

A nominating committee, consisting of S. N. Castle, E. J. Mehren, F. Lavis, D. L. Turner and C. M. Holland, was chosen by ballot to report a ticket of officers of the section two weeks in advance of the annual meeting, May 12.

New Headhouse of St. Paul Union Depot Opened

The new headhouse of the St. Paul Union Depot Company was opened to passenger traffic April 5, completing the first construction stage of the new terminal project, as outlined in *Engineering News-Record*, June 20, 1918, p. 1184. Work on this building started in August, 1917, foundation work being practically completed when the railways were taken over by the Administration Jan. 1, 1918. After a long period of negotiation, the building of the terminal was placed on the priority list, and work was resumed Aug. 13, 1918.

Work is now in progress on the second construction stage, involving a structure to carry six new stub tracks and the erection of a portion of the permanent waiting room above them.

St. Paul has long been in need of adequate terminal facilities for passenger traffic, as the city is the transfer for all traffic—passenger, mail and express—for the Northwest. The station is used by nine roads, four of which extend to the Pacific Coast.

W. C. Armstrong is chief engineer in charge of the project. Morris, Shepard & Dougherty and George J. Grant Construction Company, copartners, are the general contractors. Charles S. Frost, Chicago, is the architect.

Commission To Study Mail Tunnel Plan in Large Cities

As a result of the agreement of the conferees on the postoffice appropriation bill, a commission is to be appointed which will study among other things the advisability of establishing a system of tunnels for the handling of mail matter in large cities. These tunnels have been suggested as a substitute for pneumatic tubes.

The commission is to consist of the chairman and four members of the Committee on Postoffices and Post Roads of the Senate, and the chairman and four members of the corresponding committee of the House, and a postal expert appointed by the Postmaster General. The Commission in turn is to appoint an advisory council of seven to be composed of those having special knowledge of the problem.

U. S. Chamber of Commerce to Hold Annual Meeting

"Increased production" is announced as the keynote of the eighth annual meeting of the Chamber of Commerce of the United States, to be held at Atlantic City, N. J., April 26 to 29, inclusive. The program provides for both general sessions and group meetings. In the fields served by readers of *Engineering News-Record* the following addresses are scheduled: "Port and Terminal Facilities," by B. F. Cresson, consulting engineer, New York and New Jersey Port and Harbors Development Commission; "Highways," by George M. Graham, general manager, Pierce-Arrow Co.; "The Country's Highway Program," by Thomas H. McDonald, director, U. S. Bureau of Public Roads; Roy D. Chapin, Hudson Motor Car Co.; W. A. Alsdorf, Ohio Good Roads Federation, and A. G. Batchelder, American Automobile Association.

"The Regulation of Highway Transportation" will be the subject of an address by J. F. Witt, Nagle, Witt, Rollins Engineering Co.

The group meeting on Industrial Production will have as its chairman Charles F. Lang, president, Lakewood Engineering Co.

James H. McGraw, president, McGraw-Hill Co., will speak on "The Function of the Business Press in Relation to Production."

Western Society Will Have Lunch Meetings and Talks

Monthly luncheon meetings have been arranged by the Western Society of Engineers, the first being held on April 2, with an address by Samuel Insull on the engineer's influence in public utilities.

Ohio Technical Societies Endorse Joint Conference Report

At a meeting in Columbus on March 30 the Association of Ohio Technical Societies instructed the secretary to advise the secretary of Engineering Council that "the sense of the meeting favored the report of the Joint Conference Committee of the Founder societies, and that the Association of Ohio Technical Societies desired to cooperate with the Founder societies in any manner that might be advantageous."

The following officers were elected: President, C. L. Rood, Toledo; vice-president, Monroe Warner, Cleveland; secretary-treasurer, G. Gale Dixon, Akron.

Membership in the association is held by the following Engineering Societies throughout the state: Cleveland Engineering Society; Cleveland Chapter of the A. A. E.; Cincinnati Chapter of the A. A. E.; Ohio Engineering Society; Engineers' Club of Columbus; Engineering Society of Akron; Toledo Chapter of the A. A. E.; N. W. Ohio Surveyors' Association.

Urge Membership in International Roads Congress

At a recent conference of the executive committee of the the American Association of State Highway officials, the recommendation was made that the United States accept the invitation of foreign countries to join the permanent International Roads Congress. The invitation was transmitted through the Consul General at Paris to the Secretary of Agriculture. Inasmuch as the roads congress constitutes an international tribunal for bringing together the best experience and results in highway construction and administration, the joining in by the United States has been strongly urged by Thomas H. MacDonald, chief of the Bureau of Public Roads, a member of the executive committee of the American Association of State Highway Officials, and who advised Secretary Meredith of that committee's recommendation. The suggestion has also been made that an invitation be extended to the road congress to hold its next annual session in the United States.

To Enlarge Advisory Committee

Secretary Meredith notified the highway officials that he would enlarge the advisory committee of state highway officials, which consults with the department on Federal road building policies, to include the entire executive committee of twelve members. This step has been taken so that the committee can better represent all parts of the United States, and make it more possible to work out a classification of roads for the entire country, thereby providing a basis for a more orderly national program of road building. The officials who attended the meeting were: Paul D. Sargent, chief engineer, Maine State Highway Commission; George P. Coleman, chairman, executive committee, Virginia State Highway Commissioner; W. G. Thompson, State Highway Engineer, New Jersey; George E. Johnson, State Highway Engineer, Nebraska; W. D. Uhler, State Highway Engineer, Pennsylvania; S. E. Bradt, Superintendent of Highways, Illinois; and Thomas H. MacDonald, chief of the Bureau of Public Roads, Washington, D. C.

Engineering Section of Safety Council To Meet April 27

The engineering section of the National Safety Council has called a conference of all persons interested in engineering and accident prevention, to be held at the Engineering Societies Building, New York City, April 27.

The morning session will take up the relationship of safety and engineering efficiency and the question of safety education in technical schools. The afternoon session will be devoted to safety standards: First, the present movement for uniform standards; second, the National Safety Council's part in this movement.

To Form Welfare Association in Canada

A new association, named the "Institute of Professional Civil Servants," is being formed in Canada to promote the welfare of its members, to maintain high professional standards and to enhance the usefulness of the service to the public.

Membership will be open to those officers of the public service of Canada who are engaged in (a) engineering, (b) technological or (c) scientific work, or the direction of administration of such work.

No Open Opposition to Public Works Bill, Report States

Marshall O. Leighton, chairman of the National Public Works Department Association, has issued the following statement regarding the status of the campaign for which the association was formed:

"No open opposition of any consequence has yet developed. We have been agreeably surprised to find approval in many places where we expected opposition. Outside of Congress, the movement has been endorsed by such men as Herbert C. Hoover, General Leonard Wood, Governor Frank O. Lowden, General George W. Goethals, W. Murray Crane and others. Each day brings news concerning the approval of some important person.

"The members of Congress are friendly to the Jones-Reavis Bill, but our difficulties lie in securing concerted action thereon. This is due to two causes: First, the lack of strong and effective effort from "back home"; second, the fatigue of Congress. The latter difficulty applies to all legislative measures. The members are so distracted by the consequences of war and the political conditions that it is difficult for them to concentrate on anything. It is practically impossible to keep a quorum on the floor of either House even to act on the appropriation bills necessary for the conduct of Government work. Committee chairmen find it difficult to secure committee attendance and hearings are attended by merely a handful of legislators. Much important legislation of an urgent nature is being held up by this condition, and, from an impartial survey of the situation, it appears certain that the public works bill is making as much or more real progress than any other legislation now being considered. Even the budget legislation, which was pledged in party platforms three years ago, has been hung up in Senate Committee for three months.

"The members of both Houses of Congress are anxiously looking forward to a vacation which they richly deserve. We hope that our bill will be brought out of committee of both Houses and placed on the calendar prior to adjournment, but in order to make sure of this, renewed efforts should now be made to show the members of both Houses of Congress that their people back home demand immediate action that will secure organized economy in our public works."

On April 6 the contributions received in support of the association's campaign totalled $14,750.

Dr. George Otis Smith Receives Geographical Society Medal

The American Geographical Society on April 6 awarded the Charles P. Daly gold medal to George Otis Smith, director, U. S. Geological Survey. The medal bears this inscription: "To George Otis Smith, Director of the United States Geological Survey. He helped disclose and develop the natural resources of his country, adapting them to its service in peace and war."

GEORGE OTIS SMITH

President Greenough of the Society in making the presentation spoke of the patriotic and vital part taken by the Geological Survey in the prosecution of the war. He mentioned that 477 members of the Survey had been in the military service. While asserting that the Director of the Survey is entitled to first place in the allocation of honor for the organization's recent achievements in the application of geographic science to the Nation's needs, President Greenough made it plain that the Daly medal is also a public recognition of the work done by Lieutenant Colonels Brooks, Marshall, Birdseye and Glen Smith; Major Bagley, Dr. Umpleby and Dr. Bastin, in the organization of departments of work of special importance to the Nation, at home and in France, in addition to Majors L. L. Lee and J. H. Wheat, Captain A. T. Fowler and Lieutenant Mudd, and many others.

The Daly medal has been awarded to the Arctic explorers Perry, Amundsen and Stefansson and to other geographers, including two members of the United States Geological Survey, G. K. Gilbert and Alfred H. Brooks.

U. S. Chamber of Commerce Issues Public Works Questionnaire

The question of whether or not the Federal Government should establish a Department of Public Works was submitted April 12 for a referendum vote to the 1,305 member organizations of the United States Chamber of Commerce. The result of the referendum will determine the National Chamber's attitude on this quastion when it comes up for Congressional action.

The committee appointed by the National Chamber to make a study of this matter drew up the following questions for submission:

1. Shall there be established by the National Government a Department of Public Works?
2. Shall such department be established by a suitable modification of the existing Department of the Interior excluding therefrom the non-related bureaus or offices and by the change of name of the Department of the Interior to the Department of Public Works?
3. Shall such department be established by the creation of an entirely new department?

The desirability of a Federal Department of Public Works was suggested by Engineering Council, an organization member of the National Chamber. Engineering Council believes there is an urgent need in the National Government for such a department to carry on the work of an engineering and construction character.

Engineering Council has gone on record as favoring the adoption of the Jones-Reavis Bill, now pending in Congress, providing that the name of the executive department at present designated as "Department of Interior" be changed to the name of "Department of Public Works" and that the head thereof shall continue to be a member of the Cabinet under the official designation "Secretary of Public Works." This bill would transfer much of the work now transacted by bureaus under the Department of Interior.

The committee appointed by the Chamber in making its recommendation did not pass upon the merits of the proposals embodied in the Jones-Reavis Bill. Instead, it submitted the three propositions for a referendum vote, one of which calls for an independent Department of Public Works.

Charles Nagel, formerly Secretary of Commerce and Labor, and honorary vice-president of the National Chamber, was chairman of the committee, the other members of which were: Samuel B. Botsford, Buffalo; J. Parke Channing, New York; L. S. Gillette, Minneapolis; Ira N. Hollis, Worcester, Mass.; Frederick H. Newell, Urbana, Ill.; William C. Redfield, New York City, formerly Secretary of the Department of Commerce; Frank A. Seiberling, Akron, Ohio; F. Harper Sibley, Rochester, N. Y.; M. C. Tuttle, Boston; William F. Willoughby, Wash.

Major E. A. Kingsley Receives French Decoration

In recognition of his work as officer in charge of road construction and maintenance in the Intermediate Section, East, of the A. E. F., with headquarters at Nevers, France, Major E. A. Kingsley, Engineers, consulting engineer and formerly city engineer of Little Rock, Ark., has received from the French government, through the adjutant general of the U. S. Army, the "Merite Agricole." The decoration was awarded on recommendation of Colonel Mahieu, of the French road service, with whom Major Kingsley was associated in his duties abroad.

McClintic-Marshall Claim Still Fails To Receive Approval

Another effort to secure action on the bill to relieve the McClintic-Marshall Company failed in the Senate on April 6, but it is believed that the question has been threshed out sufficiently to permit the passage of the measure the next time it is reached on the calendar. The claim grows out of work done by the company in Panama. The claim originally was for nearly $2,000,000, but only $700,000 of the claim was approved. The claim was investigated by special commission headed by General Rosseau.

Detroit Votes to Build Municipal Street Railway System

Bonds to the amount of $15,000,000 for a municipally owned railway system were approved by a popular vote of 89,285 to 51,093 at an election held in Detroit, Mich., April 6. The affirmative vote was about 64 per cent of the total against a required 60 per cent to carry the bond issue. The bonds will be used to construct and equip 101 miles of track and to take over 55.5 miles of lines now operated by the Detroit United Rys., the franchise for which has expired. These lines will not be taken over until the city has constructed its proposed line. The system thus built and acquired by the city will be run in opposition with the remaining lines of the Detroit United Rys. Construction of the city line was begun the next day after the favorable vote.

A charter amendment adopted in 1913 provided for a street railway commission which was to acquire a railway. In November, 1915, and again in 1919 the people voted against buying the property of the Detroit United Rys. The first defeat was attributed to the fact that no price had been fixed, the plan being to have the price determined by the judges of the Wayne County Circuit Court. In the 1919 election the defeat of the proposed purchase was attributed to the fact that the price agreed upon between the city and the owners of the street railways was considered by the people to be excessive.

Small Slides Stop Panama Traffic

There was a renewal of slides in Gallard Cut on the Panama Canal during the end of March. Movement of the banks is to be expected there until equilibrium is reached and dredges are kept in attendance and work continually to keep the canal open. The recent stoppage had some prominence because it occurred just prior to the passage through the canal of the British warship carrying the Prince of Wales, but was not of particular importance.

Handling Machinery Manufacturers Elect Officers

At the meeting of the directors of the Material Handling Machinery Manufacturers' Association, April 6, the following officers were elected for the coming year: President, Charles F. Lang, president Lakewood Engineering Co., Cleveland; vice-president, Rumsey W. Scott, Otis Elevator Co., New York; treasurer, Lucian C. Brown, Elwell Parker Electric Co., New York, and secretary and manager, Zenas W. Carter, New York.

Argentina's Building Program

There is a large field for the sale of American construction materials in Argentina, according to a report just made public by the Bureau of Foreign and Domestic Commerce, Department of Commerce, which points out that the investment of American capital in Argentine enterprises is an important factor in securing contracts.

Buenos Aires is in great need of first-class office buildings. Several departments of the government are being crowded out of their old quarters for lack of space and modern hotels and apartment houses of the American type are required. Notices appear in the newspapers of the capital from time to time inviting bids on various public construction enterprises. The time-limit for these is usually short, but if American firms were represented in Buenos Aires they could secure many such contracts.

The National Council of Education has adopted a large building program for public schools. The plans to be completed in the next few years call for an expenditure of about $8,500,000. The needs of various cities in the Province of Buenos Aires will call for the installation of sewerage and water systems costing $2,300,000.

The various provinces of Argentina have building programs independent of those of the central government, says the report, but also receive federal aid in the execution of many public works. Definite projects in which the central government plans to aid the provincial governments in the immediate future call for an expenditure of $10,000,000 for sewerage and water systems alone.

The report is signed by Trade Commissioner W. W. Ewing.

Convention Plans of A. A. E.

Chapter representation at the sixth annual convention of the American Association of Engineers, to be held in St. Louis, Mo., May 10 and 11, will be in proportion to chapter membership. One chapter is entitled to one delegate or more, not to exceed one for each one hundred members. Each delegate is entitled to cast a number of votes equal to the number of certified and junior members in good standing in the chapter which he represents, but not to exceed five hundred in all.

One of the subjects to be discussed is "The Reorganization of A. A. E. on a Business Basis." The suggestion has been made by W. W. K. Sparrow, assistant chief engineer of the Milwaukee, that the association employ a high-salaried paid president. On the evening of the first day of the convention there will be held seven group meetings for various groups of engineers. Among the subjects to be considered are:

- Getting Salary Schedules for Public Service Engineers Into Budgets.
- What Part Shall A. A. E. Take in the Presidential Campaign?
- Making a Chapter a Force in a Community.
- The Federal Department of A. A. E.
- Opportunities for the Engineer in Each of the Various Branches of the Profession.
- Co-ordinating A. A. E. Activities in the State.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

TWELFTH NATIONAL CONFERENCE ON CITY PLANNING, 60 State St., Boston; Cincinnati, April 19-22.

NATIONAL FIRE PROTECTION ASSOCIATION, 87 Milk St., Boston; May 4-6; Chicago.

AMERICAN ASSOCIATION OF ENGINEERS; 63 E. Adams St., Chicago; May 10, 11, St. Louis, Mo.

AMERICAN WATER WORKS ASSOCIATION, New York City; Montreal, June 21-26.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; Asbury Park, N. J., June 22-25.

AMERICAN PUBLIC HEALTH ASSOCIATION, Boston; San Francisco, Aug. 30-Sept. 3.

The Association of Members, Am. Soc. C. E., San Diego, Cal., has elected for the coming year the following officers: President, George Cromwell; vice-president, Fred J. Grumm; secretary-treasurer, Rudolph C. Wueste.

The National Lumber Manufacturers' Association will hold its annual meeting April 20-22, in Chicago, in conjunction with the American Lumber Congress. Most of the papers scheduled relate to business, economics or politics.

The Engineers Club of Minneapolis, at a meeting, March 15, endorsed the principle of a law for licensing and registering engineers for Minnesota and advocated the introduction of a bill at the next session of the legislature. The matter was referred to the Minnesota Joint Engineering Board, with the recommendation for immediate action.

The "4 State Section," American Water Works Association, will hold a meeting at the Bellevue-Stratford Hotel, Philadelphia, Friday noon, April 16, at which time the Mayor of Philadelphia will outline the needs of that city in connection with its increased water supply.

PERSONAL NOTES

John B. Otto has resigned as city engineer of Williamsport, Pa. He was city engineer in 1876 and was again elected in 1909.

N. L. Reeve, formerly with the U. S. Reclamation Service, and more recently at Hog Island, has entered the hydraulic division of the Boston office of Stone & Webster.

W. E. Herring, for many years connected with the U. S. Forest Service, and later with the Puget Sound Traction, Light & Power Co., has joined the hydraulic division of the Boston office of Stone & Webster.

August E. Christhilf has been appointed chief engineer of the Annex Improvement Commission of Baltimore, succeeding J. Morris McCummings.

C. E. Miller has been appointed chief engineer of the Belzoni Drainage District, Belzoni, Miss.

Philip L. Siteman has resigned from C. E. Smith & Co., consulting engineers, St. Louis, to become associated with D. G. Cooper, of Paxton, Ill. The new firm, known as Siteman & Cooper, civil engineers, will engage in general engineering practice.

Hart Cummin, formerly sales engineer, Platt Iron Works Co., Dayton, Ohio, has become associated with Gaylord C. Cummin, New York City, in the practice of consulting municipal engineering.

Willis Whited, for the past eight years bridge engineer, Pennsylvania State Highway Department, has been appointed consulting engineer to the department. Prior to joining the highway department, he was for 12 years bridge engineer of Pittsburgh.

Stacy S. Rumpeltin has been appointed village engineer, and John A. Giles, of Binghamton, consulting engineer, of Johnson City, N. Y.

F. W. Crockef, formerly traveling inspector for the U. S. Shipping Board, Emergency Fleet Corporation, Houston, Tex., has been appointed engineer of the Kansas City (Mo.) Bridge Co.

V. G. Younghusband, who has superintended the work on the new Parliament Buildings at Ottawa, has left the Peter Lyall Construction Co. to enter the employ of the Foundation Construction Co., Montreal.

H. C. Culverhouse, formerly assistant highway engineer of Jefferson County, Ala., has been appointed assistant engineer of the Alabama State Highway Department, succeeding A. L. Smith, who has been made division engineer.

R. J. Lewis has been appointed city engineer of Fort Madison, Iowa, succeeding H. R. LeSeur, resigned.

Major Carl H. Reeves has been appointed superintendent of the Department of Public Utilities of Seattle, succeeding Thomas F. Murphine, resigned.

E. A. Moritz, office engineer, U. S. Reclamation Service, Denver, Colo., has been appointed project manager of the Flathead Project, with headquarters at St. Ignatius, Mont.

Allen R. Boudinot, recently building inspector, Ordnance Department, Rock Island (Ill.) Arsenal, has become assistant engineer to E. E. Mashburn, consulting engineer, Cotton Plant, Ark. Mr. Boudinot was at one time city engineer of Davenport, Iowa.

Paul B. Sutton has been appointed city engineer of Watertown, N. Y.

Major Wildurr Willing, U. S. district engineer, at St. Louis, and secretary of the Mississippi River Commission, has been transferred to Boston, where he will be district engineer in charge of river, harbor and fortifications.

John H. Lewis, for 14 years state engineer of Oregon, and R. R. Clark, formerly with the state highway department and more recently engaged in contracting and municipal engineering work at Portland, have organized the firm of Lewis & Clark, with offices in Portland. The new firm is prepared to act as consulting and managing engineers on irrigation, drainage, water power and municipal work, as well as the construction of bridges, grain elevators, docks and similar structures of steel and concrete.

E. J. Buegler, formerly consulting engineer of Westinghouse, Church, Kerr Co., has been elected vice-president of the Foundation Co. in charge of engineering.

J. L. Haugh, formerly engineering assistant to the regional director of the Northwestern region, U. S. Railroad Administration, has been appointed assistant to the president of the Union Pacific, with headquarters at Omaha.

Major Albert K. B. Lyman, recently instructor in engineering at Camp Humphreys, Va., succeeds Major Wildurr Willing as U. S. district engineer at St. Louis.

J. R. Leighty, recently corporate chief engineer, Missouri Pacific R.R., has been appointed assistant to the vice-president, with headquarters at St. Louis.

C. W. Cheatham, of the Missoula office, U. S. Bureau of Public Roads, has been appointed senior highway engineer of the bureau in Alaska.

A. S. Baldwin, recently corporate vice-president, Illinois Central R.R., has been elected vice-president in charge of Chicago terminal improvements.

OBITUARY

Melvin B. Newcomb, chief engineer, rubber machinery department, Wellman-Seaver-Morgan Co., died March 13, after a short illness, at his home in Akron, Ohio. Mr. Newcomb was born in Bridgeton, N. J., in 1889. He received his mechanical engineering education at the University of Wisconsin. At various times he was connected with the I. P. Morris Co., Philadelphia, Allis-Chalmers Mfg. Co., Milwaukee, Wisconsin Engine Co., Corlis, Wis., and the Firestone Tire & Rubber Co., Akron. In 1918 he joined the hydraulic turbine department of the Wellman-Seaver-Morgan Co., and a few months later was appointed chief engineer of the rubber machinery department.

Charles H. McCullough, Jr., president of the Lackawanna Steel Co., died at Baltimore, April 3, aged 51 years. He was born in Philadelphia, and was a graduate in mechanical engineering of Stevens Institute of Technology. In 1891, he became associated with the Illinois Steel Co. at its South Works plant, Chicago, and served in various capacity in that company, finally becoming vice-president. He resigned, in 1905, to become vice-president and general manager of the Lackawanna Steel Co., and was elected president, Jan. 1, 1919.

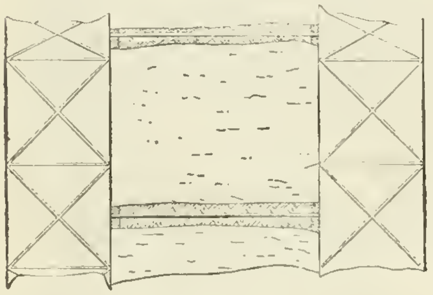
Henry Foster Newell, for eight years a member of the engineering staff of the Panama Canal Commission, died at Ancon, April 5. He was born at Bradford, Pa., in 1882. Previous to his work in the canal zone, he was engaged in surveying and general engineering work in the Southwest, serving at one time in a machine-gun company on the Mexican border. His principal work was in connection with exploration and detailed mapping of the tributaries of the Chagres River, and the location of works for the defense of the Panama Canal. He was a brother of F. H. Newell, former chief engineer and director of the U. S. Reclamation Service, now professor of civil engineering at the University of Illinois.

Patent Sought on New Floor Block

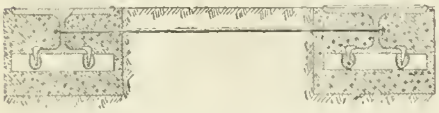
B. S. McConnell, one of the department managers of the Republic Creosoting Co., Indianapolis, Ind., has applied for patent on a new floor block used in the construction of factory floors. Mr. McConnell s invention consists in cutting off each of the four corners of each block, to provide space for the penetration of whatever binder is used.

Patent Issued on Automobile Railway Track

A patent has recently been issued to John J. Ahearn, Palmer, New York, upon what the patentee calls an "automobile railway-track." The track consists of T-rails formed upon supporting plates and tied at intervals with tie-rods. The tread face of the T-rail is provided with various designs for preventing automobiles or other vehicles from skidding or slipping. Short ties are secured to the supporting plates of the rails by spikes and the ties and rails are then embedded within cement so that the tread plates are disposed in a plane with the surface of the roadbed. The invention is presumably applicable to any type of road surface. The accompanying drawing shows the type of construction and the tread face preferred by the inventor.



Plan



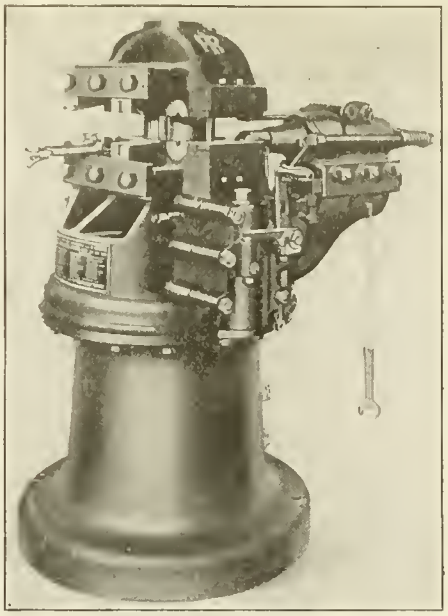
Vertical Section

T-RAILS WITH SPECIAL TREAD SURFACE FORM HEAVY TRAFFIC ROADWAY

Improved Drill Steel Sharpener

A new compressed air, drill steel sharpening machine—the 1-R No. 50 Sharpener—has been developed by the Ingersoll-Rand Co., New York City. It was designed primarily to sharpen and shank cruciform steel up to 2 in. in diameter, or round, hexagonal, octagonal, quarter-octagonal, auger or spiral steel up to 1⅞ in. However, it has performed other tasks and, when fitted with special devices, will forge boltheads, pins, stanchions, etc. In fact, nearly 200 different products have been made by it.

The single lever, which controls all of the machine's operations, is fitted with a safety locking device. The throttle valve is of the balanced spool type and operates easily and quickly. The hammer cylinder is an improved valveless type. A substantial base and the Ingersoll-Rand "heartbeat" system of lubrication are other features.



NEW COMPRESSED AIR MACHINE MAKES 200 PRODUCTS

BUSINESS NOTES

Harold E. Ketchum, vice-president, Graff Construction Co., Seattle, Wash., has been made general manager, Francis A. Vaughn Mfg. Co., Milwaukee, Wis., manufacturers of column clamps, tools and contractors' equipment. Mr. Ketchum has been in charge of construction work for the past twelve years on engineering structures, notable among which are the Detroit-Superior high level bridge, Cleveland, the Twelfth St. Trafficway, Kansas City; bridges eight and nine, Canadian Northern Ry., B. C., and the general storehouse at Bremerton Navy Yard. During the past three years he has constructed and equipped the factories of the American Nitrogen Products Co., at LaGrande, Wash., and Vancouver.

The American Concrete Pipe Association elected the following officers at its annual convention held in Chicago, Feb. 20 and 21: President, A. N. Shearman, Knoxville, Tenn.; vice-presidents, Ernest Bent, Los Angeles; Harry K. Cain, Mankato, Minn.; A. M. Hirsh, New York. Manager, G. E. Warren, 210 South LaSalle St., Chicago.

The Portland Cement Association announces the opening of a new office at 146 Fifth St., Portland, Ore., with Hans Mumm, Jr., as district engineer in charge.

The Shockley Engineering Co., Kansas City, Mo., announces its removal to larger quarters in the Graphic Arts Bldg., that city.

Dayton-Dowd Co., Quincy, Ill., announces the opening of a branch office in Cleveland, under the management of L. E. Maher, Maher Engineering Co., Chicago. This office will handle the line of Dayton-Dowd centrifugal pumps in addition to other mechanical equipment, and is prepared to give prospective pump users complete information covering their problems.

The James Leffel & Co., Springfield, Ohio, manufacturers of turbine water wheels, has moved its Boston offices from 79 Milk St. to 161 Devonshire St. This office will be in charge of A. S. Addison, who will be transferred from the main office and factories in Springfield.

W. D. Ward, for the past twenty-five years sales engineer in the home office of the Pelton Water Wheel Co., San Francisco, has been appointed manager of the company's Atlantic department, 90 West St., New York.

The Chicago Pneumatic Tool Co., has transferred its general offices to the Chicago Pneumatic Building, erected for the company at 6 East 44th St., New York City. The Chicago district sales branch, previously in the Fisher building, has moved to 300 North Michigan Boulevard, and the service branch has been consolidated with the sales branch, both departments to be under the direction of J. L. Canby.

The F. C. Austin Machinery Co., Chicago, has been incorporated to take over the business of the F. C. Austin Co., Inc., the Municipal Engineering & Contracting Co. and the Muskegon plants of the Linderman Steel & Machine Co., retaining the personnel of those companies. F. C. Austin, however, retires from active management, and B. A. Linderman assumes control. The offices of the combination will be in the Railway Exchange Building, Chicago.

The Jeffrey Manufacturing Co., Columbus, Ohio, has opened a new branch office in Los Angeles, to take care of its business in California, Arizona, Nevada and the State of Sonora, Mex. The office will be in charge of F. R. Field, recently manager of the Denver office of the company.

R. E. S. Geare, of Geare and Co., engineers, specializing in sales engineering in the construction and power plant field, which concern has for the past four years handled the business of the T. L. Smith Co., of Milwaukee, has been appointed general sales manager of the Smith Co., in charge of its general sales offices in the Old Colony Bldg., Chicago, where the advertising and sales departments are now located.

Ralph G. Macy has resigned as chief engineer of the Walter Kidde Co., to join the engineering staff of the Engineering & Appraisal Co., New York City.

A Consolidation of Engineering News and Engineering Record McGraw-Hill Company, Inc.—JAMES H. McGRAW, President

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN
Editor

Volume 84 NEW YORK, THURSDAY, APRIL 22, 1920 Number 17

The Results of the Questionnaire

QUESTION 3, on which discussion centered during the balloting on the questionnaire of the American Society of Civil Engineers, has been lost. That is the outstanding fact in connection with the returns.

Questions 1 and 2, on external relations, which provide for civic and welfare activity, were, on the other hand, carried, indicating that the society disapproved only of the special means for such activity recommended by the development committee, that is, through federation with other national and with local societies.

The questions relating to internal changes were carried, with the exception of Number 7, which provided for an increase in non-resident dues of more than $5, but not more than $10 per annum. Question 6, which provides for an increase in non-resident dues of not more than $5, on the other hand, carried.

Fortunately the results are clear. The society does favor a broader program; it does favor co-operation with other societies; it objects only to the particular method of co-operation proposed by the Joint Conference Committee. The society favors increased internal activities and a democratization of its organization—and is willing to have its non-residents pay $5 additional to meet the cost.

Therefore, there is clear gain. We know definitely that a broader scope is desired, and that the members approve of co-operative effort. We know that they want greater internal activity and are willing to pay for it.

One of the very notable features of the result is that the largest majority on any proposal was polled on Question B3 (of the internal group), that which provides that the directors in each geographical district be nominated and elected by vote of the corporate members resident therein. Out of a total of 3,743 votes cast on this question there were only 567 adverse votes. Moreover, it is interesting to note that District 1, generally considered as favorable to the present method of organization, cast 568 *for* and only 176 *against* the more democratic method proposed by Question B3.

In defeating Question 3, under external relations, the safer, the more conservative, course has been pursued. The society avoids work that would have been onerous, indeed. There surely was opportunity for unfavorable alliances, as the opponents predicted. We know that many members were adverse to federation, but we did not feel that there was serious danger.

One may properly ask how the two votes, one favoring co-operative effort and the other opposed to the Joint Conference plan, are to be interpreted. We understand them to mean that the society favors co-operation only when it is in a position to exercise a very powerful, if not a dominating, influence. That, too, is a safe and conservative course, surely calculated to preserve the society's prestige.

Now that the decision has been made, *Engineering News-Record* is not going to quarrel with it. Question 3 was lost by a majority vote of 87, in a total vote, on that question, of 3,821. Districts 1 and 3, including the Metropolitan district, New York State and Canada, cast a total of 1,074 ballots, with 287 in favor of the proposal and 787 against it. The adverse vote was, thus, more than 3 to 1, and the adverse majority 500. On the other hand, all the other districts cast 2,747 ballots with a majority *favoring* the proposal of 413. In other words, New York City and New York State, for the Canadian vote is very small, overcame the favorable majority of the rest of the country and defeated the proposal by 87 votes. District 8, including Illinois, Indiana, Kentucky and Tennessee, was the only one besides Districts 1 and 3 to vote adversely on Question 3. Its negative majority in a total of 271 votes was 29.

The closeness of the vote and the fact that New York negatived the positive vote of the rest of the country may cause dissatisfaction, but with such dissatisfaction we would have no sympathy, particularly since all the other proposals were carried. Certainly every effort was made to get out the vote. Discussion was lengthy and many sided. The minds of the members were directed to the full merits of the question, yet in the whole country outside of New York the number of members who favored Question 3 exceeded those who opposed it by only 413. In other words, the whole country did not come down to New York with a landslide in favor of the Joint Conference proposal. Opinion was not evenly divided, it is true, but there was a favorable majority of only 413 in a total vote in those districts of 2,747.

Moreover, the adverse majority of 87 should be considered in the light of the fact that on all other questions the vote was favorable by ratios ranging from 2 to 1 to nearly 6 to 1. In other words, such was the feeling against Question 3 that despite overwhelming positive majorities on all other proposals, that question was defeated.

As to conclusions from the ballot, certainly the vote precludes the entrance of the American Society of Civil Engineers into the conference planned by the Joint Conference Committee, and will be a serious blow to the federation movement—if it does not kill it entirely. There have been repeated assurances that the other societies would go ahead alone, and we, ourselves, have said they should do so. Possibly, though, the withdrawal of the civils may prompt the almost total abstinence of the locals. Under that condition the movement would be dead.

It is evident, too, that the defeat of Question 3 is likely to give a strong impetus to the American Association of Engineers. If the men who, while opposing

Question 3, approved of the A. A. E., will act in accordance with their expressed views, that organization will have an accretion of a goodly number of strong men. If they add to the association's balance and prestige without slowing up its work materially, the A. A. E. will set an example that even the strongest and most virile federation would have difficulty in equalling.

For ourselves, we have believed that federation—under the leadership of the founder societies—would be the quickest way of bringing about unified professional action. The majority does not so believe, and, therefore, as civil engineers we must address ourselves to studying other means of functioning in civil and welfare matters. It is hardly likely that there will be other than very limited activity through the society itself. We take the adverse vote as equivalent to bidding us to function through another body.

The smoke of battle will now clear away. The differences should be forgotten, and energies concentrated on the great work of strengthening the internal activities and reforming the organization as provided in the favorable vote on the second group of questions.

The heavy majorities on that group, supported by a willingness to provide larger funds, are an indication of the enthusiasm with which the membership will approach the task of expanding the activities and changing the form of organization. That for which so many members have argued and waited—increased activity—is in a way to become an accomplished fact.

To those who, like ourselves, hoped that Question 3 would carry there is this consolation—that the society has elected to proceed on the surer, the safer course. After all, the greatest asset the society has is its prestige, and that surely is preserved by the results of the ballot. We do not believe it would have been injured by participation in the proposed federation.

The work that was to have been done by the federation must be done. That is universally conceded. We are content, if the profession wills it so, to turn to another agency. What we are concerned about is merely that the work shall be done, and that it shall be done well and creditably to the profession.

Break-Up of the Railroad Strike

A WEEK ago the outlaw railroad strike had reached such proportions that it promised to become a national calamity. At this writing, the strike appears to have practically broken up. Now that the Railroad Labor Board has been organized the matter of wages may be duly presented. Had not the law provided such recourse, the case of the employees, which we believe is a good one in itself, would probably have been lost—through force of public sentiment and the attitude of the railroad managements as a result of the ill-advised attempts to tie-up the roads without warning. It was pointed out in an article by Charles Whiting Baker, in *Engineering News-Record* of Feb. 19, 1920, p. 385, that the railroad wage increases already granted had been more than offset by the rising cost of living. When the railroad unions presented their demands some eight or nine months ago they were asked by officers of the Government to hold the matter in abeyance in the hope that the cost of living would be reduced. In the meantime it increased, and no action was taken. The stage was set for the radical strike organizer and for the time being his deception—that the brotherhoods secretly favored the strike—was successful. A good case has been injured by employing syndicalist methods in the false hope of their gaining a just end.

Renouncing the Plumb Plan

AN INTERESTING outcome of the railroad strike is the report that the Brotherhood of Railway Trainmen has withdrawn from the Plumb Plan League, mentioning the possibility that other of the brotherhoods may follow. It is pointed out that labor leaders fear the effect of the league's propaganda in fomenting outlaw strikes. This is indeed significant. When the Plumb plan was first proposed it appeared evident that it was really more a step toward a distinct end than an actual plan of railroad operation—the end being the control of the railroads by labor. Some of the propaganda of the Plumb Plan League appears to have planted seeds of sovietism, in fear of which the more far-seeing labor leaders are withdrawing their support.

Concrete Roadbed for Railways

MANY railway engineers will read with surprise the article on the use of concrete roadbed for railway track, published elsewhere in this issue, since it is not generally known that such construction has been in use for some years and with highly satisfactory results under conditions of heavy traffic and unstable soil. While the idea is not new, the feature of surprise will be that the existing installations are not experimental but form part of track construction where special methods are required to meet special conditions. Its main purpose is to reduce maintenance work and expense, in which it appears to have been quite successful.

On all roadbed, except in the rare cases of solid rock, there is a continual depression of track due to the ballast being worked into the soil of the roadbed. This must be made good by additional ballast to maintain the track at normal surface, which means a continual expenditure of money, material and labor. Where very soft ground occurs, such expenditures may be excessive and they result in no permanent improvement. With a concrete slab base to distribute the pressure and to separate the loose material of the ballast from the yielding soil, or to eliminate ballast entirely, this continual waste and work is avoided, with consequent saving in expense and more permanent maintenance of track.

That the present installations represent very diverse ideas on the part of their designers is only natural, in view of the limited extent of and experience with construction of this kind. Three points of distinct difference may be noted. In some cases ballast is eliminated, while in others the ordinary ballasted track is laid upon the concrete. Again, some have monolithic slabs over the entire length and width of the area to be covered, while others have rows of slabs of moderate length and built independently for each track. In the third place, it is of particular interest to note that while one engineer aims at an absolutely rigid track and roadbed, another adopts special means to ensure resilience or elasticity in the track.

Since maintenance of track is a large and troublesome factor in railway service, it appears reasonable to expect a further development of the concrete slab system, in view of the success obtained thus far at reasonable cost and under severe traffic conditions.

Street Congestion in the Cleveland Referendum

A QUESTION compounded of the elements of two important municipal engineering problems comes before the voters of Cleveland next week. One of the problems, at least, is quite new in its present-day aspect, as is also the composite. The citizens are to vote on a bond issue for constructing downtown terminal subways for street cars, a project intended to serve the dual purpose of relieving street congestion and later providing a rapid-transit trunk line.

Other cities are struggling with the problems of improving their street-traffic conditions and shortening the time of transit between living districts and business centers. In Detroit, a closely similar composite solution was worked out; it was rejected by the city recently, but under political circumstances that robbed the result of engineering significance. Pittsburgh and Cincinnati, with traffic conditions not greatly unlike those of Cleveland, are also considering both problems. A number of other communities have reason to concern themselves with either street congestion or rapid transit. Hence the broad meaning of the Cleveland vote.

Crowding of streets gave trouble many decades ago. Its new aspect of today is due to the many-storied office building, the great multiplication of automobiles, and increasing street-car concentration in downtown districts. The automobile has made the situation critical quite suddenly, the more so as street-car lines carrying heavy traffic tend to withdraw a good part of the street width from general use; and under the prevailing system of routing street-car lines with sole regard to their own traffic, and without consideration of other street services, downtown concentration of trolley routes is a natural result. Gradually increasing congestion in the business districts of large cities in recent years has made itself felt as a serious disadvantage to the commercial life of the communities. No advance has been made in dealing with the problem since the institution of police control of traffic, and definite proposals for a more thorough-going solution are quite recent. Since any effective solution is bound to involve large expenditures, little planning can be done until it is known whether the taxpaying public will be likely to vote the funds.

Last summer a clean-cut expression of the public attitude toward this question was obtained in Pittsburgh. A vote of $6,000,000 for a loop subway encircling the downtown district turned solely on the question of street congestion. The favorable outcome of the vote justified the deduction that the citizens of Pittsburgh see profit in an expenditure of $6,000,000 for improving downtown traffic by removing the street cars from the surface. The expected gain in commercial efficiency through greater ease and rapidity of communication in the business district is held to outweigh the cost of the enterprise. Thus the Pittsburgh vote furnished a helpful indication to engineers concerned with municipal services of all kinds.

The Cleveland referendum cannot have the same meaning, due to the fact that rapid transit is involved. In fact, rapid transit may be the dominant consideration in shaping the vote. This is unfortunate, for after the Pittsburgh decision in favor of eliminating street congestion it would be valuable to get confirmatory evidence on the attitude of the public.

An interesting statement of the way in which rapid transit is involved in the Cleveland project has been prepared for *Engineering News-Record* by the originator of the terminal subway project; it is published in the present issue. In the light of that statement the project presents itself as one for obtaining rapid transit by indirection. Reading the statement in conjunction with the original report on the project (see *Engineering News-Record*, July 24, 1919, p. 170), we may learn that a rapid-transit system in Cleveland at the present time would be unprofitable, and that its construction should therefore be postponed, but that piecemeal construction of a rapid-transit line can be made to pay its way by the device of utilizing parts of the system temporarily for the relief of street congestion. Thus, at the outset and during the early years, the $15,000,000 investment is to find its justification in the improvement of street-traffic conditions which it will bring about.

As to the permanent status of the street-congestion problem in Cleveland, the solution offered leaves obvious doubts. So far as the report and the statement commit themselves on this point, it appears to be considered that the initial improvement in street conditions will somehow be maintained when rapid-transit trains displace the surface cars in the subway. But this depends on whether or not the surface-car service will be permanently reduced; that is, whether most of the surface traffic will be transferred to the underground line. In view of city growth and the continuing need for short-haul car service, it would appear only prudent to assume that street congestion will be about the same after installation of the rapid-transit service as it is now. In other words, the present expenditure for relief of congestion might well be devoted to that purpose permanently.

Such considerations suggest that rapid transit and surface congestion are separate problems which do not accommodate themselves to a joint solution. In the same connection it needs to be recalled that many existing rapid-transit services have built up their own traffic, independent of and superimposed upon that of pre-existing lines, which means that rapid transit will increase rather than diminish congestion. This in turn means that the two problems in question are independent, or, if anything, antagonistic rather than co-operative, and therefore not amenable to co-operative solution. However, the enthusiastic support of the terminal-subway project by the city's able Rapid Transit Commission expresses a definite conclusion to the contrary effect.

Under the circumstances, the Cleveland referendum is no less interesting in its complexity than in the nature of the questions involved. While the vote will have great meaning for the city itself, it will not mean anything definite with regard to the traffic and transit problems of other cities. Were the dual purpose of the project fully clear to the voters, the result of the referendum would represent a popular verdict on the possibility and desirability of a joint solution. Or, again, were the vote simply on a project for eliminating street congestion, its result would constitute a most welcome confirmation of the Pittsburgh vote. But the present indications are that the issue will hinge on the public's desire for rapid-transit, and that little light will be thrown on the taxpayers' attitude toward expenditures for the relief of street congestion.

Henry Martyn Robert

Soldier, Parliamentarian, Author and Engineer—

An Appreciation of the Author of "Robert's Rules of Order," and Chief of Engineers, U. S. Army, Retired

TO every engineer no less than to every educated American citizen the title "Robert's Rules of Order" is a household word. We meet the little volume, or hear weekly references to it, upon our entrance into high-school debating societies. Later we take it into our college fraternities and clubs, and throughout busy professional and business lives we rest heavily upon it in all deliberative assemblies. We diligently thumb its pages to find authority to support our "points of order," and we unhesitatingly abide by the decision of the chair when he tells us that it conforms to Robert.

Brigadier-General Henry Martyn Robert

But how many engineers know that the author of that volume is one of their own professional brethren, that he is a civil engineer, a retired member of the Corps of Engineers of the United States Army and at one time Chief of Engineers?

Yet that is the case, and happily this young old man, now in his eighty-third year, is living a vigorous life at his home in Owego, N. Y., not resting upon his laurels but busily at work on another volume on parliamentary procedure.

Brigadier-General Henry M. Robert, U. S. A., retired, is of Southern ancestry, having been born at Robertville, S. C., May 2, 1837, the son of Rev. Joseph Thomas Robert, LL.D., and Adeline (Lawton) Robert. One of his ancestors, Pierre Robert, was pastor of the first Huguenot colony that landed in South Carolina after the revocation of the edict of Nantes. He entered the Military Academy at West Point in 1853 and was duly graduated in 1857. Then followed a busy life, for the country was young, requiring the services of army engineers in regions inaccessible by railroads. Moreover, the Civil War entered, with its feverish activity. While a cadet, at the age of nineteen, the future General on one occasion acted as assistant professor of mathematics, and immediately upon graduation was made acting assistant professor of natural philosophy and astronomy, and also acting assistant professor of practical military engineering. In 1858 he was ordered to Washington Territory with a detachment of troops to take command of engineering operations in a campaign against the Indians in Oregon and Washington. Lack of rail transportation made it necessary for him to go via Panama, and during his journey through the Tropics, though his scrupulous care protected his men from the then raging Panama fever, he himself took the disease—a matter that was only an incident then, but which interfered seriously with his activities during the Civil War.

While on service in Washington Territory he participated in a now almost forgotten incident that brought us near the verge of war with Great Britain. The dispute between Canada and the United States over the Northwest boundary had not been composed, and during the heat of the controversy, with Washington Territory cut off from Washington city except by long-delayed mail communication, all of the United States troops in the Northwest were ordered to San Juan Island in Puget Sound, and Lieutenant Robert was placed in charge of the construction of the defenses on the island. Eight 32 pounders, hardly more than saluting weapons, taken from the transport "Massachusetts," were the only artillery available, but these pieces were duly placed along the line of defense. Happily, no clash came, and on the arrival of General Winfield Scott the troops were withdrawn.

Ordered East just before the outbreak of the Civil War, he was, at the beginning of hostilities, placed in charge of the construction of a portion of the defenses of the City of Washington. He was, however, still suffering from the effects of the Panama fever and under the tremendous strain involved in preparing these defenses, his strength proved inadequate and he was transferred to Philadelphia, in connection with the work on the defenses of the city and its port. Again, however, his strength proved insufficient and in 1862 he was transferred to New Bedford, Mass., and placed in charge of the construction of defenses there. He continued at this point until the close of the war, and was then transferred to the Military Academy and placed in charge of the Department of Practical Military Engineering. Here he remained until 1867, when he was transferred to San Francisco as chief engineer of the Military Division of the Pacific. Subsequent transfers placed him in charge of defenses of the Columbia River, of the operations of the Thirteenth Lighthouse District, of harbor improvements in Oregon and Washington, of lighthouse construction on Lake Michigan, and, during an eight-year period, of harbor improvements on Lake Michigan, Green Bay, and Lake Superior.

Then his activities were transferred farther East, and from 1883 to 1885 various river and harbor work on Lakes Erie, Ontario, and Champlain, and the St. Lawrence River occupied his attention. The Corps of Engineer activities in the neighborhood of Philadelphia were under his charge for five years. In 1890 he became engineer-commissioner of the District of Columbia and after a year of service was placed in charge of improvements on the Tennessee, Cumberland, and other rivers in that neighborhood, and later supervised river and harbor work on Long Island Sound and the fortifications of Long Island Sound and New York Harbor.

Served on Many Engineer Boards

He had by that time, 1895, been promoted to the rank of Colonel, and then began, backed by a long and varied experience, the most fruitful period of his engineering career. He was made division engineer of the Southwest Division, which included eleven engineer districts from Pittsburgh to Galveston, with headquarters at New York. In that capacity he continued until 1901, and during that period served as president of engineer boards on no less than thirty-three projects, including such notable improvements as the harbors at Galveston, Philadelphia, Pensacola, New York, and Bridgeport, river improvements that included the Delaware, the Hudson, and the East Rivers, and the Southwest Pass of the Mississippi. During this period and in the years immediately preceding he had served on eighteen other engineer boards, the reports including studies of improvements of the Columbia River and many harbors on the Great Lakes, among them Marquette, Green Bay, and Manitowoc. While stationed at New York he was president of the Board of Engineers for Fortifications, president of the New York Harbor Line Board, of the Philadelphia Harbor Line Board, and the Board for Examining Officers of the Corps of Engineers for promotion. One of the most important reports under his presidency was that on the new channel entrance to New York Harbor, which has since been constructed and now forms the main channel from sea to upper bay.

On April 30, 1901, he reached the headship of his Corps, as Chief of Engineers, with the rank of Brigadier General, but under the inexorable operation of the retirement law held the place for only three days.

His retirement, however, did not mark the close of his engineering endeavor. In fact, some of his most notable engineering work was done after that date.

While his name, necessarily, will be connected with works over a very large extent of territory, some of them of extremely great importance in the annals of river and harbor engineering, probably the port and city with which his name will be most connected is that of Galveston, Tex. Following the Galveston tidal wave disaster of 1900 he was appointed chairman of a board of engineers to report on methods of preventing destruction by future tidal waves, the other members of the board being Alfred Noble and Major H. C. Ripley. Their studies resulted in the recommendation of a seawall, which, under a somewhat modified design, was built and has effectively saved the city on two subsequent occasions. After the storm of 1909 General Robert was called in again, this time alone, to report on the repair of the damage done, and, again, after the great storm of Aug. 19, 1915, he was called upon to recommend still further measures of protection.

His repeated retainer on the seawall problem—a display of confidence in him by the people of Galveston—was due in part to a very shrewd prediction which he had made as a result of his engineering studies of the port problem. The incident is worth repeating as an illustration of General Robert's engineering thoroughness.

In 1889 the President made General Robert a member of a board of engineers to recommend the western Gulf port which the Government should develop to handle the growing tonnage, largely cotton, from the Texas and southwestern hinterland. There was bitter competition. Sabine Pass, Brazos River and Aransas Pass strongly presented their claims.

With a clear vision of the future development of that section—a vision that has long since materialized—General Robert argued that the plans should be laid on broad lines. A 600-ft. channel, 30 ft. deep, he contended, should be the ultimate goal, with shallower waterways on either side, the whole width being about 2,000 ft. and giving a channel cross-section of about 50,000 sq.ft. In addition, the flow should be such that, with the aid of jetties, the channel would maintain itself and save the expense of constant dredging. Galveston alone would meet the conditions. General Robert's studies and arguments were so convincing that his colleagues concurred with him and recommended Galveston for comprehensive development.

Galveston Port Development

There was at Galveston at that time a channel cross-section of about 160,000 sq.ft., but the water over the bar was shallow. That was strongly urged against Galveston by the rival ports, but, despite the opposition, Congress approved the plans and appropriated the money which put Galveston on the map.

Despite the fact that rival delegations failed to prevent the appropriation, discussion did not down and it was freely predicted that the port of Galveston would never be a success. The jetties were begun about 1890. From then until April, 1895, the depth on the bar had increased only a few feet, giving a channel depth of 14½ ft. General Robert, however, never losing faith in the project, had been studying the soundings with minute care. He found that the bar was steadily traveling seaward and that while the front of the bar had advanced only two miles, the rear had advanced four miles. In other words, the bar was going to sea and at the same time was getting narrower.

In May of 1895 while General Robert was on his way to Galveston by boat the captain expressed the view that 18 ft. of water could never be secured or maintained over the bar. The general promptly predicted that on Dec. 31 of that year, there would be 18 ft. over the bar, and a gain of a least 2 ft. each year until a depth of 24 ft. was reached. He was laughed at and even his colleage, General Comstock, believed that he had made a serious blunder. General Robert had seen, however, from the rate of travel and the lay of the gulf bed, that the bar was just getting into deep water and that the depth over it would soon increase very rapidly.

On Dec. 31 there was 19 ft. of water and for the next three years the depth increased fully as much as predicted.

In addition to his port and seawall work at Galveston, General Robert was called in at various times as consulting engineer on the design of the causeway connecting Galveston with the mainland. In 1911 he was called to the Tropics as consulting engineer to design the improvements to the Port of Frontera at the mouth of the Grijalva River in the State of Tobasco, Mexico.

His literary-engineering activity has included the planning and supervision of a two-volume index to the reports of the Chief of Engineers. These volumes were models of indexing, including under their topical and personal indexes reference to the minutest phases of the works reported on. These volumes have since been superseded by consolidated indexes extending over a longer period.

ROBERT, THE PARLIAMENTARIAN

But this biography was to have been about Robert, the parliamentarian.

That is true, but being an engineer and writing for engineers, the writer could not refrain from first proving that the subject of this sketch is indeed a professional brother to all of us, thinking in our terms, speaking our language—an engineer, accustomed to scientific habits of thought. In fact, the writer holds that Robert is the better parliamentarian because he is an engineer, for it enabled him to bring to bear upon parliamentary procedure the mind and methods of the applied scientist. To this scientific analysis of his subject is due, we believe, his position as the leading parliamentary authority of this country.

But how did an engineer, pursuing the arduous duties of his profession, come to be the country's leading parliamentarian?

When about twenty-five years old the future general was stationed, as previously recorded in Massachusetts. Unexpectedly, he was called upon to preside at a small gathering. He knew nothing about parliamentary procedure, but while in the chair determined that he should not remain in ignorance thereof. This experience taught him, too, that a knowledge of parliamentary law was a part of the necessary equipment of every educated man.

On searching for information he found only half a dozen pages on the subject, and these in a book of miscellaneous information. He made notes and carried them with him.

Later being transferred to California, he was thrown in with people who had come from every section of the country. Their views on parliamentary law showed a wide divergence in practice. About that time, also, he learned of the existence of Cushing's "Manual of Parliamentary Practice" and of the rules adopted by the Houses of Congress. Study of these, which he immediately secured, showed that they differed much from the practice as he found it, while analysis indicated an absence of accepted principles and many absurdities in practice and in the formulated rules. Particularly did he, with a strong sense of democracy, object to the general adoption of many of the rules of Congress (such as the shutting off of debate by majority vote) which prevent a body from being truly deliberative. These rules, he recognized, were necessary for Congress—a bi-partisan organization with a large amount of work to do—but he believed that they were not sufficiently democratic for the average body, which convenes not to put through party measures but to get at the will of the assembly and to make that effective.

As a result of his studies, he wrote a fifteen-page manual for the guidance of himself and his friends in conducting the deliberative work of charitable, social and civic organizations in which they might be interested.

Then for some years he gave no attention to the subject. Being transferred to Milwaukee and having some leisure during the first winter, he determiend to write a manual that could be used generally and that might aspire to become an authority for the use of legislatures and other official bodies. With his customary energy he bent all his effort to the task. Analyzing each motion and each step of procedure carefully, he tested it by principles which he had concluded were fundamental—these principles being such as would guarantee the deliberative character of the assembly and safeguard the rights of the individual members. As a result of this critical analysis he abandoned much of the procedure laid down in Cushing and the Congressional manual. Basing his rules on a set of principles, they were consistent throughout, and the logical structure and sound basis of the procedure won instant recognition, so that within a few years after the first appearance of the book Robert displaced Cushing and all the other manuals as the standard of parliamentary procedure in this country.

The story of the publication of the original work is an interesting commentary on the confidence of the author in the correctness of his rules and of the persistence with which he was accustomed, and is still accustomed, to pursue that on which he embarks. When he prepared the small pamphlet on parliamentary law, above referred to, he offered it for publication to one of the leading Eastern publishing houses. The manuscript was returned with the comment that there was small demand for such a book. When, therefore, the manuscript of "Rules of Order" was ready he determined to publish the book himself. He bought the paper and personally selected the type in order that the various sections and subdivisions might be thrown in such relief as to appeal to the reader. In fact, the type faces in the hands of the Milwaukee printer who was doing the work proved insufficient to meet his demands and special fonts of type were bought. With this arrangement, since he paid all the bills, he could revise and change as he wished. He continued experimenting until he found a combination of type faces that made the book, in his opinion, as usable as it was possible to make it.

As an indication of how the volume developed, it is interesting to note that even when he put his hand to the actual work of publishing the book only Part I of the "Rules of Order," as we now know the book, had been written. Upon reading the proof of Part I to his wife, she objected that the work consisted only of bare statements of rules, of immense value to one quite familiar with the organization of assemblies and methods of procedure, but quite baffling to one who had never had parliamentary experience. For that reason he at once wrote Part II, which explains how a society is organized and conducted.

Then, when the book was practically all printed, the contest of a member of a religious society against ejection prompted him to hold up the publication in order that he might write Part III—on the legal rights of an assembly to protect itself.

His original estimate of the demand for the book was such that he determined to have 4,000 copies printed. With one of the bound copies in hand he approached a Chicago publishing house, S. C. Griggs & Co., which has since passed out of existence, with the proposal that they publish it. His suggestion was met by the response from the head of the firm that "It is useless to accept a book on parliamentary law from an unknown author, for Cushing and parliamentary law are synonymous terms. Moreover, what in the world does an army officer know about parliamentary law?"

General Robert met the publisher's rejoinder by pointing out that he was substituting for the somewhat illogical parliamentary law of that day a thoroughly logical structure. Whether that had any effect on the publisher is not recorded, but when the unknown author volunteered at his own expense to send 1,000 copies free to the officers of legislatures, to college professors, law authorities, etc., in order to advertise the book and to secure for it the criticism of competent authorities, the publisher capitulated and agreed to handle the work. General Robert's closing shot on reaching the agreement was that he believed his book accorded more with the American spirit than any parliamentary manual then in existence and that if he was right the experts would commend it; if he was wrong, the book would be condemned and it would be well for himself, personally, if he quickly found out the attitude of those who professed to know something about parliamentary law.

The book appeared Feb. 19, 1876, and such was its success that by July 1, of that year, the remainder of the 4,000 volumes, which had not been used for propaganda purposes, were sold by the publisher. In fact, within six weeks of the publication date the reception had been so favorable that the publisher was clamoring for "copy" for a revised edition. Parliamentary authorities in every part of the country poured upon the publisher commendations of the new work, while the reviewers, with one lone exception, welcomed it as a tremendous step forward in parliamentary practice.

The author's faith in his work had been justified. From every side came commendation of the principles Robert had laid down for safeguarding the deliberative character of assemblies. His maxim that "We are here to get at the will of the assembly" had met instant response.

Year by year the sale of the volume increased so that by the end of 1914 over 500,000 had been printed and sold.

The volume was revised in May, 1915, under the title of "Robert's Rules of Order, Revised." As an evidence of General Robert's thoroughness, it should be recorded that he worked three years on this revision. There were no fundamental changes from the first book, but the text was clarified, the order changed so as to make reference easier, and the work greatly enlarged.

For some years now he has been working upon a new book on parliamentary procedure. Unlike "Rules of Order," it is to be not a mere statement of rules—a codification—but a readable volume that will show by examples how a deliberative assembly is organized, how motions are put, etc. The former work is a ready reference book for those already familiar with parliamentary procedure, while the latter is to have an educational character and a readable style. The new work takes up each class of motion or procedure separately, explains the circumstances requiring its use, its effect, its limitations, privileges, etc., and the reasons for according the motion or procedure its privileges or for hedging it about with limitations. In addition, it will contain answers to some 250 questions that have been submitted to General Robert by presiding officers of assemblies and societies, by teachers of parliamentary practice, etc., together with the answers thereto.

The text of the new book is now pretty well along and promises to make a volume of large size. General Robert will be content with nothing short of completeness, and to that end has already put some five years on the work.

ROBERT, THE MAN

So much for the engineer and the parliamentary authority.

What manner of man is this who has achieved the topmost place, as Chief of Engineers, in his vocation, and has also become the country's leading authority in his avocation?

Energetic, strong in mind and body; heaped with honors, but nevertheless extremely modest; enthuiastic, interested in the events of the day; a sane optimist, and, above all, a sterling character.

The writer well remembers his first meeting with General Robert. We were seated on the piazza of the Hotel Galvez, at Galveston, while a spice-laden breeze from the tropics came in over the sea. The general had been introduced as the engineer of the sea-wall work. For an hour he told the sea-wall story, from the day of the original Robert-Noble-Ripley report.

Then, knowing that his listener, through his editorial capacity, had contact with publishing, he began to inquire about the sales' experiences of book publishers. He had, he remarked, written a "little book" quite a few years ago and had recently finished a revision. The listener was astonished at the sales of the volume. Most books have a very short life. They blossom to fullness in a year or two and then gradually drop back into oblivion, the sales decreasing year by year. But here was a marvelous work. According to the speaker, its sales had increased from year to year for 40 years. There had never come a slump. What was this marvelous volume? For a half hour or more, in which details of book publishing were discussed, the name of the volume was never mentioned, the listener's curiosity rising at each sentence. Was it a religious book? Some of them had had remarkable records. If not a religious book, what could it possibly be?

Finally curiosity overcoming discretion, and possibly courtesy, the question was asked, "What is the title of the book?" So this man, eminent as an engineer—eminent above all others in the science of parliamentary law, was too modest to reveal his identity until he was forced to disclose it. And yet it is characteristic of the man.

Today, despite the fact that his eighty-third birthday is nearing, the general is hale and hearty—his mental powers undiminished, his physique still equal to fairly hard work. In conversation, whether arguing, expounding or reminiscing, he habitually sits on the edge of his chair—a trait characteristic of the enthusiasm and energy he puts into all he does. He writes interestingly, on Oct. 11, of last year, about that which was then engaging his attention:

"My friends tell me," he says in a letter, "that they have never seen me looking better. I presume it is due to my physical work this summer. We bought a house here last March and have been at work remodeling it for six months, sometimes with nine carpenters, masons, plasterers, plumbers, etc., at work, at the same time. As the work has been done by day labor, it required constant oversight, especially as the architect lives in Binghamton. We have been living in the house since July 10, though the painters did not finish until a few days ago. It will be another month before we have our pictures and books out of storage and arranged."

And then he continues with much detail to tell, by contrast, of his mental work—the writing of the new book.

Such occupations are assurance that he is still, at 83, vigorous in mind and body.

We know that all his professional brethren join with us in wishing many happy years to this honored member of the profession, this modest gentlemen who has stood for more than a generation as the leading parliamentary authority of this country. E. J. M.

City Planning Progress in Detroit

Activities of the City Plan Commission of Detroit, Mich., created under the new City Charter that went into effect on Jan. 1, 1919, include plans for a number of important street widenings, a boulevard encircling the city, material additions to the parks and the playgrounds of the city, and much preliminary work on zoning. The various activities of the new commission from the time it got to work on March 1 to Dec. 31 are reviewed in a brief report submitted to the City Council.

It may be noted that for ten years prior to Jan. 1, 1919, there existed in Detroit a City Plan and Improvement Commission created by ordinance in 1909. This commission had only advisory powers. Nevertheless its work, according to the report of the new commission, "included many creditable ideas and plans for the improvement and betterment of the city." Among these were studies for a general city plan of Detroit and environs by Edward H. Bennett of Chicago and plans and recommendations for river front improvement, a lakeside boulevard, and several parks and playgrounds. The new commission has various specific powers and duties as set forth in Chapter X, Sections 1-12 of the new charter of the city of Detroit.

In its nine months of existence the new commission made studies, plans, and recommendations for opening, widening or extending 68 streets and thoroughfares. Among these were the Dix-High-Waterloo thoroughfare across the entire city; widening of Michigan Ave. to 100 ft., and Livernois Ave. to 106 ft.—these three for various distances. During the nine months the commission acted favorably on 31 plats for street and lot layouts. Under the new charter the commission must approve not only all new plats within the city of Detroit but for three miles outside the city limits before they can be officially put on record.

After investigation and recommendation by the commission a $10,000,000 bond issue for park and recreation purposes was placed on the ballot in April, 1919, and endorsed by popular vote. Additional lands for park purposes recommended by the commission during the year and ordered condemned by the common council totaled 1,745 acres against 1,235 acres for the total area of Detroit's parks on Jan. 1, 1919—an increase of 141 per cent.

In the zoning field the commission made study maps for use, height and area districts, together with valuation, industry and railroad, population density, population distribution, residence location, vacant area and building development maps. At the close of the year the commission was working on tentative final zoning maps for use, height and area districts.

The commission has issued two special reports relating to a proposed constitutional amendment authorizing the practice of excess condemnations in Michigan. The legislature has passed an act under the terms of which such an amendment will be submitted to popular vote of the State in November, 1920. James S. Holden is president and T. Glenn Phillips is consultant and secretary of the City Plan Commission.

A Billion for Road Work Possible

According to figures recently compiled by the Portland Cement Association, a summary of state and county bond issues for road-building purposes as of March 1, 1920, indicates that there was authorized during 1919 and so far in 1920, $635,641,729. For the remaining months of 1920, elections in the states and counties of the states are to be held which will determine whether an additional $391,253,800 is to be appropriated for road-building purposes. Therefore, the total, including the amount of money authorized and that proposed, is $1,026,895,529. Most of the elections, proposing additional state expenditure, will be held in November. The following chart, which indicates the distribution of proposed and authorized money by state and county, contains a few issues which were voted late in 1918, but from which little money has been taken for actual construction:

	Amount Authorized		Amount Proposed	
State	State	County	State	County
Alabama	$25,000,000	$5,000,000		
Arizona		8,800,000		
Arkansas		4,900,000		
California	40,000,000	28,435,000		$1,400,000
Colorado			$25,000,000	
Delaware		500,000		
Florida		2,615,000		
Georgia		15,375,000		
Idaho		7,873,000	2,000,000	
Illinois	60,000,000	9,052,845		4,100,000
Indiana		860,000		
Iowa		18,475,000		
Kansas		50,000	60,000,000	
Kentucky		2,830,000		
Louisiana		8,267,000		
Maine	8,000,000			
Michigan	50,000,000	3,100,000		550,000
Minnesota		12,800,000	100,000,000	
Mississippi		15,848,000	25,000,000	
Missouri		15,119,600	60,000,000	2,550,000
Montana		6,283,000	15,000,000	850,000
Nebraska		3,000,000		
Nevada	1,000,000	200,000		
New Mexico		200,000	2,000,000	
North Carolina		13,459,635		
Oklahoma		1,297,000		1,400,000
Oregon	12,500,000	9,516,704		2,000,000
Pennsylvania	60,000,000	16,217,945		3,064,500
South Carolina		8,560,000		
South Dakota				2,000,000
Tennessee		7,385,000		700,000
Texas		88,708,000		1,250,000
Utah	4,000,000	2,766,000		150,000
Washington		9,535,000	30,000,000	512,000
West Virginia		8,426,000	50,000,000	1,727,300
Wisconsin		36,887,000		
Wyoming	2,800,000			
Totals	$263,300,000	$372,341,729	$369,000,000	$22,253,800

Planning Transit Development in Cleveland

By Henry M. Brinckerhoff,
Consulting Engineer, New York City

THE plans for a Rapid Transit Commission of Cleveland for a group of short terminal subways for street cars, leading to loop stations under the Public Square, are now before the people of that city for consideration and will be voted upon at the election April 27. These plans [summarized in *Engineering News-Record* of July 24, 1919, p. 170,] call for a bond issue by the city of $15,000,000, most of the interest on which is to be spread upon the general tax levy. The Cleveland Railway Co. is to operate the car service in the subways under an agreement with the city which is essentially the Tayler-Cleveland street railway plan enlarged to cover this new service. The company will pay the interest on the tracks and electrical and other equipment in the subway, while the city will own the structures themselves, pay the interest thereon, and control the train and car service under the Tayler plan of regulation.

A simple techincal statement of the case for the proposed terminal subways for street cars, by the engineer who planned them. While these subways have the main function of relieving street congestion by taking many of the down-town cars off the streets, they are also intended as the initial element of a future rapid-transit system. In preparing for the bond-issue referendum on the project, to be voted on April 27, the city authorities have featured the proposed system as a beginning of rapid transit. Mr. Brinckerhoff tells why it is "A First Step in Rapid Transit."

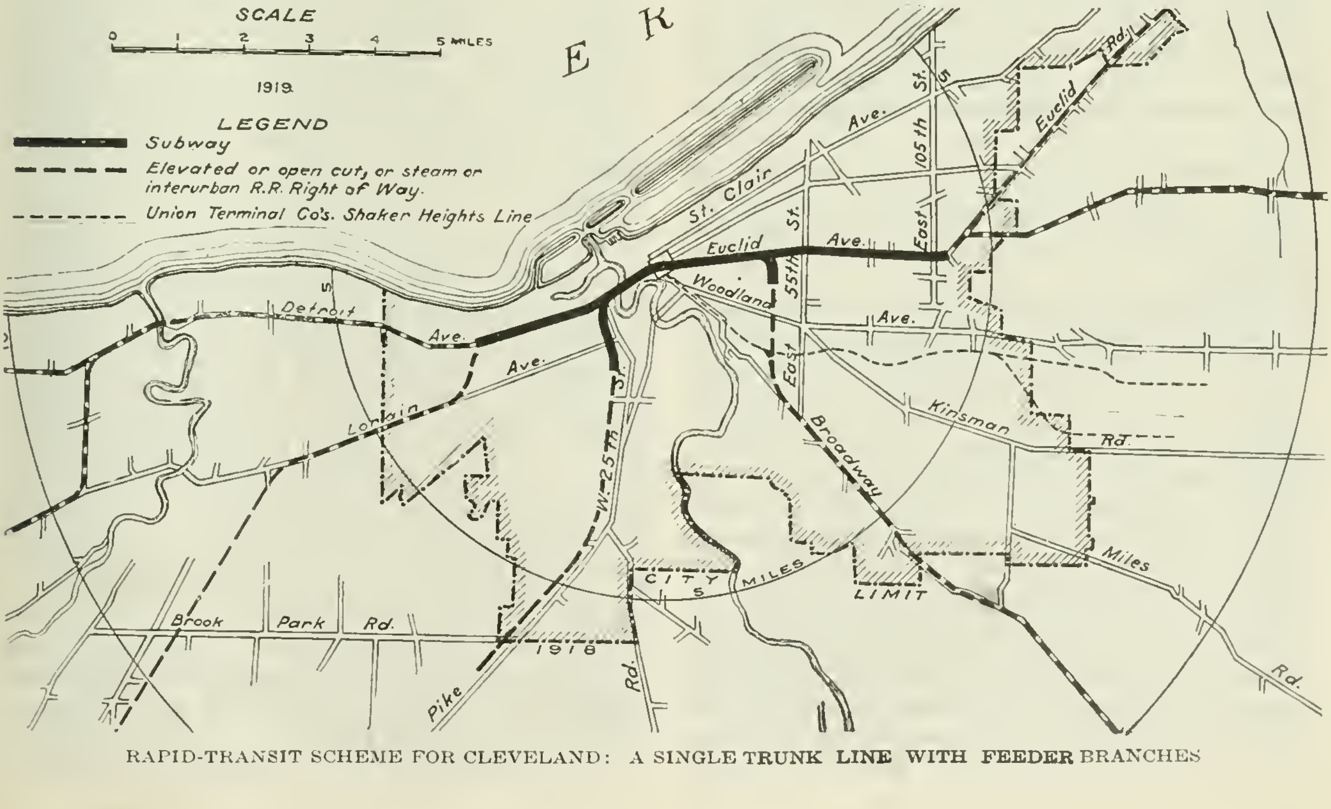
An interesting question arises in this connection as to the principle underlying the construction of short sections of subways in the center of the city as a "first step toward rapid transit" as is stated in the commission's announcements. In the following the writer presents a brief statement of the basis of the plan and the warrant for the phrase just quoted.

Rapid Transit Needs—Cleveland has just reached the point where its metropolitan district houses one million people. Cities which have passed this mark, such as Philadelphia, Chicago, Boston and Brooklyn, commenced the development of rapid-transit systems when they were at or near one million in population. The general public demand for a rapid-transit serivce is therefore normal as viewed from the standpoint of experience and the development of cities which in population and area have grown to perhaps twice the size of Cleveland today.

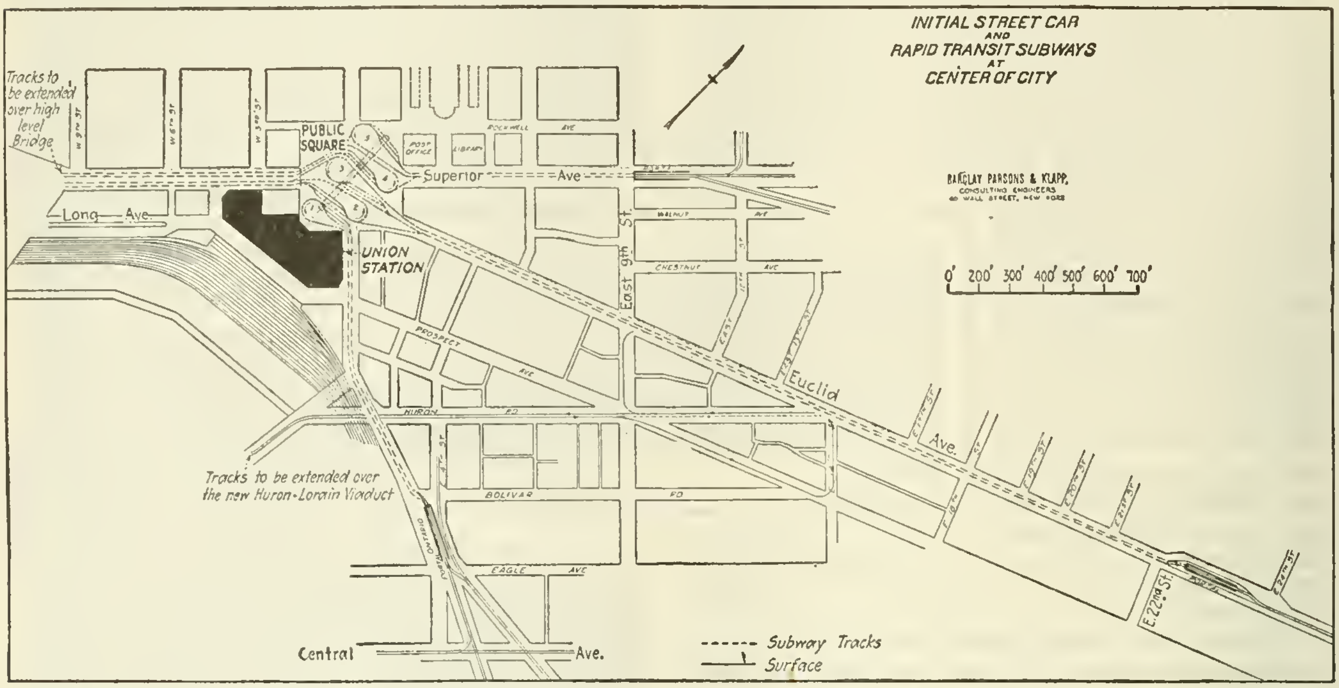
Unified Transit—In studying the larger cities from whose traction history and present condition certain valuable lessons can be learned, we must remember that their surface and rapid-transit lines were built under private initiative and on a competitive basis. Much of the trouble lying at the bottom of the present public complaints of inadequate service is due to the practical financial difficulties of earning fixed charges upon the investment in duplicated and competing lines. This coupled with a natural public demand for a low rate of fare exaggerates the effect of the economic waste of two competing systems as against one unified consolidated set of transportation lines.

From the viewpoint of the car riders the ideal system in a large city would be one giving the freest possible use of all lines, surface and rapid-transit, by universal transfer of passengers and the arrangement and co-ordination of each class of service to completely cover and serve the constantly broadening city area.

No Duplication of Lines—An effort to produce such a co-ordinated system in the larger cities today



RAPID-TRANSIT SCHEME FOR CLEVELAND: A SINGLE TRUNK LINE WITH FEEDER BRANCHES develops at once the fact that there is a considerable duplication both of physical structures and investment, as the tracks and equipment are in places in duplicate and often parallel, due to their competitive orign. If these tracks and systems could be completely wiped out and a carefully planned unified system substituted the rapid transit trunk lines could be used for the congested and long-haul business and the surface cars run as feeders to these trunks to accommodate the strictly short-haul traffic. Thus, much better accommodations could be afforded the public at less original cost and at a lower operating expense.



RECENT PROJECT FOR TERMINAL SUBWAYS FOR STREET CARS, INTENDED AS A FIRST STEP IN RAPID TRANSIT

Given a city like Cleveland, therefore, without any rapid-transit development, and looking to a future city of perhaps twice its present size, it is reasonable to propose to so plan the initial steps of the rapid transit lines as to avoid the obvious shortcomings seen in the dual competitive systems found in our larger cities. The fact that Cleveland has controlled its street car service for the past ten years under the direction of a city commissioner makes easy the task of dealing with the practical operating questions of such a combined service.

With the present high cost of materials and labor in all construction, and with the propasal to expend public money upon permanent structures without thought of profit, the obligation lies heavily upon the engineer to plan the system so as to make each dollar build the maximum of facilities and the design provide for the greatest economy in running costs.

The plan proposed by the Cleveland commission attacks the problem by first bringing the surface-car lines to their maximum capacity and usefulness.

Relieving Downtown Congestion—The principle difficulty with the existing Cleveland surface-car lines lies in the congested condition of all traffic in the central business district. Forty-five per cent of the passengers riding on the street-car lines entering this district ride to or through the Public Square or its immediate vicinity. The greatest volume of long haul traffic in the city is east and west parallel with the lake shore, and passes through the Public Square.

The principal surface-car lines entering this central district, will under the proposed plan be run down into the subways before reaching the congested area. The result will be that with the wide streets comparatively unobstructed in the outlying sections and with the cars in the subway in the congested districts, a very much more regular and higher speed service will be rendered than at present.

The elimination of congestion in the Public Square district during rush hours will not only save a certain amount of time for the rider, but make it possible to load fully the outlying tracks, which now have greater capacity for car movement than can be passed through and loaded in the Square and congested delivery district. This will therefore result in making it possible to run many additional cars, with consequent greater comfort to the public and greater earning capacity for the system.

Provision for Through Routing—The arrangement of the subway tracks in the Public Square is such that the radiating street-car lines can be operated independently from this point in various directions or can be conected up and run through across the city. The loading platforms, switches, loops, etc. are so designed in this central subway transfer station as to permit through routing of a part of any of the surface lines and the turning back of the unbalanced portion. In this way the usual practical objection of through routing is avoided, as no idle car mileage need be run but the through cars can be proportioned to the actual demand for through service and the heavier end of the line fully supplied with cars without running useless mileage on the lighter side of the city. It will be admitted that this should produce a street-car system operating under the most favorable conditions for the rendering of regular, uninterrupted and high-speed service to the traveling public.

Future Train Operation in Subways—The question of rapid transit is answered by designing the sections of the subway, the loading platforms, curves, loops and all clearances so that trains of standard rapid-transit cars can be run through these subways. The development of separate rapid-transit train service on any one of these lines can then be accomplished by extending any one of the five radiating subway sections far enough to warrant such service.

It is contemplated that it may be possible to connect the present short subway sections to elevated lines, or to lines on private rights of way or even to use some of the steam railway lines to reach the outlying districts. The present subway construction is therefore literally a *first step in rapid transit.*

Co-ordinating Subway and Surface—If one of the present short sections is extended, as for instance the Euclid Ave. section, for several miles, train service can be placed in this subway and a limited number of street cars continued to be operated upon the street-car tracks directly above. As this plan contemplates a unified system operated by the same company and under city control, transfers can be given from the rapid-transit line to the street cars by vertical transfer at station points. The subway trains will then perform the function of express service and the street cars on the surface tracks above will operate as local service, making frequent street corner stops. The subway trains will stop only at stations spaced at about one-third mile intervals. In the building of further street-car lines or in the re-routing of the existing lines, further development of this idea can be obtained by running cars directly to certain stations on the extended subways where transfers can be given to the trunk or rapid-transit subway trains.

Thus it is planned to develop a system which will produce a thoroughly co-ordinated development of surface and rapid transit lines.

ECONOMY OF CO-ORDINATION.

It is interesting to note in this connection that cities such as Chicago, Boston, Brooklyn and Philadelphia have from $95 to $110 per capita invested in their combined surface and rapid-transit lines. A study of a plan for a city such as Greater Cleveland when it shall have grown to a population of 2,000,000 indicates the possibility of developing a satisfactory trunk-line rapid-transit system giving transfers to a surface system with radiating or crosstown street car lines at from $70 to $75 per capita.

The economic value of locating and building the rapid-transit lines so as to utilize effectively the street car lines to their maximum capacity as feeders, and for local hauls, is obvious. This will avoid the evil of competing lines and effect a great saving in investment, while at the same time keeping the whole system under one management and city control.

Boston Conditions—The objection made by those familiar with the transportation system of Boston that a similar plan in that city resulted in high rates of fare and excessive investment per capita misses the very essence of the proposed Cleveland rapid-transit plan. The Boston system started with street-car subways in the downtown district but the subsequent development has been allowed to run into the excessive building of expensive rapid-transit subways and tunnels. The high cost is partly due to the separation of the various parts of metropolitan Boston by waterways requiring long subaqueous tunnels. Narrow and crooked streets have made difficult the full development of surface-car lines. In Boston also the interest charges are all carried by the car riders.

In Cleveland with its wide streets and with only its single river and valley separating its principal metropolitan area, no excuse arises for such great expenditures in subway and tunnel construction. The commission's plan also provides for relieving the street car passenger by spreading the fixed charges largely on the tax roll.

A Hub Built First—The rapid-transit commissioners' plan in Cleveland will in this first step create a hub with radiating spokes, any one of which can be developed by extension into the outlying districts of the city. The extension of any one line must depend upon the traffic development in the district such as to warrant the extended building of the permanent rapid-transit structures and the operation of trains.

"The First Step in Rapid Transit" is therefore a justified expression as the development of this system is planned. It is proposed to attack first the most vital difficulty confronting the city, namely, that of congestion and delays to the existing service. Outlying rapid-transit lines not traversing this downtown district and leaving the street-car lines choked and throttled by vehicle traffic would not be a justifiable first step. More of Cleveland's own citizens will be benefitted by the present proposed first step than by the expenditure of an equal amount of money in a single competing rapid-transit line in any one of the various radiating directions followed by its main thoroughfares.

A Common Weakness of Reports

The February, 1920, *Bulletin* of the Affiliated Engineering Society of Minnesota contains a paper on municipal engineers' records and reports, prepared by H. F. Blomquist, principal assistant engineer St. Paul (Minn.) Water Department. From his paper, which was read before the Minnesota Surveyors and Engineers' Society, are taken the two paragraphs which follow:

> A common weakness in reports is to detail unimportant things and leave out the conclusions or results obtained and other important things. It is not important how much the street department paid to Tom Jones or Sam Smith in payrolls during the past year, but it is important how much of the payroll was spent for cleaning streets, paved and unpaved, and ho wmuch street cleaning cost per square yard, how much was spent for street sprinkling, how much for permanent work, such as building culverts, sidewalks, pavements, etc. Almost every good thing can be overdone, and reports are not to be excepted.
>
> In making a report its purpose as well as the viewpoint of those to whom it is to be made should be kept in view. Too much detail work included in a report confuses the reader and often prevents him from grasping the value of part of it. For example, it would be undesirable to include in the published annual report all the readings and detail description of a test for the efficiency of a steam or electrical pumping plant, or measurements and data taken for determining the strength and condition of a bridge; but it is important to give a general description such test or examination, and a clear statement of the results obtained. The detailed description and data connected with such work should be carefully included in a special report for the office files, and other necessary requirements.

Railway Reclamation of Damaged and Old Materials

Scrap Saved, Sorted and Put in Condition for New Service—Engineers in Charge of This Work on Rock Island Lines

(Abstract of Committee Report, American Railway Engineering Association)

WIDER realization of the advantages of reclaiming and utilizing scrap material has been impressed upon the railways by war conditions and such reclamation was one of the subjects covered in the report of the committee on natural resources, presented at the recent annual meeting of the American Railway Engineering Association. It is shown that many railways have gone so far as to erect shops equipped with special appliances for working over at small cost much of the worn and damaged material that formerly went into the scrap pile.

Rails with split and battered ends can be sawed into shorter lengths and used again; worn and broken frogs and crossings, switch points and rail ends can be built up and welded, many of them in place, by means of the oxy-acetylene welding torch; worn and bent anglebars can be swedged into their original sections by means of a drop-hammer. By oiling track bolts at regular intervals the bolts can be kept tight, with a saving in labor and in wear on angle-bars and rail ends, while in rail renewal work it allows many bolts to be reclaimed that would otherwise find their way to the scrap pile.

Many roads are finding the sawmill a useful agency in the conservation of timber. Old stringers and other large timbers can be sawed so as to recover a great deal of valuable lumber. Much of the lumber that is being used for signs and crossings might be conserved by substituting other materials more permanent and in many cases no more expensive than wood. For example, the report suggests that an old boiler tube set in concrete and flattened at the upper end to receive a steel plate makes an attractive sign that requires very little expense for maintenance.

Salvage Possibilities in Lumber

Ties can be utilized for cribbing or fuel and some from the main track can be used in yard tracks and sidings. Elm and maple pile-heads can be sawed and turned into jack and cant-hook handles; oak pile-heads can be sawed into center and ballast stakes; while cedar pile-heads can be sawed into shingles. It frequently becomes necessary to renew certain timbers in wooden structures, even though only a very small portion of the member removed fails. These can be worked into usable sizes for other purposes.

A reclamation plant established by the Rock Island Lines at Silvis, Ill., is an example of systematic attention to this question. It has a scrap dock 48 ft. wide and 1,500 ft. long, with six bins 28 x 42 ft. for storing unsorted scrap, eight bins 28 x 30 ft. for sorting scrap and 74 bins of various sizes for sorted scrap. Three traveling gantry cranes of four and ten tons capacity have lifting magnets for 1,500 and 8,500-lb. loads. A shop 25 x 270 ft. contains a 100-lb. hammer, two 150-lb. power hammers, double and single alligator shears, bolt shear, rattler for cleaning, drill press, nut tapping machine, four electric welders, four oxweld outfits, air-operated shear and air-operated punch.

Reclamation of material on this road is handled through a committee consisting of the chief engineer (as chairman), purchasing agent, general mechanical superintendent and general storekeeper. Each operating division has a sub-committee consisting of the division engineer (as chairman), master mechanic and division storekeeper. These sub-committees hold monthly meetings at which new items of reclamations and progress are discussed, after which a report is made to the general committee. It is the duty of these sub-committees to see that scrap is promptly collected and shipped to the plant, each division being assigned a certain shipping day or days during the month in order to prevent overcrowding of the plant at Silvis. In addition to supervising the handling of materials, they have done much toward promoting the reclamation idea on their divisions and encouraging the study of uses for reclaimed materials.

Material that can be reclaimed on each operating division is used by that division, thereby avoiding the congestion which would otherwise occur at Silvis. All material is sorted into three classes: Scrap for sale, material fit for further use, and material to be repaired for further use. One factor in reclaiming material is that of safety, as every item reclaimed is put in perfect condition.

Bolts and nut locks were reclaimed during one month to the amount of $599, at a total cost of $89; thereby effecting a saving of $510. In the same time 27,065 lb. of nuts of various sizes were reclaimed by sorting and retapping at a net saving of $72. About 1,743 lb. of lag screws were reclaimed by rattling until bright as new, at a saving of $133.

This plant is doing such work as welding cast-iron spokes on driving wheels; building up worn spots on firebox castings with acetylene welding; mating and pairing flange worn steel-tired wheels before turning, thereby saving a great deal of labor; reclaiming salt deposits from refrigerator cars for use in thawing switches during the winter and for use in fire barrels; pressing oil from waste (one barrel of waste netting about 20 gal. of oil); burning the waste and reclaiming about 50 lb. of babbit (this reclaimed babbit is as good as new); reclaiming barbed wire for use in building rip-rap. The systematic reclamation work on the Rock Island Lines was noted in *Engineering News-Record* of Feb. 5, 1920, p. 289, in connection with the reconstruction of the Platte River bridge.

Light Colors Advocated for Bridge Paints

LIGHT-COLORED paint for the finishing coat on steel structures, on the score of efficiency and appearance, was advocated at the annual meeting of the American Railway Bridge and Building Association by J. R. Shean, of the Pacific Electric Ry., Los Angeles, Cal. Unless the price of material is the main consideration he sees no reason why steelwork should not be painted in light colors, since their resistance to heat rays, as compared with dark colors, would be easier on the oil film which holds the pigment together.

Canary yellow, pearl gray or light olive green will change an unsightly black structure to one that will be at least more in harmony with the surroundings. These light colors, says Mr. Shean, will have a sufficiently longer life than the dark colors to pay for any difference in cost. It may be argued that light colors become unsightly in a short time from dirt and smoke. This cannot be noticed to any extent, he thinks, except overhead on through truss bridges and on overhead bridges, but even with black paint the smoke marks show conspicuously here.

As supplementing Mr. Shean's remarks, reference may be made to the experiment with a pale buff color for the Loop elevated railway in Chicago, this being made at the request of the merchants on the streets occupied by the structure, as noted in *Engineering News* of Oct. 2 and Nov. 20, 1902, pp. 264 and 429. The effect in brightening the streets was remarkable, but soot and dirt which collected on the upper portions and mud which spattered the columns soon began to mar the appearance of the structure, so that it was eventually repainted the original dark gray.

Kansas City Water-Works Capacity To Be Increased

WITH improvements and additions now under way the water supply of Kansas City, Mo., is expected to be increased from 50,000,000-gal. capacity to 80,000,000 gal. This amount, the officials estimate, will be good for about seven years only. The existing sites, reservoirs, stations and flow lines cannot easily be extended beyond this capacity without wholesale revamping. In consequence George W. Fuller, consulting engineer, New York City, has been called in to review the whole situation and will study every possible means of obtaining water which have been proposed in the past in the light of present-day conditions and future requirements.

For immediate improvements he has practically approved the program under way, consisting of additional pump capacity well along toward completion at the Quindaro and at Turkey Creek stations, of an additional flow line between the two stations, baffling of certain of the reservoirs, and a few changes in operation to increase the efficiency of the settling basin.

Future water supplies may be obtained through the present intake at Quindaro, but the head is such that if filters are constructed an entirely new layout of station and reservoirs must be effected. Other serious objections are that the river channel tends to recede from this bank in floods and that the works are in Kansas, with present taxes of $35,000 paid on full valuations. Future expenditures when made would carry taxes so heavy that the money rate would be augmented from 4½ per cent on bonds to 6½ per cent or more by the taxes. Some salvage chould be obtained of the existing plant by turning over to Kansas City, Kan., which has its plant adjacent to Kansas City, Mo. A second proposition is to build an entirely new system across the river on the Missouri side, where the bank is ledge rock and the channel stable. Taxes would thereby be eliminated. This would probably have several alternatives because of the possibility of different sites for filters and reservoirs. It would involve a difficult crossing of the river by bridge, pipe lines or tunnels. The third proposition, never seriously considered by engineers, is to go 150 miles to the Ozark Mountains for spring water.

Data are now being collected by the water department for Mr. Fuller under the direction of W. G. Goodwin, engineer and superintendent. It is expected this will require two months, when a preliminary report may be made. A final report will be presented in August and used in a campaign of education for financing whatever scheme is proposed. The State Legislature will have to grant an extension of the bonding limit of the city and then would come another campaign to induce the citizens to vote the bonds. This part of the program is estimated to require two years. Add a construction program of five years and the city would be brought close to the limit of the capacity of the existing plant.

Red Cross Sanitary Survey in Eastern Europe Outlined

At the first annual conference of the General Council of the League of Red Cross Societies, held at Geneva, Switzerland, March 2 to 10, 1920, Prof. George C. Whipple, chief of the Department of Sanitation, a branch of the General Medical Department, and his associate, Col. F. F. Longley, presented an outline of proposed activities. These, Professor Whipple informs *Engineering News-Record*, include sanitary surveys in Eastern Europe to be undertaken with three principal objects: (1) To ascertain the facts as far as they are available; (2) to demonstrate the value of sanitation to the community; (3) to serve as the basis of public health measures and appropriations. It is expected that the surveys will be conducted jointly by sanitary engineers and physicians.

The sanitary surveys will be conducted in seven parts, as follows: (1) The Locality; (2) Climate; (3) People; (4) Vital Statistics; (5) Sanitation; (6) Health Administration; (7) Special Survey Information. Under sanitation there are the following 12 main sub-divisions: (a) Water Supply; (b) Drainage and Sewerage; (c) Disposal of Human Excreta; (d) Use and Disposal of Animal Manure; (e) Refuse Disposal; (f) Disposal of the Dead; (g) Sanitation of Buildings; (h) Sanitation of the Air; (i) Control of Animals and Insects; (j) Food Sanitation; (k) Sanitation of Transportation Facilities; (l) Miscellaneous Sanitary Matters.

To Classify British Roads

At the first meeting of the Roads Advisory Committee held at the [British] Ministry of Transport, Whitehall-gardens, Feb. 5, the proposals of the Minister of Transport with regard to the classification of the roads of the country were submitted in the form of a memorandum. The committee agreed that the work of classification should be undertaken at once, and approved of the following general principles: (1) The roads of the country to be divided into three classes: (*a*) First class, (*b*) second class, (*c*) all other roads. (2) The classification to be made on the basis of the relative importance of the various highways for traffic purposes. In deciding whether a road should be included in Class 1 or Class 2 the following considerations should be taken into account: (*a*) Whether the road was an important route for through traffic or possessed more than local importance; (*b*) the size and importance of the centers of population connected by it; and in particular (*c*) whether the cost of maintenance was considered to be materially affected owing to through traffic forming a substantial percentage of the total traffic on the road.

While the committee agreed to recommend that grants from the Exchequer should take the form of contributions toward the maintenance of roads in Classes 1 and 2, it postponed making any recommendations as to the form the grants should take until more precise information could be supplied with regard to the funds likely to be available, and the mileage and cost of maintenance of roads to be included in Classes 1 and 2.—*The Engineer.*

Progress on New Orleans Inner Harbor—Navigation Canal

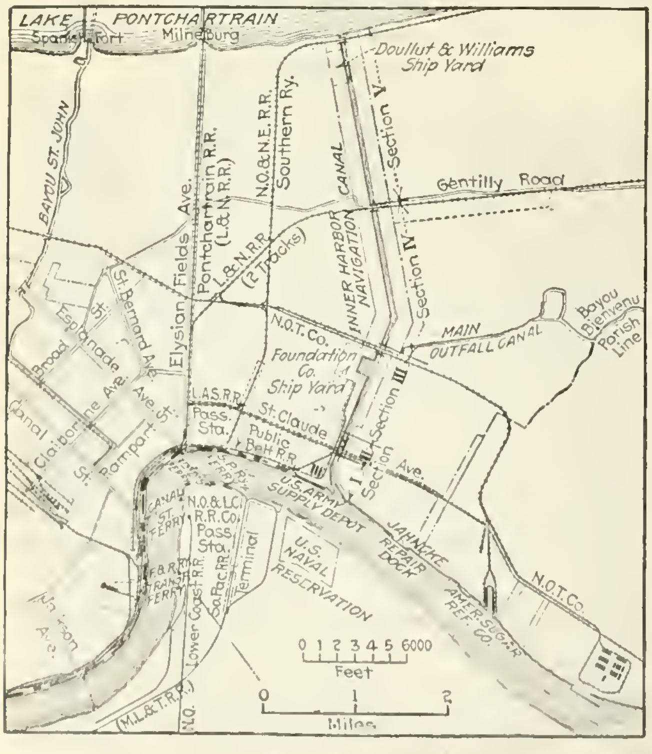
Practically All Excavation Complete and Bridges Erected—Lock Excavation Unwatered and Concreting Started

By Marshall G. Findley
Assistant Designing Engineer, Board of Commissioners of the Port of New Orleans, New Orleans, La.

CONSTRUCTION of the New Orleans Inner Harbor—Navigation canal, connecting the Mississippi River with Lake Ponchartrain, has progressed favorably since its initiation in 1918. The work is now considerably more than half completed, the principal remaining tasks being actual construction of the lock and cutting the approach from the river.

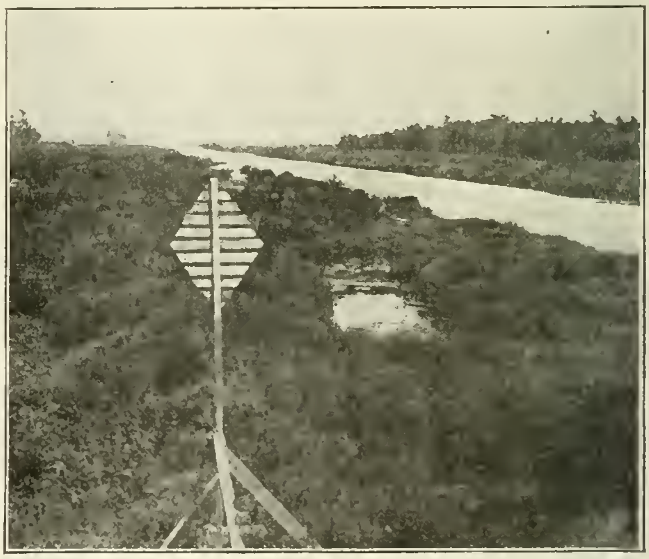
As described in *Engineering News-Record*, Aug. 15, 1918, p. 304, the work consists of a deep canal connecting river and lake, with a level maintained at that of the lake, El. 20 to 26, zero of which is approximately 20 ft. below mean low water in the gulf (Cairo datum), by a lock separating that level from that of the river, which varies from El. 20 to 39. It is approximately 28,000 ft. long, will have a depth of 30 ft., a bottom width of 150 ft. and a water level width of 330 ft. The lock has a usable length of 640 ft., a width of 75 ft. and a depth over sills of 30 ft. There are four lift bridges crossing the canal, one of which will be supported on the lock substructure, and a large concrete siphon carrying one of the city's main drainage outlets. The estimated cost of the project is $19,500,000, which should cover all charges, property, dredging, construction plant and operations, financial charges and damages.

The canal is divided for convenient reference into five sections. Beginning at the river, section 1 is approximately 2,000 ft. in length, and will have on either side continuations of the river levees, 23 ft. above low water and a channel 125 ft. wide by 30 ft. deep at low water. Section 2 is the lock. Section 3, from about Sta. 31 to about Sta. 87, includes the siphon and the Florida Walk bridge. Section 4 is from about Sta. 87 to Sta. 175, and includes the Louisville & Nashville Bridge. Section 5 is from about Sta. 175 to Sta. 277 and includes the New Orleans & Northeastern bridge.



NAVIGATION CANAL BETWEEN MISSISSIPPI AND LAKE PONTCHARTRAIN AT NEW ORLEANS

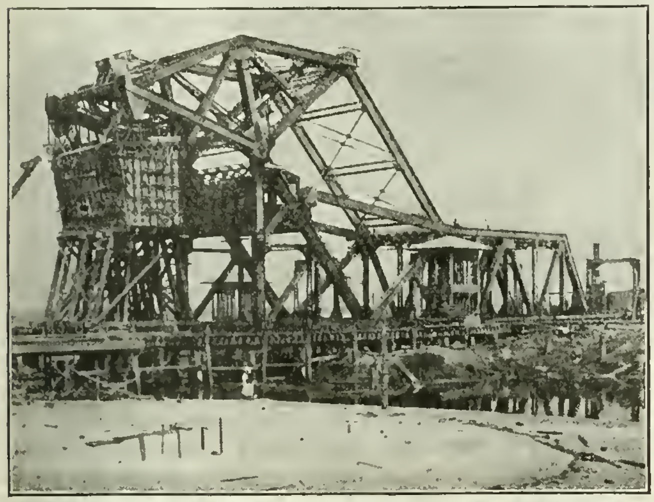
The work already accomplished may be roughly divided, as follows: Location and soil examination, dredging, constructing and unwatering caissons for substructures, construction of the siphon, construction of three bridge substructures, erection of the three bridges, preparation of the lock site for the actual work of construction. Of the preparatory work little is worthy of mention. Borings made with a 2-in. pipe proved worthless, but a 10-in. pipe, driven 3 ft. at a time and excavated before further driving, gave trustworthy results. Borings from 40 to 90 ft. long made in this manner gave the necessary information for constructing the various caissons and for unwatering the lock site.



CANAL AT LOUISVILLE AND NASHVILLE BRIDGE

No attempt has been made to dredge the full length of channel to finished section, but sufficient work has been done to make every portion of the canal accessible. In section 3 from the lock to the siphon at Florida Walk, a stretch of 5,500 ft., a channel 130 ft. wide and 24 ft. deep has been cut and also the turning basin for the shipyard of the Foundation Co., a total of 1,353,000 cu.yd. of excavation. In section 4, from Florida Walk to the Louisville & Nashville Bridge, a distance of 8,800 ft., a channel 100 ft. wide and 24 ft. deep has been completed, requiring 817,000 cu.yd. of dredge excavation. In section 5, from the L. & N. bridge to Lake Pontchartrain, a distance of 10,000 ft., a channel 20 ft. x 140 ft., supplementary work for the shipyard of Doullut & Williams, and the necessary dredging in the lake to give a 14-ft. channel depth, have required 1,870,000 cu.yd. of dredging. In section 2, the lock site excavation, amounting to 582,000 cu.yd., has been accomplished by hydraulic dredges.

Altogether five dredges of the centrifugal type have used. A large part of the canal runs through an old swamp forest of gum and cypress. Under the root mat of this forest were found the stumps of an older forest. For 15 ft. below the surface the soil was practically a solid mass of roots and stumps. Some were partially decayed, but most were in good state of preservation. The condition thus described at first seemed impossible for hydraulic dredges, but the conventional pump runners were discarded by W. J. White, the dredging superintendent, and special runners substituted with great success.



ONE OF THE BASCULE BRIDGES ACROSS THE NEW ORLEANS INDUSTRIAL CANAL

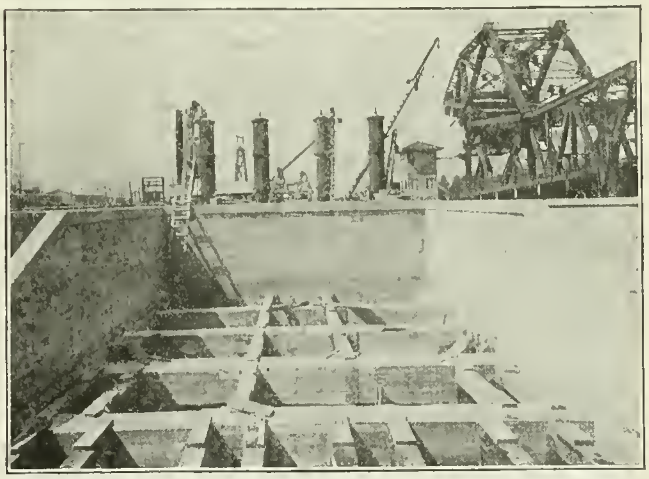
[A description of these runners will appear in an early issue of *Engineering News-Record*.—EDITOR.]

To October 1, 1919, a total of 5,258,000 cu.yd. had been excavated by hydraulic dredges at a unit cost of 23.6c. This does not include the dredging required to make Bayou Bienvenu available as an outlet for the ships built by the Foundation Co.

At Florida Walk, the site of the siphon and one of the bascule bridges, the first operation was cutting off the drainage canal by constructing cofferdams of earth-fill held between two braced walls of 10-in. sheet piling. The excavation was made from El. 21 the natural ground, to about El. 0, in the open, by dragline excavator and cranes. A cofferdam of interlocking wood sheet piling 50 ft. wide and 230 ft. long was driven and excavation made by using a clam-shell bucket. Cross bracing was placed as excavation went down. A number of movements of earth laterally some of them due to underlying quicksand were arrested, but no material interference to progress resulted. Foundation piles were driven before excavating the cofferdam to El.-22, one foot above the top of a hard layer of red sand at El.-23.0 found floating upon underlying quicksand.

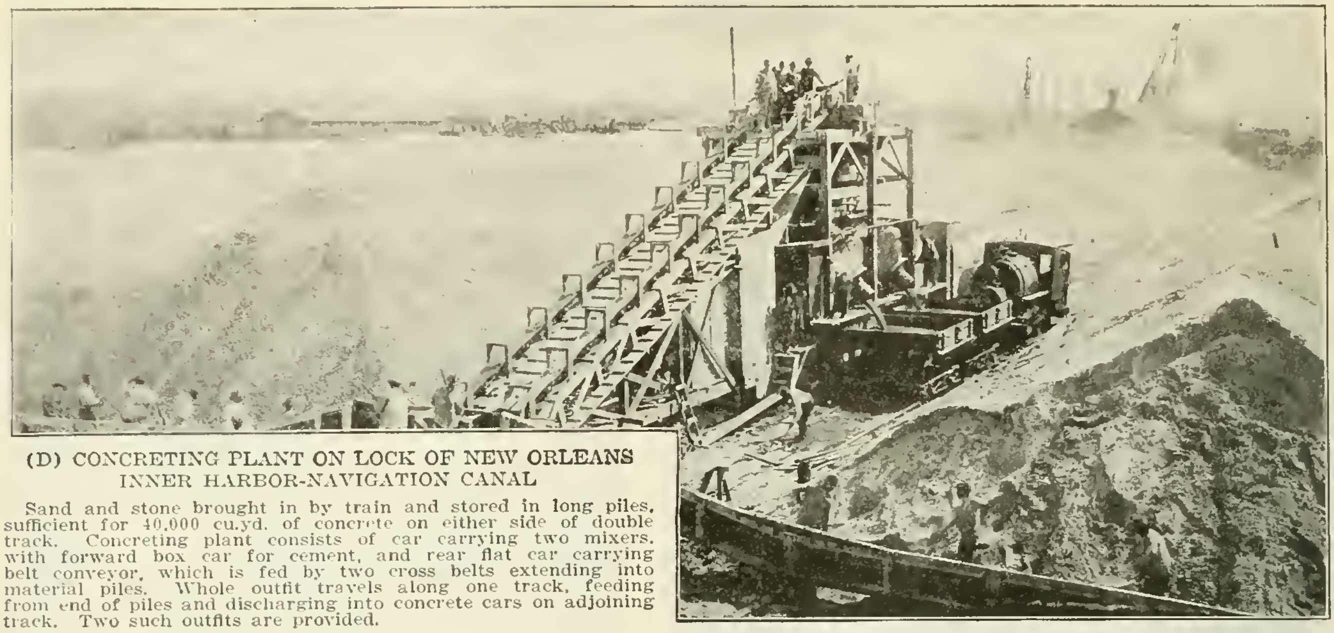
Of the four bridges crossing the canal, one is on the extreme south end of the lock walls. The superstructures and foundations of the other three bridges were originally designed identical, although minor variations were made later, especially in the foundation piers. The superstructures are steel trusses of the Strauss bascule type, designed to carry on two tracks Cooper's E-60 loading, two highways, and two future trolley tracks. The main pier, as originally designed, on the west side, consists of a four-beam and four-column structure designed to resist by portal action horizontal forces due to wind and traction, and resting on a base-slab, 54 ft. x 66 ft. This in turn rests on approximately 350 piles, driven to a resistance of 16 blows to the foot, by a steam hammer. The rest pier on the east side in like manner consists of a beam and two columns carrying loads down to a slab 30 ft. x 54 ft. supported by approximately 170 piles. Test piles took a load of 32 tons without settlement. A design safe load of 18 tons per pile was used for cases involving considerable eccentricity, the average being about 10 tons.

At two of the bridges wood sheetpile cofferdams were driven at about 10 ft. distance from the edge of the slab, and excavation carried down to about El. + 10. At Florida Walk the siphon excavation was widened past the bridge, at about El. + 4. Then in all cases inner caissons were driven, consisting of tongue-and-groove solid 10-in. wood sheetpiling 48 ft. long, at the edges of the base slabs. Top bracing was placed, leaving openings about 6 ft. square, through which excavation was made by means of a bucket. At Florida Walk it then proved practicable to clean up the bottom by hand labor, cut off pile tops, and lay the base slab, after which the remainder of the job was straightforward. At both other bridges the upward pressure from lower strata of water-bearing sand caused trouble, in one case lifting a 14-ft. blanket of clay; consequently, it was necessary to allow water to fill the inner caissons, excavate deeper, and lay under water a much thicker unreinforced slab varying from 8 to 14 ft. Then the inner caissons were successfully unwatered and the remainder of the structure built according to design.



LOOKING INTO THE HEAD WALL OF THE FLORIDA WALK SIPHON

At the site of the lock the first operation was driving an outer line of sheetpiling 48 ft. long to enclose a space 1,600 ft. long by 650 ft. wide. This enclosure serves to cut off a stratum of quicksand about 3 ft. thick at Elev. 0 to—5. Then two hydraulic dredges cut their way through an opening left for the purpose at the north end of the enclosure. In two months, from December, 1918, to February, 1919, these dredges excavated an area 47 ft. deep over an area 1,100 ft. long



(D) CONCRETING PLANT ON LOCK OF NEW ORLEANS INNER HARBOR-NAVIGATION CANAL

Sand and stone brought in by train and stored in long piles, sufficient for 40,000 cu.yd. of concrete on either side of double track. Concreting plant consists of car carrying two mixers, with forward box car for cement, and rear flat car carrying belt conveyor, which is fed by two cross belts extending into material piles. Whole outfit travels along one track, feeding from end of piles and discharging into concrete cars on adjoining track. Two such outfits are provided.

by 120 ft. wide, at bottom, with sides sloping at approximately 1 in 4. Across the north gap a cofferdam consisting of two lines of sheetpiling braced and earth-filled was built. A pumping system was installed and the water lowered to about El. + 4. Piledrivers were brought in to drive a second line of 54 ft. sheetpiling, enclosing a space 280 ft. wide by 1,200 ft. long and intended to complete the cutoff of the layer of quicksand at El. and to cut off a 20-ft. layer of quicksand between —22 and —42. The lateral pressure, proving higher than was anticipated, caused movements in this second line of sheetpiling when the water in the lock excavation was lowered to El. — 3.5. A third line of sheetpiling, of 12 in. 38 lb. Lackawanna steel section, was driven 170 ft. wide by 1,037 ft. long. Of the piles under the structure those needed for construction trestles were driven and left high. Using these piles for working supports, lines of timber bracing about 15 ft. apart were placed from one line of steel sheetpiling across the lock to the other.

At this point pumping operations were resumed. The water had been maintained all these months at about El. 0. Starting in November, 1919, and pumping at full capacity a few hours each day, the water was lowered about 9 in. a day until it was at El. — 8.8. The daily cessation of pumping was intended to give time for all possible gradual adjustments, so as to avoid if possible any sudden movement filling large voids left by water. At El. — 8.8 the pumping was stopped for some time. Lower lines of bracing rangers were placed and cross braced so as to form trusses across the lock. Thus it is hoped that absolutely all lateral movement of sheet piling will be prevented. Then pumping was resumed and the bottom was bared the first week of January, 1920.

It was early realized that perhaps the most serious danger in unwatering the lock would be due to the upward pressure of water in the lower strata of quicksand. Accordingly a number of 10-in. pipes were driven outside of the steel caissons, to tap the quicksand layer between El. — 23 and El. — 42. These are attached to a pumping system which maintains the water in them at El. — 18. Another line of 10-in. pipes was driven within the caissons to El. — 60, tapping a third layer of water-bearing sand. These pipes are bored so that water in them is maintained at lock cofferdam water level. A fourth line, consisting of five pipes 10-in. in diameter, was driven to El. — 60 in the lock caisson to serve as indicators. Measurements show that the water in these indicator-pipes has been very little higher than the water in the lock caisson, the average difference being about 3 ft. and the greatest differences having occurred when piledrivers were at work near the indicator pipes. As these pipes are nowhere closer than 78 ft. to the open pipes, this is thought very encouraging.

For convenience of construction the base slab is to be divided into 69 monoliths, of which a typical one will be 9 feet deep, 15 ft. wide, and 117 ft. long and contain 600 cu.ft. Three construction trestles were built from each end of the excavation north and south toward the center. Forms and reinforcement were successfully placed in the first monolith, and the concrete was put in place March 9, 1920.

This work is being done by force account by the Board of Commissioners of the Port of New Orleans, of which W. O. Hudson is President, Arsene Perrilliat, Chief Engineer, and James Cosgrove, Superintendent of Construction. The consulting engineers are Geo. W. Goethals, Inc. represented in New Orleans by Col. Geo. R. Goethals.

Tie Renewal Record for Nineteen Years

Renewals of ties on the Delaware, Lackawanna & Western R. R. have never been more than 10.2 per cent of the total ties in track for any one year since 1900. In a table giving the record in a committee report presented at the recent meeting of the American Wood Preservers Association there are four years when the percentage was 10 per cent or slightly more. Considerably more than half of the renewals since 1910 have been made with treated ties, until at the end of 1918 there were 3,348,765 treated ties, out of the total 10,524,129 ties, inserted for renewals since 1900 in 2,671 mi. of main and side tracks. The percentages of ties inserted the last four years ending 1919 are 7.1, 5.7, 4.4 and 5.4 per cent respectively.

Proportioning Concrete From Study of the Aggregate

Comment on paper "Mixing Concrete by Surface-Areas on Actual Work," by R. B. Young, in "Engineering News-Record," Jan. 1, 1920, and reply by Mr. Young to one of the criticisms.

Proportioning Method of Narrow Application

By G. M. WILLIAMS
U. S. Bureau of Standards, Washington, D. C.

THE assumption made at the beginning of Mr. Young's article for the selection of the "economical" mixture seems to the writer to be erroneous, and the methods employed lead to results similar in practical application to those which may now be obtained by the common method of volumetric proportioning. The terms "surface area" and "water-cement ratio" as used are merely new terms for expressing the same qualities which are now determined in the volumetric method of proportioning.

Both of the proponents of new methods of proportioning included in their theories water formulas, which it was claimed would result in equal consistencies and equal strengths for all workable mixtures. General laws were stated by which strength could be predicted for all normal concretes. The method employed by Mr. Young narrows the conclusion down to the possible value of any particular predetermined grading of an aggregate because of the limitation which he places on surface areas.

The first and greatest limitation which Mr. Young employs, and which removes his method from any possibility of being of general application to wide ranges of combinations, as was claimed for the methods proposed by Professor Abrams and Mr. Edwards, is the determination at the outset, without the employment of strength tests, of the "most economical aggregate grading," which he states to be "the one containing the lowest surface areas per cubic foot of material which can be successfully handled and placed." Whereas the surface area theory proposed by Mr. Edwards would admit of the use of wide variation in gradation (large differences in surface areas), Mr. Young at the beginning limits his aggregates to the "lowest areas which can be worked." Such a result is, of course, obtained by keeping the fine material in the sand or fine aggregate to a minimum. In usual concrete mixes, where the ratios of fine to coarse are as 1 to 2 (such as 1:2:4, 1:3:6, etc.) the area of the sand is usually more than 90 per cent of the total area of both coarse and fine. Therefore, to obtain low areas it is necessary that the grading of the sand, the material whose variation most greatly influences workability and segregation, be made as coarse as possible and still permit of a workable mix.

Furthermore, the use of high area aggregates requires larger quantities of cement, which, if the same flowabilities are obtained, result in high strengths which are unnecessary and uneconomical. It is clear that this limitation to low area aggregates is essential for economy, and as a result the method employed is narrow and limited rather than broad and general as is that proposed by Mr. Edwards.

Tests made along his line with which the writer is familiar do not bear out the basic assumption that low surface areas are most economical. It is found that the limitation of aggregates to low total areas results in "harsh" mixes which are difficult to work and whose strengths are lower than mixtures having higher surface areas. It is also found that the quantity of cement required per cubic yard of wet concrete is greater for such harsh, low area mixtures than for the high area mixtures.

The resulting concretes, which Mr. Young's method provides, in reality result in false economy, since the concretes are more difficult to place, have lower compressive strengths and require a slightly greater quantity of cement. In other words, the use of low surface area aggregates is generally opposed to economy and strength.

The concretes shown in Table I were made with sands of varying degrees of fineness combined with the same gradation of coarse aggregate, all from the same source of supply.

TABLE 1. PROPORTIONS 1 :½:3 BY VOLUME. AGE 28 DAYS. EQUAL FLOWABILITIES FOR ALL.

Aggregate Number	Surface Area Sq.In. per 100 G. Agg.	Surface Area per Gram Cement	Pounds Cement for 1 Cu.Yd. Concrete	Compressive Strength
1	103	5.0	603	1,873
2	114	5.6	600	2,456
3	167	8.2	600	2,348
4	233	11.6	600	2,508
5	268	13.3	601	[illegible]
6	315	15.4	597	2,850
7	393	19.2	594	2,865

These concretes are fully comparable since equal consistencies or flowabilities were obtained as measured on the "flow table." Concretes 1 and 2 were so harsh that they would be ruled out as unworkable but No. 3 was a somewhat harsh, but workable concrete. The base of working or plasticity increased with the amount of fine material in the sand and it is seen that strengths were not reduced. The tendency to segregate when very fluid was less marked as the amount of fine material in sand or the surface area increased. It is also found, with flowabilities equal, that the cement paste in a high area mix contains a smaller proportion of water than in one having a low area. This condition no doubt partly accounts for the higher strengths of the mixes containing the higher quantities of fine aggregate. In such mixes, although the calculated w/c relation may be equal or nearly so for two mixtures, the paste of the low area mix will be the wetter, so that the true w/c relations may be quite different. Further, as the flowabilities of the two are equally increased, the low area aggregate concrete will be the first to segregate, and become difficult to handle.

For apparent economy the modified surface area theory as employed by Mr. Young necessitates the selection of such an aggregate as numbers 3 or 4 above. The resulting concrete requires slightly more cement per cubic yard, has a lower compressive strength, and is more difficult to place. Such a condition results since the basis of the modified method is the erroneous assumption that the most economical mixture is one having the lowest total surface area, and which Mr. Young states is near the border line of workability.

It is apparent that the making of strength tests does not enter into the procedure of this modified theory until after the "economical" mixture of aggregate is selected. After surface area is determined various ratios of cement to areas per 100 square feet of aggregate are selected, concretes are then made up of equal consistencies as determined by eye and compressive strength for each mix determined. The strength values with calculated factors for areas and water-cement ratios are then plotted and the limiting factors for various classes of concretes determined from the resulting curves.

That this method differs little from methods at present in use, except that the measured and calculated factors are given different names, is apparent. In practice we have found that Potomac River materials, in the proportion of 1 part sand to 2 parts aggregate is about the limit of coarseness which it is desirable to use. Less fine sand in the fine aggregate or a smaller ratio of sand to coarse aggregate, results in harsh concretes, difficult to properly place, while with the same flowability, a finer sand or more sand increases workability and results in less segregation in the wetter mixes. The above 1 : 2 combination is probably quite similar to that which Mr. Young would select as his "economical grading" if using our materials. In accordance with Mr. Young's next step in the process we will make up concretes having the same consistencies of flowabilities with the following proportions of cement to aggregate: 1 : 1½ : 3, 1 : 2 : 4, 1 : 2½ : 5, 1 : 3 : 6, and 1 : 4 : 8.

Recent determinations indicate Potomac River materials to have the approximate areas of 1,830 sq.ft. per 100 lb. and 86 sq.ft. per 100 lb. respectively for the sand and gravel.

The data in Table II will then result:

TABLE II.

Proportions	1:1½:3	1:2:4	1:2½:5	1:2½:6	1:4:8
Cement pounds, per 100 sq.ft.	3.3	2.5	2.0	1.65	1.24
Per cent water by weight of cement or w/c	Increases as quantity of cement decreases				
Strength	Decreases as quantity of cement decreases				

It is seen from this table that a table similar to that presented by Mr. Young in his Table II will result. Although we may not be accustomed to calculating and viewing our mix from the viewpoint of surface area and the cement-surface area relation, the relation is there and maybe obtained by computation. Although we may not be accustomed to calculating or expressing water in terms of quantity of cement the relation is also there. Percentage of water by weight of cement is calculated as easily as water-cement ratio, but it is seen that both are incidental and a resultant, for any given flowability, of the predetermined grading and mix. Our results may be plotted in the same manner as Mr. Young's Figs. 3 and 4 and we may likewise draw up a table similar to his Table III. In the field, quantity of cement and mixing water may be varied as described by Mr. Young, and the resulting concretes strengths may be checked up in the same manner by molding samples of field concrete.

However, with our present knowledge of the advantage to be gained by using more fine aggregate (greater surface area) in our mix, we would not confine ourselves to such a low area combination as is required by the economical considerations of Mr. Young's modified method. Very likely we would reduce the above number of mixes and add a similar series in which the sand-gravel ratio would be 2½ to 3½ or even larger or add more fines to the sand and maintain the same relative porportions. Past tests show that the 2½ to 3½ or 2½ to 4 ratio mixes will have greater workability for the same flowability, higher strengths, and require less cement per cubic yard of concrete. While the surface area method limits the investigator to low areas aggregates, the old volumetric trial method obtains identical results and permits the use of wide variation in gradations which are generally found to result in more satisfactory concretes.

Proportioning Method Works Well in Practice

By R. B. YOUNG

Hydro-Electric Power Commission of Ontario, Toronto, Ont.

Mr. Williams' criticisms are interesting, but he fails to develop any practical objections to the use of the method described. His sweeping statement that the method cannot possibly be of general application to wide ranges of combinations is not borne out by actual experience, unless it happens that by "wide ranges of combination" he includes impracticable mixtures such as would never be used in actual work. No claim has been made that a method has been developed that will function under these conditions, and the fact that the method will not do so does not detract from its practical value. It has already been used with a wide range of combinations such as are met with in commercial work with satisfactory results.

Whether the "most economical grading" of the aggregate, as defined in the article under discussion, is or is not the most economical or whether it is or is not obtained in the field is not vital to the success of the method in controlling the quality and mobility of the concrete. It is important that by its use it is possible to obtain concretes of the strength and consistency desired, to confine the variations in both strength and consistency within narrow limits and to do this regardless of the varying character of the materials. This feature—continuous control—is considered very important.

Mr. Williams dwells at some length on the cement requirements of different gradings and speaks of economy of concretes as if the quantity of cement used alone determined this. In actual work cement is only one factor entering into the cost of the finished concrete. It is often more profitable to use an inferior material which is close at hand than to import a better aggregate which would require less cement. It is at times cheaper to use additional cement rather than to carry out the screening and handling necessary to produce an aggregate more economical in this material. The most economical grading is usually, therefore, a matter of academic interest.

In considering Mr. Williams' comments on the theoretical basis of the methods described, it is necessary to bear in mind that he and his associates deny the validity of the data originally presented by both Professor Abrams and Mr. Edwards upon which the theories underlying the method were derived, and that his counter arguments are based upon as equally unsubstantiated data of his own. It is therefore not surprising that he arrives at totally different conclusions than do those who accept the data of these gentlemen.

It is true, as Mr. Williams points out, that data from such tests as he describes can be used to obtain a table similar to our Table III. It is also true that data in the form which Mr. Williams obtains it cannot be used to more than estimate the proportions necessary in any given case and even where one of the proportions actually tested are used, it in no way guarantees field concrete of similar quality unless the consistency and grading of the aggregate is the same in both cases. Moderate variations in the gradation or moisture content of the aggregates cannot easily be compensated for. By putting these results in the form we do we compensate for these variations and eliminate guess work, and therefore this method of using the data has decided advantages over the others.

It may be true as Mr. Williams intimates that Fig. 4 is "representative of the variation in strength with increase in mixing water and change in cement content for this one graded aggregate," but it is also true that the grading of the fine aggregate and the relation of fine to coarse aggregate can be varied within a considerable range, and the curves obtained with such combination so closely agree with one another that any one of these curves can be said to represent all. This has been brought out by our laboratory tests and substantiated by our field experience. Thus these objections are not of any consequence.

Our method of proportioning was developed with both the scientific and practical aspects of the problem in mind. No doubt it includes features not acceptable to the highly scientific and theoretical members of the concrete fraternity. It is, however, helping us to produce better and cheaper concrete and it is results that count.

Proportioning the Concrete for Government Ships

By H. A. DAVIS

Formerly Inspecting Engineer, Concrete Ship Section, E. F. C., San Diego, Cal.

It may be of interest to cutline briefly the method used by the writer in controlling the quality of the concrete used in concrete ships of the Emergency Fleet Corporation.

The character of the concrete work called for in concrete ships demanded a high strength requirement, great flowability and the maximum size of aggregate was limited to ½ in. In order that the concrete used be as uniform as possible the aggregate, generally crushed shale slag, was separated into sand (below ⅛ in.) and coarse aggregate (⅛ to ½ in. or ⅜ in.).

Then preliminary laboratory tests of each aggregate intended for use in these ships were made according to the following plan:

The first series comprised a study in which the cement content was the variable, a fine to coarse aggregate ratio being assumed that insured a concrete containing sufficient mortar, and a consistency measured by the slump apparatus that a knowledge of possible field requirements indicated would be suitable.

In the second series the effect of varying the water content was studied. The cement content was selected from the first series results in light of the strength requirement and the same fine to coarse aggregate ratio maintained. The relation between amount of water in concrete and amount of "drop" measured by the slump apparatus was established for future use in field.

A third series was made in which the effect of small variations in the ratio of fine to coarse aggregate was studied the same cement content as in series two being maintained and a constant consistency as in series one being controlled by "drop" or slump test.

In the field the concrete was proportioned in the light of the preliminary laboratory data to meet the constructor's desires as to workability of concrete as far as possible without sacrificing the strength requirement and with due regard to the amount of fine and coarse material as received on the work from the economic viewpoint. It was necessary at times to use small amounts of extraneous materials to achieve these results but when such was necessary its advisability or effect on the resulting concrete was determined by actual tests. The consistency was controlled in the field so that as uniform as possible a concrete could be used throughout, by the slump test using the apparatus devised by the writer and described in *Engineering News-Record*, March 27, 1919. Frequent tests were made in field to determine the grading and weight of aggregate as furnished.

The writer has found this appartus useful not only in maintaining a uniform consistency in the field but as an indicator in the laboratory of the workability of the concrete. A concrete mixture that irrespective of the amount of drop indicated by this apparatus that always produces a symmetrical cone never gave any difficulty as to workability in the field. In fixing the amount of drop permissible careful consideration must be given to the character of work.

Applying the writer's method to any concrete work, it may be said to comprise direct and sufficiently comprehensive studies of the three variables (cement content, water content and gradation of aggregate) the importance of which is recognized by practically all experimenters and proportioning in the field in a way to maintain in the concrete the qualities desired both for the work and by the construction as far as possible in a manner to interfere as little as possible with the constructor's work and so that a uniform concrete be used throughout handling of which workers become familiar with and more efficient as work progresses.

This last factor is essential, as field changes in the concrete mixture made during progress of work frequently result in confusion and difficulties and are a source of irritation to the construction.

Any discussion of the theoretical basis for such studies has been purposely avoided by the writer, for it is believed that too much emphasis has been laid on this phase of the subject to the confusion of the actual users of concrete. The theoretical basis used by the experimenter in outlining necessary direct tests is not as important as the recognition by the experimenter of the requirements due to the character of the work, and difficulties and variations in the important factors that may be encountered in the field.

An experimenter of sufficient experience acquainted with the aforementioned requirements and difficulties should be able to outline a series of preliminary laboratory tests sufficiently comprehensive to cover these points and be able to apply this information in the field in a manner to give proper consideration to the requirements of the work, the difficulties of the construction and other economic phases. The writer recognizes the value of such indirect tests as mechanical analyses of aggregate, volumetric tests of concrete to determine yield and density, etc., as means of cataloging experience for future use and for reducing to a reasonable minimum the necessary direct tests to be made in the solution of such concrete problems.

Wood Block Pavement Fails Through Contraction and Flotation

Loosely Laid Blocks Shrunk by Sun and Floated by Melted Pitch—Precautions in Construction Remedy Trouble

By W. W. Horner
Chief Engineer, Sewers and Paving, St. Louis, Mo.

EXPANSION has been believed to be the greatest destructive agency in new wood block pavement. It appears, however, that a certain amount of expansion is not only desirable, but essential. Contraction under certain conditions may be a greater danger than expansion. Evidence that this is a fact is furnished by experience in constructing certain sections of wood block pavement in St. Louis, Mo., in the season of 1919. One section of pavement was destroyed and another section suffered damage because of contraction of the blocks and their flotation due to melted pitch.

The St. Louis pavement, designated Contract *A*, and one block in length, is on an east-and-west street having double car tracks on a 40-ft. roadway. The concrete base was finished with a 40-lb. concrete roller and a belt, the resulting surface being very satisfactory. After setting it was mopped with pitch at 140 to 145 deg. melting point, and the blocks were laid generally after the pitch had cooled. The blocks were not laid tight. They were lug blocks, having $\frac{3}{16}$-in. projections, and were laid in contact without ramming. A light rain occurred during the paving, and the bottom of the blocks were thoroughly wetted, but no appreciable expansion took place and the water was drained out, the paving and rolling completed, and the pitch filler placed. The schedule of work is given by Table I.

The first outstanding feature of this work was the entire absence of bleeding. The second and most surprising feature was the remarkable contraction which took place in the block after laying. Throughout all of this work there was little excessively hot weather, but the air was very clear and the temperature of the pavement in the sun undoubtedly reached a high mark. All the blocks showed a notable shrinkage in the pile when exposed to the bright sun. The blocks continued to shrink on the street, and apparently the filling of the joints with pitch had very little effect on the rate of shrinkage. The looseness of the blocks was aggravated by the rather loose laying in the beginning, but the results would have been the same in any case as joints originally $\frac{3}{16}$-in. wide opened to $\frac{3}{8}$ in. and even to $\frac{1}{2}$ in. After the blocks had reached this condition of contraction, the third unfortunate factor came into play. This was the combination of the block shrunk out of contact with its neighbors; the very hot sun bringing the pavement to a temperature greater than the melting point of the pitch; the resulting liquefaction of the pitch, and the floating of the blocks as individual pieces of wood in the pitch pools. The illustration shows this condition; in some instances the blocks are an inch above the pavement.

TABLE I. SCHEDULE OF OPERATIONS IN CONSTRUCTING PAVEMENT A

Day	Temp. Max.	Average Daily Max.	Average Daily Mean	Remarks
May 10–25	75	66	59	May 10 and 12, blocks shipped. May 26, began paving. May 31, completed paving.
May 26–31	88	82	75	
June 1–10	88	82	73	Joints badly opened. Pitch settled. Pavement somewhat rough. June 29, rerolled blocks and refilled joints with pitch.
June 11–18	91	90	80	
June 19–26	92	89	77	
June 27–30	90	83	74	
July 1–15	96	90	81	Work noticeably rough. Pitch again settled in joints.
July 16–31	99	92	82	
Aug. 1–9	102	91	81	Aug. 9, surface in extremely bad condition. Decided to remove and repave entire block.
Aug. 10–20	95	88	78	
Aug. 21–31	90	83	75	
Sept. 20	..	..	..	Removal of block started.

Contract *B* was also a one block street in an east-and-west direction, but differed from *A* in having a narrow roadway without car tracks, and in being almost completely shaded by high buildings. It is also bordered by loading platforms for wholesale mercantile houses, and carries intense traffic, largely steel-tired drays. With respect to traffic and to sun conditions, the situation was almost the exact opposite of that on Contract *A*. In other respects the work on the two contracts was almost identical (slight difference in preliminary steaming and in the oils) and the conclusion may be drawn that the failure of the blocks on *B* to contract was due to the shady condition and to the ironing effect of traffic. In appearance the blocks were very similar to those used on *A* and like all of the blocks furnished failed entirely to show any signs of bleeding. No defects appeared and the pavement continued to improve in smoothness. The work on the whole was highly satisfactory.

Contract *C* was a north-and-south street having a

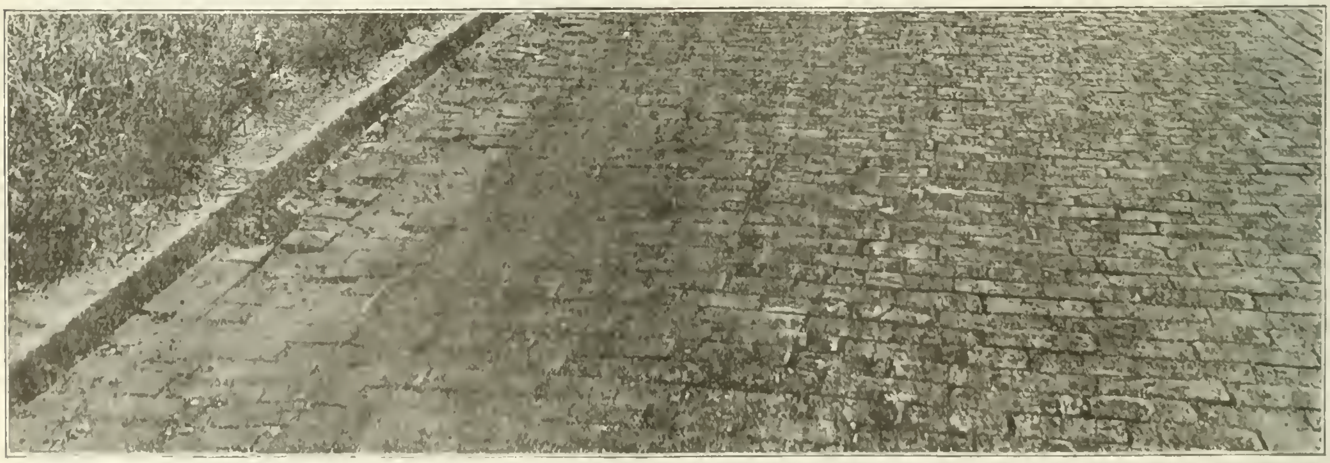


FIG. 1. WOOD BLOCK PAVING, CONTRACT "A," SEVEN WEEKS OLD, SHOWING SHRINKAGE, AND FLOTATION IN THE PITCH FILLER

50-ft. roadway and double car tracks. There is comparatively little shade and the traffic while considerable, is largely pleasure cars. The manufacturer who supplied the blocks for Contract *A* also furnished the blocks for this contract. These were also lug block, had the same dry appearance, and also failed to show apppreciable signs of bleeding. They were laid slightly tighter than those on Contract *A*, but were not driven up tight. Except for a very few feet at one end, a large part of these blocks lay several days before the joints were filled with pitch, and during this time the shrinkage was very rapid. There was also a very definite tendency for the longer blocks to warp or curl upward, and when the pitch was applied these blocks in particular were inclined to float. This was undoubtedly due to the hot pitch from the joints running under the upturned ends of the blocks and combining with the paint coat pitch in place. All of this pitch had a melting point of from 140 deg. to 145 deg. F.

EFFICACY OF SAND COATING

In these two city blocks of paving probably 200 blocks floated somewhat in the pitch. This occurred during the actual pitching, or within a few hours thereafter, and the fact that the trouble did not become worse, was probably due to the heavy coating of sand which was put over the pavement, and which was thoroughly wetted four or six times a day throughout the rest of the summer. It is interesting to note in this connection that even though this wet blanket of sand lay on the blocks almost continuously during one week of moderate weather, there was only one instance in which any signs of expansive pressure appeared, and this did not indicate any material amount of expansion.

About the time that the first two blocks on Contract *C* were paved a definite deterioration of the Contract *A* pavement became evident, and it was decided to take all possible precautions on the remainder of *C* to prevent the occurrence of a similar situation. At the request of the writer the block manufacturer also decreased somewhat the preliminary steaming treatment on the *C* block after the first car loads had been shipped and this may have had some effect in reducing the contraction.

To prevent the floating of the blocks in the hot pitch two changes were made in the methods of construction. First, the blocks were driven together with a heavy sledge as tightly as possible. The result was that even where considerable shrinkage took place, the blocks were not usually relieved from contact with each other, and the floating of individual blocks was to an extent prevented. The second change was to raise the melting point of the pitch filler, at first to 150 deg. F., and after about two blocks more had been laid, to 160 deg. F., at which point it was kept.

As there was still some evidence of the curling of the blocks on the hotter days, an additional preventive was used against flotation. This consisted of casting over the pavement and sweeping into the joints a sufficient amount of limestone dust, or fine sand, to fill the bottom of the joints about ½ in. By this means the pitch in the joints was kept away from the pitch in the base, and the tendency of the hot joint pitch to flow under the warped block was reduced.

The writer felt also that the trouble was somewhat aggravated by the original separation of the blocks produced by the lugs, and it was decided that the east half of the street would be constructed of rectangular blocks. No actual demonstration of the advantages of this change was possible as the paving of the east side was done under more moderate temperature conditions, and shrinkage of the blocks was much less apparent. It does not appear, however, that the use of lug blocks is of any advantage under conditions where the blocks tend to shrink apart.

How many of the above precautions were really necessary cannot be now determined, but it has been demonstrated that non-bleeding and highly shrinking blocks can be satisfactorily laid even during long dry summers in this climate, if they are driven tightly together, if a fine mineral filler is used in the bottom of the joints, if a somewhat high melting point pitch is used, and if the preliminary steaming is not too great, and finally, if the pavement after laying is protected from the direct sun heat with a moderate amount of wet sand.

The laboratory record of the oil, and the log of the treatment of blocks of the three contracts showed that there was little difference in the oils used, except as to the lighter oil used on *C* and in one charge on *A*; that the treatment did not vary greatly, and that the variations which existed might divide the blocks into two classes with respect to the preliminary steaming. The Contract *A* blocks and the first ten cars of *C* blocks were steamed for about four hours at a temperature of from 245 deg. F. to 252 deg. F., while the *B* blocks and the remainder of the *C* blocks were steamed at from 230 deg. F. to 235 deg. F., and generally for not over 3½ hr. It appeared that these two different classes of blocks actually behaved differently in the street in respect to the amount of shrinkage, but from the data in hand we are not justified in charging the excessive shrinkage of the one class of blocks to the higher temperature of the preliminary steaming.

LABORATORY TESTS OF WOOD BLOCKS

Unfortunately no laboratory tests for absorption and shrinkage were made on either Contract *A* or Contract *B* blocks immediately after delivery. No tests were made on the *B* blocks at any time, but a sample of left-over block from Contract *A* was secured, and a study made after these blocks had been taken away from the street, and stored in the contractor's yard for nine weeks. These blocks must have seasoned considerably during the storage period. In spite of this, however, they show the following remarkable results:

Five blocks immersed in water at 77 deg. F. for 45½ hr. showed an average increase in weight of about 5½ per cent and an average linear expansion of 0.25 per cent. These same blocks seasoned in an oven at 158 deg. F. for 43½ hr. showed an average loss of weight of 7.6 per cent and an average linear contraction of 1.75 per cent from their original dimensions as received. A second series, in which the tests were reversed, that is the block was first seasoned and later immersed, showed an average loss in seasoning at 158 deg. F. in 42½ hr. of 8.6 per cent by weight, and an average linear contraction of 2.1 per cent. After immersing for 43½ hr. at 77 deg. F., a net gain in weight averaged only 1.6 per cent, and two of the blocks actually showed a net loss. None of the blocks came back to their original size, and the average linear contraction after immersion was still 0.6 per cent as compared to 2.1 per cent after direct seasoning. In other words, even after this long storage period it was practically impossible to make this block expand, and the contraction values reached a seriously high percentage.

Blocks from Contract *C*, treated on Aug. 30 by the somewhat lighter preliminary steaming system, showed an average linear expansion after seasoning at 158 deg. F. for 48 hr. of 2.2 per cent or very nearly the same as the stored *A* block mentioned above, and an average linear contraction of 1.2 per cent. Untreated block taken from the same stick of timber showed an average linear expansion of 0.5 per cent.

Various other tests have been made from time to time, not as part of the completely predetermined investigation, but more to bring out the characteristics of the blocks which were being handled. These tests have been tabulated in Tables II and III.

TABLE II. TESTS FOR EXPANSION AND CONTRACTION

Immersed in Water				Seasoned at 158°			
Condition	Hours	P. C. Gain Net, from Original	P. C. Lin. Exp., from Original	Condition	Hours	P. C. Loss Net, from Original	P. C. Lin. Contracting from Original
Contract A Block After 9 Weeks Storage							
As received.......	48	+ 5.40	+0.25	After immersion	48	7.70	2.00
After 48 hr. seasoning at 158° F..	48	+ 1.50	—0.19	As received.....	48	8.90	2.10
Average.......	48	3.45	+0.03	Average.......	48	8.30	2.05
Contract B Block from East Side of Street							
As received......	22	+ 3.43	+0.21	After immersion	16	3.55	3.44
As received.......	116	+11.28	+0.35	After immersion	116	13.50	3.31
As received.......	22	3.93	+0.28	As received....	22	4.76	0.82
As received.......	116	8.19	+0.61	As received.....	116	10.29	2.58
				As received.....	22	3.72	0.62
After seasoning....	22	3.77	+0.37	As received.....	116	12.54	2.98
After seasoning...	116	7.53	+0.39				
Average.......	116	9.00	+0.45	Average.....	116	12.11	2.96
Contract C, Block from Treating Plant							
After seasoning....	48	1.0	—1.2	As received.....	48	8.8	2.2
Contract C Block, Untreated Block							
				As received.....	48 (at 160 d. F.)	12.0	1.[illegible]
After seasoning....	96	14.0	—0.5	....	Ditto	13.0	1.5

The figures of Table II demonstrate clearly that these blocks after treatment were in the condition which wood preservers have always considered ideal, that is, expanded the maximum possible amount, and this result is well checked by the failure of the blocks on the street to expand when covered with wet sand. The whole experience shows clearly the absurdity of sprinkling these blocks before paving, as is advocated in some of the standard specifications. The blocks which are seasoned in two days at sun temperature to such an extent that they still remain contracted after soaking in water for two days, will hardly be materially affected by light sprinkling.

The measurements in Table III were taken with the idea of determining the effect on the block of exposure during shipment. These tests were made from five sticks of timber from each of which three adjacent blocks were sawed. The first group was tested immediately after treatment; the second group after delivery on the work, and the third group was not treated, but was tested the same time as the first.

Inspection of Table III rather leads to the conclusion that the action of the blocks in the street was not due to any positive effect of the treatment, and that the result would have been very similar if the timber had been handled untreated. In all cases it appears that the fiber of the treated block was about at the moisture saturation point, that the addition of the water simply filled the cells, without being able to cause expansion, while the abstraction of water was directly from the fiber, and contraction necessarily followed.

TABLE III. CHANGE DURING TREATMENT AND TESTS

	P. C. Weight	P. C. Lin. Exp.	
Average gain in treatment, Group 1	+44	+0.32	A
Average gain in treatment, Group 2.	+39	+0.08	B
Net loss in shipment..........	5	—0.24	B
After seasoning 48 hr. at 160° F, Group 1........	+31	—1.10	C
Net loss in seasoning at 160° F..................	13	—1.52	C'
After immersion 96 hr. at 77° F, Group 1........	+45	—0.38	D
Net change after seasoning and immersion........	+ 1	—0.70	D'
After seasoning 48 hr. at 200° F, Group 2........	+20	—3.26	E
Net loss in seasoning at 200° F..................	19	-3.34	E'
Untreated block, Group 3, after seasoning 48 hr. at 160° F.....	—12.0	—1.88	F
Untreated block, Group 3, after seasoning 48 hr. at 160° F. and 96 hr. at 200° F.....................	—23.0	—5.8	G

These tests have indicated a possibility of arranging the laboratory control of street work based directly on the moisture content of the block as shown by the tests. The 48-hr. tests for seasoning at 158 deg. F. and for immersion at 77 deg. F. can always be carried out before blocks arrive on the street, and the characteristics of the blocks determined from these tests will indicate whether precautions against contraction or against expansion are necessary.

Another interesting result of the examination of this wood pavement was the remarkable reduction in melting point of the pitch. In one instance the pitch tested at 145 deg. melting point and then cooked considerably before pouring, was found after ten weeks in the pavement to have a melting point of 131 deg. This occurred apparently through contact with the creosoted block and in spite of the fact that there was no appreciable bleeding of the block during this time. In another instance the reduction was from 145 deg. to 111 deg. under similar conditions of non-bleeding block, but the second sample was taken about 1 ft. from the street car rail and the packing under the head of the rail was a mixture of sand with a pitch cut-back, and the cut-back may have become somewhat diffused.

CONCLUSIONS

Where economic conditions permit, specifications for block delivered during the summer months, and to be laid under climatic conditions similar to those in St. Louis, should require their manufacture from thoroughly dry timber. It seems probable that this change will give a block which is capable of expansion and consequently of some bleeding, but the writer believes that the modern specification for a smooth concrete and pitch bed and a bituminous filler, if carefully carried out will permit of absorption into the block at so slow a rate that expansion troubles will never be noticeable. If a small amount of bleeding does appear in the first year, the effect will not be serious compared to the conditions outlined above.

If it is necessary to treat partially green (or partially seasoned) timber for use under these climatic conditions, it would seem advisable to reduce somewhat more the amount of preliminary steaming. It would also seem advisable to make accelerated expansion and contraction tests and to regulate the details of paving in accordance with the results. If considerable contraction is indicated, it would be advisable to pave the block as tightly as possible, to use a fine mineral dust in the bottom of the joints, and possibly to substitute an asphaltic for a pitch filler during very hot weather. With these precautions there seems no reason why even the partially seasoned block cannot be handled in extreme weather, and why the resulting pavement under the present specifications could not be more nearly the ideal in appearance than even our best work in the past, and there is every reason to believe that the life of the pavement will be very considerably increased.

To Build Large Bridge Across the Connecticut at Springfield

Monumental Structure of Concrete Arches To Be Started After Some Years of Discussion As to Location

By C. M. Spofford
Fay, Spofford & Thorndike, Consulting Engineers, Boston, Mass.

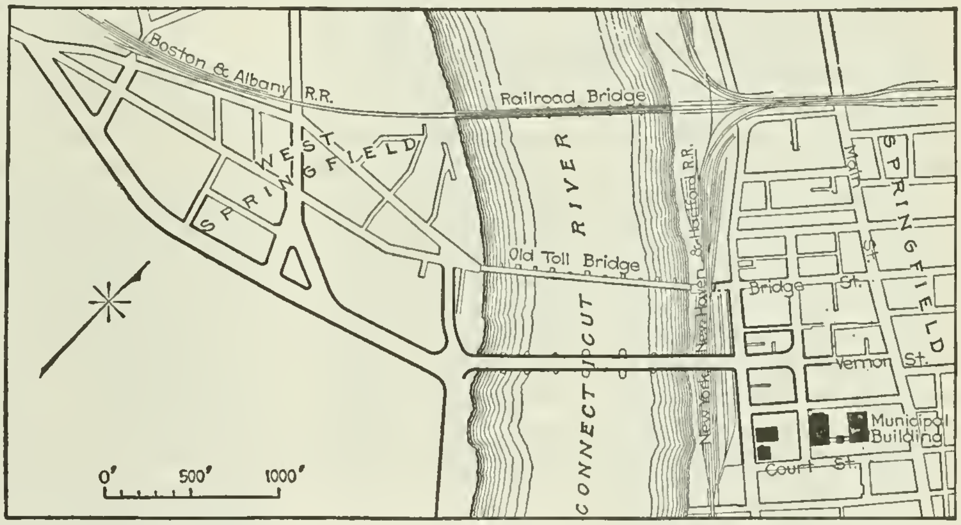
ONE of the largest bridges to be built in this country since the war is to be started at Springfield, Mass., as soon as open weather permits construction operations. This bridge, across the Connecticut River, connects the city of Springfield and the town of West Springfield; it has been under consideration for a number of years and under definite study by a commission for the past three years. The procedure has been somewhat complicated, but difficulties have now been adjusted, bids were opened Mar. 10 and the contract has been awarded.

The inadequacy of the existing bridges here has long been recognized, but a new bridge has been delayed for years by disputes among various factions and by the possibility that the New York, New Haven & Hartford R.R. might adopt certain plans long under discussion for altering or removing its railroad yard which occupies the river front on the Springfield side of the river and which would be crossed by a new bridge. Finally, the situation became so acute that the Massachusetts Legislature was requested to grant authority to construct a bridge across the river and what is more remarkable, to determine its location. This appeal resulted in the Legislature in 1915 pasing an act establishing a Board of Commissioners to be appointed by the Supreme Judicial Court of the County of Hampden to determine the location, make the necessary plans and estimates of cost, and apportion the expense between the county and the various municipalities especially benefited.

This commission after a number of hearings decided to lay out the bridge so as to establish the westerly end near the old toll bridge and the easterly end adjacent to the Court Square in Springfield where has been growing up a group of beautiful municipal buildings. This location gave a skew bridge making an angle of approximately 68° with the river, centering on the large tower of the Springfield municipal group.

Plans were made for such a bridge and were submitted to the Supreme Court in June, 1917. This bridge had a 42-ft. roadway and two 9-ft. sidewalks. Immediately, however, upon publication of the report protests arose against the location and against the narrowness of the roadway. Petitions requesting the recommital of the commissioner's report and revisions which contemplated a bridge 75 ft. wide, located square across the river, just below the Springfield Public Square, was circulated and signed by more than 17,000 inhabitants of Hampden County. The commissioners thereupon withdrew their original report and proceeded to prepare designs which culminated in the design which is at present contemplated.

This new bridge, plans for which were presented to the court in October, 1919, contemplates a new system of approach streets to be built on undeveloped land at West Springfield, to connect the westerly end of the bridge with the built up section of that town and with the main thoroughfare to the west. Practically all the land and filling for these approaches would be furnished without charge by the realty interests who control the vacant land.



LOCATION OF NEW BRIDGE ACROSS CONNECTICUT RIVER AT SPRINGFIELD, MASS.

A perspective of the proposed new bridge is shown on p. 818. It is divided into two portions; (a) the river bridge consisting of seven reinforced-concrete arch spans with a total length of 1,129 ft. between abutments and a clear width of roadway of 60 ft. with sidewalks 10 ft. wide on each side. Each span consists of five two-hinged arch ribs, two spandrel walls, columns and a floor system, all of reinforced concrete. The channel span. which is the third span from the Springfield end, has a clear opening of 176 ft., a rise above the river at low water of 45 ft. with a clearance of 41 ft. for a width of 60 ft. (b) A reinforced-concrete viaduct having a total length of 300 ft., consisting of nine spans, eight of which have a length of 31 ft. in the clear.

The river bridge is necessarily unsymmetrical on account of the location of the channel which is nearer the Springfield side of the river but it was found possible to repeat two spans on either side of the channel span, hence the five spans forming that portion of the bridge between the two sets of small towers shown in the perspective are symmetrical with respect to the channel span. The other two arch spans are of lesser length than any of the arch spans above mentioned and in a measure, balance the viaduct at the easterly end. The piers flanking the channel span and surmounted by high ornamental towers are necessarily large in order that they may serve as abutments provided the arch construction of the channel span should ever be replaced by a draw span. This contingency seems extremely unlikely but the legislative act authorizing the bridge required that such provision should be made. The remaining piers are dependent for their stability against overturning upon the lateral support furnished by the adjoining arch spans and a carefully planned system of erection of the ribs and floor system in all arch spans is specified by the engineers, in order to insure stability of these piers during construction.

The piers and abutments are to be supported by wood piles driven to a bearing in clay, a stratum of which is shown by borings to lie at a moderate depth below the river bed. The piers themselves are of concrete with granite facing above low water. The exterior shell of the towers and cartouches, the railing on the river bridge and certain other ornamental features are to be constructed of artificial stone.

The steel reinforcement of each of the arch ribs consists of two latticed girders connected by cross latticing and provided with hinges at each end at the center. It is planned to have these ribs shipped in sections; in all spans field splices which may be riveted up before erection, if desired, are provided at or near the quarter points. These steel ribs are to serve as centering for the rib concrete, this feature having two distinct advantages: (a) practically the full compressive strength of the steel reinforcement is utilized, which is not possible with the ordinary rod reinforcement where the stress in the steel depends entirely upon the relation between the moduli of elasticity of steel and concrete, and (b) falsework in the river to support the bridge during construction is necessary only during the brief period required to erect the steel ribs in a given span which requires only a bent at the center of each span. This latter condition is especially important in the case of a river like the Connecticut which is subject to severe and sudden floods and to bad ice conditions.

Each steel rib is to be erected as a three-hinged arch but will ultimately be spliced at the crown, thus transforming it to a two-hinged arch and reducing the center deflection under live-load, which is one of the serious objections to three-hinged arches. The side ribs carrying the spandrel walls are to be spliced at the crown when the rib concrete is poured and the interior ribs are to be spliced after the rib and superstructure concrete is poured, the pouring of the rib concrete at the crown of the arch being postponed in order to permit the splicing of the steel.

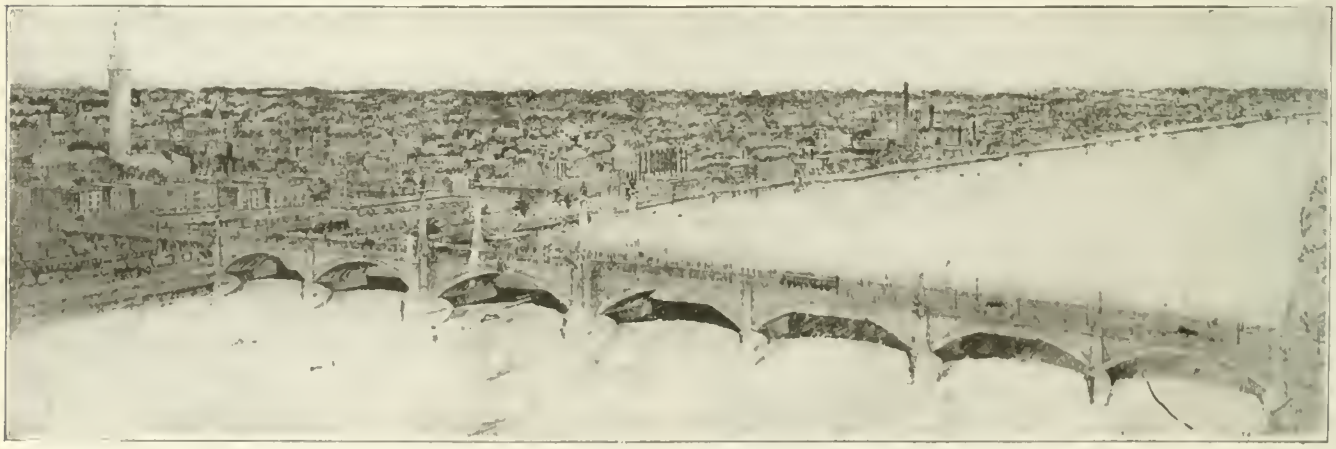
The bridge roadway is to be paved throughout with stone block paving; the sidewalks are to have granolithic surfaces.

The construction of the bridge is in charge of the Hampden County Commissioners: Charles C. Spellman, chairman; George W. Bray, William H. Ensign, with Ely and Ely, of Springfield and Westfield, as legal advisers. The designs were prepared by Fay, Spofford and Thorndike, consulting engineers, of Boston, who are acting as supervising engineers during construction; Haven and Hoyt, of Boston, serving as advisory architects.

Bids for the bridge construction, opened March 10, were as follows: P. McGovern, $4,167,000; Holbrook, Cabot & Rollins with C. W. Blakeslee & Sons Co. (joint bid), $3,775,000; H. P. Converse Co., $3,254,883. The engineer's estimate was $3,399,000. The contract was awarded to H. P. Converse Co. of Boston.

Township Rewards Distributed

The Pennsylvania State Highway Department recently announced the proportion in which the $1,000,000 appropriated by the 1919 legislature for payment of state rewards to township supervisors is to be apportioned. The old system of bonuses to townships has been abolished, and in its place comes the method of distributing rewards for work actually accomplished by townships in road improvements. The money is apportioned among the various counties according to the mileage in townships of the second class. The mileage is compiled from map surveys made by the township division of the state highway department. There is a total of 74,875 mi. of township roads in townships of the second class, and the distribution therefore will be at the rate of $13.35 per mile. Cameron County with 125 will receive the smallest apportionment, and Lancaster with 2,567 mi. will receive the largest apportionment, this latter being $34,283.80.



PERSPECTIVE OF CONCRETE ARCH BRIDGE AT SPRINGFIELD, MASS.

Activated-Sludge Experiments at Worcester, Massachusetts

A Year's Study of New Process Showed It Not So Well Adapted to Worcester Sewage As Imhoff Tanks and Sprinkling Filters

By Ray S. Lanphear
Supervising Chemist in Charge of Sewage-Works, Worcester, Mass.

THE policy of the Worcester Sewer Department for the past sixteen years has been to operate experimental sewage treatment plants, testing the newer methods that gave promise of good results. It was appreciated that chemical precipitation of sewage was inefficient, in view of later developments, and that the sand filter area would be limited by the quantity of sand at the present disposal plant site. For two years, commencing July, 1911, the Imhoff tank-sprinkler filter method was investigated with excellent results, and in 1916, the superintendent of sewers recommended that a treatment plant of this type be constructed. About this time, the activated-sludge process became prominent and our policy required that it should be tried out before a definite decision was made. Therefore, an experimental activated-sludge plant was operated from July, 1917, to August, 1918, when the supervising chemist was asked to accept a commission in the Service and the work was discontinued. In spite of the sudden interruption, sufficient results were obtained to indicate that this method of treatment was not as satisfactory in many ways for Worcester sewage as was the Imhoff tank-sprinkler filter method.

General Description of Plant

The experimental activated-sludge plant consisted of a bar screen grit chamber, sewage aeration tank, sludge aeration tank, sedimentation tank, sludge concentration tank and a shallow tank used for concentration experiments and for measuring excess sludge previous to disposal. The details are shown in the accompanying plans. Sewage was taken from the outlet of the main grit chambers in a 6-in. pipe line to the screen chamber. From this chamber the sewage passed in a trough, by a swivel gate, where excess quantities of sewage could be wasted, to a grit chamber which was formed by a depressed section of trough bottom. The sewage flow was measured by a weir and hook-gage and then continued in the trough to the sewage aeration tank. Just before entering this tank, the sewage received the returned sludge.

The effluent from the sewage aeration tank passed in a trough to a point above the center of the sedimentation tank and was measured by a weir and hook-gage. The inlet to the sedimentation tank was a box of increasing area of cross-section which extended down into the tank about 8 ft. The effluent was collected in a circumferential trough and the sludge settling to the bottom of the tank was raised by air-lift and delivered in a trough, containing swivel gates, to the sewage aeration tank, sludge aeration tank or to the sludge concentration tank. The sludge, with or without reaeration, was returned to the sewage in a trough previously mentioned and was measured as the difference of the combined sewage and sludge and the sewage flows.

The equipment for furnishing compressed air included two 10-hp. single-phase motors, belt connected to two No. 2 Nash hydro-turbine compressors or blowers. The air used for aeration of sewage and of sludge was measured by venturi meters and that for the air lift, by a Westinghouse No. 12 gas meter. A pressure gage, thermometer and a waste valve were suitably installed. The air passed through cheesecloth screens and was washed in the compressors previous to use.

Preliminary Treatment of Sewage

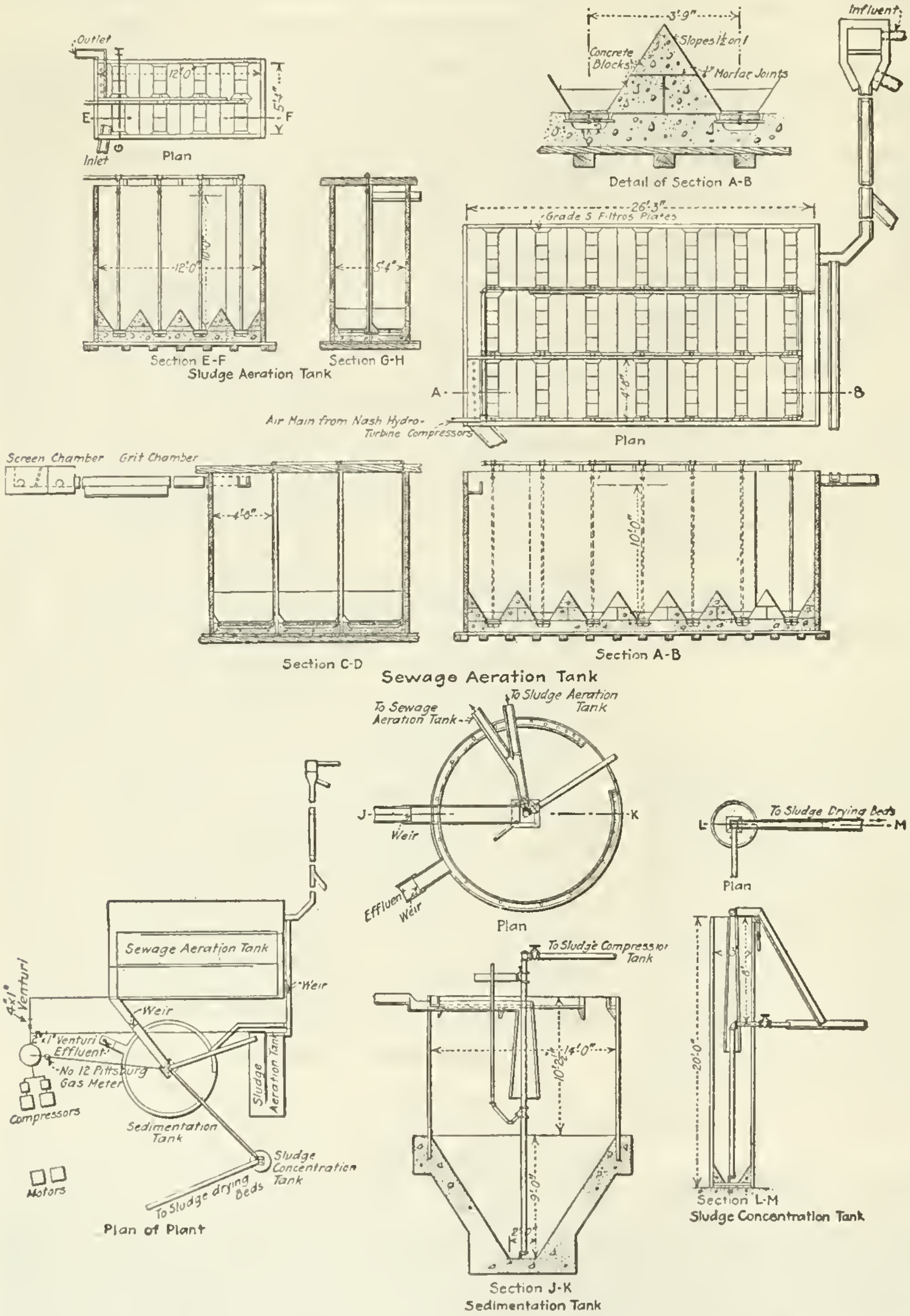
The bar screen had ½-in. openings and its working area was about 4.5 sq.ft. The screen was cleaned hourly and an average quantity of 11.4 cu.ft. of screenings, containing about 149 lb. of organic matter, were removed per million gallons of sewage screened. In all oxidation processes of sewage treatment it has generally been found to be advantageous to remove much suspended matter by preliminary treatment, especially the coarse matters which could not be oxidized or which, on account of their physical character, did not readily permit of oxidation. Much of this matter would require oxidation in order to maintain good activated sludge and when the large quantity of air which was used with the screened sewage is considered, it is believed that screening would have to be practiced in connection with activated-sludge treatment of Worcester sewage.

Removal of additional quantities of suspended matter by fine screens does not appear to be necessary for the successful operation of this process of sewage treatment. Fine screening of sewage might be attempted as a means of reducing the quantity of air required. On account of the character of Worcester sewage, with its apparently large oxygen requirement as shown in these experiments, it is believed that fine screening would not materially reduce the quantity of air required.

The grit chamber, 72 x 10 x 8 in. deep, was installed as a precautionary measure in case grit should pass the main grit chambers. Material removed from this chamber many times had a mineral content of from 70 to 80%, which is characteristic of deposit from grit chambers in regular use. Slight deposits did occur on some filtros plates, but the air distribution was also a contributing factor. This result indicates that when combined sewage is to be treated by this process, grit chambers must be carefully designed and operated if deposits in the sewage aeration tank are to be avoided.

Aeration of Sewage and Sludge

The sewage aeration tank was constructed of wood with a concrete bottom; it was 26 ft. long, 14 ft. wide and 10 ft. deep, from filtros plates to water level, and had a capacity of 25,283 gal. The tank was divided into three channels giving the sewage a travel of nearly 80 ft. The bottom of the tank was of saw-tooth construction, rows of four filtros plates, Grade "S," being placed 45 in. c. to c., giving a ratio of tank surface to working plate area of 5.2 to 1 per cent. Concrete blocks were placed between the rows of plates and had slopes of 1.5 on 1. Compressed air was delivered by a 4-in. header to three 2½-in. pipes, one for each channel. Each set of filtros plates was supplied with air by a 1-in. pipe which entered a chamber under each set of plates made by using a form when putting in the concrete bottom. Each of these pipes had a valve near the top whereby the quantity of air passing to each set of plates could be regulated. Much care had to be exercised in their use if trouble was to be avoided. This method of installing the filtros plates proved very successful. Only a few leaks developed along the edges of the blocks where they rested upon the plates. Liberal and careful use of cement grout corrected the difficulties. The sludge aeration tank was of similar construction and had a capacity of 4,386 gal. The ratio of tank surface to air diffuser was 4.76 to 1.



GENERAL LAYOUT OF PLANT. DETAILS OF VARIOUS TANKS FORMING WORCESTER EXPERIMENTAL ACTIVATED-SLUDGE PLANT

Satisfactory results of the treatment of weak sewage required at least 4 hr. aeration of the sewage with at least 2 cu.ft. of free air per gallon. The sludge need not be reaerated and the quantity returned to the sewage should be about 20% of the sewage flow. At such times as the sewage is of weak character, the greatest dilution of the effluent will occur in the river. There was no nitrification of the effluent. The stability of the effluent was obtained by clarification of the sewage and reduction of its organic content. A total quantity of free air of 1.75 cu.ft. per gallon of sewage, together with 3.8 hr. aeration of the sewage and 3.1 hours reaeration of the sludge did not remove the color of the trade wastes from the sewage. With the above conditions of operation, the average stability of the effluent was about three days in a closed bottle at 20° centigrade.

Strong sewage required at least 6 hr. aeration together with not less than a total quantity of air of 3 cu.ft. per gallon. The sludge was reaerated from 5 to 6 hr. with about $\frac{1}{6}$ of the total quantity of air, while the quantity of sludge returned to the sewage was about 25% of the sewage flow. The possibility of eliminating reaeration of sludge while treating strong sewage was not determined on account of the interruption of the operation of the plant. With the above conditions of operation, the average stability of the effluent was about six days.

The factors of operation as given in the two preceding paragraphs are considered as minimum quantities and periods of time. If an average stability greater than 75% is desired, the results of operation indicated that the strong sewage will have to be aerated longer than 6 hr., the sludge reaerated at least 6.5 hr., using a total quantity of about 4 cu.ft. of free air per gallon. The quantity of sludge returned to the sewage would be slightly more than 25% of the sewage flow.

The quantity of sludge returned to the sewage was regulated according to the results of a 30-minute settling test of the effluent of the sewage aeration tank. The effect of variation of the density of the sludge upon the bulk of solids necessary for the clarification of the sewage are offset by maintaining a uniform percentage of sludge according to this test. This test was also an excellent indicator of the character of the sludge and the effect of the quantity of sludge returned. Excessive quantities of sludge without sufficient solids always produced an unsatisfactory effluent possessing a yellow or brown color.

Filtros plates proved satisfactory for the diffusion of air into the sewage and sludge. Each 1-in. pipe was fitted with a union so that pipe distributors could have been substituted for the plates. No baffles were used in either aeration tank, but plans had been made to put them into the sewage aeration tank. The filtros plates in the sewage aeration tank were not brushed; this was done once and apparently did no good. Foaming occurred in the sludge reaeration tank when the sludge was of very poor quality for activated sludge and a light voluminous scum formed if changes were not made to improve conditions. Aeration of the sewage tended to separate the grease and a scum formed on the trough to the sedimentation tank and a yellow mass of grease tended to collect on the water in this tank.

WORCESTER SEWAGE CONTAINS MUCH TRADE WASTE

The quantity of air and the period of aeration required for treating Worcester sewage are greater than those which have been considered as possible for use at other places. Our sewage contains much trade-waste of varying character and quantity and this process of sewage treatment has been found to be very sensitive to such changes. This is due to the stability of the final effluent being entirely dependent upon the degree to which organic matter of the sewage has been removed, since there has been no nitrification of the effluent and it contains only a small amount of dissolved oxygen. For these reasons, this process does not give uniformly good results with similar conditions of treatment. It was shown that with a sewage such as we have, a great flexibility of operation must be provided and this in itself presents an operating condition of greater concern than is found in any other method of sewage treatment. It was impossible to operate with what might be considered a real minimum quantity of air and periods of aeration.

The sedimentation tank was of the Dortmund type, 14 ft. in diameter and 9.6 ft. deep, with a conical bottom, 9 ft. deep, with slopes of 1.5 on 1. The capacity of the tank was 11,058 gal. in the circular section and 4,017 gal. in the conical bottom. During operation, the conical bottom was usually kept filled with sludge as an aid in returning to the sewage sludge possessing sufficient and uniform density. The sludge did not slide down this slope readily and a sqeegee was used. Based on the circular portion of the tank, the sedimentation period varied from 1.6 to 2.9 hours.

Experience with this type of tank indicated that it was not particularly suited for the purpose. A shorter period of sedimentation was possible, but means are necessary for keeping the tank as free as possible of sludge and at the same time obtaining sludge with a reasonable density.

While the final effluent contained no nitrogen as nitrates and very little dissolved oxygen, the clarification was generally excellent. This is attributed to the presence of ferrous sulphate in the sewage, which was oxidized and an excellent precipitant formed. This ferrous sulphat was also the cause of considerable of the large air consumption.

The results of chemical analyses of the sewage and final effluent showed a general lack of reduction of free ammonia, considerable reduction of albuminoid ammonia and oxygen consumed and absence of nitrification of the effluent. The removal of suspended solids was generally from 85 to 95% and the precipitation of iron was usually about 90 per cent.

There appeared to be a considerable range of relative stability of effluents having from 0.110 to 0.160 part per 100,000 of albuminoid ammonia and that it was necessary that this content be below 0.200 part if at least 75% relative stability was desired. Effluents containing less than 0.200 part did not always have a stability greater than 75%. The quantity and character of the finely divided particles of suspended solids in the effluent exerted considerable influence upon the methylene blue test. The percentage of saturation of dissolved oxygen of the final effluent usually varied from 20 to 60 in the morning and from 0 to 40 in the afternoon. Many determinations were from 20 to 30%. The dissolved oxygen demand of the sewage, three days incubation at room temperature, varied from 130 to 216 p.p.m. and of the effluent, from 9 to 40 parts, a reduction of from 75 to 95 per cent.

HIGH RANGE OF BACTERIAL CONTENT

The variation of bacterial content per cubic centimeter was as follows: Screened sewage, 750,000 to 2,500,000; final effluent, 50,000 to 350,000; effluent from sewage aeration tank, 3,000,000 to 6,000,000; both influent and effluent of sludge reaeration tank, 6,000,000 to 30,000,000. The best results were obtained when maximum periods of aeration and quantities of air were used, when the reduction of bacteria was about 97.5%. When the final effluent was of good chemical quality, but not perfectly stable, its bacteria content increased to from 50,000 to 100,000 per c.c. During the winter these figures increased to from 150,000 to 350,000. The results of the second summer did not approach those of the first, being much like those of the winter. This is explained as being due to the use of less air and shorter periods of aeration. The variation in the bacterial content of the sludge bore no direct relation to the variation of the quantities of air used or the period of aeration. When the sludge was not reaerated its bacterial content was about 15,000,000 per c.c. There was a plainly indicated range of bacterial content of the final effluent according to its quality, the bacterial content of the sewage aeration tank effluent appeared to be quite uniform, while that of the sludge varied considerably and in such manner that no well defined limits can be given for good activated sludge.

The suspended solids in the final effluent were determined daily by the Gooch method and usually varied from 0.7 to 3 parts per 100,000 when the chemical analysis was good. With a poor effluent the quantity increased two to three times. During such a period, the putrescibility test was made on filtered samples as well as total samples, the filtered samples having a stability of 99 as compared with from 55 to 72 for the unfiltered samples. These results indicate the marked effect of suspended solids upon the stability of the effluent and the necessity of always obtaining a clear effluent if high stability is desired.

Special samples of final effluent collected for the determination of nitrates and nitrites gave results which verified the analyses of the composite samples and showed that nitrification was not taking place.

Worcester sewage is apparently of such character that nitrification does not take place readily with this process of sewage treatment. A stable effluent can be obtained by oxidation of the organic matter and its reduction to a quantity fully as small as that which is present in our sand filter effluent. The lack of nitrification and the low dissolved oxygen content of the final effluent furnish no factor of safety. As a rule, biological methods of sewage treatment produce such factors and in this way, sewage of varying character can be cared for. With the activated-sludge process of treatment of Worcester sewage it would be practically impossible to operate and constantly obtain uniformly good results. This was well shown by our inability to duplicate the results of 1917 during July and August, 1918.

THE RESULTING ACTIVATED SLUDGE

Activated sludge was always of brown color, the particular shade of which was very variable and apparently due to changes in the character of the sludge. The sludge was usually of flocculent character and when mixed with water or sewage settled rapidly. When the sludge was very dark brown in color, indications pointed toward insufficient aeration and the flocculent character disappeared. If the color of the sludge became very light brown, it was necessary to observe that over-aeration was not changing the flocculent condition to one of finely divided solids which did not readily separate from sewage or water. The odor of good activated sludge was generally characterized as earth or that of humus matter and, when not so good, it possessed an odor of decaying angleworms, similar to that of final settling basin sludge after sprinkling filters. Undoubtedly, the best means of ascertaining the character of the sludge is the test of putting a small quantity of sludge into water and observing the manner in which it settles. The test was made by putting about 50 c.c. of sludge into 450 c.c. of water contained in a 500 c.c. cylinder.

The quantity of sludge produced per million gallons of sewage varied from 12,000 gal. in the summer to 25,000 gal. in the winter. Both quantities are much greater than have been produced by any other process of treatment of Worcester sewage. The density of the sludge varied from 97.1 to 98.7% moisture. The dried sludge contained from 50 to 70% of organic matter, from 8.5 to 18% of iron, from 2 to 9% of fats and from 4.0 to 6.5% of nitrogen. While this quantity of nitrogen is greater than that of any other Worcester sludge, it is believed that the results and cost of sewage treatment are not such that any material advantage can accrue from this increased nitrogen content of the sludge.

Fertilizer analyses of dried activated sludge of four periods averaged the following percentages: Total nitrogen, 4.06; available nitrogen, 1.39; total phosphoric acid, 2.26; citrate insoluble acid, 0.50; citrate soluble acid, 1.76. In our earlier experiments, dry Imhoff tank and final settling basin sludges gave the following average percentages, respectively: Total nitrogen, 2.61, 2.42; available nitrogen, 1.25, 1.71; total phosphoric acid, 1.66, 3.43; citrate insoluble acid, 0.46, 1.16; and citrate soluble acid, 1.20, 2.27. The potash was not determined on account of the small quantity contained in Worcester sewage sludge, usually less than 0.05 per cent.

The ultimate treatment of activated sludge to render it fit for disposal, commercially or otherwise, has not yet been satisfactorily determined at any place. The greater part of our sludge was air dried upon sand drying beds, but this was demonstrated to be impracticable on account of the small depth which could be applied. If more than 4 or 5 in. were put on to a bed, the sludge settled rapidly and water was left on top, which had to evaporate before actual drying commenced. The dose of sludge could only be of the size from which the bulk of the water would drain during the application to the bed. Concentration of the sludge improved results very slightly. These small doses of sludge dried quickly, cracking of the dried sludge commencing after 24 hr., and it could be removed at the end of the second day.

Concentration of sludge for from 15 to 24 hr. decreased the volume to be handled about 50% and its water content from 98 to 96%. In no case were we able to obtain sludge containing less than 95% of water. Better results of concentration of sludge can be obtained if the activated sludge is in a flocculent condition. Experiments with various containers demonstrated that a concentration tank having its depth from one to six times its diameter or shorter side would prove most efficient. The only virtue of a deep tank was that heavier sludge could be obtained if longer periods of concentration were used. Small changes of temperature did not materially affect the concentration of sludge.

One of the essential requirements of this process of sewage treatment, without consideration of the large quantity of air necessary for sewage treatment, was that our present installation of sludge presses should be satisfactory for handling activated sludge. It was demonstrated with a small section of one press that the press cake could not be formed, with or without the aid of lime, in less than 1½ hr. with 70 to 90 lb. pressure. Lime increases the cost of operation and decreases the commercial value of the press cake. Compressed air and water were used for forcing the sludge into the press with apparently no difference in the results. Radial streaks of soft sludge were invariably present, making the cloths hard to clean and the cake unsatisfactory for disposal. Radial sticks were sewed on to press-cloths with the result that the streaks of soft sludge became narrower. The results indicated that the present form of our press plates was unsatisfactory for use with activated sludge, the volume of a single press cake being too great. Apparently, the form of press and plates should be such that the cake would be dewatered to some 75 or 70% in about 30 minutes.

ACTIVATION VS. IMHOFF TANK-SPRINKLING FILTER

The effluent from activated-sludge treatment of Worcester sewage was of much better appearance and chemical analysis than that from the sprinkling filters when sufficient air was used to obtain a stable effluent. These are absolutely the only points in favor of the process from the sewage treatment point of view. The organic content of the filter effluent was only slightly more than 0.200 part per 100,000 of albuminoid ammonia and its stability was perfect during a greater part of the year, even when operating at a rate of 2,000,000 gal. per acre daily at Worcester. The filters will take a temporary overload without additional cost of operation. The quantity of sludge to be handled by the activated-sludge process is from four to eight times that produced by the Imhoff tank-sprinkling filter process. We have been able to dispose of a large proportion of our press cake by giving it to farmers, and it is anticipated that the Imhoff tank air-dried sludge can be disposed of in a similar manner. It is considered that the cost of operation as concerns the quantity and class of labor required is entirely in favor of the Imhoff tank-springling filter process of sswage treatment. It is a well known fact that the cost of sewage treatment by the activated-sludge process where the air requirement is much less than for Worcester sewage has been considered prohibitive unless sufficient income was to be derived from the disposal of the sludge to admit of the process being adopted.

Aside from a consideration of all the above facts, the activated-sludge process of sewage treatment is considered unsatisfactory for Worcester sewage for the reason that it does not give uniformly good results under apparently similar conditions of operation. No factors of safety are present to offset the demands made upon the method of treatment by the constantly changing character of the sewage.

The experimental plant was designed and operated under the direction of Matthew Gault, superintendent of sewers, the writer serving as supervising chemist in charge of the sewage treatment works.

Progress in Engineering Education at Columbia University

(Abstract of Annual Report of President Nicholas Murray Butler)

IN HIS recently published annual report Dr. Nicholas Murray Butler, president of Columbia University, discusses at some length the "Problems and Standards of Engineering Education." Under this title he has stressed what is becoming widely recognized as the major deficiency in the education of engineers—lack of broadness, the humanities—and has described the remedial efforts and success of the Columbia Schools of Mines, Engineering, and Chemistry. The succeeding paragraphs are a partial abstract of Dr. Butler's report:

The outstanding part that engineering and engineers have played in the war and the large amount of attention given to intensive training of men in technical subjects by both the Army and the Navy have just now directed increased attention to the long-discussed problems of engineering education. Wherever these problems are seriously and capably discussed, it seems to be agreed that while engineering schools may have turned out well-trained graduates, those graduates have not been on the whole sufficiently well-educated men. Of late, committees of some of the engineering societies have been asking the question: "Do engineers as a group have the same standing and influence in their communities as men in other professions?" They fear the answer is in the negative and many allege as the reason that engineers are on the whole not so well educated as their contemporaries in other professions. However this may be, it is a fact that, coincident with the growing importance of engineers in public life, the requirements of the times are setting broader standards of education for the engineer. For example, a report just issued by the Committee on Development of the Institute of Electrical Engineers and endorsed by the institute in convention declares squarely in favor of a six-year course in electrical engineering, two years of this to be given to the study of the humanities.

Two 3-Year Courses

The faculty and trustees, aided by the advice of a committee of alumni, determined in 1912 upon Columbia's present arrangement for the education of engineering students; that is, a three-year professional course of engineering in its several branches based on admission requirements to be met ordinarily by not less than three years of college work, including specified and thorough training in mathematics, physics and chemistry. An arts curriculum in Columbia College, requiring, besides the foregoing courses in the humanities and in elementary drafting has been prepared as a pre-engineering course. Completion of this course and the first year of the engineering course entitles the student to the A.B. degree or completion of the Columbia College course and one of the applied science courses entitles the student to the degree of A.B. and B.S.

Viewed in detail, two ideas with respect to this curriculum were dominant. First, that for reasons relating directly to his achievements in practice as well as for his own self-satisfaction, the engineer has need of a broader education in the humanities than can reasonably be arranged in a four-year course, for the engineer needs the broader outlook on life that comes from contact in college with men who have other than the engineering viewpoint. Second, that the effective method of arriving at a higher standard in the study of engineering subjects is to base this study on the more thorough and scientific training in the fundamental sciences of mathematics, physics and chemistry.

Less Than 30% of Engineering Students Graduate

No less cogent were certain considerations relating not directly to the content of the curriculum, but to the membership of a student body. Fewer than 30 per cent of the students who enter engineering schools remain to graduate. Many of those who do stick it out would have done better to have followed other courses. The decision to attend an engineering school is usually made at an early age and frequently on insufficient ground, but, once in, the student who is good enough to hold his place is likely to desire to finish the course. This means that even after the inevitable clearing out of the large mass in the first and second years of the usual four-year course, there are left a considerable number of students whose influence is inevitably to depress the standards of instruction, who cannot be dropped from the schools but who would certainly be more in place in some other system of training.

The clear differentiation in the present program between the undergraduate work and the professional school work, together with the deterring influence of the longer course upon those whose resolve is not firmly established, operates to collect in the professional engineering schools a group of men of sound and homogeneous preparation, each of whom is there for a good reason. The interaction of the minds of these well-selected students on one another is by no means one of the least important features of this arrangement and the possibilities of a much higher standard of instruction is obvious. As for those other students who may have spent one or more years in college looking forward to an engineering course only to discover that their real interest lies elsewhere, they are when in college in the very best situation for directing their attention to preparation for other fields of labor. The present course appeals to a special class of students who desire the broadest, most thorough education for the engineering profession and have the faith that their own ability and character are worth the investment of six years of college and professional schooling. The members of the teaching staff find that the superior preparation and the more determined interests of the students do indeed enable a much higher standard of instruction to be set.

Pre-Engineering Students.

The pre-engineering students are not encouraged to consider themselves a separate group in Columbia College; in their classes they are naturally rather grouped by themselves, but they do not study "engineering history" or "engineering English"; they are simply encouraged to get the best there is out of American college training and college life. Many students begin the pre-engineering course who do not finish it, or who take it not at all as a preparation for engineering but as an excellent academic course with major interest in the physical sciences. Of the students in college who have at some time started in to take this course, more than half have not completed or continued it. In the main these were students who found that their interests merely lay in other directions and who turned from the engineering course to other college work more desirable for them with no difficulty or embarrassment.

Pile and Concrete Piers for Missouri River Bridge

Scour and Ice as Factors in Planning Reconstruction and Special Pier Design for Truss Spans of Milwaukee Railway Briidge

TIMBER pile piers carrying two 300-ft. steel truss spans constitute a notable feature of the new Missouri River bridge for the Chicago, Milwaukee & St. Paul Ry., at Chamberlain, S. D., since piers of this type are rarely used for structures of such size. Deep piling in soft material and the use of concrete reinforcing slabs and concrete-faced ice-breakers render these large piers of exceptional interest, the slabs representing novel development in pile pier design. War, engineering, traffic and finance conditions all combined in leading to the adoption of this type of pier.

When the branch line from Chamberlain to Rapid City was built in 1905 a 1,500-ft. pile trestle was used for crossing the Missouri River, with a 366-ft. pontoon for a draw span. Floods and ice caused continual trouble in maintaining the trestle, and in 1918 the pontoon had become so leaky that it was necessary to remove it, a temporary 75-ft. plate-girder swing span being put in its place and carried on pile piers.

To reduce the maintenance troubles, it was planned to build a more permanent structure, having long spans to give clear passage for ice and flood waters. The present site is unfavorable, however, since it would require long and expensive work in the construction of deep foundations for masonry piers. Further, it was considered desirable to relocate the line to secure a high-level crossing without a drawspan at a site some distance downstream, but the policy of the U. S. Railroad Administration was opposed to the undertaking of such an extensive and costly railway and bridge project during the war.

Under these conditions, a plan was adopted for replacing part of the old trestle with two 300-ft. truss spans supported on pile piers, and installing a new 262-ft. draw pontoon at the east end. A practically permanent structure was obtained in this way, the problem of relocation being left for some future time when traffic and other conditions warrant its consideration. As the country is low and flat, the railway rises to the level of the bridge by approach grades of 0.6 per cent.

Ice and scour were two special difficulties to be considered in the design of the piers. In the first place, the great quantity of ice coming down in the spring made it imperative to provide resistance to and protection against the heavy pressure exerted against obstructions, especially if the flow is checked so as to form an ice jam. In the second place, the sand and alluvial silt which form the river bed for a depth of 20 ft. or more, fills in during normal flow and is scoured out by the high current velocities at flood periods, the depth of scour ranging from 10 to 30 ft.

Long piles and a concrete diaphragm or slab connecting them so that they act as a unit in resisting pressure were the means adopted for insuring stability of the piers. Protection against ice pressure is provided by extending the pier upstream as a timber crib to form a large ice breaker, the inclined nose of which is faced with concrete. For protection against scour, the river bed around each pier is covered with a mattress of willow brush. This was woven on scows which dropped downstream as the mattress was launched, and sunk by loose rock thrown upon it from barges, while rock is also deposited around the base of the pier.

Seven rows of piles are used for the pier proper, spaced 2 ft. c. to c., with twelve piles in each row and

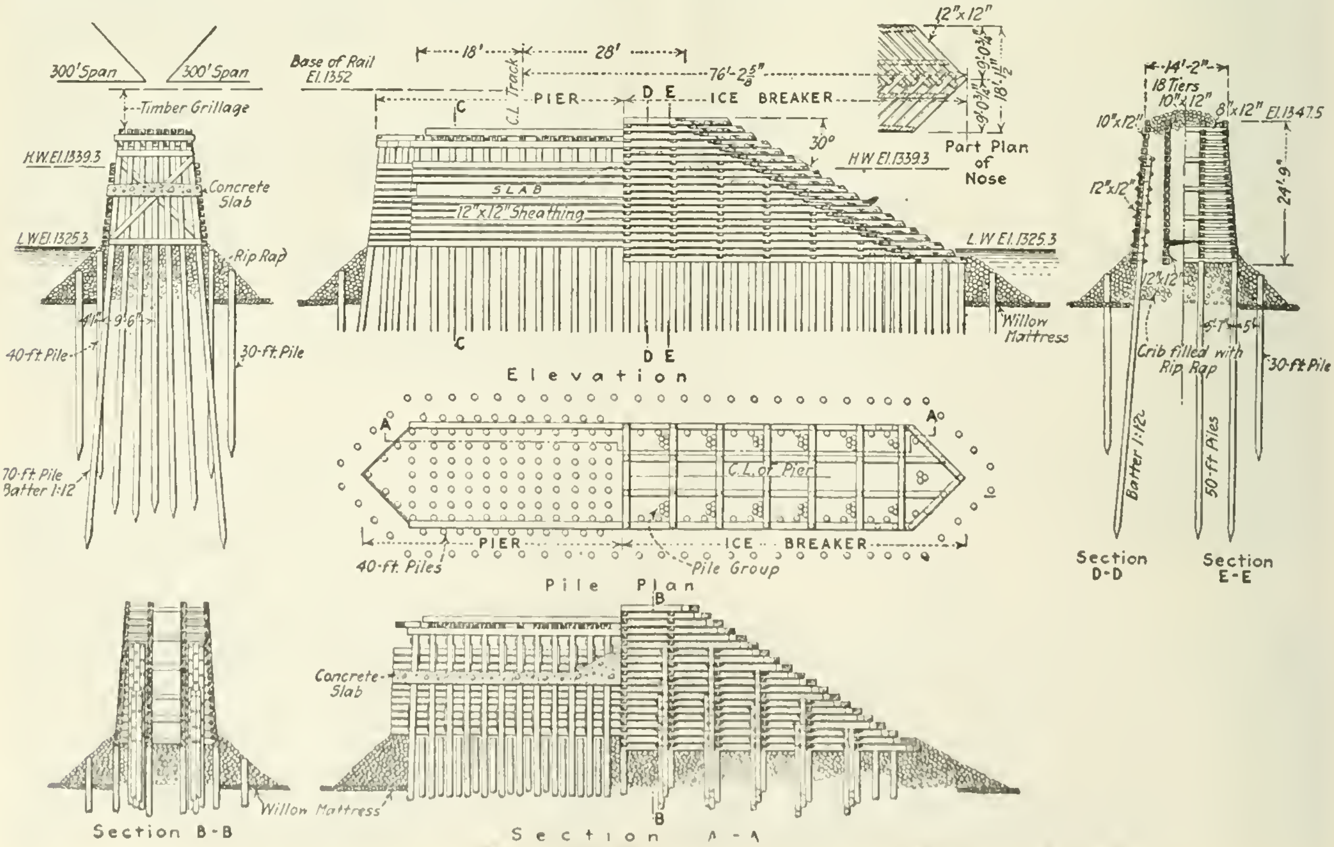


FIG. 1. PILE PIERS WITH CONCRETE DIAPHRAGMS FOR CHAMBERLAIN BRIDGE

with the caps about 3 ft. above high-water level, the outer piles being battered. This construction is shown in Fig. 1. Cedar piles 70 to 80 ft. long are used, with a penetration of 30 to 50 ft. below the river bed, all piles being driven to refusal in the sand and gravel underlying the silt. Longitudinal timbers 12 x 12 in., 3 in. apart, are bolted to the batter piles to form a fender or sheathing which prevents the ice from lodging against the piles, while plank sheathing is spiked to the downstream end of the pier. To hold the riprap in place, a line of 30-ft. piles is driven all around the outside of the pier, and a row of 40-ft. piles along each side; the heads of these piles are cut off below low water, the projecting ends being covered by the stone fill.

Midway between high and low-water levels is a concrete reinforcing slab held in place by 12-in. spikes driven partly into the piles so that their projecting ends are embedded in the concrete. Its thickness is 30 in., increased to 66 in. at the upstream end to afford a bearing for the cribwork of the icebreaker. The concrete is a 1:2:4 mix reinforced with longitudinal and transverse bars at top and bottom, the transverse bars being looped around the outer piles. A plank platform supported on timbers spiked temporarily to the piles served as the bottom form, and the concrete was well rammed so that after taking its final set it would fit tightly against the piles.

A concrete slab or deck to cover the top of the pier and form the bridge seats was included in the original design, as in the Platte River bridge of the Rock Island Lines described in *Engineering News-Record*, Feb. 5, 1920, p. 237. Construction of the Missouri River bridge was delayed, however, until so near the opening of spring in 1919, that it was considered inadvisable to delay the steel erection for the time necessary for the placing and setting of the concrete. A timber grillage therefore forms the deck of the pier, upon which the shoe castings for the truss spans are placed. As protection against fire from engine sparks and cinders the entire top of the pier is covered with a sheeting of galvanized steel.

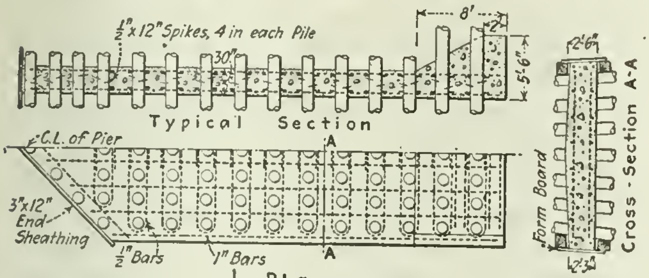


FIG. 2. CONCRETE REINFORCING SLAB FOR TIMBER PILE PIER

The icebreaker, which is built integral with the pier proper, has four-pile bents spaced 8 ft. c. to c. and of varying height, all piles being 65 to 75 ft. long. Each bent is capped and behind each cap are two groups of five piles, while longitudinal struts between the piles of the two inner rows, forming part of the cribwork, assist in making a very rigid structure. This crib is filled with stone, and riprap is placed along the outside, over the heads of the anchor piles noted above. The horizontal sheathing of the pier is extended along the icebreaker.

Reinforcing bars were laid along the timbering at the slope of the nose of the icebreaker, and concrete was filled over the timbers and bars, with a minimum thickness of 12 in. At the ridge it is faced by a line of old rails embedded flush with the concrete and anchored by U-bars passed through holes in the web. To prevent scour at the nose, the concrete is carried down about 5 ft. as a toe wall in front of the first set of piles, the rail also being extended to the bottom of this wall.

Pile driving was done largely by two railway pile drivers on the trestle, one of these having a steam hammer and the other a 2-ton drop hammer, while both were equipped with water jet apparatus. For work outside their reach, the power boat or scow for operating the pontoon was equipped temporarily with leads, a steam hammer, a steam pump for the jet pipes and a centrifugal pump with flexible suction pipe for excavating sand bars formed at the pier sites. When working above the bridge, the boat was held in position by lines leading to an anchor block sunk in the river, while for work below the bridge these lines were attached to the old trestle.

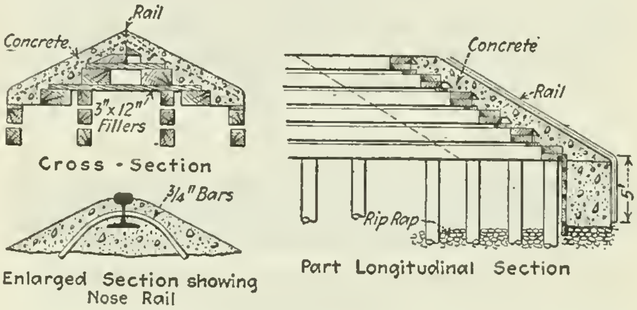


FIG. 3. CONCRETE ICEBREAKER OF PILE PIER

All construction work, including erection of the steel spans, was done by the railway company's forces, under A. Daniels, district engineer, and W. E. Duckett, resident engineer. The plans for the piers and truss spans were prepared by H. C. Lothholz, then engineer of design. The design and construction were under the direction of Charles F. Loweth, chief engineer of the Chicago, Milwaukee & St. Paul Ry. The substructure was commenced in July, 1918, and was ready for steel erection in January, 1919, the spans being completed early in March. The new pontoon was launched and installed in April, when the ice went out.

To Promote Public Hydro-Electric Projects in Georgia

Government-owned hydro-electric developments are to be urged by an organization known as the Municipal League of Georgia, with headquarters at Albany, Ga., with M. W. Tift, mayor of that city, as president. The League was organized about a year ago, for the purpose of defeating a bill in the legislature intended to prevent towns and cities in the state from owning their own light and power plants. It is now devoting its attention to the development, under state control, of municipal ownership of all the hydro-electric energy that will be required for the use of the state. The membership is composed of mayors and other officers of the towns and cities of the state, and each town or city has one vote in the direction of affairs, regardless of the size of the city.

Concrete Roadbed for Track, Tunnels and Stations

Ballasted and Unballasted Track on Concrete Slabs on Soft Ground Gives Good Results—Rigidity and Resilience Basis of Different Designs

A CONCRETE slab base under railway track to secure increased stability and decreased maintenance has been tried with success, though on a small scale, by several railways, mainly where soft roadbed is a factor in maintenance work. Particulars of some of these experiments are given in the 1920 report of the ballast committee of the American Railway Engineering Association, from which much of the following information is taken. Such construction in open track is a different matter from the use of concrete floors in terminal stations and submarine tubular tunnels, but reference is made also to installations in such places and in ordinary railway tunnels. No reference is made in the report as to the use of concrete slabs at highway crossings, although this has been tried by some steam and electric railways in order to reduce the maintenance work required at such crossings. The designs of track construction with concrete bars are of distinct types, one having the ordinary ballasted track laid upon the slab, while in the other the rails are carried by wood blocks or stringers laid directly upon the concrete.

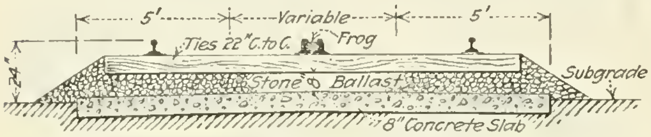


FIG. 1. CONCRETE SLAB UNDER MAIN LINE CROSSOVERS, LONG ISLAND R.R.

Slabs Under Ballasted Track

On the Long Island R.R. there are three installations of slabs under ballasted track. One of them is at Jamaica, N. Y. Here there is a complicated track layout with numerous crossovers and slip switches carrying a heavy traffic of 550 to 800 trains daily, with a large amount of switching. When these tracks were elevated and rebuilt in 1912, on a sand and gravel fill 20 to 30 ft. high, it was considered that additional expense would be justified in securing a stable roadbed and reduced maintenance cost by giving an increased and continuous bearing. Stone ballast and 100-lb. rails are used.

Concrete slabs are placed under the cross-overs and at other points, being of irregular shape and size to conform to the lines of the tracks. Their outer edges are 5 ft. from the center lines of these tracks and their ends are just beyond the switch points. As shown by the typical section, Fig. 1, these slabs are 8 in. thick, slightly cambered in cross-section. The concrete is a 1 : 3 : 6 mix, and as local gravel was used the cost of the slab in place was only about 10c. per sq.ft. Although the slabs have never been uncovered, except on small areas, there are no indications of their having cracked or broken to such extent as to interfere with their usefulness. In seven years there has been very little expense for track maintenance and only two renewals of frogs or switch points.

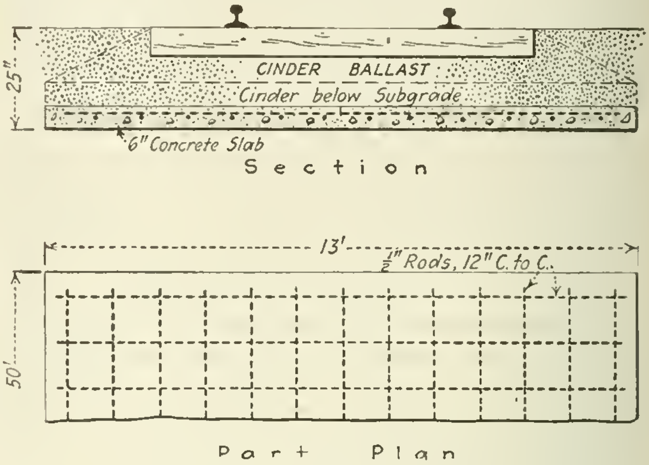


FIG. 3. CONCRETE SLABS SUPPORT TRACK ON SWAMP, NEW YORK CONNECTING R.R.

On the six-track Woodside-Winfield cutoff, built in 1914, there are numerous diagonal intersections of streets, involving a series of bridges. The gravel fill is about 20 ft. high and in order to prevent the settlement which frequently occurs at the back of bridge abutments, the roadbed was covered at several points

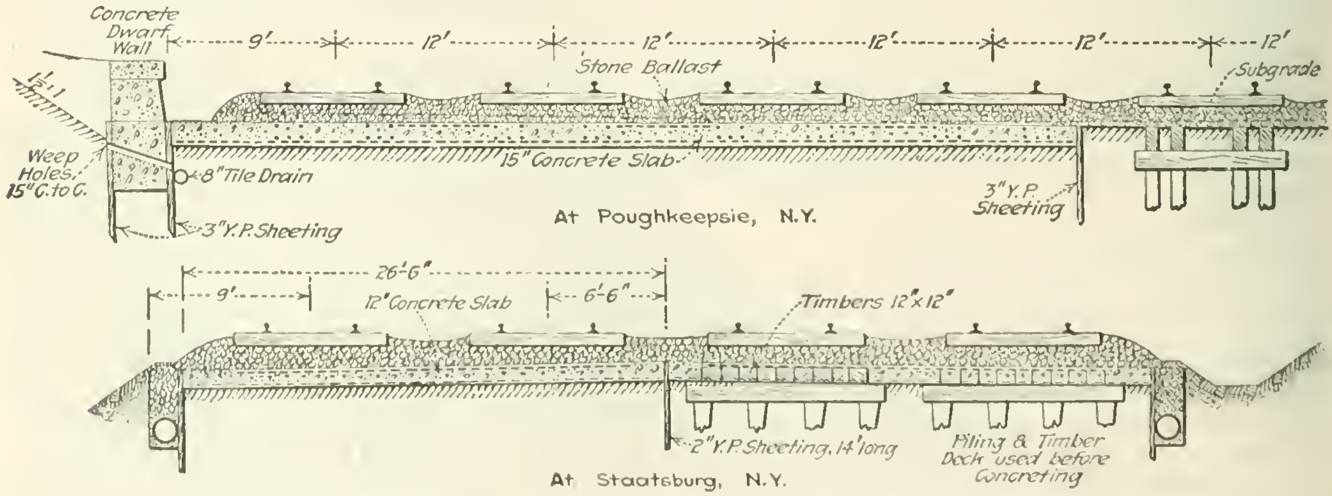


FIG. 2. CONCRETE SLABS ON SOFT ROADBED, NEW YORK CENTRAL R R

with 8-in. concrete slabs. At the Bay Ridge ferry landing, where heavy locomotives handle about a thousand cars daily to and from the floats, concrete slabs were placed in 1916 on a fill of silt and riprap. Each slab is about 200 ft. long, carrying two tracks with a double cross-over connection.

Monolithic slabs over the roadbed have been used at two points on the main line of the New York Central R.R., under the direction of George Kittredge, chief engineer. These are shown in Fig. 2. In widening for six tracks at Poughkeepsie in 1909, the soft blue clay caused considerable difficulty and it was decided to carry two tracks on piles while building a concrete slab on the roadbed for the other four tracks. This slab is about 50 ft. wide and 15 in. thick, reinforced on top and bottom with ⅝-in. bars and having extra longitudinal bars in the bottom under each rail. There are three slabs of 100 ft. to 425 ft. in length, built where the soft spots occurred. They cost about $5.70 per linear foot of single track and have proved effective under a traffic of nearly 100 trains daily.

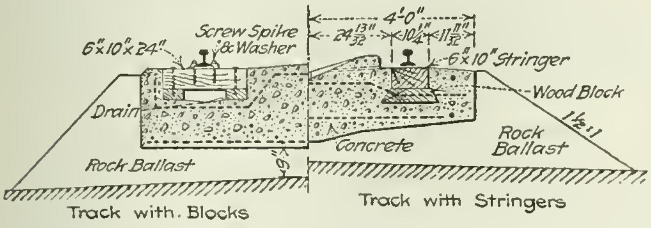


FIG. 4. CONCRETE SUPPORTS FOR UNBALLASTED TRACKS, NORTHERN PACIFIC R.R.

Similar troubles with soft roadbed were experienced in grade reduction and four tracking at Staatsburg, N. Y. Piling with caps and a solid floor of longitudinal timbers was used to carry two tracks while a concrete slab was built to carry the others, as shown in Fig. 2. Here the slab is 12 in. thick, with wire mesh reinforcement, and its cost was about $5.60 per foot of single track. This construction extends for about 3,800 ft. and it has proved quite satisfactory.

The New York Connecting R.R. (Pennsylvania R.R. System) has two stretches of concrete slabs 100 ft. and 150 ft. long where it crosses Juniper swamp. These slabs are separate for each track; they are 6 in. thick, 13 ft. wide and in lengths of 50 ft., reinforced at the top, as shown in Fig. 3. In one case there has been a slight settlement but there are no indications of failure in any of the slabs. Less maintenance is required than beyond the slabs, while part of the adjacent track requires excessive maintenance and the swamp clay has worked up through the cinder ballast.

On the Southern R.R., a number of soft spots in roadbed have been covered with concrete slabs since the first experiment of this kind was made in 1911. The purpose is to avoid the great expenditure of time and material by section forces in maintaining the track in line and surface over these soft spots or water pockets. The slabs are 15 to 60 ft. in length. They have proved successful, track at one bad place having had to be tamped only once in the two years since the concrete was placed. During construction, the track is carried by bridge ties supported on stringers parallel with the rails, trains being run then at reduced speed.

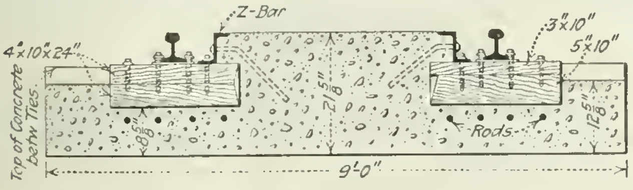


FIG. 5. CONCRETE ROADBED, CHICAGO JUNCTION R.R.

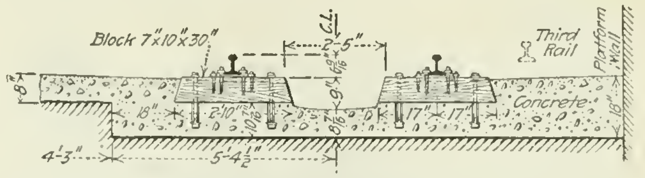


FIG. 6. TYPICAL CONCRETE FLOOR CONSTRUCTION FOR TUBE TUNNELS AND STATIONS, PENNSYLVANIA R.R.

Concrete roadbed construction on open track without ballast has had its most extensive trials on the Northern Pacific R.R., where three single-track stretches of different types aggregating 1,998 ft. in length were laid in 1914, as described in *Engineering News-Record* of Dec. 12, 1918, p. 1,071. Their cost was $7 to $10.65 per lineal foot, and in the following four years only $454 were spent for lining and surfacing. Short transverse blocks were used in two of the designs and longitudinal timbers in the third, as shown in Fig. 4.

On the Chicago Junction Railway, a 500-ft. stretch of track carrying heavy traffic was laid in 1911 with a concrete slab having the rails carried on short wood blocks spaced 34 in. c. to c. It will be noted by Fig. 5 that the concrete was very thick between the rails and was faced with Z-bar guards anchored to the concrete. Each rail block was in two parts, held in place by screw spikes through the bottom flanges of the Z-bars. Removal of the spikes enabled the upper block to be slipped out and the lower block could then be lifted from the pocket in the concrete. This construction required half a cubic yard of concrete per foot of track.

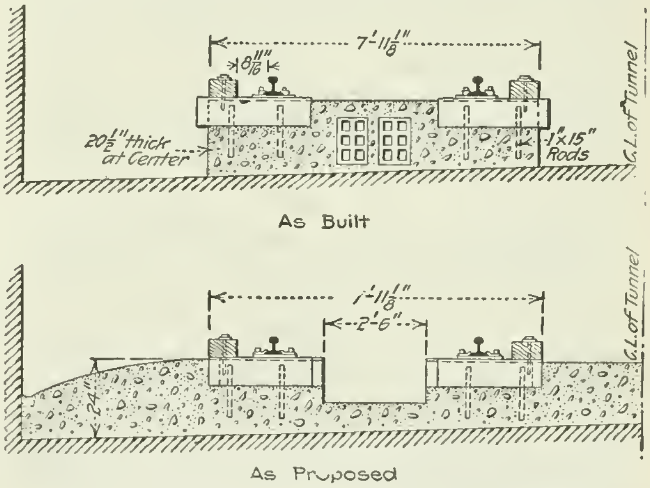


FIG. 7. RIGID CONCRETE TRACK FOR TUNNELS, DELAWARE, LACKAWANNA & WESTERN R.R.

Track floor construction with ties and short blocks, used by the Pennsylvania R.R. for its station and submarine tunnels at New York, is shown in Fig. 6 and is typical of designs used in other similar stations and tunnels. It is adopted mainly for the purpose of reducing maintenance work and enabling the floor to be kept clean, for in the Pennsylvania station it is laid on a rock base. It is of interest to note also that this design has been adopted for the new elevated track floor of the

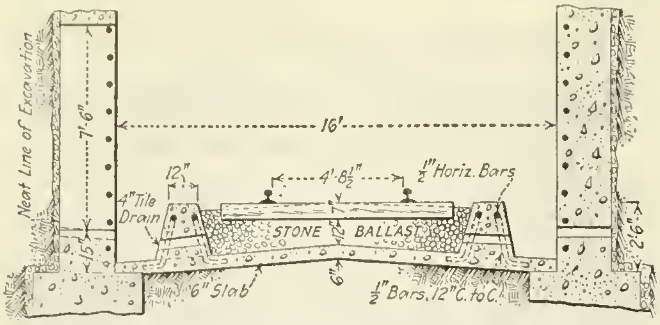


FIG. 8. CONCRETE BASE AND DITCHES FOR BALLASTED TRACK IN TUNNELS, NORFOLK & WESTERN R.R.

Union station at Indianapolis, Ind., as shown in *Engineering News-Record* of July 10, 1919, p. 86.

A concrete track support without ballast was used in the Bergen Hill tunnel of the Delaware, Lackawanna & Western R. R. in 1909, being designed by Lincoln Bush, then chief engineer, with the special purpose of forming a rigid roadbed. This was described in *Engineering News*, Aug. 19, 1909, p. 190. As shown in Fig. 7, it provides a separate and massive base for each track. Its cost was $14.26 per foot of double track, including the vitrified conduits for electric cables, while a ballasted floor with conduits and tile drains was estimated to cost $14.71 per foot and a saving of 40 per cent was predicted in cost of maintenance and renewals.

This tunnel is 4,280 ft. long and carries heavy traffic, but during 1917 and 1918 the total expense for maintenance was only $298. The concrete roadbed stood up well, but there has been some difficulty in removing the spikes and in spacing rail when relaying. A modified design suggested by Mr. Bush provides for a monolithic concrete floor over the entire width of the tunnel, as shown in Fig. 7.

A concrete slab construction for tunnels, providing for ballasted track between curb walls to form large side ditches, is shown in Fig. 8. This was designed by J. E. Crawford, chief engineer of the Norfolk & Western R. R., to meet the special conditions of this road. As there is a very heavy traffic of soft coal the fine coal dust tends to clog the ditches, interfering with drainage and causing considerable maintenance expense due to cleaning the ditches in the tunnels. The design, which provides for both single track and double track construction, includes a 6-in. concrete base with curb walls to retain the ballast and keep it out of the ditches. Weep holes provide for drainage of the ballast. The tunnel would be of such width that men could work in the ditches and be clear of trains. This design has not been applied in practice.

An unusual tunnel track construction shown in Fig. 9 was laid in 1916 for about half a mile in a freight tunnel under the city of Buneos Aires, Argentine Republic. This was adopted after experiments on a stretch of track in the open air. Full length ties are used, having the ends seated in pockets in concrete sills or stringers. As the rails are on the unsupported portion of the ties the construction gives resilience instead of rigidity.

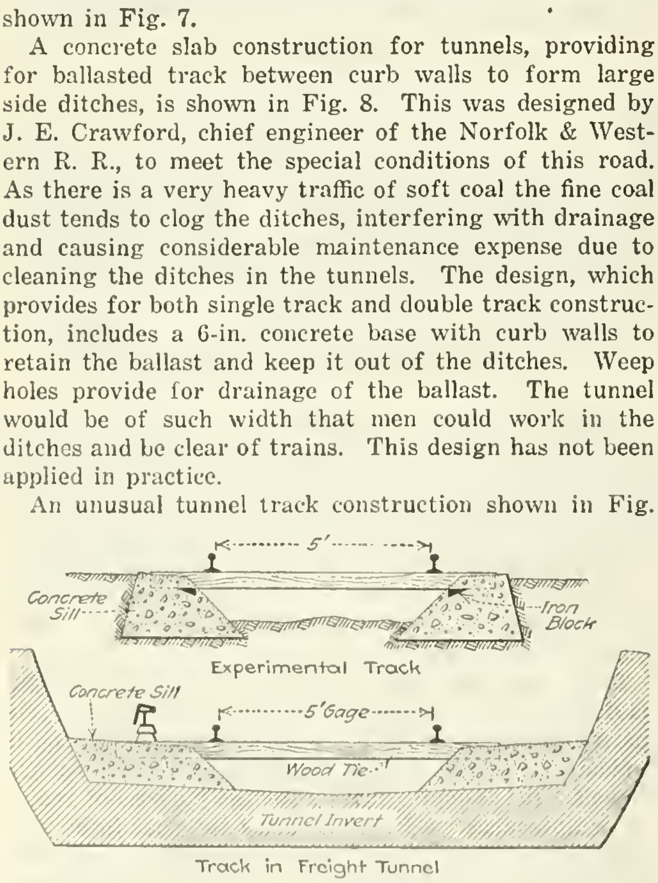


FIG. 9. RESILIENT TRACK CONSTRUCTION FOR TUNNEL, BUENOS AIRES WESTERN RAILWAY

This construction, built as shown in Fig. 9, was found to give less pounding and an easier riding track than when the concrete supports were placed directly under the rails. It was designed by Wm. Lowe-Browne, assistant general manager (then chief engineer) of the Buenos Aires Western Ry., and was built under the direction of H. E. Boardman, then principal assistant engineer.

Higher Duty of Irrigation Water

By George Ebner

Operation Manager, the Valier-Montana Land & Water Co., Valier, Mont.

THE unprecedented shortage of stream flow over the greater part of the Western states during the past year has resulted in awakening the public to the greater need of irrigation development and of increasing the storage facilities to lessen the loss of water. Many constructed projects are seeking additional storage and the matter of further reservoir capacity is being discussed in many communities.

The question arises, however, whether the development of a higher duty per acre on many projects might not receive more attention with greater benefit, both to those already constructed and to proposed developments. For example, a project not in the Southwestern states is said to have used approximately five acre-feet per acre gross, and is now considering an additional acre-foot storage. It is obviously more economical to calk a leaking ship than to supply pumps. With more study of the problems of canal losses, efficient canal operation, farm use, farm distribution systems, and farm waste, the duty might be appreciably increased. If more labor, supplied in farm distribution, will increase the duty, this should be furnished and the water saved for use on new irrigation development. A national resource should not be wasted merely to increase the profit on the constructed areas.

It is questionable if water can be stored with benefit for a year of 50 per cent normal stream flow, as 1919 has been. Combined with the low supply is the increased demand due to less precipitation and higher average temperature. Since these periods are, perhaps, twenty years apart, and it is a good reservoir that does not lose 10 per cent a year, storage would prove of little value. In addition, the construction interest charge over a period of years might easily exceed the net value of the crop produced with the net period storage.

Storage facilities should be constructed wherever water can be conserved beneficially, but it is held that expansion should be planned for economic irrigation development and not to provide an additional supply when this encourages wasteful use of water.

Road Oils in Baltimore County

According to the report of the roads engineer, Baltimore County, Md., recently published, that county used 280,961 gal. of road oil during 1919. The total cost was $33,788.90, an average of 12c. a gallon.

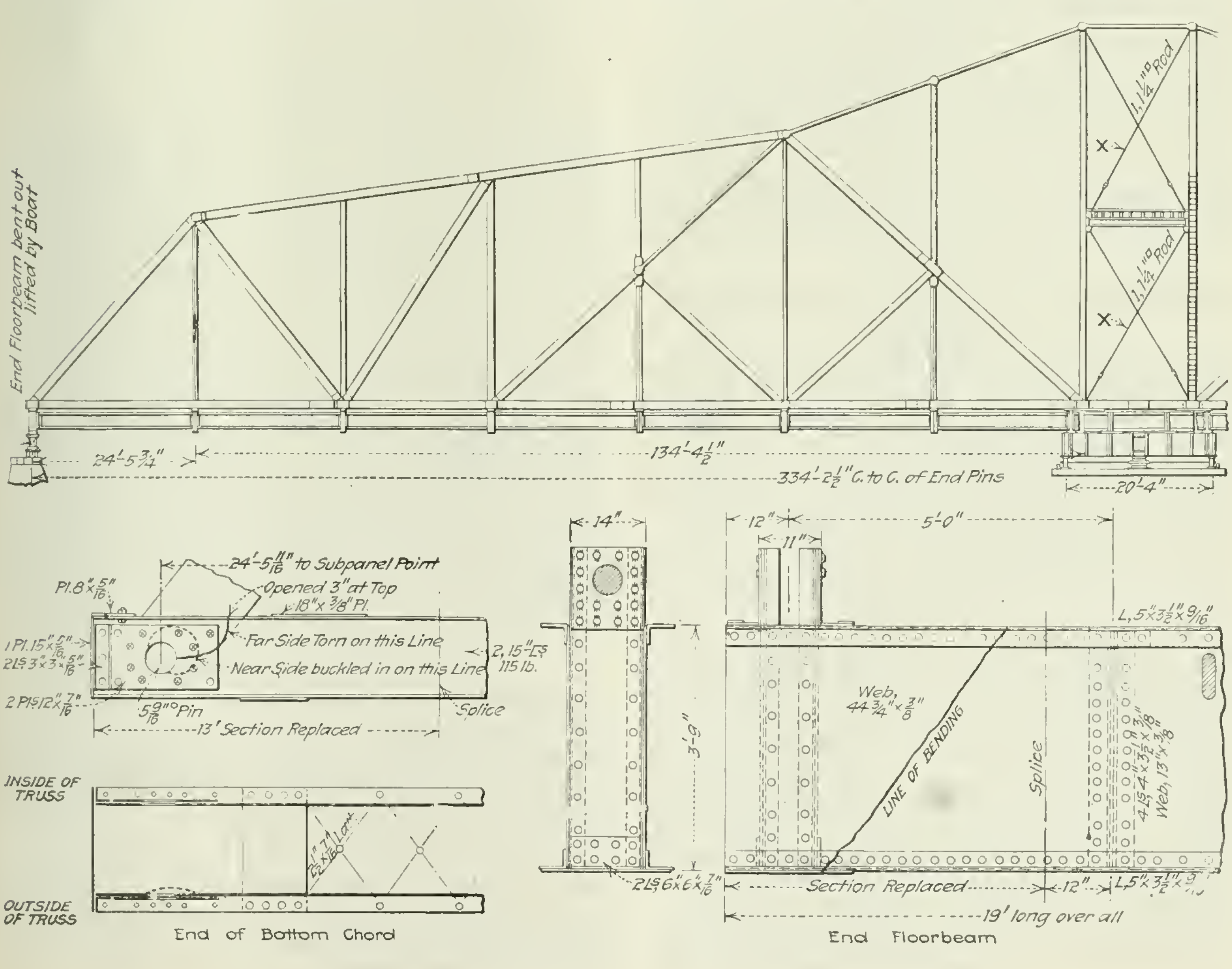
A Swingbridge Accident of a New Kind; Repair of Damage

UNEXPECTED emergency conditions bearing on service and operation of swingbridges developed in an accident that involved the Southern Pacific railroad swing span across the estuary between Oakland and Alameda, Cal., on Jan. 5, 1920. As reported in our issue of Jan. 8, p. 109, a vessel striking the span at a low stage of the tide jammed its nose under one end of the 334-ft. span, and when the tide lifted the vessel it tilted the span to a dangerous degree and distorted it sufficiently to overstrain some members. Damage resulted from this distortion as well as from the collision itself. The bridge was out of service six days; the harbor entrance was blocked for 22 hours.

The accident occurred at 7:20 p.m. The draw had been opened to let vessels pass out when the steam schooner "Tamalpais," approaching in the opposite channel, attempted to pass through and struck the end of the span. Responsibility for the collision has not been placed; apparently neither the steamer captain nor the bridge tender foresaw the action of the other. The span was swung toward closed position in such a way that its end swept inboard on the port bow of the steamer, demolished the forward winches, snapped off the 2-ft. foremast, and wedged firmly on the forward deck of the boat, which sloped upward toward the bow. This occurred when the tide elevation was —1.6. Six hours later the tide had risen to +4.8, making a total elevation of the end of the bridge of 6.4 ft. above normal level. In this position a very heavy concentrated weight was thrown on four or five turntable wheels on the far side of the center pier. These wheels are about 18 in. in diameter and 5 in. in width. It was feared that if a high wind should come up or if the tide rose higher the span might slip off the center pier or the wheels might be crushed by the excessive weight. The span was therefore securely fastened to the pier with chains and turnbuckles, and wedged with blocks of wood so as to prevent rocking as much as possible.

At noon of the day following, the tide was 7.9 ft. above the level at which the collision occurred. By this time, however, two carloads of rail had been loaded onto the bow of the boat and the oil tanks in the stern had been emptied so that the bow floated some 14 in. lower in the water. To supplement these measures a heavy upward pull was applied to the end of the bridge by heavy tackle hung from the leads of a floating piledriver. Under these conditions, shortly before the corresponding low tide on the day after the collision, two tugs were able to pull the steamer out from under the span. The span was then swung to its open position and put on falsework for repair.

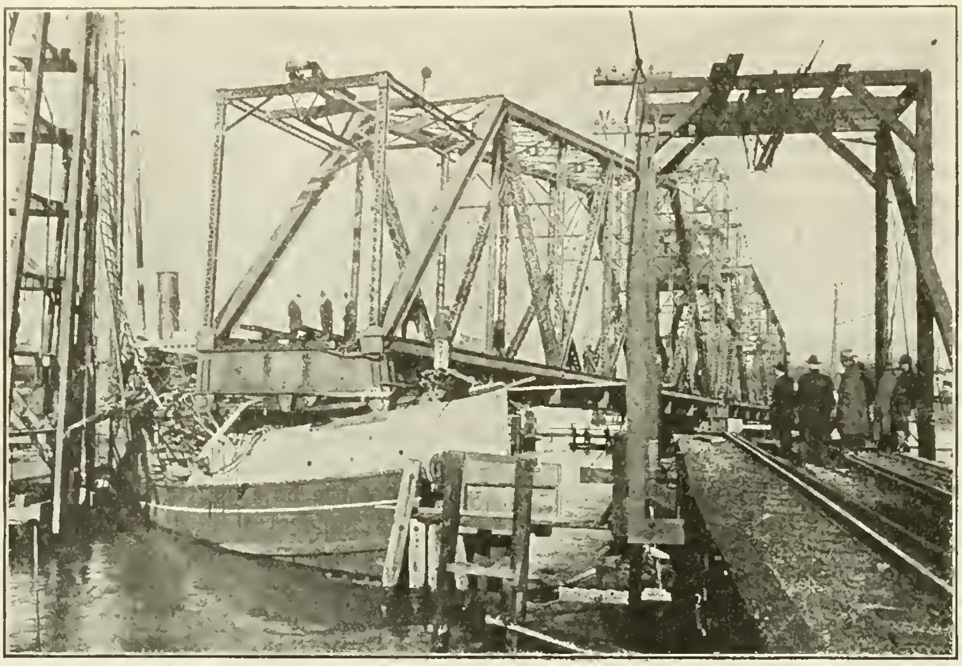
The impact of collision broke the bottom chord, as shown in the accompanying sketch, and bent it so that it was thought desirable to cut it off with an oxyacetylene torch and replace a 13-ft. section. When the new



End of Bottom Chord

End Floorbeam

STRUCTURAL DAMAGE AND REPAIRS TO OAKLAND HARBOR DRAW
Operating lever of end lift was also bent, but this could be used again after straightening.



OAKLAND HARBOR SWINGBRIDGE; NOTE BUCKLED CHORD AND FLOORBEAM
End of draw jammed on bow of steamer by collision, and draw tipped. Released a day after accident.

section had been riveted on, the flange angles were welded together with the torch. A section of the floor beam was also renewed in the same way. Four tension rods in the tower, indicated by x x in the sketch, were stretched about 8½ in. This resulted from the stresses in the tower when it was tipped by the high tide. At that time there was even noticeable downward curve in the bottom chord under the tower posts on the side nearer to the elevated end. This curve disappeared, however, when the bridge was leveled. The stretched rods were taken out and cut off and then put back in the structure. No other serious damage to main members was found and the bridge was again in service on Jan. 11.

Interesting the Younger Men in Society Activities

HOW to secure the working interest of members, especially the younger members, of a technical society formed a large portion of the presidential address of Leonard Metcalf, March 17, in closing his term as head of the Boston Society of Civil Engineers, Some of the methods have already been tried with success. Mr. Metcalf tells of them as follows:

One of the most promising lines of work lies in efforts to bring together effectively in this Society the young engineers of different offices in this city and neighborhood, interested in special problems of design. These meetings should tend to broaden acquaintanceship, stimulate interest and give opportunity for really effective educational work. During the past year this movement was instituted and three such meetings have been held at which there were presented and discussed some interesting recent problems in foundations for structures on the water front. From 35 to 50 of the younger men of the Society attended each of these meetings, and a lively and helpful discussion has resulted. The interest aroused and the response of the younger men have been most friendly and encouraging. Their comment has been favorable and appreciative.

The meetings can probably be made more helpful and the diffidence of the younger men in speaking be better overcome, by limiting the attendance to the younger men, with but two or three of the older men, particularly experienced in the subject matter under consideration, present to assist in broadening and drawing out friendly discussion and comparison of ideas. The discussions can be vitalized by taking up specific actual problems recently faced by these young engineers in their daily work with which they are therefore so thoroughly familiar that they can speak upon them informally without effort. Additional meetings can then be held, to broaden the examples of the application of the theories involved. Oral presentations are to be encouraged, rather than written ones.

In this way groups of capable young engineers can be drawn together, and activity of interest in the work of the main society be gradually but materially stimulated.

Recent experience indicates further that it would be advantageous either to form a new section of the Society for this purpose, or to appoint a committee largely composed of the more active of the younger and middle-aged men of the Society, with perhaps two of the older men on the committee, who are in sympathy with the movement and whose greater acquaintance and experience would contribute to the breadth and sustained interest in this work.

An effort should be made to bring the older men into friendly touch with the younger men in every way possible and to the advantage of both.

Past-president Gow has made a very sensible suggestion that appears worthy of adoption. His proposal is that meetings be held during the course of the year in which some of the more experienced men be asked to give practical talks upon some phases of their engineering experience, their failures and successes. Arrangements should be made to have others join in the discussion at the same time, so as to broaden its scope. Every effort should be used to draw out the younger men. This actual participation would tend gradually to bring the younger men into closer touch with the Society, through the informality of the procedure and their interest in such practical matters.

In view of the rapid advance in cost of living and consequent inadequacy of current fund, it appears reasonable to use a portion of the income of the permanent fund for social activities, which may bring men into closer touch with one another in advance of and after the regular meetings. Unless this is done either the activities of the Society must be curtailed or the dues raised. Action has been taken along this line, by authorizing the Board of Government to make use of the current income of the fund during the year 1919-1920. The present, as well as the future generation of engineers, may justly benefit by these funds.

Colorado Engineers Classified

A classification of its members by classes, was recently made by the Colorado Society of Engineers with the following results: Eminent engineers, 2 per cent; engineers, 38 per cent; assistant engineers, 35 per cent; draftsmen, 15 per cent; instrument men, 6 per cent; surveyors, 4 per cent. As rated the eminent engineers are entirely outside of any class, due to some particular attainment or distinguished service. The classification was based largely on present occupation and followed the fairly well standardized positions of the civil engineering branch.

LETTERS TO THE EDITOR

Prohibition and the Foreign Born

Sir—In an editorial in your issue of April 15, p. 747, you name prohibition as a factor that is deterring immigration, but it seems to the writer that you should bring forward some more stable evidence than the vaporings of a professional jokesmith and a pro-booze advocate.

To refer to George Washington is not evidence, because the Father of his Country also kept slaves, and wore knickerbockers and a three-cornered hat. If he were with us today he would give a fair trial to a law which has passed through all the checks provided by our constitutional government.

The three-months' period which has elapsed since the prohibition amendment went into operation is entirely too short a time to determine the effect upon the peoples of foreign countries. It has been reported that immigration is increasing, and that Italy is taking steps to provide for a large exodus of its men to this country.

If you have any real facts you should publish them. Leacock is probably trying to perpetrate a joke, and it seems to be on *Engineering News-Record*.

LEWIS D. RIGHTS,
New York City. Civil and Consulting Engineer.

["Who's Who" gives the following facts regarding the "jokesmith." "Leacock, Stephen Butler; B.A., Ph.D., F.R.S.C., Litt.D., Fellow Royal Colonial Institute, Head of Department of Political Economy, McGill University, Montreal." Evidently Professor Leacock's reputation suffers from his avocation.—Editor.]

How the Mayor of a Southern Town Saved "Engineering Expense"

Sir—A certain small town in the South was preparing to make some street improvements, paving, storm water drainage, curb and gutter, etc. Several competent engineers, learning of the proposed improvement, made application in person to the mayor of the town for the position of engineer. The mayor very candidly ignored the applicants, with the statement that he did not need an engineer, that he wanted a first-class contractor, who could do first-class paving.

A contractor was sent for, who promptly went to the mayor. He was told by the mayor that the town had $150,000 to spend on paving the streets and he wanted to know of him how much street he would pave for that amount of money, and give the town a turn-key job. The contractor replied that he could not say off-hand, first, because he didn't have any engineer's specifications or quantities, and, secondly, the class and kind of pavement would largely determine the extent of pavement the stated amount would pay for. He didn't know how much storm severage was necessary, together with the different diameters, and the exact measurement and kind of pavement wanted was the absolutely necessary information he must have before he could make any intelligent proposition to the town.

He ventured the opinion to the mayor that the first thing for the town to do was to employ a competent municipal engineer to make surveys, draw up plans and specifications, and an estimate of the quantities, that is, give in detail the number of feet and diameter of all storm sewerage to be installed, the number of lineal feet of curb and gutter to be built, and the approximate number of cubic yards of excavation, and the number of square yards of pavement desired. The mayor very promptly told him that no storm sewerage was necessary, and that there would be no need of change of the granite curb, for he himself had placed that and knew that it was placed right, and that there was no grading to be done, except a few small bumps which he expected the contractor to do for nothing. He would not employ an engineer under any consideration, but the contractor might employ a dozen if he saw fit, but there would be no engineering expenses to the town.

The contractor told him that he would think the matter over and make him a proposition, and departed. The contractor got in touch with one of the engineers who he knew had applied for the engineering and was familiar with the proposed improvement, and had him go to the town and make some surveys and observations, and subsequent calculations. While the engineer was making the surveys, however, the mayor came to him and asked him what he was doing, and who employed him to do this work. The engineer informed him that he was doing it for the contractor. This satisfied the mayor, and the engineer completed his work and gave the desired information and data to the contractor.

The contractor agreed with the engineer that he was to supervise the engineering of this work throughout its progress to completion in the event the job was landed, it being stipulated that the engineer would receive a percentage of its total cost for his professional services. The contractor made a bid at the prevailing prices, and simply added the engineer's percentage to the bid, and presented it thus to the mayor. The proposal was not on a competitive basis, but in the nature of a private deal. The mayor was so highly pleased with the prices that he immediately and without further question awarded the contract to this contractor. So the town is now, as the mayor thinks, to be paved upon an outlay of something over $150,000 without the ostensible services of an engineer at the expense of the town.

N. C. HUGHES, JR.,
Chief Engineer, Laurens County Highway Commission.
Laurens, S. C.

Weariness Caused by Conduct of Am. Soc. C. E. Meetings

Sir—Your correspondent from the Middle West whose views on engineering society meetings are expressed in the column "Impressions Here and There" in your issue of April 8, p. 728, is right, but he does not realize that, besides the weariness that comes from overcrowded programs, from proceedings starting 3½ hours after one leaves one's office, from ill-considered programs often presented under indifferent presiding officers, the New York members also have been wearied at the quiet persistence which has overcome all efforts to make the meetings of real interest.

We are now trying to start a New York Section to try and correct these things. Out of nearly 2,000 potential members, however, hardly 200 have joined it, because of this weariness, and the indifference bred of long experience.

It is to be hoped, however, that before the first annual meeting of the New York Section on May 12, a large majority of the members in the Metropolitan district (District No. 1) will have joined the New York Section and will turn out in force on that date to demonstrate that though we may have been weary in the past at the administration of the American Society of Civil Engineers in New York, we still have a "kick" left as engineers, and we hope to make this section a live as well as dignified one.

New York City. F. LAVIS.

Economic Highway Construction

Sir—In a letter printed in the March 4 issue of *Engineering News-Record*, p. 486, a correspondent argues that "it is contrary to the spirit and needs of the times" to attempt to limit the abuse of the highways by overloading trucks. He seems to think that such a move would "tend to check the development of transportation" and offers as a substitute for weight of traffic laws the building of fewer miles of highway, but those miles capable of carrying trucks of twice the size of those in service today. It is unfortunate that figures are not presented showing the economic benefit of such a procedure, especially to those communities which will be obliged to forego good roads in order to assist other communities financially in building roads capable of carrying the super-trucks of the future.

It is true that the history of transportation, especially upon the railroads, shows a steady increase in the size of load carried. There are, however, many miles of railroad, especially branch lines and logging railroads, that have not adopted the 200,000-lb. capacity car nor the 250-ton locomotive. Neither does the development of transportation indicate the probability of the universal adoption of such units, nor is there any demand that all track and bridges be rebuilt to carry such loads. One cannot therefore argue that the history of the development of transportation proves that it will be necessary to build our highways for trucks with double the carrying capacity of those now in use. It may prove this for 5 per cent of our roads, but certainly not for all of them.

The problem is an economic one, and data are being rapidly accumulated on which a solution may be based. That road should be constructed for which the sum of (1) interest upon the first cost, (2) the yearly cost of maintenance and repairs, (3) the annual charge for reconstruction when worn out and (4) the annual cost of conducting transportation upon the road is a minimum. This sum, moreover, must be assessed against the general public, the property owners and the users of the road in accordance with the benefit derived by each class from the improved road, and will involve graded vehicle license fees, a gasoline tax, general taxation and special improvement taxes upon property. If the saving in the cost of conducting transportation by the use of heavier loads (requiring full loads in both directions) exceeds the interest and excess maintenance charges on the more expensive road required to carry the traffic in large rather than in small units, then the stronger road should be built. If this saving is not shared by all who pay for and use the road, the extra expense of the stronger road should be assessed against those who do benefit by it, in order that the economic benefit may not be overestimated. On some very heavy traffic roads a complete consideration of the problem of conducting transportation will require an estimate of the cost of improving, extending or building new railroad lines to handle part of that traffic. It is well known that railroads can handle freight above a certain minimum amount per year for a few cents per ton-mile, including the cost of the roadbed, while few trucks are handling freight for less than 15c. per ton-mile, not including the cost of the roadbed. The cost of this roadbed is paid for by the public, generally indirectly but none the less surely. A neglect of this fact is liable to do serious damage to the movement for good roads in this country. Propagandists cannot fool all the people all the time, nor can they defeat the laws of economics. H. E. PHELPS,

State College of Washington, Dept. Highway Engineering.

Elevating Outer Rails for Fastest Trains

Sir—My attention was attracted to the abstract of the report of the Bureau of Safety of the United States Interstate Commerce Commission which appeared in *Engineering News-Record*, Feb. 26, 1920, p. 433, under the heading. "Speed too Great for Elevation of Outer Rail Caused Derailment." I read it with a good deal of care. The reasoning of the engineer who made this report, reminded me of the Swede who went into a liquor store (previous to July 1, 1919) and asked the clerk if he had any squirrel whiskey. The clerk said, no, but that he had some Old Crow, to which the Swede replied, "Yumping yemming, aye don't want to fly, aye yust want to yump around a leetle."

The reason that I am writing this letter is that to the non-technical man, this report may seem plausible and some of our railway presidents and managers may arbitrarily order that curves be elevated for the speed of the fastest trains, which would bring about disastrous results. The statement is made that "the speed of a train seldom reaches the point where it actually overturns; long before such a speed is reached the speed is sufficient to cause the equipment to rock back and forth until finally the wheel climbs the rail and results in derailing the train."

I know of one case where a young brainless freight engineer was in charge of an engine hauling an excursion train and he ran down a hill at a speed of 60 to 65 miles per hour until he struck an 11° curve elevated about five inches and the coaches actually turned over. This is not guessing: The section men who were working near the location saw the train coming and ran for their lives. It was also witnessed by a farmer and some of his family who lived close by.

I have seen and heard of many derailments caused by wheels mounting the outer rail on account of the elevation being too great for the speed, but this is the first time that I have ever heard of the reverse. Some twenty years ago I was acting superintendent of a mountain section of newly built railway crossing two ranges of mountains. The grades were 2.2 per cent and the maximum degree of curvature 14°, maximum elevation 4½ inches. We had a schedule of 25 miles per hour but as that speed could not be maintained on the up grade the result was that our passenger trains often ran 37 miles per hour down the hills. I was personally very often on these trains when such speeds were made and I can assure you there was no "rocking back and forth." We later reduced the schedule speed not so much for fear of derailments but for fear of breaking a rail or flange, as most of the equipment used was carried on cast iron wheels. Imagine this condition and decide for yourself which is the safer, riding 40 miles per hour over an 8° 10′ curve elevated 4¼ inches or riding 20 miles per hour over the same curve elevated 8½ inches. The outer rail must be depended on to guide the equipment around the curve regardless of the speed and the greater the vertical pressure of the wheels on this rail the less the liability of the outer wheels mounting the rail.

For a further discussion of this last mentioned feature see page 931, Volume 20, *American Railway Engineering Association Proceedings.* J. G. SULLIVAN.

Winnipeg, Man.

The Relation of War Taxes to Increase in the Cost of Living

Sir—I have been very much interested in your recent articles on economics and particularly in those comparing the 1914 and 1919 cost of living.

There is one matter, however, which does not seem to me to have received the attention that it should and that is the percentage of the increased cost that is due to taxes, particularly war taxes. With the numerous bases used for the estimates and graphs, it is rather difficult even to estimate whether the tax factor has been taken into consideration. To illustrate: When the curves cross in the graphs in Mr. Baker's article in the Feb. 19 issue, does it mean that exactly the same amount of commodities (including rent, amusement, etc.) can be purchased as could have been secured in the base year; or does it indicate that the same can be purchased minus the amount necessary to pay the war taxes?

This matter was brought rather emphatically to my attention by a recent statement that two-fifths of the total increase in costs in England was due to war taxes. While I would not vouch for this figure, much less use it in computations on prices in this country, I believe that it is universally admitted that war taxes are a potent factor in increasing our cost of living. R. B. EVERETT.

Saranac Lake, N. Y.

[The articles referred to did not discuss the causes for the increase in prices that has taken place. Undoubtedly the war taxes have played a part in this increase; but probably not a very large part. Taxes collected from business concerns form, of course, part of the expenses of operation and the price of the product must cover this cost if the company is to remain solvent. With demand outrunning supply, however, as it has done during the past year in many industries, the producer would be likely to keep up his prices even if the excess profits tax were taken off. Again the bulk of the war taxes are taxes on personal incomes, and these tend to lower commodity prices rather than raise them since they reduce the amount which the taxpayers have to spend in buying goods.—EDITOR.]

A Reverse Curve Problem

Sir—In Searles' "Field Book," issue of 1903, p. 97, is given a problem to join two curves with a tangent when the curves are reverse to each other. The solution given is approximate and requires that part of the work shall be measured in the field. Other solutions are given in *Engineering News*, Nov. 6 and Dec. 18, 1902, pp. 382 and 524, and Jan. 8 and Feb. 12, 1903, pp. 36 and 152. But all these solutions depend on some measurements taken in the field.

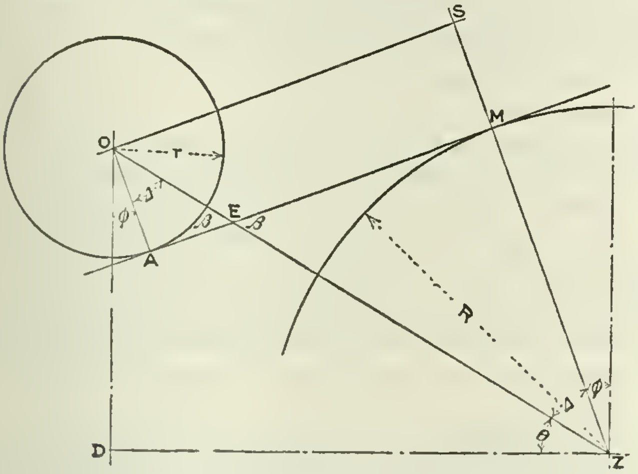


DIAGRAM OF CURVE PROBLEM

We have had occasion to determine an exact solution in a case where both radii and the distance between centers of curves were known, and the exact tangent points and distance were required. The solution given herewith is by Luther D. Beckley, one of our associates, and it is curious to find that so simple a solution has not found its way into the handbooks.

Problem: To find angle ϕ and tangent $A\ E\ M$:

Known : R, r, OD and DZ

$$OD = DZ \tan \Theta$$

$$\tan \Theta = \frac{OD}{DZ}$$

$$OZ = (R + r) \sec \Delta; \text{ or } \sqrt{\overline{OD}^2 + \overline{DZ}^2}$$

$$\operatorname{Sec} \Delta = \frac{OZ}{R + r}$$

$$\phi = 90^\circ - (\Delta + \Theta) = \textit{angle required}$$

$$\left.\begin{aligned} AE &= r \tan A \\ EM &= R \tan A \end{aligned}\right\} AE + EM = \textit{tangent required}$$

William H. Adams,
Consulting Engineer.

Detroit, Michigan.

Mr. Humphrey's Topsoil Theories Criticized

Sir—Mr. Humprhey's article appearing in *Engineering News-Record*, March 18, p. 566, has been read with interest. The statement that nature, through the ages, has been preparing a crust for road purposes applies equally well to the soil at most any reasonable depth; in fact, the soil two feet below the top was formed years before the top soil and usually by the same process. Some of the best dirt roads of the state are in this county, and the soil on which they lie was placed by the hand of man. The value of soil as a road surface depends upon the kind of material and its drainage more than upon its age.

Highway specifications state that no organic matter be placed in fills, means, as every engineer knows, that no sod or grass be placed.

I wonder if Mr. Humphrey has ever observed a roller passing back and forth across a strip of sod in a fill, and has seen the sod spring back to its original position after the roller had passed, or if he has ever seen a trench cut through an old fill into the original surface. The original ground surface is as clearly marked as if it had been painted, and one can, even after years, pull the old sod and grasses from under the fill with ease.

His point as to getting water away as soon as possible is well taken, and every highway engineer has this point ever in mind. But perhaps Mr. Humphrey is not aware of the cries that go up from the farmer and boards of commissioners when culverts are placed for the purpose of running water into the fields.

Clay, when kept dry, is most suitable. I know of places on the National Pike where the old surface was cut from 2 to 10 ft., and they are in perfect repair after standing the war traffic and other heavy traffic for four years. I cannot conceive of a highway engineer placing a surface so low that it cannot be drained. He will endeavor by every means to get his surface higher with drainage in view. It should be not only "on a level with, or a little above, the surrounding land," but as far above as economy will permit.

I believe engineers generally recommend sowing grass on berms and slopes. The maintenance manual of the highway department in this state has in italics that "it is generally desirable to have the slopes of all types of roads sodded." Fertile soil is good but not essential. There are grasses that will grow in every soil, from sand to shale.

The description of the road maintained is highly interesting and I wondered at letting the water run along the road until I read further and found that the heaviest grade was 2 per cent. Heavier grades would have played havoc with the road. Even with flat grades, it would not have been very pleasant to have traveled this stretch of road in your new car just after a heavy rain. The statement at the end of this paragraph that the road had been corduroyed years before leads to the question, if it was corduroyed, how was it possible to have only top soil for a surface, as nature placed it?

If this theory of laying roads along the original surface is true, then every railroad in this country is built wrong. It would have been much cheaper for them to have laid their tracks across long, level bottoms, on the ground, instead of building embankments miles long. But they did so arguing that in order to counteract the force of capillary attraction and thus keep a fine, dry base, it was essential that they keep well above the adjacent surface. Time and observation have proven this theory correct.

Good highway engineering means the least expenditure in order to procure the best road with a minimum upkeep and minimum operating cost. G. E. Mattingly.

Cambridge, Ohio.

Early Results of Iowa Registration Law

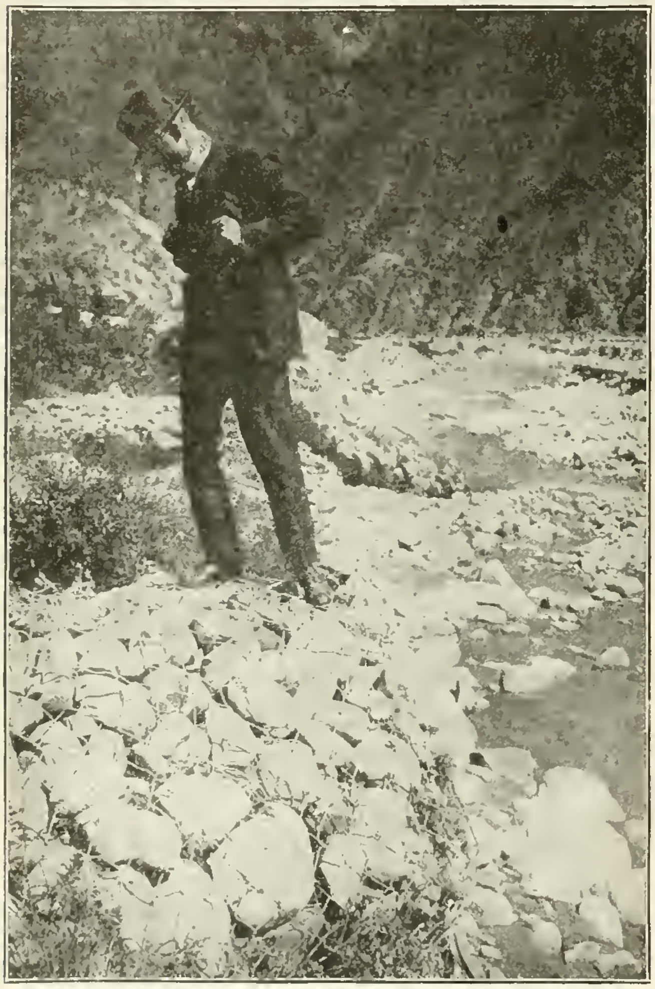
Twice the most sanguine estimate of the number of engineers within the State of Iowa have registered under the new registration law. K. C. Kastberg, secretary of the State Board of Examiners, told the members of the Iowa Engineering Society at the recent Fort Dodge meeting that 1672 application blanks were requested and that 1142 of these had come back filled in. Nearly 1,000 certificates have been granted so far. Three classes of certificates are issued: for professional engineers, for land surveyors, and for both combined. Already the law has had its effect on the public although in operation only since Jan. 1. Ten calls have come to the board asking for the names of registered engineers who might be available in a particular locality. In taking office the board members were instructed by the governor to proceed not only on the theory of protecting the public but also of improving the status of the engineering profession. Until some workable reciprocity arrangement can be effected with Illinois, certificates of about fifteen consultants in that state are being held in abeyance. Some difficulty arises from the fact that the Illinois law is for structural engineers only.

HINTS FOR THE CONTRACTOR

Wire Bags, Filled With Cobbles, Prevent Scour

By Albert A. Northrop
Stone & Webster, New York City

WOVEN galvanized wire which is known commercially in the United States as "Cyclone Fence" is being used extensively by the railroads of Chile and Bolivia where embankments are in danger of scour. Blocks of cobbles, broken stone or boulders are built up in any size or shape desired and surrounded with wire mesh which frequently is woven on the spot by means of an extremely simple machine that can be fastened to any carpenter's bench. The photo above shows one of these stone piles held in place by the mesh.



STONE FILLED WIRE BAGS TO PREVENT SCOUR

These bundles of stone are used as extensions to abutments, diagonal fenders at the base of an embankment to ward off the stream and are even used to repair a break. Bags of the stone are made and rolled into place until a sufficient foundation has been established upon which loose fill can be dumped. Their use is as varied as the ingenuity of the person protecting the embankment or diverting a river can devise. Frequently willow branches are stuck between the stones or between the blocks themselves where they take root and after a time form themselves into a willow hedge.

Sand Sluiced to Centrifugal Pump

REMOVAL of excavated material by sluicing through a trough to a centrifugal pump was the method employed in making the excavation for a water control basin on the canal system of the Lake Worth Drainage District of Florida. About 600 cu.yd. of fine sand had to be handled, but as the location was difficult of access the contractor did not wish to employ a derrick. The basin was located in a canal full of water, this being dammed or bulkheaded at each end of the excavation.

A timber flume, 150 ft. long, was laid along the bottom of the excavation and water was kept flowing through this by means of an 8-in. siphon at the upper end. A plank gangway was laid along the length of the flume. Men shoveled the sand into the flume, which delivered it to a sump for a 12-in. steam-driven centrifugal pump, this pump handling also the seepage water. The sump was at one corner of the pit, and its bottom about two feet below the lowest point of excavation.

The lift was 16 ft., but owing to the flexibility of the pump it was possible to reduce its speed without breaking the suction and thus to regulate its capacity according to the amount of water to be handled. Special care was taken to keep control of the water level so as to avoid pumping it too low and starting a flow of sand under the foundation. J. C. Wagen, Lake Worth, Fla., is chief engineer of the District. The contractors are Wills & Son & McCarthy, West Palm Beach, Fla.

Physical Effects of Pneumatic Tools on Limestone Workers

EFFECTS of pneumatic tools on the hands of workmen, reported by the Bureau of Mines, have been investigated by Dr. F. M. Barnes of St. Louis who was retained by the operators to study conditions in the Bedford (Ind.) limestone region. The workers are subject to a disorder particularly of the left hand known as "white fingers." The first effect is described as a feeling of coldness and pricking; the fingers then turn white and become numb. If the hands are warmed, rubbed or exercised the abnormal feeling soon passes. It is a temporary condition creating no permanent disability nor connecting it with any known disease. The cause is (1) mechanical irritation of the skin, (2) continued muscular contraction of a cramping nature, (3) low temperature. The latter is the most important, for the condition occurs in winter only. It cannot be attributed to the pneumatic tools alone, for it does not appear in summer when these tools are most used, and it affects also stone workers who chisel and mallet only.

Suggestions to prevent occurrence of the ailment are to keep the tool warm. An enlargement and covering of the chisel shank would also constitute a marked improvement by making it possible to hold the chisel without cramping the hand. Gloves help and the disorder diminishes if the workman discontinues the prevalent practice of blocking the exhaust with the thumb or finger of the right hand forcing a draft of cold air along the chisel to the fingers of the left hand.

NEWS OF THE WEEK

New York, April 22, 1920

Results of American Society of Civil Engineers Vote on Questionnaire Covering External and Internal Relations

(Polls Closed April 14, 1920)

A. External Relations

1. Shall the American Society of Civil Engineers "adopt the principle of becoming an active National force in economic industrial and civic affairs"? (See paragraph in Division C of Report* at top of p. 10.)

Yes..........2889 No.......... 910

2. Shall the Society actively co-operate with other engineering and allied technical associations in promoting the welfare of the Engineering profession? (Report, Division C, pp. 10-19.)

Yes..........3115 No.......... 685

3. Shall the Society for the purposes set forth in Questions 1 and 2 actively co-operate in the creation of the comprehensive organization as outlined in the Joint Conference Committee Report? (Report, Division C, pp. 10-19.)

Yes..........1867 No..........1954

B. Internal Relations

1. Shall the recommendations of the Committee on Development as to technical activities be adopted? (Report, Division A, Section 1-5, pp. 4-6.)

Yes..........2864 No.......... 711

2. Shall local sections be created to embrace the entire membership of the Society? (Report, Division B, Section 1, paragraphs a, b, c and h, p. 6.)

Yes..........2854 No.......... 831

3. Shall the directors in each geographical district be nominated and elected by vote of the corporate members resident therein. (Report Division B, Section 1, paragraphs e, f and g, p. 6.)

Yes..........3176 No.......... 567

4. Shall a portion of the Society dues be allotted to local sections? (Report Division B, Section 1, paragraph i, page 6.)

Yes..........2561 No..........1130

5. Shall the present Nominating Committee be abolished and candidates for the office of President, two Vice-Presidents and Treasurer be nominated by representatives of local sections in annual conference? (Report, Division B, Section 1, paragraphs j and k, pp. 6-7.)

Yes..........2613 No..........1091

6. Shall the dues of all non-resident members above the grade of Junior be increased to provide for greater activities of the Society, said increase not to exceed $5 per annum?

Yes..........2583 No..........1149

7. In case it should be found that the activities brought about by the movement to expand both the internal and the external work of the Society would require more funds than would result from the increase in dues contemplated in Question 6 of Internal Relations, would you favor increasing the dues of all non-resident members above the grade of Junior by an amount greater than $5 but not greater than $10 per annum?

Yes..........1701 No..........1976

---

* The "Report" referred to is the report of the Committee on Development to the Board of Direction, submitted Oct. 14, 1919.

Am. Soc. C. E. Votes Against Federation Plan

Question 3, of Questionnaire Submitted for Letter Ballot Defeated by 87 Votes—Total of 3,913 Ballots Canvassed

By a margin of 87 votes the membership of the American Society of Civil Engineers has defeated the proposal to co-operate actively with other engineering organizations "in the creation of a comprehensive organization" to secure united action of the engineering and allied technical professions in matters of common interest to them. This decision is the outstanding feature of the vote on the questionnaire, canvassed April 14, containing 10 specific inquiries as to the future conduct of the Society's external and internal relations. The total valid ballots cast were 3,913, representing about 45 per cent of the corporate members entitled to vote.

The questionnaire was based upon the report of the Society's Committee on Development and on the Joint Conference Committee report made by representatives of the four national engineering societies. The form and subject matter of the questionnaire was the chief feature of the American Society of Civil Engineers' annual meeting in New York in January, at which time the decision was reached to canvass the corporate membership of the organization by letter ballot. The complete results of the canvass are indicated in the tabulation on this page.

Question 3 under "External Relations" and question 7 under "Internal Relations" were defeated; all of the others passed. Question 3, involving the proposal of a federation of engineering societies for non-technical work, was the one upon which the opinion of the Society's membership was most sharply divided, the conservative element having carried out an active campaign for its defeat, while a rival faction of the organization was equally energetic in its efforts to have question 3 answered in the affirmative.

An analysis of the vote shows that the New York and Illinois districts cast the heaviest vote against Question 3, while the Pennsylvania region voted almost 2 to 1 in the affirmative. District 1 (New York City and vicinity) and District 3 (New York State, exclusive of District 1, and the Province of Quebec) voted heavily against question 3. District 8 (Illinois) also opposed Question 3, as did Districts 2, 5 and 9, the latter three by very close votes. Question 3 found its main body of supporters in Districts 4 (Eastern Pennsylvania, Maryland, New Jersey and Delaware); 6 (Western Pennsylvania, West Virginia and Ohio); 7 (Ontario, Michigan, Wisconsin, Minnesota, Manitoba, Iowa, Illinois, Indiana, Kentucky and Tennessee); and 11 Texas, Mexico, New Mexico, Arizona and Southern California). The remaining districts of the Society were about evenly divided in their vote covering the comprehensive national organization for civic and welfare work. The vote by districts on Question 3 is tabulated herewith.

VOTE BY DISTRICTS ON QUESTION 3

(External Relations)

District	Yes	No
1. (Resident)	214	572
1. (Foreign)	21	35
2.	134	135
3.	73	215
4.	273	108
5.	111	126
6.	237	134
7.	169	84
8.	121	150
9.	91	94
10.	89	82
11.	149	85
12.	89	58
13.	96	76
Total	1,867	1,954
Majority		87

Question 7, involving an increase of dues for non-resident members above the grade of Junior, was defeated by a majority of 275 votes.

By its vote on the questionnaire the membership of the Society has expressed its wish to become "an active national force in economic, industrial and civic affairs," to "co-operate with other engineering and allied associations in promoting the welfare of the engineering profession," but in so doing it has refused to be a party with other organizations in the creation of the "comprehensive organization" for civic and welfare work as provided for in the report of the Joint Conference Committee, and involving the acceptance of the principle of a federated engineering body.

The formation of local sections embracing the entire membership of the Society has been endorsed and approval has been given to the proposal that directors in each geographical district be nominated and elected by vote of the corporate members resident therein. The vote will result in the abolition of the present nominating committee and the nomination of officers by representatives of local sections in annual conference.

Comment on the results of the questionnaire will be found in the editorial columns of this issue.

Zoning Studies Being Made for Dallas

Zoning studies at Dallas, Tex., are being made under the direction of the Metropolitan Development Association, a co-operative organization of various civic interests. The Association has engaged Robert H. Whitten, city zoning expert of New York and Cleveland, to direct its zoning studies. Charles Saville is secretary-manager of the Association, E. A. Wood is resident engineer, and George E. Kessler, of Kansas City, is city planning consultant.

Close Vote on Construction Service in Senate

When Senator Lenroot's proposal to strike out the section of the army reorganization bill which provides for a separate construction service came to a vote in the Committee of the Whole, it was lost by just one vote. The closeness of the vote stimulated all interested to muster their friends for the final vote taken in the Senate proper. The opposition to a separate construction service proved to be much stronger in the Senate than had been anticipated. Senator Lenroot is credited with changing a number of votes by the arguments which he presented against the separate service. One of the most telling points made by the opposition was in their connecting the construction service with the cost-plus contracts. It was pointed out by those desiring a separate construction service that the cost-plus policy did not originate in the Construction Division but was a heritage from the Council of National Defense which bore the approval of the Secretary of War, and continued to have his backing despite the protest made by General Goethals. Senator Lenroot, however, was not convinced that the cost-plus system was adopted by the Construction Division under protest. He quoted from General Marshall's testimony before a congressional committee to show that he has been an exponent of the cost-plus contract.

Mr. Lenroot also pointed to charges of waste which have arisen in connection with the building program at home, while not a word of criticism has been heard concerning the construction abroad which was in the hands of the Engineer Corps. To show that the Engineer Corps was engaged in construction work on a large scale in France, Mr. Lenroot produced figures to show that it had built 17,120 barracks; 4,100 ft. of docks; 1,035 miles of standard gage railroads; storage space covering more than 500 acres, and hospitals for 280,000 beds.

Senator Sterling pointed out that the recent willingness on the part of the Quartermaster General to surrender his claim for the construction work was due to an understanding that the Quartermaster General would have jurisdiction over the operation and maintenance of the buildings constructed.

In contrast with the 23-24 vote on the Lenroot Amendment in committee of the whole was the vote of April 20 in the Senate proper, when the Lenroot Amendment to strike out the section providing for a separate construction service was defeated 16 to 38. Since the House by almost as decisive a vote rejected the construction service as a separate entity, it can be foreseen that the conferees will have great difficulty in reaching an agreement. An effort to add two brigadier-generals to the staff of the chief of engineers was defeated decisively. The number of engineer officers was increased to 650.

Municipal Improvement Bonds in Chicago Fail to Carry

Four bond issues aggregating $34,500,000 for municipal improvements in Chicago were adversely voted upon in Chicago, April 13. The money was to be apportioned as follows: $15,000,000 for street lighting; $9,500,000 for bridges; $5,000,000 for parks and playgrounds; $5,000,000 for a municipal convention hall. The city is so near the limit of its bonding power that a favorable vote would have meant an encumbering of the city's entire bonding power for the next five years. Improvements now under way call for the expenditure of $35,000,000 of unexpended authorized bond funds, and if all bonds already authorized were sold, the city would be within $1,000,000 of the limit of its bonding power. The votes of the women were far more numerous against the bonds than were those of the men.

Hearings to Begin on Townsend Highway Bill

In connection with the presentation of the conference report on the Postoffice Appropriation Bill, Senator Townsend, the chairman of the Committee on Postoffices and Post Roads, announced that he intended to proceed with hearings on his national highway bill so that Congress may be given concrete information as to an improved highway policy. Senator Townsend emphasized the need of such an investigation as this time when continuity of good roads is so necessary in the general welfare in times of railroad strikes and when for other reasons the rail transportation facilities are unable to meet the needs of the public.

Senator Townsend declared that he is not at all pleased with the way Federal money is being expended in highway construction. He pointed out that many of the states apportion their federal-aid money among their counties in the same way that the Federal Government apportions it to the States, that is, according to population, territory and mileage of roads. The result, the Senator stated, is "little patches of roads here and there all over a state, beginning nowhere, leading nowhere, having no system in view and being washed away in many instances by the first flood that comes after they have been completed. Sixty per cent of the federal aid already expended has been devoted to temporary roads. I maintain that present methods of expending federal aid funds are wasteful and inexcusable."

Before Senator Townsend would vote for another dollar for the federal aid fund, he will insist that a policy be adopted which will permit of connecting the road systems between states and provide for permanent maintenance. He will insist on a national system, built and maintained by the Federal Government for the good of the whole country.

Advise Am. Soc. C. E. Representation on War Memorial

Having found unsuitable all of the 67 proposals before it, the jury chosen by the Mayor's Committee on the Permanent War Memorial, New York City, has recommended a nation-wide competition, all the plans thus secured to be passed on by a committee of nine, one chosen at large and eight selected, one each, from lists of three submitted by eight societies, including the American Society of Civil Engineers, the New York Chapter of the American Institute of Architects and the New York Chapter of the American Landscape Architects. The final choices from the various lists, as well as the selection of member at large, would be made by the chairman of the Mayor's Committee on Permanent War Memorial. The jury is against any memorial that is wholly utilitarian in character. For a site it recommends that the War Memorial Committee consider a tract of land north of Dyckman St. lying along the Hudson River and Spuyten Duyvil Creek, some 4,000 ft. long and 1,500 ft. width, much of which is 200 ft. above the river.

Railroad Labor Board Appointed —Holds First Meeting

The Railroad Labor Board, for which provision is made in the Transportation Act, Feb. 28, 1920, was appointed by President Wilson April 14 and held its first meeting two days following, with seven of its nine members present.

The membership of the Board consists of George W. Hangar, Washington, D. C.; Henry Hunt, Cincinnati, and R. M. Barton, Tennessee, representing the public; Horace Baker, J. H. Elliot, and William L. Clark, representing the railroads, and Albert Phillips, A. O. Wharton, and James J. Forrester, representing the employees.

Under the terms of the Transportation Act, it is the duty of the Railroad Labor Board to render decisions in matters which local boards of adjustment have been unable to decide. It is also the duty of the Board to look into and, if it should be considered proper, to suspend wage arrangements entered into between the employees and the railroad management which might require action on the part of the Interstate Commerce Commission.

A. R. E. A. Will Join Council

The American Railway Engineering Association has accepted an invitation from the United Engineering Society to become a member society of the Engineering Council. The A. R. E. A. now becomes the sixth member society of the council. The other members are the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Mining and Metallurgical Engineers, the American Institute of Electrical Engineers and the American Society for Testing Materials.

Senate Adds $8,000,000 to Rivers and Harbors Bill

Appropriations for rivers and harbors made by the House of Representatives in its current bill totalled $12,000,000, which is very much less than the average spent in any one of the past ten or fifteen years. This sum, however, has been increased to $20,000,000 in the Senate bill which has just been reported out of the committee. The additional $8,000,000 seems to be voted to a number of small projects, most of them in the Southern States. Reading through the list, the Senate additions are Delaware River and Woodbridge Creek, N. J.; Northwest River, Sterlings Creek, Oyster Channel, York River, Carters Creek, Morattico Creek, all in Virginia; St. Marks River, Charlotte Harbor Channel, Santa Sound, St. Petersburg, St. Johns River, Apalachicola River, all in Florida; Tansas River, La.; Galveston Channel, Aransas Pass, Corpus Christi, and Rockport, Tex.; La Grue River, Ark.; Tennessee River; Kentucky River, Ky.; Los Angeles Harbor, Cal.; Tillamook, Tualatin, Ore.; Cumberland River, Tenn.; Willapa River, Wash.; Houston Ship Channel, Tex. It will be seen, with the exception of one in Southern California and three in the extreme Northwest, all of these are in the South. Nor do the North or Middle West figure very heavily in the House original appropriation.

Joint Water-Supply Scheme for Saskatchewan Cities

An investigation of the possibilities of a joint water-supply scheme for the cities of Regina and Moose Jaw together with some twenty to twenty-five towns and villages and ten or twelve rural municipalities is being made by a commission appointed by the Provincial Government. The chairman of the commission is A. J. McPherson, consulting engineer, Sterling Trust Building, Regina, and the secretary is W. C. Bettschen, also of Regina. A supply from the South Saskatchewan River is under consideration. *Engineering News-Record* is informed by Mr. McPherson that a rough estimate of the cost of the system at present prices ranges from $8,000,000 to $9,000,000 and that this would provide for some 200 miles of pipe up to 36 in. in diameter, pumping capacity of some 10,000,000 U.S. gal. per day against a total head of 400 ft., and works to remove sand and silt, besides four or five small reservoirs with a combined capacity of about 50,000,000 U. S. gal. The commission will report on the financial ability of the proposed district to provide for the work, as well as on a method for raising fixed charges and operating costs, and a system of administration. The commission hopes to carry its investigations far enough to warrant a popular vote on the formation of the proposed district before the meeting of the next session of the Provincial Legislature at the close of this year.

Senate to Investigate the Housing Crisis

The Senate has approved a resolution by Senator Calder providing that a committee of five Senators is to inquire into and report to the Senate as follows:

> (a) The existing situation in relation to the general construction of houses, manufacturing establishments, and buildings, and the effect thereof upon other industries and upon the public welfare; and
>
> (b) Such measures as it may deem necessary to stimulate and encourage such construction work, to encourage popular investment rather than spending, to foster private initiative in building, and to insure co-operation between labor and persons or corporations engaged in transportation, banking, or other business necessary to the development of such construction.

The committee is instructed to report prior to Dec. 1.

In explaining the need for the resolution, Senator Calder declared that the country is in need of $4,000,000,000 worth of buildings. Senator Calder stated that he proposes to resist with all the power he possesses in the Senate and elsewhere any effort to induce the government of the United States to go into the business of supplying housing for private individuals.

Pittsburgh Improvement Bonds Fail to Draw Bids

No bids were received April 8, the time fixed for receiving proposals, by the City Controller of Pittsburgh, for $7,281,000 of city improvement bonds. These bonds were a part of the $22,000,000 bond issue authorized in 1919 for city improvements, and were to bear interest at 4½ per cent. The failure to receive bids is due to the present condition of the money market, as 4½ per cent interest was considered insufficient in financial circles.

If the City Council acts promptly and increases the rate of interest, the work contemplated under this bond issue will only be delayed six weeks. The Director of Public Works is ready to advertise for bids for the different projects, but the contracts cannot be awarded until the bonds are sold and the money is in the city treasury.

The list of improvements covered by this bond issue and therefore delayed are as follows: Widening of Second Avenue, $1,410,000; Boulevard of the Allies, $1,140,000; street improvements (repaving mainly), $861,000; widening of Broad Street, Eastend, $777,000; widening of Ferry Street, $351,000; improvement of East Carson Street, $315,000; East Street improvement, $300,000; Beechwood Boulevard bridge at Shenley Park, $270,000; Highland Park improvements, $231,000; Saw Mill Run sewer, $210,000; Negley Run sewer, $210,000; Soho Run sewer, $135,000; improvements at Mayview Poor Farm, $99,000; Nine Mile Run sewer, $90,000; Island Avenue Bridge, $90,000; improvement of Baker Street, $90,000; Mount Washington Roadway (engineering work only), $30,000; Warrington Avenue improvements, $132,000; funding bonds, $540,000.

New York State Licensing Bill Passed by Senate

The bill providing for the licensing of engineers, introduced in the New York legislature by the New York Chapter of the American Association of Engineers and endorsed by the New York Section of the American Society of Civil Engineers and other engineering societies in the state, was passed April 15 by the Senate. It will be introduced into the Assembly immediately.

Start Work on Detroit Street Railway Project

Excavation for the foundation of the first section of Detroit's municipal street railway was started last week after the voters had approved the $15,000,000 bond issue to finance the extensions planned by Mayor Couzens and his street railway commission. Tentative arrangements had been made with a local contractor to start construction and as soon as the result of the ballots was assured approval was granted by the City Council, including the issuance of $100,000 in public utility bonds to meet the initial expenses of starting work.

The project, which includes the construction of 101 miles of new tracks with the necessary power houses and equipment, will be carried out under the direction of the Department of Public Works. A supervising engineer will be appointed to take charge of the construction and upon the completion of plans and specifications, bids will be asked and contracts awarded on foundation work. Rails and ties will be purchased directly by the city, according to present plans.

Madison Rejects Municipal Street Railway Ownership

The purchase of a privately owned street railway system at Madison, Wis., was defeated by a vote of three to one in an election held April 6. Had the vote been favorable the price would have been determined by the State Railroad Commission.

House Committee Favors Transfer of Road Building Equipment

The Military Affairs Committee of the House of Representatives has reported favorably the Reavis bill (H. R. 13,329) providing for the transfer of additional machinery and equipment from the War Department's surplus to the Bureau of Public Roads for use in highway construction. In reporting the bill, the committee emphasizes the need of suitable storage facilities for road building material and equipment, to be used in the forest reserves and which are provided for in the bill. Without this authority the Department would not be permitted to use its funds to provide these needed storage facilities.

To Loan Tractors for Road Work

Tractors may be loaned by the War Department to the states for use in highway construction, as the result of a provision embodied in the Postoffice appropriation bill. As agreed to by the conferees, the bill provides that the Secretary of War, in his discretion, may loan such tractors as may be spared, provided that all expenses for repairs and upkeep of the tractors as well as loading and freight charges are to be paid by the state.

Lang to Preside at Chamber of Commerce Industrial Section

As chairman of the Industrial Production Section of its eighth annual meeting to be held in Atlantic City April 26-29, the U. S. Chamber of Commerce has selected Charles F. Lang, president of the Lakewood Engineering Co., of Cleveland. For the past 10 years Mr. Lang has been in close touch with the most important engineering work in this and foreign countries. Starting his business career as cash boy in a department store he now heads a big industrial organization specializing in the manufacture of a great variety of construction plant and equipment.

Charles F. Lang, of Swiss descent, was born in Cleveland, March 27, 1871. At an early age it became necessary for him to leave the public school which he attended in order to work as a cash boy in a dry goods store. Later he took up the study of law with a firm of Cleveland attorneys, and until he completed his study at the age of 26 years he paid his way by working as a clerk. Following his admission to the Ohio bar he practised his profession in Cleveland for the succeeding twelve years. In 1896 he assisted in forming the Lakewood Engineering Co., but took no active office in the organization until 1910, when he gave up his law practice to devote his entire efforts to the promotion of the Lakewood Company, of which he is now president and treasurer.

In addition to presidency of the Lakewood Engineering Co., other offices now held by Mr. Lang in the field of industrial engineering are as follows: Director in the Allied Machinery Co., of New York, a subsidiary of the American International Corporation; director and vice-president of the American Safety Device Co. of New York; president of the Cameron Clay Products Co. of Emporium, Pa.; vice-president of the Duplex Foundry & Manufacturing Co. of Elyria, Ohio; director of the Lakewood-Galion Company, of Galion, Ohio; director of the Milwaukee Concrete Mixer Co. of Milwaukee, Wis.; vice-president of the Western Patent Scaffolding Co., Chicago; director of the Equipment Corporation of America, Chicago, and vice-president of the Cleveland Railway Supply Co., Cleveland.

Highway Work in Ohio Not to Stop

After a conference with deputy engineers and others interested in road improvement, Highway Commissioner A. R. Taylor has announced that road improvement in Ohio would go forward this year if the officials of the various counties, in which improvements are proposed, will consent to an increase in the estimate of highway costs. For a time it was believed that practically all highway work would be stopped because of the lack of bids on work already offered. Contractors have been loath to take a contract under present estimates because of the increase in cost of materials and labor, and delays in transportation of materials. However, with the decision arrived at engineers will re-estimate work which will be offered again.

Largest Single Unit Cotton Mill Under Construction

What is believed to be the world's largest cotton mill housed under one roof is to be built by the Aberthaw Construction Co., Boston, Mass., at Summersworth, N. H. The mill is to be built for the Great Falls Manufacturing Co., and when completed will be approximately 1,900 ft. in length and 144 ft. in width and either five or six stories in height. The estimated cost of the job is $7,500,000. A storage yard has been established at Summersworth, and men are on the job receiving materials. Actual construction will begin before the end of April. Lockwood, Greene & Co., New York City, are the architects.

Massachusetts Highway Program Totals $7,000,000

For highway construction, reconstruction, and maintenance work, the State of Massachusetts has approximately $7,000,000 to spend during the 1920 construction season. The project calling for the greatest expenditure will be, perhaps, that of the road from Orleans to Provincetown. This construction, totaling 25 miles, will be of a sand-asphalt mix, and the total work, which includes the widening of an existing road to 18 ft., will cost in the neighborhood of $400,000. A continuation of the Mohawk trail from Greenfield west will be of cement concrete construction and will cost near $350,000. This piece of construction entails heavy excavation and a certain relocation to reduce an existing 14 per cent grade to a 6 per cent grade. The Northampton and Pittsfield Road is to be improved with bituminous macadam, and with drainage and necessary bridges, will cost approximately $300,000. The Newburyport Turnpike from Newburyport to Boston will receive attention this season, six more miles of bituminous macadam being scheduled for construction. An estimate of the cost of the Newburyport improvement is $275,000.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

NATIONAL FIRE PROTECTION ASSOCIATION, 87 Milk St., Boston; May 4-6; Chicago.

AMERICAN ASSOCIATION OF ENGINEERS; 63 E. Adams St., Chicago; May 10, 11, St. Louis, Mo.

AMERICAN WATER WORKS ASSOCIATION, New York City; Montreal, June 21-26.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; Asbury Park, N. J., June 22-25.

AMERICAN PUBLIC HEALTH ASSOCIATION, Boston; San Francisco, Aug. 30-Sept. 3.

PERSONAL NOTES

F. R. McMillan, for the past two years research engineer, Emergency Fleet Corporation, U. S. Shipping Board, has accepted a position in the New York office of the Turner Construction Co. Mr. McMillan was formerly an assistant professor in structural engineering, University of Minnesota. He was called to the shipping board at the time of the formation of the concrete ship section to develop apparatus and methods for the determination of stresses in ships under the action of the waves at sea.

John A. Stevens, engineer, Lowell, Mass., announces the opening of a branch office, in charge of Marcus K. Bryan, at 502 Frederick Bldg., Cleveland, thoroughly organized to render consulting services for the analysis, design, construction, and management of power plants.

L. I. Goldberg has resigned as engineer of the Michigan State Highway Department to engage in the contracting business at Traverse City, Mich.

Howard K. Rumberger, of Bellingham, Wash., has been appointed city engineer of Ferndale, Wash.

R. B. Abbott, formerly division superintendent, Philadelphia & Reading R.R. at Philadelphia, has been promoted to assistant general superintendent at Reading, Pa.

Joseph H. O'Brien, formerly vice-president and chief engineer, Central Construction Corporation, and previous to that association for 15 years with the Westinghouse, Church, Kerr Co., has been appointed chief engineer of the Foundation Co., New York City.

Samuel P. Hall, architect, recently of the Construction Division U. S. Q. M. C., and Harold M. Bush, mechanical engineer, colonel of Field Artillery, A. E. F., announce the formation of the firm of Hall & Bush, for the general practice of architecture and engineering, and as specialists and consultants with particular attention to factories and other industrial plants. The firm has established connections with Henry V. Hubbard, professor of landscape architecture at Harvard University, late chief of the Division of Town Planning, U. S. Housing Corporation, for the treatment of housing problems, real estate developments and landscape architecture. The offices of the firm are at Columbus, Ohio.

Harold B. Barry has been promoted from the position of district engineer of the St. Louis-San Francisco R.R., at Memphis, Tenn., to that of principal assistant engineer, with headquarters at St. Louis.

Percy Pennybacker has resigned as assistant to the bridge engineer, Texas State Highway Department, to enter the employ of Harrington, Howard & Ash, consulting engineers, Kansas City (Mo.) as draftsman.

Lieutenant-Commander J. N. Laycock has been transferred from the Philadelphia Navy Yard to the Cape May Naval Station to take over the duties of the officer in charge of public works construction at that station. He was formerly head of the Technical Division of the Public Works Department, Philadelphia Navy Yard.

C. J. Victoreen has been appointed city engineer of Cadiz, Ohio.

C. W. Wood, formerly assistant engineer of the South San Joaquin irrigation district, California, has been appointed chief engineer, succeeding R. W. Olmsted, who recently resigned to become chief engineer of the advertising firm of Foster & Kleiser, San Francisco.

George O. With, who recently resigned as city engineer of Joliet, Ill., is now manager of the Chicago office, Consolidated Expanded Metal Co., of Braddock, Pa.

Henry Oakes recently resigned as city engineer of Muskegon, Mich., to engage in engineering work at Erie, Pa.

Brigadier-General William L. Marshall, for the past ten years consulting engineer to the Secretary of the Interior, has tendered his resignation on account of ill health.

John R. Sexton has been promoted from division engineer of the Marion and Chicago sections of the Erie R.R., to regional engineer in charge of the Chicago region, with office at Chicago.

D. N. Neal, office engineer of the Western Pacific R.R. at San Francisco, has been promoted to bridge engineer, with same headquarters.

B. E. Clark, of McAlester; E. K. Ramsey, of Oklahoma City; L. K. Forde, of Cherokee, and Clarence A. Wood, of Stillwater (Okla.), have been appointed, by the state engineer of Oklahoma, district engineers to supervise the work and make reports on the progress of projects in their respective districts.

C. Franklin Hunt, recently with the engineering firm of Hoadley & Giles, Binghamton, N. Y., has been appointed village engineer of Endicott, N. Y.

Frank Schaak, Jr., transitman in the service of the U. S. War Department at Muscle Shoals, Ala., has joined the Missouri State Highway Department at Jefferson City, Mo.

W. C. Burnham, bridge engineer of Oklahoma, will leave the office of the state engineer some time during April to supervise the construction of the Calvin steel bridge, Federal Aid Project No. 16, Hughes County, Okla.

Pusey Jones has been promoted from acting engineer of structures of the Boston & Maine R.R. to bridge engineer with office at Boston.

J. H. Stevens, formerly with the New York State Highway Department, has been appointed village engineer of Massena, N. Y.

R. S. Belcher, superintendent of the Somerville (Tex.) timber-treating plant, Atchison, Topeka & Santa Fe R.R., has been promoted to manager of treating plants for that system, with headquarters at Topeka. He succeeds G. E. Rex, who recently resigned to become vice-president, National Lumber & Creosoting Co., Kansas City.

A. E. Triplett, division engineer, St. Louis-Southwestern R.R., at Pine Bluff, Ark., has been promoted to superintendent, with headquarters at Mt. Pleasant, Tex., succeeding H. H. Hooper.

E. E. Adams, consulting engineer, Union Pacific, with headquarters at New York, has been appointed assistant to the president, in charge of purchases, engineering and standards, with headquarters at Omaha, Neb.

J. O. Preston has resigned from the staff of the Rochester (N. Y.) Bureau of Municipal Research, Inc., to become assistant to G. H. Ley, chief engineer of the I. K. Davis Co., contractors and engineers, Philadelphia, Pa.

Lieutenant-Colonel George D. Snyder has been commissioned Colonel, commanding the 22nd Regiment, Engineers, New York Guard. He joined the regiment in 1915, serving with it on the Mexican Border in 1916, and when it was reorganized for the World War as the 102nd Engineers he served with it in all the actions with the 27th Division in Belgium and France. Colonel Snyder is a member of the firm of Jacobs & Davies, Inc., consulting engineers, builders of the Hudson tunnels.

F. E. O'Brien has been appointed assistant city engineer of Watertown, N. Y.

OBITUARY

Dr. John A. Brashear, expert instrument maker, died at Pittsburgh, April 8. He was born at Brownsville, Pa., in 1840. After receiving a common school education, he became a machinist. He enlarged upon his elementary knowledge of astronomy, which had been imparted to him by his grandfather, until he won recognition as one of the most eminent astronomers and instrument makers in this country. After ten years' work he completed his first telescope, in 1874. In 1880 he turned his attention wholly to the manufacture of telescopic instruments. He invented the spectroscope for astronomic uses, and in 1888 completed his spectroscope for the 36-in. telescope. From 1898 to 1900, Dr. Brashear was the director of the Allegheny Observatory, during which time remarkable scientific researches were carried out under his supervision. During that period he was also acting chancellor of the Western University of Pennsylvania, now the University of Pittsburgh, and taught gratuitously in that institution for several years. He was one of the original directors of the board of trustees of the Carnegie Institute of Technology, and took an active part in its development. Dr. Brashear was past-president of the Engineers' Society of Western Pennsylvania and of the Pittsburgh Academy of Science and Arts. He was also an honorary member of the Royal Astronomical Society of Canada and a Fellow of the American Association for the Advancement of Science and of the Royal Astronomical Society of Great Britain.

Frank Aubrey Martin, civil engineer, died at Waukesha, Wis., Jan. 29. He graduated from Missouri State University in 1912 and took a position as government inspector on the Keokuk dam. The following year he was appointed city engineer of Webb City, Mo., which position he filled until 1915, when he went to Topeka, Kan., as engineer for the Santa Fe. Two years later he became assistant county engineer of Shawnee County, Kan., from which position he was obliged to resign, owing to ill health, the latter part of 1919. Mr. Martin was 33 years of age.

Adolph Green, contractor, Green Bay, Wis., died suddenly, Feb. 27, at 69 years of age. One of Mr. Green's most important undertakings was the reconstruction of the railway bridge across Fox River, at Green Bay, in 1906. He retired from active duties in 1907, but up to the time of his death was president of the Adolph Green Construction Co., which was engaged in the construction of substructures for several bridges across the Mississippi, Platte and Fox Rivers.

Asphalt Association Holds Annual Meeting

George Otis Smith, director, U. S. Geological Survey, as the principal speaker at the annual meeting of the Asphalt Association held April 14 at the Engineers' Club, New York City, urged the necessity of greater quantity production of petroleum and its products. He made it clear that, while there has been a constantly increasing production from year to year, the demand continually outruns the increase, necessitating most intelligent and useful disposition of materials produced. Increased use of asphaltic materials in highway construction has made, said Mr. Smith, greater production in petroleum products imperative. Lieut.-Col. Cheney, U. S. A., explained the system of vocational training which is now a feature of army policy.

Officers elected for the following year are J. R. Draney, United States Asphalt Refining Co., President; J. M. Woodruff, Sinclair Refining Co., vice-president; Herbert Spencer, Standard Oil Co., treasurer. The old board of directors was re-elected with W. T. Headley, Headley Good Roads Co.; Carl F. Hetherington, of Hetherington & Berner, and James G. Clark, Standard Oil Co., as new directors representing the contributing membership, and with James Pearson, Construction and Paving Co., Ltd., and J. K. Hollinghead, Standard Bitulithic Co., representing the associate membership.

New members admitted to the Association include Cressy Road Sprayer Manufacturing Co., Everett, Mass.; Willite Road Construction Co. of America; Brooks Construction Co., Fort Wayne, Ind.; Butler Construction Co., Waukesha, Wis.; Constable, Hart & Co., Ltd., London; P. Flanigan & Sons, Baltimore; Kilmer & Barber, Ltd., Toronto; Southern Paving Construction Co., Chattanooga, and Union Paving Co., Philadelphia.

Prizes Awarded in Lakewood Engineering Contest

The first prize of $1,000, offered by the Lakewood Engineering Co., Cleveland, for the best treatise on industrial haulage, using Lakewood Tier-Lift trucks, has been awarded to Clarence Irving McNair, Jr., of Cloquet, Minn. Mr. McNair is secretary of the Northwest Paper Co., and his prize-winning paper was entitled "Analysis of the Application of the Tier-Lift Trucks to the Pulp and Paper Industry." The second prize was awarded to F. C. Peters, chief mechanical engineer, and G. R. Reese, assistant mechanical engineer, New Jersey Zinc Co., Palmerton, Pa. The third prize went to Theodore M. Prudden of the Whitin Machine Works, Whitinsville, Mass.

The committee making the wards, appointed by the Society of Industrial Engineers, was composed of A. Russell Bond, of *Scientific American Monthly*; Professor Dexter S. Kimball, Dean of the School of Engineering, Cornell University; and Irving A. Berndt, vice-president of B. E. Knoeppel Co. The standard of papers submitted was declared to be unusually high, and a large volume of data was added to present knowledge of methods of factory haulage.

BUSINESS NOTES

The T. L. Smith Co., Chicago, announces the opening of a New York City branch office at 50 Church St., and a warehouse service station, under the supervision of E. R. Marker, recently of the Milwaukee office, which will supply all territory east of Cleveland.

The Victor L. Phillips Co., Kansas City, Mo., conducting a general business in transportation and construction equipment, has purchased the business of Wiley Brothers, Oklahoma City.

The Locomotive Crane Co., of America announces its removal from Chicago to its new plant at Champaign, Ill.

Fred J. Passino, who for many years has covered the Southwest for the Independent Pneumatic Tool Co., Chicago, has been appointed assistant manager of the Eastern division, with headquarters at 1463 Broadway, New York City.

The Mathieson Alkali Works, Inc., has moved its general offices from Providence, R. I., to 21 West 43rd St., New York. It announces that E. M. Allen has been elected president, succeeding E. E. Arnold, resigned; F. B. Richards succeeds J. R. Gladding as secretary and treasurer. The operating department will be under Max Mauran, vice-president; Colonel Charles A. Vaughn will be manager of the Niagara Falls works, and J. H. McMahon will be manager of the Saltville, Va., works. John A. Kienle, formerly sales manager, Electro Bleaching Gas Co., has been appointed general manager of sales, with E. E. Routh, formerly manager of bi-carbonate sales, appointed as his assistant.

The Cement-Gun Co., Inc., Allentown, Pa., announces the following changes in position of various company officials: B. C. Collier elected vice-president, in addition to continued duties of general manager; W. J. Roberts advanced from vice-president to president; S. W. Traylor, formerly president, now chairman, board of directors.

Water Works Manufacturers' Association has changed its location from 18 East 41st St., to Room 1009, 25 West 43rd St., New York City.

The Thompson-Starrett Co., New York, has opened an office in the Perry-Bayne Building, Cleveland

A Consolidation of Engineering News and Engineering Record McGraw-Hill Company, Inc.—JAMES H. MCGRAW, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN
Editor

Volume 84 NEW YORK, THURSDAY, APRIL 29, 1920 Number 18

Chicago Getting Frugal

RECKLESS bond issues got a setback in Chicago April 27, when five municipal improvements calling for an expenditure of $34,500,000 were voted down. Citizens apparently looked at the increased tax bills of the past year before going to the polls. And the women exceeded the men 5 to 4 in their zeal for economy. Probably the average voter did not go farther in his reasoning against the bonds than the tax increase but the analysis of the Chicago Bureau of Public Efficiency is more explicit. In substance it is: (1) The tax levy for bond interest and redemption has more than doubled in five years, increasing from $5,000,000 to $10,259,887. (2) The proposed bonds would have encumbered the bonding power for the next five years. (3) Improvements under way call for $35,000,000 of unexpended authorized bond funds. Still more bonds may be needed to complete some of the projects. If the proposed bonds were authorized it would be necessary to postpone or abandon partially finished work until the city were again within its debt limit. (4) At present prices bonds must sell at 92. (5) Prices are abnormal. Labor and materials are needed for more urgent purposes. (6) The city's finances are thoroughly demoralized. Its budget calls for several million dollars more than its available income. Defeat of the bond issue will restrain further reckless waste and expenditures. In view of this analysis it is not surprising that the bankers recently refused to help out the city with loans for corporate expenses, as they had done a few years ago in a similar emergency. Living within one's income is no less imperative on cities than on individuals in these days, and somehow Chicago will be able to limp along without the additional lights, bridges, parks and convention hall that the people voted down.

Encumbering the Future

CHICAGO'S calling a halt on the authorization of bonds when there is no possibility, physically, of getting the work done within any reasonable period is one of the hopeful signs of the times. The piling of bond issue on bond issue in this country cannot help but bull the material and labor market beyond reason. It has the same psychological, if not actual, effect as that of the over-orders with which manufacturers are finding their books encumbered. Some wise manufacturers are not buying raw materials to fill more than 30 per cent of their booked orders. They know what the maximum possible consumption is and how many cancellations there must be. The authorization of debts for posterity to pay should not be lightly done. We need these particular improvements but before authorizing them we should be sure that something else is not more needed or will not be before the bonds are redeemed.

Society Unity Progresses

BOARDS of all of the founder societies held regular meetings in Chicago on April 19 and material proof of their co-operation, if the middle-west engineer needed any, was accentuated by a "Joint Engineering Societies Dinner" in which was included the Western Society of Engineers. How, not whether, the many societies of the country may co-operate was the topic of conversation despite the adverse vote of the American Society of Civil Engineers against participating in the formation of a comprehensive organization. No definite program was outlined, but Calvin Townley sounded the keynote in the one word "service"—unselfish service to the state and society. If this high ideal is adhered to the framers of more definite aims and objects will have done well.

Contraction in Wood-Block Paving

UNIQUE experiences with wood-block paving in St. Louis, Mo., are reported in the article by W. W. Horner on p. 814 of our issue of April 22. Briefly, on certain streets where the temperatures of summer construction run high, the blocks shrank loose and the pitch fillers melted and floated them up so that the surface of a newly-laid pavement was practically destroyed. The circumstances and the results of the failure are fully explained by Mr. Horner. He also outlines such investigations as the conditions permitted to be made to determine the cause of the peculiar phenomena which occurred. So far as was disclosed, no cause appeared for the extraordinary contraction and warping action exhibited by the blocks. Thoroughly seasoned and impregnated in apparently the manner generally recognized as insuring a non-bleeding and dimensionally stable product, the blocks shrank and curled up like autumn leaves. Without explanation of the block distortion and therefore, without knowledge of the means of remedying the trouble, the problem resolved itself into one of construction methods to meet unusual conditions. It is comforting to observe that successful methods were discovered and that they are comparatively simple and inexpensive. So far, then, as the strange block action as observed in St. Louis and as described by Mr. Horner offers a construction problem to the practical paving engineer that problem may be considered solved. But the problem of accounting for the phenomena of block distortion is more fundamental. It is a problem for the timber preservation expert. His task is one of determining minutia of treatment technique, and of appraising their effects. Time may be required. Meanwhile the paving engineer will record the fact that under certain conditions contraction of wood block pavement may be as serious a destructive agency as expansion has long been considered.

Congress and the Cantonments

No one who has followed the temper of the Congressional committees who are "investigating" the war will be surprised at the tone of the majority report on cantonment construction. Washington has long since discounted the findings of such committees, remembering that this is Presidential year, and that the first principle of politics is to prove the general incapacity of the opposing party. The unfortunate thing about this particular report is that on the basis of certain obvious evils there has been built up a long chain of damaging charges which are by no means proved and which, if generally accepted, will be bound to lower the public estimation of the profession of engineering and the business of contracting.

In brief, the report charges that the Council of National Defense usurped the prerogatives of the regular governmental organization in the matter of providing camps for the draft army and delegated such power to a group of engineers, architects and contractors, who by means of a vicious form of cost-plus contract permitted certain favored contractors to make inordinate profits in the construction of the camps, at the same time delaying that construction and increasing costs from 40 to 60 per cent, or about $80,000,000. It is the claim of the majority of the committee that by the usual method of competitive bidding the established army bureaus could have completed the camps at lower costs and within the prescribed time.

The assertion of usurpation of power is pure politics and therefore of minor consequence; the gentlemen who make it have doubtless forgotten that they were loud in a demand for a Ministry of Munitions two years ago. Nor is there anything to commend in the suggestion that the Quartermaster Corps or the Corps of Engineers should have proceeded to build the camps by the competitive bid method. The Quartermaster Corps had in its personnel a few engineers who were accustomed to build the very minor structures required for a peacetime army. Its main duty was furnishing supplies to the troops. To add to this tremendous task the responsibility of getting together in three months housing for nearly a million men would have been ridiculous. The Engineers, on the other hand, while quite competent professionally, were pitifully undermanned for their real business, that is, the development of the military engineering end of the war establishment. Their every effort was needed for that. An extraordinary control of the cantonment construction was clearly indicated, though in an ideally prepared army organization the extension of existing facilities should be possible.

As to lump-sum or unit-price competitive bidding, it simply would not have worked. This is the nub of the whole matter. The committee assumes, first, that it would have been possible to have obtained such bids, and, second, that once obtained the work would have been carried to a rapid and economical conclusion. It bases its premises on testimony of a few relatively unimportant contractors who, two and a half years after the event, testified that they would have been glad to bid and would have completed the work much cheaper than it ultimately cost. As the minority report so well points out, "no contractor could go to one of the camps and, without a knowledge of conditions at the site before the work was started or the trials experienced and obstacles overcome by those who actually did the work, make an intelligent estimate of what the job would have cost two and one-half years before." To assume so is merely to forget, as all the "investigating" committees forget, the superiority of hindsight to foresight in the matter of prophecy. With the uncertain conditions in the labor and materials market in the beginning of the war, it would have been rank lunacy for any contractor to make a bid for so large and uncertain a piece of work as a cantonment without protecting himself to the limit. Had such bids been made and accepted, these protective additions, together with extras, would have brought the costs well up to those which were actually incurred.

There remains the indictment of the cost-plus contract. Here the committee is on somewhat surer ground. It would be hardly possible to get together a more complete set of arguments against this method of letting public contracts than is contained in the majority report. Practically all the points to be made are there—the dangers of favoritism, the destruction of the morale of labor which is secure in the knowledge that it can loaf with impunity because the Government is rich and the boss cannot lose, the tendency to waste and the division of authority.

No one who was in Washington in the spring of 1917 or who followed the camp construction that summer has any illusions as to a 100 per cent efficiency in building the cantonments. Wire pulling was just as evident in the scramble for contracts as it was in the selection of sites, though inasmuch as the congressmen themselves were the offenders in the latter, the committee chooses to forget it. At every camp a certain proportion of the labor were flagrant profiteers, intent on giving a minimum of work for a maximum of pay. In the aggregate, waste due to carelessness and to crookedness was tremendous. The shedding of responsibility, in the vernacular, "passing the buck," was just as popular in the camp construction as it was in all the other war activities.

All of this, however, was a part of the general psychology of war. Conditions, admittedly, were not ideal, but they were as good as could have been expected in an imperfect world, especially in that part of it thrust, unprepared, into the midst of a great conflict. That any of the evils were aggravated by the method adopted for camp construction is not shown by the committee's report. Indeed, it is more than likely that all of them would have been present in greater or less degree under any system of contract. The abnormality of building simultaneously in three months and at the beginning of a war sixteen large cities would negative all the records of experience.

In more auspicious times the men who were responsible for the camp construction might adopt different methods. Time reveals many things. They were, however, confronted with an extraordinary situation. They were forced to use their best judgment as to the method of meeting it. Nothing has been advanced to show that that judgment was not as good as was humanly possible, or that results, though imperfect, were any worse than would have been brought about under any other method They have the additional merit of having been successful, however far they fell below perfection. The stupendous character of the task has been lost sight of in its achievement. Because it was done, it is easy to assume that any one could have done it by other methods. In an ideally regulated future, there ought to be some way of providing that a contractor, taking no risk, does not get one hundred times the pay of an engineer serving in responsible charge as Constructing Quartermaster. There ought to be some method of getting labor to give full service when labor is scarce. Unfortunately it is difficult to work out such social problems in the beginnig of a great war.

One good thing the committee has done. It has brought squarely before the engineering and contracting professions the inherent difficulties of the cost-plus contract as applied to public work. There has been much propaganda lately favoring this system, largely based on some real advantages that it has. This report shows only too clearly that the possibilities of public scandal, the ease with which proper performances can be given an improper appearance, far outweigh such real advantages. In normal times, competition, based on financial outlay and assumed risk, must remain the foundation of public contracts.

Prosperous Systems and Rate Regulation

AT LEAST one point of rather striking similarity between the railroad situation in Canada and that in this country was remarked in these columns April 15. The comparison was drawn between the Canadian Government's apparent unwillingness to grant rate increases sufficient to render losing lines supporting, for fear of too great dividends accruing to the strong Canadian Pacific Railway, and the previous policy of the Interstate Commerce Commission in this country to hold rates so low that many roads were threatened with bankruptcy. There is ground for belief that members of the commission had felt obliged to take this course in order to prevent the earning of huge dividends by certain prosperous systems. Now, the new Transportation Act limiting "excess" earnings by a "take-off" above 6 per cent should tend to alter this policy.

Following the present period of guaranteed earnings, it has been stipulated by Congress that, from Sept. 1, 1920, to March 1, 1922, rates shall be made to produce a net return of 5½ per cent, on aggregate "value," and after that time, a rate of return to be fixed by the Interstate Commerce Commission. An additional one-half of one per cent is to be allowed for unproductive betterments, but one-half of the "excess" above 6 per cent must be paid into the Federal transportation fund. There is reason to believe that this arrangement will result in a more liberal attitude on the part of the commission.

We are now witnessing the instance of a large system going into the market with a $50,000,000 bond issue at 7½ per cent, taking into consideration banker's discount. With the "take-off" set at one-half the excess above 6 per cent, a railroad will have to earn 9 to pay 7½ per cent. In the instance at hand the new expenditure must result in earning an additional net revenue considerably greater than the bond interest rate to justify the investment, since the railroad is in a fair way to earn appreciably more than the allowed 6 per cent and will be subject to the take-off. Were the lines less advantageously located and not likely to earn mcre than the fixed rate, new expenditures would not have to bring as great an additional net increase with respect to the new investment, since the take-off would not apply. Here again, the levelling process of the Transportation Act promises to have an important effect with respect to new capital in lessening the tendency to starve all of the railroads for the sake of checking big earnings of a few.

Railroad starvation is the direct cause of serious shortage of transportation facilities. Although it was partially the natural result of previous high-handed acts of some railroad managements, we believe that it had its real origin in the fear of permitting too great dividends to a few rich systems regardless of the plight of the average railroad. Under the terms of the new law this objection begins to disappear and there is already to be seen striking evidence of a more liberal attitude on the part of regulative bodies.

Designed Plans for Temporary Trestles

GUESSWORK is perhaps more common in estimating temporary trestle costs and quantities than in computing the values of most other items of a construction plant. This comes largely from a habit born of the time when, in the great bulk of grading operations, timber for rough trestle building was available at inconsiderable prices and often at the price of cutting it from the adjacent forest. Those days have gone. With them has gone also any justification for extravagant practices in building construction trestles. Except in rare instances sawed timber is the only timber now available, and present prices make sawed timber almost precious, even as a material for permanent structures.

These considerations lend importance to the temporary trestle plans and quantity tables on p. 844, prepared by J. F. Herlihy. The data given apply to a wide range of conditions and are published in such form that they may be used directly from the printed page or transferred into a note book for greater convenience. It will be a gross error to assume that those drawings and tabulations represent a degree of refinement in planning construction trestles which goes beyond the practical needs of the contractor.

Timber prices now make necessary designed plans for temporary trestles. As used in most grading operations the structure is buried in the fill. Generally speaking, the salvage under all conditions of use is insignificant. Economy of material is the first result of design. Its even greater advantage is that quantities can be known precisely. This is of great practical importance, first to the estimator in fixing bidding prices, and second to the purchasing agent, who may thus make his mill orders and shipping directions definite and issue them in time to allow for possible delays in delivery.

A collateral advantage of designed plans for construction trestles is that the field superintendent knows exactly the kind of structure which he has to frame and erect and can systematize and standardize the construction procedure so as to minimize time and cost. To the home office is given the reasonable certainty that, however far afield the operations may be, there will be no failure of the structure built, because of faulty design and construction. Finally, there is the fact not to be overlooked that another detail of contracting procedure has been raised above the fog of assumption and guesswork.

Construction Trestle Plans and Quantity Tables

Tabulations Adapted to Wide Range of Requirements Expedite Work of Estimator, Purchasing Agent and Erection Superintendent

By F. J. Herlihy
Winston Bros. Co., General Contractors, Minneapolis, Minn.

Quick estimates of the cost of temporary trestles may be made by means of the accompanying plans and quantity tables. The data apply to both narrow gage and standard gage structures and to a range of sizes which meets the demands of all ordinary operations. They have been developed from actual construction experience and are in regular use both for estimating costs and for planning grading operations in which trestles are required. There is, in fact, quite as much value, in the data, to the trestle builder in the field as to the estimator and the purchasing agent in the office.

As printed, the drawings and tables contain all the details of the original prints and may be used directly.

The plans, Figs. 1, 2 and 3, and the Tables I, II, III and IV are for trestles varying in height by multiples of 2½ ft. from 5 ft. to 40 ft. for hauling outfits consisting of 4-cu.yd. cars, dinky locomotives, and 3-ft. gage track.

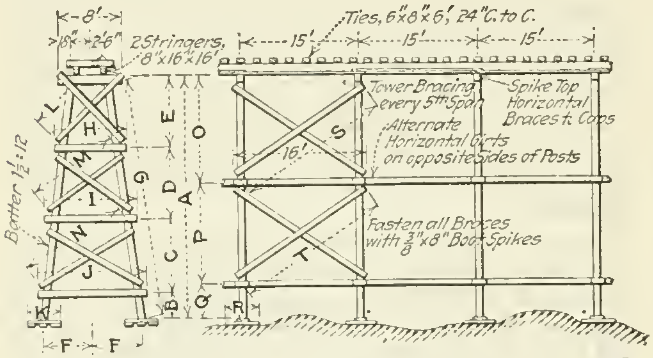

8'
18"
2'6"
2 Stringers, 8"x16"x16'
Ties, 6"x8"x6', 24" C. to C.
15'
15'
15'
Tower Bracing every 5th Span
Spike Top Horizontal Braces to Caps
Alternate Horizontal Girts on opposite Sides of Posts
16'
Fasten all Braces with 3/8"x8" Boat Spikes
Batter 1½:12
L
H
M
I
N
J
K
F
F
G
E
D
C
B
O
A
P
Q
R
S
T

FIG. 1. NARROW GAGE TRESTLE FROM 30 TO 40 FT. HIGH

The plans, Figs. 4, 5 and 6, and the Tables V, VI, VII and VIII, are for trestles of corresponding variations in height for standard gage equipment.

Table IX gives quantities per foot of trestle for both 3-ft. gage and standard gage equipment. It is useful particularly for quick cost estimating.

The data are for framed bents resting on mud sills as these are more economical ordinarily than are driven bents. In places where the foundation material encountered is too soft to give the required bearing for mud sills, either full length pile bents may be driven or short piles may be driven and capped close to the ground, and then framed bents erected on top of the caps. If the latter method is employed the plans and tables shown will still be applicable.

For the trestles shown the bents are designated as one-story, two-story and three-story bents, each set of sway bracing being considered as one story. The plans are so worked out as to use standard sizes and lengths of timber for all trestles. The plan views and details of the tops of bents shown in Figs. 3 and 4 are typical for all trestles and show those details for 4-cu.yd. and standard-gage outfits, respectively. Only fixed dimensions are shown on the plans. Variable dimensions are designated by capital letters and their values are tabulated in Tables I and V.

A minimum height of 5 ft. is taken for trestles, as it is usually more practicable to raise the track than it is to build trestles for fills which are shallower than 5 ft. It is not practicable to construct fills higher than 40 ft. from a single trestle. When higher fills are necessary and conditions will permit, they should be constructed in two or more lifts, depending upon their height, with 40 ft. as the maximum height of the trestle. When the topography is such as to make the construction of high fills in one lift necessary, special trestles designed to suit the conditions should be used.

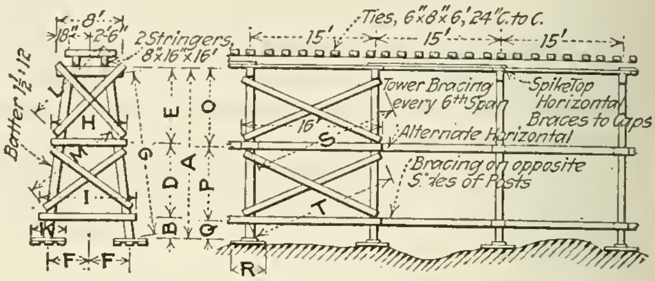

8'
18"
2'6"
2 Stringers, 8"x16"x16'
Ties, 6"x8"x6', 24" C. to C.
15'
15'
15'
Tower Bracing every 6th Span
Spike Top Horizontal Braces to Caps
Alternate Horizontal
Bracing on opposite Sides of Posts
16'
Batter 1½:12
L
H
I
K
F
F
G
E
D
B
O
A
P
Q
R
S
T

FIG. 2. NARROW GAGE TRESTLES FROM 20 TO 30 FT. HIGH

Tables II, III and IV and VI, VII and VIII show bills of material for one bent, one span and one set of tower diagonals for the different heights of trestles, tabulated for 4 cu.yd. and for standard gage outfits, respectively. For a trestle which falls between the heights designated, all material, except posts, should be ordered for the next higher trestle than the one being considered. The lengths of posts for such trestles can be ascertained by adding to or deducting from the lengths shown for posts of tabulated heights, the difference in height between the bent tabulated and the one considered. The slight error due to the inclination of the batter posts will be negligible, as extra length is provided in the tabulated lengths to allow for squaring up the ends of the posts in framing them.

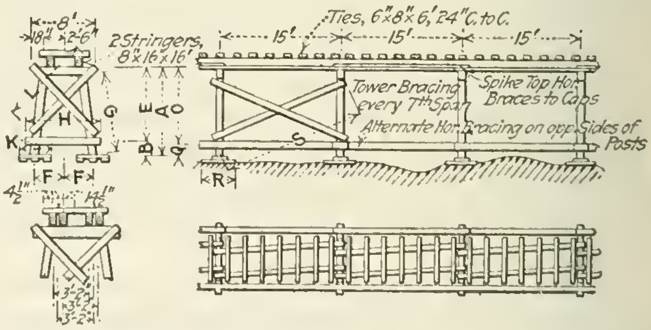

8'
18"
2'6"
2 Stringers, 8"x16"x16'
Ties, 6"x8"x6', 24" C. to C.
15'
15'
15'
Tower Bracing every 7th Span
Spike Top Hor. Braces to Caps
Alternate Hor. Bracing on opp. Sides of Posts
L
H
G
E
A
O
K
F
F
R
S
4½"
1½"
3'-2"
3'-2"
3'-2"

FIG. 3. NARROW GAGE TRESTLES FROM 5 TO 20 FT. HIGH

The construction shown is that commonly used for ordinary work. In locations where standing timber is available, or where it is cheaper or is expedient, poles or round timber of equivalent strength may be substituted for the square timber.

The 4-cu.yd. outfit trestles have bents composed of two posts, each set on a batter of 1½ in. in 1 ft. with minimum diameters of 6 in. and 8 in. at the tips and butts respectively, capped with 8 x 12-in. caps, 8 ft. long and securely braced with 3 x 8-in. sway and sash braces. The bents are founded on mud sills of two 3 x 12-in. plank 4 ft. long placed on six pieces of plank of the same dimensions, laid at right angles to the sills directly on the ground to spread the foundation. The floor consists of two 8 x 16-in. stringers 16 ft. long and eight 6 x 8-in. ties 6 ft. long for each span. The stringers are so laid that the longitudinal center line of each rail coincides with the longitudinal center line of the stringer at the center of the span, and the center between each line of stringers on adjoining spans coincides with the center line of each rail at the bents. The trestles are braced longitudinally with continuous lines of 3 x 8-in. girts 16 ft. long and 3 x 8-in. tower diagonals at the intervals shown.

The standard gage outfit trestles have bents composed of four posts each with minimum diameters of 7 in. and 10 in. at the tips and butts, respectively; the inside posts are set plumb and the outside posts are set on a batter of 1½ in. in 1 ft. The posts are capped with 12 x 12-in. caps 12 ft. long and are securely braced with 3 x 8-in. sway and sash braces. The bents are founded on 4 x 12-in. mud sills resting on eight 3 x 12-in. plank 4 ft. long laid directly on the ground. Where the topography is such as to necessitate it, these sills may be cut into short sections. The floor consists of four 8 x 16-in. stringers 16 ft. long and eight 6 x 8-in. ties 8 ft. long for each span. The trestles are braced longitudinally with continuous lines of 4 x 8-in. horizontal girts 16 ft. long and 3 x 8-in. tower diagonals at the intervals shown.

Caps for all trestles are drift bolted to posts with ¾ x 18-in. drift bolts; stringers are drift bolted to caps with ¾ x 20-in. dirft bolts; all bracing is spiked to the posts and caps with ⅜ x 8-in. boat spikes and every

TABLE I. DIMENSIONS IN FEET AND INCHES OF NARROW GAGE TRESTLES SHOWN BY FIGS. 1, 2 and 3

Mark	One-Story Bents							Two-Story Bents					Three-Story Bents				
Height	5'-0"	7'-6"	10'-0"	12'-6"	15'-0"	17'-6"	20'-0"	20'-0"	22'-6"	25'-0"	27'-6"	30'-0"	30'-0"	32'-6"	35'-0"	37'-6"	40'-0'
A	5'-0"	7'-6"	10'-0"	12'-6"	15'-0"	17'-6"	20'-0'	20-0'	22-6"	25-0	27'-6"	30'-0"	30'-0'	32'-6	35'-0"	37'-6"	40'-0"
B	1'-0"	1'-6"	1'-6'	2'-6"	3'-0"	5'-6"	5'-6"	1'-0"	3'-6"	3'-0"	1'-6	4'-0"	1-6'	1-6	1-0"	1'-6"	4'-0"
C	...	...	...	...	...	...	...	...	...	...	...	...	9'-6"	12'-0"	10'-0'	10'-0"	10'-0"
D	...	...	...	...	...	...	...	9'-0"	9'-0"	12'-0"	14'-0"	14'-0"	9-0"	9'-0'	12'-0'	14-0	14-0
E	4'-0"	6'-0"	8'-6"	10'-0"	12'-0"	12'-0"	14'-6"	10'-0"	10'-0"	10-0"	12'-0"	12'-0"	10-0	10-0"	12-0'	12'-0	12-0'
F	3'-0"	3'-3¾"	3'-7½"	3'-11¼"	4'-3"	4'-6¾"	4'-10½"	4'-10½"	5'-2¼"	5'-6"	5'-9¾"	6'-1½"	6'-1½'	6'-5¼'	6-9"	7'-0¾"	7'-4½"
G	4'-0⅜"	6'-6⅝"	9'-0⅞"	11'-7⅛"	14'-1⅜"	16'-7⅝"	19'-1⅞"	19'-1¾"	21'-8"	24-2¼"	26'-8½"	29'-2¾"	29'-2¾'	31'-9'	34-3⅛'	36'-9⅜'	39-3⅝"
H	8'-0"	8'-0"	9'-0"	9'-0"	10'-0"	10-0"	10'-0"	9'-0"	9'-0"	9'-0"	10'-0"	10'-0"	9'-0	9-0"	10-0"	10-0"	10'-0'
I	...	...	...	...	...	...	...	12'-0"	12'-0"	12'-0"	14'-0"	14'-0"	12'-0"	12'-0"	12'-0"	14'-0"	14'-0"
J	...	...	...	...	...	...	...	...	...	...	...	...	14'-0"	14'-0'	16'-0"	16'-0"	16'-0'
K	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4-0'	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
L	12'-0"	12'-0"	12'-0"	12'-0"	14'-0"	14'-0'	16'-0"	12'-0"	12'-0"	12'-0'	14'-0"	14'-0"	12'-0"	12'-0"	14'-0"	14'-0"	14'-0"
M	...	...	...	...	...	...	...	12'-0"	12'-0"	14'-0"	16'-0"	16'-0"	12'-0"	12'-0"	14'-0"	16-0"	16'-0"
N	...	...	...	...	...	...	...	...	...	...	...	...	14'-0"	16'-0'	16'-0"	16-0	16-0"
O	4'-0"	6'-0"	8'-6"	9'-6"	13'-6"	17'-0"	19-6"	9'-6"	9'-6"	9'-6"	13'-6"	13'-6"	13'-6	17'-0"	17'-0"	17'-0"	19'-6"
P	...	...	...	...	...	...	...	9'-0"	9'-0"	13'-0"	13'-0"	13'-0"	13-0'	13'-0'	16'-6"	16'-6"	19'-0"
Q	1'-0"	1'-6"	1'-6"	3'-0"	1'-6"	0'-6"	0'-6"	1'-6"	4'-0"	2'-6"	1'-0"	3'-6"	3'-6"	2'-6"	1'-6"	4'-0"	1'-6"
R	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
S	18'-0"	18'-0"	18'-0"	18'-0"	20'-0"	22'-0"	24'-0"	18'-0"	18'-0"	18'-0'	20'-0"	20'-0"	20'-0"	22'-0"	22'-0"	22'-0"	24'-0"
T	...	...	...	...	...	...	...	18'-0"	18'-0"	20'-0"	20'-0"	20'-0"	20'-0'	20-0'	22'-0"	22'-0"	24'-0'

TABLE II. BILL OF MATERIAL FOR ONE BENT OF NARROW GAGE TRESTLE

Item	One-Story Bents							Two-Story Bents					Three-Story Bents				
Height	5'-0"	7'-6"	10'-0"	12'-6"	15'-0"	17'-6"	20'-0"	20'-0"	22'-6"	25'-0"	27'-6"	30'-0"	30'-0"	32'-6"	35'-0"	37'-6"	40'-0"
8 x 12 x 8'-0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3 x 12 x 4'-0	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
3 x 8 x 8'-0	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.
3 x 8 x 9'-0	..	.	1	1		.		1	1	1	..	..	1	1	..	.	..
3 x 8 x 10'-0				.	1	1	1	..	..	..	1	1	..	..	1	1	1
3 x 8 x 12'-0	2	2	2	2	..	..	..	5	5	3	..	..	5	5	1	..	.
5 x 8 x 14'-0	..	.	..	.	2	2	..	..	..	2	3	3	3	1	4	3	3
3 x 8 x 16'-0	.	..	..	..	.	..	2	..	..	..	2	2	..	2	3	5	5
5'-0 posts	2	.	..		..	..	..	..	..	..	..	..	..	..	..	..	..
7'-0 posts	..	2	.	..	..	..	..	..	..	..	..	..	..	..	..	..	..
10'-0 posts	..		2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
12'-0 posts	..	.	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..
15'-0 posts	..	..	..	..	2	.	..	..	..	..	..	..	..	..	..	..	..
17'-0 posts	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..
20'-0 posts	..	..	..	..	..	..	2	2	..	..	..	..	..	..	..	..	..
22'-0 posts	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..
25'-0 posts	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..
27'-0 posts	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..
30'-0 posts	..	..	..	..	..	..	..	..	..	..	..	2	2	..	..	..	..
32'-0 posts	..	..	..	..	..	..	..	..	..	..	.	..	..	2	..	..	..
35'-0 posts	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..
37'-0 posts	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
40'-0 posts		..	..	.	..	..	..	..	..	..	..	..	..	..	..	..	2
¾ x 18 drift	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
⅜ x 8 spike	80	80	80	80	80	80	80	100	100	100	100	100	130	130	130	130	130

TABLE III. BILL OF MATERIAL FOR ONE SPAN OF NARROW GAGE TRESTLE

Item	One-Story Bents							Two-Story Bents					Three-Story Bents				
Height	5'-0"	7'-6"	10'-0"	12'-6"	15'-0"	17'-6"	20'-0"	20'-0"	22'-6"	25'-0"	27'-6"	30'-0"	30'-0"	32'-6"	35'-0"	37'-6"	40'-0"
8 x 16 x 16'-0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
6 x 8 x 6'-0	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
3 x 8 x 16'-0	4	4	4	4	4	4	4	6	6	6	6	6	6	6	6	6	6
¾ x 20 drift	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
⅜ x 8 spikes	50	50	50	50	50	50	50	60	60	60	60	60	60	60	60	60	60
⅜ x 9 spikes	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

TABLE IV. BILL OF MATERIAL FOR TOWER DIAGONALS FOR NARROW GAGE TRESTLE

Item	One-Story Bents							Two-Story Bents					Three-Story Bents				
Height	5'-0"	7'-6"	10'-0	12'-6"	15'-0"	17'-6"	20'-0"	20'-0"	22'-6"	25'-0"	27'-6"	30'-0"	30'-0"	32'-6"	35'-0"	37'-6"	40'-0"
3 x 8 x 18-0	4	4	4	4		..	..	8	8	4	.	.	..	..	..	..	..
3 x 8 x 20-0	.		.	..	4	.	.	..	..	4	8	8	8	4	..	..	..
3 x 8 x 22-0			.	..	..	4	.	..	..	..	..	..	..	4	8	8	..
3 x 8 x 24-0	..	.	..	..	..	..	4	..	..	..	.	.	..	..	..	..	8
x 8 spikes	50	50	50	50	50	50	50	100	100	100	100	100	100	100	100	100	100

second tie is line spiked to the stringers with ⅝ x 9-in. boat spikes. The top girt for all trestles is laid flatwise on top of the cap instead of being spiked to the side of the posts as in permanent trestles so as to provide a walkway around the hauling trains. There is often a difference of opinion as to the intervals between tower spans for trestles and as the tables show quantities for a single tower only, they are applicable no matter how many tower spans are decided upon.

All plans and tables were worked out in such a form as to serve not only the purposes of the estimator and the purchasing agent, but also to be used as finished drawings for the construction men in the field. They were originally drawn and blueprinted on sheets 4¼ x 7¾ in., which are a convenient size to put into loose-leaf binders and carry in the pocket. Table IX was of course made up for the estimator's use exclusively.

In ordering material a profile of the natural ground along the line of the trestle on which the grade line and center lines of bents are shown is the only information necessary. From this information the number of bents of the different heights may be ascertained and the unit quantities for these bents as well as for the other members of the trestle may be read directly from the tabulated quantities.

Usual construction methods are followed in the field. The bents are framed on the ground and raised to their true position, the first two by gin pole. After these two are braced, the others are raised by block and

TABLE V. DIMENSIONS IN FEET AND INCHES OF STANDARD GAGE TRESTLES SHOWN BY FIGS. 4, 5 AND 6

Mark	One-Story Bents					Two-Story Bents						Three-Story Bents			
Height	5'-0"	7'-6"	10'-0"	12'-6"	15'-0"	17'-6"	20'-0"	22'-6"	25'-0"	27'-6"	30'-0"	32'-6"	35'-0"	37 -6"	40'-0"
A	5'-0"	7'-6"	10'-0"	12'-6"	15'-0"	17'-6"	20'-0"	22'-6"	25'-0"	27'-6"	30'-0"	32'-6"	35'-0"	37'-6"	40'-0"
B	1'-0"	2'-6"	1'-0"	1'-0"	1'-0"	1'-6"	4'-0"	2'-6"	2'-0"	1'-0"	3'-6"	1'-6"	2'-6"	1'-6"	2'-0"
C												11'-0"	10'-6"	13'-0"	11'-6'
D						7'-0"	7'-0"	11'-0"	14'-0"	12'-6"	12'-6"	11'-0"	10'-6"	14'-0"	12'-6"
E	4'-0"	5'-0"	9'-0"	11'-6"	14'-0"	9'-0"	9'-0"	9'-0"	9'-0"	14'-0"	14'-0"	9'-0"	11'-6"	9'-0"	14'-0"
F	2'-0"	2'-3¾"	2'-7½"	2'-11¼"	3'-3"	3'-6¾"	3'-10½"	4'-2¼"	4'-6"	4'-9¾"	5'-1½"	5'-5¼"	5'-9"	6'-0¾"	6'-4½"
G	4'-0¾"	6'-6⅝"	9'-0⅞"	11'-7⅛"	14'-1¼"	16'-7¼"	19'-1¾"	21'-8"	24'-2¼"	26'-8½"	29'-2¾"	31'-9"	34'-3⅛"	36'-9¾"	39'-3⅝"
H	12'-0"	12'-0"	12'-0"	12'-0"	14'-0"	12'-0"	12'-0'	12'-0"	12'-0"	14'-0"	14'-0"	12'-0"	12'-0"	12'-0"	14'-0"
I						14'-0"	14'-0"	14'-0"	16'-0"	16'-0"	16'-0"	14'-0"	16'-0"	16'-0"	16'-0"
J												18'-0"	18'-0"	18'-0"	20'-0"
K	14'-0"	14'-0"	14'-0"	14'-0"	14'-0"	16'-0"	16'-0"	16'-0"	18'-0"	18'-0"	18'-0"	18'-0"	18'-0"	20'-0"	20'-0"
L	12'-0"	12'-0"	14'-0"	16'-0"	18'-0"	14'-0"	14'-0"	14'-0"	14'-0"	18'-0"	18'-0"	14'-0"	16'-0"	14'-0"	18'-0"
M						14'-0"	14'-0"	16'-0"	18'-0"	18'-0"	18'-0"	16'-0"	16'-0"	18'-0"	18'-0"
N												18'-0"	18'-0"	20'-0"	20'-0"
O	4'-0"	6'-6"	9'-0"	9'-6"	13'-6"	13'-6"	17'-0"	9'-6"	13'-6"	13'-6"	13'-6"	17'-0"	17'-0"	17'-0"	19'-6"
P								9'-0"	9-0"	13'-0"	13'-0"	13'-0"	16'-6"	16'-6"	19'-0"
Q	1'-0"	1'-0"	1'-0"	3'-0"	1'-6"	4'-0"	3'-0"	4'-0"	2'-6"	1'-0"	3'-6"	2'-6"	1'-6"	4'-0"	1'-6"
R	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
S	18'-0"	18'-0"	18'-0"	18'-0"	20'-0"	20'-0"	22'-0"	18'-0"	20'-0"	20'-0"	20'-0"	22'-0"	22'-0"	22'-0"	24'-0"
T								18'-0"	18'-0"	20'-0"	20'-0"	20'-0"	22'-0"	22'-0"	24'-0"

TABLE VI. BILL OF MATERIAL FOR ONE BENT OF STANDARD GAGE TRESTLES

Description	One-Story Bents					Two-Story Bents						Three-Story Bents			
Height	5'-0"	7'-6"	10'-0"	12'-6"	15'-0"	17'-6"	20'-0"	22'-6"	25'-0"	27'-6"	30'-0"	32'-6"	35 -0"	37'-6"	40'-0"
12"x12"x12'-0" caps	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4"x12"x14'-0" sills	1	1	1	1	1	1									
4"x12"x16'-0" sills							1	1	1	1					
4"x12"x18'-0" sills											1	1			
4"x12"x20'-0" sills													1	1	1
3"x12"x 4'-0" sills	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
3"x 8"x12'-0" brace	4	4	2	2		2	2	2	2			2	2	2	
3"x 8"x14'-0" brace			2		2	6	6	4	2	2	2	4	4	2	2
3"x 8"x16'-0" brace				2				2	2	2	2	2	2	2	2
3"x 8"x 18'-0" brace					2				2	4	4	4	4	4	4
3"x 8' x 20'-0" brace														2	4
5'-0"/9 posts	4														
7'-0"/9 posts		4													
10'-0"/9 posts			4												
12'-0"/9 posts				4											
15'-0"/9 posts					4										
17 -0' /9 posts						4									
20'-0"/9 posts							4								
22'-0"/9 posts								4							
25'-0"/9 posts									4						
27'-0"/9 posts										4					
30'-0"/9 posts											4				
32'-0"/9 posts												4			
35 -0"/9 posts													4		
37'-0"/9 posts														4	
40'-0"/9 posts															4
¾"x18" D bolts	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
⅝"x8" B spikes	120	120	120	120	120	200	200	200	200	200	200	260	260	260	260

TABLE VII. BILL OF MATERIALS FOR ONE SPAN OF STANDARD GAGE TRESTLE

Description	One-Story Bents					Two-Story Bents						Three-Story Bents			
Height	5'-0"	7'-6"	10'-0"	12'-6"	15'-0"	17'-6"	20'-0"	22'-6"	25'-0"	27'-6"	30'-0"	32'-6"	35'-0"	37'-6"	40'-0"
8"x16"x16'-0" stringers	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
6"x 8"x 8'-0" ties	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
4"x 8"x16'-0" brace	4	4	4	4	4	6	6	6	6	6	6	6	6	6	6
¾"x20" D bolts	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
⅝"x 8" B spikes	50	50	50	50	50	60	60	60	60	60	60	60	60	60	60
⅝"x 9" b.n. spike	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

TABLE VIII. BILL OF MATERIAL FOR TOWER DIAGONALS OF STANDARD GAGE TRESTLE

Description	One-Story Bents					Two-Story Bents						Three-Story Bents			
Height	5'-0"	7'-6"	10'-0"	12'-6"	15'-0"	17'-6"	20'-0"	22'-6"	25'-0"	27'-6"	30'-0"	32'-6"	35'-0"	37'-6"	40'-0"
3"x8"x18'-0" brace	4	4	4	4				8	4						
3"x8"x20'-0" brace					4	4	4		4	8	8	4			
3"x8"x22'-0" brace												4	8	8	
3"x8"x24'-0" brace															8
⅝"x8"B. spike	50	50	50	50	50	50	50	100	100	100	100	100	100	100	100

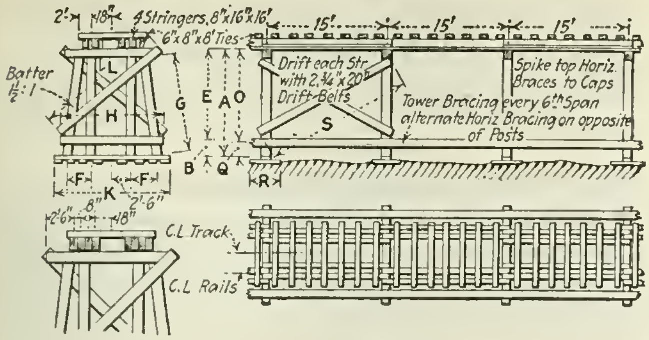

2'
18"
4 Stringers, 8"x16"x16'
6"x8"x8' Ties
15'
15'
15'
Batter ½:1
L
H
G
E
A
O
Drift each Str. with 2¾"x20" Drift-Bolts
S
Tower Bracing every 6th Span alternate Horiz. Bracing on opposite of Posts
Spike top Horiz. Braces to Caps
B
Q
R
F
K
F
2'-6"
2'-6"
8"
18"
C.L Track
C.L Rails

FIG. 4. STANDARD GAGE TRESTLES FROM 5 TO 15 FT. HIGH

tackle attached to the next previously erected bent. As temporary trestles are built for utility only, and as they will be buried soon after they are built, no expense should be incurred for æsthetic features. The only materials recoverable are the ties and stringers which may be removed on completion of the fill and used again elsewhere. Where longitudinal bracing interferes with the ends of transverse bracing at connections to the posts, the corners of the transverse bracing may be trimmed off with axes, or, where the interference is slight, the longitudinal bracing may be raised or lowered a trifle to clear the transverse bracing.

Economy may be accomplished in the construction of trestles for very long fills, in some instances by furnishing only enough stringers to take care of the dumping area of the trains and building the fills up to grade progressively from one end. In this manner the stringers may be removed from the finished fill as it is completed and shifted ahead, thus keeping to a minimum the stock of stringers to be carried. Great care should be taken, however, when fills are constructed in this manner to maintain a very flat slope on the face of the fill or the material will slide forward and force the trestle out of line. Except for very long fills it will generally be found more economical to furnish enough stringers to build the trestle complete, which will enable the building up of the fill in uniform layers across the entire opening, thus preventing any crowding of the trestle out of line, which is a serious matter. The extra expense of constructing a trestle, strong enough to carry the locomotives, complete at the outset is usually more than compensated for by the elimination of the troubles encountered by dumping from the shoulder from a partially completed structure.

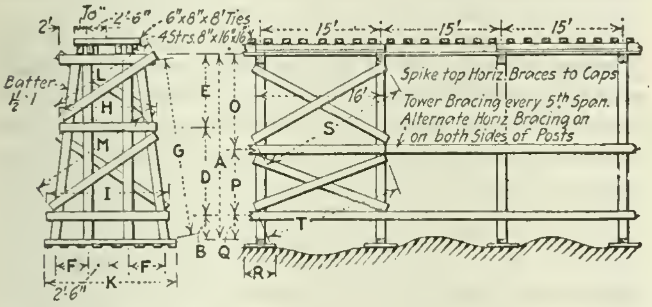

2'
To"
2'-6"
6"x8"x8' Ties
4 Strs. 8"x16"x16'
15'
15'
15'
Batter ½:1
L
H
M
I
E
O
G
A
D
P
16'
S
T
Spike top Horiz. Braces to Caps
Tower Bracing every 5th Span. Alternate Horiz. Bracing on both Sides of Posts
B
Q
R
F
K
F
2'-6"

FIG. 5. STANDARD GAGE TRESTLES 17½ TO 30 FT. HIGH

TABLE IX. QUANTITIES OF MATERIAL PER LINEAR FOOT OF NARROW AND STANDARD GAGE TRESTLE

Description	Height Trestle	Poles, Lin. Ft.	Caps, M. Ft.	Stringers, M. Ft.	Ties, M. Ft.	Bracing, M. Ft.	Hard ware lb.
		4-Yard Outfit					
1-Story Bent	5'-0"	0.70	0.005	0.023	0.012	0.022	4.50
	7'-6"	0.98	0.005	0.023	0.012	0.022	4.50
	10'-0"	1.40	0.005	0.023	0.012	0.022	4.50
	12'-6"	1.68	0.005	0.023	0.012	0.022	4.50
	15'-0"	2.10	0.005	0.023	0.012	0.023	4.50
	17'-6"	2.38	0.005	0.023	0.012	0.023	4.50
	20'-0"	2.80	0.005	0.023	0.012	0.025	4.50
2-Story Bents	20'-0"	2.80	0.005	0.023	0.012	0.032	5.30
	22'-6"	3.08	0.005	0.023	0.012	0.032	5.30
	25'-0"	3.50	0.005	0.023	0.012	0.034	5.30
	27'-6"	3.78	0.005	0.023	0.012	0.034	5.30
	30'-0"	4.20	0.005	0.023	0.012	0.034	5.30
3-Story Bents	30'-0"	4.20	0.005	0.023	0.012	0.039	6.10
	32'-6"	4.48	0.005	0.023	0.012	0.040	6.10
	35'-0"	4.90	0.005	0.023	0.012	0.042	6.10
	37'-6"	5.18	0.005	0.023	0.012	0.042	6.10
	40'-0"	5.60	0.005	0.023	0.012	0.043	6.10
		Standard Gage Outfit					
1-Story Bent	5'-0"	1.40	0.011	0.046	0.018	0.031	6.55
	7'-6"	1.96	0.011	0.046	0.018	0.031	6.55
	10'-0"	2.80	0.011	0.046	0.018	0.031	6.55
	12'-6"	3.36	0.011	0.046	0.018	0.032	6.55
	15'-0"	4.20	0.011	0.046	0.018	0.033	6.55
2-Story Bents	17'-6"	4.76	0.011	0.046	0.018	0.045	8.50
	20'-0"	5.60	0.011	0.046	0.018	0.046	8.50
	22'-6"	6.16	0.011	0.046	0.018	0.048	8.60
	25'-0"	7.00	0.011	0.046	0.018	0.049	8.60
	27'-6"	7.56	0.011	0.046	0.018	0.051	8.60
	30'-0"	8.40	0.011	0.046	0.018	0.051	8.60
3-Story Bents	32'-6"	8.96	0.011	0.046	0.018	0.060	10.70
	35'-0"	9.80	0.011	0.046	0.018	0.060	10.70
	37'-6"	10.36	0.011	0.046	0.018	0.062	10.70
	40'-0"	11.20	0.011	0.046	0.018	0.065	10.70

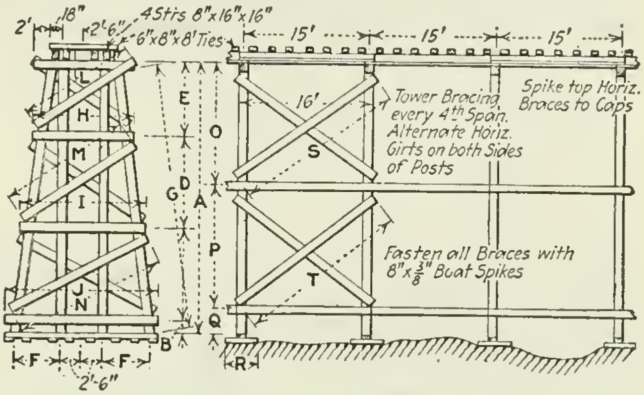

2'
18"
2'-6"
4 Strs 8"x16"x16"
6"x8"x8' Ties
15'
15'
15'
L
H
M
I
J
N
E
O
D
G
A
P
16'
S
T
Tower Bracing every 4th Span. Alternate Horiz. Girts on both Sides of Posts
Spike top Horiz. Braces to Caps
Fasten all Braces with 8"x⅜" Boat Spikes
B
Q
R
F
F
2'-6"

FIG. 6. STANDARD GAGE TRESTLES FROM 32½ TO 40 FT. HIGH

Breaking Ice from Water Tank by Rifle Shots

Ice that had formed on the outside of a new elevated water tank, and on a staging left for use in painting the tank, was shot away in small pieces by firing 600 rounds of soft-nosed bullets from a 44-caliber Winchester rifle, according to a statement by D. C. Winsor in the *Quarterly of the National Fire Protection Association* (Boston, Mass.) for October, 1919. The tank has a capacity of 50,000 gal., and is supported by a 90-ft. steel tower. The tank had been erected to replace an old one during the severe winter weather of 1918. After water had been turned in, a small piece of wood lodged in the check valve on the supply pipe, so the tank overflowed and a large amount of ice attached to the combined structure was formed. As to this ice and its effect on the structure, Mr. Winsor writes: "It is estimated by the tank builders that the extra weight carried by the structure for the time mentioned probably amounted to about 15% or 62,500 lb. extra dead weight. The extra area exposed to wind pressure probably increased the wind load 25%, hence the factor of safety tank trestle was about 3.4 for the posts. Some struts and wind braces had even a smaller factor of safety, owing to the unevenness of the distribution of the extra ice load." Although the ice was in position for about a week, it does not appear, Mr. Winsor states, that it did any damage to the tank or tower.

Complete Vote on Am. Soc. C. E. Questionnaire

In the accompanying table is given the complete vote, by districts, of the American Society of Civil Engineers upon the Questionnaire based on the report of the Development Committee and sent out to the membership in the form of a letter ballot which was canvassed April 14. The figures are from the canvassing committee's official report to the Board of Direction. Of a total of 4,026 ballots received 3,913 were valid. The 113 ballots excluded from the count consisted of 12 unsigned; 3 letters or telegrams asking the secretary to cast ballot; 50 from members in arrears of dues; 5 from persons not entitled to vote; and 43 with lettered, instead of written signatures. The committee reports that the 43 ballots excluded for lack of written signatures were:

Question	Yes	No
A-1	30	14
A-2	30	13
A-3	18	23
B 1	36	5
2	33	8
3	36	6
4	30	10
5	30	13
6	25	16
7	11	30

For the information of readers in studying the returns the following description of the geographical location of the Society's "districts" and the number of corporate members in each is appended:

District 1—50-mile radius, N. Y. City (1,248), all outside North America (933). Total corporate members, 2,181.

District 2—Maine (36), New Hampshire (25), Vermont (5), Massachusetts (355), Rhode Island (38). Connecticut (110), New Brunswick (6), Nova Scotia (1). Total corporate members, 576.

District 3—N. Y. State (395), Quebec (62). Total, 457.

District 4—Eastern Pennsylvania (441), Maryland (138), New Jersey (76), Delaware (26). Total, 681.

District 5—District of Columbia (310), Virginia (215), North and South Carolina (114), Georgia (84), Florida (60). Total, 783.

District 6—Western Pennsylvania (240), West Virginia (60), Ohio (321). Total, 621.

District 7—Ontario (54), Michigan (147), Wisconsin (60), Minnesota (111), Manitoba (7), Iowa (60). Total, 439.

District 8—Illinois (397), Indiana (57), Kentucky (36), Tennessee (72). Total, 562.

District 9—Alabama (83), Mississippi (30), Louisiana (71), Arkansas (32), Missouri (205). Total, 421.

District 10—Oklahoma (33), Kansas (55), Colorado (86), Utah (39), Nebraska (38), Wyoming (21), North and South Dakota (15), Montana (50), Saskatchewan (2), Alberta (12). Total, 351.

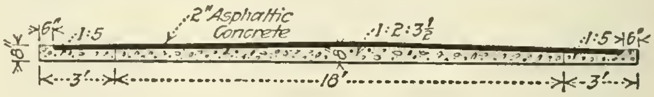
District 11—Texas (182), Mexico (28), New Mexico (12), Arizona (26), Southern California (197). Total, 445.

District 12—British Columbia (15), Idaho (37), Washington (148), Oregon (86), Alaska (12). Total, 298.

District 13—Northern California (398), Nevada (9). Total, 398.

Old Concrete Road Widened at Low Cost

An old concrete road in Milwaukee County, Wis., constructed of pit-run gravel in 1912, was cheaply widened last year by adding two side strips of concrete and surfacing the whole pavement with 2 in. of asphaltic concrete. It cost about $1.50 a square yard to construct the side strips, and the surfacing, performed under two contracts at different prices, averaged in cost about $1.17½ a square yard. From the old concrete road 18 ft. wide in bad condition a 24-ft. road of asphaltic concrete on a cement base was secured at an average cost of a little more than $1.50 a square yard.



As originally constructed the concrete slab was 8 in. thick at the center and 6 in. thick at the sides. It was widened 3 ft. on each side with a slab of 1 : 5 pit gravel concrete. A curb 2 in. high and 6 in. wide finished the edge off each slab. With the 2-in. surfacing a practically new pavement, 24 ft. wide, 10 in. thick at the center and 8 in. thick at the edges, was obtained.

The new construction was begun by plowing up the shoulder on one side of the original road to a width required for the 3-ft. slab. The loosened soil was shoveled out and spread to form the new shoulder. Then the bottom of the excavation was hand tamped and concreting begun. For this a one-bag batch paving mixer was employed. When this side slab was completed the operation, working in the reverse direction, was repeated to construct the other side slab. By this procedure the concreting was performed with only half of the road closed to traffic. The asphaltic surfacing was laid to full width in one operation but as this material was in condition in 36 hr. to carry the traffic the surfacing interrupted only slightly the use of the road.

There were 1$\frac{1}{10}$ mi. of road widened and the work was completed in six weeks, placing the concrete slab by force account, and the surfacing by contract. The gang placing the slabs averaged about 22 men, five men grading, two setting forms and 15 men placing the concrete.

AM. SOC. C. E. BALLOTS CANVASSED UPON QUESTIONNAIRE

	A. 1		A. 2		A. 3		B. 1		B. 2		B. 3		B. 4		B. 5		B. 6		B. 7	
District	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No.
1. Resident	472	288	568	192	214	572	484	219	488	236	568	176	411	322	409	331	518	223	460	267
1. Foreign	41	15	46	9	21	35	37	11	39	14	43	9	30	22	29	23	35	17	20	33
2	217	52	241	26	134	135	213	41	198	62	218	37	182	77	179	74	186	76	98	153
3	143	144	160	126	73	215	161	108	156	121	200	82	138	138	138	138	115	174	66	220
4	358	26	356	27	273	108	346	26	334	42	346	35	317	57	312	67	307	73	173	202
5	178	57	194	43	111	126	174	42	171	57	197	33	145	80	164	65	154	82	94	138
6	306	70	324	55	237	134	308	46	302	61	332	39	288	79	300	69	284	87	116	246
7	220	36	222	33	169	84	217	30	222	29	240	16	206	44	211	42	195	58	108	139
8	223	47	238	33	121	150	211	39	216	48	238	31	191	73	196	67	188	73	126	129
9	130	47	143	33	91	94	136	37	133	41	146	32	117	56	126	50	144	60	91	83
10	135	36	139	32	89	82	129	31	139	27	152	15	119	49	126	39	105	60	66	101
11	196	38	204	31	149	85	195	27	191	37	207	24	175	53	177	51	162	65	132	97
12	129	20	130	20	89	58	122	16	126	20	131	18	116	29	116	28	98	50	66	80
13	141	34	150	25	96	76	131	38	139	36	158	20	126	51	130	47	122	51	85	88
Total	2,889	910	3,115	685	1,867	1,954	2,864	711	2,854	831	3,176	567	2,561	1,130	2,613	1,091	2,583	1,149	1,701	1,976
Majority	1,979		2,430	....	....	87	2,153	...	2,023	....	2,609	...	1,431	...	1,522	...	1,434		....	275

House Committee Condemns Army Camp Construction

Majority Report Alleges Loss of Millions Due to Waste, Inefficiency and Cost-Plus Form of Contract

SELECT Committee on Expenditures in the War Department has submitted to the House of Representatives a report of Subcommittee No. 2, on camps, as its own report on the investigation which has been held for some months into the construction of the draft army cantonments which were built in the summer of 1917. The report, which is not signed, is accompanied by a minority report signed by Representatives Flood, Doremus, Donevan and Lea, all Democrats. The majority report is a scathing criticism of the whole method and practice of building the camps, including an indictment of the cost-plus contract as the cause of waste and profiteering, together with recommendations for a method of conducting similar work in future emergencies. The minority defend the methods and men criticized and disagree generally with the report.

The object of the investigation was "to inquire not only into the legality or illegality, but also to the propriety or impropriety and recklessness of the expenditures and to determine whether the contracts and system under which such expenditures have been made were made necessary by reason of the emergency existing, or whether they should be condemned and expressly prohibited in any future emergency which should arise." To this end the committee had many hearings and listened to testimony from many men, from workmen on the camps up to the responsible heads of the bureaus and committees concerned, all of which it is stated, is contained in supplementary documents. Such quotations or abstracts as are quoted are mainly from those whose testimony backs up the findings of the majority. The printed document contains 174 of the regular Congressional document octavo pages.

The first concern of the committee was as to the authority of the Council of National Defense to constitute the Emergency Construction Committee, of which Col. W. A. Starrett, the New York architect, soon became head, and which, in effect, formulated the policy of camp construction and contracts. It finds that the intention of Congress was "perverted from its clear intention and transcended, particularly in matters relating to construction work." It finds, further, that the Emergency Construction Committee usurped the functions of the Cantonment Division, then a part of the Quartermaster Corps of the Army, and that this usurpation consisted mainly in establishing a cost-plus form of contract and in selecting the contractors without the usual governmental form of calling for competitive bids. Specific charges are made that the committee, itself made up of architects, engineers and contractors (with one Army engineer who, in the language of the report, "was too busy to attend" the meetings of the committee), called into its deliberations hundreds of other contractors and that "many of the contractors who received the most lucrative fees did take part in the discussions and help formulate the contract, so far as the fee and what was to be done for it were concerned." More than mere insinuations are made that some of the committee, through relatives or firm affiliations, benefited by contracts.

The cost-plus form of contract as used in the cantonment construction is criticized in detail in that it did not provide adequate supervision over audits, permitted undue extension of overhead charges, and gave exorbitant fees for what was practically personal service inasmuch as the Government paid separately for plant and organization. Its method of award, it is claimed, permitted favoritism.

The committee cites the various arguments made in favor of the cost-plus contract, but denies their validity. It denies that the method led to increased speed in construction, but caused delay in the initiation of the work, its progress and its completion. This delay was due to the time consumed in formulating the contract, in surveying the contractor field "instead of calling contractors in promptly to bid competitively," neglecting any bonus for speed, loss of time due to decreased morale of the workmen and the indifference of the contractor in getting a fair day's work and recklessness with men and material, for the cost of which the contractor was not responsible.

Claims that lump-sum bids could not be taken because of the inadequacy of the early designs of the camps are not accepted by the report. It states that most of the work was the repetitive building of a simple frame barracks and that a design for an adequate building of this sort had long been prepared by the Army. Bids could have been taken for these as units, and the sewer, water and other public services let on a unit price basis. There is an alternative suggestion in an isolated part of the report that the Corps of Engineers could have gone in on every site and started work on a day-labor basis until such time as the plans could be sufficiently developed to permit lump-sum bidding when the work could have been turned over to the successful contractor.

The committee takes no stock in the claim that "the fluctuations of the material market and of the wage scale were such that no responsible concern would have bid, or even if they had bid that their bids would have been unreasonable." It had testimony from some contractors that they were ready and willing to bid for the construction of the cantonments according to the lump sum or unit price method. One such contractor testified that he would have built Camp Grant (one of the two camps examined in detail by the committee) for $9,000,000 as against the $13,000,000 it actually cost.

The major part of the report is given over to proofs of the waste and inefficiency of the camp construction, taken mostly from testimony of workmen on the two camps investigated These charges consist mostly in specific descriptions of loafing, double-pay taking, material wasting, misdirected effort, etc., which came under the observation of the witness Mainly as a result of this testimony, the committee finds "that one of the most far-reaching and serious results of the cost-plus system was the utter demoralization of labor, both skilled and unskilled," a condition which "still continues, and no end thereof nor relief is in sight." The report hastens to add, however, that "generally, organized labor took a reasonable view of the situation, and at times tendered its services to better conditions, which apparently were refused, when tendered."

As a result of the waste and inefficiency revealed it is the conclusion of the committee that the cantonments cost from 40 to 60 per cent more than they should, or that about $80,000,000 could have been saved.

It specifically finds Secretary of War Newton D. Baker responsible for the "entire situation resulting, including violations of law, defrauding, waste, losses and delay," and Col. W. A. Starrett, with his associates on the Emergency Construction Committee, responsible for introducing the criticized policies and for the methods of their administration. The committee recommends that the legal departments of the Government should forthwith proceed to recover from those who received undue amounts of money for the cantonment work, but specifies only a few minor instances of dereliction.

The committee recommends that legislation be enacted prohibiting any Government construction being done on a cost-plus basis, either in emergency or normal times, and that Congress make provision to place all engineering and construction work for the Army under the Corps of Engineers. It states that in its opinion the Construction Division, as now constituted, appears to be in sympathy with the contractors in theory and fact. Finally it recommends an amendment to the Constitution of the United States "to make profiteering in war times treason."

The Minority Report

The minority report defends the adoption of the cost-plus contract in the emergency. It states that "the clear weight of the testimony is that the usual method of advertising for bids and awarding contracts to the lowest responsible bidder on a lump-sum or fixed-cost basis was not only impossible but would, if adopted, have resulted in disaster to this vital construction program. It must be remembered that the plan which is so severely condemned by the majority was successful in accomplishing the object in view. If a different plan had been adopted, and had failed, our troops would have reached the camps without shelter, heat, water or sanitation. Such a hazard was unthinkable. The only way in such an emergency was the sure way." It further contends that statements of what bids would have been, made two years after construction started, are worthless.

The minority defends the form of contract and the method of its formulation. It believes that a great number of responsible Government officials were concerned in deciding upon the contract and that under the conditions existing their collective judgment was unanimous and justified. It further thinks that the Government was amply safeguarded against loss, insofar as could be foreseen. Bonuses, it contends, were impossible in a contract the time or quantity of which could not be predicted.

A large part of the minority report is given over to the professional records of the men criticized by the majority and a defense of their actions. Particularly does the minority defend the calling in of construction experts to advise on the provisions of a construction contract and on the methods of carrying it out. It claims that the camps were finished in a marvelously short time and without undue cost, considering the times. The wastes cited by the witnesses were specific and minor in the particular, and bore only a small proportion to the enormous cost of the projects. Testimony was heard to the effect that up to 50 per cent of the lumber had been wasted at Camp Sherman. Actual figures show that all but 10 per cent of the lumber delivered is accounted for in the structures.

The final opinion of the minority is that "the Secretary of War was amply justified in abandoning the usual peace-time method of awarding contracts upon competitive bidding and in substituting for it the so-called cost-plus system for cantonment construction" and that "if the views of the majority had been adopted at the beginning of the war, the whole building program would have been in a state of chaos, many of our troops would have perished with cold or died of disease in the winter of 1917, and the German Army would have been in Paris before our soldiers could have entered the battle lines."

Alaska Railway Work for Season of 1920

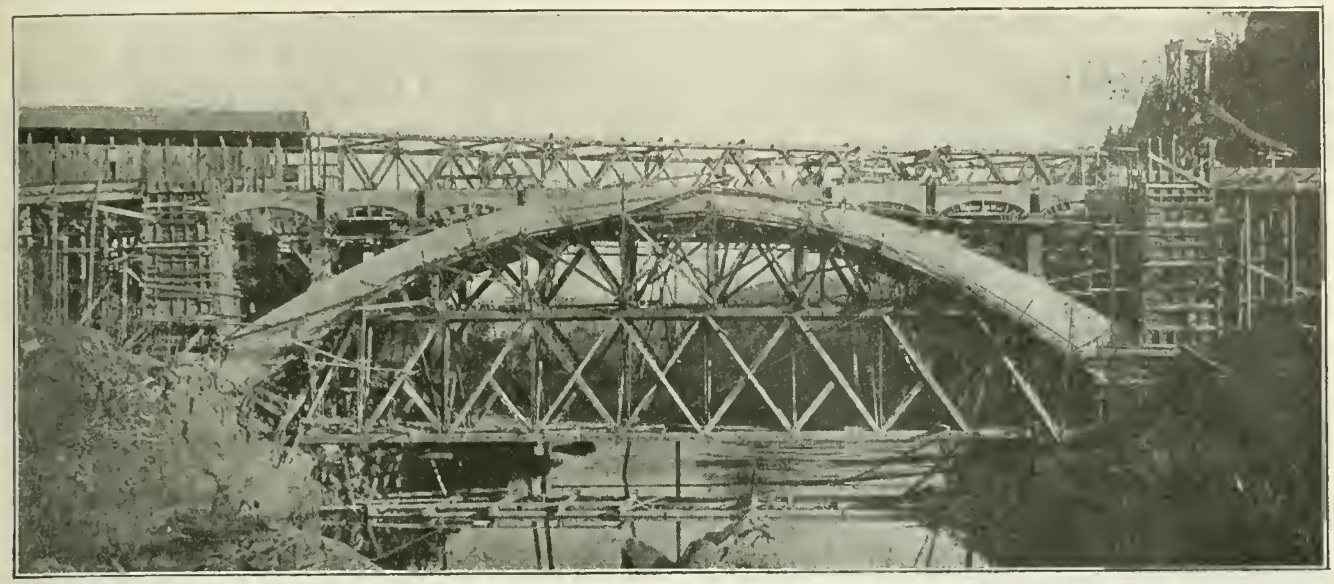
CONSTRUCTION and preparatory work for the season of 1920 on the southern and northern sections of the Alaska Government Ry., as outlined by Col. Frederic Mears, chairman and chief engineer, Alaskan Engineering Commission, includes heavy bridges and rock-cut work, as well as new grading and repair of old grades. A map of the Alaska Ry., extending northward from Seward 470 miles to Fairbanks and from that point 39 miles to Phalaluka was shown in *Engineering News-Record* Jan. 2, 1919, p. 46, indicating progress to that time.

The contract has been let for the 504-ft. truss span over the Susitna River, 265 miles north of Seward. Examinations are being made for the foundations of the Hurricane Gulch steel arch bridge 284 miles north of Seward, which will be the northern limit of operation for the southern division this year. It was necessary to start excavation at this point early in the season owing to the heavy yardage in the approach cut. Several miles of sidehill grading work will be carried out by steam shovel along the Susitna River. North of this work, in the same locality, about 24 miles of regrading are required to repair the old grade which has deteriorated badly at several points owing to its abandonment in 1917-18. Distribution of supplies and materials from the present end of track, 237 miles north of Seward, for a distance of 38 miles northward was carried out during the winter months by sledding over frozen roads.

On the northern division construction will be confined to Nenana Canyon, over a distance of about 10 miles, 120 miles south of Fairbanks, from the present end of track. Here engineers have been assigned to construction sections and six station gangs have made contracts for heavy rock-cut work.

Aërial Tramways for India

Projects for the construction of aërial tramways of ropeways for public traffic in India are under consideration by the Government Railways Board. In the Board's report for 1919 it is stated that this system of transportation is well established in India for mining and other private industrial enterprises, but has not been used for public service. It is considered that experience in other countries has proved this system suitable for the opening up of mountainous districts where the cost of railways or roads would be prohibitive, and there is a wide field for its employment for this purpose in India. As there is difficulty in securing engineers with experience in this line of work, the Board is arranging to have an officer trained specially in aerial tramway construction.



Truss Centering Used for 113-Ft. Concrete Arch

Timber Howe Truss Adopted Instead of Falsework Because of Depth of Water in Channel of Rogue River Bridge

By C. B. McCullough

Bridge Engineer, Oregon State Highway Commission, Salem, Ore.

Owing to the depth of water in the channel of the Rogue River at Rocky Point, Ore., where a 113-ft. concrete arch bridge was to be built, it was decided that a trestle type of falsework was impracticable and instead a timber Howe truss, centering support was used. The view and details herewith show the construction. The arch centering was carried on two 96-ft. trusses, one to each arch rib, each truss being swung from a bank. Stresses and deflections were computed as shown in Fig. 1, and the falsework camber adjusted accordingly. Concreting on the right arch rib was commenced at 10:50 a.m., Nov. 6, 1919, and was finished the same day at 5 p.m. The left arch rib was begun at 8:30 a.m., Nov. 8, and finished at 4:15 p.m. the same day. A comparison between the computed deflection and the actual measured deflection immediately after concreting, and also after the concrete had been in place 15½ hr. is shown above. No further settlement was observed.

The trussed centering was very carefully braced and gone over immediately before concrete was poured; the end posts and end panels of the lower chord were braced at their mid points transversly and the entire framework strutted in such a manner as to eliminate to the maximum possible extent cross bending due to column action. Concreting operations were very carefully watched and the agreement between theoretical and calculated deflection was as close as could possibly be desired.

The general features of the design for this structure and description of the keyways which were contemplated for anchorage of the rib bars against negative bending stresses at the skewback, appeared in *Engineering News-Record* Nov. 27-Dec. 4, 1919, p. 924.

The method for anchorage therein described was modified somewhat during construction, owing to the disclosure, after excavation had developed, of several fissures in the rock which appeared to render any anchorage by the method contemplated more or less uncertain. It was therefore decided to excavate beyond the original keys into the solid rock and to grout in place at each skewback four 2½-in. swedge bolts. These bolts were given a length sufficient to insure a penetration into the solid rock of 5 ft. and were hooked around 2½-in. round transverse bars, computed to carry the

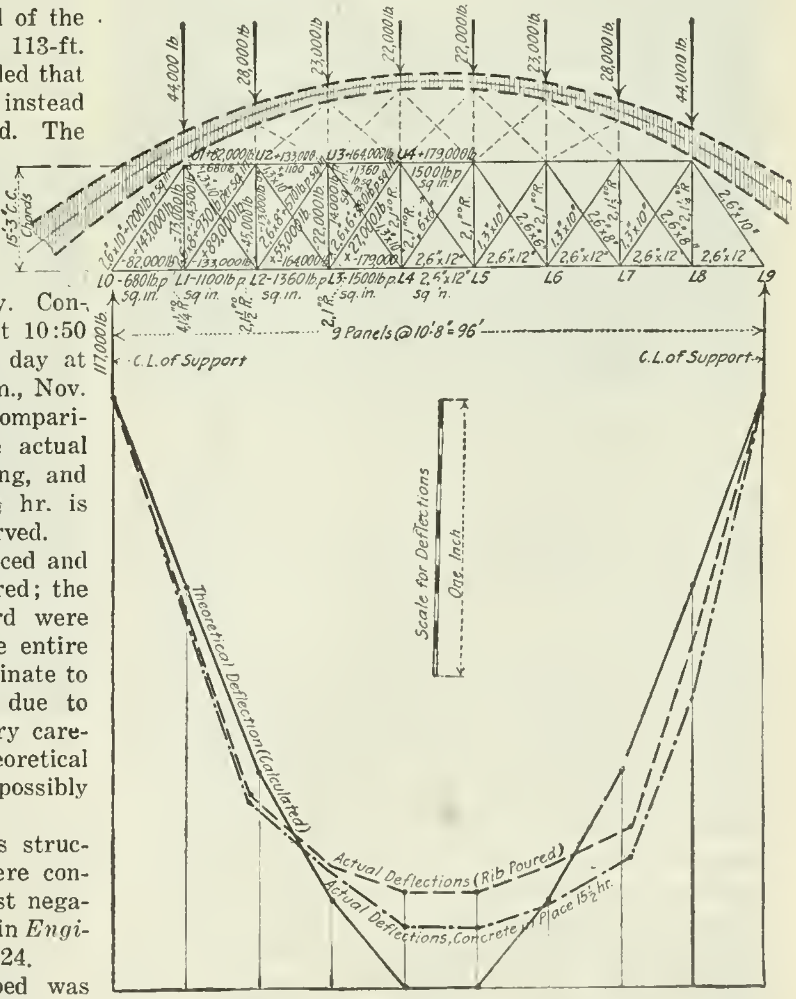


FIG. 1. STRESSES AND DEFLECTIONS IN HOWE TRUSS CENTERING FOR ROGUE RIVER ARCH

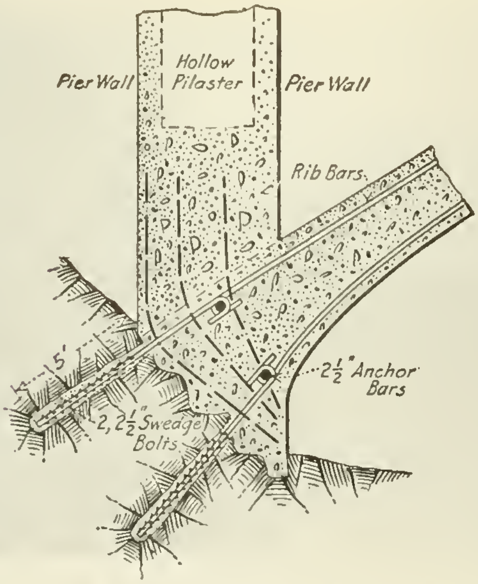


FIG. 2. TYPICAL ABUTMENT DETAIL AS BUILT IN ROGUE RIVER ARCH

bending strain due to the tension on the rib bars. The rib bars in turn were hooked around these anchor bars and a slight tension taken on the same as pouring commenced. The method of anchorage finally adopted is given in Fig. 2.

Metering Federal Government Buildings

Progress in metering Government water service in the District of Columbia is being made, according to the 1918-19 annual report of M. C. Tyler, Colonel of Engineers, U. S. A., in charge of the Washington Aqueduct and District of Columbia filtration plant. During the year meters were installed on a number of Government buildings, including the Patent Office and White House, and on 92 parks and reservations. Colonel Tyler says: "The District engineer points out the impossibility of determining in advance the needs of the District without records as to the consumption of Federal buildings, and also the difficulty of fixing the responsibility for the waste of water where large consumers have a wholly unmeasured supply." As indicating the huge consumption and the possible economies that might be brought about in Government buildings, even when metered, the report states that for the last fiscal year the average daily consumption at the Government Printing Office was 2,527,300 gal. This large use is due to the use of filtered water for condensing purposes, which might be reduced by supplying the printing office with power either from the new central power plant or from the capitol power plant, both of which use untreated river water for condensing, or a reduction in consumption might be brought about by installing cooling towers in the building. The report adds that "this method is not always entirely satisfactory in operation." Any one of the methods suggested, the report states, would reduce the water consumption at the Government Printing Office from 2,527,300 gal. to an estimated 550,000 gal. a day. At 5½c. per 1,000 gal. this would amount to $39,694 a year, besides which the District would be saved "its present heavy expense for pumping condensing water through the sewers."

Progress and Costs on Erie, Pa. Flood Control Project

Mill Creek Which Flooded City in 1915 Enclosed in Concrete Tube—Bids Varied Due to War Conditions

By Farley Gannett
Gannett, Seelye & Fleming, Engineers, Harrisburg, Pa.

CONSTRUCTION of the flood protection works at Erie, Pa., involving the covering of Mill Creek flowing through the city, is progressing favorably. Work has been carried on continuously since the initiation of the project, although the rising costs, due to war-time conditions, have materially changed the original estimates. An analysis of these changing costs gives an interesting commentary on the difficulties of carrying out public work today. A description of the engineering features of the project appeared in *Engineering Record*, Oct. 9, 1915, p. 440 and *Engineering News*, Nov. 11, 1915, p. 937.

Mill Creek enters Erie at its southern limits and flows north through the city, discharging into Lake Erie by way of Presque Isle Bay. On August 4, 1915, this ordinarily mild little creek of twelve square miles of drainage area, overflowed its banks and caused a loss of thirty-four lives and several million dollars of property, repeating an offense which has recurred at about twenty-year intervals for many years of the city's life.

Following a thorough study of the situation an engineering report was submitted to the city recommending the construction of detaining dams south of the city and a concrete tube to carry the resultant regulated flow. An alternative plan in the same report was to construct a concrete tube to carry the entire flow of the creek. Although the recommended plan was cheaper, the unfortunate fear which exists in many communities regarding dams brought about the adoption of the alternative plan.

COMPLETED 22 x 18-FT. TUBE CARRYING MILL CREEK THROUGH CITY OF ERIE, PA.

The adopted plan called for the construction of a concrete tube of uniform dimensions throughout except for short transition sections at the ends, extending from the southern limits of the city to the north of the creek, a distance of approximately two miles. For the greater portion of its length it lies in the old creek channel except for occasional departures to secure better alignment. The tube is "tomato" shaped, and measures internally 22 ft. horizontal, and 18 ft. vertical diameter. At the intake end converging concrete walls about 1,000 ft. long conduct the water into the tube and accelerate it to the proper velocity. At the outlet end are diverging walls about 400 ft. long to bring the velocity by expanding section back to normal.

A contract for the entire project was let in December, 1916, and construction started in May, 1917, but difficulties due to the war forced the contractor to discontinue work after several hundred feet of tube had been completed and the major portion of the outlet.

In July, 1918, a second contract was let covering about 4,000 ft. of tube at the upper end and the completion of the outlet. This contract was successfully completed in August, 1919, and the creek is now flowing through this part of the tube.

A separate contract was let for the intake in July, 1919, and this part of the work is now about 90 per cent completed.

On August 1, 1919, a contract covering the balance of the work, about 8,000 lineal feet of tube was let to the Folwell-Ahlskeg Co., which firm had previously completed the upper third of the work.

The tube is being constructed by the cut and fill method. Excavation for the first 4,000 ft. of the tube was made by drag line, the spoil being hauled away by dump cars drawn by dinkey engines. On the present contract, however, the excavation is being made entirely by steam shovels and the spoil is being moved by wagon trains drawn by caterpillar tractors.

Near the south end of the work a central concrete plant has been erected where all the concrete ingredients are hauled by belt conveyors and arranged so as to require a minimum of labor. Concrete is hauled from the plant by an industrial railway, the tracks of which are laid along the top of the tube. Tube concrete is placed in 60 ft. sections, and about six hours are required to pour a section. The most careful preparations have been made for heating materials and keeping the concrete at the proper temperature until setting takes place so that the work can be carried on during the winter.

The Erie Concrete & Steel Co. are contractors for the intake work and the Folwell-Ahlskeg Co. for the tube. Gannett, Seelye & Fleming, Inc., were retained by the city to make the original reports and have been in charge since that time.

This work has been let to contractors in whole or in part at three different times. The first was in 1916 when war prices had hardly begun to affect costs or bid prices, as at that time there was little anticipation that this country would become involved. The second time was in May, 1918, in the utmost activity during the war, and the work was undertaken with the approval of the Government to assist transportation and housing conditions in the city of Erie. The third time was in July, 1919, nearly a year after the armistice, just as the resumption of work was showing its effect in rising wages and material costs. Particularly did the great amount of highway work being started, bring about a labor shortage and consequent increase in wages.

In 1916 wages were about 25c. an hour and labor was relatively efficient. This was the prevailing wage on the work through the first part of the original contractor's execution of the work he accomplished. Rising prices brought about his failure and bankruptcy, and the work shut down.

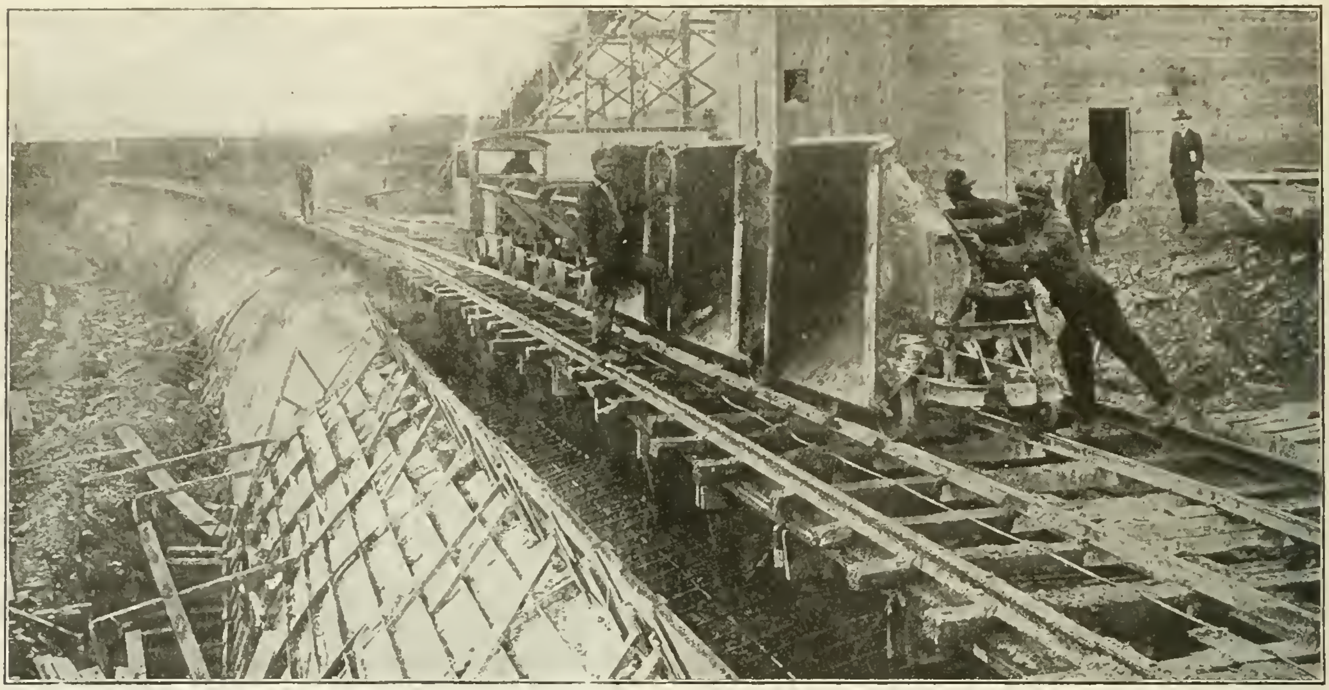
PLACING THE INVERT OF MILL CREEK TUBE
In background metal screeds hung from timber frames to form invert.

When in July and August, 1918, the second contractor started work, he paid first 40c., then 45c. and finally 50c., and 55c. an hour until the armistice, when wages dropped to 50c., 45c. and 40c. in the winter of 1919. When he completed Section 2 in June and July 1919, wages were working up again to 45c. and 50c.

When the third contract was let in August, 1919,

TABULATION OF QUANTITIES AND PRICES ON ERIE FLOOD PROTECTION WORK, 1916–1919

		A		B		C			
		Dec., 1916		May, 1918		July, 1919			
		Entire Job		Sections 1 and 2		Section 3		Section 4	
Item	Description	Quantity	Unit Pc.	Quantity	Unit Pc.	Quantity	Unit Pc.	Quantity	Unit Pc.
1	Excavation: Class A—Earth	81,000 cu.yd.	0.45	4,350	1.40	29,000	1.90	30,000	1.14
2	Excavation: Class D—Rock	110,000 cu.yd.	0.80	30,000	3.00	39,000	3.33	33,000	2.38
3	Concrete—Class A	49,000 cu.yd.	4.45	14,190	9.80	17,600	9.98	17,200	11.40
4	Reinf. Steel: Furnished and placed	800 tons	100.00	......	....	105	95.00	306	95.00
5	Portland Cement: Placed in work	85,000 bbl.	1.90	20,000	2.66	28,500	2.85	26,500	2.85



CONCRETE DEPOSITED IN ARCH FROM TRACKS MOUNTED ON INTERIOR METAL FORMS

wages were well established at that level, and have remained so.

There is presented here a tabulation of the important items in these contracts, which covered exactly the same work to be done under exactly the same conditions each time they were bid upon, except that the original contract involved greater quantities, as it covered the whole job, including the intake and outlet.

The original contract called for the completion of the entire work for $812,000. Under the three contracts above mentioned, plus the cost of Contract No. 5 for the intake works, and Section 1, the outfall, the entire job will cost about $1,800,000. The 1916 contract prices were too low even for 1916, and the contractor would undoubtedly have lost money had war prices not been involved. The bid was below the engineer's estimate and $80,000 or about 10 per cent below the next lowest.

The table brings out some very interesting things. Noticeable among these is the lower cost of reinforcing steel, which was $100 per ton in 1916 and $95 in 1919. One explanation is, that the contractors who bid $95 had learned to place it very cheaply in Section 2, also steel prices were high in 1916 due to foreign demand for munitions. Next to steel, the item for portland cement furnished and in place was the most stable, increasing from $1.90 to $2.85 per bbl.

Earth excavation increased from 45c. per cu.yd. in 1916 to $1.40 in 1918, and to $1.52 in 1919, the latter being the mean price on Sections 3 and 4. In Section 3 the work passes through a thickly built up section under numerous streets, car tracks, factories, apartment houses and residences. Thus the bid for excavating earth in Section 3 is $1.90 and in Section 4, $1.14, while rock costs $3.33 in Section 3, and $2.38 in Section 4. The fact that there is little local spoil area in Section 3 adds to the lenth of haul and to the cost. Undoubtedly the original price of 45c. was too low, even for 1916. The rock excavation price of 1919 is four times that of 1916, which was also far too low for that period.

Concrete materials and placing, excluding cement, more than doubled in price between December, 1916, and May, 1918, and increased another 10 per cent for the average of Sections 3 and 4 by July, 1919.

It should be remembered in comparing the costs in 1916 with 1918 that the quantities are very different, the former being for the whole job, and the latter for about one-quarter of the whole work. An idea of this difference in cost resulting from the extent of the work may be gained from the fact that the successful contractors in Sections 3 and 4 reduced their prices on both sections 5 per cent when awarded the two sections as against their bids on either section singly.

Careful study of the May, 1918, prices on Section 2 and July, 1919, prices on Section 4, which are more nearly comparable than Sections 2 and 3, shows reductions on most items but concrete. The reduction in earth excavation price from $1.40 to $1.14 is due chiefly to the larger amount of it to be handled, 30,000 cu.yd. as against 4,350 cu.yd. The rock excavation is about the same in the two contracts, and shows a reduction from 1918 to 1919 of $0.62 per cu.yd., or nearly 20 per cent.

When the bids of May, 1918, were received there was every prospect of the continuance of the war for a considerable period, and the element of risk of rising prices, freight and material delivery delays, labor shortage, etc., was great, so that these bids probably had a large leeway for covering such risk. This danger was eliminated with the armistice when wages were suddenly but temporarily lowered, and labor became more abundant. This period of lessened costs added to the very mild winter, enabled the cutting of costs considerably and let the contractor out with a fair profit.

Design of Trestle Girders for Coal Pier

Through an error in make-up and transcribing from blueprints a drawing indicating plate-girder construction was used at the bottom of page 761, *Engineering News-Record*, April 15, 1920, in connection with the article on the new coal pier of the Central Railroad of New Jersey. The drawing should have shown 15 ft. spans consisting of two 24-in., 80-lb. I-beams with 15-in., 33-lb. channel stiffeners, placed 5 ft. apart.

Additional Water Supply for the City of Chicago, 1920-55

Plans Involve Doubling Capacity in 35 Years at Cost of Sixty Million Dollars—Selective Metering Only Proposed

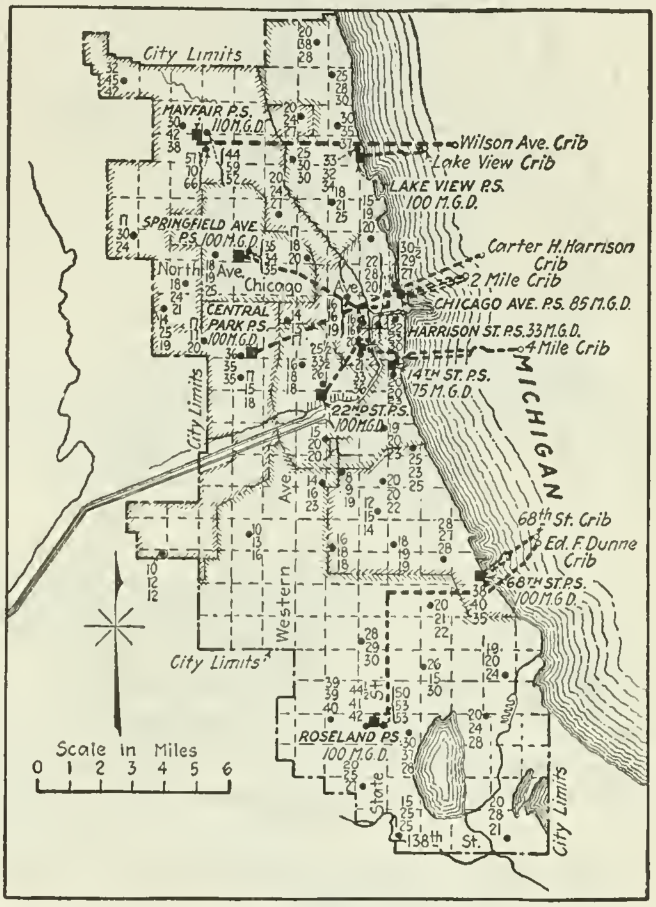
PRACTICALLY a complete reconstruction or revision of the water-works system of Chicago will be undertaken within the next 35 years if the comprehensive plans of P. S. Combs, city engineer, are carried out. The capacity would be doubled, new intake cribs built, pumps added to nearly every pumping station, three new stations built, two stations completely electrified and the distribution system from the pumps and the inland tunnels to the wet wells would be unified and interconnected, all at a cost of more than $60,000,000, of which $4,419,100 would be spent in 1920. The plan does not embrace universal metering but a continuance of the past practice of metering only the taps of those who waste wilfully. By 1940 60 per cent only of the services would be metered. Former plans have been based on much more rapid installation of meters.

The direct pumping system of Chicago consists of a series of intake cribs in Lake Michigan connected by tunnels to the suction wells of pumping stations, most of which were located originally near the shore line. In general, the plan aims to extend the tunnel system so that the stations will be near the centers of their respective distribution systems and also alongside railroad switch tracks. Full electrification of pumping plants, so as to eliminate coal and ash haul, is proposed for the Chicago Ave. and Hyde Park stations. Eventually a north and south land tunnel in Western Ave. interconnecting the three intake systems would be built. The controlling idea has been to interconnect the whole system so that in case of accident to any one pumping station, crib or tunnel, service could still be obtained from the unit adjoining.

Preliminary study of the problem consisted of a comprehensive survey of the whole area of the city, taking each square mile as a unit. Data were gathered as to the population and water consumption from 1890 to date. The curves were extended to 1940. Personal surveys were made of each of the 200 sq.mi. to record areas devoted to domestic and industrial uses, parks and railroads and areas unimproved. The general trend of improvements to and from districts was taken into consideration.

Throughout the preliminary work the unit of 300 gal. per capita daily of maximum consumption was used, this being slightly less than the present maximum requirements. The average was taken at 240 gal. at the present, this amount gradually decreasing to 160 gal. per capita in 1940, at which figure the consumption was assumed to remain constant. Discussing per capita consumption, the report warns the reader not to confuse maximum and average per capita figures. On maximum consumption the system must be built, whereas the average has nothing to do with the capacity of the system although it is the governing factor in the cost of operation. The maximum load is controlled by the use and leakage of water, and can be lowered by stopping leaks both above and below ground and by educating the consumer to use but not abuse the water system.

From the data secured a district was laid out for each pumping station to serve, due consideration being given to the present location of stations, equipment, possibilities of enlargement without undue cost, present mains supplied, additional expenditures necessary, economy of operation and upkeep and service to the consumer. After these districts were laid out it was found that a large section in the southwest part of the city could not now or in the future be supplied from existing stations in an economical manner; nor even by sacrificing economy of operation could adequate service be rendered. The William Hale Thompson station at Forty-seventh St. and Western Ave. was decided upon for immediate construction and also the Southwest station at Seventy-third St. and Central Park Ave.

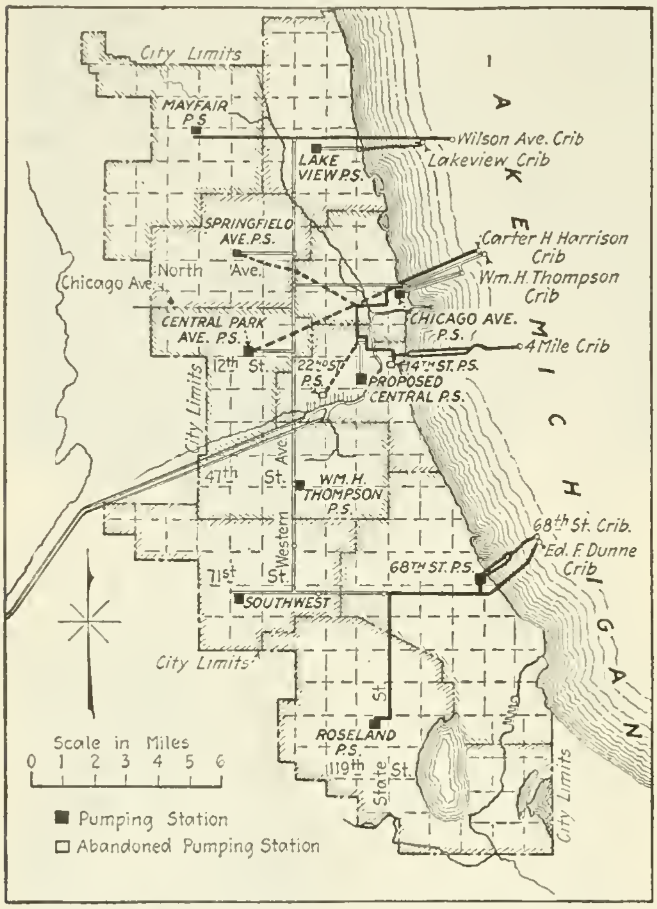


PRESENT PUMPING STATION DISTRICTS WITH RESULTING PRESSURES

Capacities of the stations ("P. S.") in millions of gallons per day ("M. G. D.") are maximum daily performances. The round black dots represent gage stations and the upper, middle and lower figures are gage readings on July 26, Sept. 4 and Dec. 10, 1919, respectively.

At present many districts are without service at the peak load. Had adequate service been given in 1919 it is estimated an additional 200,000,000 gal. daily capacity would have been required. This amount is in excess of all existing reserves. Results of a detailed survey of water pressures indicate that under average conditions quite a number of sections have the required 25 lb. pressure necessary to give service on the third floor of buildings, but there are many districts below 20 lb. Some sections are always below 15 lb. and still others below 10 lb. When the maximum load occurs all of these pressures drop anywhere from 3 to 8 lb. Pressure gage readings on three dates are indicated on the drawing that shows the present pumping station districts. The plan outlined to eliminate this low pressure condition involves numerous additions to the four existing pumping stations which now have a capacity of 928,000,000 gal. daily and a reserve of 193,000,000, although all of the reserves were not available in 1919 when the highest recorded daily consumption was 948,000,000 gal. The estimated total requirements, working capacities and reserve capacities in million gallons daily will be as follows if the program proposed is carried out:

	Required	Working Capacity	Reserve Capacity
1919-1920	1,072	928	193
1920-1925	1,109	1,127	284
1925-1930	1,354	1,343	392
1930-1935	1,576	1,713	642
1935-1940	1,799	1,863	485
1940-1955	2,031	2,060	545



ULTIMATE PUMPING STATION DISTRICTS, NEW TUNNELS AND CRIBS

Some of the more important proposed changes and installations at the pumping stations are as follows:

Lake View Station; The five original boilers have never been given a certificate to operate by the city boiler inspector. Three have been condemned and sealed by the inspector. A boiler consigned to the Springfield Ave. station was diverted last year to Lake View and is carrying the full load. In consequence, new boilers are needed at once. As the station is not on a railroad it is planned to replace it in 1934 at a cost of $2,200,000 by a new station located near the center of the district.

Springfield Ave. Station: This 20-year old station has obsolete, worn-out, cracked cylinders. Complete rehabilitation is essential, during which the new Mayfair station would carry the load. Three triple-expansion pumps from Chicago Ave. are to be moved to this station.

Central Park Ave. Station: Conditions similar to those exist at Springfield Ave., but new units must be purchased.

Chicago Ave. Station: On account of its architectural and sentimental value, this station, although located at the extreme east side of the district and away from the railroads, will be maintained but completely electrified and its present steam units transferred to the Springfield Ave. station.

Fourteenth St. Station: This is a coal-haul station but to maintain service to its districts it needs much additional capacity. It, together with the Twenty-Second St. and Harrison St. stations are eventually to be replaced by a single new station on which it is planned to start work in 1921. On completion of the new station in 1924 the three old stations would be abandoned. The new station is planned as a standby service for the Loop district in case of any accident to the Chicago Ave. station.

Sixty-Eighth St. Station: Complete electrification is planned for this station, which was acquired through the annexation of Hyde Park and has given much trouble from unsatisfactory and worn-out units. The station will not be moved to the center of its district because to do so would mean the scrapping of its distribution system.

Roseland Station: This new station is unable to give good service over the 85 sq.mi. of area in its district since the "haul" is too long and friction head too great. The revamped Sixty-eighth St. station will supply a large portion of the eastern side of the Roseland's district and eventually the proposed 300,000,000-gal. William Hale Thompson station will care for all of that portion north of Seventy-ninth St. The proposed 160,000,000-gal. Southwest station would care for a part of the district now supplied by Roseland, which will later be taken over in part temporarily by the William Hale Thompson station.

Chicago has seven cribs and it is proposed to add one more. Four are in good condition but three need repairs. It is planned to start construction on the new William Hale Thompson crib alongside the Carter H. Harrison crib in 1920 and complete it in 1923. A 20-ft. tunnel will connect it with the shore near Chicago ave., also connecting it there with the four existing tunnels, and then extending it west to Western Ave., eventually connecting north and south with the Springfield and Central Park stations. The William Hale Thompson station will be served at first from the southern crib system but eventually tunnel connections in Western Ave. north from this station and south from the Wilson Ave. tunnel would be completed, thus interconnecting the whole tunnel and crib system and giving four points at which the north and south tunnel could be tapped.

Financially, the plan calls for a total expenditure of $61,439,000 by 1950. In 1920 there would be spent $2,200,000 on pumping stations, $780,000 on tunnels, $439,000 on cribs and $1,000,000 on water pipe extensions. Similar heavy expenditures are proposed for the succeeding five years. It will be necessary to float a loan in 1921 to meet the costs in excess of the revenue and to continue to make loans until 1928 when $15,000,000 would have been borrowed. A retirement fund would be started in 1929 and wipe out the loans by 1935.

St. Louis Tunnels Unwatered by Air Lift

Difficulties With Other Types of Pump—Two-Stage Air Lift Has Capacity of 3000-4000 Gallons per Minute—Maximum Head 76 Feet

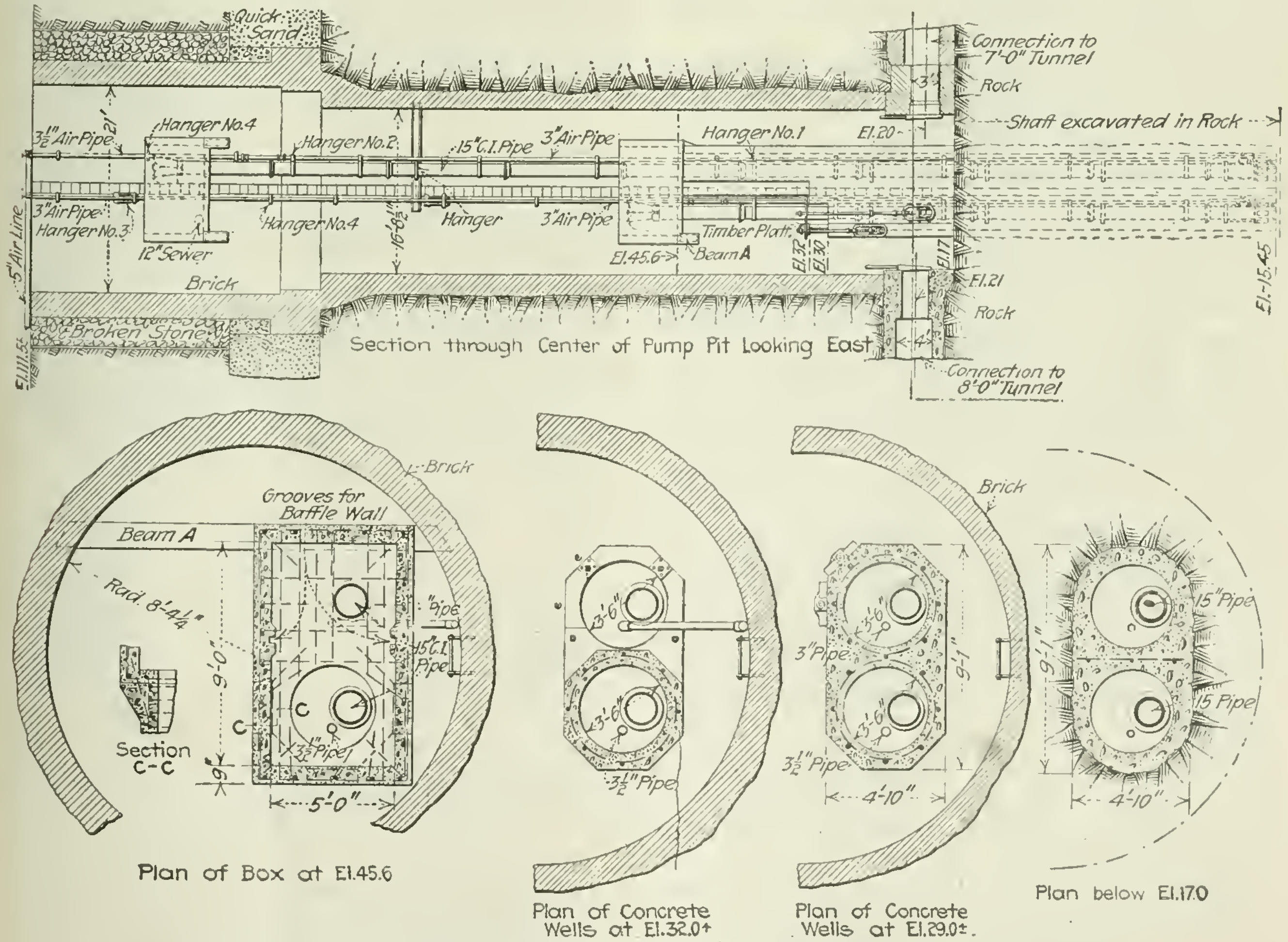
By Edward E. Wall
Water Commissioner, Department of Public Utilities, St. Louis, Mo.

When the intake tower and tunnel of the St. Louis water-works was built at the Chain of Rocks more than 25 years ago, the tunnel was connected at the river bank with a pump-pit shaft constructed for the purpose of installing at some future date pumps for unwatering the tunnel. It was decided at that time not to install any pumping machinery in this shaft. This was a wise decision, for it is probable that any pumps designed and constructed at that time would have proved entirely inadequate for the purpose.

About 10 years ago the great difficulty in obtaining a sufficient supply of water through this tunnel at seasons of low water gave rise to the belief that the tunnel was in some way obstructed. Also, the serious trouble arising each winter from the great quantity of floating and frazil ice coming into the suction well of the pump gave color to the theory advanced by someone that there was a break in the tunnel through which the river water flowed without control. There was a story circulated that at the time the tunnel was built an enormous leak occurred in the roof which the builders were unable to stop and which continued until the tunnel was completed. How they managed to finish the tunnel with this tremendous leakage no one seemed to be able to explain.

In 1911 it was decided to make a serious attempt to unwater this tunnel. An 8-in. pump was purchased and installed, but failed at any time to pump the guaranteed quantity of water, and after the valves had repeatedly given way under the maximum head of 100 ft., one of the cylinders cracked. The cylinder was welded and the valves were reconstructed, and repeated attempts were made to pump out the tunnel. The pump was unable to stand up under the 100-ft. head and drain the tunnel. It was then decided to install in this shaft a motor-driven centrifugal pump, completed in 1913.

In building a new intake and tunnel, which was completed in 1915, a connection was made to the same pump-pit shaft so that the new tunnel might also be unwatered by the same motor-driven centrifugal pump. The capacity of the pump was 4200 gal. per minute, with maximum lift of 84 ft., diameter of suction 12 in., diameter of discharge 12 in., speed 1200 r.p.m., efficiency 70 per cent, horsepower required for this duty, 117. The pump was mounted on a common bedplate with the driving motor and connected by means of a flexible coupling. The pump unit complete was mounted on an elevator platform which was lowered and raised by means of a hand-operated windlass. The discharge from the pump was connected to a 12-in. stationary discharge pipe at intervals of 12 ft. from El. 34 to 94, by means of a flexible hose about 5 ft. in length.



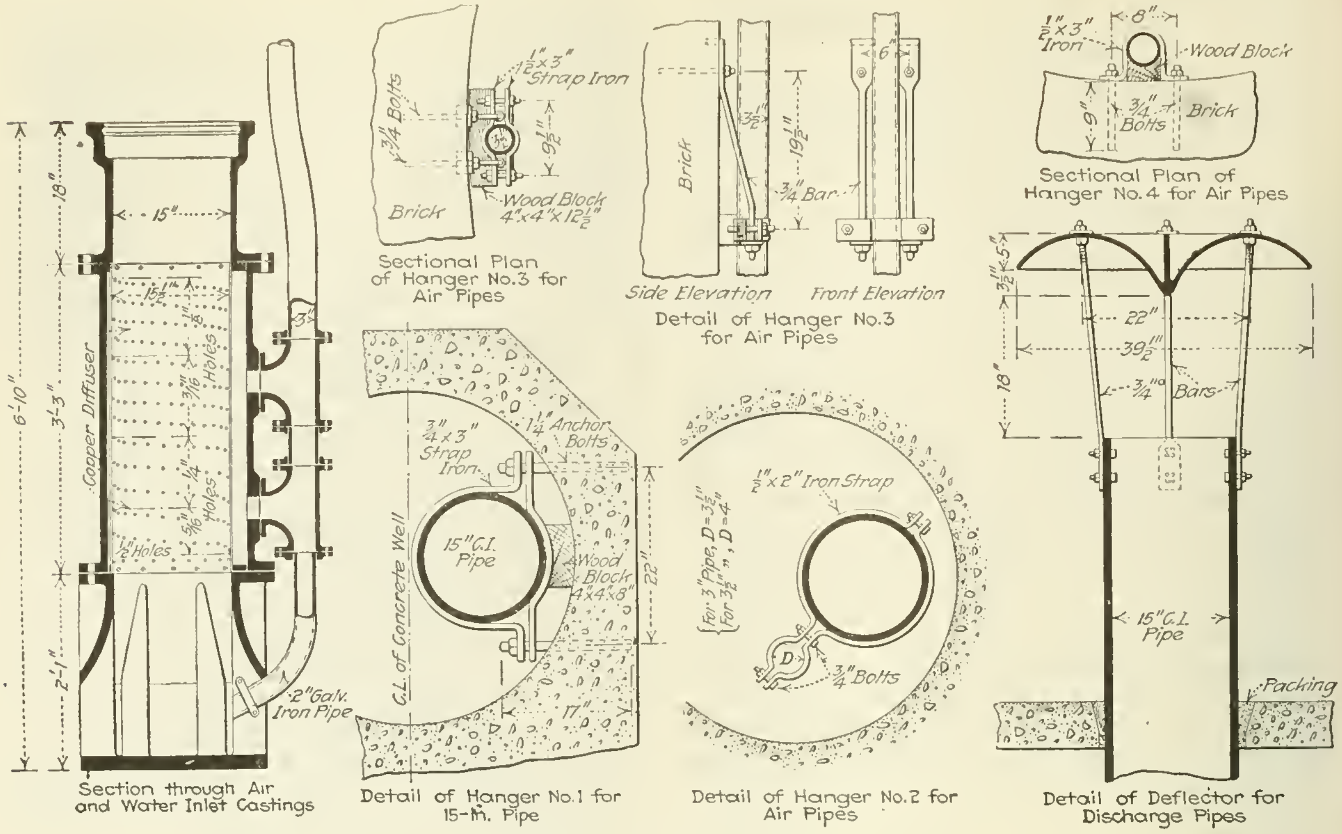
Plan of Box at El.45.6

Plan of Concrete Wells at El.32.0±

Plan of Concrete Wells at El.29.0±

Plan below El.17.0

PIPING ARRANGEMENT OF TWO-STAGE AIR LIFT AT ST. LOUIS
(Upper drawing shows section through shaft. Rotate page to bring shaft into the vertical.)



Section through Air and Water Inlet Castings

Sectional Plan of Hanger No. 3 for Air Pipes

Side Elevation — Front Elevation — Detail of Hanger No. 3 for Air Pipes

Sectional Plan of Hanger No. 4 for Air Pipes

Detail of Hanger No. 1 for 15-In. Pipe

Detail of Hanger No. 2 for Air Pipes

Detail of Deflector for Discharge Pipes

DETAILS OF AIR-LIFT PARTS

The difficulties experienced in operating this pump were found to be as follows:

1. A force of 10 or 12 men was required to raise or lower the pump all of the time when the pump was below the elevation of the river.

2. It was found impossible to open the gate in the pump pit leading to the tunnels to be unwatered and lower the pump to the next connection beneath, before the water would rise in the well. In the last six years the motor was drowned three times.

3. If the gate was kept closed until the well was unwatered it was a very difficult operation to open the gate against the head of water.

In the autumn of 1916 the well was pumped out and the gate was opened to the new tunnel and, because of difficulties in operating the gates, connecting and disconnecting the pump discharge, temporary breakdowns, etc., it was seven days before the new tunnel was unwatered. During the same season an attempt was made to unwater the old tunnel, and after seven or eight hours' work the water was only 10 ft. lower than the water in the river, and the idea of unwatering the old tunnel with this pump was abandoned. The discharge at this time was found to be 2200 gal. per minute, the falling off in capacity being due to the wearing of the impellers and the slowing up of the motor due to changes in the winding.

In 1917 various schemes were proposed for unwatering the tunnels; among them was an air-lift pump. In 1918 a design of a two-stage air-lift pump was made with a capacity of 3000 to 4000 gal. per minute at a maximum head of 76 feet.

The first lift was from El. 22 to El. 49.6, and the second from El. 48.6 to El. 98. A 55% submergence was decided upon. This submergence required an excavation in the bottom of the present pump-pit shaft 32.5 ft. deep and the building of two 42-in. concrete wells from the bottom of the excavation to the bottom of the overflow boxes, at El. 45.6 and 94, respectively.

The work was done in January, February and March of this year. Fifteen-inch bell-and-spigot discharge pipes were placed in these wells, and special footpieces and air diffuser were provided. The air is carried through a 3- and 3½-in. pipe to the first and second lifts, respectively. These pipes were connected to a 5-in. air line about 550 ft. in length leading to an air compressor in the boiler room.

The estimated air required for 3000 gal. for both stages was 1950 cu. ft. per minute. The compressor used for this work was a compound machine having a piston displacement of 2450 cu. ft. per minute acting as a two-stage compressor and 3333 cu. ft. per minute acting as a twin single-stage compressor at 100 revolutions per minute.

The cost of the air-lift pump and installation are as follows:

Air compressor	$4,215.92
Erecting	899.41
Pipe line and laying	1,376.89
Shaft excavation	2,389.11
Concrete wells	3,351.80
Building	594.05
Cast-iron pipe, etc.	590.62
Miscellaneous	753.44
Total	$14,171.24

During the first week of August the new tunnel was unwatered in seven hours. On Aug. 30 the gates were closed at the ends of the old tunnel and the air pump was started, and in six hours the tunnel was dry for the first time since it was built. The operating of the air-lift pump was very satisfactory. The flow of water was steady, and the absence of a gush of air, followed by a gush of water, as usually observed in a high-lift pump, was gratifying. This condition was always maintained until the water was almost exhausted and the flow of water to the pump became much less than the capacity of the air lift, when the gushes of air and water commenced.

An examination of the old tunnel proved it to be in excellent condition, the fabled leak being nonexistent and all fancied obstruction of no consequence.

The air-lift pump was designed and built under the general direction of the water commissioner, the details of design and construction being under the direct charge of C. M. Daily, engineer-in-charge supply and purifying section.

Utilizing Imhoff Sludge on Land at Plainfield Sewage-Works

By John R. Downes
Superintendent, Plainfield, North Plainfield and Dunellen Joint Sewage Disposal Works, Bound Brook, N. J.

THE possibilities of recovering the "Economic Values in Sewage and Sewage Sludge" as discussed by Raymond Wells in *Engineering News-Record*, Nov. 27-Dec. 4, 1919, p. 948, may be summed up as follows: "Commercial recovery of the byproducts may be possible on a self-sustaining basis where the population is over 150,000 and the nitrogen in the sludge is over 3 per cent with 25 per cent of fats in such condition as to be amenable to treatment. For the small, isolated plant only the most direct recovery of the fertilizer value, with total disregard for the fats, seems practical. The writer believes that at the Joint Sewage Disposal Plant of Plainfield, North Plainfield and Dunellen, N. J., such recovery has been reduced to its simplest terms—by growing crops directly on the sludge. By this means oats and corn have been raised as described in the following paragraphs, which also give the methods of applying the sludge to the land.

A particularly favorable opportunity to determine the actual value of the sludge was afforded by the availability of a piece of land which had been stripped in grading, and on which by experiment it was found that nothing would grow. The land ran from clear sand to gravelly sand and soft red shale.

This piece of land was liberally coated with "Imhoff" tank sludge from the local plant. About forty one-horse, one-ton, loads of spadable (75 per cent moisture) sludge per acre was used the first year and 42 bu. of oats was raised. The second year, with three tons of sludge per acre, placed in the hills only, 50 bu. of corn was raised.

Since the land had no crop value whatever, we may figure the value of the sludge as follows: 40 tons of sludge broadcast the first year and three tons in the hills the second year made a total of 43 tons of sludge on which was raised 42 bu. of oats and 50 bu. of corn. At present (January, 1920) market quotations the crops would be worth $95.90 and to produce them at the present labor cost of $0.45 per hour would cost $51.80, leaving $44.10 as the total gross yield value of the 43 tons of sludge, or $1.02 as the value of a ton of sludge delivered in the field and spread. Delivery and spreading at the center of our disposal area, ⅛ mile from the drying beds, costs $0.45 a ton, leaving the net yield value of the sludge $0.57 a ton.

With our sandy soil and our production of approximately 300 tons of sludge a year per 1,000,000 gal. daily flow of sewage, this method of disposal requires between 20 and 25 acres of tillable land per 1,000,000 gal. daily capacity. One-third of this is idle to receive sludge, one-third is in crops on sludge one year old and one-third on crops on sludge two years old. The land will apparently stand a new coat of sludge every third year.

The aim of the works manager is to get his sludge out of the way as quickly and economically as possible and with the least amount of odor. This, as well as the recovery of any fertilizer value in the sludge, is met by direct cropping.

At the present moment we think that the best method of handling our sludge is the one practiced, as follows: A broad stone fork with square tines spaced ¾ in. apart is used for removing the sludge from the surface of the stone drying bed. When the 2-yd. manure spreader is filled, the tractor hauls it to the field, the gear is thrown in, the load spread and the return trip made without stopping. After a strip across the field has been covered, a little time is allowed for it to dry slightly on the surface, so that it will not be too slippery for the tractor, then it is turned under with the gang plow.

At current prices for labor, gasoline, etc., it costs $0.45 per cubic yard to dispose of the sludge in this manner. This figure covers upkeep and repair of tractor. As compared with our former method of hauling by one-horse dump wagon, and spreading by hand, the difference in cost is shown, by careful analyses, to be exactly that of spreading by hand, $0.11 per cubic yard. There is the great additional advantage, however, that the sludge is entirely out of the way, and cannot produce odors as it does when exposed in heaps, despite all theory to the contrary. Also the labor problem is much more easily handled, since spreading the sludge by hand is one thing to which the laborers object.

Up to the point of covering the sludge with the plow the operation is clearly a sludge disposal charge. Even beyond this point it is proper to charge the cost of cropping the land to sludge disposal, since removing the nitrogen and humus from the soil in preparation for the next dose of sludge is an essential disposal problem. Furthermore, it is essential to keep down weeds for the sake of appearances. This can be done by cropping.

The screenings from the Riensch-Wurl screen are also handled in a very satisfactory manner by means of the caterpillar tractor and manure spreader. The screenings are retained for 24 hours in a tip dump body so balanced that, when loaded, it just tips back on removing the latch. The impact of the sliding body of screenings against the front end board of the spreader, causes the latter to move forward on its concrete runway so that loading is both even and complete.

I am often asked as to the comparative value of the screenings and the tank sludge as fertilizer. We have not made this comparison for the reason that we find it convenient to cover the screenings with one or more loads of sludge before plowing under.

The experiment has given data on the actual effort required to raise a bushel of corn or oats in man-hours which may interest some in this day of fictitious prices. On the basis of 50 bu., of corn per acre, it required 1.56 man-hours actual labor to produce 1 bu. plowing to husking included. Gasoline equal to 0.04 man-hours and the use of a horse for cultivation equal in value to 0.06 man-hours makes a total of 1.66 man-hours. Oats, plowing to threshing included, required 0.76 man-hours per bushel. What a blissful world it would be if prices could be reduced to this basic relation between human effort and the production of the staff of life!

Design and Construction of Notus Canal Inverted Siphon

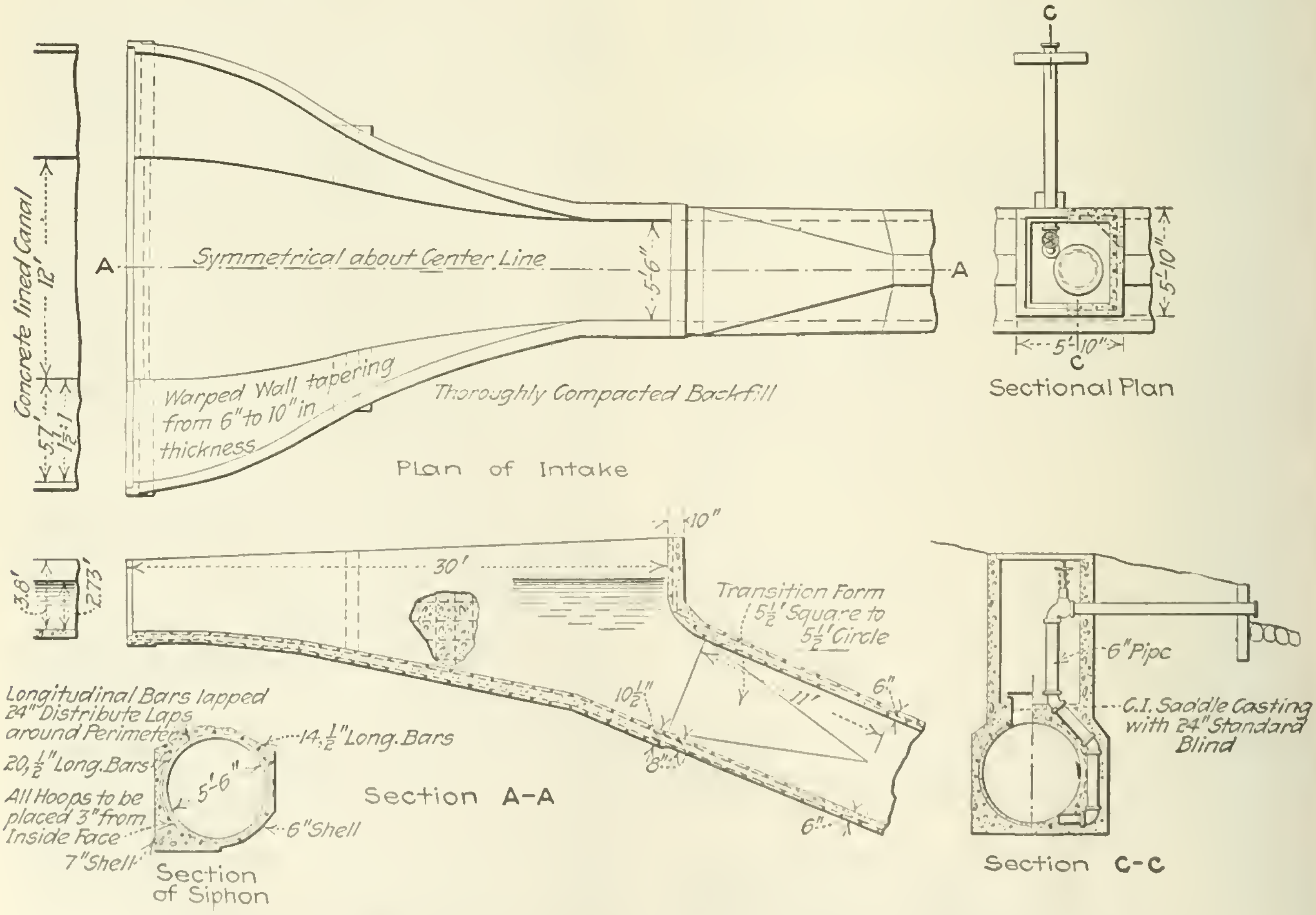
Seepage Water Head Saved by Warped-Surface Inlet and Outlet — Water Drained From Trench Each Side of Invert Form

SEEPAGE water collected from one part of the Boise project of the U. S. Reclamation Service near Caldwell, Idaho, is to be conveyed by the Notus Canal 25 mi. to 6,000 acres in the first unit of the Black Canyon Irrigation District. On the line of the canal a reinforced-concrete inverted siphon 2,000 ft. long with a capacity of 120 sec.-ft. will carry the water beneath the Boise River.

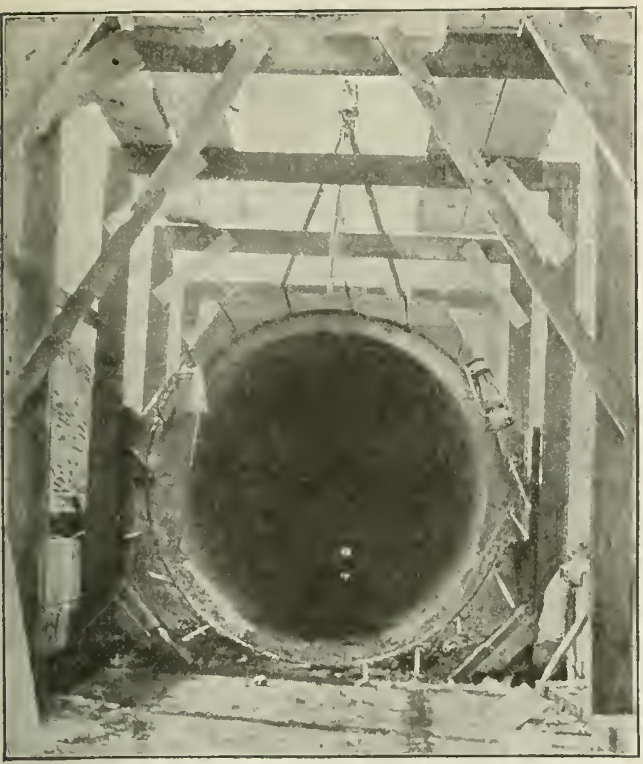
Seepage water by Idaho law belongs to the original divertor and may be reused or resold by him provided he does not let it get back into a natural river course. The river bed, therefore, is not utilized to carry the water to lands below, but the siphon carries it onto bench land available on the opposite side from which it is collected. Construction methods are the chief features of the work, but the warped surfaces in the siphon inlet and outlet to prevent loss of head deserve notice.

Above and below the siphon the hydraulic properties of the canal are as follows: $r = 2.01$; $n = 0.015$; $s = 0.0003$; $A = 43.94$; $v = 2.73$; $Q = 120$. For the siphon the velocity was increased to 5.05, the area decreased to 23.76 and correspondingly $r = 1.375$; $n = 0.014$ and $s = 0.00144$. The siphon invert at the lowest point is 66 ft. below the hydraulic gradient of the canal, but low water in the river will always reduce the head by at least 8 ft., making the net pressure head 58 ft. For 600 ft. under the river channel proper a 7-in. shell was specified, and for the remainder a 6-in. shell. A wasteway is provided just before the line rises from the flood plane of the river to the outlet, and a manhole with blank flange for pumping out the siphon is located at the lowest point near the river. Details of the inlet and typical cross-sections are shown in the drawing. The inlet is 7 ft. shorter than the outlet, since the canal above the siphon is in lined section having a 12-ft. bottom width, whereas below the outlet the canal gradually expands to an earth section having a 16-ft. bottom width.

INNER FORMS OR DRUMS FOR SIPHON
A 4-in. strip was left out of the bottom of each drum


C
Concrete lined Canal
12'
5.7'
$1\frac{1}{2}$:1
A
Symmetrical about Center Line
5'-6"
A
Warped Wall tapering from 6" to 10" in thickness
Thoroughly Compacted Backfill
Plan of Intake
5'-10"
5'-10"
C
Sectional Plan
3.8'
2.73'
30'
10"
Transition Form $5\frac{1}{2}$' Square to $5\frac{1}{2}$' Circle
$10\frac{1}{2}$"
11'
6"
8"
6"
Longitudinal Bars lapped 24" Distribute Laps around Perimeter
14, $\frac{1}{2}$" Long. Bars
20, $\frac{1}{2}$" Long. Bars
5'-6"
All Hoops to be placed 3" from Inside Face
6" Shell
7" Shell
Section of Siphon
Section A-A
6" Pipe
C.I. Saddle Casting with 24" Standard Blind
Section C-C

DETAILS OF REINFORCED-CONCRETE SIPHON ON NOTUS CANAL, BOISE RECLAMATION PROJECT



FORM BENTS USED ON NOTUS SIPHON

As the summer of 1919 was the dryest season of record, no rain having fallen for 155 days, the river was nearly dry and the trench through the extremely porous gravel flood plane through which the siphon was laid was excavated without difficulty. A small dragline outfit mounted on multipedal tractors operating a ½-yd. bucket, did the major portion of the work.

Inner forms consisted of drums 8 ft. long, made in four sections and set after the reinforcing steel and outside bents had been placed. The drums were blocked up from the bottom, wedges being placed between the forms and the steel to give the proper spacing. Support from the top was afforded by wire to the top crosspiece of the bents. The blocking below was knocked out after concreting commenced. To insure getting concrete into the whole of the invert, since the section was all deposited at one time, a 4-in. strip was left out of the bottom of the drums through which the concrete would rise. When that occurred a strip was nailed over the opening. The extra inch of concrete was trimmed off when the forms were removed, usually within 10 days after depositing.

Bents for the outside forms were spaced 5 ft. 4 in. apart and consisted of 4 x 6-in. uprights with 2 x 6-in. cross-pieces erected on 4 x 6-in. sills separated by 2 x 6-in. cross sills. Planks on the outside of the uprights enabled the gravel backfill to be carried that high and assisted in holding the foot of the uprights against the pressure of the wet concrete. An absolutely dry bottom was not feasible, without an expensive underdrain, so channels were provided on each side by nailing 2-in. planks to inclined braces at the foot of the uprights. These channels were so effective that the water was hardly colored by cement being washed out from the invert concrete. Inspection of several hundred feet of the completed siphon by a representative of the *Engineering News-Record* disclosed a few honeycombed spots and a smooth job inside.

The bents and steel were erected ahead of the setting of 8 or 10 drums. The latter were easily placed by three men, this being the same crew that erected the bents. Bags of cobbles placed on top of the bents prevented their floating. The drums were reused five to seven times. Progress was 66 to 110 ft. of completed section per day with a crew of 14 men.

Two pumps, an 8-in. and a 5-in., were all that was necessary to keep down the water. Pumps and the concrete mixer were motor driven from a power line conveniently passing the outlet end.

The siphon was built by a day labor force under the general direction of J. B. Bond, project manager, with G. H. Hogue as engineer in charge and C. A. Williams as superintendent of construction.

Resurfacing an Old Brick Road

By Edward Stingel
Civil Engineer, New Philadelphia, Ohio

A METHOD used in resurfacing an old brick road in a county having mostly hard-surface roads is here described. The first road to be built in Tuscarawas County, Ohio, by the State Highway Department, was 1.30 mi. of the New Philadelphia-West Lafayette inter-county highway. The road was constructed in the summer of 1907, and at a cost of $13,000, and the type was sand-filled brick on a rolled gravel base retained with 5-in. curbs. The slab had an over-all width of 14 ft.

Instead of using No. 1 pavers No. 2 pavers were used; which proved too soft to withstand the heavy traffic passing over the road. After a number of year's service the road developed considerable roughness and later wore into holes; finally, in 1918, it was thought advisable by the maintenance bureau of the State Highway Department to resurface it. Two methods of repair were considered: (1) laying a new brick surface on a thin mortar base over the old brick surface; (2) resurfacing with plain concrete. After a careful review of the condition of the old road, costs, desired durability, ease and speed of construction, etc., it was concluded to build a concrete pavement over the old brick surface to a minimum thickness of 7 in. While this thickness may be excessive it was thought best to err, if at all, on the side of safety. The old brick were removed at bridge approaches and at the ends to meet the old grades, otherwise nothing was done to the old brick surface other than cleaning with brooms.

The concrete was mixed in the proportion of one sack of cement to 1½ cu.ft. of fine aggregate, and not to exceed 3 cu. ft. of coarse aggregate. After the concrete was placed and tamped it was rolled with a metal roller 6 ft. long, 10 in. in diameter, and weighing 70 lb. The surface was then finished with a rubber belt 8 in. wide.

The sand and gravel were shipped from a commercial plant. The local gravel, as a rule, carries too much native sandstone to pass the state highway specifications which allow a loss by abrasion of not tc exceed 12 per cent for this class of work.

The work was done by Springer & Rogers of New Philadelphia, Ohio, at a contract price of $25,000. An examination of the cost of the original road and that of rebuilding shows that it was uneconomical to use the No. 2 pavers to save first cost. The slight extra expenditure necessary to have secured No. 1 pavers, perhaps, would have doubled the life of the road and thereby reduced greatly the maintenance costs.

Notes from Foreign Fields

ENGINEERING IN NORTH CHINA

By DONALD F. MCLEOD
Professor of Railway Engineering, Chinese Government Engineering College, Tangshan, North China

ENGINEERING construction in North China, outside of a small amount of work on railways, is confined to the cities and ports. There are no factory towns in the country, no isolated residences, no electric interurban railways, no water-power plants, or hydro-electric plants with electric-transmission towers stalking across the face of the country, as in America, no telephone poles along the country roads, no bond-issue roads, no automobiles, or motor trucks, except in the large cities. There are no ordinary highways of gravel, macadam, concrete, brick, etc.—not even sand-clay roads, or earth roads properly built. There are, however, some modern pavements in the cities.

Such roads as there are, consist of mere trails, absolutely ungraded, except where the surface drainage has followed the course of the road and produced sunken-road effects through hundreds of years of traffic. In spite of the generally rough, and rutted condition of such roads, there is a large amount of traffic on them. The typical, and practically the only, wheeled vehicle is a kind of cart, the axle of which is, generally, attached rigidly to the two wheels and turns with them. These vehicles carry such heavy loads, on such narrow tires, and the traffic is of such concentration, that any road surface, except a first-class pavement, would be destroyed by them in a few years. Grading the roads, without protecting newly filled places with a good wearing surface, would be wasted effort. The cart wheels would soon cut ruts so deep that the axles would drag on the ground.

HIGHWAY MAINTENANCE

Drainage details, a *sine qua non* of the roads of Eastern America and the Middle West, are missing on the roads of North China, and, for the most part, do not appear to be needed. There are no fall rains—only a few tenths of an inch of moisture in winter, in the form of snow and there are no spring rains. During three winters in this country (Province of Chi Li), the writer has not seen enough water to cause pools on the flattest surfaces. Occasionally after a heavy summer thunderstorm, rain water stands on the ground for a few hours, but in most localities it soon disappears.

The comparative absence of water accounts for the wonderful service given by roads on which, as far as the writer can find out, no maintenance work is ever done. An appearance of maintenance work in progress is sometimes given by Chinese farmers working at the margin of the road with shovels. These shrewd workers, however, are "looking out for number one" in characteristic Chinese fashion. The work they do consists of the digging of a series of pits about 2 ft. deep, about every 3 ft., paralleling the margin of the road. These little pits are quite effective in confining traffic to the road itself, and keeping it from damaging the winter wheat.

The comparative lack of rail communication in China may be illustrated by saying that New York State, on the Chinese basis, would have a total of only 122 miles of railway, if supplied with railways on the basis of its area, China having only about 10,000 miles of railway on a total area of 4,000,000 sq. miles, or one mile of railway per 400 sq. miles of area. Since there are no highways, in an American sense, the lack of railways has to be made up, in part, by the use of inland waterways.

The eastern provinces of China have extensive areas of gently sloping country in which the rivers are sluggish, and adapted to light-draft navigation. The system of inland waterways has been improved in time past by linking up various rivers and lakes by means of shallow canals. However, maintenance on these canals has been neglected, and some of them have become so silted up as to be unusable. Often those in use have so little water supply that even the very light-draft Chinese boats get stranded in the shallower places, and the boatmen have to resort to scraping together low temporary dams to raise the water level.

The Chinese junks used on the canals are comparatively long and narrow. The ones used on the larger canals and rivers draw from 4 to 6 ft. when loaded. They are propelled, as far as possible, by sails. The boatmen show considerable skill in unstepping and stepping the masts where bridges cross the canal. Using a 30-ft. gin pole, for example, they quickly erect a 50-ft. mast. When the wind is light, or unfavorable, the junk-men peel off what little clothing they wear, swim and wade ashore, and pull on the towing ropes. These naked boatmen are the only draught animals used in propelling canal boats, as far as the writer has observed. There are horses in the country, but they are used mostly by soldiers. The numerous mules and donkeys are used mostly as farm or pack animals.

There are no locks on Chinese canals, in the sense in which an American regards a lock. There are different levels of the water, however, controlled by dams. In these dams there are openings, controlled by stop-logs, wide enough to admit a canal boat. When a boat comes to one of these dams, and the next stretch of canal is at a higher level, the stop logs are taken out and the boat hauled through the opening over the out-rushing water, by means of capstans and ropes.

CANAL TRANSPORTATION

No doubt, as Charles Whiting Baker so ably shows, in *Engineering News-Record* of Jan. 1, shallow inland waterways are uneconomical in a country like America, where rail communication has been brought to such a high state of efficiency. But in China the railways are inadequate, and highways non-existent. Furthermore, labor is cheap. A canal boat of 6 tons' capacity, with crew of three, costs only about $2.40 for labor.

To show that railways do not take the place of canals in China the case of a canal paralleling closely a line of railway may be cited. This is the canal, about 70 miles in length, paralleling the Peking-Mukden Ry. from Tientsin to a point about 7 miles distant from Tangshan. The freight rates on this railway are so high and the scarcity of rolling stock is such that, during the open season of the canal, a great deal of coal is carried from the mines at Tangshan over the 7 miles required to reach the canal. There it is transhipped by hand labor to canal boats. The principal return cargo is rice. Another outward-bound cargo from Tangshan is a local product made of glazed earthenware, known as kangs. The material of which these kangs, a variety of large, vase-like container, is composed closely resembles that of which shale paving blocks are made in America. A large kang holds about one and a half times as much as an American flour barrel. It is decay-proof and water-tight and from the sanitary standpoint is superior to a flour barrel, a container unknown in North China. However, it is not used for the transport of its contents, since a kang of a barrel-and-a-half capacity weighs about 150 lb.

The Grand Canal is of particular interest at the present time, for it is being studied by American engineers with a view to its rehabilitation. The American International Corporation is in charge of the work. The consulting engineer is John R. Freeman and the chief engineer, Joseph Ripley.

The Grand Canal extends from Hangchow to Tientsin, and thence by a small river to Peking, a total distance of about 800 miles. It is somewhat longer than the water route from Cincinnati to New Orleans, along the Ohio and Mississippi. Its course roughly parallels the coast, and crosses two large rivers, the Hoang Ho and the Yangtse Kiang. Parts of it were put in operation thousands of years ago.

Four years ago the sum of $6,000,000 was made available for the improvement. The surveys have been in progress about two years. When the $6,000,000 was first available it was equivalent to about $12,000,000 in Chinese money, which would have gone much farther in canal construction then than the same amount of Chinese money now, as the cost of materials and wages has increased considerably since then. It can be concluded that if the $6,000,000 were put into Chinese money at the present rates of exchange (Feb. 17, 1920), in which event only about $5,500,000 Chinese money could be made available, the amount of construction work and material which could be put into the canal would be much less than half of what could be done when the money was secured.

The work of the field surveys for the improvement of the Grand Canal has been hindered by the apparent necessity of having each field party accompanied by a guard of soldiers, as protection against bandits. The experience of the past few years has given justification for the maintenance of such a guard. The files of *Engineering News-Record* contain an account of George Allen Kyle's enforced sojourn of several months with the bandits who captured him in Honan. A large ransom had to be paid for his release. On the Lung Hai Ry. in the Hoang Ho Valley, not far from the route of the Grand Canal, bandits two years ago stopped a passenger train by putting a pile of stones on the track. All of the passengers were robbed, and several of them killed. After this the Lung Hai Ry. schedules were revised so that trains should pass through this region only by daylight. At the present writing an American Y. M. C. A. missionary has been in the hands of bandits for two months in the province of Yunnan.

The engineering problems connected with the modernizing of the Grand Canal are of considerable difficulty. The principal ones are the protection of the canal from damage by floods and the provision of sufficient water for the section north of the Hoang Ho in dry seasons.

One of the sources of flood is the western slopes of the Shantung mountains. Another is the Hoang Ho. As regards the former, such gagings of the Shantung stream as are available indicate that the quantity of water to be discharged is very great, being the run-off from an area of about 9,000 sq. miles, at about 28 sec.-ft. per square mile, a total of about 250,000 sec.-ft. As the canal occupies the natural outlet for all the streams flowing westerly from the Shantung mountains, this enormous flood flow must be discharged by the canal itself and such overflow channels as are acquired by such a tremendous discharge.

The streams which give this flood flow are those which must supply the northern section of the canal in dry seasons. In former times the problem was easier, as the Hoang Ho discharged into the sea south of the Shantung peninsula. Now, however, the Hoang Ho discharges into the sea north of the Shantung peninsula. Consequently the feeder for the northern section must cross the Hoang Ho. It is proposed to make the crossing by means of tunnels under the river. The water of the Hoang Ho itself can not be used to supply the canal, as it contains too much silt in suspension and would soon fill the canal with mud.

The extreme flood discharge of the Hoang Ho is not known. The engineers making the present studies for the improvement of the canal were fortunate enough to have an opportunity of gaging the highest stage of water which has occurred in the past ten years. A lock will be necessary at each side of the river where the canal crosses, and a system of guide ropes designed so that boats crossing will not be carried away by the swift current of the Hoang Ho. Provided the Hoang Ho can be confined to its present course the task of maintaining the canal will be easier. However, the Hoang Ho has occupied ten different locations for the 400 miles from the mountains of the interior and the sea during recorded history. In the last move the change in the location of the estuary was about 260 miles. For 200 miles above the estuary the river is diked on both sides, and, for the greater part of this distance, double diked on both sides. The river is now under control, apparently, as far as channel movement is concerned, for the last move took place about a hundred years before the discovery of America.

DONALD F. MCLEOD

Tangshan, North China, Feb. 19, 1920.

Comparing Notched-Bar Impact Tests

Studies of the results of notched-bar impact tests by W. C. Unwin lead him to conclude (*Engineering* of Sept. 12, 1919, p. 329) that the common practice of comparing tests by reducing their results to the basis of rupture work expended per unit volume is seriously faulty. No consistent way of comparing small and large bars—as, for example, the 10 x 10-mm. testpiece with the often used 30 x 30-mm. testpiece—is in existence. The unsatisfactoriness of all existing methods of reduction is brought out by Dr. Unwin through the calculation of the mean errors of sets of observations comprising different sizes of bars, these mean errors being found to be erratic and excessive in amounts. Dr. Unwin has been able to reduce the mean error considerably by rating the rupture work on the basis of the five-fourths power of the area, or in another case, on the basis of the product of breadth of testpiece by the three-halves power of the depth. Believing that by further trial in the same direction a satisfactory method of rating impact-test results may be discovered, he suggests that impact tests be reduced to the basis of work divided by the *n*th power of the area, and that the value of the exponent *n* be determined from extensive new series of impact tests carried out with great care.

Altitude Observation of the Sun for Meridian

By John D. Adams
Office of the United States Surveyor General, Phoenix, Ariz.

During the number of years in which the writer has been connected with the execution of the public land system of surveys, he has been impressed with the lack of a working familiarity, on the part of civil engineers in general practice, with the necessary procedure for the quick and accurate determination of meridian.

The reason for this, no doubt, lies in the fact that this procedure is avoided as much as possible, on account of the fact that it is so frequently inconvenient, as in the case of an observation on Polaris in the chilly hours of the early morn, or is uncertain when use is made of a solar attachment that has not been tested in months. But Polaris and the mechanical solar are fortunately not our only resources, as there still remains the "direct solar," or observation of the sun through the main telescope of the instrument, a method of determining the meridian that has many advantages to the man who wishes to do his work in the daytime, to do it well and get out of the field as soon as possible.

The hesitancy with which many engineers undertake this form of observation is probably due to the fact that the instrumental readings must pass through a trigonometric formula before the azimuth of the sun can be ascertained, but often this need not be done until one returns to the office, when a set of logarithmic functions will dispose of the matter very quickly. The slight mathematical work is surely no valid objection—certainly not enough to counterbalance the many advantages. Here only the few simple adjustments of the main telescope are involved, and even then any reasonable errors may be eliminated by reversing, whereas the solar attachment affords no such remedy and at the same time involves a number of adjustments, the disarrangement of any one of which may render the observation worthless. In the case of the direct solar we do mathematically what the solar attachment does mechanically, and what it may do very satisfactorily if it is frequently tested during the morning and afternoon hours on a meridian determined from Polaris.

Formula—Probably the most convenient formula for the determination of meridian from observation of the sun's altitude is:

$$\text{cos azimuth} = \frac{\text{sun's declination}}{\text{cos latitude} \times \text{cos altitude}} - \text{tan latitude} \times \text{tan altitude.}$$

It must be borne in mind that south declinations (from about Sept. 21 to Mar. 21) are negative in sign. If the algebraic sign of the result is negative, the sun's azimuth, so derived, is to be referred to the south point; if positive, to the north point.

Declination—To determine the declination one must have recourse to an ephemeris of the sun such as is put out by instrment makers or in a very superior form by the Government Printing Office, Washington, D. C., at a cost of 5c. In addition to solar data, this excellent publication gives the times, for every day in the year, of upper culmination and elongation of Polaris.

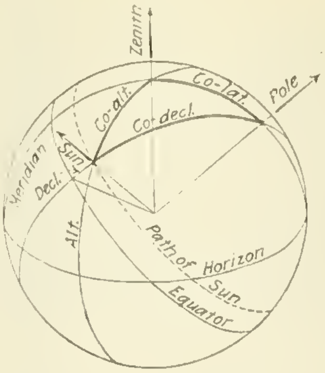


FIG. 1

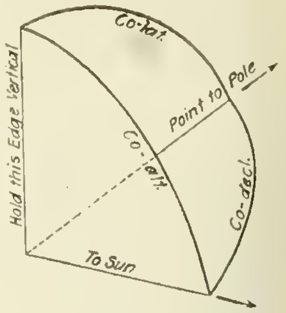


FIG. 3

In using the ephemeris it is only necessary to multiply the "difference for one hour" by the number of hours elapsed since Greenwich noon and add the result to the tabulated declination if the declinations are at that time of year increasing, or subtract it if the declinations are decreasing. The declination not being a matter of observation, no correction should be applied to it for refraction.

Local Mean Time Unnecessary

Time—As there is considerable misunderstanding in the matter of time, it should be stated that local mean time is not necessary for practical results. The reason why this is so may be better understood if one would conceive of the watch being set to Greenwich time, in which event it would only be necessary to consult it at the time of the observation and then multiply the hourly difference by the watch reading—that is, if the watch says it is 8 o'clock the multiplier will be 8. If the watch is set to 75° meridian time, the difference between it and Greenwich will be five hours, so that the values given in the tables will all take effect at 7 a.m. by such watch. Consider three watches accurately set, one for Greenwich, reading noon; one for standard time, reading 7 a.m.; and one for local mean time, reading 7: 30 a.m. If an observation is later made at 3:30 p.m. local mean time, then the standard watch will read 3 p.m. and the Greenwich 8 p.m. Making the necessary subtractions, we get identical results, or eight hours as the period of time elapsed since Greenwich noon.

Latitude—The latitude may be derived with sufficient accuracy from the topographic sheets of the Geological Survey, the General Land Office state maps, or, if the latitude of a nearby point is known, correction may be made by allowing 52 sec. per mile.

To make an independent field determination, altitude observation may be made on the sun at apparent noon, or upon Polaris at culmination. Simple and practical formulas for these observations may be found in the Standard Field Tables of the General Land Office, published by the Government Printing Office. This is a very compact and convenient publication of over 200 pages, and contains a great many valuable tables and formulas for the engineer.

Altitude—Before using the observed vertical angle of the sun in the formula, the correction for refraction (always subtractive) must be applied. The accompanying Table XX taken from the above mentioned publication, gives the various values, and is more comprehensive than those usually supplied.

TABLE XX. MEAN REFRACTIONS IN ZENITH DISTANCE

Bar. = 29.6 Ins Temp = 50° F

Apparent Altitude		Refraction		Apparent Altitude		Refraction		Apparent Altitude	Refraction	
°	''	'	''	°	'	'	''	°	'	''
7	30	6	53	12	0	4	25	25	2	3
"	40		45	12	30		15	26	1	58
7	50		37	13	0	4	5	27		53
8	0		30	13	30	3	56	28		48
	10		22	14	0		47	29		44
	20		15	14	30		39	30		40
	30		8	15	0		32	32		32
	40	6	2	15	30		25	34		25
8	50	5	55	16	0		19	36		19
9	0		49	16	30		13	38		14
	10		43	17	0		7	40		9
	20		38	17	30	3	1	42		4
	30		32	18	0	2	56	44	1	0
	40		26	18	30		51	46	0	56
9	50		21	19	0		46	48		52
10	0		16	19	30		42	50		48
	20	5	6	20	0		37	55		40
10	40	4	57	21	0		29	60		33
11	0		48	22	0		22	65		27
	20		40	23	0		15	70		21
11	40		32	24	0		9	80		10
12	0	4	25	25	0	2	3	90	0	0

Procedure—To secure a meridian that will be accurate to the nearest minute and one that will serve as a basis to check the solar attachment, it is customary in the public land surveys to make a series of two or three sets of observations, direct and reversed. The sun is first observed, say, in the upper right limb, the altitude reading taken and the horizontal angle measured to any suitable reference point. The instrument is reversed and the process repeated with the sun in the lower left limb. A mean of each of the two pairs of readings is used in the formula. Similarly with the second and third sets, after which the mean of the resulting azimuths is taken as final.

With a table of logarithmic functions, the work involved is slight. Ordinarily, the difference in declination will be negligible during the time consumed in making the observations, so that values of sin decl. ÷ cos lat. and tan lat. will remain constant throughout the series.

A prismatic eyepiece is a great convenience for making the observation, particularly in the southern latitudes, but very good results may be obtained by letting the image fall on a white card.

Refinements—In very close work, especially in the spring and autumn when the declination is changing more rapidly, it is advisable to take into account the "equation of time' stated in the ephemeris, as the tabulated declinations are based on Greenwich apparent noon. Failure to do this, however, should in no case give a resulting declination more than about 12″ in error.

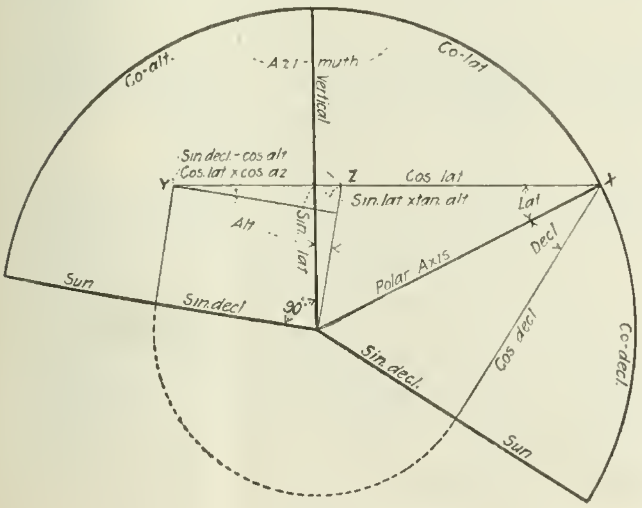


FIG. 2. HOW PRICE OF STIFF PAPER IS MARKED TO FORM MODEL OF SPHERICAL TRIANGLE

Modification of the correction for refraction may be made for high altitudes or unusual temperatures on the basis of Table XXI also taken from the Government publication.

TABLE XXI. COEFFICIENTS TO APPLY TO MEAN REFRACTIONS FOR VARIATIONS IN BAROMETER AND TEMPERATURE

Barometer In.	Elevation Above Sea Level Ft.	Coefficient	Barometer, In.	Elevation Above Sea Level, Ft.	Coefficient	Temperature (Fahr.) Deg.	Coefficient
30.5	—451	1.03	25.4	4,535	0.86	—24	1.17
30.2	—181	1.02	25.1	4,859	0.85	—17	1.15
30.0	00	1.01	24.8	5,186	0.84	— 9	1.13
29.9	+ 91	1.01	24.5	5,518	0.83	0	1.11
29.6	366	1.00	24.2	5,854	0.82	+ 8	1.09
29.3	643	0.99	23.9	6,194	0.81	16	1.07
29.0	924	0.98	23.6	6,538	0.80	25	1.05
28.7	1,267	0.97	23.3	6,887	0.79	35	1.03
28.4	1,493	0.96	23.0	7,239	0.78	40	1.02
28.1	1,783	0.95	22.7	7,597	0.77	45	1.01
27.8	2,075	0.94	22.4	7,960	0.76	50	1.00
27.5	2,371	0.93	22.1	8,327	0.75	55	0.99
27.2	2,670	0.92	21.8	8,700	0.74	60	0.98
26.9	2,972	0.91	21.5	9,077	0.73	66	0.97
26.6	3,277	0.90	21.2	9,460	0.72	77	0.95
26.3	3,586	0.89	20.9	9,848	0.71	88	0.93
26.0	3,899	0.88	20.6	10,242	0.70	100	0.91
25.7	4,215	0.87	20.3	10,642	0.69	114	0.89
25.4	4,535	0.86	20.0	11,047	0.68	128	0.87

Any true refraction either in zenith or polar distance = tabulated refraction × coefficient for barometric pressure × coefficient for temperature

The differences between the true and the tabulated refractions are generally small and generally negligible, excepting for the combined effect of low, apparent altitude of observation with high elevation above sea level or extremes of temperature.

An ultrarefinement may be made by correcting the vertical angle of the sun, or altitude reading, for parallax by adding 9″ cos altitude.

Demonstration of Formula—Those who have largely forgotten their spherical trigonometry and others who are interested in instruction work in the department of civil engineering may find the following proof of the formula for direct observation of interest, not only from the fact that the merest elements of place trigonometry are involved, but on account of the method employed as an aid to the ready visualization of spherical triangles.

In Fig. 1 is given the usual representation of the various arcs involved, and the problem is to solve the spherical triangle between the sun, pole and the zenith. Cut a circle of about 3-in. radius from a piece of stiff paper, and draw four radii so disposed that the intervening sectors will represent the co-altitude, co-altitude and co-declination, all as shown in Fig. 2, after which cut away the surplus material. Lightly score with the knife along the two radii marked "vertical' and "polar axis," and then bend until the result is as indicated in Fig. 3. when it will be apparent that we have an excellent model of the spherical triangle and the three involved planes.

Flatten out again, and place on it the various construction lines and symbols shown in Fig. 2, the truth of which will be evident to anyone with an elementary knowledge of the relation of sines, cosines and tangents. Attention may be drawn to the fact that when the colatitude plane is placed flat on the table, the point X is vertically over Y. A few minutes' study with the diagram opened up and bent into shape will show that we have one value for the line X-Z as a whole and a value for each of its two parts, from which an equation may be instantly made, and this is the equation of the direct solar.

Railway Spreader Car Handles Heavy Materials

Dumped Iron Ore and Stripping Spread by Wings and Plows Pneumatically Operated on Car Pushed by Locomotive

IN DISPOSING of lean ore and the overburden or stripping on the open-cut mines of the Oliver Iron Mining Co., in Minnesota, the material is deposited in large spoil banks or fills, the ridges of material dumped from the cars being leveled by means of spreaders propelled by locomotives. For this service in handling specially heavy material a spreader car of exceptional strength and weight has been built recently and is shown by the accompanying illustrations. Its special features lie in matters of detail, the general design being similar to other machines of the same class used in this service and in railway construction and improvement.

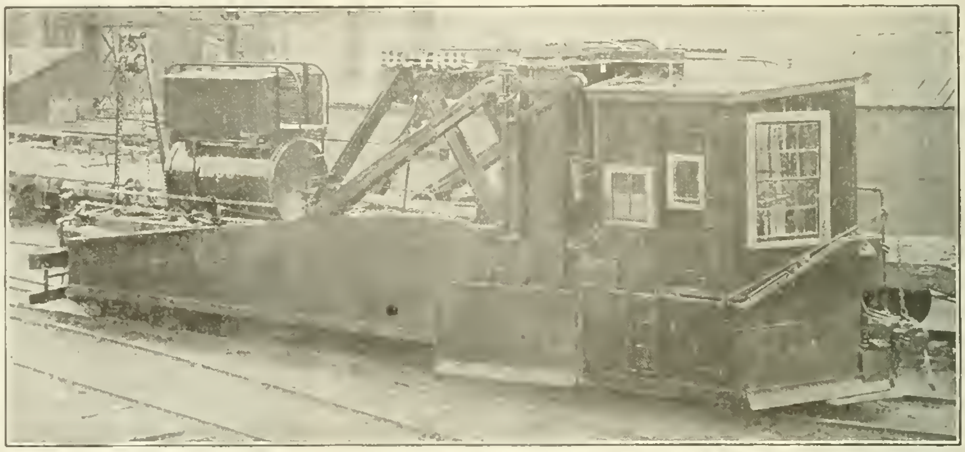


FIG. 1. SPREADER CAR FOR LEVELING DUMPS OF IRON ORE AND STRIPPING

As to the severe condition of the work done by this spreader car, it may be explained that the lean ore averages a weight of about 4,000 lb. per cu.yd., while the overburden averages about 3,200 lb. The latter consists of a mixture of sand, gravel and red clay; it contains a large percentage of boulders and any pieces that will pass through a 7-yd. dipper on a steam shovel are loaded into the cars. When these materials are frozen they are hard to handle except by a powerful spreader. Dump cars of 20-yd. and 30-yd. capacity are used, dumped by air under control from the locomotive.

Work is carried on day and night, about 200 cars being handled on each shift. Trains of five or six 20-yd. cars are handled by 64-in. standard-gage locomotives of the 0 : 6 : 0 class, having cylinders 19 x 26 in. and 42-ton tenders. An engine of the same type and weight, operates the new spreader car. With the spread of wing 22 ft. from center of track, the bank can be widened for 8 ft. before it is necessary to shift the track to the slope, while with lighter machines it has been necessary to move the track 4 ft. at a time. With the smaller machines, also, the dump cars are separated or spotted so as to make separate dumps to be spread, while the new machine spreads a continuous pile dumped by the entire train. This work is under the direction of M. H. Godfrey, district manager of the Oliver Mining Co.

The spreader consists essentially of a heavy steel car frame mounted on trucks and carrying at each side a pivoted wing, which can be swung out to any desired angle up to 45 deg. with the center line of the track, being braced in this position by a strut which transmits the thrust to the car frame when the wing encounters a pile of material to be leveled. The wing can be raised and lowered and can be inclined in a vertical plane for dressing the slopes of cuts. All these adjustments are effected by compressed air cylinders, the air supply being taken from a tank receiver connected to the train line.

Each main wing is 25 ft. long, made of three cast-steel plates, reinforced with a cast-steel angle on the bottom or cutting edge. The outer section is attached to the main part of the wing by dumb-bell clamps so designed that they will break and thus release the end of the wing if it should encounter an obstruction too heavy to be moved. In this way serious damage to the wing itself will be avoided. The heel of the wing is attached by pins to a casting which can be raised and lowered on vertical posts, and which has rollers bearing against these posts to facilitate movement. When in its horizontal position the wing has a vertical travel of 3 ft. 7 in., with the cutting edge 2 ft. below the head of the rail when in its lowest position. The width of spread is 12 to 22½ ft. from the rail to the outer end of the wing.

In a vertical plane the wing may be inclined to a maximum angle of 15½ deg. with the horizontal, and adjusted with its outer end from 1 ft. below to 7 ft. above the inner end. This adjustment is made by means of a belted telescopic joint in the diagonal tension member extending from the head of the guide post to the middle of the wing. To make this adjustment, the outer end of the wing is attached to the chain of a differential hoist on an A-frame at the rear of the car. The joint in the tension member is then disconnected and the wing raised by the hoist, pivoting on the main pin in the crosshead. When raised to the required angle, the telescopic joint is bolted up and the chain hoist then detached. The wing can be folded flat against the car, regardless of its inclination from the horizontal.

Operation of Spreader Wing

Initial movement of the wing is effected by the piston rod of a horizontal cylinder placed at right angles to the track. This acts also as an air buffer when the wing is folded back. With the wing thus pushed out, its further movement is effected by the wing brace or strut, which consists of a length of 9-in. heavy steel pipe having cast-steel fittings for a universal joint at each end. The joint at the rear end has a ball engaging a socket formed in a crosshead which travels on a guide with a movement of about 18 ft. This crosshead is operated by an endless chain passing over a sprocket wheel the shaft of which is geared to a compressed air cylinder. The position of a movable stop, carrying locking dogs, determines the angle of the wing opening, and when the crosshead makes contact with this stop it locks automatically in position, so that the thrust is taken directly by the guide and car frame. After the movable stop is set for any desired width of spread, the wing can be closed and opened to this width from the cab.

An auxiliary wing is pivoted ahead of the main wing and has its rear end bearing against the latter. This prevents the plowed material from piling against the inner end of the wing or flowing over the track, while it also protects the hinge mechanism from being fouled by the material.

A front or pilot for clearing snow or loose material from the track is a special part of the equipment. It consists of two blades hinged to a post at the center line of the track and braced in position by struts. These blades can be adjusted by handle to form an ordinary nose or wedge plow, throwing the material to both sides, or to form a diagonal plow of 9½ ft. spread, throwing the material to either side. The plow has a vertical lift of 13½ in. on its guides, the flangers on the bottom edge being 2½ in. below the rail head with plow in its lowest position.

A cab at the forward end houses the operating mechanism, which consists mainly of a group of four valves controlling the air cylinders. Two valves provide for raising and lowering the two main wings, a third controls the power gear for operating the crossheads of the wing braces (these being operated independently of each other), while a fourth controls the raising and lowering of the forward plow.

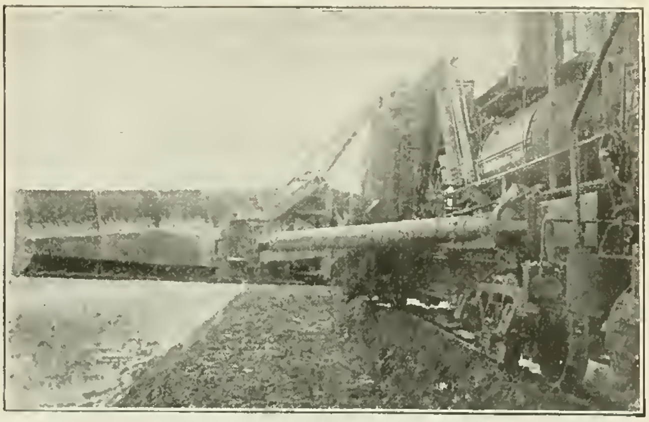


FIG. 2. CAST-STEEL SPREADER IS HELD BY ADJUSTABLE BRACE AND TENSION MEMBER

The machine, designed and built by the Bucyrus Co., is 45½ ft. long and weighs 68 tons. About 40 tons are concentrated on the front truck in order to hold the car down to its work and prevent it from being raised or derailed when the plow encounters heavy resistance. The equipment includes air brakes and automatic couplers, so that the car can be hauled in freight trains for transportation.

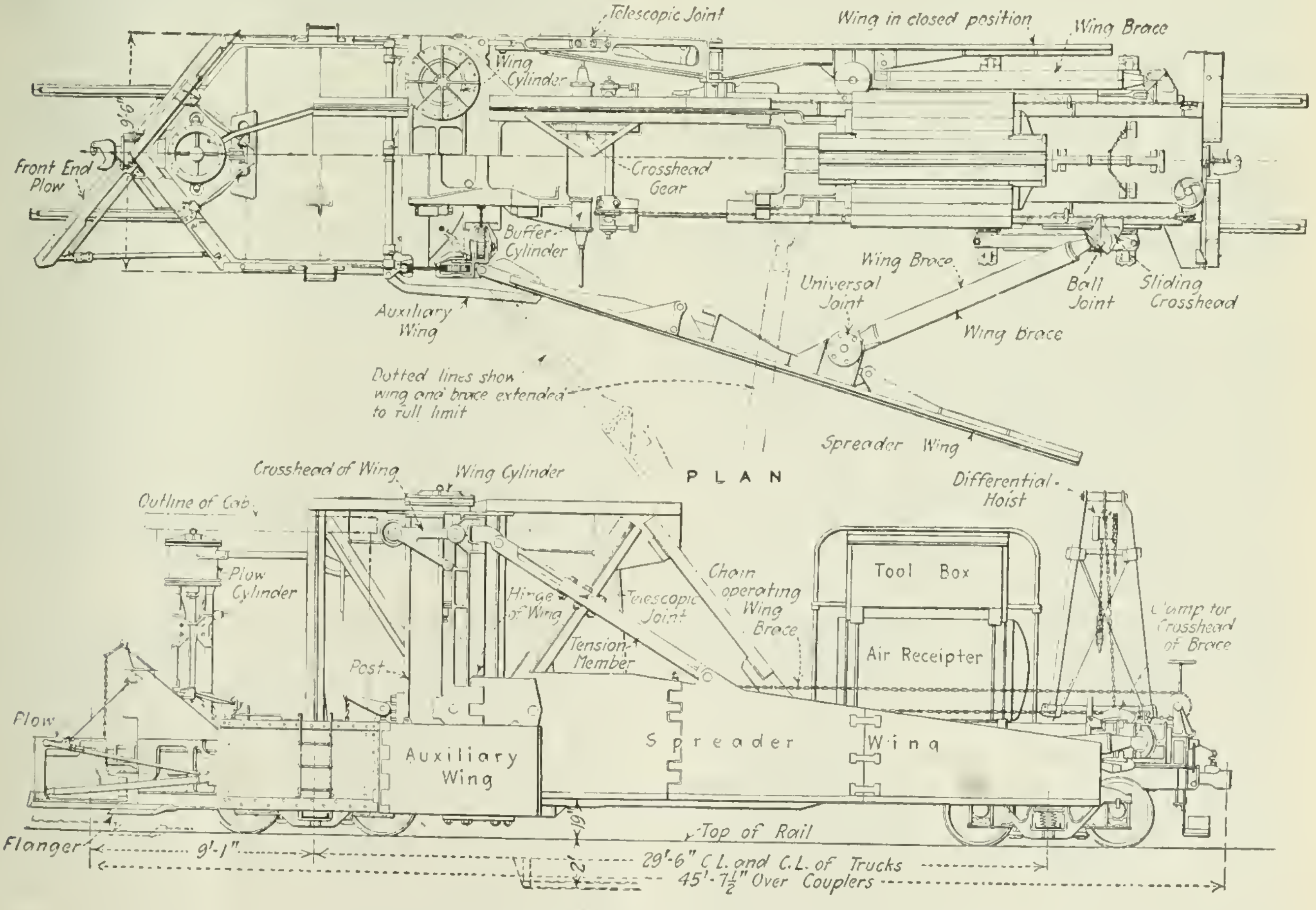


FIG. 3. MECHANISM OF PNEUMATICALLY OPERATED SPREADER CAR

Freighting with Motor Trucks on Kern River Project No. 3

Experience Gained in Delivering 28,000 Tons of Freight to California Job Over a 50-Mile Haul on Mountain Roads

WHEN the Southern California Edison Company early last year decided to rush construction on the hydro-electric development known as Kern River No. 3, the transportation problem presented itself first. The nearest railroad station was the little desert town of Caliente, 40 miles from construction headquarters, making the average haul to the several sites about 50 miles. The road was practically all up or down hill, the grades ranging up to 16 per cent. The construction contemplated called for supplies and materials amounting to 35,000 tons. The first question was whether it would be desirable to build a railroad. Surveys and estimates of cost were made but it was finally decided that it would be more economical to use motor trucks.

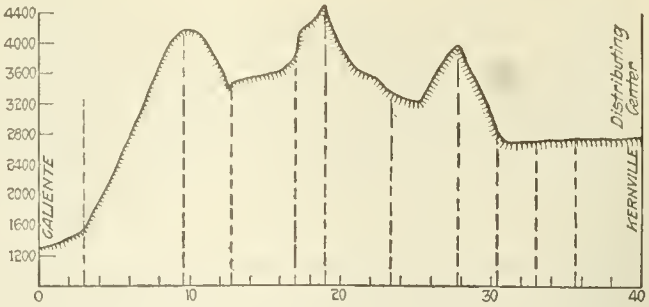
To begin operations the company simply called for privately owned trucks to come in and handle the freight at the best price they could quote. The freight movement had to be started promptly and the company was not yet ready to provide its own transporation. There was a ready response to this call and the the freighters charged $20 per ton for delivery to headquarters camp with stipulated prices for going beyond this distributing center. In order to control the situation and have first-hand information on costs, the company put on a few trucks of their own. Privately owned trucks then reduced their rate to $15 per ton.

After the company gained practical experience in handling the freight under local conditions it came to the conclusion that the net haulage costs should be still further reduced. A conference with the private truck owners was then called and the company offered them $10 a ton on a permanent basis, the company to do all loading and unloading and road maintenance. This figure was accepted.

Before the end of the summer the company had operating out of headquarters camp, 43 of its own trucks of 1 to 12-ton capacity. In addition, 52 privately owned trucks were regularly operating so that a total of 95 were employed continuously in handling through freight alone. During the winter season a smaller fleet was used. The tonnage hauled was 28,000.

In planning its own truck operations the company placed first importance on providing everything necessary in the way of spares and repair parts. Expert advice on mechanical troubles was made available and every endeavor was made to maintain the best possible service. A garage fully equipped with machine tools, hydraulic tire presses, etc., for the upkeep of rolling stock was located at Caliente.

Two elements found essential to successful maintenance were capable drivers and an effective system of inspection. The most satisfactory drivers were found to be those able to analyze trouble as it occurred on the road. Despite the most careful inspection system, it was reasoned, emergencies en route would be inevitable and the loss of time from this source would be an important matter. The careful handling of the trucks when they worked well and intelligence in emergencies was found to be well worth the difference in cost between good and indifferent drivers. A great convenience was the telephone line strung along the 50 miles of road with stations about 4 miles apart or as near this as convenient locations could be found. That is, stations were put, preferably, at the tops or near the bottom of the grades.



PROFILE, SHOWING ABSENCE OF LEVEL STRETCHES

At the outset inspections and overhaulings were made on a mileage basis but this was soon changed to the more effective system of inspecting the parts most subject to trouble at the end of every trip and making a general overhauling whenever the operation of the truck became at all unreliable. An expert mechanician was therefore always on duty at each terminal to inspect every incoming truck and indicate what repairs if any must be made before it could go out. An inspector was also assigned to the road to give aid to drivers where necessary and to ride with and observe the operation of trucks under scrutiny for any reason. Careful study made on the trucks while actually in operation proved to be well worth while. For example, loss of compression, due to excessive wear on cylinder rings, was traced to dust sucked in through the carburetor in the slow trips up the long dusty grades. After clarifiers of a suitable type were put on this trouble was eliminated.

Delaying a truck was considered an out and out loss, hence the organization of freight handling crews was given careful attention. Occasional loss of time on the road was unavoidable but delay at terminals, it was reasoned, could largely be prevented by well organized forces. Loading and unloading crews were operated on a call shift basis. Thus trucks were not held at either terminal except to wait their turn when they arrived faster than they could be loaded or unloaded. All loading and unloading, both on company and private trucks, was done by company forces and the company reserved the right to assign the kind of freight and to limit the quantity per load taken by private trucks.

Constant care was required to keep the several units of the transportation scheme co-ordinated. For example, a number of cars of freight arrived on which waybills had been lost. The railroad would not permit the cars to be opened until the missing waybills were found. Of course, demurrage was not being charged while the cars were locked but the company suffered a demurrage loss nevertheless because when the cars were finally released they were ready without warning. To have moved this additional freight without any hitch in regular procedure would have meant an additional supply of trucks and freight handling crews.

Normally the rate of receiving freight at Caliente was between six and eight cars a day. During summer weather it was desired to get a stock of cement stored at headquarters camp so as to decrease the necessity of maintaining continuous freight service in winter. Hence that commodity came in at the rate of five cars a day. Besides this, miscellaneous freight was usually received at the rate of three to five cars per day. Because of the long railroad haul and the heavy grades between Caliente and Los Angeles, there was no dependable rate at which freight arrived at the Caliente siding. The variations ranged from 29 cars in two days down to nothing for days at a time when no freight trains came through. Experience with these conditions demonstrated the need for large warehouse capacity at the rail terminus. The storage space had to be increased from time to time, particularly for cement. It was found to be good policy to keep the warehouses half full. This afforded equal protection in both directions, i.e., stoppage on the railroad that would leave the trucks idle or truck shortage that would result in demurrage on cars that could not be unloaded.

AN 11-TON LOAD EN ROUTE TO KERN PROJECT

With so many trucks on the road the difference in time made on the 50-mile haul made a considerable diversity factor in loading requirements. Despite this, during the height of the season there was occasionally a lineup of a dozen or more trucks waiting to be loaded. At such times the policy of "first in, first loaded" was strictly observed. Truck drivers were not required to wait on their trucks in such lineups. A run over the road one way constituted a shift and on arrival the driver turned the machine over to a "spotter" who took responsibility for seeing that the load was properly checked off and delivered to the right place, that the truck was inspected, got gas and water, and was turned over to the next driver all ready for the return trip.

The type of truck selected by the company for handling the heavier loads consisted of two parts, a four-wheel motor section and a two-wheel trailer section, as shown in the illustration. The trailer could be detached from the motor by jacking up the front end of the former and supporting it temporarily on trestle or strut. This was a timesaver at terminals and increased the flexibility of the fleet.

The handling of unusually heavy loads was studied in detail. Of the freight handled in quantities, the 11-ton pipe sections were some of the largest pieces. These were put only on trucks that could safely carry 15 tons. Even these trucks at times could take these loads over the heavy grades only by "bucking," that is, by halting on the grades to speed up the engine, pulling forward until the engine was about to stall and then repeating. This, being extremely hard on the equipment, was avoided by coupling a 4-ton truck with a 3-ton load ahead of the one carrying the pipe section.

Pieces weighing up to 32½ tons are allowed in the generating equipment specifications and company officials directing the truck operations see no particular difficulty in delivering these by trucks except the question of getting across streams. A trailer carrying this load and three trucks for motive power, each with enough load to give traction, would weigh about 75 tons all told. Of the three trucks, two would pull and one would push, the latter being behind to facilitate backing up, if that became necessary. Of course, such loads could not use the bridges and it is anticipated that special stream crossings that could be provided at low water will have to be used.

Operation of Denver Water Plant Under City Control

All Rehabilitation Funds Must Come from Revenues, as There Are No Other Provisions for Financing—Water Famine Imminent

FINANCIAL results of the first 14-months operation of the water-works of Denver under municipal control are given in a report to the City Council, March 10. The latter body had requested information as to why extensions which it had ordered were not carried out. The reply of the Board of Water Commissioners in substance is that up to Dec. 31, 1919, it had spent or encumbered with contracts and orders for material a sum greater by $219,451.33 than the net income from operations, $475,084.95. The total income was $1,915,012.87, from which was deducted interest on bonds, $726.316.08; insurance, $8,692.55; refunds on water licenses, $17,484.02; taxes, $26,172.65; operation and maintenance, $661,262.62. Of this latter sum upkeep of the mine conduits cost $106,018.01.

Discussing the financial difficulties the report states that the charter provides that the maintenance, operating expenses and interest shall be paid first. If any revenue remains it is to be applied to capital construction, but no other means of financing extensions and betterments exist. There was deducted from the purchase of the plant $630,000 for depreciation, yet no funds were given the board to rehabilitate the plant as a result of this depreciation. During the period of the option to buy the plant the Denver Union Water Co. was not permitted to make improvements other than those authorized by the Public Utilities Commission. Several essentials which the company desired to make, says the report, were denied. During the option period the company did only such maintenance work as could not be postponed.

Some of the features which the board on taking over the plant found required immediate attention, and for which it had no funds, was as follows: Several areas, notably the stock yards, were inadequately supplied with water for domestic use and practically none for fire protection. The wood stave conduits, some of which had been in service more than 25 years, required extensive repairs. To provide insurance against a water famine in the event of breakage of one of the old lines, contracts were let for 10,000 ft. of 54-in. reinforced-concrete pipe. Not more than this amount can be built in any one year, and it will require 5 years to complete this line with the funds available. The seriousness of the situation is indicated by the fact that only 78,000,000 gal. daily can be brought into the city, the storage is 75,000,000 gal., while the peak load in 1919 was 86,500,000 gal. If the peak load continues for 6 days the limit is reached without the breaking of any conduits

For present needs the board recommends an immediate increase in conduit capacity to carry a total of 100,000,000 gal. daily and, if consumption and waste is to continue as in the past, additional reservoirs must be built and the distribution system amplified. Ten years hence the city should have conduits with a combined capacity of 150,000,000 gal.; modern filters must be constructed at Kassler and Marston Lake, an aerating basin at Marston Lake must be built to eliminate the odors occasioned by vegetable growth, and many miles of distribution and feeder mains must be laid.

Retaining Wall in Deep Cut Displaced by Slide

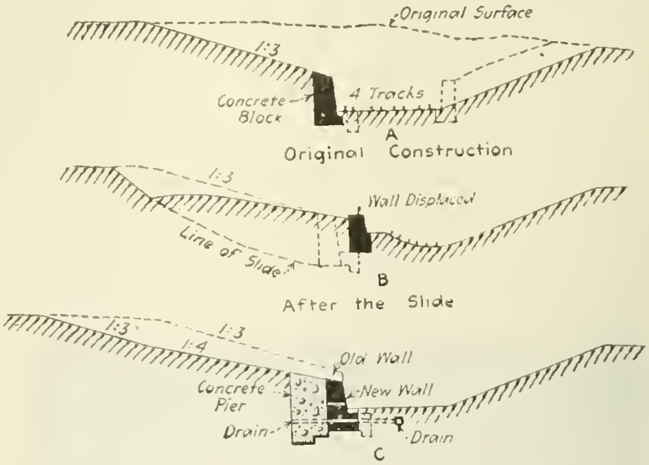
Moving Earth Pushes High Wall Outward 20 Feet Without Overturning It—New Wall Made Lower and Carried Deeper

A LANDSLIDE which blocked the four-track main line of the Great Central Ry., England, illustrates the risk of cutting through unstable material, although conditions may make such construction necessary. At Wembly there is a cut nearly a mile long through soft clay, at a maximum depth of 80 ft. According to an article in the *Revue Generale des Chemins de Fer*, the construction was considered undesirable when the railway was built in 1905, but since the line had to pass under existing railways near each end of the cut it was impracticable to raise the grade and a four-track tunnel was considered too costly.

Concrete retaining walls were built for about 1,600 ft. at the deepest part of the cut, mainly on the high side, as shown in the accompanying drawing. At the maximum section the wall was 30½ ft. high above subgrade and 14½ ft. thick, with the footing 8 ft. below grade in a stiff blue clay that appeared to afford ample stability. To prevent sliding, concrete blocks 10 ft. long, 8 ft. wide and 14 ft. thick were built at intervals along the face of the foundation below subgrade. Behind the wall 6-in. drains were imbedded in broken stone, leading to weepholes at 10-ft. intervals, while a drain along the top of the wall carried off surface water. The face of the cut above the wall was dressed to a slope of 1 on 3.

No cracking or displacement of the wall was noted until February, 1918, but there had been some sliding of the ground above it and a system of dry stone drains was laid along the slope. The first indication of movement of the wall was the raising of the adjacent track, which was at once closed to traffic. Cracks in the slope gave evidence of a serious disturbance of the earth and it was noted that wood struts between the retaining wall and the track ditch were under heavy pressure. Four days later a 600-ft. length of wall was sheared from its base and pushed outward bodily, as shown at B, in the drawing, the movement at the middle being about 20 ft. At the top of the slope the earth sank nearly 15 ft., leaving a steep face. The slip occurred within a few minutes and affected all the tracks, so that traffic was suspended. The volume of the moving mass of earth was estimated at 500,000 tons.

To hold the displaced wall, heavy timbers were placed across the floor of the cut, under the tracks, with inclined shores bearing against them. To brace that part of the wall which had not moved, 6 x 5-ft. concrete struts and blocks 20 x 20 x 10 ft. were built against the footing. The cut was then widened on the opposite side to permit of laying a double track around the slip. Traffic was resumed within seven days.



WALL IN 80-FT. CUT DISPLACED AND REBUILT

As the first step in reconstruction, conrete piers 60 ft. apart were built in heavily braced pits behind the old wall that remained, these piers being 12 ft. long on the face and of a thickness varying with the height. The new wall is built between two piers at the ends of the break, being connected to them by dovetailed joints reinforced with old rails. Its foundations are carried deeper than those of the old wall and the footings are extended to connect with the lower part of the old wall which remains in place below the subgrade and which thus serves as a brace. The new wall is on the original line but its height is 7 ft. less than the old wall, while the surface of the cut above it is dressed to a slope of 1 on 4 and then 1 on 3, as shown at C, thus reducing the surcharge.

A study of the excavations for the piers indicated that the plane of the slide came close to the base of the old wall and followed approximately the dotted line shown in B. The surface of the fault was smooth and slippery, with a shiny appearance, and it was concluded that a film of water had served to lubricate this surface so that the wet superincumbent mass slid upon it.

Greeks Return to Native Land

During the three months' period from the latter part of June to the latter part of September, 1919, approximately 12,000 Greeks landed in Greece on ships plying directly between New York and Patras or Piraeus. The amount of money taken back to Greece by these returning Greeks is very large, reports A. W. Weddell, consul general at Athens. He reports that since Jan. 1 this year more than 130,000,000 drachmas ($25,090,000 at normal exchange) in postal orders have been remitted to Greece from the United States, in addition to moneys taken back by returning Greeks in the form of drafts bank notes, etc.

Determining Bitumen Content in Bituminous Concrete

Surface Area of Aggregate, Its Specific Gravity and Adsorption, and Consistency of Bituminous Cement Are Factors

By Roy M. Green
Professor of Highway Engineering, Agricultural and Mechanical College of Texas

NO PART of bituminous-concrete pavement construction is as little understood as that pertaining to the correct methods of determining the required proportion of bitumen to be used in any mixture. The printed information on the subject is very misleading, and it is certain that successful results would be impossible in many localities in the United States if the specifications that are given in some of the textbooks on the subject were followed. This is true for all parts of Texas, as has been recently demonstrated through an investigation of the existing bituminous pavements in that State. (Bulletin No. 22, "Bituminous Pavement Investigations in Certain Texas Cities, Part I, Bitulithic," Engineering Experiment Station, A. & M. College of Texas, College Station, Texas.) The usual specification for this type of construction, where a formula is actually given, is as follows:

	Per Cent
Bitumen	7 — 9½
Passing 200 sieve	4 — 7
Passing 10 on 200 sieve	24 — 32
Passing ¼ screen on 10 sieve	8 — 12
Passing ½ on ¼ screen	12 — 20
Passing 1 on ½ screen	26 — 35
Passing 1½ on ½ screen	36 — 50

The requirement of from 7 to 9½ per cent of bitumen in a mixture having a maximum size of 1½ in. is certainly excessive, for out of a total of twenty-four representative samples of successful bitulithic pavements taken from the streets of various Texas cities only five had as much as 7 per cent bitumen contained in them. Further, the aggregate contained in these samples was, in every case, less than 1½ in. in maximum size and consequently required more bitumen than would have been necessary had the aggregate been larger. It would seem, therefore, that the usual specification for this type of construction does not fit conditions in Texas and it is doubtful if it fits local conditions in many other parts of the United States.

Since the correct proportion of bitumen to be used is dependent upon several factors that are influenced by local materials it would seem desirable to have some sort of test whereby the correct amount of bitumen may be determined for any case. Before explaining the method to be used in making such a determination it would be well to point out the various factors that must be considered in arriving at the correct proportion to be used.

Surface Areas and Film Thicknesses

It is a recognized fact that in order to produce successful results it is necessary to have the bitumen in the mixture from an unbroken film, around each particle, of sufficient thickness to hold the aggregate firmly in place regardless of the thrusting action of traffic. It is also true, with the same type of construction, that as the surface area of the aggregate increases the amount of bitumen must also increase. Since the surface area of the aggregate has some influence upon the amount of bitumen to be used it is of interest to compare the surface areas of a fine and coarse mixture such as sheet asphalt and bitulithic.

One thousand grams of the aggregate from a standard sheet asphalt mixture has approximately 188,000 sq.cm. (202 sq.ft.) of surface area while that of an equal weight of one inch bitulithic aggregate has only an area of 64,000 sq.cm. (69 sq.ft.) (Calculations were made upon the assumption that the average diameter of the particles between any two sieves was the mean of the sizes of openings of those sieves.) In other words, the sheet asphalt mixture has 2.94 times as much area as the same weight of a one inch bitulithic aggregate. (The grading of the aggregate will be given later.) If the thickness of the liquid film of asphalt cement, necessary to hold the particles in place, is the same in both cases there should be 2.94 times as much asphalt cement used in the sheet asphalt mixture as in the bitulithic. This is not the case, however, as the sheet asphalt aggregate will usually carry about 10.5 per cent of bitumen, by weight, while the bitulithic usually requires about 6 per cent. The sheet asphalt carries 1.75 times as much bitumen as the bitulithic while it has a surface area 2.94 times as large.

Reducing this information to the average thickness of films upon all particles it is seen that, in the case of the sheet asphalt mixture, the average thickness of film is 0.000628 cm. while in the case of the bitulithic it is 0.010 cm. Since the aggregate below the 10-mesh size is the same in both cases then the thickness of film for that part of the mixture should be the same, the difference in average thickness being due to the bitumen on the large aggregate. If this is the case there is a thickness of film over the stone part of the aggregate as great as 0.0483 cm. or about 77 times as great as for the very fine parts of the mixture. It is therefore apparent that the percentage of bitumen necessary in any mixture can not be entirely determined by the extent of surface area.

Effect of Consistency of Bituminous Cement

The thickness of the surface film of bitumen over each particle is influenced by the consistency of the bituminous cement in the mixture. This fact would seem self evident, as it is apparent that the more fluid the material is the thinner the covering over each particle may be made and still have a sufficient thickness to be continuous. The importance of keeping the bituminous cement at the proper consistency for mixing is therefore evident if close control of the product is desired.

If all aggregates were composed of the same minerals the determination of the percentage of bitumen would be greatly simplified because for a given consistency of bituminous cement equal surfaces would require equal amounts of bitumen, when dealing with the same type of mixture. It is natural, however, that an aggregate composed entirely of quartz will retain less bituminous cement than one composed of more or less soft limestone. As an illustration of this difference in carrying capacity, limestone, broken to the size for use in topeka construction, that has commonly been used in many Texas cities, carries approximately 11.1 per cent, by volume, of bitumen, while commercial trap rock broken to the same size carries only 8.2 per cent. This fact, in conjunction with the added fact that their specific gravities are very different, has been responsible for some of the failures of topeka bituminous concrete pavements in that state, in cases where the same plant weights were used for both kinds of aggregate.

Another difficulty which must be considered is that due to the difference in specific gravity of the various large aggregates now in use. The specific gravity has an influence upon the proportion because all mixtures are made at the plant by weight when the real purpose is to obtain the correct volume of bitumen. Returning again to the comparison of the trap rock and limestone, referred to above, the limestone has a specific gravity of 2.65 as compared with 3.18 for the trap rock. If the intention is to use equal volumes of bitumen, say 15 per cent, by volume, it is necessary to have 6.23 per cent, by weight, bitumen for the limestone aggregate as compared with 5.25 per cent, by weight, for the trap rock. It is apparent that it would be disastrous if the same amount of bitumen, by weight, were used in each case even though the aggregates might have the capacity for carrying films of equal thickness upon their surfaces.

METHOD OF PROPORTIONING

From the foregoing discussion, it is seen that the operator of a bituminous mixing plant must consider the surface area of the particles that are to be coated and the capacity of the aggregate for retaining the bituminous cement. In putting this into practice, however, the operator obtains information concerning the surface area by consideration of the grading of the particles and the specific gravity of the aggregate. These considerations would seem to point to the logical method for proportioning the bitumen in an aggregate which is composed of a mixture of stone, sand, and stone dust, which is as follows:

Separate the aggregate on the 10-mesh sieve and first consider the part that passes that sieve. The illustration taken is that for bitulithic with an aggregate of the following grading.

	Per Cent
Passing 200 sieve	4.8
Passing 80 on 200 sieve	9.6
Passing 40 on 80 sieve	12.8
Passing 10 on 40 sieve	5.9
Passing ¼ screen on 10 sieve	13.3
Passing ½ on ¼ screen	17.8
Passing ¾ on ½ screen	17.9
Passing 1 on ¾ screen	17.9

Since the aggregate below the 10-mesh sieve has the same range of size as that used in sheet asphalt construction the percentage of bitumen necessary for that part of the mixture is determined in the same way, namely, by the "Pat Stain." (A complete description of this test is given in "The Modern Asphalt Pavement" by Clifford Richardson, p. 514.) The stain should be the same as that designated as "Strong" by Clifford Richardson in his book "The Modern Asphalt Pavement."

The material retained on the 10-mesh sieve is then treated as follows, in order to get an idea of the correct amount of bitumen necessary to coat it properly. It is first heated to a working temperature and enough asphalt, of the proper consistency, added to coat all particles. The mixture is then spread in a thin layer upon a clean piece of paper and placed in an electric oven maintained at a working temperature, and allowed to remain for 30 min. The excess of asphalt cement will run off the stone and leave it thoroughly coated. The stone is then struck off the paper with a hot spatula and allowed to cool. After cooling it is weighed and the amount of bitumen used is thereby determined. If a natural asphalt has been used, containing mineral matter, or if a check is desired, an analysis of the sample may then be made. In case there is such a great excess of asphalt in the sample that the stone cannot be removed from the paper without taking a large amount of asphalt with it, a second heating may be resorted to, using the same sample with a fresh paper.

Knowing the percentage of fine aggregate and coarse aggregate in the mixture and the percentage of bitumen necessary for each, the percentage of bitumen necessary for the finished mixture may be easily calculated. For example, if the foregoing aggregate requires 11 per cent of bitumen to coat the fine aggregate and 3 per cent for the large aggregate, the finished aggregate would require 5.8 per cent of bitumen. Since in this grading there is 33.1 per cent of the aggregate passing the 10-mesh sieve and 66.9 per cent retained on that sieve, the foregoing result is obtained as follows: 33$\frac{1}{10}$ g. of fine aggregate will require 4.09 g. of bitumen, which is 11 per cent of the total of 37.19 g. of fine aggregate and bitumen necessary for that aggregate. Sixty-six and nine-tenths g. of large aggregate will require 2.07 g. of bitumen, which is 3 per cent of the total of 68.97 g. of large aggregate and bitumen carried by that aggregate. This makes a total of 106.16 g., of which 100 g. is aggregate and 6.16 g. is bitumen. The bitumen in this mixture is, therefore, 5.8 per cent of the total sample, this result being obtained by dividing 6.16 by 106.16 and multiplying by 100.

This method of determining the correct proportion of bitumen to be used in bituminous concrete construction takes into consideration all the various factors discussed, namely, surface area of aggregate, consistency of bituminous cement, adsorption of aggregate, and specific gravity of aggregate.

Objection to British Institution as Sole Body To Determine Registration of Engineers

The secretary of the Society of Engineers (British), in a communication to *The Engineer*, states that an executive committee of that body, appointed to deal with the question of the registration of engineers, passed the following resolution Jan. 19:

> That this society cordially approves the principle of the registration of engineers, but joins with other objectors in opposing the bill promoted by the Institution of Civil Engineers on the following grounds:
>
> 1. Though in the broad sense in which the Institution of Civil Engineers interprets its charter, professional engineers in all branches would be included in the term "civil engineer," it is nevertheless a fact that the term "civil engineer" is employed in a restricted sense, and is so used and understood by the public, by the universities, by technical schools, and by the engineering world in general. As the usage is at present, the title amounts to a misdescription.
>
> 2. This society objects to the Institution of Civil Engineers being the sole body to determine who are to be placed on the register. The Institution of Civil Engineers, though a competent authority as regards its own members, has no mandate from the engineering profession as a whole to act on its behalf, and the determining body should be representative. Such a body should consist of members elected by the leading engineering institutions and societies and of certain members nominated by his Majesty, much on the same lines as the general council is appointed to regulate the qualifications of practitioners in medicine and surgery under the Medical Acts

Dangerous Stresses From Falling Loads on Floors

Multiplication of Static Load Effect Determined by Formulas Based on Assumption of Perfectly Elastic Impact

By J. W. Ledoux
Consulting Engineer, American Pipe and Construction Co., Philadelphia

ENGINEERS sometimes meet concrete mechanical problems concerning which the reference and textbooks may be examined in vain for practical aid. A common example is that of a floor on which heavy loads must be moved. The books are very complete concerning the method of proportioning structures for dead loads but extremely vague in regard to loads that are tumbled about.

It is impossible to move machinery and concentrated loads without danger of an occasional fall. Whether moved by hand or otherwise, they are not always laid down quietly; they may be dropped a fraction of an inch or several inches. Take the case of a highway bridge: A worn-out plank may be reinforced by spiking a new plank over the defect, and a heavy truck may drop from the edge of this plank an inch or more to the original floor, or some object may have been carelessly left on the bridge floor, which would produce the same result.

The effect may be illustrated by the idea of a weight dropping on a beam, since practically all floors can be resolved into this simple conception. Consider a weight of W pounds falling h inches on a beam of length L, moment of inertia I, and modulus of elasticity E; it deflects the beam z inches and produces a maximum fiber stress of S pounds per square inch. The pressure of the weight on the beam, which causes the deflection, is greatest when the deflection reaches its maximum, when it amounts to F pounds; the average value of the pressure during the deflection may be called F_1. By an application of the laws of mechanics the following eight relations may be deduced, in which all values are to be expressed in pounds and inches:

$$\text{Deflection, } z = \frac{FL^3}{rEI} \qquad (1)$$

$$\text{Pressure, } F = \frac{kSI}{Lc} \qquad (2)$$

$$\text{Work done, } W(h + z) = F_1 z \qquad (3)$$

$$\text{Av. press., } F_1 = \tfrac{1}{2} F \qquad (4)$$

$$\text{Then } F = 2W\left(\frac{h}{z} + 1\right) \qquad (5)$$

$$\text{and } F = W + \sqrt{W^2 + \frac{2rWhEI}{L^3}} \qquad (6)$$

$$W = \frac{k^2S^2IL}{2rhEc^2 + 2SL^2kc} \qquad (7)$$

and the fiber stress is

$$S = \frac{WLc}{kI} + \sqrt{\left(\frac{WLc}{kI}\right)^2 + \frac{2rWhEc^2}{k^2IL}} \qquad (8)$$

The half depth of the beam is denoted by c, while r and k are constants of deflection and bending moment, respectively; r has the value 3 for a cantilever beam loaded at the end, and 48 for a simple beam loaded at the middle, while k is equal to 1 and 4 for these two cases.

The formulas err on the safe side, because no allowance is made for inertia of the beam or for the local effects of impact. It should be noted also that the beam is assumed not to be stressed beyond the elastic limit, so that it remains perfectly elastic.

As a concrete case take a yellow-pine floor plank acting as a simple beam 12 in. wide by 3 in. thick, and 60 in. long, and assume a weight of 500 lb. to drop 1 in. on its center. Formula (6) shows this to be equivalent to a steady load of 3540 lb. Formula (8) shows the maximum fiber stress to be 2950 lb. per square inch, or nearly seven times as great as with a steady load of 500 pounds.

The purpose of this presentation is not to suggest increasing the usual allowances for structural beams to allow for dropping loads, but rather to call attention to the danger of carelessness in permitting them to fall.

Sewage Treatment Plans for the Chicago Sanitary District

WITH the intent of starting construction at an early date on a comprehensive program, studies are now being made of the treatment of the sewage of the entire Sanitary District of Chicago. This announcement accompanies one to the effect that construction will start soon on a plant to treat the sewage of the Calumet region for which a sedimentation plant will probably be installed, so designed as to be convertible into an activated-sludge plant.

An activated-sludge plant at Maywood is now under construction to treat the sewage from towns along the Des Plaines River above Riverside. With the exception of this plant, which will abate the nuisance in the Des Plaines River Valley by October, 1920, the district has devoted its major disposal efforts toward the treatment of industrial wastes from the stockyards district, wastes from tanneries in the North Branch of the Chicago River, and also wastes from the Corn Products Co. at Argo.

Negotiations are practically completed with the stockyards interests for the construction of a large activated-sludge plant which may cost eventually $9,500,000. Construction of the first unit may be started this season. Similar negotiations are in progress with the tanning and other industries, while the district and the Corn Products Co. have agreed to provide funds jointly for an experimental plant to treat its wastes. An experimental plant is also in operation on wastes of a large chrome tannery of the Griess-Pfleger Co.

With the completion of the Calumet-Sag channel and the Calumet intercepting sewer during the coming winter, all sewage now discharged into Lake Michigan in the southern part of the district below 7th St. can be diverted into the main drainage canal. To prevent this sewage from increasing the pollution of the canal and subsequently the Illinois River, the Sanitary District has purchased the 106-acre site of the old Pullman sewage farm at $159,600 on which it will at once begin construction of the works mentioned in the opening paragraph.

Topographical Survey of Flint, Mich.

In the article on the topographical survey of the city of Flint, Mich., in *Engineering News-Record* of April 8, p. 700, it should have been stated that this survey was made under the direction of Ezra Shoecraft, city engineer, who engaged the H. H. Randall Co. to carry out the work.

Panama Canal and Arkansas Razor Backs —*A Feat in Mathematical Gymnastics*

By R. L. Kirkpatrick
Balboa Heights, Canal Zone

It is related that the halls of Congress once resounded from a speech by one of Arkansas' enthusiastic representatives on the then moot subject of changing the name of Arkansas. In his eulogy of the might and resources, supposedly accumulated and due to the existing name, he stated that if all the hogs raised in Arkansas each year were a composite hog it could dig the Panama Canal with one swing of his snout.

It may serve to give a more concise idea of the yardage excavated on the Canal, if an analysis is made of the yardage in terms of rootings by this composite hog, or to supply the necessary number of hogs and give them one root apiece; incidentally illumination may be cast on some of the inaccuracies of occasional over-enthusiasm in Congressional debates.

Up to Jan. 1, 1920, 252,132,590 cu.yd. of excavation had been taken from the canal prism. A really excellent New York newspaper almanac, probably not consulted by the Congressman in question, gives the swine population of Arkansas in 1918 as 1,643,000, valued at $22,180,000.

In good Iowa and Illinois sod the writer has observed plump and vigorous Poland-Chinas overturning, he estimates, at maximum output, a ½-gal. measure of soil per swing per snout. This was in early April when the spring rains had made the green herbs and grubworms underneath especially desirable and succulent, filling the hog with a *consuming* desire for high achievement. On a basis of Panama Canal yardage his work figures out as follows:

One-half gal. equals $231/2 \times 1728 \times 27$ equals 0.00247 cu.yd. per swing per snout, and 252,132,590/0.00247 equals 102,100,000,000 flourishes per hog, or 102.1 billion hogs rooting at one time.

It must be granted that the Arkansas razor back is an unusual excavator, likely he excels his more northern brother as a steam shovel even if he is not such a lard can. On the other hand the razor back has small incentive to put forth his best efforts for forsooth he must work with low morale; near three-quarter of his labor must be in soft or hard rock classification on the canal job. His is to be a hard labor with small reward. Granting that his hog-like persistency may keep him at work anyhow, he has a physically impossible task at his Iowa relative's pace. Let us help him out by supplying one-half more of him, i.e., put 51.05 billion more Arkansas hogs to work or 153,150,000,000 hogs in all and give them a root apiece. It is seen that our *reductio ad absurdum* method casts considerable doubt on the Congressmen's razor back prides fulfilling the specifications.

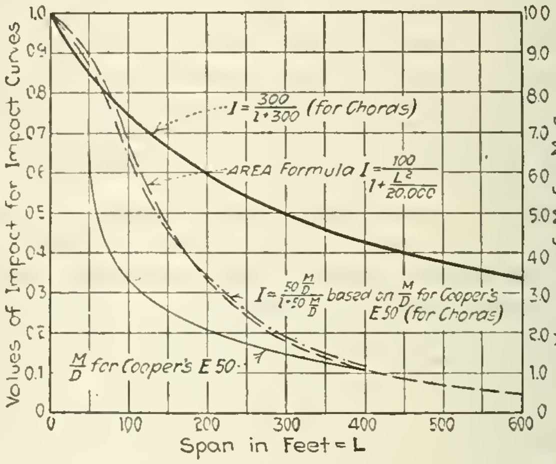
Calculating in terms of a composite hog to do the Canal job in one expenditure of energy it may be assumed that Arkansas' porcine population may displace 3 cu.ft. when he takes his daily wallow in the nearby swamp and that he weighs 150 lb., i.e., he weighs 150/3 or 50 lb. per cu.ft. It follows that our Arkansas hog is very sizable as he weighs $153,150,000,000 \times 150/2000$ or 11.486 billion tons, and he occupies 11.486 billion $\times 2000/50 \times 27$ or 17.10 billion cubic yards.

If pork is worth 15c. a pound, a ton of pork on the hoof is worth $300 per ton and 11,486,000,000 tons are worth $3,445,800,000,000. This composite hog seems to be a valuable piece of property, too much so to use for steam shovel purposes. His value may be sufficient to pay off the world's debts, to buy a few oil stocks, and make a few careful selections in investments in Mars, Saturn and Jupiter. It is wondered how many other of the Congressional effusions per day may not stand the light of mathematical investigation.

An Impact Formula Applicable to Ballasted and Concrete Bridges

By H. M. Gibb
Rawalpindi, India

A NEW impact formula has been devised by the writer to make the impact dependent on the ratio of live load (M) to dead load (D) and also dependent on the loaded length of the bridge. It agrees very closely with the A. R. E. A. formula for values of M/D based on Cooper's E50 loading, and is therefore in conformity with current practice for steel bridges. When steel bridges with ballasted floors or reinforced-concrete bridges are considered the A. R. E. A. formula makes no reduction in impact for the greater dead load of these types as compared with open-floor steel spans. The new formula is,



GRAPH OF NEW IMPACT FORMULA AND TWO OTHERS

$$I = \frac{50\,M/D}{l + 50\,M/D}$$

I = impact coefficient or the proportion to be added to the live-load stress to allow for impact.

l = loaded length of the span in feet which produces the maximum stress in the member.

M = live load per foot of loaded length l.

D = dead load of whole structure per foot of span (but in computing I for the floor system, D includes only the dead load supported by the beam under consideration plus the weight of this member).

The diagram herewith shows above formula graphed. The ratios of M/D used have been derived from the graph given on page 24 of Part III, "Modern Framed Structures," by Johnson, Bryan and Turneaure, using Curve B for dead load. The live load is Cooper's E50. The A. R. E. A. formula and the new formula proposed in the present article give curves which are very similar throughout and practically the same values of impact. When M/D is 6.0, which occurs when the span is about

50 ft., the writer's formula is identical with C. C. Schneider's formula, $I = 300/(l + 300)$; for greater values of M/D the results are very slightly greater than those of the Schneider formula. It therefore conforms very well to existing practice and is also simple to use.

For a steel span of 16 ft., the new formula gives impact of 98 per cent; for a reinforced-concrete slab of the same span 86 per cent. For a 100-ft. steel span with open floor and for one with a reinforced-concrete floor and ballast the impact values are 64 per cent and 29 per cent respectively.

The formula is also susceptible of the usual variations to allow for structures carrying more than one track and to make the value for zero span other than 1.00

Record of Engineers Suggested by Doctors' System

American Medical Association's Method of Keeping in Touch With History and Practice of 160,000 Physicians

By Everett Judson

Sanitary Engineer, With the Hill Pump Valve Company, Chicago

THE relation of engineers, individually and collectively, to society is the leading theme of engineering discussion. Raising the standard of professional ethics, reorganizing of engineers into a more influential association, and the securing of just remuneration for service rendered, are among the leading topics. In recent Government work the writer, as assistant sanitary engineer of the United States Public Health Service, became acquainted with certain activities and services of the American Medical Association which are worthy of careful consideration by those interested in the engineer's problems.

The American Medical Association has approximately 80,000 members, including only physicians who are licensed to practice in one of the states or territories of the United States. Each member is, first of all, a member of a component county society. The county medical societies are joined into state associations, and these state associations unite to form the American Medical Association. Keeping in touch with its own membership would seem a sufficient task for the association, considering how completely it is done, but in addition the association maintains contact with about 80,000 medical men who are nonmembers. This keeping in touch with 160,000 men does not mean just knowing where they are, but also what is their education, what they have done and what they are doing.

This task is assigned to the biographic department. Here we find recorded for each physician the year and place of his birth, high school and college or colleges attended, name of medical school and year of graduation, state wherein licensed, date of license, and latest address. Also the record of his interneship. Through the catalogs of the various medical colleges and schools the entrance requirements and the courses given are obtained. To aid in judging the value of the training, information about the faculties is necessary, so records are kept which show the character and amount of experience of each professor and instructor.

After completion of interneship the building up of practice begins. Through the secretaries of the various state medical licensing boards the biographic department obtains lists of all new physicians licensed in each state. The secretary of the county medical society or one of the correspondents advises the biographic department when the new man locates himself. By the same means the department learns of men who excel in some special line of endeavor. Others may have distinguished themselves in research work, and their writings are published. Still other may be holding some public office for which their training has especially fitted them. On the other hand, a man may be accused or found guilty of questionable or illegal practice. All this information is pretty sure to reach the biographic department. In a few cases it was discovered that doctors were running "diploma mills." The association promptly published the facts, and this publicity enabled public sentiment to put the "mill" out of business.

The biographic department originated from the necessity for the American Medical Association to know all that it was possible to know about each member of the profession, so that it could judge more intelligently the value of papers sent for publication in the *Journal.* Then, too, it keeps the data up to date for the American Medical Directory, which it publishes every two years.

This much the biographic department does for the American Medical Association, but let us consider now what it does for the public. When the Army and Navy were confronted with the task of building up a large personnel in a very short time, they were able to accomplish it without sacrificing quality. The officials were not acquainted with the thousands of men who offered their services, and to have verified the data through correpondence would have taken a long time. But through the coöperation of the American Medical Association the files of the biographic department were placed at the disposal of the United States Government, and the Government's data were quickly supplemented and verified.

During the influenza epidemic of 1918 the United States Public Health Service appointed several hundred medical men for emergency work. These were obtained in the shortest possible time, and still the public received the best medical aid available, owing to the coöperation of the association. Other Government bureaus make use of this service, and it is the policy of the American Medical Association to extend the services of its biographic department to representatives of the Government when this will serve the public interests.

It is realized that the engineering profession has no centralized organization like the association, and that the two profesions are decidedly different in several respects. Probably a complete record of the individual who offers an article for publication in an engineering magazine is not so essential as is the case with the *Journal* of the association. However, the opinion is held that in the present reorganization of engineers provision should be made for establishing a department similar to that described above. The present leaders are working for more centralization, and as this problem is worked out provision could be made for collecting data regarding engineers, while the data already in the files of some of the organizations could be taken over by such a department.

The expense and effort of organizing the department would be justified in many ways. It would hold a restraining hand on those few who might otherwise attempt questionable practices. It would improve the standard of professional ethics. The service which it could render the Government in a crisis is apparent. Its usefulness in peace times, though not spectacular, would be far-reaching. The industrial and educational value of a directory of engineers modeled after the "American Medical Directory" can be readily appreciated, for it would contain information concerning the college or colleges which a man attended, together with the date of graduation and the degree conferred, his connections with the recognized engineering and scientific societies, and a brief statement of his experience. The benefits of such a department to the public and the profession will be manifold if its establishment is undertaken and carried through in the spirit of justice and service to all.

Rising Cost Effects as Viewed in Iowa

A DISCUSSION of the varied and in some cases disastrous effects of rising costs on municipal work in Iowa was precipitated at the recent meeting of the Iowa Engineering Society. B. J. Whipple, of the Lehigh Sewer Pipe & Tile Co., stated that in tile manufacture increases in freight had been 25 per cent for long hauls and 18 per cent for short hauls; 123 per cent in coal and 127 per cent in labor; other items in proportion.

C. T. Wilson said that the time was rapidly approaching when the 25 per cent limit of assessed valuation would be reached and municipal improvements would have to cease. Some of the difficulties encountered by the contractors he enumerated as follows: On work carried over from last season the material men would not carry over last year's quotations; recent legislation secured by the bonding companies required bonding for the full amount, thus eliminating smaller and weaker contractors; labor cost twice as much and was only half as efficient as in pre-war days; materials had doubled in cost and were still rising; delays in payment when the job had been completed tied up unnecessarily the contractors' funds.

"Old data on unit costs must now be translated from money to man-hours with an estimated efficiency factor," said M. G. Hall. He was of the opinion that some contractors were more careless than formerly, allowing work to proceed inefficiently and thereby running up the cost. J. G. Thorne, a contractor, was of the opinion that the engineer and contractor did not get close enough together on the various units used in estimating. He stated that assessed property values would have to be raised or work would stop. Another contractor stated that the contractor on outside work must not bid more for labor than industry; otherwise industry would soon call for construction curtailment. [This has actually happened in a case in Michigan.—EDITOR.]

J. H. Dunlap indicated that it was the proper function of the society to help adjust conditions. Members now were writing to the secretary asking for data on unit costs. Their collection would be a proper work for a permanent secretary. Seth Dean stated that the best source for cost figures he had found was the business news sections of the technical journals and he made a plea for engineers to be more careful in giving unit costs to the journals.

Mention was made by W. W. DeBerard of a proposed Eastern contract whereby some of the extra-hazardous conditions would be assumed by the owner. A schedule of wages and freight rates and material would be set up. If prices went higher the owner paid 75 or 80 per cent of the advance but if lower the contractor would benefit.

Is the Workman Responsible for High Labor Cost?

BY DAN PATCH
Aberthaw Construction Co., Boston, Mass.

THERE is much talk abroad as to the decreased output of that part of the industrial population known as "productive labor." The writer has had cited to him several instances to the effect that workmen are not doing their customary tasks in the construction game. The concern for which the writer works, as a member of the "non-productive" and less criticised, but no less guilty part of the force, has an interesting system of following the cost of work under construction, which by the way is all contracted for on the basis of cost plus fee.

To the superintendent of each job is issued what is known as the job "bogey score." This is a tabulation of the various operations to be performed, quoted in quantity of each and cost per unit at which it is believed each should be performed with labor at the wages prevailing.

For some years the costs made on the various job operations have been corrected back to a standard wage and either flat units or curves of units established as standards from which to set the "bogey" units for new construction. A study of these standards and the plotting of the costs of jobs completed in 1919, raised the question as to whether these later costs indicated the much talked of reduction in production.

Accordingly some of these data have been re-plotted in such a way as to bring out the answer to this question. It is to be noted that, because our concern was, like many others during the war, engaged in construction not of the typical reinforced concrete design, few data are available for 1918. These data, together with personal observations on the jobs now under construction, have led the writer to believe that slacking on the part of the individual workmen is not the cause of a large increase in the labor cost of building construction. If this is so, what *are* some of the factors which have increased the labor costs of construction work beyond the point which the advance in wage rates would seem to justify.

FACTORS MAKING HIGH LABOR COSTS

First: An increase in the amount of overhead cost. This is caused by the following items.

(1) Additions are made to the overhead field organization due to transportation and labor conditions. Men are hired to trace and get through cars of material which under normal conditions would come through without such chasing. This is properly a material charge, like freight, but of necessity gets into the job pay roll and increases the labor cost. Due to shortage of labor, scouts are used to locate the necessary help. Due to difficulties of transient labor in finding lodgings there is an additional pay roll in order either to erect bunk houses or scout for housing.

(2) In most field offices and in many drafting and engineering offices the old practice of paying weekly wages for an indefinite or long number of hours, has given way to paying a weekly rate based on 48 hr. with rate and a half pay for all time beyond the 48 hr. This has increased the overhead cost.

(3) Jobs which formerly ran on a 10-hr. day are now running on a 9-hr. day and some on an 8-hr. day. This

increases the ratio of overhead to productive labor, as well as the influence of start and stop time. This overhead factor will be reduced somewhat when normal transportation conditions return and when labor supply can properly meet the demand.

Second: Comparisons of labor costs are usually made on the basis of the nominal wage rate of the trades. Prior to the war, or at least some years ago, the overtime rate was in many instances the same as the regular hourly rate and comparison on the basis of wage rate was approximately correct. The following quotation from a report on brick mill construction, dated Sept. 14, 1914, is significant. "There is no necessity of paying men extra time after 8 hr. have expired nor upon Saturday afternoon, as men are perfectly willing to work at the usual rate of wages in order to complete any certain job that they are on, provided their foreman has maintained an enthusiastic and loyal spirit in his gang at all times."

Such is not the fact today and most mechanics are working on a basic 44- or 48-hr. week with rate and a half for all time in excess. This may make the rate from 8 per cent to 15 per cent greater than the nominal rate. The following figures indicate why overtime has been resorted to for the trades while unskilled and unorganized labor has had less of such overtime and has been willing to work a longer basic week. According to the data of the U. S. Dept. of Labor the index number for wholesale commodity prices has increased from 132 in 1914 to 206 in 1919, an increase of 56 per cent. Wage rates for the same period have increased as follows:

	1914	1919	Per Cent
Masons	$0.65	$0.90 to 1.00	38.5 to 24
Carpenters	0.55	0.80 to .85	45.5 to 54.5
Laborers	0.25	0.50 to .55	100 to 120

Organization evidently acts as a damper to the law of supply and demand. The man with a trade must have enough overtime to bring his real rate up to the per cent advance in commodities or there will be injustice done him. This overtime to mechanics is similar to the bonuses paid by some commercial and banking houses to their employees. It allows a little chance to reduce expenditures when the period of prosperity breaks, without reducing wage or salary rates. Unorganized, unskilled labor may follow the laws of supply and demand, though it is possible that, being nearer the critical line, and being where the largest rent increases have occurred, buying in small quantities, working more intermittently and moving often, the laborer has needed more than proportional increases to keep abreast.

This factor will be reduced when the present boom of industrial expansion to get world trade while prices are high is over, and Europe is back on the job as a competitor with fair exchange values.

MATERIAL STORAGE NECESSARY

Third: On account of congested production and transportation of materials entering into building construction, deliveries are called for considerably in advance for the time when the material can be built into the structure, in order to be sure of having it at hand when needed. On a certain percentage of this material the anticipated delays will not occur, and material will have to be unloaded and stored away from the proper place, to be re-handled later and to be teamed, adding to the labor cost of the building. This factor will be reduced with the return of normal production and transportation of building materials.

Fourth: Due to the demand for speed in construction, jobs are started before the engineers have completed the design and working plans. This precludes a comprehensive planning, and adds to the labor cost.

Fifth: The trades are becoming diluted. Employers have hired and unions have admitted to their membership many men who are rated as journeymen, but who have hardly had the training or experience formerly required before a workman could be thus rated. This means that without any moral obliquity or intentional slacking a given number of men cannot, due to lack of "know how," do as much today as a few years ago. Unfortunately this condition has been intensified in many cases by a lack of foremen to supervise the gang properly. This factor may be reduced by the employers and unions getting together on the question of apprenticeship, training and journeymen standards. A boom in construction is accompanied by a rise in unit costs, a small building program by a drop in unit costs.

It is one thing to charge labor with being inefficient, which may be largely a force of circumstances or up to the management, and quite another thing to charge labor with being unwilling and lax in performing its duty.

California Water-Power Needs Increasing

NORMAL industrial and commercial growth of California, and the power demand incidental thereto, will require the increase of electrical generating facilities at the rate of 60,000 kw. per annum, according to the estimates recently made by the Railroad Commission of that state. To meet these needs the requisite expenditure is estimated to be about $20,000,000 annually.

There are now under way four large hydro-electric projects in California, the completion of which will require a total expenditure of about $25,000,000, according to the Railroad Commission report. These projects (which do not include the Hetch Hetchy development) are expected to be completed within a year and will increase the energy available in the state by about 120,000 kw. They are the Caribou plant of the Great Western Power Co. on the Feather River, the Kerckhoff plant of the San Joaquin Light and Power Corporation on the San Joaquin River, the Kern River Plant No. 3 of the Southern California Edison Co. and San Francisquito Plant No. 2 on the Los Angeles aqueduct.

In addition to these it should be noted that the Pacific Gas and Electric Co. has recently raised the height of its Lake Spaulding dam, purchased and added to its system the power production facilities of the Northern California Power Co., has under way plans to lease the properties of the Sierra and San Francisco Power Co. and is considering a power development on the Pitt River in northern California.

There are 75 hydro-electric plants in the state and 50 steam plants, the combined installed capacity of which totals 770,000 kw. During 1918, 75 per cent of the total number of kilowatt-hours produced was developed in water-power plants. Due to the absence of construction in the past few years, the production of energy from all sources is now far below the amount required to meet present demands.

Fee Schedule for Consulting Engineers

As a guide for fees to be asked by consulting engineers in the Kansas City district the following schedule has been proposed. It was drawn up by W. L. Benham following conferences with several other engineers.

FEES FOR MUNICIPAL AND VALUATION WORK

Size of project..	$50,000 to $100,000	$101,000 to $500,000	$501,000 to $1,000,000	$1,000,000 and Upward
Preliminary Investigations, report and estimate..........	1.50%	1.00%	0.75%	0.50%
Plans, specifications, estimates attending lettings and final inspections and tests..........	3.50%	3.00%	2.75%	2.50%
*Supervision of construction...	2.50% or $250 to $300 per mo. for each man furnished and an extra fee of $25 per day plus expenses when called from office for inspection	2.00% or same monthly charge per man and an extra fee of $35 per day plus expense when called from office for inspection.	1.50% or same monthly charge per man and an extra fee of $50 per day plus expense when called from office for inspection.	No fixed sum or per centage but same monthly and daily charge as for preeeding class of work.
*Appraisals, including testimony or investigations......	3.00% or $75 per day and expense up to $300 and $50 per day thereafter. Minimum fee $1000. Each man furnished at cost plus 50%.	2.00% or same as in previous column.	2.00% or $100 per day plus expense up to $5000 and $75 per day thereafter Minimum fee $2500. Each man furnished at cost plus 30%.	2 00% Same as in previous column.
Reports, investigations, examinations, expert testimony, checking fellow engineers' work, etc.	$75 per day plus expenses up to a fee of $2000. then $50 per day thereafter. Minimum fee, $500. Each man furnished at cost plus 35%.			

*Provision should be made in contracts requiring contractor to pay engineer or city a stipulated fee per month for delay in completing work according to contract.

Although it has no official standing and has not been adopted formally or informally, it is based on bookkeeping costs wherein are represented proper profits, overheads, costs of getting business and all legitimate general expenses.

Shipbuilding Profits in Great Britain

According to a statement of the "Times Engineering Supplement" of March, 1920, shipbuilding in Great Britain has made a very good financial record. Ships built in the United Kingdom, it is stated, were turned out at a lower cost than those of other countries, and sold at higher prices.

Of the 821 vessels ordered by the Ministry, 129 were cancelled after the Armistice was signed, 155 were transferred to private owners under the agreement with Lord Inchcape, 120 were transferred on similar terms to their builders, 104 were sold to foreign owners, 156 were sold to British owners direct; while of vessels built abroad 101 were sold to foreign owners and 18 to British owners, while of the total 20 were sunk and 18 are yet unsold. The 260 vessels built in the United Kingdom were sold for £47,900,000—a profit of £11,600,000, as compared with their cost of £36,300,000; but the 119 vessels built abroad cost £26,400,000 and realized only £17,200,000—a loss of £9,200,000—leaving a net profit on the whole programme of £2,400,000. Put another way, it may be said that the United Kingdom vessels cost an average of £139,615 each and sold for an average of £184,231—a profit of $44,616 per vessel; while the vessels built abroad cost £221,848 each and sold for £144,538—a loss of £87,310 per vessel. This seems to prove pretty conclusively that the shipyards of the United Kingdom are as capable as ever they were of competing economically with those of the United States and Canada.

LETTERS TO THE EDITOR

Engineering—A Job or Profession?

Sir—The State of Tennessee, along with other states of the Union, is planning large things in highway work. Large bond issues have been voted and extensive road projects are being, or have been, laid out. To make this possible, the legislature of 1919 passed a General Enabling Act (Senate Bill No. 149) authorizing counties of the state to issue bonds for road building purposes and prescribing rules and regulations for such bond issues and for the conduct of this work. To Sec. 11 of this act, referring to the employment of engineers, attention is called. This section reads as follows:

> "Be it further enacted, That said commissioners shall employ a competent engineer, and, if need be, assistant engineers. Said engineers shall be employed to lay out the work on the roads herein provided for or that may herein or by the court hereafter be provided for, making estimates on said roads and work done by contractors building said roads; *and said engineers shall execute to the County so employing him a bond for not less than ten thousand dollars, or more if more should be demanded by the county court of said county employing him, that he will honestly and faithfully execute all work intrusted to his care by said commissioners of said county.* In the event he should wilfully or intentionally fail to execute any work intrusted to his care in such manner as not to be to the best interest of the county so employing him, then said bond shall be forfeited to said county, said bond to be signed by good and solvent personal bondsmen, or by some good bond company authorized to do business in the State of Tennessee; and as a compensation for the performance of his faithful duty, he shall receive an amount as may be agreed upon by him and the road commissioners having charge of said work. *And all engineers so employed by any county in the State of Tennessee under this act shall take and subscribe to an oath before entering upon his duties for said county that he will honestly and faithfully execute all work intrusted to his care without favor or partiality to any section of said county over that of any other portion of said county. Any engineer employed under this act for any county in the State of Tennessee shall be subject to removal or discharge by said commissioners for said county at any time when in the judgment of a majority of said commissioners it appears that it will be to the best interest of said county to make such removal, first giving thirty days' notice of same.*"

The italics in the above act are used to call attention to those particular parts. It is not our purpose to make hostile criticism or to provote such, but we believe that laws should be so framed as to promote rather than to obstruct the progress of the communities they are intended to benefit. Therefore, to that end, their provisions should be such as to offer every legitimate inducement to men of skill and ability to undertake the work contemplated. We submit that the italic portions of the foregoing section of Tennessee's road law will tend to have just the opposite effect. We have not seen the road statutes of other states but we are led to wonder if such provisions in regard to engineers appear in them all. If so, it but emphasizes the pressing need that the engineer should make himself known, that the true character of his services should be understood by the public and that he should establish himself legally upon a professional status by the enactment of suitable license laws in all the states. Until that is done, the engineer will continue to be regarded in the eyes of the law as a hireling and his services will never receive recognition in their true professional character. A failure to command such recognition not only limits the sphere of the engineer's usefulness but indirectly it operates to the detriment of the interest of the public, as is evidenced by the enactment of such laws as the foregoing.

Incidentally the present writer submitted this statute to a leading lawyer of Tennessee and asked him why it was necessary to throw such restrictions around an engineer, why he should be made to give bond (since he handles no money), why he should be subject to discharge at the whim of a board without its assigning any reason save personal interests, and why he should, in addition, take an oath to discharge his duties faithfully and honestly. We asked this lawyer why the engineer could not be treated as a professional man, like a lawyer or a doctor, and not as a hireling, and evidently regarded as a rascal at that. The lawyer replied that the engineer had no legal status as a professional worker in Tennessee, that he was classed as a tradesman and that such a statute in the present condition of affairs was the only recourse the state had for protection against fraud and dishonesty. In the case of the lawyer or doctor, a revocation of license would punish and remove possibility of practice by the unworthy, but in the case of the engineer anyone could practice who might choose to do so, with no restrictions whatever placed upon him save such as might be put in each particular contract. He very frankly admitted that it is unfortunate that such should be the case, but said until the engineers establish themselves upon a professional basis in the eyes of the law they may expect to be dealt with in just this manner.

We respectfully submit this law to the engineers of the country and ask that consideration be given to it as well as to laws of similar character that may be in force in other states. While we believe engineers should neither expect nor seek class legislation favoring them they should nevertheless do all in their power to secure the amendment or repeal of such laws as the foregoing, that their profession may be recognized and understood in its true nature and that their opportunities for real service may thereby be enlarged and broadened. We believe that in so doing they will not only render a lasting service to their own profession, but will also confer a much larger benefit upon the public as well.

WALTER H. DRANE,
Chief Engineer, Smith Co. Highway Commission.
Carthage, Tenn.

Incompetence and New York's Port

Sir—The editorial on "Incompetence and New York's Port," in your issue of April 8, p. 697, again calls attention to the immense amount of fruitless effort which has been expended in trying to bring the freight-handling facilities of the port up to modern standards. One of the reasons for this failure is the diversity of interests involved, each one powerful enough to defeat the plans of the other. While many people know that New York is the greatest financial center in this country, few realize that it is the largest manufacturing center also. According to the U. S. census bulletin of 1905, more than 55 per cent of the population of the city were engaged in the manufacturing business, and the value of the production was equal to 10 per cent of all the manufactured products in the U. S., greater than the value of the entire foreign commerce.

In order to supply the raw materials, and to take away the finished products, enormous transportation facilities are required and particularly on Manhattan Island which is the heart of this great industrial center. The most intensive development is required where the largest amount of goods are to be handled, and that is on the North River waterfront of Manhattan. Pier rentals in this section run well above $100,000 per annum, with a large number of applications from steamship companies, who can't get dock space at any price, on file in the dock department.

It would seem, therefore, that from the standpoint of the City and State of New York, that the first consideration would be the full development of the freight-handling facilities of the North River waterfront of Manhattan Island. Studies to this end, and reports have been made for the past fifty years or more, beginning with O. Vandenberg, in 1866, who suggested a marginal elevated railroad and since followed by at least fifty others, the majority of whom favored an elevated road, but up to date absolutely nothing has been accomplished, although it did seem as though there was a chance when in July, 1910, the writer with two others, E. P. Goodrich and Harry Nichols, were appointed as a board of consulting engineers to devise a plan for the removal of tracks of the New York Central & Hudson River R.R., from the surface of Ninth Avenue, and also to report on a plan for the improvement of the freight-handling facilities of the North River waterfront.

Unfortunately, this board failed to agree in its recommendation and their work, like their predecessor's, amounted to nothing. There were, however, two points on which the board were in absolute agreement and these were: First, that the freight should be handled through joint terminals located at various points along the east side of West St., and that the railroad occupancy of piers should be reduced.

From pier 1 to pier 42, North River, a distance of 9,765 ft., the railroad's occupy 4,930 ft., or 55.4 per cent.; ferries, 1,087 ft., or 11.2 per cent; leaving only 3,748 ft., or 38.4 per cent for shipping and public piers.

It is the opinion of the writer that any port improvement plan which ignores West St. must be a failure, for what is the use of landing freight in Jamaica Bay or Staten Island which is destined for Manhattan?

If an elevated railroad is built along West St. for the use of all roads, connecting with unit terminal stations on one side and the piers on the other, with a tunnel connection under the river for the Jersey roads, the Jersey waterfront as well as Manhattan can be relieved and the freight-handling capacity increased many fold, and the port problem will never be successfully met until this is done.

ERNEST C. MOORE,
New York City. Consulting Engineer.

Engineering Compensation and Prospects of Federal Government Employees

Sir—I desire to call your attention to an article on p. 754 of your issue of April 15, wherein you state that the Joint Reclassification Committee of Congress has recommended a substantial increase for all the federal scientific and technical services. Attached herewith you will find a table that I have prepared which will show a very substantial decrease for a certain group, and but a miserly increase for another group.

Most of these schedules I have copied from the report of Engineering Council which appeared in the *News-Record*, Jan. 15. Schedule on line two was recommended by the Advisory Committee (see p. 561, March 18, 1920). A further study of table 1 of Engineering Council's report will reveal that, since July 1, 1915, the total increase in salary for the junior grade was 13.3 per cent which, with the 9 per cent proposed by the Reclassification Committee, will make a total of 22.3 per cent.

	Junior Grade			Assistant Grade			Associate Grade			Professional Grade			Senior Grade		
	Max.	Min.	Avg.	Max.	Min.	Avg.	Max	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.
1	2,580	1,620	1,981	4,140	2,700	3,225	5,760	4,320	4,700	7,860	5,940	6,500	....	8,000	....
2	2,580	1,860	2,100	4,080	2,880	3,280	5,460	4,260	4,660	7,920	5,820	6,500	12,000	8,400	9,600
3	3,240	2,260	2,720	3,240	3,040	3,400	5,280	3,980	4,600	6,780	5,610	6,040	9,750	8,600	9,175
4	2,160	1,800	1,875	3,000	2,400	2,590	3,840	3,240	3,360	5,040	4,140	4,330	*	*	*
5	3,000	1,000	1,719	4,500	1,020	2,222	5,000	1,800	3,104	7,500	1,800	3,801	10,000	4,500	5,867
6	3,756	1,878	2,818	4,883	2,304	3,600	5,634	2,304	4,312	9,000	5,200	6,381	9,900	9,000	9,450
7	.....	....	+9 0	....	....	+16 5	....	....	+8 0	....	....	+14.0	....	....	....
8	.....	....	—33 5	....	....	—28.0	....	....	—22.0	....	....	—32.0	....	....	....

Line 1—Proposed salary schedule recommended by Engineering Council.
Line 2—Proposed salary schedule recommended by Advisory Committee (see News-Record, p. 561, March 18, 1920).
Line 3—Proposed salary schedule recommended by Bureau Chiefs (see report of Engineering Council).
Line 4—Proposed salary schedule recommended by Reclassification Committee.
Line 5—Salary paid to employees of 16 Engineering Bureaus in Civil Establishments (see report of Engineering Council).
Line 6—Salary paid to employees of 4 Engineering Bureaus in Navy Department (see report of Engineering Council).
Line 7—Average per cent of increase for employees of 16 Engineering Bureaus in Civil Establishments (if proposed schedule of Reclassification Committee is adopted).
Line 8—Average per cent of decrease for employees of 4 Engineering Bureaus in Navy Department (if proposed schedule of Reclassification Committee is adopted).
*Salary not recommended by Reclassification Committee.

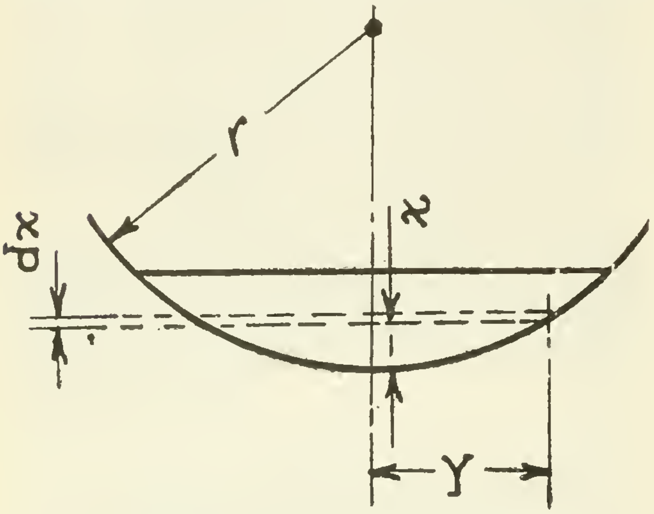
Assistant Grade 9.0 + 16.5 = 25.5 per cent
Associate Grade 9.9 + 8.0 = 17.90 per cent
Prof. Grade 5.0 + 14.0 = 19.00 per cent

Compare these figures with the increases of 50 to 105 per cent secured by unskilled and skilled labor, and I am sure you will agree with me that the proposed salary schedule of the Joint Committee, if adopted by Congress, will hardly persuade anyone to stay in the Federal Government employ.

A. Miedwig,
Construction Division of the Army.
Washington, D. C.

Areas of Segments of Circles

Sir—I have read with interest the many articles appearing in *Engineering News-Record* on the subject of areas of segments of circles, within the last few years. My experience has caused me to be especially interested in this particular phase of calculation. The most promising of these methods and the one most fundamentally correct in its basis was that published in a letter of Leopold Pistner in your number of Nov. 8, 1917, p. 894. This dealt with a calculus method but unfortunately only three terms were given with a corresponding limit of error of 0.03 per cent to 0.6 per cent.



It being my opinion that some of your readers might be interested in a closer limit of accuracy, I have developed Mr. Pistner's theorem to a greater number of terms, and present it here with a different method of development.

Let A = area of the segment.
x = the versed sine, or width of segment.
y = the sine or half the chord.
r = the radius.

By geometry, $y = \sqrt{x(2r-x)}$.
If $r = 1$, $y = \sqrt{2x-x^2}$.
It is evident that
$dA = dx\,2\sqrt{2x-x^2}$.

First expand $\sqrt{2x-x^2}$ which can be done by Tayler's theorem, the binomial theorem, or ordinary square root.

Tayler's theorem is:

$$f(x-y) = f(x) + f'(x)\frac{-y}{1} + f''(x)\frac{-y^2}{1.2}, \text{ etc.}$$

Substituting $2x$ for x, and x^2 for y we have,

$$\sqrt{2x-x^2} = \sqrt{2x} - \frac{x^2}{2\sqrt{2x}} - \frac{x^4}{8(2x)^{\frac{3}{2}}} - \frac{3x^6}{48(2x)^{\frac{5}{2}}} - \frac{15x^8}{24\cdot16(2x)^{\frac{7}{2}}}$$

$$= \sqrt{2}\,x^{\frac{1}{2}} - \frac{x^{1\frac{1}{2}}}{2\sqrt{2}} - \frac{x^{2\frac{1}{2}}}{16\sqrt{2}} - \frac{3x^{3\frac{1}{2}}}{192\sqrt{2}} - \frac{15x^{4\frac{1}{2}}}{24\cdot16\cdot8\sqrt{2}}$$

Integrating this series (see page 319, "Bowser's Calculus") we have:

$$\frac{A}{2} = \frac{\sqrt{2}\,x^{1.5}}{1.5} - \frac{x^{2.5}}{5\sqrt{2}} - \frac{x^{3.5}}{56\sqrt{2}} - \frac{x^{4.5}}{288\sqrt{2}} - \frac{x^{5.5}}{1126.4\sqrt{2}}$$

$$A = r^2\left[\frac{4\sqrt{2}}{3}\left(\frac{x}{r}\right)^{1.5} - \frac{\sqrt{2}}{5}\left(\frac{x}{r}\right)^{2.5} - \frac{\sqrt{2}}{56}\left(\frac{x}{r}\right)^{3.5} - \frac{\sqrt{2}}{288}\left(\frac{x}{r}\right)^{4.5}\right.$$

$$\left. - \frac{\sqrt{2}}{1126.4}\left(\frac{x}{r}\right)^{5.5} - \frac{\sqrt{2}}{u}\left(\frac{x}{r}\right)^{n+.5}\right]$$

In the above n = number of term.
For any term,

$$u = \frac{(n+0.5)\underline{\lfloor n-1}\,(2^{n-1})}{2\underline{\underline{\lfloor 2n-5}}}$$

Where $\underline{\underline{\lfloor z}} = 1\cdot3\cdot5\cdot z$

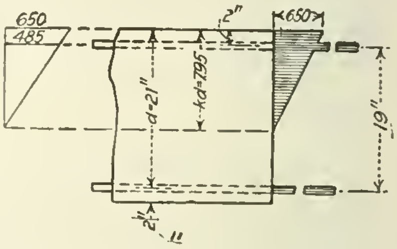
The above formula should be appreciated as an especially accurate and easy one. When it is considered that each succeeding term can be obtained by simply multiplying the preceding one by x over r, and its constant, it is seen to be exceedingly easy of application.

D. W. Starkey.
Chicago.

Simple Designing of Double Reinforced Concrete Beams

Sir—For many of the cases in the design of reinforced concrete, the use of diagrams based on general algebraic derivations such as those given by Arthur G. Hayden in *Engineering News-Record*, March 25, 1920, p. 634, gives the simplest method of solution. In a few cases, however, the use of the numerical values from the start in the analytical solution is not only simpler but makes possible the design when diagrams or tables are not readily available. This can best be illustrated by an example of rather common occurrence.

Continuous beams of T section nearly always require compressive steel to make up for the deficiency of concrete at the supports where the moment is negative, the dimensions of the beam at such points being fixed by the stem of the T. The problem here is as follows: Given the dimensions of the concrete section of a beam to find the steel required in the top and in the bottom to carry a given moment.



Let us say that the given amount is 900,000 in. lb. and the concrete section is limited to 13 in. in breadth and 21 in. depth to steel, 23 in. total depth. $f_c=650$ $f_s=16{,}000$ $n=15$. The resisting moment of the beam can be considered as the sum of two moments the first being that of the beam without compressive reinforcement and with 0.77% tension steel and the second that of the compression steel and additional tension steel.

The value of the first resisting couple $= R\ b\ d^2 = 107.4 \times 13 \times 21 = 616{,}000$ in. lbs.

The steel required for this couple $= 0.0077 \times 13 \times 21 = 2.10$ sq.in.

The moment to be carried by the second couple $= 900{,}000 - 616{,}000 = 284{,}000$ in. lbs.

If two inches of cover is used at both top and bottom, the arm of this steel couple is $d - d' = 21 - 2 = 19$ in.

When $f_c = 650$ and $f_s = 16{,}000$, $k = 0.378$ and $kd = 7.95$ in.

From a diagram drawn to any scale or by proportion the stress in the concrete 2 in. from the surface of the concrete is 485 and the stress in the steel at this point is 15 times 485, but since the steel displaces an equal amount of concrete it is only 14 times as effective as the concrete.

The area of compressive steel then is

$$\frac{284{,}000}{485 \times 14 \times 19} = 2.20 \text{ sq.in.}$$

and the additional steel for tension is

$$\frac{284{,}000}{16{,}000 \times 19} = 0.93 \text{ sq.in.}$$

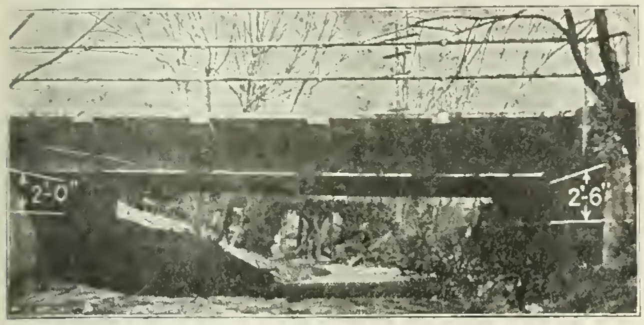
which must be added to the steel in the first couple to obtain the total tension steel required or 2.10 + .93 = 3.03 sq.in.

R. R. Martel,
Pasadena, Cal. California Institute of Technology.

HINTS FOR THE CONTRACTOR

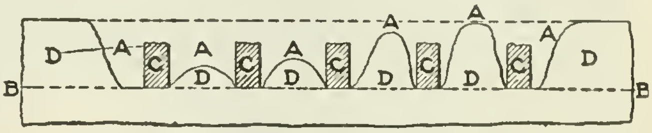
Concrete Bridge Raised by Screw Jacks

USING 60 screw jacks and ordinary house raising processes a concrete girder bridge weighing 88.6 tons and having a clear span of 36 ft. was recently raised to conform to the new grade of a street being paved at Davenport, Iowa. The bridge carried a 24-ft. paved roadway and two 4-ft. sidewalks and was raised 2 ft. at one end and 2½ ft. at the other end, as indicated by the accompanying view. Including $40 premium on a bond required of the contractor, the cost was $440. It required two weeks to complete the operation.



STREET BRIDGE RAISED BY SCREW JACKS

When the bridge was constructed in 1913, the old abutments were cut out roughly, as indicated by the sketch, to provide seats for the girders. Afterwards the spaces *AA* were concreted in one pouring with the girders *CC*. In raising the bridge, cribbing was built up underneath at each end and on each cribbing 30 jacks were set to bear underneath the bridge platform. Under pressure from the jacks, the abutment concrete was cracked with chisels along the line *BB*. The gap, after the bridge was raised, was packed with concrete. Nine days later sand-cement mortar was worked into the spaces left by the shrinkage of the concrete.



FRONT ELEVATION OF ABUTMENT

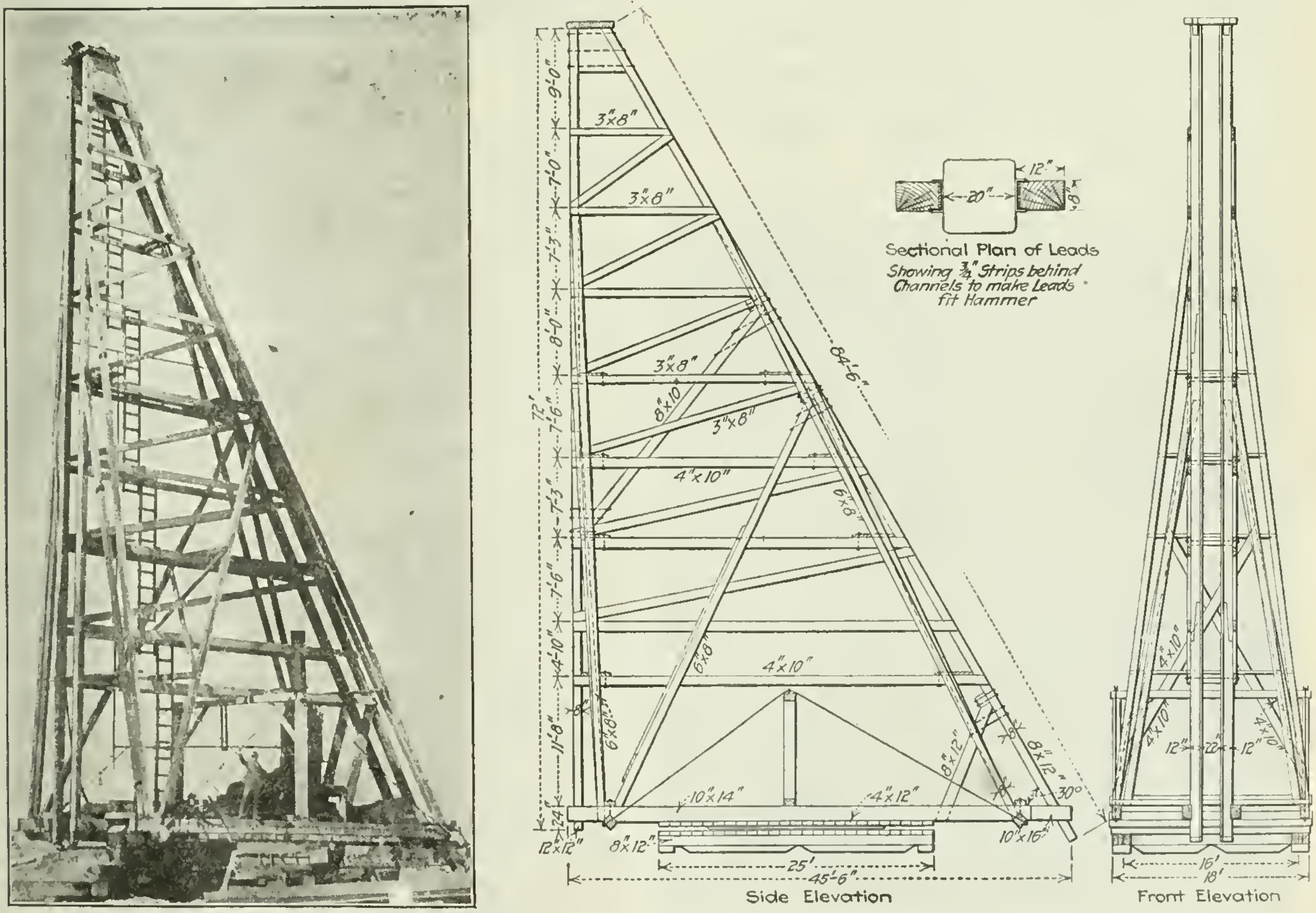
A professional house mover, H. Behrens, Davenport, Iowa, was the contractor for the raising operation, which was performed under the direction of City Engineer Roscoe K. Earle.

Piledriver Has Double Set of Leads

BY MARSHALL G. FINDLEY

Asssistant Designing Engineer, Board of Commissioners, Port of New Orleans, La.

THERE are about 2,000 batter piles in the walls of the lock now being built by the Board of Commissioners of the Port of New Orleans, for the new Inner



PILEDRIVER IN NEW ORLEANS HARBOR WORK HAS LEADS ON BOTH VERTICAL AND INCLINED SIDES

Harbor Navigation Canal. For these piles it was decided to build two special drivers, of the details and general appearance shown in the foregoing illustrations, the novel feature being the placing of leads on both the vertical and sloping sides of the drivers. Both vertical and inclined leads are extended out a short distance from the plane of the main frame members and are detailed to take steam hammers. Provision is made for a shift of the top sheaves depending upon which of the leads is being used. A 60-ft. pile can be handled in the vertical lead and one of 75-ft. in the other leads, which are at an angle of 30 deg. with the vertical.

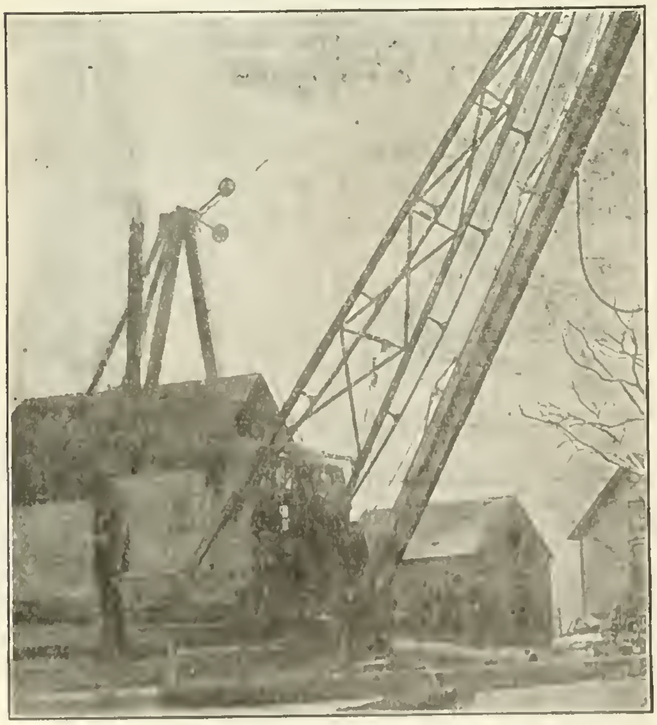
Driving Piles Through the Ice

By H. McL. Harding
Consulting Engineer, New York City

Better spacing and alignment of piles, both straight and batter, resulted from driving them from a machine mounted on ice at Milwaukee, Wis., the past winter, than has been possible with the usual floating driver. The operations were in connection with the municipal port development, and showed that, for some types of construction, winter work even in this latitute can be carried on quite as efficiently as summer work.

Along the inner shore of Jones Island, there is being built about 1,600 ft. of quay construction, which comprises the driving of rows of vertical and batter piles and attaching longitudinal and other timbers. The depth of the water near the shore, especially where the inner rows of vertical and batter piles are being driven, varies from 1 to 3 ft. This section is later to be filled with earth. In the summer, it would be necessary to dredge sufficiently deep to bring the scow supporting the piledriving machinery close to the shore or else to erect falsework along or near the bank. Either of these methods would have been expensive and have consumed much time in preparation.

For an average of some 70 ft. from the shore the ice was frozen some 2 ft. in thickness and when the water was 1 ft. in depth the earth under the ice was also frozen. After some consideration of the situation some 12 x 12-in. timbers were laid upon the ice and upon them were placed rollers which carried the framework of the piledrivers and the house containing the boilers, engines, cable drums, fuel, controls and accessories usually required for pile driving.



BATTER PILES BEING DRIVEN THROUGH ICE FOR MILWAUKEE HARBOR WORKS

ROWS OF BATTER AND STRAIGHT PILES DRIVEN THROUGH ICE

A small hole was started in the ice and by means of piledrivers and the house containing the boilers with a steam jet apparatus, consisting of a flexible armored hose with a 1-in. pipe bent at right angles, in about five or six minutes a hole in the ice was made and enlarged and the frozen earth was sufficiently softened so that the vertical and batter piles could be freely and easily driven. The alignment of not only the vertical but also of the batter piles driven at an angle of 30 deg. was so perfect that it was impossible to detect any variation.

After the several rows of piles were driven the longitudinal and other timbers were placed in position, the cuttings for these in the ice and earth also being carried on from the surface of the ice. The winches for operating grab buckets for other work similarly were moved to and fro upon timbers on the ice.

It was estimated from the progress that the number of piles driven in a day was double that which would have been possible in summer from the floating scow. The men, even those occupied in the outside work, could easily find time when the 60 to 65 ft. piles were being driven to become warm in the winch boiler room house. The men were more comfortable than when working in the cold water of the spring and fall. The lost days due to stormy weather were not more than during the other seasons.

NEWS OF THE WEEK

New York, April 29, 1920

Founder Boards Meet with Western Society

Many Views Expressed on Subject of Increasing the Engineer's Influence in Public Affairs

Governing boards of the founder societies and the membership of the Western Society of Engineers held a joint dinner and meeting April 19, in Chicago, where the representatives of the national bodies were having board meetings. Society unity was promoted and the occasion afforded to Middle West engineers a demonstration of the co-operation of the national organizations.

Arthur P. Davis, president of the American Society of Civil Engineers, in outlining the progressive ideas he had expressed at a meeting of the New York Section, March 31 (see *Engineering News-Record* April 15, p. 789), stated that the great changes which have come into men's minds in the past five years must be reflected in an expansion of the society to keep abreast of them.

In responding for Herbert Hoover, president of the American Institute of Mining and Metallurgical Engineers, who was unable to attend, Arthur Fletcher, director, laid stress on the engineer's fitness and duty to solve the present industrial problems.

F. J. Miller, president of the American Society of Mechanical Engineers, predicted the early construction of an engineering building in Chicago where might be housed some of the branch offices of the nationals. As to the public work of the proposed federation, he expressed the opinion that engineers should speak as expert witnesses only, not forgetting that the layman has as much right to his opinion as the engineer to his on matters of public policy; otherwise dissension will be created. On the question of publicity he outlined a plan whereby local societies should select one man to collaborate with the editors of the local press in translating what the engineer is doing or trying to do in the public interest. This man would learn through the editors what will interest the public and can give the editors accurate information on these subjects.

"How to obtain teamwork among engineers is the problem ahead of us," said Calvert Townley, president of the American Institute of Electrical Engineers. Unselfiish public service must be rendered and kept as the ideal of professional organization. To this kind of service the public will respond.

If the many societies can be made to understand that no one wants to take away any of their rights but to encour-

(*Continued on p.* 884)

E. J. Mehren to Investigate European Conditions

E. J. Mehren, editor of *Engineering News-Record* sailed for Europe on the "Adriatic," April 24. He will study conditions in the civil engineering field in England, France and Germany and will be abroad until the latter part of August.

Mr. Mehren has also been appointed special agent for the U. S. Bureau of Public Roads, in order to secure certain information while abroad for that organization.

Senate in Favor of Separate Construction Service

The final vote in the Senate on the Construction Service of the Army showed 33 Senators for a separate construction service and 18 opposed. An earlier announcement of this vote failed to take into consideration certain pairs among Senators. While there is a very determined portion of the House membership which is opposed to a separate construction service, the chances apparently are very much in favor of recession on the part of the House.

New York Port Treaty Rejected

Governor Edwards, of New Jersey, has vetoed the bill which had been passed by the Legislature committing New Jersey to the treaty between that State and New York in the control of New York harbor. The treaty authorizes the formation of a joint port body, composed of three representatives from each state, which would exercise full authority over the port. A similar bill which was before the New York Legislature never came to a vote before the Legislature adjourned on April 24. The New Jersey Legislature still has the opportunity to pass its bill over the Governor's veto. Meanwhile the New York-New Jersey Port and Harbor Development Commission is working on its comprehensive scheme for the development of the port and should render a report by July 1.

Call Issued for Organizing Conference of Engineers

Civil Engineers Not To Be Bound Without Letter Ballot—Delegate Representation Changed

To 111 national, state and regional engineering organizations the Joint Conference Committee of the national societies of civil, mechanical, electrical and mining engineers this week issued a call to participate in an Organizing Conference to be held at Washington, D. C., June 3 and 4 for the purpose of creating a "comprehensive organization" to secure united action of engineering and allied technical professions on matters of common interest to them.

Following the American Society of Civil Engineers' canvas of ballots on the Questionnaire and the defeat of Question 3, as reported in *Engineering News-Record* last week, the board of direction of the society considered at its recent meeting in Chicago the status of that organization with respect to participation in the Organizing Conference. Under date of April 19, telegrams were sent to R. L. Humphrey, Gardner S. Williams and George G. Anderson, the American Society of Civil Engineers' representatives on the Joint Conference Committee, informing them that the board of direction requested the society's representatives, pending further instructions, to refrain from participation in the issuance of the call for the conference at Washington.

Basis of Delegate Representation

The situation, so far as the American Society of Civil Engineers was concerned, was complicated by the defeat of Question 3 and by the fact that the board of direction desired a change in the basis of delegate representation at the Washington conference. As originally planned, national societies were to have one delegate for from 200 to 2,000 members, and an additional delegate for each 2,000, or major fraction thereof, while local and state bodies were to be represented by one delegate for from 100 to 1,000 and one delegate for each additional 1,000 members, or major fraction thereof. This plan of representation was changed just before the call was sent out to a uniform basis of one delegate for from 100 to 2,000 members for all organizations and additional delegates for each additional 2,000 members or major fraction thereof.

The board of direction of the civil engineers passed a resolution at its Chicago meeting which was substantially as follows: Without committing the society to the approval of any tentative draft of a constitution for the new organization, submitted by the Joint Conference Committee, the Am. Soc. C. E.

board instructs its representatives (1) to urge that the call to the Organizing Conference be limited to technical societies, and (2) to endeavor to secure a change in the call which would make representation of national societies the same as for local organizations. This change in representation has been made as above outlined.

The board also was specific in stating that the American Society of Civil Engineers was not to be bound by anything the conference might do, but that its delegates must submit, through the board to letter-ballot of the society, the acceptance or rejection of any organization decided upon at Washington.

To State Result of Questionnaire

The board also passed a resolution naming the president of the society as a member and chairman of the committee of delegates, specifying that, while the delegation should include members of the Joint Conference Committee, their number should be a minority of the total delegation. According to the board's resolution, the American Society of Civil Engineers' delegates will be instructed to state at the Washington conference the result of the vote on the Questionnaire by which the plan of organization suggested by the Joint Conference Committee has been negatived. It was the sense of the board, expressed in Chicago, that the delegates should present the plan outlined by the Alvord committee.

With regard to the American Society of Civil Engineers' wish that representation at the Washington conference be confined to "technical" societies, it was stated at the Joint Conference Committee's headquarters in New York this week that the American Association of Engineers had been invited to send delegates to the Washington meeting.

Object Defined

The call has taken the form of four mimeographed pages explaining the objects of the Organizing Conference, with enclosures consisting of the report of the Joint Conference Committee, a synopsis of the action taken on the committee's report by various national and local engineering organizations, the American Society of Civil Engineers' Questionnaire ballot and a credential blank. The object of the conference is stated as follows: "Co-operation of engineering and allied technical organizations to further the public welfare wherever technical knowledge and engineering training are involved, and to consider matters of common concern to these professions."

The Joint Conference Committee desires to receive the names of all delegates prior to May 15. The committee is also preparing a form of constitution and by-laws for the proposed comprehensive organization.

As yet the delegates for the American Society of Civil Engineers have not been announced. President A. P. Davis, however, will head the conference representatives of the civil engineers.

A. A. E. Passes 16,000 Mark

The membership of the American Association of Engineers on April 15 was 16,007.

Speakers Named for A. A. E. Convention at St. Louis

Among the speakers at the sixth annual convention of the American Association of Engineers to be held at the Planters Hotel in St. Louis on May 10 and 11 will be M. O. Leighton, chairman of the national service committee of Engineering Council, who will speak on "Getting Salaries for Public Service Engineers Into Budgets," Frances A. Kellor, vice-chairman of the Inter-Racial Council of New York and a recognized authority on immigration and racial problems, who will speak on "The Manpower Engineer—The Opportunity of Americanism" and Fred Lavis of the American International Corporation of New York, who will speak on "Opportunities for the Engineer."

The principal speakers at the banquet on May 11 will be Doctor F. H. Newell, president of the American Association of Engineers and head of the department of civil engineering at the University of Illinois, and L. K. Sherman, president of the United States Housing Corporation.

A feature of the convention will be group meetings for draftsmen, federal engineers, mining engineers, highway engineers, industrial engineers, chemical engineers, municipal engineers and railroad engineers. These meetings will be held on the evening of May 10. They will consider problems peculiar to each group and make a report to the general business session on the following day.

Founder Boards Meet

(*Continued from p.* 883)

age and strengthen them in their work, Mr. Townley believed that the organizations would join in a broad unselfish movement for the good of the state. "The war was called an engineers' war. Let us make the peace an engineers' peace," was his final appeal.

Dr. Theodore G. Soares, head of the department of theology, University of Chicago, indicated the important place the engineering professor had in life and the grave responsibilities resting on the engineer. Because of the sheer bigness of modern life, he pointed out, abler advice than ever before must be obtained. It is the acceptance of the expert that is going to make real democracy and votes must be weighed as well as counted. In a New England town meeting one man's vote might be as good as another on questions relating to the town pump, but in a city of 3,000,000 people the problem of obtaining pure water is vastly different and must be left to experts. Disagreeing with Mr. Miller, he held that the engineer must be less modest. He must be more than an expert witness. He must prescribe, order and see that his orders are carried out.

St. Lawrence Engineers Appointed

Announcement has been made that two engineers to take charge of the engineering details in connection with the investigation of the improvement of the St. Lawrence River have been appointed by Canada and the United States. The Canadian appointment is W. A. Bowden, chief engineer of the Department of Railways and Canals at Ottawa. The United States has appointed Lt. Col. W. P. Wooton, Corps of Engineers, U. S. A., who is stationed at Detroit. Engineering plans and estimates are to be submitted to the International Joint Commission not later than one year from now, and the Commission is requested to forward to the two governments its final report not later than three months thereafter.

Discuss Future Organization of Engineer Corps

As finally agreed upon by the Senate, the Army Reorganization bill provides 650 officers for the Corps of Engineers. Senator Ransdell of Louisiana took the stand that the Corps was not being treated equitably in the bill but his amendment to increase the number of officers still further was voted down. His amendment also provided for two Assistant Chiefs of Engineers with the rank of Brigadier General. Speaking in support of his amendment he reviewed the importance of the duties performed by the Engineer Corps. In that connection Senator Wadsworth, who was in charge of the bill, made the following statement:

"Under the terms of the bill the Engineer Corps are made combat troops, placed upon the same basis as the Infantry, the Cavalry, the Field Artillery, the Coast Artillery, the Signal Corps, and the Air Corps. Being made combat troops, an officer of the Engineers is eligible for a brigadier generalship of the line, just as an Infantry officer, a cavalryman, a field artilleryman, or a coast artilleryman. There is no limit to the number of officers from the Engineer Corps who may be promoted to the grade of brigadier general of the line.

"The incentive under the terms of the bill for officers to join the Engineer Corps and serve in it, in my humble judgment, is greater than at any former time; for, whether they could contend before that they were combat troops and their men eligible for brigadier generalships of the line and major generalships in the line, the matter was not entirely clear, and many members of the corps labored under the impression that when it came to the matter of promotion to the grade of brigadier general in the line, an Engineer officer was apt to be discriminated against. The bill places the Engineers upon exactly the same basis as the Infantry, Cavalry, and other combat branches, so the Engineers will have the same opportunity for promotion to the higher grades as every other combat branch."

Start Work on Big Rail and Deep-Water Terminal at New York

Dredging for the channel of the first pier unit of a new rail and deep-water terminal in New York harbor, in the Greenville section of Jersey City, has been started by the Lehigh Valley R.R. The new development will be known as the Claremont Terminal. The first unit on which construction has now been started will be a 3,000-ft. wharf at the foot of Chapel Ave., Jersey City, for which a 35-ft. channel is now being dredged to deep water, requiring the removal of 3,500,000 cu.yd. of material.

It is planned that the terminal ultimately shall consist of three piers each about 7,000 ft. long and 400 ft. wide, carrying a large trackage and facilities for handling heavy miscellaneous export and import freight as well as for handling coal and ore. The pier lengths will include slips extending about 3,000 ft. back of the established bulkhead line. Ultimately an aggregate dock space of some 6 miles in length will be provided and the entire terminal will cover about 550 acres of ground.

The wharf now under construction will provide facilities for unloading 2,500 tons of ore per hour and will include an open pier with gantry crane for handling miscellaneous freight and a two-story steel and concrete warehouse. A yard, with a capacity for about 500 cars, which will be partly carried on the pier, is to be built in connection with the present unit.

Various newspaper reports have stated that the New York Central R.R. is planning a big freight terminal along the west bank of the Hudson River, just north of Weehawken. Officials of the railroad company have, however, stated that the only plan in contemplation is the necessary extension of yard facilities to serve the new piers for the Cunard Steamship Co., construction of which at Weehawken is now being planned.

Engineers Do Manual Labor During Strike

The Michigan Central Railroad section of the American Association of Engineers recently adopted a resolution offering the services of each of its members to the management during the recent railroad strike. The Pennsylvania Railroad section postponed its annual convention in order that its members might render such extra service as they might be called upon to perform on account of the strike. Railroad members of the association all over the United States have been engaged in all sorts of extra duty, such as firing engines, throwing switches and running engines. One switching crew on the Chicago Burlington & Quincy, made up entirely of civil engineers. performed work consistently in from 50 to 60 per cent less time than was occupied by the regular crew in performing the same duties.

Cleveland Subway Bonds Defeated

Early reports from Cleveland indicate that the street-car subway bond issue for $15,000,000 was defeated by a two to one vote in the referendum of April 27. The main reason for the defeat, according to local observers, is the people's conviction that the proposed expenditure would not provide real rapid transit.

New Water Conduit for Seattle

A new conduct some 15 miles in length for the water-supply system of Seattle, Wash., is to be built and bids are desired for 66-in. riveted or 64-in. lock-bar steel pipe, according to information supplied *Engineering News-Record* by A. H. Dimock, city engineer. Alternative bids for 58-in. steel pipe will also be received. The conduit will extend from Volunteer Park reservoir, where it will connect temporarily with the existing pipe lines and eventually by means of a tunnel with the proposed reservoir.

Unusual Program for American Water Works Convention

A goodly number of papers on various water-works in Canada, together with synopses of the main papers listed, are features of the tentative program for the fortieth annual convention of the American Water Works Association to be held at the Windsor Hotel, Montreal, Que., June 21-24.

The half-dozen papers dealing with Canadian water-works include one on "The New Water Supply of Winnipeg," by James H. Fuertes and William G. Chase. Among the other papers are: "Difficulties in Building the Louisville Pumping Station," by James B. Wilson; "Cost-Plus Contracts in Water-Works Construction," by George W. Fuller; and "The Trend of Prices," by Leonard Metcalf, the latter being a continuation of an earlier paper by Mr. Metcalf.

Superintendents' Day will be Thursday, June 24. All members having experiences in the selection, installation, reading and maintenance of water meters are requested to communicate at once with the editor of the *Journal* of the Association, John M. Goodell, Upper Montclair, N. J., or at least to come to the convention prepared to state their experiences. Water waste and legitimate use will also be discussed on Superintendents' Day. On the same day there will be a separate meeting of the Chemical and Bacteriological Section of the association, at which Col. George A. Johnson will introduce the subject of the quality of water.

On the afternoon and evening of June 23 entertainment will be provided by the Water Works Manufacturers' Association. An afternoon trip through the rapids of the St. Lawrence River has been planned, while in the evening there will be a smoker for men and a theater or card party for the ladies.

Four Bids Received on Hetch Hetchy Tunnels

Four bids, the lowest totaling seven and a quarter million dollars, were received by the City of San Francisco, April 21, for the construction of 18.3 miles of concrete-lined tunnels for the Hetch Hetchy water supply project. The net height and width of the tunnel section is 10 ft. 3 in. The figures submitted in the bids were as follows:

Construction Company of North America, $7,292,900. Also $82 per foot of tunnel.

R. C. Storrie, $8,798,000. Also $96 per foot of tunnel.

Utah Construction Company, $150 per foot of tunnel.

Healy-Tibbits Company, $178 per foot of tunnel.

By the terms of the information given to bidders proposals could be "submitted on the entire length, 18.3 miles, or the work may be divided into two sections 4.5 and 13.8 miles in length respectively." The foregoing figures are for the entire length of tunnels, and include the cost of concrete lining.

City Engineer O'Shaughnessy expressed satisfaction on learning the figures submitted by the Construction Company of North America, which are slightly less than those of the city engineer's estimate and more than one and one-half million dollars lower than the next highest bid.

The president of the Construction Company of North America is Charles Tinkler, who was formerly manager for MacArthur Brothers on the Hetch Hetchy tunnel work done by that firm.

Detroit Chapter A. A. E. Wants Law Against Strikes

Actuated by the serious conditions resulting from the railway yardmen's strike the Detroit chapter of the American Association of Engineers has defined its attitude toward the causes and has offered a remedy for their removal. The remedy would consist of state and federal laws to establish "the public's absolute right to continuous service from public utilities by making it a felony for any owner, employee or others to commit any voluntary act calculated or likely to cause serious impairment or discontinuance of necessary services to the public."

The chapter also asks for "state and federal industrial tribunals with authority to take charge of, on their own initiative or on an appeal, and decide any industrial controversy that is likely to jeopardize the public welfare, or of any other industrial controversy on request of either party, to impose penalties and compel compliance with its decisions."

Throop College Changes Name

By the unanimous vote of its Board of Trustees, Feb. 10, Throop College of Technology has become the California Institute of Technology.

Call for Engineers on Sewage Problem at Oklahoma City

Consulting engineers versed in sewage disposal are invited to submit statements of their training and qualifications to H. E. Musson, chairman of the Committee on Engineering of the Sewage Board of Oklahoma City. The board named was appointed in accordance with a resolution of the city commissioners of Oklahoma City asking that the Lions', the Rotary, and the Kiwanis Clubs, the Chamber of Commerce, the Building Trades Council, and the American Association of Engineers each appoint one of its members to act on a sewage board to consist of the representatives named, together with the city engineer, city physician, and sanitary engineer of the State Board of Health. The board named is "to make an investigation of the sewage problems confronting Oklahoma City and advise with the city commissioners with reference to the same." The circular that has been issued inviting consulting engineers to communicate with the Committee on Engineering states that Oklahoma City has approximately 4,000,000 gal. of untreated wastes from packing plants and 7,000,000 gal. of domestic sewage, together with sewage from other industries, such as oil refineries, to be treated every 24 hours.

Kansas Highway Officials Study Road Construction Problems

As an outgrowth of a meeting recently held in the offices of the Kansas State Highway Commission, attended by approximately 70 contractors and material men of the state, a committee has been appointed to investigate the supply of materials and co-operate with the Highway Commission, keeping it informed as to the status of materials, so that contracts will not be let in excess of the amount of materials available. During the meeting it was discovered that the road building program was a great deal larger than the material supply and the transportation would allow to be constructed. It was the general opinion, however, that Kansas would proceed with highway work as rapidly as conditions would permit, but it was not considered advisable to force the road building program. Lack of transportation appears to be the chief difficulty to overcome, and M. W. Watson, state highway engineer, speaking in that connection, asserted that "the general public has been educated to designate open top equipment as coal cars and as a result of this general opinion influences have continually been brought to bear on the government officials in charge of the distribution of cars to give preference to coal shipments even at times when the supply of coal was adequate throughout the country."

Kansas has under construction at the present time approximately 200 miles of hard surface roads which, in the opinion of Mr. Watson, will utilize all available materials and labor.

New York License Bill Passed

Both houses of the New York State legislature passed the engineers' license bill recently introduced by representatives of a group of technical societies. The bill awaits the governor's signature. Originally separate bills were presented to the legislature by the New York chapter of the American Association of Engineers and by the Albany Society of Civil Engineers. A joint committee consolidated the two into a compromise bill, which was passed without substantial opposition.

Rail Administration Announces Barge Line Expenses

Obligations totaling $15,265,550 were incurred by the United States Railroad Administration for inland waterway barge line equipment, according to figures made public in connection with a request for the deficiency appropriation. The sum of $11,786,544 has already been advanced on the obligations contracted, leaving a balance required of $3,479,011.

Allowing for omissions of general items, an expenditure of $4,591,210 was made for the New York State Barge Canal; $7,697,300 for the Mississippi River line, and $2,601,096 for the Warrior River line. From Sept. 30, 1918, to Dec. 31, 1919, the New York State Barge Canal tonnage was 122,379 tons eastbound and 43,879 tons westbound. The Mississippi Barge line tonnage was 90,438 tons southbound, and 37,709 tons northbound; and on the Warrior River line 152,037 tons southbound, and only 189 tons northbound.

Civil Service Examinations

New York State

For New York State civil service examinations listed below, apply to the State Civil Service Commission, Albany, N. Y. Applications must be filed not later than May 5.

Assistant sanitary engineer, State Department of Health, $2,600 to $3,000 per year.

Engineering assistant (civil) State Engineer and Highway Departments, $1,080 to $1,560 per year.

Engineering draftsman, grade 8, $1,501 to $1,800 per year.

Junior assistant engineer (civil) grade 2, State Engineer and Highway Departments, $1,980 to $2,280 per year.

Junior assistant engineer (civil) grade 1, State Engineer and Highway Departments, $1,620 to $1,860 per year.

Canada

For Canadian civil service examinations listed below, apply to the Employment Service of Canada or the Secretary of the Civil Service Commission, Ottawa. Applications must be filed not later than May 6.

Hydraulic engineer, $2,700 to $3,180 per year.

Assistant hydraulic engineer, $2,100 to $2,580 per year.

Junior engineer, $1,680 to $2,040 per year.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

NATIONAL FIRE PROTECTION ASSOCIATION, 87 Milk St., Boston; May 4-6; Chicago.

AMERICAN ASSOCIATION OF ENGINEERS; 63 E. Adams St., Chicago; May 10, 11, St. Louis, Mo.

AMERICAN WATER WORKS ASSOCIATION, New York City; Montreal, June 21-26.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; Asbury Park, N. J., June 22-25.

AMERICAN PUBLIC HEALTH ASSOCIATION, Boston; San Francisco, Aug. 30-Sept. 3.

The San Francisco Association of Members, Am. Soc. C. E., held its regular bimonthly meeting April 13. By way of experiment at the meeting, the association had as dinner guests five senior civil engineering students from Stanford University and five from the University of California. The idea was to give these men an opportunity to get acquainted with the purposes of the local section and the parent society. It is possible that the plan may be continued throughout the year, having a different group of students at each meeting. The paper of the evening was entitled "Timber Preservation, Costs, Methods and Results," by Edmund M. Blake, production engineer for Charles R. McCormick & Co.

The Engineers' Society of St. Paul, Minn., held its regular meeting Monday evening, April 12. A committee report on municipal salaries was presented recommending that the society adopt the grading and schedule of salaries as reported by the committee of Engineering Council on classification and compensation of engineers; the recommendation was adopted. St. Paul has at present a salary limit of $5,000 for appointive officers; and through the efforts of the society the city council has passed a resolution recommending to the charter commission that such restriction be removed. This matter and the placing of such officers under civil service will be followed up before the charter commission by a special committee of representative engineers.

The Engineering Society of Western Massachusetts held its regular March meeting, which had been postponed on account of weather conditions, on April 6, at the offices and factory of the Fisk Rubber Co., Chicopee Falls, Mass. The members of the society, as the guests of the Fisk Co., were taken on an inspection trip through the factory, which was followed by supper and a talk in the evening on the manufacture of tires from the raw product to the finished product.

John Bogart Dead

John Bogart, former secretary, as well as treasurer and director of the American Society of Engineers, and at one time state engineer of New York, consulting engineer to the New York Board of Health and chief engineer of the New York Rapid Transit Commission, died at his home in New York City, April 23, aged 84 years. At the time he was taken ill, eleven days before his death, he had been actively practising, having been the senior member of the consulting firm of Bogart & Pohl.

Although a general practitioner, as were practically all of the pioneers of engineering, Mr. Bogart was perhaps best known for his work in connection with public park planning and improvement in New York City and elsewhere, and in his later years for hydro-electric development at points along the St. Lawrence River, in the southern and western states and in British Columbia. He also was engaged on development work in various Venezuelan harbors.

Mr. Bogart was born in Albany, N. Y., Feb. 8, 1836. He was educated at Albany Academy and Rutgers College, from which institution he was graduated with a B.A. degree in 1853, taking a master's degree three years later. He began the study of law, but, because of his health, sought employment in the engineering corps of the New York Central R.R., a few months after his graduation. Thereafter he followed engineering work exclusively, though he continued his studies of law for several years. From the New York Central Mr. Bogart went as an assistant in the engineer department of the canals of the State of New York. From there he aided in the construction of roads, bridges, drainage and landscape developments of Central Park, New York City.

Served in Civil War

During the Civil War Mr. Bogart was engineer of fortifications on Fort Monroe and other points, serving under the direction of officers of the Corps of Engineers. He resigned that office in 1866 and returned to New York City to engage on public park work. He then served as chief engineer of the Park Commission of Brooklyn, having much to do with the development of Prospect Park, as chief engineer, Department of Parks, New York; and he designed parks at Albany, New Orleans, the state grounds at Nashville, the West Side parks at Chicago, and the park system of Essex County, N. J. From 1888 to 1891, inclusive, he was state engineer of New York and from 1892 to 1900 served as consulting engineer to the state health board.

As consultant to the Niagara Falls Power Co., Mr. Bogart was among the first engineers of this country to assist in developing power for transmission for commercial use. Other hydro-electric work was done by him as consulting engineer for the St. Lawrence Power Co., Atlanta Water and Electric Power Co., the Cascade, British Columbia Power Co., the Knoxville Power Co., the Niagara, Lockport and Ontario Co., and the Chattanooga and Tennessee River Power Co. Railroad work did not escape his attention and he served as consultant to several roads, including the New York Central R.R.

Secretary, Am. Soc. C. E., 1878-1890

Mr. Bogart served the American Society of Civil Engineers as secretary from 1878 to 1890. He also served as director from 1873 to 1875 and as treasurer from 1875 to 1877. After leaving the secretaryship he was again made treasurer, holding that office for four years.

JOHN BOGART

Because of his interest in inland waterways Mr. Bogart represented the United States at the International Congress of Navigation at Düsseldorf, Germany, in 1902; at Milan, Italy, in 1905; and at St. Petersburg, in 1908. He was a member of the Permanent Board of International Navigation Congresses and the only civilian member of the U. S. Government board on the Lakes to the Gulf Waterway.

Mr. Bogart was formerly a lieutenant-colonel of the New York State National Guard and was a member of the Institution of Civil Engineers of Great Britain. He had also served as member of the Municipal Art Commission of New York, and as vice-president of the Institute of Inventors, London.

Import Duty to Aid Profession

The Council of the Royal Architectural Institute of Canada has petitioned the Customs Board at Ottawa for a revision of the basis of appraisal on imported architectural and engineering plans with the object of increasing the duties, and so foster the development of architecture and engineering in Canada.

PERSONAL NOTES

LEWIS E. KNERR, former captain of Engineers, U. S. A., has resigned his position in the Tacoma (Wash.) city engineer's office to become constructing engineer of the Seattle (Wash.) Hemlock Mills, Ltd.

CLOYD M. CHAPMAN, formerly with Westinghouse, Church, Kerr & Co., Inc., has opened an office at 171 Madison Ave., New York City, for the practice of consulting engineering.

A. A. MCGRATH and **W. M. SCHENKELBERGER** have gone into partnership under the firm name of McGrath & Schenkelberger, for the practice of civil engineering, with offices in the American Trust Building, Cleveland.

A. G. GOULD, for the past 14 years vice-president and treasurer of the Gould Construction Co., Davenport, Iowa, has severed his connection with that company to become vice-president and chief engineer of the H. Denburger Contracting Co., Bethlehem, Pa.

W. R. ELLIOTT has resigned as general manager and chief engineer of the Salt River Valley Water Users' Association (Ariz.) to go into private practice.

O. C. STRAIGHT and **FRED B. MCCLURE**, civil and mining engineers, have opened offices in Fairmont, W. Va., as successors to the Fairmont Engineering Co.

P. H. NORCROSS has been selected by the board of water commissioners of Atlanta, Ga., to make a special survey of the water system of that city in line with an extensive program recently adopted for the improvement of the Atlanta water supply.

FRED O. EICHELBERGER, city engineer of Dayton, Ohio, has been appointed director of public service, succeeding H. P. Martin, who has resigned to become manager of the Des Moines district for the Delco-Light Co. The position of city engineer is left unfilled by the new appointment of Mr. Eichelberger.

HAL M. SCOTT, former captain of Infantry, 32nd Division, U. S. A., has been elected chief engineer, and **JOHN P. BONNER**, former captain of Trench Mortars, 2nd Division, U. S. A., has been elected resident engineer, of the Greenbrier & Eastern R.R. Co., with headquarters at McClungs, Greenbrier County, W. Va. Construction has just been begun on this railroad, which will connect with the Sewell Valley R.R., at Rainelle, W. Va., and will be about 12 miles in length.

ROBERT H. FORD has been promoted from principal assistant engineer to assistant chief engineer of the Chicago, Rock Island & Pacific Ry.

WALTER L. DECKER, formerly construction engineer of the American Ship Building Co., at Cleveland, is now associated with the Austin Co., of that city, as district superintendent.

H. J. HARDER, city engineer of Paterson, N. J., has been appointed a member of the New Jersey State Department of Health.

C. A. HOWLAND, assistant engineer, New York State Department of Health, has resigned to take a position with Johnson & Benham, consulting engineers, New York and Kansas City. He will be located at Kansas City.

H. E. BILGER, formerly in the Illinois State Highway Department, later senior highway engineer, U. S. Office of Public Roads, and more recently consulting engineer, Monmouth (Ill.) Stone Co., has become general manager of the Highway Culvert Form Co., Peoria, Ill.

LOUIS T. C. LORING, for 20 years with the Massachusetts State Highway Commission, 17 of which was spent as assistant engineer in Division 1, is now associated with the Portland Cement Manufacturers' Association at Boston.

MAJOR RAY W. BERDEAU, formerly with the U. S. Engineers, on New York harbor improvements, has left for Hong Kong, China, in the employ of the Vacuum Oil Co.

HENRY WELLES DURHAM, formerly Major, Engineers, with the American Expeditionary Forces, has received from the French Government the *Mérite Agricole*, a decoration conferred in recognition of his work on road construction and maintenance during his service abroad with the Division of Construction and Forestry.

L. FRED PATSTONE, recently Major, 217th Engineers, U. S. Army, has resigned as city engineer of Manila, P. I., to accept the managership of the China Commercial Development Co., with offices at 34 Nanking Road, Shanghai.

ANTON ANDERSON has been appointed engineer of maintenance-of-way, Chicago, Indianapolis & Louisville Ry., with office at Lafayette, Ind.

OBITUARY

ALVIN ETHEREDGE, civil engineer, died at Columbia, S. C., March 22, at 58 years of age. He was born in what is now the town of Saluda, S. C., and received his education at Furman University and the Worcester Polytechnic Institute. Mr. Etheredge was engineer in charge of the surveys of proposed railway routes from Augusta, Ga., to Knoxville, Tenn., and from Augusta to Newberry, S. C. Neither of these projects materialized, but the grading of the Augusta-Newberry route was practically completed. He was also in charge of the construction of the Carolina Light & Power Co., at Graniteville, S. C., the second long-distance transmission power plant built in the South.

J. W. GRAFF, civil engineer of Seattle, Wash., died recently. He was widely known throughout the Northwest, having had charge of the location work on the Northern Pacific and Great Northern railroads to the Pacific Coast. In the early 80's he had charge of the location of the Esquimalt & Nanaimo Ry. on Vancouver Island, and in 1905 located the Chicago, Milwaukee & St. Paul Ry. to the Pacific Coast. Born in Fredriskhald, Norway, he received his education in that country and Germany, and came to America in 1882.

A. K. GAULT, division engineer of the Chicago & Northwestern Ry., at South Norfolk, Neb., died recently.

WARREN CUMMINGS KNOWLTON died at Denver, Col., Feb. 4, aged 41. He was a graduate in civil engineering of the University of Minnesota. He began his railroad work as rodman, instrument man and locating engineer on the Great Northern R.R. in Idaho and British Columbia, in 1900. Subsequently, he was in charge of field surveys and construction work on the Chicago Great Western R.R., and the New York Central & Hudson River R.R., division engineer on the Virginian Ry., and in charge of the engineering and construction of the Pacific Ry. between the Atlantic and Pacific Oceans in Costa Rica, for W. H. Knowlton, commissioner and contractor for that work for the Costa Rican Government. For the past nine years Mr. Knowlton had been engaged in grain and stock raising in South Dakota and Colorado.

JAMES HENRY DECKER, a former resident of Watertown, N. Y., died at Lafayette, Ind., March 29, at 37 years of age. He graduated from Purdue University in 1905, and immediately afterward joined the engineering staff of the Panama Canal Commission. During his seven years' service on the canal, Mr. Decker designed several of the large bridges crossing the main spillway. During the war he was associated with the A. G. McKee Engineering Co., Cleveland, and engaged in the design of blast furnaces for the U. S. Government.

ALBERT E. WOOLF, American pioneer in attempts to treat water and sewage electrolytically, died in New York City, April 19, at the age of 74 years. In the early nineties he applied electrolytically produced hypochlorite under the trade name "electrozone" directly to sewage, water, a polluted dock slip, and to a fill of mixed garbage and refuse, all in or pertaining to New York City. He also built an "electrozone" plant to treat the sewage of Danbury, Conn., which figured in a protracted lawsuit and was soon abandoned. "Electrozone" was also used in Havana Harbor during the American occupation of Cuba. At the time of his death Mr. Woolf was head of the Woolf Laboratories, New York City.

BUSINESS NOTES

WILLIAM N. KEISER, formerly with the Hydraulic Steelcraft Co., Cleveland, has been appointed manager of the general construction equipment department of the Lakewood Engineering Co., of that city.

HAROLD S. HUTTON, formerly sanitary engineer with the U. S. Public Health Service, has been appointed district sales representative of Wallace & Tiernan Co., Inc., with headquarters in the Commonwealth Building, Pittsburgh. He succeeds P. O. Collins, who is on an indefinite leave of absence on account of illness.

THE HARRISON SAFETY BOILER WORKS, Philadelphia, formerly conducted as a co-partnership by Jos. S. Lovering Wharton, William S. Hallowell and John C. Jones, has been incorporated as the H S B W—Cochrane Corporation, with the following officers: President, Mr. Wharton; vice-president and general manager, Mr. Jones; secretary and treasurer, Mr. Hallowell; general sales manager, Horace E. Sibson; general works manager, Axel B. Wallem.

THE KENNEDY VALVE MANUFACTURING CO. announces the appointment of C. H. Kennedy, formerly New York district manager, as general sales manager, with headquarters at the plant, Elmira, N. Y. J. S. Hanlon, formerly Boston representative, takes Mr. Kennedy's place in New York. George W. Waters, formerly in the sales department, New York office, has been made Boston representative. F. N. Decker, formerly at Elmira, has been placed in charge of a new sales office opened at 208 Mutual Building, Kansas City.

THE LINK BELT CO., Chicago, is expanding its works in Chicago, Indianapolis, Philadelphia, Seattle and Toronto. New manufacturing facilities have been added to the several plants and the personnel of both the factories and sales offices has been increased. The company announces its purchase of the Fairmount foundry, at Philadelphia. A new administration building is also under construction at the Philadelphia plant, a similar building is to be erected at Chicago and a new warehouse is under construction at Seattle. A. C. Johnson, formerly chief engineer of the Chicago works, has been elected a vice-president of the company and resident general manager at Chicago. He succeeds Prentiss L. Coonley, who recently resigned to become president of the Isko Manufacturing Co.

THE READING (Pa.) IRON CO. has purchased two of the plants of the Susquehanna Iron Co. at Columbia, Pa., known as the Susquehanna mill and Columbia mill.

A Consolidation of Engineering News and Engineering Record McGraw-Hill Company, Inc.—James H. McGraw, *President*

Engineering News-Record

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. Mehren
Editor

Volume 84 NEW YORK, THURSDAY, MAY 6, 1920 Number 19

Keep Pushing the Public Works Department

REPORTS from Washngton indicate that the campaign for a new Department of Public Works may have been too effective. So thoroughly has Congress been persuaded of the inefficiency of government administration that it proposes an entire revision of departmental functions and activities, as a first step to which bills have been introduced providing for the inevitable investigation which precedes every Congressional action. There is a great danger that the movement for a reorganization of Federal public works will have to await the slow process of a general reorganization. Washington needs reorganizing. President Taft recognized that; and the report of his commission, headed by Dr. F. A. Cleveland, is an admirable text on what is needed to be done. To appoint another commission now is only to postpone indefinitely the necessary reforms and to accumulate data that are already available. What is needed is action, not investigation, and the best initial action is the formation of a Department of Public Works. Other revisions can come later; it is only by slow steps that government methods are changed. The engineers who have been backing the Public Works Department idea must guard against this latest step which promises to nullify their progress.

Stealing Labor

WE COMMENTED April 1 upon the necessity of budgeting construction work to fit the available labor and materials supplies. An indication of the need for some such drastic procedure is afforded by the fact, recently come to light, that a Pennsylvania contractor who expects to begin work before long has for some time been subsidizing the common labor employed on other jobs in his vicinity. He is paying the men he expects to "lift" one dollar a day each while they are engaged in their present employment, with the understanding that when his work opens up they are to desert their present jobs and join his forces. Recently, also, we talked with an engineer who predicted that as soon as highway work again gets under way the project he is supervising will either be drained of men or wages will have to be put up sharply. He is working on a project essential to the safety of a large community. Its completion is certain to be delayed because of the mad scramble for the labor available.

Looking at the Other Fellow's Job

THE incidents recited in the preceding note point to the need of engineers looking beyond their own work and comparing its importance with that of other prospective construction in their localities. Seated in his own office, oblivious to the necessities in other lines of engineering, the paving engineer may be able to justify to himself a large construction program. The highway engineer, isolated in his turn, can demonstrate tremendous savings to the public from building hard-surfaced roads, while the water-supply engineer, on his part, realizing the imminence of a water shortage, can justify an extensive program. It is just this sort of thinking by isolated groups that is bringing about a construction crisis. Under these conditions, there is no certainty that the work most needed by the community will be done; rather, the agency that has or can get the most money, even if the work be a totally unnecessary one, will command the material and labor markets. If the Government or the United States Chamber of Commerce will not initiate the needed conferences, there is open an excellent opportunity for the engineering societies and the contractors' organizations of the country to help bring order out of chaos and confer a benefit upon the community.

New York Port Treaty Not Dead

BARRING the remote chance of a special session of the New York Legislature and the passing of the New Jersey bill over the Governor's veto, the proposed interstate control of New York harbor must go over for at least another year. In spite of strong backing and its many commendable features, the reform involved is too radical for easy adoption. Some opposition arises from an honest demand that the interstate commission put forward a tangible scheme of port development before the extraordinary control be put into effect, but the temporary defeat of the idea is due entirely to selfish reasons. Jersey City, whom the Governor is representing rather than New Jersey as a whole, fears a reduction of tax income if a government body is substituted for the railways as the majority owner of its water front. The present administration in New York City simply cannot let go of any present control for possible future benefits. Perhaps the fact that within the year the Jersey shore will be the site of the largest port work the harbor has ever seen will serve as the writing on the wall to the New Yorkers, and a Jersey City man will not always be Governor of the State. The port treaty is by no means dead.

City Terminal Planning

AN ALL important phase of the modern city planning problem was ably presented at the National Conference on City Planning by Col. W. J. Wilgus, an eminent authority on railroad terminal problems, whose paper is printed in full on p. 901. Of the various elements of the city plan, the railroad terminal layout of any large city is probably the least susceptible to radical changes in arrangement because of the great expense involved and the intimate relation of existing freight facilities to the location of industries. The period of concentrating main-freight terminals at the business center of the large city is now passed, and congestion is forcing the stations and yards outward—shortening the rail haul slightly and increasing the truck haul. Largely to avoid congestion of city streets with motor transfer haulage, Colonel Wilgus suggests building a subway system for distributing inter-city freight in small standard gage cars carrying demountable motor-truck bodies, similar to those used at Cincinnati for the inter-station movement of less-than-carload lots, as described in *Engineering News-Record* of March 11, 1920. For some extreme cases this radical step may well be justified, but where motor trucks largely displace horse drays, as in Cincinnati, the city may find that street congestion is relieved rather than increased by substituting a few motor trucks for a much larger number of drays. Colonel Wilgus's paper is striking evidence that the motor truck is gaining in recognition not as a competitor to rail transportation but as a partner capable of bringing out a greater usefulness of terminal facilities.

Poor Service Easily Attained

BETWEEN satisfactory and unsatisfactory service by a public utility there is a line which can be crossed in a day going down grade but back over which it may take years to climb. Such is the reasoning advanced by George G. Earl, general superintendent of the Sewerage and Water Board of New Orleans, in his recent annual report, in which he appeals for funds to anticipate the time when the capacity of the water filtration plant will be overtaxed and the 19-year-old pumping equipment of the extensive drainage system, which is fast becoming obsolete, will need replacing. There are literally hundreds of smaller municipal water plants in the Middle West which have been permitted to run too close or have already crossed the line into the zone of unsatisfactory service. Cities on the east side of San Francisco Bay have been on the line a long time. Chicago has had poor water service in some districts for years and Denver will be perilously close to a water famine this summer. In most cases the engineer has foreseen the danger and has done all in his power to awaken to action the fund-providing officials. The momentum of a great public utility going down hill is not easily overcome, and engineers should not hesitate to picture as vividly as they can the effect of poor service on the public.

Can the Rainy Day Hazard Be Eliminated?

IN attempting to visualize the extent of the road paving program in Iowa recently, F. R. White, chief engineer of the State Highway Commission, likened the task of building the State's 6,400 miles of primary road by present methods to filling with tincups 300 trains of fifty 10,000-gal. tank cars each.

Mr. White was trying to show the necessity for imagination and an inventive genius which will develop methods of laying roads in a continuous stream, *night and day, rain or shine, winter and summer.* We are far from that point now; few contractors figure on night work and none have yet attempted to house their operations so that even a summer shower may be weathered.

We shall come to these things—gradually, of course—but it does not seem a long stretch of the imagination to propose, at least, an equipment of a quarter of a mile of tent canvas which could be quickly erected over mixer, subgrade and stock piles. A light mounted steel frame might be drawn forward on the side forms with the canvas cover at the top partially spread in the day time for protection of the men from the sun. A simple intermediate step might be to cover the subgrade for a day's run ahead during storms.

The cost? Without stopping for figures, does it not appear likely to be offset by the savings accruing from constant use of organization and equipment?

In the efforts of engineers and contractors to get large mileage laid, factory methods must inevitably be adopted. Why not eliminate the weather factor by housing the plant? When men become available, why not light up the factory and run the machinery continuously? Stranger things than these may be seen before many months. Any method which will fill in the valleys on the progress chart will do more to keep red ink off the balance sheet than will occasional record days.

Riding Down With the Lowering Leaf

WHEN the new Michigan Avenue bascule bridge over the Chicago River was lowered into place for the first time a two-inch news item appeared in the *Chicago Tribune.* M. J. Faherty, president of the Chicago Board of Local Improvements, climbed to the top of the leaf and rode down with it. The reporter duly recorded the act and rightly so, for the early completion of the structure is due in large part to his indefatigable energy in pushing the work. If Mr. Faherty wanted to ride the lowering leaf he simply gave vent to his boyish enthusiasm in the most natural way. A correspondent who saw the news item, asks us the following questions: "Who designed the bridge? Who fabricated the steel? Who erected it, and why are these points of information less important to the general public than the circus stunt of riding down with the lowering leaf? Is the fact that the names of the men responsible for the design and successful construction of this bridge are omitted from the newspapers' account, indicative of a fundamental lack of news value in engineering work, or is it an indication of the lack of news sense on the part of the men whose names were omitted?"

So much has appeared in the Chicago newspapers about the bridge and when it would be finished that it is surprising the reporter got this much of a story since the structure will not be open to traffic before May 15, and the test of the leaf was made early in April. Probably that is all the reporter or the copy reader with his blue pencil thought the restricted news page could stand, but the designers, fabricators and erectors were not forgotten. In a five-inch editorial in a succeeding issue is an appreciation headed "Brawn Takes Its Profit from Brains" in which appear such sentences as the following: "Without the creative ability of the engineer there would have been no bridge for Chicago and no positions at high wages for those who did the manual work. The bridge is a monument to the general value of rewarding ungrudgingly those who contribute by their superior ability to the welfare of all." Perhaps Mr. Faherty inspired the reporter or got the engineer of the bridge to do so. He is that kind of a man. Truly, the engineers got a most generous share of praise even though their names were not given. This incident contains a lesson in engineering publicity which indicates that the newspapers are ready to do their part and it only remains for the engineers to learn their methods.

Representation at Organizing Conference

ATTENTION is called to the news article in this issue stating the basis upon which delegates to the Organizing Conference of engineering societies, to be held in Washington, D. C., next month, will be chosen. In its "call" to the meeting the Joint Conference Committee, representing the founder societies, made an error in announcing that societies, both national and local, would be allowed to send one delegate for from 100 to 2,000 members, and an additional delegate for each additional 2,000 members or major fraction thereof. As corrected, the delegate representation will be on a 1 to 1,000 basis (societies of 100 and less than 1,000 members being entitled to one delegate).

Following the defeat of Question 3 of the American Society of Civil Engineers' letter ballot canvassed April 14, there has been much speculation as to that organization's attitude with respect to the Washington meeting. It should be stated, therefore, in order to clear up any misunderstanding, that the American Society of Civil Engineers will be represented by delegates at the Organizing Conference, but these delegates will have no power to act for the society. They will be instructed along certain specific lines, as outlined in detail in our news pages last week. It is also definitely provided, by action of the society's Board of Direction, that the acceptance or rejection of any organization for the proposed federation of engineering societies in non-technical work be submitted, through the Board, by letter ballot to the membership. The membership last month registered its disapproval of the "comprehensive organization" outlined in the Joint Conference Committee's report. It will have another opportunity, however, to join with other national and local engineering organizations in any federation that may develop as a result of the Washington conference, or, if a negative vote is polled on the next letter ballot, to be a non-participant in such activities as may be undertaken. Certainly any federated movement of this country's technical bodies would be incomplete without the civil engineers, but it should be noted that the civil engineers are the only national organization in which the opinion of the membership on this subject of federation has been canvassed. In the case of the other founder societies, action on the report of the Joint Conference Committee was largely in the hands of the directors, not the individual members.

It will be particularly interesting, therefore, to observe the reception, by the membership of the founder societies, of any plan of federation which may take form at Washington, for it is idle to suppose that any of the national organizations could be committed to the project without a vote of the membership.

At this time it is useless to speculate on the outcome of the meeting. It will be an important gathering and one at which there should be a countrywide representation of delegates. Great influence would attach to any national federation of technical societies and, from the point of view of its political importance, it would carry more weight than an organization of individual engineers. Whatever decision may come out of the Organizing Conference will have a profound significance for the profession as a whole. It is the duty of engineers, therefore, to inform themselves thoroughly on the general subject of a federaton of engineering societies in order that, when the time comes, their decision may be based on sound, well considered judgment.

New Plan for Chicago Water-Works

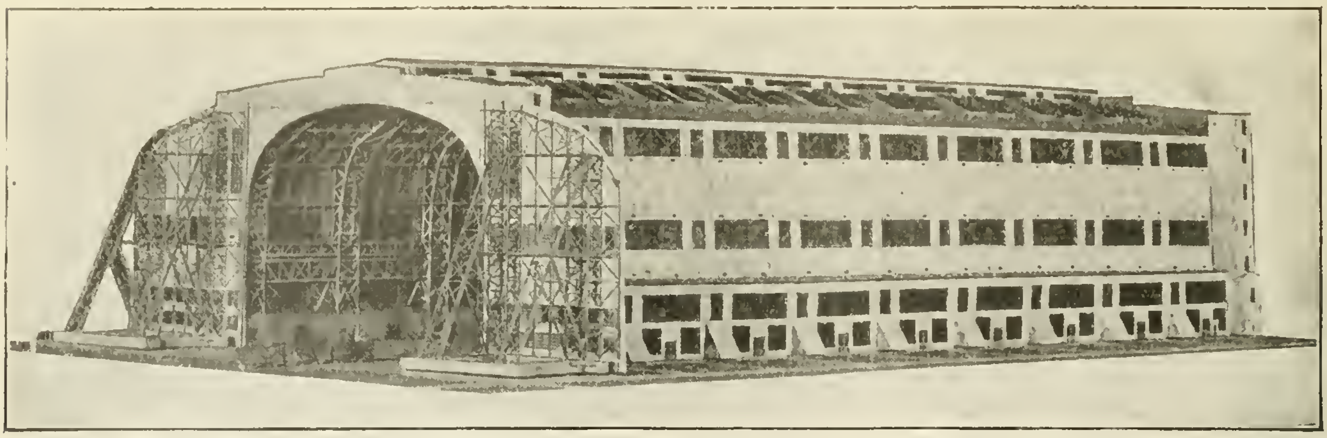
CHICAGO has no chance or need to promote a spectacular additional water-supply scheme like that of San Francisco, New York or Los Angeles, since Father Dearborn had the forethought to locate his town on the hore of Lake Michigan. However, a comprehensive plan has been projected (p. 844), as a guide for the next 35 years. Unfortunately it does not include universal metering.

To a Mulholland who has conceived the plans for an Owens River mountain supply the problem in a direct pumping system on a lake of pure water probably appars decidedly simple. But, like a telephone system, the larger a water-works becomes the more complicated it gets, and there is something more to the problem than adding a few pumps and new intakes. All pumps cannot be located economically on the lake shore; some must be placed inland to be near the center of the district they serve. Since gravity imposes a limit on suction possibilities, there is necessary a system of tunnels to the suction wells as well as one of force mains leading from the pumps. Economic limits in length and size are imposed on both systems, and with direct pumping maximum demand is the controlling factor in providing capacity.

In presenting this report, involving such enormous expenditures and enlargements, the city engineer has probably advanced the cause of water waste prevention much farther than the report of the Chicago Bureau of Public Efficiency of a few years ago, which indicated that one-half of the water pumped was wasted and that few new pumps, cribs or tunnels would be necessary if full metering were completed within ten years. But the present city administration does not favor full metering, and for that matter no past political administration in Chicago has favored it, although through the efforts of the American Association of Engineers the City Council in 1918 came within a few votes of adopting a full metering policy.

Since the powers that be will not furnish the means to stop the waste there is nothing else for the engineers to do but lay elaborate plans to continue to pump 300 gal. per capita, the fundamental basis of the plan. Rightly, the city engineer calls attention to the necessity of much rehabilitation and new equipment but to pump more water only to have half of it wasted is almost criminal. It certainly is not something of which to be proud. Once the overburdened tax payer is shown who is paying for that pumping, the Chicago City Council is likely to be told, in no uncertain terms, that appropriations for waste prevention rather than for new equipment will be in order.

The engineers of Chicago have a special duty in connection with this water waste situation, for the facts in the case are not easy to understand. The city engineer has come to them for assistance to check up on his plans. He has stated that if he is wrong he desires enlightenment; if he is right he wants and should have backing. If a no-metering policy is to be followed he is right, but *Engineering News-Record* believes in metering. The near approach to success in its campaign for metering made in 1918 by the American Association of Engineers indicates that renewed effort to convince the city officials of the reasonableness of selling water as well as gas by the cubic foot instead of by guess might prove successful.



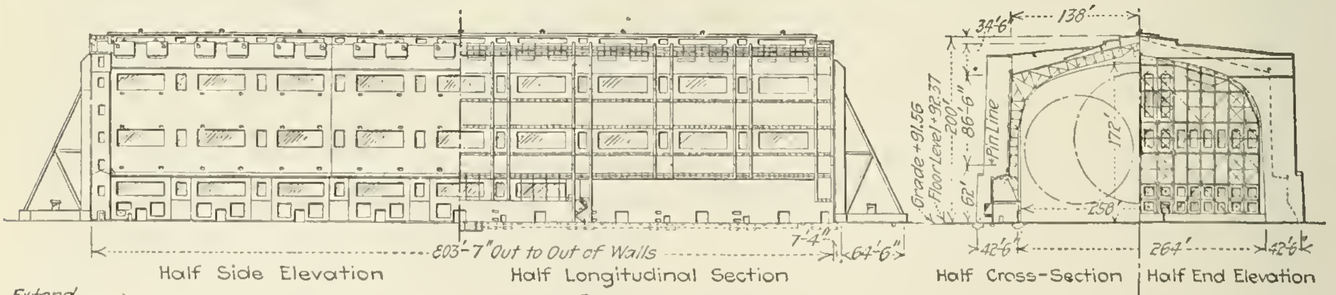
SMALL SCALE MODEL OF LAKEHURST HANGAR. NOTE FREIGHT CARS FOR SCALE

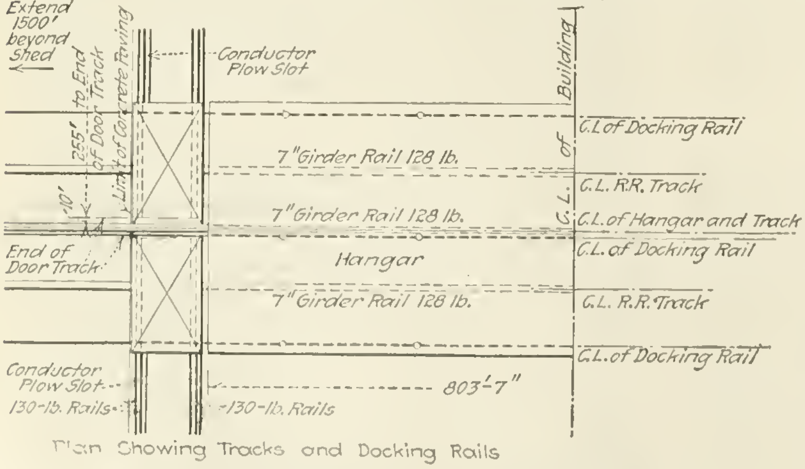
Navy Dirigible Hangar at Lakehurst a Huge Structure

Approximately 6.4 Acres Covered by Roof Arches Abutting on High Triangular Towers—803 x 360 Ft. in Plan and Arch Crown 172 Ft. Above Ground—End Doors Are Self-Supporting Structures

AT THE Naval Air Station, Lakehurst, N. J., the United States Navy is now building a hangar for rigid dirigibles which has the largest clear roof area of any structure in this country, and is the largest hangar in the world. The Lakehurst hangar, which is to be used to house the largest airships now being considered for the United States, and also as a constructing shed for new dirigibles, was designed in 1919 and will be completed some time this year. Its outside dimensions are 954 ft. in length out to out of doors and 350 ft. in width by 200 ft. in height, with clear inside dimensions of 803 ft. by 262 ft. by 172 ft. In order to provide the requisite clearance to dock and land the hugh airships, the clear height of the roof at crown is 172 ft. at the door and 195 ft. from the floor to the center of the pin. This is far greater than in any of the similar roof types used for armories, the nearest approach to the hangar in previous practice.

In design, the Lakehurst hangar roof is a series of three-hinged trussed arches, supported on high triangular towers. The ribs are in twins, spaced each 17 ft. 4 in. center, the bents themselves being 69 ft. 6 in. apart, with the roof and siding carried across that span on trusses. The outside siding follows the slightly inclined outer chord of the arch rib down to about the junction with the outer leg of the tower, at which point it extends as a roof over the space between the inner and outer siding of the towers. This space for the full length of the building on both sides is divided into two stories with rooms for office and shop purposes. As shown in the elevation and plan the roof, with its monitor, and the siding are generously provided with glazed sash. The remainder of the roof is covered with a felt layer roofing and of the sides a corrugated asbestos board.



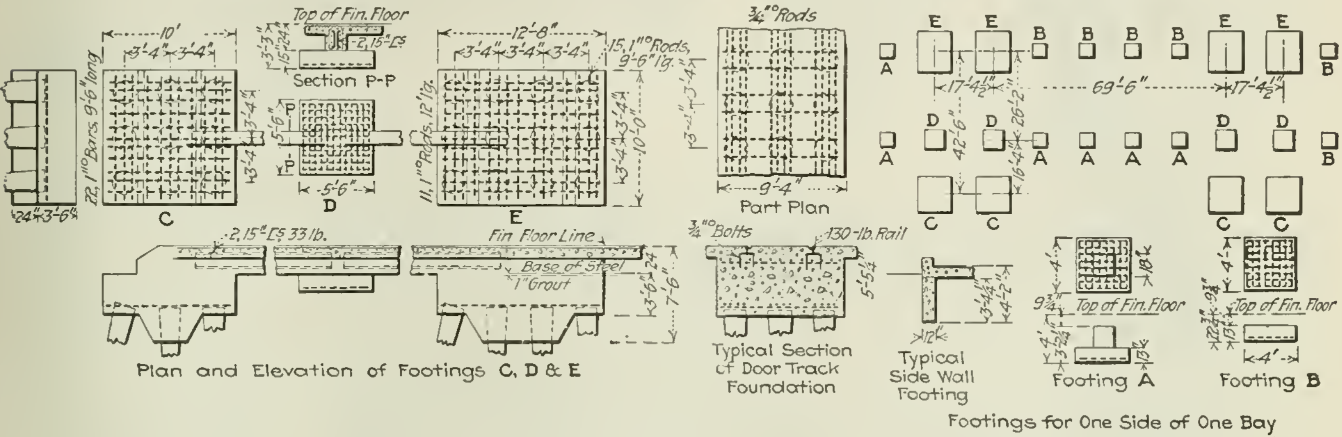


GENERAL OUTLINE AND PLAN OF HUGE DIRIGIBLE HANGAR FOR U. S. NAVY AT LAKEHURST, N. J.

Of far greater novelty in design are the main doors at each end of the structure. The two ends are in duplicate and each has a two-leaf rolling, self-supporting door approximately the same shape as the arch opening; that is, 177 ft. high, 136 ft. long and 77 ft. deep. These doors of structural steel framing covered with asbestos siding are electrically operated and travel on railway tracks running parallel to the ends of the shed clear beyond the arch and are designed to take wind pressure on each side.

In addition to the structure proper, the hangar has three lines of railway inside and docking rails which pass through the shed and extend 1,500 ft. beyond each end.

The shed is located in the ocean belt of New Jersey where the soil is dry sand capable of high bearing capacity when confined. In order to insure against movement, however, concrete piles are provided in all of the pier bases, stub piles under the main tower legs, and longer piles in the door foundations. As shown in the details of the footings herewith, there are separate concrete pedestals under each of the three legs of the tower with stub piles about 10 ft. long embedded in the outer and inner pedestals, the middle one with a lighter bearing requiring no piles. The outer row of piles in each pedestal is driven on a 1:4 slope. In addition, the three pedestals are tied together by concrete incased channels riveted to the legs of the tower. On the same drawing is a detail of the footing under the two tracks for the door, each a continuous concrete base resting on 30-ft. straight concrete piles and carrying the tracks as an integral part of the structure. The pile spacing is based on a safe load capacity of 25 tons per pile.



DETAILS OF FOOTINGS FOR HANGAR STRUCTURE AND FOR TRACKS ON WHICH DOORS RUN

The steel framing is not especially exceptional except in size. Each arch is a three-hinged type of rather simple trussing carried on the triangular trussed towers 64 ft. above the ground. The pin span is 264 ft. and the rise from pin to pin, 131 ft. Horizontal trusses at every other panel point carry the siding framing, and the roof framing is carried on longitudinal trusses at every panel, both outer and inner chords of the ribs being thoroughly cross-braced. All these details are shown on the sheet of details on page 894.

The shed is designed for a combination of dead, snow and wind load, with a basic dead load of 35 lb. per square foot, snow load of 20 lb. per square foot, and wind of 30 lb. per square foot. Investigation was made for various combinations of loading, as shown in the tabulation on the sheet of details, p. 895, for several of the typical members. The base unit stress in steel is 16,000 lb. per square inch, but as shown in the schedule this is modified for various combinations of loadings as follows:

For dead load plus 20 lb. snow load	Add 0
For dead load plus 30 lb. wind load	Add 10%
For dead load plus 30 lb. wind load plus 20 lb. snow load	Add 50%
For dead load plus 10 lb. wind load plus 40 lb. snow load	Add 50%
For dead load plus 30 lb. wind load plus 10 lb. snow load	Add 25%
For dead load plus 40.lb. snow load	Add 25%

All the stresses shown on the diagram, which were the designed stresses, were adjusted to a basis of 16,000 lb. per square inch. Further unit stresses are as follows:

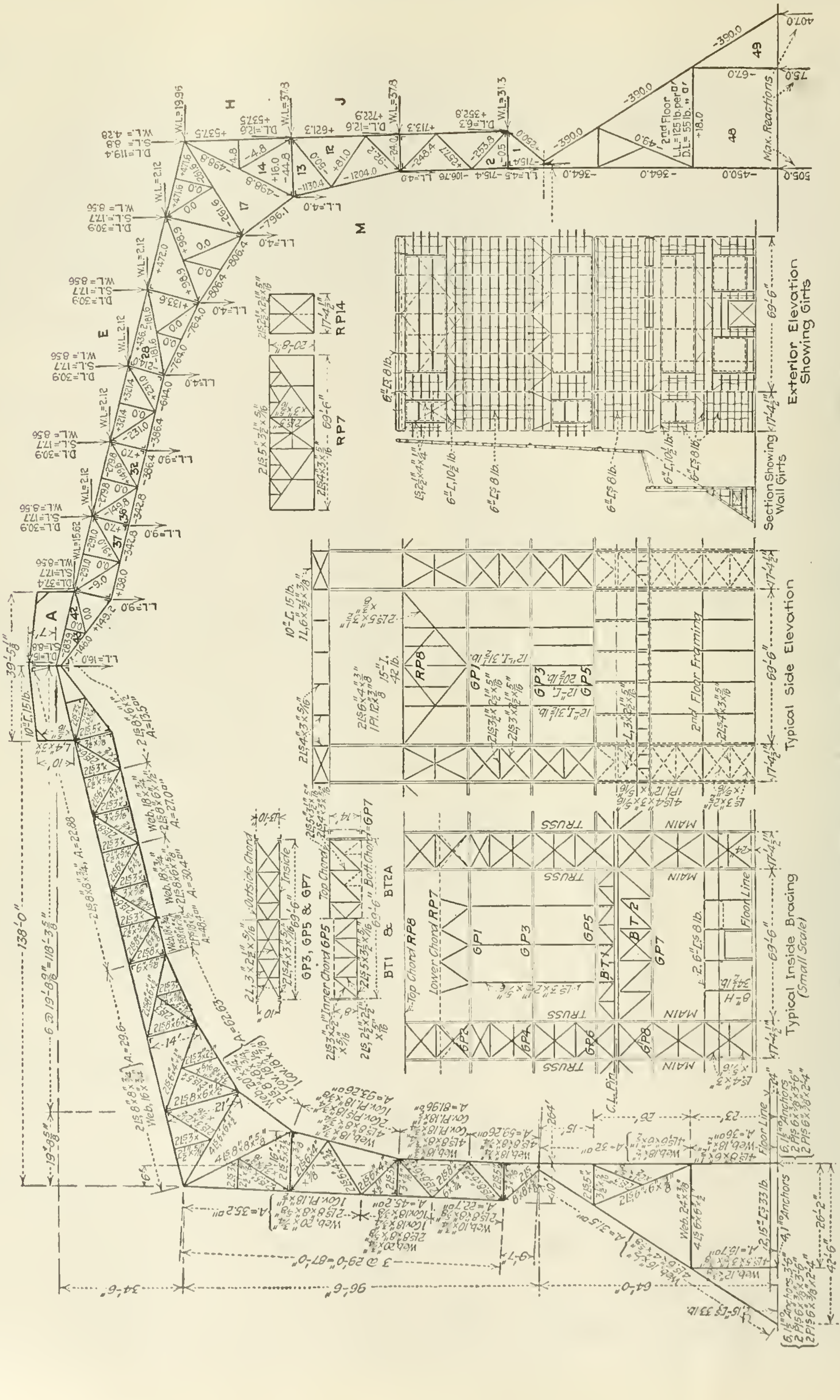
Direction compression, rolled steel and steel castings	16,000
Tension, net section, rolled steel	16,000
Bending on extreme fibers of rolled shapes, built sections, girders and steel castings	16,000
Bending on extreme fiber of pins	24,000
Shear on shop rivets and pins	12,000
Shear on bolts and field rivets	10,000
Shear, average, on webs of plate girders and rolled beams, gross section	10,000
Bearing pressure on shop rivets and pins	24,000
Bearing on bolts and field rivets	20,000
Axial compression of gross sections for ratio of l/r up to 120	16,000—70 l/r
With a maximum of	13,000

The factor l/r shall not extend 100 for main members nor 120 for secondary members, nor 140 for bracing struts. For bracing subjected to tension l/r shall not exceed 200; l being the unsupported horizontal projection of the length of the member.

The structure is divided longitudinally in three sections by expansion joints just outside the main truss members as shown in the detail in an accompanying drawing. At these joints a curved copper sheet is inserted for closure.

The details of the doors are shown in one of the drawings. At each end there are two duplicate right and left doors of the design shown. In effect they consist of a vertical frame 10 ft. wide and shaped to the arch opening, with an inside sheathing of asbestos board. This frame is carried on two standard-gage trucks, but its stability is assured by two diagonal braces extending back to another horizontal truss which rests on trucks traveling on another standard-gage track. The main frame is cross braced in the rear plane, the girt framing carrying the sheathing being in the front or inside plane. Wind loads are transmitted through the sheating to transverse trusses in a horizontal plane spaced every vertical 32 ft. and through them to the two rear braces which form in effect the triangular truss system shown in the stress sheet.

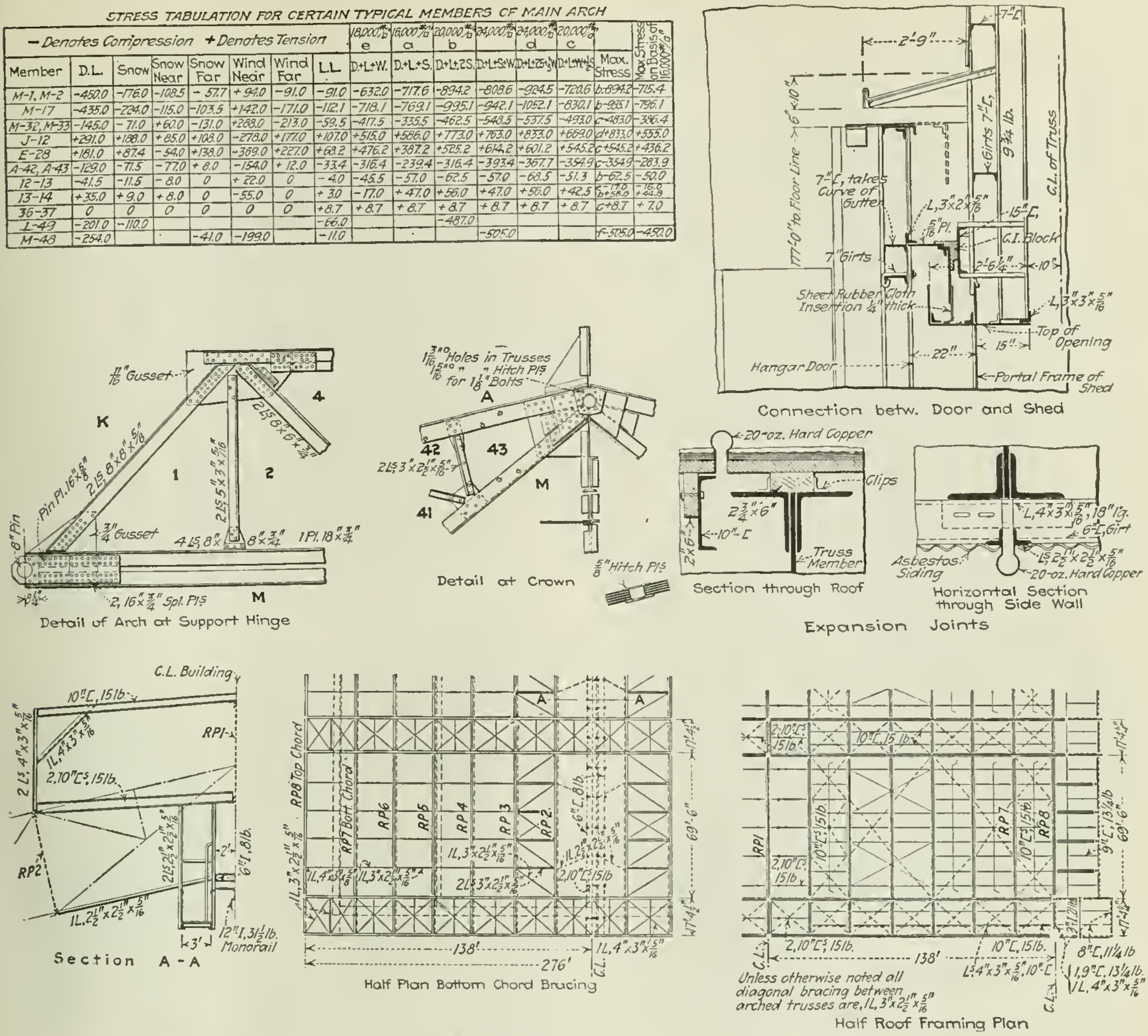
The lower horizontal trusses are encased in concrete, as shown in one of the typical sections, in order to give sufficient counterweight to balance the pressure of the wind against the full face of the doors. These horizontal girders were figured for the steelwork to support the dead weight of the steel during erection, and after being encased in concrete, they were figured as reinforced-concrete girders to support the counterweight, the lower flange angles becoming the reinforcing steel for the girders. The wind is figured in either



DETAILS OF THE MAIN TRUSS AND STEEL FRAMING OF LAKEHURST HANGAR

STRESS TABULATION FOR CERTAIN TYPICAL MEMBERS OF MAIN ARCH

− Denotes Compression + Denotes Tension								18,000#/□" e	16,000#/□" a	20,000#/□" b	24,000#/□"	24,000#/□" d	20,000#/□" c		
Member	D.L.	Snow	Snow Near	Snow Far	Wind Near	Wind Far	L.L.	D+L+W.	D+L+S.	D+L+2S.	D+L+S+W	D+L+2S+⅓W	D+L+W+½S	Max. Stress	Max Stress on Basis of 16,000#/□"
M-1, M-2	−450.0	−176.0	−108.5	− 57.7	+ 94.0	−91.0	−91.0	−632.0	−717.6	−894.2	−808.6	−924.5	−720.6	b-894.2	−715.4
M-17	−435.0	−224.0	−115.0	−103.5	+142.0	−171.0	−112.1	−718.1	−769.1	−995.1	−942.1	−1052.1	−830.1	b-995.1	−796.1
M-32, M-33	−145.0	− 71.0	+60.0	−131.0	+288.0	−213.0	−59.5	−417.5	−335.5	−462.5	−548.5	−537.5	−493.0	c-483.0	−386.4
J-12	+291.0	+188.0	+ 85.0	+108.0	−278.0	+177.0	+107.0	+515.0	+586.0	+773.0	+763.0	+833.0	+669.0	d+833.0	+555.0
E-28	+181.0	+87.4	− 54.0	+138.0	−369.0	+227.0	+68.2	+476.2	+387.2	+525.2	+614.2	+601.2	+545.2	c+545.2	+436.2
A-42, A-43	−129.0	−71.5	− 77.0	+ 8.0	−154.0	+ 12.0	−33.4	−316.4	−239.4	−316.4	−393.4	−367.7	−354.9	c-354.9	−283.9
12-13	−41.5	−11.5	− 8.0	0	+ 22.0	0	− 4.0	−45.5	− 57.0	− 62.5	− 57.0	− 68.5	− 51.3	b-62.5	− 50.0
13-14	+35.0	+ 9.0	+ 8.0	0	−55.0	0	+ 3.0	− 17.0	+ 47.0	+56.0	+47.0	+56.0	+42.5	e-17.0 b+56.0	−16.0 +44.8
36-37	0	0	0	0	0	0	+8.7	+ 8.7	+ 8.7	+ 8.7	+ 8.7	+ 8.7	+ 8.7	c+8.7	+ 7.0
L-49	−201.0	−110.0					−66.0			−487.0					
M-48	−254.0			−41.0	−199.0		−11.0				−505.0			f-505.0	−450.0



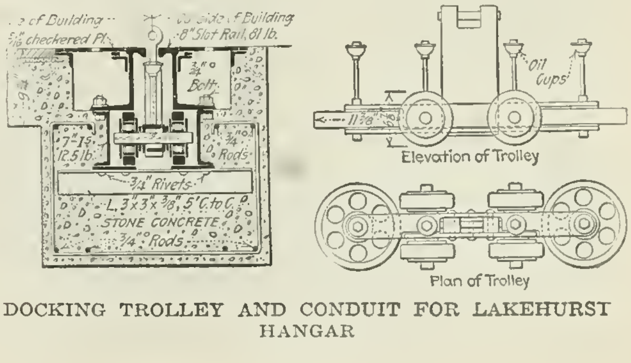
STRESSES AND SOME DETAILS OF THE MAIN ARCH FRAMING

direction, because when rolled out the doors are in the open exposed on both sides.

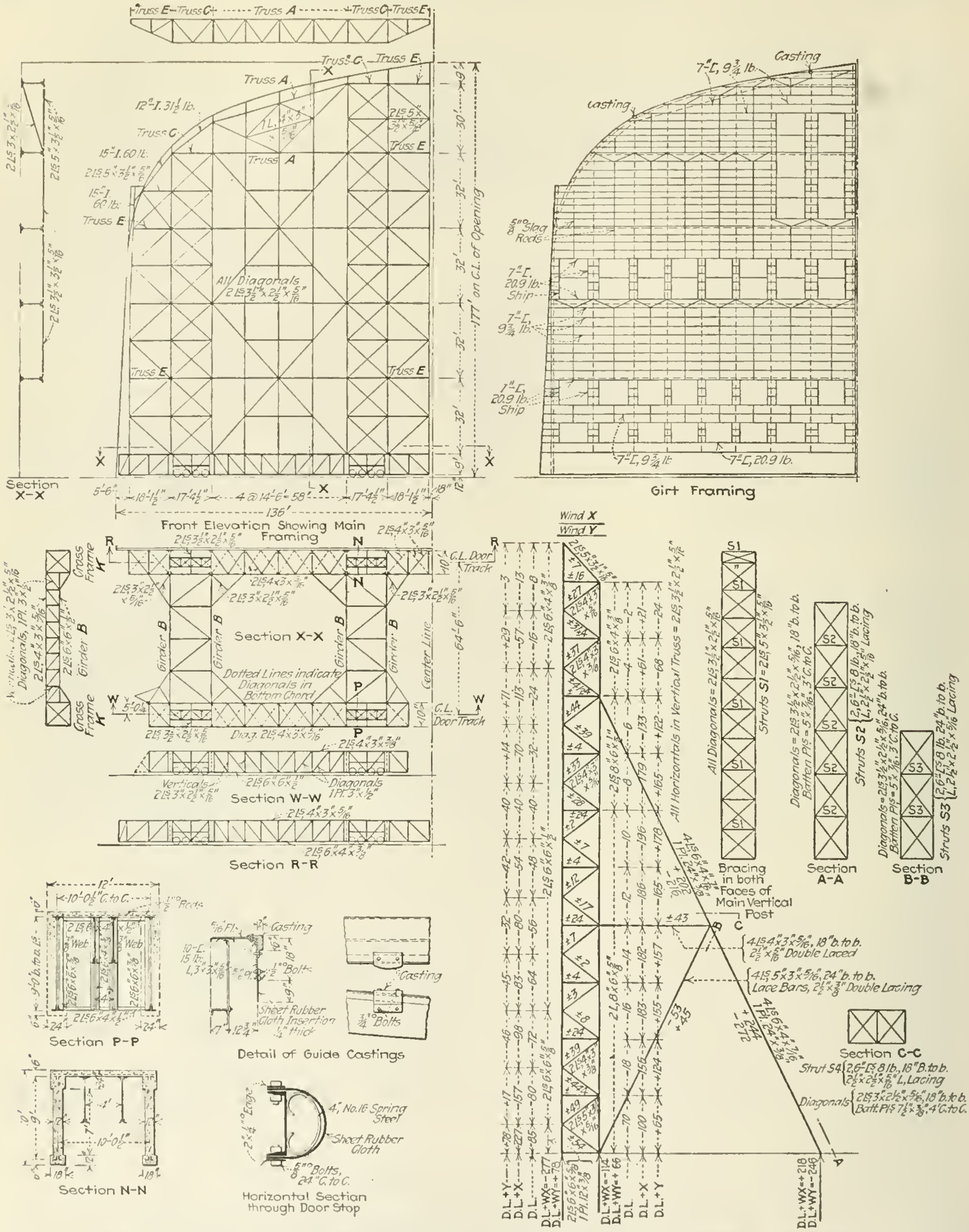
The doors are assumed to have no bending under the wind load, but at their upper face there are two castings provided, one near the crown and one at the haunch of the curve, which bear against horizontal channels framed into the portal arch of the shed. Here, too, an overhanging plate has pendant from it a sheet rubber cloth which drops down into a groove formed by a channel in the end arch frame so as to make a closure of the door above. This detail is shown in one of the drawings. At the bottom, the door is provided with a wooden weather strip, of 2 x 6 in. timber. The meeting faces of the doors at the center have a continuous semi-circular strip of sheet rubber cloth supported by 4 in. wide steel springs 3 ft. on centers. This will form a closure of the doors meeting at the center. The ends of the base framing where doors come together will have 12 x 12 in. timber bumpers to absorb the shock when doors come together.

These doors are, as stated, mounted on standard-gage trucks which travel on two lines of track laid on a concrete base. They are driven by electric motors with the power transmitted through plow which collects current from conductors in a slot. This slot or conduit, however, only approaches the outer edge of the door, so as to avoid possible fire risk of electric conductor near the open door of the hangar. The plow is carried in the extension of the forward lower truck of the door.

Each leaf of the door is supported on four trucks, each truck having eight wheels. The maximum vertical dead load per truck is estimated to be 562,000 lb.



DOCKING TROLLEY AND CONDUIT FOR LAKEHURST HANGAR


Truss E
Truss C
Truss A
Casting
Casting
5/8" ⌀ Slag Rods
All Diagonals 2 L's 3 1/2" x 2 1/2" x 5/16"
177' on C.L. of Opening
Section X-X
Front Elevation Showing Main Framing
Girt Framing
136'
Girder B
Cross Frame K
Center Line
C.L. Door Track
Dotted Lines indicate Diagonals in Bottom Chord
Section W-W
Section R-R
Section P-P
Section N-N
Detail of Guide Castings
Sheet Rubber Cloth Insertion 1/4" thick
3/4" Bolts
4" No. 16 Spring Steel
Sheet Rubber Cloth
Horizontal Section through Door Stop
Wind X
Wind Y
All Horizontals in Vertical Truss = 2 L's 3 1/2" x 2 1/2" x 5/16"
All Diagonals = 2 L's 3 1/2" x 2 1/2" x 5/16"
Struts S1 = 2 L's 5" x 3 1/2" x 5/16"
Bracing in both Faces of Main Vertical Post
Section A-A
Struts S2
Section B-B
Struts S3
Section C-C
Strut S4
Diagonals
D.L.+Y
D.L.+X
D.L.
D.L.+WX
D.L.+WY

ELEVATIONS AND SECTIONS OF THE SELF-SUPPORTING DOOR TO LAKEHURST HANGAR

Vertical live-load per truck is 496,000 lb. and total vertical load 1,058,000 lb. The maximum horizontal thrust for a 30-lb. wind on each leaf of the door is 720,000 lb. and the maximum horizontal thrust for a 10-lb. wind on each leaf of door is 240,000 lb. The doors are designed to operate under a 10-lb. wind load. In addition to the electric drive, an emergency winch with cables for hand operation is provided to open and close the doors in case of the failing of the current or motor.

The entire clear floor of the hangar is to be of asphalt block on an 8-in. concrete base. Other floors, notably the office and service rooms, are to be of concrete, tile or wood flooring on concrete. Expansion joints in the floor base of the main portion of the building are to be provided at the junction of the floor with the longitudinal curb under the interior partitions, and transverse joints will be provided every 40 ft., the joints to come on truss lines.

An interesting feature of the shed are the docking rails. These are placed running through the shed and extending beyond 1,500 ft. at each end. They are in effect conduits with narrow slots through which lines reaching from a trolley inside the conduit can be extended to the airship being launched or docked. The section through one of the conduits is shown herewith, this being similar in general detail to the ordinary trolley or conduit construction with slots except that provision has to be made for the uplift of the airship against the under face of the slot. A trolley of special design, also shown, is provided which when not in use rolls along the bottom track in the conduit but when in use for docking or launching rolls on its upper bearing on the under side of the slot rail. There was considerable difficulty in designing a detail of the crossing of this launching conduit with the door tracks. It was felt to be necessary to provide some closure of the slot during the passage of the door trucks because of the shock to so large and heavy a structure by the jolting over this opening. Accordingly, a special detail, not shown in the drawings herewith, was designed in which at each crossing of rail with slot there is a moving rail which can be thrown by interlocked connecting rods tying together all of the crossings. When the doors are not in use, this rail leaves the slot open for the passage of the trolley and guys and lines to the airship. When the door is about to be moved, the connecting rod is thrown and the rails move up to fill up the slot opening and provide a continuous track for the door.

Special attention had to be paid to the lighting of the shed because of the possible presence there of an explosive mixture due to the escape of hydrogen from the dirigible. Therefore, no wires or exposed connections are taken inside of the shed. All lighting is through heavy glass covers in walls and floor and roof, with the connections well outside the structure and with gasproof glass covers. On account also of the gas which is used to fill the balloons, the lights in the skylights are of actinic glass which will cut out the detrimental rays.

Special provision for working in the shed is made by a number of so-called catwalks, which are horizontal balconies running along under the roof. Fastenings are placed at the various roof rafters for traveling hoists. These added considerably to the designed loads on the roof.

Special attention is paid the architectural features of the shed. In so huge a structure this was difficult, but the architectural design was aided considerably by the building of two successive models, a view of one of which is shown herewith. By the use of this model the design of the doors was improved considerably. Under the present design, the curve of the upper part of the door is so made that when the door is open it forms a continuous and pleasing line from the monitor down to the edge of the door.

The hangar was designed by the Bureau of Yards and Docks under the direction of Rear Admiral C. W. Parks, Civil Engineer Corps, U. S. N., Chief of Bureau, and Commander Kirby Smith, C. E. C., U. S. N., Project Manager. J. Michaelson had charge of the engineering computations, and Wm. Partridge developed the architectural details.

How Wisconsin University Assists Owners and Engineers in Land Drainage

THAT land drainage can be stimulated by practical demonstration was shown at the recent annual meeting of the American Society of Agricultural Engineers, at Chicago, in a paper by E. R. Jones, chairman of the department of agricultural engineering of the University of Wisconsin and also state drainage engineer.

In a community where several landowners are considering drainage, the Wisconsin College of Agriculture will lay out a drainage system on one farm, staking the lines and establishing grades and explaining the methods at a meeting of landowners. This service is free but is limited to communities that need object lessons, while the person served must agree to engage a private engineer to insure proper construction according to the plans recommended. In this way the farmers are taught to help themselves in the simpler projects and to engage engineers for the larger ones.

At first engineers were inclined to object to this service, but it has been found to increase directly the demand for their services. In one case, the result of a demonstration was the use of 15 carloads of tile in one season in a district which previously had no tile drainage, while an engineer in that district now has all the work he can handle in laying out drainage systems for farmers. In order to eliminate communities which might ask for demonstrations merely out of curiosity, the service is restricted to places where the landowner agrees to install the system as laid out. He is expected also to advertise the demonstration so as to have a large attendance.

Three other lines of activity of the College of Agriculture were noted by Mr. Jones. One of these is in advising landowners in cases where the drainage outlet would be through the lands of unwilling owners, a law passed in 1919 providing that in such cases the willing owners must petition the circuit judge for a drainage district and must accompany the petition with plans showing specified features. The engineers of the college will help the owners to decide whether a district organization is desirable and how much land should be included. This service is free but is rendered at such times as will involve the least expenditure of time and money.

Reports are made on all drainage districts that are organized and under another law of 1919 these reports are now submitted to the state chief engineer, who has power to prevent the organization of projects on poor lands and the execution of faulty plans on any lands. The agricultural engineer of the college is made state drainage engineer, by whom both preliminary and final plans and all assessments must be approved. There is little friction in this procedure, as the various engineers keep in touch with the college and take its suggestions, so that the final plans usually are in such shape as to be readily approved. The College of Agriculture is in close coöperation with the state drainage association, which has nearly 400 members and holds a winter convention and a summer field meeting each year.

Municipal Engineers' Salaries Proposed by A.A.E.

THE accompanying schedule of salaries of engineers in municipal service, prepared by a committee of the American Association of Engineers headed by S. C. Hadden, is the third national schedule for engineers in public service issued by the association. Schedules for state and for county highway engineers have been endorsed in final form by the board of directors of the association, but the municipal schedule is still in tentative form and is issued now for the criticism of the profession.

The preparation of these three schedules has been under the direction of the committee on salaries of engineers in public service, of which A. N. Johnson, consulting highway engineer of the Portland Cement Association, is chairman. Mr. Johnson and the rest of his committee with the assistance of a large number of corresponding members prepared the schedules for state and county highway engineers. The municipal schedule was prepared by a sub-committee headed by Mr. Hadden.

The municipal schedule is expected to be adopted at the next meeting of the board of directors on May 9 at St. Louis. Criticisms are requested to be sent to S. C. Hadden, 63 East Adams Street, Chicago, before that time.

RECOMMENDATIONS FOR SALARIES FOR ENGINEERS IN MUNICIPAL SERVICE PROPOSED BY AMERICAN ASSOCIATION OF ENGINEERS

Schedule 1

Cities up to 15,000 population

City Engineer—In charge of all engineering work of the city except water works	$ 3,500	$5,200
First Assistant Engineer—Duties as assigned; no executive work	2,400	3,000
Second Assistant Engineer—Performs or has charge of drafting and surveying work	1,800	2,400
Rodman and Chainman	1,200	1,600
Inspector on Construction Work—First Class	2,400	3,000
Second Class	1,200	1,600
Superintendent of Water Works—In charge of maintenance, operation and extension of water works system	1,800	2,600
Superintendent of Streets and Sewers — In charge of maintenance of city streets and sewers	1,800	3,000

Schedule 2

Cities from 15,000 to 50,000 population

City Engineer—In charge of all engineering work of the city, except water works	4,800	6,000
First Assistant Engineer—Duties as assigned but responsible for office engineering work	2,400	3,600
Second Assistant Engineer—Chief of Survey Party and Supervising Engineer on Construction	2,400	3,600
Instrumentman	1,800	2,000
Draftsman	1,800	2,400
Rodman, Chainman and Tracer	1,200	1,600
Inspector on Construction Work—First Class	2,400	3,000
Second Class	1,200	1,600
Superintendent of Water Works—In charge of maintenance, operation and extension of water works system	3,600	5,000
Superintendent of Streets and Sewers—In charge of maintenance of city streets and sewers	2,400	4,000

Schedule 3

Cities from 50,000 to 100,000 population

City Engineer—In charge of all engineering work of the city, except water works	5,500	7,500
Deputy City Engineer—Office engineering and special work as assigned	3,200	4,800
Division Engineer—In charge of surveying operations and supervision of city construction work	3,000	4,500
Assistant Engineer—Reports to division engineer and acts as chief of party or construction superintendent	2,800	3,000
Instrumentman	2,200	3,000
Draftsman	2,200	3,000
Rodman, Chainman and Tracer	1,500	1,800
Inspector on Construction Work—First Class	2,600	3,200
Second Class	1,500	1,800
Superintendent of Water Works—In charge of maintenance, operation and extension of water works system	4,500	6,000
Superintendent of Streets and Sewers—In charge of maintenance of city streets and sewers	3,600	4,800

Schedule 4

Cities from 100,000 to 300,000 population.

Department Commissioner—Commissioner of Department of public works or head of special commission as on transportation, sewage disposal, additional water supply or other similar work of the first magnitude	7,500	10,000
City Engineer—In charge of all engineering work of the city, except water works	7,000	8,500
Deputy City Engineer—Principal assistant to city engineer assigned to special work	4,800	8,400
Division Engineer—In charge of major subdivision of the city engineering work such as pavements, sewers, bridges, etc.	4,000	4,800
Office Engineer—In direct charge of design, reporting to division engineer	3,600	4,000
Assistant Engineer—First Grade	3,200	3,800
Second Grade	2,800	3,100
Reports direct to division engineer and acts as chief of party, squad-leader or construction superintendent.		
Testing Engineer, Chemist or Bacteriologist—In charge of testing work in construction material laboratory, water purification plant or sewage treatment plant	3,200	3,800
Instrumentman	2,400	3,200
Draftsman—First grade	2,400	3,200
Second Grade	1,800	2,100
Rodman, Chainman and Tracer	1,700	2,000
Inspector on Construction Work—First Class	2,800	3,400
Second Class	1,700	2,000
Superintendent of Water Works—In charge of maintenance, operation and extension of water works system	5,000	7,000
Assistant Water Superintendent—In charge of domestic distribution system	3,600	4,800
Water Works Mechanical Engineer—In charge of pumping plants of city water works	3,600	4,800
Superintendent of Meters and Services—In charge of installation of water meters, service pipes and meter reading	3,600	4,800
Superintendent of Water Filtration—In direct charge of city water purification plant	3,600	4,800
Superintendent of Streets—In charge of maintenance of street, including street cleaning and refuse collection	3,600	4,800
Superintendent of Sewers—In charge of sewer maintenance, repairs and new connections	3,600	4,800
Superintendent of Sewage Disposal—In direct charge of sewage disposal plant operation	3,600	4,800
Superintendent of Refuse Disposal—In charge of municipal refuse destructor or incinerator	3,600	4,800

Schedule 5

Cities from 300,000 to 500,000 population.

Department Commissioner—Commissioner of department of public works or head of special commission as on transportation, sewage disposal, additional water supply or other similar work of the first magnitude	10,000	15,000
City Engineer—In charge of all engineering work of the city, except water works	9,000	12,000
Deputy City Engineer—Principal assistant to city engineer assigned to special work	6,000	7,500
Division Engineer—In charge of a major subdivision of the city engineering work such as pavements, sewers, bridges, etc.	4,200	6,000
Office Engineer—In direct charge of design, reporting to division engineer	3,800	4,200
Assistant Engineer—First Grade	3,400	4,000
Second Grade	2,000	3,300
Reports to division engineer direct and acts as chief of party, squad-leader, or construction superintendent.		
Testing Engineer, Chemist or Bacteriologist—In charge of testing work in construction material laboratory, water purification plant or sewage treatment plant	3,400	4,000
Instrumentman	2,400	3,200
Draftsman—First Grade	2,400	3,200
Second Grade	1,800	2,100
Inspector on Construction Work—First Class	2,800	3,400
Second Class	1,700	2,000
Rodman, Chainman and Tracer	1,700	2,000
Superintendent of Water Works—In charge of maintenance, operation and extension of water works system	7,500	10,000
Assistant to Water Superintendent—In charge of domestic distribution system	4,800	6,000
Water Works Mechanical Engineer—In charge of pumping plant of city water works	4,800	6,000
Superintendent of Meters and Services—In charge of installation of water meters, service pipes and meter reading	4,800	6,000
Superintendent of Water Filtration—In direct charge of city water purification plant	4,800	6,000
Superintendent of Streets—In charge of maintenance of streets, including street cleaning and refuse collection	4,200	6,000
Superintendent of Sewers—In charge of sewer maintenance, repairs and new connections	4,200	6,000
Superintendent of Sewage Disposal—In direct charge of sewage disposal plant operation	4,800	6,000

Superintendent of Refuse Disposal—In charge of municipal refuse destructor or incinerator	4,200	6,000
City Managers—Where a City Manager is employed his position shall be defined as the Administrative head of the municipality, appointed by its Legislative Body, and his duties make him the head of the service, safety, health, and welfare departments of the city. The following salaries are proposed for City Managers:		
Schedule 1	5,000	7,500
Schedule 2	7,000	8,500
Schedule 3	8,500	10,000
Schedule 4	10,000	12,000
Schedule 5	12,000	15,000

These schedules not to operate to reduce any existing salaries.

Zoning of Portland, Ore.

ZONING ordinance, dividing the city of Portland, Ore., into eight use and six height districts and containing also some provisions as to the portions of lot that may be occupied by each building has been adopted by the City Council. The ordinance is subject to approval at the general election—November, 1920.

The eight use districts are in three general classes. Residence districts include Class 1, single family dwellings, and Class 2, all kinds of dwellings. Business and public use districts include (3) retail business, offices and dwellings; (4) public and semipublic uses; (5) wholesale and retail business and dwellings, and (6) hospitals and institutions. Industrial districts embrace (7) ordinary factories and warehouses without dwellings; (8) noxious industries without dwellings.

The height districts provide for buildings of 2½, 3, 4, 6, 8, and 10 stories in height, with height limits of 38, 42, 60, 85, 105, and 130 ft. These heights may be exceeded for such towers, spires, gables and tanks as have areas not exceeding 15 per cent of the area of the lot and base areas greater than 2,500 sq.ft. Church spires, chimneys, flag poles and wireless towers are excepted. Special provisions govern the distance of high buildings from the street and permit dormers above the height limit provided these are not more than 60 per cent of the length of the building at such height limit, and that the length must be decreased by 1 per cent for each additional foot in height.

In the home area districts not more than 40 per cent of the area of any lot may be occupied by a building at grade, and not more than 30 per cent at an elevation 16 ft. above grade.

In use districts 3, 4, 5, 7 and 8 a rear yard must be provided having a minimum depth of 8 ft. and increasing by 2 in. for each 1 ft. of height of building.

Amendments and changes in district lines may be made by the Council on request of property owners if approved by the City Planning Commission after public hearings have been held by the Commission and the Council. Charles H. Cheney is the consultant engineer to the commission.

Air Agitator Speeds Floc Formation

To hasten the formation of a "floc" in the sedimentation basin of the Bridgeton (N. J.) water filtration plant during floods when the turbidity is high and alkalinity low, compressed air is introduced at a point near the entrance to the basin. The air is distributed from a horizontal perforated pipe extending across the basin several feet below the surface. A violent agitation is obtained, which, according to a recent issue of the New Jersey Public Health *News*, satisfactorily coagulates the chemical within the first 15 ft. of the 115-ft. travel in the basin, thus permitting setling within the 1¾ hr. detention period.

Felling A Concrete Chimney

Nearby Structures Made Necessary a Complicated Procedure of Blasting and Tug Lines To Avoid Danger

By A. D. Butler

City Engineer, Spokane, Wash.

BECAUSE of the existence of buildings very close to a 210-ft. reinforced-concrete stack in the city of Spokane, Wash., the necessary felling of the chimney, which had become obsolete, involved considerable difficulty. After a legal controversy as to the responsibility for the demolition, a method of felling was adopted which proved successful, although it was somewhat complicated.

DRILL HOLES IN STACK PREPARATORY TO BLASTING

In order to widen their yards the Spokane and Inland Empire Ry., in 1915, proposed an exchange of property with the city of Spokane, the railway company taking over the property on which the crematory buildings stood and paying for their moving and rebuilding on a strip of ground adjoining their former site on the north, the transaction carrying with it the necessary transfer of property.

Accordingly a new modern crematory was built on the new site, using the incinerators, brick and other movable parts of the old building. It was impracticable to move the old stack; hence, a new stack was built and the old one left where it stood. This old stack was of concrete heavily reinforced, 9 ft. 10 in. in diameter at the base, 210 ft. high and weighing about 200 tons. The city, bowing gracefully to the railway company, said: "You may have the stack." The railway company, bowing back, entreated the city to take it away. The proximity of the new crematory buildings on the one side and the Inland yards on the other made the removal of the stack unusually hazardous; since if the stack should fall to the south it might do several thousand dollars damage to railroad property, while if it fell to the north it might do at least $20,000 damage to the new crematory.

This Alphonse and Gaston attitude of the city and railway company over who should have the privilege of removing the stack, led to a law suit which dragged on for about two years, during which time a great deal of correspondence was had with many contracting firms concerning its removal. Some firms made personal inspection of the stack and its location, and although there were some offers to do the work none of them would assume any liability for damage.

CUTTING THE REINFORCEMENT WITH GAS FLAME

The decision of the court left the burden for the removal of the stack on the city. The city council therefore ordered the engineering department to proceed to remove it by day labor.

By observations with transit it was discovered that the structure leaned slightly to the south and east. With this in mind a dead-man was anchored somewhat north of the direction in which it was hoped to fell the stack, endeavoring in this way, if possible, to counteract the tendency of the stack to go too far south, which might endanger the railroad property.

An attempt was first made to shoot a line over the top of the stack with a gun used for the purpose by the fire department; but the 200 ft. vertical height proved too great, so a light scaffold was built up on the inside to a height of 100 ft., a hole was put through the shell of the stack, and a $\frac{3}{4}$-in. cable fastened securely to another anchor on the inside. The cable was then fastened to a 1-in. manila line, which passed through a double and triple block which was fastened to a deadman. The line was thence run at right angles a distance of about 50 ft. to the drum of a windlass. The windlass, acting in conjunction with the set of blocks would develop a strain on the cable of about twenty tons. It was observed that when the cable was stressed to a maximum, the top of the stack could be drawn over about 1 in. Sixty-five holes were drilled around the stack in a belt about 4 ft. wide on the side in which it was desired to have it fall, leaving about one-third of the circumference untouched except for several emergency holes which were drilled to be used in an extreme case. Owing to the large quantity of steel reinforcing in the stack, considerable trouble was experienced in drilling these holes.

After the drilling was completed, the wind being favorable, the work of blasting the concrete away was begun. On the north side of the stack was an opening 4 ft. wide and 7 ft. high, through which the smoke flues had entered. In order to keep the section symmetrical, an opening was first blasted out directly opposite this one, then a similar opening was shot out in the direction toward which it was desired to fell the stack, leaving two sections calculated to act as columns and amply sufficient to support the weight to which they would be subject. They were left as nearly symmetrical as possible in order not to permit the stack to settle out of line. These piers were loaded and shot simultaneously, but although the stack listed about 6 in. in the direction of the cable, it did not fall, being supported only by the reinforcing steel and one-third the circumference. An acetylene torch was then employed to cut the steel reinforcing bars, and although this also permitted the stack to be drawn over a few inches more out of line, yet it resisted all the strain that could be thrown into the cable by taking up the slack in the cable after each shot was fired.

It was possible by this time, however, to throw the stack out of line in the proper direction altogether about 2½ ft.

It was now thought safe to load and shoot the emergency holes on that portion of the circumference still untouched. By the shooting of these holes there was left only about 4 ft. or one-seventh of the concrete ring intact. After shooting these holes, the stack started slowly to fall in the direction in which the cable was attached.

The cable was quickly tightened and determined the direction of the fall. When the stack had tilted over at an angle of about 30 deg. the segment of concrete left on the back broke, permitting the stack to drop back, which broke all the reinforcing, after which it fell very rapidly.

Due to its initial leaning to the south, the general direction of the stack was about 10 deg. south of the direction in which the cable was pulling. The upper

BASE OF STACK AFTER FALLING

two-thirds of the stack completely collapsed, burying itself in the soft ground.

The total cost of felling the stack, including labor, staging, lines, powder, etc., was $274. The total time actually spent was five days with a crew of four men.

Relation of Railroad Terminal Problem to City Planning

By William J. Wilgus

(Paper Delivered Before National Conference on City Planning)

THE RAILROAD problem may be said to embrace three separate and distinct phases: That having to do with passenger and freight traffic destined for local distribution; that dealing with direct movements to and from local industries and other facilities having their own side tracks; and that having to do with the interchange of traffic destined for points beyond.

In discussing the first of these phases, which has to do with the local distribution of freight and passenger traffic, it should be borne in mind that the railroad terminal is not such in the sense that the movement of either freight or passengers there terminates. The terminal is merely a step in the journey between the point of origin and that of final destination, where the passengers or freight are transferred from one means of transportation to another. Stated differently, the terminal is to be considered as a means of transition from one transportation agency to another. It is a terminal only for the vehicles employed in effecting a portion of the journey of their contents. The passenger, on arrival at the terminal, alights from his train and continues therefrom by vehicle or on foot to his residence or place of business; and the article of freight is transferred from the freight car to the truck that is to effect the final delivery.

It has seemed well to dwell somewhat on this feature so as to remove from the mind the idea that the railroad terminal is really a terminal for the object that is being transported. Having that idea firmly in mind, it is possible to discuss more clearly alternative solutions of the terminal problem.

In the early stages of the growth of the American city there were no rapid transit facilities quickly and cheaply to convey the passenger from the terminal to his home or place of business, and land for terminal purposes was comparatively cheap. Therefore the station was placed as closely as possible to the business center of the community. Similarly, the comparative cheapness of property, coupled with the slowness and limited radius of action of horse-drawn trucks, led to the placing of local freight terminals adjacent to the business center.

In the course of time conditions in these particulars have radically changed. Our cities have shown a remarkable increase in population; the property occupied for railroad terminals has become extremely valuable and is in urgent demand for civic expansion; streets have become congested with pedestrians and vehicles; rapid transit facilities for annihilating space have been installed in most of our large cities, and the slow-going horse-drawn vehicle has been largely replaced by the high-capacity fast-moving motor truck.

In considering the solution of any given railroad problem it is therefore necessary carefully to weight the arguments for and against the location of passenger and freight terminals as near as possible to the business center. The advantages are convenience to that portion of the traveling public which can most easily complete its jorney on foot, and, in the case of freight, a slight saving in time and expense because of shortness of haul by motor truck between the freight station and the point of origin or destination. The disadvantages are the maintaining for railroad purposes in the midst of the city of vast wastes which block orderly civic expansion and contribute largely to the congestion that increasingly is becoming such a fruitful source of delay, inconvenience and expense to the public.

If, as in the case of the Grand Central Terminal at New York, the railroad approaches and station can be placed beneath the surface so that streets may be carried overhead without interference with the city's normal development, and if it is practicable to move trains by electricity so as to do away with nuisances incident to the use of steam locomotives and thereby permit the utilization of valuable "aerial rights" for revenue producing purposes, the better solution may be the placing of the terminal as near as possible to the business center. If, however, the underground treatment is impracticable and if the number of railroad lines and the shape of the city are such as to make undesirable this manner of solution, the course to pursue would be the banishment of the passenger terminals from the heart of the city to points sufficiently removed therefrom to afford ample space at moderate cost for the stations and yards, with contiguous parks, all planned in such manner as not unduly to interfere with future city growth.

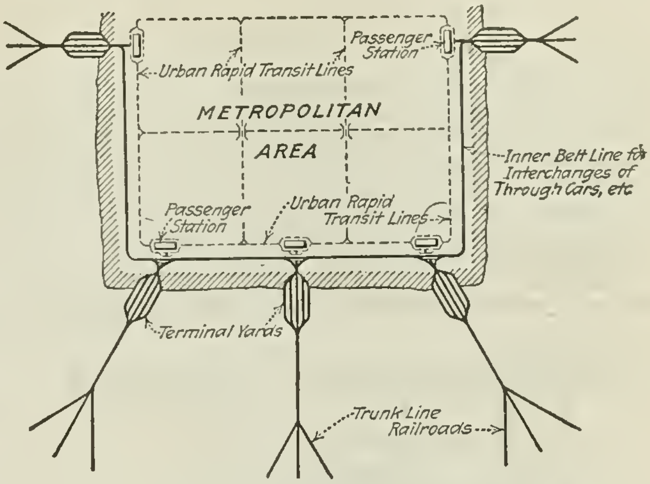

Passenger Station
Urban Rapid Transit Lines
METROPOLITAN
AREA
Inner Belt Line for Interchanges of Through Cars, etc
Passenger Station
Urban Rapid Transit Lines
Terminal Yards
Trunk Line Railroads

FIG. 1. PASSENGER TERMINALS IN OUTSKIRTS OF METROPOLITAN AREA CONNECTED BY BELT LINE

An arrangement whereby two or more passenger terminals thus located at points comparatively remote from the business center may be inter-connected and also placed in close touch with all parts of the city by means of urban rapid transit facilities, is illustrated in the accompanying sketch (Fig. 1).

In the case of local freight terminals the advantages of having them well removed from the business center would seem far to outweigh the small advantage of a shortened haul for the motor truck. The larger portion of the expense of freight distribution lies in delays to trucks awaiting opportunities for loading and unloading at the terminals, due to restricted facilities and congested surroundings. This situation is constantly becoming worse, and is contributing in a large degree to the high cost of living in great cities. Instead of continuing the journey of the railroad car as close as possible to the business center, with the attendant high cost of property and of operation, coupled with congestion and general inefficiency, for the sole purpose of shortening the haul by motor truck, it would be better to shorten the railroad haul somewhat, lengthen the haul of the motor truck, and place the points of interchange where cheap lands abound.

In communities where the streets are broad and not overcrowded, it would be possible to continue freight distribution by means of motor trucks, but where surface congestion makes this course undesirable small car freight subways, as illustrated in the accompanying sketch (Fig. 2) should be created, in which the freight would be moved by electrically operated multiple unit trains of cars having a capacity of, say, ten tons, from the trans-shipping points on the various railroad lines, through "gridiron" sorting yards, and thence beneath the city streets to a multiplicity of points throughout the city where mechanical devices would transfer the removable car bodies from the subway vehicles to the chassis of motor trucks for short-radius surface distribution, in a manner similar to that now in vogue at the Norwood substation of the Baltimore & Ohio R.R. in Cincinnati, described in *Engineering News-Record,* March 11, 1920.

This arrangement, offering as it does all the advantages of the American type large capacity car for long hauls and of the European type of car of moderate capacity for short hauls in cramped quarters, would mean diffusion instead of concentration of freight deliveries. Thus, it would solve the market problem and enormously reduce terminal costs and delays through centralized control and the employment of labor-saving devices.

There still remain to be considered the phases of the railroad problem which have to do with the placing of cars on the side tracks of private industries and waterfront facilities at or near the business center; and also means of interchange between carriers for the kind of traffic that is destined for points beyond.

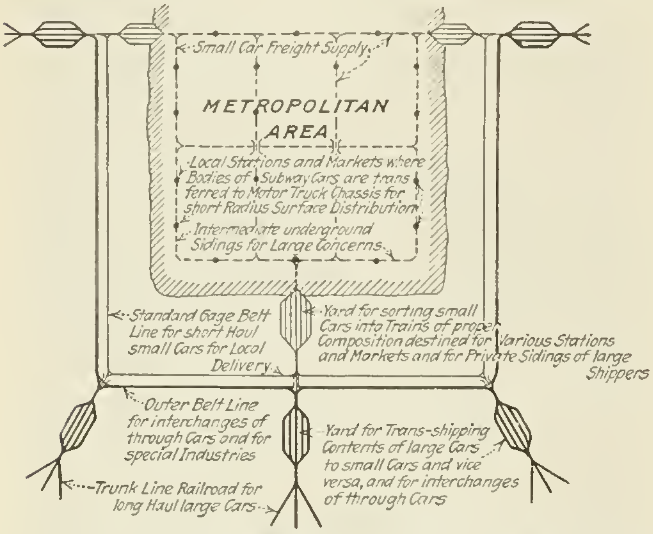

Small Car Freight Supply
METROPOLITAN AREA
Local Stations and Markets where Bodies of Subway Cars are transferred to Motor Truck Chassis for short Radius Surface Distribution
Intermediate underground Sidings for Large Concerns
Standard Gage Belt Line for short Haul small Cars for Local Delivery
Yard for sorting small Cars into Trains of proper Composition destined for Various Stations and Markets and for Private Sidings of large Shippers
Outer Belt Line for interchanges of through Cars and for special Industries
Yard for Trans-shipping Contents of large Cars to small Cars and vice versa, and for interchanges of through Cars
Trunk Line Railroad for long Haul large Cars

FIG. 2. FREIGHT TERMINALS OUTSIDE OF METROPOLITAN AREA CONNECTED BY OUTER AND INNER BELT LINES

These needs as a rule are best met by means of belt lines, an inner one for local interchange and an outer one for the bulk of the traffic that should be excluded from the congested regions of the city. The majority of the large cities of the country are already served with inner belt lines, and many of them also with outer ones. Both are highly desirable, not only from the standpoint of interchange of passenger and freight equipment, but also for the proper development of large industrial enterprises and for the unrestricted and prompt movement of military trains in time of war. The latter need was strongly proved at Paris during the World War when it became necessary to construct missing links in the outer belt line so that troop and supply trains from different directions could be thrown to the aid of the Allied armies in stemming the advance of the enemy. An example of the evil effects that flow from the lack of adequate inner belt lines and of a comprehensive outer belt line is that of Greater New York, where the absence of these facilities is a growing menace to its commercial supremacy and to its safety in time of war. In fact, the experiences of the World War demonstrated that the latter defect bore heavily, not alone on the local community, but on the nation at large, through gross delays and confusion in the embarkation of troops and supplies.

Summarizing, the railroad problem in its relation to city planning should be treated in the light of the situation as it exists in each community, due weight being given to the following considerations:

Passenger and freight terminals for serving the community should be so located, in liaison with suitable lines of urban distribution, that the business and residential sections will be given ample opportunity for healthy expansion, that congestion will be avoided on the city streets; that full opportunity will be given for the aesthetic development of the community, and that delays and costs to the public will be reduced to the minimum.

Inner belt lines should be provided for the convenient placing of cars on private sidings of industries located where labor is readily accessible, and on tracks serving the local waterfront.

Outer belt lines should be created for the speedy and economical interchange of through freight and for access to water terminals lying outside of the city proper.

It should be added that of course grade crossings, in the interest of both safety and economy, should be avoided to the fullest extent.

Large Highway Bridge Wrecked by Pressure of Cake Ice

Brattleboro Steel Span of 330 Ft. Pushed Off Supports in Flood—Low Clearance and Effect of Power Dam Involved

By George F. Eckhard

Professor of Structural Engineering, University of Vermont

HEAVY damage, involving many hundreds of thousands of dollars' loss and the destruction of a 330-ft. steel highway bridge span at Brattleboro, Vt., was caused last month by high water and ice along the Connecticut River. Along the West River, a small tributary of the Connecticut, five bridges of 60-ft. or shorter span were washed away. The damage was notably severe near Brattleboro, Vt., where one life was lost and much public and private property was destroyed. Impact and pressure of floating ice was responsible for the failure of the 330-ft. bridge. The circumstances of this accident draw attention to the relation between underclearance and safety against ice, to the strength of lateral systems and to anchor-bolt practice.

The high-water conditions existing at the time of the failure of the bridge are believed by many persons to have been aggravated by artificial obstruction to the normal stream flow of the river. At Brattleboro the Connecticut River is divided into two channels by an island; a highway from Vermont to New Hampshire which crosses there is carried over the west channel by a steel span and over the east channel by a timber bridge. About three-fourths of a mile below the city, the Boston & Maine line through Brattleboro from the north crosses the river into New Hampshire, while the Central R.R. of Vermont continues south along the west bank. Six miles below, at Vernon, Vt., the Connecticut River Power Co. has a power dam, whose influence on the water level extends beyond Brattleboro.

There is a long history of failure and rebuilding of highway bridges at the site of the one just destroyed. The earliest bridge, a timber structure built in 1804, was carried away by flood in 1820. In 1824, in 1825, and again in 1843, the span over the east channel was destroyed by high water. In 1857 the two spans then carrying the highway over the west channel were swept away. In 1862 and in 1869 the bridges over both channels were lost in the "big floods" of those years.

The recently destroyed steel span was erected over the west channel in 1903. Its length was 330 ft. between faces of abutments; the deck accommodated a 26-ft. roadway and a 6-ft. sidewalk on the downstream side. The floor construction was plank on stringers. The loss of former bridges at the same site had demonstrated the serious consequences of failure to provide sufficient clearance above high water. Therefore the new structure was built with its lower chord 5 or 6 ft. higher than that of previous bridges, and it was believed at that time that the clearance was ample to insure the safety of the bridge. In 1909 the Connecticut River Power Co. built its dam at Vernon. This dam, 32 ft. high, created a basin 16 miles long. The Boston & Maine bridge was built in 1912; it is a structure of seven spans, flanked on either bank by an approach fill, and was not injured by the flood.

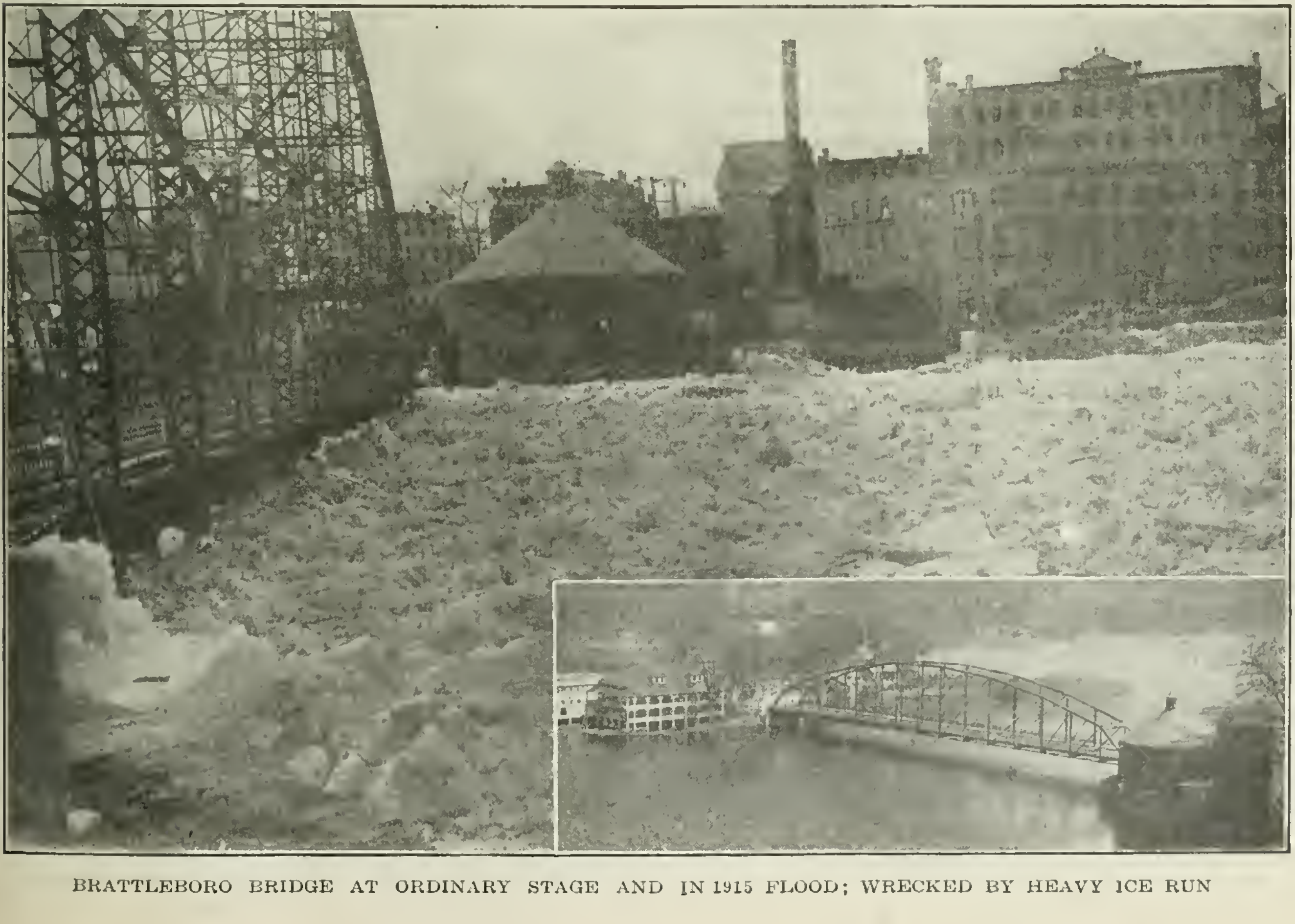
During the past winter ice formed from 1 to 3 ft. thick in the Connecticut. With the coming of mild weather, melting snow swelled the stream to flood proportions, and on Sunday, March 28, the water was only a little below the lower chord of the Brattleboro bridge. The field ice above the dam and to a point about a mile below the railroad bridge held firm, as did the ice in the east channel opposite Brattleboro. In the west channel, however, immense masses of floating ice gathered above the highway bridge and were carried along by the current, forming jams both below the railroad bridge and between the two bridges.

About 5 p.m. of March 28, the water level at the highway bridge was rising rapidly, and finally blocks of ice began pounding against the lower chord and floor system. As the hammering action and pressure of ice increased, a distinct distortion of the floor system was noted, which increased until the horizontal deflection of the lower lateral system became at least 2 ft. Since this deflection is beyond the limit of elastic deformation, it is likely that certain members of the lower lateral system gave way or tore from their fastenings. Shortly after the failure of the laterals the whole span was shoved off its bearings by the ice pressure and fell into the river, 40 ft. deep. The ultimate failure came after but did not result from the failure of the lower lateral system. Observers agree that there was no collapse nor buckling of the truss as a whole, but that it was shoved downstream as a unit and remained in nearly upright position until practically free of the abutments before finally overturning in its fall. No anchor bolts were used at the bridge seats, and in consequence no damage was done to the masonry abutments.

The loss of the highway bridge was due to no structural defect of either the steel truss or its foundations, but must be attributed wholly to inadequate clearance between the bridge and highwater elevation. The weight of steel in the bridge was about 270 tons. Had the lateral system been designed of sufficient strength and rigidity to resist the ice pressure, it is doubtful whether a correspondingly strong anchorage could have been provided.

The peak of high-water flow was reached on March 28, being 60,000 sec.ft. at the Vernon dam. In former years 80,000 to 90,000 sec.cft. has been passed with safety. The depth of water over the dam crest at the time of the failure was 8.5 ft., which is but 1½ ft. above the top of the flashboards. The rapid breaking up and release of the ice over a distance of several miles above the bridge, and the ice jams formed just below, resulted in a piling up of the ice in the constricted channel at the bridge, which produced sufficient pressure to move it from its foundations.

During the critical period of ice flow and high water, the power company alternately opened and closed the gates at the dam, hoping thereby to start the ice above



BRATTLEBORO BRIDGE AT ORDINARY STAGE AND IN 1915 FLOOD; WRECKED BY HEAVY ICE RUN the dam. Later dynamite was also used in the attempt to break up the ice, but neither method was effective.

Immediately after the destruction of the steel span the selectmen of the towns of Brattleboro, Vt., and Hindsdale, N. H., delivered to the Connecticut River Power Co., owner of the dam, a demand that it make good the loss of the bridge as well as the damage to certain roads by high water. The power company promptly declined to accede to these demands and refused to admit any liability in the matter. Whether or not either the power company or the railroad is in any measure responsible for the conditions which caused the loss of the highway bridge can be determined only by an exhaustive engineering investigation of all the contributing factors.

City Planning Conference

A RAPID fire review of city planning progress in a dozen American cities, detailed reports on the local features of city planning problems and prospects in Cincinnati, a group of papers on railroad terminals in relation to city planning, zoning and regional planning were the main topics considered at the Twelfth National Conference on City Planning held in Cincinnati April 19-22.

Both the City Planning Conference and the City Planning Institute re-elected Nelson P. Lewis, chief engineer of the Board of Estimate and Apportionment, New York City, as president and Flavel Shurtleff, Boston, Mass., as secretary.

President Lewis' Address

"Trunk Highways and City Thoroughfares" was the subject of Mr. Lewis' presidential address. He defined trunk highways as "State roads which are certain to be to some extent interurban highways, beginning, ending in, passing directly through or skirting the edges of populous districts or any 'main traveled' roads connecting more or less important centers of population." City thoroughfares were defined as "traffic arteries of an urban district, more particularly those leading into or out of the town or connecting its residential, commercial, administrative, or industrial centers." Little consideration, Mr. Lewis stated, has ever been given to the co-ordination of trunk highways and city thoroughfares, a fact that can be appreciated by all who have floundered "about in perplexity while trying to find the best exit from a city to the good road known to exist in an adjoining district or the most direct road to another town."

To illustrate this lack of co-ordination between rural and city through routes, Mr. Lewis outlined an imaginary journey of 150 miles by automobile through a number of cities and towns, pointing out how readily many obstacles to travel might be removed, often to the great benefit of the city or the rural district in question without regard to considerations of through traffic.

City Planning Problems in Cincinnati

The extent to which topography governs city planning, even through the long period that proceeds conscious systematic planning, was brought out in papers on "Cincinnati's Rapid Transit System and the City Plan," by Frank L. Raschig, principal assistant engineer, Cincinnati Rapid Transit Commission, and on "Cincinnati's Highway System and the City Plan," by H. S. Shipley, principal assistant engineer, in charge of highways, City Engineer's office, Cincinnati. Mr. Raschig outlined the rapid transit system under construction for Cincinnati. He closed with a paragraph of general application to the city transit problem, as follows:

"With rapid transit, the whole pulse and life blood of the city will be quickened; social intercourse will be easier, for distances will be partially annihilated. The working man can live in the suburbs and work in the city and will not be exhausted by a long ride; the city will grow and spread out and the whole tendency will be toward a city more convenient and useful to everybody."

Mr. Shipley stated that Cincinnati was laid out in 1788 by Israel Ludlow on a plan modeled after that of the city of Philadelphia, with streets 66 ft. wide, at right angles to each other, on two terraces or plateaus, one of which was the wide flood plain adjoining the river and the other a somewhat higher level. These two plateaus had an area of about 4 sq.mi. as compared with the present 70 sq.mi. now within the city limits. This area soon became congested and since then the city has expanded, following the valleys of streams tributary to the Ohio. In this way a fairly good system of radial thoroughfares came into existence piecemeal, along the lines of least resistance. These can and should be improved to meet modern ideas of city planing. There is even more need for circumferential thoroughfares.

In concluding his paper, Mr. Shipley suggested that the only way of carrying out the necessary improvements to the street plan of Cincinnati, in view of the financial condition of the city, seems to be "the adoption of a benefit assessment plan, by which the districts receiving the direct benefits of improvements would pay a considerable part of their cost."

The Railroad Terminal Problem

The report of the Railroad Terminal Committee of the Conference was submitted by Nelson P. Lewis, chairman of the committee, accompanied by a statement of general principles of "Railroad Terminals and their Relations to the City Plan" by Charles H. Cheney, consultant in city planning, San Francisco, and J. P. Newell, of Portland, Ore., and also by a paper on city railroad terminal planning by W. J. Wilgus, New York City. Mr. Wilgus' paper is printed in p. 901 of this issue. Messrs. Cheney and Newell urged unified control and operation of all railroad lines within the limits of the city as essential to the requirements of modern business and public convenience, as well as economy in capital outlay and operating expenses. With unified control, municipal ownership of intra-city lines is probably not necessary. Industrial districts or zones should be planned with relation to railroad facilities. There should be co-ordination of water and railway transportation facilities and the relation of the steam and street railway systems should also be co-ordinated. The authors also suggested full co-operation between cities and railroads "in planting and improving the appearance of the borders of rights of way, yards, bridges, viaducts, stations and terminals within the city limits. Such co-operation would do away with much of the damage to adjacent property values and rentals due to railway property."

A paper scheduled on the program as "The Urban Auto Problem," by E. P. Goodrich, consulting engineer, New York City, contained not only various suggestions for solutions for this problem, particularly in the business districts, but also a lengthy historical review of good regulation of traffic on city streets.

Embankment and Concrete Work for Large Oil Reservoirs

Great Care in Handling Material Secures Smooth Hard Surfaces—Fills Are Compacted 15 Per Cent—No Joints in Concrete Paving

IN THE yards at El Segundo, Cal., where the pipe lines of the Standard Oil Co. terminate, there are now five oil storage reservoirs excavated in natural depressions and lined with concrete. The first three were laid out for a capacity of 500,000 bbl. and the two added later have a capacity of 1,000,000 bbl. each. The first four were circular and the fifth, which has just been completed, is oval in plan. The latter has a total of 326,000 sq.ft. of paved area, as against 310,000 sq.ft. in the circular reservoir. The circular reservoirs are about 500 ft. in diameter.

The soil conditions are well adapted to construction of this sort; it is possible to work the material in such way that extremely solid embankments are secured. The earth is compacted so firmly that, according to the contractors, "a spike is driven in it with a hand axe only with difficulty and it is impossible to drive stakes in the usual way." In a basin carefully finished to exact grade with such a firm surface as this it is only necessary to place a thin sheet of concrete for it serves the sole purpose of making the basin oil tight. Despite the thin paving laid without expansion joints, no cracking or leakage has been reported. The slight variation of temperature is obviously a favorable factor.

The knoll on which the reservoirs are located is only a few hundred feet from the ocean beach. The soil is a sandy loam with occasional banks of clean drifted sand. The desired finish cannot be secured with sand unless it contains a certain amount of clay or loam. Sometimes soils with little or no sand content are added to a sandy spot to improve the binding qualities, for as much as 30,000 cu.yd. of sand has been excavated in one cut and wasted because it could not be used to advantage. This did not upset calculations, however. It has been possible to determine so closely the nature and quantity of materials to be moved that cut and fill are made to balance within 500 cu.yd. on a 50,000-cu.yd. job.

This is the more remarkable because the excavated material is compacted into 15 per cent less space than it originally occupied and exactly this much shrinkage is figured when balancing cut and fill. On the sides the excavation is carried 6 ft. back of the slope on which paving is to be laid so that a very compact fill of this width can be made there. In other words, material is excavated in order that it may be put back and compacted into 15 per cent less space than it occupied before. A large factor in the contractors' success is in laying out a program for handling this material such that there will be the shortest average haul and a minimum of interference between teams. Endeavor is made to keep the teams moving over a figure-eight route.

The established custom is to begin the excavation by making a narrow cut to final depth around the outer edge, leaving only four inclines at quarter points on the circumference over which teams have access to the center. The four quadrants, called "swings" are worked as units, usually two at a time. By keeping two swings under way simultaneously the scrapers can put in a 6-in. layer of material and then move over to the other swing while a "Petrolithic" roller compacts the layer just placed.

Nine scrapers is about the economical limit to work on a swing at one time without interference. Ordinarily such a crew will place the material in layers at the rate of 35 cu.yd. per hour. Recent contracts have therefore specified that the Petrolithic roller, when kept moving constantly, shall not be permitted to finish compacting material at a rate faster than 35 cu.yd. per hour. This affords a convenient balance of one roller for each nine-team scraper crew. Only wheel scrapers are permitted and their routes of travel are arranged so that movement of material from one point to another is always via the strip being compacted in one of the swings.

Before any excavation is begun a road grader cleans off all earth down to the grass roots and this material is wasted. Plows then loosen the material for the scrapers layer by layer until the subgrade is reached. The floor is plowed to a depth of about 1 ft. below fin-

LAYING PAVEMENT ON FLOOR OF THE MILLION-BARREL OIL STORAGE RESERVOIR AT EL SEGUNDO ished grade and after a road grader has leveled it off to as uniform a grade as possible, a 5-ton steam roller goes over it. After this a 20-ft. plank with a team on each end, the drivers standing on the plank, is dragged across the floor until the desired uniformity is secured, and, finally, the road roller goes over it once more.

CONCRETE FINISHING CREW SCREEDING SLOPES

The secret of success in all this endeavor to get compact material on slopes and floor is the way in which water is applied. In order to get a uniform distribution of water for binding purposes, the material is all well sprinkled before it is excavated. This increases the weight of material to be handled, of course, but permits of larger scraper loads because the material clings together better. Sprinkling is continued judiciously during rolling and dragging. Inspectors have strict instructions on this point and if an excess of water causing a sogginess occurs the section affected is removed and refilled. The floor has a slight slope toward a depression near one side into which inlet and outlet pipes are led through the embankment. This is called the swing pit.

In the 6-ft. width of fill compacted on the embankments (which are made on a 2 to 1 slope) an excess of about 14 in. in width is allowed in placing the material. This makes it unnecessary for the roller to work so close to the edge as to cause sloughing. When the embankment has reached full height this 14-in. excess is trimmed off and finished to the prescribed surface by hand. In this process screeds are first set in the slope, 12 ft. apart, running up and down the slope, and grades for top and bottom are given by transit. Thus when the slope has been trimmed so the screed board can be worked from top to bottom on the screeds, much as a template works on header boards, the surface is as true to grade as the 12-ft. screed-board can gage it. Because of the hardness of the compacted material, this trimming has to be done with a heavy short-handled hoe or a mattock which literally cuts away the surface.

To reduce the amount of hand work required, as material accumulates below the screed board, a buck scraper is used to drag it down to the reservoir floor where it can be removed by wheel scrapers. The four runways are cleared to slope one at a time by hand, the material trimmed down from the last one being piled on the floor for removal with that taken from roof post footings which are not dug until after the floor is brought to final grade. The footing excavation requires a good deal of hand work, as much as 136 cu.yd. being taken from post footings in the larger reservoirs. An excavation 4 ft. wide and 4 in. deep in the floor around the entire circumference is also made by pick and shovel methods to provide a footing for the slope paving.

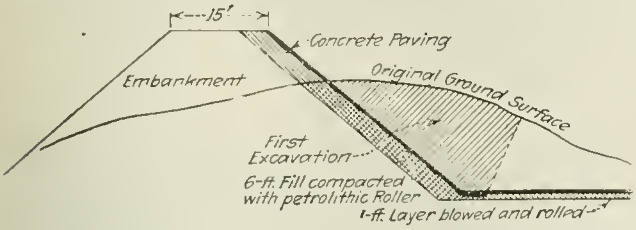
The concrete mixing plant containing two mixers is set on the inner edge of the embankment top under the boom of a derrick that delivers sand and crushed rock from gondola cars direct to bunkers. The mixers are not moved from this point for the entire job which, on a 1,000,000-bbl. reservoir, requires the paving of 6½ acres. Except for the amount of water, the same mix is used for slopes and floor, the proportions being 1:2:4, the rock consisting of ¾-in. and 1-in. sizes in equal proportions. The pavement is 4 in. thick in the floor and on the slopes ranges from 3½ in. at the bottom to 2½ in. at the top. The very accurate finish on the embankment and the careful operation of screed boards makes it possible to work very close to the prescribed thickness. For the floor, concrete from the mixer spout runs down the slope in a chute which delivers to buggies on the floor. For the slope the mixer spout delivers to cars on a track entirely encircling the reservoir on top of the embankment. They are taken by hand to the point where the slope is being paved. The top of the embankment is not paved.

The reinforcing consists of 6 x 6-in. mesh of No. 6 wire. On the slopes it is laid circumferentially. Reinforcing is laid over the entire area at once, lapped one mesh at joints and tied, and as the concrete is being poured, it is pulled up to position in the paving by means of a hook. On the floor, concreting begins at the swing pit and the entire bottom is poured without joints. Header boards are placed 12 ft. apart and the 12-ft. strips are poured alternately and given a trowel finish. Working a crew of ten men on buggies (for the average floor delivery) and eight men spreading and finishing on the floor, together with two men on Koppel cars serving the slope and five men receiving and finishing on the slope, it has been possible to average more than 120 cu.yd. of concrete per eight hours. The yardage placed on the slope was only a small part of the total. On exceptionally good days 180 cu.yd. were placed all told, and an average of 160 cu.yd. was maintained on one occasion for five consecutive days.

Entirely separate crews are worked on the slopes because a stiffer mix and different methods are required here to handle the concrete to advantage. Screeds similar to those used in trimming are first placed 12 ft. apart on top of the reinforcing and hoes or square nosed shovels are used for spreading the concrete. This crew works from the top down and is followed by two screed board men who work from the bottom up. If concrete accumulates above the screed board the shovelmen from a strip nearby help by shoveling the surplus further up the slope. After a little practice the shovelmen gage their work very accurately and seldom have to come back to help the screed board crew. As on the floor, the slope strips are placed alternately.

The mix is somewhat too stiff for the screed board to leave a very smooth finish, so 1:2 grout is dumped on the screeded slopes and spread with a trowel. Chutes are sometimes used on the slopes.

The reservoirs are covered with a prepared asbestos roofing supported on a wood frame. The roof supports are single 6 x 6 posts about 25 ft. long. After the roof is on, the entire concrete paving is given a brush coat of sand and cement.


15'
Concrete Paving
Original Ground Surface
Embankment
First Excavation
6-ft. Fill compacted with petrolithic Roller
1-ft. Layer blowed and rolled

CROSS-SECTION SHOWING ORIGINAL GROUND SURFACE

Contract prices for the construction of these reservoirs in 1919, when common labor cost $4 per eight hours, were as follows:

For excavating material and delivering it to fill or spoil bank, 75 cents per cu.yd. For compacting fill, 15 cents per cu.yd. Hand trimming side slopes, 3½ cents per sq.ft. Grading floor, ½-cent per sq.ft. Digging footings in finished floor surface and removing material from reservoir, $5 per cu.yd. Reinforced concrete paving, $16 per cu.yd. (It is notable that on the entire 6½ acres only 4,000 cu.yd. were required.) The cost of carpenter work on the roof, which contains about 806,000 board ft. on the larger reservoir, is estimated at about $14 per thousand ft. of lumber, although this work was not let by contract.

Bent Brothers of Los Angeles have carried out the general contracts on all five of these reservoirs.

Paper-Wrapped Garbage Makes Trouble

ATTEMPTS to dispose of paper-wrapped garbage at Minneapolis, Minn., by feeding to hogs have given so much trouble that the contractor has been forced to change the site of his hog-feeding ranch. For years past the garbage of Minneapolis has been burned. The local health department had taken great pains to educate the people to wrap their garbage in paper before putting it in the collection can, this having been urged by the department on the grounds of sanitation. When the contract was let for feeding the garbage to hogs it was considered undesirable to tell the people to stop wrapping the garbage in paper and it was supposed that the garbage could be handled at the hog-feeding ranch without serious trouble even if it were wrapped in paper. The feeding company has estimated that half the weight of the material it receives is paper. It has found it difficult to dispose of the paper by any means attempted. When the paper has been burned in the open air it has created a smoke that has settled over large areas of the surrounding country and given rise to many complaints from the inhabitants. Suits brought against the feeding company on account of the nuisance incident to its plant have led the company to agree to discontinue the feeding of garbage at this place on May 1 of this year. The contract will still have nine or ten months to run and the company is looking for a new site. It is reported that the company will not attempt to secure a renewal of the contract at its expiration. The contract is held by the Reservoir Heights Stock Ranch Co. which pays $1.26 a ton for the city's garbage.

Salary Increases of Engineers in Iowa

AN investigation of salaries paid engineers in Iowa in 1915 and 1919 in State, county and city service was made recently and reported to the Iowa Engineering Society by the committee on professional practices. The conclusions were to the effect that the salaries in 1915 were too low, that they had not been increased in proportion to the increased cost of living and that they should be increased to at least 50 per cent above *what they should have been in 1915.* (Italics editor's.) Letters were sent to 170 engineers with the following results:

Teaching Staffs	Average Salary 1915	Average Salary 1919	Percentage of Increase
Deans and directors	$4,900	$5,150	5 1
14 Professors	2,900	3,726	28 44
18 Associate professors	1,955	2,546	30 23
14 Assistant professors	1,585	2,025	27 76
23 Instructors	1,194	1,628	37 20
Highway Commission			
Chief engineer	$3.600	$5,000	38 89
Road designers	1,500	2,100	40 00
Road draftsmen	1,380	1,600	16 00
Resident engineer	1,600	2,100	21 25
Bridge engineer—head of department	2,300	3,600	56 52
Assistant bridge engineer — preparation of plans	$2,200	$3,200	45 45
Bridge designer	1,600	2,400	50.00
Bridge draftsman	1,380	1,700	23 19
Drainage engineer	1,800	2,500	38 89
District engineer	2,000	3,000	50 00

The position of road engineer at $2,700 in 1915 was discontinued in 1919, and the positions of engineer of road management, engineer of road maintenance, engineer of road design and engineer of road construction were created at $3,375.

County Engineers	Average Salary 1915	Average Salary 1919	Percentage of Increase
72 County engineers	$1,633	$2,165	32.59
48 Assistant county engineers	1,156	1,610	39, 36
9 Second assistant county engineers	965	1,520	57.51
7 Drainage engineers	1,747	2,322	32.96
2 Assistant drainage engineers	1,380	1,716	24 35
32 Helpers, rodmen and chainmen	757	1,142	50.77
Municipal Engineers in Cities of First Class			
11 City engineers	$1,845	$2,058	11.52
9 Assistant city engineers	1,370	1,706	24.51
6 Second assistant city engineers	1,180	1,561	32.33
5 Draftsmen and office clerks	1,099	1,378	25.33
11 Rodmen	791	1,066	34.71
Municipal Engineers in Cities of Second Class			
8 City engineers	$1,485	$1,890	27 33
5 Assistant engineers	1,174	1,801	53 42
6 Rodmen	783	1,151	47 00

The high percentage of increase for assistant city engineers is due to one city reporting a man hired by the day and the salary computed yearly on that basis.

Brittleness in Sheet Lead

Cases of brittleness in sheet lead have recently been studied by the Bureau of Standards. Effects of corrosion sometimes transform sheet lead into a brittle, granular condition, which has often been supposed to be chargeable to allotropic transformation resulting in something analogous to the well-known "gray tin." Metallographic examination of such brittle lead by Henry S. Rawdon now has shown that the individual grains of the brittle lead are the same as those of ordinary lead, but the inter-crystalline cohesion of the grains is abnormally low. Corroding agents attack the impurities in the metal, which lodge chiefly between the grains, and possibly also attack the presumptive "inter-crystalline cement." Specimens of exceptionally pure lead (99.993 per cent) immersed for 24 days in a neutral solution of lead acetate became appreciably embrittled by the formation of minute intercrystalline fissures. No evidence was found that there is an allotropic form of lead or anything similar to "gray tin."

First Year's Operation of Washington's Municipal Garbage Reduction Works

Contractor's Plant Purchased at Low Figure—Book Profit, $26,600, General Overhead Excluded—53,258 Tons of Garbage Yielded 3,380 Tons of Tankage and 1,027 Tons of Grease Valued Together at $227,000

By F. C. Bamman
Consulting Engineer, Washington, D. C.

CONSIDERED purely as a commercial enterprise, Washington's garbage reduction works would pay but little income tax at the close of its first year under municipal control. Revenues exceeded expenses, it is true, and with most methods of municipal accounting a small profit would be shown. But when, to the items the municipality regards as expenses, are added those other unavoidable items a private company *knows* to be expenses, at least the major part of the "profit" moves to the wrong side of the ledger.

GENERAL VIEW OF WASHINGTON GARBAGE WORKS

The relatively poor showing of the Washington plant is not necessarily a reflection of the ability of the municipal officials charged with its operation. The plant had admittedly reached its economic life some years ago. The private company owning it to July 1, 1918, naturally permitted it to run down during the closing months of the contract, and the spirit of labor unrest, high labor costs, the usual legislative "red tape" limitations, the big decrease in by-product prices, etc., all conspired to bring about a condition detrimental to efficient management. The most important factors would have likewise existed to curtail profits had private operation con-

Prior to July 1, 1918, both collection and disposal of Washington's garbage was done under a single contract. Collections were made by horse-drawn vehicles carrying a metal tankbody of about 2½ cu.yd. capacity. The filled tanks were removed from the running gear at a transfer station within the city limits and placed on rack cars for rail transportation to the disposal plant about 30 miles down the Potomac River, in Virginia.

After repeated advertisements for bids to carry on the work by contract, the entire plant and equipment of the contractor, the Washington Fertilizer Co., was purchased by the District of Columbia. This purchase included the horses, vehicles, tank cars, equipment and lease of transfer station, etc., as well as the reduction works. The price paid was $85,000, said to be less than an official survey gave as the junk or forced sale value of the various items turned over.

The District, upon taking over the work, continued collection along the general lines laid down by the contractor. The same system of tank wagons was generally continued, but motorized equipment was placed in service for making collections from hotels, restaurants and other large garbage production centers in the downtown districts.

The transfer station was retained, both because of its excellent location from a haul standpoint and to avoid the unenviable difficulty with adjacent residents and property holders which could be expected with the introduction of such a station in a new location. While the general plan of operation was retained, the entire transfer station property was overhauled and improved. Sanitary conditions in and about the station are certainly far better than when the work was done by contract.

The reduction works turned over by the company was built about 20 years ago and has been used continuously for disposal of Washington's garbage. The process employed is cooking by steam in sealed digestors, pressing by internal steam pressure and then in hydraulic rack presses; the drying of the pressed cake in a direct heat dryer and the leading of the liquids extracted by pressing through settling and grease skimming basins. Extraction of grease by application of a solvent is not attempted nor is any equipment included to recover the solids contained in the liquids resulting from the pressing process. The plant location is isolated and condensation of vapors has not been necessary. Digestors are vented directly into the atmosphere and dryer fumes undergo no treatment to relieve them of odors.

The general appearance of the works is shown by the accompanying view. It leaves much to be desired from the standpoint of sightliness, while its wooden floors and general physical character do not admit of a high sanitary condition. The main or digestor building contains 24 Chamberlain digestors, 8 hydraulic rack presses, unloading apparatus, skimming basins, etc. The dryer house, with its single direct heat dryer, is located about 100 ft. away and the pressed cake is conveyed from the presses by a belt conveyor. The power plant, totaling 450 hp. in six boilers is between the two in a lean-to to the main building.

TABLE 1. SUMMARY OF EXPENDITURES WASHINGTON GARBAGE REDUCTION PLANT, YEAR ENDED JUNE 30, 1919*

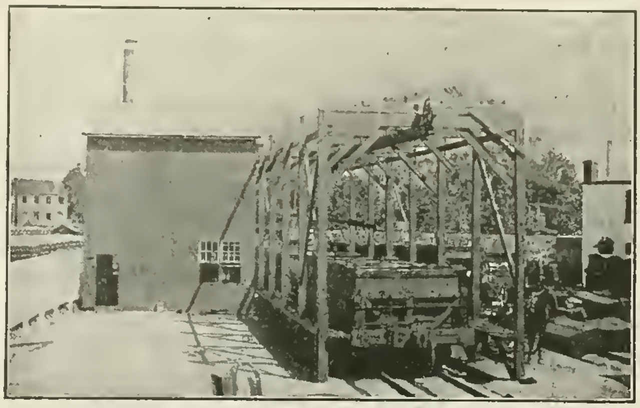
	From Annual Report of D. C. Supervisor	According to Writer's Investigation
Capital investment	$63,303 41	$73,446
Operation costs, other than labor	$118,757 05	$90,345
Labor, direct operation	85,069 51	85,844
Supervision, plant overhead, etc.	6,200 04	8,787
Total expenditures	$210,026.60	$184,976
Fixed charges		15,424
Total expenditures and fixed charges	....	$200,400
Revenue, grease and tankage	$230,288.97	227,000
Profit, excluding fixed charges	20,262 37	42,033
Profit, including fixed charges		26,600

* See text for items of expense not included

TABLE II. OPERATION ACCOUNT WASHINGTON GARBAGE REDUCTION PLANT, 1918–19*

Capital Investment:				
Purchase price, entire plant and equipment			$85,000	
Less inventory, collection equipment			35,110	
Net cost reduction plant				$49,890
Plant betterments: Miscellaneous equipment			10,617	
Small tools			1,040	
Conveyors, etc			1,400	
Lumber, etc			2,000	
Railroad siding			1,000	
Pipe lines and fittings			1,154	
Labor for installation			6,345	
Total betterments				23,556
Total investment				$73,446
Operation:				
Supplies and repair parts:				
Repair parts		$4,366		
Miscellaneous hardware		2,584		
Miscellaneous supplies		2,959		
Forage		374		
Belting, cable, etc		1,064		
Lumber, and mill work		889		
Press cloth and burlap		6,984		
Press racks		4,105		
Freight and expressage on supplies, etc		1,308		
Total supplies and repair parts			$24,633	
Coal Account:				
5,662 tons coal, including freight			28,386	
Freight, etc., on garbage:				
Freight, rack cars	$21,195			
Gondolas	4,890			
	$26,085			
Mileage rebate	498			
Net freight		25,587		
Rental of gondolas		7,137		
Repairs to rack cars		2,417		
Repairs to railroad siding		950		
Total garbage transportation			36,091	
Miscellaneous Account:				
Chemical analyses		$407		
Miscellaneous expenses		828		
			1,235	
Total direct cost other than labor				90,345
Labor costs:				
Power plant and repair shop		8,663		
Repairing press cloths		489		
Repairing press racks		743		
General repairs		341		
Unloading coal		4,143		
Handling ashes		461		
Boiler repairs		182		
Total for power plant and repairs			15,022	
Unloading and conveying raw garbage			14,213	
Cooking and pressing		31,609		
Dryer house and drying		11,873		
Grease skimming and storage		1,593		
Total for digesting, pressing and drying			45,075	
Bull gang, miscellaneous labor, etc			2,283	
Total direct labor cost			76,593	
Bonus pay, Act of Congress			9,251	
Actual labor cost				85,844
Total direct labor, supplies, and repairs				$176,189
Plant Overhead:				
Superintendent		2,500		
Assistant superintendent		2,100		
Chief engineer		1,600		
Timekeeper and clerk		1,544		
Overhead labor			7,744	
Bonus pay, Act of Congress, $120 each			480	
Rents		460		
Taxes		103		
Miscellaneous overhead			563	
Total plant and overhead				8,787
Total direct expenditures, reduction plant				$184,976
Fixed charges:				
6% interest on investment, $73,446			4,407	
Depreciation, 15% of investment			11,017	
Total fixed charges				15,424
Total: Operation and fixed charges				$200,400
Revenue:				
Sale of 2,057,584 lb. grease				185,437
Sale of 3,380 tons tankage			41,572	
				227,009
Profit				$26,609

* See text for items of expense not included



WASHINGTON GARBAGE TRANSFER STATION

From a contractor's viewpoint, the plant was far from a bad one. Odors incidental to the process were not seriously objected to and practically the only people affected were those connected with the plant in some capacity. The cost of operation was comparatively low, colored labor being generally used and their pre-war wage scale averaging around $1.50 per day. The Washington grease yield has always been high and, being composed only of pressed grease, it found a readier sale than that produced by both pressing and percolation, if not commanding a premium. The Washington Fertilizer Co., in fact, claimed that the advantages of producing a purely pressed grease more than offset the value of the additional grease which could be recovered upon extracting with a solvent.

From a municipal standpoint the plant is far from satisfactory and although many improvements have been made it is still regarded by district officials as only a temporary expedient at best. Changes made by the municipality include improvement in methods of unloading, installation of new digestors, relocation of railway siding, etc. Further improvements are contemplated and in progress, but these are all intended only to tide over until a permanent method of disposal is decided upon. Whether this will be another reduction plant, disposal by feeding, or some other methods of utilization, District officials will not venture an opinion.

The cost data submitted herewith do not include any items incidental to collection or loading on cars; they deal only with the reduction plant and transportation to it. The cost data are not comparable with the prior contract cost, which covered both collection and disposal, nor are they always directly comparable with published figures for other municipal plants.

Table 1 gives a summary of the writer's investigation as compared with the statement given in the annual

TABLE III. ORGANIZATION SCHEDULE, WASHINGTON GARBAGE REDUCTION PLANT

Supervisory and clerical.	
1 Superintendent	$2,500 year
1 Assistant	2,100 year
1 Timekeeper and clerk	5.65
2 Watchmen	3.41
Power-plant and repair shop:	
1 Chief engineer	$1,600 year
3 Engineers	4.61
3 Firemen	4.61
3 Laborers	3.00 to $3.41
2 Skilled laborers	3.97
1 Seamstress	2.93
Unloading section, raw garbage:	
1 Engineer	$4.61
2 Skilled laborers	3.97
2 Dumpmen	3.01
Cooking and pressing section:	
3 Cookers	4.61
9 Pressmen	4.29
20 Skilled laborers	3.97
Drying section	
1 Foreman-fireman	$4.29
4 Skilled laborers	3.97
Grease recovery section:	
1 Greaseman	4.61
Miscellaneous section	
1 Foreman	$4.37
1 Skilled laborer	3.97
6 Laborer	$3.01 to $3.41

report of the supervisor of city refuse. It will be noted that the two accounts do not check closely. The writer, in undertaking his investigation, assumed as part of the capital investment such outlays made by the District during the year as it would have made before beginning to operate the plant had time and opportunity offered. Improvement and operation were conducted simultaneously, the contractor treating the garbage delivered June 30, 1918, and the District operation beginning the following day. The official statement assumes as capital investment only the initial cost of certain large items of equipment and does not add the expenses incidental to the installation of such equipment, nor other items which the writer regards as plant betterment rather than repair items.

The difference in the two statements for the item of operation other than labor is partly accounted for by the items transferred to investment, but is also caused by the official statement disregarding the inventory value of supplies and materials on hand at the expiration of the year.

The labor items, while seemingly about the same in each statement, vary approximately $10,000, but this about equals the equipment installation costs transferred in the writer's statement to investment. This $10,000 difference is due to the omission in the official statement of certain items of bonus pay. These bonus amounts were not part of the regular appropriations under which the plant operated and did not come under the control of the supervisor. They are nevertheless costs and a proper charge against the plant.

The difference in the amounts shown as revenue is largely due to the writer's investigation having been made later than the official statement, when certain shipments of by-products were figured at assumed values pending settlement. The profit indicated in the two statements varies more than 100 per cent, but this difference has already been explained. It is rather significant that the writer's investigation indicates the greater profit and that, because of the small investment for a plant of this type, the fixed charges assumed are not sufficient to equal this difference.

TABLE IV. TANKAGE CONTRACTS, WASHINGTON GARBAGE REDUCTION PLANT, 1918–19*

Contract effective July-December.	
NH_3@$5.62; P_2O_5@10c.; K_2O@$1	f.o.b. plant
Total sold; 61 cars or 1,637.82 tons	$30,001.92
Contract effective January:	
NH_3@$2.75; P_2O_5@10c.; K_2O@60c.	f.o.b. plant
Total sold; 11 cars or 322.72 tons	$3,319.07
Contract effective February-March:	
NH_3@$2.35. P_2O_5@10c.; K_2O@ nothing.	Less freight
Total sold; 21 cars or 631.16 tons	$3,630.94
Contract effective April-June:	
NH_3@$2.25; P_2O_5@10c.; K_2O@ nothing	Less freight
Total sold; 29 cars or 787.95 tons	$4,619 63
Total for year; 122 cars or 3,379.65 tons	$41,571.56

* Prices given are per ton of tankage for each single per cent of the respective items. Thus, with a tankage analysis showing NH_3, say 3.0, P_2O_5 at 10.0, and K_2O at 0.5 and with a contract at say $3, 10c and 50c., respectively, the value of one ton of tankage would be

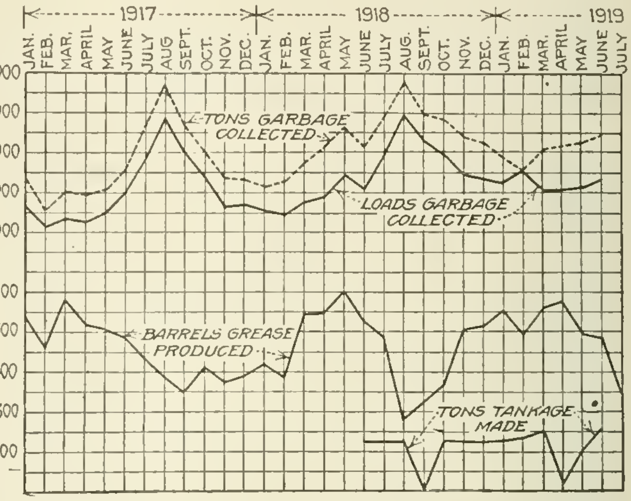
NH_3, 3×$3	$9 00
P_2O_5, 10×10c.	1 00
K_2O, 0.5×50c	25
Value of one ton tankage	$10 25

TABLE V. GREASE CONTRACTS, WASHINGTON GARBAGE REDUCTION PLANT, 1918–19 *

Contract effective July-December.	
13$\frac{5}{8}$c. per lb	f.o.b. plant
Amount sold; 2,429 bbl. or 906.690 lb. net	$121,887.88
Average weight per bbl., 373.3 lb.; moisture, 1.62%, insoluble, 0.48%; unsaponifiable, 2.23%.	
Contract effective January:	
7.03c. per lb	f.o.b. plant
Amount sold; 416 bbl. or 156,300 lb. net	$10,881.55
Average weight per bbl., 369 lb.; moisture, 1 56%; insoluble, 0.26%; unsapooifiable, 2.19%.	
Contract effective February-March:	
5.28c. per lb	f.o.b. plant
Amount sold; 1.209 bbl. or 452,739 lb. net	$23,706 79
Contract effective April-May:	
5.02c. per lb	f.o.b. plant
Amount sold; 1,066 bbl. or 397,513 lb. net	$19,678 42
Contract effective June:	
6 55c. per lb	f.o.b. plant
Amount sold; 386 bbl. or 144,342 lb. net	$9,282 80
Total for year; 5,506 bbl. or 2,057,584 lb. net	$185,437 44

* Under each contract 3% M.I.U. (moisture, impurities, unsaponifiable) was allowed

The profit indicated under either of the two accounts is in reality a paper rather than an actual profit. No interest on working capital has been included; insurance in any form is prohibited by law; no taxes are paid. Because of statute limitations, appropriation rulings, etc., none of the general office expenses properly chargeable to operation are included. No pro rata charge has been made for the time of the supervisor, although he has unquestionably spent a considerable portion of his time on garbage disposal matters. The salaries and considerable expenses incidental to selling by-products and keeping accounts are not included. Neither are such items as postage and stationery, telephone and telegraph, the pro rata share of the purchasing department chargeable to reduction, or the similar amount chargeable because of auditors' expenses, the rental charge for office space occupied in the Municipal Building at Washington, the pro rata share of the salaries and office expense of District officials superior to the supervisor of city refuse, and so on. These items, while all but impossible to determine in this particular case, would have a considerable bearing on the operation of this plant as a purely commercial enterprise.



GARBAGE COLLECTED, GREASE AND TANKAGE PRODUCED AT WASHINGTON, JANUARY 1, 1917, TO JUNE 30, 1919

Table 2 gives in considerable detail the items making up Table 1. In the case of supplies, repair parts, coal, etc., the amounts given are actual purchases less material on hand at the close of the year. The fixed charges show depreciation to have been assumed at 15 per cent. This is seemingly high but the general condition of the plant, and its low initial value, make this rate desirable and necessary.

Tables 4 and 5 indicate a condition common to a number of garbage reduction plants at the beginning of the year. During the war garbage grease prices had reached unheard of heights; its value lay in the need of glycerine, of which normal garbage grease carries 10 per cent. Most grease contracts expired on Dec. 31 and, the armistice having been signed and the need for glycerine explosives no longer existing, the new year found a number of plants without contracts, or else under agreement to sell their product at practically the buyers' offer. In the case of the District plant, the return was cut to all but half.

Tankage contracts were affected in the same way by the release from munition purposes of nitrogen carriers all but non-existent as fertilizers during the war period. Almost no market was to be found.

The sharp decrease in the prices of by-products materially affected the success of the distrct and every other reduction plant. With income suddenly decreased there was no corresponding tendency on the part of labor costs or operation expenses. They, if anything, showed increases.

Fortunately, better prices are now prevailing. Table 4 shows the district's low tankage value to be in the April-June contract. The price now being received is NH_3, $3.85; P_2O_5, 10c.; K_2O, nothing. For grease, the April-May contract marks the low point. June is over 1½c. better and the present price is 9.77c. per pound.

The record of garbage collection (Table 6, also see diagram) is particularly interesting in that, unlike most cities, Washington's garbage production increased during the war period. This increase is easily accounted for by the increased population engaged in war activities. The record also shows that 1919 production exceeded that of 1918. This same condition can be noted of garbage production in most other cities. Once the patriotic appeal for food saving ended, high prices failed to hold down wastage. Pre-war production has not been reached and will not be until prices drop, but the downward curve of per capita production reaches a level and slowly climbs toward its old high level.

TABLE VI. TONS GARBAGE COLLECTED AT WASHINGTON
from 1915 to 1919 inclusive

Month	1915	1916	1917	1918	1919
January	3,745	3,743	3,319	3,108	3,853
February	3,283	3,427	2,574	3,291	3,557
March	3,548	3,565	3,054	3,579	4,085
April	3,829	3,835	2,935	4,149	4,151
May	3,969	4,313	3,038	4,606	4,227
June	4,002	3,927	3,592	4,135	4,419
July	5,266	5,314	4,633	4,869	....
August	8,341	5,850	5,692	5,732	....
September	5,330	4,419	4,633	4,957	....
October	4,607	3,928	4,087	4,823	....
November	3,930	3,292	3,349	4,334	....
December	3,846	3,368	3,401	4,251	....
Total	51,718	49,031	44,307	52,014	.....
Total for year ending June 30		52,202	44,683	48,843	53,258

TABLE VII. SUMMARY, GREASE AND TANKAGE ANALYSES, WASHINGTON GARBAGE, 1918-19
(In percentages of weight of garbage)

Grease

		Moisture		Insoluble		Unsaponifiable		Available Fat	
Month	Number of Analyses	Monthly Average	Cumulative Average	Monthly Average	Cumulative Average	Monthly Average	Cumulative Average	Monthly Average	Cumulative Average
July	3	2.43	2 43	0 53	0 53	2 27	2 27	94.77	94 77
August	2	1.41	1.92	0.48	0 51	2 58	2.42	95 53	95.15
September	2	1.63	1 82	0 54	0.52	2 30	2.38	95.53	95 28
October	2	1 98	1 86	0 55	0 53	2 30	2.36	95.17	95 25
November	3	1.02	1 69	0 43	0 51	1.99	2.29	96.56	95 31
December	3	1.31	1.63	0 39	0 49	2 12	2 23	96.18	95.65
January	4	1.41	1 60	0,26	0 45	2.21	2.25	96.12	95 70
February	3	1.26	1.56	0.32	0.44	2 16	2.24	96.26	95 76
March	4	1.50	1.55	0.32	0.42	2.23	2 24	95.95	95.79
April	3	1.38	1.53	0.43	0.43	2.43	2.26	95 76	95.78
May	3	1.68	1.46	0.35	0.42	2.43	2.27	95.54	95.85
June	3	2.35	1 53	0.83	0.45	2.55	2.30	94.27	95.72

Yearly Average, M.I.U. (Moisture, Impurities, Unsaponifiable), 4.28 per cent.

Tankage

		Ammonia		Bone Phosphate		Potash	
Month	No.	Per Analysis	Cumulative Average	Per Analysis	Cumulative Average	Per Analysis	Cumulative Average
July	1	3 06	3 6	12 45	12 45	0.60	0.60
August	2	2 80	2 93	10.53	11 49	0 36	0.48
September	3	2 93	2 93	11.95	11 64	0 33	0.43
October	4	2.86	2.91	11.36	11 57	0 41	0.43
November	5	2.86	2 90	11.71	11 60	0.47	0.43
December	6	3.12	2 93	11 80	11 65	0 54	0.45
January	7	3.32	2 99	10.49	11.47	0.41	0.45
January	8	3.04	3 00	11.36	11 46	0 31	0.43
February	9	3.04	3 00	9.57	11 25	0.35	0.42
March	10	2.98	2 99	9 48	11 07	0 39	0.42
April	11	3 08	3.01	10 62	11 03	0 29	0 41
May	12	3.22	3 02	11 34	11 06	0 32	0.40
June	13	3.10	3.03	11.30	11.07	0 33	0.39

PER CAPITA PRODUCTION HIGH

Washington has long been noted for its high per capita garbage production. In a number of instances this high production has been cited as indicating extreme wastefulness on the part of Washington housewives. As a matter of fact, the true cause was the complete elimination of private collectors and the inclusion of the garbage produced by all of the city's large floating population while determining the per capita production on the basis of Washington's permanent population.

Since the date of beginning municipal collection and disposal, a change in the police regulations has permitted the private collection of garbage and a large amount of material formerly going to the reduction plant is being utilized by private parties. The Washington housewife is to be relieved of the stigma of wastefulness and Washington's garbage production will fall to that of other cities. The sanitary conditions of the city cannot fail to suffer from the change and it cannot be expected that the reduction plant will nearly equal the old recoveries of by-products with the lessened quantity and elimination of the higher quality material—that produced by the larger hotels, apartments, and restaurants.

The control of Washington's garbage collection and disposal system is vested by the commissioners in the supervisor of city refuse, Morris Hacker. The contractor's plant superintendent, J. G. Crane, has been retained by the district in a like capacity.

Steel Water Main Electrolysis in St. Louis Serious

EXTENSIVE electrolysis of a 36-in. steel lock bar water main laid in 1917 in St. Louis caused serious trouble at three points during the year which ended April, 1919, according to the annual report of the water commissioner, E. E. Wall. This five-mile main extends from Bissell's Point pumping station to Compton Hill reservoir. It has only four cross-connections to the distribution system, but passes under numerous street-railway tracks. A description in detail of the conditions by L. Chivvis, engineer in charge of the distribution section, follows:

During October, 1918, the first leak due to electrolysis was found at Park and Theresa. The pipe was uncovered and was found to be badly pitted. Rivet heads were partially eaten off, several holes had progressed far enough to cause leaks, and in 137 places the holes were deep enough to require welding. The protective coating of burlap and rubber cement had not prevented this action, since a large percentage of the pits were found under an apparently perfect cover. After a conference with the United Railways engineers the line was drained, and all damage repaired by the company's welding crew, using oxygen and acetylene gas. After a series of potential readings and gradient determinations, it was decided to drain the steel pipe electrically to the 39th St. power house. This was done Dec. 16, 1918, by welding a plate to the pipe, and from this leading a 500,000 circ.-mil cable to Grand and Park, where the newly bonded Park Ave. rails can be relied upon to make the return current to 39th Street.

The element of danger in bonding this pipe to the rails lies in its very purpose. Providing an outlet of low resistance at the point of bonding affords an easy and inviting path for stray currents that are near the steel line and encourages them to travel toward and from the cast-iron system where it lies close to the steel main, and at the four points where the two systems are connected. The increase of current leaving the cast-iron main at points of near approach to the steel will increase the electrolytic damage at these points, and the very great increase of flow at the four points of actual contact is likely to cause trouble where this current has to leap over any lead joints which may have a high insulating value due to the lead not making a perfect contact with the pitch-coated pipe. The uncertainty of the location of such joints would point to an insulated pipe length at these four contact points as the proper solution, but this in its turn is open to the objection that it would increase the flow at the points above mentioned, where the cast iron is separated from the steel by a short distance. Potential gradient determinations south of Park Ave. showed a flow of 18 amp. before bonding and 155 after, the greater part of the increase probably coming through a 36-in. cast-iron outlet and a 6-in. filling connection.

During March, 1919, the second series of leaks developed at St. Louis and Garrison and one block south on Garrison. Excavation showed that at Coleman a hole had been eaten in the steel main due to its proximity to a 20-in. cast-iron water pipe which was in turn feeding the street car-rails at St. Louis. At the St. Louis Ave. crossing 187 pits of welding size were discovered and were promptly repaired as before by the United Railways Co.'s welding crew. Shortly after, a third alarm from North Market and Laflin disclosed damage of almost as great magnitude and was handled in the same manner.

In neither of the last two cases was the pipe drained to the rails. A cable was welded on at North Market St. and connected to the rails, but inasmuch as the current immediately leaped from 17 amp. to 480, its use was discontinued. A short bond was welded between the steel and cast-iron mains at Coleman to prevent a recurrence of trouble at that point and to distribute the flow.

The solution of the trouble at North Market and at St. Louis Ave. is still to be made, although the three-wire system, wherein the rails are neutral, was suggested by United Railways engineers.

Mr. Chivvis concludes that the steel pipe itself has shown that it is not an ideal material for city use where its excellent qualities as an electrical conductor subject it to damage from stray currents, although the entire absence of trouble on the 8-in. steel line to Bellefontaine Farms is an indication of its utility in outlying districts.

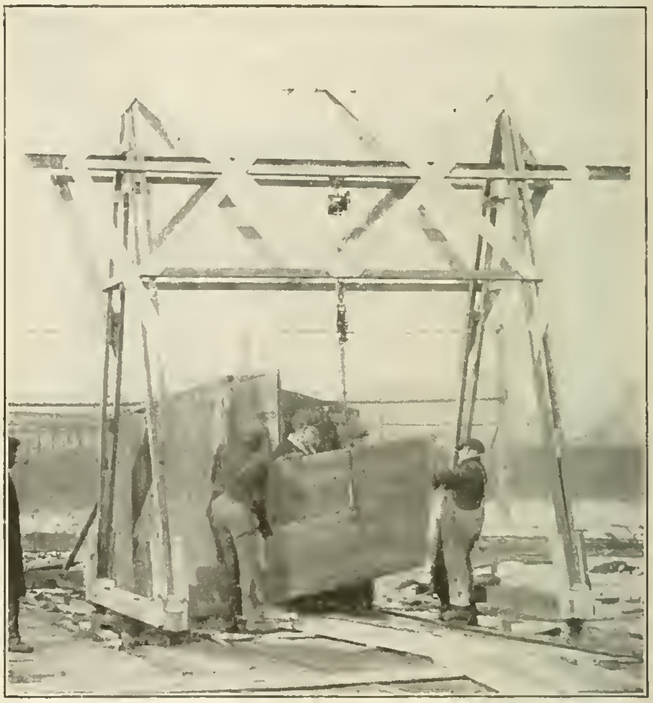
Water-Works in the Province of Quebec

Water-works in the Province of Quebec number 440, but more than half of them serve populations of 500 or less each, according to a paper by T. J. Lafreniere, chief sanitary engineer Quebec Provincial Board of Health, read before the meeting of the Engineering Institute of Canada on Jan. 28. The 192 works serving places of over 500 each supply a combined population of 1,383,700. Of this total population 86 per cent is supplied from rivers, 4 per cent from lakes, and 10 per cent from springs or wells. Regardless of size and number of works, a population of 860,000 is supplied with filtered water and 170,000 with chlorinated water.

Thin Bath-House Concrete Slabs Cast and Handled on Edge

RECONSTRUCTION of the Amusement Park at Brighton Beach, New York, destroyed by fire last year, has involved the use of concrete construction as a substitute for the old type of wooden bath-houses. The new bathing pavilion, with a capacity of 11,000 bathers, includes 4,790 small bathhouses (3 ft. 6 in. x 4 ft. in plan- and 209 large bath houses (6 x 7 ft. in plan) each of the latter being equipped with 10 lockers. For the large bath-houses the walls are of metal lath and cement stucco construction, but in the case of the smaller shelters precast slabs of cinder concrete, only 1¾ in. thick and unreinforced, are employed. Special care had to be exercised in casting and placing these thin slabs.

Forms for the slabs are built of selected 6-in. roofers with 2 x 2-in. battens forming the ends of the slabs. The slab is cast on one of its long edges, the bottom being a 2 x 2-in. piece secured by bolts cast in the concrete, which is the permanent door buck of the completed bath house. Form panels are set up in batteries of 25 to 50 yoked together with timbers and wedges.



TRAVELER ERECTING PRECAST BATH-HOUSE SLABS

A tapered plug, 1⅞ in. in diameter at the large end and 1⅝ at the small end, is secured to each form at the center of gravity of the slab; the resulting hole, used only for erection, is later filled.

Since the green slabs have no transverse strength it is essential that they be handled entirely on edge. As the slabs are stripped they are lifted on edge and carried to storage on a special hand truck. After three or four days they are taken to the erection traveler shown in the photograph.

For handling the slabs on edge under the traveler a special sling was designed consisting of a ⅝-in. wire rope passed through a 4-in. sheave block. Fastened to one end of the sling is a tapered steel bolt fitting the holes cast in the slab. A wedge secures the bolt. About 100 bath houses per day have been erected by the traveler.

In February 100 slabs were cast each day in alternate ends of a steam heated casting shed. The cost of the concrete bath houses, according to E. L. Sayers, general manager of the Macaday Building Corporation, which is reconstructing the park, is only slightly greater than the cost of wood houses on which the fire insurance rate is $1 each per year.

The work is being done under the supervision of Stewart, Holden & Sayers, consulting civil and mechanical engineers, New York City.

Steel Framing of Narrow Building

Cantilever Foundation Girders Carry Wall Columns for Plate-Girder Floor-Beams Spanning Full Width of Structure

CANTILEVER foundation girders and plate-girder floor-beams which span the entire width of the building and support concrete floorslabs without intermediate steel framing, constitute the distinctive features of steel structural design in an unusually narrow building in Chicago. This is the Waterman Building, for store and retail purposes, which has a frontage of 27 ft. 9½ in. on State St., a depth of 148 ft. and a height of seven stories. It takes the place of an old brick and timber structure and had to be erected between existing buildings, with an old party wall left in place on one side.

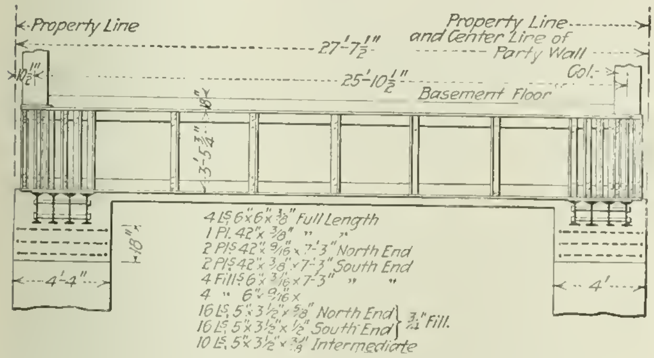

Property Line
Property Line and Center Line of Party Wall
27'-7½"
10½"
25'-10½"
Col.
Basement Floor
8"
3'-5¾"
4 Ls 6"×6"×⅜" Full Length
1 Pl. 42"×⅜" " "
2 Pls 42"×9/16×7'-3" North End
2 Pls 42"×⅜"×7'-3" South End
4 Fills 6"×3/16×7'-3" " "
4 " 6"×9/16×
16 Ls 5"×3½"×⅝" North End
16 Ls 5"×3½"×½" South End
¾" Fill.
10 Ls 5"×3½"×⅜" Intermediate
18"
4'-4"
4'

FIG. 1. CANTILEVER FOUNDATION GIRDERS OF NARROW BUILDING

Along each side were sunk nine open shafts or wells for foundation piers, spaced 18 ft. on centers and extending through stiff blue clay to hardpan at a depth of about 70 ft. below the street grade. These piers are 4 ft. and 4 ft. 4 in. in diameter, belled out at the bottom in the usual way to give the required load distribution of 6 tons per square foot. As a rule, such piers are kept away from the property lines, but in this case their outer surfaces are directly on these lines, which means that the piers on one side extend to the center line of the party wall. The concrete is mainly 1:2:4, but the tops of the piers are of 1:1:2 concrete reinforced with steel hoops and capped with the I-beam grillage to support the girders.

Transverse foundation girders placed upon these piers are 27 ft. 6½ in. long, coming within 3 in. of the lot lines. At the extreme ends of these girders are seated the columns, the cantilever distance between centers of pier and column being 13½ in. for the 4-ft. piers and 15½ in. for the larger piers. This cantilever distance is reduced to a minimum by placing the piers on the property lines, as described. The girders are 42 in. deep, except that those at the ends which carry the walls, but have only half a panel of floor load, are 36 in. deep. Stiffeners and web reinforcing plates are arranged at the loaded ends of the girders as shown, all stiffener angles and fillers being made a tight fit between the flange angles, and the web plates being milled for bearing on the girder shoe plates and the shoes of the columns.

For the columns, an H-section is used in the lower floors, composed of a 12-in. web plate, two 14-in. side plates and four angles. Above the fourth floor this is changed to an I-section, with a single 12-in. web plate. The columns are in two-story lengths. Longitudinal struts are framed between the columns at each floor level, these being 15-in. channels on the side for the new wall and 6-in. H-beams on the side for the party wall. At the first floor the H-beam was omitted, as it was not necessary for construction purposes. An 8-in. channel is placed about 6 ft. above the floor, however, for the support of a tile wall, thus forming a recess for wall cases.

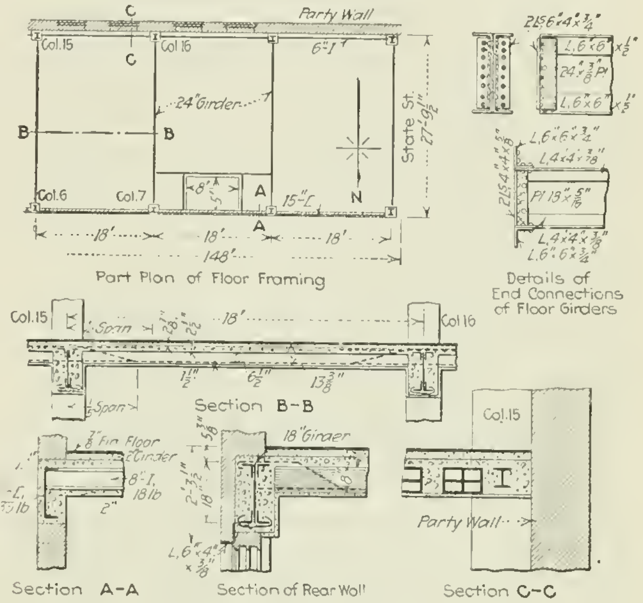


FIG. 2. LONG SPAN FLOOR CONSTRUCTION WITH PLATE-GIRDER FLOOR-BEAMS

Practically the only steel framing for the floors and roof consists of the row of nine transverse plate-girder floor-beams which are riveted to the faces of the columns. There is, however, certain supplementary framing for the stairways, elevator shafts and skylights. The adoption of plate-girders instead of large I-beams was determined by wind-bracing conditions for this tall and narrow building, more efficient riveted connections for this purpose being practicable with the girders. Vertical angles on the ends of the girders are riveted against the columns, while top and bottom angle brackets have one leg riveted to the column and the other to the flange, thus making a stiff connection. The girders are 24 in. deep, except that 18-in. girders are used in the rear or alley wall, where the load is one-half panel of floor and the wall. These also meet the requirements of window space. A 30-in. girder is used in the front wall at the second floor and above, on account of spandrel requirements.

Reinforced-concrete slab-and-joist construction, with 12-in. tile fillers between 5-in. joists, is used for the floors and roof, the ceilings being plastered directly upon the tiles and joists. The slab is 2½ in. thick; the total depth over the joists is 10½ in. For the basement, however, a 7-in. flat slab is used. The skylights are of the sawtooth type, with 3½-in. concrete slabs and with glazed fronts facing the north. All floors are designed for a live load of 100 lb. The Waterman Building was designed by Holabird & Roche, architects and engineers. The Dahl-Stedman Co. has the general contract.

Where Is Our Road Program Taking Us?

By J. N. Mackall
Chief Engineer Maryland State Roads Commission

The highway construction program has reached the point where it will be limited, not by the funds available, but by the availability of materials, machinery and contractors to do the work. Has this situation with reference to funds for construction been formulated with due consideration for the necessary maintenance program? It is the opinion of the writer that it has not, and he believes that this is certainly to some degree attributable to the highway commissioners and engineers.

The opinion is held by a vast majority of people that the funds for the present highway construction program are being invested in "permanent" roads, meaning by "permanent" that they will last for at least two generations. Is there any foundation in fact for such belief? Have concrete roads, either plain or reinforced, given any indications of a life of 25 yr. or more, and have any bituminous pavements, even the highest type, sheet asphalt, when subjected to heavy traffic, given any such indications? With a few exceptions, it is the opinion of the writer that they have not.

For proper financing, it seems a fundamental fact that the roads should be constructed, in the first instance, from the general funds, and should forever thereafter be maintained from current receipts, even though that maintaining requires resurfacing, or even rebuilding. Any course other than this will lead to ruin. If the funds from motor vehicles are used to float bond issues, the maintenance fund is cut off. On the other hand, if the general fund is used for maintenance, it will eventually bankrupt the government.

Concrete Considered Best Construction

The principal form of construction now being used, and in the opinion of the writer, the very best, is cement concrete; but it is best because it is going to give a long life at low maintenance, and by long life the writer means from 10 yr. on very heavy-traffic roads to 15 or 20 yr. on moderately heavy-traffic roads. When it reaches the point where it no longer can be economically maintained as a concrete road, it can be resurfaced with some form of good hot mixed bituminous pavement to give another period of long life, conserving the entire initial investment, instead of having to be "junked," as has been the experience in the past with many broken-stone roads, whether constructed as water-bound macadam or as bituminous macadam.

Maryland is now confronted with the problem of resurfacing some of its earlier concrete roads which have given satisfactory wear for a period ranging from 7 to 10 yr. During 1919, the commission resurfaced 2.8 mi. of the Baltimore-Washington Road, which was constructed partly of concrete and partly of penetration macadam, and 1.5 mi. of road leading to Camp Meade, which was constructed of hassam compressed pavement, in 1914. Further sections of the Baltimore-Washington Road will need to be resurfaced in 1920, notably the section through the village of Elkridge, 1 mi. in length, and the section from the District of Columbia line to Bladensburg, 1.5 mi. in length.

Failure of the concrete sections on the Washington Road was due for the most part, not to poor subgrade, nor to insufficient depth of concrete, but to the disintegration of the surface. This disintegration was such as to force the belief that it was due to "fatigue," and if this conclusion is correct, then it is the writer's opinion that the use of light metal reinforcement, or the adding to the depth of the concrete over the present depth of 6 in. at the side and 8 in. in the center, is not going to add materially to the value of the concrete as a pavement. The writer has used the word "fatigue" for the want of a better term to describe the failure. The disintegration of the surface appeared at a number of points throughout a section simultaneously. At each point of failure the rupture in the surface was small in size at the beginning, but soon developed very considerably in size and depth, which demonstrates that the actual point of failure is only infinitesimally weaker than the adjacent and whole surrounding section, and when once the surface breaks, the disintegration is rapid. If the disintegration were confined to the top surface, it might be claimed that it was due to abrasion from impact, but since when a failure occurs, it progresses in area and depth, it can hardly be attributed to abrasion.

Disintegrated Concrete Replaced

These sections of concrete which showed disintegration were entirely removed and replaced for the full depth with new concrete struck off level with the surrounding surface, but when they were opened for traffic, almost immediately the surface adjacent to them began to disintegrate, which showed that there was no longer very great resistance left in the adjacent concrete, and it is believed that it can be saved only by resurfacing with a good bituminous pavement. It will be resurfaced during 1920 with a standard sheet asphalt pavement, consisting of 1½ in. of binder and 1½ in. of topping.

The question as to when a concrete road is "worn out" has never been definitely answered, but the failures on the Washington Road have shown that, when a concrete road reaches the point where patching with concrete is necessary (except, of course, failures from poor subgrade), it is worn out, and cannot be longer economically and successfully maintained as a concrete pavement, but only as a concrete base for some form of bituminous top.

Let it be understood, however, that this commission is entirely satisfied with its concrete pavements and that its decision to build extensively concrete pavements at this time was reached with a full knowledge of the failures in the concrete section as noted above. There is no other type of pavement so far developed, which, at little or no maintenance cost, would have given from 7 to 10 yr. of wear under the tremendously heavy traffic on the Baltimore-Washington Road, which could still be resurfaced with sheet asphalt to give another period of long life, thus conserving the entire initial investment. This, too, despite the fact that this concrete was considered good concrete when it was built, but would not be considered first-class concrete as we know concrete roads today.

Corrosion of Steel in Concrete Roof Over Dry Kiln

Failure Due to Combination of Poor Concrete Weak Design, Cinder Fill and Heat and Moisture in Kiln

By Alvin H. Weber
Henry C. Weber Construction Co., Bay City, Mich.

POOR design and construction added to certain adverse conditions of service combined to cause the recent failure of a reinforced-concrete roof to a dry kiln. The subsequent investigation revealed some facts which should be considered in similar design and construction.

The roof was approximately 18 ft. span, made up of 10-in. terracotta tile and 4-in. concrete joints, with no concrete over the tile, but instead an 8-in. layer of soft coal cinders was pleced over the tile for insulation and over this was a 2-in. layer of concrete. The under side of the slab was covered with cement plaster ½ in. thick. The wood dried was maple and the temperature varied from below freezing with the kiln open in the winter to a maximum of 170 degrees.

The first sign of any undesirable action, occurring two years after the completion of the work, was the cracking of the plaster followed almost immediately by leakage in the roof. A tar and gravel roof over a wood substructure was put over the slab to prevent the leakage and it was some time after this precaution had been taken that failure occurred.

The investigation of the failure brought out several facts. The aggregate was of a very poor mixture and the amount of cement used was entirely inadequate. The 10-in. tile and concrete joists together with the steel were adequate to carry the load across the span but at certain intervals along the walls there was no bearing owing to the fact that the vent flues passing up through the roof were flush with the walls and at these points no header was framed across this non-bearing interval to the bearing joists on either side, leaving a section of slab 3 x 8 ft. without any support and held in place only by arch action. Failure occurred at several places simultaneously though some of the sections did not fail entirely but remained intact and had to be broken down.

The most important revelation of the investigation was brought out by an examination of the reinforcement. Several bars were examined and at the center of the span the cross section of what had been a ¾-in. square twisted bar was less than ¼ in., tapering almost uniformly to the original cross section at either end of the span. A further investigation of the twists showed that there was very little if any stretch in the bars. A final fact which has some bearing on the conclusions was the condition of the metal hoppers which diverted the roof water into the conductor pipes. It was found that the original hoppers were of galvanized iron and corroded so quickly that they had to be replaced in a very short time. Copper was substituted and at the time of the failure these hoppers were corroded to some extent but the action had been slower than in the case of those originally installed.

The preliminary conclusion to be drawn was that for some reason the concrete had cracked to such an extent that the steel was exposed to corrosive influences of some nature. With safe working limits there is no danger from corrosion on account of fine cracks due to tension or expansion in a reinforced beam or girder. Therefore these must have been comparatively large cracks, which were due to poor concrete, violation of the fundamental principles of reinforced-concrete construction, and perhaps, to extreme variations in temperature.

The effect of water trickling through the cinders after the roof started to leak seems to be negligible. Cases of serious corrosion of steel imbedded in cinders are on record but in this case the steel was not imbedded in the cinders and the only possible action due to the presence of this material would be the formation of weak acid solutions as the water passing through the cinders united with some of the impurities. Sulphuric acid would be the most easily formed and most destructive but a chemical analysis of soft coal cinders shows the presence of but 0.83 per cent of sulphur so that in the worst possible case this effect on corrosion would be small. Considering the fact that the leakage through the roof was allowed to continue only for a short time, the corrosion due to the formation of acids or soluble salts may be considered as having little effect in this particular case.

The hopper corrosion, which must have been caused by action from below the slab, was due partly to the action of the heat upon the wood, forming certain destructive chemical combinations. This would seem to be verified by the fact that even after the substitution of copper for the original material a certain amount of corrosion occurred. The effect of this influence upon the steel bars could not be determined but there is no doubt that it has some effect and the writer is inclined to believe that the pitted condition of the corroded bars was largely due to this influence. The greatest accelerator of the corrosion was without a doubt the heat and moisture present in the kilns.

Tests of Wooden Struts

Compression tests of 82 spruce struts of sizes corresponding to those used in aeroplane construction were made recently at the Bureau of Standards, and the conclusions therefrom are reported in the Bureau's "Technologic Paper 152" by Prof. J. E. Boyd. These struts were about 1¾ in. square and ranged from 12⅝ to 126¼ in. long (slenderness ratios 25 to 250). From the results it is concluded that a formula of Rankine type as follows:

$$\frac{P}{A} = \frac{5200}{1 + \frac{1^2}{3000r^2}}$$

gives satisfactory results for short columns (below slenderness ratio 80), while for longer columns the Euler formula

$$\frac{P}{A} = \frac{16\ 000\ 000}{(I/r)^2}$$

may be used. These formulas apply to round-end struts, which means practically to all actual working conditions. Where the ends of a strut are fixed or have square ends "accurately fitted to rigid supports" the Rankine formula should have its denominator constant increased from 3,000 to 12,000.

It is also concluded that the modulus of elasticity of the wood may be conveniently determined by compression tests on very long, round-end struts, with slenderness ratio of 200 or over, applying Euler's formula to the result.

Methods Employed in Sinking Large Open Caisson

Depth of Final Penetration Controlled by Friction Collar—Winter Concreting Made Safe by Heated Housing

METHODS of general applicability were developed in sinking a large open caisson at Milwaukee last year, to attain certain essential objects: (1) check the settlement of the well at a specified level by artificially increasing the soil resistance, (2) control the groundwater pressure in closing the bottom, and (3) carry on concreting in winter weather without loss of quality of concrete. Construction of a dense water-tight shell in cold weather was the first requirement of this work. A second requirement was that a tight bottom must be placed against a rising pressure of water and without disruptive stresses from the water until the concrete had attained strength. The main governing condition was that the caisson must be brought to rest with precision since the wall inside contained a number of recesses into which future floor slabs and partition walls were to be fitted at prescribed elevations.

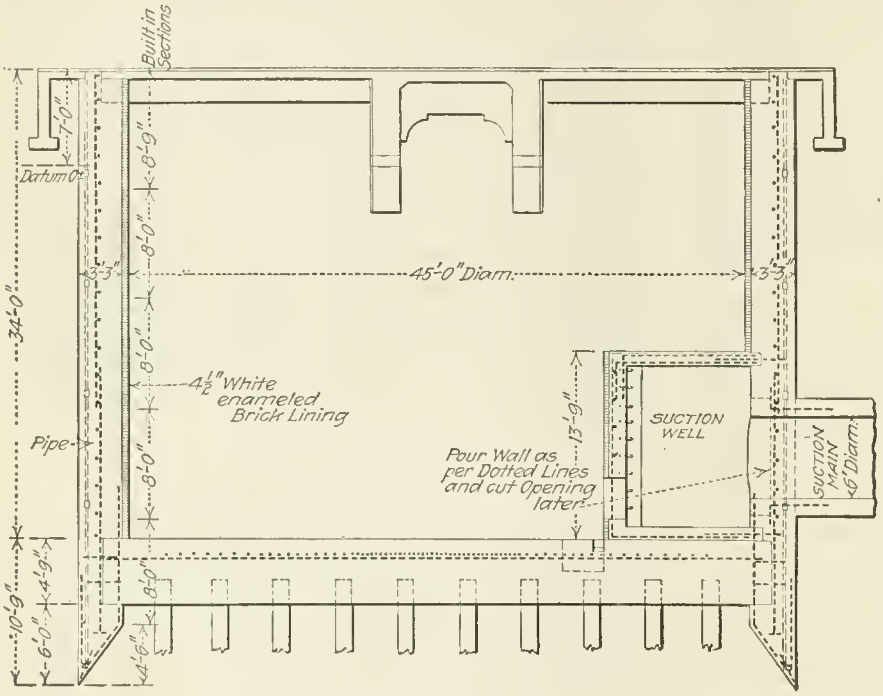


FIG. 1. PUMP WELL SUNK AS AN OPEN CAISSON

The caisson forms the outside wall of a pump well for the new Jones Island sewage disposal plant, being constructed by the Sewage Commission of the City of Milwaukee. A transverse section of this pump well is shown by Fig. 1. The portion sunk as caisson was the concrete cylinder, 3¼ ft. thick and 52¼ ft. in outside diameter. The depth from top to cutting edge was 44¾ ft. The soil penetrated was 17 ft. of sand and then 22 ft. of marsh muck overlying another stratum of sand, into which the cutting edge penetrated. Groundwater level was about at datum, 7 ft. below the top of the caisson. The ring and the cutting edge were reinforced, but no metal shoe was used on the cutting edge. At sixteen equidistant points around the ring, 1½-in. pipes opening out on the inside slope of the cutting edge were embedded, to be used, if necessary, for water jets to facilitate sinking. These pipes were never employed for jetting. Construction was begun by concreting a section 8 ft. high resting on a ring of planks on the bottom of an open pit, as indicated by Fig. 2. To start sinking, the planks were chopped through close to the cutting edge. Excavation was then begun by a derrick-operated clamshell bucket. When the first 8-ft. ring had settled to the required depth, forms were erected and a second ring was concreted. Then the excavation and sinking were resumed. Repetition of these operations completed the sinking until near the bottom. At no time was any weight added to the concrete to make the caisson sink, and until near the bottom no other means than excavation with the clamshell was required to keep the ring going down and on an even keel.

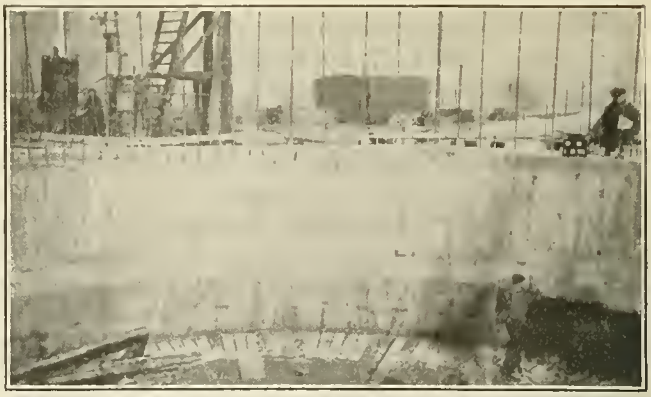


FIG. 2. CUTTING-EDGE SECTION COMPLETED AND READY TO BE SUNK

Control of the sinking was planned to ensure (1) that the caisson should come to a full stop at a specified elevation and (2) that it be as nearly plumb as possible when it assumed this final position. Careful maintenance of the level of the cutting edge at all times from the commencement of sinking was the first step toward ensuring the two results sought. From

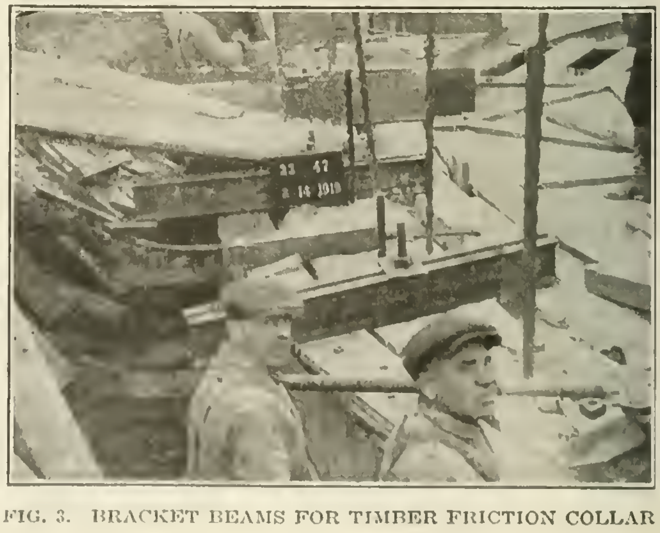


FIG. 3. BRACKET BEAMS FOR TIMBER FRICTION COLLAR

an outside point, level sights were constantly taken on filled marks on the sixteen jetting pipes projecting above the top of the concrete ring. Ordinary hose clamps were placed on the pipes at the marks and the readings taken by holding the rod on the clamps. These were raised as each addition was made to the ring so that always the ring of clamps was exactly parallel to the cutting edge. On one occasion the ring settled a maximum of 1 ft. out of level but ordinarily the difference was only a few inches and was corrected immediately by shifting the excavation toward the high side.

As the final depth was approached, provision was made to check the settlement and to hold the ring at the prescribed elevation while the excavation for the bottom was completed. An exterior bracket was constructed around the caisson just below the final 8-ft. ring, radial steel beams (Fig. 3) were placed at intervals around the ring, projecting out about 2 ft., and under their projecting ends was placed a circle of timbers. With the additional vertical bearing of this bracket it was estimated that the caisson would settle 1 ft. to the required elevation when the final ring of concrete was placed on the top. To maintain the level in the final sinking, jet pipes connecting a 2-in. hose with 1-in. pipe ends were worked down along the high edge as occasion necessitated. When brought to a stop the caisson was 3 in. high, 2 in. out of plum and $1\frac{1}{2}$ in. off center. The circumferential brake had proved slightly more effective than was anticipated but yet had stopped settlement well within the limits of error provided for in molding the interior recesses for slabs, girders and partitions and by leaving the top of the last ring 6 in. low.

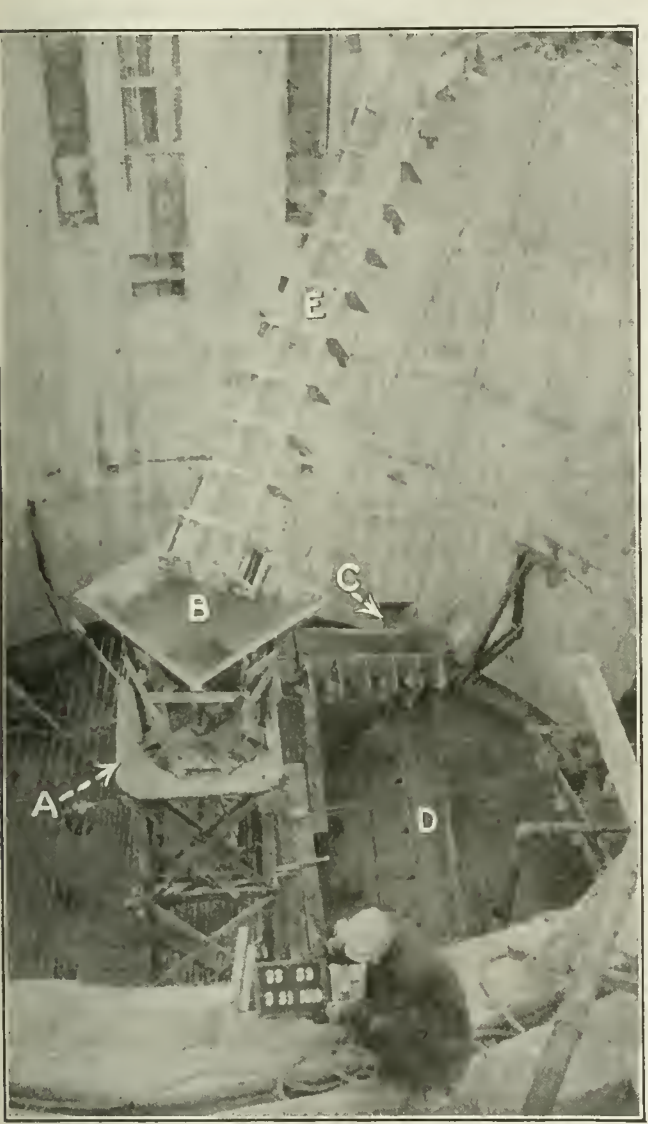


FIG. 5. CHUTING ARRANGEMENT FOR DISTRIBUTING CONCRETE TO FLOOR SLAB

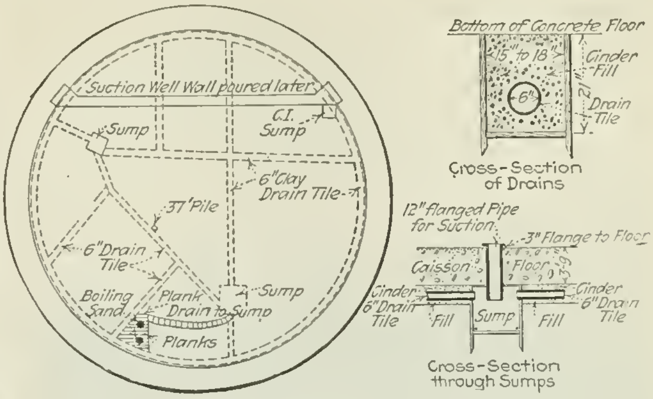


FIG. 4. DRAINS KEPT BOTTOM FREE FROM WATER WHILE CONSTRUCTING FLOOR

Piles for the floor foundation were driven by a steam hammer hung from the derrick boom, after all the concrete had been poured and the caisson had come to rest. No appreciable settlement was caused by the driving of the piles.

The bottom was about 1 ft. of marsh muck overlying sand and fine gravel carrying water Drainage of the bottom was the first necessity in placing the concrete floor. Fig. 4 shows the arrangement of drains adopted. In only one place did these drains fail to keep the water down. Here it boiled up alongside two piles, and a special plank drain was built. The plank was covered with several inches of dry cement and the concrete was placed on this, which forced the water through the drain. With the pumps working, the concrete floor was placed. The water was then allowed to rise and cover the floor to datum for one month until it had set and gained strength. Finally the water was pumped down, the pipes were capped and the sumps and drains filled with grout forced in under water pressure through 2-in. pipes tapped into the flanges. The completed floor was watertight.

The plant arrangement for concreting the bottom proved particularly convenient. On a tower set on four piles arranged about the center of the bottom circle a braced tower was erected as shown by Fig. 5. On a small platform *A* at the top was set a frame holding a hopper *B* with an attached radial chute *C*. The frame was pivoted and set on a ring of casters so that the hopper could be rotated horizontally. From the radial chute *C* the concrete flowed to a portable chute *D* which delivered to the floor slab. By this arrangement con-

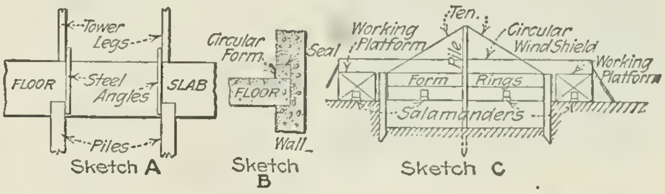


FIG. 6. WINTER HOUSING OF WORK AND MINOR CONSTRUCTION DETAIL

crete was delivered by direct chuting to any part of the slab. The hopper received concrete through chute *E* from a battery of three mixers arranged at the top of the caisson as shown by Fig. 7. So as not to interfere with the concreting of the floor, the tower legs were supported on the piles by means of angles attached as shown by sketch *A*, Fig. 7. The angles were cut off and left embedded.

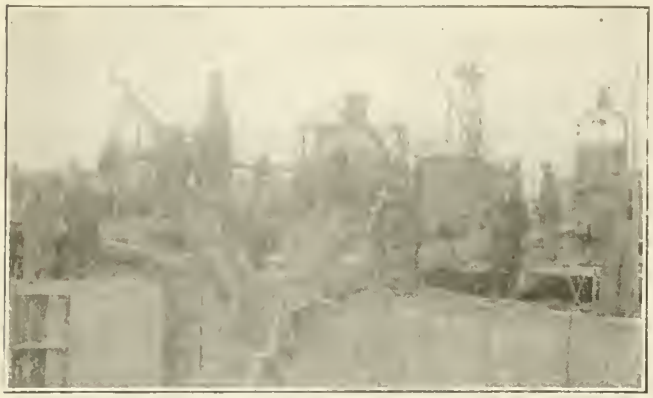


FIG. 7. BATTERY OF THREE MIXERS DISCHARGING INTO SINGLE CHUTE TO HOPPER

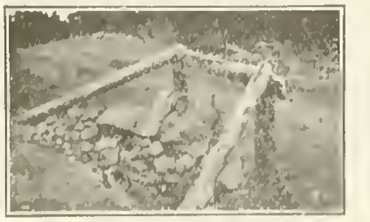
Another detail of the floor slab is indicated by sketch B, Fig. 6. To allow for irregularities in sinking the caisson the inside slot for the floor slab was made higher than the depth of the floor, which left a circular space to be filled. A circular form was set as shown by the sketch and behind it the cavity was filled with grout.

Winter concreting was accomplished without a single failure, by an adaptation to the conditions of well-known practices. The sand, stone and water were heated by steam coils and jets; the mixed concrete entered the form rings at 50° to 70° F. Around the caisson a circular windshield was erected as indicated by sketch *C*, Fig. 7. Inside this shield was a working staging and runways. Salamanders set under the staging kept the outside forms warm, and others located inside the ring kept the inside forms warm. The top of the caisson was tented over as indicated by the sketch, and the top edge of the concrete, where pouring was not in progress, was kept covered by planks and hay.

The construction described was performed by Klug & Smith, Milwaukee, Wis., contractors, for the Milwaukee Sewerage Commission. T. Chalkley Hatton, chief engineer. G. R. Young was division engineer during the first part of the operation and later was succeeded by R. R. Lundahl. H. E. Nichol was resident engineer.

Simple Barrier Protects Mountain Culverts

Culvert inlets on the uphill side of the mountain road in Idaho entering Jackson Hole by the Teton route are protected by the railing shown in the cut. During the winter the log rails mark the road limit. The slope leading to this drain is steep, and the rock dam is essential to the diversion of all the water into the culvert. This road is being constructed by the state, with the aid of the United States Forestry Department.



The Ultimate Aim of Engineering Organization

(Extracts from a Paper Presented to the Michigan Engineering Society by Louis E. Ayres, Ann Arbor, Mich.)

WHEN the wave of enthusiasm for engineering organization, which has been sweeping over the country for the past two years has passed, what then? In four or five years a great percentage of the engineers will have joined some society, local, state or national. Perhaps in five years all of us may have become affiliated in a single national unit. By that time most of the objects that are held commonly in mind today as among the purposes behind the present spirit of co-operation—better wages, greater public recognition, suitable registration—will have been accomplished. Will this great movement then, its work done, its objects consummated, suffer disintegration? Unless we can discover some worthy object, some great and lasting aim and purpose toward which our efforts may ever be directed, we can hardly expect to survive as a large national unit more than a very few years. It is believed that there is an object to be accomplished that is big and worthy, a work to be done than transcends all selfish interests. The fact that we have thus far gained such an impetus is in itself evidence that beneath all our interest and activity there has been a subsconscious realization of the bigness of our purpose.

Must Speak as a Unit

Whether we like it or not the time has passed when the individual can hope to possess the influence in the affairs of society that he once enjoyed, unless he stands as the leader of the group. Professional men have not yet spoken as a single social unit. Doctors, lawyers, teachers, engineers and all the other products of our schools and universities who *should* be best fitted to represent the public in the counsels of government, having rights at least equal to and responsibilities even greater than those of the capitalists, or the laborers, or the farmers, have not yet been united into a single social class. Let me suggest that the perpetuation of democracy as we know it will depend upon whether or not these classes of our society become organized as units for social and political purposes and united in the great common aim of public service. Unless our educated and professional classes make a study of the social, economic and political problems of democracy and set out to put into force and effect those measures and movements necessary for their solution, democracy will disappear. No one anticipates that we will ever experience a soviet regime in America, but we are likely to suffer from the domination of one or more of its organized classes unless the other units of society, of which you and I are members, can become a sufficient force in government to act as the defenders of public rights.

To assist in leading our nation out of the economic chaos that now exists is surely a task worthy of our best endeavors. Herein lies the greatest reason for an all comprehensive engineering organization, unselfish in its controlling purpose and equal to the task of enabling that profession which has heretofore been so largely responsible for man's advancement to take its proper place in the larger sphere of opportunities afforded by a new world and a new social order. Let not my intention be misunderstood. I am not advocating that all engineers abandon at once the technical work by which they earn their livelihood. Not in the least. I do fully expect, however, that a portion of the profession should and will give more attention and study in the future to social, economic and political matters, and some of us who are in a position to do so will devote a large portion of time to public affairs. If as a class we become effective we must develop leaders, men, as Roosevelt put it, "to whom are granted great visions, who dream greatly and strive to make their dreams come true; who can kindle the profession with the fire from their own burning souls."

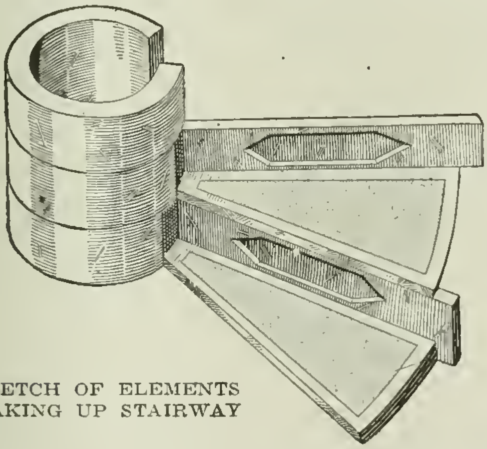
In national affairs there is no reason why a national society of engineers may not at an early date gain recognition from our federal government and, on a par with the representatives of organized capital, labor and agriculture, assist in the solution of the national problems and the determination of national policies. Let it be emphasized, however, that our power must never be used for a selfish purpose or it will soon come to naught. We must teach, preach and live the doctrine of service. Service must be our motto. It is what I put in that counts, not what I get out. It is what I do and give that makes me rich, not what I receive. We are a profession and, as the doctors have expressed it, "a profession has for its prime object the service it can render humanity; reward or financial gain should be a subordinate consideration." Let us make articulate the voice of service.

We need to support all good laws and oppose bad ones, regardless of whether our own rights or privileges are concerned. On election day we should be found at the polling booths, conversant with the issues at stake and the candidates in the race. In short we should be American citizens in every sense of the word, and as individuals and as a unit intent upon the promotion of Americanism.

Is this too big a job for you and me and for the 200,000 or more engineers scattered throughout our country? I think not. I cannot help but feel that in the subconscious minds of many of us has been at work just such a conception of the ultimate purpose of engineering organization.

Spiral Stairway Made of Precast Concrete Members

IN the new Welland Canal locks a mooring gallery runs longitudinally through the lock wall for its full length at an elevation about 30 ft. below the top of the well. Through openings into the lock from this gallery boats are moored during the locking operations and as the water rises the lines are cast off of the bollards and the men go up through stairways to the top of the lock. These stairways for the larger part of the 30-ft. depth have been built in spiral form of precast concrete members, according to the details shown in the accompanying drawing.

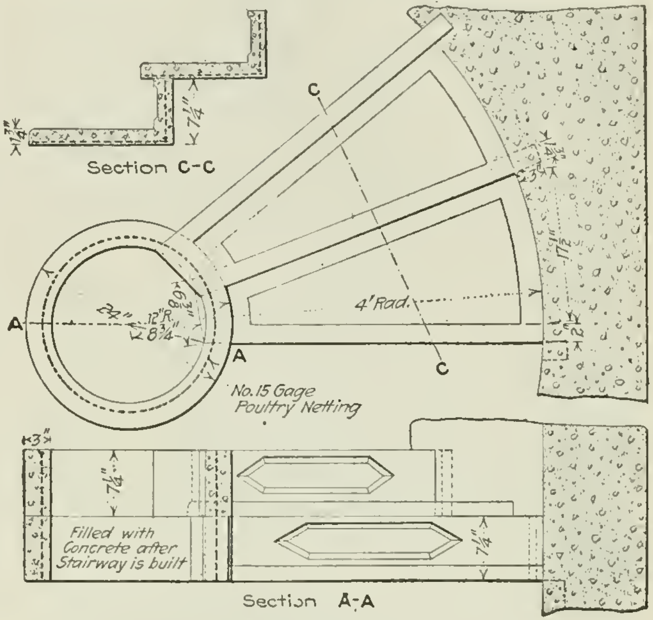


SKETCH OF ELEMENTS MAKING UP STAIRWAY

In building the lock a cylindrical opening 8 ft. in diameter is left from the mooring gallery floor to the lock-wall top. With the exception of the lower 6 ft., which is in straight stairway, the whole staircase is in spiral form rising around a central concrete column made up of precast hollow cylinders with each step a precast concrete piece comprising a tread and the next higher riser.

The supporting cylinder blocks are each 2 ft. in outside diameter with 3-in. walls 7¼ in. high, reinforced with No. 15 gage chicken wire. A radial opening is left in the wall of this annular ring of sufficient size to admit the stair unit. This stair unit, as shown on the detail, is sector shaped with the riser protruding 3 in. beyond the plane of the tread, this protruding end being left to take bearing in a groove cut in the cylindrical wall of the opening, into which it is grouted after the stair unit is placed.

In construction the first cylinder support piece is placed with the stair section fitting into the opening. The next higher center cylinder block is then placed on top of the first and turned radially in a horizontal plane just sufficient to place the opening in the proper position to engage the next higher stair unit. The staircase is erected in this manner in successive units clear around the double turn to the top of the lock wall. After all the units are placed the opening in the cylindrical block support is filled with mass concrete.



DETAILS OF NARROW PRECAST CONCRETE STAIRWAY FOR WELLAND CANAL LOCK WALL

In addition to the precast pieces for the spiral stair unit a precast tread 12½ in. wide and 1¾ in. deep is made for the straight approach section to the spiral staircase.

The Welland Ship Canal work is in charge of Alex. J. Grant, engineer in charge, St. Catharines, Ont.

Army Appropriation for Alaska Road Work

Despite the unusual effort made by those interested in Alaska to increase the military road-building program in the territory, the Army appropriation bill was reported to the House carrying only $150,000 for that purpose. The sum of $422,000 was asked. The Alaska road commission has constructed since its organization in 1905, 1,031 mi. of wagon road, 636 mi. of sled road, and 3,225 mi. of trail, a total of 4,890 mi. of transportation route, together with a large number of bridges. This construction work and maintenance charges had cost up to July 1, 1919, $4,923,576.93.

In addition to Army appropriations, funds for road building in Alaska are obtained from trade and occupational licenses, from which source the road commission obtains about $125,000 per year. Then, the territory of Alaska provides some $225,000 per year for road construction, 80 per cent of which is turned over to the road commission.

Report of the Kaw River Flood Protection Problem

Improve Channel by Removing Buried Bridges and Wreckage—Dredging Not Advocated as Deposits Will Scour

FLOOD protection works which will give the Kaw River at Kansas City, Kan., capacity sufficient for such a great flood as that of 1903 at a cost of only $400,000 are recommended by C. E. Smith, consulting engineer, Kansas City, Mo., in place of works proposed by the Kaw Valley Drainage Board at a cost of $1,500,000. After the voters had failed to authorize the bond issue for $1,500,000, in 1919, some of the property owners engaged Mr. Smith to investigate the problem. His plans provide mainly for clearing the channel and raising the levees from 2 to 5 ft.

A discharge capacity of 306,500 cu.ft. per sec. is assumed, being the average of estimates by fifteen engineers, and as the flood discharge of 1903 was from 250,000 to 280,000 cu.ft. it is concluded that the theoretical cross-sectional area of 28,980 ft. is sufficient, but must be secured and maintained. This area is for a channel cleared to a depth of 45 ft. below the tops of the levees as proposed in 1904, but such a depth has never been obtained. Blue clay and rock limit the scour line to 45 ft.

During low water periods, which extend through the greater part of the year, a considerable width of the river bed is dry and has become covered with willows. This growth causes sedimentation during high water and also prevents scour of the deposit, so that there is a continual process of ascretion. The areas thus overgrown must be cleared and kept clear, in Mr. Smith's opinion, in order to reduce the deposit of silt and to facilitate scouring by floods.

Obstructions in the river bed are another cause of the prevention of scour which ordinarily would take place during high water and would thus automatically enlarge the channel capacity when necessary. These obstructions are of an extraordinary character, including bridge trusses and girders, bridge piers, riprap, railway cars, barges, piling and other wreckage brought down by floods and now buried in the silt. Such wreckage should be removed promptly and the report recommends a complete examination of the river bed by means of a barge equipped with jet pipes, thus loosening the deposit and locating obstructions. A fill forming the approach to one of the bridges obstructs the channel and this should be replaced by a trestle pending the result of litigation over changes in the bridge.

In his conclusion that no general scheme of dredging is necessary, Mr. Smith differs from the engineers of the Drainage Board and agrees with earlier reports of the U. S. Engineer Corps. He considers that the expense is not justified for the purpose of locating obstructions and decreasing the cost of their removal. On the other hand, with the obstructions removed there will be no necessity for derdging since the floods will readily scour out the channel to the hard bottom. Further, the Kaw River carries a great amount of sediment and during low water periods the conditions are ideal for depositing this material, so that a dredged channel would soon be filled. Measurements taken late in 1918 and after the spring runoff of 1919 showed that scour due to this runoff had increased the cross-sectional area of waterway by 2,000 to 3,000 sq.ft.

For the levees, a raise of 2½ to 5 ft. is advocated, instead of the general raise of 5½ ft. as planned by the Drainage Board. Rock revetment would be used on the lower part of the slopes and on the concave side of bends. This rock may be deposited in a mass along the low water line and will then fall and spread over the slope when the water begins to scour below that line. Although twelve bridges are below the Board's new levee elevation, Mr. Smith advocates leaving eleven of these until flood conditions demonstrate the necessity of raising them.

As the low lands known as the West Bottoms, occupied by industries and forming a peninsula between the Kaw and Missouri Rivers, are partly in Missouri, the report recommends that the Drainage Board should negotiate for extending the levee work along the river front in Missouri in order to protect property in Kansas. An opening for the discharge of Turkey Creek must be left until the completion of the Turkey Creek sewer which will divert the flow from the present open channel. As the Kaw River is almost at right angles to the Missouri, a dike or jetty at the mouth of the former is proposed in order to deflect the flow into the direction of the current of the latter, but the land in that vicinity is not considered of sufficient value to warrant the cost of protective works as planned by the Drainage Board. A summary of Mr. Smith's estimate of cost is as follows: Removing obstructions from the channel, $100,000; concrete walls, levees and revetments, $89,752; completing protection of West Bottoms $81,000; completing protection at Argentine and Armourdale, $104,248; jetty at mouth of river, $25,000; total, $400,000.

Road Conditions as Shown by Rainfall Data

Realizing the need for up-to-date, complete, and accurate information on highway conditions, an effort has been made to determine the effect of rainfall on highways so that telegraphic reports of rainfall can be utilized in making up the daily highway and weather bulletins. The following results were obtained after a study of replies to questionnaires mailed to co-operative observers, correspondents, meteorologists, engineers, and others familiar with highways and weather conditions in the communities in which they live. The results apply to dirt roads in Arkansas and mainly to spring, late autumn and early winter conditions.

It should be remembered that all the results are averages, and that only reliable estimates in measurable amounts of precipitation were used to obtain the figures. The average opinion of the correspondents is that 1.38 in. of rainfall make dirt roads muddy; those located in the lowlands estimated that 1.13 in. was the required amount; in the uplands 1.51 in. They estimated that 2.78 in. of rainfall make dirt roads very muddy; those in the lowlands, 2.25 in.; and these in the uplands or hills, 2.9 in. The variations for surface conditions is 29 per cent in both instances. It is interesting to note that it requires about twice as much rainfall to make certain roads very muddy as to make them muddy. The estimated amount required to make dirt roads impassable averages 4.04 in., varying from 3.57 in. for lowlands to 4.35 in. for the hills and uplands—*Monthly Weather Review.*

Drainage Results and Proposals on the Salt River Project

TRIAL drainage wells sunk in typical seeped areas on the Salt River Irrigation Project, Arizona, last season have proved successful in lowering the ground water levels. In consequence a plan has been formulated to provide drainage for the five principal districts seeped or threatened with seepage. In April a bond issue of $400,000 will be voted upon to provide the funds in accordance with the recommendations of D. W. Murphy, consulting engineer, Los Angeles, who submitted a report to the Water Users' Association in February.

A consulting board, consisting of W. H. Code, W. R. Elliott and Mr. Murphy, in February, 1918, found that in five years there had been an average rise of 7.5 ft. in the ground water level, sufficiently high over a large area to be a source of danger. On the board's recommendation wells were sunk and motor-driven pumps installed on three separate areas.

Mr. Murphy finds from readings taken on wells during October, 1919, 43,000 acres of lands damaged or threatened as it was learned that the ground water level was 10 ft. or less below the surface. During the past two years readings over the whole project have been taken. A typical record is the average of 16 wells on the Laveen area: October, 1918, 8.2 ft. to ground water; May and October, 1919, 9.7 and 8.8 ft. respectively. From the three separate areas supplied with wells installed and pumps available for operation in 1919, the results are as follows: (1) On an area of 25,000 acres on the "south side" the average lowering from May to October, 1918, was 3 ft. From May to October, 1919, it was 2.5 ft. (2) In the vicinity of the Grand Canal north of Phoenix 1,493 acre-feet was pumped from four wells in the period from Sept. 1, 1919, to Feb. 1, 1920. The results showed over an area 1½ x 2½ miles in extent, the average elevation measured in 24 test wells being 4 ft. lower than in May, 1919, and 2.4 ft. lower than in October, 1918. Six test wheels on adjacent unpumped areas indicated a rise of 0.4 ft. since May, 1919.

Conditions on the five principal areas needing drainage vary according to the material underlying the surface and will be handled differently. From logs of various wells it was learned that the Tempe district is underlaid with caliche to a depth of 50 ft. Below the caliche porous water-bearing gravels are found and the high ground water is due to the upward pressure from the water in the gravel layer.

Only pumping of wells can be effective through the caliche. Drains of any practical depth are of little use. The Laveen area is a flat depression one mile in width at its widest part. The formation consists principally of clay and caliche, broken by thin strata of sand, gravel and mountain wash through which ground water percolates slowly to the lower position of the area. Since there is no deep lying porous gravel beds, deep drains only will answer here for the ground water lies on top of the more or less impervious clasp. The Salt River and the New River areas are seeped from percolation from higher ground. Drainage can be effected by intercepting this percolation with a line of wells and also a deep drain tapping porous sands and gravel through the lower portion of the area. The seepage accumulated contains large quantities of alkali and a drain is the only effective means of leaching out these salts.

The most difficult tract is a portion of the Arizona and Grand Canal area on which some wells have already been installed. Careful observations and studies must be made as the work progresses. The formation to considerable depths is principally caliche, clay and mountain wash, none of which is a good water bearing material. The strata of sand and gravel are thin and the water under pressure moves freely but in small quantities. The strata are too deep to be tapped by drains and a large number of small wells yielding about ¾ sec.-ft. each seems to be the only feasible method of drainage.

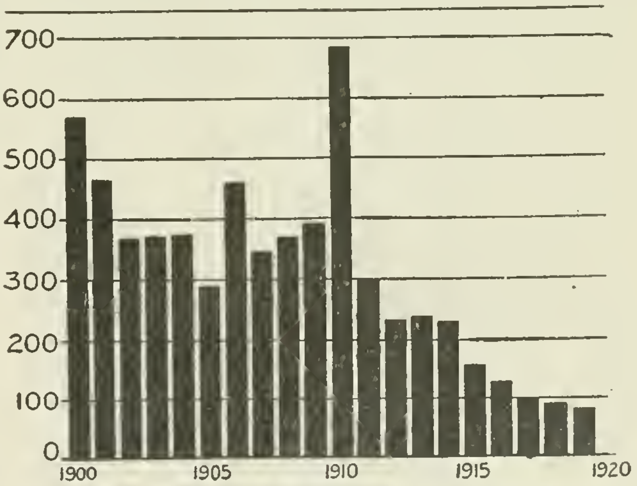
Since the quantity pumped may be in excess of irrigation requirements and may have to be removed during the non-irrigating seasons, as well as being unsuited because of alkali content, 25 miles of waste ditches are provided. Mixing alkali water with several times its volume of river water will bring the resulting dilution in many cases within usable limits, but frequent analysis of each well is then essential.

Utilization of the ground water to the full as an additional water supply to supplement the reservoir water will require additional pumps over those which it is proposed to install at first as a minimum for drainage only, since to accomplish the drainage it may be necessary to pump all or a greater portion of the time.

This work is being carried out under the direction of W. R. Elliott, project manager, Salt River Valley Water Users' Association.

Reduction of Typhoid Fever in Minnesota

THE reduction of typhoid fever in Minnesota during the past 20 years is shown by the accompanying diagram, taken from a leaflet being circulated by the Minnesota State Board of Health. In 1910, the highest year shown on the diagram, the Legislature appropriated to the State Board of Health for a pure water-supply campaign the sum of $5,000 for work in 1911, while for 1912 an appropriation of $7,500 was made for the sanitary engineering work of the Board. From 1912 to date the appropriation has been $7,000. In 1914 the Engineering and the Laboratory divisions of the board were merged and since that time the work on water supply and sewerage systems has been conducted by the Division of Sanitation of which H. A. Whittaker is director.



DEATHS FROM TYPHOID FEVER IN MINNESOTA FROM 1900 TO 1919, INCLUSIVE

From 1900 to 1910 the average typhoid death rate in

Minnesota was 428. In 1910 there were nearly 700 deaths and 14,000 cases of typhoid in Minnesota, while in 1919 the deaths numbered only 82 and the cases about 1,640. The population of the State has increased materially during the time covered by the diagram.

The leaflet already mentioned gives credit to the Division of Preventable Diseases as well as to that of Sanitation for the reduction of typhoid effected. The leaflet also states: "Investigations made by the Division of Sanitation show that there are as many water supplies that are as unsafe (today) as those which have previously caused epidemics."

Waterbound Macadam and Bituminous Concrete Roads Rejuvenated

By Charles F. Puff
Assistant Chief Engineer, Bureau of Highways, Philadelphia, Pa.

With the development of the automobile it became apparent at once that waterbound macadam pavements would be of no value unless something were done to protect the surface, therefore bituminous surface treatment came into use. For the past 10 years waterbound macadam roads have been surface treated with tar and asphalt applications, which transformed these old dusty, pot-holed or loose stone highways into surfaces as smooth as sheet asphalt. At one stroke, dust was eliminated, the metal of the road remained in place, smooth riding was furnished and considerable money was saved in maintenance.

With the accomplishment of smooth and dustless riding, the engineer once more settled into a study of the good and bad features of the various characters of bituminous treatments and surface coverings and at present it is developed into an important factor in the science of road maintenance. Treatment after treatment was applied, but when the number had advanced to ten, it became apparent that there was a limit to the beneficial effects of this work. The bituminous material became wavy, rippled and corrugated and once more new methods had to be evolved.

The first remedy for this condition we employed was to resurface the road to a depth of 3 in. with either waterbound or bituminous macadam, but as funds are not always available another method suggested itself. This method consists in spiking up the road, re-distributing the bituminous covered stone to a proper cross-section, adding as much clean ¾-in. stone as is necessary to absorb the surface tar or asphalt and then roll thoroughly with a 10-ton roller. After rolling, a seal coat of hot tarvia, hot ugite or hot asphalt is applied at a rate of ⅓ to ½ a gal. per square yard. Then 20 lb. per square yard of ½-in. and ¾-in. trap rock chips are spread and the road is again rolled with the 10-ton roller. This practically gives a light penetration road.

In Philadelphia there are several examples of this construction which are in good condition after 2½ yr. of extra heavy travel. The tonnage on one strip of roadway amounted to 570 tons per foot of maximum traveled width of road. It is the Lincoln Highway, Philadelphia-New York route. The cost at that time was about 10c. per square yard, while, at 1919 prices, the cost would be at least 15c. per square yard.

Another method which has proven successful when a surface treated road becomes badly potted consists in cleaning the road by sweeping in the usual manner, painting all depressions and filling with clean ¾-in. stone. Then apply a hot asphalt oil or hot tar of heavy consistency, to the amount of ⅓ to ½ gal. per square yard, and cover the same area with from 20 to 30 lb. of clean ¾-in. trap-rock chips, and roll thoroughly with a 10-ton roller. In the absence of ¾-in. covering, it has been shown the Delaware River washed pebbles, ¼ in. to ½ in. screen, provide an acceptable substitute. These pebbles are tough and offer considerable resistance to crushing. The cost of this repair varies from 6½c. to 11c. per square yard.

During the years 1912 to 1914 many of the older macadam roads of Philadelphia were reshaped and covered with from 2 in. to 2½ in. of bituminous concrete. This material consisted of amesite, filbertine and topeka. After the unusually heavy frosts of the winter of 1917-1918 many of these surfaces showed signs of disintegration, while others heaved badly. The remedy applied was as follows:

The cross section of the road was re-established by the aid of bituminous penetration patches, then a seal coat of asphalt cut-back (35 per cent naphtha) in the amount of ½ gal. per square yard, was applied. This was covered with 20 lb. of ½-in. trap-rock chips per square yard. In a few instances this seal coat has preserved the pavement for 2 yr., in others it was deemed advisable to surface treat after the expiration of one year.

A variation of this method consisted in applying the first coat in the form of a light (cold) tar treatment, ¼ to ⅓ gal. per square yard, with a slag or pebble covering. This was followed up in the next season with a hot tar or hot asphalt application with a pebble or slag covering. The idea of this variation was to obtain greater penetration on the first treatment. To date both methods have shown good results, but no decided superiority has become evident, with the exception that in the latter method the surface treated is more plastic.

In conducting this work only standard road equipment was used, such as pressure distributors, gravel spreaders, a 10-ton, 3-wheel roller, well equipped with sharp spikes, a grader and, in some cases, a 100-gal. stone and tar heater, together with shovels, forks and picks. Usually a foreman with 12 men constituted the working force. The rate of speed is entirely dependent upon the condition of the road and varies from 1,500 to 2,500 linear feet on a road 18 ft. wide.

Results of State Supervision of Filters

The beneficial results from technical local supervision of filtration plants and state supervisory control cannot be definitely expressed, but certain features were cited by W. H. Dittoe at the recent meeting of the American Public Health Association.

1. Under such operating conditions the constant production of satisfactory water is assured. This is particularly important in Ohio, where so large a percentage of the population is dependent upon purified water.

2. The total cost of plant operation and maintenance will in many instances be reduced. The greatest saving is in the cost of chemicals and frequently exceeds the salary of the superintendent.

3. The knowledge gained from close study of operation of water purification plants throughout the State has enabled the department to give helpful advice to municipalities and their engineers when engaged in projects.

4. The system including local technical supervision with state supervisory control has furnished a medium for the interchange of information.

Experience With Insect Larvae in Decreasing Canal Capacity

LARVÆ of insects at times attach themselves to the concrete flumes and concrete lining of irrigation canals in such quantities as to increase the friction to a point where the carrying capacity is reduced materially. In 1918 the flumes carrying the main supply of water from the Milner Dam on the Snake River, Idaho, to the project of the North Side Twin Falls Land & Water Co., were infested to such an extent that the capacity was reduced about 10 per cent. The water had to be shut off for two days and the larvæ removed with slip scrapers, fresnos and dump wagons. In earlier years the fluctuation of the carrying capacity had been noted and charged to variation in the rating, leaks, temperature, etc. A similar experience in 1919 on the Tieton Canal of the Yakima Project in Washington is reported by R. K. Tiffany, project manager in the *Reclamation Record* for February, from which the following notes are abstracted:

The larvæ are found atached to the inner wall of the concrete-lined canal, where the velocity is 9 to 10 ft. per second. The surface is quite smooth, as it was cast in metal forms. The temperature of the water ranges from 45 deg. to 70 deg. F.

An inspection of the canal at spillway 1 during August showed no water grass or algæ present, but the sides of the section were thickly infested with small brownish-colored worms, slightly less than $\frac{1}{16}$ in. thick and varying from $\frac{3}{8}$ to $\frac{1}{2}$ in. in length. These worms gained lodgment in the small pores in the concrete, and upon gradually reducing the quantity of water flowing, they followed down the sides to the lower level. When the canal was suddenly shut down they emerged from the pores and crawled over the concrete. Apparently the full colony survived a two-day shut-down about the middle of September, but no traces were to be found two weeks after the water was shut off on Sept. 30.

Upon making an examination of this part of the canal two days after the close of the irrigation season, a larger species was found with the others in the pools in the bottom. The larger variety averaged about $\frac{1}{2}$ in. in length and from $\frac{3}{32}$ to $\frac{1}{3}$ in. in thickness, and were brown and greenish-brown in color.

Small nests or cocoons of these two varieties of insects were removed from the sides of the concrete about the middle of October. The smaller cocoons were scattered thickly over the sides of the section with openings directed downstream; the larger cocoons were less frequent, opened against the current, and were found in the shaded areas and under Steeple tunnel. It required some care to remove the smaller cocoons with a pocketknife. The larger variety were readily dislodged with the fingers.

L. O. Howard, chief of the Bureau of Entomology, U. S. Department of Agriculture, states that the forms are cases of the caddis fly and the cocoons and pupa shells of one of the black flies of the Simulium. He suggests no other method of removal than scraping them off with a hoe or some other instrument.

Ralph H. Smith, associate entomologist of the University of Idaho, suggested to R. E. Shepherd, manager of the North Side Twin Falls Land & Water Co., that a heavy cotton rope might be soaked in kerosene and hung along the sides of the concrete retaining walls so as just to touch the surface of the water. This would keep a film of oil along the moistened surfaces of the walls where the water splashes up, and might possibly prevent the females from laying their eggs. In laying their eggs the female flies light upon the concrete wall and move down to a point where they can dip the posterior end of the abdomen in the water, or at least in the surface film of water on the walls. If a film of kerosene were present the end of the female's abdomen would get a coat of kerosene, and although it would be ever so small an amount, it would be sufficient to kill her. Mr. Smith did not know of the oiled rope ever being tried for such purposes, and so it would be a matter of experiment to find how long one oiling of a rope would last. He suggested that crude oil might do the work just as effectively as kerosene.

J. G. Needham, limnologist of Cornell University, suggested painting the walls with some asphaltum mixture as a repellant which would prevent deposition of the eggs. The suggestions were received too late to be put into effect by Mr. Shepherd, and in 1919 the larvæ were not present in sufficient numbers to cause trouble.

Sign Boards for French Highways

WAR has had its impress upon certain governmental bureaus of the French Republic, as is indicated in a recent article by Louis Dreyfus, American Consul at Paris, for, finding that road signs adopted by the French and Allied armies during the war were so efficacious for the traveler by automobile, the French Ministry of Public Works has decided to carry out the ideas developed through the war traffic, by erecting danger signals and indicating noteworthy places, and by denoting the route to be followed as regards direction and distances.

According to a circular on this subject emanating from the Ministry of Public Works and directed to the prefects of the departments, the names of villages must be conspicuously posted; the inscription must be readily legible and placed on a post, or preferably on a wall or building, as nearly at right angles to the road as possible, and on its right. Only the name of the locality should appear on the sign. Efforts are also to be made to have the name of the town placed on the city hall, railway station, postoffice, and other public buildings.

As to danger signals, the four signals adopted by the International Conference relating to automobile traffic will be the only ones used. They are the signs for inclines, turns, road crossings and railroad crossings. These are to be posted about 275 yd. before the place to be designated, unless special conditions should require otherwise. They are to be perpendicular to the road, and on the right of the direction followed.

Signs indicating direction are to be situated at the entrance or exit of places, as well as at branches or crossings of importance. There is to be a different sign board for each direction, containing only the name of the first place in the direction one is proceeding, and the name of the first town of importance toward which one is traveling. The latter name will be identical on successive posts until the town in question is reached. Distances will be recorded in kilometers beside the name of town. The inscriptions are to be headed with an arrow and abbreviation indicating the class of road. All signs are to be placed so that they will be within the radius of the lights on vehicles. They are to be 6 ft. 6 in. above the level of the road if they are in a place near which there is pedestrian traffic, and 6 ft. 3 in. high at the most if they are on a wall. The placing of signs on walls or buildings is recommended.

Inscriptions are to be white on a dark blue background, with the lettering 6 in. in height. Numerals will be a little smaller than letters. Iron, varnished sheet iron, or wooden signs can be used. Enamel signs are not recommended as they deteriorate too easily and are difficult to repair. On the other hand, wooden signs and posts which are prepared with care can be preserved for a long time. Maintenance of the signs is to be looked after so that inscriptions are always legible. It is planned to have the roads of France completely equipped with these signs by the end of 1921, at the latest.

Excess Motor Equipment Alloted to States for Highway Work

STATE highway officials again are expressing disappointment at their inability to secure certain classes of materials for roadbuilding purposes from the War Department. It had been expected that the action of Congress in expressly directing the Secretary of War to turn over surplus materials suitable for road-building purposes would accelerate delivery. Previously, legislation left the transfer of materials to the discretion of the Secretary of War.

One of the results of the mandatory statute has been the withdrawal of much of the needed material from the surplus list. Steam shovels, cranes, mobile machine repair shops, and industrial railway steel, are items than can be used to great advantage at a number of points but the greatest difficulty is being experienced in securing this property. The War Department is said to have very imperfect inventories. Even when agents of the Bureau of Public Roads locate the material, it generally means a long fight to secure its transfer. The latest statement from the U. S. Bureau of Public Roads concerning allotments and deliveries of motor vehicles to the states is given herewith.

		Allotments			Total Vehicles allotted	Total Motor Vehicles delivered to April 1, 1920	Percentage delivered April 1, 1920
		Trucks	Fords	Autos			
1	Alabama	432	53	11	496	340	69
2	Arizona	282	35	6	323	277	86
3	Arkansas	343	42	8	393	326	83
4	California	622	77	15	714	579	81
5	Colorado	358	44	9	411	344	84
6	Connecticut	124	15	4	143	125	87
7	Delaware	34	4	4	42	42	100
8	Florida	236	29	6	271	200	74
9	Georgia	553	68	14	635	514	81
10	Idaho	251	31	6	288	230	80
11	Illinois	898	110	22	1030	892	87
12	Indiana	556	68	14	638	505	79
13	Iowa	595	73	15	683	517	76
14	Kansas	593	73	15	681	538	79
15	Kentucky	400	49	10	459	348	80
16	Louisiana	280	34	7	321	287	89
17	Maine	196	24	5	225	182	81
18	Maryland	181	22	4	207	137	66
19	Massachusetts	303	37	7	347	208	60
20	Michigan	596	73	15	684	543	79
21	Minnesota	584	72	14	670	549	82
22	Mississippi	366	45	9	420	307	73
23	Missouri	697	86	17	800	614	77
24	Montana	413	50	10	473	370	78
25	Nebraska	440	54	11	505	387	77
26	Nevada	265	33	7	305	240	79
27	New Hampshire	83	11	2	96	88	92
28	New Jersey	245	30	10	285	273	95
29	New Mexico	331	40	8	379	315	83
30	New York	1021	126	25	1172	843	72
31	North Carolina	470	58	12	540	447	83
32	North Dakota	319	39	8	366	287	78
33	Ohio	761	94	19	874	762	87
34	Oklahoma	476	58	12	546	510	93
35	Oregon	326	40	8	374	295	79
36	Pennsylvania	942	116	23	1081	776	72
37	Rhode Island	48	6	1	55	52	95
38	South Carolina	296	36	8	340	281	83
39	South Dakota	333	41	9	383	278	73
40	Tennessee	462	57	11	530	461	87
41	Texas	1199	148	30	1377	1045	76
42	Utah	237	29	6	272	225	83
43	Vermont	95	12	3	110	85	77
44	Virginia	406	50	10	466	399	85
45	Washington	298	36	7	341	263	77
46	West Virginia	217	27	5	249	195	79
47	Wisconsin	521	64	13	598	399	67
48	Wyoming	252	31	7	290	232	80
49	Dept. of Agriculture	1129	287	55	1471	799	54
	Totals	21,065	2737	557	24,359	18,933	78

Test Shows Actual Live Load on School Room Floor

To ascertain definitely what live load actually comes upon an ordinary class room floor, E. H. Enger, architectural engineer of the Bureau of Buildings, Minneapolis Board of Education, recently made test at South High School, Minneapolis. As a result of the test the municipal building department reduced the standard required by 25 lb. per square foot. Before that time the Board of Education was compelled to provide for 100 lb. live load per square foot.

In a room 24 ft. 5 in. x 32 ft. (781.3 sq.ft.), 258 pupils were placed. This gave each pupil 3.03 sq.ft. of floor area, including space taken up by desks. The room was crowded, two pupils in each seat, aisles full and space in front, rear and sides of room filled. The room normally held 48 pupils and one teacher.

The pupils were weighed one at a time as they filed out of the room. The result was:

Desks, 48 at 55 lb	2,640 lb.
One desk at 87 lb	87 lb.
Pupils, total weight	29,848 lb.
Total weight	32,575 lb.

This makes the total live load per square foot, 41.7 lb. Average weight per pupil was 115.6 lb. Under normal conditions the result would have been:

48 pupils at 115.6 lb	5,550 lb.
48 desks at 55 lb	2,640 lb.
1 desk at 87 lb.	87 lb.
1 teacher at 175 lb	175 lb.
Total weight	8,452 lb.

This gives a load per square foot of 10.83 lb. Had the room been filled with adults at 150 pounds average, as in night school work:

48 persons at 150 lb	7,350 lb.
48 desks at 55 lb. each	2,640 lb.
1 desk at 87 lb.	87 lb.
Total weight	10,077 lb.

This gives a load per square foot of 12.9 lb.

Good Concrete Watertight Under 35-Ft. Head

Tests of concrete tanks for watertightness have recently been made by the United States Bureau of Standards. These tanks were made of ordinary 1 : 2 : 4 concrete with only the usual precautions for good material and mixing and placing. For a while the loss increased slightly with time, but after 150 days it was found that the day loss curve took the form of a straight line showing daily loss had become constant. This loss, however, was so low that the outside of the tanks were dust dry. It is the conclusion, therefore, of the Bureau that 1: 2: 4 concrete in this case was sufficiently waterproof for this head.

Swamp Drained by Conduits Under Floor of Culvert

By R. C. Hardman
Formerly Superintendent Division of Municipal Engineering, The Panama Canal

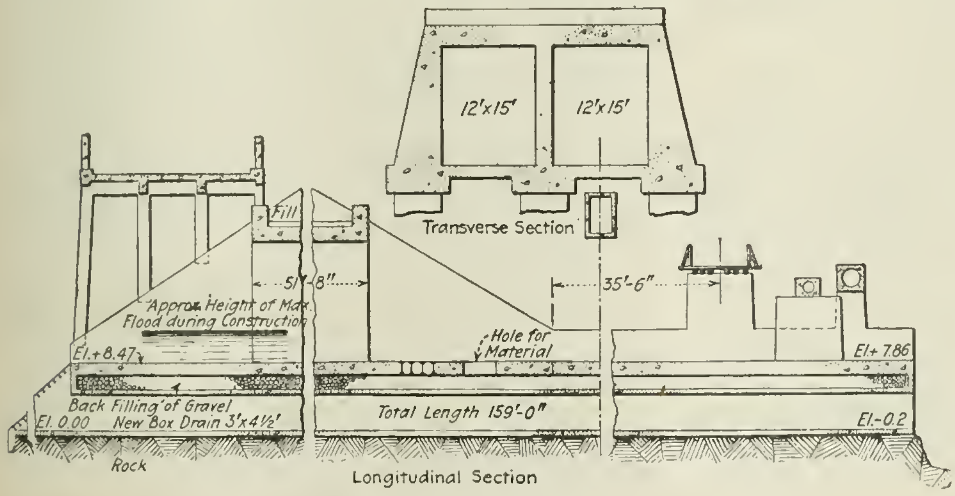
To eliminate an anopheles-mosquito-breeding swamp resulting from the very flat grades of the Cardenas River in the Panama Canal Zone the bed of the stream was lowered 8½ ft. by means of a 3 x 4½ ft. reinforced-concrete box drain under the floor of an existing culvert. The stream was carried by the culvert, which has a concrete bottom at El. 8.47, which is higher than the old stream bed. As a consequence the stream backed up and formed the swamp. The culvert discharged the stream with a drop of about 15 ft., or to about El. 7. By the construction of the box drain the stream has been brought to approximately its former level.

The culvert was originally built to carry the Panama Railroad and had a width at the top of 37 ft. 6 in., but was later widened to 51 ft. 8 in. The floor was likewise extended at the lower end to carry the stream under an old highway bridge and two pipeline trestles. More recently a reinforced-concrete highway bridge was constructed upon the upper wing walls as shown in the drawing. The floor of the culvert and the apron extension has a total length of 149 ft.; that part of the floor under the culvert proper is reinforced by old rails on 2-ft. centers transversely and on 4-ft. centers longitudinally; the apron floor is not reinforced. Consequently in the construction of the drain the portion under the old culvert was done by tunnelling, the material being removed through four holes in the floor. The portion under the apron was by open cut.

As the work was all done in the rainy season when high floods are to be expected, no attempt was made to exclude from the work any but the normal stream flow and high tides, which reach a maximum at El. 11.2. This was accomplished by small cofferdams built around each end of the culvert barrel under which the drain was built. The other barrel of the culvert was separated from the first by temporary low bulkheads and by means of three lines of 20-in. dredge pipe the normal flow of the stream was carried. Floods, which reached a maximum elevation of about 12.5 during the work, handicapped the work somewhat but none was disastrous. Cofferdams were kept dry by a steam pump having a 6-in. suction and discharge.

The excavation, which was mostly of stiff blue clay, presented no unusual difficulties. Rock, varying from nothing to about 2 ft. was encountered practically the full length of the work, the lower end only of the drain not being founded on rock. Backfilling between the top of the drain and the bottom of the culvert floor was made with gravel and sand well rammed in.

The work was carried out by the forces of the Division of Municipal Engineering, under George W. Green, acting superintendent, and W. E. Maxon, who served as general foreman.



LONGITUDINAL AND CROSS-SECTIONS OF DRAIN 159 FEET LONG UNDER CULVERT FLOOR AND APRON

Interest in Irrigation Rapidly Increasing in California

During 1919 the number of applications for the formation of Irrigation Districts in California was twice what it has been in any previous twelve months and the area involved was considerably more than double any preceding record. This refers to new districts and does not include applications for extensions. It is notable that among last year's applications there are fewer than heretofore of the sort which are of doubtful stability or which state officials must refuse to approve.

Among the new districts this last year have been some particularly large units. For example, the Madera and Merced districts comprise 350,000 and 173,000 acres respectively. For the former there is proposed a dam 382 ft. high on the San Joaquin River. Among the other projects now under consideration are the Pine Flat District on Kings River with a dam almost as high as that just mentioned and another large project on the Kern River. A notable feature of these proposed districts, particularly the large ones, is that they are receiving careful engineering attention in the preliminary stages.

The causes of the increased activity in the formation of Irrigation Districts in the past year are ascribed to the fact that there has not been much extension of irrigated areas during the preceding years and also because the three successive dry years which California has suffered have directed attention toward irrigation; that is, in districts where dry farming was previously satisfactory the demand is now for irrigated areas. It is notable that among the new projects those on which the water has to be pumped are in a small minority; the preference is for gravity systems. practically all of the petitions received during the last year apply for the formation of districts under the amended Wright Act. This is more properly known as the California Irrigation District Act. There is a more recent act known as the California Irrigation Act which is said to have certain advantages over the Wright Act, but the new act has not yet been tested out legally and there seems to be unanimous preference for charters whose validity has been fully proved.

LETTERS TO THE EDITOR

Rating of State Sanitary Control of Public Water Supplies

Sir—There has come to the attention of the Bureau of the Public Health Service an article in *Engineering News Record*, Jan. 1, 1920, p. 44, entitled "Rating of State Sanitary Control of Public Water Supplies," accompanied by a chart and recapitulation. The text of this article attributes the data to the Public Health Service.

A review of the records shows that the publication of this article occurred without the knowledge or consent of the Bureau and further that the Public Health Service did not prepare data such as the article is represented as having been compiled from.

In view of these circumstances it is requested that you retract your statement of the averred source of the data upon which the article was based and make suitable explanation to correct the widespread misapprehension its appearance caused, particularly on the part of the divisions of sanitary engineering of the various states. This latter result of the appearance of the article is especially unfortunate and opprobrious in view of the increasingly friendly relations existing between the Service and the various state agencies exercising control of water supplies.

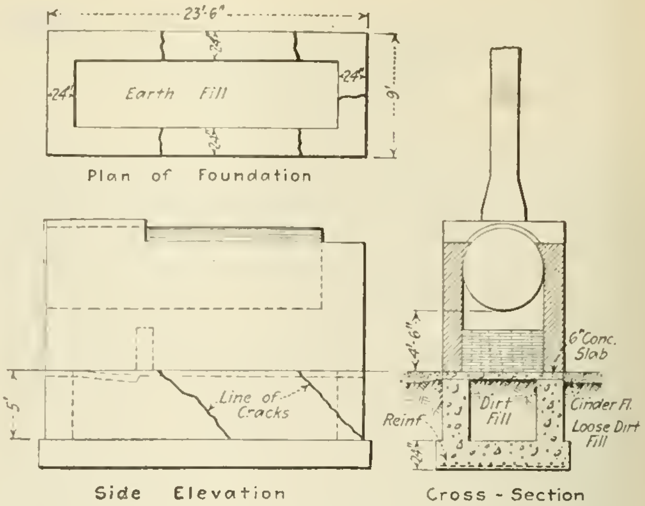
Washington, D. C. H. S. CUMMING,
Surgeon-General, United States Public Health Service.

[The map and rating data in question but not the accompanying text were sent to *Engineering News-Record* by a long trusted friend with the statement that they had been copied from a copy of a chart made up by persons connected with the United States Public Health Service. Our correspondent stated that he did not know whether the Service desired to have the data "published, but you might get permission from them if you desire." Through an oversight that we very much regret the suggestion was overlooked and the data were reproduced without consulting the Public Health Service. Except for the general title to the article and ten lines of text, all based upon the material that came to us, *Engineering News-Record* made no compilation or deductions. By a slip of the pen, Michigan was substituted for Massachusetts in the text as being one of three states that stood highest in the rating table but the table itself showed Michigan second in the list. We had no reason to suppose that the data were confidential nor that they were not authentic. The blueprint showing the data we reproduced bore a title distinctly stating that the "rating" was made by the United States Public Health Service and bore the date "1919." We are informed that there are a considerable number of discrepancies between the original data compiled by persons connected with the United States Public Health Service and those shown on the map and rating table published in our issue of Jan. 1, but a careful checking discloses no error in reproducing the map and table received by us.—EDITOR.]

Curious Cracks in Concrete Boiler Footings

Sir—An interesting development of cracks in a concrete boiler footing seems to the writer worth recording. In the early fall of 1919 the Maintenance Department of McCook Aviation Field, built a foundation of the dimensions shown in the accompanying sketch for a return tubular boiler. The foundation was built on gravel soil. of 1:2:4 concrete with walls of sizes shown. The dirt fill inside the walls was put in and watered to a puddle shortly before the top slab was poured.

After the boiler was installed and fire was started small cracks began to appear on the two side walls and rear wall as shown. From these cracks steam began to escape with considerable force. The cracks became larger in the course of a day or two until they were about ¼-in. in width. By this time escape of steam stopped and cracks ceased to open further.



Plan of Foundation

Side Elevation

Cross - Section

DETAILS OF BOILER FOOTING IN WHICH CRACKS OCCURRED

Upon investigation by digging to the footing the cracks were found to stop at the footing, proving that no settlement had taken place.

The writer's opinion is that the wet earth fill, upon being heated, produced steam enough to make sufficient pressure to crack the concrete walls. The cracking of the walls in more than one place was probably caused by walls of mud (caused by unequal settlement of dirt when watered) forming several pockets or compartments, thus confining the steam pressure to a small wall surface.

H. E. MILLER,
McCook Field Dayton, Ohio. Architecture Engineer.

Shall Chinese Be Imported To Relieve Unskilled Labor Shortage?

Sir—I have just returned from an extensive trip covering the entire West where I found from the time I left Chicago until I reached the Pacific Coast, thence from the Mexican to the Canadian borders, that the main topic of conversation, whether it was banker, farmer, merchant or engineer with whom I conversed, was the shortage of unskilled labor. This because the same was not only affecting the production of their farms and their industries but because it was also seriously handicapping many large engineering projects whose furtherance was being stunted on account of the lack of economical labor as represented by *the pick and the shovel and wheelbarrow man.*

I also found that some of the thinking people of the West were endeavoring to solve the question and have started active work in sounding sentiment as regards the modifying of the Exclusion Act so as to permit the importation of a limited number of Chinese laborers to do the menial and rough work which our white labor will no longer do. Such labor to be admitted under the direct supervision of a commission representative of our different governmental departments, the farming, labor and business interests of the country. This commission would supervise their employment so that they would not compete with our American labor nor reduce their standard of living. The importance of the question involved and of the movement impressed me so much that I concluded, on my return to Chicago, that I would endeavor to learn how the members of our profession feel about this all-important question.

As engineers we must assist in solving this vital problem of securing a source of supply of common labor, which would be both economical and efficient, if we wish to see the many engineering projects, in which we are directly or indirectly interested, completed. Unless we do interest ourselves more than passively I am afraid many of the large projects under consideration will be held in abeyance because there is no question but what one of the greatest items of cost of construction today is labor.

As city engineer of Chicago for twenty-two years, my experiences have been many as to how the increased labor costs have affected construction. Realizing what the securing of economical labor means to the future of our profession, because of the effort the present abnormal labor conditions are having on capital seeking new development projects, I concluded that it is timely to make a survey and I am desirous of securing opinions as to the importation of Chinese labor under the above-mentioned conditions.

The eyes of the world are upon America. Europe has been drained of its manhood. Continental industry has been crippled beyond hope of immediate reparation and the foodless populations of devastated countries now look to us for salvation. Shall we sit idly by and permit antiquated and perverted notions of "economic necessity" to stultify our efforts? Or shall we assert the cause of righteousness and, recognizing the needs of the hour, pronounce to the world that America is prepared to continue the pace in the race for progress already set by tireless workers of reconstruction?

As the law of supply and demand governs at all times and with the demand here and not sufficient supply available, I believe it is up to us to do something.

JOHN ERICSON,
Consulting Engineer, Department
of Public Works, Chicago.

Chicago.

"Prohibition and the Foreign Born"

Sir—I am astonished at a policy that permitted you to print such an editorial as the one found in the *News-Record* of April 15 headed "Prohibition and the Foreign Born." It is true that most of the space occupied by this editorial is in quotes, but the last paragraph so adequately expresses the editor's agreement with the sentiments that the paper has seen fit to quote, that there can be little doubt that they represent the editorial attitude.

In the first place, the subject impresses me as one that does not properly belong in the technical press, and I think you will find that most engineers will agree with me on that point. I cannot believe that *Engineering News-Record* has strengthened its position among engineers by taking up this question, whatever may be the personal desires or opinions of the writer of that editorial.

There are but few people who believe that the moral question was strong enough to add the eighteenth amendment to our constitution. You will find that the general consensus of opinion of thinking men, who have the facts at hand, is that the economic argument, and not the moral argument, was what finally put prohibition across. Your last paragraph attempts to justify the editorial on the ground that you are discussing an economic peril. It may or may not be true that you have hit upon one of the economic ills of prohibition. There probably are more of them. But engineers, above all men, are supposed to present full facts, suppressing none, before drawing conclusions. Possibly you have presented a fact that appears to support a contention you desire to make. But you have presented such partial data, and it is so apparent that much has been suppressed, that it appears most untechnical for you to attempt in this manner to arouse us to the idea that there is an economic peril. Even if it were granted that the one thing you quote is an economic evil (a concession I am not prepared to make) it is the net economic effect we want to know about.

It is inconceivable to me that a paper of such high standing as the *News-Record* should quote sucsh out-and-out liquor propaganda as the statement, "under prohibition the workers are restless and discontented," and then back up such a statement with its editorial comment. Labor is equally, if not more, restless in countries of the world where there is no prohibition. The effects of the labor troubles in England have been more far-reaching than any trouble we have had; and England has not prohibition. I have always thought that such propaganda was spread for the benefit of men who could not reason or think for themselves. I certainly did not expect to find a paper which I have always held in high esteem, spreading such illogical bunk.

Let me tell you that the prohibition amendment was not added to our constitution by "those prohibitionists who regard the taking of a drop of liquor as a deadly sin," as you appear to believe. It was put there by men vitally and actively interested in the economic welfare of this country, the same economic welfare which you say is in peril, and it is being supported there by these same men and by others of their type, in vastly increasing numbers, who are coming to realize the asset that it is to business, industry, and the general development and economic advancement of the country. If "Ye Scribe" believes that the moral question was the argument that wrote the amendment on our books he must be a Rip Van Winkle, just returning from the mountains.

EDGAR DOW GILMAN,
Cincinnati, Ohio. U. S. Engineer's Office.

[With Mr. Gilman's contention that the editorial in question "does not properly belong in the technical press" we can not agree. The big problem in the construction field today is to secure common labor. It would seem that, especially in the interests of contractors, discussion of any phase of the labor situation has a distinct place in an engineering paper. The editorial made no pretence of presenting "full facts," nor did it draw conclusions tending to "arouse us to the idea that there is an economic peril." It did advocate a calm inquiry into the effect of prohibition on immigration and into the advisability of altering the amendment. Mr. Gilman wants facts. Surely such an inquiry as is suggested is the only way of obtaining them.—EDITOR.]

A New Society of Interest to Engineers

Sir—The Secretary of the American Meteorological Society asked the writer to communicate to *Engineering News-Record* something regarding the features of the work of this new organization.

The Society, organized at St. Louis, December, 1919, includes in its objects matters of interest to various classes of engineers. As stated in the Constitution: "The objects of this Society are: The advancement and diffusion of knowledge of meteorology, including climatology, and the development of its application to public health, agriculture, engineering, transportation by land and inland waterways, navigation of the air and oceans, and other forms of industry and commerce."

The Society is intended to be largely a working organization, and to that end various special committees have been appointed, having charge of investigations and promotions of meteorological work along different lines. Of most interest to engineers are:

The Committee on Agricultural Meteorology, of which J. Warren Smith, U. S. Weather Bureau, Washington, D. C., is chairman. This committee will cover work in many respects closely related to that of Agricultural Engineers interested in irrigation and drainage.

Major-General C. T. Menoher, Air Service, Washington, D. C., is chairman of the Aeronautical Committee.

The Committee on Engineering Meteorology, of which the writer is chairman, includes several engineers among its membership. This committee will undertake at once an active study of the needs for additional rainfall stations in the United States, and all engineers interested in having increased rainfall records or other meteorological data are requested to communicate with the chairman of the committee. Co-operation with engineers and contractors is also desired in devising means for making weather and flood forecasts especially useful in river improvement and other construction work.

Persons actively interested in meteorology, or the use and application of meteorologic data, may become members. Fellows are elected by the Council, requirements for fellowship being of the same nature as those for membership in engineering societies. The fixed annual dues for members and fellows are $1. Higher grades of membership and fellowship with increased annual dues are also provided for.

Voorheesville, N. Y. ROBERT E. HORTON.

HINTS FOR THE CONTRACTOR

Friction Heads for Water Supply for Highway Construction

By R. E. S. Geare
General Sales Manager, T. L. Smith Co., Chicago

FAILURE of water supply because of insufficient pump and pipe line capacity occurs frequently in highway construction operations. In the majority of instances the cause is neglect of friction head. This resistance per 100 ft. of pipe for different volumes of flow is given in the accompanying table.

With this table the calculation of head and of horsepower is a simple operation. It is desired, for example, to deliver 100 gal. per min. to an elevation of 100 ft. through 200 ft. of 2-in. pipe with two elbows and one valve in the line; what will be the head? With 100 ft. (elevation) plus 43.5 (friction in 200 ft. of 2-in. pipe, which is double the friction in 100 ft. of 2-in. pipe as given in the table) plus 3 (friction in elbows), plus 1.7 (friction in one valve) we have: 100 + 43.5 + 3 + 1.7 = 1.48.2 ft., total head.

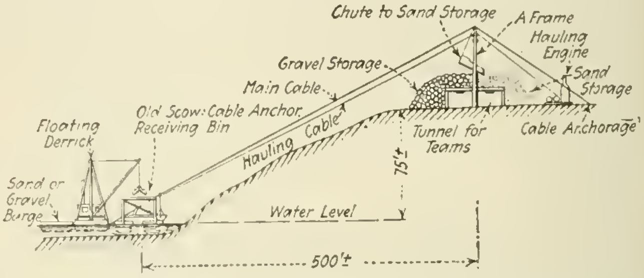
With 100 (gallons per minute) multiplied by 8.33 (weight in pounds of one gallon of water) multiplied by 148.2 (total head in feet) divided by 33,000 (33,000 lb. elevated 1 ft. in 1 min. is one horsepower) we have: (100 × 8.33 × 148.2) ÷ 33,000 = 3.74 theoretical horsepower. At 60 per cent pump efficiency we have: 3.74 ÷ 0.60 = 6.2 actual horsepower.

Once the capacity of pump and pipe line is correctly determined a few simple precautions will prevent the majority of pumping troubles experienced in highway construction. 1. Look the pump over for mechanical defects at least once a week. A new bolt or nut may avert a costly shutdown later. 2. Oil the pump regularly. 3. Be sure that the weight of the discharge line is not borne by the pump; brace the line or support it firmly. 4. With a force pump, place a foot valve, with drainer, in the submerged end of the suction line and a valve in the discharge line. 5. With a centrifugal pump, a hand or steam primer should be provided and connected to the top priming hole in the casing. Fill the casing with water *before* starting the pump.

Plant For Sand and Gravel Storage

By George W. McAlpin
Point Pleasant, W. Va.

UNLOADING Ohio River sand and gravel from barges and storing them at the top of a bank so as to be accessible to teams and trucks, is successfully handled by the plant shown in the accompanying sketch. This plant was designed and installed by the Western Rivers Co., Point Pleasant, W. Va. Sand and gravel have been unloaded and stored at the rate of 50 cu.yd. or more per hour. An old dump scow, sunk in the river to a chosen point, just below mean water level, furnished anchorage for the outer end of a cable-way rig, and also supported a loading hopper. The other end of the main cable was carried over a simple A-frame at the top of the slope, and anchored to a dead man. Sand and gravel, transferred from barges to the hopper by a floating derrick passed into a bucket, operating on the cable-way with a single hauling line and no hoisting, or main-fall line. The bucket was brought to the top of the slope and dumped by a small two-drum hoist. Upon reaching the frame the bucket engaged the end of a short chute, placed between the legs of the frame, and discharged directly into the storage pile. To dump into the gravel storage a trip line was attached to the bucket to overturn it at the desired point. The bucket returned to the foot of the slope by gravity. Tunnels, through storage piles, fitted with bin gates, permitted ready loading of trucks and wagons.



PLANT UNLOADS AND STORES 50 CU.YD. PER HOUR

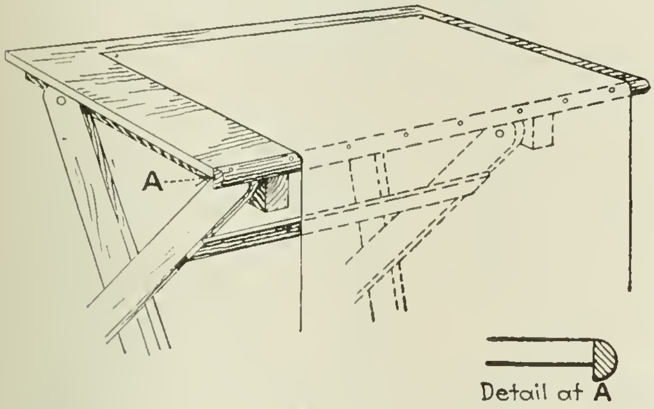
FRICTION HEADS AT GIVEN RATES OF DISCHARGES IN CLEAN WROUGHT IRON PIPE (INSIDE DIAMETER) FOR EACH 100 FT. OF LENGTH

U.S. Gal. Per Minute	U.S. Gal. Per 24 Hours	¾-In. Pipe Friction hd Feet	¾-In. Pipe Friction hd Lbs.	1 In. Pipe Friction hd Feet	1 In. Pipe Friction hd Lbs.	1¼ In. Pipe Friction hd Feet	1¼ In. Pipe Friction hd Lbs.	1½ In. Pipe Friction hd Feet	1½ In. Pipe Friction hd Lbs.	2 In. Pipe Friction hd Feet	2 In. Pipe Friction hd Lbs.	2½ In. Pipe Friction hd Feet	2½ In. Pipe Friction hd Lbs.	3 In. Pipe Friction hd Feet	3 In. Pipe Friction hd Lbs.
5	7200	7.59	3.30	1 93	.84	.71	.31	.27	.12	......	......	......	......	......	..
10	14400	29.90	13.00	10.26	3.16	2.41	1 05	1 08	.47	......	......	......	......	......	
15	21600	66.01	28.70	16.05	6 98	5 47	2.38	2.23	.97	......	......	......	......	......	
20	28800	115.92	50.40	28.29	12.30	9.36	4.07	3.81	1 66	......	......	......	......	......	..
25	36000	......	......	43.70	19.00	14.72	6.40	5.02	2 62	1.18	.51	......	......	......	
30	43200	......	......	63.25	27 50	21.04	9 15	8.62	3.75	2.09	.91	......	......	......	...
35	50400	......	......	85 10	37 00	28.52	12 40	11.61	5.05	2.76	1.20	......	......	......	...
40	57600	......	......	110.40	48 00	37 03	16 10	14.99	6 52	3.68	1.60	1.19	.52	......	.....
45	64800	......	......	....		46 46	20 20	18 74	8 15	4.60	2.00	1.49	.65	......	.....
50	72000	......	..	.	. .	57 27	24 90	23.00	10 00	5.61	2.44	1 85	.81	.80	35
75	108000	.. .	......	...		129.00	56 10	51.52	22 40	12 23	5 32	4.14	1.80	1.70	74
100	144000	......	......	.		.		89.70	39 00	21.75	9 46	7 36	3 20	3.01	1 31
125	180000	. ..	......	..	.		.	...	....	34 27	14 90	11.24	4 89	4.57	1 99
150	216000	.	......	..		..		....	.....	48 76	21 20	16.10	7 00	6.55	2 85
175	252000	......	... .			. .		. .	.....	64 63	28 10	21.75	9 46	8.85	3.85
200	288000	......	.....	. .	..			. .	. ..	86.25	37 50	28 68	12 47	11.54	5 02
250	360000	......	... ..	.....	..	.		.	.....	......	......	45 21	19 66	17.84	7 76
300	432000	......	......	......	..			.	..	......	.. ...	64.53	28 06	25.76	11 20
350	504000	......	...	.. .	.	. ..		.	. .	......	......	......	..	34.96	15.20
400	576000	......	..	....	......	.			. .	.....	......	......	.. ...	44.85	19 50
450	648000	......		. .	....					. .	.....	. ....	. .	57 50	25 00
500	720000	......	..		...					.. ..	....	. ....	. .	70 84	30 80

Half-Round Strip Protects Tracings From Harmful Creases

By C. Nye, New York City

MANY a large paper drawing or tracing has been practically ruined by pressure against it while overhanging the sharp edge of a drafting table. The drawing shown illustrates a practical remedy. A strip of half-round moulding, obtainable at carpenter shops, is secured to the edge of the board by means of small wood screws, set into the drawing board at an angle. The drawing will then hang smoothly over the edge and one may lean against it without fear of leaving a fold in the drawing. The board is not impaired and the strip can be removed at will. A strip with a diameter greater than the thickness of the board is recommended in order to give the drawing a flatter arc upon which to rest.



DRAWING BOARD FITTED WITH HALF ROUND MOULDING

Practical Points in Constructing Hydraulic Fill Dams

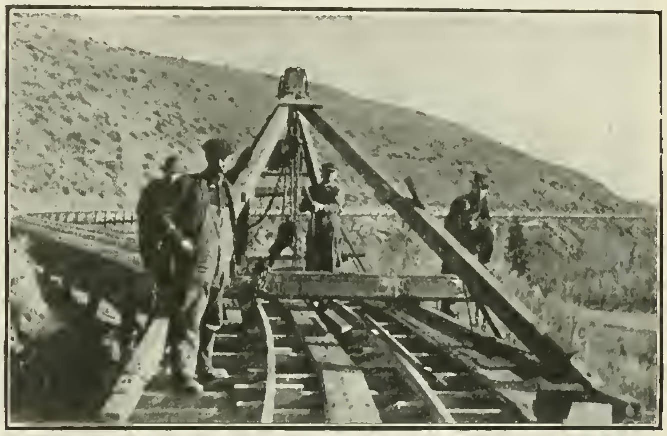
The following summary of points to be observed in the construction of hydraulic fill dams is given by Allen Hazen, consulting engineer, New York City, in a paper, "Hydraulic Fill Dams," presented before the American Society of Civil Engineers May 5 and published in the April *Proceedings*, page 525:

1. It is not well to build an hydraulic-fill dam of material of which any large percentage consists of clay or of particles less than 0.01 mm. in diameter; and in general all such smaller particles may well be wasted and excluded from the dam.
2. By reducing the construction pool to a minimum, and by controlling it and the quantities of water used for sluicing, the core material may be held to a certain degree of coarseness by wasting all smaller particles. An effective size of 0.01 mm. may reasonably be sought.
3. It is desirable to study by borings the actual consolidation of the material, and to adjust the construction of the upper parts of the dam to the demonstrated condition of that which lies below.
4. Make the toes large enough to resist with an ample factor of safety the whole pressure of the core material as a liquid until there is demonstration of the solidification of the core to a point where horizontal pressure is eliminated.
5. Increase the weight and solidity of toes by the use of rock fill, placed hydraulically or otherwise.
6. Stability is increased by compactness. It is worth while to watch voids closely, and to make every effort to hold them at a minimum. The extra weight is advantageous, but security against compression and re-arrangement with resulting temporary quicksand conditions, can be best reached in this way.

A strict application of these principles may reduce the number of hydraulic-fill dams that are built by eliminating that method of construction from consideration where the available material contains too many very small particles. It may also increase considerably the volume and cost of those that are built. It would seem, however, that following them to a logical conclusion, with such testing as can reasonably be done, will result in eliminating present uncertainties and in putting a most useful method of dam construction on a definite and safe basis.

Settled Flume Restored to Level by Derrick Traveler

A METAL flume from ½ in. to 8 in. out of level, because of rotted trestle legs, was restored to true grade by means of the traveler shown by the accompanying view. Timber bents, spaced 16 ft., supported the flume. Sliding earth had covered the concrete pedestals and the feet of the timber posts and had caused rot which permitted settlement. To restore the grade it was first undertaken to jack up the bents, cut off the foot or two of rotted timber and splice the legs, but this process proved slow and difficult and the traveler was devised as a substitute by W. T Bowman, district engineer. The traveler spans two panels of the flume so that its apex is directly over the intermediate bent which is being repaired. A 5-ton triplex chain block hung at the apex has its fall hitched to an 8-in. x 8-in. timber, which reaches across the flume and whose projecting ends are chained to the tops of the bent posts. By means of the traveler, the flume and its attached bent are lifted to grade and the rotted legs are cut off, spliced and reseated on the pedestals. To facilitate operation on the curves, the longitudinal struts connecting the feet of the traveler legs are hinged at the center. This traveler increased the speed of restoration about five fold. The reconstruction was on the Cascade Irrigation District canal along the Yakima River near Ellensburg, Wash., and is described in the *Highway Magazine* for April, 1920.



FOUR-LEG DERRICK LIFTS LOW BENTS TO GRADE

Caring for Activities of Juniors

In England, apparently, there is the same feeling as here that the junior members of engineering societies have not been properly taken care of. Accordingly, *The Surveyor*, London, commends the establishment of an "Assistants' Section" by the Northeastern District of the Institution of Municipal and County Engineers.

NEWS OF THE WEEK

New York, May 6, 1920

Change Basis of Representation at Organizing Conference

In its official call to engineering societies to participate in the Organizing Conference to be held in Washington, D. C., June 3 and 4, as announced in the news columns of this journal last week, the Joint Conference Committee of the four founder societies incorrectly stated the basis of delegate representation at the meeting. A uniform basis of one delegate for from 100 to 1,000 members, instead of one delegate for from 100 to 2,000 members as originally stated, will apply to both national and local societies. On this basis the American Society of Civil Engineers will name ten delegates to the Organizing Conference. The following letter, dated May 1, has been sent by the committee to secretaries of all organizations which will take part in the conference:

> Through a most unfortunate oversight, which is greatly regretted, the letter of invitation sent out by the Joint Conference Committee and dated April 19, contained on p. 3 an erroneous statement with regard to the basis of representation in the Organizing Conference. The same error is found on the last page of the Credential Blank.
>
> Will you please change the paragraph in question on p. 3 to read as follows:
>
> *Representation in Organizing Conference*—As a basis of representation in the Organizing Conference, the following will be tentatively used:
>
> Each national organization will be entitled to one delegate for 100 to 1,000 members and an additional delegate for each additional 1,000 members or major fraction thereof. Each local, state or regional organization or affiliation is entitled to one delegate for 100 to 1,000 members and an additional delegate for each 1,000 members or major fraction thereof. A local section, branch, chapter or association of a national organization will be represented through its national organization; this, however, shall not prevent its representation also as a part of a local affiliation.
>
> Please also make a corresponding change on the last page of the Credential Blank.

Funds for Civilian Pay in Engineer Corps Held Up

The Chief of Engineers, U. S. Army, has been placed in an embarrassing position by the action of the House in rejecting, on a point of order, the appropriation carried for services of skilled draftsmen and civil engineers in connection with the engineer equipment of troops. The appropriation was carried in the Army Appropriation bill because of the failure of the Appropriations Committee to provide for these funds in the Legislative and Executive bill, which was the proper measure to carry the appropriation. The latter bill has become a law and no additions can be made to it. As a result Congress has rendered it impossible for the Chief of Engineers to carry on the activities with which he is in charge, and which are vitally necessary to the Army, but which must cease unless the necessary funds are provided for carrying on the work.

Hearings on St. Lawrence River Development Arranged

The International Joint Commission has arranged a schedule of hearings in its investigation of the feasibility of deepening the St. Lawrence River to provide a route for ocean vessels from the Atlantic to the Great Lakes and to develop power along the route. The hearings begin on May 7 at North Bay, Canada, and proceed westward, stopping at all the important centers in the Canadian and American northwest, turning about the middle of June to come East again as far as Buffalo, which will be reached June 28 and 29.

Am. Soc. C. E. Has 9,441 Members

The total membership of the American Society of Civil Engineers on April 5, 1920, according to the April *Proceedings*, was 9,441.

Wisconsin Concrete Road Program Cut in Half

Although the proposed 1920 concrete road program in Wisconsin called for the construction of 400 mi., owing to "a rather acute situation relative to the cement supply" it has been found necessary to cut that mileage in half, the state being able to secure approximately only 700,000 bbl. of cement. In the quarterly progress report of the State Department of Engineering the statement is made that because of the cement situation the State Highway Commission has had to take control of the allotment of cement for concrete roads during the current year.

Although during January and February rather high bids were received on concrete roads to be constructed, it has been noted that later bids are more reasonable. More than 50 per cent of the mileage of concrete surfacing advertised has been awarded by contract or arranged for by day labor or force account work. Contracts for 63.77 mi. of concrete road have been awarded since January 1, 1920. On Federal-aid work 40 project statements, involving a total expenditure of $3,047,348, have been submitted, of which number 20 have been approved.

Wisconsin contemplates doing important work this year by day labor. The number of these day labor jobs has not yet been determined and the work and the organization not finally completed. Studies are being made of plant and equipment necessary, and it is expected that these jobs will go forward as soon as the season will permit. Every effort will be made to gain the utmost from these jobs in the way of information with respect to cost and other details of the work.

N. Y. Engineers and City Officials Discuss Salaries

With the object of bringing to the attention of responsible representatives of the city administration the facts regarding the inadequacy of the pay received by employees in the engineering service, the Municipal Engineers of the City of New York had as guests at their meeting held April 28 the Comptroller and the Civil Service Commissioner, both of whome spoke from the point of view of the employing authority after the case of the engineer in the city service had been presented by Arthur S. Tuttle, chairman of Engineering Council's Committee on Classification and Compensation; Robert Ridgway, engineer of subway construction, Transit Construction Commission; and J. Waldo Smith, chief engineer, Board of Water Supply. No action designed to relieve present conditions was taken at this session, although it was announced that the next meeting of the society this month would be devoted to open discussion of the subject of compensation.

Statistics presented by Mr. Tuttle showed that technical men in municipal service are receiving an average compensation considerably less than that secured by workers in the New York building trades who are now being paid on a scale of $9 a day. From 1915 to 1919 the average increase in pay of municipal engineers throughout the country has been only 9 per cent, the present average salary being slightly less than $2,000 per year, or less than a "living wage" for a man with family responsibilities. In urging increases for the New York engineers Mr. Tuttle also contended that the "dead wood" in the service should be cleaned out. He said that the setting up of new standards of compensation for engineer service in New York would quickly be followed by a general improvement in the status of city engineers throughout the country.

Robert Ridgway, speaking from an experience of 35 years in the engineering service of New York City and from the point of view of the man who has risen from the ranks to a position of high executive responsibility, made a forceful address, describing frankly the effect which the present scale of pay has had in lowering the morale of the city's engineering staffs and in creating an extremely large turnover of personnel—450 per cent in the case of the Transit Construction Commission in the period from 1913 to 1919. It is a short-sighted policy, Mr. Ridgway held, which fails to recognize that in the reconstruction period through which we are now passing, engineering skill is just as necessary as it was during the war. Inadequacy of pay to meet the present high cost of living is driving many of the best men out of the municipal service. If efficient technical organizations are to be maintained, it was pointed out, the city must meet, to a degree at least, the competition for men in private work.

J. Waldo Smith scored the engineer who, rising to the position of an employer of technical men, endeavors to show a low percentage cost of engineering on his work by compressing the payroll to the smallest limits. In the city service it was his belief that the deterioration in the quality of engineers during recent months has been most marked in the higher grades. In other words the able department head is leaving municipal service to take up more profitable work elsewhere. The value of engineering work, Mr. Smith said, should not form the basis of the pay of the engineers engaged on it. A job involving a comparatively small total cost may call for high skill in design or construction while ordinary work involving a big expenditure, such as an earth removal contract, may demand only ordinary engineering planning or supervision. While pay increases in city service may be slow, said Mr. Smith, it is equally true that decreases seldom are made and there is a great degree of permanency in such positions.

Commissioner William Drennan described the Civil Service Commission as an employment agency and made a plea for co-operation by heads of engineering bureaus in the selection of men and in the elimination of the useless city employee. At least 5 per cent of the municipal employee personnel can be "shaken out" each year, Commissioner Drennan believes, with great benefit to the service. The really valuable men, he maintained, are seriously damaged by the retention in office of incompetents. Professional dignity and modesty, he stated, deterred engineers in seeking what was due them. No such conditions were noticeable in the case of policemen and firemen.

Comptroller Charles L. Craig expressed the opinion that in years past New York City had been "over-engineered." He presented some sidelights on experiences with legislation involving appropriations at the State Capitol. A significant statement was one which explained that the progress of legislation is generally in proportion to the "voting element" behind it.

Detaining Reservoir Proposed for Hopkinsville, Ky.

A detaining reservoir and channel regulation work to protect Hopkinsville, Ky., from floods in the Little River have been recommended by Norcross & Keis, consulting engineers, Atlanta, Ga. The total estimated cost is $250,000. The proposed detention reservoir is somewhat similar to the one designed and built by the Solomon-Norcross & Keis Co. for Watervliet, N. Y., which Mr. Norcross states has proved most successful.

A. A. E. Officers Nominated

The following members have been nominated for election at the sixth annual convention of the American Association of Engineers to be held in St. Louis on May 10 and 11:

For president: L. K. Sherman, president of the U. S. Housing Corporation, Washington, D. C.

For first vice-president: T. A. Evans, senior engineer of the Board of Local Improvements, Chicago; H. O. Garman, chief engineer of the Public Service Commission of Indiana, Indianapolis.

For second vice-president: J. K. Anderson, consulting engineer, Charleston, W. Va.; Paul V. Augustinus, vice-president of the Marquette Electric Engineering Co., Chicago; A. B. McDaniel, principal engineer, construction division of the Army, Washington, D. C.

Minneapolis Engineers Endorse Hoover for President

At a meeting April 21 the Engineers' Club of Minneapolis endorsed a resolution advocating the nomination of Herbert Hoover for President.

Portland Cement Production in 1919

Preliminary estimates compiled by the United States Geological Survey, indicate that the production and shipments of portland cement in 1919 increased 13 and 21 per cent, respectively, over those in 1918 and that the stocks decreased 52 per cent, so that at the end of 1919 less than 5,000,000 bbl. of portland cement was in stock at the mills. The industry was set back considerably in 1918, when war restrictions reduced the shipments from the 90,703,474 bbl. shipped in 1917 to 70,915,508 bbl., but it is now regaining its lost ground. Early in 1919 the business was even poorer than in 1918, and practically all the increase reported was made during the latter part of 1919. The increase in the value of the cement shipped in 1919 over that shipped in 1918 was about 28 per cent. The shipments of portland cement in 1919 amounted to 85,485,000 bbl. valued at $144,461,000; the production amounted to 80,287,000 bbl.; and the stocks at the mills at the end of the year amounted to 4,976,000 bbl.

One new plant produced portland cement in 1919—the Indiana Portland Cement Co., at Greencastle, Ind. The total number of plants that produced cement in 1919 was 110, and the total number of plants that shipped cement was 113. The average factory price per barrel for portland cement in bulk in individual States in 1919 ranged from $1.57 in Kansas to $2.03 in Utah. The average factory price for the whole country in 1919 was $1.69, an increase of only 6 per cent over 1918.

The exports of hydraulic cement from the United States in 1919 amounted to 2,463,689 bbl. valued at $7,516,019, or $3.05 per bbl., increases of about 9.27 and 16 per cent, respectively, over 1918.

To Elevate Indianapolis Belt Line

The city engineer of Indianapolis, Ind., has been directed by the Board of Public Works to prepare plans and specifications for elevating the freight belt line of the Indianapolis Union Ry. from W. 10th St. to Kentucky Ave. The proposed work will extend 3½ mi., crossing ten streets and involving the separation of grades at three railway crossings. It may necessitate the relocation of the Belt Line shops. An approximate estimate of cost is $2,000,000. As several railway junctions and connections are affected, considerable time will be required to secure plans that will meet with universal approval and it is not probable that any construction work can be done for two or three years.

One-Third Iowa Highway Program Under Contract

With the assistance of Illinois, Wisconsin and Minnesota contractors more than 100 of the 300 mi. of hard surfacing scheduled for construction during 1920 by the Iowa State Highway Commission had been let by the end of March. Early in March engineers of the commission estimated that possibly the state might get 50 mi. of paving under contract for the season. However, owing to a let-up in highway construction in Illinois, contractors in that state wrote asking for information concerning certain Iowa lettings. The result was that most of the contracts let during February and March were let to Illinois, Wisconsin and Minnesota contractors.

Of the 106.23 mi. of hard surface highways already under contract 84.53 mi. will be of concrete and 21.7 mi. of brick. Contract prices on concrete range from $3.59 to $4.37 a sq.yd.; and on brick from $5.43 to $5.93 per sq.yd. The total amount of grading and excavation contracted for is 683,427 cu.yd. at prices ranging from 54c. to $1.48 per cu.yd. Eleven miles of graveling have also been put under contract at 90c. per sq.yd.

It is hoped that at least 150 mi. of the original 1920 construction program will be contracted for.

Office for St. Paul Plan Board

The City Planning Board of St. Paul, Minn., has opened offices at 705 Commerce Building, with George H. Herrold in charge as managing director. The Board was created by a city ordinance, as announced in these pages recently, and is to make a study of the physical conditions and prepare a comprehensive plan for the development of the city.

California to Have American Water Works Section

The first section of the American Water Works Association to be established west of the Rocky Mountains, to be known as the California section, is now in process of formation at San Francisco.

Hetch Hetchy 18-Mile Tunnel Contract Awarded

Award of the Hetch Hetchy contract for 18.3 miles of concrete-lined tunnel having a width and height of finished section of 10 ft. 3 in., has been made on a cost-plus basis to the Construction Company of North America, which will undertake the work immediately under the general supervision of City Engineer O'Shaughnessy of San Francisco. This is the first cost-plus contract which has been entered into by the City of San Francisco and its validity will be tested in the courts before work proceeds, although no delay on this account is anticipated.

The contractor, who will be paid in Hetch Hetchy bonds at par, guarantees that the cost of the entire work will not exceed $7,803,000, this sum including his fixed fee of $1,190,000 covering both supervision and the estimated cost of financing the project. The figures are for a fully-lined tunnel as compared with figures previously announced for partial lining only.

New York To Complete Canal Terminals

Governor Smith, of New York, has signed the Sage bill, which appropriates $1,850,000 to complete the Barge Canal terminals at Buffalo, Rochester and New York City.

Annual Meeting of the Am. Soc. C. E. To Be Held in Portland

Portland, Ore., has been designated as the city in which the annual meeting of the American Society of Civil Engineers will be held Aug. 10-12. In the rotative plan whereby the annual meetings are successively held in central cities of the several regional districts, Houston, Tex., had been chosen for the meeting place for the 1920 annual meeting, and the date had been set in October. However, owing to several proposed amendments arising out of the questionnaire which was recently voted upon, the Board of Direction recommended that the meeting be held earlier than October in order that action might be secured upon the proposed amendments during 1920. As it is so warm in Houston during the summer, Portland was selected as the meeting place.

Testing Materials Meeting Program

Preliminary announcement of the program for the coming meeting of the American Society for Testing Materials has been made. The meeting will be at the New Monterey Hotel, Asbury Park, N. J., June 22-25 inclusive. Three sessions will be held on Tuesday, June 22, and Thursday, June 24, with two sessions on Wednesday and Friday. There will be an informal dance and smoker Tuesday evening, an afternoon off Wednesday and the annual golf tournament Friday afternoon. Fifty-nine papers and committee reports are scheduled on the program.

Wanaque Dam Bids Rejected

Only two bids were received for the construction of the Wanaque dam, an earth structure with concrete and clay puddle core wall, for which plans and specifications had been prepared by the North Jersey District Water Supply Commission. The contract will be re-advertised.

The two tenders received April 27 were from Rogers & Hagerty, New York, $4,826,290; and Patrick McGovern, New York, $5,572,545.

Public Contract on Cost-Plus Minus Penalty Basis

A contract has just been awarded by the Detroit Department of Health to John Finn & Son of Detroit for the construction of a new tuberculosis sanitarium, comprising a hospital group of nine buildings, on a basis somewhat novel in public works. The contractor is to receive 7 per cent of the cost provided the total cost, including the contractor's fee and excluding fixed charges, does not exceed $1,460,800. In case the cost of the work exceeds the contractor's estimate, 15 per cent of such excess will be deducted from the contractor's fee. The Health Department originally planned to build a group to cost $1,000,000. Two lump-sum bids were received, the lower of which was about 27 per cent in excess of the limit guaranteed by the same contractor after certain revisions in the plans were made.

Patent Reform Bill Passes House

Engineering Council announces that its Patent Committee has been co-operating with the Patent Committee of the National Research Council in endeavors to secure the enactment of patent legislative bills which had been formulated by the latter committee. These bills embrace four principal features: (1) Increase in the force and salaries of the Patent Office; (2) provision empowering the court to receive opinion and expert evidence to approximate a just division of profits or damages between patentees and infringements; (3) a single court of patent appeals, and (4) the making of the Patent Office independent of the Interior or any other department.

After extensive hearings the Patent Committee and the House of Representatives decided for the present only to recommend the first two of the four features, and these were combined in the Nolan bill (H.R. 11,984) introduced in the House on Jan. 22, 1920. After a number of hearings and considerable effort on the part of the various committees back of the movement the bill passed the House on March 5, 1920, and is now before the Patent Committee and the Senate. It is stated that there appears to be an excellent chance to secure the passage of the bill through the Senate, or at least that portion thereof which gives relief to the Patent Office by increasing the force and salaries.

Orville Wright To Receive John Fritz Medal

The John Fritz Medal is to be presented to Orville Wright by the John Fritz Medal Board of Award on Friday evening, May 7, in the auditorium of the Engineering Societies Building, 29 West 39th St., New York.

Hearings on Road Bills Begin

Hearings on all road bills before the Senate Committee on Postoffices and Post Roads began May 4. The principal measure to be considered, however, is the Townsend Bill.

George S. Webster for Testing Materials Head

The nominating committee of the American Society for Testing Materials has put forward the following ticket for the ensuing year: President, George S. Webster, Philadelphia; vice-president, G. K. Burgess, Washington, D. C.; members of executive committee, L. G. Blackmer, D. E. Douty, Prevost Hubbard and R. S. Whiting. Mr. Webster has been in the service of the City of Philadelphia for many years and has just returned to his old position as chief of the Bureau of Surveys.

Senate Plans to Stimulate Construction Work

Measures to stimulate construction work in all its forms are to be considered by a special committee of the Senate, headed by Senator Calder of New York. Carrying out the provisions of a resolution to the above effect, the Vice-President named the following Senators, in addition to Senator Calder, to serve on the committee: Kenyon of Iowa, Edge of New Jersey, Wolcott of Delaware, and Gay of Louisiana.

The plans of the committee have not been formulated but it is the intention to make a nation-wide and exhaustive inquiry into the building situation.

Funds for Government Surveys

The amount for topographic surveys carried in the Sundry Civil Bill, recently reported out of committee, is $330,000. The committee was inclined to allow the $600,000 which had been asked. The appropriation for the current fiscal year is $325,000. In addition $100,000 is to be allotted to the Geological Survey for military mapping. This additional amount, however, cannot be considered as being available for general work. Such surveys can be executed only where the War Department indicates. It is expected that the entire amount will be expended at one point along the South Atlantic Coast.

Conferees Agree on Water-Power Bill

Senator Jones, chairman of the Senate Commerce Committee, has announced that the House and Senate conferees had agreed on a water-power bill. The revised bill passed the House on May 4 and is now before the Senate.

Contractor's Claim Recognized

As an incident to the passage of a bill by the Senate carrying $30,843.45 for the relief of the Leavenworth Bridge Company, the chairman of the Committee on Claims stated the policy of the Committee, with regard to the relief of contractors who suffered losses due to war conditions. He said:

"The general policy of the committee is in no case to allow for a loss which the contractor might have suffered, except where the loss was occasioned either directly by the act of the Government, or was occasioned under such circumstances as made the Government responsible and where, in addition to one of those two conditions, the department of the Government under which the work was done, after examining the facts, recommended that there was such a loss as the Government, in good conscience, ought to compensate for. Where those three conditions combine in a case, the committee generally looks with favor upon it. Certainly a contractor who suffers a loss, instead of a profit under his contract, is not entitled to reimbursement.

National Academy to Have Headquarters in Washington

The National Academy of Sciences will erect a $1,400,000 building as its headquarters in Washington, according to announcement made by Dr. Charles D. Walcott, president of the Academy and the secretary of the Smithsonian Institution, at a council meeting of the Academy in Washingon April 25. The building is to be erected opposite the Lincoln Memorial in Potomac Park. The lot was purchased by the Academy through private contribution and the Carnegie Corporation of New York has granted $55,000,000 to erect the building and endow the National Research Council. The remaining $3,600,000 of the Carnegie endowment will be used as a fund to establish an income for expenses of the Academy and the National Research Council.

South American Railroad Places Contract to Electrify

Contract has been placed for American equipment for the electrification of the double-track line of the Paulista Railway Co. between Jundiahy and Campinas, Brazil, a distance of about 28 miles, representing the first main line railroad electrification in South America. It has been announced that the contract calls for nearly $2,000,000 worth of equipment, on order with the International General Electric Co. It is to consist of eight freight and four passenger locomotives and material for the transmission line, substation, and 3,000-volt overhead. The locomotives will be built at the Erie works of the General Electric Co.

The project anticipates further extension of electrification to Sao Carlos, a distance of 128 miles. The new line is expected to be in operation July, 1921.

Detroit Society Votes to Join "Comprehensive Organization"

The Detroit Engineering Society, at a meeting held April 24 and attended by more than one-half the membership of the society, voted to join the "comprehensive organization," or federation of engineering bodies, outlined in the report of the Joint Conference Committee of the four Founder Societies. The Detroit organization has 578 members.

Another Waterways Control Bill

One more bill proposing a scheme of Federal waterways control has been introduced into the House of Representatives by Mr. Rainey. This bill (H. R. 13,435) creates a National Waterways Council made up of cabinet officers and a Water Control Board consisting of a chairman to be appointed by the previously named Council and four assistant secretaries, the chairman of the Board to receive a salary of $12,000 and each assistant secretary, $10,000. The Council is to have authority to direct and control all proceedings and operations relating to the control of waterways for whatever purpose in the United States and the technical detail of such control is to be executed under the direction of the Water Control Board. A sum of $60,000,000 to be known as the "River Regulation Fund" is appropriated. The bill has been referred to the Committee on Flood Control.

League of the Southwest Considers Colorado River Control

Concerted action of all interested parties in developing storage and power possibilities on the Colorado River was the dominant note in the three-day session of the League of the Southwest, held in Los Angeles early in April. The meeting was attended by governors of five states and a large number of delegates from all parts of the Colorado River basin. Engineers were represented on the list of speakers by John T. Whistler, engineering adviser of the Federal Farm Loan Bureau; C. E. Grunsky, consulting engineer; F. E. Weymouth, chief of construction, United States Reclamation Service, and E. C. La Rue of Pasadena.

The convention unanimously adopted resolutions covering a wide range of development of Colorado River possibilities; some of the chief features of the resolutions are included in the following: Congress was requested to appropriate $50,000 for the use of the Reclamation Service in completing investigation of the Boulder Canyon Reservoir site, this project to be a combination flood protection, irrigation storage and power development plan. The abandonment of the Ouray reservoir site was recommended. Effort should be made, it was suggested, to effect some agreement with Mexico whereby there could be joint control of irrigation works in Mexico from which American properties are supplied. The governors of the states represented in the League of the Southwest were made a permanent committee to further interests held in common and a permanent engineering commission was appointed, consisting of the state engineers of the several states and engineers of the United States Reclamation Service, to prepare a comprehensive plan for immediate action and early development.

Bill Offered to Relieve New Jersey Contractors

In order to compensate contractors for losses incurred because of the war's advancing material and labor prices, a bill has been introduced into the New Jersey legislature. The bill has passed its second reading in the Senate but has not yet reached the House. It has been referred to the committee on municipal corporations. In the bill it is stipulated that only "actual and necessary costs" shall be recoverable, though this cost shall include all items of necessary and actual cost and expense entering into the performance of the work under the terms of the original contract. No profit is allowed the contractor. Recovery is made possible only upon those contracts entered into before Dec. 31, 1917, and after the declaration of war with Germany, April 6, 1917; or upon contracts entered into previous to the declaration of war, but which remained uncompleted through no fault of the contractor or through causes "which were beyond the control of the contractor." The provisions of the bill apply only to work undertaken "on behalf of the State of New Jersey, or any districts thereof, or any county, municipal corporation, borough, town, township, village or political subdivision of the State," and to costs traceable to the existence of a war with Germany.

Changes in Engineer Corps

The following changes in duty and station of officers of the Corps of Engineers, U. S. A., are announced:

Colonel H. C. Newcomer has been recalled from Hawaii for duty in the United States. He has been succeeded as department engineer for Hawaii by Colonel Clement A F. Flagler. Colonel Flagler has been in command at Camp Humphreys. Colonel Arthur R. Ehrnbeck has been assigned as assistant to the department engineer of Hawaii.

Colonel T. H. Jackson has been appointed department engineer for the northeastern department. His headquarters are at Boston.

Colonel R. G. Alexander, who is now at the Army War College in Washington, has been ordered to West Point as professor of drawing to succeed the late Colonel E. R. Stewart.

Major Earl J. Atkisson, who has been engineer instructor at Camp Benning, has been assigned to the command of Edgewood Arsenal.

Vehicular Tunnel Bill May Be Passed Over Veto

Governor Edwards of New Jersey vetoed May 4 the bill authorizing the issuance of bonds to cover New Jersey's share in the cost of the Hudson River vehicular tunnel and the Delaware River bridge. The bill provided for a direct tax on all state property to raise the necessary $30,000,000, and will, in all probability, be passed over the Governor's veto.

To Examine Idaho Engineers

It is announced that the next examination for the licensing of engineers in Idaho will be held in the Capitol Building, Boise, September 14. An examination for surveyors at the same place is scheduled for September 7. All inquiries should be addressed to the Department of Law Enforcement, Boise, Idaho.

CIVIL SERVICE EXAMINATIONS

United States

For United States civil service examinations listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the Civil Service Commission, for Form 1312.

Logging engineer, $2,400 to $3,000 per year. File application not later than May 11.

Structural steel draftsman and designer, $2,400 per year. File application not later than May 11.

Assistant engineer, $1,500 to $2,000 per year. File application not later than Aug. 2.

Junior engineer, $1,200 to $1,500 per year. File application not later than Aug. 2.

Engineering Societies

Calendar

Annual Meetings

AMERICAN ASSOCIATION OF ENGINEERS; 63 E. Adams St., Chicago; May 10, 11, St. Louis, Mo.

AMERICAN WATER WORKS ASSOCIATION, New York City; Montreal, June 21-26.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; Asbury Park, N. J., June 22-25.

AMERICAN PUBLIC HEALTH ASSOCIATION, Boston; San Francisco, Sept. 13-17.

ORGANIZING CONFERENCE of National, State and Local engineering societies; Washington, D. C., June 3-4.

The New York Section, Am. Soc. C. E. will hold its annual meeting in the Engineering Societies Building, New York City, May 12, at 8.30 p.m. Col. Wm. J. Wilgus will talk on "The Railroad Problem in Relation to the Metropolitan District." The following names have been suggested for officers by the nominating committee: President, Wm. J. Wilgus; first vice-president, R. S. Parsons; second vice-president, J. P. H. Perry; secretary, W. T. Chevalier; treasurer, F. C. Noble; directors, O. E. Hovey and R. H. Chambers.

The California Section, American Water Works Association was organized in San Francisco April 20, and the following officers elected: Chairman, George A. Elliott, chief engineer, Spring Valley Water Co.; vice-chairman, Charles G. Hyde, professor of sanitary engineering, University of California; secretary-treasurer, George W. Pracy, superintendent, city distributing system, Spring Valley Water Co.

The Raleigh (N. C.) Engineering Society, composed of the professional engineers of that city, was organized April 19, and the following officers elected: President, H. B. Henderlite; secretary-treasurer, W. Z. Betts; chairman of committee on membership and publicity, L. P. Denmark. Membership is open to any local practicing engineer. The society expects later to affiliate with the American Association of Engineers. Its purpose is to promote the social and economic welfare of all professional engineers in the city. Meetings will be held on the first Monday of each month.

The American Public Health Association, Boston, has changed the date of its coming annual meeting at San Francisco, Calif., from Aug. 3—Sept. 3 to Sept. 13-17. This change has been necessitated by a California state election on Aug. 30.

The Southern California Association of Members, Am. Soc. C. E. held a special meeting in Los Angeles, on April 2, at which a telegram from President Davis regarding the amendments to the constitution of the society and the 1920 convention was read. After discussion of these matters, it was agreed upon by the members present that, as the board of direction had for sound reasons decided that the annual convention should be held in Houston, Tex., it was the opinion of the association that whenever the annual convention was held in District 11, it should be held in Houston, and that, apart from all other reasons, the short time available prior to August would prove a serious handicap against the proper and suitable arrangements for a convention in Los Angeles at that time. A letter from C. T. Leeds, regarding the proposed increase of pay of civilian engineers and clerks in the U. S. Engineering Department, in which Mr. Leeds requested urgent action on H. R. Bill 11892, which provides a 25 per cent increase, was read, and a telegram ordered sent to Senator Wesley L. Jones, chairman, Senate Committee on Commerce, urging fair action upon the matter, as a step in the right direction, although a 25 per cent increase was not deemed adequate.

Personal Notes

LEONARD F. AYERS, recently with the New York Central R.R., Engineering Department, at Utica, N. Y., has taken a position in the engineering department of the Colcord Coal Co., Montcoal, W. Va.

JOHN V. SPIELMAN, consulting engineer, of Russia, recently arrived at Astoria, Ore., on his way East to visit the Carthage (N. Y.) Machine Co. and other manufacturing concerns, for the purpose of buying paper-mill machinery, etc., for Russian paper mills.

ALBERT D. PAYTON has been appointed city engineer and secretary of the board of local improvements of Moline, Ill., to succeed his brother, Lyle Payton.

G. W. HARRIS, corporate engineer of the Atchison, Topeka & Santa Fe Ry. System during the period of Government control, has been appointed assistant chief engineer.

D. D. MICKEY has been appointed resident engineer of the Federal-Aid road work in Jefferson County, Kansas, with headquarters at Oskaloosa. Mr. Mickey was formerly county engineer of Geary County, Kan.

SAMUEL SCHLAU has resigned from the Liberty Iron Works and opened consulting engineering offices at 318 Greenwich St., New York City.

LAWRENCE POST, for several years with the New York Central R.R., at Watertown, N. Y., has joined the staff of the Morgan Engineering Co., Memphis, Tenn.

HENRY R. STEVENS, formerly electrical engineer with Stone & Webster, at Seattle, and more recently connected with the Fresno office of the San Joaquin Light & Power Corporation, has been appointed general superintendent in charge of the construction of the Kerckhoff power house on the San Joaquin River, Cal., succeeding W. A. Whitmire, who has been awarded a contract for driving part of the big tunnel for the Kerckhoff project.

J. M. SILLS has been appointed district engineer of the St. Louis-San Francisco Ry., at Springfield, Mo., and F. P. SWARTZ, district engineer, at Fort Worth, Tex. Division engineers have been appointed as follows: D. E. GELWIX, Springfield, Mo.; E. T. BOND, Enid, Okla.; H. F. BUSCH, Fort Scott, Kan.; J. G. TAYLOR, Memphis, Tenn.; L. L. KERNE, Chaffee, Mo.; PERRY TOPPING, Fort Smith, Ark.; T. E. BLISS, Fort Worth, Tex.; R. OWEN, acting division engineer, Sapulpa, Okla. H. B. BARRY, district engineer at Memphis, has been appointed principal assistant engineer, with office at St. Louis. C. B. SPENCER, formerly assistant district engineer in the valuation department, Interstate Commerce Commission, has been appointed valuation engineer, with office at St. Louis.

GEORGE I. SIKES, of Buffalo, N. Y., has been appointed manager of the recently organized Bradford Housing Corporation, Bradford, Pa.

A. LINCOLN FELLOWS, senior irrigation engineer, Division of Irrigation Investigations, U. S. Office of Public Roads, has been placed in charge of the Denver office of the division, with direct supervision of work throughout the Rocky Mountain region. He will also be available for consultation regarding irrigation and drainage engineering and practice.

PROF. O. H. LELAND, for the past 17 years a member of the faculty of the College of Civil Engineering, Cornell University, has become associated with the J. G. White Engineering Corporation, New York City. During the war he served as lieutenant-colonel of the 303rd Engineers, 78th Division, and after the armistice commanded the 314th Engineers, 89th Division in the entry into Germany with the Army of Occupation.

R. K. HALLETT, recently assistant engineer in charge of construction work in the field at Hercules, Cal., for the Hercules Powder Co., has been transferred to the company's plant at Carthage, Mo., as resident and maintenance engineer in charge of all maintenance, safety and construction work.

SELDEN P. SEARS has resigned as assistant engineer in the Hartford (Conn.) water department. He will be henceforth in the employ of C. W. Blakeslee & Sons, New Haven, Conn.

LUIS G. MORPHY has resigned as principal assistant engineer of the Boston & Albany R.R. to take a position with the Foundation Co. of New York as its representative in South America.

THORNDIKE SAVILLE, professor of hydraulic and sanitary engineering, University of North Carolina, has been appointed hydraulic engineer for the North Carolina Geologic and Economic Survey, and will have charge of a thorough study and investigation of the water resources of the state.

CHARLES H. RICHARDS has resigned as engineer in the valuation department of the Pacific Gas & Electric Co. at San Francisco, on appraisal of hydro-electric properties of that company, to accept a position with J. B. Lippincott of Los Angeles.

J. C. SCHWAAB, formerly assistant engineer in the valuation department of the Chicago & Alton R.R., has been appointed city engineer of Alton, Ill.

JACOB LOEWENSTEIN, for the past eighteen years engineer with the American Bridge Co., New York, has severed his connection with that company and opened an office at 347 Madison Ave., New York, as consulting engineer, furnishing service in technical knowledge and in purchase of steel for buildings, bridges and other structures.

R. F. KELKER, JR., Marshall D. Gates and Charles E. DeLeuw announce the organization of the firm of Kelker, Gates & DeLeuw, engineers, at 111 West Washington St., Chicago, and 325 Pekin St., Lincoln, Ill.

W. H. NELSON has been elected engineer of Smith County, Kan., with residence at Smith Center; G. A. RUSSELL, engineer of Geary County, at Junction City; E. H. GREEN, engineer of Pawnee County, at Larned, and W. R. SCHREINER of Sumner County, at Wellington, Kan.

R. E. J. SUMMERS, formerly captain of engineers, with the 15th U. S. Engineers, has resigned as assistant engineer on design and estimates of McClintic-Marshall Co., Pittsburgh, to become structural engineer for the H. K. Ferguson Co., engineers and builders, Cleveland

LLOYD W. STRAYER has resigned as division engineer of the Baltimore & Ohio R.R. to become associated with the Johnson Limestone Co., New Castle, Pa.

GEORGE H. BAYLES has left Morgantown, W. Va., to become chief engineer and superintendent of construction of the A. J. Krebs Co., builders, Atlanta, Ga.

EDWIN J. BEUGLER, recently consulting engineer of Westinghouse, Church, Kerr & Co., has become associated with the Foundation Co., New York, as vice-president in charge of engineering.

JOSEPH H. O'BRIEN has severed his connection with the Central Construction Corporation of Harrisburg, Pa., to become chief engineer of the Foundation Co., New York.

ROBERT S. WAIT has resigned as city engineer of Norwich, N. Y.

BUSINESS NOTES

JONES & SMART, general contractors and builders, Houston and Ranger, Tex., announce the establishment of offices and general material yards for builders' supplies at Dallas, Tex.

D. C. REEVES, recently tractor sales manager of the J. I. Case Plow Works, at Racine, Wis., has joined the Holt Manufacturing Co., Inc., Peoria, Ill., as domestic sales manager.

THE OXWELD ACETYLENE CO., Newark, N. J., and Chicago, has recently extended its manufacture of oxy-acetylene apparatus and equipment to include "Eveready" welding and cutting outfits.

JOSEPH T. RYERSON & SON, Chicago and New York, will henceforth be the sales representatives of the Camden (N. J.) Iron Works for its hydraulic machinery products.

THE RUST ENGINEERING CO., Pittsburgh, announces that the partnership consisting of S. M. Rust, of Pittsburgh, E. J. Lee Rust, of Birmingham, and E. M. Rust, of Washington, D. C., has been dissolved. The business will hereafter be carried on by the Rust Engineering Co., of Pittsburgh, the Rust Engineering Co. of Washington, and the Rust Engineering Co. of Birmingham, Ala. The business of the new corporations will be managed by boards of directors, of which the three former partners will form a majority in each case, and the business policy of the partnership will be continued in operation by the corporations which have replaced it.

H. C. PASTORIUS, for 20 years connected with the Central Railroad of New Jersey, is now associated with the Emanuel Slag Co., Allentown, Pa., in charge of that company's sales and traffic.

M. C. W. BOYD has resigned as manager of sales of the Heltzel Steel Form & Iron Co., Warren, Ohio, although retaining his official connection with the company. He will henceforth be general manager and treasurer of the Good Roads Corporation, of Kansas City, Mo., manufacturer of high-pressure atomizing road oilers, power flushers, power spreaders of tar and bituminous materials. W. J. Savage has been appointed director of sales in charge of the steel form department, and E. V. Ford will be in charge of Parrish templates and finishing machines, of the Heltzel Co.

THE MITCHELL-RAND MANUFACTURING CO., New York, is now putting out the structural compounds that it formerly made for the Universal Compound Co., taking contracts for the application of the materials in waterproofing and damp-proofing work. The Universal Co. has discontinued operations. E. A. Oldershaw, who has been engaged in the structural paint and waterproofing line for over 15 years, is in charge of the waterproofing department and will give his entire attention to this branch of the business of the Mitchell-Rand Co.

L. V. JAMES, with James B. Clow & Sons, Detroit, has entered the employ of the Bryan-Marsh Division, National Lamp Works, General Electric Co., at Chicago.

THE CONNECTICUT CONSTRUCTION CORPORATION, Meriden, Conn., owing to the confusion of that firm with other companies bearing similar names, has changed its name to Robinson & Powers, Inc.

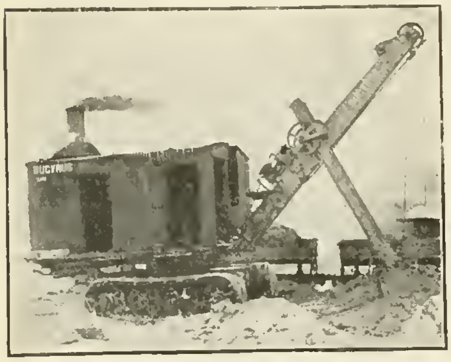
E. F. GASSEL, formerly construction superintendent, Power Construction Co., Worcester, Mass., is now holding a similar position in the Massachusetts Oil Refining Co., East Braintree, Mass.

ROWLAND G. RICE and ROBERT S. JONES, formerly with the F. W. Mark Construction Co., Inc., have organized the Rice-Jones Co., with offices at 10,600 Euclid Ave., Cleveland. The new firm will handle general building construction.

THE CAMBRIA STEEL CO., Johnstown, Pa., has promoted D. S. Muckley from superintendent of wire mill to superintendent of the Gautier department, and H. H. Phillips has been promoted to wire mill superintendent.

Convertible Excavator and Crane

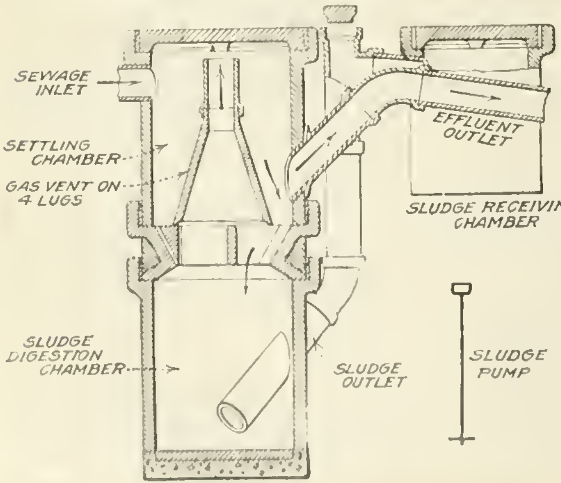
A revolving steam shovel which can be rigged for various kinds of work, and can be converted readily into a dragline or grab-bucket excavator or a locomotive crane, is the latest machine put out by the Bucyrus Co., Milwaukee, Wis., for construction and industrial work. It operates ordinarily a 1-yd. or ¾-yd, dipper, the latter with a 24-ft. or 30-ft. dipper handle for deep trenching, while for high lifts from deep pits the machine may have a 26-ft. boom and 17-ft. dipper handle. No bail is used, the hoisting block being attached to the back of the dipper by a pin connection. For use as a dragline or grab-bucket excavator a 35-ft. or 40-ft. boom is mounted for buckets of 1 yd. and ¾-yd. respectively. As a crane, the lifting capacity is about 10 tons on a reach of 20 ft. In working order the machine weighs about 30 tons on road or railway wheels and 34 tons on tractions of the caterpillar type. The tractions are driven by direct gearing.



CONVERTIBLE EXCAVATOR RIGGED AS STEAM SHOVEL

Ready-Made Vitrified Clay Two-Story Septic Tank

A two-story or imhoff tank for sewage clarification and sludge digestion has been put on the market by the Ferguson Segment Block Co., St. Louis, Mo. The design and operation of the tank is shown by the sketch. The hand pump is used only at intervals. Meanwhile the cover is applied to the top of the sludge discharge pipe.

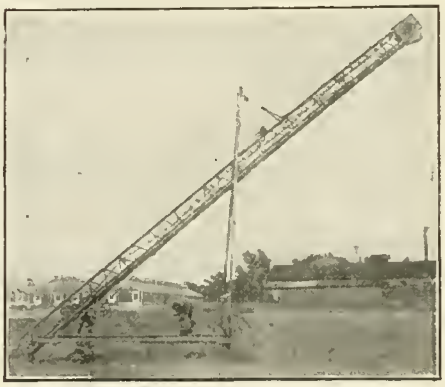


SECTION THROUGH TWO-STORY SEWAGE TANK

Chain Conveyor Delivers Concrete to the Forms

The delivery of concrete to the forms by means of a portable conveyor is a method which has been used in the construction of concrete buildings at Cleveland, Ohio, and elsewhere. The machine, shown in the accompanying view, consists of a steel frame mounted on wheels and having pivoted to one end a 42-ft. box-lattice boom in which the conveyor travels, the upper end of the boom being suspended from the head of an A-frame. A gasoline engine drives the conveyor, which is an endless chain fitted with flights or blades and having a speed of about 175 ft. per min. Concrete is spouted from the mixer to a boot or hopper on one side of the foot of the boom.

This system is considered especially applicable to work spread over a considerable area and having a height not exceeding 25 ft. The machine can be moved readily from place to place and is ready for use as soon as it is in position, thus eliminating much delay. Its range may be increased by attaching a spout to the head of the boom. In constructing an addition to the plant of the Barber-Greene Co., at Aurora, Ill., it was estimated that 50 cu.yd. per 8-hr. day could be placed. The machine is handled by the Hydraulic Steelcraft Co., Cleveland, Ohio.

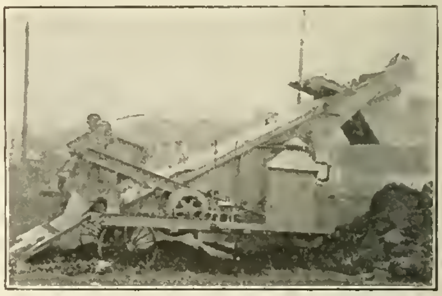


ADJUSTABLE CONCRETE CONVEYOR MOUNTED ON CARRIAGE

A New Excavator

The New Model K Excavator and loader manufactured by the T. L. Smith Company of Milwaukee, Wis., is a portable dragline filling the big gap between the steam shovel and the gang of hand shovelers. The machine stays on the ground level and draws the dirt to it. It therefore eliminates the building of trestles, which is a necessity accompanying digging devices which "go down into the hole." After the work is finished, the excavator can be moved on to the next job just as easily and quickly as a wagon.

Two men operate this machine—one at the operating levers and one at the loading point. At a point anywhere within 50 to 200 ft. from the machine is stretched a chain, at right angles to the line of digging; upon this chain are two sheaves, hooked to the chain, either sheave may be unhooked and re-located in an instant. One heavy cable passes from the hoist drum on the machine, then to the digging skip, then through both sheaves, back to the retrieving hoist drum on the machine. The operator at the machine manipulates two levers and a foot brake. As he places power on the digging line, the other man manipulates the handles, on the slip, so as to fill it with the material to be dug or removed. The slip has a capacity of 15 cu.ft. per trip. As soon as the slip is filled, the man releases the handles and allows the slip to ride to the excavator. As the slip strikes the apron at the machine it unlocks the catch of the pivot arm on the machine. The arm then carries the slip up over the machine and onto a slanting chute located on the front of the machine, whence the material in the slip discharges into the waiting wagon, truck or railroad car. The slip is then quickly retrieved to the starting point and the operation repeated.



NEW DRAGLINE DRAWS MATERIAL TO LOADING POINT

Turner Company Constructed 75 Industrial Buildings in 1919

Statistics compiled recently by the Turner Construction Co., of New York City, indicate that during 1919 that organization's forces erected 75 industrial buildings, 25 concrete workmen's homes, and 20 miscellaneous concrete structures for oil refinery purposes. Of the 75 factories and warehouses, 62 were five stories and less in height and the average total floor area per building was 62,046 sq.ft. While these figures indicate that the majority of the work was on average size buildings, the company has had on hand at various times 19 jobs in excess of $1,000,000 in cost.

North Carolina Highway Commission to Issue Monthly Bulletin

Beginning with April the North Carolina State Highway Commission publishes a monthly highway bulletin embodying a digest of the progress of all road work in the state.

A Consolidation of Engineering News and Engineering Record — McGraw-Hill Company, Inc.—James H. McGraw, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. Mehren
Editor

Volume 84 — NEW YORK, THURSDAY, MAY 13, 1920 — Number 20

How Will They Work?

MULTIPLE hopper bottoms for sewage sedimentation basins are no longer a novelty but their use for water settling basins is rare if not new. In the coagulation basin at Atlanta, Ga., described on p. 958, such a bottom is used for the inlet end of the basin. News of the practical working of this design will be awaited with interest.

City Planning Progress at St. Louis

STEADY progress is being made in carrying out the street widenings and openings designed by the St. Louis City Planning Commission to give that city a street system adapted to traffic needs. The general scheme, with an outline of the work thus far accomplished is presented on p. 954. St. Louis deserves credit for its persistent and consistent city-planning work. Its major traffic plan and its zoning system put it at the very forefront in city planning activities.

Wrapped Garbage

HOWEVER well the practice of wrapping garbage in paper before putting it in the cans may have worked at Minneapolis while the garbage was incinerated it appears from the note printed on p. 907 of our issue of May 6 that it has caused the hog-feeding contractor much trouble. Not only is the bulk of material to be handled largely increased but in addition there is a vast quantity of paper to be gathered up in the feeding places. Burning this in the open air has caused trouble. It always was a question in the minds of some whether the Minneapolis health department could not have got more health benefit from an equal amount of work put on something besides educating housewives to wrap their garbage—and tie it with a pink ribbon, the facetious have said.

The 1920 Road Program

MR. PIEPMEIER'S article on p. 949 of this issue indicates graphically the lapse between the time highway contracts are entered into and the time work upon them commences. As chief causes for the delay he assigns inability of contractors to secure adequate plant, shortage of material, shortage of labor, labor strikes and lack of transportation. To correct these conditions research has been carried on by many states on the availability of local materials. A general appeal went forth late in 1919 from the Bureau of Public Roads urging state highway departments to "let highway contracts early in 1920." Contractors have been busy during the winter adding to equipment. But the greatest of all deterrents to the successful prosecution of highway programs remains—for labor is even more volatile in its 1920 demands, and railroads are finding it difficult to transport perishable freight. The case of Illinois is typical, and we can see in the 1920 highway program only a restriction in new construction to those jobs where materials and labor are locally ample, or where commercial motor traffic demands new construction at any cost; and the exercise, in maintenance, of super-skill.

Innocent Until Proved Guilty

THE time has gone by in Chicago when public officials can suspend engineers in public service without notice being taken of that fact by the engineering societies. The Western Society of Engineers has a civic committee looking into the suspension of two engineers in the bridge department. A similar committee of the Chicago Chapter of the American Association of Engineers has concluded an investigation, and the chapter May 7 approved a set of resolutions drawn up by its committee condemning the action of the officials "in besmirching the character" of the engineers by publicity of unproved charges and offering them the moral support and backing of the chapter. Statements in the letter suspending the engineers charged them with removing bridge plans, specifications and other papers from city offices for the use of a bridge company with which they were connected. Much publicity was given to this letter but the engineers feel that they are not in a position to answer the allegations until formal charges are made before the Civil Service Commission. It is certain both societies will follow the procedure closely and therefore the engineers are assured of not being condemned by their brother engineers, even for political purposes, until proved guilty.

Technical Articles in Newspapers

ENGINEERING information is served regularly to newspaper readers in some foreign countries and it has its effects. Industrial developments of all kinds in the Scandinavian countries are due largely to the foresight and vision of the daily papers, which are keen and eager to give their readers authentic articles on technical and scientific matters—the only way by which a true public interest can be created for the intelligent industrial development of the country. J. W. Dyckman, a metallurgical engineer of San Francisco, made the foregoing statement in April before the American Electrochemical Society in explaining the rapid utilization of water power in Norway, a financially poor country with a small population. A recent London daily contained more than two columns on foundations, in which the author-compiler, an engineer, started with the conditions in Chicago, skipped to Australia, to South America, the Continent and back again to London. There was absolutely no news value in the foundation story nor any attempt made to inject news. It was a solid informative digest on foundations, such as an engineer, not a foundation expert, would like to read. The problem of educating the American public through the newspapers is one still ahead of the engineering profession. Here is a task that awaits the new federation of engineering societies.

Using Available Aggregate

THE tabulation of concrete proportions in A. N. Johnson's article on another page is the most practical application of the various new concrete-mix theories that has yet appeared. Based though it is on Professor Abrams' elaborate series of tests and his fineness modulus theory, its application lies in the very prosaic but most important problem of utilizing an available aggregate or of balancing the cost of two kinds of aggregate. The "artist stuff" is all omitted, though without it the tables could never have been developed. For any given aggregate a concrete of desired strength can be obtained with the stated proportions. The user need know nothing of fineness modulus, surface area, or other laboratory constants; all he has to do is to find the grading of his aggregate and to be sure that the concrete is made to the required proportions and of a "practical workability." Unfortunately that last term is still indeterminate, in spite of the several gages which have been proposed, but it is no more indeterminate for a 1: 2.6: 4.3 mix of hitherto rejected aggregate than it is for a 1: 2: 3 of Fuller-curve material. The proof of the usefulness of the tabulation is in the actual strengths of the concretes so made. If, as the Abrams' experiments show, the proportions there stated will give a concrete which tests as consistently around 3,000 lb. per sq.in. as a standard 1: 2: 3 mix, under usual conditions of production and with the same criterion of consistency, its application is manifest though limited. To insure better and cheaper concrete by observance of aggregate grading and adherence to a proved consistency measure is a step beyond, which this practical application does not fully reach.

A Halt in New York's Highway Program

HIGHWAY builders throughout the country will at once recognize the significance of the statement of Commissioner Greene, of the New York State Highway Department, appearing in the news pages this week. A decisive step has been taken. In addition to withdrawing all roads advertised for new construction in the letter of May 5, it is announced that "there will be no further new roads offered for construction until the situation shows a decided change for the better." A variety of reasons have combined to put into effect so drastic a policy. Chief among them are the shortage and high cost of labor, shortage of transportation, lack of competition in bidding and advances in prices of materials. If the announcement meant that New York had, for a time at least, suspended road construction the situation would be alarming. This, however, is not the case. The State has in hand 183 uncompleted but active road construction contracts involving about 600 miles of unfinished work, to say nothing of extensive maintenance required on other routes. Commissioner Greene points out that under present conditions the undertaking of new enterprises on a large scale would create a situation forcing contractors on the new and on existing contracts to bid against one another at ever increasing prices. The suspension of all new work, the Commission feels, is the only solution to the present difficult problem. *Engineering News-Record's* attitude regarding this year's highway construction program was stated March 4, p. 451. Here the wisdom of curtailment of highway work to reasonable dimensions, in order that promises to the public might be fulfilled, was advocated. New York State has gone a step farther. Instead of curtailing, it has suspended new work. In the light of what has happened in New York a reading of the editorial above referred to is worth while. In its bearing on the general situation, also, the announcement in this week's news pages to the effect that the General Contractors' Association is beginning an inquiry into material prices is worth noting.

Status of Vehicular Tunnel

THERE is encouragement in last week's news to the effect that although the Governor of New Jersey has vetoed the bill authorizing funds for the construction of the vehicular tunnel between New York and New Jersey, the measure may be passed over his head. In fact, the Assembly has already taken affirmative action, and it is expected that the Senate will follow suit this week. So much for the New Jersey end of the project. On the New York side the Legislature has approved an initial outlay of $1,000,000 and the bill carrying this appropriation is now awaiting the signature of the Governor. It is believed that there is little likelihood of its non-approval. It is high time to put the vehicular tunnel work under contract. There has been more than enough talk about this project. A half dozen public hearings afforded engineers and laymen alike an opportunity of expressing their views and the minutes of these meetings, while they may bring out, here and there, a point of interest, are in reality a huge volume of verbiage of no particular value in the planning or the conduct of the work. The project is one of such importance to both states concerned that construction should be started forthwith. With twin tubes under the Hudson, strikes of ferryboat operators, lighterage employees, stevedores, and other water-front and terminal personnel would cause much less concern than at present. There would always be available an open route for the transport of freight and produce by motor truck between Jersey and New York. As shown conclusively in the chief engineer's report, the vehicular tunnels will be more than self-supporting—estimates indicate that they will return a handsome profit on the investment. Under these circumstances the precise manner of providing funds for the tunnel construction, while it may be an interesting subject of discussion for economists, is merely holding up much needed work. The time for talking has passed. The time for actual digging has arrived. It is hoped, therefore, that the executives of the States of New Jersey and New York will place no obstacles in the way of an early start on this important public improvement.

Municipal Engineers' Compensation

A MOVE in the right direction was made, as reported in last week's news, when the Municipal Engineers of the City of New York invited to their regular meeting the Comptroller and the Civil Service Commissioner in order that these public officials might learn at first hand the attitude of engineers in the city's service toward the present salaries that are being paid. In the past many engineering societies have discussed the subject of compensation among their own membership. While some results are to be expected from such meetings, in the way of arousing sentiment, they are, if taken alone, ineffective because they do not reach the people who have the power to change conditions. The New York engineers, however, presented their case to the city officials with direct influence to adjust rates of compensation. It would be a good thing if more engineering organizations took the opportunity to bring the membership into closer contact with elective or appointive public officers. Evidence that this procedure is being followed more and more is developing every week. By acquainting public officials not only with the real conditions in the profession, but with engineers themselves, technical men are not merely serving their own selfish ends but are working for the best interests of the municipality. A reading of the extracts from Mr. Ridgway's address before the Municipal Engineers, appearing elsewhere in this issue, indicates conclusively that city engineering organizations everywhere are being broken up by the withdrawal of good men and by a general lowering of the morale among those that remain. While at the present time there is no great activity in public works construction, due to the high prices of material and shortage of labor, the time will come when the great volume of delayed improvements which have piled up must be put through. Skilled engineering personnel will then be needed if the work is to be done well and economically. City officials who fail to see far enough ahead to recognize this situation will have a rude awakening. Now is the very time when city engineering organizations should be held together and it is a short-sighted policy which fails to provide adequate compensation for the retention of the best men in the service.

University Faculty Salaries

THE financial status of teachers in the University of Illinois, ascertained by a questionnaire handled by the Federation of Teachers, indicates an alarming situation in one of the strongest Middle Western state institutions. Rumbles of dissatisfaction because of inadequate salaries in the state universities are heard with increasing frequency. One of Iowa's institutions has had difficulty in holding its personnel and no doubt the same condition exists to a certain extent in all schools.

Campaigns for increased endowments of schools outside of the state institutions have made sufficient headway to inform most people that educational staffs have learned all about the shrunken value of the dollar. Exact statistics, however, have not been published widely, and the University of Illinois figures are illuminating, since they represent answers from 40 per cent of the 400 members of the teaching staff. Notwithstanding their longer term of service and advancement in rank, an overwhelming majority of members of the faculty are worse off financially than they were six or seven years ago. Not a few men intimate that they will soon be compelled to accept attractive offers elsewhere unless the situation is relieved. The report clearly indicates that two-thirds of the married instructors, three-fourths of the assistant professors having more than one child and one-half of the full professors having more than two children cannot and do not live within their salary. To avoid a deficit all ranks have usually had to resort to most rigid economies and to cut far below any reasonable minimum the amounts allowed for savings and professional expenditures. As a natural result there is little room for that buoyancy and enthusiasm, that combination of free play and concentration of mind essential to growth and success in intellectual life.

The significant fact is that hordes of graduates are being turned out to whom practically free instruction has been given. Who pays for this generosity? Is not too great a portion of it taken from the pockets of the instructors who for loyalty or a desire to retain work for which they are fitted, or perhaps for lack of salesmanship or business ability, stay on year after year at less than a living wage?

Leaky Cross-Connection Kills Fifteen

THE foregoing title and a corresponding story should have appeared in the newspapers of Bloomington, Ill., following a typhoid outbreak at the Chicago & Alton shops, which State Board of Health officials traced to a leaky valve in a cross-connection between the city supply and that furnished for industrial uses at the shops. The creek supply for the shops gave out, a 33-in. outlet sewer was tapped and the contents, consisting of sewage and creek water, led into the suction well from which the industrial supply was pumped. The leaky valve admitted the polluted water to the city mains that supplied city water for drinking purposes in the shops.

This epidemic did not occur during the war emergency two or three years ago, nor in Bolshevistic Russia. It happened in January, 1920, in the heart of the Middle West, in the State of Illinois. Details of the piping system will not be found elsewhere in this issue because there is nothing new or complicated to relate. The official who made the investigation apparently has become so hardened to the usualness of the occurrence or perhaps to the hopelessness of ever expecting anything different that he concludes his report in these words: "The situation at Bloomington is only one more reminder of the dangers of permitting connections between two supplies, one of which is of safe quality and the other unsafe or questionable. Several Illinois cities have already paid dearly for their experience along these lines and no time should be lost by others similarly situated, to have such connections removed." At least 15 dead from typhoid fever, 130 cases and between 300 and 400 down with severe intestinal disturbance: That is a casualty record which if it had occurred from a race riot, a cyclone or a Mexican raid, would have claimed space in every newspaper of the country, with demands that the guilty parties be held responsible. But this calamity is unnoticed in the press, and some time afterwards another eight-page typewritten report is filed in the archives of the Board of Health, while the guilty go scot free. A few gentle taps on the wrist are administered no doubt, but what assurance have the 2,000 shop workers in Bloomington that the two systems will not again be connected when water is short and there is a handy sewer to tap?

Unfortunately there are still some engineers, especially those in the employ of the fire insurance companies, who see no harm in cross-connections or who put property risk above life risk. Some day sanitarians will ask organized labor to help them get through real legislative safeguards in this line with adequate enforcement provisions and drastic penalties for breaking the law.

Unwatering the Lock Site of New Orleans Harbor Canal

Sheetpile Cofferdams, Driven in Successive Rows Nearer and Nearer to Lock, Cut Off Porous Underlying Quicksand Strata Which Are Tapped With Flowing Wells as Dams Close In

By George R. Goethals

Vice President, Geo. W. Goethals & Co., Inc., Consulting Engineers,
Board of Commissioners, Port of New Orleans, Louisiana

GROUND conditions in the alluvial plain at New Orleans are anything but favorable for the construction of large sursurface structures such as the lock now being built for the Inter Harbor-Navigation Canal. The ground level is about El. +25 (Cairo datum) with the river, from which the city is protected by levees, varying between +19 and +39. Underlying about 22 ft. of alluvial deposit are alternate layers of clay and flowing sand, the latter being water bearing but self-contained owing to the seal made by the clay. In this ground there has to be built the lock, a concrete structure 1,035 x 130 ft. in plan with its lowest part at El —22 and its highest at +45. The instability of the ground and width of the open excavation required made inadvisable cross-braced sheathing for the full height and the water-bearing strata indicated difficulty in keeping the hole dry. As a solution it was decided to make the excavation on a low slope by dredging, thus reducing the danger of slip, and to use a novel system of sheetpile cut-offs with drainage wells into the porous strata to keep the water from the excavation.

In brief, the method consisted in inclosing the excavation in a sheet-pile cofferdam reaching down through the first layer of flowing sand, driving inside of this dam a series of wells to the next lower porous layer, then a closer cofferdam cutting off this layer and again a series of wells into the next lower layer. Pumps at the wells kept the water leveled in the strata low enough so that the upward pressure on the bottom of the excavation was safe against flow out during the lowering of the water level inside the innermost cofferdam. Excavation under this method has been successfully completed and piles driven in the footing. Concrete for the lock is now being placed.

Fig. 1 is a cross-section of the lock side, showing a typical section of the lock, together with the nature and extent of various foundation sub-strata. The excavation was accomplished by means of hydraulic dredging. After the withdrawal of the dredge, a cofferdam was constructed at the north end of the lock to shut off the water in a partly finished section of the canal from the lock prism. The ground at the south end still remains intact.

All of the quicksand strata, being subject to static heads noted, required that certain safety precautions be taken before the water left in the lock prism, after the dredging had been completed, could be removed. The first step was to drive the outer line of wooden sheetpiling completely surrounding the lock, shown in the figure as cutting off the first or upper stratum of quicksand. The primary purpose of this was to maintain the water table in adjacent ground so as to guard against settlement of adjacent building foundations. The second stratum of quicksand, extending from El. —23 to El. —44 was next cut off by means of a wooden cofferdam 54 ft. in depth, and completely surrounding the lock. This is the inner wooden cofferdam shown in the figure. It was believed that this cofferdam, built of Martinez sheetpiling, would prove a sufficient safeguard to allow the water to be removed without further difficulty. To enable this cofferdam to be driven, the water in the lock prism was lowered to about El. +4 without difficulty.

In May, 1919, unwatering operation was resumed and everything went favorably until El. —3.5 had been attained. At this point, the bottom of the lock, at the south end, began to boil violently. This was accompanied by simultaneous movements of the banks at the

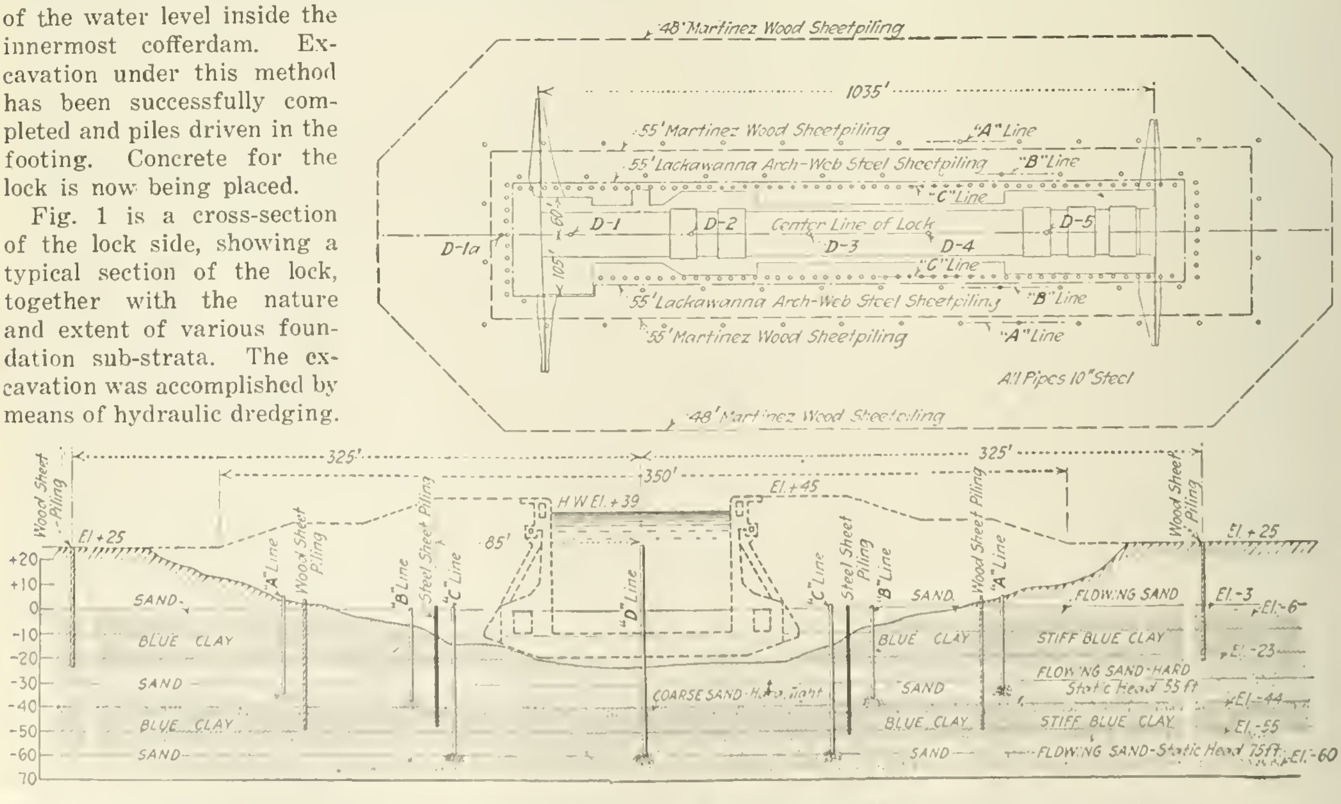


FIG. 1. PLAN AND CROSS-SECTION OF LOCK AT NEW ORLEANS, SHOWING LOCATION OF COFFERDAMS AND DRAINAGE WELLS

south end, and sides of the lock. The maximum movement occurred between the southeast corner and a point on the east bank 300 ft. north of said corner. Here the movement was sufficiently extensive to cause the line of sheetpiling to rupture for a length of 300 ft. and to move the broken section bodily for a distance of 25 ft. toward the center of the lock. This entire movement occupied an interval of approximately six hours and stopped entirely when the water was turned back into the lock prism and had risen about 6 in., bringing it back to El. —3. For safety, the water was carried up to an elevation of zero and maintained between El. 0 and —1.

This experience demonstrated the fact that the wooden cofferdam line was not adequately tight nor sufficiently strong to prevent the flow of quicksand under pressure through its interstices or to hold back tendencies of the banks to slide, unless further safety measures were undertaken. What undoubtedly happened to cause the slide above mentioned was this: As soon as the water in the lock was lowered below El. —3, the upper quicksand layer began to flow out into the lock prism. This caused the clay blanket lying above El. —3 to settle down to replace the outflowing sand. This vertical movement was accompanied by a natural tendency for the whole mass to move toward the center of the lock, which, in turn, caused the sheetpiling to rupture, allowing a movement of the second layer of quicksand through the ruptured sheetpiling, and causing the boiling noticed inside of the lock prism.

Following this slide, it was decided to construct a third cofferdam immediately outside of the lock masonry line, leaving enough space, however, for the later convenient handling of concrete forms. This cofferdam was of same depth as the inner wooden cofferdam but was constructed of Lackawanna interlocking steel sheetpiling. The ruptured length of the inner wooden cofferdam was re-driven. The steel cofferdam was braced transversely from side to side by means of heavy 10 x 10-in. timbers, fastened to and partially supported by piles driven for this purpose. In addition to bracing steel to steel, the steel cofferdam was likewise braced to the inner wooden cofferdam and provision was made for bracing the ends of both coffers against the system of transverse braces. The result was to form an incollapsible box, capable of resisting any pressure likely to be brought about by small bank movements.

On account of the tendency for the underlying quicksand strata to boil, and in order to prevent the flow of the quicksand in these layers, measures were taken to relieve the pressure in these strata by means of small artesian wells. To accomplish this, three lines of 10-in. pipe were driven entirely surrounding the lock.

The A line consists of 10-in. pipe driven on 100 ft. centers immediately outside of the inner wooden cofferdam and penetrating the quicksand stratum beginning at El. —23.

The B line is composed of pipe driven on 100 ft. centers, staggered with respect to the A pipe, located between the inner wooden coffer and the steel coffer, and penetrating into the same sub-stratum.

The C line is composed of 10-in. pipe driven on 20 ft. centers just inside of the steel cofferdam and reaching the quicksand stratum beginning at El. —55.

All of these pipe were cleaned out and filled for a few feet from the bottom with clean gravel to serve as a filter.

The intention was to keep the water in the A and B lines pumped out to an elevation of —18 ft. during the unwatering process. While the water in the lock was standing at zero, these pipe showed a small discharge at zero. It was demonstrated by experiment that the supply of water reaching the pipes in the A and B line was so limited that small duplex pumps, operating three A pipe and three B pipe each, would be capable of holding the water in these pipes at an elevation of —18, thus practically relieving the static head in the stratum in question.

The C pipe were to overflow at the same elevation at any time as the water in the lock prism. These developed a flow at zero, ranging from 4 to 7 gal. per min., which was greater than was found in the A and B pipe, but was to be expected on account of the deeper stratum into which the C pipe penetrated. The C pipe were tapped successively at lower elevations as the water in the lock was drained.

In addition to the foregoing, 5-in. 10-in. pipe were driven on 200 ft. centers along the center line of the lock penetrating the stratum beginning at El. —55, or, in other words, the same which the C pipe were intended to relieve. This latter line is known as the D line. The pipes of this D line were to serve as what might be called safety barometers to indicate the static head at any time in the lowest quicksand stratum. These pipes were not tapped anywhere and the water would rise in them to a height corresponding to the pressure below. It was to be expected that as the water in the lock prism fell and the C pipe were allowed to discharge themselves at successively lower elevations corresponding to the fall of water in the lock prism, the water in the D pipe would also fall. It was also expected that while the water in the D pipe would fall, it might lag somewhat behind the fall of water in the lock prism. In other words, the D pipe were to serve as possible danger signals during the unwatering operation. By assigning assumed weights of 100 lb. per cu.ft. to the material between the bottom of the lock excavation and the quicksand stratum at El. —55, and neglecting the frictional cohesion of this material as a resistent against any tendency of the blanket to rupture on account of boils, it was computed that if the elevation of water in the D pipe should ever be 18 ft. above the elevation of water in the lock prism a condition of theoretical equilibrium would exist between the weight of material overlying the quicksand stratum beginning at El. —55 and the upward thrust from this stratum, due to the presence of water under pressure. Stated in other words, if at any time the difference in elevation between water in the D pipe and water in the lock prism were less than 18 ft. there would be no danger of the bottom of the lock blowing up.

The foregoing additional safeguards occupied the construction time between May and the first of November, including six weeks of idleness on account of a strike.

On Nov. 18, 1919, the pumps operated by compressed air were started and from that date on the water in the A and B pipes was maintained at elevations varying from —15 to —18. For the first 10 ft., in anticipation of a possible movement of the banks, due to further oozing of the upper quicksand stratum, the water was lowered approximately 1½ ft. on alternate days, and the other days were reserved for observation. The following schedule indicates rate at which water was lowered during this first period.

Date	Water Elevation Reached in Lock Prism
Nov. 19	—2 2
21	—3 5
23	—4 5
25	—5 5
27	—6 5
29	—7 5
Dec. 1	—8 75

At latter elevation pumping operations were discontinued to allow a supplementary line of bracing to be installed at El. —9. This was regarded as esesntial, inasmuch as the first system already described, lacked a proper amount of lateral stiffness. The new braces were placed immediately below the old set and connected thereto by means of cross-braces, thus forming a system of transverse trusses running across the lock and supported by the piles already referred to. These trusses were given lateral stiffness by means of occasional horizontal braces. It took from Dec. 1 to Dec. 24, 1919, to install this supplementary system of braces.

On Dec. 26 pumping operations were resumed and continued in accordance with the following schedule, it being regarded as unnecessary to suspend pumping on alternate days for observation purposes.

Date	Water Elevation Reached in Lock Prism
Dec. 26	—11 4
27	—12.5
28	—13.6
29	—14 5
30	—15.5

At this point pumping operations were suspended for three days in order to determine whether the lag in fall of water in pipe D-1 was due to local influence or otherwise. This will further be discussed below.

Pumping operations continued:

Date	Water Elevation Reached in Lock Prism
Jan. 3	—16 5
4	—17 5

During the unwatering process transit and level readings were taken twice daily on established points along the banks of the lock, and along the wood sheetpiling; level readings were also taken on points established on piles in the lock prism. The former were for the purpose of determining any tendency of the banks to move, and the latter for the purpose of noting any tendency of the bottom to heave up. The inner line of wood sheetpiling moved toward a maximum distance of 3 in. Further movement was arrested by the braces. This movement was not accompanied by any bank movements visible to the eye and was noticeable by the transit readings only.

Attention is now invited to Fig. 2, which shows graphically the behavior of pipes in the D line during the unwatering program. It will be noted that the fall of water in the D pipe has practically been uniform with fall of water in the lock. In the case of pipe D-1, the peculiar condition noted between Dec. 12 and Dec. 20 is due to an abnormal condition resulting from disturbances around the bottom of the pipe produced by pile driving. The filter at the bottom of the pipe was undoubtedly damaged on account of the sudden jets produced under the blows of the hammer, and the water would be impelled into the pipe under this jetting, but fail to fall of its own weight through the damaged filter. When pile driving in the immediate vicinity of this D pipe had been completed, the water gradually fell, since which time the pipe has been acting normally. This was the reason for putting into service and starting pipe D-1-A, as it was not known whether pipe D-1 could be further relied upon.

Attention is also invited to the note at the top of this figure. This note explains the practically constant fall of the D pipe with respect to the water in the lock while latter was above an elevation of El. —10. On account of the mud line close to the steel sheetpiling where the C pipe were driven, it has been impracticable to tap the C pipe below elevation of El. —16. It was not feasible to do this until after Jan. 5. It takes some time to accomplish this punching, inasmuch as the mud has to be jetted from around the outside of the pipes, in order to make a tap at this elevation possible. This accounts for the lag and irregular behavior of the D pipe with respect to water in the lock after Dec. 26. At present the C pipe are being treated by tapping them at El. —16 with 1 in. pipe which are being laid laterally toward the center of the lock to a point where they can discharge freely without fear of being clogged due to future excavation processes. It was found impossible to jet around the C pipe and maintain the hole even in the stiff clay encountered. The hole would gradually fill up and the

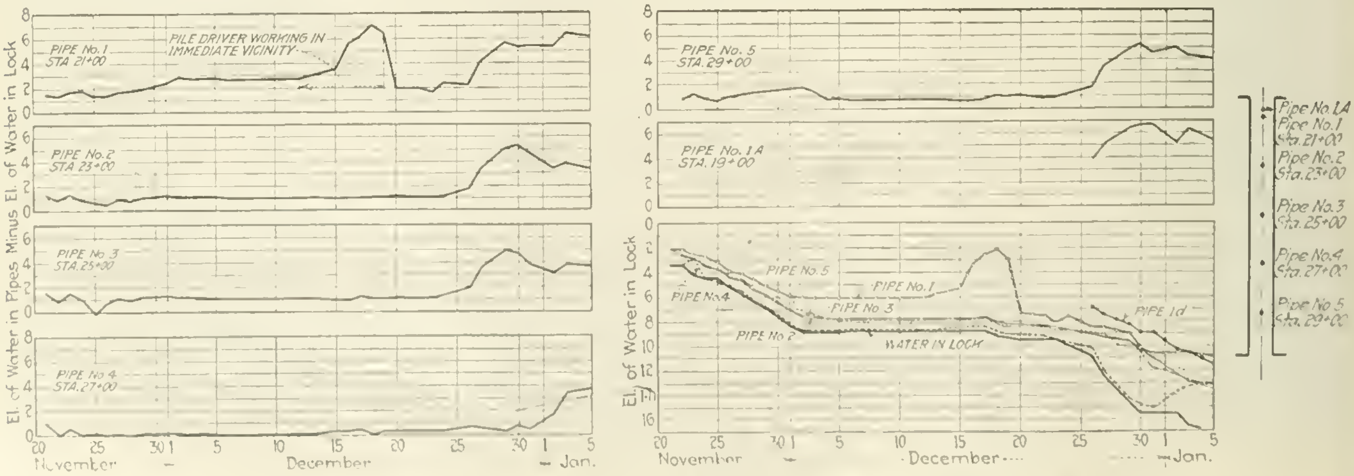


FIG. 2. LOG OF UNWATERING OPERATION, SHOWING WATER CONDITIONS IN WELLS

orifice tapped in the pipe would become clogged. As this report is written, the water in all D pipe is gradually falling and will undoubtedly fall to within 3 ft., in all cases, of the elevation of discharge of the C pipe.

With water withdrawn to El. —17.5 practically all of the bottom of the lock prism is exposed. Not more than 2 in. of water remains. Material exposed is a soupy ooze into which a man will sink of his own weight for 3 ft. before bringing up on the hard material on which dredging stopped. It will be very easy to excavate this material by means of the centrifugal pumps that have been purchased for this purpose. Should the water be withdrawn at the present time this soupy material will quickly dry out and harden and would ultimately require jetting before removal by the centrifugal pumps; hence it has been deemed advisable to retain water elevation where it now stands, and then excavate the lock bottom by sections.

At the south end of the lock the bottom is higher than elsewhere but this was to be expected on account of the slide which took place in May, when a great deal of bank material slid in. The following table gives the average elevation of the bottom of the lock today on transverse sections taken every 100 ft. apart:

Instrument Station	Elevation of Bottom	
21	13.5	Hard material
22	17.5	
23	17.5	
24	17.5	3 ft. to hard material
25	18.0	
26	16.5	
27	17.5	
28	17.5	
29	18.0	
30	16.5	
31	17.0	

Bear in mind that the elevations noted in this table represent the top of the soft mud. The hard bottom occurs on an average of at least 3 ft. below elevations noted, in all cases except for the first three stations. Latter are at the south end of the lock, and elevations noted represent solid material. Very little of the latter will have to be removed, however, as most of it is outside the masonry line.

During the unwatering operation, it has been impossible to obtain any pipe flow data of sufficient value to go on record.

The pipes of the A and B lines, as has been stated, were connected up half a dozen to each pump. While effort was made to maintain the water level in these pipes at about El. —18, practically speaking it was almost impossible to regulate the speed of the pumps to make sure of this. For these reasons, the flow from any individual pipe could not be measured with any accuracy. It may be noted in passing that the supply of water reaching the B pipes was more limited than that which got to the A pipes. This was to be expected, however, for the reason that the portion of the stratum relieved by the B line was supposedly cut off by a wooden cofferdam. A phenomenon difficult to explain is the fact that the discharge from groups of A and B pipe at the north end of the lost—farthest from the river—is nearly double that from the groups at the south end.

Data on the C pipes is likewise lacking for the following reasons. When lowering the water in lock prism from El. —1 to —10, the C pipes were discharging through orifices punched at El. —10. Consequently the discharge could not be measured. During the second phase of the unwatering progress, the C pipe were punched every two feet or so and above the water level in the lock but there was not sufficient time to get discharge data. At present, with all C pipe punched at El. —16, it will be feasible to resume bi-weekly discharge readings. It is interesting to note that the C pipe system is so sensitive that punching a hole in any C pipe as much as one foot below the discharge orifices in the immediately adjacent C pipes practically stops the flow from the latter.

It should also be noted that during the majority of the time that the unwatering operation was taking place, the Mississippi River was at +33, or within 6 ft. of maximum recorded flood stage.

The methods employed to unwater the lock were devised by George M. Wells, of this firm, R. O. Comer, designing engineer, made many of the investigations and worked out many of the details in collaboration with Mr. Wells. J. Devereux O'Reilly was Chief Engineer up to Nov. 1, 1919. Under his charge, a large part of the details and safety devices for unwatering the lock were installed. General Arsene Perrilliat became chief engineer Nov. 1, 1919, and under his administration the actual unwatering operation took place. James Cosgrove was superintendent of construction during the entire time and was in direct field charge of all the installations and operations herein described.

Sand for Earth Road Maintenance

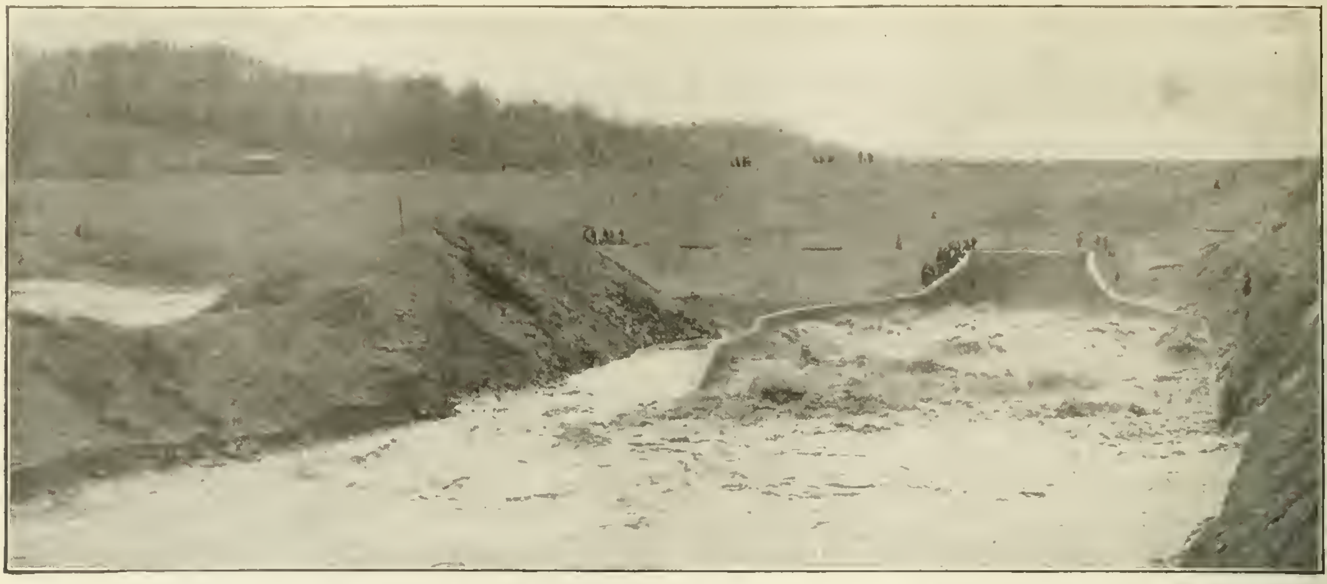
By N. S. Mullican

Highway Engineer, Davie Co., N. C.

In the maintenance of earth roads there is no material so effective as quartz sand, if the road has a red clay base. It is not necessary to plow, disk and harrow the roadbed in order to effect a mixture of sand and clay, as has been the belief for so long among engineers using sand clay construction. The materials will effect their own bond when placed together and subjected to pressure due to traffic. Therefore, for the benefit of others who have problems similar to mine, I desire to give my experience in this method of road maintenance.

The road I have in mind, a 7-mi. section, had been originally given but a top-soil surfacing, which had been worn out with traffic and age, and had every appearance of being but an ordinary clay road, a type well known throughout the South. The first thing that was done was to machine the roadbed until the surface was brought to the required cross section and was perfectly smooth.

The coarse sand was taken from the creek bed nearby and spread upon the road in a 4-in. layer. The sand was spread evenly with a road machine and the road was then opened to traffic. After two or three days it was necessary to drag the road, for a great deal of the sand had been rolled to the shoulders. Continuing this frequent dragging, and especially after rains, the surplus sand would gradually disappear, being absorbed by the clay, until, at the end of 60 days, all the sand had been driven into the clay. Then another coat was applied, this time but 2 in. in depth, which was just enough to absorb any clay not absorbed by the first coat. This method of treatment has proved a most excellent and economical way of securing a smooth and more or less impervious surface which is capable of carrying fairly heavy traffic with a reasonable degree of maintenance.



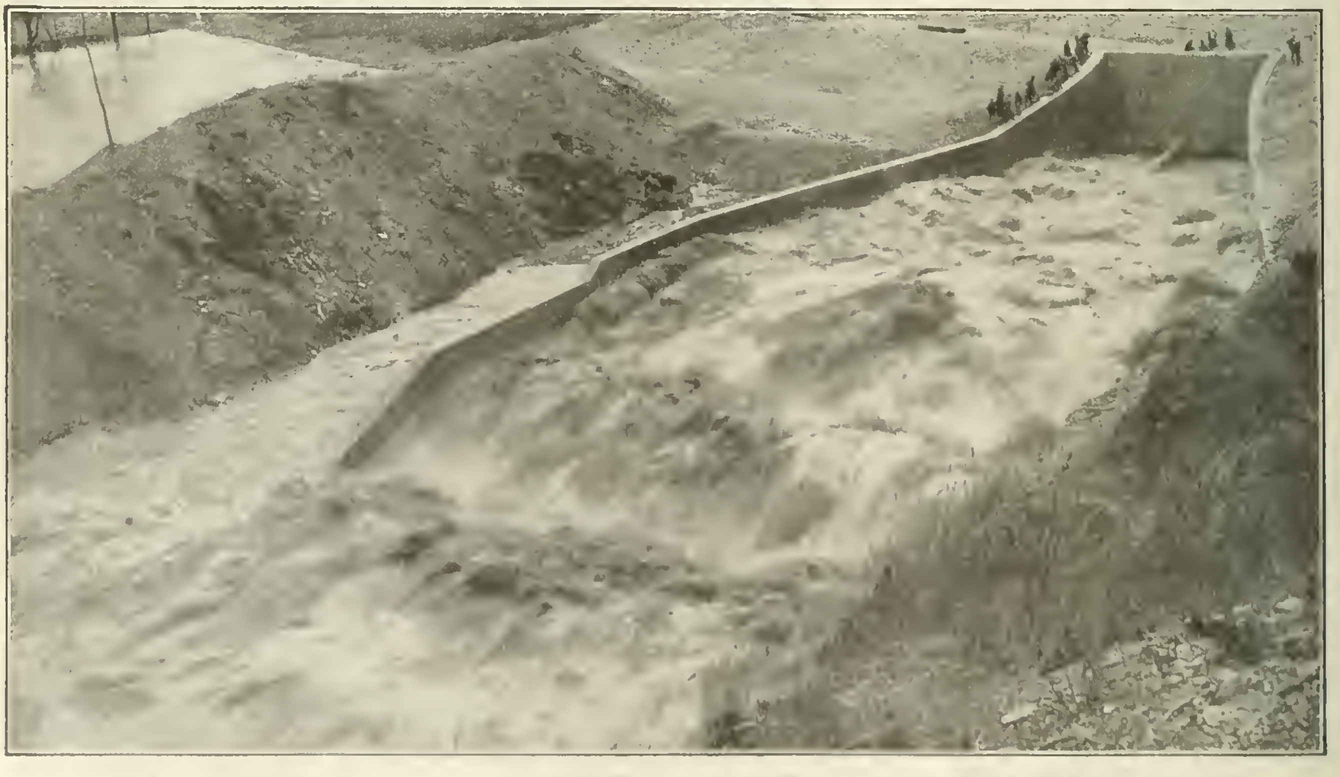
DISCHARGE AT GERMANTOWN DAM SHOWING JUMP IN POOL AND SMOOTH WATER BELOW

Highest Miami Flood Since 1913 Tests Conservancy Works

No Injury to Construction Work — Germantown Dam Impounds 25 Ft. of Water — Hydraulic Jump at Conduit Discharge

During the week April 18-24, 1920, the highest flood that had occurred in the Miami River since 1913 was experienced. No damage was done, and, in fact, the river did not reach the danger point anywhere along its length, but the flood supplied a test of the behavior of the uncompleted conservancy works that was of much value to the engineers. In particular the uncompleted Germantown dam on Twin Creek, now about 60 ft. high above river bed, was put under a head of about 25 ft. of water by the flood flow ponding back of it. The discharge conduits of this dam for the first time developed a well-defined hydraulic jump in the pool provided for that purpose at the outlet end, and thus gave the first full-scale verification of the effectiveness of the design. Such a test might have been obtained before this except for the fact that during the construction period, to guard against overtopping of the dam from flood ponding, the conduits have twice the cross-sectional area that they will have in their final service condition.

Two views of the discharge at Germantown are given in the accompanying photographs. The distant one gives a good picture of the downstream slope of the dam at its present height of 60 ft., and also shows the jump in the pool and the relatively smooth flow of



CLOSE-UP OF HYDRAULIC JUMP AT GERMANTOWN DAM, WHICH CONFIRMS EXPERIMENTAL STUDIES water away from it. The other view, giving a "close-up" of the jump, shows in the background the flow out of the downstream end of the conduit and its rise in the jump. The latter will be seen to be a faithful duplication of the action studied in the miniature experimental apparatus used in working out the original design of the jump pools, as described and pictured in these columns three years ago (*Engineering News*, Jan. 17, 1917, pp. 144-151, see especially Fig. 13, p. 150). It is fair to say that in the present condition of the pool there is more disturbance in the jump and just below it than would occur later with a similar flood, due to the fact that the conduits are twice their final depth and that the lowered floor slopes up from the outlet end, reaching the permanent floor at a point some distance downstream from the end of the conduits, which tends to create marked irregularity of flow at about the center of the hydraulic jump pool.

At the Lockington Dam also the river channel is closed. A natural spillway has been left open at one side of the outlet structure to take care of the peaks of the larger floods which might occur during the spring's flood season. A little water passed through this spillway during the recent flood, but water was backed up behind the dam to a depth of 19 ft. A very well-defined jump occurred at this dam. The Lockington outlet structure is an example of the retaining-wall type which is in use at three of the Conservancy dams. The gap between the walls is left open during construction. Later, after the earth portion of the dam is completed to its full height, a cross dam will be built in between these walls, and the permanent conduit openings (two in number at this dam) will be left through the cross dam at the present river level. These contracted openings, of course, will give a different effect as to the jump, but from the indications given by this recent flood, it seems that the designs are sound.

At the approach and throughout the continuance of the flood the office of the Miami Conservancy District Engineering Department was the central point of information on rainfall and flow conditions and issued frequent forecasts. The forecaster, who was on the job continuously, was able to predict the river stage close enough for all needs 24 hr. in advance. A great many of the leading merchants in the larger cities depended wholly on the District advice in connection with moving goods out of their basements and lower floors. It was, in fact, not necessary to move anything, but probably a great deal of such work would have been done except for the confidence reposed by the people in the technical information supplied by the District.

There was no damage to speak of to any of the District construction work, although by far the larger part of it is in uncompleted condition. The high-water stages of the past two years merely held up the work in places temporarily, and did not essentially put the works to any test with respect to the effect of flow velocity and the like. The Germantown dam closure, and river diversion at Lockington, were accomplished late last fall and the present flood season therefore is the first in which the outlet works were called upon for real service. The engineers of the District are well satisfied with the outcome of the tests.

Skillful Underpinning Checks Warehouse Collapse

Eight-Story Brick Building Anchored Back, Jacked Up and Set on New Foundations While Loaded With Merchandise

By George F. Paul
Chicago, Ill.

REPLACEMENT in successive small units of the rotted pile foundations of a Chicago warehouse averted partial collapse of the building and, perhaps, obstruction by the ruins of the nearby channel of the Chicago River. A lowering of the water level since the foundations were constructed is the attributed cause of failure. Almost complete decay of the pile tops and grillage capping was disclosed when, after serious settlement of the building, the foundations were uncovered and unsuspected danger of sudden collapse appeared. The reconstruction restored the original secure condition of the building. A sketch of the building is shown by Fig. 1. It is an eight-story structure with brick walls, iron columns, steel floor beams and wood floors, and was built in 1872. Originally, the front wall was on line with the second row of columns, as indicated by the dotted line. After a fire in 1881, the building was widened 18 ft. its whole length, the addition being supported on pile-and-grillage column and wall footings built where the old wharf had been.

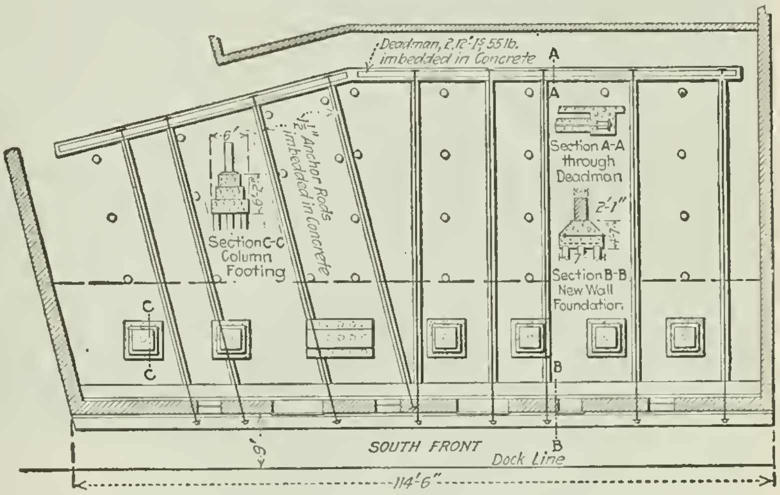

Deadman, 2, 12"-I's, 55 lb. imbedded in Concrete
A
A
Section A-A through Deadman
1½" Anchor Rods imbedded in Concrete
6'
4'-6"
Section C-C Column Footing
2'-1"
7'
Section B-B New Wall Foundation
C
C
B
B
6'
SOUTH FRONT
Dock Line
114'-6"

FIG. 1. PLAN OF UNDERPINNING AND ANCHORING SETTLED PART OF WAREHOUSE

Settlement began to be noticed about two years ago, but about the middle of 1919 it assumed serious dimensions. A crack in the west end wall opened from footing to roof. In the front wall the joints opened up in zig-zag cracks; the window arches cracked and spalled; the stone lintels broke in two, and the bottom of the wall shoved out about 2½ in. In this condition of progressing failure reconstruction was begun.

So dangerous was the building considered by the contractors that they feared to touch the foundations until the front wall had been anchored as firmly as it could be. On every other floor, at each transverse line of columns, holes were drilled through the walls and steel rods carrying broad outside anchor plates were carried back to bands on the third row of columns and pulled taut. The settlement had been greatest for some 50 ft. about mid-length of the front wall, and therefore reconstruction was begun here. The settlement to be overcome was 0 to 7 in. All six floors of the building were laden with sacks of coffee and chests of tea, the load being estimated to be about 150 lb. a square foot.

Two steel I-beams about 26 ft. long were set parallel on each side of the wall as indicated by Fig. 2. Needle beams resting on the I-beams were inserted through the wall and the I-beams were then blocked and wedged up to a firm bearing. A 6-ft. section of the wall footing was then cut out, the grillage removed, the piles cut off to sound wood below water level and the trapezoidal concrete footing indicated in Fig. 1, was constructed.

When the concrete so placed had set, the space between footing and bottom of wall was filled by three longitudinal rows of screw jacks set so as to touch each other. Then another 6-ft. section was removed and rebuilt, and so on, until the whole of the part affected by settlement had been supported. The column footings were replaced by similar methods, a nest of 24 jacks being put under each column.

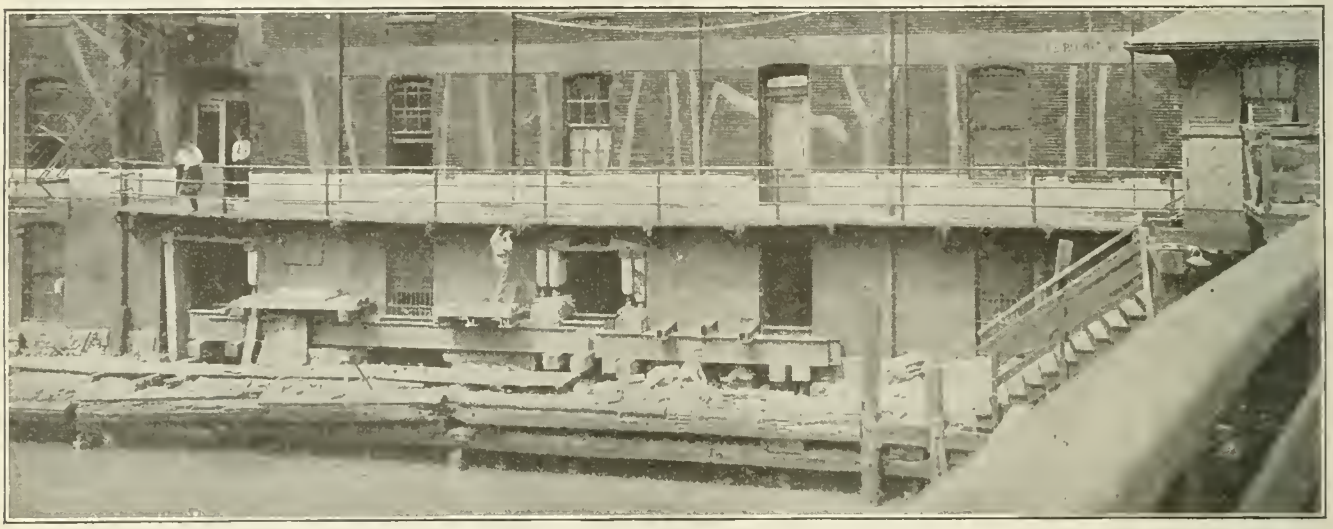


FIG. 2. NEEDLE BEAMS SUPPORT FRONT WALL DURING UNDERPINNING OPERATIONS

When the operations outlined had been repeated until the columns, the front wall and the west end wall (back to the crack) were on jacks, the raising was begun. By simultaneous advances of ⅛ in. the jacks were screwed up until the floors and walls were level. During the raising, practically all of the cracks were closed. Finally, the jacks were removed a few at a time and replaced with brick masonry. To insure the new front-wall footing from sliding forward it was anchored back as shown by Fig. 1.

About six months were required for the operation. The contractors were the L. P. Friestedt Co., Chicago, Ill. S. M. Gooder was the superintendent for the contractors.

Mortar Tamping Reduces Powder Cost

A mortar composed of quick setting cement, plaster of paris and screenings, is advocated for tamping blast holes, by O. P. Chamberlain, general manager, Dolese & Shepard Co., Chicago. The mortar plug is located above the dynamite charge exactly as is the ordinary tamping of screenings or sand. Its use, it is stated, will reduce the amount of dynamite required fully 25 per cent, presumably by making a tighter hole.

Compensation from the Engineer's Point of View

(Extracts from an address by Robert Ridgway, Engineer of Subway Construction, Transit Construction Commission, New York City, delivered April 28 at a meeting of the Municipal Engineers of New York. The general subject under discussion was "Classification and Compensation of Engineers in the Municipal Employ." There were present at the meeting, as guests of the society, the Comptroller and the Civil Service Commissioner.—EDITOR.)

The engineering employee is an educated man. His is work that cannot be picked up by a handy man in a few months' time. He, or someone for him, has spent money and he has given precious time in preparation for his life's work. He is entitled to sufficient compensation to make up to him this time and money spent and to maintain himself and his family not only in decency but in comfort. He should be in a position to educate his children, if he is fortunate enough to have any, and to take part in the affairs of the community in which he resides as a good citizen should do and as educated men in other occupations do.

The engineering employee will not be as good a citizen or give the best service to his employer if he is constantly worried as to where the rent money is to be found and how he is going to obtain needed food, clothes and medicine for those dependent upon him and for whose welfare he is responsible. None of us can do his best work when worried and distracted and with thoughts that are embittered by what seems to be an injustice. When a man has sufficient food, clothes and shelter and a little surplus in addition he can look at things cheerfully but it is hard to be an optimist and to preach contentment when month by month expenses crowd or exceed revenues in spite of the practice of every economy and with no change for the better in sight.

Everyone who has had the direction of men, whether engineers or not, knows the value of cheerfulness and contentment in the force and the demoralization which results from grouchiness and discontent. In one case obstacles which seemed almost insurmountable are overcome with ease and a prodigious amount of work is accomplished through willing team play and co-operation, while in the other case the work drags in spite of everything, errors are made and demoralization follows to the great loss of the employer. The most successful leaders in all enterprises have recognized and profited by these facts and they know that adequate compensation is advisable to assist in maintaining the interest of a good man in the job and to keep him from seeking a better one. We all know that more can be done with a small efficient force than with a much larger but demoralized one.

Among engineers, as among the laborers, poor pay and discontent mean an excessive turnover on the job, to its detriment. Successful managers of industrial plants frequently speak with pride of the small turnover in their force and claim it makes for efficiency. The same considerations apply with equal weight to engineering service. Good pay keeps good men and poor pay keeps poor men. Good men seek and find better jobs while poor men remain because they cannot obtain better jobs. There are exceptions to all rules, of course, and it sometimes happens that good men remain through a sense of loyalty and interest in a particular job after it ceases to be attractive to them in a pecuniary way. Frequently good men remain so many years in the same public employment that while invaluable for the particular work in which they have specialized they are unfitted by habit and training to undertake new employment and consequently, in the absence of proper recognition, their very loyalty and good service have worked to their positive personal detriment.

I do not wish to be understood as discouraging the idea of a moderate turnover in the force. Changes are necessary for many reasons. It is well to have good men step out from time to time to take up greater responsibilities, thereby giving opportunity to promote and encourage those left behind. Incompetents should be weeded out and shifts made to keep men from growing stale. Any such changes as make for improvement and development should, of course, be encouraged but changes that lead to demoralization are bad.

Figures taken from the records of the New York subway construction work indicate that there was a turnover in the engineering force of practically 450 per cent in the six-year period from 1913 to 1919, during which period the force averaged about 1,040 men; 13 per cent of the force resigned in two months during 1919, most of the reasons given for such action being lack of opportunity and insufficient compensation.

Many have called attention to the part played by our engineers in the recent world war which has been called an engineers' war. Their part would have been even more important had the struggle continued. They have just as important a role to play in the rehabilitation of the world made necessary by the waste of war. The morale of our people has been lowered due to the reaction from the excitement and stress of the struggle. The engineer can lead in the work of restoring this morale if his own morale is not broken. He is as well if not better fitted to carry on the battles of peace as those of the war. Why then is it not the best public policy to encourage him to continue in the work where he is so much needed and for which he has been trained and not drive him through necessity to seek other employment? Is it wise to discourage such men so that they will either seek a future in other lines of human activity, leaving the public work to be done by those less competent to do it, or remain on the job to have their ambition and interest destroyed through a lack of recognition of their service, perhaps entering into unnatural alliances to obtain what they believe to be their due? If we were all doing the work for ourselves or for a private corporation I believe there would be but one answer.

The cost of living has gone up by leaps and bounds since 1914. Common labor on subway work which received $1.60 per day of 8 hours in that year, now gets from $4 to $5 per 8-hour day and the end is not yet. Every class of labor and the material entering into the construction have jumped in price, and the cost of living has mounted to such heights as none of us could have foreseen six years ago. Engineering salaries on public work have not kept pace with these conditions. They have either remained stationary or have been given such slight advances as do not in any way compensate for the increased cost of living.

New York City owes much to its engineers who have planned, constructed and operated the works on which the health, comfort and convenience of the public depend. Generally speaking these utilities function so well that few ever stop to think of the vision of the men whose minds conceived them, of the careful study of each one of the multitude of details making up every structure and of the everyday hard work, carried on amid all sorts of discouragements, which made the plans materialize. Seldom if ever have there been instances of faithlessness on the part of the engineers to the trust reposed in them. The public structures have been well built. Many of them stand as monuments to the constructive genius of the men whose names are forgotten or who were never known to those who today utilize and admire their handiwork.

The City urgently needs its engineering staff. Because of its record of accomplishment and of the quantity and quality of the work it has done and is doing for the City the members of this technical staff are certainly entitled to a careful consideration of the merits of any pleas which they may make for relief from their present condition.

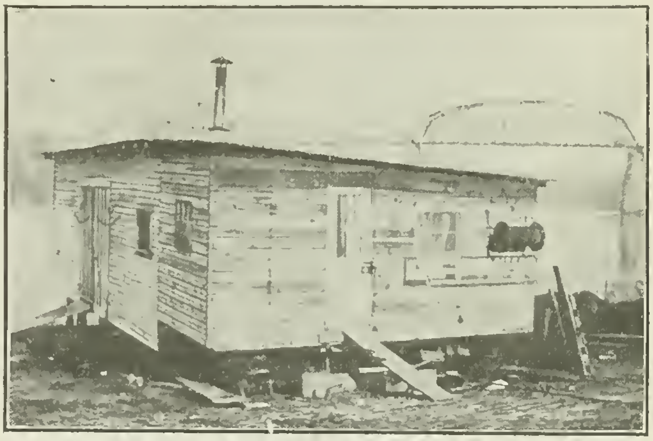
Wharf-House for Variable Rivers

By George W. McAlpin

Point Pleasant, W. Va.

TEMPORARY storage of freight on rivers with large variations in level presents a number of difficulties. The problem has been satisfactorily solved at Point Pleasant, W. Va., on the Ohio River, by the use of the movable wharf-house shown in the accompanying view.

This building is nothing more than an ordinary shed, built on a frame resting upon wheels and made to suit the slope of the public wharf. By means of a ½-in. wire line, leading to a small winch at top of bank, the wharf-house may be brought up the bank as the stage of river requires. It descends the slope by gravity.



FREIGHT WAREHOUSE MOVED UP AND DOWN BANK

The wharf-house is carried on a frame of 6 x 8-in. timbers and fitted with four wheels, 2 in. in diameter and 8 in. tread. The house proper is about 16 x 26 ft. A 6-ft. extension, at one end, provides an office for the clerk. Large double doors are provided at one side for the entrance and exit of freight. Being on wheels, the shed can always be placed near the water's edge and thus facilitates handling of freight. It may be pulled up the bank during high water and again lowered as the water recedes. Small chocks are used, under the front wheels, as an additional safeguard to prevent the house moving. Telephone connections, as may be seen from the view, are provided on a reel attached to the house.

Ed. Varian, of Point Pleasant, W. Va., has found the idea, which he originated, to work out successfully in practice.

A Call for A Practical View In Structural Teaching

By Edward Godfrey
Structural Engineer, Pittsburgh, Pa.

THIS article is not intended to discredit proper theory, theory based on fact, but it is a plea in the interest of average designers and in the interest of safe design for simplification of theory in connection with problems of design. It is easy for a college professor or a man who thinks in integral signs to work up a nice theory for keeping stresses within prescribed limits, but here are some questions that every theoretical investigator should ask himself and should answer satisfactorily:

Queries: 1. Is my theory based on fact? 2. Does it take account of all the facts that may have a measurable influence in the results? 3. Are the properties assumed for the materials considered actually the properties of those materials, or are they just ideal assumptions as to the properties? 4. Is there any way to simplify the formulas in their application to practical design, or is there some simpler way to arrive at equivalent results? 5. Are there practical considerations which, in fabrication of the structure or in its handling, may vitiate the assumptions? 6. Does the formula or method presuppose workmanship that is of unattainable perfection or not commercially possible or usual? 7. Will the average designer use it?

If the safety and economy of structures were dependent upon the intricate nature of the mathematical formulas employed, then it would be in order to go to the limit in abstruse mathematics during the engineering course. But the end and aim of instruction in structural engineering is to enable men to design structures that are safe and economical, and manifestly the method that produces this result in the simplest way is the best possible method. A simple method is better grasped by the average designer and is less liable to give rise to errors. If it can be shown that a theory is based on false premises as to the nature of the materials, and, further, that introduction of that theory decreases the chances of safe design because of the difficulty of applying it, a strong case is made out for substituting simplified for complex theory.

There can be no conflict between theory and practice, if the theory is right and is based on fact. There is just as much theory in practice as there is in what is termed theory. Horse sense is simply the fag ends of theory that do not admit of nice theoretic treatment by formulas. It is when theory goes beyond the province of premises based on fact that it begins to be useless and a cumbersome burden in our engineering literature and college courses.

Retaining Wall Theories—Retaining wall theories as given in our textbooks are very complex. They are based on the assumption of properties that no earth possesses. The things that work against a retaining wall are frost and wedges of wet, lubricated earth. If the earth be assumed to be a liquid of a weight per cubic foot a fraction of its actual weight, the designing of retaining walls and bins can be greatly simplified; and stability as well as economic design can be arrived at by this simple method as well as by the most complex theory.

Elastic Arches in Masonry—The elastic-arch theory in masonry is purely theoretical, with a slender basis in fact. The old row-of-blocks method is more reliable. It is good practice to design by this method for hinged ends, and then anchor the ends into the abutment as part of the factor of safety. Over in Europe they were so anxious to meet all the conditions of the theory that they made polished and greased hinges for a masonry arch; the arch collapsed.

Assumption of horizontal pressure against the haunches of an arch and reliance upon the same in design has also little to warrant it in fact.

Truss Pins—Many years ago it was discovered that truss pins did not fail when their theoretic stress exceeded the ultimate strength of the steel. The toughness of the steel allowed adjustment in the stresses. Engineers wisely allowed unit stresses no higher than would be safe, if they actually were realized. There are other examples where steel will adjust itself to theoretically adverse conditions and give permanent stability.

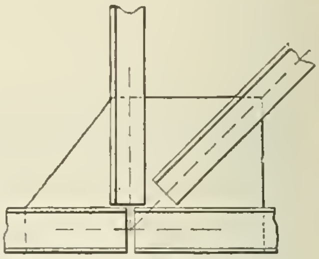


FIG. 1. GUSSET USED AS CORD SPLICE

Secondary Stresses and Least Work—It is surprising to find how few engineers engaged in designing know anything about secondary stresses, relative rigidities or least work. Still fewer make any use of them. Once in a while a designer wastes a lot of time figuring the secondary stresses due to the deflection of a truss. There may be designers who make allowance for the deflection of a girder rigidly attached to a column (the proper detail) and proportion the column or bridge post for the bending moment, but I have never had a design of that sort to check.

Do theorists ever stop to consider that the milling of a girder $\frac{1}{16}$ or $\frac{1}{8}$ in. out of true on the end may give rise to theoretical stresses just as great as those due to the deflection of the girder, and that the inaccuracy may be in a direction that would double the stress due to deflection? It is a simple matter to show that commercial shop work gives rise to paper stresses that would wreck many a structure. But the structures stand up, and there is no record of a single failure from these textbook stresses. In my judgment, structures that have the most stresses of this kind are the safest, for example the Firth of Forth bridge.

The things to be feared and most carefully guarded against in structural steelwork are buckling failure and excessive deflection. It is vastly more important to guard against these, even at the cost of some little increase in unit stress, than to take such care of theoretical unit stresses. Rigid connections lessen deflection and forestall buckling, hence these are excellent, in spite of the fact that they give rise to secondary stresses. The only high beam-and-column building that ever collapsed was one having cast-iron columns. The *lack* of rigid connections, this bugbear of the theorist, is the thing that brought down the building.

If the space given over to discussion of least work were taken up with emphasis of the importance of proper bracing of compression members and the upper flanges of beams and girders, proper details, questions of bracing and stability in general, and the glaring faults in design, the work turned out by designers would be greatly improved.

I have heard an eminent engineer say that girder webs should be spliced for bending as well as shear, because the web plate is subject to the same extension and shortening, at the bottom and top edges, as the flanges. What could happen, if a web plate is spliced only for shear, say with a single row of rivets on each side of the cut? Suppose the extreme rivets should slip an insignificant trifle; this would not impair their value for taking shear one iota, and, with flanges proportioned for the full flange stress there is absolutely no weakness of any kind in the girder. There are many cases where, if the fact is recognized that steel is tough as well as elastic, it will be seen that unit stresses may be increased a little without introducing any real menace to the structure; the theoretical treatment of our textbooks fail to recognize this. It is not by any means true that wherever there are adverse conditions connecting high unit stresses in the steel the structure will adjust itself to those conditions. It will do so only where the toughness of the metal comes into play and reduces the real unit stress or forestalls any increase of deflection beyond a small amount.

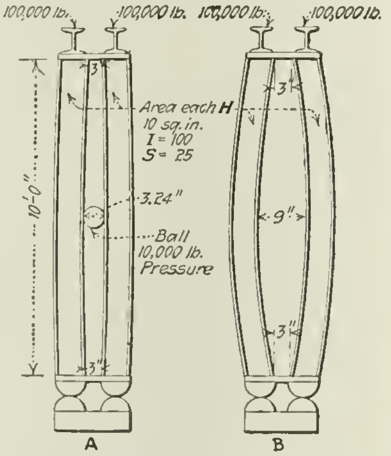


FIG. 2. TWO DOUBLE COLUMNS OF UNEQUAL SAFETY

Fig. 1 shows a gusset plate used as a splice. Some designers will take this whole plate as available as though it were symmetrical, which is plainly an error. Theoretically a plate wider than the channels will have an extreme-fiber stress greater than a symmetrical plate just the width of the channels. Why not use the portion of the plate covered by the channels as available for splices? For, the part of the gusset plate above the channel does not render the splice any less safe—not in a tough metal like steel.

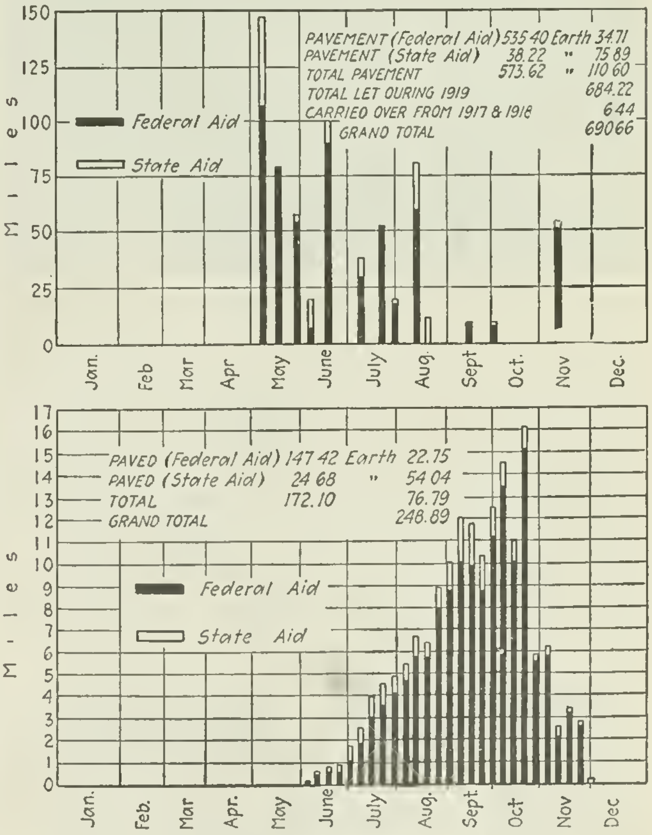
Two pairs of twin columns are sketched in Fig. 2. In the pair at A, straight columns are wedged apart 0.24 in. and held with a ball (so as not to brace the flanges). In the pair at B the H-sections are bowed. The bending moment in the first pair is 300,000 in.-lb. due to the pressure on the ball. The bending moment in the second pair is 300,000 in.-lb. due to the bow. Theoretically, then, the pairs of columns are identically stressed. Actually, if they were made of a hypothetical metal such as the theorist deals with, the nearest thing to which is glass, they would be equally dangerous. I venture to say that there is not an engineer living who will assert that the columns at A are anywhere near as unsafe as those at B. What becomes of our theory, then?

Mill-building designing can be and has been made very complex, so much so that designers ignore completely the textbook treatment, with the result that designs are generally bad. Mill-building design can be made quite simple, if relative rigidity and least work be put to sleep. The method is simply to take advantage of the full available bending strength of the columns (to resist wind moments) at the base and at the foot of knee braces, regardless of whether the angles of inclination of the column axes at the points of inflection are identical or not. If textbooks would show this simple method, it would doubtless improve mill-building design, because it would put the subject within reach of the average designer.

Road Construction in Illinois During 1919

By B. H. Piepmeir
Engineer of Construction, State of Illinois, Department of Public Works and Buildings, Division of Highways

During 1919 there were 685.39 miles of Federal-aid and state-aid roads placed under contract. In addition there were 6.44 miles of roads carried over from 1917 and 1918, making a total of 691.83 miles placed under construction in 1919. There were completed during 1919, 247.24 miles, or 36 per cent of all work. The accompanying chart clearly shows when the work was placed under contract and the construction progress. A careful study of the chart shows that a great many more miles could have been completed had the work been placed under contract at an earlier date. There were several other outstanding causes that delayed the work. It will be noted that the maximum mileage per week was not reached until the month of October, a condition attributable to the inability of contractors to secure road equipment. Many contractors were delayed from three to four months in getting proper machinery, and delays due to machinery repairs



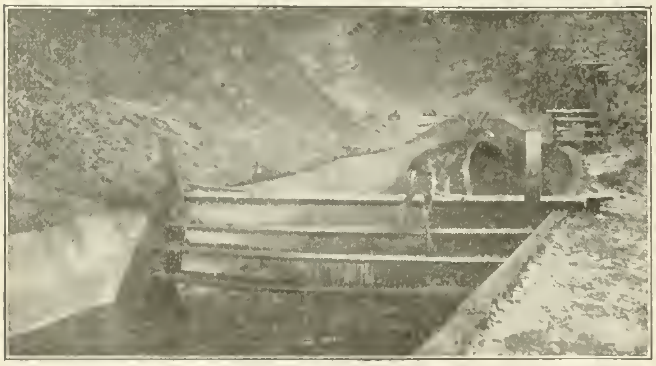
TOP—CONTRACTS LET AND TOTAL MILEAGE. BOTTOM—WEEKLY PROGRESS, 1919 were also very serious. Another serious cause for delay was shortage of material, much of the equipment working but half the time on account of such a shortage. Then labor shortage and labor strikes in various divisions of work seriously delayed the delivery of materials and the progress of the work. About the time that the maximum amount of work per week was reached it was suddenly stopped by winter weather. Had the construction season been two months longer fully 100 per cent more work could have been finished.

The slow progress of the work in 1919 could in no way be charged against the contractors. In general they exerted every possible effort and in many instances the contractors who tried to produce the greatest mileage got the least results.

On account of the unfavorable conditions existing during 1919 the contractor who organized and planned to do a large volume of work produced much less in proportion to his investment and effort than the one who operated the smaller unit. It was almost impossible to work the larger units to their capacity on account of the shortage of labor and material. The smaller units were worked to their capacity a very large part of their time, hence proved to be more economical. However, the larger units have their many advantages and under normal conditions prove their economy.

Deer Ladders a Necessity in Flume

The three miles of concrete-lined flume which brings water to the Cherry Creek power house on the Hetch Hetchy Project, lies in a territory abounding in deer.



HOW DEER USE LADDERS BUILT ESPECIALLY FOR THEM

When water was first turned into the flume there was a good deal of trouble with deer which got into it and could not get out unaided. As many as 30 to 40 deer have been taken out of the flume in a single month.

To relieve this condition, deer ladders made of planks, as shown in the accompanying illustration, were built in the flume line at intervals. The ladders extend below the water as well as above so that the deer can find a footing on which to climb out. Since the ladders were put in there has been no further trouble with the deer.

Aerial Photography and City Planning

At the recent meeting of the City Planning Conference at Cincinnati provision was made for the appointment of committees to consider the adaptability of aerial photography to city planning and also the usefulness of moving pictures in city planning propaganda, these committees to report to the next conference.

Suitable Areas for Regional Plans

Condensed from a Brief Submitted to a Committee of the City Planning Institute by Thomas Adams, Town Planning Adviser, Canadian Commission of Conservation, Ottawa, Ont.

IN DETERMINING what a region should be for purposes of planning, we should have in mind the limited area which it is practical for any man or group of men properly to plan in one operation. Moreover, we should have in view what is the dominating feature which makes the area appropriate as a unit for planning. An arbitrary city boundary is not a satisfactory planning unit unles sit be in the case of a city that is practically stationary in development. I think the groups of regions and order of planning to have in mind are: (1) An industrial area having problems and conditions in common and comprising incorporated areas, or parts of incorporated areas, adjacent to one to one another; (2) An agricultural region round a market town or village, where the problems of town and country are so intermingled as to require treatment in one comprehensive scheme; (3) A mining region, consisting of a series of villages in a large coal bearing or other area where the industry dominates the whole development; (4) A metropolitian region where a large city has thrown out a number of satellite towns or suburban districts or has overgrown its boundaries.

As a tentative scheme the following may be considered as the order in which planning should be done: (a) Regional survey of social, industrial, and other conditions; (b) a regional plan, showing tentative proposals for main highways, extensions of highways, general position of districts for industry and residence giving some indication of height and use of buildings, etc.; (c) a definite city or town plan, going into detailed development subject to general conformity with the regional plan.

Where necessary, the city plan might be preceded by a further survey to be called the "civic survey" as supplementary to the regional survey, but dealing only with the incorporated area.

The objective should be to adapt the area to the planning rather than to attempt to adapt a plan to an unintelligible boundary of an incorporated area. By these means we shall simply be adopting the British and German idea that we should plan the environments of a city at the same time that we attempt to deal with the improvement of the existing city. The German plans deal with town extension rather than with town reconstruction. The British plans deal primarily with areas unbuilt upon. American city planning and zoning schemes have been too much confined to areas already developed and should broaden out to deal both with developed areas and with undeveloped areas including those that grow out from one common centre and are likely to undergo development in the future. Modern transportation and methods of power distribution are forcing us to adopt new geographical areas for planning.

The suggestion is that this regional scheme should merely be a tentative one as the basis for the civic plans to be prepared for each administrative unit within the region. It is also the proper area for carrying on research and surveys of conditions.

New Chicago Double-Deck Bascule Highway Bridge

A NEW double-leaf double-deck highway trunnion bascule bridge of 256-ft. span and 6,700 tons weight, scheduled to be put in service on May 14, over the Chicago River at Michigan Ave., is the main feature in the widening and extension of Michigan Ave. to connect the boulevard systems north and south of the river.

The bridge is of the trunnion type developed for the city's bridges in 1898 by the engineering bureau of the Department of Public Works, under John Ericson as city engineer. It has four lines of trusses, forming practically two separate bridges, the inner trusses being connected by bolted diaphragms which can be disconnected if necessary, as in case of damage to one part of the bridge by a vessel. The lower deck is for trucks and wagons and the upper deck for automobiles and pleasure traffic, the latter reaching the upper elevation by inclined viaduct approaches. On the upper deck are two 27-ft. roadways with 15-ft. sidewalks on cantilever brackets, making a total width of 91 ft. 9 in. On the lower deck are two 18-ft. roadways and 6-ft. sidewalks, all between the trusses.

SOUTH LEAF OF DOUBLE-DECK BASCULE BRIDGE AT CHICAGO

Each leaf weighs 3,350 tons, with 1,595 tons of counterweight, and is operated by pinions gearing with concave racks in the heels of the outer trusses. For each leaf there are four electric motors of 100 hp., two being for reserve. A description of the substructure, with deep foundation piers carrying concrete boxes for the tail pits, was given in *Engineering News-Record*, Dec. 25, 1919, p. 1056. Another double-deck trunnion bascule bridge of the same type, but of 245-ft. span, carries Lake St. and the elevated railway across the Chicago River. In span, but not in weight, the Michigan Ave. bridge is surpassed by two other bascules of different types: the 336-ft., 3,750-ton Strauss trunnion bascule of the Canadian Pacific Ry. over the ship canal at Sault Ste. Marie, Mich., and the 310-ft., 4,500-ton Scherzer rolling-lift bascule over the Tennessee River at Market St., Chattanooga, Tenn.

Plans for the Michigan Ave. bridge were prepared in the city's bureau of engineering under the direction of Hugh E. Young, engineer of bridge design; Thomas G. Pihlfeldt, engineer of bridges; P. S. Combs, city engineer, and C. D. Hill, chief engineer of the Board of Local Improvements. William A. Mulcahy was chief engineer in charge of construction. The general contract was taken by the Great Lakes Dredge & Dock Co., which did the substructure work and steel erection, the steel being fabricated by the American Bridge Co. Erection was commenced Sept. 22, 1919, and completed Jan. 15, 1920.

Building Trades Receive Flat Increase of One Dollar Per Day

Acting upon a request from the Building Trades Council, New York City, for an increase in wages for all trades, the Executive Committee of the Board of Governors of the Building Trades Employers' Association has granted a flat increase, effective May 1 of $1 per day. Thereby modifying the wage scale fixed November 20, 1919. The new scale and the trades affected are given herewith:

	Per Day, Eight Hr.
Art Glass Workers	$8.00
Asbestos Workers and Insulators	9.00
Blue Stone Cutters	9.00
Carpenters	9.00
Dockbuilders, House Shorers and Sheathpilers	9.00
Cement and Concrete Workers (Laborers)	6.50
Composition Roofers and Waterproofers	8.00
Composition Roofers and Waterproofers (Foremen)	8.50
Electrical Workers	9.00
Electrical Workers' Helpers	5.50
Elevator Constructors	9.00
Elevator Constructors' Helpers	7.00
Hoisting Engineers, by the Week	52.25
Hoisting Engineers, by the Day	10.00
Hoisting Engineers, Running Compressors, extra per Week	7.00
Housesmiths and Bridgemen, Local No. 40	9.00
Housesmiths' Finishers, Local No. 52	9.00
Housesmiths' Helpers	7.00
Marble Cutters and Setters	9.00
Marble Carvers	10.00
Marble Polishers, Bed Rubbers and Sawyers	8.50
Marble Cutters' Helpers, Riggers, Crane and Derrick men	7.00
Mosaic and Terrazzo Workers	8.00
Mosaic and Terrazzo Workers' Helpers	6.50
Metallic Lathers	9.00
Plasterers	9.50
Plasterers' Laborers	7.00
Plumbers and Gasfitters	9.00
Roofers and Sheet Metal Workers	9.00
Riggers and Machinery Movers	9.00
Steam and Hot Water Fitters	9.00
Steam and Hot Water Fitters' Helpers	7.00
Stone Derrickmen	8.00
Tile Layers	9.00
Tile Layers' Helpers	7.00
Wood Lathers	9.00

Alaska Lignite Compares Favorably With That of North Dakota

Steaming tests on the relative value of Alaska lignite and spruce carried out by the Alaska station of the Bureau of Mines indicate substantially the same behavior as that of North Dakota lignite. From 3 to 4 lb. of water were evaporated in a 125-hp. water tube boiler with lignite obtained near the surface and therefore not considered of the highest quality available. The spruce evaporated 3.7 lb. After 14 months the loss of weight due to weathering of the lignite was 6.1 per cent.

Difficulties of Winter Work on Alaska Railway

A TEMPERATURE range of from —70 deg. F. in winter to +100 deg. F. in the shade in summer, combined with a precipitation of 40 to 80 in. in the rainy district, are conditions in Alaska which accentuate the difficulties of railway construction and maintenance, as outlined by F. A. Hansen, engineer of construction and maintenance of the Alaskan Engineering Commission, in the *Alaska Railroad Record*. Survey work and distribution of supplies must be done during the winter in preparation for the short construction season of June to September. Distribution in winter has the advantage that transportation of materials on selds over the ice is easier and cheaper than building corduroy roads over soft ground in the warmer months.

The engineers' work in winter includes running surveys in deep snow, climbing slippery hills for cross-section work and digging through several feet of snow to ascertain soil and surface conditions. Camp construction for stationmen and supply points seems almost impossible with timbers frozen solid and everything deep in snow and ice. Keeping warm under canvas with the thermometer low is a difficult proposition. But it is necessary for the engineers to be active during the winter in order to get the main camps established and material, supplies and contractors' equipment distributed along the line.

Extraordinary difficulties have been met this year, says Mr. Hansen. For the advance from Indian River, which is at the head of navigation on the Susitna River, it was necessary to transport supplies into the Broad Pass Country over snow which since Jan. 1 has averaged at least 10 ft. in depth. From Talkeetna to the Broad Pass summit about 5 or 6 ft. of snow will fall in a single storm. All trails are obliterated and must be remade despite the fact that teams are constantly on the trail. For long distances the trail is on the river. A sudden thaw and the trail is gone. Several times teamsters have had narrow escapes as sled and cargo sank beneath the softened ice. When starting with a load from the end of the track, with a warm chinook blowing, the thermometer may be above freezing point, but by nightfall it may fall to 40 deg. below zero. From Mile 240 supplies are transported over trails to Hurricane Gulch, Mile 284, which is the objective point for the construction work in the coming season, as outlined in *Engineering News-Record*, April 29, 1920, page 850.

From its southern terminal at Seward the railway passes for 90 miles through a district that experiences many climatic extremes but not the lowest temperatures. The line is flanked by glaciers and rugged mountain sides that are saturated by heavy rainfall and are alternately frozen by the north wind and thawed by the breezes of the Japan current blowing through Portage Pass. Then the line is confronted by the tremendous tides of Turnagain Arm, where in the winter a sea of ice moves at the rate of 10 mi. per hour, tearing at the rock-protected slopes of the fills and threatening to lift the trestles from their foundations. This latter trouble has been overcome by filling in around the piling with heavy rock. Under the influence of a warm chinook wind the snow starts to melt on slopes that reach back into the mountains for a mile or two, and then come the slides. Since snowslides cannot be stopped, it is necessary to build snowsheds where these slides usually cross the railway.

Sudden temperature rise and rainfall in January may result in filling the space between the rails with water; which a sudden drop in temperature will turn into a sheet of ice covering the rails. To avoid this trouble, the weather conditions are watched and trains are operated continuously over the threatened stretch of track, using the flanger to throw out the water as it accumulates.

Reinforcement of Manholes in Tanks

MOST steel structures are designed to carry stresses due to assumed loads, which exceed anything they will ever have to carry in actual practice, but a steel tank when filled is subject to the full stress for which it is designed, and therefore has no factor of safety above that shown by a calculation of the stresses. It is quite customary in designing large tanks to use from 16,000 to 20,000 lb. per sq.in. as the allowable unit stress in tension in the plates, and the tank is then said to have a factor of safety of 3 to 3½, because the ultimate strength of the plates is that many times the stress to which they are subjected. The actual factor of safety is really much less than the above figures, as the elastic limit of steel is not much more than one-half the ultimate strength, and if steel is stressed up to the elastic limit it cannot properly be said to have any factor of safety.

Large tanks are now usually built with double butt joints in the lower rings of heavy plates, and these joints, if correctly designed, have an efficiency of approximately 90 per cent. It is safe to say that the weakest point in large tanks as they are generally built today is not at the joints in the plates but at the manhole, which is almost invariably located in the lowest ring near the bottom, at the point of greatest stress. These manholes are usually 20 in. in diameter and built in the form of a flanged steel nozzle with a steel plate cover bolted on.

It seems like wasted effort to build a tank having rings 5 ft. wide with butt joints having 90 per cent efficiency to splice the plates, and to then cut a 20-in. manhole in the center of the plate, taking out one-third of the metal and reducing the efficiency at that point to 66⅔ per cent. It is true that the manhole nozzle reinforces the opening to a certain extent, but as it is usually made of a light steel plate, rolled into a circle and sometimes riveted, sometimes welded together, the amount by which it reinforces the opening is not enough to compensate for the metal cut out. The obvious remedy is to put a reinforcing plate around the manhole opening having as much section as the manhole cut out, and attaching it to the shell plate with enough rivets to develop its full strength.

It is a certain fact that there are many large tanks in use today which have a very small factor of safety at the manhole opening. Occasionally, as at Boston, one will fail, and the attention of buyers will again be forcibly called to the old adage that no chain is stronger than its weakest link, and that a mere statement of the plate thicknesses of which a tank is to be built is no indication of the real value of the structure.—From *The Water Tower*, Chicago Bridge & Iron Works.

Concrete and Stone Bridges Show Low Maintenance Cost

Repairs Negligible in Pittsburgh's Experience With Concrete Arches for Ten Years and Stone Arches for Twenty Years

EXCELLENT maintenance records are being made by large reinforced-concrete arch bridges in Pittsburgh. The earliest of these is the Meadow St. bridge built in 1910, which has a central span of 209 ft. Two years later the 300-ft. Larimer Ave. arch was constructed, and in the same year or the following year several others were built, of spans up to 168 ft. All these structures are today in excellent condition; none of them calls for any expenditure to improve its structural or æsthetic condition, according to John D. Stevenson, bridge engineer of the city's Department of Public Works. While the surface of the concrete has been darkened and soiled by locomotive blast where the bridges are over railroads, and thereby the effect of special color and texture has been lost, cleaning is not considered worth while.

From the department's cost records the following figures for maintenance and repair expenditures to date have been obtained:

Meadow St. arch, 1910 (209-ft. span, cost $72,353); total expenditure $598, covering three repaintings of the metal handrail.

Larimer Ave. arch, 1912 (300 ft. 4⅝-in. span, cost $168,109); total expenditure $1289. Besides handrail painting, this includes draining and cleaning one of the abutments, whose interior had filled with water from a pipe leak (1914), and minor repairs to footwalk and rail (1916).

Atherton Ave. bridges, 1912 (three 90-ft. arches over Pennsylvania R. R., $93,128; one 168½-ft. arch over Pittsburgh Junction R. R., with 41½ and 56-ft. flanking spans, $91,000); no expenditure whatever and none now needed.

Hoeveler St. arch, 1912 (total length 163 ft. 6 in., reinforced-concrete arch with filled spandrels, span 60 ft. 8⅜ in., cost $28,765.81); total expenditure $32.76, all on lamp posts.

Murray Ave. arch, 1913 (total length 375 ft., reinforced-concrete arch rib of 210-ft. span, 66-ft. clearance height, cost $97,895.76); total expenditure $935.61, all on railing and lamp posts.

Heth's Run arch, 1915 (total length 327 ft., clearance height 68 ft. 9 in., reinforced-concrete arch with filled spandrels, clear span 195 ft., cost $136,066.57); total maintenance expenditure $298.40, all of which was on lamp posts.

Stone-arch bridges show equally good records, and experience with them extends over a longer period of time. On the face of the returns they have in fact given better service, but some modifying factors need to be taken into account. Neither light posts nor paving on these particular structures is maintained by the Department of Public Works, and therefore the corresponding maintenance expenditures do not appear in the records. The paving on the Stanton Ave. and Schenley Park stone arches (mentioned below) is maintained by the Bureau of Parks, while the Lincoln Ave. stone arch was at one time repaved by the Division of Streets in connection with adjacent street repaving.

Furthermore, all of the stone arches have stone parapets, while most of the concrete bridges have metal railings. These latter are damaged rather frequently by collisions, and also require repainting. When these facts are considered, Mr. Stevenson states, it is doubtful that the stone arches really have a lower maintenance cost than the concrete arches. The following data, however, are quoted from the records of the Department of Public Works:

A 50-ft. stone arch on Hill Road, built in 1895; a 60-ft. stone arch on Stanton Ave., built in 1896; and a 150-ft. stone arch at the entrance to Schenley Park, built in 1898, have had no money spent upon them for repair or maintenance, exclusive of paving. In the case of the Lincoln Ave. bridge over Washington Boulevard, comprising two 130-ft. stone arches, built in 1905, the sum of $9 was spent for repainting the handrail. This bridge, however, was once repaved.

The Stanton Ave. arch, which is of filled spandrel construction, may require some expenditure for repairs in the future. The spandrel wall on one side has pushed out, presumably from the pressure of the fill, so that it overhangs the arch ring about 1 in. As there has been no movement here during the past five years, immediate repair is not considered necessary.

Maintenance of the city's numerous steel bridges varies widely, depending on local conditions such as low clearance over railroad tracks, and paving maintained by the street railway company. Renewal of wood flooring and sidewalks also contributes to the maintenance cost. A particularly good record was made by the Schenley Park bridge over the Pittsburgh Junction R. R., a 360-ft. steel arch with crown height of about 100 ft. above the track. This structure, built in 1896, has required an expenditure of only $12,800 for maintenance and repair work, exclusive of paving, practically all of which represents repainting. This is less than $600 per year, representing 4% interest on $15,000. The bridge, however, needs repainting badly and in another year will need a new handrail. Another good record is that of the Forbes St. bridge over the Pittsburgh Junction R. R., built in 1898. It is a structure 255½ ft. long, and contains a three-hinged steel arch of 144-ft. span. It cost $53,344, and the maintenance cost (largely for painting) amounts to $5,125.65.

The Beechwood Boulevard bridge over Forward Ave., a wooden structure 555 ft. long, built in 1909, exemplifies very high maintenance costs. The bridge had a clearance height of 125 ft., and comprises three 15-ft. wood beam spans and 12 wood Fink truss spans (seven of 30 ft., one of 45 ft., three of 60 ft., and one of 75 ft.). Its original cost was $24,922. Though only 10 years old, it has cost $13,526.97 to maintain, of which sum $4,228.38 was spent in 1918. It is in very bad condition at present, and will have to be replaced. A concrete arch bridge is under consideration for this place.

How Much Alkali Can Crops Tolerate?

The alkali content which crops will tolerate regularly varies from 500 p.p.m. with sodium carbonate to 5,000 p.p.m. of sodium sulphate. For sodium chloride it is 1,000 p.p.m. and a content of 4,000 p.p.m. of mixed salts is dangerous. Much stronger solutions may be applied in single irrigations or for only one year according to a bulletin of the Utah Agricultural Experiment station.

Progress of the Major Street Plan in St. Louis

Avenue Widened for One Mile To Give Continuous Five-Mile Thoroughfare Between Business and Residential District at Cost of $550,000—Benefit Taxing District—Widening Street to 100 Feet for Distance of 6½ Miles To Cost $2,250,000

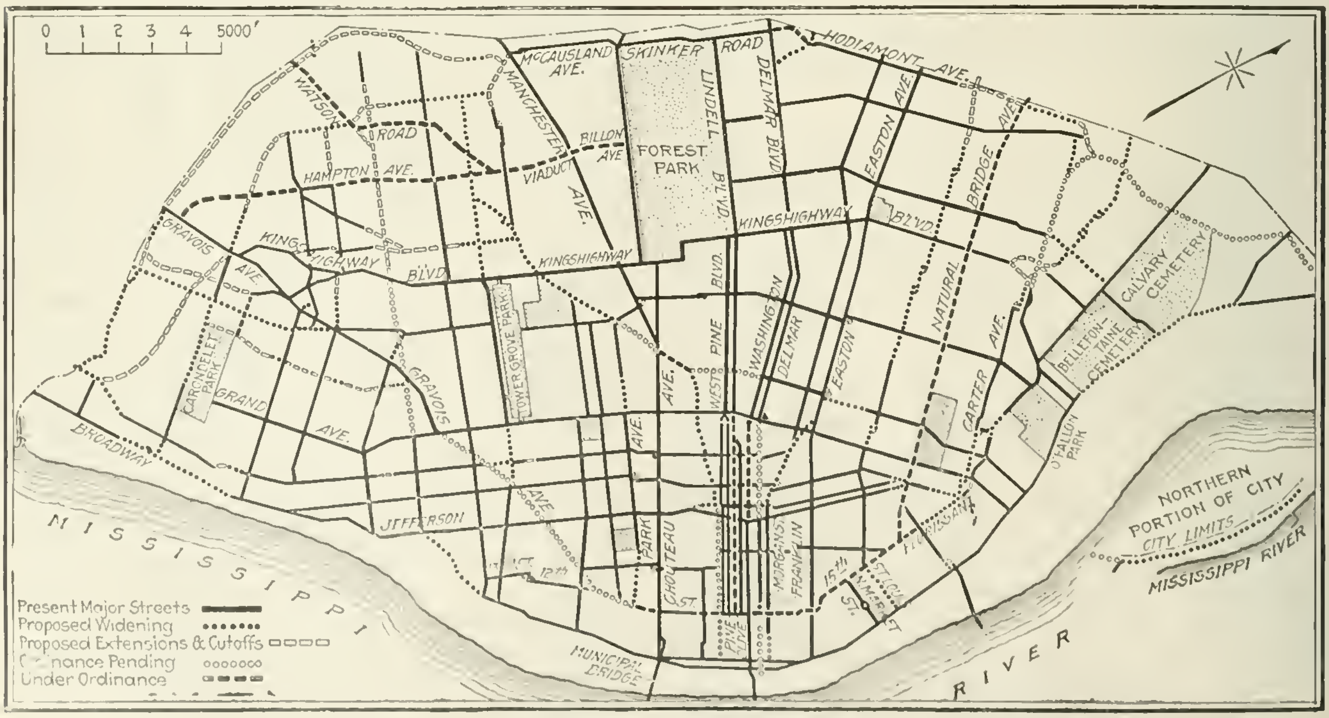
By Harland Bartholomew
Engineer, City Plan Commission, St. Louis

The major street plan for St. Louis, Mo., prepared by the City Plan Commisssion early in 1917, and described at length in *Engineering News-Record*, July 19, 1917, p. 100, has received the approval of the Board of Public Service and substantial progress has since been made. Ordinances have been passed and legal proceedings for land taking are in various stages of progress for the majority of the more important and most expensive projects under the plan.

The most important project now nearing completion is the widening of Washington Ave. from 60 to 80 ft. between Jefferson and Grand Avenues, for a distance of 5,479 ft. This will create the first direct and continuous street approach to the business district having a width of over 60 ft. West of Grand Ave., Washington Ave. now has a width of 70 ft. The improvement will create a direct continuous thoroughfare five miles long between the business district and the most active residential district, precisely in the line of heaviest traffic movement. Its total cost is $552,512, of which the city's share is $66,715. The widening is accomplished by taking 10 ft. from properties on either side of the street—many properties having a 10- to 15-ft. setback from the present street line. By passing an amendatory ordinance to the original bill permitting encroachments of not over 3 ft. to remain, a substantial saving in damages to improvements was effected and the total cost of the improvement materially reduced. Washington Ave. has an offset at Grand Ave., the city's busiest crosstown thoroughfare, which has already been remedied previous to the completion of the entire street widening plan.

Two interesting and important precedents were established with this improvement; one, the fixing of the benefit taxing district, and the other, a very commendable co-operative effort between several public organizations, city authorities and property owners whereby threatened legal proceedings were averted and a further possible delay of two or three years avoided. The benefit taxing district was confined entirely to property fronting on Washington Ave. throughout its length of six miles. This is the first time a benefit district failed to include one or more parallel streets. Its establishment was perfectly logical, however, since the actual benefit which will accrue to property as a result of the opening is increased value for commercial or apartment house purposes resulting from probable increased traffic—Washington Ave. being destined to become one of the city's leading business thoroughfares. When the street is first opened it will attract traffic from other parallel streets and hence its result on those streets will be in no wise a direct benefit to them; and in fact would really be detrimental, were it not for the fact that traffic is increasing so rapidly that there will be a sufficient amount to sustain realty values on other parallel routes.

When the report of the commission to fix benefits and damages was filed, exceptions to the findings of the commission were taken by owners of four different properties. For the court to review the work of the com-



RELATION OF PRESENT STREET OPENINGS AND WIDENINGS TO THE MAJOR STREET PLAN OF ST. LOUIS mission, with possible appeal from its decision to higher courts, would undoubtedly have consumed two or three years' time, if not considerably longer. Since the number of exceptions taken were so few in number and in value as compared with the many hundreds of properties involved, a committee of citizens and of representatives of public organizations prevailed upon the objectors to withdraw their suits and the work was permitted to continue to immediate completion.

From the north and from the south sections of St. Louis there now exists no satisfactory, continuous wide street connection to the business district. To remedy this situation an ordinance was passed in April, 1918, providing for the extension of 12th St. directly south, 80 ft. wide, from the southern end of the 12th St. viaduct to Park Ave., from which street 12th again continues southwardly having a width of 80 ft. This improvement will cost $246,000. The city's share was fixed by the commission as only $6,000. Northwardly from the viaduct to Market St., a width of 150 ft. is proposed (a distance of 1,152 ft.) to correspond with the present width of 12th St. between Market St. and Washington Ave. The ordinance for this widening was passed Feb. 14, 1919.

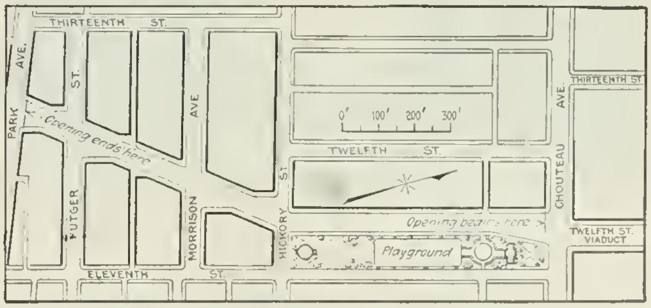
CUT-OFF RECENTLY COMPLETED AT WASHINGTON AND GRAND AVENUES

To the north, 12th St. is the principal approach from the business district, though its present inadequate width must of necessity be increased. This will be a more difficult and expensive improvement than any now under way. It will be approximately two miles long, have a width of 100 ft., and afford an outlet for at least four important radial thoroughfares. Its cost will be about $1,500,000, of which the city's share is estimated at $450,000. The proposed street follows the lines of what are now called High St. and 15th St. It traverses largely the foreign quarter, will destroy no particularly good buildings and consequently is a comparatively cheap undertaking when compared with its great length. This street will form the logical route for any future rapid transit line to the north and northwest. It will be of immense value to a great portion of the north and northwest sections, thus permitting a large benefit assessment district with no particularly burdensome local assessments. The ordinance for this project was passed Feb. 24, 1920.

The Board of Public Service recently authorized the preparation and introduction of two other ordinances which will complete the 12th St. development in the northern and southern parts of the city. The first provides for the widening of Palm St. and Natural Bridge Ave. from 60 to 100 ft., beginning at the terminus of the North 12th St. opening and extending to the city limits, a distance of 4½ miles, traversing much undeveloped property in the western part of the city. This project is estimated to cost $750,000. The ordinance for it was passed in April, 1920. The second project is for the widening of Gravois Ave. and 12th St. to 100 ft. southwestward from Hickory St. to Grand Ave., a distance of 2½ miles. This project is estimated to cost $1,250,000 and involves the destruction of a considerable number of buildings, but most of these buildings are old structures of small value.

LOOKING WEST ON WASHINGTON AVENUE, EAST OF GRAND AVENUE, IN 1918

The most important of all the major street plan projects has been the widening of Olive St. between 12th St. and Channing Ave., a distance of approximately two miles. Olive St. is 60 ft. wide and has a 36-ft. roadway, occupied by the most used transit line in the city. Olive St. was formerly one of the important business streets of the city but for several years property has depreciated in value because of its inadequate width and inaccessibility for traffic purposes. Numerous suggestions for rehabilitation of the street have been made for several years, but nothing done. In co-operation with owners and agents a plan was prepared for cutting off 40 ft. from the front of the lots on the south side in order to create a 100-ft thoroughfare. This plan was arrived at only after consideration of numerous other plans, such as widening on both sides of the street or by taking all of the property on the south side of the street to the alley. The lot depths on either side of Olive St. average about 109 ft. There are several large buildings on the north side of the street, to condemn whch would cost a considerable sum of money. It was found that by far the cheaper plan



SOUTH TWELFTH STREET EXTENSION AND VIADUCT APPROACH

Now being completed. Distance 1,520 ft. Width 80 to 210 ft. Cost $246,000.

ABRUPT ENDING AT CHOUTEAU AVENUE OF TWELFTH STREET VIADUCT OVER MILL CREEK VALLEY

The buildings that here block the way have recently been torn down and a direct connection between the viaduct and Twelfth St. south of Park Ave. is being made.

would be to take 40 ft. from the south side, leaving lot depths of 69 ft. Where owners in any one block may wish to close the alley this will be done by the city to permit of uniting Olive St. with that property immediately in the rear on Pine St.

After numerous meetings, hearings and public discussion the ordinance providing for the widening of Olive St. as recommended was passed on March 26, 1920. The estimated cost of this improvement is $2,000,000. To have secured the necessary width by cutting 20 ft. from both sides of the street would have cost over $1,000,000 more than the present plan, while to have taken all of the property on the south side of the street would have cost over $6,000,000, and would have resulted in a street 184 ft. wide, which is considered too wide for good business purposes.

Grand Ave., as previously stated, is the city's most important crosstown thoroughfare. Curiously enough, at its busiest part there are but two direct street crossings, thus causing increased traffic congestion where there is most need of relief. The Washington Ave. widening project, as previously stated, makes possible the elimination of one of these irregular intersections or "jogs." An ordinance passed in February, 1919, provided for the elimination of two more "jogs," one at Lawton and Pine Sts., by connecting these two on the east with West Pine Boulevard on the west of Grand Ave., the connection being made in the form of a "Y," a direct right angle crossing of Grand Ave. being created. Still another "jog" will be removed by connecting Delmar Ave. on the west with Morgan St. to the east of Grand Ave., for which an ordinance has also been passed. Each of these "cutoffs" is designed to create new approaches to the business district from the west by creating new direct street connections.

PROGRESSIVELY CONTRACTING STREET WIDTH

Looking north on 12th St., St. Louis. In the foreground the street is 150 ft. wide. Between the two buildings it narrows to 80 ft. In the extreme distance north of Franklin Ave. it narrows to 50 ft. Twelfth St. is the principal entrance to the business district for all vehicle traffic from the northern part of the city. Under the present plan it will be widened to 100 ft. for a distance of 6½ miles. The two large buildings shown in the view will be left undisturbed except for arcading on the first floor of each in the first bay.

For the further improvement of the Delmar-Morgan approach to the business district, a slight correction in the width of Morgan St. will be made by increasing the present width of 50 and 60 ft. between High and 14th Sts. to 80 ft., to correspond with the present width of Morgan St. west of 14th St. This ordinance has also been passed.

Watson Road, one of the radial thoroughfares in the southwestern part of the city, will be increased from its present varying widths of 50 and 60 ft. to a uniform width of 80 ft., for which an ordinance was passed in April, 1917. The widening will be accomplished without much expense since there are as yet no buildings to be removed. It is approximately 2½ miles long.

WATSON ROAD: RADIAL STREET IN UNDEVELOPED DISTRICT

An ordinance for widening this street from its varying width of 40, 50 and 60 ft. to a uniform width of 80 ft., for a distance slightly more than two miles, was passed in 1918. Affords an excellent example of the possibility and desirability of widening important streets before the presence of expensive buildings make it very costly, if not prohibitively so.

A most important crosstown thoroughfare will be created by the widening of Billon Ave. from 60 to 80 ft. and connecting it with Hampton Ave. by means of a viaduct over Manchester Ave., the Frisco and Missouri-Pacific railroads. Hampton Ave. will be extended and widened to 80 ft., thus making a continuous thoroughfare 4½ miles long in a section of the city now largely undeveloped. This new thoroughfare will be the principal approach to Forest Park from the south. Part of the widening has already been accomplished by dedication. The remainder is now under ordinance.

On Lindell Boulevard, between Grand and Channing Aves., a distance of 1,240 ft., there is now an irregular building line on the north side of the street resulting in an irregular street width of from 59 to 78 ft. This will be corrected by establishing a new building line on the north side of the street, giving a uniform width of 80 ft. This ordinance was passed in 1918. It is interesting in that no immediate improvement is contemplated, simply the establishment of a building line is now authorized; owners of encroaching buildings to be paid for their property as they conform to the new line within ten years.

Another street opening for which the ordinance was passed April 2, 1919, is the connection of Skinker Road with Hodiamont Ave. in the extreme western part of the city. The opening will be 100 ft. wide, 2,400 ft. long and will destroy but few existing buildings. It will be part of a complete crosstown thoroughfare eventually to be created, more than 20 miles long, more than 10 miles of which already exist.

OTHER APPROPRIATIONS

Progress on the development of Kings highway has also been made. An ordinance for the opening of the last section between Carondelet Park and Christy Park was passed in March, 1918. The viaduct over Broadway has recently been completed at an approximate cost of $60,000. In 1917 an appropriation of $40,000 was made for improving one section in Christy Park and a further appropriation of $40,000 for finishing the other section at Christy Park is included in the $24,000,000 bond issue to be submitted to popular vote on May 11. Between Easton Ave. and Natural Bridge Ave. the widening of Kingshighway from 100 to 150 ft. was held up for several years because of litigation growing out of tax assessments. In 1917 the city appropriated $163,000 which was paid into court and the city given possession of the land. In April, 1918, an ordinance for the improvement of this section was passed and the paving and planting will be completed this year.

It is estimated that the total cost of the various widenings and extensions outlined above will be approximately $10,000,000, exclusive of the improvement of the streets. Practically all of them have been made necessary as a result of the practice, until recently, of making all streets in the city 60 ft. wide irrespective of location or probable use. It is estimated that 75 or 80 per cent of all streets in the city are 60 ft. wide.

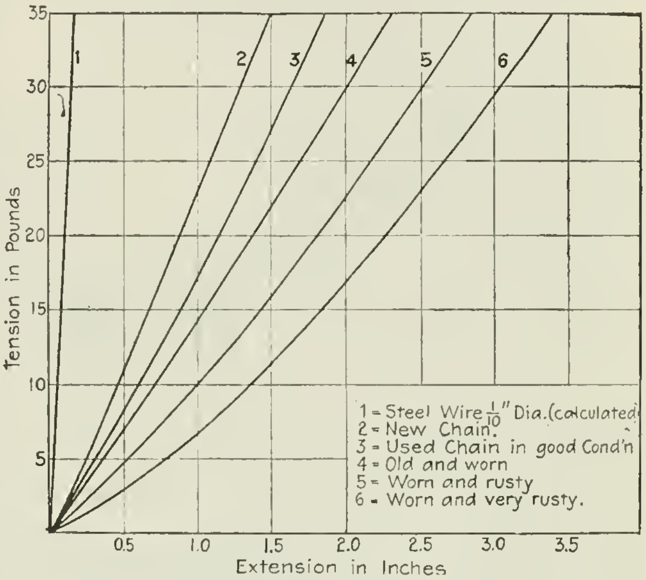
Little opposition has arisen to the various projects, due largely to the fact that all local civic organizations have been active in supporting them. The fact that a definite plan has been established and followed lifts each project out of the realm of local importance and makes possible its consideration from the standpoint of city-wide benefit and usefulness. For the past year the City Plan Commission has adopted the policy of leaving the initiative for street opening proceedings with owners of property affected in order to avoid undertaking too large a program at one time. This has not served to reduce interest and initiative, however, for petitions for four large projects—widening of Newstead Ave., widening of Florissant Ave., widening and extension of Easton Ave. from Cass Ave. to Morgan St., and the widening of Morgan St. from Grand Ave. to 3rd St.—have been circulated and filed with the City Plan Commission.

Address by Burnard Geen

The presidential address before the Society of Engineers (see *Engineering News-Record* April 1, p. 673) was delivered by Burnard Geen, whose name was incorrectly printed as "Green" in the issue referred to.

Tests of Extension in Steel Surveyor's Chains

THE use of the old survey chains is still so prevalent in Ireland that a paper describing extension tests of several such chains under varying tensions was included in the latest volume of the transactions of the Institution of Civil Engineers of Ireland. The test was conducted by J. T. Jackson, member of the Institution, and D. E. Allen, a student.



EXTENSION TESTS OF 100-FT. STEEL CHAINS

Five 100-ft. steel chains, one 100-ft. steel band chain, and two 66-ft. steel chains were tested in experiments. One handle of the chain to be tested was firmly fixed at a point in a floor and the other handle attached to a spring balance by means of a special hook. The extension was read on a boxwood scale fixed to the floor and the tension applied by means of an arrangement of two levers, so placed that the pull could be applied, the tension read on the spring balance and the extension read on the boxwood scale by one person. The spring balance was tested up to 35 lb. and found to be correct. A correction of +0.4 lb. was applied to the spring balance readings because of its use in a horizontal position. The zero readings were taken, not with the chain lying quite unstretched, but with a small tension of about $\frac{1}{4}$ lb., just sufficient to keep the links in their proper position.

The mean diameter of the wire in the five circular-section links varied between 0.1 in. and 0.11 in. The weight of the chains varied between $4\frac{1}{4}$ lb. and $5\frac{1}{2}$ lb.

RESULTS

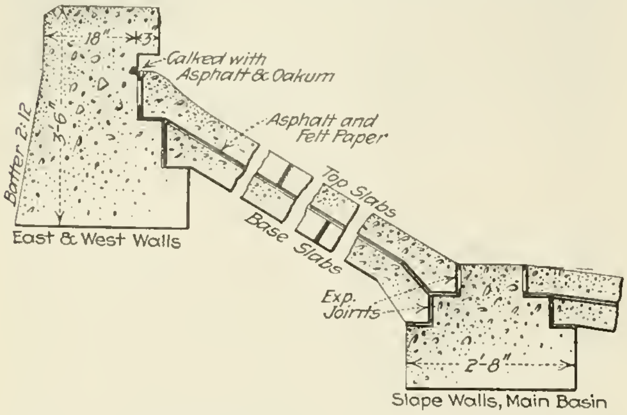
The results of the testing of the five 100-ft. circular-section chains, together with the description of their condition, is shown in the accompanying illustration. The curve marked No. 1 is plotted from the calculated result of stretching steel wire 100 ft. long and 0.10 in. diameter (approximately the same as that of the chains on the assumption that Young's modulus for this wire is 30,000,000 lb. per square inch.

The conclusions were as follows: Extension due to pull is almost altogether due to bending of the small links; is much greater for old and worn than for new or nearly new chains; and increases less rapidly than the load, especially in the case of the more worn chains.

New Coagulation Basin for Atlanta

Low Baffle Wall Forms Mud Section With Multi-Hoppered Bottom—Basin May Be Operated With Water at Various Depths

When it was decided to increase the coagulating capacity of the water-purification plant of Atlanta, Ga., a radical departure in design, as compared with the old coagulating basins, was adopted. The old basin was baffled to give the water a zigzag course. The new basin, nearing completion in December, 1919, has a single, low baffle wall across its entire width about one-fourth of the distance from the inlet end, which divides the basin into a mud compartment with 24 hopper-bottom mud outlets, and a main compartment with three hopper bottoms in its entire length. All the hoppers, small and large, are connected to a mud outlet pipe system, there being no valves on the mud downtake from any one of the 27 hoppers. When the mud valves controlling either the mud or the main compartment are opened, the deposit will be forced out by the weight of the superincumbent water.



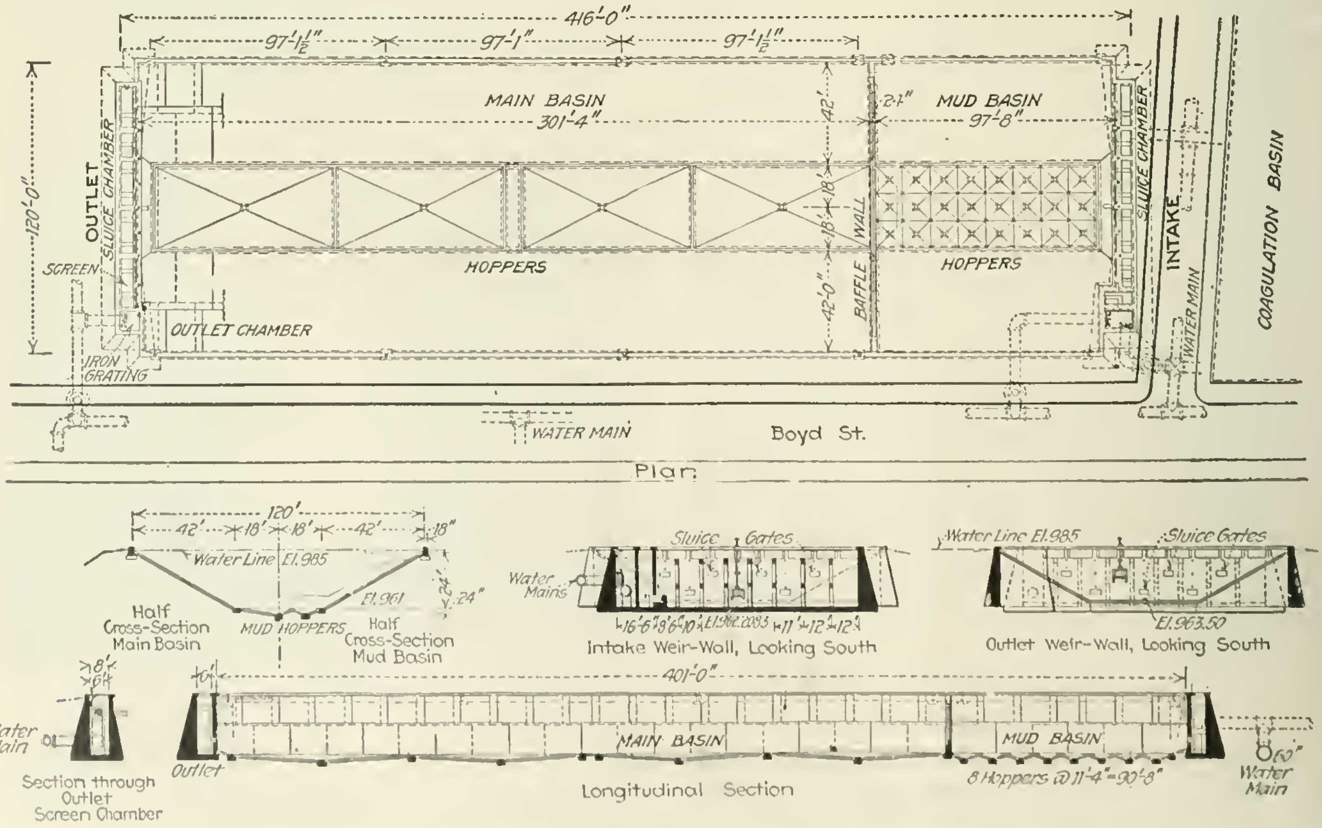
DETAIL OF SLOPE PAVING FOR COAGULATION BASIN

The new basin is 120 ft. wide and about 400 ft. long, with sloping sides from a level near the top. An intake or inlet extends across the basin, with a mixing chamber at one of its ends. An outlet chamber extends across the other end of the basin. The raw and coagulated waters may be passed at will over weirs or through gates at different levels, as shown on the cross-sections. A detail of the slope paving is also reproduced herewith.

The holding capacity of the old coagulation basin is 7,250,000 gal., and the capacity of the new basin is 5,500,000 gal., giving a total holding capacity of 12,750,000 gal. The average daily water consumption, based on pumpage, with no allowance for slip, was about 25,000,000 gal. in 1918, with an average peak load of 37,500,000 gal., and a daily range of rate of 42,000,000 to 12,000,000 gal. per day, the latter from 12:30 to 4 a. m.

Before the water goes to the coagulation basins it has had from 7 to 10 days' undisturbed sedimentation in one or the other of two large reservoirs that serve for both storage and sedimentation. After coagulation the water is passed through mechanical filters, now operating above their rated capacity. The filtered water is chlorinated.

W. Z. Smith is general manager of the water-works of Atlanta, and William Rapp is superintendent of construction. The general scheme for the new basins was worked up by Mr. Smith, Mr. Rapp and by C. E. Kauffmann, the latter making the detailed drawings. Mr. Kauffmann is engineer of bridges and estimates, under H. L. Collier, chief of construction of Atlanta.

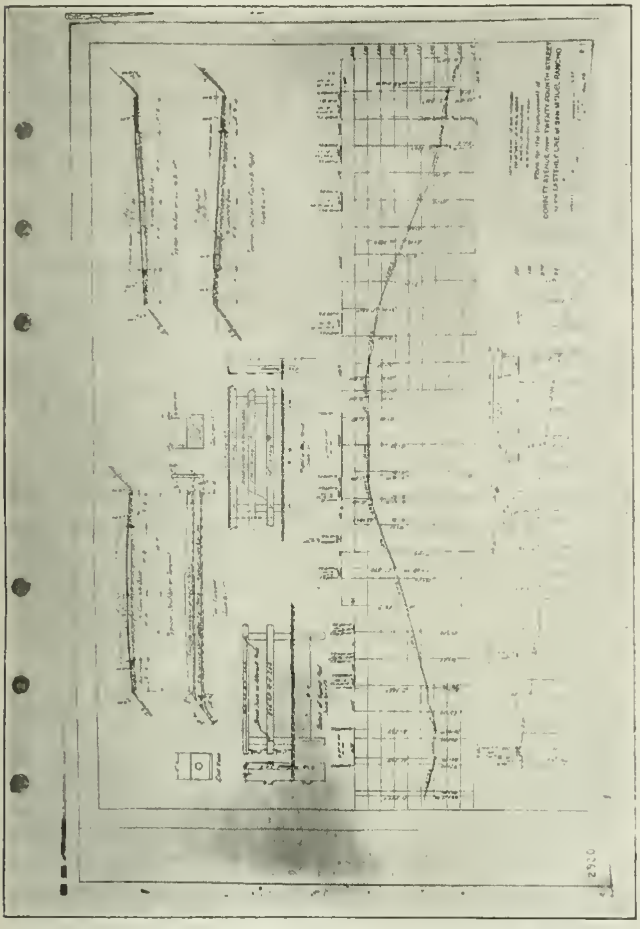


PLAN AND SECTIONS OF NEW 5,500,000-GALLON COAGULATION BASIN FOR ATLANTA, GEORGIA

Small Loose-Leaf Photos Replace Big Blueprints

By Charles W. Geiger
San Francisco, Cal.

REDUCED to a size suitable for a 5 x 7-in. loose-leaf note book, photographic copies of working drawings required by inspectors and others connected with a street improvement are used instead of large blueprints by the Engineering Bureau of San Francisco. The above illustrations shows such a sheet. Each person carrying one of the sets of photos is equipped with a magnifying glass, which makes the numbers and orders on the photographs as visible as they would be on a large blueprint. The system is also much more economical than providing blueprints.



5 x 7-IN. LOOSE-LEAF REPRODUCTION OF BLUE PRINT

GRADES MARKED ON SLIPS OF PAPER ON STEEL PINS

Another photographic innovation which is rendering great service consists of taking pictures of a street before improvements have been started. The photograph shown was used in the preliminary study of readjusting an old pavement, changing the width of the street, and cutting down the knoll at the left. The various grades are marked on the slips of paper shown, which are fastened to steel pins stuck in the ground.

Garbage and Refuse Collection and Hog Feeding at Salt Lake City

"The hogs squeal louder for uncooked garbage."

By Sanford J. Truman
Treasurer Mountain States Feeding Co., Salt Lake City, Utah

THREE years' experience with the collection and disposal of the garbage, ashes and other waste matter of Salt Lake City have taught the writer some things that may be told with possible benefit to others. The main lessons, taking into account conditions prevailing here, are that horses and wagons are better than motor trucks and trailers for collection; that private disposal by burning in stoves and through individual collectors, not only becomes a public nuisance and does not effect an economic saving, but robs the contractor of much material which is the best hog feed in the world; that it is better to buy stock hogs than to raise pigs to feed; and that hogs thrive better on raw than cooked garbage.

The first contract between Salt Lake City and the Mountain States Feeding Co. was made in August, 1917. Under it the City of Salt Lake was to gather all the garbage and waste material that was offered in a reasonably separated state and deliver it to the Mountain States Feeding Co. at two separate loading stations, located one in the northern and the other in southern part of the city, from whence it was to be taken by us and disposed of at our feeding farm or dumping ground. On Aug. 5, 1918, we made a revised contract under which we agreed to gather and dispose of all the garbage, market waste, ashes, tin cans, rags, bottles and leather produced within the city limits (with the exception noted later) for a period of five years for $3,000 a month. This contract does not cover ashes or trade waste from business houses, public heating or lighting plants, or from apartment houses of more than four suites. It does entitle us, however, to all the eatable waste garbage from all these places.

In the business district collections are made daily between the hours of 7 p.m. and 3 a.m. In the residence section collection is made once a week in the day time, the city being divided into six zones, having a collection in each zone on a stipulated day of the week.

We desired the collection contract in order that we might secure a better separation of edible waste from the market waste, such as tin cans, bottles, etc. The separation has not been all that we desired under our present contract, but has been improved by educational work through publicity in the newspapers, by collectors and other agents of the contractor, and, where needed, through tagging the garbage receptacle with a 5½ x 7-in. buff-colored card of explanation, headed boldly, "This Receptacle is Not Emptied for the Reason the Garbage and Waste Matter is Not Properly Separated," followed by instructions that if observed by the householder, will ensure collection. The city administration is co-operating with us and the separation is therefore rapidly improving.

Another difficulty encountered is the burning of garbage in winter by the residents of apartments and of houses where stoves are used. We make pleas for the saving of this valuable hog food. Moreover, when we took the work under our present contract, some 65 individuals with unsanitary conveyances were coming into the city at all times during the day and night to get garbage from certain restaurants and eating houses. They were reluctant to give up this garbage and about twenty of these independent haulers banded together and brought suit to enjoin the city from the enforcement of the garbage collection ordinance. They carried the case into the District Court but were defeated.

Before taking up the means of collection employed within the city limits, it may be noted that the garbage only is transferred at a special station within the city limits to specially constructed railway cars and transported over the lines of the Bamberger Electric Railroad Co. to our feeding farm, seven miles north of Salt Lake City, where a switch runs directly into our main building. All other waste matter is delivered to a dumping ground within three miles of the business district.

From August, 1918, until August, 1919, collections were made with two 3½-ton trucks and one 2-ton truck, each truck trailing one or two 2½-ton trailers, all having specially constructed steel dumping bodies and with compartments to keep the garbage separated from other material. In addition to the truck and trailer equipment we used five horse-drawn wagons. We found that owing to the excessive costs of upkeep on our trucks and trailers, the abuse which they received from the class of labor we had to have for the operation, and because our trucks were continually stopping and starting up when collecting from house to house, that we were operating under tremendous upkeep expenses. In August, 1919, we discontinued the use of all trucks and trailers with the exception of a 3½-ton Federal truck with trailer, which is used in the business district at night. This truck and trailer, supplemented with two two-horse outfits with specially constructed bodies on the wagons, collect every night all the garbage and other material which we have to collect within the business district. In the residence district we use horse-drawn conveyances exclusively. We are operating 16 two-horse teams, each team drawing a wagon having a specially constructed body with movable partitions so that the garbage and other waste material are kept separate, and one outfit can serve its own allotted territory.

At the sorting dump the tin cans, rags, bottles, leather and other materials are salvaged, the cans being sold to the Utah Copper Co. for smelting purposes. What other wastes are not salvaged proves a most excellent filling material and are eagerly sought after to be used in low places which owners desire to have filled.

Our hog farm comprises 60 acres, but only a small proportion of this area is used. Our main building is 70 x 140 ft. in plan and we have 48 colony houses. Altogether, the buildings cover about six acres. Each colony house will accommodate 50 hogs and includes a 9 x 64-ft. shelter and a 9 x 64-ft. open feeding floor, besides which there is a 15 x 64-ft. runway. The hogs both eat and sleep on board floors, which we find are more healthful than concrete, since they hold less moisture. Our hogs are never bothered with rheumatism. Flowing wells supply fresh water, which is conveyed to a standpipe and thence is piped to a trough at each colony house. Hose can be attached to our water system, which allows us to give the hogs a shower bath during the hot summer months and also gives us fire protection for our colony houses.

At the beginning of our operations we expected to buy brood sows and raise our own pigs. This was soon found to be disadvantageous, since which time we have bought feeders and stockers weighing from 80 to 100 lb. The hogs eat from 15 to 20 lb. of garbage a day, each, besides which they are fed about 1 lb. of corn a day. This gives a daily gain on each hog of from 1¼ to 1¾ lb. Deducting from our haulage expense what the city pays us for collection, the garbage costs us an average of about 5.6 cents per hog per day.

At a considerable cost we installed a digester at the garbage feeding plant. This was primarily for recovering grease from dead animals, but we also proposed to extract grease from the garbage and at the same time cook the garbage for the hogs. We found within a short time that the raw material as it comes from the restaurants, hotels and residences is more palatable. The hogs squeal louder for uncooked than for cooked garbage. There was not much profit in the grease which we extracted and there was no advantage in cooking the garbage, for after 30 or 40 days the hogs soon tired of the cooked garbage. In fact, it's something like eating quail. A man finds it good for one meal, but would tire of it is served to him daily for a month or two.

In the winter, before feeding we warm the garbage by injecting steam into it.

Old hogs are double treated with cholera serum before they enter our pens. Then before being put on full feed we allow what we call a "sweat period" of 18 to 21 days. We have never lost a hog that has been treated in this way.

The Mountain States Feeding Co. has invested $150,000 in its collection equipment, land, buildings and live stock. It has fed as high as 2,500 hogs with garbage at a time and during the winter months it feeds an average of 1,500 hogs. In the immediate future and with the proper separation and conservation of all the garbage and edible waste matters coming to us under our present contract, we should be able to feed on an average of 3,000 to 3,500 hogs from Salt Lake City's population of 135,000 people.

Ohio Health District Law Weakened

A considerable weakening of the Ohio health district law outlined in *Engineering News-Record*, Dec. 25, 1919, p. 1067, has been effected by legislative amendments made and passed this year. These amendments (*American Journal of Public Health*, March, 1920, p. 285) permit part-time instead of full-time health officers, cut out civil service provisions, leave observance of many important features of the original law optional with local boards of health, and make separate health districts of cities of more than 5,000 instead of 25,000 as under the old law. The financial stringencies of Ohio municipalities in general and a Supreme Court decision indicating that the original law would be in part unconstitutional are given as reasons for the amendments to the health district law.

Tile Drainage of Irrigated Land for Seepage Relief at Twin Falls

Wells on Surveyed Line Drilled in Lava Rock to Water-Bearing Strata—Size of Drain Tile Based on Yield

BY ROGER M. ADAMS
Superintendent of Maintenance Twin Falls Canal Co., Twin Falls, Idaho

ON the 240,000-acre tract of the Twin Falls Canal Co. a peculiar form of drainage work is carried out, which has been developing through the last eight years. Most of the seeped areas are located parallel to deep natural channels, or coulees, the water percolating toward the coulees being confined in porous strata between successive lava layers. Along the coulees the porous strata are sealed putting the water under pressure. Drilled wells tap these water-bearing strata and the resulting artesian flow is carried by an underground tile system to the coulees. The method of draining is as follows:

1. A contract is made with the land owner wherein the company secures whatever easements for right-of-way are needed to properly execute the work.

2. A survey is made and stakes set showing the skeleton of the tile system and outlet.

3. Six-inch wells are drilled with a deep-well rig, and where necessary a 5⅝-in. well casing is placed in the holes, which are located on the edge of trench lines.

4. From the quantity and duration of the flow from the wells the size of each branch line of tile is computed, taking into consideration the grade of the line.

5. The outlet is designed for a load three times as great as the sum of all the branches.

6. The trench diggers, compressor men, and air-hammer men then move to the job with their machines and tools and commence work, while the well drills are moved to the next job. The wells are tapped at a depth of 6 ft. or more and the tile laid at 6 ft. depth to the outlet.

7. After the tile is laid and covered with gravel to a depth of from 3 to 6 in. the trench is backfilled, first with lava rock blasted from the trench, then with topsoil.

8. A stream of water is turned onto the upper end of the backfill and conducted along it in corrugations provided until no appreciable amount of the water sinks. This puddling is done very carefully, and all possible attention is given to getting the sides of the trench into a well-sloped-off condition so that the wet puddle, when drying, sinks against the sides of the trench as a wedge in a slot.

9. All trees and willows or other plants that send roots to water are cut down to a distance of 60 ft. from any tile line and the stumps burned.

10. A deep furrow is plowed parallel to and 5 or 6 ft. from each side of every tile line to conduct all waste and irrigation water into channels provided, which do not deposit the water on newly backfilled trenches, for at least one season. Farming the land drained is then possible, and it is expected of the owner if the season is not too far advanced.

In item 7 above, mention is made of the lava rock which is displaced from the trenches. The entire tract is underlaid at a greater or less depth by this lava rock. Volcanic ash forms the topsoil, in depths varying from a few inches to 60 ft., the most usual depths being 6 to 12 ft. over the "seeped" areas.

The lava was not all deposited in the same flow, but at intervals between which there must have been considerable periods of no flow. To bear out this idea, there is found in some localities a stratum of washed sand; in others, a clay strata; in others, broken lava of considerable depth, showing unmistakable signs of the evaporation of water.

A log is kept of all wells drilled, and these records are studied for information as to the stratification, width of opening laterally between the strata, and the depth of the opening which carries the water. Drilling is carried on only until the water-bearing stratum is reached. A well that shows an excessive pressure, forcing the water from it, is supplied with more area by drilling holes close to it before the rigs are moved from the spot. The wells are placed closely enough to enable one line of tile to tap the group. In this manner the flow of the water into the tile is rendered a gravity flow only.

The general slope of the land is northwest. For this reason drilling is always carried forward from the south toward the north, on any projected tile line. In this way fewer unnecessary holes are put down. Observation wells are put down 200 or 300 ft. uphill from the end of each tile line for purposes of observation and check on the success of the work in lowering the water-table to the desired depth.

WASTE CHANNELS

In most cases, irrigation waste channels are used for the outlets of the tile systems. There are few of these wastes that are artificial; 95 per cent of the channels so used are coulees. The larger coulees, and natural channels—even the Snake River—are in deep depressions which have perpendicular walls. The strata of the walls are not open at intervals at various depths, as is the land farther back from the channels, but is sealed up. There are none of the clay, sand, or spongy, incinerated material strata to be found on the coulee walls, only a seamed lava wall. The underground outlets for the water that percolates downward from the irrigated lands of the tract have no unconfined outlet at the edges of the coulees, and this barrier is of considerable thickness laterally from the edges of the coulees, hence drilling for the relief of pressure on the wells is not attempted close to the edge of coulees. The study of the logs has developed the fact that the greatest pressure on wells is obtained from wells that are drilled at the break of the slope near the crown of the swale that natural causes have made at the border of the coulees, and some ten or twenty rods from them.

From the above it may be seen that the "seeped" area is near the natural channels. That is where the first of the wet area showed up, and the progress was backward, or uphill. Also it may be one reason why the seeped area is relatively small—0.57 per cent of the total area of the tract. There is not a great probability of more than 1 per cent showing up in the future.

The cost of the drainage work is divided among those benefited. Fifteen dollars per acre drained is charged the owner of the land. The remainder of the cost is assessed to the whole acreage under the tract, and amounts to about 40c. per acre, and is added to the general operation and maintenance charge.

Rectangular Co-ordinates Used in Surveys and Maps

Grid System Based on Lambert Projection, Employed by Armies in France, Is Recommended for Civilian Practice

By H. A. Foster
Former Second Lieutenant, 29th Engineers, U. S. Army

Editor's Note: *This article introduces and explains the advantages of certain methods of computations by a system of rectangular co-ordinates as adapted to U. S. Army practice from that of the French. Another article by Lieutenant Foster describing such methods and their application in simplifying triangulation will be published soon.*

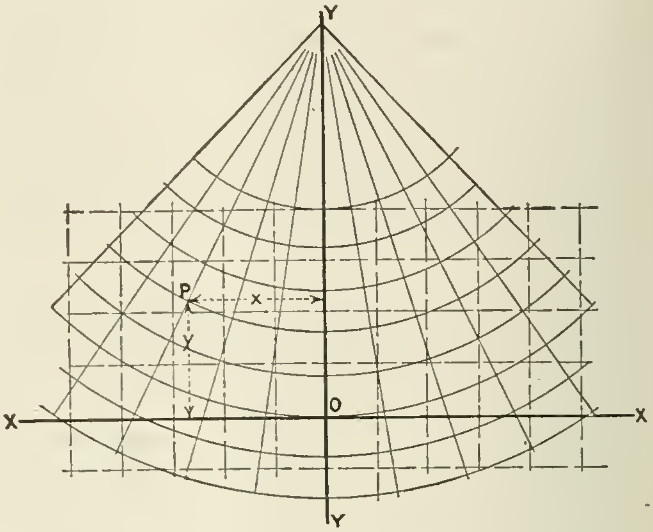
In the solution of triangulation problems for military surveys in France, certain methods of computation were used by the American army which are rather new to engineers in this country. The French and British armies had developed special methods for their own use before American participation in the war. The French system differed considerably from that used by the British; and it is the French method, with some modifications, which was adopted by the American army. To explain the method, it is first necessary to describe the conditions under which they are used. For this purpose, a brief description will be given of the system of military mapping which was used in France.

The French military map is based on Lambert's "Conformal Conic Projection." The following publications of the U. S. Coast and Geodetic Survey afford a complete discussion of the Lambert projection: "The Lambert Conformal Conic Projection," Spec. Pub. No. 47; "Lambert Projection Tables for the United States," Spec. Pub. No. 52; "General Theory of the Lambert Conformal Conic Projection," Spec. Pub. No. 53. In this projection the meridians are represented by straight lines converging to a common point and the parallels of latitude are represented by concentric circles with this same point as their center. The angles between successive meridians and the distances between the parallels are determined by formulas which depend on certain mathematical properties of the projection. These formulas need not be considered here. The linear scale of the projection is not a constant, but varies slightly for different latitudes. But the projection is "conformal" throughout; that is, the angle between any two lines on the projection is the same as the angle between the corresponding lines assumed to be drawn on the earth's surface.

On this projection, the intersection of a certain meridian and parallel is chosen as the origin for a system of rectangular co-ordinates. The given meridian is the Y-axis, and the X-axis is drawn through the origin, perpendicular to the Y-axis, or tangent to the parallel of latitude at that point. The whole map is then divided up into a system of squares by drawing lines parallel to the X-axis and Y-axis, the distance between successive lines being generally one kilometer. As can be seen on the figure, the Y-lines will not be parallel to any meridian except the meridian through the origin; and similarly, the X-lines will not be tangent to any parallel of latitude except where they intersect this same meridian.

Now consider any point, P, whose latitude and longitude are known. It is possible, by certain formulas, to compute the rectangular co-ordinates of this point with respect to our X- and Y-axes. This will give us the values x and y, which represent the distance from P to the Y- and X-axes respectively.

It will readily be seen that these rectangular co-ordinates, expressed in yards or meters, are much more convenient to use than the original geographic co-ordinates of the point, which were expressed in degrees of longitude and latitude. In France, the military authorities knew the geographic co-ordinates of a great many points, mostly church steeples, which were scattered all over the country. It was not a difficult matter to convert these into the corresponding rectangular co-ordinates, so that each of these points was accurately located by its X- and Y-co-ordinates. Then the co-ordinates of any new point which it was necessary to locate, such as the telescope in an observation post or the directing gun of a battery, were determined by running surveys connecting the new point with two or more of the known points; and the co-ordinates of the new point were computed.



Advantages of System

To illustrate the advantages of this system, consider the case of our battery, whose rectangular co-ordinates have been determined as described above. The battery commander desires to fire on a certain target which is behind a hill or some other feature that screens it from his view. But the co-ordinates of the target have been determined by some method, such as direct observation from two different points, or aerial photographs. Knowing the co-ordinates both of his battery and of the target, the battery commander can readily compute the distance to the target—i.e., the range—and the direction of the target. He can, therefore, aim his guns accurately upon the target without ever being able to see it.

The system of squares that has been described was commonly known as a "grid system." It should be observed that the grid system is independent of the type of map projection on which it is used. The system of projection must first be selected; then the grid is superimposed on the projection. Also, the grid may be applied to the projection in any given manner. The point of origin may be shifted as desired. But of course it is always convenient to have one of the axes of co-ordinates parallel to some meridian.

Most of the official maps published in the United States are made on the Polyconic projection. The application of a grid to this projection is somewhat more difficult than in the case of the Lambert projection. So it has been proposed to use the Lambert projection for certain maps, especially military maps, where the use of a grid is very desirable. Tables in the publications cited above give the data necessary for the application to the whole of the United States of a system of rectangular co-ordinates based on the Lambert projection. Some work has also been done toward applying a grid system to the polyconic projection. These tables make it possible to determine the rectangular co-ordinates of any geodetic point whose latitude and longitude are known, thereby avoiding the labor required in solving a formula. So for any section of the country in which certain known geodetic points are available, a grid system can readily be established; and any future surveys in that section can be based on rectangular co-ordinates.

However, it is not necessary to know the latitude and longitude of any point in order to base the survey on rectangular co-ordinates. Instead, co-ordinates can be assumed for the starting point of the survey, and the Y-azimuth of the starting line (that is, the angle it makes with the Y-axis) can also be assumed. The axes of the grid system are therefore determined, and the survey can be completed without reference to latitude or longitude. Thus it is possible to compute any survey by rectangular co-ordinates.

PRACTICAL APPLICATION OF SYSTEM

For a practical application of the system consider a large irrigation or drainage project. To lay out the plans for such work extensive surveys are necessary and by which many stakes or monuments are located. These are plotted on the map as reference points. As the work progresses it becomes necessary to locate many additional points by extension from these reference points. All of this work will be greatly simplified if the survey has been computed in terms of rectangular co-ordinates. Every known point will then be located by its individual co-ordinates, which can be used both for plotting it on the map and for relating it to other points.

In a later article certain methods of computation will be described which greatly simplify the solution of triangulation that is based on a grid system. These methods of computation involve a semi-graphic adjustment of the results of the triangulation. This adjustment does not give results which are as refined and precise as those given by the method of least squares, which is commonly used in this country. But the results will be quite accurate; and the work involved is very much less than is required in making a least squares adjustment. The graphical methods used also have a special advantage in that they indicate very clearly the amount of adjustment that is necessary; and they show very distinctly whether any of the observations were inaccurate or wild. The methods may appear at first to be somewhat involved, chiefly because they are different from what most surveyors are accustomed to. Nevertheless after a little practice, they are found not to be difficult, and in plane surveys where rectangular co-ordinates can be introduced, these methods undoubtedly have very great advantages.

Analysis of New Orleans' Rainfall Statistics for Twenty-five Years

Based on records of rainfalls in New Orleans, La., for the 25-year period from 1894 to 1918 inclusive, a table has been compiled giving the annual maximum amount falling in inches within stated periods ranging from three minutes to twelve months. The information was given in the latest annual report of George G. Earl general superintendent, Sewerage and Water Board.

Time Period	Greatest	Date of Occurrence	Average	Least	Date of Occurrence
3 min.	0.63	Dec. 25, 1916			
5 min.	0.84	Dec. 25, 1916.	0.46	0.30	'97-'98-'99-'08
15 min.	1.73	Dec. 25, 1916.	1.09	0.68	'08
30 min	2.64	Apr. 27, 1900	1.71	1.00	'97
45 min	2.99	Oct. 29, 1918	1.96	1.30	'97
1 hour	3.53	Oct. 29, 1918	2.16	1.39	'06
2 hours	4.66	Mar. 22, 1912	2.71	1.58	'02
3 hours	5.80	Mar. 14 and 15, 1903	3.09	1.66	'08
4 hours	6.60	Mar. 14 and 15, 1903	3.21	2.01	'08
5 hours	7.02	Mar. 14 and 15, 1903	3.52	2.05	'08
6 hours	7.10	Mar. 14 and 15, 1903	3.62	2.10	'08
7 hours	7.30	Mar. 14 and 15, 1903	3.74	2.20	'08
8 hours	7.40	Mar. 14 and 15, 1903	3.83	2.30	'08
9 hours	7.50	Mar. 14 and 15, 1903	3.94	2.40	'08
10 hours	7.60	Mar. 14 and 15, 1903	4.01	2.50	'08
11 hours	8.37	Apr. 25, 1907.	4.11	2.60	'04-'08
12 hours	8.75	Apr. 25, 1907	4.19	2.60	'04
13 hours	8.81	Apr. 25, 1907	4.21	2.60	'04
14 hours	8.81	Apr. 25, 1907	4.29	2.60	'04
15 hours	9.06	Apr. 25, 1907	4.33	2.60	'04
16 hours	9.21	Apr. 25, 1907	4.37	2.60	'04
17 hours	9.30	Apr. 25, 1907	4.40	2.60	'04
18 hours	9.35	Apr. 25, 1907	4.43	2.60	'04
19 hours	9.40	Apr. 25, 1907	4.47	2.60	'04
20 hours	9.50	Apr. 25, 1907	4.50	2.60	'04
21 hours	9.60	Apr. 25, 1907	4.53	2.60	'04
22 hours	9.70	Apr. 25, 1907	4.56	2.60	'04
23 hours	9.75	Apr. 25, 1907	4.59	2.60	'04
1 day	9.80	Apr. 25, 1907	4.63	2.60	'04
2 days	9.90	Apr. 25-26, 1907			
3 days	9.90	Apr. 25-26, 1907			
4 days	11.51	Apr. 22-25, 1907			
5 days	12.73	Apr. 21-25, 1907			
6 days	12.82	Apr. 21-26, 1907			
7 days	14.01	Sept. 29-Oct. 5, 1915			
8 days	14.12	Sept. 29-Oct. 6, 1915			
15 days	22.24	Sept. 29-Oct. 13, 1915			
30 days	23.00	Sept.-Oct., 1915			
1 mo.	16.01	Sept., 1898	10.10	5.84	'17
2 mos	26.62	Apr.-May, 1907.	16.00	9.14	'02
3 mos	30.81	Mar.-May, 1912	21.00	11.65	'02
4 mos	36.48	July-Oct., 1915	24.00	12.86	'02
5 mos	41.75	June-Oct., 1915	28.00	14.90	'02
6 mos	47.69	1912	33.00	17.28	'02
7 mos	51.58	1912	37.00	21.53	'02
8 mos	55.19	1912	40.00	24.98	'02
9 mos	59.87	1912	44.00	28.83	'02
10 mos	67.73	1911-1912.	49.00	31.27	'17
11 mos	71.74	1911-1912	52.00	31.53	'17
12 mos	74.68	1912.	53.83	33.51	'17

The following tabulations give maximum, minimum and average monthly rainfall for the same 25-year period:

INCHES RAINFALL PER MONTH

Month	Maximum	Minimum	Average
January	7.65	0.75	3.47
February	13.27	1.29	4.58
March	11.77	1.23	4.37
April	12.64	0.66	4.71
May	13.98	0.10	4.09
June	10.48	1.21	5.19
July	10.93	2.51	6.20
August	9.21	3.01	5.55
September	16.01	0.39	5.29
October	12.14	0.60	2.95
November	6.32	0.21	2.38
December	13.18	1.62	4.90
Per annum	74.68	33.51	53.82

Making Brick from Waste Granular Granite

Waste granite in the Barre (Vt.) district accumulates in the quarries in large quantities. Its removal is expensive and recent investigators at Montpelier, Vt., have been experimenting with it in the production of a brick similar to sand-lime brick. Granules of granite are mixed with lime, moulded and hardened under steam pressure. The brick are said to be of excellent quality for structural purposes, according to the Bureau of Mines.

Aggregate Proportions for Equal Strength Concrete

Tables Give 135 Combinations of Fine and Coarse Aggregate Producing Equal Strength Concrete—Most Natural Gravels Included in Tabulation

By A. N. Johnson
Consulting Engineer, Portland Cement Association

A method of applying fineness-modulus theory of proportioning concrete to actual field use in concrete highway construction as outlined in addresses before the American Road Builders Association and various state and local engineering societies.

AGGREGATES having far greater ranges of size than have been considered permissible can be employed for concrete pavement. The concrete mixtures from all will be equally strong and uniformly workable. Proper proportions are all that is necessary. These proportions can be determined in the field by means of tables, which embrace the ranges of sizes and gradings ordinarily exhibited by natural gravels. Great extension by this means of the sources of materials available for concrete road construction is accomplished, and one of the most troublesome problems of the road builder is materially simplified.

Numerous tests conducted by Prof. D. A. Abrams of Lewis Institute, Chicago, have demonstrated that by determining the fineness modulus (*Engineering News-Record*, April 17, 1919, p. 758), it is practicable to make concrete of equal strengths from quite dissimilarly graded materials. For example, one aggregate may range from 3-in. pieces to the finer sand particles, while the second may contain no pieces over 1-in. in size and yet, by varying the proportions of cement, each of these aggregates may be used and the strength of the resulting concrete will be the same.

Present Specifications Exclude Usable Materials

Many supplies of aggregates now excluded by the narrow restrictions of our specifications, may be employed and just as good concrete produced as that made under our present specifications. We have been somewhat inclined to develop a standard specification and have lost sight of the fact that it is not the specification that is to be standard but rather the product. If concrete possessing the same strength and durability can be made from aggregates having various gradings and limiting sizes then there is no reason to adhere to specifications which confine the selection of aggregates to those of a particular grading and exclude all others.

Under our standard specifications for fine aggregate, we are limited to the use of material varying from ¼-in. size down to the finer materials, specifying that it shall be reasonably well graded between the smaller and larger particles. Suppose, however, there is available a quantity of sand containing no particles larger than ⅛-in., are we to throw away these sands, or may we use them, varying the proportions so as to produce the same strength concrete as is obtained with the sand containing ¼-in. particles?

Our specifications today for coarse aggregate, while they vary somewhat more than for fine aggregate, restrict the choice of materials to very narrow limits, the sizes usually specified varying from ¼ in. to 2in., some to as high as 3 in. and a number limiting the larger size to 1½ in. But we have at hand, let us say, a large amount of material which contains no particles less than 1 in. in size, varying from that to 2 in. or possibly to 3 in., or there is other material available containing nothing less than ½ in. and perhaps nothing over 1 in. The question is, can we use aggregates, which vary so widely from our present specifications, in such a way as to produce concrete as strong and durable as with the aggregates that comply with our present specifications. From Prof. Abrams' work we know the answer to be "yes." Also Prof. Abrams has prepared Table I and II which puts the results in a practically available form.

Tables Based on Present Practice

The basis upon which the tables have been calculated is the production of a concrete that experience has shown will have sufficient strength and durability for its purpose. There have been many miles of concrete roads built using a 1:2:3 mixture with the fine aggregate varying from ¼ in. to the finer particles and the coarse aggregate varying from ¼ in. to 1½ in. or 2 in. Such a concrete tested under laboratory conditions, using 6 x 12 in. cylindrical test specimens, and with a plasticity that secures a practical workability, gives very closely at 28 days a compressive strength of 3,000 lb. per square inch. This was taken as a basis upon which the tables have been prepared.

Five different fine aggregates were selected, varying, as the table will indicate, from the finest which contains no particles over 1/28-in. and others not over 1/14, ⅕, ¼ and ⅜ in. in size respectively. A wide selection of coarse aggregates is given beginning with the first group which has the smaller limit of size at ¼ in., while the larger limit varies from ¾ in. to 3 in. In the second group the lower limit for the coarse aggregate is ⅜ in., with sizes for the upper limit varying from ¾ in., to 3 in. Similarly there are groups with the lower limit at ½ in., ¾ in., and 1 in., respectively, the upper limits in each group varying in sizes to 3 in., making in all 27 variously sized coarse aggregates, each in turn combined with five different fine aggregates or sands, thus making 135 combinations of fine and coarse aggregates each of which is proportioned so as to produce under practical working conditions as to consistency the same strength concrete.

In all cases it is to be assumed that all aggregates that are to be used, irrespective of size or grading, are to be of material structurally sound, clean and free of organic impurities. Also it should be observed that Professor Abrams' tests demonstrated that the resistance to abrasion of conretes varied as the compressive strength, the greater the strength, the greater the resistance to wear; and that conretes of equal crushing strength gave about equal resistance to abrasion.

In the practical application of the tables we first have to define how to determine what is the upper limit of size for a given aggregate. Should any sand containing a few ¼-in. particles be classed as one varying from zero to ¼ in., or should there be required a certain percentage of material between the ¼-in. size and the next lower limit, as shown in the table, which is ⅛ in.? The proper allowance, Professor Abrams tells us, should be 15 per cent; that is, a fine aggrategate with ¼-in. particles which did not contain 15 per cent by volume of the material passing the sieve with eight openings to the inch, should be classed as ⅛-in. sand, not ¼-in.

The following rule is to be applied to determine the limits of sizes for the coarse aggregate: There shall be not less than 10 per cent of material between the largest size and the next smallest size shown in the table. Thus a coarse aggregate to be classed as 2½-in. size shall have not less than 10 per cent of the material between the 2½-in. size and the 2-in. size it should be classed as 2-in. providing there should be at least 10 per cent of the material retained upon the 1½-in. screen.

The lower limit of size of a coarse aggregate shall be the largest size shown in the table for coarse aggregate below which there is not to exceed 10 per cent by volume of the material. Thus a coarse aggregate in which the lower limit of size is to be 1 in. should be an aggregate in which there is not to exceed 10 per cent by volume of the material passing the 1-in. screen. In all coarse aggregates if there is to exceed 5 per cent of the volume passing a ¼-in. sieve, then such excess shall be considered as fine aggregate and the amount of fine aggregate to be used is to be modified accordingly.

It will be noted that in addition to the proportions regulating the combination of the various fine and coarse aggregates with the unit quantity of cement, there is also given in the tables the quantities of the materials to be used to make 1 cu. yd. of concrete. These quantities are in barrels and hundredths of barrels for cement and in hundredths of subic yards for the aggregates. The quantities shown do not make allowance for waste from any source, so that for practical estimates they should be increased as experience in handling the work according to the particular method to be employed indicates as necessary.

It will be supposed that one sand is that usually specified, from ¼ in. down, and must be shipped in at a cost of $2 per cubic yard; that one coarse aggregate, varying from ¼ in. to 2 in., must also be shipped in at a total cost of $3 per cubic yard; that there is available locally a supply of sand and coarse aggregate, each being rather fine, the sand varying from ⅛ in. down which costs $1.50 per cubic yard, while the coarse aggregate varies from ¼ in. to 1 in. and may be secured at a cost of $2.50 per cubic yard. The cement in each case is assumed to cost $3 per barrel. The cost of a cubic yard of concrete using the materials to be shipped in would then be as follows:

1.52 bbl. cement at $3	$4.56
0.43 cu.yd of sand at $2	0.86
0.81 cu.yd. of coarse aggregate at $3	2.43
Total cost of 1 cu yd. concrete	$7.85
Using local materials the cost would be:	
1.72 bbl. cement at $3	$5.16
0.46 cu.yd. of sand at $1.50	0.69
0.66 cu.yd. of coarse aggregate at $2.50	1.65
Total cost of materials for 1 cu.yd. concrete	$7.50

PROPORTIONS AND QUANTITIES OF AGGREGATES PER CUBIC YARD OF 3,000-LB., 28-DAY CONCRETE

SIZES		FINE AGGREGATES, SCREEN OPENINGS PER INCH														
COARSE AGGREGATES Inches	Cement in Barrels Aggregates in Cubic Yards	0-28			0-14			0-8			0-4			0-⅜ In.		
		Cement	Fine	Coarse	Cement	Fine	Coarse	Cement	Fine	Coarse	Cement	Fine	Coarse	Cement	Fine	Coarse
No. 4 Screen to ¾	Proportions	1	1.3	2.4	1	1.6	2.4	1	1.8	2.3	1	2.0	2.3	1	2.7	1.5
	Quantities	1.96	.37	.69	1.85	.44	.66	1.82	.48	.62	1.75	.52	.59	1.79	.72	.40
No. 4 Screen to 1	Proportions	1	1.3	2.7	1	1.6	2.6	1	1.8	2.6	1	2.0	2.6	1	2.6	1.8
	Quantities	1.90	.36	.76	1.77	.42	.68	1.72	.46	.66	1.67	.50	.62	1.72	.66	.46
No. 4 Screen to 1½	Proportions	1	1.2	3.1	1	1.6	3.2	1	1.7	3.1	1	2	3	1	2.4	2.4
	Quantities	1.82	.32	.84	1.68	.40	.79	1.63	.41	.75	1.61	.47	.72	1.62	.57	.57
No. 4 Screen to 2	Proportions	1	1.2	3.5	1	1.5	3.5	1	1.6	3.7	1	1.9	3.6	1	2.2	3.1
	Quantities	1.75	.31	.90	1.63	.36	.85	1.55	.36	.85	1.52	.43	.81	1.53	.50	.70
No. 4 Screen to 2½	Proportions	1	1.1	3.8	1	1.4	3.9	1	1.6	4.0	1	1.8	4.0	1	2.1	3.5
	Quantities	1.72	28	.97	1.58	.33	.91	1.51	.35	.89	1.49	.40	.88	1.50	.46	.78
No. 4 Screen to 3	Proportions	1	1.1	3.9	1	1.4	4.1	1	1.5	4.1	1	1.7	4.1	1	2.0	3.7
	Quantities	1.69	.28	.97	1.58	.33	.97	1.49	.33	.90	1.49	.37	.90	1.49	.44	.81
⅜ to ¾	Proportions	1	1.3	2.3	1	1.7	2.3	1	1.9	2.3	1	2.2	2.2	1	2.8	1.4
	Quantities	1.96	.37	.67	1.85	.46	.63	1.82	.51	.62	1.75	.57	.57	1.79	.75	.37
⅜ to 1	Proportions	1	1.3	2.6	1	1.7	2.6	1	1.9	2.5	1	2.2	2.4	1	2.7	1.7
	Quantities	1.90	.36	.74	1.77	.44	.68	1.72	.48	.64	1.67	.54	.59	1.72	.68	.43
⅜ to 1½	Proportions	1	1.3	3.0	1	1.7	3.0	1	1.9	3.0	1	2.1	2.9	1	2.6	2.2
	Quantities	1.82	.35	.80	1.68	.43	.75	1.63	46	.73	1.61	.50	.68	1.62	.63	.53
⅜ to 2	Proportions	1	1.3	3.3	1	1.7	3.4	1	1.8	3.5	1	2.0	3.4	1	2.4	2.9
	Quantities	1.75	.34	.86	1.63	.41	.83	1.55	.42	.80	1.52	.45	.77	1.53	.62	.66
⅜ to 2½	Proportions	1	1.3	3.7	1	1.6	3.7	1	1.7	3.9	1	2.0	3.8	1	2.3	3.3
	Quantities	1.72	.33	.95	1.58	.37	.87	1.51	37	.87	1.49	.44	.84	1.50	.51	.74
⅜ to 3	Proportions	1	1.2	3.8	1	1.6	3.9	1	1.7	4.0	1	1.9	4.0	1	2.2	3.5
	Quantities	1.68	.30	.95	1.58	.37	.91	1.49	.37	.88	1.49	.42	.88	1.49	.48	.77
½ to ¾	Proportions	1	1.5	2.3	1	1.9	2.2	1	2.1	2.2	1	2.3	2.1	1	2.8	1.3
	Quantities	1.96	.44	.67	1.85	.52	.61	1.82	.56	.59	1.75	.59	.54	1.79	.75	.34
½ to 1	Proportions	1	1.5	2.5	1	1.9	2.5	1	2.1	2.4	1	2.3	2.4	1	2.8	1.6
	Quantities	1.90	.42	.70	1.77	.50	.66	1.72	.53	.61	1.67	.57	.59	1.72	.72	.41
½ to 1½	Proportions	1	1.4	2.8	1	1.9	2.9	1	2.1	2.9	1	2.2	2.8	1	2.7	2.1
	Quantities	1.82	.37	.75	1.68	.47	.73	1.63	.51	.69	1.61	.52	.66	1.62	.65	.51
½ to 2	Proportions	1	1.4	3.3	1	1.9	3.3	1	2.0	3.4	1	2.2	3.3	1	2.7	2.7
	Quantities	1.75	.36	.86	1.63	.46	.79	1.55	.46	.78	1.52	.50	.74	1.53	.62	.62
½ to 2½	Proportions	1	1.4	3.6	1	1.8	3.6	1	1.9	3.7	1	2.1	3.7	1	2.6	3.1
	Quantities	1.72	.35	.91	1.58	.43	.85	1.51	.42	.83	1.49	.46	.81	1.50	.57	.69
½ to 3	Proportions	1	1.3	3.7	1	1.8	3.8	1	1.8	3.9	1	2.1	4.0	1	2.4	3.3
	Quantities	1.68	.33	.92	1.58	.42	.89	1.49	.40	.86	1.49	.46	.88	1.49	.53	.63
¾ to 1	Proportions	1	1.7	2.4	1	2.1	2.4	1	2.4	2.1	1	2.6	2.2	1	3.1	1.5
	Quantities	1.90	.48	.68	1.77	.55	.63	1.72	.61	.53	1.67	.64	.55	1.72	.79	.39
¾ to 1½	Proportions	1	1.7	2.7	1	2.0	2.8	1	2.3	2.7	1	2.5	2.7	1	3.0	2.0
	Quantities	1.82	.46	.73	1.79	.50	.70	1.63	.55	.65	1.61	.59	.64	1.62	.73	.48
¾ to 2	Proportions	1	1.7	3.1	1	2.0	3.1	1	2.3	3.1	1	2.5	3.0	1	3.0	2.4
	Quantities	1.75	.44	.80	1.63	.48	.75	1.55	.53	.72	1.52	.56	.67	1.53	.68	.55
¾ to 2½	Proportions	1	1.7	3.3	1	2.0	3.5	1	2.3	3.4	1	2.4	3.4	1	2.9	2.8
	Quantities	1.72	.43	.84	1.63	.47	.83	1.51	.52	.76	1.49	.53	.75	1.50	.64	.62
¾ to 3	Proportions	1	1.7	3.5	1	2.0	3.7	1	2.3	3.7	1	2.4	3.6	1	2.8	3.1
	Quantities	1.68	.43	.88	1.58	.47	.87	1.49	.51	.81	1.49	.53	.79	1.49	.62	.68
1 to 1½	Proportions	1	1.7	2.8	1	2.0	2.9	1	2.3	2.7	1	2.6	2.6	1	3.1	2.0
	Quantities	1.82	.46	.75	1.68	.50	.73	1.63	.55	.65	1.61	.62	.62	1.62	.75	.48
1 to 2	Proportions	1	1.5	3.2	1	1.9	3.5	1	2.2	3.3	1	2.4	3.3	1	3.0	2.6
	Quantities	1.75	.39	.83	1.63	.46	.85	1.58	.51	.76	1.52	.54	.74	1.53	.68	.59
1 to 2½	Proportions	1	1.4	3.4	1	1.9	3.8	1	2.0	3.7	1	2.3	3.7	1	2.7	3.1
	Quantities	1.72	.35	.86	1.58	.45	.89	1.51	.44	.83	1.49	.51	.81	1.50	.59	.69
1 to 3	Proportions	1	1.3	3.6	1	1.8	4.0	1	2.0	3.9	1	2.2	3.9	1	2.7	3.3
	Quantities	1.67	.33	.90	1.58	.42	.94	1.49	.44	.86	1.49	.48	.86	1.49	.59	.73

Based upon laboratory investigations, using approved materials. Compressive strength, 28 days, with workable plasticity, 9 x 12 in. cylinders, 3,000 lb. per square inch.

In this instance the local aggregate, although fine and requiring more cement, will produce a yard of concrete at less cost. In general it will be found that the use of finer sand or of finer aggregate increases the amount of cement, the opposite being true for coarser sizes. Thus a coarse aggregate with all of the fine material removed, varying from 1 in. to 3 in. in size, combined with sand varying from ¼ in. down, uses 1.49 bbl. of cement; whereas an aggregate varying from 1 in. to ¼ in. combined with the same sand, ¼ in. down, requires 1.67 bbl. of cement for a cubic yard of concrete.

If the producer of aggregate materials can say what are the sizes of aggregates he can furnish, they can be used to make a concrete of a given strength. Should concrete of a strength other than 3,000 lb. per square inch be desired, then another table would be calculated with the proportions and quantities required accordingly; but the table given here is confined to the use of concrete for concrete roads where a better quality and greater strength are required than is necessary for concrete for many other structures.

Surveys for Flood Protection at Columbus, Ohio

Complete Topographical Map Based on Permanent Bench Marks—Four Miles of River Completely Surveyed

By R. C. Chaney

Construction Engineer, River Channel Improvement, Columbus, O.

SURVEYS were begun in the spring of 1917 for the preparation of the plans for the improvement of the channels of the Scioto and the Olentangy rivers for flood protection, through the City of Columbus, Ohio. The length of river selected for attention was approximately four miles; it extended from the confluence down to below the thickly settled portion of the low flood plain, and included most of the bank responsible for the disaster of 1913. The continuation of the protection up the Olentangy was contemplated as soon as the more urgent work was under way, and all plans were made with the idea of their fitting into the ultimate completed improvement, including, for instance, increased capacity —to be secured by further deepening—additional bridges, the improvement of the boulevards to be built early, and such parking and further development as might be determined upon. The development of an organization to handle the engineering, as a bureau of the City Engineer's Office, Henry Maetzel, city engineer, was begun Feb. 1, 1917, with the appointment of Mr. R. H. Simpson as engineer in charge, and the writer as principal assistant.

Locating and Leveling Circuit of Bench Marks

The need of a topographic map of the affected portion of the basin was at once apparent. Earlier studies of the problem had been based upon stadia maps, but for various reasons these were not available or were unsuitable, and it was determined to prepare a new map upon which to base studies for the channel improvement, and from which to work out the details of alignment and location. Accordingly parties were placed in the field engaged upon the establishment of a system of principal bench marks, some traverses for the location of certain levees and the triangulation network on which to hang the stadia survey.

A circuit about eight miles long, comprising a system of 36 principal or control bench marks, spaced from 1,000 to 1,500 ft. apart, and located along the border of the affected zone on both banks, was established. Most of these marks were brass plugs set in concrete monuments. The monuments were approximately 1 ft. in diameter and from 4 to 5 ft. deep, with the top formed and surfaced. A few plugs were set in conveniently located masonry. A reconnaissance trip spotted the locations. The party then, consisting of an assistant engineer, transitman and rodman, with the help of some prisoners borrowed from the city work house, and operating with a light Ford truck, placed the monuments.

Levels were run around the circuit, with a Buff & Buff hydrographer's level. This instrument was secured for such work and was a three screw Y-level with a micrometer attachment for slow movement in levelling, a mirror, and a bubble tube, sensitiveness of 6″ per graduation. An iron pin with ring was used for a turning point. Great care was used in this work, by an experienced party, and excellent results were secured.

For the purpose of locating some two miles of existing levee, and tying in some principal streets, railway lines, etc., for early local plats, later to be made a part of the stadia map, closed traverses were run, totalling 10 miles in length. No extreme refinement was used in this work. Care was taken, however, to repeat all angles, to secure uniform tension of tape, to level the tape, to plumb over irregularities of ground, etc. A good field party on this work gave rapid and very satisfactory results. One traverse, with 14 angles and a length of measured line of 3¼ miles gave a closing error of 1:70,000. This work was done in cold weather.

The most interesting feature of the survey, however, was the triangular system and its use. This system consisted of a network of 120 stations, following the old banks of the river, and located for use as a foundation for the stadia work, and also to conform as nearly as practicable to the desired shape of figure for accuracy of observation and computation. Another use will be explained further on in this article. The bulk of the system, consisted of a series of quadrilaterals, but occasionally a triangle was unavoidable. At the extreme south end of the system triangles only were used. No attempt was made at reduction to sea level, nor was the true azimuth of lines determined. The extremes of elevation of stations were 700 and 745 ft. above sea level. For stations, sections of ¾ in. galvanized water pipe 30 in. long, wedge pointed, and capped, were used, except for a few cases where brass plugs were set in masonry. The stations were cut-stencilled for identification. The pipes were referenced by measurements to witness stakes, or otherwise, and driven slightly below the surface to be free from disturbance The length of sides of figures varied from 205 ft. to 1,920 ft. The angle limits were 25° and 75°. However, a few exceptions to this rule were unavoidable.

Three base lines were used, the south one a little over 1,500 ft. long, the central one about 500 ft. long, and the north one, 1,900 ft. long. These were measured over lines of graduated stakes 25 ft. apart, with measured pull on a tape compared with the standard 100 ft. of the College of Civil Engineering, Ohio State University, with temperature and slope corrections. Three measurements were made of each base, means being used.

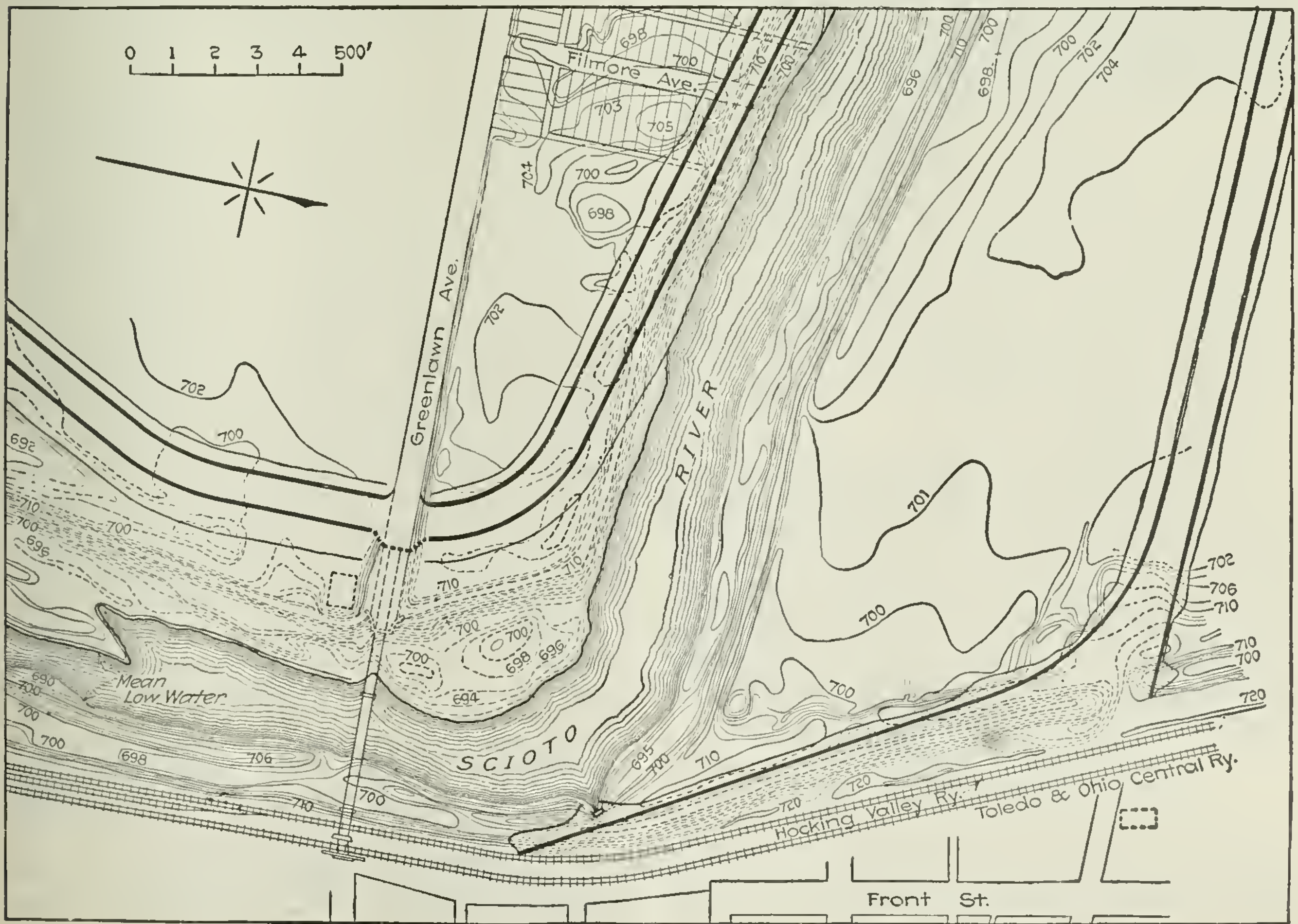
The field of observing the 590 angles was performed by a party of a work assistant engineer, a transitman and three rodmen, using a Berger instrument No. 1, leading to minutes. Sights were taken, except in a few cases where a yellow pencil was entirely visible, to 10 in. square targets, plumbed over the stations. Angles were turned, doubled, tripled, etc., until a set of six values was secured, consistent within 15″. As the readings were recorded, the observer noted the increments for big irregularities as a guide for accepting the set, and when completed, a mean value was noted and the increments compared with this. A set with more than one bad increment, or whose increments varied over a range of more than 15″ from the mean, was discarded, or additional readings were taken. In any case, the mean of the variations of the increments from the mean value was a fair criterion of the value of the set of readings. When a figure was completed all triangles and the quadrilateral were closed as a final field check. When not closing within 15″ the bad angle was found and returned. All angles were turned by the same man, and careful work by him, and by the target men, gave very satisfactory results.

The observations were given to the reduction team, who checked the field test of angles, adjusted the values for closing the figures, and computed the lengths of the sides. The computer and checker worked with a vega table of seven-place logarithms. The adjustment of figures gave some trouble. An attempt at a "rational" method was based upon a principal of correction arrived at by assigning the angle a portion of the closing error obtained by weighing it with respect to its size-variation from 56°, taken as the ideal, and with respect to the consistency of the set of observations. This set of values, however, was rarely more nearly closing than the observed set. A second adjustment was then made, which was really little more than an arbitrary or forced closing. If this resulted in too great a departure from the field mean, the figure was repeated in the field. This was found to be the only cure for some adjustment cases. Most cases answered so satisfactorily to the adjustment process, that little time was wasted on bad ones, and they were immediately under suspicion upon developing any difficulty of adjustment. Only one third field observation was found necessary. The resulting angles were expressed in values to the second. Adjustment by least squares was not employed on account of the time required by the process.

The reduction was carried upstream from the south base to the central with 208 intervening angles. The computed and measured lengths of the central base differed by 0.038 ft.; of the north base, by 0.070 ft. This was entirely satisfactory and assured a dependable network from which both to map and carry out field location.

Following the reduction of the triangulation system, the stadia party using the network, rapidly covered the topography, locating levees, low water line, buildings, streets, roads, bridges, dams, railroads, etc., with little need for additional base line or traverse. There was nothing unusual in this work.

Upon the satisfactory closing of the triangulation the mapping was taken up. The calculation of the system had included the determination of co-ordinates of the system, referred to axes, of direction at 90°, but selected so that they parallelled the edges of the map. It was



CONTRACT DRAWINGS SHOW IN DETAIL PLAN OF PROPOSED CHANNEL found that the entire length of rivers under study could be drawn to a scale of 1 in. = 100 ft. on a one piece map. This necessitated 62-in. paper 10 yd. in length, which, mounted on linen, was secured after some difficulty. The platting of the triangulation was done with great care, controlled within 6000-ft. zones, each station spotted by its coordinates, then the lengths of the triangulation sides scaled for check. It was practicable to get a consistency to within 1 ft. for all points.

The platting of the stadia work was carried on behind that of the triangulation system, a drawing table 64 in. wide by 14 ft. long permitting a number of draftsmen to work simultaneously. The map was completed by the drawing in of 1-ft. contours and all topographical features of interest, including sewers, railroads, property lines, traverses, etc.

The paper location of the flood protection works was a simple matter now, and the levee lines were worked out completely with coordinates of points of curves and tangents. The field location was then simply a matter of traversing from triangulation points, and the running in of the levee centerlines, and the adjustment. The control for these lines was then established by placing concrete monuments on radial lines from ends of curves and other points with reference distances and angles of permanent sights. In the mapping of the topography, water colors were used, red for surveys, brown for contours, blue for water, green for sewers, and black for other features. The system of co-ordinates provided excellent means of location for any point of the proposed work, or relocation of features of the original topography after or during the progress of the construction.

The contract drawings, 24 by 36 in. in size, were based upon the map. All topography was traced direct from it. The folio for the principal contract, that for the channel excavation and embankment, included first, an index sheet, or general plan, followed by map sheets with match lines, taken from the big map, showing in more detail the plan of the proposed channel. After these came such details as channel sections, etc. The index map was to the scale of 1 in. to 400 ft., and gave a comprehensive view of the improvement as a whole, with locations of levees and other improvements, and quantities of excavation and embankment by sections for the purpose of showing local balance of cut and fill. It contained also a statement of the estimated quantities, some 44 items.

The map sheets of this folio contained little in addition to the information shown by the large map. Field folios of these sheets provided all data for location parties, and were used printed on cloth for general field work. For greater convenience these drawings were photo-reduced in the ratio 1:5 and bound in pocket books. This was particularly convenient in the case of the contracts for the structures, such as bridges, levee walls, sewers, dam, etc. The large map constituted a permanent record of the original situation, with the improvement of the rivers shown in true relation.

Concrete Mixture Was 1 : 1½ : 3

In Table 1, on page 811 of *Engineering News-Record*, April 22, 1920, the proportions of the concretes made by G. M. Williams were 1:1½:3, not 1:½:3 as the dropped type in some of the issues of the paper made the caption to the table read.

Timely Treatment for Saving Wood Block Pavements

By John Stanley Crandell
Consulting Engineer, General Tarvia Dept., The Barrett Co., New York City

The problem that many of the city engineers have to solve today is "How can my wood block pavements be saved?" If taken in time, the solution is simple. If maintenance is delayed, total dissolution of the pavement may be looked for with certainty.

Let us assume a case: The pavement is in a southern city; laid two years ago; supervision poor, with consequent skimping of cement in concrete base, sand cushion of irregular depth, sand filled joints, and good blocks badly laid. At present all the joints are only partially filled with sand, and many of them are so empty that the blocks can be lifted out with the fingers. When it rains the pavement swells so that hummocks and ridges appear; as vehicles pass by, muddy water is forced out of the open joints, and descends in a spray over the clothes of unfortunate pedestrians; if the rain is intense, the entire pavement may float away. Sometimes, in damp weather, large areas bulge and swell so that travel is unsafe. During dry spells the blocks shrink, become loose and rattle as traffic passes over them; the loose blocks begin to check and split, and finally splinter into match wood.

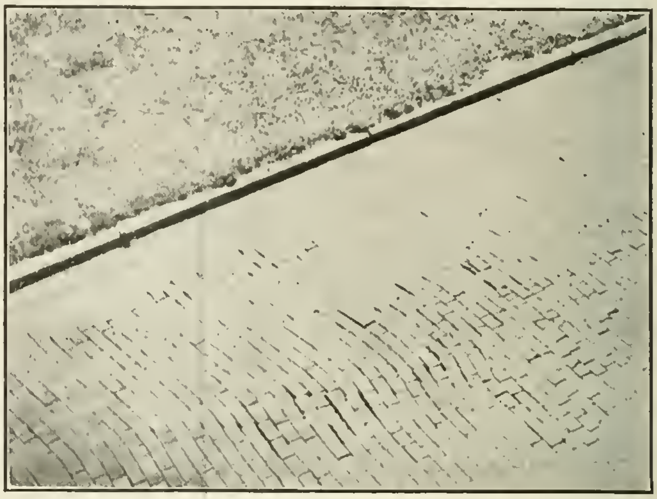


FIG. 1. OPEN JOINTS IN WOOD BLOCK IN PENSACOLA, FLA.

Even in such a bad case the pavement can be made reasonably good at slight expense if it is repaired *in time*. First, examine carefully the entire area, to determine, if possible, where any cracks may exist in the concrete base. Where a crack is suspected, remove some of the blocks and see if the crack is beneath. If it is, take up the blocks above it, and, after cleaning out the crack, fill it with hot coal tar pitch. Make sure that no water will be able to find its way up through the foundation into the sand cushion. Second, where the surface of the pavement is uneven, showing that the sand cushion has shifted due to the presence of water, take up the blocks, strike off the cushion, and relay the blocks, replacing broken ones with new ones. Try to get the same size blocks for renewals. Third, replace all shattered blocks with new ones, taking care to bed them properly. Fourth, sweep filth out of joints, or, if sweeping fails, flush the joints with a fire hose of sufficient pressure to tear loose the filth. Fifth, let the pavement dry thoroughly. Sixth, apply a coat of light coal tar, using about one gal per square yard, or more if the pavement will absorb it. This should be applied hot, and should be swept into the joints with push brooms or squeegees. Seventh, keep traffic off until the next day, and before traffic is admitted sand the pavement well with clean, hot sand. It may be necessary to repeat this treatment using a lesser amount of tar. In most cases one application is sufficient. The tar should conform to the following specifications:

(1) The specific gravity shall be not less than 1.20 or more than 1.26 at 60 deg. F.

(2) The viscosity tested by the standard Engler Viscosimeter, shall be not less than 125 sec., nor more than 200 sec. for 100 c.c. at 212 deg. F.

(3) On distilling 100 c.c. of the material, no distillate shall come over below 338 deg. F.: on continuing the distillation to 572 deg. F. not more than 25 per cent of distillate shall come over. The specific gravity of the entire distillate shall not be less than 1.03 at 60 deg. F. The residue from the foregoing distillation shall have a melting point not greater than 165 deg. F.

(4) The free carbon shall be not less than 12 per cent nor more than 22 per cent.

LIGHT TAR BETTER THAN PITCH

It may be asked "Why not use paving pitch instead of a light tar to fill the joints?" The answer is that in a pavement such as we have considered here, the joints are, to a large extent, partly filled with sand and dirt, and a considerable yardage will be found where the joints are full to the top before the tar is applied. Further, not only are the joints to be made waterproof but the blocks themselves must be waterproofed as well, and a light hot tar will do this work better than a heavy paving pitch. Again, the light tar will form a mastic with the sand in the joints, whereas paving pitch will not be so likely to. If water can be kept out of the sand cushion the pavement will usually give good service.

Now, let us assume another case. The pavement is in a northern city—foundation fair; cement-sand cushion, fair; pitch filler had been used, but joints were not well filled; the blocks were supposed to have a 16-lb. treatment, but in reality it was an 8-lb. treatment; blocks have dried out, are loose in dry weather, and swell and cause bulges in wet weather. Here the treatment is simplicity itself, and the results will be successful if the treatment is given *in time*. First, clean the pavement thoroughly, flushing with water if necessary. Second, examine the blocks carefully, replacing any that show signs of rotting or of splintering. Third, when the pavement is dry, and on a warm, sunshiny day, apply a coat of light tar such as is used for cold surface treatments of macadam, using about ½ gal. per square yard, or more if the blocks will absorb it. This tar should pass these specifications:

(1) The specific gravity shall be not less than 1.14 nor more than 1.18 at 60 deg. F.

(2) The viscosity tested by the Engler Viscosimeter, shall be not less than 100 sec. nor more than 250 sec. for 100 c.c. at 104 deg. F.

(3) On distilling 100 c.c. of the material to 338 deg. F. not more than 7 per cent shall distill over On continuing the distillation to 572 deg. F. the residue shall be not less than 65 g. This residue shall be a soft pitch at 60 deg. F. If the residue appears hard, it shall be tested for melting point and the melting point shall not exceed 140 deg. F. by the half-cube method in water. The specific gravity of the entire distillate shall be not less than 1.01 at 60 deg. F.

(4) The free carbon shall be not less than 4 per cent nor more than 12 per cent.

Fourth, keep traffic off until the pavement shows no further signs of absorbing the tar, after which cover with clean sand.

From time to time sand must be strewn over these surface treatments if they show signs of becoming unduly sticky. A mat coat is thus built up that protects the blocks from wear for a time, while keeping surface water from entering the pavement.

Before attempting to cure a wood block pavement's ills by surface treating the blocks, the engineer should make sure that the trouble is not caused by sub-surface water finding its way up through the concrete base, or through cracks or expansion joints. In many cases the sand cushion is always wet from this cause. If the blocks have not been given a thorough treatment with creosote oil before they are laid they will rot from the bottom up to the top. This decay cannot be detected for some time, but suddenly the pavement fails and it is discovered that many of the supposedly sound blocks are, in reality, mere shells. To give such a pavement a surface treatment would be a waste of money, and would discredit surface treatments.

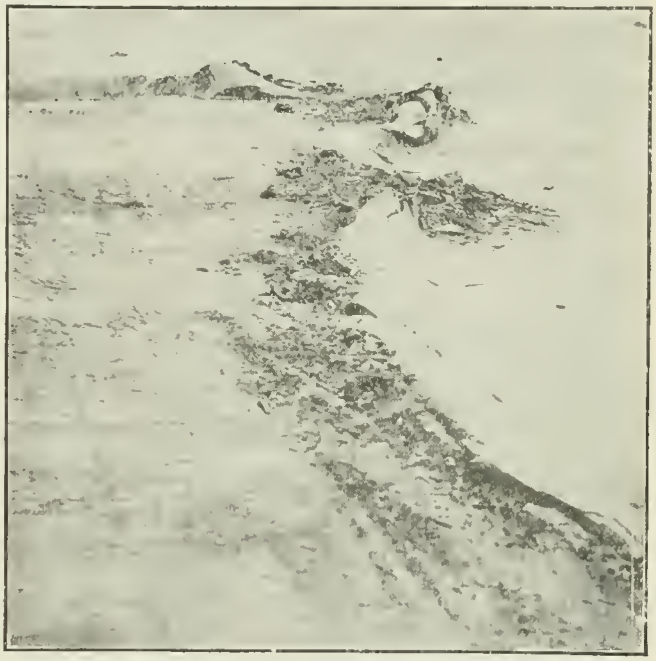


FIG. 2. SWELLING OF WOOD BLOCK CAUSES ASPHALT SURFACE FAILURE—NEW YORK CITY

If sand is used liberally as a cover, there will be no objections forthcoming from the public about smeary streets that exude tar. Pea gravel or good quality stone chips may be used in place of sand.

It must be kept in mind that surface treatments are really maintenance work and must be renewed from time to time. How long they will last is not known. There is a street in Milwaukee treated four years ago that is in excellent condition today. The wood block pavements in Memphis, Tenn., and other cities have been treated satisfactorily. But after awhile re-treatments are necessary.

In every case the engineer should "do it now," because there is no other paving material that goes so quickly as wood block when it begins to fail. Ten cents' worth of tar may save a yard of pavement that cost $3, if applied when it is needed.

Plan Piers of Record Length for Terminal at New York

Lehigh Valley Railroad Starts Building First Unit of Three Piers, Each Seven Thousand Feet Long—To Carry Extensive Trackage—First Wharf Will Have Ore and General Freight-Handling Facilities

CONSTRUCTION of the first unit of a new rail and deep-water terminal to have three piers each seven thousand feet long carrying extensive trackage, warehouse and freight handling facilities has been started by the Lehigh Valley Railroad Co. at the tide flats in the Greenville section of Jersey City on New York Harbor. The first unit of the terminal, for which a 35-ft. channel is now being dredged out to deep water, will be a 3,000-ft. wharf near the foot of Chapel Ave., Jersey City, providing facilities for the handling of general heavy freight and for unloading ore from boats into cars at the rate of one car per minute. The preliminary plan for the ultimate development includes storage and classification yards, an engine terminal, and a large grain elevator, as well as the three long piers. The entire terminal will cover about 635 acres and will provide a total dock length of about six miles.

The present New York Harbor facilities of the Lehigh Valley R.R. and the new Claremont Terminal are shown in Fig. 1. The first unit of the new terminal will replace the railroad company's ore pier at Constable Hook, and supplement the company's piers at the "National Docks" at Black Tom, and the Tide Water Basin Terminal in Jersey City. At the site of the Claremont Terminal the shore is tide flat land and the new piers will be built out approximately from the present shore line to the established bulkhead line some 5,000 ft. beyond. Hydraulic filling from channel dredging is being employed to build up land for the yards and approaches, as in the case of the Greenville terminal yard of the Pennsylvania R.R. adjacent to the new Claremont Terminal at the south. Fig. 1 approximately indicates the extent of hydraulic filling and dredging that will be necessary. Following the construction of the first unit, it is planned to extend the piers to the pierhead line indicated as "approved by Assistant Secretary of War, Oct. 30, 1915." This extension, together with the dredging of slips to extend 3,000 ft. inland from the government bulkhead line, will give a total pier length of about 7,000 ft. The piers will carry large warehouses, open dock and storage space and will be fully equipped with traveling revolving gantry cranes and other mechanical freight-handling machinery. To provide the necessary car service for these facilities, extending such a long distance from main yards, extensive trackage for storage and for some classification will be carried out on the piers, as indicated in Fig. 2, in order to insure an adequate car supply so that loading or unloading at any portion of the piers will not be subject to interruption. A pier width of about 400 ft. is provided to carry sufficient trackage for these purposes, together with warehouse and open dock space, and at the same time will afford greater rigidity of construction. The slips between the piers are designed with a clear width between piers at the pier head line of 550 ft., tapering to 450 ft. at the inshore end of slip. This special feature of opening up the width, at the entrance from the approach channel, is expected to facilitate the easy and rapid passage of steamers and docking at piers, allowing ample fairway for passage in the slips when steamers of maximum beam are moored opposite each other along sides of each pier.

The first unit now being built comprises approximately the first half of pier 1 (Fig. 2) extending from the bulkhead to be established by the railroad company about 3,000 ft. to a point just beyond the bulkhead line established by the War Department and the State of New Jersey. Thus, almost the entire length of the south side of this first wharf unit will be filled in prac-

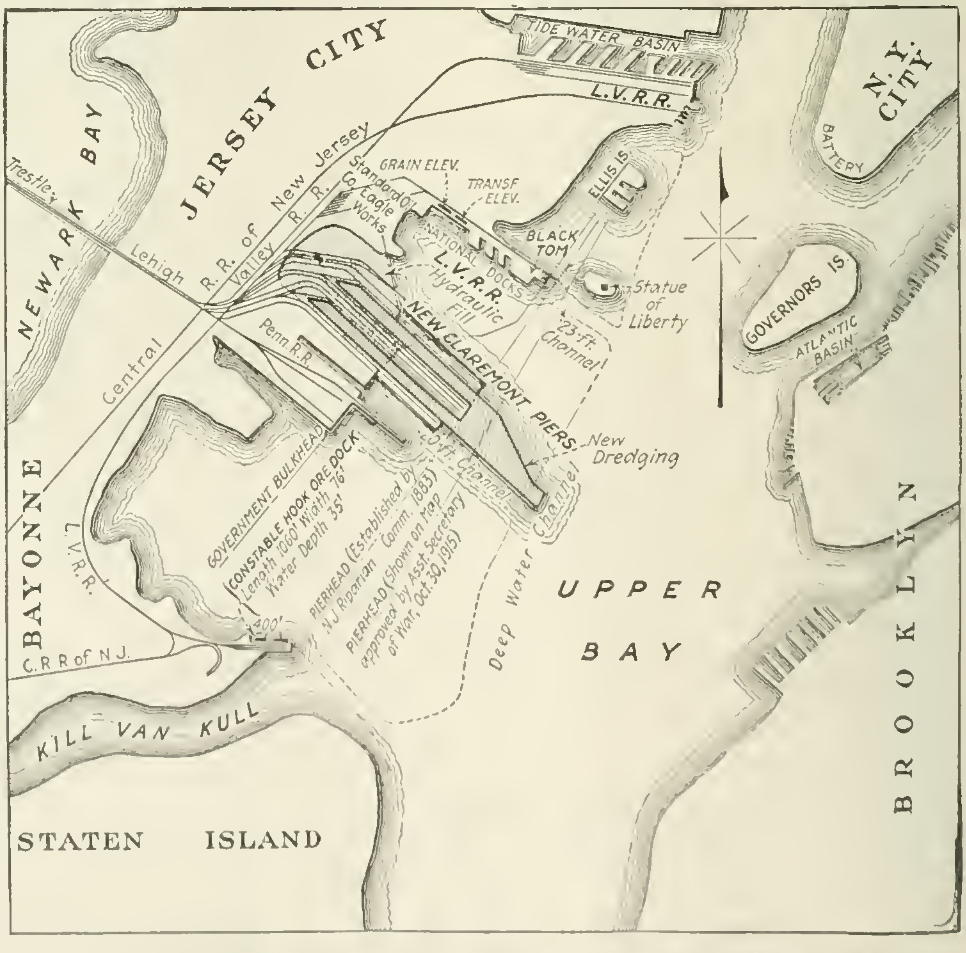


FIG. 1. WATER-FRONT FACILITIES OF LEHIGH VALLEY RAILROAD IN NEW YORK HARBOR TO BE ENLARGED BY NEW CLAREMONT PIERS

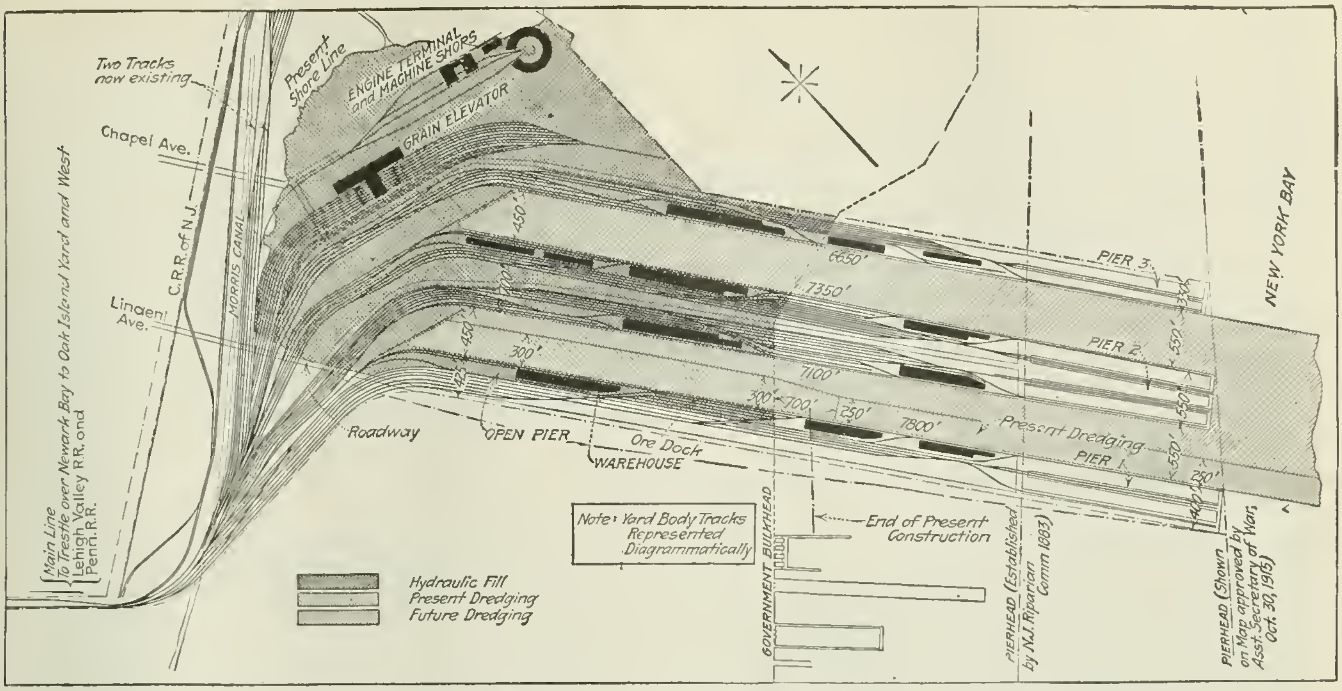

Two Tracks now existing
Chapel Ave.
C.R.R. of N.J.
MORRIS CANAL
Linden Ave.
Main Line To Trestle over Newark Bay to Oak Island Yard and West
Lehigh Valley R.R. and Penn. R.R.
Present Shore Line
ENGINE TERMINAL and MACHINE SHOPS
GRAIN ELEVATOR
450
400
450
425
300'
Roadway
OPEN PIER
Ore Dock
WAREHOUSE
6650'
7350'
7100'
300'
700'
250'
7800'
PIER 3
PIER 2
PIER 1
Present Dredging
330'
550'
550'
550'
250'
400'
NEW YORK BAY
Note: Yard Body Tracks Represented Diagrammatically
End of Present Construction
GOVERNMENT BULKHEAD
PIERHEAD (Established by N.J. Riparian Comm 1883)
PIERHEAD (Shown on Map approved by Asst. Secretary of War, Oct. 30, 1915)
Hydraulic Fill
Present Dredging
Future Dredging

FIG. 2. RAIL AND DEEP-WATER TERMINAL TO HAVE THREE PIERS OVER SEVEN THOUSAND FEET LONG

tically level with the Pennsylvania R.R. property to the south. Wooden sheet piling will be driven for the entire length of the wharf and 40 ft. from the dock line, to retain the hydraulic fill, and tracks south of this line will be carried on solid fill. The channel now being dredged extends along the north side of the wharf site, 300 ft. wide to the Government bulkhead line, from which it tapers to 250 ft., extending out to deep water about 7,000 ft. from this line. When pier 2 is constructed this channel will be widened between the two piers to a maximum of 550 ft. The dredging which will be necessary for the entire project as ultimately planned will amount to about 12,000,000 cu.yd. Dredging for the present slip will require the removal of 3,600,000 cu.yd. A large portion of the hydraulic fill from dredging will be required in building up to the necessary elevations for gravity yard rises, some of which will be about 35 ft. above mean low water.

The track layout for the portion of the first pier now being constructed is indicated in Fig. 3. This unit will comprise an open pier dock 720 ft. long carrying four tracks and open storage space served by a gantry crane, a concrete and steel warehouse 816 ft. long and 100 ft. wide, and farther outshore an ore dock 1,068 ft. long equipped with four unloaders. From the end of the ore dock a pile trestle will be built out about 700 ft. to carry the drill track for pulling out strings of loaded ore cars and delivering them to loaded tracks connected with the main running track. Two 600-ft., 20,000-ton boats may be docked at one time at the ore unloaders; two boats at the warehouse dock, and one at the open dock.

While the yard and pier layout will afford some opportunity for the classification of freight, it is the general plan of operation that classification shall be done at the Oak Island yard of the Lehigh Valley R.R., between Newark Bay and the City of Newark. Trains of loaded ore cars will be run out from the dock over the Newark Bay trestle to the Oak Island yard. The ore-handling facilities will be used principally by the Bethlehem Steel Co. in connection with the movement of ore from steamers from Cuba and the West Coast of South America to the plant at Bethlehem, Pa.

The dock will be equipped with two 15-ton Hulett electric ore unloaders, of the bucket and boom type, for unloading from ore carrying boats of typical sections. They will load into cars under the machine. The

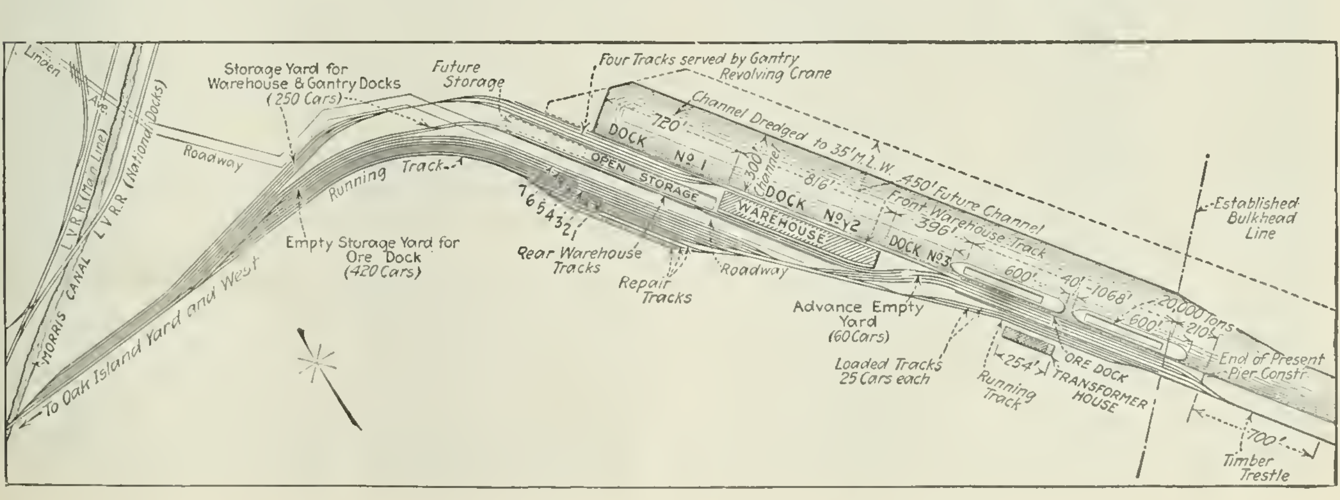


FIG. 3. TRACK LAYOUT OF FIRST PIER UNIT—ORE-UNLOADING, WAREHOUSE AND GANTRY DOCKS

capacity of each "larry" or traveling overhead hopper (30 tons) is such that two trips will fill an ordinary car. The larry car runway will extend to the rear a sufficient distance to permit loading ore in cars on the track at the rear of the back leg if so desired. The maximum capacity of each machine when unloading boats so designed as to allow the bucket to fill itself will be about 500 tons per hour. In addition to the two Hulett machines there will be two rope system ore unloading towers, portal type, equipped with grab buckets having a capacity of 5 tons. Towers will be electrically operated, with 30-ton traveling larries, mounted in the framework of the unloading towers.

To insure the desired flexibility of operation for rapid unloading of ore, it was thought necessary to provide storage space for empties with a capacity of over 400 cars, connecting as near as possible with the ore-loading tracks on the dock under the loaders. For this purpose a large portion of the empty storage gravity yard is located beyond the bulkhead line established by the railroad company, as shown in Fig. 3, to bring the storage tracks as near as possible to the loaders. These tracks have a storage capacity of over 420 cars part of which are on a grade of 0.7 per cent. Strings of about ten to fifteen cars will be delivered by a steam drill engine from this yard to the advance empty tracks which have a capacity of 60 cars and connect with the ore-loading tracks. To avoid hampering the operation of the overhead ore unloaders, electric locomotives operating on narrow-gage tracks, between loading tracks 1 and 2, and 3 and 4, will be used to move strings of cars from the advance empty tracks, and spot them under the larries on the ore dock by means of poling arms with adjustable clearances. From the approach to the ore dock cars will be handled by the electric locomotives to the east end of the dock where strings of ten loaded cars each will be delivered to a steam locomotive operating over the drill track carried by the timber trestle. The loaded cars will be pulled out on the trestle and then pushed into the two loaded tracks south of the unloaders. It is planned to unload ore and handle outgoing loaded ore trains at the rate of one car a minute with the four unloaders operating simultaneously.

At the start of unloading operations, storage yard tracks 1 to 7 and the advance empty yard will be filled with empties. First, cars from tracks 1 and 2 will be delivered in strings of about fifteen to the empty advance yard, so that these two tracks may be made available (as unloading progresses) for either running or loaded storage, as might be required in case of delay in pulling out loaded trains or other emergency. For this purpose, tracks 1 and 2, together with the running track, have a ladder track at the east end separate from that serving storage tracks 3 to 7. The steam locomotive operating on the timber trestle at the end of the pier will deliver loaded cars to the two tracks which lie between the ore loading tracks and the running track. Each of these loaded tracks has a capacity of 25 cars, which will be pulled out westward by a drill engine operating on the running track, consolidated into a 50-car train. The loaded train will then be pulled out to the Oak Island yard, or into the advance loaded yard which will be located between the extreme west end of the project and Newark Bay, parallel to the main line on the north side. Approaching this yard, crossovers will be provided to transfer outbound loaded ore trains from left hand track to right hand main line track and to the advance loaded yard. Since these trains will be pulled out of the running track only at intervals of about one hour, it will be possible to use this track, west of the connection with the west ladder track of the empty storage yard, to deliver trains of empties into the yard, so that a large supply of empties may be continuously maintained to serve the ore loading tracks. In this way, both empty and loaded cars may be handled in and out of the dock, each at the rate of about one car per minute.

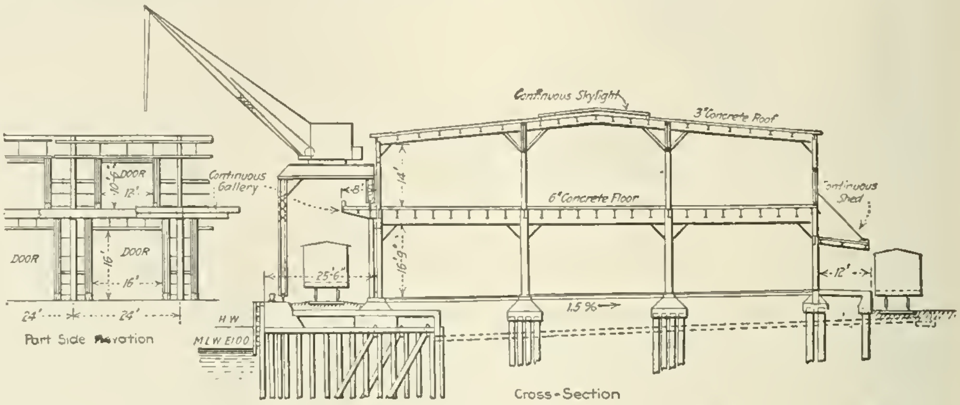


FIG. 4. TYPICAL CROSS-SECTION OF WAREHOUSE—PRELIMINARY DRAWING

As indicated in Fig. 3, the open pier and warehouse docks are connected with a receiving and storage yard having a capacity of 250 cars. The four tracks on the open pier and the open storage space will be served by an electrically operated traveling gantry crane of the portal type, supporting a traveling revolving crane of 30 tons capacity. The rear gantry track will be used as a running track for the front warehouse track. Two rear warehouse tracks which can serve alternately as running tracks are provided. As shown in the drawing, a roadway, consisting of an extension of Linden Ave., Jersey City, is to lie between the outshore portion of the empty storage yard for the ore dock and these two tracks, so that one could be used as a team track. The connections between the ore dock loading tracks and the front and rear warehouse tracks are to be used only in cases of emergency where greater flexibility of operation is desirable.

The warehouse is being planned to provide for both storage and classification of import and export freight. A preliminary cross-section drawing, together with a section of the side elevation, is shown in Fig. 4. On the north side of the warehouse, adjacent to the slip, a revolving crane mounted on a traveling portal gantry will load and unload from ship to cars on the front track or the upper or lower floors of the warehouse. Inside the warehouse freight will be transported by electric trucks and elevators will transfer trucks from one floor to another. A loading platform for the rear track will extend the entire length of the shed. It is thought that this arrangement will insure a high degree of flexibility in operation. Freight may be received or discharged from cars on either track into and out of the warehouse; received or discharged from cars on front track to or from boat, and received or discharged from either floor platform of warehouse to or from boats and cars.

Dredging for the first slip has now been in progress for about four weeks and approximately 10,000 cu.yd. of material are being pumped inshore from the channel daily. The Gahagan Co. of Brooklyn, N. Y., has the contract for the dredging operations. Construction of the terminal is being carried out under the direction of George T. Hand, chief engineer. Plans are being prepared under the direction of J. J. McCleece, architect, and the construction work in the field is under the supervision of W. R. Johnston, terminal engineer. The bulkheading of the wharves will be built by Henry Steers, Inc., New York. The ore-handling equipment is to be furnished by the Wellman-Seaver-Morgan Co., Cleveland, and the Mead-Morrison Mfg. Co., East Boston.

Effect of Calcium Chloride on Steel

TESTS made by the United States Bureau of Standards and noted in the report of the Director for the fiscal year 1918-1919 indicates a corrosive action of calcium chloride on steel in concrete. Plain and galvanized wire mesh imbedded in slabs of river sand mortar gaged with plain water and with a 4 per cent solution of calcium chloride showed at the end of two years that the corrosive effect of the salt was very marked. Plain wire mesh imbedded in 1:3 mortar was attacked the most, being completely eaten through in places. Galvanized metal was attacked seriously, although not as badly as plain mesh. Metal imbedded in 1:2 mortar was not so badly attacked as that imbedded in 1:3 mortar. In all cases of metal, both plain and galvanized, imbedded in mortar, gaged with plain water, the reinforcement was in excellent condition; it was not rusted, which demonstrated the protection afforded by the portland cement. A comparison of the condition of the reinforcement imbedded for two years and that imbedded for one year showed the rusting due to calcium chloride was progressive, and becomes worse with age. Reinforcing rods imbedded in 1:2:4 and 1:1½:3 concrete, made with and without calcium chloride, also showed a corrosion due to calcium chloride, but to a somewhat lesser extent.

Available Federal-Aid Funds

MORE than $117,000,000 is still available to states for Federal-aid highway construction. Most of the money cannot be used prior to June 30, 1920, though approximately $35,000,000 of the apportionment for the fiscal year ending on that date is still available. Two states only have failed to use all Federal-aid money apportioned to the various states during the fiscal years 1917, 1918 and 1919. They are Alabama and Kentucky, the latter state still having more than $250,000 unused from those years. Texas has the greatest apportionment —$10,706,238.65, with New York a close second. One-third of the states have used all funds available until the 1920 fiscal year.

The status of Federal-aid funds as of March 31, 1920, based on projects approved as reported by district engineers is given herewith:

STATUS OF FEDERAL AID FUNDS ON MARCH, 31, 1920, BASED ON PROJECTS APPROVED AS REPORTED BY THE DISTRICT ENGINEERS.

State	Balance Available from Apportionment for fiscal years 1917-18-19	Balance Available from Apportionment for fiscal year 1920.	Balance Available from Apportionment for fiscal year 1921.*	Total Apportionment Available
Alabama	$ 72,604 11	$1,995,501 80	$2,104,883.51	$4,172,989.42
Arizona	....	810,213.98	1,373,644.16	2,183,858.14
Arkansas	....	1,156,091.78	1,685,178 09	2,841,269 87
California	....	322,593.64	3,054,675 51	3,377,269.15
Colorado	....	1,596,537.28	1,755,759 17	3,352,296.45
Connecticut	....	137,547 22	613,349 43	750,896.65
Delaware	....	17,290 62	162,674 81	179,965.43
Florida	....	602,816 41	1,147,447 92	1,750,264 33
Georgia	....	....	2,564,693.45	2.564,693 45
Idaho	....	....	1,027,253 64	1,027,253 64
Illinois	....	....	2,505,801 86	2,505,801.86
Indiana	....	....	16,602 40	16,602.40
Iowa	....	....	279,240 11	279,240 11
Kansas	....	....	1,957,843 36	1,957,843 36
Kentucky	253,954 53	1,856,043 83	1,951,755 43	4,061,753 79
Louisiana	....	47,966 58	1,362,231 13	1,410,197 71
Maine	....	....	750,671 21	750,671 21
Maryland	....	....	465,990 18	465,990.18
Massachusetts	....	925,017 95	1,472.788 83	2,397,806.78
Michigan	....	930,752 58	2,891,667 97	3,822,420.55
Minnesota	....	....	1,708,409.62	1,708,409.62
Mississippi	....	1,307,227 29	1,807,557.17	3,114,784 46
Missouri	....	796,972 05	3,387,899 60	4,184,871.65
Montana	....	1,558,098 79	2,006,990 13	3,565,088.92
Nebraska	....	....	1,085,814.61	1,085,814 61
Nevada	....	1,152,498 10	1,276,344 43	2,428,842.53
New Hampshire	....	19,054 70	414,838 93	433,893 63
New Jersey	....	....	272,119.17	272,119.17
New Mexico	....	721,462 67	1,598,467.85	2,319,930.52
New York	....	4,485,582 52	4,971,893.11	9,457,475.63
North Carolina	....	....	289,124 78	289,124 78
North Dakota	....	609,355 70	1,536,227 80	2.145,583 50
Ohio	....	731,797 54	3,706.246.81	4,438,044.35
Oklahoma	....	1,058,599.50	2,302.478 33	3,361,077.83
Oregon	....	67,027.10	1,576,152.03	1,643,179.13
Pennsylvania	....	....	4,467,785.17	4,467,785.17
Rhode Island	....	133,074 47	233,256 87	366,331.34
South Carolina	....	844,009.66	1,436.019.04	2,280,028.70
South Dakota	....	362,200.99	1,615,779 44	1,977,980.43
Tennessee	....	2,069,075 33	2,261,913.90	4,330,989.23
Texas	....	4,844,640.19	5,861,598 46	10,706,238.65
Utah	....	....	320,530 94	320,530.94
Vermont	....	359,304 11	450,077 09	809,381.20
Virginia	....	1,146,248.18	1,977,673 83	3,123,922.01
Washington	....	....	909,812 72	909,812.72
West Virginia	....	....	856,999.53	856,999.53
Wisconsin	....	2,341,489.24	2,544,945.35	4,886,434.59
Wyoming	....	674,153.97	1,233,715.84	1,907,869.81
Totals	$326,558.64	$35,680,245.77	$81,254,824.72	$117,261,629.13

*Funds shown in this column cannot be used prior to June 30, 1920.

Sewage Siphon Designed in Spite of Meager Reference Data

Isolated Disposal Plant Enabled To Operate by Improvising Timing Mechanism—Full Calculations Given

By G. H. Bayles
Recently on Engineering Work in Chile

Sometimes the engineer in an isolated place finds himself puzzled to make even what would be a simple design if he had available all the possible sources of information. A case in point was the design of an automatic timed siphon for a sewage-disposal plant, described below. Ten-inch timed siphons had been ordered, but an unusual and unavoidable delay in their delivery would have tied up the job unless some substitute could be made. The engineer found nothing in the available books that gave any details of such design, so, from a general sketch in a book on sewage disposal, he studied out the principle and made the design.

The foundry on the job was too busy to undertake large castings, and the pattern-making at the time would have caused almost as much delay as waiting for the delivery of the order. It was necessary, therefore, to use such pipe as were available and as little shopwork as possible. These considerations influenced the using of 9-in. pipe and boiler-plate bells. The job was located at an elevation of nearly 9,000 ft. above sea level, which also influenced the design and modified the dimensions of all parts.

Nothing new or unusual is clamied by the author for this design, but the details of the principles involved are not given in the handbooks or in current literature, and a statement of them here with an example worked out in full may sometime prove convenient to other engineers.—Editor.

The following terms adapted from the description given by the Pacific Flush Tank Co. of the Miller automatic timed siphon, will be used in the explanation:

Main Trap—The combination of 9-in. pipes and elbows set in concrete, the long leg of which extends above the main floor of the siphon chamber, the short leg being connected to the discharge pipe from the contact beds.

Blow-off Trap.—Two-inch pipe which is screwed into the short leg of the main trap and having one end extending above the water line in the chamber, the other extending up under the bell.

Bell—The plate-iron drum which is placed over the long leg of the main trap and which is supported by angle-iron legs.

Harding Vent—Two-inch piping attached to the side and near the top of the bell.

Starting Bell—Nine-inch pipe and flanges bell suspended in the timing chamber by piping leading to the blow-off trap.

Draining Siphon—Two-inch piping leading from the long leg of the main trap, passing through the wall between the main siphon chamber and timing chamber and extending down into the tile well located in the latter.

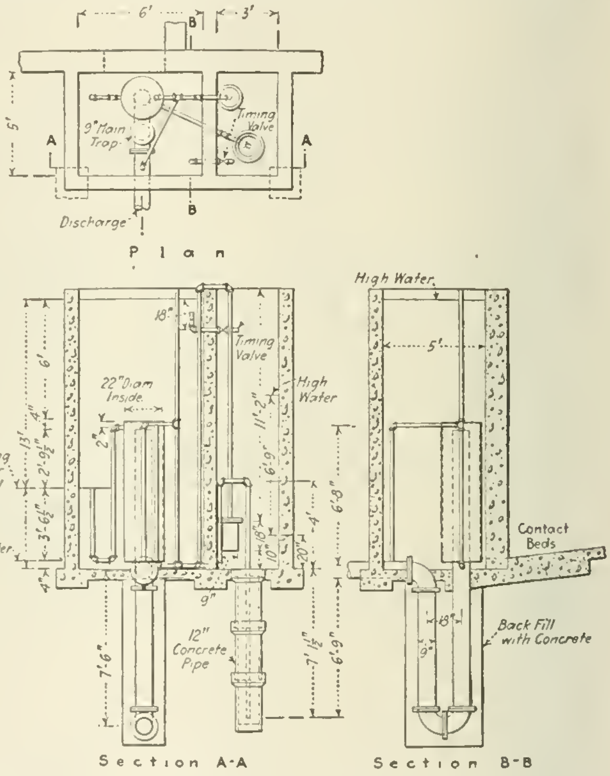
Timing Valve—Valve on piping connecting main siphon chamber and timing chamber.

Main Siphon Chamber—Chamber in which the main siphon is located and having an opening at the bottom into the contact bed.

Timing Chamber—Chamber containing starting bell, draining siphon and timing valve.

The height of the bell was taken arbitrarily as a little more than half the depth of the siphon chamber, in order to simplify the general dimensions. The principle of the design is then as follows: The short leg of the main siphon, the outside leg of the blow-off trap and the tile well in the timing chamber must all be a little longer than the distance from the final water level inside the bell to the high-water level in the main siphon chamber.

The short leg of the Harding vent must be of such length that the egress of air from the bell is cut off at a point where a sufficient quantity of air is retained in the bell and connected piping to balance the additional head of water above the main trap without permitting the water to overflow into the main trap. The size of the starting bell must be such that when the air inclosed in it and the pipe leading from it to the blow-off trap has sufficient compression to start the siphon some space occupied by air will still remain inside this bell. The height of the inverted U of the draining siphon must be such that the rise of water in the timing chamber will not citate sufficient pressure to overcome the pressure from the main siphon and put the draining siphon into operation before the main siphon is started.



SIPHON HAD TO BE BUILT OF AVAILABLE PIPE AND WITH LITTLE SHOPWORK

The size of the pipe extending up under the bell and forming part of the blow-off trap must be such that it will contain sufficient water to make it certain that the other leg of the blow-off trap and the pipe leading to the starting bell are both filled to the overflow point before the water in the main siphon chamber reaches the maximum elevation. The pipe leading from the main siphon chamber into the timing chamber, and on which is placed the timing valve, must be of sufficient size to allow the timing chamber to be filled in the minimum time necessary for the sewage to remain in the contact bed. The size of the pipe for the draining siphon should be such that the timing chamber will be emptied a little after the contact bed is emptied. This size is easily determined by comparing the rate of flow through the draining siphon and the quantity of water to be handled with the rate of flow through the main trap and the quantity of water that has to pass through it.

It was found that a 9-in. main trap would empty the contact bed in less than 10 min., and as pipe of this size was available and the speed of operation was considered satisfactory, 9 in. was adopted as the diameter of the main trap. No fine calculation was made before the diameter of the bell for the distance from the top of the main trap to the inside of the top of the bell, but a diameter of 22 in. and a height of 4 in. above the main trap were found to be sufficient for easy flow, and such dimensions were therefore adopted. A 2-in. pipe was found to be of sufficient size for the draining siphon as well as for the pipe connecting the two chambers. All other small piping was arbitrarily made of the same size in order to simplify the pipefitter's work, except the portion of the blow-off trap extending up under the bell, which was found to require a 3-in. pipe so as to have sufficient water remaining in this trap to cause proper operation of the device.

By reference to the figure, it will be seen that the maximum water elevation in the main siphon chamber is 6 ft. 4 in. above the top of the main trap, and an elevation of 2 in. below the top of the main trap was assumed for the maximum height of the water inside of the bell. The distance then from the invert of the main trap to the top of the opening at the bottom of the U is taken as 6 ft. 9 in., which leaves a 3-in. water seal in the main trap. The height of the water column in the blow-off trap is made 6 ft. 8 in., which leaves a 2-in. water seal in this trap but which, in case of water rising above the calculated elevation in the main siphon chamber, will cause this trap to discharge before the main trap.

In case the main siphon chamber is not filled to the assumed elevation, it was thought best to raise the top of the inverted U of the drainage siphon sufficiently to cause the starting bell to operate in any case. For this reason the U of this siphon is somewhat longer than necessary for ideal operation. The length of the leg of the draining siphon extending into the tile well is made such that the pressure due to the rise of water in the main siphon chamber will not cause the air to blow out through this pipe. A little more than 6 ft. 9 in is required, and the depth was made 7 ft. 1½ in. in case there should be some suction on this line after the timing chamber is emptied to the floor level, and the water level lowered somewhat into the tile well.

The measurements and calculations for the siphon are, then, as follows:

Main Siphon	Diameter inches	Area sq. in.
Bell	21¾	371.54
Bell, less 9¾-in., less 3½-in pipes	..	287.26
Outside large siphon	9¾	74.66
Inside large siphon	9	63.62
Outside auxiliary siphon	3½	9.62
Inside auxiliary siphon	3	7.07
Inside 2-in pipes	2	3.14

One atmosphere taken at 10.70 pounds

9-in. pipe to floor	63.62 sq in. ×	85 in. =	5,407.70 cu.in.	(1)
9-in. pipe to bottom	63.62 sq in. ×	163 in. =	10,370.06 cu.in	(2)
Bell above 9-in. pipe	371.54 sq in. ×	4 in.		
Less	9.62 sq.in. ×	3 in =	1,457.30 cu.in.	(3)
Bell to 2 in. below top of 9 in pipe (371.54—74.66—9.62)	287.26 sq in. ×	2 in. =	574.52 cu in.	(4)
3-in. auxiliary (Press.)	7.07 sq.in. ×	78 in. =	551.46 cu in.	(5)
3-in. auxiliary (Atmos.)	7.07 sq.in. ×	12 in. =	84.84 cu.in.	(6)
2-in. vent (Press.)	3.14 sq in. ×	6 in. =	18.85 cu in.	(7)
2-in. vent (Atmos.)	3.14 sq in. ×	79.75 in. =	250.64 cu in	(8)
2-in. siphon (Press.)	3.14 sq in. ×	232 in. =	729.14 cu.in.	(9)
2-in. siphon (Atmos.)	3.14 cu.in. ×	154 in. =	484.00 cu in.	(10)

When the main siphon chamber is full of water the air pressure inside of the bell is 1.264 atmospheres. Therefore, from equations above

(2)	10370.06 cu in.
(3)	1457.30 cu in.
(4)	574.52 cu in.
(5)	551.46 cu in.
(7)	18.85 cu.in.
(9)	729.14 cu.in.
	13701.33 cu in. × 1.264 = 17,318.49 cu.in. at atmospheric pressure.

When operation begins the pressure is atmospheric.

(1)	5407.70 cu.in.
(3)	1457.30 cu.in.
(6)	84.84 cu.in
(8)	250.64 cu.in.
(10)	484.00 cu.in.
	7684.48 cu.in.

17318.49 cu.in.

Then

7684.48 cu in.

9634.01 cu in. is the volume required in the bell below the top of the 9-in. pipe; and

$$\frac{9634.01}{287.26} = 33.53 \text{ in.} = \text{cut-off of vent below top of 9-in. pipe.}$$

Starting Bell—At atmospheric pressure:

2-in. pipe	214.375 in. × 3.14 sq. in. =	673.75 cu.in.
9-in. pipe bell	18.000 in. × 63.62 sq.in. =	1145.16 cu.in.

or a total of 1818.91 cu.in. and at a pressure of 1.264 atmospheres this is 1432.21 cu.in.

With pressure at 1.264 atmospheres there is needed, 2-in. pipe 294.375 in. × 3.14 sq.in. = 925.18 cubic inches. There will therefore be a surplus space inside of the starting bell of 1432.21 — 925.18 = 507.03 cu.in., which makes the water level inside the bell when operation begins 507.03/63.62 = 8 in. below the top of the bell. This allows sufficient surplus air to make satisfactory operation certain.

On account of slight variations in final dimensions from the figures used in the preliminary design the siphon did not operate at exactly the calculated elevation of water in the chambers. To adjust this, the Harding vent was cut off a little, but the principle, of course, was not changed, and after that slight adjustment was made the siphons worked perfectly.

Costs of Concrete Canal Lining Compared

A comparison of the cost of lining the canals of the Orland Project of the U. S. Reclamation Service in California has been made for the period previous to 1918, for the 1918-19 season and the 1919-20 season. It indicates a gradually rising cost for material and labor and a decrease in superintendence and general expense. A. N. Burch, project manager, gives the figures in the *Reclamation Record* for March. Because of the demonstrated success of earlier work in maintenance costs and water saved a decision was made to line the whole of the 70-mile distribution system, involving 650,000 sq.yd. of concrete. About 120 days only is available each year between irrigation seasons. Substantially the same methods have been used throughout. The relative economy of the 1919 results is due largely to better organization, careful co-ordination of the different operations involved, and unremitting attention to details.

	Prior to 1918	1918-19	1919-20
Cement	$0.0977	$0.1200	$0.1260
Sand and gravel	0.0424	0.0535	0.0643
Labor, preparing canal	0.0691	0.0738	0.0853
Labor, mixing	0.0301	0.0392	0.0293
Labor, placing	0.0307	0.0413	0.0564
Labor, sprinkling	0.0043	0.0052	0.0013
Engineering and supervision	0.0292	0.0230	0.0259
Equipment maintenance	0.0074	0.0062	0.0088
General expenses	0.0438	0.0272	0.0311
Total per square yard	0.3547	0.3894	0.4248
Quantity, square yards	267,320	57,880	30,000

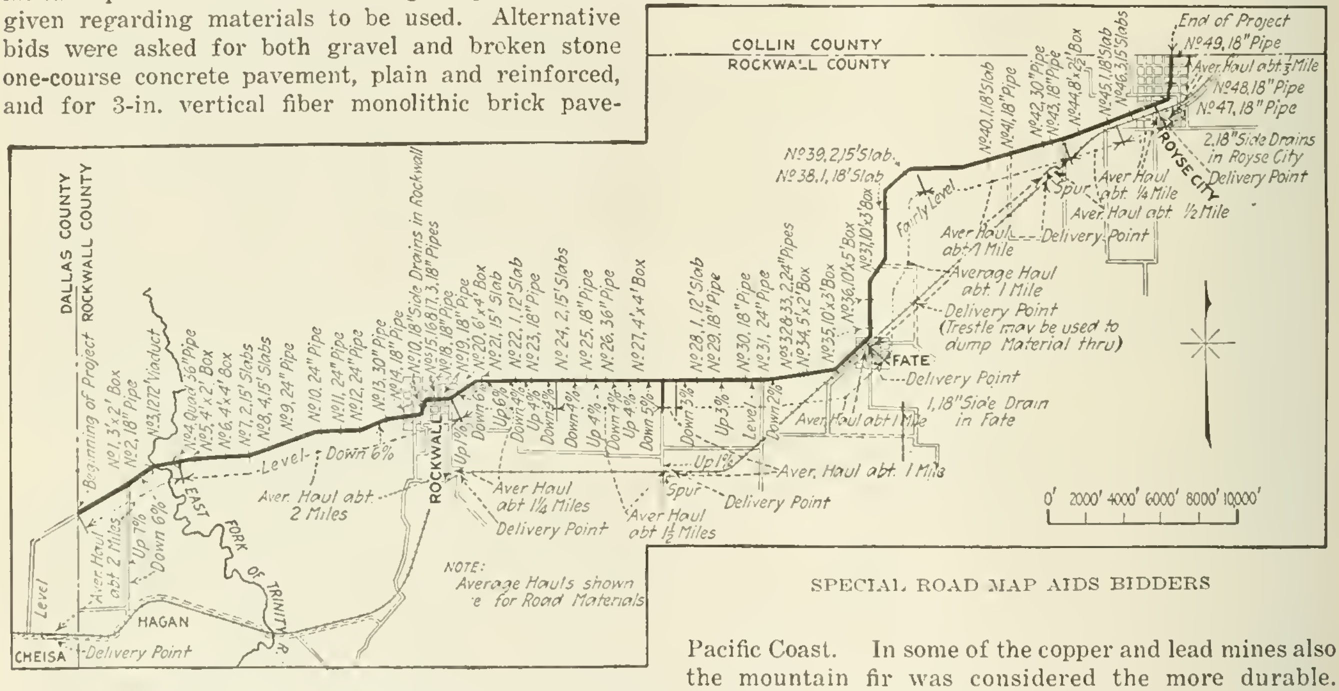
Selling Methods For Highway Work

By Julian Montgomery

County Engineer, Rockwall County, Texas

A DEFINITE selling plan secured bidders for the Bankhead highway in Rockwall County, Texas, when contracts elsewhere were going begging. Maps, specifications and proposals were all prepared with the definite purpose of selling the contract.

When ready to let the contract every available weather forecast was closely studied in order to choose favorable weather for the period of advertising, when the contractors would be inspecting the job. Care was taken in the preparation of the "proposals" to let it contain all the essential data, arranged in such a way that the principal quantities would immediately attract the eye. This official proposal was placed in two of the leading state newspapers located in opposite parts of the State, and in the *Engineering News-Record*. It was run for three weeks and called for the construction of an 18-ft. concrete or brick road including a concrete viaduct over the East Fork Trinity River. The greatest latitude possible consistent with good practice was given regarding materials to be used. Alternative bids were asked for both gravel and broken stone one-course concrete pavement, plain and reinforced, and for 3-in. vertical fiber monolithic brick pavement. Alternative bids were also asked for reinforced concrete, segmental block and double strength vitrified clay pipe for culverts.



SPECIAL ROAD MAP AIDS BIDDERS

A layout map was prepared to a scale of 1 in = 2,000 ft., showing the location of the road to be constructed, all drainage structures (including size and number) all intersecting roads, adjacent railroads, towns, delivery points, average hauls from each delivery point, and controlling grades of all roads over which material was to be hauled, together with a table showing the size of each drainage structure and the quantities of materials contained in each. Lists were prepared giving the locations and addresses of all sand and gravel pits, rock quarries, cement and brick plants, mill agents, etc., for a radius of 50 mi.

Six complete sets of road plans were kept on file in the county engineer's office, available for inspection at all times. For a week after advertising was begun, specifications, proposals, layout map, etc., were sent only to those who wrote for them or otherwise requested them. At the end of a week, however, all available data were sent to every large responsible contractor in Texas and to several outside of Texas. These data included specifications, proposals, list of material locations, layout map (described above) and blueprints of the principal drainage structures.

Quite a number of contractors became interested, and about twelve agreed to submit bids. Five of them dropped out for various reasons. Of the seven left, everyone bid, but six of them collaborated in pairs making four bids received from the seven contractors. The bid accepted was for an 18-ft. one-course gravel concrete pavement, reinforced over fills and was submitted by T. J. Worthington and MacElwrath & Rogers, of Corsicana, Texas. The bid was reasonable, wonderfully well balanced, and was between 3 and 4 per cent higher than the writer's estimate which was made some two months previous.

Relative Durability of Douglas Fir Ties

Railroads using Douglas fir ties have held the opinion that the Douglas fir grown in the Rocky Mountains was more durable than that grown on the Pacific Coast. In some of the copper and lead mines also the mountain fir was considered the more durable. While no authentic records are available where coast and mountain fir ties are laid in the same locality, such service records as there are, according to the Forest Products Laboratory, fail to show that the Mountain fir has superior lasting qualities. In some instances the mountain fir and in others the coast fir has proved the more durable. Botanically there is no difference in Douglas fir according to the locality in which it grows. Tests made by the laboratory indicate that Pacific Coast fir is on the average somewhat denser and therefore stronger and harder than mountain fir. The parts of coast timber usually cut into ties are boxed hearts or wood cut near the piths or from the tops of trees. These are the poorer parts, and coast fir ties therefore generally contain no better wood than mountain fir ties. The conclusion of the laboratory is that there is practically no difference in the durability of Douglas fir ties cut in the mountains and those cut along the Pacific Coast, but it has been observed that the latter take preservative treatment a little more readily than the former.

LETTERS TO THE EDITOR

"Business" and "Professional" Classification for Engineers Suggested

Sir—The classification of engineers into "professional" and "business" engineers seems to be crystallizing. One's instinctive sympathy goes perhaps to the professional—the man who is faithfully following the more or less painful route to technical excellence and service, although it must be remembered that many men fall in this class more because they lack imagination and initiative than because they love the science. However, it seems regrettable that the world's reward often goes not to the reticent though highly developed technical mind, but to the shrewd, acquisitive or aggressive person, seemingly regardless of his genuine engineering qualifications. In all the hubbub about compensation of engineers, this side of the matter deserves consideration. I have wondered whether the compensation committees have ideas or programs that touch this particular problem. "BUSINESS ENGINEER."

Progress in Two Directions

Sir—Regarding the article of John R. Downes on "Utilizing Imhoff Sludge on Land" in your issue of April 29, it is pleasing to see a record of real industrial progress in two directions:

1. During the last fifty years we have read and heard much from men who worked in theoretical atmospheres, but were not engaged in practical pursuits, about great wastefulness in communal activities. These statements and arguments were often good and true. Yet they were vain and fruitless, because they overlooked the fact that the labor required to save was greater than the labor required to produce. As it actually cost me more for labor to sift my furnace ashes and rescue one pound of unburnt cinder than to pay for one pound of new coal of equal calorific power, I stopped the sifting. It would seem that this should not be, nevertheless with the available present efficiency it was so.

As we advance in civilization, accumulating more knowledge and acquiring more skill, less labor will produce the same result. The enormous amount of labor employed by the Egyptians to build their pyramids would today be comparatively slight, as we would substitute steam power, modern machinery, and better efficiency in management.

Mr. Downes has done for us what Imhoff and his associates did for Europe, namely, raised crops of corn and oats on inoffensive sewage sludge at much less than the usual cost. No doubt this experience will give encouragement for similar trials and advancement elsewhere.

When I studied engineering the idea was impressed upon me that the fairest and best way to measure the real value and cost of work was *not* by days' wages, which differed in every country and in the same country from decade to decade, and were also dependent on boss rule, irrespective of personal skill and industry of the individual. However, this method has persisted and is still widely practiced at the present time.

A far more rational way, we were then told, and one constantly tending to develop greater skill in the worker and greater inducement to his advancement, is to measure the cost by man-hours, wherever practicable. This better method has unfortunately been resisted in practice, partly by ignorance, mostly by those who played upon innocent minds, against their own real advantage and in favor of fancied or temporary advantages, who felt no interest in securing better work from others, nor were they the real friends of progressive labor. Piece and contract work are now the nearest approach to the man-hour method. The best man gets the greatest return.

If, in addition to valuing its quality, work were more generally measured by the amount a man can do in one hour, we would then have accumulated records of the number of hours required by one active laborer, and one slow laborer, for instance: To excavate a cubic unit of different soils and gravels under varying conditions of wetness; to blast and remove a cubic unit or rock, soft, hard, massive or laminated; to build different classes of masonry, either in bulk or in a wall or as columns; to sweep 1,000 sq.yd. of asphalt, Belgian block or cobble stone pavements; and similarly, to do all kinds of construction or maintenance work, entirely independent of wages for each kind of work. Such records are numerous in European textbooks.

Mr. Downes contributes also to this class of information, which, if generally recorded for all classes of work, would indeed, viewing the present uncertainties of wages, cost of living, and cost of works, make a more "blissful world" for the engineer and others. To ascertain the probable unit costs of new works, we would simply multiply the universally established man-hours, if they were available, according to the character of the labor available, by the wages prevailing on the day of the estimate, and have a more rational, more reliable and more just basis than we now have for making our estimates. And more important still, it would be easier, and rest on a more practical and sound foundation, to increase, according to actual merit, the present rewards for honest, capable, and striving labor.

Montclair, N J. RUDOLPH HERING.

Hudson Vehicle Tunnel Designs

Sir—I beg to correct a misapprehension occurring in your article of April 15, p. 777, in an article, "Hudson Vehicle Tunnel Designs and Bidding Methods," quoting from the reply by C. M. Holland, Chief Engineer, to a memorandum of General George W. Goethals, where Mr. Holland is apparently misled by a recorded and somewhat cursory recollection on the part of the late General Raymond, who was chairman of the Board of Engineers of the Pennsylvania Railroad Company's extension to New York City.

In this statement of Mr. Holland's there is considerable, though unwitting, misapprehension of the character of the cast-iron lining of the Pennsylvania Railroad Company's tunnels under the Hudson River, and with the approval of Samuel Rea, President of that Company, the following correction is submitted:

First—While it is true the "ordinary" lining of the Pennsylvania Railroad Hudson River tunnels has been sometimes referred to as "light" iron, it should not be thus designated. This lining was and is the standard lining adopted and installed.

Second—The "heavy" lining as distinguished from the "ordinary" was not used for the entire length under the Hudson River through the silt. There, under the river, all in silt, the lengths were as follows: "Ordinary" (or standard) lining 3,318 ft.; "heavy" lining 5,522 ft. As compared with the "heavy" lining under the river, the "ordinary" lining in this location was subjected to much greater stress and distortion, caused by construction methods which were later modified. Though thus severely tested and distorted, it remained intact and returned after a lapse of time to almost its true circular shape.

Third—The "heavy" lining referred to was this same "ordinary" or standard lining, thickened in the skin and in the flange, as the means of increasing the *weight* of the tunnel, to meet the at-the-time suspected buoyant force, with no intention of but incidentally increasing its strength. The flange depth was not increased.

Fourth—This "ordinary," or standard, lining, erroneously referred to as "light" iron, was designed as a permanent structure of adequate strength to alone support all forces without the assistance of the inner concrete lining. In actual construction it was, in this respect, adequately tested during the two to three years after the entire iron lining was erected and prior to installing the inner lining of concrete. This interior concrete lining was adopted as an additional measure of insurance in protecting the iron lining from railroad accidents and fire, as well as giving a durable high-class masonry interior finish with many accessory uses.

Fifth—Not one single crack in this "ordinary" lining, or for that matter the "heavy" lining, occurred under the river due to silt stresses. The only, and insignificant, cracks which occurred were one transverse crack in one flange of each of five segments of the "ordinary" lining, and one similar crack in a segment of the "heavy" lining, due possibly to rough usage in handling, but more likely to shield jack thrusts, none of them in the least detracting from the satisfactory results of the work. The "number of cracks" referred to as having occurred during construction were in the tunnels under the land. On the Manhattan side they were entirely confined to one tunnel and on the New Jersey side they were largely confined to one tunnel, and almost all of them were due to causes we are satisfied should not recur. None of these cracks necessitated the removal of any segments.

Finally—Should these tunnels be reproduced today, the "ordinary" (or standard) lining would be used throughout the entire length of over 12,000 ft., except where special cast steel lengths are used in passing under bulkhead walls or such locations, giving irregular and excessive loads, but this applies to but a few hundred feet of the length of the entire tunnel.

These statements of fact require no substantiation, but it is none the less satisfactory to recall their conditioning is well recorded by the papers of Messrs. Hewett and Brown, in the *Transactions* of the American Society of Civil Engineers, Vol. 68, September, 1910—for example, on p. 214, where reference is made to the suspicion that the tunnels were subject to a buoyant action, deciding the use of a *heavier* type of lining; on p. 228, where the cause of this alarm is found to be due to driving the shields "blind," causing the tunnels to rise, and so forth . . .; on p. 249, where consequences occasioned by thus driving the shields "blind" not only caused a rise of the tunnels but distortion from its circular shape. In these papers of the American Society no reference is made to a "light" type of lining; we had no such classification nor the necessity for it.

In discussing this matter yesterday with Mr. Lindenthal, for a time a member of the Board of Engineers of the Pennsylvania Tunnel Extension and later one of those consulted on the occurrence of this phenomenal behavior of the tunnels, he recalled considering increasing the weight of the tunnels temporarily during construction by ballasting in the invert and later by permanently increasing the thickness of the upper two-thirds of the internal concrete lining 6 in. In this way the weight of the completed tunnel would be increased practically to the same degree as was done by increasing the thickness of the metal lining one-half inch. The idea of increasing the thickness of the concrete was of course a passing thought; by so doing it would have robbed the tunnel of much necessary space.

April 30, 1920.
New York City. James Forgie,
Chief Assistant Engineer during Design and Construction.

Glad Question 3 Was Defeated

Sir—The editorial on the results of the American Society of Civil Engineers' questionnaire in your issue of April 22, p. 795, is of interest to all members of that "ancient and honorable" society, but particularly so to some who are, as I am, also members of the American Association of Engineers. Had these questions been submitted to us five years ago, I should have voted "aye" on No. 3. As it was, I voted "no"; and was active in my efforts to get my fellow members to see it as I did.

For many years I felt that there was an element missing in the American Society of Civil Engineers. The intellectuality was there, the sporadic sociability was there, but the interest in the members as human beings whose lives, liberties and pursuits of happiness depended upon such vital things as employment and compensation, was wanting. This lack of human interest was made shockingly plain to me when, a few years ago, I tried to invoke it in behalf of a worthy member who was being unjustly treated through political influence in Washington. I found then that it was simply non-existent.

When the American Association of Engineers was started by a small group of earnest young men, I suspected it of being a labor union affiliation and held aloof for a time. Finally, it came into the minds of some of the older engineers that a movement had been inaugurated which, under proper guidance, could be a boon to the profession and which, on the other hand, might, if antagonized, become a harmful agency. Well, we came into the movement and the counsel of the old men and the action of the young evolved a vigorous welfare organization on proper lines, with the golden rule as its standard of right and fellowship.

The astonishing progress made by this organization proved that it met a need of the engineers in every branch of the profession, for it opens its arms to them all. Its growth commanded attention and excited—shallI say jealousy or only a spirit of emulation. In my judgment, whichever it was, it was awakened too late.

The organization was a going concern, functioning with vigor and doing its work so well that it deserved support and not opposition. Therefore, I opposed Question 3 and am glad it was defeated.

As "nothing succeeds like success," the future of the American Association of Engineers is assured.

Isham Randolph,
Consulting Engineer.

A Reverse Curve Problem

Sir—Referring to W. H. Adams' letter to the editor in your issue of April 22, p. 833: He is mistaken in the statement that his solution of the reverse curve problem has not found its way into the handbooks. Nagle's Field Manual for Railroad Engineers, edition 1897, p. 72, gives this solution.

Using Mr. Adams' notation, the length of the rerquired tangent, *AM*, is determined from triangle *OSZ*:

$$AM = OS = \sqrt{\overline{OZ}^2 - \overline{SZ}^2}$$

$$\cos \triangledown = \frac{SZ}{OZ}$$

A. C. Love,
Professor of Railway Engineering, Texas
Agricultural and Mechanical College.
College Station, Texas.

British Engineers' Fees

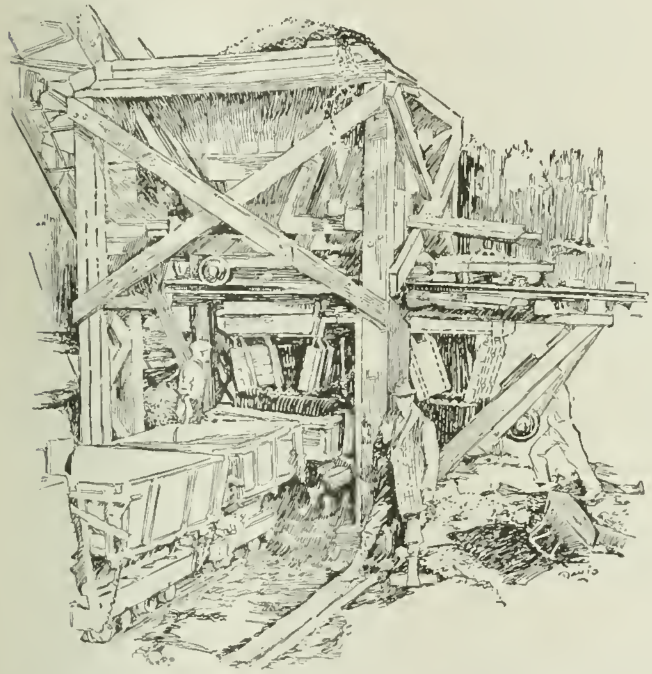
The council of the Institution of Civil Engineers (British) has had under consideration certain inquiries from members as to the propriety of increasing fees over pre-war rates. Dealing first with the commission charged for the design and superintendence of the construction of works, the council find themselves in a little difficulty, in that the increased cost which the engineer has to incur under post-war conditions is met by the increased cost of the work on which he charges commission. But this evidently only holds good so long as the work is executed at pre-war speed. The question of fees will depend therefore on the cost of the works and the contract time for completion, and it would certainly be proper to stipulate for an extra fee in the event of the work seriously exceeding the contract time owing to unforeseen difficulties with labor or supply of materials. With regard to the fees charged for other classes of work, however, such as enquiries, reports, and Parliamentary work, the same considerations do not arise, and the council of the institution express the definite opinion that civil engineers are justified in making an advance of 50 per cent on pre-war rates. These decisions will come as a considerable relief to many engineers who have been feeling the full strain of the constant increase of office and living expenses, and at the same time it is plain that the legitimate interests of clients have not been overlooked. It now only remains for the members generally to adopt the higher scales that have been approved by the institution.—*The Surveyor.*

HINTS FOR THE CONTRACTOR

Car Loading Hopper for Draglines and Grab Buckets

By R. E. Post
Seattle, Wash.

IN LOADING small cars with draglines or grab buckets it is essential to have a hopper because it is difficult to spot the bucket sufficiently close for satisfactory loading. In the design of such a hopper several considerations must be taken into account. (1) It should be so arranged that a dinkey can pass under it or at the side of it. (2) The fall of the material must be broken so that it will not break car doors and bottoms. (3) The hopper should be light enough and, at the same time, strong enough to be moved quickly without cleaning out the accumulation of material in the corners.



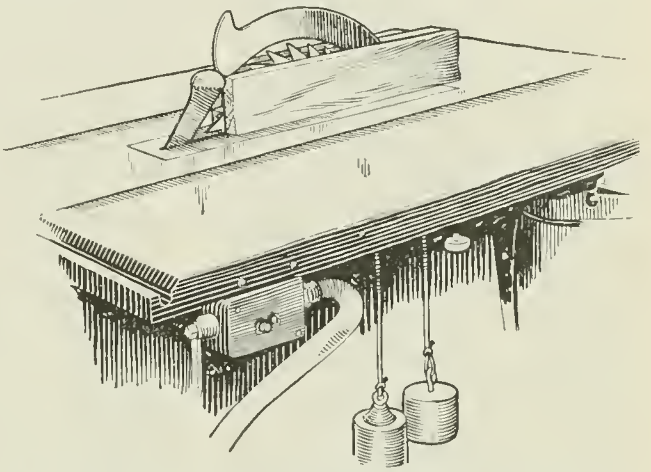
MOUNTED MOUTHPIECE MOVED FROM UNDER HOPPER ON TO BUCKET FOR DINKEY TO PASS

The side-loading hopper is not satisfactory for ordinary damp or wet material. In a straight drop hopper the fall of the dirt when the opening is high enough to allow a dinkey to pass is so great that large rocks will break car doors and bottoms. To secure the advantages of a straight drop hopper, and not break up cars, the arrangement shown in the cut was devised.

The hopper itself is of the usual type mounted on rollers. Below the hopper is a carriage carrying a mouthpiece to which are hung two adjustable deflector doors. The carriage runs on rails fastened to the hopper timbers, is controlled by an endless line operated by a hand winch, and is moved in for loading and out for the dinkey to pass. The deflector doors may be adjusted so as to break the fall of the material.

This was the cheapest and most successful of a number of hoppers of different types used during the construction of the Keechelus Dam at Meadow Creek, Wash.

Guard Insures Sawyer's Safety

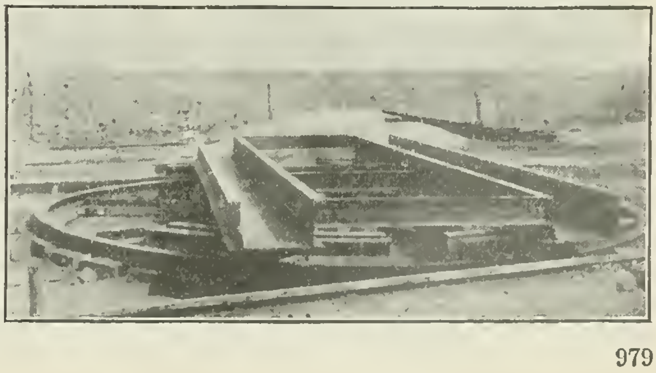


THE accompanying sketch illustrates a saw guard consisting of two curved arms, mounted so that they revolve about the same center as the saw. Upon pushing a piece of lumber against the free end of the arm above the saw it revolves, the free end rises until it rests upon the surface of the lumber. This sketch indicates two things: first, how the arm in front of the saw comes into action, maintaining at all times a complete screen in front of the saw teeth; second, that the arm above the saw not only serves as a guard above the teeth, but acts as a splitter behind the saw, so preventing the "kickback" which is one of the most serious dangers with a saw. If the lumber is thicker than the exposed portion of the saw, and it is desired to saw a groove in it, the arm above the saw simly retreats entirely and disappears beneath the table. The arms are actuated and kept in proper position by counterweights. The sketch and subject matter herein reproduced are taken from a recent bulletin of the United States Bureau of Labor Statistics.

Turntable for Trucks

By F. W. Epps
Bridge Engineer, Kansas Highway Commission.

IN the constructing of hard surfaced roads in central Kansas, the contractor has designed a turntable of channels for turning trucks for unloading. The truck is driven onto the turntable, turned around, dumped and run out. The contractor has also provided a wooden track of a U shape which is made in 9-ft. section. This track is used to keep the trucks from cutting up the subgrade. The track connects with the turntable.



News of the Week

New York, May 13, 1920

Contractors To Investigate Material Prices

To Co-operate with Material Dealers In Effort to Reduce High Construction Costs

At a conference of representatives of the leading construction firms of the United States, called by the Associated General Contractors of America at Chicago, April 23, a committee was appointed to investigate present high prices of construction material with a view to eliminating the causes and bringing about a reduction in prices. The committee was authorized to invite the co-operation of material dealers and manufacturers in making an analysis of the present cost of production, and, if necessary, to request the assistance of the Federal Trade Commission in investigating existing conditions. The contractors plan, also, to include in the scope of their investigations, the relationship of present currency inflation, labor inefficiency, and so-called luxury production, both in construction and in other fields, all of which are blamed for existing high prices. If necessary, they will recommend legislation looking toward a solution of present conditions.

W. A. Rogers, president of the Associated General Contractors of America and president of Bates & Rogers Construction Co., Chicago, Ill., who presided at the conference, stated that "the leading construction firms of the country have come to the conclusion that the contractors should no longer pass the buck to the ultimate consumer and therefore must take a hand in starting a movement to secure determined action, looking toward relief."

Water-Power Bill Held Up in Senate

Serious opposition to the Water-Power Bill has developed in the Senate. The measure was recently reported out of conference and the House of Representatives, by an overwhelming vote, 259 to 30, adopted the bill as agreed upon in conference. Certain interests in New England, however, are convinced that the definition of "navigable waters" as agreed upon by the conference committee will interfere unduly with private enterprise. As a result several New England senators have organized what probably will become a filibuster, unless the bill is changed so as to meet their demands. The opposition is based on the fear that permission of the Federal Government will have to be secured for any activity, not only on navigable streams but on all tributaries. There is also objection to any licensing system.

A. A. E. Approves Home-Building Project

By Telegraph from "Engineering News-Record's" Western Editor

Plans for group insurance, and the formation of a home-owning and building company were authorized by the American Association of Engineers at its sixth annual convention held in St. Louis, Mo., May 10th and 11th. Seven corporation trustees, elected by the Board of Directors, are to formulate plans and handle the new company without involving financial obligations by the Association. An existing 21-story building in Chicago is under consideration.

The Board of Directors has accepted the invitation of the Joint Conference Committee of the Founder Societies to send delegates to the Organizing Conference in Washington, D. C., June 3rd and 4th. With regard to the principles underlying the proposed federation of Engineering Societies, the A. A. E. passed a resolution approving the non-interference and local affiliation clauses, but objected to a national federation as being unnecessary machinery, which would duplicate that of the American Association of Engineers, which is now functioning.

It is believed that the proposed federation will receive little or no financial support from A. A. E. The Association's delegates, however, will present to the Organization Conference certain suggestions on the subject of united action by the Engineering profession.

Engineering Institute of Canada to Fix Rates of Pay

At a special conference of members of the Engineering Institute of Canada, held in Montreal, April 13, to consider matters related to the material welfare of the membership, a resolution was passed calling upon the society's council to appoint a Committee on Policy and to approve the establishment by the Institute of rates of remuneration for its members, both by fee and by salary.

Tunnel Bill Passed Over Veto

The New Jersey Assembly on May 5 passed, over the veto of Governor Edwards, the Hudson Vehicular Tunnel and the Delaware River Camden-Philadelphia Bridge Bill, providing for a $28,000,000 bond issue for New Jersey's share, upon the approval of the voters of the State at the next election. The direct tax feature, for paying the interest on the bonds, which was objected to by Governor Edwards, is retained in the bill as passed. The Senate passed the bill May 11.

New York State Highway Program Suspended

Commissioner Greene Announces Withdrawal of All New Construction Because of High Costs

In accordance with his recent published statement to the Governor of New York, that all new construction would be suspended because of the high prices of labor and materials, State Highway Commissioner F. S. Greene withdrew all bids advertised for the letting of May 5. Eleven roads in eleven separate counties and aggregating approximately 40 miles of various types of surfacing, most of it cement concrete, were included in the May 5 advertisement.

Inasmuch as Commissioner Greene has received but thirty acceptable bids upon seventy highways advertised as new construction; inasmuch as in submitting a bid a contractor must at the most equal the engineer's estimate; and in view of the excessive cost of labor, materials, and the lack of transportation, Commissioner Greene thought it best to discontinue all new construction not already contracted for. His full statement giving reasons for such discontinuance was recently addressed to Governor Smith and is reprinted herewith:

> In November, 1919, this Commission outlined its road construction policy for 1920, and published a program of individual roads proposed to be constructed. This program was based on, and with the hope that conditions would not be materially different from those of 1919.
>
> In accordance with that published program four lettings have been held covering seventy highways, but only thirty acceptable bids were received and these lettings showed that there was little or no competition among contractors. In the last letting of April 16th, including fifteen new highways, only five acceptable proposals were received. Since then there have been sharp advances in the cost of materials.
>
> After a careful analysis of the situation, it is evident that it is not good business or for the best interests of the State to continue the proposed program, and this Commission has determined to withdraw all roads advertised for new construction in the letting of May 5th, and wishes to announce that there will be no further new roads offered for construction until the situation shows a decided change for the better.
>
> Advertisements for maintenance work will be continued and it is proposed to devote every energy of the Department to the completion of existing construction contracts and the maintenance and repair of our present road system. The conditions which have forced this Commission to defer new construction are briefly as follows:
>
> 1. Shortage and high cost of labor.
> 2. Shortage of railway cars and uncertainty of transportation.
> 3. Lack of competition in bidding.
> 4. Seemingly unjustifiable advance in cost of materials.
> 5. Commercial quarries restricting output and in some instances closing down.
> 6. Necessity of assuring,—by utilizing labor which would otherwise be diverted to new work,—the completion of the maintenance program which because of the present condition of our highways is an economical necessity and more essential than new construction.
> 7. The obligation of the State to protect

existing contracts from labor shortage by not offering new work, at advanced prices in competition, thus insuring the completion of all existing contracts. At present there are 183 uncompleted but active contracts with approximately 600 miles unfinished. If the policy is pursued of constantly increasing estimates and permitting contractors to bid against themselves at ever-increasing prices, the same condition would be created that existed from 1915 to 1919 when there were broken down and abandoned contracts, representing approximately 850 miles of torn up highways, in practically every county in the State.

As soon as the conditions mentioned above show a change for the better and it is clear that road work can be continued economically and without detriment to the State's interests, the program for new construction announced by this Commission for 1920 will be resumed.

Voters Fail To Approve $15,000,000 for Cleveland Subway

As announced in these columns April 29, the $15,000,000 bond issue for the construction of street-car subways in the downtown sections of Cleveland was defeated at the polls April 27 by a vote of more than 2 to 1. Linked with the issue was another for $2,000,000 bonds for the completion of the new jail and criminal courts building, which was in addition to nearly $2,000,000 appropriated for this purpose three years ago. The voters killed this measure by a vote of nearly 5 to 1. A measure for $3,500,000 bonds for a new city hospital carried almost unanimously.

Chief reasons advanced by opponents of the subway measure were that the time is inopportune, because housing, rather than public improvements, is most needed now; that the plan for the subways as it stands does not mean real rapid transit; that the real purpose of the construction—to place trolley cars underground and relieve streets of traffic congestion—does not now justify the cost of the project.

Fielder Sanders, street railway commissioner; H. L. Davis, mayor; C. A. Otis, head of the rapid transit commission, and other advocates of the subway bond issue expressed surprise at the overwhelming criticism of the measure, but looked upon its defeat as but temporary. The contention is advanced that delay in this project will make traffic congestion intolerable.

The subway project was developed by Barclay Parsons & Klapp. It provided for underground routes leading from different sections of the outskirts of the business district to a central station under a public square, with transfer terminals. The lines leading to the edges of the business district included those along Euclid Ave. to East 22nd St. Superior Ave. to East 12th St., West Superior Ave. to the new high level bridge, Ontario St. south to Market House.

The city was to build the subways and equip them, with the exception of power and cars, and rent the system, at 6 per cent of the cost, to the Cleveland Railway Company.

The cost of operating the system was to devolve on the railway company, but the cost of construction, leaders in opposition to the plan claimed, was to be borne eventually by the people in increased taxation.

Engineer Licensing in Canada

Licensing of engineers is provided for in legislation recently enacted in British Columbia and Manitoba. The current *Journal* of the Engineering Institute of Canada says that in New Brunswick and Nova Scotia during the present sessions of the Legislative Assembly other professional engineering acts will have been passed. The Alberta Act was passed recently. In Quebec there has been established the corporation of professional engineers. In Ontario the matter of arriving at an acceptable bill is in the hands of an advisory conference committee. In Saskatchewan changes were suggested by the Premier which caused the bill to be withdrawn. The success attending the bill in British Columbia and Manitoba will, it is believed, have a beneficial effect on Saskatchewan legislation.

Atlantic County Lets Costly Highway Contract

Atlantic County, N. J., has recently let a contract for the construction of 8.09 miles of Warrenite surface paving to the Standard Bitulithic Co., Newark, N. J., for an average price of $73,476.03 per mile. The road to be improved is what is known as the Pleasantville-Mays Landing Road. Though the contract price appears high, it includes heavy excavation, the construction of a concrete base, the laying of surfacing 20 ft. wide, and the construction of 5-ft. shoulders. Other items are also included such as drains, head walls, guard rails, etc. Unit prices were $1.92 for excavation; $2.59 per square yard for a 6-in. concrete base; $2.50 per square yard for Warrenite surfacing, and 74c. per square yard for crushed rock shoulder.

Concrete Ship "Polias" Still on Rocks

Captain E. M. Mills, of the U. S. Coast Guard Station at Burnt Island, near where the concrete steamship "Polias" was wrecked some months ago, has written to Lewis R. Ferguson, who investigated the condition of the ship for the government, as reported in *Engineering News-Record*, March 4, 1920, p. 483, as follows: "The old steamer still lies in the same position, and though severe storms have washed over and around her since you were here she remains the same. No apparent change has been noticed, and, with the exception of the paint washing off, I do not believe the hull has been damaged in the least. I am still of the opinion that the concrete boat is, if kept off the rocks, the strongest built ship afloat, as no steel nor wood ship would have stood the severe storms that have beaten against the 'Polias' during the last two months with such little damage done."

The U. S. Shipping Board has not made any announcement as to its intention regarding the disposition of the ship.

Public Works Fund Now $20,000

Contributions to the fund being raised by the National Public Works Department Association totaled $20,184.06 on May 5. The campaign is planned to yield about $78,000 and to each state is assigned a quota of this amount. On this basis New York is expected to yield $20,000; Illinois, $10,000; Pennsylvania, $8,000. From these amounts the sums range to $100 for such states as Nevada, Vermont, South Carolina, and others.

Civil Engineer Killed While Acting as Switchman

Loyalty to his employer during the recent switchman's strike resulted in death for J. W. Wilkinson, office engineer, Nickel Plate. While performing extra duty as a switchman in the yards in Cleveland he received injuries, April 23, from which he died the next day. Mr. Wilkinson was an active worker in the Cleveland Chapter of the American Association of Engineers. His record is simply given as No. 3363; graduate of Allegheny College; in railway work as a civil engineer 21 years.

Annual Convention, Tri-State Water and Light Association

The Tenth Annual Convention of the Tri-State Water and Light Association of the Carolinas and Georgia will be held at the Piedmont Hotel, Atlanta, Ga., June 19-21. The program will be divided between water and light subjects. Among the topics to be discussed which will be of interest to water-works men are fuel oil, filtration of turbid river waters and waterworks extensions. There will also be an "Exhibitors' Night," May 20, for the display and demonstration of exhibits by representatives of manufacturers. W. F. Stieglitz, secretary-treasurer, Columbia, S. C., is convention manager.

Contractors Define Practice Outside Home Territory

To correct the practice of bidding up wages, which is followed by some contractors who undertake an occasional operation in new territory, thus disturbing the labor conditions under which contractors native to that territory are operating, the Associated General Contractors of America have enacted the following by-law:

"Firms or corporations, members of any associated organization of the Associated General Contractors of America, who shall undertake a construction contract outside the jurisdiction of the associated organization of which they are members and within the jurisdiction of any other associated organization, should affiliate with said other associated organization and abide by its rules and regulations at least for so long as said firm or corporation shall continue to undertake construction work within that jurisdiction."

Government Pays for Boston Dry Dock

The Federal Government, through the Navy Department, has paid the State of Massachusetts $4,158,385.58 for the 1,200-ft. dry dock at Boston, alongside of the Army Supply Base. The dry dock was built by the state.

To Complete Montreal Aqueduct

By action of the Administrative Commission of Montreal a Bureau of Works for the Enlargement and Improvement of the Aqueduct has been created consisting of A. E. Doucet, director of public works, chairman; R. S. Lea and Walter J. Francis. This bureau, subject to the direction of the commission named, is "to study in all its details the question of the establishment of a water-supply service sufficient for all the requirements of the city, which shall comprise the creation of power—hydraulic, electric or otherwise—the enlargement of the filtration plant, prepare the plans, specifications and estimates on this subject, and to supervise all the work that is executed." Messrs. Lea and Francis are to be paid $10,000 a year for their services, including all the time necessary "to see that the plans are promptly prepared and the work carried out in an efficient manner, but they shall not be required to give more than 200 days' service a year." A report on completing the aqueduct enlargement, and on other extensions of the work, was made early this year by R. S. and W. S. Lea (see *Engineering News-Record*, March 4, 1920, p. 491).

Bureau of Water-Works Extension Formed at Columbus, Ohio

To carry out the water-works enlargement at Columbus, Ohio, recommended last year by Prof. John H. Gregory, Baltimore, Md., and for which $3,000,000 of bonds were voted last November (see *Engineering News-Record*, Nov. 13-20, 1919, p. 885) a Bureau of Water-Works Extension has been created by ordinance. The bureau will be a part of the Water-Works Division of the Department of Public Service. Professor Gregory has been appointed consulting engineer and C. B. Hoover has been appointed engineer in charge of the bureau. Engineering positions not yet filled are an office engineer, two field engineers, four assistant engineers, four transitmen, eight rodmen, six draftsmen and two inspectors. Professor Gregory had charge of the building of the new water-supply works and sewage-works some years ago and for four years Mr. Hoover was under Mr. Gregory on those works. For some ten years past Mr. Hoover has had charge of the operation of the Columbus sewage-works and sewage pumping station and has also done considerable engineering work for the Water-Works Department, the department being responsible for the operation of the sewerage system as well as the water-works.

Begin Hearings on Townsend Road Bill

Hearings were begun last week on the Townsend Road Bill before the Senate Committee on Post Offices and Post Roads. As explained by Senator Townsend, the hearing will attempt to develop whether Congress should continue its present system of Federal aid, whether it is to appropriate larger sums to use after 1921, or whether it is to make a change in its road policy.

Among those who appeared before the committee was M. O. Eldridge, director of road activities of the American Automobile Association. Prior to his connection with that organization he was, for twenty-five years, in the service of the Bureau of Public Roads. Mr. Eldridge asserted that state-wide taxation should support state-aid highway construction as well as funds with which to match Federal-aid money, and that neither counties nor local contributions should be depended upon to supply the latter. He also said he did not believe a uniform Federal-aid law applicable in that many states depended upon Federal-aid funds for earth and gravel construction, whereas richer states should apply those funds to durable types.

Mr. Eldridge does not believe a uniform State-aid law is practicable. Many States, he told the committee, are not applying Federal money to durable types of construction. In Alabama, for instance, 28 per cent of the projects approved, up to Sept. 30, were earth and 34 per cent gravel. In Iowa 66 per cent are earth and 21 per cent are gravel. In many States, he declared, it is questionable whether Federal-aid money should be applied to earth roads.

One of the arguments for devoting more money to the development of certain trunk-line roads, advanced by Mr. Eldridge, is that 10 per cent of the roads of the country carry 90 per cent of the volume of traffic.

Hearings Before Senate Committee on Post Roads

That 85 per cent of all commodities transported in the United States pass over highways at some stage in their distribution is one of the facts brought out at the hearing before the Senate Committee on Post Offices and Post Roads. None of the witnesses appearing is urging any stimulation of road construction at this time, due to the great need for the labor on farms and in the central industries. It is argued, however, that this is a particularly propitious time to formulate better policies with regard to road building. Each witness who has appeared thus far has favored the construction of certain highways to be built and maintained by the Federal Government.

The recent railroad strike has stimulated greatly the interest in highways as it is realized that labor troubles are likely to occur frequently, making rapid transportation of foodstuffs on the highways necessary to prevent famine conditions in centers of population. Among those who have testified before the committee are George C. Diehl, highway engineer, Buffalo; Henry G. Shirley, chief engineer of the Maryland State Roads Commission; Lincoln Tyler, Rotary Club, New York City; A. M. Loomis and D. C. Atchison of the National Grange; Benehan Cameron, president of the Bankhead National Highway Association; and George M. Graham, sales manager, Pierce Arrow Motor Car Co.

New Commerce Commissioners

To fill the vacancy in the Interstate Commerce Commission following the expiration of the term of James S. Harlan and to provide the two additional members called for in the Transportation Act, President Wilson has nominated three new members to the Commission. Nominations have been sent to the Senate naming Henry Jones Ford, James Duncan and Mark W. Potter.

Mr. Ford is professor of politics at Princeton University and from 1872 to his association with Johns Hopkins University in 1906 he was engaged in newspaper work in Baltimore and Pittsburgh.

Mr. Duncan is a vice-president of the American Federation of Labor and has been associated with organized labor since 1881, when he became a local officer in the Granite Cutters' International Association.

Mr. Potter has been president and chairman of the board of directors of the Carolina, Clinchfield & Ohio Ry. since 1907. He entered railway service in 1905 as counsel for the road.

U. S. Engineers to Build Pipe Line in France

Engineers will leave New York this week for France to supervise the construction of an oil pipe line from Le Havre to Paris. Maxime Furland, president of the Compagnie Francaise de Transports des Mazouts et Petroles, to whom the contract for building the line has been awarded by the French Government, has just sailed for France with Wynn Meredith, vice-president of the American Oil Engineering Corporation of New York, which has been engaged by the French concern to do the engineering work. Seton Porter, vice-president of the corporation, states that operations will begin this month and will be completed in about a year.

The new line is designed for carrying a capacity of 24,000 bbl. of oil per day. It will be about 130 miles long and will be similar to the one constructed in California, extending from Coalinga in the San Joaquin Valley to a large refinery on San Francisco Bay. This type of construction will be utilized because the French line will use Mexican crude oil, a heavy oil which must be heated, unlike the oils of the Texas and Oklahoma fields. There will be two pipes, one 25 cm. in diameter for the heavy oils and the other 10 cm. for petroleum.

Most of St. Louis Bonds Defeated

Only five of the eighteen items included in the proposed bond issue for public works at St. Louis received the necessary two-thirds majority at the election on May 11 and they amounted to only $3,750,000 out of the proposed total of $24,000,000. Among the items voted down were $9,000,000 for River des Peres improvement and $2,575,000 for sewers. (See *Engineering News-Record*, Feb. 12, 1920, p. 349.)

Ask for Low Bid on Competitive Bridge Designs

Competitive designs as well as competitive bids are being asked for in the proposals for the new Main St. bridge across the Chemung River at Elmira, N. Y. Four designing engineers were invited to submit designs of the structure, which has to be built within the authorized bond issue. They were governed only by the limiting stresses in steel and concrete and bearing values in piling, except for the necessary requirements of location, etc., and stipulation that the bridge must be of reinforced concrete. Each of these four designs is being checked and reviewed by the city engineer and if any design does not comply with the requirements, its designer does not receive the fee of $500 which is to be given to each of the four, provided his design is satisfactory.

Bids are now being asked on the designs, and it is apparently the intention of the city to award the construction contract to the low bidder. The engineer who made the design upon which award is made receives his designing fee, which is a named percentage of the contract cost of the bridge.

Highway Engineering Fellowships Offered at Michigan

The Department of Civil Engineering at the University of Michigan announces that the following fellowships are available during the collegiate year 1920-1921: The Roy D. Chapin fellowship in highway transport, providing for the investigation of approved subjects relative to highway transport; the Roy D. Chapin fellowship in highway engineering, providing for the investigation of subjects relative to hard surface roads and pavements; and the two Detroit-Edison fellowships in highway engineering open for the investigation of matter concerning the cost of country roads. Each fellowship pays the sum of $250 with an allowance of $50 for expenses.

Applicants for these fellowships must hold a B.A. degree from a college of recognized standing, and must enroll as a candidate for master of science, or master of science in engineering either during the first or second semester or during the winter period from December to March. Applications for fellowships will be received by Arthur H. Blanchard, professor of highway engineering, at Ann Arbor, Mich., not later than Sept. 1, 1920.

R. S. Parsons—General Manager of Erie Railroad

R. S. Parsons, previously chief engineer and recently appointed general manager of the Erie R.R., is one of the railroad engineering heads recently to become the operating head of a large system. Having served as chief engineer during the period of Federal control, Mr. Parsons was appointed general manager over the four regions of the Erie system which were created in the recent reorganization when the railroads were returned to private operation.

Chief Engineer of Railroad Has Been Made Operating Head

R. S. PARSONS

Mr. Parsons has been in the service of the Erie system continuously since his graduation from Rutgers College in 1895, when he entered the engineering department of the road as a transitman. His rise was rapid, and in the following year he was made assistant engineer. Three years later he became division engineer, New York, Susquehanna & Western, and the Wilkes-Barre & Eastern roads. In 1903 he was appointed engineer, maintenance of way, of the Erie, with headquarters at Cleveland.

After serving as engineer, maintenance of way, for three years, Mr. Parsons entered the operating department as assistant general superintendent of the Erie line. A year later he became superintendent of the Susquehanna Division, and in 1910 was transferred to the New York division as superintendent, where he served for three years. He was then made assistant general manager of the Lines East of Buffalo and Salamanca, with headquarters at New York. In 1914 he became general manager of the Ohio Grand Division, later known as the Erie Lines East, with headquarters at Cleveland. In January, 1916, he was appointed chief engineer of the Erie R.R. and in the following September was made assistant to the president and chief engineer. A year later he became assistant to the president and general manager of the Erie Lines, in charge of operation.

Mr. Parsons served as chief engineer during the period of Federal control. When the railroads were returned to private operation the Erie system was reorganized, being divided into four grand divisions over each of which a manager was appointed. Mr. Parsons then became general manager of the entire system and thus the operating head of the lines as a whole.

Census Shows Decline in Rate of City and Town Growth

The aggregate population of 428 cities and towns of the United States, for which the census count for 1920 had been completed up to April 14 as compared with the total population for the same places in 1910 and 1900 has been announced by the Bureau of Census as follows: From 6,323,035 in 1900 to 8,119,182 in 1910, and 9,899,554 in 1920. The percentage increase from 1900 to 1910 was 28.4 against 21.9 from 1910 to 1920. The decline in immigration due to the World War is given by the Census Bureau as doubtless the most important cause for the falling off in the percentage of city growth. The Bureau gives the total immigration to the United States in the last ten years as only 5,431,000, compared with 8,795,000 between 1900 and 1910. The Bureau states that the recent epidemic of influenza probably had some retarding effect on the increase of city population during the past decade. It should be noted that the 1920 census is taken as of Jan. 1, while the 1910 census was as of April 15 and the 1900 census as of June 1. This makes the 1910 census 1½ months short of ten years, and the 1920 census 3½ months short, thus making a difference of about two months between the length of time covered by the 1920 and 1910 census.

Hirst Pleads for Cars to Ship Highway Building Materials

In a letter recently sent to presidents of all the railroads serving Wisconsin, A. R. Hirst, state highway engineer, has protested against the non-shipment of cement for roadbuilding purposes into the state. His letter points out the necessity of free movement of roadbuilding materials in order to carry out Wisconsin's "reasonably possible" program of 140 miles of concrete road. Mr. Hirst says he is sensitive to the fact railroads are now operating under extreme difficulty but nevertheless he believes that in no other way "could more stored productive energy be released with an equal amount of transportation capacity than would be the case if the available supply of cement were quickly released for use." Barred from assistance from the railroads Mr. Hirst predicts the almost total suspension of the building industry with its consequent loss to contractors, laborers, skilled craftsmen and materials producing plants.

C. P. R. Offers McGill Scholarship

Grant Hall, vice-president of the Canadian Pacific Ry., has announced the offering by the railroad of a scholarship covering four years' tuition in architecture, chemistry, civil, mechanical or electrical engineering at McGill University, Montreal. The award, to be made to an employee less than 21 years old or to the minor son of an employee, is subject to a competitive examination to be given at several Canadian cities next June.

Iowa Engineers Voting on State Consolidation

A meeting of delegates from the state and local engineering clubs and societies in Iowa, April 22 and 23, drafted a constitution for a state body which would take the name of the Iowa Engineering Society, but include under a consolidation plan all of the local technical societies and clubs in the state. The plan was proposed at the meeting of the state society in February but delegates from the locals were not at that time willing to accept the constitution as drawn up. In consequence adjourned meetings of the delegates and of the state society were provided for. The latter has approved a constitution which the delegates submitted but it must now be voted on by letter ballot before final ratification.

The various local clubs must also ratify the proposal to become a part of the Iowa Engineering Society before their part of the consolidation is complete. June 1 is the date set for closing the polls.

Essential features in the new constitution are as follows: The objects are to advance engineering knowledge and practice, to promote social and economic welfare, to encourage civic and public service and to maintain a high professional standard among its members. Local engineering clubs are to become district clubs and members of the locals will automatically become members of the state society. A club will elect an applicant to membership in the local, which election will automatically place him on the roll of the state society.

An advisory council composed of the officers of the state society, representatives of the district clubs, and representatives of the members at large, is to hold two meetings annually and handle matters of interest to the profession in the state, initiate policies and devise methods for stimulating the activities of the society. Policies and methods recommended by the council are to be submitted to the annual meeting of the society for approval. If approved, the executive committee, which is composed of the officers of the council, who are officers of the state society, are made responsible for carrying out the recommendations. Dues are $6 for the state organization, plus assessments not in excess of $10 per year by order of the council. The expense of the district clubs is to be determined locally and is additional.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

AMERICAN WATER WORKS ASSOCIATION, New York City; Montreal, June 21-26.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; Asbury Park, N. J., June 22-25.

AMERICAN PUBLIC HEALTH ASSOCIATION, Boston; San Francisco, Sept. 13-17.

ORGANIZING CONFERENCE of National, State and Local engineering societies; Washington, D. C., June 3-4.

The Western Society of Engineers, Chicago, at a meeting of its railway section, April 29, listened to a paper entitled "Recent Developments in Railway Water Supply," by C. R. Knowles, superintendent of water service of the Illinois Central R. R. At a general meeting, May 3, a paper on "Santa Fe Apprentice System" was read by F. W. Thomas, supervisor of apprentices, Atchison, Topeka & Santa Fe Ry. By this system the mechanical department has developed and trained a sufficient force to supply shop foremen and master mechanics from its own personnel.

The Seattle Association of Members, Am. Soc. C. E., held its regular monthly meeting April 26. In order to further the activities and interests of the local association, the president had been asked to appoint a number of additional committees. A motion was made and carried, therefore, that he appoint a committee on committees, whose duty it would be to appoint such new committees and outline their activities. A. H. Dimock, as chairman of the committee on the Jones-Reavis bill for a national Department of Public Works, requested interviews from members which he might forward to society headquarters, such interviews to cover duplications of engineering work in Government bureaus which had come to the personal attention of the members. His remarks brought out discussion of the subject, with several instances. T. A. Noble announced that the engineers of Everett, Wash., were taking a more active part than formerly in public affairs and had asked for co-operation from the Seattle Association.

The Ottawa Branch, Engineering Institute of Canada, held a meeting April 21, at which John Murphy, chief electrical engineer, Canadian Department of Railways and Canals, was the speaker. His subject was Canada's ice problems and their solution, illustrated with moving pictures and lantern slides. One interesting and unique feature was a moving picture of frazil and anchor ice in the act of creation.

PERSONAL NOTES

J. E. Ennis, assistant engineer of rolling stock of the New York Central R.R. under Federal control, has been appointed engineer of equipment claims, at New York City. The office of engineer of rolling stock, roadway and structures has been abolished.

L. C. Fritch, vice-president and chief engineer of the Chicago, Rock Island & Pacific Ry. Co. under corporate control, has been elected vice-president in charge of construction, maintenance and capital expenditures, with headquarters at Chicago.

George E. Bates has been appointed assistant to the general manager for industrial development of the Delaware & Hudson Co., W. W. Bates, appointed assistant to the general manager for personnel; H. E. Burch, assistant to the general manager for transportation, and R. J. McCarty, Jr., superintendent, Saratoga division, all located at Albany, N. Y.

L. C. Read has been appointed city engineer of Sandusky, Mich.

H. R. Muldoon, formerly engineer in charge of road construction for Roane County, W. Va., and Thomas M. Brady, of Washington, D. C., in charge of road construction in Walton District, Roane County, announce the opening of a general engineering office at Spencer, W. Va.

Ross K. Tiffany has resigned as project manager, U. S. Reclamation Service, to open a consulting engineering office in the Old National Bank Building, Spokane, Wash. He will handle matters pertaining to investigation, organization, construction, betterment, management and finance of irrigation projects. Mr. Tiffany has for the past 19 years been engaged in the irrigation development of the Yakima Valley.

H. N. Aikman, recently with Dwight P. Robinson & Co., New York City, has resigned to become engineer in charge of the steel, and a portion of the reinforced concrete, work of the Fargo Engineering Co., Jackson, Mich.

H. M. Hadley and W. F. May have opened an office in the Downs Block, Seattle, Wash., to conduct a general engineering business under the firm name of May & Hadley. During the war Mr. Hadley served with the Emergency Fleet Corporation in the design of concrete ships. Mr. May, who was formerly with the Stone & Webster interests in California and the Alaska Highway Commission, served two years with the 18th Engineers at Bordeaux.

Robert Crawford has resigned as superintendent of sewers of Akron, Ohio, to enter the employ of a Cleveland engineering firm.

John B. Wright, formerly captain of Engineers, U. S. A., and consulting highway engineer, of Keene, N. H., has been appointed municipal manager of Springfield, Vt.

Benjamin F. Latting, for the last two years in charge of the design of steel hangars for the Army Air Service at Washington, D. C., has accepted the position of assistant to the chief engineer of the Indiana Bridge Co., Muncie, Ind.

A. P. Miller, of Glen Miller, Ont., has been appointed assistant engineer on the Trent Canal for the Canadian Department of Public Works.

William A. Hansell has resigned as superintendent of public works of Fulton County, Ga.

Gordon Grant, formerly chief engineer of the Transcontinental Railway and of the Quebec & Saguenay line, has been appointed chief engineer of highways, under the Canadian Department of Railways and Canals, with headquarters at Ottawa.

Knight, Quale & Gamer, engineers, of Cleveland and Columbus, have opened offices in Akron, Ohio, specializing in allotment surveys, sewerage and water supply, building construction and power and lighting projects.

Philip Earnshaw, of Kingston, Ont., has been appointed instructor in civil engineering at the Royal Military College, in that city.

R. M. Sias, engineer of Galveston County, Tex., has resigned to engage in private business in Galveston.

Earl Heber, general superintendent of the Walsh Construction Co., Davenport, Iowa, who has been in Watertown, N. Y., the past year in charge of the New York Central R.R.'s engine-house and improvements there, has gone to Wilmington, Del., to take charge of the Walsh Co.'s contract for the construction of a $1,000,000 memorial bridge in that city.

James M. Stevenson has been appointed resident engineer for the Canadian Department of Public Works in the Province of Alberta, with headquarters at Calgary.

John H. Milburn, office engineer of the engineering department, Baltimore & Ohio R.R., has been appointed by the American Railway Engineering Association a representative of that body on the Advisory Council to the U. S. Board of Surveys and Maps.

Philip Burgess and Charles F. Long, of Columbus, Ohio, have dissolved partnership. Mr. Burgess has entered into a new partnership with Chester A. Niple and Warren F. Hopkins, under the firm name of Burgess & Niple, with offices at 141 East Broad St., Columbus, Ohio.

E. H. Dobson, formerly general superintendent of the G. A. Fuller Co., and L. O. Maines, formerly district manager, Philadelphia District, Rust Engineering Co., have incorporated under the name of the Dobson-Maines Co., to conduct a general construction and engineering business, with offices at 49 Conestoga Building, Pittsburgh.

Victor Peiman, civil engineer, recently in the employ of the Leonard Construction & Engineering Co., of Chicago, as a designer in reinforced concrete, is now with the T. E. McShaffrey Construction Co., which is erecting a large reinforced concrete structure for the Goodrich Rubber Co. at Akron, Ohio.

J. A. S. Redfield, division engineer of the Chicago & Northwestern Ry. Co., at Fond du Lac, Wis., has been appointed assistant engineer of maintenance, with headquarters at Omaha, Neb.

Otto Genglin has been appointed city engineer of Texarkana, Tex.

Obituary

Alfred Samson, superintendent of the Levis drydock for the Canadian Public Works Department, died at Quebec, April 25.

Major T. H. Jones, city engineer of Brantford, Ont., for 37 years, died in that city April 25.

Samuel Bundock, the last of the three principal civil engineers who made the survey for the Northern Pacific R.R., in Montana, died recently at Warm Springs, Mont., at the age of 75.

James Edwin Miller, one of the pioneer engineers in Chicago's public improvements, died at Evanston, Ill., April 22. He was born at Laurens, N. Y., in 1831, and went to Chicago in 1856, when he entered the city engineer's office. Later he formed a partnership with the late O. B. Green, and at various times was connected with the design and construction of the city's first water-works crib and first sewerage system on the west side and of the Washington and LaSalle Street tunnels. He was in charge also of the straightening of the Chicago River at its mouth. He then became associated with the firm of Fox & Howard, and after the Chicago fire, with Charles S. Crane, formed the Chicago Dredging & Dock Co., which later was merged with the Great Lakes Dredging & Dock Co.

John C. Winston, director of public works of Philadelphia and long known as a leader in municipal reform, died at Germantown, May 6. He was sixty-three years old, was born in Darlington, Ind., and was graduated from Haverford College in 1881. A successful publisher, Mr. Winston became interested also in civic reform, and acted as chairman of the Committee of Seventy organized in Philadelphia. He was appointed chairman of Philadelphia's charter-revision committee. Mr. Winston was responsible for the provisions in the contract and public works clauses of the charter, and particularly for that clause which provides that after 1921 Philadelphia shall do its own street cleaning, unless the work is awarded to private contractors by a majority vote of council. Upon the election of Mayor J. Hampton Moore, Mr. Winston, last December, was appointed director of public works.

Alexander von Babo, engineer of bridge design in the Chicago Department of Public Works, died April 29. He was born at Heidelberg, Germany, in 1854, and studied at the Polytechnic School of Karlsruhe and the University of Berlin, receiving his diploma as civil engineer at the former institution. In 1881 he went to Canada, in the employ of Blanchard & Wilson, surveyors, at Winnipeg. The following year he entered the Chicago office of the Delaware Bridge Co., after which for short periods he was at Indianapolis, with W. Sherrer, architect for the Indiana state capitol, engaged in the structural steel design; with the Iron City Bridge Works, Pittsburgh; in the city engineering department of Chicago under Samuel Artingstall, city engineer; the Union Bridge Co.; with Geo. S. Morison and Morison & Corthell. In 1888 he became the representative in this country for the German electrical engineering firm of Siemens & Halske. He again entered the engineering department of the Chicago Department of Public Works, as engineer in bridge design, in 1899, and retained practically the same position up to the time of his death. Mr. von Babo assisted in the design of the Chicago type of trunnion bascule bridge and invented the operating system, which consists of a pinion and concave rack, as noted in *Engineering News-Record* of April 8, 1920, p. 720. In 1902 he designed the first temporary bridge with pontoon draw for use while rebuilding bridges over the Chicago River (see *Engineering News*, Jan. 11, 1906, p. 43). He was a member of the Western Society of Engineers.

Business Notes

The M. B. Suydam Co., Pittsburgh, has opened an office at Buffalo, N. Y., under the supervision of James M. Hawkins.

Charles E. Morrell, Jr., has resigned as superintendent of construction, U. S. Public Health Service, to take a similar position with the Gallivan Building Co., Greenville, S. C.

E. G. Lewis, formerly manager, Cleveland office of the Bucyrus Co., has been appointed central sales manager, with headquarters in the McCormick Building, Chicago. He succeeds E. C. Hingston, resigned. The Cleveland office will be continued under Mr. Lewis' jurisdiction.

L. D. SHEPPARD has resigned from the construction department of Day & Zimmermann, Inc., Philadelphia, to become superintendent for Everett Winters, general builder, Detroit, Mich.

J. W. HOLMAN, for several years connected with the Robert Grace Contracting Co. and the Mellon-Stuart Co., Pittsburgh, is now associated with the Culbertson Construction Co., with offices in the Stambaugh Building, Youngstown, Ohio.

STANDISH & ALLAN, engineers and contractors, Chicago, announce the association with their firm of Jerome F. Wilhelm, formerly of the Union Bridge & Construction Co. of Kansas City. The firm will continue to operate under the name of Standish & Allan. Mr. Wilhelm will have charge of all pneumatic foundation work.

THE LOS ANGELES SHIPBUILDING & DRY DOCK CO., San Pedro, Cal., has added to its executive staff James Reed, recently commander of Construction Corps, U. S. Navy, as assistant general manager. For the past six years Mr. Reed has been New York superintendent, Hull Division, Mare Island Navy Yard, in connection with tanker, destroyer and battleship construction.

THE PATTON CLAY MANUFACTURING CO., Patton, Pa., has become a licensee of the Dunn Wire-Cut Lug Brick Co., of Conneaut, Ohio, and will engage in the manufacture of wire-cut lug paving brick.

THE DETROIT GRAPHITE CO., Detroit, Mich., announces the election of J. W. Austin as its assistant secretary. He will also direct the purchasing policy for the Detroit and allied Canadian plants of the company.

THE CHAIN BELT CO., Milwaukee, Wis., announces the appointment of H. S Rosenthal, formerly of the Waterloo Construction Machinery Co. and the Clyde Iron Works, as its Southern district sales manager for "Rex" mixers and pavers. He will have complete charge of the sales in Texas, Arkansas, Louisiana, Mississippi, Alabama, Florida and Tennessee.

Safety Bolt Breaks With Overload, Stopping Crusher

A new stone crusher, developed in Sweden during the war, incorporates a new detail in design which insures safety against overload. In this machine the power is transmitted from the crank shaft to the oscillating jaw through an unequal arm lever, and through a roller mounted between the main roller and the jaw. The jaw forms the concave face upon which the roller operates without sliding friction and without need of lubrication. The lever is constructed in two parts, kept together by a hinge and by a safety bolt arranged to break for an overload, caused for instance by the lodgment of a sledge hammer between the jaws. When such an overload occurs and the bolt breaks, the motion of the lower part of the lever is stopped. The upper part of the level continues to move, swinging on the hinge until the motive power is shut off and a new safety bolt inserted. The safety bolt is turned with a narrow incision to a certain depth, leaving the bolt strong enough to stand any normal strain. Under the head of the bolt is placed a cupped disk of hardened steel designed to deflect more than the bolt stretches.

The crusher, which has been used extensively for crushing road material, is described in a recent letter from Gustaf Rennerfelt, of Stockholm, Sweden, who claims for his invention over other stone crushers higher efficiency, less need of lubrication, and particularly safety against overload.

New Tractor Makes Appearance

A 7½-ton four-wheel-drive tractor, designed and developed for us in logging camps, mines, oil fields, plantations and among other industries where there are insufficient or no transportation facilities has just appeared on the market by the Rogers Tractor & Trailer Co. of Albion, Pa. The manufacturers have incorporated in the machine a four-cylinder Buffalo gasoline motor, with a 6¾-in. bore, 9-in. stroke. It is capable of developing 98 hp. It has a sliding gear transmission which was a design and construction of the Rogers Co., two speeds being provided forward and two speeds reversed. Power, transmitted to the drive wheels by bull pinions, is delivered without the use of a single universal joint. These wheels, 48 in. in diameter, with a 24-in. face, are equipped with fifteen 3-in. channels 7/16 in. thick, to provide traction.

NEW TRACTOR CROSSING STONE BARRIER

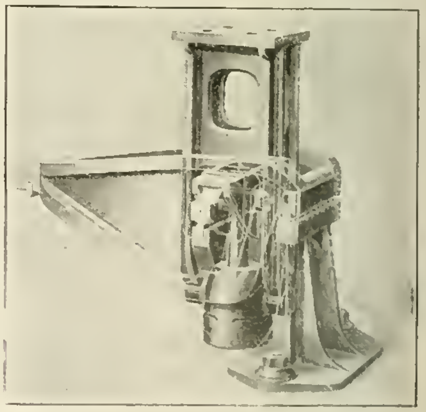
The manufacturers claim that any one of the four wheels of the tractor can be raised up to 5 ft. from the ground without throwing any gears out of alignment or causing any friction. The front wheels can be tipped at one angle and the rear wheels at the opposite angle, as the frame is constructed in two separate parts, though hinged in order to permit oscillation.

Track Scale Embodies New Features

A track scale embodying new features has been placed on the market partly as a result of the new specifications adopted jointly by the American Railroad Association, the American Railway Engineering Association, and the Bureau of Standards.

The new specifications make necessary such changes in design that scales in accord with them will not be interchangeable with old scales, and this occasion was taken to make other departures from previous standard design. In the design of the scale as shown in the accompanying cut the *I* section levers were abandoned and double web section is used for all of the levers in the scale. The connections between levers of the standard *I* section must be made between pivots projecting from both sides of the levers, with the assumption that load is applied along the center of each bearing and transmitted along the center line of the connecting lever. Hence, if load on both sides is not equal, a torsional strain is produced in the lever. In the new scale initial load is suspended from the center of the main lever bearing, as shown in the cut. From that point it is transmitted to the true center line of the lever to each succeeding bearing, and the tip of one main lever of each pair is directly over or below the true center line of the opposite lever so that the combined pull of both is on a straight line to the center of the bearing.

SCALE HAS WEB SECTION LEVERS


MAIN BEARING CONSTRUCTION

The new scale is built in two capacities for light duty service or such service requiring the weighing of a relatively small number of cars. It is made by E. & T. Fairbanks & Co., St. Johnsbury, Vt.

A Consolidation of Engineering News and Engineering Record — McGraw-Hill Company, Inc.—JAMES H. MCGRAW, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

E. J. MEHREN
Editor

Volume 84 — NEW YORK, THURSDAY, MAY 20, 1920 — Number 21

A Seaport a Mile High

"THE billion-dollar Great Lakes-Tidewater project, which would almost make a seaport out of Denver," is under discussion in the shadow of Pikes Peak, according to a Denver newspaper. Even allowing a few thousand feet elevation to be expressed in that word "almost," there still should be quite a job here for the designers and builders of locks.

Upstream Blankets for Dams

UPWARD pressure on dams having porous foundations has been more a matter of theoretical consideration than of actual test. For that reason the experiments carried out at Dayton, and noted on another page, are valuable though they are somewhat inconclusive. Their best value is the indication of the tightening effect of an upstream blanket. Whether the lengthening of the "line of creep" reduces pressure proportionately or not, the final mud jetting operations in the test showed that the silt deposited above the dam effectively served to keep water away from the bottom of the dam. That fact may be used, if necessary, to justify the mechanical placing of such a blanket if it is feared that it will not be automatically deposited in a short time.

Small Bridge Foundations

DURING a recent spring flood four small bridges went out in one New York county. Each bridge was fairly modern and each had a superstructure of admirable design and sufficient strength for modern loads. In every case the foundation was vulnerable against underwash, that potent weapon of the flood. Old and obvious as is the lesson here, the concentration of failures makes it well worth repeating. No structure is stronger than its footing, and where that footing is subject to attack, as it always is in a bridge, more care can well be bestowed upon it than upon the more obvious superstructure. In large bridges the foundation is always watched, but in the many small crossings which are a part of all roadwork, too frequently the major attention is given to loads and stresses on the truss or arch, and the footings are considered only enough to see whether they will safely bear that load under normal conditions. In small bridges, particularly, watch your footings.

The New York Section

WITHIN the few weeks since its organization the New York section of the American Society Civil Engineers has gathered together a membership of 248, making it the largest of the local sections of that society. At its first annual meeting, held last week, proposals were made through special committee reports which, when carried out, will make it a contender for the place of the most business-like and progressive of all the sections. In proposing dinner meetings, over by 9 p.m., the New York section cannot fail to increase its membership and add to the interest of its sessions. In agreeing to join, in several meetings during the year, with the local branches of the other founder societies it evinces a broad social co-operative spirit. The New York section, though containing in its membership many whose faces are familiar at meetings of the society at large, has no national character, nor wants one. Its opportunities for service are local. Its beginning is auspicious.

The Hen and the Egg

IN proposing, at the recent annual meeting of the National Highway Traffic Association, that the question of equitable loads allowed to motor vehicles be considered at some future meeting, one of the members of the association foresaw the destruction of a vast mileage of highways unless drastic action were taken to limit to the least destructive load the weight of truck and contents. After several minutes of futile discussion another speaker analyzed the situation as being analogous to the question: "Which came first, the hen or the egg—the highway or the motor vehicle?" For the better part of an hour champions of the hen and champions of the egg defended their respective theories and the annual meeting ended with an exclamation from one member that "we can now consider the egg scrambled." Highway transport is not a single responsibility. Its efficiency depends not solely upon the highway engineer nor the automotive engineer but upon their hearty co-operation. It is just as harmful to limit the axle weight of trucks by laws based upon the present condition of roads—except of course as a temporary measure—as to expect that highway departments will respond to every caprice of automobile design. Highways must, however, be considered as only a means to an end: that end, national transport. It is just as necessary to pass regulations governing the nature and the strength of roads as to pass regulations controlling the weight and speed of the vehicles using them. The future highway must be constructed with regard to its use by self-propelled vehicles, and the automotive engineer, because of the heterogeneous types of road surfacing, must design and construct reasonably light vehicles capable of carrying its required load at minimum cost. Until that co-operation has produced its results enforcement of maximum load regulation is a necessity. Not all heavy haulage operators are as farsighted as is George H. Pride, who has said that owners of commercial motor lines will bring about their own destruction by truck overloading. Connecticut and New Jersey, the two Atlantic states that have suffered most, perhaps, in the breaking up of their roads this spring, have found drastic regulation essential. And regulation will be necessary as long as 14-ton loads pound over highways of light design.

Lessons from A. A. E. Convention

DELEGATES to the convention of the American Association of Engineers at St. Louis last week represented a constituency, many of them with definite instructions, and it was this back-home constituency that ruled the meeting regardless of new light which the delegate got from the debate on the floor or from the small group conference. Lesson 1, then, is the danger of the instructed delegate. More time spent in the choice of a delegate and less in debate on what he shall stand for in detail is essential, leaving to him the freedom to exercise his best judgment on all except broad principles.

This leads to lesson 2, which is the distinct evidence shown of a desire to decentralize all duties that can possibly be handled locally. Even though the work can be done more efficiently at headquarters, the home chapter wants to handle its own money and its own affairs, leaving to headquarters only the duties of national importance.

Few conventions are able to muster a quorum before 10:30 a.m., but this one was scheduled to start at 8 a.m. on the second day. A quorum was present twenty minutes after that time, which is the best of evidence that a responsive membership back home had made its impress so strongly and seriously upon the delegate that he was willing to work three sessions a day without murmur, if only he could better serve the interests of his fellow engineers.

The A. A. E. delegate was not particularly interested in what other societies were doing. He did not comment on the action of his board of directors in accepting the invitation to the Organizing Conference in Washington. Not even in cloak room discussion did the matter have much attention. The consistent ignoring of the existence of A. A. E. by the other national societies has been met, as heretofore, by attendance strictly to its own business of handling welfare and other non-technical work. There was not expressed any antagonism against the technical societies; rather sympathy and encouragement for their upbuilding into still stronger positions.

Analysis of the choice of officers indicates that A. A. E. members have an appreciation of the fact that men in the midst of their active careers make the best executives. The youngest official, a director, was graduated more than 10 years ago, the next 14, and then, with the exception of one out of college 35 years, on up to the president who graduated from Massachusetts Institute of Technology in 1892. Every officer is a graduate; two hold high positions in government service; one is chief engineer of a state utility commission; one is a city water-works managing engineer; one is a consulting engineer; one a college professor; two are railroad valuation engineers, and one a first assistant railroad engineer. Two only are from Chicago, and the remainder are scattered over the country from Washington, D. C., to Portland, Ore. Altogether the A. A. E. would seem to have a well-officered national organization equipped to co-ordinate the efforts of its rapidly growing membership into a force for upbuilding the non-technical interests of all engineers and to assist engineers everywhere in fulfilling those civic responsibilities which education and experience place at their door. With 17,000 earnest members led by able officers much may be accomplished before the association delegates meet a year hence.

A Transportation Crisis

WHEN an official representative of the railroad executives issues a statement that "the food and fuel situation is assuming threatening proportions" as a result of various factors contributing to a general transportation shortage, there seems little doubt that a crisis in transportation has occurred. With railroad development virtually at a standstill for four years, the transportation system of the country has been unable to withstand the shock of a tremendous volume of business following closely on the heels of a labor upheaval. Additional track facilities and the equipment necessary to afford a proper factor of safety cannot be supplied for so long a time that temporary remedy must be sought in radically altered operating methods. To this end the American Railroad Association has asked the Interstate Commerce Commission to invoke the drastic priority powers which are granted by the recent Transportation Act, since the railroad companies cannot legally enforce the blanket priority orders and embargoes that seem necessary to relieve the congestion.

The construction industry is so seriously affected that the keenest interest will be taken in developments of the next few weeks looking to a solution of the most serious traffic blockade since 1917. The volume of work that is in progress and planning for the immediate future—particularly highway work—is great enough to tax the normal capacity of the railroads in transporting materials. Now, an almost universal shutdown is threatened.

Embargoes are onerous, but they must be faced until the situation is relieved. It is evident that the railroads cannot continue to accept new business at the normal rate and at the same time clean up the blockade. This policy, with embargoes against the acceptance of freight from foreign lines, is in large measure immediately responsible for the present situation. Such competitive methods of railroad business-getting, harking back to the "good old days," cannot succeed in this crisis. A broader view of the situation must be taken by the private traffic managements or it will not be possible to give the public adequate and satisfactory service. This, after all, is the ultimate test of private operation, which this journal and its predecessors have always favored. We believe, however, that the railroad managements have become thoroughly alive to the danger of failure, now that the executives have made application to the commission for taking such drastic steps to prevent a complete breakdown. There is reason to believe that the shortsighted competitive methods of interline embargo and similar practices will quickly be abolished, and we hope that the present emergency will result in their permanent and enforced abandonment.

At best the situation can be but slowly relieved and industries far down in the priority lists must make plans accordingly for transporting their materials as best they can. What this means to the construction industry was learned during the war. That industry represents such a large volume of shipping that it is by no means powerless to act as a unit against such old-fashioned methods of competitive railroad operation as the interline embargo. Now a crisis has occurred and it must be faced by shippers and railroad companies alike.

Activated-Sludge Moves Forward

MILWAUKEE will be written in the annals of sanitary engineering as the first large city to commit itself unreservedly to the activated-sludge process of sewage treatment. Its action has been neither blind or hasty. It has shown wisdom in using plenty of time, money and expert skill in preliminary studies and in working-scale experimentation before making detail plans for the construction of a plant designed to treat ultimately a dry-weather flow of 130,000,000 gal. of sewage. Its caution has been one of wisdom rather than of timidity because a considerable portion of the time and energy put upon activated-sludge studies at Milwaukee has been for the purpose of determining how best to design the different elements of the plant and combine them into a harmonious whole rather than to reach a decision as to whether this particular process of sewage treatment should be adopted.

The extended article on the basis of design for Milwaukee's activated-sludge plant submitted in this issue by T. Chalkley Hatton, chief engineer, Milwaukee Sewerage Commission, is designed, according to the author's own statement, to answer the many questions pouring in upon Mr. Hatton from every part of the world regarding this epoch-marking project. Taking into account the necessary limitations of space in an engineering journal, Mr. Hatton's article may fairly be considered as one of the most important contributions ever made to the literature of sewage treatment. With remarkable compactness and clearness Mr. Hatton not only outlines the design of the plant, together with its main objects and its promises of achievement, but he also correlates these facts and opinions with the data gathered from the experiments and from other sources. Articles of this sort are all too rare.

It is no disparagement of what has been decided upon at Milwaukee, nor of the activated-sludge process in general, to urge that because Milwaukee has decided to put in a sewage treatment plant of the type indicated it does not follow that any other given city should do so. The whole study, the conclusions reached and the plant design based upon them illustrate anew and forcefully the remarkable extent to which local conditions—including particularly character of sewage and the environment of available sites—govern and should always govern the method of sewage disposal chosen for any given city. At Cleveland and also at Worcester, Mass., where in each case extensive tests of the activated-sludge process have been made, the experimental data, in the light of governing local conditions, were held to be against the activated-sludge process. What the governing conditions are at Milwaukee is clearly pointed out at the beginning of Mr. Hatton's article. These conditions are worthy of careful study by any one having a sewage-disposal problem to solve in order that he may determine to what extent the particular local conditions confronting him toward or away from the activated-sludge process.

That an activated-sludge plant intended, like this one for Milwaukee, to produce an effluent of high character and marketable fertilizing material is complex and expensive will be evident to any one who gains from Mr. Hatton's story a complete picture of the works that have been designed for Milwaukee. But to offset the heavy capital and operating expenses, Mr. Hatton is counting on a large revenue from the sludge. It should also be noted that at Milwaukee any other process of treatment available to meet local conditions could by no possibility be placed upon the small site available so that heavy additional capital charges would have been entailed for an outlet sewer leading to some other site.

In the minds of a not inconsiderable number of engineers there are still doubts as to the mechanical and commercial practicability of recovering the fertilizing value in the sludge from this process. It is true that various and long continued experiments with sludge dewatering have been made at Milwaukee, but that portion of Mr. Hatton's article dealing with the dewatering plant seems to indicate that finality has not yet been reached, even from the viewpoint of design. If we turn from the sludge-handling experimental plant at Milwaukee to the much larger working plant being built at Houston, Tex., it appears that, after many months of remodeling, the Houston dewatering apparatus was at last accounts still in the hands of the contractor awaiting the completion of further changes. When the Houston dewatering plant is finally accepted by the city we shall still have to await some months or perhaps a year or two of daily operating service before we can be sure that a mechanically and commercially successful dewatering plant has been achieved.

Another element in the utilization of sludge from activated-sludge plants is the marketing of the product. There is little experience to go on here. However, it does not seem too much to hope that not only will all the mechanical difficulties in connection with sludge dewatering yet be overcome, but also that, once a satisfactory dried sludge is produced, at least the better governed of our municipalities will be able to cope with the selling problem. It must be remembered that the cities handling activated-sludge must not only be able to market their products, but also to operate their plants with such efficiency as to produce a salable material that has not cost far more than it will bring in the market. If it be urged that this is a problem in municipal government rather than in sewage engineering, it may then be answered that the two are inseparable.

The words of caution and of questioning in some of the preceding paragraphs are not intended to lessen the high degree of credit due to the Milwaukee Sewerage Commission, its engineering and other technical staffs and advisors. They are intended rather and only to put other cities and other engineers on their guard lest, on the strength of the Milwaukee studies and conclusions, these other cities and engineers should venture too boldly in adopting the activated-sludge process without first having taken every reasonable step to make sure of its local availability.

Finally, the activated-sludge process remains, as it has been since its development was first given attention a few years ago, one of the most if not unqualifiedly the most promising method of sewage treatment of the many that have come to the front in the last three decades. If other cities will follow the example of Milwaukee and make equally careful and skilful studies of the process before adoption, design their plants in accordance with the lessons thus derived, operate them with equal skill and then record, interpret and present the results in like manner, there is much reason to hope that this new process will take a leading place among the available methods of sewage treatment.

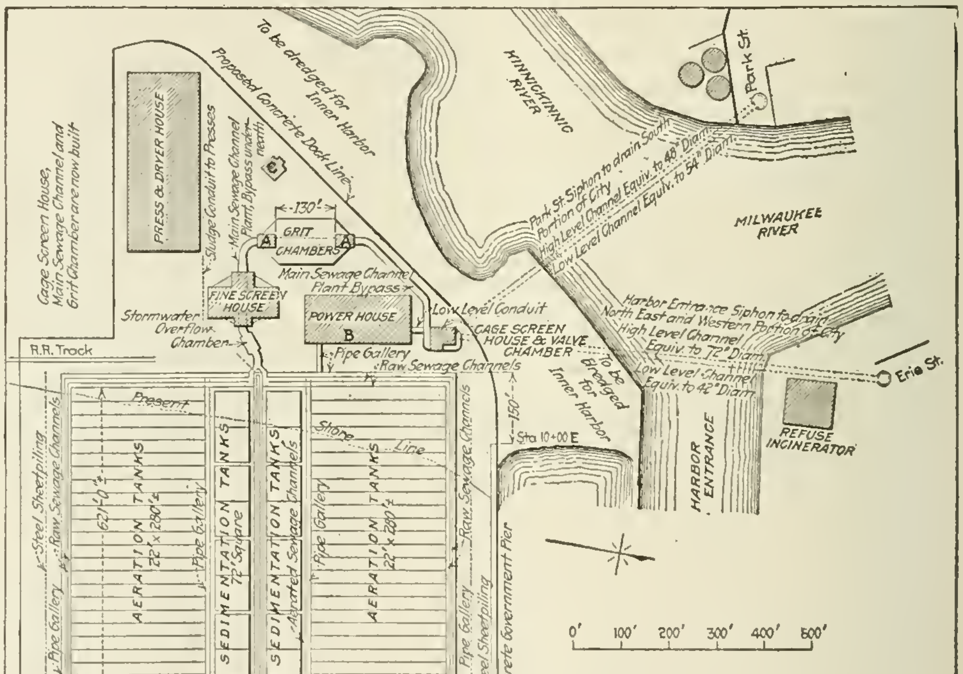
Activated-Sludge Plant for the City of Milwaukee

Plans Adopted for 85,000,000 Gallons of Sewage in 1930 and 130,000,000 in 1950—Bar Screens, Grit Chambers and Fine Screens Precede Activation—Sludge Acidified, Pressed and Dried for Fertilizer

By T. Chalkley Hatton
Chief Engineer, Sewerage Commission, Milwaukee, Wis.

INASMUCH as statements have been printed that, after many years of investigation, the Sewerage Commission of the City of Milwaukee has abandoned the intention of building a sewage disposal plant of the activated-sludge type, it may be of interest to readers of *Engineering News-Record* to know that the contrary decision has been made by the Commission, the reasons for such decision, the characteristics of the plant now being designed and the basic data governing the design—the latter compiled from what has, perhaps, been the most exhaustive investigation by any municipality of a sewage treatment process.

As early as August, 1917, the Sewerage Commission reached the conclusion—from the experiments it had conducted for two years—that the activated-sludge process was best adapted for treating the sewage of Milwaukee. Before undertaking such a large expenditure (about $5,000,000) for what was practically an experimental process, it was considered good policy to call in the services of a consulting engineer especially qualified to pass judgment upon the report of the chief engineer, and the character of the data upon which this report was based, to ascertain what, if any, changes should be made in the recommendations embraced in said report. For this purpose, Harrison B. Eddy was engaged with the distinct understanding that his studies and findings were to be restricted to the activated-sludge process—the commission being convinced, from the results of the experiments conducted under its direction on other well known methods of sewage treatment, and its knowledge of the peculiar governing conditions existing in Milwaukee—that the activated-sludge process was the only one which would meet these conditions in a satisfactory manner.


To be dredged for Inner Harbor
Proposed Concrete Dock Line
KINNICKINNIC RIVER
Park St.
Cage Screen House, Main Sewage Channel and Grit Chamber are now built
PRESS & DRYER HOUSE
Sludge Conduit to Presses
Main Sewage Channel Plant, Bypass underneath
C
130'
A
GRIT CHAMBERS
A
Main Sewage Channel Plant Bypass
FINE SCREEN HOUSE
Stormwater Overflow Chamber
POWER HOUSE
B
Low Level Conduit
CAGE SCREEN HOUSE & VALVE CHAMBER
Park St. Siphon to drain South Portion of City
High Level Channel Equiv. to 48" Diam.
Low Level Channel Equiv. to 54" Diam.
MILWAUKEE RIVER
Harbor Entrance Siphon to drain North East and Western Portion of City
High Level Channel Equiv. to 72" Diam.
Low Level Channel Equiv. to 42" Diam.
Erie St.
REFUSE INCINERATOR
HARBOR ENTRANCE
To be dredged for Inner Harbor
R.R. Track
Pipe Gallery
Raw Sewage Channels
Present Shore Line
150'
Sta 10+00 E
Steel Sheetpiling
Raw Sewage Channels
621'-0"±
AERATION TANKS 22' x 280'±
Pipe Gallery
SEDIMENTATION TANKS 72' Square
SEDIMENTATION TANKS
Aerated Sewage Channels
Pipe Gallery
AERATION TANKS 22' x 280'±
Raw Sewage Channels
Pipe Gallery
Steel Sheetpiling
Present Concrete Government Pier
100'
Steel Sheetpiling
Main Outfall and Plant Bypass
168.46'
1000'
El. of Lake -1.00±
Flow Line El. about -14.0
Eastern Extremity of Sewage Disposal Tract, Sta. 17+68.46 E
0' 100' 200' 300' 400' 500'
A = Gate House
C = Administration Building
B = Blowers and Generators, Sewage Pumps and Sludge Pumps

GENERAL LAYOUT OF ACTIVATED-SLUDGE SEWAGE-WORKS FOR MILWAUKEE, WISCONSIN

After a very careful and painstaking study of all the data available from the experiments made under the direction of the Sewerage Commission, Mr. Eddy reported, the latter part of 1917, that it was inadvisable to proceed with building the plant in accordance with the chief engineer's recommendations until further investigations had been made, and suggested that a small plant be constructed on the lines recommended and operated for a year to demonstrate the possibilities of the process.

Following this suggestion, the Sewerage Commission rebuilt its experimental plant with a view of determining many points more closely than they had theretofore been determined, equipping it with the most modern measuring appliances obtainable—which had not been done in the first investigations—and operated the plant continuously for over a year with a fluctuating flow of sewage corresponding to that which will govern the operation of the final plant. As a result, Mr. Eddy has reported that the activated-sludge process will best meet the Milwaukee conditions, and the Sewerage Commission, by formal resolution, has adopted it and directed the chief engineer to prepare final plans and specifications to the end that a plant may be completed as promptly as possible.

The peculiar conditions which influenced the engineers in recommending, and the Sewerage Commission in adopting, the activated-sludge process as the best method of treatment may be briefly stated as follows: The Milwaukee water supply is taken from Lake Michigan through an intake located approximately four miles from the harbor entrance through which nearly all the sewage of the city finds its way to the lake. During southeast winds, this sewage reaches the intake in a few hours. To the south and north of the harbor entrance, the public bathing beaches are located, which thousands of bathers daily use from three to four months of the year.

The city has begun an extensive development of its harbor, the ultimate value of which might be considerably nullified through sewage contamination. The logical site for a sewage treatment plant is at or near the harbor entrance, the apex of the three watersheds upon which the city is built. This site must be upon land to be recovered from the lake in from zero to 14 ft. depth of water, and at best only 35 acres can be thus recovered, the balance of the lake front having been unalterably condemned for harbor purposes. And last, but by no means least, the general topography of the city and the surrounding country presents no available site for the disposition of sludge without creating a nuisance which would, without doubt, be estopped either by litigation or legislation.

MILWAUKEE'S THREEFOLD SEWAGE PROBLEM

The threefold problem to be solved in determining the best type of sewage treatment consisted of (1) producing a clear effluent from which from 90 to 95 per cent of the bacteria had been removed and which would be stable for at least three days; (2) the final disposition of the sludge by such a method as would not cause a nuisance to the citizens, the lake users or to the suburban neighbors; and (3) finding a type which could be contained upon the least area.

This was the reason for the persistent efforts upon the part of the Sewerage Commission to investigate the activated-sludge process in such detail and the large expenditures made therefor, which have exceeded $350,000 (including costs for experiments conducted upon other types of treatment) and which, so far as the writer knows, are the most extensive investigations ever made by any one city in any one line of municipal improvement. In passing, it might be well to state that the investigations as a whole have embraced grit chamber operation, fine screening, Imhoff tank sedimentation, trickling filters with varied depths of stone beds, chlorination, colloidal slate filters similar to the one tried out at the Lawrence Experiment Station under the direction of Henry Clark, electrolytic chlorination without lime, chemical precipitation, the draw-and-fill aeration process, mechanical disturbance with air applied for oxidation only, reaeration of sludge, sludge drying, sludge dewatering by several types of filter presses, sludge drying by artificial heat, acidifying sludge for dewatering and settling, and numerous other minor investigations.

The ultimate plans which have been tentatively agreed upon and prepared embrace the following features which are given in sequence as the sewage passes through the plant:

DAILY FLOW OF SEWAGE TO BE PROVIDED FOR, GALLONS

Date	Average	Average With Storm Water	Maximum	Maximum With Storm Water
1922	65,000,000	67,000,000	98,000,000	147,000,000
1930	85,000,000	86,500,000	128,000,000	165,500,000
1950	129,000,000	130,000,000	193,000,000	231,000,000

LOW-LEVEL SEWAGE TO BE PUMPED, GALLONS

Date	Average	Average With Storm Water	Maximum	Maximum With Storm Water
1922	30,500,000	31,000,000	460,00,000	51,000,000
1930	33,500,000	33,500,000	50,000,000	55,500,000
1950	40,000,000	40,000,000	60,000,000	65,500,000

These quantities represent the ultimate capacity for which the plant is being designed, but the grit chamber and fine screening plant are being designed to provide a maximum capacity of 321 m.g.d., which is the capacity of the intercepting sewers reaching the disposal plant. This extra 100 m.g.d. storm flow is expected to reach the plant during 400 hr. of the year, and will flow through the grit chamber and fine screens only, after which it will be chlorinated and by-passed into the lake.

One third of the sewage, amounting to an average dry weather flow of 40 m.g.d., daily, reaches the plant at El. —25 and is termed the low-level sewage; the balance, amounting to 90 m.g.d. reaches the plant at minimum El. + 8.50. The low-level sewage first passes through cage screens with vertical bars spaced 2 in. apart (not staggered); thence to three 30-m.g.d. electrically-driven centrifugal pumps automatically controlled, the motors being of the variable-speed type, controlled by electrical contact from a float built in the suction well. These pumps deliver the low-level sewage into the main conduit, where it joins the high-level sewage after the latter has passed through a grid screen with vertical bars spaced $3\frac{11}{16}$ in. apart.

GRIT CHAMBER FOLLOWED BY FINE SCREENS

The conduit delivers the sewage to a grit chamber built in eight parallel and similar compartments controlled by sluice gates actuated by hydraulic cylinders, and is designed to provide for a flowing-through velocity of from 0.64 to 1.0 second-feet.

From the grit chamber, the sewage is conducted to the fine screens which are designed in units, with brass or manganese bronze plates slotted with $\frac{3}{32}$ in. by 2 to $2\frac{1}{2}$ in. openings, mechanically cleaned by brushes, and which are to have a capacity of passing 130 m.g.d. of dry-weather flow under a 4 in. loss of head, and 321 m.g.d. of dry-weather and storm flow under a 12 in. loss of head. The screenings are to be delivered upon a common belt conveyor available to each unit.

The screened sewage passes into and through the aerating tanks which are to be approximately 340 ft. long, 22 ft. wide and 15 ft. effective depth, built in parallel, with filtros diffusion plates built in gutters at right angles to the direction of flow and 4.5 ft. between centers.

THICKENERS TO BE USED IN SEDIMENTATION TANKS

From the aerating tanks, the mixed liquor, containing the sludge and liquor, flows into conduits which deliver it to the several sedimentation tanks, which are to be built in parallel, 72 ft. square on top, 72 ft. in diameter on bottom and 15 ft. effective depth, with a bottom slope of approximately 18 in. Each of these tanks is to be equipped with a Dorr thickener or similar device for continuously and uniformly removing the precipitated sludge to a central outlet in the bottom.

The clarified liquor flows over weir troughs built across the top of the sedimentation tanks at such intervals as to provide for a maximum flowing-through velocity of 1.5 ft. per minute, and the effluent passes direct into the conduit carrying it to the lake near the harbor entrance in 14 ft. depth of water. The sludge is removed from the sedimentation tanks by hydrostatic head, over adjustable weirs, and flows through an open aerated conduit to a junction where a part (apportioned by will of operator) flows direct to the filter press pumps, and the balance to the return-sludge pumps. The latter are electrically driven and automatically controlled and deliver the return sludge into the screened liquor conduit where the two mix, are aerated while passing through this conduit, and together reach the aerating tanks.

TANKS TO CARRY 18 PER CENT RETURN SLUDGE

The control of the plant is largely centered in the junction separating the excess from the return sludge. The aerating tanks are designed to carry, under normal conditions, 18 per cent of return or activated sludge; they can carry 50 per cent without in any way interfering with the process. During Sundays and holidays, when the press and drying plants are shut down, there will be no excess sludge, all being returned through the plant at an approximate additional rate of 12,000 gal. per 1,000,000 gal. of sewage.

The excess sludge passes into a small suction well where sulphuric acid is added to assist in dehydrating it and to which a stuff pump is connected. This pump forces the sludge through a piping system which supplies the filter presses under the required pressure, which is automatically regulated. The filtrate from the presses flows by gravity back to the low-level sewage well where it mixes with the raw sewage and passes through the plant; the sludge cake, containing approximately 80 per cent moisture, is deposited upon a button conveyor operating under each press, which takes it to a main belt conveyor which carries it through the press house to a storage tank in the center of the dryer house.

The screenings from the fine screen conveyor are delivered to and pass through a set of steel rolls which reduce the moisture from 85 to about 80 per cent. They are then conveyed by a belt conveyor underground from the screen house to the press house where they are delivered on the sludge cake conveyor with the sludge cake and carried to the storage tank in the dryer house. The screenings from the coarse screens are to be pressed in the cider press type of press in common use and transported to the sludge cake conveyor. A grab bucket, operated by an electric hoist moving on an overhead mono-rail, carries the mixture of screenings and sludge cake to a small hopper located in front of each dryer from whence it is carried by screw conveyors into the dryer.

The dryers are to be continuous, revolving and of the direct or direct-indirect heat type, coal or oil burners, depending upon the type of boilers to be used in the adjacent boiler plant. They are to be 60 ft. long by 82 in. in diameter, each capable of producing one ton of sludge containing 10 per cent moisture per hour from sludge cake containing 85 per cent moisture and evaporating 8 lb. of water per pound of combustible.

From the dryer, the dried product is conveyed by bucket conveyor to a shaker screen, 10 meshes to the inch, the residue passing to a mill which grinds it, delivers it to the bucket conveyor and back to the screen. The fine sludge which passes through the screen is conveyed to a series of storage hoppers holding about 10 days' output. These hoppers terminate in square bottoms to which bags are attached and through which they are filled. These bags stand upon weighing scales arranged to automatically cut in the feeding valve and to record the number and weight of bags filled.

From the scales, the bags are carried by a bag conveyor to the car loading platform or to a storage house. Conveyors are also to be provided to carry the dried product to cars or boat for shipment in bulk.

The grit accumulating in the grit chamber will be removed, as demanded, by means of a ½-yd. clamshell bucket worked on the end of a 50-ft. boom operated by a 10-ton locomotive crane moving on tracks on either side of the grit chamber, this boom being of sufficient length to span four chambers. The bottoms of these chambers are protected from damage from the bucket by steel rails laid 15 in. apart and ½ in. above the concrete bottom, and the top edges of the division walls are protected against like damage by 6 x 6-in. timbers securely anchored to the walls. The grit is to be deposited back of bulkheads to make up land adadjacent to the future docks, and when this means of disposal is no longer available, it will be loaded upon cars and deposited outside of the city.

TEN THOUSAND HORSEPOWER AIR REQUIREMENT

The type of power plant has not yet been decided upon; that is, whether it shall be a steam or internal combustion engine plant, and if steam, whether the fuel used will be coal, powdered coal or crude oil. Specifications are in preparation for all types, and proposals will be invited covering each, whereupon the decision will be made to adopt the type which seems to promise the greatest economy. The ultimate power requirements are as follows:

	Hp.
For low-level centrifugal pumps	805
Blowers for compressing air and auxiliaries	10,057
Generators for operating miscellaneous motors for all purposes connected with the process	973
Total power required in 1950	11,835

The entire plant, including buildings, coal storage, tanks, etc., for the 1950 period will cover about 22 acres, 17 of which are to be recovered from the lake.

The basic data upon which the entire plant has been tentatively designed, and which have been prepared from the results of the experiments conducted during the past five years, are as follows:

The screenings collected by the coarse screens are estimated to be 0.022 cu.yd. or 0.02 ton per 1,000,000 gal. of sewage, this estimate being based upon records taken for several years' operation of a 4-in. spaced rack screen placed across the old intercepting sewer which carries the present sewage to the experimental plant.

GRIT CHAMBER AND FINE SCREEN DESIGN

While a temporary grit chamber was built and operated for over a year, passing a daily flow of 11,000,000 gal. at a velocity ranging from 0.64 to 1.12 ft. per second, no reliable records of the amount of grit which could be expected from the entire city flow of sewage could be obtained. For this purpose, the grit records of the plant at Rochester, N. Y., for 1918 and 1919, as furnished by N. A. Brown, superintendent, have been assumed as fairly representing what we may expect at Milwaukee. The Rochester records give an average of 2.03 cu.ft. of grit collected per million gallons of sewage, and range from 4.05 cu.ft. in March to zero during May, July and November. During the first nine months of 1919, the average was 2.52 cu.ft., ranging from 5.40 cu.ft. in July to zero during February and March. For the Milwaukee plant, 2.30 cu.ft. per million gallons have been assumed. This represents an average daily deposit in the 1950 period of 11 cu.yd. and would fill the sedimentation compartment of one chamber in seven days.

Band screens having manganese bronze plates slotted with $\frac{1}{8}$-in. slots 2 to 2½ in. long, cut transversely with the line of flow, moving at the rate of 10 ft. per minute and with plates slotted with $\frac{3}{32}$-in. slots, 2 to 2½ in. long moving at the same speed, were operated throughout 1919. These screens were cleaned by brushes revolving at a peripheral speed of 60 ft. per minute in the direction the screen moved.

When a constant loss of head of 2 in. was maintained on the $\frac{1}{8}$-in. screen, with the raw sewage containing 350 p.p.m. suspended matters, a 16 weeks' constant run gave 129,435 gal. of sewage passing through the screen per square foot of wet area, from which were collected 1017 lb. of screenings at 85 per cent moisture per million gallons of sewage. The slots represented about 27 per cent of the total plate area.

When a constant loss of head of 4 in. was maintained on the $\frac{1}{8}$-in. screen with the raw sewage containing an average of 295 p.p.m. suspended matter, 246,000 gal. per square foot of wet screen area passed, and 472 lb. of screenings containing 86 per cent moisture per million gallons of sewage were collected. This run was made from July 19 to Aug. 30, 1919.

SCREENS WITH $\frac{3}{32}$-IN. SLOTS ADOPTED

From Sept. 9 to Nov. 30, 1919, a continuous run was made with the $\frac{3}{32}$ in. slots with a constant 4-in. loss of head; 449,290,000 gal. of sewage were passed from which were collected 277,800 lb. of screenings containing 87.2 per cent moisture. The raw sewage contained an average of 277 p.p.m. of suspended matters. That is, the screenings collected amounted to 618 lb. per million gallons of sewage and the screens passed 195,300 gal. per square foot of wet area. The $\frac{3}{32}$-in. slots occupy 24.6 per cent of the plate area. The above experiments showed that the $\frac{1}{8}$-in. screen would pass about 20 per cent more sewage and collect 30 per cent less screenings than the $\frac{3}{32}$-in. Aside from this, the indications were rather pronounced that the $\frac{3}{32}$-in. screen permitted the screened effluent being treated at a higher rate per acre, which means less contact period between air and sewage and consequently less area for aeration tanks. The $\frac{3}{32}$-in. slots were adopted.

The natural query arises, Why not introduce much finer screens and thus increase the rate of treatment per acre? The answer to this, as we have seen the conditions here, is that the sludge resulting from too fine screens, is impracticable to dewater because it contains insufficient coarse matters to afford vehicles by which the water can be led from the interior of the sludge cake to the filter cloths. For instance, sludge containing considerable hair dewaters much quicker than one with less hair. To one who observes the pressing of sludge, it is quite apparent that the coarser the mass forming the cake, the dryer it is and the quicker it becomes dry.

BETTER RESULTS WITH TANKS 15 FEET DEEP

After operating two 15-ft. and two 10-ft. deep aerating tanks in parallel from Nov. 4, 1918, to March 15, 1919, it was found that the 15-ft. gave rather better results than the 10. As the 15-ft. tanks required less area of plant, the balance of the demonstration run was made with the tanks operating in series. the 10-ft. tanks being used primarily to produce sufficient sludge to supply the presses and dryer. (See table.)

CHARACTERISTICS OF SEWAGE TREATMENT IN AERATING TANKS 15 FT. DEEP THROUGH SEVERAL PERIODS OF 1919

Characteristics	3/16 to 5/11	5/25 to 6/22	6/22 to 9/28	9/28 to 11/2*	1/1 to 12/28 1919
Free ammonia, p.p.m.	11.4	15.1	14	....	14.1
Oxygen consumed, p.p.m.	31	30	29	....	31
Dissolved oxygen, p.p.m.	6.8	4.5	5.6	4.8	5.7
Nitrites, p.p.m.	0.59	0.62	2.23	0.88	0.89
Nitrates, p.p.m.	0.60	0.41	1.13	0.24	0.55
Per cent of sludge in tanks	18	18	18	16	18
Per cent of sludge returned	13	20	19	17	18
Gal. ret'd sludge per 1,000,000 gal. sewage	131,200	193,000	191,400	171,500	178,000
Per cent of water in ret'd sludge	97.4	97.7	98	97.7	97.5
Gal. waste sludge per m.g.s.	8,831	12,020	13,270	13,040	12,447
Cu.ft. air per gal. of sewage	1.49	1.52	1.47	1.17	1.44
Air pressure, in lb.	7.07	7.16	7.20	....	7.08
Contact in hours	6.53	5.23	4.88	5.16	5.33
Million gallons treated per acre	15.7	18.5	20.1	25.5	18.5
Per cent bacteria removed, 20°	95	98	98	96	97
Per cent bacteria removed, 37°	97	99	99	97	97.4
Per cent suspended matter removed	97.9	98.7	99	97.7	98.2
Stability in hours	120	115	119	103	113
Suspended matter in raw sewage	265	276	313	270	303
Per cent suspended matter removed by screens	3.7	3.2	2.9	3.7	3.7

* The special run from Sept. 28 to Nov. 2, was made to ascertain whether standard effluent could be maintained during peak load in tanks without increasing the air applied. Analytical records not taken after Sept. 30.

To better understand this test, it should be stated that the plan adopted for operating the plant is to apply a uniform volume of air to the tanks throughout the 24 hr. at a rate of 1.5 cu.ft. of air per gallon of sewage, based on the average flow. During low night flows, when the sewage is diluted, the contact period will be increased and the rate of air per gallon of sewage passing will of course, exceed 1.5 cu.ft. per gallon. Contrariwise, during the peak load of the day, the contact period will be greatly diminished as will the rate of air applied per gallon. During the night flow, the activated sludge passing through the tanks will be so greatly strengthened as to provide ample biological treatment for the peak flow, and the above tests seem to amply prove this assumption.

INCREASE OF AIR PRESSURE ON FILTROS PLATES

At this point it may be well to call attention to the slow and gradual diminution of the efficiency of the filtros plates which is shown by the increased pressure of air. This pressure started on Jan. 1 with 6.9 lb. and was 7.21 lb. on Sept. 30 when the records were no longer taken. This condition existed in spite of extreme precautions taken to clean the air passing to the plates, which consisted of drawing the air through one layer of 16-oz. duck, and another layer of canton flannel, and washing it by a hydro-turbo blower of the Nash type. The tanks have not been emptied since Nov. 4, 1918, and therefore no examination of the plates has been made.

The present plant, so far as the aeration and sedimentation tanks are concerned, is being planned to provide for the treatment of sewage up to the 1930 period. If the assumptions prove excessive, as the tests indicate, it simply means that this period can be extended without extensions to the plant. We have therefore designed the aeration tanks for a 6-hr. contact period for the average dry-weather flow and the application of 1.5 cu.ft. of air per gallon of average dry-weather flow.

Attention should be called to the strength of the sewage treated during this demonstration, as indicated by the suspended matters recorded. This is due to the fact that the intercepting sewer, which delivers the sewage to the testing station, carries a very large proportion of industrial wastes—much greater than will be obtained at the plant when all the domestic sewage is added. This condition will, undoubtedly, reduce the air and contact requirements as well as the amount of excess sludge to be handled.

In a continuous run of four months with two 15-ft. tanks in parallel, one having 1 sq.ft. of filtros plate area to 4.4 sq.ft. of tank area, and the other 1 to 6, the former showed so much better results that a 1 to 4.5 ratio has been adopted.

Study of Sedimentation of Aerated Sewage

The problem of sedimentation received much detail study. Four sedimentation tanks were built with 15 ft. effective depth; two 11 ft. square and two 9 ft. square on top, and of corresponding diameters on bottom. Through each vertical foot of each tank, a pipe with a hand cock was screwed, and for four months samples of the tank liquor were drawn every hour throughout the 24 and allowed to settle in graduated cylinders. During this period, the liquor was passed through the tanks at different rates per day and per week and curves of sedimentation plotted from the settlements shown in the cylinder.

These investigations, while interesting in many other ways, conclusively indicated that sedimentation could be satisfactorily effected at the rate of from 1,800 to 2,000 gal. per square foot of tank area; that the flowing-through velocity should be confined to 1.5 ft. per minute, and that 15 ft. was a minimum depth when treating the ordinary fluctuating flow of sewage. This fluctuating flow caused the fine sludge zone to rise from 2 ft. during low flow to 13 ft. during peak flow, above which it would not go when the flow was at the rate of 2,000 gal. per square foot or less.

The design is based upon 1,600 gal. per square foot, providing for the maximum dry-weather flow at this rate, and a maximum running-through velocity of 1.5 ft. per minute.

Hour's Settlement Gives 98 Per Cent Sludge

It is important to remove the settled sludge from the sedimentation tanks as it settles, and at the same time to give it a little time to separate itself from much of the water. Should the sludge be removed as fast as it accumulated, the resulting moisture would be from 99 to 99.5 per cent, whereas an hour or more of settlement will reduce this to 98 per cent, a much less quantity to handle. This feature is obtained by allowing from 2 to 3 ft. depth of sludge to remain in the tank above the plow which is moving at a constant speed below this mass and plowing the thicker sludge to the center outlet. The speed of this plow should not exceed 13 ft. at the periphery and the plows should be so set as to draw pretty uniformly from the entire bottom. The plow used by the testing stations was made by the Dorr Co., New York City, and has been a very satisfactory device.

As previously stated, the sludge is drawn from the sedimentation tanks by hydrostatic head through hand-controlled submerged weirs. It discharges into an open conduit, the bottom of which contains filtros plates through which the air enters the sludge in sufficient quantity only to keep it from settling while flowing to the junction, where the excess sludge is divided from the return sludge. This is an important feature because activated sludge will quickly settle when moving at a velocity of less than 2 ft. per second, and soon becomes septic, which in turn destroys its dewatering properties.

A special experiment was conducted from March 16 to June 15, 1919, to determine the volume of sludge produced in the 15-ft. tanks. With sewage containing 273 p.p.m. of suspended matters, 157,000 gal. of return sludge and 12,100 gal. of excess sludge were produced per million gallons of sewage. During this period, 18 per cent of sludge was retained in the aerating tanks and about 13.5 per cent returned. Both the return and the excess sludge contained 97.5 per cent moisture.

Upon this basis, the plant is being designed and provides for pumping a daily average of 13,433,000 gal. of return sludge for the 1930 period, and 20,250,000 gal. for the 1950 period, and for dewatering and drying 1,028,500 gal. of sludge during the 1930 period and 1,560,900 gal. for the 1950 period.

The excess sludge will flow to a stuff pump designed to operate automatically from the pressure in the pipe delivering the sludge to the presses. The service for 1930 will be 357 gal. per minute minimum; 714 gal. average; and 1,076 gal. maximum. Two pumps will be installed.

Sulphuric Acid to Assist Dewatering Process

The sulphuric acid for assisting in dehydrating the sludge will be discharged into the stuff pump well. It will be arranged to be applied automatically with the speed of the pump, feeding on an average of 4.5 c.c. per gallon of sludge. It is important that this acid should not be allowed to remain in the sludge too long. There should be some free acid when the sludge reaches the presses.

We now come to the most important problem of the activated-sludge process, the dewatering of the sludge. Experiments to this end have been carried out for four years with three types of presses and two types of centrifuges, with numerous kinds of filter cloths, plates, screens, racks and feeding devices and, although the sludge has been dewatered by means of every device used, it is felt that improvements are still possible which will solve this problem better than we have been able to solve it so far.

The sludge comes to the presses containing from 97 to 98 per cent of water and must be reduced to 80 to 85 per cent before it can be economically dried. Its character changes considerably from day to day and this has more or less influence upon the dewatering process. The main requirements which must be met to practically solve the problem are: Time of pressing, stability of filter cloths, clean cloths when cake is dumped, stability of plates or racks, maintaining free drainage in plates and racks and reducing labor to a minimum. True, these requirements are more or less interdependent, but each must be considered.

The centrifuges used were not at all successful from the start, and were abandoned. The two types of presses which have given the best result are the plate press made by the Simplex Co., Chicago, and the platen press, manufactured by the Worthington Pump & Machinery Co. of New York City, and known as the Berrigan press.

Eleven-oz. duck cloths were used, and the cloths were washed down with a hose stream four times during the run, and even so each pressing showed a diminution of cake produced, indicating that the bags would have to be removed, thoroughly washed and replaced every second day if the press efficiency was to be maintained.

A sample run of the Simplex press is as follows:

Number of pressings	8—continuous
Number of plates	10
Effective size of plates	33x33 in
Sulphuric acid	5.2 c.c. per gal.
Time of pressing (complete)	4 hr. 9 min
Moisture in wet sludge	97.6 per cent
Moisture in cake	82.7 per cent
Pounds of cake	3,710
Pounds per sq ft. filter cloth	3.06

A sample run of the platen or Berrigan press, when using burlap bags, is as follows:

Length of run, two pressings a day	3 days
Number of bags	10
Effective size of bags	41x72 in.
Sulphuric acid used	4.5 c.c. per gal.
Time of pressing complete	4 hr., 51 min.
Moisture in wet sludge	98 per cent
Moisture in cake	81.7 per cent
Pounds of cake per pressing	1,363
Pounds of cake per sq.ft. filter cloths	3.38

Because the methods for filling this press are not well adapted to its type, it is estimated that at least 20 minutes can be cut off the time of pressing, allowing 4.5 hr. for the entire operation.

BURLAP BAGS GIVE BEST RESULT IN PLATEN PRESS

While the burlap bags are fairly clean after each operation, their efficiency can be increased by slightly washing them down with a hose stream after each operation. The burlap bags have given the best results in the platen or Berrigan press; they drain freely, are easily washed, appear to be as stable as duck bags and cost about one-fortieth as much. They are not adapted to the plate press.

Experiments are now being conducted with the type of filter plate made by the John Johnson Co., Brooklyn, N. Y., and the Worcester plate, as used in the sewage disposal plant at Worcester, Mass.

The Berrigan press, as it is being designed, will contain 22 racks and bags, 72 x 48 in.; will be fed under a uniform pressure of 10 lb., and will use 200 lb. per square inch when pressing. It is assumed that it will produce 3 lb. of cake per square foot of filtering area and make five pressings per 24 hours. If the Berrigan press is used, the press layout will provide only for the 1922 period—for 65,000,000 gal. of sewage per day. This will require 38 presses for active use and four additional ones for spares. These will be installed in units of 12 each because two men can attend to this many on a shift.

WEIGHTS OF DRIED SLUDGE AND SCREENINGS

It is estimated that from the 785,500 gal. of excess sludge at 97.5 per cent moisture produced daily in 1922, 668,500 lb. of sludge cake at 80 per cent moisture will be produced. Our experiments on drying have indicated that this sludge cake, when reduced to 10 per cent moisture, will weigh just 25 per cent of the cake, so that the daily output of dried sludge from the sludge cake will be approximately 83.5 tons. In addition to the sludge cake, the screenings must be dried. In 1922, these will amount to 24,100 lb. at 80 per cent moisture or to 5,300 lb. at 10 per cent moisture.

The propositions submitted by two reputable dryer manufacturers are practically equal, so far as output is concerned. Briefly, they are that with a 60-ft. by 82-in. dryer, 5,000 lb. of water per hour can be evaporated, and that it will require 1 lb. of combustible to evaporate 10 lb. of water. This will require five dryers for 1922 period and nine dryers for the 1950 period. The former number is now being provided for.

To reduce the odors arising from the drying of the sludge, the gases are drawn through a dust chamber and from thence through a spray washer where the soluble gases are removed with the water which flows back to the low-level sewage well. This method has been tried out at the station and found satisfactory.

For the purpose of briefing the foregoing information, the following summary of data upon which the Milwaukee sewage disposal plant is being designed, is submitted.

Average dry-weather sewage to be treated, 1922, 65 m.g.d.
Average dry-weather sewage to be treated, 1930, 85 m.g.d.
Average dry-weather sewage to be treated, 1950, 130 m.g.d.
Coarse screenings collected from 3⅞-in and from 2-in. wide openings, in grid and cage screens, respectively, 0.022 cu yd., or 0.02 tons per 1,000,000 gal. of sewage.
Grit to be disposed of, 2.3 cu ft per 1,000,000 gal. of sewage.
Fine screenings from 3/32-in. slots, 4 in. average loss of head, 618 lb., at 87.2% moisture p.m.g. of sewage.
Excess sludge produced, 12,100 gal., baving 97.5% moisture, p.m.g. sewage treated, or 102,850 lb ; specific gravity, 1.02.
Sludge cake produced 10,083 lb., having 80.3% moisture, p.m.g. sewage treated.
Dried sludge produced, 2,521 lb., having 10% moisture, p.m.g. sewage treated or 1.26 tons.
Press will produce 3 lb of cake per square foot of filter cloth in 4.5 hr., or 5 operations per day of 24 hrs.
Dryers will reduce 6,700 lb. sludge cake at 80% moisture to 10% moisture, and will evaporate 8 lb. of water per pound of combustible.
Depth of aeration tanks, 15 ft., effective.
Depth of sedimentation tanks, 15 ft., effective.
Contact period based on average dry-weather flow, 6 hrs.
1.5 cu.ft. of air per gallon of sewage based on average dry-weather flow, which includes air applied at all points
Air to be applied at a constant volume throughout the 24 hrs.
Pressure of air, 7 lb.
Sedimentation based on 1,800 gal sewage per square foot of tank area based on 4.5% nitrogen as ammonia recovered from dried sludge.

Engineers can well appreciate the hesitation with which the author submits any estimate of the cost of construction or operation of such a plant under the existing problematical future conditions influencing such costs, but he feels that this article would incompletely answer the queries of many interested engineers should this phase of the subject be entirely omitted, and so cost estimates are given below, based on the best and most recent information available.

In comparing these estimates with the cost of other disposal plants treating sewage by different processes, it should be considered that the Milwaukee plant must be built upon recovered land, the cost of which exceeds a half million of dollars; that all structures must be supported upon pile foundations wherein 25- to 40-ft. piles are to be driven on 4-ft. centres; and that the cost of materials and labor is from 60 to 100 per cent more than pre-war costs.

GROSS AND NET ANNUAL COSTS

The estimated cost of building the plant for a capacity of 85,000,000 gal. per day (1930 period) is $5,000,000. A considerable portion of this cost covers the requirements for the 1950 period, or 130,000,000 gal. per day, but assuming this entire cost to be chargeable to the lesser capacity, the annual cost is estimated to be $33.58 per million gallons of sewage treated, which embraces capital charges of $14.07 and operating costs of $19.51 per million gallons. These estimates are based upon labor at $4 per 8-hr. day; electric current, 7.5 mills per kw-hr.; coal, $4.75 per net ton; filter bags (burlap), 20c each, and 12 sets per year per press; 4.5 c.c. sulphuric acid per gallon of sludge at 1c. per pound; one ton of dried sludge per 1,000,000 gal. of sewage; and 4.5 per cent of nitrogen as ammonia in dried sludge, worth $4 per unit. This means that there are 90 lb. of nitrogen to every ton of dried sludge, not allowing for the 10 per cent moisture remaining in the dried sludge.

From these estimates, it will be seen that the net cost of the treatment, including the $18 per ton return from the dried sludge, will be $15.58 per 1,000,000 gal. of sewage treated, which compares favorably with any other type of treatment producing a comparable effluent.

It is believed that the return from the dried sludge has been conservatively valued inasmuch as the sewage treated in the demonstration plant has produced 1.25 tons of dried sludge per 1,000,000 gal. of sewage and the sludge has contained about 5.5 per cent nitrogen as ammonia, which has been worth, during the war, from $5.50 to $7.25 per unit, and is now quoted at $6.50.

There are many features connected with this process of sewage treatment which it is important to know to insure successful operation of any plant built, but this article has already attained much greater length than its author intended. His purpose of answering briefly the many questions asked him by engineers, concerning the results of our work here in Milwaukee, has been accomplished to the best of his ability with the available data.

The experiments have been ably conducted under the immediate direction of William R. Copeland, chief chemist; the designs are being worked up under the direction of Darwin W. Townsend, engineer of designs; construction is under the charge of James L. Ferebee, principal assistant engineer. Harrison P. Eddy and Will J. Sando are consulting sanitary and power engineers, respectively, and Philip, Eschweiler and Barkhausen, local architects, form the art committee to pass upon the design of the superstructures comprised in the plant.

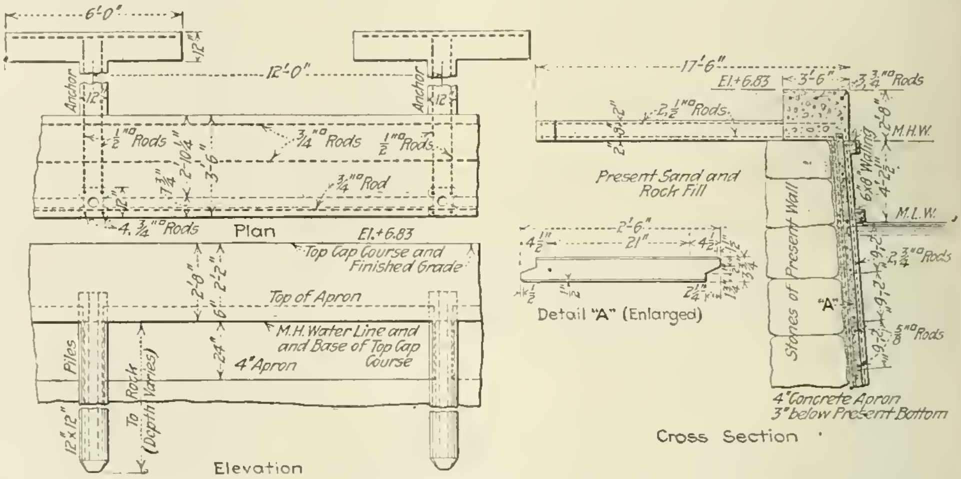
Water Powers in British Guiana

An investigation into the possible development of hydro-electric power in British Guiana has been made by Stafford X. Comber, M. Am. Soc. C. E., and Mr. Comber's preliminary report has been printed by the Government of British Guiana. It records a remarkable piece of pioneer engineering investigation, for Mr. Comber had to proceed alone, at short notice, 150 miles into the vastness of the tropical Guiana Jungle and secure his technical data with the assistance of only a few native Indians. The trip was made during the period of heaviest rainfall ever recorded in the forty years during which records have been kept. The report notes that the total amount of 24-hr. horsepower that could be developed on the three main rivers of British Guiana from natural head, calculated on a basis of 95 per cent at the turbine intake, would probably be about 800,000 hp. It is understood that the provincial government is seriously considering the report with a view to the development of the more important and readily accessible powers revealed by Mr. Comber's investigation.

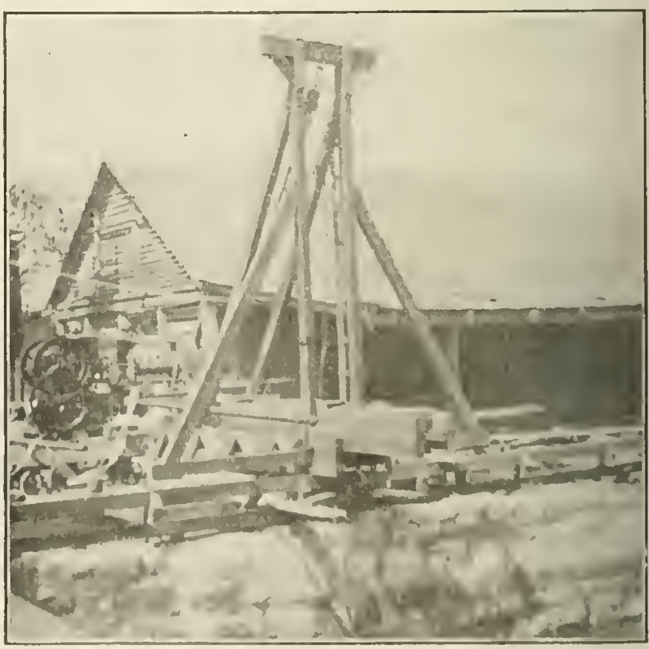
Concrete Facing Placed on Old Masonry Sea Wall

West Indian Stone Quay Wall Protected Against Underwash and Erosion by Precast Pile and Slab Structure

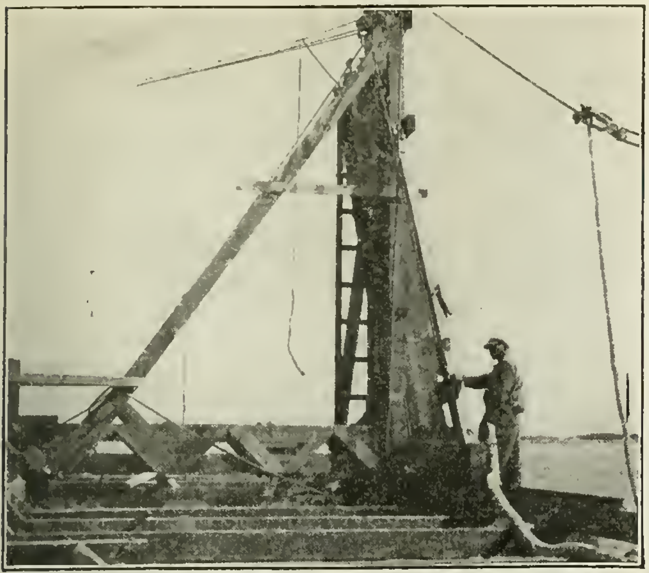
QUAY walls in the harbor of Nassau, British West Indies, have commonly been built of native calcareous quarry stone laid upon the coral sand bottom and backfilled with earth. The stone is comparatively soft and uneven in texture and is rapidly worn away by wave action on the exposed face. Furthermore, the shifting bottom sands are comparatively light and are readily drawn into suspension by propeller suction and the heavy ground surge which is caused by severe northeasters to which the harbor entrance is exposed. In order to stabilize one such wall there has recently been built for the Royal Bank of Canada, in Nassau, a new sea wall in which a complete concrete facing, made up of precast concrete slabs slipped down in the grooves in



DETAILS OF PRECAST CONCRETE FACING PUT ON OUTSIDE OF OLD MASONRY WALL AT NASSAU, B. W. I.



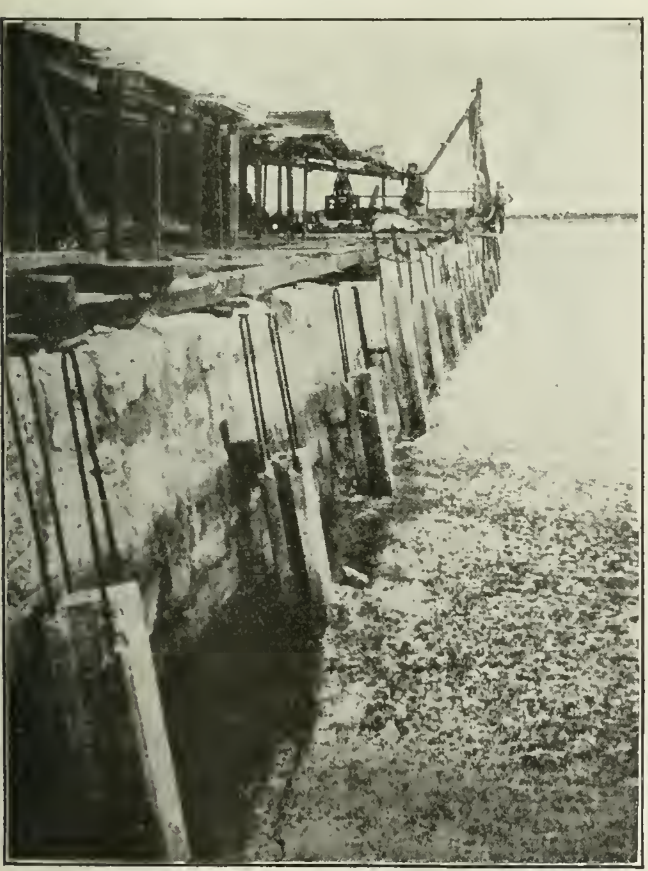
PILEDRIVER MOUNTED ON TOP OF OLD SEA WALL WITH LEADS HORIZONTAL



PILEDRIVER LEADS LIFTED TO DRIVING SLOPE

spaced concrete piles and backfilled with concrete, has been used. The new structure was designed and built by Purdy & Henderson Co., under the direction of H. F. Lame as superintendent in charge of the company.

The maximum depth of water at these walls is about 18 ft. at high tide and the sand bottom varies in depth from 4 to 12 ft. overlying a coraline rock which is badly pocketed. At this particular site steel rod soundings showed the coral rock at a maximum depth of 25 ft. below mean high water. The quay is in two sections at right angles, one about 193 ft. and the other, 108 ft. long. The details of the new construction are shown in the accompanying drawing. The precast facing to be erected outside of the existing structure consists of reinforced-concrete piles 12 x 12 in. in section and spaced about 12 ft. c. to c. The reinforced-concrete slabs are 2 ft. 4 in. by 2 ft. 6 in. and 3¾ in. thick. They are, as shown, reinforced with ⅝-in. marginal rods and are provided with mating grooves on the long side. They slip down in the grooves of the piles and combine to present on the water side a smooth-concrete surface of sufficient density to resist erosion and protect the embedded reinforcement from sea-water action. Between this space and the existing structure mass concrete is deposited completely filling the intervening space. This is brought to the finished level of the wall forming at the top a heavy beam top course 2 ft. 6 in. deep and 3 ft. 6 in. wide, spanning two panels.



PILES DRIVEN ON OUTSIDE SLOPE OF OLD SEA WALL

LOWERING THE PROTECTING SLABS IN SPECIAL TONGS

Alternate piles are anchored back to solid earth beyond the line of intersection of the angle of repose of the soil backing with the wharf level, and each pile is dowled 2 ft. into rock at the point, using a 2-in. diameter steel dowel, 4ft. long.

The piles in addition to being slotted on the sides are provided with a central vertical hole, which is used to serve several purposes. Internal curing is carried on by filling the cylinder with water after plugging the lower end of the pile. The holes furthermore decrease weight and serve for jetting. Drilling and doweling were also done from the center of the pile after it was driven, and the hole then was filled with grout.

As the piles had to be spaced exactly and jetted true to line and to a fixed slope it was necessary to devise a special pile carrier and spacer. This is shown in two of the accompanying views. It is a light structure of triangular vertical frame carrying a set of movable leads pivoted at the bottom of the vertical, the whole traveling along a timber framing mounted on the top of the old quay wall. When a pile is to be driven it is slid in from the rear into the leads which are then at a horizontal position. The leads then are swung up to a vertical position through a line fastened to a block and fall at the top of the vertical. The driver itself is mounted on an outrigger and travels on rails set on a timber frame at the top of the wall. The tracks being laid true to line and grade and the lead adjustment being exact, positive alignment of the piles was assured.

Paired outriggers were used in setting the slabs and a special roller frame guide rigged to the outriggers was used to carry the slabs. The roller frame guide traveled by gravity in the slots of the piles and prevented the slabs from running unevenly, thus avoiding any injury to the corner of the slabs. Special hooks were made for lowering the slabs so arranged as to permit their being detached from above after the slabs had been placed under water.

PROTECTING CONCRETE SEA WALL IN PLACE

The bottom sections of the slabs were jetted into position below the existing harbor bottom. The vertical and horizontal joints were then calked on the exterior face in the concrete backing deposited through a chute in water.

Traffic on British Canals

Strongly as the advocates of inland waterway transport press the case for putting the canal system in a position to handle a larger traffic, it seems to be widely felt that the outlay involved in the improvement schemes which have been put forward cannot be justified by the traffic possibilities. Perhaps the comparatively small expenditure involved in carrying out the scheme outlined in the report which Sir Maurice Fitzmaurice presented to the Canal Control Committee—the approximate cost was £4,000,000—might be authorized, but even this is doubtful. It is admitted that the cost of canal transport has in comparison with the pre-war period increased by about 200 per cent, so that in spite of the increase in railway rates there is still a considerable disparity in the operating costs of railways and canals, particularly in the low-grade traffic which forms the bulk of the leads on inland waterways. A review of the transport situation suggests the conclusion that for the time being at least the railway system can be relieved of only a comparatively small tonnage by the other transport agencies.

[*From the annual review number* (*Jan. 1920*) *of the engineering supplement of the "Times," London.*]

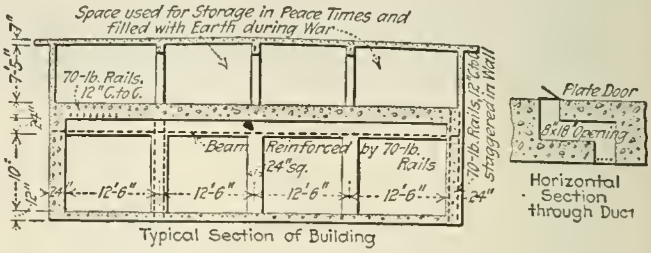
Bomb and Bullet Proof Magazine Has Double Roof

By R. C. Hardman

Superintendent, Division of Municipal Engineering, the Panama Canal, Ancon, C. Z.

AIRPLANES and aërial bombs have materially influenced the design of magazines for the storage of explosives. Such structures, built in Panama during the war, exemplifies the protection that now has to be given. The novel feature is the double roof, though the very heavy reinforcement shows the provision against the attack of high explosive.

The structure, which is 54 x 75 ft. in plan, is designed to be bullet-, fire- and bomb-proof, either from the land or air. It is divided into two large compartments for the storage of ammunition and other high explosives and one small compartment for black powder, etc. Contrary to the usual practice in magazine construction the building has two stories, wherein lies the provision for air protection. The second story is in reality formed by a double roof, the upper 7 in. thick and the lower, which also serves as a floor, being 2 ft. thick. The space between the two roofs is used in peace times for the storage of inflammable but non-explosive materials, and in war times for a filling of earth, sand or similar material.


Space used for Storage in Peace Times and filled with Earth during War
70-lb. Rails. 12" C. to C.
7"
7'-5"
24"
10'
12"
24"
12'-6"
12'-6"
12'-6"
12'-6"
24"
Beam Reinforced by 70-lb. Rails
24" sq.
70-lb. Rails, 12" C. to C. staggered in Wall
Typical Section of Building
Plate Door
8"x18" Opening
Horizontal Section through Duct

EXPLOSIVES MAGAZINE PROTECTED AGAINST AERIAL ATTACK

All walls proper are 2 ft. in thickness and the footings, floor, walls and lower roof are reinforced with scrap 70-lb. steel rails closely spaced. Columns and beams are similarly reinforced. The second story is of ordinary reinforced-concrete construction.

Ventilation of the building is secured by means of zigzag ducts, which permit of the passage of air freely but do not permit of a straight line entrance for small projectiles and similar articles. The outer opening of each air duct is completely covered by a heavy steel plate door and the inner end is provided with closely spaced bars.

All door and window openings in the first story of the magazine are protected by both fire-proof and projectile-resisting doors of heavy plate and angle construction. All doors are placed in recesses so that no direct line of entrance is possible through cracks. Second-story openings are protected by steel plate doors only.

There is no means of access to the second story except by ladder from the outside. Supplies and sand must be placed by a hand hoist moving upon a trolley which slides back into the building when not in use, thereby permitting a tight closure of the door through which it operates.

All artificial lighting is by electricity, the enclosed marine type of fixture being used. Needless to say, the switch panel is placed outside the magazine.

A number of magazines of this general type have been built, all the designing and constructing being done by the forces of The Building Division of The Panama Canal, of which Hartley Rowe was resident engineer, T. C. Morris assistant engineer and the writer engineer-designer.

The Future of A.A.E.

Inaugural Address Delivered May 11, by Le Roy K. Sherman, President, American Association of Engineers, at the Sixth Annual Convention, St. Louis, Mo.

THE reason for the existence of the American Association of Engineers is no longer open to debate. The answer is covered by the fact—10,000 new members in one year. The progress of the A. A. E. in the stream of professional advancement was blocked by the ice of conservatism. The ice has broken. The American Association of Engineers has reached a position of power and numerical strength where no combination can stop the progress in the accomplishment of its ideals. The Association seeks the co-operation and good will of all in the profession.

We are living in the days of readjustment. There is a reaction from the war period of self-sacrifice, generosity, and harmony. The restraint of the individual has been removed and the pent-up combative spirit of selfishness, greed and intolerance has broken into the flames of radicalism. Almost every separate trade, industry, business, or profession today is organized for its material ends. Those individuals or groups which are not so organized are at a merciless disadvantage in obtaining mere equity. They are but pedestrians in the road of reckless juggernauts. Radical thought has not been confined to the trades. We have seen examples of scores of the most highly trained and specialized technical men carried off their feet in one evening's meeting to accept membership and dictation in the closest form of trade unionism. We are not here to discuss the merits or value of trade unionism to the trades; that is for them to decide. It is our province to consider dispassionately the relative advantages and disadvantages of trade union membership for men of the engineering profession or for those young men in the ranks who, by education and ambition, aim to become professional engineers.

Let us note the recorded statement of our Board of Directors:

"We believe in organized representation for the correction of wrong, the advancement of the profession, and service to the public, but are opposed to methods inconsistent with the dignity of the profession and which would lessen public confidence. The American Association of Engineers recognizing the many fundamental differences between the principles and objectives of the trade union and of an organization of professional men, expresses the opinion that an engineer cannot subscribe to the tenets of both."

The Association today has been the means of preventing the exodus of thousands into the alternative of trade unionism. The A. A. E. is conserving the unity and integrity of the profession. For this the thanks and respect of those most honored members of the old school is due to the American Association of Engineers.

In the year ahead, as in the past, the fundamentals for our activities are two-fold. One, the aim to correct the errors and faults of the engineers themselves; the other, to correct or improve the external conditions and the public's relations toward the profession, which limit the opportunities and welfare of engineers and their usefulness to society.

We are beginning to be more candid with ourselves. We will approach perfection more quickly by recognizing our shortcomings. In our training as engineers we have become experts in the use of materials and their relative strengths. We have become masters in the determination of stresses and the utilization and knowledge of the laws of physics and, truly, that is fundamentally engineering. But efficiency is not limited to the acquirement of the best economy of materials; efficiency must include also the study of other relative values. As engineers, our training in the analysis of the strength and use of materials is exactly the training required for solving the problems in relative values, and those are the problems of the executive, the manager, and leader. Therefore let us expand the usefulness of our training to include the factors of relative values and cost. Let us study the human equation and develop the art of constructive imagination. Through efficient service to the public, our clients, our employer, the men we assist will measure our usefulness and our value and thus aid our material compensation and reward.

I am now, and all my life have been, an engineer, although I have held some official titles not designated as engineer. Therefore I am not guilty of heresy when I maintain that the training of an engineer should be a means and not necessarily an end in life's work.

In our relations to the public there are many important matters pending: Equitable compensation of engineers in municipal and railway service; the engineers' license law; a national department of public works; the enactment or modification of proper building laws and laws regarding reclamation and public improvements; the question of professional ethics involved in outside work undertaken by public employees or officials. It should be our duty to aid in the solution of problems involving relations between the public and the various utility companies which are fundamentally engineering work. For example, the removal of onerous burdens on public utility companies which increase cost of operation without resulting in an improvement to the service. The public utilities companies may have sinned against the public in the past, now they have suffered the penalty and they are entitled to redemption.

There will arise other problems during the year, matters for prompt action for the welfare of the profession and its individuals. The greatest potential value of the American Association of Engineers is that they are organized and ready to act in any section of the country promptly and intelligently.

General policies, procedure, and initiative to a large degree must always devolve upon the membership and committees in the chapters. To carry out this work, to attend to the details, to act at the critical time, there is required the services of paid, full-time workers. We have a few of these local secretaries. They are busy men. There should be a representative of the A. A. E. with an open office in every geographical center. They should be under the direct supervision of the national secretary with authority and duty to serve all the chapters within their district. Likewise, there will be required assistant secretaries to devote all of their time to the detailed work in specific lines of activity. Effective service for prompt detail work cannot be had without the man on full time and full pay.

The basic organization of the A. A. E. is correct. It has the two departments, the legislative and the executive. Our legislative department consists of the board of directors and the president, all elected for temporary tenure of office and without pay. The executive department includes the national secretary and his assistants in office and field; all are appointed for continuous service and paid.

We face the coming year with hope and confidence for the future of the A. A. E. We shall have our successes and our disappointments. I am a fatalist to the extent that I believe in the philosophy of "what ought to be will be." It is the philosophy of "Let us believe that right makes might." It is the philosophy of "Trust in God and keep your powder dry."

The following verse is very appropriate, I think:

I hate to be a kicker,
I generally stand for peace,
But the wheel that does the squeaking,
Is the wheel that gets the grease.

Let us not be dismayed but let us take advantage of that trait of American citizenship which, opposed from the outside, binds and unifies the associations of men in the fight for a common cause. In our work for the coming year let us meet this barried and petulant world with the attributes of engineering service she so sadly needs; sane, balanced judgment to govern decisive actions.

Teredos Destroy Piles in Waters Not Previously Infested

After Immunity for at Least 50 Years, Untreated Timber in Upper San Francisco Bays Attacked Vigorously—Repairs Under Way on Many Wharves

WATERFRONT structures in San Pablo and Suisun Bays, which are inland arms of San Fransisco Bay, have always been built on untreated piles because attacks by marine borers were unknown in these waters. Several wharves are still in use in which a majority of the piling is 50 years old. Consternation has been spread in recent months, therefore, by the discovery that teredos are now at work even as far up as the head of Suisun Bay. Within about a year repair and reconstruction work have been started or have been recognized as necessary in practically all untreated pile structures along the extensive shore lines of these two bays.

As early as 1914 teredos were found in dolphin piles in the channel through San Pablo Bay, and also in the breakwater on the south end of Mare Island (which had then been in place four or five years). The piles attacked, however, were in deep clear water where the tidal currents were strong. No record could be found of any borers having been discovered as long ago as that near the shores. The water near shore in many places being comparatively shallow, less salty and often muddy, due to wave action in the tide flats.

The first discovery of full-grown teredos and extensive teredo action close in shore was made at Crockett in structures of the California and Hawaiian Sugar Refining Co. early in 1917. This company was then about to start extensive new work on their wharves. Before construction was actually under way, however, they found a good deal of their piling being attacked vigorously and accordingly the construction plan was entirely changed so as to use creosoted or concrete piles exclusively. In addition to revising plans for the new work, they found it advisable to replace most of the piles under their wharves and warehouses. Under some of the structures close inshore bulkheads and sluiced-in material to raise the mudline was found to be sufficient.

Soon after the discovery of teredos at Crockett they were found in some other structures in the vicinity. However, these cases of teredo attacks "were not taken very seriously" by owners of wharves on the shores of the upper bays. Certainly at that time it was not believed that borer action would become general in these waters and would be found even considerably farther up. The Southern Pacific Co., for example, pulled some piling at Vallejo Junction expressly for inspection purposes as late as June, 1919, and reported no sign of marine borers.

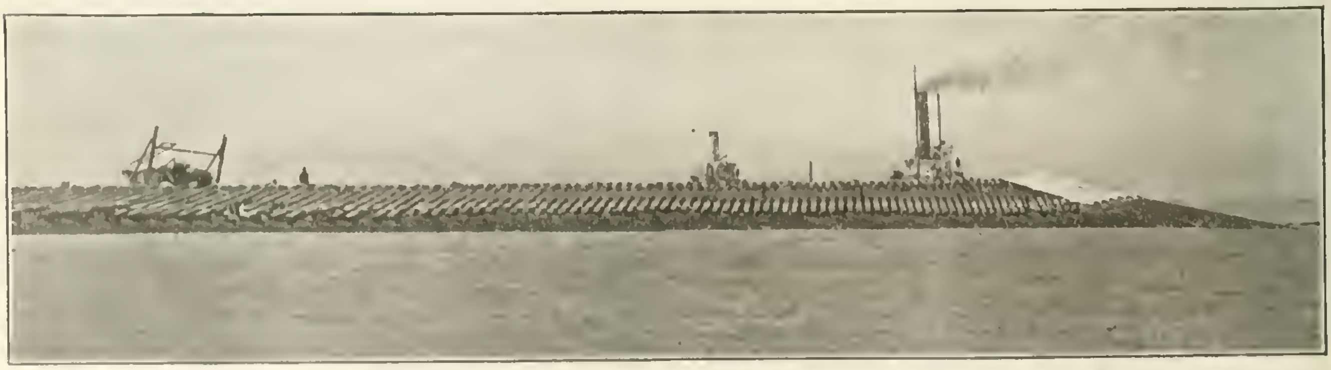
In the fall of 1919, however, discoveries of piling damaged by teredos came at frequent intervals all along the south shores of San Pablo and Suisun Bays. Still more extensive damage was found early in 1920. By this time the seriousness of the situation was realized and thorough examinations were made of all important structures that were supported on untreated piles. By the middle of March the extent of the damage was known and safety measures planned. The situation is apparent from the following résumé of conditions at points along the upper bay shoreline. In all these structures the length given is parallel to shore. Wharves are not ordinarily built out into the channel there.

The Associated Oil wharf about 1,000 ft. long, located at Martinez, was rebuilt with creosoted piles early in 1920 because the piling along the fender line had been entirely cut off by teredos. The tidal currents are swift and the water is deep alongside this wharf.

At McNear's two wharves, a mile below Fort Costa, teredos, were discovered in the piles about Feb. 1, 1920. These structures are 14 and 27 years old respectively. Piles of the latter age in the outer row on a fender line where the water is about 3 ft. deep were found to have been entered to a depth of 2½ in. The remainder of the wharf was in fair condition. The slight penetration here was ascribed to shallow water. On the adjoining wharf which is only 14 years old but where there is 20 to 37 ft. of water along the deep water side, teredos had entirely cut off many of the fender piles. The extent of the damage decreased toward the shore line as the depth became less. Where eddies occurred that kept the water more or less muddy, teredo action was very slight or entirely absent.

The Matson Navigation Co. wharf at Crockett is 135 ft. wide by 1,044 ft. long. No teredo action was discovered in this structure until March, 1920, when 25 piles were pulled in different parts of the wharf for examination. Then it was found that contrary to precedent teredos had attacked the piles even in sections where mudflats were exposed at low tide. The penetration was about 2½ in. in all parts of the structure except along the fender line where the damage ranged from a penetration of 4 in. up to entire destruction of the piles.

The wharf owned by the Selby Smelting Works below Vallejo Junction was found to be in bad condition late in the fall of 1919 when the piling gave way in several places due to teredo attacks. Repair on this wharf is



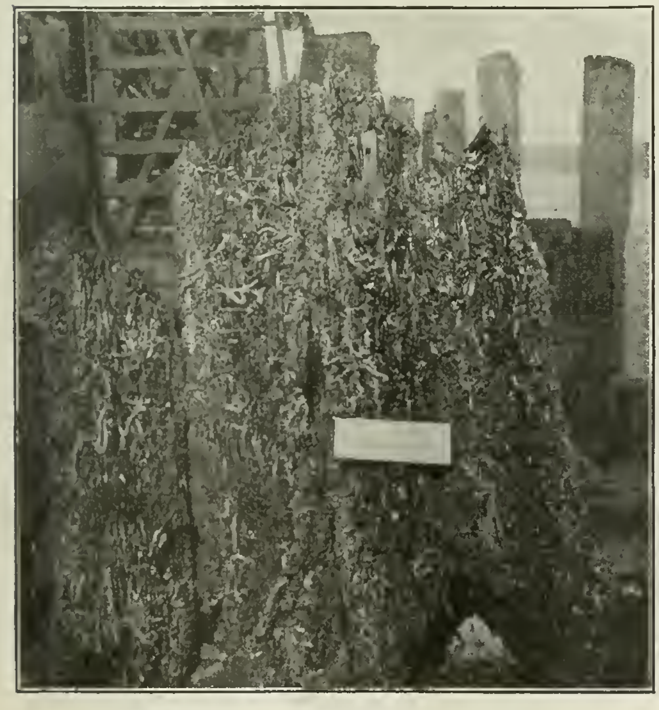
TUGS RECOVER PART OF FERRY SLIP THAT COLLAPSED SUDDENLY AND FLOATED AWAY being made by sulicing in material to raise the mudline under the structure.

The Sperry Flour Co.'s wharf at South Vallejo has been in service since 1868, supported on untreated piles. It is located in a comparatively narrow channel well away from the tidal currents which sweep through the main thoroughfares up and down the bays. There was no fear of borers at this point until an examination made in the fall of 1919 showed that teredos were in fact in the piles and had penetrated to a depth of about 1 in. Work was begun immediately on a plan for building a dike of heavy material around the structure and filling inside this with dredged material.

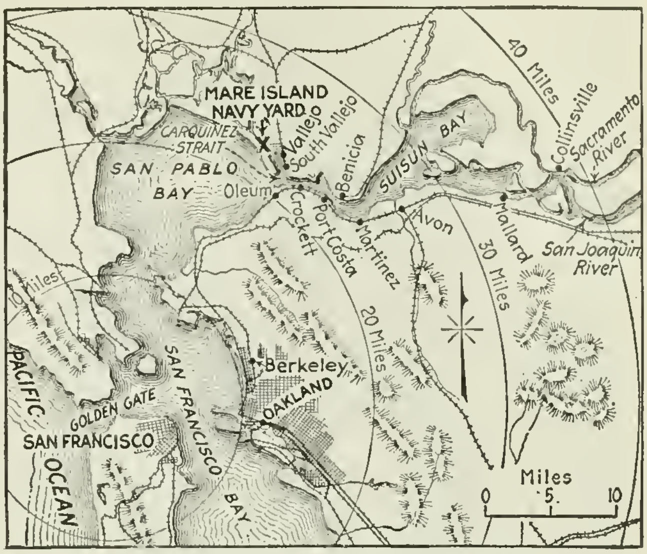
Although evidences of the action of pin-head teredos were reported as far up as Collinsville, which is at the mouth of the Sacramento River, the farthest point upstream at which damage has been reported is at Avon. Piles pulled for test purposes recently at Mallard are reported free from teredos.

An example of how unexpectedly the teredo attacks become serious is shown by the collapse of several structures while in service in these waters. A part of the Grangers wharf near Port Costa used for storing grain collapsed in September, 1919, because the pile supports were weakened by teredo action. The owners of the grain brought suit against the wharf owners to recover $10,000 damage for the grain destroyed. At Oleum a considerable length of the Union Oil Co.'s wharf collapsed and fell into the bay in February of this year when piles eaten off by teredos suddenly gave way.

A part of the outer guide wing on the Southern Pacific ferry slip at Port Costa went out with so little warning on Feb. 26, 1920, that men who were fishing from the piles barely had time to escape. The immediate cause of collapse is believed to have been the weakened condition of piles attacked by teredos. The section that went out was 30 ft. wide and about 250 ft. long. Most of the piles in it were over 100 ft. long. An engineer who witnessed the collapse stated that the entire length of piling went over gradually and without a sound, evidently giving away under the pressure of the outgoing tide which was running perhaps seven miles an hour at the time.



GREEN PILING HONEYCOMBED BY TEREDOS
Unusually complete destruction; piles were pulled after 30 years under boiler house at Crockett, in water 20 ft. deep.



MAP OF SAN FRANCISCO BAY, SHOWING REMOTE POINTS WHERE TEREDO ACTIVITIES HAVE ONLY RECENTLY BEEN NOTED

By way of general comment on the situation as a whole it may be noted that the heaviest teredo action in these waters has thus far been found just at the mudline. Just below the mudline the borings always cease abruptly and from this zone of greatest activity upward the extent of the action decreases rapidly. It has been found that although there is no record of teredos entering a sound creosoted pile standing alone, yet if a piece of untreated wood be spiked to a creosoted pile below water line, the teredo enters the untreated wood and when grown to a length of an inch or more will bore thence through the creosoted pile itself.

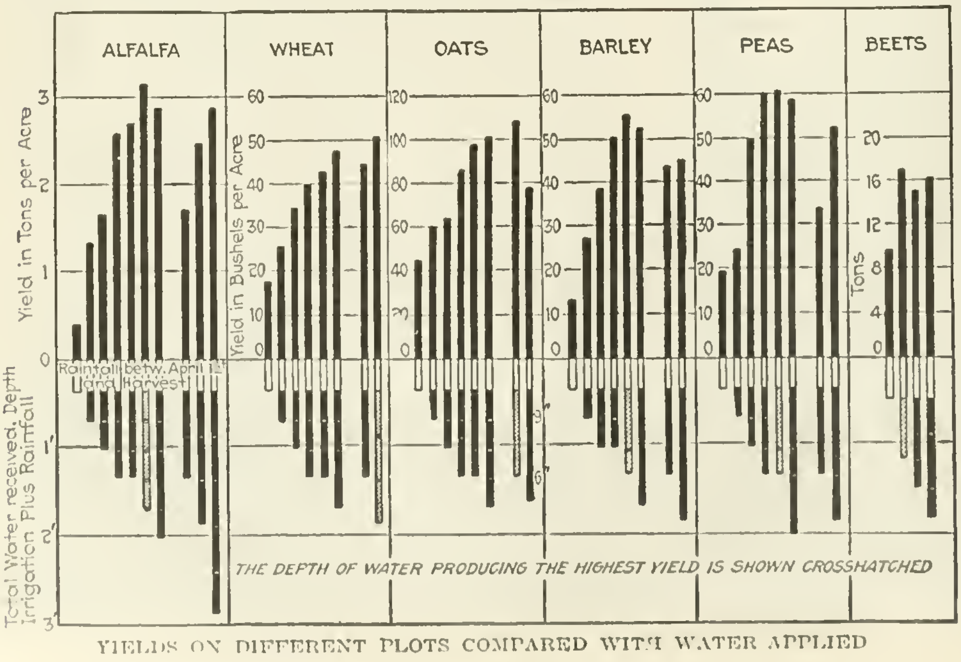
In a few of these upper bay structures piles which have been in service about 40 years were driven with the bark on. These are still intact, although others alongside from which the bark was peeled, have been entirely eaten off at the mudline. However, above the water line the bark is subject to rapid destruction by dry rot and below the water line teredos enter the pile if any abrasion or break in the bark occurs. Hard, fine grained fir piles such as were available 40 years ago were used in the construction of these wharves. The progress of teredos in such piles is much slower than in the rapid-growth soft wood now ordinarily sold for piling. In clear salt water where tidal currents are strong, such as has been the condition in the main channel through the upper bays in the past year or two, the sapwood of fir dolphin piles has been penetrated to a depth of 6 in. in three or four months.

As to the cause of teredo attacks in waters where they have not before appeared, the reasons advanced are that heretofore borers reaching the upper bays have been killed by the annual fresh water floods from tributary rivers. In the past three seasons, however, there has been unprecedented drought, extremely low water and no floods. The dredging and straightening of the channel in the lower Sacramento River, particularly below Rio Vista is also believed to be a factor. As an indication of how conditions have been effected by drought and work on the channel it is pointed out that the tidal currents in Carquinez Strait have very materially increased in recent years and now run as high as eight miles per hour. Thus structures in which borers have heretofore been killed before they were well started, have in recent years been subjected to unrestrained teredo attacks under conditions highly favorable to their rapid development.

Experiments on Duty of Water in Alberta

Abstract of paper read before the Western Professional Meeting, Engineering Institute of Canada, by F. H. Peters, M.E.I.C.

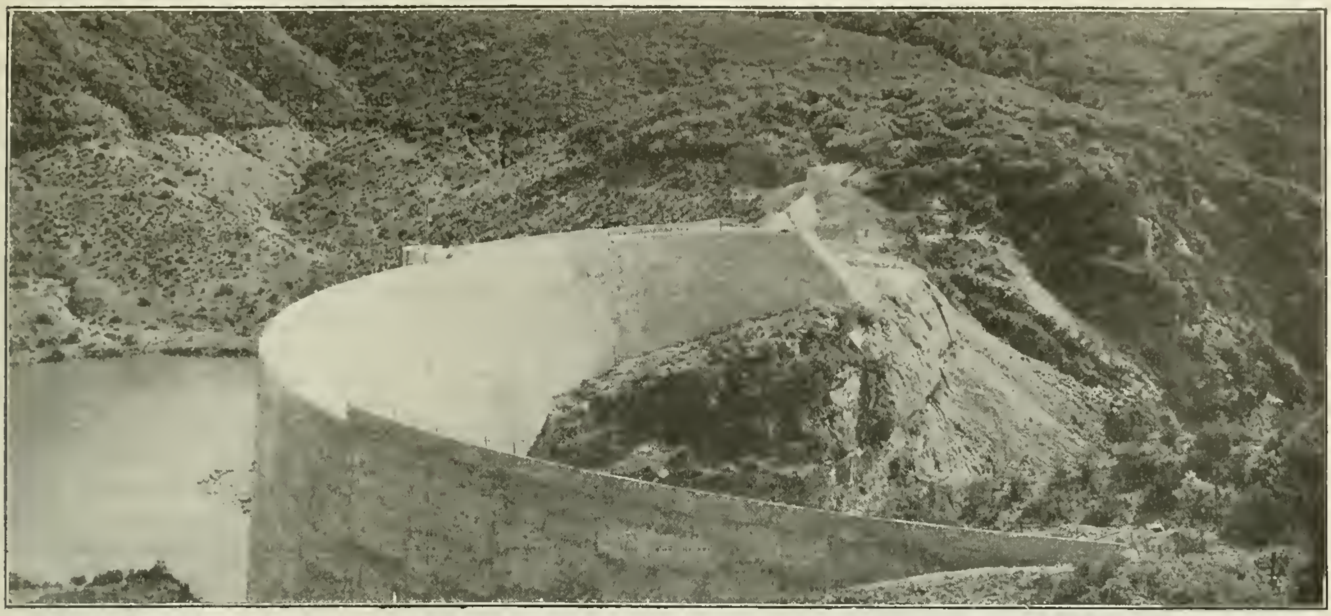
To determine the amount of water which will produce the largest crop yield was the aim of experiments in 1917 by the Irrigation Branch of the Department of the Interior in Western Canada at Ronalane, Alberta, shown in the diagram. The method of carrying on these experiments is such as to give definite and positive results. A piece of land is selected which has consistent characteristics throughout and this is then divided up into a number of smaller plots. To determine the duty of water for wheat, for example, perhaps ten of these plots are sown to wheat. They are then all treated exactly alike except that varying depths of water are applied. The first plot is left dry; the next receives 4 in., the next 8 in., the next 12 in., and so on up to a point where so much water is applied that the yield is actually decreased. This work is checked by determining from soil moisture investigations the quantity of available water in the soils, both in the spring and in the fall of the year. Sometimes with the deeper rooted plants, the plots which do not receive sufficient irrigation water draw on the available moisture which was in the soil in the spring, and conversely with some of the plots that receive large quantities of water, the plants cannot use all of the water supplied and some of it is stored up in the soil. By determining the quantity of water available in the soil in the spring and again in the fall, just what quantity of water has actually been used by the plants during the growing season can be determined. In the alfalfa crop the first group of columns shows the application of 4 in. irrigations, while the second group shows the results from the application of 6 in. irrigations. Similarly for the wheat, oats, barley and peas, the main group of columns shows 4 in. irrigations, while the last two groups in each case show 6 in. irrigations.



YIELDS ON DIFFERENT PLOTS COMPARED WITH WATER APPLIED

Institutions and Their Councils

No one who has given any thought to the elections of Members of Council of our engineering institutions can feel satisfied that they are conducted in the best possible way. In the hands of the councils rest the welfare of the institutions, and it is they who are responsible for such progress as the institutions may make, or for such weakness as they may display. Unless, then, members are content to regard the work of these learned societies as complete when they have conferred upon those who are duly elected and pay their annual tolls the right to put certain symbols after their names, the importance of having the right men on the councils is manifest. Yet what do we find? This, that only from ten to fifteen per cent. of the members return their ballot papers, and that the remainder exhibit no interest whatever in the result. This carelessness about a matter of such great importance is deplorable, and on several occasions we have urged that steps should be taken both to awaken members to their responsibilities and to place the elections on a better footing. Much of the indifference is, we are convinced, the result of ignorance. Members do not know why they should elect certain men in preference to others, and hence either vote for none or, worse still, strike out those names nearest the end of an alphabetical list! We have urged that steps should be taken to inform the electors of certain facts. In the first place, where members of councils offer themselves for reelection some indication of the zealousness with which they have performed their duties during the preceding year should be given, and in the second, where new members are nominated, a brief outline of their qualifications should be presented. We do not think this is all that can be done to give life to the elections, but it is the first and most important step. For its recent election the Institution of Automobile Engineers acted on our suggestion, and, we are glad to know that the result is excellent. The ballot papers contained a brief outline of the qualifications of all candidates for the council and a record of attendances—in percentages—at council and committee meetings. Three candidates who never appeared at council or committee meetings were rejected, and in the two cases where men with poor records for attendances were nevertheless returned we have only to glance at their qualifications to find the reason. We congratulate the institution very heartily on this issue. It is particularly gratifying to us because it verifies our anticipation.—*The Engineer*, London.



Gibraltar Water-Supply Dam at Santa Barbara

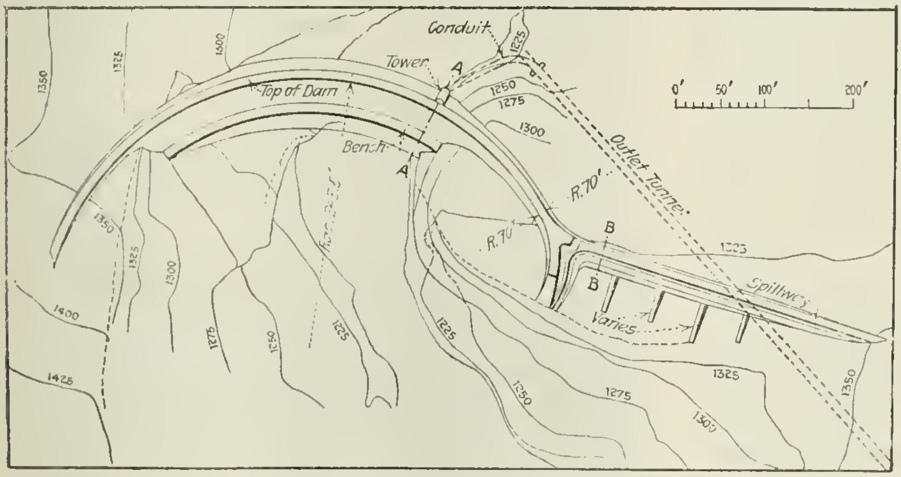
Arched Structure on Santa Inez River Has Artificial Abutment—Surfaces Are Accurately Aligned

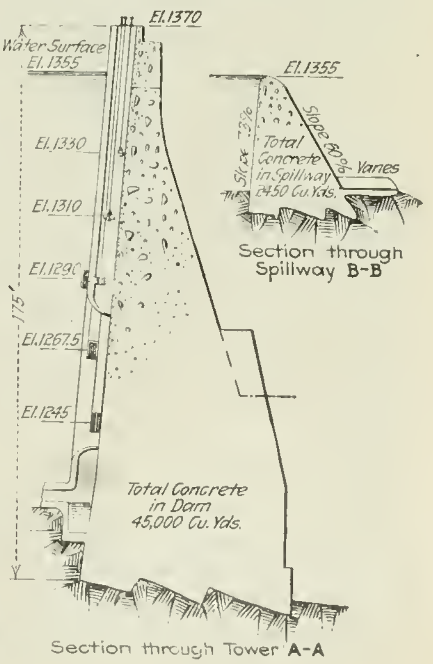
TO PROVIDE storage for its water system the City of Santa Barbara, Cal., has built by contract the Gibraltar dam, an arched masonry structure on the Santa Inez River about six miles east of the city. The damsite is on the far side of a high mountain range through which a 4-mile tunnel, 4 x 6 ft. in cross-section, was driven some years ago to bring water from the Santa Inez River. An account of how all construction equipment and materials for the dam were taken through this small tunnel was published in *Engineering News-Record*, April 3, 1919, p. 681.

The first work at this damsite was done in 1913. At that time the foundations were brought up to the level of the stream bed. The work was resumed on July 8, 1918, when a contract was signed for completing the structure to a total height of 185 ft. above bedrock. The radius on the center line is 238.5 ft. The width varies from 65 ft. at the bottom to 8 ft. at the top and the length, measured along the curve, is 1,100 ft. Because the south wall of the cañon was not high enough, a 3,000-cu.yd. concrete block was poured to take the thrust of the arch on that side. In order to make sure that a solid abutment would be available, this block was placed nearly a year before the main body of the dam was begun. It was pictured and described briefly in *Engineering News-Record*, April 24, 1919, p. 820.

On the side of the artificial abutment away from the cañon an extension of the dam structure in a straight line provides a spillway with its top 10 to 13 ft. below the parapet level, and about 300 ft. in length. The capacity of this spillway is about twice the maximum flood on record. Four concrete vanes parallel with the direction of flow and just below the rollway were put in to prevent the current from cutting across toward the deeper portion of the cañon. The vanes have transverse holes at the lowest point so that the spillway pools, which serve as water cushions, drain out when overflow ceases.

When the water stands at spillway level, it will be 135 ft. deep behind the dam and will form a lake about 4½ miles long containing 16,000 acre-feet. The intake tower, which is built into the upstream face





Section through Spillway B-B

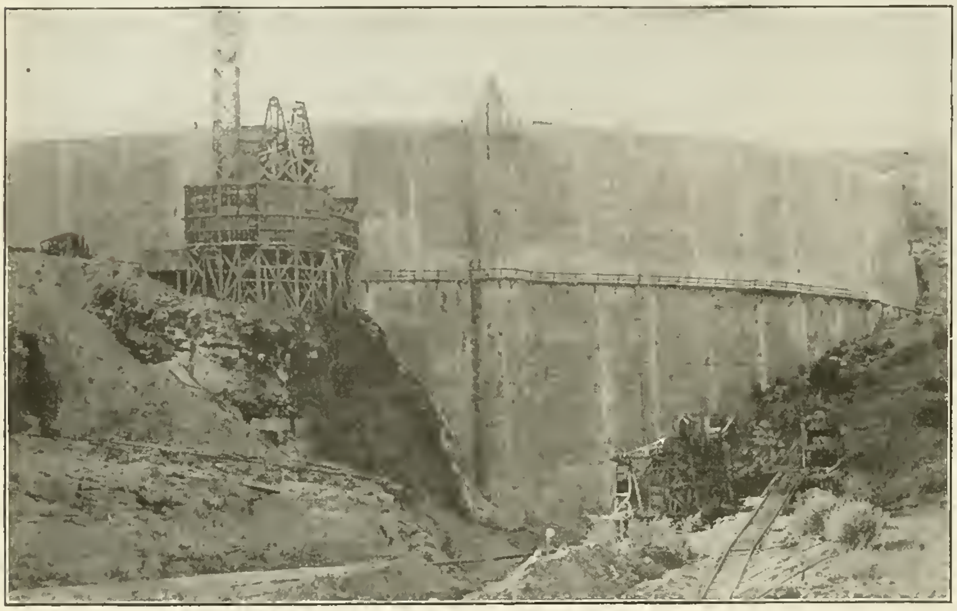
Section through Tower A-A

GENERAL DETAILS OF GIBRALTAR DAM, SANTA BARBARA, CAL.

of the dam, has openings for admitting water at five levels, each opening being controlled by a 16-in. valve operated by a hand wheel from the parapet. Screens for these openings, placed on the outside operate in grooves made in projecting ribs of concrete. From the intake tower in the dam water will be conveyed through a 3½-ft. concrete conduit, 200 ft. long to a 900-ft. tunnel. A measuring weir at the lower end of this tunnel was put in so that the quantity of flow can be conveniently gaged occasionally. Below the weir 1,600 ft. of 3-ft. reinforced-concrete pipe connect the line with the north portal of the 4-mile tunnel.

Rock and sand for the dam were obtained from deposits in the stream bed just above the site by a steam shovel and were loaded in 6-cu.yd. cars which were hauled by a gasoline locomotive to the crushing and screening plant located in the river bottom 200 ft. upstream from the face of the dam. After crushing, screening and washing, the aggregate was transported by a 1½-cu.yd. automatic dumping bucket running on a 1½-in. cable to rock and sand bins on the hill above. The location of these bins and the mixing plant and tower with them was given considerable thought because of the necessity for reaching all parts of the curved structure conveniently from the one point of delivery. By building a 185-ft. tower on top of the south wall of the cañon it was possible to get ground anchorages for cables supporting chutes through which gravity delivery was made to all parts of the work with only one change of the cable anchorage. The chutes were set on an angle of about 3 to 1 and delivery was made for a distance of 400 ft. each way from the tower.

Before concreting was started a reserve supply of 32,000 sacks of cement was brought through the tunnel and stored in a warehouse near the damsite. When concrete was under way the cars carrying 50 sacks each were picked up bodily as they arrived and transported across the cañon to the mixing plant by means of a cableway. The concrete was mixed and delivered to a 30-cu.ft. skip in capacity loads at the rate of one batch per minute, this rate being continued for long stretches at a time without interruption and without cutting the time of mixing below 30 seconds for each batch. Seven men were used in the mixing crew assigned as follows: one man operating bin gates, one man dumping water, operating mixer and giving signals, two men unloading cement from cars, two men dumping cement from sacks into charging hopper, and one man bundling up and tying empty sacks.



UPSTREAM FACE OF GIBRALTAR DAM DURING CONSTRUCTION
Stone crusher in right foreground. Aggregate delivered to concreting plant at left by cableway.

A total of 54,000 cu.yd. was poured in spillway and dam (above streambed level). The work was completed and accepted in eighteen months, although during five months of this time no work was carried on. The stoppage was deemed advisable because during the winter months the rock and sand deposits were ordinarily covered by high water. The contractor was particularly careful in securing alignment of the dam faces during construction, the result being that at no place on the dam is variation from true line greater than one inch. As a result of careful proportioning of the aggregates and handling of the concrete, the exterior surfaces are notably free from irregularities and voids.

When concreting was started, a 4 x 6-ft. opening was left in the lowest portion of the dam. This was sufficient to pass the stream flow during construction. After the work was entirely completed and closure was desired a 4 x 5-ft. gate valve which the contractor happened to have on hand was fitted to a frame around the opening on the upstream face and arranged to be operated by a 3-in. pipe, 150 ft. long, running to a hand wheel on top of the dam. The pipe was held in place by wooden guides fixed to the face of the dam. After the gate was closed, the opening through the dam was concreted from the downstream end. No attempt was made to salvage the gate valve used to effect closure.

Quinton, Code and Hill, Los Angeles, were consulting engineers. The contract was awarded to Bent Bros. and W. A. Kraner, having supervision of the work. C. W. Hamilton and M. H. Slocum were resident superintendents.

Water and Moist Air for Absorption Tests

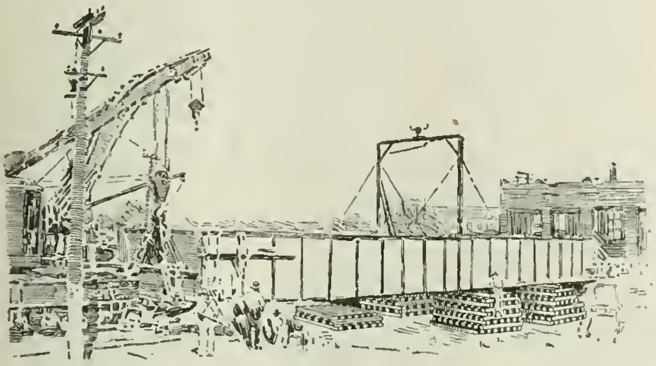
Exposure to moist air has been found just as severe a test as immersion in water, in testing the absorption of moisture by wood through varnish and other coatings. In tests made recently at the Forest Products Laboratory, birch panels with various coatings were tested by exposure to moist air (95 to 100% humidity) and water, respectively, for periods of 17 days. The weight gained from the moist air exposure was practically identical with that gained in the water immersion; for example, a coating consisting of a filler plus three brush coats of spar varnish allowed 12.60 grams of water to pass per square foot of surface in water exposure and 12.25 grams in moist air exposure.

Lifting a Turntable Out of Its Pit Without Jacking

By G. T. Kuntz
Assistant Engineer, Union Pacific R.R., Junction City, Kansas

A ONE hundred-ton turntable, 92 ft. long, for the new round house of the Union Pacific R.R. at Junction City, Kan., was moved Sept. 12, 1919, from an old to the new location, 1,600 ft., between 10 a.m. and 8 p.m. Speed in raising the turntable out of the old pit, was obtained by lifting one end with a 100-ton wrecking crane and rocking the other end over two cribs of ties.

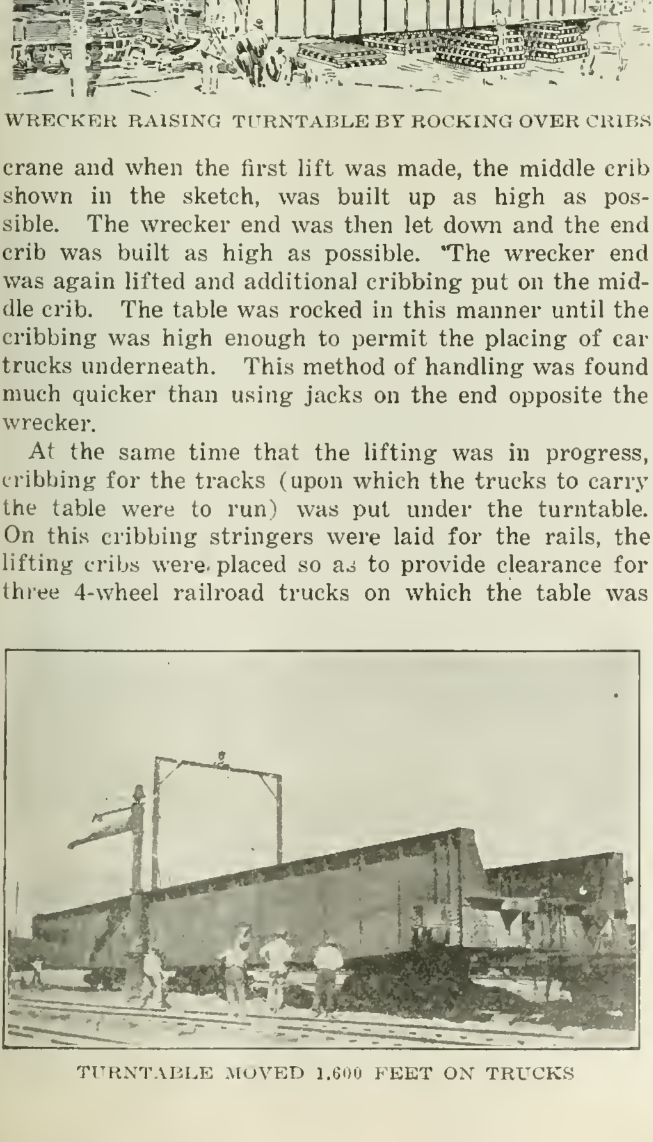
Cribbing at the new site was completed several days before moving the old turntable. Also all ties and timbers necessary had been brought to the site. The motor and cab were removed for overhauling while the moving operation was taking place.



WRECKER RAISING TURNTABLE BY ROCKING OVER CRIBS

The table was lifted up at one end by the wrecking crane and when the first lift was made, the middle crib shown in the sketch, was built up as high as possible. The wrecker end was then let down and the end crib was built as high as possible. The wrecker end was again lifted and additional cribbing put on the middle crib. The table was rocked in this manner until the cribbing was high enough to permit the placing of car trucks underneath. This method of handling was found much quicker than using jacks on the end opposite the wrecker.

At the same time that the lifting was in progress, cribbing for the tracks (upon which the trucks to carry the table were to run) was put under the turntable. On this cribbing stringers were laid for the rails, the lifting cribs were placed so as to provide clearance for three 4-wheel railroad trucks on which the table was moved, but the third truck was not required. The trucks were fitted with heavy oak bolsters attached in such a manner as to allow the bolster to turn freely. As soon as the cribs were built up to clear the height of the trucks, the trucks were pushed under the table and the full weight was transferred to them. An engine then hauled the table to its new location, through several switches and around two sharp curves, but no difficulties were encountered. The table was lowered into its new position by the same method used to raise it.



TURNTABLE MOVED 1,600 FEET ON TRUCKS

As soon as the table had been taken out of the old pit, the center casting was removed by a long boom derrick and carried over to its new location, at the same time that the table was being moved by the locomotive. To allow the center casting to be placed quickly, the cribbing at the new site extended to within 4 ft. of each side of the center, and the gap was spanned by three 18 x 16-in. stringers placed under each rail.

Technical Control of Filters in Ohio

OHIO has fifty-one filter plants with a total daily capacity of 502,000,000 gal. Twenty-one are under constant supervision of a technical superintendent, twenty-two have intermittent technical supervision and eight have no technical supervision or analytical control. The State Board of Health, according to W. H. Dittoe, chief engineer, in a paper before the American Public Health Association, received reports from 47 of the plants including four of the last class. The eight plants which receive no technical supervision vary in daily capacity from 100,000 to 800,000 gal. Of the nine disinfection plants, eight are under technical supervision with analytical work to check efficiences.

The experience of the Department in connection with the control of operation of water purification plants has led to the adoption of certain guiding principles which are as follows:

1. Every filtration or disinfection plant should have some degree of technical supervision, and filter plants having capacities of 1,000,000 gal. per day or more should be under daily technical supervision. The superintendent of filtration, whether employed constantly or intermittently, should be given full authority over the plant and other plant employees. As the problem is principally plant operation and maintenance, the employment of an analyst to examine samples and act in a merely advisory capacity does not provide efficient supervision.

2. The superintendent of filtration should be qualified by training in water supply engineering, chemistry and bacteriology, and, when employed for the larger plants, should have had experince in the operation of a smaller one. In rare instances it is possible for a man to become qualified by experience without fundamental technical training.

3. In passing upon the operating results of a water purification plant the efficiency of each individual process should be considered independent of the next succeeding process. Coagulation must be efficient to prevent excessive load on filters. When daily technical supervision is not provided, a factor of safety must be furnished by using constantly a quantity of coagulant as specified by the department in excess of that which would otherwise be required. The rate of operation of gravity rapid sand filters should not exceed 125,000,000 gal. per acre daily, and if this rate is exceeded filter efficiency suffers. Disinfection should be applied to filter effluents and must be a true factor of safety.

4. The final effluent of the purification plant must show negative presumptive tests for B. coli in at least 80 per cent of all samples collected throughout the month. If the construction of the purification plant will permit, this standard is applied to effluent of filters before disinfection, in which case disinfection becomes a true factor of safety.

Triangulation Simplified By Army Co-ordinate System

By H. A. Foster
Former Second Lieutenant, 29th Engineers, U. S. Army

A DESCRIPTION of the U. S. Army Engineers' adaptation of French military methods of applying to surveying and mapping a system of rectangular co-ordinates based on the Lambert conformal conic projection was given in a previous article in *Engineering News-Record*, May 13, 1920, p. 962. An explanation will be given here of four methods of computation which were utilized in applying the system to triangulation, and which greatly simplify the latter operation. They are the *intersection*, the *three-point*, the *resection* and the *approximate orientation* methods.

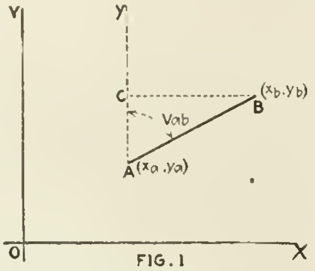


FIG. 1

First, to derive necessary equations for finding Y-azimuths and distances, consider two points, *A* and *B* (Fig. 1), joined by the line *AB*. The co-ordinates of *A* are x_a, y_a; and those of *B* are x_b, y_b. Now the Y-azimuth of the line *AB* is its inclination to the Y-line through *A*, measured clockwise around the circle from the north. It is generally called V_{ab}. It can be seen that the Y-azimuth of the line *BA*, or V_{ba}, is equal to 180° + V_{ab}.

Let *Ay* be the Y-line through *A*. In the right triangle *ABC*,

$\tan CAB = BC/AC = (x_a - x_b)/(y_a - y_b)$, or

$$\tan v_{ab} = \frac{(x_a - x_b)}{(y_a - y_b)} \qquad (1)$$

When the differences $(x_a - x_b)$, $(y_a - y_b)$ are taken in magnitude without regard to sign, the angle *v* thus computed is the small angle by which line *AB* is inclined to the Y-line. The Y-azimuth is easily derived from angle *v*, if the respective positions of *A* and *B* are noted.

In Fig. 1, let *D* equal the distance from *A* to *B*. Then,

$$D = \frac{x_a - x_b}{\sin v} = \frac{y_a - y_b}{\cos v} \qquad (2)$$

Suppose the instrument has been set up at a known point—a point whose co-ordinates are already known—and a set of readings has been taken on several other points, one of which is also known. The Y-azimuth from the instrument to this other known point can then be computed by means of eq. (1). Also the Y-azimuths to all of the unknown points may be determined by means of the angles observed between the known point and the unknown points.

In triangulation the simplest way to locate a new point is to take sights on it from several known points—the *intersection method* of location. The sights if plotted to a large scale would appear as a group of intersecting lines which form a small polygon. The most probable position of the new point will then be somewhere within this polygon of error.

The principal characteristic of the method of computation to be described here is the use of an approximate point. Instead of taking the angles as observed, and making a direct analytical solution of the problem, we make a preliminary graphical solution, by actually plotting the known points and observed angles to a small scale, the intersection of the several plotted sights locating the unknown point. The co-ordinates of this point are then scaled off as accurately as the scale of the plotting will permit. These co-ordinates define a certain point on the map, which is near the true position of the unknown point, and hence is called the "approximate point." The next step is to compute the corrections to be applied to the co-ordinates of the approximate point in order to obtain the true co-ordinates of the desired point. Let us call *A* (see Fig. 2) the approximate point and *O* the desired point and let *M* be one of the known points from which *O* has been sighted. First compute the Y-azimuth of the *observed* direction, *MO*, by means of the reading on *O* as described above, which is V_o, or the angle *yMO*. The Y-azimuth from *M* to the approximate point *A* may be calculated by means of eq. (1), since the co-ordinates of both *M* and *A* are *known*. This gives V_a, which is the angle *yMA*.

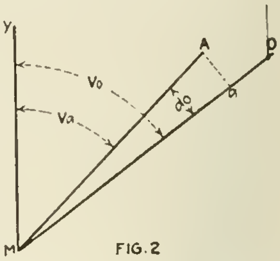


FIG. 2

Now from *A* drop a perpendicular, *Aa*, to the line *MO*. The angle *AMa*, or *do*, is equal to $V_o - V_a$. Then we have, in the triangle *AMa*, $Aa = MA \cdot \sin do$. The distance *MA*, or *D*, may be calculated from the co-ordinates of *M* and *A*, eq. (2). If *do* is less than three degrees, we can replace sin do by *do* (in minutes) x sin 1′, or dó sin 1′.

Hence, letting $Aa = q$,

$$q = D \text{ dó} \sin 1'. \qquad (3)$$

Now let us draw a sketch showing the area in the vicinity of *A* and *O*, to as large a scale as possible—such as 1:100. By means of the distance *q*, and the Y-azimuth V_o, we can plot the line which represents the sight from *M* to *O*. The true position of *O* will then be somewhere on this line, which is therefore called the "locus" for the observation from *M*. Such a locus can be drawn for each intersection observation taken on the desired point from the other known points. The common intersection of these loci gives the desired point *O*. From the co-ordinates of *A* the co-ordinates of *O* may be determined by scaling from the large-scale sketch the differences in their *X* and *Y* co-ordinates.

The intersections of the above loci, however, usually give a triangle or polygon of error, due to discrepancies in the original observed angles, or in the co-ordinates of the known points. If the loci when plotted on the large-scale sketch intersect in a polygon, the most probable position of *O* within this polygon is derived from examination of the quantities *D* sin 1′ dó. The term *D* sin 1′ represents the displacement of the locus under consideration when the Y-azimuth changes by 1′. Hence the relative "sensitivities" of the loci may be considered as being proportional to the distances from the known points to the desired point. Suppose, for instance, in Fig. 3, that

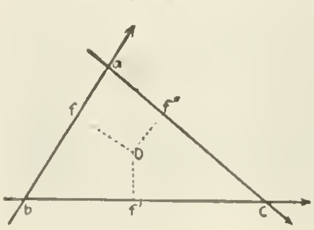


FIG. 3

the triangle of error, *abc*, is obtained. The problem is to locate O in such a manner that the perpendicular distances to the loci will be respectively proportional to the sensitivities of the loci; or so that

$$of/D = of'/D' = of''/D'',$$

where D, D' and D'' are distances from A to the known points, from which observations were taken. The graphical location of O may be made by replacing the triangle of error by a smaller similar triangle within, its sides distant from the original loci by amounts respectively proportional to D, D' and D''.

Fig. 4 shows such a sketch. A is the approximate point, and O is the true position of the new point.

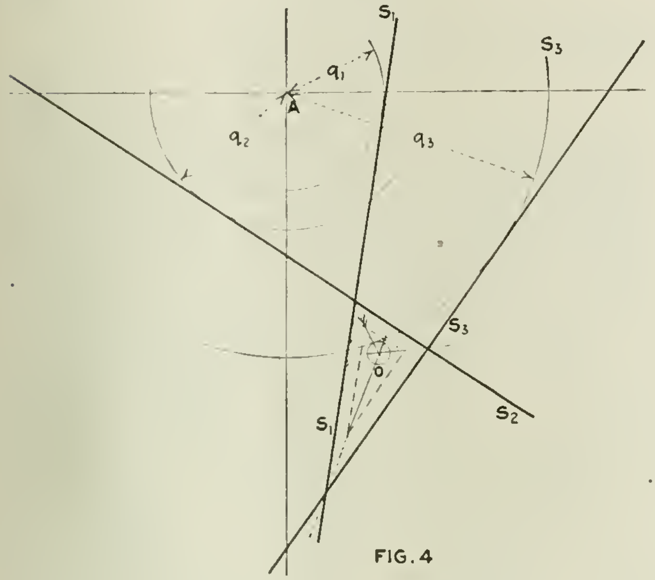


FIG. 4

Sights have been taken upon O from the known points S_1, S_2 and S_3—(which are not shown on the sketch). The corresponding loci are plotted by means of the distances q_1, q_2 and q_3, and the respective Y-azimuths of the three loci. The correct position of the point O is found in the triangle of error as described above. The differences between the co-ordinates of A and O—i.e., dx and dy—are scaled from the drawing, and the co-ordinates of O are computed from those of A. Thus, in the figure,

$$x_a = 29395.0 \qquad y_a = 444417.0$$
$$dx = \underline{\quad +1.0} \qquad dy = \underline{\quad -2.7}$$
$$x_o = 29396.0 \qquad y_o = 444414.3$$

If the instrument has been set up at an unknown point, and observations are taken on three or more known points, the new point is located by the *three-point* method. Thus, in Fig. 5 M and N are two known points which have been sighted from O, and α is the observed angle. Then O will lie somewhere on the circumference of the circle *MON*, whose radius is determined by the fact that the chord *MN* must subtend the angle α. The arc of this circle in the vicinity of the correct position of O is a locus for the point O, determined by the angle α. The intersection of several of these loci will give the correct position of the unknown point.

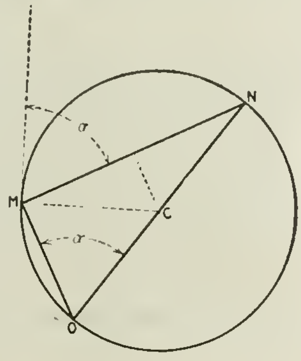


FIG. 5

In this method, as in the intersection problem, we make use of an "approximate point," A, in order to determine the true co-ordinates of the desired point, O. We now consider the graphical methods of determining the approximate point.

1st Method—Two circles can be plotted, one being the locus of all points which will subtend the observed angle *MON*, and the other the locus of all points which will subtend the observed angle *NOP*. Each circle may be drawn as follows: at M, lay off the observed angle *MON*, as the angle α; to the line thus determined draw a perpendicular at M, intersecting the perpendicular bisector of *MN* at C; construct a circle with radius *MC*, and center C. Any point on this circle will subtend the observed angle *MON* between stations M and N. Similarly, draw another circle, using stations N and P or M and P. The point desired, that is, the approximate point A, lies at the intersection of the two circles.

2nd Method—Suppose α to be the measured angle between M and N, and β to be the measured angle between N and P; M, N and P are the known points. As in Fig. 6, draw *MS* perpendicular to *MN*, and *PR* perpendicular to *NP*. Draw *NS* making the angle *MNS* equal to $(90° - \alpha)$. Draw *NR* making angle *PNR* equal to $(90° - \beta)$. These two lines interesct *MS* and *PR* in S and R. Draw *RS*. Draw *NA*, from N perpendicular to *RS*. Then A represents the approximate point. *Proof*—Suppose m, n and p, Fig. 7, to be plotted from known points, and suppose a, the approximate point, to be already located. Suppose circles *mna* and *npa* to be drawn. Draw *ms* perpendicular to *mn*, cutting the circle at s, and draw *pr* perpendicular to *np* cutting the other circle at r. Draw *as* and *ar*. Since *smn* and *npr* are right angles, *ns* and *nr* are diameters. Hence angles *nas* and *nar* are right angles, and *sar* is a straight line.

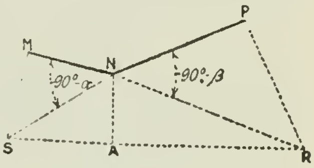


FIG. 6

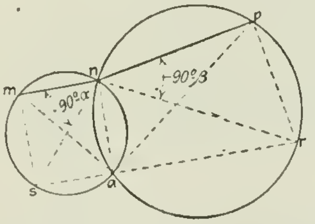


FIG. 7

Now angle *man* $= \alpha$ and *nap* $= \beta$; therefore *mas* $= 90° - \alpha$ and *par* $= 90° - \beta$.

But angle *mas* = angle *mns* and *par* = *pnr*. Hence, *mns* $= (90° - \alpha)$ and *pnr* $= (90° - \beta)$. Therefore the construction described for locating point a is geometrically correct.

Determination of Point by Three-Point Method.—Sights have been taken from O, the desired point, to known stations M, N, P, *etc.* An approximate point is first found graphically and definite co-ordinates x_a and y_a assumed for the point A. Next the observations are considered in pairs, as for instance, the two known points M and N. The problem is to draw a locus containing O by means of a distance computed from A. This locus is drawn on a large-scale figure. The same operation is performed with the observations on N and P, giving another locus which intersects the first one in the desired point. Then the values of dx and dy, or the amounts to be added to x_a and y_a to obtain the co-ordinates of O, are scaled from this large-scale drawing. In case a check is made, or several three-point problems observed, a point O is chosen from the triangle or polygon of error as explained later.

Now in Fig. 8, a, m and n represent the assumed point A and the known points M and N, the co-ordinates of which are known. Suppose a circle described through m, n and a. (This circle is in this figure only for demonstration. In the large-scale sketch only the point A and the loci are plotted, as of course the points M and N would be off the sketch). Through a, draw a tangent at. Suppose o to be the location of the desired point. The problem now is to compute the displacement ai of the circle, so that the tangent or the circle—they coincide in the large-scale sketch—will pass through o. Also, as points a and o are close together, tangent $t'o$ to circle nmo may be considered as parallel to at.

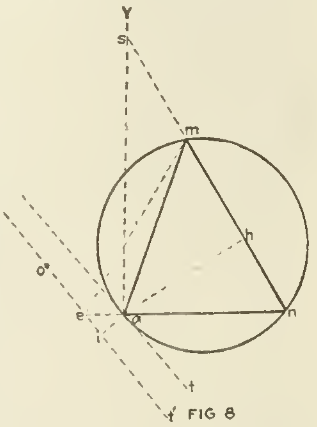


FIG 8

Draw ah perpendicular to mn, and ai perpendicular to at and ot'. Prolong na to meet ot' in e, and draw em. Now, in the triangles amh and aei, the angle aei (= angle nat) is measured by arc $na/2$ as is angle amh, as well. Also the triangles are right triangles and therefore are similar. Hence,

$$ai/ah = ae/am \quad \text{or} \quad ai = ah \times ae/am$$

or q, the displacement desired, equals $ah \times ae/am$.

Now consider the triangle aem;

$$am/\sin aem = ae/\sin ema. \tag{4}$$

But we have assumed that the circle mon coincides with the tangent, ot', in the vicinity of o, when the sketch is to a large scale. Therefore the angle men is equal to angle mon, being measured by one-half the same arc in the same circle.

Angle men = angle $mon = R_n - R_m$, where R_m and R_n are the readings of the instrument at O, on M and N respectively.

Call $R_n - R_m$ the observed angle, O. Then, angle $men = O$. Hence $\sin aem = \sin O$; and by eq. (4),

$$am/\sin O = ae/\sin ema \tag{5}$$

Now, angle man = angle ema + angle mea,
or angle ema = angle man — angle mea

$$\begin{aligned} &= \text{angle } man - O \\ &= (Y_{an} - Y_{am}) - O \\ &= V_{an} - V_{am}) - O \end{aligned}$$

V_{an} and V_{am}, the Y-azimuths from A to N and M respectively, are easily computed since the co-ordinates of A, N and M are known, from the formula of eq. (1).

Call the angle ema, d_o. Then, $do = (V_{an} - V_{am})$. — O.

Now, $q = ah \times ae/am$ (from above)
or calling $ah = h$, $q = h \times ae/am$.
But from eq. (5) above, $ae/am = \sin ema/\sin O$.
Hence, $q = h \sin ema/\sin O = h \sin do/\sin O$.
or, when do is small,

$$q = \frac{h}{\sin O} \sin 1' \, do \text{ (in minutes).} \tag{6}$$

Next, work out another formula for h. In triangle amn, $am/\sin mna = mn/\sin man$.
Call $am = d$; $an = d'$; $mn = D$.

Then, $d \sin mna = D/\sin man$,
or $d/D = \sin mna/\sin man$. Multiply by d'.
Then, $dd'/D = d' \sin mna/\sin man$,
or $dd'/D = h/\sin man$. (7)

Now, from above, angle man = angle $ema + O$
$= do + O$.

Hence, $\sin man = \sin do \cos O + \cos do \sin O$.
But, when d_o is very small, $\sin do$ = zero; and $\cos do = 1$ (approximately).
Hence, $\sin man = \sin O$.
Substituting this in eq. (7) above gives

$$\frac{dd'}{D} = \frac{h}{\sin O}. \tag{8}$$

Substituting Eq. (8) in Eq. (6) gives

$$q = \frac{dd'}{D} \sin 1' \, do'. \tag{9}$$

This formula gives the required value of the displacement of the circle; and since the circle and its tangent coincide near O for the large-scale sketch, the locus containing the required point is a line whose distance from A is given by the above formula for q. Values d, d' and D are easily found from the co-ordinates of M, N and A; and do, equal to $(V_{an} - V_{am}) - O$, is easily found since O is measured and V_{an} and V_{am} can be found from the co-ordinates of M, N and A.

The distance from A to the line containing O is then computed. It remains to find its direction. It should be remembered that, since o and a are close together, we may consider at and ot' parallel.

$$\text{Angle } Yat = Yan + nat = V_{an} + amn.$$

Produce nm to meet aY in s.
Then, $amn = asm + sam = asm + V_{am}$.

$$\begin{aligned} \text{Hence,} \quad \text{Angle } Yat &= V_{an} + V_{am} + \text{angle } asm \\ &= V_{an} + V_{am} + (180^\circ - V_{mn}) \\ &= V_{an} + V_{am} - V_{mn} \end{aligned}$$

Calling angle Yat, the Y-azimuth of the tangent at, V_s, we have

$$V_s = V_{am} + V_{an} - V_{mn} \tag{10}$$

The three Y-azimuths V_{am}, V_{an} and V_{mn} may easily be computed from the co-ordinates of M, N and A.

Remarks—(1) When the point O is determined by the intersection of several of these lines, the point is finally chosen from the triangle or polygon of error. This is done remembering that since

$$q = \frac{dd'}{D} \sin 1' do',$$

the sensitivity of any of these lines is

$$\frac{dd'}{D} \sin 1',$$

which is the change in q for a change of 1′ in do. Obviously, the sensitivities of loci are directly proportional to their respective values for dd'/D.

(2) To check the computations, if there are three known points only, three loci may be obtained by choosing three of the different pairs of known points. For instance, if the known points are M, N and P, by taking the angle on M and N one locus is obtained; on M and P another; on N and P a third. If the work is correct these three lines should intersect in a point, for the three points M, N and P are only sufficient to locate the desired point without check.

(3) The position of the locus relative to the approximate point (that is, the side of the circle of radius q on which the locus is plotted) must be determined by examination of the plotted positions of the known points. Determine by inspection the location of the center of the circle through the two known points, M and N, and the approximate point A. Let O be the angle observed at the true point, between M and N; and let C be the computed angle at A between M and N ($C = V_{an} - V_{am}$).

Then if C is greater than O, the locus will lie on the side of A away from the center. If C is smaller than O, the locus will lie on the side of A toward the center.

THE RESECTION METHOD

The resection method is a combination of the intersection and three-point problems. Sights have been taken to known points from the desired point O, which has also been sighted from other known points. The location of the approximate point is graphically obtained. The "intersection" loci and the "three-point" loci are determined as explained above and are plotted on the same sketch. The correct position of the desired point is chosen in the polygon of error, after considering the sensitivities of the several loci.

Fig. 9 illustrates the use of the resection method. M, N, P and Q are known points, and O is the desired point. M and N have been sighted from O, and the circle through M, N and O is a locus for the desired point. O has also been sighted from P and Q. Hence we have two intersection loci and one three-point locus, and the point is located with one check. The solution of this particular example by ordinary methods would be rather inconvenient, but by this method, it is very simple.

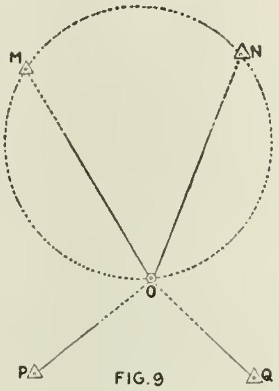


FIG. 9

Eccentric Stations—In the location of a point by resection, it may happen that the instrument cannot be set up over the desired point—the "signal"—but must be moved to an eccentric point nearby, from which the observations are made. However, sights to this station from other known points are made on the *signal* and not on the eccentric point. In performing the computation for such a case, we first determine an "approximate point" for the *signal* by plotting the intersection observations on the small-scale diagram. Let the true position of the signal be C, and the approximate point for the signal be A_1. Also let S be the true position of the eccentric point, or the position of the instrument. Having determined the co-ordinates of the approximate point A_1 from the plotting board, it is necessary to compute the co-ordinates of a corresponding approximate point for S, the eccentric station. Call this approximate point A. These two points A and A_1 are only approximate points for S and C. But the *differences* between the co-ordinates of A and A_1 are correct, and are the actual differences between those of S and C.

In Fig. 10, S is the eccentric station where the resection angle is taken. C is the signal observed upon by intersection. M is a known point sighted from S:

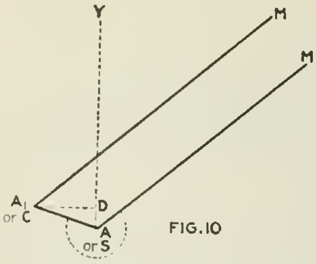


FIG. 10

If SC be small, V_{sm} may be considered equal to V_{cm}. V_{cm} may be computed from known co-ordinates of M and A_1. Therefore V_{sm} is known. Formulas will be deduced for the difference betwen the co-ordinates of S and C, or A_1 and A. Suppose the reading on C to be r_o and on M to be r, and let L = ecc. distance = SC.

$$\begin{aligned} V_{sc} &= V_{sm} - (r - r_o). \\ dx = CD &= SC \sin CSD \\ &= L \sin V_{sc} \\ dy = DS &= SC \cos CSD \\ &= L \cos V_{sc}. \end{aligned}$$

Then if we are computing the co-ordinates of S from those of C,

$$\left.\begin{aligned} x_s &= x_c + dx \\ y_s &= y_c + dy \end{aligned}\right\} \text{ or } \left\{\begin{aligned} x_a &= x_{a_1} + dx \\ y_a &= y_{a_1} + dy \end{aligned}\right.$$

Having the co-ordinates for the two approximate points, A_1 and A, the resection computation is then carried through as follows:

N and P being two known points sighted from the eccentric point S, we compute a locus containing S from the angle observed between N and P, by the ordinary three-point method of computation, using approximate point A. If the signal, C, has been sighted from the known point M, another locus containing S is determined by computing the displacement q, using A_1 as the approximate point, and then drawing the locus as if it had been computed for the approximate point A. The intersection of these two loci gives the location of S on the sketch. Then dx and dy, scaled off and added to the co-ordinates of A, give x_s and y_s, the desired co-ordinates of S.

To show why the procedure described above is used the following explanation is given. (See Fig. 11.) The approximate points A and A_1 are plotted in their correct relative positions.

Using A_1 as the approximate point for C, A_1O_1 is computed as the displacement to the *intersection* locus, for the angle observed at M, say. OP is this locus, and the correct position of C is somewhere on it, as shown in the figure. Draw O_1R parallel to A_1A, and drop AO perpendicular to OC, cutting O_1R at R. Then AA_1O_1R is a parallelogram, and O_1R is equal to A_1A.

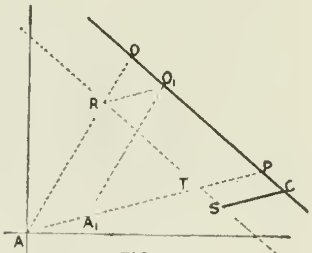


FIG. 11

Now draw RS parallel to OC, and draw CS parallel to O_1R. Then CS is parallel and equal to A_1A. And therefore S is the correct position of the eccentric point, if C is the correct position of the signal. In other words, RS is a locus containing S.

But $AR = A_1O_1$. Hence the *Locus RS containing S* would have been obtained if we had plotted from A, as the approximate point, the displacement A_1O_1. Then on a large-scale sketch, with A plotted and A_1 not plotted, we can draw loci as follows containing S: Any three-point locus, computed as usual with A as the approximate point. Any intersection locus, with observation made on C, the displacement having been computed from A_1 but plotted from A on this sketch.

The desired point S should be chosen from the triangle or polygon of error, by weighting the loci by the ordinary methods for intersection and three-point problems.

This method of treating the eccentric station computation is very useful, for it eliminates the necessity of reducing the observed angles to what they would have been if the measurements had been made at the center, as is generally done in this country.

Suppose angles are measured by the three-point method at point O, with observations on M, N and P. (Fig. 12.) Obtain a point as near O as possible, by one of the graphical methods already given for finding the approximate point in the three-point problem. Call this point A. With its coordinates of one of the known points, say M, we may compute the Y-azimuth, V_{ma} or V_{am}. Using this value of V_{am} as an approximate value, V^1_{om}, for the Y-azimuth from O to M, compute from the observed angles approximate Y-azimuths to N and P, giving V^1_{on} and V^1_{op}. It is to be remembered that if Y-azimuths had been *computed* from A to M, N and P, they would not differ by these observed angles. Also notice that each of the three approximate Y-azimuths found as stated above differs from its true value by a constant amount, namely the difference between the Y-azimuths V_{am} and V_{om}, the latter being unknown. From these, we know the azimuths in the opposite directions over the lines. That is, we have *approximate values* V'_{mo}, V'_{no} *and* V'_{po}, the first being V_{ma} and the others being in error by the difference between V_{ma} and the true value of V_{mo}, which is unknown. With these three approximate values V'_{mo}, V'_{no} *and* V'_{po}, compute three loci, using the approximate point A and following the intersection method. Note that, since the approximate value of V_{mo} is equal to V_{ma}, the displacement, q, for the first locus will be zero.

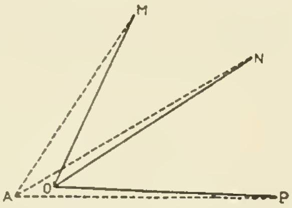


FIG 12

These three intersection loci will give a triangle of error for O on the large-scale sketch. However, the two three-point angles furnish no check; and the triangle of error results *solely* on account of the difference between V_{ma}, approximately V_{mo}, and the true value of V_{mo}, or the error in the assumed orientation. Changing V_{ma} by a certain value simply amounts to changing the approximate Y-azimuths V'_{mo}, V'_{no} and V'_{po} by a constant amount. Hence, from the triangle of error, the point O is determined by moving each locus by an amount proportional to its sensitivity (or proportional to D), all being moved in directions corresponding to changes in the approximate values V'_{mo}, V'_{no} and V'_{po} in the same direction, the movement being such as to reduce the triangle of error to a single point. This then will be the true point O determined from the two angles without check.

This method corresponds exactly to the three-point location as determined with a plane-table. The use of an approximate Y-azimuth, V'_{mo}, corresponds to the approximate orientation of the plane-table, and the selection of the final point in the triangle of error is performed in the same manner as on the plane-table.

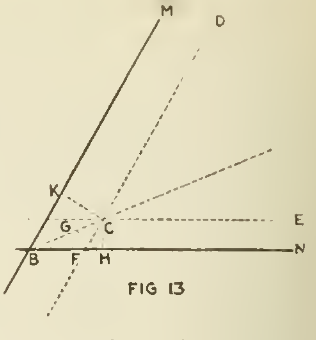


FIG 13

Now consider how to use this method in connection with ordinary intersection observations; that is, in resection. Let Fig. 13 represent a portion of the large scale adjustment sketch. BM is the locus determined from M, and BN is the locus determined from N by the approximate orientation method described above. Now the sensitivity of any intersection locus, proportional always to the distance from the known point to the approximate point, is likewise proportional to the distance the locus would be moved if the azimuth of the observed line were changed by a certain amount. Suppose we change our original orientation by a certain arbitrary amount, thereby changing V'_{mo}, V'_{no} and V'_{po} by the same amount. Then locus BM is transposed parallel to itself to some position like CD, and BN to CE, the distances CK and CH by which the two loci are transposed being proportional, respectively, to the relative sensitivities, or to D_{am} and D_{an}. Draw BC.

Now, in changing the original orientation, the Y-azimuths of both of the loci have been changed by the same amount, and hence, the angle between them has not been changed. Therefore BC is the locus of all the points at which the same angle would be observed between the two known points M and N. In other words, BC is the three-point locus for the angle observed at O between M and N. The sensitivity of this three-point locus is found as follows:

Let F be the point at which CD intersects BN. Draw FG perpendicular to BC. Now F represents the point to which B would be moved if the observed Y-azimuth for the intersection locus BM were changed without changing the Y-azimuth for BN. This amounts to changing the value of the original angle observed between the two known points M and N by the same amount by which the observed Y-azimuth for the locus, BM, was changed. Therefore F is a point through which the three-point locus, BC, would pass if the observed angle were changed by the given amount, and FG represents the distance by which the three-point locus would be transposed. Therefore FG represents the sensitivity of the three-point locus, and is measured on the same scale as CK and CH.

For example, suppose $D_{ma} = 7{,}000$, and $D_{na} = 6{,}000$. Suppose we make KC equal to some arbitrary distance like 14 mm., which is convenient. Then HC must be made equal to 12 mm. in order that BM and BN may be transposed by distances proportional to their sensitivities. These transpositions would result by changing V'_{mo} and V'_{no} by the same amount, or in other words by changing the approximate orientation by a certain amount, this amount being something which we neither know nor wish to know. Then if we find FG equal to 8 mm., we know that the relative sensitivity of the three-point locus BC, is equal to 4,000. In other words, the relative sensitivity of the three-point locus is equal to

$$\frac{D_{na}}{CH} \times GF, \text{ or to } \frac{D_{ma}}{CK} \times GF.$$

The three-point locus can now be used in connection with any intersection locus. A locus determined by an intersection observation from *P*, for instance, would be plotted, and its relative sensitivity would be taken as D_{pa}; and the three-point locus would be combined with the intersection locus, as in the resection method.

In Fig. 14 is shown an example of the plotting for this method. In this example, the known points *M*, *N*, *P* and *Q* were sighted from the unknown point. An approximate Y-azimuth for *OQ* was computed from the co-ordinates of the approximate point *A*, and the several loci *MM*, *NN*, *PP* and *QQ* were determined as described above. Then these loci were transposed to their dotted positions. The displacement of the locus *MM*, for example, was proportional to the distance *MA*. Then the corresponding *three-point* loci, shown in heavy lines were drawn. These all intersected in a common point, *O*; and there was no polygon or error. But if there had been a polygon of error, the *three-point* loci would have, themselves, been transported by amounts proportional to their sensitivities. For example, the sensitivity of the locus *M-Q* is proportional to the distance *ab*. In this example, no direct intersection loci are given. But if there had been intersection observations, their loci would have been computed by the regular method, using the approximate point *A*. Then these loci would have been combined with the three-point loci, such as *M-P* and *M-Q*.

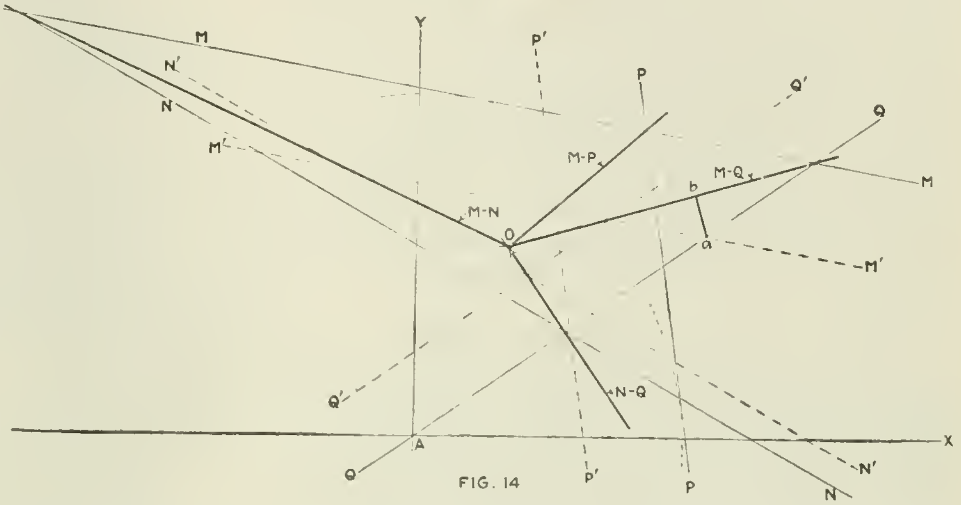


FIG. 14

In the foregoing discussion, the simple intersection and three-point methods are the easiest to understand and to use. The resection method is merely a combination of these two, with certain modifications in the case of an eccentric station. The approximate orientation method is the most difficult to understand—the sketch which must be plotted is more complicated than in the simple three-point method—but the actual amount of computation involved is considerably less, and after a little practice it would probably be considered the most desirable one to use.

TABLE I. REPRESENTATIVE TRAVERSE CIRCUITS ON THE SURVEY AT FLINT, MICH.

Distance Around Circuit, Feet	Error in Latitude	Error in Departure	Error of Closure
31,717.83	1.44	2.64	1 : 10,550
23,682.10	0.93	0.40	1 : 23,400
44,695.95	0.34	0.95	1 : 35,025
29,104.60	0.45	1.48	1 : 18,825
11,837.20	0.51	0.01	1 : 23,175
27,478.24	0.85	0.07	1 : 32,225
36,211.05	0.57	1.72	1 : 19,975
17,260.00	0.14	0.51	1 : 32,625
16,110.70	0.18	0.62	1 : 24,950
21,915.35	0.88	0.59	1 : 20,675
Average.			1 : 24,150

TABLE II. ACCURACY OF TOPOGRAPHIC SURVEYS

(Comparative study based upon test profiles)

	Dayton	Jackson	Flint
Length of test profile...	3,162 ft.	3,150 ft.	6,423 ft.
Number of test points....	50	52	130
Extreme relief...........	51 ft.	38 ft.	30 ft.
Total plus areas..........	591 sq.ft.	1,048 sq.ft.	896 sq.ft.
Total minus areas.........	1,002 sq.ft.	628 sq.ft.	792 sq.ft.
Aver. uncompensated area	0.134 sq.ft.	0.188 sq.ft.	0.016 sq.ft.
Average error of each test point	0.55 ft.	0.53 ft.	0.26 ft.
Test points that disagree with contours: By more than 0.5 ft......	35%	37%	22%
By more than 1.0 ft...	15%	11%	0.03%
By more than 1.5 ft.	7%	4%	None

Note:—Scale of map in each of the above surveys is 1 in 2,400, with a contour frequency of one foot. The results for the Dayton and Jackson surveys are obtained from a number of tests. Only one test profile on the Flint survey was available when this table was prepared.

The methods described in this article were developed chiefly by officers in the French army. The explanation of the methods as given herein is based on lectures given to the computing division of the 29th Engineers, U. S. Army, by First Lieut. E. F. Church, formerly of the U. S. Coast and Geodetic Survey.

A Course in How To Use the Mind

There is one particular subject which I believe should be taught to all students of all faculties and it is a question upon which I am rapidly becoming somewhat of a crank. I refer to the importance of teaching the students the best methods of intellectual work. It seems illogical to me to take the trouble to initiate the students in the principles of the different sciences with an abundant use of language and a great display of apparatus, to compel them afterward to pass severe examinations on these various sciences, and, yet, not to consider it worth while to instruct them in the art of cerebral work.

Apparently all of us seem to take for granted that the students know, by intuition, the best methods of study, although it has been demonstrated that they invariably adopt the worst ones because they are less painful and do not make the same demands upon their powers of attention or concentration.

Students unconsciously drift into bad intellectual habits, and only realize their mistakes when it is very difficult to adopt new methods. "You cannot teach an old dog new tricks" is an old saying and William James considers that men fall into the "old dog" class at twenty-five. This eminent psychologist declares that fe wmen change their habits of thought and action to any marked extent after they are passed the middle twenties. It is easy to surmise that Professor James either married in his early twenties or died a bachelor. Those of us who married after we passed thirty can vouch for the fact that habits can be modified after that age, but we will probably also admit that our road to perfection would have been made easier if the way had been pointed out to us when we were in our early twenties.

Psychologists as a general rule also tell us that relatively few people acquire new habits of their own volition. Habits are for the most part inherited or imposed upon us by external authority, and it seems to me that in order to spare to the student this reversal of intellecual method long after his graduation, cerebral habits of the right kind should be imposed upon him, at the very beginning of his college career, through the institution of a course on "How to use the mind"—*Arthur Surveyer* in a discussion before the Engineering Institute of Canada.

Highway Inspection Methods Taught at Oregon Institution

Agricultural College and State Highway Commission Co-operate to Secure Competent Inspectors on Highway Construction

By S. H. Graf

Professor of Experimental Engineering, Oregon Agricultural College

FOR a number of years there has existed very close co-operation between the state highway department and state college of Oregon. One form of this co-operation has been the employment of students during the summer months as members of field parties and as inspectors on highway and bridge construction. This year the program under way is of considerable magnitude, totaling nearly twenty million dollars. Naturally, the greatest activity must take place during the summer, which is also the vacation period of the college, so that undergraduate students fit very nicely into the construction program of the highway department. In this way, these students may earn money and at the same time gain experience so that upon graduation, on account of their practical experience, they will be more valuable men.

During the past two seasons, many students have been used as inspectors, but since they have been without experience and in the case of lower classmen, without any instruction in highway engineering subjects, a preliminary training of several weeks has been required. This, of course, is expensive and during the rush season very inconvenient. In order to avoid or shorten this field training, the writer was asked by State Highway Engineer Herbert Nunn to design a course for students desiring summer work as inspectors. After consultation with Dr. E. W. Lazell and K. S. Hall, in charge of testing and inspection, the course outlined below was planned, and is being given to about forty students. It is a three-credit course, consisting of twelve lectures and twelve three-hour laboratory exercises. In addition to this, there are problems and assigned readings for home work. The state highway department supplies the students with copies of the specifications, manual of instructions to employees, report blanks, etc., and these are studied and discussed. In explanation of what in some sections of the country would be regarded as a peculiar limitation of the subject, it should be stated that at present only two principal types of pavements are used in Oregon, asphaltic concrete (both fine and coarse aggregate), and portland cement concrete (one course only).

The syllabus of the course follows:

LECTURES

1. On types of pavements
    a. Specifications
    b. Asphaltic pavements: sheet, fine aggregate asphaltic concrete, coarse aggregate asphaltic concrete
    c. Cement concrete pavements: One course, two courses.
2. Paving materials
    a. Asphalt
    b. Portland cement
    c. Concrete sand
    d. Mason sand
    e. Muck sand—filler
    f. Gravel—pebbles and crushed
    g. Crushed stone.
3. Sampling methods
    a. Asphalt
    b. Portland cement
    c. Sand
    d. Rock—quarry and gravel
    e. Paving mixtures.
4. Standard tests
    a. Asphalt
    b. Cement
    c. Sand—concrete and paving
    d. Gravel
    e. Broken stone.
5. Proportioning of mixtures
    a. Asphaltic
    b. Concrete—standard and ideal. Often judged by looks on road
    c. Calculation of mixtures (weight and volume)
    d. Corrections for wet materials
    e. Calculating yield of "pull."
6. Mixture tests
    a. Asphaltic topping extraction
    b. Specific gravity
    c. Sawing sections
    d. Photographing sections
    e. Concrete—analysis—limitations of
    f. Concrete sections.
7. Paving plants and equipment
    a. Concrete mixers
    b. Bituminous paving plants
    c. Rollers
    d. Trucks.
8. Mixture inspection
    a. Rock—dryers, dryness
    b. Asphalt—weight and temperature
    c. Mixture—temperature
    d. Cigar box samples
    e. Check box weights
    f. Scale tests—by standard weights—your own weight—or compare with each other
    g. Concrete plants shut down for low temperature
    h. Report forms.
9. Surface inspection
    a. Subgrade — true, elevation, super-elevation, templates
    b. Materials—clean—dust-free
    c. Cement—covered account of rain
    d. Temperature of mix on road
    e. Thickness. Yield. Calculations reviewed
    f. Rolling
    g. Surface appearance
    h. Chopped samples
    i. Report forms.
10. Characteristic defects
    a. Cracks—too hot—too much sand—wet or yielding subgrade—too little asphalt
    b. Flush coat—thin and even—water to help spreading
    c. Squeegee hot—roll in while flush coat is hot
    d. Concrete—cracks, pockets, roughness
    e. Foreign matter—expansion joints flush—barricading, covering, and wetting.
11. Principles of inspection
    a. Enforcement of specifications
    b. Helpfulness—not antagonism
    c. Catch mistakes—before they occur
    d. Do not be autocratic
    e. Plant and surface inspectors should co-operate with each other, with resident engineer, and with contractor.
12. Personal qualities requisite for success
    a. Winning personality
    b. Tactfulness
    c. Firmness
    d. Knowledge of specifications
    e. Be sure you are right, then go ahead.

LABORATORY EXERCISES

1. Sieve analyses of sand, gravel, and broken stone.
2. Proportioning of mixture from representative supply of materials.
3. Mixing and molding representative-types of pavements according to specifications.
4. Consistency tests of asphaltic materials.
5. Specific gravity tests on various materials.
6. Analysis of bituminous road surfacing.
7. Tests on portland cement.
8. Tests on concrete sands.
9. Tests on rock for pavements.
10. Mixing of, and compression tests on concrete cylinders
11. Visit to bituminous paving plant in vicinity.
12. Visit to concrete job in vicinity.

Chart for Discharge of Water Columns Supplying Locomotives

BY F. D. YEATON
Oak Park, Ill.

IN RAILWAY water supply work it is frequently necessary to determine the discharge from water columns and the accompanying chart has been found useful in the solution of such problems. This chart gives the discharge in gallons per minute through a 10-in. telescopic water column for various flow heads "H" and for both 10-in. and 12-in. cast iron pipes connecting with the tank at distances varying from 200 to 1,000 ft. The coefficients of friction have been taken from Bulletin 48 of the Universtiy of Illinois.

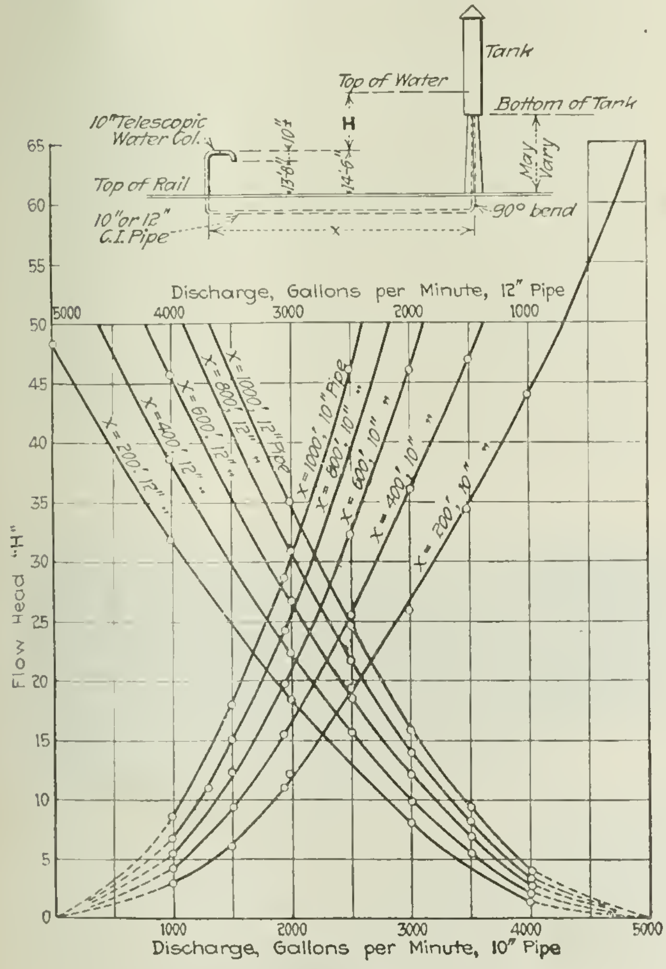


CHART SHOWS DISCHARGE OF RAILWAY WATER COLUMNS

The following problem illustrates the use of the chart and is typical of those encountered in practice: A water column is to be erected 600 ft. from a storage tank. It is desired to determine the minimum height of the tank to furnish 2,000 gal. per minute through a 10-in. column. The connecting line between the storage tank and column is 12 in. in diameter. Without the aid of the chart this problem would require several trials, but from the chart the flow head, H, necessary to give the required discharge at the water column, is read as 12 ft. The height of the tank can then be easily adjusted for the minimum flow. The formula for flow-head H is given below:

$$H = m\frac{v^2}{2g} + e\frac{v^2}{2g} + h_1 + n\frac{v^2}{2g} + \frac{v^2}{2g}$$

$m\frac{v^2}{2g}$ = entrance head

$e\frac{v^2}{2g}$ = loss in elbow or bend

$n\frac{v^2}{2g}$ = loss in water column

$\frac{v^2}{2g}$ = velocity head

If the height of the tank and water column are known, it is an easy matter with the aid of the chart to determine the maximum and minimum discharge from a water column located any distance from the storage tank.

Railways in China

OF 6,836 miles of railway in China in 1918, over 4,000 mi. of main and branch lines were owned and operated by the government, these comprising 14 railways in 14 out of the 18 provinces. In addition there were 11 provincial and private railways (some owned by mining companies) aggregating 425 mi. and five concession lines aggregating nearly 2,300 mi. These figures are given in the report on the government railways by the Ministry of Communication, Republic of China, for the calendar year 1918.

Taking the 18 provinces as a whole, there are about 460 sq.mi. of territory and 107,000 population per mile of railway. These figures compare with 40 sq.mi. and 8,000 population for India, and 12 sq.mi. and 3,800 population for the United States. It is stated in the report that owing to the extent of waterways in China these average figures always will be higher there than in other countries.

The construction cost for the government lines has averaged $126,000 per mile, ranging from $80,000 to $145,000. There are only 13 mi. of double track, but sidings and industrial lines raised the trackage to a total of nearly 4,300 mi. The equipment included 653 locomotives. Owing to the fact that equipment must be purchased abroad, the policy is to extend the life of the engines as long as possible by means of extensive repairs and renewals, rather than to purchase new ones. Operating expenses were 44 per cent of operating revenues. The traffic consisted of 25,475,379 passengers and 18,551,684 tons of freight.

Measuring Upward Pressure Under a Masonry Dam

Tests Made on Island Park Dam at Dayton, Ohio, to Determine Extent of Under Pressure Through Porous Foundations

By E. W. Lane and E. L. Chandler
Assistant Engineer and Assistant Division Engineer, Miami Conservancy District, Dayton, Ohio

FEW data regarding tests of upward pressure under masonry dams and similar structures on porous foundations have been published. The experiments described in this article were conducted with the idea of adding to the meager fund of information available and to afford a more reliable basis for the methods now followed in estimating such pressures.

The determinations were made at Island Park Dam in Dayton, Ohio, the dam having been built across the Great Miami River in 1917 as a part of Dayton's park system. Fig. 2 is a photograph of the dam under low water conditions. Fig. 1 is a general plan, the location of the two sets of test pipes being shown by the lines *AA* and *BB*. The topography both above and below the dam in the vicinity of the testing apparatus is shown in Fig. 3 and in Fig. 1 is a profile along the line of each set of test pipes. The irregular form of the stone riprap will be noted in these profiles and also on the topographic map. As originally placed the riprap was in a layer about 2 ft. thick extending for a distance of 20 ft. downstream from the apron. The greater part of the stones adjacent to the apron have been displaced and piled in an irregular ridge with the crest about 20 ft. downstream from the edge of the apron, leaving the sheetpiling unprotected to a depth as great as 4 ft. in some places. The material upon which the dam was constructed is composed of sand and gravel with a slight intermixture of clay, as shown in Fig. 3. This diagram shows the result obtained from two of several borings made as a part of the investigation preliminary to the construction of the dam. The essential features of the design of the dam may be seen in Fig. 4. It is an over-fall type, gravity section, concrete structure. Features of the design are the fore-apron extending upstream from the overall section and the arrangement of the piling.

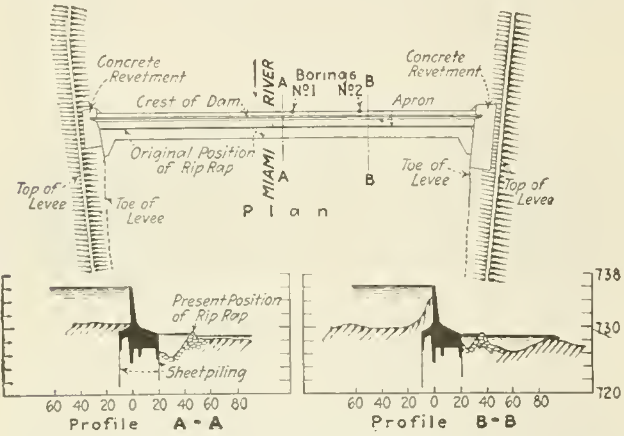


FIG. 1. PLAN AND PROFILES OF ISLAND PARK DAM, MIAMI RIVER, DAYTON, OHIO

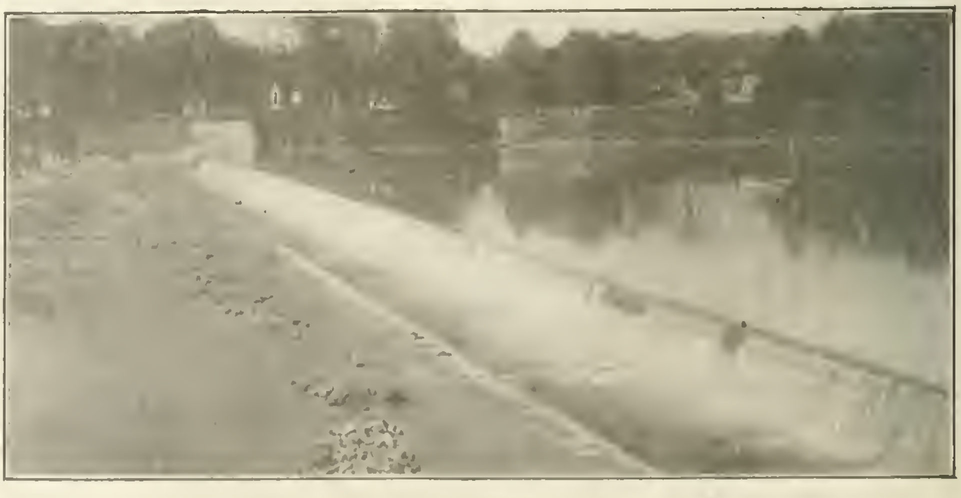


FIG. 2. ISLAND PARK DAM ON THE MIAMI RIVER AT LOW WATER STAGE

The apparatus for making the tests was installed by the Miami Conservancy District acting in conjunction with the Department of Public Service of the City of Dayton. B. M. Jones, now division engineer for the Lockington Dam, supervised the installation. The pipes were placed when the dam was built, and it was the intention to study the effect of the accumulating head behind the dam as the closure was made. The war activities, however, interrupted the program and the investigations were finally carried out during the summer of 1919 by the writers of this article. Since the construction of the dam, a blanket of mud had accumulated over the bottom of the pond. It varied in thickness from 2 to 8 in. and apparently exerted a very marked influence on the upward pressures. For this reason the variation and magnitude of pressures was found to be much less than would probably have been the case could observations have been taken before the formation of the mud deposit.

The apparatus employed was very simple. A system of 1-in. pipes was installed, extending from the top of the apron down through the concrete, to what were considered critical points beneath the dam. The arrangement is shown in Fig. 4. The lower end of each pipe terminated in a bag of coarse gravel to prevent the pipe from becoming clogged. The upper end was threaded and fitted with a coupling into which was screwed a plug. When an observation was being made each plug was replaced by a short length of pipe and elevations on the tops of these pipes were taken. The water rapidly came to a fixed level inside the pipes and its position was easily determined by measuring down from the tops. The elevation of the water thus obtained was an indication of the pressure underneath the dam, at the other end of the pipe, since that pressure was balanced by the water column created. Two sets of test apparatus were installed affording two independent determinations. Readings on each set were taken at several different times and the pressures obtained were so consistent that the results are evidently reliable.

Under ordinary conditions, the upward pressure beneath the dam at the lower end of a pipe, if expressed

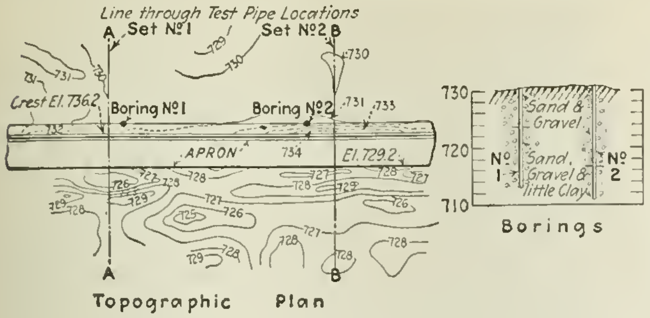


FIG. 3. TOPOGRAPHIC PLAN AND BORINGS AT ISLAND PARK DAM

in feet of water, would be equal to the difference in elevation between the under surface of the dam and the free water surface in the pipe. The results of the experiments are shown in Fig. 4 by the piezometric lines connecting the points above the lower ends of the pipes, the elevation of each point being that to which the water surface rose in the corresponding pipe. The pressure on the lower side of the dam at any point, under ordinary conditions, would be represented by the distance from the bottom of the dam up to this line.

An unexpected discovery was that gas was accumulating in considerable quantities beneath the dam. It escaped from several of the pipes, particularly from pipe No. 9 of Set 1. (See Fig. 4.) In a period of about a month between observations gas had collected so that the flow from a ¼-in. nipple connected into this pipe was sufficient to maintain a flame about a foot high for ten minutes. The flame was generally colorless, changing at times to light blue, its presence being always evident by reason of the heat generated. The gas was evidently methane, formed by the decomposition of slight quantities of vegetable matter in the gravel. The dam, because of its shape, acted as a gas holder. It is of interest to note that the gas confined beneath the dam increased the upward pressure, or the tendency of the dam to float. For example, if gas collected until it displaced the water above the lines *AB* and *A'B'* (Fig. 4), the upward pressure would no longer be represented by the distance from the bottom surface of the dam to the piezometric line, but by the distance from the lines *AB* and *A'B'* to the piezometric line. No actual measurements were made of the elevation of surface corresponding to lines *AB* and *A'B'*, but they probably did not fall below the positions shown. The possibility of increased pressure generated in the manner described should be considered in the design of structures of this type.

In Fig. 4 are shown the elevations of the piezometric lines as measured on the two sets of pipes. For Set No. 1, two lines are shown, one a full line and one dotted, representing the extreme conditions found in a number of observations taken at different times. For Set No. 2, only one line is shown, that line being typical of the conditions found. Some of the pipes that had become clogged, are represented by dashed lines.

The most noticeable result of the measurements was the low pressure indicated by pipe No. 10, the one extending above the upstream sheetpiling. This pressure is much less than would be expected from the elevation of the headwater above the dam, due undoubtedly to the presence of the blanket of mud previously mentioned.

After having made several observations on set No. 1, an attempt was made to remove the mud from the region just upstream from the pipes, thereby approximating the conditions which existed when the dam was built. To accomplish this a stream of water from a fire hose nozzle, acting under a head of about 75 lb., was employed. Sufficient result was obtained to raise the water column through pipe No. 10 to about the height of the head water level, indicating a fairly direct communication between the head water and the pipe. This had no appraciable effect upon the other pipes, however, and no line is shown on the diagram to represent the condition. Just what is to be inferred is not quite apparent. It may be that the channel created through the mud was so small that the flow through it became rapidly diffused after reaching the gravel, the result being that while it did have considerable effect on pipe No. 10 it failed to affect the pressure under the dam. Again, it may be possible that the upstream sheetpiling was so effective that the upward pressure under the dam was always small and that the piezometric lines shown also represent the conditions as they existed immediately after closing the dam.

An inspection of the results shows that, in general, a considerable drop in pressure was caused by the upstream sheetpiling, and a lesser one by the downstream piling. A slight drop in pressure also existed between pipes No. 9 and No. 7 and a somewhat larger one between No. 7 and No. 6. Between No. 6 and No. 1 there was no variation in pressure.

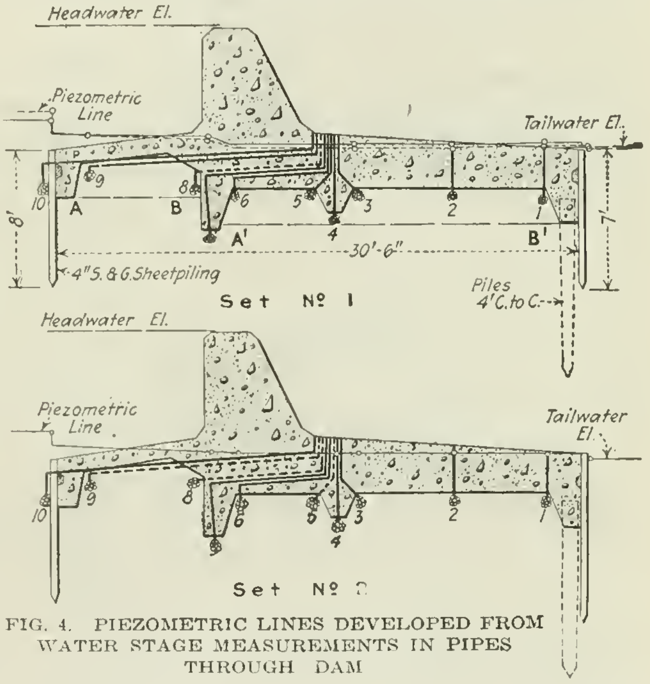


FIG. 4. PIEZOMETRIC LINES DEVELOPED FROM WATER STAGE MEASUREMENTS IN PIPES THROUGH DAM

Probably the most widely used method of estimating the upward pressure under a dam with a porous foundation is based on the "line of creep" theory. According to this theory the flow follows the line of contact of the dam with its foundation. Where sheetpiling or cut-off walls are introduced, the flow follows down one side of the piling or cut-off, and up the other side. The path which the water takes is known as the line of creep. At any given point the distance of the piezometric line below the headwater elevation is the same proportion of the total drop between headwater and tailwater, that the length of the line of creep up to that point is of the total length of creep. If it is assumed that the effect of the mud blanket is eliminated by considering that the elevation of the piezometric line at pipe No. 10 is the headwater elevation, it will be seen that the results agree only partially with this theory. It should be noted that the effects of gas under a dam is to decrease the length of the line of creep.

From these experiments it seems evident that although sheetpiling and cut-off walls are of value in reducing upward pressures, their effect is not necessarily in accordance with the line of creep theory. The results obtained are probably not representative of conditions existing immediately after the closure of the dam and it is therefore concluded that the greatest danger exists when the head against such a structure is first accumulated. The upward pressure may soon be reduced to an unimportant factor, the length of time required to bring about the change being dependent upon the rapidity with which silt is deposited over the bottom. It is also evident that the formation of gas under a dam is a potential source of danger if the shape of the structure is such as to confine the gas.

The fact that dams on porous foundations are being frequently constructed makes investigations of this sort valuable and the writers hope that further work will be done along the lines indicated in this article.

Recommend Closure of Atchafalaya River

UNDER orders of the Federal River and Harbor Act of 1916 and the Flood Control Act of 1917, a report has been made to the Secretary of War, and through him transmitted to the House of Representatives, on the problem of the control of the Atchafalaya River, which parallels the lower course of the Mississippi. At present the Atchafalaya is practically a continuation of the Red River, except that at their juncture an old channel of the Mississippi, known as Old River, diverts part of the Red River flow into the Mississippi and at times of high water diverts a part of the Mississippi River flow westward into the Atchafalaya and through its shorter channel to the Gulf.

A number of schemes have been proposed in the past fifty years to protect the land in the Atchafalaya basin. These include closing the Atchafalaya at its head and allowing the Red River to flow into the Mississippi, and closing off Old River and allowing the Red to flow down through the Atchafalaya basin, separating that basin entirely from the Mississippi flow. The current report, which was made by the Mississippi River Commission, indorsed by the Board of Engineers for Rivers and Harbors, and by Major General W. M. Black, then Chief of Engineers, U. S. Army, recommends the adoption of the latter plan.

This latest report contemplates the extension of the Tensas levee southward across the Old River to a connection with the Atchafalaya levee, a dam across Old River, a canal and lock to provide a navigable connection between the Mississippi River and the Red, and the enlargement of the Mississippi River levee to resist the additional flood height which would result below the juncture when the Atchafalaya would not be available as an overflow channel. The total estimated cost is over $13,000,000.

It does not appear from the report that any of the above concurring bodies or persons are particularly enthusiastic about the project. Each is merely stating, that provided something is to be done in the Atchafalaya delta, the scheme recommended is the best.

Details of Heavy Timber Framing

Derrick Tower Anchored to Pile Foundation—Base and Cap of Crane Runway Supports—Plank Trusses of Punch Shop

TIMBER framing found more extensive use during the rush construction of the war period than for many years before. Some ingenious and instructive details of framing were developed to meet the special needs arising. A few such details, taken from one company's practice, are set forth herewith.

One of the structures built for the New Orleans shipyard of the Foundation Co., where vessels of catamaran type are being built for the French government, is the rotating derrick with tower support described in *Engineering News-Record* of March 27, 1919, p. 638; here a special base detail was required for the tower posts, as the posts had to be anchored to the foundation piling in order to provide for uplift. The detail was worked out by C. A. Wentworth, chief engineer of the company, on the basis of principles and methods used in structural steel detailing. Two other timber-framing details designed for the same yard are those of the A-frame posts which support a crane runway in the yard, and those of plank trusses carrying the roof of the punch shop.

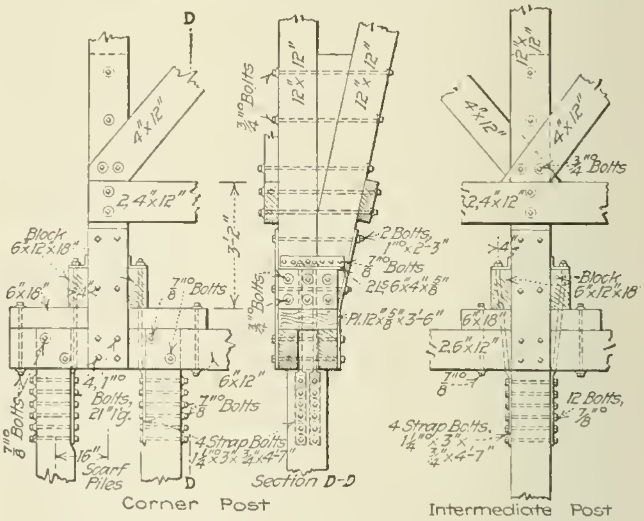
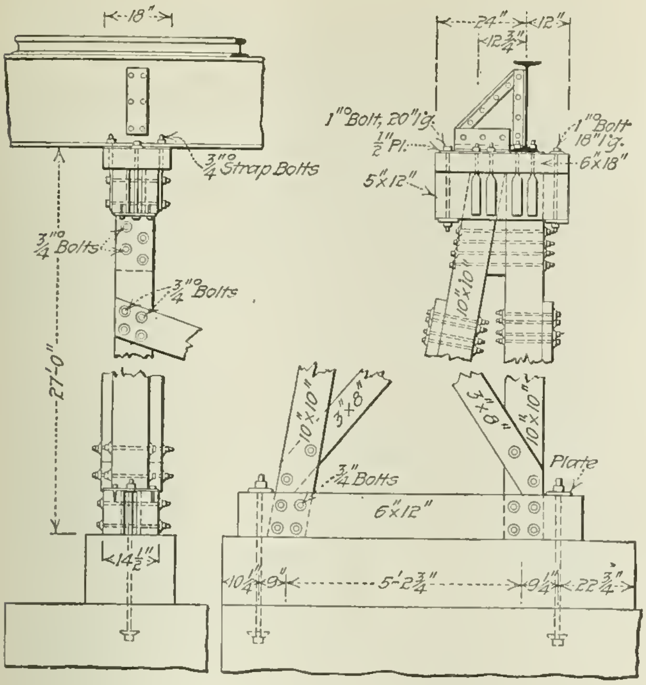


FIG. 1. BASE SUPPORT AND ANCHORAGE OF DERRICK TOWER POSTS

At the location of the derrick towers the ground was too soft for direct footings, and as permanent foundations were not warranted on account of the relatively short time the derricks were expected to be in use, pile foundations were adopted. However, as uplift might occur under certain load conditions, it was necessary to anchor the tower posts directly to the piles.

The footing pile row is capped by two 6 x 12-in. clamps bolted to the heads of the piles, carrying a 6 x 18-in. rider. On the latter rest both the vertical post and the inclined or brace post of the tower leg, the inclined post being framed down at its end to a 6-in. width. The connection is stiffened against distortion by steel scabs, 12 x ⅝ in., connecting the posts with the pile caps. But the anchorage which could be secured through these plates was not sufficient for the uplift occurring under extreme conditions, and therefore a direct anchorage was provided. This consists of two brackets, each made of a 6 x 12 block capped with a steel angle, bolted to the sides of the post and engaged



Details of Crane A-Frame

FIG. 2. BASE AND CAP OF A-FRAME POST OF CRANE RUNWAY

by 1¼-in. anchor bolts; the bolts pass down along the sides of the piles and have long strap ends, which are bolted to the piles. This detail leaves the strength of the cap unimpaired, gives a large bearing area for the downward load on the post, and at the same time transmits the uplift directly to the piles. Two of these bases are shown in Fig. 1, the two-pile foundation of a corner post and the one-pile foundation of a post at the middle of one side of the tower.

Anchorage against uplift had to be provided for also in the case of the A-frame posts of a traveling-crane runway. Furthermore, the post caps in this case had to be developed into a secure and rigid seat for the crane girder, capable of resisting any tendency of the girder to tip over. Both details are sketched in Fig. 2.

Each post consists of a plumb and a batter timber, connected to a single base. The sills are made of two 6 x 12-in. timbers spread about 3 in. and notched around the posts, which are gained to 5-in. thickness. The anchor bolts, set in the masonry foundation, pass between the two cap timbers and engage bearing plates resting on the caps. These bolts, together with the direct bearing of the uprights on the sills, take care of both downward load and overturning effect. The base was bedded in grout when the A-frame was set up, in order to give firm seating to the frame on the foundation concrete.

At the top of the posts the seat for the crane girder comprises two 5 x 12-in. clamp timbers engaging both plumb post and batter post, a ½-in. steel bedplate for the girder, and four strap bolts fastened to the sides of the clamp timbers and engaging the crane girder I-beams and its kneebrace. The girder is held securely by the steel kneebrace and the combination of steel bearing plate and anchor bolts, without play or lost motion, so that the detail takes care of both vertical load and horizontal thrust.

Plank construction was employed for the roof trusses of the plate-and-angle shop. The roof framing consists of triangular transverse trusses spaced 17½ ft. apart. As the wall columns are spaced 35 ft., lattice trusses in the line of the side walls were provided to carry the intermediate roof trusses. The lattice trusses as well as the roof trusses are built up of planks (Fig. 3). The ends of the roof trusses are detailed so that they fit either at the post or at the mid-vertical of the side-wall truss without any change.

In both trusses the plank web members enter the 4½-in. space between the two planks forming each chord. As the webs are 2½ in. thick, two web members of opposite inclinations can lap at the ends as well as at intersections without any cutting. The chord splices in these trusses are designed to develop about two-thirds of the total strength of the stick spliced; the bolts are figured to carry 3000 lb. each.

At the ends of the roof trusses the chords are made solid by filler blocks, and the top chord is notched into the bottom chord. Scabs bolted to the outside, and diagonal bolts downward through the two chords further secure the joint. A bolster block under the bottom chord is also bolted vertically through both upper and lower chord, and provides a solid bearing surface for the top of the post.

A steel angle seat bracket on the inner face of the post is bolted through the full depth of the truss; on the outer face of the post are fastened strap bolts which pass up through the truss and the eave purlin, so that the truss is secured firmly. Kneebrace planks are bolted to the outside of truss and post. Both the truss seat and the kneebrace fit either the post or the side-wall truss vertical.

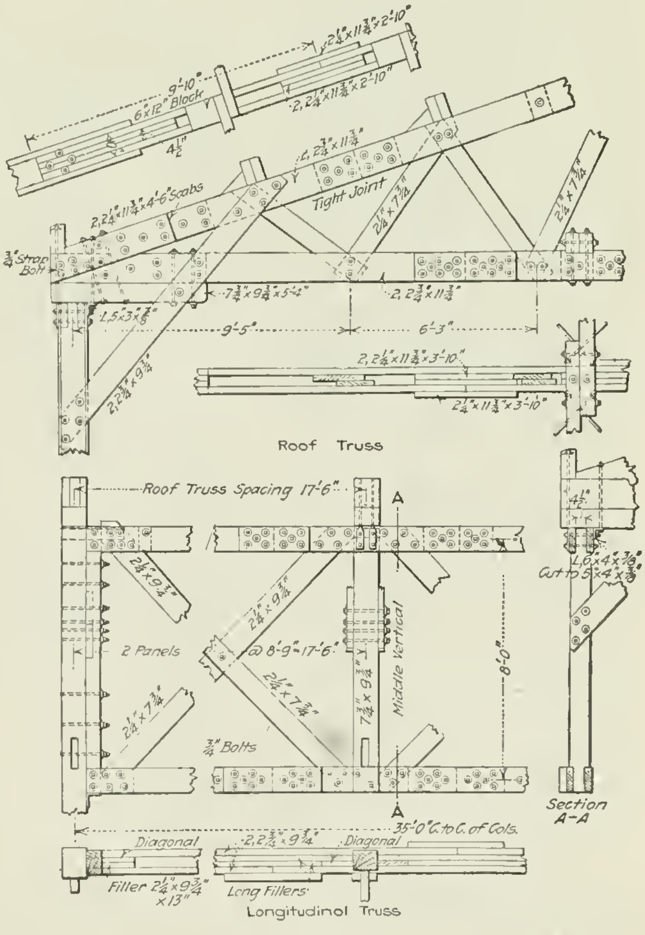


FIG. 3. PUNCH SHOP ROOF TRUSS DETAILS

Similar details of construction are used in the side-wall truss itself, which is also illustrated in Fig. 3. The economy in size of joint secured by lapping the web members is especially apparent in this truss. Of particular interest is the connection of the truss to the post which is a plain bolted face connection.

A Simple Mechanical Control for Dosing Sewage Beds

By Perry Thompson
City Sanitary Engineer, Yonkers, N. Y.

With a view to designing for contact beds an inexpensive, positive mechanical control without small air or sewage pipes to become clogged by grease or rust scales, and not dependent on a nicely balanced air or water pressure, and which would neither require the payment of a royalty nor the employment of specially trained men for installation, the writer recommended to a land company the device and general plan shown herewith. The company wished to construct an inexpensive, inconspicuous and somewhat temporary system of sewage disposal consisting of settling tanks followed by primary and secondary contact beds, the effluent to enter a stream where dilution was quite ample.

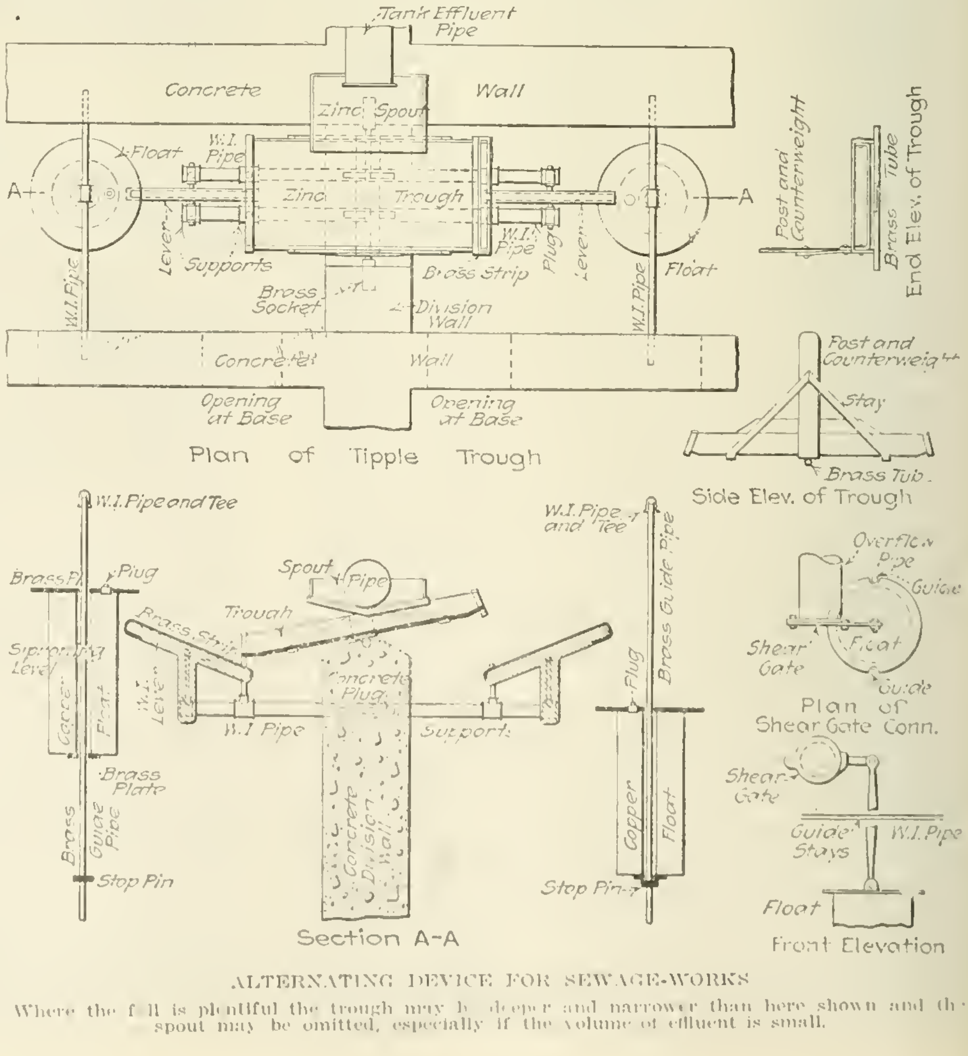
The "tipple-trough" is not altogether new. A similar one was designed by the writer for a large institution at Chappaqua, N. Y., where it has operated satisfactorily for several years. As may readily be seen, its usefulness is not confined to contact beds.

Briefly, the operation of the system is as follows: Sewage from either or both settling tanks falls from the spout into the trough which we will suppose to be tilted toward the float chamber connected with primary bed 1 and to be held in that position by the counterweight arm till the bed is full and the siphon has lowered the water level and the float sufficiently for the latter to tip the trough so that the flow will enter the float chamber connected with primary bed 2.

While primary bed 2 is being filled slowly from the trough, secondary bed 1 is being filled rather rapidly by the siphon in primary bed 1, but the latter flow is not sufficient to cause the siphon in secondary bed 1 to start because the capacity of the secondary beds is a little greater than that of the primary beds; the sewage is therefore held in contact while primary bed 2 is filling to the overflow point. As the sewage in secondary bed 1 rises it causes the float in the chamber connected therewith to rise and thereby open a shear gate on the end of the overflow pipe from primary bed 2. When the sewage in primary bed 2 has risen to this point it therefore flows into secondary bed 1 for a very brief time until the siphon in the latter bed has lowered the sewage there and the float in the chamber connected therewith sufficiently to close the gate, when primary bed 2 continues to fill till its siphoning level is reached and the lowering sewage has carried down the float in the chamber connected therewith and tipped the trough back toward set 1. As the sewage rises in secondary bed 2 it causes the float connected therewith to open the shear gate on the end of the overflow pipe from primary bed 1, so that this overflow may later come into play and cause secondary bed 2 to be filled to the siphoning level, after which the descending float connected with the latter bed shuts off the sewage which rises in primary bed 1 till the siphoning level is reached, and thus the operation goes on continuously and automatically.

No dimensions are given because they will vary with the amount of sewage. The net capacity of the primary beds should be from 2 to 4 hours flow when new, according to the time of day, the local conditions and the quality of the settling tank effluent.

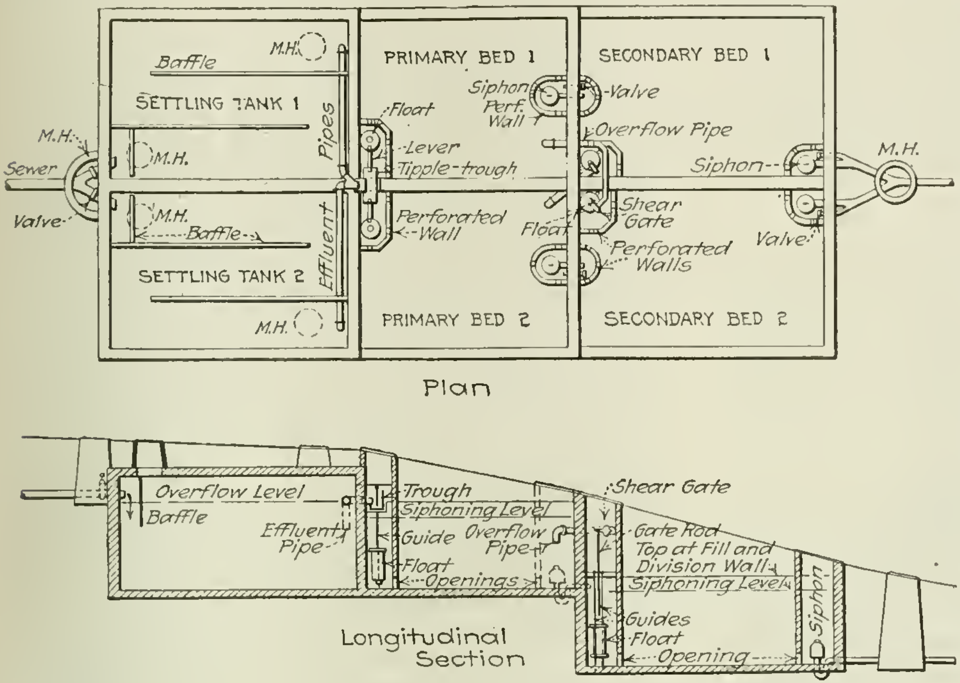
The capacity of the secondary beds should be about 15 per cent greater than the primary beds, according to the adjustment of floats, the promptness of siphonic action, etc. The elevation and size of the overflow pipes will also vary according to the amount of sewage and



ALTERNATING DEVICE FOR SEWAGE-WORKS

Where the fall is plentiful the trough may be deeper and narrower than here shown and the spout may be omitted, especially if the volume of effluent is small.

the length of contact desired. The overflow can be made adjustable by being set in watertight slides provided with means for fastening securely. Of course the connecting rods from shear gates to floats would also have to be adjustable. All parts of the controlling apparatus except the pipes which secure the float-guide pipes, the main portions of the levers, the lever support pipes, the overflow pipes, the siphons and the bodies of the shear gates, should be made of brass, copper, zinc or other non-rustable metal. By a judicious selection of brass pipe and tubing almost any size of guide, shaft, axle or socket may be obtained. The float chamber and siphon chambers should be covered, at least in winter.



GENERAL PLAN OF SEWAGE-WORKS WITH AUTOMATIC ALTERNATING DEVICE

Portion of East Cleveland Zoning Ordinance Upheld

THE provision of the zoning ordinance of East Cleveland, Ohio, that prohibits the building of apartment houses in certain areas of the city was upheld in the Court of Common Pleas, County of Cuyahoga, Ohio, on April 30, in a decision handed down by Judge Kramer (State of Ohio, ex rel, Max Morris vs. C. M. Osborne, city manager). East Cleveland is a suburb of Cleveland with a population of some 30,000. On July 15, 1919, the City Commission passed an emergency dividing the city into four building zones. Zone "A" is the industrial zone and is unrestricted; "B" is the business zone and is restricted against manufacturing of all kinds; "C" is the apartment zone and is restricted against manufacturing and business; "D" is the private dwelling zone and is restricted against manufacturing, business and apartments.

The case in court arose on the refusal of the building inspector to issue a permit for the erection of eight apartments in a zone restricted to one- or two-family dwellings. The case had previously been before Judge Foran, who sustained the validity of the zoning ordinance (Ohio Law Bulletin, March 15, 1920, p. 98). The case was not fully argued before the Judge and no evidence was submitted by either party. On rehearing the city submitted evidence to show the relation of the zoning ordinance and the restriction against apartment houses in particular to the purposes for which the police power may be exercised. Testimony was given by C. M. Osborne, city manager of East Cleveland; Dr. Haven Emerson, former health commissioner of New York City, on the relation between the apartment and the public health; Robert H. Whitten, advisor, Cleveland City Plan Commission, on the general advantages of a zone plan and the need of keeping apartments out of the one- and two-family house section, and by Paul Feiss, chairman of the Housing Committee of the Chamber of Commerce, on the relation of apartment house limitation to the general housing problem. Practically no evidence was submitted in rebuttal by the relator. Excerpts from the decision follow:

> It would seem that there could be no two opinions upon the proposition that the apartment house, or tenement house, or tenement, in a section of private residences, is a nuisance to those in its immediate vicinity. Under the evidence, and as a matter of common knowledge, of which the court may take judicial notice (16 Cyc. 582), it shuts off the light and air from its neighbors, it invades their privacy, it spreads smoke and soot throughout the neighborhood. The noise of constant deliveries is almost continuous. The fire hazard is recognized to be increased. The number of people passing in and out rendered immoral practices therein more difficult of detection and suppression. The light, air and ventilation are necessarily limited from the nature of its construction. The danger of the spread of infectious disease is undoubtedly increased, however little, where a number of families use a common hallway, and common front and rear stairways.
>
> The erection of one apartment house in a district of private homes would seriously affect only those persons living in the immediate vicinity thereof, but the common experience is, that the erection of one apartment drives out the single residences adjacent thereto, to make way for more apartments. The result is that, in time, and not a very great time, when one apartment is erected, the whole street is given over largely to apartment houses.
>
> With the growth of its population, it appears to be practically certain that unless restricted, the greater part of East Cleveland will be built up with apartments, and the home owners must choose either to adopt apartment life or abandon their depreciated property, and move out of the city or into its more remote parts.
>
> If the claim of the relator here is sound, a city of private homes, grass plots, trees and open spaces, with the civic pride and quality of citizenship which is usually found in such circumstances, is powerless to protect itself against the obliteration of its private residence districts by apartments, which shut out the sun and sky from its streets and one another, and are generally owned by those whose greatest interest is in the revenue that the building will produce. If such is the law, it must be conceded that it is unfortunate.
>
> The apartment house is, for many, a desirable convenience, and, for some, a necessity. They are a recognized necessity in cities of any size. Their erection should not be prohibited, and under this ordinance, are not prohibited.

Private residences, with yards for play spaces, with grass, trees and flowers, are necessities for people with children, and as much a convenience to the people without children, who take an old-fashioned pride in owning their homes, as is the apartment to those who are willing to accept its restrictions, for its compensatory freedom from responsibilities. It is at least equally important to the community to preserve the private home for this class, as it is to provide the apartment for the first. Under this zoning ordinance, both the private home is preserved and the apartment house is provided.

It seems eminently fair to restrict the apartment builder to a limited area, where his use of his property will do the least damage to others, and to the community. The necessities or convenience of those who live in them will be served thus with the least sacrifice of the necessities and conveniences of others. Whatever of the burden arising from apartments there are will be borne by those whose purposes they serve, and not shifted to the other property owners of the city, to make their property unfit for use as a home.

* * * *

This court is therefore of the opinion, first, that the ordinance here in question is a valid exercise of the police power by the city of East Cleveland, under the authority of its charter; second, that it has not been shown that the classifications made under this ordinance are unreasonable, arbitrary, discriminatory and not uniform in operation.

The petition of the relator therefore will be dismissed, and an exception given.

Fire Protection Equipment and Pumps for Large Buildings

CENTRIFUGAL pumps for fire service should have not more than four stages according to amendments to the specifications for fire pumps adopted at the recent annual meeting of the National Fire Protection Association in Chicago. Although certain advantages of the multi-stage pumps are recognized it is important to secure simplicity of design. Two or more stages should be provided where pressures above 100 lb. are required. The committee on fire pumps also submitted requirements for pumps driven by gasoline engines. Rules for supervision and care of valves controlling water supplies for fire protection were adopted practically as submitted by a committee. One of the most effective methods of insuring proper maintenance of such valves is said to be securing them in the open position by a seal which must be broken before the valve can be closed. Alternative methods including electrical valve indicators, signal devices and recording systems are also covered by the report of the committee on valve practice.

Safe construction and equipment of apartment houses was the subject of a report by the committee on building construction. It includes buildings of brick, tile, concrete and concrete blocks, but bearing walls of hollow brick and concrete blocks are limited to 45 ft. in height. Columns and floor framing may be of steel or concrete, with slab floors or girderless concrete floors. The handling of explosives and inflammable liquids were among the subjects considered and there was an illustrated address by J. W. Stevens on intensive work in fire prevention. One afternoon was spent at the Underwriters' Laboratories, inspecting the apparatus and the various tests in progress.

Officers elected include the following: President, W. E. Mallalieu, New York; vice-presidents, H. O. Lacount, Boston, and W. C. Robinson, Chicago; secretary, Franklin H. Wentworth, Boston, Mass.

Belt Line Suggested to Ease N. Y. Terminal Congestion

Supremacy of New York Port Depends Upon Action to Lower Terminal Cost, Says Col. Wilgus

CREATION of an outer belt line linking all of the rail carriers of the Port of New York with each other and with the water front, and the unification of the management of all transportation facilities within its circumference, including inner belt lines, water front development of public nature, and the portion of the lighterage fleet retained for terminal service that must be continued to be handled by water, were urged as a means of reducing the terminal cost in the Port of New York by Col. William J. Wilgus in a paper, "The Railroad Problem in Relation to the Metropolitan District," read at the annual meeting of the New York Section, American Society of Civil Engineers, May 12, at the Engineering Societies' Building, New York City. Upon some such general plan for connecting the main lines of the eight railroad systems entering New York outside the zone of greatest congestion, whereby passengers and freight could be freely transferred, and upon co-ordination among the several carriers, depend the supremacy of New York as a port, asserted Col. Wilgus.

As primary causes why New York is sometimes referred to as "the terminal sore spot of the United States" and why terminal charges here range as high as $35 a car load in comparison with $2.50 in San Francisco and even lower terminal costs in other ports, Col. Wilgus assigned the following reasons: First, a lack of co-ordination between the carriers; second, the interposition of a water barrier between the mainland and the leading centers of the port, which imposes on the rail carrier the burden of effecting its collection and deliveries by means of water-front operations on both shores, plus lighterage; and third, the requirement in the seaboard rate that "the land carrier shall deliver and receive freight at ship side, thereby removing the incentive to the owner or lessee of the pier—the water carrier—to advocate more efficient interchange facilities from which the major benefit will go to those who do not share in the cost of providing them."

PUBLIC INTEREST DEMANDS ACTION

Public interest, declared Col. Wilgus, demanded that these obstacles to progress be overcome, and as a personal plan he suggested the creation of an outer belt line which might extend from the New York Central in the vicinity of Yonkers westerly to the West Shore R.R. near Dumont; thence continuing west to the rear of Paterson, N. J., intersecting the various lines of the Erie and Delaware, Lackawanna and Western railroads; thence southerly along the Passaic River to a crossing of the divide near the Delaware, Lackawanna and Western R.R. at Summit, N. J.; thence southerly and easterly via South Plainfield to Perth Amboy, N. J., intersecting the Central R.R. of New Jersey, Lehigh Valley R.R., Philadelphia and Reading R.R., and Pennsylvania R.R.; thence northeasterly across Staten Island to Stapleton, where connection would be made with the Baltimore & Ohio R.R.; and thence under the upper bay to Bay Ridge on Long Island, from which connections would radiate to the Brooklyn water front to Jamaica Bay and via the Long Island and New York connecting railroads to points in Long Island and the Bronx. Such a route he asserted would enable railroads to interchange freight and passengers freely, as well as troops and supplies in times of war or insurrection, at points remote from the congested regions of the port. Delivery of them would be possible then without the "expensive and uncertain intermediary of harbor floatage," would be possible direct to bottoms along the water fronts of all sections of the port, save Manhattan.

Inasmuch as transshipment of Manhattan freight from standard railroad car to distributing vehicles is necessary Col. Wilgus asserted that it should be done not on costly property, among congested surroundings at concentrated localities as near as possible to Broadway, but should be done at trunk line termini somewhere in the New Jersey meadows. Breaking bulk on the New Jersey side would therefore eliminate transference of New England freight to the Manhattan side. From the New Jersey side the Manhattan bridge could be carried in trains of electrically operated multiple-unit vehicles beneath the river, and through small subways near the surface to and from any points of the city where there would be direct contact with the large shippers, or where mechanical devices would transfer the removable containers from the subway vehicles to motor truck chassis for short-radius door to door delivery. With the adoption of some such general plan as Col. Wilgus indicated, he asserted there would be a policy of diffusion rather than concentration of market products, fuel and other freight. A valuable part of the water front would also be released for legitimate water-borne commerce. Relief of street congestion would be a natural result.

BRIDGES OVER HUDSON PROBABLE

The vehicular tunnel now proposed by New Jersey and New York could not be considered as a means of solving Manhattan's freight distribution problems, but merely looked upon as a street extension across the river. Hudson River bridge crossings near 59th St., and near Fort Washington, for the accommodation of pedestrians, motor vehicles and joint trunk line traffic, were also deemed probable.

Col. Wilgus also referred to the twelve Staten Island piers, contracts for the construction of which have been recently let. He expressed the hope that even yet something might be done to change the design of those piers not only to provide sorting and temporary storage space but also comprehensive track layouts and motor truck hauling accommodations. The construction of craneless piers at Staten Island were said to be regretted particularly in view of the future operations of the Erie Barge Canal which are unequipped with self handling cargo devices and in view of "the surety that in case of war, many kinds of cargo must be handled here for which the ordinary ship tackle would be unsuited." The reason why such design was determined upon, apparently he finds in the fact that the plans were made to suit the wishes of the prospective lessees, the steamship companies, whose policy "very naturally is dictated by self interest rather than a general good."

Despite the urgent need for a revision in terminal policy Col. Wilgus says that such a radical change as outlined above would be predicated upon a solution of the general railroad problem by the nation in such a manner as to ensure harmony between railroad managers and employees and the public at large, so that capital would again flow into the expansion and extension of railroad systems. Pending such a comprehensive solution he expressed the hope that any work done by local communities would be carried out with the idea in mind that all agencies and individuals concerned would be considered rather than any special interest.

Members of the New York section, after discussing Col. Wilgus's paper, declared it to be of such importance that wide circulation of it not only among engineers but among all agencies and individuals interested in the future of New York as a port would be highly desirable. Through a motion the Board of Direction was given power to act in connection with that matter as well as in conferring with the proper officials over a proposed revision of the Staten Island piers.

Compensation of Chinese Engineers

By R. D. Goodrich

Engineer in Charge of Works, Commission for the Improvement of the River System of Chihli, Tientsin, China

THE accompanying schedule of salaries (paid in 1919) of the Chinese engineers employed by the Commission for the Improvement of the River System of Chihli, may be of interest in connection with the current discussion of the compensation of engineers. Although there is less engineering work in China now than formerly and salaries are somewhat lower, they are still able to command what would seem to us at home a high level of salaries. It should be noted that these salaries are for engineers on surveys and that some instrument men are receiving as much as $250 a month with an added allowance of $80 to $100. These salaries are in local currency and may be converted into gold at the present rates of exchange by deducting about 10 per cent. Of course under pre-war conditions, with silver and gold at rates of 2 to 1 or more, the comparison would be very different.

The schedule is as follows:

TOPOGRAPHIC SURVEY STAFF

Grade	Initial Salary	
Chief of party	$400	An increase of $25 each year to a maximum of $500.
Engineer surveyor	250	An increase of $25 each year to a maximum of $350.
Assistant engineer, 1st grade	180	An increase of $15 each year to a maximum of $225.

Engineer surveyors and assistant engineers first grade are also promoted by selection to fill vacancies in the complement of grades above them.

Grade	Initial Salary	
Assistant engineer, 2nd grade	$150	An increase of $15 after one year and promotion in grade after two years.
Assistant engineer, 3rd grade	120	An increase of $15 after one year and promotion in grade after two years.
Cadet, 1st grade	75	An increase of $15 a year for two years and promotion in grade after three years
Cadet, 2nd grade	60	Promotion in grade after one year.
Draftsman (tracer)	60	An increase of $15 each year to a maximum of $120.

HYDROMETRIC SURVEY DEPARTMENT

Grade	Initial Salary	
Hydrometric surveyor	$200	An increase of $25 each year to a maximum of $300. The senior hydrometric surveyor receives a charge allowance of $25.
Assistant hydrometric surveyor	100	An increase of $20 each year to a maximum of $200.
Draftsman	60	An increase of $15 each year to a maximum of $120.
Observers	60	An increase of $15 each year to a maximum of $120.

In addition, field allowances amount to about 25% of these salaries, besides transportation paid.

Convention of the American Association of Engineers

Abstracts of Addresses and Reports Presented May 10 *and* 11 *at the St. Louis Meeting of One Hundred and Fifty Delegates from One Hundred and Thirty-three Chapters.*

Organization and Work of the A. A. E.

By Prof. F. H. Newell
Retiring President, Urbana, Ill.

WHY is it that the American Association of Engineers, the youngest among so many engineering societies, has grown so strong? The reason is summed up in the word "Service." It is because it is trying to carry out the principles of true democracy and fellowship among the rank and file of professional engineers; because it is bringing them together to study the human factors, to consider the relations of man to man in industry and in economic affairs, and to work for each other and for the greatest good to the greatest number, co-operating with all, but not losing time by waiting for any. It is this spirit which is the strength of the organization.

During the year which has elapsed, the membership has increased from 4,000 to 17,000. The number of clubs has grown from 11 to 49 and of chapters from 21 to 133. The secretarial or clerical force for handling the rapidly increasing correspondence and routine work has increased from 20 to 75. The approximate amount of money received during the year has been $170,000. Practically all of this has been re-invested in the active work of the organization, as it has been the policy of the association to make returns to the members as quickly as possible through the services which may be rendered. Our official organ, *The Monad*, published in an edition of 5,000, has been transformed into the *Professional Engineer* with an edition of 20,000. Our employment service has received 5,000 inquiries, and has placed 1,800 persons, with a saving to them, as computed on the basis of the commercial employment agencies, of $200,000. This has been at an approximate cost of $10,000. In publicity, the local chapters and the Chicago headquarters have sent out material which has been reproduced in thousands of papers, each item calling attention to the engineer as a factor in human society.

Organization—Out of the recognition of the adage that "the Lord helps those who help themselves" has come our present association, originated and maintained by men who are determined not to rely upon others, nor to wait for some older society to awake to their needs, but to get together and make an effective agency for self help—and for service to humanity. By experience there has been learned the un-wisdom of waiting for others to do those things that can be best done ourselves—depending on our own courage and initiative.

The form of organization has necessarily been elastic, adjusted from time to time to fit the rapidly changing numbers and needs. In fact, the growth has continually forced adjustments. At all times, however, the local club or chapter has preserved its initiative and vigor.

This form of organization of A. A. E. must necessarily be one which will permit engineers to meet as often as practicable and to become acquainted with each other so that they may work in unison and in groups throughout all portions of the country. This results in the formation of clubs of a few engineers, meeting together in each smaller city, or in a large construction camp. Some of these clubs, favorably situated, grow rapidly into chapters composed of from 20 to 1,000 members, men who assemble at frequent intervals in the large cities, appoint committees and sub-committees to take up matters of common interest. These chapters propose to meet periodically in state assemblies, whose functions are similar to those of the old state engineering societies; also they are grouped into districts for the convenience of administration.

Chapter Work—Upon the effective work done by the individuals in each and every chapter depends largely the success of the A. A. E. While national headquarters may handle the larger problems and those of nation-wide interest and may systematize the details of employment, the preparation of information on salaries, the publication of news to the members, and correlate interests all along the line, yet it is in the chapters that the detailed work is accomplished; there the members get together and discuss the details, educating each other and producing in the aggregate the results for which the organization has been formed.

In some localities there already exist local sections of older technical societies and independent organizations. This results, temporarily, at least, in an apparent duplication of organiztion, but this condition is being remedied by the fact that there is usually a large enough number of engineers, not yet members of any society, sufficient to bring about a consolidation into the more vigorous and purely democratic chapter of A. A. E. In this way there have already disappeared a number of small engineering societies, these being replaced by live chapters of A. A. E., devoted to social, economic and civic affairs of interest to all.

All welfare work to be successful must be conducted from the ground up; it must be thoroughly democratic, and not a matter of authority nor of effort conducted by the best people, or those at the top reaching down in well meant efforts to help the man below.

Questions have been asked as to whether there is likelihood, if pending changes are made, of the overlapping of activities of the A. A. E. and of Engineering Council or other bodies representative of the older technical societies. It is hardly probable that under intelligent direction and with a proper display of the co-operative spirit, that there can be any such overlapping. There may be, it is true, some competition, but in such cases it is believed that the stimulus to effective work will be far more valuable than any loss which comes through apparent duplication.

Practical Efforts—The operations by which A. A. E. is seeking to carry out its ideals of service to the members and the public may be classified as pertaining mainly to employment, salaries, education or publicity, ethics, legislation and responsible control. No matter how able the engineer may be or how much time and money he may have expended on his education, or how wide his experience, all of these fail of utility to the world and are like a crumbling building on weak foundations unless he has work.

Recognizing this condition, the American Association of Engineers has made as one of its first and fundamental duties that of endeavoring to study working conditions in a broad way, and specifically to aid its members to the end that each man may find an opportunity for the best exercise of his qualifications. Thus it is that the employment service has been, and probably will continue to be, one of the most important functions of the association and of its chapters and clubs.

The association has succeeded in greatly improving the conditions of men in railroad employ. In the same way, in the case of public servants, notably in municipal engineering offices, and in highway construction, it has developed the existing facts, and has presented fair schedules or statements of minimum requirements which are being widely accepted. It is giving attention to another very deserving class of its members, namely, the engineering educators.

The work of the local chapters is largely educational in the sense that it serves to a certain degree as a post-graduate course for men who have passed through college or through the hard school of experience and who, getting together, exchange ideas and educate each other in various lines of mutual concern. More than that, in some of the chapters, steps are taken to maintain courses of instruction which are found by the members to be of peculiar advantage to them. Notably is this the case in public speaking where classes have been formed to give the members opportunity to discuss among themselves the matters of common interest and to improve in their methods of presentation of facts to all kinds of people.

The object to be attained in publicity is to let the public know something of the elementary facts regarding the work of the engineer, so that, appreciating these, better support will be given to engineering work in general. It is not intended to advertise any one engineer, but on the contrary to build up such an understanding of the possibility of further development of engineering for the public good that the plans and efforts of engineers will be supported by the public, particularly in lines which lead to better health, better comfort, and increased prosperity; through the development of highways, railways, means of transmitting intelligence, light, power, water supply, drainage, irrigation and other infinite applications of mechanical electrical and chemical forces.

Without such knowledge, systematically diffused in easily understandable form, the public and the men in control of large affairs are often unaware of the simple fact that society depends upon the engineer for most of its modern necessities.

The effort is continually made to keep before our membership the ideals of higher ethical relations between engineers and in their dealings with the public. This can best be done by bringing all of the engineers concerned into the organization, and then having these matters considered by properly qualified practice committees. It is by no means easy to rectify the abuses or neglect of a generation, but it is none too soon to begin systematically on the examination and correction of some of these matters.

The A. A. E. has co-operated in the general movement for a federal department of public works, and has urged that the next Secretary of the Interior be an engineer. This is indicative of similar efforts being made all along the line to insure that qualified engineers be given full responsibility for large executive departments.

The Present Activities and Future Responsibilities of A. A. E.

By C. E. Drayer
Secretary of the Association

Employment—The employment department has been placing members in such numbers that the saving, upon the basis of charge by a commercial agency, is more than the total receipts of the association from fees and dues. Last month 300 men were placed—an annual rate of 20 per cent of the entire membership. Men have been taken from misfit jobs and put where their abilities and inclinations fit. Increases in salaries have been obtained by offers of new positions.

Between 40 and 50 per cent of the positions filled are in the Chicago district. Of the calls for employment service at headquarters between 70 and 80 per cent are from Chicago members. This indicates that employment service is largely local and that it should be offered by every chapter. A way will be found to give it.

Compensation—The success of A. A. E. in the railroad field and, in a much less degree, in the municipal and other fields is well known. There are those who would check our endeavor to get the engineer an adequate salary but instead my hope is that we can give the same special attention to the public service, industrial and teaching fields as we have and are giving, to the railroad field.

Legislation—A major activity of the association as provided in the constitution is to supervise legislation affecting engineers. No legislation affects engineers more intimately than licensing. There are plenty of good license laws in operation or proposed. A. A. E. has obtained the passage of a good law in Virginia and has one in New York before the governor. Activities are under way in a number of other states. The time is nearly here when the engineer in the state not having a license law will be under considerable handicap.

Publicity—The opportunity for publicity work, not only from headquarters but abroad especially by the chapters, challenges the imagination. A few realize the potentiality of this service, not only to the engineer but also to the community. It is to be hoped that during the present year a man may be added to the staff who will give his time to this one major activity.

Welfare Work—Article 2 of the constitution provides that the association shall take action necessary to safeguard the profession's welfare. This broad province might be considerably subdivided. If we can insure health and happiness in a considerable degree to our membership we will be fulfilling one of the fundamental objects of the association. Not long ago a former chief engineer of a large railroad died at the age of 70 after several years of bitterness and dissappointment due to reverses that had overtaken him in his old age. No one wanted to employ the old man, especially with his discouraged attitude of mind. Wouldn't it be worth while to try to find a way to ameliorate such a happening?

In modern days life, health, accident insurance and old age pensions are looked upon as having their proper place in protecting against certain types of misfortune. The engineer is especially a safe risk and in a mutual company should be able to carry insurance at a favorable premium. A proper investment for the funds from insurance would be an office building, the permanent home of A. A. E. It is recommended that the association make a study of insurance and pensions with a view of offering to the membership the advantages arising therefrom.

Ethics and the Practice Committee—Last year the association brought out the "Engineers' Applied Ethics." Many of our ablest and highest minded engineers have commented upon it and all pronounced it excellent and surpassed by none. "The Engineers' Applied Ethics" should be so well known to all of us that we should be able to quote from it at will.

No law, however good, is self enforceable, so we have the Practice Committee, created at the last convention, to interpret the code in the problems met in practice and to enforce it. Because of several questions that have arisen during the past year in A. A. E., and because of the experience observed in other organizations, it has been suggested that a final tribunal in matters of ethics and practice be provided. This is eminently sound.

Unity Plan—The Board of Directors at its meeting Feb. 4 approved the recommendation of the national membership committee that members of recognized societies be admitted for one-half the current entrance fee. This plan commends itself as the quickest way to bring about unity and effective co-operation in the United States through the instrumentality of the organization designed to this end.

Evidence of the soundness of such a plan is best found in its operation. During April approximately 30 per cent of our applications (other than student) were on unity plan blanks. These applications are mostly from members in our local and state societies. Obviously the continuance of this plan for the remainder of the year will result in the initial integration of most societies, except the national technical societies, under the banner of A. A. E. Co-operation with the national technical societies will also be made much easier.

Reorganization—The founders of A. A. E. were men of unusual vision but few, if any of them, foresaw the wide reaches of A. A. E. of today and of the years just ahead. There are now some 200 subordinate organizations divided roughly into 150 chapters and 50 clubs. Little imagination is required to see that number soon doubled. Some of the chapters will number in the thousands.

The reorganization problem is one for experts to study before submitting a plan to our chapters. The center of the circle is service—the greatest service possible to the members and through them to the community. Clearly, the chapter is the unit, yet the unit must be supervised and correlated for the service of the whole. The plan of organization should be simple, ensure full control and fix responsibility.

For Americans the tried and satisfying type of organization is a duplication of or a parallel to our political organization; the indivduals gathered together in the community group, then co-ordinated by states and the states into a national organization, yet through the whole a myriad of threads from the individual to national headquarters, tying all together in a mighty whole.

Headquarters can best serve by becoming an organization of experts, not only to advise but having full authority to direct. No more should headquarters be irresponsible to its members than should chapters be irresponsible to headquarters. Chapters should be checked up and the highest degree of service maintained in a business way. Leaders must be developed. This program calls for talent in the employ of the association. In our judgment, first the number of district secretaries should be increased to give supervision to the whole, then state secretaries (or by groups of states where the engineering population is scanty) and last, full time secretaries in the local chapters. There would be exceptions to this order due to local or regional development.

Employment Service

By E. B. Miller

Assistant Secretary in Charge of Employment Department

MORE THAN 1,800 men were placed in new positions by the service department of the American Association of Engineers during the year ending May 1, at an aggregate payroll of $4,000,000. Over 5,000 openings were received to which 17,000 members were referred. In April headquarters received 463 vacant positions to which 2,003 men were referred; of these 182 reported that they had obtained places. The cost was $6 per man reporting as placed in April. The offices at Pittsburgh, Washington, New York, Minneapolis, Chicago, El Paso, Los Angeles, Seattle and in Oregon handled 247 vacant positions and referred 400 men of which 118 obtained positions.

Standing Committee Reports

PRACTICE COMMITTEE—H. W. Clausen, chairman of the Practice Committee, stated that twelve former cases had been reported upon. Under the rules no names are given. The motto is to search for the truth, to correct wrongs and to educate the thoughtless.

A resolution was passed calling on engineers in public service to obtain written orders from their superiors when the performance of these orders would be contrary to the dictates of the conscience of the engineer. These orders are to be forwarded to the practice committee for action and publicity. If the engineer is unjustly discharged the official is to be condemned and the employment department will endeavor to locate the engineer elsewhere and will refuse to recommend other engineers to the same position.

The recommendation that the practice be condemned of suspending civil service employees in advance of preferment of charges, as has been done recently in Chicago, was concurred in.

Education—The committee on education, headed by Prof. Frederick Bass, University of Minnesota, outlined courses to be handled by chapters in evening classes. Use of the resources of nearby universities are suggested for technical review of engineering subjects. The evening class work suggested, and now being carried out in Chicago and a few other chapters, includes courses in American government, public speaking, banking, business law, public management, salesmanship and public utility operation.

Compensation—The municipal schedule proposed by the committee on salaries of engineers in public service was submitted by the chairman, A. N. Johnson, highway engineer, Portland Cement Association. It was adopted. (See *Engineering News-Record*, May 6, p. 898). On salaries of engineering educators, Prof. C. J. Tilden, Yale University, presented a progress report and a tentative schedule which has been sent out to the members of the committee.

Qualifications—The committee on qualifications, headed by W. H. Dean, assistant engineer, city engineer's office, Chicago, handled 19,864 applications last year. It is strongly against asking those clearly not qualified to become members.

Employment—George C. D. Lenth, assistant chief engineer Sewers Board of Local Improvements, Chicago, chairman, recommended that the country be divided into four or five employment districts with offices in each district; that there be installed a card system, covering the personnel of the entire membership, similar to the cards used in the army; that a special charge be made for positions paying more than $2,400. The latter provision was voted upon unfavorably.

Chapter Activity—A debating society is the latest chapter activity undertaken in the Chicago chapter, stated W. J. H. Strong, chapter president. It grew out of the class in public speaking. Other activities taken up in a series of regular meetings are (1) economics for the engineer, (2) science for the engineer, and (3) self-help for the engineer.

F. K. Bennett, paid secretary of the Twin Cities chapter, stated that interest had been greatly augmened by a ladies auxiliary which provides monthly dinners and dances. The ladies keep the men informed as to meeting nights and urge attendance.

The Idaho chapter has induced half of its clubs in various cities to join the chambers of commerce. It will work through the latter in getting legislation for compensation or legislation for engineers. In turn the engineers will work for measures in which they are less personally interested.

Opportunities for American Engineers in Foreign Countries

By F. Lavis

Consulting Engineer, New York

BEFORE a nation can participate in the development of foreign enterprises it must develop among its own people a desire to buy the stocks and bonds of these enterprises. That desire hardly exists today in the United States. Fifty per cent of foreign engineering developments are likely to be connected with transportation.

In the construction of railways, especially in undeveloped or partly developed countries, I believe our engineers by virtue of their experience and training are pre-eminent. We know better, or at least we practice better, the art of adapting the railroad to its work than do European engineers.

Another important foreign field which American engineers are well able to take care of is that of the development of electric power. To say the least, we are, I believe, as well able to cope with these problems as the Europeans. In the development of oil fields and the construction of pipe lines our engineers are leaders. We are today directing the construction of a pipe line between Havre and Paris in France. The field of sanitation and municipal engineering is only beginning to open up. The principal cities of South America are fully alive to the need of good water supplies, sewerage and paving. The whole world is waking up to the changes brought about by the use of motor trucks and the need of good roads.

South and Central America and Mexico are attractive fields for us because they are our nearest neighbors and we know them. They need outside help for their development just as we needed it in the past. Besides money, which is the *sine qua non*, they need our technical skill and our organizing ability. The field there in almost every line of engineering endeavor is limited only by the amount of money we are willing to invest.

With the exception of Spain, the Balkans and Russia, we can pretty nearly entirely eliminate Europe from the field of possibilities abroad for American engineers. Russia and the Balkans will undoubtedly open up a field for our activities as soon as they are able to establish safe and sound governments. Before the revolution in Russia we were already investigating some very important transportation, coal and steel projects there, which were more or less linked up together, but these countries are off the map for the present.

Of all the European countries today, Spain presents the most attractive field. Her material development is probably the most backward of any of the European countries except the Balkans, she has a good laboring population, large undeveloped natural resources, and since the beginning of the present century has been making remarkable progress toward economic prosperity, which has been greatly accelerated during the war.

There remain Asia, Africa and Australia. Both Africa and Australia are almost entirely dominated by European influences, largely by the British. The field for the American engineer in those continents is therefore quite limited.

The future of Siberia is inevitably linked up with the future of Russia. It is an enormous country with the characteristics of our great Northwest and Canada, and will open up some day, perhaps a little distant, a great field for American enterprise, particularly in connection with the construction of railways and the development of its great resources of mineral wealth. As in China, we shall be faced to some extent with the competition of the Japanese, but in this the question of investments will be the deciding factor.

Is the American engineer equipped to play his part in the development of foreign enterprises? Technically, I believe he is, but in many other ways he is not. I have felt for some time that our engineering schools for many years have been turning out merely technically educated engineers —men who are only to a certain degree a little better than skilled mechanics. Many of us have immediately gone from the schools out into the woods and lived the life of pioneers, disregarding and often disdaining the refinements of civilization. Engineers in foreign countries, men in official life, whether it be in Mexico, South America, China or elsewhere, are generally well educated, cultured persons. Perhaps some of them set too great a store by some of the refinements, even some of the ceremonies of older civilizations.

The engineer who goes abroad should be able to associate with the well educated eminent foreign engineers, with bankers, cabinet ministers, presidents and with kings with just the same right degree of cordiality as he does with a contractor, a drill runner or the driver of a team of mules. This *savoir faire*, this knowledge of how to meet any conditions of life will also do him no harm at home.

Engineers should not disdain a dress suit, frock coat, a silk hat or patent leather shoes, and should have the manners that go with them.

Engineers who wish to do something more than run a transit or figure the strains on a bridge, should have a fair knowledge of world politics, of world history. They should know what the main currents of commerce are and where they run, they must have a knowledge of business, of methods and customs of finance and not be afraid of knowing something of art and literature.

Engineering Publicity—Why and How

By Cedric B. Smith

Editor, Professional Engineering

A SIMPLE definition of engineering publicity is anything concerning engineers or engineering which is brought to the attention of the public. Publicity is nothing more nor less than advertising. What engineers have to sell is far more important to mankind than any one of a dozen things made as popular as kodaks and grape nuts have been by advertising. Services are to be sold. The better known the local body of engineers, the more force will the organization and individual have in politics.

Magazines, moving pictures and public speakers are available mediums of publicity, but the most common, easiest and most efficacious is the newspaper. The subject matter in magazines invariably follows the trend of current events. Current events are reflected most plainly in newspapers, hence if the latter contain engineering publicity, it follows that the magazines will also contain material concerning engineers and engineering. The word "engineer" appears in magazines of general circulation today at least several times more often than it appeared even one year ago. The *Saturday Evening Post* is running a series of articles written by an engineer. Where writers of fiction formerly made their hero a lawyer or a physician, they now incline toward an engineering hero with a virile background of engineering accomplishment.

What Is News?—The word news is one which is almost in universal use. One of us often says to another, "What Is the News?" in other words, What is new? When it comes to writing a formal definition of the word news, however, even experienced men find themselves in difficulty. In the issue of March 18, 1911, of *Collier's Weekly* there appeared a list of ten different definitions of news, submitted by as many newspaper editors. One said, "News is whatever your readers want to know." Another defines news as "anything that people will talk about; the more it will excite comment, the greater its value." "News is everything that happens," is the opinion of another editor. Possibly the best of all of these definitions is the following: "News comprises all current activities which are of general human interest and the best news is that which interests the most readers."

In efforts to obtain publicity search must be made for events which will appeal to the greatest number of readers. We must, if we are to deal in human relations, take cognizance of public opinion and be sensitive to popular interest. If the association is to serve the public well it must keep the public acquainted with its activities in behalf of the public. To acquaint the public the association must rely largely upon news. The special features which will appeal to the newspaper readers must be sought for and displayed as a means of acquainting the people with the efforts that are being made, even though these features may not be the most important from the engineer's standpoint. In addition to this, we must continually bend our efforts to educate newspaper editors to a better appreciation of engineering news.

Publicity in the form of news stories must of necessity be handled principally by local chapters and clubs on account of the fact that local news is in greater demand than national news of equal importance.

The Local Committee—Successful publicity accomplishment requires hard constant effort on the part of publicity committees. Give publicity committees full support and encouragement, and endeavor to have built up in the committee a tradition for getting all of the news while it is hot and getting it in print. The committee should meet often with the chairman to discuss publicity problems and means for accomplishing a greater amount of good for the chapter and the profession. At these meetings publicity methods can be discussed and different members of the committee assigned to different tasks. Their chairman should keep a "future" book exactly like that of the city editor of a newspaper. Possibly the city is expected to authorize the construction of a bridge. A member of the committee should be assigned to this subject exactly the same as a reporter is assigned to a story by the city editor of a newspaper. His connection with fellow members in the city engineer's office should get him in touch with sources of information which will give him the news even quicker than a reporter of one of the dailies. A man assigned to cover a meeting should send advance notice to the papers, and the story of the speaker or his subject. He should obtain advance copies of the address for the papers and finally see that the reporters who attend the meeting are supplied with full information or that an account is sent to each of the morning papers.

Publicity committees are the most important ones in the chapter. Fill them with capable, energetic men, selecting preferably those who have a liking for newspaper work, using young men for leg-work; that is, for gathering news, and the older, more experienced engineers for evolving publicity schemes and sketching out feature material. Urge members of the committee to become familiar with newspaper offices and newspaper practices. They should study the news stories in the papers each day, talk to reporters and become thoroughly acquainted with the elements of their task.

(The Presidential address of L. K. Sherman appears on page 999 of this issue.)

ENGINEERING LITERATURE

A REVIEW OF BOOKS AND A LISTING OF NEW PUBLICATIONS

Retaining Walls

REVIEWED BY EDWARD GODFREY

Pittsburgh, Pa.

RETAINING WALLS: THEIR DESIGN AND CONSTRUCTION—By George Paaswell, C. E. New York and London: McGraw-Hill Book. Cloth; 6 x 9 in.; pp. 275; 9 plates and 133 figures in the text. $4.

In his first three chapters the author deals with theories of earth pressures and of reinforced-concrete as applied to retaining walls. Various types of walls are next considered. Expansion joints and wall failures are emphasized in the fifth chapter. Plant and forms are very fully treated in two chapters. Concrete proportioning and placing are given much space. The rest of the book takes up other than concrete walls, surface treatment, waterproofing, drainage, field and office work, specifications, etc. A good bibliography is found at the end.

The author gives very practical problems that illustrate well his principles of design; also he gives some good practical suggestions that will aid the designer in keeping in view the fact that designs are made for execution in stone and steel and not as exercises in the working out of mathematical formulas. This is an excellent feature in an engineering work.

Much space is given up to "artist stuff" about the water ratio in concrete mixes and mixing concrete with brains instead of cement. This theory works out nicely in the laboratory, but on the job *cement* and *thorough mixing* produce better results than exponential formulas without them.

The author takes liberties with nomenclature that are exceedingly confusing—in fact intolerable. The letter k represents five different things on pp. 86, 24, 52, 96, and 152; p is different on pp. 87, 93, and 96; c is different on pp. 16, 17, and 22; d is different on pp. 89 and 91; q is different on pp. 65 and 89; g is different on pp. 27, 12, and 45. The last-named letter seems to mean the unit weight of earth, in most places, though an hour's search could not verify this. In Fig. 46 x is used for two different values. On p. 27 capitals and small letters are indiscriminately mixed in figure and text. The publishers should at once remedy this by issuing a sheet of errata, containing also a list of letters used and the pages where they have one meaning and where another.

The theoretical treatment of the fundamentals of earth pressure is admirable, chiefly because of what it omits. One admires the restraint of a man who knows all about the theory of the ellipse of stress and can omit it entirely in a book of this sort. The theory is simplified greatly—in fact, down to where the author almost shows that the whole thing can be discarded and instead the absurdly simple method can be substituted of using for all horizontal earth pressures an equivalent fluid pressure on the basis of an assumed fluid of a weight some fraction of the actual weight of earth. The writer has reviewed four books on this subject, and Mr. Paaswell is the first author to give even passing recognition of the equivalent fluid pressure.

The author acknowledges that many earths will stand a considerable time with no retaining wall. Theory defied. He tells, on p. 162, of walls that were "designed upon the assumption of a dry granular fill," and they failed. Standard theory discredited. Frost and rain are the great forces working against a retaining wall. Neither is amenable to theory. A simple theory of fluid pressure will take care of the effect of rain; anything more is ultra-theoretical. Frost is chiefly effective near the top of the wall and demands stability there that the theory does not touch upon. Mr. Paaswell does not recognize the place of either frost or rain in his theoretical treatment, though he does emphasize the importance of drainage elsewhere. This is standard but not safe.

The author discourages the use of a revetment wall by saying: "It is more of historic than of present interest" (p. 65). The revetment wall deserves a better place. An excellent example of the economy and efficiency of a stone revetment wall is to be found near the Union Station in Pittsburgh. There are many sloping and crumbling shale cuts where a revetment wall would be eminently in place.

Mr. Paaswell rejects the proposition that the counterfort of a reinforced-concrete retaining wall is merely the concrete covering for anchor rods tying the bottom slab and the vertical wall together. He says it is a triangular beam which is "standard." Nevertheless, he emphasizes again and again, in his example of a practical design, the importance of anchoring the wall and the slab *into the counterfort.* The latter is fully anchored twice, once by vertical rods and once by tension reinforcement of his triangular beam. *Then he designs a counterfort that could split in two and wreck the wall by merely cracking the concrete, without disturbing the steel.* (Fig. 51, p. 111). On p. 101 he refers to reasons given for treating the counterfort as a beam. The only reason for this that can be found is on p. 97—where "The counterfort will be treated as a cantilever beam." For the "depth" of the beam he uses a horizontal line, which, however, is diagonal to the steel. This is not correct. He makes the rods 1¼ in. in place of the required 1 in. merely to increase the grip. Steel is too precious for this. He should have added to the length at the upper end and saved the wall from possible collapse.

A proposition that would vitally affect design cannot be ignored, regardless of its author. It must have recognition, even if that recognition is to show why it is not true. Mere dismissal because in one's opinion it is not true is not sufficient.

Plain Talk on Inventions and Investors

INVENTIONS: THEIR DEVELOPMENT, PURCHASE AND SALE—By William E. Baff, Patent Attorney. New York, D. Van Nostrand Co. Cloth; 5 x 8 in.; pp. 230; $2 net.

Described as "essentially a manual on the marketing of inventions," the author also states that this book is intended "not alone for the ordinary layman without experience and worldly wisdom but for busy people in every line desirous of understanding the nature of patent property in inventions." Although the author treats of various phases of his subject that might be expected to suggest the consultation of an engineer, he does not seem to recommend or even mention such action on the part of inventors, investors or manufacturers. The volume promises to be useful to the class of readers for whom it is designed. If widely read and profited by the book would lead to better and perhaps, but not necessarily, fewer patents, and would save inventors, investors and, last but not least, the public at large much loss.

How an Engineer Should Write

By P. B. McDonald

Assistant Professor of English, New York University,
New York City

TECHNICAL WRITING—By T. A. Rickard, Editor of the *Mining and Scientific Press*, San Francisco; Formerly Editor of the *Engineering and Mining Journal*, New York, etc. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 5 x 8 in.; pp. 178. $1.50.

This is a better book than the author's "A Guide to Technical Writing," which was reviewed in the Engineering Literature section of *Engineering News*, Jan. 19, 1911. The present volume has grown from a series of five lectures delivered before the engineering classes of the University of California in 1916. It is designed especially to be of use to the engineer and the advanced college student. The style and method are that of the keen editor rather than that of the academic expounder. In the review of the earlier book in *Engineering News* fault was found with the emphasis which the author placed on diction and sentence structure, to the neglect of the psychology of thinking and writing—what some professors of rhetoric call synthesis and organization, or the composition as a whole. Mr. Rickard's point of view seems to be that, if the student can use words and construct his sentences properly, his arrangement of larger units depends upon common sense rather than on knowledge of a system.

Another objection in the review of 1911 was that the author cited himself as authority too freely. This objection is not so evident in the new book. While the author is not lacking in courage to trust his intuitions, he gives a number of excellent examples from Huxley, Ruskin, Sir Arthur Quiller-Couch, George M. Wood of the United States Geological Survey, Sir Clifford Allbutt, etc. Indeed, the book has quite a classical tone to it. Not only is the style more restrained and scholarly than in the "Guide to Technical Writing," but more important material is considered. There is a chapter on the relative pronouns, for instance, that brings out points that other rhetoricians have overlooked.

In the sentence "The engineers, who refused to submit, were discharged," the author points out that considerable difference arises in the meaning when the commas are omitted and the 'who' changed to 'that.' Many other excellent illustrative sentences are given, particularly in the interesting chapters on "Jargon" and "Slovenliness." The following extracts from the book are picked almost at random:

"Take note of the fact that nonsense remains nonsense however much you may disguise it in a veil of words. We think in words, and when we lack clear words we lack clear thoughts. . . . The following is a quotation from an address delivered by a prominent financier in San Francisco: 'Let us learn, then, to realize that each has his dominion and his empire of domination, in which by the exercise of these qualities that are alike in spelling success each may rise to a position of leadership, with potentialities of power as great in its sphere of action as that of the many, to whom we look for the time being, because of some particular preferment as a leader.' This is balderdash. It is the 'delirious trimmings' of language."

Of another confused sentence, this time from a technical journal, the author remarks that it reminds him of the following passage from 'Alice in Wonderland': "Never imagine yourself not to be otherwise than what it might appear to others that what you were or what you might have been was not otherwise than what you had been would have appeared to them to be otherwise."

The author cites Ruskin and Huxley for examples of commendable English. From Huxley, under whom he studied in the Royal School of Mines, he quotes. from the 'lay sermon' on the formation of coal, that remarkable description of the prehistoric coal forests in which "stupid, salamander-like Labyrinthodonts pottered, with much belly and little legs, like Falstaff in his old age." One of the passages quoted from Ruskin is his artistic delineation of the district between Valorsine and Martigny. Mr. Rickard says: "This 'play of human speech' is so exquisite that it is safe to infer the toil of the true artist. Note the imagery: the paths like 'winding stairs'; the rounded rocks like 'plunging dolphins'—the porpoises of unpoetic fact; 'the crest of corn upon the rock casque'; the meadows 'like inlets of lake among the harvested rocks.'"

Of Mr. Rickard's own style, it can be said that he prefers short, pithy sentences, self-conscious almost in the French manner. His phrases scintillate sharply and pique the reader to continue. Some critics will consider that he splits to many puristic hairs, but the careful student will find a world of valuable suggestions compact in this little work. The author has been quick to see the scientific, scholarly, and practical.

New Viewpoints of City Planning

WHAT OF THE CITY?: America's Greatest Issue—City Planning What it is and How to go About it to Achieve Success—By Walter D. Moody, Managing Director, Chicago Plan Commission. Author of "Wacker's Manual of the Plan of Chicago," etc. Chicago, Ill.: A. C. McClurg & Co. Cloth; 5 x 8 in.; pp. 441; illustrated. $2.50.

The chief value of this informing and inspiring book lies in its story of Chicago's leadership in city planning and in executing the notable plans that have been made. Interspersed with this story are some good observations on city planning in general and a mass of information and assertion about the greatness and the mere bigness of Chicago that must be wearisome to almost every reader outside Chicago as well as to modest and cultured people in the windy city itself.

Aside from his lively story of the origin and progress of city planning in Chicago—or perhaps one should say as a part of that story—the author's most distinctive contribution to city planning literature is his explanation and advocacy of what in the commercial parlance of the day is called the "salesmanship" of city planning. As the author well says, two hundred cities have gone more or less extensively into city planning —officially in some cases but more generally through the efforts of private citizens, civic or commercial organizations—but in only ten or twelve instances have the plans got far, if any, beyond the paper stage. Chicago leads not only in fullness and boldness of conception but also in the degree of execution. This leadership has come from the late David H. Burnham on the artistic and technical side and from Charles H. Wacker, chairman of the Chicago Plan Commission, on the broad promotional side, while the author has been an exponent of the "salesmanship" idea. Steadily back of all that has been accomplished has been the Chicago Commercial Club and other local organizations and the Chicago Plan Commission. It is noteworthy that Commercial Club members have subscribed $303,600 to promoting the Plan of Chicago against only $99,190 appropriated by the city of Chicago—but the millions upon millions of bonds voted by the people of Chicago to carry out the plan should not be overlooked. Worthy of mention, also, is the fact that the Chicago Plan Commission has a total membership of 328. Just how the commission functions with the city authorities the author might well have explained. The inference is that the commission is simply a body advisory to the City Council and promotional with the mass of the people and with their leaders in various organizations. Remarkable educational work has been done through the public schools.

The author truly says: "Rarely in America is city planning initiated by the municipal government." The movement must be started and at least the early stages of specific planning must be financed privately—as distinguished from official municipal action. The same is also true of the promotional work. In fact, so little confidence has the author in either initiation or the continuous prosecution of city planning by the city itself that he comes out strongly for endowment. That this should be the conclusion of one so intimately associated with Chicago's great achievement affords a subject for reflection. It seems almost an indictment not merely of municipal government but of democracy. But it is not quite fair to the author to question his conclusion when set forth almost wholly detached from his context. Therefore we feel all the more justified in commending the book to the attention of all close students of municipal affairs.

PUBLICATIONS RECEIVED

[So far as possible the name of each publisher of books or pamphlets listed in these columns is given in each entry. If the book or pamphlet is for sale and the price is known by the editor the price is stated in each entry. Where no price is given it does not necessarily follow that the book or pamphlet can be obtained without cost. Many, but not all, of the pamphlets, however, can be obtained without cost, at least by inclosing postage. Persons who are in doubt as to the means to be pursued to obtain copies of the publications listed in these columns should apply for information to the stated publisher, or, in case of books or papers privately printed, then to the author or other persons indicated.]

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION: Proceedings, 1919—Chicago, Ill.: C. A. Lichty, Secretary. Cloth; 6 x 9 in.; pp. 176. $1.

CONNECTICUT PUBLIC UTILITIES COMMISSION: Report, 1918-19—Hartford, Conn.: The Commission. Cloth; 6 x 9 in.; pp. 811.

THE DETERIORATION OF STRUCTURES OF TIMBER, METAL AND CONCRETE EXPOSED TO THE ACTION OF SEA-WATER: First Report of the Committee of The Institution of Civil Engineers—Edited by P. M. Crosthwaite, B. A. I., M. Inst. C. E., Secretary to the Committee and Gilbert R. Redgrave, Assoc. Inst. C. E. London, Eng.: H. M. Stationery, Imperial House, Kingsway. Cloth; 6 x 9 in.; pp. 301; illustrated. 30s.

EDUCATION AND TRAINING FOR THE ELECTRICAL AND ALLIED ENGINEERING INDUSTRIES: Report of Education Committee of the British Electrical and Allied Manufacturers' Association (Incorp.), New York: Longmans, Green & Co., London; Edward Arnold. Cloth; 5 x 8 in.; pp. 64.

FLORIDA ENGINEERING SOCIETY: Year Book, 1920—Gainesville, Fla.: Secy., J. R. Benton. Paper; 6 x 9 in.; pp. 45; illustrated. 25c.

FURTHER INCIDENTS IN THE LIFE OF A MINING ENGINEER—By E. T. McCarthy, A. R. S. M., M. I. M. & M., M. I. M. E., M. Am. I. M. E., F. R. G. S. New York: E. P. Dutton & Co., London: George Routledge and Sons, Ltd. Cloth 6 x 9 in.; pp. 400. $7.

HOME BUILDING FOR WAGE EARNERS: A Financial and Economic Problem—New York: Fred T. Ley & Co., Inc. Paper; 6 x 9 in.; pp. 55; illustrated.

An instructive exposition of the details of industrial housing, written mainly for the company whose employees need homes by Leslie H. Allen.

THE HOUSING PROBLEM: Its History, Growth, Legislation and Procedure—By John J. Clarke, M. A., F. S. S., Accountant of The University of Liverpool; Lundie Medallist for Citizenship, etc.; with an Introduction by Brig.-General G. Kyffin-Taylor, C. B. E., V. D. New York and London: Sir Isaac Pitman & Sons, Ltd. Cloth; 6 x 9 in.; pp. 544. 21s net.

HOW TO USE CEMENT FOR CONCRETE CONSTRUCTION FOR TOWN AND FARM: Including Formulas, Drawings and Specific Instruction to Enable the Reader to Construct Farm and Town Equipment—By H. Colin Campbell, C. E., Director Editorial and Advertising Bureau Portland Cement Association, Contributing Editor to Numerous Farm, Trade and Technical Periodicals. Chicago, Ill.: Stanton & Van Vliet Co. Cloth; 5 x 8 in.; pp. 380; illustrated. $2.

A popular text mostly for the amateur. Worth while for the prospective user of home-made concrete.

INTERNAL-COMBUSTION ENGINES: Their Principles and Application to Automobile, Aircraft, and Marine Purposes—By Wallace L. Lind, Lieutenant Commander, United States Navy, M. S. (Columbia University) New York and London: Ginn and Co. Cloth; 6 x 9 in.; pp. 225; illustrated. $2.20.

For the average student. There is a chapter on the Thermal Properties of Gases, and the Principal Ideal Cycles Applicable to Internal-Combustion Engines.

INTERNATIONAL WATERWAYS: I—The Evolution of the Principle of International Waterways; II—A Reference-Manual to the Treaties, Conventions, Laws, and other Fundamental Acts Governing the International Use of Inland Waterways—By Paul Morgan Ogilvie, M. A. New York: The Macmillan Co. Cloth; 6 x 9 in.; pp. 424. $3.

Historical résumé of the part that waterways and particularly boundary waterways has played in commercial development in the world, together with a reference manual listing all of the international conventions or treaties relating to boundary waters. "The purpose of this reference manual is to provide a facile means of determining the law governing navigation of any specific waterway."

INVESTIGATION OF THE COMPRESSIVE STRENGTH OF SPRUCE STRUTS OF RECTANGULAR CROSS SECTION AND THE DERIVATION OF FORMULAS SUITABLE FOR USE IN AIRPLANE DESIGN—By James E. Boyd, Professor of Mechanics, Ohio State University; Expert on Aviation Problems at Bureau of Standards, Washington, D. C.: The Bureau. Paper; 7 x 10 in.; pp. 43; illustrated. 10c. from Superintendent of Documents.

MASSACHUSETTS COMMISSION ON WATERWAYS AND PUBLIC LANDS: Report, 1913—Springfield, Mass.: The Commission. Cloth; 6 x 9 in.; pp. 99; folding map.

THE MISSISSIPPI RIVER COMMISSION: From Annual Report Chief of Engineers, 1919—Washington, D. C.: War Department. Paper; 6 x 9 in.; pp. 1813; illustrated.

THE NEW INDUSTRIAL UNREST: Reasons and Remedies—By Ray Stannard Baker, Garden City, N. Y.: Doubleday, Page & Co. Cloth; 6 x 9 in.; pp. 231. $2.

NEW SOUTH WALES DEPARTMENT OF PUBLIC WORKS: Report, 1918-19—Sydney, Australia: The Department. Paper; 8 x 13 in.; pp. 91; illustrated.

OPPORTUNITIES IN ENGINEERING—By Charles M. Horton. New York and London: Harper & Brothers. Cloth; 5 x 8 in.; pp. 90. $1.

ORGANIZED LABOR IN AMERICAN HISTORY—By Frank Tracy Carlton, Ph. D., Professor of Economics, De Pauw University. New York and London: D. Appleton and Co. Cloth; 5 x 8 in.; pp. 313. $2.50.

PIEUX ET SONNETTES—Par Edouard Noe et Louis Troch, Ingenieurs. Paris: Gauthier-Villars Et Cie. Paper; 7 x 10 in.; pp. 348; illustrated. 20 francs.

SELECTED ARTICLES ON PROBLEMS OF LABOR—Compiled and Edited by Daniel Bloomfield with an Introduction by Meyer Bloomfield. New York: The H. W. Wilson Co. Cloth; 6 x 9 in.; pp. 436. $1.80.

Not the "labor problem" but "problems of labor," as is pointed out in the Introduction, is the subject of this compilation. Some of the main heads under which the selections fall are: Causes of Friction and Unrest, Cost of Living, Profit Sharing, The Shorter Work-Day, Trade Unionism, Labor Disputes and Adjustment, Housing, and Industrial Hygiene.

THE SUPERVISION OF PUBLIC WATER SUPPLIES BY THE NEW YORK STATE DEPARTMENT OF HEALTH—By Theodore Horton, C. E. Reprinted from Journal of the New England Water Works Association, Vol. XXXIII, No. 4. Boston, Mass.; The Association. Paper; 6 x 9 in.; pp. 8.

TECHNICAL WRITING—By T. A. Rickard, Editor of the "Mining and Scientific Press" San Francisco; Formerly Editor of the "Engineering and Mining Journal." New York, etc. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 5 x 8 in.; pp. 178. $1.50.

THE WESTINGHOUSE E-T AIR BRAKE INSTRUCTION POCKET BOOK: A Complete Work Explaining in Detail the Improved Westinghouse Locomotive Air Brake Equipment, Including both the No. 5 and the Standard No. 6 Styles, with Recent Modifications—By W. W. Wood, Air Brake Instructor, Author of "The Walschaert Locomotive Valve Gear," "Locomotive Breakdowns," etc. Second Edition—Revised. New York: The Norman W. Henley Publishing Co. Cloth; 5 x 7 in.; pp. 258; illustrated with colored plates. $2.50.

A detailed instruction book on the latest forms of improved "E-T" air brake equipment, with changes in practice made necessary by higher speeds and heavier rolling stock. Contains color diagrams of air equipment, including the modern distributing valve. Also contains detailed directions for operation and maintenance and enginemen's examination questions and answers. The first edition was noticed in *Engineering News*, June 17, 1909.

LETTERS TO THE EDITOR

Suggested Remedies for Some Ills of the Engineer

Sir—Referring to the discussion on the improvement of the status of engineers in society, it is my opinion that Mr. Swaab's article, in your issue of March 4, p. 482, hits the vital spot. The fact that lawyers and physicians are as a rule in business for themselves is the main reason for their dignity. Since they are, as a body, established on every hand in all communities, their signs hung out and the public obliged to go to them, they thus obtain a large amount of advertising. Also, their independence makes them broader men, since they are free to assert their own individuality and since success depends entirely on themselves.

When a client engages a lawyer or physician, he does not make a bargain as to the fee—the client merely decides what quality of lawyer he wants according to the importance of the case, and after the work is done the lawyer submits his bill in amount to suit himself.

If, by some united action, engineers should break away from existing custom and take their profession into their own hands, engaging recent graduates as assistants, then would the tables be turned and the capitalists, promoters, municipalities, etc., would come to them for advice at such prices as they (the engineers) might elect. This would require that engineers be broader and better able to handle all phases of at least one subdivision of engineering. The practice of some corporations of subdividing work so that engineers are made to specialize on one detail, and become proficient in that only, tends to split the profession into a large number of routine workers.

It is, of course, true that lawyers and physicians necessarily come into direct contact with people from all walks of life, and are thereby more universally recognized, whereas engineers' dealings are usually confined to a limited class of society. H. W. KENNEY.

Washington, D. C.

Shall Chinese Labor Be Imported?

Sir—I noticed in the *Engineering News-Record* of May 6, p. 926, a letter from John Ericson, former city engineer of Chicago, offering a solution for the shortage in unskilled labor. Mr. Ericson was kind enough to send me a copy of this same letter under date of April 27, to which I replied on May 1. I am inclosing you copy of my reply to Mr. Ericson, thinking that it may interest you.

EDWARD E. WALL,
St. Louis. Water Commissioner.

[Copy of Mr. Wall's letter to Mr. Ericson follows.—EDITOR.]

May 1st, 1920.

I received your communication of April 27 yesterday and, while I agree with you that shortage of unskilled labor is a very serious problem at the present time, I am unable to bring myself to the belief that your suggested remedy, namely, that of the restricted importation of Chinese laborers, would either be a wise thing to do or would result in the solution of the problem.

In the first place, you will find the entire population of the Pacific coast opposed to this proposition to the absolute point of rebellion. Next, I believe you would find the entire body of organized labor in opposition to such a measure. In my opinion the importation of Chinese labor would make a bad matter worse. The importation of these laborers would still further intensify the division of all labor into classes, which, in my opinion, is one of the evils which have helped to bring about our present difficulties.

I believe that a step towards the solution of our problems lies in getting more work, both in quantity and variety, from the individual. The efforts of labor organizations for many years have been directed toward the division of labor into an infinite number of areas, which may be considered as bounded by circles touching each other but not intersecting or over-lapping. At the present time their efforts have apparently reached the climax of success, and we have the condition in which each mechanic, artisan and laborer performs only the task allotted to his little restricted circle.

For example, the carpenter will now do nothing but saw, plane and fit boards and nail them together. He will not handle his own lumber nor wait upon himself, but has to have a helper to do his menial tasks. This is the case with all classes and conditions of labor; consequently, no man is doing the full amount of work of which he is capable during the eight hours to which he has limited his working time each day.

It should be evident, it seems to me, that production must be greatly restricted under such methods of industry. We should get back to the time when workmen of all classes took pride in the work that they turned out and did not hesitate to turn their hand to any task that was connected with or incidental to the job.

Another thing that has largely contributed to bringing about the serious condition of affairs in this republic is the facility which has been afforded the labor organizations for adding increase upon increase to the prices demanded for their services. This has resulted in enticing the laborers from the agricultural districts into the smaller towns, from thence into the larger towns and finally into the large cities, causing great congestion of population and consequent scarcity of housing, forcing up the price of all commodities, followed by increases in wages and so on ad infinitum.

The only possible remedy for this condition of affairs is to force up the prices of farm products until farming becomes far more profitable than the returns paid to mechanics and laborers generally. Either this or a very substantial reduction in the wages paid mechanics and laborers, so that the present prices of farm products will induce men to go back to agricultural pursuits.

In my opinion, this country of ours must come back to sane methods of thinking. It may be possible that this present condition is simply a wild dissipation in which we are all indulging and a little later on we will get over this intoxication and will come back to earth again. In short, my idea of a solution of our troubles is that we must speed up production by making our labor more efficient and inducing our population to become more economical.

Approximate Rules for Strength of I-Beams

Sir—On page 686 of your issue of April 1, 1920, Edgar Piercy criticizes the approximate methods for quickly determining the strength of I-beams submitted by W. H. Cullers and the writer on page 388 of your issue of Aug. 21, 1919. By reference to the Aug. 21, 1919, issue, it will be seen that the writer suggested "another very simple way of arriving at the approximate section moduli of I-beams," as a commentary on the article appearing in your issue of July 17, 1919, page 115, by Manton E. Hibbs. Both the text and table in Mr. Hibbs' article make it clear that the entire reference is to *standard* I-beams. The method proposed by the writer, of multiplying the depth by the weight per foot and dividing by 10, was intended to apply only to such beams as were covered by Mr. Hibbs' article.

Mr. Piercy has made the error of assuming that the method had a universal application. This would be manifestly illogical, inasmuch as the heavier beam sections of a given depth are in general composed of a standard I-beam plus a rectangle of steel, the full depth of the beam. The approximate formula for the section modulus of a standard beam is $wh/10$ whereas the formula for section modulus of a rectangular steel beam is $wh/20.4$, from which it will be seen that a pound of standard I-beam is twice as valuable in bending as a pound of extra-weight web.

Ready rules such as those suggested are a great convenience, particularly on rush work, field operations, rough checking of work already in position, etc. It should be noted that the vast majority of I-beams used are of standard weight and ordinarily these are the ones available from stock. G. S. BURRELL.

Charleston, S. C.

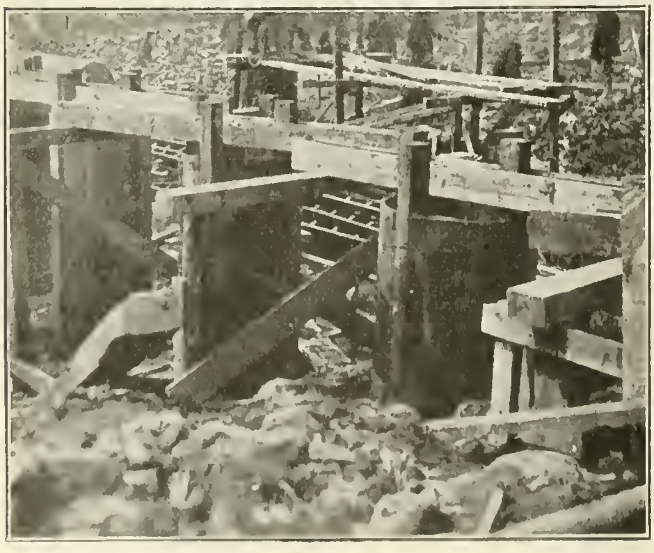
HINTS FOR THE CONTRACTOR

Collapsible Forms Used in Pouring Walls of Deep Circular Pits

RECENTLY there were constructed in Detroit about 100 30-in. diameter pits approximately 20 ft. deep, below the basement floor of a new building, to take the travel of a press plunger. They were lined with 6 in. of concrete and a 12-in. mat placed in the bottom. The holes to be excavated were therefore 42 in. in diameter. As the material on the site was stiff, blue clay, no sheathing of any kind was necessary. The excavation was handled by a small caisson bucket raised and lowered by means of a small derrick equipped with hoisting engine. The buckets were small enough to enable a man in the hole to fill them and the derrick could be moved easily from one line of holes to another. Two men, one in the hole and one on top could excavate to the required depth in from two to three days.

The form used had to be collapsible so that it could be removed from the top as there was not enough room for a man to go down inside to strip it. A cylindrical form the full depth of the hole was made in four longitudinal sections. Between each two sections, a 4-in. x 4-in. timber was fitted as a key, the side against the concrete being dressed to 3 in. The four timbers, 4 in. x 4 in., extended about one foot beyond one end of the form, so that the form could be suspended in the hole. The other end of the form had a wooden bottom with a 1-in. hole drilled through the center, into which fitted an iron pin driven on center in the clay at the bottom of the hole and projecting up about 16 in. The 4-in. x 4-in. pieces were not fastened in any way but were kept spread by 2-in. x 4-in. struts not nailed, and spaced about 4 ft. apart. The side of the form was made of 1-in. x 6-in. boards nailed to 2-in. x 4-in. templates about 12 in. apart.

To assemble these forms, a cradle was used to hold the sections while column clamps were put around and tightened. Then a few turns of wire were made around the forms but not fastened to it, and then the clamps were removed before lowering forms into the hole. The forms were well smeared up with crude oil just before being placed. They were stripped on the day after concrete was poured by knocking down from the top the struts holding the 4 x 4's and then knocking the 4 x 4's toward the center of the hole. Each longitudinal section was then easily removed.



Wire mesh was used for reinforcement and dropped into hole after form was placed. The form was hung from the top and braced carefully to resist upward pressure of concrete.

Concrete Plug and Grout Injection Close Tunnel Leak

COMPLETE closure of a leak amounting to 1,000,000 gal. a day under 500 lb. pressure, which developed from a rock fissure crossing a raise being driven in the mine workings of Modderfontein East, Ltd., South Africa, was effected at small expense by constructing a concrete plug or dam and by subsequent grout injection. As described by Thomas Blanchford in the January, 1920, *Journal of the South African Institution of Engineers*, the work to effect closure was carried out substantially as follows:

A 1:1:2 stone concrete was rammed into the face to a thickness of approximately 4 ft. No hitches for support were cut in the rock, but forty 1-in. steel pegs were driven into the rock in two rows around the perimeter of the drive so as to project a distance of about 1 ft. 6 in. into the mass concrete. In addition to this, two rows of ½-in. bars, one vertical and one horizontal, the bars being also about 1 ft. apart, were embedded in the concrete during construction and tied by means of wire to the pegs, thereby forming a double grille system of reinforcement.

The water was confined behind the concrete to as small a channel as possible with the aid of 21-gage steel sheets, and released through two 6-in. pipes fitted with stop valves. By this means it was possible to place the concrete in position without interference from the water. Six 1½-in. cementation pipes were also built in the dam for the purpose of filling and solidifying the fissure and for the subsequent testing of the ground in advance. While this work was in progress three release holes were drilled into the hanging wall from the front of the dam at an angle of 45 deg., thereby intersecting the fissure approximately 12 ft. above the hanging of the raise, water being tapped in each of these holes.

The work of construction of the dam occupied two days, after which it was allowed to set for 3 days. During this period the water was flowing freely from the 6-in. drain pipes.

A total of 4 tons 14 cwt. (about 25 bbl.) of cement were required for the dam. Injection was then started and 25 tons 9 cwt. (about 170 bbl.) of cement was injected at pressures of from 25 lb. to 220 lb. The total time of construction was 14 days and the total cost was about £398 or less than $2,000.

NEWS OF THE WEEK

New York, May 20, 1920

Engineer Delegates Named for Organizing Conference

Returns on May 15 Indicate 90,000 Engineers Will Be Represented at Washington Meeting

At least 100 delegates, representing a membership of more than 90,000 engineers, will attend the Organizing Conference of technical societies to be held in Washington, D. C., June 3 and 4, according to a statment given out May 15 by the Joint Conference Committee, which has just announced a tentative program for the meeting to consider the formation of a countrywide federation of national, state and regional engineering bodies. Thirty-one societies, on May 15, had advised the committee that delegates had been named or would be appointed forthwith. Among them are the following:

American Society of Civil Engineers.
American Institute of Mining and Metallurgical Engineers.
American Society of Mechanical Engineers.
American Institute of Electrical Engineers.
American Society for Testing Materials.
American Electric Railway Engineering Association.
American Association of Petroleum Geologists.
American Ceramic Society.
American Society of Safety Engineers.
American Association of Engineers.
Cleveland Engineering Socety.
Engineers Club of Philadelphia.
Florida Engineering Society.
Illinois Society of Engineers.
Kansas Engineering Society.
Mohawk Valley Engineers' Club.
Portland (Ore.) Technical Council
Trenton Engineers Club.
Vermont Society of Engineers.
Washington Society of Engineers.

The committee urges all engineering societies to be represented and to participate in the deliberations of the Conference, which, the committee believes will be "one of the most important gatherings that has been held in the history of the engineering profession in this country."

Richard L. Humphrey, chairman of the Joint Conference Committee, will call the Conference to order at 10 a.m., June 3, in the New Willard Hotel. Following the election of a temporary chairman and the appointment of committees there will be fifteen-minute addresses on the general subject of the engineer in public affairs by Arthur P. Davis, president, Am. Soc. C. E.; Philip N. Moore, past-president, A. I. M. E.; William F. Durand, chairman, San Francisco Section, A. S. M. E.; and Le Roy K. Sherman, president, A. A. E.

At a round-table luncheon, June 3, James H. McGraw, president, McGraw-Hill Co., Inc., will speak on "The Value of Publicity for Engineers." The afternoon session will be devoted to committee reports and ten-minute discussions on licensing of engineers by T. L. Condron, F. H. Snow and D. W. Brunton. The topic of good roads has

(*Continued on p. 1032*)

Governor Signs New York Engineers Licensing Bill

The bill for the licensing of engineers and land surveyors in New York State was signed by the Governor May 14 and is now a law, although its requirements do not become effective until a period of two years has elapsed. The measure was initiated by joint action of the New York Chapter of the American Association of Engineers and the Albany Society of Civil Engineers and was endorsed at a recent meeting of the newly formed New York Section of the American Society of Civil Engineers.

The new act requires a license for any person "practising or offering to practice professional engineering or land surveying." A state board of licensing consisting of five members, who have been engaged in the practice of engineering for at least 10 years and in responsible charge of work 5 years, is created. They will receive compensation for attending board meetings in addition to traveling and clerical expenses. Two regular meetings yearly and special meetings when desirable are provided for. The licensing fee to be paid is fixed at $35..

Minimum Requirements

The minimum requirements for candidates applying for licenses as professional engineers are as follows: Age, 21 years; professional practice, 4 years, of which 1 year shall have been "in responsible charge as assistant." No citizenship requirement is stipulated. Land surveyors, however, must be citizens and have had 3 years' experience, 2 years in an engineering school being considered equal to 1 year of practice.

Unless disqualifying evidence be before the board, the following facts established in the application "shall be regarded as prima facie evidence, satisfactory to the board, that the applicant is fully qualified to practice professional engineering or land surveying.

"(a) Six or more years of active engagement in professional engineering work, one of which shall have been in responsible charge of work, or in the case of applicants for license as a land surveyor, four or more years of active engagament in land surveying work of a character satisfactory to the board;

"(b) Graduation, after a course of not less than four years in engineering from a school or college approved by the regents as of satisfactory standing, and an additional four years of active engagement in professional engineering, one of which shall have been in responsible charge of work, or two years of active engagement in professional land surveying of a character satisfactory to the board."

(*Continued on p. 1032*)

A. A. E. Convention Favors Decentralization Plan

Chapters to Be More Active—Delegates Will Attend Organizing Conference —Group Insurance Considered

A distinct desire for decentralization of routine work and evidence of a wide-awake constituency were clearly shown at the St. Louis convention May 10 and 11 of the American Association of Engineers. The practical effects of this attitude were expressed by an unwillingness to vote for any increase in dues or entrance fees, and by a demand for the doing of more work by the chapters. Only twice was the roll call by chapters demanded — once on the question of increasing dues to $12, and once to $15. The latter proposal was lost by a vote of 5,702 to 2,835. With few exceptions all of the twenty proposed amendments to the constitution and by-laws were defeated and the sane procedure of leaving the work to a committee prevailed. It was felt that the organization is growing too fast to redraft a suitable constitution until the conditions to be met are better known and the society is more stable.

D. L. Turner, chief engineer, Transit Construction Commission, New York, clarified the situation, after a day's parliamentary debate, much lobbying and cloak-room discussion, by proposing a letter ballot, carried on by the chapters, on such necessary legislation as the board of directors felt essential to meet emergencies. A letter ballot to individuals handled entirely by headquarters costs more than $1,000, but chapters can canvass their members at a much lower cost. Provision for so doing and for delegate representation at conventions instead of the town-meeting plan were the only amendments passed.

Group Insurance Plan

As reported briefly last week, the appointment of a committee to consider the creation of a group-insurance, home-building and owning company as an auxiliary, entirely separate from the association financially, was authorized. The 21-story City Hall Square Building in Chicago, which has been appraised recently at 95 cents per cubic foot, has been offered at about one-half that figure. A committee headed by Harold Almert, consulting engineer, Chicago, is looking into the proposal, which requires an initial payment of $216,000. The building would be used as the legal reserve back of a group insurance plan. The purpose of the enterprise is to stabilize the organization.

Without qualifications the statement of the national board of directors (see

Engineering News-Record, Nov. 13-20, 1919, p. 903) on the attitude toward labor unionism, as applied to engineers, was endorsed and the statement added that the advocacy by a member of A. A. E. of strikes or other methods commonly employed by labor unions to secure their ends be considered a sufficient ground for his expulsion. Greater individual application and industry was approved as a manifest duty of every member.

Last year's decision to stay out of Canada was rescinded. A special committee was authorized to canvass fully the question of admitting non-citizens to membership, the relations to foreign engineers, engineering societies of recognized standing and the establishment of chapters in foreign lands.

Attitude on Organizing Conference

The question of participation in the Organizing Conference in Washington, D. C., as noted last week, was explained by Prof. F. H. Newell and not followed by discussion, the convention apparently acquiescing in the action of the board of directors in its decision to be represented by delegates to be chosen by the out-going and in-coming presidents. The financial part of the unity plan recently promulgated, whereby members of 122 engineering societies might become members of the A. A. E. under a reduced entrance fee of $5, was not approved, the convention being of the opinion that any arrangements must be reciprocal.

Several resolutions on general subjects were approved, such as state and federal highway programs; aircraft development; adoption and strict enforcement of civil laws; civil service laws to allow non-resident candidates equal privileges with resident candidates, for the purpose of bringing in new blood, new methods and ideas; engineers to fill city managers' positions; engineers or architects for building commissioners; endorsement of qualified engineers seeking public office; reservation of Alaskan timber for the manufacture of paper; prohibition of export of such natural products as petroleum, wood and wood pulp or paper. Questions to be asked of each presidential candidate related to his attitude on the proposed national department of public works; appointment of an engineer to the Interstate Commerce Commission; conservation and development of natural resources; budget system; reclamation of waste lands by drainage, irrigation, flood control or other methods.

Results of the election, in which 4,682 ballots were cast, only 34 being invalid, gave L. K. Sherman, president, U. S. Housing Corporation, for president, 4,616 votes; H. O. Garman, chief engineer, Indiana Public Service Commission, for first vice-president, 2,770 votes; A. B. McDaniel, principal engineer, Construction Division of the Army, 1,962 votes for second vice-president. The six new directors are Edmund T. Perkins, consulting engineer; Prof. Frederic Bass, University of Minnesota; R. W. Barnes, first assistant engineer, Southern Pacific Ry. Co., Portland, Ore.; W. C. Bolin, pilot engineer, valuation department, Baltimore & Ohio R.R., Chicago; B. A. Bertenshaw, valuation engineer, Cleveland, Cincinnati, Chicago & St. Louis R.R., Cincinnati; Charles A. Finley, managing engineer, Bureau of Water, Pittsburgh. Of the 11,300 certified and 2,000 junior members eligible to vote 33 per cent exercised their franchise. The new board of directors elected the following to the executive committee: L. K. Sherman, Ray Burnham, A. N. Johnson, E. T. Perkins and H. O. Garman.

Buffalo was chosen as the place for the next year's convention.

New York License Bill

(Continued from p. 1031)

Licenses are to be granted by majority vote of the board.

The following exemptions are provided for by the act:

"1. Offering to practice in this state as a professional engineer or land surveyor by any person not a resident of and having no established place of business in this state.

"2. Practice as a professional engineer or land surveyor in this state by any person not a resident in this state and having no established place of business in this state, provided that said person is legally qualified for such professional service in his own state or country where the necessary qualifications for which in said state or country meet the requirements of the board of regents.

"3. Practice as a professional engineer or land surveyor in this state by any person not a resident of and having no established place of business in this state, or any person resident in this state, but whose arrival in the state is recent; provided, however, such a person shall have filed an application for license as a professional engineer or land surveyor, and shall have paid the fee provided for in section thirty-nine of this act. Such exemption shall continue for only such reasonable time as the board requires in which to consider and grant or deny the said application for license.

"4. Engaging in professional engineering or land surveying as an employee of a licensed professional engineer or a licensed land surveyor, or as an employee of a professional engineer or land surveyor authorized by paragraphs two and three of this section, provided that said practice may not include responsible charge of design or supervision as principal.

"5. Practice of professional engineering or land surveying solely as an officer or as an employee of the United States.

"6. Practice of professional engineering or land surveying solely as an employee of this state or any political subdivision thereof, at the time this act becomes effective and thereafter only until the expiration of the then existing term of office of such employee."

It is stipulated that two years after this act goes into effect, no county, city, town or village or other political subdivision in the state shall engage in the construction or maintenance of any public work costing more than $2,000 and involving professional engineering or land surveying of which plans, specifications and estimates have not been made by, and the construction and maintenance supervised by a licensed, professional engineer or land surveyor.

Hearing on Increase of Niagara Power

A hearing on the proposed increase in diversion of water at Niagara Falls will be held at the Chamber of Commerce Building at Niagara Falls, N. Y., on June 3, 1920, at 2:30 p.m., city time. According to the notice sent out by Col. J. G. Warren, Corps of Engineers, U. S. A., the hearing is "upon the subject matter of a report upon an investigation of the diversion of water from the Great Lakes and Niagara River, N. Y., by the Division Engineer, Lakes Division, in accordance with Joint Resolution approved June 30, 1917, authorizing and directing the Secretary of War to 'Make a comprehensive and thorough investigation, including all necessary surveys and maps, of the entire subject of water diversion from the Great Lakes and Niagara River, including navigation, sanitary and power purposes, and the preservation of the scenic beauty of Niagara Falls and the rapids at Niagara River, and to report to Congress thereon at the earliest practicable date.'"

The report may be seen by interested parties, prior to the hearing, at which they are invited to be present, at the office of the Board of Engineers for Rivers and Harbors, 735 Southern Building, Washington, D. C., and at the office of the Division Engineer, 537 Federal Building, Buffalo, N. Y.

Organizing Conference

(Continued from p. 1031)

been assigned to Thomas H. MacDonald and W. D. Uhler. In the evening Homer L. Ferguson, past-president of the U. S. Chamber of Commerce, will talk on "Co-operation of the Business Man and the Engineer in Public Affairs."

A business session will occupy the morning of June 4. Prof. F. H. Newell will be the speaker at luncheon, while in the afternoon, at the Cosmos Club, the general subject will be co-operation of engineers in local affairs. A number of addresses are on the program for the evening session. The speakers include Robert S. Woodward, president, Carnegie Institute; George Otis Smith, director, U. S. Geological Survey; and James R. Angell, chairman, National Research Council.

Highway Council Urges Road Plank in Party Platforms

Members of the Federal Highway Council are receiving circular letters from that organization requesting all possible assistance in its efforts to have incorporated as a plank in the party platforms of the Republican and Democratic parties the creation of a Federal highway commission of five members, the establishment of a national system of highways, the continuance of Federal-aid after 1921, and the expenditure, in so far as possible, of Federal appropriations so as to provide definite systems of connected highways—national, state and county.

Commission of Five Members

The plan contemplated by the Federal Highway Council is the creation of a commission of five members, selected geographically, with authority to take over the present highway activities of the Department of Agriculture in co-operation with the states, and the expenditure of present and future appropriations of Federal-aid. Instead, therefore, of such works being handled by one of sixteen bureaus of a governmental department, the responsibility will be placed in a separate body, the sole duty of which will be the study and administration of highway affairs. The proposed plan further includes the division of the United States into five districts, giving each district one commissioner. Each commissioner will personally study conditions for highway development in his own district and, having direct authority, will support and strengthen the efforts of the district highway engineers representing the Federal government, now located throughout the country. The proposed national system is to consist of sufficient mileage to provide two roads across each state, and, where practicable, one running east and west and one north and south, and connecting with similar roads in adjoining states. The continuance of Federal aid until after 1921 is deemed advisable until such time as the states will be able to complete their state systems as a part of a definite systematic plan of highway development.

National System Mileage

The Federal Highway Council believes that the Federal Governmtnt should take over approximately 60,000 mi. of the main highways, to construct and rebuild, where necessary, as a national system. It also believes that the states should take over approximately 240,000 mi. of the main state system, and the counties an additional 300,000 mi. of market county roads. This total would make a system of 600,000 mi., of which one-third at least has been improved and from 300,000 to 350,000 mi. remain yet to be improved. Even with this immense mileage under improvement there will still be approximately 2,000,000 mi. of unimproved roads in the United States.

Suspend New Road Construction in Minnesota

The Commissioner of Highways of Minnesota has sent out a request to all county officials to make no more contracts for roads this season, unless to complete sections of work already started. This request is virtually an order, as the counties, in order to get State and National aid, must have the approval of the Highway Department on such work.

One Texas County To Open Bids on $5,000,000 Road Job

According to information recently received from W. H. Eccles, its engineer, Eastland County, Texas, will, May 31, open bids for the construction of 215 mi. of highways, total cost of which will approximate $5,000,000. Durable pavements will consist of bituminous macadam, brick or concrete. Considerable sand-clay construction is also included.

Favor Public Works Department

Through the efforts of the Engineers' Society of St. Paul, the St. Paul Association of Public and Business Affairs has voted on the questionnaire of the National Chamber of Commerce in favor of a department of public works, after receiving an adverse report from its legislation committee. At the meeting of the Society, May 10, Herbert Hoover was indorsed for President.

Col. W. J. Wilgus Heads New York Section, Am. Soc. C. E.

Colonel W. J. Wilgus was elected president of the New York Section of the American Society of Civil Engineers at the annual meeting of that organization in New York City May 12. The other new officers are: first vice-president, R. S. Parsons; second vice-president, J. P. H. Perry; secretary, W. T. Chevalier; treasurer, F. C. Noble; directors, O. E. Hovey and R. H. Chambers.

In adopting a part of a special committee report the section decided to hold meetings the second Wednesday of the month from October to May inclusive. The last meeting of the year will be the annual meeting. The special committee appointed to report upon the time of meeting recommended that a certain number of sessions during the year be held jointly with the local branches of the other founder societies and that meetings be held as early as 5:30 p.m. Though discussion indicated it to be the wish of those present that meetings should be held early, decision as to the time, and number of meetings to be held jointly with other local engineering sections was left to the Board of Direction.

The New York section now contains 248 members, making it the largest local section of the American Society of Civil Engineers.

A. A. E.'s Attitude on Organizing Conference Stated

In accepting on behalf of the American Association of Engineers the invitation to participate in the Organizing Conference of engineering societies to be held at Washington, D. C., June 3 and 4, C. E. Drayer, secretary, sent the following letter to the Joint Conference Committee:

> Your valued invitation of April 19 to the Organizing Conference of June 3 and 4, 1920 has been received by the American Association of Engineers.
>
> The American Association of Engineers has for six years been engaged in the furtherance of the purpose announced in your kind invitation.
>
> This Association, therefore, accepts your invitation for the purposes outlined herein and will co-operate with your conference in any manner which will promote the welfare of the engineer and the objects of the American Association of Engineers.
>
> In its co-operation with the Organizing Conference the American Association of Engineers must itself discharge the obligation which has been placed upon it by 17,000 professional engineers. This duty cannot be delegated to another organization, no matter how earnest its purposes may be. In accordance with Section E, page 4 of the call, [from which the following matter is *italics* is quoted], which requests an expression of the attitude of the Association toward the proposed organization, we may say:
>
> 1. *Non-interference with the interrelations with respect to technical matters, and the maintenance of the autonomy, functions and operations of individual organizations.*
>
> We endorse this provision.
>
> 2. *Local affiliation of existing groups of engineers in order to facilitate united action in local questions of public welfare and other matters of common interest.*
>
> This idea is approved.
>
> 3. *National association of engineering organizations by means of a national council composed of representatives widely chosen by local affiliations or organizations and by national organizations, meeting annually and acting through an Executive Board.*
>
> We are not in favor of this idea because in our opinion it would duplicate effort and add useless machinery, which would tend to restrict progress along welfare and non-technical lines. Our Association is doing such work at the present time in an efficient manner and our growth proves that results are being obtained. This viewpoint is based on the result of our experience and consequently we do not believe that the organization proposed would be any improvement over existing machinery.
>
> 4. *Financial support of such association by contributions from all participating organizations on a basis of membership.*
>
> In view of the above little or no financial assistance from this Association should be expected.
>
> 5. *A form of organization which will permit expansion and development.*
>
> It is our opinion that the simpler the machinery for this end, the better same will be adapted to expansion. Our delegates will be in a position to advise on this point.
>
> All acts of our delegates would, of course, have to be approved by the Association.

Mississippi Valley Associations Merged at St. Louis

Affiliation of the Mississippi Valley Waterways Association with the Mississippi Valley Association was effected at the recent meeting in St. Louis, the former becoming the waterways bureau of the main association. Officers elected by the Mississippi Valley Association include the following: President, H. H. Merrick, Chicago; vice-president on land reclamation, Edmund T. Perkins, Chicago; vice-president on waterways, James E. Smith, St. Louis; secretary for waterways, Thomas H. Lovelace, St. Louis; executive secretary, J. B. Morrow, St. Louis.

Propose Anglo-American Standards for Rolled Steel Shapes

During 1919 the British Engineering Standards Association undertook the revision of their standards for rolled steel shapes, and following a visit of their secretary to this country they sent a formal invitation to the American Engineering Standards Committee to co-operate in the possible adoption of Anglo-American standards for these shapes. Under the auspices of the American body the following representatives of American societies and official bureaus have been holding conferences: *United States Navy*—Commander C. M. Simmers, Lieutenant Commander H. D. Rouzer; *Association of American Steel Manufacturers*—R. B. Woodworth (chairman), G. H. Blakeley, G. E. Thackray; *American Bureau of Shipping*—C. A. McAllister, David Arnott, John Martin; *American Society of Civil Engineers*—J. H. Edwards, J. B. French, H. G. Balcom; *Society of Naval Architects and Marine Engineers*—Fred T. Llewellyn, E. H. Rigg, J. W. Stewart; *Railway Car Manufacturers' Association*—A. E. Ostrander.

On April 27 the committee, which is known as the "Sectional Committee on Steel Shapes" of the joint sponsor bodies, formulated a complete preliminary report for transmission to the British Engineering Standards Association as a basis for discussion on common Anglo-American standards. Criticisms or suggestions will be welcomed by the committee if addressed to Dr. P. G. Agnew, secretary, 29 W. 39th St., New York City.

Highway Traffic Association Holds Annual Meeting

Election of officers, and the reading of various reports and three papers relating to the motor truck and the highway, marked the annual meeting of the National Highway Traffic Association, held March 13, at the Automobile Club of America, New York City. Papers were presented by Nelson P. Lewis, chief engineer of the Board of Estimate and Apportionment, New York City; T. H. Aspell, manager, truck tire sales department, B. F. Goodrich Rubber Co.; and H. Eltinge Breed, consulting highway engineer.

The officers of the association were re-elected. They are: President, Arthur H. Blanchard; vice-presidents, David Beecroft and R. C. Hargreaves; treasurer, George H. Pride; and secretary, Elmer Thompson. The following directors were elected: For Connecticut, S. W. Taylor; Delaware, T. Coleman duPont; for District of Columbia, W. P. Eno; Illinois, W. T. Beatty; Indiana, Tom Snyder; Massachusetts, Charles Henry Davis; Michigan, Roy D. Chapin; Missouri, F. W. A. Vesper; Nebraska, George W. Wolz; New Jersey, S. P. Leeds; New York, Col. Jefferson deMont Thompson; North Carolina, R. J. Corbitt; Ohio, F. A. Seiberling; and Wisconsin, Philip A. Koehring.

Committee Organized to Study Housing Situation

Organization in Washington, D. C., of the Calder committee, which is to make a study of the building and housing situations has been completed. W. F. Miller, of New York, has been retained as assistant to the committee and will be in immediate charge of its activities. The principal object of the committee is to find means for stimulating construction. The exact program which the committee will follow is in the course of formulation.

Power Company to Float $5,000,000 Bond Issue

The Southern California Edison Company of Los Angeles, Cal., has been authorized by the California Railroad Commission to issue $5,000,000 of 6 per cent 25-year gold bonds with which to finance extensions to the hydro-electric system. The company stated to the Commission that it proposed to expend $8,500,000 between March 1 and Dec. 31, 1920. Of this amount more than $4,000,000 will be expended on tunnels and power plants in the Kern River and Big Creek generating systems.

A. S. M. E. to Hold Annual Meeting

The American Society of Mechanical Engineers will hold its annual spring meeting in St. Louis, Mo., May 24-27, with headquarters at the Hotel Slatter. The committee on meetings and program, in addition to the usual technical sessions, has planned for excursions to the water-power development on the Mississippi at Keokuk, and to Tulsa, the "hub" of the industrial Southwest. There will also be an opportunity to visit several of the leading industrial plants of St. Louis.

The technical features will cover a variety of topics—Mississippi River transportation problems; housing; appraisal and valuation; pulverized coal uses; aeronautics; and foundry work.

New Jersey Highway Department to Combat Truck Overloading

The overloading of motor trucks has reached such an alarming stage, as judged by the effects upon state highways, that the New Jersey Highway Commission has decided to install scales in various parts of the state to weigh the trucks and contents. The highway department will purchase three sets of scales which it will pay for by moneys obtained through fines and from increased license fees where the vehicle is found carrying a load exceeding that for which it is licensed. The highway department believes that in some cases trucks have carried gross loads 15,000 lb. in excess of the amount specified in the license and of the loads allowed by law. Representatives of several counties of the state have appeared before the board and asked that work be hurried on highways seriously damaged during the past winter.

Activated-Sludge Experiments at Champaign-Urbana

Tests of sewage treatment processes are being arranged by the State Water Survey Division of the Illinois Department of Registration and Education, under the direction of Edward Bartow, Chief of the Division. It is proposed to install at first a 100,000-gal. activated-sludge plant complete in every particular required to yield a good effluent and dried sludge. The experiments will be directed particularly to securing information on the reduction of the amount of air used and on how the sludge can be economically dried.

The City Council of Champaign will permit further use of the old sewage tank employed in earlier experiments together with adjacent land. Separate tanks are being built and the old tank may be used for some other experiment. Various manufacturing companies interested in either developing the activated-sludge process or else in the promotion of the use of plants or apparatus for that purpose have volunteered to supply portions of the necessary equipment either without charge or at reduced prices.

The Department of Municipal and Sanitary Engineering, and also the Engineering Experiment Station of the University of Illinois, are much interested in the proposed experiments and their co-operation is expected. Various sanitary districts in the State of Illinois will co-operate in the experiments.

Engineering Council Votes on Public Works Referendum

In the referendum on a National Department of Public Works conducted by the Chamber of Commerce, U. S. A., Engineering Council voted as follows on the three questions propounded:

1. "Shall a Department of Public Works be established by the national government?"—In favor.

2. "Shall a Department of Public Works be established by a suitable modification of the existing Department of the Interior, excluding therefrom the non-related bureaus and offices and by change of name from Department of the Interior to Department of Public Works?"—In favor.

3. "Shall a Department of Public Works be established by creation of an entirely new department?"—Opposed.

Washington Zoning Work Starts

Work on zoning the District of Columbia began last week with the arrival of Harland Bartholomew, city plan engineer, St. Louis, who has been engaged as consultant by the Zoning Committee, headed by Lieutenant-Colonel C. W. Kutz, engineer commissioner of the District of Columbia. Under the Congressional act that authorizes zoning the work must be completed by Sept. 1. The limiting height of business houses is now 160 ft., and on ordinary business streets, 110 ft. Residences are ordinarily limited to 85 ft.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

AMERICAN WATER WORKS ASSOCIATION, New York City; Montreal, June 21-26.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; Asbury Park, N. J., June 22-25.

AMERICAN PUBLIC HEALTH ASSOCIATION, Boston; San Francisco, Sept. 13-17.

ORGANIZING CONFERENCE of National, State and Local engineering societies; Washington, D. C., June 3-4.

The Jackson (Mich.) Engineering Society, at its first annual meeting, held recently, elected the following officers: President, Howard C. Corwin; vice-president, Tony Obuchowski; secretary, Chauncey A. Bullard; treasurer, R. E. Robinson. The society was formed a year ago to meet the demands of local engineers for an organization which would take up problems confronting them in their everyday work. Meetings are held every two weeks.

The Engineers' Society of Pennsylvania, Harrisburg, has nominated the following for officers for the coming year: For president, W. Grant Rauch, Harrisburg; first vice-president, W. R. Denehey, Harrisburg; second vice-president, R. Boone Abbott, Reading; resident directors (to serve three years), R. L. Gillispie and William D. Uhler, Harrisburg; non-resident director (to serve three years), Gifford Pinchot, Milford; secretary, Howard E. Moses, Harrisburg; treasurer, John C. Herman, Harrisburg. All ballots must be received before 8 p.m., on May 17, the date of the annual meeting.

PERSONAL NOTES

A. A. Matthews, chief engineer of the St. Louis Southwestern Ry., Tyler, Tex., is now in charge of all engineering, maintenance and construction work, the office of engineer of maintenance having been abolished. C. B. Petticrew has been appointed division engineer, at Illmo, Mo. Other division engineer appointments are as follows: W. H. Raleigh, at Pine Bluff, Ark.; J. F. Montgomery, at Mt. Pleasant, Tex., and R. B. Albaugh, at Tyler. J. G. Irby has been appointed assistant engineer, at Mt. Pleasant; V. C. Noll at Tyler, and W. G. Hazlewood at Illmo.

R. G. Kenly, general superintendent of the Minneapolis & St. Louis R.R., under Government control, has been appointed assistant to the president and chief engineer. L. C. Miller, recently office engineer, has been appointed assistant chief engineer and will have charge of valuation work. R. C. Smith, recently assistant engineer, has been appointed principal assistant engineer, in place of F. K. Bennet, resigned.

William C. Markham has resigned as superintendent of construction for New York State Architect and has been appointed chief engineer of the Detroit Municipal Railways, in charge of the construction of that city's new street car lines provided for by a recently passed $15,000,000 bond issue.

John Irwin has resigned as city engineer of Mt. Clemens, Mich., to take up private practice.

Frederick G. Cottrell, chief metallurgist, has been nominated by President Wilson as director of the U. S. Bureau of Mines, to succeed Van H. Manning, whose resignation will take effect June 1.

E. K. Cortright has resigned as chief engineer of the Morgan General Ordnance Depot, to join, as a partner, the firm of John Noble Pierson & Son, architects and engineers, Perth Amboy, N. J.

George Engel, commissioner of public works of Detroit, has resigned to go into private business in that city.

C. L. B. Sanders, who has been employed recently in connection with sewer extension for Gainesville, Ga., has been elected city engineer.

E. A. Fonda, contractor, of Greenville, S. C., will shortly establish offices in New York City and Atlanta, Ga. Sanford N. Mapes, formerly superintendent with McKim, Mead & White, now general superintendent for Mr. Fonda, will have supervision of the Atlanta office, which will direct the Georgia, Florida, Alabama and Mississippi operations.

Orlando K. Morgan, engineer of maintenance-of-way, Carolina, Clinchfield & Ohio R.R., has been appointed chief engineer.

Carl C. Widener has resigned as city engineer and superintendent of public works of Bozeman, Mont. He will continue his work on improvements for the city, however, under a new arrangement which will give him also sufficient time to devote to private business.

Norman Hatton, S. E. Holmes and C. B. Anthony announce that, owing to the withdrawal of William J. Klein from their firm, they have formed a new partnership under the name of Hatton, Holmes & Anthony. They will practice architecture, general engineering, machinery layouts, heating and ventilating and industrial engineering, with offices in the Masonic Temple, Cedar Rapids, Iowa.

A. R. Scott, engineer of Spokane County, Wash., and E. C. Wood, deputy engineer, have recently resigned. Mr. Scott is taking care of interests in the oil fields at Roundup, Mont. H. S. Baker, principal assistant engineer of construction, has been appointed county engineer to succeed Mr. Scott.

Courtney C. Washington, resident engineer, Gulf, Colorado & Santa Fe Ry., at Galveston, Tex., has been appointed Galveston County engineer to succeed R. M. Sias.

Stuart M. Miller, formerly with the Chicago, Burlington & Quincy R.R. on field layouts for the Chicago freight terminal project, is now with H. L. Stevens & Co., in charge of purchasing, receiving and inspecting local materials used in the construction of a new hotel at Norfolk, Neb., and of the field layout of the building.

Richardson & Gay is the name of a new consulting firm composed of Edward B. Richardson, formerly of Richardson & Hale, consulting engineers, who served in the war with the 26th Division and was discharged from the Army as lieutenant-colonel of Field Artillery, and Harry Gay, for the past nine years in the Boston office of Stone & Webster in its division of construction and engineering. The firm's address is 220 Devonshire St., Boston.

S. C. Whipple, for some time past connected with the engineering staff of the California State Water Commission, has been named one of the assistant state engineers. His headquarters will be in Sacramento.

George J. Boutelle has been elected city engineer of Chester, Pa., in place of B. G. Ladomus, for a term of four years.

J. C. Meacham, formerly assistant road engineer, Brooke County, W. Va., has been appointed engineer of road construction in Clay District, Marshall County, W. Va., with headquarters at Moundsville.

Gideon F. Barstow, formerly city engineer of Stillwater, Minn., and for the past two years engineer in charge of road construction in Clay County, has resigned to become location engineer of St. Louis County, Minn.

James L. Shields, formerly with the Johnstown (Pa.) Water Co. and later in the construction department of the Cambria Steel Co., has entered the engineering and construction departments of the Reading (Pa.) Iron Co.

J. T. Patterson has been appointed senior highway engineer, U. S. Bureau of Public Roads, at Missoula, Mont., succeeding C. W. Cheatham.

Virgil W. Samms, city engineer of Pocatello, Idaho, and Harry Orr, an employee of the city water department, have resigned to form a partnership as consulting engineers in Pocatello. John Neville, assistant city engineer, has been appointed city engineer to succeed Mr. Samms.

Lieutenant-Colonel G. S. Smith, U. S. Geological Survey, is in Dayton, Ohio, assisting in the conduct of tests of airplane cameras to be used in survey work.

W. A. Bowden, chief engineer, Department of Railways and Canals, Ottawa, has been re-elected, by the Canadian Government, consulting engineer in reference to the International Joint Commission on the question of the further improvement of the St. Lawrence River between Montreal and Lake Ontario.

J. A. Redfield has been appointed assistant engineer of maintenance, Chicago & Northwestern Ry., at Omaha, Neb. **D. Rounseville** has been appointed assistant engineer of maintenance, at Chicago. **C. J. Frederici**, general inspector of bridges, has been appointed division engineer, at Fond du Lac, Wis. Other recent appointments and transfers as division engineers are as follows: **H. M. Spahr**, Green Bay, Wis.; **H. G. Lennox**, South Pekin, Ill.; **T. J. Irving**, Boone, Iowa; **M. E. Thomas**, Boone; **J. A. Dyer**, Mason City, Iowa; **W. T. Main**, Eagle Grove, Iowa; **B. R. Kulp**, Madison, Wis.; **D. K. VanIngen**, Chadron, Neb.; **R. D. Anderson**, Huron, S. D.; **C. F. Womeldorf**, South Norfolk, Neb.

A. H. Fuller, for 18 years dean of engineering, University of Washington, and present director of engineering, Lafayette College, has been appointed head of the civil engineering department of Iowa State College. He will take up his new duties July 1. Prof. Fuller will also act as consulting engineer to the Iowa State Highway Commission.

J. W. B. Bower has resigned as general superintendent, Engineer Branch of the Department of Soldiers' Civil Re-establishment, Ottawa, to accept a position as chief engineer for a Montreal engineering and contracting concern. **W. H. George**, assistant to Mr. Bower, will succeed him as general superintendent.

J. Devereau, **John Cary Regan** and **E. J. Burke** announce that they have formed a partnership to be known as the firm of York, Regan & Burke, located at 1323 N. Clark St., Chicago. As architects and consulting engineers, they will handle concrete engineering, theater construction, buildings, bridges, concrete steel structures, industrial plants, churches and civic improvements.

A. B. Cook has resigned as city engineer of Santa Barbara, Cal., to open, in that city, an engineering office. He will have associated with him Carl Wyant, formerly deputy under him.

Frank Wallace, recently in the county engineer's office at Colfax, Wash., has been appointed resident engineer, U. S. Bureau of Public Roads, at Missoula, Mont.

William H. Green, formerly with the Boise project, has been appointed project engineer, U. S. Reclamation project at Huntley, Mont.

J. A. Duck has been loaned by the U. S. Geological Survey to the State of Illinois for the purpose of making a special drainage survey of that state.

OBITUARY

Homer Hamlin, of Los Angeles, a widely known consulting engineer, died suddenly in Washington May 14, a victim of cerebral hemorrhage. He had just arrived in Washington to attend a hearing before the Secretary of the Interior on the Salt River reservoir project.

John Wesley Hyatt, inventor of the roller bearing named after him and also of a number of other well known mechanical devices and processes, died at Short Hills, N. J., May 10. He was a brother of Isaiah S. Hyatt, to whom a basic patent for rapid or mechanical filters was granted in 1884 and is credited with having done pioneer work in this field as early as 1881. The brothers were associated in various other inventions. Mr. Hyatt was born at Starkey, N. Y., in 1837.

Reuben A. Hartwell, an engineer who had engaged in the development of the Erie Canal, died recently at Utica, N. Y., aged 84. When 18 years of age he was associated with his uncle, Daniel R. Hartwell, engineer in charge of the widening operation of the canal in the Oneida district. In 1864 he was made leveler on the Chenango extension, and in 1882 was appointed assistant engineer of the Champlain Canal. At the time of the $9,000,000 appropriation he was assigned to the Mohawk district.

Who's Who in Engineering To Be Published in England

England is to have an engineering "Who's Who." Descriptive material for such a volume to include professional biographies of all prominent British engineers is now in course of collection and preparation for publication. The work is being edited by John E. Sears, M. A., Assoc. M. Inst. C. E.

The work will not only be a biographical list of individual engineers but will include descriptive lists of engineering firms and of industrial firms. According to a statement of its editor, the particulars concerning many eminent engineers and engineering firms have already been received. He promises that the first issue will be very representative. For the list of engineers, information as indicated in the following is being collected for publication: Name, title, branch of engineering, address, telegraphic address, telephone number, year of birth, parentage, marriage, education, training, professional career, present position, chief works, publications, membership in engineering institutions and clubs, and war services. In the case of firms the following is included: Principals or directors and officers, date of establishment and incorporation, capitalization and amount issued, antecedents, warrants and appointments, war services, list of principal manufacturers.

There will be no charge to engineers and firms for publication of their names and descriptions in the volume. The publication is to sell at 21 and 25 shillings.

Ohio Highway Work Blocked by Bond Decision

By a recent decision of the Ohio Supreme Court that the interest on road improvement bonds already issued cannot be increased from 5 to 6 per cent, a large part of highway work in that State, particularly that undertaken by various counties, is temporarily blocked. The court's ruling was made in the test suit which Cuyahoga County commissioners directed the county prosecutor to file against the county auditor compelling the auditor to place the increased interest charge on the tax duplicate of the affected property. This action was pursued after the legislature had authorized a 6 per cent interest on highway bonds. Bonds had been prepared and assessments on property started at 5 per cent in almost every county in the State, but before the bonds were sold the legislature allowed the increased rate of interest and the bonds became unsalable at the 5 per cent rate. The amount of money tied up in highway bonds destined for use in Cuyahoga County alone approximates $2,000,000. Legal procedure necessary in the reassessment of property and in the readvertisement of bonds will prolong the work at least two months, it is estimated.

Asphalt Interests Object to New York's Highway Policy

With reference to the communication from F. S. Greene, state highway commissioner, to the Governor of New York, announcing a suspension of new road construction (see *Engineering News-Record*, May 13, p. 980) J. E. Pennybacker, secretary of The Asphalt Association, has issued a statement from which the following is quoted:

> A rather small percentage of state contracts was completed during 1919 and it would be interesting to find out from Commissioner Greene just what percentage was completed. It is also known that he has been unsuccessful in obtaining bidders on several concrete road projects for 1920. If he persists in his adherence to the plan of building only concrete roads, the result will be a large mileage on paper and very few miles in surface.
>
> As contrasted with this probability, it can be stated confidently that there are large contracting organizations ready and capable of taking up and carrying through to completion sheet asphalt jobs. This is due to the fact that during a long period of years large and efficient asphalt contract organizations have been built up in connection with city work and can easily extend their activities to country highways.
>
> The policy of the State Highway Commissioner in throwing everything into concrete has overloaded the concrete contractors, who, for the most part, have come into this field in the last few years. Would it not be better to turn to an established type of pavement with a long record of success, and for which competent contractors are available, and which in any event can be built at far less cost than concrete, than to embark upon the uncertain course of trying to build concrete roads with an utter disregard of the salvage value of macadam?

A Consolidation of Engineering News and Engineering Record
McGraw-Hill Company, Inc.—JAMES H. McGRAW, *Presiden*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN
Editor

Volume 84 NEW YORK, THURSDAY, MAY 27, 1920 Number 22

Time Needed for Discussion

IT IS desirable that adequate opportunity be given delegates to the Organizing Conference of engineering societies in Washington next week for a full and free expression of opinion from the floor. From a study of the tentative program published in the news columns of last week's issue, however, it appears that the time for discussion will be very small if all of the listed speakers on a variety of definitely assigned topics are to be heard. Two chief motives evidently have governed the program committee: First, a desire to consider the business of forming an engineering federation, and, second, to furnish to delegates, through the medium of specially chosen speakers on such topics as the engineer in public affairs, licensing, publicity, etc., inspiration and a broad outlook upon the opportunities which lie in the proposed unification of engineering effort. The program announced last week was tentative and it is understood that it will be so revised as to give more time to the proposed federation—which is the avowed object of the conference. This is a move in the right direction.

New York Joins Licensing States

WITH New York added to the states that require engineers to be licensed (see p. 1031, May 20), half the battle is won. Every state added to the list, and particularly every large state, is bound to lead many opponents of licensing into advocates. As Mr. Drayer said in his recent report as secretary of the American Association of Engineers, "the time is nearly here when the engineer in the state not having a license law will be under considerable handicap." One reason is that the license laws carry reciprocity clauses. An engineer in a state without a license law will have to secure a separate license in every state that has one, or else be debarred from practice there; but if he hold a license from his own state, the way is made easy for him to practice in any state that has a license law with reciprocity provisions. Ultimately, wise license laws, well administered, will raise the status of the engineer in public esteem and increase the solidarity of the engineering profession.

Raising the Freight Blockade

SUCH radical steps have been taken to relieve the railroad tie-up, since we commented on the situation last week, that progress toward a temporary solution should be noted. The Interstate Commerce Commission has begun to use the executive powers granted by the Transportation Act in time of emergency and apparently has secured full co-operation from the private managements through the agency of the American Railroad Association and the Association of Railway Executives. Equipment is being "relocated" on a large scale to the sections of the country from which essentials must be quickly shipped and the inter-line embargo —against receiving freight from foreign lines—appears to be vanishing as a competitive measure. When it is considered that new freight equipment and locomotives now on order will not be delivered until between the first of August and October, there is no great hope of immediate solution being found in the Government-financed equipment orders under discussion in Washington. This offers none too bright a prospect to many branches of the construction industry, but steps now being taken should soon afford relief in many quarters.

The St. Louis Bond Vote

THE defeat of five-sixths of the proposed $24,000,000 bond issue at St. Louis on May 11 (see p. 1080) must be interpreted in the light of the fact that the state constitution requires a two-thirds majority vote to carry bond issues. The actual majorities were from 61 to 69 per cent, with an average of 10,000 more votes for than against the various items. Considerably less than half the voters who registered went to the polls. In view of these facts it cannot be said that the people of St. Louis were strongly protesting against municipal outlay during a period of high prices. A goodly majority of those who took the trouble to go to the polls voted for every item on the long list. This action is in strong contrast with the votes a few weeks earlier on public improvements at Chicago and Cleveland, where strong disapproval of every item voted for was recorded, with the exception of hospital facilities at Cleveland. The difference may well have been largely due to the care with which the Cleveland bond program was formulated after extended consideration of all the public improvement needs of the city and with the advice of a committee representing various civic and commercial organizations.

Road Subgrade Study

REPAIR of disintegrated road surfaces as practiced ten years ago and today has an analogy, it appears, in the ways of the old medical practitioner and those followed by the modern physician. The pill and powder panacea is fast being discredited; now the diagnosis is the thing. The modern practitioner's first move is to accumulate a mass of facts, which, to the layman and particularly to the patient, appear wholly irrelevant. These facts form the "history" of the case and upon it and his years of research the physician relies to cure not only existing ills but any succeeding ones. During the past few months road surfaces that were believed to have only begun their useful lives have entirely disintegrated. Failures have been such that more than superficial diagnosis is a necessity. The histories of road failures must be obtained to guide future design and insure healthy pavements. This is a fact all realize, but few are the highway departments that have reached that stage in their development where intensive research is possible. Highway engineers, therefore, generally will be interested to know that the Bureau of Public Roads, at the instance of its chief, Thomas H. MacDonald, has undertaken the collection of the "histories" of anæmic highways. Details of the plan whereby this information is to be secured are given elsewhere in this issue. Road failures are to be examined where it is apparent the subgrade is responsible. The entire field organization of the bureau is to aid the testing division in the work. It is clear that results obtained will be far-reaching, since the investigation will cover roads of every type, built under every degree of engineering difficulty, upon a variety of subgrades, and where temperature ranges are widest.

An Unresponsive Answer

ANSWERING the question "whether an engineer or an architect should have charge of the design and construction of bridges and other important structures," Engineering Council this week makes public the conclusions reached by one of its committees in joint session with a committee of the American Institute of Architects, as reported in the news section of this week's issue. The answer is unresponsive. It does not meet the issues of the Pittsburgh bridge case, out of which the question arose, and it is not likely to promote a better understanding of engineering responsibilities within the profession or among the public which it serves. Other organizations of engineers that have studied the relation of the question to safety and sound public policy have expressed quite definite conclusions. It was hardly to be expected that Engineering Council would do less than did, for example, the American Institute of Consulting Engineers. A broad, yet clear and forceful, statement of principle was due. Instead, the report confines itself to easy generalities. It says that "the special conditions surrounding each case should determine whether an architect or an engineer should be selected to have charge." Doubtless it was not lack of courage that led the committee to this form of statement. But it may be that the key lies in a subsequent passage, to the effect that "whether the engineer is chief and the architect associate or vice versa is an administrative detail of relative unimportance." If the committee really interpreted its problem as concerning a mere administrative detail the tenor of the report is explained. But we fear that if the engineers of the country are to have no other guidance than such pronouncements, they will prefer to depend on their individual judgment.

Railway Service and Rates

THE ease of descent into poor conditions and the difficulty of ascending again to normal or improved conditions (the "facilis descensus" of our Latin school days), as noted in regard to public utilities in *Engineering News-Record* of May 6, p. 890, is illustrated forcibly by the present railway situation. An abstract of the report of the Division of Capital Expenditures, United States Railroad Administration, appears on another page of this issue. Failure of Congress to make an appropriation for railway work in March, 1919, and failure of the Railroad Administration to provide adequate maintenance, have resulted in postponed improvements, insufficient equipment and depreciated property in many cases. Thus, when the railways were returned to their owners they were, on the whole, below normal condition and their expenses had been increased enormously. It is evident, therefore, that they have before them a long and heavy pull up grade to reach satisfactory conditions of service and finance. A railway system that is efficient and a safe investment is a necessity for progress and prosperity, but funds are needed for efficient service and the payment of expenses. Although increased freight rates appear to be generally recognized as inevitable under the circumstances, there is a tendency to claim exemptions for various industries. But such rates should be accepted without attempts to avoid an equitable share of the burden that must be imposed if the railway system is to function successfully, affording the service that is necessary to make possible any greatly increased production.

New York City's Port Policy

MUCH criticism has been leveled at the Dock Department of the City of New York for the inadequacy of the new steamship pier layout on Staten Island now just starting construction. Some of this has been ill considered—mere sheeplike following of the general principle that freight-handling equipment is of itself a manifestation of modernism in steamship pier design. But a great deal of the objection is based on the best judgment of engineering talent in harbors and terminals and finds expression mainly in the contention that the 125- and 130-ft. piers are too narrow. It is hoped that the publication in this issue of the details of the project and the defense of the conception by the city officials will result in a discussion of the criticised elements of the design, which, though probably of small effect on the future of the scheme, may serve to clarify engineering opinion on the subject.

It should be said, however, in advance of such a discussion that the position of the city authorities is clear. First and foremost, they represent only the City of New York; so far as they are concerned, the port does not exist west of the state boundary line. Nor do they choose to contemplate or foresee any future rearrangement of conditions of control. That a consideration of the port as a whole might result in benefit to their city and state does not enter into their calculations. They are committed to a port of the City of New York, regardless of geographical or economic alliances. This position inevitably leads to the conclusion that the port must always be a lighterage proposition and the design and layout of piers are governed by this fact. Finally, they hold that whatever is is right, that the present rate system in New York harbor will prevail and that the steamship companies will continue to shoulder the cost of freight transfer onto the railways, who in turn pass it on to the shipper. Therefore they prefer to accept the opinions of the steamship interests as the governing factor in pier layout regardless of the effect of such a policy in adding to the final cost of freight transfer in the port.

That this is a narrow view which will ultimately react against the best interests of New York City seems obvious. However, any consideration of the Stapleton development must take it into account. Engineering has been forced into the background by political expediency.

The Proposed Engineering Federation

ANSWERS to the call for the Organizing Conference of engineering societies to be held in Washington next week indicate that at least 100 delegates representing nearly 90,000 engineers will participate.

The stage is set, therefore, for the most important deliberative gathering that engineers have ever planned. It is essential, if the best interests of the profession are to be served, that the views of technical men on the proposed federation of engineering societies shall be thoroughly representative. Any decision reached or any plan promulgated at Washington must reflect the best thought of engineers throughout the country, and not in one or more sections. The question to be decided by the profession is a national one. It calls for a nation-wide representation of engineers at Washington. While the acceptances to the call thus far received assure the success of the meeting, it is desirable that all societies which have not already done so take steps immediately to insure participation in the deliberations by their delegates. The time is short. The situation demands quick action.

For years past a national, all-inclusive organization of engineers has been considered. The topic has been discussed frequently in the presidential addresses of the heads of the largest national societies, but nothing resembling concerted action by these bodies was done until Engineering Council, representing the directorates of the four founder societies, was formed several years ago. Meanwhile the American Association of Engineers, from small beginnings in 1915, grew apace until it now shows a membership of 17,000. Apathy on the part of the founder societies toward the human and the economic problems of the engineer gave birth to the new organization, which is designed to supply to its members the kind of service which the older societies were negligent in providing. Then followed the appointment by the founder organizations of "development committees" and Joint Conference Committee representatives, the movement toward a national federation of engineering societies culminating in the announcement of the Organizing Conference to be held next month.

The present situation is a complex one, especially in view of the recent defeat by the members—not the directorate—of the American Society of Civil Engineers of the third proposal in its questionnaire-ballot covering the "comprehensive organization" plan offered by the Joint Conference Committee's report. Underneath the cross-currents of individual judgment, however, it is clear that there is a strong general sweep of opinion toward the acceptance of some means for securing unified action by engineers in civic, economic and other non-technical matters. The overwhelming affirmative vote on Questions 1 and 2 of the American Society of Civil Engineers ballot is strong evidence in support of this belief. The big question which the Organizing Conference must answer, therefore, involves not the end, but rather the means toward that end.

Opinion is very sharply divided on two alternative projects. One group of engineers believes that an entirely new organization, or possibly one involving the reconstitution of Engineering Council along more democratic lines, should be created to effect the unification of the profession by means of a federation. The other group holds that the American Association of Engineers, first in the field of welfare activities, now a going concern with a large membership and organized primarily for non-technical work, is the logical agency by which the so-called welfare activities should be handled. The association will send 17 delegates to the Washington conference. It is possible that they, or the representatives of other organizations, may bring forward some plan whereby the American Association of Engineers and the proposed federation may be able to work effectively along non-conflicting lines. The acceptance of such a plan, if it be possible to devise one, would clear the atmosphere and open up the way for real constructive work.

Recognition of the aggressive and efficient record of the American Association of Engineers cannot be denied, but consideration must be given to the potential influence which would lie in an association of all of the country's engineering organizations, representing more than 100,000 engineers, as against a smaller body of individual members. On the one hand, the association of individual members would be closely knit and capable of direct action. On the other, in the larger organization, the weight of numbers, in addition to the prestige of the nation's leading engineers, would be a powerful political factor, provided that the national societies are whole-heartedly in favor of the movement. If opinion in the founder societies generally is divided —as it was in the case of the American Society of Civil Engineers—the federation, if endorsed, would labor under the handicap of opposition from what may be termed a group of "irreconcilables." The federation movement must either be generally and enthusiastically supported or it must be abandoned. A half-hearted acquiescence in the project will result only in failure.

The real sentiment of the rank and file of American engineers toward this vital project of a federation cannot be accurately determined by decisions of boards of directors and executive committees or by opinions of uninstructed delegates returning from the Washington meeting. Only after a broad, democratic expression of opinion by letter ballot to the members of all organizations participating in the Organizing Conference and a wide publication of the proceedings of the meeting can the future of the proposed federation be fairly decided. The American Society of Civil Engineers is the only national body which has taken such a referendum vote, the result being the defeat by a close margin of the proposal to accept the "comprehensive organization" outlined by the Joint Conference Committee. Following the Washington meeting, other organizations must be canvassed in the same democratic way as was followed by the civil engineers. As a matter of fact, the civil engineers will again vote upon the question of the federation by letter ballot and will have the benefit of mature consideration as a basis for revoking or endorsing their original action.

It remains for the Washington conference, therefore, to demonstrate what means engineers wish to adopt to achieve the end of unified action. The decision to be made is a momentous one. It should be made only after a thorough realization on the part of the profession of the various factors which enter into the problem. When the next questionnaire ballot to engineering society members comes it should propose something so definite that no one can offer as an excuse for not voting or for voting no that he does not know what he is asked to vote on.

Stray Points in Structural Steel Design — Part I

Practical Notes on Spacing of Tie Rods in Floors, Weakening of Beams by Flange Holes, Excessive Horizontal Shear, Use of Average Test Results, and Beam Deflections

By R. Fleming
American Bridge Co., New York City

THOUGH the principles governing steel design are well defined, the structural engineer is often obliged to settle questions regarding which information is scattered and fragmentary. He also meets conditions where practice is varied and divergent. These may be called "stray" points in structural design, some of which will be taken up in this article.

Goodman, in the preface to his "Mechanics Applied to Engineering," says:

> There are comparatively few engineering problems in which the data are known to within, say, 5 per cent, hence it is a sheer waste of time for the engineer in practice to use long complex methods when simple, close approximations can be used in a fraction of the time.

Accuracy is a relative term. The survey of a prairie farm and of a valuable city lot may each be termed accurate, but not to the same degree. In structural work certain stresses are negligible. The engineer, however, should know the degree to which such stresses affect calculations. In all approximate stresses the degree of approximation should be well understood. It would be of lasting benefit to a designer of structural steel if he would investigate once for all the deflections due to shear and variable moment of inertia, the strength of beams with flanges unsupported laterally, the value of countersunk rivets, the design of lattice bars, and kindred subjects.

Spacing of Tie Rods for Floor Arches

How shall tie rods for tile arches as shown in Fig. 1 be spaced? The thrust, T, per lineal foot of arch is determined by the usual formula,

$$T = \frac{3\,w\,L^2}{2\,r}$$

in which $w =$ load per square foot uniformly distributed, $L =$ span in feet and $r =$ rise of arch in inches. Practice varies from using tie rods in all bays to omitting them in all but the outer bays and the portions of bays adjoining floor openings. An article, "Tie Rods for Floor Arches," by F. N. Kneass, *Engineering News*, March 18, 1915, p. 518, and discussions in subsequent numbers take up the subject at length. The present writer recommends that tie rods be placed in all bays, calculated for a tensile stress of 25,000 lb. per sq.in. for intermediate and 12,500 lb. for outer bays and portions of bays adjoining openings. For cases similar to Fig. 1 he considers the rise of arch to be the distance from the center of tie rod to top of tile. However, with the low working stresses assumed and the fact that the designer may not know the depth of tile that will be used, the writer believes it is permissible to use the depth from tie rod to top of beam as rise of arch.

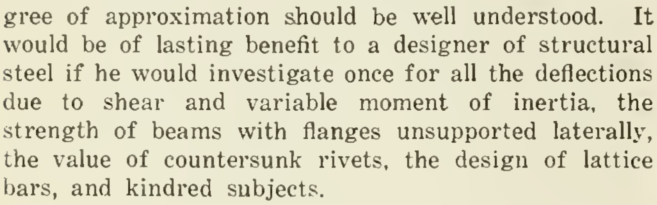


FIG. 1. POSITION OF TIE-RODS IN TILE FLOOR ARCH

A point often neglected in the design of beams for arch floors is the thrust stresses thrown into the outer beams and the channels around openings. These are additional to those due to vertical loading. Approximate methods for combining these stresses may be found in the Cambria and Carnegie handbooks.

Weakening Effect of Flange Holes in Beams

Bolt holes are often punched or drilled in the flanges of beams without any thought of a reduction of strength of the section at which they are located. If the holes are near the point of maximum flange stress the strength of the beam is materially lessened. For standard beams and channels the reduction of strength in a section due to holes in the flanges at that section is shown in Table I.

Where beams have not been designed with section of flange holes omitted, holes should be located so as not to weaken the beam. Fig. 2 shows the percentage of reduction of maximum bending moment at distances from the center of a beam under uniform load and under central concentrated load.

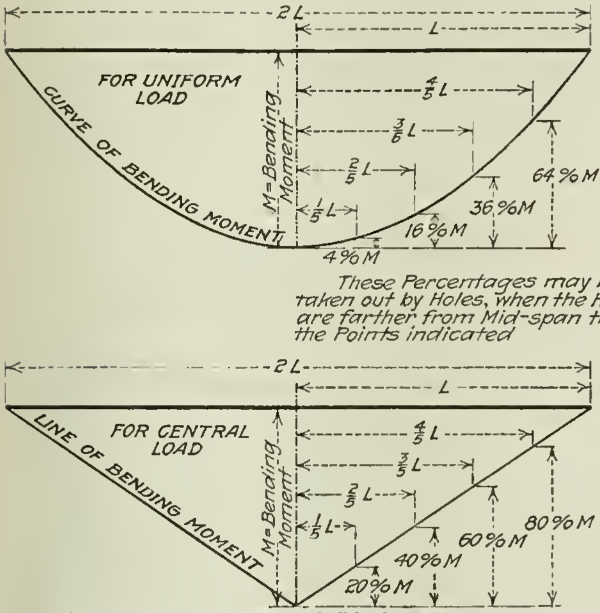
The Horizontal-Shear Danger

Beams of short span uniformly loaded and beams with heavy concentrated loads near the supports may have sufficient strength for bending moment but be insufficient for horizontal shear. (Of course, the vertical and horizontal shearing stresses at any point of the web have the same value, but it is better for the structural engineer to think in terms of horizontal shear. He will not then be confused by doubts concerning the shearing strength of the flanges). Fig. 3 shows the design of a crane-runway support found weak in horizontal shear. The defect was remedied by changing the light 15-in. channel to one of heavier weight and

TABLE I. REDUCTION OF STRENGTH IN BEAM SECTION DUE TO HOLES IN FLANGES

Beams or Channels	Diameter of Bolt, In.	Diameter of Hole, In.	Percentage of Reduction, One Hole in Flange	Percentage of Reduction, Two Holes in One Flange	Percentage of Reduction, One Hole in Each Flange	Percentage of Reduction, Two Holes in Each Flange
Beams In. Lb.						
6 x 12 25	[illegible]	[illegible]	15 9	31 5	18 1	36 1
7 x 15	[illegible]	[illegible]	14 4	28 1	16 1	32 2
8 x 18	[illegible]	[illegible]	14 6	30 0	17 5	35 0
9 x 21	[illegible]	[illegible]	13 9	27 7	16 1	32 3
10 x 25	[illegible]	[illegible]	12 5	25 1	14 7	29 5
12 x 31 5	[illegible]	[illegible]	11 3	22 6	13 4	26 7
15 x 42	[illegible]	[illegible]	9 8	19 6	11 8	23 6
18 x 55	[illegible]	[illegible]	10 0	20 0	12 2	24 4
20 x 65	[illegible]	[illegible]	9 6	19.2	11 7	23 4
24 x 80	[illegible]	[illegible]	8 6	17 2	10 4	20 8
Channels						
6 x 8	[illegible]	[illegible]	23 2		28 2	..
7 x 9 75	[illegible]	[illegible]	21 5		26 3	....
8 x 11.15	[illegible]	[illegible]	23 5		28 6	..
9 x 13.25	[illegible]	[illegible]	20 1		24 7	. .
10 x 15	[illegible]	[illegible]	20 1		25 0	
12 x 20 5	[illegible]	[illegible]	19 8		24 4	
15 x 33	[illegible]	[illegible]	16 0		20 1	

thicker web. From the writer's personal knowledge there are instances in existing structures where beams are designed for bending only and are weak in horizontal shear. One such instance is in a prominent public building where granite columns rest near one end of floor beams. In this case the weakness in shear is further emphasized by the fact that the usual standard connection angles are used.



These Percentages may be taken out by Holes, when the Holes are farther from Mid-span than the Points indicated

FIG. 2. BENDING MOMENT DIAGRAMS FOR UNIFORM LOAD AND CENTRAL LOAD

The maximum intensity of longitudinal shear in beams is at the neutral axis. Table II gives this intensity in coefficients of the total vertical shear at the section considered.

USING AVERAGE VALUES OF TEST RESULTS

Discrimination must be exercised by the engineer in making use of the "average" value of strength found in a number of test pieces. In a series of timber tests the horizontal shearing resistance in 12 pieces ranged from 188 to 497 lb. per sq.in. with an average of 370 lb. In another series the values in 4 pieces ranged from 293 to 505 lb. with an average of 364 lb. per sq.in.

The reports of any series of tests should give individual results if practicable or in some way give the reader an indication of the variability of the phenomena involved. It is only when variations are slight that conclusions may safely be based upon average values. What would be thought of the bottom chord of a bridge composed of four bars, two iron and two steel, equal in area of cross-section and proportioned according to the average tensile strength of iron and steel?

THE DEFLECTION OF BEAMS

Table III is given for reference. All the formulas, except those of Column 5, are for deflection due to flexure. All beams are assumed to have a constant moment of inertia except those of Column 4.

Rankine sixty years ago showed that the deflection of a beam due to shearing stress is so small compared with that due to the bending action of the beam that it may safely be neglected. For illustration, the deflections due to both flexure and shear of a number of beams fully loaded are shown in Table IV.

TABLE II. HORIZONTAL SHEAR IN BEAMS. FORMULA $Sh = \frac{MsV}{It}$

Section I-Beam In. Lb.	I	t	M_s	Sh
6 x 12.25	21.8	0.23	4.2	$0.84V$
7 x 15.0	36.2	0.25	5.9	$0.65V$
8 x 18.0	56.9	0.27	8.2	$0.53V$
9 x 21.0	84.9	0.29	10.8	$0.44V$
10 x 25.0	122.1	0.31	14.0	$0.37V$
12 x 31.5	215.8	0.35	20.8	$0.28V$
15 x 42.0	441.8	0.41	34.3	$0.19V$
18 x 55.0	795.6	0.46	51.7	$0.14V$
20 x 65.0	1169.5	0.50	68.6	$0.12V$
24 x 80.0	2087.2	0.50	101.5	$0.10V$
Channels In. Lb.				
6 x 8.0	13.0	0.20	2.5	$0.96V$
7 x 9.75	21.1	0.21	3.5	$0.79V$
8 x 11.25	32.3	0.22	4.7	$0.66V$
9 x 13.25	47.3	0.23	6.1	$0.56V$
10 x 15.0	66.9	0.24	7.7	$0.48V$
12 x 20.5	128.1	0.28	12.4	$0.35V$
15 x 33.0	312.6	0.40	25.0	$0.20V$

NOTATION: S_h = intensity of horizontal shear.
M_s = statistical moment of section included between the neutral axis and the extreme fibers
I = moment of inertia of beam.
t = thickness of web.
V = total vertical shear at section considered.

The deflections, Δs, are determined from the formulas of Column 5 in Table III, by assuming that the whole shearing stress is uniformly distributed through the web of the beam. The web is then regarded as a rectangular prism of b = thickness of the web and d = depth of the beam.

An interesting academic study may be made of shearing-stress deflections. The shearing stress in a beam is not uniformly distributed through the web, but it is possible to calculate the true deflections due to shear in sections for which the true shear distribution is known. Examples of such calculations are given by Fuller and Johnston, "Applied Mechanics" (Vol. II); Morley, "Theory of Structures"; and Tilden, *Engineering News*, Feb. 24, 1910, p. 228. The method is laborious and almost nothing is gained in accuracy; for any beam in Table IV, the difference is less than 1/300 in. from that given.

As to plate girders, Hudson, in his book "Deflections and Statically Indeterminate Stresses," says that in

TABLE III FORMULAS FOR DEFLECTIONS OF BEAMS

1	2	3	4	5
Beam and Loading	Maximum Deflection in Terms of Loading	Maximum Deflection in Terms of Stress on Extreme Fiber	Maximum Deflection of Beams of Constant Strength and Uniform Depth (Boyd)	Maximum Deflection of Beams of Rectangular Cross Section Due to Shear (Hudson)
Case I—Cantilever Beam. Concentrated load P at free end .	$\frac{P l^3}{3EI}$	$\frac{2 f l^2}{3 E d}$	$\frac{P l^3}{2 E I_m}$	$\frac{6 P l}{5 E_s b d}$
Case II — Cantilever Beam. Load W uniformly distributed.	$\frac{W l^3}{8 E I}$	$\frac{f l^2}{2 E d}$	$\frac{W l^3}{4 E I_m}$	$\frac{6 W l}{10 E_s bd}$
Case III—Beam supported at ends. Concentrated load P at center.	$\frac{P l^3}{48 EI}$	$\frac{f l^2}{6 E d}$	$\frac{P l^3}{32 EI_m}$	$\frac{6 P l}{20 E_s bd}$
Case IV—Beam supported at ends. Load W uniformly distributed . .	$\frac{5 W l^3}{384 EI}$	$\frac{5 f l^2}{24 E d}$	$\frac{W l^3}{64 EI_m}$	$\frac{6 W l}{40 E_s bd}$

NOTATION: P = concentrated load.
W = uniformly distributed load.
E = modulus of elasticity for flexure (= 30,000,000).
E_s = modulus of elasticity for shear (= 12,000,000).
I = moment of inertia of beam of uniform cross-section.
I_m = moment of inertia of beam at greatest cross-sectional area.
b = breadth, d = depth, l = length of beam, all in inches.
f = stress in lb. per sq. in. in extreme fiber.

investigating the effect of shear in producing distortion it will be very nearly correct to assume that the web alone resists all the shearing stresses and that the shear is uniformly distributed. Also, that the shearing stresses, in modifying the effect of the flexural stresses in designing, need be considered only for very deep girders subject to very heavy loads. Girders carrying considerable loads are usually designed with the flanges composed of angles extending full length and cover plates of varying length. This is done to make the girder of as nearly constant strength as practicable. The moment of inertia is thus not constant but variable. Maximum deflections are given in Column 4 of Table III for girders of uniform depth and theoretical constant strength. It is noted that deflections are from 20 per cent to 100 per cent greater than for beams with constant moment of inertia. In Cases III and IV, the most common conditions of loading, deflections are 50 and 20 per cent greater.

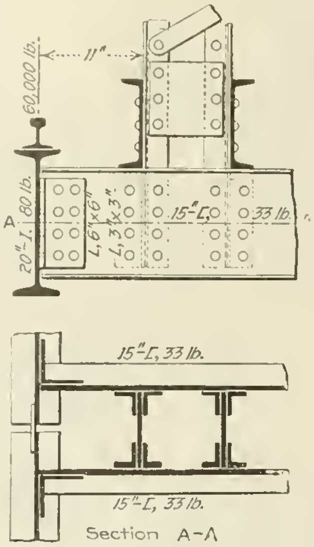


FIG. 3. CRANE-SUPPORT BRACKET IN WHICH WEB SHEAR IS A FACTOR

TABLE IV. DEFLECTION OF BEAMS: FLEXURE AND SHEAR

I-Beams In. Lb	Span in Feet	Load in Pounds	Distribution	Δf in Inches	Δs in Inches	Δf + Δs in Inches
8 x 18	5	30,300	Uniform	0.050	0.011	0.061
8 x 18	10	15,150	Uniform	0.200	0.011	0.211
8 x 18	15	10,100	Uniform	0.449	0.011	0.460
8 x 18	5	15,150	Middle	0.040	0.011	0.051
8 x 18	10	7,600	Middle	0.160	0.011	0.171
8 x 18	15	5,050	Middle	0.359	0.011	0.370
12 x 31.5	5	76,700	Uniform	0.033	0.014	0.047
12 x 31.5	10	38,350	Uniform	0.133	0.014	0.147
12 x 31.5	20	19,175	Uniform	0.534	0.014	0.548
12 x 31.5	5	38,300	Middle	0.027	0.014	0.041
12 x 31.5	10	19,150	Middle	0.107	0.014	0.121
12 x 31.5	20	9,575	Middle	0.427	0.014	0.441
20 x 65	10	124,700	Uniform	0.080	0.019	0.099
20 x 65	20	62,350	Uniform	0.321	0.019	0.340
20 x 65	40	31,175	Uniform	1.281	0.019	1.300
20 x 65	10	62,400	Middle	0.064	0.019	0.083
20 x 65	20	31,200	Middle	0.256	0.019	0.275
20 x 65	40	15,600	Middle	1.024	0.019	1.043

Notation: Δf = deflection due to flexure.
Δs = deflection due to shear
$\Delta f + \Delta s$ = total deflection.

Hudson, in his book previously quoted, illustrates by example the more exact method of using actual moments of inertia as found at different sections. For a light plate-girder center-bearing drawbridge with girders of 72-in. web plate 138 ft. long with each flange of 2 angles and 3 cover plates, he finds the moment at the center support 15 per cent greater than that obtained by the ordinary method of using a constant moment of inertia. For a heavy plate-girder center-bearing drawbridge with girders of 101-in. web plate 159 ft. long with each flange of 2 angles, 2 side flange plates and 4 cover plates, the moment is 11 per cent greater than that obtained by the ordinary method.

Again, using the variable moment of inertia, for the shorter and lighter draw-span, the deflection of the end of the span due to the shearing stresses caused by uniform loading is about 4 per cent of that due to the flexural stresses from the same cause; the deflection of the end of the span due to the shear caused by a load at the end is about 3 per cent of that due to the flexural stresses from the same cause. The calculated moment over the center support obtained by a consideration of the flexural stresses alone is about 2.6 per cent greater than that obtained by taking into account the effect of the shearing stresses. For the longer and heavier draw-span, the consideration of the effect of the shearing stresses shows differences about twice as great, in each instance, as for the shorter and lighter structure.

A symposium, "The Deflection of a Beam of Non-Uniform Section," may be found in *Engineering News* of Sept. 14, 1907, p. 526.

(To be concluded.)

The Proletarian Mind

By P. B. McDonald

Assistant Professor of English, College of Engineering, New York University

SUCH keen observers as Lord Milner are saying that the world is to be ruled by the proletariat, the class without capital which has only its wages to depend on for a living. Labor is taking the control of things from the bourgeoisie, or middle-class capitalist, say the prophets, just as the middle class dispossessed the aristocracy; in the words of Macaulay, history is a record of the taking of power from one class by another, with the resistance of the enjoyers of privilege gradually overcome by the insistence of the new claimants. There is chance, of course, of a conservative reaction, such as occurred after the Napoleonic wars. Although the middle class is unorganized and slothful, it is not incapable of stubborn intrenchment, and has a tradition of producing great leaders. Most of the famous thinkers of the last several centuries have come from the middle class. Yet men of distinctly proletarian type of mind have lately risen to power, and it is worth while to speculate on the characteristics of such a mind as compared with the better-known middle-class and aristocratic minds.

The typical proletarian mind has not yet had a chance to assert itself, but approximations to it are evident in such public figures as Lloyd George, Gompers, and a host of minor labor leaders. These men, risen from the humblest environments, have not acquired the bourgeois point of view in rising, as many leaders of humble birth have done, but exemplify to a considerable degree the hard-headed, persevering, intuitive mind of the proletariat. Men of scant formal education, they do little reasoning of the kind that philosophers call rationalism, but, seeing conditions that appear to them wrong, they set about to remedy them with the means at their disposal. Too often their views are short, and they have not learned to disregard pin-pricking details, as have the rationalistic middle class and the leisurely and careless but very capable aristocracy. As yet the proletarian makes an uninspiring figure of a leader; he is unlovely and commonplace; witness the pictures of Ebert in Berlin, or the average labor-union committee—and looks count enormously!

Yet the labor leader of the better type has his points. He is terribly sincere; he takes a unified view of things; he has not the distressing fears of the bourgeois; and he is not a puritan. Trivial as the matter was, a recent cartoon in a radical magazine indicated Labor's contempt for the priggish (as they see it) middle class; a well-dressed mother and little daughter were shown out walking, the child was pointing up and saying, "Oh, mamma, see the aeroplane," and the mother was saying, "How often have I told you not to point?" There is no denying that large sections of the middle class are caricatured by such a cartoon. Such sections are too apt to have a horror of committing social errors, a morbid regard for appearances, and a certain habit-formed aridity and insensitiveness. Though hard-working, according to their lights, they are wasteful and conventional and inclined to slave for Mrs. Grundy rather than for the good of the community.

The middle class is studious and conscientious, opportunistic and political, educated formally rather than practically—witness such public men as Roosevelt, Asquith, Clemenceau, Wilson. The aristocracy is farseeing, talented, unhurried. Mr. Balfour is a type. They stand for a certain glamor and sense of fitness, but, as Editor Raymond of the British *Outlook* has pointed out, they believe that what oases of culture the world has would be lost if overwhelmed by the masses.

Much Yet to Learn

On the whole, the proletariat still has much to learn from the other two classes. They must learn not to antagonize all the rest of the nation. They should learn some economics and history, together with moderation and patience. Even though it is true that, like the Irish, the game has gone against them in the past, there is no sense in spoiling the world in which they too must live. They are likely to be farther ahead in the end by co-operating with the other classes than by drawing lines too tightly and excluding the more thoughtful kind of leadership. Rather than risk everything, part of which is not theirs, on a single doubtful issue, they should envisage the complexities of the world's problems and the need for men of various training and persuasions. It has been the aristocracy that was most inclined to encourage the development of talented individuals, and even the puritanical middle class has been more lenient than labor seems to be toward the exceptionally gifted intellectual—the type that does not fit into a factory conception of the world, yet a type from which, properly aided, much originality and invention is possible.

The best idea of what the proletarian mind is like is to be gained by listening to the conversation of men who work for wages and belong to a labor union. If the middle-class intellectual thinks he has nothing to learn from paying attention to such a conversation, he is sadly in error. He will find to his surprise that the wage-earner, though narrow-minded, to be sure (as are many capitalists), has a certain homely philosophy that is not unlike that of Abraham Lincoln's and that is convincing at times by its elements of irresistible truth. Though he is liable to be embittered and materialistic, the wage earner shows a rough sense of justice and a naive wish to balance things off into a practical compromise. It is only when he sees no better way out that he submits to the leadership of the radical element of his party. Lacking education and proper leadership, he is beginning to recognize some of the pit-falls that beset a reformer. He needs to understand better the problems that confront society, just as the other classes need to understand him .

The Urban Automobile Problem

In a paper on "The Urban Auto Problem," delivered before the recent National Conference on City Planning at Cincinnati, Ernest P. Goodrich consulting engineer, New York City, finds that the study of traffic problems in congested areas leads to the following conclusions with reference to the planning of cities in their relation to the automobile problem:

(1) Streets should be designed with heavier pavements than at present.

(2) The elastic principle should be applied to the determination of the width of all thoroughfares, that streets wider than those now contemplated can be secured most economically by the use of several levels in the segregation of different kind of travel upon them, so that street car traffic may be carried in subways or in elevated structures and provisions be made for overhead sidewalks, and similar features.

(3) Special traffic studies should be made to determine the most advantageous location for cut-offs and detours (radial and circumferential streets) and whenever found economically feasible they should be introduced into existing systems, and as far as possible, planned for any future development.

(4) In connection with the handling of freight by automobile trucks, private rights of way should be arranged by the trucking interests to reach freight stations located near the centers of distribution.

(5) In connection with such special rights of way, in other places where traffic conditions warrant, separation of grades and crossings is to be considered.

(6) Of all intersections, study should be made of the economical possibility of enlargement by cutting off building corners and providing set-backs to the building line for a considerable distance of each side of each corner. In order to provide reservoir standing space for street traffic.

(7) These set-backs and cutoffs should be accompanied by set-backs of the curb and enlargement of curb radius.

(8) Where considerable enlargements are deemed necessary, consideration should be given to the possibility of introducing features at intersections around which traffic should be carried by the rotary principle.

(9) In cases of extremely heavy traffic, consideration should be given to the introduction of pairs of one-way streets in lieu of extra wide thoroughfares.

(10) A scheme of designing streets in threes should always be considered for those destined to carry heavy traffic, so that surface railways, commercial vehicles and other traffic may be cared for.

Depth of Water in Golden Gate

In a recent talk at the San Francisco Engineers' Club Colonel E. E. Winslow, Corps of Engineers, U. S. A., referred to interest which the U. S. Navy is taking in the possible dredging of the bar just outside the Golden Gate. The recently passed Rivers and Harbors Bill included an item for a preliminary survey and report on this work. The question at issue would be the dredging of a channel 1,000 to 1,500 ft. wide across the bar. The present minimum depth of water on the bar is 32 ft. and there has been no change in depth or location of the bar as far back as records go. The distance across the bar between 36-ft. contours, is about one-half a mile and between the 40-ft. contours about one mile. At present large boats do not cross the bar, deeper channels being on either side. Some years ago submerged rocks in the north channel were blasted down to a minimum depth of 40 ft. and with a knowledge of the channel it is possible to navigate a large vessel so that it is never in less than 50 ft. of water at lowest tide. The south channel has a minimum depth of 35 ft.

Concrete Consistency Measured by the Flow Table

New Apparatus Devised at Bureau of Standards Gives Accurate Measure of Flowability or Workability of Concrete

By G. M. Williams
Associate Engineer, U. S. Bureau of Standards, Washington, D. C.

"Flowability" is one of the several expressions sometimes used to describe the consistency or placeability of concrete. The quality of a concrete or mortar mixture which has to do with ease of placing may be referred to as "consistency," "mobility," "plasticity," "workability," or "flowability," and these words, although having perhaps slightly different meanings to many people, are generally synonymous as used.

The consistency or flowability which must be used in any case is dependent upon the nature of the work, type and arrangement of forms and reinforcing steel. For any given condition there is some minimum flowability which must be attained to result in good workmanship, and economy, and proper progress in the process of concreting. With given materials and proportions, flowability may be increased only by use of more mixing water which in turn will lower compressive strength. It is generally agreed that concretes must have the same consistency or flowability to be comparable, yet we have had no satisfactory method for measuring and controlling consistency. Consistency has usually been crudely estimated by eye or the judgment or feel of the operator, and as a result, test data obtained even in the same laboratory, must in many cases remain as small and isolated groups of tests, none of which bears any definite and known relation to the others. Studies made of the results of such tests are likely to lead to faulty conclusions since such concretes are not comparable.

The cylinder slump test and its modification, the cone slump, have been proposed and used for this purpose, and while they are far superior to the old method of "eye" and "feel," they fail fully to meet the requirements of such a test. One criticism of both is that the concrete seldom really slumps when the form is withdrawn, but the mass merely collapses into an unsymmetrical pile. In this respect the cone slump is less satisfactory than the cylinder, since when the former is employed the mass loses all lateral support as soon as the upward movement of the form is started and the tendency of the top to fall over is unresisted. A further criticism of both slump tests is that with different gradations of aggregates, or with different proportions of cement to aggregate, equal slumps do not result in concretes of equal flowabilities, so that the resulting concretes are not comparable. Investigations in the concrete laboratory of the Bureau of Standards

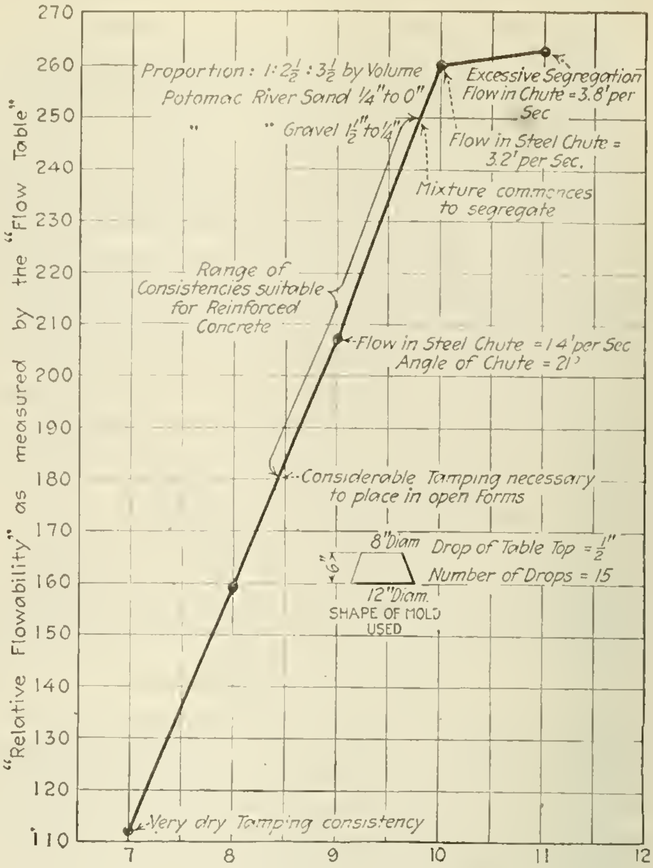


FIG. 2. FLOWABILITY OF 1:2½:3½ VOLUME CONCRETE AS MEASURED BY THE FLOW TABLE

Successive batches of concrete were prepared, each containing 1 per cent more mixing water than the preceding. Flowability is directly proportional to quantity of mixing water for any given mix within a practical and usable limit, and is also proportional to velocity of flow in a steel chute.

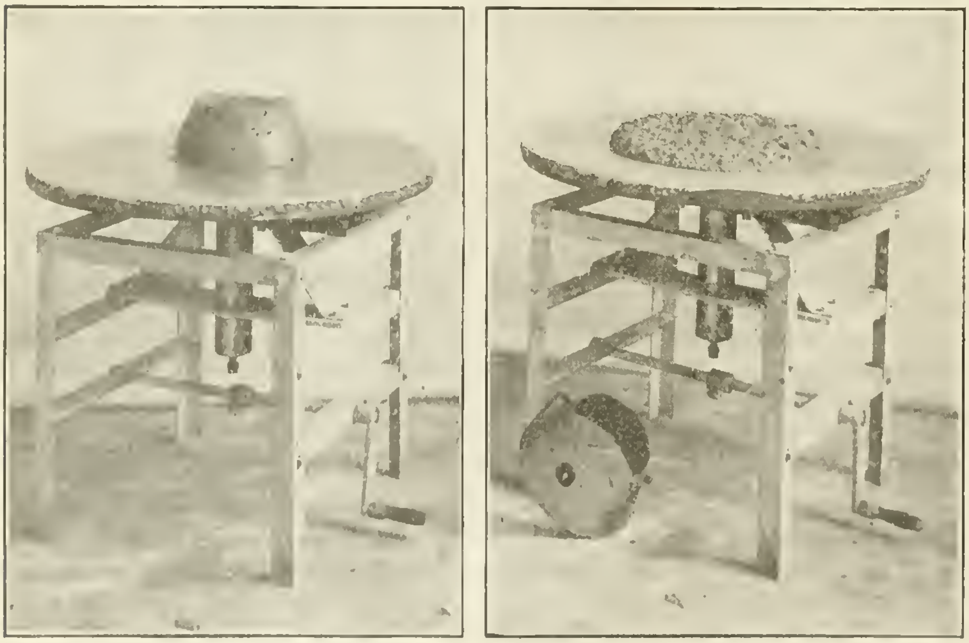


FIG. 1. FLOW TABLE USED IN CONCRETE LABORATORY OF BUREAU OF STANDARDS TO MEASURE CONCRETE CONSISTENCY

A mass of concrete is molded on the metal-covered table top in the shape of a frustum of a cone. The form is removed and the table top is raised and dropped a given number of times by means of a cam. The new diameter of the mass divided by the old, multiplied by 100, is called relative flowability. The 1:1½:3 concrete shown has a relative flowability of 170, about the driest consistency which can be generally used in reinforced-concrete work.

have emphasized that the control and the measurement of flowability is of fundamental importance, not only in laboratory testing of concrete but in the practical application of the results of such investigations to concreting practice in the field.

During the past year and a half a new form of consistency measuring apparatus, designated as the "flow-table" has been used in the concrete laboratory of the Bureau. The type first employed consisted of a piece of sheet steel about 30 in. square, supported at its center in a horizontal position. A mass of concrete was molded at the center, the mold withdrawn, and the edge of the plate struck a given number of weighted downward blows with a suitable hammer arrangement. The amount of spread of the mass was a measure of the flowability of the concrete.

The preceding type of apparatus gave very satisfactory results, but further experiment resulted in a table of the type shown in Fig. 1. This consists of a metal covered table top which can be raised vertically by means of a cam working at the end of a vertical post to which the top is attached. The height of drop can be adjusted by means of a bolt at the lower end of the shaft. A mass of concrete or mortar is molded at the center of the table in a sheet metal mold which has the shape of a hollow frustum of a cone. For aggregates up to 2 in. maximum size this cone has a height of 6 in. and upper and lower diameters of 8 in. and 12 in. For smaller aggregates when made up in small quantities, a cone having a height of 3 in and upper and lower diameters of 4 in. and 6 in. is used. The mass of concrete is tamped just sufficiently to completely fill the form, the form is withdrawn, and the table top is dropped 15 times through a distance of ½ in. The mass flattens and usually spreads concentrically. Two diameters at right angles to each other are measured, the long and the short if difference is apparent, by means of a self reading caliper which is so graduated that the sum of the two readings is the value for "flowability," which may also be calculated by dividing the new diameter by the old and multiplying by 100.

A typical curve showing the relation between the flowability of concrete as measured by the flow-table, and the quantity of mixing water used is shown in Fig. 2. Five separate batches of 1:2½:3½ volume proportion concrete were prepared with percentages of mixing water ranging from 7 to 11. Seven percent resulted in a concrete too dry for ordinary construction work. Nine percent of mixing water resulted in a concrete which flowed sluggishly in a steel chute which had an angle of 21°. Ten per cent furnished as wet and fluid concrete as is ever needed in practice. With 11 per cent a sloppy, segregating concrete difficult to properly sample was obtained. The added water in excess of 10 per cent resulted in practically no increase in flowability as measured by both the flow-table and the steel chute. This straight line relation between mixing water and flow as measured by the flow-table is characteristic of results obtained with other concretes, mortars, neat cement and lime pastes.

Fig. 3 shows graphically some results of tests in which the flow-table and the cone slump were used. A single batch of concrete was employed in this case for all determinations shown, additional quantities of mixing water being added for each ½ per cent increase. Due to loss of paste, absorption, etc., a slightly flatter curve was obtained with the flow-table than resulted for the individual batches of concrete included in Fig. 2. With the exception of the dip in the curve for 10 per cent mixing water, the values for the cone slump are of the usual order of accuracy obtained by either of the slump methods. It is seen that the change in values for the "cone" between 8½ per cent and 9 per cent, omitting the 5½ slump for 8½ per cent, is greater than that caused by the addition of all the mixing water beyond 9 per cent. A really desirable and necessary consistency for reinforced concrete work was not obtained until 9 per cent mixing water was used. It is characteristic of consistency measurements made by the slump methods that marked differences in slump result for differences in quantity of mixing water over a very narrow range only, and before practical working consistencies are obtained.

The advantages of the flow-table over the slump methods may be listed as follows:—

1. The flow table accurately measures flowability or consistency of a concrete, mortar, cement or lime pastes for all consistencies varying from dry masses which have only a slight tendency to flow or change their shape when acted upon by external forces, to those consistencies which are so fluid that the water and laitance will flow away from the coarse aggregate.

2. The relation between flowability and quantity of mixing water is practically a straight line relation for all workable and usable mixtures and consistencies.

3. The stiffening of a mass of concrete due to absorption of water by the aggregate, evaporation or setting of the cement is indicated by reduction of flow of the mass on the flow-table.

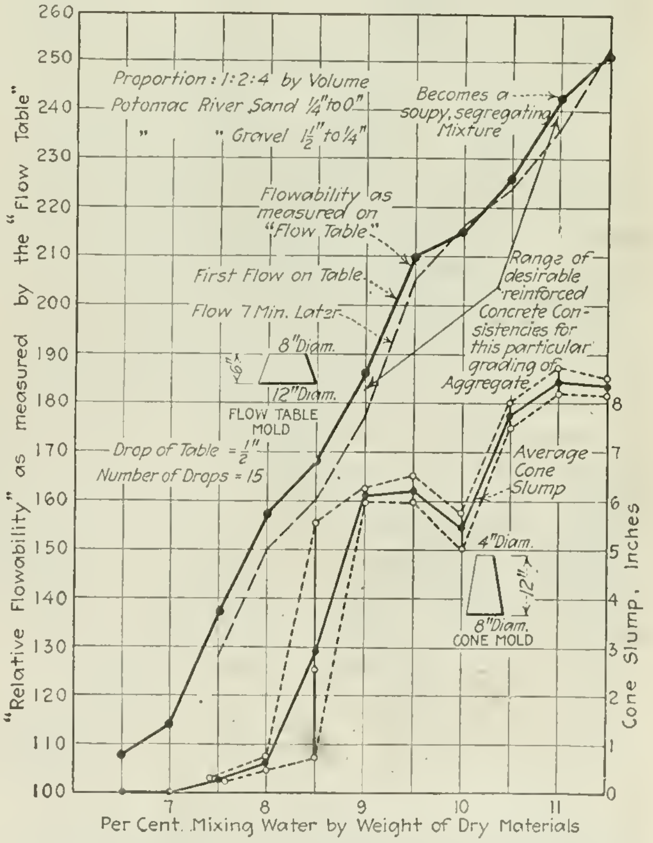


FIG. 3. COMPARISON OF CONSISTENCY MEASUREMENTS BY "CONE SLUMP" TEST AND BY FLOW TABLE

Increasing flowabilities were obtained by adding more water to the same batch of concrete.

The rapid stiffening due to absorption of water by the cement and the aggregate is so marked that it is found necessary to measure the flowability at some definite interval of time after the addition of the mixing water. This is especially necessary when working with concrete composed of aggregates varying widely in gradation. This time interval is that which would be required in practice to properly place the concrete in the forms.

While the apparatus shown in Fig. 1 is rather heavy and cumbersome for use in the field, the method of test is fully applicable to field conditions, and a machine of more recent design now used in the laboratory can easily be carried about by one man. So far as comparative tests have been made on various tables, the results indicate that flow for any given number of bumps and height of drop is independent of the weight of the top, so that in standardizing the apparatus consideration need be given only to (a) size and shape of molded specimen, (b) height of drop of the table top, and (c) number of drops of the table top.

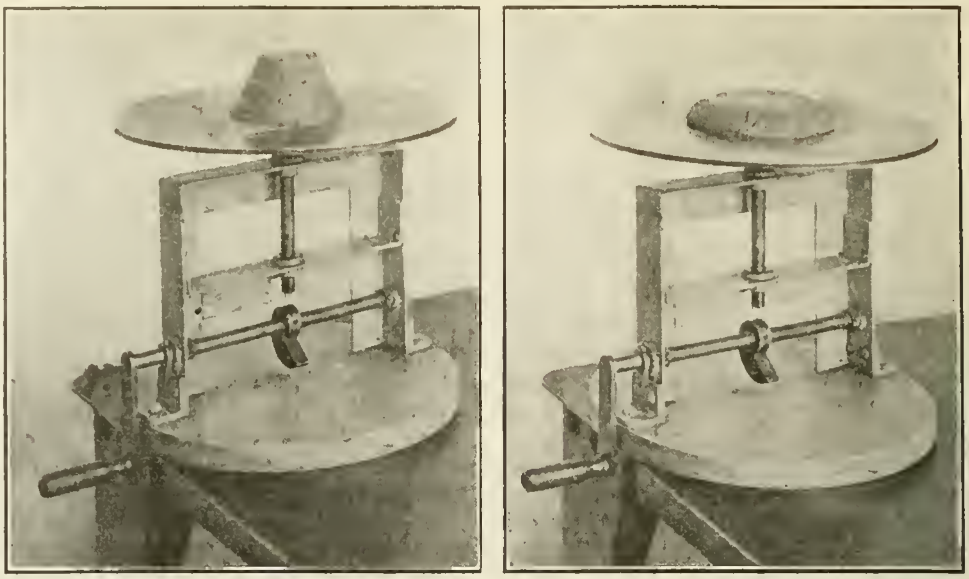


FIG. 4. FLOW TABLE USED IN BUREAU OF STANDARDS IN MEASURING CEMENT AND MORTAR CONSISTENCY

Views show the mass of standard sand mortar before and after being dropped twenty-five times. In this case the relative flowability was 126. A 1 : 3 standard sand mortar of normal consistency has a flowability of 110 as measured on this table.

Although the flow-table was first employed as a means of measuring consistency of concrete, its use has indicated that it may be of value in the control and measurement of several other properties involved in the tests of cement and concrete. These possibilities may be cited as follows:

1. Segregation. In working with dry concretes or concretes having a small ratio of cement to aggregate, or small quantity of fine aggregate, it has been noted that considerable of the coarse aggregate may be found outside of the well defined line of mortar which is considered as the flow line. The quantity of such coarse material appears to be a measure of the harshness or tendency to segregate, and such observations will permit of determination in the laboratory of the ease of working in the field of different combinations of aggregates whose flowabilities are the same.

2. Time of Set. The rate of hardening of mortar or concrete from the time mixing water is added is measured by "flow" of separate specimens on the table at intervals. A practical application was the determination of the rate of hardening of two mortar floor toppings, one containing an accelerator, on actual construction work. The mortar containing the accelerator was finished in one-half of the time required for the other, and the rate of hardening as measured on the flow-table was twice as fast for the former.

3. Normal Consistency. The apparatus shown in Fig. 4 has been in use in the cement testing laboratory of the bureau for checking determinations of the quantity of mixing water required for normal consistency of neat cement and standard sand mortars. Results so far obtained indicate the method to be more accurate and consistent than determinations by the "ball method" or the Vicat needle.

4. Selection of Concretes for Field Use. The flow table furnishes a means of measuring and expressing the missing factor "flowability" which is needed to permit of predicting in advance the approximate strength values which may be obtained for any given proportions of cement and aggregate. The ranges of strength values which may be expected for any aggregate when used with varying cement content and for the extreme ranges of consistencies needed in practice can be determined by a series of tests. Knowing in advance the type of construction, experience will permit the minimum usable flowabilities to be estimated, and for any required strength values the necessary ratios of cement to aggregate may be selected. The selections may be checked by the results of field tests of concrete, and a few trials will indicate strength variations which may result for the degree of thoroughness of field inspection employed, and permit of proper allowances for unavoidable variations in cements, aggregates, and curing conditions, etc.

The foregoing description of the flow table and its method of use is given with the hope that those who are interested in the testing of concrete will give the method a trial. No doubt further tests under widely different conditions will point out modifications and changes in the method and apparatus which will increase its value, and any criticisms based upon its application under such conditions will be appreciated.

Curing Concrete in Silicate Baths

Experiments to determine the effect upon the strength and permeability of concrete due to curing at different periods of time in solution of magnesium fluosilicate and sodium silicate have just been completed by the Bureau of Standards. These tests, although of a preliminary nature and limited in extent, appear to indicate that rich concrete mixtures may be improved in strength by curing for certain periods in magnesium fluosilicate, but they are not made less permeable. Both 1 : 1 : 2 and 1 : 2 : 4 proportions were improved in strength and made slightly less absorptive by curing in sodium silicate solutions.

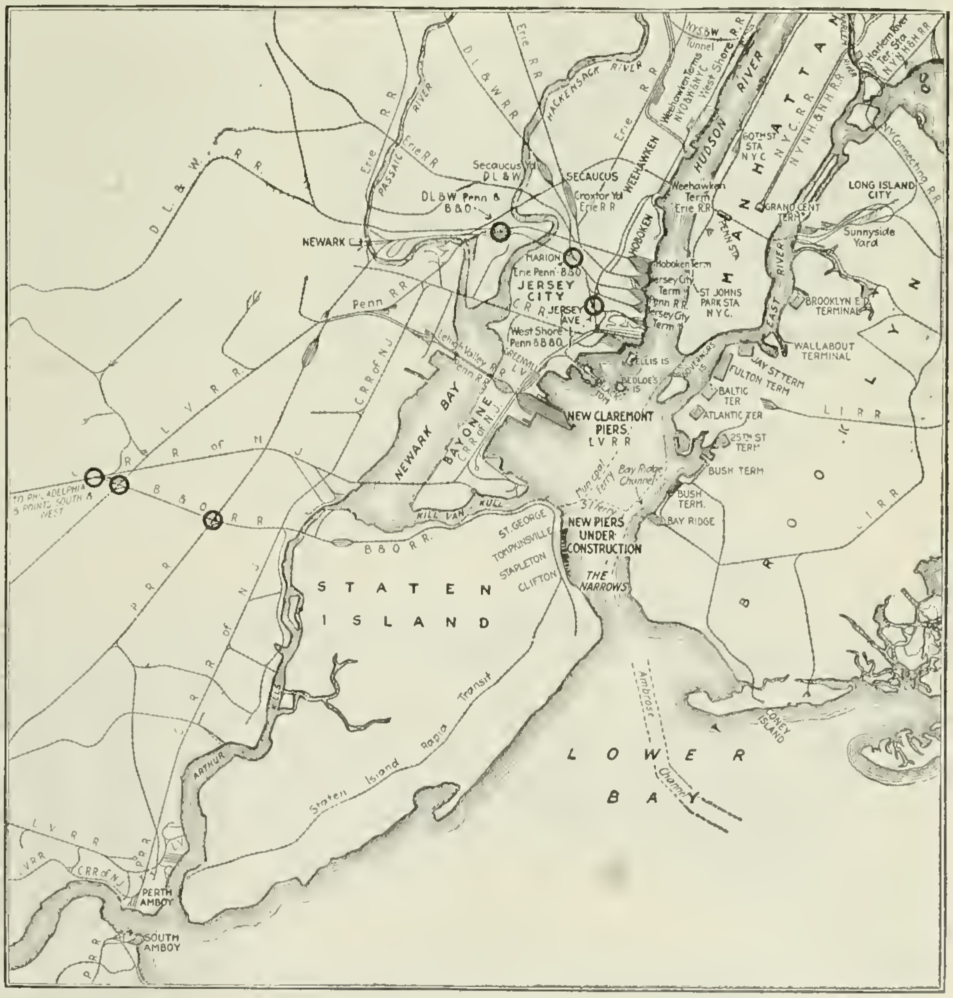
New York To Build Steamship Piers on Staten Island

Twelve Piers About 1,100 Ft. Long and From 125 to 209 Ft. Wide With 300 Ft. Slips Have One or Two-Story Sheds—Type of Pier and Shed Varied to Suit Lessees

NEW YORK CITY has just started the largest steamship pier project in its history in a part of the city hitherto ignored in municipal harbor development, that is Staten Island. Contracts have just been signed for the construction there of twelve new piers varying in length from 1,000 to 1,160 ft. and in width from 125 to 209 ft., with uniform 300-ft. slips. In accordance with the present practice of the Board of Estimate of the city, the money for the project was not appropriated until leases had been executed for the use of the piers, and accordingly the designs of the several piers differ considerably to meet the wishes of their respective lessees. Structurally, however, the design is uniform and in accordance with established practice in the City of New York.

Extending along the Staten Island shore for about a mile and a quarter between Tompkinsville and Clifton, these piers are located just inside the Narrows and face the Bay Ridge district of Brooklyn. In undertaking this improvement the city is practically transferring its past activities to the New Jersey side of the harbor, for while the Borough of Richmond is a political subdivision of the City and State of New York, physically it is close to and a parcel of the main land of the State of New Jersey. The Boroughs of Manhattan and Brooklyn, where the city's port activities have centered in the past, have an island location separated from the main land by the North and East Rivers, and this debars them from direct rail connection with the trunk lines of the continent, except in a roundabout way. The new Staten Island piers are located on the Baltimore & Ohio R.R., which at the six different points marked on the accompanying map of New York and vicinity connects with all the trunk lines terminating on the New Jersey side of the River, the Pennsylvania, the Philadelphia and Reading, the Central of New Jersey, the Erie, the Delaware & Lackawanna, the Lehigh Valley, and the West Shore thus affording direct rail connection with every part of the continent. At present the two tracks of the Baltimore & Ohio R.R. parallel the shore just back of the bulkhead line of the new piers but plans are being formulated in conference between the representatives of the railways and the Dock Department for the development of a proper track layout behind the piers as well as for enlarged yard and connecting facilities in the railway approaches.

The matter of improving the Stapleton waterfront first came up in 1918, when it became evident that the commerce of the port required a large increase of its wharfage facilities. The question at first arose as to whether the steamship companies would consent to lease piers so far away from the heart of New York City, or rather the Borough of Manhattan, where particularly the passenger lines have always had docking facilities close to the hotel and shopping districts. It was feared that the distance from Richmond Borough to this district—about 12 miles—would mitigate against the rental of any piers for ocean-going lines. However, this proved to be no obstacle, and the conditions laid down by the Sinking Fund Commission that leases be executed with prospective lessees for every pier to bring the city an income of 7½ per cent on the total cost of the improvement was readily met. For 11 out of the 12 piers the city before a single pile is driven holds properly secured leases, which in the course of 30 years will amortise every dollar expended by the city on this whole develop-



MAP OF NEW YORK HARBOR SHOWING RAIL CONNECTIONS TO NEW STATEN ISLAND PIER DEVELOPMENT

ment. One of the piers is reserved as an open pier for public wharfage.

As the policy of the city is to have all leases executed before any action can be taken toward the realization of any proposed plan, it is necessary that the planning be done in accordance with the needs and desires of the lessees. The city then takes the attitude that since the lessees assume the financial responsibility for the whole enterprise, their views must be considered and their avowed needs suited. The judgment of lessees as to the needs for the proper and economic conduct of their business must be final.

The layout of the new piers is given in an accompanying drawing. The site which is being acquired by the city through condemnation proceedings lies between the existing piers of the American Dock Co. and the Pouch Terminal, both privately owned. There are 12 new piers, the details of which are stated in the table on p. 1051. It will be seen that these vary from 1,000 to 1,160 ft. in length, the variation being due to channel and shore line irregularities and from 125 to 209 ft. in width, though the slip width is consistently 300 ft. Eight of the piers are 125 ft. wide and are completely covered, except for string-piece space, with a one-story shed; two are 130 ft. wide completely covered with a two-story shed and two are 209 ft. wide with a middle two-story shed of 131 ft. width and a marginal railway space of 28 ft. on each side. On these latter two full mechanical equipment is to be installed for handling freight direct from the cars into the ships and vice versa.

Drawings herewith show the cross sections of a 125-ft. pier, a 130-ft. pier and a 209-ft. pier and represent the three types of construction adopted for a single-story shed, a double-story shed of standard design, and a double-story shed with complete mechanical freight handling equipment. The general design represents no novel features. It is the standard Dock Department pier with reinforced-concrete deck, finished with a 2-in. asphalt block for a wearing surface. The only departure from the regular design in the pier work is a simplification of the timber work wherever that was possible without sacrifice of strength, in order to reduce the labor costs. The contracts just let provide also for dredging sufficient to open 30 ft. depth to the 40-ft. channel.

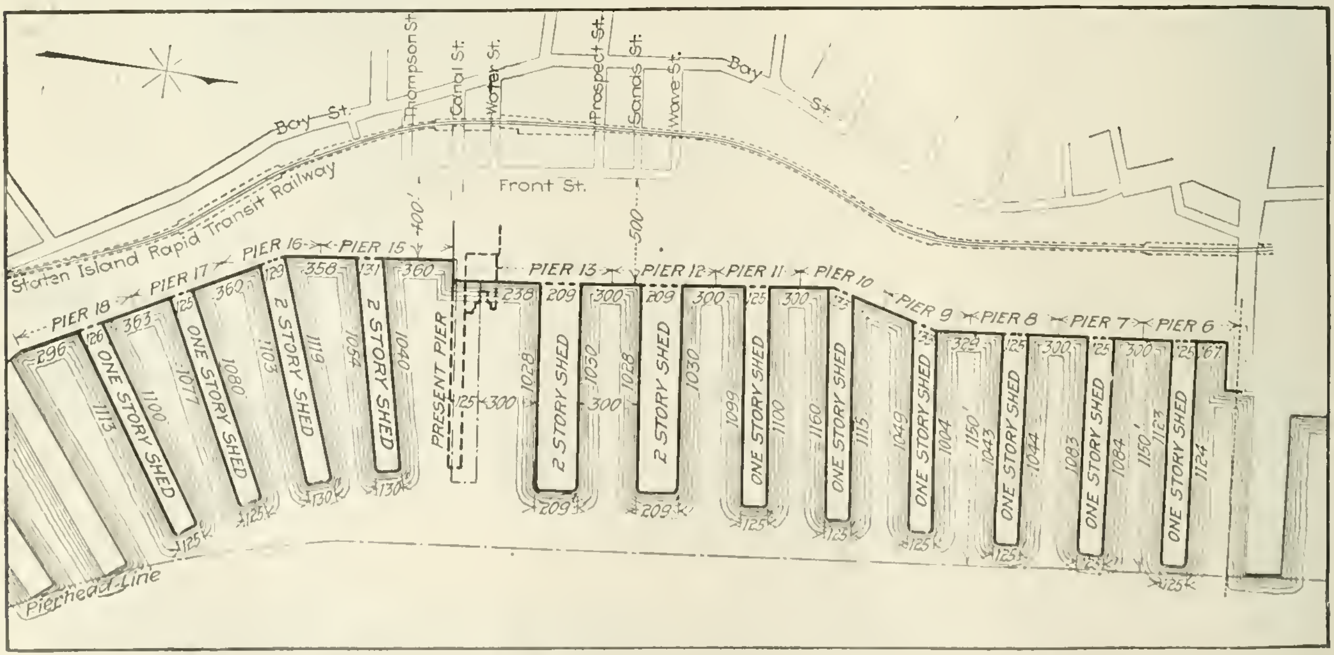
All piers contain proper structural provision for a double-track railroad inside the sheds, and the 209-ft. piers are provided with two tracks on each side of the shed, the floor of the shed being on the same level as the floor of the cars to facilitate the handling of freight.

The pier decks are designed for a live-load of 500 lb. per square foot, and the second floors of the sheds for a live-load of 400 lb. per square foot for the 209 ft. shed and for 350 lb. per square ft. for 130 ft. shed. The main floor is on the street level and is therefore approachable by tracks or drays from the street. The second floors are reached only by elevators and stairways under the present scheme but the topography is such that in future it will be possible to connect the floors with inland streets by viaduct over the marginal railway tracks.

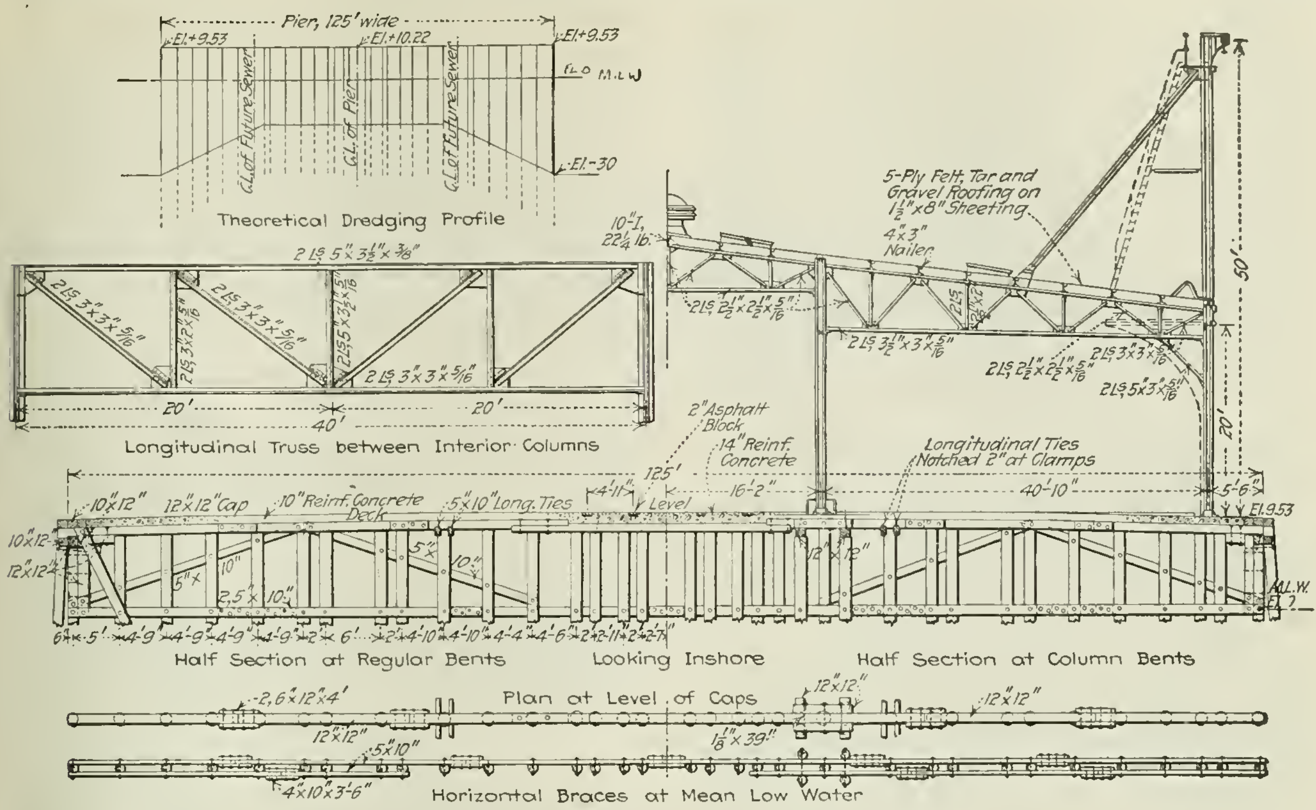
In a general way the sheds are of standard Dock Department design, very airy and light and as economcial as long experience and study of detail could make them. They are all equipped with sprinkler systems, ample water-supply for fire and ship watering purposes and ample electrical supply for light and power. As is common in the later New York piers doors are continuous around the pier sheds.

All sheds are equipped with the now familiar cargo girders, except the two 209-ft. piers, where the cargo girders do not apply on account of the complete crane equipment for handling cargo. The equipment for each of these two piers calls for seventeen 2½-ton traveling cranes, two 20-ton truck elevators and two 10-ton freight elevators. There is also provided a loading platform around the second floor of the shed.

Ever since the plans for this improvement have become public there has been criticism bestowed on them by quasi public bodies and individuals. Those charged with the duty of planning and bringing this work into reality have carefully considered every contrary point that was brought out, and state that no reason of weight for modifying the plans have been discovered.



GENERAL PLAN OF TWELVE NEW STATEN ISLAND SHIPPING PIERS BEING BUILT BY NEW YORK CITY

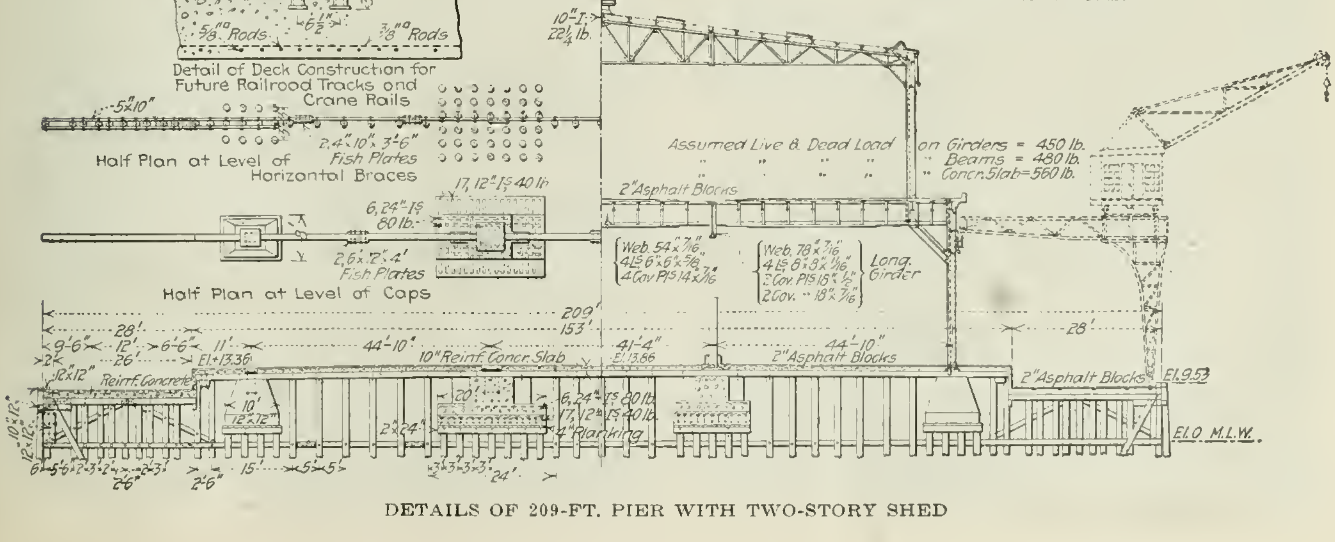


DETAILS OF 125-FT. PIER WITH ONE-STORY SHED

The points of criticism raised have been the narrowness of the pier structures, failure to provide track facilities on the piers and a lack of cargo-handling machinery. The arguments of the engineers and officials of the Department of Docks in defense of the present design and scheme may be stated as follows:

Engineers of other coastwise cities who studied the needs of their ports and those who had the duty and responsibility of planning for them are confronted with conditions widely different from those obtaining in the City of New York, and so have brought out developments of a different character. New York harbor by virtue of its insular location has sprung up and developed as a lighterage proposition. Up to about the year 1830 the shore along the North River was a series of beaches and while there were wharves, or rather landing platforms built over the beaches, small boats were used both to land and unload the trading vessels which were moved in the deeper water of the channel. Thus wharves becoming inconvenient to use, the citizens who had been given waterfront grants by the State began bulkheading their properties at the point where the water was of sufficient depth so that the small boats, and even the larger vessels, could moor at these bulkheads, thereby make the loading or unloading of them more convenient. This was the beginning of West St. and the portion of New York harbor adjacent to the lower end of Manhattan Island.

In about 1857 the Board of Aldermen discovered the possibilities of the new harbor and assumed control of



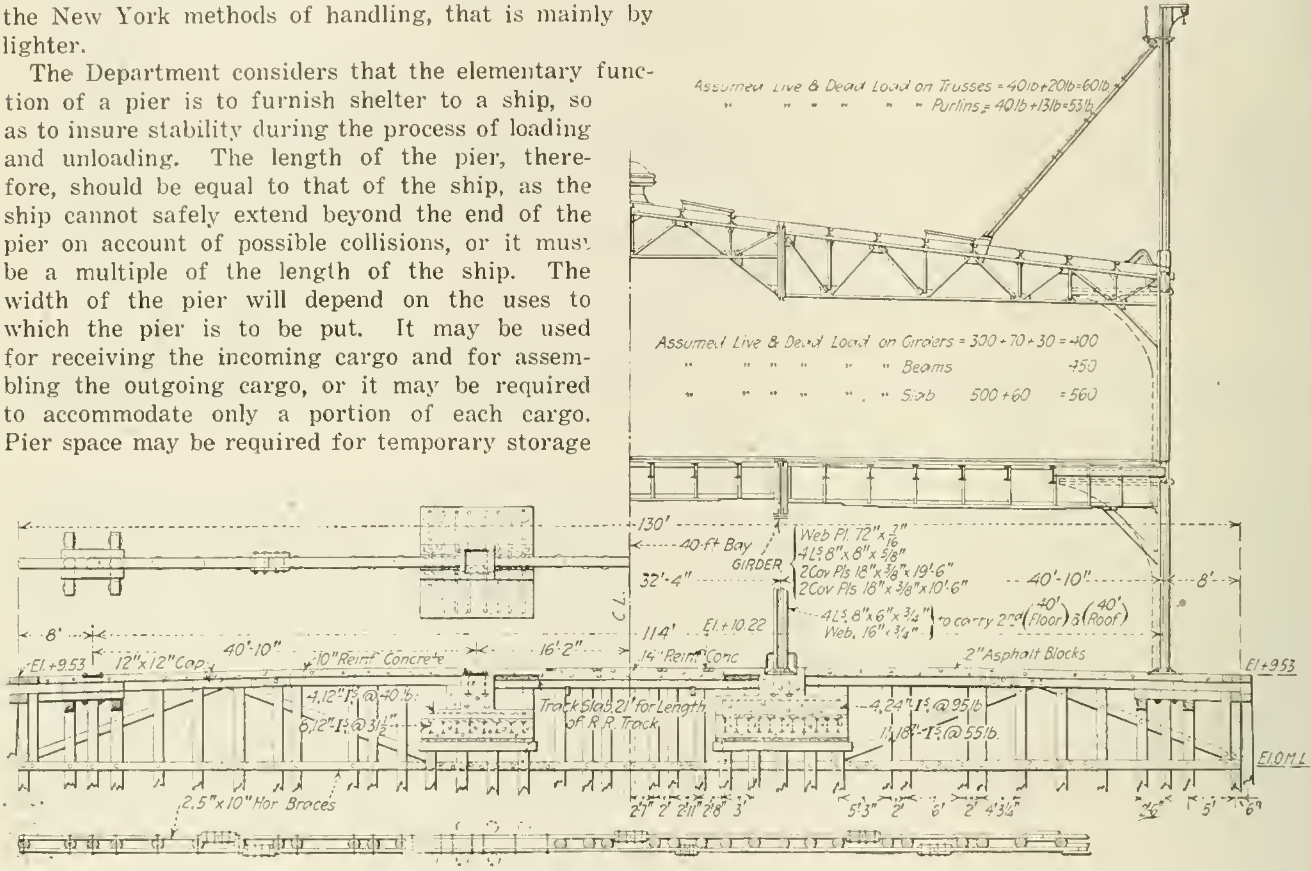
DETAILS OF 209-FT. PIER WITH TWO-STORY SHED its development, but it was not until after the Civil War that a systematic plan of development was laid out by Gen. George B. McClellan. This plan covered the North River from Vesey to Perry St. and the piers built under this plan, 40 or 60 ft. wide and with 100 to 150-ft. slips, proved adequate for many years. As the length of ocean-going vessels increased the piers were extended, but the widths of the slips remained unchanged. The result is that in many cases only one ship can be berthed in those narrow slips, and many years' experience in this harbor has shown that 125-ft. pier and 300-ft. slip is sufficient for all purposes in handling the ocean-going commerce of the port under the New York methods of handling, that is mainly by lighter.

The Department considers that the elementary function of a pier is to furnish shelter to a ship, so as to insure stability during the process of loading and unloading. The length of the pier, therefore, should be equal to that of the ship, as the ship cannot safely extend beyond the end of the pier on account of possible collisions, or it must be a multiple of the length of the ship. The width of the pier will depend on the uses to which the pier is to be put. It may be used for receiving the incoming cargo and for assembling the outgoing cargo, or it may be required to accommodate only a portion of each cargo. Pier space may be required for temporary storage of a whole cargo or of a portion thereof. The ship's cargo may be received on the pier by truck or rail, or alongside by lighter, barge or railroad float, and as these conditions of traffic will vary so the demand for pier space will vary in proportion, and no rule can be established, according to the Department, except what has been learned by years of costly experience.

When it comes to slip widths, a slip between two piers must accommodate two ships, and leave space for a lighter alongside of each and passage room for one lighter in the middle of the slip, with additional room for a coal barge between ships and pier.

As to cargo-handling equipment, the ship's crew should be put to work at the ship's winches while in port, and this is another reason why the steamship companies do not require extensive mechanical equipment on the piers.

The Department claims, however, that there is quite a difference of opinion among steamship men themselves as to what is the best harbor outfit in the way of piers and equipment, and this variation of opinion is nowhere better indicated than in the requirements put forward by the lessees for the new Staten Island piers. From the 209-ft. piers, equipped with double-deck sheds, double tracks on each side of the pier and an abundance of cranes and elevators to handle cargo mechanically to the one-story sheds with cargo masts and where in one instance the lessee even objected at the present time to having tracks constructed (although provision is made in the pier for such future tracks), there exists a wide difference, with the gap filled in with one-story sheds with tracks in the center and double-story sheds with double tracks on the first deck.



DETAILS OF 130-FT. PIER WITH TWO-STORY SHED

It is interesting to note that the International Mercantile Marine, one of the leading steamship firms in the world, has leased one of the piers with the one-story shed, railroad tracks to be omitted. When there is so much difference of opinion among practical steamship men, the Department considers it natural that students of the matter should be unable to agree.

A comparison of cost between the fully equipped 209-ft. pier and the one-story 125-ft. pier has been made. Assuming the cost of a 125-ft. pier complete, including dredging, but exclusive of property acquired, at 100 per cent, a 209-ft. pier will cost complete, including dredging and mechanical equipment, but exclusive of acquired property, 251 per cent, making a difference of 151 per cent, on which the lessee has to pay a rental of 7½ per cent a year to which must be added 7½ per cent on the cost of additional property required for the wider pier and the cost of maintaining and operating the equipment. As against this may be set forth the rapid loading of ships and the gain in earning power of same by the more rapid turn about.

DATA ON STATEN ISLAND PIER DEVELOPMENT FOR NEW YORK CITY

No.	Average Length, Ft.	Width, Ft.	Shed	Lessee
6	1,124	125	1-story	Green Star S.S. Co.
7	1,084	125	1-story	Open
8	1,044	125	1-story	Wesel-Duval Co.
9	1,026	125	1-story	Moore & McCormack
10	1,137	125	1-story	Raporel S.S. Line
11	1,100	125	1-story	International Mercantile Marine
12	1,030	209	2-story	Pan American Terminal & Dock Corp'n
13	1,030	209	2-story	
15	1,047	130	2-story	Union Transport Co.
16	1,110	130	2-story	
17	1,078	125	1-story	Nippon Yusen Kaisha
18	1,106	125	1-story	Compagnie Generale Transatlantique

The inauguration of this development is due to the efforts of Dock Commissioner Murray Hulbert. The plans were drawn, and the work will be carried out under the direction of T. F. Keller, Chief Engineer, assisted by J. J. Pemoff, Assistant Engineer in charge of the Bureau of Contract Supervision. The contracts already awarded are as follows:

Piers 6 to 11, both inclusive, to the Terry & Tench Co.; Piers 12 and 13 to Smith, Hauser & McIsaac, Inc.; Pier 15 to George B. Spearin, Inc.; Pier 16 to the Snare and Triest Co.; Pier 17 to Barth S. Cronin, Inc.; Pier 18 to the Phoenix Construction Co.; and the sheds on Piers 6 to 11, both inclusive, to the Bethlehem Bridge Co. The contract for the sheds on Piers 12, 13, 15, 16, 17 and 18 are now being advertised.

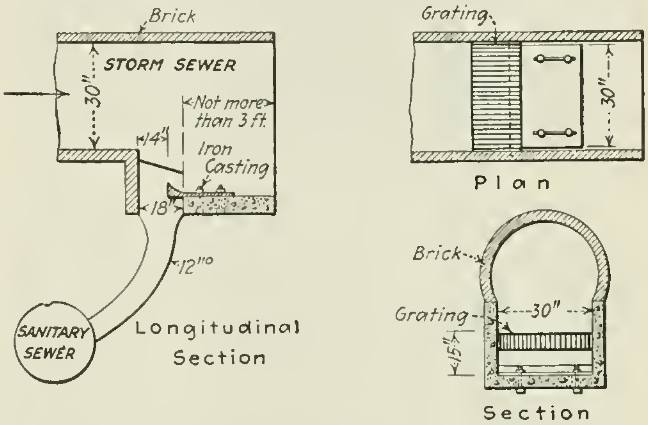
Traps and Leaping Weir Eliminate Odors From Waste in Sewer

STENCH and vapor from the untrapped street inlets of a storm sewer carrying industrial wastes, and from the stream into which the sewere discharges became so objectionable at Danville, Ill., last year as to demand prompt relief. This 36-in. brick sewer on North St. is not limited to storm water but carries hot brewery waste, hot water from an ice factory and sour milk from a creamery, these wastes making a peculiarly offensive combination. The remedy adopted for the streets was to equip all inlets with 12-in. vitrified pipe traps placed 24 to 36 in. below the surface, some corners requiring as many as eight traps. These cost complete about $25 per trap and so far there has been no trouble from clogging and freezing. The results have been entirely successful, although it was feared at first that trapping the inlets would serve only to drive the stench out at the numerous unknown sewer connections.

This sewer discharges into Stony Creek, a small stream which goes dry in summer, and at such times the discharge of the industrial wastes into the stagnant pools concentrated the stench to such an extent that residences near by were almost untenable. Storm flow could be discharged with impunity, but the problem was to care for the dry weather flow. A drop connection was made with a trunk sanitary sewer passing under the mouth of the storm sewer, and the bottom of the latter was cut away to permit the installation of a leaping weir, constructed as shown in the accompanying drawing.

There has been some trouble with the grid or screen. It was placed at an angle so steep as to be self-cleaning, but the dry weather flow trickled along the bars and into Stony Creek in sufficient quantity to renew the nuisance during hot weather. The angle is now reduced so that there is no trouble from trickling, but the grid gets clogged with leaves. It is thought that the difficulties would be overcome by returning the grid to its original slope and cutting the channel, so that any trickling moisture would drop into the sanitary sewer.

This leaping weir is designed to discharge all flow less than 30 gal. per minute into the sanitary sewer, and all higher flow into Stony Creek. It is proportioned in accordance with a formula for drop and span which was derived from experiments made at the University of Illinois by H. E. Babbitt, assistant professor of sanitary and municipal engineering, who described the Danville work at the recent annual meeting of the Illinois Society of Engineers. The work on the weir and the trapped inlets was done by the city sewer department under the direction of H. H. Edwards, city engineer of Danville, Ill.



LEAPING WEIR DIVERTS DRY-WEATHER FLOW OF STORM SWER

Many Power Projects in California

As a result of complete stoppage of all hydro-electric development during the war and the rapid increase in the demand for power that followed, an unusual amount of power development is now under way in California. Thirteen steam and hydro-electric projects in that state scheduled for completion this year or next year will have an installed capacity totaling 260,500 kw. These plants are listed in the following table:

Power Developed by	Location of Plant	Date Set for Completion	Source of Energy	Installed Capacity, Kw.
San Joaquin Light & Power Corp........	Bakersfield....	June 1, 1920	Steam	12,500
San Joaquin Light & Power Corp..........	San Joaquin (Kerckhoff)	Oct. 1, 1920	Hydro	30,000
San Joaquin Light & Power Corp.......	McKittrick	Jan. 1, 1921	Steam	15,000
Southern California Edison Co ..	Big Creek (new unit)	Nov. 1, 1920	Hydro	16,500
Southern California Edison Co .	Kern River No. 3	Nov. 1, 1920	Hydro	30,000
Southern California Edison Co	Long Beach	Mar. 1921	Steam	35,000
Southern California Edison Co	Big Creek No. 8	Apr. 1, 1921	.....	22,500
Pacific Gas & Electric Co...	Oakland.......	Nov. 1, 1920	Steam	12,500
Pacific Gas & Electric Co .	Pitt River ...	Jan. 1, 1921	Hydro	24,000
Los Angeles Gas & Electric Corp	Los Angeles	Jan. 1, 1921	Steam	10,000
Southern Sierras Power Co	Adams Plant	Jan. 1, 1921	Hydro	2,500
Great Western Power Co...	Feather River (Caribou)	Mar., 1921	Hydro	40,000
Southern Sierras Power Co..... ..	Levining Creek	Oct., 1921	Hydro	10,000

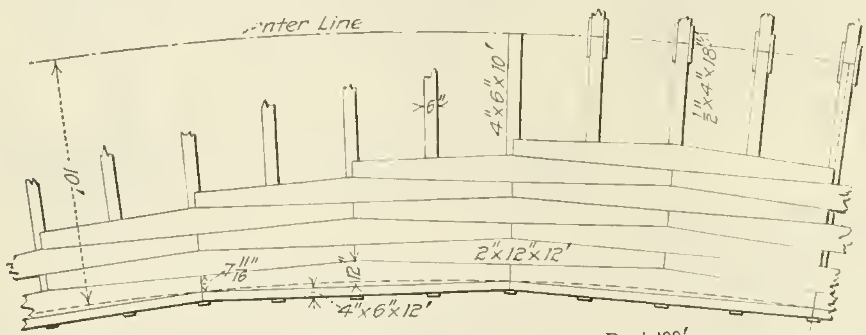
Plank Surfacing Suggested for Secondary Highways

By George Kershaw

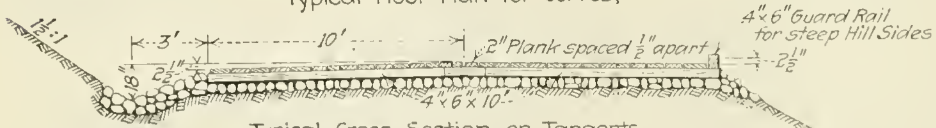
Hendersonville, North Carolina

As a transitory type of road construction on secondary systems, to serve a public demanding something better than sand-clay roads, though unable to invest in a so-called durable type of surfacing, I would suggest the use of planking, laid upon a well drained and well compacted subgrade. Particularly could such a type be used where lumber is plentiful and where county organizations could acquire their own mills and creosoting plants. Though I have had no personal experience with this type of road-building, as illustrated in the accompanying sketch, my ideas as to its method of construction would be as outlined in the following paragraphs:

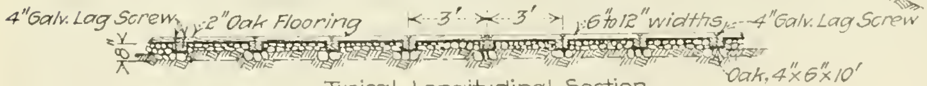
A proper foundation of telford, or some other equally successful material for eliminating all soft or poorly drained portions of the subgrade, must be provided where found necessary. After subgrade has been brought to the required cross-section, trenches 8 in. wide and 4 in. deep, 3 ft. C. to C., shall be excavated at right angles to the axis of the road, and filled with 2½-in. crusher run stone. On the bases so formed, 4-in. x 6-in. sleepers are placed as shown in the drawing and the spaces between timbers then filled flush with their upper surfaces with 2½-in. crusher run stone. The whole is then to be rolled until thoroughly compacted, and low spots filled to give a smooth even surface. The 2-in. plank flooring is then laid with the axis of the road and fastened to the sleepers with lag screws, $\frac{5}{16}$ in. x 4 in., countersunk. The whole is then rolled to give perfect contact with the base.



Typical Floor Plan for Curves, Rad. 100'



Typical Cross-Section on Tangents
(Curves to have Plane Surface with proper Elevation)



Typical Longitudinal Section
(Extra Foundation to be used where Sub-soil requires it)

PLAN AND SECTIONS OF SUGGESTED SURFACING

Shoulders of 4-in. to 6-in. stone carried out to ditches as shown on the sketch must be provided to insure good drainage, bearing in mind that the wearing surface is not at all impervious to water.

County commissioners should acquire small tracts of timber land or cutting privileges adjacent to roads needing improvement. They should purchase their own sawmills, preferably of small portable type, also creosoting plants if it is deemed advisable to creosote timbers. Small plants of this type are today logging and sawing small tracts at a contract price of $13 for M. f.b.m. Assuming the county could do as well and allowing $5 per M. for stumpage and $2 per M for haulage and creosoting sleepers, making a total of $20 per M. f.b.m., the cost would run about as follows:

WEARING COURSE	
Sleepers—3520 pieces 4 in. x 6 in. x 9 ft	63,360 f.b.m.
Planks—2 in., 8 in. to 12 in. widths, 6, 12 and 18-ft. lengths	190,080 f.b.m
Total lumber	253,440 f.b.m.
At $20 per M at roadside.	$5,068 80
Lag screws 95,000, 5-16 in. x 4 in	1,710 00
Rough carpenter and unskilled labor for laying sleepers and flooring at $4 per M. f.b.m.	1,013 76
Total	$7,792.56
BASE	
2½-in. crusher run broken stone laid 4 in. thick and rolled 1173¼ cu.yd. at $4 cu.yd. in place	$4,693 00
Total cost 18-ft. road, exclusive of excavation, culverts, foundations and incidentals (including overhead)	$12,485 56

Regarding the probable life of such a wearing surface we may reasonably expect 7 yr. of good service with light maintenance cost (Trautwine allows white oak crossties a life of 5 to 12 yr.), which could be prolonged to 12 yr. with an increased cost for renewals. After removal of wearing course and sleepers the base would still be available and should present, after filling spaces left by sleepers, a well compacted condition suitable for receiving a new wearing course of topeka mix, bituminous penetration or concrete.

To "Variable Designs for County Highway Systems" appearing in *Engineering News-Record* of Jan. 29, 1920, I would add this as a possibility. The method I have described seems practical both as to first cost and promised service and has some precedent in logging operations and bridge and dock flooring. I have had no personal experience with a road of this kind and hope to be able, through the columns of the *Engineering News-Record*, to hear from some one who has seen a similar type in service, or at least to elicit some discussion as to its probable usefulness

---

All California Power in One Big System

After carrying out a plan recently agreed upon whereby transmission lines of the Pacific Gas and Electric Company and the San Joaquin Light and Power Corporation will be connected at Newman, Cal., there will be united in a single network, power lines from ninety-one electrical generating stations. This will include practically all important plants in the State of California. The total installed capacity in these stations is about 1,000,000 hp. Another interconnection expected some time this year will tie into this network the Truckee General Electric Co. This will bring in plants in the central region of California, east of the Sierra Nevada range, and Nevada near the interstate line.

Some Shortcomings of Public Improvement Minutes

By Frank B. Tucker

New York City

Engineers who have to refer to the minutes of public improvement bodies for data essential to contemplated projects upon which they have to report are usually exasperated at the meagerness, inadequateness and incompleteness of such minutes both from an engineering and a business viewpoint, and will bear witness to the truth of the argument so often reiterated by *Engineering News-Record* that at least one member of all bodies that have to consider and pass upon engineering matters should be an engineer.

The writer has frequently to search the records of the city, towns and villages which were merged in 1898 to form the Borough of Queens, City of New York for data and facts regarding the city's title to streets within the limits of these onetime autonomous governments and for conclusive evidence proving that the original pavements upon streets of these former civil subdivisions were laid and paid for before consolidation.

The City of New York will not improve a street to which it is not sure that it has either a fee or an easement title, in fear lest it trespass upon private property and thereby jeopardize its right to assess the cost of the improvement upon the benefited property. The streets of these onetime governments that were paved and the cost thereof completely paid for before consolidation are entitled to repavement out of the general tax levy whenever, and as often, as necessary, regardless of the character or quality of the ante consolidation pavement. But where, however, it cannot be proved that a street was paved and the cost thereof paid for before consolidation the law classifies a new pavement thereon as an original pavement and assesses its cost upon the property deemed benefited thereby.

None of these old governments of Queens kept exemplary records. The officials of each suited their own conveniences and whims in the matter, as did also the officials of different administrations of the same government. In fact they seem to have left the matter of how the records should be kept pretty much to the clerk who kept them. The records of all of these governments, considered for their entire corporate existence, are woefully remiss in details, usually unwittingly but sometimes apparently wittingly.

Information Incomplete

Seldom do they contain the information one would look for had one of the officials been an engineer. Some streets acquired by condemnation or cession are so loosely described as to preclude their accurate re-establishment today. The sole reference to an important street improvement may be the bromide "On motion of Mr. Blank it was regularly moved and seconded that Blank Street be improved." What the limits, what the cost thereof, how defrayed, the minutes do not tell. And if we turn to ledgers and cash-books, in the few intances where such books have been preserved, we find little augumentative of the minutes.

The slipshod methods of these governments is well illustrated by an experience the writer had some time ago in an effort to prove that the pavements of a number of streets in one of the villages had been laid and paid for before consolidation, money being available for the repavement of these streets if the facts regarding their original pavement showed them to be entitled thereto.

The illustration typifies the loose accounting methods in vogue in the village, towns and city of Queens County prior to 1898, and is probably typical to a greater or less degree of public records as they are kept today throughout the country.

In the village in question a number of streets had a worn-out macadam pavement. That this pavement had been laid before consolidation, in fact the approximate date thereof, was quite easily determined by corroborative statements of disinterested old-time natives of the village and by the circumstantial evidence of the absence of any record of the pavement having been laid since consolidation. But to prove that the cost of the pavement had been paid for from money derived from (1) assessment of benefited property, (2) the general tax levy, or (3) a bond issue that had matured and been paid before consolidation, was quite a different matter.

The Case of Mr. Jones

The records of the village for the period at which old-timers stated the pavement had been laid showed many payments to a contractor, whom we shall call Jones, for street improvements, and the natural inference was that Mr. Jones was the contractor who had paved all or some of the streets in question and as such should be able to explain the fund from which he had been paid or at least to furnish a lead that would enable its determination. Accordingly the writer sought Mr. Jones. Inquiries disclosed the fact that he had completely obliterated himself from present day affairs of the village and was living in quiet seclusion on an unpretentious street thereof. On being interrogated as to whether he had paved the streets in question and as to whether he knew how the cost of the pavement had been defrayed he was exasperatingly taciturn and positively refused to put in affidavit form the meager information he begrudgingly gave on these matters.

He had laid the pavement but would not go on record as having done so. He explained his relation thereto by saying that he had only done what the president of the village had told him to do; that upon the completion of a job he had gone to the president and so informed him; that the president had then sent him to the village treasurer for his money, and that the treasurer had then and there paid him his money without any explanation.

The free and easy manner in which the president and treasurer of this village, according to Jones, spent the money intrusted to their care would have subjected the present day property owners upon the streets in question to assessment for the cost of the new, modern pavement that was laid upon their streets had not several substantial old-time property owners given affidavits satisfactory to the corporation counsel that one-third the cost of the original pavement of these streets had been paid for by an assessment upon the benefited property owners and the other two-thirds thereof out of the proceeds of a bond issue whose retirement before consolidation was a matter of record.

In the matter of streets acquired, widened or altered, every public body responsible therefor should be careful to see that its minutes state definitely the title acquired, whether easement or fee, and that a plan showing the property acquired by courses and distances, starting from a fixed point that may reasonably be expected to be possible of identification by a later generation, is a part of its minutes.

Really, the statutes or other authority under which streets, parks and other public properties are acquired should specifically require that one member of the commission, board or what else should be an engineer or a surveyor, or at least it should make compulsory the employment by such bodies of a competent engineer or surveyor, for without the services of one of these disputes are pretty sure to arise at a later date as to the true bounds or location of the property acquired.

In the matter of the physical improvement of a street, the official record thereof should give the name of the street, and space may well be afforded for all the names by which the street may have been known, and if a new street its location should be given with reference to some old one; should give the limits between which the improvement is made; should give the nature of the improvement, and lastly should give the fund or funds out of which the cost of the improvement is met.

The records of the City of New York as kept in these matters today are not only complete but replete, though some difficulty is found by those not familiar with the regimen of procedure in running down the facts.

Street acquisition and physical improvements originate with the local boards of improvements, into a number of which the city is divided. Both acquisitions and physical improvements then go to the board of estimate and apportionment, the actual governing body of the city, for authorization. Following such authorization, acquisitions and physical improvements part company. The acquisition of a street being a legal matter goes to the courts for adjudication, the city being represented by its corporation counsel, for whom the president of the borough wherein the street lies makes all necessary maps and plans; the physical improvement of a street being an engineering matter goes to the president of the borough wherein it lies for performance. The courts apportion the awards and assessments that it makes in street acquisition cases and sends an accounting thereof directly to the comptroller for payment and collection; but the borough president has to certify the lump cost of a physical improvement to the board of assessors, whose duty it is to apportion it upon the property benefited and to then send it to the comptroller for collection. The court files its report in the matter of the acquisition of title to a street with the clerk of the county wherein the street is situated, but all the contractual papers in relation to a physical improvement of a street are in the custody of the comptroller.

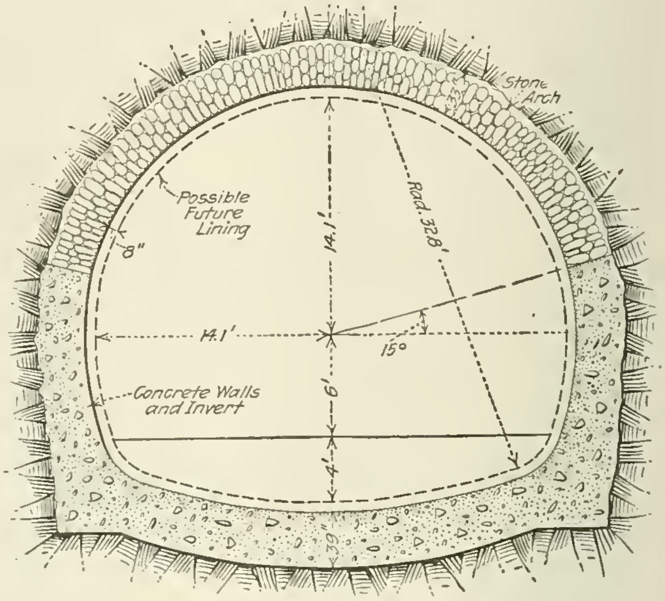
Cost of Water Filtration at Washington, D. C.

The cost of water filtration per 1,000,000 gal. at the Washington or District of Columbia filtration plant was $1.03 for the fiscal year 1918-19 for all labor and material coming under the classification "filter operation." Of this total 92c. was for labor and 11c. for material. Taking labor and material together, the $1.03 was divided, in costs, as follows: Office charges, 24 for filtration and 4 at the main office; laboratory, 22; scraping, 8; ejecting and washing, 10; smoothing, 1; resanding, 8; raking, 4; incidentals and repairs, 4; filter attendants, 12; pumping wash water, 6. E. D. Hardy is superintendent of filtration.

Restoration of Underground Flows Cut by Alpine Tunnel

Mountainside Wells Went Dry When Tunnel Tapped Large Water Pocket—Walled-Off Fissure Ends Connected by Pipes

PERMANENT pipe lines connect up the courses of the underground waters that flooded the tunnel headings of the four-mile Mont d'Or tunnel through the Alps, on the Frasne-Vallorbe direct railway route between Paris and Switzerland. This tunnel was opened to traffic in 1915. Particulars of the difficulties encountered were given in *Engineering News* of Jan. 15, 1914, p. 131, while details of the control works have been published recently in the *Révue Générale des Chemins de Fer*, from which the following information is taken.

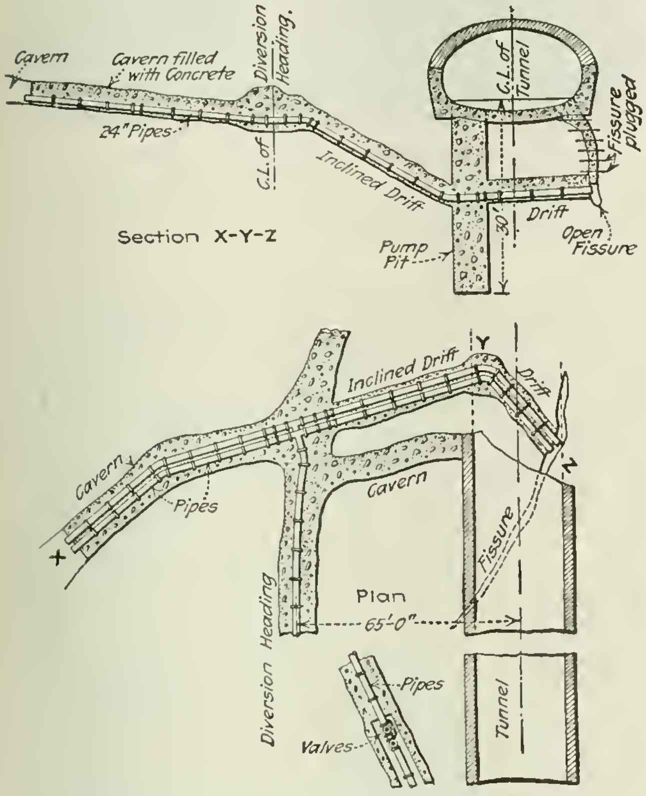


CROSS-SECTION OF MONT D'OR TUNNEL

A violent inrush of water occurred in December, 1912, in the heading from the Swiss end. The heading was finally sealed in advance of the leak with a concrete bulkhead in which were embedded pipes fitted with valves, after which the tunnel was completed to this point, with full section and lining. The water behind the bulkhead was then drawn off through the pipes, the bulkhead was removed and work on the abandoned heading was resumed. In April, 1913, another inrush of water occurred about 440 ft. beyond the first one and several wells on the French side of the mountain went dry. After some difficulty the bulkhead was rebuilt to close the heading a second time.

The next step was to start a diversion heading just below the bulkhead, swinging away from the axis of the tunnel and then running parallel with it on an ascending grade at a distance of about 65 ft. It was hoped in this way to intercept and divert the stream of water pouring into the tunnel heading. Opposite the point where this stream had been encountered, the diversion heading penetrated a large cavern or great fault in the rock, in which the underground waters flowed. This was explored for about 350 ft. and then plugged with a heavy mass of masonry on both sides of the heading. This diversion heading was then pushed forward, swinging around until it again struck the axis of the tunnel, beyond the place where the second flooding had occurred. Tunnel headings were then started in both directions from this point, toward the French portal and back toward the abandoned Swiss heading.

Investigation showed that the two points of entrance of the water were in connection with each other and with the cavern. The second inrush had come through a fissure having an opening nearly 90 ft. long, and 15 to 30 in. wide at about the subgrade level of the tunnel.



PIPE LINES RESTORE NATURAL WATER CHANNELS AROUND TUNNEL

Other fissures were discovered which would be under the walls and invert, all of which had to be sealed in order to make the tunnel stable and watertight. It was necessary also to re-establish the communication between the second stream of water and the cavern in order to restore the water supply of the wells on the French slopes. Solid masonry and grouting with cement were employed to close the opening at the first leak and the smaller fissures.

For the great fissure at the second leak it was necessary first to lower the water level by pumps, these being placed in a pit connected with the fissure by a horizontal gallery or drift, as shown above. The fissure was then enlarged sufficiently to admit a man, all loose and disintegrated rock being then removed and holes drilled for horizontal steel bars whose ends were thus embedded in the rock. Finally the fissure was filled to a depth of about 25 ft. with concrete reinforced by the transverse bars.

To enable the water under this plug to pass to the cavern and its system of channels or fissures, an inclined gallery was driven from the pump pit to the cavern, as shown. Two lines of 24-in. cast-iron pipe were then laid from the fissure to the main part of the open fault. A third pipe branching from these was laid in the diversion heading to a point near the first break, where it discharges into the central drain of the tunnel. Its outlet end is fitted with valves, so that the subterranean waters can be drawn off if necessary to facilitate repairs or the closing of minor leaks in the tunnel walls. These pipe lines are embedded in the concrete with which the headings and drifts were closed after the completion of the work.

For a length of about 250 ft. near the leaks the tunnel section was enlarged to permit a future 8-in. lining of cast-iron rings or concrete on the inside, if necessary to make the tunnel watertight. Here the stone arch and the concrete side walls are 32 in. thick, while the invert, subjected to upward pressure, is 39 in. thick. In its normal section this double-track tunnel is 28 ft. 3 in. wide, with a height of 24 ft. from invert to crown, as shown in the drawing, while it has a clear headway of 20 ft. above the rails.

Relief Sewers Recommended for Springfield, Mass.

IN a report recently submitted to Robert P. Marsh, superintendent of streets and engineering, Springfield, Mass., upon the sewerage and drainage of a portion of the City of Springfield, Metcalf & Eddy, consulting engineers, Boston, recommend relief sewers for a large part of the most densely built up section of the city, and submit a five-year program of construction designed to relieve at the end of that period the present deficiency in sewer capacity. For the initial estimates cost figures for 1909 were taken, as explained further on.

The city is sewered mainly on the combined system and several of the sewers have been extended back from the river considerably beyond the limits of the area naturally draining through them. The material increase in area thus made tributary together with the more complete development of the densely built up portions of the city, has resulted in frequent flooding of streets and some basements in parts of the city. It is found, too, that rainfalls of higher intensity than was supposed at the time the present sewers were planned occur in Springfield with some frequency. A 26-year record of a recording rain gage was available and the results which were analyzed in detail show rainfall frequency curves corresponding closely with those from New York City and materially higher than those for Boston.

A portion of the recommendations were submitted during 1919 in a progress report and the principal drains recommended at that time as most urgently required were built during that year. In order to base the cost estimates upon the same unit figures, all of which must be revised year by year before undertaking any part of the program, all the estimates submitted were based on prices prevalent in Springfield in 1909. No attempt was made to include the cost of cutting and restoring street pavement or of meeting special and unusual difficulties in particular localities where detailed local knowledge is necessary to an intelligent estimate. The estimates submitted amounted to $874,000 on the above basis, of which $36,000 was indicated for 1919 construction. The amount suggested for succeeding years ranged from $133,000 to $203,000. It is probable that on the present basis of prices, and including the local difficulties omitted from the estimates, the work recommended would cost from $1,200,000 to $1,500,000.

Lay Concrete Channel Lining With Large Traveling Form

In Improving Onondaga Creek at Syracuse Steel Framework Carrying Concrete Chute Car Moved Along Channel

CONCRETE lining in the improved and deepened channel of Onondaga Creek at Syracuse, N. Y., is expedited and advanced with little interruption by the use of special steel forms. These forms are of particular interest not only on account of their size and rigid construction but because of the special features in their design which permit rapid resetting and adjusting in position on tangent and curve. The facilities provided for the final grading of the side slopes and for the depositing and compacting of the concrete thereon are also of interest because of their originality and the greater progress made possible.

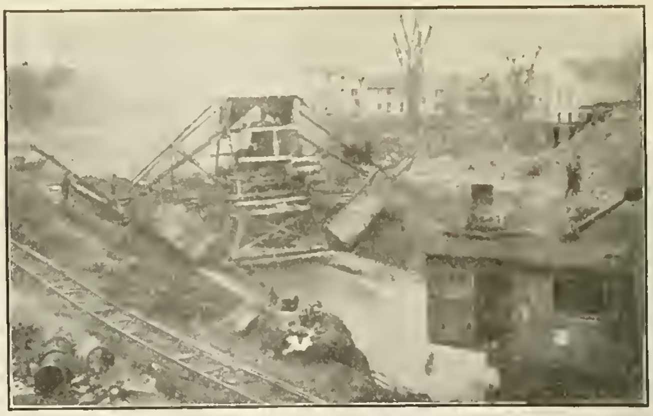
Onondaga Creek flows in a northerly direction about midway between the easterly and westerly boundaries of the city and has a drainage basin of about 113 square miles above Onondaga Lake, into which it discharges. The dry weather flow approaches 0.25 sec.-ft. per square mile as a minimum. The maximum recorded flood flow of 60 sec.-ft. per square mile occurred March 12, 1920. The stream is subject to rapid rise following storms and the steel forms were designed to permit the passage of flood water with the minimum of obstruction.

INVERT LAID PREPARATORY TO LINING

The deepening and improvement of Onondaga Creek through the central portion of the city was undertaken for the efficient operation of the intercepting sewer system which parallels the creek. This required a comparatively small concrete lined channel 30 ft. in width, 5 ft. depth, in the bed of the old stream. Certain features of this work were described in *Engineering News*, July 13, 1911, p. 38.

The improvement now under construction throughout the southern section of the city is designed for flood protection as well as for the operation of the sewer system. The contract for this work, awarded February, 1919, provides for extending the improvement a little more than two miles.

A typical cross-section of the concrete lining is shown herewith. The invert is 28 ft. wide, 2 ft. deep with bottom slopes toward the center of 1 on 7. Above the invert the side slopes are 1 on 1 for a height of 10 ft., making the inside top width of the channel 48 ft. The concrete invert is 8 in. thick and the side slopes 12 in. The contract includes about 6,700 lin.ft. of this cross-section.



CONCRETE LINING FORM IN ACTION

Through one of the city parks, for a distance of about 1,300 lin.ft. the concrete side slopes are brought up for a height of only 3 ft. above the invert. Outside the concrete channel the earth banks slope up 1 on 10 for 6 ft. and then 1 on 3 until meeting the original ground surface. These earth banks are to be seeded and planted with shrubbery. Except during the spring run-off, it is only occasionally that the flow of the creek will exceed the capacity of this smaller concrete channel. This cross-section of channel through the park offers an excellent opportunity for landscape development and lessens the danger of accident to children playing in the vicinity.

The southernmost section of the city, where a greater hydraulic slope or grade is available, the width of the channel is reduced from 48 to 41 ft. This extends for a distance of about 2,500 lin.ft.

High water conditions prevail throughout the spring. It is rarely possible to divert the flow from the creek earlier than June, leaving only approximately five months during which construction may be carried on. For the purpose of draining the section of creek work under this contract, two concrete flumes were constructed. Each flume is about 1,200 ft. long, and the combined capacity is 300 sec.-ft. These flumes discharge into a large combined sewer and then into a section of the creek previously deepened and improved.

Excavation is made with a Monighan walking dragline excavator which travels backward upstream on the

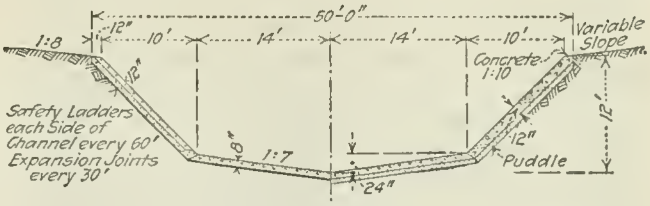
VIEW OF THE FINISHED CHANNEL

old bed of the unwatered creek in advance of the excavation. The material removed, which is mostly sand and gravel, is deposited in 3 cu.yd. dump cars running on a narrow-gage track along the top of the slope. A train of four to six cars hauled by a dinkey locomotive transports the excavated material to sections requiring embankment or to spoil banks. The invert is excavated closely to grade. The side slopes are cut slightly wider so that no trimming of the banks are required.

On completion of several hundred feet of excavation, placing of the concrete invert is begun near the end of the deepened channel and progresses downstream. The top surface of the concrete is brought to the required height by means of grade boards; no forms are required except steel channels which are set accurately to line and grade at the outside edges of the invert. A small pump at the upstream end of the invert prevents ground water rising and flowing over the fresh concrete.

Details of the side-wall forms are shown clearly by the accompanying drawing and photographs. The form consists of five units, each 14 ft. long, mounted on double flanged wheels which travel on a 16-ft. gage track laid on the concrete invert. Each unit is made up of three rigid trusses spaced 6 ft. centers and substantially cross-braced. The steel face of the forms against which concrete is deposited are attached to arms which slide within the upper and lower chord members of the trusses. This arrangement permits the face forms to be moved horizontally for adjustment in the desired position. The movement and adjustment is controlled by three screw jacks at each end of each truss, insuring extreme rigidity when set in the desired position.

The form units, 14 ft. in length, when set in position on tangent stretches of the creek channel are spaced 4 ft. apart, the intervening space being filled with planks for which grooves are provided at the end of the face plates. On curves the planking is cut to fill the intervening space between the units, which are set a minimum distance of 12 in. apart at the top of the forms on the inside of the curves.

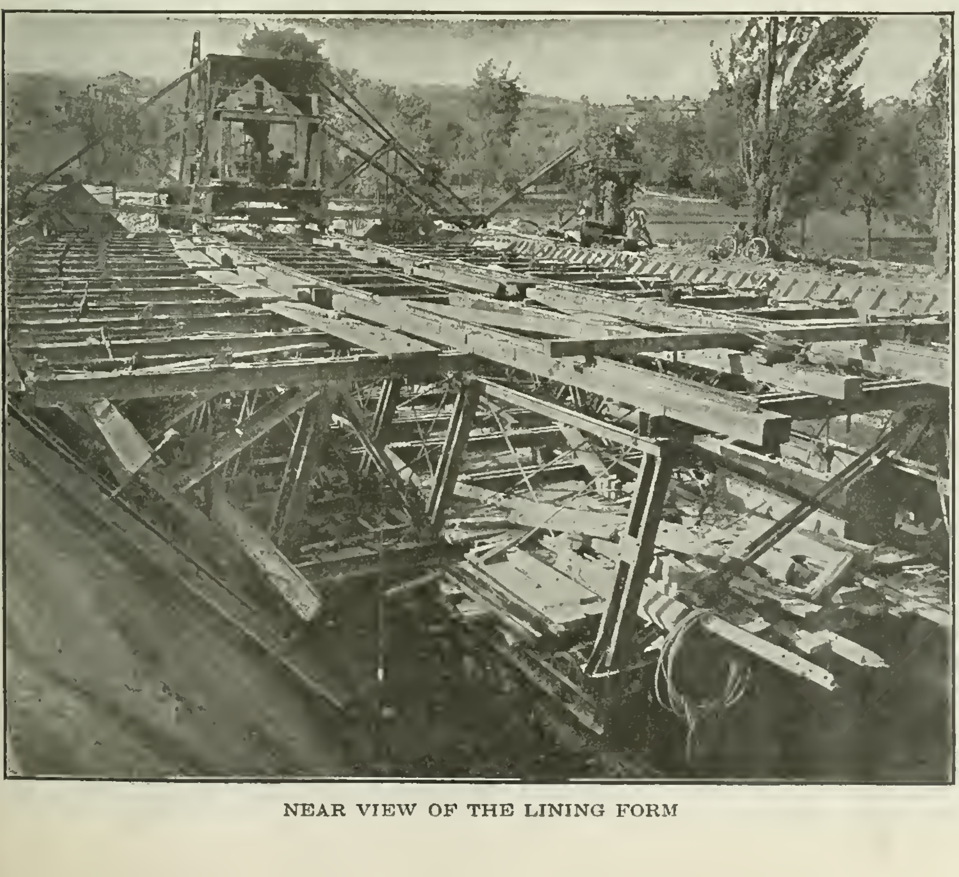


TYPICAL 48-FT. SECTION OF ONONDAGA CREEK

In setting the side-wall forms in position, the first operation is to carefully align the track midway between the two outside edges of the invert which has been accurately formed as above mentioned. The form units are then rolled forward, the face of the forms jacked out to the back line or earth face of the concrete side walls, the planking set between the form units and the intervening space between the face of the forms and the excavated bank filled with earth and compacted by puddling and tamping.

On completion of the refilling and compacting of the foundation for the side-wall concrete, the base forms are pulled horizontally away from the earth banks by the screw jacks a distance of about 17 in., which gives the required space of 12 in. perpendicular to the slope to be filled with concrete.

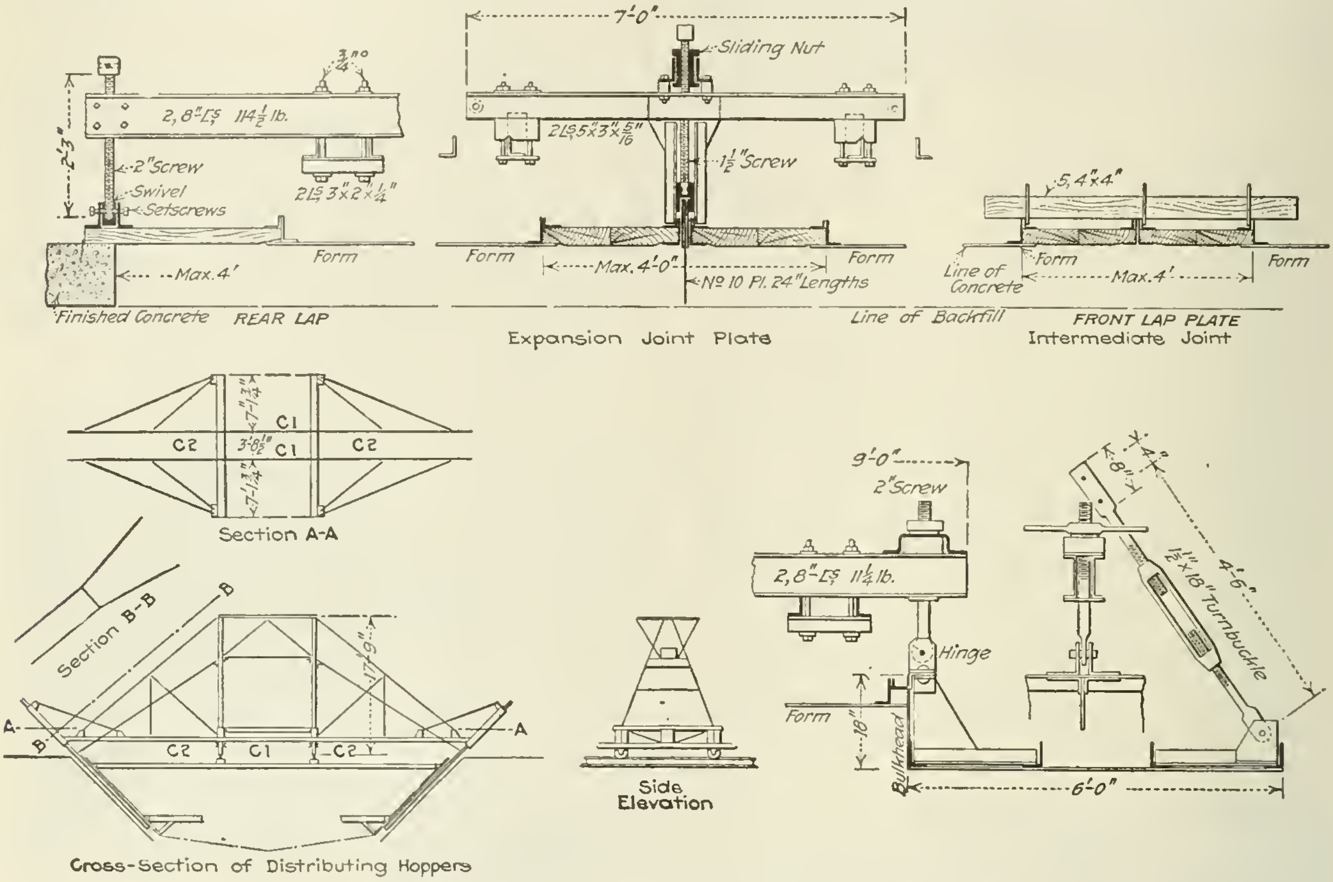
Concreting is carried on from a secondary traveler which runs on a track on top of the form trusses, as shown in the views and drawing. This is in effect a car with a hoisting engine and outriggers on both sides. Its interesting feature is the chute arrangement which is combined with a tamping device. It will be noted that the outriggers extend clear over to the side slopes and carry chutes from the hoppers on top of the car. These chutes run out to the side slopes and there empty into other chutes which are hung by rods from the main car frame and which slide down into the lining space. The bottom ends of these latter chutes are used as spades, in a way. In operation, the concrete, which is mixed at a central plant and brought to the machines in trains of narrow-gage cars, is lifted into the hoppers on top of the car and chuted down the main chutes into the side chutes, which are at the beginning of the operation at the bottom of the slope. These chutes then are joggled up and down by the hoist on the car and are raised as the concrete rises in the space to be filled. A special device is the hinged plates at the forward end of the forms. These can be made to die down as extensions of the regular side-slope forms, in which position they are placed during the puddling operation, and then can be pulled up to form



NEAR VIEW OF THE LINING FORM

stops for the end of the lining concreting. Another detail, shown in the drawings, provides a connection between the form and the old concrete already in place.

For the 41-ft. section, the middle panel of the form trusses are changed, as shown in the right-hand half of the cross-section of the forms.



IMPROVEMENT DETAILS OF THE CONCRETE LINING FORM

Rapid progress is made with the device. The whole of a 90-ft. section can be puddled and concreted in a working day and the framework pulled ahead by its own power for the next 90-ft. stretch. Expansion joints are provided every 30 ft. by inserting a steel plate into the side slope according to the detail shown in one of the drawings.

The work is being done for the Syracuse Intercepting Sewer Board under the direction of Glenn D. Holmes, chief engineer. The contractor, John Young of Syracuse, was the originator of the ideas embodied in the forms and prepared working drawings from which they were made by the Blaw-Knox Co. of Pittsburgh.

Lincoln Highway in New Jersey

In a recently published report of the chairman of the New Jersey Highway Commission, the assertion is made that the Lincoln Highway should receive the greatest consideration by the Highway Commission in completion and maintenance, so that it would be fitted to carry the heavy type of traffic required of "the heaviest traveled road in America." According to the present program, by the end of next year the entire 54 miles of the Lincoln Highway in New Jersey will be paved. During the present season the total amount spent by state and county for reconstruction of the highway is $1,382,572.

Causeway Being Built Near Singapore

THERE is now under construction a long and deep causeway across the Strait of Johore between Johore and Singapore, in the Federated Malay States. This structure, known as the Johore Causeway, consists of a large bank of granite rubble 3,480 ft. long in water averaging 47 ft. deep. It is to have a width on top of 60 ft., affording room for a double-line railway and a roadway for vehicular traffic of 26 ft. 6 in., protected on the outer side by a concrete parapet wall and divided from the railway by substantial fencing. The work when completed will close the Strait completely, so it is necessary to provide a passageway through the causeway in the way of a lock which will be required on account of tidal differences on either side of the causeway. The lock is 170 ft. between sills, 32 ft. wide, and has a depth of 10 ft. at low water. The roadway and railways are carried over the lock by a rolling lift bridge. The causeway will consist only of granite rubble of all sizes, no admixture of earth or soft materials being permitted. All the granite used in the construction, amounting to nearly 2,000,000 cu.yd., is to be obtained from the Island of Pulo Ubin, about 15 miles from the site. The stone in the underwater parts of the bank will be deposited from large barges and for the upper part is to be unloaded from trucks or cars running along the already completed portion of the bank or placed in position by floating cranes. The work is being carried out by the Federated Malay States Rys. by Topham, Jones & Railton, Ltd., to the design and under the supervision of Messrs. Coode, Matthews, Fitzmaurice and Wilson. The estimated cost is over £1,000,000 Sterling. It is described in *The Engineer*, London, April 30, 1920.

Reconstruction of Outlet End of Branch St. Sewer, St. Louis

Undermined and Washed Out Brick and Stone Sewer Replaced With Reinforced Concrete by Day Labor — Cost Data

By W. W. Horner
Chief Engineer, Sewers and Paving, St. Louis, Mo.

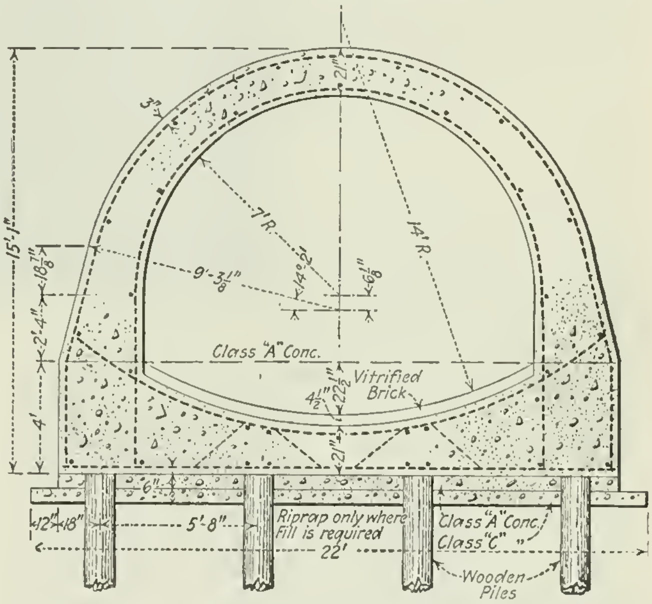
RECONSTRUCTION of the demolished river end of one of the large trunk sewers of St. Louis, Mo., was carried out during the past winter by city forces. Incidentally, the work fits into the reclamation of a considerable area of land needed by the city for dock and terminal facilities. This article describes the design and construction of the sewer and gives some cost data.

The Branch St. sewer is an old brick and stone conduit of a horse-shoe shape, some 12 ft. wide, built about 1870. It discharges into the Mississippi River on a mud flat. The undercutting of its mouth by the current of the Mississippi, and to a greater extent by its own outfall flow, has resulted in the gradual crumbling away of the end of the sewer. In the spring of 1919 it was decided to rebuild the broken portion of the outlet, and to extend the mouth of the sewer to the harbor line along the Mississippi River, requiring the construction of a length of about 330 ft. Some months later, after plans had been made, and equipment partly assembled for this construction, an extraordinary storm caused the collapse of 260 ft. more of the old sewer (see *Engineering News-Record*, Nov. 27-Dec. 4, p. 958) and necessitated construction of a total length of 595 ft. Plans for the new sewer called for a reinforced-concrete structure of the standard horse-shoe type, 14 ft. wide by 11 ft. high, supported on wood pile bents, each of four piles 40 to 50 ft. long, having an average penetration of about 25 ft. The bents were generally placed 5 ft. center to center, and were not capped, but the concrete invert of the sewer was made very heavy, and was specially reinforced over the pile heads.

The flow line of the proposed sewer is only slightly above the mean low water of the Mississippi, and winter stages at greater elevations are quite common. It was, therefore, considered inadvisable to attempt to let this work by contract, on account of the numerous contingencies involved, and the possibility of high water requiring the construction to extend beyond the first winter. The Department of the President, which has all engineering work in charge, decided to make arrangements for the use of labor forces employed by the Utilities Department in the construction of the adjacent North Market St. docks, and an arrangement was entered into to that end. This was particularly advantageous, as it permitted the transfer of labor from one project to another, and prevented the entire disorganization of the sewer forces during bad weather. A considerable amount of equipment used on dock construction was also available for the sewer work.

Pile Driving: The first work done at this site after the washout was the driving of a pile trestle by the Terminal Railway Co. of St. Louis. This was emergency work in order to restore switching service. The Terminal crew also drove the foundation piles for the sewer near this point, and the city's pile driver was set up on these piles. To hasten the work the city also rented a barge and set up a driver which was started at the outfall end of the new work. This outfit worked in to a point where the water was too shallow to float the barge. The third driver was then set up on the piles driven by the second outfit, and worked shoreward to meet the first. The penetration of the piles for the first 150 ft. at the river end averaged about 32 ft. below subgrade of the sewer, and for the remainder of the distance, about 24 ft. This work was not carried on continuously, as the river rose after about two weeks' work, submerging all pile driver equipment, and it was not until about Dec. 10 that the river was low enough to resume operations.

As the piling at the shore end had been completed before high water, it was decided to start the concrete work at that point, and to rush the work throughout the winter. It was, of course, necessary to flume the flow of the Branch St. sewer past the sewer construction. The best method of doing this was the subject of some debate. The construction superintendent at first proposed to build the flume the full size of the sewer, but from previous experience on this type of work the engineers were convinced that a heavy rain would carry out any structure that could be built, and, therefore, decided on a small flume about 4 x 4 ft. in section. A dam was built in the mouth of the old sewer, backing the water up about 4 ft., and the flume was carried along the line of the work a distance of about 50 ft., at which point it was diverted to one side, and the water carried in the new channel paralleling the sewer. This flume had about four times the capacity of the ordinary dry-weather flow, and successfully carried the flow of a number of moderate rains without interfering with construction.



CROSS-SECTION OF RECONSTRUCTED SEWER OUTLET

After subsidence of the river it was found that the excavation around the pile caps would vary from 1 to 6 or 8 ft. and on account of the location of the gorge it was practically impossible to put in any machinery for handling it. Most of the excavation was done by hand, and as the ground was generally frozen, much of it had to be blasted. A small amount of material was washed out with water pressure. Excavation and pile cut off were carried along just ahead of the invert concrete.

Concrete: Concrete work was carried out through December, January and February under very unfavorable conditions. There were comparatively few days in this period when the air temperature was above freezing, and on several days the temperature was below ten. Both sand and gravel arriving on the work in car load lots were generally frozen, and much of it had to be picked out or melted. The cost for handling and unloading materials was therefore extremely high. After unloading, the materials froze on the stock piles, and artificial heating had to be resorted to. During the latter part of the work an extra boiler was used to supply hot water to the mixers. Two concrete plants were used to expedite the work. At the shore end, where the gorge was narrow, a mixing plant was set up on the bank and the concrete was chuted directly into the work. Near the river this was not practicable, and a tower and spouting equipment were set up. This equipment is shown in the accompanying view, the wooden chutes from the first plant appearing on the right of the photograph, and the mixer and tower in the distance. The first section of invert was concreted on Dec. 16 at the shore end, and the first section of arch on Dec. 31. Work from this plant was carried riverward about 250 ft. The first stretch of invert was concreted from the tower plant about the middle of January, and the last portion of the arch was finished on Feb. 17. To push the work, 110 ft. of arch forms were constructed of wood, which was more than double the amount normally used on work of this character. A traveling frame was used to brace the outside form of the arch concrete.

Cost: The original estimate for this work was $103,000. The work was actually executed for a total cost of $73,500, but other work added in connection with the repair of a break in the sewer above the end, and the construction of a pile fender, brought the total expenditure to $85,420. This included all charges except the use of some equipment borrowed from other city departments. The work was carried out as a strictly union job, all forms, form moving, and form setting being done by carpenters at $1 an hour, all reinforcement being handled by iron workers, also at $1 an hour, and concrete by union concreters at about 70c. Common labor was paid 50 to 60 cents.

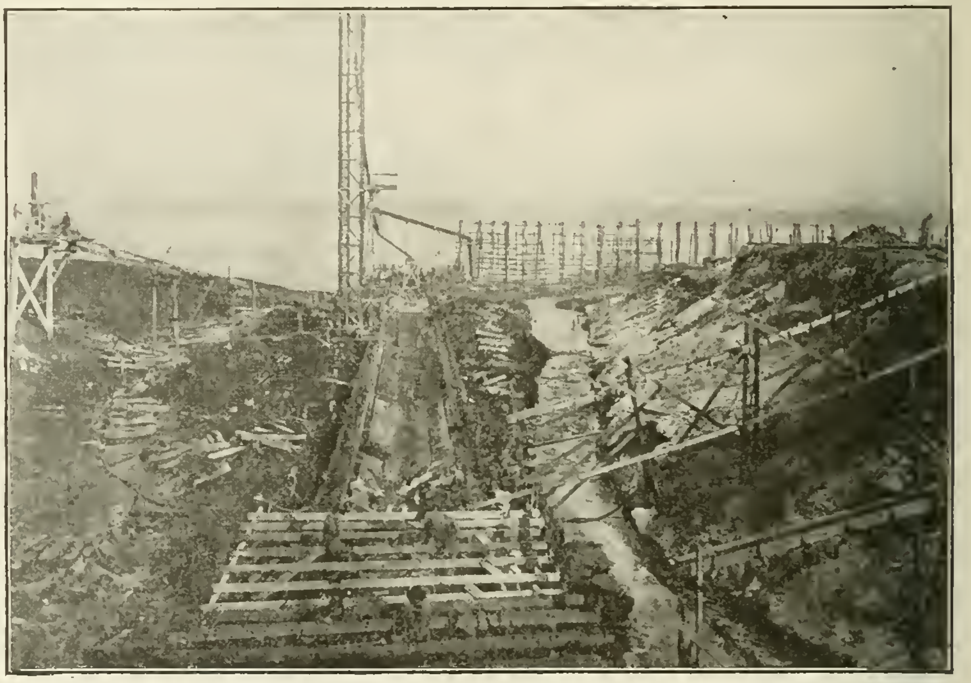
The concrete was a 1:2:4 mix, using a gravel aggregate. The cost of placing 2028 cu.yd. of concrete was about as follows:

For material delivered	$18,781
Labor in placing	11,312
Lumber for forms	2,476
Insurance	1,200
Equipment charge	788
Maintenance of equipment and tools	4,840
Coal	235
Miscellaneous labor	1,000
Total (about $13.50 per cubic yard)	$40,632

There should probably be an additional charge for use of borrowed plant, but the total unit cost would not be in excess of $14, which is considered extraordinarily good for work of this character in such a hazardous situation and under the extreme weather conditions that prevailed during almost the entire construction period.

The total cost of the sewer proper was as follows:

Concrete in place	$40,630
Reinforcement in place	10,070
Piling	15,200
Vitrified brick invert	2,200
Excavation	5,400
Total (about $123 per foot, including piling)	$73,500



GENERAL VIEW OF SEWER CONSTRUCTION, SHOWING CONCRETE PLANT

The total cost per foot for the piling in place is about 70c., of which the cost of the piling was 18c. delivered, and 21c. for the actual handling and driving in the field.

This work was carried out under the direction of the Department of the President, under E. R. Kinsey, president of the Board of Public Service, through the Division of Sewers and Paving, of which the writer is chief engineer. Ernst Paffrath was resident engineer in charge, and was responsible for the direction of all engineering features. W. H. Smith was in charge of the labor forces of the Department of Public Utilities, of which J. A. Hooke was the director.

The work of filling the gorge around the structure of the sewer will be partly accomplished by silting from the Mississippi during the next high water season, and partly by dredging from the river. The actual filling of this land will provide about three acres of additional ground for the city's dock and terminal sites, which ground is valued at over $150,000. The completion of this sewer, however, is only one step toward the reclaiming of land in this vicinity.

The total area being made available by the construction of dock walls, the pile fenders and the filling of low ground is in excess of 25 acres, and there will thus be added to the city's river front holdings, property worth over a million dollars.

Various Methods of Locating Leaks in Water Mains

Electric Devices for Detecting Sound—Chemical Solutions—Charts of Water Hammer and Hydraulic Gradient

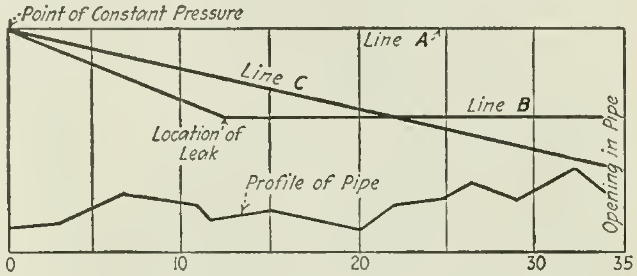
SOME of the methods employed in locating leaks in underground pipes were described at the recent meeting of the Illinois section of the American Water Works Association by Prof. H. E. Babbit, University of Illinois. A leak discovered by a surface indication is likely to be at some distance from that point and may be located by driving a rod at intervals back from the wet spot.

Sound Detectors: Leaks which give no surface indication are the most common and the use of sound is the principal method of detecting and locating them. Water escaping at high velocity through a small aperture will make more noise than when the aperture is large, while a free discharge will be more noisy than a submerged discharge. One of the simplest instruments used for locating leaks by sound is the aquaphone, which consists of a metal rod soldered to the center of a thin metal diaphragm as used in an ordinary telephone receiver. The point of the rod protrudes from the end of the receiver and is placed in contact with the pipe or fixture. If the pipe is buried, a rod may be driven down to make contact with it, the instrument being placed in contact with the rod. Considerable experience is necessary for the successful use of this instrument.

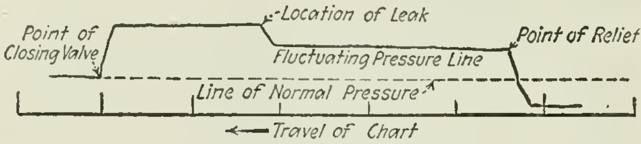
The detectaphone, the sonograph, the sonoscope, the geophone, etc., are somewhat similar instruments, the volume of sound in some of these being increased by an electrical amplifier placed in the line between the point of contact and the receiver. The receiver is similar to the ordinary telephone instrument with electric coil and magnet. The sound waves set up in the pipe are converted to electric waves in the amplifier and transmitted to the receiver much more loudly and clearly. All of these instruments require direct contact with the pipe, which is an undesirable feature, as the exact location of the leak may require excavations to be made, since the sounding rod is not always satisfactory.

In the Darley leak locator, direct contact with the pipe is not required. A delicate sound detector is set up on a small four-legged brass table which rests on the surface of the ground and is protected from air currents by placing the box containing the electric cells over it when in use. The vibrations set up in the detector are converted to electric waves which are transmitted to a specially sensitive telephone receiver. This instrument is so sensitive that it will detect the sound of a leak through the pavement and ground at the ordinary depths to which water pipes are buried, but it cannot be used in a high wind or where other noises may interfere.

Hydraulic Gradient: The characteristics of the hydraulic gradient are useful in the location of a leak, as shown in the diagram, the profile being that of a long pipe line or an isolated portion of a distribution system. It is suspected that a leak exists somewhere between stations 0 and 35. If the pipe line is shut off completely except at 0 and no leak exists, the gradient will lie along the line *A* and the pressures throughout the pipe line will indicate this height. If the pipe is opened and no leak exists the hydraulic gradient will be represented by line *C*, provided the diameter and other conditions are constant. If a leak exists and the pipe is closed the pressure at station 35 will be less than that at 0; the line of pressure will be horizontal up to the leak and will slope uniformly upwards from there to station 0, as in line *B*. These lines can be determined by locating two or more points and plotting their position on the chart, the leak being located at their intersection. This method was used with success by Professor Babbit in locating a leak in a five-mile pipe line at Nogent-en-Bassingny, France, during the war.



Hydraulic Gradient Chart



Water Hammer Chart

TWO METHODS OF LOCATING LEAKS IN WATER MAINS

Water Hammer: The phenomenon of water hammer may be utilized. If a valve in a pipe line is closed quickly, a wave of high pressure travels from the closed valve up the pipe to a point of relief and a wave of low pressure then returns to the original starting point. The pressure at the valve fluctuates above and below normal until the disturbance has become stilled. Intermediate discharges between the valve and the point of relief will cause fluctuations in the pressure at the valve. The speed at which the wave travels is affected by the diameter and material of the pipe and other factors and varies between about 3,600 and 4,200 ft. per second. In locating a leak, its approximate location should be determined and the line of pipe isolated by the closing of valves so that it is connected to only one large service main, preferably much larger than the pipe in question. It may be necessary to shut off service connections or to apply the method when the services are not being used.

A quick-shutting valve is attached to a hydrant so located that the leak is between it and the water main, the distance from the hydrant to the connecting main along the pipe line being accurately determined. A delicate recording pressure gage is attached to another nozzle on the hydrant. In the pulsograph, a dial is revolved by clockwork, time is recorded by the vibrations of a tuning fork and variations in pressure are recorded by a delicate pressure gage. After the instruments are connected and the clock work is running, the valve is opened and is then suddenly closed while water is flowing, when the pressure line on the diagram will jump up and remain until a slightly relieving wave has returned from the point of the leak when it will drop a little. The pressure will then remain constant until the low pressure wave has returned from the point of relief. The exact location of the leak is then determined by proportion from the diagram.

Chemicals: A method requiring the use of chemicals was suggested by T. J. Hoxie in the *Journal* of the New England Water Works Association, Vol. 27, p. 307. The leak is located within a certain section of pipe which is isolated, and all service connections are closed. A corporation cock is tapped into the main above the leak, to which is connected a 6- or 8-in. length of 2- or 3-in. pipe and a valve. Two or three pounds of caustic soda are inserted in the tube, the large valve is closed and the time of opening the corporation cock is recorded. Samples are collected at various points along the pipe and tested for alkalinity. As soon as alkalinity is found at any point it indicates that the leak is below that point because the flow created by the leak has carried the chemical down. Finally a point will be reached where the alkalinity does not appear. The indication is that the leak is between this point and the point at which it was last found. Water is withdrawn from the point at which the alkalinity has not appeared, the quantity drawn before alkalinity being carefully measured. This quantity divided by the volume per unit length of pipe will determine the distance to the leak.

Piston or Displacement: An ingenious method based on volumetric displacement was used for the location of a leak in a pipe line during the construction of the Field Museum in Chicago. A piston was made which fitted the inside of the pipe closely. A Y-branch was inserted in the pipe line, the piston was put in the pipe and a cable attached to it was passed through a packed joint in the plug closing the Y-branch. The water was then turned onto the pipe just sufficiently to keep the piston moving. When it had reached the leak it stopped, and the length of cable paid out measured the distance to the leak.

Leaks in Submerged Pipe: For locating a leak in a submerged pipe a quantity of bluing was dumped into the line and the appearance of color at the surface located the leak.

Wireless Pipe Locator: If the location of the pipe line itself is unknown it may be found by a wireless pipe locator. A circuit is made by connecting two points on the pipe line by an electric wire. A battery and vibrator are put in this circuit, the vibrator serving to interrupt current rapidly. An induction coil and a detecting coil connected to a telephone receiver are carried in the hand. When the induction coil held in a horizontal position is brought into the vibrating electric fields set up by the electric circuit through the pipe and wire a singing noise is heard in the telephone receiver. The volume of sound increases until directly over the pipe, when it ceases altogether. If the coil is then turned into a vertical position the loudest sound is heard.

Paris Coal Prices

Effective from March 16, 1920, a mandate issued by the préfet of the Sei. for the City of Paris fixed the prices of coal per ton as follows: anthracite, nut, 450 fr.; anthracite, large, 430 fr.; anthracite, small, 390 fr.; run of the mine, 400 fr.; briquets, 425 fr. Wood belonging to the municipality will be sold at a uniform price of 160 fr. a ton. Using the normal exchange rate for francs, nut anthracite costs $86.85 per ton. At present exchange it is about $26 a ton.

Is the Town an Efficient Unit for Any Highway Administration?

By George C. Diehl
Consulting Engineer Buffalo, New York

In the early days of the New England colonists, the town or township was adopted as the unit of highway taxation and administration. Since then innumerable changes have occurred, and traffic conditions of those days are no longer recognizable. Means of intercommunication have been developed so that now it is easier to cross a state in a motor vehicle than it used to be in many cases to travel between two places in the same town. Telephone, telegraph and rail facilities still further accentuate this change. In view of such a transformation, might it not be appropriate to ask: "Is the town or township the most efficient, or even the proper unit, for highway administration today?"

Without much argument it will be conceded that it is not the correct unit for *all* roads, as city streets, park drives, national and state highways and county roads never can or would have developed under town control. The query then arises, "Is the town or township an efficient unit for the administration of *any* highway?"

It is a fundamental of taxation that it should be spread as near as possible in proportion to benefits. With highway transportation as at present developed and with the certainty of the enormous future increase in the number of motor trucks on "country roads," it seems safe to assert that from cities to the remotest farm which sends produce to market, benefits accrue from the improvement of the roads. It also seems safe to say that a more durable and expensive type of road building must be adopted for the so-called "township road."

If the populous centers benefit from the improvement of farm to market roads, and if the advantages extend beyond the limits of the town, it must be agreed that the tax unit must be larger than the town. National and state highways are being cared for through a national and state unit of taxation, and the only remaining unit is the county. This is the logical and the equitable basis for taxation for secondary roads.

The amount required for highway purposes bears quite a definite relation to the amount of tonnage and this has increased so much more rapidly that the town cannot begin to afford the large sums which are required, but by increasing the unit to the county, then the large centers help carry the load.

In many counties the amount available, without an increase of tax rate would be 15 to 20 times the present highway fund, or to state this in another way, one-half the tax rate would produce 7 to 10 times the amounts now available. The increased fund would not only permit of more durable construction, but better tools and equipment could be purchased. (It is unnecessary to comment on the condition and kind of highway machinery in many towns.)

Highway work could be better systematized, work would not stop at town lines, improvements would be connected and county systems developed, petty town politics would cease to dictate highway policies, road foremen could be selected by reason of ability and assured of a fair salary and reasonably long tenure of office, with possibility of promotion in a good-sized, well-managed county road business.

All secondary town road work should be done under the general supervision of the state highway department. Such control is now in effect in many states. In Pennsylvania there are 8,000 town highway officials, in New York State 934 town superintendents and over 6,000 officials who determine road policies. It is at once apparent that the problem would be greatly simplified if the state highway department had to do with only 60 or 70 county units.

Many other arguments can be advanced both for and against this proposition, but the correct answer must come from practical men who have had to do with state, county and town road matters, and a discussion is urged of this important matter at all road gatherings.

Estimates for Reproduction Cost of Water Works

CHANGED conditions in the valuation of water-works due to the great increase in prices of materials under war conditions, together with probable future changes in such prices, were reviewed in a paper presented at the recent meeting of the Illinois section of the American Water Works Association by L. R. Howson, of Alvord & Burdick, consulting engineers, Chicago. From this paper the following information and tables have been taken.

In appraising water-works properties the measure of value most commonly used is the estimated cost of reproduction. Prior to the war the basis for the estimate of future prices was the average of the prices which prevailed during, say, the preceding five-year period. Within the last five years, however, construction prices and conditions have changed, and the question arises as to where the reproduction cost of the future will probably lie. On several recent boards of arbitration, selected to fix the value of water-works properties, two estimated costs of reproduction have been made; one on a pre-war basis and the other on the basis of present day prices, the value being reasoned from these limiting estimates.

Few well-informed people will contend that pre-war prices will again prevail in our time, says Mr. Howson, so that a cost of reproduction using pre-war prices represents in all probability a minimum measure of the value of the property. Most appraisers are also of the opinion that the crest of prices has been nearly or quite reached, and that soon there will be a gradual recession to some new intermediate level. Accordingly, a reproduction estimate based on the present price basis represents approximately the maximum value of the property to those who hold this opinion.

Average prices of the more important water-works construction materials from 1910 to 1918 are shown in Table I. The results of cost of reproduction estimates made for six water-works properties during the past year on both the pre-war and the present price bases are shown in Table II. In the ordinary water-works property from 50 to 75 per cent of the total value lies in the distribution system, for which reason the fourth column of Table II shows the relative proportion of the distribution system cost to the entire plant cost, both based on pre-war units. Prices of materials for the distribution system have increased in relatively greater proportion than have those for other water-works materials, and accordingly the greater the proportion which the distribution system is of the entire property the greater will be the cost of reproduction at present prices as compared to pre-war prices.

It will be seen from this Table II that for properties in which approximately 50 and 75 per cent of the total value prior to the war was in the distribution system; the cost of reproduction at the present time would be approximately 75 per cent and 100 per cent, respectively, above the pre-war cost. Since the making of these estimates the costs of lumber, millwork and some other materials have risen, which would tend to increase these percentages slightly.

TABLE I. AVERAGE PRICES FOR WATER-WORKS MATERIALS, 1910-1920

Materials	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919
6-in. cast-iron pipe, f.o.b. Chicago	$26.92	$24.11	$26.17	$26.83	$24.21	$24.54	$31.25	$54.90	$57.85	$57.97
6-in. valves	12.50	12.50	12.50	12.50	12.50	12.50	16.50	19.50	21.00	22.50
2-nozzle hydrants	25.00	25.00	25.00	25.00	25.00	25.00	34.50	41.50	49.50	49.50
⅝-in. meters	10.40	10.40	10.40	10.40	10.40	13.25	14.10	14.10	14.10	14.10
Cross compound pumps per M.G. cap.	3,000.00	2,700.00	2,500.00	2,500.00	2,500.00	2,500.00	3,300.00	7,500.00	7,500.00	7,500.00
Lumber, dealer's price	26.00	26.00	26.00	26.00	24.00	28.00	28.00	40.00	43.00	58.00
Cement (net)	1.25	1.25	1.25	1.25	1.15	1.15	1.43	1.78	2.00	2.00
Brick (Chicago)	6.50	6.50	6.50	6.50	6.50	7.00	7.00	9.00	12.00	14.00
Steel bars	.01¾	.01¾	.01¾	.021	.019	.019	.03½	.064	.04½	.04
Common labor in Central Illinois	.20	.20	.22	.22	.22	.22	.25	.28	.35	.40
Teams	.40	.40	.40	.40	.45	.50	.60	.70	.75	.80

TABLE II. COMPARATIVE PRE-WAR AND PRESENT PRODUCTION COST OF WATER-WORKS

				Costs of Reproduction				
				Pre-War		Present		
Plant	Population Served	Tons of C.-I. Pipe Per 1000 Pop.	Per Cent Distributing System of Total Cost to Reproduce Pre-War	Cost of Pipe Per Ton		Cost of Pipe Per Ton		Excess Present Over Pre-War Cost %
A	92,000	245	58½	$27.10	$3,700,000	$63.00	$6,400,000	73
B	8,500	217	79	29.00	280,000	57.05	503,000	80
C	10,000	286	61	28.00	264,000	55.00	444,000	68
D	12,000	294	77	28.00	394,000	59.50	689,000	75
E	25,000	170	66½	27.10	632,000	68.00	1,192,000	89
F	25,000	179	46	27.50	761,000	52.80	1,242,000	63

Note:—With pipe at present price ($66 Birmingham) percentages in last column would be raised to: 78 for A, 91 for B, 87 for C, 86 for D, 91 for E, 74 for F.

Dustproof State Health Laboratory Rooms

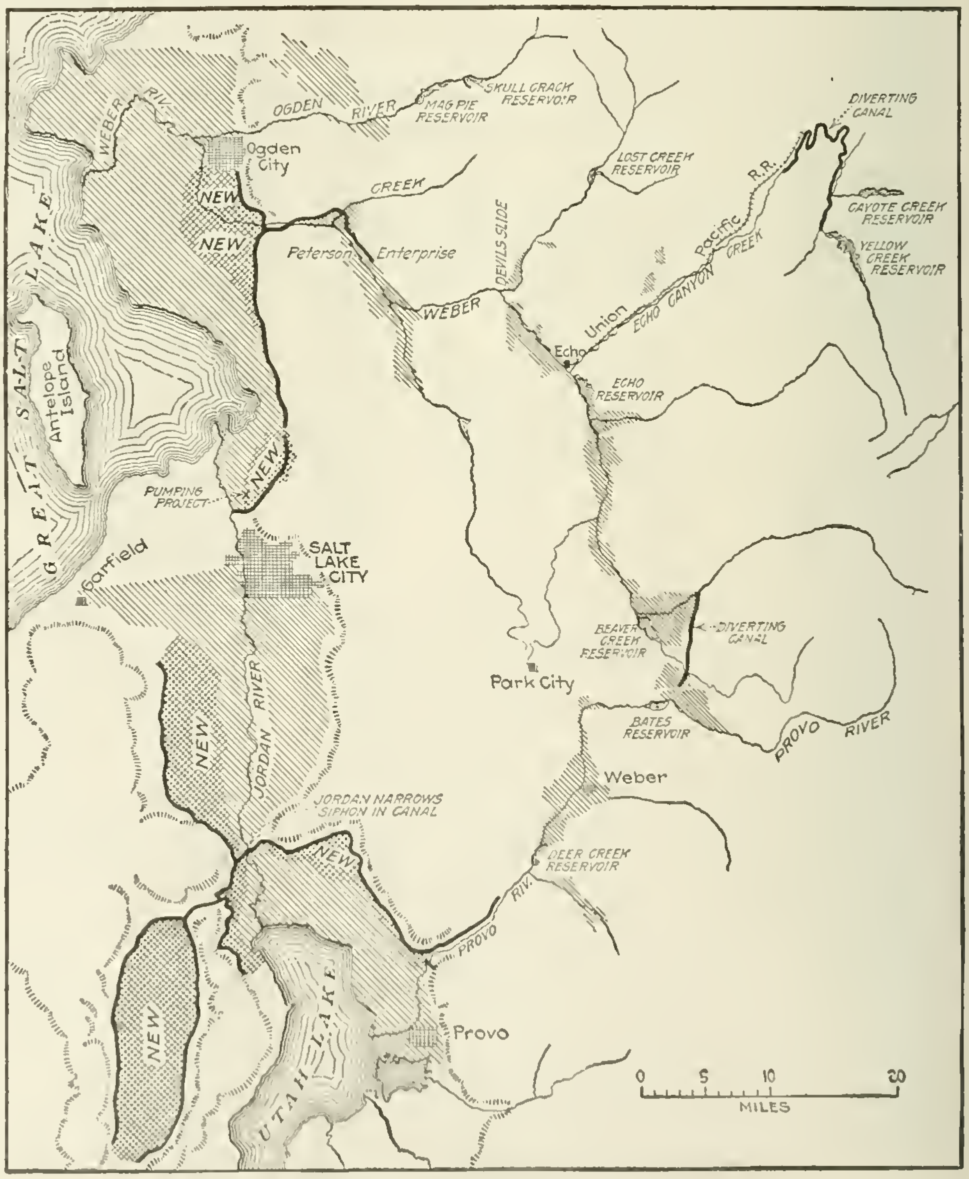
Dustproof rooms in the new laboratory building of the New York State Department of Health, according to the Department's *Health News* for December, 1919, were constructed as follows: "The walls of the rooms are of metal, forming frames for windows down to a point level with the table top in the room. Below this point they are constructed of expanded metal, plastered flush with the window frames. The doors are metal covered, suspended from above on rollers. In order to assure ventilation and at the same time reduce the amount of air contamination, space is left between the top of the side walls and the ceiling, this space being protected with a metal apron."

Plans for Ultimate Development of Oldest Irrigated Area

Utah Water Storage Association Proposes Method of Successive Interchanges of Water Over Three Water Sheds

ULTIMATELY 437,000 acres of land will be irrigated in the eight counties in the immediate vicinity of Salt Lake City, Utah. As with other areas of the West, Utah's future agricultural growth depends upon the storage of the flood waters now being wasted. Long ago appropriations of natural flow were exhausted for here, 72 years ago, irrigation was inaugurated in America by an Anglo-Saxon race. Spurred to action last year by the extreme shortage of water, the Utah Water Storage Association was formed to investigate and collect all possible data on the water supply, lands irrigable and ways and means of supplying the water to the lands within possible reach of water from the Weber, Jordan and Provo rivers. A. F. Parker, Ogden, is consulting engineer for the association, and from his recent report on tentative plans these notes are taken. The situation is so complicated locally that no attempt will be made here to indicate any but the largest features, whereby water is diverted from the headwaters of one stream to another in three or four successive steps. The principles on which the work was carried out, namely, the greatest benefit from a full development for the utmost advancement of the State, are applicable to other districts which are tied together topographically. The primary object of the association is to see that the development of the water resources of the State shall be considered and planned as a whole, and that any work done shall be done in accordance with and as a part of such plan. If each locality is allowed to develop a water supply in the easiest way for them, and with regard to their local needs only, it will be sure to result in a failure to make the best of possibilities. A beginning was made on the three river systems noted since they are the most important in the State. The relative water supplies available from the three streams in acre-feet are as follows: Weber River, 448,000; Provo River, 318,000; Ogden River, 229,000. It was concluded that the land which might be irrigated ultimately from these watersheds would be as follows: Under Weber River, 134,000 acres; under Provo and Jordon Rivers, 247,000 acres; under Ogden and lower Bear Rivers, which must be considered at the same time, 56,000 acres. From these data it is seen that the Weber River supply is the largest and supplies the greatest amount of water for irrigation. It is so situated that the waters of its upper reaches may be easily diverted into the Provo, and, with enough storage facilities for a full development, it is possible to make use of nearly all of the flood waters. So the local conditions demand that the Weber River be the first investigated since it is the larger and has first to supply the lands within its direct reach and then to furnish more or less water from its surplus to the Provo River, where there are ample areas of land awaiting it; in fact, more land than there is water from any practical source available.

Of the various feasible reservoirs the proposed 105-ft. Echo dam, costing $2,500,000 for a storage of 62,000 acre-feet would be the main dependence for storage on the Weber River system. The Yellow Creek floodwater reservoir is on a tributary of the Bear River.



ULTIMATE DEVELOPMENT OF IRRIGATED LANDS TRIBUTARY TO SALT LAKE CITY

Diversion of it to the Weber via Echo Canyon Creek would require replacing the Bear River water from the Green River watershed, but this diversion would release Weber water at its source to the Provo. Extensive storage on the Provo River could probably be obtained most advantageously at the 115-ft. Deer Creek reservoir storing 88,000 acre-feet at a cost of $25.50 per acre-feet.

The areas marked "new" on the drawing are not all new and some of the other areas will be more fully covered than at present. Of the canals indicated the Provo system would be the most elaborate, involving a crossing of the Jordan Narrows with three miles of inverted siphon to reach the West Side lands. Rough estimates place the cost of the main 600-sec.-ft. canal at $3,200,000, including the siphon at nearly $1,000,000. The north and south branches are estimated at $529,000 additional. The Weber River high line would cost about $2,000,000, and an alternate low line, $1,300,000.

Necessity Demands Use of Untried Methods, Says British Road Engineer

BECAUSE, through force of circumstance, British roads have had little maintenance during the war, and because well known and tried maintenance materials are not obtainable in sufficient quantities, the British view has recently been expressed that experiments with untried materials or the employment of any other short-cut to temporary relief may be worth while, even though a percentage of the experiments produce failure. Such a stand is taken by H. Richardson, chief assistant city surveyor, Birmingham, in an article appearing in a recent issue of *The Surveyor*.

Mr. Richardson explains that so many roads have waited their turn for so long a time to be given maintenance and repair attention that the public will soon demand action on all highways. Not only has the shortage of labor, labor's general decreased efficiency and working hours and its increased remuneration greatly affected road construction, but there is a decided lack of road materials with which British road engineers are and have been acquainted. The demand in Birmingham for tarred materials, for instance, is far in excess of the supply and the output of firms further afield is snapped up by towns nearer than is Birmingham. The same situation is noted in the case of broken stone. Such a shortage of materials has existed that a keen but friendly rivalry in obtaining supplies has been produced among the various district surveyors.

Mr. Richardson believes it "possible considerably to shorten the time required if we are prepared to take a few risks in adopting, without waiting to apply the test of time and wear, any promising but comparatively untried materials or methods. Experiments need not be costly even if, as is not unlikely, a few failures are encountered, but in any case the experience gained will generally be well worth the time, trouble and cost." He does not advocate the adoption of cheap work or risky experiments on important roads subject to heavy traffic but as such roads, generally speaking, are in the minority it is his belief that many miles of secondary road in need of repair could afford to take risks. "Makeshifts are seldom cheap," says Mr. Richardson "and in road making should not usually be tolerated, but our post-war problem requires us to save time, and to encroach as little as possible on the available supplies of ordinary materials which are so urgently needed on more important roads."

It is upon the maintenance of suburban roads carrying only light traffic that Mr. Richardson would depart from established practice. Such roads, which form the great proportion of the British mileage, have good foundations and the only immediate necessity is surface restoration and that often along the center of the roads only. It was Mr. Richardson's suggestion that the speeding up in road work might be affected by the introduction, in addition to present practise, of new materials, new methods of preparation and new systems of laying and finishing. In the formation of a tarred-macadam mixture for surfacoing roads, he recommended clinker ash from refuse destructors, when broken and screened and freed of such pieces as would float upon the surface if the whole was thrown into a tank of water. Lacking destructor clinker good material he asserted was available in boiler ash, slag, old building materials, etc. Concerning new systems of laying and finishing Mr. Richardson indicated the possibility of carpeting instead of coating modern traffic roads, using $\frac{1}{4}$-in. to $\frac{1}{2}$-in. slag, clinker, or any suitable material locally available. He predicted good use from a worn out waterbound macadam road if scarified, levelled along the shoulders and restored as to crown, and coated with from 1 in. to $1\frac{1}{2}$ in. of tarred material of suitable grade. Another suggestion for restoration was that roads of a present high crown be scarified, crown reduced, and road rerolled, spreading excess material where it is needed. He also pointed to the possibility of using as coarse aggregate many waste materials such as broken bricks, old concrete, clinker ashes, gravel, broken pebbles, or any clean, hard material.

House Committee Recommends Increase for Road Material Investigation

In recommending an increase of $30,000 in the appropriation for road material investigations, the House Committee made the following statement:

In the suddenly expanding program of new road construction the highway engineer is facing the problem of road design without adequate data from which to form definite conclusions as to the types, the strength, or the materials which can be most economically used. Motor-driven traffic has now become the chief factor in determining the services that will be required of our highways, and the rapidity with which this character of traffic has developed has not permitted the gradual evolution of road types, as was the case with the prevailing road types developed to take care of the animal-drawn traffic. With the suddenly revolutionized methods of highway transportation, road surfaces which were adequate under former demands are failing to meet the greatly increased numbers and weights of motor vehicles. At the same time the cost of highway construction has materially increased. Highway construction, it is apparent, will be one of the greatest public activities which has ever been undertaken, and appropriations running into the hundreds of millions of dollars have already been made to finance that large program. The increased appropriation requested under this item will provide for conducting a comprehensive series of laboratory and field tests designed to give information which will permit of the selection of the right type and right design of road to economically serve the purpose for which intended. It is proposed to conduct a large number of such experiments, in co-operation with the various state highway departments. A part of the increase will also be needed to provide additional testing equipment and employ additional assistance to take care of the increased volume of routine testing and research work in the Washington laboratory.

Impressions Here and There

ENGINEERING AFFAIRS IN DENVER

DENVER'S civil engineering population is not busy, as formerly, on big hydro-electric, irrigation or railway projects for which this mountainous semi-arid region forms a natural setting. Expanding highway staffs are therefore being built up the more easily from these less active fields. Hydraulic developments have been strangled by legislation or lack of it, and business in irrigation has been curtailed for several years because Colorado was the storm center of so many ill-advised schemes. Here a decade ago broke the fury of the outraged Eastern investor whose money, too often in bonds, went to pay for surveys and preliminary investigations to learn whether or not the land was irrigable.

Irrigation these days is on a substantial basis, but the Standley Lake dam still remains in its mis-shappen condition as a testimonial to the persistent lack of confidence of those with money, although a comparatively small sum would repair the slides and make the dam useful to a 90-ft. height, 15 ft. below the original. There it stands, its huge caving cracks not easily discernible through a rank protecting overgrowth of weeds. Mutely it calls for an earth-moving force to mend it. Particularly urgent was the appeal last summer on account of the unprecedented drought, coupled with the cry of the world for farm products.

Drainage of irrigation projects recently has become an outlet for the engineer's endeavor. Much education of the layman owner still is required, but stern necessity and the example of good results already accomplished are driveng work, formerly done without technical supervision or preliminary investigation, into the engineering offices. A few civil engineers have taken on oil engineering and found it profitable. Railroad engineers, as such, have had hard sledding, for it has been difficult to persuade the railroad administration to look with favor even on maintenance expenditures almost absolutely essential to keep the roadbed factor of safety above one. As an example, on one road ordinary replacements of worn-out rails have been 6,000 tons of rails per year, but the administration could not see that more than 3,000 tons were necessary. One can hardly blame railroad engineers under these circumstances for becoming less optimistic than the members of this loyal, enthusiastic, hard-working, poorly-paid branch of the profession usually are.

With this condition in the regular fields it has not been so hard for highway officials to recruit staffs to carry out their rapidly increasing programs. Chances for advancement are greater in newer organizations. probably railroad experience is more nearly adaptable to highway work, but many irrigation engineers are finding places on road work. Earthwork is common to both. A road location is not unlike canal alignment, and in the intermountain country the highway programs have not yet advanced far beyond the grading stage. Eastern practice is relied upon where the comparatively few hard surfaces are applied. The irrigation chiefs are not complaining particularly about losing men since the salaries which it has been possible to pay have not been very lucrative. Federal engineers in particular have been hard hit because of the diminishing value of the dollar, but the *esprit de corps* in the Reclamation Service has held this organization together remarkably well so far, the men looking hopefully for better things to be provided by congressional appropriations.

ROAD BUILDING

Probably the most potent factor in advancing a comprehensive road program in Colorado is the rapidly increasing tourist traffic. For years the state received the two- or three-day extra stop-off portion of the vacationist's time—and money. Now it is his destination. In 1915 31,000 people tarried in Denver a brief three or four hours, while in 1919 169,490 spent their whole vacation period of from two weeks to three months in Colorado. Their objective was the mountains at close range and that means good roads. With a jitney, a tent and a driver, all rentable in Denver, one may vary scenery, camping spot and fishing at will. To the demand for good roads from the local merchants is added that of the opulent farmer of the neighboring plains states coming in his own car, and of the train-weary Easterner seeking escape from excessive temperatures.

Colorado roads are good in those regions where suitable material lies along the roadside, but otherwise the state is extremely backward in providing funds for building a comprehensive system. The bulk of the money is spent by the counties, and those adjacent often have vastly different views as to the consideration their particular mileage of a through route is entitled to. Public opinion is focusing on this condition and the state system will get funds before long.

As to details the Mountain Parks drive, entirely within the disintegrated granite area, is a good road, but in the 12 mi. between Denver and the first hogbacks is a stretch of clay, most slippery after the frequent summer showers. Two or three sections of surfaced road now cross this clay barrier, but several more are needed.

Like Illinois, hard surfacing has been done all over the state in exasperatingly small sections. Material progress has been made, however, on a north and south "military" road just outside the first mountain range. More than $500,000 is being spent on a 64-mi. section north and south of Walsenberg which will permit all-the-year traffic from Denver into New Mexico. In an inspection trip over this road last August, J. E. Maloney, chief engineer of the State Highway Department, reported meeting cars from out of the state at the rate of 30 per hour.

Denver has a miniature federal department of public works, in a way, for here are located the construction headquarters of the Reclamation Service and a combined Federal-aid and Forestry district highway office. The engineer-appraiser for the Farm Loan Bureau is located in the recently completed postoffice, but apparently it is not large enough for all of the Federal offices, the Reclamation Service being in a private building and the road bureau in the old postoffice.

What W. H. Whistler is doing for the Farm Loan department resembles what many "invisible" engineers attached to bond houses and financial institutions have been doing for years in appraising properties. Only he has the whole irrigation territory and must work wholesale, taking entire irrigation systems or whole watersheds, classifying and rating them according to the numerous factors which go to make up the values in property. Security and stability of structures, priority rights, drainage necessities, climate, soil fertility, crop possibilities, flood dangers, markets, transportation and class of colonization, are some of the subjects gone into in detail before an opinion is rendered as to the relative desirability of placing loans in that particular region. Since the loans are of the long-term class, and the banker must take into account almost a certainty of other than present ownership, the engineer must find real intrinsic values and disregard that greatest of credit assets, personal reputation.

WATER PLANT NOW THE CITY'S

Municipal engineering works in Denver now include the water problem, and the biggest part of that problem is how to get money for improvements and still retain the citizens' confidence. Aside from the troubled financial and political aspects an inspection of the system has always been worth while because of the numerous sources of supply and the many kinds of treatment employed. When the city took over the plant last year business men succeeded to the control, but most of the former operating staff, efficient and hard working as ever, was retained. Little change is noted anywhere except in the front office. Here the former "sleepless-night" anxiety is still in evidence, because of the increasing consumption and inadequate funds for new construction. An admitted error was made in voting bonds sufficient only to buy the plant, providing little or nothing for much-needed extensions, for replacing obsolete and worn-out machinery and for conduits that have outlived their designed length of life. Usually, previous to the purchase of a utility by a municipality, money cannot be found to keep a plant far ahead of year to year requirements. The Denver plant is no exception. In fact, the case is exaggerated, for the company and city have kept the courts busy with their contentions since the early nineties. Now the commission must sell to the citizens the idea of increasing the indebtedness if good service is to be maintained. Several millions are needed. Shall it be raised by bond issue, by an increase in water or in tax rates, or by some flat front-foot-readiness-to-serve charge, thus making the vacant lot owner bear his share. Naturally, metering also is under consideration, but the past education of the public has all been away from that viewpoint. Strange enough, several engineers, mostly irrigation, hold to the idea that meters are impractical in an irrigated country if lawns are to be maintained generally.

Engineering society life in Denver dates from 1909, when members of the American Society of Civil Engineers were able to induce the parent body, almost unwillingly, to permit the formation of a Colorado Association. A strenuous debate occurred at the first meeting between those who wanted to admit Am. Soc. C. E. members only and those who wanted to let in non-members. The exclusives won out. Looking at it from a distance, two quite divergent consequences would doubtless have followed had the minority prevailed. The Colorado Society of Engineers would have come into being then rather than nearly 10 years later, but its personnel and objective might have been so different that the virile things it is now doing, particularly along welfare and civic lines, might never have been accomplished. At present the younger society is distinctly the dominating one. Its meetings are well attended, and it does not refrain from putting on rival technical meetings, although it considers non-technical work its field. The miners and mechanicals have societies in Denver, and an Engineering Council, made up of representatives of all technical societies, is attempting to face and serve the public with a single solid front. Colorado engineers have the machinery to fall in with any national federation proposed; in fact, they have been waiting for it some time.

The typical Colorado engineer is a sociable individual, willing to travel a hundred miles to attend a two-dollar dinner. He makes less fuss over it than would his back-East suburban-commuting brother in Chicago to staying downtown in the loop. There is something in the ozonized air, altitude or continuous bright sun, that provokes a Coloradoan, engineer or not, to argumentative discussion. M. L. Holman of St. Louis holds that people, normal back East, become otherwise once they get into Colorado, and George G. Anderson once argued with the writer on a street corner for a half hour on the effect on the eyes and brain of the glaring sun. At any rate, start a debate at a regular Wednesday noon luncheon of Am. Soc. C. E. members and the subject will receive round-table treatment without pussy-footing. Everybody knows where the other fellow stands. Rivalry is keen, occasionally leading to uncharitable condemnation, for the Western engineer is outspoken.

As to his deeper nature and inner feelings on the real things of life the Colorado engineer is a far more serious citizen than he is usually given credit for. Prof. L. G. Carpenter, head of the Colorado State Council of Defense, who had an unusual opportunity during the war to learn the inside story of many Western engineers, has stated that he was astounded at the calculated sacrifices and profound thinking through to a logical conclusion of many an engineer apparently unconscious of civic responsibilities. We will never know what the average engineer thinks, he says, but the war came nearer than anything else to making him show it by action.

DENVER, COLORADO.

Tests of Stored Cement

Tests were made last year by the United States Bureau of Standards on cement which had been stored for a considerable period. In some cases the storage period amounted to more than a year. Several such samples were submitted for tests. The results of tests indicated reduction in strength for the storage cement, but this change was not marked for material which had been stored on the job for less than one year. One lot, which had been in storage over two years, gave the same strength of compression for 1 : 1–½ : 3 concrete as was obtained for a 1 : 2 : 4 concrete made with the same brand of new cement. The old cement was with a 5 per cent calcium chloride solution, and showed an increase of about 30 per cent in 7 days over the same cement with ordinary mixing water.

Proportioned Aggregate Hauled in Ten-Batch Trucks

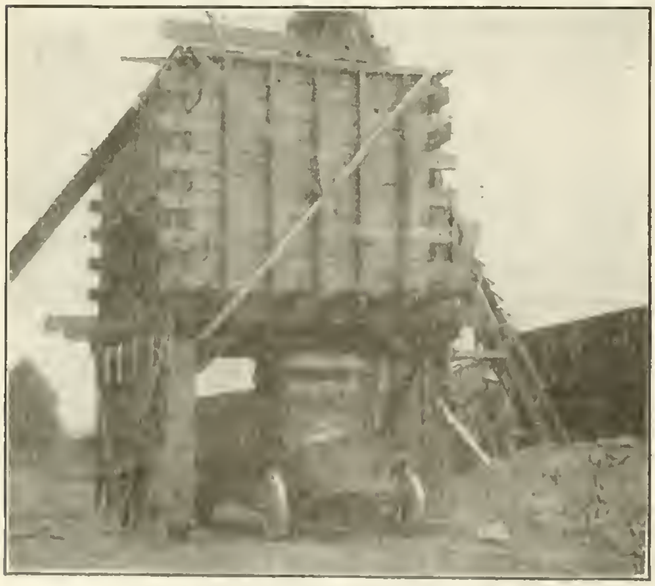
Reinforced Slab Laid Directly on Old Bituminous Macadam—Two-Bag Batch Paver Averages 80 cu.yd. in Place Per Day

TWO trucks delivering proportioned aggregate in boxes and one truck delivering cement in bags successfully served a paving mixer which averaged 270 lin.ft. a day on concrete road construction near Buffalo, N. Y. A two-bag batch mixer was operated and the aggregate boxes held 3 cu.ft. of sand and 6 cu.ft. of stone. The aggregate trucks made twelve trips a day carrying ten-batch loads. Compared with serving the mixer from stockpiles on the grade, this method was estimated by the contractor to have reduced by one-half the number of workmen required.

Some years ago the road, which is a main traffic route in Erie and Niagara counties, was surfaced with waterbound macadam and later with bituminous macadam. This top had become increasingly difficult to maintain and it was decided to resurface portions of the road with concrete, and, since the old surface was in fairly good condition, to place the concrete directly on the old road. A wire-mesh reinforced slab uniformly 6 in. thick of 1 : 1½ : 3 concrete was adopted.

Materials were delivered in bottom-dump cars to a railway siding where the loading plant was located. This plant consisted of a two-compartment elevated bin to which the sand and stone were delivered by a bucket conveyor or from a pit under the siding. By locating the conveyor on line with the bin partition delivery was made to either compartment by shifting the discharge chute at the tops of the conveyor. Gates in the bottom of the bin delivered sand and stone to the batch boxes on motor trucks which passed underneath the bin to receive their loads. In charging, sand was first run in to mark and then the box was filled to the top with stone. Ten batch-boxes exactly filled the truck body.

Home-made, wooden batch-boxes were used. Through each box, just above the center of gravity of the load, a steel rod was inserted so that its ends projected about 6 in. outside the box. Hooks on the hoisting yoke of the mixer crane engaged these projecting ends in handling the boxes to and from the truck.



BATCH BOXES ON TRUCK LOADED FROM ELEVATED BIN

To permit motor truck delivery alongside, the mixer was operated on one side instead of at the center of the new pavement. Arriving at the mixer the truck was unloaded, a box at a time, by the mixer crane. The boxes were emptied into the charging skip by tilting them bottom up while suspended from the crane. When operations proceeded smoothly, it required about 1¾ min. to handle a box or 15 min. to unload a truck. Cement in bags was piled near the mixer for hand charging.

CRANE ON MIXER UNLOADS BATCH BOXES FROM TRUCK

From a count made recently when visiting the work it was found that an average of 270 lin.ft. of slab was being laid with three trucks hauling aggregate and one truck hauling cement. The operating force and the estimated wage cost for hauling materials and placing concrete were about as shown by the table.

ESTIMATED OPERATING COST OF HAULING MATERIALS AND CONCRETING HIGHWAY NEAR BUFFALO, N. Y.

Item	Cost
4 motor trucks at $25	$100.00
3 men at bins at $3.50	10.50
2 men on cement truck at $3.50	7.00
1 man on crane at $3.50	3.50
2 men charging mixer at $3.50	7.00
3 men spreading concrete at $3.50	10.50
2 men finishing at $3.50	7.00
2 men on forms at $3.50	7.00
1 engineman	5.00
1 fireman	4.50
1 foreman	6.00
Total	$168.00

Wing & Munger, of Holley, N. Y., were the contractors for the work which was executed under the general supervision of Charles J. McDonough, Engineer Ninth Division, New York State Highway Department. W. N. Harris was the engineer in charge.

Article on Structural Teaching—Correction

In the article, "A Call for a Practical View in Structural Teaching," by Edward Godfrey, *Engineering News-Record* May 13, 1920, p. 948, two typographical errors occurred: The word "no" opposite the middle of Fig. 1 should be omitted and the word "connecting", four lines below Fig. 2, should be "connoting".

Denver & Rio Grande Terminal at Mountain Summit

Coal Traffic Is Governing Factor in Selection of Site for New Division Point—Steep Grades Limit Yard—Unusual Layout for Tail Switching—No Turntable or Track Scale

IN SELECTING a mountain summit at the apex of steep grades as a site for a main line division terminal with large freight yards, the Denver & Rio Grande R.R. made a radical departure from ordinary practice in locating division points which has evidently been justified by improved traffic conditions. This new terminal is at Soldier Summit, Utah, at an elevation of 7,440 ft. It supersedes a former division point at the foot of the grade on the eastern slope. The location was selected in order to effect economy in the handling of heavy coal traffic on long grades of 2 per cent, with loaded movement mainly in one direction and empty car movement in the opposite direction. Topographic conditions limited the space available and imposed exceptional difficulties in planning the layout of the yards and terminal facilities. The traffic averages twenty trains daily, ten in each direction.

Coal traffic was the governing factor in both the location and the design of the new terminal. The Utah coal fields are on the eastern slope of the Wasatch Mountains, but practically the entire output is shipped westward and has to be carried across the mountains, through the pass at Soldier Summit. In 1918, selected as a typical year, the coal and coke moved westward through this gateway aggregated about 4,500,000 tons; other freight increased the total westward bound traffic to 5,000,000 tons. Eastbound freight, which does not include any coal or coke, was about 900,000 tons.

LOADED AND EMPTY TRAIN MOVEMENTS

On the eastern slope, the maximum ascending grade is 2.4 per cent, and as pusher engines were required for the heavy trains a division point was located at Helper, 25 miles from the summit. Prior to 1913, the maximum descending grade on the western slope was 4 per cent and the braking capacity of loaded trains limited their tonnage materially, the average weight of westbound trains from Helper being then about 850 tons, handled on the down grade by a 110-ton engine of the 2-8-0 class.

To improve this condition a 28-mile double-track detour line having a maximum grade of only 2 per cent, was built from Soldier Summit to Thistle. Since 1913, therefore, it has been possible to operate trains of any length and weight economically. At present the solid westbound coal trains starting from Soldier Summit average 65 cars and a total weight of 4,000 tons (instead of 850 tons), handled by a single road engine of the class mentioned above. The trains are of approximately the same weight in summer and winter.

Owing to the widely separated points of production of coal and coke on the east slope, the collection of loaded cars from these points is effected necessarily by numerous short trains which operate on branch lines and on the ascending grades of the main line. It is evident that it would be an advantage to assemble this traffic at a point where solid trains could be made up for the westerly movement. The logical location for such assembly was Soldier Summit, because it is the first station beyond the most westerly junction where coal reaches the main line and because westbound trains encounter no adverse grades beyond the summit. Thus full tonnage trains can be operated to junctions and interchange points from which the coal traffic is distributed. These conditions are explained by the maps and profile, Figs. 1 and 2.

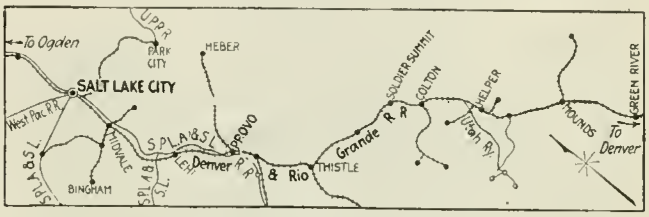


FIG. 1. LINES SERVED BY YARD AT SOLDIER SUMMIT. DENVER & RIO GRANDE R.R.

Another factor in selecting the division point was the thorough train inspection and air-brake test that must be made on all trains descending from the summit in either direction. For safety and efficiency it is desirable to have this work done where all necessary facilities and appliances are in the hands of a well organized force of inspectors. But it is difficult to maintain competent forces and adequate facilities at outlying points, so that a division terminal is the logical place for such inspection.

Empty car movement is an important element in the operating conditions. Westbound through freight traffic is of such character that there are no empty cars from the east available for loading with coal and coke for further movement westward. It is necessary therefore, to bring in sufficient empty cars from the west to be distributed to the mines for loading and then to be assembled in westbound trains. With the maximum grade against eastbound traffic reduced from 4 per cent to 2 per cent it was practicable to haul long trains of empty cars from the west, such trains now averaging about 75 cars. These trains had to be broken up, however, for distribution of cars in short trains to the mining centers. For this purpose, Soldier Summit was again the logical point. Further, labor conditions were favorable to the selection. With a terminal here it is practicable and economical for engine and train crews to make daily trips delivering empty cars to the mines and bringing back loaded cars within the periods prescribed by the law regulating hours of service.

A very desirable equalization in length of operating divisions was effected by the establishment of a division terminal at Soldier Summit. With the terminal at Helper, there was an eastern division only 72 miles long to Green River, but the western division to Salt Lake City was 119 miles long and included all the mountain grades grouped at its eastern end. With the division point transferred to the new location, the lengths of the two divisions are 97 and 94 miles respectively.

A marked economy in time and car service has resulted from the new operating conditions and has proved the wisdom of selecting this location for the division terminal. When the old terminal was at Helper, a coal car required an average of 8.1 days for the round trip from Salt Lake City, going empty to the mines and returning loaded. Since the Soldier Summit terminal has been in operation the time for the round trip has averaged only 5.5 days, a reduction of about 30 per cent, which means a corresponding increase in the capacity of the car equipment.

Freight Yard Layout

In planning the freight yard arrangement to meet the special conditions of the heavy traffic at this point the following requirements were governing factors: Receiving yards for long trains of empties (100 cars maximum) from the west and shorter loaded trains (50 cars maximum) from the east; a departure yard for westbound solid coal trains; a combined classification and departure yard for eastbound trains of empty cars (50 cars maximum) for distribution to the mines. A layout suitable for these conditions would provide ample facilities for handling the through main line freight traffic in addition to coal and coke.

Topographical limitations also exerted a governing influence in the design of the yard layout, the trackage having to be confined within narrow limits. Much study was devoted to obtain a favorable utilization of the space available, owing to the heavy expense of grading a site and to the fact that any lowering of the summit elevation was out of the question. Even with this careful attention to adapting the layout to the topography, there was about 460,000 cu.yd. of excavation for grading, most of this being solid rock. All yards and terminal facilities are on the north side of the main line.

Limited extent of level ground for a yard at the summit of heavy grades necessitated special arrangements to secure a layout suitable for economical operation and having tracks of the required length. The main line has a level stretch of 2,750 ft., approached from the west by a 2 per cent grade and from the east by a 1 per cent grade followed by 1,600 ft. of 0.56 per cent. In its original alignment the main line included considerable curvature in conforming to the topography of the mountainous country.

Traffic requirements demanded tracks at least 4,400 ft. long, capable of holding 100 cars, these tracks preferably being straight. Tracks of this length, however, would extend over the 1 per cent and 2 per cent grades at the east and west ends respectively, making it impracticable to handle switching movements from either end. As the first step, the double track main line was shifted south and relocated so as to give the greatest possible length of tangent and still connect with the old alignment at each end. The yard tracks were then laid out parallel to this tangent and continued eastward as straight lines to obtain the necessary length, a connection on a curve of 8 deg. being then run from the east end ladder tracks to the main line, as indicated in Fig. 3. The total distance between the main line crossover connections at the ends of the yard is 7,758 ft.

Yard Switching Movements

Operation of the yard by switching from the ends was precluded by the relatively great length of tracks and their connection with heavy main line grades, as noted above. To overcome this difficulty at the west end, a stub tail track or drill track, 1,600 ft. long was led from the throat of the yard on a supported ascending grade of 1 per cent, diverging from the main line by a curve of 8 deg. as shown on the plan. Cuts of 40 cars can be pulled from the westbound receiving yard to this drill track and then switched down the 1 per cent grade into the long westbound classification tracks. Switching for the eastbound yards is operated on the ladder near the middle of the layout, the cars on the receiving tracks being pulled westward and then pushed into the eastbound classification tracks.

Unusual arrangement of the yard units will be noticed on the plan. Ordinarily the westbound receiving yard would be at the east end of the layout and cars would move west through the several units to a westbound departure yard at the west end. At Soldier Summit, however, the westbound receiving yard is at the west end of the site, with its corresponding departure yard adjacent to and parallel with it. The tracks of this latter yard are continued east to form the eastbound receiving yard, which in turn is parallel with its corresponding departure yard. Thus inbound trains entering the terminal from either end pass to the opposite end before being set on the switching tracks to be broken up or separated. The westbound receiving yard has seven tracks about

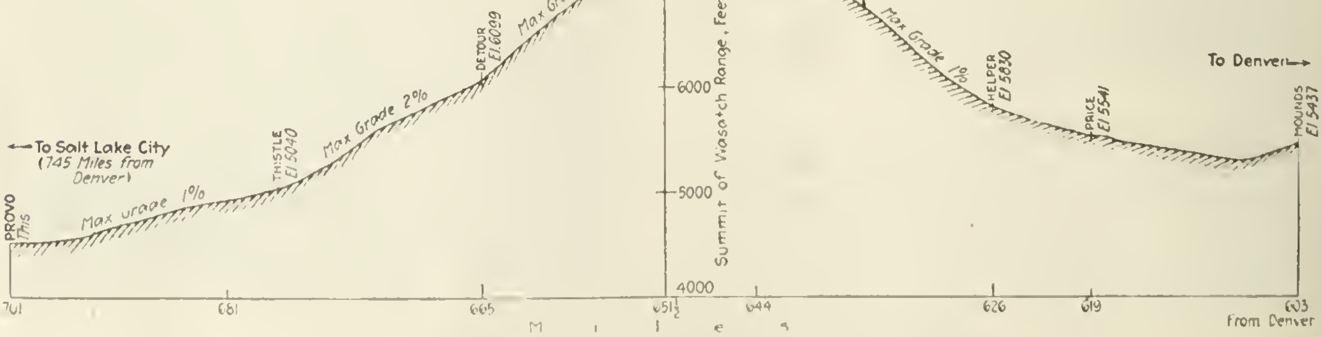


FIG. 2. PROFILE OF LINE OVER WASATCH MOUNTAINS

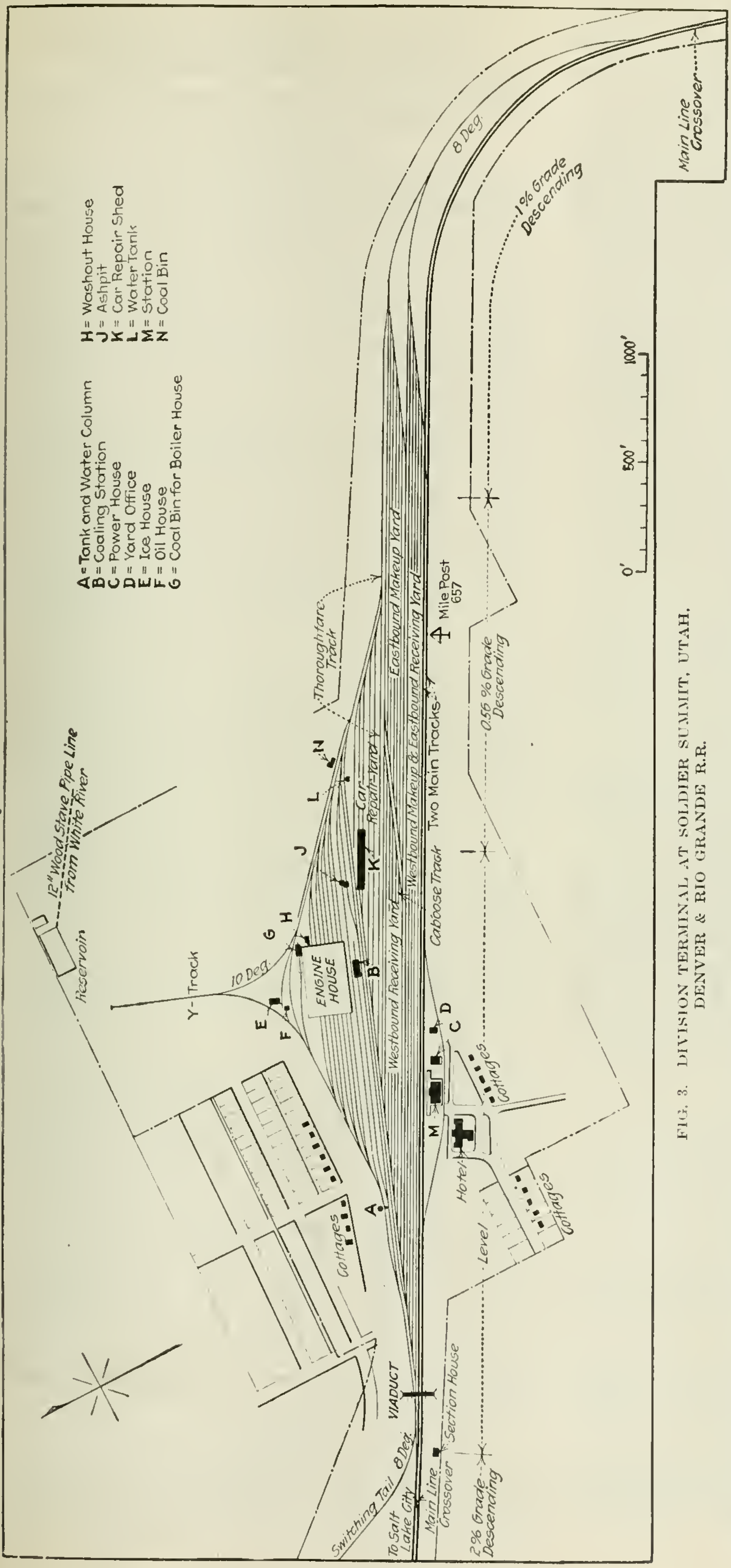


FIG. 3. DIVISION TERMINAL AT SOLDIER SUMMIT, UTAH. DENVER & RIO GRANDE R.R.

2,000 ft. long; the eastbound departure yard has six tracks of the same length, and the combined westbound departure and eastbound receiving yard is composed of six tracks about 4,400 ft. long. No difficulty is experienced in handling both eastbound and westbound trains on these long tracks.

Yard tracks are spaced 15 ft. c. to c. and the same spacing is used at main and lead tracks. Ladder tracks are on an angle of 8 deg. and where they are double the tracks are 15 ft. c. to c. All tracks are laid with 85-lb. rails in gravel ballast. Yard turnouts and main line connections have 16½-ft. switch rails and No. 10 frogs. Departure tracks are equipped with compressed air piping for testing the brakes on trains made up ready for the road engines. No special provision is made for clearing snow from switch and yard tracks.

A caboose track is provided between the westbound and eastbound departure yards, and has a ladder track connection at each end, as shown on the plan. Caboose cars do not pass through this terminal, as it is a division point. When an eastbound train arrives, the caboose is uncoupled and a switch engine sets it on the caboose track, from the east end of which it is switched into the east end of the departure yard to be coupled to the rear of an outgoing westbound train. In the same way, a caboose from an arriving westbound train is set on the caboose track and then moved through the west end for switching to an outgoing train in the eastbound departure yard. A thoroughfare or running track is arranged between the car repair yard and the westbound receiving yard.

As coal cars are weighed at the mines no track scale has been installed at the yard, but the original design includes this equipment for the purpose of both checking and weighing. All ordinary freight is through traffic and no facilities are required for handling less-than-carload freight, but provision is made for icing refrigerator cars and for watering stock cars. For lighting the yard, electric lamps of 1,000 cp. are installed on posts spaced 400 ft. apart, the lamps being about 45 ft. above the ground.

Beyond the freight yards is a car repair yard having four through tracks with a maximum length of 1,300 ft. and one short stub track for material. Two of the tracks are partly covered by a repair shed. These car repair tracks are spaced 20 ft. c. to c. and can accommodate a total of 100 cars. They are equipped with compressed air piping for pneumatic tools.

A rectangular concrete enginehouse 200 x 326 ft., having eight through tracks connected to lead tracks at both ends, is a striking feature of the engine terminal. It was found that this arrangement permitted a more economical and convenient utilization of the space than the usual arrangement of a roundhouse with tracks radiating from a turntable, while it eliminates the trouble of keeping a turntable pit clear of snow in winter. A Y-track with 10 deg. curves and connecting with the enginehouse leads provides for turning the engines. The building can accommodate 24 locomotives. Road engines of westbound trains are cut off in the receiving yard and move forward to a ladder track from which they move back either to the coaling station or the enginehouse. Road engines of eastbound trains move forward to the loop connecting with the main line and then back into the engine terminal. For switching service, there are three yard engines, in addition to which the engine terminal has to provide for cleaning, coaling and handling about 65 road engines daily.

There being no town at this point, housing accommodation had to be provided for about 200 men and their families. The railway company laid out a townsite and built ten 6-room and ten 4-room frame cottages. A sewerage system connected to a septic tank was also built. Several more cottages have been brought to this site from the former division point at Helper, which is now abandoned. A frame hotel provides for transient and unmarried employees, and a Y. M. C. A. building is being erected. The railway station is a two-story frame structure 36 x 100 ft., with division offices on the upper floor.

The planning of the entire terminal and the design and construction of the various parts were carried out under the direction of J. G. Gwyn, chief engineer, and Arthur Ridgway, assistant chief engineer, Denver & Rio Grande R.R.; L. B. Furman was resident engineer in charge. All track work was done by company forces. The new division point was put in service in November, 1919, and represents a total expenditure of about $1,250,000.

Cement Plaster on Gypsum

Researches have recently been carried on by the U. S. Bureau of Standards, looking into the subject of the adherence of cement plaster to gypsum. The findings are reported as follows:

> There seems to be no detrimental reaction between the two materials; the tensile strength of the mixture of gypsum and cement is very nearly equal to their combined tensile strengths dependent upon the proportions of the two ingredients used.
>
> The suction of the surface to which the plaster is applied is an extremely important factor; for example, if gypsum plaster is applied to a dry concrete surface, the suction of the concrete will take so much water out of the gypsum that it will prevent its proper hardening.
>
> The expansion of neat cement, when wet, is of an entirely different order fromm the expansion of neat gypsum, and a bond between the two materials can be permanently maintained only when enough sand is added to both materials to reduce the same for both.

Bureau of Public Roads Begins Highway Subgrade Study

District Engineers to Select Soil Specimens Where Roads Fail as Aid in Securing Data on Soil-Bearing Power

IN ORDER that every effort possible may be exerted immediately to obtain accurate scientific information regarding soil characteristics producing high or low bearing value, the Division of Tests, U. S. Bureau of Public Roads, has begun investigations in the vicinity of Washington, D. C. As little can be accomplished there that will be of anything but local value, the Chief of the Bureau of Public Roads, Thomas H. MacDonald, has, in a circular letter, recently addressed all the district engineers soliciting their assistance.

Working upon the assumption that all soils have adequate bearing value when the amount of water within them is kept at a low percentage, or that other soils may be rendered of greater value if artificially treated, a thorough study of subgrade conditions will be made first-hand. To get the needed information district engineers are directed to make investigation of soil conditions where failures in road pavement have been noted, the failure being obviously due to poor soil conditions. They are asked to work in co-operation with the various state highway departments in securing this information and in making inspections of road failures due to poor subgrades.

Inspections will include taking samples of 1 cu.ft. from the subgrade, preferably directly under the failures; the taking of photographs of the site of the failure; and complete information regarding the topography of the road in the vicinity of the failure. Detailed information regarding the character of the failure is also to be noted, as well as the approximate

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PUBLIC ROADS

Investigation of Road-Failures Produced by Failure of Subgrade
Name of Road and Location (State, Co., Towns)................
Type of Road...
Year Built...
Volume and Approximate Character of Traffic................
....
Description of Drainage: Ditches, underdrains; drains under road; size or dimensions. (See attached Sheet 2)..................
Location of Failure: (State how far from top of grade, per cent grade, whether in cut or fill, on side hill or on flat, as well as geographic location.) (See attached Sheet 2)...............
....
....
....
Photograph of Failure, Film No..........Negative No..........
Photograph of Road Cross-Section, showing surface drainage conditions, Film No..............Negative No.............

Data on Soil Sample (1 cu.ft.)

Identification Mark: (State, County, Sample No.)...............
Location of sample with respect to road (horizontal and vertical location) ....
Does material as represented by sample extend at least 3 ft. below road surface?..
Is there any indication that a more porous or a more impervious layer underlies this material.................................
At what depth?...........Small sample marked...........
Note proximity of water, whether in ditches, in seepage strata, on surface, on shoulders, etc.................................
....
....
....
State your opinion as to how the water reached the subgrade, whether by vertical or horizontal capillarity, from surface, from underlying seepage strata, etc..................................
....
....
....
Are drains operating?......................................
Is outlet above or below water surface or ground?..............
Remarks:...

INFORMATION SHEETS WILL CONTAIN ROAD FAILURE DATA amount of traffic, drainage conditions, the probable presence of water-bearing strata, or other features that may make for a wet subgrade. Particular attention is to be paid to the manner in which water reaches the subgrade, whether by vertical or horizontal capillarity, through seepage strata, from the surface, etc.

Sample bags with tag envelopes in which to ship soil samples to the Division of Tests are provided, as are blanks upon which road failure information can be tabulated.

The memorandum from Mr. MacDonald to his various district engineers is given herewith:

> It would seem to me to be very desirable in view of our enormous road building program that every effort possible be made immediately to obtain accurate scientific information regarding the characteristics of soils which render them of high or low bearing value, as the case may be.
>
> The Division of Tests at Washington has begun an investigation in the vicinity of Washington with this idea in view but little can be accomplished along this line unless a nation-wide research be made obtaining the services of various co-operating agencies. The problem of eliminating road failures due to poor foundations seems to be possible of solution in one of the following ways:
>
> (1) Make the road surface thick enough so that the pressure will be sufficiently distributed to the underlying subgrade, or so that the surface because of its inertia may absorb a considerable amount of the shock of traffic, or
>
> (2) Design the slab to have sufficient strength to bridge over the soft subgrade, or
>
> (3) Improve our drainage systems to exclude the moisture in dangerous amounts from soils which are rendered of very low bearing value by the presence of water.
>
> It is perhaps true that all soils have adequate bearing value when the amount of water in them is kept to a sufficiently low percentage, or it may be possible that certain soils will be susceptible of treatment which will render them of higher bearing value than they have in their natural state. It is obvious that if we are to advance our ideas regarding road construction we must begin with the road foundation and must gain accurate information as to what properties of soils make them good or poor soils for foundation purposes. With this knowledge in hand, we will then be in a better position to say how the road should be designed when it is to be laid on these particular soils, or possibly how we should treat the soil when its characteristics are known in order to increase its bearing value.
>
> With the idea in mind of gaining this preliminary information, I should like to have you obtain the co-operation of the various state highway departments in your district in an investigation of soil conditions existing where failures due obviously to poor soil conditions have occurred in the roads. I would suggest that you designate someone in your district to make an inspection of a number of road failures due to poor subgrades, whether due to poor drainage or to peculiar soil conditions, working in co-operation with the state highway departments and also, wherever possible, with the state geologists.
>
> In this inspection samples of one cubic foot each should be taken from the subgrade, preferably directly under the failure, photographs should be taken of the site of failure, and complete information should be given regarding the topography, preferably in the form of cross-sections and profile of the road in the vicinity of the failure. Notes should be taken regarding the character of the failure, the approximate amount of traffic, drainage conditions, the probable presence of water-bearing strata, or other conditions that may make for the wet condition of the subgrade. It is particularly important that data be given tending to show how water reached the subgrade, whether by vertical capillarity, horizontal capillarity, through seepage strata, from the surface, etc. An auger 1½ in. in diameter will be useful to explore the underlying subgrade and much useful information may be obtained by noting the texture and condition of moisture of the soil at different depths. Thus if the soil at the surface is wet, and is very compact, dense and dry below, the probability is that the water entered the subgrade from the surface and was prevented from escaping by the underlying impervious layer. If the underlying layer of a wet subgrade is wet and porous and it in turn is underlain with compact impervious clay which is dry, it would seem that the porous layer is a seepage stratum through which water is flowing and is rising to the top of the subgrade by vertical capillarity. A number of combinations of conditions are to be expected and must be carefully studied to determine how the water which existed in the subgrade at the time of failure arrived there.
>
> Similar samples and observations should be taken from spots in the same road which have not failed. The samples so taken should be sent to the Bureau headquarters at Washington, where they will be subjected to suitable tests. Bags of one cubic foot capacity are being sent to you for use in this investigation. If the texture changes down to a depth of 5 or 6 ft., as determined with the auger, take a 1-qt. sample and place in small white cloth bag provided for this purpose.
>
> This preliminary investigation need not be very extensive so far as the number of samples are concerned. If samples are secured from fifteen bad failures in each district, together with five samples from parts of the same roads which did not fail, these samples will serve the purpose of this preliminary investigation.
>
> I shall appreciate it if you will have this investigation begun immediately. I am enclosing herewith a number of blank forms which should be used by the engineer assigned in your district to this work. I am also sending under separate cover 20 sample bags and tag envelopes to be used for shipping the samples to Washington. It is suggested that when selecting the failures, differences in the soil characteristics as wide as possible be sought and that failures on fills as well as on cuts be investigated.

Italian Housing Activities

According to the U. S. Department of Commerce, the Italian Government has considered several legislative bills designed to increase materially housing facilities throughout the Italian domain. Legislative assistance offered so far includes loans to building organizations, co-operative societies and municipalities; state aid to commercial, industrial and agricultural organizations in the production of houses for their own employees; complete exemption from customs duties of imported building materials; exemption from the normal tax and the super tax for houses coming within the definition of popular or economical houses, as well as popular hotels and dormitories constructed by the municipality for a period of twenty years; and the exemption of certain other buildings not of a luxurious character from the normal tax and super tax for a period of 10 years.

In aiding tenants and discouraging rent profiteering Government commissioners will be appointed in cities of over 100,000 inhabitants to see that tenants receive full protection afforded them by law in connection with the leasing of apartments, furnished rooms, etc., and in regard to eviction. It is also provided that the civil and military offices of the government, having a temporary character owing to the war, must be removed within three months from private buildings. In addition, through a decree of the Ministry of Industry, Commerce and Labor, buildings intended previous to the war for use as hotels and which have been sold for other purposes but are not yet converted, can be redeemed at the selling price, providing a guarantee is given that they will be used as hotels for not less than 10 years.

Pre-Conference Reflections

What the Societies Have Accomplished to Date in Non-Technical Work.

(Editorial Correspondence)

INSTRUCTED or uninstructed, the conscientious delegate before entering into the Organization Conference at Washington, D. C., June 3 and 4 is bound to think back over the past year and reflect upon the achievements of the societies in the field of welfare work. How far along the road of progress has the profession already gone? An appraisal of the work that is now being accomplished is essential, if in his work in the conference he is to utilize rather than upset or disorganize the agencies which have already proved useful.

What, then, are the chief lines of non-technical achievement to be included in such reflection and appraisal? They will come under a comparatively few heads: Compensation, employment, legislation, publicity and ethics; these cover the main part of the field in question.

Under *compensation* the $5,000,000 increase in yearly income obtained for the railroad engineers will doubtless rank as the biggest accomplishment, though the numerous schedules set up in the federal, state and municipal fields have had a remarkable influence in educating the engineer and his employer as to his actual worth. Engineering Council and the American Association of Engineers both started on the railroad question, but the latter followed through. Both have worked hard on schedule-making, but the association is entitled to the credit of more aggressive action in attempting to get the schedules put into affect. Further, the same body earned respect and appreciation by some forceful bits of local work, as when it saved the rapid-transit engineers in New York a holiday season without pay last January. Latest, and from some standpoints most important of the year's achievements in compensation, is another tally for the association, namely, its appointment by the Interstate Commerce Commission as recognized spokesman for railroad engineers on wage questions—the first recognition of any engineering body in such capacity by any public authority in America!

Next, as to *employment*. The younger and lower-priced men are well taken care of by the service bureau of the association, but this has not reached far beyond the $2,400 class of position. The joint employment bureau of the Founder Societies, giving a service less extensive numerically, has probably covered a higher class. Neither service has as yet extended in scope far enough to reach the whole country, though plans are being developed to this end. Meanwhile a number of local societies are doing commendable employment work. Thus, in the intermountain country the Colorado Society of Engineers has gained for itself an enviable reputation.

In *legislation*, the American Association of Engineers points to the license laws on the books of Virginia and New York as its accomplishment, but probably no better general draft of a licensing or registration bill has been brought out than that of Engineering Council. Engineers working locally, without national assistance, have done more work than either of these bodies, however; Iowa, Colorado and Michigan are examples of states that have put through bills with little or no assistance from outside. These states, moreover, afford striking illustration of one great feature of professional activities, for the mere passage of their license bills has galvanized the engineers throughout the state to a realization of the necessity of co-operative activity as never before. Subsequently, the state society of Michigan became a part of the American Association. The Colorado society is so nearly akin to the Association in principle and achievements that it is hard to see why they are apart; the Iowa societies are working on statewide union, but just now are battling over a constitution which may tie them all (including certain chapters of the American Association, anomalously), into a comprehensive organization to be delivered into the Orgonizing Conference fold.

Coming to a different phase of legislation, the work of Engineering Council in furtherance of the proposed department of public works has been highly effective. It is likely to produce a permanent effect on our system of government. Truly, this has been an effective display of the strength of the engineering profession in public service.

What of *publicity* for the engineer and engineering? It would seem that honors go begging. The American Association has obtained columns and columns of newspaper notice, but it has been so largely organization propaganda as to be little more than advertising, in its effect. Let it be said in fairness, however, that the war did much to advertise the engineer.

Good work has been done by local societies in publicity. Iowa engineers obtained a certain amount of valuable press notice during the licensing campaign. Probably the state society has one of the best-laid plans for statewide publicity of engineering so far proposed; it yet needs vitalization.

No national view of the publicity subject has been taken as yet, it would seem, but Engineering Council's success in its propaganda for a national department of public works is indicative of what could be done had it the funds.

In *ethics* there is little progress to record. Valuable work has been done by the American Institute of Consulting Engineers, slowly but continuously, in its investigation of individual questions presented in practice. By contrast, the Western Society of Engineers has still before it, like Banquo's ghost, the Ira O. Baker-C. D. Hill case, seemingly daring neither to dismiss it nor to try it for fear of splitting the society. The American Association of Engineers has the beginnings of a judiciary body for the protection of individual rights in its Practice Committee.

No engineering organization has yet such a virile stable supreme-court-like body as the American Institute of Architects possesses. Until such august bodies are set up, with rules, regulations and authority back of them, consulting engineering will continue to be a hazardous occupation and—to be really and truly pessimistic—engineering as a whole somewhat short of a profession. Plenty of codes have been written, and are still being written, but few are enforced.

Summarizing such reflections, the delegate cannot fail to observe that a great deal has already been done. Most of this, too, is the achievement of the past year, it will be seen on further scrutiny of the facts. The work at which the efforts of the Washington conference are directed is already going on, apparently. How shall it be continued? What is the best kind of organization for dealing with these and other non-technical matters? That is the delegate's problem. W. W. D.

Cost of Railway Improvement Work Under Government Control

RAILWAY improvements, new construction and additional equipment authorized by the United States Railway Administration during its first two years of control of the railway system represented a total estimated cost of $1,171,131,168, and the cost of work done and equipment purchased during that period aggregated $805,895,738, or a little under 70 per cent of the amount authorized. In 1918. expenditures for capital account were considerably below the amounts authorized, owing to the impossibility of getting work done, but in 1919 the much smaller amounts authorized were exceeded by the actual expenditures. A summary of these results, compiled from the 1919 report of the Division of Capital Expenditures, is shown by the accompanying table. More detailed figures for the 21-month period, to Sept. 30, 1919, were given in *Engineering News-Record* of Feb. 5, 1920, p. 272.

TABLE OF AUTHORIZED AND ACTUAL EXPENDITURES ON RAILWAY IMPROVEMENTS UNDER THE U. S. RAILROAD ADMINISTRATION IN 1918 AND 1919

Years	Additions and Betterments	New Construction	Equipment	Total
Authorized:				
1918	$567,327,140	$49,603,560	$289,247,838	$906,178,538
1919......	215,946,749	7,826,263	41,179,618	264,952,630
1918-19...	783,273,889	57,429,823	330,427,456	1,171,131,168
Expended:				
1918......	272,232,972	21,346,231	180,058,810	473,628,013
1919......	237,143,941	10,011,832	85,101,952	332,267,725
1918-19..	509,376,913	31,358,063	265,160,762	805,895,738

NOTE.—Authorized amounts represent the estimated cost of work authorized Expended amounts represent expenditures for work actually done.

It is pointed out in the report that when Congress adjourned on March 4, 1919, without making any provision or appropriation for the continued development of the railway facilities, it was deemed necessary by the Division of Capital Expenditures to reduce the proposed budget and to suspend all authorized improvements except where continuance of work was necessary to insure safety and in such cases as progress had reached such a point that it would have been more expensive to stop the work than to continue it, or where the railway companies were willing to furnish the funds necessary to complete the projects. The same condition made it impracticable to order additional locomotives and cars. Although Congress made an appropriation in June, 1919, this did not change circumstances materially, the situation then being that the Railway Administration was not able to furnish large additional amounts for improvements and the railways were not able to finance additional amounts. Further, it was then too late to carry out extensive plans before the end of the year.

To complete the improvement program, exclusive of equipment, the report estimates that from $200,000,000 to $250,000,000 will be needed. This includes projects which were started in or before 1918 but were stopped for lack of funds, projects which were approved under Federal control but were not started on account of lack of credit, and projects which were under construction as necessary for the safe and proper operation of the railways but which would not be completed by the end of 1919. The amounts named are exclusive of those chargeable to operating account.

Asphalt Coating for Exposed Steel in Waterfront Concrete

CONCRETE beams along the San Francisco waterfront, in which the reinforcing steel is exposed, have been under observation for more than two years. In this time the cause of the cracking and spalling has not been definitely determined, but it has been concluded that the deterioration is not increasing (at least not rapidly) and that it will be worth while to put a protective coating over the exposed steel in the more serious breaks without attempting to patch the concrete. A statement about the condition of waterfront concrete at San Francisco appeared in *Engineering News-Record*, March 21, 1918, p. 575.

The damage to the beams was at first believed to be caused by salt which penetrated to the steel and corroded it, the resulting expansion spalling off the overlying concrete. Cracks that have been recognized during the long period of observation have thrown considerable doubt on this theory. For example, practically no exposures of steel occur in piles and comparatively little in floor slabs, while extensive cracking and spalling has occurred on beams, particularly on the under side beneath the railroad tracks. This has lead to the suggestion that vibrations have caused the original cracking through which the salt suspended in particles of moisture has gained access to the steel.

On the other hand, this is not a wholly satisfactory explanation because in some places the concrete has scaled off without exposing the steel beneath and when more concrete was cut away here to get at the steel, the latter was found to be free from corrosion. The possibility that laitance was the cause of this scaling is considered unlikely because it occurs for the most part on the bottoms of beams.

Whatever the cause, it has developed that the effects are not cumulative. At least, if there is an increase in the extent of the exposure, it is occurring so slowly that inspections over a two-year period have shown very little change. Hence, while close observation will be continued the exposed steel is to be protected from the salt air.

This is being done by first brushing the surface well with distillate to insure bond and then painting with E grade asphalt. This coating is being applied only where reinforcing steel is actually exposed, but a generous application is made covering the adjacent concrete on which the surface has been broken.

Teredos Work Under 40 lb. Pressure

Two wood-stave pipe lines through which the Union Oil Co. pumps salt water at Oleum, Cal., have been entirely destroyed by teredos which must have been drawn in through the centrifugal pumps and entered the wood staves from the inside. The pipe-lines were 10 and 12 in. diameter, respectively, and were operated under a pressure of 40 lb. per square inch. The pipes were damaged so badly that they had to be replaced. When detailed examination was made it was found that the teredos were in a thriving condition, some of them having attained a length of 8 in.

LETTERS TO THE EDITOR

May His Tribe Increase and Engineering Publicity Therewith

Sir—Your issue of May 6 carried an interesting editorial on the viewpoint of the public press toward engineering works. Your suggestion as to the source of inspiration of the recent editorial in the Chicago *Tribune* fails, as the following statement will disclose:

On Jan. 12 the *Tribune* published an editorial entitled "A Thrill and a Bridge" and in highly laudatory terms spoke of the iron worker constructing the bridge, and the American flag at the top of the steel span—the leaf was erected in a vertical position. There was no mention of the bridge engineer.

As I was the engineer of bridges for the City of Chicago when the original plans were made—there have been some slight modifications from the original plans—I felt it due the present city staff that they receive some mention. So I wrote the editor of the *Tribune* on Jan. 12 (the letter being published two or three days later) complimenting the writer on the well written editorial, and calling his attention to the fact that the bridge was a highly specialized piece of mechanism, the creature of the engineer's brain. I pointed out that his linotype operator, type setter or newsboy did not make a great paper. The editorial writer, I stated, was an effective link.

So, when the leaves of the bridge were dropped to grade, and fitted nicely together, the same editorial writer, who had thought over the matter, wrote another editorial to which you refer, entitled "Brawn Takes Its Profit from Brains," the last paragraph reading: "The bridge is a monument to the general value of rewarding ungrudgingly those who contribute by their superior ability to the welfare of all."

As you say, it is well for the engineer not to overlook such legitimate publicity of his own achievements. We have been too modest—so if the bridge engineers of the city have gained public credit through some small effort of mine I am content. A. J. HAMMOND,

Assistant Engineer, Chicago Union Station Co.

Chicago, Ill.

[The possibility we suggested was that the president of the Board of Local Improvements inspired the editorial, "or got the engineer of the bridge to do so." We are quite as well pleased to know that the engineer acted on his own initiative. May his tribe increase.—EDITOR.]

A Plea for Arbitration Contract Clauses

Sir—By virtue of a recent rather costly experience I am even more than ever an advocate of an arbitration clause in contracts. And by reason of such an experience it seems to me that the Associated General Contractors of America could not perform better service than to relieve such a condition as is herein described.

I had a contract in a neighboring state for 18 mi. of highway grading, of which approximately 2 mi. on either end was light team work, and the rest through rock canyons, involving rather heavy excavation. The contract was undertaken in 1915 and labor was abundant and efficient, and a great part of the work was "stationed." From the time we started, Jan. 1, until the job ended, in late November, only one day was lost on account of bad weather.

Grade stakes from which we worked were set at each station and usually the plus 50s, though no stakes were set at grade, with the exception of one which happened to come at the edge of the road bed. No profile was supplied the contractor. During the setting of the stakes, for some reason which I never knew, 40 re-cross-sections were taken and in every instance showed an entirely different ground line clear across the section. Yet no other further cross-sectioning was done. As the work progressed, there was a constant complaint of shortage of quantities. Except the two light ends, almost the entire work was sidehill work and the rock easy to handle. We were assured that when the work was completed a remeasurement would be made and all quantities picked up. The remeasurement was made. Working without stakes set at grade we had missed the grade considerably, and low. Finishing stakes were not given until all the excavation was done, so in order to put the road to grade we had to make additional excavation and do considerable back filling for which we received no extra compensation. When we received our final estimate we discovered that including the team work and all other items we were given an average of but 4.7 cu.yd. per man, which we knew to be not over half of the material actually moved.

When we made an investigation we discovered that in the remeasurement a variation of 0.4 ft. was allowed as between the old and the new grade stakes, and in setting slope stakes a variation of 5 ft. from a right angle was not infrequent practice. We asked for an adjustment and were refused. We offered to abide by the decision of an independent engineer appointed by the state. Arbitration of the case as well was refused. Then we sued.

Our engineer secured blue prints showing the first and last measurements, and the forty re-cross-sections were put upon these from notes secured from the highway commission's engineers. It appeared an impossibility to measure the work and so we asked for reasonable cost and came to trial. The three expert engineers I had secured to offer expert testimony, all residents of the city where case was tried, said emphatically that it was impossible to make an estimate from such data as was at hand. Besides the foregoing I had submitted the blue prints to at least twenty engineers, every one of whom said it was impossible to make an estimate.

The judge before whom the suit was tried, though painstaking and interested, was not a technical man, naturally, and at the end of the third day of trial it was discovered he was interpreting the ground line as that line denoting the finished road surface. The result was that the judge found evidence conflicting and technical and he was not competent to pass upon it, but he found a clause in the contract that the engineer's estimate should be final and binding, and he would therefore sustain the estimate as rendered. I question if one could ever find a more painstaking judge, but you can't give a liberal education in engineering in nine days. Had there been an arbitration clause in our contract so that the case could have been reviewed by one who understood blue prints and field notes, I undoubtedly would have received justice.

Then, no contractor would dare go before an arbitrator without a just case and no engineer would care to be reviewed by a competent arbitrator and have an unjust case or a "bonehead" deal shown up. E. T. JOHNSON.

Portland, Ore.

How Lower Highway Building Costs?

Sir—A few very commendable suggestions were offered by Mr. Collins in *Engineering News-Record*, April 8, p. 703. However, the growing tendency among many contractors is to shift the responsibility of high costs to the inexperienced engineer.

We must all admit that many of us lack experience in highway construction. However, in my twelve years of experience, I have observed that excessive costs and failures are not all due to the inexperienced engineer. In fact it may be said that greater losses are generally due to contractors and superintendents being inexperienced in highway construction. It is a very noticeable fact that few complaints concerning the engineer come to headquarters from the experienced contractor or contractor who is on the ground and is in actual contact with the work. Hundreds of instances can be cited where mistakes made on the part of the superintendent have been reported by him to his headquarters as being the result of errors on the part of the supervising engineer.

It is evident that many requirements on the part of the average engineer or inspector may be justly criticised, however experience has shown that a very small percentage of the claims or requirements of the engineer is not clearly covered in the specifications upon which the contractors bid, hence cannot be used by the contractor as any claim for excess cost.

Many contractors bid on work with a total disregard for some of the fundamental provisions of the specifications and they then claim undue advantage is being taken of them by the field engineer or inspector when he insists that the basic requirements of the specifications be executed.

It must be admitted that most state road specifications are drawn by engineers who have had a wide experience in construction work, hence most of their provisions are essential to good construction.

It is the inexperienced contractor or superintendent, who is constantly complaining of the decisions of the engineer, not because the engineer or inspector is in error, but because he does not realize the importance of many of the requirements of the specifications.

Mr. Collins remarks: "Cut out some of the fads, such as the cylinder or cone test for determining whether concrete is too wet or not." The principal purpose for inserting such tests in the specifications is to make the specifications complete and thereby eliminate chance for argument with the field engineer or inspector. It is just as important to specify a standard consistency for concrete as to specify standards for the grading or cleanliness of aggregates. When you buy oats, wheat, hay, machinery, gasoline, etc., you expect it to meet a certain established standard. Then why shouldn't the taxpayers expect a certain standard in concrete when they are buying and paying $40,000 for a mile of road, especially when the proper and uniform consistency of concrete may readily affect the strength or usefulness of the road to the amount of 25 per cent?

In reference to states making allowances for materials, facts show that over 90 per cent of all states doing a large amount of road work allow from 75 to 100 per cent on materials delivered. Further, the amount retained by states for work done varies from 10 to 20 per cent. This is not withholding an excess amount of money when it is considered that practically all states are paying for materials delivered.

In reference to hand labor on road work—it is not the engineer who is requiring hand work. Certain results are specified and the machinery company immediately devises some modern machine to do the work and the contractor buys it with the result that it took more time, money and labor to perform the operation with the new machine than it would have done with a simple machine or hand labor.

It is not uncommon to see from $75,000 to $150,000 worth of unbalanced equipment on a road job and then to see the contractor fail to complete 10 miles of road in a season. Contractors have seriously overestimated the value of equipment and in a great many instances overloaded with equipment to the extent that it takes all of their time and energy to keep all of the different units working 50 per cent of the time. Naturally the ledger at the close of the season shows a large expense and a small mileage of work completed.

Excessive equipment is not within itself the cause of excess expense. The chief causes may be assigned to the inability of the contractor or superintendent to keep all units working 100 per cent efficient. The chief reasons why all operations have not been 100 per cent efficient during the past few years are unsettled conditions, poor railroad transportation, uncertain labor conditions and shortage in materials and equipment.

The minor errors or inexperience of the engineer and contractor may cause a few losses and result in a slight increase in prices but let us be conscientious and assign the causes for high cost where they belong, and let the engineer and the contractor unite in an effort to lower highway building costs by attacking fundamental causes.

B. H. Piepmeier,
Engineer of Construction, Illinois Highway Department.

Springfield, Ill.

Drop Hammers Excel in Driving Steel Sheeting in Hard Ground

Sir—Since the results obtained are contrary to the opinion which prevails among contractors experienced in driving steel sheeting, a further explanation may be desirable to account for the fact that heavy drop hammers proved more satisfactory than steam hammers in driving sheet piling for Dry Dock No. 3 at the Philadelphia Navy Yard, as stated in the article in *Engineering News-Record*, April 15, 1920, p. 748. At the outset I freely admit that I consider the steam hammer superior to the drop hammer under any but such extreme conditions as were encountered on the work described.

As pointed out in the article, the sheeting was driven around the dock bottom to hold the banks from sliding and to exclude water from the bottom of the excavation. In order to accomplish this it was necessary to drive the sheeting through the gravel and sand strata and well into the underlying red clay. It was the gravel and sand which made the driving so difficult.

Several feet of ordinary sand lay over the gravel stratum, which varied in thickness from 4 to 8 ft., and under this gravel and overlying the red clay was a very hard and closely compacted white sand. The gravel was semi-cemented and contained many bolders up to 1 cu.ft. in volume. This gravel was quite pervious but unless the water was given a chance to flow freely it remained tightly compacted and hard. The white sand closely resembled a soft sandstone. Efforts to dig it with orange-peel buckets of the heaviest type were largely unsuccessful, but if water was allowed to flow over it freely the sand was readily washed away.

In attempting to drive sheeting through this material, the point brought up on the gravel, and from then on until the point entered the red clay, the driving was exceedingly difficult. An attempt was made to put this sheeting down with a No. 0 Vulcan hammer but almost no progress was made. Records were kept of the driving and where the gravel and sand were thickest as many as 2,200 blows of the steam hammer were necessary in order to drive the sheeting home. This pounding naturally resulted in the bending up of the head of the sheeting and several cutoffs were necessary before the required penetration was obtained. When using a heavy drop hammer, weighing from 3,200 lb. to 4,200 lb., considerably better progress was made, although the driving was slow and tedious. Several attempts were made to sink the piles by means of water jets, but the gravel was too heavy and the attempts were unsuccessful. The driving could only be accomplished by striking heavy, solid blows of sufficient force to break down the material at the pile point and force it to penetrate.

To illustrate the difference in the effect of the steam hammer and the drop hammer, I would compare the operation with that of driving a large spike into an oak timber. If a light hammer were used the spike would be very slowly driven and the head would probably be badly battered up. If a sledge were used, the driving would be more rapid and the spike would not be subjected to such severe battering. The blow must be heavy enough to break down the resistance of the material to be penetrated.

Some of the sheeting was driven by steam hammers, and more of it might have been so driven, but the great weight of the steam hammers, the consequent difficulty in handling them, and the necessity of maintaining large boilers for furnishing steam made the use of drop hammers more satisfactory in the long run.

As might be expected, much of the sheeting was found to be badly distorted and bent when the earth was finally excavated inside the lines of sheeting. This does not indicate faulty sheeting. On the contrary, I think it is rather to the credit of the sheeting that it stood up as well as it did under the conditions.

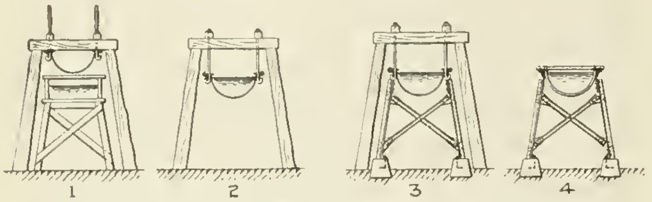
Charles A. Lee,
Lieutenant-Commander (CEC) U. S. N. R. F.

Navy Yard, Philadelphia, Pa.

HINTS FOR THE CONTRACTOR

Metal Flume Quickly Erected from Pole Scaffold

BY enclosing the old structure with a pile scaffolding, a metal flume was constructed last season to replace a wood flume and daily irrigation was maintained. The work was performed in Calaveras County, California, on a ditch owned by D. Fricot, and is described by the owner in the *Highway Magazine* for April, 1920. Both the new and the old construction are indicated by the sketches, which show the sequence of operations.



SEQUENCE OF FLUME ERECTION OPERATIONS
(1) Scaffold built and girders hung from hook bolts. (2) Old flume removed and new flume carrying water. (3) Bents hung from girders and footings concreted. (4) Flume finished and scaffold removed.

Using poles cut from the adjacent woods, a scaffolding was built and the girders for the new flume were suspended under its platform and above the old flume by means of long, threaded hook-bolts. When above 200 ft. of girders had been suspended and connected up, water was shut off and the old flume was removed.

Flume removal was begun early in the morning. As fast as the old structure was cleared away the girders were lowered to grade and the curved flume sheets were placed. By the end of the day, the 200 ft. of new flume was sufficiently finished for water to be turned through it. Then the steel bents were bolted to the girders and the concrete pedestals were built up to meet them. When the concrete had become hard, the supporting hook bolts were removed and the scaffold was taken down. The new flumes complete cost about $5 a foot. About 1,200 ft. of the old flume were replaced, as described, with a total of 36 hr. interruption to irrigation.

TNT Practicable for Ordinary Blasting

COMPARED with ordinary 20-per cent dynamite, TNT is stronger and can be as safely handled and cartridged for ordinary blasting operations. Tests in the field, directed by the Bureau of Mines to determine the practicability of the industrial use of surplus TNT accumulated for war uses gave the following results:

As an outcome of investigation in Wisconsin, in the course of which data were obtained for a large number of stumps blasted, it was determined that the necessary charges per square inch of stump cross-section were 0.055 oz. of 20 per cent ammonia dynamite, 0.0387 oz. of TNT, when using a No. 8 cap, and 0.0445 oz. of TNT when using a No. 6 cap. This indicates a slight advantage for the No. 8 cap, and it was believed by the operators that in the use of the explosive a stronger effect was noticeable with the larger cap. Hence in determining a load it seems desirable to allow about three-fourths as much TNT as would be required of the ordinary dynamites.

In ditching about the same results were obtained with a 5½-oz. cartridge of TNT as were obtained with an 8-oz. cartridge of 20-per cent ammonia dynamite. With one cartridge of TNT in a hole, the holes placed 18 in. apart and driven 24 in. deep, and the charge detonated with No. 6 electric caps, a ditch 54 in. wide and about 20 in. deep was made. Approximately the same size ditch was made with 8-oz. cartridges of 20-per cent ammonia dynamite placed in the same way. In rock work very satisfactory results were obtained by using quantities of TNT that were about 75 per cent of those of the 20-per cent ammonia dynamite usually used.

Full details of handling, preparation of cartridges and charging are given in Circular 94, U. S. Department of Agriculture.

Movable Support for Sinking Pumps

By R. E. Post
Seattle, Wash.

IN putting down a pump or enclosed foundation with sheet piles the sinking pumps are often in the way of the pile hammer unless they are handled by a separate derrick, which is an expensive solution of the problem. The bridge shown in the illustration was devised to get around this difficulty and worked very well when used during the construction of the Keechelus Dam at Meadow Creek, Wash.

The device consists of a bridge supported by bents placed outside of the excavation. A rail is spiked to the top of each trestle cap so that the bridge may be easily moved on this rail with a bar. The pumps are hung with cables operated by winches fastened to the bridge itself. The discharge and steam pipes have swing joints to permit of vertical movement of the pumps and have hose connections at one end of the bridge to permit of lateral movement of the bridge and pumps as whole.

NEWS OF THE WEEK

New York, May 27, 1920

Council Committee Reports on Pittsburgh Bridge Case

Direction of bridge design by architects is approved by a committee of Engineering Council, according to a formal statement just issued by council headquarters. The committee consisted of J. Parke Channing, F. C. Shenehon and Henry C. Meyer, Jr.; it considered the question jointly with a committee of the American Institute of Architects, whose representatives were E. J. Russell, William P. Bannister and Richard E. Schmidt. Following is the statement reporting the committee's findings:

Committee's Findings

"The question whether an architect or an engineer should have charge of the design and construction of bridges and other important structures was brought to the attention of Engineering Council by the American Society of Civil Engineers and by the American Institute of Consulting Engineers. Each organization had adopted formal resolutions expressing its belief that engineers should have charge of design and construction of bridges and other structures in which engineering elements predominated. Occasion for these resolutions was given by the engagement not many months ago of architects to have charge of the design and construction of certain conspicuous bridges in Pennsylvania. This perplexing problem has been considered by the joint committee of Engineering Council and the American Institute of Architects. Whether engineer or architect has the primary engagement for a project on which the services of both are needed, an important requirement, frequently neglected, is that the collaboration should date *from the beginning.* Each should be given fair credit for his contribution to the completed structure.

"After a full and frank discussion of the points at issue, the committee, composed of three engineers and three architects, all of whom were present, unanimously concluded that the special conditions surrounding each case should determine whether an architect or an engineer should be selected to have charge. The safety, adequacy, durability and suitability to purpose of any structure, whether bridge or building, are axiomatic. Under certain conditions structures should in addition be aesthetically excellent. In such cases the design must involve, therefore, collaboration between engineers and architects.

"Whether the engineer is chief and the architect associate or vice versa is an administrative detail of relative unimportance. Either combination should secure satisfactory results."

It is not known at this time whether Engineering Council as a whole will consider and act on this report, according to A. D. Flinn, secretary of the council.

Two Engineers Named Directors of U. S. Chamber of Commerce

The U. S. Chamber of Commerce, at its annual meeting in Atlantic City, April 26-29, elected two engineers, Howard Elliott and L. B. Stillwell, as directors of the chamber. Mr. Elliott is a member of the American Society of Civil Engineers and chairman of the board, Northern Pacific R.R. Mr. Stillwell is past-president of the American Institute of Consulting Engineers and of the American Institute of Electrical Engineers; member American Society of Civil Engineers; and is in practice as an electrical and consulting engineer.

Milwaukee Postpones Construction of Fine Sewage Screens

Construction of the fine sewage screens for Milwaukee, outlined in *Engineering News-Record,* March 11, p. 511, has been postponed until conditions are more normal. Meanwhile experiments will be made with another type of screen, which it is hoped will be as satisfactory as the type bid on and less costly. The date for receiving bids was first set for April 8 then postponed until April 22. On the latter date only one bid was received—from the Chain Belt Co., Milwaukee, which had joined with the city in developing the proposed type of bronze plate belt screen at the testing station. This bid was for $258,600, which was more than 100 per cent above the preliminary estimate. T. Chalkley Hatton is chief engineer of the Milwaukee Sewerage Commission.

Urge Appointment of Shenehon

To fill the vacancy in the American Section of the International Joint Commission created by the death of former Governor Glenn, engineering organizations of the Middle West, including the Western Society of Engineers, the American Association of Engineers and the Sanitary District of Chicago, are recommending the appointment of an engineer. Francis C. Shenehon, consulting hydraulic engineer of Minneapolis, is being supported as a logical candidate for the position. Mr. Shenehon's experience covers 30 years' work in connection with the large problems of navigation and water power in the Great Lakes district.

Pension for N. Y. City Employees

A bill providing for pensions for all employees of the City of New York, and also for disability and life insurance, introduced in the New York Legislature and backed by the Rapid Transit Section of the New York Chapter, American Association of Engineers, has been signed by the Governor.

Conference To Represent 100,000 Engineers

Forty-seven Societies Will Send Delegates to Consider Plan for Engineering Federation

Returns received by the Joint Conference Committee up to May 25 show that 47 organizations, with an aggregate membership exceeding 100,000, will send delegates to the Organizing Conference in Washington, D. C., June 3 and 4. Details of the tentative program were announced last week; there will, in all probability, be certain minor changes before the date of the meeting but the sessions will follow the general plan previously outlined. The names of delegates appointed by the American Society of Civil Engineers and the American Association of Engineers appear elsewhere in these columns. There follows the complete list of societies which will be represented:

American Association of Engineers
American Assoc. of Petroleum Geologists
American Ceramic Society
American Concrete Institute
American Electric Railway Engineering Association
American Electrochemical Society
American Institute of Electrical Engineers
American Institute of Mining and Metallurgical Engineers
American Railway Engineering Association
American Society for Testing Materials
American Society of Civil Engineers
American Society of Mechanical Engineers
American Soc. of Refrigerating Engineers
American Society of Heating and Ventilating Engineers
American Society of Safety Engineers
American Water Works Association
New England Water Works Association
Illuminating Engineering Society
Institute of Radio Engineers
Mining and Metallurgical Society of America
Society for the Promotion of Engineering Education
Society of Automotive Engineers
Society of Naval Architects and Marine Engineers
Society of Industrial Engineers
Colorado Society of Engineers
Portland Technical Council
Kansas Engineering Society
Engineers Society of Western Pennsylvania
Mohawk Valley Engineers Society
Florida Engineering Society
Illinois Society of Engineers
Indiana Engineering Society
Brooklyn Engineers Club
Cleveland Engineering Society
Detroit Engineering Society
Vermont Society of Engineers
Society of Engineers of Eastern New York
Assoc. Engineering Societies of St. Louis
Atlanta Joint Technical Society
Engineers Club of Trenton
Engineering Society of Akron
Engineering Society of Buffalo
Engineers Club of Columbus
Engineers Club of Philadelphia
Washington Society of Engineers
Joint Council of Engineers, San Francisco
National Fire Protection Association

Civil Engineer Delegates to Organizing Conference Named

The ten delegates who will represent the American Society of Civil Engineers at the Organizing Conference to be held in Washington, D. C., June 3 and 4, have been named by President Arthur P. Davis. In addition to Mr.

Davis the delegation includes the following:

Richard L. Humphrey, consulting engineer, Philadelphia, and chairman of the Joint Conference Committee.

Francis Lee Stuart, consulting engineer, New York City.

Leonard Metcalf, consulting engineer, Boston.

George G. Anderson, consulting engineer, Los Angeles, Cal.

Gardner S. Williams, consulting engineer, Ann Arbor, Mich.

John W. Alvord, consulting engineer, Chicago.

Willard Beahan, first assistant engineer, New York Central Railroad, Cleveland, Ohio.

Edward E. Wall, water commissioner, St. Louis.

J. C. Hoyt, hydraulic engineer, U. S. Geological Survey, Washington, D. C.

By action of the Board of Direction at its Chicago meeting in April, the delegates will not have power to commit the society to any federation which may be formed at the Washington meeting. The delegates will bring back a report and any further action by the civil engineers must be through a letter ballot to the membership.

A. A. E. Selects 17 Delegates to Organizing Conference

The American Association of Engineers has selected the following seventeen delegates to represent it at the Organizing Conference of engineering societies to be held in Washington, D. C., June 3 and 4:

George W. Fuller, consulting engineer, New York City.

Isham Randolph, consulting engineer, Chicago.

W. H. Finley, president, C. & N. W. R.R., Chicago.

Dr. F. H. Newell, University of Illinois, Urbana.

L. K. Sherman, president, A. A. E., Washington, D. C.

Daniel L. Turner, chief engineer, Transit Construction Commission, New York City.

R. C. Bailey, Washington, D. C.

A. B. McDaniel, professor of civil engineering, George Washington University, Washington, D. C.

William J. H. Strong, Chicago, Ill.

A. N. Johnson, Portland Cement Association, Chicago.

E. T. Perkins, president, Perkins Engineering Co., Chicago.

Dean G. M. Butler, University of Arizona, Tucson.

H. O. Garman, chief engineer, Public Service Commission, Indianapolis.

I. W. McConnell, vice-president, Dwight P. Robinson & Co., Inc., New York City.

Morris Bien, U. S. Reclamation Service, Washington, D. C.

W. A. E. Doying, inspecting engineer, Panama Canal, Washington, D. C.

J. K. Anderson, consulting engineer, Charleston, W. Va.

It has not been announced, at this writing, whether all the members above listed have accepted.

Will Build Large Wireless Station

Contracts were let last week for the construction of a wireless station of great size at Rocky Point, L. I., for the Radio Corporation. The station when completed will have a diameter of more than 3 mi., and will have twelve sets of antennæ supported by 72 self-supporting steel towers 400 ft. high at a distance of 1½ mi. from the power house. It will consist of five units, intended respectively for communication with Argentine, France, Scandinavia, Germany, Italy, and Poland. The cost is estimated at $10,000,000. According to the J. G. White Engineering Corporation, contractors for the station, work will begin immediately.

Most of St. Louis Bonds Defeated by Constitutional Handicap

Although every one of the items in the proposed $24,000,000 bond issue at St. Louis received from 62 to 69 per cent of the vote cast on May 11, and the average majority was some 10,000, only five of the eighteen items were carried, owing to the constitutional requirement of a two-thirds majority. The items are shown in the accompanying table. In planning the bond program, the city authorities had the advice of a committee representing numerous civic and commercial bodies. The bond issue was promoted by a Citizens' Municipal Bond Committee, through newspaper advertisements and otherwise. A Supervisory Committee of seven members, representing as many organizations, was created to represent the public and confer with the Board of Public Service in the expenditure of the proceeds of the bonds. The Chamber of Commerce selected for this committee Baxter L. Brown, ex-president Engineers' Club of St. Louis.

ST. LOUIS BOND ELECTION VOTE

	Amount		Vote* Margin
Elimination of grade crossings	$905,000	+	872
Purchase and equipment of new parks	1,385,500	—	1,363
Improvement of existing parks	1,174,500	—	658
Municipal auditorium	900,000	—	2,767
Sewers	2,575,000	—	869
River Des Peres improvement	9,000,000	—	2,173
Municipal work farm (to replace the present Workhouse)	400,000	—	3,072
Municipal sanatorium farm (for tubercular, curable insane, feeble-minded and infirm)	1,100,000	+	674
Municipal Bridge, west end approach	1,500,000	—	2,463
Municipal dock and rail terminals	1,700,000	—	1,689
Widening streets	1,250,000	—	821
Fire engine houses and equipment	360,000	+	930
Bellefontaine farms (delinquent boys)	156,000	—	1,162
Additional cells, City Jail	76,000	—	2,415
Morgue	68,000	—	13
Municipal garage	90,000	—	2,787
Maintenance of streets	360,000	+	159
Electric lighting system, parks and streets	1,000,000	+	203
Total	$24,000,000		

*Plus sign (+) indicates number of votes above and minus sign (—) number below the required two-thirds majority. The total number of votes cast ranged from 61,677 for lighting to 64,908 for the auditorium The registration was 147,105

Presidential Candidates' Views on Engineer Matters Sought

The American Association of Engineers, through its secretary C. E. Drayer, has addressed to each of the candidates for the presidency a letter in which the candidate is requested to give an answer to each of six questions. The complete letter follows:

> At the Sixth Annual Convention of the American Association of Engineers last week a series of six questions was drafted, designed to bring out the position of candidates for President on subjects in which the engineer will be especially interested. A resolution was unanimously passed directing that these question be sent to all candidates.
>
> The American Association of Engineers is composed of 18,000 professional engineers rather evenly distributed over the country. They wish to help maintain our government on a high plane of efficiency.
>
> If you will kindly answer the following questions at your early convenience, steps will be taken to acquaint our members and the public with your answers:
>
> 1—Are you in favor of a National Department of Public Works, for the purpose of reducing and co-ordinating the present number of bureaus and commissions, and reducing the useless expenditures of money incident thereto?
>
> 2—Are you in favor of assembling and co-ordinating all the engineering and construction enterprises of the government (excepting the purely military works) in a department such as the National Department of Public Works, to the end that economy and efficiency will be obtained?
>
> 3—Do you favor the appointment of an engineer of recognized ability and unimpeachable character as a member of the Inter-State Commerce Commission?
>
> 4—Do you favor the budget system of appropriation of public funds?
>
> 5—Do you favor the reclamation of waste lands by drainage, irrigation, flood control or other methods?
>
> 6—Do you favor giving the settler the advantage of procuring the land by a sound financial system such as is provided by a rotating fund?

The foregoing letter has been sent to Major General Leonard Wood of Chicago, Senator Hiram Johnson of California, Governor Frank O. Lowden of Illinois, Herbert Hoover of New York, Senator Warren G. Harding of Ohio, Governor Henry J. Allen of Kansas, Governor Calvin Coolidge of Massachusetts, Hon. William Jennings Bryan of Nebraska, Wm. G. McAdoo of Washington, D. C.; A. Mitchell Palmer of Washington, D. C.; Governor James M. Cox of Ohio, and Senator Atlee Pomerene of Ohio.

Mechanical Engineers Discuss New Code of Ethics

A proposed new code of ethics, prepared by a committee of the American Society of Mechanical Engineers, but intended to serve as a basis for a code of principles for all engineers, was discussed at the semi-annual meeting of the society in St. Louis this week. The essential feature of the code is its brevity—it contains but fourteen short paragraphs. The code is intended to be a brief, positive statement of the professional relations of engineers to the public, to their clients or employers, and to one another.

The committee formulating the code recommended the establishment of a standing committee on professional conduct to interpret it, and also to judge cases of questionable ethical conduct on the part of engineers.

Terminal Engineers Elect Officers

At the recent annual meeting of the Society of Terminal Engineers, New York City, the following were elected as officers for the coming year: President, John Meigs; vice-presidents, E. H. Lee, Calvin Tompkins, Charles Whiting Baker, Maurice W. Williams and R. H. McLain; treasurer, W. Joshua Barney; secretary, J. H. Leonard, 20 Vesey St., New York City.

Los Angeles Engineers Discuss Building Ordinance and Terminals

The Southern California Association of Members, Am. Soc. C. E., called a special meeting for April 28. The desirability of having eliminated from the City Building Ordinance of Los Angeles a clause requiring that plans of reinforced concrete buildings have the approval and signature of a licensed architect was called to the attention of those present, and a committee appointed to report on the matter at the next meeting. The association approved the action taken by the American Institute of Architects at its Nashville Convention, in April, by which the institute is bound to observe the decisions of the National Board of Jurisdictional Awards in the writing of specifications, under penalty of suspension from the Institute. Edwin A. Bergstron, president of the Los Angeles Chapter of the institute, read a resolution, unanimously adopted at the special meeting of April 23, which severely condemned the action against alliance with labor unions. A committee of three was appointed to consider the matter in all its phases and to act for the association and to further notify the board of direction of the society and Engineering Council of such action as was taken by this association.

The proposed method of conducting discussion on "Railroad Terminal Situation in Los Angeles" was outlined by President Barnard, who requested that no unnecessary publicity be given in the press until the association had complied with Mayor Snyder's request contained in a letter to the association in which it was stated that "its members are interested in civic affairs and respectfully request that, independent of any special interests or prejudiced advocacy of any plan, they (Southern California Association) discuss its provisions and make, as early as possible, their constructive recommendations in writing to the committee appointed by me." Mr. Anderson, chairman of the committee on review of the railroad commission's report on Railroad Grade Crossings and Terminals in Los Angeles, read a report of that committee, on which there was considerable discussion. The report of the committee is to be printed and sent to the members for study. On motion of Mr. Hawgood, the board of directors was requested to ask Mayor Snyder to furnish the necessary copies of the Railroad Commission's report to the members for their study, to the end that the association could intelligently comply with the request contained in his letter above referred to.

Highway Engineers and Contractors Urge Cut in Construction

The shortages in labor and materials and the lack of transportation have resulted in the recent adoption of two widely separated sets of resolutions urging a cut in construction work to the minimum consistent with the most urgent public needs. The first of these resolutions comes from W. S. Keller, state highway engineer of Alabama, who recently called together all state highway engineers and Federal highway engineers in District No. 8, comprising the states of Alabama, Tennessee, Florida and Georgia. In the resolution, all city, county, state and Federal engineers are urged to co-operate in cutting down as far as possible construction programs for the current year.

In a special meeting held in St. Paul, May 10, the Northwestern Association of General Contractors resolved that in the interest of the public good it was necessary to eliminate all non-essential construction in order to divert labor and materials to "essential productive industry."

No Bids on Pittsburgh Job

No bids were received by the Director of Public Works, Pittsburgh, in response to his advertisement, for the widening and improving of East Carson Street. The estimated cost of these improvements was $315,000 and as contracts are not awarded by the city unless bids are as low as the estimated cost, it is evident that the contractors were not willing to undertake the work at the city's estimate. The specifications will probably be revised and another attempt made to secure bids.

Berresford Heads Electrical Engineers

At the annual business meeting of the American Institute of Electrical Engineers, held in New York City, May 21, the report of the committee of tellers on the election of officers for the administrative year beginning Aug. 1, 1920, was presented, and the following were declared elected: President, A. W. Berresford, Milwaukee. Vice-presidents, E. H. Martindale, Cleveland; Charles Robbins, Pittsburgh; Charles S. Ruffner, New York; C. E. Magnusson, Seattle; C. S. McDowell, U. S. Navy; L. T. Robinson, Schenectady. Managers, E. B. Craft, New York; Harold B. Smith, Worcester; James F. Lincoln, Cleveland. Treasurer, George A. Hamilton, Elizabeth, N. J. (re-elected).

At the meeting of the Board of Directors held on the same date, F. L. Hutchinson was re-elected secretary of the institute for the coming administrative year.

Construction Industries Approve Public Works Department

Approval of the plan for the creation of a National Department of Public Works was given by the membership of the National Federation of Construction Industries in a letter ballot recently canvassed. The two questions submitted were:

"1. Shall the Federation endorse the Jones-Reavis Bill s-2232-H. R. 6649 for the creation of a Federal Department of Public Works?

"2. Shall the Federation endorse the principle of a Federal Department of Public Works?"

The results of the ballot were as follows:

	Question 1, Per cent	Question 2, Per cent
ASSOCIATIONS		
Yes	72.7	100
No	18.1	...
Not voting	9.2	...
	100	100
INDIVIDUALS		
Yes	75.0	92.8
No	17.7	7.2
Not voting	7.3	..
Total	100	100

It will be noted that 100 per cent of the member associations approved Question 2 and that 92.8 per cent of the individuals approved it.

Reclamation Service Changes

On recommendation of Arthur P. Davis, who for several years has been director and chief engineer of the U. S. Reclamation Service, the Secretary of the Interior has changed the title of F. E. Weymouth from chief of construction to chief engineer, with an increase of salary. The title of Mr. Davis has been changed from director and chief engineer to director. There is no change of duties in either case.

Huge Concrete Building for Manhattan

Reinforced concrete has not been used as extensively in building construction on Manhattan Island as in the rest of the country, or for that matter in other boroughs of New York City. There is now, however, under construction the largest building of that type ever built in Manhattan and one of the largest concrete office buildings ever erected. The structure, to be occupied mainly by the Western Electric Co. and the New York Telephone Co., is partly an 11-story office building and warehouse and partly a 5-story and basement warehouse and will occupy the entire block surrounded by Hudson, West Houston, Greenwich and Clarkson Streets. The construction will cover an area of 338 x 200 ft. There will be 583,000 sq.ft. of floor area, and it will be throughout of reinforced concrete, with the exception of a veneer of brick on the exterior walls. Work was begun May 1. It is expected that the owner will occupy the building by May, 1921. The cost of the whole operation will involve nearly $3,000,000. The Turner Construction Co. is the contractor, McKenzie, Voorhees &

Gmelin are the architects, and Meyer, Strong & Jones are consulting engineers on the electrical and mechanical equipment.

Would Extend Payment by Railroads for Betterments

A bill amending the Transportation Act, giving the railroads the right to extend payment of indebtedness, due to the Government for additions and betterments made during the period of Federal Control, over a period of fifteen years instead of five years, as now provided, has been introduced by Senator Cummins, chairman of the interstate commerce committee. The bill also prescribes that the Interstate Commerce Commission, rather than the Secretary of the Treasury, be empowered to designate the security to be offered by railroads in making loans from the $300,000,000 Government revolving fund.

It is understood that the interstate commerce committees of both branches of Congress have agreed to these amendments, suggested by testimony of railroad officers and shippers taken recently before the Interstate Commerce Commission and the Congressional committees.

Secretary of Interior Succeeds Hines as Rail Director

John Barton Payne, Secretary of the Interior, has been appointed by President Wilson to succeed Walker D. Hines as Director General of Railroads, in which capacity Mr. Lane will have charge of winding up the affairs of the Railroad Administration and making settlement with the private managements as provided in the Transportation Act.

Jerry O'Shaughnessy Honored After Fifty Years' Service

On the recent fiftieth anniversary of his entering the service of the waterworks of Columbus, Ohio, Jerry O'Shaughnessy, for many years superintendent, was presented by his associates with a floral tribute and $100 in gold. Illustrated appreciations appeared in the local newspapers. It was with pick and shovel on May 9, 1870, at the age of 17, that Mr. O'Shaughnessy began his long period of service by helping dig the foundations for the old West Side pumping station. When the station was put in use, April 1, 1871, he became wiper. After six months in this position, followed by a like period as fireman, he became engineer at the station, which position he filled for 17 years. He then resigned to become engineer of the Wyandotte Building. After 18 months, or in 1896, he was appointed superintendent of water-works, which position he has held ever since, except for three mayoralty terms when the mayor was a political opponent. Mr. O'Shaughnessy has been a member of the American Water Works Association for over thirty years.

Show Need for More Engineers

That the number of graduates from technical colleges is insufficient to meet the demands of the country for engineers was the contention of educators and representatives of industry at a conference held in Washington May 14 and 15 under the auspices of the U. S. Bureau of Education, presided over by Dr. Walton C. John. Hon. P. P. Claxton, commissioner of education, declared that there was a growing need for closer relationship between industry and the higher branches of education and called attention to the need of more men for highway engineering and motor transport engineering as a result of the rapid development in that field in the past few years. This need was also emphasized by Thomas H. MacDonald, chief of the Bureau of Public Roads, and Roy D. Chapin, president, Hudson Motor Car Co.

Doctor John, in his address, pointed out that 150 colleges were at present giving one or more courses in highway engineering but that only two were offering complete courses in highway and highway transport engineering. A resolution was adopted by the conference calling attention to the need for a greater activity and closer co-ordination between industry and education.

Engineers Consider Licensing

The Lincoln (Neb.) chapter of the American Association of Engineers, May 17, considered the tentative draft of a bill for the licensing or registration of professional engineers and land surveyors in Nebraska. This bill will be one of the principal topics taken up at the meeting of the Nebraska State Assembly of Engineers to which Prof. E. E. Mickey, State University, and G. W. Bates, city engineer, Lincoln, were elected delegates.

Doctor Drinker Retires as President of Lehigh University

Dr. Henry S. Drinker, president of Lehigh University since 1905, has announced his retirement to become effective at the convenience of the Board of Trustees. He will reach the age of seventy this year. Dr. Drinker believes that his work should be turned over to a younger man.

Doctor Drinker graduated from the Lehigh School of Mines in 1871 and entered the Mining Department of the Lehigh Valley R.R. at Wilkes-Barre, Pa. He was engaged in mining and railroad engineering work for the Lehigh Co. for several years, and in 1876 was admitted to the bar and engaged in the practice of railroad and corporation law, becoming attorney and eventually solicitor of the Lehigh Valley R.R. At two different periods he also served as assistant to the president of the road and was vice-president of the East Jersey Water Co. In 1912 he was appointed a member of the executive committee of the new Water Conservation Commission of Pennsylvania.

Ask More Money for Eastern Super-Power Investigation

Although a bill has passed the House of Representatives carrying an item of $125,000 to be devoted to an investigation of the possibilities of the so-called Boston-Washington super-power project, the Secretary of the Interior has asked Congress for a total appropriation of $250,000 for the purpose, and hearings are now being held by the House Committee on Appropriations in consideration of the matter. The investigation would be undertaken by the United States Geological Survey and would cover water, steam, electric, and all power production and distribution in relation to the industries within the territory surveyed.

Conflict in House Reports on Col. Cooper's Muscle Shoals Work

Col. Hugh L. Cooper, consulting engineer, New York City, comes in for some attention in the reports made to the House of Representatives by its special committee which is investigating war expenditures. In connection with the government's nitrate program, the majority report says:

> Anyone who opposed or sought to modify the plans of the President and Secretary of War for the development of Muscle Shoals was either disregarded or disciplined. . . . Colonel Hugh Cooper, builder of the Keokuk dam, and called by the President to build the Wilson dam, advised that the foundations of the dam were probably unsafe, and within the same month was relieved from further service at Muscle Shoals, and sent to France.

The report made by the minority refers to Colonel Cooper as follows:

> As for Colonel Hugh Cooper and the Wilson dam, in March, 1918, Colonel Cooper, who is an eminent engineer and the successful builder of the Keokuk Power Dam in the Mississippi River, was ordered to the Muscle Shoals site to inspect it and to review the plans and recommendations of Major Burgess. This was before the order for its construction was issued and was evidently in preparation for that order. Colonel Cooper performed these duties and made a number of recommendations, the most important of which were fully adopted It was probably the purpose to have Colonel Cooper begin the work when he went there, if satisfied with the plans but in view of his recommendations, which were highly important, the construction was delayed in beginning until the following August, evidently in order that these recommendations might be considered and the investigations which he suggested made. In the meantime, the services of this eminent officer were needed in the building of an immense dock projected in France, and in May, 1918, he was returned there, being made base engineer at base No. 2 at Bordeaux.
>
> Instead of being disciplined, the suggestions of Colonel Cooper with regard to the dam were largely followed, the investigations as to foundations were made, and while this was in progress he was, because of his recognized ability for the work, sent to another place to serve his country.

Pittsburgh Construction Work Inactive

Shortage of labor and materials in Pittsburgh, coupled with the strike of the railroad trainmen, has caused a radical curtailment of plans for construction work during the present year. The city has available for repaving work about $1,650,000, but under present conditions it will be able to spend but half that amount. The plaza entrance to Shenley Park will undoubtedly be held over for another year. The Beechwood Boulevard bridge at the entrance to Shenley Park and the Island Avenue bridge will be held over for a year on account of shortage of structural steel. It is doubtful if anything is done on the proposed Boulevard of the Allies this year, except to complete the surveys.

Professor Whipple on Mission To Combat Cholera and Typhus

Prof. George C. Whipple, chief of the department of sanitation of the League of Red Cross Societies, accompanied by Capt. Patrick Kenny, private secretary to Sir David Henderson, director general, left Geneva May 5 for a trip to Roumania on a joint mission for the League of Red Cross Societies and the League of Nations. Conferences will be held with the Roumanian officials and inspections will be made in regard to methods of combatting typhus and cholera, which now threaten western Europe. Professor Whipple expects to spend the month of June in England, July and August in France and Switzerland and September in Italy. He will return to Harvard University about Oct. 1.

Buffalo Engineers Co-operate With Chamber of Commerce

Buffalo engineers and architects have formed a temporary organization as a unit of the new ways and means committee of the Chamber of Commerce of that city. William B. Powell, of Cundall, Powell & Mosher, architects, has been selected as temporary chairman of the organization. The members of the organizing committee include L. A. Harding, Charles Wood, Frederick K. King and Dr. C. C. Derrick. Plans are underway to establish a permanent organization of engineers and architects to co-operate with the Buffalo Chamber of Commerce in promoting the city's engineering and industrial development.

Bascule Supersedes Swing Bridge

A single-leaf double-track trunnion bascule bridge giving a clear navigable channel of 125 ft. is to replace the present drawbridge of the Wabash R.R. over the Rouge River at Detroit, Mich., as ordered by the War Department in connection with the widening of the channel. The bridge is so designed as not to involve any patents on bascule bridges. It will be operated by direct-current electric motors with a gasoline engine for reserve. The main pier of the trunnion end will be carried down to rock but the rest pier will have a pile foundation. To avoid interference with the existing swingbridge the new span will be erected in vertical position. The design and construction are under the direction of A. O. Cunningham, chief engineer of the Wabash R.R. The new masonry will be built and the old substructure removed by the J. W. McMurry Contracting Co., Kansas City, Mo. The erection of superstructure and dismantling of the old bridge will be done by the Kansas City Bridge Co., the steelwork and machinery being fabricated by the American Bridge Co. It is expected to have the new bridge in operation early in 1921.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

AMERICAN WATER WORKS ASSOCIATION, New York City; Montreal, June 21-26.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; Asbury Park, N. J., June 22-25.

AMERICAN PUBLIC HEALTH ASSOCIATION, Boston; San Francisco, Sept. 13-17.

ORGANIZING CONFERENCE of National, State and Local engineering societies; Washington, D. C., June 3-4.

The Western Society of Engineers at its meeting May 20 held a general discussion on Chicago terminal problems. J. R. Bibbins, of the Arnold Co., discussed the relation of motor trucking to city pavements and suggested a much more extensive use of electric railways for local freight service. A. J. Hammond, assistant chief engineer of the Chicago Union Station Co., outlined the plans and progress for the new railway terminal. The society has resumed the practice of several years ago in providing an out-of-town excursion May 28 to Madison, Wis., to visit the Forest Products Laboratory, University, Gisholt Machine Co., and State capitol.

The Canton (Ohio) Engineers' Club has been formed with more than one hundred members. Engineers will address the club twice a month, and a library will be installed in the clubrooms. The officers elected are as follows: President, E. J. Landor; first vice-president, H. J. Eberman; second vice-president, H. B. Waha; secretary, J B. Haller; treasurer, L. D. Merry.

The Engineering Society of Western Massachusetts held its first annual meeting at Springfield, May 10. Following the speech of acceptance by C. C. Chesney, the new president, Magnus W. Taylor, chairman of the Industrial Conference Board, spoke on "High Lights on the Present Industrial Situation."

The State Sanitary Engineers' Assocition will meet in Washington, D. C., May 23-27, at the time of the conference of State and Provincial Health Officers. The organization of the assocition, started in New Orleans last fall at the American Public Health Association, will be completed. Chairman, C. A. Haskins, State Department of Health, Lawrence, Kan.; secretary, M. Z. Bair (Arkansas).

Personal Notes

GEORGE M. SMITH, superintendent, Delaware division of the Pennsylvania R.R. Co., at Wilmington, has been appointed superintendent of the Baltimore division, with headquarters at Baltimore. He succeeds GEORGE R. SINNICKSON, resigned. H. H. GARRIGUES, engineer of maintenance of way, Southern division, becomes superintendent of the Delaware division, succeeding Mr. Smith. FRANKLIN DUANE, division engineer of the Baltimore division, succeeds Mr. Garrigues. W. F. MILLER, division engineer, Williamsport (Pa.) division, succeeds Mr. Duane as division engineer of the Baltimore division. N. D. VERNON, supervisor of the Maryland division, becomes division engineer of the Williamsport division in place of Mr. Miller. W. L. BURT, assistant superintendent, Maryland division, has been transferred to the Baltimore division as assistant superintendent, and the position of assistant superintendent of the Maryland division has been abolished.

PHILIP GUISE, formerly chief engineer of the Mason & Hanger Construction Co. on the erection of the Charleston, S. C., army base, has been elected secretary to the newly created engineering board for the pier development of Jersey City.

WALTER S. OLSON, formerly lieutenant, Chemical Warfare Service, U. S. Army, has been appointed office engineer by the Commissioner of Drainage and Waters of Minnesota, St. Paul, Minn.

JAMES R. POLLOCK, assistant engineer, Illinois State Board of Health, has joined the city engineer's staff in Flint, Mich., and will make an investigation of the sewage disposal problem.

A. W. VERHAREN has been appointed city engineer of Helena, Mont.

FREDERICK L. FORD, formerly city engineer of Hartford, Conn., and recently city engineer of New Haven, has resigned to become vice-president and general manager of the Connecticut National Pavements, Inc., just organized, which will take over the rights of the National Paving Co., with headquarters at New Haven.

CAPTAIN A. M. DAVIDSON, assistant division engineer, Baltimore & Ohio R.R., at Cleveland, has been promoted to assistant trainmaster at Portsmouth, Ohio. CAPTAIN P. W. ELMORE, assistant engineer, Indiana division, has been promoted to assistant division engineer at Toledo. LIEUTENANT J. W. PURDY, assistant engineer, Ohio division, has been promoted to assistant division engineer, at Chillicothe, Ohio. MARK H. BEARD has been appointed assistant division engineer, Cleveland division, at Cleveland.

F. P. MOFFAT, of Winnipeg, formerly senior division engineer on the

Hudson Bay Ry., is now in the employ of the Canadian Department of Railways and Canals in connection with the valuation of the Grand Trunk Ry. System, preparatory to its being taken over by the Canadian Government.

J. E. Byers, filtration plant superintendent at Twin Falls, Idaho, has resigned to accept a position with Burns & McDonald, Kansas City, Mo. He is succeeded by L. G. Satterly.

Clarence Wilson has been appointed water superintendent at Montpelier, Idaho, to fill the vacancy caused by the resignation of W. J. Barnes.

H. J. Finebaum, formerly engineer, Shipyard Plants Division, Emergency Fleet Corporation, at Philadelphia, on the design of floating drydocks, is now assistant engineer in charge of the office of C. W. Hudson, consulting engineer, New York City.

Philip Baron, for the past several years associated with Thomas L. Tomlines, consulting engineer, Syracuse, N. Y., in paper mill design and construction, has accepted a position with the St. Regis Paper Co., Deferiet, N. Y.

Lieutenant-Colonel E. B. Morden, recently provisional appointee, has been appointed permanent chief of the Bureau of Street Cleaning of Philadelphia. During the war Colonel Morden was constructing quartermaster at Camp Custer, Battle Creek, Mich., and subsequently constructing quartermaster of the Philadelphia Army Supply Base.

Elwyn E. Seelye, consulting engineer; Edwin A. Fraser, formerly with the Truscon Steel Co.; A. L. Stevenson and C. H. Hamilton have formed a partnership under the firm name of Seelye & Fraser, with offices in New York City. A. L. Stevenson will have charge of the designing department and C. H. Hamilton of the concrete detailing department. An associate structural steel detailing company has also been formed under the firm name of Seelye & Tarbell. Charles E. Tarbell for a number of years was connected with the Westinghouse, Church, Kerr Co., and during the war was structural engineer on the $60,000,000 Government nitrate plants at Toledo and Cincinnati.

G. C. Koons, assistant division superintendent of the Pennsylvania R.R., at Miffintown, Pa., has been appointed assistant chief engineer, with office at Philadelphia.

Edmund S. Davis will retire as chief engineer of the Boston Transit Department on July 1. As an engineer of the department for the last 25 years, and for eleven years chief engineer, he has been connected with the construction of all of the Boston subways. In his present absence from the department, on leave, Ernest R. Springer, assistant engineer, is acting chief engineer, but no permanent appointment will be made until the vacancy actually occurs by the retirement of Mr. Davis.

Col. Chester Harding, Corps of Engineers, U. S. A., Governor of the Panama Canal, has, at his request, been placed on the retired list of the Army, with the rank of brigadier-general.

F. L. Francisco, city representative on the Board of Supervising Engineers, Chicago Traction, has resigned and will give his entire time to his consulting practice as a member of the firm of Francisco & Jacobus, New York and Chicago.

W. R. Holway, president, Holway Engineering Co., Tulsa, Okla., has been retained as consulting engineer by the city of Tulsa to advise in water and sewerage problems.

E. L. Brandt, assistant engineer in charge of special work on the Michigan Central R.R., has been made assistant secretary of the American Association of Engineers in charge of the railroad department.

Nicol, Gould & Redman is the name of a new engineering firm established by David A. Nicol, recently highway engineer of Saginaw County, Mich.; Fletcher A. Gould, formerly professor of civil engineering at James Millikin University, and Charles H. Redman, an engineer of thirty years' experience in municipal, railroad, drainage and appraisal work. The firm is located in the Mercer Building, Saginaw, Mich.

Obituary

D. O. Robinson, superintendent of construction on the Hetch Hetchy project in California, was recently killed in an accident on the site of that work. He was formerly mechanical superintendent on the construction of the Lower Otay Dam at San Diego, Cal., completed in 1919.

Colonel Thomas Mann Randolph Talcott, civil engineer, died at Richmond, Va., May 7, aged 82 years. He was born in Philadelphia, in 1838, one of the sons of Captain Andrew Talcott, formerly of the Corps of Engineers, U. S. Army. When his father was appointed chief engineer, in 1858, of the Mexico & Pacific R.R., now the Mexican Ry., between Vera Cruz and the City of Mexico, he accompanied him as his personal assistant. When the Civil War broke out Colonel Talcott was commissioned first lieutenant of engineers in the Confederate Army, under General Lee, and assigned to the river, coast and harbor defense of the State of Virginia. At the close of the war he returned to Mexico and had charge of construction as division engineer of the Maltrata incline between Maltrata and Boca del Monte. Upon his return to the United States, about 1867, at various periods Colonel Talcott served as assistant engineer, Louisville, Lexington & Cincinnati R.R.; division engineer, Chesapeake & Ohio R.R.; general manager, Richmond & Danville, now the Southern Ry.; vice-president and general manager, Mobile & Ohio R.R.; assistant to the president of the Seaboard Air Line Ry., and, in later years, as vice-president, and general manager, Tidewater & Western R.R. He was a member of the American Society of Civil Engineers from 1886 to 1898. Colonel Talcott was also the author of a book entitled "Cost of Transportation by Rail."

Homer Hamlin, consulting engineer, of Los Angeles, whose death was noted in these columns last week, was born at Pine Island, Minn., in 1864. He entered the city engineer's office at San Diego, Cal., as assistant, in 1887, and was successively leveler on construction of the city sewerage system and assistant city engineer in charge of street grading and paving, sewers and water-works. He also made the surveys for the construction of the San Diego cable and electric railways, and superintended the construction of the Coronado Beach outfall sewer. In 1895 he was draftsman in the county surveyor's office at Los Angeles, engaged in the preparation of estimates on street improvement and sewer construction. He was appointed chief deputy city engineer in 1900, and in that capacity made a geological survey of the San Fernando Valley for the city water supply, and prepared plans for the extension of the city sewerage system. The following year Mr. Hamlin became engineer of the U. S. Geological Survey on hydrographic and geologic surveys in California, making surveys of reservoir and dam sites for Salinas Valley and designing dams, tunnels and other structures for the storage and use of the flood waters of that region, finally preparing a general report on the project. In 1903 he was placed in charge of the Division of Hydrology of California, mapping underground and artesian water supplies and the amount of irrigated and irrigable land. Following that work he designed dams, canals and levees for the reclamation of land along the Colorado River for the U. S. Reclamation Service. He was appointed city engineer of Los Angeles in 1906, from which office he resigned in 1917 to enter private practice as an engineer and geologist, specializing in surface and underground water supply, sewerage, sewage disposal, irrigation, land drainage and municipal engineering problems. He was sent to Washington by the Salt River Valley Water Users' Association because of his familiarity with the situation, to present to the Secretary of the Interior the desirability of the construction of the Paradise-Verde Project in Arizona. During the past two years he spent considerable time in Phoenix in the compilation of reports for the Reclamation Service and for the Water Users' Association on the proposed development.

A Consolidation of Engineering News and Engineering Record McGraw-Hill Company, Inc.—JAMES H. McGRAW, *Presiden*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN
Editor

Volume 84 NEW YORK, THURSDAY, JUNE 3, 1920 Number 23

At Last a Water-Power Bill

AFTER twelve years of argument and disappointment a Federal water-power bill has passed both houses of Congress, but the history of the bill has been so tumultuous and its fortunes so changeable that it would not do to pronounce judgment or to forecast possibilities until the President has signed it. Probably it is too late to hope for active starting this year of any of the numerous projects that, by report at least, have been waiting on tiptoe for the passage of the bill. Once the President signs it, though, the Government agencies delegated to supervise our Federal water-power policies must immediately organize for service so that the preliminary details of licensing and rate-fixing can be completed and the decks cleared for construction at the earliest possible moment.

Politics!

HARD working taxpayers who put their country above their party will see red when they read the report of the Congressional investigation of the nitrate plants, noted on another page. Common sense will tell them that no human activity could be so completely bad as the Republicans make out the whole nitrate program to be nor so divinely perfect as the lone Democrat would have us believe. Normally, party politics do not come under the purview of this journal, but the recent congressional "investigating" committees have been "too much." If some one will get up a political party that is willing to admit that it is occasionally wrong and that its opponent is sometimes—even though not so frequently—right, we will support it. Temporarily, at least, our opinion of the American people is at a low ebb, because such drivel as this report is obviously what they like, else men shrewd and practical enough to get into Congress would not feed it to them.

Art in Engineering Detail

ROUGH-AND-READY differentiation between the art and the science of engineering, however useful and necessary, is likely to result in obscuring the inherent unity of the two. The same habit of thought and the same methods are brought into play by operations that are strictly part of the art of engineering rather than its science, as by the most highly technical analysis or computation. This is perhaps most apparent, and most instructively so, in the treatment of details. A discussion of stray points in structural design, whose concluding installment is published in this issue, instances how even very "practical" items of engineering are pervaded by reasoning and conclusions of purely scientific character. The fact that many problems are not susceptible of treatment by formula should not mean that they may safely be handled by unguided judgment alone. The true course of solution lies in a fair estimate of the influence of those factors that cannot be measured or introduced into the calculation directly. In most of the detailing that engineering operations involve, this is the case, and correspondingly detailing is a most fruitful field for applying the art of engineering in its truest way.

Destructive and Suicidal

ENTIRE control of the building industry in St. Louis is apparently sought by the local Building Trades Council, judging from a resolution recently passed by that body. The resolution, which becomes effective Sept. 1, has a two-fold aim: To force owners to let contracts upon every bit of construction simultaneously, and to make mandatory the filing with the Trades Council of the names of all bidders. The council, in a recent letter to St. Louis architects, contractors, associations of general contractors, and master builders "expects that owners and architects will let their contracts to one of the contractors or shops approved by the council." It does not seek to "recommend any particular contractor or shop" but simply to approve a list of those "in harmonious relations" with the council. The expressed purpose of the council's action is to avoid strikes or delays in construction work "due to the presence of non-union men." By the provisions of the resolution, therefore, if a contractor employs union labor exclusively his efforts to secure a contract or execute one will not be interfered with by the council. Should he, however, run an open shop, he begins work with a foresworn enemy and with little chance for success. The single aim of the resolution is too crudely apparent—the elimination of all open-shop competition. The action of the council is too clearly another outcropping of an intention shown by many radical labor organizations to control all industry. When will the unions realize that such attempts threaten the very life of industry and the whole common good and are therefore suicidal?

Business Recognizes the Engineer

AT ALMOST every meeting of technical men these days one hears pleas for a closer association between engineers and business men. Professional aloofness is now recognized as one cause which has prevented a fuller understanding of the engineer by the public and, in consequence, has operated against proper recognition and the material benefits which generally accrue therefrom. While there has been much talk, the sum total of actual results has been far short of what is desirable. It is well worth noting, therefore, that a real step forward was taken last month when the United States Chamber of Commerce, for the first time in its history, named two engineers, L. B. Stillwell and Howard Elliott, as directors. To the American Institute of Consulting Engineers, which has been a member of the

Chamber since 1914 and which was represented at the recent annual meeting by George W. Fuller and Colonel F. A. Molitor, much of the credit for the results accomplished is due. The chamber's action means that the engineering profession has been officially recognized as an important influence in the conduct of the nation's business. In future councils of business, therefore, the voice of the engineer will be heard. In the world's progress the engineer feels that he is a vital factor, but the drawback has been that he has not taken the trouble to make the public accept the same point of view. Hence the complaints within the profession about inadequate compensation and lack of status among men. For these conditions the engineer himself is largely to blame. He has stood apart from the rest and, instead of helping shape public opinion, has been content to accept himself at the public's valuation, instead of at his true worth to society. With engineer directors in the United States Chamber of Commerce, however, the policies formed by that body—the mouthpiece of business—will not in future represent solely the views of merchant, manufacturer and banker.

Valuable Service Not Appreciated

INADEQUATE compensation is depriving our cities of their best public servants. The case of the city engineer of Worcester, 43 years in the employ of the city, was noted in our issue of April 15, p. 746. Since then the City Council voted Mr. McClure a salary increase of from $4,000 to $6,000, but the mayor vetoed the increase and for weeks the council remained unable to agree on what to do next. As a result, Mr. McClure will leave the city on June 30, after 43 years of devoted service, and just as the city is starting on a large sewage-works project.

A Start in the Right Direction

IN passing an ordinance directing the city manager of Xenia, Ohio, to assess and collect water rates sufficient to provide for operating expenses, interest on bonds and sinking fund redemption, the City Commission has made a right start after taking over the waterworks from a private company. Unfortunately this action does not appear to have been taken from a sense of sound municipal policy but because unless the works are made self-supporting the bonds issued to pay for the works will carry the city's debt limit beyond the statutory limit. The city should now go further and provide for an equitable distribution of the water-works expenses and capital charges between the city as a whole and private water consumers.

Plank Surfacing for Secondary Highways

CORRESPONDENCE with ten widely separated state highway departments as to the feasibility of constructing plank surface roads for secondary highways indicates that such construction is impractical for two reasons: The present prohibitive price of lumber, and the rapid depreciation of plank surfacing even under light vehicular traffic. States in the lumber producing sections of the Middle West and Far West estimate that lumber needed for such construction, as outlined by Mr. Kershaw in *Engineering News-Record*, May 27, p. 1052, would be at least twice the figure quoted by him. Some states even put the price as high as $65 per thousand feet, board measure, at roadside. Mr. Kershaw's design was also considered inadequate as to thickness of surfacing planks. The consequent increase in the amount of lumber needed to carry even normal traffic would make his suggested type of surfacing exceed in cost some light bituminous types. Judging from letters received from states where lumber is most plentiful it is apparent that the plank surface highway has little place in modern road construction.

Over-Promotion of Roads

TWO communications received recently by the same mail indicate sharply the complexity of the road problem from the engineer's view. One came from an automobile publicity department and the second from a road engineer in Arkansas. The first was a flamboyant facetious mimeographed publicity sheet in the guise of a local newspaper story, suggesting the formation of a national automobile political party. The "news item" stated that there are more than seven million motor vehicles in this country, and suggested that if the owners would all vote the national automobile ticket they could swing every national and state election. Planks in the platform, which were supposed to be the ideas of the local distributor of automobiles (a space being left in the copy for the editor to fill in his name) are as follows: (1) Good roads everywhere with a just distribution of the cost thereof; (2) scientific supervision of gasoline sources of production; (3) fuller use of highways for passenger transportation by motor car and freight transportation by motor truck, both to be encouraged by the Federal and State governments; (4) widening of highways wherever necessary to care for the constantly growing volume of automotive traffic; (5) a scientific investigation of license rates and a just way of determining them; (6) for president, a big automotive business man who could operate the nation on the same basis of efficiency as he employs in operating his factory.

The paragraph from the engineer's letter is as follows:

"One of the very interesting features of the road problems to be solved in this state, is the fact that we are cutting brand new roads through wild country and we find the heaviest motor trucks ready to start hauling over these roads the day they are completed. In the older states we had years after the roads were first built to prepare for such traffic. What is a state to do that cannot afford expensive paved roads when such traffic takes possession of any highway that we attempt to improve with a little gravel or macadam? Of course we expect to pave a lot of the roads, but it would be a big help to civilization just to build light gravel roads in some of the back woods counties so that the natives, who have never been off the plantation on which they were born, could drive their mules to the county seat once a year and pay their taxes. The work now under construction and projected will cost some $5,000,000. I expect to see these communities develop very rapidly during the next few years. They are forty years behind the times, but they have all the good things that made the other states develop."

Of course the advertising man in Detroit who wrote the platform knows that the whole idea of a national automobile party is foolish but it makes snappy "copy" for the country editors and the automobile interests must promote the building of more roads or the saturation point will soon be reached. On good authority it is stated that the total output of 5,000,000 machines which manufacturers planned to turn out in 1920 has been cut materially and the 1921 quota halved. Reports also indicate that labor is not so scarce in Detroit as it was a month ago. The engineer's letter shows the effect of the over-promotion by the automobile interests. What a costly experiment it is going to be for Arkansas. Motor trucks "taking possession" of her newly made light traffic roads through almost virgin territory will surely ruin them in a season. The engineer cannot possibly locate the paved roads in the right place until the country starts to develop. There is need for a most careful planning to get the through routes properly allocated and for regulation to keep box-car loads off the by-ways. A country forty years behind the times cannot spring forward over that period of time in a year by the simple act of building roads. The reversion to type will be swift and the local sentiment vindictive if the roads are ruined by outside interests almost before the mules are hitched to take the long contemplated trip to the county seat. The engineer will then be in a precarious position for not having built the proper road or foreseen the future traffic requirements.

Ultimate Irrigation Plans in Utah

PLANS made to expand the "cradle of irrigation" in America, the Salt Lake district, to its ultimate limit were explained on p. 1064 of our issue of May 27. Small attempts at irrigation were early made about the missions in California and in the Southwest a little irrigation was done by the Indians but little was known of it. In 1847 a small band of hardy pioneers of the Mormon faith reached the shores of Great Salt Lake and began there, in the very midst of the arid West, the diversion of the mountain streams to the desert lands. Thus was irrigation inaugurated in arid America by the Anglo-Saxon race. Operations have been expanded from one stream to another and a few reservoirs have been constructed, for long ago the natural flows were appropriated. Further developments require the building of dams to impound flood waters only and high-line canals to reach areas on the upper benches. Knowing full well that there is more land than water, and that the best plan for all concerned might not be possible after individuals and smaller communities developed local supplies in the easiest way, eight counties in northern Utah formed the Utah Water Storage Association to lay out the development of the water resources of this part of the State as a whole so that any future work may fit into the plan.

The most interesting item in the report recently issued is the proposed scheme of interchange of water over several watersheds from the Northeast to the Southwest. Figuratively speaking, it means tipping water from one basin into another so that the latter may in turn tip an equal amount into an adjacent basin, all with due regard to the prior rights of the intermediaries, whose benefit will come from a more stable supply for themselves and from living in an expanding country. Thus will water, belonging to the Colorado River system, be brought into the no-outlet watershed of Great Salt Lake. It will be many years before the whole scheme is an accomplished fact, but whatever is done will work toward this end. Many intricate Federal, state and local adjustments must be made, but in Utah the give-and-take principle has long been practiced. With this broad viewpoint of the greatest good for the greatest number in mind, it is easy to see much prosperity ahead for the people of Utah.

Recognizing the Human Elastic Limit

WHY WILL so many engineers who show a sense of proportion and fitness in their daily work present a paper before an engineering society which is far too long to be read aloud? These engineers recognize that there is an elastic limit in structural materials but fail to see that human beings have their elastic limit as well—especially after a hard day's work in their offices and while foregoing their usual evening at home or club. It is high time society members did something more than voice disapproval of such papers among themselves. They should join forces in getting action by their society; action that will not only disapprove such papers but will see that they are not presented.

There is seldom any good reason for actually reading a paper. If the speaker knows enough about a subject to warrant his making an address upon it, even if he be unused to speaking, he can prepare topical notes that will suffice as a guide to logical presentation. But bad as it is to read a paper, it is far worse when the paper consists largely of detailed matter, particularly figures, which the hearers cannot possibly remember. Yet again and again the desire to include details is made the excuse for reading the paper instead of presenting it orally. It may be desirable to write out the paper in detail so it can be printed and circulated and filed for reference, but that is another matter. If the subject cannot be presented without detailed figures or written formulas it is not suitable for presentation at a meeting. Time devoted to minutiæ is not only time lost but it may deprive those present of any benefit there might be in a general discussion following a short, ably presented paper.

Offhand, spontaneous comment that sometimes follows a paper concluded early in the evening may be of more value than the paper itself. It is true that too often no discussion whatever is forthcoming. That indicates something wrong and is no excuse for permitting evenings to be wasted in dawdling presentations. If the subject is a live one the secretary can always arrange in advance with a few members to come prepared with short discussions.

A technical paper that is published where it may be used for reference is one thing and an address on a technical subject in open meeting is quite another thing. Until would-be speakers learn what that difference is, technical societies would do well to adopt and print some form of specific instructions to speakers—or to readers of papers, where papers are read. This might be done in a leaflet headed "Specifications for Speeches and Papers" which the secretary could hand to those with whom arrangements are made for addressing the society. Living up to rules stated in a half dozen pointed paragraphs under such a heading might save members of technical societies from hours of agony.

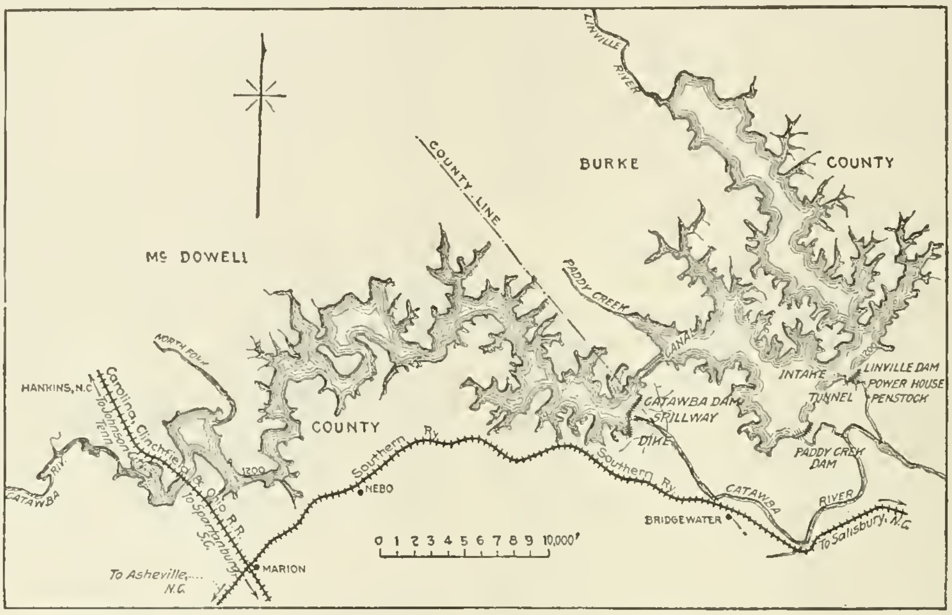
Finally, we again urge that in presenting papers or in making speeches the engineer who is addressing an audience—any audience—should remember that human beings, like structural materials, have elastic limits which he must recognize or run the peril of failure.

Reservoir and Plant for New Southern Water Power

Hydraulic, Structural and Equipment Features of the Bridgewater, N. C., Project of the Western Carolina Power Co.—Storage Reservoir Formed by Three Widely Separated Dams

By William S. Lee, Vice-President and Chief Engineer, Southern Power Company
and
Richard Pfaehler, Hydraulic Engineer, Western Carolina Power Company, Charlotte, N. C.

STORAGE capacity not only for a new hydro-electric station but for a number of allied down-river plants has been provided in the large Bridgewater project in North Carolina, which was commenced in August, 1916, and put into operation last fall. All but one of the hydro-electric plants operated by the Southern Power Co., of Charlotte, N. C., are located on the Catawba River. In order to increase the primary power output at these plants it was decided by the Western Carolina Co., an organization affiliated with the Southern Power Co., to build the Bridgewater reservoir to retain the high-waters of the upper Catawba River and its tributaries and to yield them during the periods of low water on the lower Catawba River. The water discharging from the reservoir is conducted to the new Bridgewater power station by a short tunnel and penstock before it continues to flow in the old river bed. The operations included the construction of three separate dams as well as the powerhouse and appurtenances.



THE BRIDGEWATER RESERVOIR FORMED BY THREE SEPARATE DAMS

Hydraulic Conditions

The drainage area of the Catawba River tributary to the Bridgewater storage reservoir is 370 square miles and the average annual rainfall is from 55 to 60 in. The headwaters of the Catawba come from the steep slopes of the Blue Ridge and Linville Mountains and floods are frequently caused by heavy rains. The highwaters of August, 1908, were considered to be the most severe on record until they were exceeded, by more than 100 per cent, by the floods in July, 1916, which were due to unprecedented rains falling over the eastern slopes of the Blue Ridge Mountains. These rains were caused by the movement of two tropical cyclones, one passing inland over the Mississippi coast and drifting over northern Alabama and eastern Tennessee into the Carolinas, and the other moving in from the Atlantic until it had reached western North Carolina. According to the "Monthly Weather Review" of August, 1916, the rainfall at Altapass, N. C., which is lying on the dividing line of the Catawba and North Toe (Tennessee) River, was measured to be 19.32 in., between 2 p.m. July 15 and 2 p.m. July 16, 1916.

Using the highwater records compiled by the Southern Power Co., it is estimated that, on July 16, 1916, the maximum discharge of the Catawba River into the then proposed Bridgewater Reservoir corresponded to 150 cu.ft. per sec. per square mile drainage area, which is equivalent to a depth of water of 5.58 in. over the whole watershed. For comparison, the precipitations determined by the U. S. Weather Bureau at stations in or adjacent to, the Bridgewater basin are given in Table I. It will be seen that the rainfalls on two successive days were uniformly high throughout the district.

TABLE 1

Station (North Carolina)	Daily Precipitation in Inches	
	July 15, 1916	July 16, 1916
Altapass	3.90	19.32
Blowing Rock	9.85	6.50
Marion	7.83	3.69
Morganton	4.67	4.79

In view of the fact that the Bridgewater reservoir is located within an area which is subject to torrential rains, a spillway capacity is provided which will correspond to twice the record discharge of July 16, 1916, over the entire watershed, before the reservoir level will reach the top of any of the impounding earth dams. The quantity of flood run-off which may be absorbed by the reservoir capacity is disregarded in the estimate.

Storage Capacity of Reservoir

The Bridgewater storage reservoir consists of the three arms formed by the valleys of the Catawba River, Paddy Creek and Linville River. The available storage capacity contained in the Paddy Creek and Linville valleys is 7,266,244,000 cu.ft., and in the Catawba valley 5,315,599,000 cu.ft., giving a total capacity of 12,581,843,000 cu.ft. The Catawba River carries about 75 per cent of the entire flow discharging into the Bridgewater reservoir, whereas the available storage capacity in the Catawba valley is only 42 per cent of the total reservoir capacity. By means of a canal of about 2,500 ft. length, it is, however, made possible to divert portions of the flow carried by the Catawba River into the Paddy Creek and finally into the Linville arm of the reservoir. The canal cross-section is of ample size so as to permit the floodwaters to pass through the canal at low velocities, whenever the water surface in the Catawba arm is above El. 1,167. When full, the water surface of the entire reservoir is at El. 1,200 covering an area of 6,509 acres.

ECONOMIC VALUE OF RESERVOIR

As long as the water surface is above El. 1,167 all the water stored in the reservoir will be discharged through the turbines at Bridgewater Station. Below El. 1,167 no flow may be passed through the turbines at Bridgewater Station and no flow may be passed through the diverting canal; the water stored in the Catawba valley down to El. 1,110 must be discharged through any or all of the four 6 ft. diameter sluice gates provided in the masonry spillway. It is the intention to stop operation of the power station as soon as the water surface of the Paddy Creek and Linville reservoir is below El. 1,150. The stored water between El. 1,150 and El. 1,105 may be utilized, however, to make up a portion of the deficiency in flow of the Catawba River below Bridgewater Station by opening the two 4 ft. diameter turbine relief valves and the 6 ft. diameter gate valve provided at the downstream end of the steel penstock.

The estimated annual flow into the reservoir is indicated in Table II.

TABLE II. GIVING THE NUMBER OF TIMES THE BRIDGEWATER RESERVOIR MAY BE FILLED IN ONE YEAR.

Class of Year	Mean annual run-off per sq. mi. drainage area cu. ft. per sec.	Total annual run-off on watershed Billion cu. ft.	Number of times reservoir may be filled during year to El. 1200	
			Lowest Water El. 1150	*Total available storage exhausted
Extreme dry ...	1.5	17.502	1.83	1.39
Medium dry....	2.0	23.357	2.44	1.85
Medium wet....	3.0	35.005	3.66	2.78
Extreme wet ...	3.8	44.340	4.64	3.52

*Lowest water elevation at 1,105 for Linville & Paddy Creek reservoir and at 1,110 for Catawba reservoir.

Using the records obtained by the U. S. Geological Survey for the Morganton, N. C., gaging station the following discharges applicable for the Bridgewater reservoir were deduced:

Year	Mean Annual Run-off per Sq.Mi. Drainage Area in Cu.Ft. per Sec.
1904	1.43
1905	2.14
1906	3.43

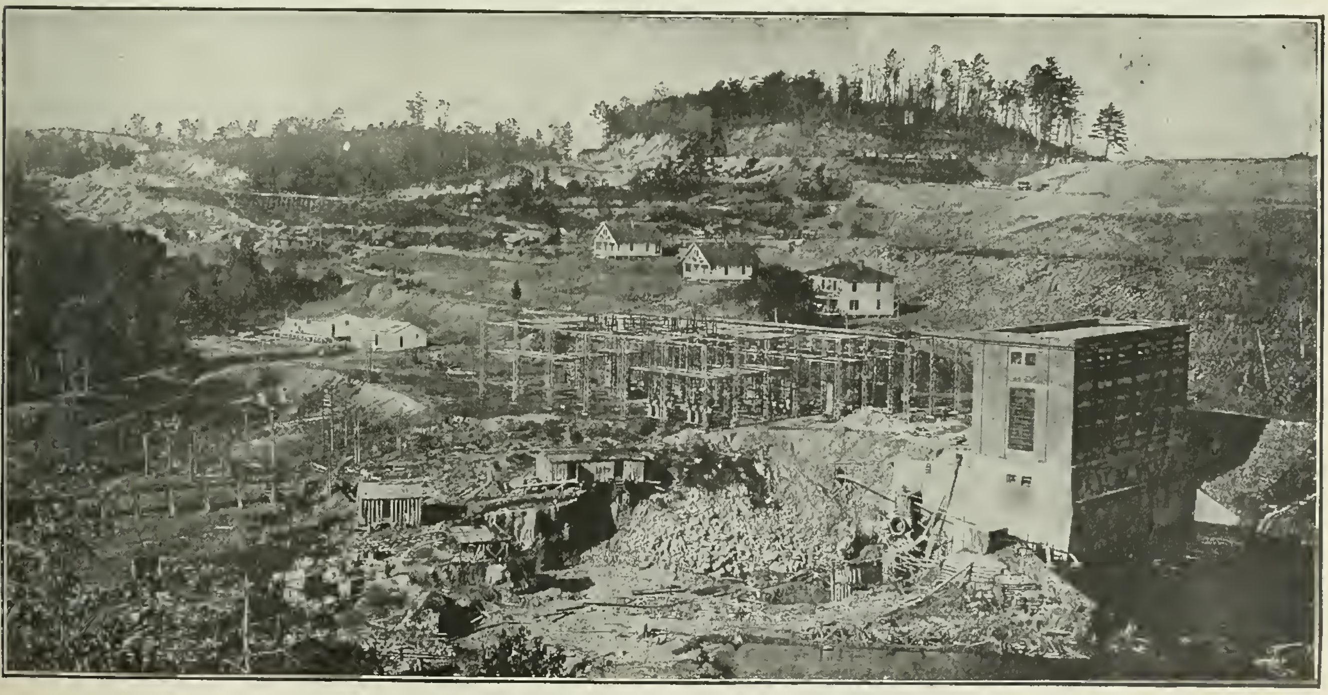
Not considering the Bridgewater power station, the water discharged from the storage reservoir will be available at the following Southern Power Company's plants:

Name of Station	Head at Station in Ft.
Lookout Shoals	76
Catawba	24
Fishing Creek	51
Great Falls	69
Rocky Creek	61
Wateree	72
Total	353 ft.

Using this head of 353 ft., a station efficiency of 80 per cent, and the total available storage capacity of 12,581,843,000 cu.ft., the potential energy contained in the full reservoir is 83,667,000 kw.-hr. The potential energy referred to the Bridgewater Station, considering the available storage capacity in the Catawba valley between El. 1,200 and El. 1,167 and in the Paddy Creek and Linville valley between El. 1,200 and El. 1,150, is estimated to be 18,940,000 kw.-hr.

REQUIRED STATION CAPACITY

The conditions are that, in addition to the existing minimum monthly power output, an output of 17 million kw.-hr. shall be obtained at the stations on the Catawba River by use of stored water from the Bridgewater reservoir. Using an average head of 115 ft. at the Bridgewater Station and a combined head of 353 ft. at the six other plants on the Catawba River the proportionate additional monthly station output of the Bridgewater Section above its primary power output will be 4,177,000 kw.-hr. The estimated minimum monthly out-



END OF CATAWBA DAM EMBANKMENT AND THE BRIDGEWATER POWER HOUSE put of the Bridgewater Station without storage regulation, would be 1,447,000 kw.-hr.; the required maximum monthly output of the Bridgewater Station will be, therefore, 5,624,000 kw.-hr. The actual installation is 20,000 kw. giving a load factor of 39 per cent under these extreme conditions.

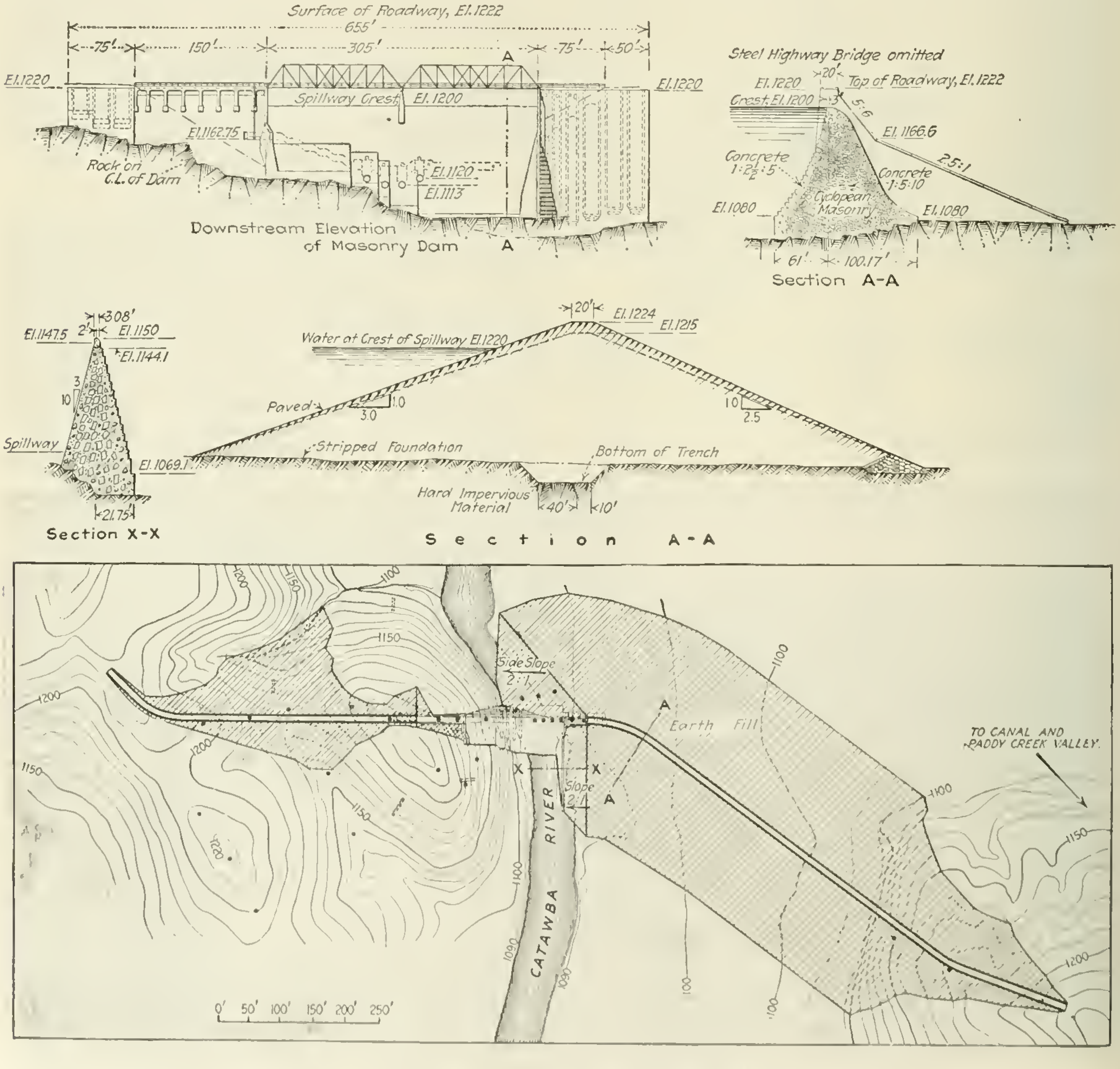
Designing Features of Structures

Owing to the fact that the tracks of the Southern Ry. run along the Catawba River at and east of the town of Bridgewater, N. C., it was found impracticable to consider the construction of a high dam across the Catawba below the mouth of the Linville River. It was, therefore, decided to build separate impounding structures in the Catawba, Paddy Creek and Linville valleys. The sites selected are all located within a radius of 2½ miles from the railroad station at Bridgewater. The topographical and geological conditions encountered at the three dam sites precluded the use of concrete masonry dams. An abundance of suitable earth fill materials was, however, available at the three sites, and earth dams were adopted, the specifications calling for the construction of the dams by the use of steam shovels and the hydraulic sluicing method. In this connection it may be mentioned that the total amount of earthfill materials involved in the entire work was 4,520,000 cu.yd. The spillway structures and extensions tying in with the earthfill work are of cyclopean masonry.

Conforming to the three main arms, of which the Bridgewater reservoir consists, the entire development is subdivided in three zones marked Catawba River work, Paddy Creek work and Linville River work, respectively.

Catawba River Work—The short length of the diverting canal between the Catawba and Paddy Creek valleys, and the fact that the Catawba riverbed and the lower portion of the hill forming the right bank consist of rock favorable for the foundation of a 125 ft. high masonry spillway, were the determining factors in the location of the Catawba dam.

A number of borings and test pits made at the site disclosed the fact that the bottom land on the left side of



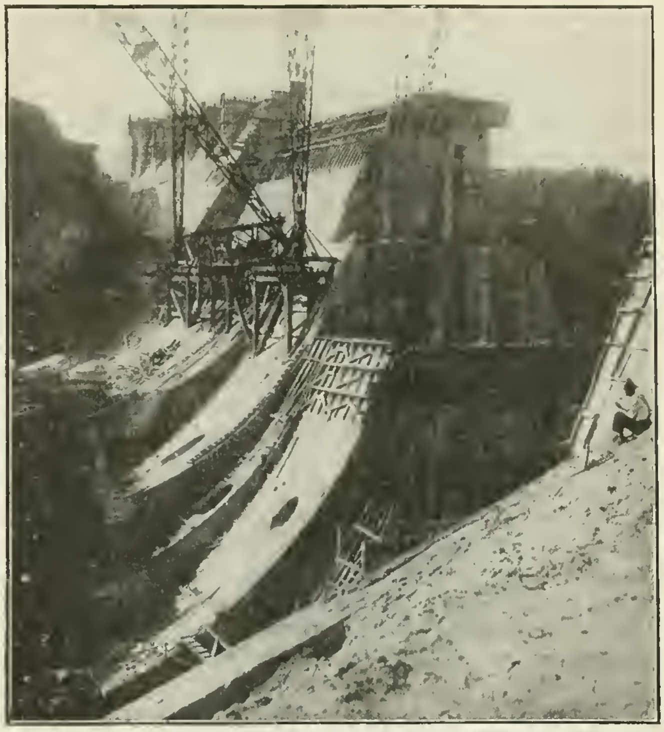
DETAILS OF THE MAIN CATAWBA DAM

the river is underlaid by a water-bearing stratum of round river gravel and boulders beginning about 12 ft. below the surface and having an average thickness of 6 ft. Since it was essential to have a watertight core for the 120 ft. high earth dam to be built over and across this bottom land, it was specified that a trench of 50 ft. minimum width at the bottom should be excavated down to impervious ground and backfilled with selected material.

In order to obtain a satisfactory seal between the north end of the 305 ft. long spillway masonry across the riverbed and the earthfill, a 125 ft. long concrete core-wall with seven fins, each extending 27 ft. 11 in. upstream, is provided. The corewall proper and the fins rest on a common concrete masonry base of 39 ft. 5 in. width and 12 ft. minimum thickness going down to rock foundation; the maximum height of the corewall above the base is 165 ft. A retaining wall of concrete masonry is running 274 ft. downstream measured from the vertical plane through the spillway crest. The upper part of the 75 ft. long portion of corewall nearest to the spillway is built in form of a U abutment. On the upstream side, the sloping earthfill material is retained by the spillway masonry. To protect the upper portion of the downstream side slope from the action of highwater passing over the spillway, a splashwall is provided connecting the retaining wall with the face of the U abutment.

The ogee masonry spillway is of the gravity type and designed for uplift at the base decreasing in a parabolic function from full hydrostatic pressure at the heel to zero at the toe.

As previously mentioned, the lower portion of the hill on the right side of the river consists of rock (gneiss) gradually changing into disintegrated material and clay toward the surface. Taking these geological conditions into consideration, the gap between the spillway and the hill side is closed up by a 150 ft. long masonry bulkhead decreasing from a height of 102 ft. to 60 ft. with the top 22 ft. above the level of the spillway crest. A 75 ft. long corewall, with four fins on the upstream side, is extending still further into the hill and connects with a small earth fill required for joining the south end of the Catawba work with the existing grounds lying above the highwater line of the reservoir. The construction trench cut through the hill is backfilled with selected material and forms a portion of the above mentioned small earthfill; beginning at the junction of the corewall with the bulkhead, the earthfill is given a side slope. A short diverting splashwall is provided on the south end of the spillway, with outlines similar to those on the north end.


CATAWBA DAM UNDER CONSTRUCTION

The 20 ft. wide top of the Catawba earth dam will be portion of a public highway, and the reservoir crossing is effected by two 153 ft. long steel spans of the through

CATAWBA DAM. CORE WALL WITH FINS SHOWN AT LEFT

truss type supported by a reinforced-concrete pier in the center of the spillway. The top of the bulkhead and of the U abutment on the north side of the spillway carry a reinforced-concrete slab bridge.

All the material excavated from the diverting canal cut is used for the construction of the Catawba earth fill.

Paddy Creek Work.—There is a ravine at the lower end of the ridge between the Paddy Creek and Linville River valleys, and the indications are that the Linville River formerly passed through this gorge before it carved its present way through the hill to reach the Catawba River. The site selected for the Paddy Creek dam is below this ravine so that a natural channel is formed between the Paddy Creek and Linville River valleys, by means of which the waters stored in the Paddy Creek valley may be passed into the Linville basin even if the reservoir is drawn down more than 100 ft. below the spillway crest level.

No masonry is involved in the construction of the Paddy Creek dam; but it is estimated to contain 1,450,000 cu.yd. of earthfill materials. The upstream slope of the fill is covered with riprap. To provide an outlet for seepage water accumulated within the dam area, the downstream toe across the riverbed and the bottom land is built of rockfill material having an average height of 15 ft. The maximum height of the dam is 165 ft.

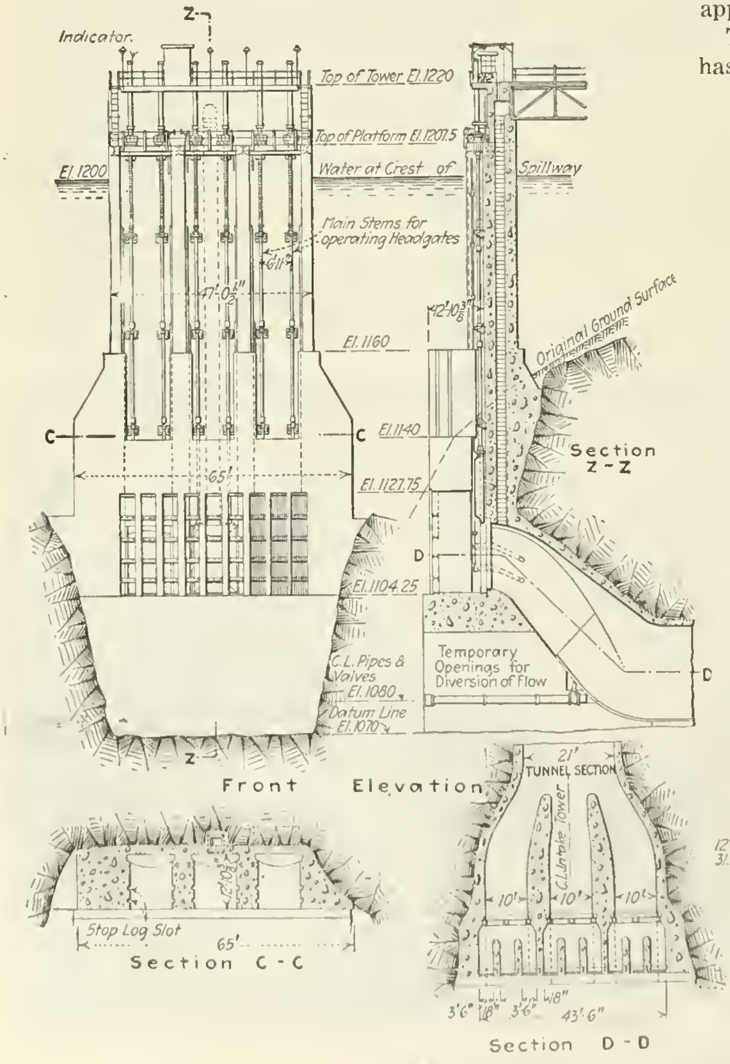
About midway between the Paddy Creek and Linville River dam sites, a depression in the ridge has been further deepened to bedrock and enlarged so as to obtain an additional spillway for discharging the floodwaters into the Catawba River.

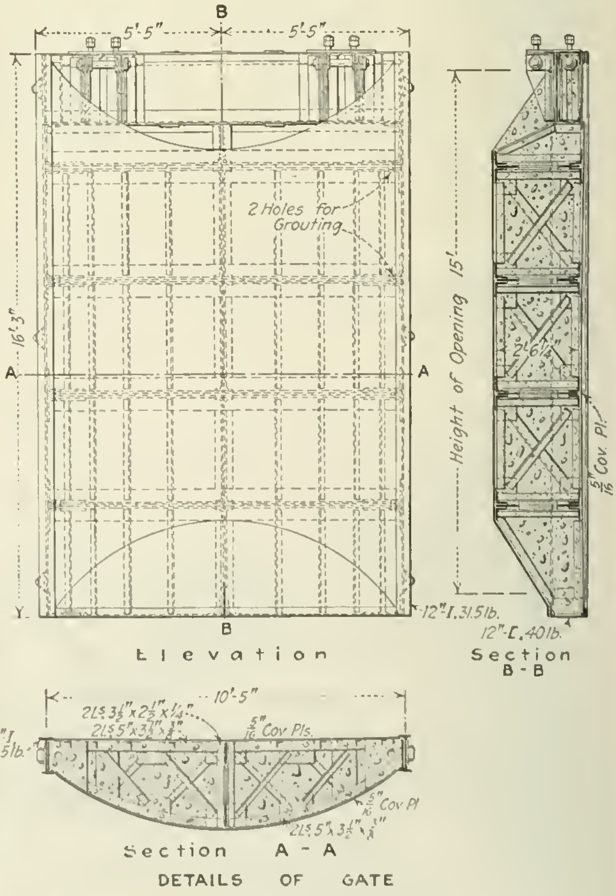
Linville River Work.—The most favorable conditions for the location of a dam were found in the Linville valley where the river breaks through the last obstructing range of hills to join the Catawba River. A bluff consisting of gneiss rises immediately on the right side of the river, and in view of the fact that the normal water level of the Linville River is 17 ft. lower than that of the Catawba River, measured below the respective dam sites, it was decided to pierce this bluff by a tunnel and build the power station right below the Linville dam, at a point where a small grist mill was formerly operated by water power.

The Linville dam is built entirely of earthfill material with the exception of the 12 ft. high rock fill forming the downstream toe. The upstream slope is covered with riprap. It is estimated to contain 1,250,000 cu.yd. of earth fill materials and the maximum height is 160 ft.

The normal flow of water used in the design of the Linville tunnel intake is 2,000 cu.ft. per sec. The top of the intake opening is at El. 1,120 permitting an 80 ft. draw-down of the reservoir without decreasing the wetted intake area. Measured from its foundation the intake structure has a total height of 150 ft. and a steel foot bridge of 5 ft. width and 80 ft. span is provided to connect the top of the tower with the earthfill approach from the Linville dam.

The rack structure forming a part of the intake tower has nine 3 ft. 6 in. wide openings, each 23 ft. 3 in.





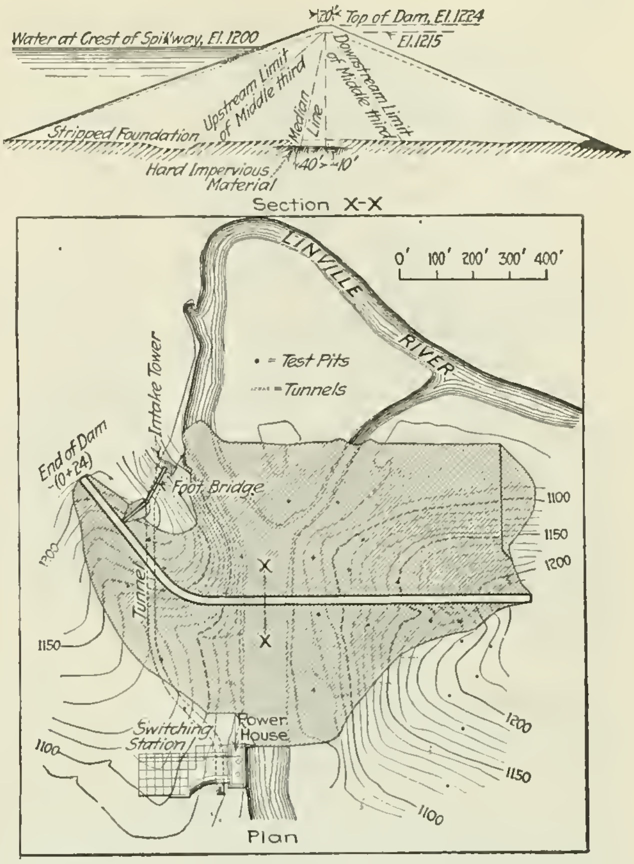
DETAILS OF GATE

DETAILS OF INTAKE TOWER AT LINVILLE DAM.

The 18 in. thick reinforced-concrete baffle piers between these openings are designed to transmit the proportionate amount of water pressure, which may be caused by the clogged-up racks, to the 12 ft. 3 in. high masonry block with top at El. 1,140. This masonry block contains three openings, through which the headgates may be passed for closing up the three 10 ft. wide by 15 ft. high intake openings.

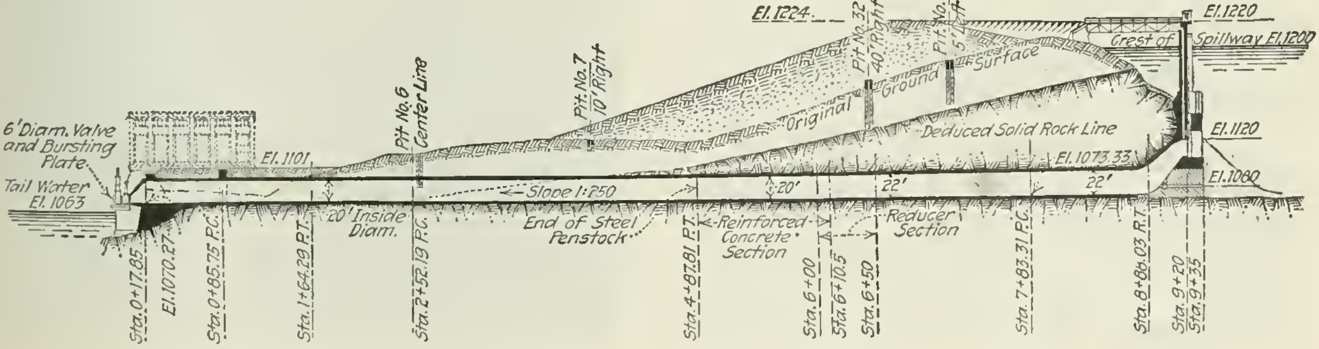
The weight in the air of each of the concrete filled steel headgates is 60,000 lb. This weight is, however, by far not sufficient to lower the gate completely in place, assuming the case that the water is rushing through the intake openings at a velocity corresponding to a 100 ft. head, which will exist in the reservoir at highwater stage. This severe operating condition was specified for the design of the headgate hoist apparatus. On top of the tower, the housing for the 75 hp. motor and the line shaft drive are placed. On the deck provided 12.5 ft. below the top of the tower, the ball race thrust bearings engaging the three pair of 6 in. diameter gate stems of 88 ft. 11½ in. length, each, are located. Each gate stem is built up of four pieces of cold rolled steel shafting and the 18 ft. long portion of the upper piece is provided with left and right hand Acme threads, respectively. Cast together with the uppermost cast steel coupling is a 17 x 10½ in. flat top which will bump against the bottom flanges of the 24 in. I beams, supporting the thrust bearings, in case the head gate should overtravel when being raised. To prevent the stems from being subject to buckling when the gate is lowered into position, a ring is fastened to the top of each stem which will come in contact with the revolving bronze stand nut forming part of thrust bearing, before the headgate can strike the stops attached to the bottom of the headgate frames. These mechanical limiting devices were considered to be more satisfactory than electrically operated limit switches. A gate position indicator is provided for each headgate on top of the 9 in. gas pipe encasing the threaded portion of the stem above the cast iron cover protecting the thrust bearing. The graduations giving the gate positions for each $\frac{1}{10}$ ft. movement are painted on the pipe.

The beginning of the tunnel is bell shaped so as to have smooth inflow conditions for the water and to permit the placing of two partition walls which subdivide the intake into the three headgate openings. The entire tunnel is lined with concrete and along the first 230 ft. length it has a horseshoe shaped cross-section of 409.4 sq.ft. free area. Then, in a length of 50 ft. it changes its shape into a circular section of 20 ft. diameter. This transition is made because the solid rock over the tunnel is gradually decreasing in thickness, and a fault line consisting of thin layers of decomposed rock with mud seams and water intersects the tunnel roof about 75 ft. below the beginning of the circular section. To take care of the uplift pressure in the water filled tunnel, considering the extreme highwater stage of the reservoir, steel reinforcement is placed in the concrete lining of the circular section, and the amount of reinforcing steel is gradually increased corresponding to the reduction in height of the decomposed rock and earthfill material above the tunnel roof, until the penstock steel takes up full water pressure.

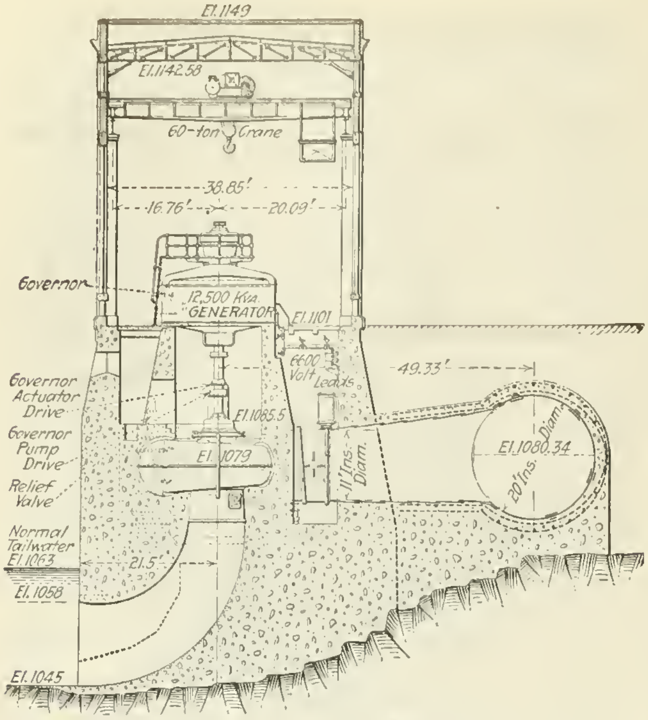


DETAILS OF LINVILLE DAM. ONE OF THE EARTH FILLS, SHOWING ALSO THE POWER HOUSE LOCATION

The penstock of 20 ft. inside diameter is built up of 1 in. plate steel having a tensile strength of from 55,000 to 65,000 lb. per sq.in. and a minimum yield point of one-half of its tensile strength. For the circumferential connections of the courses, single riveted lap joints of 4 in. width are used, and for the longitudinal connections, double-riveted double strap butt joints; the diameter of the rivets is 1¼ in. Stiffening rings made



SECTION THROUGH LINVILLE DAM AT POWER HOUSE AND INTAKE



SECTION THROUGH THE BRIDGEWATER POWER HOUSE SHOWING TURBINE LAYOUT

up of 4 x 4 x $\frac{5}{8}$ in. angles are riveted to the outside of the penstock and the average spacing of same is 3 ft. Two branches decreasing from 14 ft. inside diameter to 11 ft. inside diameter lead from the penstock to the power house. The penstock end is formed by a reducer having an outlet of 6 ft. inside diameter. The entire weight of the steel involved in the penstock is 935 tons.

Two 6 ft. diameter gate valves are attached to the reducer in tandem, and a hinged cast-iron head, provided with a nest of seven cast-iron bursting plates of 0.391 in. thickness over an 18 in. diameter area, each, is bolted to the discharge flange of the gate valve, furthest downstream. The bursting plates are designed to give way at a pressure of 80 lb. per sq.in. in the penstock due to waterhammer, and with all seven plates blown out, the discharge of water will be sufficient to prevent further rise of pressure in the penstock and turbine casing. It is, however, figured that this condition will only exist in case the two turbine relief valves should become stuck and would not open.

The entire 20 ft. inside diameter penstock is enclosed in concrete of 2 ft. minimum thickness and covered with earth. At the downstream end a heavy concrete wingwall connecting with the powerhouse substructure is built. No provision for any expansion joints in the penstock is made.

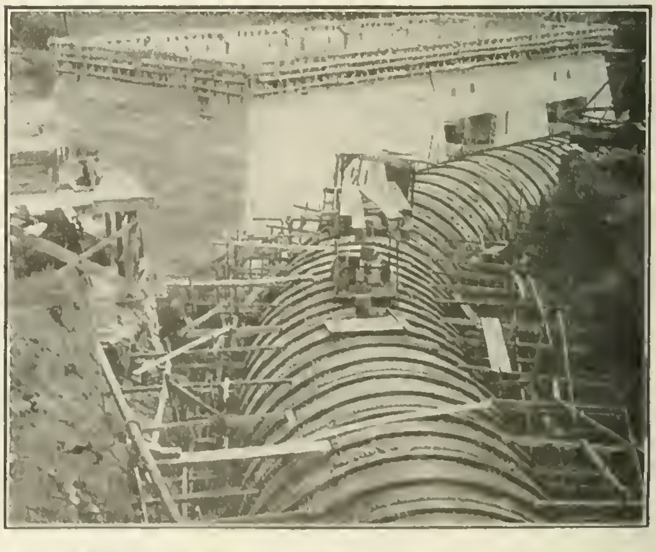
Power Station.—The excavations for the powerhouse substructure are carried down to solid bedrock. The generator floor is at El. 1,101 which is 38 ft. above the normal tailwater level and 56 ft. above the bottom of the draft tube outlet. The height of the substructure which consists of concrete masonry was principally determined by the record flood of July 16, 1916, when the highwater level at the powerhouse site, due to back water from the Catawba River, was at El. 1,090.6. The basement openings through which the ventilating air for the generators passes, are provided with heavy window sash and wire mesh glass. The generator floor system is built of reinforced concrete.

In the powerhouse superstructure red brick encases the structural steel frame supporting the roof trusses and the runways for the 60-ton electric crane. The window-sills and lintels are of concrete strengthened by steel bars. The roof consists of cement tile which is covered with pitch, tarred felt and cinder concrete.

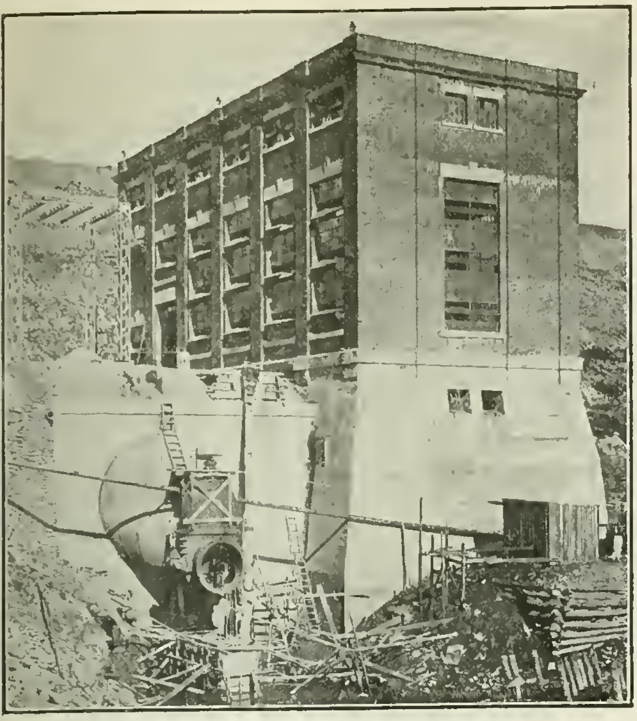
The two turbines installed in the power station are of the Francis, vertical shaft, single runner, volute casing type, operating at a speed of 171.5 r.p.m. Each machine is guaranteed to deliver 13,200 hp. to the generator shaft when operating under an effective head of 115 ft. with an efficiency of 85 per cent. The range in head on these waterwheels will be from 135 ft. to 85 ft. depending on the reservoir stage. The maximum output of each turbine considering the limits of head of 135 ft. and 85 ft. will be 16,800 hp. and 8,000 hp. respectively; above an effective head of 115 ft. the turbine gates will be, however, blocked so that the power developed will not be greater than that corresponding to the rated output of 10,000 kw. of each generator.

The turbine casings are of cast iron and were subjected to the hydrostatic pressure of 95 lb. per sq.in. in the manufacturer's shops. Between each penstock branch and turbine casing a hydraulically-operated butterfly valve is inserted. The lens shaped valve disk is made of cast steel and has a diameter of 11 ft. The operating cylinder is suppled with oil taken from the governor system under a pressure of 150 lb. per sq.in. A locking device is connected with the operating cylinder, by means of which the butterfly valve may be kept in a closed position without the use of oil pressure. The minimum time required for completely closing the valve is 15 seconds, thus preventing an excessive rise of pressure in the penstock in the event that the pressure piping to the cylinder should break.

The governor system for the two turbines is interconnected and the rotary oil pumps of 125 gal. per min. capacity, each, have mechanical drives. Each turbine is provided with a governor operated relief valve having an opening of 4 ft. 6 in. in diameter between the turbine casing and the relief valve elbow and a discharge opening of 5 ft. 6 in. in diameter below the relief valve. On the basis of the normal head being 115 ft. and full load suddenly thrown off one unit, the relief valve will discharge 35 per cent of the water capacity of the wheel. The governor is adjusted to close the gates in 3.5 sec-



POWERHOUSE FOUNDATION AND 20-FT. PENSTOCK



PENSTOCK REDUCER WITH 6 FT. VALVE AT POWERHOUSE

onds, and the guaranteed speed regulations based on a fly wheel effect of 3,360,000 lb.-ft. squared in the rotor of the generator and on the dimensions and lengths of the tunnel and penstock are:

	LOAD ON				
Percent load changes	10	25	50	75	10
Percent speed changes	1.5	3.6	8.0	15	3
	LOAD OFF				
Per cent load changes	10	25	50	75	100
Per cent speed changes	1.8	3.8	9.0	16.8	34

In view of the fact that the load taken up by the Bridgewater Station is only a small portion of the load on the entire system of the Southern Power Co., these regulating conditions are considered satisfactory.

The draft tubes are built of concrete, the upper portion is, however, lined with ⅜ in. thick plate steel and the draft tube ring connecting with the speed ring is built of cast iron. The water discharges from the draft tubes into the tailrace blasted out of the bed of the Linville River.

A description of the methods used in building the earth dams is contained in a subsequent article.

The complete Bridgewater project was executed under the direction of W. S. Lee, vice-president and chief engineer of the Western Carolina Power Co. Albert S. Crane of the J. G. White Engineering Corporation was retained as consulting engineer in connection with the design and construction of the earth dams and masonry structures, and F. H. Cothran was the resident engineer. J. B. Duke is the president of the company.

Tunnel 484 Feet in 432 Hours

Tunneling progress of 484 ft. in 432 hours working time was made last October in the 8 x 8 ft. drift of the Holmes mine, one of the Cleveland-Cliffs Iron Co.'s properties situated at Oshpeming, Mich. The rock was diorite, hard and dense. Drilling per round required from 17 to 19 holes aggregating more than 100 ft.

Asphaltic Concrete Roads as Built in California

"Black Base," With Bitulithic Topping, Laid on Compacted Adobe Soil Gives Long Service Even on Heavy Traffic Routes

By C. S. Pope
Consulting Highway Engineer, San Francisco, Cal.

While the use of asphaltic concrete for pavement bases has been a more or less well-established custom in California for a great many years and is today in use in more than fifty of its municipalities, yet it is a fact that text books which are recognized as authorities on paving and highway construction give scant or no consideration to this very useful type of base, a condition due, no doubt, to the fact that most of our text books are written by Eastern engineers, whose experience has been largely confined to Eastern conditions and practices. The lack of recognition by Eastern engineers is, of course, also influenced by the fact that this type of pavement has been considered uneconomical because of the high price of the cementing material.

A true asphaltic concrete, often called "black" base to differentiate it from hydraulic-cement concrete or "white" base, is composed of asphaltic cement, a proportion of fine mineral aggregate passing a ¼-in. screen and a proportion of coarse mineral aggregate approximately double the quantity of the fine aggregate ranging in size from that rejected by a ¼-in. screen to that passing, say, a 2½-in. mesh. All of the above material is heated and plant-mixed.

That part of the City of Los Angeles specifications governing the laying and rolling of asphaltic concrete is given below:

Laying—The mixture shall be hauled to the street in canvas-covered wagons or trucks and shall have a temperature when it reaches the street of not less than 225 deg. F. The mixture shall be dumped on metal platforms. It shall then be uniformly spread upon a subgrade here with hot shovels or forks to such a depth that after rolling to its ultimate compression it will have the thickness shown upon the cross-section. The surface must be smooth and uniform, corresponding with the elevations required by the plans.

Rolling—After the base has been spread it shall be immediately and thoroughly rolled with a roller weighing not less than 8 tons and having a weight of not less than 210 lb. per linear inch width of tire. While still hot the entire surface of the base shall be re-rolled with a roller weighing not less than 12 tons and having a weight of 400 lb. per linear inch width of tire. The rolling must be continued until no movement is perceptible. Any portions of the base not absolutely unyielding under the roller must be removed and replaced. The specific gravity of the base when rolling has been completed shall be not less than 88 per cent of the specific gravity of the combined stone and sand contained in the base.

Protection—The base shall be kept barricaded until the wearing surface is laid.

The result is a firmly compacted base, both solid and waterproof, but to a certain extent flexible, so that any slight settlement does not affect its cohesion, supporting power, nor the adhesion of the surface course. A rational use of this base, as in any other type of base, would contemplate its construction on a subgrade of normal firmness, or that after proper compacting, will remain firm.

It must be remembered that the greatest single enemy of the asphaltic construction is water, either in the subgrade or in the base itself. The water may usually be excluded from the subgrade, but there are certain conditions where this can only be done at prohibitive expense. It is necessary in such a case, and advisable in all cases, to prevent capillary infiltration of water, either by laying a thin course of stone or gravel without filler on the subgrade to break up any capillary action or to lay so dense a base that it is practically impervious to moisture.

Asphaltic concrete bases used to be constructed of poorer materials assembled in a coarser grading with less asphaltic cement and less care in the mix than was given to wearing surface. There is an increasing tendency, however, to make the mix of the base as carefully as that of the surface and especially to secure a water resisting mixture. Also, as it is apparent that the conditions to be met by the base as regards displacement are different and not so serious as those to be met by the wearing surface, it is both possible and desirable to increase the percentage of asphaltic cement.

BASE LAID WITH VARYING THICKNESS

It must be borne in mind that this base is practically waterproof and that a subgrade normally stable will not change through surface infiltration, though it may be ruined from side infiltration, as for instance through irrigation.

The base has been laid of varying thickness—from 2½ in. to 5 in.—but in general it is not considered good practice to lay a base more than 3½ in. thick in one course, because the chilling of the mixture may prevent the necessary compression being obtained.

This base may be surfaced with asphaltic concrete of the bitulithic type, sheet asphalt or topeka, the first being the most generally used and giving great satisfaction. For California conditions, there is no question but that this type of construction is well adapted not only to city streets, but to use in highway construction, and has proved both adequate to the traffic and economical in construction and maintenance. This is particularly true where the soil is adobe or heavy loam. It is quite essential that asphaltic concrete bases be kept as dry as possible making it often desirable to lay a light compacted layer of broken stone or gravel before laying the base, to break up any tendency toward capillary saturation.

One of the earliest examples of this type of construction in central California is at Visalia; a pavement laid in 1896 and subjected to the continuous mixed traffic of medium intensity. It still presents a first-class appearance. As originally constructed it consisted of a 4-in. base composed of gravel, sand and refined asphalt, all plant-mixed, with a 2-in. wearing surface.

USE ON HEAVY TRAFFIC ROUTES

In the city of Los Angeles, Lake Shore Avenue is a typical example of the best type. Another Los Angeles example is a street at San Pedro leading to the government harbor fortifications. This pavement is a 3-in. asphaltic concrete base with a 2-in. Warrenite wearing surface, all laid on well-rolled adobe soil. In addition to normal traffic, this paving was, immediately after completion, subjected to the hauling of some 30,000 tons of building material for the fortifications, most of which was carried on 5-ton trucks. Later, the 14-in., 60-ton coast defense guns were hauled over this pavement, which now is in good condition.

While many cities of the State have used an asphaltic concrete base construction, it remained for Kings County to show most strikingly its faith in this type.

Kings County, occupying very largely the old bed of Tulare Lake, possesses wonderfully rich soil, but in some cases the ground water comes right up to the surface. Despite this condition the county constructed its highway system of 4-in. asphaltic concrete with a small amount of thicker pavement. This highway was begun in 1916 and finished in 1918 at about the same time that the concrete state highway, 4-in. in thickness, was constructed through this county. Its total length amounts to 103.8 mi., of which by far the larger portion consist of a pavement 16 ft. in width, composed of an asphaltic concrete base 2½ in. thick, and a wearing surface 1½ in. thick. Maintenance of this road averaged $381 per mile in 1918 and only $8 per mile in 1919. Repairs are concentrated on short sections.

This is, of course, an extremely light construction, and considering the saturated conditions of soil over certain parts of the county covered by the road system, use of so light a type might be criticized.

FAILURES DUE TO POOR DRAINAGE

While it is true that certain small portions of this road have failed entirely, failures occurred only on sections subject to saturation from ground water. Greater experience would have caused the engineers to reinforce during construction sections that failed, with a sub-base of rock or gravel sufficient to maintain a solid foundation. The failures serve to illustrate, first, the folly of specifying a standard type of construction for an entire road system—where it can be noted that conditions of soil and traffic are not uniform in all sections of the system—and second, that certain discretion must be exercised by the engineer on all successful construction.

Other advantages of the "black base" which are of considerable importance are as follows:

(1) Bases may be thinner than hydraulic cement concrete and yet not crumble.

(2) The base is flexible and therefore not easily shattered by general settlement, as in the case of fills or adobe soil. The base is always in contact with the subgrade, a condition which does not obtain with a rigid base.

(3) Depressions may be filled up without renewing the base, by simply adding a patch to the surface.

(4) There is perfect adhesion between the base and the surface.

(5) The completed pavement is a tough elastic sheet, well able to absorb shock.

(6) The pavement is waterproof.

(7) The paving is easier riding, not so hard on horses, and presents a pleasing appearance.

(8) The pavement will not buckle during hot weather, and if properly surfaced is unaffected by heat or cold.

New York State License Fee

The license fee for professional engineers in New York State, according to the bill signed May 14 by the Governor is $25. The amount of $35, noted in the news section of this journal May 20, p. 1031, is the combined fee for an engineer and land surveyor.

Alkali Damages Part of Winnipeg Concrete Aqueduct

Four-Mile Stretch of Pressure Pipe in Red River Valley to Be Underdrained to Carry Away Damaging Alkali Water

CONTRACTS are soon to be let for the underdrainage of 1½ miles of the Winnipeg Aqueduct, which was completed last year to carry the water supply of the city of Winnipeg from Shoal Lake, 97 miles away. This stretch of the aqueduct is part of a four-mile section of 8 ft. concrete pressure pipe in the Red River valley near the city, all four miles of which is eventually to be drained in the same fashion as a measure of protection against the alkali ground water which is slowly destroying the texture of the conduit concrete.

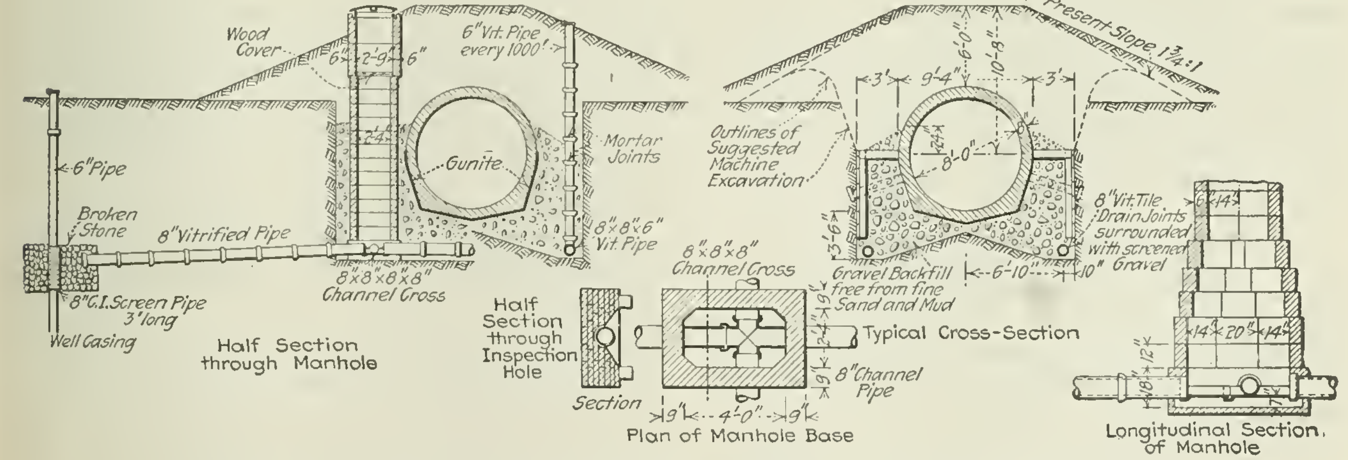
There have been alkali troubles of the concrete in and around the Winnipeg district for some years, and investigations under governmental jurisdiction are now under way. The result of the studies is that while there may be methods of producing the concrete and of protecting it which will render it safe against the attack of the alkali, the best precaution is to divert the ground water from the concrete by drainage. Such underdrainage was provided in the extreme westerly 12 miles of the aqueduct, which part is built of precast reinforced-concrete pipe. The next adjoining four miles of inverted siphon, crossing the Red River valley, built of 96-in. conduit poured in place in the trench, was not underdrained and here the softening of the concrete by the soil alkali was observed to have begun about a year ago, the pipe then being about 2½ years old.

Consequently, the chief engineer of the Greater Winnipeg Water District, W. G. Chace, recommended to the Administration Board of the district that these four miles should be uncovered and then backfilled with gravel, in which would be laid below the pipe two lines of outletted vitrified tile. This recommendation was referred to a board of five engineers, four of whom confirmed his recommendation and further advised that the pipe be undermined and underpinned with gravel. One of the five engineers considered that there was no need of alarm regarding possible alkali disintegration. At any rate, the Administration Board followed the lead of the chief engineer and four consulting engineers and ordered tenders for the underdrainage of 1½ miles of the four-mile section.

The accompanying drawing shows the nature of the work to be undertaken. A conduit of 8 ft. circular interior diameter and 8 in. walls with circular arch and trapezoidal inverts, was built in an open trench and backfilled to a height 8 ft. above the outside crown of the conduit. The underdrainage work now contemplated consists in completely uncovering the pipe and excavating to a depth of 2 ft. 8 in. below the lowest part of the invert, that depth of excavation to be only at the sides of the trench with a rise in height of 2 ft. at the center of the trench under the center of the pipe. On either side of the trench are to be laid lines of 8 in. open joint tile underdrains and backfill is then to be carried up somewhat above the center line of the pipe with a gravel free from fine sand and mud. The upper part of the fill is then to be completed with the original backfill, using all surplus excavations to flatten out the original slope.

At intervals of 1,000 ft. are to be vertical inspection holes of 6-in. vitrified pipe with mortar joints rising from the drain tile, and at every mile there is to be a pipe connection across the trench to the drain on the opposite side and a transverse line of 8-in. pipe to a drainage well off line of the aqueduct and beyond the backfill. The wells are to be located where ground water is at least 15 ft. below the surface, so that it can be assured that the drainage from under the aqueduct will pass off. They are to be drilled until a supply of water is reached from which 5,000 gal. per day can be pumped without lowering the level of the water in the well more than 10 ft. After each well has been driven to a depth of 50 ft. it is to be tested for water-flow capacity, and if the specified flow be found the well will be sunk no lower. If sufficient flow be not found the well must be sunk another 20 ft. or until there is reason to believe that within less additional depth a sufficient increment in capacity shall have been struck. The testing and sinking is to be repeated until enough water capacity is found or the well proves dry at the depth possible to drive within the casting started.

At the junction of each cross drain with the longitudinal drain on the well side there will be a manhole made up of superposed concrete rings. At the bottom of this manhole the crossing is made of channel pipe to make cleaning out easy.



METHOD TO BE ADOPTED IN UNDERDRAINING WINNIPEG AQUEDUCT IN ALKALI SOIL

Precautions are to be taken in the excavation not to damage the structure of the conduit. When the conduit is laid bare it is to be examined carefully for alkali disintegration, and if any softening is found the surface is to be cleaned with chisels or scrapers and then sandblasted as thoroughly as practicable. The surface then is to be given a coat of portland cement mortar with a cement gun to a minimum thickness of ½ in. Side braces of timber, as shown in the drawing, are provided to hold the trench in place during excavation and cross-struts placed against the pipe. These are to be left in place in the fill.

The work is of considerable extent, including according to the estimate of quantities for every mile of conduit 200 ft. of well drilling, 42,000 cu.yd. of earth excavation and backfill, 11,000 lin.ft. of 8 in. vitrified tile, and 12,000 cu.yd. of gravel backfill.

Community Service Applied to Highway Construction

By William W. McClendon

City Engineer, Mineral Wells, Tex.

Mineral Wells, a town of 10,000 population, is situated in Palo Pinto County, 54 mi. west of Fort Worth and in the heart of the West Texas Oil field. Due to its proximity to oil fields, highways connecting it to other points in the county have been subjected to immense increases in motor and freight traffic. The 35-mi. stretch of road leading from Mineral Wells to the Stephens County line is now subjected to an average of 67 vehicles per hour for a period of 10 hr., of which traffic 45 per cent is truck, the average load, excluding truck weights, being five tons.

Due to the fact that this immense increase in traffic has been imposed almost overnight, so to speak, the maintenance fund which the county has had to spend on this road has long since been exhausted and the roads have become almost impassable.

The citizens of the town and members of certain oil concerns raised $10,000 to be spent toward permanent improvement on this road, which sum was augmented by a like amount from the county and $20,000 from the State Highway Commission. It was agreed that this money be spent on the road west of the town of Palo Pinto, the county seat, 13 mi. west of Mineral Wells.

Due to the mountainous character of the country where this $40,000 was to be expended in permanent improvement, it was found that the first 10 mi. would be so heavy that even the sum of $40,000 would be exceeded. The drainage structures alone averaged 3½ culverts and two bridges, of not less than 20-ft. span, per mile. Plans and estimates were prepared showing that the permanent construction would be limited to a 4-mi. stretch.

A canvass of the county indicated that sentiment was against a county bond issue for the road improvement and an investigation made to see if it was not possible to form a shoe-string road district and vote bonds for the improvement of the road proved legally impossible. A plan was then originated by the Mineral Wells Chamber of Commerce whereby citizens of that town and inhabitants along the road take the improvement of the road into their own hands. A canvass concerning this plan showed it favorable. Accordingly a committee on arrangements was organized and a definite day was set upon which all business houses were to close and every one was to turn out to work on the improvement of the road. A log of the 35-mi. stretch was made and the condition of the road, indicating needed improvements, was recorded in detail. Blueprints, each representing a mile of road, were made and distributed to captains in charge of gangs who were to improve their particular mile of road. Locations of material piles were noted as well as bad spots in the road. Sheets also carried the information as to the exact number of men, teams, trucks, picks and shovels necessary to build that particular mile of road in one day.

The committee then secured a tabulated list of all available men with their addresses and phone numbers, as well as the list of teams, trucks, picks, shovels, etc., available. The day on which the road was to be worked was postponed several times because of inclement weather, but on Nov. 21, 1919, the big working day came. The writer with his partner, A. B. Purnell, acted as general supervisor over the entire 35-mi. stretch, assisted in keeping things moving and offering suggestions wherever needed. All business during the day was suspended and the full organization as originally planned and which turned out, consisted of the following: 1,270 men, 1,000 picks and shovels, 175 trucks, 110 teams, 3 tractors, 4 graders and 6 road drags, post hole diggers, sledges, etc. The road was put in excellent condition for the entire 35 mi. and now 10-ton truck loads that formerly found an impassable road find easy traction. Twelve new culverts and eight new bridges were put over creeks where formerly there had been nothing. As an example of the celerity with which the men worked one section containing 20 carpenters under the captaincy of a local contractor tore out and built a new 10-ft. span bridge 6 ft. high and 18 ft. wide in 1½ hr., that time including even the time employed in filling bridge approaches. The same procedure is contemplated in the improvement of the road leading north from the city and the same committee has been appointed to formulate the plans for this construction.

Taxation on English Motor Vehicles

According to an editorial recently appearing in the *Engineer*, a change is contemplated in the method of taxing motor vehicles in England. Heretofore, the revenue has been obtained from two sources; a graduated tax on private vehicles and a tax of sixpence per gallon on gasoline. It is now proposed to do away with the latter and place a much higher tax on the vehicle. One pound per horse power has been suggested, which would mean in the case of most cars. a tax of between three and four times that at present in force. That the *Engineer* believes such a tax inequitable is apparent in the following: "On the suggested horsepower assessment alone, the tax on a Ford would be out of all reason compared with that of a Rolls-Royce; while if the wear and tear of the roads is considered, the difference in the weight should enable a lighter machine to escape with a much more relative impost. We should suggest, therefore, that the taxation of private cars and commercial vehicles alike should be based on some formula which takes into consideration both the horse power of the engine and the weight of the vehicle, as by that means the taxation imposed would bear some relationship to the wear and tear inflicted on the roads surface.

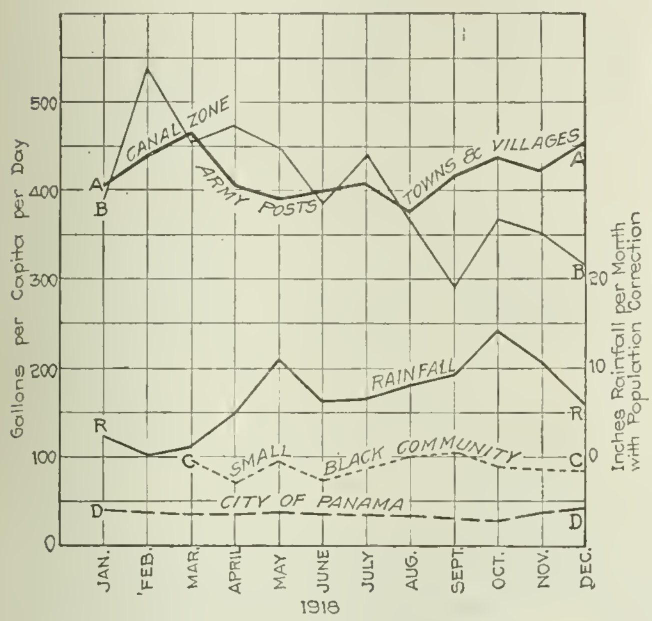
Per Capita Water Consumption in the Canal Zone and City of Panama

By R. C. Hardman

Engineer-Designer, the Building Division, Panama Canal

STUDIES of the per capita water consumption for the calendar year 1918 in the Canal Zone and in the City of Panama, Republic of Panama, reveals some very interesting data concerning the effect of a tropical climate and different environments and social conditions.

The population studied can be roughly divided into three classes—American, West Indian and Panaman—and the lines between the three are drawn rather sharply, both from a social and a geographical sense. Therefore it is comparatively easy to differentiate between them in a study of this nature, which is here presented by curves A to D, showing the daily per capita consumption by months.



WATER CONSUMPTION AND RAINFALL IN THE CANAL ZONE AND THE CITY OF PANAMA

A. This curve represents the Canal Zone population of the principal towns and villages and covers 16,450 men, women and children, both white and black. Of these 5,834 are American employees and their families and 10,616 are black West Indians. The American employees live in free quarters, while the blacks pay a nominal rental. but all are supplied with water free of cost to the individual. Every facility is offered both black and white for bathing, shower baths being installed profusely. The industrial uses of water are not numerous or large. The standard of living among the American employees is high, as all are highly paid, while that of the West Indian is higher than usually found among labor of this nature, as the occupants of Canal quarters are the better-paid and more nearly permanent employees.

B. The Army posts studied contained an average population of 2,778, who live under practically the same conditions as the American employees under A.

C. This curve represents one black community which is entirely isolated and contains no industrial uses of water except a commissary and clubhouse. The population is 1,663 and has also been included in curve A. The bulk of the population lives in quarters housing 12 families with one house holding 48 families.

D. The city of Panama has a population of 61,074, mixed in color and social status, but with white in the small minority and blacks in the majority. The living conditions among the poorer classes of blacks and natives are execrable. All water services are metered, the water rate being 35c. gross and 25c. net per 1,000 gal. Adequate facilities for bathing are not to be had as on the Canal Zone.

The above explanations, it is believed, will be sufficient to make plain the different social orders, and the reasons for the great variations in consumption.

The population represented by curve A is divided into two portions with different percentages of whites and blacks. One portion has a black percentage of 78 and the other 59.5 per cent. The portion having 78 per cent shows a daily average for the year of 51 gal. per capita less than the one more nearly white.

Curve C shows the consumption in a "black" town with no industrial uses to be somewhat less than 100 gal. per capita. A similar community of Americans, with no industrial uses, shows a consumption of 288 gal.—practically treble that of the blacks. (The record is for four months only.)

In an attempt to ascertain how much of the consumption was for strictly domestic uses and how much industrial and irrigation, a number of family and bachelor quarters were metered in the Canal Zone. The results were so at variance, ranging from 72 to 302 gal. for family quarters, with an average of 161, that no dependence could be placed upon them. A female bachelor building showed 446 gal. and male bachelors but 241 gal. The per capita consumption of all individual quarters metered showed an average of 278 gal., which checks very closely with the 288 gal. mentioned in the preceding paragraph.

The results of the study are that the average consumption for all purposes on the Canal Zone is about 400 gal.; that for American domestic use is 300 gal., and that for West Indian employees is 100 gal. for purposes of estimating. The reasons for the high consumption are (1) the water is free and unmetered; (2) the tropical climate; and (3) the facilties for bathing freely and often.

As an interesting side light, the curve R is plotted to show the relation of rainfall to water consumption. As nearly 12,000 of the population considered lives in a district having a 54.82-in. rainfall and the balance in a district having 125.27 in., a curve having the elements of rainfall and population was evolved. This was done by taking the monthly rainfall in each district, multiplied by the population, the sum of the two products being then divided by the total population. The result gives a sort of "rainfall per capita of population" curve. It will be noted that the water consumption is high when the rainfall is low.

Municipally Owned Paving Plants

According to figures recently compiled by the Milton Hersey Co., Ltd., of Montreal and Winnipeg, there are 72 municipally owned paving plants in the United States. In addition, the United States Government operates 12 plants of its own. Canada and foreign countries have a total of 16, making a total of 100 municipally owned asphalt paving plants in the world.

Engineering Factors in Irrigated Farm Appraisals

Engineer-Appraisers of Federal Farm Loan Banks Have Developed Values in Terms of Adequacy of Water Supply

ATTACHED to every one of the twelve Federal Land Banks whose district includes irrigated or drained lands is an engineer-appraiser with engineer assistants. These engineers are directed so far as the character of investigations and reports are concerned by the Office of the Engineer, Irrigation and Drainage, J. T. Whistler, located in Denver. Assignment to this or that district is left to the banks. Reports are reviewed by the Denver office and the conclusions reached and recommendations made by the engineer-appraisers are approved or disapproved. The banks are authorized to act on recomendations of the engineer-appraisers as soon as reports are made. but any modifications made by the final review supersedes the original conclusions and recommendations. The character of the investigations and the classifications to which the experience of three years' operations have led were given recently as follows in an address of Mr. Whistler before the Idaho Irrigation Congress:

Three principal subjects are considered by the engineer appraisers: Water supply, involving a complete presentation and study of water rights; drainage conditions, and construction, both as to character and adequacy. There are districts, of course, where character of construction will be much more important than the matter of drainage, as for example, where a dam is constructed with inadequate spillway capacity, pumping plants in which the cost of operation and maintenance with depreciation practically absorbs the profits of the farm, or a canyon canal poorly located and maintained, on which perhaps the entire irrigated area depends. On the other hand, there are projects where irrigation construction features are simple and maintenance low, but where adverse drainage conditions have arisen or will arise which may very seriously affect values, sometimes within a few years, sometimes 10 or 20 years later.

The necessity for considering such matters is apparent when it is realized that federal farm loans may run 40 years and are now being made with an amortization period of 34½ years, in which period a comparatively small part of the principal is paid off during the first 10 years.

In addition there is included in the report all general information which may be considered of value to a layman-appraiser following the engineer-appraiser, such as climate including rainfall, topography as affecting a consideration of drainage problems, and also construction and maintenance of ditches, soils, crops, markets, transportation and any history of development which may throw further light on the value of property, such as failure and reconstruction of a dam, financial difficulties, with perhaps failures which may account for an otherwise apparently excessive bonded indebtedness.

WATER SUPPLY CLASSIFICATION

In making recommendations it was at first difficult to do so without using expressions of land values to show relative values as affected by the various conditions described. It was desirable that expressions of relative values be not used in the reports, the principal reason being that actual appraisals of individual farms will almost certainly be made by other engineers from time to time, even if some of the first appraisals are made by the engineer-appraiser making the report. It was felt that the report should not influence subsequent appraisers otherwise than by fully presenting conditions and facts. There was finally evolved a system of water supply or water right classification in which all water supplied under the different water rights are divided into the four following classes, without reference to values expressed in dollars but in terms of adequacy of supply:

Class 1.	Water supplies which have no shortage during ordinary years.
Class 2.	Water supplies which have some shortage in normal years, but which furnish sufficient water to mature crops. Where storage is involved, those providing two-thirds or more of a full supply are in this class if not in class 1.
Class 3.	Water supplies which furnish water only during the normal flood season. Where storage is involved, those providing one-third to two-thirds of a full supply.
Class 4.	Water supplies which furnish during the irrigating season a full supply for not to exceed 30 days in normal years and none in years of low run-off. Winter irrigation supplies and those providing less than one-third of a full supply where storage is involved.

CONSTRUCTION

Under the subject of construction perhaps the problem which most often adversely affects the value of irrigated lands is that of insufficient spillway capacity from reservoirs the storage water from which may be the principal source of supply to the lands. It often happens, for illustration, that dams have been constructed little by little, the height being increased several times and temporary construction replaced as found necessary by permanent construction, in which altogether the cost of the storage provided may be greater than its value to the irrigated lands. So long as the dam stands, however, the lands have a certain value, even if less than the cost of construction. If the dam as finally constructed is found sound and the spillway capacity adequate the lands under it can be given a value on the conditions existing, regardless of whether the project was financially a proper one in the beginning. If the spillway capacity is insufficient and the dam should go out with a flood, it is clear that such a dam would probably not be reconstructed and the security afforded by these lands would, of course, then be little or nothing.

In less flagrant cases of ill-advised construction, the loans under a project might be such that in time something approaching half the interest in the lands of the project would be held by one of the banks through mortgages by the borrowers. Should an important structure such as a dam fail, it is not inconceivable that the borrowers might say "Our real interest in the project is not sufficient to justify our again expending the amount of money which it will cost to replace the dam," and the bank might be called upon to assist because of its interest in the lands.

DRAINAGE

Perhaps the greatest uncertainty connected with the engineer-appraiser's work is that relating to drainage. As is well known, many lands, which ten years ago were free from drainage troubles and without suspicion of adverse conditions arising, are today badly alkalified and are often waterlogged. Engineers of the Agricultural Department engaged in drainage investigations would have been laughed at if they had advised that drainage would ever be needed, and yet today the lands may be producing little or nothing. In most cases it is a matter of $25 per acre to provide drainage. Reclamation of the alkalified lands is another matter and, depending on the character of the alkali salts and of the soil, this reclamation may cost more than the lands will be worth when reclaimed. It is the duty of the engineer-appraiser to anticipate these conditions so far as possible.

Dry Dock Three Ships at Once at Panama

Full use was recently made of the large dry dock at Balboa, C. Z., when three ocean steamers were docked in it at one time. A view of the dock with the three ships in it was published in the "Panama Canal Record" of May 12, 1920. The ships were respectively 262 ft. and 2,939 gross tons, 261 ft. long and 2,482 tons, and 445 ft. long and 7,059 tons. The total length of the three ships was 968 ft. The dry dock is 1,000 ft. long and 110 ft. wide.

Ease of Operation Governs Design of New Seattle Pier

Experience on Similar Adjacent Pier Led to Different Shed and Track Arrangement and Special Crane

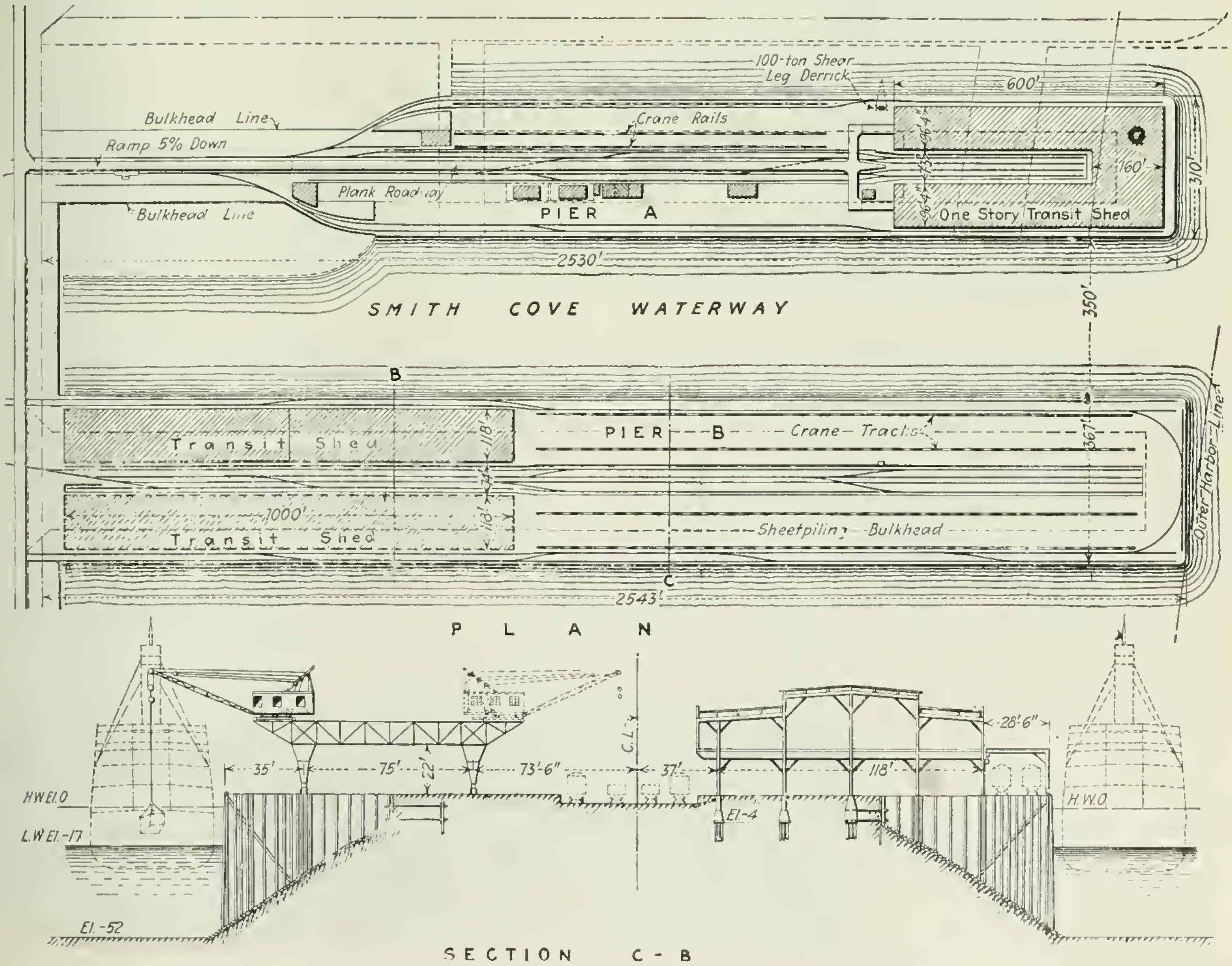
By George F. Nicholson
Chief Engineer, Port of Seattle

For five years the Port of Seattle Commission has operated the municipally owned Smith's Cove Pier A (310 ft. wide by 2543 ft. long) and in that time has accumulated a store of information of value in designing the adjoining pier of similar size now under construction. The Commission's experience has been the more valuable because of the very heavy traffic in recent years over existing facilities in close proximity to the old pier. In 1918, for example, 808,000 tons of freight were handled over Pier A on which the Commission made a net profit of $378,000. The freight passing over Pier A in 1919 totaled 1,100,000 tons.

Pier A, which was described in *Engineering News*, March 11, 1915, p. 476, has accommodated six large deep sea vessels, all of which were loading or discharging freight simultaneously. Under traffic conditions of this sort it has been possible to make a thorough and careful analysis of the track and shed arrangement and equipment in use on this pier. When the time came to begin construction on the pier adjoining not only was this experience carefully reviewed but the Port Commission sent its engineer on a tour of inspection including every important port of the United States so that a study might be made of ideas and improvements which have succeeded elsewhere.

The new unit, Pier B, is 365 ft. wide and 2,560 ft. long, and when completed will cost $2,500,000, an increase of about $1,000,000 over the cost of Pier A. This is due to the increased cost of materials and labor and larger and better equipment on Pier B.

As shown in an accompanying view, the central 215 ft. of Pier B is being filled in solid, the material being pumped by suction dredges from the slips alongside the pier. This fill contains about 1,000,000 cu.yd. (Another 1,000,000 cu.yd. is being used to fill a waterfront street connecting the Smith's Cove Terminal with Seattle's business district.) The 75-ft. wharf along either side of this central fill on the new pier makes it possible to maintain a 35-ft. depth of water at low tide without the use of a retaining wall. As the tidal variation here is 17 ft. there is a total of 52 ft. of water at high tide alongside the pier. The 1½ to 1 slope from the top of the fill to the channel bottom is covered by a 2 to 3-ft. thickness of rock placed to protect it from wave action. The wharf is constructed entirely of creosoted piles and timbers, a total of 12,000 piles being used.



LAYOUT OF OLD PIER "A" AND NEW PIER "B" AT SEATTLE'S SMITH COVE DEVELOPMENT

GENERAL VIEW OF SMITH COVE TERMINAL, SEATTLE, WASH.

The arrangement of tracks on Pier B was decided upon only after a study of various alternatives. On Pier A the arrangement is two shipside tracks along the face of the dock on the open wharf and one alongside the sheds. Experience with this arrangement indicated that two shipside tracks along the sheds would be an improvement and this plan is being followed on Pier B. The advantage is that in some cases when several boats are being loaded on one side of the pier with export cargo, which is chiefly steel, iron and lumber, it can be loaded directly from car to ship along the full length of the dock.

In addition to these tracks along the face of the dock there are four depressed tracks in the center. On Pier A these were separated by a 20-ft. roadway which was considered necesasry to accommodate the vehicular traffic to and from the sheds on the outer end of the pier. On Pier B, however, this roadway was eliminated by placing the transit sheds at the street or inner end of the pier. Thus the four central depressed tracks were placed together which makes it possible to handle cargo from four tracks to one side of the wharf, should that be necessary. This is a distinct advantage over the arrangement on Pier A.

Not all of the crossovers from track to track are shown in the illustrations. On Pier A these were located about every 750 ft. This was found insufficient in working a number of boats simultaneously so in laying out trackage on the Pier B crossovers were provided for about every 450 ft. In order to make it easy to get the switch engines and trains from one side of the pier to the other, a connecting track was laid around the outer end of Pier B on a 133-ft. radius. From this curve there is also a track along the face of the outer end of the pier which can be used in unloading or loading ships and barges that tie up across the end of the pier. Pier B will have a total trackage of 5 miles as against about 4 miles on Pier A.

The mechanical handling equipment on the new pier will consist of two gantry cranes of 12½-ton capacity, one on each side of the open wharf section, and a heavy revolving crane at the end of the pier for making heavy lifts. The latter will have a maximum capacity of 100 tons. Three 35-ton and one 15-ton locomotive cranes will be provided for handling heavy commodities on the open wharf section. There will also be four electric elevators with 10 x 24-ft. platforms for use in the transit sheds. A very complete assortment of light handling equipment will be provided, including electric tractors, trailers, stackers, conveyors, and portable platforms for use with the two-story sheds.

CENTRAL FILL IN PIER "B" AT SEATTLE

The two gantry cranes being put on Pier B are of a type consisting essentially of a locomotive crane operating on an elevated transfer bridge. This arrangement makes it possible to handle freight to and from cars located on any of the eight tracks in the open wharf section of pier; to and from ships, and also to and from any part of the open storage area of the pier, in one continuous operation. This would not be possible with any ordinary type of crane because of the distance across the pier (205 ft.) that must be covered by the crane hook.

By providing a gantry bridge on which the locomotive type of trolley can be used, greater dispatch and cheaper operation is made possible with a comparatively short boom. The gantry type of crane occupies the least possible storage space, requiring only two narrow tracks of 30-in. gage running longitudinally with the pier. Moreover, it provides a very efficient method of locomotive crane service to every square foot of storage area from or to cars and ships. It has a decided advantage over the surface locomotive crane, in that it is elevated above the storage, cars and ship's decks, and therefore has ample boom clearance at all times.

With the gantry crane used on Pier A, which has a hinged apron that can be raised and lowered, and which operates on tracks close to the outer edge of the pier, there are certain stages of high tide when it cannot be operated without interference with the ship's rigging and booms. Also the hinged apron has to be lowered very carefully between the ship's boom or alongside ship's bridge over the hatch. With the new crane there will be no interference with the ship's rigging at any stage of the tide, so that the crane can be operated the full length of the wharf while the ship is loading or discharging. With the Pier A gantry crane the bracing in the two inner legs of crane interferes with the movement of long sticks of lumber and long bar or sheet steel to and from cars or when loading from wharf to ship. This makes it necessary to raise the load very high under the trolley cage in order to get it clear. With the new

FOUNDATIONS FOR WAREHOUSE ON ONE SIDE OF PIER "B"

type of crane there will be no interference of this kind.

The new pier is divided into an open section and a shedded section because the chief import cargoes handled at this terminal are merchandise and boxed and baled goods which need protection from the weather, while the chief export cargoes are steel, iron and lumber that do not need protection from the elements. A ship with an import cargo discharges into the transit sheds and then is warped along the pier to the open wharf section where it takes on its cargo of steel, iron or lumber.

By locating the 120-ft. x 1,000-ft. transit sheds at the shore end of the pier, not only is the need for a roadway on the remaining open section of the wharf removed, but the main office and passenger terminals are located near shore where they are more readily accessible. The passenger accommodations will be on the second floor of the shed, the waiting room being 48 ft. wide and 80 ft. long. Along the face of the pier a portable adjustable ramp will allow the passengers to leave the ship and enter the second floor of the transit shed in close proximity to the waiting and baggage rooms on an easy grade and without crossing any railroad tracks. In fact, with this arrangement the passengers will not cross any roadways or tracks at grade from the time they leave the ship until they reach the street cars and waiting automobiles on the waterfront. The use of an overhead bridge and the Garfield Street viaduct is not only a means of convenience and safety for the passengers by keeping them away from rail and vehicular traffic, but it also reduces the fire hazard and avoids traffic delays. Work on Pier B started in February, 1919, and the construction schedule calls for its completion about July 1, 1920.

New Railroad Line Opened in Poland

The first railway line built by Poland since the armistice has been formally opened for traffic between Kutno and Strzalkow, 111 km., effecting a cutoff of 71 km. in the rail connection between Warsaw and Posen. It was decided in February, 1919, to undertake construction which was begun the following July. Temporary bridges have been used and work is now progressing in building second track and permanent bridges. The new line is intended also to serve as a link in the projected International Transcontinental Railway between Vladivostok, Moscow, Warsaw, Paris and London.

Prices and the Cost of Living

Announcing not only an indefinite continuation of present high prices but a possibility that prices of commodities will rise still higher, Royal Meeker, Commissioner of Labor Statistics, United States Department of Labor, makes the following comment in a recent issue of the "Monthly Labor Review":

> If prices are to be lowered, the causes operating to boost prices must be attacked. The amount of money and checks in circulation must be appreciably reduced and the quantities of necessary goods must be increased in amount. The stocks of commodities manufactured on Government account must, so far as is possible, be salvaged and thrown upon the market. The extraordinary demand for goods must be curtailed or the production of these goods expanded.
>
> The financing of the war has made $2 grow where but $1 grew before. This, coupled with the fact that there has been an enormous destruction of economic goods and of the farms, mines, forests, and factories supplying these goods, explains the enormous and world-wide decrease in the purchasing power of money which causes increased prices. As long as the people have twice as many dollars with which to buy a smaller number of commodities, prices are bound to remain high. It will take a long time to deflate the world's inflated currencies or to inflate the world's deflated supply of goods. The profiteers are being blamed on all hands for the increased prices. Undoubtedly, profiteering of a most reprehensible sort has existed and does exist today, but the profiteer is a result of ever increasing prices rather than a cause thereof. His influence in boosting prices is negligible. If all the profiteers in the world could be apprehended and thrown into jail or lined up and shot, it would have no appreciable influence upon prices.
>
> It has been suggested that the abnormally high prices are psychological in effect, and that prices will fall just as soon as the people can be made to think falling prices. Of course, psychology is involved in every price, but the larger quantities of currency, and the smaller amount of commodities are typical facts that no psychic legerdemain can overcome.
>
> I see no prospect of any considerable fall in prices for several years to come. It will be impossible for the governments of the world to pay off their debts very rapidly. On the contrary, there is every reason to apprehend that credit must be issued to foreign government, foreign manufacturers and foreign business men in order to rehabilitate the broken and shattered industries of Europe. This being the case, we may expect that larger volumes of checks and credit instruments will be thrown into circulation, thus boosting the prices still higher.
>
> Some business men are apprehensive lest the United States be flooded with European made goods which will bring prices tumbling down. The price of foreign exchange at the present time is such as to make it highly profitable for American business men to buy large quantities of goods in Europe, especially in Germany and Austria, if European countries only had the goods to sell. Not until Europe has rehabilitated its industries may we expect to have our markets flooded with European goods.
>
> Production should be speeded up to the limit, and debts should be paid not with more debts but with economic goods and services. These processes should be set in motion without delay. It will require several years to readjust industry and trade on a firm basis again. In the meantime, the United States Government should, in my judgment, join with the other leading governments of the world in the creation of an International Commission to study ways and means of setting up a true and relatively constant standard of value to displace the present monetary units which are merely units of words and consequently variable in value or purchasing power. The most important constructive work that can be done in any field, is the establishment of a stable standard of value, so that all the people, rich and poor, employer and employee, bond-holder and stock-holder, may be spared for all time the agonies of changing price levels.

Stray Points in Structural Steel Design—Part II

Friction and Shear in Riveted Joints—Effects of Blind Following of Precedent—A Table of Lattice-Bar Stresses—Light Bracing Struts—Points in Detailing That Affect Design

By R. Fleming,
American Bridge Co., New York City

The Frictional Resistance of Riveted Joints.—Johnson, in his book "The Materials of Construction," writes: "It seems probable that all riveted joints in practice do their work through friction alone, and that in no case are the rivets subjected to either shearing or bearing stress." As long as rivets remain tight this is more or less true; if they become loose dependence must be placed entirely upon shearing and bearing.

Exact values cannot be assigned to the frictional resistance of plates held together by rivets. They are a function of the tensile stress in the rivets due to cooling and of the frictional resistance of the surfaces in contact. The stress due to temperature dropping through a certain number of degrees can be determined mathematically, but this does not solve the problem. Johnson shows that a change of only 154 deg. Fahr. in temperature would bring rivets to their elastic limit if they were not allowed to contract. He continues: "Evidently, therefore, all well-driven rivets in plates which are tightly clamped together when the rivet is driven and so held till the rivet cools are left in a state of tension exceeding their elastic limit. If the coefficient of starting friction be taken at 0.4, and the elastic limit of steel rivets be taken at 30,000 lb. per sq.in. and of iron rivets at 25,000 lb. per sq.in., it follows that the frictional resistance would be 12,000 lb. per sq.in. of rivet section for steel rivets and 10,000 lb. per sq.in. for iron rivets, in lap-joints, and twice these amounts for butt-joints with two cover plates."

An article, "Experiments for the finding of strains in material caused by riveting and which may tend to produce flaws in rivet holes," by C. Bach and R. Baumann, in the *Zeitschrift des Vereines Deutscher Ingenieure* for Nov. 23, 1912, describes a set of experiments from which it was concluded that the tensile stresses in ordinary rivets parallel to the shank after they have cooled subsequently to being driven by a hydraulic riveter was about 31,000 lb. per sq.in. of rivet cross-section. A lecture by Preuse on "Experiments in Riveting," reported in the same paper March 9, 1912, p. 404, seems to show that the rivets of a joint act mainly to hold the plates together by friction. This opinion is partially endorsed by Professor Batho in his paper, "The Partition of the Load in Riveted Joints," *Journal of the Franklin Institute*, Nov., 1916, p. 553.

The most available reports of tests to determine the slipping resistance of riveted joints are those in "Tests of Metals," 1882, Watertown Arsenal. Experiments were instituted to determine the amount of friction that is caused from the pressure with which one plate is forced against its neighbor by riveting. Iron and steel plates ¼ and ⅜ in. thick were used, held together first with one and afterward with five iron rivets. Joints were hand-riveted. In general, the tests showed the resistance offered by friction of the steel plates to range from 14,500 to 18,000 lb. per sq.in. of rivet section.

Tests recorded by Dupuy in his memoir, "Upon the Resistance of Rivets," *Annales des Ponts et Chaussés*, 7th Series, Vol IX, 1895, pages 5-107, show the first slipping resistance (as determined by an extensometer) of plates held together by steel rivets occurring at 7,500 lb. per sq.in. of rivet cross-section for hand-riveting, and 10 to 12,000 lb. for hydraulic riveting.

As the plates were butt-jointed the rivets were in double shear and the values given are for each of two areas of cross-section. The values are much lower than might be expected in present practice.

Talbot and Moore in their "Tests of Nickel-Steel Riveted Joints," *Bulletin No. 49*, 1911, of the Engineering Experiment Station, University of Illinois, report: "In the tests there was a noticeable slip of joints generally at loads within ordinary working shearing stress of rivet. * * * All the riveted joints failed by shear of rivets as was to be expected, at ultimate shearing stresses which ran fairly uniform in both the nickel-steel series and the chrome-nickel steel series for all the types of joints tested."

While friction is an important factor in the strength of riveted joints, it is too uncertain to be depended upon, and under shock or vibration may, in the writer's opinion, be destroyed altogether. For this reason connections must be designed using the shearing and bearing values of rivets. Recent specifications and building codes are becoming agreed on allowable working stresses of 12,000 lb. and 24,000 lb. per sq.in. for shearing and bearing values of shop rivets. However, because of the frictional resistance of rivets, there is a tendency to increase these values. The present specifications for steel work of the New York subways allows 15,000 and 30,000 lb. The Carnegie "Pocket Companion" allows 30,000 lb. per sq.in. bearing value for "enclosed" shop rivets in beam connections.

Much has been said about secondary stresses resulting from eccentric riveted connections. Nearly 20 years ago a strict theorist called the attention of the writer to the details of some roof trusses in which according to his calculations rivets were stressed in shearing and bearing far beyond any allowable limits. The usual explanation why these and similar structures are standing is that they have never had the load for which they were designed. It is also brought to mind that shearing and bearing values are based upon the diameter of the rivet before driving while the actual diameter of the rivet when in place is $\frac{1}{16}$ in. more than the nominal diameter. Probably the main reason why connections such as these do not fail is that the frictional resistance of the surfaces brought in contact is sufficient to prevent bending from being developed.

Articles have been written for the purpose of showing that the standard connection angles of beams are weak because of secondary stresses due to eccentricity. Yet the connections are used by the ten-thousand without records of failure. The Carnegie "Pocket Companion" boldly says in the table of the strength of connection angles, "Connections are figured for bearing and shear (no moment considered)."

It is always wise to avoid as far as practicable eccentrict riveted connections. But before condemning existing structures in which they are found, it should be remembered that there is an indeterminate, yet not to be neglected, frictional resistance of surfaces in contact which tends to decrease the stresses due to bending moment.

PRECEDENT AND ORIGINALITY

The structural designer may at times ask himself: "Shall I follow established precedent, or shall I break loose and be original?" A paragraph from a paper by the late Emil Gerber ("Some Commercial Features of Structural Engineering," in *Proceedings of the Engineers' Society of Western Pennsylvania*, Vol. 23, 1907, p. 125) is here in place:

> A careful study of precedents is essential in these days. "There is nothing new under the sun" is becoming more nearly true every day. I do not wish to detract from originality but indifferent originality is more expensive and less creditable than good imitation, and the success of the engineer is directly proportional to the success of his work and to the lowness of its cost. Neither should precedents be followed blindly but the simplest and most direct means to the ends sought should be used.

Precedents have often been followed blindly, especially in specification writing. The Schneider Specifications for Steel Railroad Bridges contains a sentence, "Pins exceeding 7 in. diameter shall be forged under a steel hammer striking a blow of at least 5 tons." Mr. Schneider meant a *steam* hammer, but probably the proof reader failed to see the error, and "steel" it has remained in reprints and a number of specifications.

Rivets in Girder Cover Plates.—Another instance where precedent has been blindly followed is in a provision found in some specifications that cover plates of built single-web girders if 14 in. wide or over must have four rows of rivets. The writer is informed that the origin of this provision dates back to the 80's. Wilson Bros., of Philadelphia, were preparing designs and specifications for the Pennsylvania R.R. Cover plates 14 in. wide were piled on flange angles having an outstanding leg of but 4 in. The engineers wished the cover plates, where more than one, tacked together by a row of rivets outside the flange angles, and so called for four rows of rivets in the 14 in. plates. Because this clause was in the Pennsylvania R.R. Specifications it has been copied when entirely different conditions prevail. What reason is there for 4 rows of rivets to fasten 14- or 16-in. cover plates to 6 x 6-in. flange angles? In compression members it often borders on absurdity. Only two rows of rivets are used for the box-shaped top chords of bridges.

Maximum Rivet Pitch.—A clause found almost invariably in specifications for steelwork is that the maximum pitch of rivets in built-up compression members shall not exceed 6 in. During the early days of iron fabrication such a provision may have been needed but that is notthe case now. The rivets in flanges of plate girders take the increment of flange stress. This increment is often quite small. In columns the rivets hold the component parts together and take the stress due to flexure. It is recommended to designers of steel structures that the precedent established by two or three generations of specification writers be cast aside and that the maximum spacing for rivets be increased.

On the other hand, some attempts at originality are reprehensible. Occasionally an engineer will try his hand at beam connections. As is well known, the end connections are standardized for each size of beam, independent of its length. By proportioning the connections according to the loads carried a few pounds may be saved in weight, but changes in such standards as beam connections increase cost and, what is often more important, cause delay in fabrication.

Freaks of originality are often found in the return of working drawings sent for approval. If details are in error they certainly should be corrected, but whims are expensive. To save $5 to the purchaser, the approver of details has been known to put the manufacturer to $50 expense by insisting upon details out of the usual.

To secure beneficial results the choice of originality or precedent should be studied for each individual case.

THE DESIGN OF LATTICE BARS

The great mass of articles and papers relating to lattice bars of compression members has been written since that memorable Aug. 29, 1907, the date of the Quebec Bridge disaster. The late C. C. Schneider ("Report to the Royal Commission on the Design of the Quebec Bridge") recommends that lattice bars be designed to resist a shearing stress corresponding to the allowance for flexure in the formula used for designing the column. This method is embodied in the "General Specifications for Steel Railroad Bridges," 1910, of the American Railway Engineering Association, and is followed by many companies. For the formula 16,000 — 70 l/r, used more than any other in specifications, the shearing stress S transmitted by the lattice bars is determined by the equation

$$S = \frac{560\,A\,r}{d}$$

in which A = area of section, r = radius of gyration of section about axis at right angles to plane of latticing, and d = extreme width of member in plane of latticing.

The handbooks of the Cambria and Carnegie steel companies, Modjeski in the design of the present Quebec Bridge, and a number of specifications call for the latticing of compression members to be strong enough to transmit in transverse shear 2% of the direct stress of the members. The specifications of the American Railway Engineering Association published in the January, 1920, *Bulletin*, call for 2½%.

Table V gives the maximum transverse shear in a number of columns made of two channels latticed, both by the equation $S = \frac{560\,A\,r}{d}$ and by assuming 2% of the safe axial load determined by the formula, 16,000 — 70 l/r with a maximum of 13,000. The channels are spaced with flanges turned out and with the distance between backs such that the radii of gyration about the two rectangular axes are equal.

It is seen that for the colums in the table, representing ordinary construction of lengths between 30 and 100, 2% of the axial load is in excess of the shear derived by the method of th elastic curve. It is also seen that for columns with light loads or small areas the latticing will be ridiculously small if proportioned by either method. Most specifications require the width of the lattice bars to be not less than about 3 times the diameter of the end rivet and the thickness not less than 1-40 to 1-60 the distance between end rivets but in no case less than ¼ in. In ordinary structures these requirements will determine the size of latticing for compression members. When they do not, the writer recommends that lattice systems be designed for a shear equal to 2% of the axial load.

Lattice bars are in compression as well as in tension. For compression they should be designed by the same formula used for designing the column. When bars are long it is often advisable to use angles instead of flats.

STRUTS CARRYING NOMINAL STRESS

A problem often arising in the design of steel structures, especially light mill buildings, is that of compression members with small or nominal stresses. The experienced designer, if left to himself, can solve the problem by drawing upon his experience and common sense. But the difficulty is that he is not always left to himself. Building codes and specifications usually put limits to the unsupported lengths of columns. No designer should object to this provided he is assured that they will be interpreted according to their intent and spirit rather than the strict letter. Two or three instances of what is meant will be given.

TABLE V SHEARS IN LATTICE BARS

Column	A Sq.In.	r Inches	d Inches	Load, Thousands of Pounds	$S = \frac{560\,Ar}{d}$ Pounds	S = 2% of Load, Pounds
2 8-in. Chan 11.25 lb	6.70	3.11	9.5			
10 ft. long				87.1	1,228	1,742
20 ft. long				71.0	1,228	1,420
2 10-in. Chan 15 lb ..	8.92	3.87	11.6			
15 ft. long				113.7	1,666	2,274
20 ft. long				104.0	1,666	2,080
30 ft. long				84.6	1,666	1,692
2 12-in. Chan 20.5 lb.	12.06	4.61	13.6			
20 ft. long				149.0	2,289	2,980
30 ft. long				127.0	2,289	2,540
15-in. Chan. 33 lb ..	19.8	5.62	16.3			
2 35 ft. long				116.1	2,289	2,322
20 ft. long				257.4	3,823	5,148
30 ft. long				228.0	3,823	4,560
40 ft. long				198.4	3,823	3,968
2 15-in. Chan. 50 lb ..	29.42	5.23	16.2			
20 ft. long				376.2	5,318	7,524
30 ft. long				329.0	5,318	6,580
40 ft. long				281.7	5,318	5,634

The building code of a certain city contains the paragraph: "Columns and compression members shall not be used having an unsupported length of greater ratios than given in the tables." The highest ratio of l/r given in the tables is 120. The design of a proposed building was passed upon favorably by the building department. During the progress of the work it was desired to use web plates instead of lattice bars for some columns. This increased the ratio l/r from 110 to 130, but although the sectional area was greater, the building department rejected the change, holding that it conflicted with the provision that no l/r should exceed 120. It was only after some argument that the change was allowed.

In another city a mill building was erected the past year with trusses 16 ft. apart and spanning 75 ft. between columns. The columns were but 15 ft. high. Because of a 120 limit for l/r in its building code the building department insisted that the longitudinal struts in the bottom-cord bracing, made of two angles back to back, should be increased from the size shown on the design to 6 x 4 x ⅜-in. So there was the anomaly of struts between bottom chords, transmitting no calculated stress, made of greater sectional area than the chords themselves, which had to carry maximum stresses up to 86,000 lb. Another building in the same city, with trusses 14 ft. 10 in. apart, has the longitudinal struts in the plane of the bottom chord made of two angles 3-½ x 2-½ x ¼ in. in the older part and two angles 5 x 3-½ x 5/16 in. in the newer part. In extending the building the working drawings of the previous portion were used except for these struts, as the building department insisted that they should be increased to meet the 120 limit on l/r in the code.

The former Memphis Bridge Co., in "Standard Specifications for Steel Highway Bridges and Concrete Foundations," had a clause which read:

> No compression member, however, shall have a length exceeding 140 times its least radius of gyration, except those for lateral and wind bracing, which shall not exceed 160. In figuring the radius of gyration, webs of columns and beams and inner legs of angles forming struts may be omitted, provided that the remaining flanges have the required area.

In response to a letter of inquiry, the one-time president writes: "I think the clause referred to covers a point that should be taken care of in all specifications. Certainly it is good sound common sense. A given amount of metal in a certain position has at least as much strength when tied together with continuous metal or solid plates as it would have if tied together by lacing bars."

The writer has in his own specifications a clause which reads:

> The effective length of main compression members shall not exceed 120 times their least radius of gyration, and for secondary members and lateral bracing 140 times their least radius of gyration. Any portion of the cross-section of a compression member may be neglected in computing the radius of gyration, provided that portion be neglected in the design of the member.

It is to be noted that the last sentence has its limitations and should not be followed indiscriminately. Eccentric loading, shock, rust, bending of horizontal and inclined members from their own weight, should be taken into account. In most cases, the rule can be followed with satisfactory results.

POINTS IN DETAILING THAT AFFECT DESIGN

No engineer is thoroughly competent to design steel structures unless he has had previous experience in detailing. For this reason fabricating companies seldom employ as designers men who have not spent three or more years in making working drawings. Instructions for a drafting room can usually be read with profit by a designer. This may be the case with the following extracts from instructions prepared by F. L. Castleman, Plant Engineer of the American Bridge Co., at Pencoyd, Pa.

> Where one-hole shop connections are required, use bolts instead of rivets where allowable, as it is very difficult to drive shop rivets in one-hole connections. Avoid the use of clip angles requiring two shop rivets. Use three rivets where practicable. This does not apply to top or bottom connections for beams to columns, as these clips can be easily held in place while riveting.
>
> No ditto signs are to be used on general plans. All sizes and elevations must be repeated.
>
> Open holes in beams and in beam connections should be figured from the bottom of the beam so that the work can be laid out from the bottom of the beam, and any variation in depth of beam be thrown from the top, where the detail is usually such that the variation in depth will cause no interference. In cases where the beam should be laid out from the top in order that the distance from top to the first hole be exact, the distance should be marked "exact." Beams that are required to be flush on top should be figured from the top only.
>
> In using standard connections for beams, especially short

beams, be sure that they are capable of carrying the loads that the beams take.

Pairs of beams with less than 2½ in. (preferably 3 in.) between flanges can have neither rivets nor bolts inserted. For such cases use through bolts or single 6 x 6 angle riveted to girder beams.

Pairs of girders with less than 3 in. (preferably 3½ in.) between flanges should be provided with hand-holes not less than 6 in. in diameter. Space hand-holes so that a man does not have to reach more than 2 ft. up or down to insert a rivet. Hand-holes are not needed when the distance between flanges is over 3 in. (preferably over 3½ in.) and a man does not have to reach over 2 ft. up or down to insert a rivet.

See that depth of piece does not exceed shipping clearance.

The method of fireproofing should be well understood, so that seat angles can be cut where necessary to keep them within the fireproofing.

Avoid as far as possible bevel cuts on plates and angles for both main and detail material. Avoid the use of curved angles where one or both ends are too long to allow the angle to be punched.

The matter of foreign freights should be carefully watched. Detail export work, as far as practicable, knocked down, and so that ocean freight is paid by weight and not by measurement. Where a gross ton of 2,240 lb. occupies more than 40 cu.ft. of space the ocean freight has to be paid by measurement. Additional rates are often required for pieces over 30 ft. in length and pieces weighing over 4,000 lb. Projecting pieces should be shipped loose, to avoid bending and breaking in loading. Special consideration should be given each order for this feature.

NEGLECT OF "TRIVIAL" MATTERS

Some of these points may seem trivial to the designer, but it is the lack of knowledge of trivial matters that often adds to the cost of fabrication and erection. For instance, an architect designed a number of girders, carrying heavy loads, of pairs of 20 and 24-in. beams spaced 8 in. centers. This gave a distance of less than 2 in. between flanges, causing difficulty in detailing, fabricating and erecting. There was but little reason why the distance of 8 in. could not have been 10 in., avoiding trouble and giving better conections.

In another instance connections of girders to columns in an office building were specified which, after the steelwork was erected, had to be cut with an oxy-acetylene flame to bring them within the fireproofing.

Still another instance is a case where the dimensions locating seat angles for beams connecting into girders were given from the bottom of the girders. During fabrication the top flanges became slightly displaced, but the workmen gave little thought to it as they maintained the distance from the bottom flanges to seat angles. When it came to erection the beams had to be coped in the field, at large expense.

Fuel Saving by Electrifying Railroads

A fuel saving of 122,500,000 tons of coal per year would be effected by the electrification of all of the railroads in the United States according to a statement of Frank M. Kerr, Montana Power Co., Butte, Mont., in making the report of the Committee on the Electrification of Steam Railroads before the recent annual convention of the National Electric Light Association in Pasadena, Cal. "If all the steam railroads in the country were electrified with power furnished from large steam generating electric stations, the total fuel required would be equivalent to 53,500,000 tons of coal, as against the actual figure for railroad coal used during the year 1918, of 175,000,000 tons."

Twin Concreting Plants for Large Foundation Area

Towers Instead of Cables Carry Main Chutes and Have Steep Zigzag Auxiliary Chutes—Large Storage Capacity

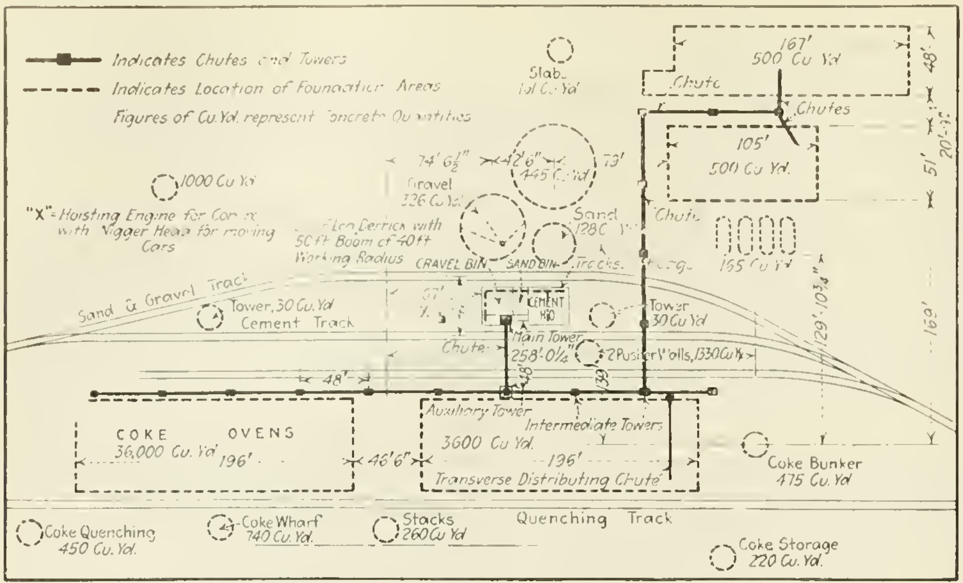
Two large concrete-mixing plants with distributing chutes supported by towers at 50-ft. intervals, and each plant serving a radius of 350 ft. from its main hoisting tower, form the main part of the equipment for building the concrete-slab foundations and substructures of the blast furnace and by-product coke ovens now under construction at Granite City, Ill., for the St. Louis Coke & Chemical Co. These two concreting plants are shown in Fig. 1, while Fig. 2 shows the layout of one plant.

The various foundations, some of which are of great size and which will require in all about 30,000 cu.yd. of concrete, are scattered over an area about 800 x 1,800 ft. The two concreting plants are about 1,200 ft. apart, each being located near the center of the yardage to be placed and convenient to the railway tracks which are laid over the site. The easterly plant serves the group of coke ovens and their accompanying structures, while the other serves the work for the blast furnace, power house and stock bins. Portable mixers operated by gasoline engines will be used for any small structures outside the radius of the main plants.

In the concrete distribution system the lines of chutes are supported by timber towers spaced about 50 ft. c. to c. instead of being suspended from cables stretched between towers at considerably larger intervals. One reason for this was that the plants will be in use for a year or more, and it was considered that there would be less trouble with a rigidly supported chute system.

It is the contractor's opinion that in first cost of installation there is little difference, the cable system being slightly the cheaper. The greater rigidity and permanence of the tower system, however, makes this cheaper in operation where a large yardage is to be placed. There is thought to be less danger of clogging the rigid chutes, as those which are suspended deflect due to the sagging of the cable under load, which thus reduces the slope ahead of a heavy batch of concrete. When clogging does occur, as it may in either system, the rigid chutes are the more quickly cleaned and restored to operation, because the men can work to better advantage and have less fear in working on them. Further, it is considered that in the event of a chute breaking the damage is likely to be confined to narrower limits and to be repaired more readily with rigidly supported chutes. In fact, a case is cited at Fort Worth, Texas, where considerable damage was done and the work was delayed seriously owing to the breaking of the cable of a suspended chute system.

The hoisting tower at each plant is 175 ft. high, with a 1-yd. elevator bucket discharging into a hopper near the top. At the west plant there is a second hopper, about 50 ft. from the ground, to serve the large foundation for the blast furnace. About 30 and 40 trips per hour could be made to the upper and lower hoppers respectively. From the outlet gate of the upper hopper in each case a short chute leads to the main line of chutes. Branches from the latter are built as required, the flow to them being regulated by gates.



LAYOUT OF CONCRETING PLANT SERVING A RADIUS OF 350 FT.

The greatest length of the main chute is about 350 ft., while the maximum distance from the hoisting tower to the point of discharge is nearly 450 ft. Portable extensions mounted on cars may be placed at the lower ends of the fixed chutes. Wood is used for the chutes, which are 12 in. wide and 8 in. deep, the spans between the towers being stiffened laterally by truss wires over horizontal struts. These struts carry gang planks, so that there is ready access for repair and cleaning.

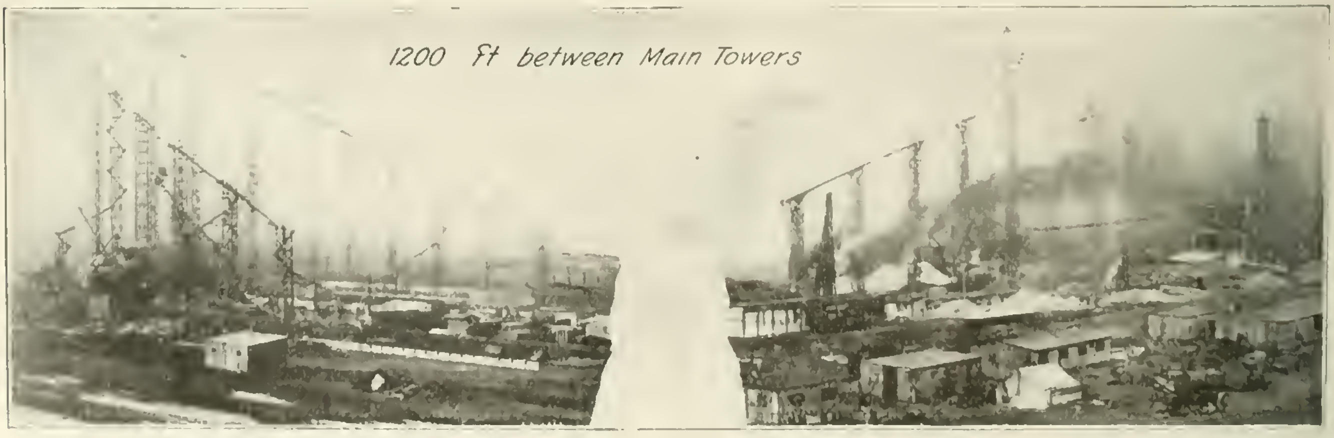
A uniform slope of 1 on 3 is employed, this being sufficient to give a free flow for a fairly stiff concrete without fear of clogging. To deliver concrete at points beneath the main chutes, there are zigzag drops composed of short lengths of chute built into the towers, portable chutes being connected to these at any required height. In these zigzags the slope is 45 deg., but as spilling sometimes occurs it is planned to cover many of these short steep chutes.

Concrete materials are brought in by rail, large stockpiles of stone and sand being formed and large sheds stored with cement in sacks so as to provide against delay in case of traffic interruption. At each plant the stockpiles will average 1,000 tons of stone and 1,000 tons of sand, while the cement shed provides storage for six carloads. A stiff-leg derrick with ¾-yd. grab bucket and 50-ft. boom is erected on a platform to unload the cars of aggregate and also to supply the bins over the mixer, which hold four carloads of stone and two of sand. Cement sacks are unloaded from cars by hand, being placed on a small flat car which runs on a lateral elevated track into the cement shed.

Measuring hoppers in the overhead bins are directly over a two-compartment charging hopper. When these compartments have been filled with stone and sand the cement is added and the hopper then tilted to deliver the batch to the mixer. An operator at the charging hopper controls the feed gates and the hopper by means of a bank of levers. Two or three men are required to deliver the sacks of cement to the hopper. The 1-yd. mixer is driven by an electric motor, its movements being controlled by an operator who also regulates the water supply. An automatic device insures that the batch is retained in the mixer for the specified period of about 1 min. The mix is 1:3:5, or in some cases 1:2:4, using stone of 1-in. to 2-in. size.

About 350 men will be required when the work is in full swing. As most of these come from St. Louis, ten miles distant, a spur track has been laid from an electric railway, and special cars leave at stated hours, this service being paid for by the coke company. At night each man is given two tickets, one to take him home and the other for returning to work next morning. A number of the men, however, live on the work and for these a commissary and bunkhouse are provided, having 50 bunks and accommodation for 150 men at meals.

This foundation work, which will aggregate about 30,000 cu.yd., exclusive of concrete piles, is to be completed by the end of 1920. The Fruin-Colnon Contracting Co., St. Louis, has the contract, with S. W. Bowen as engineer in charge and Charles Schrader as superintendent of construction. The work is under the general direction of P. E. Irvine, general super-



TWO CONCRETING PLANTS 1,200-FT. APART SERVE LARGE AREA OF FOUNDATIONS AND HAVE CHUTES SUPPORTED ON TOWERS intendent for the St. Louis Coke & Chemical Co., of which C. S. Lomax is chief engineer.

Mutual-Admiration Societies

By P. B. McDonald

Assistant Professor of English, College of Engineering, New York University

Of late years it has become fashionable to organize societies. The argument for them is that they cannot do any harm and might do some good. A nucleus of members is obtained by inviting a few people who have an axe to grind; others join because these joined. If all goes well, the society is soon holding regular meetings, choosing officers and committees, and publishing a periodical. Thus we have societies for promoting or preventing nearly everything that can be promoted or prevented—from using dental floss to docking horses' tails. As someone recently said, "In this country one is asked, 'Are you succeeding at what you are doing'? in contrast with the French query 'Is what you are doing worth while'?"

Perhaps it is true that this plethora of societies does occasional good and little positive harm. But they consume a great amount of time, and clutter up the mails, and emphasize the American tendency for mutual admiration. At a typical meeting of a typical society Jones gets up and tells how he uses his dental floss or how he persuaded his neighbor not to dock his horse's tail. When he finishes his valuable and spirited talk (later to be published in the society's bulletin) Brown rises and compliments Jones on his masterly address before beginning his own story of the "Brown method" of manipulating floss. Robinson then compliments both Jones and Brown, and adds his priceless opinion. Finally, the chairman compliments everybody and the meeting is adjourned. The only variation to this pleasant procedure comes when a member strays in who believes in criticism rather than in mutual admiration. But he is promptly suppressed as being "impossible" or "merely a destructive critic," and the pink tea continues.

While speaking of destructive criticism, which so many good people condemn, it might be noted that most of the great critics of history have been destructive, such as Horace, Boileau, Pope, Swift, Voltaire, Hume, Carlyle. They attached the silly fads of their day in order that people might perceive more clearly the really great and eternal things, as Professor Babbitt of Harvard has pointed out. It is the opinion of such keen observers as Paul Elmore that the world today needs a Pope or a Swift to satirize the foolish. Caustic criticism of, say the church, does not necessarily mean that the church is entirely wrong, but that its procedure at the time is wrong. Hume did not attack the beliefs of the church, but the false proofs that the church advanced in the 18th century. A destructive critic such as Hume clears the way for a better building-up of belief. He should not be condemned for not doing the building himself. Furthermore, destructive criticism is suggestive—Hume woke Kant from his domestic slumbers—and in a way it is complimentary, since it implies that the subject attacked is important enough to warrant criticism. To call a man "behind the times" may mean that, in a better humor, the critic would praise him for staunch loyalty to proved ideals.

But, to return to the muttons, mutual-admiration societies are making Americans narrow-minded. The atmosphere of such gatherings is vitiating. A chemist who has come from a meeting of a chemists' society where only pleaasnt remarks are encouraged feels that chemistry is the be-all and end-all of creation. He is likely to become so chemically-minded that he almost ceases to be a human being. The society may discourage adverse criticism so thoroughly that it, itself, becomes tedious and humdrum.

Possibly the mutual-admiration spirit is the consequence of what might be called the "Pollyanna" or "glad" idea. It partakes a little also of the "brotherly," "man-building" enthusiasm of up-lift movement, and a little of the "advertise-yourself" principle of chambers of commerce. From all sides people are being urged to get together and form mutual-admiration societies. Employers are advised to give a half-hour talk each noon to their workmen so that the men can see what a nice employer they have. Freshmen arriving at college are herded together to be lectured to by some sanctimonious fellow concerning the evils lying in wait for young boys fresh from home. As much as possible is being done by large meetings and associations; as little as possible is left to the individual. Is it any wonder that the number of flabby uninteresting people seems increasing?

Some years ago, when organizations were relatively few, a vigorous organization of selected persons could frequently advance their own interests considerably. But today, when every class or group is organizing, it is a public detriment to have so much partisan spirit displayed. Democracy, as Herbert Hoover has pointed out, does not mean a war of classes; rather it means a form of government under which the individual counts for something. A candidate for an elective office today cannot be a plain citizen; he must belong to all the fraternal and sectarian organizations possible.

America has overdone the idea of organization. Too many organizations have become merely mutual-admiration societies, breeding narrowness and factionalism. Individual criticism has not been properly encouraged. It is the salvation of a democratic form of government. The overdose of system which the world received from Germany should be recognized as unpractical, and the right kind of individualism should be revived—not the individualism of eccentricity and anarchy, but the individualism which produces well-balanced individuals able to think and judge for themselves.

Steam Shovel Reduces Quarry Loading Cost

The greatest increase in output, the greatest saving in labor and greatest decrease in the cost of production in crushed stone quarrying, states O. P. Chamberlain, general manager, Dolese & Shepard Co., Chicago, in a paper read Feb. 12, 1920, before the American Road Builders Association, can be secured by substituting loading by steam shovel for loading by hand. The following data are given: A steam shovel operating at cost of $55 per day of 10 hr. and producing 1,000 tons per day, loads at a quarry cost of 7.8c. per ton, against 20c. per ton for hand loading. These figures include a depreciation and maintenance charge on the shovel of $7,000 per year, and are conservative, as, in the writer's own operation, the steam shovel performances, averaged over long periods, are 1,780 tons per day of 10 hrs. Such operation means a loading cost of but 4.4c. per ton of stone loaded. Using the conservative figures of a saving of 7.8c. per ton in a one-shovel plant, which should produce 400,000 tons per year, the annual saving in the substitution of steam-shovel loading for hand loading is $58,800.

Protecting Buildings Against the White Ant

Precautions in Construction to Keep Out Insect Which Destroys Much Property All Over United States

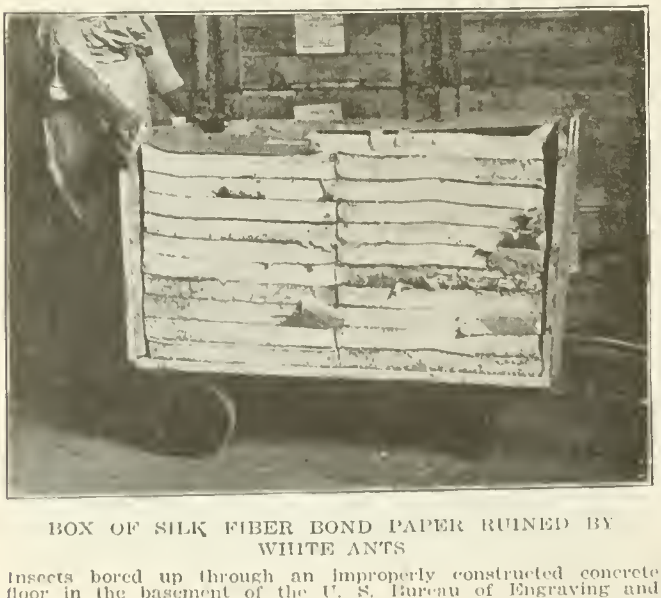
By Thomas E. Snyder

Specialist in Forest Entomology, Bureau of Entomology, U. S. Department of Agriculture, Washington, D. C.

IT IS not generally realized that it is necessary to protect buildings in the United States against the ravages of "white ants" or termites. These insects and their damage are usually supposed to occur only in tropical countries. This is a wrong conception, since the Bureau of Entomology, U. S. Department of Agriculture, receives on the average 40 to 50 requests per year for information as to how to get rid of "flying ants" or white ants which damage the foundation timbers and other woodwork of buildings in all parts of the United States. About one dozen of these requests are annually received from Washington, D. C.

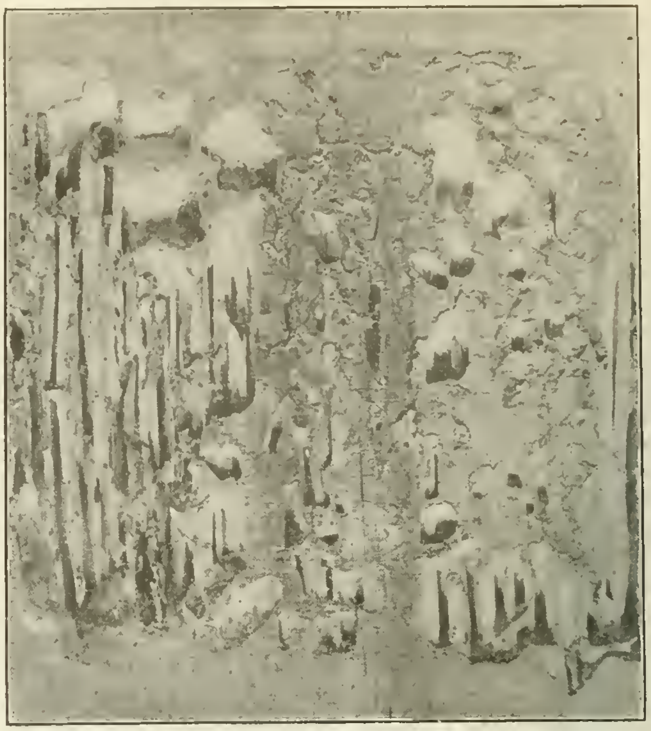
Damage to both old and new buildings occurs not only in rural communities but also in large cities and affects the welfare of manufacturers, farmers and householders. While the damage is more common in the southern and southwestern states, it occurs in all sections of the country, even in the far northeast and northwest. Even when the damage is discovered, the usual belief is that the insects which are doing the damage, i. e., the white ants, are from Africa, China, or some other foreign country. This is not true. There are 39 species of termites or white ants in the United States—a greater number than the combined known species of such tropical countries as Japan, Hawaii, and Cuba; or than in both Japan and Panama together.

Some notable cases of such damage which have been successfully treated by this Branch in the past few years are: In Washington, D. C., the flooring of the basement of the old building of the Bureau of Engraving and Printing where valuable documents were destroyed, the remedy alone costing $1,000; the flooring in the basement of the vault room of the new building of the Bureau of Engraving and Printing, where valuable silk-fibre bond paper has been destroyed; documents stored in the basement of the Treasury Building and plans stored at the Washington Navy Yard; flooring and exhibits in the old National Museum (above); a Christian Science church in the northwest section; the parquet oak floor of a tailor shop in the northwest business section, the remedy costing over $1,000; and the foundations and the woodwork in a number of valuable residences.



BOX OF SILK FIBER BOND PAPER RUINED BY WHITE ANTS

Insects bored up through an improperly constructed concrete floor in the basement of the U. S. Bureau of Engraving and Printing, Washington, D. C.



AUSTRALIAN HORSECHESTNUT BOARD DAMAGED BY WHITE ANTS WHICH CAME THROUGH FLOORING

Old building U. S. National Museum, Washington, D. C.

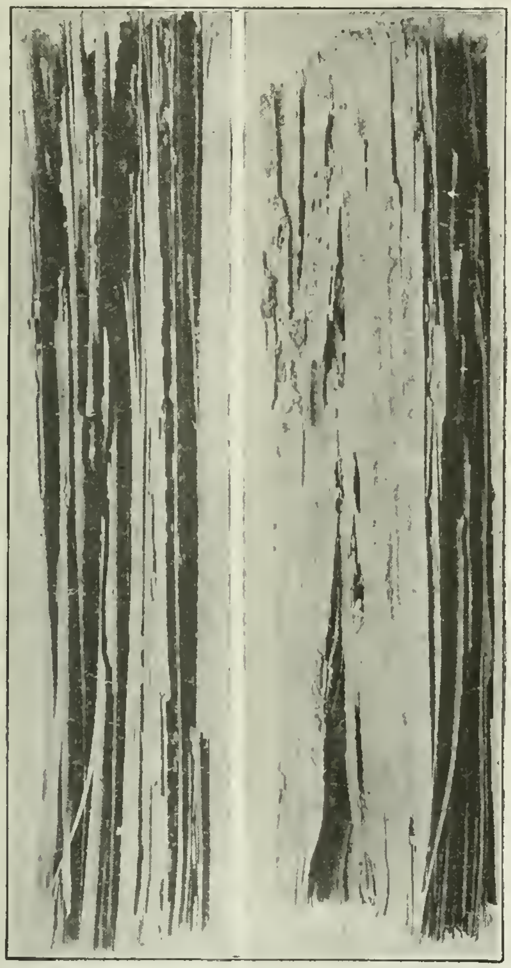
The flooring and woodwork of a valuable residence at New Orleans, La., remedy costing $3,000; the flooring of a large hospital at Dover, N. H.; a railroad station at Baltimore, Md.; a factory building at Bloomfield, N. J., and the foundation timbers and woodwork of valuable residences in St. Louis, Baltimore and New York are examples of similar damage which has occurred recently at other localities.

In all the cases of serious damage referred to this Bureau recommendations have been made and, when these were adopted and properly carried out, no further damage occurred, but cases where it was attempted to merely patch up the damage and kill the few insects which were exposed in the infested timber resulted in failure.

No insects occurring in houses are capable of greater damage than termites or "white ants," not only to the integrity of foundations but also to the contents of the buildings. The damage they do is usually hidden until beyond repair; they work in the interior of the wood and do not come to the surface except when the winged adults swarm in the spring.

A prevalent idea, even among entomologists, is that termites only infest *old* buildings. It is not the age of a building but the manner in which it is constructed that renders it liable to attack. Improperly constructed *new* buildings, which have been built for only one, two, or three years, are commonly badly infested. The insects during this period have often reached the second and third floors. Indeed, we have records of serious damage to the foundations of improperly constructed buildings which had only been completed for from three to six months.

Such damage is all in unnecessary expense. It has been found by investigations conducted by the Branch of Forest Entomology that white-ant-proof buildings can be constructed just as effectively as rat-proof buildings. The old recommendations for remedying and preventing damage by spraying, fumigating and patching up are utterly useless and result in a sense of false security which is soon dispelled by the reappearance of the insect in more numerous hordes.



PINE FLOORING OF RESIDENCE DAMAGED BY WHITE ANTS IN NEW ORLEANS, LA.

Note the paper-like consistency of the wood which has been eaten out in layers, with the grain, the insects preferring the softer rapidly growing wood.

Both the remedy and preventive is the same in case of measures against our common species of white ants (species in the genus *Reticulitermes* Holmgren), namely, complete isolation of all untreated wood from the ground.

Since these insects always require access to earth, when this source of moisture is shut off they will not be able to extend their galleries farther and will perish. In case of infested frame buildings, when once the infested beams are disconnected from the earth, the insects infesting the woodwork, no matter in how great numbers, will soon dry up and die. Thus, if the untreated foundation timbers are cut off from contact with the soil, the source of moisture, the white ants will die in the flooring and woodwork, even if they had penetrated to the second and third floors.

This positive and demonstrated fact has resulted in a great saving in reconstruction since, unless seriously structurally weakened or the wood is continually damp, the damaged woodwork need not be removed because the white ants will dry up.

One of the most common sources of infestation by white ants in the case of buildings constructed of stone and steel is through improperly constructed concrete flooring. Usually, the base of the concrete floor is a loose combination of coarse gravel or cinders and cement grout. This very rough conglomerate, although several inches in thickness, has many cracks and even large holes through it. Over this is laid a solid concrete, about two to three inches in thickness, of fine texture. However, in this concrete, while it is still moist, wooden sleepers are laid; these untreated sleepers extend down to or nearly reach the coarse, open conglomerate—which is in contact with the earth. To them is nailed the wooden flooring.

It will be seen that this is faulty construction. White ants have free access from the earth, in which they have galleries, through the porous conglomerate to the untreated beams and flooring (see diagram A). There should be a layer of solid concrete of a thickness of at least 1 in. between the grout and the wood (see Diagram B).

Other sources of infestation in the case of stone or steel buildings are steel or stone pillars or piping extending down through the concrete floor to foundations in the earth. Often there is not a tight connection between these pillars or piping and the concrete floor. Overlapping strips of metal extending horizontally several inches from the pillars or pipes should be embedded in the concrete floor in order to obtain a tight point of juncture (see Diagram B); or liquid (adhesive) asphalt pored in to plug up the crevice.

White ants will utilize any such crevice to leave the ground and penetrate through the flooring in search of wood—their food.

The following suggestions are important:

EARTHLIKE SHELTER TUBES OF WHITE ANTS

Constructed of earth mixed with finely digested, excreted wood and built over brick wall in heated, dark, damp basement. These tubes extend through cracks between the basement pipe flooring and the wall near a steam radiator. Note the granular structure. The insects use these tubes in passing over impenetrable substances and to protect them from the light in extending their galleries—in this case up to the next floor in an old building in Washington, D. C.

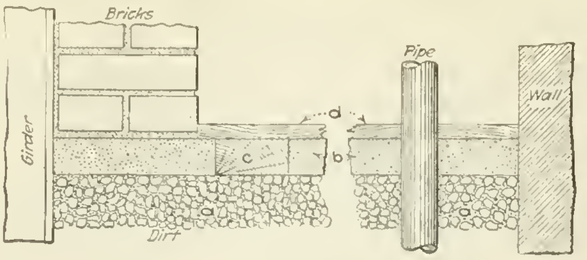


DIAGRAM A

a = Gravel or cinders loosely cemented with coarse concrete, 3 in. thick, but with many crevices and holes.
b = Solid dense concrete, 2 in. thick.
c = 2 x 4 in. untreated wood sleeper set in moist concrete over the grout.
d = $\frac{7}{8}$-in. pine flooring nailed to sleepers.

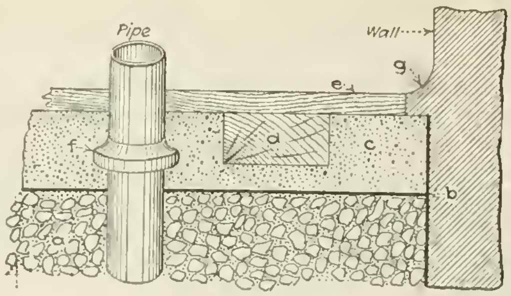


DIAGRAM B

a = Gravel or cinders loosely cemented with coarse concrete, but with many crevices and holes.
b = Asphalt waterproofing $\frac{1}{8}$ in. thick.
c = Dense concrete, 3 in. thick.
d = 2 x 4 in. untreated wood sleeper set in concrete.
e = $\frac{7}{8}$-in. flooring nailed on sleepers.
f = Metal collar around pipe which runs down through the concrete; this collar should be soldered to the pipe and embedded in the concrete.
g = Shoulder of concrete at point of juncture of wall and concrete floor to avoid a right angle connection and consequent cracking.

IMPROPER AND PROPER METHODS OF BUILDING GROUND FLOOR TO PROTECT AGAINST WHITE ANTS

In order to prevent the insects from reaching the woodwork of buildings from these nests in the ground the foundations should, where possible, be entirely of stone, brick, or concrete, including the pillars in the basement or cellar. The walls, partitions and flooring in the ground floor, basement, or cellar should also be of concrete. Wooden flooring can be laid over this concrete floor if more desirable. Concrete floors should be of the densest concrete possible, so as to avoid dampness and should be strong enough to prevent cracking. The points of juncture between concrete walls and flooring should be filled in by rounding off the concrete at these places, since cracks often occur where the wall and floor join at right angles; termites often come up through cracks between walls and flooring.

Bungalows or frame buildings in the country which have no cellar should be raised from the ground on stone foundations to a height which will allow light and air to penetrate beneath.

Where stone or concrete foundations are impracticable, timber impregnated with coal-tar creosote should be used. Untreated beams should never be laid on the earth. Where beams are embedded in moist concrete, the concrete should be allowed to dry before the wooden floor is laid. If not, they will rot even if they do not become infested with white ants.

If possible, at least one sheet of asphalt waterproofing should between the grout and the solid concrete. Then sleepers are blocked up and laid on this asphalt before pouring in the concrete about them.

The supports of the woodwork of coal bins in basements or cellars should not be set in the ground but should rest on concrete. Window sills and frames in the basement or cellar should be laid over concrete, and the woodwork should not come in contact with the ground through which white ants can come up from subterranean galleries. Complete dryness of foundation timbers and basement walls and flooring is an important means of rendering buildings safe from attack by white ants. Good subventilation should be secured; that is, a deep air space should be left between the ground and wooden flooring.

Supports of porches or steps should never be laid directly on the ground but should rest on rock or concrete.

More detailed information on termites or white ants may be obtained from Farmers' Bulletin No. 1,037, U. S. Dept. of Agriculture. In this bulletin the procedure is outlined by which it is possible to get rid of white ants, which are already infesting buildings. Initial proper construction will, however, insure against such damage.

State Aid for Cheap French Dwellings

THE French law of April 12, 1906, amended Dec. 23, 1912, relative to state loans to enterprises engaged in the building of cheap dwellings has been further amended so as to provide for multiple dwellings, or apartment houses. The principal provisions of the amendment according to a recent issue of the *Monthly Labor Review* issued by the Bureau of Labor Statistics, U. S. Department of Labor, allow certain state aid on multiple dwellings when the annual rent of each apartment does not exceed at the time of construction a maximum of 300 francs per year for three rooms and toilet containing a total floor area of from 376.7 to 484.4 sq.ft., for communes having a population of 5,000 and under; to 720 francs per year for the city of Paris for the same number of rooms, with the same approximate floor area. For more than 484.4 sq.ft. of floor space the maximum annual rental is fixed at 325 francs for communes of 5,000 population and under to 760 francs to the city of Paris and the Province of the Seine. The law also applies to construction of apartments containing two rooms with kitchen and toilet, one room with kitchen, and one isolated sleeping room.

The annual rental of individual dwellings is fixed at 4 per cent of the actual cost. The state may advance through the mortgage bank not more than 200.000.000 francs and the Bank of Deposit and Consignation (under government supervision) is authorized to advance not more than 300,000,000 francs for such enterprises.

Loans are to draw 2 per cent interest annually if used in the acquisition or construction of individual cheap dwellings, or in the acquisition of small properties, under the provisions of the law of April 12, 1906, that of April 10, 1908, and subsequent laws. If used for the acquisition or construction of cheap dwellings or small properties for rent only, the rate of interest is $2\frac{1}{2}$ per cent. Provision is made for loans for completing dwellings now under construction.

Repair Holes in a Concrete Ship With Cement Gun

Patches Readily and Successfully Placed Over Holes Punched in Hull of Government Concrete Freighter

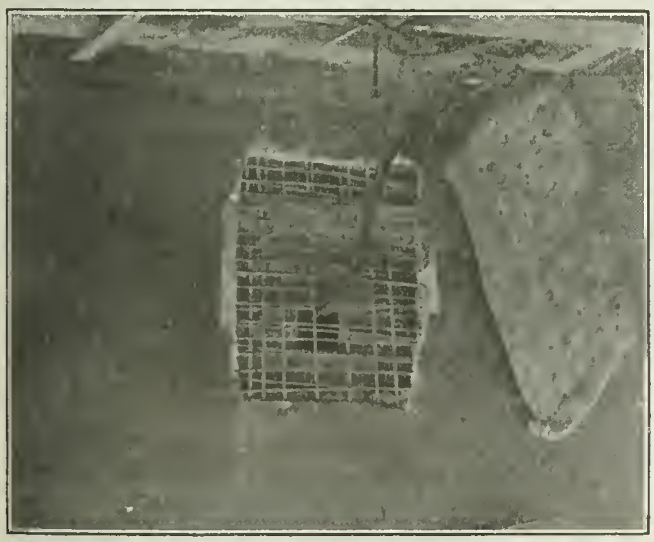
ONE of the arguments which has been advanced in favor of concrete ship construction is the ease of repair. In proof of this a recent experience with the United States Shipping Board's concrete freighter "Cape Fear" is offered.

The "Cape Fear" was built by the Liberty Shipbuilding Co. at Wilmington, N. C. It is of the so-called 3,500-ton class, designed and built by the Concrete Ship Section of the Emergency Fleet Corporation. The ship while recently in New York harbor suffered some damage by collision either with a pier or with some other craft, and three holes were punched in her port side. One was just aft of the collision bulkhead, one in the fore hold, and one abreast the boiler room. In New York it was attempted to repair the ship by chipping out the largest hole, approximately 4 ft. square, clear through the shell and pouring concrete between inner and outer forms. It was found, however, that this method of repair would not insure a perfectly tight hull and when the ship came into Newport News it was decided to make a new repair in the yard of the Newport News Shipbuilding & Dry Dock Co., using concrete placed by the cement gun.

The work was done under the direction of Godfrey L. Smith, civil engineer of the company, and the information herewith is from a statement of the repair job made by Mr. Smith.

The first procedure was to cut out all of the concrete that was placed in New York and to clean out the shattered material in the smaller holes which had not been repaired in New York. A form was then put on the inside of the ship at each hole about 3 in. clear of the inside of the shell and the mortar placed against this form with the cement gun. The extra 3-in. thickness was not thought necessary in the yard but was placed because the captain of the ship very much desired an added thickness shell to insure a perfectly safe patch.

The reinforcement of the shell, as shown in the view herewith, consisted of two networks of small rods, one near the outside of the shell and one near the inside, and these rods were so closely spaced it was necessary for the workmen to stop guniting twice and to cut the concrete off the reinforcement with trowels in order to get the necessary amount inboard of the reinforcement. The holes were finally filled, however, up to about ½ in. outside the hull, after which they were trimmed down to a fair line by means of shape steel trowels and the surface rubbed by wooden floats.



HOLES IN HULL OF CONCRETE SHIP "CAPE FEAR"

Inasmuch as the captain was in a great hurry to get away from the yard, it was then decided to speed up the hardening process by steaming. A canvas screen was dropped over the side of the ship well over the patches and held close against the ship. Live steam was then turned into the space between the canvas and the hull and kept on all night. The following morning the steam was shut off, the canvas screen raised and the surface rubbed down smooth with a carborundum brick and water. The canvas screen was then replaced and steam was left on all of that day and night. The following morning it was evident that the job was entirely satisfactory as there were no cracks anywhere in or around the patch. It was then painted with a special concrete paint and when this was dry a coat of black asphaltum varnish was applied. A hose test of 1⅛-in. nozzle and 150-lb. water pressure was applied 12 to 15 ft. from the patch and showed no leakage through the hull at any place. The ship left a day after the final patching and so far as is known suffered no further difficulty in its hull.

Reconstruction Work in France

The work of reconstruction is proceeding so slowly in the devastated regions of France that efforts are being made to reorganize the administrative service, which seems to be wholly incapable of carrying out this vast undertaking. Apart from the reconstruction of roads and bridges, very little has been done beyond clearing up some of the areas. Most of them have remained untouched. The inhabitants complain that they can obtain no assistance and no redress, and it is urged that something must be done at once to save the devastated regions from absolute ruin. The trouble arose first of all from the refusal to accept British and American aid immediately after the Armistice, when efforts were made to carry out the work of reconstruction under conditions that would have been highly advantageous to France, some groups of contractors even undertaking to accept payment out of the war indemnity. The French government, however, decided to reserve the work for French manufacturers. Besides, negotiations were in progress with the Germans to supply the necessary labor. The Germans have done practically nothing, and the French can do scarcely more on account of the financial situation not permitting of funds being devoted to the work. Now that it is proposed to compound with the Germans and secure from them a fixed sum for reconstruction, there is a prospect of a serious start being made with the work. In any case, if France is to benefit from a rapid reconstruction it can only be with foreign aid, so that there is a possibility of the government being induced to relax its present exclusive policy and permit British firms to assist in the carrying out of this vast work.—*The Engineer.*

New Pumping Plant for Water-Works of Peekskill, New York

Steam Turbine Drives Large and Small Centrifugals—Water Power Provided for Latter, or as Auxiliary in Turning Both

By Henry W. Taylor
Consulting Engineer, New York City

THE development of a new pumping installation for the water-works of Peekskill, N. Y., involved the consideration of the most efficient method of utilizing the water power owned by the city, the high cost of coal delivered to the pump house, and the necessity of installing the new apparatus while the existing pumps were kept in operation in the same pump room.

In the Spring of 1918, the pumping equipment consisted of (1) A Holly-Gaskell pumping engine with a nominal capacity of 3,000,000 gal. per 24 hours and a working capacity of not over 2,250,000 gal. per day. (2) Two displacement power pumps, which were operated from a jackshaft receiving power from a water turbine in the basement of the building, or from another jackshaft with pulley and belt to a Corliss engine. (3) A centrifugal pump, with belt drive from a 100-hp. electric motor. All this equipment was continuously subject to repair and was unreliable.

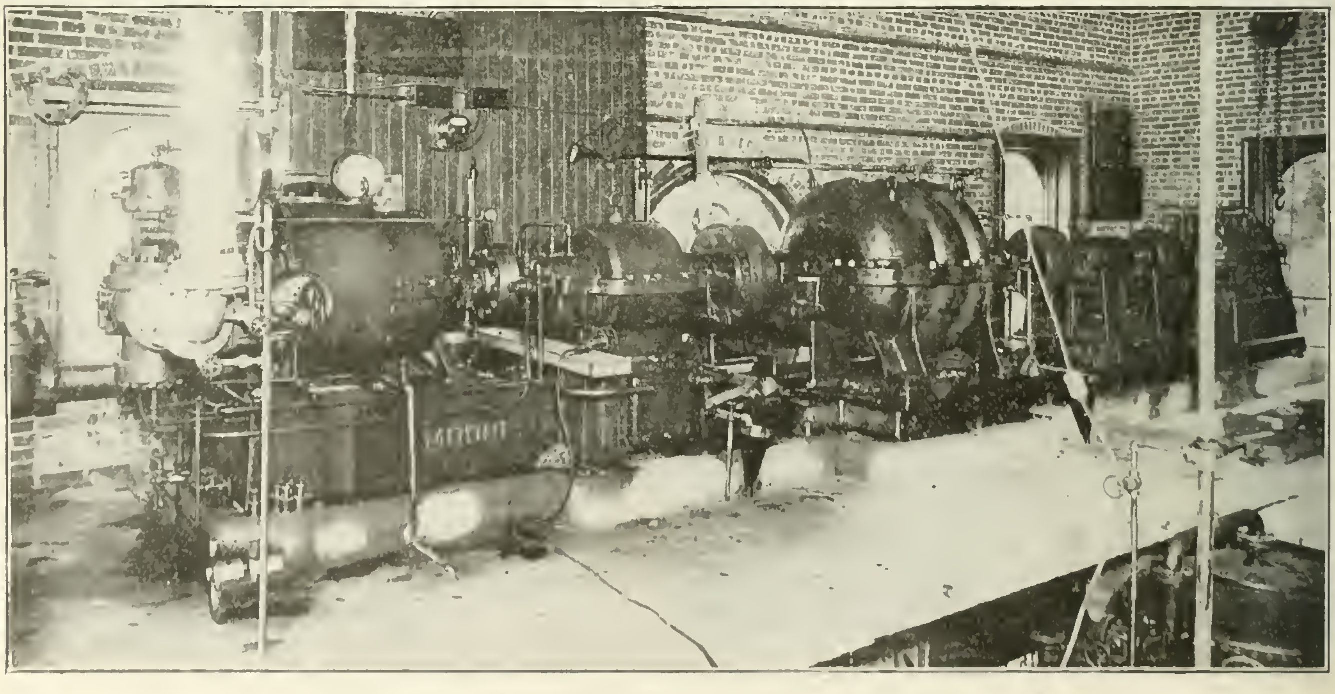
The required pumpage for 1918 was estimated at approximately 3,300,000 gal. a day. The existing main steam unit had a deficiency of about 800,000 gal. When the water-power pumps were driven by the Corliss engine (non-condensing) the coal cost rate was about twice that of the Holly-Gaskell pumping engine, and when electricity was used, the cost was prohibitive. The pumping head was about 360 ft.

From the reports of the Board of Water Commissioners the cost of pumpage per million gallons for the past three years was approximately as follows: 1915, $16.30; 1916, $17.80; 1917, $31.60. With coal prices of 1918, the cost per 1,000,000 gal. of operating the Holly-Gaskell old equipment was estimated as follows: Holly-Gaskell engine, $29.50; Corliss engine, about $45; Electric pump $70. As compared with the above, the unit cost of operation was estimated as follows: Pumpage by steam turbine, $28, assisted by estimated available waterpower, $17.45.

It was at first considered that a complete electric-driven pumping station might well be installed to avoid the excessive costs of coal, which, when delivered to the plant, about three miles from tide water, was costing over $8 per gross ton. Several schemes, however, were developed which included the use of electric-driven pumps, of modern steam pumps, of centrifugal pumps driven by steam turbine and water power and of units driven by crude oil, etc. When the matter was taken up with the Electric Light & Power Co., it was discovered that due to a large development charge involved in supplying the pumping station with about 400 hp. of electrical energy it would be impossible for the company to give a rate of less than 2.03 c. per kw.-hr., which was more than the cost of pumping by steam turbine gear set with direct connection to centrifugal pumps.

After a complete investigation the commissioners decided to install a 400-hp. steam turbine with gear reduction from 3,600 to 1,200 r.p.m. direct connected to a 4,000,000-gal. centrifugal pump which operates under a head of about 365 ft. To transmit the available water power to this same pump shaft, the 4,000,000-gal. pump shaft was direct connected to a belt shaft and beyond this belt section of shaft was installed a 1,000,000-gal. pump, operating against the same head. This small unit is available for use for water power only or for use in connection with the 4,000,000-gal. pump with both steam and water drive, to give a total capacity of 5,000,000 gal. from the new apparatus.

The water power is thus conducted to a large unit of high efficiency and is relayed by a steam drive at the other end of the pump. In past operation, the old reciprocating pumps with water drive required about 75 hp. to turn the apparatus over and consequently small amounts of water power were not subject to actual use.



NEW 5,000,000-GAL. PUMPING INSTALLATION AT PEEKSKILL, N. Y.

With the new layout, 25 hp. from the water power can be transmitted to the main pump shaft and reduce the steam consumption by this amount. On the other hand, when the new steam unit is shut down, and if there is a reasonable amount of water power available, one coupling can be broken and one made up, so that the water power is devoted entirely to the 1,000,000-gal. unit. From the point of view of water power, the new layout provides a steam auxiliary which makes up for a lack of water storage and at the same time provides a simple method whereby even minor quantities of water power can be transmitted to a shaft which operates a large unit of relatively high efficiency.

The turbine installed was a Moore, with a Moore gear set and a Schutte-Koerting water-jet condenser the steam inlet of which is on a line with the side outlet of the turbine. There are only two joints between the turbine and the condenser which can cause trouble from air leakage. The circulating water for the condenser is taken from the power head race and the water is pumped by a water-power-driven centrifugal pump which will produce a flow of about 1,000 gal. per minute. During the Summer time a vacuum of 28½-in. with a 30-in. barometer is obtained and for lower temperatures of water a vacuum of 29 to 29½-in. has been obtained. The discharge from the condenser is carried to an auxiliary suction well and in case of low flows in the creek this circulating water can be picked up by the 4,000,000-gal. water supply pumped and delivered to the reservoir.

The turbine and gear set are mounted on one bed plate which is flanged at the ends and bolted to the bed plate which carries the 4,000,000-gal. pumping unit. The 1,000,000-gal. pump bed plate was extended to receive the intermediate shaft section containing pulley and belt from the water-wheel jacket shaft. The combined bed plate when bolted together represent a continuous plate about 26 ft. long. The overall length of the entire apparatus is 29¾ feet.

An auxiliary outfit is provided for the circulating water to the condenser consisting of a second centrifugal pump, which is electrically driven. The motor shaft of this unit is extended to receive a pulley and the motor is so placed that a small belt can be installed from this pulley to the main shaft pulley and the condenser pump can be driven from this main shaft when the water power is not available for protracted periods.

The new outfit includes also a new feed-water heater, a new feed-water filter and a full complement of venturi meters to measure flows of water, General Electric steam-flow nozzle and gage, pressure and vacuum gages and accessories for all parts of the machinery.

It was necessary to install the new apparatus and have the main unit of 4,000,000 gal. capacity in operation before any of the old apparatus was removed. The capacity of the old plant involved so small a margin of reserve that this proceedure was imperative as a precaution againstlong delays in receipt of different items of the new machinery.

The new outfit is installed in the room housing the water-power-driven pumps and the centrifugal pump and it was impracticable to place it elesewhere in view of the transmission of power from the water wheel in the basement of this room. The new turbine and centrifugal pumps were therefore installed on a concrete platform about 5½ ft. above the existing floor level. This brought the platform above the water cylinders of the old pumps and above the centrifugal pump. By making temporary connections for the discharge of the old power pumps, the new pumping unit was completely erected before any of the old pumping units were put out of commission. This elevated platform also made it possible to install all the suction, discharge and by-pass piping for the pumps and auxiliaries underneath this platform and did away with the necessity of doing any work in the rough basement underneath the pump room, where the handling of heavy pipe would have been extremely difficult. All connections are available for inspection and repair above the main floor of the room. This method of installation, which was required by the circumstances and the necessity for which developed as the work progressed, undoubtedly increased the cost of the installation.

The suctions of the centrifugal pumps were installed without valves and are primed by a connection to the vacuum chamber of the condenser. The pumps are Alberger multi-stage centrifugals.

The total cost of the installation was practically $24,000. The work was done under the trying war conditions of labor and equipment deliveries. No contracts were let except those for machinery, and the work was carried on by the Water Commissioners without a general contractor. The work was started in October, 1918, and the large unit was put into operation in April, 1919. Subsequent adjustments in alignment of turbine, gear and pumps indicated that the original allowance for expansion in the gear was much too large. Temperatures of the water pumped and used in the condenser and for oil cooling materially affect alignment and various alignments were made before satisfaction was obtained and vibration of couplings and excessive noise in gear were eliminated.

Recommendations Made for Engineer License Law in Minnesota

The engineer's license laws of Iowa, Oregon and Florida most nearly fulfill the requirements of a desirable and ideal license law, according to a recent report of the legislative committee of the Twin City Chapter of the American Association of Engineers. The report names the important features of a license law to be:

Definition of professional engineering, land surveying, and architecture, and of professional engineers, land surveyors, and architects.

Qualifications for registration and method of determining qualifications of applicants.

Reciprocity.

Application of law.

Revocation of license for cause.

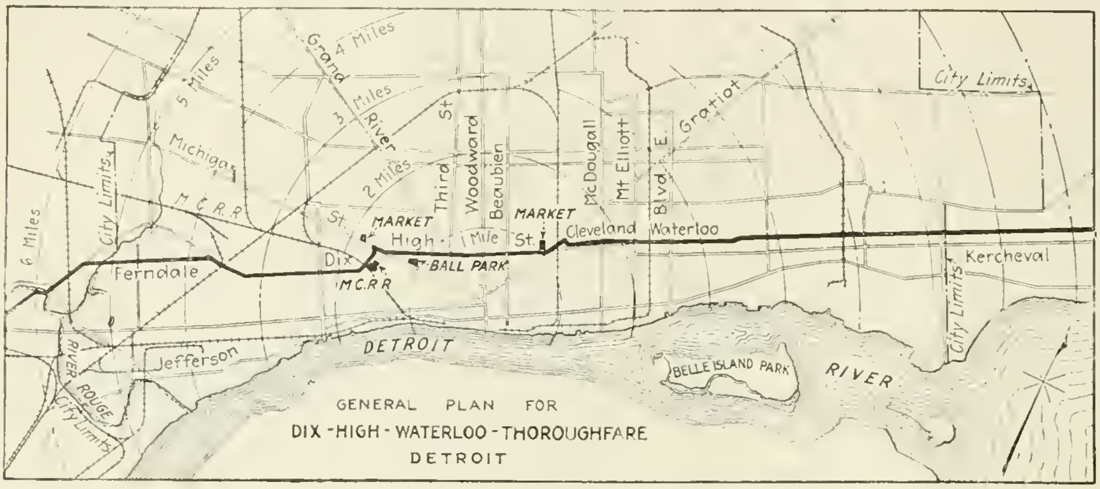
Penalty for violation of act.

The committee recommends that in the license law proposed in Minnesota one of the members of the board of examiners shall be the dean of the engineering college in the University of Minnesota. A further recommendation is that members of the board should be appointed by the governor from nominees submitted by the constituent engineering societies of the Joint Engineering Board of Minnesota.

The committee also recommends that no exemptions to the law be made, except for Government and military engineers on Government or military work, or those constructing buildings for themselves and for their own use at a cost of five thousand dollars or less

Cross-City Thoroughfare to Relieve Detroit Traffic Problem

The Common Council of the City of Detroit has approved the opening and widening of a portion of the Dix-High-Waterloo thoroughfare, which is a cross-city boulevard proposed by the City Plan Commission to relieve traffic congestion. The establishment of a wide and continuous crosstown street which will intercept the existing main radial streets before they reach the business center, will, it is pointed out by the City Plan Commission, secure effective relief from present conditions. The provision for rapid and direct east or westbound traffic across the city will also tend to collect and disperse most traffic directed to or from northern sections of Detroit without having it pass through the central zone of greatest congestion.



GENERAL PLAN OF PROPOSED THOROUGHFARE

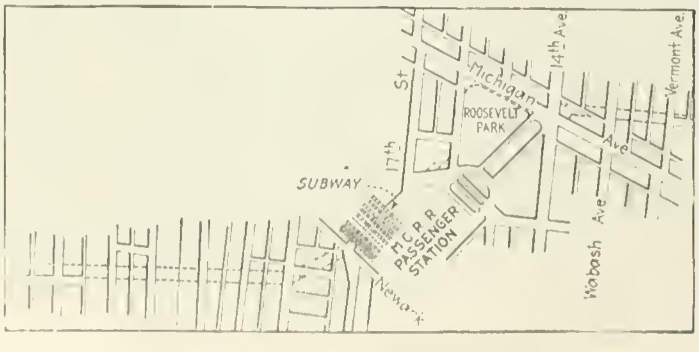
Careful study and consideration of the present traffic problems of Detroit, which bear directly upon the existing layout and widths of the main business streets, led finally to the selection of High St. for an intersecting downtown thoroughfare. It is already a fairly continuous route across the main part of the city, and it is planned to widen and extend it as indicated on the accompanying map to join Dix Ave. on the west and Waterloo St. on the east, thus forming a continuous crosstown business route between the east and west industrial belt, and adjacent commercial centers.

High St. parallels the river front about a mile north of it, and is just far enough away from the center of Detroit to separate through traffic from the slower moving traffic of the downtown district. Its total length within the city limits, together with the extension proposed, would be approximately 12 mi. It passes through the eastern market place and gives fairly direct access to a similar market center on the west side of the city. Furthermore, it goes directly in front of and almost along the west side of the Michigan Central station and thus makes that railroad center directly accessible from all parts of the city, though more especially so from the east and north.

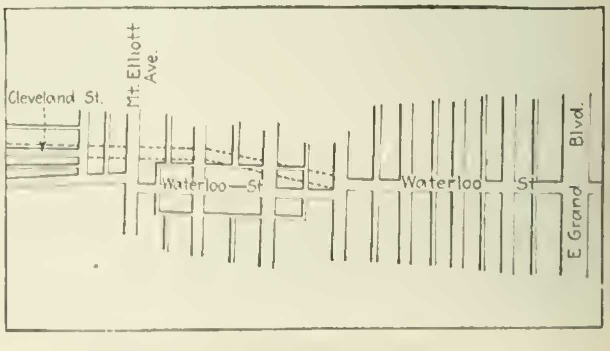
The present plan suggests the widening of High St. and its extension within the more congested sections of the city to a width of 80 ft. This width is based upon the latest standards of traffic experts according to the newest types of auto trucks and other commercial carriers, and has been supplemented by traffic counts at known points of street congestion along the proposed route. The City Plan Commission is awake to the fact that great expense is attached to such an undertaking of street widening and extension, but it considers that advantages directly derived therefrom by the city at large and by individuals will more than offset the expensive improvement costs. The city is to bear a reasonable proportion of the cost of the improvement and contiguous property will as well bear its share.

It has been ascertained that the assessed valuation of the entire property affected in any way by the widening is approximately $3,000,000. While no assurance can be given as to the cost of the improvement the City Plan Commission judges that it should not exceed this valuation, considering that in many places the widening does not materially damage the property itself. The procedure which would be undertaken in case the Common Council decides favorably on this recommendation is by condemnation proceedings, and every property owner would have an opportunity to present to a jury his claim for the damage done to his property.

This is the first extensive street widening problem which Detroit has had to face. However, it is considered easy to accomplish from an engineering standpoint. The exact work that will have to be done in case



DETAIL AT MICHIGAN CENTRAL STATION



CLEVELAND-WATERLOO CONNECTION

the Common Council will approve the entire project will be to widen Michigan Ave. at 14th St. to 80 ft. connecting with Gratiot Ave. at Riopelle St.; extend Dix Ave. and open it into 18th St. at the subway beneath the Michigan Central tracks at the new station—the route will be along the west side of the new park in front of the station to Michigan Ave. and will connect with High at 14th St. East of Riopelle St. the route will follow Gratiot Ave. across Bequindre nearly to St. Aubin; thence along Cleveland St. which will be opened and widened to Bellevue Ave. where it will connect with Waterloo St., which is also to be widened and straightened. The Common Council has approved the opening and widening from 14th and Michigan Ave. easterly, and it is thought that the project will be approved in its entirety in the near future.

Various types of paving, including sheet asphalt, creosoted block, vitrified brick, and cedar block, are surfacings now covering parts of the proposed thoroughfare, though officers of the City Plan Commission assert that in case the project is approved sheet asphalt will most likely be used, though no definite decision upon that point has yet been made. It will likely take several years to complete the project.

Timber Arch Bridge of Unusual Type in Service Seventy-Three Years

After 73 years of service an unusually interesting wooden bridge at Lowell, Mass., carrying Broadway over the Pawtucket Canal, has been replaced by a steel arch structure. Increasing street-car loads rather than decay brought about the replacement. The structure was of a type not suited to concentrated loading, though for a number of years it has carried street cars in addition to the regular vehicle traffic of a main street.

Built in 1846 by the proprietors of the locks and canals, the bridge dates back to the early days of the Merrimac River canal system, of which the Pawtucket Canal is a constituent part. It stood almost without repair until 1917. Up to a year ago it was of the single-arch form shown by the view Fig. 1 and the upper sketch in the drawing, Fig. 2. The span of the structure varies from 64¼ ft. at the downstream side to 73¼ ft. at the upstream side, the abutments being not parallel.

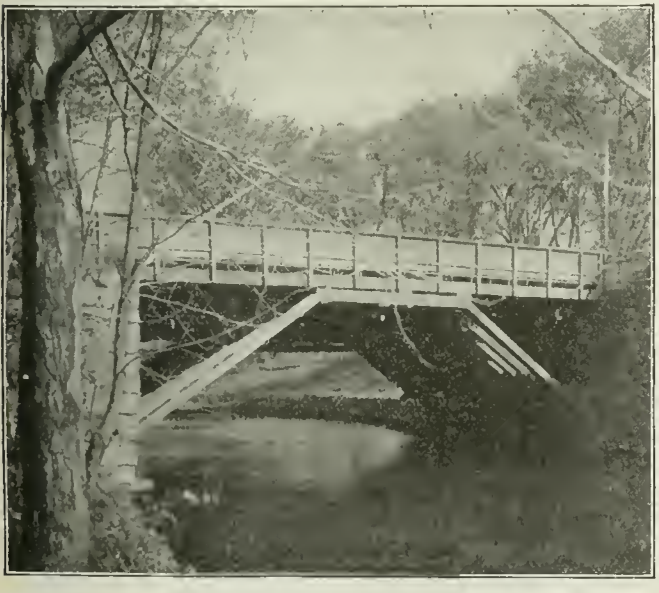


FIG. 1. DOWNSTREAM SIDE OF BROADWAY BRIDGE OVER PAWTUCKET CANAL, LOWELL

(View in 1915 before addition of secondary arch system)

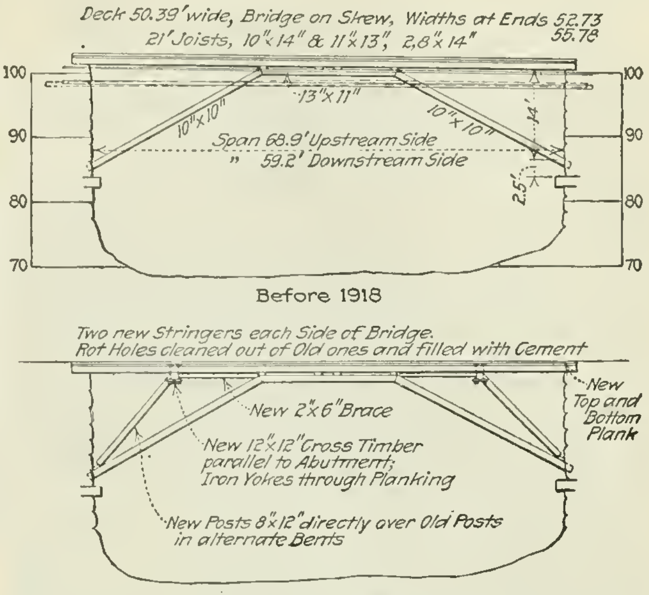

Deck 50.39′ wide, Bridge on Skew, Widths at Ends 52.73
55.78
21′ Joists, 10″×14″ & 11″×13″, 2,8″×14″
100
90
80
70
13″×11″
10″×10″
10″×10″
14′
Span 68.9′ Upstream Side
" 59.2′ Downstream Side
2.5′
Before 1918
Two new Stringers each Side of Bridge.
Rot Holes cleaned out of Old ones and filled with Cement
New 2″×6″ Brace
New Top and Bottom Plank
New 12″×12″ Cross Timber parallel to Abutment; Iron Yokes through Planking
New Posts 8″×12″ directly over Old Posts in alternate Bents
After 1918 Repairs

FIG. 2. SKETCHES SHOWING CONSTRUCTION OF BROADWAY BRIDGE AND 1918 STRENGTHENING

As will be seen, this structure is a three-segment rib arch and therefore is not of rigid type. Its stability under unsymmetrical loading depends on the stiffness of the joints and the stiffening action of the stringers or floor joists. In 1917 and 1918 the floor was repaired and at the same time it was considered necessary to reduce the flexibility of the structure under street cars. For this purpose a secondary arch system was inserted, as shown in the lower elevation in Fig. 2. The work was carried out by the canal company with the co-operation of Stephen Kearney, city engineer of Lowell, on whose authority the preceding information is given. The revision was only a war-time expedient, however, and during the current year the bridge was replaced by a steel structure, as previously stated.

Determining Bearing Power of Soils

With a view to determining the physical characteristics of various subgrade soils, thereby obtaining a scientific measure of their bearing value, an investigation is now being carried on by testing engineers within the Bureau of Public Roads. The work includes taking samples of soil at spots in the subgrade of highways where failure has begun, and studying surrounding geological conditions to determine in what manner moisture reaches the subgrade, thus destroying its value.

In this investigation it is hoped that co-operation will be secured from various state highway departments. The Bureau of Soils is co-operating with the Bureau of Public Roads in the investigation.

So far samples of soil have been taken from the Washington-Baltimore Road in Maryland, and are now under observation. Later the work will be extended beyond Baltimore and on other roads in Maryland. Some progress has been made in laboratory testing, a number of samples of subgrade material having been examined already.

Report on Test of Two-Way Tile and Concrete Floor

Preliminary Results of Stress-Deformation Records Made on Experimental Structure by Bureau of Standards

ONE of the most extensive stress-deformation tests on a full-size structure has recently been completed by the Bureau of Standards on a specially built two-way tile and concrete floor. While complete results have not been worked up, it is possible now to give a preliminary report of the test, from data obtained from W. A. Slater, of the Bureau of Standards, who had charge of the work. The structure was built by and the tests made for J. J. Whitacre, of Waynesboro, Ohio, and Prof. R. H. Danforth, of the Case School of Applied Science, co-operated in the tests.

The purpose of the test was to obtain data which would afford a basis for the design of a two-way reinforced-concrete and hollow tile floor system. The test was planned to obtain information on (1) the effect of variation in the ratio of length to width of panels on moments in two directions, (2) the relation of maximum negative moment to maximum positive moment, (3) the distribution of stresses in the reinforcement, the concrete and the tile at points of maximum positive and negative moment, (4) the deflection of the slab and girders under different loadings and (5) the anchorage of bars required for negative reinforcement.

For the purpose of obtaining the data desired, a large slab was constructed upon which strain measurements were taken on approximately 900 gage lines in the reinforcement, 500 gage lines in the concrete and 75 gage lines in the tile. Deflection was observed in 40 places.

The slab is 117 ft. 6 in. long and 50 ft. wide, and is divided into 18 panels. Six of these panels are 16 ft. square, six are 16 ft. by 19 ft. 3 in., and six are 16 ft. by 22 ft. 6 in. These panels are supported by reinforced-concrete girders, the stems of which are generally 12 in. wide, making the clear spans of the slabs about 12 in. less than the panel lengths and widths as given above. The slab, whose total thickness is 6 in., is made up of 6 x 12 x 12-in. clay tile laid in such a manner as to form rows in two rectangular directions with 4-in. ribs of reinforced concrete between each two rows of tile. The ends of the tile were left open, allowing a small amount of concrete to enter the cells so that they form an integral part of the slab.

Each concrete rib throughout the slab has as reinforcement one ½-in. plain, round bar extending the full length of the rib. The center of the reinforcement extending in the short direction of the panel is about 1 in. above the bottom surface of the rib and the reinforcement extending in the long direction is about 1½ in. above the bottom surface of the rib. Over the support in each rib is one ½-in. plain, round bar whose center is 1¼ in. below the top of the rib. This rod extends to a point one-fourth of the span length from the support.

Loading the slab began on Dec. 20, 1919, and continued at intervals up to Feb. 5, 1920. At this time the applied load on the square panels was 397 lb. per square foot, on the intermediate size panels 280 lb. per square foot, and on the long panels 230 lb. per square foot. This load was allowed to remain in place until April 3, 1920. Under this loading the stresses in the reinforcement at points of maximum negative moment were 40,000 to 50,000 lb. per square inch. The stresses in the reinforcement at points of maximum positive moment were less than 12,000 lb. per square inch.

The load was then shifted from one part of the slab to another in order to secure relatively high stresses in the steel resisting positive moment in typical panels. On April 20, 1919, when the stresses in the positive steel in typical panels were over 30,000 lb. per square inch, the load on an interior square panel was 730 lb. per square foot, on an interior intermediate panel, 615 lb. per square foot and on an interior long panel, 505 lb. per square foot. The loads on typical exterior panels of each size were approximately 70 per cent of the load on interior panels of the same size.

The data of the final loading which so far have been worked up, show:

(1) The tile was effective in resisting compressive stresses, the deformations observed in the tile being approximately 70 per cent of the deformations in the concrete;

(2) The negative bending moment for interior square panels based on maximum weighted stresses observed after the load of 397 lb. per square foot had been in place about two months was less than 1/44 Wl for all panels and the average was considerably less than this; in this formula W is the total load on the

TEST FLOOR MADE UP OF TWO-WAY TILE AND CONCRETE CONSTRUCTION panel in pounds and l is the clear span length in inches;

(3) Positive bending moment for an interior square panel, based on maximum stresses observed under the load of 730 lb. per square foot, was about 45 per cent of the negative bending moment:

(4) The negative bending moment for exterior square panels based on stresses, observed after the load of 372 lb. per square foot had been in place on the panels for about two months, was about 20 per cent more than that for interior square panels;

(5) The positive bending moment for exterior square panels was about 25 per cent more than that observed for interior square panels.

Complete results have not, as yet, been worked up for the negative and positive bending moments for the oblong panels, the point of inflection, deflections under different loadings, vertical shearing stresses, etc.

New Contract Provisions Proposed

Labor and Materials Cost Variations Covered in 16 Clauses Recommended by Contract Committee of A. G. C.

As a result of a study, during the past year, of 113 different forms of contracts of various types, the committee on contracts of the Associated General Contractors of America has approved 16 provisions which it recommends be included in every contract made by members of the Associated General Contractors. Although the committee is not yet prepared to submit a complete form of contract, embodying every provision which it believes should be included in a good contract, it has recommended immediate adoption of certain clauses, including those to take care of variations in the cost of labor, materials and freight rates. Another provision covers reduction in the amount of surety bonds from time to time during the execution of the work, so that the bond will cover only the uncompleted portion of the work.

The 16 provisions recommended are given herewith:

1. *Action on bids.* Bids should be submitted with the provision that they must be acted upon within a reasonable time.

2. *Freight rate changes.* Bids should be submitted on the basis of existing freight rates, with the provision that in case a change in rates should occur between the time bids are received and the date fixed for the completion of the contract, the contract price should be increased or decreased accordingly.

3. *Wage scale changes.* Bids should be stated and be submitted on existing wage rates, with the provision that the contract price shall be increased or decreased in accordance with any change in such rates before the date fixed for the completion of the contract.

4. *Material price changes.* Bids should be submitted on the basis of existing prices for materials f.o.b. the producer's plant or distributor's yard, with the provision that the contract price shall be increased or decreased in accordance with any change in such price that takes place within the time allowed the contractor to purchase and fabricate his material.

5. *Monthly estimates.* Monthly estimates should include materials delivered and suitably stored as well as materials incorporated in the work.

6. *Partial payment.* Certificates should be prepared and delivered to the contractor between the first and the tenth day of each month, showing the proportionate parts of the contract price earned during the preceding month. These certificates should be paid by the owner by the 10th day of the month. Interest on the first payment should be made the contractor at the prevailing rates.

7. *Contractor's right to stop work.* Under the following conditions, the contractor should have the right to stop work or terminate the contract upon three days' written notice to the owner and the architect, and recover from the owner payment for all work executed and any loss sustained upon any plant or material, and reasonable profit and damages;

(a) If the work should be stopped under an order of any court, or other public authority, for a period of three months, through no act or fault of the contractor, or anyone employed by him;

(b) If the architect or engineer should fail to issue the monthly certificate for payment in accordance with the terms of the contract;

(c) If the owner should fail to pay the contractor, within seven days of its maturity and presentation, any sum certified by the architect or engineer or awarded by arbitration;

(d) If the owner does not permit the contractor to proceed with construction within a reasonable time after signing the contract.

8. *Retained percentage.* The retained percentage should be based on 100 per cent of the work performed and should never exceed 10 per cent. When the amount retained reaches a total sum, which shall be mutually agreed upon by the owner and the contractor, no further reduction from payment should be made.

9. *Surety bond.* When a surety bond is given, it should be reduced at agreed intervals so as to cover thereafter, only that portion of work left uncompleted.

10. *Penalty clauses.* Whenever any provision is incorporated in the contract for a penalty against the contractor (including liquidated damages), there should also be inserted a provision for a bonus of like amount.

11. *Act of God or a public enemy.* The contractor should not be held liable for results arriving from the act of God or a public enemy.

12. *Time allowed for completion of work.* The time allowed for the completion of the work should be based on "weather-working" days instead of on elapsed time and, if necessary, allowance should be made for time spent in performing unproductive work, made necessary by flood or other natural causes beyond the control of the contractor.

13. *Inspection.* Where practicable, material should be inspected at the source so that possible delay may not result from the rejection, at the site of the work, from material furnished in good faith to the contractor.

14. *Force account work.* Payment for force account work should be made on the basis of the total actual profit of the work, including the actual labor and material cost, rental on equipment, liability insurance, etc., plus a reasonable percentage to cover overhead and profit, total to be not less than 15 per cent.

15. *Change in quantities.* In case the actual quantity of any item in a unit price contract is less than the estimated quantity by more than a certain fixed per cent, the unit price paid the contractor for that item should be increased by an amount to be agreed upon. Similarly, a decrease in the unit prices should be made in case the quantity is increased over the estimate by more than a certain fixed per cent.

16. *Arbitration.* In no case should the engineer or architect be made the final judge as to the interpretation of the drawings and specifications or the performance of the contract. All decisions and interpretations should be subject to prompt arbitration at the choice of either party to dispute.

The contract committee, whose recommendations, indicated above, were printed in a recent issue of *The Bulletin* published by the Associated General Contractors of America, is headed by J. W. Cowper, the other members of the committee being: Arthur Bent, Bent Bros., Los Angeles; M. L. Cunningham, Municipal Improvement Co., Oklahoma City; Avery Brundage, Chi-

cago; D. G. Goggin, Fred T. Ley & Company, Springfield, Mass.; L. S. Oakes, Winston Bros. Co., Minneapolis; J. W. Rollins, Holbrook, Cabot & Rollins Corp., New York City; and E. Stanley Holland, Bates & Rogers Construction Co., Chicago.

Nitrate Plant Construction Both Scored and Praised

SELECT Committee on Expenditures in the War Department, of the House of Representatives, has issued another of its subcommittee reports on the investigations in which it has been engaged for some months past. This one—the work of Subcommittee No. 5 on Ordnance—is the result of the hearings "upon the activities and expenditures of the President and War Department in their efforts to build and operate plants for the manufacture of nitrates for the winning of the war." Like its predecessor on cantonment construction, noted in these pages some weeks ago, it is strictly a partisan performance, the majority report condemning every act of the Administration being signed by two Republicans, and the minority report denying every allegation of the majority, by one Democrat.

The plants in which nitrates were to be made by the Government comprised Nos. 1 and 2 near Sheffield, Ala., on the Tennessee River by the famous Muscle Shoals, No. 3 at Toledo, Ohio, and No. 4 near Cincinnati, Ohio. No. 1 was an experimental plant authorized by the National Defense Act of 1916, which appropriated $20,000,000 for the purpose of the manufacture of nitrates, though the selection of the site was not decided upon nor work started until after the United States was in the war. It involved also the construction of the since named Wilson dam across the Tennessee River at Muscle Shoals and the projected construction there of a hydro-electric power plant. Plants Nos. 2, 3, and 4 were built under the War Emergency Act and the sites selected subsequent to the beginning of plant No. 1. Plants Nos. 1 and 2 were completed before the armistice but never supplied any product for war purposes. Plants Nos. 3 and 4 were shut down after the armistice after about $7,000,000 had been expended on each. Construction of the Wilson dam was shut down for a time toward the end of the war due to the difficulty in obtaining priority for material for it, but work was recommenced just before the armistice and is now under way.

The majority report contends that the whole nitrate program was one of misdirected effort; that the labor and money required to construct the nitrate plants could have been utilized better in producing food or other war essentials; that there was no necessity at any time which required the War Department to embark upon the building program for the manufacture of nitrates for war purposes, but that it should have early in 1916 purchased and stored in this country sufficient Chilean nitrates to last during the war; that "the excuses given for the program that German submarines might possibly cut off our supply of Chilean nitrates or that Chilean nitrate producers might raise the price thereof was visionary and not justified by the facts"; that the selection of Sheffield, Ala., and Muscle Shoals, was in effect merely a concession to numerous interests which had been for years trying to induce the National Government to dam the Tennessee River for the production of hydro-electric power at this point; that the contracts made by the War Department with the Air Nitrates Corporation, which had charge of the construction of the last three plants, are unilateral and unfair and unjust to the Government; that the ordnance officers charged with the responsibility for the plants failed in most instances to guard the interests of the United States; that the Ohio sites were entirely unsuitable for the location of such plants; that they were merely selected to appease the Ohio delegation in Congress which was strenuously objecting on the floors of Congress to the selection of the Southern site; that the cost-plus system of contract caused great additional expense to the Government and had a demoralizing effect upon the labor of the country and delayed completion of the plant; that there was excessive waste in labor and materials caused by neglect and inefficiency or wilful intent of the contractors; that there was a careless and wilful disregard and destruction of property purchased with public funds; that the work of construction on the plants was inefficiently conducted. Finally, the majority recommends that plants 1, 3, and 4 be abandoned, and plant 2 (Muscle Shoals) be leased.

The minority member denies in toto all of the contentions of the majority which reflect upon the judgment and performance of any of the officials or officers connected with the projection or construction of the nitrate plants. He says that a proper consideration of possibilities made imperative the independence of the United States in the production of nitrates; and that the charge that the Government did not store up Chilean nitrates is in effect a charge against Congress which did not provide the funds for such purposes. He contends that the strictures on the Wilson dam and on plant No. 1 are not pertinent because these plants were authorized before the United States was in the war and were in effect merely a necessary preparation against possible contingencies either for peace or war necessities of nitrates, the former for fertilizers, the latter for explosives. He defends in set terms the contracts between the Government and the Air Nitrates Corporation, and also the integrity of the officers and contractors connected with the construction. The minority member finally refuses to accede to any recommendation as to the future of the plants because there is a bill before Congress and in the hands of another committee.

The only issue on which both majority and minority agree is that the Alabama Power Co. took advantage of the Government's necessity to enlarge facilities of their plant at the expense of the Government.

New Highway Laws for Finland

After operating for 35 years under regulations stating that highways and village roads are to be "constructed and maintained by those who need them" the national government of Finland has passed a law which goes into effect Jan. 1, 1922, whereby roads are to be classified and a large percentage of the 30,000 mi. is to form a national system. Under the new law all roads will be classified according to administration as highways administered directly by the State, those maintained at State expense, and local roads. Highways forming what will be known as first class roads will be those from 19 to 23 ft. in width; second class, 16 to 20 ft. and village or local roads not less than 10½ ft.

LETTERS TO THE EDITOR

Shall Chinese Labor Be Imported?

Sir—In the May 6 issue of *Engineering News-Record*, p. 926, you published a letter by me bearing on the subject of how best to meet the serious conditions existing and confronting this country on account of the shortage of common labor, and the high cost of living. A similar letter was sent to every member and associate member of the American Society of Civil Engineers, about 2000 in all.

By May 15, more than 1,000 answers had been received representing every State in the Union. These letters were classified and the results are herewith presented. Additional answers to my letter being received daily, the presentation of the final results will be deferred to a later date.

For importation of Chinese labor	608
Favorable to such importation	74
For immigration, exclusive of Asiatics	86
For increase of labor-saving machinery	10
Neutral	95
Against any immigration	101
Waiting for further information	28

Those who expressed themselves for importation of Chinese labor were strongly in favor of concerted action for a modification of the Exclusion Act and many were for amending the present drastic immigration laws.

Those against Chinese or all immigration, while admitting that we were facing a most serious labor situation, offered as a solution, some the introduction of more labor-saving machinery, others the bringing about of better efficiency of the labor now available and increasing the working day to ten hours or more, and still others the closing down or curtailing of all non-essential industries until conditions shall have improved. Comments on these various suggestions are withheld for the present.

Such a large majority of the writers expressed themselves in favor of and urged that a concerted action be taken by the engineering fraternity to solve this difficult problem, that we have decided to organize the "National Immigration Council," whose purpose it will be to carry on an educational campaign with the American public, showing the necessity for action and what that action should preferably be. This, of course, will require the co-operation of patriotic and influential men in every State and a beginning is being made among the Engineers to have such men serve on an Advisory Committee.

Chicago. JOHN ERICSON,
Consulting Engineer.

Sir—I have just noted Mr. Ericson's circular letter requesting an expression of opinion as to the advisability of importing Chinese, under restrictions, to supply the demand for unskilled labor. I am opposed to the importation of the Coolie class of labor because I believe that it is morally and economically unsound in principle.

I believe that it is morally unsound to use any people to do the work of another people in the country of the latter. When the American people cannot do their own work from bottom to top it will indicate a decadence and a dependence upon a race of workers, and history has shown that only the worker races survive. America has been made what it is, the most progressive country, by Americans of the pick and shovel, axe and scythe, pioneer-frontier type. The pick and shovel American is respected in the West even today. A man is not of the type of Americans who made America what it is, unless he has eaten his peck of dirt and served his time on the shovel, pick and barrow handles. It does not make any difference how well-to-do you or I or any other man may be, that does not excuse our sons from doing their share of the world's physical labor. It is the moral duty of the physically and mentally sound to do some productive labor. It is the moral duty of the younger generation to do the hand labor that they may better fit themselves to do the head labor. A race of strong men is not made by gymnasium exercise; it is made by physical labor; it perpetuates itself by physical labor; and, it becomes decadent and finally extinct without physical labor. We can easily recall many famous Americans who builded the foundations of their successful lives with the pick and shovel in their own hands.

It is economically unsound to import Coolie labor to do our work because our work cannot be done for us, as a whole, more economically than we can do it for ourselves. If we have Coolie workers, we will have American idlers An idle, non-productive man is a parasite, no matter how many Coolies are used in his place. It is not economically sound to encourage the parasites and discourage the workers of any country. There is no labor that is menial except in the minds of the parasites and the unlearned. When we import Coolies to do our labor, we put our workers in the class of Coolies automatically. Our shortage of labor today is due largely to the fact that cheap labor has been imported, in the past, and put to work along side of young Americans, thus degrading our own people and betraying their loyalty as workers. It was a short-sighted policy then; it may complete the damage beyond repair if we do not look wholly to our own people to do our own work henceforth.

Instead of invoking the law to permit the importation of Coolie labor I would have the law define the crime of idleness and the punishment thereof. For an immediate solution, I would put the question up to the young manhood of this country. An efficient labor bureau in the Department of Labor could do this. Groups of young men are easily accessible in the colleges and high schools. Ask them whether their backs are so weak that we must import and sustain a Coolie class to do their work. I know what the response will be. I have seen them use picks and shovels, scythes and pitchforks, axes and mauls. Some of them, now world famous and honored, I have seen with calluses on their hands as thick as sole leather.

Shortly the colleges and high schools will close for the summer vacation. What systematic effort, what effort of any kind, is being made to use this man-power? Thousands of these young men are looking and will be looking for a job of most any kind for the vacation. Why should they waste their time seeking employment? Why is not the Department of Labor empowered to secure employment for these willing workers? These young men can and will revive the dignity of labor if you put the proposition up to them and back them loyally, but you cannot be loyal to them and put them in the class of coolies.

Revive the dignity and loyalty of labor in this country by loyally backing the young manhood of this country against cheap labor of the coolie class and you will have a plentiful source of physical workers.

Lakeport, Cal. [illegible]. A. KITTS,
California Highway Commission

Sir—Concerning the importation of Chinese labor, proposals similar to Mr. Ericson's are being brought forward quite frequently at present. It seems to me that we have had enough experience with immigration to teach us that there are more important considerations than immediate labor supply. The immigration we encourage at present will to a large extent determine the character of American civilization. To adopt the proposals made in this letter would tend strongly toward a permanent stratification of the population of this country. It is generally admitted that Chinese laborers would not be absorbed into the population, and we would be starting a race problem all over again.

Unless the passion for rapid growth can be subordinated to consideration for a final well-being of the country, the political and social standards upon which America was founded will be seriously jeopardized. "The pick and shovel and wheelbarrow man" of today if a Chinese Coolie, will be the serf of tomorrow. Just at the time when the rest of the world is shaking itself free from feudalism is a poor time for America to adopt a feudal policy.

Dayton, Ohio. ARTHUR E. MORGAN,
President, Morgan Engineering Companies

Sir—The proposition submitted by Mr. Ericson in *Engineering News-Record* of May 6 p. 926—to admit Chinese labor for the relief of the existing serious shortage of labor—is one that should appeal to unprejudiced persons as eminently beneficial. The only adverse argument worthy of consideration would seem to be the antagonism that might be met from labor through fear of the effect on wages. To throw open our doors without let or hindrance to large populations having lower standards of living than we have would indeed be a questionable policy, but with due restrictions—which, to avoid the appearance of favoritism, might well apply to all nationalities by basing the limitation on a percentage of the existing naturalized population of each nationality—and with some provision for their suitable distribution throughout the country in accordance with the demand, the result would seem to be only beneficial to the laborer as well as to the country at large.

The Chinese laborer has the reputation of being a hard-working and faithful workman and if admitted in numbers merely sufficient to restore an economic equilibrium between demand and supply, would provide one of the most important of the several factors essential to a return to reasonable living conditions—a matter now so earnestly desired—and at the same time add impetus to the construction of public works.

New York City. KENNETH ALLEN.

Sir—There is no doubt that we are experiencing a marked shortage of common labor on construction work, but I am not satisfied that the remedy lies in the importation of Oriental labor. In fact, even though it is decidedly inconvenient at present and even though much construction work may be delayed or even abandoned because of this shortage of common or unskilled labor, I am afraid that the remedy suggested might prove very much worse than the disease.

Even if it were possible to introduce large numbers of Oriental laborers into this country without depressing American standards, I do not think it would be desirable to do so. The one great force that has done so much to develop American inventive genius is the plain fact that we Americans are naturally lazy, as regards physical labor, and that we abhor menial tasks. If there be one field in which Americans excel, it is in the invention and development of labor-saving devices, devices calculated to relieve us of the necessity for performing distasteful tasks, and as long as it remains comparatively expensive to hire someone else to relieve us of these tasks we are going to continue developing labor-saving machinery. As long as we continue our search for the method and the machine that will eliminate the last possible stroke of physical effort that can be eliminated, so long shall we be able to hold our own against the world.

But suppose that we can hire Oriental laborers to perform the menial and the arduous tasks at comparatively low wages; what incentive is there left to produce more labor-saving machinery? Is it not true that, regardless of what natural resources are available, those countries which have the most plentiful supplies of cheap labor are the countries which are making the least progress?

Then there is the question of efficiency. I have had no practical experience with Chinese laborers but I do know that the mere fact that wages are low is no proof that the cost of the work done will be low. Even without any increase in their standards of living, Chinese laborers would have to receive a higher money wage in America than in China. Would not their cost, figured against their units of production, be greater than Americans or Europeans? While I have no doubt that an effort would be made to regulate the importation and employment of the Chinese so that they would not, by their competition, force down the standards of American labor, I do not believe it could be prevented.

The law of supply and demand governs the sale of labor-power as well as of all other commodities. If a sufficient supply of Chinese labor is available and can be bought on the basis of a wage sufficient to maintain a Chinese laborer, probably without family, on his own standard of living, who will purchase labor-power at a price high enough to support an American with a family?

CHARLES F. DINGMAN,
Engineer, Flynt Building and Construction Co.
Palmer, Mass.

Sir—Mr. Ericson's letter discussing the shortage of unskilled labor, brings up a point of vital interest. Some of the experiences in the Pacific Coast states, with laborers from the Orient have been so unfortunate that one can scarcely blame their inhabitants for not taking kindly to the thought of an extensive new "invasion." Of course the ground of strictest justice is to make one set of immigration laws to cover all colors and kinds, health, educational and financial qualifications. Then let normal laws work. Demand will produce supply, if legislatures and congress and commissions without end do not in their usual positively stupid way interfere.

The New York legislature adjourned a month ago, leaving many more than 1,000 bills passed, as a record of its activity. Does anyone imagine that any large percentage of these possible laws have any real necessity for existence? The Governor will veto many, but why pass them? Often because some good man or woman sees some special trouble, rushes a complaint to an Assemblyman or Senator; a bill is drafted, almost unnoticed it slips along; and—another law exists.

Equally, labor legislation, good or vicious, slips through, bringing in its train some special betterment, but a whole sequence of unfortunate results. Education, Christian treatment of others and standing up for the real dignity of labor, not its so-called "rights," will alone cure the conditions from which we are all suffering.

Immigration is once more beginning and in time will help relieve the difficulties; I doubt whether the Chinese solution would result well. It would be somewhat in the nature of employing strike breakers, which, though sometimes justified, is not always the best or most successful way in the long run.

Sometimes positive action is essential. I believe, however, that in the present labor question, dignified inaction may produce the best result, through operations of normal law.

LOUIS J. TRIBUS,
New York City. Consulting Engineer.

Prohibition and the Foreign Born

Sir—I have been endeavoring to answer the editorial which appeared in your issue of April 15, p. 747, under the heading "Prohibition and the Foreign Born." My company is very much disappointed to see such an article in your estimable paper, which we read weekly.

This great country of ours has been placed under prohibition because manufacturers and business men have to a very large extent taken part politically and financially to bring this about. One of the maxims of industry is "Safety First." The duPont Powder Company has discharged all drinking employees. A powder mill is no place for an unsteady hand and an inflamed eye. A big manufacturer who has come up from the ranks of labor recently said: "Whiskey is the monkey-wrench in the machinery of industry." This is why the Carnegie Steel Company, the United States Steel Corporation and all kinds of industry and business have helped to wipe this curse of liquor from the map. The results already show that crime, poverty and the lowest diseases everywhere are diminishing and the working man who used to be absent on Mondays and Tuesdays because of his Sunday debauch, is now on the job regularly.

Commenting on the quotation from Professor Leacock of McGill University, Montreal, I would like to state that prohibition is increasing efficiency and it is reasonable to believe that commercial competition will naturally and inevitably cause other nations to adopt our policy. Drunken Europe can never compete with sober America. The "dry" provinces of Canada will compel Quebec to go dry and some day the people of Quebec will also realize the favor that was done them.

So far as prohibition might operate against immigration, we feel that the benefits which America offers to the foreign born far outweigh the "disappointment" which he may experience by the absence of liquor, and the wife of the laboring man is thankful to get to a place where the weak determination is helped by making it impossible for the bread earner to get the liquor.

We are for prohibition all the time, and will exert ourselves politically and financially to maintain the law.

Philadelphia. THOMAS C. SATTERTHWAIT,
Secretary, Shoemaker-Satterthwait Bridge Co.

Sir—Anent "Prohibition and the Foreign Born," the very able editorial which has aroused the ire of Edgar Dow Gilman (May 6 issue, p. 927), I desire to say that an experience of nearly thirty years in handling men in various occupations, over twenty of which have been spent in contracting and engineering lines leads me to concur in your statement that it *is* a problem to be investigated.

Mr. Dow, in common with many advocates of so-called efficiency, fails to give the human equation its proper value in the scheme of things. These reasoners are for the most part, men who have not mingled intimately with their fellow men and cannot realize the trials, tribulations and tastes, of the "common peepul." As laborer, foreman, inspector, superintendent and employer, it has been my very great fortune to have been thrown close to my brother workmen and I have many times seen the ragged edge smoothed down through the humanizing influence of a friendly drink. The laborer is not a man with highbrow tastes in the choice of his enjoyments and after his day of bone-breaking, ambition killing, monotonous work, his glass of ale at quitting time has given him the relaxation his body needed. It has caused him to forget the trifles that caused him annoyance.

The saloon has many unfavorable attributes, certainly, but it was the workman's gathering place and club. Such a place is essential to the genus homo. The habits of people, transmitted through many generations, may not be broken abruptly without upsetting the entire domestic situation. Men do not readily pick up new schemes of life or enjoyment, no matter how desirable from a social or "efficient" point of view, and the attempt so to do results only in unrest and consequent loss of the little efficiency gained by keeping the men as comfortable in mind and body as circumstances permit.

Mr. Dow announces just who put the eighteenth amendment across. This statement of his many deny. He seems to think that all those men who stayed at home during the war are the efficient ones; that the opinions of four and one-half millions of voters were not consulted and of these most were not cognizant that there was any such movement on foot except the very proper war-time prohibition for the conservation of resources.

"Efficiency"!! Oh what is not perpetrated in thy name? "Efficiency," like charity "covereth a multitude of sins."

There can never be efficiency by law. Efficiency only comes through the comprehensive understanding and tolerance of the frailties and foibles of the common man as well as a just recognition of his many, many good qualities. I believe in men and I believe that they are most amenable when least interfered with in their pursuit of life, liberty and happiness.

Wilkes Barre, Penn. EUGENE BEAUMONT.

Sir:—I do not agree with your correspondent, Lewis D. Rights (April 22 issue, p. 831), that prohibition has not affected foreign-born labor. Through personal contact with Italian laborers I can say positively that they are and have been leaving the United States on account of prohibition. It may be true that Italian immigrants are returning to this country, but I doubt whether they will do the pick-and-shovel work which we need. It also may be true that prohibition was legally passed *by reason of* all the "checks" provided by an "anti-saloonatic league."

We do not build a single track railroad, and wait for the "effect" on the community, when we know that a double-track line, will be necessary in "three months;" but some of us can sit in an office and figure with a single-track brain.

Rockville Center, N. Y. WALTER G. FEDERLEIN,
Construction Engineer.

Sir—My attention was attracted to your editorial "Prohibition and the Foreign Born," appearing in your April 15 issue, by the letter of Edgar Dow Gilman relative thereto, appearing in your issue of May 6. If you desire to present facts, I suggest something more creditable and convincing than quotation from liquor propaganda. Mr. Gilman's reference to the great labor unrest in England, where there is no eighteenth amendment, is pertinent. One of the well established economic facts in this and other countries, including England and Germany, is that the drinking which wage earners do wherever liquor is available materially depreciates the reliability and value of the labor and increases the cost and decreases the output of the product.

Some of our captains of industry may object to the eighteenth amendment for themselves but they are, I believe, as a rule, favorable to its application to their employees. Certainly they do not, and with good reason, want their employees to come to the plant under the influence of liquor. For years they have been endeavoring to push the saloon away from the plant door. The logical end is nothing short of the eighteenth amendment.

Giving back liquor to the wage earners would be, in my opinion, economic folly. Contentment of labor, if such contentment exists, due to drinking liquor is the result of "soused" insensibility to low standards and conditions of living. Such a laborer is not the typical American workman who, in years gone by, helped to make the efficiency and greatness of American industry. Is it your view that the future of American industry is dependent for its labor supply on the beer and wine soaked dregs of Europe? Have you overlooked the recent poll by the *Literary Digest* of American labor, showing a big majority favorable to prohibition?

El Paso, Tex. J. L. CAMPBELL,
Chief Engineer, El Paso & Southwestern System.

Stealing Labor

Sir—I have read with considerable interest the editorials "Stealing Labor" and "Looking at the other Fellow's Job," which appear in the *Engineering News-Record*, May 6, p. 889.

This National Association of Building Trades Employers feels that propaganda of this sort should be spread broadcast and often. We feel so strongly on the matter of contractors endeavoring to make their work attractive by added compensation in the shape of "overtime," "bonuses" and "expenses" that we are constantly watching these matters and correcting these pernicious practices whenever and wherever we find them among our membership.

The following resolutions were passed at a recent meeting of the association and I would feel indebted to you if you would give them publicity:

"Whereas, The lack of apprentices in the building trades is being seriously felt at the present time on account of scarcity of competent mechanics to do building construction work, and

"Whereas, The necessity for providing mechanics is apparent to those engaged in the industry and should receive the early and serious consideration of all contractors; therefore be it

"Resolved, That the members of this Association be instructed to use every means possible to encourage the young men in their respective localities to enter apprenticeships in the numerous building trades.

"Resolved, That it is the sense of this meeting that overtime work is detrimental to the interests of the building industry, and that every effort possible should be made by contractors in all parts of the country to discourage the practice, except in emergency cases."

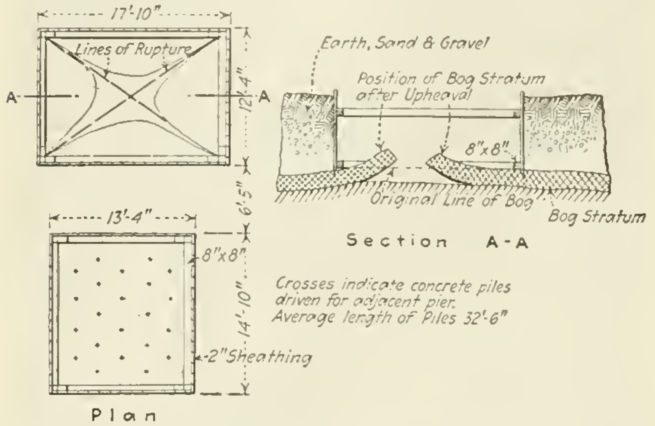
The above resolutions have been sent out as orders to the various member associations.

F. G. WEBBER,
Executive Secretary, National Association
of Building Trades Employers.

An Effect of Pressure-Transmission on Soft Soil

Sir—A condition of soil swelling, somewhat unique, was observed recently during the pile-driving for the foundations of the Metropolitan Life Insurance Co.'s Printing Building at Thompson Ave. and Court St., Long Island City.

Pits for concrete foundations were sheathed with 2-in. plank, carried down to the top of an old bog. When the piles were driven for the first footing it was noticed that this bog layer ruptured in the center of an adjoining pit. The swelling caused the bog layer to heave up in pyramid form as indicated in the accompanying sketch. The sheathing did not extend into the bog more than 6 in. The bottom timber holding the sheathing rested upon the bog and the obvious explanation is that this stratum failed from upward pressure. The bog layer is about three feet thick.



BOG SURFACE RUPTURED BY TRANSMITTED PRESSURE CAUSED BY PILE-DRIVING

Wm. T. Quinn,
Superintendent, Turner Construction Co.
New York City.

Panama Canal and Arkansas Razor Backs

Sir—Referring to article "Panama Canal and Arkansas Razor Backs—a Feat in Mathematical Gymnastics," by R L. Kirkpatrick, appearing in your issue of April 29, p. 874, I wish to suggest that Mr. Kirkpatrick's calculations are based upon an erroneous conception of the qualifications of the Arkansas hog. These hogs, as the name implies, not only "buck the line," but they "go through." No reliable result can be determined by comparing the power of the Razor Back with the casual rooting of the Iowa or Illinois swine.

A proper solution would be to take the cross-section of a composite hog and multiply this by an earthquake and volcanic factor, representing his dynamic force. If Mr. Kirkpatrick will compute this, he will see that not only is the Arkansas Statesman sustained, but that a sea level canal would thus be provided and the Culebra slides made impossible.

Bridge Junction, Ark. H. N. Pharr
Chief Engineer, St. Francis Levee District.

Leaky Cross-Connections

Sir—Perhaps it was not so intended, but the reference in the last paragraph of the editorial on "Leaky Cross-Connections" in your issue of May 13, p. 939, might readily give the impression that fire protection engineers generally were in favor of cross-connections between two supplies, one of which is unsafe or questionable.

The fire protection engineer is not the responsible party in making the connection originally or in its continuance. Insurance standards require, for complete reliability, two independent sources of supply, and the plant management or the municipal authorities may, and often do, use one source which is unsafe or questionable from a sanitary standpoint, for the reason that it is a cheaper or easier one.

The engineers of the National Board of Fire Underwriters do not, and we believe other engineers should not, favor such connections, but there are cases where they have already been made and it is not possible, without the charge of discrimination, to refuse credit for them as emergency sources. It is, however, standard practice with many of the insurance bureaus to recommend secondary sources of supply which will be safe, as for instance, a storage reservoir.

The double check-valve, designed some years ago for use on connections to sources of doubtful quality, has been permitted by some health authorities and has a satisfactory record. It should be installed most carefully and be maintained under a thorough inspection system.

George W. Booth,
Chief Engineer, National Board of Fire Underwriters.
New York City.

[We did not intend to include all fire protection engineers. The language used in our issue of May 13 was: "Unfortunately there are still some engineers, especially those in the employ of the fire insurance companies, who see no harm in cross-connections or who put property risk above life risk." We are glad to print Mr. Booth's strong statement against cross-connections.—Editor.]

Engineering Instructors' Pay

Sir—Your columns have contained many valuable discussions of the shortcomings of our engineering colleges. Speaking for the teachers in general we are glad to get the opinions of the men who use our products. However, it seems to me that time and ink can be more advantageously used at the present in trying to bring about certain practical changes which are much more needed than are the improvements in pedagogy. To make clear what I have in mind, consider two advertisements which have appeared recently.

"Wanted, Instructor in Civil Engineering, salary $1800 per year, one month vacation on full pay. A man is wanted who can teach drawing, mechanics, surveying, railroad engineering, and hydraulics."

"Wanted, Instructor in Civil Engineering. Salary $1800 per year. A man is wanted who can teach topographical drawing, surveying, design of framed structures, and highway engineering. A 1920 graduate will be considered."

At this time when any one who has a degree from an engineering school can get a job that will not only pay $150 per month to start, but which offers a good chance for promotion, how can a college pick up a good instructor for $1800 per year? Time was when only men who stood at the top of their class were even considered for instructors. Now the Universities must take what is left after the good commercial jobs are filled. It may be possible for a 1920 graduate of average capacity to teach five highly specialized technical courses simultaneously, but I doubt it.

The personality of the instructor, his breadth of view, the inspiring influence of his character are more important than his technical knowledge. How much of strength of character in addition to expert technical knowledge can be demanded in the present labor market for $1800 per year?

After everything has been said and done, the strength of a college does not lie in its equipment, and it does not lie in its curriculum. The preeminence of an institution lies in the personality of its faculty In the present notoriously underpaid condition of our instructors, everyone interested in the welfare of our educational system should cease academic discussions of pedagogy and lend his influence to raising the pay of the teaching profession to a level where it will attract the best of our manhood. We should get behind all efforts of this kind, notably those of Prof. C. J. Tilden's committee of the American Association of Engineers which is preparing a schedule of recommended salaries for engineering teachers. This committee includes in its membership leading engineers in all branches of the profession. Those really interested in the welfare of our engineering schools will do well to get in touch with this committee and to lend it their moral and active support.

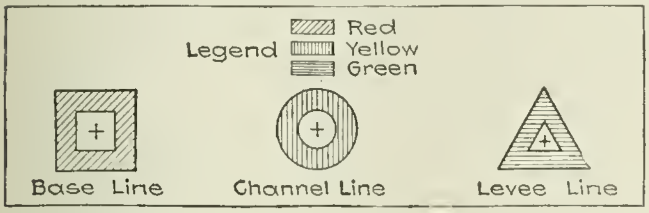
Urbana, Ill. W. M. WILSON,
Associate Professor of Structural Engineering,
University of Illinois.

HINTS FOR THE CONTRACTOR

Colored Figures Mark Transit Points

BY H. A. BRENTLINGER
Dayton, Ohio

IN levee work in the Miami Conservancy District points along base, channel and levee lines were readily spoted by the use of colored figures. These were used only in concrete where crosses were hard to find or identify. Base line points were marked with a red square; channel points enclosed in a yellow circle; and the levee line points marked with a green triangle. Stationing was indicated above all points and the offset of channel and levee points below.



Wooden Roller Used in Striking Concrete

BY SEARCY B. SLACK
Montgomery, Ala.

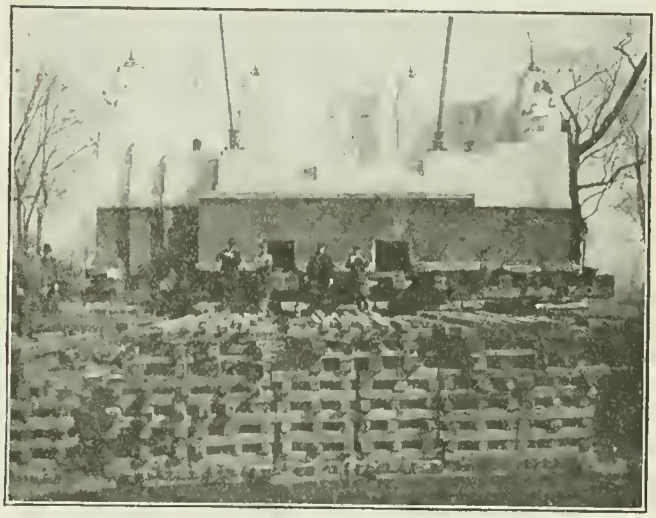
A WOODEN roller, turned from hardwood, is being used successfully for striking concrete pavement 9 ft. wide with a 1½-in. crown in Brooks County, Ga. The diameter of the roller at the ends is 9 in. and at the center 6 in. It was used first without protection, but the concrete so injured the surface of the wood that it was necessary to wrap the roller with a strip of galvanized iron 2 in. wide for its full length. The ends of the roller are provided with wheels having 1-in. flanges which run on the inside of the 2 x 6 in. form boards. Handles provided at each end allow the roller to be pushed forward in striking the material. Considerable difficulty in striking the concrete with a straight edge had been experienced previously, a condition the roller has largely remedied. The concrete pavement is being built of a crushed slag aggregate making the material difficult to finish. After striking the surface with the striking roller it is finished by means of a light wooden roller and hose in the usual manner.

This work is being done for Brooks County, Ga., by F. W. Long & Company, Jacksonville, Fla., Contractors, and is under the general supervision of Garrett & Slack, project engineers, for the State Highway Department of Georgia.

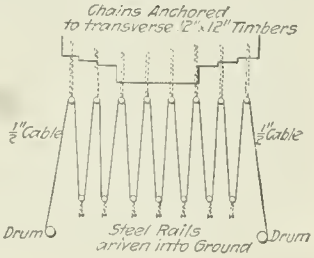
Marble Band Stand Successfully Moved

BY GEORGE J. TRINKAUS
Assistant Engineer, Lincoln Park Commission, Chicago

A MOVING operation, unusual in that the foundations were moved with the superstructure, has been completed at Lincoln Park, Chicago. The structure moved was a band stand, consisting of marble facing over a brick interior. Two groups of figures in marble by Lorado Taft are striking features and in all respects the structure was of such distinction that unusual care was warranted to prevent damage. Its moving was accomplished without checking or cracking the marble.



The weight to be moved was about 300 tons. The lateral dimensions are 44 x 27¾ ft. The foundations are reinforced concrete walls and pedestals. Both superstructure and foundations are shown by the view which also shows the cribbing on which the structure was moved. In preparation for moving, the foundation was first uncovered by excavating entirely around it, and the 4-in. concrete basement floor was then taken out, together with several thin partition walls in the basement. Screw jacks were then used to raise the stand to a height of 9 ft. above its original grade. Before raising, level marks were cut on all four sides of the foundation walls and at convenient corners to facilitate holding the structure level during raising and moving. The diagram illustrates the pulley arrangement. Two teams of horses furnished the motive power at the drums. The distance moved was 300 ft. and one right angle turn was made. The moving was done by Crowe Bros., moving con-


Chains Anchored to transverse 12"x12" Timbers
½" Cable
½" Cable
Drum
Steel Rails driven into Ground
Drum

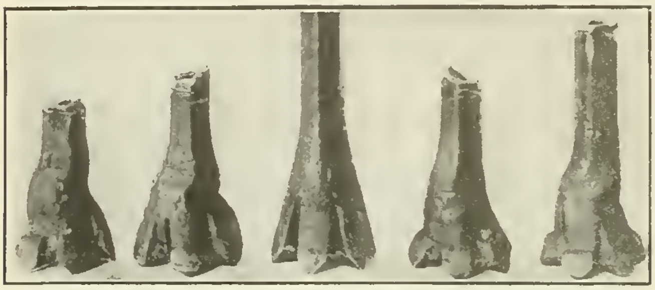
tractors, Chicago, under the supervision of John C. Canon, superintendent and secretary, and George T. Donoghue, chief civil engineer of the Commissioners of Lincoln Park.

Rock Drill Efficiency Requires Competent Blacksmithing

By D. E. Dunn

New York City

A POOR blacksmith is often at the bottom of a complaint that drills are poor. Even with the advent of the drill-sharpening machine, an incompetent or a careless blacksmith can make a useless tool from an excellent piece of drill steel. The illustration from actual practice demonstrates the possibilities. The four bits at the right and the left are typical examples of the output of a job blacksmith using a sharpening machine. They were the basis of a vigorous complaint by the owner that has jackhammer drills were failing to produce. Investigation by the representative of the drill manufacturer disclosed the kind of blacksmith's work which is illustrated. Using the same sharpening machine the manufacturer's representative produced from the same steel the bit shown in the center of the illustration. With this bit the jackhammers began again to produce. No drill sharpener, however good, can eliminate the necessity of a skilled blacksmith. This is a truth which users of rock drills cannot afford to forget.



EXAMPLES OF GOOD AND POOR DRILL SHARPENING

Estimating Equipment Rental

YEARLY EXPENSE involved in owning equipment comprises three elements: 1, annual interest on original investment; 2, annual depreciation; and 3, insurance and storage during idle times. The annual interest rate represents the rate which, if applied annually against the original capital cost, will take care of interest charges throughout the useful life of the equipment at six per cent per annum on the average capital value. For example, if equipment costing $12,000 has a salvage value of $3,000, its average capital value during each year of its life is the mean between $12,000 and $3,000 or $7,500. Six per cent on $7,500 is $450. This is 3¾ per cent of $12,000, which is, therefore, the proper annual interest charge to be made against the original capital cost.

The annual depreciation rate is determined by dividing the original capital cost, minus salvage value, by the estimated length of life of the equipment, and then dividing this result by the original capital cost. Taking the same equipment mentioned above, and assuming its length of life to be six years,

$12,000 minus $3,000 equals $9,000

$9,000 divided by 6 equals $1,500.

$1,500 divided by $12,000 equals 12.5 the per cent which represents the annual depreciation rate to be charged against the original capital cost.

The rate to be charged for insurance and storage will vary with each organization, but once reduced to a percentage basis will be approximately the same for all equipment.

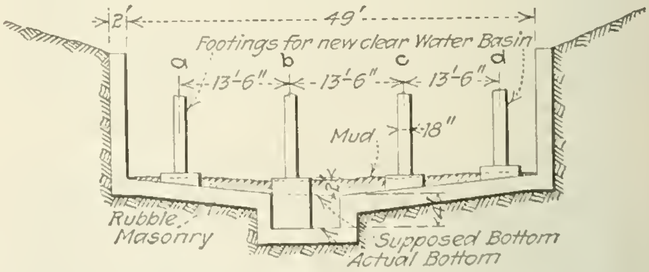
After the total annual percentage charge to be made against the original capital cost of any equipment is found, the same percentage may be used to find the expense chargeable to any other equipment which has the same length of life and whose salvage value is in proportion to the original cost, no matter what the actual original cost may be. The amount thus arrived at becomes a fixed annual charge against the equipment during each year of its life. A daily charge for owning equipment is estimated by dividing this fixed annual charge by the average number of earning days per year for each piece. To this amount, however, must also be added the average daily cost of general shop repairs or maintenance and the average daily cost of field repairs, before the full cost of the equipment on any job is secured.—*The A. G. C. Bulletin.*

Basin Footings Rest on Rubble Lining of Well

By James Riehl Arnold

Bucyrus, Ohio

AN EXTENSION to the waterworks at Bucyrus, Ohio, necessitated the carrying of a new clear water basin across an old well whose bottom was lined with rubble masonry of high bearing value. Soundings in the well gave the impression that its bottom was as indicated in the accompanying sketch, and the footings were, therefore, designed to rest on the old masonry at a 12-ft. depth. In the construction, a great amount of earth was thrown into the old well, and, in addition, heavy rains flooded part of the job, leaving 2 ft. of soft mud which had to be cleared out of the way of the concrete work. When the forms intended for the footing of column *b* were placed it was found that a 4-ft. sump occupied the middle of the old well, the bottom of this sump being about 6 ft. below the surface of the mud. Foreman Glen Havens of the Rust Engineering Co. constructed a water-tight box of tongue and groove boards which was sunk in place by man weight and finally by driving with an 8 x 8-in. timber.



The inside of the box was baled out, and the concrete and steel were placed, bearing on the rubble at the bottom. The box was left in the ground. In the pouring of the column which rested on this footing, corrections for a slight, unavoidable eccentricity were made.

Chester & Fleming of Pittsburgh were the consulting engineers.

NEWS OF THE WEEK

New York, June 3, 1920

N. Y. Municipal Engineers Endorse Council's Salary Classification

Engineering Council's classification of salaries and grades for engineering service was endorsed by the Municipal Engineers of the City of New York at a meeting held in the Engineering Societies' Building, May 26 and devoted exclusively to a discussion of compensation. The approved schedule of minimum and maximum salaries follows:

Grade	Salary Range Min.	Salary Range Max.
8—Junior Aid	$1,380	$1,920
7—Aid	1,980	2,920
6—Senior Aid	3,000	3,840
5—Junior Ass't Engineer	1,980	2,940
4—Assistant Engineer	3,120	5,040
3—Senior Ass't Engineer	5,220	7,080
2—Engineer	7,200	No limit
1—Chief Engineer	10,000	No limit

Action by the society followed the submission to its Board of Directors of a report on classification and compensation by a committee consisting of Philip P. Farley, chairman, Amos Schaeffer, Robert Ridgway, Chandler Withington, W. W. Brush, Arthur W. Tidd, H. K. Endemann, Elmore F. Austin, Samuel Hamburger, Victor H. Reichelt, and Charles E. Conover. The board, however, objected to the term "sub-professional," employed by Engineering Council's committee in explaining its classification, on the ground that it was distasteful to the men in the lower ranks of the service. The society, while approving in full Engineering Council's classification, concurred in the findings of its Board of Directors and endorsed the suggestion that Engineering Council be urged to consider the desirability of substituting the terms "engineering" and "engineering aid" for Council's designations "professional" and "sub-professional" as descriptive of character of duties performed.

Discuss Engineer Qualifications

In defending Engineering Council's nomenclature Arthur S. Tuttle, deputy chief engineer of the New York Board of Estimate and Apportionment, and chairman of Council's Committee on Classification and Compensation of Engineers in Municipal Service, contended that the larger aspects of the problem, particularly as they involve a proper recognition by the pubilc of the qualifications of an engineer, demand a clear distinction between types of service which demand broad experience, judgment and technical skill, and those that do not. Any failure to recognize this distinction, he pointed out, would tend toward a lowering of professional standards and would, in the end, work to the disadvantage of all engineers. In this view Robert Ridgway, engineer of subway construction, Transit Construc-

(*Continued on p. 1128*)

Hoover To Become Member of A. A. E.

Herbert Hoover, chairman of the American Relief Commission and president of the American Institute of Mining and Metallurgical Engineers, has applied for membership in the American Association of Engineers. The membership number assigned to Mr. Hoover is 20,000. General Leonard Wood, who is also a member, has membership number 10,000. The association has not declared itself in favor of either General Wood or Mr. Hoover as possibilities for the presidency.

Illinois Central Defers Improvements

Work on the new Chicago terminal station, electrification and lake front improvement is not likely to be undertaken this season by the Illinois Central R.R., owing to the financial situation and other uncertain conditions. It is proposed to build a subway at Randolph St., however, to enable pedestrians to pass under Michigan Ave. and avoid the delay and inconvenience of crossing the dense automobile traffic on the avenue.

Hudson Vehicle Tunnel Contract Authorized

Preparation of plans, specifications and contract forms for the construction of the four permanent ventilating shafts of the Hudson River vehicular tunnels was authorized May 25 by the state bridge and tunnel commissions of New York and New Jersey. Chief Engineer Clifford M. Holland and his engineering staff are now at work on the details of the shaft portions of the project and it is expected that a call for bids will be made by Sept. 1.

The Governor of New York on May 24 signed the bill making available another $1,000,000 for the subaqueous interstate vehicular route. New York's first $1,000,000, of which about $100,000 has been spent, was appropriated last year. Last year New Jersey provided $1,000,000 for the work and this year the state legislature passed over the Governor's veto a bond issue bill for $28,000,000, half of which is to be devoted to tunnel construction and half to the proposed Camden-Philadelphia bridge. This $28,000,000 bond issue will be referred for referendum vote of the New Jersey electors in November.

The question of widths of roadway in the tunnels, about which there has been a great deal of discussion, has been settled by the joint commissions in adopting the 20-ft. roadways originally recommended by Mr. Holland. The proposed use of concrete blocks for the tunnel construction has been definitely rejected.

Federal Water-Power Bill Passes Both Houses

Measure Sought For Past Twelve Years Now Before President For Approval

(*Washington Correspondence*)

Threats to filibuster against the conference report on the water-power bill in the Senate simmered down to perfunctory opposition when the conference report actually came before the Senate. It was approved May 28 by a vote of 45 to 21. While there was objection on the ground that the measure did not properly protect the interests of the public, the real opposition came from the fear that the powers granted by the bill interfered too greatly with rights which heretofore have been regarded as belonging to the states. The licensing feature was unpopular in that it would require those interested in the use of water "to come, hat in hand, to Washington" to make the necessary arrangements.

The bill provides for a Federal Power Commission which is to be composed of the Secretaries of War, Interior and Agriculture. The commission is empowered to appoint an executive secretary. It is recognized that this officer will be in practically absolute control of the administration of the law. In addition, the commission "may request the President to detail an officer of the Engineer Corps to serve as engineer officer."

Commission With 45 Functions

The bill prescribes forty-five specific functions, or duties, for the commission. These duties fall under the following heads:

General administration of water powers; design, construction and operation of project works; regulation of financial operation; regulation of rates and service; valuation of properties of licensees; general investigations; specific investigations.

Under these heads a few of the more important duties which are specifically designated are: To issue licenses for power projects and transmission lines on navigable waters, public lands and reservations of the United States; to hold hearings in connection with application for permits or licenses; to approve maps, plans and specifications of project works; to require that project works be properly maintained and kept in efficient operating condition; to regulate under certain conditions the amount and character of securities which may be issued for the financing of power projects; to make valuations of properties for the purpose of rate making and to determine what is the net investment in the property; to report on the utilization of water resources of any region to be developed;

to report on the water power industry and its relation to other industries; to make examinations and surveys and report in connection with any project which the Commission believes should be undertaken by the Unitede States; and to report on the Great Falls water-power project near Washington.

The bill having passed both houses, is now before the President for approval.

Possibly No Rivers and Harbors Bill

It is reported from Washington that there may be no Rivers and Harbors Bill this year because of the inability of the House and Senate conferees to come to an agreement. The House bill carries only $12,000,000 while the Senate provides $24,000,000.

Canadian Water-Works Men Invited

A special invitation to attend the Montreal convention of the American Water Works Association, June 22 to 24, has been sent out to Canadian water-works men by J. M. Diven, secretary, 153 W. 71st St., New York City. If any Canadians have been missed Mr. Diven would be glad to send them a program.

Building Industries Ask Recognition in Car Service

Following the petition of the carriers to the Interstate Commerce Commission to invoke its executive powers to relieve the nation-wide freight congestion, the National Federation of Construction Industries has addressed a request to the commission asking that recognition be given the various branches of the construction industry in such orders for car service as might be issued by the commission. The closing paragraphs of the builders' petition follow:

> The railroads are dependent upon the construction industry for the meterial wherewith to maintain their roadbeds. Highways, bridges, agricultural, industrial and other structures are products of this industry. Approximately fifty per cent. of the cement produced in this country, and large quantities of hollow tile, brick, lumber, lime, crushed stone, sand and gravel and other materials supplied by the industry are consumed by the farmers of the United States, mainly in the improvement and enlargement of their productive units.
>
> The attention of the Commission is respectfully called to the fact that the uses to which construction materials are usually put are essential to the walfare of the general public; and that the degree of essentiality of any material in an emergency such as is now reported to exist should be determined by the consideration of the purpose to which it is put.
>
> WHEREFORE, having called the earnest attention of the Commission to the essential character of the construction industry, and having set forth all the matters hereinbefore mentioned, and now assuring the Commission of its willingness to furnish to the Commission upon request any additional facts which it may have in its possession or may be able to obtain, your petitioner prays that in the effective exercise of the powers and duties cast upon the Commission by law in emergencies such as are reported now to exist, the Commission will recognize the essential character of the service being rendered by the construction industry and save the same harmless in this emergency.

Minnesota Engineering Board Endorses Shenehon for Joint Commission

The Minnesota Joint Engineering Board has passed resolutions, urging the appointment of Francis C. Shenehon, consulting engineer, of Minneapolis and formerly Dean of the College of Engineering, University of Minnesota, to the vacancy in the membership of the International Joint Commission. The action of the Board is based on the following statement of conditions:

1. The death of Governor Glenn has created a vacancy in the membership of the American Section of the International Joint Commission (as noted in *Engineering News-Record* last week, p. 1079).

2. As the work of the commission deals primarily with expert hydraulic investigations and judicial findings relating to the boundary waters between the United States and Canada, stretching from the Lake of the Woods and the international streams of the Minnesota frontier, through the Great Lakes and the St. Lawrence River to St. Regis, the deliberations of the commission will be clarified and the reaching of conclusions facilitated by including in its personnel an engineer of national and international reputation, whose life work has familiarized him with the physical and economic phases of these great waterways.

3. The Canadian section of the Commission already has the advantage of an engineer in its membership.

4. The two existing members of the American section are from Maine and Wyoming. The propriety of the selection of the third member from Minnesota, one of the states contiguous to the Great Lakes and greatly interested, is obvious.

5. The comprehensive and exhaustive investigation of the feasibility and desirability of a deep-draft waterway between the Great Lakes and the Ocean, recently imposed by Congress on this Commission, involving technical questions of wide reach in navigational and water power development, accent in a way not before accented, the need on the Commission of an Engineer expert in these subjects.

Mr. Shenehon has had a great variety of experience in connection with the Great Lakes. From 1891 to 1898, he was engineer of ship locks, canals, docks, power house and river improvements, St. Marys River, Michigan; from 1898 to 1902 he conducted hydraulic investigations on the Niagara and St. Lawrence Rivers; and up to the present time he has continued in consulting business in connection with the Great Lakes. The report on control of Lake Erie, published in *Engineering News-Record*, of Feb. 12, 1920, shows Mr. Shenehon's familiarity with the general subject.

He was Dean of the College of Engineering of the University of Minnesota from 1909 to 1917.

Engineer Board Named To Form National Highway Policy

The Advisory Highway Board which has been appointed by the Secretary of Agriculture will hold its first meeting in Washington June 4 and 5. At that meeting the Board expects to decide upon the basic principles which should be followed in working out a national highway policy. The personnel of the committee is as follows: Paul D. Sargent, chief engineer, State Highway Commission, Augusta, Maine; Joseph Hyde Pratt, secretary, American Association of State Highway Officials, Chapel Hill, N. C.; George E. Johnson, state engineer, Department of Public Works, Lincoln, Nebraska; W. G. Thompson, state highway engineer, Trenton, N. J.; Ira R. Browning, state road engineer, Salt Lake City, Utah; W. D. Uhler, chief engineer, State Highway Commission, Harrisburg, Pa.; C. J. Bennett, state highway commissioner, Hartford, Conn.; A. B. Fletcher, state highway engineer, Sacramento, Cal.; W. R. Neel, state highway engineer, Atlanta, Ga.; W. S. Keller, state highway engineer, Montgomery, Ala.; Geo. P. Coleman, state highway commissioner, Richmond, Va.; S. E. Bradt, superintendent of highways, Springfield, Ill.

New York State Control of Barge Canal Deferred

Senator Wadsworth's joint resolution to Congress requiring the Federal Government to return all control of the New York State Barge Canal to the State of New York has passed the Senate, and is now before the House. It is stated that there is no immediate prospect of its passage in that body.

Salary Schedule Endorsed

(Continued from p. 1127)

tion Commission, concurred. William W. Brush, deputy chief engineer, Department of Water Supply, Gas and Electricity, favored the use of the terms "engineering" and "engineering aid" as being more truly descriptive of the kind of work performed and, at the same time, as offering no grounds for complaint on the part of men classified in the lower group. From the discussion by other members of the society it was clear that there was a rather general objection to the term "sub-professional." When put to a vote the proposal to suggest to Engineering Council the substitution of the terms already indicated was passed, although this action does not affect in any way the complete endorsement of Council's schedule of salaries and grades by the Municipal Engineers of the City of New York.

The point was made by several speakers that it is time for engineers to stop quibbling over mere details of terminology and to get together in a country-wide movement supporting the new schedules of compensation which have been recommended.

No New York Water Power Law This Year

Having failed throughout the past session to come to any agreement on a state water-power policy, the New York State Legislature in its last days passed an innocuous looking act ostensibly intended only to protect the State of New York in the event of the Federal Water Power Bill being enacted before New York could pass a bill protecting its own rights in state water-power. The bill provided that no water could be diverted from Lake Erie, the Niagara River, or the boundary waters of the State, or used in developing hydro-electric power until a written instrument had been filed with the Secretary of State under which the individuals or companies diverting the water assented to the right and power of the State to exact a reasonable rental for the water and consented to the right and power of the State to fix a reasonable rate for the hydro-electric energy developed.

It was the intent of the promoters of the bill to prevent the State losing its water-power rights to the Federal Government by reason of the fact that there were no laws on the statute books providing for the assertion by the State of its rights in these powers. It did not commit the State to either the government ownership or government development plan of water-power control.

The bill, however, did not appeal to Governor Smith of New York who vetoed it on May 18. The Governor said that the bill, if it became law, would "so vitalize some practically defunct corporations as to permit them to exercise the right to take water for hydraulic or hydro-electric power purposes, where they now have only the right to take it for entirely different purposes." The Governor at the same time came out strongly in favor of the public development of the water-power in the State.

Winnipeg Entertains Seventh Good Roads Congress

Highway engineers from the United States as well as from all parts of Canada were among the speakers who were listed on the program of the seventh annual good roads congress held in Winnipeg June 1-3. Among them were E. O. Hathaway, district engineer, Bureau of Public Roads; Professor Arthur H. Blanchard; A. P. Sandles, National Crushed Stone Association; A. R. Hirst, state highway engineer, Wisconsin; Col. W. D. Sohier, former chairman Massachusetts Highway Commission; W. H. Connell, consulting engineer, Philadelphia. Besides the reading of numerous papers on highway construction, maintenance and administration, there were several demonstrations of actual road building, and of road grading and dragging. The congress was presided over by S. L. Squire, president of the Canadian Good Roads Association.

Year's Trial Proves Value of Co-operative Plan at M. I. T.

For the past year an experiment in co-operative engineering education has been conducted by the Massachusetts Institute of Technology and the General Electric Co. While the co-operative scheme in itself is not new, several departures from the usual plan were introduced.

The class was limited to 30 students, chosen entirely upon the records which they had made in the equivalent of the first two years' work of the electrical engineering course at Technology. Included in this group were graduates from Yale, Harvard, Dartmouth, Princeton, the Naval Academy, besides men who had completed their first and second years solely at Technology. The year (12 months) is divided into four three-month periods, the students spending alternately 13 weeks at the Lynn works of the General Electric Co. and 11 weeks at the Institute, followed by a two weeks' vacation. The group at Lynn is housed in a fine old residence which has been converted into a modern club house. No break is made in the major studies when the students are at Lynn, courses being conducted at the works in principles of electrical engineering and in general studies. The progress of the students through the plant is regulated, not by the production needs of the various departments, but by the advantage which the experience in each department is to the student.

The result of this year's work has been gratifying to the originators of the plan. Because the students were a selected group, were all taking the same course, and were thrown together intimately at work and at the club house, a spirit of loyalty to one another, to the Institute and to the General Electric Co., soon became manifest and every man strove to make a reputation for the course. Their enthusiasm was soon shared by the officials and superintendents of the co-operating company.

As evidence of its approval of the work, the company has increased the number of men who can be enrolled in this year's class to 60 and has already secured a new club house in order to furnish rooming accommodations for them. The new class which has already nearly completed its quota of members will enter upon the work July 6.

Carpenters Strike in McKeesport

Contractors in McKeesport have learned that it is dangerous to delay, and as a result of their hesitancy building construction is at a standstill due to a strike of the carpenters. The carpenters, who have been receiving 87 cents an hour, demanded $1.12½, and the contractors had all but signed the new agreement when they decided to attempt a compromise at $1 per hour. This compromise offer was met by the carpenters with a new demand for $1.25 per hour, and as they now refuse to compromise a strike is in progress.

Engineers Question Candidates for Public Office

The Charleston (W. Va.) Chapter of the American Association of Engineers has adopted a resolution requesting all candidates for public office in West Virginia to answer the following six questions:

(1) Are you in favor of the enactment of a law for the licensing of professional engineers, architects and land surveyors?

(2) Are you in favor of giving greater powers to the state board of health, and enacting legislation to remove the present conflict in authority between the state board and local boards?

(3) Do you favor providing the state board of health with increased funds to carry out necessary work, such as is now done by all progressive states?

(4) Are you in favor of the state acquiring land and taking the lead in reforestation, thus stimulating private interests in the work of reclaiming denuded areas and adding to the wealth and resources of the state?

(5) Do you favor submitting to the voters a constitutional amendment permitting cities to issue bonds to at least ten per cent of their assessed valuation, for the purpose of acquiring and operating such self-supporting and income-bearing properties as water works, electrical plants and market places?

(6) Are you in favor of amending the constitution for the issuance by the state of $50,000,000 bonds for good roads?"

The chapter has requested the assistance of other engineering and architectural organizations in giving prominence to these questions as a means of developing a public appreciation of the necessity for engineering talent in state administration.

Research Council Elects Officers

The National Research Council has elected the following officers for the year beginning July 1, 1920: Chairman, H. A. Bumstead, professor of physics and director of the Sloane physical laboratory, Yale University; first vice-chairman, C. D. Walcott, president of the National Academy of Sciences and secretary of the Smithsonian Institution; second vice-chairman, Gano Dunn, president of the J. G. White Engineering Corporation, New York; third vice-chairman, R. A. Millikan, professor of physics, University of Chicago; permanent secretary, Vernon Kellogg, professor of entomology, Stanford University; treasurer, F. L. Ransome, treasurer of the National Academy of Sciences. Not all of the chairmen of the various divisions of the council have been selected but will be announced later.

Industrial Course at Penn. State

A two weeks' summer course in industrial organization and management is being offered for the fifth consecutive year by the Pennsylvania State College from Aug. 9 to 21. It is designed to meet the needs of manufacturers, superintendents, employment directors, foremen, accountants and all others who pilot the daily affairs of industry and who are willing to devote two weeks to intensive study. Its purpose is to assist men in the development of their jobs and to illustrate to them by practical examples the most effective methods of modern organizations.

Building Trades Attempt to Make St. Louis Closed Shop City

The Building Trades Council of St. Louis officially served written notice upon all architects, general contractors, associations of general contractors, master builders, and others engaged in building operations that on and after Sept. 1, 1920, no work will be begun or undertaken on any building operations in the territorial jurisdiction of the council, unless the names of all contractors and sub-contractors bidding on any certain work or for the installation of equipment shall be submitted to the council for examination and approval. The council also demands that contracts for building and equipping every structure in its entirety be let simultaneously.

The council will furnish the architect or contractor with a printed list of the various parts of the work to be done on buildings. This list is to be filled out with the names of the shops or firms to whom the work has been awarded, and then posted in the tool shed or office on the job before work is begun so that representatives of the trades may see it.

The resolution is given herewith:

Whereas, There has been a common practice prevalent among owners of buildings to reserve some of their contracts for work to be done on their buildings, which practice has resulted in much dissatisfaction, and in many instances in delays in completing the operations on such buildings or jobs on account of some of the contracts or sub-contracts being let out to persons or firms not employing union labor, and thus causing much complaint on the part of the trades affiliated with this council, and much criticism by the owners and by the general contractors that employ union labor, and much apathy on the part of the financial interests that promote building operations, and

Whereas, The Building Trades Council of St. Louis, Mo., has repeatedly declared itself to be in favor of a plan of letting all contracts and sub-contracts for the building and equipping of all structures at one and the same time so as to eliminate the possibility of some of the work being let to firms that do not employ union labor, therefore be it

Resolved, That this Building Trades Council in regular meeting assembled on this, the 21st day of April, 1920, does hereby re-affirm its position in regard to letting contracts for the entire structure at one and the same time, and be it further

Resolved, That the secretary of this council be authorized to serve a written notice bearing the official seal of this council to all architects, general contractors, associations of general contractors, master builders and others engaged in building operations to the effect that on and after Sept. 1, 1920, no work will be begun or undertaken on any buildings in the territorial jurisdiction of this council, unless the names of all contractors and sub-contractors bidding on all of the work to be done on the said buildings in their entirety, and for the installation of all equipment shall be submitted to this council for their examination and approval, and be it further

Resolved, That all trades affiliated with this council shall submit to the secretary of this council a written or printed list of all the shops or persons employing their members in compliance with their trade rules, and that any corrections to said list be immediately submitted in writing to the secretary, so that all names of fair shops may be accessible for comparison with the names of contractors and sub-contractors contained in the lists of bidders sent to this council by the architects or owners.

Col. Cooper Appointed Consulting Engineer at Muscle Shoals

Hugh L. Cooper & Co., of New York City, have been appointed consulting engineers on the new hydro-electric plant and dam now under construction by the Government at Muscle Shoals on the Tennessee River. The appointment comes from Major General Beach, Chief of Engineers, U. S. A., who is in charge of the work. Colonel Cooper made a report on the dam construction at Muscle Shoals about two years ago, when he was in the Army, but returned to France before any of his recommendations were carried out.

Lincoln Highway Association to Build "Ideal Section"

What it terms an "ideal section" is to be constructed some time this summer on the route of the Lincoln Highway by the Lincoln Highway Associations. To secure such a section, a board of engineers will be appointed by the association to pass upon plans submitted in reply to a questionnaire that has gone broadcast throughout the United States. The association has sought the advice and opinion of highway commissioners and highway engineers, and from the mass of correspondence in reply, the board of engineers will be asked to select specifications covering the construction of an ideal section. That there will be a wide divergence of opinion among American engineers in determining what specifications should cover the construction of an ideal section is a matter appreciated by the association.

Tentative plans for the construction of this section combine not only considerations of permanency, traffic volume, safety and convenience, but of beautification and of accommodation. It is well understood by the association that the exact location of any section of highway is largely determined by the question of cost, type of drainage provided, thickness of surface desirable, width of paving, etc. The ideal section will therefore be placed upon average subsoil in the open country.

Conditions in Russia Discussed at Joint Meeting

Under the auspices of the Joint Committee of Russian and American engineers of Engineering Council a largely attended meeting on Russia and the possibilities of a *liaison* between the engineering societies of Russia and of America was held in the Engineering Societies' Building, New York, May 26. W. N. Polakov presided. In the introductory address, N. A. Stephanoff sketched the development of the engineering profession in Russia and pointed out the special qualifications, due to conditions and national psychology, by virtue of which Russian engineers are well adapted to co-operate with American engineers; their excellence in engineering theory and their conscientiousness in detail development were particularly emphasized. In 1910, it was stated, there were 45,000 engineering students in Russia attending polytechnic or special colleges; in addition to these, there was a large class of "practical" engineers. Since the beginning of the war, however, the number of engineers in Russia has been greatly decreased through emigration.

W. F. Dickson, for many years manager of the Russian Singer Co., then outlined some of the achievements of Russian engineers, in bridge engineering, in railway construction, and electrical, steam and aerial engineering. He recalled how, in spite of the relatively backward national development, much work of leadership and new creation had been accomplished by engineers of Russia.

The principal feature of the evening was in illustrated lecture on "Resources of Russia," by Dr. J. M. Goldstein, professor of economics in Moscow University. By means of a great number of lantern slide diagrams, Professor Goldstein showed the very low state of development of Russia's natural resources. Not only are these resources still largely unexplored and unknown, but the agricultural and mineral production per capita, and particularly the amount of power used in manufacturing per capita of the population, are only small fractions of the corresponding amounts shown for other countries. In agricultural exports, Russia has therefore been far outstripped in the last decade or more by such countries as Argentina. Export of oil has decreased not only relatively to that of other countries but also in absolute amount.

Road Condition Bulletins To Be Issued by Massachusetts

Announcement is made by John C. Cole, Commissioner, Department of Public Works of Massachusetts, that highway bulletins will be issued for the purpose of informing truckmen and motorists of the condition of the state roads. The location of detours, the condition of roads under construction as well as the condition of the roads constructed will be posted weekly.

City Board Overrules Objections to $1,000,000 Sewer

Bids for the construction of a trunk line sewer system for the city of Anderson, Ind., were received May 24 by the city's board of public works, in spite of a remonstrance against the improvement made May 12 and carrying the names of more than 2,000 citizens. The improvement will cost nearly $1,000,000.

Let $1,000,000 Sewer Contract

The Green & Sons Construction Company, of Chicago, offered the only bid presented for the construction of the new trunk line sewer at Anderson, Ind., and received the contract for $919,692.40. The bid was the same as the one offered by the company last March when the contract was awarded and soon afterward rescinded because of irregularities in the proceedings.

Committee of Management Named for Grand Trunk

Announcement has been made of the appointment of the Committee of Management for the co-ordination of the Grand Trunk Ry. with the Canadian National system. The committee will consist of: Chairman, Howard G. Kelly, previously president, Grand Trunk Ry.; C. A. Hayes, vice-president, Canadian National Rys.; S. J. Hungerford, assistant to vice-president, Canadian National Rys.; Frank Scott, vice-president and treasurer, Grand Trunk Ry., and W. D. Robb, vice-president, Grand Trunk Ry., who is in charge of transportation, construction, and maintenance of way of the Grand Trunk Ry.

Indianapolis Approves $2,000,000 Flood Protection Work

Under orders issued by the Indianapolis board of public works May 26, the city engineering department will begin plans for the completion of the flood prevention work on the east side of White River between the New York Central railroad bridge, south of Washington street, to Raymond street. F. C. Lingenfelter, city engineer, estimated that the cost of the work would be about $2,000,000. A channel line will be established on the east side of the river providing for a channel of 650 ft. in width, in conformity to the floor prevention work already constructed on the west side of the river.

Two bends in the river, one at the Belt railroad and the other between Morris street and Oliver avenue, will be eliminated and the river will have a straight sweep. Mr. Lingenfelter recommended that the work be started as soon as possible, as a repetition of the 1913 flood would greatly endanger the Oliver Ave., Kentucky Ave. and Morris street bridges. He pointed out that the completion of this work at the present time was more important than to take up the flood prevention work farther north, as the widening of the channel at this point would relieve the territory to the north in case of a flood and would protect the three important bridges.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

AMERICAN WATER WORKS ASSOCIATION, New York City; Montreal, June 21-26.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; Asbury Park, N. J., June 22-25.

AMERICAN PUBLIC HEALTH ASSOCIATION, Boston; San Francisco, Sept. 13-17.

ORGANIZING CONFERENCE of National, State and Local engineering societies; Washington, D. C., June 3-4.

The Albany (N. Y.) Society of Civil Engineers was addressed May 25 by Albert H. Perkins, chief of the Division of Waters, New York State Conservation Commission, who spoke on "Water Power Economics and Politics."

The Utah Society of Engineers elected the following officers at the recent annual meeting: President, H. T. Plumb; vice-presidents, Leroy M. Pharis and E. H. Beckstrand; secretary, W. E. Turner, and treasurer, R. K. Brown.

The Boston Society of Civil Engineers and the New England Water Works Association will hold a field day June 9 at Wardhurst, Lake Suntaug, Lynnfield, Mass. A train with special car is scheduled to leave North Station, Boston & Maine R.R. at 9:04 Eastern Standard time.

PERSONAL NOTES

Lieutenant-Colonel Arthur Parker, Q. M. C., recently discharged from the Army, has been appointed city engineer of Cheyenne, Wyo., succeeding E. W. Glafke, who has removed to California.

Captain O. G. Baxter has resigned as senior drainage engineer, U. S. Bureau of Public Roads, and has established the Baxter Engineering Co., with offices in the Moore & Turner Building, Little Rock, Ark. The Baxter Co. will specialize in drainage and is prepared to give expert advice and reports upon organization, design and construction of drainage and flood protection projects.

Warren E. Darrow, who served as captain of Engineers, U. S. A., during the war, and who has been commissioner of public works of Utica, N. Y., for the past five months, has resigned from that position on account of poor health. Daniel T. Butterfield has been appointed to the office.

Charles Greenwood, engineer of Lewis County, at Chehalis, Wash., has resigned to engage in the logging business. Roy L. Green, of Centralia, has been appointed to succeed him.

L. E. Strahm has been appointed city engineer of Kent, Wash.

Henry M. Weitzner, formerly of the Nitzberg & Weitzner Co., Inc., has opened offices in New York City, under the name of Engineering Construction Co., and is prepared to execute all kinds of engineering and general contracting work.

J. E. Pierson has been appointed engineer of District 2, Wyoming State Highway, comprising the Counties of Carbon, Sweetwater, Unita and Lincoln, with headquarters at Rock Springs, Wyo. He succeeds R. V. Newcomb, resigned.

Captain A. E. Stone, until recently with the Construction Division of the Army, at Washington, D. C., has resigned to accept a position with Thomas Palmer, general contractor, Scranton, Pa. He will have supervision of construction work.

Horace E. Smith, engineer of Okanogan County, Wash., has resigned to enter private business in Okanogan.

Lieutenant R. J. Osborne has been discharged from the Construction Division of the Army and has taken a position in the engineering department of the St. Regis Paper Co., at Deferiet, N. Y.

David J. Howell, senior member of the firm of David J. Howell & Son, civil engineers, Washington, D. C., has been appointed chief engineer of the Arlington Sanitary District, by the Board of Supervisors of Alexandria County, Va., which acts as the sanitary commission for that district. A bill was recently passed creating a sanitary district of Alexandria County and providing for water and sewerage districts to be known as the Arlington Sanitary District. The three members of the board of supervisors are designated as the sanitary commission and are empowered to divide the county into sub-districts upon application of a certain number of qualified voters in one or more of said districts.

A. D. Scott, construction engineer, of Watertown, N. Y., who has lately been with the Hydraulic Construction Co., that city, has become associated with James P. Brownell, consulting engineer, of Carthage, N. Y., as construction engineer for Mr. Brownell on the erection of a new power house for the Northern New York Utilities, Inc., at Black River, N. Y.

Frank S. Robertson, who for the last six months has served the district as chief engineer, has been made general manager of the Cameron County Water Improvement District No. 2, with headquarters at San Benito, Tex. He succeeds P. R. Foley, who tendered his resignation as a member and president of the board. I. N. Penrod, a director, was elected to fill the vacancy.

W. H. **Dean**, assistant engineer in charge of the Twelfth St. bridge, city engineer's office, Chicago, has been appointed manager of the Chicago chapter, American Association of Engineers, to fill the vacancy caused by the resignation of E. J. Burke, who has entered the firm of York, Regan & Burke, as previously reported in these columns.

Dr. Louder W. Jones, dean of the Colleges of Engineering and Chemistry, University of Minnesota, has resigned to accept a professorship at Princeton University, his resignation to become effective July 1. During the war he was director of research in the Chemical Warfare Department at Washington.

E. M. **Evans**, recently city engineer of Herkimer, N. Y., has been appointed city engineer of Norwich, N. Y., to succeed Robert C. Wait. Mr. Evans was formerly general superintendent of construction in the Department of Public Works and Roads, Province of Quebec, in the engineering department of the New York Central and the Delaware & Hudson roads and with the New York State highway and canal departments. Previous to his employment at Herkimer, he served as city engineer at Oil City and Franklin, Pa.

O. E. **Carr**, for the past two years city manager of Springfield, Ohio, has resigned to accept the city managership of Dubuque, Iowa, at a salary of $700 a month. Mr. Carr installed the city-manager form of government at Cadillac, Mich., in 1914, and the commission-manager form at Niagara Falls, N. Y., in 1916.

Louis A. Wilson, recently with the Iowa Highway Commission, is now with the Holt Manufacturing Co., Peoria, Ill., in sales research work on construction and road building.

Claud A. Renshaw, civil engineer, Roundup, Mont., has been elected mayor of that city.

C. E. **Southworth**, for the past three years project engineer at Fort Hall, near Pocatello, Idaho, resigned recently to engage in a private business enterprise at Tonopah, Nev.

H. S. **Baker**, chief deputy of Spokane County, road construction engineer, has been appointed engineer of Spokane County, Wash., to fill the vacancy caused by the resignation of Allan R. Scott, who is entering private business. Mr. Baker will have charge of maintenance on the county roads.

Frank Wallace, recently connected with the county engineer's office at Colfax, Wash., is now resident engineer at Missoula, Mont., for the U. S. Bureau of Public Roads.

E. L. **Alspaugh**, formerly with the Oregon State Highway Commission; Fred Cotter, formerly of the Portland, Ore., office, and L. F. Martin, have received the appointment of chief of party with the U. S. Bureau of Public Roads, and will be located in the Missoula, Mont., office.

OBITUARY

Timothy Foley, widely known railroad contractor, died at his home in St. Paul, Minn., May 25. He had been in ill health since last fall, the cause of his death being pernicious anemia. Mr. Foley was born Aug. 20, 1838, in Lanark County, Ontario, Canada. He came to Minnesota in 1879, accompanied by his brother, Michael Foley, now the only surviving member of the firm of four brothers, known as Foley Brothers. His firm was largely interested in the building of virtually all the railway lines of the Northwest, including the Great Northern, Northern Pacific, Soo Line, St. Paul, Burlington and Northwestern in the United States, and the Canadian Pacific, Canadian Northern and the National Transcontinental in Canada. At one time Mr. Foley was president of the Duluth & Winnipeg Railway, now a part of the Great Northern System. His company recently finished the construction of the ocean terminals at Halifax, Nova Scotia. Besides his activities in railroad construction, Mr. Foley was one of the pioneer lumbermen of Minnesota, and was the active head of many lines of business enterprises in the Northwest. During recent years he gave extensively to charities and assisted numerous educational institutions. Mr. Foley was a life-long friend of the late James J. Hill, with whom he worked in the building of the empire of the great Northwest.

Christopher Kuppler, founder of the contracting firm of Chris. Kuppler & Sons, of Seattle and Port Angeles, died recently in Seattle at the age of 60. For the past 32 years, Mr. Kuppler has been engaged in contracting work in the Puget Sound district, particularly in the Puget Sound Navy Yard and Port Angeles.

John B. Fraim, recently in charge of construction work at the Sparrow's Point (Md.) plant of the Bethlehem Steel Co., died May 9, at Biglerville, Pa. Mr. Fraim was engaged in structural steel and bridge building work for 45 years, during which time he built bridges in nearly every part of the United States and in Canada. For a number of years he was superintendent of erection for the Pennsylvania Steel Co.

James W. Johnston, contractor, died recently at Utica, N. Y. He was born in Belfast, Ireland, in 1840, and when he came to this country settled near Utica. After serving through the Civil War, he engaged in various enterprises until 1890, when he became associated with the contracting firm of T. J. Dyer & Co., and engaged in canal construction. In later years he was in charge of a large amount of road, sewerage and grading work in the vicinity of Utica.

Bion Bradbury, formerly commissioner of public works of Portland, Me., and during the war plant engineer for the Cumberland Shipbuilding Co., died at Cape Elizabeth, Me., May 16. In his early years of engineering activities he served for seven years on the U. S. Coast and Geodetic Survey on the Eastern coast, Lake Champlain, Florida, Mississippi River and Narragansett Bay. He later associated himself with Edward C. Jordan, of Portland, doing location work for the Rumford Falls, Rangeley Lakes, and Franklin & Megantic narrow-gage railroads in Franklin County. When Mr. Jordan became city engineer, Mr. Bradbury was appointed his first assistant, in which capacity he did a large amount of the survey and topographical map work on outlying sections of Portland and the Islands of Peaks, Long and Cliff. In 1907, he was appointed commissioner of public works and re-appointed in 1910, finishing his term in 1913, at which time he resumed private practice until the outbreak of the war. Mr. Bradbury was a member of the Maine Society of Civil Engineers. He was also appointed by Governor Milliken a member of the Maine Water Power Commission.

James M. Edwards, civil engineer and railroad operator, died in New York City, May 24, at the age of seventy. Mr. Edwards was born in Oglethorpe County, Georgia. He was graduated from the University of Georgia in 1869 as a civil engineer. Between 1881 and 1884 he was engaged in building the Louisville, New Orleans and Texas Railroad, now the Yazoo & Mississippi Valley. He was in charge of operations as vice-president and general manager until 1894. Later he was connected with the Illinois Central. In 1890 he moved to New York City and, associated with the R. T. Wilson Co., he became interested in street lines and had charge of the construction of the Yonkers street railroad, of which he was president, and the Nashua electric line in Brooklyn. In 1902, in conjunction with Tom L. Johnson, Mr. Edwards reorganized and consolidated the street railroads in Detroit into the present Detroit United Railways of which for a time he was president. When the Wilson firm turned its attention to the chemical industry, Mr. Edwards became head of Matheison Alkali Works of Saltville, Va., and of its subsidiary, the Castner-Eltro Alkali Co. of Niagara Falls, continuing as president of this company until after the death of Mr. Wilson. He retired from business in 1917.

Sutherland Hutton, civil engineer, Santa Monica, Cal., died in that city May 14. He was one of the founders of Santa Monica and at one time was park commissioner.

Robert Stone, fifty-five years old, a civil engineer of Muncie, Ind., is dead of heart disease. He is survived by three sons and two daughters.

A Consolidation of Engineering News and Engineering Record McGraw-Hill Company, Inc.—JAMES H. MCGRAW, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN
Editor

Volume 84 NEW YORK, THURSDAY, JUNE 10, 1920 Number 24

Where Will City Wages Stop?

WITH unskilled municipal laborers at Albany, N. Y., and elsewhere asking for wage advances to $5 a day, the question naturally arises, where will city wages stop?

National Budget Must Come

FAILURE of the National budget bill by a last-minute filibuster in the Senate is a cause for deep regret. The United States has long stood alone among the nations of the world in having no budget system. State after state of the Union has recently enacted budget measures and our most progressive cities preceded the states in this particular. The sentiment of the country is now so strong for a national budget that it cannot be long postponed.

Hope for Better Government

PROMISE of better government for Atlanta is offered by the charter amendment campaign being waged under the leadership of its president, Eugene R. Black. A city manager is proposed and also a single- instead of two-chambered city council. Atlanta is one of the few American cities that still clings to the cumbersome bi-cameral city council, with its divided responsibility and delays. A single small legislative body with legislative powers only, and a chief executive officer, chosen for competence, and well paid, is the plan for a city that wishes to show twentieth century progress and efficiency.

Notes from Foreign Fields

ON PAGE 1169 of this issue appears the first of a series of impressions which E. J. Mehren, editor of *Engineering News-Record*, is writing during an extended European trip. No attempt will be made to introduce technical details into these letters. They are designed merely to picture things seen abroad through the eyes of an engineer-observer. This week's impressions concern London traffic and Westminster Abbey's tribute to famous engineers and scientists. Later letters will deal with such subjects as the Institution of Civil Engineers, random highway observations, and construction methods in England. During Mr. Mehren's progress through France and Germany notes on his experiences and general observations in those countries are expected.

Another Year Lost

BY HIS action in failing to approve the water-power bill, the President has postponed hydro-electric development at least one and possibly two years. The present Congress, which only just managed to agree on a bill, will hardly attempt to meet the President's mind again when it assembles in December. Unless there is an extra session the next Congress does not convene until December, 1921, at which time both legislative and executive personnel will be changed and the work of building up a water-power bill will have to start anew. As indicated in our news columns there is confusion in Washington as to why the President allowed the bill to lapse, but whatever the reasons, with coal and labor at their present price this is a poor time to hold up economical power for another two years.

The Largest City

DISAPPOINTMENT because New York City did not reach the six million mark in the 1920 census may well be momentary when all the data are considered. In fact, disappointment may properly give place to pride and congratulation. The gain for the decade is over 854,000, which alone would place New York fourth on the list of American cities, with possible apologies to Detroit when its count is announced. New York's total count of 5,621,151 makes it twice the size of any other American city and probably the largest in the world, London being the only possible near approach to a rival. Factors in the failure of New York to reach the six million mark are the practical stoppage of immigration during the war, heavy emigration immediately thereafter, housing shortage and other causes for the flow of population to the suburbs. These factors hit Manhattan borough hardest of all, and go far toward explaining its decline of 47,439 or 2 per cent in population. Presumably the other boroughs of Greater New York, as well as the suburbs, were gainers through these factors, especially by the conversion of dwelling sites into places of business. The heart of any metropolitan center is bound to lose population, first in percentage growth, then actually, as the decades pass. The real test of growth becomes more and more that of the whole metropolitan district. When the figures for the entire metropolitan district of New York are available it seems probable that they will show an excess over the London metropolitan district—but for the London figures we must await the British census of 1921. Meanwhile New York City may claim to be the largest city as well as the center of the largest metropolitan district in the world.

Rating Irrigation Districts

IRRIGATION engineers not familiar with the work of the engineer-appraisers in the service of the Federal Farm Loan Banks will find on p. 1100, of our issue of June 3, a classification of projects according to the adequacy of water supplies. The classification is the result of the observation of the engineers for the past three years. It must be borne in mind that the rating is made with special reference to the particular conditions under which these banks make loans. Primarily the land must stand alone for the loans are all on such a long time basis, 34½ to 40 years, that personal credit, on which short time loans are ordinarily made, does not enter into consideration. Because intrinsic values only are considered, the classification of the appraisers must, therefore, be quite definite and stringent. On new projects it is conceivable that a higher rating might be obtained in some cases without undue additional expendtures, thereby raising the loan value of every owner in the district. Since on the ease, rapidity and succes of colonization depends the success of the project from the financial standpoint of the investor and the higher the rating the greater the loan value, irrigation engineers may well keep this classification in mind.

Speaking for the Profession

ENCOURAGEMENT and inspiration flow from the manfully expressed resolution of the Board of Direction of the American Society of Civil Engineers on the question of bridge design by architects. The statement of the board, quoted in full on p. 1175, is equally notable for what it says and for the way in which it is said. Both substance and manner of expression make obvious a conviction of a mission and a determination to uphold that mission: the representation of the civil engineering profession as a unified technical group.

There is no temporizing in the statement of the board, no evasion of a crucial question by disposing of it as administrative detail. When we deplored the findings of a committee of Engineering Council two weeks ago, because they failed as to underlying principle, we had in mind just such a statement of clean-cut conviction as that now given us. That Engineering Council went outside of its mandate in taking up the question—as is stated very distinctly in the resolution of the Board of Direction—may serve to explain the halting and evasive results reached by the council's committee. Where proper warrant of purpose is lacking, convictions are likely to be absent, or at least the courage to set forth these convictions in unmistakable terms. Conversely, the resolution of the board, in its manfully direct wording, is a most evident expression of authority to speak for civil engineers as a professional group.

Solidarity of civil engineers is vital to the interests of the profession. But those who are to speak for the profession must themselves be civil engineers. The power cannot be delegated to agents foreign to the needs and the traditions of civil engineering. This is an elementary truth, but because it is easily overlooked, or at a critical moment forgotten, the forceful expression given to it in the resolution of the Board of Direction is of high inspirational value. The entire membership of the society, the whole body of American civil engineers, indeed, may read in the words of the board a new expression of its own unity as a body of professional co-workers.

Guided by such a spirit as speaks from the board's resolution, the profession cannot fail to progress. There have been many centrifugal tendencies in the engineering world during recent months; there has been a startling lack of centripetal forces. So long as a group of clear-seeing, courageous and active men guide the work of the American Society of Civil Engineers and make it the militant champion of the interests of its members, a sound nucleus of professional strength will always exist, and both the public interest and the interests of the profession will be served. Under such leadership, any functions and services that can more fittingly be left to other organizations may and should be delegated. But the civil engineering profession will uphold the principle that, as custodian of a great science and art, it must retain the control of vital professional interests in its own hands.

The Federation of Engineering Societies

IN LAYING the foundation last week for a national federation of engineering societies the Organizing Conference at Washington, D. C., took action which will add a new chapter to American engineering history. The two-day meeting of delegates representing more than sixty national, state, and local societies, reported in detail elsewhere in this issue, was unique in its purpose, in the widely representative character of its participants, and in the spirit of co-operation and service which animated every session, and which, at times, seemed to transform the delegates from mere technical men concerned chiefly with the details of engineering construction and design into apostles of a new order of professional solidarity.

For years past there has been an apparent desire for engineering unity, for some agency which would endow the profession with a voice articulate throughout the nation. The federation born at the Organizing Conference will fill this need, provided that the work begun at Washington by the endorsement of a constitution and by-laws is followed up by all organizations which were represented at the gathering by delegates. The conference has done its part by building up and setting into motion the machinery for the federation; the societies must now discharge their obligations by an immediate canvass of their membership on the acceptance of the federation principle. Already the American Society of Mechanical Engineers—the only national organization which sent to the conference delegates empowered to act for it—has pledged its membership in the new federation. It appears, also, that the American Institute of Electrical Engineers will follow suit. Action by the other national and local societies should not be delayed.

Never before have engineering organizations throughout the country enjoyed the opportunity that is now presented to them of affiliating to secure united action. At one of its sessions the conference had the privilege of listening to an address by a business man whose views are entitled to great weight, Homer L. Ferguson, past-president of the United States Chamber of Commerce. In one sentence he epitomized the engineers' problem and its solution: "You won't have much of anything these days unless the voice of your business or profession is heard." This voice, to which Mr. Ferguson referred, must reach other ears than those of engineers. It has a real message to deliver—the message of service to the public through the use of technical knowledge and engineering experience. The voice of the engineer must be strong and must carry far. It will succeed in delivering its message to the nation only if it speaks for all, not one or more groups of engineers. The opportunity has arrived. It has been a long time coming. It should be grasped now, for it may not come again.

The conference was truly remarkable in its representative character, as indicated by the list of societies and delegates on another page. Engineers have been criticised, and justly so, for their professional aloofness. During the past decade or so the profession has become highly specialized and where, in former times, we had only "engineers" we now have civil, mechanical, electrical, mining, industrial, automotive, and scores of other classifications. This specialization has tended to segregate engineers into groups working more or less independently. At the conference, however, engineers of all kinds met and worked together. While there are undeniable advantages in the form of organization by specialties for technical advancement, its drawbacks from the point of view of influencing public opinion and establishing engineers in the position which they should occupy in the minds of men are manifest. The federation of engineering societies, as did the conference which created it, offers to technical men, for the first time in their history, an opportunity of presenting a *united* front on matters of civic and economic import.

For just such an opportunity engineers have been groping for years past. No one who has attended society meetings, especially since the armistice was signed, can have failed to sense the desire for professional unity. Progress toward the achievement of this ambition has been delayed not by reason of an antipathy toward co-operative effort, but rather by uncertainty as to how best to achieve it. Temperamentally reticent in matters of self-advancement, engineers have remained divided into their little cliques while the lawyers, the doctors, the laborers, and the business men of the nation have banded together into powerful organizations, influential in molding public opinion and commanding the attention of national and state legislatures. The chief significance in the Organizing Conference, therefore, lies in the unmistakable proof which it affords that engineers *can* cast aside their old traditions and work together in a broad, co-operative movement.

So much, then, for the general scope of the conference and the opportunity which it offers. To readers of this journal the attitude of two organizations, the American Society of Civil Engineers and the American Association of Engineers, is of prime interest. When the civil engineers announced that they would send delegates to the conference—after the society's membership, in a letter ballot, had defeated the Joint Conference Committee's specific plan for an engineering federation—attention naturally centered upon the action of these delegates at the Washington meeting. While there is nothing of finality in their vote, inasmuch as they were not empowered to commit the society to any course of action, it is highly significant that the delegation of ten members, as a body, endorsed the principle of an engineering federation and its organization on lines of society, rather than individual, membership, and also approved the constitution and by-laws submitted for the new federation. Predictions that the civil engineer delegates might bolt, or at least assume an attitude of coldness toward the objects of the conference, certainly were not borne out by what happened at Washington. Willard Beahan's emphatic denial of the accusation that the society had gone on record as opposed to a federation of societies is, at least, a straw in the wind. The course is still clear for the American Society of Civil Engineers to join the federated movement. The membership will have an early opportunity to record its decision on the next letter ballot.

It was hardly to have been expected that the American Association of Engineers would have taken any action tending toward a transfer to a new organization of functions which it was organized primarily to carry out. W. J. H. Strong made the association's position clear in the statement which is referred to in the report of the conference elsewhere in this issue. It appears that A. A. E. will not become a member society of the federation, although the association has pledged its co-operation in the new movement. Of the sincerity of this pledge there can be no doubt. By their action in endorsing the Williams resolution endorsing the principles of the federation and its organization on society rather than individual membership lines and in many other ways the American Association of Engineers has gained great prestige as a constructive force in engineering affairs at a time when selfish interests might have seemed to justify an obstructionist policy at the Washington meeting. Nevertheless, no obstructionist tactics were employed, and, while differences of opinion were to have been expected, they were stated frankly, fearlessly and in a spirit of good will and co-operation. While the Federated American Engineering Societies and the American Association of Engineers may pursue separate ways, the prospect of any bitterness or strife between the two organizations in the conduct of their future work seems very remote.

The effect of the federation on the future of Engineering Council was not made the subject of any specific statement, but an interpretation of Philip N. Moore's remarks would indicate that Engineering Council will cease to function as soon as the new federation develops machinery which can handle the so-called welfare activities of the member societies. This seems logical.

A word as to the general conduct of the meeting is in order. The conference set a new mark in orderly parliamentary procedure, due to the combined influence of an efficient presiding officer and to the mental attitude of the delegates who realized that they were at Washington on a mission of tremendous importance to the profession they represented. Ample time and opportunity were available for full discussion of organizing details in spite of opinions to the contrary stated in advance of the meeting by interests not in sympathy with the movement, who believed that the program would be a "cut-and-dried" affair. There was a nicety of judgment shown in the apportionment of time between the business sessions and those at which speakers on general topics were scheduled, which produced a well-balanced, satisfying program.

It is to be remarked that the general trend of thought in the special addresses of business men and engineer-executives indicated that the engineer's chief deficiencies—which prevent him reaching heights hitherto unreached—are the lack of what was termed "the business instinct" and failure to take his part in public affairs. It seems to this journal, however, that the organization of the Federated American Engineering Societies is tangible evidence of a realization of these deficiencies and presents a well-conceived plan of action for correcting them. This new point of view will mean better things for city, state and country, and a brighter future for the engineer himself.

Organizing Conference Lays Foundation for "Federated American Engineering Societies"

Constitution for New National Body to Serve Public Welfare Through Professional Unity Adopted at Meeting of Delegates from 61 Organizations at Washington, D. C.

Dedicated to public service through the medium of technical knowledge and engineering experience, and to united action upon matters of common interest to the engineering and allied technical professions, an ational federation of engineering socieites took definite form last week when delegates of national, state and regional organizations throughout the country, at the closing session of the Organizing Conference held in Washington, D. C., June 3 and 4, unanimously approved a constitution and by-laws for the new body and gave to it the name of "The Federated American Engineering Societies." The federation was given an official status when L. P. Alford, representing the twelve delegates of the American Society of Mechanical Engineers — who had been sent to the conference with power to act for their organization — announced that the society pledged its membership in the new federation. Speaking for the American Institute of Electrical Engineers, Calvert Townley assured the conference that he could predict with reasonable certainty that the American Institute of Electrical Engineers would be a participant in the new organization. Two other events in connection with the formation of the federation are significant: The first was the unanimous approval of the federation principle and the constitution and by-laws by the delegation of the American Society of Civil Engineers, headed by President Arthur P. Davis, and the frank admission by W. J. H. Strong, speaking for the 17 delegates of the American Association of Engineers, that while his organization would co-operate with the new federation in every possible way, it would probably not seek admission to membership. When the roll-call vote on the approval of the constitution and by-laws was begun the American Association of Engineers went on record as "present but not voting."

The conference was a notable one from many points of view. It marks the first definite step which engineers of the United States have ever taken to combine the country's separate organizations—national, state and local—into a single big affiliation of nation-wide scope. If the expectations for a representation of at least 100,000 engineers in the new body are realized it will carry a political influence never before approached in the history of American engineering. Another impressive feature about the meeting was its representative character. The creation of the Federated American Engineering Societies represents the wishes of no single group of engineers, for the delegates present hailed from California, New York, Florida, Minnesota, and all important centers between these localities. In addition to the four founder societies—the national organizations of civil, mechanical, mining, and electrical engineers—there were present delegates from state and regional organizations, as well as from engineer clubs of cities and local affiliations. The final count showed 61 organizations represented by 123 delegates. Representation at the meeting included, in addition to those national and local societies with which readers of *Engineering News-Record* are most familiar, organizations whose interests covered such widely divergent subjects as geology, ceramics, electro-chemistry, refrigeration, naval architecture, heating and ventilating, radio telegraphy, automotive industries, fire protection, military engineering, and other specialties.

The feature of really outstanding significance, however, was not the geographically representative character of the conference nor the diversified interests participating, but the spirit of co-operation and enthusiasm which was manifest at every session. The clear-cut impression carried away from the meeting can probably best be stated in these words: The engineering societies of the country, if truly represented by their delegates, have decided to speak with a united voice. They have determined to work for the public welfare and the advancement of the profession, not individually, but as a team.

ATTITUDE OF AM. SOC. C. E. AND OF A. A. E.

The observer familiar with the events which have led up to the conference looked to the meeting for answers to two questions. First: Will the American Association of Engineers participate in any federation formed? Second: What will be the attitude of the American Society of Civil Engineers in the light of the defeat by its membership of Question 3 on the recent letter ballot, which read, "Shall the Society, for the purposes set forth in Questions 1 and 2, actively co-operate in the creation of the comprehensive organization as outlined in the Joint Conference Committee report?"

As far as the A. A. E. was concerned, its attitude, as expressed by its delegates, boiled down about to this: Our organization is a going concern and is already accomplishing many of the objects sought by the new federation of engineering societies. We are a large organization, having at present 18,125 members, and we believe that the results sought by the federation could best be achieved if engineers, as individuals, would join our organization. We feel, however, that the trend of opinion at the Organizing Conference is definitely toward the federated societies plan. In the way of any such federation we do not propose to place obstacles; we wish to co-operate with the new organization, but we do not feel that it would be consistent with the aims and objects of the American Association of Engineers to relinquish independent control of welfare work —the very purpose for which the association was formed—and join the federation.

The case of the American Society of Civil Engineers presents a different aspect. It will be recalled that the membership, on Questions 1 and 2 of the questionnaire ballot canvassed April 14, voted overwhelmingly in favor of the general principle of becoming an "active national force in economic, industrial, and civic affairs," and of co-operating with other engineering and allied technical associations in promoting the welfare of the engineering profession. In defeating Question 3 the society, as explained by Willard Beahan, one of its delegates, disapproved, not the general principle of a federation of engineering societies, but the specific plan of federation proposed in the Joint Conference Committee's report. The delegates of the American Society of Civil Engineers to the Organizing Conference were not empowered to act for the society. They will, however, bring back a report of the meeting and the decision on the question of joining the newly formed Federated American Engineering Societies will be submitted to letter ballot of the membership.

R. L. Humphrey Sounds Keynote

The keynote of the Organizing Conference was sounded at the opening session on the morning of June 3 in the auditorium of the Cosmos Club, when Richard L. Humphrey, chairman of the Joint Conference Committee of the four founder societies, which had issued the call for the meeting of delegates, presented a brief historical sketch of the movement toward a federation of engineering societies and stated that the time had now come for engineering organizations to decide whether to create a comprehensive organization or to pursue their ways separately. The conference, he explained, was made up of delegates named by national, state and regional organizations; to 110 of these societies invitations to participate in the conference had been sent. About 60 per cent of the organizations invited had sent delegates to the meeting. After these preliminary remarks the first business session was begun by the election of Calvert Townley, past president of the American Institute of Electrical Engineers, as chairman, and John C. Hoyt secretary.

Prominent at this first session was the delegation of 17 from the American Association of Engineers, grouped in three solid rows of seats at the front of the auditorium. The A. A. E. delegates had held a caucus in Washington the previous night, and it was apparent from the outset that they had agreed upon a well-defined plan of procedure. In fact, the early business of organizing the conference was largely done on the initiative of A. A. E. members.

Dr. F. H. Newell presented the first resolution, providing that the delegates at the meeting should have full power to make rules governing the procedure. Dr. Newell suggested also that certain set speeches on the program be eliminated in order to give the conference more time for a consideration of the matter of organizing the federation.

Williams Offers Basic Resolution

After it had been decided to limit all addresses from the floor to 5 min., Major Gardner S. Williams, representing the Grand Rapids (Mich.) Engineering Society, focused the attention of the delegates upon the fundamental objects of the meeting by offering the following resolution:

"Resolved, that it is the sense of this convention that an organization be created to further the public welfare wherever technical knowledge and engineering experience are involved, and to consider and act upon matters of common concern to the engineering and allied technical professions.

"Resolved, that it is the sense of this convention that the proposed organization should be an organization of societies or affiliations and not of individuals."

In this resolution the crux of the conference was contained, for it embodied two essentials upon which opinion was expected to differ: First, acceptance of the principle of an engineering federation; and, second, organization on the basis of *society*, rather than *individual*, membership. The first half of the resolution, obviously, would require a statement as to policy from the delegation of the American Society of Civil Engineers, while the latter half of the resolution was clearly aimed at the A. A. E. Action on this resolution would mean a square facing of the issues involved. Dr. Newell suggested a procedure, prior to a vote on the measure, by which every delegation present should express in 3-min. addresses its views on the Williams resolution. Objection to this scheme developed and the proposal was defeated.

"The vital question to be decided," said Dr. Newell "is whether the new organization is to be of societies or of individuals." The speaker then presented a brief history of what the American Association of Engineers had done since its organization in 1915 and invited members of other engineering societies to join with the 18,125 men now enrolled in A. A. E. Dr. Newell pointed out that if Major Williams' motion prevailed there would be two large societies, one of delegates and one of individuals, attempting to do the same kind of work. The A. A. E. movement, Dr. Newell contended, is now too great to be abandoned.

Opinion Favors Federation

A spirited discussion followed. Except among the A. A. E. delegates, opinion seemed decidedly in favor of the federation of societies. The general trend of thought is indicated by the remarks of C. E. Grunsky, representing the San Francisco Joint Council of Engineering Societies, who said: "A new society is needed to represent *organized engineering*." It was pointed out that the proposed federation would represent at least 100,000 engineers. The point of view of the small local engineering society was expressed by Major William J. Shea, representing the Brooklyn Engineers Club, who held that while the local society is doing excellent work, it needs some agency whereby its efforts can be

Engineering Societies and Delegates at Organizing Conference, Washington, D. C., June 3-4, 1920

American Association of Engineers,
L. K. Sherman, chairman, Washington, D. C.
R. C. Bailey, Washington, D. C.
Morris Bien, Washington, D. C.
W. A. H. Doying, Washington, D. C.
George W. Fuller, New York City
H. O. Garman, Indianapolis, Ind.
A. N. Johnson, Chicago, Ill.
Leonard B. Smith, New York City
F. H. Newell, Urbana, Ill.
E. T. Perkins, Chicago, Ill.
Wm. J. H. Strong, Chicago, Ill.
R. H. Jacobs, New York City
W. P. Tunstall, Norfolk, Va.
K. P. Armstrong, Washington, D. C.
Dean G. M. Butler, Tucson, Ariz.

American Association of Petroleum Geologists,
James O. Lewis, Washington, D. C.

American Ceramic Society,
E. W. Washburn, Urbana, Ill.

American Electric Railway Engineering Association,
J. H. Hanna, Washington, D. C.
C. S. Kimball, Washington, D. C.

American Electro-Chemical Society,
W. D. Bancroft, Washington, D. C.
G. W. Coggeshall, Washington, D. C.

American Institute of Electrical Engineers
H. W. Buck, chairman, New York City
A. W. Berresford, Milwaukee, Wis.
John H. Finney, Washington, D. C.
James H. McGraw, New York City
L. F. Morehouse, New York City
L. T. Robinson, Schenectady, N. Y.
Samuel Sheldon, Brooklyn, N. Y.
C. E. Skinner, East Pittsburgh, Pa.
Calvert Townley, New York City
R. H. Dalgeish, Washington, D. C.
C. F. Lacombe, New York City
Robert P. Parrott, Washington, D. C.

American Institute of Mining and Metallurgical Engioeers,
Percy E. Barbour, New York City
Philip N. Moore, Washington, D. C.
Allen H. Rogers, New York City
J. V. W. Reynders, New York City
G. Aersten, Nicetown, Pa.
Capt. A. F. Incas, Washington, D. C.
J. E. Spurr, New York City
H. G. Pomeroy, Palo Alto, Cal.
Thos. T. Read, Washington, D. C.

American Railway Engineering Association,
Earl Stimson, Baltimore, Md.

American Society of Agricultural Engineers,
M. A. R. Keeley, Washington, D. C.

American Society of Civil Engineers,
Arthur P. Davis, chairman, Washington, D. C.
George G. Anderson, Los Angeles, Cal.
J. C. Hoyt, Washington, D. C.
Leonard Metcalf, Boston, Mass.
E. E. Wall, St. Louis, Mo.
Gardner S. Williams, Ann Arbor, Mich.
Robert A. Cummings, Pittsburgh, Pa.
George R. Putnam, Washington, D. C.
Willard Beahan, Cleveland, Ohio

American Society of Naval Architects and Marine Engineers,
J. H. Linnard, Washington, D. C.

American Society of Refrigerating Engineers,
W. H. Ross, New York City

American Society for Testing Materials,
G. K. Burgess, Washington, D. C.
G. S. Webster, Philadelphia, Pa.
C. D. Young, Philadelphia, Pa.

American Society of Heating and Ventilating Engineers,
C. L. Riley, Plainfield, N. J.

American Waterworks Association,
John M. Goodell, Montclair, N. J.
Edward C. Hardy, Washington, D. C.

Associated Engineering Societies of St. Louis,
William E. Rolfe, St. Louis, Mo.

Boston Society of Civil Engineers,
Leonard Metcalf, Boston, Mass.

Brooklyn Engineers Club,
Wm. J. Shea, Major, Washington, D. C.

Cleveland Engineering Society,
J. F. Oberlein, Cleveland, Ohio

Colorado Society of Engineers,
J. D. Ward, Philadelphia, Pa.

Duluth Engineers Club,
O. H. Dickerson, Duluth, Minn.

Engineers Club of Baltimore,
W. W. Varney, Baltimore, Md.

Engineers' and Architects' Club of Louisville,
H. C. Williams, Louisville, Ky.

Engineers' Club of Philadelphia,
Guilliam Aertsen, Nicetown, Pa.

Engineering Society of Eastern New York,
Arthur M. Greene, Jr., Troy, N. Y.

Engineering Society of Buffalo,
W. B. Powell, Buffalo, N. Y.

Engineers' Society of Pennsylvania,
Howard E. Moses, Harrisburg, Pa.

Engineers' Society of Western Pennsylvunia,
A. F. Treschew, Pittsburgh, Pa.

Florida Engineering Society,
L. R. McLain, St. Augustine, Fla.

Grand Rapids Engineering Society,
Gardner S. Williams, Ann Arbor, Mich.

Illuminating Engineering Society,
Walter C. Allen, Washington, D. C.

Indiana Engineering Society,
H. O. Garman, Indianapolis, Ind.

Institute of Radio Engineers,
Maj. General George Squier, Washington, D. C.

Iowa Engineering Society,
John H. Dunlap, Iowa City.

Kansas Engineering Society,
Lloyd B. Smith, Topeka, Kansas

Los Angeles Joint Technical Society,
George G. Anderson, Los Angeles, Cal.
W. K. Barnard, Los Angeles, Cal.

Mohawk Valley Engineers' Club,
Byron E. White, Utica, N. Y.

National Fire Protection Association,
Samuel J. Prescott, Washington, D. C.
Ira H. Woolson, New York City

Nashville Engineering Association,
W. G. Waldo, Chattanooga, Tenn.

Northeastern Water Works Association,
Leonard Metcalf, Boston, Mass.

Oregon Technical Council,
David C. Henny, Portland, Ore.

Providence Engineering Society,
J. C. Hall, Providence, R. I.

San Francisco Joint Council of Engineering Societies,
C. E. Grunsky, San Francisco, Cal.

Scieotific Club, Indianapolis,
W. A. Hanley, Indianapolis, Ind.

Society of Automotive Engineers,
Coker F. Clarkson, New York City
Howard E. Coffin, Detroit, Mich.
Charles M. Manly, New York City

Society of Industrial Engineers,
L. W. Wallace, Baltimore, Md.

Society for Promotion of Engineering Education,
Arthur M. Greene, Jr., Troy, N. Y.

Society of American Military Engineers,
John H. Finney, Washington, D. C.

Taylor Society of New York City,
Harlow S. Person, New York City

Technical Club of Dallas,
C. H. Koch, Dallas, Tex.

Topeka Engineers' Club,
Lloyd B. Smith, Topeka, Kansas

Vermont Society of Engineers,
George A. Reed, Montpelier, Vt.

Washington Society of Engineers,
M. O. Leighton, Washington, D. C.

American Society of Mechanical Engineers,
L. P. Alford, Chairman, New York City
N. S. Carman, Cleveland, Ohio
R. H. Fernald, Philadelphia, Pa.
W. B. Gregory, New Orleans, La.
W. A. Henley, Indianapolis, Ind.
D. S. Kimball, Ithica, N. Y.
L. C. Nordmeyer, St. Louis, Mo.
V. M. Palmer, Rochester, N. Y.
N. P. Porter, Tulsa, Okla.
Arthur L. Rice, Chicago, Ill.
Calvin W. Rice, New York City
Paul Wright, Birmingham, Ala.

Association of Railroad Engineers,
Lewis S. Billau, Baltimore, Md. (unofficially)

Engineers' Club of St. Louis,
Wm. E. Rolfe, St. Louis, Mo.

Engineers' Club of Trenton,
James E. English, Trenton, N. J.

Engineering Council,
Charles Whiting Baker, New York City
M. O. Leighton, Washington, D. C.

Illinois Society of Engineers,
L. K. Sherman, Washington, D. C.

Engineering Society of Akron,
Fred E. Ayer, Akron, Ohio

Detroit Engineering Society,
D. James Sterrett, Detroit, Mich.

Total Societies	61
Total Delegates	123

combined with those of others and made more effective and whereby it would be assisted in matters of state and national scope. This point of view was concurred in by J. F. Oberlein, for the Cleveland Engineering Society, J. C. Hall for the Providence Engineering Society, W. E. Rolfe for the Associated Engineering Societies of St. Louis, and others. That the federation idea was nothing new was pointed out by L. W. Wallace, of the Society of Industrial Engineers. He cited the cases of affiliations of local associations which had done successful work at Cleveland, St. Louis, and Indianapolis. Co-ordination, he believed, could best be accomplished by societies, and not by individuals.

The opposite viewpoint was taken by George W. Fuller, consulting engineer, of New York, representing A. A. E. "It is not practicable," said Mr. Fuller, "for a group of national societies to be organized from the top down. The confederation idea has not proved successful in this country." The A. A. E., Mr. Fuller pointed out, was organized from the bottom up, was a going concern, and one which, by interesting itself in the problems of the young engineer, had done effective work in removing the menace of labor unionism in engineering circles. Speaking along similar lines, W. J. H. Strong called attention to the apparent financial weakness of the proposed federation and made the definite statement that whether or not a federation was formed, the American Association of Engineers would continue with its present work.

In this discussion delegates from the smaller engineering societies and the A. A. E. contingent were very active. While opinions differed radically, there was never at any time throughout the conference any show of ill will or antagonism. The A. A. E. delegates, one after one, made a persistent and forceful presentation of their case, but it was clear, as time went on, that the sweep of opinion was toward the federation and against the acceptance of the American Association of Engineers as a substitute for a national affiliation of engineering interests by societies instead of by individuals.

A. A. E. VOTES "AYE"

After the current of discussion had ebbed and flowed for several hours, the first dramatic incident of the conference was staged when a roll-call vote on the Williams resolution was demanded. By an odd twist of circumstance the pivotal organization, the American Association of Engineers, would, according to the alphabetical listing of the delegations on the official roster, have to cast the first vote. As Chairman Townley turned to Secretary Hoyt with the order, "Proceed with the roll call," an expectant hush settled upon the gathering.

"American Association of Engineers," called the Secretary.

President L. K. Sherman, of A. A. E. rose. The only sound that broke the stillness in the auditorium was the creaking of the wooden seats as delegates leaned forward in order that no word of the reply should escape them.

"The American Association of Engineers, seventeen delegates, votes aye!" announced Mr. Sherman.

A storm of applause greeted this declaration. The A. A. E., fighting gamely, had sensed the trend of opinion and had, in a spirit of true sportsmanship, cast a vote which would not obstruct the objects of the majority. In the noisy confusion which followed some one moved "to dispense with the further calling of the roll," but after the meeting had calmed down the names of all delegations were read and unanimous endorsement was given to the principles of the creation of the federation and its organization by societies, not individuals.

The conference had made a momentous decision.

The passage of the Williams resolution marked the first milestone in the progress of the conference toward its goal. The secretary's canvass showed that 119 votes in favor of the measure were cast, there being no negative votes; of the 57 societies represented at this session by delegates, 5 societies did not vote. The way having been opened for the organization of the conference, Chairman Townley named three large committees, the first on constitution and by-laws, R. L. Humphrey, chairman; the second, on resolutions, Philip N. Moore, chairman; the third, on program, R. H. Fernald, chairman. Each of these committees consisted of about 25 members. They were made purposely large, Chairman Townley stated, in order that thoroughly representative opinion could be secured.

CONSTITUTION APPROVED

Inasmuch as the essential business of the conference was organization on definite lines, interest centered principally upon the report of the Committee on Constitution and By-laws which was submitted by Chairman Humphrey on the morning of June 4. The committee's recommended constitution was approved by the conference substantially in its original form, in spite of a lengthy discussion on details. The main features of the adopted constitution—which is subject to editorial revision follow:

The name of the new organization is "The Federated American Engineering Societies." Its object is "to further the interests of the public through the use of technical knowledge and engineering experience, and to consider and act upon matters common to the engineering and allied technical professions."

Membership—The membership is to consist of national, local, state, and regional engineering and allied technical organization and affiliations. The management of the organization is vested in a body designated as the American Engineering Council and an executive board of that body. The council is to consist of representatives of every member society. Each national, state, regional or local organization is entitled to one representative on the council for a membership of from 100 to 1,000 inclusive, and one additional representative for every additional 1,000 members or major fraction thereof. The duties of the council are to co-ordinate the activities of state councils and of local affiliations whenever these activities shall be of national or general importance, or affect the general interest of engineers. It is specified that no organization shall have more than 20 representatives on the council.

Officers—The elected officers of the council are to consist of a president, to hold office two years and to be ineligible for re-election, four vice-presidents, to hold office for two years (two to be elected every year), and a treasurer, to hold office for one year. These officers are to be elected by letter ballot of the representatives of the member societies on the council. There will be an executive officer, with the title of secretary, appointed by and holding office during the pleasure of the executive board. The secretary will not be a member of the executive board but may be a representative on the council.

Management—The general management of the affairs of the Federated American Engineering Societies is to be in an executive board of 30 members of the council, of whom 6 shall be the officers and 24 shall be selected, a part by the national societies and the remainder by the local, state, or regional organizations, according to districts. It is planned to have the national and local organizations represented on the executive board in the ratio of their membership in the council.

Funds—The constitution provides that the funds of the organization shall be provided on the basis of $1.50 per member for national societies and $1 per member for local, state, or regional organizations. The formation of local affiliations and state councils is provided for.

Authority—Under the section "Authority" the constitution provides as follows: "Local affiliations, state councils and the American Engineering Council shall deal with local, state, and national matters respectively and they shall be autonomous with respect thereto. It shall, however, be the duty of the American Engineering Council to interest itself in the activities of local affiliations and state councils if such activities are of national scope or affect the general interest of the engineering and allied technical professions; provided that nothing herein stated shall be construed as preventing the discussion by any local affiliation or state council or by the American Engineering Council of any matters of interest to engineers and members of allied technical professions for action by the said Council on local or state matters where no local affiliation or state council exists."

Publicity—There is also a definite provision in the constitution favoring a policy of publicity and close co-operation of the federation with the technical press.

A. A. E. "Present but Not Voting"

When the acceptance of the constitution was put to a roll-call vote interest again centered on the action of the American Association of Engineers, particularly in the light of its endorsement of the Williams resolution presented at the first day's session. When the first name on the list was called Mr. Strong explained that, before announcing his organization's position, he wished to make a statement in order that any misconception might be avoided. The affirmative vote on the Williams resolution, Mr. Strong said, was cast in order that the A. A. E. might not appear in the light of an obstructionist. He explained that entry into the Federated American Engineering Societies would require a payment by A. A. E. of about $30,000. The association felt that it was not justified in turning over this sum for welfare work which it believed its own machinery was able to handle effectively. Mr. Strong further explained that a proposal made to the Organizing Conference and providing for the assignment of all welfare work of the new organization to the American Association of Engineers had been rejected, as had also a tentative offer of appropriations by A. A. E. for certain specific purposes. Nevertheless, it was maintained that the attitude of the American Association of Engineers toward the new federation would be one of co-operation. Future developments may indicate, said Mr. Strong, that the two organizations may be needed and the time may come when an amalgamation may be considered. For the present, however, the American Association of Engineers could not endorse the constitution and by-laws for the new federation and Mr. Strong requested that the secretary record the American Association of Engineers as "present but not voting."

Practically all of the other organizations represented by delegates at the conference endorsed the constitution. There were 88 affirmative votes, none negative; eight societies went on record as "present but not voting," and ten were "absent." The secretary's list showed that on the final day of the meeting 61 engineering organizations had registered, with 123 delegates; After the constitution was unanimously adopted a set of by-laws also was endorsed. It was explained by Mr. Humphrey that the constitution had purposely been made short and simple, and that details as to the administration of the new federation could be taken care of by provisions in the by-laws as the need for them became apparent.

Resolutions Approved

The conference endorsed three measures submitted by the Committee on Resolutions, the first urging an increase in salary for engineering educators; the second, a prompt enactment of legislation which would put into effect the salary readjustments provided for in the report of the reclassification committee on salaries for Government employees at Washington; and the third endorsing the creation of a Federal Department of Public Works.

Inspirational Addresses

The sessions of the conference were divided into two general classes: The first, business sessions, had to do with ways and means of bringing the new federation into existence. The second group was devoted largely to addresses of an inspirational character designed to indicate to engineers fields for activity in the interest of public welfare and matters of concern to the profession which should receive attention by the federated organization.

In a forceful address at the afternoon session of June, 3, Arthur P. Davis, president of the American Society of Civil Engineers, made a plea for united action by engineers, and pointed out the tremendous prestige which a federation of engineering societies would carry, not only because of the great membership of more than 100,000 represented, but on account of the combined high technical attainments of such an all-inclusive membership. High technical standards, however, Mr. Davis believed, should have no part in the reuirements for membership in the new federation.

Philip N. Moore, past-president, American Institute of Mining and Metallurgical Engineers, endorsed the federation of engineering societies as offering a medium to engineers for speaking on matters of national import. Himself a member of Engineering Council, Mr. Moore pledged the support of that organization to the new federation. "Engineering Council," said Mr. Moore, "is ready to turn its work over to any organization that will do it better than it has been done in the past." All efforts toward the success of the new federation, Mr. Moore contended, will be in vain unless the individual societies give it their active support.

Thomas H. McDonald, chief of the U. S. Bureau of Public Roads, after presenting a brief review of the financial condition of the Federal-aid road program, pointed out that an organization such as the Federated American Engineering Societies could do a great work by bringing its influence to bear in opposition to any policy which classified the construction and maintenance of public highways as non-essential work, and therefore not entitled to recognition in the delivery of materials by the railroads.

William D. Uhler, chief engineer, Pennsylvania State Highway Department, spoke on the economic value of good roads.

THE ENGINEER IN BUSINESS

Three addresses were delivered at the evening session, June 3, in the grand ballroom of the New Willard. Homer L. Ferguson, past-president, U. S. Chamber of Commerce, urged upon engineers the development of the business point of view. They have practically all of the qualifications for becoming business men, according to Mr. Ferguson, except the one of "thinking on their feet." It was insisted that engineers must become better public speakers. Undue reticence is the main trouble, said Mr. Ferguson. "It is not unusual," continued Mr. Ferguson, "for engineers, when they get up to speak, to act as if they had a gold brick to sell." Speaking of the objects and the opportunities of the federation of engineering societies, Mr. Ferguson made this significant remark: "You won't have much of anything these days unless the voice of your business or profession is heard."

PUBLICITY FOR ENGINEERS

The second address of the evening, "Publicity for Engineers," was delivered by James H. McGraw, president, McGraw-Hill Co., Inc., New York. "I am here," said Mr. McGraw, "because I see in this meeting one of the most forward steps that have been taken by engineering organizations in their history." One of the most constructive acts the federated societies could perform, Mr. McGraw pointed out, would be to visualize the opportunities for publicity for the engineer and perfect methods of securing this publicity. The public is now conscious of the engineer as a servant, but Mr. McGraw contended that he should be regarded as a leader, as a man upon whose thinking our national life depends. Service to the nation, said Mr. McGraw, is what the engineer has to advertise. but before reaching his ultimate place in public esteem he must become a better business man, leave behind the narrowness that goes with a specialized kind of thinking, and give expression to the idea that he is the man who makes our present life possible. In other words, the engineer must be human as well as an engineer. The technical press, according to Mr. McGraw, is behind the engineering societies and their developments. He made an emphatic plea for complete understanding and co-operation between the engineering societies and technical and business papers.

The evening's program was concluded by an address on "The Engineer and National Prosperity," by Dr. George Otis Smith.

The final session of the conference on the evening of June 4, after the business had been concluded by the approval of the constitution and by-laws. was made notable by an address on "The Executive in Engineering," by Samuel M. Vauclain, president of the Baldwin Locomotive Works. Mr. Vauclain presented an intimate picture of the problems which face an executive in a great manufacturing plant and touched upon many of the human phases of industry. The really great executive in engineering, as defined by Mr. Vauclain, is the man "who has confidence not only in himself but in those whose work he directs."

Other addresses were made by Robert S. Woodward, president, Carnegie Institute, Washington, D. C., and James R. Angell, chairman, National Research Council. Both of the evening sessions at the Willard Hotel were followed by smokers at which the delegates to the Organizing Conference were the guests of the Washington Society of Engineers.

RESOLUTIONS OF APPRECIATION PASSED

The two-day session concluded with resolutions of appreciation of the work done in organizing the Federated American Engineering Societies by Richard L. Humphrey, chairman of the Joint Conference Committee, and Calvert Townley who was chosen chairman of the Organizing Conference at its first session and presided at all meetings during the two-day period.

There is given on p. 1138 the complete list of national, state, and local engineering organizations participating in the conference, together with the names of their delegates. The final count shows that 61 organizations, represented by 123 delegates, took part in the Washington meeting.

Carnegie Educational Foundation Makes Annual Report

In the fourteenth annual report of the Carnegie Foundation for the Advancement of Teaching, recently made public there is shown total resources of $21,643,000, representing the permanent general endowment of $13,150,000, the endowment of the division of educational enquiry of $1,250,000, and three reserve funds. One reserve fund, now amounting to $6,512,000 and increasing at the rate of six hundred thousand dollars a year, is to be spent, principal and interest, in the retirement during the next sixty years of the six thousand teachers now in the associated institutions. Another reserve fund, now a third of a million dollars, is to be accumulated to one million dollars and expended, principal and interest, in aiding universities and colleges to adopt the new plan of contractual contributory annuities inaugurated by the Foundation during the year.

Of the total expenditures, $5,600,000 went to the associated list of 73 institutions. The report indicates the appropriation to each of these institutions during each year of the foundation's history. Harvard has received a total of $556,000; Yale $491,000; Columbia, $405,000; Cornell, $326,000; Amherst, Johns Hopkins, Massachusetts Institute of Technology, Princeton, Stevens Institute of Technology, Tulane University, the universities of California, Michigan, Minnesota, Missouri, and Wisconsin, each received more than $100,000, the average for these eleven institutions being $130,000.

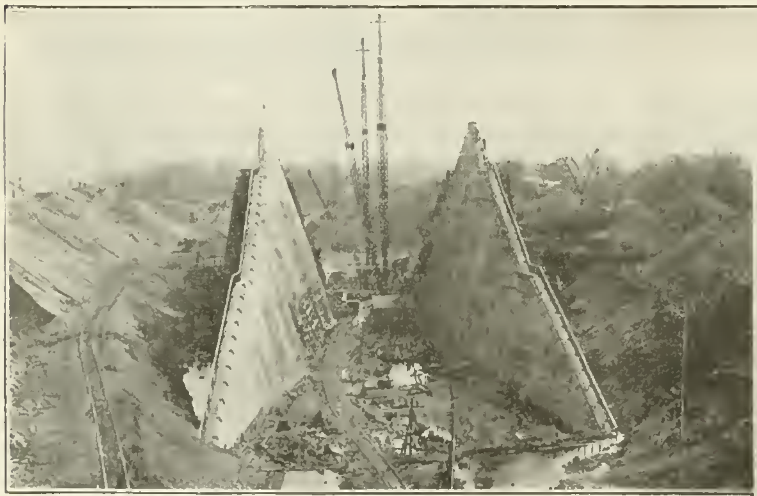
The resources of the foundation were increased during the year by three and one-third million dollars, two and one-half million from the Carnegie Corporation and the remainder from accumulated income.

Design of Dams and Auxiliary Structures of Miami Conservancy District

Final Proportioning of Earth Dams — High Retaining Walls Governed by Base Pressure — Outlet Conduits — Lining of Jump Pools — Three-Hinged Arch Bridges and Continuous Girder Spans of Concrete

VARIOUS difficult problems of structural design were encountered in developing the flood-protection plans of the Miami Conservancy District, whose operations extend along the Great Miami River from Sidney to Hamilton, in southwestern Ohio. Three years ago, when the official plan of the district had just been formulated and had received court approval, we were able to present a summarized description of the project as a whole and of the principal elements of its retarding-basin work. During the subsequent preparation of bidding plans and while getting ready to begin construction, the engineers of the District made modifications in numerous details of the original designs, but the essential description of the structures as previously given (see *Engineering News*, Jan. 25, 1917, pp. 144 to 151) remains without change. It has since been possible to obtain from the designers information as to the reasoning and analyses on which the proportioning of the dams and auxiliary structures was based. A condensed statement of the methods is given in the following, with special reference to the features of departure from precedent or ordinary procedure.

The five dams of the District range from 73 to 124½ ft. in height from stream bottom to crest; their length ranges from 1210 to 6400 ft. Being located in populous valleys, they were required to be proportioned with unusual regard for safety. Further, they will be dry during many years at a time, except for occasional wetting of their lower portions in flood time and such saturation as may result from rainfall. The effect of this condition on their stability and tightness could not be foreseen with certainty, and it seemed wise to provide for increase of section to allow for it. On the other hand there were strong reasons for seeking economy: not only the magnitude of the enterprise and the length of the dams, but also the necessity for completing each embankment in the shortest possible time in order that its valley might be closed without creating abnormal hazards during construction.



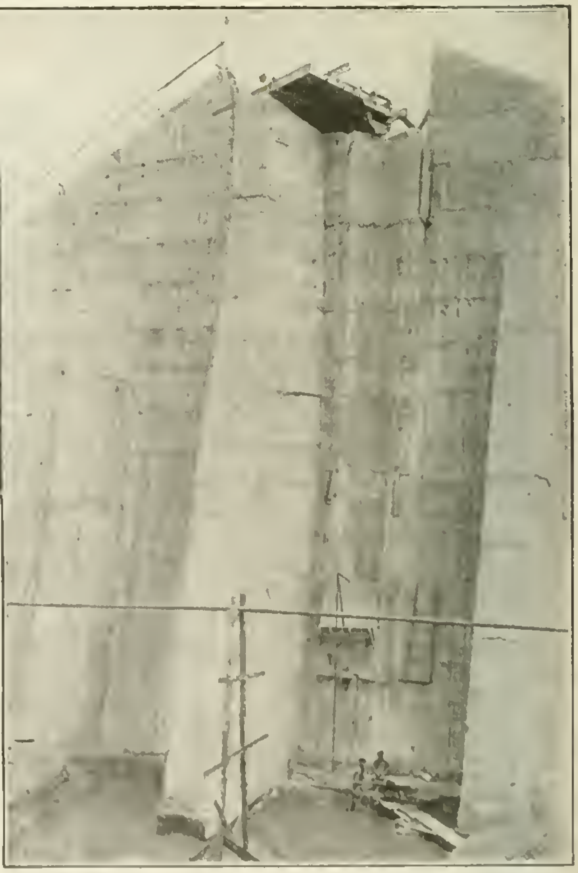


FIG. 1. RETAINING WALLS AT LOCKINGTON—BACK OF WALL GROOVED FOR BOND WITH EMBANKMENT. CUTOFFS INDEPENDENT OF WALL BUT NOTCHED IN

The design finally settled upon, shown in Fig. 2 herewith, represents slight changes from that shown in these pages three years ago, as already referred to. The section is distinctly more ample than that of other high embankments of admittedly conservative design, as, for instance, those of the Board of Water Supply of New York City. The cross-section is marked by the use of frequent benches to interrupt the side slopes, by concave sides whose slope flattens from 2:1 at the top to 3½ or 4:1 at the base, by grassing of both slopes, and by thorough provision for drainage of the slopes to prevent wash.

With respect to interior structure, all of the dams were designed to have a central portion of impervious material, integrally joined with the outside portions, built of coarser material. Originally, three methods of construction were considered as alternatives: Hydraulic deposition, dump deposition with hydraulic sluicing of the finer material into final position, or wholly dry construction by dumping, spreading and rolling. More than a year later, when it was decided that construction would be done by force account, the District adopted the hydraulic method for all five dams. At this stage

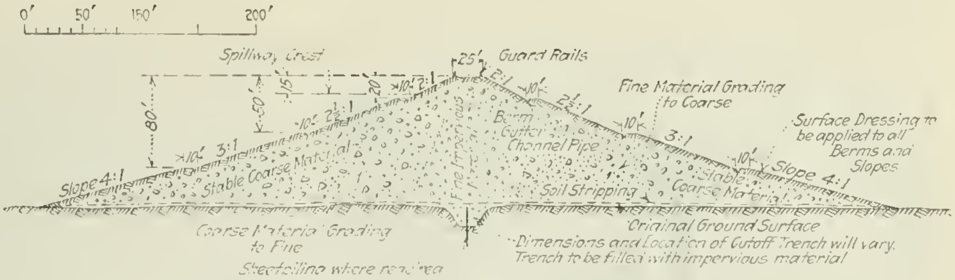

0'
50'
150'
200'
Spillway Crest
25'
Guard Rails
Fine Material Grading to Coarse
Surface Dressing to be applied to all Berms and Slopes
80'
50
15
20
10' 2:1
2:1
10'
10' 2½:1
2½:1
10'
3:1
10' 3:1
10'
Slope 4:1
Slope 4:1
Stable Coarse Material
Fine Impervious Material
Berm
Gutter
Channel Pipe
Soil Stripping
Stable Coarse Material
Original Ground Surface
Coarse Material Grading to Fine
Sheetpiling where required
Dimensions and Location of Cutoff Trench will vary. Trench to be filled with impervious material

FIG. 2. FINAL DAM SECTION OF MIAMI CONSERVANCY DISTRICT (TYPICAL)

the question of core width and structure assumed great importance. Principles were therefore formulated with respect to holding the core width at the base to an amount not exceeding the final dam height above the point in question, and controlling the grading of materials in core and banks (by control of the mechanical analysis of the material pumped in). The governing line of thought, and a series of experiments and field observations to fix on grading of material and get a check on the core consolidation, were described in an article entitled "Study of Pressures in Hydraulic Dam Cores" in *Engineering News-Record* of Dec. 25, 1919, pp. 1040-1044.

On account of the necessity of carrying up the embankment on either side of the stream-control gap before the outlet structures (conduits or spillway dams) are completed and before the stream can be diverted through them, and also to avoid interference with railway lines and roads before completing their relocation, the embankment is terminated at the outlet works or at the stream bank or side of railway right-of-way, as the case may be, by a cross dike until the closure section can be filled in. The cross dike introduces a structural irregularity into the hydraulic embankment but in building it the finest material is placed along that part corresponding to the core of the finished dam, and it is believed thorough bonding is secured.

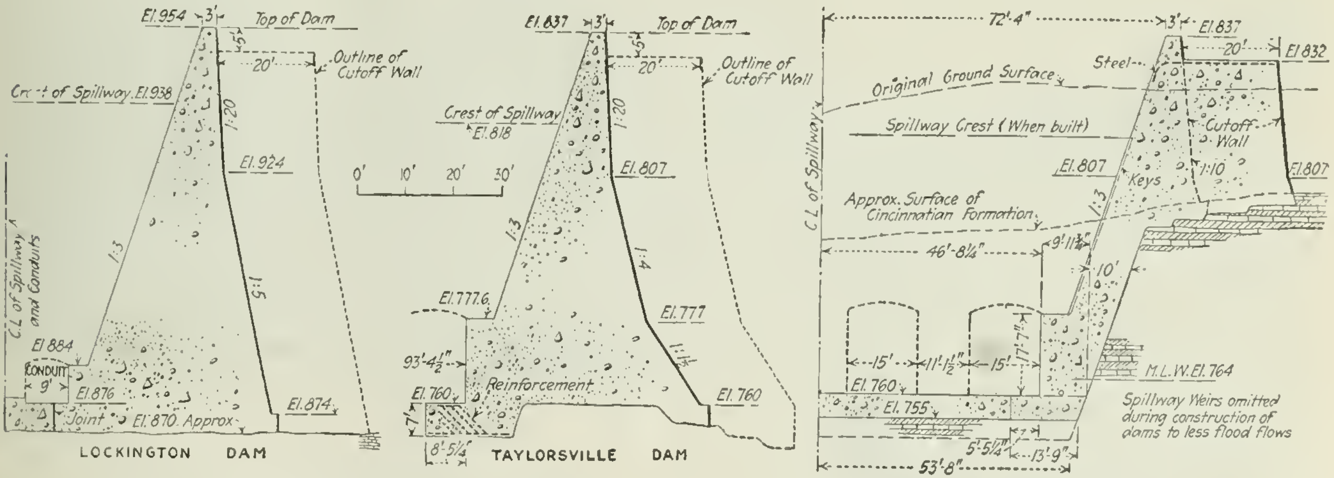
As the valley bottoms of the Miami area consist of gravel and sand lying in relatively deep glacial gorges, it was considered necessary to take special care to safeguard against shortcircuiting of water flow. Therefore the stream bed, which was generally exposed gravel, was covered (after cleaning) with a minimum of 4 ft. of tight material, rolled. Elsewhere over the dam site the soil was explored by test pits here and there, and where gravel was found at less depth than 3 ft. sufficient rolled fill was placed on the surface to give a 3 ft. minimum thickness of seal (in the case of the two high dams, Englewood and Germantown, 4 ft.).

The cut-off trench along the center line of the dam, which extends across the width of the valley and up the sides to spillway level, was filled with core material by hydraulic deposition between the upper and lower toe embankments. Thus the cut-off consists wholly of fine material. The depth of this cut-off was fixed by judgment; a tight seal stratum can not be reached.

RETAINING WALLS OF GREAT HEIGHT

Of the five dams, the two highest are full-length embankments pierced by twin concrete culverts or outlet conduits for discharging both the normal stream flow and the flood discharge from the filled basin, and protected each by a spillway remote from the outlet conduits. The other three dams (Huffman, Taylorsville, and Lockington, 73 to 84 ft. high) have the spillway and outlet combined in a single concrete dam built into a large concrete notch which interrupts the embankment. Such a spillway notch consists of (1) retaining walls terminating and holding the embankment section on either side, (2) a concrete overfall dam built between these walls and pierced by the discharge conduits for stream and flood flow (the spillway crest will come into action only in the most extreme flood contingencies and serve chiefly to give definition to the maximum flood detention level of the basin), and (3) concrete pavements upstream and downstream of the weir, the downstream section leading into the basin in which the outflow energy is dissipated by a hydraulic jump. It will be seen that the spillway-notch construction involves retaining walls of great height. From foundation to dam crest these walls are 78 ft. high at Huffman, 83 ft. at Taylorsville, and 84 ft. at Lockington. They must be stable without support from the spillway weir.

In dealing with the difficult design problem presented by these retaining walls, it soon appeared probable that the vertical load on the base would be a limiting factor, in view of the available foundation material. In the



Maximum Sections of Retaining Walls

Landside Wall, Taylorsville

FIG. 3. LOCKINGTON AND TAYLORSVILLE SPILLWAY-NOTCH WALLS AT MAXIMUM SECTION (83 AND 84 FT. HIGH), AND LANDSIDE WALLS AT TAYLORSVILLE

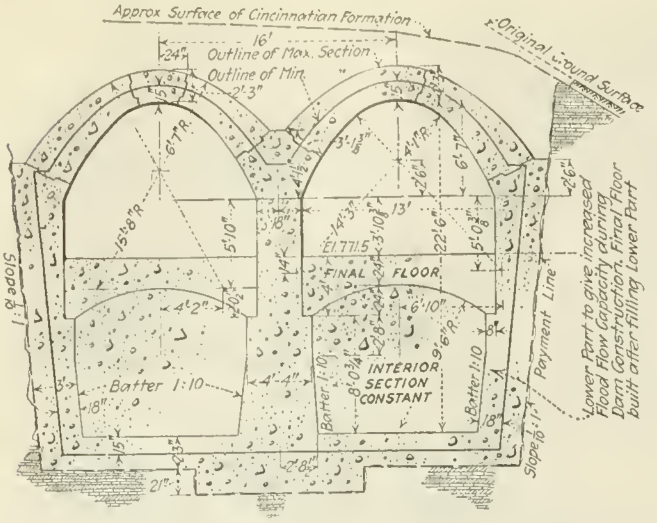


FIG. 5. ENGLEWOOD DISCHARGE CONDUITS, WITH OUTLINE OF MAXIMUM AND MINIMUM SECTIONS

sequel the entire design was governed by the necessity of limiting the foundation pressure, as will be explained.

The spillway and outlet structures are in all cases founded on rock; and it was in fact the contour of rock surface that fixed the location of the outlet structures. At all except one of the dams, Lockington, the rock is the Cincinnatian formation of the Miami region, a deposit consisting of alternate layers of limestone and shale (really partly consolidated clay). The clay appears hard and permanent when first exposed, but contact with air and water soon causes it to slack into the condition of a rather tough, slippery, plastic clay. The layers range in thickness from a fraction of an inch to a foot or more, and in no case are the limestone layers thick enough to be considered independent of the shale laminae. The conclusion was drawn that, with regard to the possibility that the shale layers might become softened and under heavy loading squeeze out, it would not be wise to exceed a loading of 6 tons per square foot. At Lockington, where a massive limestone without shale interleaving is found, 12 tons per square foot was adopted as the pressure limit.

With these very low limits of base pressure, the wall design became exceedingly difficult. Every effort was required to limit the maximum base pressure. One other factor controlled the design: The consulting board of engineers of the district decided early in the course of the planning of the flood-protection works that reinforced concrete should not be used in any vital structure above permanent water level; a vital structure was defined as one whose failure would endanger life or affect the stability of other works. Under this ruling it was necessary to design the retaining walls as gravity walls, except that reinforcement might be used in the very lowest sections, below stream level

Since the shape of the spillway notch did not impose close limits on the face batter of the walls, a batter of 1 in 3 was adopted. For given base width the maximum foundation pressure is less if the median line of the wall leans backward than if it is placed vertical or leaning forward. With the adopted face batter as starting point, the wall was analyzed at successive elevations to determine the required thickness to resist the embankment pressure. These analyses led to shaping the back of the wall to a generally concave outline, comprising three batters, as shown in the cross-section, Fig. 3. The concave back further tended to hold down the foundation pressure at the toe of the wall. Finally, however, it proved necessary, in order to hold to the limit of six tons at the toe, to extend the toe beyond the face as a reinforced cantilever, in the case of the Huffman and Taylorsville walls; for the latter the maximum toe projection is 6 ft. At Lockington, on account of the higher permissible loading, no toe extension was required, and the back of the wall was shaped to but two batters.

All these calculations were based on the maximum estimated pressure of the core fill, under conditions prevailing during construction. Because this material will consolidate, decreasing the lateral pressure, it is believed that the computed stress and load conditions are temporary. Fully as important, however, is the fact that the Cincinnatian formation was found to be of considerably better character in the actual foundation pits than it was assumed to be, from the exposures and test pits, and at the present time it is thought that a footing pressure of 8 tons or more might have been used in the design without danger. This conclusion is considered specially dependable because of two facts: (1) the strata receiving the footing loads are under considerably higher pressure from overburden in the natural hillsides at the end of the dam, and (2) the soil under the main embankment of the dam itself is loaded to the assumed footing pressure.

Fixing upon the value of lateral earth pressure to be adopted for the calculations, in the case of the hydraulic core backing of the retaining wall, gave rise to some interesting considerations. For the case of true hydrostatic pressure of mud against the wall, it was concluded that the lateral pressure of a liquid weighing 87 to 90 lb. per cubic foot might have to be reckoned with, as some evidence was found to indicate that truly liquid mud might be of this weight. It was not considered possible, however, that the liquid condition could exist for the full height. As an extreme condition it was thought that hydrostatic pressure might exist for the upper half and pressure from partly consolidated material in the lower half of the wall. It was not necessary to consider either the condition of liquid fill for part of the height of the wall, or the permanent condition of a semi-consolidated fill, weighing 125 lb. per cubic foot or more but exerting a lower lateral pressure; only the critical conditions occurring during construction needed to be taken into account. With regard to this, the final conclusion was that the design should be made for an intensity of horizontal pressure equal to 75 lb. times height to top of fill, and for a vertical pressure equal to 100 lb. times the height. In a limited zone at the center line of the dam a liquid pressure of 90 lb. per cu.ft. was assumed for the top 30 ft. of height. In the portions of the wall holding the toes of the dam, a material reduction in lateral pressure was assumed. Beyond this point the procedure followed ordinary wall-design methods. The maximum compression in the concrete was limited to 500 lb. per sq.in. (with occasional excess). Longitudinally, the wall was cut by an expansion joint every 30 ft. and the sections keyed together by vertical tongue-and-grooving. Variations in wall dimensions were made in general only from section to section, the footing dimensions and all but the back batter of the upper part of the wall being held constant within any expansion section.

Several cut-off walls project from the back of each retaining wall to bond into the embankment, as may be seen in Fig. 1. These are in all cases built on separate foundations and concreted separately from the wall, but are notched into the wall to a depth of 12 in. for stability and tightness. They are also tied at the top to the retaining wall by reinforcing steel.

Grooving the back of the main retaining wall for closer bond with the embankment soil was tried at Lockington, the nature of this grooving being shown by one of the views. It is believed to be an advantageous modification and will be used in building the Taylorsville walls. The view of the Lockington wall also shows a concrete chimney for pool drainage built against the back of the wall; this will be provided at all three dams.

Landside Walls—An unusual modification of wall construction was required on the land side of the Taylorsville spillway notch, which abuts directly against the hillside rock. In those portions of this wall where the rock face extends to the top of the wall the concrete will constitute only a facing or revetment; here the face of the excavation has been cut to a batter of 1 in 3 to the top of the facing, and this will also be the batter of the facing, while above the top of the concrete the rock is cut to a slope of ½ in 1 and will not be faced. In its central portion, however, the landside wall extends for a considerable height above rock. Here it is built to the cross-section typically represented in Fig. 3. Lateral pressure of the backing acts only above the rock line. From the toe of the upper section of the wall, compression is assumed to travel down the lower leg to bring an evenly distributed loading on the footing and toe projection.

The backs of the landside walls were provided with a vertical drain in each 30-ft. section. The high retaining walls holding the main dam are not drained.

Very high water velocities and much turbulence and impact will exist within the spillway notch and in the jump pool directly downstream from it, when flood discharges pass down. It was believed that these actions in so far as they affect the pavement will be resisted by the weight of the pavement without anchoring. The thickness of the concrete here was determined initially on the basis of a hydrostatic uplift equal to half the difference between lowest water surface at the point in question and the simultaneous water level below the outlet works. However, the thicknesses so found were increased to suit practical requirements. The greatest floor thickness will be that in the jump pool at Taylorsville, 9 ft.; in the spillway notch generally and at the downstream end of the jump pool the pavement will be of minimum thickness, 2 ft.

DISCHARGE CONDUITS

The outlet conduits of the Germantown and Englewood dams are twin arch culverts under an earth loading ranging from nothing at their ends to about 115 ft. at midlength. As the water flowing through them at maximum flood will occasionally reach velocities exceeding 50 ft. per second, structural defects would be particularly serious. Not merely stability but also rigidity sufficient to guarantee against any local elastic failure was therefore important.

The foundations are on rock throughout, the Cincinnatian formation already referred to; the footing pressure was limited to 6 tons per square foot as in the case of the Taylorsville and Huffman retaining walls. While settlement was not to be apprehended, the great range of loading nevertheless made it important to forestall large differences in the elastic distortion of the structure. For this reason four different cross-sections were used (Fig. 5); for example, at Germantown the crown thicknesses of the arch are 18, 21, 24, and 27 in., the latter being for 110 ft. embankment height.

The following general assumptions governed the design of the long conduits: (a) The weight upon the conduits will be that of the material included between the vertical planes passing through the boundaries of the structures. (b) The embankment weighs 125 lb. per cu.ft. (c) The ratio of horizontal to vertical pressure in the fill is estimated at ⅓. Under temporary conditions this might be sometimes exceeded, and consequently in certain cases the horizontal pressure is taken as the full hydrostatic pressure due to the maximum level of water

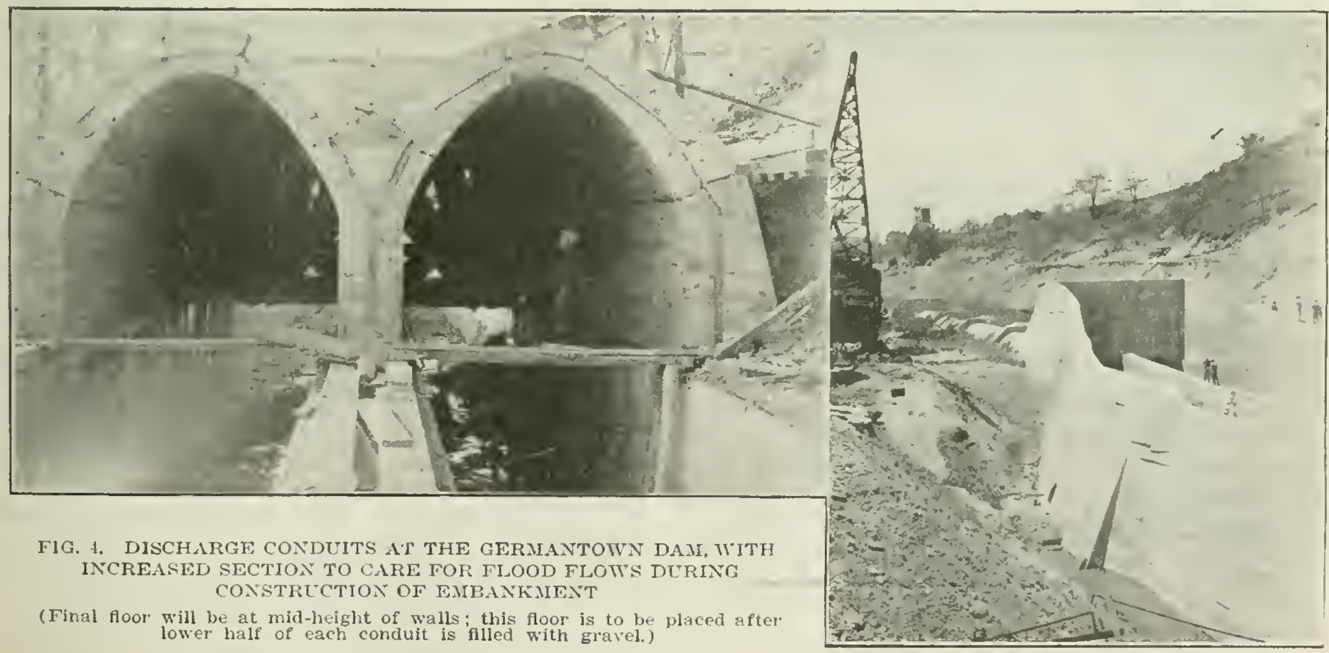


FIG. 4. DISCHARGE CONDUITS AT THE GERMANTOWN DAM, WITH INCREASED SECTION TO CARE FOR FLOOD FLOWS DURING CONSTRUCTION OF EMBANKMENT

(Final floor will be at mid-height of walls; this floor is to be placed after lower half of each conduit is filled with gravel.)

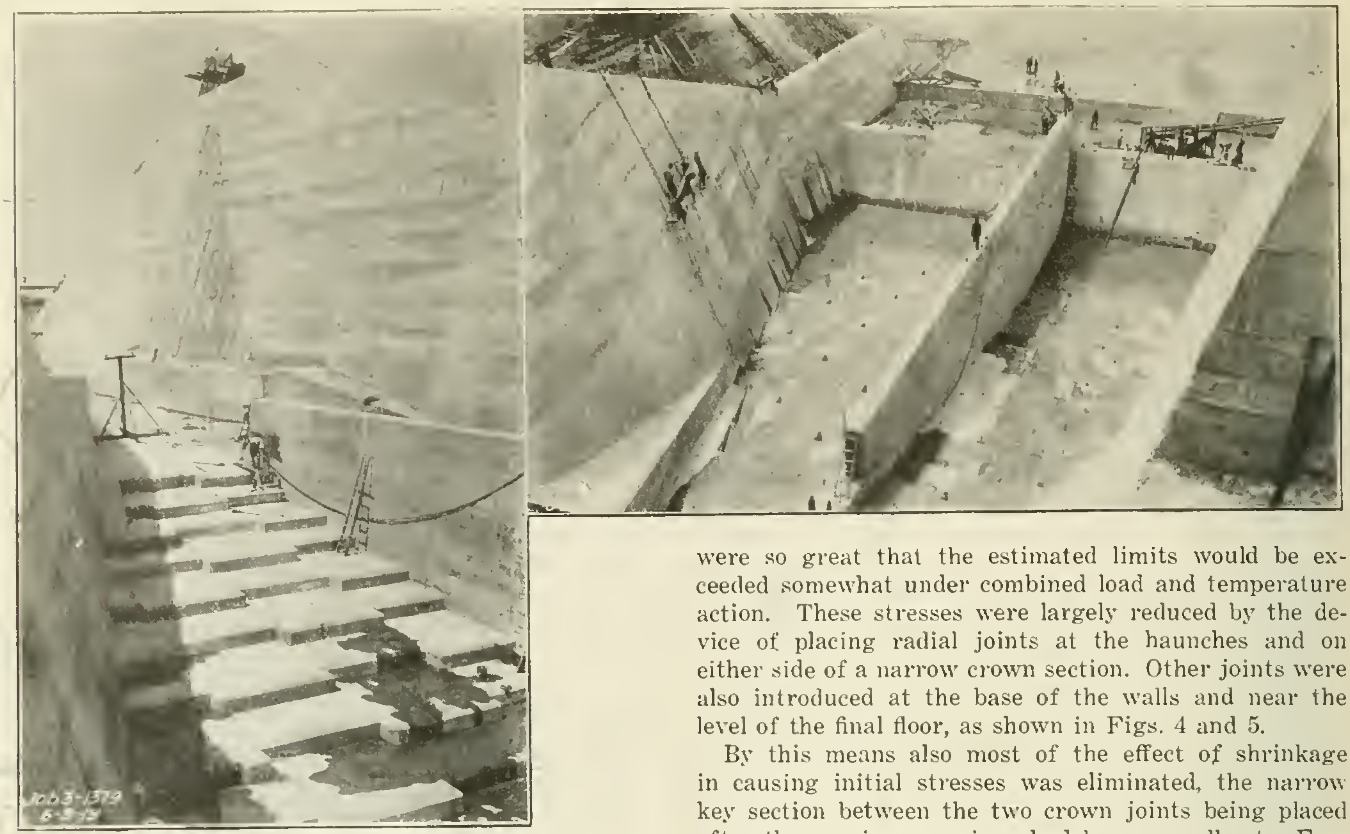


FIG. 6. UPPER AND LOWER PORTIONS OF LOCKINGTON JUMP POOL

in the basin. (d) Temperature stresses are to be calculated for rise of 32.5 deg. and a fall of 65 deg. F. (e) Compression stresses on the concrete are to be limited to 500 lb. per sq.in. for any conditions of permanent load. Temporary stresses, including the effects of extreme temperature changes, are to be limited to 750 lb. per sq. in. in compression, disregarding tensile stresses in the concrete. (f) No reinforcing steel will be used in the arches of the conduits nor shall there be tensile stresses in the concrete for any probable permanent condition of load. (g) The portion of the conduits from the center of the dam to the inlet shall be designed for a permanent condition of earth cover only, with the horizontal component of pressure equal to ⅓ of the vertical, but shall also be safe for the following temporary conditions; first, with water within 5 ft. of the top of the dam, conduit closed, horizontal component of pressure equal to of vertical; second, same condition except horizontal component of pressure equal to full hydrostatic pressure. The portion of the conduit from the center of the dam to the down-stream end shall be designed for the permanent condition only.

With regard to shape of cross-section, hydraulic considerations were primary, since the structures are to carry large flood discharges at high velocity. However, when the general shape of the interior had been decided upon, the details of the section were determined so as to minimize the stresses from the external earth pressure. In general the stresses were determined by considering the arches as continuous elastic structures after the method developed in *Engineering Record*, May 22, 1915, p. 648. The temperature stresses were computed in the manner usually followed in treatment by the elastic theory.

It was found that in some cases temperature stresses were so great that the estimated limits would be exceeded somewhat under combined load and temperature action. These stresses were largely reduced by the device of placing radial joints at the haunches and on either side of a narrow crown section. Other joints were also introduced at the base of the walls and near the level of the final floor, as shown in Figs. 4 and 5.

By this means also most of the effect of shrinkage in causing initial stresses was eliminated, the narrow key section between the two crown joints being placed after the previous pourings had become well set. Furthermore, by the time the crown section was placed the previous sections would have had time to reach something near their probable mean temperature. The presence of the joints permitted in general a certain freedom of adjustment of the structure to the later effects of shrinkage and temperature change. (The presence of these joints might have permitted the analysis of the arches as approximately three-hinged structures, but this was not actually done.) The arch conduits when constructed were singularly free from cracks or other indications of distress in the concrete and this is believed to have been largely due to the presence of the radial joints.

As the preceding indicates, the conduits were designed not as rigid boxes but as arches on separate abutments. The wall load therefore is carried directly by the wall footings and the pavement between them supports no load except that of the water.

Rich Concrete Surfacing.—It was specified in the original plans for the conduit construction that a rich interior facing should be applied to the inside of the conduits as wear-resistant lining. This was to be made of 1:1½:3 mixture using a specially selected crushed granite as coarse aggregate. It was foreseen in the structural design of the conduits that this lining might perhaps be applied as a separate course from the body of the conduit concrete, so that the thicknesses shown by the drawings are in all cases 3 in. more than the structural calculations demanded.

River gravel taken directly from the Miami Valley was shown by test to make a concrete fully equal and in some tests superior to that made with crushed granite brought from a distance. It was then decided to use for the wear-resistant lining the same gravel that served for making the body concrete, but to change the mixture to 1:1½:3 (in place of 1:2:4) by adding a bag of cement per batch when mixing concrete intended for the face portion. Further, in the thick parts of the work, as in the lower part of the walls, two mixtures are used, being placed simultaneously and separated only by their being deposited against the face form or farther back in the section; but for the thinner parts, as the arches, the rich (1 : 1½ : 3) mixture is used for the whole thickness, as this is cheaper than trying to gain a little cement at the cost of separating two mixtures in a thin wall. This integral rich-mixture construction is used for the arch and the thin upper part of the conduit wall, and the separation is used only in the more massive lower parts of the wall.

Somewhat similar remarks apply to the retaining-wall work and the jump-pool lining, in which the face is composed of a 1:2:4 mixture and the body of 1:3:6. The richer lining layer is generally 1 ft. thick.

SPECIAL DESIGN OF CONCRETE BRIDGES

In the design of bridges required in connection with the Taylorsville and Huffman basin construction, conditions were encountered that led to several original details. Three-hinged reinforced-concrete arches were built at two of the locations, the adoption of hinging being due to the desire to avoid large stresses in the concrete due to settlement and temperature effects; the hinges also have interesting details. An electric railway viaduct crossing through the Huffman basin was designed with continuous concrete girders.

In planning a crossing over the relocated line of the Cincinnati, Hamilton & Dayton R.R. at the west end of the Taylorsville dam it was desired to use a concrete span for appearance and to give low maintenance cost. It is expected that this line may at some time be four-tracked, and in order to span the future roadbed width and the embankment slope a span length of nearly 100 ft. became necessary. The length was considered to eliminate a girder design and demand an arch.

As the foundation material was earth, and compression or settlement might occur, a monolithic arch ring might be subject to cracking. On this account and to avoid high temperature stresses the three-hinged arch type was adopted. Its application to the case is shown in the accompanying outline drawing Fig. 7, which illustrates a second bridge of the same kind, but skewed in plan, subsequently built at the Huffman dam.

Normal bridge design methods were used in working out the main elements of the structure. The hinge details are special; they are shown separately in Fig. 7.

A manganese-bronze pin forms the hinge of the joint. This is 1½ x 20 in. in the case of the Taylorsville arch, and 2¼ x 28 in. in the case of the Huffman arch. The seats for the pin are formed by manganese bronze journal blocks, resting in a cast-iron pressure-distributing shoe (cast steel in the case of the Huffman bridge, with base 28 x 38 in.). Each half of the hinge is completely encased in concrete to within ¼ in. of the center line of the joint, leaving a ½-in. open joint in the concrete.

The Taylorsville arch rib was shaped in accordance with the stress requirements due to the variation in position of the pressure line, so that it has its greatest depth at the haunches. The Huffman arch was modified by shaping the rib at its outer face to an outline increasing in depth from crown to springing (this is not shown in Fig. 7). Only the outer face of the rib is carried to this shape, however, the main body of the rib being made to the outline required by the pressure lines.

At a crossing of the Ohio Electric Ry. through the upper part of the Huffman basin, requiring a bridge over the Mad River, the waterway was increased for flood-flow purposes by adding to the bridge two lengths of reinforced-concrete trestle. These trestles consist of 30-ft. simple reinforced-concrete girder spans carried by two-pedestal piers on a single foundation slab. There is an expansion joint at both ends of each span. At one point, however, where several skew spans became

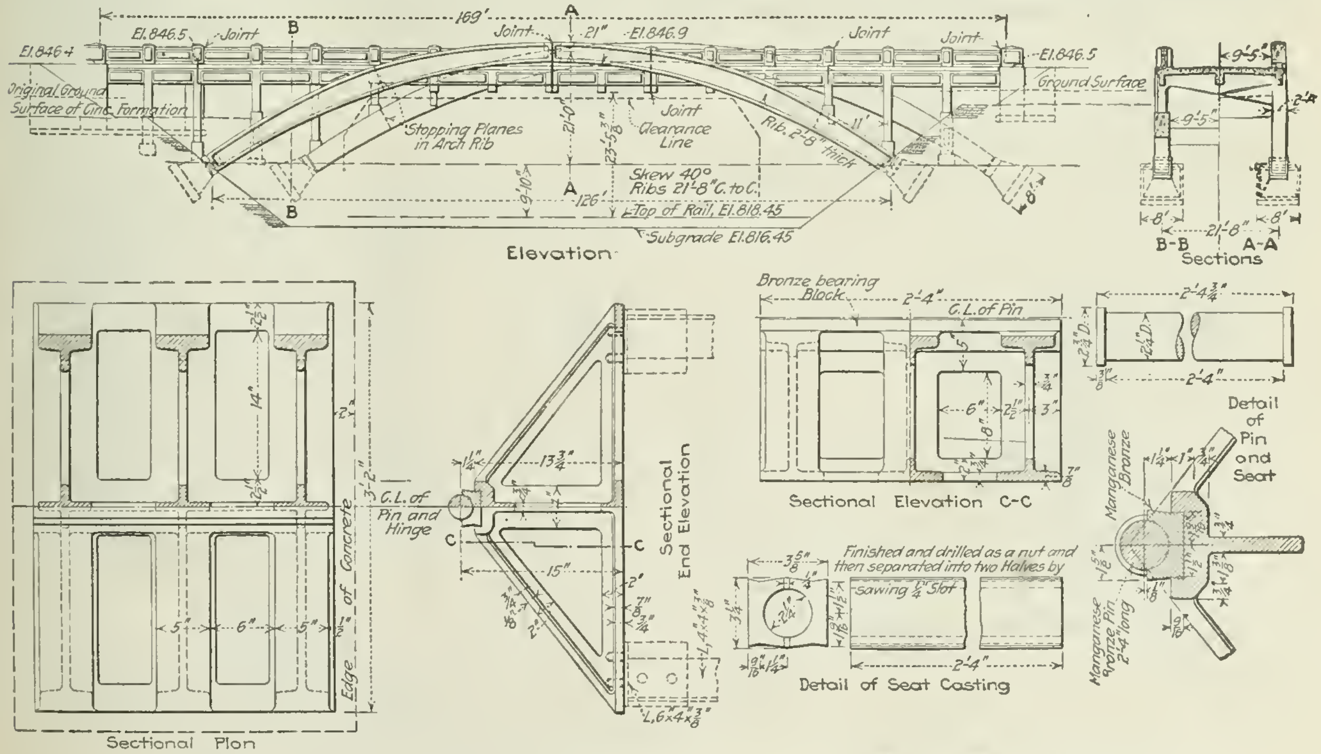


FIG. 7. THREE-HINGED CONCRETE ARCH BRIDGE FOR ROAD AT HUFFMAN DAM: CROWN HINGE DETAIL

necessary, the distance between centers of supports was lengthened to 36 ft., and here, to retain the same depth of girder, three consecutive spans were made continuous over the piers. The arrangement is shown by a small-scale sketch in Fig. 8, and requires no further explanation. The reinforcing steel is unusual in the method of end anchorage used, as shown.

Longitudinal forces of rather large amount act at the tops of the piers, arising from sliding on the expansion bearings due to temperature change, or from braking thrust of cars. The two-pedestal pier is depended upon for longitudinal stability.

Remarkably heavy loading was specified (by the Ohio Electric Ry.) for these structures. Each track is required to carry two 100-ton cars coupled, and the roadway has a 12-in. thickness of ballast. This loading is equivalent to 6,000 lb. per lineal foot of track, or 50,000-lb. axle concentrations. Traffic of this weight is not running on the railway at present.

The general types of structures, the standard dam section and similar features of the designs described in the preceding article were worked out under the direction of Arthur E. Morgan, chief engineer of the district. Charles H. Paul, assistant chief engineer, had supervision over the preparation of contract plans and specifications and the detail designs of structures. S. M. Woodward, consulting engineer, directed the hydraulic computations and assisted on many features of the designing. Walter M. Smith, designing engineer, had direct charge of all designs, giving special attention to the arch design for the conduits, and the forms and centering. He was assisted by Ross M. Riegel, assistant designing engineer, who dealt chiefly with the combined conduits and spillways and the arch bridges.

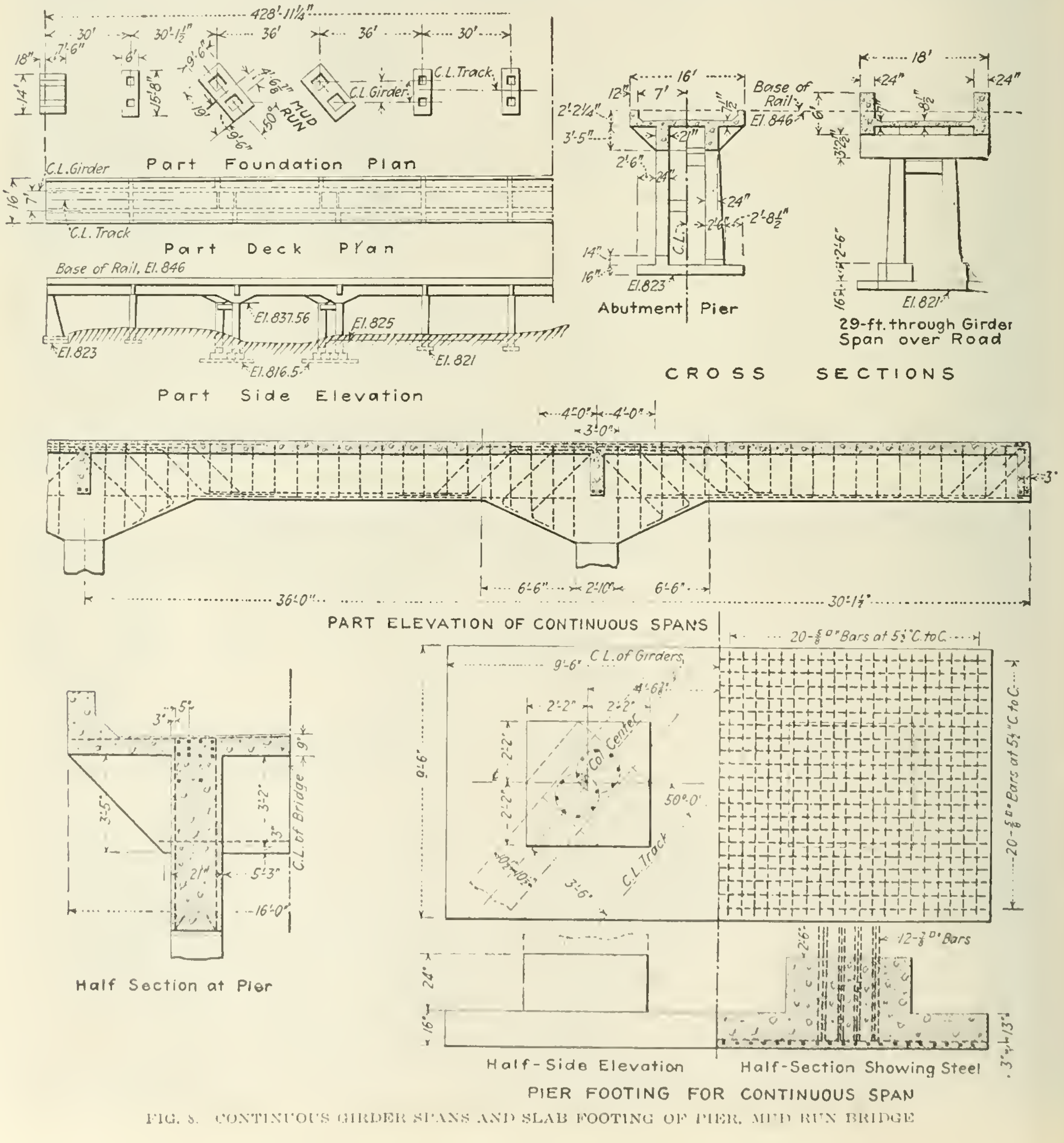


FIG. 8. CONTINUOUS GIRDER SPANS AND SLAB FOOTING OF PIER, MUD RUN BRIDGE

War Department Would Study Waterway Economics

An outline of a new Federal inland waterway policy is contained in a statement of the Secretary of War in connection with the recent hearing on the Wadsworth resolution returning the New York State Barge Canal to the State of New York. It is evident from this that the War Department is willing, even anxious, to take control of the national study of waterway transportation. Extracts from the statement are as follows:

Students of inland waterway transportation, of whom there are many in, as well as outside, the War Department, have long been advocating the necessity for the establishment of a governmental agency qualified and authorized to make a comprehensive survey of the national waterway situation, more particularly from what might be called a practical operating point of view. National waterway development has in the past been greatly handicapped by the lack of such a comprehensive consideration of its purely traffic features, with the result that we are now forced to admit that many of the appropriations invested in localized waterway promotions have not paid anticipated dividends. Such expenditures have been not only a waste of public money, but at the same time have handicapped the development of those waterway projects which possess real merit; and to this end have acted as a deterrent to the healthy promotion of water-borne traffic as a whole. One of the sections of the Transportation Act provides an ideal means for filling this long-felt need. If the War Department is permitted to continue on the program on which it now is engaged, it seems certain that the constructive development of national waterway transportation will receive a necessary impetus which could be secured in no other manner.

It will be my endeavor, and I have already directed definite steps toward that end, to prepare for the consideration of Congress accurate and disinterested data with regard to the traffic possibilities of various waterways, with particular regard to their utilization in connection with joint rail and water hauls, in a comprehensive manner which is in striking contrast to our previous largely sectional consideration of waterway transportation. Such data, when it is available, will be of inestimable value in connection with the intelligent consideration of future proposed waterway appropriations, and will also go far toward clarifying the present uncertainty as to the extent of profitable utilization of existing waterways.

This, though important, is but one phase of our undertaking. In my interpretation, the Transportation Act charges the War Department with not only analyzing the traffic possibilities of existing waterways, but also with determining and demonstrating the most economical methods for their utilization. The converging of these two distinct lines of endeavor will result, I am sure, in a much more intensive utilization of the waterway as a common carrier in the future than has been the case in the past, with a proportionate reduction in general transportation costs and relief of the railroads from some of the overwhelming burdens which they are today facing.

It is the latter phase of the operative development of waterway transportation, a phase equally if not more important than the work of furthering the utilization of existing equipment and waterways, which the resolution now under consideration particularly effects. To enable the practical execution of this work, Congress has seen fit to turn over to the War Department the floating equipment acquired by the U. S. Railroad Administration for its waterway operations. It is my construction that these barges should be operated by the War Department from altogether different motives than they were by the Railroad Administration. The latter organization, having a number of waterways on which it wished to operate, but lacking sufficient floating equipment for their efficient utilization, contracted for the necessary barges and used such of them as it secured for the primary purpose of relieving the acute railroad congestion which we faced during the war. The War Department, on the other hand, is merely accepting this equipment which the government already owns, in lieu of the purchase of new equipment which otherwise would be necessary in the execution of its new duties in developing types of equipment and demonstrating the nature of services essential to successful waterway operation.

While it is true that the New York Barge Canal operations of the War Department could be abandoned without frustrating our plans, however, the sale to private interests of the equipment with which these operations are being conducted would seriously handicap our entire waterways program at this time.

Incidentally, it may not be irrelevant to point out that this floating equipment on the New York canal exists only through the initiative of the Federal Government and was constructed because private capital had failed to provide the canal with the barges found to be necessary for its effective utilization during the war. When this construction was undertaken by the government it was considered advisable to incorporate in the designs of these new barges certain features never before attempted in this country, particularly with regard to the introduction of a type of barge capable of carrying its own cargo and at the same time serving as a propellant for other barges, thus offsetting the dead expense of tow boats. This and similar practicable improvements in barge construction the government is attempting to develop for the benefit of waterways generally, but it is hoped to demonstrate the economic features of waterway operation, not alone through the development of more suitable floating equipment, but also through the utilization of such improved equipment on a large scale and in maximum quantities, a proposition which is believed to be essential for the most efficient waterway utilization, but one which has not heretofore been, and which probably will not now, be taken up by private capital unless its feasibility is practically demonstrated by the government. This is one subject which we are particularly anxious to accomplish, but the passage of this resolution will counteract materially our efforts in this direction, in that it will probably have the effect of splitting up those boats among a number of small operators, while it is believed that the maximum of economy in waterway transportation can be obtained only through the organization of large and heavily capitalized operating companies.

Water-Power Development in Canada

The Dominion Water Power branch of the Canadian Department of the Interior, and the Dominion Bureau of Statistics have completed a census of the development of water power, according to which there is installed throughout Canada some 2,418,000 turbine or water wheel hp. of which 2,215,000 is regularly employed. Of the total power installed 1,756,791 hp. or 72.7% is in central electric stations, i.e. where power is developed for sale and distribution. In the pulp and paper industry 473,265 hp. is utilized of which 381,631 hp. is generated directly from water in pulp and paper establishments, while 91,634 hp. is purchased from hydro central electric stations. Hydro power used for other purposes is listed as follows: for lighting 434,613 hp.; in mining industry, 177,728 hp.; in flour and grist mills, 42,736 hp.; in lumber and saw mills, 37,918 hp.; and in other manufacturing industries, 172,955 hp. The total installation is comprised of 3,370 units of an average capacity of 715 hp. The figures of 70 representative hydro-electric stations with an aggregate turbine installation of 745,797 hp. show a total construction cost of $50,740,468 or an average of $69.11 installed hp.

Factors Affecting the Use of Water in Irrigation

Experimental and Practical Aspects Discussed in Conjunction with Presentation of Data on Water Use Collected from 22 U. S. Reclamation Service Projects

BY E. A. MORITZ
Office Engineer, U. S. Reclamation Service, Denver, Colorado

A DETERMINATION of the amount of water used by irrigation projects and its relation to the quantity scientifically and practically needed has been for years the favorite topic for debate at all gatherings of irrigation engineers. However, we still seem far from a satisfactory solution of the question. The present discussion takes up the scientific and practical aspects of the subject in conjunction with data in regard to the disposition of the water used on 22 projects of the U. S. Reclamation Service. There is shown how much water is delivered to the land, what portion is lost by seepage and how the quantity used varies during the several months of the year. The water requirements of irrigation depend upon such a multitude of varying factors that a separate analysis is usually considered necessary in each case, based upon experiment and experience obtained under similar conditions. Acceptance of this dictum as an answer to the question of quantity would not lead to a solution of the problem as it is obviously impossible to duplicate any given set of conditions. Irrigation is a growing industry. In a large sense it is yet in its infancy in this country. It is not surprising, therefore, that accurate knowledge in all its phases is not at hand. Development will come with growth, and time is required to bring the facts to light. The early irrigators had troubles enough without bothering to measure the quantities of water they used except in a relative fashion. Consequently, until comparatively recently, since irrigation farming has become an industry handled on a large scale by business organizations, no accurate records were kept and we were compelled to grope along with little more guidance on the subject of water requirements than the early irregators had. Now the situation is much better as a result of the many scientific investigations that have been made and the practical experience data that has been recorded but there is still much obscurity and the object of this article is to throw an increment of additional light on the subject.

What is the maximum area which a given water supply will irrigate? Early answer must be given to the financial interests and laid down as the basis for designs. The engineer is compelled to make assumptions based on past experience. The better and more complete the experience the more nearly will estimates be realized. Feeling that a new era of irrigation development is nearly upon us, and that engineers should have the benefit of the widest available information which the U. S. Reclamation Service afforded, Mr. Moritz was asked to collect operating information from 22 projects representing almost every condition to be met with in the semi-arid part of the country. His preliminary discussion makes apparent the significance and importance of the statistical data.—Editor.

Although, as stated there are a multitude of varying factors that influence the quantity of water required to raise crops by irrigation, most of them can in the course of time be brought under control to a greater or less extent or will automatically adjust themselves to the natural requirements of the particular project in hand and there remain only three fundamental factors upon a consideration of which the probable water requirements must be based. These are the soil, the climate, and the class of crops.

It may be stated at the outset that no exact or accurate prediction can be made of the effect, either actual or relative, of each of these factors on the water requirements but knowledge of the class of crops is fundamental in the design of an irrigation project and the irrigation engineer is compelled to make an analysis of the situation and arrive at definite figures on the basis of such information as is available, coupled with judgment and experience.

Where all other conditions are equal there are porous soils that apparently require two or three times as much water for successful farming as more impervious soils; that is, where 2 acre feet per acre are required for the tight soils, 4 or 6 acre feet are apparently needed for the more open soils. The quantity of water usefully consumed by the plants is undoubtedly the same in each case, the excess water being lost by deep percolation into the substratum. The figures used in the foregoing illustration are quite common; in rarer instances the quantity of water applied to porous soils might be very much greater. Such great variations do not occur when whole projects are considered but the condition described obtains only in comparison between farms or, at most, districts of a project, although on the Umatilla Project in Oregon and the Boise and Minidoka projects in Idaho areas of several thousand acres apparently require markedly larger quantities of water than other parts of the project. On the first two projects it has been found necessary to eliminate several thousand acres from the project because of the excessive quantities of water needed to raise crops on the very porous soils.

Opinions differ as to whether an excessive use of water on porous soils is necessary. Certainly if it is necessary then the proper thing to do is to refrain from attempting to crop such land, especially if water is not plentiful. Moreover, the places are few where excessive use of water can be practiced very long without water logging adjacent or lower lying lands, thus making necessary the construction of drainage works. Much of the drainage of irrigated land that is now necessary could have been obviated by the more careful and sparing application of irrigation water, but it is very difficult to impress this fact upon irrigators in time to prevent the damage.

Climate determines the length of the growing season. Longer seasons permit greater crop production, and a corresponding increase in the water requirements of the crops results. Rainfall, especially during the irrigation season, is an important item, although usually not as valuable as an equal quantity of water applied artificially because it may not come at the right time and in the case of a light rainfall a large percentage of it may not reach the plant roots while in the case of a heavy rainfall of short duration surface runoff may dispose of a large percentage. In a warm climate with a high wind movement evaporation undoubtedly disposes of a considerable proportion of the water. Nearly all irrigated regions are subjected to hot winds occasionally, and it has been found by experience in some cases to be almost impossibly to supply enough water to the fields to overcome the evil effects of a prolonged hot wind.

CLASS OF CROPS

All crops do not need the same quantity of water. With similar conditions of soil and climate where grains require 15 to 18 in. of water, root crops, such as potatoes and sugar beets, require 18 to 24 in. and alfalfa requires 24 to 30 in. The water requirements of orchards are not so well known but they probably fall somewhere between grain and root crops.

Under identical conditions one man uses 2 acre feet per acre while another uses 4 acre feet per acre to raise a crop of alfalfa, both apparently obtaining about the same results as to yield and quality of product. It has been quite conclusively demonstrated that the total yield will continue to increase with additional application of water but the yield per unit of water decreases with the additional water used. Thus Widtsoe (John A. Widstoe: Paper presented before the Second Pan-American Scientific Congress, Washington, D. C., Dec. 27, 1915) cites a yield of alfalfa of 9.12 tons per acre with 30 in. of water and a yield of 9.19 tons per acre under identical conditions with 60 in. of water, the yield per acre inch in the first case being practically double that in the second case.

At the inception of a project it cannot be predicted what crops will be raised and this cannot be controlled by the designer nor by the manager of the completed project. However, some information is always available in regard to the crops that will probably predominate. For example, on most larger projects, taken collectively, forage crops constitute about one-half the cropped area. In the prairie states grains will make up most of the remainder and where sugar beets, fruit or cotton are grown the percentages are about 50 per cent forage crops, 25 per cent grain and 25 per cent fruit, sugar beets, or cotton. The uncertainty is therefore not as great as it might at first appear and the larger the project the less the uncertainty as to the class of crops that will be raised because a diversity of crops is necessary for the success of the project.

The information available on the quantity of water required to grow crops is derived from two main sources: (1) scientific experiments made on small tracts of land on which a single crop was grown and accurate measurement made of the quantity of water used; (2) records of results of practical operations of irrigation systems. To the engineer charged with the design of an irrigation system the latter is by far the more important and useful source of information. The former has an important supplemental value.

These have been made principally by the U. S. Department of Agriculture and the various State Experiment Stations. Typical of the results so obtained are those of the Utah Experiment Station at Logan, Utah, a partial summary of which is given in the following table*:

TABLE I. ACRE YIELDS OF CROPS WITH VARYING QUANTITIES OF WATER

(Rainfall and soil water=13.74 in.)

Water applied, in.	Wheat Bu.	Corn Bu.	Sugar Beets Tons	Potatoes Bu.	Alfalfa Tons
5.0	37.8	.	13.8	154	...
7.5	41.5	79.1	...	182	
10.0	43.5	89.5	18.6	195	4.9
15.0	45.7	93.9	19.5	227	3.8
20.0	.	91.6	21.3	267	4.5
25.0	46.5	99.2	. .	..	4.6
30.0	.	97.1	20.8	244	4.4
35.0	48.5		.		
40.0	...	..	....	250	..
50.0	49.4	..	24.5	...	5.4
55.0	...	96.8	...	...	...
60.0	.	....	....	304	...

* John A. Widtsoe—Paper before Second Pan-American Scientific Congress, Washington, D. C., December 27, 1915

The above results are substantially confirmed by other experiments. They show that in general the yield of a crop is increased with the application of additional water but not in proportion to the quantity of water applied. From the data available Widtsoe expresses his conclusion in the following form, which he calls the first law of irrigation: "The crop producing power of each unit of irrigation water diminishes as the total quantity of water used is increased."

Table I shows that the greatest yields per acre are obtained with quantities of water that even the most lavish users of water would consider excessive. Much of the water so used is wasted because the crops have not the power to limit the quantity of water that they can economically use but, as Widtsoe says, the excess water is merely carried through the plant as through a pumping system and wasted by transpiration into the air. This fact lies at the bottom of and is the cause of the great disagreement between irrigators and irrigationists as to the quantity of water *needed* by crops. This is also why, fundamentally, scientific data are a valuable supplement to the results of practical operations, which latter record experience only without regard to the fundamental principles and requirements involved.

Since there appears to be no reasonable limit to the quantity of water that a plant can tolerate so long as the ground is not actually saturated, irrigators are inclined to use a quantity limited only by the supply available or the cost of applying it to the land, even though such lavish use of water injures the land, and, in fact, the quality of the crop also. The truth of this has been demonstrated in practically all irrigated districts where history and statistics will show that at first, when small areas only were irrigated and water was plentiful, much water was used, whereas, as time went on and water became more scarce its use was adjusted to the supply available with just as good and perhaps better results as to crop yield, and infinitely better results as to the economical development of the community.

The difficulty in measuring the large quantities of water used for irrigation, and the apparent high cost of doing so has been a deterring factor in the accumulation of accurate data on the quantity of water used by irrigators. The reasonableness of the cost of obtaining a given result is measured by the value of the result obtained. When water is plentiful it does not pay to spend large sums of money in measuring it out; or, in other words, the value of the commodity does not warrant its careful measurement. Generally, this principle has been recognized and acted upon on all projects at their inception and consequently no adequate provision was made for water measurement. When water became scarce and the need arose for measuring it carefully, it was in many cases very difficult to install devices that would give accurate results. Consequently, even now on projects where water is very valuable and all water is measured out, the quantities used are frequently in doubt because of the crude nature of the measuring devices.

The projects of the U. S. Reclamation Service do not differ from other irrigation enterprises in their lavish use of water, especially during the early stages of development. Moreover, few of the projects have passed this stage. Statistics have, however, been kept of the quantities of water used, crops grown and related data and these form a very important source of information for the use of the irrigation engineer.

Table II shows the average results of operation of 22 government projects for the seven irrigation seasons 1912 to 1918, inclusive. It also shows the maximum and minimum quantities of water used per season during that period. On most of the projects much improvement is possible in the use of water and the figures shown do not necessarily indicate that so much water is needed to raise crops. The abundance of water available in most cases has made economy unnecessary. A careful investigation into the accuracy of these figures has developed that they are probably correct within 5 to 20 per cent. Not all the figures are of equal accuracy: Class A represents an accuracy of 5 per cent or less; Class B, 5 to 10 per cent; Class C 10 to 15 per cent and Class D 15 to 20 per cent.

The possibility of reducing the quantities of water used on these projects is indefinite, but like all irrigation development in the past there will no doubt be a slow evolution from present wasteful use to a more and more economical use as more lands are brought under irrigation and water becomes less plentiful and consequently more valuable. Only time can bring this matter to its ultimate solution. Threats of injury to lands and prospects of heavy costs for drainage, and financial deterrants such as charging high rates for excessive quantities of water do not seem to have the desired effect in holding down the use of water to minimum or even reasonable requirements. The ultimate solution appears to lie solely in the operations of a physical deterrant in the form of limited available water supply so that it will not be possible to use too much water because the water is not there to use. This condition has been reached in parts of Colorado and California with the result that now only from one-half to one-third as much water as formerly is used.

What can be accomplished under force of circumstances has been well demonstrated on the Orland project. The average use of water on that project during the six years 1912 to 1917 was 3.66 acre-feet per acre. In 1918 the water supply was much less than usual, and it was possible to deliver only 1.91 acre-feet per acre. In his annual report the project manager states: "Due to the limited water supply it is estimated that there was a loss of 20 per cent in the alfalfa crop, although there was ample water for all other crops." Alfalfa comprised about one-third the cropped area, so that the crop loss over the whole irrigated area amounted to only about 7 per cent with a water supply of only 52 per cent of the usual supply. The rainfall during the irrigation season was also less than the average. Including rainfall the average water supply in the years 1912 to 1917 was 4.01 acre-feet per acre and in 1918 it was 2.21 acre-feet per acre or 55 per cent. This shortage in the water supply came on unexpectedly, and the farmers were not trained to get along with such a small supply, hence there was some crop damage, but it is not unlikely that if such a limited water supply became habitual the Orland project would get along very nicely on 2 acre-feet per acre of water instead of the nealy 4 acre-feet now used.

TABLE II. TOTAL QUANTITIES OF WATER DELIVERED AT THE LAND, CROPS GROWN AND OTHER DATA, YEARS 1912 TO 1918, INCLUSIVE. GOVERNMENT PROJECTS

Project	Acre Feet per Acre Delivered at the Land Including Precipitation during Irrig. Season			Precipitation During Irrig. Season	Temperature During Irrig. Season	Percentage of Cropped Area in Different Classes of Crops					Relative Accuracy of Figures in Columns 2, 3 and 4
	Max.	Min.	Mean	Mean	Mean	Cereals	Forage	Orchard	Vegetable	Miscellaneous	
1	2	3	4	5	6	7	8	9	10	11	Class
Salt River, Ariz.	4.24	3.11	3.64	0.69	69	19	64	2	3	12	C
Yuma, Ariz	4.85	3.40	3.96	0.22	73	32	44	0	2	22	C
Orland, Cal.	4.55	2.21	3.76	0.34	70	9	86	3	2	0	B
Uncompahgre, Colo.	7.02	5.40	6.14	0.59	60	33	42	6	14	5	B
Boise, Idaho	4.35	2.73	3.47	0.60	61	48	47	1	3	1	A
Minidoka, Idaho.											
No. Side Gravity	6.71	3.95	5.46	0.53	59	25	63	1	6	5	B
So. Side Pumping	3.45	2.87	3.23	0.53	59	39	45	0	9	7	A
Huntley, Mont.	2.40	1.46	1.97	0.73	63	36	37	0	2	25	C
Milk River, Mont	1.84	1.20	1.51	0.70	57	48	51	0	1	0	D
Sun River, Mont	2.35	1.94	2.18	0.73	59	43	54	0	3	0	B
Lr. Yellowstone, Mont.	2.53	1.83	2.21	0.83	62	56	41	0	2	1	D
No. Platte, Neb	3.56	2.72	3.17	0.94	63	36	50	0	5	9	B
Newlands, Nev.	3.99	2.67	3.36	0.27	59	11	86	0	2	1	B
Carlsbad, N. M	4.08	2.61	3.43	1.01	66	29	52	1	0	18	C
Rio Grande, Tex.	8.92	4.75	6.82	0.63	67	25	62	2	5	6	C
Umatilla, Ore	8.73	5.56	6.98	0.33	62	3	84	7	4	2	A
Klamath, Ore.	1.74	1.13	1.48	0.33	60	36	61	0	2	1	B
Belle Fourche, S. D	2.22	1.42	1.92	0.87	64	49	47	0	1	3	B
Okanogan, Wash	3.07	1.41	2.38	0.41	63	5	36	51	7	1	A
Yakima, Wash.:											
Sunnyside Unit	3.67	2.70	3.37	0.28	62	13	56	19	9	3	A
Tieton Unit	2.55	2.07	2.38	0.19	64	22	44	13	19	2	A
Shoshone, Wyo.	2.86	2.16	2.61	0.48	57	41	55	0	2	2	B

NOTE—On the Rio Grande project from 1912 to 1917, all water was delivered at lateral and community ditches; in 1918, about 15% of the total was delivered at the land.

ALFALFA THE BACKBONE OF IRRIGATION

Table II contains interesting information of the classification of crops raised. It is probably not generally known or realized that alfalfa constitutes the greater part of the crop on nearly all irrigation projects, and that such special crops as fruit, cotton and sugar beets constitute relatively small percentages of the crop even when these special crops are supposed to be grown on a large scale. For example, the Salt River project has quite a reputation for cotton production but only 24 per cent of the area was devoted to cotton in 1918 while 53 per cent was devoted to forage crops. Also the Yakima project is in the heart of a fruit growing district but on the Sunnyside unit only 17 per cent of the area was devoted to fruit in 1918 while 54 per cent was devoted to forage crops and on the Tieton unit the percentages were 27 and 43 respectively. Combining all the projects the percentage of area devoted to forage crops, mostly alfalfa, is 56, which demonstrates in a broad way that alfalfa is the backbone of irrigation agriculture and that other crops are more or less incidental.

For purposes of design of the principal canals and structures and determination of storage requirements, a knowledge of the quantity of water required each month is of prime importance.

TABLE III MONTHLY USE OF IRRIGATION WATER DELIVERED AT THE LAND YEARS 1912 TO 1918, INCLUSIVE GOVERNMENT PROJECTS

Project		Acre-Feet per Acre Delivered at the Land (Precipitation not included)											
		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Salt River	Max.	0.25	0.33	0.32	0.37	0.49	0.50	0.37	0.37	0.47	0.28	0.19	0.11
Project	Min	0.01	0.02	0.19	0.25	0.32	0.21	0.21	0.28	0.21	[illegible]	0.09	0.03
Arizona	Av.	0.08	0.13	0.26	0.31	0.38	0.38	0.35	0.33	0.34	0.20	0.14	0.07
	Av. %	2.7	4.4	8.7	10.5	12.8	12.8	11.8	11.1	11.4	6.7	4.7	2.4
Yuma	Max	0.20	0.41	0.40	0.42	0.44	0.53	0.61	0.62	0.51	0.34	0.22	0.21
Project	Min.	0.05	0.03	0.28	0.31	0.27	0.40	0.39	0.42	0.36	0.22	0.04	0.03
Arizona	Av.	0.10	0.18	0.35	0.36	0.37	0.45	0.48	0.50	0.44	0.27	0.13	0.11
	Av. %	2.7	4.8	9.4	9.6	9.9	12.0	12.8	13.4	11.8	7.2	3.5	2.9
Orland	Max.	..	0.06	0.31	0.53	0.79	0.81	0.80	0.78	0.67	0.30	....	....
California	Min		0.00	0.00	0.01	0.21	0.37	0.33	0.24	0.00	0.00	....	....
	Av.		0.01	0.07	0.28	0.59	0.67	0.68	0.59	0.40	0.12	....	....
	Av. %		0.3	2.1	8.2	17.3	19.6	20.0	17.3	11.7	3.5	....	....
Uncompahgre	Max.				0.43	1.32	1.34	1.35	1.11	0.77	0.50	....	....
Valley	Min.				0.00	0.72	1.02	0.83	0.85	0.58	0.33	....	....
Colorado	Av.				0.20	0.97	1.17	1.11	0.97	0.71	0.42	....	....
	Av. %				3.6	17.5	21.0	20.0	17.5	12.8	7.6	....	....
Boise	Max.				0.37	0.86	0.83	0.90	0.65	0.47	0.07	....	...
Idaho	Min.				0.00	0.19	0.55	0.54	0.26	0.12	0.02	....	....
	Av.				0.16	0.52	0.69	0.71	0.48	0.27	0.04	....	....
	Av. %				5.6	18.1	24.0	24.7	16.7	9.4	1.5	....	....
Minidoka	Max.				0.44	1.24	1.36	1.53	1.38	0.82	0.18	....	....
(No. Side Gravity)	Min.				0.00	0.36	0.89	0.97	0.87	0.35	0.00	....	....
Idaho	Av.				0.17	0.78	1.08	1.20	1.06	0.58	0.06	....	....
	Av. %				3.5	15.8	21.9	24.3	21.5	11.8	1.2	....	....
Minidoka	Max.				0.25	0.55	0.79	0.90	0.79	0.43	0.05	....	....
(So. Side Pump.)	Min.				0.00	0.10	0.43	0.68	0.37	0.25	0.00	....	....
Idaho	Av.				0.04	0.32	0.59	0.77	0.61	0.35	0.02	....	....
	Av. %				1.5	11.8	21.9	28.5	22.6	13.0	0.7	....	....
Huntley	Max.				0.03	0.16	0.40	0.64	0.57	0.11		....	....
Montana	Min.				0.00	0.00	0.01	0.26	0.28	0.05		....	....
	Av.				0.00	0.06	0.23	0.46	0.40	0.09		....	....
	Av. %				0.00	4.8	18.5	37.1	32.3	7.3		....	....
Milk River	Max.				0.14	0.40	0.34	0.62	0.12	0.05	0.06	0.03	....
Montana	Min.				0.00	0.00	0.00	0.16	0.00	0.00	0.00	0.00	....
	Av.				0.04	0.16	0.14	0.34	0.06	0.02	0.04	0.00	....
	Av. %				5.0	20.0	17.5	42.5	7.5	2.5	5.0	0.0	....
Sun River	Max.					0.54	0.80	0.93	0.58	0.18	0.01	..	....
Montana	Min.					0.00	0.15	0.06	0.18	0.01	0.00	....	....
	Av.					0.14	0.41	0.50	0.32	0.07	0.00	....	...
	Av. %					9.7	28.5	34.7	22.2	4.9	0.0	....	....
Lower Yellowstone	Max					0.20	0.71	0.98	0.48	0.11	0.06	....	....
Montana	Min					0.00	0.08	0.46	0.06	0.00	0.00	....	....
	Av.					0.04	0.37	0.68	0.23	0.05	[illegible]	....	....
	Av. %					2.9	26.8	49.3	16.7	3.6	0.7	....	....
North Platte	Max					0.31	0.75	0.72	0.80	0.47	0.02	....	....
Nebraska-Wyoming	Min.					0.01	0.25	0.56	0.23	0.22	0.00	...	...
	Av					0.16	0.49	0.65	0.57	0.37	0.00	..	....
	Av					7.1	21.9	29.0	25.5	16.5	0.0	..	....
Newlands	Max			0.26	0.73	0.96	0.68	0.75	0.49	0.32	0.16	0.04	.
Nevada	Min			0.01	0.21	0.43	0.39	0.18	0.15	0.22	0.01	0.00	.
	Av.			0.08	0.41	0.66	0.61	0.57	0.40	0.27	0.09	0.01	.
	Av. %			2.6	13.2	21.3	19.7	18.4	12.9	8.7	2.9	0.3	.
Carlsbad	Max.	0.03	0.15	0.22	0.52	0.51	0.58	0.50	0.62	0.38	0.19	0.11	
New Mexico	Min.	0.00	0.00	0.00	0.06	0.32	0.17	0.08	0.02	0.16	0.02	0.00	
	Av.	0.01	0.05	0.10	0.42	0.40	0.36	0.33	0.38	0.23	0.09	0.06	
	Av. %	0.4	2.1	4.1	17.3	16.5	14.8	13.6	15.6	9.5	3.7	2.4	
Rio Grande	Max.	0.17	0.47	0.83	0.91	1.04	1.18	1.13	0.80	1.05	0.68	0.29	0.40
New Mexico-Texas	Min.	0.00	0.05	0.15	0.65	0.93	0.80	0.22	0.05	0.04	0.09	0.00	0.00
	Av.	0.03	0.26	0.61	0.82	0.98	1.03	0.81	0.63	0.59	0.28	0.07	0.09
	Av. %	0.5	4.2	9.8	13.2	15.8	16.6	13.1	10.2	9.5	4.5	1.1	1.5
Umatilla	Max.			0.21	1.09	1.59	1.71	1.78	1.63	1.10	0.26	0.05	
Oregon	Min.			0.00	0.25	0.66	0.98	0.94	0.82	0.52	0.00	0.00	
	Av.			0.04	0.76	1.15	1.36	1.29	1.28	0.71	0.06	0.01	
	Av. %			6	11.4	17.3	20.4	19.4	19.2	10.7	0.9	0.1	
Klamath	Max.				0.02	0.38	0.47	0.42	0.26	0.06		...	.
Oregon	Min.				0.00	0.00	0.29	0.14	0.16	0.03		..	
	Av.				0.01	0.21	0.38	0.29	0.22	0.04		....	.
	Av. %				0.9	18.3	33.0	25.2	19.1	3.5		...	.
Belle Fourche	Max.					0.03	0.68	0.69	0.30	0.14	0.02	....	
So. Dakota	Min.					0.00	0.02	0.10	0.03	0.07	0.00	....	.
	Av.					0.01	0.33	0.41	0.19	0.11	0.00	....	
	Av. %					0.1	31.4	39.0	18.1	1.04	0.0	..	
Okanogan	Max.				0.02	0.55	0.66	0.91	0.77	0.37	0.03	0.04	
Washington	Min.				0.00	0.06	0.30	0.16	0.10	0.00	0.00	0.09	.
	Av.				0.00	0.25	0.49	0.52	0.57	0.12	0.01	0.01	.
	Av. %				0.00	12.7	24.9	26.4	28.9	6.1	0.5	0.5	..
Yakima	Max.		...		0.34	0.60	0.59	0.65	0.63	0.44	0.27	....	..
Sunnyside	Min.	.	...		0.16	0.48	0.49	0.54	0.26	0.11	0.18	....	...
Washington	Av.	..	..		0.28	0.54	0.54	0.60	0.55	0.36	0.22	....	...
	Av. %	.	...	.	9.1	17.5	17.5	19.4	17.8	11.6	7.1	....	...
Yakima	Max.				0.04	0.47	0.56	0.57	0.57	0.38		....	...
Tieton	Min.				0.00	0.31	0.34	0.42	0.43	0.12		....	...
Washington	Av.				0.01	0.43	0.47	0.51	0.50	0.27		....	...
	Av. %				0.5	19.6	21.5	23.3	22.8	12.3		....	....
Shoshone	Max.				0.19	0.40	0.70	0.80	0.48	0.23	0.19	0.12	..
Wyoming	Min.				0.00	0.08	0.34	0.48	0.27	0.10	0.01	0.00	
	Av				0.04	0.27	0.50	0.64	0.42	0.17	0.05	0.04	
	Av. %				1.9	12.7	23.5	30.0	19.7	8.0	2.3	1.9	

TABLE IV SEEPAGE LOSSES

Project	1912	1913	1914	1915	1916	1917	1918	Mean	Predominating Soils
	Total Losses—Per Cent								
Salt River	40.0	40.0	42.7	40.0	43.3	43.7	45.9	42.2	Sandy loam and clay.
Yuma	34.4	32.0	27.7	20.0	27.4	25.3	23.2	27.1	Rich alluvium.
Orland	20.0	26.5	26.0	27.3	20.5	27.3	33.1	25.8	Sandy loam, silt and gravelly loam.
Uncompahgre	4.8	5.1	7.6	12.4	2.2	2.9	7.7	6.1	Red sandy gravel, adobe and clay loam.
Boise	45.5	33.9	34.8	37.1	34.8	35.8	35.1	36.7	Clay loam and light sandy loam.
Minidoka:									
No. Side Gravity	28.0	22.6	25.0	36.3	43.9	48.9	41.4	35.2	Sandy loam, clay loam and volcanic ash.
So. Side Pumping	35.1	32.9	35.1	36.3	38.8	36.6	35.6	35.8	
Huntley	16.2	21.6	28.6	41.3	40.3	48.9	47.5	34.9	Clay and sandy laom.
Milk River	42.8	32.7	40.8	61.4	38.5	41.4	35.3	41.8	Sandy loam, clay and gumbo.
Sun River	20.0	38.1	39.7	41.8	41.9	37.6	40.3	37.1	Sandy loam, clay, adobe and alluvium.
Lower Yellowstone	43.0	52.0	52.4	43.1	47.9	42.8	46.9	46.9	Sandy loam, gumbo.
North Platte	38.7	38.4	36.8	66.0	40.7	47.2	37.7	43.6	Sandy loam.
Newlands	39.8	36.7	29.9	41.2	29.9	32.2	38.0	35.4	Sandy loam, clay and volcanic ash.
Carlsbad	48.0	54.5	55.5	48.6	58.5	57.2	50.1	53.2	Pecos sandy loam; large lime content.
Rio Grande		6.8	2.7	5.1	6.5	3.7	14.9	6.6	Rich alluvium.
Umatilla	27.8	27.4	40.1	43.8	36.5	24.8	32.2	33.2	Sandy loam.
Klamath	36.1	39.8	40.1	50.3	49.1	41.5	40.4	42.5	Disintegrated basalt, volcanic ash.
Belle Fourche	31.7	40.2	43.6	31.1	15.7	31.5	32.6	32.3	Clay and sandy loam.
Okanogan	47.1	38.4	21.1	24.1	22.2	20.4	33.7	29.6	Volcanic ash, sand and gravel.
Yakima Sunnyside	26.7	25.8	28.4	31.2	26.2	26.8	23.4	26.9	Sandy loam and volcanic ash.
Yakima Tieton	16.6	21.4	27.2	27.4	27.3	26.2	27.8	24.8	Volcanic ash.
Shoshone	36.4	36.5	37.2	35.1	34.9	41.8	37.7	37.1	Light sandy loam and clay loam.

The quantity of water lost in transit on an irrigation project is enormous and in some cases appears to equal or even exceed the quantity delivered to the farms. Much thought has been spent in considering methods and means of preventing such losses but these efforts have on the whole been attended with only moderate success. Even on projects where a considerable percentage of the canals has been lined with concrete the losses from the remaining canals which were probably thought not to need lining so badly constitute a large percentage of the diversion.

Many methods other than lining with concrete, such as oiling, puddling, artificial silting and lining with wood, have been used with more or less satisfactory results but the present state of the art indicates that concrete lining is the most practicable and satisfactory method. It is very costly, especially the lining of old canals which have a greater cross section than is needed for the smoother concrete surface, but its results are certain and permanent, especially in the milder climates and for this reason lining with concrete is now recognized as the standard method of preventing seepage losses. Even concrete lining, however, does not prevent losses entirely.

Table IV shows the losses that occurred on some of the government projects in each of the seven years 1912 to 1918, inclusive. The small indicated loss on the Uncompahgre project is due to the fact that most of the canals on this project act as collecting channels for lost and waste water of canals higher up, this resulting in virtual compensation for losses by gains. The peculiar arrangement of this distribution system together with the nature of the soil is therefore favorable to conservation of the water supply as far as waste and seepage losses are concerned. The small loss on the Rio Grande project results from the fact that the losses shown are those occurring in a few trunk canals only. The practice on that project in the past has been to deliver water to community ditches and water measurements were not made by the project management beyond the diversion to these ditches. In 1918 some of the community ditches were operated by the project management and water measured at the farms. That is the cause of the large increase in the indicated seepage loss in 1918.

Excluding the Uncompahgre and Rio Grande projects, for the reasons stated in the preceding paragraph, the lowest mean loss, 24.3 per cent, was on the Tieton project, Washington and the highest, 53.2 per cent on the Carlsbad project, New Mexico. The average loss for all the projects, exclusive of Uncompahgre and Rio Grande, is 36.1 per cent. It is difficult to explain the large variation in the losses on the basis of inherent differences in the plan of the distribution system or the differences in the material in which the canals are built. The latter is undoubtedly the most important factor and it is reasonable to suppose that a project having a long main canal and scattered lateral system will have relatively greater losses than one having a short main canal and a compact lateral system.

The Tieton project shows the smallest losses. The explanation for this probably lies in the fact that the main canal is a concrete channel for the first 12 miles of its length and most of the remainder occupies a natural drainage channel in impervious material. Some of the laterals also occupy natural drainage channels in similar material. The distribution system is very compact and pipes and flumes were freely used for the conveyance of water. The Orland project also shows a very low loss, which is no doubt due to the

TABLE V. DATA ON IRRIGATED AREAS OF 22 GOVERNMENT IRRIGATION PROJECTS LISTED IN TABLES II, III AND IV

Project	1912	1918	Mean Years 1912 to 1918, Inclusive
	Area Irrigated—Acres		
Salt River, Ariz	120,938	205,616	180,707
Yuma, Ariz	13,767	45,670	28,364
Orland, Cal	4,230	14,764	9,140
Uncompahgre, Colo	27,887	58,270	42,186
Boise, Idaho	65,042	131,500	95,950
Minidoka, Idaho			
North Side Gravity	37,174	53,830	44,491
South Side Pumping	33,092	50,143	41,063
Huntley, Mont	14,425	18,958	17,481
Milk River, Mont	352	24,842	7,244
Sun River, Mont	6,824	7,569	6,437
Lower Yellowstone, Mont	5,068	21,075	10,567
North Platte, Neb	50,250	88,771	69,315
Newlands, Nev	36,620	42,311	38,506
Carlsbad, N. M	13,459	19,460	15,260
Rio Grande, Tex	23,115	64,781	43,771
Umatilla, Ore	4,600	9,100	5,990
Klamath, Ore	23,834	38,268	27,959
Belle Fourche, So. Dak	27,897	52,445	41,926
Okanogan, Wash	7,260	6,402	7,536
Yakima, Wash:			
Sunnyside Unit	62,800	84,650	71,531
Tieton Unit	15,008	26,400	20,880
Shoshone, Wyo	16,524	38,282	26,421

fact that the main canal is short and the distribution system is compact.

It is evident from Table IV that 25 per cent is about the minimum loss that could be safely assumed under favorable conditions and that 50 per cent is sufficiently high under unfavorable conditions.

Table V is a statement of the irrigated areas of the several projects, which is needed to give the reader a more comprehensive understanding of the figures in Tables II, III and IV.

Tests on Finely Ground Cement

COMPARATIVE strengths of concretes made with standard and with finely-ground portland cement have been reported by the U. S. Bureau of Standards. The two cements were tested in 1 : 1½ : 2; 1 : 2 : 4, and 1 : 3 : 6 concretes of two consistencies, as well as in a neat mix, and in a 1 : 3 standard sand mortar. The following results and conclusions were obtained:

The strengths of concrete made of the fine cement were regularly and consistently greater than those made with the normal cement so far as the tests have been completed.

The percentage increases in strength of the fine cement concretes over the normal cement concretes were:

	2 days	7 days	28 days	3 months	6 months
Minimum	90	50	30	21	14
Average	121	66	56	41	42

It should be noted that the difference in fineness between the two cements was 12 per cent and to obtain the per cent increase in strength for each per cent increase in fineness, the figures in the above stable showing the increase should be divided by 12. The normally ground cement had 86 per cent passing the 200-mesh sieve as compared with 98 per cent for the finely ground material.

These percentage increases were highest at the earliest ages and the leanest mixes.

The strength increases of fine over normal cement concrete were greater in the mixes containing the greater proportions of cement.

If the two cements had been used on a job, the following approximate mix proportions could have been used to give the same strength at 28 days, if consistencies and aggregates were the same:

Using Normal Cement	Using Fine Cement	Approximate Saving in Bags of Cement per Cubic Yard
1 : 3½	1 : 5	2.1
1 : 4½	1 : 6	1.5
1 : 6	1 : 8	1.2

(Proportions were one part of cement to sum of volumes of sand and gravel measures separately.)

When used in 1 : 3 mortar, the fine cement produced a more marked percentage increase than when used in the concretes. The percentage increases in the neat mixture, however, were of the same order as in the concretes. Thus, in the cases of cements tested, the results of the work in neat cements gave a better indication of their value in concrete than tests in a 1 : 3 Ottawa sand mortar.

In most cases, the fine cement required no more water than the normal cement to produce a given consistency, when the aggregates and mix were the same.

It was found that when the special cement was tested for fineness on the 200-mesh sieve, the lumps of very fine material were not broken up under the sieving action and would not pass through the meshes, but when this cement was tested by the air analyzer these lumps were broken up and the results thus secured gave a true indication of the fineness of the cement. It is, therefore, recommended that the air analyzer be used in determining the fineness of very fine cement whenever possible, but that if this cannot be done care be taken to prevent this balling on the 200-mesh sieve if the determination is made in the usual manner.

The Geologist as Engineer

THE GEOLOGIST of the early part of the century, intent on the great fundamental problems of the science, on the discovery of the principles of erosion, intrusion, the succession of strata, and the studies in biological development associated therewith, scarce seemed to have any direct contact with practical affairs. With the further progress in these and other branches, however, each and all have been found to have a practical application, and the development of a type of geologist who has specialized as geological engineer, studying and applying the principles of the science to industry, has been rapid, until today there exists a numerous and important profession.

Most notable has been the development of the geologist who specialized in mining problems, and further specialization has taken place into metalliferous deposits, coal, oil, and non-metalliferous (as commonly so called), and even into quarrying. Regarded at first by the mining engineer (himself just newly arrived) with the same collegiate upper-class man contempt which the miner had accorded to him, the geological engineer in mining has won all the recognition due him and has taken his permanent place in the industry. Meanwhile, the geological engineer is also finding fields of usefulness in railroad and bridge, dam, subway, and other engineering work, in problems of water supply, road-building, land classification, and even in military science and problems of governmental policy.

The geological engineers at present far outnumber the geologists, much as the mechanical engineers outnumber the students of mechanics and physics. The affiliations of the geological engineer are naturally mainly with other engineers; the geological engineer specializing in mining has affiliated himself with the mining engineer, and has indeed, become one of the varieties of mining engineer into which specialization has led; and is so recognized. His main field of development, so far as it depended on organization or association, has been in the Institute of Mining Engineers, the name of which organization, in deference to the progressive specialization, has been recently changed to the Institute of Mining and Metallurgical Engineers, and we understand would have been the Institute of Mining Metallurgical, and Geological Engineers, except for the unwieldiness of the name. At present the presidents of our two great mining societies—Winchell and Lindgren—are both geological engineers.—*Engineering and Mining Journal.*

Milwaukee Water Supply Again Has Tastes and Odor Difficulty

A recurrence March 8 of the obnoxious tastes and odors in the Milwaukee water supply, which have been absent, with the exception of a slight taste Dec. 9, 1919, since closing the chemical plant of the Newport Hydro-Carbon Co., at Carrolville, early in 1919, has led the authorities to carry on an extensive investigation. The work is being done jointly by the city and State Board of Health to determine where the pollution comes from and to suggest remedies for its removal. Former investigations reported in the *Engineering News-Record*, Jan. 23, 1919, p. 181, indicated that the tastes came from chlorinating a water polluted with coal-tar derivatives from coke and phenol plants. One part of phenol in 500,000,000 parts of water gives a taste reaction with chlorine.

Marine Railway for 5,000-Ton Ships at Astoria, Ore.

Cradle on Inclined Track With Motor-Driven Chains Hauls Out Vessels for Repair—Compares Favorably With Dry Dock for Ships of Moderate Size

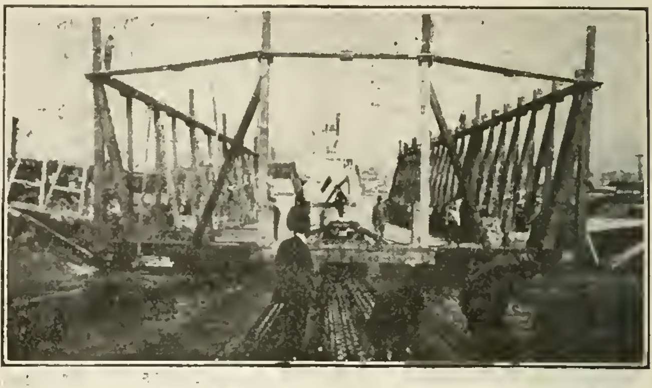
By C. O. Crisman
Denver, Col.

During the war a number of marine railways were built by the Emergency Fleet Corporation, as one of its steps in increasing the dry-dock facilities of the country. The largest is a 5,000-ton railway at Astoria, Ore. It represents a type of structure having certain distinct advantages over the graving dock.

A marine railway, for docking ships for repairs, calking and painting or the installation of machinery, consists of an inclined track which extends under water far enough to permit a vessel to be floated upon a traveling cradle and far enough from shore to permit bringing the vessel entirely out of the water when the cradle is hauled to the upper end of the track. A docking device of this type can be built in less time and at less cost than a dry dock of equal capacity, but the capacity is limited.

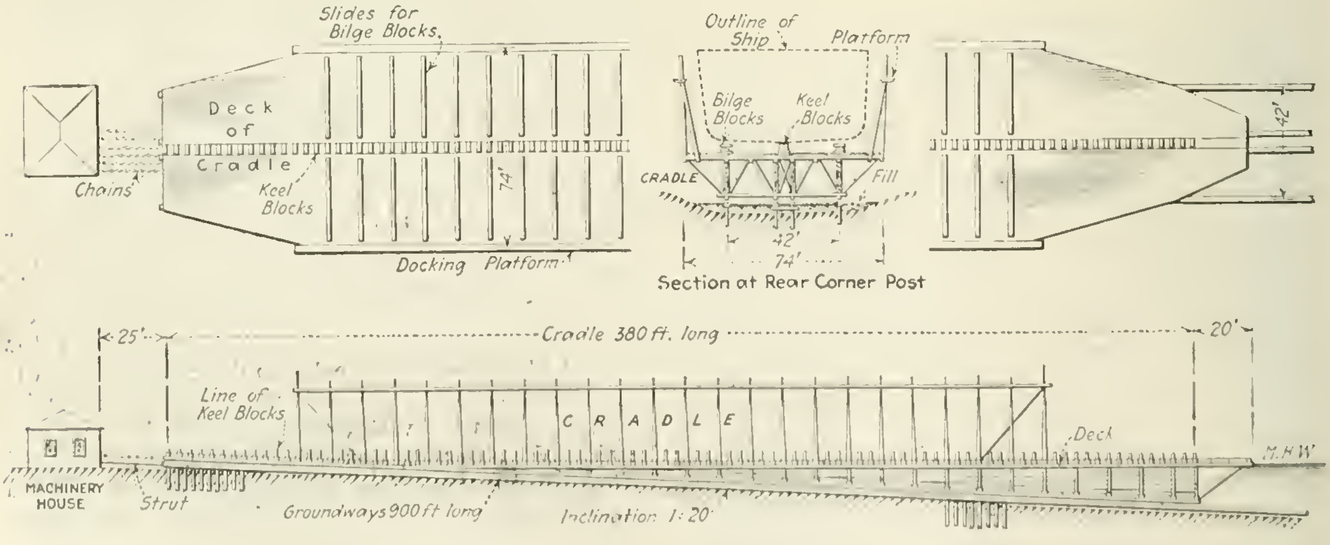
The location of the Astoria marine railway, on Young's River at its confluence with the Columbia River, about 10 mi. from the mouth of the latter, has the advantage of being in fresh water, where the average tidal range is only 7½ ft. and the weather is mild throughout the year. The lifting capacity of 5,000 gross tons is distributed over a keel-block length of 380 ft. on a cradle 74 x 380 ft. At mean high water the cradle in its outer position has 18 ft. and 23 ft of water over the keel blocks at the forward and outer ends respectively. When hauled out its deck is 2 ft. above water level. A similar railway of somewhat smaller capacity, at Alameda, Cal., is shown in the view. The general design of the Astoria railway and cradle is shown in accompanying drawings.

A slope of 1 on 20 is used for the track and groundways. The site was excavated and dredged 2 ft. below the pile cutoff, which ranges from zero to 42½ ft. below mean high water, the excavation having a bottom width of 52 ft. and side slopes of 1 on 2 to 1 on 3. After the groundways were built, material was backfilled nearly to the track level. Four rows of piles were driven to carry the four longitudinals and rails, the pile spacing being from 4½ to 8 ft. under the outer rails and from 2½ to 6 ft. under the inner rails. Near the upper end of the ways, inclined spur piles were driven along the center line, in order to anchor the structure in position and to resist any tendency to longitudinal movement. The piles at the upper end were required to be of sufficient size and length to sustain a bearing load of 21 tons each. this load being reduced gradually to 16 tons at the outer end. Lighter load and longer spacing for piles at the outer end are permitted because of the buoyancy of the ship and cradle.

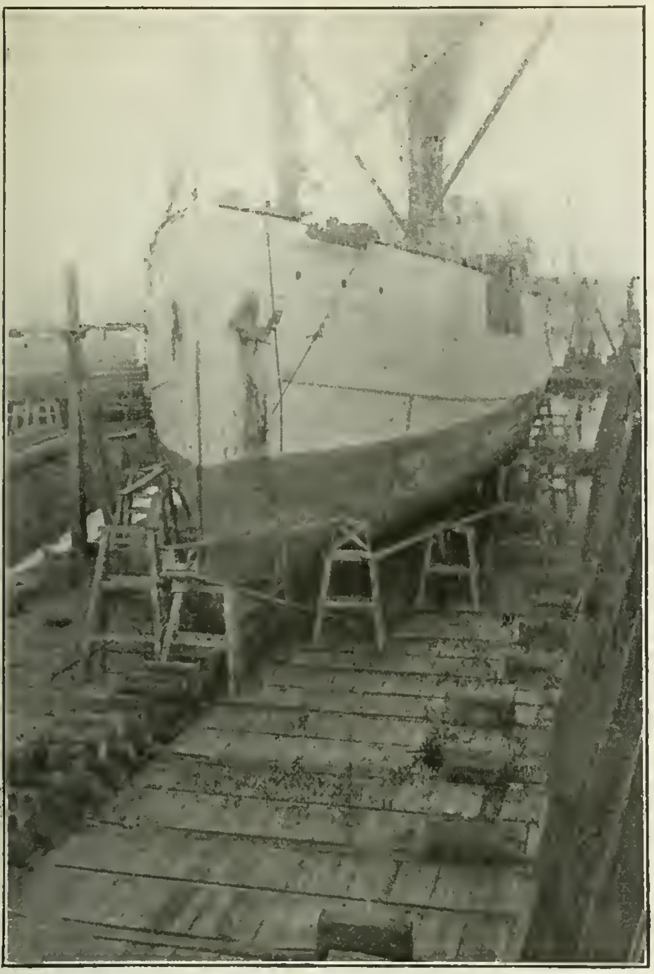


CRADLE BEING LOWERED IN 4,000-TON MARINE RAILWAY AT ALAMEDA, CAL.

The groundways, 900 ft. long, consist of four longitudinals spaced 6 ft. and 42 ft. apart, each composed of three layers of timbers bolted together. The longitudinals are driftbolted to the piles and secured by cross-timbers and diagonal bracing. Above low water the ways were built in place; for the 650-ft. stretch under water they were constructed on shore in sections more than 200 ft. long, launched, floated into position and sunk by weights, the bolts then driven by a diver.



CRADLE AND WAYS OF MARINE RAILWAY



STEAMER SECURED IN CRADLE

Chain paths of 3-in. plank fastened to the cross timbers extend from the upper end to the downhaul sheaves. Four flat steel rails 1 to 1½ in. thick are laid on the longitudinals and secured by countersunk bolts, the inner rails being 12 in. and the outer rails 6 in. wide.

Four longitudinals or runners forming the base of the cradle are faced with similar flat rails, and between the two sets of rails are 4-in. double-flanged cast-iron rollers, spaced 10 in. apart. These rollers are held in wooden frames forming continuous roller nests which extend 630 ft. down the track, this distance being sufficient to provide rollers under the cradle at any position. Timber framing forms the superstructure of the cradle, the buoyancy of which is overcome by 550 tons of ballast filled between the main deck and sub-planking under the deck beams.

Bilge blocks to support the vessel laterally are spaced 12 ft. apart on each side of the deck of the cradle and have a transverse travel on slides carried by the main deck beams. They are moved by chains passing through lead blocks and operated by hand winches along the top of the cradle. Platforms are provided for working these winches and handling the ropes for bringing the vessel into position. The keel blocks and bilge blocks are of such height that there is room for men to work between the deck of the cradle and the bottom of the vessel.

Chains are used for hauling the cradle. They are operated by sprocket wheels driven by a 250-hp. motor through a train of gearing. Slow speed is provided for heavy loads and higher speed for moving the cradle when empty or carrying light loads. The machinery is anchored to a heavy base of reinforced concrete. Struts of the same material are placed between this base and the head of the groundways, to take the thrust in hoisting and to prevent any sliding of the machinery foundation.

Six uphaul chains of the open-link type are attached to the cradle through a system of equalizing sheaves to maintain an equal distribution of the stress. They are of wrought iron, 2 to 2½ in. in diameter, this variation allowing for the increase in stress as the loaded cradle emerges from the water. Six downhaul chains attached to the cradle are led through sheaves secured to the groundways 594 ft. from the upper end, so that power can be used in lowering the cradle. These chains are of 1¼-in. iron. Slack in the chains can be eliminated by shortening the bridle chain which carries the equalizing sheaves.

The power required to raise the loaded cradle depends upon the friction to be overcome. With an inclination of 1 on 20 the lifting force amounts to 5 per cent of the combined weight of vessel and cradle; friction will vary with the alignment of track, distribution of load, accuracy of rollers and condition of rails, but in a well built railway it should not exceed 4 per cent. Any additional stress due to starting is small, as at that time the cradle is submerged and the vessel practically floating. The total power necessary will be approximately 9 per cent of the entire load to be raised.

In preparing to dock a ship, the cradle being at its upper position, the heights of the keel blocks are adjusted to conform to the shape of the ship's keel, and the bilge blocks are adjusted to support the hull laterally. The cradle is then run down the track until it is in sufficient depth of water for the ship to be floated over

CRADLE AND STEAMER HAULED OUT OF WATER

the keel blocks and secured in position by ropes operated from winches at the corners of the superstructure. The cradle is then started, but as soon as the keel touches on the keel blocks at any point, it is stopped until the bilge blocks are moved into their corresponding positions in contact with the hull.

Then the cradle is moved again until the vessel rests at another point, this series of operations being repeated until the entire length of the vessel is supported. Further progress of the vessel and cradle up the ways is continuous. About an hour is the time required for getting a vessel out of the water. When the repair work has been completed the cradle is lowered until the vessel floats off. It is then hauled out ready for adjusting the keel and bilge blocks for the next vessel.

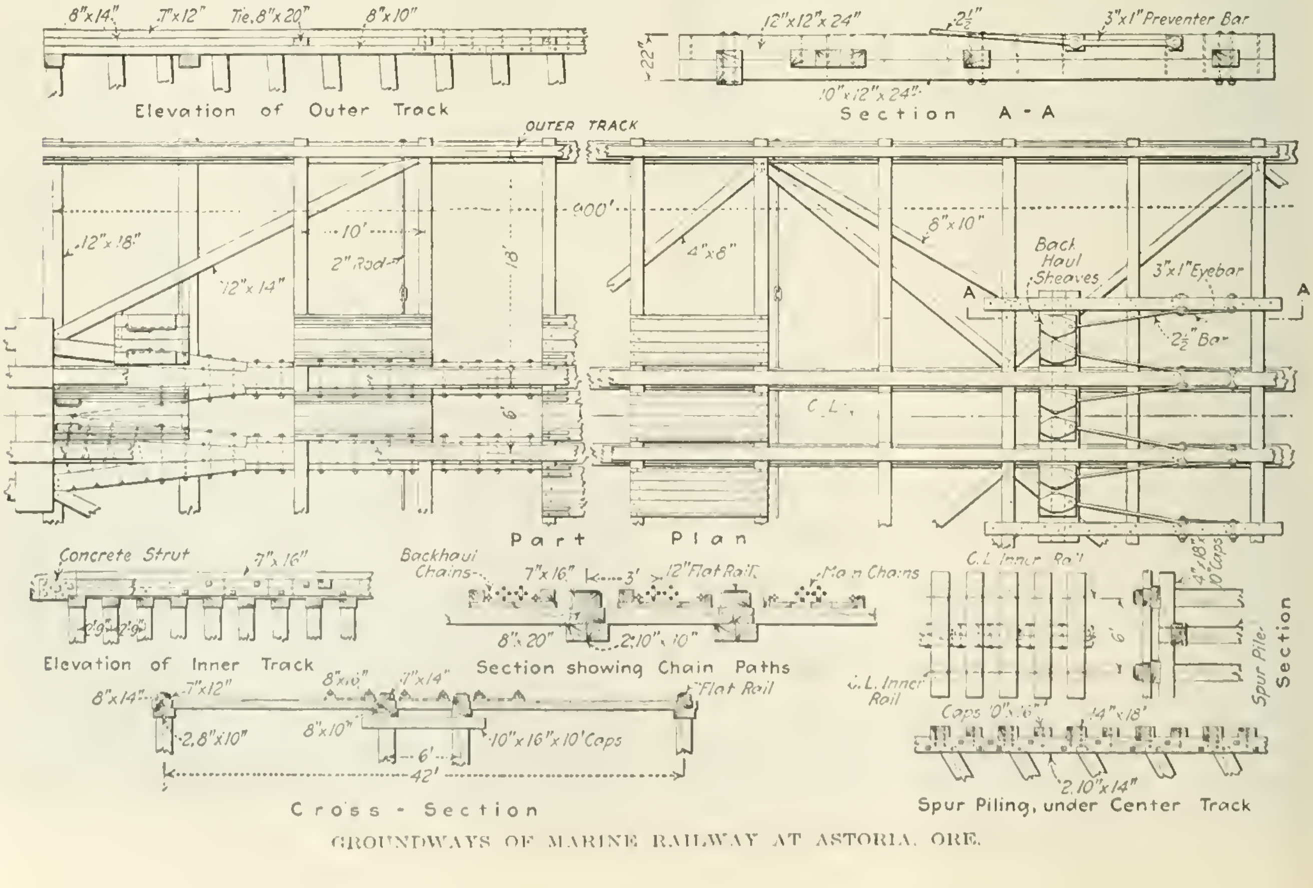
Speed of operation is one of the advantages of a marine railway, the time necessary for docking being usually from three to four hours. This short time directly affects the labor costs. Another advantage is the close proximity to the repair shops. As the cradle is open on all sides and its floor is practically at the level of the ground it gives greater accessibility than do docks, and the handling of heavy materials is facilitated. Traveling cranes are sometimes provided alongside the upper portion of the ways. Maintenance cost is low owing to the simplicity of the structure.

The application of the marine railway is subject to certain limitations. The length of groundways usually must be about three times that of the longest vessel to be handled, depending somewhat upon the length and draft of vessel and the tidal variation. Therefore, in most cases the outer portion will be in a pocket dredged below the bottom of the channel, so that it is difficult or impossible to keep the tracks clean. This trouble increases with the length of the ways. For the foundation, the bearing power required varies directly with the load, and the conditions at each site will determine whether it is possible to secure a pile spacing close enough to meet the load requirements.

The cost of foundations and ways increases so rapidly with the depth of water that this system of docking becomes uneconomical for the great length and depth of submerged structure required for ships of great size. To shorten the haul, the inclination of the groundways might be increased, but this would necessitate more powerful hauling machinery, while experience indicates that a grade of 1 on 20 is preferable to a steeper inclination. The cradle could be made large enough for any vessel, but as all the hauling stress is taken by its inner longitudinals any large increase in stress would involve construction difficulties.

As the hauling chains operate over toothed sprocket wheels, uniformity of the links is essential, but the size of chain is limited by the fact that a 2¼-in. or 2⅜-in. chain is about the largest size that manufacturers can guarantee to be uniform. It is possible to use any desired number of chains, but the difficulty of transmitting and distributing the stress to the frame of the cradle increases with the number of chains. On the basis of all these conditions a capacity of 5,000 gross tons dead weight has been determined upon by marine engineers as the present economic limit.

The marine railway at Astoria, Ore., was designed by the Crandall Engineering Co., Boston, Mass., the construction being done in co-operation with the Astoria Marine Iron Works. The work was carried out under the direction of Captain R. E. Bakenhus, manager of the division of shipyard plants, Emergency Fleet Corporation, Philadelphia, Pa., and J. W. Ferguson, district plant engineer, Portland, Ore. The writer was resident engineer. The estimated cost is $204,000 for the railway, cradle and operating machinery.



GROUNDWAYS OF MARINE RAILWAY AT ASTORIA, ORE.

Engine Terminal for Mountain Division in Utah

Rectangular Enginehouse Without Turntable Avoids Snow Troubles and Utilizes Space—Ash Removal by Steam Jets

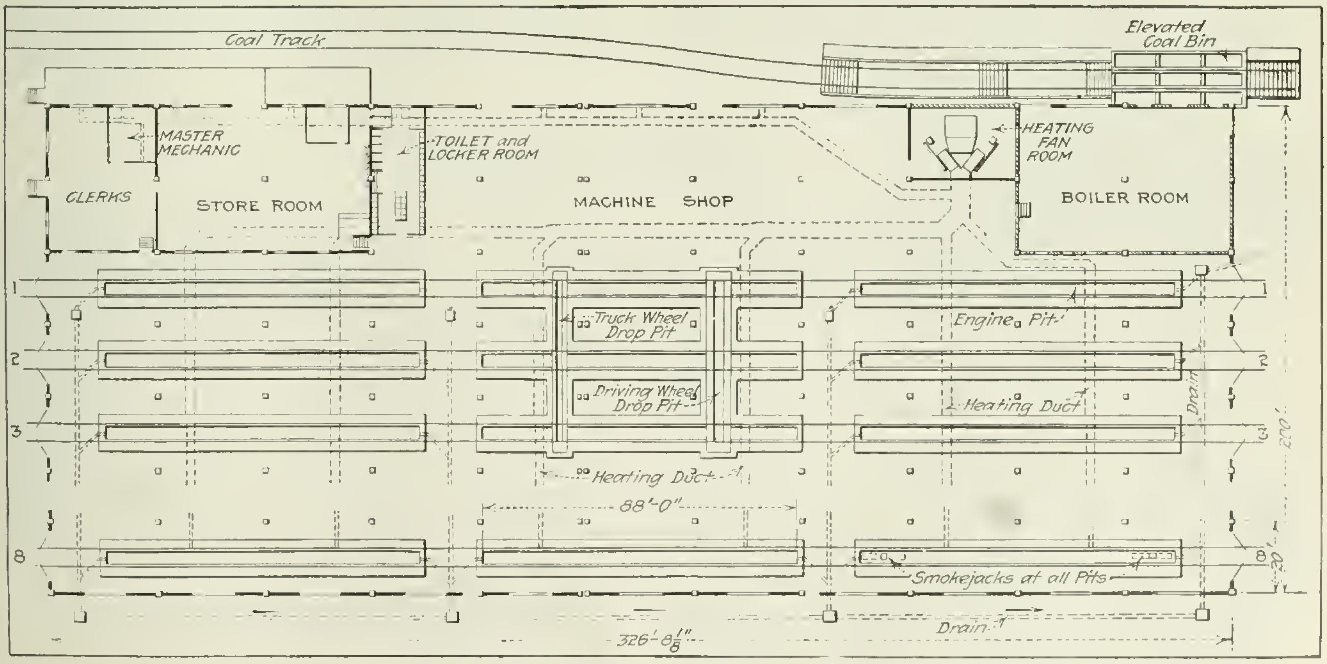
SNOWFALL, climatic conditions and restricted space were governing features in the design of the engine terminal for the new division point established by the Denver & Rio Grande R.R. at Soldier Summit, Utah, the location being the crossing of the Wasatch mountains at an elevation of 7,440 ft. above sea level. A rearrangement of operating divisions was made in order to secure greater efficiency in the handling of heavy traffic, and extensive yards are provided for classification and assemblage of cars, as described in *Engineering News-Record* of May 27, 1920, p. 1069. A 24-stall rectangular concrete enginehouse, a steam-jet conveyor system for handling ashes and a Y-track instead of a turntable are important features of the terminal. There are three yard engines and twelve Mallet pusher engines stationed at this point, besides which the terminal has to provide facilities for cleaning, running repair work and supply of coal and water for about fifty engines daily.

The selection of this unusual type of enginehouse. rectangular in plan and having parallel tracks served by switch connections, instead of the ordinary segmental or circular roundhouse with radial tracks served by a turntable, was based largely upon the difficulty of keeping a turntable pit free from drifting snow under the severe climatic conditions which occur at Soldier Summit. Another reason was that for housing long Mallet engines a roundhouse requires an excessively large area, so that the rectangular arrangement gave a more economical utilization of the restricted space available. Estimates showed that the cost would be about the same for the circular and rectangular arrangements at this point.

In the design and location of the rectangular engine house without turntable, provision had to be made for turning the engines by means of a Y-track so arranged as to require a minimum movement of the locomotives. To meet this condition it seemed desirable to locate the building within the area enclosed by the Y-track, as shown on the plan. Further, it is necessary to secure a switch layout which will facilitate movement to and from the enginehouse tracks. Eight parallel tracks spaced 20 ft. c. to c. extend through the building and are connected at each end to a diagonal lead, these leads being continued to a junction so as to form the Y-track for turning the engines. Each house track can accommodate three engines, giving a total capacity for 24 locomotives.

Reinforced concrete of the unit type construction is used for the enginehouse, which is 200 x 326 ft. in plan. Brackets or corbels are formed 7 ft. below the tops of the columns, so that girders seated on the heads and brackets form alternate high and low bays extending across the building. In the high bays or monitors, the roof is flat and the vertical faces are filled with stationary and pivoted sash. In the low bays, a ridge arrangement transverse to the tracks is used for the purpose of good drainage. Concrete slabs of channel section resting directly upon the longitudinal girders form the roof covering and are sheathed with two layers of roofing paper mopped with hot asphaltic composition. Simple footing blocks support the columns. Large window areas are provided in the concrete side walls. In the end walls are track openings 14 x 18 ft. fitted with wooden double-leaf swinging doors.

Each of the 24 engine pits is 88 ft. long, and has 36-in. reinforced concrete walls capped with jacking timbers. Between the pits the floor is of gravel, level with these timbers. Flat base plates support the 85-lb. track rails which are secured by nuts and by circular clips on inclined anchor bolts. Three of the pits are connected by a pair of deep transverse drop pits in which travel trucks with 10-ton pneumatic jacks for handling wheels and axles, one drop pit be-



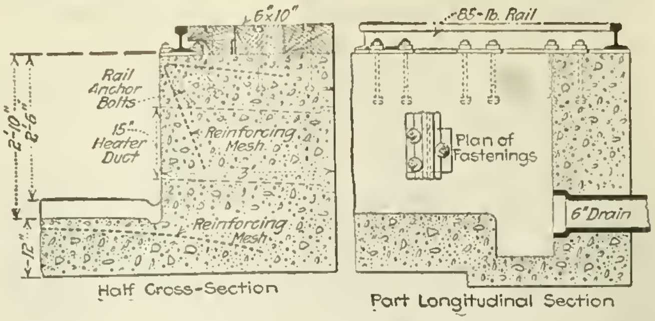
PLAN OF RECTANGULAR ENGINEHOUSE

ing for driving wheels and the other for truck wheels. Swinging girders carry the track rails of the engine pits across the drop pits. As heavy repair work will not be done at this terminal, no overhead traveling crane or power jack lifting equipment is provided, the engines being raised by portable hand jacks when wheels have to be removed. Drainage of the pits is afforded by sloping the floor from the middle to each end, where drains are connected. Over each end of the pit is a wooden smoke jack with open flue, no damper being provided.

For the heating system, air heated by passing over steam radiators is delivered into a system of ducts by two fans, each having a discharge capacity of 27,000 cu.ft. per min. From a longitudinal duct along one side, six ducts extend across the building, reducing from 30 in. to 15 in. in diameter and having 15-in. tile branches from the tops of the conduits to the sides of the pits. Each pit has two of these branch conduits. Overhead mains for steam, water and compressed air are carried by brackets on the columns and have drop pipes with service connections at all the pits.

Electric lamps suspended from the girders provide for general lighting and connections are provided on the columns for the attachment of extension cords. All electric conduits are embedded in the concrete. Along the north side of the main floor is the machine shop, which is not separated from the engine space but has an enclosed store room and office at one end and a boiler room and fan room at the other end. An elevated 200-ton concrete bin approached by an inclined track holds coal for the stationary boilers and a steam conveyor system with 8-in. pipe removes the ashes to a dump 150 ft. distant. For washing out the engine boilers with hot water there is a separate plant with heaters and pressure tanks.

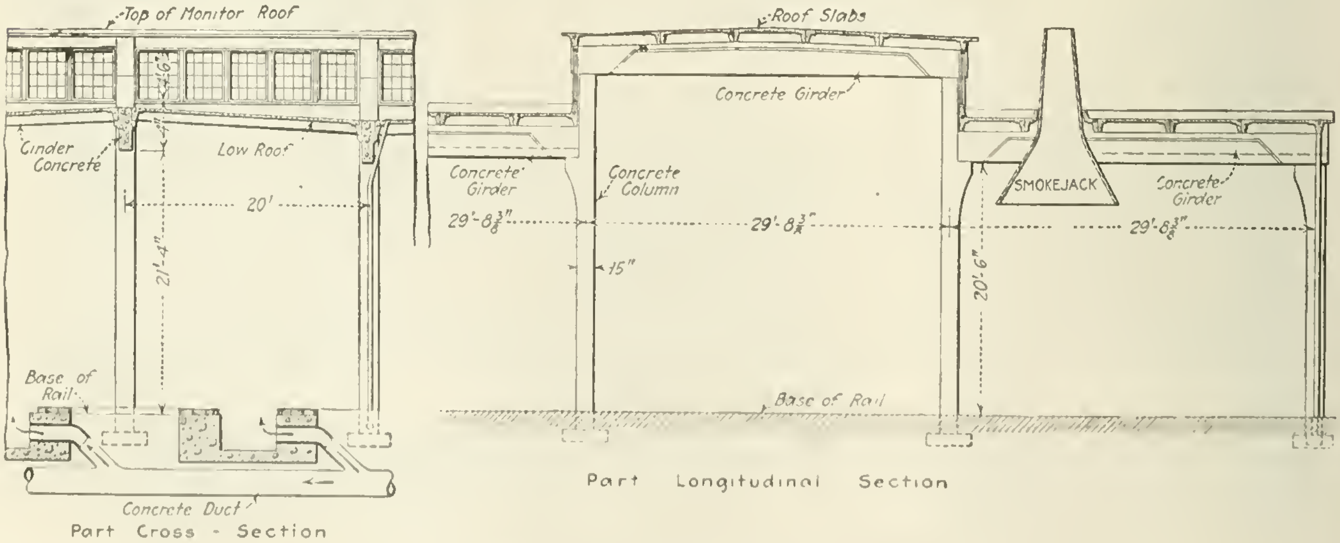
Steam jet conveyor systems provide for the removal of ashes from the boiler house and from the ashpits where the locomotives have their fires cleaned or dropped. This method of handling ashes was adopted mainly because of the difficulty of loading wet cinders into cars during the winter and the attendant cost and difficulty of emptying the cars. The topography was favorable to the steam system, as there was a large depression available into which the cinders could be blown and disposed of without further cost. During mild weather it is proposed to blow the ashes into cars for use in filling at various points. From the boiler house ashpit, the ashes are blown through an 8-in. pipe to a dump 150 ft. distant. A water filled ashpit served by a gantry or locomotive crane with grab bucket was considered for handling ashes from the engines, but the steam conveyor system was adopted as preferable.



DETAIL OF REPAIR PITS

Locomotives which require cleaning of fires are served by two concrete ash hoppers on a pair of tracks spaced 20 ft. c. to c., the hoppers being staggered in position and having sloping sides so as to deliver the ashes by gravity at opposite ends of a pit between the tracks. In a trench along the floor of the pit is an 8-in. cast-iron pipe having an open-end tee opposite the bottom of each hopper. From one end of the pit the pipe is diverted at an angle of 45 deg. and carried horizontally underground 175 ft. to a gulch into which the ashes are discharged. At the opposite end of the pit, the pipe has a vertical riser connected to an overhead pipe carried across the adjacent engine track by a latticed girder and ending in a spout for discharging ashes into a car on an outer track.

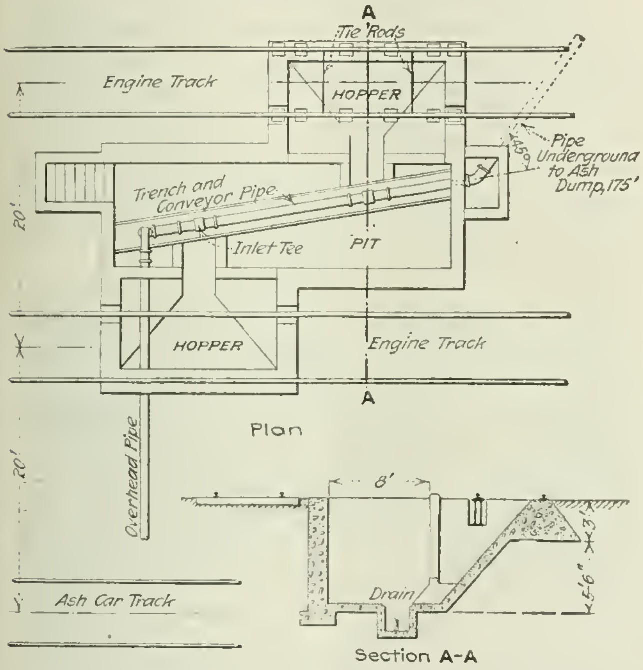
A 2-in. steam jet enters each end of the pit pipe, so that ashes can be moved in either direction as required. Steam is piped 500 ft. from the boiler house and has a pressure of 80 to 120 lb. One man attends to the valves and assists the gravity feed of ashes



ENGINEHOUSE BUILT OF CONCRETE UNITS

to the pipe inlets if necessary. Each locomotive drops an average of 1.3 cu.yd. and the total amount handled daily is about 65 cu.yd., in addition to which the boiler house conveyor handles about 2 cu.yd. daily. One rail of each ashpit is carried by a girder composed of a pair of I-beams spanning the sloping face of the hopper, the other rail being carried upon the concrete wall. Both rails are secured to flat base plates by bolted clips, gage being maintained by tie rods in spacing sleeves.

A 300-ton coaling station of timber construction has been built. It has ten elevated pockets and chutes placed in two rows and serving two engine tracks spaced 45 ft. c. to c. and is approached by an inclined trestle with a grade of 6 per cent, which extends 80 ft. beyond the pockets and up which hopper bottom coal cars are pushed by a locomotive. Under the extension or tail trestle is a bin for wet sand. After the sand has passed through steam heated driers it flows by gravity to steel drums buried in the ground, from which it is blown by air at 80-lb. pressure to overhead bins supplying the locomotives.



ASHPIT WITH STEAM-JET CONVEYOR

A gravity water supply is brought from Price River by a 12-in. wood stave pipe line 4 mi. long and is delivered to a 1,000,000-gal. concrete reservoir on high ground behind the terminal, the water level in the reservoir being 40 ft. above rail level. For watering the engines there are two 50,000-gal. elevated wood tanks, one of which has two spouts for direct delivery to engine tanks of different heights and the other serves a 12-in. water column. Electric current for light and power is taken from the Utah Light & Power Co.'s transmission line which passes over the range and serves the coal mines on the east slope of the Wasatch Mountains.

The new engine terminal at Soldier Summit was designed and built under the direction of J. G. Gwyn, chief engineer, Arthur Ridgway, assistant chief engineer, and W. W. Lemen, superintendent of motive power, Denver & Rio Grande R.R.

Sewage Effluents for Disposal With and Without Dilution

Results To Be Aimed At and Methods To Be Employed—What May Be Accomplished By Various Means Commonly Considered

THE major portion of the report on Sewage Works Operation, submitted to the Sanitary Engineering Section of the American Public Health Section late in October, 1919, related to standards for sewage effluents to be disposed of (1) without and (2) with dilution. The committee was composed of C. B. Hoover, Columbus, Ohio; W. L. Stevenson, Harrisburg, Penn.; C. E. A. Winslow, New Haven, Conn.; Paul Hansen, Springfield, Ill., and Robert H. Morse, Baltimore, Md. An abstract of the report follows:

The following characteristics are proposed for an effluent which will not require dilution and which will insure a satisfactory stream condition.

1. A reasonable freedom (less than 0.5 cc. per liter) from suspended matter.

2. Total suspended matter content not to exceed 25 parts per million.

3. Oxygen demand not to exceed 10 p.p.m. after 24 hr. at 37 deg. C.

4. Nitrate and nitrate nitrogen content which would represent a fairly complete mineralization of the nitrogenous matter.

5. Chlorine treatment wherever a low bacterial count is deemed necessary.

It is not to be inferred that an effluent must equal these characteristics in order to show a 100 per cent stability value by the methylene blue test for an effluent inferior in quality to the one proposed may show a 100 per cent stability value but it will not be apt to insure a highly satisfactory stream condition.

An effluent of the character proposed may be produced by the following processes: (1) Sand filtration. (2) Sprinkling filters followed by efficient sedimentation. (3) Activated sludge.

There are many factors which must be considered in determining sewage treatment requirements where dilution is available. Among these are the characteristics of the stream such as velocity of flow, normal summer and minimum rate of flow, the uses to which the stream is or is apt to be put, the present and probable future values of riparian properties, climatic conditions, etc. Under suitable conditions, a stable dilution for municipal sewage may be obtained with from 4 to 6 sec-ft. of relatively clean water per 1000 people contributing sewage.

Where raw sewage is to be discharged into a stream where the dilution is thought to be adequate, the desirability of removing the coarsest suspended matter by screening or rapid sedimentation will be governed by local conditions. Where the available dilution is such that more thorough treatment is necessary, the practical question before the operator is, what is a reasonable expectancy from the various types of sewage treatment devices.

1. *Fine Screening.*—A removal of from 5 to 15 per cent of the total suspended matter may be reasonably expected.

2. *Sedimentation.*—A reduction of from 25 to 30

per cent in the dilution requirements is a reasonable expectancy from efficient sedimentation. The efficiency of sedimentation should be determined on the basis of the removal of settleable suspended matter by volume or by weight, preferably the latter. The efficiency may be determined volumetrically by use of the conical settling glasses, and gravimetrically by inserting, at the end of the two-hour settling period, a rubber stopper attached to a glass rod, in the conical settling glass of the raw sewage to a point just above the top of the settled solids, pouring off the supernatent liquor and determining the suspended matter in it by the Gooch method. The suspended matter in the supernatent liquor represents the non-settling solids and this value subtracted from the total suspended matter value of the raw sewage will give the settleable solids by weight. The total suspended matter by weight into the settleable suspended matter by weight will give the per cent of the total suspended matter of the raw sewage that is settleable. The per cent of removal by weight of total suspended matter by the tanks divided by the per cent of settleable solids by weight will give the removal of settleable solids by weight by the tanks. It is proposed that the following standard in terms of percentage removable of settleable solids be applied to sedimentation results:

Ninety or more, excellent; 80 to 90, good; 70 to 80, fair; less than 70, poor. The percentage of removal of settleable solids on the volumetric basis, as determined by the conical settling glasses, is ordinarily considerably less than on the gravimetric basis (sometimes 10 to 15 per cent).

3. *Bacterial Oxidation.*—Under this heading will be considered sand filtration, sprinkling filters, and activated sludge.

When a sand filter fails to produce an effluent equal to or better than the one proposed above for an effluent which does not require dilution, there is something radically wrong and the filter may be regarded as not functioning normally, as freedom from settleable suspended matter, a high degree of oxidation of nitrogenous material, and a low bacterial count, are normal characteristics of sand filter effluents.

Sprinkling Filters.

The normal characteristics of the effluent from a sprinkling filter which is dosed with well settled sewage, are as follows:

1. From 10 to 20 per cent less total suspended matter than in the applied sewage.

2. From 2 to 10 times as much settleable suspended matter as in the applied sewage.

3. Oxidized nitrogen in the form of nitrates and nitrates to the extent of from 1 to 10 parts per million.

4. Reduction in the oxygen demand of the applied sewage of from 50 to 90 per cent, 80 per cent being a reasonable expectancy.

5. A reduction in the total bacterial count of the applied sewage of from 40 to 70 per cent, 60 per cent being a reasonable expectancy.

A well designed and properly constructed sprinkling filter, operating under optimum conditions with respect to the total dose and its distribution, and followed by efficient sedimentation, should produce an effluent which will not require dilution. Efficient sedimentation will reduce the total suspended matter content, practically eliminate the settleable material, and reduce the oxygen demand. Sprinkling filter effluents which have not the characteristics proposed for effluents not to be diluted will require more or less dilution and when four or more parts of diluting water are required for stability, the effluent is a poor one although it may be satisfactory for some particular case.

Activated Sludge.

The normal characteristics of activated-sludge effluents as produced experimentally are as follows:

1. Low total suspended matter content.

2. A practical absence of settleable suspended matter.

3. Presence of oxidized nitrogen as nitrites and nitrates in amounts equivalent to or better than in sprinkling filter effluents.

4. A low oxygen demand.

5. A high reduction in total bacterial count.

The normal expectancy from this process of treatment when operated as a municipal function rather than on a special experimental basis, has yet to be demonstrated. If a plant of this type is turned over to an operating personnel of the usual type, it is very apt to be a dismal failure as other types of treatment works using less particular processes of treatment than those employed in activated sludge have often failed to give satisfactory service through a lack of competent supervision.

Middle Atlantic States Road-Building Program

According to a report by Samuel Knopf, assistant engineer Delaware State Highway Department, and read before the fifth annual meeting of the American Association of State Highway officials held recently at Louisville, Ky., the highway program contemplated by the five Middle Atlantic States comprising New York, Pennsylvania, Delaware, New Jersey and Maryland, includes the construction of about 2,100 mi. of hard-surfaced highways at an expenditure in the neighborhood of $100,000,000. Just what amount of this program will be carried to completion depends not upon the amount of funds but upon those same limiting factors that operated during the 1919 season—amount of labor and materials available, transportation, and the lack of experienced and fully equipped contractors' organizations.

The program to be carried out requires the moving of 11,500,000 tons of aggregates, which includes the tonnage required to complete the projects carried over from this year's work To this also must be added the tonnage of aggregates required in the resumption of building operations, railroad improvements, street work, maintenance of roads, etc., which have been seriously curtailed during the war and the year 1919 waiting for decreases in prices. "To meet this tremendous demand for materials successfully," says Mr. Knopf, "transportation facilities must be improved; plant capacities enlarged, and production increased. Each is supplementary to the other. The development of one, without the development of the other, would tend to increase rather than minimize a difficult situation."

Wide-Spaced Stockpiles and Wet Haulage Successful

Stock Storage Ahead of Construction Aids Progress—Road Grade Completed to Profile Without Stakes

SUCCESSIVE mixing plant set-ups at stockpiles 500 ft. apart, and wet haulage of concrete, have given successful results on the Gray's Lake-Volo Road in Lake County, Illinois. Steady operation has been assisted by the large accumulation of stock ahead of construction. Construction itself is according to the specifications of the Division of Highways of Illinois, and 16-ft. concrete slab has been finished at the rate of 50 ft. an hour. With the wrinkles in operating procedure ironed out an average progress greater than this is anticipated, but, including lost time in shifting plant, 500 ft. a day has represented high output with team haulage of concrete. Near the close of last season, when truck-tractors were substituted for teams, 550 to 575 ft. was the high output, with stockpiles 600 ft. apart.

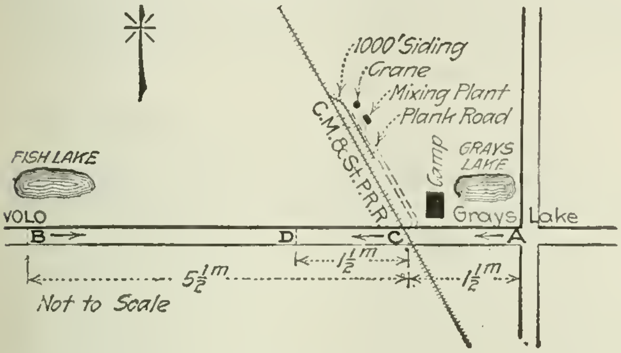


FIG. 1. CONSTRUCTION PLAN FOR GRAY'S LAKE-VOLO HIGHWAY

Besides the distinctive character of the concreting plant and methods, the work from Gray's Lake to Volo has developed unusual grading methods. Workmen finish the subgrade directly from the engineers' notes without stakes. Exact surface and profile, within the small variation permitted by the Illinois State specifications, are secured with blade graders and Fresno scrapers.

From Gray's Lake to Volo is 7 mi. An old waterbound macadam of poor surface but giving a hard track, extends the length of the new work. At about 1½ mi. east of the Gray's Lake end, as indicated in diagram by Fig. 1, the Chicago, Milwaukee & St. Paul Ry. crosses the highway and provides the nearest railway connection for materials and equipment. A 20-car siding was put in and was connected with the highway by a 10-ft. plank road built very solidly of 3-in. maple planks on 3 x 12-in. stringers. Curb timbers were placed at the edges of the road, as shown by Fig. 2, to keep the truck wheels directly over the stringers. With the old macadam, this plank road provided a substantial hard track for trucks the full length of operations. The order of these operations was, with a portable outfit, to pave the stretch from *A* to *C* and then transfer the outfit to *B* and work east to *D*. In the meantime, by wet haulage from a stationary mixer at the siding, the section *C-D* can be constructed.

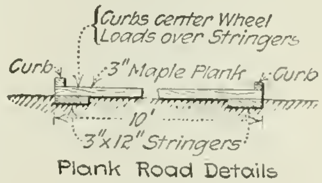


FIG. 2. CURBS ON PLANK ROAD CENTER LOADS OVER STRINGERS

Station B. M.	Dist. Stake to C.L.	Grade Differences	Elevations		Rod Readings	N. Side Road	Center Line Road	S. Side Road
			Grade	Sub-Grade				
B.M.	..		203 13	203 38	0 25			
363+00	30'		203.50	202 84	0 54	2/F2	3/F2	4/F2
+12.5					1 04	7/F3	6/F2	5/F5
+25					1 54	8/F3	9/F2	10/F1
+37 5		—1.99			2 04	13/F3	12/F2	11/F3
363+50			201.51	200.85	2 53	14/F2	15/C1	16/G
+62.5			......	......	2.92			....
+75.		—1.55	......	......	3 31			....
+87 5			......	......	3 70			...
364+00	31'		199 96	199.30				..

FIG. 3. EXAMPLE OF ENGINEERS' NOTES FOR FINISHING SUBGRADE

GRADING WITHOUT STAKES

Grading ran about 4,000 cu.yd. per mile in cuts and fills of from 2 to 4 ft. The old macadam is loosened with a scarifiier pulled by a 10-ton roller. Then the roller, operating a heavy railroad plow, turns the material to a depth of 12 in., repeating the plowing as many times as is necessary to loosen the cut to depth. Fresno scrapers, operated by three horses, move the material. From four to six scrapers are employed, the operators working to grade stakes set every 50 ft. by the county engineer. This is the rough-grading operation.

The finish-grading outfit consists of the roller, a medium-heavy road grader and one Fresno scraper. Four or five passes of the roller and grader cut down the humps and fill in the hollows, and, with the Fresno to smooth up behind, complete the subgrade. There are five men in the finishing gang, one on the roller, one grader man, two grade men and a foreman. The finishing is in direct charge of the contractor's engineer. who eliminates the use and inconvenience of final stakes by checking the grade with frequent level shots during the day, from a set-up about midway of a 1,000-ft. section. The procedure in detail is best explained by the specific operation illustrated by Figs. 3 and 4.

In a notebook, the engineer transcribes from the plans and computes the figures given in the first six columns of Fig. 3. Each 50-ft. section is divided into quarters, as indicated in column 1, and a simple computation then gives the rod readings opposite the quarter points. With these the engineer and a rodman proceed to check up a 50-ft. section.

Using a 12½-ft. rod, readings are taken in the order numbered on Fig. 4 and are noted as indicated by Fig. 3. In the case noted a 2 to 5-in. fill is required over the section except at one point, where a 1-in. cut is required, and another point, which is at grade. This is a Fresno scraper operation, the operator being directed by the engineer or a grademan from the engineer's notebook. With his level standing, the engineer rechecks the elevations as often as is needed, alternating between the tasks of reading level and directing the scraper and grader operations.

On this work the use of Fresno scrapers has proved unusually effective in reducing the normal finishing operations. In roughing out the grade, Fresnoes work as close as 1 in. without difficulty, the broad, flat edge permitting a planing cut to be made with great accuracy. On the fine finishing of sub-grade, a careful operator skins down humps and spreads the material into the hollows to almost theoretical perfection. Their quick

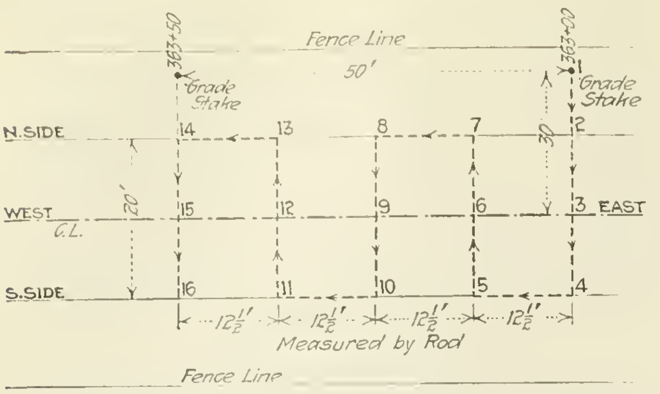


FIG. 4. SEQUENCE OF LEVEL READINGS IN CHECKING UP GRADE

dumping action and wide spreading discharge fit well into the operations of widening out the old road bed and making wide, flat fills.

Following the subgrading just ahead of the mixer is a form crew of three men. About 1,500 ft. of steel forms are used. They are set directly on the finished grade and require very little leveling up, owing to the accuracy with which the subgrade is finished.

Portable Mining Plant

Materials storage was the first operation of concreting. In fact it preceded in large part the grading. Broadly, the plan was, having the original macadam to give a hard track for motor trucks, to distribute the sand and gravel stock ahead of construction or virtually to store enough materials for the entire job as a preliminary operation before tearing up the old grade, and to put this stock in its final position for transfer direct to the mixer. This involved storage on the grade and therefore separate stockpiles so as to leave as much as possible of the old grade uncovered for the regrading operations. Stockpiles 500 ft. apart were estimated to afford about the relation between distance of wet haul, frequency of plant shifts and free space for grading operations that would be most economical. In placing the stockpiles, sand and cement were put on one side of the grade and gravel on the opposite side. Where the stockpiles came the roadbed was graded ahead of the regular grading operations when necessary.

Concreting is performed with a portable outfit comprising a charging crane, a mixing plant and a cement conveyor which are shifted to successive stock piles. The general arrangement is shown by the diagram Fig. 5. A platform on wheels travels on a track laid on the subgrade and carries a 15-cu.yd. charging bin for sand and gravel, a 1-cu.yd. mixer and engine, and a cement platform, measuring box and discharging hopper. The track, Fig. 6, on which the platform travels, consists of four twin sections of 30-lb. rail fastened to 3 x 12-in oak planks. The platform is just high enough to allow the trucks or carts for wet-batch haulage to be backed under the discharge hopper. This hopper holds something over a batch, so that the supply of mixed concrete for the carts is practically continuous. Aggregates are loaded into the platform bin by a full revolving crane on caterpillars and operating a ¾-cu.yd. clamshell. Cement is handled from stock to the platform by a belt conveyor on a frame with wheels.

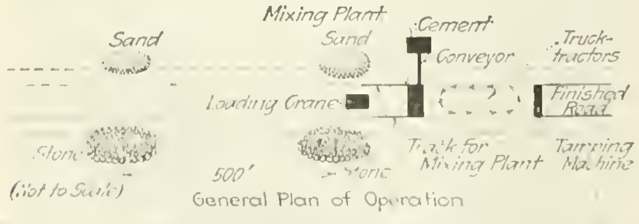


FIG. 5. GENERAL PLAN FOR LAYING CONCRETE PAVEMENT

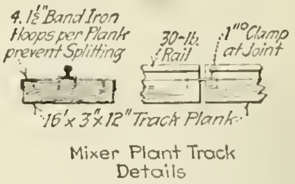

4-1½" Band Iron Hoops per Plank prevent Splitting
30-lb. Rail
1" Clamp at Joint
16' x 3" x 12" Track Plank
Mixer Plant Track Details

FIG. 6. DETAILS OF THE TRACK FOR PORTABLE MIXING PLANT

In shifting the plant, the crane travels by its own power, making the trips in about 10 min. The mixer outfit is hauled by the roller. With four men to take up and lay ahead the track sections, a shift requires about 30 min. A complete change of set-up requires about an hour. Including time of making the shift the plan of operations is to cover the distance between two stockpiles in a day's work.

Wet-Batch Haulage Improvements

Distribution of the concrete between mixer set-ups is a wet-batch haulage operation. At first ½-cu.yd. one-horse carts were used, six carts for five hours for long haul, and three carts for ten hours for short haul. With this outfit excessive time was consumed in backing the carts into place to receive and to discharge batches. Toward the end of the season, truck tractors were substituted for horse carts. Final improvements of the new haulage method had not been completed when cold weather stopped the concrete work, but the truck tractors had demonstrated the possibility of increasing the distance apart of stockpiles to 600 ft. and the high output to from 550 to 575 ft. of pavement a day.

The contractors for the Gray's Lake-Volo Road are Paschen Bros., Chicago, Ill. Walter M. DeBerard is engineer for the contractors in direct charge of field construction.

Salary Increase Arguments

In arguments for an increase of from 50 to 75 per cent in the salaries of the municipal engineers in St Paul, appearing in the *Bulletin* of the Affiliated Engineering Societies of Minnesota are the following statements:

> Not one man in a thousand is aware of the fact that the Department of Public Works actually earns from 50 to 100 per cent of its entire cost of administration. In the main, this money is earned, to wit: (1) Through force-account paving work; (2) through renting out of tools and equipment, when not needed by the department; (3) through profits on numerous paving repair and other repair jobs of all kinds executed by the department for all public utility companies, private firms, etc.; (4) through charging of certain fees, which fees are for services rendered by the department.
>
> On force-account paving work alone the saving to citizens in the last few years has amounted to about $100,000 as compared with the lowest bids received by contractors. What was saved on such work done by force account where no bids were asked for, or where no bids were received, can only be surmised and no definite proof can be furnished, but it is believed from the amount of work done and from the experience had on other work, at least another $100,000 was saved.

An Efficient Catalog File

By R. George Roesch
With Thompson & Binger, Inc., Engineers & Contractors,
Syracuse, N. Y.

A POINT that most people have failed to take seriously, is that the systematic filing of catalogs for ready reference requires the same, if not more, thought and care as correspondence in any modern office. The system outlined herein will take more time to start than the old haphazard way of indiscriminate filing and the continual use of an index, *but*, it will save all that time and more when it is used. While there are variations without number, the method is given here just as it is successfully used and it is to be noted that there is room for much expansion without changing it in any respect.

"Cap" size drawer cabinets are handiest, the number used depending entirely on the number of catalogs to be filed. A card index of all catalogs, listed both according to manufacturers and to products, is also kept for the convenience of the uniniated, but no index will be required by those who understand the system.

First: All catalogs are considered as falling into *three* general groups, as seen by the contractor; "Plant"; "Building Materials"; and "Mechanical Equipment."

Second: Each of these three groups are divided into as many sub-divisions as necessary (ten being used in the outline shown).

Third: Each sub-division is divided into sections, and each section is given over to catalogs illustrating the same articles of manufacture.

The method used to indicate these various sections is shown in the accompanying illustration: Consider the outline. "Plant" comprises a group known to contractors as equipment or materials needed and used in engineering and construction work but which do not become a part of the completed structure. To "plant" are assigned catalogs from numbers 1,000 to 2,000. Under "plant," for instance, we find "Excavating and Foundation Equipment" (the first used equipment, and the first sub-division), to which are assigned catalogs from numbers 1,100 to 1,200. "Excavating and Foun-

OUTLINE OF CATALOG FILING SYSTEM

PLANT—1,000 TO 2,000

Excavating and Foundation Equipment		1,100 to 1,200
Excavators	1,110 to 1,120	
Derricks and pile drivers	1,120 to 1,130	
Pumps and air compressors	1,130 to 1,140	
Cars and scrapers	1,140 to 1,150	
Loaders and unloaders	1,150 to 1,160	
Future sections	1,160 to 1,200	
Forms and Form Equipment		1,200 to 1,300
Column forms	1,210 to 1,220	
Tank forms	1,220 to 1,230	
Miscellaneous forms	1,230 to 1,240	
Form clamps	1,240 to 1,250	
Future sections	1,250 to 1,300	
Concrete Handling Equipment		1,300 to 1,400
Mixers	1,310 to 1,320	
Towers and spouting equipment	1,320 to 1,330	
Hoists	1,330 to 1,340	
Engines and boilers	1,340 to 1,350	
Bins and buckets	1,350 to 1,360	
Screens and gravel washers	1,360 to 1,370	
Future sections	1,370 to 1,400	
Small tools		1,400 to 1,500
Barrows and buggies	1,410 to 1,420	
Bar benders and cutters	1,420 to 1,430	
Saws and power tools	1,430 to 1,440	
Lights	1,440 to 1,450	
Finishing machines	1,450 to 1,460	
Painting machines	1,460 to 1,470	
Jacks and miscellaneous tools	1,470 to 1,480	
Specialties	1,480 to 1,490	
Future section	1,490 to 1,500	
Engineering Supplies		1,500 to 1,600
Instruments—Field and office	1,510 to 1,520	
Books	1,520 to 1,530	
Testing instruments	1,530 to 1,540	
Future sections	1,540 to 1,600	
Future Sub-Divisions		1,600 to 2,000

BUILDING MATERIAL— 2,000 TO 3,000

Concrete Work		2,100 to 2,200
Sheet piling and piles	2,110 to 2,120	
Waterproofing and damp-proofing	2,120 to 2,130	
Reinforcing systems	2,130 to 2,140	
Inserts and anchors	2,140 to 2,150	
Curb bars, etc	2,150 to 2,160	
Future sections	2,160 to 2,200	
Masonry Work		2,200 to 2,300
Brick	2,210 to 2,220	
Hollow tile	2,220 to 2,230	
Stone	2,230 to 2,240	
Cements and mortar ingredients	2,240 to 2,250	
Plasters and plaster boards	2,250 to 2,260	
Future sections	2,260 to 2,300	
Roofing and sheet metal work		2,300 to 2,400
Cement, slate and tile	2,310 to 2,320	
Prepared roofing	2,320 to 2,330	
Ventilators and skylights	2,330 to 2,340	
Coping and flashing blocks	2,340 to 2,350	
Future sections	2,350 to 2,400	
Flooring		2,400 to 2,500
Cement floors	2,410 to 2,420	
Hardeners	2,420 to 2,430	
Wood floors	2,430 to 2,440	
Tile floors	2,440 to 2,450	
Mastic floors	2,450 to 2,460	
Composition floors	2,460 to 2,470	
Future sections	2,470 to 2,500	
Sash and Doors		2,500 to 2,600
Hollow metal and metal covered sash	2,510 to 2,520	
Steel sash	2,520 to 2,530	
Sash operators	4,530 to 2,540	
Glass and glazing	2,540 to 2,550	
Hollow metal and metal covered doors	2,550 to 2,560	
Rolling shutters	2,560 to 2,570	
Finish hardware	2,570 to 2,580	
Store fronts	2,580 to 2,590	
Weather strips, etc	2,590 to 2,600	
Screens and screening material	2,590.0 to 2,590.10	
Miscellaneous Iron and Steel		2,600 to 2,700
Stairs and fire escapes	2,610 to 2,620	
Grilles and gratings	2,620 to 2,630	
Iron covers, doors and frames	2,630 to 2,640	
Partitions and fences	2,640 to 2,650	
Steel buildings	2,650 to 2,660	
Structural steel	2,660 to 4,670	
Masons' specialties	2,670 to 2,680	
Future sections	2,680 to 2,700	
Decorative Materials		2,700 to 2,800
Paints, stains and varnishes	2,710 to 2,720	
Ornamental tile	2,720 to 2,730	
Architectural terra cotta	2,730 to 2,740	
Bronze tablets	2,740 to 2,750	
Wrought iron work	2,750 to 2,760	
Future sections	2,760 to 2,800	
Future Sub-Divisions		2,800 to 3,000

MECHANICAL EQUIPMENT—3,000 TO 4,000

Sanitary Equipment		3,100 to 3,200
Pipe and fittings	3,110 to 3,120	
Plumbing fixtures and drains	3,120 to 3,130	
Sewage disposal equipment	3,130 to 3,140	
Water supply systems	3,140 to 3,150	
Future sections	3,150 to 3,200	
Heating and Ventilating Equipment		3,200 to 3,300
Pipe and fittings	3,210 to 3,220	
Boilers and radiation	3,220 to 3,230	
Ventilating and air conditioning equipment	3,230 to 3,240	
Heat regulating equipment	3,240 to 3,250	
Future sections	3,250 to 3,300	
Electrical Equipment		3,300 to 3,400
Wiring materials	3,310 to 3,320	
Lighting fixtures	3,320 to 3,330	
Clock systems	3,330 to 3,340	
Motors	3,340 to 3,350	
Future sections	3,350 to 3,400	
Elevating and Conveying Equipment		3,400 to 3,500
Elevators	3,410 to 3,420	
Elevator appliances	3,420 to 3,430	
Mechanical conveyors and hoists	3,430 to 3,440	
Bucket conveyors	3,440 to 3,450	
Gravity conveyors and chutes	3,450 to 3,460	
Cableways	3,460 to 3,470	
Future sections	3,470 to 3,500	
Power Plant Equipment		3,500 to 3,600
Boiler equipment and boilers	3,510 to 3,520	
Chimneys	3,520 to 3,530	
Oil and gas burning equipment	3,530 to 3,540	
Coal handling equipment	3,540 to 3,550	
Ash conveyors	3,550 to 3,560	
Power transmission	3,560 to 3,570	
Future sections	3,570 to 3,600	
Oil Handling Equipment		3,600 to 3,700
Oil well equipment	3,610 to 3,620	
Oil meters and measuring devices	3,620 to 3,630	
Gas and oil tanks and pumps	3,630 to 3,640	
Oil filters	3,640 to 3,650	
Future sections	3,650 to 3,700	
Warehouse and Storage Equipment		3,700 to 3,800
Refrigerating apparatus	3,710 to 3,720	
Insulation materials	3,720 to 3,730	
Rug cleaning equipment	3,730 to 3,740	
Hand and power trucks	3,740 to 3,750	
Piling and stacking machines	3,750 to 3,760	
Future sections	3,760 to 3,800	
Miscellaneous Equipment		3,800 to 3,900
Sprinklers and sprinkler equipment	3,810 to 3,820	
Vacuum cleaners	3,820 to 3,830	
Foundry equipment	3,830 to 3,840	
Fire fighting apparatus	3,840 to 3,850	
Awnings, shades, etc	3,850 to 3,860	
Future sections	3,860 to 3,900	
Future Sub-Division		3,900 to 4,000

dation Equipment" is comprised of its appropriate sections, the first being "Excavators," catalog numbers 1,110 to 1,120.

Thus, to find a catalog on "Erie" excavators, it is recognized immediately that it will be found in the section given over to "Excavators," sub-division "Excavating and Foundation Equipment," and that portion of the file carrying catalog on "Plant."

The same principle holds true throughout and familiarity with the general scheme means, no time lost in referring to an index. Expansion can be carried to any desired limit by the simple expedient of carrying the catalog numbers into decimals.

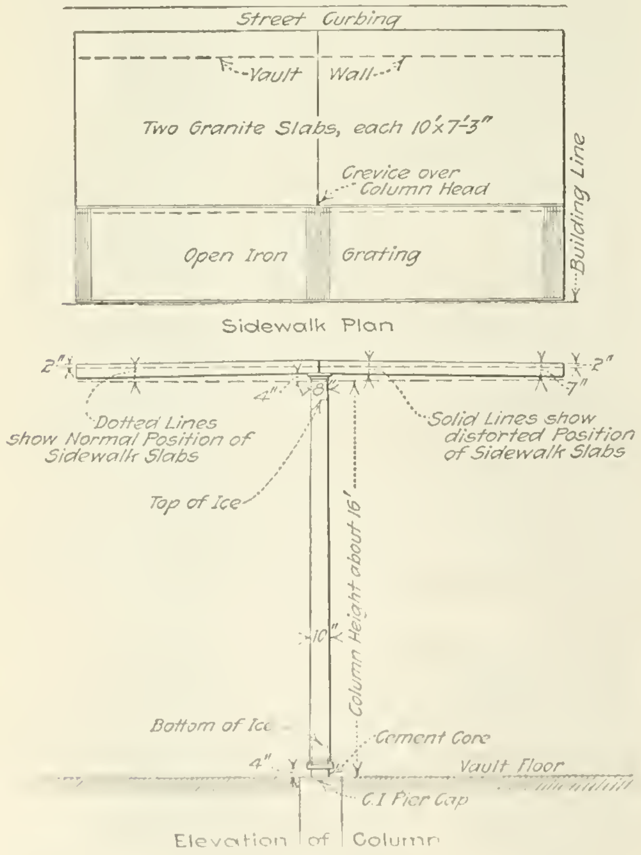
Ice Inside Cast-Iron Column Raises Floor

By Charles Balderston

Architect, Philadelphia, Pa.

During the past winter the writer had called to his attention a case of ice formation inside a cast-iron column which resulted in lifting the column several inches off its base and pushing up a heavy granite sidewalk a like distance.

The column is located in a vault under a sidewalk and carries the inner sides of two 10 x 7-ft. granite slabs about 7 in. thick. There is a joint between the slabs in line with center of the column head, and water had trickled in this joint at a point directly over the column where the cement had dropped out. The column has no cap nor integral base plate, but rests upon a cast-iron pier cap on the masonry foundation. The bottom of the column has a core of concrete about 15 in. high, making a water seal. Extending the entire front of the building, there is an open iron grating, about 4 ft. in width, the outer edge of this grating being carried on the inner edge of the granite slabs. Consequently the vault under the sidewalk is exposed to the outside temperature.



CAST-IRON COLUMN WHICH FILLED WITH ICE

When the writer saw the column it had been lifted 4 in. above the iron pier cap and the superimposed work had been correspondingly lifted. Exploration with an auger through the crevice between the granite slabs over the column head proved the presence of the ice. This was removed by drilling a hole just above top of cement core and then heating the column. With this relief the column and sidewalk gradually settled down to normal positions. After this the granite was jacked up a little and a lead capping was put on the column; there was no easy way to pour in concrete for filling the column to its top, or that would have been the alternative treatment. It should be remarked that the column has an entasis, being 10 in. diameter at bottom and about 8 in. at top, which doubtless contributed to lifting power of the ice.

A 900-In. Rain Gage on a Peak of Kauai

What appears to be the largest rain gage in existence has recently been installed in one of the Hawaiian Islands. John C. Hoyt, Chief, Division of Surface Waters, United States Geological Survey, has written to *Engineering News-Record* regarding this gage as follows:

"I have just returned from the Hawaiian Islands and while there visited the general location of this gage, which is on Mount Waialeale, a peak on the Island of Kauai. As stated on p. 303 of the *Monthly Weather Review* for May, 199, there is probably no place in the world where there is a greater rainfall than at this point. The new gage, which was recently installed by the Water Resources Branch of the United States Geological Survey in co-operation with the Public Lands Department, T. H., has a capacity of 900 in. and consists of a copper receptacle of sufficient size to hold that amount of water falling on an opening of 6 in. in diameter. The gage, which was previously located at this point, had a capacity of 500 in. and was not sufficient to take care of a year's rainfall. On account of the difficulty in visiting the gage only one or two visits can be made to it a year. It is specially interesting to know that within 15 miles of this point the rainfall is less than 20 in. This extreme variation is a common characteristic of change in climatic conditions in various parts of the Hawaiian Islands."

Meters and Low Water Consumption

St. Paul, Minn., has 97.6 per cent of its domestic and industrial water consumption metered, but as many commercial users are not metered the percentage of total consumption that passes through meters is only 62.8 per cent. The daily consumption is 63 gal. per inhabitant, 76.4 gal. for each person supplied and 424 gal. per tap. The cost of supplying water per million gallons, figured on maintenance, is $40.01. Adding bond interest and sinking fund the cost is $70.83. The St. Paul waterworks supplies only 60 per cent of the total water used within the area served, the remainder of the supply, mostly large consumers, being from artesian wells owned by the consumers.

Precast Concrete Slabs for Small Irrigation Structures

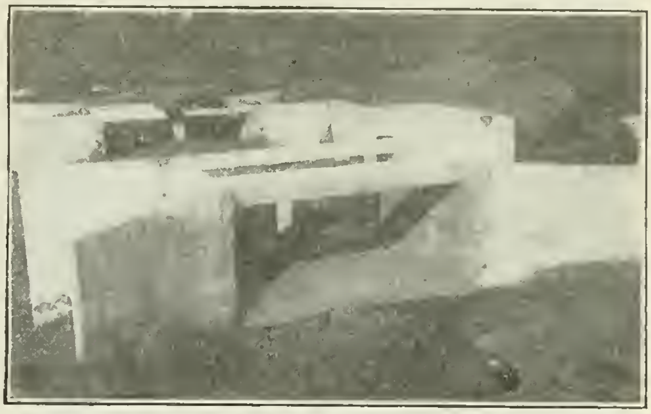
"Concrete Lumber" Being Used on Several California Districts Has Many Advantages Over Redwood—Cost Is About the Same

By Roger W. Olmsted
San Francisco, Cal.

REINFORCED concrete precast in thin slabs and popularly known as "concrete lumber" is now being used for constructing gates, checks, drops, etc., in several irrigation districts in California. The South San Joaquin Irrigation District has begun the replacement of about 3,000 irrigation structures with precast slabs and at current prices their cost is about the same as it would be for redwood which is ordinarily used. The idea was developed in this district, but a commercial organization has recently been formed to contract for making the slabs on other districts. Control of the system is retained by means of patent covering the design of the joints.

Despite the name "concrete lumber" no nails or bolts are used in the assembly of the structures. The bond between slabs is obtained by beveled lugs on ends and sides which fit into corresponding recesses in the adjoining labs. Beams are used as spreaders. The structures are designed so that joints between slabs will come where the bending moment is least, thus requiring the lugs to resist shear only. The ordinary joints will not resist tension, although one form of dovetailed tension joint has been used successfully where tensions between slabs could not otherwise be taken care of. The shape of the lugs and the location of the reinforcing steel within has been worked out, by calculation and test, so as to develop the maximum strength at the joints.

The structures on the South San Joaquin Irrigation District which are now being replaced with concrete lumber are to handle from 20 to 45 sec.-ft. and have net openings ranging from 2½ x 6 ft. to 3 x 12 ft. The wooden service gates contain 600 ft. board measure and the check gates 925 ft. board measure, No. 1 common redwood. These wooden structures were built early in 1914 and after six years of use many require replacement on account of decay. The new concrete slab gates are of approximately the same dimensions, having a total surface area of between 220 and 300 sq.ft.

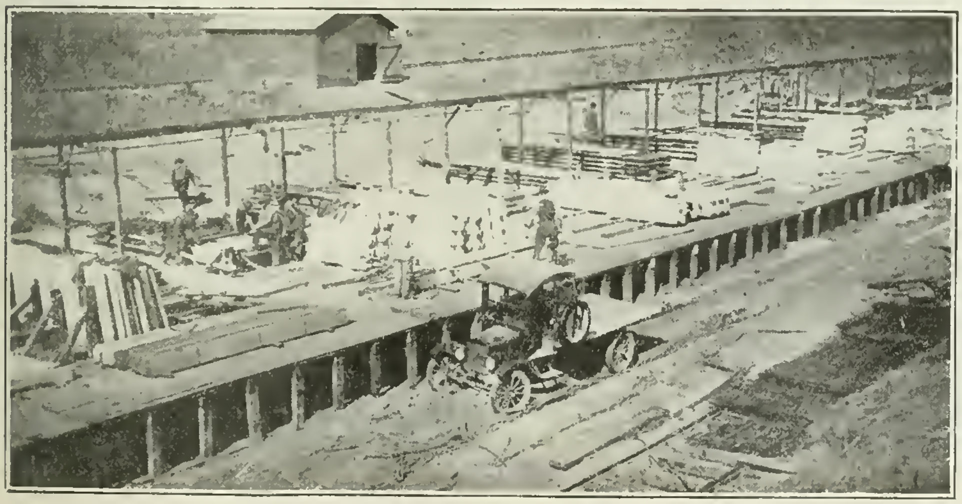

TYPE OF IRRIGATION STRUCTURE BUILT OF CONCRETE LUMBER

To make the slabs for these structures, the district established a casting yard in a gravel pit at a convenient location where there was an amply supply of very clean and well-graded sand in bank formation carrying sufficient rock up to 1 in. in diameter to make good concrete. The yard is served by a railroad spur and is so laid out that the casting platform is at a lower level than the railroad track and the gravel supply. The motor trucks which carry away the slabs load on a depressed roadway so that the truck bed and casting platform are on the same level. The platform is 50 x 100 ft. in plan and has an overhead crane rail for its entire length on which a chain block is used for handling forms and slabs.

It was found that the requirements of the district could be met by four standard types of structures. Slabs of various sizes and shapes were required but it was found possible to standardize certain features, for example, all slabs are made 2 in. thick and the spacing of the lugs is uniformly 6 in. The two largest sizes of slabs are 2 x 8 ft. and 4 x 6 ft. respectively.

The lugs are all 6 in. long by 2½ in. wide. The beveled face is 22½ deg. from the line normal to the plane of the slab. At first a 45-deg. slope was used, but after some experiences with the slabs this was decreased to 22½ deg. It is now thought that this is not sufficient, and a series of laboratory tests are to be carried out to determine the best slope and also the most advantageous position of reinforcing. At present the reinforcing for the lugs is bent by hand around some conveniently arranged bolts in a wooden form built up for the purpose. The lug reinforcing wires are only long enough to go once around the outer edge of the lug for which they are made and to leave two ends long enough to give a bond in the concrete of the slab itself.

The concrete is poured onto 5 x 20-ft. trays, built up of 2 x 12-in. surfaced lumber and well oiled. The various sizes and shapes of slabs are outlined on these trays with 2 x 2-in. strips. The trays are stacked five high with reinforcing in place and a sixth tray is arranged ready for


CASTING PLATFORM FOR CONCRETE LUMBER

FILLING THE TRAY FORMS AS THEY ARE STACKED

pouring on the platform beside the stack. Thus, when this tray on the platform has been poured, another tray can be quickly set on top of it from the stack that stands waiting and the concrete can be poured practically continuously.

The first reinforcing used was 3 x 16-in. galvanized mesh of No. 6 and No. 10 wire, respectively. This was found to be insufficient to take care of handling stresses, particularly in the wide slabs. The reinforcing was therefore changed to a 6 x 6-in. mesh, all of No. 6 wire. This, with a light top reinforcing, was found to be sufficient to take care of the working strains as well as those ordinarily developed in handling. The handling stresses are often very severe and slabs are occasionally cracked, but it is thought better economy to lose an occasional slab than to attempt double reinforcing on all slabs.

The forms are designed so that the slab is cast with the finished face downward. The reinforcing rests on the bottom of the tray but is worked upward immediately after pouring just enough so that the reinforcing will not show through the face of the concrete. The cracks due to stresses incurred in handling are usually on the compression side of the slab and very often these in no wise destroy the value of the slab. Some which were cracked in this way were used just as originally intended and are giving satisfactory service.

The crew in the casting yard consists of seven men for an output of 20 gates per week. Each gate contains from 17 to 20 pieces, in the latter case there are 16 slabs, 2 beams and 2 center posts. A motor truck with driver and one helper for loading and unloading delivers from casting yard to the point of installation an average of three structures per day where the haul does not exceed six miles.

HORIZONTAL JOINTS IN VERTICAL SLAB WALLS

The erection crew consisting of four men is ordinarily able to make excavation for and erect two structures per day. A few structures have been erected by two men, but this requires the exercise of some ingenuity as it is necessary to handle slabs weighing 600 lb. The wedge fit on the lugs brings the joints together tightly so that but little grout is required to take up the play and make the structure water-tight. Wooden groove boards are bolted to the face of the structure to receive the removable wooden flash boards.

Of the 120 structures that have thus far been set, three were partially washed out, due to careless backfilling. However, this did not damage the individual slabs in any way and they were simply reset, re-joined and the structure rebuilt exactly as it was before except that the back-fills were properly puddled in place. This illustrates an advantage which the precast slab structure has over the monolithic type.

In the Cordua Irrigation District a casting yard was laid out and slabs were poured before any of the ditch excavation was begun, thus the structures were completed and in the field before the earthwork was finished. A total of 105 structures averaging about 160 sq.ft. of surface area each were cast in sixty working days, including organization and the laying out of the casting yard. The majority of these structures were delivered along the ditches before the last of the casting had been completed.

GROUTING A VERTICAL JOINT IN CONCRETE LUMBER STRUCTURE

The saving in cost of the precast gate over the cost of monolithic structures varies from 25 to 40 per cent, depending on the number of structures and local conditions. In the South San Joaquin Irrigation District the service gates containing 220 sq.ft. of surface area are installed complete for approximately $75 and the check structures containing 280 sq.ft. for $95, all lumber included. Reduced to a yardage basis, this is equivalent to concrete at $50 per cu.yd. The amount of concrete per slab gate is only from one-third to one-half that of the monolithic structure.

Facts on Federal-Aid Road Work

IN THE examination of witnesses appearing before the Senate Committee on Post Offices and Post Roads in connection with the hearings upon the several highway bills which have been presented to Congress, some illuminating data were incorporated in the testimony of M. O. Eldridge, for many years with the Bureau of Public Roads and now director of road activities for the American Automobile Association. In his studies as to the use to which the various states put Federal-aid funds, Mr. Eldridge finds that 34 states are using Federal aid for exclusive use upon state systems and 14 are not. Twenty states apply their Federal-aid money to durable types of construction and 17 do not. Nine other states use most of their Federal-aid funds for durable paving. Only 17 states apply Federal-aid allotments exclusively to designated state systems and to durable types of construction. These states are Arkansas, Illinois, Indiana, Kansas, Maine, Maryland, Michigan, Montana, New Hampshire, New Jersey, New York, Ohio, Oklahoma, Pennsylvania, Rhode Island, Vermont, and Washington.

The following table shows the average cost per mile, by types, of Federal-aid projects executed to date, as reported by Mr. Eldridge:

AVERAGE COST, BY TYPES, OF FEDERAL-AID PROJECTS EXECUTED DURING FISCAL YEARS 1917, 1918 AND 1919, AND FIRST QUARTER 1920

Type	Mileage Approved	Per Cent of Total	Total Cost	Average Cost per Mile
Earth	2,003.61	26.7	$8,662,794.52	$4,324
Sand-clay	670.41	8.9	2,840,147.90	4,236
Gravel	2,112.20	28.1	13,717,562.96	6,494
Macadam	190.48	2.5	2,281,917.24	11,980
Macadam, mat top	170.08	2.2	1,275,712.95	7,501
Bituminous macadam	192.42	2.6	4,593,953.27	23,875
Bituminous concrete	141.79	1.9	3,530,686.46	24,901
Concrete	925.58	12.3	29,757,483.78	32,150
Brick	110.12	1.5	4,731,227.11	42,964
Miscellaneous	37.79	0.5	189,614.53	5,108
Undetermined	963.65	12.8	13,362,947.15	15,942
Total	7,518.13	...	$84,035,045.00	.....

Of the miles of Federal-aid projects approved to Sept. 30, 1919, 4,877 mi., or 66 per cent, of the total (7,518 mi.), are roads of the less durable types, namely, earth, sand-clay, gravel, and macadam, suitable for light traffic only. These roads will cost $27,502,421, which is about 33 per cent of the total ($84,035,045) cost of projects executed to the end of the first quarter, 1920.

STATES USING FEDERAL AID ON THE LESS DURABLE TYPES

	Earth, Per Cent	Gravel, Per Cent	Sand-clay, Per Cent	Total, Per Cent
Alabama	....	34.6	58.1	92.7
Florida	...	....	61	61
Georgia	6	....	91	97
Idaho	90.1	9.1	....	100
Iowa	66	21.5	....	87.5
Louisiana	2.1	95.5	....	97.6
Minnesota	16	76	....	92
Mississippi	18	79	....	97
Missouri	...	73	....	73
Montana	....	100	....	100
Nebraska	76	4	1	81
Nevada	29	58	....	87
North Carolina	18	8	45	71
North Dakota	84	10	1	95
South Carolina	4	3	47	54
South Dakota	25	75	....	100
Utah	52	.	...	52
Wyoming	47.6	31.1	....	78.7

The distribution, by states, of less durable types built by Federal-aid is given in the above table.

Springfield Relief Sewers: A Correction

By a typographical error the estimates for the cost of relief sewers at Springfield, Mass., printed on p. 1055 of our issue of May 27, were given as based on 1909 instead of 1919 prices.

Notes from Foreign Fields

LONDON AFTER FOUR DAYS

BY

E. J. Mehren

EDITOR, ENGINEERING NEWS-RECORD

IT takes a brave man, indeed, to attempt to write impressions of such a city as London after an acquaintance of only four days. Still, one does have impressions which, with suitable reservations, may be of interest, if not of value.

Of one thing I can already speak positively: I had been warned that one could not do business as speedily here as in the States, and that our English friends would probably be uncommunicative—difficult to "draw out." My experience has been quite the contrary. There has been rare courtesy—of a kind that we are largely strangers to; there has been the utmost frankness; there has been a desire to expedite appointments due to an evident appreciation that a man from overseas is limited as to time. Everyone to whom I have gone, with or without letters of introduction, has done his utmost to help.

Much to my surprise, London does not impress me as a foreign or a strange city. It reminds me of Boston. I have found two Americans and two Englishmen who have been similarly impressed. The resemblance lies not merely in the buildings and in the narrowness and crookedness of the streets, but in the atmosphere of the two cities as well. Arthur J. Martin, the well-known sanitary engineer who, with Dr. Soper and Mr. Watson, of Birmingham, England, reported on the Chicago sewerage problem some years ago, said to me yesterday that he did not feel at home in America until he went to Boston. He longed for a crooked street while in New York, but was able to find only partial relief by walking along the sinusoidal paths of Riverside Drive.

So far, two engineering features have impressed me particularly in London: the pavements and the buses. I have seen only the pavements in the business section of London, in the "City" and in Westminster. They are in very good condition, despite the fact that they carry a dense traffic, with a large proportion of heavy vehicles. Without having traffic counts before me I should hazard the statement that the truck and bus loads represent a larger volume of really heavy traffic than we have in any of our cities. In spots Detroit and Cleveland may have heavier average loads, but here heavy loads are found everywhere. The steam lorries, too, generally pull one trailer. The double-deck motor buses are heavy affairs and travel, except in severe congestion, between 15 and 20 miles per hour.

The other feature that has impressed me so strongly is the motor bus transportation. Buses run everywhere, some runs, I am told, being as long as 25 miles. They seem to furnish a satisfactory mode of transportation for relatively short runs. Despite the rise in all costs here, the minimum charge for bus rides is only one penny, or 2 cents in our money. That is true of the "Underground" as well. All fares are on the zone system, the rates running one penny per mile. At this rate, however, both the buses and the Underground, so a disinterested authority tells me, are losing money. Efforts are being made by the utility company to secure an increase of rates. The municipal tramways, owned and operated by the London County Council, are likewise losing money; that is, they are earning operating expenses and interest, but will this year probably not be able to put the proper amount into their sinking fund.

In the field of construction, conditions resemble those in the States. Indeed, my first impression is that conditions are actually worse here. Wages and materials are at abnormal levels, and have prevented the extensive resumption of construction. There is no large amount of railroad or public work under way, except housing. In the latter field there are tremendous schemes, regarding which I propose to write later. Private work, too, is discouraged by the high prices, and is now still further subject to curtailment by the power of the Ministry of Health to prevent "luxury" construction. This restrictive power has already been commented on in *Engineering News-Record.*

It is evident that labor here is entirely out of hand. The leaders have lost control over the men; radical counsel prevails. Restriction of output, of which many examples have been given me, is evidently worse than it is in the States. Prices continue to rise, and here as well as at home there is a feeling that a crash is bound to come.

London, May 8, 1920

ENGINEERS IN WESTMINSTER ABBEY

Until yesterday I did not know that there was in Westminster Abbey a well-defined location for the tombs and monuments of scientists and engineers. We all know of Poets' Corner and of the Royal Chapels which contain the bones of many of England's kings and queens, but the engineers' and scientists' corner (an inadequate description for one spot in the quiet nave and in the north aisle) has not been celebrated in the descriptions of the Abbey that have come to my hand. Consequently I was the happier at the discovery.

Against the screen of the choir stalls, looking into the nave, is the monument of Sir Isaac Newton, while directly in front, well out in the center of the nave, are the tombs, under the pavement, of Telford and George Stephenson, Telford's marked by one of the small square pavement stones cut with his name and Stephenson's by a full length floor panel—a work of art in bronze. A statue of Telford stands elsewhere in the Abbey. What a fitting home for the long sleep of these master engineers! Above them springs the wonderful Gothic nave, airy in its lightness, yet built of stone—a sight such as I have never seen. The master builders of a later age lie asleep beneath the work of the master builders of all time, masters who outrivalled those of ancient Egypt, or Greece or Rome—the Gothic cathedral builders of the Thirteenth Century. Egypt built great temples and mighty pyramids; so did Greece and Rome. But structurally the forms were simple. With the high-flung naves and crossings and choirs of the Middle Ages came engineering problems of no mean order. Yet so well were the principles understood that wonderful grace and appearance of lightness were secured. Today, with all our advances, we do nothing to equal their master works.

But to return to the engineers in Westminster: By the side of Newton, directly in front of the Newton monument, lies the body of the late Lord Kelvin, while 20 ft. to the north, in the aisle, lie, side by side, the bodies of Herschel, the astronomer, and of Charles Darwin. Above these vaults, casting on them a light mellowed by the art of the stained-glass worker, are a memorial window to Sir Benjamin Baker, the inscription recording two of his great works—the Forth Bridge and the Assuan Dam—and another to Lord Kelvin, "Engineer and Natural Philosopher," as the inscription has it. In this same north aisle are memorial windows, also, to Stephenson, Joseph Locke, designer of the Crewe engine; Brunel, Trevithick, and Charles William Siemens.

The Siemens window looks down on a group of tablets to scientists—to Lister, the physician; Darwin, Hooker, the botanist; Adams, the astronomer, and Joule, the physicist. The Joule tablet bears this inscription: "This tablet is here placed near the graves of Newton, Herschel and Darwin by those who in many lands have united to perpetuate the memory of James Prescott Joule, F.R.S., of Manchester, in recognition of services rendered to science in establishing the law of the conservation of energy and determining the mechanical equivalent of heat."

In the central part of the nave and the north aisle are buried other great men with kinship to engineers. We find the tomb of Sir Charles Lyall, the geologist. It is covered by a brass-lettered slab bearing this tribute: "Throughout a long life he sought the means of deciphering the fragmentary records of the earth's history, in the patient investigation of the present order of nature, enlarging the present boundaries of knowledge and leaving on scientific thought an enduring influence." Out in the center of the nave, near the graves of Telford and Stephenson, are four graves placed with singular appropriateness under this great nave—mortal remains of four architects who played an important part in the revival of Gothic architecture. They are Sir Charles Barry, architect of the Houses of Parliament; Sir George Gilbert Scott, George Edmund Street and John Loughborough Pearson.

As I turned to leave this part of the Abbey, after musing there an hour, I chanced to walk over the Telford inscription and my eye caught on the slab at Telford's feet the name of Livingstone—David Livingstone, the African explorer—and the thought struck me that he was in kindred company. He explored an unknown country; he extended the bounds of knowledge regarding a section of the earth's surface. So did Telford and Stephenson and Lyall explore the unknown; so did they, and their great fellow engineers and scientists about them, extend the bounds of knowledge. They, no less than he, were explorers of a dark continent and have placed humanity under tribute for all time.

London, May 9, 1920.

City Zoning at Dallas, Texas

Work is being done preliminary to the establishment of a zoning system for Dallas, Tex. Much of the information necessary for use in dividing the city into industrial and residential districts has been gathered. Robert H. Whitten, city plan consultant, Cleveland, Ohio, has been retained to assist in the work.

Henderson Liftable Bridge Plan for Pittsburgh

Proposed for Rebuilding of Sixth, Seventh, and Ninth Street Bridges—Large Saving in Approach Grades

AN ORDER of the War Department requires the Allegheny River bridges at Pittsburgh to be altered or reconstructed to give a clearance height of 33 ft. above flood level (the latter taken as 14 ft. above pool level). Under this order, which also prescribes certain span lengths, as noted in *Engineering News* of March 29, 1917, p. 533, plans are now being prepared for the rebuilding of the bridges at 16th St. (destroyed by fire some months ago) and 43d St. Following this work, the large downtown bridges at 6th, 7th, and 9th Sts. must be rebuilt, the last to be started within little more than a year from the present time. In view of the serious inconveniences resulting from the necessity for providing long approach grades to suit the greatly increased elevation of the bridges under the War Department order, the planning of the downtown bridges constitutes a difficult problem. A wholly new solution is suggested in a proposal recently made by A. A. Henderson, assistant county engineer of Allegheny County. He proposes that the river spans be arranged so that they can be adjusted in vertical position to suit the water stage, being kept ordinarily at proper clearance height above pool level, and raised in flood time to maintain the clearance. Apart from the novelty of the proposal, its service value entitles it to attention. Long approach grades would be done away with, as the approaches would be adjusted to the low-water position of the bridge. During high water the gradients would be steeper, but traffic would not be materially inconvenienced because the condition would be maintained for only a short time.

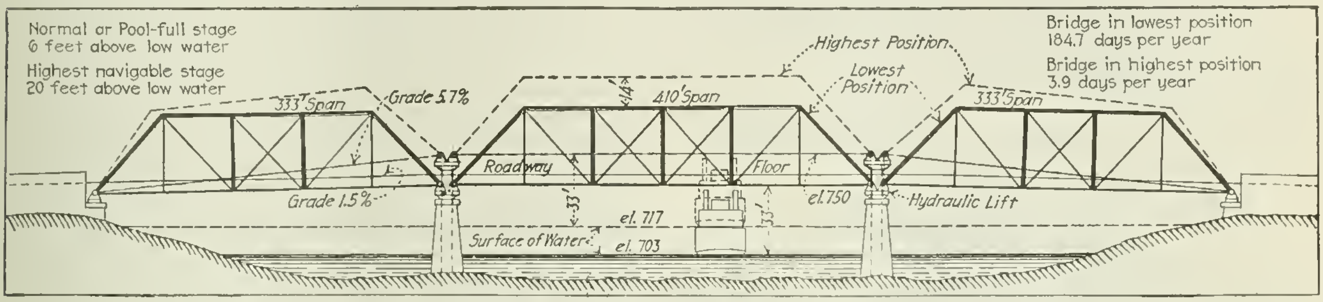


FIG. 1. DIAGRAM OF HENDERSON LIFTABLE SPAN ARRANGEMENT PROPOSED FOR ALLEGHENY RIVER BRIDGES; SPANS FOR SIXTH STREET LOCATION

(Elevation 703 is normal water level or pool-full stage, which is 6 ft. above low water)

A diagrammatic sketch of the proposed arrangement is shown in Fig. 1 herewith. The structural and mechanical nature of the proposed arrangement will be sufficiently evident from the sketch to require no further explanation. It should be borne in mind that the raising of the structure, while involving very great weight, would need to proceed at only an extremely slow rate, and in any event would be an infrequent operation, so that the type and construction of the raising machinery would be likely to differ fundamentally from that applied to ordinary lift bridges.

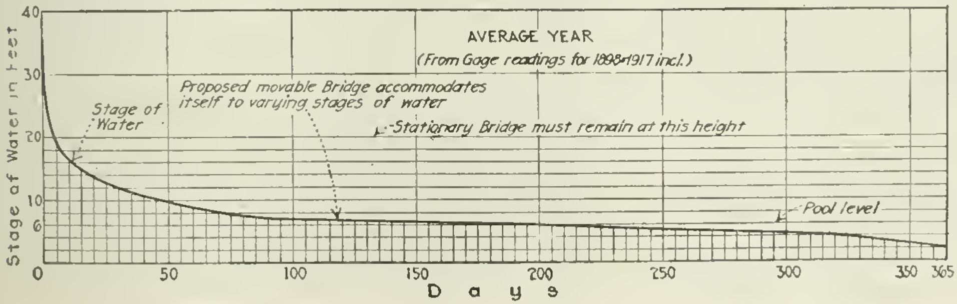


FIG. 2. AVERAGE DURATION OF WATER STAGES, PITTSBURGH HARBOR

Mr. Henderson says: "The hydraulic lift, though possibly not the cheapest method, will apparently be the most effective and satisfactory. Other means may be employed if desired." And concerning the necessity for providing attendants to operate the machinery, he remarks: "The necessity for employing operators for a movable bridge should not be considered as introducing a new feature in the maintenance of the bridges. At present the bridges are under constant supervision of persons employed for that special purpose, and this practice will doubtless be continued in respect to the new bridges, regardless of the type erected. By judicious selection and a proper assignment of duties, the attendants can, without large increase of number, be rendered able to handle the operation of the lift."

In the curve plot Fig. 2, prepared by Mr. Henderson, is represented the condition as to variation of water height in the Allegheny River. From this it is clearly apparent that if the permanent position of the bridges must be fixed to suit the 20-ft. stage, traffic will have to overcome a useless rise and fall averaging 28 ft. If, as was agreed by the city and county authorities in discussions of the subject several years ago, the approach grade should be not steeper than 3 per cent, the 14-ft. difference in elevation involves extra approach lengths of several hundred feet each on either side of the Allegheny river.

Centrifuge Tests at Milwaukee Sewage Station

A Te Meer centrifuge is to be installed at the Milwaukee sewage testing station for the purpose of demonstrating its capacity for dewatering activated sludge. The machine is an improvement of the Schaeffer Te Meer centrifuge and is a new type of the machine now being used at Hanover and Frankfort, Germany. It is expected that the Barth Manufacturing Co., New York City, will deliver the new machine at Milwaukee in August. T. Chalkley Hatton is chief engineer, Metropolitan Sewerage Commission.

LETTERS TO THE EDITOR

Shenehon for Joint Commission

Sir—In regard to item in your issue of May 27th under the heading, "Urge Appointment of Shenehon," I wish to say that the movement to have Francis C. Shenehon of Minneapolis appointed on the International Joint Commission was inaugurated by the Minnesota Joint Engineering Board. They secured the endorsement of Mr. Shenehon by the Minneapolis Civic and Commerce Association and by the St. Paul Association of Public and Business Affairs. They also secured a strong editorial favoring the appointment in the Minneapolis papers and a very favorable endorsement editorially by the St. Paul papers.

The Board's efforts at Washington were taken up through the Engineering Council and its Washington office, and later through their Senators and Representatives. Endorsements of the business associations being sent direct to Secretary Tumulty.

St. Paul GEORGE H. HERROLD,
Secretary-Treasurer, Minnesota Joint Engineering Board.

Progress of the Co-operative System of Engineering Education

Sir—In *Engineering News-Record* of April 8, p. 698, you had two editorial notes entitled "Progress of the Co-operative System" and "Stubborn Criticism." I agree with you most heartily in your endorsement of the co-operative principle in engineering education.

I first encountered co-operative students from the University of Cincinnati in the great Miami Valley immediately following the 1913 flood. Two of these young men were working in a bridge gang. They were "putting in" the same number of hours, eating the same food, in short, experiencing the same living conditions as did the rest of the bridge gang. I have also seen these "co-ops" at work as inspectors, rodmen, chainmen and instrument men—as tracers, draftsmen and designers. In general, as "co-ops" they are good inside or outside men. I have seen a very high grade of design work carried to a successful conclusion by some of the more brilliant of these co-operative students. It is not exceptional that a pair of these "co-ops" receive as high as $150 to $200 a month for their services.

One of the best features of the system is that the average graduate is not only able to put himself through a five-year course without any debt, but he has about $200 savings in his pocket when he graduates. The University of Cincinnati has graduated a number of young engineers who put themselves through solely by their own earnings—young men who were sons of parents amply able to meet all expenses of the course. These young men were just as proud of having earned their own way through as were the young men who had no backing from home and were forced to earn their own education or never have it. Practical ability to solve the engineering problems in an accurate and expeditious style is chief among the assets of a young "co-op" graduate. Their theoretical education has been strengthened materially because they have been able to see just where the theory fitted into the practice.

Upon graduation, the co-operative student has a definite practical value in the industrial market. His references are not confined to those from college professors vouching for his theoretical ability. He can show letters from the heads of industrial or engineering concerns. Those who have come in contact with the system and have given it a fair trial recognize that practically all young engineers who are the products of it become assets immediately upon graduation.

The system weeds out the young man who is not fitted for any kind of engineering, and it retains both the theoretical and practical student. There is not an engineering school in the country that has not made numerous mistakes in dismissing from its courses young men who are essentially practical engineers. The co-operative system discovers this young engineer and puts his practical ability on an equal plane with theoretical ability.

Certain conditions are absolutely essential to the carrying on of this type of course. Peculiarly gifted personalities must be at the head of each co-operative department. These men must be able to meet, converse and co-operate intelligently with men of large business acumen. The educational institution proposing to start this system must have an industrial or engineering center nearby, otherwise students will not be able to acquire the practical end of engineering without excessive expense, due to transportation or living costs. It is necessary to have the co-operation of business concerns lying in the immediate vicinity of the school proposing this course.

There are a number of possible applications of this system which are interesting to observe. We are face to face today with a labor shortage. Statistics prove that we probably cannot count on immigration to solve this problem for us. The common laborer of today is insisting that his son shall not be the common laborer of tomorrow. This means that unless some scheme is devised we will gradually have fewer and fewer men willing to perform the more common tasks. Among the trades we find that the apprentice system is almost a thing of the past. The co-operative scheme can, I believe, go a long way toward filling these two gaps in industrial life. In other words, the scheme can be applied not only in the engineering field but to practically all other professional and trade fields. High schools are trying the scheme for some of their more purely industrial courses such as printing, woodturning and engraving. Industrial and business courses also have been started.

F. H. PLAISTED,
Office Engineer, C. C. C. & St. L. R.R.
Cincinnati, Ohio.

Insufficient Theory Dangerous in Structural Design

Sir—To my mind Mr. Godfrey's article, "A Call for a Practical View in Structural Teaching," in *Engineering News-Record* of May 13, 1920, emphasizes the need of a rational application of theory by the practical designer. No one but a rule-of-thumb designer with little or no knowledge of the fundamentals of mechanics would make the mistakes in design which Mr. Godfrey cites in his article.

The case of the twin columns shown in Fig. 2 illustrates very well the error which the man who is *not* well grounded in his theory will make. The "theorist" will immediately tell you that the bending moments in the two cases A and B are not equal. The bending caused by the 100,000-lb. load on top of column A will relieve some of the pressure on the ball and reduce the bending moment on the column. On the other hand the bending moment in column B will be increased by the deflection of the column under the 100,000-lb. load. The exact amount of these moments is very difficult of exact determination but an approximate solution can be worked out by assuming the bending due to the transverse load as the eccentricity of the direct load.

But even if the dimensions on the two sketches had been such as to produce equal bending moments in the two cases, the "theorist" would not pronounce the two columns of the same strength. Assuming the elastic limit of the material (which marks the ultimate strength in columns) to be 32,000 lb. per sq.in., Column A will carry an ultimate load of about 240,000 lb. while Column B will carry less than 130,000 lb. In other words, the "theorist" will tell you that the factor of safety on Column A is about twice that on Column B, although the maximum fiber stresses at the 100,000-lb. load may be nearly equal.

I think that Mr. Godfrey has been troubled by designers who have had too little theory rather than by those with an overdose of it. A little knowledge is often a dangerous thing, and too much designing is being done by handbook engineers whose knowledge of fundamental theory is very limited. The effort of our colleges should be to turn out men with a thorough knowledge of theory and its practical applications, rather than rule-of-thumb engineers who depend upon handbooks for their theory. Mistakes in theory are not always absent in our handbooks, and a good designer must know his theory in order to use a handbook intelligently.

Clyde T. Morris,
Professor of Structural Engineering,
Ohio State University.

Columbus.

Tonnage Maps for Railway Valuation

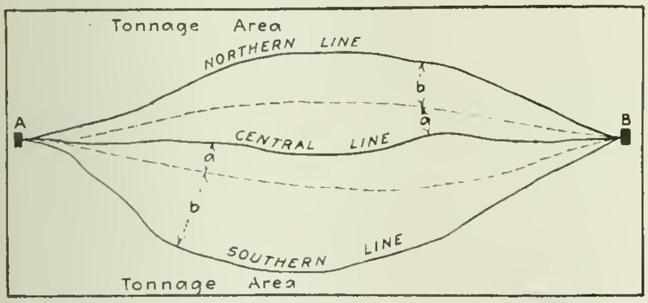
Sir—The Transportation Act, 1920, has revived the subject of railway values. The act although showing evidences of haste, which under the circumstances was unavoidable, is now the law. The immediate interest of engineers is concerned with its practical applications.

The market value of a railway property is based on its dividend earning capacity. These dividends are earned on the tonnage carried by the railways. Hence, the most important factor of value in estimating the market value of a railroad is the amount of tonnage that it controls.

This tonnage control produces certain common factors; i. e., in any given territory the competitive lines will average about the same operating standard, as falling below this common standard will result in a loss of through tonnage. The result is that regardless of the amount of tonnage contiguous to the main line, the through freight standard must be maintained, so that operating costs approximate a certain uniformity. These costs are further stabilized by the rates being fixed by the Interstate Commerce Commission, and the "blanket territory system" of rate making.

To ascertain the amount of tonnage controlled by any given railroad, a tonnage map must be compiled. A typical instance is illustrated by the accompanying drawing. In considering this situation no account will be taken of branch lines operated by the various companies, as these do not affect the general principle involved.

In compiling tonnage maps the unit is the county, and maps should be made to a scale of one mile to an inch. With such a county map, expert tonnage estimators would survey every square mile and assign to it its proper tonnage value. The next step would be to fix the lines of demarcation between the various railways and the variable (a) and (b) distances, indicated in the drawing. At terminals, junctions, and connecting points, all available tonnage would be allocated to the proper company. In estimating available tonnage, a period of 20 years would be the limit for forecasting future conditions.



Considering the tonnage maps as completed, we have a basis to determine the value of a railway property in the following order:

(1) Amount of all tonnage controlled by the railway.

(2) Cost of construction, value of all property, equipment, etc.

(3) Amount of stocks, bonds, notes, issued against the company.

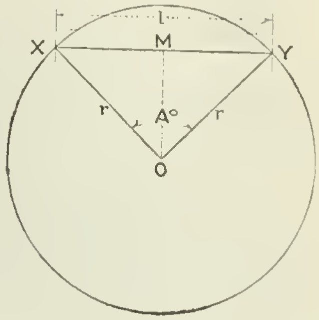
The one asset that a railway has is its tonnage resources, and until these can be determined, railway values can only be determined in an arbitrary manner. To merely take into account the cost of construction and equipment is an effort to balance expense ratios. The concrete fact of value can only he ascertained by an inventory of tonnage assets.

Olympia, Wash. **Frank W. Harris.**

Solution for Area of Segment of Circle

Sir—I wish to submit a solution for solving the area of a segment of a circle which is as accurate and easier than the one shown in the April 29 issue of *Engineering News-Record*.

In any segment you must know two of the following three things: Radius, r; long chord, l; and the angle at the center, A.



$$\text{Area of the entire circle} = \pi r^2$$

$$\text{Area of the Sector } OXY = \pi r^2 \left(\frac{A}{360}\right)$$

$$\text{Area of the triangle } OXY = XM \times OM$$

$$= r^2 \sin \tfrac{1}{2} A \cos \tfrac{1}{2} A = r^2 \frac{\sin A}{2}$$

$$\pi r^2 \frac{A}{360} - \frac{r^2 \sin A}{2} = \frac{r^2}{2}\left(\frac{\pi A}{180} - \sin A\right) =$$

$$\text{Area} = \frac{r^2}{2}(.0174533\,A - \sin A)$$

I cannot tell where I got it, but have used it for over a year in calculating property areas.

James R. Murray,
Civil Engineer.

Chicago.

Designing Double Reinforced Beams

Sir—In *Engineering News-Record*, April 29, p. 880, R. R Martel presented a method of designing reinforced-concrete beams with double reinforcement which is similar to a method used by the writer for the past twelve years or more.

With the same premises as used by Mr. Martel:

The unit fiber stresses and the ratio of moduli fix the position of the neutral axis at $0.378d$, from the top of the beam, and also the "percentage" of steel at $0.0077bd$.

The lever arm from the center of steel to the center of compression in the concrete is $d\ (1 - 0.378/3) = 0.874d$.

The area of steel required to resist 900,000 in. lb. moment is, $A = 900,000 \div 16,000 \times 0.874d = 3.06$ sq.in.

The tension in the steel is 3.06 × 16,000 . . . . . . = 48,960 lb.

The compression the beam is able to carry is
$0.378db$ 650/2 . . . . = 33,589

Excess which must be taken by compression
steel 15,371

By proportion, 7.95 : 650 :: 5.95 : 485.

485 lb. × 14 equals 6,790 lb. per square inch which the compression steel can carry. 15,370 lb. ÷ 6,790 lb. per square inch equals 2.26 sq.in. of compression steel.

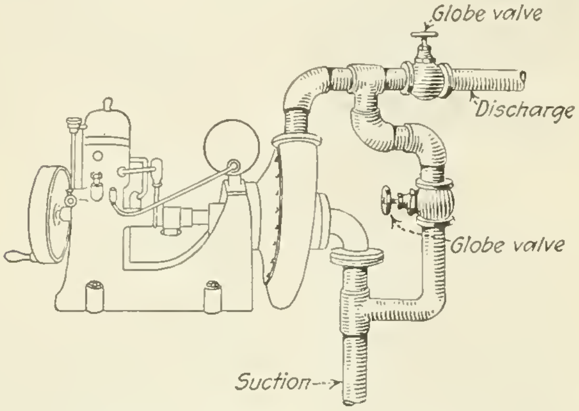
If, instead of compression steel the beam is of *T* section, say a slab 5 in. thick is supported by the beam, their upper surfaces being at the same level, the design of the beam would be the same as that given above including the excess of 15,371 lb. tension over allowable compression. Now again by proportion 7.95 : 650 :: 2.95 : 241 lb. per square inch and the average compression in the wings of the *T* is the average of 650 and 241 or 445 lb. per square inch. As the slab is 5 in. thick, the compression per inch of wing width is 2,225 lb. and the total width of both wings is 15,371 ÷ 2,225 equals 6.9 say 7 in., 3½ in. on each side of the beam. The usual criterions regarding the total width of *T*, depth of slab, width of beam and length of span should, of course, be applied in order to see that the *T* design falls within their requirements. **F. H. Burnette.**

Indianapolis, Ind.

HINTS FOR THE CONTRACTOR

By-Pass Pipe Maintains Suction in a Centrifugal Pump

A SUCCESSFUL arrangement for preserving continuous flow and of preventing a centrifugal pump from losing suction due to low water in the sump, is shown by the accompanying sketch. The discharge is simply by-passed around the pump and through it again in such volume as the circumstances require. By proper adjustment of the globe valves on the discharge pipe and on the by-pass the water can be kept at any desired level in the sump. This arrangement is called to the attention of contractors by R. T. Brown, chief of surveys, South Carolina State Highway Department. A method of accomplishing the same object by letting a controlled portion of the discharged water flow back into the sump through a trough, was described in *Engineering News-Record*, Jan. 8, 1920, p. 104.



BY-PASS PREVENTS LOSS OF SUCTION

Fast Work on Kerckhoff Tunnel

BY R. K. OBERTEUFFER

Assistant Engineer, San Joaquin Light & Power Corporation, Auberry, Cal.

IN *Engineering News-Record* of Feb. 12, 1920, there was described the Kerckhoff power project of the San Joaquin Light and Power Corp., more especially the 18,000-ft. tunnel. Since that article there have been several changes in methods and contractors. D. D. De Luca, the contractor who started the south portal, is now also driving the north portal and Adit 1. W. A. Whitmire, former general superintendent, holds the contract for Adit 2, driving north and south from that point. Some remarkably fast tunneling has been done on this enterprise during recent months, especially in Adit 1.

The contract for Adit 1 was formerly held by Contractor Iverson, whose best record, made in November, 1919, was 399 ft. Contractor De Luca took over this tunnel on Feb. 1, 1920, driving 344 ft. in that month. In March he made 439 ft., and in April 451 ft. The following facts in connection with the April performance may be of value for comparison with the details of other tunneling:

Heading and bench method used, with a 14- or 15-ft. bench. Holes in bench, 16; one shift of drillers loads and shoots all holes, working from 7:30 p.m. to 4:30 a.m. Holes in heading, 38 to 46; one shift of drillers works usually from 2 p.m. to 11 p.m. The first round is usually fired at midnight. Four men muck back after shooting and go home when finished, usually after 7 hr. work. Mucking is done by a Marion 40 steam shovel, loading into a three-car train, cars holding 6 cu.yd. The shovel works from 10 a.m. to 5 p.m.

There was 30,657 lb. of 60 per cent powder used during April, or an average of about 68 lb. per foot. A total of 5,640 cu.yd. of material was taken out. George De Luca and John Bracca are shift bosses for the contractors.

Prizes for Shaft-Sinking Record

THE *Engineering and Mining Journal*, in its issue of May 15, offers a gold medal to the shaft-sinking crew breaking the present world's record of 310 ft. in 31 days, made by the Crown Mines, Ltd., Johannesburg, South Africa, during July, 1919. A silver medal will also be presented to each qualified member of the sinking crew.

The recent records are as follows:

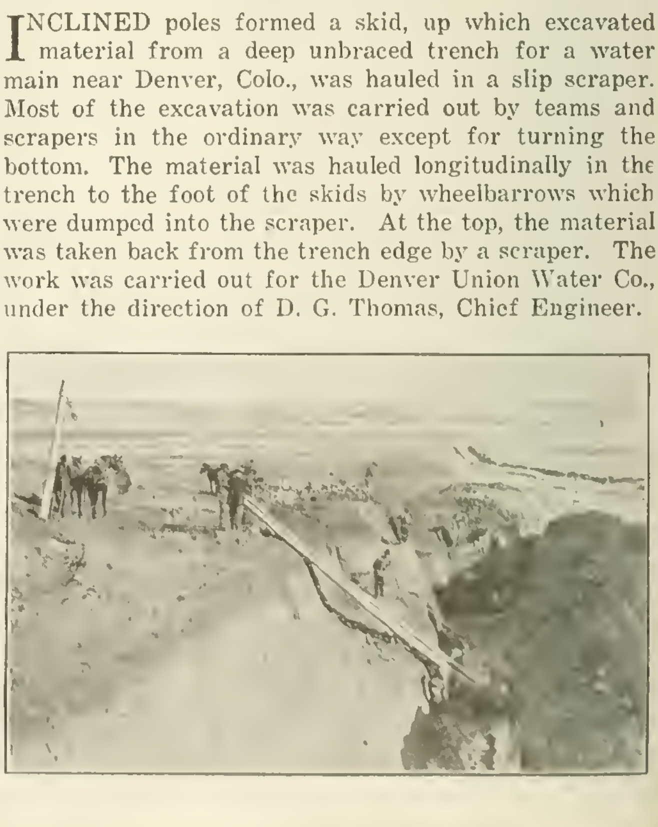
Distance	*Period*	*Date*	*Company*	*Place*
261 ft.	31 days	Aug., 1916	Walter Fitch, Jr.	Eureka, Utah
279 ft.	31 days	Dec., 1918	Crown Mines, Ltd.	Johannesburg, S. A.
310 ft.	31 days	July, 1919	Crown Mines, Ltd.	Johannesburg, S. A.
308 ft.*	31 days	Feb., 1920	Van Dyke Copper Co.	Miami, Ariz.

* Record in the United States.

Records will be judged by a committee of three, one member to be designated by the editor of the *Engineering and Mining Journal*, one by the director of the Bureau of Mines, and one by the secretary of the American Mining Congress. Rules governing the award will be formulated and published at a later date.

Inclined Skids Expedite Excavation of Deep Trench

INCLINED poles formed a skid, up which excavated material from a deep unbraced trench for a water main near Denver, Colo., was hauled in a slip scraper. Most of the excavation was carried out by teams and scrapers in the ordinary way except for turning the bottom. The material was hauled longitudinally in the trench to the foot of the skids by wheelbarrows which were dumped into the scraper. At the top, the material was taken back from the trench edge by a scraper. The work was carried out for the Denver Union Water Co., under the direction of D. G. Thomas, Chief Engineer.



NEWS OF THE WEEK

New York, June 10, 1920

Water-Power Bill Fails To Become Law

President Neglects To Take Action Before Congress Adjourns—No Explanation Given

(Washington Correspondence)

By what is colloquially known as a "pocket veto" the Federal Water-Power Bill, passed by both houses of Congress on May 29 automatically failed to become a law when Congress adjourned on June 5, before the President took any action on it. By the constitution if the President does not take action on any bill within ten days the bill automatically becomes law, except if congress adjourns before the ten day period expires when the bill fails of enactment.

Explanations that do not explain are the order in Washington with respect to the failure of the bill. The nearest to an official statement in the matter was made informally by Secretary Tumulty, who announced that Secretary John Barton Payne, of the Interior Department, was vigorously opposed to the measure and then later stated that the President had received this and other bills at too late a date to permit his final consideration and favorable action in view of a serious difference of opinion which has developed.

The Water-Power Bill went to the President for signature about June 1. On June 3 it was referred to the Secretaries of War, Interior and Agriculture, who by the terms of the bill, would have been members of the proposed Federal Power Commission. All three Secretaries reported to the President on or before Saturday, June 5. It is known that the Secretaries of Agriculture and War reported favorably, recommending that the bill be signed. However, Mr. Tumulty's statement above referred to, clearly implies that the Secretary of the Interior recommended against the bill. This fact is also borne out by the general belief that Secretary Payne is personally opposed to the measure. The nominal grounds upon which he is supposed to have recommended veto are that such an Act would tend to destroy the national parks. Considerable credence may be given to the story on the ground that Judge Payne has been, since 1911, President of the Board of South Park Commissioners of Chicago, and this activity is known to have received the greatest personal interest and attention of the President.

There is no question but that the bill is still objected to by several influences, for as late as the time of the confer-

(Continued on p. 1176)

American Society Takes Issue with Council In Pittsburgh Bridge Case

Action of Engineering Council Unauthorized, Says Board of Direction—Statement of Principle Reaffirmed

Reaffirming its previous statement of principle that only civil engineers should be entrusted with responsibility for bridge design and construction, the Board of Direction of the American Society of Civil Engineers on June 2, 1920, adopted resolutions declaring Engineering Council to have no authority to deal with the matter, as being one solely within the province of civil engineers. A joint committee of Council and the American Institute of Architects which considered the question of architects and engineers in bridge design reported its findings recently, as summarized in an official statement from the council headquarters printed in these columns May 27, 1920, p. 1079. However, the official statement omitted the concluding sentence of the committee's report as quoted in the Board of Direction's resolution.

Resolution of Am. Soc. C. E. Board

"*Whereas*, The Board of Direction of the American Society of Civil Engineers on April 20th, 1920, passed the following resolution:

Whereas, It has come to the attention of the Board of Direction of the American Society of Civil Engineers that the work of preparing plans and specifications for and in supervising the construction of bridges and other important engineering structures has been awarded to architects, and

Whereas, The work involved in the design of such structures is primarily engineering with respect to safety, cost, design, and adequacy, and

Whereas, The procedure thus established is detrimental to the public interest, in that it subordinates the safety, adequacy, and cost of such structures to their appearance, therefore be it

Resolved, That it is the opinion of the Board of Direction of the American Society of Civil Engineers that the responsibility for the design and construction of such work should be entrusted only to qualified civil engineers.

Following which copies were sent to Engineering Council and to the American Institute of Consulting Engineers for their information, and

"*Whereas*, A joint committee of Engineering Council and the American Institute of Architects at a meeting held May 4, 1920, in Washington, D. C., adopted the following:

The safety, adequacy, durability and suitability of purpose in any structure, whether bridge or building, are axiomatic. Under certain conditions structures should in addition be aesthetically excellent. In such cases the design must involve, therefore, collaboration between engineers and architects. Whether the engineer is chief and the architect associate or vice versa is an administrative detail of relative unimportance. Either combination should secure satisfactory results. The Committee cannot, therefore, concur in principle with the resolution of the American Institute of Consulting Engineers of Feb. 5, 1920, or in the resolution of the American Society of Civil Engineers of April 20, 1920.

"*Be It Resolved*, That the Board of

Senate Committee To Study Construction Shortage

A committee of the United States Senate has been appointed by the Vice-President pursuant to Senate Resolution 350 to look into and report on the present construction situation. The specific things to be looked into according to the words of the resolution are: "(a) The existing situation in relation to the general construction of houses, manufacturing establishments and buildings, and the effect thereof upon other industries and upon the public welfare, and (b) such measures as it may deem necessary to stimulate and encourage such construction work, to encourage popular investment rather than spending, to foster private initiative in building, and to insure co-operation between labor and persons or corporations engaged in transportation, banking, or other business necessary to the development of such construction."

The committee consists of W. M. Calder, chairman; W. S. Kenyon, W. E. Edge, E. J. Gay and J. O. Wolcott. The chairman may be addressed Special Committee on Reconstruction and Production, Senate Office Building, Washington, D. C. He is anxious to get the names of any persons who may have information regarding housing and industrial shortage or who has any suggestions regarding the present construction situation.

Utah County Reconsiders Bonds

Because of the high cost of construction material and the condition of the bond market the County Commissioners of Cache County, Utah, have decided that the county shall not now be bonded for $700,000 to supply money for road construction. The cost of the bond election was also considered objectionable.

Direction of the American Society of Civil Engineers reaffirms its attitude as previously indicated by its resolution of April 20, 1920, and expresses its view that the matter of bridge design as established by practice is one solely within the province of civil engineers, and it is therefore not a matter upon which Engineering Council has been delegated authority of action.

"*Resolved Further*, That Engineering Council be requested to refrain from any attempt to represent this society in discussion of this matter.

"*And Whereas*, Publicity has been given to action of the joint committee of Engineering Council and the American Institute of Architects as above cited, the Secretary is instructed to send copies of this resolution to Engineering Council, American Institute of Architects, and to the technical press."

Population of New York City Was 5,621,151 Early in January

The population of New York City, according to the count made by the Bureau of the Census early in January, was 5,621,151, but the figures are subject to final revision. The figures by boroughs and for the entire city, compared with like figures for 1910 and 1900, with increases by totals and percentages, are as shown in the accompanying table.

POPULATION OF NEW YORK CITY IN 1920, 1910 AND 1900

	Population 1920	1910	1900	Increase 1910-20 Number	Per Cent	Increase 1900-10 Number	Per Cent
Manhattan	2,284,103	2,331,542	1,850,093	*47,439	*2.0	481,449	26.0
Bronx	732,016	430,980	200,507	301,036	69.8	230,473	114.9
Brooklyn	2,022,262	1,634,351	1,166,582	387,911	23.7	467,769	40.1
Queens	466,811	284,041	152,999	182,770	64.3	131,042	85.6
Richmond	115,959	85,969	67,021	29,990	34.9	18,948	28.3
New York City	5,621,151	4,766,883	3,437,202	854,268	17.9	1,329,681	38.7

* Decrease.

Engineering Foundation Seeks Endowments

Engineering Foundation is in possession of a fund of somewhat above $300,000, practically all of which has been given by Ambrose Swasey. With the proceeds of this endowment it has maintained a liaison between engineers as represented by the founder and other societies and scientific workers as represented in the National Research Council. It is felt, however, by the Foundation that its field is very much greater and that it could do a much more useful work if it were in possession of greater funds. It is, therefore, making known that it is in a receptive mood toward contributions which would bring the endowment fund up to at least a million dollars in the near future. The Foundation does not plan to build laboratories and conduct research work directly, but rather to stimulate, co-ordinate, and support research work in existing scientific and industrial laboratories, co-operating in so far as may prove advantageous with the National Research Council. Charles F. Rand has been elected chairman of the Foundation to succeed Dr. W. F. M. Goss, resigned. The office is in the Engineering Societies' Building, 29 West 39th St., New York City.

Work on Safety Codes Initiated By Standards Committee

Arrangements have been made for the formulation of a considerable number of safety codes under the auspices of the American Engineering Standards Committee. The subjects of the codes for which arrangements have been completed, together with the organizations designated as sponsors, are: *Abrasive Wheels* — Grinding Wheel Manufacturers of the United States and Canada, and International Association of Industrial Accident Boards and Commissions. *Explosives* — Institute of Makers of Explosives. *Foundries*— American Foundrymen's Association, and National Founders' Association. *Gas Safety Code*—Bureau of Standards, and American Gas Association. *Head and Eye Protection*—Bureau of Standards. *Paper and Pulp Mills*—National Safety Council. *Power Presses*— National Safety Council. *Pressure Vessels, Non-fired*—American Society of Mechanical Engineers. *Refrigeration, Mechanical*—American Society of Refrigerating Engineers. *Woodworking Machinery*—International Association of Industrial Accident Boards and Commissions, and National Workmen's Compensation Service Bureau.

A number of additional codes are under consideration. A large representative advisory committee of specialists, organized by the National Safety Council, the National Workmen's Compensation Service Bureau, and the Bureau of Standards, at the request of the committee, to act as its advisor, is actively working on the question of what additional codes are most urgently required and what organizations are in the best position to undertake sponsorship for such codes.

WORK ON SPECIFICATIONS

Five standard specifications were recently submitted by the American Society for Testing Materials for approval as "American Standards" of the American Engineering Standards Committee. The subjects are: Specifications for Drain Pipes, Test for Toughness of Rock, Test for Penetration of Bituminous Materials, Method for Distillation of Bituminous Materials Suitable for Road Treatment, and Method for Sampling Coal. They were referred to a special sub-committee to make recommendations for final action.

At the request of the Swiss Standards Association, Baden, Switzerland, for co-operation in the work of standardization of ball bearings, the committee has requested the American Society of Mechanical Engineers and the Society of Automotive Engineers to act as joint sponsors for the project.

Water Power Bill

(*Concluded from p. 1175*)

ence report to the Senate, barely a week before passage, Senators Lenroot, King and Norris all took occasion to point out their objection to the proposed regulation. Two grounds for opposition were thus cited: First, that the proposal made the development of water-power a dominating influence, even with the right on the part of the Federal Commission to interfere with navigation on important navigable streams; second, that the terms for continuing a license after the initia period were such as to give practicall perpetual lease to the original licensee

It is probably the opposition thus voiced has led to the common rumor in Washington, which however can not be confirmed, that either Senator Lenroot or Senator King had some influence in causing the "pocket-veto." In any event, great surprise is expressed at every turn that the President should have declined to sign a bill so well known as of great importance, solely on the ground that possibly some measure of damage might be done to our national parks.

Two power projects had been suggested as the possible cause of Secretary Payne's objection. It had been proposed that a dam be placed near the Idaho state line just outside of the boundaries of Yellowstone Park in such a way that the storage of water would have been within the park territory. Another dam on the Yellowtsone River, within the boundaries of the park, had also been proposed. It is quite possible that these two projects, among others, may have been the cause of the Secretary's feeling of opposition. However, he refuses to make any statement in the matter to the press, up to the time that this is written (June 9).

The provisions of the bill include arrangements that while license may be granted for dams, reservoirs and other projects in or upon any part of the public lands and reservations of the United States, these reservations are defined specifically to include national monuments, national parks, national forests, etc. It is evident therefore, that one who desired to object on this ground would find some measure of plausibility in the terms of the proposed act.

In view of the fact that objection came from the Interior Department, it was questioned whether the United States Geological Survey might not also have opposed the legislation but Dr. George Otis Smith, director of the Survey, stated, "It was as much a surprise to me as to any one else that the bill was not signed."

Form New Firm of Engineering and Industrial Consultants

From the group of engineers who were associated in the War Department Claims Board, which adjusted all uncompleted contracts after the armistice, has been formed an organization named the Technical Advisory Corporation with offices at 132 Nassau St., New York City, for the purpose of carrying on an advisory engineering and general consultant service. These men were connected with the Technical Advisory Committee of the War Department which reviewed practically all claims and proposed settlements presented for adjustment, made physical investigations and appraisals, scrutinized costs and policies, investigated management, methods, material economies and disposals, prices and rates, conducted negotiations and public hearings, and recommended final action. The work which they now propose to carry on is of somewhat similar nature. The company will not undertake contracts for construction or assume financial responsibility, but will offer two classes of service—industrial and engineering. In the former it undertakes work as economists, cost reducers and business advisers; in the latter it will furnish complete factory and institutional layouts and specifications and supervise the execution of plans. It also will offer a routine retainer service to merchants and manufacturers.

The officers are Campbell Scott, president, and Ernest P. Goodrich, William D. Ennis, and Rumsey W. Scott, vice-presidents. C. Scott, who was chairman of the Technical Advisory Committee of the War Department, has been a manufacturer and administrator with the General Electric Co., C. & C. Electric Co., Southern Engineering Co., Otis Elevator Co., Crocker-Wheeler Co., etc. Mr. Goodrich, following a term of service as civil engineer, United States Navy, has been in extensive civil engineering practice for a number of years. Mr. Ennis is a specialist on fuel, power and economics of material utilization and has been connected with the American Locomotive Co., the American Linseed Co., and the Watervliet Arsenal. Rumsey Scott has been sales engineer and district manager for corporations manufacturing elevators and electrical equipment, and is a specialist on the economics of material transport, and on passenger and freight elevator installation. Associated with the main officers are Frank B. Malty who has been a civil engineer on many railroads, river and canal works, and who was, as lieutenant colonel of engineers, in charge of construction of railways, docks, terminals and warehouses at St. Nazaire, France; Walter Rautenstrauch, advisory engineer to manufacturers and mechanical engineer; George B. Frankforter, chemist and metallurgical engineer; Arthur W. Hixson, chemical and metallurgical engineer, and Fred E. Rogers, mechanical engineer and editor of *Machinery*.

Minnesota Engineers and Architects Plan United Action

A definite move is under way in Minnesota to combine the public activities of all the engineers and architects in the state. It is proposed to form a state organization embracing the local organizations of St. Paul, Minneapolis, Duluth and the Iron Range, the state society and the members of the national societies not affiliated with local organizations. About four years ago, the Minnesota Joint Engineering Board was formed, consisting of representatives from the nine engineering organizations in the State. The new plan is to unite the individual members along the same line, and in addition, include the architects.

For the purpose of discussing such a plan, a meeting has been called for June 19-20, in Duluth, to which all engineers, architects and their friends are invited. Ladies are urged and expected to attend. A special train will leave the Twin Cities, Friday evening, June 18, and return Sunday evening, June 20. There will be inspection trips Saturday morning, a business session in the afternoon and an informal dinner dance in the evening. Sunday will be devoted to visits to various points of interest.

Cement Association Protests Road Construction Limitation

Acting upon the report that the Association of Railway Executives intended to urge upon the Interstate Commerce Commission the necessity of refusing cars for road building materials, the Portland Cement Association has issued a circular letter registering its emphatic protest against any further obstacles to highway construction. The letter further points out that for the past two or three years highway programs have been either suspended or seriously curtailed. In view of impending food shortages and also because of the relief highway transportation offers to the railroad industry, "such discrimination as that proposed should not now be tolerated," the letter states. The Portland Cement Association believes that greater need of highway transportation will be felt when crops are moved later in the season and that nothing should be put in the way of offering relief by the continuance of essential roadwork.

Pennsylvania Road Program

According to recent reports from the Pennsylvania State Highway Department, there are under construction approximately 950 miles of highway in that state at the present time. It is expected that contracts will be let on fifty more miles during the current month, bringing the total to 1,000 miles of new highway being constructed by the state. So many detours are made necessary through this construction that the highway department issues periodic bulletins for the convenience of motorists indicating where the detours are.

Advisory Council to Map Board Is Named

Organizations interested in map-making have designated representatives who will act as an advisory council to the United States Board of Surveys and Maps. Included in the list are the following:

American Society of Civil Engineers, Prof. J. K. Finch, Columbia University, New York City; American Association of State Highway Officials, M. W. Watson, state highway engineer, Topeka, Kansas; American Geographical Society, Dr. Isaiah Bowman, director, New York City; American Railway Engineering Association, J. H. Milburn, office engineer Baltimore & Ohio Railroad, Baltimore, Md.; American Society of Mechanical Engineers, J. Waldo Smith, chief engineer, Board of Water Supply, New York City; American Water Works Association, Robert E. Horton, Voorheesville, N. Y.; Engineering Council, A. Stuart Baldwin, vice-president, Illinois Central Railroad, Chicago, Ill.

Federal Department of A. A. E. Formed at Washington

Government engineer members of the American Association of Engineers held a convention at the Washington Hotel, Washington, D. C., May 22, and formed a Federal Department of the A. A. E. A constitution and by-laws were adopted providing for a council of eight men who are to devise ways and means of obtaining the objects of the Federal Department. Four men were elected for 2 years and four for one year.

The object of the Federal Department shall be to improve the economic conditions in the government service by increasing efficiency and by any just means found advantageous to the welfare of the federal service and to the federal employees.

Among the matters discussed at the convention were means of saving the engineering service of the various government departments from what threatens to be a total collapse because of depletion of personnel. Statistics were cited to show that last year the number of technical engineers in the War Department alone had been reduced by voluntary resignations from approximately 1,000 to 525. An investigation into the causes of such wholesale resignations revealed, it was stated, that the men resigned to accept positions which pay on an average 64 per cent more than they received from the government.

At the evening session, held in the offices of the Board of Trade, the convention was addressed by M. O. Leighton, chairman of the National Public Works Department Association. He called attention to the fact that the per capita cost of running the government in 1914 was about 17c.; it is now $47. He pointed out that there are 29 agencies of the government doing public construction work and estimated that 20 per cent of the amount spent on public construction could be saved by placing all of this work under a single head.

Addresses were also made by F. E. N. Thatcher, district eastern secretary of the Ohio Valley District, and L. B. Smith, northeastern district secretary, describing the work of the American Association of Engineers in their districts.

Toll Bridge To Be Acquired By Condemnation

In negotiations for state purchase of the toll highway bridge over the Delaware River between Phillipsburg, N. J., and Easton, Pa., it has not been possible to agree on a price. The joint interstate commission valued the bridge at $225,000, but the owners demand $400,000, it is said, the latter figure representing double the highest recorded price at which stock has been sold. The commission now plans to institute condemnation proceedings.

Proposed Bill Would Use Allied Debt for Road Building

A bill has been introduced into the House of Representatives providing that the allied war debt to the United States be set apart as a fund to be held in perpetuity by the Government, and the interest and income arising therefrom to be used in the construction, maintenance and improvement of post roads and public highways throughout the United States. The war debt of Great Britain, France, Italy, Servia and Roumania to the United States aggregates $9,000,000,000 and the earnings from that fund the proposed bill would use subject to regulation prescribed by the Secretary of Agriculture, and also to conditions named in the Act of Congress approved in February, 1914, providing for the construction and maintenance of rural post roads. However, the proposed bill imposes the following conditions: (1) That the funds be distributed among the states, territories, and District of Columbia according to area, population, and miles of public highways and post roads improved and to be improved; (2) That when a certain amount of the allied indebtedness is paid back to the United States the Secretary of the Treasury shall direct the investment of the funds so provided.

Iowa State College Celebrates Semi-Centennial

Popular phases of engineering were covered in addresses by three prominent engineers at the engineering symposium held at Ames, Ia., on June 8 in connection with the semi-centennial celebration of Iowa State College. A. P. Davis, president of the American Society of Civil Engineers and director of the U. S. Reclamation Service spoke on the subject of present tendencies in engineering organizations. T. H. MacDonald, chief of the U. S. Bureau of Public Roads, a civil engineering graduate of the college, discussed "The Past, Present and Future of Highway Engineering and the Relation of Iowa State College Thereto." J. W. Hook, president of the Allied Machinery Corporation, talked on "The New Business World and the New Business Training for Engineers."

New Association for Universal Lumber Grading Rules

An intensive campaign for the adoption of uniformity in grading lumber and in the stock sizes as a means of bringing about more efficient distribution is the aim of the newly organized American Wholesale Lumber Association. Any movement for standardization comes from the consumers and L. R. Putnam, directing manager, states that the American Railway Engineering Association, the Western Society of Engineers and the American Institute of Architects have already made urgent requests for standardization. The new organization of wholesalers is working in co-operation with the National Lumber Manufacturers' Association. Committees will soon be named.

Kansas City Sanitary Committee

As a result of the success of its committee on traffic problems the Kansas City Engineers Club has appointed a Civic Sanitation Committee, the first problem for which will be the water supply system. The chairman is F. W. Fratt, manager of the Eclipse Valve Co.

Semi-Trailers Liable to Tax

Thousands of dollars in taxes are involved in a dispute between the Bureau of Internal Revenue and the Trailer Manufacturers' Association over the correct definition of a semi-trailer. The revenue law imposes a sales tax on automobiles, motor trucks, parts and accessories but does not mention trailers, and it specifically exempts tractors. Early in 1919 the Revenue Bureau ruled that tractors even when sold in combination with trailers were exempt and that trailers regardless of the number of wheels that they possessed were not parts or accessories of automobiles or trucks, which interpretation led trailer manufacturers to believe that all types of trailers were exempt from the sales tax. No returns were made and no taxes paid on sales.

In March of 1920 however, the bureau revised its ruling and held that tractors which support a part of a load, and semi-trailers for use of such tractors are both taxable, the former as an automobile truck and the latter as a part of a truck. By its most recent ruling the Bureau of Internal Revenue declared that taxes on sales of these articles must not only be paid hereafter but that the manufacturer must pay back taxes on sales from Feb. 25, 1919. It holds that the tax payer and not the bureau is responsible for any errors of interpretation of the law. What final disposition of the matter will be made has not yet been indicated.

Hold Hearing on Increased Niagara Power

Pursuant to a Congressional order, Col. J. G. Warren, Corps of Engineers, U. S. A., in charge of Great Lakes division of the U. S. Engineer Department, has made a report on the subject of water diversion from the Great Lakes to the Niagara River, including navigation, sanitary and power purposes, and the preservation of the scenic beauty of Niagara Falls and the rapids of the Niagara River. The report recommends a possible diversion of 120,000 sec.-ft. for power purposes at Niagara Falls, instead of the 50,885 sec.-ft. now permitted under treaty arrangement. This would be divided as 80,000 sec.-ft. above the Falls and 40,000 ft. below the Falls, and makes a large increase in the American utilization. It was also recommended that there be constructed above the point of the Horseshoe Falls a submerged weir of such dimensions that the water remaining in the river, estimated at 50,000 sec.-ft. as the extreme minimum limit, will be spread more evenly over the channel and the gorge. The weir, it is suggested, will serve to stop erosion which is now threatening to destroy the beauty of the Falls. Various suggestions are made as to the possible locations of developments to utilize the new power proposed.

A hearing was held on the report at Niagara Falls on June 3. Some objection was made by Buffalo interests that the report favored the Niagara Falls electrochemical industry too much, and opposition to the proposition of increasingly permitted utilization was made by J. H. MacFarland of the American Civic Association, on the ground that it would destroy the scenic beauty of the Falls. However, the hearing, which was before an army engineer board, was favorable to the Warren report.

Referendum Against Public Works Department

Although majority vote in favor of the Federal Department of Public Works was registered in the recent referendum of the Chamber of Commerce of the United States, that referendum failed to carry under the rule of the Chamber because there was not a requisite two-thirds majority. Out of the 1250 member organizations, 477 registered 1,375 votes. The three propositions submitted were: Shall the Department of Public Works be established by the National Government? In favor 826, against 549. Shall the Department of Public Works be established by a suitable modification of the existing Department of Interior excluding that from the non-related bureaus and officers by changing the name from the Department of Interior to the Department of Public Works. In favor 675, against 679. Shall the Department of Public Works be established by creation of an entirely new department? In favor 282, against 992.

Omaha Buys Gas Works

After thirteen years of effort the city of Omaha, Neb., has acquired the ownership of the gas works supplying the city. A bond issue of $3,500,000 for municipal ownership of gas works at Omaha was defeated at an election held in November, 1907. In May, 1918, the people voted to acquire the gas works at a price to be determined by a court. A valuation of $3,760,000 was placed on the plant by Burns & McDonnell, consulting engineers of Kansas City, representing the city. Valuations in behalf of the company were made as follows: H. C. Anderson, $5,518,000; William A. Baehr, $5,570,000; W. H. Taylor, $6,281,000. In February, 1920, the court awarded the gas company $4,500,000, and on March 20, 1920, the city commissioners voted to take over the works at the price stated and voted also $1,000,000 for improvements and extensions. The plant will be operated by the city under the direction of a bi-partisan board of directors and a manager.

Elected President of Institution of Civil Engineers

John A. Brodie, city engineer of Liverpool, England, has been elected president of the Institution of Civil Engineers. As an apprentice in civil engineering, he entered the shops of the Mersey Dock estate, in 1875, under the late G. Fosberry Lyster. In 1879, he secured a Whitworth Scholarship and spent three years in Sir Joseph Whitworth's works, at the end of which period he went to Spain in charge of harbor work there. After the completion of that work he was appointed general engineering assistant in the city engineer's office in Liverpool. He engaged in private practice with John T. Wood, in that city, in 1882, and designed and carried out an improved system of handling refuse at destructors. He also designed and developed a combined destructor and steam generator.

During his office as city engineer of Liverpool, Mr. Brodie has been in control of the operation and maintenance of over five hundred miles of road and nearly the same number of miles of sewers, as well as the cleansing operations of the city, requiring a staff of between three and four thousand men. He has also been in charge of the construction and maintenance of the permanent way and pavement of electric tramways, as well as the structures and electrical equipment for same. In connection with the road construction, Mr. Brodie has brought into extensive use in Liverpool concrete-macadam blocks and pitch-macadam pavements. He is also the originator of a concrete laborer's dwelling made from destructor clinker, which is now in use in Liverpool.

Mr. Brodie was one of the first members and a vice-president of the Liverpool Self-propelled Traffic Association, and has been frequently called upon to give evidence before committees and the Local Government Board regarding regulations in connection with heavy motor cars and street traffic. He is a member of the Institution of Mechanical Engineers and a past-president of the Liverpool Engineering Society. He has also had conferred upon him by the Liverpool University, of which he was elected a professor of engineering in 1903, the degree of Master of Engineering

He has been recently appointed adviser to the Government of India in the laying out of the new capital of Delhi, which engagement is expected to terminate in about five months.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

AMERICAN WATER WORKS ASSOCIATION, New York City; Montreal, June 21-26.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; Asbury Park, N. J., June 22-25.

AMERICAN PUBLIC HEALTH ASSOCIATION, Boston; San Francisco, Sept. 13-17.

The Montreal Branch of the Engineering Institute of Canada has elected the following officers for the year 1920-1921: Chairman, Arthur Surveyer, vice-chairman, James H. Hunter, and secretary-treasurer, J. L. Busfield.

The Western Society of Engineers on May 28 made a trip to Madison, Wis., to inspect the machine-tool works of the Gisholt Machine Co., the newly completed State Capitol and its power plant, the Materials Testing Laboratory of the University of Wisconsin, and the Forest Products Laboratory. Special tests were conducted in the materials laboratory and the Forest Products Laboratory.

The Niagara Peninsula Branch of the Engineering Institute of Canada is making arrangements to hold a professional meeting at Niagara Falls, Ont., Sept. 16-18, 1920. The officers of the branch, elected for the following year, are: Chairman, W. P. Near; vice-chairman, N. R. Gibson; secretary and treasurer, R. P. Johnson.

The Louisiana Engineering Society held a regular meeting June 4 at which W. M. White, manager, hydraulic department, Allis-Chalmers Co., delivered an illustrated lecture.

The Oklahoma Society of Engineers held its mid-year meeting in Muskogee, June 8 and 9. A prominent place in the program was given to highway subjects. R. C. Terrell, state engneer of Oklahoma, spoke on "The Policies of the Highway Department." W. L. Benham, of Johnson & Benham, consulting engineers, Kansas City, Mo., delivered a paper on "Relative Cost of Municipal Improvements Before and After the World War." The evening session on the second day of the meeting was addressed by Governor Robertson of Oklahoma.

PERSONAL NOTES

Julian Montgomery, formerly county engineer of Rockwell County, Tex., has been appointed city engineer of Wichita Falls, Tex.

Homer Hillman has been appointed engineer of Sherman County, Kan., with headquarters at Goodland.

L. C. Teeter has been appointed engineer of Riley County, Kan., with headquarters at Manhattan.

C. E. Donnelly, chief draftsman, office of city engineer, Kansas City, Mo., has been appointed assistant city engineer.

Arthur R. Holbrook has been appointed office engineer in the special engineering bureau in charge of waterworks extension in Columbus, Ohio.

Richard A. McFadden has resigned as surveyor of the Second Survey District of Philadelphia.

Eugene Prentice, Pittsfield, Mass., has been appointed special assistant to the city engineer of Binghamton, N. Y.

Charles J. Des Baillet, for the last three years manager and chief engineer of the Sherbrooke corporation, has been appointed by the Water Board of the City of Montreal, Canada, as engineer in charge of aqueduct work.

Col. Spencer Cosby, Corps of Engineers, U. S. A., has been assigned to duty as division engineer at Savannah, Ga., succeeding Colonel T. H. Rees, who was recently appointed department engineer at San Francisco.

Arthur H. Pratt, designing engineer, North Jersey District Water Supply Commission, has been appointed deputy engineer.

Albert A. Chenoweth and **Herman Rettinghouse** have become associated in partnership under the firm name of Chenoweth & Rettinghouse, civil engineers, Boyce-Greely Building, Sioux Falls, S. D. Mr. Rettinghouse recently retired as chief engineer of the Chicago, Milwaukee, Minneapolis & Omaha Ry. Mr. Chenoweth has been engaged in private practice in Sioux Falls.

Jerome H. Fertig, engineer for the Ralph Schneeloch Co., Portland, Ore., and chief engineer and member of the Board of Directors of the Mt. Shasta Land and Irrigation Co., has been appointed project engineer of the Grants Pass Irrigation District, Grants Pass, Ore.

E. C. Hall, previously of the Worden Allen Co., Milwaukee, has entered private practice, specializing in construction engineering, with offices in the Majestic Building, Milwaukee.

Walter F. Barker has been appointed New York district manager for the new office of the George F. Watts Corporation, engineers and contractors, at 30 Church St., New York City. Henry Porlier is chief engineer.

H. N. Aikman, who has been associated with the Dwight P. Robinson Co., New York City, has become engineer in charge of structural steel design, Fargo Engineering Co., Jackson, Mich.

Clarence H. Larsen and **John Glenn Mason** have become associated in partnership under the firm name of Larsen & Mason, architects and engineers, Terminal Building, Lincoln, Neb.

J. S. Shaw, who before the war was engaged in construction work in Texas at Fort Worth, Dallas and Austin under the name of the Shaw Construction Co., has been elected general manager of the Mackle Construction Corporation, Atlanta, Ga.

Ermon M. Peck, formerly resident engineer of housing developments at Cradock and Truxtun, Va., United States Housing Corporation, has been appointed general manager, Hartford Home Building Association, Inc., Hartford, Conn.

J. Ross Eakin, United States Geological Survey, sailed from Seattle May 20, in charge of a party which will make topographic surveys in the Mt. McKinley region of Alaska.

C. L. Nelson, United States Geological Survey, will be in charge of field parties, which will undertake the mapping of the Conejos quadrangle of Colorado.

A. O. Burkland, United States Geological Survey, has been appointed in charge of field surveys to be undertaken in Hawaii through a co-operative agreement with the Territory.

Frank S. Knittle, formerly county and city engineer, Douglas, Wyo., has been appointed city engineer of Casper, Wyo.

W. S. Richmond, Larner-Johnson Valve and Engineering Co., Philadelphia, has become principal assistant engineer to Col. W. P. Wooten on the St. Lawrence River surveys.

Joseph A. Martin, commissioner of purchases and supplies, Detroit, has been appointed commissioner of public works for that city, succeeding George Engel, recently resigned.

Lewis D. Kelsey, formerly city engineer of Aberdeen, Ore., has been appointed city engineer of Raymond, Ore.

Charles A. Will, secretary, W. H. & F. W. Cane, Inc., and James W. Nelson, construction superintendent of the same firm, have retired from that organization and have become associated in partnership under the firm name of Will & Nelson. They will engage in general building and contracting, with offices at 307 Washington St., Brooklyn, N. Y.

J. Walter Ackerman, chief engineer and superintendent, Board of Water Commissioners, Auburn, N. Y., has resigned to become superintendent of the water, light and power department of Watertown, N. Y.

OBITUARY

Louis J. Putnam, chief engineer, Chicago & Northwestern Ry., was drowned near Leroy, Mich., May 31, while attempting to rescue his son. He was born at Manchester, Iowa, in 1878, and was educated at Cornell College, Mount Vernon, Iowa. He began railroad work in June, 1898, with the Illinois Central, and a year later entered the engineering department of the Chicago & Northwestern as an instrument man. In February, 1901, he was appointed assistant engineer and thereafter was engaged on construction, location and maintenance work. He was later made acting division engineer of the Ashland division, with headquarters at Kaukauna, Wis. In March, 1907, he was assistant engineer in charge of second track and terminal improvements at Janesville, Wis., and later assistant engineer in charge of the construction of the bascule bridge over the north branch of the Chicago River and the Wells Street yard at Chicago; resident engineer, Milwaukee track elevation, and resident engineer, Escanaba Ore Dock construction. From July, 1910, to April, 1912, he was in the service of the Milwaukee, Sparta & Northwestern, a subsidiary of the Chicago & Northwestern Ry., first as resident engineer on construction, and then as acting resident engineer. In April, 1912, he was promoted to division engineer at Boone, Iowa, and in May, 1913, he became principal assistant engineer of the Northwestern, with headquarters at Chicago. In June, 1918, he was appointed chief engineer of the Northwestern.

William Maxwell Brown, chief engineer, Passaic Valley Sewerage Commissioners, died at his home in Newark, N. J., May 29, at the age of sixty-six. Mr. Brown entered engineering work in 1874 as assistant engineer in the office of the city engineer of Providence, R. I., and was afterwards resident engineer on the extension of the water-works of Brookline, Mass. From 1878 to 1884 he was assistant on the construction of the Boston drainage works, and later was assistant engineer for the Massachusetts Drainage Commission and chief engineer of the water-works of Westerly, R. I. In 1895 he became superintendent and chief engineer, Metropolitan Sewerage Board, Boston. When the Metropolitan Water and Sewerage Boards were combined, he became chief engineer of sewerage works, which position he held until coming to Newark in 1912 as chief engineer of the Passaic commission.

Edmund Gybbon Spilsbury, mining and metallurgical engineer, died in New York City, May 28, at the age of seventy-five. He graduated from the University of Louvain, Belgium, in 1862, and came to the United States after engaging in mining and civil engineering work in Europe and Africa for eight years. He was a member of the American Society of Civil Engineers and was a trustee of the United Engineering Society from 1916 until his death, as well as a member of the Engineering Foundation Board. He was chairman of the Engineering Societies' Library Board from 1918 to 1920, and was a member of the board from 1913.

BUSINESS NOTES

The Parsons Engineering & Machinery Corporation, New York City, has recently been organized to carry on the business of handling contractors' construction equipment. H. F. Parsons, formerly in charge of the construction equipment department of the P. W. Burnham Co., 111 Nassau St., and during the war superintendent for Thompson Starrett Co., is general manager of the new company. The construction department of the Burnham Co. has been abandoned and the business will be conducted by the Parsons Corporation.

The Worthington Pump & Machinery Corporation, New York City, announces that, in addition to its other lines of hydraulic machinery, it has now completed preparations to furnish improved water-power machinery of all capacities for low, medium and high head service, including oil pressure systems, water-wheel governors and other auxiliaries.

Lockwood, Greene & Co., engineers, New York City, have opened a Philadelphia office in charge of Charles P. Wood. At the outbreak of the war, Mr. Wood was chief engineer and superintendent of a ceramic plant at Metuchen, N. J. He entered the Army as lieutenant in 1917, and in 1919 acted in connection with a Government investigation of industrial machinery in France and Belgium, on which he was engaged until his association with Lockwood, Greene & Co.

W. T. Chollar, previously of the Atlas Portland Cement Co., has been appointed district manager, Lakewood Engineering Co., with headquarters at the New York office, succeeding George S. Hedge, who has retired from active business. Mr. Chollar's experience in the construction field covers a period of nine years, beginning with his association with the Atlas company as Western sales manager. Since then he has served as manager of the service department of the Atlas company, comprising both the advertising and sales promotion departments.

A Consolidation of Engineering News and Engineering Record
McGraw-Hill Company, Inc.—JAMES H. MCGRAW, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN
Editor

Volume 84 NEW YORK, THURSDAY, JUNE 17, 1920 Number 25

The Water-Works Convention

HUNDREDS of water-works men will gather at Montreal next week for the annual convention of the American Water-Works Association. In accordance with the time-honored custom we devote a large part of the issue preceding the convention to water-works subjects. Topically and geographically the articles have a wide range, as may be seen by the following comments suggested by several of the articles. This issue is by no means given up to water-works subjects and of the articles designed primarily for water-works men a goodly number will appeal to all who wish to keep abreast of engineering progress as a whole.

Arc Weld Aids Main Tapping

ONE of the greatest advances ever made in the field of water-works operation appliances was the use of tapping machines. They made it possible not only for service pipes but also for large branch lines to be connected with water mains under pressure, with no interruption of the water supply. An additional tapping facility, for use on the very thin shells of steel mains, is giving much satisfaction at Los Angeles, as described on p. 1212. This is a portable electric arc welding outfit for attaching a tapping shoulder to riveted mains so that the latter may be tapped as are cast-iron mains.

Pump-to-Pipe Connections

WATER-WORKS pump-to-force-main connections are often clumsy, due sometimes to piecemeal construction to meet increasing consumption. That courage in both design and capital outlay—extending, if need be, to the complete reconstruction at old stations—can substitute safety, convenience and economy for clumsiness, risk and unduly high operating expense, is shown by the description of the new header system at Toledo on p. 1184. The article shows anew that what *can* be cured *should not be* endured—even if one must contend against great odds through several political administrations.

Sandwasher Evolution

WHATEVER the efficiency and economy of the drifting-sand water filter may prove to be no one can deny the ingenuity that has been shown in its design. One of its most interesting features is the continuous sandwasher. Sceptical observers shook their heads at the thought of the heavy wear and tear of the moving sand on this device. Experience showed that this was a subject for concern. To let a promising engineering development be handicapped by a mere detail would be a sad reflection on engineers and engineering. The evolution of the sandwasher, with particular reference to avoiding metal erosion, is described on p. 1192. Loss-of-head data add to the interest and value of the article.

Adapting Old Tools to New Uses

IN THE utilization of a sand blast to clean out the holes in strainer plates of St. Louis filters, the filtration expert has successfully adapted to its uses one more tool from another industry. Picking open 102,000 strainer holes per filter by hand was a slow and tedious job shunned by all the men in the plant, says Mr. Daily (see p. 1198). Again, passing sand from one filter to another by a sand ejector is an old scheme, but obtaining a continuous circulation in one bed through one jet is new. The point in this case is the application of wash water through the underdrains, permitting the ejector to sink through the softened sand bed, thus making the feed of sand to the jet automatic without labor. The latter is a factor not to be overlooked in these days of "no common labor."

Building Up Filter Sand

THE experience of so many filter plants with increased sand size due to accretion when using lime and iron as coagulants brings up the question, Is it worth while to be so particular in specifying sand size? Why not pick a sand from a supply near home and then build it up chemically to the size required, thereafter alternating the kind of chemical used so as to maintain that size? Some operators do alternate the chemicals, but the task of building up a small size sand and then maintaining it has not been attempted.

Leaky Cross Connections

TESTIMONY as to the danger from leaky cross-connection between city and private water-supply systems continues to pile up. Following the article and editorial on the subject in this journal on May 13, a letter appeared in the issue of June 3, p. 1124, showing that the engineers of the National Board of Fire Underwriters are against such connections. Two further letters appear in the present issue and also an article on the use of the alkali test to locate a leaky cross-connection. Where such connections cannot be avoided two safety valves rather than one should be used and they should be frequently inspected.

Water Economy on Railways

WATER consumption by railways aggregates a volume and cost not generally realized. It occurs at so many places on a railway system that it is not easily kept under control. Within recent years the railways have come to appreciate the possible large savings that may be effected by systematically checking waste and improper use at the numerous and scattered water stations, shops, terminals and other points. This waste is particularly serious where water is scarce, requires treatment, is purchased or is unusually expensive for any cause. Particulars of consumption, waste and waste prevention recently compiled by railway men are given on p. 1202. The data indicate that as the need of additional supply, better quality and more economical use of water have been recognized, there has been greater attention given to railway water departments, whose responsibilities formerly were limited and vague. A number of railways have established a comprehensive water organization which not only provides the supply and the facilities for its use, but has supervision of construction, equipment, treatment and maintenance of all water service. An organization of this kind can wage effectively a campaign for water-waste prevention at widely scattered points on a large railway system.

We Are Complimented

IT is not often that *Engineering News-Record* is read on the floors of Congress. When it is we take some measure of pride in it. With all due modesty, then, we note that in the speech by Representative Nelson, of Minnesota, as printed in the *Congressional Record*, there appears almost in its entirety our recent editorial on the St. Lawrence power and navigation scheme. That there is no mention of this journal or even a sign of quotation marks is doubtless an inadvertence. Or else Mr. Nelson is like the lyre-smiting 'Omer—"What 'e thought 'e might require, 'e went and took."

Municipal Housing

MUNICIPAL housing has been practiced abroad for decades and is now going ahead on a vastly increased scale. American housing conditions never were and probably never will be as bad as those of Europe, but our standards and the ability of our wage and salary earners to pay, are higher than those abroad. These reasons, together with the stoppage of dwelling construction at a time when almost everything unites to discourage building operations and when there is a strong tendency to ask for government aid, all combine to bring pressure upon our cities to follow overseas precedents and embark upon municipal housing. Abroad, engineers have had much to do with municipal housing schemes and if our cities are to build houses there is at least equal reason for the work being assigned largely to engineers here. How many of our engineers are ready for it?

Shippers and Higher Rates

SOME time ago we asked the question, "Do Shippers Want a Railroad Subsidy?" Since that time the attitude of organized shipping interests has apparently undergone so great a change as to have put an entirely new light on the matter. In testimony taken before the Interstate Commerce Commission last week, the chairman of the National Industrial Traffic League urged that action be taken to increase rates: "We are paying today indirectly for a lack of service more than we would be called upon to pay in rates sufficiently high to maintain an adequate service." When it is recalled that bodies of shippers in the past were organized largely for the avowed purpose of holding railroad rates down to a bare minimum, such comment as this, from shipping interests, is most significant. Willingness to pay higher rates for adequate service is being manifest by shippers everywhere. Now let the railroads meet them halfway with proof of their willingness to break away from some of the business-getting policies of the good old days.

Planning Ahead for Water Power

LOOKING ahead is becoming a most important feature of water-power development. Time was, not so long ago, when each hydro-electric scheme was sufficient unto itself and little thought was given to prospective increases in output which require additional storage and flow. Today the prospective linking up of drainage areas for greater storage and planning of future plants for connected power lines must be kept in mind in the original design. In both California and New England this foresight is being executed in definite fashion and storage basins are being prepared and plant sites located some time in advance of the real need for the power to be developed therefrom. Primarily, the study of drainage basins is undertaken to get the maximum total power out of a stream but other advantages come of comprehensive studies. Considering the power sites of a basin relatively often makes it possible to rearrange the general scheme so as to use additional storage capacities here and there or to plan diversions of storage and flow so greater peak loads of short duration can be carried. A definite program for a term of years reduces the development cost because the company can then afford to gather and maintain a high class construction organization of its own, with which the work may be done for less than by contract. Moreover, a definite schedule makes it possible to allot to each year the desirable expenditures for that season and these figures for a term of years ahead greatly facilitates the financing which the company will have to do. The foreknowledge of what power increases may be expected enables the commercial department to plan its schedules more intelligently; business of a certain character can be sought for at the right time and effort is not wasted on other business which would exceed the profitable maximum. Commercial considerations, therefore, link up with technical ones.

Prompt Action Needed on Engineering Society Federation

THE story of the Organizing Conference at Washington early this month was told in last week's issue of this journal. The meeting having developed a plan whereby a federation of engineering societies can be created, the next step must be taken by the individual bodies whose delegates were present if the federation is to develop into something more than a paper organization. The observer at the conference could not fail to note among the delegates a spirit of determination to bring about unity of action in public affairs and in matters of civic and economic importance, insofar as engineers are concerned with them. The individual will to do is present and must be backed up by group action. Delay now may wreck the federation plan at the very time it is ready to go forward. It is the duty of the societies, therefore, to put the question before their memberships and to obtain, not general discussion, but a *decision.*

The American Society of Mechanical Engineers, as noted in an editorial last week, is definitely committed to the federation plan. Reasonable assurance also has been given of the entry of the American Institute of Electrical Engineers into the new body. Up to the time of writing, however, no word has been received from the local engineering societies. It is vital, if the federation is to be truly representative of the whole country's engineering interests, that the local organizations be adequately represented and take just as active a part in the federation as the larger national engineering units. In fact, it is upon the locals that the Federated American Engineering Societies will depend in great measure for strength. At the Organizing Conference opportunity was given for a full and free discussion of the subject. Questions touching all phases of the new body were asked and answered. The leading technical journals in all fields of engineering carried a full account of the meeting and published, either in whole or in abstract, the constitution and by-laws endorsed. There is no excuse, therefore, for failure to reach a decision on the ground of ignorance of the objects of the federation, its organization and the general scope of its proposed activities.

If the voice of the engineering profession is to be heard—and the importance of its message both to the country at large and to engineers individually was emphasized by practically every speaker at the recent Washington meeting—engineering societies, national, state, regional and local—must get behind the federation and give it their unqualified support. Before the new organization great opportunities lie. They will not be realized if a mere handful of societies accept the plan recently proposed. By united action only is the full measure of success for the federation plan to be realized.

Safety Administration at the Frontier

RECENTLY an important undertaking in bridge reconstruction was carried out at Niagara Falls. One of the two great railway structures crossing the gorge of the Rapids was rebuilt, as described recently in a paper before the American Society of Civil Engineers. A striking feature of the work, not mentioned in that paper however, was the fact that the Canadian railway authorities took cognizance of the work, while no United States authority concerned itself with it. There was an evident intention on the part of the former to see that the interest of the Canadian traveling public was protected, whereas no one made the public interest of our country his business.

Under our existing administrative systems, supervision over matters affecting the safety of travel is exercised by railroad and utility commissions, including those of the individual states and the Interstate Commerce Commission. But the Interstate Commerce Commission limits its safety functions very closely to questions arising from accidents, and takes no general jurisdiction over safety; it deals with the subject as to the facts only. State utility commissions, on the other hand, are commonly so fearful of invading the field of interstate commerce that they confine themselves to matters lying wholly within the state. Whether or not these be the controlling reasons, both the Public Service Commission of New York State and the Interstate Commerce Commission, answering our inquiries about safety jurisdiction over bridges crossing the Niagara frontier, have specifically disclaimed jurisdiction. They referred to two other bodies, the War Department, which through its Engineer Corps has Congressional authority over navigable streams, and the International Joint Waterways Commission. But upon inquiry it appears that these two bodies also are not interested. The Waterways Commission, which has broad powers over international streams, does not concern itself with the safety of bridges crossing them, and the War Department's interest is confined to navigation and this of course only in case of navigable streams.

Public interest in bridge safety is a matter of development. Time was when the safety of a bridge was no one's concern but the owner's. Today, many states maintain a current inspection of railway and trolley bridges, and it can truthfully be said that they do excellent service to the public by this work. The co-operation of railway and public representatives accomplishes more than one alone could achieve. And most obviously in the case of a bridge owned by one party and used by the trains of railways which lease the bridge, is there opportunity for conditions to occur that are unsatisfactory from the standpoint of public safety. These remarks do not of course apply to the Niagara railway arch, for a most excellent record was made there, in point of maintenance as well as procedure of reconstruction; the bridge is today stronger and better than when it was first completed. But there are other bridges over the Niagara as well as over other international waters, and it is a fair question to ask whether public safety supervision should not be so administered as to include bridges at a boundary.

Frontier questions constitute a decided puzzle in this field, as has been experienced previously in the case of bridges crossing from one state to another within the United States. There are instances in which interstate bridges have been regarded by public service authorities as being within the jurisdiction of neither state. In other cases, the authorities of one state took the common-sense view that the part of an interstate bridge within their own state is not likely to be safe unless the whole bridge is safe, and accordingly they treat the entire structure as if it were in their state. This simple expedient cuts a legal knot that either exists or may easily be imagined to exist.

So in the case of the Niagara Gorge bridges, for example, it is readily seen that the half of a bridge lying within New York State is safe only if the whole span is safe, and the same for the Canadian portion. Possibly the Canadian railway authorities acted on this view. But it is certain that those of New York State did not.

It should not be difficult to find means for bridging the jurisdictional gap existing at frontiers, provided there is an earnest desire to guard the public safety, and not merely a purpose to carry out the letter of a law. The existing situation is anomalous. It would still be so in a measure if the Interstate Commerce Commission took jurisdiction over common-carrier safety at frontier points, since this would still leave electric-railway bridges unsupervised. State public utility commissions, however, in most instances have functions broad enough to cover both railway and electric railway matters. Thus the question could most quickly be disposed of by proper interpretation of the powers of state authorities. So long as such powers are interpreted in a narrow, literal sense, which demands that the whole of a bridge be within the state in order to bring it within the jurisdiction of the utility commission, public safety administration will be interrupted at frontier points in an unexpected and undesirable way.

Revamping Toledo Pumping Station Under Service

Piecemeal Construction Carried On Ten Years Under Four Administrations—Six Hydraulically-Operated Valves Manipulated from Table in Pumping Station Control Central Header System

By George N. Schoonmaker
Assistant Commissioner of Water, Toledo, Ohio

FOLLOWING the introduction of filtered water into the mains of Toledo, Ohio, in 1910, the consumption rose so rapidly that a substantial increase in high-lift pumping capacity was needed. How the reconstruction and rehabilitation of an uneconomical obsolete pumping plant was accomplished a little at a time during ten years because of lack of funds and authority and through succeeding political administrations is a typical instance of handicaps frequently met with in growing cities that can ill afford the inconvenience of a water shortage.

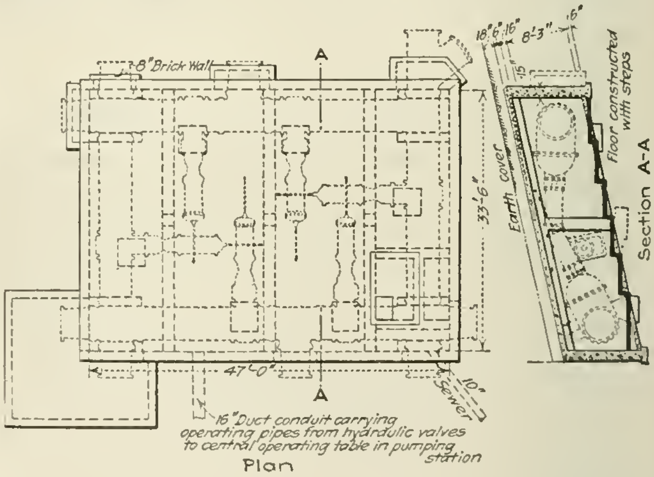
Incidental to the revamping of the station was the construction of a central header system of 48-in. pipe for collecting, controlling and distributing all of the water furnished to the city. This rectangular header system, with its five inlets and five outlets, hydraulically controlled by six valves, is a novel arrangement the advantages of which are made plain by the accompanying illustrations.

The pumping equipment at the beginning of the period noted was not only inadequate to meet the suddenly increased demands but was also obsolete and uneconomical, both as to engines and boilers. Pumps installed in 1873 were still in daily service. The pumping station was too small to house modern engines. A recommendation was made to the city council by the superintendent of the water department for authority to build a new pumping station, equip it with modern machinery and boilers and abandon the old station. This recommendation was not approved and the department had to rebuild and enlarge the old station and equip it piecemeal with new boilers and pumping machinery.

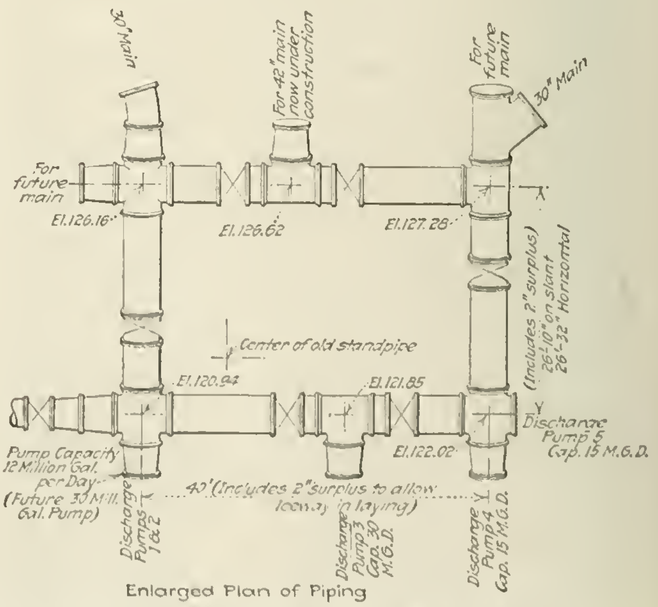
The first portion of the work, completed in 1913, was the installation of a 30,000,000-gal. triple expansion crank-and-fly-wheel pumping engine in the central section of the pump room, enlarged to accommodate it. Subsequently the remainder of the new building was erected around the old structure and the old building was then torn down. New boilers, coal-handling equipment, a 225-ft. chimney, an electric crane, electrical generators and a 30,000,000-gal. centrifugal pump with steam turbine were installed while keeping the old station and its equipment in continuous operation. The war and the necessity for doing this work in small sections greatly delayed construction so that the station was not completed until early in 1920, after a 10-year period of almost continuous tearing down and rebuilding.

Besides replacing antiquated machinery the department had to provide more ample force mains. Included in the original layout of water piping at the station was a 60-in. steel standpipe, 228 ft. high, inclosed in a masonry structure, that served only as a surge tank. As it was within 100 ft. of the old pumping station it was a source of possible disaster. The old discharge mains were so inadequate in size and so ineffectively controlled as to require complete revision. A new and well designed system of discharge mains was needed, but the old standpipe stood in the path of any new system of adequate capacity. This old structure was considered by station employes and residents as necessary to the operation of the station. Serious objection was raised to its removal, for sentimental and operating reasons. Without the knowledge of even the station employes the standpipe was closed off and drained and the pumping station was operated for two years by direct pumping to prove to both the employees and the public that no necessity existed for the standpipe. In 1916 the standpipe was razed and work was commenced on the construction of new force mains and the central header system. The work was interrupted by the war and the header system was not put into service until 1919.

The header system is in a concrete underground structure covered with a concrete slab roof. It is built


8" Brick Wall
A
18'6"
16"
8'3"
6"
Floor constructed with steps
Section A-A
Earth cover
33'-6"
47'-0"
A
Sewer
16" Duct conduit carrying operating pipes from hydraulic valves to central operating table in pumping station

Plan


30" Main
For 42" main now under construction
For future main
30" Main
For future main
El. 126.16
El. 126.62
El. 127.28
(Includes 2" surplus) 26'-10" on slant 26'-3½" Horizontal
Center of old standpipe
El. 120.94
El. 121.85
El. 122.02
Discharge Pump 5 Cap. 15 M.G.D.
Pump Capacity 12 Million Gal. per Day (Future 30 Mill. Gal. Pump)
Discharge Pumps 1 & 2
40' (Includes 2" surplus to allow looseness in laying)
Discharge Pump 3 Cap. 30 M.G.D.
Discharge Pump 4 Cap. 15 M.G.D.

Enlarged Plan of Piping

CENTRAL HEADER SYSTEM FOR BROADWAY PUMPING STATION, TOLEDO WATER-WORKS up of 48-in. cast-iron pipe, special castings and six 48-in. hydraulically operated gate valves which are so placed that by shutting off two valves any line leading from the header to the city or from the station to the header can be closed off without interrupting the flow of water from or to the header through the other lines. The valve control is manipulated from a special operating table of the type ordinarily used in filter plants. This table, which is located in the main pumping station building, is fitted with three-way cocks and is provided with an indicating dial attachment for each 48-in. valve. Water pressure for operating the valves is obtained both from the force mains and from an auxiliary connection to the boiler feed pump system in the station.

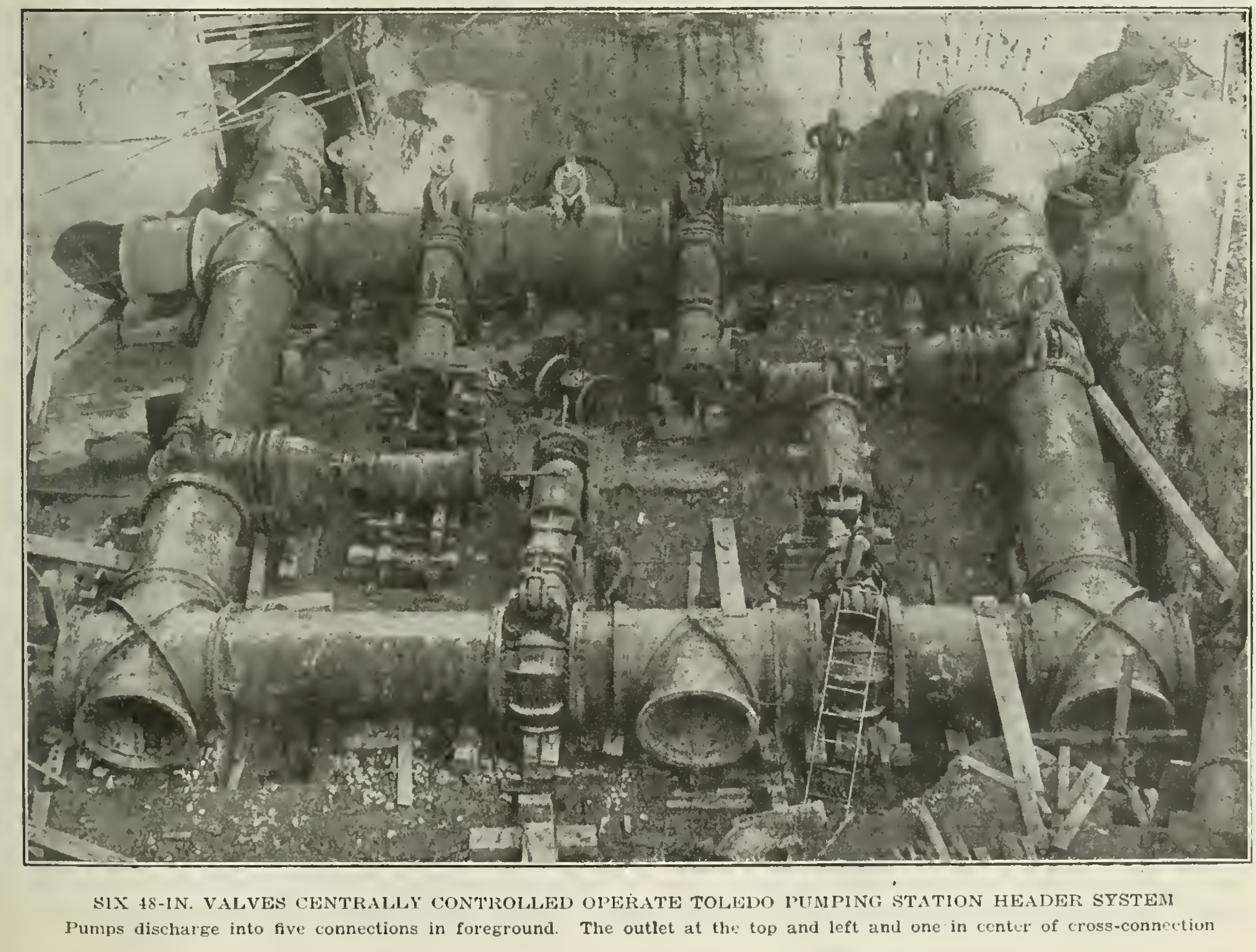
The piping and valves are placed upon the lower courses of masonry formerly supporting the standpipe and are blocked up on concrete piers so that all parts are accessible. The bell-and-spigot joints are poured full depth with lead and calked inside and out. The six valves have flanged connections to the pipe system. After the header system had been tested to 150 lb. per square inch and the joints recalked where necessary and the header retested, a concrete floor was poured and the walls and roof constructed.

The entire work of installing and constructing this header system was done by the employees of the water department using a 40-ton stiff-leg derrick with an 80-ft. boom. In order to align the header connections with the pump discharge of the force mains leading to the city, it was necessary to tilt the whole system of piping; the discharge side taking one angle from the horizontal and the entrance side taking an angle directly opposite. With castings of the sizes used this work was difficult but was accomplished with precision and all discharge and entrance connections were made to meet the exact elevations of the old piping.

It is believed that this header system is as flexible and as fool-proof as can be found oridinarily in connection with modern pumping stations, and certainly it is a distinct improvement over the relics of old pumping station discharge systems, as usually modified and augmented to meet the needs of a growing waterworks. The capacity of the header system is calculated at 120,000,000 gal. daily with a present maximum momentary peak demand of 52,000,000 gal. and an average daily consumption of 25,000,000 gal.

The original pumping station capacity in 1910 was 46,000,000 gal. per day, with a boiler capacity of 2,000 boiler horsepwoer which has been increased to 110,000,000 gal. and 2,800 hp., with space provided for an additional pumping capacity of 19,000,000 gal., making a total projected station capacity of 120,000,000 gal. per day. This will adequately supply an average daily consumption of 60,000,000 gal. for a population of a little less than 600,000.

Aside from the somewhat unique feature of the header system it is of interest to note that a municipal project designed and planned ten years ago has been actually carried to completion, following closely the original design, through four distinct city administrations. The writer does not recommend the methods



SIX 48-IN. VALVES CENTRALLY CONTROLLED OPERATE TOLEDO PUMPING STATION HEADER SYSTEM

Pumps discharge into five connections in foreground. The outlet at the top and left and one in center of cross-connection

STIFF-LEG DERRICK PLACED SPECIALS IN HEADER

adopted by Toledo in the reconstruction and rehabilitation of an obsolete pumping station, but this brief summary indicates what has been accomplished in municipal work through succeeding political changes, in the face of a refusal by the legislative body of the city to provide funds and authority for the construction of a new pumping station.

The rebuilding, enlarging and re-equipping of the pumping station, and the construction of the header system, was designed jointly by William G. Clark, consulting engineer for the Toledo Water Department, and D. H. Goodwillie, then superintendent of the water department and now director of public service of Toledo, the writer having served as construction engineer in charge of the execution of these improvements.

Higher Rates for British Consultants

The council of the British Institution of Civil Engineers recently issued a statement justifying an increase in consulting engineers' fees over pre-war rates. With respect to reports, inquiries, parliamentary work and general advice on engineering matters the council is of the opinion that civil engineers are entitled to an advance of 50 per cent over former charges. These views have been supported by the British Association of Consulting Engineers.

Results of Completely Metering Omaha Water Supply

By F. P. Larmon
Chief Engineer, Metropolitan Water District of Omaha

FULL metering of the water supply of the city of Omaha has resulted in a material saving in the amount of water pumped and in postponing for several years the enlargement of the pumping equipment. It has also contributed largely to the reduction in water rates which the Metropolitan Water District has been able to make from those charged by the Omaha Water Co. previous to the taking over of the plant by the district July 1, 1912.

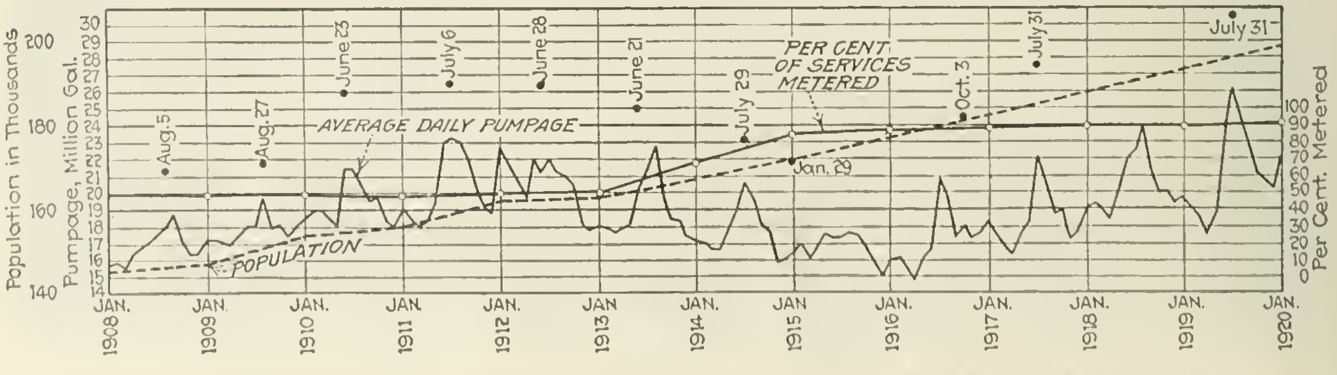
The water supply is lifted from the Missouri River to sedimentation basins, from which it is pumped into the distributing system. A part of this water is again lifted by booster pumps to a high service system. On account of the triple pumping of part of this water, any reduction in leakage or wastage is a material factor.

On the accompanying chart is shown the average amount pumped daily for each month from Jan. 1, 1908, to Jan. 1, 1920. The small circles represent the maximum amount pumped on any day for each year. A population curve and one showing the percentage of services metered are also added.

In 1899 the Omaha Water Co. had placed meters on about 25 per cent of its services. The number was gradually increased until in 1905 practically 50 per cent of the services were metered. This percentage held stationary until 1912 when the plant was taken over by the Metropolitan Water Board, which promptly took steps to meter the entire city. In 1913 about 67 per cent of the services were metered; in 1914 the percentage reached 84; in 1915 it was 87 per cent and on Jan. 1, 1920, out of a total of 34,632 recorded services, 31,573 were metered, representing 91 per cent. Deducting the number of services which were not in active use and from which meters had been removed, and also the city services, for which no charges are made, 98 per cent of the services are metered. The few unmetered special flat-rate services are rapidly being eliminated.

The chart shows a constant increase in amount pumped up to 1912, at which time, coincident with the introduction of more meters, the consumption decreased, although the population was steadily increasing. This condition prevailed until 1915 when practically all of the active services were metered. From that time on, the increase in consumption has been practically uniform and corresponds closely with the increase in population.

The average daily consumption per capita was 115 gal. in 1908 and increased each year up to 1912 at the rate



MONTHLY CONSUMPTION OF WATER IN OMAHA IN RELATION TO METERS AND POPULATION of about 3 gal., so that in 1912 it was 128 gal. With the introduction of meters there came a decrease which continued until 1915, when the average daily consumption per capita was 94 gal. If the rate of increase previous to 1912 had been continued to 1915, the figure would then have been 136 gal., so there was an apparent saving of 42 gal. Since the completion of the metering program in 1915, the increase has been in about the same ratio per capita per year as it was in the period from 1908 to 1912. For the year 1919 the average daily consumption per capita was 107 gal. If the city had not been metered and the ratio had continued as shown prior to 1912, the average daily consumption per capita would probably have been 148 gal., or an increase of 41 gal. over the actual consumption.

CONSUMPTION HIGH

The consumption is rather high, due to the large use of water by the stock yards and packing houses, to which is delivered nearly one-third of the water pumped. During the years 1918 and 1919 the use by these concerns was rather in excess of what it had been previous to that time, in the latter year accounting for 36 gal. out of the 107 gal. per capita.

HOW METERING AFFECTED THE TOTAL AND AVERAGE PER CAPITA CONSUMPTION AT OMAHA, NEB.

Year	Total Yearly Consumption in Million Gal.	Per Cent Metered	Average Daily Consumption per Capita	Probably Consumption if Not Fully Metered
1908	6,144	49	115	115
1909	6,480	49	118	118
1910	7,051	48	125	121
1911	7,375	49	121	124
1912	7,573	49	128	127
1913	6,932	67	116	130
1914	6,437	84	104	133
1915	5,943	87	94	136
1916	6,111	88	94	139
1917	6,515	89	97	142
1918	7,233	89	105	145
1919	7,616	91	107	148

While a conclusion as to what would have happened, had conditions of the period previous to 1912 continued, is in a way unsatisfactory and subject to criticism, yet it is believed that a study of the records of the amounts pumped before and after full metering, will justify the statement that the actual amount pumped in 1919 is at least 30 per cent less than it would have been if the system had not been fully metered. This reduction made a saving not only in the actual cost of pumping, but also made it possible to defer the enlargement of the pumping facilities from 1912 until 1918, at which time it was found advisable to replace one of the main pumps by a larger unit.

Canadian Power Statistics

Announcement has just been made by the Dominion Water Power Branch, Department of the Interior, of the central power station statistics of the Dominion of Canada as of Jan. 1, 1919. There were in the Dominion at that time 795 central stations, of which 377 were commercial and 418 municipal. These generated a total of 1,841,114 hp., or 2.09 hp. per thousand population. Of this 1,682,191 was generated by water power, or 91.4 per cent of the total. It is also reported that of the developed water power in the Dominion 72.7 per cent is utilized in connection with the central electric station industry.

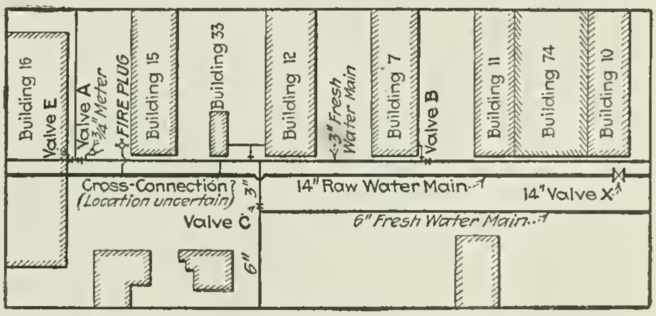
Leaky Cross-Connection Located by Alkali Test

By Lieut. W. Mack Angus and Carl Francis
Public Works Department, Navy Yard, Philadelphia

BECAUSE dual supplies of potable and raw or unfiltered water are in common use in industrial plants, especially shipyards where raw river water may be had merely for the pumping, the following description of a method used in locating a cross connection between dual supplies may be of interest. This dual system had given satisfactory service for many years when complaints suddenly arose of bad drinking water in several buildings in the plant, which covers some 900 acres and is laid out with streets and other features common to large modern shipyards. The first reports of bad tasting water were followed by a slight outbreak of dysentery and other intestinal disorders among the occupants of the buildings in the plant but there was no typhoid outbreak. As the trouble started immediately after putting some new raw water pumps in use which gave a material increase in pressure it seemed reasonable to suppose that some unknown cross connection between the raw water and fresh water systems was causing the trouble.

City water as it came to the plant had a decidedly unpleasant odor and taste at this time, due to ice on the river and consequent poor aëration of the raw water supply to the city's filters, so laboratory tests were decided upon to determine definitely whether or not the pollution was local or general. Ten lactose-peptone fermentation tubes were inoculated with water from each of a number of samples taken, 1 cc. of water being introduced into each tube. Specimens were taken from the pump house where the city pressure is boosted for use in the plant and other specimens were obtained from drinking fountains and wash basins in buildings from which complaints of bad water had been received and from other buildings in their vicinity. One tube of the ten prepared from the pump house specimen showed gas in 24 hr. while some of the specimens showed gas in all ten tubes within 18 hours.

All piping in the buildings where polluted samples had been obtained was next thoroughly examined and one small cross connection was found in this way. The connection had been made by a mechanic who evidently had wished to change the water supply to certain fixtures from raw water to city water and had deemed it safe to have a by-pass valve that would admit raw water to the potable water line in case of failure of the latter supply. This by-pass valve was leaking slightly and was thus polluting the water at one or two drinking fountains. The cross connection was removed and the attention of shop foremen called to regulations for-



ALKALI TEST TO LOCATE LEAKY CROSS-CONNECTION bidding cross connections between the two water systems. A repetition of the test for gas forming organisms showed that there was still a serious local source of pollution, so the search for cross connections had to be continued.

This time the underground mains and not the piping systems in buildings were examined. Valves at street intersections were closed so as to give a definite direction of flow in all mains in and near the suspected area and fermentation tests were made. The trouble was thus almost definitely located as being somewhere on an old 3-in. main between valves *A* and *B*, in the accompanying sketch. This stretch of pipe had not hitherto been considered a likely location for the cross connection, as Buildings 7, 12 and 33 were all fed from the pipe in question and none of these buildings had made serious complaints of bad water. Closing valves *A*, *B* and *C* made the diagnosis of "cross connection somewhere between *A*. *B* and *C*" absolutely certain as water continued to run at high pressure from the fresh water faucets in buildings 7, 12 and 33. The fresh water connection to building 15 had previously been shut off as the building had been vacated preparatory to extensive alterations. The interior piping and plumbing systems of buildings 7, 12 and 33 were again examined for cross connections but none were found. Finally, the curb cocks for these buildings were shut off one at a time and the result of the shut down on the buildings supplied through the cock and the other buildings noted. As the closing of a curb cock in each case shut off the water from the building supplied through the cock, and did not shut off the water from the other buildings of the group, it was evident that the cross connection was in the 3 in. main proper and not in a supply line or service connection on the "building side" of the curb cock. Valves *A*, *B* and *C* were kept closed from this time on and occupants of buildings 7, 12 and 33 were warned not to drink water obtained in the buildings until further notice.

How Test Was Made

To get the actual location of the underground cross connection without digging up the entire length of pipe under suspicion was the next step. This was successfully carried out by using a modification of the alkali test described in *Engineering Record*, Sept. 13, 1913. The test was made by connecting a ¾-in. house meter with hose connections to an outlet made for the purpose in the main under suspicion near valve *A*. This connection was easily arranged in the manhole containing valves *A* and *E* and was itself provided with a globe valve for controlling the flow through the meter. This globe valve was closed, after a few cubic feet of water had been allowed to run through the meter, and the curb cock controlling the supply to buildings 12 and 33 was also closed. The curb cock supplying building 7 was left open, but all faucets in the building except a convenient one over a large sink were closed and the 14-in. valve *X* in the raw water main was closed. The next step was to open the 4½-in. steamer connection to the fire plug near valves *A* and *E*, throw 20 lb. of lump caustic soda in the bottom of the plug, close the steamer connection tightly and pump water *into* one of the 2½-in. connections of the hydrant with a gasoline driven fire engine, thus forcing the alkali into the 14-in. raw water main. As soon as the pumping engine started work the water running into the sink in building 7 was tested for alkalinity with phenolphthalein, a strong alkaline reaction being obtained after twenty minutes pumping, which showed that the caustic soda solution had worked down the 14-in. raw water main from the fire plug to the cross connection, through the cross connection to the 3-in. fresh water main and down this main to building 7. The spigot in building 7 was then shut off, the meter at *A* read carefully, and water was drawn through the meter until an alkaline reaction was obtained at this point. A second reading of the meter gave the contents of the pipe from the cross connection to the meter and as the main was of known size it was a simple matter to compute the distance back to the cross connection, proper corrections being made for the cubical contents of the meter and its connecting hoses.

It was feared that a leak between the cross connection and the meter might cause the test to fail by allowing the alkali to work from the cross connection to building 7, which would lead to the discovery of the leak and not the cross connection. This actually happened; a large leak being found within 5 in. of the location indicated by the test; but by good luck the cross connection was so near the leak that it was discovered while the leak was being excavated so that a repetition of the alkali test was unnecessary. The cross connection consisted of a 1½-in. pipe that had evidently been used to supply cooling water to a disused compressor in building 33. The dual supply had been provided with a valve on each main and a check to prevent raw water from getting into the potable water main. The check was out of order and both valves were wide open so that an almost unobstructed 1½-in. connection existed between the two mains. The connection, which was not shown on any drawing or blueprint, was removed entirely. It showed clearly the danger of any cross connections between raw and potable water systems except such connections as are located in boiler rooms where they may have the most careful supervision and attention, and even in such cases that cross connections are unsafe if protected by only one check valve.

A Water Project for Washington and Vicinity

In making studies of possible sources of water supply for the Washington Suburban Sanitary Commission, Robert B. Morse, chief engineer, Maryland State Board of Health, has found possibilities of developing a gravity water supply for a large part of the District of Columbia in conjunction with the needs of Maryland territory adjoining the District of Columbia. A report on this subject of Mr. Morse was printed under date of June 14, 1918. A second report, dated Dec. 15, 1919, has recently been published, in which Mr. Morse outlines two projects involving ultimately the utilization of water from the three Patuxent Rivers, the northwest branch, and Rock Creek. The first project contemplates the ultimate development of 170,000,000 gal. a day and the immediate development of 100,000,000 gal. The other project is for 200,000,000 and 130,000,000 gal. respectively. Various dams or filtration plants and a conduit would be required in each case. No estimate of cost has yet been made. The Washington Suburban Sanitary Commission (611 F St., N. W., Washington, D. C.) was incorporated by the Maryland Legislature in 1918. It is already building small waterworks for portions of the territory under its jurisdiction.

Flint Water Filter Improvements and Reconstruction

Michigan City Outgrows Capacity in Four Years—Dry-Chemical Feed Replaces Wet Method—Softening Provided For

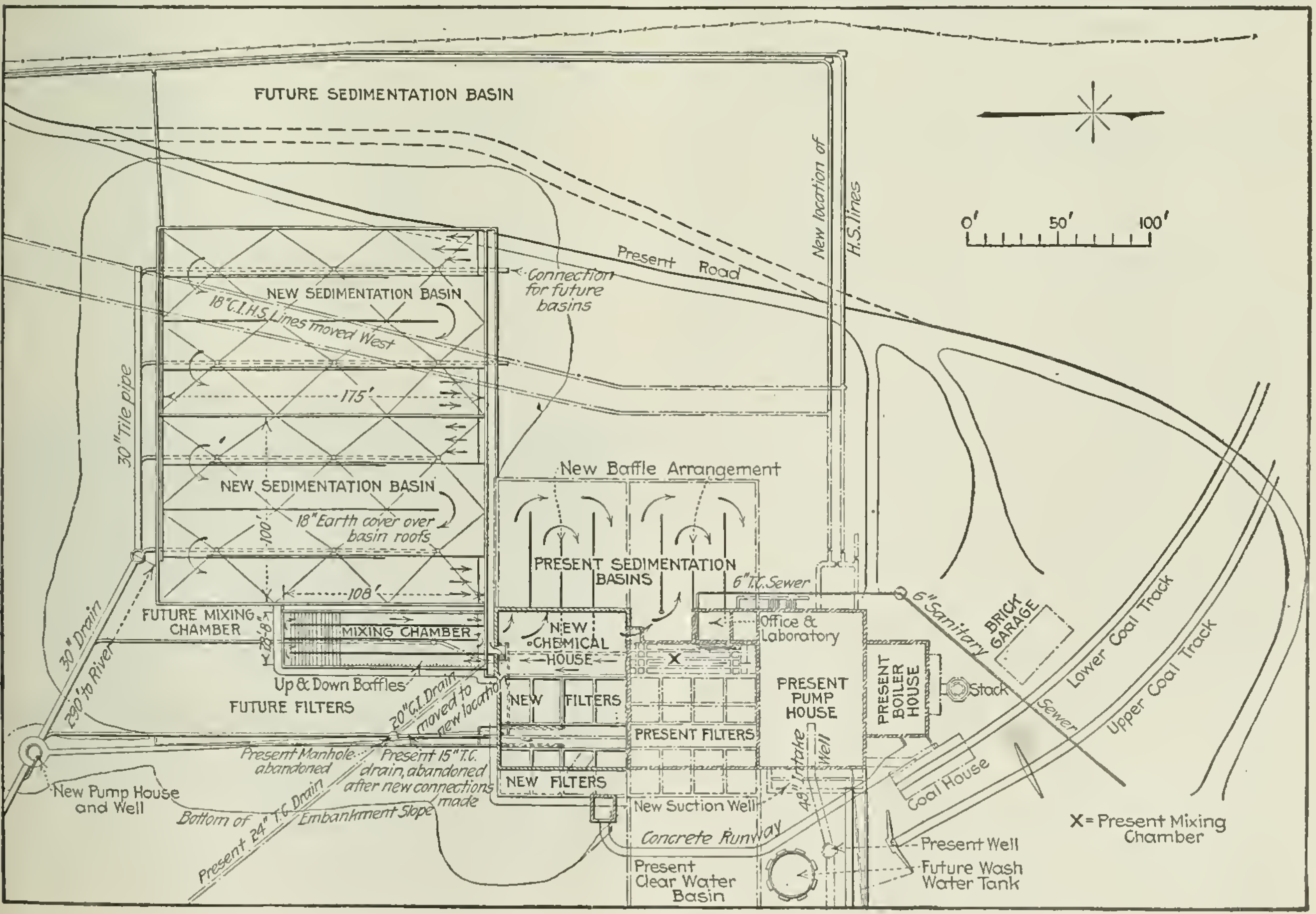
SO RAPID has been the growth of Flint, Mich., that the water filtration plant completed in 1912 needed enlargement in four years instead of the expected twenty years later. The war so delayed construction that the new work was not completed until 1919. Reconstruction, including a change from wet to dry chemical feed, was carried on with the old filters in full operation. The plant as it now stands is probably the first one designed throughout for the use of chemicals in a dry state, although 25 or 30 other plants have had their chemical feed changed from the solution to the dry type.

The original plant, built by the Pittsburgh Filter Manufacturing Co., from plans prepared by W. G. Clark, consulting engineer, Toledo, Ohio, had a nominal capacity of 8,000,000 gal. daily. This capacity has been doubled, with provision for an increase to 36,000,000 gal., and also for water softening.

The new construction consists of two settling basins of 2,250,000 gal. capacity each; a baffled mixing chamber; eight additional filter units of 1,000,000 gal. capacity each; a new head house and chemical storage building; a new laboratory; chemical feeding devices; and a new intake and suction well, the entire work costing somewhat in excess of $300,000.

The old settling basins, with a 3½-hour detention period and a velocity of 1¾ ft. per minute, were found to be too small for economical results. At the nominal daily rate of 16,000,000 gal., the new settling basins, which are 16 ft. deep, will have a 7-hours detention period and the same velocity as the old basins when operated in parallel. The new basins have flat slab floors and roofs, and each is provided with six openings to the drains for cleaning. A 6-in. flushing pressure line, with 4-in. branches on the baffle wall, is laid along one end of the basins. Distribution of the water over the full cross-section at the inlets is effected by a 6-in. baffle wall, 4½ ft. in front of the inlet gate, perforated with 3-in. holes, 9-in. c. to c. both ways over a 9 x 25-ft. area. Choice of this method of securing a uniform distribution was based on reports of its satisfactory use in several other plants. The discharge from the basins is over a solid baffle wall with four stop-plank openings at the top, 4 ft. deep and 5¼ ft. long.

Through the new mixing chamber, with its four channels 6⅝ ft. wide and 20½ ft. deep, the water makes a passage of the 108-ft. length four times, but the design is such that from one-fourth to the entire capacity of the chamber may be used. The up-and-down plank baffles are spaced 2 ft. c. to c. but the grooves in the walls are on 12-in. centers so that different arrangements may be made. All "over" baffles have swinging 18 x 24-in. wood flap gates at the bottom to equalize any unbalanced pressures while draining and to permit such sediment as may collect to be flushed to one of the two drain pipe openings provided. The maximum loss of head was calculated to be 4 ft., but will vary according to the arrangement of baffles. As operated, the maximum recorded has not exceeded 30 in. The old



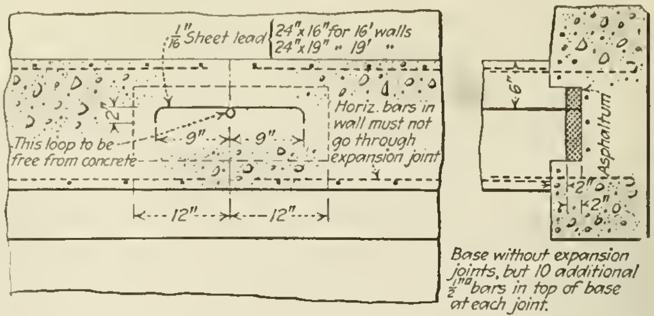
LAYOUT OF RECONSTRUCTED WATER FILTRATION PLANT AT FLINT, MICHIGAN mixer, in which the water remained for 10½ min. and passed at a velocity of 0.4 ft. per second, gave fairly good results with alum but proved inadequate when lime and iron were used. The greatest velocity assumed for the new basins is 0.5 ft. per second. There has been no settling in the new chambers. Should a deposit occur ample provision is made for its removal through sludge valves.

The filters are of the usual type, equipped with air and water manifolds. Each controller responds to a master controller operated from the clear well, water in which is maintained at a pre-determined level.

FOUR-PASS MIXING CHAMBER WITH UP-AND-DOWN WOOD BAFFLES

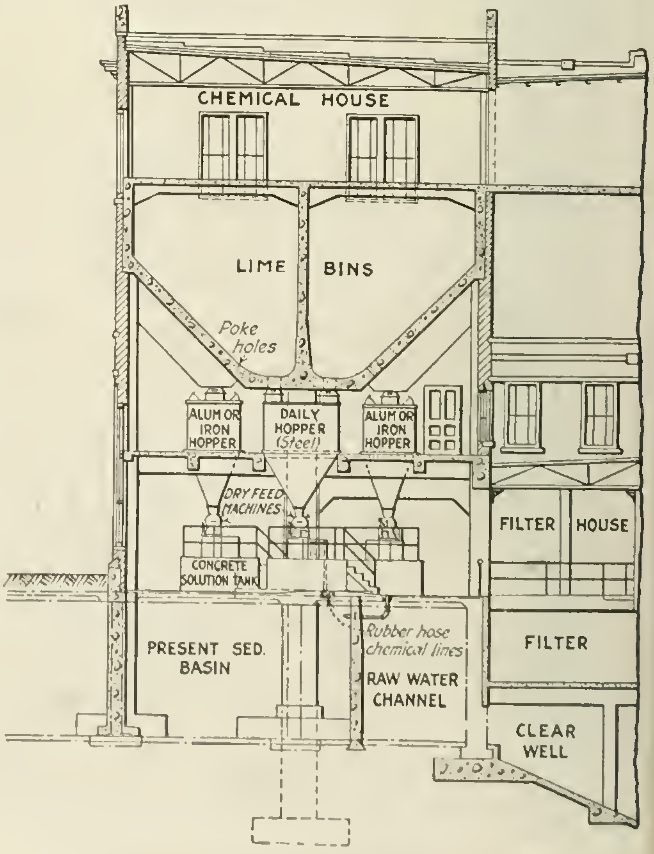
Eight reinforced-concrete self-supporting hopper-bottom bins provide storage for from 10 to 12 cars of chemicals. On the charging floor above them additional flat storage is available. The chemical is transferred at the unloading building from cars onto a storage battery car by which it is transported over an elevated concrete runway to an elevator in a tower at the rear of the new filters. Six of the bins, storing hydrated lime, are connected to three dry-feed-machine hoppers by chutes with slide gates, and the other two bins, for alum or for iron sulphate, are each connected to separate machines.

From the hopper bins the feed is entirely by gravity and dry until it has passed the measuring machines. The latter consist of a cast-iron housing into which is fitted a motor-driven corrugated drum wheel upon which the material rests. The wheel carries the material forward through an adjustable orifice. The degree of opening, and, therefore, the rate of feed, is indicated by a pointer on one side of the frame. Wide adjustment of feed is obtained in three ways: (1) By the orifice opening. (2) By the adjustment of the ratchet operating the feed wheel. (3) By the speed of the motor. Each machine will discharge with an accuracy of from 95 to 98 per cent at the rate of from 100 to 16,000 lb. daily. The motor speed is controlled automatically in proportion to the supply of water to the plant. Head through the Venturi meter on the supply line to the basins actuates an equal pressure diaphragm operating a valve which supplies water to the motors. The discharge from the motors is used in dissolving the powdered material after it is measured out, but more water may be added to obtain any degree of dilution necessary to avoid the corrosive action of the chemicals. Rubber hose is used to carry the solutions to the point of application.


$\frac{1}{16}$" Sheet lead
24"x16" for 16' walls
24"x19" " 19' "
2"
9"
9"
This loop to be free from concrete
Horiz. bars in wall must not go through expansion joint
12"
12"
6"
Asphaltum
2"
2"
Base without expansion joints, but 10 additional $\frac{1}{2}$" bars in top of base at each joint.
Horizontal Section
Section

EXPANSION JOINT FOR SEDIMENTATION BASIN

The most difficult construction feature arose from the necessity of maintaining uninterrupted service. This problem was by no means easy as the old mixing chambers had to be reconstructed, the old settling basins altered, the chemical plant removed entirely and a new intake and suction well cut in. The work was so planned and executed that only for a few hours was it necessary for the city to obtain a supply directly from the river, and that at a time when the raw water was at its best. The procedure was as follows: The settling basins, headhouse and chemical equipment and new filter units with the clear well below the filter boxes were practically completed ready for use with the old plant maintained in operation. For a considerable period it was necessary to operate with one basin only, since columns supporting the building and the storage bins were constructed in the second basin. There was constructed also, in the end of this basin, a portion of the conduit carrying the water



CROSS-SECTION OF CHEMICAL HOUSE

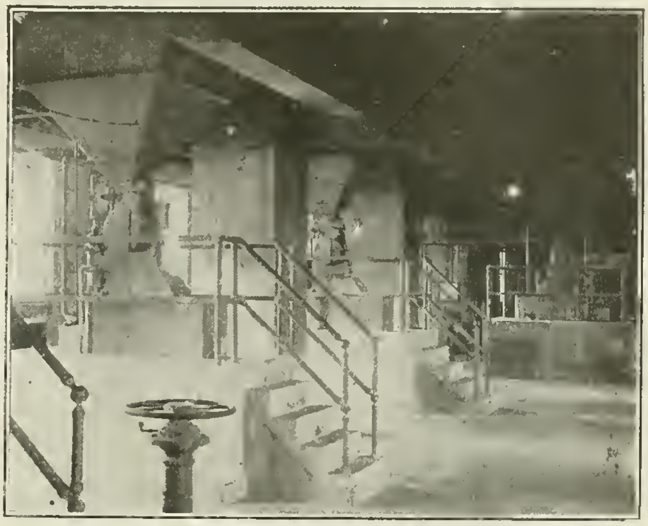
from the inlet well to the mixing chamber. When this point in the new construction was reached the old mixing chamber was put out of commission and reconstructed to form the completed conduit to the new mixing chamber. The top of the conduit was covered to sustain an upward pressure on it due to a head of 3 ft.

When the supply conduit between the new and old filters was connected, the plant had to be closed down for a few hours to permit bulkheads to be built, forms erected and the concrete to get an initial set. After removal of the bulkheads the water was turned into the new mixing chamber, settling basins and filters, but it was then necessary to make a connection between the new clear water basin and the old one. The work was done from a float in the old clear well. A tight bulkhead provided with packing was sunk against the wall of the basin at the point of the desired opening. By means of a pipe through the bulkhead the water on the wall side was drawn out so that the pressure of the water in the basin would keep the bulkhead in place while an opening was cut through from the opposite side of the wall.

A new intake was built because the 3½-ft. brick conduit, 500 ft. long, connected directly to the suction of the low lift pumps, was slowly filling with a sand deposit. From the new intake a 48-in. reinforced-concrete conduit leads to a new suction well 10 ft. wide and 40 ft. long. The well extends below the outside wall of the existing station, necessitating a new foundation wall, which was built in sections. The old conduit was left intact and inclosed in the walls of the suction well while the well construction was under way. As the well is divided into sections so arranged that either conduit may be thrown out of commission, there was no interruption of service in changing over to the new intake. The suctions of two of the low service pumps were connected into the new well and used while the old conduit was cut off. The portion passing through the well was removed and a sluice gate fitted to the end entering the well.

To enlarge the plant to its ultimate capacity, no interruptions will be required in the operations, since special provisions have been made to add filter units, basins and clear well by cast-iron frame openings covered with removable plates.

HOPPER BOTTOMS OF CHEMICAL STORAGE BINS WITH CHUTES TO DRY-FEED MACHINES



CHEMICAL ROOM WITH DRY-FEED MACHINES

The additions to the plant were designed and constructed by the Pittsburgh Filter Manufacturing Co., under the general direction of F. N. Baldwin, superintendent of waterworks.

Screw Spikes on Electric Railways

In the electric railway field, a recent questionnaire covering the screw spike question, circulated by one of the large Eastern companies, resulted in replies the majority of which indicated that electric railway engineers have not found the use of the screw spike justifiable for ordinary electric railway conditions either in private right-of-way or in paved streets. Here it may be noted that the screw spike is not used either in the New York subways or upon the elevated roads, except under certain conditions at stations and other special locations.

We are inclined to the belief that the cut spike will continue as the standard rail fastening for electric railways, but attention is called to the point that recent experiments made at the civil engineering laboratories of Columbia University indicate the value of preboring holes in the ties to receive the spikes. The crushing and bunching of the wood fibers is thus materially reduced and the elasticity of the fibers, upon which the resistance to withdrawal partly depends, is retained to a far greater degree and over a longer period. It should also be noted that preboring should be done before creosoting or other treatment is applied. Attention is again called to the desirability of making new comparative tests of standard cut spikes made with the regular chisel point and with the Goldie or diamond point. The latter should prove the better of the two because its shape should lessen the crushing and bunching of the wood fibers, due to its better cutting action, and it is believed that the Goldie point will insure the best results when driven in prebored holes. Upon occasion it may be necessary to resort to double spiking in order to reduce the load which each spike must sustain in resisting withdrawal, and it will be found advisable to give close attention to such details if the most effective use of the cut spike is to be obtained.—*Electric Railway Journal.*

Sandwashers for the Drifting-Sand Rapid Water Filter

With Particular Reference to Experience at Toronto — Loss-of-Head Studies and Sand Scour Lead to Changes in Details

By William Gore
Of Gore, Nasmith & Storrie, Consulting Engineers, Toronto, Ont.

THE drifting-sand filter system which has been established at the water-works of Toronto, Ont., and elsewhere depends for its successful application upon the efficient working of continuously operated sandwashers. These washers have something in common with the ejector sandwashers developed for use with slow sand filters, but differ in that they form part of a closed hydraulic system and are required to work with a minimum water pressure with water practically unlimited in quantity. While water pressures of 120 lb. per square inch are commonly adopted with slow-sand ejector washers, these are called upon to work with pressures of $\frac{1}{100}$ of that amount.

The system with a sandwasher applied to a single unit is illustrated in Fig. 1. The treated raw water enters the filter partly by a standpipe running through the center of the unit, which passes up through a separator or sandwasher in the bottom and delivers above the sand at the top of the pipe, and also partly through a bypass. Within the sandwasher the raw water pipe is formed, similar to that of the tube of a venturi water meter, and the difting sand, after being collected and washed in the sandwasher, is inducted into the raw water at the throat of this venturi tube. The sand passes up the standpipe with the raw coagulated water, and is delivered with it above the top of the sand already there. This sand forms a volcano-like cone that continuously drifts away and is continually being replaced with the washed sand from the sandwasher, leaving a round-topped body of stationary sand below, resting upon the filtered water collecting system. This body of stationary sand does the final filtration. The surface of this body is more than twice the plan area of the unit and is the actual filtering surface, thus economizing the plan area of the filters. The drifting sand passes down all around the boundary of the stationary sand to a system of slots and continues through a system of converging ports to the outlets on the external extractors and thence by a system of pipes to the sandwasher. At the sandwasher the sand falls to the bottom through a current of raw water and is thus freed from its impurities. It is picked up by the inductorand carried on to the filter as previously described. The dirty water, impurities or suspended matter pass upward and out at the top of the sandwasher by an outlet suitably controlled. In the external extractors sand traps are placed of such a form that the sand is kept out of the piping system except when the inductor is in full operation. That is to say, the sand moves only when there is an abundance of running water to carry it forward to the sandwasher and from the sandwasher back again into the filter.

LOSS OF HEAD IN TYPICAL DRIFTING-SAND FILTER

Duration of Run, Hr.	Rate of Filtration, Millions Imp. Gal per Acre per Day Based on Plan Area	Loss of Head in Sandwasher, Ft.	Loss of Head in Filtering through Drifting Sand, Ft.	Loss of Head in Filtering through Stationary Sand and Underdrains, Ft.	Induction Head Provided by Sandwasher, Ft.	Diff. of Head at Bottom of Drifting Sand and in Washer, Ft. Col. 6—Col. 4	Remarks
0	150	3.0	3.6	2.3	5.1	1.5	1 grain per gal. of alum
5	150	2.6	5.2	1.7	6.1	0.9	
10	150	2.6	5.1	1.9	6.0	0.9	
15	150	2.5	3.8	1.8	4.8	1.0	
20	150	2.5	3.3	2.1	4.3	1.0	
25	150	2.5	3.2	2.4	4.1	0.9	
30	150	2.4	4.0	2.4	4.7	0.7	
35	150	2.4	4.1	2.5	4.8	0.6	
40	150	2.5	3.9	2.8	4.7	0.8	
45	150	2.5	4.0	2.8	4.8	0.8	
50	150	2.5	3.7	2.6	4.3	0.6	
55	150	2.6	3.7	2.7	4.4	0.7	
60	150	2.4	3.4	2.7	4.2	0.8	
65	150	2.5	3.3	2.7	4.0	0.7	
70	150	2.4	3.2	2.7	3.8	0.6	
75	150	2.4	3.7	2.9	4.3	0.6	No coagulant
80	150	2.3	3.3	2.9	3.9	0.6	
85	150	2.3	3.4	3.2	4.1	0.7	
90	150	2.5	3.8	3.5	4.6	0.8	
95	150	2.6	3.5	3.7	4.4	0.9	1 grain iron sulphate and ½ grain lime
100	150	2.6	4.1	4.0	4.9	0.8	
105	150	2.8	4.9	4.2	5.6	0.7	
110	150	4.2	5.6	4.6	6.5	0.9	
115	150	4.2	5.3	4.5	6.2	0.9	
120	150	4.2	5.4	4.8	6.4	1.0	

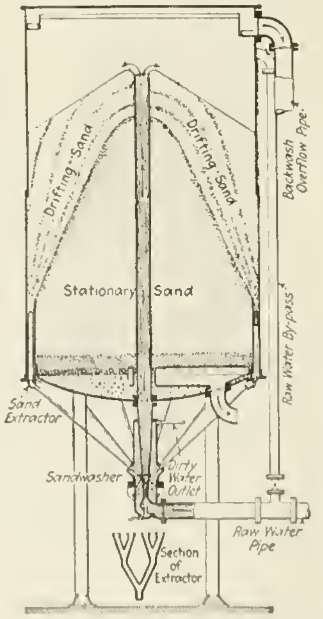


FIG. 1. TYPICAL SECTION OF DRIFTING-SAND FILTER UNIT

There are 30 of these units in each of the 10 filters of the Toronto plant. Each unit has a washer and 264 sand extractors connected with the washer by inclined pipes.

The main difficulty so far experienced with this system has been the erosion of the metal parts of the sandwasher where the sand and water are moving at high velocity or with unsteady motion. The erosion has taken place in the throat of the venturi tube, in the sand nozzle which conveys the cleansed sand from the bottom of the washer to the throat, and in the bottom of the washer itself, and a good deal of research work has been carried out in order to get rid of this erosion.

In the earlier washers side delivery of the sand to the ejector throat was adopted, but more recently the longitudinal or trailing nozzle delivery has been adhered to except for small units. The adoption of the trailing sand nozzle arose from experiments carried out at Toronto in 1915 with an 8-ft. 7-in. diameter filter unit similar to Fig. 1, and equal in area to one of the 30 units which make up the Toronto plant. [For a detailed description of the 72,000,000-U. S. gal. plant at Toronto see *Engineering News*, Sept. 21, 1916, p. 566, and for contract test results and operating results see *Engineering News-Record*, Oct. 31, 1918, p. 817, and Oct. 30-Nov. 6, 1919, p. 822—Editor.]

The more important part, that is, the base, of the sandwasher, as finally developed by the experiments, is shown by Fig. 2. A run at the full rate during 400 hr. using this sandwasher, did not disclose any scour whatever. It was believed that the problem of scour had been satisfactorily solved, and subsequent events have proved this to be the case. [The subject of scour and the further development of the sandwasher is taken up again further on—Editor]

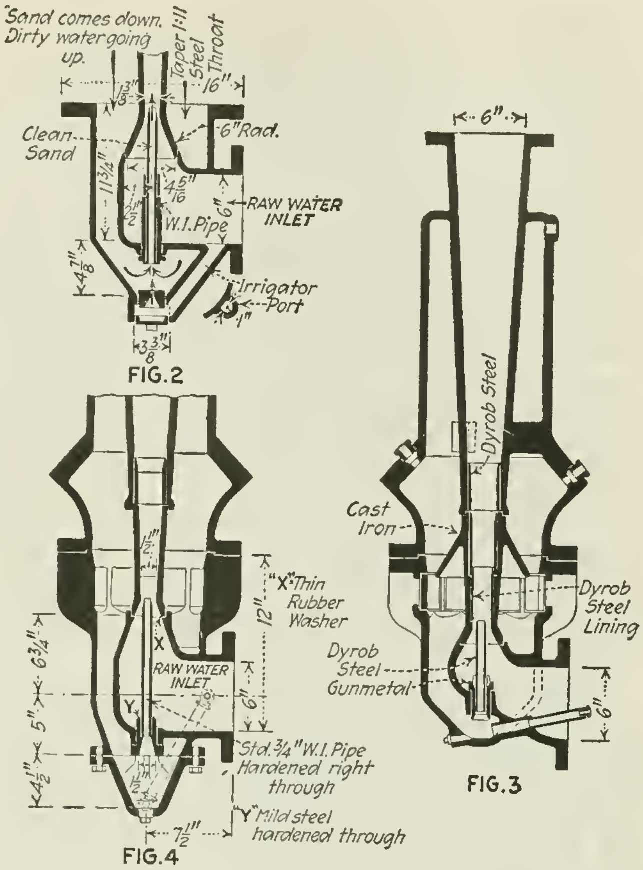
To make clear the nature of the work the sandwasher is called upon to do, the accompanying table is given. It shows observations of the various losses of head in the typical drifting-sand filter. The observations were made upon the test filter during a run of 120 hours, but during working hours only, the water being pumped from a local pond in which there was a considerable amount of suspended matter. The figures apply almost equally well to the Toronto plant, as sand of the same depth and quality is used, with water containing, on the whole, less suspended matter of a vegetable origin but more of a mineral origin.

During most of this test about two-thirds of the water being filtered was passed through the sandwasher, and the remainder bypassed to the top of the filter. At the first set of observations, and again when the filter began to clog after 110 hr. an increased proportion of water was sent through the sandwasher. This is shown in column 3 by the increased losses of head.

The drifting-sand filter has very definite loss-of-head characteristics which are brought out by the table and these affect the working of the sandwasher. These characteristics have been studied in considerable detail. It will be noted that under normal working conditions, an induction head (column 6) of less than 5 ft. is required in the sandwasher body. During the early hours of a run a maximum slowly develops and fades away again. This is due to the effect of the flat sand surface remaining immediately after a backwash. Another maximum develops towards the end of the run. This appears to be due to a less effective drift of the sand, as clogging takes place in the stationary sand which increases in bulk and area at the expense of the drifting sand, reducing the filtration area of the drifting sand. The greater part of the induction head provided by the sandwasher ejector is taken up by the filtration losses in the drifting sand (column 4). Thus, if no filtration was in progress, an induction head of 1 ft. or less (column 7) is all that is necessary to cause the sand to circulate. But as the water passing through the sandwasher throat has to be filtered or sent to waste, the practical minimum limit with a normally designed plant is about 50 per cent of the rated output, and the simplest working conditions are found at about 66 per cent of the rated output. The loss of head in the stationary sand (column 5) has very little effect on the operation of the sandwasher. This loss follows the normal law of filtration loss of head. That is to say, there are slow increased losses of head at the beginning of a run which increase as the run proceeds.

In summing up the experience with the test filter sandwasher two points appeared to require further consideration. One was that the irrigation water jet at the bottom of the washer would foul with sand occasionally after shutting down the filter, and the other that the sand nozzle (13½ in. in length), was rather long and absorbed by friction more head than was thought necessary. In the design for the actual sandwasher bases for the Toronto plant (Fig. 3) both of these defects were removed.

Some experience with Toronto sandwashers (Fig. 3) disclosed a local erosion in the throat at a point opposite the main water inlet, which reduced the efficiency of the ejector, and it was found necessary to line the throat of the venturi tube. This has been conveniently done with carbonized wrought-iron pipe in steps, as shown. The smallest diameter tube required renewal about every four months and the intermediate one yearly. The sand nozzles last a full year and the scour at the bottom of the washer has had to be repaired once in three years. These experiences being so different from what might have been anticipated from the experiments with the test filter, it was decided to study the matter in further detail.



CHANGES IN DESIGN OF SANDWASHER

(2) Base of washer in experimental filter. (3) Original design for Toronto plant. (4) New base for Toronto filter.

A sandwasher base from one of the filters was connected up to an independent source of water supply, with the water jet and sand nozzle exposed, and it was found that the velocity of the water at the jet varied from point to point in a given plane normal to the direction of motion; it being greatest at the point of maximum scour and at least at a point diametrically opposite. At the point of highest velocity there was the greatest suction with the result that the sand coming out of the nozzle was drawn toward that point. There was also at this point considerable turbulence owing to it being on the line of coalescence of the two streams of water formed by the sand nozzle acting as an obstruction in the fairway of the water. By comparing the two designs, the cause of the difference in the experiences is apparent. In the test filter design (Fig. 2) the water passing to the throat does so from a comparatively quiescent large body of water, and forms a comparatively steady jet, while in the adopted design (Fig. 3) the spaces provided were restricted, and the water passed at moderate velocities past the sand nozzle and up around the bend, hugging its periphery, producing the disturbances noted.

It was decided to introduce at two points in one of the Toronto filters sandwasher bases corresponding in the form of the water passages closely to those of the test filter. The actual design is shown by Fig. 4. A considerable improvement in the bottom of the sandwasher was introduced and the sand nozzles were formed so as to be drawn out from below. These have been in operation over twelve months and show very little scour, and none at the bottom of the washer, and they run without attention.

As a matter of performance, each of these sandwashers during the twelve months they have been in operation have properly washed and cleaned about 5,000 tons of sand, withdrawing it from, and delivering it again to, a height of about 18 ft., with practically no attention, and the throats and sand nozzles are still in good condition. This is considered to be highly satisfactory, and shows that these sandwashers are highly efficient machines. The work of installing new sandwasher bases and throats throughout the whole plant is now in progress.

In the sandwasher recently applied to pressure filters at Rockland, Ont., the raw-water supply pipe as it enters the sandwasher is widened out from 4 to 6 in. to reduce the velocity of approach with the idea of maintaining the steady jet at the throat of the sandwasher.

Barges and Towboats for Mississippi

IN a paper entitled "Design of Barge Fleet for Upper Mississippi River," presented at the recent spring meeting of the American Society of Mechanical Engineers, William S. Mitchell describes the barges and tow boats which are now being built by the United States Engineer Department for Mississippi River navigation. The barges are 300 ft. long, 48 ft. wide, and 10 ft. deep, the width allowing three barges to be grouped about each tow boat. Such a barge will carry 850 tons of cargo on a draft of 4 ft. during low water, increasing at high stages to 2,500 tons on an 8-ft. draft when going upstream, and to 3,000 tons on 9-ft. draft when floating over the rapids coming downstream. The dimensions are fixed just within the physical limits set by bridges and locks in the river reach to be navigated, that is, up to St. Paul. The barges are of the semi-hopper type having a hold 5 ft. deep over part of their length and width, the hoppers being 256 ft. long, 36 ft. wide, and 6 ft. deep. Side tanks or pontoons can be used for expansion tanks or storage space for liquid cargoes. The barges are of steel on easy lines. The loaded economical speed is calculated at 5¼ miles per hour, and at this speed and 3½-ft. draft the resistance was found on trial to be 1.7 lb. per ton of displacement, about one-third less than the resistance of standard short rake scow-bowed barges. The tow boats are of the stern paddle wheel Western river type, with a low-water draft of 4 ft. at the bow and 3 ft. at the stern. They are the largest stern-wheel tow boats, with one exception, ever built. The hulls are 230 ft. long, 58 ft. beam, and 8 ft. deep. They will displace about 1,100 tons when under steam. Each boat is equipped with two Heine cross-drum, marine type boilers, 4,250 sq.ft. of heating surface, and 100 sq.ft. grate surface, and twin tandem compound condensing 24-in. high-pressure and 48-in. low-pressure cylinders, with an 8-ft. stroke, designed for an initial pressure of 250 lb. with steam superheat of about 75°. Each boat is equipped with two sets of balanced rudders, one set of four rudders fitted at the stern transom forward of the wheel, and the other set of two rudders fitted aft of the wheel.

Detroit's New 350-Million Gallon Filtration Plant

Old Open Reservoir to Be Covered for Filtered Water—Short Mixing Chamber—Steel Roof Over Coagulation Basin

BY THEODORE A. LEISEN
Civil Engineer, Detroit Water Works

CONSTRUCTION of the largest water filtration plant in the country began in April at Detroit, following the award of a contract for building the substructure of a low-lift pumping station which will deliver water from the present intake conduits to the first element of the purifying plant. The Walsh Construction Co., of Davenport, Iowa, is the contractor. When this station is completed, two units of the ultimate installation of five centrifugal pumps are to be placed for suction booster service in connection with the existing high-pressure pumping station during periods of low water. It is expected that the pile foundations of the filters and coagulating basin will be placed under contract before the end of the 1920 season, to be followed next year by construction of the coagulating basins and filters themselves. The last element of the work will be the reconstruction of the existing open raw-water settling reservoir, whereby it is to be converted into a covered filtered-water basin. The completion of this work will represent the final development of water supply at the present pumping station in Water-Works Park, as the distribution facilities here are limited by the street space available for outgoing mains. It will provide for the city's growth of the next eight or ten years it is estimated.

As a whole the plant represents standard modern practice in rapid filtration, with but minor modifications, and follows in practically all details the general preliminary plans prepared by the writer in 1917. In its structural design, however, the plant has a number of individual features, resulting from the local conditions which the designers had to meet. The filters and coagulation basins will both be constructed substantially on the surface of the ground and will in effect be ordinary concrete buildings with walls strong enough to resist the pressure of the contained water, and covered by a steel truss roof of ordinary mill-building type. The subsoil is not considered reliable enough to carry the structures direct, and piles will therefore be driven all over the site to take the load down to solid ground. The filtered-water basin will be of a standard construction, consisting of groined flat-arch invert and roof, and concrete columns, but the conditions under which this structure will be built are quite unusual, as it is to occupy the present raw-water settling reservoir. The sloping side embankments of the latter are to be excavated, vertical side walls of the new basin built, the bottom excavated and piles driven for the new floor and column foundations. The finished basin roof will be covered with soil for lawn or garden.

In the operative design of the plant attention may be directed to the short mixing chamber with close-set baffles, so arranged as to give alternately transverse and vertical baffling. This chamber is designed for a relatively high velocity of flow, in the view that mixing is a physical rather than a chemical operation. Up to the outflow gates of the mixing chamber the plant is single, but beyond these gates it is in duplicate or multiple, so that entire flexibility of operation is assured. An element in which many filter houses are troublesome in operation, the valve arrangement in the pipe gallery, has in this plant been made the object of elaborate study, and it is believed exceptional simplicity has been attained, so that valve and pipe trouble in operation should be almost wholly eliminated. The arrangement of the piping will be shown at a later date, when contract plans are completed. The plant as a whole has been designed for convenience in operation, the placing of all of the operative parts in a contracted area and under one roof having been done with this in view.

While full working details of all parts of the plant have not yet been elaborated, the designing having been delayed by the interruption of work on account of the war, the general plan has been fixed, in accordance with the accompanying Fig. 1, which shows the relative arrangement of the different elements of the plant. The structural disposition of the various elements will be as shown on the section Fig. 2. Details are being worked out at present by the writer, with F. H. Stephenson as associate engineer.

On account of the large quantity of ice and also of hair-like vegetable débris carried by the water in certain seasons, rotary screens are provided for at the inlet end of the low-lift pumping station (see Fig. 1). These screens consist of seven units, each 33 ft. long vertically between centers of roller shafts, and 6 ft. wide, covered with 14-gage copper wire, three meshes to the inch. They are to be motor operated independently at a rate of 10 ft. per minute, and will be cleaned automatically while in operation. Prior to completion of the basins and filters, the low-lift station will discharge by way of the two present conduits to the pressure pumps; later these conduits will be supplied instead from the effluent conduit of the filter house, while the low-lift pumps will discharge by way of a short lateral connection to the mixing chamber.

One of the sections in Fig. 2 shows the compact arrangement of the mixing chamber and the alternately horizontal and vertical baffling, as well as the position of the two 8½ x 14-ft. outlet gates to the coagulating basin. Each of these basins has a flow length of about 1,000 ft. and a mean cross-section of about 1,500 sq.ft., which will give a normal velocity of less than 10 ft. per minute. Floor drains in the basins permit of washing the sediment to a transverse sewer crossing the site under the basins.

From the conduit which collects the settled effluent at the discharge end of the coagulation basin the water passes to the supply channels of the filter house, just north of the basins. The filters are in rectangular arrangement, in five double sets of eight boxes each. The effluent is collected by a concrete conduit extending east and west under the floor of the filter house to a connection with the conduit leading to the filtered water basin and the pressure pumps. Wash water for the filters is stored in two tanks in the third story of the

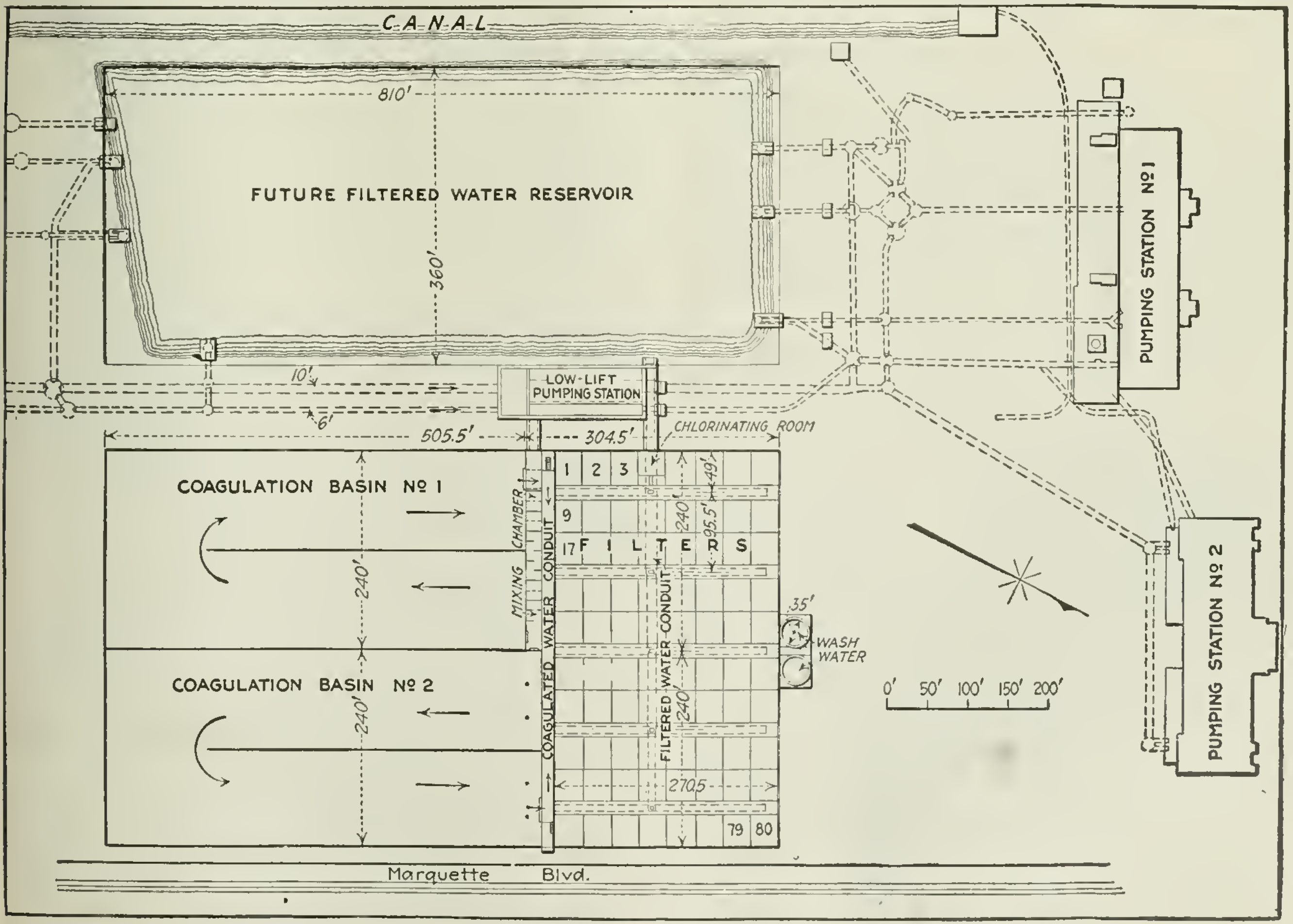
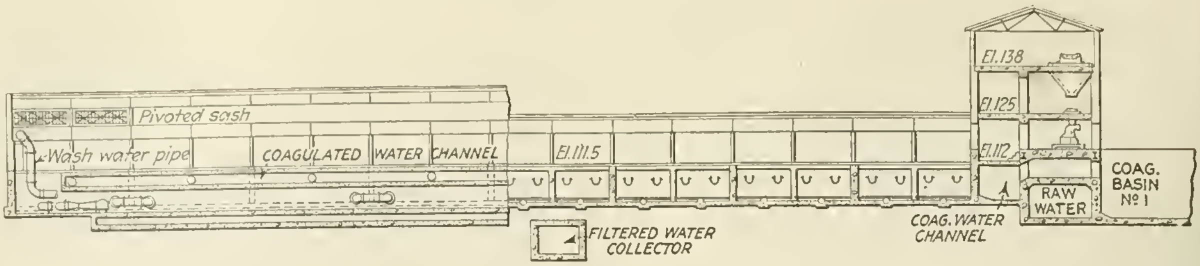
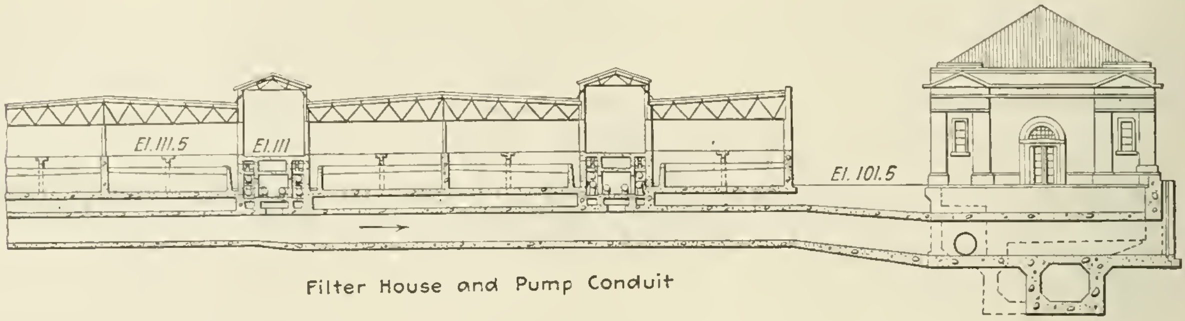


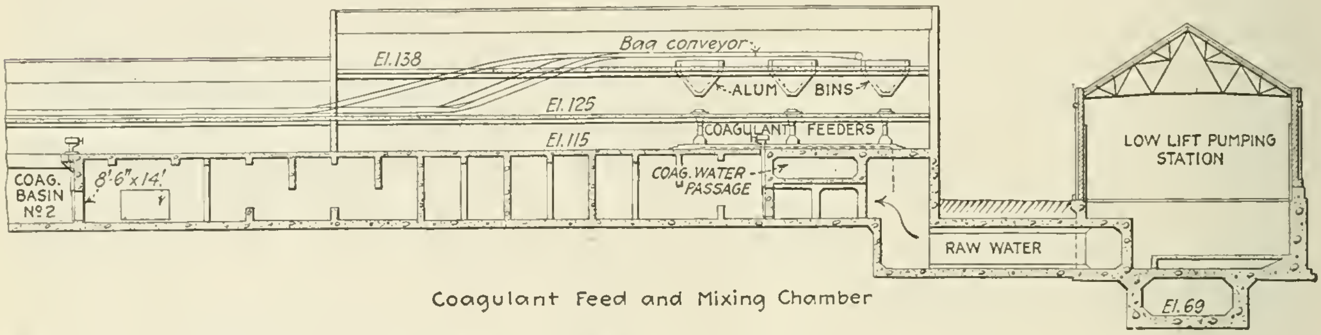
FIG. 1. NEW DETROIT FILTER PLANT WILL REPRESENT ULTIMATE DEVELOPMENT OF PRESENT WATER-WORKS SITE



Filter House, Longitudinal Sections



Filter House and Pump Conduit



Coagulant Feed and Mixing Chamber

FIG. 2. SECTIONAL VIEWS OF MIXING CHAMBER, COAGULATION BASIN HOUSE AND FILTER HOUSE

entrance tower of the filter house. A chlorinating room has been provided on the level of the operating floor, over one of the filter beds, and in line with the end of the filtered water collecting conduit, from which the filtered water may be treated with chlorine gas if found necessary.

The normal rate of operation will be at 160,000,000 gal. per acre, or 4,000,000 gal. per bed. This rate, as demonstrated by the experimental work, can be increased safely to 175,000,000 or 180,000,000 gal. per acre. No air wash is provided nor contemplated.

When the site was explored by borings and soundings to determine the character of the ground available for carrying the foundations of the filter plant, the presence of fill was revealed. It was known, moreover, that in former years a small water course crossed the present Water-Works Park to the river. The filled material has not sufficiently consolidated since its deposition to form a secure foundation stratum. The conclusion therefore was that the entire site should be piled. Concrete piles are being used to carry the substructure of the low-lift pumping station and pump foundation basins and filters, and probably for the filtered water reservoir. In order to maintain proper progress of the entire work these pile foundations should be started before winter.

As it was desired to use the existing storage reservoir for the clearwater basin of the plant, the elevations of the other structures had to be fixed to suit both this old reservoir and the suction wells of the pumping stations. The coagulation basins and filters are therefore necessarily placed above ground level. On the east these structures border a residential street and a pleasing architectural exterior was therefore desired. Filter house and basins were treated as a unit architecturally. In structure they consist of unbroken concrete walls, brick veneered, about 15 ft. high, developed on the exterior into piers and recessed panels, surmounted by a building superstructure. The roof is carried by steel trusses, those in the filter house spanning each single line of filters, 48 ft. and those in the coagulation basins spanning 118 ft., the half width of a single basin. These long span trusses are spaced 36 ft. on centers and carry lattice-girder purlins on which rest the roof slabs of reinforced concrete or gypsum "pyrobar."

Refuse Disposal Studies at Philadelphia

An investigation to secure information on which to base a plan for future street cleaning, ash, rubbish and garbage collection and disposal at Philadelphia is to be made by the Department of Public Works under the direction of E. B. Morden, chief of the Bureau of Street Cleaning, and Edward D. Very, assistant engineer of the Bureau. The investigation is to be completed by Aug. 1. Data will be collected by employees of the department. It is expected that from time to time the department will call in consulting engineers having had practical experience with the various phases of the subjects which are now under consideration.

Concrete Destroyed in Vacuum in Calaveras Dam Culvert

Experience in Temporary Intake Led to Successful Use of Vent Pipes to Break Vacuum in New Design

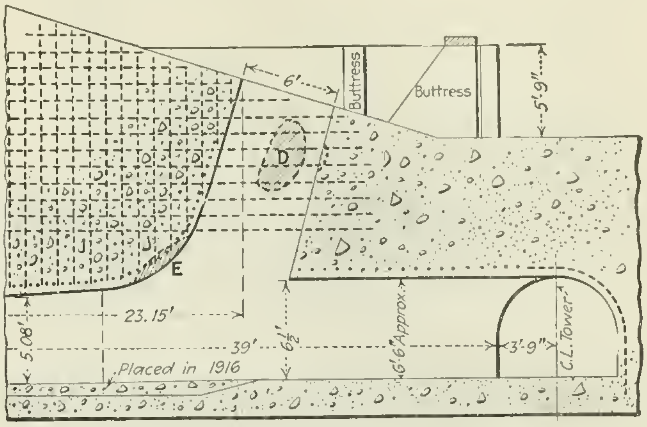
CONCRETE was disintegrated and eaten away to a serious extent by vacuum in the headworks of the culvert under the Calaveras dam of the Spring Valley Water Co., San Francisco, where an intake had been provided for temporary use in controlling storage waters during construction. At first there was some doubt as to the cause of the damage, but this was cleared up later. That the conclusions reached were correct is indicated by the fact that in the similar outlet which has since been built for permanent service damage from vacuum was entirely prevented by the use of vent pipes.

In the headworks where damage from vacuum occurred, five gates were provided, the arrangement and dimensions of the passage-ways into which they lead being as shown in the accompanying sketch. After water had been passing through this intake at heads up to 35 ft. for about two weeks, the concrete surfaces were found to have been disintegrated at the points *A*, *B*, *C* and *D*, *E*, *F*. At some of these points the concrete was gone to a depth of about 4 in. The most severe disintegration occurred at *B* and *E*.

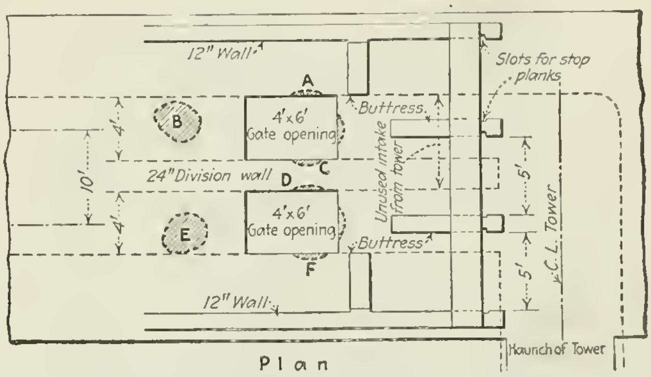
It is notable that the location of the damaged spots corresponds exactly in the two passage-ways. The disintegration at *B* and *E* are on the top of the passage-way toward the side opposite the division wall. In addition to these two points of greatest damage there were several places where less severe effect was found and for the most part the location of the points of lesser damage corresponded in the two passage-ways.

Evidence that the damage was not caused by erosion was found first in the way the destruction occurred on the end of the diversion wall. Instead of having rounded corners this was eaten away to a depth of several inches, square across the ends of the wall and the surface left was rough and jagged, wholly unlike the result of erosion by water currents.

There is no question about the quality of the concrete, according to engineers in charge of construction. During the work tests were made frequently on the concrete, using 6-in. cylinders 8 in. long. These showed a compressive strength of 2,800 lb. per square inch. The proportions of the mix in the headworks was 1 : 2 : 4. These materials were washed and screened and the rock was graded in two sizes. Because of the use of reinforcing in the head works the concrete specified there was of a somewhat better grade than that in the culvert itself which is of mass construction.



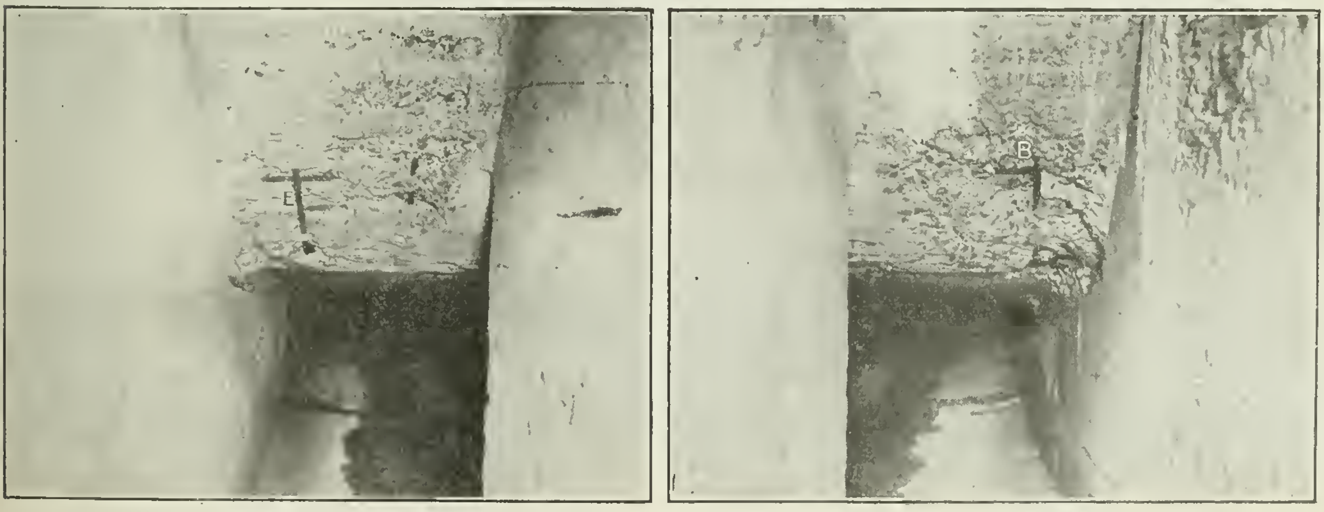
Elevation



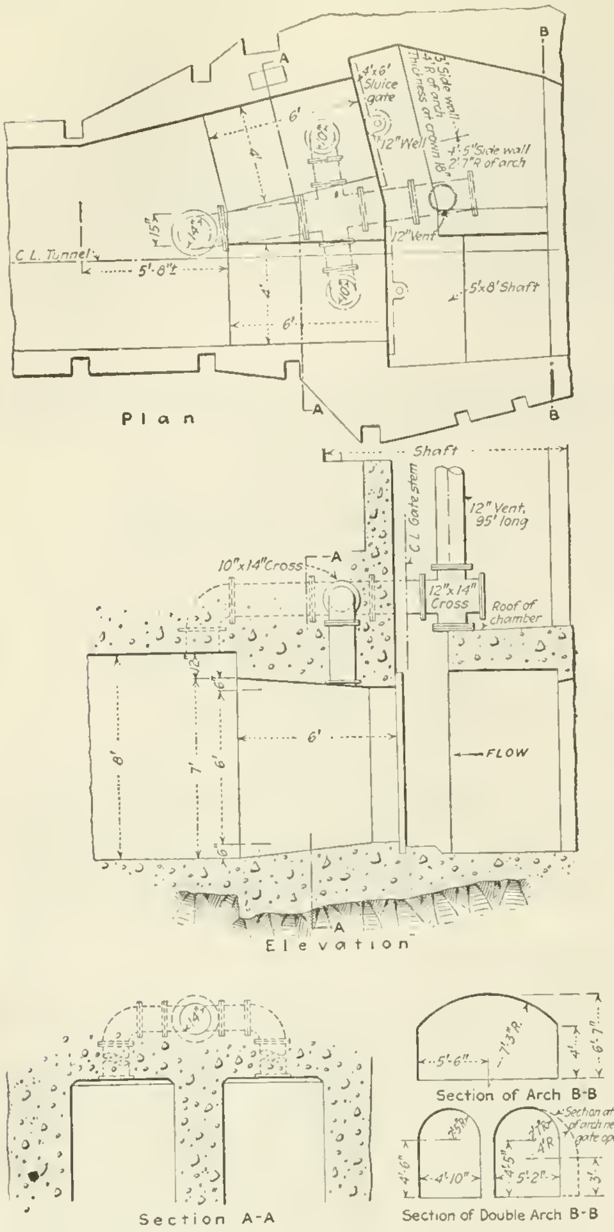
Plan

CONCRETE TORN OUT IN VACUUM OF TEMPORARY CULVERT TO CALAVERAS DAM

In the design of the new permanent outlet tunnel around one end of the dam it was desired to enlarge the cross-section suddenly beyond the intake gate. This introduced much the same conditions with regard to probability of vacuum effect as in the temporary head works in the culvert under the dam. However, a 12-in. vent pipe was led into this intake with three openings, as shown in the accompanying illustration.



TEMPORARY CULVERT SHOWING LOCATION OF DESTROYED CONCRETE



NEW CULVERT WITH VENT PIPES TO BREAK VACUUM IN CALAVERAS DAM

During the past season water has passed through this new intake continuously for three months under heads ranging up to 65 ft. without having caused any damage whatever to the concrete lining of the tunnel. Air is drawn into the upper end of this vent pipe at velocities so high that it has not been possible to measure them with instruments thus far tried.

G. A. Elliott is chief engineer of the Spring Valley Water Co.

Chicago Housing Project

The first 175 houses of 10,000 planned by the Chicago Housing Association are nearing completion. More than 3,000 applications have been made for them. Buyers will pay about $35 per month, of which $10 will be rent and the balance will be applied on the principal which will be liquidated in about 15 years. The houses range from $4,000 to $4,500 in cost and buyers must pay 10 per cent down. A revolving fund of $750,000 for the project has been pledged.

Water Jets and Sand Blast Clean St. Louis Filters

Jets Set in Beds for Five Hours Cut Coating from Sand Grains and Break Up Mud Balls—Blast Opens Strainer Holes

By C. M. Daily
Engineer in Charge, Supply and Purifying Section, St. Louis Water Division

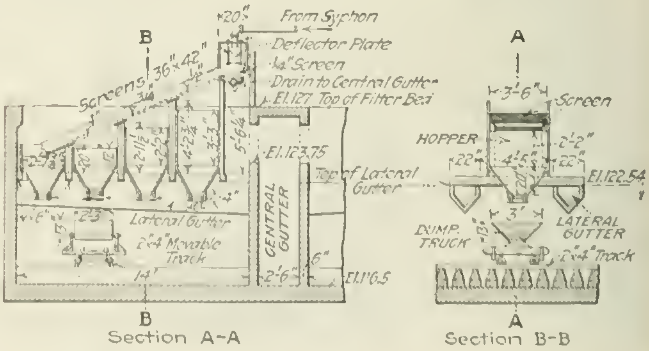
IN THE 4½-year period of operation of the water filtration plant at St. Louis, Mo., many things have developed which probably are not common to all rapid filters but throw light on filter operation in general. Among them are the accumulation of mud through the sand and along the sides of the bed, the coating of the sand and gravel and their tendency to cement together. The sand and gravel have been cleaned mechanically by water jets, and a sand blast machine has been developed to clean out the holes in the strainer plates.

The plant was put in operation May 15, 1915, and it has remained continuously in service, filtering 4,390 million gallons of water through each unit, which required 994 washings. The water filtered had an average turbidity of 15 parts per million.

Originally the filtering material was composed of 30 in. of sand and 12 in. of gravel. The gravel complied with the specifications requiring the bottom 5 in. to be screened through a 1½-in. screen and be retained on a ¾-in. screen, the 4-in. second layer to pass through a ¾-in. screen and be retained on a ⅜-in. screen, and the 3-in. third layer to pass through a ⅜-in. screen and be retained on a 3/16-in. screen.

The sand specifications called for an effective size of from 0.4 to 0.5 mm., and for a uniformity coefficient not over 1.65. In many of the units the sand was much finer than specified, the average effective size being 0.34 mm. and the average uniformity coefficient 1.81. In the units where the specifications were complied with the filters were equally as efficient in the removal of turbidity and in some instances required less than 60 per cent as many washings as the units having the finer sand.

Mud balls were noticed after the plant had been operated a few months. The formation was caused by too low a rate of wash, about 18 in. vertical rise per minute, which broke up the layer of sediment on top of the sand into fragments large enough to resist the action of the wash water tending to carry it in suspension. By coalescence the mud balls became of such size that they gradually worked their way downward through the sand while washing, or they were thrown



GRAVEL SCREENS, HOPPERS AND DUMP TRUCK

to a point where the upward rise of the wash water was the weakest, forming hard patches throughout the bed and against the sides of the filters. At first these patches were broken up by pulling a screen of ¼-in mesh through the sand while washing. The rate of wash water was increased to 24 in. vertical rise per minute, but the strainer system was found clogged in spots, producing conditions favorable for mud-ball formation, which occurred in so many places as to necessitate the removal of the sand and gravel and the cleaning by hand of the holes in the strainer plates. Since the holes numbered more than 102,000 per filtering unit, the cleaning operation was a slow and tedious job shunned by all the men in the plant.

In the spring of 1918 a coating on the sand was found to have increased the effective size to 0.381 mm., reducing the uniformity coefficient to 1.43. The depth of sand was reduced to 28 in. The percentage of sand under 0.25 mm. in size had decreased from 2.59 to 0.61.

The necessary change in the filter plant operation, developed during 1918, reduced the sand to an average depth of 26 in. and increased the length of run between washings about 35 per cent without decreasing the quality of the filtrate. The rate of washing was increased to about 27 in. vertical rise per minute in order to eliminate the mud balls, if possible. This caused the finer sand to be carried away, thereby increasing the amount of water filtered between washings. In the spring of 1919 the sand was found to be caking badly. The grains were held together by a soft coating which could be removed slowly by washing, but which was very hard to dissolve. Hard patches appeared on the beds, and the wash water distribution became very unequal. Investigation showed that the gravel also was slightly cemented together. Although improved operating conditions have been reported in another plant after the gravel was cemented no improvement was noted in St. Louis and steps were taken to remove the cementing material.

The total quantity of coating on the sand averaged 7.01 per cent of its weight and on the gravel 1.93 per cent. Careful study of the problem of cleaning the sand and gravel economically was made by means of experimental apparatus constructed in the plant. These experiments led to the construction of the improved apparatus now in use, which consists of four water jets with ¾-in. nozzles, and 1½- to 2⅜-in. throats; 4-in. discharge pipes; a gravel screen having four sizes of separation and a hopper under each screen; a truck for hauling the screened gravel, and a sand blast machine for cleaning the holes in the strainer plates.

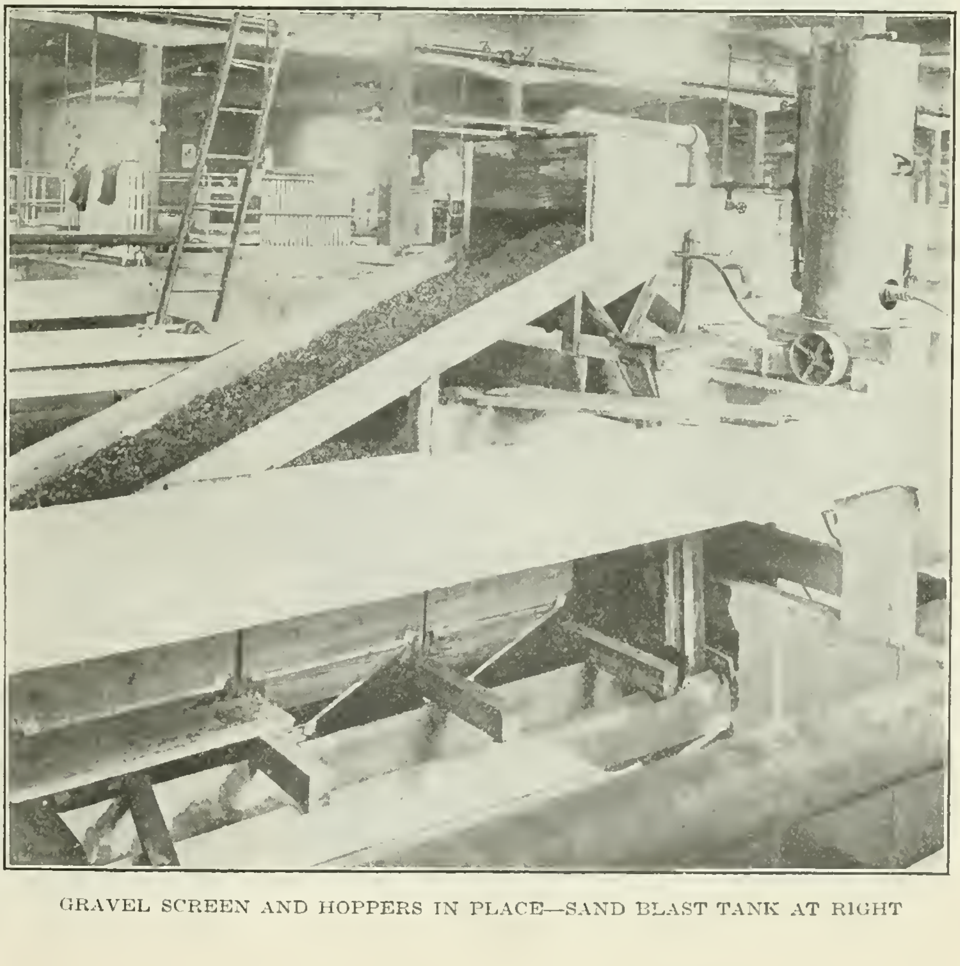
ANALYSIS OF THE COATING ON THE SAND AND GRAVEL

	Sand, Per Cent	Gravel, Per Cent
SiO_2	0.4	0.5
$Fe(OH)_3$	12.9	33.0
$Al(OH)_3$	17.3	17.1
$CaCO_3$	45.7	48.9
$CaSo_4$	0.3	0.1
$Mg(OH)_2$	10.0	0.4
Clay	13.4	0.0

The sand is cleaned by the water jets, one being placed in each half of a filter bed on top of the sand. The jets discharge into the opposite half of the bed through a wooden box, 12 in. square and 4 ft. deep, containing a series of sloping screens. Water at 100 lb. pressure is used in the jets.

In operation, wash water is turned on at from one-tenth to one-fourth the normal rate. The sand bed thus softened allows the jets to sink through to the gravel. The slowly rising wash water furnishes the means of transporting the sand from the discharge of one jet to the suction of the other at the opposite end of same half of the bed. As the waste wash water flows out through the trough to the sewer, it carries away the coating removed by the scouring action of the water and the sand passing through the jets and screens.

The sand washing is continued for about five hours without the aid of manual labor. At the end of that time the discharge from the jets is still turbid but an average of 2.14 per cent of weight is removed, amounting to 7,000 lb. per filter. The 4.87 per cent of coating still remaining on the sand is further reduced by about ½ per cent by jetting the sand from one half of the filter to the other half in which the clean gravel has been screened and properly placed. During the experimental work half a bed was jetted into the other half without washing. The coating scoured off the sand, settled in a layer on the bed, and could not be



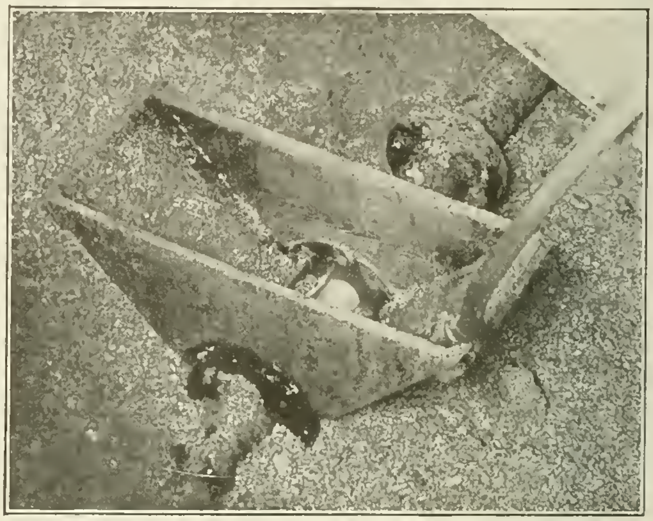
GRAVEL SCREEN AND HOPPERS IN PLACE—SAND BLAST TANK AT RIGHT removed by the ordinary process of washing the filter. It was only broken up into small pieces or mud balls.

It was found economical to remove and store all the sand from one bed and the gravel from one-half of the bed at one end of the plant in order to have room to screen and place the gravel and clean the strainer plates. When the gravel and sand had been cleaned in 39 of the 40 filters and the remaining filter was filled with the gravel and sand removed and set aside from the first filter.

For cleaning the gravel and strainer plates, a sand blast is used, beginning with strainer plates in the half bed from which all material has been removed. When these plates are cleaned the gravel from the adjoining half bed is shoveled into a jet and discharged into a box which diverts to the sewer the water escaping through the screens. The gravel, assisted by men with rakes, rolls over stationary screens and drops into four hoppers suspended from the wash water gutters. It is discharged from the hoppers into a small truck which is wheeled and dumped on the half bed where the strainer plates have been cleaned. Sand from the half filter adjoining the one from which the gravel was removed is now jetted onto the cleaned gravel in place. The lower 2 in. of sand is shoveled into the jet; the remainder flows to the jet as described previously.

CLEANING STRAINER PLATES WITH A SAND BLAST

The sand blast requires a 30-lb. air pressure and is supplied with sand passing through a screen with 20 meshes to the inch. About 1 cu.yd. of sand is used per filter bed. A $\frac{3}{16}$-in. nozzle is used, made by drawing down a $\frac{1}{2}$-in. pipe and drilling to size. One man cleans the plates in one-half bed per day. More than 97 per cent of the holes are opened and the top sides of the plates are scoured bright. On the under side was found a coating which still remains. Analysis indicated the following composition in percentages: ZnO, 38.7; SiO_2, 2.9; CuO, 41.0; Al_2O_3, 3.0; PB So_4, 2.2; Loss on ignition, 10.6.



GRAVEL JET WITH V-SHAPED FEED BOX

In passing through the jets and over the screens the gravel from one bed has about 450 lb. of coating removed. Whatever coating remains is hard and has no tendency to cement the gravel together. More than half of the plant has been cleaned. Although the sand still has 4 per cent of coating it has no tendency to cement together and the effective size remains below that required by the specification. Probably the entire plant will be cleaned by May, and, barring the loss of 4 in. of sand during the $4\frac{1}{2}$ years of operation, the plant will be as efficient and in as good condition as when installed, the operating force wiser in the art of filter operation and the trouble experienced in the past will be more easily remedied in the future.

The cost of the work per filter unit is as follows: Labor, $169; wash water, $88; tap water, $9; total, $266. The wash water was estimated at $20.60 per million gallons, and the tap water at $19.61. The washing and cleaning plant cost $750, or $18.75 per filter unit, but it will be useful for future work. The cost per filter of jetting the sand for five hours was $35.50, divided as follows: Labor, $2; wash water, $31; tap water, $2.50.

Sieve Tests Check Closely

According to a report from the U. S. Bureau of Standards, a cement company recently sent around to a number of laboratories a sample of cement with a request for a 200-mesh sieve determination, in order that the results as obtained in the different laboratories might be compared. It was found that the extreme variation was only 0.3 per cent.

Tests of Solid and Laminated Wood Sheetpiles

Laboratory Tests on Quarter-Scale Models Under Bending Loads

DISTINCT superiority of solid over compound or laminated wooden sheetpiles is indicated by the results of some bending tests on model piles, made several years ago but not reported hitherto. The relative transverse strength and stiffness of the two types of pile and the efficiency of three types of fastenings were studied.

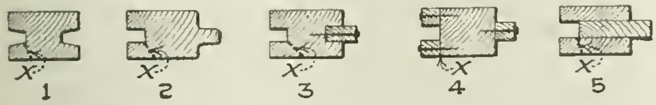


FIG. 1. SECTIONS OF SHEETPILES TESTED FOR STRENGTH

The tests were made at Cornell University in 1915 by Prof. A. P. Mills, using 15 piles furnished by J. W. Pearl, Chicago, who gives the present information as to the results. There were five types of piles (Fig. 1), three specimens of each type. The strength comparison for the five types is given in Table I. No tests were made with two or more piles interlocked. All test piles were of yellow pine and were 3 in. thick, 3¾ in. wide and 9 ft. long, representing piles 12 x 15 in., 36 ft. long, to quarter scale. Variable loads were applied at eight points through a system of levers (see Fig. 3) so arranged as to reproduce the shears and moments that would result from earth or water pressure increasing uniformly from the top to the bottom in a pile secured at the top by a tie-rod or waling timber and at the bottom by the earth penetrated. The reaction was distributed over four points of support near the toe and concentrated at a single point near the head. A test in progress is shown in the view Fig. 2. The results of tests on laminated piles built up in three ways are shown in Table II. The first two columns represent sticks 3 x 3¾-in.; the second being grooved at both ends for splines; the other three columns represent piles made of three 1 x 3¾-in. planks. Pile C had fastenings of eight ½-in. oak pins or trenails and two ¼-in. bolts at head, six trenails and two bolts at toe and 24 wire 8-d. nails in central portion. Pile D had four bolts at each end and 34 nails. Pile E had 10 bolts at head and eight at toe, and 24 nails. All bolts, trenails and nails were in two rows, driven in equal numbers from opposite sides, staggered and with the spacing varied to approximate the variation in shearing stress along the pile.

TABLE I. COMPARATIVE STRENGTH OF WOOD SHEET PILES OF DIFFERENT TYPES (See Fig. 1)

Type	Transverse Load, Per Cent.	Deflection Under Trans. Load, Per Cent.	Resistance to Splitting at X: Pile 6 In. Thick, Per Cent.	Resistance to Splitting at X: Pile 12 In. Thick, Per Cent.
1	100	100	100	100
2	100	100	90	75
3	100	100	90	75
4	80	125	45	37½
5	67	30	50	50

Types of Piles: 1, Solid; grooved both sides, easy to drive and pull and stop leaks; high salvage. 2, Groove and tongue-shaped out of solid wood, making 25% waste; expensive. 3. Grooved both sides but tongue spiked in one groove; hard to pull and to stop leaks. 4. Three pieces spiked on square timber to form tongue and groove; weak and liable to leak. 5. Laminated interlocking pile, low strength, high deflection and low salvage.

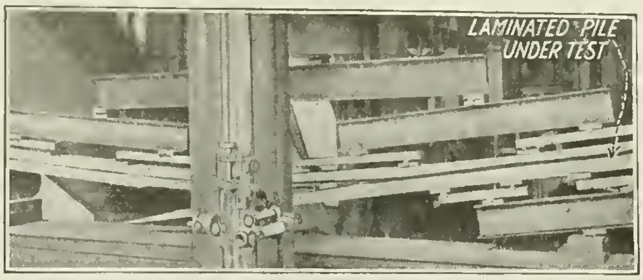


FIG. 2. LAMINATED WOOD SHEETPILE IN TESTING MACHINE

TABLE II. TESTS OF MODELS OF WOOD SHEETPILES

	Solid Stick	Solid Grooved	Laminated C	Laminated D	Laminated E
Av. ultimate load, lb.	7000	8023	5667	4813	4933
Failure	Broken	Broken	Cracked	(a)	(b)
Deflect. at 3000 lb., in.	1.73	1.43	3.90	3.88	4.00
Deflect at 4500 lb., in.	2.65	2.06	6.20	6.30	6.80
Av. slip at free end; 3000-lb. load			0.11	0.096	0.112
Av. slip at free end; 4500-lb. load			0.189	.....	0.173
Av. slip at max. shear; 3000-lb. load			0.120	0.099	0.111
Av. slip at max. shear; 4500-lb. load			0.207	......	0.179

NOTE—(a) Cracked, 2; flexure, 1. (b) Cracked, 1; flexure, 2.

In all tests the loads were applied progressively in equal increments of 500 lb., and the deflections at six points were noted for each increment. In the laminated piles, the slippage for each increment was measured at

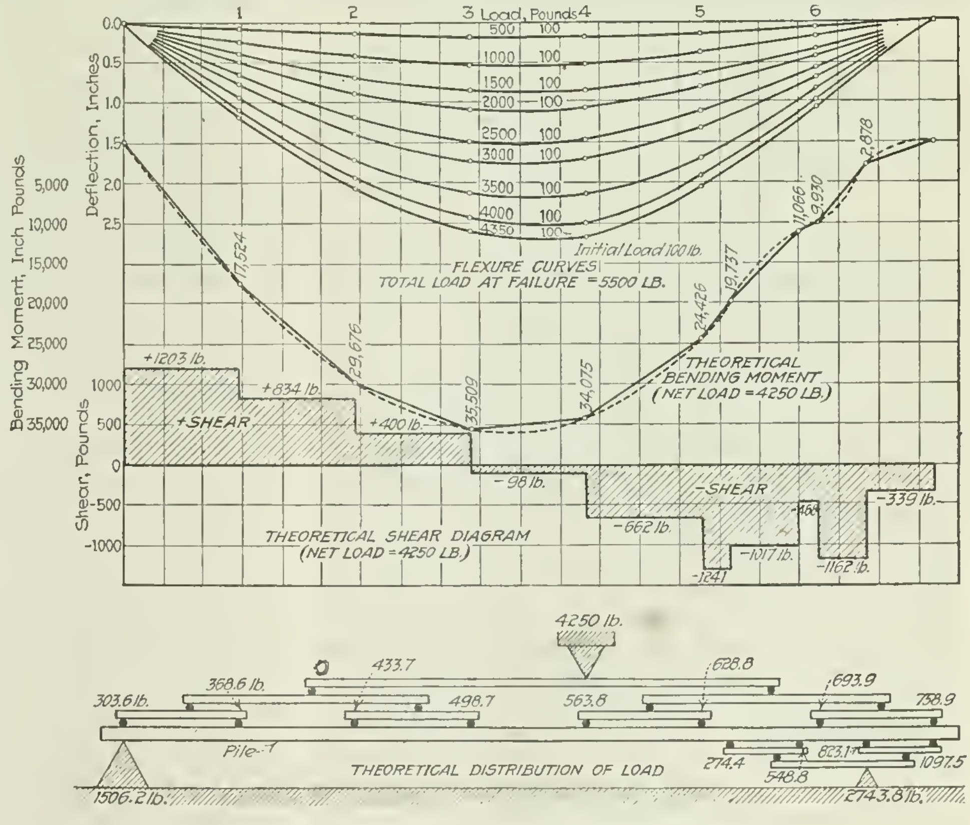


FIG. 3. DIAGRAM OF TEST ON SHEETPILES

the point of support of the free end or head and at the maximum shear point, which was about 30 in. from the toe. The loads were increased until fracture resulted or the deflection reached the limit of the equipment.

Within the limits of the tests the deflection and the slippage were closely proportional to the loads. Slippage on the upper joint was about 8% more than that on the lower joint, while at the point of maximum shear the slippage was about 4% greater than at the free end.

Truck Carries 16-Ton Load Over Mountain Roads

INCIDENT to the construction work on the Barret dam, a new unit in the water conservation system for the city of San Diego, Cal., now under way, one of the heaviest jobs of hauling by auto truck over dirt roads ever done in that section was accomplished without mishap. This consisted of the transfer from the lower Otay Dam, recently completed, to the Barret damsite, a distance of 28 mi., of the body or main shell of a gyratory rock crusher, the single piece weighing 16½ tons.

SIXTEEN-TON LOAD ON 5½-TON TRUCK

The hauling was done by a 5½-ton truck, at an average speed of 1½ mi. an hour. There are many heavy grades in the distance covered, and it was found necessary to have the aid of another auto truck to check speed going down grades and to assist in negotiating up-grades.

Electric and Steam Pumping Costs at St. Paul

Costs of pumping water in St. Paul by steam and electricity are given as follows in the last annual report of J. W. Kelsey, general superintendent, water department. Raising 1,000,000 gal. 152.3 ft. by an electrically driven centrifugal unit cost $3.48 in 1918 or 2.28c. for 1-ft. lift. In 1919 the cost per foot of lift was 2.34c. The over-all efficiencies for the two years were 79.5 and 78.5 per cent respectively. The current cost is based on a charge of $4 for pumping 1,000,000 gal. against a 158.5-ft. dynamic head with an over-all efficiency of 72 per cent. The price varies with head and efficiency. Steam operation of a 10,000,000-gal. triple expansion pump for the year 1916, the last year it was used continuously, cost, for fuel alone, 1.73c. per 1,000,000 gal. raised 1 ft. This figure is based on coal at $4.40, giving a duty per 100 lb. of [illegible]03,700 ft.-lb. At the present time it is estimated that labor would cost 2.16c. for steam operation against 1.11c. for the electrically driven units. Relative costs for miscellaneous supplies and repairs are estimated at 0.55 and 0.32c., making a total of 4.44c. for steam and 3.71c. for electricity.

Railway Water Consumption and Waste Prevention

Numerous Plants with Private or Purchased Supply Aggregate Large Consumption—Methods of Reducing Use and Waste

WATER consumption by railways for locomotives, shops, stations and general purposes aggregates about 900,000,000,000 gal. annually. At an average cost of 7c. per 1,000 gal. (exclusive of interest and depreciation) it represents an expenditure of $63,000,000 a year. The foregoing figures include approximately 13,000 water stations for supplying locomotives. These figures were given at a meeting of the Western Society of Engineers by C. R. Knowles, superintendent of water service, Illinois Central R. R. They are supported in a report by F. D. Yeaton, assistant engineer of the Chicago, Milwaukee & St. Paul Ry., who estimates a total consumption of 2,000,000,000 gal. daily at an average cost of over 5c. per 1,000 gal. The latter further gives an average of 8,000 gal. per mile per day, as on his road this consumption ranges from 2,000 gal. on branch lines to 10,000 gal. on the main line. A saving of 10 to 18 per cent in total annual consumption is considered practicable.

An analysis of the consumption of 15,622,000 gal. of water on the Illinois Central R. R. showed that 77 per cent was obtained from 230 railway pumping stations and 23 per cent from 232 city and private waterworks plants. About 74 per cent of the total was used by the locomotives, 12 per cent for washing and filling locomotive boilers, 8½ per cent for sanitary and domestic purposes and 5½ per cent for stationary power plants. On the Chicago, Milwaukee & St. Paul Ry. about 80 per cent of the water supply is furnished by the railway and 20 per cent is purchased from municipalities.

WATER WASTE PREVENTION

With this large total water consumption at scattered water-supply systems of various sizes and types there are such numerous opportunities for waste that railways which have undertaken waste prevention campaigns have found them productive of direct financial saving as well as of improved conditions. Waste is particularly serious when it includes water that is purchased from municipalities, as this is of relatively high cost, and also when the water has been given a purifying or softening treatment. Such treatment by railways is increasing steadily in order to secure increased service efficiency and reduced repair costs for the locomotives.

On the Chicago, Milwaukee & St. Paul Ry., Mr. Yeaton estimates that a saving of at least 10 per cent in cost of water purchased can be effected, which would amount to $107,000 annually. On its lines east of the Missouri River this road has 28 terminals consuming from 100,000 to 2,700,000 gal. daily and aggregating 11,220,000 gal. At an average cost of 5c. per 1,000 gal., which he considers a low figure, there would be for these stations alone an annual saving of $20,476, which at 6 per cent represents the interest on $341,366. In a recent report by A. B. Pierce, engineer of water supply, Southern Railway System, it is estimated that an annual saving of $119,999 can be effected by waste prevention and more efficient operation of water stations.

A water-waste prevention campaign on the Illinois Central R. R. during the five years 1915-1919 resulted in an average saving of $65,379 or nearly $200 daily. As an illustration, a comparison was made of 14 of the largest water stations using city water, these stations representing 70 per cent of the total consumption and 62 per cent of the total cost of city water. During the five-year period the consumption was reduced by 2,270,595,830 gal. with an actual saving of $135,435 on the water bills, as compared with the year 1914. This reduction represents the checking of waste and improper use. At the same time, the tonnage handled showed an increase of 28 per cent, increasing the water consumption at least 10 per cent and thus adding a further saving of $131,420.

During this five-year period the water pumped at the railway plants was reduced 5 per cent, which at 2c. per 1,000 gal. effected a saving of $60,038. Thus for the five years there was a total saving of $326,894 in cost of water. Opportunities for further saving are considered to be large, as the cost of water at many points has increased materially.

CAUSES OF WASTE OF WATER

Waste may occur in the delivery and distribution of water by pump slippage, broken and leaky mains and service pipes, leaky valves and hydrants and defective plumbing. Waste by improper or careless use of water may include overfilling of tender tanks, letting water run from faucets or hose, using leaky hose and connections, opening hydrants for drinking or miscellaneous purposes and then failing to close them properly. Waste by defective valves and plumbing in wash rooms and toilets at railway stations, shops and engine terminals is a prevalent condition. It has been shown that leakage by improperly adjusted valves in toilet tanks may cause a loss of $3 to $50 a month, depending on the number of fixtures and the cost of water. In one case, the defective toilet facilities at a large terminal were found to be causing a loss of over $400 a month in cost of water.

Overfilling tender tanks is so conspicuous that it is likely to receive attention, but it is really one of the minor forms of waste and its correction is easier than that of the innumerable small leaks and wastes where water is running continually. A source of extensive waste is at engine ashpits where cinders are cooled or washed down by means of a hose, the water being left running when the hose is not in use. Water columns and tank fittings are often leaky, causing not only waste of water but trouble with ice on the track in winter. A specific case on the Union Pacific Ry. was neglect of a defective float valve on a boiler washing plant at a roundhouse, with the result that water costing 30c. per 1,000 gal. was allowed to flow into the sewer at the rate of 180,000 gal. daily.

At engine terminals and roundhouses there is much waste from leaky valves and connections, boiler washout plants, feed-water heaters, wash basins, toilets and appliances directly connected to sewers or drains. Hydrants at coach yards and railway stockyards are likely to be leaky and misused. Hydrants for watering passenger cars are in the same condition and are often allowed to run freely, with the excuse of delivering cool water in summer and preventing freezing in winter. Cooling water for air compressors and internal combustion engines is often allowed to run to waste.

Much of this waste can be checked by close and systematic supervision under the direction of some official who is held responsible for proper conditions and has authority to order repairs. One railway has instituted measurements of normal consumption at different points as a check upon future records. At treating plants, close account is kept of the water pumped and water and chemicals used. Education of employees as to the losses by waste is important and must be carried on continually to be effective. Aids in this direction are circulars and talks explaining sources of waste, its cost and how to reduce it. Printed notices may be posted in enginehouses and shops, but these need to be renewed or changed occasionally or they will cease to attract attention.

Waste prevention devices, visible indicators and audible warnings may be applied in many ways. Indicators on tender tanks have been suggested, to show the fireman when to begin closing the standpipe valve so that the tank may be filled without overflowing. At water stations on the Southern Railway, Mr. Pierce, engineer of water service, has introduced automatic controlling valves in concrete pits, which can be inspected and repaired more readily than float valves in high tanks. He has applied air chambers and relief valves on long pipe lines to reduce water hammer and leakage; also electric signals to notify pump men when the elevated tanks are filled, so as to prevent overflow.

In conclusion, the following is quoted from the paper by Mr. Knowles, already mentioned, in regard to the waste-prevention campaign on the Illinois Central R. R.:

> This saving (nearly $200 per day) has been accomplished by investigating every possible source of waste and keeping the importance of the subject constantly before officer and employee. The principal saving was made in the cost of city water and efforts were directed chiefly toward correcting the waste of water purchased from outside parties, as the cost of water purchased is generally higher than that of water pumped by company forces. Large reductions were made also in the consumption of company water. In order to keep a check upon the water purchased, all bills are entered on a card index for the purpose of comparing cost and consumption. Any increased consumption is noted and called to the attention of the officer having jurisdiction. If a satisfactory explanation cannot be given an investigation is made, which invariably results in disclosing and correcting the waste.
>
> Probably there are few water services on the average railroad where a saving cannot be effected. It is usually the smaller leaks at slop sinks, wash basins, toilets, urinals and other fixtures connected direct to sewers and drains that cause the greatest waste and are the most difficult to correct because of the apparent insignificance of the loss and hidden nature of the waste.
>
> As an example of the quantity of water that may be wasted through small openings, a $\frac{1}{16}$-in. stream, such as may be caused by a worn faucet washer, will, at 40-lb. pressure, waste 18,844 gal. per month, which at 20c. per 1,000 gal. will amount to $3.68, or enough to purchase a new faucet. A $\frac{1}{4}$-in. stream, such as may occur at an overflowing toilet flush, will waste 301,500 gal. per month at a cost of $60.30, or enough to install a first class toilet complete.
>
> It is not surprising that water waste occurs on the railways when we consider that the daily consumption is nearly 2,500,000,000 gal., delivered through innumerable connections and under the control of thousands of employees, the greatest number of whom have no conception of the value of water. It is a mistake to assume that the waste cannot be corrected or that correcting an occasional waste here and there solves the problem, as it is only by continued effort that maximum results are to be obtained.

The development of an adequate water supply and the economical and efficient design and construction of water stations, together with efficient supervision over maintenance and operation, are problems that require the undivided attention of a staff trained in water service work. The problems connected with water supply can best be solved with a separate organization charged with the sole responsibility for their successful operation.

Fire Protection for Seattle Oil Pier

SPECIAL precautions have been taken to prevent and combat fire at the Oil Dock, Pier A, Smith's Cove Terminal, at Seattle, Wash., which was described in *Engineering News-Record*, June 3, 1920, p. 1101.

A boom has been constructed of heavy Douglas fir logs, approximately 24 in. in diameter and installed so as to belt the waterside of the oil dock to retard the spread of burning oil in case of fire. Also three fire aprons reaching down below low tide and dividing the oil dock to two sections and separating it from the transit shed have been built for the same purpose.

On the top of the dock fillers have been placed under the bull-rail to form an oil-tight bulkhead along the face of the dock and a timber bulkhead has been built all around the south and north end as well as along the depressed tracks. This bulkhead is provided with hinged sections across the railroad tracks at the north and south end of the dock. Bags of sand have been provided for tightening these hinged sections of the bulkhead. All wooden structures on the oil dock have been sprayed inside with fire resisting paint, and wire screens have been provided to close all openings under oil tables, etc., where any danger from collection of débris is evident. Scale houses and other portable equipment showing evidence of fire hazard have been discarded and replaced with steel and iron construction. The boiler room, originally of frame construction, has been rebuilt of fire-resisting material (tile, concrete and steel frame), and automatic sprinkler systems have been installed in the boiler room and oil heating houses.

In addition to the fire-prevention measures an elaborate system of fire-protection equipment has been installed. This comprises three 40-gal. chemical engines located at the south center and north ends of dock and thirteen 2½-gal. chemical engines located approximately every 100 ft. along the depressed track. Also a great number of extinguishers and sand buckets are located in each of the oil bulking sheds.

In addition to the chemical engines there are hose carts containing 200 ft. of 2½-in. fire hose for connection to fire hydrants located approximately 200 ft. apart along the face of the dock and also along the roadway in the center of the pier. Fire-hose valves and hose reels containing 50 ft. each of 1½-in. fire hose are installed every 100 ft. along the depressed track side of the dock. There are about thirteen of these and they are located together with the 2½-gal. chemical engines which combination constitutes the one-man equipment.

In addition to the standard fire hydrants fire monitors are located along the center of the pier about 100 ft. apart. The monitors, being 30 ft. in height, would cover the full width of the oil dock in case of fire, in addition to protecting the steel dock and transit sheds by preventing the spread of fire.

Additional auxiliary fire-alarm boxes have been installed down the center of the oil dock where they are readily reached from any part of the dock. Several watchmen clock stations are provided.

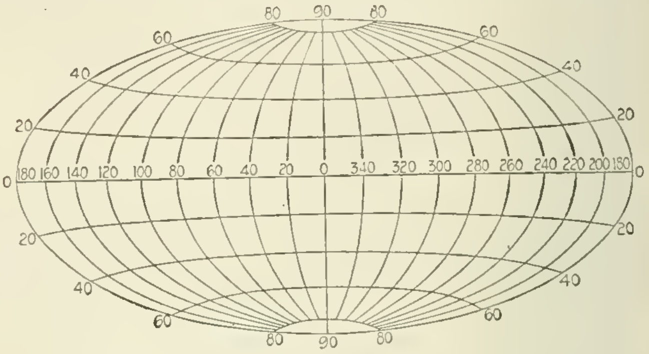
Equal-Area Projection of Sphere an Aid to Mapping

By R. L. Faris

Acting Superintendent, U. S. Coast and Geodetic Survey, Washington, D. C.

A PROJECTION of the whole sphere on an equivalent or equal area system devised by Aitoff, has just been issued by the U. S. Coast and Geodetic Survey, size 11 x 22 in. The sphere is represented within an ellipse with major axis twice the minor axis. No shoreline has been included since it is intended primarily for the plotting of the stars in astronomical work, its value for this kind of work being suggested by Prof. Benjamin Boss of the Dudley Observatory, Albany, New York.

The projection is bounded by an ellipse similar to that which is used in Mollweide's equal area projection but, since the parallels are curved lines, the distortion in the polar regions is less in evidence. The net-work of meridians and parallels is obtained by the orthogonal or perpendicular projection of a Lambert meridional equal area hemisphere upon a plane making an angle of 60° to the plane of the original.



AITOFF'S EQUAL-AREA PROJECTION OF SPHERE

The fact that it is an equivalent or equal area projection combined with the fact that the celestial sphere is represented in one continuous map, will show at a glance the relative frequency of stars in the different regions of the expanse of the heavens. As constructed the radius of the sphere to be projected is taken as a decimeter so that the graticule has a very convenient size for general use.

As used for a map of the world, this projection is well adapted to replace the Mercator projection in atlases of physical geography or for statistical purposes and has the advantage over Mollweide's in that its representation of the shape of countries far east and west of the central meridian is not so distorted because meridians and parallels are not so oblique to one another. By employing the meridian of Greenwich as a central meridian, the continental masses can be mapped where the projection is at its best and the greater distortion transferred to the Pacific Ocean.

Sack Cleaning Machine Saves Money

In cleaning by machine 100,000 cement sacks on a concrete road job in Wisconsin 200 bbl. of cement were recovered. A bundle of 60 sacks, after cleaning, cleaning, thus reducing the freight charges on re-weighed 25 lb., as compared with 50 to 75 lb. before turned sacks. Altogether the contractor estimated that he saved $1,000 on his cement sack account.

Pressure Filters at Lynchburg on Gravity Supply

Good Results Obtained from Well Equipped Plant—High Coagulant Tank—Spray Aerators Remove Tastes and Odors

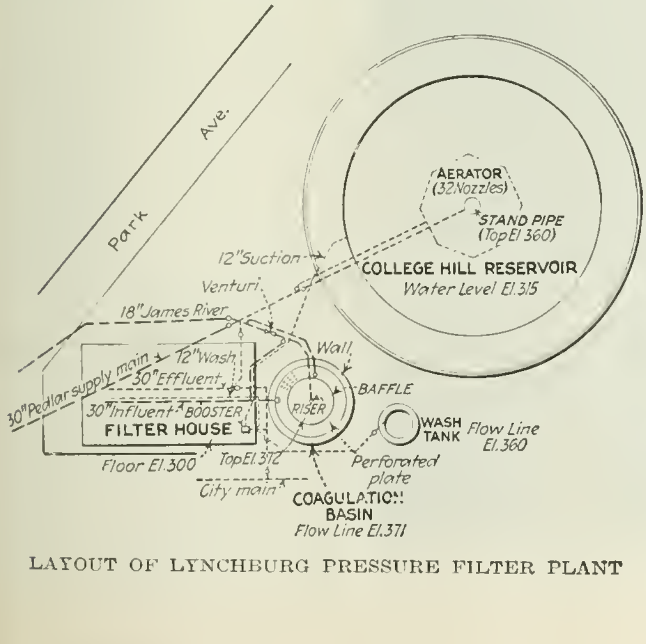
By Richard Messer, Chief Engineer, and A. S. Holway, Assistant Engineer, Virginia State Board of Health

PROBABLY the most completely equipped pressure filter plant in the country is located at Lynchburg, Va., a city of 35,000 population. It includes 12 cylindrical pressure filters having a total rated normal capacity of 6,000,000 gal. per day, and is giving satisfactory service according to present standards. Noteworthy features in the design and arrangement are a cylindrical coagulant tank 50 ft. in diameter and 60 ft. high, the application of alum and soda ash solution to the influent by pumping, rate controllers on filters and wash water line, many other automatic devices and an aerating system.

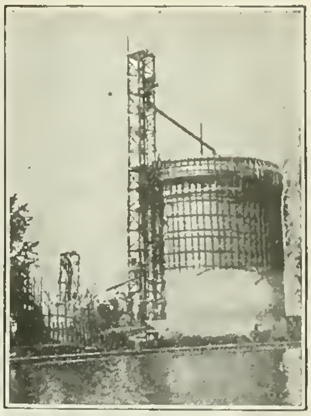
The supply is brought by gravity from the Pedlar River through a 30-in. gravity wood stave line, 23.2 miles in length. Until 1907, when the Pedlar system was completed, water had been taken without treatment from the James River. A concrete dam at the intake is 500 ft. in length, has a maximum height of 70 ft. and forms an impounding reservoir of 500,000,000 gal. The catchment area, estimated from a survey made by the U. S. Forest Service, is 33.2 sq.mi., on which there is a population of about 800 people. Of this area 1.33 sq.mi. is owned by the city, about 13 sq.mi. has been approved by the Forest Service for purchase and the remainder is divided into small tracts privately owned. When James H. Fuertes, consulting engineer, made his report on this project in 1903, it was the intention of the city to secure the entire catchment area.

Soon after completion it became apparent that the Pedlar supply was not all that was to be desired with regard to quality. During the winter and spring months the turbidity was often objectionably high, tastes and odors occurred during the summer, due to algae, and B. coli were found present at frequent intervals. Furthermore there was always the danger of a break in the single gravity main.

In 1913 liquid chlorine apparatus was installed at the intake as a temporary measure pending final recommendations by George W. Fuller. In his preliminary report of December, 1912, Mr. Fuller had recommended pressure filters, æration, additional storage in the city and a duplication of the gravity main at the river crossings. In his final report, three years later, he recommended that the pressure filter plant be located on College Hill, within the city; that æration should be provided at the Pedlar intake and after filtration; that pumping equipment be installed to deliver James River water to the filter plant in case of an emergency; that additional storage in the city be provided, and that metering of all services be undertaken. The improvements so far completed are in accordance with these recommendations, except for the new storage reservoir in the city and the ærator at the dam.



LAYOUT OF LYNCHBURG PRESSURE FILTER PLANT



COAGULANT TANK 60 FT. HIGH UNDER CONSTRUCTION

In reaching a decision to adopt pressure filters, instead of the usual gravity filters, several factors due to local conditions had to be taken into consideration: (1) In order to provide for emergency use of James River water, the plant must be located in the city, the most favorable site being on College Hill. (2) This scheme was cheaper in first cost and annual expense than the alternative projects considered. (3) By using a deep cylindrical coagulation tank and pressure filters on College Hill, instead of the gravity filters, there is a saving in pumping costs of between $6,000 and $7,000 per year. To maintain the high service supply, water is delivered into the College Hill reservoir at El. 360. To provide sufficient head for operating the filters the top of the coagulation tank was fixed at El. 372, at which elevation the estimated carrying capacity of the 30-in. wood main is approximately 10,000,000 gal. daily. The physical features of the site are such that gravity filters would have to be built at a lower elevation than the College Hill reservoir, necessitating constant pumping. (4) The water as delivered at the plant is only slightly polluted. The turbidity seldom exceeds 100 p.p.m. and is usually under 30 parts.

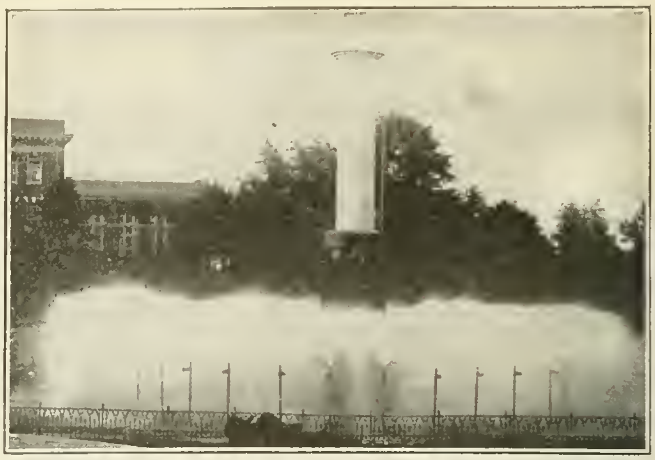
The plant comprises: (1) A coagulation tank having a retention period of 3.4 hours; (2) 12 horizontal steel pressure filters 25 ft. long and 8 ft. in diameter; (3) a 65,000-gal. concrete wash water tank on a concrete tower, 29¾ ft. in height; (4) automatic chlorinators in duplicate; (5) an aerator in the reservoir.

Raw water, into which the chemicals have been pumped, is discharged at the top and center of the coagulation tank through a 30-in. riser, in which it has a travel of 150 ft. from the point of application of the coagulant to the discharge. The flow is then directed downward by a cylindrical baffle having a diameter of 34 ft. and extending to within 9 ft. of the bottom of the tank, which is flat. To secure an even distribution there is a horizontal perforated plate between the baffle and the outer shell, a few inches below the water level. The holes in this plate are

3 in. in diameter, and the number can be varied by closing them with brick placed over the holes to secure an equal upward velocity in all parts of the tank between the baffle wall and the outer wall of the tank. A special pitot tube has been devised by the engineer in charge to register the difference between the velocity head and static head at each hole. In this way equal distribution is noted. If no "streaming" or short cuts take place the velocity under 100 per cent displacement would be 0.66 ft. per minute. The water from the coagulation tank is discharged through a 30 in. outlet, heading in the perforated plate. There are two overflow pipes, one within the other, with their tops 1 and 2 ft. respectively above the top of the perforated plate. By this means small overflows go back to the raw water supply pipe and large overflows go to the sewer. The tank is cleaned every four months.

Aluminum sulphate and soda ash are dissolved in concrete tanks, to which compressed air is admitted to agitate the solutions. The orifice boxes supply the solution feed pumps, of which there are two alum pumps, each with a capacity of 8 gal. per minute, two additional alum pumps, at 4 gal. per minute and two soda ash pumps at 4 gal. per minute. The 6 per cent chemical solutions are diluted at the pumps with filtered water about 1 to 8.

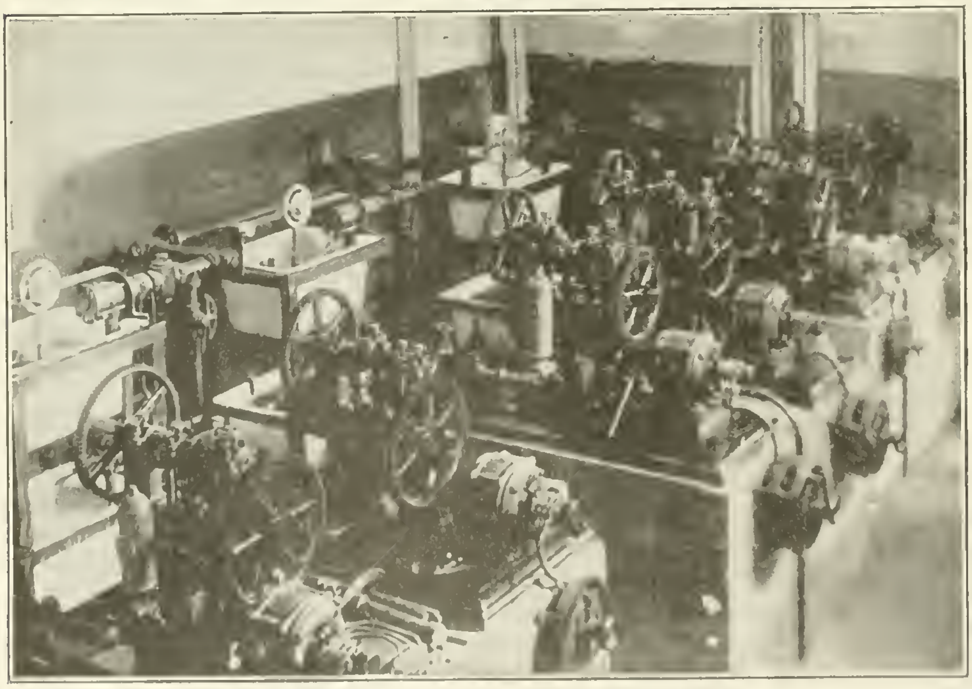
The average head in the filters is 65 ft. and the total operating head is 12 ft. Each unit is equipped with a rate controller of the Venturi type and a mercury gage which indicates the rate of flow through the filter. The filters are washed by air and water combined, through the same manifold and strainer systems. For the past six months air has been used irregularly about once a month. The rate is 540 cu.ft. of air at 5 lb. pressure being furnished by a rotary blower and wash water being drawn from a concrete tank filled by gravity from the filtered water main. Another rate controller of the venturi type regulates the rate of flow of wash water to the filter, usually 7½ gal. per square foot per minute.



AERATOR WITH THIRTY-TWO SPRAY NOZZLES

After treatment with liquid chlorine the filtered water flows to the small standpipe in the center of the 4,000,000-gal. reservoir. When there is trouble due to tastes and odors from algae, the water is passed through an aerator consisting of 32 nozzles furnished by the Spray Engineering Co., arranged in a circle as shown in the photograph. The water is shot upward in a fine spray under 25 lb. pressure on the nozzles. The number of nozzles now in use is 24 for 9,000,000 gal. treated. Because of the large area of the reservoir the loss from the wind is small.

To facilitate the control of the plant there is brought to one gage board the following: Two recording gages showing the height of solution in the alum tanks, two similar gages for soda ash; manometers connected to the 6-in. and 12-in. wash water controller; an indicating water level gage for College Hill reservoir; pressure gages for the effluent and influent lines, raw water line and booster pump discharge, and a recording water level gage for the wash tower. These gages, in conjunction with the indicating recording venturi meter on the raw water line, the gages on the individual filters and the samples taken in the laboratory, give the operator excellent information of how the plant is performing at all times.



SOLUTION ORIFICE BOXES AND PUMPS

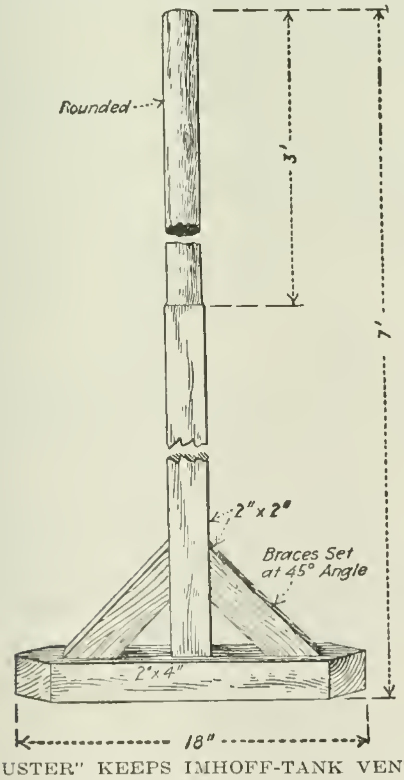
Successful operation since June, 1919, has demonstrated that under special conditions pressure filters can be designed and equipped to give satisfactory results. It has been necessary to use chlorine only for short periods. The filtered water is consistently of zero turbidity and is almost colorless. It has been found that the alkalinity has practically no value in forming a coagulant with the aluminum sulphate and that a sufficient amount of soda ash to complete this reaction must be used at all times. The alum used varies from 0.35 to 1.25 grains per gallon. Although the growths of algae in the storage reservoir were not as luxuriant as usual during the summer of 1919 aeration removed whatever tastes and odors existed. It also reduced the free CO_2 from an average of 13 p.p.m. to 1½ parts, which is considered satisfactory. The decision as to the installation of the second aerator just below the Pedlar dam will depend largely on the effectiveness with which tastes and odors are removed by the present installation this summer.

The greatest operating difficulty is the one always experienced with pressure filters. Under conditions where it is difficult to secure satisfactory coagulation the operator has no means of noting the failure of the chemicals to react properly until the results are evidenced in the filtered water. It is planned to minimize this difficulty by constructing a suitable stairway to the top of the coagulation basin, which will make this point of observation easier of access.

The cost of the filter plant and the appurtenant piping was approximately $220,000. The main features of the design of the plant were in accordance with the recommendations of Mr. Fuller's report noted above. Harry L. Shaner, then city engineer, executed the detailed designs and supervised the construction in its initial stage. The work was completed under the supervision of his successor, C. L. DeMott. The filters were installed by the Roberts Filter Manufacturing Co. Since completion R. F. Wagner, assistant city engineer, has had immediate charge of the operation, while the bacteriological examinations are made in the office of Dr. Mosby G. Perrow, city health officer.

"Scum Buster" for Imhoff-Tank Gas Vents

THE accompanying sketch shows a "scum buster" used at the sewage works of Albany, N. Y., to help keep the gas vents in the Imhoff tanks free from sludge or scum. It is made from 2 x 2-in. and 2 x 4-in. timber, as shown. Joseph Murray is assistant engineer in charge of the Albany sewage works, under Frank R. Lanagan, city engineer.



"SCUM BUSTER" KEEPS IMHOFF-TANK VENTS FREE FROM SLUDGE OR SCUM

Brick Laid on One-Inch Base Good After Four Years

No Defects Due to Weakness of Slab Are Apparent —Gravel Subsoil Contributed to Success

By Harlan H. Edwards

City Engineer, Danville, Ill.

FOUR years ago this summer 7 mi. of 9-ft. monolithic brick pavement was laid on a 1-in. concrete base in Stockton township, Iroquois County, Illinois. This pavement was a success from the start. The contractors made rapid progress, obtained a very smooth surface, and at the same time made a fair profit at a price of $8,500 per mile, with a 7-ft. earth shoulder on each side of the slab. At the present time the pavement has passed through practically four winters and there is not a defect except in the first section laid, where poor grouting has shattered the tops off a few bricks, and except at the ends of a concrete bridge, where a fresh fill settled and consequently took the pavement with it.

The construction of the Stockton township road was the outome of observations of an experimental monolithic brick road built in 1914 near Danville, Ill. This was one of the first experimental roads of monolithic brick to be constructed and it was described in the *Engineering Record*, Sept. 30, 1916, p. 400. Briefly four sections of 15-ft. pavement, crowned 1½ in., were built as follows: (1) A length of 36 ft., of 3-in. brick on a 3-in. base of 1:3½:6 concrete; (2) a length of 64 ft. of 4-in. brick laid longitudinally on a 2-in. base; (3) a length of 50 ft. of 4-in. brick laid transversely on a 2-in. base, and (4) a length of 48 ft. of 4-in. brick on a 1-in. base of 1:3½ cement-sand mixture.

In constructing these sections of pavement, the concrete was placed just as wet as was necessary for workability but not so wet that it would run at the edges. The slab was struck off with a templet but the concrete was not tamped and the brick were laid and grouted immediately. The road selected for the experiment carries a heavy traffic from coal mines. The fourth experimental section was placed where it received the most severe test, at the edge of a soft gravel road. In the spring, when the frost was breaking up, this gravel road was little better than a series of mud holes from which heavily laden coal wagons bumped up onto the pavement. In the summer, on the contrary, the gravel surface was high above the brick and the traffic dropped down upon the edge of the pavement. After four years of this punishment the slab showed no signs of failure. A new pavement was laid beyond the experimental sections, replacing the gravel road. Today, after six years of use, the experimental sections look as well as they did when built.

The experience with these test roads emphasizes the results obtained in actual service from the Stockton township road. A fact of importance to be kept in mind is that while the soils vary many times in character in the length of the pavement, under them all is a good bed of gravel. This gravel subsoil acts continuously as an efficient subsurface drain, performing good service at the most critical time when the thaw sets in and before the road surface and the ditches have thawed out.

At the prices of 1916, a saving of at least $3,000 a mile was effected by the construction described and apparently a good pavement was secured. Many roads today could be paved with a corresponding saving in cost. While the monolithic form of brick pavement has now virtually been abandoned on account of construction difficulties, the principle of seeking the greatest economy consistent with safety still applies and more forcibly than ever. With prices of labor and material rising enormously it behooves engineers to spend a little more time on subgrade problems. Make the foundation strong and the slab will take care of itself.

Current Progress in Water-Wheel Design and Operation

Part of the Report of the Committee on Prime Movers presented to the National Electric Light Association at the convention at San Francisco, May 18-22, 1920.

THE increased size of water-wheels, together with the large number installed, seems to be the most important feature of the past year's development.

Single wheels of approximately 40,000 hp. capacity have been installed, and much larger ones are contemplated. The growth of operating systems makes feasible this increased size of individual units. One large manufacturing company reports that it has totalled nearly one-quarter of a million kw. in large hydro-electric generators (in units of over 1,200 kw. each) started in the past year. While all of the large water-wheel manufacturers report this tendency toward larger units, yet there are a large number of smaller vertical, direct-connected wheels being installed as additional or replacement units.

The higher efficiency obtained from these modern installations makes it profitable in a large number of cases to replace the old with the new. The large units are uniformly distributed over the United States. Many of the older hydraulic developments which used dams and canals, supplying many widely scattered individual water-wheels (necessary in the earlier days to distribute the power of the total fall in the river to the various manufacturing plants), are now planning a single hydro-electric station to utilize the entire fall and transmit the power electrically.

It is interesting to note that the tests of the large water-wheels in place show remarkably high efficiency. B. F. Groat, a consulting engineer of Pittsburgh, reports that "one of the most important things accomplished this past year was to prove that overall water power efficiencies approximating 90 per cent are an established fact reckoning from water to generator terminals."

Several large units have been started and continuously operated for over a year without a single shut-down on account of wheel troubles.

During the past year a new type of water-wheel has been developed by Forrest Nagler of the Allis-Chalmers Co. This is an exceptionally high-speed runner and was designed for low head plants.

The Great Western Power Co. of California has ordered from the Allis-Chalmers Co. four 15,000-hp. tangential wheels built for operating under an effective head of 1,008 ft. These wheels contain 21 buckets, each 36 in. wide and 24 in. deep, and water is supplied from thirteen nozzles. They are to operate one each overhung from the ends of a 22,200-kva. generator shaft running at a speed of 171.4 r.p.m. It may be of interest to state that several water-wheel manufacturers designed and recommended Francis type wheels for this head at a speed of either 600 r.p.m. or 750 r.p.m. The operating engineers, however, were afraid that the erosion on the clearance passages and gate mechanism might be rather severe when operating under a pressure of over 430 lb. per square inch. This, coupled with the fact that it would require a turbine type generator with smooth core field which was not suited for charging conditions on their long transmission line, led them to choose the impulse wheel.

On their impulse type plants, development has been along the central oil system for bearings, governors and relief-valve control, with combination pressure and governor-operated relief valve. These relief valves either discharge direct into the atmosphere or into other conical-shaped baffles, which consume the energy in the water. This point is often essential, as their mountain power houses are situated in narrow canyons where space is not available for allowing these high-pressure streams to escape unchecked.

The Pelton Water Wheel Co. is at present constructing some 800-ft. Francis wheels for the Southern California Edison Co. These machines are to be run 600 r.p.m. and deliver a maximum horsepower of 22,500.

Automatic hydro-electric plants are receiving considerable attention. Several plants of this type have been built or rebuilt and are working very satisfactorily. These plants operate without attendants, and the gate openings and output are regulated, according to the water supply available, by means of a float control from pond-level. These plants may be tied into a local power system or be run in connection with a steam station which takes care of the fluctuation of load and varying flow of stream.

In the last few years there has been a decided tendency to confine the power station building to the housing of generating apparatus and its control, locating step-up transformers and generally high-tension equipment outdoors. There is a more radical tendency, where climatic conditions are favorable, to carry this outdoor principle to the generating apparatus itself, housing only the control apparatus.

The Kingsbury and other forms of flexible thrust bearings for water-wheel units, have thoroughly established themselves and are generally giving good service. There has been a tendency in certain cases, with the use of spring-supported bearing, for vertical vibration of the shaft to occur. This appears only in rare cases, where there is sufficient hydraulic disturbance in the runner to cause movement. This has been overcome by blocking the springs in the bearings. The spring bearing also gives trouble with direct-connected shaft governor.

The Wellman Seaver Morgan Co. has produced an interesting improvement in the butterfly valve which practically eliminates the former difficulty of making it tight. The valve is provided with a cylindrical seat which, after the valve is closed, is brought up against the valve disk by differential hydrostatic pressure, producing a uniform water seat completely around the disk.

The Johnson type of valve continues to give satisfaction.

While there is a tendency in the larger units to make each unit self-contained and complete in itself with its own exciter, governor, pumps, etc., practice in general is divided between this tendency and that of centralizing the auxiliaries.

A very satisfactory solution of this problem is found by incorporating the best points of both systems so far as is possible. This is accomplished by having individual speed control sets for each of the main units and by having an emergency pipe connection from each individual set to each adjacent set. Each main oil pressure set is of sufficient size to operate two main units in an emergency. This arrangement has the effect of making it possible to operate every unit in the power house from the governing system of its adjacent unit. Thus all of the advantages of the central oil pressure system are combined with the advantages of the individual system.

French Lumber Use

Notwithstanding the intensive care France gives to her forests, she is compelled to import from 30 to 40 per cent of the lumber she requires. Most French farmers get along with the identical buildings of their great grandfathers. The annual per capita consumption in France is not more than 100 board-feet per capita or less than one-third used by Americans.

Load Distribution Over Stringers of Highway Bridges

Iowa Tests on Three-Inch Plank Floors Indicate That Stringer Load Is Only About One-Half of Wheel Concentration

CAREFUL measurements of the distribution of load concentrations over the several stringers of a typical plank-surface highway-bridge floor, made at the Iowa Engineering Experiment Station, at Ames, supply new and valuable data bearing on the load capacity of ordinary highway bridges. A report on the tests has been made by T. R. Agg and C. S. Nichols, in Bulletin 53 of the station. The tests were made with the use of the strain gage, applied in very thorough manner; they covered a sufficient range of variable factors to give the results wide practical application; and at the same time the consistency of the several results among themselves demonstrates the value of the test method.

Plank floors on steel stringers were the special object of inquiry, because many bridges with floor of this type exist in country districts, and it is economically necessary to maintain them in service as long as possible under tractor and motor-truck traffic. Calculation of safe load capacity requires knowledge of how a wheel concentration is distributed to the various stringers. It was therefore aimed to determine by the tests (1) what percentage of the wheel load is carried by a single I-beam or channel stringer and what percentage is distributed by the planking to the other stringers; (2) whether two layers of planking have greater distributing effect than a single thickness; (3) whether the distributing effect is greater or less when the planks are loose from the nailing pieces; (4) whether there is much change in load distribution as the diagonal cleats of a traction-engine wheel come into different positions of bearing.

All tests were made on a floor 16 ft. wide, of 3-in. plank laid transversely on longitudinal I-beams and channels spanning 18 ft. The stringers ranged from 6-in. I-beams, spaced 12 in., to 9-in. I-beams spaced 27½ in. When the effect of a double floor was under study, a course of 2-in. plank was laid over the 3-in. plank, the upper course being in some cases longitudinal and in some cases diagonal. Loads were applied by a pair of 80-in. wheels 2 ft. wide, spaced 6 ft. c. to c., loaded by hydraulic jacks bearing against a set of reaction girders above the test platform. The bottom flange of every stringer was laid out in a continuous series of gage lengths for a 15-in. Berry strain gage, and under each test load all the gage lengths were measured.

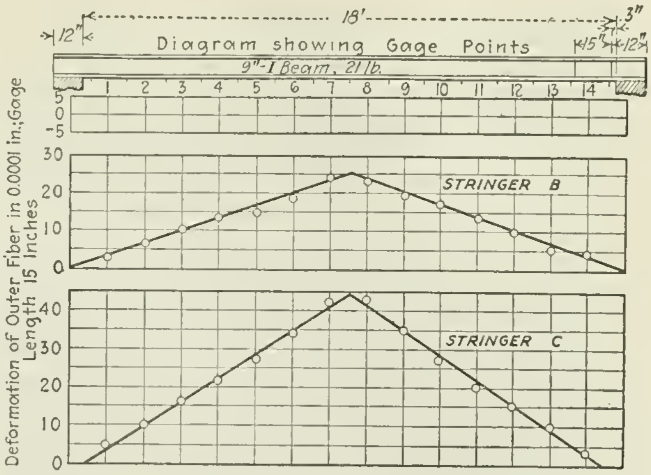


FIG. 1. MOMENT CURVES FOR TWO ADJACENT STRINGERS, ONE DIRECTLY UNDER WHEEL

Briefly, the results of the tests were:

The greatest load concentration on a single stringer was equal to 55% of one wheel load; i.e. 45% or more was distributed through the planking. The distributing effect was slightly improved (the concentration decreased) by adding a second layer of plank laid lengthwise. The distribution was not so good when the ends of the planks were loose as when they were firmly spiked down.

When one of the wheels approached the side of the bridge floor, the share of load borne by the outer stringer increased rapidly from practically zero to nearly as much as the maximum that same on any other stringer. Therefore, say the authors, it appears

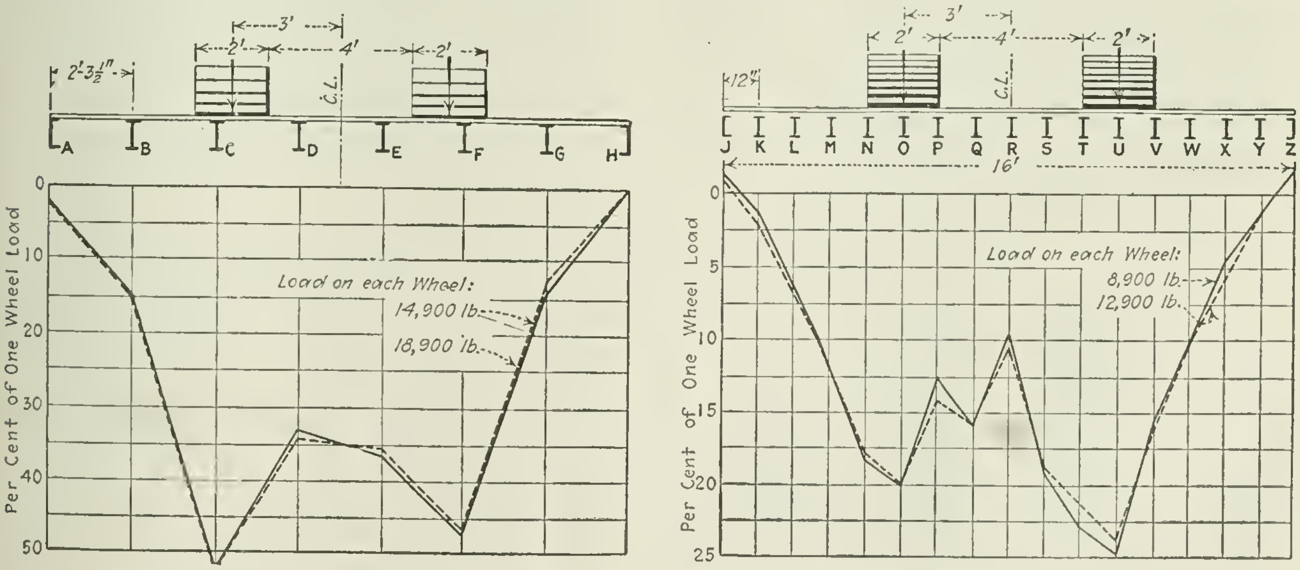


FIG. 2. DISTRIBUTION OF CONCENTRATED LOADS LATERALLY TO THE VARIOUS STRINGERS OF THE FLOOR

At left, floor of six 9 x 21-lb. I-beams and two 9 x 13¼-lb. channels, floored with 3 x 12 transverse plank fastened to nailing strips on channels. At right, floor of seventeen 6 x 12¼-lb. I-beams, floored with 3 x 12 transverse planks fastened to nailing strips on outer stringers.

advisable to make the outer stringer just as strong as any other stringer.

With shallow stringers closely spaced, the distributing effect of the floor plank was found to be greater than with deeper stringers widely spaced. The authors conclude that shallow joists "may be safely employed if enough are used to insure wheel bearing on two joists." It is to be noted that the wheels in the test were 2 ft. wide.

Illustrating the nature of the test results, Fig. 1 herewith shows the moment curves for two adjacent stringers in one of the tests (six 9-in. I-beam stringers, two 9-in. channel stringers). The points marked are the plots of the deformations in successive strain-gage lengths, and thus are direct measures of the moment along a stringer; the lower of the two curves refers to a stringer under a wheel, the upper and adjoining stringer. For all stringers the moment curves were of the same triangular outline, indicating that the unloaded as well as the loaded stringers can be considered to carry a concentrated load.

In Fig. 2 are reproduced two of the plots representing load distribution transverse of the floor. They are by no means the most regular of the various sets of curves obtained in the different tests. However, as will be seen, they give a direct comparison of load distribution with wide and close spacing of stringers.

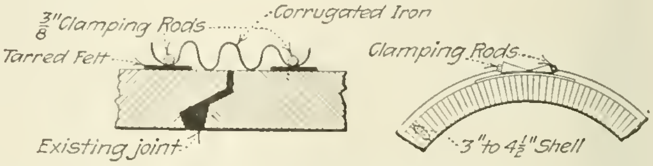
Heavy Leakage from 42-in. Concrete Pipe on Sooke Pipe Line

Pipe Not Covered — Few Expansion Joints — Leakage Records Given — Joints Being Reinforced

THERE has been heavy leakage for several years through joints of the concrete pipe line bringing water from Sooke Lake to Humpback reservoir for the city of Victoria, B. C. When this line was built in 1913 a few expansion joints were put in near the end of the line but their use was soon discontinued, the idea being to let cracks develop where they would and then to give them such treatment as seemed necessary. However, contraction and expansion resulted in slight but continued movement in every pipe section. This cause leakage at practically every joint, which amounted to a serious total for the entire length of the line. No effective means of preventing this loss has as yet been applied. A tabulation bringing the leakage data up to date, which has just been completed by F. M. Preston, city engineer of Victoria, is published herewith. Details of design and construction are given in *Engineering Record*, Oct. 2, 1915, p. 406.

The conduit is 27½ miles long and consists of 42-in. lock-joint pipe, 3 in. thick, precast in 4-ft. sections. Except for the siphons, the pipe is laid on hydraulic grade and without backfill. Due to the rough country traversed a great part of the line is on curve. The concrete itself, which was cured by a steaming process, is proving highly satisfactory, the leakage occuring only at joints. When the pipe was first put in service there was practically no leakage. During the first season's operation, however, the leakage appeared and since that time has responded to weather conditions very closely, as shown in the table.

The worst conditions obtained in December, 1919, when almost the entire flow was lost by leakage for a period of six days and the conduit was choked with broken ice when the thaw set in. If the pipe could have been kept full it is thought that this difficulty would not have occurred. As it was, ice about 6 in. thick formed inside the pipe and, when the temperature rose, this ice thawed and came away from the pipe in long pieces which were broken by passing through the siphons and which finally formed an ice jam in the pipe. With the pipe blocked, practically the usual quantity of water continued to enter it at the intake and was practically all lost through leakage. This leakage did not all occur at open joints as at this time two of the washout valves had been cracked by the frost.



DETAIL OF JOINT REINFORCEMENT

The width of the corrugated iron will be governed by commercial sizes of sheets

Several expedients that have been tried for checking the leakage have been unsuccessful. For example, silt has been shoveled into the manholes to see if the joints would not at least temporarily silt up. Particularly troublesome joints have been patched with concrete periodically. No adequate relief has thus far been found. Experiments will be tried this year with corrugated iron strips placed circumferentially around the joints and clamped to the pipe by a pair of clamping rods, as shown in the accompanying illustration.

F. M. Preston is water commissioner and city engineer of Victoria, B. C.

TABULATION OF LEAKAGE DATA, SOOKE LAKE AQUEDUCT, VICTORIA, B. C

	Water Leaving Sooke Lake	Water Arriving at Humpback	Water Lost Gal.	Per Cent Loss Total	Loss in 1916 per Cent	Loss in 1919 per Cent	Max. per Cent Loss on Any Day in Any Month		Mean Temp. on Day of Max Loss Deg. F		Mean Temp. for Months Deg. F.	
	Total for All Months, 1915 to 1919								Air	Water	Air	Water
January	334,541,300	165,500,000	169,041,300	50 6	58 9	54 5	78	1919	35	39	30	39
February	133,250,000	74,700,000	58,550,000	43 8	40 0	44 3	60	1919	33	40	33	38
March	279,166,600	158,000,000	121,166,600	43 4	64 8	50 0	60	1919	41	43	36	40
April	482,916,600	291,500,000	191,416,600	39 8	50 3	42 7	68	1917	42	41	47	48
May	649,625,000	479,800,000	169,825,000	26 1	17 2	33 5	57	1918	50	56	52	54
June	774,000,000	666,900,000	107,100,000	13 9	10 3	15 9	37	1919	52	58	57	61
July	782,658,100	687,800,000	94,858,100	12 1	4 8	15 4	28	1919	58	64	59	67
August	764,666,600	648,500,000	116,166,600	15 2	11 1	17 4	33	1918	58	66	62	68
September	733,749,900	601,900,000	131,849,900	18 0	17 4	23 0	40	1919	47	62	57	64
October	777,358,400	605,210,000	172,148,400	22 2	29 9	39 5	81	1919	30	50	47	55
November	521,062,500	313,500,000	207,562,500	39 8	41 1	48 2	69	1915	39	48	40	47
December	411,500,000	162,000,000	249,500,000	60.6	39 4	76 0	91*	1920	19	35	36	40
Totals	6,644,495,000	4,855,310,000	1,789,185,000	Av., 26.9								

* Temperature dropped to 10 deg.

British Engineers Interested in Concrete Consistency

Paper Proposes Measure of Optimum Water Content But Does Not Suggest Practical Workability Limit

APPRECIATION of the role of consistency in concrete strength is becoming evident in British technical literature, although they seem not to have progressed as far in the study as in this country. A recent paper entitled "The Consistency of Portland Cement, Mortar, and Concrete," by H. G. Lloyd, read before the Concrete Institute, is the first indication of an interest in the subject. This paper proposes a method whereby can be determined the precise amount of water required for the chemical or physical hardening of mortar or concrete. The method fails for practical application in that there is no measure suggested for the variations from this optimum amount that are necessary, the author admits, for practical workability.

The author states that it is well established that every portland cement requires a definite quantity of water in order that it may set perfectly. He goes further and states that a mortar or concrete to set requires the amount of water necessary for the cement setting plus just enough water to dampen the surfaces of the fine and the coarse aggregate. It is on the asumption that each ingredient in a mortar or concrete should be supplied with its requisite amount of water that the attempt is made in the paper to determine the quantity of water required by portland cement mortar or concrete. This method consists in determining the optimum amount of water, first for the cement, second, for the fine aggregate, and, third, for the coarse aggregate, a proper mathematical average of the three being the optimum water content for a perfect setting of the concrete.

The proper amount of water for the cement is measured, according to the author, by its consistency, and that consistency may be measured by either the Boulogne method or the Vicat apparatus. The Boulogne method is a visual observation of the behavior of a neat cement mortar pat. The Vicat test, as is well known in this country, is a needle test on a cement mortar pat. With either of these tests the optimum amount of water for the cement alone may be found.

The method of finding the proper amount for a mortar is described in the following words in the paper:

> In order to arrive at the percentage by weight of water necessary to be added to the portland cement and sand, it is customary to mix the dry materials and then to add a weight of water known to be less than the requisite amount and so to continue adding further small quantities until the physical characteristics of the mortar indicate the desired consistency.
>
> This object may be attained by a simpler method if it is approached in a different manner. Suppose that a test on a sample of portland cement is to be made in accordance with the standard portland cement specifications, and that eventually the sample complies with all the requirements. Suppose also it is known that the portland cement requires 22 per cent of water. The mortar briquettes are about to be made in the proportion of three parts by weight of standard sand to one part by weight of portland cement. What quantity of water must be added to the dry materials in order to obtain what may be called "standard" consistency for this particular cement and sand? If the ingredients are considered separately it will be seen that since the quantity of water required by the cement is known, it only remains to find out how much is required by the sand, in order that it may have the surface of each grain covered by a thin film of water. In other words, the sand needs damping so that it may not take the water for this purpose from the portland cement.
>
> The quantity of water required to damp the sand can be ascertained easily in the following manner: Weigh out half a pound of dry, standard sand; immerse it in clean water in a small bowl; stir it well and allow to stand; then pour off the superfluous water and empty the sand onto a clean cloth and wring out the cloth with the sand in it; screw the cloth up by the four corners and whirl it at arm's length until only occasional drops are thrown off. Pour the sand onto a sheet of plate glass; then with a small trowel push the sand to one side of the glass. Mop up the water on the glass, push back the sand with the trowel, and repeat the process to and fro, mopping the glass each time, while keeping the sand well mixed, until no pools of water remain on the glass and the glass is only just uniformly damp. Weigh out a convenient quantity of the sand, dry it thoroughly and weigh it again; the difference in weight will be that required to damp the known weight of dry sand. The percentage weight can then be calculated. Suppose that it is 4 per cent of the weight of the dry sand. The total weight of water to produce the sand to consistency may then be calculated as follows:
>
> 1 lb. of portland cement at 22 per cent .... = 0.220 lb. of water
> 3 lb. of standard sand at 4 per cent .... = 0.120 " " "
> 4 lb. of dry materials require 0.340 " " "
>
> i. e., the dry materials require 0.340/4 of 100 = 8.5 per cent of water to produce a standard consistency.
>
> This may be reduced to a rational formula and thereby the necessity for doing a physical test to obtain the consistency of the cement mortar may be avoided.

In order to obtain the standard consistency for any proportions of concrete composed of portland cement, sand, and coarse aggregate the same principle may be adopted as in the case of mortar. The quantity of water required to damp the stone may be obtained experimentally in exactly the same way as that described for sand. Then the following formula will apply:

$$w = \frac{Cc + Ss + Gg}{C + S + G}$$

where w = percentage of water by weight required by the combined weight of portland cement and sand
C = the number of parts by weight of dry portland cement.
c = percentage of water by weight required by the portland cement.
S = the number of parts by weight of dry sand.
s = the percentage of water by weight required by the sand.
G = the number of parts by weight of coarse aggregate.
g = the percentage of water by weight required to damp the coarse aggregate.

These figures give what may be considered the optimum amount of water, but the author recognizes that the consistency thus secured is not necessarily the most workable consistency for different kinds of work, for he says: "With the information thus obtained the consistency of the mortar could be agreed upon for various classes of work and the volume of water for each mixing." He further states without explanation that neat portland cement suitable for pointing brickwork requires a + 16 per cent consistency. Portland cement mortar suitable for facing work requires a + 23 per cent consistency; for brick backing, 33 per cent; and that a 1:2:2 gravel concrete, with the gravel passing a ¾-in. square mesh and retained on a ¼-in. square mesh requires a + 60 per cent consistency. This is "suitable for foundations and all positions where a consistency which will enable the concrete to fill cavities and envelop large stones or projections from heavy castings."

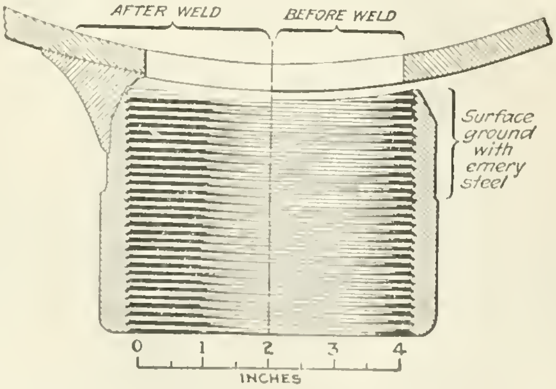
The author finally states: "In this paper an attempt has been made to eliminate differences in mortars and cements due to differences of consistency. In fact a method has been described for determining a standard consistency and also for prescribing on a rational basis one which is greater or less than the standard consistency. It should therefore afford a practical method for men working in different parts of the country (with the same cement, but with different aggregates) to obtain comparable results so far as consistency is concerned, so that briefly a means is afforded by the use of these rational formulas to compare (1) the relative strength of mortars and concretes made up of various proportions of the same materials, and (2) the relative strength of mortars and concretes made up of the same cement but with different aggregates in any desired proportions."

Arc Welding Outfit Used Before Tapping Steel Water Pipe

Coupling Welded to Main By Portable Outfit So Tapping Machine May Be Used on Irrigation Mains Fed By Los Angeles Aqueduct

A PORTABLE electric welding outfit mounted on a motor-truck is now used exclusively for tapping services into the large irrigation mains fed by the Los Angeles aqeduct in the San Fernando Valley. A standard pipe coupling, the size of the desired service, is welded to the main, a valve attached and the main then tapped through the valve by means of the usual tapping machine, without shutting off the water.

The mains supplying Los Angeles aqeduct water to the San Fernando Valley for irrigation purposes range up to 72 in. in diameter and the heads vary from 50 to 500 ft. To avoid the disadvantages of having to tap into the main lines, some of the large trunks were paralleled by smaller pipe-lines to which the services were attached. Where this was not done, and services had to be tapped into the main itself, there was always a considerable loss of water incidental to emptying perhaps two or three miles of mains. The usual practice, therefore, was to wait until orders were received for several services, then the main was emptied and all these connections installed at the same time. Where there were already a great many services on the line to be emptied, care had to be taken to avoid serious inconvenience to consumers. Thus there was often considerable delay and possibly the loss of a crop before new applicants could be served.



OUPLING WELDED TO STEEL WATER MAIN

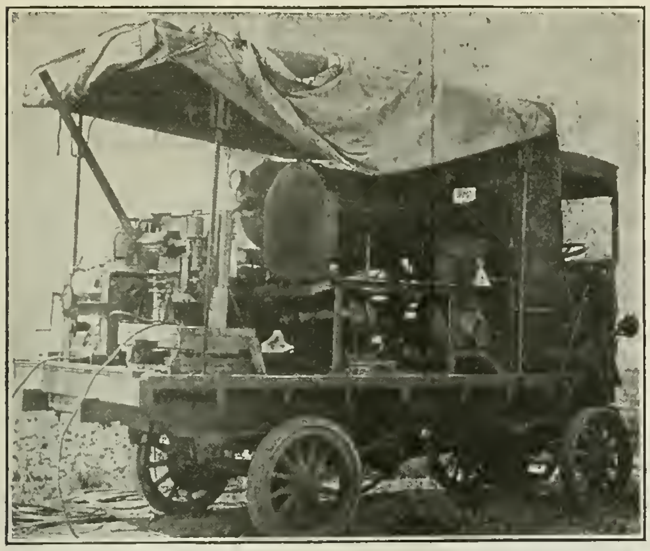
WELDING 4-IN. COUPLING TO STEEL WATER MAIN

Under the new system when a service order is received a portable electric welding outfit is taken to the job on its own wheels, and about four hours after the work starts the connection is completed and ready for the meter setters. After considerable experience with this method the water department reports that there is no difficulty in making the joints water tight and of ample strength, and that there is a marked saving in both labor and material.

The procedure is to take a standard pipe coupling of the size desired and turn it in a lathe or grind it with an emery wheel to give a bright surface all around for about 2 in. from its end. The end is beveled to an angle of about 60 degrees and if the main to which it is to be attached is of small diameter the beveled end of the coupling is ground so that the space between the main and the bottom of the beveled cut will not exceed ⅛ in. at any point.

Before the welding is commenced the surface of the main where the service is to be attached is first ground with an emery wheel so that the bond can be made on polished metal. The coupling is then stuck to the main by spot-welding in several places, after which the first layer of metal is applied. Considerable skill is required in handling the electric arc until the first layer of metal is deposited. Successive layers can be placed with less difficulty. The danger in careless or inexperienced work on this first layer is that holes may be burned in the pipe. When the weld is completed a reducer and plug is screwed into the coupling and after filling the latter with soap and water the air-hose is attached and 100 lb. pressure is applied to test the weld for leaks.

The welding equipment, in the form of a complete and compact unit, is mounted on a 1½-ton motor-truck. The main parts are a 6-cylinder gasoline engine which



ARC WELDING OUTFIT USED BEFORE TAPPING WATER MAINS

drives a D.C. generator and an air compressor. This gasoline engine, which is entirely separate from the engine of the truck itself, is belt-connected to both the generator and the compressor. It is equipped with a very sensitive governor to give accurate voltage control. The panel on which switches and controls are mounted is built up on a small platform supported on wheels so that it can be taken to any desired part of the work, thereby reducing the number of attendants which the plant requires. The air-compressor delivers to a receiver from which air lines are lead to the tools used for grinding, chipping, calking, etc. An air pressure of about 100 lb. per square inch is ordinarily used for this work.

The outfit was developed by S. Barton Brown, an electrical engineer of Los Angeles, to meet the need of the city water department in making San Fernando service connections. The foregoing information was supplied by H. A. Van Norman, assistant engineer of the Department of Public Service of the City of Los Angeles.

Kansas City Engineers Study Traffic

To help solve acute local traffic and rapid transit problems the Kansas City Engineers Club organized a traffic and transit committee which is now in its second year. To assist its investigations it has a number of subcommittees, covering such matters as traffic census, handling less-than-carload freight, time contour map, inner belt trafficway, automobile licenses, effect of height of buildings on street congestion, one-way traffic streets, etc. In October, 1919, a comprehensive census was made of traffic in the business district. Plan for a comprehensive system of one-way traffic streets in this district have been worked out in order to give immediate relief to the congestion, pending the widening of streets to form an inner belt trafficway entirely surrounding the district. Recommendations have been made also to regrade and repave certain streets in order to attract traffic to them. It is not the intention to do engineering work that should be done by the city's departments, but rather to act the part of good citizens in pointing out lines of development and also to show the value of the engineer to the community.

Notes from Foreign Fields

ENGINEERING CENTER OF THE BRITISH EMPIRE

BY
E. J. Mehren
EDITOR ENGINEERING NEWS-RECORD

THE engineering center of the United States, we all concede, is on Thirty-ninth Street, near Fifth Ave., New York City. There, in one building, we have the homes of all the great engineering societies of the country.

In England—yes, in the British Empire—the engineering center is equally well defined although the headquarters are not under a single roof. With few exceptions, though, they are to be found in a relatively small area—within a few blocks (a most indefinite term in London) of Westminster Abbey, the Houses of Parliament and the Government offices. The center of the group, of course, is the imposing home of the Institution of Civil Engineers on Great George Street, while nearly all of the other societies have their offices in Victoria Street, which joins Great George Street at Westminster Abbey.

If I have rightly sensed the attitude of English engineers, there will be no disagreement with the statement that the home of the civil engineers is the center of the engineering life of the British Empire. The Institution, comparable in its field to our own society of civil engineers, is by all odds the most influential of the engineering societies of the United Kingdom. That position is due to its greater age, to the distinguished character of its membership through a full century of existence, to the excellent quality of its work and to its steadfast adherence to the very highest ideals in society activity. Moreover, to a greater extent than with our own society of civil engineers, it has among its members engineers who follow specialties other than those covered by the restricted use of the term civil engineering. Dr. Tudsbery, the secretary, said that no count had been made, but that he would venture the estimate that one-third of the membership was following other specialties.

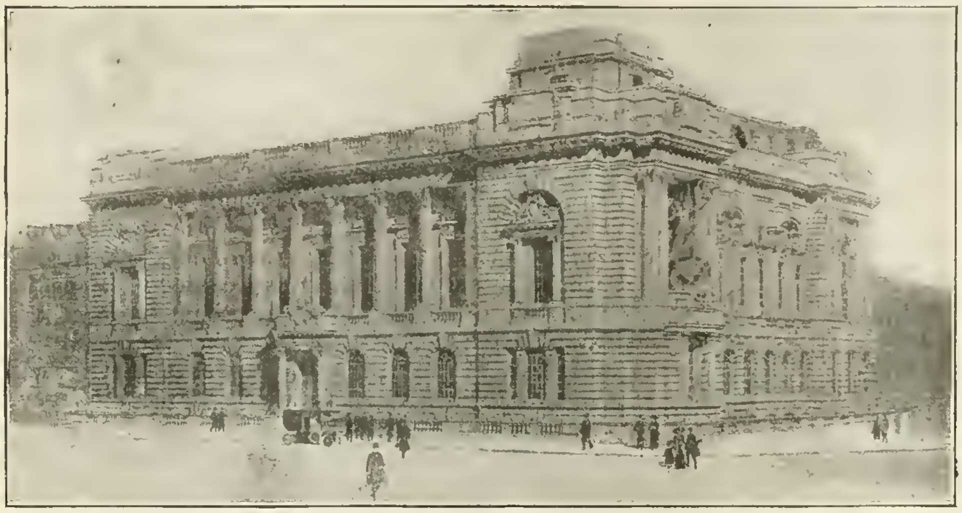
The home of the Institution of Mechanical Engineers is the next building down the street from that of the civil engineers. The building of the Institution of Electrical Engineers is not in this locality, but that is the only engineering society of importance, so far as I learned that has strayed from this centre.

In Victoria Street are to be found the offices of the institutions of automobile, gas, heating and ventilating, mining, municipal and county, sanitary, and water engineers. The Institute of Metals is here, too, as is also the Society of Engineers. These are but a few of the societies which have their offices in this neighborhood.

Here, too, have gathered the offices of engineers. One can go into entry after entry on Victoria street and find the names of engineers predominating on the directory boards—many of the names internationally famous.

Civil Engineers' Home—The home of the Institution of Civil Engineers is a building to be proud of. The accompanying halftone, though made from a rendered drawing, gives an excellent view of the building. However, a very small building, the leashold on which has not expired, stands just where the group of statuary is seen at the corner. With the exception of this small portion, the structure is completed.

The area is about 22,700 sq.ft. On the ground floor are two large reading rooms and a number of offices, including that of the secretary. A grand staircase leads to the second floor, where are to be found the main library, an impressive oak-finished room 28.5 ft. wide and 158 ft. long; the Great Hall, 45 ft. wide and 100 ft. long, rising three full stories a height of 45 ft.; and a lecture theater, with tiered seats, accommodating several hundred. On the top floor are another library room, the museum and offices.



LONDON HEADQUARTERS OF THE INSTITUTION OF CIVIL ENGINEERS

The finish throughout is in harmony with the spaciousness and proportions of the various rooms and halls. The corridors, staircases and rotunda—running up through the full height of the building and surmounted by a dome—are in gray marble, the Great Hall in plaster panels between pilasters of marble with bronze bases and capitals, the reading rooms and library in either oak or walnut.

All in all the impression the building makes is that of the home of a solid, prosperous, dignified organization—and in so doing it truthfully represents the great Institution that it houses, and forms a fitting centre for the engineering interests of the British Empire.

We in the United States can rightly share in the professional pride that springs from the traditions, strength and influence of the Institution. Surely, our English friends freely include us in their professional kinship. I was fortunate in having as my guide through the building Sir Maurice Fitzmaurice, C. M. G., F. R. S., past-president of the Institution. Mr. Tudsbery, being absent on my first visit, could not be with us. Sir Maurice referred with unrepressed pride to the fact that Alfred Noble had been an honorary member of the Institution. Upon Mr. Noble's death General Goethals was elected an honorary member in his place.

Thus does the great Institution officially testify to its feeling of kinship to American engineers.

London, May 11, 1920.

Removal of Taste Producing Protozoa from Illinois Reservoirs

WASTES and odors in the water supply of Mt. Vernon and Danville, Ll., during the past year were investigated by Dr. Edward Bartow, chief of the Illinois State Water Survey, and were traced to microorganisms (mostly protozea). Treatment of the reservoirs with copper sulphate eliminated the oganisms and restored the palatability of the water.

Complaints at Mt. Vernon began early in January, 1920. Microscopical examination showed that the reservoir water contained synura, dinobryon and uroglena. The first of these gives the odor of ripe cucumbers, with a bitter or acrid after taste; the others give fishy odors. The water was treated with copper sulphate at the rate of 2½ lb. per 1,000,000 gal. About 10 lb. at a time was placed in a canvas bag towed behind a boat. A larger charge might have given uneven distribution owing to rapid dissolution of the sulphate. In about a week the water was usable.

At Danville the water supply is taken from two impounding reservoirs, 4 miles apart. In a severe drought in 1919 the lower reservoir was drawn down 5 ft. and then maintained at that level by water from the upper reservoir. Complaints of taste and odor began in August. Inspection showed patches of green and brick-red scum in both reservoirs, but not near the dams. Even where there was no scum the water had a reddish tint.

The microscope showed several organisms which had not been found by similar examination in 1916 and 1917, while euglena showed a great increase over former years and was visible as a brick red scum. Anabena, uroglena and peridinium were in abundance. All of these organisms produce oily or fishy tastes. Treatment of the lower reservoir with 1½ lb. of copper sulphate per 1,000,000 gal., distributed as described above, had no effect. A second application was made, with 8 lb. per 1,000,000 gal., and water flowing from the upper reservoir was treated with 5 lb. per 1,000,000 gal. by discharging a solution from a barrel through a calibrated faucet. Treatment at both places continued from Oct. 2 to Oct. 9. On Oct. 4 all suckers were found dead for a distance of about half a mile below the upper dam, but none were found below the lower dam. Tastes and odors began to disappear Oct. 7 and in a few days the water had returned to normal condition. Rainfalls on Oct. 5 and 9 may have been a factor in bringing about the improvement.

Teach Fire Prevention in Schools

The study of fire prevention has been added to the curriculum of the New York public schools. Fire prevention has been a compulsory course for some time in Kentucky. New Jersey has a law, recently passed, which provides for the teaching of fire prevention.

ENGINEERING LITERATURE

A REVIEW OF BOOKS AND A LISTING OF NEW PUBLICATIONS

The Review of "Retaining Walls"

Sir:—I have read with much pleasure and profit Mr. Godfrey's review of my book on Retaining Walls. Several of his criticisms call for some explanation from the author.

The devotion of a considerable portion of space to "artist stuff" is demanded by the edicts of economy and good construction. In the light of present-day prices, it seems unjustifiable to mix up expensive materials with an efficiency of only ten to 50 per cent when modern research has shown the way to obtain much higher efficiencies. The reviewer does scant justice to the host of investigators who are doing much to raise the standard of concrete mixing and proportioning. "Cement and thorough mixing" alone, will not produce the desired results. N. C. Johnson, a hard-headed and practical investigator, has shown this quite fully.

The question of nomenclature is always an irritating one. In spite of an implied indifference or carelessness in the use of the same symbol, much attention was devoted to the construction of a good working symbolism. Generally, the manufacture of a textbook does not justify the use of many fonts of type or the use of other alphabets than the English. Several of the important characters, such as *K*, *J*, etc., were kept distinct throughout the text. (The letter *g* is quite obviously defined on p. 47). In quoting other authors, their nomenclature has been preserved. In treating reinforced concrete, the recommended letters of the special committee on concrete of the American Society of Civil Engineers were used. A little study of the several uses of the same letter will show that confusion is hardly probable except in the most cursory of readings. The same letter never appears twice in the one expression and although, in one figure, the letter *x* is used twice, the text is very clear on the separate definitions. A table defining the several symbols is always annoying, at least to me. I feel as though I am in duty bound to memorize such a legend, and brain fag results before the text has been started.

The question of rain is fully covered, I feel, in the treatment of saturated soils and drainage. Frost is much of a bug-a-boo. Too often it is made the scapegoat for a poor design or foundation. I have omitted its consideration, because what I would say would, or could, leaves but little that is constructive in the reader's mind.

If Mr. Godfrey will reflect what proportion of all walls built were revetment walls, fifty to seventy-five years ago, and what proportion at the present time, he will agree that the wall is more of historic than present interest. However, a theoretical treatment of this type has been given in the text.

I approach the subject of counterfort walls with much diffidence and anxiety. I certainly did not want to give a dogmatic treatment of the theory (in spite of Mr. Godfrey's implication). I emphasized throughout the discussion of this wall, the difficulties and in fact the absurdity of laying down a hard and fast treatment. This is impossible. But a continuous and simple design is essential, and this is all that the text attempts. I certainly will not take issue with Mr. Godfrey as to what is the correct design of a counterfort. If he will furnish me with a good, simple design, continuous and easy to follow, I will use his method as cheerfully as the one outlined in the book.

I hardly think that the wall shown in Fig. 51, page 111, is as close to incipient failure as Mr. Godfrey thinks it is. Probably all standard concrete design can be libelled for the same defects as he would point out in the wall shown.

GEORGE PAASWELL.

New York City.

For the Structural Draftsman

REVIEWED BY R. FLEMING

American Bridge Co., New York City

STRUCTURAL DRAFTING AND THE DESIGN OF DETAILS—By Carlton Thomas Bishop, C. E., Assistant Professor of Structural Engineering, Sheffield Scientific School of Yale University, etc. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 10 x 8 in.; pp. 352; illustrated. $5.

The structural draftsman is coming into his own. Not only is he in greater demand and at a larger salary than ever before, but a literature is being created for his benefit. The latest and most comprehensive of the books written for his special needs is the one under review.

The 44 chapters of the book are divided into three parts. Part I, of 4 chapters, is Introductory, taking up notation and definitions, the organization of a structural steel company, the manufacture and the fabrication of structural steel. Evidently much thought has been given to the notation adopted but the reviewer takes exception to the terms "pound-feet" and "pound-inches" being used instead of "foot-pounds" and "inch-pounds" for expressing moments. Any theoretical advantage is more than offset by the further confusion it would cause in the present chaotic state of engineering symbols. The definitions of engineering terms, filling 12 pages, are clear and concise.

Part II, of 25 chapters, is devoted to structural drafting proper. What may be called the mechanical features of drafting are considered at length. A chapter is given to inking and tracing, another to erasing and another to drawing directly in ink on tracing cloth. After disposing of preliminaries common to all drawings, single chapters are given to beams, plate girders, latticed girders, roof trusses, bridge trusses, columns, bracing systems and miscellaneous framing. Then follow chapters on erection plans and diagrams, material order bills, shop bills and shipping bills, miscellaneous drawings and lists, and checking and correcting drawings.

The choice of material entering into a treatise like Part II depends largely upon the personal equation of the writer. The reviewer would condense the chapters on ordering and billing and would add a chapter on drafting room errors—their classification, cause and cure. Chapter XIV, "Clearance and Erection

Considerations," is unusually good but the importance of the subject warrants a more extended treatment. Incidentally, riveted joints have often been used for bridge spans of more than 200 ft. (p. 120). The B. & O. R. R. is now building a 434-ft. double track bridge over the Allegheny River near Pittsburgh, in which riveted joints are used throughout.

Part III, entitled "The Design of Details," begins with a chapter on shear and bending moment and is followed by chapters on the design of beams, of tension and compression members, and of plate girders. Riveting has four chapters. Cover plates, web stiffeners, splices, pins, reinforcing plates, bearing plates and column bases, and grillage beams have each a chapter.

The author holds himself well within his subject and does not trespass upon the field belonging distinctively to the designer of the structure itself. Before a draftsman can detail beam and girder connections intelligently he should understand the principles of shear and bending moment so well presented in Chapter XXX. The chapter on tension and compression members is good but a page on angle clips at ends of members could profitably be added. (While examining the chapter the reviewer was interrupted to look at the detail of an angle that emphasized the author's subheading: "The least net section is not necessarily a right section.")

An occasional statement in the chapters on plate girders and riveting should be modified. Thus, p. 219, "Full-sized holes cannot be punched satisfactorily in metal thicker than ¾ in.," is not strictly true. If the thickness of the plate does not exceed the diameter of the hole it can be punched without difficulty. Again, p. 266, "It is impracticable to use more than one web thickness in any girder," does not hold for heavy girder work. The Cunard Building, New York City, now being erected, has a number of girders in which the web is made of two plates each ¾-in. thick.

Following Part III are 36 pages of tables and diagrams. A valuable feature of the table, "Properties of Wooden Rectangular Beams," is that the section moduli are shown not only for nominal dimensions in even inches but also for dimensions which conform to the actual sizes of planed and sawed lumber.

The 169 figures of the book are well drawn and are easily understood. An inherent difficulty in the making of any book on structural design or drafting is the matter of illustrations. While principles remain the same, types of construction and details are constantly changing. Bethlehem columns or plate and angle columns are taking the place of the "Typical Office-Building Columns," Fig. 133, composed of channels and plates. With the present high price and scarcity of labor the tendency is to fewer pieces and simpler details. The "Typical Drawing for a Roof Truss," Fig. 116, shows a truss that today is not "typical." The top chord on each side of the peak would be divided into 4 instead of 5 parts and designed to resist cross bending. The slight increase in the weight of steel is more than compensated by the handling of fewer pieces in shop fabrication. Another saving of labor is the elimination of unnecessary cuts in plates and angles. The gusset plates shown in many of the figures would be made rectangular. Diagonal cuts in angles would be avoided, especially where the angles are embedded in fireproofing as in Fig. 145. Nothing is said about rolled steel slabs though they are largely used in place of cast-iron bases, as shown in Fig. 291; also for the bases of columns as illustrated in Fig. 135, where wing plates and considerable riveting would thus be avoided. On the whole the author well covers his field.

Some features of the book are worthy of special mention. The "Synopsis" at the beginning of each chapter gives in a few lines a statement of the contents of the chapter. Each figure bears the same number as the page upon which it is shown, thus facilitating easy reference. The author in his footnotes is generous in giving references to other books where the subject under consideration may be found treated more fully. Thus, "A copy of Smoley's 'Parallel Tables of Logarithms and Squares,' McGraw-Hill Book Co., Inc., New York, should be included in the equipment of every structural draftsman." Again, "For other angles see Conklin's 'Structural Steel Drafting,' John Wiley Sons, Inc., New York; Turner's articles in Vol. 43 of *Engineering News;* or Dannenberrg's diagrams in the *Engineering Record*, Feb. 17, 1912." Ketchum's "Structural Engineers' Handbook" is referred to 18 times.

The reviewer heartily agrees with the author in his insistence that formulas and tables should not be used until their underlying principles are understood.

To the student or inexperienced draftsman the book is invaluable. He cannot afford to be without it. In addition to a clear and comprehensive presentation of the subject he will find notes of warning that if observed will save him from many a pitfall. The experienced draftsman can hardly fail to add to his efficiency by reading it. There is not a dull chapter in the book and he will find the restatement of that with which he is familiar to be interesting.

The typography of the book is all that needs be desired. This, with the general excellence of the contents, will make it a standard in the field of structural drafting for some time to come.

Highway Construction in California

CALIFORNIA HIGHWAYS: A Descriptive Record of Road Development by the State and by Such Counties as Have Paved Highways—By Ben Blow, Manager Good Roads Bureau, California State Automobile Association. San Francisco, Cal.: H. S. Crocker Co. Cloth; 6 x 9 in.; pp. 308; illustrated. $6.

The record of accomplishment by which California has set a fast pace in highway construction is presented in a comprehensive way in Ben Blow's "California Highways." This is the first attempt to present between the covers of a single book the general outlines of the scope of plans and accomplishments of the state and individual counties in highway construction. Mr. Blow has long been an indefatigable worker for improved highways and has personally conducted the campaign for bond issues in so many parts of the state that he is conceded to be one of the best, if not the best, authority on the California highway situation in general.

The first part of the volume outlines the history of the movement for good roads in California, including bond issues; histories of the first bureau of highways and the present highway commission, and their organization and personnel; the use of convict labor; types of road construction; and road maintenance; with a discussion of road loads, safety designing, tree planting and camp sites. The second section deals with the seven highway divisions into which the state is divided, and includes a discussion of state highway routes. A third section in 27 chapters is devoted to what the author calls "California's good road counties" and takes up in detail the road situation in each. The numerous one- and two-page maps give the reader a very clear idea of road locations in each section. The large state map inserted in the back cover shows the proposed and completed trunk lines and identifies pavement types, and the excellent halftones with which the book is illustrated constitute in themselves a record of road construction from the Oregon line to the Mexican border.

A Thoroughgoing Committee Report

THE DETERIORATION OF STRUCTURES OF TIMBER, METAL AND CONCRETE EXPOSED TO THE ACTION OF SEA-WATER. First Report of the Committee of The Institution of Civil Engineers—Edited by P. M. Crosthwaite, B.A.I., M. Inst. C.E., Secretary to the Committee and Gilbert R. Redgrave, Assoc. Inst. C. E. London, Eng.: H. M. Stationary Office Imperial House, Kingsway. Cloth; 6 x 10 in.; pp. 301. illustrated. 30s.

When the Institution of Civil Engineers sets about investigating anything it does it with true British thoroughness. The execution may be somewhat slow and ponderous but the results are there for those who seek them. All of these characteristics are shown in the first report of the Institute's committee "appointed to investigate the deterioration of structures of timber, metal and concrete exposed to the action of sea-water." For a preliminary report it is distressingly long and the various abstracts and rehashes of the fundmental records are too much like the interminable endorsements on an army document, but the subject of sea-water deterioration is covered in admirable fashion.

The committee has followed the empiric method in its first report. Called on to investigate the behavior of structures in sea-water—a subject of vital interest to the British—its initial step was to find out how such structures had behaved in the many British harbors the world over. Apparently the committee made no effort to get information on any any non-British structure, though the Institution has members and correspondents in all countries. This neglect of foreign sources has probably not seriously detracted from the report except possibly in the case of sea-water concrete, which has been studied so much more extensively in the United States than elsewhere. Certainly the report is not complete without some reference to those studies.

At any rate, the list of reports is geographically imposing. The British Isles are covered, of course, but Africa, Australia, New Zealand, India and the Middle East, China and the Far East and America (Halifax and Jamaica) all contribute their share. Ports not heard of in this country and so obscure as to require a search in the atlas are called upon for experiences. The effects of the omnipresent teredo and the corrosive sea salts are traced throughout the Seven Seas—where those seas wash British shores. The result is a collection of data without parallel. For the engineer who wants to go back to fundamentals and does not choose to accept another man's deductions this series of local reports is invaluable.

In addition to these reports there are some conventional, though adequate, papers on timber, marine borers and iron corrosion, and some abstracts of the literature of the subject of sea-water deterioration, which is inadequate because it takes up only papers presented to the Institution. A real bibliography of the subject would reveal much more information than the committee is aparently aware of. Finally there are a series of abstracts of the various local reports, which are valuable for the casual reader who does not care to study them in detail. The real value of the report, however, lies in the detail of structural behavior in the many waters of the world.

The committee is also conducting a number of experiments and studies, the details of which are not announced, which are to be made the subject of a later report.

Chronicled in Germany in Three Languages

COPIES of the first two issues of a new monthly, published separately in German, English and Spanish, with "Engineering Progress" as the title of the English edition, have been received. The new journal is published under the auspices of the *Verein Deutscher Ingenieure*, the *Verein Deutscher Eisenhüttenleute*, and the *Verband Deutscher Elektrotechniker*, with C. Matschoss, Berlin, Germany, as editor (annual subscription, $4 or 18 shillings; sample free on request from Auslandverlag G. M. B. H., Berlin S. W. 19, Krausenstrasse 38-39). Articles in various fields of engineering are included, besides short book notices and miscellaneous notes. The salutatory follows:

> After years of sanguinary struggle, engineering seems best fitted to bridge the gap between conflicting interests and to tie afresh the broken bonds. Humanity will be thrown back for generations unless man concentrates all his intellect, all his physical strength upon the one problem: to creat new values. Never yet was mankind afforded greater opportunities for work. The task is gigantic, and the success would be equally so if the conception of a community of interests were developed and strengthened throughout the world. Hearken to the voice of our age! Look ahead! Work! Have faith in the future, in the solidarity of work! Don't fight one another—help each other!
>
> For over five years enormous values have been destroyed, and nothing but powder and shot has been produced. Many factories have been razed to the ground and in those that continued to produce, the wear and tear of the machinery has been such as to make a speedy renewal an imperative necessity. The reconstruction of the devastated stretches of country in Europe requires enormous quantities of goods. Even before work on a large scale has begun, the general craving for goods is such that it can only be satisfied to an insignificant extent. The introduction of the standard eight-hour day all over the world will naturally mean a proportionately reduced production, for the time being.
>
> It will be the duty of all nations, therefore, to produce more than ever before. No longer need we worry to find a market for the product of our work. The care whence to procure the necessaries of life must be met by an increased production, the science of engineering must assist us in this task.
>
> The development of the engineering industry of a country is determined to a considerable degree by its resources. The raw material possessed in abundance by the sparsely populated country is refined by the craftsmanship of the workers in crowded districts. Thus the tendrils run from one people to another, furthering the idea of the uniformity of all human aims and ambitions. The manufacturer, the engineer, the merchant, the overseer, and the worker, all must help. They must rebuild the world entirely; they are to make it a new, a better, and a more comfortable world than the one that has gone to wreck, and when we speak of their work in these columns we shall remember the words of Carlyle: "The true Epic of our time is not Arms and the Man but Tools and the man—an infinitely wider kind of Epic."

The foregoing ideas have led to the publication of this paper the object of which is to give a true record of the latest and greatest achievements in the wide field covered by the various engineering industries. It is published in the German, English, and Spanish languages, under the auspices of the three leading German engineering institutions: The Verein Deutscher Ingenieure—the Verein Deutscher Eisenhüttenleute—the Verband Deutscher Elektrotechniker. It will be the endeavor of the editors appointed by these institutions to achieve the objects outlined above in a sober and impartial manner. "Engineering Progress" is to be a new link in the chain of great international engineering publications, appearing in the different languages, and all aiming at the realization of the same universal ideal.

A Lost Opportunity in Authorship

OPPORTUNITIES IN ENGINEERING—By Charles M. Horton. New York and London: Harper & Brothers. Cloth; 5 x 8 in.; pp. 90. $1.

It is no easy task to present, in the form of a short popular essay, the opportunities afforded by a given profession, or business or industry. Such an essay should show insight, be interesting and should convince without misleading. This volume may serve from the viewpoint of popular interest but few engineers of education, experience and good judgment would consider that it had a full measure of the other two essentials. The author's viewpoint seems to be confined too much to mechanical engineering, and that in a rather narrow and commercial field, to reflect a broad conception of engineering either as a profession or as an opportunity for service.

PUBLICATIONS RECEIVED

AMERICA'S GREATEST DAM: Wilson Dam, Nitrate Plant No. 2, Muscle Shoals, Alabama—By William Benjamin West, B.S., Associate, American Institute of Electrical Engineers. Cambridge, Mass.: The Author, Mass. Institute of Technology. Paper; 9 x 6 in.; pp. 64; illustrated. $1.

SEWAGE TREATMENT EXPERIMENTS AT BROOKLYN, N. Y.: A Brief Review of Five Years' Work—By George T. Hammond, M. Am. Soc. C. E., Engineer in Charge of Experiments and of Sewer Design, Brooklyn, N. Y., etc. Reprinted from the Proceedings of the American Society for Municipal Improvements, 1919. Brooklyn, N. Y.: The Author, 156 Berkeley Place. Paper; 6 x 9 in.; pp. 103; illustrated.

CANADIAN DEPARTMENT OF RAILWAYS AND CANALS: Report, 1918-1919—Ottawa, Can.: The Department. Paper; 7 x 10 in.; pp. 75.

COAST EROSION PROTECTION WORKS ON THE CASE SYSTEM IN BRITISH GUIANA—By Gerald O. Case, Associate Member of the American Society of Civil Engineers, Associate Member of the Engineering Institute of Canada, Vice-President of the Tidal Engineering Corporation. New York: The Author. Paper; 6 x 9 in.; pp. 63: illustrated.

Description of elaborate reclamation and protection work carried out by the author.

DIE BERECHNUNG DER WARMWASSERHEIZUNGEN: Zweite Auflage Nach dem Tode des Verfassers resorght von Professor Dr. Georg Recknagel, Korresp. Mitglied der Bayerischen Akademie der Wissenschaften zu Munchen. Berlin, Germany: Druck und Verlag von R. Oldenbourg. Paper; 9 x 13 in.; pp. 110; illustrated. 25 M.

A treatise on the calculation of hot-water heating systems.

DRAINAGE ENGINEERING—By Daniel William Murphy, A. B., A. M., Ph.D., Consulting Engineer, M. Am. Soc. C. E., Former Drainage Engineer, United States Reclamation Service. New York and London: McGraw-Hill Book Co., Inc. Cloth; 6 x 9 in.; pp. 178; illustrated. $2.50.

ELECTRIC DRIVEN WATER WORKS IN INDIANA: The Application of Electric Motive Power to Small Waterworks Plants—By D. D. Ewing, Professor of Electrical Railway Engineering, and G. C. Blalock, Instructor in Railway Engineering. Lafayette, Ind.: Director of Engineering Experiment Station, Purdue University. Paper; 6 x 9 in.; pp. 100; illustrated.

A more general discussion of electric-driven pumps than the word "Indiana" in the title would indicate. There is bibliography and a summary of pump tests.

EMPLOYMENT STANDARDIZATION IN THE PUBLIC SERVICE—By William C. Beyer, Assistant Director, Bureau of Municipal Research. Supplement to the National Municipal Review, June, 1920. Philadelphia, Pa.; National Municipal League. Paper; 7 x 10 in.; pp. 12.

ENGINEERING FOR LAND DRAINAGE: A Manual for the Reclamation of Lands Injured by Water—By Charles Gleason Elliott, C.E., M. Am. Soc. C. E., Consulting Drainage Engineer, etc. Third Edition, Revised. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 5 x 8 in.; pp. 363; illustrated. $2.50.

Earlier editions were noticed in this section of *Engineering News*, March 19, 1903, and August 15, 1912. The author specifies these changes in the present edition: "The discussion of the hydraulics of flow in underdrains has been rewritten, and new tables for the discharge of tile drains have been introduced which, it is believed, correspond quite closely to results obtained in practice. A diagram to facilitate the application of Kutter's formula in the design of ditches and canals has been added, as well as historical drainage matter, and a more complete text on drainage by pumps and on the drainage of irrigated lands."

GOVERNMENT CONTROL OVER PRICES—By Paul Willard Garrett; Assisted by Isador Lubin and Stella Stewart (History of Prices During the War), Wesley C. Mitchell, Editor in Chief. Washington, D. C.: War Industries Board. Paper; 6 x 9 in.; pp. 833; illustrated.

HIGHWAYS OF MINNESOTA: Report of the Commissioner, 1918-19—St. Paul, Minn.: The Commissioner. Paper; 6 x 9 in.; pp. 40.

LOUISIANA BOARD OF STATE ENGINEERS: Report to His Excellency, Ruffin G. Pleasant, Governor of Louisiana, April, 1918-20—New Orleans, La.: The Board. Paper; 6 x 9 in.; pp. 157.

THE MOVEMENT FOR THE REORGANIZATION OF STATE ADMINISTRATION—By Charles Grove Haines, Professor of Government. Austin, Texas: The University of Texas. Paper; 6 x 9 in.; pp. 80; illustrated.

NEW JERSEY DEPARTMENT OF HEALTH: Report, 1919—Trenton, N. J.: The Department. Cloth; 6 x 9 in.: pp. 440; illustrated.

NEW YORK STATE TAXATION AND RETRENCHMENT: Report of the Special Joint Committee—Albany, N. Y.: Special Joint Committee on Taxation and Retrenchment. Paper; 6 x 9 in.; pp. 153; illustrated.

Deals with cities and counties but chiefly with cities. Summarizes results of hearings at which many officials gave their opinions.

NON-TECHNICAL CHATS ON IRON AND STEEL—By LaVerne W. Spring, A.B., Chief Chemist and Metallurgist, Crane Co., Chicago. New York: Frederick A. Stokes Co. Cloth; 5 x 8 in.; pp. 358; illustrated. $3.50.

THE PEAT RESOURCES OF IRELAND: A Lecture Given Before the Royal Dublin Society by Professor Pierce F. Purcell, Assoc. M. Inst. C. E. London: Department of Scientific and Industrial Research. Paper; 7 x 10 in.; pp. 25; illustrated. 9d.

Contains enough general matter to appeal to most engineers and publicists who are giving attention to the possible utilization of peat for fuel. A foreword by George Beilby, director of the Fuel Research Board mentioned above, is not very optimistic as to peat utilization on a large scale, but praises the lecture and urges the need for study of the engineering problems of peat utilization.

PERFORATED CASING AND SCREEN PIPE IN OIL WELLS—By E. W. Wagy. Washigton, D. C.: Bureau of Mines. Paper; 6 x 9 in.; pp. 48; illustrated. 20c. From Superintendent of Documents.

PIEUX ET SONNETS—Par Edouard Nos et Louis Troch, Ingenieurs. Paris: Gauthier-Villars et Cie. Paper; 7 x 10 in.; pp. 348; illustrated.

The latest French work on piles, pile-drivers and piledriving. A much more elaborate treatise than is available in English, particularly in the mathematical study of the bearing power of piles.

THE PORT OF NEW YORK—By Thomas E. Rush, Surveyor of the Port. New York: Doubleday, Page & Co. Cloth; 6 x 9 in.; pp. 361; illustrated. $3.50.

PRICE LEVELS IN RELATION TO VALUE: Presented Before the Fortieth Annual Meeting of The American Society of Mechanical Engineers—By Cecil F. Elmes, Chicago Manager, Sanderson & Porter. Chicago, Ill.: Sanderson & Porter, Paper; 9 x 11 in.; pp. 25; illustrated.

SEVEN CENTURIES OF BRASS MAKING: A Brief History of the Ancient Art of Brass Making and Its Early (and even recent) Method of Production.—Contrasted with that of the Electric Furnace Process—A Twentieth Century Achievement—Bridgeport, Conn.: Bridegport Brass Co. Paper; 8 x 11 in.; pp. 78; illustrated.

A good example of the trade catalogue that consists mostly of historical and technical matter relating to an industrial art.

SHANGHAI MUNICIPAL COUNCIL: Report and Budget, 1919-20—Shanghai, China: The Council. Paper; 8 x 13 in.; pp. 453; illustrated.

A large variety of public works and other city activities are reviewed in this handsomely made volume.

SOME OBSERVATIONS ON TYPHOID FEVER IN IOWA—By Max Levine and H. E. Middleton. Reprinted from the Journal of the Iowa State Medical Society, Feb., 1918. Ames, Iowa: Iowa College of Agriculture and Mechanic Arts. Paper; 6 x 9 in.; pp. 14; illustrated.

STATE AND TERRITORIAL HEALTH OFFICERS' PROCEEDINGS, 1919 CONFERENCE—Washington, D. C.: U. S. Public Health Service. Paper; 6 x 9 in.; pp. 110.

WHAT WILL METRIC STANDARDIZATION COST?—San Francisco, Calif.: World Trade Club. Paper; 4 x 9 in; pp. 147; illustrated. 50c.

ZONING—By Edward M. Bassett of the New York Bar, Counsel of Zoning Committee of the City of New York, Former Chairman of Districting Commission of the City of New York. Supplement to the National Municipal Review, May, 1920. Philadelphia, Pa.: National Municipal League. Paper, 7 x 10 in.; pp. 36.

An authoritative review of the subject, followed by a useful bibliography, the latter prepared by Theodore Kimball of the Harvard School of Landscape Architecture.

LETTERS TO THE EDITOR

Spanish Novelist's Reference to the Engineer Is Resented

Sir—Judging from the articles by V. Blasco Ibañez, now running in the daily press, the civil engineer, as in many parts of this country, is not held in very high esteem in Mexico. Note the reference to Bonillas, a one-time candidate for president: "Later, he studied engineering in the Massachusetts Institute of Technology. His record as a fighting man, however, was not brilliant. He even failed to become a general. He merely served as an *engineer*, marching in the rear of the revolutionary army with the obscure civilians, who looked after the administrative affairs of the regime."

Again: "The defects of the *engineer*, Bonillas"; "What the *engineer*, Bonillas lacks"; and "The obscure Mexican-American *engineer*, converted by the revolution into a diplomatic agent."

Had it not been for engineering talent like that of A. A. Robinson, Rudolph Fink, Howard Schuyler, Andrew Talcott, Sigismund Low and other well-known engineers, Señor Ibañez would not be touring Mexico in luxurious and palatial Pullmans, but instead "hoofing it" or traveling astride of that well-known transportation agency, the Mexican burro.

Emile Low.

Buffalo, N. Y.

More About Leaky Cross-Connections

Sir—I note in your issue for May 13, p. 939, an editorial entitled "Leaky Cross-Connection Kills Fifteen." The story is an obvious one which he who runs may read. But there must be more ways than one by which contaminations are inadvertently made. I once saw a blueprint tank, on a top floor of a building, into which water from a hose, attached to a faucet, was continually running *except* when people drew water on the lower floors. This caused the blueprint water to suck back into the pipe system, and those who drank water below were getting a mixture for whatever it was worth. I am not aware that anybody was injured by it, but I presume that there are tanks installed on top stories backing and filling with far worse liquids than blueprint water.

G. W. Lee.

Brookline, Mass.

Sir—I have read with much interest your recent editorial on leaky cross-connections. You may be interested to know that the Minnesota State Board of Health felt that the question of cross-connections was such a menace to the health of the people of the State that the following regulation prohibiting such connections was passed on Oct. 8, 1918: "There shall be no physical connection between water supply systems that are safe for domestic use and those that are unsafe for domestic use."

Immediately following the passage of this regulation, an active campaign was started to eliminate these connections throughout the State. You can imagine the protests that arose from the interests affected. We were accused of being unreasonable, unfair and many other things, but we have vigorously enforced this regulation and most of the connections have now been eliminated. Minneapolis has reported that all such connections have been severed, and St. Paul informs us that they are now ready to make such a statement. Duluth is actively engaged in eliminating connections there and we are informed that the work will soon be completed. The work in the smaller cities and villages of the States is completed so far as our investigations have extended.

It is very gratifying to us to see such an article appear in the pages of your journal; it assures us that the positive stand we have taken on this problem is correct.

I am enclosing a copy of a reprint [from Public Health Reports] on an epidemic of dysentery in South St. Paul in 1914 which involved the use of a cross-connection. At least one other small epidemic has occurred in the State from such connections.

H. A. Whittaker,
Director, Division of Sanitation.
Minnesota State Board of Health, St. Paul.

[The leaflet mentioned by Mr. Whittaker may doubtless be secured by those interested by sending a 2c. stamp to the Minnesota State Board of Health, St. Paul, Minn.—Editor.]

Shall Chinese Labor Be Imported?

Sir—I note a letter in the issue of *Engineering News-Record* for June 3, p. 1121, signed by John Ericson, M.Am. Soc.C.E., which contains the following sentence: "A similar letter was sent to every member and associate member of the American Society of Civil Engineers, about 2,000 in all."

This statement is in error, as the total corporate membership of the American Society of Civil Engineers, which includes members and associate members, was 8,852 on May 25, 1920—the total membership of the society being 9,525 at that time.

Inasmuch as the figures given by Mr. Ericson to indicate the results of his questionnaire upon the subject of importation of Chinese labor might be very misleading if taken to indicate the relative proportion of the members of the American Society of Civil Engineers who either favor or oppose his proposal, I hope you will publish the foregoing figures.

H. S. Crocker,
Acting Secretary, American Society of Civil Engineers.
New York City.

Sir—To say that I was surprised at reading the communication of John Ericson in your issue of May 6 is stating it mildly. That an engineer and good citizen of Mr. Ericson's standing should advocate such a thing as admitting Chinese laborers to the United States to relieve the labor situation is almost unbelievable. To my mind it shows that even the best men in this country fail to grasp the cause, much less the true remedy, for our serious labor shortage, for did they do so they would never give up hope of redeeming this country in the right way instead of further degrading it by surrendering to the yellow peril.

All we need to do in this country to relieve the labor shortage is to repeal the prohibition amendment to the Federal Constitution, or at least to so amend it as to permit the use of wine and beer as beverages by the working class. The 18th amendment has not prohibited the capitalist class from using liquor, because their cellars were filled before prohibition became effective, nor has it affected the middle class, because they have permanent homes, in which they can ferment their own wine and brew their own beer. With the common laborer it is entirely different, for "the pick and the shovel and the wheelbarrow man" seldom has a permanent place to live, where he can set up a home brewery or winery, and is therefore the only one being deprived of liquor.

It is not only the foreign born, but also large numbers of native born laborers in this country who resent this discrimination, as they do not earn enough to purchase the high priced commodities of bootleggers and moonshiners, however numerous these may be, or how plenty their wares. For this reason they have been leaving this country ever since prohibition became effective, particularly since the Volstead Act put the ban on even 2.75 per cent war beer.

Before prohibition, even during the war period, we had plenty of Italian, Swiss, Greek, Slavonian and other common and farm labor in most parts of California, but they have now left here for foreign countries and are still going. Also large numbers of American born laborers have left for Canada, Cuba and South America on account of prohibition. I have personally kept track of over 200 such laborers, who have known me for many years and worked on different construction jobs on which I have been consulting engineer, and nine-tenths of them have left this country on account of prohibition, while the remaining one-tenth are talking about doing so. Many of those who returned to their native countries, not finding conditions favorable there, have written to me saying they are going to South America rather than to return to a "dry" United States. We are now reduced to depend almost entirely upon Japanese and the lowest class of Mexican cholos for our common labor, for even the better class of Mexican laborers left here in large numbers upon the advent of prohibition.

If we have lost all hope of redeeming the United States by repealing or modifying the present prohibition laws and their enforcement, it may be fitting to admit the Chinese as our equals, because they come from a country where prohibition was first adopted, 459 B. C., and has been enforced so long that the Chinese Empire has lost its power and the people have degenerated through the use of drugs and narcotics taken as substitutes for vinous, malt and spirituous stimulants. But I sincerely trust that we will not have to degenerate to the condition of China and the other old prohibition countries in the world, but will remove prohibition before it is too late.

F. C. FINKLE,
Consulting Engineer.
Los Angeles.

Mr. Luten's Attorney Takes Exception

Sir—In *Engineering News-Record*, Feb. 26, 1920, p. 417, you quoted the opinion of the Circuit Court of Appeals for the Eighth Circuit in the case of Luten vs. Wilson Reinforced Concrete Co. The opinion does Mr. Luten and his business an injustice.

With the exception of the Turner and Norcross patents in the field of flat-slab construction the courts never before had an opportunity to consider reinforced-concrete patents upon a record that offered any full history of the art. In the Wilson case Mr. Luten and the State of Nebraska, coöperated in making a record that showed the history of the entire art, and especially as related to reinforced-concrete bridges. This was done by the plaintiff in the hope that the court would consider the subject broadly and give an opinion on the case before it, that would be a guide in the future as to how far devices for effective reinforcement of concrete are patentable.

The opinion shows that this hope was not realized. The opinion is to the effect that Mr. Luten has been guilty of fraudulent methods in promoting the use of his patents and in procuring the payment of royalty thereunder and that because of this fraud, the patents are invalid.

In the preparation of the case both parties devoted themselves to the art, and gave scant consideration to the matter of exploiting the patents. The attorney for the defendant asked that all circulars and advertising matter of the plaintiff be produced, and this was done without reservation, and without any explanation or testimony regarding them. The attorney for the defendants built up a false structure on the basis of these circulars, and the District Judges adopted his theory. The attorney then had the opinion printed and I have no doubt he sent the copy to you for publication. This is fully as reprehensible as the publication of favorable opinions by Mr. Luten.

Aside from the validity of his patents, Mr. Luten has made substantial contributions to the art of reinforced-concrete design and construction. This fact was recognized by the Circuit Court of Appeals in the case of Luten vs. Whittier, where it was said:

> Plaintiff is evidently an intelligent and skillful bridge engineer, designer and builder. His work has doubtless contributed greatly to the reinforced-concrete bridge-building art, and he is entitled to great credit therefor. His success in that art is perhaps due in part to the invention in suit, but it seems to us not improbably due in larger part to his personal efficiency and perhaps to other claims of the patent in suit not here involved, as well possibly to numerous other patents which he has taken out.

Mr. Luten's profits come from friendly users, and not from royalty collected by suits or by blackmail. The reference in his circulars to the expense of patent litigation showed the unprofitable character of infringement suits. For years his advertisements have given notice to the profession that "Designing engineers will not be enjoined under the Luten Patents except when they oppose authorized Luten Designs for their own infringing plans." Mr. Luten does not attempt to monopolize the bridge business of the country or to collect royalty from that part of it that he cannot serve efficiently. All he asks is that he shall not be required to compete with unauthorized users of his patented inventions.

In one of his circulars published in 1914, he said: "A free license is granted on any infringing structure for which Luten Designs have not attempted to compete. This free license is for the benefit of innocent infringers only. It is not available when wilful and persistent opponents of Luten patents are interested in the letting." He has always asked public support upon the claim that bridge builders can pay his royalty and get a better bridge for less money. He has always urged that this test is best made after the bids have been submitted on competing plans.

Referring again to the opinion, the Judge says "Insofar as we can discover, none of the Luten patents has ever been sustained in a contested case, and they have been frequently held to be invalid for want of patentability." It is not true that none of the Luten patents had ever been sustained in a contested case. Three were held valid in the case of Luten vs. Mercantile Bridge Co., in Illinois, and two in the case of Luten vs. Rhoades and Kinsely, reported in 194 Fed. 169. These were contested cases as the records show. They were not contested with the thorough investigation of the record that characterized the Wilson case. But the same criticism obtains as to the cases in which the patents were held "invalid for want of patentability." With the exception of the case of Luten vs. Whittier, 251 Fed. 590, in which the Court of Appeals for the Sixth Circuit held five claims of patent 853,203 invalid, no court decided against the Luten patents after a consideration of any full and complete testimony as to the art.

The case of Luten vs. Boyer, Patterson and Morris was decided for the plaintiff after a contest, and the patents were held valid and infringed.

The opinion correctly states the cases in which the courts have decided against Mr. Luten, but the statement that the patents have been frequently held to be invalid for want of patentability is misleading. It is stating less than a half truth. Four patents only were involved in the Wilson case. Two of these four patents are in this case held invalid for the first time by any court; and of the other two this is the second time that they have been held invalid as to a few claims by a Circuit Court of Appeals.

The opinion in this case goes on to say that "Notwithstanding this experience these patents have been exploited by a skillful campaign of advertising in which it has been repeatedly asserted that no suit based on a Luten patent has ever been lost or dismissed." This statement was published, but when it was made it was true, and when it ceased to be true it was no longer published. In no form was the claim made when it was not wholly true. The charge of the court is unfair in that it conveys the belief that the claim was widely advertised at a time when it was untrue.

The opinion goes on to say that "the record in this case leaves no doubt that the entire scheme by which it has promoted these patents has been fraudulent." I can only say that the record that shows this is wholly incomplete, and presents a picture of the scheme of promotion that is not true. The court then details five methods of promotion and indicates that they are fraudulent.

The first quotes from a circular setting out the number of patents, of patent applications, the obtaining of decrees, and stating that no cases have been lost or dismissed. As said above, all this was true when the circular was sent out. Threats may be objectionable, but notice is not, and if the promise of suit is in general followed by suit, it is a notice and not a threat. It has not been the practice of Mr. Luten or of the National Bridge Co. to make idle threats. In fact one of the complaints made is that he brings too many suits.

The second method of promotion complained of is sending out in 1913 a list of "Luten Patent Decrees," giving the title of the case and the court in which they were rendered. This showing was sufficient to enable any one to inquire into the case. Not all of the decrees were by consent. Three were after contest, and some were taken by default. The need of the notice grew out of a number of very aggravated cases of infringement.

A third cause of criticism by the Judge is the use of an advertisement entitled "To Whom It May Concern." This was used ten or eleven years ago. The advertisement lists the number, date and expiration of the first sixteen patents issued to Mr. Luten, and briefly defines the rights of a patentee, and the methods provided by law for the enforcement and protection of those rights, and concludes with the reported cost as actually given to Luten of the cases of Cameron Septic Tank Co. vs. Town of Saratoga Springs, aand Warren Bros. vs. City of Owosso. There is no charge that the advertisement is in any way false, and it correctly states the law of patent protection for the patentee.

The fourth specification of fraud by the judge is in these words: "Another showing is a collection in separate documents of all the consent decrees." A study of these decrees should convince any one of the fairness and honesty of the promotion of these patents by Mr. Luten. Fifteen of the decrees recite plainly in the first sentence that they were taken by consent of the parties, one recites the same thing in the last words of the decree; three show in the first sentence that they were rendered after a trial, and three state in the first sentence that they were taken pro confessor, i.e. by default. It is not conceivable how notice could be given of these decrees in any fairer or less deceptive way than by a copy of the decree approved and entered by the Clerk of the Court under the orders of the judge. Complaint of the use of a true copy of the decree is not fair and unbiased criticism. In patent litigation much weight is given to the opinion and decrees in other cases upon the same patents, and if decisions against the validity of the Luten patents are to be referred to as indicating invalidity and turpitude, certainly Mr. Luten may refer to the decisions in his favor as indicating validity and honesty. It has become the habit to sneer at consent decrees. Justices of the Supreme Court of the United States have not this habit. What consent decrees mean, and their value, was stated many years ago in a decision in a patent case in which Mr. Justice Nelson of the Supreme Court of the United States joined. The case of Porter vs. Fuller was one of a large number of cases involving the infringement of the Wilson patents on sewing machines. It was said:

> If, as Ingersoll, District Judge, states—and certainly we are bound to take his statements as correct—the suits were without collusion, were honestly defended, and finally the defendants only yielded to a judgment when it was evident that a contest would not be sustained. I think the evidence is quite as strong in favor of the propriety of these verdicts, and quite as much weight should be given to them, as if there had been a full trial and a jury had passed upon the facts; because it would indicate decidedly that the defendants and their counsel (and the papers show that they were eminent counsel—some of the first members of the bar), after a full examination of the facts in the cases, come to the conclusion that they could not be successfully defended, and, therefore, did not choose to risk a verdict of the jury upon them. It is stated as to those cases in Massachusetts, that there were no trials, but decrees were entered by consent, and so also in the cases before Justice Grier. There is no evidence in either of those cases that there was any collusion, and, in the absence of evidence, certainly the presumption is that there was none. These objections, therefore, to the force that should be given to the previous adjudications, we think cannot be sustained.

There was no collusion in any of the Luten decrees.

The fifth charge made by the judge in the Wilson case indicating fraud, and characterized as one of "a few of the more glaringly culpable of the representations," is, "Another advertisement sets forth that fifteen thousand designs for concrete bridges have been supplied under the Luten patents, and over six thousand of them have been actually erected." Mr. Luten admits that such advertisement was made, and also admits that it is true that he has done just what the advertisement says. If it is fraud and is glaringly culpable to make a commercial success of the inventions for which the United States government has issued him some forty-seven letters patent, the only honest and laudable field of invention is limited to devices such as perpetual motion and wet concrete.

The learned judge then refers with vivid irony to the brilliant campaign of promotion, the use of the arts of the advertiser and the photographer, and all these themes pressed with masterful skill "in that form of argumentation which is peculiar to the patent lawyer and the patent expert—a union of science and logic." If science and logic are to be avoided, what is left?

The charge against Mr. Luten is summed up thus: "We call attention to only two of the most reprehensible features of this campaign of deception by the use of half truths. First, the use of consent decrees throughout the entire literature without disclosing that they were by consent, and not the result of litigation. Second, the threat of patent litigation." The force of these two criticisms is destroyed by the intemperate words that follow: "This has been practiced with a studied use of menacing arts that would be blackmail on a vast scale if the threat had only been criminal instead of civil prosecution. In law this is a saving distinction, but not in ethics." With all deference to the opinion of the learned judge who wrote the opinion, Mr. Luten has never done anything that justifies any such charge. It is not admitted and is not decided that there is any moral turpitude involved in accepting consent decrees, when offered by the defendants, and he has not used threats of patent litigation in the sense that is unlawful or unethical. He has insisted on his rights under his patents, and when he found it necessary to do so has brought suits. Many times the charge has been made, and in the Eighth Circuit in particular, that no patent is of any value until it has been sustained by the courts. And now he is pilloried because he has sought to take the judgment of the courts as to their validity.

RUSSELL T. MACFALL,
Attorney for O. B. Luten.

Indianapolis, Ind.

Study of Concrete Road Experience Urged

Sir—Is the monolithic, hard surface type of country highway paving, being so extensively constructed throughout the United States, justified by experience? This question is of grave importance at the present moment because of the extremely large mileage of this type being advocated and laid. It is of such importance that it warrants a careful study by, and comprehensive report from, the Bureau of Public Roads. The fact that state highway departments have adopted this type of paving as standard for country highways, without that information which might be made available through a comprehensive investigation such as that suggested above, makes the desirability of such a study all the more apparent. The fact that large sales organizations, offering the services of expert and well-paid engineers, are influencing the determination of the type of paving to be employed in numerous communities, is but another argument in favor of the governmental inquiry suggested.

It is a fact that, up to the present time, the only attempts to place an accumulation of data before state and county commissions have been made by these commercial agencies. Therefore, it is plain that a report prepared by governmental authority, placing at the disposal of the country at large a thoroughly impartial and uncommercial tabulation of actual information on this subject is vital to the future welfare of our good roads movement.

Although the Bureau of Public Roads is now engaged on extensive tests or various type roads as to impact, etc., and the report as to the results obtained will be of great value, I believe, nevertheless, that a report setting forth the experience so far obtained in the construction of cement concrete roads in this country would be of great value to all concerned.

Monolithic paving of the cement concrete type has been tried out in small amounts during a period extending back many years. Prior to about eight years ago, however, these experiments were carried on in isolated instances only. Since 1912 a large amount of this type of paving has been laid, and these eight years of experience should, at least, furnish sufficient data to permit a reasonable determination of the efficiency and economy of its use. A governmental inquiry, such as is suggested herein, should be entirely independent of the influence of local, state and county engineers, as well as engineers employed in advocating the various paving materials. Local results are liable to influence the judgment of those only locally responsible, whereas the question as a whole can only be determined by a nation-wide consideration of the subject.

The use of an easily replaced wearing surface on an adequate foundation, as weighed against the maintenance and ultimate replacement of a monolithic type paving, gives the thinking engineer a serious problem and a tabulation of the actual facts deduced by the last eight years of experience might save many a costly mistake.

The writer believes that through some properly authorized engineering association or agency, this matter should be taken up with the proper governmental bureau or department.

FRED G. SIMMONS,
Consulting Engineer.
Milwaukee, Wis.

[A recent letter from the Bureau of Public Roads is to the effect that such a study has been contemplated for some time and that "it is expected within a very short time investigation will be undertaken with a view to securing definite information as to the comparative value of the different types of pavement now in general use."—EDITOR.]

A Plea for Bread—Through Road Construction Postponement

Sir—This letter might be called a plea for bread for the people. The farm labor shortage this year is serious and may later become alarming. Just after the armistice was signed a movement was set on foot (very rightly) for a large program of public works, especially road building, to provide against unemployment of the men from the army just being demobilized. Now the situation has changed greatly, there being no fear of unemployment but on the contrary a labor shortage and still the program of road work has not been greatly reduced but perhaps increased. Will not some highway departments voluntarily postpone (not abandon) a part of their program for this year and so make more labor available for the farms and for raising food? This has been done in New York State. Will not other states follow this good example and voluntarily reduce their labor requirements by letting some of the work wait till next year and perhaps also get the work done for less by so doing?

Mr. Ericson, formerly city engineer of Chicago, is advocating bringing in Chinese labor but those who know what the race problem is in the case of negroes have doubts.

Nashville, Tenn. JOHN WILKES.

[Illinois and Minnesota as well as New York have heavily curtailed road construction.—EDITOR.]

Suggestions for Plank Surfacing of Secondary Highways

Sir—I read with considerable interest the article on p. 1052 in the *Engineering News-Record* of May 27, 1920, entitled "Plank Surfacing Suggested For Secondary Highways." Fortunately, we are not without experience as to how practical such a type of construction would be. A great many years ago "corduroy" roads were built in many sections of the country. Plank roads, too, of the type under discussion, although with not quite the elaborate methods of sub-drainage suggested, were constructed. A number of years ago in cutting through a road in western New York I discovered the remains of a plank road which had been covered under successive layers of gravel to a depth of about 3 ft. In the city of Charleston, W. Va., brick pavements were laid perhaps twenty years ago on such a plank surface used as a foundation course. Then too we have the action of plank bridge floors to guide us. During the construction of U. S. Government Explosives Plant "C" at Nitro, W. Va., temporary plank roads were laid as an absolutely necessary means of affording transportation through the mud in the early spring of 1918. These roads had no drainage provisions, however, and were badly worn under the heavy traffic in a few months.

A plank road might be justified in a pioneer country, or in times of great emergency, but could only be regarded as a temporary expedient. There would be no ultimate economy in such a type of construction. The article mentioned suggests a base course of broken stone 4 in. thick at a cost of $4,693 per mile, and estimates the plank surface at $7,792 per mile. Under these circumstances it would be much better economy to lay two courses of broken stone 4 in. thick at a total cost of $9,386, add a cold surface treatment of bituminous material at ½-gal. per sq.yd. which would perhaps cost $1,000, making a total cost of $10,386, compared with $12,485 for the suggested type of construction. My own experience leads me to believe that the suggested type of construction would not prove satisfactory under traffic for a great length of time and as shown above would not be economical.

H. J. SPELMAN, Division Engineer,
West Virginia State Roads Commission.
Huntington, W. Va.

Longest Suspension Bridge in New Zealand

Sir—I notice in your issue of Aug. 7, 1919, p. 263, that you refer to a suspension bridge constructed over the Manawatu River, near Palmerston North, as being the longest suspension bridge in New Zealand. As a matter of fact there is a suspension bridge in New Zealand over the Grey River, built in 1883, which has a central span of 660 ft.

F. W. FURKERT,
Asst. Engineer-in-Chief,
Public Works Department.
Wellington, N. Z.

Theory Shows Why the Pairs of Columns Are Not Equally Safe

Sir—An article by Edward Godfrey in your issue of May 13 presents a case of two pairs of columns and says: "Theoretically, then, the pairs of columns are identically stressed. Actually if they were made of a hypothetical metal, such as the theorist deals with, the nearest thing to which is glass, they would be equally dangerous." If they were equally unsafe, an increase in loading would produce the same effect on both, but this is not the case.

If the load on each column is increased from 100,000 to 120,000 lb., the moment in each column of the pair A is either decreased or remains the same, and the fiber stress is 24,000 lb. or less on the compression side. In the case of B, the moment increases with the load and the fiber stress becomes 26,400 lb. The pressure on the side of A would probably be relieved before the ultimate stress was reached so that this column would actually carry a great deal more than B before failure.

As a matter of fact, they are not identically stressed at any load, for in the case of A, the bending moment varies in a straight line from the ends to the center whereas in the case of B, the moment varies in proportion to the curve of deflection.

This would seem to explain "what becomes of the theory" and why "there is not an engineer living who will assert that the columns at A are as unsafe as those at B." It is doubtless a matter of common sense, as Mr. Godfrey says, but the sense is founded on nothing more than simple mechanics.

CHARLES C. HULBERT,
Consulting Engineer.
New York City.

[As the above reasoning shows, there may be a large difference between factors of safety computed respectively on the basis of stress and on the basis of load. This fact has been recognized before, but is commonly ignored in discussions of columns as well as of composite structures like bridges, where a somewhat similar line of reasoning applies. It is essential to effective discussion of column formulas, comparisons of safety of tension and compression members, and similar studies involving "factors of safety."—EDITOR.]

NEWS OF THE WEEK

New York, June 17, 1920

A $90,000,000 Water Project for Oakland District

California Cities Could Get 250,000,000 Gallons Daily from Eel River by 127-Mile Aqueduct

By C. E. Hickok

Secretary, Engineering Committee, East Bay Water Commission and City Engineer, Alameda, Cal.

THE cities on the east side of San Francisco Bay will go 127 miles north to the Eel River for a water supply if the report of the East Bay Water Commission is carried out. This plan is considered a more feasible one than to join with San Francisco in the Hetch Hetchy project. Oakland, Berkeley, Alameda and Richmond, having a combined population of 370,000 people, joined in the investigation started in 1918 by establishing the commission named.

Due to the marked inadequacy of the present water supply of this district water has been lacking for domestic purposes and industrial development has been seriously deferred. During the summer of 1918 it was necessary to prohibit the sprinkling of lawns and gardens. The city council of each city appointed three members, consisting in each case of the city engineer, the city attorney and either a member of the city council or a private citizen to form an investigating committee.

Upon organization an engineering committee was formed consisting of all the engineers on the commission, to which was entrusted the direction of the engineering investigations. Similarly, a legal committee was formed of the lawyer members to consider the legal phases.

The engineering committee made exhaustive studies of the local sources of supply, including the existing system of the East Bay Water Co. and smaller companies. Studies were also made of the San Joaquin, Sacramento, Eel and McCloud Rivers as possible sources.

On Sept. 10, 1919, the commission, upon the recommendation of the engineering committee, appointed Philip E. Harroun, chief engineer, to be in charge of all further engineering investigations. Mr. Harroun's report was approved by the engineering committee and made public on April 28. Mr. Harroun concludes as follows: ". . . that the Eel River project is the project which should be selected for the supply of the East Bay Cities on account of the purity, quality and quantity of its waters, the cheapness of its construction, and the fact that it can be delivered into the cities probably within three years and certainly within four . . ."

(*Continued on p. 1224*)

Consulting Engineers Reaffirm Their Stand on Bridge Design by Architects

Action just taken by the council of the American Institute of Consulting Engineers on the Pittsburgh bridge case expresses complete agreement between that organization and the Board of Direction of the American Society of Civil Engineers. The Consulting Engineers reaffirm the principles of their resolution of Feb. 5, 1920, and express agreement with the resolutions of the Board of Direction. The new action was taken after the report of a joint committee of Engineering Council and the American Institute of Architects, noted May 27, p. 1079.

New York To Spend $4,000,000 for Snow-Removal Equipment

The Board of Estimate and Apportionment of New York City, on June 4, appropriated $4,127,000 for the purchase of motor-operated snow removal equipment by the Department of Street Cleaning. In urging the appropriation Mayor Hylan is quoted as saying: "I will not take the responsibility for any delay in this matter. We do not want the conditions of last winter repeated. If we put off action until the new budget is adopted the winter will be upon us and there won't be time to get the snow removal equipment."

Colorado River Flood Danger Said to Be Safely Passed

Press despatches from the Imperial Valley, California, state that the crest of the annual June flood in the Colorado River was passed on June 9 without serious damage having been done. A few days earlier there was a small break in the Ackerson levee, called the "first line of defense." This break washed out a few hundred feet of the levee that was being strengthened by dumping rock from a railway line on top of the levee. The rock was being added, it is said, because of a small break in the Ackerson levee in February, 1919.

More Water for Norfolk, Virginia

Lake Prince is advised as the source for a 15,000,000-gal. water-supply for Norfolk, Va., by Dabney H. Maury, consulting engineer, Chicago, in a report just made to the city authorities. A 36-in. supply main 100,700 ft. long would be required. For this cast-iron, wood stave and reinforced-concrete pipe, according to soil and hydraulic conditions, are recommended at estimated costs of $28.70, $12.16 and $15.25 a foot respectively. The total estimated cost of the project is $4,200,000.

Hopes Raised on Water-Power Bill

Attorney-General Rules Pocket Veto Does Not Hold But President Has Not Acted

For a time last week the hopes of the advocates of a Federal water-power bill were raised by some peculiar announcements from the White House. At this writing (June 16), however, there is no indication that the status of the bill is any different than was stated in these columns last week, which was that it was killed by the failure of the President to sign it before the adjournment of Congress.

The bill passed Congress May 29 and was sent to the President for his approval on June 1 or 2, the exact time not being known at present. On June 5 Congress adjourned without having received any notification from the President as to the bill. This situation has been known for years as a "pocket veto" and, with one possible exception has always been construed to kill the bill under the provision of the Constitution which reads "if any bill shall not be returned by the President within ten days (Sunday excepted) after it shall have been presented to him, the same shall be a law in like manner as if he had signed it, unless the Congress by their adjournment prevent its return; in which case it shall not be a law."

The matter seemed closed until June 10 when Secretary Tumulty announced that Attorney General Palmer had made an "informal ruling" that the President has ten days after the presentation of bills in which to sign them, whether Congress adjourns in the interval or not. No explanations of the ruling were given, though the presumption is that the interpretation hinges on the fact that the constitutional clause quoted refers only to a neglect to sign. It is stated, too, that in one instance President Lincoln approved a bill after Congress had adjourned and that although the Judiciary Committee of the House disapproved of the procedure, the bill stood as law.

At any rate gossip in Washington had it that the administration, goaded by the political capital being made at the Republican National Convention of the "pocket veto," was seeking some means of permitting the water-power bill to become law. If this is a fact, either the need for such a manœuver was later discounted or the means sought thought insufficient, for up to June 15 the President had not acted. Very obviously, if any action comes now the constitutionality of any bill so signed will be subject to court review.

Ask Consideration in New Rates on Construction Materials

The National Federation of Construction Industries has presented a petition to the Interstate Commerce Commission requesting a hearing, before a final schedule of railroad rates is adopted, to go into effect Sept. 1, 1920. The closing paragraph of the petition follows:

> Your petitioner respectfully prays your Honorable Body, should the Commission decide to grant the applications of the Carriers to give them increases in revenues through increased freight rates, that before a schedule of increased freight rates is made effective, the Commission will arrange for the Federation and such of its constituent associations as may desire to be heard, to present to the Commission their data and arguments relative to the transportation costs to be placed upon their respective construction materials.

The Federation has also issued a circular letter to its membership requesting that members advise the general secretary, Drexel Building, Philadelphia, of any desire to participate in the hearing for which it has petitioned.

Hudson Bay Railway Work Confined to Maintenance

That work on the Hudson Bay Ry. this year will be confined to the repair of existing grades and maintenance and will not involve new construction was indicated in the reply made to delegates from the Western Provinces who went before the Ministers, April 22, to urge the completion of the line. It had been indicated previously in the report of the Minister of Railways and Canals, before Parliament, that the Government did not contemplate completing the line this year.

The committee from the Western Provinces stated that 332 miles of the road out of a total distance of 424 miles, from Le Pas to Hudson Bay, had been completed when work was suspended in 1918 and that, while $30,000,000 had been spent on construction, only $1,750,000 more was needed to complete the line.

The reply of the Ministers to the Western delegates left the impression that in addition to the repair and maintenance work promised, some additional track might be laid this year possibly as far as Limestone River. It was made clear that it was never the intention of the Government to abandon the work.

Progress on Alaska Railroad

The estimate of the Alaska Engineering Commission for the Alaska Railroad was cut but slightly by the Appropriations Committee. The Sundry Civil Bill carries $7,000,000 for work on the railroad during the next fiscal year. Colonel Frederick Mears, chairman and chief engineer of the Alaska Engineering Commission, told the Appropriations Committee that 100 miles of grading still remain to be done on the railroad. Of that amount 24 miles will be done during the coming summer. The grading is over the Alaska range and involves an $800,000 bridge over the Susitna River.

Council Asks Societies To Endorse Salary Classification

The Classification and Compensation Committee of Engineering Council, over the signatures of Arthur S. Tuttle, chairman, and Charles Whiting Baker, secretary, on June 9 addressed a letter to the secretaries of each of approximately 100 national or local engineering and other technical societies, asking formal endorsement by the governing body or by the society as a whole of the classification adopted by Engineering Council, to the end that it may become generally recognized and put into effect. As to the suitability of the scale compensation and the employment policy tentatively suggested, the committee desires an expression of views.

Through the medium of their society publications or some other convenient means, the secretaries are requested to urge the members to report to the committee any action taken to increase compensation or to adopt the standard classification. The committee proposes to act as a clearing house for receiving and giving out information to any group of engineers for use in discussing these matters with authorities who have the responsibility for fixing compensation. "Through co-operative action," the Committee states, "the effectiveness of the work done toward increasing compensation can be materially advanced."

To date several societies have taken action in regard to this matter. The Municipal Engineers of the City of New York on May 26, endorsed the classification and adopted a schedule providing for compensation at a rate approximately 20 per cent greater than that tentatively suggested by Engineering Council's committee. The classification has been closely followed by the Congressional Joint Commission on Reclassification of Salaries in its recommendations concerning engineers in the Federal service. It was approved on April 13, by the executive committee of the American Society for Testing Materials. The Boston Society of Civil Engineers made the endorsement of the tentative schedule of compensation the subject of a letter ballot by the full membership, which is now being canvassed. It is hoped to bring about a recognition of Engineering Council's classification as standard.

The committee has been reorganized and is now made up as follows: Arthur S. Tuttle, Chairman, deputy chief engineer, Board of Estimate and Apportionment, New York; Charles Whiting Baker, secretary, consulting engineer, New York; Frederick W. Cappelen, city engineer, City Hall, Minneapolis, Minn.; Philip P. Farley, consulting engineer, Brooklyn; O. C. Merrill, chief engineer; Forest Service, Washington D. C.; C. A. Morse, chief engineer, C. R. I. & P. R.R., Chicago, Ill.; M. M. O'Shaugnessy, city engineer, City Hall, San Francisco, Cal.; R. S. Parsons, general manager, Erie R.R., New York; and Edmund I. Mitchell, assistant secretary, New York.

New Charter for Montreal Proposed

In a preliminary canvass the Charter Commission of Montreal has found that most of its members favor having the proposed new charter provide for a city manager, a council of 9 to 15 members chosen by proportional representation instead of by wards, the referendum and the recall.

$90,000,000 Water District for Oakland

(*Continued from p. 1223*)

The Eel River project will consist of a storage dam, a diversion dam and an aqueduct 127 miles long. The aqueduct will consist of 30 miles of tunnels, 6 miles of concrete conduit and 91 miles of steel and concrete pipe, including a tunnel crossing under the Sarquinez Straits 2 miles long and 600 ft. below the water surface.

The safe net yield of the Eel River project is estimated at 250,000,000 gal. daily. The estimated cost, if developed in three stages, is $90,479,000 or $362,000 per 1,000,000 gal. daily. With credit for power development along the aqueduct the cost would be $82,229,000 or $329,000 per 1,000,000 gal. daily. If the project were developed at once to its full safe yield of 250,000,000 gal. daily the total cost would be decreased by approximately $24,000,000.

The proponents of the Hetch Hetchy project now under construction by the City of San Francisco for the development of the waters of the Tuolumne River have contended that the East Bay cities should join with San Francisco in that project. However, the report of Mr. Harroun shows that the expense of the East Bay cities for their share of the cost of the Hetch Hetchy project would be $56,718,000 more than the cost of the Eel River project.

The estimated cost of the Hetch Hetchy project to Irvington gate house, from which point diversions would be made to the East Bay district and the city of San Francisco, respectively, is $169,083,000. It is estimated that the East Bay district would be charged with 60 per cent of this cost and in addition would have to pay for the cost of a conduit from Irvington gate house to Lake Chabot in Oakland, making a total cost of $123,457,000.

The East Bay Water Commission expects to present in June its recommendation as to the proper procedure for the formation of a water district, embracing the cities and territory concerned.

Charles E. Hewes, city manager, Alameda, is chairman of the commission. Engineers on the commission are Marston Campbell, formerly city engineer, Oakland; H. D. McGlashan, district engineer, U. S. Geological Survey, Oakland; Lewis A. Hicks, consulting engineer, Berkeley; H. D. Chapman, city engineer, Richmond, and the writer.

General W. M. Black Heads New Engineering Firm

Maj. Gen. William Murray Black, Corps of Engineers, U. S. A., retired, who was Chief of Engineers of the United States Army during the war, has formed a partnership with Col. C. A. McKenney and Lieut. Col. John Stewart for the general practice of consulting, organization, and administrative engineering, giving special attention to river and harbor, port and terminal work, hydro-electric development, and municipal and highway engineering. The offices of the new firm, which is called Black, McKenney & Stewart, are at 618 17th St., N. W., Washington, D. C.

General Black graduated from West Point in 1877 and rose through the Corps of Engineers to the position of Chief, which he took March 7, 1916, retiring Oct. 31, 1919. He is the author of "Public Works of the United States" and many treatises dealing with the civil and military work of the Corps of Engineers. His assignments in the Corps, in addition to the usual river and harbor details, were of a much more civilian character than many officers of the Corps get. First, he was engineer-commissioner of the District of Columbia in 1897-98, and just after the Spanish War, from 1899-1901, he was chief engineer first of the Department of Havana, and second of the Department of Cuba. During this period he had extensive sanitary work to do in Havana, and he also organized the Department of Public Works at Cuba.

Colonel McKenney graduated from Princeton and spent a large part of his professional life in the Engineering Department of the District of Columbia. At the outbreak of the war he was assigned as an assistant to the Chief of Engineers, in which capacity he was charged with the co-ordination of the Engineer Corps Supply operations with the supply operations of other branches of the government and the civilian population. He became later a colonel of Engineers and was detailed to the General Staff as War Department representative on the Priorities Division of the War Industries Board.

Colonel Stewart has been connected with the Cranford Paving Co., general contractors of Washington, D. C., first as office assistant and finally as assistant to the president. In 1910 he became president and chief engineer of the Cranford Construction Co. He entered the war as captain of Engineers, and became lieutenant colonel in August, 1918. His main duty was in connection with transportation, coal supply, etc., incident to the war operations. He was also executive officer and engineer of the Committee of Inland Waterways of the United States Railroad Administration.

General Black has recently resigned as consulting engineer of the Port and Harbor Facilities Committee of the United States Shipping Board.

Cleveland Water-Works Enlargement Recommended by Engineers

Doubling the present capacity of the water-works of Cleveland, Ohio, so it would serve 1,900,000 population in 1940, is recommended in a report of an engineering commission appointed last November consisting of J. W. Frazier, James H. Herron and City Engineer Robert Hoffman. The enlarged works would be sufficient for all Cuyahoga County and would cost some $30,000,000, which it is proposed to secure from water-works revenue provided by increasing the rates from 40 to 60c. per 1,000 cu.ft. Some of the enlargements advised are more pumps, a new east side tunnel by 1930 and a new west side tunnel by 1937, new filtration plants and a high service reservoir. Thomas S. Farrell is director of public utilities and John T. Martin is commissioner of water. An investigation of the water-supply needs of Cleveland was begun in 1917 by A. V. Ruggles.

Reconstruction Committee Named by Construction Industries

In accordance with recently announced plans to assist the newly created Senate Special Committee on Reconstruction and Production, the National Federation of Construction Industries has appointed a similar committee to co-operate with the Senate Committee. Its personnel is: B. F. Affleck, Chicago, Ill., Universal Portland Cement Co.; Philip H. Gadsden, Philadelphia, Pa., vice-president United Gas Improvement Co.; John L. Kaul, Birmingham, Ala., Kaul Lumber Co.; Charles F. Lang, Cleveland, Ohio, president Lakewood Engineering Co.; Gen. R. C. Marshall, Jr., Washington, D. C., chief Construction Division, U. S. A.; W. T. Rossiter, Cleveland, Ohio, vice-president Cleveland Builders' Supply Co.; J. Willison Smith, Philadelphia, Pa., vice-president Land Title and Trust Co.; and Robert C. Wright, Philadelphia, Pa., general traffic manager Pennsylvania R.R. Co.

New Jersey Highway Commission Favors Truck Regulation

The New Jersey State Highway Commission has gone on record as favoring the regulation of the size and weight of motor trucks in New Jersey, and an increase in the annual registration fee. A resolution covering these points was adopted at a recent meeting of the commission and copies have been forwarded to Governor Edwards, the members of the State Legislature and the members of the Boards of Freeholders throughout the state. The resolution points out that changes are necessary in order to maintain the improved highways of the state. It is said that the present license rates are noticeably low compared to those existing in other states. The increase in fee is urged in order to meet the damage done to the highways by the heavy trucks each year.

Engineers Direct Relief to New York Freight Tie-Up

An organization to operate independent motor trucks to relieve the freight situation in New York City is being directed by engineers, headed by Colonel F. A. Molitor, Colonel Charles B. Hine, and Major J. P. Hallihan. Colonel Molitor, who during his service with the A. E. F. in France, was detailed to reorganize the system of handling supplies at the various storage depots in the S. O. S., is in charge of operations for the Citizens' Transportation Committee, formed by the Merchants Association of New York City to break the tie-up of freight which has resulted from the long drawn-out strike of longshoremen.

A corporation known as the Citizens Trucking Co., with a capital of $100,000, has been organized by the Transportation Committee and is equipped with about 80 motor trucks and garage and warehouse facilities for the handling of freight from terminals affected by the strike, which is not confined to the coastwise steamship lines.

The operation of the independent trucks, under the direction of Colonel Molitor, began last week when loads were handled from the coastwise steamship piers in trucks operated by ex-service men of the 165th Infantry or the old 69th Regiment of New York. This week between 50 and 70 trucks are in operation, and are practically all of 5-ton capacity. Freight which has been collected on the piers has been sorted so that trucks can carry full loads, making three or four trips per day under a centralized system of dispatching, which in some cases has resulted in return loads being handled.

The present phase of the longshoremen's strike extends to the piers of the coastwise steamship lines including the Morgan Line of the Southern Pacific Co., the Clyde Line, the Mallory Line, and the Ocean Steamship Co. Union truckmen had refused to handle freight on these piers which had been loaded by non-union longshoremen. After repeated efforts to end the strike had failed, there were still 3,000 tons of coastwise freight held on the piers, most of which was of such essential character that serious consequences were threatened to the business and life of New York City.

Some difficulty has been experienced in persuading other carriers and warehouse corporations to accept goods handled by the independent trucks, but a decision was handed down last week by Justice Lewis L. Fawcett, New York Supreme Court, ruling it to be a violation of the United States Shipping Act and a crime to refuse to transport merchandise in the furtherance of an illegal combination and restraint of trade. It is now thought that carriers and warehouses which heretofore have refused to accept freight moved by independent trucks will now be compelled to do so by injunction under Judge Fawcett's decision.

Winnipeg Entertains 200 Delegates at Good Roads Congress

Approximately 200 delegates from all parts of Canada and from many parts of the United States, and representative of the technical and business sides road construction, attended the seventh annual Good Roads Congress held in Winnipeg, June 1-3. Co-operation among the various educational, technical, governmental and civic bodies for building connected systems of highways and co-ordination among all bodies charged with road construction and maintenance were keynotes of many of the speeches and papers delivered and read before the congress.

President S. L. Squire, in his address, summed up the economic importance of stated that, inasmuch as there were serviceable highway systems when he 350,000 mi. of highways in Canada as compared with 37,000 mi. of railroads, and inasmuch as the value of the rolling stock using highways was not less than the entire capital stock of all railways, federal and provincial governments could now be convinced that money expended on improving roads was no longer a grant but an investment.

Not only were the technical features of road construction dwelt upon in the various papers read, but the broader aspects received full consideration. Of chief appeal at the present time where those papers relating to the necessity for co-operation between the highway departments and colleges for training a competent and large enough body of highway engineers to handle the administration of highway funds and as well direct construction of the vast mileages included in present day road programs; and those in which emphasis was placed upon most careful maintenance as the only means through which existing mileage could be saved until costs of materials and labor allow greater activity in construction of so called durable types.

At the closing session resolutions were adopted: Favoring the linking of the provincial highway systems by a trunk road; urging upon the local good roads associations the need of co-operation through a central association; endorsing the grant of federal aid for road construction; and asking for a grant to assist the association's work. A resolution urging co-operative action between the federal and provincial governments for the early planning of a national highway, was referred to a committee for further consideration.

The following officers were elected: President, A. E. Foreman, chief engineer of the Public Works Department, British Columbia; first vice president, Dr. E. M. Desaulniers, Montreal; second vice president, Hon. S. J. Latta, Minister of Highways, Saskatchewan; secretary-treasurer, George A. Mc Namee, Montreal; members of the advisory committee, U. H. Dandurand, Montreal; W. A. McLean, Deputy Minister of Highways, Ontario; B. Michaud, Deputy Minister of Highways, Quebec; J. A. Duchastel, city engineer and manager, Outremont, Quebec; S. L. Squire, past president, and A. F. Macallum, past vice president.

No Public Works Department Possible This Year

Congress adjourned May 31 without passing any bill for a Public Works Department or in fact for any investigation or revision of government activities. The National Public Works Department Association, however, states that the so-called reorganization of Federal departments plank in the Republican platform is due to the efforts of those who have been backing the Public Works Department idea. This plank reads as follows:

"We advocate a thorough investigation of the present organization of the Federal departments and bureaus, with a view to securing consolidation, a more businesslike distribution of functions, the elimination of duplication, delays and overlapping of work and the establishment of an up-to-date and efficient administrative organization."

The Smoot-Reavis resolution also failed to be enacted. This resolution provided for the appointment of a Congressional committee to make studies looking to the reorganization of the administrative branch of the government. It was brought up in the closing hours of Congress and the vote was 141 for and 131 against. Under a suspension of the rules, a two-thirds vote was required and therefore the resolution was lost. The vote was along strict party lines, the Republicans approving the idea and the Democrats being against it. The opposition of the Democrats was not to the reorganization of the executive department in the necessity of which they apparently concurred, but to the manner in which it was to be done. They desire that the organization be carried out under the newly created director of the budget and the Republicans desire that it be done through a joint committee of the Senate and the House.

Examination for Commissions in Engineer Corps Announced

In view of the passage of the Army Reorganiation Bill, creating a number of vacancies in the commissioned personnel of the regular army, the War Department has announced that examinations will be held throughout the United States beginning July 7. Applications for this examination close June 23. Exemptions will be granted from examination, it is stated, to those candidates who can convince the examining board that they have the required degree of education for appointment. For commissions in the Corps of Engineers examinations will be held at Boston, New York, Charleston, S. C., Chicago, Fort Sam Houston, Tex., and San Francisco.

$12,000,000 Rivers and Harbors Bill Was Passed

Congress just before adjournment agreed on a Rivers and Harbors Bill carrying a $12,000,000 appropriation and the bill was signed by the President. The Senate agreed to forego its bill which called for nearly twice the amount in the bill as passed.

Duquesne Voters Kill Bond Issue

The voters of the Borough of Duquesne, Pa., refused to sanction a proposed bond issue of $745,000 for street improvements and the reconstruction of Thomson Run bridge. They believe that the work can be delayed until better prices prevail.

Provisions of Merchant Marine Act Suspended by Shipping Board

Two sections of the new merchant marine act have been suspended temporarily by the United States Shipping Board. The first prevents the granting of export and import rates lower than the domestic rail rates on commodities carried in foreign vessels, and provides that such preferential rates shall be given only on goods carried in American vessels (Section 28). The Board claims that a great volume of shipments has already been booked under existing tariffs and that the enforcement of this section at once would cause disturbance of commerce. It has therefore asked the Interstate Commerce Commission to suspend this provision of the law for ninety days. Under another requirement of the new act, a vessel is forfeited in the event of charter to aliens other than under regulations prescribed by the Board (Section 18). On June 9 the Board passed a resolution providing that vessels documented under the laws of the United States may be chartered to aliens for periods not exceeding three months or for a voyage the probable duration of which will not exceed three months. By this resolution, therefore, the Board has in effect suspended Section 18. It is announced that specific regulations covering voyage and time charters will be issued by the Board later.

United States May Join International Road Congress

As a result of the recent two-day meeting at the office of the Bureau of Public Roads, Washington, D. C., the executive committee of the American Association of State Highway Officials recommended the acceptance by the United States of the invitation of foreign countries to become a member of the Permanent International Association of Road Congresses. The committee also recommended that the International Association be invited to the United States for its next meeting. Invitation to join the Association was received by the State Department from the American Consul-General in Paris. Secretary of Agriculture Meredith concurred in the recommendation of the executive committee and asserted that he would recommend to the State Department that Congress be asked to authorize acceptance of the invitation.

Thomas H. MacDonald, chief of the Bureau of Public Roads, strongly advises the United States to become a member of the International Road Congress, inasmuch as it is the only civilized country not now a member and also inasmuch as good would come of joining an organization which constitutes an international tribunal for bringing together the best experience and results in highway construction and administration.

Civil Service Examinations
United States

Highway bridge engineer, $2,100 to $2,700 a year. Form 1312. File application not later than July 13.

Junior highway bridge engineer, $1,320 to $1,920 a year. Form 1312. File application not later than July 13.

Safety engineer, $2,500 to $3,000 a year. Form 1312. File application not later than June 22.

Superintendent of Motor Transportation, $2,100 to $2,400 a year. Form 1312. File application not later than June 22.

Engineer in forest products, $2,160 to $3,600 a year. Form 2118. File application not later than June 22.

Assistant engineer in forest products, $1,500 to $2,100 a year. Form 2118. File application not later than June 22.

Research engineer, $3,000 to $3,600. Form 2118. File application not later than July 20.

Assistant civil engineer, U. S. Navy, $3,200 to $9,600 a year. File application with Bureau of Yards and Docks not later than Aug 1.

ENGINEERING SOCIETIES

Calendar
Annual Meetings

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York City; Portland, Ore., Aug. 10-12.

AMERICAN WATER WORKS ASSOCIATION, New York City; Montreal, June 21-26.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; Asbury Park, N. J., June 22-25.

AMERICAN PUBLIC HEALTH ASSOCIATION, Boston; San Francisco, Sept. 13-17.

The Oklahoma Members, Am. Soc. C. E., in connection with the recent meeting of the Oklahoma Society of Engineers, held at Muskogee, perfected a state organization, with officers as follows: President, H. V. Hinckley, consulting engineer, Oklahoma City; vice-presidents, E. S. Alderman, Federal Road Engineer, Oklahoma City; C. M. Pritchard, consulting engineer, Tulsa; E. M. Graham, consulting engineer, Muskogee; F. D. Brown, city engineer, Shawnee; H. F. Layton, Empire Gas Co., Bartlesville; Max L. Cunningham, Municipal Construction Co., Oklahoma City; secretary, F. H. Craddock, Musson & Gayle, Oklahoma City.

The San Francisco Section, Am. Soc. C. E., held a meeting, June 8, to discuss the general topic "Causes of and Problems Attendant Upon Increased Salinity in San Pablo and Suisun Bays." A. A. Brown, chief engineer of the California and Hawaiian Sugar Co., read an illustrated paper on "Teredo Attacks on Piles that Have Been Immune for 50 Years." A paper by T. H. Means, consulting engineer, on "What Increased Salinity Means to Irrigation and Potable Water Systems" was also presented. More than one hundred members and guests attended, and many phases of the problem under consideration were brought out in the general discussion that followed the papers. To make sure that the discussion would be comprehensive, the two main papers were made brief and arrangement was made in advance with six members to come prepared to make four-minute discussions. It was announced at the meeting that 40 members of the section (the maximum number that could be taken) had purchased tickets for the four-day inspection trip over the Hetch Hetchy project scheduled for June 12-15.

The Iowa Section Am. Soc. C. E. was addressed at Ames, June 8, by President A P. Davis, on "The Duties of the Engineer Outside of His Strictly Technical Activities." Mr. Davis was at the Iowa State College attending the semi-centennial celebration, at which time he received the honorary degree of doctor of engineers.

PERSONAL NOTES

JAMES W. COSTELLO, engineering supervisor, Bureau of Street Cleaning and Refuse Collection, Newark, N. J., has been appointed head of the newly created Division of Streets. This Division will include three old bureaus: (1) street cleaning and refuse collection; (2) streets, formerly in charge of paving, repaving, maintenance of all highways and supervision of the municipal asphalt plant; (3) street regulation, which had charge of street obstruction, sidewalk repairs, street signs, and permits for street openings.

T. P. JOHNSTON, research engineer, Southern Pine Association, has resigned to enter the engineering department of the Pennsylvania R.R., with headquarters at Philadelphia and Baltimore. Mr. Johnston was previously in the engineering department of the Union Pacific.

W. E. BLOMGREN, division engineer, Frannie division, Shoshone (Wyo.) Project, United States Reclamation Service, has resigned to become assistant engineer for A. J. Wiley, consulting hydraulic engineer, Boise, Idaho.

T. O. RUSSELL, formerly chief engineer, Alsea River Lumber Co., Glenbrook, Ore., and later consulting engineer for that company, has been retained by the Miami Corporation as consulting engineer on the development of its tract of 30,000 acres of timber in western Oregon, near Willamina.

KARL R. KENNISON, formerly plant engineer, Emergency Fleet Corporation, in charge of shipyard and dry-dock construction at New Orleans, Mobile, and Pensacola, has opened offices for private practice at 18 Tremont St., Boston.

JOHN N. MACKALL, for the past two years chief engineer, State Roads Commission of Maryland, has been appointed by the Governor as chairman and chief engineer of that body, succeeding Frank H. Zouck, the former chairman, who has resigned. Mr. Mackall has been connected with the State Roads Commission in engineering work for the past sixteen years, except between 1916 and 1918, when he was office engineer, Pennsylvania State Highway Department.

CHARLES D. EVANS and E. W. BUXTON have become associated in partnership, under the firm name of Evans & Buxton, for the practice of engineering, with offices in the Simon Building, Shreveport, La.

J. C. MEACHEM, formerly assistant engineer of Brooke County, W. Va., has been appointed district road engineer, Marshall County W. Va.

JACOB L. CRANE JR., of Gannett, Seelye & Fleming, engineers, Harrisburg, Pa., sailed from New York, June 9, for Venezuela and Colombia, to take up several private engineering projects.

SIDNEY A. DEAN and WILLIAM A. DOERRIES have formed the Ozark Engineering Co., Springdale, Ark., to engage in the general practice of engineering, specializing in highway and municipal work.

WILLIAM G. THOMPSON has resigned as state highway engineer of New Jersey to engage in engineering work with private interests in New York City.

HENRY B. ALVORD, formerly assistant professor of civil engineering at Bowdoin College, has been appointed assistant professor of railway engineering at Northeastern College, Boston.

DR. VAN. H. MANNING has resigned as director of the U. S. Bureau of Mines and has accepted the position of director of research with the recently organized American Petroleum Institute.

E. S. DRAPER has been appointed principal assistant engineer, Boston & Albany R.R., succeeding L. G. Murphy, resigned.

E. H. MCMILLIN has resigned as

road engineer of Gilmer County, W. Va.

W. E. **Putnam**, since 1916 with Ford, Bacon & Davis, New York, engaged in valuation work, has returned to Birmingham, Ala., to be associated with Robert L. Totten, consulting engineer.

F. M. **Veatch**, who recently resigned as sanitary engineer of the Nebraska State Board of Health, is now chief engineer of the Henningson Engineering Co., Omaha.

James H. Johnston has been appointed superintendent of highways of Providence, R. I. He suceeds the late Ralph A. Vickere.

Watson H. Clark, formerly of the New Jersey State Highway Commission, has been appointed consulting engineer to the Highway Department of New Jersey, pending the appointment of a successor to William G. Thompson, who has resigned as state highway engineer, as noted elsewhere.

Julian Montgomery has resigned as county engineer, Rockwall County, Tex., to become city engineer of Wichita Falls, Tex.

John A. Focht, assistant engineer of Rockwall County, Tex., has been appointed county engineer, succeeding Julian Montgomery, resigned as noted elsewhere.

W. W. K. **Sparrow**, chief engineer of the Chicago, Milwaukee & St. Paul Ry., has been appointed assistant to the president of that road, succeeding H. M. Sloan, resigned. He will be in charge of valuation, adjustment of Federal accounts and other assigned duties, with office in Chicago. During Federal control he was corporate chief engineer of the road.

George K. Armes has resigned as assistant engineer and office engineer of the Florida State Road Department, and will open an office in Tallahassee as a consulting and highway engineer.

George M. Wisner, for 13 years chief engineer of the Sanitary District of Chicago, has resigned to go into private practice, although he is retained as consulting engineer to the district. Edward J. Kelly, assistant chief engineer, will succeed Mr. Wisner.

C. I. **Anderson** has recently been appointed engineer of bridges, Illinois Central R.R.

George Garrett, recently city engineer, has ben appointed city manager of La Grande, Ore.

F. A. **Jones** has been appointed office manager of the Boston & Albany R.R.

A. H. **Krom**, assistant secretary of the American Association of Engineers has resigned to enter business. Mr. Krom was one of the organizers of the association and is member number 1.

Lieut.-Col. Charles W. Kutz, engineer commissioner of the District of Columbia, has been promoted to the rank of colonel. Colonel Kutz is chairman of the commission in charge of zoning the City of Washington.

Harry F. Ferguson, recently senior assistant engineer, has been appointed acting chief sanitary engineer of the division of sanitation and engineering of the Illinois State Department of Public Health. He succeeds Paul Hansen, recently resigned.

OBITUARY

Beverly R. Value, president of the General Contractors' Association of New York, died in New York City, June 10. He was born in Montgomery, Ala., in 1863 and was graduated from the School of Mines, Columbia College, in 1884. The next year he became a member of the engineering staff of the New York Aqueduct Commission. In 1886 he was appointed assistant engineer in charge of the construction of Section 6 of the new Croton aqueduct, and following its completion, in 1900, was engaged for a year on final estimate work and the preparation of records for court action. From 1893 to 1900, he was in charge of construction of the new Croton dam, under Charles S. Gowen, division engineer. From 1900 to 1903 he was division engineer for the New York City Rapid Transit Commission on subway construction. The next five years he spent as chief engineer of the Electrical Development Co. during the construction of the hydro-electric plant at Niagara Falls, and as engineer of the McCalls Ferry Power Co. on the construction of a similar plant on the Susquehanna River. During the last 12 years Mr. Value has been associated as chief engineer, comptroller and director of H. S. Kerbaugh, Inc., the Empire Engineering Corporation, and the Kerbaugh-Empire Co. and as secretary, treasurer and director of George W. Rogers & Co. He was a member of the American Society of Civil Engineers and the Engineers' Club. Mr. Value was born in Montgomery, Ala., in 1863.

Albert Chatigny, civil engineer, of Montreal, died in that city June 3. He was for many years in the Federal Public Works Department, during which period he was one of the engineers selected to take charge of the construction of the channel between Montreal and Quebec. Mr. Chatigny was a graduate of the Ecole Polytechnique of Montreal. He was 43 years of age. He contracted tuberculosis in a training camp during the war.

Arnold E. Broennimann, civil engineer, died May 29, at Watertown, Wis., in which town he was born in 1876. He graduated from the University of Wisconsin in 1897 and afterward engaged in deep waterway work for the Government, eventually becoming a member of the survey staff of the New York State Deep Waterway Commission.

BUSINESS NOTES

Sidney S. Friedman and **Joseph D. Karasik** have incorporated as Karasik, Friedman & Co., with offices in the Woolworth Building, New York as dealers in iron and steel and new and relaying rails.

The Power Plant Supply Co. has been organized, with offices at 707 Canal Road, Cleveland, to deal in pumping machinery and power plant equipment. William E. Berrington is secretary and manager of sales.

The Milliken Brothers Mfg. Co., Inc., New York, manufacturers of all-steel, one-story industrial buildings, have established branch offices at Chicago, Cleveland, Atlanta, Ga., Chattanooga, Tenn., New Orleans, Dallas, Tex., Houston, Tex., and Tulsa, Okla. Representatives have also been appointed in London, Melbourne, Australia, and Havana, Cuba.

The California Engineering Co. announces the openings of offices at 131 Leidesdorff St., San Francisco, for investigating and reporting on problems in the fields of civil, mechanical, electrical, hydraulic and marine engineering; also the organization, development and management of engineering projects. Paul B. McKee is president of the company and Paul R. Parker is vice-president and chief engineer. Three associate engineers are named as follows: P. O. Crawford, W. M. Shepard and C. E. Blee.

The W. D. Sullivan & Sons Co., contractors and engineers, has been organized with headquarters at Columbus, Ohio. The new company has specially organized departments for highway, railroad, and bridge construction, industrial plants, sewer construction, excavation, and designing and engineering. The officers of the company are: President, W. D. Sullivan; first vice-president, Charles B. Pray; second vice-president, H. M. Ogden; secretary-treasurer and general manager, H. E. Sullivan. The department managers are: W. D. Sullivan, H. M. Ogden, C. B. Pray, G. R. Ensminger, J. F. Brown, C. C. Schulmann, and W. H. Butterworth.

The Wellman-Seaver-Morgan Co., Cleveland, announces the election to its board of directors of John A. Penton, president of the Penton Publishing Co., to fill the vacancy on the board caused by the death of Samuel T. Wellman.

The George F. Watts Corporation, engineers and contractors, steel construction, of Boston, Mass., announce the opening of a permanent New York City branch office at 30 Church St., with Walter F. Barker as New York district manager and Henry Porlier as chief engineer.

A Consolidation of Engineering News and Engineering Record McGraw-Hill Company, Inc.—JAMES H. McGRAW, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN
Editor

Volume 84 NEW YORK, THURSDAY, JUNE 24, 1920 Number 26

A Public Works' Function

TULSA, a growing city in Oklahoma, proposes to establish a municipal system of garbage and refuse collection in place of the present haphazard collection by "every man who owns a donkey or burro." Thus far the project is sound, but the proposal to have the work done by the health department is unsound. Such operations should be conducted by the public works not the health department, both because of their small relation to health and because functionally the operation of public services belongs to the works of the engineering department of a city.

Does Earthwork Shrink?

OPINION representing the majority of engineers answers "yes" to the question, "Does Earthwork Shrink?" Nevertheless, a small but persistent voice says "no," and proceeds to intimate that majority opinion is not based upon exact knowledge—an intimation which seems to be supported by facts. From the extended review of the subject on p. 1256 it appears that there is a reduction of quantity between excavation and fill which reduction is commonly termed shrinkage, but to which a number of factors contribute. That review indicates that there are conditions which bear important relations to construction work and to both construction and valuation quantities. It suggests also the opportunity for scientific engineering research and experiment to determine the relative values of the several factors as well as the fact and extent of actual shrinkage of excavated material deposited in a fill.

Engineers as Railway Executives

A SURPRISING number of appointments of railway engineers to positions outside of their own departments seems to indicate a growing appreciation of the fact that the engineer is fitted especially by his training and experience to deal with problems other than those of his strictly technical work. As examples of the movement it may be noted that engineers hold the positions of president on the Chicago & Northwestern, Grand Trunk, Great Northern, Chicago & Western Indiana, Delaware & Hudson and Pere Marquette; vice-president on the Illinois Central, Rock Island, Norfolk & Western, Philadelphia & Reading and Central of Georgia; assistant to president on the Burlington, New York Central, Union Pacific, Chicago & Northwestern, Erie, Southern, Central of New Jersey, Missouri Pacific, Minneapolis & St. Louis and others. In these and other analogous positions, the engineer has to act in an executive or advisory capacity with broad problems of railway affairs and with such matters as wages, rates, valuation, budget making and transportation or operating difficulties. On some roads, the chief engineer retains his title but deals largely with the matters noted above, having an assistant chief engineer to handle the bulk of the technical and routine matters of the department. In the above lies a strong argument for the appointment of engineers as members of boards and commissions. Reference may be made also to the fact that a number of engineers have become railway superintendents and have made good in the operating service.

A Lesson in Road Foundations

ONE of the boldest experiments in monolithic brick-road construction recorded during the few years of high popularity of that type of pavement was the completion in 1916 of a seven-mile brick road on a 1-in. gravel concrete base in Iroquois County, Ill. The construction of this road was described by Harlan H. Edwards in *Engineering Record*, Sept. 30, 1916, p. 400. At our request Mr. Edwards recently made a critical inspection of this road to discover its condition after nearly four years of service. His conclusions were given in our issue of June 17, p. 1207, with supporting records from an even less well remembered experiment in laying brick on a thin concrete base. The fact disclosed is truly remarkable. Not a single defect due to slab weakness exists. This result is explained by three words—a good foundation. In this particular instance the quality of foundation is due to a fortunate circumstance and not to planned construction, but its effect in preserving the stability of the pavement is not less important. Engineers probably should not, and certainly will not often repeat the construction described but they may well conform their practice constantly to the lesson of good foundation which experience with it has emphasized.

City Planning Pays

THAT city planning is a profitable investment, both to property owners and to the city, is a statement made in the recent report of the Chicago Plan Commission, which points out that the improvements resulting from its work have a direct financial return in increased property values besides stimulating the commerce, prosperity and welfare of the city. In support of its statement, the results of two recent projects now near completion are cited. The widening and extension of Michigan Ave. is estimated to have increased the value of property in the zone affected by about $35,000,000 and new buildings representing an aggregate value of $100,000,000 are under construction or projected. On 12th St. or Roosevelt Road the frontage value of land and buildings was $8,000,000 prior to the widening and extension, but although the improvement is not yet complete the value has increased to about $10,500,000. From the increased values due to these two improvements the city will receive an annual revenue of $3,575,000 if the taxes are assessed on the full increase in valuation. Property values and city revenues will continue to increase with the full development of these improvements. Similar results are expected to attend the various other improvements, the increased values extending through the adjacent districts and not being limited to the immediate vicinity. As the total expense for promoting the Chicago Plan has been about $400,000, the report seems to have good ground for its statement that the commission "is not a money spending, but a money earning institution."

Business Assists Utilities

ORGANIZED business men of Chicago in their appeals to the State Public Utility Commission for immediate action on pending rate adjustments, as noted in the news section of this issue, p. 1272, are setting an example which should be followed by similar bodies in other cities. Recently the more influential bankers of Chicago appeared before the commission and as a result of their efforts to make clear the critical situation of the public utilities business interests have begun thinking about rates in terms of service rather than politics. In the document signed by the officials representing 16,213 individuals and firms the needs of the community, the financial inability of the utilities to meet them, the serious and continuing menace to the commercial development of Chicago, the imminent danger of injury to private interests as well as to the public at large from lack of service were all pointed out. It is time business spoke with a united voice on such situations and it is encouraging to have so large a city as Chicago point the way.

An Endowed Hydraulic Laboratory

THE case for an endowed American hydraulic laboratory is presented on another page in the picturesque and forceful language characteristic of Clemens Herschel. The strong personal note in the article is justified by Mr. Herschel's own well known part in the development of applied hydraulics, which part, according to the article, has been hampered by the lack of adequate hydraulic laboratory facilities, available to all who could justify their claims of need.

The highest possible economic utilization of water becomes more important with every passing day. Scores of hydraulic questions press for answer. Our college hydraulic laboratories—considering their many limitations due to size, character of equipment and particularly the fact that their primary purpose is for use in instruction—do not fully meet the need. Practically all other hydraulic testing laboratories are connected with one or another commercial enterprise. Where, then, shall the hydraulic engineer turn?

Mr. Herschel's answer is that we should have an endowed hydraulic laboratory. From that few if any of our readers will dissent. Ways and means are the real questions for discussion. If sufficient funds were available to meet expenses it seems probable that the college laboratories, which are increasing in number and in the adequacy of their equipment, would be able to meet much of the need, so far as plant alone is concerned. This plant, for many of even the working-scale tests, need not be elaborate, nor are high heads or large volumes needed for all tests. Extraordinary facilities could be found or created at some colleges. Or they could be provided, as Mr. Herschel sees reason to hope will soon be done at Niagara Falls, in connection with private or public hydraulic works.

An endowment is the great and immediately pressing need. This would present administrative problems demanding most careful consideration to ensure fair opportunity to all deserving applicants for testing facilities, in the order of merit and promised public good.

Engineers and Railway Problem

IN the discussion and controversy over the railway situation, is not too much attention being concentrated on the rate question? It should be frankly recognized that freight rates are only one factor and that complete solution of the railway problem is not to be found in the settlement of the rate question alone. In other words, is not too narrow a view shown by those active in the consideration of the problem? Furthermore, do not other serious phases of the situation distinctly call for attention by the trained mind and broad vision of the engineer, in order finally to effect the results which are sought by those who have occupied themselves with consideration of the railroad problem as a whole? At times it has appeared that the railways failed fully to realize that the situation has its opportunities as well as its difficulties.

Attention is called to the abstract on p. 1260 presenting two views of the plan for relief by increasing freight rates. Improvement and extension of the railway system are necessary to keep pace with normal industrial development and require new capital and strengthened railroad credit. Presumably increased rates will be necessary to bring about this result, but it is suggested that higher rates may increase prices of commodities to such an extent as to decrease demand so that reduced volume of traffic may offset the effect of higher rates. This seems improbable, but the suggestion indicates the futility of relying on freight rates alone to serve as a solution.

In the present traffic tangle is there not evident opportunity for introducing more scientific methods of railroad operation? A marked increase in freight rates might have the result of checking, to some extent, the present cross hauling and indirect movement of freight, largely a result of competition for business between railroad companies. In the emergency the railways have been directed by the Interstate Commerce Commission to ship by the most direct routes, regardless of instructions of shippers, and there is reason to hope that the practice may be permanently retained. Such changes in operating methods offer opportunity of a cheaper handling of traffic, reduced mileage, and the liberation of cars for mainline service.

One of the fundamental policies of private railroad managements has been to "get business." Where followed blindly, this policy has resulted in delay and congestion of traffic, unnecessary haulage, and unfair competition. We have commented previously on the use of the interline embargo as a competitive measure. Under this system a company refuses to accept freight from another line while soliciting new business for its own line, over the same route. Obviously the result is to aggrevate rather than to relieve a bad situation. Much effort has been expended in obtaining business which produces cross hauls of like commodities and also in getting short-haul business which is handled by the railroads only at a loss, but which might be handled to advantage by interurban lines or motor transport.

Delay and congestion at yards and terminals, with consequent slow movement of freight—a freight car averaging only about twenty miles per day—have been continuously troublesome for years past and constitute one of the great defects in railway operation. Recently the situation has become acute. Large guantities of new rolling stock will be delivered to the railroads by the builders in the next few months. Great sums of money are being spent on this equipment, but we do not find that any adequate provision is being made to afford the necessary additional line and terminal track facilities. Present congestion of terminals appears to call for the expenditure of at least as large a sum of money as will be required for the new mechanical equipment. When this development begins to take place there will be a decided need for the best engineering thought—a broader view of the problems at hand that will not be bound by time-worn precedent.

Are not the railways so alarmed over the financial situation and so intent on obtaining more income that they overlook their own shortcomings and their opportunities for the more economical use of present facilities and the possibility of more effectively extending them? Loyalty of the public to the railways has been urged, but loyalty of the railways to the public should first be demonstrated.

The need is apparent for a wider comprehension and a more constructive view of the situation, for which the engineer is peculiarly fitted by his experience and training. Times and conditions are still in a state of change and an unprejudiced viewpoint will be necessary in introducing new methods instead of trying to adapt old methods to new conditions. Here seems to be the opportunity for engineers and for the railways.

Has the Water-Power Bill Become Law?

IN spite of the fact that *Engineering News-Record* is definitely in favor of the Federal Water-Power Bill which was passed in the recent session of Congress, it has serious doubts of the validity of the signature which the President affixed to it some time before June 12, as announced by the White House on June 18. Possibly the bill has become good law, but before its provisions can be enforced the interpretations of the highest court will be required.

The whole issue hinges on an interpretation of the Constitution. In Section 7, paragraph 2, it is stated that "every bill which shall have passed the House of Representatives and the Senate shall before it becomes a law be presented to the President of the United States; if he approve, he shall sign it, but if not, he shall return it, with his objections, to that house in which it may have originated, who shall enter the objections at large on their journal, and proceed to reconsider it." After provision for passage by two-thirds vote over the veto, the clause continues: "If any bill shall not be returned by the President within ten days (Sundays excepted) after it shall have been presented to him, the same shall be a law in like manner as if he had signed it, unless the Congress by their adjournment prevents its return; in which case it shall not be a law."

With one possible exception the precedent during the 131 years of the existence of this government has been that a bill not formally acted upon in either way by the President at the adjournment of Congress automatically fails to become a law, provided the President did not have it in his possession over the ten-day limit. This precedent has been overruled by the opinion of the Attorney-General, on which the President acted.

On June 5 this year Congress adjourned without having heard from the President in regard to the Water-Power Bill which had been passed on May 29 and submitted to him June 1 or 2. The bill, therefore, by long precedent, was dead. However, nearly a week later, the White House announced that the Attorney-General had stated "that the adjournment did not deprive the President of the ten days allowed by the Constitution for the consideration of the measure, but only, in case of disapproval, of the opportunity to return the measure to the house in which it originated." This is an entirely new interpretation which on its face may appear valid, although it is somewhat tortuous. The difficulty to such an interpretation, however, is clearly indicated by the President's subsequent action on the bill.

The ten-day limit on the Water-Power Bill expired June 12. No notice of any action on the bill, however, came from the White House until June 18 when it was announced that the President had signed the bill "within the ten-day period, of course." Here is where the weakness of the Attorney-General's decision appears. If the President can wait one week before announcing the past signing of the bill, what is to prevent him waiting two months or two years? If the adjournment of Congress does not automatically kill all bills in the President's hands, what is to prevent the President from signing such bills within the ten-day limit, putting them away in a secret drawer to be brought forward as law when and if political strategy requires it? The signature of the President is a personal act and need be known to no one but himself. Certification of the signature as given by the Secretary of State is necessary to the recording of the law, but there is nothing in the Constitution requiring such certification within the ten-day limit.

In every other contingency but the one set up by the Attorney General's ruling, the fate of a bill is definitely known within ten days. During the session of Congress if the President would kill a bill he must return it to Congress before ten days elapse. If he fails to do so it is enacted automatically, whether he acts on it or not. The moment the ten days expire no subsequent announcement by anyone has any effect on a bill's status. By the new ruling, however, bills before the President in the ten-day period after adjournment have no definite term of life. An announcement of a refusal to sign has no constitutional standing, and on the other hand, at any time he chooses the President may announce his previous signature. As no provision is made in the Constitution for his active veto, because there is no Congress to which to return bills, the possibility of their being revived by a long slumbering signature always exists. In the week between June 12 and 18 the President had it in his power to tear up his signature and thus kill the Water-Power Bill. That week might have been extended indefinitely, with consequent Presidential leeway in approving bills clearly not indicated in the Constitution. Such a looseness in the process of law enactment is incomprehensible.

Engineering News-Record wants to see water-power development go forward. There never was a time when quick and decisive action was needed more imperatively. It therefore hopes that the constitutionality of the law's enactment will be decided at once so that all doubt of proceeding under it will be settled.

Precast Concrete Roof Trusses in Panama Pier Shed

Discussion of the Feasibility of Concrete Roof Trusses with Comparisons of Cost Data Between Two Similar Sheds, One with Reinforced-Concrete Roof Trusses and One of Structural Steel

By Guy W. True
Engineering Designer, the Panama Canal

REINFORCED concrete was substituted for steel in the construction of the pier shed for Pier 6, the latest of the shipping piers at Cristobal, C. Z., with a consequent saving in cost and an assurance of completion at a time when steel deliveries were uncertain and the cost of steel high. Precast concrete trusses were used for the roof with marked success and economy. Although unusual conditions led to the adoption of this type of structure, the results have been so satisfactory as to make worth while an analysis of the condition of design and a comparison with the usual steel structure as a guide for future work. A detailed description of the sub-structure of this pier, which is also of a novel type of reinforced-concrete design, appeared in *Engineering News-Record*, Nov. 27–Dec. 4, 1919, p. 912.

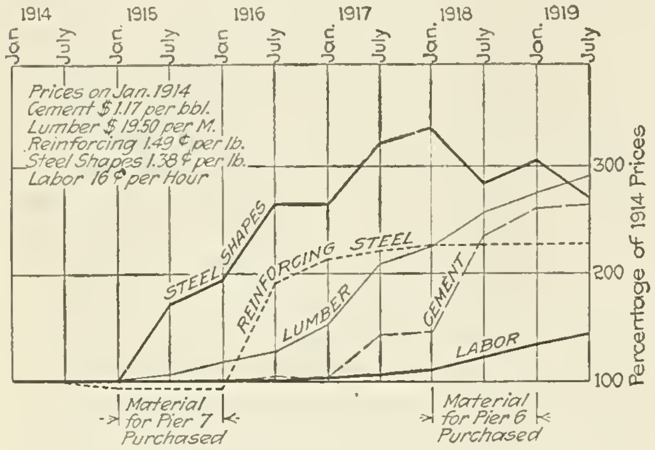


FIG. 1. PERCENTAGE INCREASE IN PRICES ON ISTHMUS OF PANAMA, 1914-1919

Innovations in roof framing design, particularly for long spans, are constantly being put forth by designers. Wood, of course, has been largely superseded by structural steel, due not only to advantages accruing from the higher allowable unit stresses but the comparatively decreased fire hazard. When properly maintained, steel has undoubtedly a greater durability than wood, but as most structures have outlived their usefulness long before the material has begun to deteriorate it can hardly be offered as a valid criticism.

The progress of reinforced concrete as a roof material has been considerably retarded by the inherent dead weight of the concrete. This objection particularly applies to long span construction (of 30 ft. or more) where the major part of the stress in the concrete beams is due to the dead weight of the concrete itself. This factor has necessarily limited its economical use, and thus we find that concrete has been used as a roof framing material in preference to steel in such instances, only when other considerations than cost governed.

Sometimes it is desirable to incase steel roof girders with concrete as a protection against fire. The cost of this extremely conservative type of construction naturally excludes it from any except the occasional design.

Of late the costs of both labor and all engineering materials have undergone increases far greater than most engineers ever anticipated. If all items advanced proportionately these price changes would have little effect upon design except possibly a more exact calculation of stresses. The important fact, however, to be noted in reviewing these price changes is that the rates of the present prices of each material to its value before the war is different for each item. Fig. 1 gives the ratio of costs of steel, cement, lumber and labor on the isthmus to costs in 1914. As transportation to the isthmus is included in all items, they may not be exactly the same as similar quotations in the United States. The chart shows that these ratios have a wide range.

It will be noted that structural steel shapes have the greatest variation and labor the least. From the relatively slight increase in labor costs, it might be inferred that complicated structures requiring more than the usual amount of field construction could be specified to advantage.

The chart further emphasizes the fact that an economical solution of a problem in design might be totally different if made under conditions in 1918 than if made in 1914. Those familiar with European cost data during the decade prior to the war, can readily see that prices in America have now approximately approached the ratios that then existed in Europe. Obviously, economical requirements demand more exact analyses leading to what might ordinarily be considered bold designs. As Europe has numerous examples of such structures it may naturally be expected that these types of design will come into more common use in this country, provided, of course, that the present ratio of prices continue.

DETAILS OF DESIGN OF PIER 6

The shed of Pier 6 is 945 ft. in length, 159 ft. in width and has a clearance under trusses of 25 ft. The layout of the design is simple, columns being spaced 39¾ ft. transversely and 45 ft. longitudinally. The longitudinal trusses are 45 ft. in length, 4 ft. deep and are spaced approximately 10 ft. on centers. Each truss is composed of 3½ cu.yd. of concrete, contains 1,000 lb. of reinforcing steel and weighs about 8 tons. These trusses are supported by the cross truss which carry the load directly to the columns.

The cross trusses are about 39 ft. in length, 7 ft. deep, and extend from column to column. Each one contains 8½ cu.yd. of concrete, 4,000 lb. of reinforced steel and weighs 19 tons. As these trusses were sloped ½ in. per foot to conform to the pitch of the roof, level notches were required in the top chord as a support for the seats of the longitudinals.

The design of the longitudinal trusses which support the inner crane rail is a modified form of the standard truss. It is slightly deeper, and has accordingly a correspondingly greater resisting moment sufficient to carry the wheel loads of the crane. The crane rail is securely bolted to the top chord, as some positions of the load on the crane develop an uplift on the inner rail. Naturally, the truss is designed to withstand this negative moment. The crane was designed to withstand a load of 11,000 lb. in the cable passing through the suspended blocks.

The entire pier is covered with a roof slab of 3½ in. thickness. This thin slab might well have been made thicker to minimize deflection and consequent reduction of tension cracks with increased water-tightness. However, as any increased weight of the slab affected the design of the trusses materially, preference was given to the thin slab, a waterproofed covering, of course, being required.

As the possibility of any very heavy live-loads being placed on the roof was very remote, a live-load of only 10 lb. per square foot was used in design. It should be remembered, in comparing this designing load with specifications in the United States, that no wind, snow or ice load need be taken care of in roof design in this locality. As a matter of fact this live-load has been used in roof design of numerous other Canal structures with success. The consequent ratio of live to dead loads used in truss design is therefore about one-eighth. This means that each of the 315 longitudinal trusses is carrying about eight-ninths of the full design load due to dead weight alone. The cross trusses have, of course, an even greater proportion than this.

Various kinds of trusses were fully investigated before a decision was reached as to the most suitable type. Among these were bow string trusses (lower curved chord), the Vierendeel truss in which no diagonal members are used, and, finally, the Visintini truss which was subsequently recommended. The Visintini truss, when diagonals are used in all panels, is of practically the same form as the Pratt truss used in this country.

The slope of the diagonals was fixed at 60 deg. and no verticals used so that it closely resembles a Warren truss. This particular type of design had comparatively simple form work as compared with the others and offered no objections to development of satisfactory end connections and various other details.

The investigation of primary stresses were made under the assumption that it was a simple structure; that is, hinged at the joints. It would appear off-hand that the large size of cross-section of members as compared with their respective lengths would cause introduction of secondary stresses through distortion. These were accordingly investigated under the assumption that the increase in lengths of tension members was solely a function of the stress in the steel.

As the incasing concrete of these members reduces the elongation an appreciable amount, it is evident that this assumption was on the safe side. Calculations (made for full load) showed that the maximum fiber stress in the concrete due to such secondary stresses was approximately 300 lb. per square inch. In a tension member this figure is of course meaningless, as the steel not the concrete is carrying stress there. In compression members, however, it is additive to the primary compressive stresses. As 750 lb. per square inch is permissible in certain parts of design it was considered reasonable to allow this figure decreased by 250 lb. per square inch; that is, 500 lb. per square inch as a maximum compressive stress in the concrete neglecting the effect of secondary stresses. The exact theory and path of stress at the joints is in reality not known to any great degree of certainty and sufficient stirrups were placed there to tie the mass of the concrete together and take care of these unknown factors as much as possible.

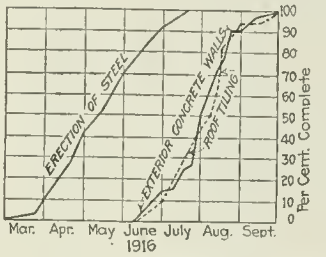


FIG. 3. PROGRESS CHART OF ERECTION—SHED OF PIER 7

Erection stresses were small when calculations were made assuming the support as suspended from the erecting crane, but other stresses in handling, such as raising the truss from a horizontal to a vertical position, could not well be calculated and the compression steel and stirrups shown in columns were counted upon to resist this effect. Particular care was demanded in the erection to minimize these unknown stresses.

Of the general proportions of the trusses little need be said as the ratio of depth to span is not widely different from ordinary design. The width of the top chord is in reality small when compared with the span length. During erection great care was necessary not to handle the trusses on their side because of this feature, but after the structure was completed lateral deflection was not possible as the chords were well supported by the roof slab or other trusses.

In figuring the bending stresses in the top chords due to uniform load, the floor slab was neglected, but it of course assists that member in bending to no small extent, because of the bond developed between them.

Marked advantages would be obtained if all trusses could be made continuous and preliminary designs were made with this as an objective. As the various trusses

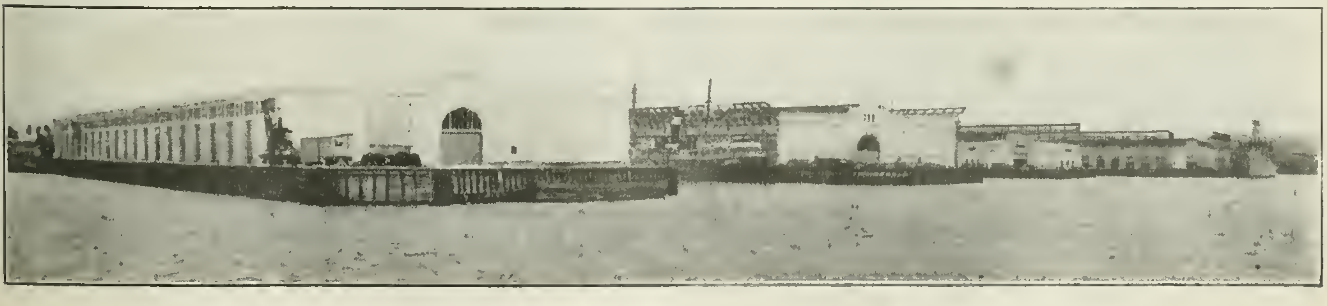


FIG. 2. PIERS 6, 7 AND 8, IN ORDER FROM LEFT TO RIGHT, CRISTOBAL, CANAL ZONE

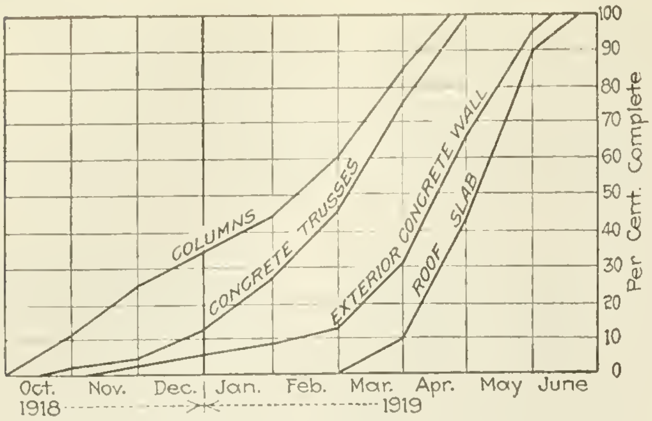


FIG. 1. PROGRESS CHART OF ERECTION OF REINFORCED-CONCRETE SHED OF PIER 6

were built separately and later placed in their final position, a joint over the top of the supports was required to secure continuity. The difficulty of obtaining an adequate joint for this purpose was the main cause of the rejection of this type of design. Care was taken in the accepted design to avoid any condition of restraint at the ends, and, hence, the actual stresses are undoubtedly close to calculated ones. As the roof slab is poured continuously over the tops of longitudinal trusses probably some small restraint is caused from this condition, but the play betwen the ends of the lower chords tends to offset this disadvantage and the resulting stresses may accordingly be neglected.

Deflections of the trusses are negligible, as they are less than would be the case if a beam of similar resisting moment was substituted. No cracks other than shrinkage cracks could be discovered.

The supports of a comparatively new type of construction should be as rigid and non-elastic as possible, so the columns were made much heavier than would ordinarily have been required. Also the possibility of adding an additional intermediate floor was allowed for.

Because of the requirement of lateral stability in addition to adequate bearing at the supports of the cross trusses, recesses of sufficient size were furnished in the upper portions of the columns. Although the resulting shape of column does not readily lend itself to construction of formwork its importance justified the particular detail adopted. The width of the cross-section of column at this detail was a factor that largely determined the size of the main body of the column in order to obtain reasonable proportions.

The unusual features and unknown factors such as erection stresses, joints, etc., entering into the truss design justified a test. Accordingly, one of the cross trusses was loaded with an equivalent of the full dead and twice the live load. The test was successful, as no noticeable cracks were developed in the course of the application of the load.

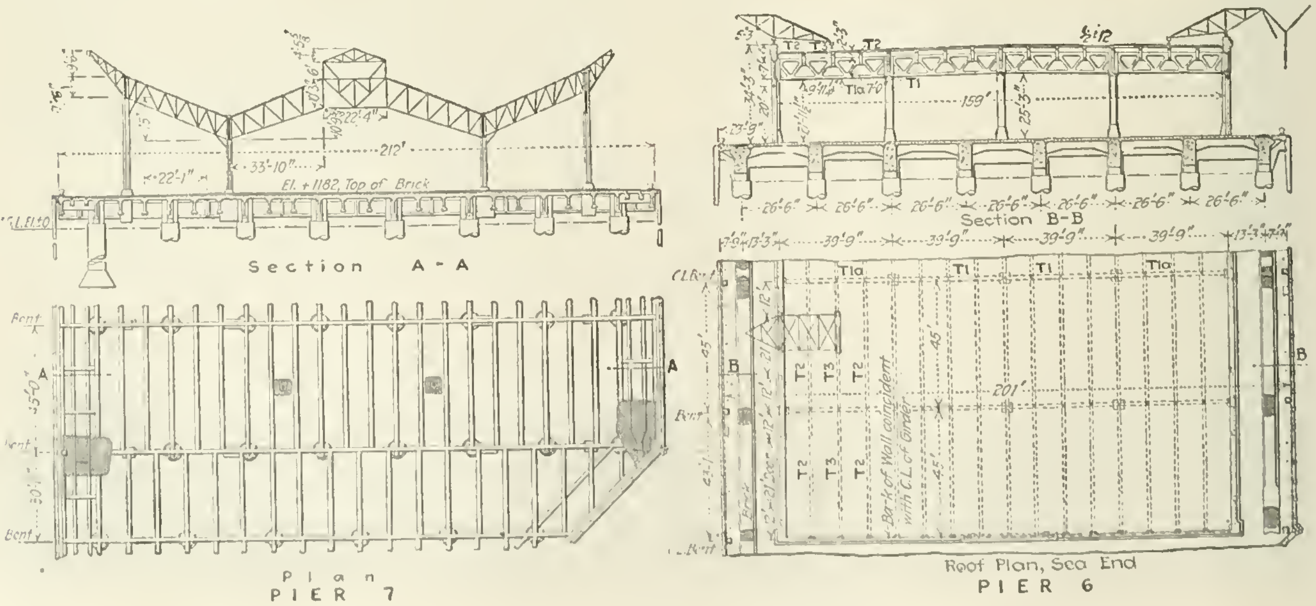
METHOD OF CONSTRUCTION

Due to lack of uniformity in the cross-section of the columns it was deemed advisable to pour them in three stages—base, main section and top. The enlarged base firmly anchored to the substructure with reinforcing resulted in a column of considerable stability, a feature of no small importance in supporting precast trusses.

The construction of the trusses themselves was naturally divided into two main parts, first their manufacture and later their erection. Forms for the triangular spaces between the web members were built of 2 x 4-in. material covered with 1-in. sheathing. A keyed joint was inserted to facilitate removal.

These forms were then laid flat on the level concrete floor of the pier, properly spaced, and after the outside portions were placed in the correct positions, the form was ready for the reinforcing. Four complete sets of forms were provided for the cross trusses and twelve sets for the longitudinals. Each form for the longitudinal trusses was accordingly used about thirty times. As they were strongly constructed, very little repairing was required, and hence the number of times that these forms were used effected a great economy in the unit cost of form work.

It was found that the reinforcing could be advantageously assembled and wired together before placing it in the forms. This process was accordingly followed, thereby enabling the reinforcing gangs to proceed independently of the group engaging in construction of



Section A-A

Plan
PIER 7

Section B-B

Roof Plan, Sea End
PIER 6

FIG. 5. COMPARATIVE OUTLINES OF PIER 6 AND PIER 7, CRISTOBAL, CANAL ZONE

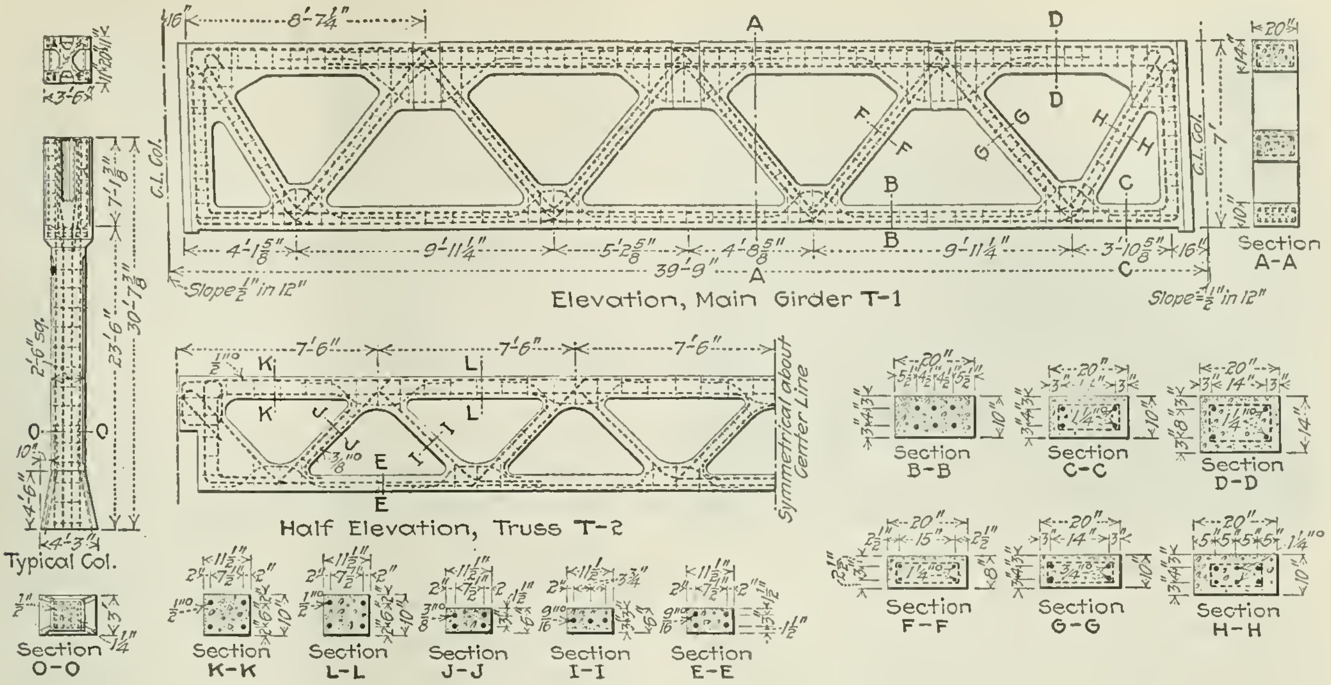


FIG. 6. DETAILS OF CONCRETE MEMBERS IN SHED OF PIER 6

forms. Furthermore, the placing of the assembled reinforcing by a locomotive crane materially increased the speed of manufacture.

After the concrete had been poured the forms were left on twenty-four hours and then removed, care being taken not to disturb the fresh concrete. Instead of complete removal, however, they were simply raised to an elevated position so that the lower part of the form was flush with the top of the completed concrete. Reinforcing was then placed and a new truss poured directly over the old one, the two pours being separated by a layer of paper. By such a system it was possible to pour several, one above the other, thus saving a great deal of valuable floor space and, incidentally, enabling construction to proceed continuously. As many as four trusses were built in each pile in this manner, the height of pile being limited only by the elevation of the concrete chute from the mixer. The spaces between the web member were then filled with water, so that it was only necessary to wet the outside portions of the trusses from time to time. Keeping the concrete moist while setting was especially important, as evaporation takes place rapidly in this climate.

All concrete was allowed to set at least thirty days before erection was permitted. The primary operation in erection was to bring the truss from the horizontal to a vertical position, then to raise it by means of locomotive cranes to its final location in the roof.

The cross trusses were erected first. Two 25-ton locomotive cranes were used, one at each end of the truss. Grout was placed in the seats of the recesses in columns so that good bearing was obtained for truss supports. More than usual care was demanded of crane operators as both ends of truss had to be kept at approximately the same elevation during erection to avoid unnecessary strains in the concrete.

In erecting the longitudinal trusses only one 25-ton crane was required. An 18-in. 92-lb. Bethlehem steel girder beam was bolted to the top chord and the hoisting tackle was fastened to the middle portion. After properly balancing, the entire arrangement was elevated to its final position where the steel girder beam was released for further use.

This method of erection was successful throughout construction, and fortunately, no accidents occurred during the course of the work.

It can hardly be expected that concrete construction will ever be as rapid as structural steel, as most of the labor in steel work is done in the fabricating plant. In viewing the progress chart, Fig. 4, it should be borne in mind that in the earlier stages of erection a portion of the field forces were engaged in the completion of the floor system, so that the later months gives a more accurate measure of the rate of progress of this class of work. From this it would seem that these unit built trusses are fully as rapid a form of construction as concrete poured in place and might possibly compete with steel for rapidity in erection.

The actual field organization that completed the above work was composed of negro labor, supervised by four white foremen, one to each gang. Twenty-two laborers were engaged on form work, twenty-two on mixing and pouring concrete, four on reinforcing, and sixteen in erection. It is very probable that speed in construction could have been further increased with an additional amount of labor and equipment.

Following the erection of the trusses the walls between the outside columns were poured in place. These walls were 6 in. thick and reinforced by ½-in. diameter rods 24 in. on centers. Finally, the construction of roof slab completed the concrete work.

For comparison of progress of the entire work with that of a similar shed of structural steel and roofed with tiling, the progress chart of Pier 7 is given in Fig. 3.

As a substitute for continuous steel framework built on Pier 7, eight movable overhanging cranes were used, running on tracks of 20 ft. 4 in. gage placed upon the roof. These structures were not operated as cranes in the usual sense as they have no motive power to move

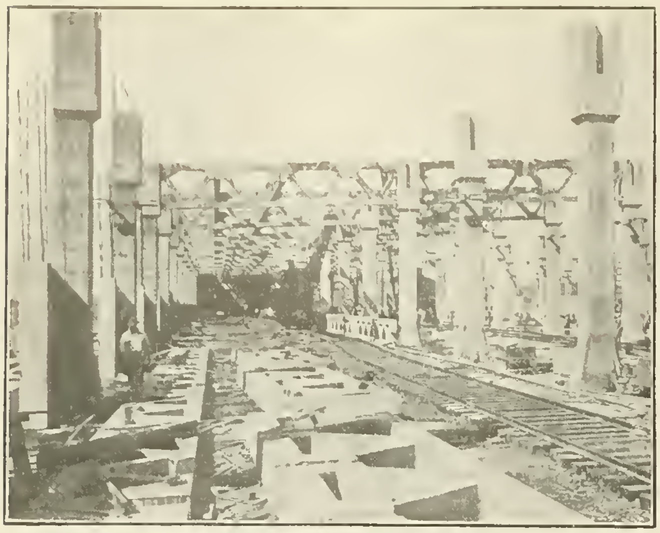


FIG. 7. COLUMNS IN PLACE FOR REINFORCED-CONCRETE TRUSSES

themselves along the track or lift a load. The apex of the crane is simply a point of support for block and tackle to be operated by a winch motor on the floor of the pier in addition to hoisting devices usually furnished by steamships. The crane is easily moved along the track by hand to the position desired.

Openings for doors were 21 ft. wide and 20 ft. high. An approved type of rolling lift door was used, as it gave entire satisfaction in prior shed construction. In resorting to this form of door a maximum amount of floor space is available for storage.

In lieu of a monitor framework for lighting in the central portion of the shed, two rows of 210 skylights were placed in openings 12 x 22 in. left in the concrete slab. No leakage resulted from this form of construction.

Sufficient electrical equipment was installed to secure ample light and power for operating the winch motors. Two units each consisting of one lighting transformer, one power transformer and switchboard were inclosed in concrete compartments with proper provisions for ventilation.

An outlet was furnished at alternate outside columns for operation of the 22-hp. portable winch motors, four motors being sufficient for unloading purposes on the entire pier. The shed is also equipped with eight soundproof telephone booths each of which contain a lighting distribution panel and a fire alarm box. Eighty-four lamps, each of 500 watts with porcelain enameled steel reflectors furnish ample light. To facilitate the cargo handling to and from ships at night additional lamps with angle type reflectors and cast-iron protectors are located on outside of shed walls at the upper portion of columns. Nine outlets in floor at the edge of dock, are supplied for ships telephones, service and emergency lighting. The power system is operated by 220 volts a.c., and the lighting system by 110-220 volts a.c.

The remarkable saving effected by the use of these concrete trusses as a substitute for steel is emphasized by the cost data presented in Tables I and II. The fact that a steel pier shed costing $387,483 in 1916 was duplicated in the face of an unprecedented rise in material costs, in concrete for $360,010 in 1919, deserves especial comment. An itemized analysis shows that although the unit cost of each item increased, the total costs were unmistakably in favor of the concrete trusses. A rough calculation indicates that had the shed of Pier 6 been executed in structural steel it would have cost at least $560,000. It is therefore evident that the employment of the concrete trusses effected a saving of approximately $200,000 or over one-third of the anticipated cost of the project.

TABLE I.—COST OF SHED OF PIER 6.

	Cu. Yds.	Unit Cost	Total Cost
Columns	764	34 14	$ 26,082.44
Trusses	1852.	43 38	80,356 87
Erection of Trusses	1852	4 04	7,500 13
Walls	1801	45 56	82,123 40
Roof Slab	1623.	32 86	53,720 55
Miscellaneous	.	. .	110,226 64
Total			$360,010 03

TABLE II.—COST OF SHED OF PIER 7.

	Unit	Unit Cost	Total Cost
Steel (Erected)	1993 Tons	81 21	$161,857 05
Concrete Wall	2347 Cu. yds.	22 96	53,879.65
Roof Tiling	1705 Squares	26.00	44,337 10
Miscellaneous	....	.....	127,409 98
Total	....	.....	$387 483 78

The unit costs of forms, reinforcing and concrete for columns, trusses, walls and roof slab are presented in Table III. These figures conclusively show that concrete trusses can easily compete with the usual monolithic concrete construction for each item given. It is possible, however, that the trusses would not show up to such an advantage if comparisons were made on a smaller sized project, as much of the saving results from the efficient use of the removable forms.

TABLE III.—PIER 6. UNIT COSTS IN DOLLARS.

	Forms (per sq. ft.)	Reinforcing in place (per pound)	Concrete (per cu. yd.)	Erection (per cu. yd.)
Columns	.205	068	13.26	...
Trusses	.134	047	11.12	4 04
Walls	.343	.056	16.81	....
Root Slab	.150	.063	15.57	....

The forms for the trusses cost only $13,918, while the cost of reinforcing was $45,831, and the concrete $20,607, making a total of $80,356. Each longitudinal truss cost about $166, while the cross trusses cost about $400 a piece. On a cost basis alone the above figures indicate that for unit built construction work, carrying light superimposed loads, reinforced-concrete trusses have a wide field for development in the future.

DISCUSSION OF THE DESIGN

There are some general comments on this design which have applicability to future work:

Generally speaking, material is used more efficiently in trusses than in beams, particularly when moment rather than shear is the governing factor. In a reinforced-concrete truss, however, the fact that the compression members should have a slight amount of compression steel to provide for unknown stresses, and that the concrete in the tension members cannot be counted upon to carry any tension, together with complicated formwork and erection, it is not evident at first sight that this type of construction will prove to be economical in the end.

Probably the best basis for comparative cost data would be an analysis of costs of two projects built at the same time, one of structural steel and the other of reinforced-concrete roof trusses. A comparison approximating these conditions is furnished by two recently constructed pier sheds on the Canal Zone. The shed of Pier 7 covering an area of 154,000 sq.ft. was built in 1916 of structural steel roof trusses, while the shed of Pier 6, covering 150,000 sq.ft., was constructed with concrete roof trusses in 1919. Since both sheds had practically the same requirements in design the costs of the two projects should be illuminating to those interested in concrete trusses as a type of roofing construction. Before describing the design and construction of Pier 6 shed, a few points relative to concrete trusses will be outlined thus enabling a better understanding of the detailed description which follows:

When concrete trusses are employed instead of beams, obviously it is not practicable to attempt to pour them in place. It is advisable to pour the trusses on their sides and later erect them in the proper position. It is interesting to note that in the truss the cost of the poured concrete alone (exclusive of reinforcing) plus the cost of erection is practically the same as the unit cost of concrete in beams poured in place. Since the unit cost of this item is the same in both forms of construction evidently a slightly economy is effected by the use of trusses as the material is used to greater advantage. This saving, however, is partially offset by the fact that the trusses are calculated as simple structures while the beams are usually figured as being continuous.

The similarity of panels in the trusses is well adapted to use of strong collapsible forms capable of withstanding rough usage, and being used many times with a resulting reduction in cost. On the other hand, although forms for ordinary beams and girders can be used more than once, a large percentage of the timber is lost through wear and tear at each operation, consequently the lumber may last but a relatively short time.

Although the depth of concrete trusses is usually greater for good proportions than an equivalent beam, the amount of reinforcing in the compression members to take care of secondary and erection stresses makes the amount of reinforcing in either design practically the same. The ease with which the reinforcing is placed in the truss while laying on its side is a slight advantage tending to lower unit costs of this item.

Of special interest is comparisons with steel construction. In roof trusses, particularly where the superimposed loads are low, the allowable unit stresses in steel are often small because of the large ratio of length to radius of gyration. In the tension members the total stresses are often so low that even minimum sized sections will have small unit stresses. Were it not for their extreme flexibility rods could be substituted in such cases. Thus it is apparent that although the nominally unit stress in light steel construction is 16,000 lb. per square inch, the actual unit stress is often far less than this. The proportional waste from these factors is much greater in the light construction than in heavier work.

If proper equipment is available and reasonable care is taken, the erection of the concrete trusses should not offer any greater difficulties than steel. As no field riveting is required in erection the cost of this item is eliminated. Since many variables enter into cost of erection. specific comparative cost data between steel and concrete is hard to obtain. The actual cost per cubic yard of erecting the concrete trusses of Pier 6 is given later under cost of construction.

Especial emphasis should be placed upon the low maintenance costs of the concrete trusses as compared with steel, particularly in a locality where corrosion takes place rapidly if the steel is not properly protected. In permanent structures, maintenance costs are of no slight importance. Painting is only a temporary expedient and must be continued throughout the entire life of the structure. It is a matter of common practice in many important permanent constructions to incase steel girders in concrete as a protective measure only. This method has been followed by the Panama Canal in construction of floor systems for piers. The cost of incasing the steel girders in the floor system of Pier 7 was $81,000, this amount being about one-third of the cost of the steel itself. The fact that engineers consider it wise to incur large expenses in initial costs for protective purposes only should therefore receive consideration when comparisons between steel and concrete are made.

The value of goods stored in a structure require a proportionate safeguard against fire, although steel is in no sense inflammable, its rapid loss of strength when subjected to any considerable degree of heat places it in the class of structures that are not considered fireproof. In a strict sense, of course, no material is absolutely fireproof. The low heat conductivity of concrete however, has caused it to be recommended by underwriters as a fireproofing material. From this

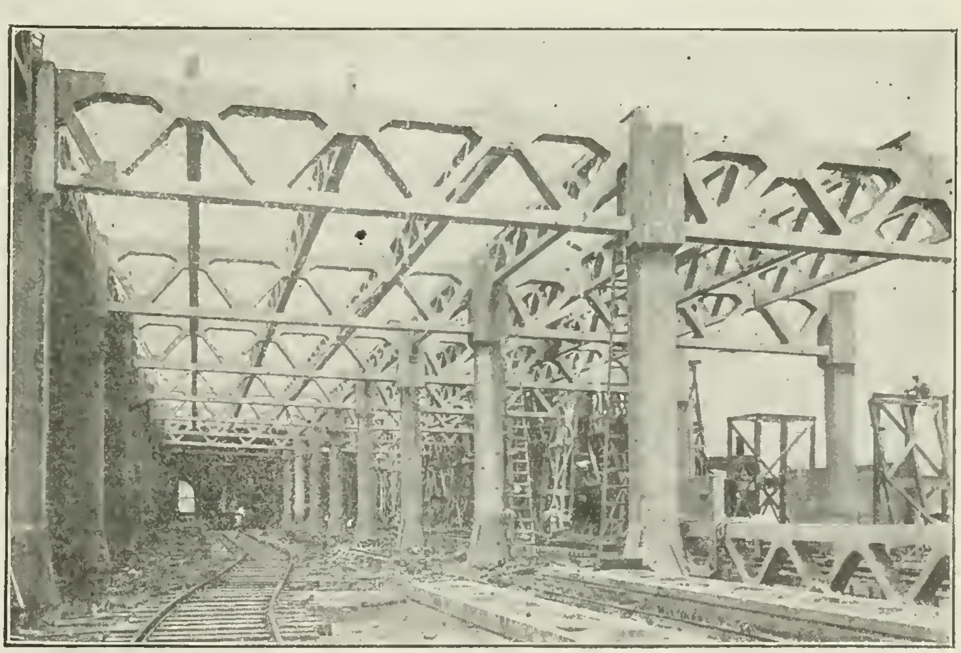


FIG. 8. PRECAST CONCRETE ROOF TRUSSES ERECTED

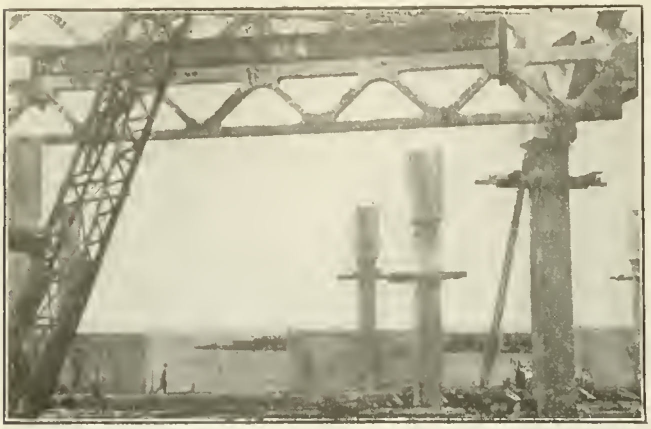


FIG. 9. SWINGING PRECAST CONCRETE TRUSS INTO PLACE

standpoint concrete has a great advantage over steel in the shed construction of piers, where large amounts of goods are stored, usually of considerable value and often of inflammatory character.

A comparison of weights of similar constructions is not of prime importance but may be worth noting as it affects foundation requirements to some degree. The weight of the structural steel trusses, purlins, columns, and lateral bracing was 26 lb. per square foot on Pier 7, while the weight of the corresponding construction, that is, columns and concrete trusses on Pier 6 was 69 lb. per square foot. No great significance is attached to the weight of walls or roof covering, hence they were not included in the above figures. It would naturally be expected that the concrete would be heavier than the steel and although this may be considered a disadvantage it applies with equal force to concrete beams as well.

The radical change from a girder of reinforced concrete to a truss of the same material deserves comment as certain questions arise in the design of the latter that may well be the subject of future investigations. The theory of stresses in the rigid joints, the amount of steel necessary in compression members, the action of the concrete in the tension members and other details of connections are all questions that can only be settled definitely by tests, experience, and possibly additional theoretical data.

Our present knowledge of concrete, however, when combined with conservative assumptions regarding these questionable points is sufficient for safe design. The tension members can hardly be considered as reinforced concrete is conceived of in the usual sense. The concrete is merely a protective coating for the steel although it transmits the stresses from one rod to another by bond.

From a theoretical point of view no compression steel is needed in compression members, but a small amount is undoubtedly justifiable to take care of erection or other possible stresses incident to such construction.

The distribution of stress at the joints is a matter of more or less conjecture. As the practice in steel riveted joints is to make such a detail stronger than the net section of members this practice would naturally be followed in concrete truss design. If sections are taken through various joints it will be found that the shearing stress on the concrete is higher than is ordinarily allowed in usual concrete design, but since the steel rods are carrying the stress from one tension member to another in such instances, it may be considered permissible to ignore the high unit shear and depend entirely upon the steel to take the load. Although stirrups have little value in assisting the concrete in punching shear at the joints they may well be added as a factor of safety.

Recommended Grade Elevation at Galveston

IN accordance with an item in the 1917 Rivers and Harbors Act, the Secretary of War has just transmitted to the House of Representatives a report of a board of engineers from the United States Engineer Department on the further protection of the city of Galveston, Tex., and Galveston Island. The history of the ocean protection work at Galveston is well known to engineers. The latest description appeared in *Engineering News-Record*, Sept. 15, 1919, p. 617. The protecting works consist, in brief, of a sea wall extending practically along the entire south or ocean front of the island, with the exception of a distance of 2,860 ft. at the extreme east end of the island between the end of the 10,300-ft. extension now under way and the south jetty. This sea wall has a top elevation of 17 ft., which is about 3 ft. above the highest water level observed in Galveston at any of the numerous tidal floods. In the original Robert report it was intended to raise the entire level of the city by filling to a grade of 8 ft. at the bay side of the island and rising approximately 1 ft. in 1,500 to the 17-ft. elevation of the sea wall.

The early Robert report further recommended a north and south levee across the island at the western boundary of the city, but neither the levee nor the complete filling behind the sea wall was ever placed. Following the 1909 floor the embankment behind the sea wall was raised so that there was a ridge elevation of + 21 near the south or ocean side, but no extensive grade elevation was carried on on the bay side. It is the opinion of the latest board that the whole grade of the city of Galveston must be raised to an elevation of 14¼ ft. if the safety of the city is to be insured. This is estimated to cost $9,500,000, of which about $6,000,000 would be city expenditure and the rest private expenditure. The board further recommends that the dislodged riprap at the sea wall be replaced, that the ridge parapet wall on the south side of the island be changed and strengthened somewhat, that the sea wall be extended the final 2,860 ft. to the south jetty. This sea wall extension, it is proposed, would be done by the Federal Government.

The board composed of Brig.-Gen. Herbert Deakyne, Colonel Spencer Cosby and Colonel T. S. Reinecke, U. S. A., with R. L. Vaughan, of San Francisco, as special consulting engineer. The report is published in document No. 693, House of Rrepresentatives, Sixty-sixth Congress, Second Session.

Some Municipal Departures

Group insurance for all municipal employees, from city judge to garbage collector, has been established by the city of Albuquerque, N. M., according to *Notes*, the the weekly publication of the Municipal Reference Library of New York City. The same publication is authority for the statement that the City Council of Johannesburg, South Africa, has voted to establish a municipal foundry at an estimated cost of about $5,000.

The Need for an Endowed American Hydraulic Laboratory

As Shown by Clemens Herschel, Consulting Engineer, New York City, in His St. Louis Weir-Test Paper and In an Interview with a Representative of Engineering News-Record.

THROUGHOUT the paper on "An Improved Form of Weir for Gaging in Open Channels," presented by Clemens Herschel at the St. Louis meeting of the American Society of Mechanical Engineers in May, 1920, illustrations were given of the need for better hydraulic testing facilities and arguments were presented for a great hydraulic laboratory—or "observatory," as Mr. Herschel prefers to say. The part of the paper dealing specifically with the weir tests was given almost in full in *Engineering News-Record*, April 8, p. 710. There follow here Mr. Herschel's statements bearing on the need for a great hydraulic laboratory, both as made in his St. Louis paper and to a member of the editorial staff of this journal.

Francis Experiments at Lowell

In opening his paper Mr. Herschel first takes up some historical aspects of the subject, which bring out the great part played by J. B. Francis in practical hydraulics. He then urges that "the only standard water-gaging apparatus is a tank or reservoir." The four paragraphs on these topics are as follows:

> To any one whose memory of hydraulic engineering in the United States, more especially in New England, runs back sixty, or even fifty, years, the standing at that time of the "Francis formula" for weir discharge will appear as little short of infallibility, or of perfection. Courts of justice recognized it as decisive; lawyers of eminence played with it as though it were one of the choicest morsels from the tree of knowledge; it was the last word in gaging the flow of water. And there was reason for such an estimate of its value at the time.
>
> James Bicheno Francis was then easily the leading hydraulic engineer in the United States, with perhaps not over half a dozen of the species in the whole country. Grappling as a young man with the problem of insuring their lawful quantities, day by day, to each of the seven "Proprietors of the Locks and Canals on Merrimack River," at Lowell, Mass., out of the common trough or canals which fed them collectively, he may be said to have been the first one who thus brought order out of the disorder which that communistic distribution of water—naturally accompanying the American system of power distribution canals for manufacturing purposes, and now passing away in favor of the electrical distribution of power—always brings with it. For the purpose named he instituted, about 1850, the series of hydraulic experiments described in his book entitled, Lowell Hydraulic Experiments; and he did this with all the accuracy obtainable at the time and place that has been named.
>
> ### Lowell Experiments on Natural Scale
>
> From another point of view than just described were his experiments of a new order of importance. If any one will consult Weisbach's "Experimental Hydraulik," or the later editions (1855-60), of Weisbach's "Mechanics," he will be surprised at the Lilliputian dimensions of the apparatus then in vogue as the basis of engineering knowledge for use in the practice of hydraulics. Thus, Weisbach's experimental reservoir had an area of 1.35 sq.ft.; and his ajutages were ordinarily about 0.03 ft. in width, or diameter. Of course, we know that Atwood's machine, of extremely moderate dimensions, will measure the force of gravity exercised by the globe which we inhabit; but it requires more confidence in the "horse sense," no less than the technical ability, of hydraulic engineers than is possessed by the average mill owner or his agent to give him confidence in the work of the engineer he employs, should that engineer base it on experiments such as inspired Julius Weisbach or his immediate disciples. So that the experiments of Francis, conducted out of doors on a scale commensurate with their importance, at the Lower Locks near the Concord River, came to the interested "Proprietors" and others as a refreshing and new conquest of mind over matter. They were much more reliable because made on a natural scale; exact, as every one could appreciate, from the care taken in making the experiments and the computations following the experiments, and thoroughly reliable.
>
> At that time arose the expression, "made with a standard weir," which has remained alive to the present day, although, as will presently be seen, there was no propriety whatever for calling any weir a "standard." The only standard water-gaging apparatus is a tank or reservoir. Weirs, orifices, venturi tubes and meters and other water-gaging apparatus and methods can become truly rated only by comparison with tank measurements, and thus thereafter competent to give reliable service. Such comparisons, moreover, establish the *degree* of reliability of the several methods that have been subjected to comparison, and from this point of view the weir has for many years been falling into deserved disrepute.

Elsewhere in his paper, Mr. Herschel says that "it is not often, as yet, that one can get a reservoir of sufficient capacity to supply 46 cu.ft. per second for the period of a hydraulic experiment; and, in the opinion of the writer, the venturi meter is the next best thing." Mr. Herschel then introduces some testimony as to the accuracy of the meter named and follows it by comments on "the imperfections of human abilities"—or variations due to the personal equation, as follows:

> That the venturi meter is of a high order of accuracy has been shown by a compilation by the writer for the Power Test Code Committee of all attainable relevant experiments made with it during its existence of thirty-odd years. A very significant series of tests, made by F. H. Shaw, of a meter at Lancaster, Pa., show an average variation of 0.036 per cent for 41 tests, covering a period of eight years.
>
> ### Variations Due to Human Imperfections
>
> The variations of this record illustrate the imperfections of human abilities rather than those of the meter. The meter, with its bronze-lined throat, surely did not vary in its action, as the 8-year record indicates; nor did the laws of nature, as manifested in the science of hydraulics. Nor can the city water-supply reservoir that was used as a tank be supposed to have varied in capacity.
>
> What, then, did vary? Plainly the accuracy of the human element brought into play.
>
> In another place the present writer has compared the case with the familiar results found on repeatedly measuring, say, with a tape line, a base line. Nothing is simpler in execution, yet, as every engineer knows, no two measurements are ever precisely alike except by accident. The end points have not moved; the steel tape has been compensated each time for stretch and temperature; and yet we take an average of measurements to represent the true distance apart of the end points. It may be argued that the percentages of variance in the two cases are different, and smaller in the case of linear measurements; but, on the other hand, feet are easier to measure than cubic feet per second. The one deals with a simple dimension, the other with four.

At another point, after stating that he forecast the new weir of 1919 by an outline published in 1898, Mr. Herschel illustrates from his own experience the long existing need for a hydraulic laboratory, and cites with feeling a denial of a request he made for aid, the denial being due to the fact that certain funds were available for researches in "pure science" only, thus:

> More particularly was it forecast in the *Transactions* of the American Society of Civil Engineers discussion of 1918 that has been named. So here was a case of an invention, or vision, if one pleases, in practical hydraulics, that had to wait twenty years in the brain of the engineer, for lack of public or private facilities to test it. An attempt to experiment, as has now been done, was made some ten years ago, but was frustrated by the writer being informed by the manager of a richly endowed institution that its funds were available only for research in sciences that had no practical applications. The wonder is that any progress at all is made in this most useful of the arts; treated by the general public, as was Cinderella in the story we all know; while the sisters of the family: astronomy, medicine, physics in general, pure science, even though it degenerate into pseudo-science, go about caparisoned in all the splendor of millions of endowment, and amidst the plaudits of the multitude. One endowment only exists as yet for the development specifically of applied science or engineering—the Engineering Foundation,—begun by Ambrose Swasey, of Cleveland, Ohio; and it is most gratifying to the writer to have been allowed to endeavor to illustrate some of the work of which such an endowment is capable.

INADEQUATE LABORATORY FACILITIES

Although expressing appreciation of the laboratory facilities afforded him for his tests at the Massachusetts Institute of Technology, scattered through the paper are a number of indications of the limitations on the tests due to inadequate facilities. These are brought together here for no other purpose than to reinforce Mr. Herschel's plea for a hydraulic laboratory—one not beset by such limitations. On this subject Mr. Herschel first remarks that the perfection of the laboratory details had been, and rightly, delayed by the war, and that doubtless its "many remediable defects" will be "eliminated in the course of time." A specific obstacle mentioned is "surgings" in the canal supplying the laboratory, indicated in the pump-well surface and pump discharge. The work of "two whole afternoons," Mr. Herschel says, "were rendered useless from this cause."

Another limitation was the turbulence due to the free discharge of the used water. "It would have been gratifying," Mr. Herschel says in his paper, "to remove some or all of these crudities, and also to extend greatly the scope of the experiments; but the limitations of the appropriation available forbade going beyond the work that was actually done."

Besides the limitation due to physical handicaps and inadequate funds, there was also a lack of time caused by the fact that a college was supplying laboratory facilities that could not be extended beyond vacation time. This is regretfully expressed by Mr. Herschel, who then pleads the need for "a hydraulic observatory," as follows:

> A crew of six men, including three observers, with a captain, had been working with the apparatus from Sept. 10 to Oct. 3, 1919, and it was with great regret that the writer gave the order to dismantle the weir because so much remained to be discovered.
>
> But Oct. 3 was Friday, the last day of the week for us. The Laboratory closed at 5 p.m.; and on Monday the regular school term commenced. The appropriation for the work was nigh exhausted and it was high time we quitted the premises.
>
> There was, first of all requiring further investigation, the effect of the radius of the weir crest. Bazin had experimented on a weir composed of two 2:1 slopes meeting at a sharp angle and with a little pipe to indicate pressure "under the nappe," *let into the body of the weir slope upstream from the crest.* This cannot enlighten us very much, but is the nearest approach to our experiments known to the writer.
>
> Our weir crest had a radius of 0.198 ft., and the outside surface was hard and smooth oil paint.
>
> No doubt the radius of the weir crest is a factor in the application of the formula found for weirs of the construction shown in this article, but it remains for other sets of experiments to reveal the limits and detailed effects of this radius.
>
> This illustrates the need there is for a hydraulic observatory, to be conducted on similar lines to those followed for so many centuries in astronomical observatories. There should be somewhere a hydraulic observatory whose work should go on continuously. It requires a trained and experienced crew and more time than we had to do work of full effect. The situation in the United States is much better than it was only twenty years ago when the hydraulic laboratory of Cornell University, the first one built in this country, was constructed. There are now at least half a dozen such laboratories, at Wisconsin, Illinois, Indiana, Iowa and no doubt other state universities, and others are projected. What is next needed is a hydraulic laboratory devoted to hydraulic experiments and sufficiently endowed, so that it may bring certain aims of experiments to a conclusion and so that it may keep continuously employed the persistent efforts of trained men with a proper and permanent apparatus.
>
> An example of the opposite method of proceeding is furnished by the experience of engineers with the venturi meter. Invented in 1886, more than thirty years ago, only a few experiments are as yet available to portray the laws that govern its action. It has accomplished much in the course of its life of thirty years, but it could have accomplished more, and that sooner, had there been a hydraulic observatory to teach its laws and qualities. During the first ten years of its life it was used only by its inventor, which is another illustration of the need of experiments which the working engineer cannot be expected to have opportunity to make in such cases.

This closes the extracts from the paper. In an interview with a member of the editorial staff of this journal, Mr. Herschel brought out some further points worthy of record here.

COLLEGE LABORATORIES DO NOT MEET NEED

Prior to the Francis experiments at Lowell, the few hydraulic experiments that had been made by Gugielmini at Parma, Italy, and by Dubuat and others in France were on a small scale and were designed to establish the laws of hydraulics generally rather than to combine their discovery and their application to practical problems. At Lowell, as has been brought out by the foregoing citations from the paper, the motive of the tests was the measurement and division of water for power. Later on, at Holyoke, Mr. Herschel, by convincing the water-power owners that a testing laboratory would pay for itself through tests made for outsiders, was enabled to make the tests that gave the world the venturi meter.

England, Mr. Herschel observed, has done nothing along the line of the "hydraulic observatory" idea, while Germany has confined its efforts to waterwheel or turbine tests by manufacturers, like the many that have been made in the United States. Cornell University gave this country its first great college hydraulic laboratory, and its example has been followed by many other technical schools. But all that has been done here by water-power owners, pump and turbine manufacturers, and the colleges does not meet the need, Mr. Herschel urges, for a great "hydraulic observatory," free from such physical, time and financial limitations as were encountered in the weir tests described in his paper.

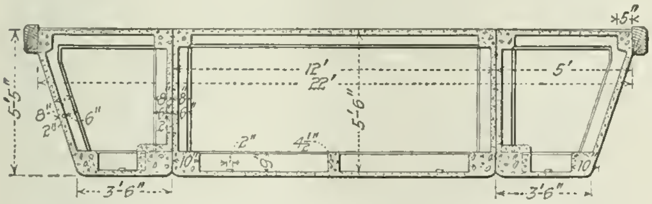
Happily, Engineering Foundation was able and willing to come to the aid of the Power Test Code Committee, last autumn, with the funds that established the principle of his new weir, Mr. Herschel said. But the funds were limited, and for some two years to come Engineering Foundation has all available test funds committed to tests on the fatigue of metals.

Later on, Mr. Herschel hopes that Engineering Foundation may have funds to devote to hydraulic studies. By that time, the new power plants at Niagara Falls, on both sides the river, will be completed and one of the old plants, it is hoped, may be made available for continued hydraulic tests. Pending both these hoped-for developments, Mr. Herschel, through the columns of *Engineering News-Record*, urges engineers, manufacturers of power, pumping and other hydraulic apparatus, and public and private users of water and water power, to work, individually and collectively, for a "hydraulic observatory" worthy of America.

Articulated Concrete Barge for Dredge Crane

A CONCRETE barge capable of being separated longitudinally in three parts so as to permit the central part to pass through narrow rock has been built for the South Level Commission, Ely, England, to be used to carry a dredging crane for the drainage work on the River Ouse. The barge is described in *Engineering* (London) April 30, 1920.

It consists in effect of three reinforced-concrete barges having an over-all length of 72 ft., an over-all beam of 22 ft., and a draft when fully loaded of 3 ft. 9 in. The center barge is of rectangular section 12 ft. wide and the two outside sections trapezoidal as shown in the accompanying sketch. The outside sections are connected to the middle one by four steel beams fitted with necessary bearing plates and secured by bolts. These sections are readily detachable so as to allow the passage of the vessel through the lock, the central section then carrying the crane equipment on a draft of 4 ft.



SECTION THROUGH THREE-PART CONCRETE BARGE

This barge was built during the war and at a time the quotation on steel barges of the same general design was £1,500, whereas the actual cost of the concrete barge was £839. The concrete is a $1:1\frac{1}{3}:2\frac{1}{3}$ mixture of sand and broken granite. The crane is mounted on the central section on a square casting about 7 ft. and specially heavy crossbeams are provided under the bearing. The vessel was designed by E. G. Crocker, consulting engineer to the South Level Commission.

Chicago Plan Commission Report on Ten-Year Activities

TWELVE public improvements promoted by the Chicago Plan Commission and now being carried out represent the work of the first ten years of the commission, as outlined in its recent report for the decade 1909-1919. These improvements comprise the widening and extension of Michigan Ave. ($14,900,000), Roosevelt Road ($8,303,000), Western Ave., Ashland Ave. and Robey St.; the extension of Ogden Ave. across the city to the lake front; the widening and double decking of South Water St.; the West Side railway passenger and freight terminals and street approaches; the lake front improvement from Grant Park south to Jackson Park; the Illinois Central R.R. terminal reconstruction and electrification; the acquisition of 14,250 acres of forest preserve, and the development of an outer highway system.

Toward the cost of these improvements the people have voted $61,500,000 of bonds; the special assessments for Michigan Ave. and Roosevelt Road amount to $8,125,238; the railway companies have agreed to spend $162,091,350, and the Forest Preserve Commission has spent $5,316,762. All these projects are expected to be completed within the next five years, except the electrification of the Illinois Central R.R. and the lake front improvement south of 39th St.

Other projects under consideration include the straightening of the Chicago River to give additional north and south thoroughfares; the lake front boulevard north from Grant Park to Lincoln Park; the West Side post office ($6,000,000 site); widening and improvement of streets in the business district; the civic center, and the zoning and housing problems.

A comprehensive project for a "Plan of Chicago," providing for a systematic series of improvements on the basis of public welfare and civic development, was originated several years ago by the late Daniel H. Burnham, the Chicago architect whose fame became world-wide as the result of his architectural scheme for the Chicago Columbian Exposition of 1893 and his later work in city planning. With the backing and financial assistance of the Commercial Club the plan was developed under his direction and was presented to the city in 1909 with the request that a commission should be appointed to study the plan and to recommend what parts should be carried out first.

The Chicago Plan Commission was appointed on Nov. 1, 1909, by the late Mayor Fred A. Busse. It is a permanent department of the city government and its members are appointed by the mayor and approved by the City Council. Its work lies in the design and promotion of public improvements included in the "Plan of Chicago." In its first ten years, however, the commission has received only $100,000 from the city for its maintenance and work, so that it could not have accomplished much except for the assistance of the Commercial Club, which has contributed about $167,000. Including $85,000 expended for the original plan, $52,000 paid to the technical staff before the commission was appointed, and $12,000 subscribed for 1920, the Club has contributed over $300,000 for the "Plan of Chicago." The commission is composed of about 300 members, including engineers, architects, business men, and city officials. Charles H. Wacker is chairman; Frank I. Bennett, vice-chairman, and Walter D. Moody, managing director.

The Professional Spirit in Engineering Education

—An Opportunity for Service

By C. R. Mann

Chairman, Advisory Board, General Staff, War Plans Division,
War Department, Washington, D. C.

THE achievement of a worthy professional recognition by engineers is still the subject of much discussion. Certain suggestions as to how engineering schools could proceed to develop men of professional attainments were presented in the study of engineering education which was made in co-operation with the national engineering societies and the Carnegie Foundation for the Advancement of Teaching and was published in 1918. The conclusions of this study were drawn and the manuscript prepared for the printer before the nation had proceeded far in its participation in the world war, or had time to analyze its experiences. The conclusions therein as to the necessity for beginning the study of engineering with real jobs and as to the importance of considering questions of values and costs in engineering instruction are still valid. But there is one additional fundamental element which was not clearly discerned before the war but which should be added if the finest results are to be obtained in the way of professional spirit among engineers.

> Whether the national spirit of service remains free and active, or is pent up until released by the next war, depends largely upon public education
>
> Current schooling is conspicuously designed to inspire the individual to make the most of himself for the sake of his own success. The required training must inspire the individual to make the most of himself for the common good.

The Spirit of Service

The world war opened our eyes to a new vision. However satisfied and happy and contented we were before the struggle, there was a thrill and an inspiration about the war work that made every man who served able to do more work and better work than ever before. There was a resurrection of the pioneer soul of our forefathers, a release of the spirit of service and sacrifice which converted a relatively humdrum existence into a life of reality and grim adventure. The joy and the tragedy of it permeated every household. We lived as a united nation for a few months. Then the crisis passed and the commonplace routine settled down once more.

No one wants war. Yet millions would feel that life was more worth while if the spirit of service and sacrifice that prevailed during the war could continue to prevail in time of peace. Nor is it inconceivable that this might be so. The problems and perplexities of peace, though less dangerous to life and limb, are no less difficult of solution. Their mastery is no less a challenge to the soldierly virtues, as defined by William James in his "Moral Equivalent of War," than is the winning of a battle or the conquering of a continent. Because they are less spectacular, they demand even greater determination, resourcefulness and the endurance that makes defeat impossible.

Whether the national spirit of service remains free and active or is again pent up until released by the next war, depends largely upon public education. And since the tone and attitude of public education is intrinsically determined by the professional schools, there exists at the present moment for these schools the finest opportunity that ever came to any institutions to contribute to the upbuilding of a democratic nation. Quick action will bring larger returns because the crust of the commonplace is rapidly forming over the pioneer spirit; and the thicker the crust, the harder to shatter it and liberate the creative energy within. Like all elemental things, the thing that needs doing is very simple. It consists in first searching out the fundamental distinction between teaching as it is and teaching as it must be to produce the desired result, and then modifying curricula and instruction accordingly. As a beginning of this search, it is suggested for discussion that the essential fundamental distinction sought may be thus expressed: Current schooling is consciously designed to inspire the individual to make the most of himself for the sake of his own success. The required training must inspire the individual to make the most of himself for the common good.

The former leads the student to think in terms of competition—of "doing" the other fellow; it gives rise to such ever-present expressions as "what do I get out of it?" and "I should worry." The latter emphasizes co-operation, develops team-play and is expressed in the motto "United we stand, divided we fall." The former encourages working for wages and profits; the latter makes the joy of production uppermost and demands just apportionment of rewards.

A practical example will help to make this distinction clearer. The design of a warehouse is a typical project in the professional courses as now given in engineering schools. The student is given in class a verbal or written specification of the conditions to be met—the nature of the chosen site, the transportation facilities, the size, the load to be carried and the limits of cost. He then goes to work with pencil and paper, under the guidance of the instructor, to make a plan. In the process he looks up necessary data in standard tables and learns much about uses of various materials and about standard practices in warehouse construction. The work is criticized by the instructor, but the building is never built.

From paper problems such as these the prospective engineer gains much technical information and a fair degree of technical skill in drawing and figuring. His imagination is given a chance to function and his ingenuity is put to a test. As a result he is better prepared to undertake a similar piece of work for an industrial firm or to secure employment in an engineer's office. Through a series of similar exercises he ultimately becomes a technical expert who can earn his living in an eminently useful calling. Still, the fact remains that relatively few of the graduates of engineering schools win recognition as professional men.

Problems from Real Life

In contrast with the current type of work just described, suppose that the professional studies in engineering schools were directed toward solving the problem of making the immediate environment of the school the best possible place in which to live. Instead of merely learning the technique of material construction, the student would investigate such public services as the water supply, transportation, electric light and power, markets, food supply, sewerage, disposal of waste, or any other of the many activities that contribute to the physical comfort of communities. The prospective engineer would then be compelled to appraise the operation of all these agencies, both in terms of public value received in proportion to cost and in terms of scientific and technical perfection. He would have to recommend changes in existing plants, to project and design new construction and to suggest reorganization of present systems of transportation, marketing, heating, lighting, and the like. He would thus be constantly solving not only the problems of material construction, which usually occupy practically all the time in current instruction, but also those more fundamental problems of relative values and costs from the point of view of public welfare.

> A technical school surely does not realize its true destiny when it is merely a factory for quantity production of standardized, technical and intellectual skill.
>
> The engineer builds for people, not for individuals.
>
> The crust of the commonplace is rapidly forming over the pioneer spirit.

This idea is not new. About 40 years ago, a professor of civil engineering at Columbia University, aroused by his own observation of the inconvenience of transportation in New York, set himself the problem of working out a system of rapid transit. He studied the problem himself and for a number of successive years set portions of the problem as exercises for the senior class. Eventually one student developed a profound interest in the study and that young man became the chief engineer of the subway system. Other schools have made similar studies to a limited extent and in every case they have found that students work with a new spirit on projects of this kind. Not only do they learn rapidly, but they also secure some conception of the complexity of the problems of values and costs. In addition they experience the joy of contributing by constructive work toward making the community a better place to live in.

Problems of the sort suggested exist in plenty in every community, large or small. The delivery system in a small town is usually a splendid example of inefficiency and waste. There are perhaps three or four groceries and markets, each of which maintains a complete system of delivery to all parts of the town. Wagons make long trips with few parcels. An organization of the delivery system could easily be made, much to the benefit of both consumer and dealer. Similarly, in large cities like New York, Boston or Chicago, traffic is almost impossible during the working hours because of the lack of system and organization in the handling of freight. Co-operation, careful planning, a good system could reduce the congestion, reduce cost and expedite the handling of goods. Individual dealers are not likely to take the initiative in developing such a co-operative system; but a simple and sensible scheme, worked out solely from the standpoint of public welfare by a disinterested institution, would have a large chance of being accepted and quickly put into effect.

The possibilities in the way of developing the spirit of service which is after all the true professional spirit, through service of the public in the manner suggested are without bound. Suppose that some engineering school should set itself the problem of determining how the state or town in which it is located could be made more productive and in every way a better place to live in. Instead of confining its efforts largely to developing technical skill and imparting information to its students, the institution would organize its instruction so that the students would secure their technical skill by solving problems of vital interest to the public. What are the mineral resources of the state, and what steps might be taken to utilize them for the public benefit? Are the industrial resources of the town fully developed? What incentives could be applied to stir local initiative for their further development? The great project of building state highways is now being formulated. How can this achievement be co-ordinated with industrial production so as to yield the greatest returns to the people of the state? What measures of public health and what legal enactments would tend to improve sanitary conditions and commercial activities? If engineering schools should undertake to make practical scientific studies of problems like this, and if they should always cling close to the ideal of public welfare, it is safe to predict that larger appropriations and more generous public support would soon solve the problem of teachers' salaries, that a finer and freer professional spirit would burst forth among the students and that the creative energies of the people would be released in greater production. All this would inevitably result in greater prosperity and a loyalty to the commonwealth and the nation equal to that called forth by the war.

New Educational Trend Apparent

The signs of the times indicate that work of this kind is rapidly gaining in favor in graduate and professional schools. The National Research Council, through its states relations section, is now studying methods of organizing for this end. The University of Wisconsin is conducting work of this type in regard to irrigation of farm lands. It is a great adventure on which they are entering and the possible returns are enormous. The spirit of service and sacrifice is contagious; it is, perhaps, one of the instinctive motives of men. It operates with a power that brooks no defeat. If the cultivation of that spirit were sanctioned by professional schools as the distinguishing mark of the professional man, the lower schools would rapidly follow suit. Then creative imagination would find freer fields for exercise, pent up energies would be released in constructive work, and there would be more artists and fewer artisans, more scholarship and less scholasticism.

A technical school surely does not realize its true destiny when it is merely a factory for quantity production of standardized, technical and intellectual skill. Professional attainments cannot be gaged with a stop watch or measured in terms of student clock hours and semesters. Nor are these practices longer needed. University professors were assigned by the hundred to positions of great professional responsibility in the war organization. They have demonstrated their compentency as experts in developing the machinery of destruction and death. Surely they are no less capable of leadership in discovering more intelligent processes of production and life.

For centuries the clergyman, the physician and the lawyer have ministered to the intimate personal longings and aspirations of men. Unquestionably, this fact had large significance in determining the popular recognition of these three oldest of the learned professions. The engineer builds for people, not for individuals. His work is necessarily impersonal and without intimate association with those he serves. Yet when he works, as thousands of engineers did during the war, under the inspiration of a spirit of service for the public good, no one questions his status. All are ready to do him honor and grant him credit for public service well done.

Organic Impurities Injure Concrete

TESTS made in the Structural Materials Research Laboratory with the co-operation of Lewis Institute and the Portland Cement Association show that the long recognized injurious effect on concrete of organic ingredients is a fact. These tests, reported by Prof. Duff A. Abrams at the recent meeting of the American Society for Testing Materials, give quantitative results. It was impossible to secure natural sands containing graduated percentage of organic impurities for a study of the quantitative effects of such impurities, so the laboratory prepared aggregate samples in which known quantities of organic impurities were present by applying tannic acid as a surface coating in quantities up to 0.4 per cent by weight. Compression tests were made on 3 x 6-in. concrete cylinders. The mix varied from 1:5 to 1:2; the size of aggregate ranged from fine sand to a ¾-in. graded aggregate. Tests were made on all mixtures and sizes of aggregate at ages of seven days, twenty-eight days, three months, one year, and two years. Specimens were stored in damp sand. The series included about 2,000 concrete tests. The following are the principal conclusions from the investigation:

> The strength of concrete was reduced for all percentages of tannic acid, for all mixes and ages covered by these tests. Less than 0.1 per cent of tannic acid in terms of the weight of the aggregate may reduce the strength of the concrete to one-half its normal value.
>
> Lean mixtures are more affected by tannic acid than rich ones.
>
> The mixtures from the finer aggregates are less affected by tannic acid than those from the coarser aggregates.
>
> All of the effects mentioned above may be summed up by saying that the reduction in strength of concrete is a function of the *concentration* of tannic acid in the mixing water. An equation is given which represents this relation for the 28-day tests.
>
> The results of these tests indicate that the wetter consistencies would be less affected by the presence of organic impurities than the drier ones.
>
> The strength falls off rapidly for small percentages of tannic acid and less rapidly as higher percentages are reached.
>
> The 7 and 28-day strengths are reduced to a greater extent by tannic acid than at ages of 1 and 2 years.
>
> Some of the 1:5 mixes in which the higher percentages of tannic acid and the finer sands were used (2 to 3-per-cent solution) disintegrated before the time of test. The 1:7 mixes (3 to 5-per-cent solution) were destroyed in removing the molds.
>
> The tests confirm the results of many other investigations made in this Laboratory in showing the fundamental dependency of strength of concrete on the quantity of mixing water as expressed by the water-ratio.
>
> The strength of concrete (stored in a damp place) both with and without tannic acid increased with age. The strength for a given condition was a logarithmic function of the age.

Recommends Study of New Terminal for Hudson Bay Railroad

FURTHER study of Churchill Harbor, instead of Nelson, for the northern terminus of the Hudson Bay Ry. is recommended in the report just made by the Canadian Senatorial Committee appointed three years ago to study the possibilities of the Hudson Bay region and the feasibility of the railroad. The committee recommends that the Government make no further expenditures on the development of the harbor at Nelson until a thorough study has been made of the possibility of building the line to Churchill Harbor and making developments at that point, which is about 150 miles northewest of Nelson, at the mouth of the Churchill River. The committee also states that the Hudson Bay route is feasible and will probably be profitable in time, pointing out great natural resources from the fishing and mining industries.

The committee states that "sufficient care was not taken in the selection of Nelson as the terminus for the Hudson Bay R.R., and that the Government should not make further important expenditures on this port without first making a new and thorough examination as to the relative merits of Churchill and Nelson as the terminus for the railroad." To utilize Nelson, however, many witnesses stated that it would be necessary to build about eighty miles of railroad across country which included thirty miles of morass land over which it would be almost impossible to build a roadbed. This was denied by other witnesses who claimed that a good and comparatively short route could be obtained by deflecting from the present route some fifty miles south of Nelson. Advantage is claimed for Nelson as "an absolutely land-locked harbor entirely protected from wind from any direction," while it is pointed out that Nelson is exposed to easterly gales. In conclusion the committee recommends the appointment of a sub-committee of engineers to examine the route to Churchill and ascertain whether it is practicable, in the meantime extenting the rails to Nelson but suspending harbor work at that point.

It is stated that there is a great opportunity for the development of a valuable fishing industry and a large mining industry, and that mines already discovered in the Hudson Bay district are of such nature as to indicate the existence of great mineral wealth. Navigation is open at least four months in the year and may be extended.

Mare Island Pontoon Crane of 150-Ton Capacity

Heavy Structural Features Include 1,000-Ton Step Bearing and Long Luffing Screws Without Intermediate Bearing—205 Tons Lifted in Test

A 150-TON pontoon crane put in service last year in the Navy Yard at Mare Island, Cal., is a noteworthy piece of heavy structural design. The main step bearing which carries the weight of the rotating element has a maximum load of 1,000 tons. Luffing the jib is done by a pair of 9-in. screws unsupported for 37 ft., which engage a crosshead. The crane lifted and swung a 205-ton load of armor plate in the acceptance test. A complete power plant is contained in the hold, so that the crane can operate independent of shore connections, but no propelling machinery is installed and a tug is required for moving the machine about except as it can pull itself along the waterfront by means of shore or anchor lines to the motor-driven capstans. Its total floating weight is about 2,600 tons.

During the year in which this crane has been in service at Mare Island it has been busy practically all the time, sometimes sixteen hours out of twenty-four. It first gained popularity with yard officials because it could handle the smaller boats that otherwise would have required the use of the drydocks, but in addition the placing of boilers, guns, armor plates and other heavy equipment has been done so much more easily with this crane than was formerly possible that it is now said to be one of the handiest pieces of equipment at the yard.

The steel pontoon which forms the support for the superstructure is 85 by 140 ft. in plan and 15 ft. deep. Full-depth collision compartments entirely surround it and there are also longitudinal and transverse bulkheads in the interior. Compartments for the boiler plant and generating unit are in the after end, and have an open hatchway covered by a deck house. One end of this deck house is enclosed so that it may be used as the crane office.

The superstructure is located on the longitudinal center line of the pontoon with its center 42 ft. from the forward end. A fixed tower 43 ft. high, which is secured to six bulkhead plates extending through the deck of the pontoon, surrounds the lower part of the rotating structure, called the pintle. The entire rotating element of the crane consists of three parts, the pintle section, the machinery section and the jib. The pintle section rests on a heavy step bearing attached to the deck, and extends above the top of the fixed tower, within which it rotates. The jib is hinged to the front side of the pintle section 60 ft. above the deck with hinge pins 24 in. in diameter. At the rear, the pintle section is extended to form a support for the machinery section in which all of the operating units are located. In this location the machinery helps to counterbalance the jib, thereby reducing the weight of concrete ballast required.

All of the motions of the crane are controlled from the operator's cab which is located on the rotating structure just below and to the right side of the jib hinge pin. The jib is luffed by a screw-operated crosshead which travels in vertical guides at the rear of the machinery section and is connected to the upper chord of the jib by heavy links. These links have 18-in. pin connections at both ends. The jib is approximately 125 ft. long and when in its highest position its top is 190 ft. above the water.

The main hoist, designed for a capacity of 150 tons at a radius of 105 ft., which gives a reach of 62.5 ft. beyond the fender line, consists of two separate units, arranged to be connected when handling capacity load. Their hook blocks are suspended from a fixed position on the jib and operate at a rate of 4 ft. per minute from any position between 25 ft. below to 95 ft. above water level.

A hook block for handling loads under 25 tons is suspended on a trolley which travels along the under side of the jib. This hoist has a vertical range from 25 ft. below to 130 ft. above water level. It can handle a capacity load at a speed of 12 ft. per minute or a 5-ton load at 60 ft. per minute. The jib when carrying the maximum load can be luffed from its lowest position to the highest in 15 min., and in the reverse direction in about 11 min. A complete rotation of 360° under full-load conditions requires between 4 and 5 minutes.

Each of the two 75-ton main hoist blocks is operated by a winding drum connected by three spur-gear reductions to a 40-hp. series-wound motor. An electrically operated disk brake is attached to the motor pinion shaft, and so connected that it sets instantly when the current is cut off the motor. In addition to this, there is also a mechanically operated band brake for emer-

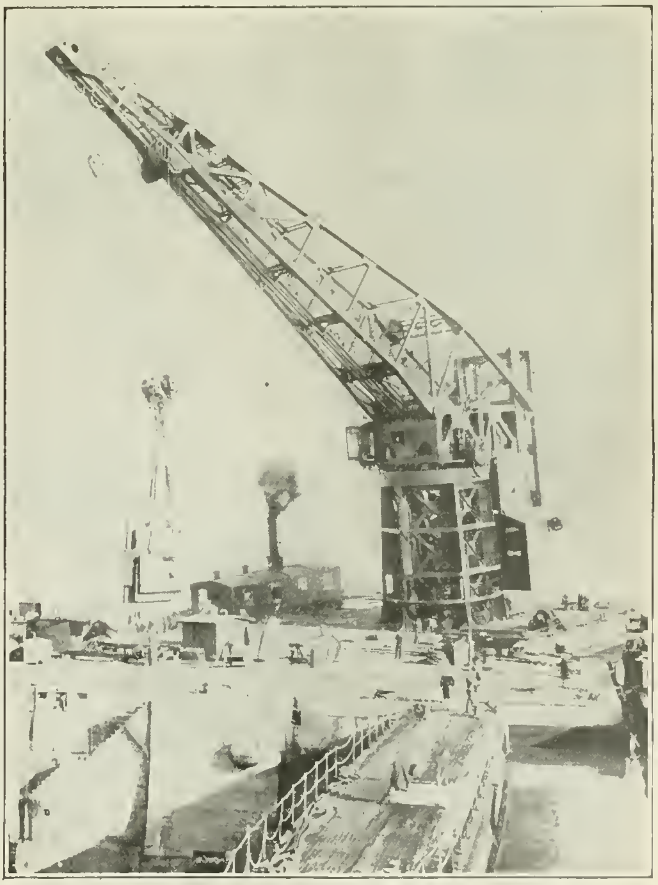


FIG. 1. MARE ISLAND 150-TON FLOATING CRANE MAKING A FULL-CAPACITY LIFT

gency use only, this brake being attached to the intermediate shaft. Two 1½-in. steel cables lead from the drum around deflecting sheaves to the 75-ton hook blocks. The gearing is proportioned for a hoisting speed of 4 ft. per minute with a 75-ton load and 8 ft. per minute at half load. The two main hoisting units are located in the lower part of the machinery section of the rotating structure. When it is desirable to operate these two units simultaneously they may be positively connected by a jaw clutch. A master switch in the operator's cab operates the magnetic switch controller which regulates the hoisting mechanism. The magnetic controller is provided with a dynamic braking device to give positive and accurate control when lowering heavy loads.

The 25-ton auxiliary hoist block is operated by a hoisting unit located in the machinery section of the rotating structure directly above the main hoist units. The motors are of the same capacity, and control and automatic braking devices are similar to those of the main hoist. This block is suspended from a movable trolley which travels along the under side of the jib.

The mechanism for moving this trolley is located over the auxiliary hoisting mechanism. Because the jib, in its highest position, is nearly vertical, the front trolley ropes are required to take practically all of the hook load, and with the boom in its upper position the load is raised as the trolley is moved toward the outer end of the jib. On the other hand very little pull is required in the reverse direction. The mechanism for this motion includes 40-hp. motors and control equipment similar, in the main, to the other two units.

The jib is luffed by a crosshead moving in vertical guides at the rear of the rotating structure which connects by two links to the back of the jib. The vertical movement of the crosshead is controlled by two screws, connected by bevel and spur gearing to two 40-hp. series motors which have the usual braking and control equipment. The thrust on these screws is carried by two conical roller bearings, each of which is designed for a load of about 450,000 lb. The screws, of forged steel, are 9½ in. in diameter and about 52 ft. long, with sufficient thread to produce a crosshead travel of about 37 ft. in about 15 minutes.

The entire rotating structure is supported by a single step bearing secured to the deck of the pontoon in the center of the fixed tower. Under full-load conditions this bearing carries a horizontal thrust of about 700,000 lb. and vertical pressure of about 2,000,000 lb., which is carried on three disks, two of bronze and one of steel, all 44 in. in diameter. Oil is pumped between these disks through a hole in the axis from which it

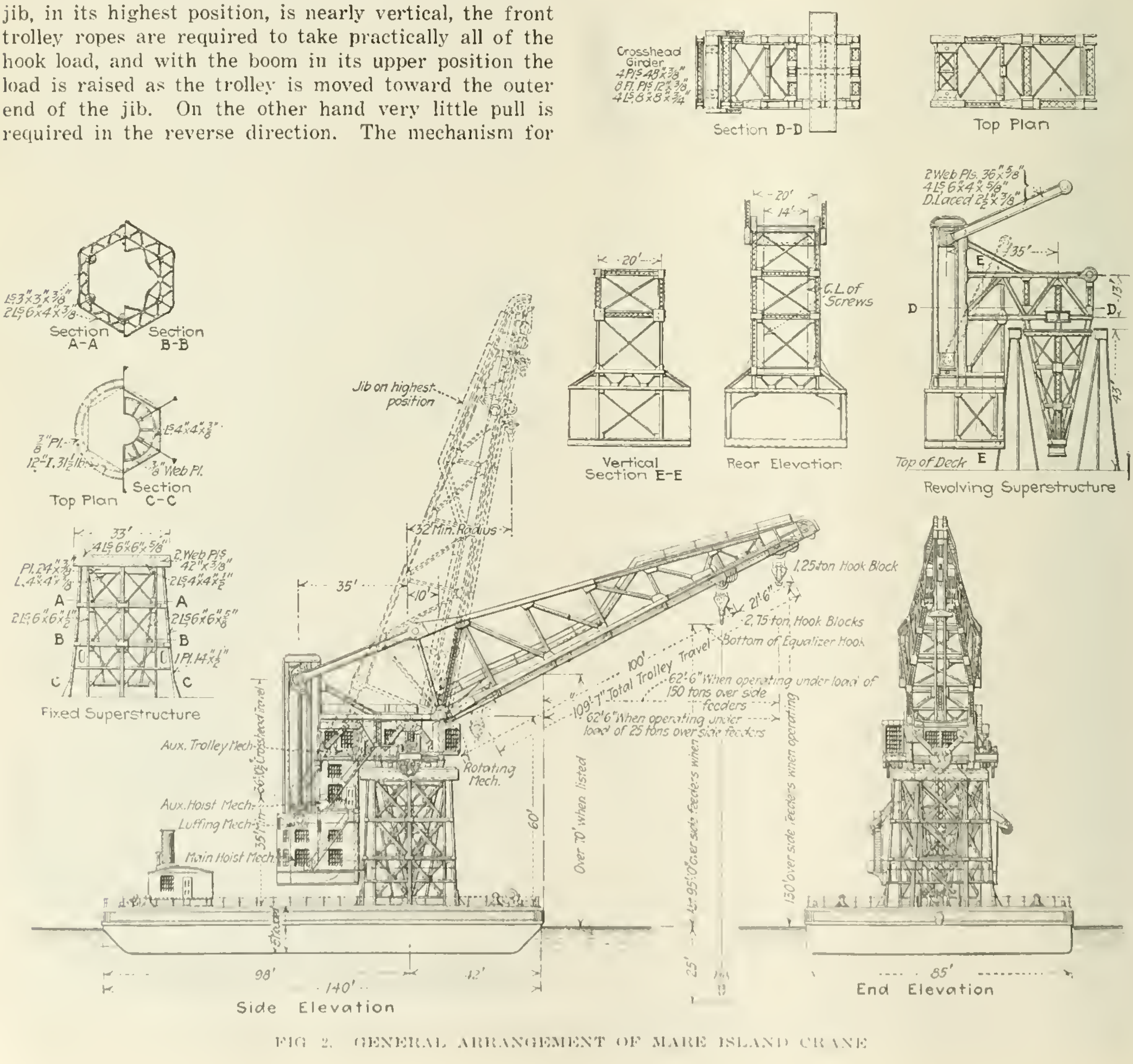


FIG. 2. GENERAL ARRANGEMENT OF MARE ISLAND CRANE

flows outward in radial grooves which do not reach quite to the edges of the plates. Thus, so long as the pressure is maintained the heavy rotating element is virtually floating on a film of oil.

The oil pressure system is very simple, consisting of a 15-gal. reservoir for lubricating oil and a hand pump which is given attention only occasionally. At first there was a high rate of oil loss from this bearing but after the careful adjustment of the copper packing glands the quantity used was reduced to about 5 gal. per month. When the hand pump is operated after the oil pressure has been released, the rotating element can be seen to rise about $\frac{1}{16}$ in.

The bearing proper, which is carried on the discs, consists of steel castings in the form of a ball and socket to ensure perfect alignment. The ball or upper casting is finished on top as an eight-section jaw clutch. The upper half of this clutch is the bottom casting on the pintle and the two parts are held together by the weight on the bearing. Play of about $\frac{1}{8}$ in. was purposely left in the fit between the two sections of the jaw clutch.

The rotating structure is maintained in vertical position by a horizontal roller bearing ring completely enclosing the pintle section of the rotating structure. Sixty cast-steel rollers held in a circular frame comprise this horizontal bearing. A circular tread surrounding the rollers is secured to the top of the fixed structure about 43 ft. above the deck. A bevel gear ring 29 ft. in diameter is secured to the fixed structure and meshes with two bevel pinions carried on the rotating structure at diametrically opposite points. The pinions are geared by three reductions of cut spur gearing to separate 40-hp. series motors, and the gearing is proportioned to

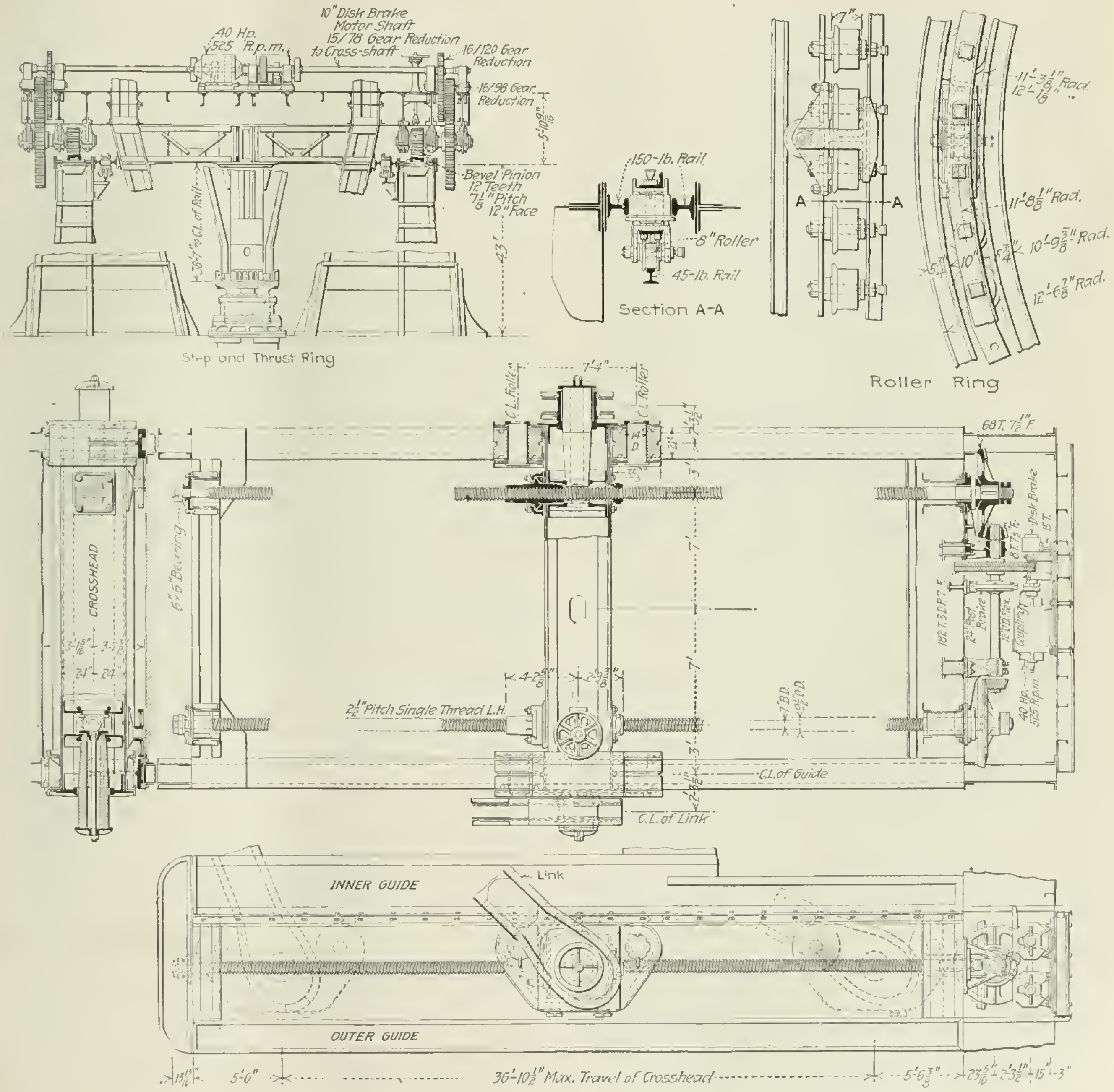


FIG. 3. STEP BEARING THRUST RING AND LUFFING SCREWS

produce a complete revolution in 4 min. under full load.

Electric current for operating the motors and lights is supplied by a cross-compound marine engine direct-connected to a 150-kw. 250-volt d.c. generator. The power leads from the main switchboard terminate in contact shoes attached to the fixed tower and engaging collector rings on the rotating structure. Steam for the engine generator set and for two steam-driven windlasses is supplied at 150-lb. pressure by a 200-hp. Scotch marine boiler.

Four capstans driven by 15-hp. motors are located at the corners of the pontoon. Internal gearing on these capstans is so arranged that the change from high to low speed is effected by simply reversing the motor. They exert a rope pull of 3,000 lb. at 40 ft. per min. At each end of the pontoon on the longitudinal center line is a steam anchor windlass designed to handle a 2-in. navy stud-link chain, which is stowed in a locker built into the pontoon directly underneath. These machines are driven by 10 x 10-in. steam hoisting engines.

The crane mechanism and crane structure itself were built by the Wellman-Seaver-Morgan Co., while the pontoon was constructed at the Mare Island Navy Yard from plans supplied by the contractors. The crane superstructure was shipped in pieces from the company's fabricating plant at Cleveland, Ohio, the largest single pieces shipped being the links connecting cross-head and jib. The assembly was made by the manufacturing company's force at Mare Island and the crane was put in service in February, 1919. The work was carried out for the Bureau of Yards and Docks, under the supervision of officers of the Civil Engineer Corps, U. S. Navy.

Hydro-Electric Power Development Begins in Nova Scotia

Provincial Government to Control Power Through Commission—Initial Project Just Started Near Halifax

IN THE Dominion of Canada there are two distinct policies of government control of hydro-electric power: One, represented by the Province of Ontario, vests all control of development and sale of power in a government commission; the other, represented by the Province of Quebec, puts on the government the duty of investigating hydraulic possibilities and developing storage, but licenses private companies to build and operate plants. Both systems in their respective provinces have been in successful operation for some years and their relative desirability is a subject of continual argument. One other province, Nova Scotia, just before the war adopted the Ontario idea; that is, the government ownership of hydro-electric plants, but it has only this year started the first practical application of the system by the construction of a plant near Halifax to supply that city with power.

Prior to 1914 no systematic investigations of water powers or water resources had been undertaken in any of the Maritime Provinces, but in that year, as a result of discussion in the Legislature of various power company charters, Nova Scotia appointed a water power commission to investigate the power resources of the province. This commission, in co-operation with the water power branch of the Interior Department of the Canadian government, started in 1915 to investigate the water-power possibilities of Nova Scotia. This work has been going on for about five years and involves water gaging, mapping, and study of prospective projects. The commission at the same time has comprehensive authority to develop power from water power and other sources as a public undertaking. It is in effect a trustee for the various municipalities of the province to supply power in bulk at actual cost. The distribution and sale of power within individual municipalities are matters which each municipality may take into its own hands. The operations of the commission are to be financed by the commission issuing its own bonds guaranteed by the province or by direct loans from the province. The commission's obligations for interest, sinking fund, maintenance and operation will be met by the sale of power, and the municipality's obligation to the commission is merely to pay the actual cost of power delivered to it by the commission.

While a number of the larger rivers of the province and a great many small sites have not yet been completely investigated, it is tentatively suggested that 300,000 hp. is the commercial capacity of the larger water-power sites of the province. There are no large rivers in Nova Scotia, but what there are are short and steep and provided with many lakes, especially on the higher elevations. These facts added to the advantage of a large rainfall offer a considerable inducement to the development of numerous comparatively small plants connected together in groups throughout the province. Such a construction will probably be the policy of the commission. A network of transmission lines are contemplated covering the greater part of the province, linking up and drawing energy from water-power and steam plants located at stragetic points. Furthermore, this system may be connected with a similar one in the Province of New Brunswick.

The first development to be undertaken by the Nova Scotia Power Commission is the development of about 12,000 hp. supplying the City of Halifax. This involves the storage of water on the Northeast River and the Indian River, which are west of Halifax and empty into the Atlantic Ocean at St. Margaret Bay. These two rivers are to be joined together, first into one power station under heads of 100 and 150 ft., and the joint water utilized again lower down at tidewater under 100-ft. head. The numerous lakes and the head-waters will be utilized to the fullest extent for storage purposes and some of these dams are now under construction. In general the design and the plants themselves consist of concrete head dams, wood-stave flume lines from 6 to 10 ft. in diameter, and concrete power stations equipped with vertical pipes and waterwheels. The present installation provides for transmission on steel towers to Halifax, 18 miles, at the generation voltage, and for distribution in Halifax from a receiving station for purposes of traction, light, and industrial use. The estimated cost of the entire development is something over $1,000,000, but only one of the upper dams and the lower dam are now under contract. The estimated cost of the present work is about $70,000.

The Nova Scotia Power Commission consists of E. H. Armstrong of Halifax, F. B. Whitman of Anapolis, and R. H. MacKay of New Glasgow. K. H. Smith is chief engineer and secretary, and C. H. and P. H. Mitchell, of Toronto, are the commission's consulting engineers on the Halifax development.

Nomographic Solution of Cubic Equation

By S. Okabe

Civil Engineer to the Department of Home Affairs of Japan

ENGINEERS not infrequently encounter the cubic equation as in determining the rise in surge tank and penstock design. For convenient use in such cases the writer submits a nomographic solution of the cubic equation.

The general equation is,

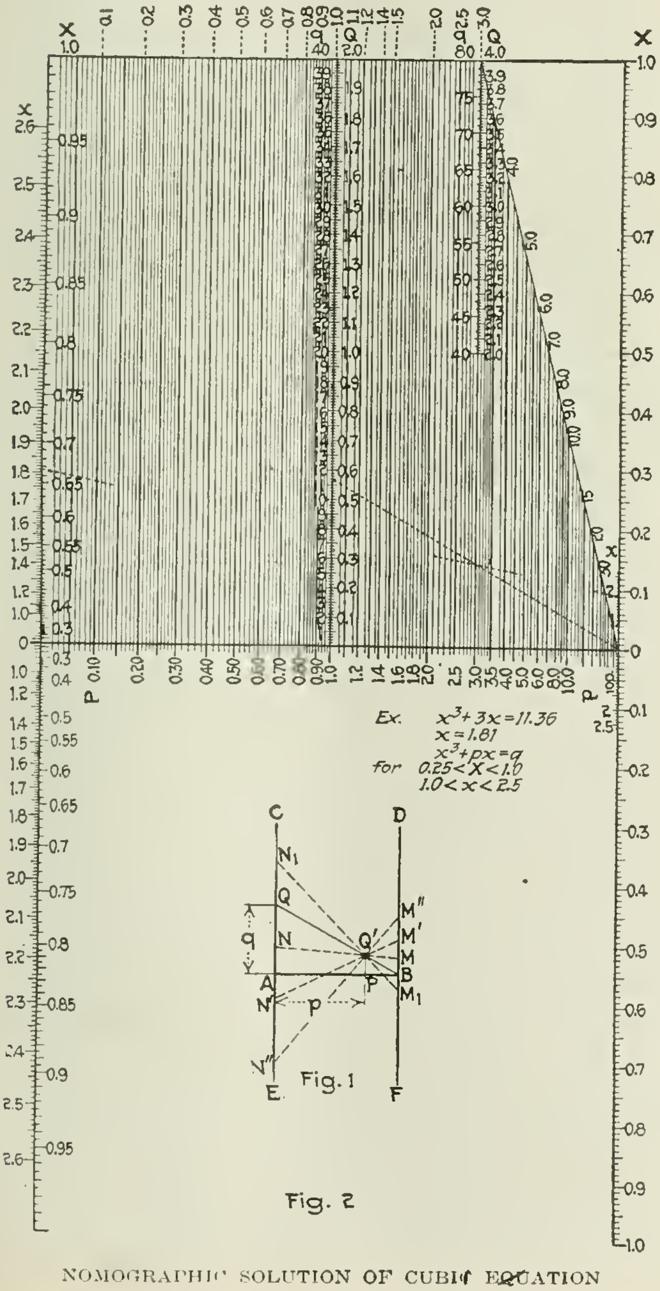
$$aX^3 + bX^2 + cX + d = O \qquad (1)$$

By putting,

$$X = x - \frac{b}{3a};\ p = \frac{3ac - b^2}{3a^2};\ q = -\frac{2b^3 - 9abc + 27a^2d}{27a^3},$$

the original equation (1) will be transferred to

$$x^3 + px = q \qquad (2)$$



NOMOGRAPHIC SOLUTION OF CUBIC EQUATION

Solving the equation (2), the required roots of the original equation (1) will be found accordingly.

Following are the solutions of the equation with positive q. (If q be negative, then the root has the same value as that of the similar equation with positive q, but its sign is opposite.)

(*a*) *In the case of positive p.*—There is only one positive root. In Fig. 1 find the points P and Q on AB and AC axes where AP and AQ are equal to absolute values of p and q in the cubic equation. Find a point Q' which is the intersecting point of the straight line BQ and the vertical straight line through P. A straight line passing through Q' will cut the axes BD and AC at M and N. Revolve this line about Q' to the point where the scale readings at M and N coincide; then the graphic chart at this instant will satisfy the cubic equation, and the readings will be its roots.

(*b*) *In the case of negative p* and $\left(\frac{q}{2}\right)^2 + \left(\frac{p}{3}\right)^3 > O$

There is only one positive root. The straight line passing through the point Q' will cut the axes BF and AC at M_1 and N_1, and if the scale readings at M_1 and N_1 coincide, the readings will be the root.

(*c*) *In the case of negative p* and $\left(\frac{q}{2}\right)^2 + \left(\frac{p}{3}\right)^3 < O$

There is only one positive root, such as in the case (*b*), and two negative roots. If the readings N' and M' coincide, and also those at N'' and M'' coincide, they will be the negative roots of the cubic equation.

Practical application of the chart.—The accompanying chart (Fig. 2) can only be used to solve the cubic equation whose roots lie between 0.25 and 2.5. Hence it must, first of all, be ascertained whether the roots lie between the limits or not. If not, they must be driven into the limits by multiplying by 10^n; for that purpose the coefficients p and q in the cubic equation must be multiplied by 10^{2n} and 10^{3n} respectively. The scales (x) and (q) in the chart are to be used when the roots lie between 2.5 and 1.0, whereas the scales (X) and (Q) are to be used when they lie between 0.25 and 1.0.

Training of Future Railroad Officers

Training and education of future railroad officers will not be confined to specialzation in a single subject, according to a recent address by Major General Sir Henry W. Thornton before the Institute of Transport. "Education and training of competent officers of the railway," said Sir Henry, "is a matter in which the Institute of Transport can, and I have no doubt will, play a large part. The high railway officer of the future can no longer be exclusively skilled in the movement of traffic, or be a brilliant engineer or a great accountant. He will have to be all of these in a degree. An analyst primarily, with the ability to appreciate the full effect of such movements as we have lately passed through, the economic side of the problem and to foresee the future. There must be a call for men of better general education, of studious and scholarly habits of mind and judicial tendencies of thought. The day of the railway officer who follows precedent merely because it is such, and is complacent in establishing practices or dwells within the narrow confines of the department in which he was educated, is past."

How Other Professions Than Engineering Are Organized

Some of the Methods Employed by Lawyers, Doctors and Architects to Secure United Action by Large Memberships

By Charles Whiting Baker
Consulting Engineer, New York City

This article is particularly timely in view of the impetus given to the plan for a federation of American engineering societies at the Organizing Conference of engineer delegates, held in Washington, D. C., June 3-4.—Editor.

THE problem just now agitating the engineering profession, as to how it may effectively organize to deal with "welfare" questions, is a problem that other professions have had to face. In those professions, as in engineering, societies were originally organized for the advancement of the profession in technical knowledge. In recent years the demand has come that these societies shall deal with the compensation of the professional man and with the problems of public welfare in which the profession is directly concerned. In some of these other professions experience has already been gained in dealing with welfare matters.

Of course these other professions also have their ultra-conservatives—the men who hold that the sole purpose of a professional society should be to hold meetings for the reading and discussion of technical papers and to preserve them in finely bound "Transactions" to be placed on the shelf. The demand has been insistent, however, that professional societies shall act on the vital matters that affect the profession's welfare; and this demand has brought more action in some other professions than in engineering.

Compensation and Uniform Fees

First of all comes the demand for united action on the matter of compensation. There are conservatives who hold that it is undignified for a professional society to deal with matters of compensation and to attempt to limit competition among its members. One hears always the stock argument that, "You are going to make our society a labor union." It is worth while, therefore, to see what action other professions have taken in this field.

The American Institute of Architects has long had a standard schedule of fees, which it recommends for the use of practitioners. The institute's constitution, indeed, says that the schedule of fees "shall not be made mandatory"; but this does not lessen one bit its moral force, for as a practical matter it could hardly be made mandatory.

In the medical profession this matter of standard fees is handled by the local associations of physicians in accordance with local circumstances.

In the legal profession, there has been no action for standardizing fees and there are two obvious reasons for this. In the first place, legal service is of such variable character that it would be exceedingly difficult to frame a schedule of fees which would be generally applicable. In the second place, in a large percentage of law practice the lawyer's services are a necessity to the client and are charged for accordingly. A standard schedule of fees would probably be opposed by many lawyers because it would serve in many cases to protect the client against exorbitant charges.

In engineering practice the variety of work makes standardization of compensation almost as difficult as in the legal profession. Nevertheless that very dignified and learned society, the American Institute of Consulting Engineers, made up largely of the Nestors of the profession, has had a standard schedule of fees in force since its organization. Surely if these eminent leaders of the profession stand for this principle, the ordinary engineer is justified in approving it.

The average engineer, however, is on a very different basis from the architect, the doctor or the consulting engineer who gets his living from fees for service rendered. Probably 95 per cent of those engaged in engineering are employed on a salary. It may be claimed that fixing standard salaries for engineering services is on a different basis from fixing standard fees, and yet why should it be? Each is justified on the basis that if living wages for engineers are not maintained, the work will not be done at all or will be done by cheap and incompetent men. This means that the public will suffer a loss many times as great as any saving it could make through obtaining the service of competent engineers at too low a rate. There is, therefore, good precedent for action by the engineering profession to protect its standards of compensation, and such action is in the public interest and not antagonistic to it.

Delegates from a large number of engineering societies met in Washington June 3-4 to plan a federation so that some authority can speak and act promptly on matters where the united voice of the profession should be heard. What light on this problem is shed by study of the organizations of other professions?

It must be said at the outset that there is no parallel situation in the other professions. Other professions are not split up into a multitude of specialties, as is engineering. In other professions too, there is no such broad "twilight zone" between the men who are certainly members of the profession and the men who as certainly are not. It is also true that no other profession has such a multitude of strong, well supported societies, both local and national, as has engineering. In most other professions, the local society is the active and influential organization and the national organization is comparatively unimportant.

Take, for example, the legal profession. The really influential and active organizations are the county or city Bar Associations. The members of these associations know each other personally. They can hold frequent meetings without difficulty and pass intelligently on any question presented. The state bar associations on the other hand hold meetings perhaps once a year which only a few can attend. Where a state association attempts to act through committees on important matters the members are often separated by great distance so that meetings are difficult.

A notable illustration of the great advantage of the local society over a state or national society in securing prompt and intelligent action is recorded in the proceedings of the New York State Bar Association for 1918. The Committee on Legal Ethics reported that the similar committee of the New York County Bar Association had functioned so effectively in answering inquiries on professional conduct that the work of the committees of both the State and National bar associations on this subject might well be turned over to it.

In the medical profession, again, the strong and active organizations are the local organizations. It is these which deal with the important questions of ethics, discipline and compensation. The national organization —the American Medical Association—has as its members the members of its constituent state and territorial associations. The business of the national society is transacted by a house of delegates chosen by the constituent societies. This body meets once a year and the business of the association is carried on by a Board of Trustees then elected.

An illustration still closer to the engineering profession is furnished by the American Institute of Architects. This institute is an association organized locally into chapters and the chapter members are also members of the institute. The institute's business is carried on by delegates elected by the various chapters who meet in annual convention. Members who are not delegates may attend the convention but without power to vote.

Thus in the medical, the legal and the architectural professions the national organization has direct relations with the state or local organizations; and the national and state organizations function only in matters where united action is necessary, leaving most of the "welfare" work to the local societies.

ORGANIZATION IMPORTANT FOR WELFARE WORK

It may be well to explain why the form of organization in engineering is specially important if the profession seriously intends to undertake welfare work. So long as a profession continues along the old lines of merely reading technical papers and publishing transactions, it makes little difference how it is organized. Society work through committees, etc., is done when the members have leisure or else it is not done at all and no one complains very much.

Suppose, however, that it is decided by the engineering profession to take up and act upon some vital current matter such as the pay of engineers, or state control of municipal work, or water-power development. At once there develops such sharp conflict of opinion that a vote is necessary to determine where the majority opinion of the profession lies. Further, if these subjects are to be acted on and not merely discussed in an academic way, the members of a society must delegate their authority to some small group or committee or society officer who will act for them.

And this must be a "blanket" authority. Suppose for example that an engineering society commissioned a representative to work for a law in a state legislature relating to land drainage. That committee must have authority to use its discretion in handling the situation. The committee may find that certain facts, unknown to the engineers when they voted, will materially change the desirable form of the legislation. It may be better to take a half loaf than have no bread.

This is no new problem. Other professions and occupations have had to meet it and it is of interest to examine their solutions. A rather close parallel to the problem before the engineering profession is the situation which has been solved by the American Federation of Labor. Hundreds of independent labor unions of every sort and kind, often warring with each other where they overlapped, needed to exert a united influence in public affairs. The federation was the solution found. Its machinery is simple. Delegates are elected to an annual national convention from labor unions all over the country, in numbers proportionate to the membership in the union. The vote in the convention on a roll call may be cast with votes weighted according to the number of members each delegate represents. This convention elects an Executive Council of 11 members which carries on the business of the federation. The constitution prescribes as its duty, "to watch legislative measures in the interest of working people and to initiate, wherever necessary, such legislative action as the convention may direct." It also carries on a large-scale propaganda for the furtherance of the labor movement and acts as an arbitrator and peacemaker in controversies between different unions.

Another notable organization which was formed to secure the united action of a great number of existing societies formed for various ends is the United States Chamber of Commerce. The members of the chamber are the boards of trade, chambers of commerce and similar commercial or manufacturing associations in all parts of the country.

These local and other associations are represented in the United States Chamber by a number of delegates proportionate to the membership. These delegates are called together in an annual meeting and they there elect officers and a board of directors who carry on the business of the association.

A unique feature of the chamber is the circulation among its members of elaborate letter ballots for the expression of opinion on public questions. A ballot was recently circulated, for example, on the proposed Federal Department of Public Works.

The grave defect of the letter ballot as a means of testing the opinion of the membership is that very many of those to whom it goes have given no adequate attention to the subject discussed, and if they vote at all, will vote in ignorance and often with prejudice. To meet this objection, the ballots sent out by the United States Chamber of Commerce are always accompanied by a full statement of the question with arguments both for and against. It should be noted that the expense of this letter ballot system is such that only an association with a very large income could carry it on successfully.

There is provision for referendum votes also, in the constitution of the American Bar Association. The clause reads as follows:

> The Executive Committee are authorized to submit from time to time by referendum to the inidividual members of the association questions affecting the substance or administration of the Law, which in the opinion of the committee are of immediate practical importance to the whole country, and they shall order such a referendum whenever directed by the General Council.
>
> The Executive Committee may arrange with state and local associations for the extension of such referendum systems to the members of such associations.

A great deal of discussion has gone on among engineers respecting the lack of an accepted code of ethics and of means of enforcing such a code if adopted. It may well be doubted, however, whether notwithstanding its lack of a code, the ethical standards of the engineering profession are not at least as high as those of doctors or lawyers, or of any other professions whose internal discipline is oftenest held up as a model to engineers.

The ethical codes formally adopted by the legal profession are admirable in every respect; but the enforcement of these codes is well recognized to be practically impossible save where the infraction becomes so serious as to render the offender liable to prosecution and disbarment or more severe punishment.

It is of interest in this connection to refer to the report of the Committee on Grievances of the New York State Bar Association, made in 1918. The committee after reporting action in the case of certain complaints said,

> Unless funds are available for a retainer of a regular attorney for the Association similar to the arrangement made by the Bar Association of New York City and for the necessary expenses of taking testimony, the present machinery of the Association is wholly inadequate to deal with the situation should serious cases demanding prosecution arise.

The committee further declared that under existing conditions the expenses in connection with the discipline of members of the bar guilty of unprofessional conduct were a very heavy burden on individual members of the committee in charge of discipline, who were in no way involved, except as a matter of professional spirit or public duty.

In the medical profession, infractions of the profession's code of ethics which transgress also the statutes against crime are of course punished; but for minor departures from the code, the medical profession is no more accustomed to discipline its members than any other profession.

Where discipline is to be exercised, however, both these professions have the advantage of being able to act through their local associations and they avoid the almost insuperable difficulties which attend the discipline of members of a national society for unprofessional conduct.

FINANCES

Engineers are paying a heavier tax to support their professional societies than is paid by the members of any other profession. The annual dues of the national engineering societies are in most cases $15. In the American Society of Civil Engineers this is increased to $25 for members resident in or near New York City. Most engineers belong also to local engineering societies and pay annual dues averaging usually about $10. Many also belong to the American Association of Engineers where they pay annual dues of $15. It is generally agreed that the dues of the national engineering societies will have to be raised to cover the additional expense of welfare work. The American Association of Engineers needed more funds than its former $10 per year dues furnished and an increase to $15 per year was made recently.

It will be of interest now to see what are the society dues in other professions. In the legal profession, the annual dues of the American Bar Association are $6 per year; but only a small proportion of the lawyers of the country are members of this body. These annual dues include a subscription to the *American Bar Association Journal*, costing $1.50. The state bar associations are more important to the lawyer than the national association. The annual membership dues in the New York State Bar Association are $5. Dues in the local, county and city associations vary of course but are generally low except where the association becomes a social club and expenses are correspondingly increased.

In the American Medical Association, the members are the members of the various local organizations which are represented in the association. The constitution provides that funds for the association "shall be raised by an equal assessment of not more than $10 annually on each of the members."

The American Institute of Architects has annual dues of $25 for fellows and $20 for members of ordinary grade. Dues for local chapter expenses are in addition to this.

The American Chemical Society has annual dues of $10 per year, and the members receive free the three regular publications of the society, costing more than half of this sum. Of these dues, a part is distributed to the local sections on the basis of 75 cents to $1.50 per member according to the size of the section.

The American Federation of Labor derives its financial support from the constituent members as follows:

> From International or National Trade Unions a per capita tax of seven-eighths of a cent per member per month. From local trade unions and Federal labor unions, 15 cents per member per month, of which 5 cents must be set aside for use only in case of strike or lockout. Local unions, the majority of whose members are under 18 years old, 2 cents per member per month. From Central and State bodies, $10 per year.

In contrast with these limited funds is the financial situation of the commercial organizations. The United States Chamber of Commerce is supported by dues paid by the local associations which are its members. These dues are approximately one-half of one per cent of the income of the local association from its membership fees. The minimum dues from a member association are $10 and the maximum $200.

In dealing with any business organization engineers are familiar with the fact that all the money expended merely to maintain the organization is an overhead expense which must be paid out of the operating receipts before profits can be determined. Professional and trade associations are not organized to earn profits; yet the same principle holds true—that the society must be judged by what it actually accomplishes in comparison with what it costs to carry it on.

Of course in certain societies which have social features, the contact established between the members is to be credited as part of the results achieved. There is a tendency, however, unconsciously to think of a society as somehow an end in itself, and to claim that the profession owes a duty of loyalty and service to it, apart from what it accomplishes.

This sort of loose thinking is doubtless responsible for a good deal of waste and misapplied energy in many professional societies. The engineer in charge of a business enterprise—if he is competent for his job—always applies to every proposed new expenditure the test, Will it pay? Will the returns received sufficiently exceed the cost of carrying it on to make it worth while? Exactly the same sort of test should be applied by the engineer to his expenditure on his numerous professional societies.

It is by no means intended by this to depreciate th importance to the engineering profession and to every other profession of its organizations. On the contrary, social and economic conditions at the present day make it imperative that engineers, like the men in every other occupation, should unite in efficient organizations to protect their common interests. Neither is it meant that engineering organizations should take any narrow view of their functions, and confine their work to things whose direct benefit to the profession can be estimated in dollars and cents, such as employment and compensation. On the contrary the great opportunity of the profession is to hear its present call to leadership, to undertake worth-while tasks and to create an *efficient* organization which can apply intelligence and ability to the successful peformance of these tasks.

Short Service of Untreated Piles at San Francisco

Piles of Piers in Sea Water Infested by Borers Last Only Few Months, or Few Years With Protective Paint

SHORT service records of untreated piles in the infested waters of San Francisco Bay, even when coated with protective paints, were noted in a report at the latest annual meeting of the American Wood Preservers Association. This information supplements the records of 18 to 29 years life for creosoted piles which were removed from Long Wharf on account of dismantling the structure and not on account of the condition of the piles, as described in *Engineering News-Record* of Aug. 21, 1919, p. 378, and in the above report.

It is stated by H. O. Demeritt, assistant engineer of the San Francisco-Oakland Terminal Railways, who has had charge of the trestle of the Key Route system since 1902, that the untreated piles driven in the Key Route structures in 1902 were replaced in 1906 and 1908, none of the old piling being removed. These later piles were of Douglas fir protected with paraffin paint between the mud line and high water. Many of the untreated piles driven in 1902 had already broken off and floated away by 1906, but the trestle was still supported at that time by the untreated piles, showing that they had a life of at least four years. The depth of water along the Key Route trestle varies from zero at the shore to 5 ft. at a distance of two miles out, and 12 ft. under the terminal, these depths being below mean lower low water. At the outer end of the terminal the depth increases rapidly to over 30 ft., which is the depth in the ferry slips.

Mr. Demeritt made a careful examination of the entire trestle piling in 1912. He found but little teredo action on the inner two miles, although the lomnoria had been very active in coning the piles off from high water to the mud line, the piles breaking off when about 2 in. of sound wood remained. Some of the piles in this section of the trestle lasted from eight to twelve years.

From the two-mile point to the end of the structure, both teredo and limnoria became more active. The piles broke off just above the mud line, and showed the uniform coning from high water to the mud line with the section near the point of breaking about 6 or 8 in. in diameter and completely honeycombed by the teredo. Most of the piles under the terminal showed about 18 ft. of surface exposed from high water to the mud line. but in the springline and fenders the exposed surface ran as high as 38 ft. These piles showed the same action of limnoria and teredo at 32 ft. below mean lower low water as was found on other piles at 12 ft. below.

Some of the 1908 piles protected with paraffin paint were found located where the mud had scoured away, leaving about 12 in. of unprotected green piling exposed at above 12 ft. below mean lower low water. This exposed area has been riddled by the teredo, but little limnoria action was found.

Thirty untreated and unprotected fir piles were driven in January, 1913, about 10 ft. south of the trestle, spaced about 50 ft. apart and used as pull-off anchor piles. In October it was necessary to replace all of these as they were completely riddled with teredo holes above the mud line. The new piles driven here were protected with Columbia paint only to mean low water. Between October, 1913, and October, 1918, these piles were completely destroyed by limnoria. A few teredo holes were also found.

In 1913, the protected piles driven in 1906 under the terminal began to fall out, and since that time all the protected piles have been replaced with creosoted piles. The failure of the protected piles, in Mr. Demeritt's opinion, was due to the action of mussels or shellfish in forcing off the outer strips of the protection and then the waves and tides would tear the burlap away, leaving the green wood exposed. The average life of these protected piles was about seven years.

Frank H. White, chief engineer of the California Board of State Harbor Commissioners, has accumulated data extending over a long period of years and convincing him that along the waterfront of San Francisco untreated piling cannot be depended upon to last more than nine to twelve months. Many piles examined by him have been completely riddled by teredo action after being in service one year. Destruction by limnoria is also very rapid, although piles on the San Francisco side of the bay opposite the former site of Long Wharf are rendered useless by teredo before being greatly weakened by limnoria.

Sodium Fluoride as a Wood Preservative

Tests made years ago at the Forest Products Laboratory indicated that sodium fluoride might be used successfully as a wood preservative, because it had high toxicity, was not injurious to metal, and was convenient to handle. In order to obtain comparative durability records, the laboratory in 1914 placed sap-pine ties treated with sodium fluoride, together with ties treated with zinc chloride and creosote, in one of the mines of the Tennessee Coal, Iron and Railway Co., at Birmingham, Ala. Similar service tests were also started at this time with red oak ties placed on the Baltimore & Ohio R.R. After five years' service the mine ties which were treated with sodium fluoride have been found in as good condition as those treated with zinc chloride, both showing very little deterioration. The creosoted mine ties apparently were in still better condition, while those untreated were in various advanced stages of decay. The red oak railway ties treated with sodium fluoride were practically all sound, as were those treated with zinc chloride, while a large percentage of the untreated oak ties had been removed. These tests, as well as others started later, must continue for a number of years, according to the views of laboratory investigators, before the relative value of the sodium-fluoride treatment for ties and timbers is known.

Crossover Practice

An Argument on the Issues of the Pittsburgh Bridge Case

Through the clashing opinions on the Pittsburgh bridge case expressed by the Board of Direction of the American Society of Civil Engineers on the one hand and a joint committee of the American Institute of Architects and the Engineering Council on the other, there has been created a sharply marked division of attitude toward questions considered vital to efficiency in engineering practice. In contributing a discussion of some of the issues, Mr. Shenehon speaks for one of the parties. He was a member of the joint committee of three architects and three engineers, and functioned as chairman of the committee.

Mr. Shenehon's views here expressed are remarkably original. They rest on two bases: First, the assumption that architects are engineers, in other words that architecture constitutes a specialty of the large field of engineering. Second, a belief in the desirability of expansion of what he terms crossover practice—apparently even when this becomes mere brokerage.—Editor.

By Francis C. Shenehon
Hydraulic Engineer, Minneapolis

The profession of engineering tends like other professions to specialization, and we think of ourselves as bridge engineers, railroad engineers, sanitary engineers, hydraulic engineers, electrical engineers, mechanical engineers, mining engineers, structural engineers, and architects.

Each of these specialties may be regarded as a branch of a single great technical trunk which contains all that is basic in the theoretical part of the profession. Perhaps most engineers are general practitioners spanning several specialties, and the specialists themselves are so nearly akin that a certain *crossover* is always likely to take place. The question now arises as to the desirable limitations which will keep each man fixed in his proper groove as the shoemaker sticks to his last. Must the bridge engineer eternally build bridges and nothing else? Shall the electrical engineer draw an insulated circle about himself and never reach outside of his energized area? Does the mining engineer keep his practice strictly within his geological zones? Does any engineer of wide practice wish to work for a prohibition law which will keep him out of any field which appears to him somehow related to his pivotal specialty?

Let it be understood that the writer specializes in hydraulic engineering and has viewed without resentment engineers of other breeds invading his field. As instances:—an eminent bridge specialist designed balanced ship locks for an Erie-Ontario canal; a specialist in bridges and buildings designed a dam, with all the complex hydraulic subtleties which this involved; an electrical engineer developed a water power. In the condemnation of the water power at the outlet of Lake Superior, a mining engineer was the writer's fellow-expert.

Here are some crossover cases: A railroad engineer acts in his function of chief in much bridge engineering. An engineer of Minneapolis has designed a million dollar apartment building. Architects designed a great power house at Niagara Falls. Engineers built the Washington Monument in the national capital.

In medicine a man is generally licensed to practice over the whole broad field. If he elects to become a specialist for the eye, ear and throat, an additional license is seldom required; and he may still serve as a physician in a case of typhoid fever. There is seldom any reason in the law why a general practitioner in medicine shall not remove a cataract from the eye of any of his patients. The man who specializes in children's diseases may also serve as an alienist. A diagnostician may operate for goiter or mastoid.

In the legal profession admission to the bar admits to general practice and reaches into any specialty in which a lawyer may wish to enter. A real estate lawyer may defend a murderer and a criminal lawyer may try an involved insurance case. A corporation lawyer may serve in riparian disputes. A specialist in insurance may try an admiralty case.

It is reasonably certain that engineers do not wish any statute law to imprison them in a limited specialty. Perhaps it is equally certain that a great vital principle of professional righteousness is recognized, which does deter each high-minded engineer or architect from undertaking service in fields in which he is not master, or in fields in which his *associates* are not masters. While the chief engineer of a railroad may not be a bridge engineer, his associates are bridge engineers; while the chief engineer of the Chicago Drainage Canal emerged from railroad engineering, his associates were hydraulic and sanitary engineers; while an architect may not be a master in difficult foundations or in intricate structural steel work, his associates are masters; while a structural engineer may have vague conceptions of esthetic values his associate architect supplies these; and while an architect might go astray in the design of a steel arch bridge his associates, if wisely chosen, will secure sound, safe, economical results.

In the end the truth must emerge out of this interlocking of specialties which characterizes most great structural achievements, that master builders are doing teamwork for the best results; and the decision as to who shall be chief is concerned more with administrative capacity and professional grasp, than with the peculiar specialty of the able engineer or architect who is selected to direct the enterprise. After all, "Where MacGregor sits is the head of the table."

The writer, as chairman of the Council committee of engineers and architects to which was referred the Pittsburgh bridge matter, feels a seventeen per cent responsibility for the judicial finding of this broad principle:

> *Where a structure, whether bridge or building, embodies work which extends into two fields, a specialist in either field may be chief and the other associate.*

Following this principle an engineer may direct the design and erection of a cathedral, and an architect may direct the design and erection of a steel arch bridge. It is very certain that this principle justifies the structural engineer whose practise already covers wide fields in which architects long exercised sovereignty; and engineers must not feel too deeply aggrieved at the reciprocal privileges accorded the architect. It is conceivable that a big, able architect might achieve better results than a little incompetent bridge engineer. The basis of judgment in the assignment of work is more likely to rest on ability than on specialty.

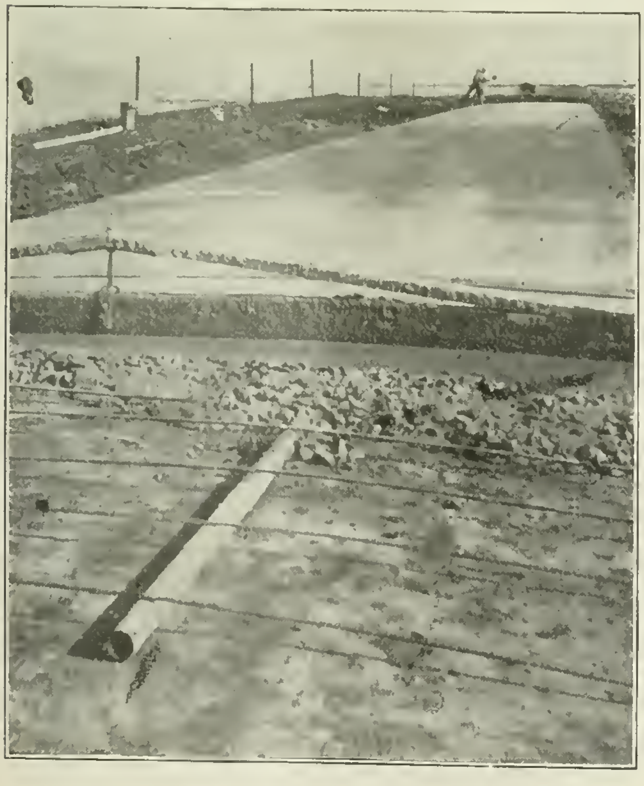
Reinforcing Concrete Pavements on California Highways

Transverse Bars Used to Prevent Cracks from Widening and to Maintain Surface Continuity

THE use of reinforcing in concrete pavements is favored by the California Highway Commission. Experiments have been under way for some time and a total of about 40 mi. of paving has been laid in which reinforcing bars were used. Although the studies are not yet completed, A. B. Fletcher, chief engineer of the commission, states that if ample funds were available for Cailfornia's highway program he would recommend the use of steel bars in all concrete paving laid by the state.

The basis on which has been decided the question of what reinforcing to use is that it is impracticable and unnecessary to reinforce pavement for beam action, as in the case of a floor slab. It is impossible to determine to just what extent the pavement will act as a slab, and, therefore, the amount of steel required to enable the slab to carry its load without cracking cannot be calculated. But the cracking in itself is not considered serious. Transverse cracks which are not ordinarily followed by any loss of continuity of surface are regarded as nothing worse than unsightly. If longitudinal cracks could be kept in the same category, it was reasoned, the steel would be serving its purpose. After some experiment based on this reasoning, the preferred plan is to use ⅜-in. twisted bars placed transversely on 18-in. centers. Assuming that longitudinal cracks would occur, this size and spacing was found to meet most nearly the requirement of maximum bond across such cracks for the minimum outlay in steel.

In recent work an improvement has been made, it is believed, by the addition of a longitudinal run of ⅜-in. bars along each edge of the pavement. Where paving has to be as narrow as the 15-ft. widths now being laid in California, the shoulders are soon worn down and at the point where transverse cracks reach the edge, triangular sections are liable to ravel out. The longitudinal bar along the edge materially strengthens these weak points. For convenience in ordering and handling, the longitudinal bars are used in same size and lengths as those laid transversely. They are laid with joints alternately butted and lapped, care being taken to bring butt joints half way between adjacent transverse bars. Thus a transverse crack in the paving can occur every 30 ft., which has been found to be the average, without crossing steel. By making the break in the longitudinal steel midway between a pair of transverse bars there is less likelihood of the transverse crack following one of the bars it parallels.


PIPE SUPPORTS REINFORCING BARS UNTIL CONCRETE IS POURED

Both corrugated and twisted steel bars have been tried. The first to be put down were ½-in. bars on 2-ft. centers. Later ¼-in. bars on 12-in. centers were tried. Partly because the latter were too flexible a change was made to ⅜-in. bars which were spaced on 18-in. centers. This arrangement worked well and no reasons that would warrant a change have as yet appeared.

In all cases the bars are put in the center of the slab as near as practicable. Several ways have been tried for getting the steel into place in the freshly poured concrete. For example, they have been thrust down from the top, pulled up from the bottom where they were laid before the pouring, or they were placed on stones which were laid on the surface before pouring, or a layer of about half the paving thickness was spread first and the steel placed on top, after which the remainder of the slab was poured. The methods now used vary on different jobs, but the preferred plan is to place the steel on the ground and after the concrete has been poured over it, pull the bars up into place with hooks.

Triangular mesh reinforcing has also been tried but it has been comparatively hard to handle, costs more and there was some question as to whether it would make the most effective use of the steel, under the theory that the primary function of the reinforcing is to provide a bond across the longitudinal cracks. On a 15-ft. paved strip, triangular mesh of weight equivalent to that of the ⅜-in. bars, costs $1,750 per mile, The ⅜-in. transverse bars on 18-in. centers cost $1,470 per mile, and the use of runs along each edge adds to this $300 per mile. These figures, made up some time ago, are on the basis of reinforcing steel at 5c. per pound, delivered. The cost for placing the steel bars and all expense incident thereto was 1c. per pound, and for the triangular mesh 50c. per 100 sq.ft.

Ban Put on London Building

According to a recent issue of *Commerce Reports* the London County Council has served notice on a number of firms ordering work to cease on their premises in respect to rebuilding or alterations. Among the firms receiving such notice are some of the largest department stores. Such action is said to have been taken under the provision in the Housing (Additional Powers) Act, 1919, authorizing a stoppage of "any building contemplated or in course of construction which may cause a shortage of labor or material for the provision of dwelling accommodations."

Shrinkage of Loosely Filled Earthwork in Embankments

Distinction Between Shrinkage and Reduction in Volume — Varied Opinions and Few Reliable Records Indicate Need of Study and Experiment

By E. E. R. Tratman
Associate Editor, *Engineering News-Record*

DOES earthwork in fills built by dumping shrink to a volume materially less than that which it occupied before excavation? What is the relation of the volume of an old fill to that of the original cut from which the material was obtained? These are matters of long controversy in connection with railway construction and more recently in regard to valuation. They enter also into highway construction, although specifications for such work sometimes provide for building fills in layers compacted by rolling. They do not apply to dams and reservoir embankments, in which special methods are employed to consolidate the material as it is deposited.

It is general opinion that shrinkage does exist, but a wide range of allowance indicates lack of agreement or authority as to the extent of shrinkage; absence of a uniform basis of comparison clouds the reliability of figures given; allowances in many cases are based on general observations or published data of doubtful value; analysis of various causes or phases of shrinkage is lacking, and there is a scarcity of reliable experimental data.

Close Determination Needed

It has been argued that an engineer needs only to know whether fills are of less volume than indicated by the original excavation. That position cannot be sustained. It would be as though he should hold it sufficient to know that a bridge weakens with age, and should not trouble to consider or study the various and relative effects of corrosion, wear, vibration, increased loading and design details. The question of shrinkage of earth, as a scientific proposition and a practical condition, should be capable of fairly close determination, but very little has been done in this direction. The question of comparative volume of an existing fill and the excavation which furnished the material is likely to involve extended periods of time and indeterminate conditions which prevent any but very approximate conclusions.

Present practice in making allowances for shrinkage appears to be based largely upon the results of limited experiments made about 1840 by Ellwood Morris and reported by him in the *Journal of the Franklin Institute*, 1841, page 235. For three embankments, aggregating over 43,000 cu.yd., he showed an average compression of 10 per cent in volume and deduced allowances of one-eighth of the volume in excavation for light sandy soil, one-tenth for yellow clayey earth and one-twelfth for gravelly earth. But there is little information as to the conditions or the accuracy of these experiments.

That shrinkage of excavated material to less than its original volume when placed in embankments is a negligible quantity and is to be excluded as a factor in railway valuation is the conclusion of a report made in 1919 by the Illinois Public Utilities Commission. This decision reopened the controversy, as in railway valuation shrinkage has been accepted as an element affecting the quantities to be allowed.

A statement by an engineer member of the commission is as follows: "If the quantities were determined by a true cross-section of the embankments as they now exist, in most cases they would be compatible with the solid contents that were placed originally, as measured at that time from material taken from cuts and borrow pits and for which the contractor was actually paid." This statement appears to overlook the influences of ditching and widening and erosion which occur during years of railway operation. The commission's conclusion is given in the following words:

"Shrinkage of earthwork has not been found to exist generally. Shrinkage may take place in certain special cases, but the quantities involved in such cases are practically negligible. Before any allowance of shrinkage shall be made by this commission, such shrinkage must be established by sufficient experimental data to show conclusively not only its existence, but its amount in the various soils when placed under unusual conditions."

The Illinois commission was not the first to assert that there is no actual shrinkage of volume in fills. The same position was taken by Prelini several years ago in his book on "Earth and Rock Excavation." It was expressed also by S. P. Baird in an article in *Engineering News* of Nov. 2, 1916, p. 850. On the basis of his own tests and observations, the latter attributed the apparent shrinkage partly to subsidence of the ground beneath the fill and partly to variations in actual yardage of excavation and fill as compared with the calculated quantities.

Doubt as to Shrinkage

From an extended inquiry and a survey of the field it appears that in answer to the question at the head of this article a majority of engineers will say that the fact of shrinkage is well established and that its extent is sufficient to have an appreciable effect upon earthwork quantities and estimates. But some will express doubt and a few will go so far as to say that any actual shrinkage is so slight as to be negligible. A brief study of individual opinions and of technical literature is sufficient to show confusion and uncertainty as to this factor in earthwork construction.

The shrinkage problem has been the subject of discussion among engineers, in technical journals and before engineering societies for over 30 years, but it remains unsettled and is not even stated on a uniform or definite basis. Two principal reasons for indefiniteness and discrepancies are lack of a universally accepted meaning of the term "shrinkage" and lack of experimental data of sufficient extent or authority to warrant definite conclusions.

In the first place there are two distinct systems of basing shrinkage. One is the relation of volume of a fresh or green fill to that of the same fill after settlement. The other is the relation of volume of a cut, borrow pit or other original excavation to that of the settled fill made from such excavation. Obviously, these are quite distinct and are not comparable, but in discussions and published information it is not always indicated which basis is employed. Both are important, but they must be considered separately. As to the first there can be little difference of opinion, except in regard to the amount, for loose material (whether earth or rock) freshly placed in a fill will surely settle or consolidate in time and thus shrink to a smaller volume. In Prelini's "Earth and Rock Excavation" the volume of the green fill is advocated as the basis for shrinkage determinations, but this excludes comparison of excavation and fill.

What Is Meant by Shrinkage?

Even with the volume of original excavation as a basis, shrinkage has two different meanings. It is sometimes taken to mean the actual consolidation of a given mass of loose material. In other words, taking a block of a hundred cubic yards of solid undisturbed ground, what volume will this same measured material have when deposited in place and after allowing time for the consolidation of its particles? On the other hand, shrinkage is taken to mean the difference between volume of existing fill and of original excavation, including not only the shrinkage proper (as above) but also such variable factors as loss in transportation, loss by erosion and apparent loss due to subsidence of subsoil and to inexactness of measurements made at widely separated times.

In illustration of the diversity of opinion as to the extent of shrinkage, the roadway committee of the American Railway Engineering Association found shrinkage allowances ranging as follows: In filling from trestles, 7 to 30 per cent for black dirt, 5 to 30 per cent for clay and 3 to 15 per cent for sand. The committee's recommendations were 15, 10 and 6 per cent respectively. In raising fills under traffic, the allowances ranged from 4 to 20 per cent for black dirt, 2 to 20 per cent for clay and 2 to 15 per cent for sand. The committee recommended 5 per cent in each case. Evidently the range is far too great to be accounted for by variations in local conditions.

This committee pointed out that while it has been general to allow 10 per cent increase in height for shrinkage in fills up to 25 ft. high and 15 per cent for those over 25 ft., "it would appear foolish to follow such a rule by making a 100-ft. fill 115 ft. high, the chances being that it would be necessary to lower the grade before laying track." It stated, however, that it is good practice to allow 10 per cent in height but to limit the increase in height to 5 ft. as a maximum, this being for a 50-ft. fill. On the other hand, shrinkage allowance in width was stated to be preferable, with an increase of 10, 15, 20 and 25 per cent for banks having a normal top width of 25, 50, 75 and 100 ft. respectively.

In its report of 1917, this committee stated that it is easier to increase the height than to lower it after track has been laid, and recommended that the width be increased from 5 to 20 per cent, depending upon material and conditions. For fills of 50 ft. and over the committee considered that there should be no increase in height, except at the shoulders to provide material for raising the subgrade after settlement. Thus, if the anticipated shrinkage is 7, 10 or 15 per cent there should be added 10, 15 or 22½ per cent respectively to the height of each shoulder.

Conclusions based on investigations by the Division of Valuation of the Interstate Commerce Commission are as follows: A cubic yard of earth measured in excavation will occupy less space when measured in compacted embankment. The height of embankment appears to have little effect on its subsequent shrinkage. The ordinary allowance for shrinkage of earth embankment is from 8 to 12 per cent, with an average of 10 per cent. These conclusions are held not to apply in the case of gumbo, hardpan, cemented gravel or materials taken from the beds of streams or from overflowed river valleys, as such materials ordinarily are dense, and the shrinkage, if any, can be determined only by actual measurements. A rule issued by the engineering section of the Division of Valuation in 1918 specifies a shrinkage allowance of 10 per cent. This figure as an average is used very widely by engineers, but recent investigation by the engineering committee of the Railway Presidents' Conference Committee, in regard to valuation, indicates that this is a minimum and that 14.4 per cent is a more correct average figure.

According to one explanation of shrinkage: "Material taken from a cut and placed in an embankment will show an increase or swelling at first because of the loosening of the particles and the consequent increase in voids, but ultimately these particles will be compacted by weight, vibration, the action of the elements and other causes until they occupy less space than they did originally." There is no dispute over the first part of this statement, regarding the initial swell of volume. But there is dispute over the second part, as to whether the ultimate shrinkage (exclusive of outside losses) will give a volume less than the original. For instance, Prelini's book, already noted, states: "The mistaken belief that earth in fill will shrink to less than the volume measured in the pit originated in the foolish manner of measuring by counting the number of cart loads, the capacity of the carts having been measured."

Factors Which Affect Shrinkage

Three combined causes have been suggested for embankments requiring more material than is called for by the theoretical cross-sections. In the first place, the theoretical section is usually exceeded, since materials which flow freely will overrun the slope stakes and exceed the base width if the crown is finished to full width; with materials which do not flow freely, the crown must exceed the normal width if the full base width is to be reached. In the second place, there is shrinkage or solidification of the material itself, which may continue through a series of years. In the third place, there is subsidence of the natural ground on which the bank is placed. This last, in Prelini's opinion, is accountable for a very large apparent loss of material and is not given sufficient consideration in comparing quantities.

Much of the discussion and the published matter of earthwork gives evidence of confusion as to shrinkage proper and shrinkage plus various losses during and after construction. It might appear at first sight that the shrinkage on the basis of volume prior to excavation could be determined readily by experiment or by measuring of cuts and fills. As a matter of fact, determination of either method is difficult, owing to the variety of factors which affect the problem.

Time is a factor of prime importance, though frequently neglected. A cubic yard of solid material may make more than a yard of fill when excavated and placed, but settlement will begin at once and will be affected by the weather and material, and by the loading and vibration in a fill carrying traffic. What time should be allowed before measurement for shrinkage is made? Should the time be the same for all materials? What time should be allowed to elapse before the fill is considered to have taken its final set or settlement? According to Gillette's "Earthwork" the settlement occurs mainly during the first year, but some engineers consider that it continues for several years. In valuation, the time (that is, the age of fill) may have a very wide range.

The character of the material is important, since it may be light or heavy, loose or lumpy, dry or sticky. The different grades of any one material also enter into consideration. Moisture content is a factor, which in turn is influenced by atmospheric conditions. Frozen material will cause heavy shrinkage and should be avoided. Varying percentages of shrinkage have been given for different kinds of material, but it is more general to allow an average figure for all "common excavation." In fact, some engineers state that they doubt whether present knowledge warrants specific allowances for different materials. Large fills are composed usually of a variety of materials, and aggregates of measurements of fills or long stretches of line are influenced by this same condition.

Surface material consisting of loose soil has been claimed to compact in fills much more than the dense and hard materials 15 to 20 ft. below the surface. Consequently, a railway having a large proportion of shallow cuts and fills might show a higher shrinkage in proportion to its yardage than another railway in the same territory but having deeper cuts in denser subsurface material. This cannot be accepted for general application without further study. Valuation figures on 600 miles of line in the ordinary earth materials of the Central States showed a range of from 6 to 18 per cent for shrinkage in the lighter grading of 6,600 to 15,000 cubic yards per mile and 7 to 14 per cent where the grading ran 26,500 to 35,000 yards per mile. The work covered fills from six to thirty-six years old and necessarily included the factor of loss by erosion and other causes.

CONSTRUCTION AS A FACTOR

The method of building the fill is another consideration, for it is reasonable to expect a difference in the behavior of material which is deposited in such diverse ways as the following: (1) placed by scraper or dump wagons and thus somewhat compacted by wheels and hoofs; (2) dumped from cars on a surface track and then spread; (3) dumped loosely over the side slopes; (4) dumped vertically from a construction trestle. Rolling railway fills in horizontal layers has been advocated in order to increase their stability and permanence, but the use of this practice has been very limited.

One recent example of shrinkage study is that of sand filled nearly 40 ft. deep between concrete walls and provided with drainage. To obtain maximum shrinkage within the shortest time, so as to avoid additional filling to maintain the grade after the line had been opened for traffic, the fills were flooded with water for about ten days. The settlement approximated 10 per cent. In ordinary fills of similar material this figure is from 7.5 to 9 per cent.

Waste or spilling of material in transportation from cut to fill, subsidence of the subsoil and erosion of slopes by wind and rain may reduce the volume of fill and increase the apparent shrinkage. The first of these losses appears to have been given little attention and no figures or allowances are available. It cannot be assumed that every cubic yard of excavation goes into the fill, and the intermediate loss may nullify comparison between the volumes of cut and fill.

In Prelini's book it is stated that while engineers have shown by comparative measurements that the volume of fills is smaller than that of the earth in its natural bed, they are mistaken in attributing this to shrinkage. In his opinion the decrease in volume is due to the fact that some of the earth removed has been lost in transportation to the fill and that much more is washed away by rain during the construction of the fill. To determine these losses in such a way as to obtain a result universally applicable is impossible in his opinion, owing to the variable local conditions of weather, length of haul, method of transportation, and the tightness of the cars or other means of transportation.

SUBSIDENCE AND EROSION

As to subsidence of subsoil there is again great difference of opinion. A fill cannot be assumed to rest upon an incompressible base, except in the rare event of solid rock, but the extent of subsidence will depend upon the character of the subsoil and the height and weight of fill. Some engineers consider that this factor is so slight that it may be disregarded and others consider that whether large or small there is no reason to separate it from shrinkage.

It is more generally considered, however, that this is a large factor which has been given insufficient consideration. In fact, as the result of extensive study by measurements and borings, one engineer concludes that the loss due to subsidence or compression of the subsoil is enormous. Swampy ground will show the highest loss of this kind, but even on firm sandy loam, a subsidence of more than a foot has been found over the entire base area of 40-ft. fills deposited from trestles.

That subsidence represents a very definite loss is stated in the 1920 report of the roadway committee of the American Railway Engineering Association. Investigation on several hundred miles of line indicates that it exists under practically all embankments and should be considered when revaluation surveys are being made. It is held that subsidence averages 1 per cent per foot of height of fill, giving 10 per cent of original volume in a 10-ft. fill.

Erosion of cuts, fills and borrow pits will begin as soon as the work begins, its extent depending largely upon atmospheric conditions. An engineer in charge of extensive valuation expresses the opinion that erosion by rain does not entirely remove much of the embankment, but simply transfers a wedge of material from the top of the slope to the bottom. He believes that the amount can be ascertained readily by comparing the present and original angles of the slope. It seems that such a method could give results which are only approximate and which would not permit close determination of volume of the fill. Erosion may be elimi nated by sodding the slopes, while as a rule it will decrease on old slopes owing to the formation of a protecting crust or the natural but irregular growth of vegetation.

In any comparison between the original volume of cut and the present volume of fill made from that cut, possible discrepancies in measurement must be taken into account. These may be due to inexactness of calculations and measurements, or to the use of different methods in the original and subsequent measurements. It must be remembered also that actual cuts and fills do not follow theoretical cross-sections, but are more or less irregular in slope and shape.

Supplementary Work on Fills

Another very important point to be considered is that cuts and fills after a few years are by no means directly comparable with their original conditions. This is evident when it is understood that during these years there has been more or less ditching and cleaning or widening of cuts, widening of fills with material obtained from these cuts and from other sources, raising of fills by new material to maintain the grade, and slipping or caving of slopes of both cuts and fills. It appears impracticable to determine the amount or relation of the variations introduced by such factors.

In a study of original and present volume with regard to grading contracts, it was found that no definite results were obtainable. Fills had been raised without record of the amount of source of material, borrow pits were not preserved, and the quantities removed from adjacent cuts by ditching were not on record. An engineer who has been trying for some years to obtain evidence on earthwork shrinkage states that in every case the complications were such as to render it impossible to arrive at conclusions. Further, to eliminate the uncertainty due to such supplementary work extended study has been made of lines where grading had been commenced or completed and then abandoned. The results indicated an average loss of at least 10 per cent for shrinkage, erosion and other factors. Most engineers will agree that exact or reliable comparison of volume in old cuts and fills is almost impossible owing to the absence of adequate records of work done upon them since their original construction.

Tests and Published Data

Coming now to the question of published records of earthwork investigations, it appears that these are limited and of doubtful authority. Many engineers of wide experience in construction admit that they have never had occasion to make careful measurements of earthwork shrinkage, but have adopted allowances used by others or set forth in technical publications. In itself this is unimportant, since it is natural that the many should rely upon the results of study by the few. The importance of the statement lies in the limited extent and inadequate records of the experiments on which such allowances are based.

That shrinkage is an important element in earthwork construction is stated almost unanimously in technical books, but the basis for the assumption is indefinite. Prelini's book takes the view that shrinkage does not occur, but fails to give evidence in support of that view. In connection with the report of the Illinois commission, already mentioned, its engineers endeavored to trace the basis of published statements as well as of the general assumption that earth in well-settled fills will have a volume less than that which it possessed prior to being excavated.

It appeared that in many cases the statements and opinions were founded directly or indirectly upon the limited experiments made about 1840 by Ellwood Morris, as stated in the opening part of this article. According to these engineers, the conclusions presented by Morris some eighty years ago have been accepted and repeated by different writers from time to time without verification or checking. Furthermore, while this ecent investigation included a search of published information and an inquiry of numerous authorities, it did not bring to light any modern experiments or tests of shrinkage.

Behavior of Rock Fills

Rock fills may be considered briefly, though they differ from earth fills essentially in that they show a permanent increase of volume as compared with the original excavation. This is due to the large volume of voids in rock blasted from the solid and to the relatively small settlement or consolidation of the material in the fill. The increase or swelling depends largely upon the kind of rock and the size of the fragments.

Even rock will show a shrinkage when the volume of settled fill is compared with that of the green fill. For this one engineer make an allowance of 20 per cent for loose rock and 30 per cent for rock blasted from the solid. In other words, the volume of settled rock fill may be 15 to 40 per cent greater than the original volume of solid rock and 20 to 30 per cent less than the volume of the fresh fill. The shrinkage allowance will be higher also for soft or friable rock than for hard rock.

Conclusions

As a general conclusion it may be said that reduction of volume of an old fill from the apparent volume of original excavation is fairly well established by experience and investigation. But what proportion of this reduction is due to actual shrinkage of the material in place cannot be stated, for it is evident that a considerable but varying and perhaps indeterminate proportion is due to numerous extraneous losses. Further, this reduction in volume necessitates the addition of material to the fill from time to time, but there may be no record of the quantities excavated or placed in this supplementary work. Again, comparisons of old and new measurements are likely to be affected to an unknown degree by the lack of close accuracy and lack of uniformity in methods of measurement.

It is unfortunate that much of the evidence on shrinkage proper (as distinct from total reduction in volume) is based upon general opinion and observation, or upon old and limited experiments which may not apply to present conditions. There appears to be little in the way of modern scientific investigation to throw light on the subject. Laboratory tests will show the compressive properties of different kinds of material under different conditions. But their results will serve only for general guidance, since an embankment may contain several kinds of material and several grades of any one material, the positions and proportions of which cannot be determined.

For definite conclusions as to shrinkage proper it appears that action should be initiated along two closely related lines of investigation. First, there must be discussion and decision as to just what conditions are to be considered and what results are to be sought. Second, having reached this decision, it will be necessary to conduct such experimental work and observations (both in the laboratory and the field) as to produce results which will permit of definite conclusions being formulated.

A supplementary conclusion, based upon the evidence of extensive work involved in maintaining fills at normal elevation and section, is that railways might well consider construction methods which will produce fills of greater solidity and permanence, even at greater first cost.

Railway Wages and Labor Efficiency

INCREASED COST and decreased efficiency of railway labor was the subject of an address delivered recently at Philadelphia by Elisha Lee, vice-president of the Pennsylvania R.R. System, who pointed out that a traffic increase of only 18 per cent for 1919 as compared with 1915 required 31 per cent more men and 129 per cent more wages. Causes for this lessened output in spite of higher wages he attributed to the following causes:

"The general lowering of the sense of personal responsibility, which unfortunately, seems inseparable from working for the Government. Loss of many of our best men in the war, some temporarily, others permanently. Establishment of the eight-hour day, inauguration of a rigid seniority rule regarding promotions and layoffs, regardless of differences in individual ability. Abolition of piece-work in the shops. Diminution of the disciplinary powers of officers, brought about by the sanctioning of appeals to Washington over decisions of officers on the spot."

Wages for track labor have increased from $1.75 per day before the war to $4.50 per day, but records of work show that the efficiency of the men has decreased 40 per cent, according to Mr. Lee. Careful study during the five years 1914-1918 as to amount of track material applied, number of men and number of hours showed that at the end of the period wages per man per hour had been doubled but that twice as many men were required. In other words, a unit of track work that cost $1 in 1914 cost $4 in 1918. There was an improvement in 1919, however, the figures for the first six months showing that the $4 figure had been reduced to $2.65. Mr. Lee expressed the opinion that this improved condition will continue.

Activated-Sludge Plant at California State Prison

For the past two years an activated-sludge plant has been in operation at the California State Prison at Folsom. Ralph Hilscher, director, Bureau of Sanitary Engineering, California State Board of Health, Berkeley, Cal., states that the Folsom plant serves a population of about 1,500 and appears to be giving excellent results, although operated by convict labor—"that is notoriously unreliable." The air diffusion at Folsom is by means of perforated pipe which Mr. Hilscher says he understands has given almost no trouble. Mr. Hilscher states that this is the only activated-sludge plant in operation in California, the one projected by the city of Hermosa Beach (see *Engineering News-Record*, Nov. 9, 1916, p. 890) never having been constructed.

Freight Rates and the Railway Problem

THAT an increase in freight rates is absolutely necessary to enable the railways to operate and give adequate service was emphasized in an address delivered recently before the Chicago Association of Commerce by Daniel Willard, president of the Baltimore & Ohio R.R.

In the year ending Oct. 31, 1919, the operating expenses of the Eastern railways were 88 per cent of the gross earnings, said Mr. Willard, and if present wages and prices of materials had been in effect the expenses would have absorbed nearly all the earnings. For the decade previous to the war, the operating ratio on these railways was about 68 per cent and in 1917 it was 74 per cent. Assuming that 75 per cent should be the maximum and that there should be a net income of 25 per cent to apply for capital purposes and other obligations, then on the basis of last year's business the Eastern railways would require an increased income of $544,000,000. If the Interstate Commerce Commission should grant the request for rates yielding 6 per cent upon the book investment account of the railways, this would produce about $550,000,000. In Mr. Willard's opinion this investment account fairly represents the aggregate value of the railways.

The higher rates proposed will not be a burden on business interests, said Mr. Willard. They will be lower than those of any other country and relatively lower than the earlier "low" rates owing to the high prices which now prevail. It has been stated by Mr. Prouty, of the Interstate Commerce Commission, that in order to make private operation a success the railways should secure rates "which are too high rather than too low." In Mr. Willard's opinion the rates asked by the eastern railways are not too high and may be too low.

Improvements, additional facilities and new equipment require an average annual expenditure of $1,000,000,000 by the railways. But for the past ten years these expenditures have averaged only $600,000,000 annually, according to Mr. Willard, and owing to the limited purchases of equipment during the period of Federal control the railways have a shortage of about 2,000 locomotives, 100,000 freight cars and 4,500 passenger cars. The revolving fund of $300,000,000 provided by Congress is not more than half the amount needed for new equipment, to say nothing of improvements and additional facilities. To obtain the needed new capital of $1,000,000,000 annually, well established credit is necessary, and in Mr. Willard's opinion this will be effected by the Transportation Act.

Another aspect of the rate question is shown by Prof. Moulton in *Chicago Commerce* for May 22. He states that while the public may have to pay the bill for increased rates through higher prices of commodities, there is a limit to the prices which the public will pay. If this limit is exceeded the market breaks owing to declining demands. If people refuse to buy goods in the usual quantities owing to increased prices, the railway may suffer through reduction in volume of traffic offsetting the advantages due to higher rates. Mr. Moulton admits that there appears to be no alternative for higher rates, but points out the critical condition of the railway problem and the entire industrial problem. He expresses the hope that the principle of wage reduction coincident with falling prices will be incorporated in the pending wage settlement.

New Code of Ethics for Mechanical Engineers

At its meeting in St. Louis May 24-27 the American Society of Mechanical Engineers approved the following code of ethics submitted by a committee consisting of Robert Sibley, John B. Martens, H. J. Hinchey, Charles T. Main and A. G. Christie:

1. The mechanical engineer should be guided in all his relations by the highest principles of honor, of fidelity to his client, and of loyalty to his country.
2. His first duty is to serve the public with his specialized skill. In promoting the welfare of society as a whole he advances his own best interests, as well as those of the whole engineering profession.
3. He should consider the protection of his client's or employer's interests in professional matters his essential obligation, provided these interests do not conflict with the public welfare.
4. He shall refrain from associating himself or continuing to be associated with any enterprise of questionable or illegitimate character.
5. He can honorably accept compensation, financial or otherwise, from only one interested party unless all parties have agreed to his recompense from other interested parties.
6. He must inform his clients of any business connections, interests or circumstances, such as might influence his judgmment or the quality of his services to his clients.
7. He must not receive, directly or indirectly, any royalty, gratuity or commission on any patented article or process used in the work upon which he is retained without the consent of his clients or employers.
8. He should satisfy himself before taking over the work of another consulting engineer that good and sufficient reasons exist for making the change.
9. He must base all reports and expert testimony on facts or upon theories founded only on sound engineering principles and experience.
10. He must not regard as his own any information which is not common knowledge or public property, but which he obtained confidentially from a client or while engaged as an employee. He is, however, justified in using such data or information in his own private practice as forming part of his professional experience.
11. He should do everything in his power to prevent sensational, exaggerated or unwarranted statements about engineering work being made through the public press. First descriptions of new inventions, processes, etc., for publication should be furnished only to the engineering societies or to the technical press.
12. He should not advertise in an undignified, sensational or misleading manner, or offer commissions for professional work, or otherwise improperly solicit it.
13. He should not compete knowingly with a fellow-engineer for employment on the basis of professional charges or attempt to supplant a fellow-engineer after definite steps have been taken toward the other's employment.
14. He should assist all fellow-engineers by exchange of general information and valuable experience or by instruction through the engineering societies, the schools of applied science, and the technical press.

Funds for Topographic Mapping

The $330,000 appropriation carried in the Sundry Civil Bill to care for topographic mapping work was increased to $370,000 by the Senate, but this increase was not sustained by the conferees, and an appropriation of $330,000 was all that was carried in the bill that was finally accepted.

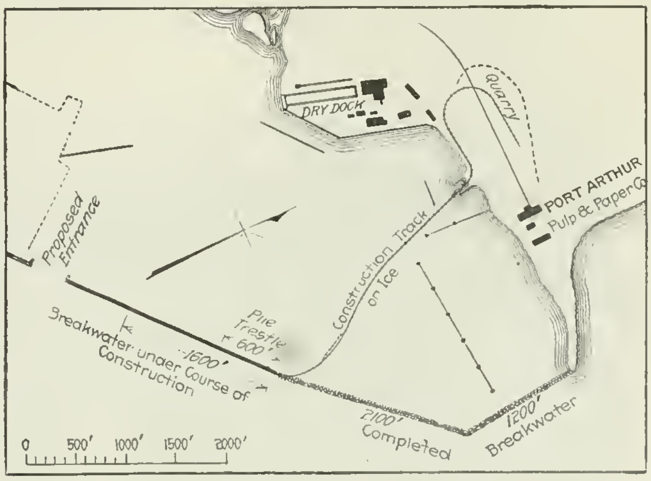
Rubble Breakwater Deposited from Railway on Ice

Work at Port Arthur on Lake Superior Carried on Throughout Winter—Terminal Dump on Trestle

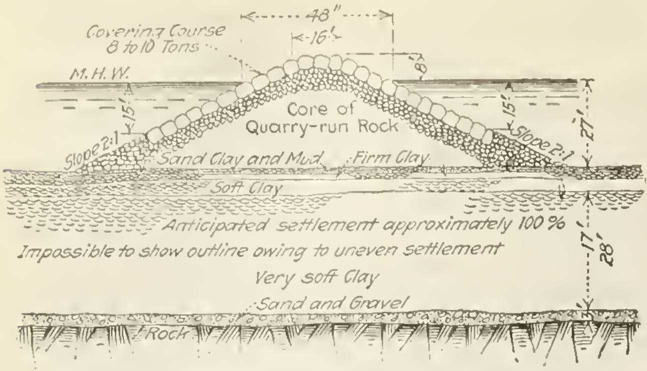
Construction of the new rubble-mound breakwater at Port Arthur, Ont., was carried on throughout the recent severe winter by the expedient of laying a 36-in. gage railway on the heavy ice of Lake Superior and moving the necessary rock in trains out to the work. As a rule in this northern latitude underwater work, such as breakwater, has to be shut down for the winter.

Port Arthur is the most westerly Canadian port on the Great Lakes and as such is rapidly developing as a transshipment point. Its importance is such that it has been subsidized by the Canadian Government, which is spending large sums of money there. Under the direction of F. Y. Harcourt, District Engineer for the Canadian Department of Public Works, a comprehensive plan has been prepared for the development of the harbor, consisting of dredging and the construction of a breakwater, several sections of which have already been built and which will ultimately protect the entire water front. The construction of this breakwater is now being proceeded with, and the successful tenderers on the last section let. Chambers, McQuigge & McCaffrey, Ltd., of Port Arthur, developed the ice-borne railway system here described.

The section of breakwater at present under construction is of the rubble-mound type consisting of a core of quarry run stone, with a covering course of regularly laid 8- to 10-ton stone, placed from 15 ft. below water level on both sides and extending over the top, which is 8 ft. above water level. At the water line it is 48 ft. in width, and at the top 16 ft. The estimated quantity of rock required for this contract is approximately 500,000 tons. This type of breakwater was adopted by the engineers of the Public Works Department after a large number of borings had been taken which showed that there was not sufficient holding material to support piling, thus prohibiting the adoption of the type common to this district,



LAYOUT OF BREAKWATER AT PORT ARTHUR SHOWING LOCATION OF RAILWAY ON ICE



SECTION THROUGH RUBBLE-MOUND BREAKWATER AT PORT ARTHUR, ONT.

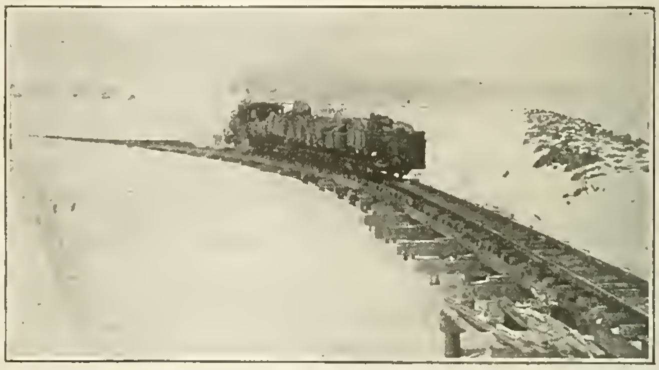
that is cribs, sunk on to a pile foundation, filled with rock and then covered with a top of mass concrete. At this point the water is from 25 to 29 ft. deep, and the bottom is very soft mud and clay to a depth of from 30 to 35 ft. before solid rock is reached.

Two sections of this type of rubble-mound breakwater have already been constructed with very satisfactory results, and two methods of placing the rock have been generally used. The bottom, up to within about 15 ft. of the surface of the water, has been placed by loading rock onto self-dumping deck-scows, which were then towed to the breakwater site, lined up between ranges, and dumped. The upper portion was then placed by loading skips, which were loaded onto scows which were towed to the site and the skips dumped by derricks on other scows. The second method was practically that usually followed in the construction of an ordinary railway embankment. The rock was loaded onto cars, which were hauled out onto a trestle built along the line of the breakwater, and there dumped. As the breakwater, as shown on the accompanying map, started out from the shore, this latter method could easily be followed. Since the completion of the last section, the construction of a large pulp mill, with several spurs and sidings to serve it, prohibited the use of this method on the present contract, for the approach to the breakwater was blocked by the pulp mill being between the quarry and the shore end of the breakwater.

It had previously been the custom to close down all work with the advent of winter, but the present contractors conceived the idea of laying a track over the ice to the breakwater and dumping the rock directly into place. After the ice had formed to a thickness of 14 in. some 3,000 ft. of track was laid from the shore to the breakwater with a passing track some 250 ft. long, and a pile trestle approach put in from the ice, up onto existing breakwater, about 100 ft. from its end. From this end, another pile trestle was constructed along the line of the new section. When the ice was 24 in. thick, the trains started hauling, and the cars were dumped from the trestle.

The tracks on the ice were laid on stringers 12 x 12 in. by 20 ft. laid end to end, carrying 2 x 6 in. by 6 ft. crossties. The object of this construction was to raise the track off the ice to avoid trouble from snow. It was found, however, that snow did not cause much interference but that a track so laid was difficult to keep in alignment, so next winter standard track ties laid directly on the ice will probably be used.

Considerable settlement took place in the pile trestle, requiring replacements of that structure from time to time. These settlements gave little warning and were likely to take place any time after the rock dump reached the water surface. The railway on the ice, however, was quite stable.



TRACK IN BACKGROUND ON ICE LEADING TO TRESTLE AT COMPLETED BREAKWATER

The rock, which is a trap formation, is obtained from a quarry located immediately opposite the breakwater. The equipment consists of four 20-ton dinkey locomotives; 36 in. gage; and some 50 dump cars of 4 cu.yd. capacity. Every car passes over a scale and is weighed, so the quantity of rock moved, which is paid for at a unit price per ton, is always exactly known. The rock is loaded by steam shovel and the

DUMP CAR TRAIN ON TRESTLE OF PORT ARTHUR BREAKWATER quarry contains the usual equipment of air compressor, air drills, plugger drills, etc.

On account of the heavy grade from the shore to the pit—6 per cent for the greater part of the distance—the engines could only haul eight of the empty cars up the hill, thus limiting the length of the train to that number of cars. Each car when loaded weighed approximately 12 tons and the engine weighed about 20 tons. To the entire weight of a train on the ice was about 116 tons, distributed over a distance of about 120 ft. The tracks at the passing siding were spaced 40 ft. c. to c. so as not to have too concentrated a load when two trains were passing each other. No difficulties whatever were experienced in running over the ice, which ultimately reached a thickness of 36 in. and an average output of something over 1,000 tons a day was maintained. Next winter the contractors expect to relay the track on the ice to complete whatever portion of their contract may not be finished by the end of the present summer.

RAILWAY LAID ON LAKE SUPERIOR ICE

Variation in the Length of Wood Fibers

THE current supposition that each species of wood has a characteristic fiber length is not born out by the many thousand measurements which have been made at the Forest Products Laboratory on wood fibers. A great difference may be found in one tree than exists between the average fiber lengths of different species. In one Douglas fir disc, for example, the fibers varied from 0.8 to 7.65 millimeters in length. On the other hand, the averages of several thousand measurements on Douglas fir and longleaf pine were less than one millimeter apart, being 4.41 and 3.67 millimeters, respectively.

During the first 20-50 years of growth, the increase in fiber length from the center of a tree outward in any plane is very striking. An approximate maximum having been attained, fiber length, though it may fluctuate somewhat, does not radically change thereafter, even in trees 400 or more years old. Some increase in fiber length occurs also for about two-thirds of the distance from the butt to the top. Within each annual ring the length of the fibers varies, particularly in the conifers, where the early springwood has the longest elements, and the last-formed cells of summerwood the shortest in the ring.

Tests Show Effect of Storage on Cement Strength

All Methods of Sack Storage Give Initial Weakness, but Strength Becomes Near Normal in Two Years

TESTS have been under way for some time in the Structural Materials Research Laboratory of Lewis Institute at Chicago looking into the effect of storage of portland cement on the strength of concrete made from it. A report on the first two years' result was made to the Portland Cement Association, under whose auspices the Laboratory is conducted jointly with the Lewis Institute, by D. A. Abrams, professor in charge, and this report has been published as Bulletin No. 6 of the Laboratory. The data given and the deductions therefrom are both novel and informing, for it is shown that for any kind of storage in sacks, varying from ideal laboratory conditions to a typical outdoor shack storehouse, there is a decided falling off in strength at the 7-day and 28-day ages of concrete, with a gradual approach of the aging concrete to the strength of specimens made from cement fresh from the warehouse. At two years, the present limit of the reported tests, the strength of concrete made from stored cement was about 85 per cent of that from fresh cement. It was also found that increased length of storage caused greater early deterioration in strength.

Extracts from Professor Abrams' report are given herewith.

Tests were made on three separate lots of portland cement, which had been in storage for periods up to two years. The cements were stored (a) in the laboratory, (b) in the basement of the building, and (c) in a shed in the yard. In general the cement was stored in lots of 800 to 1,200 lb. in standard cloth

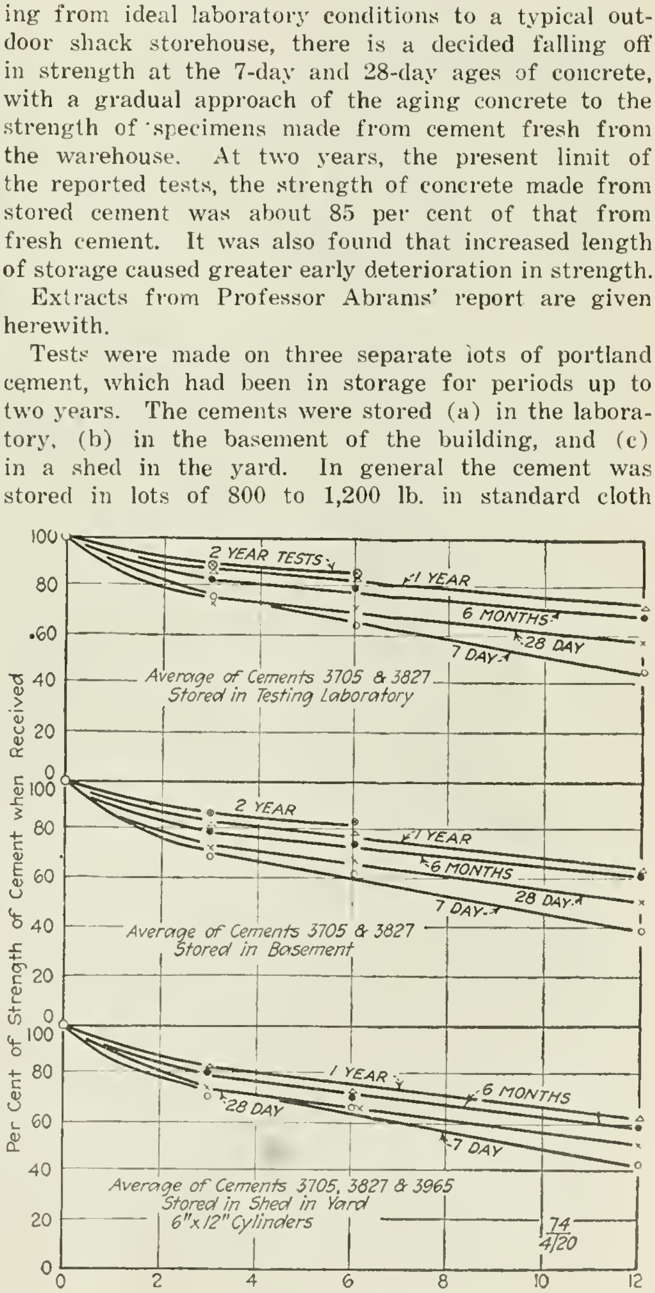


FIG. 1. RELATIVE STRENGTH OF 1:5 CONCRETE FROM STORED CEMENTS

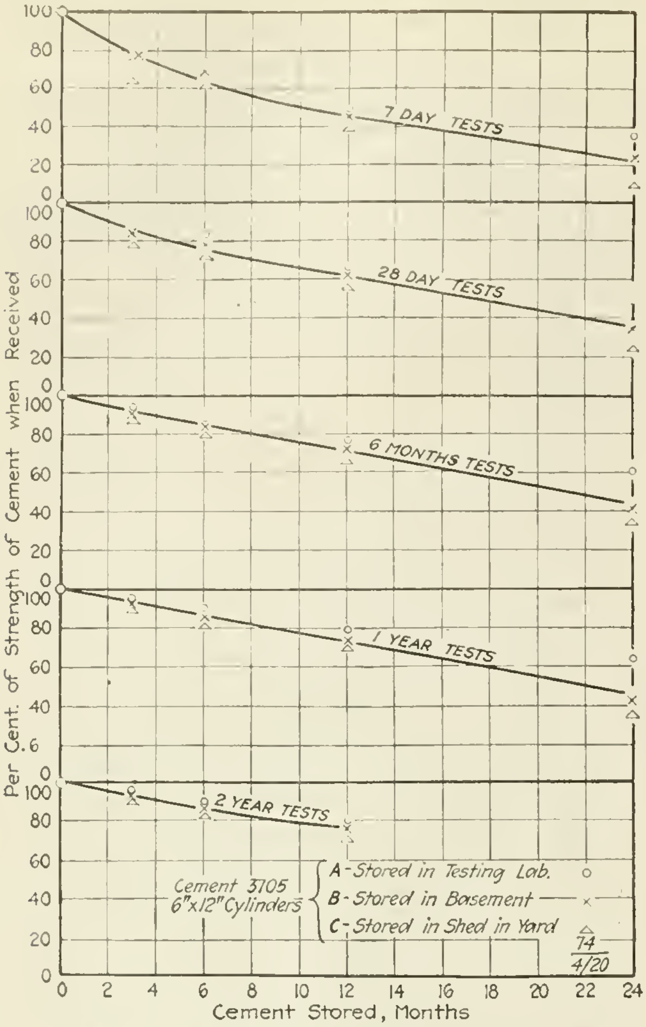


FIG. 2. AVERAGES OF TESTS OF DIFFERENT CEMENTS UNDER DIFFERENT STORAGE CONDITIONS

sacks; in one group of tests two brands of paper sacks were also used. In another group the cloth sack containers were covered with thin layers of, in one case, portland cement, and in another case hydrated lime. Tests were made at ages of seven and twenty-eight days, three months, one and two years on samples taken immediately upon receipt from the dealer's warehouses and after storage for three and six months, one and two years. The report includes compression tests of about one thousand 6 x 12-in. concrete cylinders, about one thousand 2 x 4-in. cylinders of 1:3 standard sand mortar and about 500 miscellaneous tests.

Storage conditions were as follows: (a) In testing laboratory, a large, steam heated room on the ground floor of Lewis Institute; temperature was quite uniform during the winter and humidity low during the winter. (b) In basement of Lewis Institute; temperature 5-10 deg. F. lower than (a); humidity rather high at all times. (c) In shed in yard near laboratory, no artificial heat. Sacks were piled on the floor about 1 ft. from the ground. A roof and thin board walls protected the sacks from direct contact with rain and snow, and allowed free circulation of outside air. Conditions here were similar to those in a temporary cement storage shed erected in the field. (d) Stored in laboratory two months before mixing, in a metal-lined box in basement one month after mixing. Usual conditions for cement used in the laboratory. Tests for this condition did not extend beyond the three months' storage period.

The cements used consisted of a mixture of equal parts of four brands of portland cement purchased in the Chicago market. One sack each of the four brands was thoroughly mixed dry in a concrete mixer. Before making the tests the cement samples were screened through a No. 20 sieve. In general lumps retained on the No. 20 sieve were rejected. In some of the later tests the lumps were broken and used, as noted hereinafter. Concrete consisted of one part cement and five parts by volume of mixed sand and pebbles graded up to 1¼ in. Aggregates were secured from the Elgin, Ill., pit of the Chicago Gravel Co. and the artificial grading was the same for all concrete. Concrete cylinders were proportioned separately and mixed by hand. Exactly the same quantities of cement, aggregate and water were used in each cylinder, as follows: Cement, 3.8 lb.; aggregate, 27.0 lb.; water, 980 c.c. The values give a water content of 7 per cent of the weight of the dry material, or a ratio of water to cement by volume (water-ratio) of 0.86. While the normal consistency of the cement varied slightly from time to time, these variations made only insignificant differences in the water requirements of the concrete and hence were disregarded.

The accompanying Table I is typical of those published in the original report. It gives the test figures on one typical lot of cement, and Fig. 1 is a typical diagram showing the relative strength of the concrete and the different storage conditions, the different periods of storage, and age of concrete.

Discussion of Tests

Although this investigation is still incomplete, the tests have now been under way for nearly 3½ years, and it is believed that in many instances definite conclusions can be drawn.

The samples stored in the laboratory (a) were under about the most favorable conditions possible in this latitude, so long as the cement is stored in sacks. Those in the shed in yard (c) were under conditions which would be considered good for cement stored on construction work. The basement

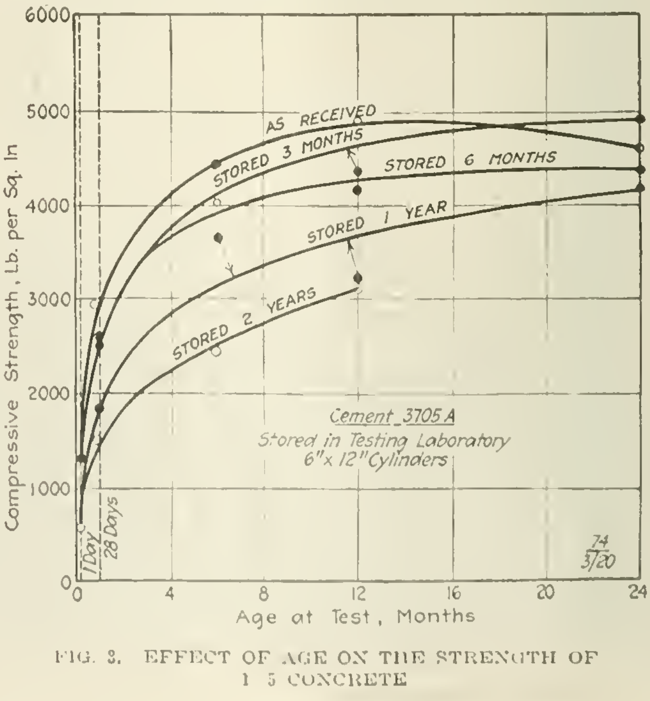


FIG. 3. EFFECT OF AGE ON THE STRENGTH OF 1 5 CONCRETE

TABLE I. COMPRESSIVE STRENGTH OF CONCRETE AND MORTAR

Cement, a mixture of four brands purchased in Chicago market.
Aggregate used in concrete, sand and pebbles from Elgin, Ill., graded 0–1¼ in.
Concrete was mixed with 7.0% and standard-sand mortar with 10.3% of water by weight of dry materials in the batch.
Concrete cylinders stored in damp sand; mortar cylinders in water.
Each value is the average of 5 tests made on different days.

Group 1 Cement Lot No. 3705 Storage Began Nov., 1916

		Compressive Strength—Lb. per Sq.In.									
		1:5 Concrete (6×12-in. Cylinders)					1:3 Standard-Sand Mortar (2x4-in. Cylinders)				
		When Received	Cement Stored for				When Received	Cement Stored for			
Mark	Storage Condition of Cement		3 Mo.	6 Mo.	1 Yr.	2 Yr.		3 Mo.	6 Mo.	1 Yr.	2 Yr.
		7-Day Tests									
3705	Tested when received	1500					2,080				
3705A	Testing laboratory		1,330	1,310	900	580		1,800	1,640	1,200	920
B	Basement		1,260	1,260	810	430		1,670	1,750	960	790
C	Shed in yard		1,200	1,140	710	270		1,750	1,520	800	530
D	Laboratory 2 mo., in metal-lined box 1 mo		1,250					1,630			
		28-Day Tests									
3705		2,940					3,800				
3705A	Same as above		2,620	2,550	1,860	1,540		2,690	3,040	1,990	1,580
B			2,520	2,520	1,720	1,000		2,930	2,840	2,030	1,590
C			2,240	2,300	1,470	600		2,470	2,750	1,600	1,000
D			2,830					2,880			
		6-Months Tests									
3705		4,450					5,130				
3705A	Same as above		4,420	4,030	3,680	2,460		3,880	4,480	3,520	2,980
B			4,370	3,850	3,150	1,460		4,340	4,200	2,900	2,910
C			4,110	3,640	3,040	950		4,210	4,170	2,520	1,690
D			4,620					4,590			
		1-Year Tests									
3705		4,930					5,060				
3705A	Same as above		4,370	4,190	3,250	3,150		4,220	4,540	3,830	3,370
B			4,510	3,820	3,190	2,280		4,540	4,290	3,400	3,040
C			4,290	3,720	3,120	2,160		4,420	4,500	2,430	1,900
D			4,940					4,280			
		2-Year Tests									
3705		4,610					4,600				
3705A	Same as above		4,900	4,340	4,190	*		4,300	4,210	3,550	*
B			4,580	4,250	4,270	*		3,650	4,100	3,820	*
C			4,410	3,760	3,990			3,970	4,490	2,800	*
D			4,820					4,070			

* Tests not due

storage (b) was intermediate between (a) and (c) so far as humidity conditions were concerned. The use of paper sacks and the covering of cloth sacks with portland cement or hydrated lime were variations of the shed storage.

In the following discussion the strength of concrete and mortar will be compared to the strength of similar specimens tested at the same age using the cements as received from the dealers' warehouses. In other words, the strength of the cement in the condition received, tested at a given age is taken as 100 per cent, the strength at the same age after storage will be some smaller percentage. Care must be taken to distinguish between the *storage period* of the cement and the *age at test* of the concrete and mortar.

1. There was no essential discrepancy between the indications of the compression tests of 1:5 concrete in the form of 6 x 12 in. cylinders and the tests on 1:3 standard Ottawa sand mortar in 2 x 4 in. cylinders.

2. Compression tests of concrete and mortar showed a deterioration in strength with storage for all samples of cement, for all conditions and periods of storage and at all test ages. The deterioration was greatest for the samples stored in the shed in yard, and least for the samples stored in the laboratory. The basement storage was nearly as severe as outdoors. The deterioration was greater during the first three months than for later three-month periods. A greater deterioration was found in the tests made at the age of seven days than at twenty-eight days and later test ages.

3. The effect of storing cements under different conditions for periods up to two years is given in Table II. The value for samples (a) and (b) are from two lots of cement; samples (c) are from three lots of cement, including different types of sacks and different covering materials. After three-months storage in shed in yard (c) the cement had 80 per cent of its original strength; after six-months, 71 per cent; after one-year, 61 per cent; after two-years, 40 per cent. Laboratory storage was less severe, especially after the one-and two-year storage. Deterioration was probably greater in these tests than would be found in a large lot of cement stored under similar conditions.

4. The effect of the age at which concrete and mortar tests are made is shown in Table II. For this comparison we have chosen the "shed-in-yard" storage for three reasons:

a. This storage condition is the most severe of those used.

b. We have tests for this storage for three different lots of cement.

c. The effect of age at test is approximately the same for all storage conditions.

Table III brings out a remarkable feature of this investigation in showing that the *effect of storage of cement is largely a question of the age at which the concrete or mortar is tested.* The average concrete strength (for all the periods of storage shown at seven days is 64 per cent of

TABLE II. EFFECT OF STORAGE CONDITION OF CEMENT

	Relative Strength of Cement After Storage Periods of									
		1:5 Concrete (6x12-In. Cylinders)				1:3 Standard Sand Mortar (2x4-In. Cylinders)				
Storage Condition of Cement	When Received	3 Mo.	6 Mo.	1 Yr	2 Yr.	3 Mo.	6 Mo.	1 Yr.	2 Yr.	Average
— When received	100									100
(A) Testing laboratory		82	78	69	53	78	80	64	51	69
(B) Basement		77	74	66	36	75	76	61	49	64
(C) Shed in yard		80	71	61	40	75	73	58	36	62
Average		80	74	65	42	76	76	61	45	

TABLE III. EFFECT OF AGE OF TEST SPECIMEN

Cement Lot No.	Placed in Storage in Shed in Yard	Average of Tests After Storage Periods	When Received	Relative Strength of Cement When Tested at Ages of — 1:5 Concrete (6x12-In. Cylinders) 7 d.	28 d.	6 Mo.	1 Yr.	2 Yr.	1:3 Standard Sand Mortar (2x4-In. Cylinders) 7 d.	28 d.	6 Mo.	1 Yr.	2 Yr.
3705	Nov., 1916	3 and 6 mo., 1 yr	100	54	69	78	80	81	62	62	70	76	77
3827	May, 1917	3 and 6 mo.	100	63	57	65	72	79	68	69	73	76	79
3965	Nov., 1917	3 mo.	100	74	87	92	93	94	80	70	72	75	81
Grand average. .			100	64	71	78	82	85	70	67	72	76	79

the strength when received; at twenty-eight days, 71 per cent; at six months, 78 per cent; at one year, 82 per cent, and at two years, 85 per cent.

This most significant relation is shown in both concrete and mortar tests of all samples of cement for all conditions of storage. Cements stored in laboratory show a smiliar variation with the age at which the *concrete is tested.*

It is a matter of utmost importance to know that the strength of concrete is not permanently reduced to the low values found in the early tests, but that at the later test periods the strength again approaches that before storage began. It should be borne in mind that the concrete and mortar specimens were stored in a damp place. The grand averages in Table III will probably be reduced when complete data of all tests up to two-year storage are available.

5. For periods up to one and one-half years there is no marked difference in the quality of the samples of cement stored in cloth or in paper sacks. The two brands of paper sacks gave almost identical results. The comparison between cloth and paper sacks is given in Table IV. If the strength of the cement when received is considered as 100, the average of cloth-sack storage for all test ages is 62, for "Jaite" paper sacks 65, and for "Bemis" paper sacks 63.

TABLE IV. EFFECT OF TYPE OF CEMENT SACK

Storage Condition of Cement	When Received	Relative Strength of Cement After Storage Periods of — 1:5 Concrete (6x12-In. Cylinders) 3 Mo.	6 Mo.	1½ Yr.	1:3 Standard Sand Mortar (2x4-In. Cylinders) 3 Mo.	6 Mo.	1½ Yr.	Average
When received	100							100
(C) In shed in yard—Cloth sacks......		67	64	46	74	71	52	62
(D) In shed in "Jaite" paper sacks..........		73	66	50	76	72	54	65
(E) In shed in "Bemis" paper sacks		72	62	48	71	74	53	63
Average		71	64	48	74	72	53	

6. The experiments in Group 3 on the use of portland cement and hydrated lime as a covering for cloth sacks showed only a slight advantage from the protection furnished in this way. There seems to be little room for choice between the two materials. The average of all concrete and mortar tests up to one year of age are given in Table V.

If the strength of the cement when received is considered as 100, the average of cloth sacks uncovered (for storage periods of three months to two years) is 62; for sacks covered with hydrated lime, 67; and for sacks covered with portland cement, 66. The beneficial results do not justify the cost of these methods of protecting cement stored in sacks.

7. The most favorable storage condition (in laboratory) and the least favorable conditions (in basement and in shed in yard) gave strengths of the same order of magnitude, indicating that the possibilities of improving the storage condition of cement *in sacks* in this climate is rather limited. The *storage period* and the *age of the concrete or mortar at test* appear to be of greater importance than the exact *condition of storage,* so long as the cement is protected from direct contact with moisture.

8. Storage of cement had the effect of prolonging the time of both initial and final setting as determined by the Vicat and Gillmore needles. Setting time was increased 25 to 50 per cent for samples stored one year and to a greater extent for samples stored two years.

9. All samples of cement were sound in the standard test over boiling water, hence no information was secured on this property.

10. The normal consistency of the cement as determined by the Vicat needle was only slightly affected by storage. For cements stored one and two years the normal consistency was in some instances increased from about 23 to 24 or 25 per cent.

11. A steady increase in CO_2, moisture, and loss on ignition, shows the result of absorbed moisture and carbon dioxide during the storage of cement in a humid climate.

12. Deterioration of cement in storage appears to be due to absorption of atmospheric moisture, causing partial hydration which exhibits itself principally in reducing the early strength of concrete and prolonging time of setting.

The exact method of dealing with lumps in stored cement is a complicating feature of such tests as those covered by this report. In the earlier samples all lumps coarser than No. 20 sieve were screened out and rejected before the cements were subjected to test. No lumps or only soft and readily broken lumps were found in the cements which had been stored less than one year. One cement placed in storage in the fall of the year in shed in yard for one year showed about 8 per cent of lumps coarser than the No. 20 sieve. These lumps were soft and easily crushed in the fingers. After two-year storage the condition was about the same.

Another cement stored in the spring of the year in shed in yard gave about 12 per cent of lumps at the end of one year. After two years' storage this sample showed 30 to 75 per cent lumps. These lumps were broken on the concrete floor with a metal tamper and used in the concrete. Even in this condition the cement had considerable strength.

Another series of concrete tests (not reported in detail) in which broken lumps only after two years' storage in shed in yard were used, showed a strength at ages of seven days to two months of 40 to 50 per cent of the strength of the other cement from the same sacks. The lumps in this case were quite hard, requiring a sharp blow from a hammer to break them.

Lumps due to absorption of moisture should not be confused with lumps due merely to pressure of the superimposed pile of cement sacks.

TABLE V. EFFECT OF HYDRATED LIME AND PORTLAND CEMENT AS COVERING OF CEMENT SACKS IN STORAGE

Storage Condition of Cement	When Received	Relative Strength of Cement After Storage Periods of — 1:5 Concrete (6x12-In. Cylinders) 3 Mo.	6 Mo.	1 Yr.	2 Yr.	1:3 Standard Sand Mortar (2x4-In. Cylinders) 3 Mo.	6 Mo.	1 Yr.	2 Yr	Average
When received.	100									100
Sacks uncovered		85	71	54	45	72	70	67	35	62
Sacks surrounded by hydrated lime		92	80	69	48	81	65	60	43	67
Sacks surrounded by Portland cement		87	82	61	52	75	76	59	43	66
Average.		88	78	61	48	76	69	62	40	

Notes from Foreign Fields

RANDOM HIGHWAY OBSERVATIONS IN ENGLAND

BY
E. J. Mehren
EDITOR ENGINEERING NEWS-RECORD

SUNDAY is surely holiday time in England. Agreeable to that spirit I had the opportunity last Sunday of motoring through parts of the counties of Essex and Suffolk, lying to the northeast of London. It was a trip without technical guidance and my observations, therefore, are unchecked or enlarged by the information obtainable from a roads authority.

The trip lay through the beautiful English countryside, put under cultivation almost to the last square foot. Fields, gardens, hedges, road-sides—all were beautifully cared for. The road surfaces were mostly water-bound macadam with a gravel sprinkling, or wearing coat, though here and there were stretches that had tar surface treatment.

Taking them all in all their condition was very good. Occasionally a stretch would be found in which there were pot-holes, but these were seldom closer than 10 ft. and rarely were there two side by side. Seldom, too, were they greater than 15 or 18 in. in diameter. Our host regarded these roads as wretched and apologized profusely for their condition. In America we expect to find macadam and surface-treated roads so much worse every spring that my American companion and I saw no reason for the profuse apologies. We would not have said that these sections were in first-class condition, but, on the other hand, we would not have called them bad.

It being Sunday, we were not able to form any impression of the traffic normally carried by the roads. We saw only horse-drawn carts, passenger automobiles, and a few double-decked motor buses. We were assured, however, that all of these roads and we went as far north as Bury St. Edmunds—carry a heavy motor-truck traffic on week days. During the war, particularly, they are said to have had a very severe pounding. They were then, it was said, in bad condition, but all vestiges of the destruction by the war traffic have now been obliterated.

Road widths were from 18 to about 22 ft., and, much to our surprise, the sides of the paved width were bordered immediately by the grass plots. These plots are raised so as to form a curb 6 to 8 in. high. There are no shoulders, as we know them—and that is, unmetaled or unpaved strips on either side. The effect is, of course, to make a narrower road than is customary with us, but a road the full width of which is metalled. I commented upon this to Sir Henry Maybury, director of the Roads Department of the Ministry of Transport, a position corresponding to that of Mr. McDonald in our Bureau of Public Roads. He told me that their experience with natural earth shoulders in England had been a very unsatisfactory one. Invariably a bad rut developed at either edge of the paved way, this being so serious a feature that it has been dubbed in England the "pig trough." This would tend to indicate very heavy traffic, so heavy as to force the drivers on to the shoulders if used. Sir Henry assured me that the practice universally is not to use unpaved shoulders.

We saw only one piece of work under way, a resurfacing job on top of a tar-bound or tar-treated macadam. A single course of stone graded in size up to about 2 in. maximum was put down and given a tar coat, this was rolled and covered with chips.

In many cases, the usual water-bound macadam was given a light dressing of gravel, of a maximum size of ½ in., carrying a very heavy proportion of coarse sand.

Another feature unusual to the American eye was the well-maintained gravel footways along, as a rule, one side of the highway.

These remarks, it should be pointed out again, are merely random observations. I hope later, after conference with some of the highway officials, to be able to give technical details.

In closing I want to note that an American is astonished at the very great amount of waterbound macadam carrying heavy traffic. In railroad trips through the country I have seen heavy lorries running at high speed over these waterbound macadam roads. How does waterbound macadam stand up under such traffic? Or does it actually stand up? On these points I am seeking enlightenment.—London, May 13, 1920.

Wet Aggregates Make Concrete Too Strong

TESTS recently announced by the U. S. Bureau of Standards show the importance of noting the moisture of sand in concrete work. When aggregates were proportioned by volume measure, as is customary on most construction work, it was found that the use of wet aggregates requires ½ to 1 bag more cement per cubic yard of concrete than do dry aggregates. Sand is generally wet or at least moist when used, so that the full difference may never be apparent in field practice, yet the use of sand from a pile which has just been exposed to rain will result in the employment of more cement for a given volume of concrete than would have been the case had the work been done on a dry day. The excess strength resulting from the increase in cement is unnecessary providing that designed strengths were obtained with the drier materials. This increased quantity of cement may be as high as one bag per cubic yard of concrete, and the increase in strength, due to the added cement in a cubic yard of concrete made with wet aggregates, is roughly proportional to the increase in cement. Therefore, if there is a marked increase at any time in the moisture carried by the sand, the tendency on the job should be to use larger volumes of sand in the batch. According to the announcement of the Bureau, marked improvement in the working qualities of the concrete will be noted under usual conditions when the relative volume of sand is increased and the gravel proportionally reduced. With well graded river sand and gravel, such as is available in the District of Columbia, the "oversanding" may be beneficlai up to the point where the volume of sand in the batch is equal to the volume of the gravel. Such concrete will not segregate for maximum flowability commonly used in construction work; it will be easier working, the quantity of cement required per cu. yd. will be slightly less and there will be no reduction in compressive strength.

LETTERS TO THE EDITOR

Prohibition and the Foreign Born

Sir—My interest has been aroused by the letters published in *Engineering News-Record*, June 3, p. 1122, concerning "Prohibition and the Foreign Born." Why is it that so many people fail to see a moderate course, but always look at one extreme or the other? This, I think, is especially true of the average prohibitionist. To such a person, "drink" is synonymous with "whiskey." But why? It shouldn't be. Mr. Satterthwait says in his published letter, "Whiskey is the monkey-wrench in the machinery of industry." Granting it, is that any reason for absolute prohibition? Cannot the rabid prohibitionists conceive of a moderate course, doing away with whiskey and gin but leaving the harmless or at most very slightly harmful ales, beer, and wines? I believe that the average Italian laborer cares far more for his wine than for whiskey and gin, and if these latter drinks were dispensed with, immigration would not be materially affected. But unfortunately there are still some extremists who cannot conceive of prohibiting anything without prohibiting everything, and these very people are often the ones who criticise the extremity and radicalism of the "reds" and I. W. W.'s. A good policy for everyone to pursue would be that of the old motto, "Moderation in all things." There is at present all too much proneness to extract a mote from some one else's eye, while having a beam in one's own. I do not mean by this that the reds are any less bad than they are pictured, but, rather, that many others are much worse than they believe themselves to be. Perhaps a common-sense liquor policy in this country would induce the return of the normal immigration tide from Europe. If so, that would be far, far preferable to the importation of Chinese labor, against which I always have been, and always will be, prejudiced, a feeling due perhaps to the fact I was born and brought up on the Pacific Coast.

Troy, N. Y. CHARLES SHEPARD.

Shall Chinese Labor Be Imported?

Sir—Referring to a letter of H. S. Crocker, acting secretary of the American Society of Civil Engineers, appearing in your issue of June 17, p. 1219, wherein he calls attention to a letter of mine in your issue of June 3, p. 1121, stating the number of members and associate members of the society to which letters relative to importation of Chinese labor were sent, as about 2,000 in all, I beg to call your attention to my original letter, of which said letter is supposed to be a reprint and wherein the number is given as about 7,000 instead of 2,000.

The number of letters actually sent was 7,975, of which 101 were returned undelivered. The number 2,000 in the letter as published is therefore, a misprint.

JOHN ERICSON,
Chicago. Consulting Engineer.

[The facts are correctly stated by Mr. Ericson. This journal is responsible for the typographical error referred to.—EDITOR.]

Sir—Enclosed you will find a copy of a letter written to John Ericson, consulting engineer of Chicago, in reply to his circular letter concerning the modification of the Chinese exclusion act. I read with considerable interest some of the comments in the recent issues of *Engineering News-Record* relative to the letter of Mr. Ericson's, and if you should wish to make use of any portion of the enclosed you are at liberty to do so. WILLIAM R. CONARD.

Burlington, N. J.

[A copy of Mr. Conard's letter to Mr. Ericson follows.—EDITOR.]

June 14, 1920.

As to the desirability and feasibility of so modifying the exclusion act as to allow the importation under certain restriction of Chinese laborers, I cannot feel that this is going to help solve the matter in really a proper manner. I will say, however, that I have never been able to reconcile in my own mind why America should exclude the Chinese and Japanese and allow entrance to other foreigners, among whom are found those who stir up trouble—as they have done—among both the Americans and those foreigners who come here with the intention of making this country their home, and who appreciate some of the blessings they are allowed to possess in this country. If there is to be a modification of the immigration restrictions it must, in my judgment, be along such lines that that undesirable class, no matter what color or nationality, shall be excluded.

In considering this question, we must not lose sight of the fact that not only is there some shortage of unskilled labor, but that unskilled labor is not producing either the quantity or quality of work of some years ago. The further fact is apparent that those who may have graduated from the unskilled to the semi-skilled and skilled classes seem to have been spreading the propaganda that "work" or "labor" or "production" or whatever term may be applied, is degrading, until this belief is impressed on the minds of the unskilled, all of which serves to lower efficiency.

The Good Book, which should be the rule and guide for our conduct, tells us that we shall gain our bread by the sweat of our brow. If labor of every class would bear this in mind, in this the best country on the face of the globe, and adopt as its watchword that greatest of all rules of living: The one given us by the Master—"That which ye would have others do unto you do ye also unto them," it is my belief we would find that, by everyone putting his shoulder to the wheel, there would not be such a labor shortage as some of us imagine.

Another fact is that within a comparatively short time the tide has begun to turn and there are more immigrants coming into this country now than we are losing, a condition which encourages me to believe that in the not too distant future, matters will naturally return to a normal basis.

Practical Designer vs. Theorist Again

Sir—I note Prof. Clyde T. Morris' criticism in your issue of June 10, p. 1172, of my article of May 13, p. 948. In this correction please note that two typograhical errors exist in the article. On page 948, near Fig. 1 the word "no" should be omitted, making it read "Engineers wisely allowed unit stresses higher." On page 949, about the middle of the first column, the word "connecting" should be "connoting."

Prof. Morris says of my Fig. 2, "The 'theorist' will immediately tell you that the bending moments in the two cases A and B are not equal. The bending caused by the 100,000-lb. load on top of column A will relieve some of the pressure on the ball and reduce the bending moment on the column." This is error No. 1. The pressure on the ball would be reduced about 400 lb., a trifle, and the eccentricity of the 100,000-lb. load will supply the bending moment, leaving it exactly the same as it was. The bending is due to the constrained shape of the column.

He further says, "On the other hand the bending moment in the column B will be increased by the deflection of the column under the 100,000-lb. load." This is error No. 2. The end load would in fact add something like ⅛ in. to the deflection of a column bowed 3 in., but the figure shows 3 in. as the deflection under load, which includes the original bow of the columns, if Prof. Morris wants to go into such fine points.

Prof. Morris goes on to figure out what ultimate load these columns would sustain, using 32,000 lb. as the unit stress at the limit of usefulness. Columns A are already strained to 22,000 lb. per sq.in., 10,000 lb. from the direct direct load and 12,000 lb. from the constrained shape (due to the pressure on the ball). An added load of 100,000 lb. will add the 10,000 lb. of unit stress, making the total 200,000 lb. and not 240,000 lb. as Prof. Morris states. Error No. 3. On the bowed column each 10,000 lb. of added load increases the direct-load unit by about 1,000 lb. and the bending unit by about 1,200 lb. Hence the bowed column could take roughly 145,000 lb. instead of 130,000 lb. Error No. 4.

In any event it is a matter of little consequence whether Prof. Morris' figures for the ultimate load or mine are correct: it does not affect my proposition in the least. A little change in the loads, etc., could be made that would give identical unit stresses at 32,000 lb. as easily as 22,000 lb. The question regarding the twin columns is not what would be the relative values of these columns if they had much heavier loads on them, or even were tested to destruction; but with unsafe loads on them, as they now have, judging by unit stresses, and the unit stresses identical, why are they not both equally unsafe? I, for one, in spite of the calculated unsafe unit stress of columns A would not hesitate to say they are safe. I would just as promptly pronounce columns B unsafe.

The thing is put in this shape, not to create an impossible condition, but to show an analogy where the actual disparity in safety between two columns identically stressed is so patent that no engineer can dispute it. The analogous case I gave in an article in your issue of Oct. 16, 1919, p. 730. In that article I criticised a detail of a girder resting on a bracket on one side of a column and failure to consider the bending moment. It was recommended that the girder be rigidly riveted to the side of the column and the bending moment thus thrown into the girder and ignored in the column. Theorists objected to this and pointed out the bending moment due to deflection, which, theoretically, might be more than in the bracket detail.

The case of the twin columns is completely analogous with that of my Fig. 1 in the Oct. 16 issue. It ought to be enough to convince anyone of the correctness of my position that such secondary stresses may be ignored and that rigid connections are immensely better than articulated ones in spite of those ignored secondary stresses.

Pittsburgh. EDWARD GODFREY.

To Strengthen the Winnipeg Aqueduct Drainage System

Sir—I have read with great interest the article on alkali damages to the Winnipeg concrete aqueduct and the means of preventing their further progress, which appears on p. 1097 of your June 3 issue. The remedies proposed and shown in detail in the article are, of course, standard ways and certain of success. The idea of protecting concrete conduits from alkali action by drainage through vitrified clay pipes goes back to the first observations by engineers of a series of difficulties along this line which occurred at Great Falls, Montana, and which were studied in detail by the Montana Agricultural College Experiment Station. Among the recommended remedies for these disintegrations was a system of under drains similar to the one you describe, and the protection of the surfaces of the structure by a vitrified clay tile lining.

Since that time the excellent work of the American Society for Testing Materials, of the Bureau of Standards and of the Iowa State College of Agriculture and Engineering—not to mention others—all co-ordinated, has resulted in specifications for vitrified clay drain tile which make it, more than ever, proof against failure from chemical causes. There is, however, one weak point which I see in the details of the proposed Winnipeg system which may cause failure from breakage. The design calls for a standpipe every thousand feet, rising from the longitudinal vitrified clay drains. The connection between the drain and the standpipe is made by a standard 8 x 8 x 6 vitrified clay T. The weight of the standpipe is, of course, not sufficient to crush the T, but the weight of the earth which clings to it and hangs upon its sockets during settlement is very considerable, and it will have a great tendency to push the standpipe down through the drain line and crush the T. This 8 x 8 x 6 T should, therefore, be securely foundationed on a small concrete block, and the concrete should surround it entirely and come well up upon the first length of pipe which enters it so that the weight of the settled earth will be taken directly in compression in the standpipe, instead of Transversely in the T. It is quite conceivable that the engineers have already taken this into account, although their general plans do not show this small detail. But since this is one of the little details the failure to observe which will completely block the drainage, I have ventured to call attention to it.

BENJAMIN BROOKS,

Chicago. Engineer, Clay Products Association.

Effect of Flange Holes in Beams

Sir—In connection with Mr. Fleming's discussion of the weakening effect of flange holes in beams, in his article "Stray Points in Structural Steel Design" in *Engineering News-Record* of May 27, 1920, I note the American Bridge Co.'s specifications for steel structures, as we have them in the Carnegie Steel Co. handbook, call for rolled beams and built-up members used as beams and girders to be proportioned by the moment of inertia of their gross sections. Most text books on the subject, I believe, use the net flange area in figuring the strength of such beams. I should like to know if any tests have been made to show whether the weakening effect of holes in girder and beam flanges is as great as the theory would indicate. It seems to me the differences in practice noted above in this respect would justify such tests if they have not already been made.

D. M. DODDS,

Kansas City, Mo. Structural Engineer.

Rectangular Co-ordinates for Maps

Sir—In an article of mine entitled "Rectangular Co-ordinates Used in Surveys and Maps." published in *Engineering News-Record*, May 13, p. 962, it is stated that some work has been done toward applying a grid system to the polyconic projection of maps as used in the United States. Since that article was published I have received from William Bowie of the U. S. Coast and Geodetic Survey its special publication No. 59, "Grid System for Progressive Maps in the United States," a publication containing complete tables and instructions for applying a grid system to a map of any part of the United States, based on the polyconic projection. It would be of great value to anyone interested in this general subject. H. A. FOSTER.

South Orange, N. J.

Should the Snow Loading Allowance on Roofs Be Increased?

Sir—As an aftermath of the past winter and the severities of weather incident to it, it is of interest to note the snow fall which occurred during that period.

It is commonly supposed and indeed stated by the "oldest inhabitants" that the snow conditions were more severe than ever before remembered or experienced. To verify the above general opinion and to determine the loading and effect at the time when snow conditions seemed to be at their maximum, some of our senior engineering students were directed to find out what the actual weight was. For this purpose they marked out an area of known size and proceeded to weigh all the accumulated snow within this limit, taking into account the ice which underlay the snow. It was found that the loading reached the amount of 35 lb. per square foot of area.

The location chosen was on a level part of the campus, the nearest building being about 40 ft. to the south. It was, therefore, felt that the conditions as tested might serve as a suitable gage for the loadings for roofs which had not been subject to the heat of buildings and consequent thawing.

Since the figure commonly employed in this latitude for maximum snow loadings on level roofs is about 30 lb. per square foot, it seems to be a pertinent question as to whether this limit should not properly be increased in view of the experiences of the past few months.

SYDNEY WILMOT,

Assistant Professor of Civil Engineering.

Brown University, Providence, R. I.

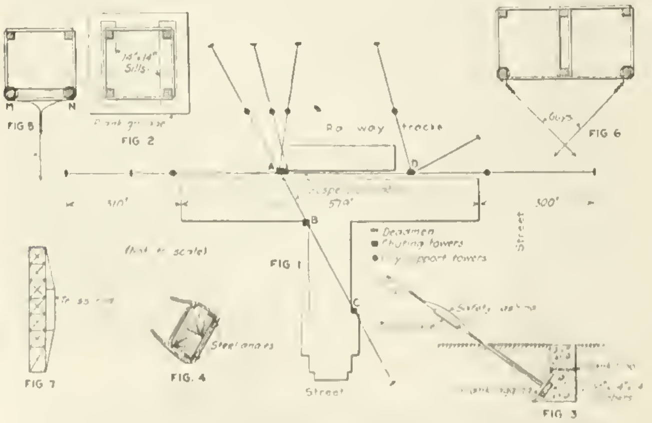
HINTS FOR THE CONTRACTOR

Details of Tower Guying Methods for Concrete Chuting Plant

With railway tracks and two streets to be spanned by guys from the four chuting towers, especial means for supporting and fastening the steel cables were employed on the Bunte factory building in Chicago. The locations of the various towers are indicated on the diagram plan, Fig. 1. Only those guys which involved some special problem are indicated. Incidentally it will be observed that the chute suspension cables have exceptional lengths of span.

There are four chuting towers. One at *A* is a double-hoist tower 230 ft. high. Towers *B* and *D* are auxiliary towers 180 ft. and 150 ft. high, respectively, and tower *C* is a rehoist tower 180 ft. high. All four towers are carried on plank grillages as indicated by Fig. 2, it being the experience of the contractors that this construction is a wise precaution against settlement. The towers are guyed with ⅝-in. wire rope at approximately 50 ft. vertical intervals. All cables are anchored to deadmen constructed as indicated by Fig. 3. The construction of the deadmen is noteworthy in the respects, (1) that the anchor timbers bear full length against a plank lagging, (2) that the anchor pit has a plank flood or bulkhead so that the backfill on top acts as a unit, and (3) that where the anchor cable is lashed around them, the timbers are armored as indicated by Fig. 4.

The guys are attached to the anchorage by turnbuckles as indicated by Fig. 3, and to prevent accident, should a turnbuckle connection fail a safety lashing of cable is provided as indicated. These lashings are quickly installed by means of cable clamps. At the tower ends the guys are fastened as indicated by Fig. 5. Coming from the ground the free end of the cable is given two turns around post *M*, then two turns around post *N* and then is carried back and clamped to the guy line. With this fastening a double connection is secured and the pull on the tower posts is symmetrical. At the double tower, Fig. 5, the guys are led away from the tower on intersecting lines. By this arrangement, it is practicable by means of the guys to rectify the lateral twists to which double towers are liable. In constructing the guy support towers, Fig. 7, which hold the lower guys clear of the streets and the railway tracks, a truss rod is used to give stiffness without heavy framing.



GUY CABLE FASTENINGS, ANCHORAGES AND SUPPORTS

The construction to which the described practices relate is being carried out by R. C. Wieboldt, general contractor, Chicago.

Temporary Trusses Support Roof Forms

By P. S. Toney

Engineer, Sinclair Refining Co., East Chicago, Ind.

By erecting temporary trusses, no scaffolding was required for erecting or dismantling the forms for a wide-slab, concrete-tile roof for a new boiler house for the Sinclair Refining Co. at East Chicago, Ind. The roof, 50 x 90 ft., is divided into three sections: A monitor 12 ft. wide, and two sections approximately 18 ft. wide, one on either side of the monitor. The roof is supported by a wall at one end and by four trusses spaced 22 ft., c to c. The monitor, as will be seen from the illustration, is supported between trusses by lattice girders. The bottoms of the trusses are 35 ft. above the boiler room floor. The problem was to support the roof form between trusses—22 ft.—and between the girder beneath the monitor and the outside brick wall—18 ft.

TIMBER TRUSSES CARRY ROOF FORMS

A temporary truss was designed to carry a total load of 26,400 lb. using a factor of safety of 2½, having a span of 22 ft. and a depth of 3 ft. 6 in. Eight trusses were constructed of 2 x 8-in. plank, six being 22 ft. in length and two, 22½ ft. long. The longer ones were used in the end bay, with one end let into a slot left in the brickwork. To allow for ease in wrecking, these trusses were made 2 in. shallower than required and to bring them to the desired height wedges were driven under them at either end. Three courses, one brick wide, were left out on the inside of the 12-in. wall to receive the ends of the roof joists, while the remaining portion of the wall supported the concrete slab.

The trusses were hoisted to place and firmly secured by wedges. A 4 x 4-in. stringer was shored up from the lattice girder to the proper height and wired in place. The roof joists were then laid on 24-in. centers between the 4 x 4 and the truss and between the truss and the recess previously mentioned in the brick wall. Upon this ⅞-sheeting was laid. The contractor was the Leonard Construction Co., Chicago.

NEWS OF THE WEEK

New York, June 24, 1920

County in Arizona Lets $4,000,000 Concrete Highway Contract

Maricopa County, Ariz., has recently entered into a contract with Twohy Bros., of Seattle, Wash., for the construction of a comprehensive system of concrete highways which, it is estimated, will take more than $8,000,000 to complete. The contract so far executed by the county calls for the construction of 9-, 16-, and 18-ft., one-course concrete pavements, 6 in. thick, to cost approximately $4,000,000.

When the county made the $4,000,000 available through bond issues, it was thought that a 4-in. pavement would be of sufficient thickness to carry even the traffic of the future. However, since that time it has been demonstrated that 4 in. is not of sufficient thickness, and additional money will therefore be required to complete the concrete road system so that it will sustain any traffic which it is called upon to bear. In order to provide additional funds a plan is now on foot in Maricopa County to float another bond issue of approximately $4,000,000.

Forty-Six Projects

There are forty-six projects in the program as outlined, comprising a total mileage of 282.2 mi. The contractor bid upon a mileage basis for the 9-ft., 16-ft., and 18-ft. pavements in thicknesses of 4, 5 and 6 in. The bid upon which his contract is based calls for the construction of 9-ft. pavement, 6 in. thick for $18,358.34 per mile; 16-ft. pavement, 6 in. thick, $28,290.86 per mile; and 18-ft. pavement, 6 in. thick, $31,404.16 per mile. These prices include the cost of pavement complete, including excavation, concrete headwalls, reinforcing steel, pipe hand-rails, and miscellaneous concrete structures, and all labor, equipment and materials.

Construction is expected to start some time around Aug. 1. Approximately 300,000 cu.yd. of excavation are included in the contract, and though a great amount of 9-ft. pavement no doubt will be laid, the grading is to be done for the full width of the road. The Maricopa County Highway Commission has not definitely decided as to how much of each of the three widths of pavement will be used, so no exact contract price is available. There is, however, a tabulation in the contract of the following known quantities: Concrete structures, 3,341 cu.yd.; reinforcing steel, 210,823 lb.; concrete headwalls, 1,093 cu.yd.; pipe hand rail, 1,021 lin.ft.; and pipe culverts, 24-in., 5,479 lin.ft.; 30-in., 1,153 lin.ft.; 36-in., 1,382 lin.ft.; 42-in., 615 lin.ft.; and 48-in., 603 lin.ft.

Construction Division Becomes Part of Quartermaster Corps

By provisions of the recently enacted army reorganization bill the construction division of the army becomes a part of the Quartermaster Corps. Before the war the construction activities of the army in this country were in the hands of the Quartermaster Corps, but as soon as camps for the draft army were required a cantonment division, under the Quartermaster Corps, was organized. This was later changed to the construction division, reporting directly to the general staff and the Secretary of War. The formal order providing for the transfer has not been issued. It is expected, however, that the Secretary of War would issue the order within a few days. Maj. Gen. Harry L. Rogers, the Quartermaster General, states that there will be no change in the operation of the Construction Division. It will continue its work, he said, in the same way that it has been conducted, the only difference being that it will be under the immediate direction of the Quartermaster General rather than the General Staff.

Bridge Washout Breaks High Pressure Gas Mains

On June 17, 1920, a highway bridge spanning Chartiers Creek near its mouth and connecting Pittsburgh with McKees Rocks, Pa., was wrecked due to the washing out of the west abutment. A heavy storm of the previous day and night caused a sudden rise in Chartiers Creek and the swift current undermined the upstream end of the west abutment, causing it to fail. The bridge dropped into the stream and was carried down stream about one hundred feet, passing entirely beneath the adjacent four-track bridge of the Pittsburgh & Lake Erie R.R.

The bridge, which was an old one, consisted of two through steel trusses of about 140 ft. span. Sidewalks had been provided outside the trusses but the downstream sidewalk had been removed and the brackets used as a support for two 8-in. high-pressure gas lines and a ten-inch water line. The bridge carried two street-car tracks as well as providing for ordinary traffic. The wrecking of the bridge broke the gas lines and the gas was ignited and for a short time the flames threatened the adjacent railroad bridge.

As this was the only highway bridge spanning the stream in this vicinity, it will be necessary to provide a temporary bridge immediately to accommodate the heavy traffic at this point, pending the construction of a permanent bridge.

President Signs Water-Power Bill

Attorney General Rules that Adjournment of Congress Does Not Invalidate 10-Day Time Limit

On June 18 announcement was made from the White House that the President had signed the Water-Power Bill within ten days after it had been submitted to him. The statement follows:

> "The President having been advised by the Attorney General in a formal opinion that the adjournment of Congress does not deprive him of the ten days allowed by the Constitution for the consideration of a measure, but only in case of disapproval of the opportunity to return the measure with his reasons to the House in which it originated, has signed the bill within the ten days period, of course."

Unless action is taken to question the legality of such unprecedented reading of the Constitution, and the action is supported by the courts, the bill is now law and its provisions will immediately go into force.

Under the terms of the bill, a commission, composed of the Secretary of War, the Secretary of Agriculture and the Secretary of the Interior, is authorized to lease up to fifty years the water-power rights on all public lands, forest reservations, Indian reservations and on navigable streams. At the end of the lease period, the government has the option of taking over the plants that have been built at an appraised valuation, of re-leasing them, or of leasing to any concern the commission chooses, with the lessee paying the appraised valuation.

Under no circumstances does the franchise granted in the lease become the property of private individuals or companies for the purpose of sale or disposal. Only the physical valuation is considered at the end of the lease.

Nebraska To Try Convict Labor for Grading Roads

Convict labor will be employed in grading four highways aggregating 46½ mi. in Johnson, Seward and Pawnee Counties in Nebraska. Contract prices on all four projects exceeded the estimates and the experiment with convict labor is an attempt to secure the improvements at the expenditure permitted. A wagon camp for eighteen men will be established on each project. The prisoners will work 60 hr. a week and will receive $1.50 per 10-hour day for their work and an additional 75c. a day per man will be paid to the institutions from which the men come. If the experiment with convict labor proves successful its use may be extended. The work is being directed by the state highway department.

Commercial Organizations Make Appeal for Public Utilities

Six commercial organizations in Chicago with a combined membership of 16,213, headed by the Chicago Association of Commerce, have joined in an appeal to the Illinois State Public Utility Commission urging immediate relief in the matter of rate adjustments for the various public utilities. Unless prompt action is taken, it is contended that even the present unsatisfactory public service cannot be maintained. If time is not available for an exhaustive consideration it is suggested that tentative orders be entered covering experimental or temporary periods until such time as experience or further investigation and deliberation will enable the commission to do complete and full justice.

A. A. E. Appoints Committee on Consulting Fees

Feeling that engineers in consulting practice are in need of the support of the whole profession in the matter of promulgating proper ethical relations and fees, the American Association of Engineers has appointed a committee on uniform fees and practice. The personnel is as follows: Farley Gannett, consulting engineer, Harrisburg, Pa.; A. N. Johnson, consulting highway engineer, Portland Cement Association, Chicago; C. J. Tilden, professor of engineering mechanics, Yale University; Edwin Duryea, consulting engineer, San Francisco; Langdon Pearse, sanitary engineer, Sanitary District of Chicago; Wilbur Jay Watson, chief engineer, Watson Engineering Co., Cleveland; John W. Cunningham, consulting engineer, Portland, Ore.; L. E. Ayres, principal assistant engineer with Gardner S. Williams, Ann Arbor, Mich; George W. Fuller, consulting engineer, New York City. W. L. Benham, consulting engineer, New York and Kansas City, is chairman.

Sewage Sedimentation Advised for Syracuse, New York

Plans for treating the sewage of Syracuse, N. Y., by sedimentation, with sludge disposal by pumping through a long, small force main to the Solvay plant and mixing it with industrial wastes there, have been approved by Metcalf & Eddy, consulting engineers, Boston. The plans were made by Glenn D. Holmes, engineer Syracuse Intercepting Sewer Board, after a considerable period of investigation. The consulting engineers estimate that a sedimentation plant would cost $794,300 and a fine screening plant $1,302,800. Approval is given to the omission of trickling filters, at one time seriously considered, the consulting engineers agreeing with Mr. Holmes that Onondago Lake will for many years to come afford ample dilution and oxidation to settled sewage. The plans must go to the New York State Department of Health for approval.

New York Contractors Charge Bad Faith by City

The General Contractors Association of New York City, through its secretary, C. A. Crane, has again attacked the city for its failure to settle with subway contractors who, because of what is known as the agreement of June, 1918, completed contracts involving the expenditure of approximately $7,000,000 in excess of the contract prices, such an increase being due to the sharp advance in the prices of materials and labor resulting from intensive war construction. The association has addressed the Board of Estimate and Apportionment, calling attention to the recent report of the Committee on Finance and Budget relating to the claims for supplies, materials and labor furnished the Board of Education during 1918, and alleging that "the Board of Estimate, in refusing to carry out its agreement" (as to subway work) "has swindled those who relied on its integrity."

In its report rendered May 28 the Committee on Finance and Budget, in dealing with claims for labor, materials and supplies furnished the Board of Education in 1918 for which no payment has been made because of no request to cover them, asserted that "aside from the injustice to those who have furnished property and services to the City of New York without, thus far, having been compensated, a condition has been created that reflects upon the entire City of New York and raised questions as to the good faith and fair dealing of its accredited officers." The contractors, in their letter to the Board of Estimate, wish to know if that report may be taken as in indication that they may now expect relief as implied in the agreement of June 15, 1918.

Agreement of 1918

The agreement upon which subway contractors base their claims for relief resulted from a joint meeting of the Board of Estimate and Apportionment and the Public Service Commission June 15, 1918. The text of that agreement is given herewith:

> It is the sense of the members of the Board of Estimate and Apportionment and the Public Service Commission, participating in joint conference:
>
> (1) That unfinished subway construction work shall be carried to completion forthwith;
>
> (2) That the men engaged upon the work shall receive the compensation which it is admitted is just;
>
> (3) That there should be no general cancellation of existing contracts or release of sureties;
>
> (4) That in the case of any contractor who declines to proceed in accordance with the plans hereinafter set forth, the Public Service Commission immediately proceed to complete the work under the terms of such contract, employing the necessary labor and utilizing the available plant of the contractor;
>
> (5) That contractors having claims present them forthwith for consideration and adjustment;
>
> (6) That contractors who have no claims for damage or delay and whose time for performance has not expired may have their contracts modified or supplemented upon their agreeing to complete the work within a shorter period than now required, and as a consideration to receive therefor a sum of money that will equal the cost of labor and material made necessary by the war;
>
> (7) That all agreements of any kind modifying existing contracts must be consented to by the sureties;
>
> (8) That any contractor who desires other or different relief under the Lockwood law may apply therefor without prejudice by reason of any of the foregoing on condition that he diligently continue his work.

It is alleged that approximately $7,000,000 of the contractors' own money, largely secured through credit from the banks because of the foregoing agreement, was spent in finishing contracts, and that up to now but four settlements have been made, and these totalling but $700,000.

Kentucky Highway Commission Appointed

Members of the recently organized State Highway Commission of Kentucky were sworn in June 17. The members are: Ben Weille, Paducah; Hugh Asher, Pineville; Green Garrett, Winchester; and Mr. Monohan, St. Matthews. A state primary system consisting of 3,500 mi. of road has been established and nothing but hard surfaced highways are contemplated for construction by the new highway department. There is under consideration a construction program calling for the expenditure of more than $4,000,000 during the current fiscal year.

New York City Post of Military Engineers Formed

With an attendance of from 75 to 100 men the organization meeting of the New York Post of the American Society of Military Engineers was held June 15, in the Army Building, 39 Whitehall St., New York City. The meeting was called by the Board of Directors of the parent organization. Temporary officers were elected and a temporary organizing and nominating committee appointed by the temporary chairman to draw up a constitution and by-laws and prepare a list of permanent officers to be presented at the next meeting of the local post at the same place on the afternoon of June 29.

The temporary officers elected are: President, Col. F. A. Moliter; vice-president, Col. George D. Snyder; secretary-treasurer, Major P. E. Barbour. The organizing and nominating committee is headed by Col. T. P. A. Luqueer. Col. F. A. Snyder and Lt.-Col. J. P. Hogan were named as two of the other members of the committee of five.

A number of the men present at the organization meeting are members of the parent organization. The names of all those attending were secured and the registration of each man's name was declared as equivalent to application for membership in the local post. The purposes for which the society was formed and the possibilities for building up a strong local organization were explained by Col. Edward Burr, Corps of Engineers, district engineer of the first New York district.

Cincinnati Southern To Renew Its Ohio River Bridge

(Special Correspondent)

Cincinnati, June 21—With the reconstruction of its Ohio River bridge, for which contract has just been let, the Cincinnati Southern R.R. by 1921 will have finally removed the restrictions on its traffic caused by the existence of its two weakest structures at the two ends of its main line at Cincinnati and at Chattanooga. The Chattanooga Bridge was ordered out of service by the U. S. Railroad Administration in August, 1919, since which time, up to the recent completion of the renewal work, all trains have had to make a roundabout detour to cross the Tennessee River. The Ohio River bridge has long necessitated operation with special light engines into the Cincinnati terminus.

Renewal of both structures was decided on in 1916. At Chattanooga considerable progress had been made on the substructure and a new lift span erected before the declaration of war put a stop to activities. For Cincinnati the consulting engineer, Ralph Modjeski, had completed plans for a heavy new double-track structure and tenders were about to be called for, when the work was held up. After the return of the railroads to private hands the leasing line, Cincinnati, New Orleans & Texas Pacific Ry. (Southern Ry. system) made arrangements to proceed with the Ohio River work, and the contract for furnishing and erecting the superstructure has been placed with the American Bridge Co.

Traffic and river conditions at Cincinnati require the erection of the new double-track structure without interrupting service over the old spans and without the use of falsework in the river, except for the 300-ft. span at the north shore and the lift span (which will replace the present draw span) at the south shore. This leaves a 300-ft. span to be erected by cantilevering from the north shore span and a 519-ft. span to be cantilevered from the former and from the lift span. The new steel will be erected on the old piers, with the load distributed by pier columns and pier girders, these supports being encased in a jacket of concrete after erection work is completed. Silicon steel will be used in all main truss members.

U. S. Engineer Office at Chattanooga

The United States Engineer Office at Chattannooga has been reestablished. For several years the work in the Chattanooga district has justified the maintenance of a branch office only. The new office will be in charge of Major Harold C. Fiske. At the last session of Congress a survey of the whole Tennessee River was authorized which will make Chattannooga the center of a considerable volume of engineering activity.

Salary Schedule for Engineering Educators Drafted

A letter recently sent out from national headquarters of the American Association of Engineers to 93 deans of engineering colleges, who are acting as corresponding members on the association's committee on salaries of engineers in teaching service, asks comment on the following schedule:

1. Dean, director or superintendent (reporting directly to the president and responsible as virtual vice-president and operating manager for conduct and policies of engineering department): $8,000 to $15,000.
2. Professor in charge of a department of study (reporting to the dean and responsible for the conduct of his department): $6,000 to $12,000.
3. Professor (a mature man with experience both as a teacher and in the practice of his profession) in full charge of courses of study: $5,000.
4. Special lecturer: by arrangement.
5. Associate professor or junior professor (a younger man, in line for professorship and in general capable of doing a professor's work): $4,000 to $9,000.
6. Assistant professor (of which there may be two or more grades; may have charge of laboratory, individual course of study, etc.): $3,600 to $7,500.
7. Instructor (teaching sections under general supervision of the professor in charge): $3,000 to $4,000.
8. Assistant instructor (full time): $1,800 to $2,400.
9. Assistant, either class or laboratory (part time): Monthly basis.
10. Student assistant: Hourly basis.

C. J. Tilden, professor of engineering mechanics in Yale University is chairman of the committee. The other committeemen are: Professor P. H. Daggett, Dean F. L. Bishop, Professor Frederic Bass, Dean Anson Marston, Professor George F. Swain, Dr. S. P. Capon, A. N. Johnson, Baxter L. Brown, H. Z. Osborne and Harrison P. Eddy.

River and Harbor Allotments

The current Rivers and Harbors Bill was passed as a lump sum appropriation of $12,000,000. The Chief of Engineers has announced the allotments, those over $100,000 being as follows: New York Harbor, $300,000; Passaic River, $170,000; Delaware River, $625,000; Baltimore Harbor, $110,000; Cape Fear River, $100,000; Savannah Harbor, $500,000; St. Johns River, Fla., $315,000; Tampa Bay, $260,000; Mobile Harbor, $200,000; Warrior Rivers, $120,000; Pascagoula Harbor, $100,000; Gulfport Harbor, $100,000; Southwest Pass, Mississippi River, $800,000; Houston Ship Channel, $300,000; Freeport, Tex., Harbor, $100,000; Mississippi River, $900,000; Missouri River, $200,000; Calumet, Ill., Harbor, $130,000; Oakland, Cal., Harbor, $200,000; Sacramento, River, $100,000; Coos Bay, Ore., $125,000; Columbia River, $226,000 and San Juan, P. R., Harbor $200,000.

Idaho Highway Program Large

Between April, 1919, and April, 1920, the Bureau of Highways of Idaho awarded contracts amounting to $2 903,228.09 and co-operated with the United States Forest Service on six contracts amounting to $735,222.20. In addition to the work now under contract, about $4,000,000 worth of work will be awarded up to July 1.

California Highway Work Stopped Pending Court Decision

State highway day labor work, authorized or under way, approximating $1,000,000 in estimated value, has been ordered discontinued by the California Highway Commission. Such action followed its previous order disbanding all survey parties engaged in locating surveys on new and uncompleted routes. These actions are a continuation of the policy of the commission inaugurated several months ago to curtail work pending readjustment necessary to make the state highway 4½ per cent bonds salable at par. All contract work and a limited amount of day labor work will be continued for the present. Work has been ordered stopped on thirty projects in twenty-one counties of the state.

Court proceedings were recently instituted by the former secretary of the State Highway Commission, W. R. Ellis, to prevent the State Highway Commission from using Federal-aid highway funds for the purpose of paying discounts on highway bonds that otherwise are unsalable, inasmuch as the California law prescribes that highway bonds be sold at par and that they shall not bear more than 4½ per cent interest. Prior to the adoption of this method of meeting the emergency, caused by the inability of the Highway Department to sell their 4½ per cent bonds at par, the legality of the method was confirmed by Attorney-General Webb, and by the fiscal agents of the state, according to a bulletin recently issued by the California State Highway Commission. It is the belief of that commission that the method conforms not only to the letter of the law but to its spirit. The commission based its belief upon the judgment that the Federal money constitutes not a construction fund but a reimbursement fund, the United States Government saying, in effect, to the states that if they will construct roads to meet Federal requirements as to specifications, the United States Government will repay the state up to half of the cost of such roads within the amounts allotted to the various states.

Commenting upon the mandamus proceedings instituted by Mr. Ellis, which have effectually tied up highway work at least pending the final decision of the court, the State Highway Commission says that "the purpose of the present action is undoubtedly simply to harrass the commission, and it is but another phase of the guerrilla warfare that the former secretary of the commission has conducted both within and without the highway department since the refusal of the commission to increase his salary." The action is holding up payrolls, and the real sufferers are the employees of the commission, contractors, and others who are entitled to payment now for services rendered to the state.

Of thirty-two surveying crews on location work, all but nine have been ordered discontinued. The only new contracts undertaken within the past few months, or that will be undertaken, are those which the counties have asked to finance by purchasing highway bonds at par. These are comparatively few in number and all belong to that class of highway which properly can be considered of paramount importance.

Court Restricts Flow of Lake to Chicago Drainage Canal

Withdrawal of water from Lake Michigan for the Chicago drainage canal is restricted to 250,000 cu.ft. per minute by a decision just handed down by Judge K. M. Landis in the U. S. District Court at Chicago, but the Sanitary District of Chicago will carry the case to the U. S. Supreme Court. The case has been in litigation for several years, the claim of the War Department being that the draft from the lake has lowered the level of all the Great Lakes except Lake Superior. It is upon this condition, and the consequent necessity of protecting navigation, that the present decision is based. Two methods of overcoming the difficulty are under consideration, one being the treatment of sewage before its discharge into the canal and the other being the construction of controlling works to regulate the flow from the eastern outlet of the Great Lakes, as described in *Engineering News-Record* of Feb. 12, 1920, p. 308.

Another Concrete Ship Ashore

In the latter part of May the concrete tanker "Selma," a 7,500-ton ship built for the United States Emergency Fleet Corporation by Fred T. Ley & Co. at Mobile, Ala., was wrecked by running on the rocks at the outer breakwater at Tampico, Mex. Details of the accident are not available, although it is reported that there was no pilot aboard and that the navigation of the ship was not all that it should have been. The bottom of the "Selma," according to reports, is damaged to a considerable extent forward of the bridge deck, but the diver's report indicates that the structural framework of the boat has not been appreciably weakened. A representative of the Shipping Board has been sent to Tampico to supervise temporary repairs. The boat has been successfully pulled off the breakwater and is now resting on a mud flat nearby. After temporary repairs are made the boat will be brought to Galveston for permanent repairs. One of the Shipping Board's steel boats, the "John D. Rockefeller, Jr.," was wrecked several months ago very close to the place where the "Selma" went aground and a wrecking crew has been working without success ever since in an effort to float the boat.

It has been rumored that the "Latham," the other 7,500-ton concrete tanker built at Mobile had been wrecked and sunk, but this is not a fact. The "Latham" docked June 16 at Philadelphia.

Contractors Circulate Car Shortage Questionnaire

Believing that the right of construction materials to transportation is subordinate only to food and fuel, the Associated General Contractors of America will attempt to make the Interstate Commerce Commission see that right through the interpretation of figures which the association is asking for in a questionnaire recently issued from the office of the secretary. Contractors are asked if they favor an effort on the part of the Associated General Contractors to secure priority for construction materials over less essential commodities, and what conditions or facts in each locality prove the need for giving construction materials preference over all other commodities other than food and fuel. They are also requested to report if work is being delayed because of car shortages by naming contracts delayed, with approximate values. They are also asked to report upon what types of cars are needed, how many daily, where, and what percentage of cars as compared with requirements has been received in the ten-day period prior to the time of reporting.

Canadian Government to Purchase Railroad Lines

It has been announced that the Canadian Government has appropriated $518,000 for the purchase of the following railroads: Elgin & Havelock, York & Carleton, St. Martin's, Salisbury & Albert, Moncton & Buchouche, Kent Northern and Caraquet & North Shore.

Road Equipment Bill Fails

Hope had been entertained that the bill turning over tractors, mobile machine shop units and other equipment for road building purposes would be among those signed by the President within the ten-day period, in which the Attorney General has ruled he might sign bills despite the adjournment of Congress. This was not the case, however, and the measure was lost.

Gen. Goethals In Engineering and Construction Firm

Announcement has been made of the formation of the new engineering firm of Goethals, Wells & Co., Inc., with offices at 150 Nassau St., New York City. The officers are Major General George W. Goethals, president, and George M. Wells, Henry Goldmark and James L. Ward, vice-presidents. Mr. Wells and Mr. Goldmark were both associated with General Goethals on the Isthmus and have been connected with the consulting engineering firm of George W. Goethals & Co., Inc., which firm will continue as consulting engineers and managers of corporations. The new firm will carry on a general engineering and construction business, specializing in the engineering and architectural design of all classes of structures and their construction.

Indiana Raises Partial Payments On Road Construction

The reorganization of the Indiana Highway Commission was effected June 16 in Indianapolis, at which time it was decided that the commission advance to contractors building state highways 100 per cent of the contract price per mile on the completion of each mile of road. The advance is not to be regarded as final until the entire contract is completed. Heretofore the limit was 80 per cent. The change was effected after a conference the commission held with contractors who have been considerably agitated over their contracts. The commission declined to lower gravel standards as proposed by some.

Money Tight for Indiana Road Contractors

State highway contractors held a conference in Indianapolis June 15 to discuss ways and means by which to finance the hundreds of thousands of dollars worth of contracts they have. They are disturbed because banks are unwilling to let them have much money and because they must pay 7 per cent interest. It has been suggested to L. H. Wright, director of the state highway department, that the state advance them more money, especially for cement. Mr. Wright was at the conference, which was attended by representatives of all the eighteen projects now under construction.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York City; Portland, Ore., Aug. 10-12.

AMERICAN PUBLIC HEALTH ASSOCIATION, Boston; San Francisco, Sept. 13-17.

The New Jersey State Association of County Engineers will hold its quarterly meeting June 25-26, at the Hotel Mannahassett, Seaside Park, N. J.

The Western Society of Engineers, at its meeting of June 14, heard two papers on the Chicago River bridges by engineers of the Department of Public Works; one by Clarence S. Rowe on "Construction Methods," and the other by Fred H. Avery on "Repair and Maintainenance Methods." The latter paper outlined some of the difficult work involved in the maintenance of bascule bridges and in the repair of superannuated swing-bridges that must be kept in service until funds for reconstruction can be obtained.

The Colorado Society of Engineers has joined the Denver Civic and Commercial Association. R. M. Hosea, president, has been named as the society representative.

The Grand Rapids (Mich.) Engineering Society elected the following officers at its annual meeting held May 28: President, Henry H. Turner; vice-president, W. A. Sperry; secretary, Major Burritt A. Parks; directors, G. W. Wagner and Daniel W. Kimball.

The Buffalo (N. Y.) Engineering Society is formulating plans to take an active interest in all civic affairs, paying special attention to engineering problems confronting the city, according to a recent announcement by President William B. Powell. Speakers of national repute will discuss engineering problems at the monthly meetings during the coming fall and winter. A close study will be made of the engineering problems in connection with the development of additional power at Niagara Falls, the development of the Erie barge canal terminal, the electrification of the steam railroads entering Buffalo, the bridge across the Niagara River at Buffalo, the canalization of the St. Lawrence River, the widening of the Niagara River at Buffalo and the industrial geography of the American Niagara frontier.

The Tri-State Water and Light Association, at its meeting held at Atlanta, Ga., May 21, elected the following officers for the ensuing year: President, A. A. Passolt, Newnan, Ga.; first vice-president, E. P. Meredith, Tarboro, N. C.; second vice-president, J. E. Gibson, Charleston, S. C.; third vice-president, D. L. Caston, Gainsville, Ga.; secretary and treasurer (reelected), W. F. Stieglitz, Columbia, S. C.

PERSONAL NOTES

F. A. Swingle and Gordon H. Taylor, of Kennewick, Wash., have formed a partnership and will engage in structural and engineering work, with offices in that city.

DeWitt O'Dell has resigned from the engineering department of the Power Specialty Co., Dansville, N. Y., and has been appointed assistant engineer in the State Engineer's Department, with headquarters in Rochester.

George Douglas Mackie, city engineer-commissioner of Moose Jaw, Sask., has been appointed to represent that city on the Saskatchewan Water Supply Advisory Council.

J. W. Johnston, for the past two years district engineer in charge of the Portland Cement Association's office at Parkersburg, W. Va., has been appointed district engineer in charge of its Milwaukee office. Previous to his connection with the association, Mr. Johnston was city engineer of Sioux Falls and engineer of Minnehaha County, S. D. J. H. Riddle, who has been in the Parkersburg office since 1916, becomes district engineer of that office, succeeding Mr. Johnston. Mr. Riddle was formerly engineer of Roane County, W. Va.

William Wells, civil engineer, of Rensselaer, N. Y., has been appointed to investigate the city's water supply problem.

Dr. W. H. Ellis, formerly dean of engineering and applied science at Toronto University, was presented, May 13, with the gold badge of honorary membership in the Engineering Institute of Canada, at a meeting of the Toronto branch, as a tribute to long and distinguished service in connection with the engineering profession.

B. E. Gray has been promoted from the position of Federal highway engineer to that of senior highway engineer of West Virginia.

John S. Brown, U. S. Geological Survey, has just completed an investigation of the water supply on several of the Florida keys for the U. S. Public Health Service.

The McClaskey & Reese Engineering Co., has opened offices in Canton, Ohio, and will engage in general engineering. Mr. McClaskey was formerly resident engineer for the firm of R. Winthrop Pratt, Cleveland, and Mr. Reese, who has been connected with the Canton water-works for the last five years, was assistant to the superintendent.

John E. Foote has resigned as city engineer of Little Falls, N. Y.

Richard K. Lynt has been transferred from the International Boundary Commission to the U. S. Geological Survey to do topographic mapping of a part of Admiralty Island in connection with a pulp wood investigation.

F. F. Miller has resigned as assistant engineer of the Semet-Solvay Co., Chicago, to accept the appointment of city engineer of New Castle, Pa. He succeeds M. H. Milholland, who has established civil engineering offices in that city.

Henry V. Macksey, who recently resigned as superintendent of public works of Woburn, Mass., has been appointed superintendent of public works of Framingham, Mass.

W. A. Hardenbergh has resigned as assistant sanitary engineer, United States Public Health Service, to become consulting engineer and southern manager, Chemical Toilet Corporation, Syracuse, N. Y.

John R. Spelman, civil engineer, New York, has been appointed consulting and resident engineer to assist W. Fred Starks, engineer of Nassau County, N. Y., in the preparation of plans, specifications and supervision for the construction of the Long Beach Bridge.

Colonel George L. Watson, formerly member of the General Staff Corps, U. S. A., and assistant chief of staff, G. 2, Third Army, has been appointed a member of the board of consulting engineers of the New York State Bridge and Tunnel Commission and the New Jersey Interstate Bridge and Tunnel Commission.

R. A. Harbaugh, recently estimating engineer of the Pittsburgh Filter & Engineering Co., has accepted a position in Detroit with the Ford Motor Co.

John Lansdale has been appointed valuation engineer, succeeding I. A. Cottingham, and C. N. Campbell has been appointed assistant valuation engineer, of the Southern Pacific Lines in Texas and Louisiana. Major Lansdale, during his service with the A. E. F. in France, was in charge under the Director of Construction and Forestry, of the railroad and dock section and it was under his immediate supervision that the construction on the Nevers cut off and Loire River bridge was carried out.

John P. Collins, former superintendent of construction of the McNichol Paving & Construction Co., of Philadelphia, has been made president of the Peninsula Construction Co., Bridgeton, Del.

Henry E. Gabriels, recently in the engineering department of the Watervliet (N. Y.) Arsenal, has been appointed city manager of Watervliet.

Charles M. Moorefield, formerly district engineer of the U. S. Bureau of Public Roads in the South, has been appointed chief engineer of the South Carolina State Highway Department.

J. B. Easter was recently appointed district engineer of the 6th State Road District of New Mexico, with headquarters at Santa Rosa, N. M.

Major L. M. Adams, Corps of Engineers, U. S. A., has left Camp Humphries, Va., where he has been an officer in the School of Engineers, to take up his new duties as chief of the Galveston (Tex.) engineering district. He relieves Colonel Spencer Cosby, who has been transferred to Savannah.

John F. Druar and Roscoe Smith, who have been associated for the past year as consulting municipal engineers under the firm name of Druar & Smith, St. Paul, Minn., have dissolved partnership. The work of the firm will be continued by Mr. Druar. Mr. Smith has entered the employ of the National Board of Fire Underwriters at New Orleans, La.

G. F. Richan, of Winnipeg, has been nominated hydraulic engineer, W. C. Warren, of Ottawa, has been nominated junior hydraulic engineer, and N. Moore, of Calgary, junior irrigation engineer, of the Canadian Reclamation Service, Ottawa.

Major C. L. Hall, assistant engineer of the Galveston engineering district, has been transferred to Washington, D. C., where he will be assigned as assistant to the Chief of Engineers.

Henry S. Spackman has retired from the Henry S. Spackman Engineering Co., and the name of the company has been changed to E. L. Conwell & Co., Inc. Mr. Spackman will continue, as heretofore, his engineering practice, with offices at 2024 Arch St., Philadelphia.

Ralph Hilscher, formerly Southern division engineer of the California State Board of Health, has recently been appointed director of the Bureau of Sanitary Engineering of the Board, succeeding C. G. Gillespie. Mr. Hilscher's headquarters are in Berkeley.

W. G. Chace has resigned as chief engineer of the Greater Winnipeg Water District, which was created in 1913 for the purpose of bringing by gravity a supply of water from the Lake of the Woods to the city of Winnipeg and vicinity. Mr. Chace has recently organized Research & Development, Ltd., a Manitoba corporation which proposes actively to initiate new industries for Manitoba based on the resources of that district and on such other commercial enterprises as may offer opportunity of success.

Milton Ruggles, consulting engineer, Stamford, Conn., has been retained by B. F. Perkins & Son, Inc., Holyoke, Mass., as chief engineer on the construction of their new manufacturing plant to be erected at Willamansett, Mass.

A. Burton Cohen has resigned as concrete engineer for the Delaware, Lackawanna & Western R.R. to enter private practice as a consulting engineer, specializing in reinforced-concrete design and construction, and bridges, buildings and railroad structures. His office will be at 1 Madison Ave., New York City. Mr. Cohen is a graduate in civil engineering of Purdue University and has been for a number of years connected with the Lackawanna R.R., particularly in the design and construction of the numerous concrete bridge and railroad structures in which that railroad has specialized in the last ten years. In his new capacity he has been appointed consulting engineer in design and construction of the Harrison Ave. bridge at Scranton, Pa., and has also a commission from the city of Corning, N. Y., to design and construct the new Pine St. bridge over the Chemung River.

Henry E. Wolff, city engineer of Winona, Minn., has resigned that position to enter private practice. He has been succeeded by Earl E. Chadwick, formerly with the Department of Public Works, Minneapolis.

Joseph D. Williams, of the city engineering department, has been appointed city engineer of New Britain, Conn., succeeding William H. Hall.

Morris Bien, assistant to the director, U. S. Reclamation Service, has been advanced to the newly created position of assistant director.

C. C. Smith, city engineer of San Angelo, Tex., has resigned to enter the highway contracting business as a member of the firm of Smith & Hicks, of Hillsboro, Tex.

H. R. Safford, since the return of the railroads to private control executive assistant to President Hale Holden of the Burlington Lines, received, on June 9, from Purdue University the honorary degree of Doctor of Engineering.

Howard Stillwell, formerly with the Solomon Norcross Co., Atlanta, has been appointed city manager of Sumter, S. C.

OBITUARY

John Scullin, chairman of the board of directors of the Scullin Steel Co., retired railroad operator, died in St. Louis, May 28, at the age of eighty-four. He had charge of construction of a considerable portion of the Missouri, Kansas & Texas line, and engaged in contract work on part of the present St. Paul, Union Pacific and Rock Island systems. He promoted the old horse-car lines in St. Louis, and later the electric lines. He was the founder of the Scullin Steel Co.

Claude Parmer, vice-president of the Kuert Contracting Co., Indianapolis, died recently. Mr. Parmer, who was thirty-four years old, served two years in the Corps of Engineers, U. S. A., in France.

Samuel Flory, founder and general manager of the S. Flory Manufacturing Co., Bangor, Pa., died recently in that city at 66 years of age. He was born in Plainfield, Pa., in 1854. About forty-five years ago Mr. Flory founded the manufacturing plant which bears his name, and operated it personally for ten years. He then organized the S. Flory Co., and in 1897 the S. Flory Manufacturing Co. was incorporated. Mr. Flory was widely known as the originator of the suspension cableway system manufactured by the company, which has been in successful operation in the slate, coal and quarry regions of the United States for more than forty years.

Charles H. Vinal, construction manager of the Allis-Chalmers Co., died at Little Muskego Lake, Wis., June 12. He was born at Keokuk, Iowa, in 1858. In 1875 he became locating engineer for the Milwaukee, Lake Shore & Western Ry., under his uncle, H. G. Reed, at that time general manager of the line, and located the road north from New London to Rhinelander and Ashland, Wis. He was appointed city engineer of Appleton, Wis., in 1890, and later was secretary and treasurer of the Hackworthy Construction Co. In 1914 he became associated with the Allis-Chalmers Co.

Whitfield P. Pressinger, of New York, vice-president of the Chicago Pneumatic Tool Co., died June 10. Mr. Pressinger was engaged in the pneumatic tool and allied machinery industry for many years, and was general manager of the Clayton Air Compressor Co. for seven years.

BUSINESS NOTES

The Chicago Pneumatic Tool Co., New York, announces the election of Allan E. Goodhue as vice-president in charge of sales. For the past year Mr. Goodhue has been managing director of the company's English subsidiary, the Consolidated Pneumatic Tool Co., London, and director of European sales for the Chicago Pneumatic Tool Co. During the war he was assistant manager of the Steel and Raw Material Section, Production Division, Emergency Fleet Corporation. He is expected to arrive in this country about the first of July.

B. G. Prytz has resigned as president of the SKF Industries, Inc., New York City, having been elected managing director of the parent company with headquarters at Gothenburg, Sweden. Mr. F. B. Kirkbride, vice-president since the organization of the company, has been elected president.

The American Manganese Steel Co., announces that Walter Brinton, for the past several years manager of its New Castle, Del., plant has been elected vice-president.

Carl Wigtel, vice-president and chief engineer of the Watson-Stillman Co., sailed, June 14, for a ten weeks' trip to the Scandinavian countries, expecting to visit England, France, Belgium and Holland. Since his connection with the company thirty-three years ago this is his first trip to his home in Norway. He will also investigate new developments in the line of hydraulic machinery in the above-named countries.

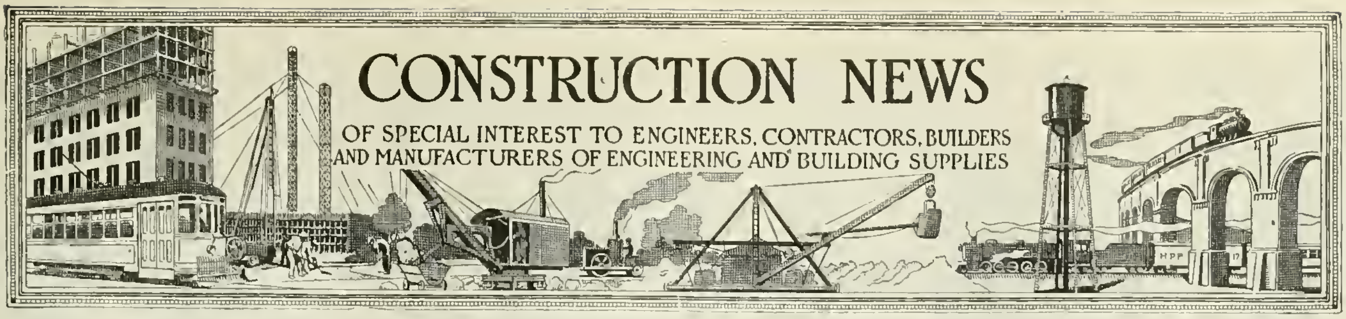
The Yale & Towne Manufacturing Co., Stamford, Conn., has accepted the resignation of John B. Milliken as treasurer. He will be succeeded by Willard L. Case, formerly advisory engineer to the Audit Co. of New York and recently consulting industrial engineer. Edward C. Waldvogel, for the past four years general manager, in charge of all sales and advertising, has been elected a director of the company.

The Winther Motor Truck Co., Kenosha, Wis., is making a large addition to its present plant, which is expected to be ready for occupancy by Sept. 1. The new structure is 60 x 400 ft., and up to date in construction and labor-saving and safety appliances. The company expects to double its present output with the new manufacturing space.

Allan Fraser, formerly sales manager at Buffalo of the American Steel & Wire Co., and more recently Eastern sales manager and assistant general sales manager of the Wickwire Steel Corporation, Worcester, Mass., has been made general sales manager of the corporation, with headquarters at Worcester.

CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES



Price advances are indicated by heavy type; declines by *italics*

PIG IRON—

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	$32.60	$36.60
Northern Basic	34.00	34.00
Southern Ohio No. 2	36.55	36.55
NEW YORK, tidewater delivery		
2X Virginia (silicon 2.25 to 2 75)	39.40	39.40
Southern No. 2 (silicon 2.25 to 2.75)	41.40	41.40
BIRMINGHAM		
No. 2 Fonodry	33.00	33.00
PHILADELPHIA		
Eastern Pa	38.10*	38.10*
Virginia No. 2	39.10*	39.10*
Basic	34.60†	34.60†
Grey Forge	34.60*	34.60*
CHICAGO		
No. 2 Foundry Local	36.25	36.25
No. 2 Foundry Southern	38.00	38.00
PITTSBURGH, including freight charge from the Valley		
No. 2 Foundry Valley	.....	.....
Basic	34.40	34.40
Bessemer	35.40	35.40

* F. o. b. furnace. † Delivered.

RAILWAY SUPPLIES

STEEL RAILS—The following quotations are per ton f. o. b. Pittsburgh and Chicago for carload or larger lota. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Current	One Year Ago	Current	One Year Ago
Standard bessemer rails	$45 00	$55.00	$45.00	$65.00
Standard openhearth rails	47.00	57.00	47.00	67 00
Light rails, 8 to 10 lb	2.58½*	3.13½	2 585*	3 13½*
Light rails, 12 to 14 lb	2.54*	3.09*	2 54*	3 09*
Light rails, 25 to 45 lb	2.45*	3.00	2.45*	3.00*

* Per 100 lb.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh				
	Current	One Year Ago	Chicago	St. Louis	San Francisco
Standard spikes, $\frac{9}{16}$-in. and larger	$3.35	*$3.70*	$4 27	$4.44	$5 65
Track bolts	4 35	4 90	5 17	Premium	6 65
Standard section angle bars	3.00		4.22	Premium	4 60

RAILWAY TIES—For fair-sized orders, the following pricea per tie hold:

		7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago	Plain	$1.48	$1.33
San Francisco	Douglas Fir—Green	*1.61*	**1 14**
San Francisco	Douglas Fir—Creosoted	**3.23**	**2.28**

Prices per tie at Missouri mills; St Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0.70	No. 1	$0.55
No. 2	.80	No. 2	.65
No. 3	.90	No. 3	.75
No. 4	.98		
7x9x8 white oak			1.05
7x9x8 red oak (No. 4)	$0.80	No. 5	.87

Note.—Add 36c. each for treatment.

PIPE

STEEL—From warehouses at the places named the following discounts hold for steel pipe:

	Black		
	New York	Chicago	St. Louis
¾ to 3 in. butt welded	47%	57.5%	45%
2½ to 6 in. lap welded	42%	53.5%	41½%

	Galvanized		
	New York	Chicago	St. Louis
¾ to 3 in. butt welded	31%	44%	30½%
2½ to 6 in. lap welded	27%	41%	27½%

Malleable fittings, Class B and C, from New York stock sell at +12½% list prices. Cast iron, standard sizes, 10% off.

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York						
	Current	One Month Ago	One Year Ago	Chicago	St. Louis	San Francisco	Dallas
4 in.	$65 30	$61.30	$70.70	$69 80	$61.00	$83 55	$70.30
6 in. and over	62.30	58 30	67.70	66 80	58.00	80.55	67.30

Gas pipe and 16-ft. lengths are $2 per ton extra.

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh: basing card of National Tube Co. for steel pipe, Cardry A. M. Byer's Co. for iron, both dated Mar. 21, 1919.

Inches	Steel Black	Galvanized	Inches	Iron Black	Galvanized
BUTT WELD					
⅛, ¼ and ⅜	50½%	24%	¼ to 1½	30%	23½%
½	54½%	40%			
¾ to 3	57½%	44%			
LAP WELD					
2	50½%	35%	2	32½%	18½%
2½ to 6	53½%	41%	2½ to 6	34½%	21½%
BUTT WELD, EXTRA STRONG PLAIN ENDS					
⅛, ¼ and ⅛	46½%	29%	¾ to 1½	39½%	24½%
½	51½%	39%			
¾ to 1½	55½%	43%			
LAP WELD, EXTRA STRONG PLAIN ENDS					
2	48½%	37%	2	33½%	20½%
2½ to 4	51½%	40%	2¼ to 4	35 %	23½%
4½ to 6	50½%	39%	4½ to 6	34½%	22½%

Malleable fittings. Class B and C, banded from New York stock sell at list 2% off. Cast iron, standard sizes, 20% off.

CLAY DRAIN TILE—The following prices are per 1000 lin.ft.:

	New York					
Size, In.	Current	One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$35.00	$35 00	$22 50	$50.00		$33 44
4	51.00	51 00	27 00	60.00	$45 00	50 16
5	65.00	65 00	45 00	70 00	65 00	62 70
6	90.00	90.00	55 00	80 00	90 00	83 60
8	130 00	130.00	100 00	120 00	150.00	133.76

SEWER PIPE—The following prices are in cents per foot for carload lots:

	New York					
Size, In.	Current	One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$0.09	$0 117	....	$0 12	...	$0.15
4	.09	.117	....	12	$0 16	.15
5	.135	.1755	.	.18	.20	.21
6	.135	.1755	$0.16	18	.24	21
8	.21	.273	.21	.28	.34	.30
10	.315	.4095	.29	.42	.47	42
12	.405	.5265	.37	.54	.64	54
15	.54	.702	.56	.72	1 00	.78
18	.75	.975	.91	.875	1 35	1 02
20	.90	.17	1 14	1.05	1 80	1 38
22	1 20	1.56	1.46	1.40	......	1.80
24	1 35	1.755	1.56	1 80	2.24	2 70
27	2.145	.260	1.90	2.75	......	3 30
30	2.376	.288	2.57	3.45	......	4 20
33	3.15	.378	3.09	4.00	......	4 025
36	3.5875	4.305	3.37	4.35	......	4 80

	3	5	8	12	24	36
Boston	$0.105	$0 1575	$0.245	$0.4725	$1.575	$5 0225
St. Paul	.125	.185	.25	.45	2 00	4.75
Denver	.12	.18	.27	.45	1.65	.....
Seattle	....	.....	.36	...	.....	.....
Kansas City	.12	.18	.25	.50	1.80	4 60
Los Angeles	.0825†	.1375†	.2475	.44	1.50	......
New Orleans			40 per Cent. off			
Cincinnati	.105	.1575	.245	.4725	1 575	3.5875
Atlanta	....	....	.34	.55	2.00	......
Montreal			50 per cent. off			
Detroit	**.117**	**.1755**	**273**	**.5265**	**2 025**	**5.125**
Baltimore	.105	.1575	.245	.4725	1.575	....

/ 4-in., 6-in., 30-in. respectively.

ROAD AND PAVING MATERIALS

ROAD OILS—Following are prices per gallon in tank cars 8000 gal .minimum f.o.b. place named:

	Current	One Month Ago
New York, 45–65% asphalt	$0.04¼	$0.04½
New York, liquid asphalt	.06	.06
New York, binder	.06½	.06½
New York, flux	.04¾	.04¾
St. Louis, 40% asphalt	.0424	**.0424**
Chicago, 40-50% asphalt	.055	*.055*
Chicago, 60-70% asphalt	.0575	*0575*
Dallas, 40–50% asphalt	.07	.07
Dallas, 60–70% asphalt	.08	.08
Dallas, 75–90% asphalt	.10	.10
San Francisco, asphalt base, per bbl.	2.25	2 25

ASPHALTUM—Price per ton in packages and bulk in carload lots.

	Brand	Package	Bulk
New York	Texaco	$22 00	$14.00
Chicago	Mexican	22.00	16.50*
San Francisco	California	17.00	13.75
Dallas	Texaco and Mexican	32 00	30.00
Seattle	D grade	25.00	.....
Denver	Trinidad	45 00	.....
Denver	California	38 00	....
St. Paul	Mexican	21.00	...
Kansas City	Mexican	25.00	23.00
Atlanta	Standard	25.00	20.80
New Orleans	....	16.50	
St. Louis	Stanolind	24.90	18.40
Detroit	Bermudez	50 00	...
Baltimore	Manco	43.00	....
Los Angeles	D grade	.....	15 00
Montreal	..	.....	19.00

*f.o.b. Whiting, Ind.

PAVING STONE—

Chicago	About 4x8x4 dressed	$2 45	sq yd
	About 4x8x4 common	2 20	sq.yd
San Francisco	Basalt block 4x7x8	65.00	per M
Kansas City	Granite	3 00	sq yd
Boston	5-in. granite	110 00	per M
St. Paul	Sandstone	2 45	sq.yd
Atlanta	Granite	2 00	sq.yd
Detroit	Granite, small	4 10	sq yd
Baltimore	Common	2.30	sq.yd
Montreal	Granite	5 90	sq.yd.

FLAGGING—

New York	Bronx	$0 21	sq.ft.
	Manhattan	22	sq.ft.
	Queens, 5 ft. square	23	sq.ft.
	5x20-in. cross-walk	75	lin.ft.
Chicago	18 in. wide	70	lin.ft.

WOOD BLOCK PAVING—	Size of Block	Treatment	Per Sq.Yd.
New York	3½	16	$3.35
New York	4	16	3.65
Chicago	4	16	4.50
Chicago	3½	16	3.50
Chicago	City specifications		5.00
St Louis	3½	16	2.90
St. Louis	4	16	3.32
Seattle	4	16	2.55
Kansas City	4	16	3 00
St. Paul	3½	..	2 45
Atlanta	3½	16	2.30
New Orleans	3½	16	2.63
New Orleans	4	16	3.00
Dallas	3½	18	2.92
Dallas	4	18	2.98
Baltimore	3½	16	3 60
Montreal	4	16	4.60

CONSTRUCTION MATERIALS

SAND AND GRAVEL—Price for cargo or carload lots is as follows, per cu.yd :

	Gravel 1½ In. Current	Gravel 1½ In. One Yr. Ago	Gravel ¾ In. Current	Gravel ¾ In. One Yr. Ago	Sand Current	Sand One Yr Ago
New York	$2.00	$2 00	$2.00	$2.00	$1 25	$1.25
Denver	1 60	*1 55*	1 60	1 55	1 25	1.10
Chicago	2.00	2 00	2.00	1 40	2 00	*1.10*
Kansas City	2.50	2 15	3.00	2 60	1 00	1 00
St. Louis	1 78	*1 76*	1.82	1 82	1.68	1.68‡
Seattle, per ton	1 25	1.25	1.25	1 25	1.25	1.25
Dallas	3 50	2 00	3.50	2 00	2.25	*1.35*
St. Paul	1.25	1 25	1.35	*1.35*	60	.60
Cincinnati	....	1 35‡	...	...	1 30	1 35‡
San Francisco	1.15	1.20	1.15	1 20	1 15	1 20
Boston	1.60	2.00	1.60	2 75	1 00	1.25
New Orleans	2.40	4 00	2.40	1 80	1.20	*1 88*
Los Angeles	....	1 25	....	...	.85	1 10
Atlanta, per ton	2 25		2.25		1 15	..
Detroit	2 50		2.00		2.50	....
Baltimore	1.54		1.75	..	65	.
Montreal, per ton	1 20		....		1 10	..

* Fine white sand, Pacific & Ottawa, per ton $6.
† Kaw River sand is $1.50 per yd. ‡ per ton.

CRUSHED STONE—Price for cargo or carload lots is as follows, per cu.yd.:

	1½ In. Current	1½ In. One Year Ago	¾ In. Current	¾ In. One Year Ago
New York	$1.75	$1 70	$1 85	$1 85
Chicago	2 00	1 60	2.00	1 70
St. Louis	1 65	1 25	1 65	1 25
Dallas	2.90	2 05	2 90	2 05
San Francisco	1 15	1 20	1 15	1 20
Boston	2 75*(del)	1 75	2 75*(del)	1 75
St. Paul (lime)	1.15†	1.15	1.25	*1 25*
Denver	.		1 60	1 55
Kansas City	2 25	1 70	2 35	1 80
Seattle	2 00	1 50	2 00	1 50
Atlanta	2 55*	3.36	2.65*	....
New Orleans	4 00	...	4.35	1.28
Los Angeles	1 20	1 50	1 20	1 60
Detroit	1 75	...	1 75	
Baltimore	1 25	..	1 50	
Montreal	2 15*	...	2 40*	

* Per ton † Limestone; traprock, $1 60 and $1.80 per ton for 1½ and ¾-in.

LIME—Warehouse prices:

	Hydrated per Ton Finished	Hydrated per Ton Common	Lump per 200-Lb Barrel Finished	Lump per 200-Lb Barrel Common
New York	$17 50	$14 50	$2.90*	$2 65*
Kansas City	25 50	21 00	2 30	2 30
Chicago	18 00	17 50	1 80	1 10
St Louis	22 00	18 00	. .	2.00
Boston	22 00	18 50	3.70*	3 40*
Dallas	30 00		2 75	
Cincinnati	14 70	11 70	12 95‡	10 70‡
San Francisco	30 00	19 00	...	2 30
St. Paul	23 00	20 00	1 60	1 50
Detroit	20 00	18 00	2.00*	1 80*
Seattle	27 *00*	.	2 85†	2 80†
Los Angeles	2 75†	2 20	2 75†	2 00†
Baltimore	19 25	16 75		11 37‡
Montreal	20 00	20 00	15 00‡	15 00‡

* 300-lb barrels †Per 180-lb barrel ‡ Per ton.
NOTE. Refund of 10c. per barrel

NATURAL CEMENT—Price to dealers for 500 bbl. or over, f. o. b., exlusive of bags:

	Current	One Year Ago
St. Paul (Austin)	$1.50	$1 93
Kansas City (Ft. Scott)	1 60	1.70
New Orleans	2.52	3 52
Atlanta (Magnolia)	1.90	....
Cincinnati (Louisville)	1 35	1.80

PORTLAND CEMENT—Current prices are for barrels in carload lots, without bags, to contractors:

	Current	One Month Ago Without Bags	One Year Ago With Bags
New York (del.)	$2.80*	$2.80	$4.00
Jersey City (del)	2 47	2.47	*3.64*
Boston	2 42	2.42	3.67
Chicago	2 00	2 00	3.05
Pittsburgh	2 05	2.05	3.15
Cleveland	2 32	2.32	3.32
Detroit	2 08	2 08	3.28
Indianapolis	2 27	2 27	3.22
Toledo	2 12	2.12	3.22
Milwaukee	2.11	2.11	3.16
Duluth	2.10	2.10	3.20
Peoria	2.12	2.12	3.16
Cedar Rapids	2.18	2.18	3.28
Davenport	2.14	2.14	3.24
St. Louis	2.20	2.20	3.30
San Francisco	2.43	2.43	3.48
New Orleans	2.36	2.36	3.77
St. Paul	2.22	2.20	3.40
Denver	3 12	3.12	3.67
Kansas City	2 36	2 26	3.30
Seattle	2.68	2 68	3.33
Dallas	2.03	2.03	2.93
Atlanta	2 70	2 50	....
Cincinnati	2.35	2 35	2 80
Los Angeles	2.78	2 78	3.68
Baltimore	2.90	2 90	
Detroit	2 23	2 23	.
Montreal	2.50	2 50	.

NOTE—Bag charge is generally 15c. each. *Delivered Manhattan, The Bronx or Brooklyn.

TRIANGLE MESH—Price per 100 sq.ft. in carload lots:

PLAIN 4-INCH by 4-INCH MESH

Style Number	Sectional Area Square Inches per Ft. Width	Pittsburgh	New York	Chicago	St. Louis	Dallas	San-Francisco
032	0 032	$0 92	$1 16	$0 98	$0 99	$1.13	$1.32
049	0 049	1.18	1.48	1.26	1 26	1.43	1.67
068	0 068	1.44	1.86	1.53	1 56	1 79	2.06
093	0 093	1 85	2.39	1.97	2 00	2 41	2.65
126	0 126	2 28	3.02	2.43	2.47	2.92	3 28
153	0 153	2.72	3.59	2.90	2.95	3.48	3.93
180	0 180	3 12	4.13	3.33	3.39	3.99	. .
245	0 245	4 12	5.44	4 40	4 47	5.27	.
287	0 287	4 76	6 29	5 08	5.16	6.10	6.86
336	0 336	5 52	7.30	5 89	5.99	7.06	.. .
395	0 395	6 40	8 45	6.83	6.94	8.19	.....
PAVING							
036P	0 036	$0 71	$0.92	$0.76	$1 77	$0.80	.....
053P	0 053	1 00	1.28	1.06	1.08	1.12	... .
072P	0.072	1 26	1.66	1.34	1.37	1.46	... .
097P	0.097	1 62	2.12	1.73	1.76	1.88	... .
049R	0.049	1 00	1.28	1.06	1.08	1.12	... .
067R	0 067	1 26	1.65	1.34	1.37	1.46	...
089R	0.089	1 62	3.11	1.73	1.76	1.88	... .

Made in 16-, 20-, 24-, 28-, 32-, 36-, 40-, 44-, 48-, 52- and 56-in. width in rolls 150-, 200- and 300-ft. lengths. Galvanized is about 10% higher.

EXPANDED METAL LATH—Prices in carload lots per 100 yd. for painted are as follows:

Gage	Weight	New York Current Carloads	New York Current Less Carloads	Chicago	St. Louis	San Francisco	Dallas
27	233	$29.10	$30.20*	$29.10	$29.00	$32.75	$32.75
26	250	30 45	31.65*	30 45	30.00	34.50	34.50
25	300	31 90	33.00*	31.90	.. ..	36.75	36 75
24	340	33 50	34.65*	33.50	33.00	39.25	39 25
22	450	36.60	37.80*	.. ..	...	43 30	43 30

About 10% additional for smaller quantities.
* Delivered on job.

BARS, CONCRETE REINFORCING—Following quotations are per 100 lb.:

ROLLED FROM BILLETS

In	Mill Pittsburgh	Warehouse, Uncut: New York Current	New York One Year Ago	Chicago	St. Louis	Dallas	San Francisco
¾ and larger	$2 35	$3.52	$4 17	$3.37	$3.84	$4.75	$4 60
⅝	2 40	3 57	4 23	3 42	3.90	4.80	4 65
½	2 45	3 62	4 27	3 47	3.95	4 95	4.70
⅜	2 60	3 77	4 42	3.62	4 20	5 00	4.85
¼	2 85	4 02	4.67	4.87	..	5.05	5.10

Twisted bars cut to length take extra of 29½c. per 100 lb.

ROLLED FROM RAILS

	Chicago	St Louis	Dallas		Chicago	St. Louis	Dalla
¾ in and larger	$3 00	$3 65	$4.25	⅜	$3.25	$3.90	
⅝	3 05	3 70	4 30	¼	3.50		
½	3 10	3 75					

BRICK—To contractors price per 1000 in cargo or carload lots is as follows:

	Common Current	Common One Month Ago	Common One Year Ago	Paving Brick	Paving Block
New York (delivered)	$22 50	$24 70	$14 00	No Quotations	
Chicago	12 00	12 00	11 00	.....	.
St Louis, salmon	12 00	12 00	12 00	..	.
Denver, salmon	14 00†	14 00†	9.50	..	38 00
Dallas	18 57	18.57	16 07	27.30	...
San Francisco	12 50	12.50	12.00	.....	....
Boston	27 00	27.00	16.53-17 00	35.00	.....
St. Paul	16 50	14 50	10.25	...	40.00
Kansas City	20 00	18 00	13 00	44.50	..
Seattle	15 00	15 00	15 00	.....	42.00
Cincinnati	17 00	17 00	16.50 17 00	36.00	
Montreal	21 00(del.)	21 00(del.)	.	*70.00*‡	
Detroit	20.00	20 00	.	38.00	
Baltimore (del.)	20 00	18 00 20 00		25 00	45 00

†Hard red is $16 in Denver ‡Not delivered

HOLLOW TILE—Price per block in carload lota for hollow building tile:

	New York Current	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas	Factory Perth Amboy, N. J.
4x12x12	......	$0.11925	$0.09	$0.08	$0.1125	$0.1088	
6x12x12	....	.159	.1268	.105	.15	.09	
8x12x12	....	....	.183	.15	...	1152	
10x12x12	....	....	.19	.173	...	2546	
12x12x12	....	....	.208	.208	...	.3082	

NOTE—New York and Perth Amboy quotations supplied only on specification.

	4x12x12	8x12x12	12x12x12
Boston	$0.15	$0.25	$0.44
St. Paul	.087	.158	.248
Cincinnati	.08705	1623	.2416
Kansas City	.0786	15	.205
Denver	.12	.18	.25
Seattle	.09	175	.30
Atlanta	.115	19	.28
Los Angeles	.082	154	
New Orleans	.165	22	.325
Detroit	106	197	.282
Baltimore	115	21	2875
Montreal	19	.28	35

STRUCTURAL MATERIAL—Following are base prices f.o.b. mill, Pittsburgh, together with quotationa per 100 lb. from warehouses at places named:

	Mill Pittsburgh	New York Current	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in	$2.45	$3.47	$4.27	$3.54	$3.47	$4.45	$5.50
Channels, 3 to 15 in	2.45	3.47	4.27	3.54	3.47	4.45	5.50
Angles, 3 to 6 in., ¼ in. thick	2.45	3.47	4.27	3.54	3.47	4.45	5.50
Tees, 3 in. and larger	2.45	3.52	4.27	3.54	3.47	4.45	5.50
Plates	2.65	3.67	4.52	3.54	3.67	5.15	5.75

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill Pittsburgh	Warehouse New York Current	Warehouse New York One Yr. Ago	Warehouse Chicago	Warehouse St. Louis	Warehouse San Francisco	Warehouse Dallas
¾ in and lsrger	$4.20	$5.00	$5.675	$4.72	$4.99	$6.15	$7.50
CONE HEAD BOILER							
¾ in. and larger	4.30	5.10	5.75	4.82	5.09	6.25	7.50
⅝ and $\frac{11}{16}$	4.45	5.25	5.90	4.97	5.24	6.40	7.50
½ and $\frac{9}{16}$	4.70	5.60	6.25	5.32	5.49	6.75	7.75

Lengtha shorter than 1 in. take an extra of 50c. Lengtha between 1 in. and 2 in. take an extra of 25c.

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	New York	Chicago	San Francisco	Dallas
Wire	$4.50	$7.50	no stocks	$5.50	$6.90
Cut	....	8.00	no stocks	6.90	6.40

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square aa follows in New York, St Louis, Chicago and San Francisco:

	1-Ply c.l.	1-Ply l.cl.	2-Ply c.l.	2-Ply l.cl.	3-Ply c.l.	3-Ply l.c.
No. 1 grade	$1.50	$1.75	$1.90	$2.15	$2.30	$2.55
No. 2 grade	1.35	1.60	1.70	1.95	2.05	2.30

Asbestos asphalt-saturated Felt (14 lb. per square) costs $156 per ton.

Slate-surfaced roofing (red and green) in rolla of 108 sq.ft. costs $2.25 per roll in carload lots and $2.50 for smaller quantitiea.

Shingles, red and green slate finish, cost $6.00 per square in carloads; $6.25 in amaller quantities, in Philadelphia.

NOTE—Jan. 1 prices not yet available.

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

	Carload Lots N. Y.	Carload Lots Chicago	Less Than Carload Lots N. Y.	Less Than Carload Lots Chicago
Tar felt (14 lb. per square of 100 sq.ft.)	$70.00	$70.00	$71.00	$71.00
Tar pitch (in 400-lb. bbl.)	21.00	18.00	22.00	19.00
Asphalt pitch (in barrels)	34.00	34.00	37.50	37.50
Asphalt felt	68.00	48.00	72.50	72.50

NOTE—Jan. 1 prices not yet available.

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Yr. Ago
No. 10	3.55	4.64	4.57	6.15	5.07	5.52
No. 12	3.60	4.69	4.62	6.20	5.12	5.57
No. 14	3.65	4.74	4.67	6.25	5.17	5.62
No. 16	3.75	4.84	4.77	6.35	5.27	5.72
Black						
*Nos. 18 and 20	4.15	5.24	5.42	7.25	6.05	6.32
*Nos. 22 and 24	4.20	5.29	5.47	7.30	6.10	6.37
*No. 26	4.25	5.34	5.52	7.45	6.15	6.42
*No. 28	4.35	5.69	5.62	7.55	6.25	6.52
Galvanized						
No. 10	4.70	5.79	5.97	...	6.50	6.87
No. 12	4.80	5.89	6.07	7.80	6.55	6.82
No. 14	4.80	5.89	6.07	7.80	6.60	6.97
Nos. 18 and 20	5.20	6.19	6.37	8.10	6.90	7.27
Nos. 22 and 24	5.25	6.34	6.52	8.25	7.05	7.37
*No. 26	5.40	6.04	6.67	8.40	7.20	7.47
*No. 28	5.70	7.04	6.97	8.70	7.50	7.77

*For painted corrugated sheets add 30c. per 1000 lb. for 5 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 15c., all gages

LINSEED OIL—These prices are per gallon:

	New York Current	New York One Year Ago	Chicago Current	Chicago One Year Ago
Raw in barrel (5 bbl.)	$1.90	$1.59	$2.09	$1.77
5-gal. cans	2.07	1.84	2.34	1.97

WHITE AND RED LEAD—Base price per pound:

	Red Current Dry	Red Current In Oil	Red 1 Year Ago Dry	Red 1 Year Ago In Oil	White Current Dry and In Oil	White 1 Yr. Ago Dry and In Oil
100-lb. keg	14.00	15.50	14.00	15.50	14.00	14.00
25 and 50-lb. kegs	14.25	15.75	14.25	15.75	14.25	14.25
12½-lb. keg	14.50	16.00	14.50	16.00	14.50	14.50
5-lb. cans	16.00	17.50	16.00	17.50	16.00	16.00
1-lb. cans	17.00	18.50	17.00	18.50	17.00	17.00

500 lb lots less 10% discount; 2000 lb. lots less 10-2½% discount.

LUMBER

San Francisco—Prices of rough Douglas fir No. 1 common, in more than carload lots:

Lumber Prices in Yards at San Francisco

	6-8-12 and 14 Ft.	10-16-18 and 20 Ft.	22 and 24	25 to 32 Ft.
3x3 and 4	$37.00	$37.50	$38.50	$40.50
3x6 and 8	38.00	38.50	39.50	41.50
4x4-6 and 8	38.50	39.50	40.50	42.50
3x10 and 12	38.50	39.50	40.50	42.50
3x14	39.00	40.00	41.00	43.60
4x10 and 12	38.50	39.50	40.50	42.50
4x14	39.50	40.50	41.50	43.50

	24 Ft. and Under	25 to 32 Ft.	33 to 40 Ft
6x10	$38.00	$40.00	$41.00
6x14	39.50	41.50	42.50
8x10	38.00	40.00	41.00
8x14	39.50	41.50	...

New York, Chicago and St. Louis

	Southern Pine New York* 20 Ft. and Under	Southern Pine New York* 22-24 Ft.	Southern Pine Chicago 20 Ft. and Under	Southern Pine Chicago 22-24 Ft.	Yellow Pine St. Louis 20 Ft. and Under	Yellow Pine St. Louis 22-24 Ft.
3x 4 to 8x 8	$50.00	$51.00	$55.00	$57.00	$44.00	$45.00
3x10 to 10x10	54.00	54.00	60.00	62.00	48.00	49.00
3x12 to 12x12	58.00	59.00	63.00	65.00	52.00	53.00
3x14 to 14x14	65.00	66.00	68.00	70.00	57.00	58.00
3x16 to 16x16	73.00	73.00	70.00	72.00	63.50	64.50
3x18 to 18x18	79.00	79.00	75.00	77.00	68.00	69.00
4x20 to 20x20	84.00	85.00	.....	.....	......	......

* Prices from Lumbermen's Bureau

Over 24 ft.—Add $1 for each additional 2 ft. in length up to 40 ft. for sizea 12 x 12 and under; for sizea over 12 x 12 add $2. For merchantable add $2 to sizes 10 x 10 and under. For prime add $2 to the price of merchantable for all sizes.

Other Cities

	8 x 8-In. x 20-Ft. and Under P.	Fir	Hemlock	Spruce	12 x 12-In. 20 Ft. and Under P.	Fir
Boston	$60.00	$55.50	$52.00	$55.00	$65.00	.
Kansas City	53.00	51.50	51.50	51.50	64.00	51.50
Seattle	.....	31.00	....	.	.....	31.00
New Orleans	45.00	......	......	.....	48.00	......
St. Paul	61.00	58.00	58.00	58.00	70.00	70.00
Atlanta	62.50	64.50	66.00	76.00	79.50	82.00
Baltimore	48.00	......	. .	......	60.00	......
Cincinnati	47.50	47.50	47.50	.....	58.00	55.00
Montreal	60.00	68.00	65.00	60.00	73.00†	73.00
Los Angeles*	.....	50.00	.....	....	.....	51.00
Denver	.....	47.50	.....	....	.....	49.00

	1-In. Rough, 10 In. x 16 Ft. and Under P.	Fir	Hemlock	2-In. T. and Gr. 10 In. x 16 Ft. P.	Fir
Boston	$50.00	$52.00	$52.00	$55.00	$55.00
Kansas City	98.50	89.75	89.75	104.75	92.75
Seattle	.....	33.00	.....	.....	36.00
New Orleans	54.00	...	.....	55.25	.....
St. Paul	60.00	54.00	49.00	65.00	63.00
Atlanta	85.00	90.00	......	77.50	87.50
Baltimore (box)	42.50	.....	....	38–42.00	......
Cincinnati	55.00	52.00	55.00	50.00	48.00
Montreal	65.00	65.00	65.00	66.00	66.00
Los Angeles*	.	49.00	.	.....	....
Denver		48.00	48.00	.....	47.00

* Base price, 2x45, is $45, Los Angeles.

Detroit—2-in. Y.P., t. and g., $52.00.

† Montreal—Up to 32 ft.; over which, $3.00 per M. increase up to 30 ft.

Dallas—Yellow pine. Price per M:

2x4 to 2x12—12, 14 and 16	$57.00
2x4 to 2x12—10, 18 and 20	59.00
2x4 to 2x12—22 and 24	64.00
4x4, 4x6, 6x6, 8x8 and 3x8	57.50
8x00, 10x00 and 3x10	60.00
12x12 and 3x12	65.00

FREIGHT RATES

On finished steel products in the Pittsburgh district, including plates, structural shapes, merchant steel, bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc., the following freight rates are effective in cents per 100 lb.:

Boston	$0 30	New Orleans	$0.38½
Buffalo	.17	New York	.27
Chicago	.27	Pacific Coast (all rail)	1.25*
Cincinnati	.23	Philadelphia	.24½
Cleveland	.17	St. Louis	.24
Denver	.99	St. Paul	.49½
Kansas City	.59	Detroit	.33
		Baltimore	.33

Note—Add 3% transportation tax. * Minimum carload, 80,000 lb.

CONTRACTORS' SUPPLIES

STEEL SHEET PILING—The following price is base per 100 lb. f. o. b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$2.55	$2.55	$4-$5

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Hercules red strand, all constructions	20%
Patent flattened strand, special and cast steel	20%
Patent flattened strand, iron rope	5%
Plow steel round strand rope	35%
Special steel round strand rope	30%
Cast steel round strand rope	22½%
Iron strand and iron tiller	5%
Galvanized iron rigging and guy rope	+12%

San Francisco: Galvanized, less 5%, bright, less 25%.
Chicago, +17½ on galvanized, 35 off on bright.

MANILA ROPE—For rope smaller than ⅝-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅝-in., 8 ft., ¾-in., 6; ⅞-in., 4½; 1-in., 3½; 1⅛-in., 2 ft. 10 in.; 1¼-in., 2 ft. 4 in. Following is price per pound for ⅝-in. and larger, in 1200-ft. coils:

Boston	$0.27½	Kansas City	$0.26½
New York	.26	New Orleans	.25½
Chicago	.26½	Los Angeles	.28
St. Paul	.26	Seattle	.25
San Francisco	.24	St. Louis	.26½
Atlanta	.29½	Montreal	.32
Denver	.27½	Detroit	.26
Cincinnati	.27½	Baltimore	.25
Birmingham	.32		

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder.

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	80%	Black Powder
New York	.....	*$0.27*	*$0.29½*	.....	*$2.20*
Boston	$.2225	.2425	.2675	$.3100	2.20
Kansas City	.185	.2275	.2525	.29	*2.25*
New Orleans	.2375*	.2275	.2475	.....	...
Seattle	.1675	.1925	.2125	.2775	2.10
Chicago	.1825	.2075	.25	.2925	2.15
St. Paul	.185	.2275	.2525	.....	2.25
St. Louis	185	.2275	.2325	.2950	1.80
Denver	1725	.215	.240	.2825	2.25
Dallas	....	.....	.288	.342	2.75
Los Angeles	25	.30	.35	.275	3.00
Atlanta	.22	.245	.265	.....	2.55
Baltimore	19	.23½	.28¾	.30	2.35
Cincinnati	.1825	.2075	.2275	.....	2 10
Montreal	.28	.31	.34	.38	3.90

* For 50%.

POLES—For plain pine poles, delivered New York, the price is as follows:

10-in. butts, 5-in. tops, length 20-30 ft	$9.00
12-in. butts, 6-in. tops, length 30-40 ft	11.50
12-in. butts, 6-in. tops, length 41-50 ft	12.50
14-in. butts, 6-in. tops, length 51-60 ft	21.00
14-in. butts, 6-in. tops, length 61-71 ft	23.50

	Dallas
6-in. x 20-ft	$4.60
6-in. x 30-ft	7.10
8-in. x 30-ft	8.45
8-in. x 35-ft	10.38

Note—At the present time it is almost impossible to give accurate prices on poles. The above are only nominal.

OLD MATERIAL—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and St. Louis the quotations are per net ton and cover delivery at the buyer's works, including freight transfer charges.

	New York	Chicago	St. Louis
No. 1 railroad wrought	$28.00	$24 00	*$23.00*
Stove plate	21.00	27.00	27.00
No. 1 machinery cast	32.00	33.50	.....
Machine shop turnings	15.00	*10.50*	*13.00*
Cast borings	17.00	12.50	*11.50*
Railroad malleable cast	23.00	25.00	*23.00*

SHIP SPIKES—Current prices per 100 lb.

	San Francisco		Seattle
In.	Galv.	Black	Black
¼	$9.20	$8.50	$8.55
⅜	8.75	6.75	8.25
½	8.60	6.60	8.30

Pittsburgh base, $3.85 to $4 per 100 lb.

LABOR RATES AND CONDITIONS THROUGHOUT THE COUNTRY

S means scarce; E, enough; P, plentiful

Cities	Bricklayers	Carpenters	Hoisting Engineers	Hod Carriers	Pile Drivers	Structural Iron Workers	Common Labor	Remarks
Atlanta	$0.90S	$0.60-75P	$0.50-65P	$.40-.45P	$0.60-.65	$0.75	$0.35P	Atlanta—Some bricklayers are receiving $1.10 to $1.25 an hour. Some shortage of skilled labor.
Baltimore	1 00E	.80-90E	.87½E	.46-.54E	.74E	.87½E	.35-.45P	Baltimore—Labor sufficient in all trades.
Boston	.90-.92P	.85-.92½P	.90-1.00P	.60-.70S	80-90P	1.00P	.52½-.62½E	Boston—No change of schedule Jan. 1.
Cincinnati	1.25S	.75	.75	.65	.50	.875P	.50S	Cincinnati—Common labor scarse.
Dallas	1 00E	.87½S	.87½E	.37½-.40S	......	.75S	.35S	Dallas—Common labor very scarce.
Denver	1.00E	1.00E	87½E	.72	......	.87½E	.56¼E	Denver—Recent cold spell slackened construction. It is predicted that soon there will be more work than men.
Detroit	1.10	.85	.90-1 00	.65-70	.90	.85-.90	.60- 65	Detroit—No general strikes, but construction is retarded by shortage of building materials.
Kansas City	1.12½S	1.00S	.90E	.68½E	77E	.90E	.57½E	Kansas City—All trades busy.
Los Angeles	.87½E	.75E	.75P	.56-.75S	.75P	.75P	.50-.62½E	Los Angeles—These figures are of Oct. 1.
Montreal	.80	.75	.65S	.50-55S	.55P	.45-.55S	.30-.45S	Montreal—Good labor scarce account of exodus of foreigners, which comprise 75 per cent of Canadian labor.
New Orleans	.87½S	.75	1.00	68¾	.80-1.00	.75	.30-.35	
New York	1 08	1 00	1 12½	.57½	1 00	1 08	68¾	New York—New agreement effective Jan. 1, expected to hold until Dec. 31, 1921.
Pittsburgh	1.00	.90	.90	.60	.60	1.00	.40-.45S	Pittsburgh—No strikes.
St. Louis	1.00	.87½	1.00-1.12½	.70	.80-.92½	.90	.45-.60	St. Louis—Skilled labor, 50c. to 75c. Bricklayers on sewers, $1.00
St. Paul	.87½	.75	.80	.50	.80	.85	.47½	St. Paul—Sewer diggers, 50c. an hour; paving-block layers, 50c.; teams, 90c.
San Francisco	1.25E	1.00E	1.00E	.87½E	1.00E	1.00E	.45-.50E	San Francisco—All lines busy.
Seattle	1.12	93½	.94	.75-.80	.90	1.00	.75S	Seattle—Considerable residence construction. Street and road work booming.

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Jan. 5	Galesburg, Ill. Adv. Dec. 11.	Dec. 11
Jan. 5	East Grand Rapids, Mich.	Dec. 26
Jan. 5	Rio, Wis.	Dec. 26
Jan. 5	Collinsville, Okla.	Dec. 26
Jan. 6	Bayonne, N. J.	Jan. 1
Jan. 7	Alpaugh, Cal.	Dec. 26
Jan. 7	Heppner, Ore.	Dec. 16
Jan. 9	Akron, O.	Dec. 26
Jan. 14	Phoenix, Ariz.	Dec. 26
Jan. 19	Sheboygan, Wis.	Jan. 1
Jan. 27	Avoca, Ia. Adv. Jan. 1.	Jan. 1
Feb. 10	Toronto, Ont.	Jan. 1

SEWERS

Jan. 5	Rio, Wis.	Dec. 26
Jan. 6	Long Island City, N. Y.	Jan. 1
Jan. 8	Windsor, Ont. Adv. Jan. 1.	Jan. 1
Jan. 14	Little Falls, Minn.	Dec. 20
Jan. 15	Duluth, Minn.	Dec. 11
Feb. 2	Kokomo, Ind.	Dec. 16

BRIDGES

Jan. 5	Leavenworth, Kan.	Dec. 26
Jan. 5	Annapolis, N. S.	Dec. 26
Jan. 5	Florida	Jan. 1
Jan. 5	Hollister, Cal.	Jan. 1
Jan. 6	Seneca, Kan.	Dec. 26
Jan. 6	Owatonna, Minn.	Dec. 11
Jan. 6	Duluth, Minn.	Dec. 20
Jan. 7	Banff, Alta.	Jan. 1
Jan. 12	Ray Junction (Kelvin P. O.), Ariz.	Jan. 1
Jan. 19	Florence, Ariz.	Jan. 1
Feb. 7	Bethlehem, Pa.	Dec. 11

STREETS AND ROADS

Jan. 3	North Carolina	Jan. 1
Jan. 5	St. Louis, Mo.	Dec. 11
Jan. 5	Fayetteville, W. Va.	Dec. 20
Jan. 5	Indiana	Dec. 26
Jan. 5	Michigan	Dec. 26
Jan. 5	Leavenworth, Kan.	Dec. 26
Jan. 5	Washington	Dec. 26
Jan. 5	Indiana	Jan. 1
Jan. 5	Aurora, Neb.	Jan. 1
Jan. 5	Michigan	Jan. 1
Jan. 6	Thomasville, Ga.	Dec. 26
Jan. 6	Randolph, W. Va.	Dec. 26
Jan. 6	Fresno, Cal.	Dec. 26
Jan. 6	Williamson, W. Va.	Dec. 26
Jan. 6	Hamlin, W. Va.	Dec. 16
Jan. 6	Indiana	Dec. 26
Jan. 6	Milwaukee, Wis.	Jan. 1
Jan. 6	Indiana	Jan. 1
Jan. 6	Carlton, Minn.	Jan. 1
Jan. 6	Blair, Neb.	Jan. 1
Jan. 6	Jonesboro, Ark.	Jan. 1
Jan. 7	Brooklyn, N. Y.	Jan. 1
Jan. 7	San Francisco, Cal.	Jan. 1
Jan. 7	Indiana	Jan. 1
Jan. 7	New Jersey	Dec. 26
Jan. 7	Palestine, Ill.	Dec. 20
Jan. 8	Indiana	Jan. 1
Jan. 9	Indiana	Jan. 1
Jan. 9	Fresno, Cal.	Dec. 20
Jan. 12	Texas	Dec. 20
Jan. 12	Bunnell, Fla.	Dec. 26
Jan. 12	Bunnell, Fla.	Jan. 1
Jan. 12	Vallejo, Cal.	Jan. 1
Jan. 12	Phoeniz, Ariz.	Jan. 1
Jan. 12	Indiana	Jan. 1
Jan. 12	Florence, Ariz.	Jan. 1
Jan. 13	Florence, Ariz.	Jan. 1
Jan. 13	Coalinga, Cal.	Dec. 26
Jan. 14	Charleston, W. Va.	Dec. 20
Jan. 14	Michigan	Jan. 1
Jan. 15	Tulare, Cal.	Jan. 1
Jan. 15	St. Louis, Mo.	Dec. 11
Jan. 16	La Grange, Tex.	Dec. 20
Jan. 16	Valdosta, Ga.	Dec. 26
Jan. 16	Liberty, Tex.	Dec. 20
Jan. 17	St. Louis, Mo.	Dec. 11
Jan. 19	Finch, Ont.	Dec. 4
Jan. 19	Tombstone, Ariz.	Jan. 1
Jan. 19	Spring Lake, N. J.	Jan. 1
Jan. 22	Wichita Falls, Tex. Adv. Jan. 1.	Jan. 1
Jan. 27	Montgomery, Ala. Adv. Jan. 1.	Jan. 1
Jan. 27	Howell, Mich.	Jan. 1
Jan. 28	St. Louis, Mo.	Dec. 11
Jan. 29	Pella, Ia.	Jan. 1

EXCAVATION AND DREDGING.

Bids Close		See Eng. News-Record
Jan. 6	Shawneetown, Ill.	Dec. 26
Jan. 6	Salem, Ore.	Jan. 1
Jan. 7	Elbow Lake, Minn.	Dec. 20
Jan. 10	Marysville, Cal.	Jan. 1
Jan. 15	Sidney, Ia.	Dec. 26
Feb. 15	Benjamin, Utah	Jan. 1

INDUSTRIAL WORKS

Jan. 5	Horicon, Wis.	Jan. 1
Jan. 5	Kiel, Wis.	Jan. 1
Jan. 5	Cleveland, O.	Jan. 1
Jan. 7	Freehold, N. J.	Dec. 16
Jan. 7	Pullman, Wash.	Dec. 26
Jan. 8	Cleveland, O.	Jan. 1
Jan. 10	Salt Lake City, Utah	Dec. 26
Jan. 12	Wakefield, Mass.	Dec. 16
Jan. 12	Plymouth, Pa.	Jan. 1
Jan. 15	Thiells, N. Y. Adv. Jan. 1.	Jan. 1
Jan. 15	Montreal, Que.	Dec. 20
Jan. 19	Yuma, Colo.	Jan. 1
Jan. 25	Shopiere, Wis.	Jan. 1
Feb. 1	Pocatello, Idaho	Jan. 1

BUILDINGS

Jan. 3	Jacksonville, Fla.	Jan. 1
Jan. 5	Gaza, Ia.	Dec. 11
Jan. 5	Hartford, Conn.	Dec. 20
Jan. 5	Middetown, O.	Dec. 26
Jan. 6	Upper Sandusky, O.	Dec. 26
Jan. 8	Fresno, Cal.	Dec. 20
Jan. 8	Elkins Park, Pa.	Jan. 1
Jan. 8	Laurel, Ia.	Dec. 20
Jan. 8	Cloverton, Minn.	Jan. 1
Jan. 8	Lyndon, Kan.	Jan. 1
Jan. 10	Kenosha, Wis.	Dec. 11
Jan. 10	Westby, Wis.	Dec. 26
Jan. 12	Cincinnati, O.	Jan. 1
Jan. 13	Ord, Neb.	Dec. 20
Jan. 13	Storm Lake, Ia.	Dec. 4
Jan. 14	Burlington, Ia.	Jan. 1
Jan. 14	Bondurant, Ia.	Jan. 1
Jan. 15	Waterloo, Que.	Dec. 16
Jan. 15	Northfield, Minn.	Jan. 1
Jan. 15	Jacksonville, Ill.	Dec. 11
Jan. 15	Charleston, W. Va.	Dec. 26
Jan. 15	East Grand Forks, Minn.	Dec. 26
Jan. 19	Lowell, Mass.	Dec. 11
Jan. 19	South Orange, N. J.	Jan. 1
Jan. 20	Three Rivers, Que.	Dec. 26
Jan. 20	Webster, S. D.	Jan. 1
Jan. 27	Cheyenne, Wyo.	Jan. 1
Feb. 1	Mitchell, S. D. Adv. Dec. 28.	Dec. 20
Feb. 1	Duluth, Minn.	Dec. 26
Feb. 1	Salt Lake City, Utah	Jan. 1
Feb. 2	Independence, Cal.	Jan. 1
Feb. 20	Salt Lake City, Utah	Jan. 1
Mar. 1	Racine, Wis.	Jan. 1
May 15	Syracuse, N. Y.	Dec. 11

FEDERAL GOVERNMENT WORK

Jan. 5	Additional Buildings—Dawson Springs, Ky.	Jan. 1
Jan. 6	Alterations to Post Office—Ashland, Ky.	Dec. 16
Jan. 7	Dirigible Hangar — Spec. 4080—Cape May, N. J.	Dec. 16
Jan. 7	Dredging — Los Angeles, Cal.	Dec. 20
Jan. 7	Water Tanks and Towers—Spec. 4103—Annapolis, Md.	Dec. 20
Jan. 7	Pattern Shop—Spec. 4041—Norfolk, Va.	Dec. 26
Jan. 7	Buildings—Spec. 4079 — Paris Island, S. C.	Jan. 1
Jan. 8	Bridge—Santa Clara, Utah.	Dec. 20
Jan. 8	Remodeling Post Office — Springfield, O.	Dec. 20
Jan. 8	Remodeling Post Office—McKeesport, Pa.	Dec. 26
Jan. 10	Barracks and Quarters, etc. —New Dorp, S. I., N. Y.	Dec. 26
Jan. 14	Sewers—Washington, D. C.	Dec. 26
Jan. 14	Quay Wall—Spec. 4044—Norfolk, Va.	Jan. 1
Jan. 19	Road Work—San Francisco, Cal.	Jan. 1
Jan. 20	Bridge—Montana	Dec. 26
Jan. 20	Aerial Defense Station — Staten Island, N. Y.	Jan. 1
Jan. 20	Additional Buildings—Dawson Springs, Ky.	Jan. 1
Jan. 21	Removing and Rebuilding—Spec. 4109 — Hampton Roads, Va.	Jan. 1
Jan. 21	Dispensary—Spec. 4101—Norfolk, Va.	Jan. 1
Jan. 26	Dredging—New York, N. Y. Adv. Jan 1.	Jan. 1
Jan. 29	Dredging—New Orleans, La. Adv. Jan. 1.	Jan. 1
Feb. 2	Tower and Dwelling—Rincon, P. R. Adv. Dec. 11.	Dec. 11

MISCELLANEOUS

Bids Close		See Eng. News-Record
Jan. 6	Engines—Stockton, Cal.	Dec. 26
Jan. 6	Asphalt, Etc. — Jackson, Miss.	Dec. 26
Jan. 6	Sewer Pipe — Brownstown, Ind.	Dec. 20
Jan. 7	Dam — New Westminster, B. C.	Dec. 16
Jan. 7	Dam—Nicoamen, B. C.	Jan. 1
Jan. 7	Cement—New Orleans, La. Adv. Jan. 1.	Jan. 1
Jan. 7	Tank—New York N. Y.	Jan. 1
Jan. 8	Stone, etc. — Long Island City, N. Y.	Jan. 1
Jan. 9	Wood Stave Pipe Material —Ravenna, O.	Jan. 1
Jan. 10	Cement—West Bend, Wis.	Jan. 1
Jan. 12	Gravel Screening and Loading Plant — Minneapolis, Minn.	Dec. 20
Jan. 13	Stand Pipe — Great Falls, Mont.	Jan. 1
Jan. 15	Survey Monuments—Toronto, Ont	Dec. 26
Jan. 17	Pipes, etc.—York, Ont.	Dec. 26
Jan. 17	Subway—Detroit, Mich.	Jan. 1
Jan. 19	Dumping Equipment — Pennsylvania	Jan. 1
Jan. 19	Gate Valves and Fire Hydrants—Whittier, Cal.	Jan. 1
Jan. 21	Breakwater — Meteghan, N. S.	Jan. 1
Jan. 22	Pipes, Valves etc. — St. Louis, Mo.	Dec. 11

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

Conn., Bristol—City plans to build waterworks system. D. F. Crowley, 192 Main St., city engr.

Conn., New Britain—City having plans prepared for new waterworks system to include raising present dam, building 4750 ft. tunnel, canal and water tower. Work involves 4700 cu yd. rock and 3000 cu.yd. earth excav. About $350,000. W. H. Hall, city engr.

N. C., Sylva—Town had plans prepared by Cox & Son, engrs., Sylva, and soon receives bids for completing waterworks and sewerage system. Bonds for $100,000 sold for project.

N. C., Wake Forrest—City plans to install waterworks system. About $80,000. W. M. Pratt, Durham, engr.

S. C., Greenville—Judson Cotton Mills plan to install water and sewerage systems in Judson Mills Village. J. E. Sirrine, Greenville, engr.

Mich., Port Huron—City Comn. plans to install additional steam driven pumping unit with 6,000,000 gal. per day capacity, also replace 2 present boilers and add 1 in reserve. E. R. Whitmore, city engr.

Ill., Rock Island—City soon lets contract laying 1320 ft. 10 in. and 2100 ft. 6 in. c.i. water pipe in 30th and 35th Sts. W. Treichler, city engr.

Wis., Brillion—City retained J. Donohue, engr., York Bldg., Sheboygan, to prepare preliminary plans for waterworks system. About $40,000. R. Luecher, clk.

Kan., Canton—City having plans prepared equipping waterworks system. Bonds for $18,000 voted for project. F. E. Devlin, El Dorado, engr.

Kan., Cheney—City having plans prepared extending waterworks and sewerage system. Bonds for $40,000 voted for project. F. E. Devlin, El Dorado, engr.

Kan., Solomon—City having preliminary plans prepared for new tank and waterworks system. About $75,000. K. Riddle, Abilene, engr.

Mont., Stevensville—City election Jan. 15, to vote on $15,000 bonds to build well and extend waterworks system. C. C. Widener, Bozeman, engr.

Okla., Pryor—City retained V. V. Long & Co., engrs., 1300 Colcord Bldg., Oklahoma, to prepare preliminary plans for building water purification plant, pumping station and transmission line.

Utah, Richfield—City election Feb. 1, to vote on $100,000 bonds to build waterworks system. Huddleston & Fiero, Kearns Bldg., Salt Lake City, engrs.

Utah, St. George—City retained Caldwell & Richards, engrs., Vermont Bldg., Salt Lake City, to prepare surveys and estimates for waterworks system. About $100,000.

Waterworks (Continued)

Ont., Guelph—City plans to repair waterworks system from pumphouse to springs, involving 20,000 ft. 20 in. c.i. pipe, etc. About $100,000. F. McArthur, City Hall, engr.

Ont., St. Thomas—W. C. Miller, city engr., soon lets contract furnishing and installing electric and gasoline auxiliary pumping equipment for waterworks. About $20,000.

BIDS DESIRED

N. J., Bayonne—Until Jan. 6, by Bd. City Comrs. furnishing and laying 44,000 ft. 48 in. steel water pipe and 1800 ft twin 38 in. flexible jointed pipe between here and Arlington. About $2,000,000. C. Potts, 30 Church St., New York City, consult. engr.

Wis., Sheboygan—Until Jan. 19, by C. U. Boley, city engr., furnishing and installing sterilizing equipment for purifying water in Lake Michigan. About $11,000. J. Steimle, clk.

Ia., Avoca—Until Jan. 27, by town, furnishing labor and materials for building (1) steel water tower and steel tank complete, (2) steel water tower and wood tank complete, (3) concrete water tower and tank complete, each tower and tank to be about 105 ft. high and 100,000 gal. capacity. F. Wise, clk.; advertised in this issue.

Ark., Monticello—Until Jan. 31, by Comrs. Water & Light Impvt. Dist. No. 1, building 400,000 gal. rein.-con. reservoir. L. W. Dillard, comr.; advertised in this issue.

Ont., Toronto—Until Feb. 10, by Bd. Control, City Hall, supplying and installing (Tender No. 36), one or more 16,000,000 to 20,000,000 Imperial gal. centrifugal pumps at the waterworks main pumping station. About $75,000. T. L. Church, ch. R. C. Harris, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Ga., Atlanta**—See "Streets and Roads."

★**O., Canton**—W. I. Zink, dir. pub. serv., let contract building rein.-con. equalizing basin, 15,000,000 gal. capacity, involving 7850 cu.yd. earth excav., 520,000 lb. reinforcing steel, piping, gate valves and sluice gates, etc., to Melbourne Bros., Canton, $298,900.

O., Cleveland Heights (Warrensville P. O.)—Kangesser Realty Co., Park Bldg., Cleveland, received bids building 8210 ft. 4-8 in. c.i. pipe water main, in Taylor Park, here, from George Bros., 1248 Boliver Rd., $19,826; A. Marra, 2276 East 105th St., $20,649; Curro Bros., 12206 Mayfield Rd., $23,479; contractors all of Cleveland.

O., Silver Lake (Cuyahoga Falls P. O.)—Village received bids Dec. 20, building two 1 story, 17 x 17 ft., concrete and brick pump houses, from Alger-Tilghman Co., Guardian Bldg., Cleveland, $9652; Dorris & Tilford, Akron, $10,282; Gangl Constr. Co., 737 2nd Natl. Bank Bldg., Akron, $10,755.

★**O., Toledo**—D. H. Goodwillie, dir. pub. serv., let contract laying 17,000 ft. 30 in. c.i. force water main from Bway. Pumping Station to Prouty Ave. across to Flaring St., to Gessner Co., Toledo. About $122,000.

Sewers

PROPOSED WORK

Conn., New Britain—City receives bids in spring building trunk line sewer in Myrtle St. About $100,000. W. H. Hall, city engr.

W. Va., Clarksburg—See "Streets & Roads."

N. C., Sylva—See "Waterworks."

N. C., Wake Forrest—City plans to install sewerage system. About $20,000. W. M. Pratt, Durham, engr.

O., Cleveland—City rejected bids received Dec. 19, constructing twelve 8 x 50 ft., concrete grit chambers, laboratory, and 1 story, 140 x 142 ft., concrete, steel and brick screen grit chamber building, at easterly sewage disposal plant. Work will be readvertised. G Gascoigne, 618 City Hall, engr.

O., Cleveland — Wight-O'Rourke Co., engrs., Rose Bldg., receives bids about Jan. 16, building 2000 ft. 48 in. segmental block sewer in Garfield Parkway, for Rozell Realty Co., c/o engineers. About $12,000.

Mich., Detroit—Dept. Pub. Wks. soon lets contract furnishing labor and material for 70 ft. rein.-con. sewer outlet in Mt Elliott Ave., section to be 4 parallel 5 ft. cylinders. About $25,000. C. W. Hubbell, city engr.

Kan., Cheney—See "Waterworks."

Neb., Grand Island—City plans to install 8 mi. 15-60 in. clay, tile and segment brick storm sewers. About $200,000. C. E. Donnelly, 405 Hall Bldg., Kansas City, Mo., engr.

Neb., Ponca—City receives bids in February laying 27,000 ft. 8-12 in. pipe sewers to include manholes and 4 flush tanks. About $48,000. A. A. Chenowerth, Sioux Falls, S. D., engr.

Utah, Richfield—City retained Huddleston & Fiero, engrs., Kearns Bldg., Salt Lake City, to prepare plans for building 3 mi. sewers in principal streets.

Ore., Astoria—City plans to build sewer from point 10 ft. west of Lot 10, Blk. 41 of Taylors Addition along Columbia Ave. to alley in Taylors Addition. 8 in. concrete or salt glazed vitr. pipe. About $10,000. E. G. Gearhart, aud.

Ore., Portland—City plans to lay vitr. or cement sewer pipes in Wygant St. from point 60 ft. west of center line of East 29th St. to proposed sewer in East 33rd St.; East 29th St. from Prescott St., East 30th, 31st and East 32nd Sts.; Glenn Ave. to proposed sewer in Wygant St. Cost $21,106. O. Laurgaard, city engr.

Ont., Galt—City plans to lay 1200 ft. 8 and 10 in. vitr. sewers in Dickson Park, Myrtle Ave., Oxford, Huron, Portland, and James Sts. About $14,700. W. H. Fairchild, city engr.

Ont., Newmarket—City having plans prepared by E. A. James Co., Ltd., engrs. 36 Toronto St., Toronto, for 8000 ft. 8-20 in vitri sewers in Darcy, Yonge and Ontario Sts., etc. About $60,000.

Ont., Oshawa—City plans to install 20,000 ft., 8-20 in. vitr. sewers in Westmount, College and Hill Sts., etc. About $35,000. Gore, Nasmith & Storrie, Hamilton Bank Bldg., Toronto, engrs.

Ont., Owen Sound—Town plans to build 3 mi. storm sewerage system, involving 16,000 ft. 8-20 in. vitr. pipe, etc. About $25,000. D. H. Fleming, town engr.

Ont., Sudbury—City plans to install 16,000 ft. 8-24 in. vitr. sewers in various streets. About $32,000. W. J. Ross, clk.

BIDS DESIRED

N. Y., Loog Island City—Until Jan. 6, by M. E. Connolly, pres. Queens Boro., building sewers and appurtenances in Pierce Ave. from 5th to 6th Aves., 1st Ward, Laurel Hill Ave. from Towns Pl. to point 300 ft. north of Towns Pl., 2nd Ward, temporary sanitary sewers and appurtenances in 87th Ave. from Queens Blvd. to 143rd St., 4th Ward.

Ont., Windsor—Until Jan. 8 by Essex Border Utilities Comm., building South Intercepting Sewer. Work involves excavating for, laying, joining and back-filling 8483 ft. 27, 39 and 42 in. rein.-con. pipe now on the work, also furnishing material for, and building 16 manholes, etc. G. M. McGregor, chn.; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Conn., Derby**—Finance Com. let contract laying sewers in various streets, to J. Driscoll, Brightwood Ave., Torrington, $28,460. Work involves 370 ft. 36 in. concrete pipe, 48 ft. c.i. pipe, 7145 ft. 8-10 in. vitr. pipe, 29 brick manholes, 550 sq.yd. tar walk, 25 sq.yd. asphalt pavement, 418 ft. rip rap and 1 special catch basin.

N. Y., Rye—Bd. Village Trustees received lowest bid Nov. 24, furnishing material and labor building sanitary sewers and sewage disposal units, involving 31,100 ft. 8 in. and 580 ft. 15 in. vitr. pipe sewers, 7100 ft. 6-16 in. iron pipe, siphon and force mains, also 1 pumping station complete, etc., from W. G. Cornell, East 17th St., New York City, $295,318

O., Cleveland Heights (Warrensville P. O.)—Kangesser Realty Co., Park Bldg., Cleveland, received bids building 16,350 ft. 8-24 in. tile sewer, 30 brick manholes and 55 catch basins, in Taylor Park, from Curro Bros., 12206 Mayfield Rd., $53,585; A. Marra, 2276 East 105th St, $53,636; George Bros., 1248 Bolivar Rd., $58,151; contractors all of Cleveland

Bridges

PROPOSED WORK

W. Va., Clarksburg—See "Streets and Roads."

Wash., Fall City—Comrs. King Co., (Seattle), soon let contract building Raging River Bridge, here, pony truss span, 96 ft. long, 20 ft. wide, rein.-con. piers, 96 ft. of pile approach, involving 250 cu.yd. concrete and 22 tons steel. About $11,000 S. J. Humes, co. engr.

Wash., Seattle—Comrs. King Co. soon let contract building 160 ft. steel span bridge, 20 ft. wide, 215 ft. approach, on Lee Hill. Work involves 300 cu.yd. concrete, 50 tons steel and 4000 lin.ft. wooden piling. About $25,000. S. J. Humes, co. engr.

Ont., Brantford—City plans to build 1100 ft. concrete bridge, 48 ft. wide, on Lorne St. About $211,000. T. H. Jones, city engr.

Ont., Chatham—City plans election to vote on bonds to build 90 ft. steel bridge, 20 ft. wide, over McGregors Creek, on Princess St. About $17,300. F. P. Adams, city engr.

BIDS DESIRED

Fla., Milton—Until Jan. 5, by State Rd. Dept., Tallahassee, building 388 ft. bridge, 18 ft. roadway, 6 ft. walk, over Blackwater River, here. C. A. Browne, Tallahassee, state highway engr.; advertised in this issue.

Ariz., Ray—Until Jan. 19, by Pinal Co. Highway Comn., (Florence), building rein.-con. arch bridge, here, consisting of two 100 ft. clear arches and 130 ft. concrete retaining wall, also for taking down, loading, shipping and re-erecting one 200 ft. steel span near Winkelman, and furnishing and erecting 200 ft. additional to steel structure together with piers, abutments, wings, etc. E. G. Dentzer, secy.; advertised in this issue.

Aria. Ray Junction (Kelvin P. O.)—Until Jan. 12, by Pinal Co. Highway Comn., Florence, building 45 ft. concrete arch bridge, near here.

Ariz., Winkelman—See "Ray."

Cal., Hollister—Until Jan. 5, by E. Dowdy, clk. San Benito Co., building rein.-con. bridges over Tequisquite Slough and Santa Ana Creek, both on Ausaymas and Fairview cut-off road. Cost between $10,000 and $15,000 each.

Alta., Banff—Until Jan. 7, by Dept. Pub. Wks., Ottawa, building 420 ft. bridge, 56 ft. wide, over Bow River. Work involves 4 river piers, 2 concrete approach piers, 2 rein.-con. sidewalks 9 ft. wide, rein.-con. roadway. About $125,000. A. Lafheur, c o Dept. Pub. Wks., Ottawa, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—City let contract building 45 ft. span jacknife swing bridge, 4 tracks, over Mystic River, involving 180 tons steel, to W. L. Miller Co., Charlestown, and Boston Bridge Co., 47 Winter St About $50,000.

★**N. C., Rutherfordton**—Rutherford Co let contract building 170 ft. steel bridge, to Champion Bridge Co., Wilmington, O., $13,271.

★**Ore., The Dallas**—City let contract building rein.-con. viaduct span, 124 ft long, on West 6th St., to Lindstrum & Feigenson, Worcester Bldg., Portland. $19,093.

Streets and Roads

PROPOSED WORK

Mass., Provincetown—State Legislature, Boston, appropriated $50,000 to build walks, drives and memorial park to Pilgrims Monument at Monument Hill, here. Architect not selected.

N. J., Jersey City—Hudson Co. Blvd Comn. will repave Hudson Boulevard from Communipaw Ave. to Central R.R. of New Jersey Bridge. About $75,000.

W. Va., Clarksburg—City had plans prepared paving various streets, laying storm sewers in Main and Pike Sts. and building bridge on Adamston, Pike and Main Sts About $900,000. Long, city engr.

W. Va., Clay—Comrs. Clay Co. had plans prepared by J. S. Chase, engr., Clay, grading and draining 3 mi. Clay Court House-Wallback Rd About $16,000 J S Chase, co engr

Streets and Roads (Continued)

W. Va., Hinton—Summers Co. voted $110,000 bonds to grade and drain roads and build bridge in Green Sulphur Dist.; $27,000 bonds to grade and drain road in Forest Hill Dist. J. D. French, Hinton, engr

W. Va., Hinton—Comrs. Summers Co. having plans prepared grading 2 mi. Tallory Rd., Pipe Steam Dist. About $38,000. H. L. Batten, Hinton, engr.

North Carolina—State Highway Comn., Raleigh, plans to gravel 3.6 mi. road, Burke Co.; also 13½ mi. Forsyth Co., and 11.6 mi. road, Caswell Co.; also hard surface 3.8 mi. road Orange Co. W. S. Fallis, state highway engr.

Miss., Jackson—City plans to repair various streets. About $90,000. M. L. Culley, city engr.

O., Bedford—S. H. Kleinman Realty Co., National City Bldg., Cleveland, receives bids about Jan. 15, improving Yorkshire Allotment, here, involving 14,000 cu.yd. grading and 11,000 ft. 2½ in. sandstone sidewalk. About $11,000. Wight-O'Rourke Co., Rose Bldg., Cleveland, engrs.

O., Cleveland—Comrs. Cuyahoga Co. rejected bids received Dec. 19, building Pleasant Valley Rd., involving 24,000 cu.yd. earth excav. About $19,872. Work will be readvertised. W. A. Stinchcomb, co. engr.

O., Columbus—City Council plans to pave with (1) brick, (2) concrete, (3) asphalt, 1388 ft. Ludlow St. from Gay to Chestnut Sts., 33 ft. wide, cost (1) $16,582; 747 ft. Pearl St. from Chittenden to 13th Aves., 20 ft. wide, (1) $6365, (2) $4367; 888 ft. 8th Ave. from 4th St. to Grant Ave., 20 ft. wide, (1) $10,250; 647 ft. 11th Ave. from 4th to 6th Sts., 36 ft. wide, (3) $12,275; 280 ft. 2nd alley north of Main St. from 17th St. to Monroe Ave., 20 ft. wide, (1) $2955, (2) $2097; 425 ft. alley north of Vermont Pl. from alley west of Michigan Ave. to Perry St., 16 ft. wide, (1) $3,613, (2) $2,545; 267 ft. alley west of Michigan Ave. from Vermont Pl. to 5th Ave., 267 ft. 20 ft. wide, (1) $2,640, (2) $1,830.

O., Dayton—City plans to pave 1500 ft. Puterbaugh Ave. from 3rd to Natl. Sts., 30 ft. wide, involving 5000 sq.yd. vitr. brick or wood block on concrete base, 3000 lin.ft. cement curbing and guttering. About $28,482. F. O. Eichelberger, city engr.

Ill., Rock Island—City soon lets contract paving ¾ mi. 41st St., 18th Ave. and alleys, 24 and 30 ft. wide, involving 11,000 sq.yd. vitr. brick on concrete base, 7,000 lin.ft. 6 x 20 in. curbing and 5600 cu.yd. earth excav About $60,000. W. Treichler, city engr.

Wis., Juneau—Dodge Co. voted $5,400,000 bonds to build 309 mi. roads, 18 ft. wide, concrete.

Wis., Kenosha—City plans to pave Charles St. from Salem to Tauck Aves., cost $28,200, Lyman Ave. to Grand Ave. N., $23,000, probably asphalt; Collin St. from Pleasant St. to Sheridan Rd., $22,600, Edward St. from Lester to Salem Aves., $16,600, Newell St. to Grand Ave. N. $27,000, West Prairie Ave. from Bain to Grand View Aves., $36,000, asphalt; Fremont Ave. from Prairie to Park Aves. $9000, brick on concrete foundation; Pleasant St. from Strong to Collin Sts., $15,000, Pine St. from Milwaukee Ave. to Chicago St., $3600, Racine Ave. from Division to Adams Sts., $66,200, North Sheridan Rd. from Grand Ave. to Limit St., $71,000, Tauck Ave. from Charles St. to Howland Ave., $12,800, Victoria St. from Grand Ave. to Garden St., $7600, Northwest Main St. from Grand Ave. to Middle St., $10,000, brick; North Oak St. from Milwaukee Ave. to North Congress St., $10,800. B. C. Brennan, city engr.

Minn., Duluth—City soon lets contract paving 1500 ft., 36th Ave. east from Superior to 4th Sts., 24 ft. wide, involving 3193 sq.yd. sandstone block, 2693 lin.ft. concrete curbing, 3775 cu.yd. earth and 65 cu.yd. rock excav., and 1740 ft. 12-18 in. sewer pipe. About $35,834. E. K. Coe, city engr.

Minn., Duluth—City soon lets contract paving 3500 ft. 11th Ave. east from 2nd to 11th Sts., 24 ft. wide, involving 8580 sq.yd. concrete, 5280 lin.ft. concrete curbing, 5117 cu.yd. earth and 90 cu.yd. rock excav. About $38,371. E. K. Coe, city engr.

Minn., Winona—A. Baeurlen, aud. Winona Co., received no bids Oct. 14, building State Rd. No. 1, Federal Aid Project No. 96, 24 ft. wide, involving 4.2 acres clearing and grubbing, 24,124 cu.yd. earth, 12,000 cu.yd. loose rock and 5000 cu.yd. solid rock excav., 4360 lbs. reinforcing steel, etc. About $32,000. Work will be readvertised about March.

Kan., Abilene—Comrs. Dickinson Co. rejected bids received Dec. 1, hard surfacing and draining 4.53 mi. Sect. A, Golden Belt Rd., Federal Aid Project No. 32, 18 ft. wide and 3.96 mi. Sect. D, Bee Line Rd., Federal Aid Project No. 29, 18 ft. wide. Work will be readvertised. K. Riddle, Abilene, engr.

Kan., Independence—Comrs. Montgomery Co. received no bids Dec. 9, gravel surfacing on macadam base, 2.246 mi. Cherryvale-Coffeyville Rd., Federal Aid Project No. 37, Sect. B, 18 ft. wide. About $50,000. Work will be readvertised. H. K. Hibbard, Independence, engr.

Missouri—State Highway Dept., Jefferson City, plans to build 9.5 mi. Springfield-Hollister Rd., Ozark Special Rd. Dist., Christian Co., involving 12,000 cu.yd. earth and 800 cu.yd. rock excav., 47,700 lin. ft. grading, 87,840 sq.yd. 5 in. and 1000 sq.yd. 7 in. gravel surfacing, 16 ft. wide, cost $35,383; 4.12 mi. Stanberry-Albany Rd., Huggins Twp. Bd., Gentry Co., 57,182 cu.yd. earth excav., 24,172 sq.yd. gravel surfacing, 10 ft. wide, one overflow and one 100 ft. steel span bridge, $84,475; 6.62 mi. Jefferson Highway, White Oak Twp. Bd., Harrison Co., 60,000 cu.yd. earth excav., 35 culverts, one 50 ft. and one 70 ft. steel span bridge, $65,620; 7.5 mi. Springfield-Sedalia Rd., Preston Special Rd Dist., Hickory Co., 15,680 cu.yd. earth and 320 cu.yd. rock excav., 39,600 sq.yd. gravel surfacing, 9 ft. wide, extensions to 8 culverts and 21 new culverts, $26,838; 8.5 mi. Red Ball Route, Canton Special Rd. Dist., 37,884 cu.yd. earth and rock excav., 79,786 sq.yd. gravel surfacing, 16 ft. wide, 19 culverts and 1 bridge, cost $88,977; 7.7 mi. Red Ball Route, La Grange Special Rd. Dist., 28,067 cu.yd. earth and rock excav., 72,277 sq.yd. gravel surfacing, 16 ft. wide, 9 culverts and one 24 ft. rein.-con. bridge, $67,760, both in Lewis Co.; 8.24 mi. Natl. Old Trails Rd., New Florence Special Rd. Dist., Montgomery Co., 10,310 cu.yd. earth excav., 43,515 lin.ft. grading, 43,516 sq.yd. 3 in. waterbound macadam wearing surface on 5 in. broken stone base, 9 ft. wide, and 17 culverts, $62,043; 6 mi. Kings Highway, Hayti Special Rd. Dist., 4000 cu.yd. earth excav., 29,040 lin.ft. grading, 56,320 sq.yd. gravel surfacing, 16 ft. wide, 5 culverts, two 30 ft. and one 60 ft. span bridges, $69,863, 5.5 mi. Portageville-Blytheville Rd., Little Prairie Twp. Special Rd. Dist., 29,040 lin.ft. grading, 57,628 sq.yd. gravel surfacing, 16 ft. wide, 5 culverts, $51,324, both in Pemiscot Co.; 13.8 mi. Boliver-Springfield Rd., Springfield Special Rd. Dist., Polk Co., 19,200 cu.yd. earth and 2500 cu.yd. rock excav., 73,200 lin.ft. grading, 35,100 sq.yd. 4 in. and 37,800 sq.yd. 8 in. gravel surfacing, 90 ft. wide, extensions to 20 culverts, 17 new culverts, repairing old approaches, clearing and grubbing, etc., $58,295; all 24 ft. wide.

Tex., Corsicana—Corsicana Co. soon receives bids grading, draining and surfacing 11.66 mi. Highway No. 14, from here to Rice and Ellis Co. line, 16 ft. wide, involving 13.48 acres clearing and grubbing, large concrete trestle, 142,621 cu.yd. earth and 1813 cu.yd. bridge excav., 13,312 lin.ft. concrete piling, 3516 cu.yd. concrete, etc. About $323,824. C. Chappell, Corsicana, engr.

Tex., Del Rio—Val Verde Co. voted $400,000 bonds to build roads. C. C. Belcher, co. judge. S. C. McCarthy, Del Rio, state resident engr.

Tex., Weatherford—Parker Co. having plans prepared draining and improving 32.6 mi. Highway No. 1 across county from Tarrant Co. to Palo Pinto Co., 18 ft. wide, involving 40 acres clearing and grubbing, 30 mi. grading, 28,600 sq.yd. surface treatment, 16,000 cu.yd. rock excav., 2900 cu.yd. class A and 2600 cu.yd. class B concrete, etc. About $602,612. O Leonard, Weatherford, engr.

Colorado—State Highway Dept., Denver, receives bids about Jan. 15, paving roads in following counties:—

Boulder Co. 1.182 mi. Federal Aid Project No. 36, between Longmont and Denver, 18 ft. wide, concrete with gravel shoulders, involving 2789 cu.yd. combined earth excav., 12,454 sq.yd. concrete, 10 cu.yd. concrete culvert headwalls, 100 lin. ft. 18 in. corrugated metal culverts, etc., cost $44,800 (state to furnish all cement); .799 mi. Federal Aid Project No. 37, east from Boulder, 18 ft. wide, concrete. 726 cu.yd. earth excav., 8440 sq.yd. concrete, 208 cu.yd. gravel surfacing, 1176 cu.yd. earth borrow, 1 bridge with two 30 ft. I beam spans, concrete abutments, piers, etc., $44,810 (state to furnish all cement).

Eagle Co., grading and draining 2.759 mi Federal Aid Project No. 78, between Red Cliffe and Minturn, 18 ft. wide, 34,496 cu. yd. combined earth and 14,262 cu.yd. solid rock excav., 14,505 cu.yd. earth borrow, 9 acres clearing, 262 cu.yd. concrete culvert headwalls, 818 lin.ft. 24 in. corrugated metal culverts, etc., $114,490.

Elbert Co., grading and draining 16,876 mi. Federal Aid Project No. 50, between River Bend and Kuhn's Crossing, 24 ft. wide, 76,003 cu.yd. earth excav., 3080 cu.yd. earth borrow, 59 cu.yd. concrete headwalls, 16,952 lb. reinforcing steel, 1 bridge with 28 ft. I beam span, 980 lin.ft. 15-24 in. corrugated metal culverts, etc., $45,643.

Larimer Co., 1,962 mi. Federal Aid Project No. 33, south from Ft. Collins, 18 ft. wide, concrete with gravel shoulders, 2939 cu.yd. combined earth excav., 20,780 sq.yd. concrete, 518 cu.yd. gravel shoulders, 632 cu.yd. earth borrow, etc., $74,682 (state to furnish all cement).

Mesa Co., 2.496 mi. Federal Aid Project No. 77, between Grand Jct. and Palisade, 18 ft. wide, concrete with gravel shoulders, 5384 cu.yd. combined earth excav., 26,360 sq.yd. concrete, 2115 cu.yd. gravel sub-base and shoulders, 905 lin.ft. 15-18 in. corrugated metal culverts, etc., $61,586 (state to furnish all cement). J. E. Maloney, state highway engr.

Idaho—State Highway Comn., Boise, U. S. Forestry Bureau and Clearwater Highway Dists. having preliminary plans prepared by W. J. Hall, engr., c/o State Highway Comn., for hardsurfacing 85 mi. Clearwater Highway from Greer to Fish Creek Summit on Montana state line. Cost to exceed $150,000.

Wash., Davenport—Lincoln Co. rejected bids received Dec. 5, building 7 mi. gravel surfaced road from Peach to Creston. About $100,000. J. L. Thayer, Davenport, engr.

Wash., Goldendale—Klickitat Co. soon receives bids building 25 mi. White Salmon-Trout Lake Valley Rd., 17 ft. wide, consisting of 9 ft. concrete strip with 8 ft. gravel road at side. About $400,000. E. P. Hinshaw, White Salmon, engr.

Wash., Seattle—City soon lets contract building 3.5 mi. Gorge Creek Rd. on Skagit River. This is portion of 37 mi. highway to be constructed in connection with proposed Skagit River hydro-electric project which will be developed. A. H. Dimock, city engr.

Ore., Eugene—Lane Co. voted $60,000 tax levy to repair and pave lateral roads in rural districts.

California—State Highway Dept., Forum Bldg., Sacramento, soon receives bids paving 30 mi of gaps in Imperial Valley Highway, concrete, Riverside and San Bernardino Counties. A. B. Fletcher, state highway engr.

California—State Highway Dept., Sacramento, plans to widen state highway pavement through Atwater 7.75 ft. on east side. Work to be done in conjunction with 7.75 ft. width to be laid by town at its own expense. Cost to exceed $10,000. A. B. Fletcher, state highway engr.

Cal., Martinez—Contra Costa Co. receives bids about Feb. 15, paving 47 mi. highways, concrete. R. R. Arnold, co. engr.

Cal., San Luis Obispo—City plans to improve and pave with concrete, street connecting state highway at northeasterly city limits on Monterey St. to Chorro St., southeast to Higuera St., southwest to Higuera St., to west line of Nipoma St.; Santa Rosa St. from Monterey St. west to city limits, to connect with Coast Highway from intersection of Broad and Higuera Sts. east on Broad St. to city limits, to connect with proposed Edna Rd.; Sycamore St., at intersection with Santa Rosa St., northeast to Hathaway Ave.; north on Hathaway Ave. to its intersection with Polytechnic Blvd.; northwest on Polytechnic Bivd. to city limits. About $85,000. W. B. Burch, city engr.

Cal., San Luis Obispo—San Luis Obispo Co. plans to grade and gravel road from San Miguel to Lynch, cost $3000; 8 mi Paso Robles-Estrella Rd. from intersection with State Highway to Estralla Bridge, $7000; 3 mi. road from south line of Supervisional Dist. No. 3 on Edna Rd., south through Edna Twp., 18 ft. wide, crushed rock with oil macadam surface, $32,800. W. Burch, co. engr.

Cal., San Luis Obispo—San Luis Obispo Co. voted $1,500,000 bonds to pave roads with concrete, macadam and gravel.

Cal., Woodland—Bd. Supervs. Yolo Co. soon receives bids building 1st section of 75 mi. roads to be paved under $1,000,000 bond issue. Alternate bids for concrete base with block wearing surface and for block base with block wearing surface. A. G. Proctor, co. engr.

Streets and Roads (Continued)

Ontario—Provincial Government, Toronto, plans to build 20 mi. road from Aston Sta. to North Gower and Vernon, Carleton Co. About $60,000. Bids will be received in spring. G. Hogarth, Toronto, engr.

Ont., Almonte—City plans election to vote on $20,000 bonds to build 3 mi. granolithic concrete sidewalk, 5 ft. wide. W. Watcharn, Almonte, engr.

Ont., Lucan—W. G. Gibson, secy.-treas., soon lets contract building 4 mi. Main St. from southeast boundry to Chestnut St., concrete, 16 ft. wide. About $18,000.

Ont., Meaford—City election soon to vote on $50,000 by-law for 18,000 sq.yd. concrete pavement.

Ont., St. Thomas—City having plans prepared by W. C. Miller, engr., City Hall, building 1¾ mi. Talbot St. from Mary to Balaclava Sts., 24-34 ft. wide, involving 30,000 sq.yd. asphalt and 1,300 lin.ft. concrete curbing. About $98,300.

Ont., Toronto—City plans to pave Davenport Rd. and extend pavement on Norway Ave. to Lee Ave. Work involves 60,000 sq.yd. asphalt on concrete base. About $330,000. R. C. Harris, city engr.

BIDS DESIRED

N. Y., Brooklyn.—Until Jan. 7, by E. Riegelmann, boro. pres., regulating and paving with permanent asphalt on 6 in. concrete base, roadway of Hegeman Ave from Georgia to Sheffield Aves., Louisiana Ave. from Hegeman to Lorraine Aves., 81st St. from 19th to 20th Aves. and regulating, grading and curbing 70th St. from 10th to 11th Aves. Liberty Ave. from Forbell Ave. to Boro line of Brooklyn and Queens.

N. J., Spring Lake—Until Jan. 19, by Common Council, paving and curbing 3rd Ave. B. Y. Patterson, acting clk.; advertised in this issue.

North Carolina—Until Jan. 3, by Div. Office State Highway Comn., Greensboro, top soiling 12.88 mi. and 8.66 mi. road, Union Co., 2.8 mi. road. Stanley Co. also hard surfacing 8 mi. road, Alamance Co. W. S. Fallis, Raleigh, state highway engr.

Fla., Bunnell—Until Jan. 12 by Comr. Flagler Co. clearing, grubbing and grading 40 mi. road and constructing 700 ft. bridges in Haw Creek Special Road and Bridge Dist., also grading, draining and hard-surfacing 3¾ mi. road and constructing bridges in district from intersection of Dean Rd. with Florida East Coast R.R. to northwest orner of Sec. 18, Township 12, South, Range 30 East. G. Moody, chn.

Ala., Montgomery—Until Jan. 27, by J. L. Cobbs, city treas., for (1) paving with gravel, Finley Ave., between Court and Perry Sts.; Clinton Ave., between Hull St. and Norman Bridge Rd., and all that portion of Bell-Air south of Oak Park, bounded by Stephenson, Pineleaf, Hardaway and Hall Sts.; (2) curbing, surface gutters (of brick) and storm drainage in Bell-Air above mentioned, and also on Finley Ave., curbing on north side of Clanton Ave. between Hull St. and Norman Bridge Rd.; (3) paving with Schillinger, or Hexagon block pavement, south side of Finley Ave. (not now paved), between Court and Perry Sts.; advertised in this issue.

Indiana—By Bd. Co. Comrs. building roads in following counties:

Jan. 6, Harrison Co., Corydon, 3 mi. stone road, Harrison Twp., known as F. G. Mosler Rd. S. C. Mauck, aud.

Greene Co., Bloomfield, road in Wright and Smith Twps., known as Riley Osborn Rd., road in Highland Twp., known as H. Derrickson et al Rd. H. C. Corbin, aud.

Morgan Co., Martinsville, 2870 ft. macadam road, Jackson Twp., known as J. N. Roberts et al Rd. H. H. Nutter, aud.

Montgomery Co., Crawfordsville, 10,560 ft. gravel road, Scott Twp., known as H. L. Smith Rd. W. F. Batman, aud.

Boone Co., Lebanon, 2 roads in Jefferson Twp., known as J. F. Hart et al Rd. and T. R. Jones et al Rd.; 2 roads in Sugar Creek Twp., known as J. W. Morrison Rd. and W. C. Jacques Rd.; road in Marion Twp., known as T. W. Padgett et al Rd.; 2 roads in Worth Twp., known as G. O. Cook et al Rd and S. J. Saunders et al Rd.; road in Jackson Twp., known as C. F. Shera et al Rd.; 2 roads in Eagle Twp., known as A Sheets et al Rd. and E. Schooler et al Rd.; road in Clinton Twp. known as A. Perkins Rd.; road in Center Twp., known as C. A. Davis Rd.; 2 roads in Chester Twp., known as Light Warner Rd and B. Coble Rd. F. P. Kircher, aud.

Wabash Co., Wabash, gravel road, Noble Twp. known as F. Lynn Rd. F. P Kircher, aud

Jan. 7, Whiteley Co., Columbia City, 23,456 ft. gravel road, Thorncreek Twp., known as Goss and Lehman Rds. T. Burwell, aud.

Jan. 8, Allen Co., Wayne, 33,245 ft. stone road, Marion Twp., known as Hoagland Rd.; 5255 ft. stone road, Madison Twp., known as Battenberg Rd.; 21,290 ft. stone road, Lafayette Twp., known as Center Rd.; 13,266 ft. stone road, Jackson Twp., known as Moore Rd.; 10,616 ft. stone road, Eel River Twp., known as McDuffee Rd.; 14,300 ft. stone road, Cedar Creek Twp., known as Hosler Rd. A. C. McCoy, aud.

Jan. 9, Allen Co., Wayne, 7380 ft. stone road Maumee Twp., known as Kneubuhler Rd.; 15,838 ft. stone road, Monroe Twp., road in Springfield Twp., known as Springfield No. 4 Rd. A. C. McCoy, aud.

Jan. 12, Allen Co., Wayne, 15,892 ft. stone road, Lake and Washington Twps., known as Kammeier Rd.; 10,588 ft. stone road, Monroe Twp., known as Barkle Jct. Rd. A. C. McCoy aud.

Michigan—Until Jan. 14, by State Highway Dept., Lansing, grading, draining and surfacing 2.09 mi. State Trunk Line Rd. No. 24-. 16 ft. wide, involving 19,620 sq. yd. gravel and 9660 cu.yd. earth excav; 3.006 mi. State Trunk Line Rd. No. 24-3, 16 ft. wide, 26,221 sq.yd. gravel and 33,393 cu.yd. earth excav.

Mich., Howell—Until Jan 27, by S. H. Aldrich, city clk., paving State St. from north line of Grand River St. to Ann Arbor R. R. Co.'s right of way; Clinton St. from west line of State St. to east line of Walnut St.; Sibley St. from west line of Michigan Ave. to east line of Walnut St.; North Michigan Ave. from north line of Ann Arbor R. R. Co.'s right of way to north city limits; South Michigan Ave. from south line of Washington St. to south line of Livingston St. and from point 294 ft. north of north line of Marion Rd. to south city limits, involving 7870 cu.yd. grading, 1105 lin.ft. 8-10 in. sewer pipe, 23,181 sq.yd. pavement, 9023 lin.ft. 4 in. drain tile, 8887 lin.ft. straight, 517 lin.ft. circular and 468 lin.ft. marginal curb.

Wis., Milwaukee—Until Jan. 6, by G. Hampel, clk. Milwaukee Co., paving 2 mi. Woodlawn Ave. from Beloit to Janesville Rds., 2¼ mi. St. Martin's-Ryan Rd. from Center to Loomis Rds., both 18 ft. wide, 1 course concrete. Wisconsin Highway Comn., Madison, engrs.

Ia., Pella—Until Jan. 29, by city, for 79,000 sq.yd brick, Portland cement, concrete, bitulithic, asphaltic concrete or sheet asphalt pavement, 5,500 lin.ft. cement concrete curb and 11,000 lin.ft. cement concrete curb and gutter. I. J. Stoddard, city engr.

Minn., Carlton—Until Jan. 6, by Comrs. Carlton Co., building 1.89 mi. State Rd. No. 1, involving 2268 cu.yd. graveling; 1¾ mi. and ½ mi. State Rd. No. 7, involving 2100 and 600 cu.yd. graveling respectively, all 24 ft. wide. About $18,000. P. D. Mold, Carlton, engr.

Neb., Aurora—Until Jan. 5, by city, improving various streets, involving 73,000 yd. sheet asphalt, asphaltic concrete, 3 and 4 in. brick or bitulithic concrete. Grupe & Walter, 204 Peters Trust Bldg., Omaha, engrs.

Neb., Blair—Until Jan. 6, by H. L. Morris, city clk., improving Dist. No. 1, involving 30,213 sq.yd. paving, 8975 lin.ft. curbing and guttering and 2286 lin.ft. curbing, etc.; Dist. No. 2, 15,619 sq.yd. paving, 8309 lin.ft. curbing and guttering and 2395 lin.ft. curbing, etc.; Dist. No. 3, 13,981 sq.yd. paving, 6200 lin.ft. curbing and guttering and 2250 lin.ft. curbing; Dist. No. 4, 18,212 sq.yd. paving, 10,451 lin.ft. curbing and guttering and 3638 lin.ft. curbing; Dist. No. 5, 800 sq.yd. paving, and 120 cu.yd. grading. Bids will be received on rein.-con. monolithic concrete, asphaltic concrete on cement concrete base, sheet asphalt on cement concrete base and brick pavement on cement concrete base. About $300,000. W. E. Standeven, 414 Bee Bldg., Omaha, engr.

Ark., Jonesboro—Until Jan. 9, by Comrs. Brook and Lester Rd. Impvt. Dist., improving 16.25 mi. gravel roads with necessary bridges and culverts. Craighead Co., involving 7 acres clearing and grubbing, 150,000 cu.yd. machine and 37,000 cu.yd. team excav., 15,000 cu.yd. gravel, 80 lin.ft. beam, 224 lin.ft. truss and 195 ft. wood bridges, 350 cu.yd. concrete, etc., J. R Rhyne, Corning, engr.

Tex., Wichita Falls—Until Jan. 22, by W. W. Murphy, aud. Wichita Co., building Sect No. 1, Lake Rd, Sects. Nos. 2 and 3, Burkburnett Rd. and Sects. Nos. 4, 5 and 6, Electra Rd. J. M Isbell, co. engr.; advertised in this issue.

Ariz., Florence—Until Jan. 12, by Pinal Co. Highway Comn. building 12 mi. highway from Oracle to Mammouth, involving 80,000 cu.yd. excav. and 600 cu.yd. concrete. E. G. Dentzer, secy.; advertised in this issue.

Ariz., Florence—Until Jan. 13, by Pinal Co. Highway Comn., grading and draining 30 mi. road between Florence and Casa Grande, involving 100,000 cu.yd. light earth and 900 cu.yd. concrete. E. G. Dentzer, secy.; advertised in this issue.

Ariz., Phoenix—Until Jan. 12, by A. F. Jones, secy. Maricopa Co. Highway Comn. building 278 mi. highways.

Ariz., Tombstone—Until Jan. 19, by T. Maddock, state engr., c/o Bd. Supervs., Cochise Co., building Sect. D Benson-Vail Highway, involving 13,000 cu.yd. excav. and incidental drainage structures.

Cal., Fresno — Until Jan. 9, by Bd. Supervs. Fresno Co. paving 12 mi. road near here, concrete and asphalt or patented surface.

Cal., San Francisco—Until Jan. 7, by city, improving 1700 ft. Market St. between Ord and Collingwood Sts., with extension to 18th St., involving 9445 sq.yd. asphaltic concrete, 180 sq.ft. basalt block conform, 1955 lin.ft. concrete curbs, 1350 sq.ft. artificial stone sidewalks, 4766 cu.yd. earth excav., etc., cost, $40,000; grading. Collingwood St. between 20th and 21st Sts. and 21st and 22nd Sts. between Diamond and Castro Sts., involving 2 rein.-con. retaining walls with armored offsets, 6185 sq.yd. vitr. brick, 1787 sq.yd. 2 in. surface asphalt on 6 in. concrete foundation, 202 sq.yd. concrete, 18,390 lb. steel, 4286 lin.ft. concrete curbs, 22,645 sq.ft. artificial stone sidewalks and 30,853 cu.yd. earth excav., About $90,000. M. M. O'Shaughnessy, city engr.

Cal., Tulare—Until Jan. 15, by F. M. Eldridge, city clk., 5 blocks 4 in. concrete pavement, 20 ft. wide.

Cal., Vallejo—Until Jan. 12, by A. E. Edgcumbe, city clk., improving Hichborn St., involving 10,400 cu.yd. excav., 68,000 sq. ft. concrete paving, 4900 ft. concrete curbs, and 29,000 sq.ft. cement walks. T. D. Kilkenny, city engr.

PRICES & CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Brooklyn—Dept. Parks, Municipal Bldg., New York City, received bids Dec. 24, furnishing all labor and material for improving East Drive, Prospect Park between main entrance of park and Ocean Ave. entrance, from Brooklyn Alcatraz Asphalt Co., 407 Hamburg Ave., $127,044, Uvalde Asphalt Paving Co., 1 Bway., New York City, $135,634; Consolidated Asphalt Co., 52-9th St., $137,849.

N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., received bids Dec. 23, regulating and grading (a) Woodside Ave., (b) 4th St., (c) 50th St., (d) 91st St., (e) 182nd Place, (f) Gunther St., from Welsh Bros., 14 Queens St., Astoria, (a) $4616, (b) $14,315, (c) $13,329, (f) $29,801; Peace Bros., 20 Main St., Flushing, (a) $6755, (c) $13,992, (d) $23,335, (e) $1990, (f) $31,747; Annarock Eng. & Constr. Co., (a) $7470, (b) $20,505, (c) $14,200, (e) $2040, (f) $32,009; A. A. Johnson, Queens Blvd., (b) $14,278; J. H. Johnson, (b) $19,645; R. A. Hess, Inc., (d) $18,336, (e) $1395, (f) $23,259; Savero & Britton, (d) $18,764, (e) $1445; C. Gallagher, (d) $18,816.

★**N. J., North Bergen**—Town Council rescinded contract let to A. Caponi, 710 Sip Ave., for improving Hamilton Ave., granite block, and relet same to R. Mazzoni, 584 9th St., West New York; 103 per cent of $61,000 (engineer's estimate).

Md., Baltimore—Bd. awards received lowest 3 bids improving Mount Vernon Place Square, involving grading, paving, cement work, etc., from Home Cement Wks., 2303 Maryland Ave., $40,250; P. G. Street, 3408 Norwood Ave., $42,069; P. T Cox Contg. Co., 405 Courtland St., $61,800.

★**W. Va., Wayne**—Comrs. Wayne Co. let contract grading 5 mi. Wayne-Huntington Rd., involving 57,380 cu.yd. excav., to Smith & Quynn, Parkersburg, $66,072; paving ¾ mi. Huntington-Kenova Rd., involving 3800 lin.ft. curbing, 876 lin.ft. guttering and 3813 sq.yd. vitr. brick, to Hunt-Forbes Constr. Co., Ashland, Ky., $18,057.

★**North Carolina**—State Highway Comn., Raleigh, let contract building 21 mi. Central Highway, sheet asphalt, Lenoir Co., to West Constr. Co., Volunteer Life Bldg., Chattanooga, Tenn., $570,000; grading and draining, to R. H. Gill Co., Binghamton, N. Y., $135,000.

Streets and Roads (Continued)

★Ga., Atlanta—Comrs. Fulton Co. will pave, relay sidewalks and water mains in Wan and Wadena Sts. About $400,000. Work will be done by day labor.

★Michigan—State Highway Dept., Lansing, let contract grading, draining and surfacing 7.411 mi. Assessment Dist. Rd. No. 265, 16 ft. wide, Ingham and Clinton Counties, involving 69,564 sq.yd. gravel, 45,157 cu.yd. earth excav. and 304 cu.yd. concrete, to Gohr Bros., 1433 Ada St., Lansing, $112,435.

★Minn., Crookston—Comrs. Polk Co. let contract building 12 mi. Federal Aid Project No. 80, County Job No. 1904, 24 ft. wide, involving 87,993 cu.yd. excav., 33,431 cu.yd. hauling, 14,229 cu.yd. gravel surfacing, culverts, etc., to B. Rude, Crookston. About $60,000.

★Minn., Dututh—City let contract improving 5,553 ft. 63rd Ave. west from Front to Roosevelt Sts., 24-32 ft. wide, involving 12,365 sq.yd. concrete paving, 4930 cu.yd earth excav., 7606 lin. ft. concrete curbing, 1028 ft. concrete heading, 200 ft. 3 in. drain tile and 1700 ft. 12 and 18 in. sewer pipe, to C. R. McLean, 307 1st Natl. Bank Bldg., $59,972.

★Minn., Foley—Benton Co. let contract clearing and grubbing 3 mi. judicial road between Benton and Mille Lac Counties, 24 ft. wide, to Freeman, Orcut & Thoas Bros., Sauk Rapids. About $15,800.

★Kan., Emporia—Lyons Co. let contract grading and paving 4.489 mi. Santa Fe Trail, Rd., Federal Aid Project No. 30, Sect. B, 18 ft. wide, 2 course concrete, also building necessary bridges and culverts on same, to McCoy & Taylor, Emporia, $253,469.

★Kan., Oswego—Labette Co. let contract grading 12.9 mi. sect. D, Ozark Trail Rd., Federal Aid Project No. 2, 17 ft. wide, to W. C. Jucksch. 516 South Main St., Sapulpa, Okla., $38,761. Work involves 2750 cu.yd. earth borrow, 44,958 cu.yd. earth and 557 cu.yd. rock excav., 424 ft. 24-30 in. concrete pipe and 204 ft. 4 in. drain tile.

★Tex., Cameron—Milam Co. let contracts grading and surfacing 9.07 mi. Highway No. 36, Branchville-Port Sullivan Rd., 14 ft. wide, involving 7 acres clearing and grubbing, 16,258 cu.yd. gravel and 18,322 cu.yd. unclassified earth excav., to A. C. Buchanan & Sons, Temple, $31,586; building rein.-con. drainage structures on same, involving 40,542 lb. reinforcing steel and 696 cu.yd concrete, to J. L. Barmore, Cameron, $17,309.

Tex., San Antonio—Bexar Co. received bids surfacing and draining 7.27 mi. Highway No. 9 from Leon Springs to Kendall Co. line, (a) gravel and bituminous topping, (b) bituminous topping, from Bexar Co., San Antonio, (a) $66,972; Ulvade Rock Asphalt Co., Swearingen Bldg., (a) $69,462, (b) $40,756; Finley Method Co., San Antonio, (b) $40, 077; Chapin-Coglazier Constr. Co., Moore Bldg., (h) $40,756.

★Okla., Hartshorne—City let contract paving 3 blocks Main St., involving 20,000 sq.yd. concrete, 200 lin.ft. concrete and 200 lin. ft. gutter, to J. W. Rooks, McAlester. About $38,800.

Ore., Portland—City Council received bids paving (a) portions of East Alder and East Morrison Sts., (b) 70th St. S. E. from 45th Ave. to north line of Foster Rd., (c) Eryant St. from Union to Vancouver Aves., (d) Blandena St. from Albina to Maryland Aves., (e) East 18th St. from south line Alberta St. to north line of Prescott St., (f) Jordan St. from Lombard to Butler Sts., (g) portions of East 33rd, Jessup, Jarrett and Simpson Sts., (h) East 79th St. from Glisan to Stark Sts., involving 16,300 sq.yd. asphaltic concrete, (1) asphaltic concrete No. 1, (2) rock macadam, (3) concrete No. 3 in roadway, (4) asphaltic concrete No. 1 in roadway, 2 in. top, (5) concrete No. 3, (6) asphaltic redress No. 1, 2 in. top, (7) asphaltic concrete No. 1, 2 in. top, (8) concrete No. 2, (9) asphaltic concrete, from Warren Constr. Co., Journal Bldg., (a1) $1.38 per sq.yd., total $6026, (c4) $1.62 per sq.yd., $18,597, (d6) $1.42 per sq.yd., $11,845, (e7) $1.41 per sq.yd., $11,008, (f7) $1.55 per sq.yd., $10,161, (g9) $1.55 per sq.yd., $23,132, (h9) $25,270; P. W. Yett, (b2) $6.70 per cu.yd., $5392; Cochran Bros., Portland, (c3) $2.25 per sq.yd., $18,402, (f5) $2.30 per sq.yd., $9777; Hahn & Rebman, Portland, (d5) $2.20 per sq.yd., $11,813, (f8) $2.25 per sq.yd. $9533; S. Simonsen, 841 East 10th St. N., (e5) $2.15 per sq.yd., $10,896.

BARGE CANAL WORK, NEW YORK, N. Y.

Bids were received by L. Nixon, supt. pub. wks., Capitol, Albany, for constructing headhouse and installing water main and electric work on Pier 93, West 53rd St., New York City, Terminal Contract No. 225, from (A) Fox-Reynolds Co., Inc., 81 East 125th St.; (B) Engineer's Estimate; (C) Associated Contractors, Inc., 17 West 42nd St. The unit bids were as follows:

	A	B	C
Maintaining traffic (lump sum)	$500.00	$500.00	$500.00
30.5 M.ft.b.m. sawed lumber	120.00	110.00	105.00
30 cu.yd. first-class concrete	20.00	15.00	17.00
17 cu.yd. second-class concrete	15.00	12.00	14.00
65 cu.yd. first-class reinforced concrete	25.00	25 00	25.00
5,600 sq.ft. granolithic surfacing	.20	.20	.20
930 lin.ft. Portland cement base	.10	.10	.12
162,000 lb. structural steel	.06½	.06½	.06½
4,700 lb. metal reinforcement	05	.05	.05
87 lin.ft. metal curb bar	.30	.30	.30
6,300 sq.ft. 4-in. terra cotta tile	.29	.25	.26
2,430 sq.ft. 6-in. terra cotta tile	.34	.30	.32
1,380 sq.ft. 8-in. terra cotta tile	40	.35	.48
45 lin.ft. chimney	4.00	4.00	4.00
1,190 sq.yd. gypsum cement plaster	1.50	1.50	2.05
53 sq.yd. Portland cement plaster	2.00	2.00	3.20
Steel stairs (lump sum)	950.00	800.00	800.00
18 windows, first floor, 3 sash	40 00	35.00	35.00
3 windows, driveway, 2 sash	18.00	15.00	15.00
36 windows, second floor, 2 sash	30 00	25 00	25.00
2 exterior doors, front	72.00	60.00	60.00
Double exterior door, rear	168.00	140 00	140.00
Single exterior door, rear	84 00	70.00	70 00
Door for coal bin	10.00	10.00	10 00
3 doors on driveway	53.00	45 00	45.00
5 interior doors with transoms, 3 ft. by 7 ft. 6 in	48 00	40 00	40.00
Interior doors without transom, 2 ft. 8 in. by 7 ft 6 in	36.00	30.00	30.00
3 interior doors without transom, 2 ft. 4 in. by 7 ft. 6 in.	30 00	25.00	25 00
3 interior doors, without transom, 3 ft. 0 in. by 7 ft. 6 in.	30.00	30.00	30.00
Pier door (lump sum)	1,100 00	1,000.00	1,000.00
390 lin.ft. mouldings	15	.15	.15
11,100 sq.ft. flashings	38	.40	.54
3,400 sq.ft. composition roofing	.13	13	.16
180 lin.ft. rain conductors	1.00	1 60	2.95
2 flagpoles	30.00	30.00	30.00
Water main (lump sum)	5,344.00	5,200.00	6,156.00
12,400 lb. metal duct and fastenings	20	.20	.20
4,700 lin.ft. No. 12 duplex rubber-insulated conductor	07	.07	.07
50 lin.ft. No. 12 single rubber-insulated conductor	04	.04	.04
260 lin.ft. No. 8 single rubber-insulated conductor	10	.10	*.10
380 lin.ft. No. 6 single rubber-insulated conductor	.15	.15	.15
900 lin.ft. No. 14 single rubber-insulated conductor	.20	.20	.20
90 lin.ft. No. 1 single rubber-insulated conductor	25	.25	.25
1,200 lin.ft. No. 00 single rubber-insulated conductor	.30	.30	.30
200 lin.ft. 250,000 C.M. single rubber-insulated conductor	40	.40	.40
280 lin.ft. No. 12 single lead-covered, rubber-insulated conductor	.10	.10	.10
100 lin.ft. No. 8 single lead-covered, rubber-insulated conductor	.20	.20	.20
1,000 lin.ft. No. 3 single lead-covered, rubber-insulated conductor	.30	.30	.30
1,700 lin.ft. No. 1 single lead-covered, rubber-insulated conductor	.37	.37	.37
300 lin.ft. No. 0 single lead-covered, rubber-insulated conductor	.40	.40	.40
1,000 lin.ft. 500,000 c.m. lead-covered, rubber-insulated conductor	1 50	1 50	1.50
40 lin. ft. No. 6 bare trolley wire conductor	10	.10	.10
950 lin ft. No. 00 bare trolley wire conductor	15	.15	15
53 lin. ft. No. 0 duplex flexible cable conductor	1 00	1.00	1.00
Switchboard (lump sum)	1,000 00	1,000.00	1,000.00
14 double-pole 60-amp. power outlets	25	.25	.25
Power distributing panel "P" (lump sum)	500.00	500.00	500.00
30 trolley brackets	12.00	12.00	12.00
8 strain insulators and supports	5 00	5 00	5 00
3 double-pole, 100-amp. enclosed cut-out switches	25 00	25.00	25.00
51 lighting fixtures "A"	15 00	15 00	15.00
8 lighting fixtures, "B"	10.00	10.00	10.00
9 lighting fixtures, "C"	3.50	3.50	3.50
26 lighting fixtures, "D"	8.00	8.00	8.00
28 lighting fixtures, "F"	10.00	10.00	10.00
9 lighting fixtures, "G"	4 50	4 50	4.50
2 lighting fixtures, "H"	75 00	75 00	75.00
26 push-button switches	1.50	1.50	1 50
21 outlet receptacles	1.50	1.50	1.50
2 lighting panel boards, type T-6	60 00	60.00	60.00
2 lighting panel boards, type T-8	70.00	70.00	70.00
Lighting panel board, type K-8 (lump sum)	60.00	60.00	60.00
2 lighting panel boards, type MT-6	70 00	70.00	70.00
Battery bench (lump sum)	100 00	100.00	100 00
4 battery-charging outlets	10.00	10.00	10.00
5 installing capstans	25.00	25.00	25.00
Installing trolley hoist (lump sum)	15.00	15.00	15 00
20-ton auto truck scales (lump sum)	1,000.00	1,000 00	1,000.00
Extended totals	$49,698	$49,753	$53,062

★California—State Highway Dept., Sacramento, will widen 5 mi. Bald Eagle Branch-Oakdale Sect. of state highway, Stanislaus Co., by building concrete shoulders 2.5 ft. on each side of 12 ft. pavement. About $20,000. Work will be done by day labor. A. B. Fletcher, state highway engr.

★Cal., Long Beach—City let contract to Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, paving Magnolia Ave. from 4th to 10th Sts., involving 112,935 sq.ft. 4 in. concrete base with 2 in. asphalt surface at $.224 per sq.ft., 82 ft. cement curb, $.50, 165 sq.ft. concrete gutter, $.25, 2377 sq.ft. cement sidewalk, $.18 and 5 concrete and corrugated iron culverts, $2150, total $27,958.

Railways

PROPOSED WORK

Texas—Central Texas Electric Ry., Amicable Bldg., Waco, plans to build interurban line from Waco to Austin, via Temple, Belton and Taylor, connecting with line from north Texas. About $4,500,000. W. G. Haag, Temple, consult. engr. and genl. supt. P. A. McCarthy & Sons, Lufkin, in charge.

Ontario—Nipissing Central Ry., North Bay, plans to extend electric line from New Liskeard to North Temisdaming. Work involves 17 mi. transmission line, 1360 wooden poles, 17 mi. 80 lb. track. About $1,000,000 S. B. Clement, North Bay, engr.

Railways (Continued)

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pennsylvania**—Exeter Coal Co., Exeter, will grade and lay track from Exeter Mountain to Lehigh Valley main track, also build 2 switches. About $12,000 Work will be done by day labor.

Excavation and Dredging

PROPOSED WORK

Fla., Tallahassee—Drainage—N B. Broward D.D. submitted report to Bd. Supervs. Broward Co. covering plan for reclamation of 526,000 acres pine and cypress land (underlaid with limestone) lying on east coast of Florida, to be reclaimed by unit plan of development. 1st unit contains 169 mi. lateral ditches involving 4,123,000 cu.yd. earth and 1,165,000 cu.yd. rock. Plans also include system of parallel lateral canals about 1 mi. apart discharging into existing canals of Everglades D.D. also building levee around outside of entire district, involving 5,277,000 cu yd. excav. and 2,177,000 cu yd. excav. for arterial system. Main canals have been constructed by State. W. C. Kayle, Ft. Lauderdale, pres. bd. supervs. I. Randolph & Co., 208 South La Salle St., Chicago, engrs.

Wis., Juneau—Excavation—City plans to excavate and lay 23,300 lin.ft. 6-20 in. tile, to drain 500 acres. About $45,000. E. Pfaff, city aud.; L. S. Keeley, Mayville, engr.

Mont., Glendive—Irrigation—Lone Horse Prairie Irrigation Dist., near here, plans to build 25 mi. canals to irrigate 18,000 acres. About $900,000. D. W. Mendenhall, agt. Dawson Co., interested. Engineer not selected.

Mont., Helena—Drainage—Langell Dist. Valley Irrigation Dist. having plans prepared by C. J. Darley, engr., for system to drain 15,000 acres of valley lands. About $180,000.

Utah, Fillmore—Drainage—Bd. Dir. Millard Co. D. D. No. 4, soon lets contract furnishing labor and materials for system to drain 5000 acres. Work involves 300,000 lin.ft. 6-18 in. drain tile. About $200,000. Caldwell & Richards, Vermont Bldg., Salt Lake City, engrs.

BIDS DESIRED

Utah, Benjamin—Drainage—Until Feb. 15, by Bd. Dir. Benjamin D. D., furnishing labor and materials for system to drain 5000 acres. About $125,000. Caldwell & Richards, Vermont Bldg., Salt Lake City, engrs. Noted July 24.

Ore., Salem—Excavation—Until Jan. 6, by Marion Co., excavating 4800 cu.yd. of rock on Pacific Highway between here and Jefferson. About $10,000. U. G. Boyer, clk.

Cal., Marysville—Canal and Flumes—Until Jan. 10, by W. Steel., secy. Cordura Irrigation Dist., Ellis Bldg., building 6 mi. canal involving 45,000 yd. excav. and embankment, also 2 semi-circular metal flumes, 76 in. diameter, on wooden structures with concrete footings, 3,100 and 1,050 ft. long.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Brooklyn—Dredging—E. Riegelmann, boro. pres., received bids Dec. 22, dredging Gowanus Canal from its head to Hamilton Ave., involving 18,000 cu.yd. scow measurement, from New Jersey Shipbuilding & Dredging Co., 50 Broad St., New York City, $26,865; Taylor & Pearson, 196 Virginia Ave., Jersey City, N. J., $54,000; W. Beard Co., 59 Pearl St., New York City, $58,500.

★**Mich., Detroit**—Excavation—Dept. Pub. Wks. let contract making test borings for proposed Belle Isle Bridge (including use of diamond drill), to Sullivan Mchy. Co., 124 South Michigan Ave., Chicago. About $15,000. Terms of contract include cost of all labor, material, repairs, travelling expenses, depreciation on equipment, etc., plus $25 per day rental

★**Minn., Ivanhoe**—Ditches—A. L. Swenson, and Lincoln Co., let contract for open work on Ditches Nos. 740, 42 and involving 7,638 cu.yd., 13,133 cu.yd. and 32,405 cu.yd excav., respectively, to Amer. Drainage Co., Thief River Falls. About $34,000.

Ariz., St. John—Excavation—State Loan Bd. Phoenix, received bids excavating Sect. A of main canal for Lyman dam project, involving 28,000 cu yd. excav., from G. C. Udall, St Johns, $.28 per cu yd., Sect. B, 22,000 cu.yd from Farr & Garcia, St. John's, $.73½, Sect. C, 10,000 cu.yd., from Udall & Morgan, St John's, $.23

Industrial Works

PROPOSED WORK

Me., Biddeford—Lockwood-Greene & Co., engrs., 60 Federal St., Boston, soon lets contract building 1 story, 160 x 200 ft., rein.-con. and steel foundry, rein.-con. flooring, concrete foundation, for Saco Lowell Shops, 77 Franklin St., Boston.

Me., Sanford—Lockwood-Greene & Co., engrs., 60 Federal St., Boston, soon receives bids building brick and rein.-con. storage plant, rein.-con. flooring, concrete foundation, for Goodell Worsted Co., here. About $50,000.

Mass., Charlestown (Boston P. O.)—L. E. Page, 505 Rutherford Ave., plans to build 1 story, brick and concrete addition, to garage rein.-con. flooring, concrete foundation, on Mill St. About $30,000. Private plans.

Mass., Everett (Boston P. O.)—MacNaughton & Robinson, archts., 101 Tremont St., Boston, soon receive bids building 1 story, 40 x 180 ft., brick and mill construction plant, concrete flooring and foundation, on Elm Way, for Cameron Appliance Co., 48 Waters Ave. About $30,000.

Mass., Holyoke — Century Machine Co soon receives bids building 2 story, 50 x 90 ft. and 1 story, 90 x 200 ft. brick and steel factory, concrete flooring and foundation, on Main St. Private plans.

Mass., Newton (Boston P. O.)—M. N. Bray Estate, Berlin St., Wollaston, having plans prepared by Kendall, Taylor & Co., archts., 93 Federal St., Boston, for 1 story, brick and steel addition to garage, here. About $25,000.

Mass., Pittsfield—General Electric Co., Morningside St., soon receives bids building 1 story, 80 x 400 ft., rein.-con. factory, rein.-con. flooring, concrete foundation. C. C. Chesney, genl. mgr. Private plans.

Mass., Roslindale (Boston P. O.)—R. McPherson, c/o J. Murray, archt., 101 Tremont St., Boston, having plans prepared for brick and concrete garage, rein.-con. flooring, concrete foundation, on Robert St.

Mass., South Boston (Boston P. O.)—Package Confectionery Co., 741 East 6th St., plans to build 3 story, 45 x 100 ft., brick and concrete plant. About $40,000. Putnam & Cox, 114 State St., Boston, archts.

R. I., Providence—J. Avilla, c/o R. I. Vehicle Co., 404 Wickendon St., having plans prepared by Marshak & Hickey, archts., 310 Strand Bldg., for 1 and 2 story, 50 x 100 ft. brick and concrete garage, concrete flooring and foundation. About $25,000.

Conn., Bridgeport—Amer. Specialty Co., 348 George St., having plans prepared for 3 story, 40 x 140 ft., brick and mill construction plant, wood flooring, concrete foundation, on Holland Ave. About $40,000. Private plans.

Conn., Bridgeport—I. Pick, c/o A. E. Fischer, archt. and engr., 373 Fulton St., Brooklyn, N. Y., having plans prepared for 1 story, brick and steel factory, rein.-con. flooring, concrete foundation, here. About $30,000.

Conn., Hartford—City plans to build garage. Architect not selected.

Conn., Hartford—F. C. Waltz, archt., 348 Trumbull St., soon receives bids building 2 story, brick and concrete garage, concrete flooring and foundation, on Albany Ave., for J. Frary, 465 Albany Ave. About $30,000.

Conn., New Haven—City plans to build ice plant. About $500,000. Architect not selected.

Conn., New London—Sheffield Dentifrice Co. having competitive plans prepared by Daly Co., Waterbury, and Flagg & Co., 27 State St., Meriden, engrs., for central heating plant

Conn., Westport—J. Levy, State St., plans to build 1 story, brick and concrete garage. About $25,000. Private plans

N. Y., Albany—White Automobile Co., East 79th St. and St. Clair Ave., Cleveland, O., having plans prepared by Watson Eng Co., Hippodrome Bldg., Cleveland, for 2 story, 75 x 200 ft., brick, concrete and steel garage and sales room, rein.-con. flooring, concrete foundation, on North Bway., here. About $100,000.

N. Y., Long Island City—J. J. Daly, c/o J. H. Baker, archt and engr., 9 Jackson Ave., having plans prepared for 1 story, 100 x 100 ft., brick and steel garage, concrete foundation, on Mott and Harris Aves. About $25,000

N. J., Bloomfield—Amer. La France Fire Engine Co., 250 West 54th St., New York City, having plans prepared by Starrett & Van Vleck, engrs. and archts., 8 West 40th St., New York City, for 1 story, 150 x 500 ft., brick and steel factory, rein.-con. flooring, concrete foundation, here. About $350,000.

N. J., Hoboken—White Metal Mfg. Co., 1006 Clinton St., having plans prepared by J. C. Schaeffler & Co., engrs. and archts., 38 West 32nd St., New York City, for 6 story, 135 x 135 ft. factory and 3 story, 20 x 80 ft. foundry, both rein.-con., rein.-con. flooring, concrete foundation.

N. J., Jersey City—City Comn. plans to build machine shop on Bright St. About $50,000. C. A. Van Kuren, city engr.

N. J., Newark—Celluloid Co., 290 Ferry St., having plans prepared by Lockwood, Greene & Co., archts., 101 Park Ave., New York City, for 1 story, rein.-con. addition to power house, rein.-con. flooring, here. About $100,000.

Pa., Palmerton—Read & Lovett Mfg. Co., Weatherly, preparing plans for 1 story, 50 x 130 ft. mill construction factory, here. About $60,000.

Pa., Scranton—City having plans prepared by F. Koester, electrical expert, 50 Bway., New York City, for 1 story, 76 x 76 ft., brick and steel lighting plant, rein.-con. flooring, rock foundation.

Pa., Wilkes-Barre—J. McNamara, Main St., Miners Mills, plans to build 3 story, 40 x 140 ft., brick and timber factory, rock foundation, on Main St., N., here. About $30,000 Architect not selected.

Del., Wilmington—Daily News Co., 511 Market St., having plans prepared by Dennison & Hirons, archts. and engrs., 477 5th Ave., New York City, for 6 story, brick, steel and stone publishing house, rein. con. flooring, brick foundation.

Del., Wilmington—White Automobile Co., East 79th St. and St. Clair Ave., Cleveland, had plans prepered by Watson Eng. Co., engrs. and archts., Hippodrome Bldg., Cleveland, for 2 story, concrete, steel and brick garage and salesroom, rein.-con. flooring, concrete foundation, on 31st St. and Market Ave., here. About $100,000.

Md., Baltimore—Champion Motors Corp. acquired 3 acre site on Eastern Ave. and Canton R.R. and plans to build fireproof plant. About $200,000. H. Crowther, pres.

Md., Locust Point (Baltimore P. O.)—Amer. Sugar Refining Co., 117 Wall St., New York City, preparing plans for plant, to include several various sized buildings, on 15 acre site, here. About $8,000,000. R. Stubbs, genl. mgr. Private plans.

S. C., Winnsboro—Winnsboro Mills Co. having plans prepared for 3 story, 120 x 720 ft., rein.-con. weave mill. Lockwood, Greene & Co., 60 Federal St., Boston, engrs.

Ala., Talladega—Chinnabee Valley Mills plan to build 1 story, 132 x 340 ft. brick and timber cotton mill; also extend Highland plant and dye house. J. E. Sinnie, Greenville, S. C., engr.

La., New Orleans—E. W. Marland, Ponca City, Okla., plans to build large oil refinery here with necessary pipe lines to North Louisiana oil fields, also build and equip line of tank steamers. About $7,000,000. Architect or engineer not selected.

O., Canton—W. I. Zink, dir. pub. serv., soon lets contract building 1 story, 30 x 96 ft., brick and concrete pump house. About $20,000. R. W. Pratt, Hippodrome Bldg., Cleveland, engr.

O., Cleveland—Acorn Refining Co., 8001 Franklin Ave., receives bids about Feb. 10, building 1 story, 30 x 50 ft., concrete, steel and brick boiler house, rein.-con. flooring, concrete foundation. About $25,000. Private plans.

O., Cleveland—Cleveland Twist Drill Co., East 49th St. and Lakeside Ave., plans to build 1 story, steel and brick factory, brick foundation, on Euclid Ave. and New York, Chicago & St. Louis R.R. About $100,000. J. D. Cox, mgr. Architect not selected.

O., Cleveland—Crucible Steel Forge Co., 6600 Grant Ave., soon lets contract building 1 story, 60 x 900 ft., steel and concrete rolling mill, heat treating plant, machine shop and warehouse, concrete foundation, on Grant Ave. About $300,000. D. W Wells, mgr. J. H. Herron, West 3rd St. and St. Clair Ave., archt. and engr.

O., Cleveland—Eaton Axle Co., 10017 Euclid Ave., having plans prepared by G. S. Rider & Co., engrs. and archts., Century Bldg., for 1 story, concrete, steel and brick factory, concrete foundation, on East 140th St. and New York Central R. R. About $100,000

Industrial Works (Continued)

O., Cleveland—Ohio Heating & Pipe Bending Co., 1063 West 11th St., plans to build I story, 80 x 100 ft. steel and brick factory, brick foundation, on West 86th St. and Denison Ave. About $50,000. B. W. Neyhard, secy. Private plans.

O., Dayton—A. Schantz Estate, 5th and Ludlow Sts., plans to build 10 story, 150 x 200 ft., rein.-con. and brick garage, rein.-con. flooring, concrete foundation, on 4th and Wilkinson Sts. About $200,000. Architect not selected.

Mich., Detroit—M. J. Schneider, 601 Dix Ave., soon lets contract building 1 story, 50 x 130 ft., rein.-con., brick and steel service station, rein.-con. flooring, concrete foundation, on Dix Ave. About $25,000. J. W. Townsend, 709 Empire Bldg., archt.

Mich., Marysville — Genl. Aluminum & Brass Co., Blvd. and St. Aubin St., Detroit, plans to build 1 and 2 story, rein.-con. brick and steel foundry, rein.-con. flooring, concrete foundation, on Cuttle Rd. About $75,000.

Mich., Muskegon Heights (Muskegon P. O.)—Shaw Electric Crane Wks., McKinney St., Muskegon, plan to build 1 and 2 story, rein.-con. brick and steel plant, rein.-con. flooring, concrete foundation, on McKinney St. and Park Ave. About $2,000,000. Manning, Maxwell & Moore, McKinney St., Muskegon, archts.

Mich., Ypsilanti — Peninsular Paper Co. had plans prepared by Smith, Hinchman & Grylls, engrs. and archts., 710 Washington Arcade, for 3 story, 66 x 99 ft., rein.-con. and brick warehouse, rein.-con. flooring, concrete foundation. About $70,000.

Ill., Chicago—Hansell-Elcock Co., Archer and Normal Aves., acquired site covering 25,000 sq.ft., on Normal Ave. and 25th St., and plans to build addition to plant.

Ill., Chicago—J. B. Rohm & Son, archts., 138 North La Salle St., preparing preliminary plans for 1 story, 100 x 140 ft., rein.-con. and brick garage, concrete foundation, on Larribee and Hobbie Sts. About $70,000. Owner's name withheld.

Ill., Quincy — Lockwood, Greene & Co., engrs., 38 South Dearborn St., soon receives bids building 3 story, 60 x 175 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, for Monroe Drug Co., 601-11 North 4th St. About $200,000.

Wis., Columbus—See "Buildings."

Wis., Durand—Wisconsin Canned Food Co., Fairchild, plans to build 2 story, 60 x 125 ft. brick, rein.-con. and steel factory, brick foundation, here. Cost between $45,000 and $50,000. Architect and engineer not selected.

Wis., Elkhorn—A. E. Carmichael, supt. constr., soon receives bids building 1 story, 60 x 135 ft. brick, rein.-con. and steel factory, brick foundation, on Main St. About $50,000. Owner's name withheld. Private plans.

Wis., Iola—J. A. Rosholt plans to build 2 story, 66 x 110 ft. brick and tile garage and sales room, rein.-con. flooring, brick foundation, on Main St. About $52,000. Architect not selected.

Wis., Jefferson—C. Baumann plans to build 4 story, 60 x 150 ft., brick and steel factory, rein.-con. flooring, brick foundation, on Main St. About $40,000. Architect not selected.

Wis., Kenosha—Bruner Dairy Co., 418 Newell St., having plans prepared by White, White & White, archts. and engrs., 414-15 Pub. Serv. Bldg., for 2 story, 100 x 110 ft. dairy, brick and concrete, rein.-con. flooring, concrete foundation, on Salem St. About $80,000.

Wis., Lancaster—Fischer & Pagenkapg plan to build 2 story, 70 x 290 ft. brick, rein.-con. and steel warehouse, brick foundation, on Main St. About $50,000. Private plans.

Wis., Merrill — Borgeson-Heib Mfg. Co. plans to build 2 story, brick, rein.-con. and steel factory, rein.-con. flooring, brick foundation, on Main St. About $25,000. Architect not selected.

Wis., Milwaukee—Herbst & Kuenzli, archts. and engrs., Caswell Blk., soon let contract building 1 story, 120 x 150 ft. brick and concrete garage and repair shop, rein.-con. flooring, concrete foundation, on North Ave., for R. & S. Realty Co., c/o architects. About $85,000.

Wis., Oconomowoc—H. Meistee plans to build 4 story, 60 x 250 ft. rein.-con. and brick factory, brick foundation. About $100,000. Architect not selected.

The Purpose of the Construction News Service of *Engineering News-Record*

is to offer you from week to week a selection of jobs as broad as the complete construction work of the country AND to keep you informed as to those to whom contracts have been awarded.

In 1919

as in other years, we endeavored to serve you to the best of our capabilities. The following tabulation gives the number of jobs, divided into the several classes of contracting, which we reported:

	Proposed Work	Bids Desired	Contracts Awarded
Waterworks	750	203	170
Sewers	651	292	323
Bridges	451	317	299
Streets and Roads	3454	1612	1519
Railways	108	10	28
Excavation and Dredging	226	152	116
Industrial Works	2640	357	2216
Buildings	4260	862	1446
Federal Government Work	578	631	491
Miscellaneous	743	353	385
	13,861	4789	6993

ENGINEERING NEWS-RECORD goes to 33,000 individuals, of whom 7000 are contractors. The editorials and technical articles are good and profitable reading, but the paper aims to do more, even, than to keep you abreast with the advancement of engineering methods; it aims to do you the very practical service of showing you where new work is imminent. If it has not been the means by which you obtained a Lucrative Contract or a Better Position, *whose fault is it?*

In 1919 we published
13,861 items of proposed work,
4,789 projects on which bids were desired,
6,993 contracts awarded.

These 25,643 items represent the *important construction work of* 1919.

We all are upon the threshold of a new year, during which *Engineering News-Record* will advise you of the Construction Work of 1920.

Industrial Works (Continued)

Wis., Racine—Horlick Malted Milk Co., Horlicksville, and L. Lehle, archt. and engr., 38 South Dearborn St., Chicago. receive bids about Jan. 3, building 4 story, 120 x 270 ft. rein.-con. and brick warehouse, rein.-con. flooring, concrete foundation. About $300,000.

Wis., Saukville—H. J. Cary forming company to build 1 and 2 story, 36 x 376 ft. brick and mill construction cannery, concrete and brick foundation. About $50,000.

Wis., Sheboygan—Sheboygan Fruit Box Co., North 15th St., plans to build 2 story, 70 x 200 ft. brick, rein.-con. and steel addition to factory and power plant, brick foundation. About $40,000. Architect not selected.

Wis., Tomah—Tomah Electric Light Co. plans to build 1 story, 60 x 135 ft. brick, rein.-con. and steel plant, brick foundation, on Main St. About $70,000. Architect and engineer not selected.

Wis., West Bend—Schmidt & Stork Wagon Co., Mill St., plans to build 1 story, 100 x 300 ft. brick and mill construction factory, concrete foundation, on Oak St. About $60,000. Architect and engineer not selected.

Ia., Cedar Rapids—C. R. Woodworking Co. receives bids about Feb. 1, building 2 story, 60 x 140 ft. brick, concrete and steel factory, concrete foundation. About $65,000. Private plans.

Ia., Davenport—M. F. Heyer, 709 Perry St., plans to build 2 story, 65 x 150 ft. factory and packing house, probably concrete and brick. Cost between $40,000 and $60,000.

Minn., Minneapolis—C. H. Johnston, archt., Capital Life Bldg., St. Paul, soon lets contract building 1 story, 100 x 150 ft., rein.-con.. steel and brick garage, on State Fair Grounds, here, for State Highway Comn., Guardian Bldg., St. Paul. About $50,000.

Minn., St. Paul—Western Chemical Co., Hutchinson, having plans prepared by Downs & Eads, archts., 803 Phoenix Bldg., for 3 story, 90 x 120 ft., rein.-con. and brick factory, on Malcolm Ave., here. About $125,000.

Kan., Neodesha—Standard Oil Co. of Kansas 5301 East 9th St., Kansas City, Mo., plans to build 1 story refinery, here, to include 42 additional stills, boiler house, etc. About $1,500,000.

Mont., Missoula—Missoula Hide & Wool Co., 511 West Main St., having plans prepared by C. N. Stehling Co., archts. and engrs., 401 4th St., Milwaukee, Wis., for 2 story, 40x200 ft. tannery, brick, concrete foundation. About $25,000.

Tex., Ft. Worth—Invincible Oil Corp., 208 West 8th St., plans to build 5000 bbl. refinery in northern section of city. About $500,000. W. R. Spann, mgr.

Tex., Houston—J. Staatler, 803 Fannin St., plans to build 2 story, 50 x 125 ft. rein.-con. and brick factory, rein.-con. flooring, clay foundation, on Milam St. About $35,000. Architect not selected.

Tex., Houston—Standard Printing Co., 1016 Capitol Ave., having plans prepared by M. J. Sullivan, archt., 612 Carter Bldg., for 2 story, 112 x 125 ft. rein.-con. and brick plant, rein.-con. flooring, clay foundation, at 1203-11 Capitol Ave.

Okla., Grandfield—Uncle Sam Oil Co., 1409 Minnesota Ave., Kansas City, Kan., plans to build 1 story refinery on G. Hancock Farm, here. About $500,000.

Okla., Lawton — Lawton Star Refinery Co. plans to build refinery on 15 acres site north of Fair Grounds. About $100,000. G. S. Hollman, mgr. Architect and engineer not selected.

Utah, Salt Lake City—Miller, Wooley & Evans, archts., McIntyre Bldg., soon let contract building 2 story, 50 x 100 ft. garage, on East 1st St., for Taylor Motor Car Co., 127 South State St. About $55,000.

Cal., Eureka—California Central Creameries, 4th and B Sts., having plans prepared by H. J. Brunnier, engr., Sharon Bldg., San Francisco, for 1 and 2 story, 110 x 240 ft., rein.-con. warehouse and office building. About $80,000.

Cal., Los Angeles—J. F. Lucey Mfg. Co., 1515 East 7th St., plans to build factory. About $250,000. Architect not selected.

Cal., Los Angeles—Los Angeles Creamery Co., 1120 Towne Ave., having plans prepared for 1 story, 50 x 250 ft., rein.-con. garage, on 12th St. and Towne Ave.

Cal., Oakland—Niedringhaus Metalware Corp., c/o Western Steel Package Co., foot of Webster St., Alameda, recently capitalized at $1,200,000, plans to build factory, here. W. Niedringhaus, St. Louis, Mo., interested.

Cal., Pittsburg—A. C. Cardinalle, et al. having plans prepared by I. Zanolini. archt., 604 Montgomery St., San Francisco, for 2 story, rein.-con. factory, concrete foundation, on 4th St.

Cal., San Francisco—W. N. Moore Dry Goods Co., 7 Front St., plans to construct 6 story wholesa building on Fremont and Mission Sts. Architect not selected.

Cal., San Francisco—Schwabacher-Frey Co., 2nd and Market Sts., plans to build 5 story, rein.-con. plant, on 3rd and Bryant Sts. Architect not selected.

Cal., Visalia—California Prune & Apricot Growers' Assn., Market and San Antonio Sts., San Jose, having plans prepared by Wallace & Bush, engrs., Bank of San Jose Bldg., San Jose, for rein.-con. and steel, packing plant, here, and in Hanford, Santa Paula, Sunnyvale and Napa, also factory and shipping department, building at main plant in San Jose. T. S. Montgomery, pres.

N. B., Moncton—Davis & Jones soon rereceive bids building 2 story, 50 x 75 ft., brick and steel packing house, rein.-con. flooring. About $30,000.

Que., Drummondsville—Gossard Corset Co., Ltd., 1006 South Michigan Ave., Chicago, plans to build 4 story, 75 x 110 ft. factory, here. About $115,000. Private plans.

Ont., Merrilton—Canadian Steel & Forging Co. plans to build steel addition to plant, also hydro-electric light and heating plants. About $200,000. J. J. Wernette, 441 Housman Bldg., Grand Rapids, Mich., engr.

Ont., Peterboro—Canadian Aladdin Co., Canadian Pacific Railway Bldg., Toronto, plans to build 3 story, 60 x 80 ft. electric light plant, here, concrete, steel and brick, rein.-con . flooring, concrete foundation. About $75,000.

Ont., Toronto—Kinnear Wholesale Grocery Co., 49 Front St., E., plans to build 4 story, 150 x 175 ft., concrete, steel and brick, warehouse, rein.-con. flooring, concrete foundation, on Dupont St. About $150,000. Architect not selected.

Ont., Windsor—Burroughs Adding Machine Co., 10 Chatham St., E., having plans prepared by A. Kahn, archt., Marquette Bldg., Detroit, Mich., for concrete and brick factory, rein.-con. flooring, concrete foundation. About $250,000.

BIDS DESIRED

Mass., Peabody—A. E. Bump, engr., 60 North Market St , Boston, receiving bids building 4 story, 70 x 180 ft. brick and concrete storehouse, rein.-con. flooring, concrete foundation, for Natl. Calf Skin Co., Webster St. About $150,000.

N. Y., Thiells—Until Jan. 15, by F. A. Vanderlip, pres. bd. mgrs., Letchworth Village, 7 Wall St., New York City, building storehouse, bakery, refrigerating plant and additional refrigeration equipment, at Letchworth Village, here. L. F. Pilcher, Capitol, Albany, state archt.; advertised in this issue.

Pa., Plymouth—Until Jan. 12, by Stave Silk Co. building 1 story, 73 x 100 ft., brick and steel mill, rein.-con. flooring, concrete foundation, on Main St About $50,000. Knapp & Bosworth, 15 South Franklin St., Wilkes-Barre, archts.

O., Cleveland—Until Jan. 5, by Acorn Refining Co., 8001 Franklin. Ave., building 4 story, 40 x 105 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation. About $60,000. Private plans.

O., Cleveland—Until Jan. 8, by Natl. Builders Co., 1187 West 11th St., building 2 story, 54 x 162 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, on Park Ave. About $60,000. D. N. Goodman, vice pres. Private plans.

Ill., Chicago—Z. E. Smith, archt., 305 East 55th St., receiving bids building 3 story, 95 x 180 ft., rein.-con. and brick laundry and boiler house, at 2135 West Madison St., for Great Western Laundry, 2319 West Madison St. About $225,000.

Wis., Horicon—Until Jan. 5, by Columbus Canning Co., building 1 story, 96 x 109 ft., brick, rein.-con. and steel factory, rein.-con. flooring, brick foundation. About $40,000. Private plans.

Wis., Kiel—Until Jan. 5, by Stoetling Bros. Co., building 3 story, 60 x 120 ft. brick, rein.-con. and steel plant, brick foundation, on Main St. About $50,000. Private plans.

Wis., Shopiere—Until Jan. 25, by Tiffany Milk Products Co., remodeling and building 3 story, 70 x 110 ft., rein.-con. and brick addition to factory, brick foundation, on Main St. About $90,000. Private plans.

Minn., Fergus Falls—Dennis & Knowles, archts., 121 Mill St., receiving bids building 2 story, 36 x 110 ft., brick and timber factory, for O. Fossen. About $75,000.

Colo., Yuma — Until Jan. 19, by Town Council, building steam electric light and power plant. About $50,000. R. D. Salisbury, 1415 East Colfax Ave., engr.

Idaho, Pocatello—Until Feb. 1, by Salt Lake Hardware Co., 257 South Main St., Salt Lake City, Utah, building 3 story, 60 x 120 ft. warehouse, here. About $60,000. J. A. Headlund, Dooley Bldg., Salt Lake City, archts.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Cambridge—Dover Stamping & Mfg. Co., 385 Putnam St., let contract building 3 story, 70 x 80 ft., brick and timber warehouse, concrete foundation, on Putnam and Pleasant Sts., to Custance Bros., 54 Bedford St., Lexington. About $30,000.

★Mass., Charlestown (Boston P. O.)—Commercial Brewing Co., Rollins St., let contract building 2 story, 70 x 182 ft., brick and concrete garage, rein.-con. flooring, concrete foundation, on Cambridge St., to J. Coblo, 32 Frankfort St., East Boston. About $100,000.

★Mass., East Boston (Boston P. O.)—Boston & Lockport Block Co., 100 Condor St., let contract building 2 story, 80 x 245 ft., brick and frame addition to factory, concrete flooring and foundation, to H. Cummings & Co., 185 Devonshire St., Boston. About $100,000.

★Mass , Medford (Boston P. O.)—Amer. Radio & Research Corp., Medford Hillside, let contract building 1 and 2 story, 140 x 200 ft., brick and rein.-con. factory, concrete flooring and foundation, to H. Cummings & Co., 185 Devonshire St., Boston. About $90,000.

★Mass., Natick—Northway Motors Corp. let contract building 2 story, 70 x 205 ft., rein -con. plant, rein.-con. flooring, concrete foundation, to J. J. Prindiville Co., South Framingham.

★Mass., South Boston (Boston P. O.)—Carter, Rice & Webster, Chauncey and Bedford Sts., let contract building 6 story, rein.-con. storehouse, rein.-con. flooring, concrete foundation, on Summer St. Extension, to Kearns Constr Co., 153 Milk St., Boston. About $450,000.

★Mass., Willimansett (Holyoke P. O.)—B. F Perkins & Son, Inc., 2 Crescent St., Holyoke, let contract building 1 story, 25 x 120 ft., concrete and steel factory, concrete flooring and foundation, here, to P. J. Kennedy & Co., Inc., 464 Maple St., Holyoke. About $25,000.

★R. I., Providence—Co-operative Club Garage, Power St., let contract building 1 story, 50 x 100 ft., brick and concrete garage, concrete flooring and foundation, on Power and Thayer Sts., to H. Cummings, 397 Massosoit Ave., East Providence. About $25,000.

★R. I., Providence—E. A. and E. G. Page, c/o Page & Page, archts., 87 Weybosset St., let contract building 1 and 2 story, 83 x 95 ft. brick and concrete garage, concrete flooring and foundation, on Fountain St., to H. Cummings, 397 Massosoit Ave , East Providence. About $25,000.

★R. I., Providence—L. Vaughn Co., 1153 Westminster St., let contract building 3 story, 35 x 100 ft., brick and mill construction factory and 1 story garage, to Williams & Marchant, Inc., 86 Weybosset St.

★R. I., South Kingstown (Kingstown P. O.)—Peace Dale Mfg. Co. will build 2 story addition to wool sorting plant and 2 story, 55 x 80 ft. brick and mill construction addition to mill. About $30,000. Work will be done by day labor.

★Conn., Bridgeport—A. F. Crotty, 385 William St., let contract building 1 story, 60 x 101 ft., brick and concrete garage concrete flooring and foundation, to J. A Welman, Fairview Ave. About $25,000.

★Conn., Hartford—Hartford Rubber Wks., Park St. and Bartholomew Ave , let contract constructing 5 story, 129 x 296 ft , rein.-con. factory, 6 story, 60 x 110 ft

Industrial Works (Continued)

brick and rein.-con. administration building and 3 story, 80 x 120 ft., employees building, concrete and steel rein.-con. flooring, concrete and brick foundation, to Stone & Webster, 147 Milk St., Boston, Mass. About $2,225,000.

★**Conn., Meriden**—Aeolian Co., Tremont St., let contract building 4 story, 50 x 104 ft. and 1½ story, 42 x 60 ft., brick and rein.-con. additions to factory, concrete flooring and foundation, to J. H. Grozier Co., 721 Main St., Hartford.

★**Conn., New Haven**—H. and T. McCluskey Sons, Inc., let contract building 1 story, 45 x 100 ft., brick and steel plant, concrete flooring and foundation, on Grand Ave., to C. W. Murdock, 185 Church St. About $25,000.

★**Conn., Seymour**—L. E. Waterman Co. let contract building 6 story, rein.-con. factory, to Turner Constr. Co., 244 Madison Ave., New York City. About $155,000.

★**Conn., Stratford** (Bridgeport P. O.)—Albert-Peck Co., Bruce Ave., will build 2 story, 67 x 180 ft., brick and mill construction factory, rock or concrete foundation. About $50,000. Work will be done by day labor under supervision of H. E. Koerner, archt., 164 State St., Bridgeport.

★**Coon., Waterbury**—Loose-Wiles Biscuit Co., 12-14 Judd St., let contract building 1 story, 42 x 145 ft., brick storage plant, concrete flooring and foundation, on 5th St., to G. A. Upham, West Main St. About $25,000.

★**N. Y., Brooklyn**—Havemeyer & Elder, 177 Montague St., will build 1 story, 100 x 150 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Nostrand and DeKalb Aves. About $60,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Interboro Iron & Steel Co., Inc., 41 Park Row, New York City, will build 1 story, 100 x 200 ft. garage on Sullivan and Bedford Aves., 1 story, 100 x 120 ft. on Malbone St. and Bedford Ave. and 1 story, 150 x 200 ft., on Sullivan and Bedford Aves. About $150,000, $65,000 and $150,000 respectively. Work will be done by day labor.

★**N. Y., Brooklyn** — (Bay Ridge) — Knickerbocker Ice Co., 1480 Bway., New York City, let contract building 1 story, 70 x 100 ft., rein.-con. and steel ice plant, rein.-con. flooring, concrete foundation, here, to F. G. Fearon, 280 Madison Ave., New York City. About $80,000.

★**N. Y., Brooklyn**—A. Milea, 139 Union St., will build 1 story, 75 x 95 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 363 Columbia St. About $25,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Perozzi Sons, Inc., 2064 Pacific St., will build 1 story, 100 x 160 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 4th Ave. and 7th St. About $50,000. Work will be done by day labor.

★**N. Y., Long Island City**—M. Brecher, 209-9th Ave., New York City, will build 1 story, 100 x 100 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Jamaica Ave. and Sherman St., here. About $25,000. Work will be done by day labor.

★**N. Y., Long Island City**—L. Gold, 44 Court St., Brooklyn, will build 3 story, 150 x 190 ft., brick and steel garage and service station, rein.-con. flooring, concrete foundation, on Ely Ave. and Jane St. About $300,000. Work will be done by day labor.

★**N. Y., Long Island City**—C. E. Shepard, 311 Hudson St., New York City, let contract building 3 story, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Van Alst Ave., here, to L. Gold, 44 Court St., Brooklyn. About $250,000.

★**N. Y., New York**—E. J. Lang, archt. and engr., 477-5th Ave., let contract to R. Schnaier, 959 Madison Ave., altering brick and steel factory, rein.-con. flooring, at 244 East 52nd St. for E. C. DeWitt, 212 5th Ave. About $50,000.

★**N. Y., New York**—Eckman Bldg. Co., 1 174 Byrant Ave., will build 1 story, 120 x 125 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 156th St. and Hegncy Ave. About $75,000. Work will be done by day labor.

★**N. Y., New York**—M. J. Gordon, 459 9th Ave., will build 2 story, 50 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 429-431 West 36th St. About $25,000. Work will be done by day labor.

★**N. Y., New York**—H. C. Griffin & Co., 143 Varick St., let contract building 3 story, 50 x 200 ft., brick and steel factory, rein.-con. flooring, concrete foundation, at 61 Vandam St., to W. Kennedy Constr. Co., 215 Montague St., Brooklyn. About $90,000.

★**N. Y., New York**—Haiss Realty Co., 141st St. and Rider Ave., will build 2 story, 50 x 100 ft., brick and steel garage, rein.-con. flooring, brick foundation, on 141st St. About $25,000. Work will be done by day labor.

★**N. Y., Syracuse**—Tompkins Bros. Co., 538 South Clinton St., let contract building 1 story, 72 x 300 ft. and 40 x 120 ft., mill construction power house and garage, on Tallman St., to Syracuse Bridge Co., University Bldg. About $80,000.

★**N. J., Hoboken**—Amer. Lead Pencil Co., Willow Ave., let contract building 1 story, 60 x 200 ft., brick and steel addition to factory, rein.con flooring, concrete foundation, to Austin Co., 217 Bway., New York City. About $50,000.

★**Pa., Easton**—Individual Drinking Cup Co., 220 West 19th St., New York City, let contract building 3 story, 80 x 300 ft., rein.-con. factory, here, to White Constr. Co., 95 Madison Ave., New York City. About $300,000.

★**Pa., Phila.**—Enterprise Mfg. Co., 3rd and Dauphin Sts., let contract building 3 story, 100 x 100 ft., concrete and steel factory, to W. Steele & Sons Co., 16th and Arch Sts.

★**Pa., Phila.**—A. Kerr Bros. & Co., Delaware and Green Sts., let contract building 2 story, 62 x 125 ft., brick and stone, on Race and 22nd Sts., to W. Cunningham, 2216 Chestnut St. About $25,000.

★**Pa., Wilkes-Barre**—Kitsee Battery Co., 62 North Main St., let contract building 3 story, 70 x 90 ft., brick and steel factory, rock foundation, to J. A. Schmitt, Bennett Bldg. About $106,000.

★**Md., Baltimore**—M. J. Reilly, agt. for Fidelity Storage Co., 812 Equitable Bldg., let contract building 6 story, 56 x 125 ft., rein.-con., brick and stone warehouse, concrete foundation, at 2104-08 Maryland Ave., to West Constr. Co., 907 Amer. Bldg. About $200,000.

★**Md., Curtis Bay** (Baltimore P. O.)—Armour Fertilizer Co., 1501 Munsey Bldg., Baltimore, let contract building fertilizer plant, fireproof construction, concrete foundation, on water front here, to Westinghouse Church, Kerr & Co., Inc., 37 Wall St., New York City. About $2,000,000.

★**Md., Curtis Bay** (Baltimore P. O.)—Curtis Bay Copper & Iron Wks., Beech St., will build 1 story, 75 x 230 ft., fireproof addition to plant, rein.-con. flooring, concrete foundation. About $100,000. Work will be done by day labor.

★**La., Shreveport**—Oil Storage Supply Co., let contract constructing 110 x 150 ft. concrete and brick storage building, here, to W. C. Hedrick Constr. Co., 613 Carter Bldg., Houston, Tex. About $175,000.

★**Tenn., Chattanooga**—Sommerville Iron Wks. let contract building 1 story, brick and steel foundry and machine shop, to Austin Co., 16112 Euclid Ave., Cleveland. About 100,000.

★**O., Cleveland** — Federal Packing Co., 3207 West 65th St., let contract building 4 story, 40 x 160 ft., concrete, steel and brick storage plant, concrete foundation, on East 4th St. and Bolivar Rd., to J. H. Dease, 526 Erie Bldg. About $50,000.

★**O., Cincinnati**—G. C. Burroughs, archt., Commercial Tribune Bldg., let contract to R. Huerman & Sons, Cincinnati, for 5 story, 60 x 80 ft., concrete factory, for D. Gruen Watch Co., Time Hill. About $80,000.

★**O., Cincinnati**—Kruse Bahlman Co., Pioneer St., let contract building 8 story warehouse, on Pioneer St., to Frank Hill Smith Co., Inc., 1035 Reibold Bldg., Dayton. About $325,000.

★**O., Cleveland**—Cleveland Folding Machine Co., 5200 Euclid Ave., let contract building 1 story, 80 x 129 ft., concrete, steel and brick factory, concrete foundation, at 1830 East 63rd St., to Watson Eng. Co., Hippodrome Bldg. About $40,000.

★**O., Cleveland**—Dill Mfg. Co., 686 East 82nd St., let contract building 1 story, 73 x 245 ft., concrete and brick factory, concrete foundation, to Bolton-Pratt Co., Columbia Bldg. About $60,000.

★**O., Cleveland**—Enamel Products Co., Eddy Rd. and Taft Ave., let contract building 1 story, 60 x 190 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, to Crowell, Lundoff Little Co., 5716 Euclid Ave. About $75,000.

★**O., Cleveland**—Lockwood, Greene & Co., archts. and engrs., Bangor Bldg., let contract to Stone & Webster Co., 516 Stambaugh Bldg., Youngstown, constructing 6 story, 80 x 240 ft. warehouse and boiler room, 2 story, 60 x 160 ft. factory addition, and 2 story, 150 x 180 ft. recreation building, all brick, concrete and steel, rein.-con. flooring, concrete foundation, on Haight Ave., for Joseph & Feiss Co., 632 St. Clair Ave. About $750,000.

★**O., Cleveland**—Ohio Body & Blower Co., 9301 Detroit Ave., let contract building 1 story, 100 x 300 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, to S. W. Emerson Co., 1900 Euclid Bldg. About $100,000.

★**O., Cleveland**—Wheeler Radiator Co., 1637 Collamer Ave., let contract building 1 story, 40 x 144 ft., steel and brick factory, on Collamer Ave., to Du Perow Constr. Co., East 22nd St. and Prospect Ave. About $25,000.

★**O., Dayton**—Wuichet Fertilizer Co., Irwin St., let contract constructing factory, including 2 story, 60 x 80 ft. and 60 x 110 ft. buildings, both rein.-con., rein.-con flooring, concrete foundation, to J. Lowes, Schwind Bldg. About $80,000.

★**Ind., Indianapolis**—F. J. Groth, Toledo, O., c/o McMeans & Tripp, archts., Majestic Bldg., let contract building 2 story, concrete and steel factory on St. Paul St. and Cleveland, Cincinnati, Chicago & St. Louis Ry., to Schlegel & Roehm, Lombard Bldg. About $28,000. Owner will furnish material. Total cost $90,000.

★**Mich., Detroit**—Buhl Sons Co., 103 West Woodbridge St., let contract building 3 and 5 story, 275 x 379 ft., rein.-con., brick and steel warehouse, rein.-con. flooring, concrete foundation, on Adair St. and Detroit River, to Foundation Co., South Military St., Port Huron.

★**Mich., Detroit**—Detroit Steel Products Co., West Grand Blvd., let structural steel contract for 1 story, 106 x 313 ft., steel shed and spring shop, concrete and steel, concrete and wood flooring, concrete foundation, on West Grand Blvd., to Russell Wheel & Fdry. Co., Chene St. and Belt Line R.R.; masonry, to G. D. Butt, 632 Farwell Bldg. About $80,000.

★**Mich., Detroit**—Fisher Body Corp., Oakland and Piquette Aves., let contract building 1 story, 310 x 482 ft. dry kilns and storage plant, rein.-con. and steel, rein.-con. flooring, concrete foundation, on Fort St., to H. G. Christman Co., Stevens Bldg.

★**Mich., Highland Park** (Detroit P. O.)—Maxwell Motor Co., Oakland Ave., let contract building 1 story, 315 x 557 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Oakland Ave., to United States Structural Co., 520 Book Bldg., Detroit. About $450,000.

★**Ill., Chicago**—Continental Can Co., 111 Washington St., let contract building 1 story, 90 x 170 ft., rein.-con factory, rein.-con. flooring, concrete foundation, on Ashland Ave. near 38th St., to E. W. Sproul Co., 2001 West 39th St. About $175,000.

★**Ill., Chicago**—Packard Auto Open Body Co., c/o S. S. Joy, archt., 2001 West 39th St., let contract building 3 story, 120 x 400 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on East 104th St. and Erickson Ave., to E. W. Sproul Co., 2001 West 39th St. About $1,000,000.

★**Ill., Chicago**—Stromberg Motor Devices Co., 68 East 25th St., let contract building 6 story, 75 x 130 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, on Wabash Ave. near 25th St., to Wells Bros. Constr. Co., 53 West Jackson St. About $300,000.

★**Ill., Chicago**—E. H. Wachs Co., 1525 Dayton St., let contract building 2 story, 100 x 125 ft., rein.-con. and brick addition to factory, rein.-con. flooring, concrete foundation, at 1531 Dayton St., to A. T. Kramer, 4447 West Madison St. About $55,000.

★**Ill., Harvey**—Buda Co. let contract building 2 story, 140 x 160 ft., brick and timber foundry, concrete foundation, on Vincennes Ave. and 151st St., to A. Lund Constr. Co., 19 South La Salle St., Chicago. About $75,000.

★**Ill., Moline**—Crandall Transfer & Warehouse Co., 410 16th St., let contract building 6 story, 82 x 116 ft., rein.-con. and steel warehouse, rein.-con. flooring, concrete foundation, on 12th St. and 4th Ave., to Bergstedt Constr. Co., Moline. About $150,000. Noted Sept. 4.

Industrial Works (Continued)

★**Ill., Rockford** — Rockford Paper Box Board Co., Catherine St., let contract building 3 story, 100 x 100 ft., brick and timber factory, concrete foundation, to Holm-Page Co., 1604 4th Ave. About $85,000.

★**Wis., Cleveland**—Cleveland Welding & Mfg. Co. will build 2 story, 60 x 120 ft., brick, rein.-con. and steel garage and foundry, rein.-con. flooring, brick foundation, on Main St. Work will be done by day labor.

★**Wis., Two Rivers**—Van Lente Motor Sales Co. let contract building 2 story, 60 x 120 ft., rein.-con. and brick garage, rein.-con. flooring, brick foundation, on Washington St., to A. Krause, Two Rivers, $51,790.

★**Wis., West Allis** (Milwaukee, P. O.)—Avery Co., 57th Ave. and Mitchell St., let contract building 1 story, 42 x 200 ft. brick and steel addition to machine shop, concrete foundation, to R. L. Reisinger Co., 425 East Water St., Milwaukee. About $50,000.

★**Minn., Hastings**—State Bd. Control, Capitol St., St. Paul, let general contract building 1 story, 45 x 140 ft., rein.-con. and brick power house, including tunnel, at State Hospital for Insane, here, to C. Ash & Son, 202 Maria Ave., St. Paul, $58,269.

★**Minn., Minneapolis**—Harris Realty Co., New England Bldg., let contract building 2 story, 100 x 120 ft., rein.-con. and brick garage, on Lincoln and Aldrich Aves., S., to F. N. Hegg, 2942 Nicollet Ave. About $52,000, cost plus percentage basis.

★**Mont., Billings**—Armour & Co., 2723 Minnesota Ave., let contract building 2 story, 70 x 80 ft. warehouse and office, on Bway. and Minnesota Ave., to Gagnon & Co., 201 North 21st St. About $90,000.

★**Tex., Hooston**—Texas Creamery Co., 312 Washington Ave., let contract building 3 story, 109 x 125 ft., rein.-con. and brick creamery, rein.-con. flooring, clay foundation, on Texas Ave. and St. Emanuel St., to W. C. Hedrick Constr. Co., 613 Carter Bldg. About $225,000.

★**Utah, Salt Lake City**—J. Headlund, archt. and engr., Dooley Bldg., let contract to Lynch Cannon Co., Dooley Bldg., constructing 5 story, 75 x 120 ft. mill construction factory, on 2nd St. W, for Sweet Candy Co., 224 South 1st St. W. About $150,000; cost plus percentage basis.

★**Cal., Richgrove**—Southern California Edison Co., Edison Bldg., Los Angeles, let contract building 3 story, 67 x 130 ft., rein.-con. sub-station, to Macdonald & Driver, 608 Hibernian Bldg., Los Angeles. About $111,000.

★**Cal., San Jose**—Security Warehouse & Distributing Co. let contract building rein.-con. warehouse and cold storage plant, to F. L. Hoyt, 566 North 16th St. About $500,000.

★**Que., St. Hyacinthe**—Manhasset Mfg. Co., 1406 Turks Head Bldg., Providence, R. I., let contract building plant here, to Raymond Concrete Pile Co., Ltd., New Birks Bldg., Montreal. About $150,000.

★**Ont., Brampton**—Universal Batteries, Ltd., let contract building 3 story, 30 x 60 ft. concrete, steel and brick factory, concrete foundation, to Blatz Bros., 187 Charlton St., E., Hamilton. About $25,000.

★**Ont., Toronto**—Murray Printing Co., 9 Jordan St., let contract building 1 story, 140 x 180 ft. concrete, steel and brick shop, rein.-con. flooring, concrete foundation, to L. E. Dowling, 167 Yonge St. About $135,000.

★**Ont., Toronto**—L. Solman, Royal Alexander Theatre, let contract building 5 story, 50 x 100 ft. concrete, brick and steel warehouse, rein.-con. flooring, concrete foundation, on King and Simcoe Sts., to R. H. Harmon & Son, 248 Dupont St. About $75,000. Noted Sept. 11.

Buildings

PROPOSED WORK

Mass., Boston — Club—Amer. Legion, Yankee Division, having plans prepared by J. H. Ritchie, archt., 8 Beacon St., for 4 story, brick, concrete and steel, on St. Botolph St. About $200,000. C. H. Cole, chn.

Mass., Boston—School Trustees Tufts College, Medford, plan to build medical school on Huntington Ave., here. Architect not selected.

Mass., Brookline — Bank — Boulevard Trust Co., Harvard and Beacon Sts., having plans prepared by Blackall, Clapp & Whittemore, archts., 20 Beacon St., Boston, for altering present building and constructing 1 story, 20 x 70 ft., frame and concrete addition.

Mass., East Deerfield—Boston & Maine R. R., North Sta., Boston, soon receives bids constructing 3½ story, 70 x 120 ft., brick and concrete Y. M. C. A. building, wood flooring, concrete foundation, here. About $80,000. H. B. Fletcher, c/o owner, engr.

Mass., Greenfield—High School—Town plans to build 3 story. About $400,000 H. Richardson, 23 Pleasant St., chn. Architect not selected.

Mass., Malden (Boston P. O.)—Bank—Malden Savings Bank, Main St., having plans prepared by Monks & Johnson, archts., 99 Chauncey St., Boston, for 1 story, 45 x 100 ft., brick and mill construction, tile flooring, concrete foundation.

Mass., Medford (Boston P. O.)—Laboratory—Trustees Tufts College plans to build brick and steel chemical laboratory, on campus. Architect not selected.

Mass., Palmer—High School — Town plans to build 3 story high school. About $250,000. Address D. F. Dillon, 431 Main St. Architect not selected.

Mass., Ware—Hospital—Ware Visiting Nurse & Hospital Assn., 98 South St., plans to convert Gilbert Home on South St. into hospital addition. About $50,000. Architect not selected.

Conn., Ansonia—Theatre and Office—I. J. Hoffman, Main St., plans to build 3 story, 80 x 150 ft., brick and steel, on Main and Water Sts. Private plans.

Conn., Hartfrod—Club—Hartford Automobile Club Garage Co., c/o C. F. Luce, archt., 36 Pearl St., plans to build 7 story, 150 x 150 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation, on Hicks and South Ann Sts., to include showrooms, offices, storage, etc. About $400,000.

Conn., Hartford—Sales—L. White, 424 Edgewood St., plans to build 4 story, 70 x 160 ft., brick and rein.-con., on Winthrop St. About $125,000. Berenson & Moses, 1026 Main St., archts.

Conn., Meriden—Church—Our Lady of Mt. Carmel Society, 116 Springdale Ave., plans to build brick church on Goodwill Ave. About, $50,000. Architect not selected.

Conn.,Torrington—School—Town having plans prepared by Sunderland & Watson, archts., 248 Main St., Danbury, for 3 story, 42 x 125 ft., brick trade school, on South Main St.

Conn., Waterbury — Hospital — Cross & Cross, archts., 681 5th Ave., New York City, rejected bids received Dec. 15, building 2 story, brick and steel, brick foundation, for State. About $200,000. Work will be re-advertised.

Conn., Waterbury—Theatre—S. Z. Poli, 24 Church St., New Haven, and T. W. Lamb, archt., 644 8th Ave., New York City, soon receive bids building 120 x 190 ft., brick, concrete and steel, concrete flooring and foundation, on East Main St., here. About $500,000. Noted Feb. 20.

Conn., West Haven (New Haven P. O.)—High School—West Haven School Dist., Orange Twp., 151 Orange St., New Haven, having plans prepared by R. W. Foote, archt., 185 Church St., New Haven, for 3 story, brick, concrete and steel. About $350,000. C. E. Thompson, chn.

N. Y., Albany—Sales—See "Industrial Works."

N. Y., Brooklyn — Theatre — W. Fox Amusement Co., 126 West 46th St., New York City, plans to build 100 x 200 ft., brick and steel, brick foundation, on Flatbush and Tilden Aves., here. About $500,000. T. W. Lamb, 644 8th Ave., New York City, archt.

N. Y., Brooklyn—Theatre—T W. Lamb, archt., 644 8th Ave., New York City, receives bids about about Jan. 15, building brick and steel, brick foundation, on Bway. and Gates Ave., here, for Loew's Enterprises, 1492 Bway., New York City. About $300,000. Noted Sept. 11.

N. Y., Elmsford — Club — Knollwood Country Club having plans prepared by C. I. Berg, archt. and engr., 331 Madison Ave., New York City, for altering 2 story, 100 x 100 ft., brick, steel and stone. About $100,000. M. Stewart, secy.

N. Y., New York—Club—Continental Athletic Club, c/o R. C. Lafferty, archt. and engr., 317-5th Ave., having plans prepared for 14 story, 100 x 200 ft. brick and steel, brick foundation, on Central Park West from 61st to 62nd Sts. About $1,500,000.

N. Y., New York—Hotel—One Hundred Forty-five West 55th St., Inc., 1 West 67th St., having plans prepared by J. E. Eaton, archt. and engr., 19 West 44th St., for 15 story, 80 x 100 ft., brick, steel and stone, brick foundation, at 139-145 West 55th St. About $750,000.

N. Y., New York—Office—Mfrs. Cloak & Suit Trade, 136 Madison Ave., having plans prepared by W. M. Mason, archt. and engr., 425 7th Ave., for 16 story, brick, steel and stone, brick foundation, on 36th and 38th Sts., 7th and 8th Aves. About $8,000,000. M. Kanner, pres.

N. Y., New York—School—Bd. Educ. soon lets contract building 4 story, 92 x 194 ft., brick and steel, brick foundation, on Bathgate Ave. and 182nd St. About $420,000. C. B. J. Snyder, Municipal Bldg., archt. and engr. Noted Sept. 18.

N. Y., New York—Synagogue—Congregation B'nai Israel of Washington Heights, 535 West 148th St., having plans prepared by E. Roth, archt. and engr., 119 West 40th St., for 1 story, 75 x 100 ft., brick and steel, brick foundation, at 617-621 West 149th St. About $200,000.

N. Y., New York—Theatre—W. Fox Amusement Co., 126 West 46th St., having plans prepared by T. W. Lamb, archt., 644 8th Ave., for brick and steel, brick foundation, on 14th St. and Irving Pl. About $300,000.

N. Y., Utica—Hospital, etc.—State Hospital Comn., Capitol, Albany, soon receives bids constructing 2 story, 22 x 299 ft., tuberculosis hospital, with 36 x 59 ft. wing, brick, concrete foundation cost $100,000; 3 story, 47 x 60 ft., residence for superintendent, brick, concrete foundation, $50,000; also 2 story 43 x 60 ft., brick mortuary building, concrete foundation, $50,000. L F. Pilcher, state archt.

N. Y., White Plains — Theatre — W. S Bessell, archt., 56 West 45th St., New York City, preparing plans for 1 story, brick and steel, brick foundation. About $100.000. Owners name withheld.

N. J., Asbury Park—School—Bd. Educ. Neptune Twp. plans election soon to vote on $250,000 bonds to build school.

N. J., Jersey City—Market—City Comn. issued $75,000 bonds to build market on Maxwell St. between Jersey Ave. and Coles St.

N. J., Madison—High School—Bd. Educ. plans to build high school. About $50,000.

N. J., Matawan—High School—Bd. Educ. having plans prepared by J. N. Pierson & Son, archts., 175 Smith St., Perth Amboy, for 8 room high school, to include auditorium, gymnasium and library. About $90,-000.

N. J., Plainfield—Jallade & Lindsey, archts., 37 Liberty St., New York City, soon let contract constructing 3 story, brick and steel building here, for Y. M. C. A., 2 West 45th St., New York City. About $200,-000.

N. J., Seaside Park—Casino—A. H. Moses, engr., 136 South 4th St., Phila., preparing plans for casino, swimming pool and dock here. Owners name withheld.

N. J., Wharton—High School—City voted $150,000 bonds to build 8 room high school.

Pa., Forty Fort (Kingston P. O.)—School—Bd. Educ. plans to build 3 story, 80 x 80 ft., brick and steel, rock foundation, on Dana St. About $200,000. J. S. Pettibone, South Franklin St., Wilkes-Barre archt.

Pa., Hazelton—Church—St. Gabriel's congregation, 122 South Wyoming St., plans to build church on Vine St. About $90,000. A. Fagan, pastor.

Pa., Lewisburg — Orphanage — United Evangelical Churches plan to build 2 story, 80 x 150 ft., brick and steel, rein.-con. flooring, rock foundation. About $150,000. Architect not selected.

Pa., Miners' Mills (Wilkes-Barre P. O.)—Church—Blessed Sacrament congregation plans to build 2 story, 40 x 100 ft., brick and steel, rock foundation, on Main St. About $100,000. A. Lynch, pastor. Architect not selected.

Pa., Phila.—Dormitory—Stewardson & Page, archts., 316 Walnut St., soon let contract building 4 story, 30 x 40 ft., brick and stone, on 35th and Woodland Sts., for University of Pennsylvania. About $50,000.

Buildings (Continued)

Pa., Phila.—Office—Rouse & Goldsbone, engrs. and archts., 512 5th Ave., New York City, receive bids about Jan. 10, altering brick and steel office building on Broad and Cherry Sts., for Sweeten Auto Co., Parkway Bldg. About $500,000.

Pa., Phila.—Salesroom and Office—McIlvain & Roberts, archts., 112 South 16th St., soon let contract building 8 story, 85 x 120 ft., rein.-con., brick and stone, on Broad and Vine Sts., for Bigelow-Willeys Co., 304 North Broad St. Cost to exceed $100,000.

Pa., Plymouth—School—St. Stephens Slovak Church, Girard Ave., plans to build 2 story, 80 x 100 ft., rein.-con., brick and steel, rock foundation, on Girard Ave. About $65,000. Architect not selected.

Del., Wilmington—Salesroom—See "Industrial Works."

W. Va., Huntington—Business—A. and S. J. Hyman, Day and Night Bank Bldg., plan to build 3 story, 90 x 100 ft., brick. About $75,000. Architect not selected.

N. C., Durham — Hospital — Trustees Watts Hospital having plans prepared by Kendall Taylor & Co., archts., 93 Federal St., Boston, for 2 story, on Broad St. Cost between $125,000 and $150,000.

N. C., Kinston—Theatre—H. Stalling plans to build theatre. About $75,000. Architect not selected.

N. C., Statesville — Theatre — R. A. Copper, et al. plan to build 50 x 100 ft. theatre. About $75,000. Architect not selected.

N. C., Wilmington—Hotel—M. M. Jacoby, et al. plan to build hotel. About $500,000. Architect not selected.

O., Cincinnati—Home—Christ Hospital Co,. Auburn Ave., having plans prepared by Tietig & Lee., archts., 4th Natl. Bank Bldg,. for 4 story, 45 x 125 ft. home for nurses. About $250,000.

O., Cincinnati—Lodge—Pythian Assn., c/o Gibson Hotel, Walnut St., plans to build lodge on 9th and Vine Sts. About $150,000. Architect not selected.

O., Cincinnati—Temple—Cincinnati Masonic Temple Co., c/o Gibson Hotel, Walnut St., plans to build 200 x 200 ft., at 5 Sycamore St. About $2,000;000.

O., Cleveland—Commercial—**J. W. Holcomb**, 916 Citizens' Bldg., plans to build 4 story, concrete, steel and brick, **rein.-con.** flooring, concrete foundation, at 3812 Euclid Ave. About $100,000. Architect not selected.

O., Cleveland—Commercial—E. Zweig, 1775 East 65th St., plans to rebuild 4 story, 60 x 140 ft., steel and brick, on St. Clair Ave. and West 6th St. About $50,000. Architect not selected.

O., Cleveland—High School—Bd. Educ. having plans prepared by W. R. McCormack, archt., East 6th St. and Rockwell Ave., for 2 story, 128 x 254 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 118th St. and Hopkins Ave. About $500,000. F. C. Hohan, East 6th St. and Rockwell Ave., dir. schools.

O., Cleveland—Synagogue—Anshe Beth Texilo congregation plans to build 1 story, concrete, steel, brick and stone, rein.-con. flooring, concrete foundation, on East 105th St. and Drexel Ave. About $750,000. L. Cahn, 10615 Grantwood Ave., treas. Architect not selected.

O., Cleveland—Synagogue—B'nai Jeshurun congregation plans to build 1 story, concrete, steel and brick, concrete foundation, on East 107th St. About $200,000. S. Goldman, East 55th St. and Scovill Ave., rabbi Architect and engineer not selected.

O., Columbus—Church—King Ave. Methodist Episcopal Church, King and Niel Aves., having plans prepared by Stribling & Lum, archts., 85 North High St., for 140 x 140 ft., brick and stone, on King Ave. About $200,000.

O., Linden (Columbus P. O.)—School—Bd., Educ. of Columbus receives bids about Jan. 15, building 2 story concrete and brick, here. About $165,000. D. Reibel & Sons, New 1st Natl. Bank Bldg., Columbus, archts.

O., Mansfield—Bank and Office—Citizens' Natl. Bank, 34 North Main St., having plans prepared by E. B. Caldwell, Jr., archt., 886 Main St., Bridgeport, Conn., for concrete, steel and brick. About $400,000.

O., Mount Vernon—Office—C. G. Cooper Co., Main St., having plans prepared by S. P. Hall, archt., 67 East Long St., Columbus, for 3 story, 40 x 50 ft., concrete, steel and brick addition. About $50,000.

O., Youngstown—Hotel—Ohio Hotel Operating Co., Boardman and Hazel Sts., having plans prepared by Clinton & Russell, archts. and engrs., 32 Nassau St., New York City, for brick and steel addition. About $350,000.

Ind., Ft. Wayne—Hotel—A Macbeth, 115 West Lewis St., having preliminary plans prepared by Serv Constr. Co., archts., 6110 Euclid Ave., Cleveland, O., for 6 story, 86 x 136 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $350,000.

Mich., Detroit—Church—St. Joseph's Episcopal Church, Woodward and Holbrook Aves., soon lets contract building 1 story, 32 x 128 ft., brick, stone and steel, concrete foundation, on Woodward Ave. J. W. Corbusier, Lennox Bldg., Cleveland, O., archt. About $75,000.

Mich., Detroit—Library—Detroit Library Comn., Pub. Library Bldg., plans to build 2 story, on Mack and Montclair Aves., also branches on West Fort St. near Waterman Ave. and on Davison Blvd. and Lumpkin Ave., brick, steel and concrete, concrete foundation. About $200,000 each. Architect not selected.

Mich., St. Clair—High School—Bd. Educ. having plans prepared by Perkins, Fellows & Hamilton, archts., 814 Tower Court, Chicago, Ill., for 2 story, rein.-con., brick and steel, rein.-con. and wood flooring, concrete foundation, on Main St. About $250,000

Ill., Chicago—High School—Bd. Educ. having plans prepared by A. F. Hussander, archt. and J. Howatt, engr. 7 South Dearborn St., for 3 story, 150 x 250 ft., rein.-con., brick, terra cotta and stone addition, rein.-con. flooring, concrete foundation, on Van Buren St. and Oakley Blvd. About $3,000,000.

Ill., Chicago—School and Church—E. Brielmaier & Sons Co., archts. and engrs., University Bldg., Milwaukee, Wis., soon let contract building 2 story, **67 x 165 ft.**, brick and concrete, rein.-con. flooring, concrete foundation, for Immaculate Conception Church, 44th and Garfield Sts. About $60,000.

Ill., Moline—Bank—Cervin & Horn, archts. and engrs., Safety Bldg., Rock Island, soon receive bids building 8 story, 54 x 85 ft., rein.-con. and brick, rein.con. flooring, rock and concrete foundation, for Moline Trust & Savings Bank, 15th St. and 5th Ave. About $250,000.

Ill., Oak Park—Church and Parsonage—First Baptist Church plans to build fireproof church and parsonage, on North Oak Park Ave. and Ontario St. About $250,000. N. M. Dunning, 310 South Wabash Ave., Chicago, archt.

Ill., Oak Park—High School—Bd. Educ. having revised plans prepared by Holmes & Flinn, archts., 8 South Dearborn St., Chicago, for 4 story, 144 x 157 ft., rein.-con., brick, terra cotta and stone addition, rein.-con. flooring, concrete foundation, on Ontario St. and East Ave. About $200,000.

Wis., Columbus—Office, etc.—Standard Oil Co., 105 Wells St., Milwaukee, plans to build 1 story, 45 x 158 ft., rein.-con. and brick office and brick and stucco filling station, brick foundation, on Main St. About $50,000. Architect not selected.

Wis., Hartford—Hotel—J. J. Gonring plans to build 3 story, 50 x 150 ft. brick, rein.-con. and steel, brick foundation. About $55,000. Architect not selected.

Wis., Iola—Sales Room—See "Industrial Works."

Wis., Kenosha—Bank and Office—Merchants & Savings Bank, 252 Main St., plans to build 5 or 6 story, 100 x 120 ft. concrete and brick, rein.-con. flooring, concrete foundation. About $175,000. Architect and engineer not selected.

Wis., Lakemills — Community — Village plans to build 4 story, 60 x 150 ft. rein.-con. and brick, brick foundation, on Lake St. About $100,000. V. Ravenhill, clk. Architect not selected.

Wis., Manitowoc—Club—Manitowoc Co. Knights of Columbus, 8th and Commercial Sts., having plans prepared by Juul & Smith, archts., Imig Bldg., Sheboygan, for 3 story, 60 x 180 ft. rein.-con. and brick, brick foundation, on 12th St. About $50,000.

Wis., Manitowoc — Theatre — Mikadow Amusement Co., 1110 Washington St., plans to remodel and build 2 story, 70 x 180 ft. brick, rein.-con. and steel addition, brick foundation, on 8th and Chicago Sts. About $60,000. J. Kadow, mgr. Architect not selected.

Wis., St. Croix—Training School—Polk Co. Teachers' Training School Assn. having plans prepared by W. L. Alban, archt., 347 Endicott Bldg., St. Paul, Minn., for 2 story, 57 x 99 ft. brick and concrete. About $55,000. H. A. Aune, Baldwin, co. supt.

Wis., Sheboygan — Theatre — Mikadow Amusement Co., 1110 Washington St., Manitowoc, plans to build 60 x 250 ft. brick, rein.-con. and steel, brick foundation, on North 8th St., here. About $100,000 J. Kadow, mgr. Architect not selected.

Ia., Iowa Falls—Memorial—Amer. Legion & Red Cross plans to build 2 story, brick, concrete and steel, concrete foundation. About $65,000. W. L. Pedicord, Iowa Falls, archt.

Ia., Whitmore—Church—Roman Catholic Church plans to build 3 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. Damon & O'Meara, Ft. Dodge, archt.

Minn., Grey Eagle—High School—Bd. Educ. having plans prepared by Stebbins & Haxby, archts. 445 Auditorium Bldg., Minneapolis, and Rose & Harris, engrs., 471 Auditorium Bldg., Minneapolis, for 2 story, 68 x 120 ft., rein.-con., brick and stone. About $100,000.

Minn., Lake Crystal—High School—Independent School Dist. No. 19 having plans prepared by Stebbins & Haxby, archts., 445 Auditorium Bldg., Minneapolis and Rose & Harris, engrs., 471 Auditorium Bldg., Minneapolis, for 2 story, 90 x 140 ft. rein.-con. and brick. About $275,000. G. Lamoreaux, clk.

Minn., Luverne—High School—Independent School Dist. No. 2 having plans prepared by Tyrie & Chapman, archts., 320 Auditorium Bldg., Minneapolis, for 2 story, 68 x 120 ft., brick and stone. About $300,000. H. W. Bertram, clk.

Minn., Pipestone—Hospital—O. Askton having plans prepared by P. O. Moe, archt., 616 New York Life Bldg., Minneapolis, for 2 story, rein.-con. and brick. About $50,000.

Minn., St. Paul—High School—Bd. Educ. having plans prepared by C. A. Hausler, archt., City Hall, for 3 story, 76 x 117 ft., rein.-con. and brick, on Carroll St. About $150,000.

Minn., St. Paul—School—Bd. Educ. having plans prepared by C. A. Hausler, archt., City Hall, for 2 story, 60 x 128 ft., rein.-con. and brick addition, on Randolph Heights. About $70,000.

Minn., St. Paul—School—Bd. Educ. having plans prepared by C. A. Hausler, archt., City Hall, for 3 story, 171 x 241 ft., rein.-con. and brick, in western section of city. About $400,000.

Minn., St. Paul—Theatre—Heilhron & Weiskopf, 866 Goodrich Ave., soon receive bids building 2 story, 72 x 150 ft., rein.-con., brick and stone, on Grand Ave. About $60,000. G. A. Blewett, 642 Endicott Bldg., archt.

Kan., Hoisington — Hotel — Hoisington Hotel Co. having plans prepared by L. B. Smith, archt., Kansas City, for 2 story, brick, rein.-con. and steel, rein.-con flooring, concrete foundation. About $75,000.

Kan., Wichita—Lodge—Elks' Lodge, 115-117 North Topeka Ave., plans to build 10 story, brick. About $350,000. Architect and engineer not selected.

Kan., Wichita—Mausoleum—Old Mission Cemetery Co. having plans prepared by S. Lovell, archt., 30 North Michigan St., Chicago, Ill., for 75 x 150 ft., rein.-con., stone and marble, rein.-con. flooring, concrete foundation. About $150,000.

Neb., Fremont—Business—Gove Motor Co. plans to build 3 story, 100 x 200 ft., brick. About $200,000. Architect not selected.

Neb., Grand Island—High Schools—Bd. Educ. having plans prepared by Kirschke & Crocker, archts., Grand Island, and receives bids about Feb. 1, for 3 story, 90 x 176 ft. junior high school and 3 story, 80 x 236 ft. high school, both brick, concrete and steel, brick foundation. About $200,000 and $400,000 respectively. Noted Aug. 7.

Neb., McCook—School—City election Jan. 6, to vote on $150,000 bonds to build school. Architect not selected.

Neb., Scottsbluff—Theatre—W. H Ostenberg, Jr. plans to build 2 story theatre. About $100,000. Architect not selected.

Mont., Billings—Hotel—A. H. Barth, 43 Yellowstone Ave., plans to build Carruthers Hotel, on 2nd Ave. and 29th St., 7 story, 140 x 150 ft. About $1,000,000. McIver, Cohagen & Marshall, 407 Electric Bldg., archts.

Buildings (Continued)

Mont., Forsyth—High School—City election Jan. 24, to vote on $110,000 bonds to build 2 story, 81 x 165 ft. high school. W. Dedrick, 308 Securities Bldg., Billings, archt.

Mo., St. Charles—College—J. P. Jameison, archt., Chemical Bldg., St. Louis, receives bids about Jan. 15, constructing quadrangular building, 1 and 3 story, 90 x 175 ft., brick and terra cotta, rock foundation, to include administration, lecture hall and power house, on Watson Rd., for Lindenwood College. About $400,000. Address J. L. Roemer.

Mo., Slater—High School—Bd. Educ. plans to build rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $70,000. J. H. Felt & Co., 802 Grand Ave., Kansas City, archts.

Tex., Dalhart—Court House—Dallam Co. plans to build brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $250,000. H. A. Noble, Kansas City, Mo., engr. Mann & Gerow, Hutchinson, Kan., archts.

Tex., Dalhart—High School—Bd. Educ. plans to build brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $130,000. Mann & Gerow, Hutchinson, Kan., archts. H. A. Noble, Kansas City, Mo., engr.

Tex., Houston—Office—Genl. Oil Co. having plans prepared by Jones & Taber, archts., 506 Binz Bldg., for 20 story, 100 x 100 ft., on Louisiana St. and Texas Ave. About $2,500,000.

Okla., Bixby—School—Bd. Educ. having plans prepared and receives bids about Mar. 1, for 2 story, 60 x 120 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $85,000. H. O. Valeur & Co., 705 Phoenix Bldg., Muskogee, archts.

Okla., Hominy—City Hall—City voted $125,000 bonds to build city hall, on Main St. Architect and engineer not decided.

Okla., Hominy—High School—City voted $65,000 bonds to build high school. Architect and engineer not selected.

Okla., Nash — Mausoleum — Mausoleum Constr. Co., Enid, having plans prepared by G. J. Cannon, archt., 206 East Natl. Bank Bldg., Enid, for 1 story, 160 crypts, marble, concrete and steel, rein.-con. flooring, concrete foundation, here. About $75,000.

Wash., Mount Vernon—Hotel—Costello & Wood plan to build 2 story, brick addition. About $50,000. Private plans.

Wash., Seattle — Lodge—B. P. O. E. Lodge, 4th and Spring Sts., plans to build 2 story, 61 x 111 ft., concrete and brick addition. About $61,500. Architect not selected.

Wash., Seattle—School—Bd. Educ. plans to build 1 story, 202 x 240 ft., frame, at 1012 West Trenton St. About $125,000. F. A. Naramore, c/o Bd. Educ., Central Bldg., archt.

Wash., Wenatchee—School—School Dist. plans to build 2 story, 88 x 140 ft., brick and stone, to include 12 rooms and 45 x 70 ft. gymnasium, in eastern section of city. About $60,000. M. A. Dean, Wenatchee, archt.

Ore., Astoria—Temple—Masonic Loan & Bldg. Assn. plans to build 2 story, 150 x 150 ft., brick or cement, in Shivelys Addition. About $50,000. Private plans.

Cal., Corona—Hotel—F. S. Johnson having plans prepared by A. B. Benton, archt., 114 North Spring St., Los Angeles, for 2 story, hollow tile hotel with 50 x 100 ft. swimming pool, at Cold Water Canyon. About $55,000.

Cal., Holtville—School—City election Jan. 9 to vote on $87,000 bonds to build school.

Cal., Los Angeles—Bank and Office—W. R. Staats Co., 104 West 4th St., having plans prepared by J. Parkinson, archt., 420 Title Insurance Bldg., for 3 story, 60 x 125 ft., at 636-40 South Spring St. About $200,000.

Cal., Los Angeles—Loft—M F. Betkouski, 1840 Canyon Drive, having plans prepared by A. C. Martin, archt., 430 Higgins Bldg., for 3 story, 25 x 195 ft., brick, concrete foundation, on East 3rd St. About $60,000.

Cal., Montebello—Schools—Trustees Montebello School Dist. having plans prepared by M. M. Marston, archt., 535 I. W. Hellman Bldg., Los Angeles, for 2 room addition to school, also 12 room and auditorium, semi-fireproof building and 2 room school. Election soon to vote on $200,000 bonds for project.

Cal., Riverside—Hotel—Mission Inn Hotel having plans prepared by A. B. Benton, archt., 114 North Spring St., Los Angeles, for 3 story, 50 x 50 ft. rein.-con. and hollow tile addition, to contain laundry, garage and help's quarters. F. Miller, proprietor.

Cal., San Francisco—Club—Women's Athletic Club, 640 Sutter St., having preliminary plans prepared by Bliss & Faville, archts., Balboa Bldg., for 6 story, 68 x 137 ft. brick addition. About $200,000.

Cal., San Francisco—Office—Standard Oil Co., Standard Oil Bldg., having plans prepared by G. W. Kelham, archt., Sharon Bldg., for 12 story, on Bush and Sansome Sts. About $1,500,000.

Cal., Turlock—Hotel—Stanilaus Hotel Co., incorporated with $250,000 capital stock, plans to build hotel. H. S. Crane, C. H. Geer, E. B. Osborn and others, interested.

Que., Montreal—School—Catholic School Com., 36 St. Catherine St., soon receives bids building 3 story, 55 x 92 ft., concrete, brick and steel, rein.-con. flooring, on Convent St. About $100,000. A. E. Viau, 36 Call St., archt.

Que., Montreal—Store—Goodwins, Ltd., St. Catherine St., W., plans to build 3 story, 70 x 125 ft. concrete and steel addition, rein.-con. flooring, concrete foundation, on University St. Bids will be received early in February. About $100,000. Architect not announced.

Ont., Toronto—Home—Victor Home, 341 Jarvis St., having plans prepared by Horwood & White, archts., Ryrie Bldg., for 3 story, 62 x 80 ft., brick, concrete foundation. About $75,000.

Ont., Toronto—Nurses' Home—St. Michael's Hospital, Church and Shuter Sts., having plans prepared by Hynes, Feldman & Watson, archts., 105 Bond St., for 6 story, 71 x 108 ft., concrete and brick, rein.-con. flooring, concrete foundation. About $200,000.

Ont., Toronto—Schools—University of Toronto, Queen's Park, plans to build six 2 and 3 story., concrete, steel and brick, rein.-con. flooring, concrete foundation. About $2,000,000. Darling & Pearson, 2 Leader Lane, archts.

Ont., Westboro — Church — All Saints Church plans to huild 1 story, stone, stone foundation. About $85,000. R. H. Sleacy, mgr. Architect not selected.

BIDS DESIRED

N. J., South Orange—School—Until Jan. 19, by Bd. Educ., building school on Grove Rd. and Turrell Ave. M. M. Proyor, dist. clk

Pa., Elkins Park—High School—Until Jan. 8, by H. C. Wise, archt., 925 Chestnut St., Phila., building 3 story, 75 x 255 ft., stone, here, for Cheltenham Twp.

Fla., Jacksonville—Church—Until Jan. 3, by Church of Good Shephard, Park St., building 1 story, 145 x 260 ft., brick, stone and concrete, concrete foundation. About $100,000. J. W. Corbusier, Lenox Bldg., Cleveland, O., archt.

O., Cincinnati—School—Until Jan. 12, by Bd. Educ., Denton Bldg., constructing 3 story, rein.-con. and brick, on 7th and Carr Sts. About $725,000. Tietig & Lee, 4th Natl. Bank Bldg., archts.

Wis., Racine—Office—Until Mar. 1, by L. Bassindale, archt., Capitol Bldg., St. Paul, Minn., building 2 story, 60 x 110 ft., brick and stone, for Journal-News Publishing Co., 328 Main St. About $100,000.

Ia., Bondurant—School—Until Jan. 14, by Bd. Educ., Consolidated Dist., building 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. Proudfoot, Bird & Rawson, Hubbell Bldg., Des Moines, archts

HIGHWAY—NEW YORK, N. Y.

Bids were received by State Highway Commission, Capitol, Albany, for constructing 2mi. Canisteo-Whitesville Rd. No. 5650, Part 3, Steuben Co., from (A) Sweeney & Boland Wolcott Rd., Rochester, (awarded contract); (B) W. L. Slocum, Greenwood, N. Y.; (C) Hendrickson-McCabe Constr. Co., Syracuse. The unit bids were as follows:

	A	B	C
Clearing and grubbing	$150.00	$150 00	$150.00
13,000 cu.yd. earth excavation	.90	1.10	1.25
10 cu.yd. rock excavation	3.25	3 20	3.00
200 lin.ft. porous tile underdrain, 6 in	.40	.40	.40
20 lin.ft. relaying old pipe	.30	.30	.20
50 cu.yd. second-class concrete	14.00	14.00	14.50
5 cu.yd. third-class concrete	13.00	13.00	13.50
130 sq.yd. concrete gutters	2.00	2.00	1.80
100 lb. metal reinforcement	.08	.08	.08
100 lb. miscellaneous iron and steel	.08	.08	.08
1,840 lin.ft. wooden guard railing	.50	.45	.50
15 guide signs (detour)	5.00	5.00	5.50
55 cu.yd. screened gravel, loose meas	2.40	2.40	2.50
4,800 cu.yd. foundation course, F or Q stone	3.75	3.00	3.80
1,565 cu.yd. top course, bit. mac. penetration method	9.00	7.00	10.00
42,300 gal. bituminous material, "A" penetration method	.20	.217	.14
270 lin.ft. 24-in. diameter concrete pipe	4.20	3.80	4.10
44 lin.ft. 48-in. diameter concrete pipe	12.60	12.82	14.00
Extended totals	$56,369	$59,044	$60,232

Bids were received by State Highway Commission, Capitol, Albany, for constructing Riders-Mills Brainard Rd. No. 1521, Rensselaer Co., from (A) Belmar Contg. Co., Inc., Troy; (awarded contract); (B) J. J. Rigney, Rensselaer; (C) Louis Mayersohn, Albany. The unit bids were as follows:

	A	B	C
Clearing and grubbing	$300.00	$300.00	$300.00
8,000 cu.yd. earth excavation	1.40	1.40	1.40
1,150 cu.yd. rock excavation	2.75	3.00	3.00
100 lin.ft. vit. clay pipe, 15 in. diameter	2.00	1.75	2.00
1,100 lin.ft. porous tile underdrain, 6 in. diameter	.30	.25	.30
175 cu.yd. stone filling	2.40	2.40	2.40
1M. ft.b.m. timber and lumber	60.00	60.00	60.00
50 cu.yd. second-class concrete	10.93	10.90	11.50
175 cu.yd. third-class concrete	10.00	10.00	10.60
185 sq.yd. cobble gutter, cement joints	1.25	1.25	1.25
430 cu.yd. cobble gutter, sand joints	.90	.90	.90
1,550 lb. metal reinforcement	.15	.15	.15
450 lb. miscellaneous iron and steel	.15	.15	.15
3,250 lin.ft. wooden guard railing	.50	.50	.50
5 guide signs (detour)	3.00	3.00	3.00
1 danger sign	5.00	5.00	5.00
1 concrete sign post	20.00	20.00	20.00
135 cu.yd. broken stone, L.M	2.95	2.95	3.25
2,550 cu.yd. found. course, F or Q stone	3.60	3.00	3.75
725 cu.yd. bottom course, broken stone	4.95	4.95	5.85
1,100 cu.yd. top course, bit. mac. Pen. method	6.25	6.25	7.40
26,500 gal. bit. mat. "A" Pen. metbod	.11	.11	.11
Totals	$43,508	$43,715	$46,271

Buildings (Continued)

Ia., Burlington—Temple—Until Jan. 14, by Masonic Temple Assn., building 3 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. Keffer & Jones, 204 Masonic Temple Bldg., Des Moines, archts.

Minn., Cloverton—School—Until Jan. 8, by H. L. Hughes, clk. Bd. Educ., building 2 story, 70 x 90 ft., brick, rein.-con. flooring, concrete foundation, for School Dist. No. 100, Pine Co. About $80,000. E F. Broomhall, 710 Alworth Bldg., Duluth, archt and engr.

Minn., Northfield—Science Hall—Until Jan. 15 (change of date), by N. E. Mohn, archt., 596 Endicott Bldg., St. Paul, constructing 3 story, 73 x 186 ft., rein.-con., brick and stone, for St. Olaf's College, here. About $200,000.

Kan., Lyndon—Court House—Until Jan. 8, by Osage Co., c/o S. Olcott, building 3 story, brick, rein.-con. and steel, rein.-con flooring, concrete foundation. About $200,000. W. E. Hulse & Co., Hutchinson, archts. Noted Sept. 18.

S. D., Webster—School—Until Jan 20, by Bd. Educ., building 2 story, 94 x 140 ft. brick and rein.-con., to include auditorium and gymnasium. About $145,000. Edwins & Edwins. Northwestern Bldg., Minneapolis, Minn., archts.

Wyo., Cheyenne—Hospital—Until Jan. 27, by S. Corson, secy. Bd. Trustees Memorial Hospital of Laramie Co., Masonic Temple, building 4 story, 200 x 200 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on 23rd and House Sts., here. About $300,000. A. A. Baerresen, Cheyenne, archt.

Okla., Kingfisher—Memorial—City receiving bids building 2 story, 110 x 125 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $75,000. Layton, Smith & Forsythe, 701 Majestic Bldg., Oklahoma, archts.

Utah, Fillmore—Court House—Until Feb. 1, by Comrs. Millard Co., building 3 story, 80 x 90 ft. About $60,000. Rutherford & Ashton, Vermont Bldg., Salt Lake City, archts. Noted Sept. 11.

Utah, Salt Lake City—Chapel—Until Feb. 1, by Bldg. Com., Emerson Ward, Mormon Church, constructing 1 story, 45 x 84 ft., brick. About $50,000. Gunther & Cannon, Deseret Bank Bldg., archts.

Utah, Salt Lake City—Gymnasium—Until Feb. 20, by Bd. Educ., building 1 story, 105 x 180 ft. brick, concrete foundation, on 3rd St. W. About $150,000. Cannon & Fetzer, Templeton Bldg., archts. and engrs.

Utah, Salt Lake City—Technical and High School—Until Feb. 20, by School Bd., building two 1 story, 70 x 96 ft. additions to technical school, and 3 story, 70 x 400 ft. high school, brick, concrete foundation. About $65,000 and $600,000 respectively. Cannon & Fetzer, Templeton Bldg., archts. and engrs.

Ariz., Casa Grande—School—Bd. Educ. having plans prepared by Lyman & Peace, archts., Tucson, for 2 story school. Bonds for $125,000 voted for project.

Cal., Independence—Court House—Until Feb. 2, by Bd. Supervs. Inyo Co., building 2 story, rein.-con. and tile, concrete foundation, here. About $150,000. W. H. Weeks, 75 Post St., San Francisco, archt.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. H., Manchester—Office, etc.—F. M. Hoyt Shoe Co., Lincoln St., let contract constructing 5 story, brick and steel office and administration building, concrete foundation, to L. H. Shattuck, Inc., 208 Granite St. About $100,000.

★N. H., Nashua—Housing—Nashua Mfg. Co. will build twenty-one 2½ story houses for workmen, timber, brick and concrete foundation, near plant. About $60,000. Work will be done by day labor.

★Mass., Boston — Business — Codman & Street, 15 State St, let contract building 7 story, 22 x 120 ft., brick, concrete and steel, concrete foundation, on Washington St., to W. A. & H. A. Root, Inc., 1 Beacon St. About $150,000. W. F. Schrafft Sons Corp., 160 Washington St., lessee.

★Mass., Boston—College—Boston University, 688 Boylston St., let contract altering building and constructing 3 story, 80 x 80 ft., brick and steel, rein.-con. flooring, concrete foundation, on Garrison St., to G. B. H. Macomber Co., 44 Bromfield St. About $250,000.

★Mass., Boston—Office—Bankers Bldg. Realty Corp., 148 State St., let contract building 12 story, brick, steel, stone and concrete, rein.-con. flooring, concrete foundation, on Post Office Sq., to J. J. Prindeville Co., 148 State St. About $450,000.

★Mass., Easthampton — Housing—West Boylston Mfg. Co., Pleasant St., let contract building 2 story houses for workmen, frame, brick and concrete foundation, to F. T. Ley & Co., Inc., 499 Main St., Springfield. About $250,000.

Mass., New Bedford—Hospital—City received bids Dec. 16, constructing 3 story, 46 x 175 ft. ward building and 2½ story, 46 x 180 ft. operating building and 2 story, 50 x 160 ft. laundry, brick and rein.-con., rein.-con. flooring, brick and concrete foundation, on Mt. Pleasant St., from G. Howard & Sons Co., 153 Main St., Brockton, $1,057,790; Coleman Bros, Marginal and Pearl Sts., Chelsea, $1,067,000.

★Mass., Three Rivers—School—Bd. Educ. let contract building 1 story, 65 x 140 ft. brick and terra cotta, to J. H. Murphy, Boston. About $50,000.

★Mass., Worcester—Bank—T. M James, archt., 3 Park St., Boston, let contract to E. Whitehead, 187 Commercial St., remodeling present building and constructing new terra cotta and marble exterior for Park Trust Co., 511 Main St. About $50,000.

★Conn., Fairfield—Club—Country Club of Fairfield, Sasco Hill, Southport, will build 2 story, 60 x 75 ft., brick and steel, brick foundation, here. Work will be done by day labor.

★Conn., Hartford—Administration, etc.—See "Industrial Works."

★Conn., Manchester—School—F. Farley, archt. and engr., 15 West 38th St., New York City, let contract to W. A. Knosla, South Manchester, building brick, steel and stone, brick foundation, on Spruce St., for town. About $150,000.

★Conn., Waterbury — Business — D. E. Carroll & Co., 176 Meadow St., let contract building 4 story, brick and concrete, concrete foundation, on West Main St., to Tracy Bros. Co., 52 Benedict St About $50,000.

★Conn., West Haven (New Haven P O.) —School—Northern School Dist., Orange Twp., let contract building 2 story, 90 x 100 ft., brick and concrete, wood flooring, on 1st Ave. and Lamson St., to M. J. Gibbaud Co., 730 Chapel St., New Haven. About $100,000.

★N. Y., New York—Loft—F. Hoy, c/o M. Courland, archt., 47 West 34th St., will alter 6 story, 25 x 100 ft. brick and steel loft building at 160 Madison Ave., and construct 6 story, 15 x 25 ft. addition to same About $65,000. Work will be done by day labor.

★N. Y., New York—Office—Bway. Realty Corp., 11 Bway., let contract altering 17 story, 162 x 200 ft. brick and steel, to Whitney Co., 101 Park Ave.

★N. Y., New York—Office—Emerson Bldg. Corp., 103 Park Ave., will build 12 story, 75 x 100 ft., brick and steel, brick foundation, at 35-37 West 45th St. About $375,000. Work will be done by day labor.

★N. Y., New York—Office—International Mercantile Marine, 1 Bway., will alter 11 story brick, steel and stone. About $1,000,000. Work will be done by day labor under supervision of W. B. Chambers, archt. and engr., 111 East 40th St.

★N. Y, New York—Office—One Hundred Ninety-five Bway. Corp. let contract altering 27 story, brick, steel and stone, at 195 Bway., to M. Eidlitz, 30 East 42nd St. About $5,000,000.

★N. Y., New York—Offices, Stores and Bank—Chase Natl. Bank, 57 Bway., let contract altering 4 story, brick, steel and stone, at 69-79 Greenwich St., to M. Eidlitz, 30 West 42nd St. About $300,000.

★N. Y., Troy—Armory—W. W. Ward, secy. State Bd. Armory Comrs., 158 State St., Albany, let contract building 2 story, 183 x 256 ft., brick, rein.-con. flooring, concrete foundation, on 15th St., here, to P. Keeler, 425 Orange St., Albany. About $379,140. Noted Sept. 18.

★Pa., Manayunk (Phila. P. O.)—Administration—Phila. Paper Mfg. Co., River Rd., let contract building 1 story, 160 x 295 ft., brick, to Hughes, Foulkrod & Co., Commonwealth Bldg., Phila. About $145,000.

★Pa., Phila.—Sales and Service—Gomery-Schwartz, 128 North Broad St., let contract building 6 story, 220 x 440 ft., concrete and brick, on 24th and Market Sts., to M. J. O'Meara, 6421 Overbrook St. About $700,000.

★Del., Laurel—Bank — People's Natl. Bank, Market St., let contract building 1 story, 32 x 62 ft., brick and marble, cement flooring, concrete foundation, to A. L. Elliott & Son, Laurel. About $68,000; cost plus percentage basis.

★N. C., Kinston — Dormitories — State Bldg. Com., Raleigh, let contract building 3 two story, brick, concrete and brick foundation, at Caswell Training School here, to R. L. Blalock, Kinston, $213,181.

★Tenn., Knoxville — Theatre — Loew's Enterprises, 1492 Bway., New York City, will alter brick and steel, here. About $150,000. Work will be done by day labor under supervision of T. W. Lamb, archt., 644 8th Ave., New York City.

★Tenn., Nashville — Theatre — Loew's Enterprises, 1492 Bway., New York City, will alter brick and steel, here. About $150,000. Work will be done by day labor under supervision of T. W. Lamb, archt., 644 8th Ave., New York City.

★O., Akron—Dormitory—Goodyear Tire & Rubber Co., East Market St., let contract building 3 story, 100 x 130 ft., concrete, steel and brick, concrete foundation, to Hunkin-Conkey Constr. Co., Century Bldg, Cleveland. About $200,000

★O., Akron—Sub-Post Office—Goodyear Tire & Rubber Co., East Market St., let contract building 1 story, 90 x 120 ft., concrete steel and brick, concrete foundation, on East Market St., to Hunkin-Conkey Constr. Co., Century Bldg., Cleveland. About $60,000

O., Cleveland—Auditorium—City received bids building 4 story, 210 x 370 ft., concrete, steel and brick, on East 6th St. and St. Clair Ave., from Natl. Concrete Fireproofing Co., Citizens' Bldg., $441,000; Masters-Mullen Co., Electric Bldg., $545,000; Cleveland Fireproof Constr. Co., Anisfield Bldg., $554,000.

★O., Cleveland—Lodge and Office—Euclid-Malta Co., care of Colcher & Smith, archts., Lennox Bldg., let contract constructing 3 story, 50 x 175 ft, concrete, steel, brick and terra cotta, rein-con. flooring, concrete foundation, on Euclid Ave. near East 105th St., to Du Perow Constr. Co., East 22nd St. and Prospect Ave. About $100,000.

★O., Cleveland—Store—C. D. Koch & Son Co., 10,300 Euclid Ave, let contract building 3 story, 60 x 180 ft, concrete, steel, brick and terra cotta, rein.-con. flooring, concrete and brick foundation, on Euclid Ave. and East 110th St., to Serv Constr. Co., 6110 Euclid Ave. About $100,000.

O., Fairport (Fairport Harbor P. O.)—School—Bd. Educ received bids building 2 story, 124 x 137 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Vine St., from Kaiser Co., Bellaire, O., $169,000; R. R. Kitchen Co., Natl. Bank of W. Va., Wheeling, $174,000.

★O., Independence—School—Independence Rural School Bd. let contract building 1 story, 60 x 100 ft., concrete, steel and brick, concrete foundation, to Willing Bros., Bellevue. About $50,000.

★O., Kenmore—School—Bd. Educ. let contract building 2 story, concrete, steel and brick, rein.-con flooring, concrete foundation, to Halfhill Constr. Co., 217 Dollar Bank Bldg., Youngstown. About $126,000.

★Mich., Detroit—Community House—Westminster Presbyterian Church, c/o G. M. Lindsey, archt., Dime Bank Bldg., let contract building 3 story, 114 x 118 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Hamilton Blvd. and Glynn Court, to Stone & Webster Co., Book Bldg. About $200,000.

★Mich., Detroit—Engine House—Bd. Fire Comrs., Learned St., let masonry contract building 2 story, 40 x 80 ft., rein.-con., brick and stone, rein.-con. flooring, concrete foundation, on 12th and LaBelle Sts., to M. Bartholomaei Son & Co., 466 Warren Ave., E., $49,200; carpentry, to C. Keller Co., 210 Moran St., $21,920; heating, ventilating and plumbing, to O'Connor Bros., 34 Roland Bldg., $9,209.

★Mich., Detroit—Office—Miller-Selden Co., Park Pl., let contract building 2 story, 40 x 100 ft., brick, steel and stone, brick foundation, on 2nd and York Aves., to W. S Pocock, 514 Hammond Bldg. About $50,000.

Buildings (Continued)

★Ill., Rock Island—Jail—Rock Island Co. let contract building 3 story, 44 x 99 ft., rein.-con., steel and brick, with 25 x 40 ft. wing, rein.-con. flooring, rock and concrete foundation, on 15th St. and 2nd and 3rd Aves., to Lorenze Constr. Co., 413-414 People's Bank Bldg., Moline. About $125,000.

★Wis., Kenosha—Store and Office—T. J. Dale, 167 Main St., let masonry contract for 3 story, 50 x 100 ft. brick and concrete, rein.-con. flooring, concrete foundation, on Market Sq., to J. Larsen, Grand Ave., carpentry, to P. J. Plantin, 700 Buckingham Pl., Chicago. Total cost, $50,000.

★Ia., Davenport—Theatre, Offices and Stores—H. C. Kahl, 1129 West 9th St., let contract building 10 story, 145 x 150 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, on Ripley and 3rd Sts., to Walsh Constr. Co., 114½ West 3rd St. About $1,500,000. Noted Aug. 14.

★Ia., Hedrick—High School—Bd. Educ. let contract building 2 story, 50 x 80 ft. brick, concrete and steel, concrete foundation, to Salter & Salter, Ottumwa. About $51,200.

★Ia., Spencer—Hotel—T. N. Tangley let contract building 4 story, 100 room, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. Boyd & Moore, 314 Securities Bldg., Des Moines, archts.

★Minn., Bronson—School—Bd. Educ. let contract building 2 story, 57 x 80 ft. school, to C. M. Labree, Ave. N., Thief River Falls. About $50,000.

★Kan., Pittsburgh—High School—Bd. Educ. let contract building 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to J. M. Leeper, 105 East 7th St., Topeka, $214,836.

★Mont., Billings—Office—See "Industrial Works."

★Tex., Ft. Worth—Hotel—Citizens Hotel Co., c/o Sanguinet & Staats, archts., 1st Natl. Bank Bldg., let contract building 15 story, 100 x 200 ft., on 8th and Main Sts., to Westlake Constr. Co., 8th and Main Sts. About $2,800,000; cost plus percentage basis.

★Tex., Houston—Office—O. L. White, 908 Clay Ave., let contract building 3 story, 95 x 100 ft. brick, rein.-con. and tile, on Louisiana St. between Rusk and Walker Sts., to J. Stadtler, 803 Fannin St. About $50,000.

★Okla., Cherokee—School—Bd. Educ. let contract building 3 story, 62 x 121 ft. brick, concrete and steel, rein.-con. flooring, concrete foundation, to E. G. Smith, Cherokee. About $60,600.

★Wash., Seattle—Church—Third Christian Scientist Church, 17th N. W. and 10th Sts., let contract building 1 story, 80 x 82 ft., brick to N. McDonald, Green Bldg. About $75,000.

★Wash., Seattle—Sales—W. H. Cleaver, Hoge Bldg., let contract constructing 2 story, 90 x 128 ft., concrete, at 1518 13th Ave., to W. J. Kelly, Securities Bldg. About $55,000.

★Wash., Seattle—School—University of Washington let contract building 3 story, brick and stone, on campus, to Hanson Constr. Co., Tacoma, $244,539.

★Ore., Portland—Hall—Knights of Columbus, 364 Taylor St., let contract building 4 story, brick and concrete, concrete foundation, on Park and Taylor Sts., to A. Guthrie & Co., Sherlock Bldg. About $100,000.

★Cal., Fresno—Hotel—H. A. Arakelian, Turlock, let contract building 6 story, rein.-con. and brick, here, to Prichard Bros., 623 Ferger St. About $200,000.

★Cal., Santa Barbara—Theatre—Portola Theatre Co., 723 State St., let contract building 83 x 200 ft., rein.-con. theatre, to J. A. Griffin Constr. Co., 602 Title Insurance Bldg., Los Angeles. About $250,000; cost plus percentage basis.

★Ont., Peterboro—Exchange—Bell Telephone Co., 118 Notre Dame St., Montreal, let steel contract for 3 story, 50 x 75 ft., brick and steel, to Dominion Bridge Co., Ltd., Dominion Sta., Lachine, Que., $18,290; balance of contract, to J. Dunlop, Peterboro, $80,468.

★Ont., St. Thomas—School—Bd. Educ. let masonry contract building 2 story, concrete, brick and steel, concrete foundation, on Wilson Ave., to J. Belbin, St Thomas, $18,460; carpentry and roofing, to A Morris, St Thomas, $21,370.

★B. C., Vancouver—Store—D. Spencer, Ltd., Hastings St., let contract altering old Clark & Stuart Bldg. on Hastings, Cordova, Richards and Seymour Sts., and constructing new 6-8 story, 100 x 120 ft. wing addition, to Dominion Constr. Co., 509 Richards St. About $1,000,000.

Federal Government Work

PROPOSED WORK

N. J., Dover (Picatinny)—Buildings—A. Niles, commanding officer, Arsenal, plans to remodel and reconstruct 40 or 50 steel and rein.-con. buildings for experimental plant for chemicals for Ordnance Bureau Buildings will be advertised separately. Specifications are now ready for Building No. 17. Cost between $4,000,000 and $5,000,000.

D. C., Wash.—Quay Wall—Spec. 4112—Bureau Yards & Docks, Navy Dept., plans to complete quay wall here.

Va., Richmond—Post Office Alterations—Treas. Dept., Wash., D. C., rejected bids received Nov. 24, altering Post Office, here. J. A. Wetmore, superv. archt.

Ga., Savannah—Dredging—U. S. Eng. Office, War Dept., Wash., D. C., soon receives bids dredging in Long Island Crossing, here.

Ky., Louisville—Lock and Abutment—U. S. Eng. Office, Louisville, receives bids in February, building lock and abutment for Lock and Dam No. 45, Ohio River. About $788,390.

O., Cincinnati—Power House—U. S. Eng. Office, Cincinnati, soon lets contract building power house at Dam 35, here.

Wash., Olympia—Waterway—U. S. Eng. Office, War Dept., Wash., D. C., plans to build waterway connecting Puget Sound with Gray's Harbor, here.

Cal., San Francisco—Stone—U. S. Eng. Office, War Dept., Wash., D. C., soon receives bids furnishing stone to repair wharf at North Jetty, here.

BIDS DESIRED

N. Y., New York—Dredging—Until Jan. 26, by U. S. Eng. Office, 39 Whitehall St., dredging in Hudson River Channel, New York Harbor; advertised in this issue.

N. Y., Staten Island—Aerial Defense Station—Until Jan. 20, by Constr. Quartermaster, 39 Whitehall St., New York City, furnishing labor and material for building barracks and quarters, mess hall, post exchange, administration building, etc., at Air Coast Defense Station, here. About $500,000.

Va., Hampton Roads—Removing and Rebuilding—Spec. 4109—Until Jan. 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., removing Bldg "B" from Detroit, and rebuilding here. About $28,000; $10 deposit required for plans and spec.

Va., Norfolk—Dispensary—Spec. 4101—Until Jan. 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building, here. About $25,000.

Va., Norfolk—Quay Wall—Spec. 1,014—Until Jan. 14 (change of date), by Bureau Yards & Docks, Navy Dept., Wash., D. C., building, here, uncreosoted timber bearings, batter piles and creosoted fender piles and chocks, etc.

S. C., Paris Island—Buildings Spec. 4079—Until Jan. 7, by Bureau Yards & Docks, Navy Dept., Wash., D. C., constructing 4 steel frame and 5 wood frame buildings, at Marine Aviation Field, here.

La., New Orleans—Dredging—Until Jan. 29, by U. S. Eng. Office, Customhouse, dredging canal between Mermentau and Calcasieu Rivers; advertised in this issue.

Ky., Dawson Springs—Additional Buildings—Until Jan. 5, Treas. Dept., Wash., D. C., (supplemental bids) for constructing 3 additional buildings at Pub. Health Sanitarium, here.

Ky., Dawson Springs—Additional Buildings—Until Jan. 20, (change of date), by Treas. Dept., Wash., D. C., constructing 19 additional buildings exclusive of mechanical equipment, at Pub. Health Sanitarium, here. J. A. Wetmore, superv. archt.

Cal., San Francisco—Road Work—Until Jan. 19, by Dist Eng., U S. Bureau of Rds., Mills Bldg., for 9½ mi. road, involving 130,000 cu.yd. excav. and 2,300 ft. corrugated iron pipe also 16½ mi. road, 40,000 yd. excav. and 1,700 ft. pipe, both masonry and timber cribbing, Klamath River Project.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. Y., New York—Dredging—U. S. Eng. Office, 39 Whitehall St., let contract dredging and removing rocks in East River, 1st Dist., to Arundel Corp., Phila., Pa., $687,350.

★N. Y., New York—Removing Wrecked Schooner—U. S. Eng. Office, War Dept., Wash., D. C., let contract removing wrecked schooner "Geneva Mertis," 1st Dist., to C. W. Johnston, Brooklyn, $2100.

Pa., Phila.—Cranes—Spec. 4092—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Dec. 23, building 3 traveling hammerhead cranes, for fitting out piers at Navy Yards, (1) net price and time complete for 2 at Norfolk and 1 at Phila., Pa., (2) net price and time for 1 at Norfolk and 1 at Phila., Pa., (3) net price and time for 1 at Norfolk from McMyler Insterstate Co., Bedford, (1) $138,875 (200 days), (2) $93,800 (200 days), (3) $48,225 (205 days); Wellman Seaver Morgan Co., 7000 Central Ave., S. E., Cleveland, O., (1) $213,450 (315 days), (2) $144,960 (300 days), (3) $76,440 (270 days), alternate (1) $223,800 (285 days), (2) $151,880 (270 days), (3) $79,900 (240 days).

D. C., Wash.—Animal House Extension—Treas. Dept., received bids Dec. 23, for labor for building extension to animal house at Hygienic Laboratory, U. S. Pub. Health Serv., from Boyle Robertson Constr. Co., Evans Bldg., $21,117, P. F. Gormerly Co., Union Trust Bldg., $23,452, H. S. Hatton Co., Wash., $29,900; cement, from Natl. Mortar Co., 101 M St., N. E., $1,381, Tidewater Portland Cement Co., $1,107, Rosslyn Steel & Cement Co., Woodward Bldg., $1,342; millwork, from T. W. Smith Lumber Co., 1st and Indiana Sts., $2.564.

★D. C., Wash.—Removal of Monument—U. S. Eng. Office, War Dept., let contract removing Lincoln Monument, to Park Transfer Co., Wash., $1850.

Va., Alexandria—Partitions—Spec. 4098—Bureau Yards & Docks, Navy Dept., Wash., D. C., received lowest 3 bids, Dec. 23, building partitions for offices, storerooms and dispensary at Naval Torpedo Assembly Plant, here, from P. F. Gormley, Union Trust Bldg., Wash., D. C., $24,702 (100 days); Hyde & Baxter, Wash., D. C., $24,490 (60 days); W. P. Lipscomb Co., 1405 F. St., N. W., Wash., D. C., $28,644 (60 days).

★Va., Harrisonburg—Extension of Post Office—Treas. Dept., Wash., D. C., let contract extending Post Office and Court House building, here, to W. P. Thurston, Merchants' Natl Bank, Richmond, $12,900.

W. Va., Wheeling—Lock Gates—U. S Eng. Office, received bids furnishing and erecting lock gates for Dams 23, 25 and 27, Ohio River, from Milwaukee Bridge Co., 1,400 34th St., Milwaukee, Wis., $191,465; W. S. Rae Co., Oliver Bldg., Pittsburgh, Pa., $194,617.

N. C., Thomasville—Post Office—Treas. Dept., Wash., D. C., received bids Dec. 18, for labor for constructing, here, from P. F. Gibbons, 1620 North Main St., Scranton, Pa., $35,980; W. P. Thurston, Merchants' Natl. Bank, Richmond, Va., $36,000.

S. C., Charleston—Heating—Spec. 4091—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Dec. 23, heating torpedo storehouse building No. 101 and constructing boiler house addition to same building, at Naval Ammunition Dept., here, (1) work complete, from J. R. Proctor, Inc., 71 Cortlandt St., New York City, (1) $6816 (75 days), (2) $40, (3) $1, (4) $400 (11 days); Austin Heating Co, 121 West 42nd St., New York City, (1) $6875; Charleston Eng. & Constr. Co., 58 Broad St., (1) $7890 (75 days), (2) $20, (3) $.15, (4) $500 (10 days).

★S. C., Paris Island—Concrete Walls—Spec. 4096—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building at Main Sta., Marine Barracks, here, to W. T. Hadlow, 15 Baldwin Bldg., Jacksonville, Fla., $4,600 (90 days).

Fla., Pensacola—Heating System—Spec. 1071—Bureau of Yards & Docks, Navy Dept., Wash., D. C., received bids Dec. 23, installing heating system at torpedo storehouse and constructing additional building with brick chimney, at Naval Ammunition Depot, here, (1) work complete, from J. W

Federal Government Work (Continued)

Eley, Pensacola, (1) $6720, (2) $20 (75 days); C. H. Turner Co., 30 East Garden St., (1) $6994, (2) $43.50; E. T. Warren Co., Newport News, Va., (1) $7300, (2) $20.

★**Fla., Tampa** — Radio Towers — Spec. 4088—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract removing and rebuilding two 200 ft. towers, here, to Donnell-Zane Co., 298 Bway., New York City, $4,262 (95 days).

★**La., New Orleans**—Stone and Willow Brush—U. S. Eng. Office, Customhouse, let contract furnishing and placing 25,000 tons stone and 5000 cords of willow brush along inner east jetty at South Pass, Missisippi River, to L. F. Alexander, Audubon Pl. Cost $226,500.

★**Tenn., Memphis**—Earthwork—Mississippi River Comm., 1st and 2nd Dists., Custom House, let contract building levee work in Lower St. Francis, 1st and 2nd Dists., to G. F. Ramsey, Porter Bldg., $174,370, and the White River Levee Dist., to Roach, Stensell, Lawrence Bros. & Co., North Memphis Savings Bank Bldg., $59,880.

★**O., Cincinnati**—Boilers—U. S. Eng. Office, War Dept., Wash., D. C., let contract building boilers for snagboat "Iroquois" 1st Dist., to C. Hegewald Co., State St., New Albany, Ind., $5900.

★**Mich., Harbor Beach**—Harbor Improvements—U. S. Eng. Office, 337 Federal Bldg., Detroit, let contract dredging main entrance to harbor to project depths of 21 and 23 ft., to M. Sullivan, 179 Iroquois Ave., Detroit. About $120,000.

★**Tex., Galveston**—Cement—U. S. Eng. Office, Galveston, let contract furnishing 46,000 lb. cement, to Texas Portland Cement Co., 1001-8 Praetorian Bldg., Dallas, $122,820. Noted June 26.

Cal., San Diego—Buildings—Spec. 4047—Pub. Wks. Office, San Diego, received bids Dec. 23, constructing 1 story central buildings, covering 30,000 sq.ft. floor space, consisting of power house at center with ell shaped east and west wings for housing utilities, at Marine Corps Base, (1) work complete, from Lange & Bergstrom, Timken Bldg., (1) $209,000 (180 days) (2) add $65 deduct $39, (3) add $3.25 deduct $.90; Kier Const. Co., foot of Rosencrans St., (1) $221,888 (180 days), (2) add $40 deduct $18, (3) add $1.60 deduct $.75.

Miscellaneous

PROPOSED WORK

Memorial Park—Provincetown, Mass.—See "Streets and Roads."

Stadium, etc.—New York, N. Y.—I. L. Rice, c/o Herts & Robinson, archts., 331 Madison Ave., having plans prepared for brick, steel, stone and concrete stadium and playground, in Central Park. About $1,000,000.

Tanks—Bayonne, N. J.—Tidewater Oil Co., Constable Hook, plans to build 15 oil tanks on New York Bay.

Steam Roller, Mixer, etc.—Highland Park, N. J. (New Brunswick P. O.)—City passed ordinance to purchase steam roller, concrete mixer, paver, 400 ft. steel forms and small concrete mixer. About $13,000. J. Hopkins, Highland Park, engr.

Piers—Jersey City, N. J.—Lehigh Valley R. R., 64 Bway., New York City, plans to build 2 steel lifting piers on water front, foot of Johnson Ave., here. About $300,000.

Turbine Engines—South River, N. J.—Town having plans prepared for 2 turbine engines, 500 kw. steam, also for building to house same. About $140,000. E. B. Hedden, town engr.

Piers—Weehawken, N. J.—Cunard & Scandinavian Amer. Steamship Lines plan to build several large 3-decker piers, adjoining West Shore Railroad Terminal, concrete and steel.

Park and Playground—Wilkes-Barre, Pa.—City plans to build park and playground. About $100,000.

Pier—Love Point, Md.—Peninsula Ferry Corp., 702 Amer. Bldg., Baltimore, plans to build 1300 ft., timber pier, here. Cost between $40,000 and $50,000. Address R. T. Ford.

Marine Ways—Mobile, Ala.—Henderson Shipbuilding Co., foot Eslava St., plans to construct marine way here. About $300,000.

Portable Asphalt Plant—Detroit, Mich.—Dept. Parks & Blvds., Farwell Bldg., plans to purchase portable asphalt plant with 1500 sq.yd. capacity. About $50,000. E. G. Heckel, comr.

Trench Excavator — Detroit, Mich.—Comr. Purchases & Supplies, Municipal Courts Bldg., soon lets contract furnishing Water Bd. with 3 ladder type trench excavators for use in laying water pipe.

Dams—Escanaba, Mich—P. L. Utley and J. G. Sutherland petitioning Bd. Supervs. Delta Co. for permission to proceed with plans for 2 rein.-con. dams over Escanaba River, Cornell and Baldwin Twps., one to be 50 x 50 ft. with concave face to serve as apron, waste gate 12 ft. wide and 12 ft. deep, log chute 5½ ft. wide and 4 ft. deep from top of dam; other dam to be similar except in height which is to be 60 ft.

Changing Electric Plant from Direct to Alternate Current—Benson, Minn.—City having plans prepared changing electric plant from direct to alternate current, involving new generator switchboard and boilers. About $40,000. W. E. Skinner, 15 South 5th St., Minneapolis, engr.

Transmission Line, Okla., Pryor—See "Waterworks."

Dam—Standard, Cal.—Standard Lumber Co. having plans prepared by Weeks & Day, engrs., Phelan Bldg., San Francisco, for rein.-con. dam.

Asphalt Plant, Sarnia, Ont.—City plans election to vote on $35,000 bonds to purchase asphalt plant and equipment. J. A. Baird, city engr.

Wharves—Bamfield, B. C.—Dept. Pub. Wks., Ottawa, soon lets contract repairing wharves in Bamfield and Ucluelet, pile and timber construction. About $30,000. A. Lafheur, Ottawa, engr.

Wharves — Uelnelet, B. C. — See "Bamfield."

BIDS DESIRED

Stone, Etc.—Long Island City, N. Y.—Until Jan. 8, by M. E. Connolly, pres. Queens Boro., furnishing and delivering 29,000 cu.yd. broken stone, 5000 cu.yd. sand, grit or broken chips, 10,000 cu. yd. sand, 70,000 asphalt paving blocks, 110,000 hard wood paving blocks, 100,000 oak key paving blocks, 600 000 gal. road oil for cold application, 200,000 gal. for hot application, 25,000 gal. fuel oil, 700 ton asphaltic cement, 150,000 gal. bituminous road surfacing material in tank cars and 864 lin. ft. 12 in. c.i. pipe.

Tank—New York, N. Y.—Until Jan. 7, by M. F. Loughman, pres. Manhattan Boro., furnishing all labor and material for furnishing, delivering and building 1 steel tank and appurtenances at asphalt plant, on 90th St. and East River.

Refrigeration Equipment—Thiells, N. Y.—See "Industrial Works."

Dumping Equipment—Harrisburg, Pa.—Until Jan. 19, by State Highway Dept., furnishing, delivering and installing dumping equipment with hydraulic and hand hoist, on Peerless, Heavy Aviation, Nash, Pierce and Packard chassis. L. S. Sadler, state highway comr.; advertised in this issue.

Cement—New Orleans, La.—Until Jan. 7, by Bd. Comrs. Port of New Orleans, Court Bldg., furnishing and delivering about 135,000 bbl. Portland cement, depending upon Board's requirements, at storehouse of Board, located near Japonica and Claiborne Sts. A. Ferrilliat, 1 Canal St., ch. engr.; advertised in this issue.

Wood Stave Pipe Material—Ravenna, O.—Until Jan. 9, by A. S. Helbig, dir. pub. serv., furnishing 3400 ft. 30 in. and 300 ft. 42 in. continuous wood stave pipe material. Seperate bids will be received for lumber, and for iron bands and shoes; advertised in this issue.

Subway—Detroit, Mich.—Until Jan. 17, by Dept. Pub. Wks., building all preliminary and temporary structures for facilitating or protecting work necessary for constructing subway section of Detroit approach to Belle Isle Bridge, work consists in general of subway and approaches in East Jefferson Ave., to carry street traffic from East Grand Blvd. to Belle Isle Park, and involves 28,000 cu.yd. dry excav., 6200 cu.yd. rein.-con., 10,000 lin.ft. concrete piles, 12,000 sq.yd. concrete paving base, 700 lin.ft. vitr. sewers and drains. 42,000 sq.ft. waterproofing, constructing and maintaining temporary trestle and remodeling 65 lin.ft. 7 ft. 3 in. sewer. G. Engel, comr.

Cement—West Bend, Wis.—Until Jan. 10, by C. Pick, comr. Washington Co., furnishing 83,300 bbl. Portland cement.

Stand Pipe—Great Falls, Mont.—Until Jan. 13, by W. H. Harrison, city clk., furnishing and erecting steel storage stand pipe, 54 ft. in diameter and 60 ft. high. W. H. Harrison, city clk.; advertised in this issue.

Retaining Wall — Ray, Ariz. — See "Bridges."

Gate Valves and Fire Hydrants—Whittier, Cal.—Until Jan. 19, by O. O. Trueblood, city clk., furnishing 180 gate valves and 33 fire hydrants. J. B. Lippincott, Central Bldg., Los Angeles, engr.

Breakwater — Meteghan, N. S. — Until Jan. 21, by S. C. Desbrochers, secy. Dept. Pub. Wks., Ottawa, rebuilding ell to main breakwater, here.

Road Roller—Ottawa, Ont.—O'Learys, Ltd., Band Natl. Bldg., receiving bids for 10 ton asphalt road roller.

Dam, etc.—Nicoamen, B. C.—Until Jan. 7, by Dominion Government, Ottawa, building dam, embankment and 3 groyners. About $35,000. A. Lafleur, Ottawa, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Elevated Railways—New York, N. Y.—Pub. Serv. Comm., 49 Lafayette St., received lowest 3 bids Dec. 23, (a) improving part of White Plains Ry., (b) completing construction of 239th St. route, from D. C. Serber, 1123 Bway., (a) $49,187, (b) $175,216; Slattery Eng. Co., 7 East 42nd St., (a) $52,490; Buckley & Blake, (a) $64,039; Bainbridge Constr. Co., 52 Vanderbilt Ave., (b) $155,288; Snare & Triest, 8 West 40th St., (b) $173,689.

Jib Cranes—New York, N. Y.—E. S. Walsh, supt. pub. wks., Capitol, Albany, received bids Dec. 23, furnishing and installing 3 ton electric semiportal revolving jib cranes on barge canal terminals, at West 53rd St. and 2 at Greenpoint, Contr. 116 Revised, from Shepard Electric Crane & Hoist Co., Montour Falls, $56,280; Wellman, Seaver, Morgan Co., 7000 Central Ave., Cleveland, O., $56,800; Heyl & Patterson, Inc., 49 Water St., Pittsburgh, Pa., $60,570.

★**Galvanized Iron Sides and Roof—Phila., Pa.**—Ford & Kendig Co., 1428 Callowhill St., let contract building galvanized iron sides and roof to crane runway between railroad and Delaware River, to W. E. Hale, 1636 Ludlow St. About $10,000.

★**Piers and Docks—Baltimore, Md.**—Canton Lumber Co. and Spedden Shipbuilding Co. let contracts rebuilding timber and concrete piers and docks, on Boston St. at foot of Kenwood Ave., to A. Miller, 3122 Foster Ave. Total cost to exceed $250,000.

★**Cast Iron Pipe and Valves—Toledo, O.**—D. H. Goodwillie, dir. pub. serv., let contract furnishing 17,000 ft. 30 in. c.i. water mains, to United States Cast Iron Pipe Co., 122 South Michigan Ave., Chicago, cost $263,000; furnishing and fitting valves for 17,000 ft. 30 in. pipe, to Rensselear Valve Co., Troy, N. Y., $25,000.

★**Water Pipe—Detroit, Mich.**—Bd. Water Comrs., 232 Jefferson Ave., let contract furnishing 5280 ft. 8 in. Universal water pipe with special fittings, to Central Fdry. Co., 322 McCormack Bldg., Chicago, $8,807.

★**Foundation, Etc.—Moline, Ill.**—Moline Trust & Savings Bank, 15th St. and 5th Ave., let contract building rock foundation and 1st floor slab, also improving sidewalks in connection with 8 story, 54 x 85 ft., rein.-con. and brick building, to J. Soller & Son, 5th and Cedar Sts., Davenport, Ia.

★**Stokers and Soot Blowers—Hartford, Wis.**—City let contract furnishing and installing stokers and soot blowers, to Combustion Eng. Co., 28 South Dearborn St., Chicago, Ill., $11,725.

Pipe—Baker, Ore.—City Comn. let contract furnishing 4,100 ft. 18 in. c.i. pipe to encase 4,100 ft. 12 in. wooden pipe, to be used in carrying water from Sam-O Hot Springs to proposed natatorium, to Coast Culvert & Flume Co., Derby St. and Central Pipe and Mfg. Co., both in Portland.

OFFICIAL PROPOSALS

Bids: Jan. 9.

Constructing 48-Inch Force Main

CITY OF AKRON, OHIO,
DEPARTMENT OF PUBLIC SERVICE
WATERWORKS IMPROVEMENT
Contract No. 164.

Akron, Ohio.

Sealed proposals for constructing a 48-inch pipe line will be received at the Office of the Director of Public Service, Delaware Building, Akron, Ohio, until twelve o'clock noon, Central Standard time, of Friday, the ninth day of January, 1920, at which time and place they will be publicly opened and read.

The contract includes the furnishing and laying of approximately 4.1 miles of pipe line, together with appurtenances, between the Cuyahoga River Pumping Station and the crossing of the Cuyahoga River south of Kent.

Alternative bids will be received as follows:

Bid "A": Furnishing pipe and special castings for a 48-inch cast iron line.

Bid "B": Laying 48-inch cast iron line.

Bid "C": Furnishing and laying 48-inch lock bar steel pipe.

Bid "D": Furnishing and laying 50-inch riveted steel pipe.

All proposals must be made on the forms furnished by the City.

Each bidder must accompany his proposal with a satisfactory bond or certified check in the sum of Fifteen Thousand Dollars ($15,000.00).

A surety bond in the amount of fifty (50) per cent of the amount of the contract will be required of the successful bidder.

Plans and specifications may be seen at the office of the Director, or copies may be obtained from the Bureau of Water Works Improvement, 102 E. Mill St., Akron, Ohio, upon deposit of Ten Dollars ($10.00), which sum will be refunded on return of the plans and specifications in good condition within ten days after the award of the contract.

The right is reserved to reject any or all bids.

H. S. MORSE,
Director, of Public Service.
G. G. DIXON, Engineer.
H. H. FROST, Supt. Water Works.

Bids: Jan. 9.

Pipe Material

Ravenna, Ohio.

Sealed bids will be received at the office of the Director of Public Service in Ravenna, Ohio, until 12 o'clock noon, January 9th, 1920, for the purchase of approximately 3400 feet of 30" and 300 feet of 12" continuous wood stave pipe material. Separate bids will be received for lumber, and for iron bands and shoes. The right is reserved to reject any or all bids.

A. S. HELBIG,
Director of Service.

The publication of an advertisement on this page is an official notice that bids are wanted from other than local bidders.

It is also a guarantee that maximum competition is invited because Engineering News-Record is the *one* nationally recognized medium for Proposal advertising. Its Searchlight Section is read each week by nearly every worth-while contractor in this country who bids on public work outside his own city.

Official Proposals reaching our office in first mail Wednesday morning (9 o'clock) can usually be published in the issue out the next day. Special price for Official Proposals, $3.60 an inch.

Bids: Jan. 14.

Verde River Gravity Water Supply

Phoenix, Ariz.

Sealed bids will be received until January 14, 1920, ten A.M., by V. A. Thompson, city manager, Phoenix, Arizona, for the furnishing of materials, tools and labor to construct a gravity water supply for the City of Phoenix. The work consists of about 32 miles of 36-inch to 38-inch wood, concrete or steel pipe line and a 25,000,000 gallon reinforced concrete covered circular reservoir. 5% deposit required with bids.

Plans, profiles and specifications can be seen in the city engineer's office at Phoenix, Arizona, or the office of Hiram Phillips, consulting engineer, 801 International Life Building, St. Louis, or copies can be had for a deposit of $10.00 which will be refunded upon return in good condition of plans within ten days after the award of contract.

The right is reserved to reject any and all bids or parts thereof.

V. A. THOMPSON, City Manager.

Bids: Jan. 31.

Reinforced Concrete Reservoir

Monticello, Arkansas.

Sealed proposals will be received by the Commissioners of aWter & Light Improvement District No. 1, Monticello, Ark., until January 31, 1920, for the construction of 400,000-gallon reinforced concrete reservoir. Plans and specifications may be seen at the office of City Clerks (where all communications should bo addressed) or may be had upon the deposit of $25.00 to be refunded upon return of same in good condition. 5% of proposal must accompany all bids as a guarantee of good faith. A good and sufficient bond will be required of the successful bidder. The Commissioners reservo the right to reject any and all bids.

L. W. DILLARD,
V. J. TROTTER,
J. W. HALL,
Commissioners.

Bids: Jan. 20.

Waterworks Improvements

Lexington, N. C.

Sealed proposals will be received by the Mayor and Board of Town Commissioners of the Town of Lexington, N. C., at the Town Hall in Lexington, N. C., until 4 p.m., Jan. 20, 1920, for waterworks improvements.

The work will consist of the following:

Brick and concrete pumping station, filter house and filter tubs.

Brick and concrete auxiliary station.

Concrete coagulating basin.

Concrete storage reservoir, 500,000 gal.

Three and one-half miles of cast-iron pipe line.

Three and one-half miles of 2200-volt transmission line.

Motor-driven centrifugal pumps and accessories.

Filter plant equipment.

Proposals must be marked, "Proposal for Waterworks Improvements."

All bids must be upon the blank forms provided in, "Proposal, Specifications and Contracts."

Each bid must be accompanied by a certified check for not less than 5% of the amount of the bid, as evidence of good faith.

Plans and specifications will be on file at the Clerk's Office in Lexington, and at the Office of the Engineer, in Durham, N. C., and copies of the specifications, form of proposal, etc., will be mailed upon application to the Engineer at Durham, N. C.

The right is reserved to reject any or all bids.

J. T. HEDRICK, Mayor.
J. V. MOFFIT, Clerk.
Engineer:
GILBERT C. WHITE,
Durham, N. C.

Bids: Jan. 13.

Steel Storage Stand Pipe

Great Falls, Montana.

Sealed proposals will be received by the City Clerk of the City of Great Falls, Montana, until 8:00 o'clock p.m., Jan. 13th, 1920, for the furnishing and erecting of a Steel Storage Stand Pipe 54 ft. in diameter and 60 ft. high, in accordance with the plans and specifications as hereinafter more particularly set forth.

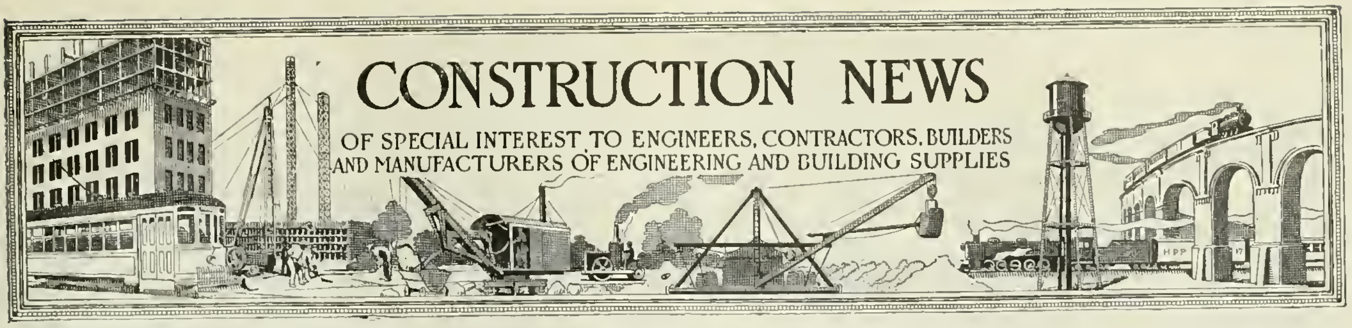
Plans and specifications will be sent on request, by the City Engineer, Great Falls, Montana.

A certified check of $500.00 payable to the City Treasurer to accompany each bid.

The City Council reserves the right to reject any and all bids.

No proposal will be considered except the same be made strictly in conformity with advertisement and upon the form of proposal bound herewith furnished together with specifications, general clauses and form of contract

W. H. HARRISON,
City Clerk



CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Jan. 14	Phoenix, Ariz.	Dec. 26
Jan. 19	Sheboygan, Wis.	Jan. 1
Jan. 19	Corydon, Ia.	Jan. 8
Jan. 27	Avoca, Ia. Adv. Jan. 1.	Jan. 1
Jan. 30	Hugoton, Kan.	Jan. 8
Feb. 10	Toronto, Ont.	Jan. 1
Feb. 12	Douglas, Ariz.	Jan. 8

SEWERS

Bids Close		See Eng. News-Record
Jan. 14	Little Falls, Minn.	Dec. 20
Jan. 14	Nokomis, Ill.	Jan. 8
Jan. 14	Brooklyn, N. Y.	Jan. 8
Jan. 15	Duluth, Minn.	Dec. 11
Jan. 19	Buffalo, N.Y.	Jan. 8
Jan. 20	Yuma, Ariz.	Jan. 8
Jan. 20	Senatobia, Miss. Adv. Jan. 8.	Jan. 8
Jan. 20	Brookhaven, Mass.	Jan. 8
Jan. 27	Edgefield, S. C.	Jan. 8
Feb. 2	Kokomo, Ind.	Dec. 16
Feb. 2	Elmhurst, Ill.	Jan. 8
Feb. 20	Carnegie, Okla.	Jan. 8

BRIDGES

Bids Close		See Eng. News-Record
Jan. 12	Ray Junction (Kelvin P. O.), Ariz.	Jan. 1
Jan. 15	Greensboro, Ga.	Jan. 8
Jan. 19	Florence, Ariz.	Jan. 1
Jan. 19	Jackson, N. C.	Jan. 8
Jan. 20	Aspermont, Tex.	Jan. 8
Jan. 26	Wilmington, Del.	Jan. 8
Jan. 27	Dublin, Ga.	Jan. 8
Feb. 7	Bethlehem, Pa.	Dec. 11
Feb. 25	Bethlehem, Pa.	Jan. 8

STREETS AND ROADS

Bids Close		See Eng. News-Record
Jan. 12	Texas	Dec. 20
Jan. 12	Bunnell, Fla.	Dec. 26
Jan. 12	Bunnell, Fla.	Jan. 1
Jan. 12	Vallejo, Cal.	Jan. 1
Jan. 12	Snyder, Tex.	Jan. 8
Jan. 12	Phoeniz, Ariz.	Jan. 1
Jan. 12	Indiana	Jan. 1
Jan. 12	Florence, Ariz.	Jan. 1
Jan. 12	Jacksonville, Fla.	Jan. 8
Jan. 13	Florence, Ariz.	Jan. 1
Jan. 13	Coalinga, Cal.	Dec. 26
Jan. 14	Charleston, W. Va.	Dec. 20
Jan. 14	Michigan	Jan. 1
Jan. 14	Florida Adv. Jan. 8.	Jan. 8
Jan. 14	Cleveland, Ohio.	Jan. 8
Jan. 14	San Francisco, Cal.	Jan. 8
Jan. 15	Tulare, Cal.	Jan. 1
Jan. 15	Oakland, Cal.	Jan. 8
Jan. 15	Santa Barbara, Cal.	Jan. 8
Jan. 15	St. Louis, Mo.	Dec. 11
Jan. 16	La Grange, Tex.	Dec. 20
Jan. 16	Valdosta, Ga.	Dec. 26
Jan. 16	Liberty, Tex.	Dec. 20
Jan. 17	St. Louis, Mo.	Dec. 11
Jan. 19	Finch, Ont.	Dec. 4
Jan. 19	Tombstone, Ariz.	Jan. 1
Jan. 19	Spring Lake, N. J.	Jan. 1
Jan. 20	Washington, Ga.	Jan. 8
Jan. 20	Ventura, Cal.	Jan. 8
Jan. 20	Warren, Minn.	Jan. 8
Jan. 22	Wichita Falls, Tex. Adv. Jan. 1.	Jan. 1
Jan. 22	Wichita Falls, Tex.	Jan. 8
Jan. 23	Ohio	Jan. 8
Jan. 27	Montgomery, Ala. Adv. Jan. 1.	Jan. 1
Jan. 27	Howell, Mich.	Jan. 1
Jan. 27	Pennsylvania	Jan. 8
Jan. 27	Montgomery, Ala.	Jan. 8
Jan. 28	St. Louis, Mo.	Dec. 11
Jan. 29	Pella, Ia.	Jan. 1
Jan. 30	Hudson, Mich.	Jan. 8
Feb. 2	St. Paul, Minn.	Jan. 8
Feb. 24	Montgomery, Ala. Adv. Jan. 8.	Jan. 8

RAILWAYS

Bids Close		See Eng. News-Record
Jan. 12	Michigan	Jan. 8

EXCAVATION AND DREDGING.

Bids Close		See Eng. News-Record
Jan. 15	Sidney, Ia.	Dec. 26
Jan. 15	New York, N. Y.	Jan. 8
Jan. 16	Fowler, Ind.	Jan. 8
Jan. 17	Marshall, Mo.	Jan. 8
Jan. 19	Des Moines, Iowa	Jan. 8
Jan. 27	Lewiston, Ill.	Jan. 8
Feb. 15	Benjamin, Utah	Jan. 1

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
Jan. 12	Wakefield, Mass.	Dec. 16
Jan. 12	Plymouth, Pa.	Jan. 1
Jan. 13	Cincinnati, Ohio	Jan. 8
Jan. 15	Thiells, N. Y. Adv. Jan. 1.	Jan. 1
Jan. 15	Montreal, Que.	Dec. 20
Jan. 15	Yale, Mich.	Jan. 8
Jan. 19	Yuma, Colo.	Jan. 1
Jan. 20	Darlington, S. C.	Jan. 8
Jan. 25	Shopiere, Wis.	Jan. 1
Feb. 1	Pocatello, Idaho	Jan. 1
Mar. 1	Edmonton, Alta.	Jan. 8

BUILDINGS

Bids Close		See Eng. News-Record
Jan. 10	West Allis (Milwaukee P. O.), Wis.	Jan. 8
Jan. 12	Minneapolis, Minn.	Jan. 8
Jan. 12	Newton (Flushing P. O.), N. Y.	Jan. 8
Jan. 12	Cincinnati, O.	Jan. 1
Jan. 13	Ord, Neb.	Dec. 20
Jan. 13	Storm Lake, Ia.	Dec. 4
Jan. 14	Burlington, Ia.	Jan. 1
Jan. 14	Bondurant, Ia.	Jan. 1
Jan. 15	Lewiston, Mont.	Jan. 8
Jan. 15	Waterloo, Que.	Dec. 16
Jan. 15	Northfield, Minn.	Jan. 1
Jan. 15	Jacksonville, Ill.	Dec. 11
Jan. 15	Flint, Mich.	Jan. 8
Jan. 15	Charleston, W. Va.	Dec. 26
Jan. 15	East Grand Forks, Minn.	Dec. 26
Jan. 15	Detroit, Mich.	Jan. 8
Jan. 19	Lowell, Mass.	Dec. 11
Jan. 19	South Orange, N. J.	Jan. 1
Jan. 20	Three Rivers, Que.	Dec. 26
Jan. 20	Webster, S. D.	Jan. 1
Jan. 20	Napoleon, Ohio	Jan. 8
Jan. 20	Detroit, Mich.	Jan. 8
Jan. 21	Morley, Ia.	Jan. 8
Jan. 22	Hagerstown, Md.	Jan. 8
Jan. 22	New York, N. Y.	Jan. 8
Jan. 25	Minneapolis, Minn.	Jan. 8
Jan. 26	Cleveland, Ohio	Jan. 8
Jan. 27	Cheyenne, Wyo.	Jan. 1
Feb. 1	Mitchell, S. D. Adv. Dec. 26.	Dec. 20
Feb. 1	Duluth, Minn.	Dec. 26
Feb. 1	Salt Lake City, Utah	Jan. 1
Feb. 1	Virginia, Minn.	Jan. 8
Feb. 2	Independence, Cal.	Jan. 1
Feb. 2	Canton, Ohio	Jan. 8
Feb. 3	Sac City, Iowa	Jan. 8
Feb. 5	Calgary, Alta.	Jan. 8
Feb. 9	Oconomowoc, Wis.	Jan. 8
Feb. 17	Columbus, Neb.	Jan. 8
Feb. 20	Salt Lake City, Utah	Jan. 1
Mar. 1	Racine, Wis.	Jan. 1
May 15	Syracuse, N. Y.	Dec. 11

FEDERAL GOVERNMENT WORK

Bids Close		See Eng. News-Record
Jan. 10	Aerial Defense Station — Staten Island, N. Y.	Jan. 8
Jan. 12	Steel Body—Tompkinsville, N. Y.	Jan. 8
Jan. 13	Experimental Shop—Philadelphia, Pa. Adv. Jan. 8.	Jan. 8
Jan. 14	Laundry, Spec. 4081—Newport, R. I.	Jan. 8
Jan. 14	Sewers—Washington, D. C.	Dec. 26
Jan. 14	Quay Wall—Spec. 4044—Norfolk, Va.	Jan. 1
Jan. 19	Road Work—San Francisco, Cal.	Jan. 1
Jan. 20	Bridge—Montana	Dec. 26
Jan. 20	Additional Buildings—Dawson Springs, Ky.	Jan. 1
Jan. 20	Well-Ft.-H.-G.-Wright, N. Y.	Jan. 8
Jan. 21	Quay Wall—Spec. 4112—Washington, D. C.	Jan. 8
Jan. 21	Torpedo Storage Racks — Newport, R. I.	Jan. 8
Jan. 21	Engine Room Extension — Spec. 4024—Puget Sound, Wash.	Jan. 8
Jan. 21	Removing and Rebuilding—Spec. 4109 — Hampton Roads, Va.	Jan. 1
Jan. 21	Dispensary—Spec. 4101—Norfolk, Va.	Jan. 1
Jan. 21	Concrete Mixer, Hoisting Engine, Clam Shell Bucket, Conveyor, Elevator, Etc.—Memphis, Tenn. Adv. Jan. 8.	Jan. 8
Jan. 26	Dredging—New York, N. Y. Adv. Jan. 1.	Jan. 1
Jan. 29	Dredging—New Orleans, La. Adv. Jan. 1.	Jan. 1
Feb. 2	Tower and Dwelling—Rincon, P. R. Adv. Dec. 11.	Dec. 11
Feb. 25	Roof — Spec. 4113 — New York, N. Y.	Jan. 8

MISCELLANEOUS

Bids Close		See Eng. News-Record
Jan. 10	Cement—Hartford, Wis.	Jan. 8
Jan. 12	Gravel Screening and Loading Plant — Minneapolis, Minn.	Dec. 20
Jan. 12	Amusement Park—Detroit, Mich.	Jan. 8
Jan. 12	Water Pipes — St. Paul, Minn.	Jan. 8
Jan. 13	Turbo Generator, Condenser, Etc.—Clarksdale, Miss.	Jan. 8
Jan. 13	Stand Pipe — Great Falls, Mont.	Jan. 1
Jan. 14	Cement—Petaluma, Cal.	Jan. 8
Jan. 15	Survey Monuments—Toronto, Ont	Dec. 26
Jan. 16	Cement — Minneapolis, Minn.	Jan. 8
Jan. 17	Pipes, etc.—York, Ont.	Dec. 26
Jan. 17	Subway—Detroit, Mich.	Jan. 1
Jan. 19	Dumping Equipment — Pennsylvania	Jan. 1
Jan. 19	Gate Valves and Fire Hydrants—Whittier, Cal.	Jan. 1
Jan. 19	Grandstand — West Allis (Milwaukee P. O.), Wis.	Jan. 8
Jan. 19	Wood Pipe—Guelph, Ont.	Jan. 8
Jan. 21	Breakwater — Meteghan, N. S.	Jan. 1
Jan. 22	Pipes, Valves, etc. — St. Louis, Mo.	Dec. 11
Jan. 26	Phase Generators—Winnipeg, Man.	Jan. 8
Feb. 2	Asphalt Road Oil—St. Paul, Minn.	Jan. 8

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

Pa., Hazleton—Wyoming Valley Water Supply Co., Markle Book Bldg., plans to build dam at Barnes Run, also new dam to replace Father Riley dam which supplies Eckley Village and colliery. About $100,000 each. Engineer not selected.

Ala., Dothan—City voted $30,000 bonds to build waterworks system. R. W. Lisenby, clk.

La., Monroe—City having plans prepared building 18 mi. 6-18 in. c.i. mains, 3,000,000 gal. filtration plant, centrifugal raw-water pumps, and service pumps 4,000,000 gal. capacity, also electric power plant, including 1,000 kw. turbo-generators with condensers, superheaters for present boilers, resetting present boilers, etc. Bonds for $450,000 voted for project. W. G. Kirkpatrick, city engr.

Waterworks (Continued)

Wis., Campbellsport—City retained J. Donohue, engr., York Bldg., Sheboygan, to make preliminary surveys for water-works system, to include elevator tank, artesian wells, etc. About $20,000.

Tex., Lubbock—City voted $10,000 bonds to extend waterworks system.

Okla., Clinton—City having plans prepared by Black & Veatch, engrs., Interstate Bldg., Kansas City, Mo., improving water-works system. Bonds for $350,000 voted for project.

Okla., Foraker—City voted $40,000 bonds to improve waterworks system. Engineer not selected.

Ariz., Nogales—City election Jan. 15, to vote on $325,000 bonds to extend waterworks system.

Wash., Walla Walla—City voted $250,000 bonds to improve waterworks system. T. G. Willis, clk.

Cal., Decoto—Citizens Water Co., Niles, plans to extend waterworks system to here. About $15,000.

Cal., Los Angeles—Bd. Pub. Serv. having estimates prepared for building pumping plant, reservoir and distributing system, to serve about 320 acres north of Griffith Park. W. Mulholland, 645 South Olive St., ch. engr.

Cal., Newport Beach—Newport Heights Irrigation Dist. having plans prepared by P. E. Kressly, engr., Newport Beach, for pumping plant, mains, reservoirs and distributing system. Bids to be received about February. Bonds for $160,000 voted for project.

Cal., San Diego—City voted $200,000 bonds to extend waterworks and improve wood-stave water pipe line between city and Lower Otay reservoir.

Cal., Santa Monica—City voted $75,000 bonds to relay water mains. J. A. Morton, city engr.

BIDS DESIRED

Ia., Corydon—Until Jan. 19, by city, improving water-works system, to include building 15,000 cu.yd. earth dam, with concrete core wall and spillway, pump house, filter plant, settling basin, filter equipment, pumps, motors and 4000 ft. 8 in. c.i force main. A. T. Gallagher, clk. M. G. Hall, Centerville, engr.

Kan., Hugoton—Until Jan. 30, by city comrs., building water-works and electric light plant. About $60,000. R. L Smith, chairman. Ruckel Eng. Co., Hutchinson, engrs. Noted Sept. 25.

Ariz., Douglas—Until Feb. 12, by Bd. Water Comrs., furnishing material and building 1,500,000 gal. covered water storage reservoir, 10 ft. high, steel, concrete foundation.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**O., Silver Lake** (Cuyahoga Falls P. O.)—Village let contract building two 1 story, 17 x 17 ft., concrete and brick pump houses, to Alger-Tilghman Co., Guardian Bldg., $9,652. Noted Jan. 1

Sewers

PROPOSED WORK

Fla., Palm Beach—City plans election to vote on $10,000 bonds to improve and extend sewerage system.

Ala., Dothan—City voted $40,000 bonds to build sewerage system. R. W. Lisenby, clk.

La., Monroe—City having plans prepared building 27 mi. 8-24 in. sewers. Bonds for $490,000 voted for project. W. G. Kirkpatrick, city engr.

Mich., Monroe—City having plans prepared extending sanitary sewers in Front St. and Conant Ave. from 3rd to 5th Sts., and in 5th St. from Conant to Eastchester Aves., to include outlet in Front St. to river east of Grand Trunk Ry., 12-24 in. vitr. crock pipe. About $53,000. L. A. Sturn, city engr.

Mich., Pontiac—City election in April to vote on $750,000 bonds to build trunkline relief sewerage system, involving 43,000 lin.ft. 12-54 in. rein.-con., vitr. and segmental block pipe, half to be tunnel and half open trench work, outlet to be 48 and 54 in., shallow open trench work, maximum depth, 30 ft. C. W. Hubbell, 2348 Penobscot Bldg., Detroit, engr.

Wis., Brillion—City plans to build sewerage system, probably gravity flow. About $30,000. J. Donohue, York Bldg., Sheboygan, engr.

Wis., Campbellsport—City having preliminary surveys prepared by J. Donohue, engr., York Bldg., Sheboygan, for sewerage system. About $70,000.

Minn., Duluth—See "Streets and Roads."

Mo., Joplin—City having preliminary plans prepared extending sanitary sewerage system. Cost between $120,000 and $150,000. A. C. Moore, Frisco Bldg., engr.

Col., Wray—City soon receives bids building sanitary sewerage system. About $70,000. R. D. Salisbury, 1415 East Colfax Ave., Denver, engr.

Wash., Sunnyside—City plans to build sewerage system. Cost between $30,000 and $50,000. F. H. Langford, city engr.

Ore., Portland—City Council received no bids building sewer in Glisan St. from centre of 10th St. to Willamette River. O. Laurgaard, city engr.

Cal., Calipatria—City voted $40,000 bonds to build sewerage system. E. M. Lynch, Central Bldg., Los Angeles, engr.

Cal., El Monte—City voted $55,000 bonds to build sewerage system and septic tank. Olmsted & Gilleden, 1112 Hollingsworth Bldg., Los Angeles, engrs.

BIDS DESIRED

N. Y., Brooklyn—Until Jan. 14, by E. Riegelmann, boro. pres., furnishing all labor and materials for repairing sewer in Johnson Ave. between Leonard and White Sts., involving 8,800 cu.yd. excav., 250,000 ft. b.m. sheeting and bracing, 1,200 cu.yd. Class "A" concrete, 224,000 lb. steel bars, etc.

N. Y., Buffalo—Until Jan. 19, by Dept. Pub. Wks., building 10-24 in. tile sewer in Iowa St. between Bailey Ave. and Eggert St., 12-18 in. dry weather flow sewer and connections in Lower Terrace, Erie and Lock Sts. and in Lower Terrace between Church and Pearl Sts., 10 in. tile sewer in Portland St. between Cumberland Ave. and Abbott Rd., 10-18 in. sewer in Fisher St. between Lang and Delevan Aves. A. W. Kreinheder, comr.

S. C., Edgefield—Until Jan. 27 by city, constructing 8 mi. sewerage and waterwork system, involving 8 mi. 8-12 in. terra-cotta pipe, 300 ft. c.i. pipe, 6 manholes, 120 manhole rings and covers, rein.-con. disposal plant, complete, etc. J. N. Johnston, Wilmington, N. C., engr.

Miss., Brookhaven—Until Jan. 20, by Mayor and Bd. Aldermen installing sewerage system, involving 13 mi. mains and disposal plant. M. L. Culley, Jackson, engr.

Miss., Senatobia—Until Jan. 20, by town, constructing 8 mi. 6-12 in. sanitary sewers, manholes, and flush tanks. H. Johnson, clk.; advertised in this issue.

Ill., Elmhurst — Until Feb. 2, by city, building sewerage system and sewage disposal plant, involving 43,981 lin. ft. 12-30 in. vitr. tile pipe sewer, 7,638 lin. ft. 36-66 in. vitr. tile segment block sewer, 180 concrete manholes, 325 concrete catch basins, 4 portland cement concrete outlet abutments, 440 lin. ft. 8-14 in. c.i. pipe, 100 cu. yd. portland cement concrete around sewers under railroads, 1 portland cement concrete settling tank, 1 portland cement concrete grit chamber, 1 portland cement concrete dosing chamber, 2 sand sludge beds, 4 sand filter beds, 1 portland cement concrete pump pit with pumping equipment, 700 lin. ft. galvanized iron water pipe and 2 portland cement concrete special manholes. E. Hancock, 2047 Ogden Ave., Chicago, engr.; advertised in this issue.

Ill., Nokomis—Until Jan. 14, by Bd. Local Impvts., building 20,500 ft. 8, 10 and 12 in. vitr. clay pipe sewer, and 1 concrete settling tank and sludge bed. J. J. Woltmann, Nokomis, engr.

Okla., Carnegie—Until Feb. 20, by city, building sanitary sewerage system throughout main streets. About $24,000. V. V. Long & Co., Oklahoma, engrs.

Ariz., Yuma—Until Jan. 20, by C. F. Stanley, city recdr., building 13 mi. 4-20 in. vitr. or cement pipe sewers, 52 manholes, pumping unit and concrete outfall sewer. F. S. Ingalls, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Brooklyn**—E. Riegelmann, boro. pres., let contract building sewers in Malta St., to Murphy Bros., 8856 26th Ave., $7,858; Stillwell Ave., to J. Jennings, $4,706; Kenmore Pl. and Mansfield Pl., to C. Petracca, 175 Spencer St., $2,604 and $3,493 respectively.

★**N. Y., Long Island City**—M. E. Connolly, pres. Queens Boro., let contracts to J. H. Johnson Constr. Co., building sewer in Greenpoint Ave. from Queens Blvd. to Hancock St., 2nd Ward, $7,000, Buell Pl., $7,178; to N. Lascalzo, 20th St., $2,993; to C. Petracca, 175 Spencer St., Brooklyn, Merrit St., $5,765; to T. Welsh, Beekman St., $3,853, Oxford St., $2,531; H. J. Mullen Contg. Co., Inc., Fulton St., Jamaica, $2,500.

★**N. J., Newark**—Passaic Valley Sewerage Comrs., Essex Bldg., 31 Clinton St., let contract building tunnel under Bayonne and New York Bay, to Foundation Co., 233 Bway., New York City; cost plus percentage basis.

★**W. Va., Warwood**—City let contract building sewers in Center and South Warwood Sts., to Vercollotti, Elm Grove. About $13,000.

★**Fla., Ft. Myers**—City let contract constructing sanitary and storm sewerage system, to W. R. Wallace & Co. About $30,000.

Mich., Ferndale (Royal Oak P. O.)—City received bid building 5,123 ft. sewer in Ferndale Ave. from Campbell Ave. to point 20 ft. west of east line of Farmdale Ave., involving 30 in. vitr. crock, also 36 and 42 in. rein.-con. or segmental block pipe, from Edwards & Son, Woodward Ave., $10 per ft.

★**Okla., Dilworth**—City let contract building sanitary sewerage system, to R. T. Spence, Wichita, Kan., $18,337.

★**Idaho, Idaho Falls**—City let contract laying 28,000 ft. 8-18 in. vitr. sewer pipe, to Lindstrom & Oren, Butte, Mont., $72,761.

★**Wash., Seattle**—Bd. Pub. Wks. let contract building trunk sewer in 63rd Ave., S. W., Alki Dist., involving 10,015 ft. 10 in. premoulded concrete or clay pipe sewer, to Sweeney & Gallucci, Tacoma, $170,793.

Ore., Portland — City Council received bids building sewers in 77th St. N. from Halsey to Oregon Sts., from J. Albert, cement, $5,188; East 42nd St. S. E. from point 120 ft. north of 55th Ave. S. E. to proposed south branch of Rhine St., from Mebemarie & Co. Portland, vitr. pipe, $9,645, Elliott & Scoggins, McKay Bldg., cement, $9,959, E Sandberg, 74 East 24th St., N., vitr. pipe, $10,780.

Bridges

PROPOSED WORK

Pa., Wilkes-Barre — City plans to tear down bridge on South St. and build modern one in its place. About $400,000. B K. French, city engr.

La., Oberlin—Police Jury Allen Co. plan to construct 900 ft. bridge over Calcasien River. About $40,000.

Wisconsin—State Highway Comn., Madison, plans to build Pume Bon Won Bridge, Niagara Twp., 35 ft. long, 24 ft. wide, rein.-con. girded span, concrete abutments, Hendricks Bridge, Pembine Twp., 8 ft long, 24 ft. wide, rein.-con. span, concrete abutments, Bridge 2 Pembine Twp., rein.-con. slab, concrete abutments, all Marinette Co.; Balton Bridge, Bristol Twp., 14 ft. long, 24 ft. wide, rein.-con. slab, concrete abutments, Kenosha Co.; Kuhn Bridge, Germantown Twp., 35 ft. long, 24 ft. wide, rein.-con. girder slab, concrete abutments, Washington Co.; Markey Bridge, Sugar Creek Twp., 40 ft. long, 24 ft. wide, rein.-con. span, concrete abutments, Walworth Co.

Wis., Alma—Buffalo Co. plans to build Beef River Bridge and fill, cost $18,000; Loomis Bridge, rein.-con., Dover Twp., $5,000; Connelly Bridge, rein.-con., Mondovi Twp., $4,582. J. Reinhart, Nelson, comr

Wis., Balsam Lake—See "Streets & Roads."

Wis., Barron—See "Streets & Roads."

Wis., Darlington—Lafayette Co. plans to build Skewis Bridge, Shullsburgh Twp., $3,400, Doyle Bridge, Shullsburgh Twp., $900, City Bridge, Shullsburgh Twp., $3,800, Village Bridge, Belmont Village, $2,915, Meekers Grove Bridge, Benton Twp., $4,500, Mueller Bridge, Elk Grove Twp., $4,500, Gough Bridge, Seymour Twp., $1,500, Driver Bridge, Willow Springs Twp., $3,800, Conley Bridge, Fayette Twp., $2,500, Murray Bridge, Darlington Twp., $3,000, Torkelson Bridge, Gratiot Twp., $9,000 and Woodford Bridge, Wiota Twp., $1,118, all concrete, also macadam surface Center Rd., Darlington Twp., cost $3,220, grade and drain Gould Hill Rd., Blanchard Twp., $1,900. G. H. Priestley, Darlington, comr.

Bridges (Continued)

Wis., Madison—See "Streets & Roads."

Wis., Shawano—Shawano Co. having plans prepared by Wisconsin Highway Comn., Madison, for 6 rein.-con. and 6 concrete bridges, in various townships. W. F. Meyer, co. highway comr. M. W. Torkelson, Madison, state bridge engr.

Wis., Stevens Point—See "Streets & Roads."

Minn., Moorhead—A. O. Houglum, aud. Clay Co., soon lets contract building Bridge 3215 over Wild Rice River, 80 ft. truss span with concrete fill, two 23 ft. I-beam spans with rein.-con. approaches, 2 rein.-con piers and 18 ft. roadway. About $11,000.

Kan., Garden City—Bd. Comrs. Finney Co. soon lets contract building 500 ft. rein.-con. girder bridge, 20 ft. wide, involving 1,788 cu.yd. concrete, 84 ton steel, 7,630 lin.ft. wooden piling and 8 ton rockers. About $25,000. P. J. Ruckel, Garden City, engr.

Kan., Winfield—Bd. Comrs. Cowley Co. soon lets contract building 225 ft. rein.-con. through girder bridge, 20 ft. wide, to have five 45 ft. spans. About $15,000. J. M. Bradley, Winfield, engr.

Man., Assiniboia—Town plans to build rein.-con. bridge over Assiniboine River at west boundary of Assiniboine Park. About $125,000.

BIDS DESIRED

Pa., Bethlehem—Until Feb. 25, by Pub. Serv. Comn. of Pennsylvania, Harrisburg, building highway bridge and viaduct over Lehigh River, here. A. B. Millar, secy.. C. W. Hudson, 15 Park Row, New York City, engr.; advertised in this issue.

Del., Wilmington—Until Jan. 26, by Washington St. Bridge Comn., Room 132, Pub. Bldg., constructing 700 ft. rein.-con. and stone bridge, 82 ft. wide, over Brandywine Creek, on Washington St., consisting of two 70 ft., one 250 ft. and two 85 ft. arch spans. Work also involves removal of existing steel bridge and stone masonry. B. H. Davis and V. W. Torbert, Whitehall Bldg., New York City, engrs. and archts.; advertised in this issue.

N. C., Jackson—Until Jan. 19 by State Highway Comn., Raleigh, building 2 steel and concrete bridges in North Hampton Co. About $50,000. W. S. Fallis, Raleigh, engr.

Ga., Dublin—Until Jan. 27, by Comrs. Lauren Co., building 4 bridges on Dixie Highway. Work involves 902 cu.yd. Class A concrete, 698 cu.yd. Class B concrete, 152,607 lb. reinforcing steel, 1,284 cu.yd. excav. and 3,720 ft. wood pile. About $90,000. Garrett & Slack, Bell Bldg., Montgomery, Ala., engrs.

Ga., Greensboro—Until Jan. 15, by Comrs. Green Co., building bridge on road from Greensboro to Eatonton. Work involves 65 yd. excav., 5.6 cu.yd. Class A concrete, 18.1 cu.yd. Class B concrete, 972 lb. steel, 8,325 ft. lumber, 5,100 lb fabricated steel, 1,513 ft. galvanized pipe, etc. About $30,000. Witcheon & Wright, Atlanta, engrs.

Tex., Aspermont—Until Jan. 20, by T. B. Hardin, judge Stonewall Co., building 160 ft., rein.-con. bridge, 18 ft. wide, over Salt Fork of Brazos River, to include rein.-con. pier, plain concrete abutment and wooden flooring. Work involves 33.5 cu.yd. rein.-con., 21.3 cu.yd concrete, 13.5 M. F. B. M. creosoted lumber, 68,775 lb. structural and 1,808 lb. reinforcing steel. About $10,000. F. L. Hargett, Haskell, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Pa., Johnstown—H. T. Jones, compt. Cambria Co. Comn., (Ebensburg), let contract building 65 ft. bridge, 20 ft. wide, over East Conemaugh River, between Franklin and Conemaugh Boros., to Bell-Bookell Co., 270 3rd Ave., Altoona. About $23,900, less $3,500 if county furnishes steel.

★N. C., Winston-Salem—State Highway Comn., Greensboro, let contract building concrete bridge over Lowry Creek, Forsyth Co., to Luten Bridge Co., 405 East 4th Ave., Knoxville, Tenn. About $11,000.

★Fla., Bradentown—See "Streets and Roads."

★Michigan—State Highway Dept., Lansing, let contract building 120 ft. bridge, 20 ft. wide, over Bad River, Brandt Twp., Saginaw Co., involving 145,340 lb. steel, etc., to Sarnia Bridge Co., 176 North St., Sarnia, Ont., $10,173; State Trunk Line Bridge No. 253 over Big Ocqueoc River, 50 ft. rein.-con. arch, 20 ft. wide, Ocqueoc Twp., Presque Isle Co., to J. Decker, Rogers City, $7,500.

★Kan., Abilene—Dickinson Co. let contract building bridges on Sect. B, Federal Aid Project 32, including three 24 ft. through girder spans, with 28 ft. roadways and one 40 ft. "T" girder, with 20 ft. roadway, to Central Bridge Co., Mankato. About $10,000.

★Kan., Beloit—Mitchell Co. let contract building 40 ft. "T" girder bridge, 20 ft. wide, on Federal Aid Project 1, Sect. 10, involving 298 cu.yd. rein.-con., 117 ton steel and 3 sets steel rockers, to Central Bridge Co., Mankato. $11,275.

★Kan., Wellington—Sumner Co. let contract building 100 ft. rein.-con. through girder bridge, 18 ft. roadway, on Meridian Highway, Project 2, Sect. C, to Missouri Valley Bridge Co., 1006 Schweister Bldg, Wichita, $18,816. Work involves 805 cu.yd. earth excav., 443 cu.yd. rein.-con., 25 ton steel, etc.

★Tex., Hemphill—Sabine Co. let contract building 6 steel bridges on Hemphill-Geneva Rd., to Austin Bros. Bridge Co., 1815 Coombs St., Dallas, $59,218.

★Cal., Eureka—Bd. Supervs. Humboldt Co. let contract building 2 steel bridges over Mattole River, one at Thorn and one at Honeydew, to Mercer-Fraser Co., 1st and G. Sts., $55,200.

★Cal., Long Beach—Bd. Supervs. Los Angeles Co. let contracts for structural steel work on Ocean Blvd. Bridge and 7th St. Bridge. to C. W. Beverstok, 3710 South Alameda St., Los Angeles, $94,666 and $36,800 respectively; timber work for 7th St., Ocean Blvd., and Anaheim St. bridges, to United Dredging Co., Central Bldg., Los Angeles, $0.18 per lin.ft. driving piles, $0.50 each for cutting, $22.50 per M.b.m. placing creosoted lumber and $15 per M.b.m. placing untreated lumber. County furnishes nails, piles, lumber and bolts.

Cal., Red Bluff — Tehema Co. received bids building rein.-con. bridge over Dry Creek, from Hart Constr. Co., $12,480, Bordwell & Zimmerman, $14,000, Ross Constr. Co., Forum Bldg., Sacramento, $15,295.

Streets and Roads

PROPOSED WORK

N. Y., New York—M. F. Loughman, pres. Manhattan Boro., rejected bids received Dec. 15, paving Lexington Ave. from 79th to 97th Sts., asphalt.

N. J., Union Hill (Weehawken P. O.)—Town Council plans to improve Main St., asphalt. Cost to exceed $20,000.

W. Va., Charleston—Logan Co. voted $1,000,000 bonds to improve roads. J. N. Smith, Logan, engr.

W. Va., Parkersburg—Wood Co. plans to surface 8 mi. and grade 3 mi. Northwestern, Elizabeth and Staunton Pikes, 16 ft. wide, portland cement concrete. About $175,000. B. Woodyard, Parkersburg, engr.

North Carolina—State Highway Comn., Raleigh, received no bids Dec. 23, hard surfacing 1¼ mi. Glaso-Kannapolis Rd., Cabarrus Co. About $45,000. Work will be re-advertised. W. S. Fallis, state highway engr.

N. C., Charlotte—Mecklenburg Co. plans to re-surface 16 mi. Charlotte and Davidson Rd. About $60,000. Engineer not selected.

N. C., Tarboro—Town Comrs. plan to improve various streets. About $300,000.

Ga., Decatur—Comrs. De Kalb Co. plan to build 13 mi. Covington Rd. and 11 mi. Decatur-Stone Mountain Rd. About $300,000. E. V. Camp, Dalton, engr.

Fla., Palm Beach—City plans election to vote on $70,000 bonds to improve various streets.

Ala., Birmingham—Jefferson Co. election Feb. 16, to vote on $5,000,000 bond to build 125 mi. hard surfaced roads.

Miss., Meridian—Lauderdale Co. voted $75,000 bonds to improve roads in Dist. 3. W. R. Pistole, clk.

La., Amite—Tangipahoa Parish voted $100,000 bonds to build roads in 4th Dist.

La., Monroe—City having plans prepared paving various streets. Bonds for $498,000 voted for project. W. G. Kirkpatrick, city engr.

La., Monroe—Ouachita Parish Police Jury receives bids about May 1, grading, draining and gravel surfacing 90 mi. road, also 10 mi. concrete, brick or other hard-surfaced road. About $1,112,000. R. P. Boyd, engr.

Tenn., Somerville—Fayette Co. plans to issue $1,500,000 bonds to build 100 mi. concrete roads. Address C. A. Stainback, Somerville.

Ky., Jenkins—Consolidation Coal Co. plans to improve various streets. About $25,000.

Ky., Louisa—City will receive bids in spring, paving 3 mi. various streets. About $160,000. A. Snyder, mayor.

Ky., Louisa—Comrs. Lawrence Co. will receive bids in spring building 40 mi. hard-surfaced roads. About $250,000 available for project.

Ky., Madisonville—Comrs. Hopkins Co. receive bids in February constructing 78½ mi. Federal and Interstate rock roads. About $1,000,000. W. W. Crick, co. judge.

O., Dayton—Dayton & Troy Traction Co., 122 South Jefferson St., plans to pave portion of South Jefferson St., incidental to erection of new freight house, involving 2,000 sq.yd. vitr. brick on concrete base. About $10,000. F. O. Eichelberger, city engr.

Ill., Chicago—Bd. Local Impvts. soon lets contract paving alley between West 46th and 47th, Honore and Lincoln Sts., involving 280 cu.yd. grading, 1,280 sq.yd. asphalt on 7 in. concrete, 320 ft. 10 in. tile sewer, etc., cost $5,127.

Alley between West 46th, West 47th, Wood and Honore Sts., 330 cu.yd. grading, 1,280 sq.yd. asphalt on 7 in. concrete, 460 ft. 10 in. tile sewer, etc., $5,770.

Alley between West 46th, West 47th, Paulina and Hermitage Sts., 200 cu.yd. grading 1,280 sq.yd. asphalt on 7 in. concrete, 120 ft. 10 in. tile sewer, etc., $4,329.

Alley between Marshfield Ave., West 46th, West 47th and Paulina Sts., 300 cu.yd. grading, 1,260 sq.yd. asphalt on 7 in. concrete, 310 ft. 10 in. tile sewer, etc., $5,087.

Alley between Rockwell St., Wilson, Sunnyside and Maplewood Aves., 495 cu.yd. grading, 1,168 sq.yd. asphalt on 7 in. concrete, $4,000.

Alley between Lawrence and Leland Aves., Winthrop St. and Chicago, Milwaukee, St. Paul R.R. tracks, 172 cu.yd. grading, 320 cu.yd. filling, 1,040 sq.yd. asphalt on 7 in. concrete, $3,900.

Alley between North, Harding and Crawford Aves. and Le Moyne St., 392 cu.yd. grading, 1,400 ft. concrete curb, 1,100 sq.yd. vitr. brick on 6 in. concrete, $5,600.

Alley between Hirsch Blvd., Potomac Ave., Oakley and Claremont Sts., 529 cu.yd. grading, 1,240 sq.yd. 7 in. concrete paving, $4,300.

Alley between East 68th, East 69th, Dante and Harper Sts., 273 cu.yd. grading, 1,560 sq.yd. asphalt on 7 in. concrete, 380 ft. 10 in. tile sewer, etc., $6,600.

Alley between Chicago Ave., Huron, Spaulding and Christiana Sts., 300 cu.yd. grading, 1,240 sq.yd. asphalt on 7 in. concrete, $2,596.

Alley between Erie and Paulina Sts., Centennial Pl. and Ashland Ave., 400 cu.yd. grading, 630 sq.yd. asphalt on 7 in. concrete, $1,697.

Alley between Ravenswood Ave., School, Melrose and Paulina Sts., 361 cu.yd. grading, 1,027 sq.yd. 7 in. cement paving, $3,400.

Alley between West 57th, West 58th, Green and Peoria Sts., 130 cu.yd. grading, 1,160 sq.yd. asphalt on 7 in. concrete, $2,358.

Alley between Chicago and Hayne Aves., Rice and Robey Sts., 641 cu.yd. grading, 1,460 sq.yd. asphalt on 7 in. concrete, $5,100.

Long Ave. from Fullerton Ave. to Altgeld St., 160 cu.yd. grading, 1,800 sq.yd. asphalt on 6 in. concrete, 1,320 ft. concrete curb, etc., $6,800.

Nelson St. from Oakley Blvd. to Western Ave. and to point 110 ft. east of Oakley Blvd., 900 cu.yd. grading, 465 sq.yd. sandstone block on 6 in. concrete, 1,700 sq.yd. asphalt on 6 in. concrete, 1,290 ft. concrete curb, etc., $8,500.

East 103rd St. from Ave. N. to Indianapolis Ave., 7,000 cu.yd. filling, 5,170 sq.yd. 8 in. slag or limestone on 2½ in. limestone bonded with asphaltic cement, 3,110 ft. concrete curb, etc., $15,500.

South Morgan St. from West 81st to West 83rd Sts., West 81st and West 82nd Sts. from Morgan St. to first alley east, 1,500 cu.yd. grading, 495 cu.yd. filling, 5,200 sq.yd. asphalt on 6 in. concrete, 3,400 ft. concrete curb, $21,500.

Streets and Roads (Continued)

Eddy and Cornelia Sts. from Cicero to Long Aves., Newport St. from Laramie to Long Aves., Lavergue, Laramie and Lockwood Aves. from Roscoe to Addison Sts., 10,900 cu.yd. grading, 35,300 sq.yd. asphalt on 6 in. concrete, 25,900 ft. concrete curb and 45 catch basins, $153,000. C. D. Hill, ch. engr.

Wis., Alma—Buffalo Co. plans to grade and drain Cochrane-Buffalo City Rd., Buffalo Twp., cost $1,575; Cochrane-Buffalo City Rd., Canton Twp., $1,200; Trunk Highway 37, Modena Twp., $3,000; incompleted roads in Naples Twp., $1,115; road west from Hess Farm, Nelson Twp., $1,600; Fountain City-Waumandee Rd., Waumandee Twp., $1,200; improve trunk highways, $18,000, grade and drain Eau Claire St. and build River Bridge, Mondovi City, $2,000. J. Reinhart, Nelson, comr.

Wis., Balsam Lake—Polk Co. plans to grade Frederic and Luck Rds., Luck Twp., $4,568, Range and Turtle Lake Rd., Beaver Twp., $4,568, Grantsburg and St. Croix Falls Rds., Eureka Twp., $2,068, grade and surface Dresser Jct.-Amery Rd., Garfield Twp., $2,068, build bridge across Clam River Rd. and grade Frederic and Shell Lake Rds., Clam Falls Twp., $5,000. C. Nystrom, Balsam Lake, comr.

Wis., Baraboo—Sauk Co. plans to grade and gravel surface Excelsior-Baraboo-Ableman Rd., Excelsior Twp., $9,900, Sauk City -Spring Green Rd., Prairie du Sac Twp., $8,700, Cassell Rd., Troy Twp., $14,000, Honey Creek-Ableman Rd., Honey Creek Twp., $13,000, Hill Point-Wards Corners Rd., Washington Twp., $18,500, Ableman-Prairie du Sac Rd., Westfield Twp., $6,800, Spring Green Rd., Westfield Twp., $5,000, Big Hollow Rd., Spring Green Twp., $3,250, Maple St., North Freedom Village, $4,500; grading and surfacing East Sauk Rd., Baraboo Twp., $6,300, Leech Creek Rd., Baraboo Twp., $1,499. W. Halbersleben, Baraboo, comr.

Wis., Barron—Barron Co. plans to grade Canton-Lehigh Rd., Sumner Twp., $858, Cumberland-McKinley Rd., Maple Plain Twp., $1,200, Cumberland-McKinley Rd., Crystal Lake Twp., $1,200, Rice Lake-Mikana Rd., Doyle Twp., $2,400, Prairie Farm-Poskin Rd., Prairie Farm Twp., $3,999, Prairie Farm-Poskin Rd., Arland Twp., $3,999; build Mill Flowage Bridge, Barron City, concrete, $9,806.

Wis., Darlington—See "Bridges."

Wis., Fond du Lac—Fond du Lac Co. voted $4,600,000 bonds to build concrete roads. Wisconsin Highway Comn., Madison, engrs.

Wis., Jefferson—Jefferson Co. plans to grade and gravel surface Concord-Sullivan Rd., Concord Twp., $6,000, Ft. Atkinson-Edgerton Rd., Sumner Twp., $2,000, Rome-Palmyra Rd., Sullivan Twp., $3,480, Waterloo-Lake Mills Rd., Waterloo Twp., $6,217, Lake Mills-Watertown Rd., Milford Twp., $4,200, Cambridge-London Rd., Lake Mills Twp., $1,500, Whitewater-Hebron Rd., Hebron Twp., $5,250, Whitewater-Hebron Rd., Cold Spring Twp., $3,600, Pipersville Rd., Watertown Twp., $3,110, Lake Mills Rd., Waterloo Twp., $3,000. R. D. Royce, Ft. Atkinson, comr.

Wis., Madison—Dane Co., plans to grade Madison-Sauk City Rd., Roxbury Twp., cost $5,000, Madison-Cambridge Rd., Blooming Grove Twp, $10,000, Madison-Portage Rd., Vienna Twp., $15,500, Mazomanie-Sauk City Rd., Mazomanie Twp., $9,000; gravel surfacing Madison-Oregon Rd., Fitchburg Twp., $8,000; concrete surface Madison-Verona Rd., Madison Twp., $10,841, Main St., Cottage Grove Village and Twp., $9,000; grading and gravel surfacing Sun Prarie-North Bristol Rd., Bristol Twp., $5,500, Edgerton-Deerfield, Albion and Christiana Twps., $10,000, Lake View-Kegonsa Rd., Dunn Twp., $6,735; paving Middleton-Sauk City Rd., Middleton Twp., Tarvia B penetration, $2,406; building Nine Springs Bridge, Fitchburgh Twp., $4,000, Genin Bridge, Montrose Twp., $2,000, Garville Bridge, Rutland Twp, $3,000, all concrete.

Wis., Medford—Taylor Co. plans to grade, drain and gravel surface Abbotsford-Medford Rd., Little Black and Deer Creek Twps., $4,893; grade and drain Hannibal and Donald Rds., Cleveland Twp., $5,000 and Gilman-Hannibal Rd., Cleveland, Aurora and Ford Twps., $6,000. F. Grahl, Medford, comr.

Wis., Milwaukee—Milwaukee Co. has $380,505 available for county and state aid highways. W. F. Cavanaugh, Pereles Bldg., comr.

Wis., Port Washington—Ozaukee Co. receives bids about March 15, grading and paving various roads, 18 ft. wide, concrete, also building necesary bridges and culverts on same. About $1,500,000. J. H. E. Mueller, Thiensville, engr.

Wis., Racine—Racine Co. voted $2,650,000 bonds to build 26 mi. concrete roads. Wisconson Highway Comn., Madison, engrs.

Wis., Stevens Point—Portage Co. plans to grade and surface Waupaca-Almond Rd., Belmont Twp., $1,984, Bancroft-Plainfield Rd., Pine Grove Twp., $1,695; grade and gravel surface Stevens Point-Rudolph S. Rd., Linwood Twp., $2,406, Amherst Jct.-Rosholt Rd., New Hope Twp., $2,419, Lanark Rd., Lanark Twp., $2,418; build Jordan Bridge, Hull Twp., concrete, $8,113. T. E. Cauley, Stevens Point, comr.

Wis., Sturgeon Bay—Door Co. plans to gravel surface Forestville Clay Banks Rd., Forestville Twp., $4,500, J Long Rd., Sevastopol Twp., $3,400, Town Line Rd., Clay Banks Twp., $3,000, West Jacksonport Rd., Jacksonport Twp., $3,400; macadam surface Sister Bay and Ephraim Rds., Liberty Grove Twp., $5,740, Idlewild Rd., Nassawaupee Twp., $3,000, Idlewild Rd., Gibraltar Twp., $3,000, Baileys Harbor Rd., Sturgeon Bay Twp., $599, Baileys Harbor Rd., Ephraim Village, $1,000. J. M. Laurie, Sturgeon Bay, comr.

Wis., Washburn—Bayfield Co. plans to clay and sand surface road, Iron River Twp., $6,000; grade and surface road, Orienta Twp., $1,500; grade, surface and drain road, Port Wing Twp., $1,500; grade and drain roads, Tripp Twp., $2,400; surface road, Mason Twp., $300, Keystone Twp., $2,200; build Sioux River Bridge, $6,027 and fill dead water channel, $2,000. J. Friberg, Washburn, comr.

Wis., Waupaca—Waupaca Co. plans to grade and gravel surface Clintonville-Marion Trunk Rd., Larrabee Twp., $6,698, Clintonville-Marion State Trunk Rd., Dupont Twp., $5,000, Iola Symco Rd., Iola Twp., $5,000, Iola Symco Rd., Helvetia Twp., $5,000, Waupaca-Marion Rd., St. Lawrence Twp., $4,000, County Trunk Rd. 5, Matteson Twp., $5,000, County Trunk Rd. 5, Dupont Twp., $2,250, County Trunk Rd. 5, Wyoming Twp., $2,750 and County Trunk Rd. 2, Lind Twp., $2,000. C. J. Knudson, Clintonville, comr.

Minn., Aitkin—Aitkin Co. plans to grade and gravel 27 mi. road across county through Aitkin to McGregor, 24 ft. wide. About $162,000. F. J. O'Hara, Aitkin, engr.

Minn., Albert Lea—Freeborn Co. plans to grade and gravel 18 mi. State Rd. 2 from here, north to county line, 24 ft. wide. About $108,000. E. V. H. Brown, Albert Lea, engr.

Minn., Anoka—Anoka Co. plans to grade and gravel 26 mi. road from Minneapolis to northern county line, 24 ft. wide. About $153,000. H. H. Thurston, Anoka, engr.

Minn., Bemidji—Beltrami Co. plans to grade 22 mi. road north from Wilton, cost, $110,000, 22 mi. road north from Washkish, $110,000, also grade and gravel 30 mi. road south and east through Bemijdi. $180,000; all 24 ft. wide. J. C. Burke, Bemidji, engr.

Minn., Bemidji—Beltrami Co. plans to gravel 5 mi. road from here to Puposky, 24 ft. wide. About $25,000. J. C. Burke, Bemidji, engr.

Minn., Benson—Swift Co. plans to grade and gravel 5 mi. road from Benson to Clontarf, 24 ft. wide, cost $30,000; also 5 mi. road from Appleton south to county line, 24 ft. wide, $30,000. L. R. Johnson, Benson, engr.

Minn., Breckenridge—Wilkin Co. plans to grade 4 mi. road north and south from Nashua, 24 ft. wide, cost $20,000; also 19 mi. State Rd. 2, 24 ft. wide, $95,000. J. F. O'Meara, Breckenridge, engr.

Minn., Detroit—Becker Co. plans to grade and gravel 9 mi. road from Detroit to Calloway, 24 ft. wide. About $54,000. H. W. Teague, Detroit, engr.

Minn., Duluth—City soon lets contract paving and building storm sewers in 1.25 mi. 8th St. from 40th Ave. W. to Elinor St., 18 and 24 ft. wide, involving 13,886 sq.yd. concrete, 4,260 lin.ft. concrete curbing, 1,020 lin.ft. concrete header, 1,000 lin.ft. concrete sidewalk, 8,725 cu.yd. earth and 180 cu.yd. rock excav., 7,200 ft. 3 in. drain tile, 5,482 ft. 12-26 in. sewer pipe, 180 ft. 26 in. and 100 ft. 30 in concrete pipe. About $82,000. E. K. Coe, city engr.

Minn., Faribault—Rice Co. plans to grade and gravel 12.2 mi. road from Lonsdale toward Faribault, 24 ft. wide, cost $72,000; also 7 mi. State Rd. 6, from intersection of State Rd. 9 east to Richland, 24 ft. wide, $42,000. W. P. Chapman, Faribault, engr.

Minn., Gaylord — F. Hoppenstedt, aud. Sibley Co., rejected bids received Dec. 23, building 1 mi. State Rds. 6 and 8, Federal Aid. Project 116, involving 68,000 cu.yd. excav., 2,000 cu.yd. riprap, 1,755 cu.yd. gravel surfacing and 130 ft. 25 and 30 in. portable culvert pipe. About $20,000. Work may be advertised.

Minn., Hastings—Dakota Co. plans to grade and gravel 15 mi. road from South St Paul to Hastings, 24 ft. wide. About $90,000. C. L. Methven, Hastings, engr.

Minn., International Falls—Koochihing Co. plans to grade and gravel 12 mi. road south of here, 24 ft. wide. About $72,000. L. A. Ogard, International Falls, engr.

Minn., Madison—Lac Qui Parle Co. plans to grade and gravel 23½ mi. road south and east from Marietta, 24 ft. wide. About $141,000. F. Foe, Madison, engr.

Minn., Madison—Lac Qui Parle Co. plans to grade and gravel 8 mi. road east from here, 24 ft. wide. About $48,000. F. Foe, Madison, engr.

Minn., Mankato—Blue Earth Co. plans to grade 22 mi. Mankato-Mapleton and Minnesota Lake Rd., 24 ft. wide. About $110,000. N. Moe, Mankato, engr.

Minn., Moorhead—Clay Co. plans to grade 27 mi. road from Moorhead east to county line, 24 ft. wide. About $135,000. P. F. Stary, Moorhead, engr.

Minn., Preston—Fillmore Co. plans to grade 8.3 mi. Federal Aid Project 39, southeasterly from Preston, 24 ft. wide. About $41,000. W. Dunbar, Preston, engr.

Minn., Red Lake Falls—Red Lake Co. plans to grade and gravel 27 mi. State Rd. 1, from here to Oklee and south to Polk Co. line, 24 ft. wide. About $162,000. O. Lind, Red Lake Falls, engr.

Minn., Red Lake Falts—Red Lake Co. plans to grade and gravel 5 mi. State Rd. 6, 24 ft. wide. About $30,000. O. Lind, Red Lake Falls, engr.

Minn., Red Wing—Goodhue Co. plans to build 10 mi. State Rd. 2, west toward Cannon Falls, 24 ft. wide. About $60,000. J. A. Prior, Red Wing, engr.

Minn., Roseau—Roseau Co. plans to grade and gravel 13 mi. road from Warroad to Roosevelt, 24 ft. wide. About $78,000. V. B. Chapin, Roseau, engr.

Minn., Walker—Cass Co. plans to grade and gravel 30 mi. road from Walker to Remer, 24 ft. wide. About $180,000. A. W. Moulster, Pine River, engr.

Minn., Wheaton—Traverse Co. plans to grade and gravel 15 mi. road from Wheaton south to county line, 24 ft. wide, cost $80,000; 15 mi. road from Brown Vallley east, 24 ft. wide, $80,000. H. Hanson, Wheaton, engr.

N. D., Devil's Lake—City Council plans to hard surface various streets in business section. About $100,000. M. J. Cowley, aud.

Mont., Plentywood—Sheridan Co. election April 23 to vote on $200,000 bonds to build roads. C. E. Coryell, Plentywood, engr.

Tex., Eastland — Eastland Co. voted $4,500,000 bonds and having surveys made building 210 mi. highways, 18 ft. wide, involving 295,600 sq.yd concrete, 1,320,000 sq.yd. bituminous macadam and 190,000 cu.yd. gravel, also 40 mi. sand clay or graded road. Noted Aug. 14.

Tex., Hondo—Medina Co. voted $800,000 bonds to build highways and laterals. C. M. Marett, Hondo, engr.

Tex., Longview—Gregg Co. voted $100,000 bonds to improve roads. E. W. Davis, Longview, engr.

Tex., Lubbock—City voted $100,000 bonds to pave various streets.

Utah, Richfield—City retained Hiddleston & Fiero, engrs., Kearns Bldg., Salt Lake City, to prepare plans for paving 2.5 mi. principal streets, 18-95 ft. wide. About $130,000.

Ariz., Phoenix—City having plans prepared paving Willetta, Lynwood and Grant Sts. L. B. Hitchcock, city engr.

Washington — State Highway Dept., Olympia, plans to build 14 mi. Washtucna-Lyons Ferry Rd., Columbia Co. The Commercial Club, Starbuck, is promoting project. About $1,400 has been raised by popular subscription for surveying and locating of road.

Streets and Roads (Continued)

Wash., Grandview—City having preliminary plans and specifications prepared for 1.25 mi. pavement. Cost between $60,000 and $80,000. F. H. Langford, c/o Langford Eng. Co., Sunnyside, engr.

Wash., Vancouver—City plans to grade and build concrete sidewalks and curbs on Railroad Ave., cost, $20,621; with wood cross walks and concrete crossings, $22,282. Former bids rejected. R. E. Brady, city clk.

Wash., Walla Walla—City voted $80,000 bonds to grade, pave and build culverts on various streets and suburban roads. T. G. Willis, clk.

Cal., Dixon—City Trustees soon let contract paving 23 blocks of streets with Warrenite and installing electroliers on main street. C. E. Sloan, engr.

Cal., Holtville—City plans to pave 15 blocks in residential section, 16, 20 and 30 ft. wide, bituminous base and bitulithic surface. H. Burk, El Centro, engr.

Cal., Los Angeles—Bd. Supervs. Los Angeles Co. rejected bids received Nov. 24, paving 2.05 mi. North Pomona Blvd., Rd. Impvt. Dist. 146.

Cal., Modesto—City having plans prepared for paving various streets (exclusive of work to be done under $100,000 bond issue). About $200,000. G. H. Freitas, city engr.

Cal., Oroville—Butte Co. voted $1,800,000 bonds to pave 196 mi. of roads.

Cal., Pasadena—City Comrs. plan to pave 1 mi. Colorado St., from Wilson to Marengo Aves., 60 ft. wide, concrete and asphalt. R. V. Orbison, city engr.

Cal., Pomona—City voted $198,000 bonds as its share towards paving 12 mi. streets, concrete base with oil and screenings surface. Total cost $396,000. Balance will be paid through assessments. C. E. Bayley, city engr.

Cal., San Diego—Bd. Supervs. San Diego Co. retained R. M. Morton, engr., Sacramento, to take charge of building 135 mi. highway, mostly 6 in. concrete. Bond for $2,300,000 voted for project. J. B. McLees, clk.

Cal., San Francisco—City plans to improve 900 ft. Appleton Ave. between Holly Park Circle and Mission St., involving 1,795 lin.ft. concrete curbing, 330 sq.ft. artificial stone sidewalks, 1,046 sq.yd. vertical fibre, 2,674 sq.yd. asphalt, 110 lin.ft. 10 in. vitr., salt glazed, iron stone pipe culvert, etc. About $12,825. M. M. O'Shaughnessy, city engr.

Cal., San Luis Obispo—Bd. Supervs. San Luis Obispo Co. having preliminary plans prepared paving with macadam various streets in Pismo, also improving road from Arroyo Grande Valley Rd. south through Berros to state highway. About $10,000. W. Burch, co. engr.

Cal., San Luis Obispo—Bd. Supervs. San Luis Obispo having preliminary plans prepared grading and graveling road from state highway, here, to Sand Hills School, Los Osos. About $20,000. J. H. Bradhoff, superv.

Cal., San Luis Obispo—San Luis Obispo Co. plans to build 8.5 mi. road from Nipoma to Guadalupe Bridge, crushed rock with oil macadam surface. About $69,700. W. Burch, co. engr.

Cal., San Luis Obispo—San Luis Obispo Co. having preliminary plans prepared grading and graveling 15 mi. road between Creston and Paso Robles, via golf links, 18 to 24 ft. wide. About $15,000. W. Burch, co. engr.

Cal., Vallejo—City plans election to vote on $250,000 bonds to grade and pave streets. T. D. Kilkenny, city engr.

Ont., Toronto—See "Miscellaneous."

BIDS DESIRED

N. J., Freehold—Until Jan. 21, by Bd. Freeholders Monmouth Co. rebuilding Rumson Rd., Sects. 1A and 1B, Shrewsbury, Twp., Ameisite, Warrenite, Topeka or sheet asphalt, involving 11,942 sq.yd. pavement and 2,127 cu.yd. concrete foundation. C. E. Close, clk.; advertised in this issue.

Pennsylvania—Until Jan. 27, by L. S. Sadler, state highway comr., Harrisburg, repaving in counties as follows:

Armstrong Co., 10,610 lin.ft. rein.con.
Beaver Co., 3,055 ft. vitr. brick.
Butler Co., 46,966 ft. rein.-con.
Cambria Co., 24,207 ft. rein.-con.
Carbon Co., 23,420 ft. rein.-con.
Clearfield Co., 13,027 ft. rein.-con. and Hillside vitr. brick, also 7,291 ft. rein.-con.
Crawford Co., 18,514 ft. rein.-con., also 18,619 ft. 1 course rein.-con. and Hillside vitr. brick or 2 course rein.-con. and Hillside vitr. brick.
Dauphin and Perry Counties, 41,753 ft. bituminous surface course on concrete foundation or rein.-con.
Fayette Co., 5,467 ft. rein.-con., also 14,496 ft. rein.-con. and Hillside vitr. brick.
Greene Co., 23,201 ft. rein.-con.
McKean Co., 14,800 ft. rein.-con.
Northampton Co., 20,164 ft. rein.-con.
Potter Co., 12,925 ft. bituminous surface course on concrete foundation or rein.-con.
Schuylkill Co., 39,500 ft. rein.-con. and Hillside vitr. brick.
Venango Co., 3,419 ft. rein.-con.
Warren Co., 22,287 ft. rein.-con. and Hillside vitr. brick, also 54,577 ft. rein.-con.
Westmoreland Co., 79,664 ft. rein.-con. and Hillside vitr. brick; advertised in this issue.

Ga., Dallas—Until Jan. 22, by Comrs. Paulding Co., building 9.5 mi. road, Federal Aid Project No. 28, involving 60,993 yd. excav. and 1,281 yd. rock. About $175,000. J. B. McCrary Co., south of Ft. McPherson St., Atlanta, engrs.

Ga., Washington—Until Jan. 20, by Comrs. Wilkes Co., paving and draining 5.236 mi. Athens and Augusta Highway, Federal Aid Project No. 92, involving 49,152 sq.yd. pavement, etc. Jandon Eng. Co., Elberton, engrs.

Florida—Until Jan. 14, by State Road Dept., Tallahassee, draining, grading and hard surfacing 54.2 mi. State Road 1, beginning at end of brick road in Duval Co. and extending west through Duval, Nassau, Baker and Columbia Counties. C. A. Browne, engr.; advertised in this issue.

Fla., Jacksonville—Until Jan. 12, by Comrs. Duval Co., repaving Orange Park Rd. from Clay Co. line to a point approximately 2 mi., running north. L. L. Meggs, chairman.

Ala., Montgomery—Until Feb. 24, by J. L. Cobbs, city treas., paving Catoma St., from Bell to Bibb Sts., brick, asphalt, bitulithic, mineral rubber, wood block, concrete, vibrolithic concrete or asphaltic concrete; advertised in this issue.

Ala., Montgomery — Until Jan. 27, by J. L. Cobbs, city treas., paving with gravel, building granite curbing, brick gutters, brick retaining wall, catch basins, storm sewers, etc., on Early St. from Court to Billings Sts., also paving sidewalk on south side of street, Schillinger or hexagon block pavement. H. A. Washington, city engr.; advertised in this issue.

Ohio—Until Jan. 23, by State Highway Comm., Columbus, building roads in the following counties:

Adams Co., Sect. "R" Cincinnati-West Union Rd., 6.255 mi. grading, constructing bridges and culverts and paving with waterbound macadam, cost, $125,100.
Cuyahoga Co., Sect. "Bedford" Akron-Cleveland Rd., .61 mi., grading and paving with brick, $50,988.
Erie Co., Sect. "A" Lima-Sandusky Rd., 3.051 mi., grading, constructing bridges and culverts and paving with concrete, $108,070.
Franklin Co., Sect. "Q-2" Columbus-Sandusky Rd., 1.02 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $30,769.
Hardin Co., Sect. "E" Findlay-Kenton Rd., 2.08 mi., grading, constructing bridges and culverts and paving with asphaltic concrete, $70,437.
Henry Co., Sect. "D-1" Bryan Napoleon Rd., .903 mi. grading, constructing bridges and culverts and paving with rein.-con. and waterbound macadam, $29,486.
Sect. "C" Bryan-Napoleon Rd., 2.396 mi., grading, constructing bridges and culverts and paving with rein.-con. and waterbound macadam, $62,117.
Huron Co., Sect. "L" Norwalk-Plymouth Rd., 2.58 mi., grading, constructing bridges and culverts and paving with concrete, $52,136.
Lorain Co., Sect. "S" Oberlin-Norwalk Rd., .75 mi., grading, constructing bridges and culverts and paving with brick or concrete, $31,124.
Mahoning Co., Sect. "Y" Canfield-Poland Rd., 1.88 mi., constructing bridges and culverts and paving with waterbound macadam, $39,485.
Perry Co., Sect. "P" Logan, New Lexington Rd., .10 mi., grading and paving with monolithic brick, $7,513.
Portage Co., Sects. "T, U, V and W" Ravenna-Warren Rd., 8.483 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $217.814.
Trumbull Co., Sect. "H" Niles-Ashtabula Rd., 5.14 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $150,957.

—Sect. "K" Niles-Ashtabula Rd., 5.69 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $92,679.

O., Cleveland—Until Jan. 14, by Comrs. Cuyahoga Co., building Drake Rd. from Wooster Pike to Hunt Rd., involving 16,000 sq.yd. waterbound macadam on 5 in. concrete base and 4,000 cu.yd. earth excav. About $37,849. W. A. Stinchcomb, co. engr.

Indiana—By Bd. Co. Comrs., building roads in following counties:

Jan. 15, Gibson Co., Princeton, 15,733 ft. stone and gravel road, Montgomery Twp., known as J. Emerson Rd.; road in Johnson Twp., known as D. Busing Rd.; Columbia Twp., known as J. Rheuff Rd.; Union Twp., known as N. P. Wirth Rd.; Montgomery Twp., known as J. F. M. Montgomery Rd.; 5,994 ft., Montgomery Twp., known as H. Armstrong Rd.; 15,774 ft. Montgomery Twp., known as E. Burkett Rd., J. H. Armstrong, aud.

Jan. 17, by Vigo Co., Terre Haute, 2 roads known as H. J. Foulkes et al Rd. and Leroy Chirsty et al Rd. T. Ferguson, aud.

Jan. 19, St. Joseph Co., South Bend, concrete and gravel road, Liberty Twp., known as W. F. Newcomer et al Rd.; 2 roads in Penn Twp., known as D. Schrock et al Rd. and Lemon Sheets et al Rd.; 2 roads in Harris Twp., known as C. N. Longley et al Rd. and C. Lerner et al Rd.; road in Union Twp., known as E. Hawblitzel et al Rd.; 2 concrete, asphalt, macadam and gravel roads, Olive Twp., known as South X Rd. and North X Rd.; concrete, asphalt, macadam and gravel road, Penn Twp., known as Ear Trail Rd. A. F. Wolf, aud.

Feb. 4, Whiteley Co., Columbia City, 13,078 ft. gravel road between Nobel and Whiteley Counties, known as D. M. Pence et al Rd. and 13,058 ft., known as G. Fry, Bert Weeks et al Rd. W. K. Burwell, aud.

Mich., Hudson—Until Jan. 30, by E. R. West, city clk., paving Market St. from Railroad to Mechanic Sts., Railroad St. from Market St. to west line of R. J. Peterson Greenhouse lot, and Lane St. from Main St. to south rail of New York Central R.R. Work involves 5,070 cu.yd. grading, 370 lin.ft. 8-10 in. pipe sewer, 5,943 lin. ft. 4 in. drain tile, 9,430 sq.yd. asphalt or brick pavement, 5,593 lin. ft. straight, 850 lin.ft. circular and 365 lin.ft. marginal curb.

Minn., St. Paul—Until Feb. 2, by G. Ries, aud. Ramsey Co., grading, claying and graveling 3 mi. Crosby Rd. between Edgerton and McMenemy, Bellaire Ave. between Lake Johanna and White Bear Lake, Bald Eagle Blvd. from end of present improvement to Hugo Rd., Lake Owasso Blvd. between Rice and Dale Sts., 24 ft. wide. About $20,000. R. R. Godfrey, co. surv.

Minn., St. Paul—Until Feb. 2, by G. Ries, aud. Ramsey Co., paving ½ mi. Long Lake Rd., 24 ft. wide, concrete. About $24,000. R. B. Godfrey, co. surv.

Minn., Warren—Until Jan. 20, by J. R. Naeseth, clk., paving 20 blocks, involving 31,000 sq.yd., either rein.-con., Class "A" asphaltic concrete, Class "B" asphalt or creosoted wood block; alternate bids on crushed stone or screened or pit gravel and separate and integral curbs. About $100,000. L. P. Wolff, 1000 Guardian Life Bldg., St. Paul, engr.

Tex., Snyder—Until Jan. 12, by W. S. Adamson, judge Scurry Co., improving and building rein.-con. drainage structures on 21.52 mi. Highway 7, from here to Nolan Co. line, 12 ft. wide, (11.15 mi. to be gravel surfaced). Work involves 13.5 acres clearing and grubbing, 143,112 cu.yd. unclassified earth excav., 28,816 lb. reinforcing steel, 265.9 cu.yd. Class A and 325.7 cu.yd. Class B concrete, etc. About $92,301. H. E. Elrod Co., Interurban Bldg., Dallas, engrs.

Tex., Wichita Falls—Until Jan 22, by M. M. Murphy, aud. Wichita Co., surfacing 8.78 mi. Highway 2, from 7 mi. north of here, southeast to Clay Co. line, 18 ft. wide, involving 64,425 sq.yd. 1 course concrete 8.1 in. deep and 28,914 sq.yd. 7.1 in. deep. About $412,966. J. M. Isbell, Wichita Falls, engr. Noted Aug. 21.

Okla., Eufaula—City receiving bids paving 5 blocks Main St., Dist. 2, 25 ft. wide, concrete. About $36,000. Hughes Eng. Co., 310 Bank of Commerce Bldg., Tulsa, engrs.

Streets and Roads (Continued)

Cal., Oakland—Until Jan. 15, by city, improving 3,200 ft. Porter and Suter Sts., between 35th and 38th Aves., Octavia and Abbey Sts. between Porter and Suter Sts., and Loma Vista Ave., between Porter and Quigley Sts., 40 ft. wide involving 6,377 lin.ft. concrete curbing, 13,120 sq.ft. concrete gutters, 32 099 sq.ft. concrete sidewalks, 6,188 cu.yd. earth excav., 8,699 sq.yd. oil macadam, 106 cu.ft. end walls, etc. About $29,000. City Council rescinded contract let to Hutchinson Co.

Cal., San Francisco—Until Jan. 14. by city, improving 1901 ft. Great Highway between Balboa and Fulton Sts., 45 ft. wide, involving 1,734 lin.ft. concrete curbing, 1,724 lin.ft. concrete guttering, 2,010 cu.yd earth excav., 9,662 sq.yd. asphaltic concrete, etc. About $30,000. M. M. O'Shaughnessy, city engr.

Cal., Santa Barbara—Until Jan. 15, by S. B. Taggart, city clk., grading and paving Micheltorena St. between Bath and San Andreas Sts., Warrenite surface on 4 in. concrete base, cement and concrete curbs, gutters, walks, etc. About $17,000.

Cal., Ventura—Until Jan. 20, by Bd. Supervs. Ventura Co. improving 8 mi. road between Ojai and Santa Paula, involving 86,000 cu.yd. excav. and 4,200 cu.yd. concrete paving and culverts, also 29,000 sq.ft. 4 in. asphalt pavement in Ojai Twp. L. E. Hallowell, co. clk.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. Y., Brooklyn—Dept. Parks, Municipal Bldg., New York City, let contract furnishing all labor and material for improving East Drive, Prospect Park between main entrance of park and Ocean Ave. entrance, to Brooklyn Alcatraz Asphalt Co., 407 Hamburg Ave., $127,044. Noted Jan. 1.

★N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., let contract regulating and grading Woodside Ave., 4th and 50th Sts., to Welsh Bros., 14 Queens St., Astoria, $4,616, $14,315 and $13,329 respectively; 91st St. and 182nd Pl., to R. A. Hess, Inc., $18,336 and $1,395 respectively; Gunther St., to Annarock Eng. & Constr. Co., $32,009. Noted Jan. 1.

★N. Y., New York—M. F. Loughman, pres. Manhattan Boro., let contract paving in and between tracks roadway of Lexington Ave. from 53rd to 59th Sts., wood block on concrete foundation. to Asphalt Constr. Co., 2197 Madison Ave., $83,178.

★North Carolina—State Highway Comn., Greensboro, let contract top-soiling 6 mi. road, Forsyth Co., to C. B. Hester, Greensboro, $34,700.

★N. C., Greenville—Pitt Co. will pave 14 mi. road from Greenville to Farmville, 16 ft. wide, brick, sheet asphalt or concrete. About $400,000. Work will be done by day labor.

★Ga., Macon—Comrs. Bibb Co. let contract building 6⅜ mi. Dixie Highway between here and Jacksonville, involving 62,083 sq.yd. Kentucky asphalt or 69,844 sq.yd. concrete, to W. Z. Williams Constr. Co., Caswell Bldg.

★Fla., Bradentown—Comrs. Manatee Co. let contract grading 9.25 mi. road from Venice to Manasota, involving 34,000 cu.yd. earthwork, 66 cu.yd. concrete in culverts, and two 40-ft. bridges, to Stony & Ross, Fruitville. About $50,000.

★Miss., Indianola—Comrs. Sunflower Co. let contract building 53 mi. concrete and gravel road, 12 ft. wide, in Beat No. 5, to Healy Constr. Co., Meridian. About $400,000.

★Michigan—State Highway Dept., Lansing, let contract grading, draining and surfacing 1 mi. State Trunk Line Rd. 19-6, 16 ft. wide, Huron Co., involving 9,383 sq.yd. gravel and 1,789 cu.yd. earth excav., to Heron & McKenzie, Pigeon, $14,019; 8.068 mi. State Trunk Line Rd. 10-3, 16 ft. wide, Arenac Co., 36,336 cu.yd. earth excav., 75,728 sq.yd. gravel, 294 cu.yd concrete, etc., to McDonald & Hagley, Omer, $112,976; 2.935 mi. State Trunk Line Rd. 10-6, 16 ft. wide, Presque Isle Co., 13,833 cu.yd. earth excav., 40,825 yd. of overhaul, 27,550 sq.yd. gravel, 121 cu.yd. concrete and 2,187 lb. steel, to E. McLure, Onaway, $51,539.

★Mich., Gladwin—Comrs. Gladwin Co. and State Highway Dept., Lansing, let contract improving 6.143 mi. State Trunk Line Rd. 30-3, 16 ft. wide, involving 25,085 cu.yd. earth excav., 60,486 sq.yd. gravel surface, 30,020 sq.yd. stone gravel surface, 320 cu.yd. concrete and 7,266 lb. reinforcement, to Beaverton Constr. Co., Beaverton, $98,360.

★Ia., Odebolt—City let contract to Western Paving Corp., Sioux City, paving Main St., involving 120,00 yd. sheet asphalt, @ $3.56 per yd. and 9,000 yd. concrete, @ $3.65 per yd.

★Minn., Alexandria — City Council let contract paving various streets, 18 ft. wide, involving 32,800 sq.yd. 6 in. bitulithic, to Genl. Constr. Co., 1254 Plymouth Bldg., Minneapolis, cost $3.95 per sq.yd. Total cost, $145,756.

★Minn., Shakopee—T. H. Walsh, aud. Scott Co., let contract building Job 1902, State Rd. 9, involving (a) 65,000 cu.yd. excav., (b) [illegible].200 cu.yd. gravel surfacing, to T. J. Fredericks, Rodgers & Curtiss Co., 715 Globe Bldg., Minneapolis, (a) $.33 per cu.yd., (b) $2.50 per cu.yd.

★Kan., Wellington—Sumner Co. let contracts to Dubois Constr. Co., Wichita, grading and draining 8.55 mi. Meridian Highway, Federal Aid Project 2, (Sects. A and B), 18 ft. wide, concrete, also building necessary bridges and culverts on same, involving 81,072 cu.yd. earth excav., 90,131 sq.yd. concrete, 528 cu.yd. rein.-con., 34 ton reinforcing steel, etc., $199,446 and $165.648 respectively; 0.832 mi. Rome Rd. Sect. X, County Project, 18 ft. wide, concrete, and building bridges and culverts on same, involving 3,075 cu.yd. earth excav., 9,149 sq.yd. concrete, 68 cu.yd. rein.-con., 2 ton steel, etc., $37,992.

★N. D., Jamestown — City let contract hard surfacing streets in business section, to F. Burke & Son, Fargo. About $270,000.

★Ark., Osceola—Dirs. Rd. Impvt. Dist. No. 1, let contract to Lawrence Bros., Falls Bldg., Memphis, Tenn., for 30 acres clearing and grubbing, $125 per acre, 15 acres grubbing, $100 per acre and 9,270 rods fence, etc., $0.42 per cu.yd. This contract let in connection with 45 mi. road improvement in Dist. No. 1. All other bids for excav., bridges, abutments, etc., rejected.

Tex., Fredericksburg—A. H. Kneese, judge Gillespie Co. received bids Dec 9, building 17.61 mi. Highway 9, from here to Mason Co. line, 16 ft. wide, from W. T. Montgomery, Alamo Bank Bldg., San Antonio, $147,463; drainage structures on same, from W. E. Dozier, Dam Blvd., Austin, $28,490, Williamson & Metcalfe, Austin Natl. Bank Bldg., Austin, $31,705. Work involves 64.26 acres clearing and grubbing, 15,483 cu.yd. gravel, 67,145 cu.yd. unclassified earth and 7,538 cu.yd. rock excav., 23,458 lb. reinforcing steel, 189.8 cu.yd. Class A, 42 cu.yd. Class B and 207 cu.yd. Class A A concrete, etc.

★Tex., San Angelo—Tom Green Co. let contracts grading 26.54 mi. Highway 4, from here to Schleicher Co. line, 16 ft. wide, involving 56.32 acres clearing and grubbing, 49,510 cu.yd. earth, 3,378 cu.yd. rock and 59,811 cu.yd. borrow excav., to W. A. Martin, San Angelo, $35,156; building necessary rein.-con. drainage structures, involving 1,936 sq.yd. concrete, etc., to McCall-Moore Eng. Co., 308-9 Amicable Bldg., Waco, $62,392.

★Idaho, Idaho Falls—City let contract for 53,500 sq.yd. bitulithic pavement, to J. C. Maguire, 615 Daly Bank Bldg., Butte, Mont., $177,119.

Ore., Portland—City Council received bids paving (a) 44th St. from Hawthorne to East Lincoln Sts., (b) Ellis Ave. from Milwaukee St. to point 100 ft. east of east line of East 22nd St., (c) East Washington St. et al, (d) Jersey St. from Baltimore to Richmond Sts., (e) Webster St. et al, (f) Church St. from East 9th St. to Union Aves., (g) Prescott St. from Concord St. to Block 6, Multnomah, (h) portions of 21st St., (i) East 12th St from south line of East Market St. to south line of Hawthorne Ave., (j) East 39th St. from Woodstock to Henry Aves., (k) Jessup St. from Interstate Ave. to Campbell St., (l) East 27th St. from Holladay Ave. to Sandy Blvd., (m) East Kelly St. from 36th to 39th Sts., (n) East 47th St. et al, (o) Tacoma Ave. from East 15th to East 17th Sts., (p) East 16th St. from Nehalem to Spokane Aves., (q) East 70th St. from Siskiyou St to Sandy Blvd., (r) 71st St. S.E. from 45th Ave. S.E. to Foster Rd., (s) East 57th St. from Sacramento St. to Sandy Blvd., (t) 21st St. from south to north lines of Clinton St., (u) Montana Ave. from Emerson St. to Killingsworth Ave., (1) asphaltic concrete No. 1, 2 in. thick in roadway, (2) concrete No. 3 in track, (3) asphaltic concrete No 1, (4) concrete No. 3, (5) asphaltic concrete No. 1, 2 in. top, (6) asphaltic concrete No 1, in roadway redress, (7) vitr. brick in track, (8) asphaltic concrete No. 1, (9) asphaltic concrete No. 1, redress, (10) concrete No. 1, redress, (11) asphaltic concrete No. 1, in center, 16 ft., (12) concrete No. 1, in roadway, 2 in. top, (13) concrete No. 3, in roadway, (14) asphaltic concrete No. 1, in roadway, (15) vitr. brick block in track, (16) concrete No. 1 redress in roadway, from Warren Constr. Co., Journal Bldg, (a1) $1.56 per sq.yd., (a2) $1.75 per sq.yd., total, $14,934, (b3) $1.46 per sq.yd., $13,924, (c5) $26,676, (d6) $1.77 per sq.yd., (d7) $7 per sq.yd., $12,548, (e8) $1.43 per sq.yd., $41,118, (f8) $1.47 per sq. yd., $10,502, (g3) $10,465, (h9) $1.60 per sq.yd., $706, (i7) $5.42 per sq.yd., (i10) $1.40 per sq.yd., $9,059, (j11) $1.51 per sq.yd., (j9) $1.70 per sq.yd., $6,090, (k5) $1.49 per sq.yd., $7,888, (l8) $1.36 per sq.yd., $3,106, (m3) $1.45 per sq.yd., $7,478, (n3) $1.43 per sq.yd., $3,596, (o14) $1.31 per sq. yd., $10,768, (p1) $1.49 per sq.yd., $2,000, (q3) $1.61 per sq.yd., $6,153, (r3) $1.57 per sq.yd., $7,132, (s5) $1.49 per sq. yd., (s4) $2.30 per sq.yd., $6,446, (t15) $5.50 per sq. yd., (t16) $2 per sq.yd., $1,933, (u12) $1.44 per sq.yd., $5,607.

United Contg. Co., Northwest Bank Bldg., (c4) $2.20 per sq.yd., $28,898, (e4) $2.22 per sq.yd., $43,152, (g4) $2/40 per sq.yd., $11,247, (k4) $2.32 per sq.yd., $8,049, (m4) $2.36 per sq.yd., $8,228, (u13) $2.30 per sq. yd., $5,625.

Cochran Bros., Portland, (f4) $1.25 per sq.yd., $10,413.

S. Simonsen, 841 East 10th St., N., (f4) $2.25 per sq.yd., $10,421, (k4) $2.25 per sq. yd., $7,849, (u13) $2.25 per sq.yd., $5,479.

Municipal Paving Plant, Portland, (o5) $1.10 per sq.yd., $8,332, (p3) $1.15 per sq. yd., $1,720.

Hahn & Rebman, Portland, (g4) $2.20 per sq.yd., $9,968.

★California—State Highway Comn., 515 Forum Bldg., Sacramento, let contract building 13.8 mi. road between Casbere Ranch and Tecate Divide, Div. 7, Route 12, Sect. F, San Diego Co., to Wright & Doran, San Diego; 6.6 mi. between Pine Valley and Casbere Ranch, Div. 7, Route 12, Sect. E, San Diego Co., to M. D. Goodbody, Amer. Bldg., San Diego; 4 mi. between Cushion Creek and Crescent City, Div. 1, Route 1, Sect. B, Del Norte Co., to Palmer & McBryde, Hooker-Lent Bldg., San Francisco.

★Cal., Bakersfield—Bd. Supervs. Kern Co. let contract improving 10.683 mi. road from Fellows to McKittrick, 15 ft. wide, involving 29,231 cu.yd. excav., 56,409 lin. ft. shaping roadbed, 1,029,209 sq.ft. 6 in. concrete paving, 258.5 ft. 12-18 in. corrugated iron culverts, 91 cu.yd. concrete end and retaining walls and 2,187 lb. rein.-con. steel, to Rogers Bros. Co., 350 Merrick St., Los Angeles. About $369,000.

★Cal., Brawley—City let contract paving portions Main and 8th Sts., involving 316,000 sq.ft. 6 and 7 in. concrete, to D. M. Ryan, San Diego, $128,377. Noted April 10.

★Cal., Long Beach—City let contract to Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, improving Magnolia Ave., involving 112,911 sq.ft. 2 in. asphaltic surface on 4 in. concrete base, 165 sq.ft. cement concrete gutters, 2,448 sq.ft. cement concrete sidewalks, etc., $27,958, Olive and Alaminto Aves., 214,497 sq.ft. 5 in. concrete, 910 lin.ft. cement concrete curbs, 1,166 sq.ft. cement concrete sidewalks, 776 lin.ft. 6 in. sewer, etc., $50,297; to G. H. Gaskill, Long Beach, 4th St., involving 23,833 sq.ft. 5 in. concrete, 910 lin.ft. cement concrete curbs, 5,831 sq.ft. cement concrete sidewalks and 776 lin.ft. 8 in. vitr. clay pipe sewer, $43,055.

★Cal., Los Angeles—Bd. Supervs. Los Angeles Co. rejected bids improving 5.62 mi. Saugus-Ventura Rd., Impvt. Dist. 5, 18 ft. wide, involving 53,500 cu.yd. earth excav., 59,440 sq.yd. concrete on 5 in. base, 29,270 lin. ft. shaping roadbed, 43 cu.yd. concrete culverts, 1,800 lbs. reinforcing steel, 357 ft. 18-36 in. corrugated iron pipe, 2 small pile bridges, etc About $120,000. Work will be done by day labor under supervision of Road Dept.

Cal., Los Angeles—Bd. Pub. Wks. received bids paving and building sewers in Temple St. Impvt. Dist., from G. R. Curtis, 2440 East 26th St., @ $0.05 per sq.ft. grading for Warrenite, $0.35 sq ft. for asphalt paving, including grading, $0.255 sq.ft. Warrenite paving, $0.05 sq.ft. rough grading, $0.05 sq ft. finish grading, oiling and rolling, $0.50 lin.ft. cement curbs, $0.18

Streets and Roads (Continued)

sq.ft. cement sidewalks, $0.26 sq.ft. concrete gutters, $0.26 sq.ft. granite block gutters, $500 for sanitary sewers, $2.50 per ft. for house connection sewers, $16,000 rein.-con. storm drain in Temple St., $1,350 storm drain in Ardmore Ave., $790 for catch basins, total about $139,000; Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., $141,200.

Cal., Los Angeles—Bd. Supervs. Los Angeles Co. received bids building cement curbs and sidewalks on 8.5 mi. of streets in Graham Rd. Impvt. Dist. 151, involving 19,200 cu.yd. excav., 88,450 lin.ft. 5 x 9 x 12 in. curbs and 438,100 sq.ft. 3½ in. walks, from L. D. Gaskill, 236 Hermosa Ave., Long Beach, $114,730; E Schelling, $127,000; C. D. Soteras, Black Bldg., $133,400.

★**Cal., Los Angeles**—City let contract paving Maple Ave., involving 51,312 sq.ft. grading, 1,251 lin.ft. cement curbs, 5,375 sq.ft. concrete gutters, etc., to G. H. Oswald, O. T. Johnson Bldg. About $17,030.

★**Cal., Los Angeles**—E. Firth, 346 South Bway., let contract grading, graveling, oiling and rolling 4 mi. streets, to C. D. Soteras, 802 Block Bldg., $24,747.

★**Cal., San Francisco**—City let contract improving London St. between France and Amazon Aves., involving 2,270 lin.ft. concrete curbing, 17,450 sq.ft. artificial stone sidewalks, 5,428 cu.yd. earth excav., 1,000 sq.yd. vertical fibre, 3,163 sq.yd. asphalt, 212 lin.ft. 10 in. culverts, 579 lin ft. 8-12 in. sewers, storm water inlet, etc, to Flinn & Treacy, 1 Montgomery St., $35,540; Arleta Ave. between Rutland and Delta Sts., involving 1,263 lin.ft. concrete curbing, 267 sq.ft. artificial stone sidewalks, 900 cu.yd. earth excav., 2,700 sq yd. asphalt, 78 lin.ft. brick culverts, etc., to Eaton & Smith, 407 11th St., $11,199.

★**Cal., Santa Monica**—City let contract paving 2nd St., involving 166,409 sq.ft. asphalt, 6,723 lin ft. cement curbs, 31,440 sq.ft. concrete gutters and 30 concrete lighting standards, etc., to J. D. Kneen Contg. Co., Dudley Bldg, $42,347.

Railways

PROPOSED WORK

Pennsylvania—Stegmaler Brewing Co., Market St., Wilkes-Barre, plans to grade and lay tracks from Central R. R. to plant. About $10,000.

BIDS DESIRED

Michigan—Until Jan. 12, by Comr. Pub. Wks. furnishing labor and material for two 400 ft. spur tracks, switch, etc., at garbage plant, foot of 24th St., also constructing 30 x 180 ft., rein.-con. loading platform, concrete foundation. About $10,000. J. Reed, engr

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Michigan**—Water Bd., 232 Jefferson Ave., Detroit, let contract laying 1,700 ft. 80 lb. spur tracks from Detroit Terminal Ry. to storage yards on St. Jean Ave. near Harper Ave. and vicinity Glendale and Buena Vista Aves., to Detroit Terminal Ry., Woodward Ave. About $15,000. Material to be purchased by owners.

Excavation and Dredging

PROPOSED WORK

Ia., Onawa—Drainage—Monona Co. receives bids about Feb. 1, straightening and enlarging 20 mi Little Sioux River, and 125 mi. laterals. About $500,000. C. Moriarty, Sioux City, engr.

Man., Winnipeg — Drainage — Provincial Government, Parliament Bldgs., plans to drain large areas in Southern Manitoba and Red River district. Will probably be open ditch work. Cost to exceed $1,000,000. J. G. Sullivan, McIntyre Bldg., engr.

BIDS DESIRED

N. Y., New York—Excavation—Until Jan. 15, by G. A. Whalen, comr. Plants & Structures, Municipal Bldg., excavating and dredging, at site of Eastchester Bridge.

Ind., Fowler—Ditch—Until Jan. 16, by Don Heaton, drainage comr., constructing Sugar Creek Ditch. Work contemplated under this improvement is excavation with floating dredge of open drainage channel, together with clearing of right of way and improvement of outlets of 2 small tributary open streams and 6 tributary tile drain outlets, length of drain 14.8 mi., size of channel varies from 30 ft. base at outlet to 14 ft. base at upper end, total excav., 718,481 cu.yd.

Ill., Lewistown—Drainage—Until Jan. 27, by Comrs. Seahorn Drainage and Levee Dist. and Kerton Valley Drainage and Levee Dist., Fulton Co., building drainage systems. Work to be let by Seanorn Drainage and Levee Dist. consists of following: Main Ditch, involving 22,000 cu.yd. cleanout, Otter Creek Levee, 30,000 cu yd repairing and enlarging, Seahorn Levees, 9,200 cu.yd. repairing and enlarging, Kerton Creek, 32,000 cu.yd. enlarging and new work; Graybeal tile line, involving 15 ft. 12 in spiral riveted pipe, 2900 ft 8-12 in tile, 2 brick wells, Asbell tile line, one 10 in flap valve, 20 ft. 10 in spiral riveted pipe, 2180 ft. 8-10 in tile, 1 brick well, Markley tile line, 15 ft. 12 in. spiral riveted pipe, 2840 ft. 10-12 in. tile, 2 brick wells; repairing sump pit, intake and walls and floors of building, resetting pumps and engine, constructing transmission line from pump station to line of Central Illinois Pub. Serv. Co., furnishing and installing 30 hp. electric motor complete with switchboard, transformers, control, belting, etc, ready to operate 12 in. centrifugal pump, electric priming device, electric pump for cleaning and filling boiler, also new building for 12 in. pump and motor, and 18 x 22 ft. frame house adjacent to the present pump station operator's house. Work to be let by Kerton Valley Drainage and Levee Dist. consists of following Main ditch, involving 30,000 cu yd. cleanout, Phalen Ditch, 1,300 cu yd. cleanout, Gardner Branch, 8,185 cu. yd cleanout, Otter Levee, 30,591.6 cu.yd. repair and enlarging; new concrete block building, pumping outfit consisting of one 75 hp. electric motor, one 20 in. centrifugal pump and all necessary transformers, switchboard, switches, belting, lights, suction and discharge pipes, sump pit and screen, also 14 x 16 ft. addition to present pump station operator's house; tile line 2, involving 15 ft. 12 in spiral riveted pipe, 8,259 ft. 10-12 in. tile, 3 brick wells, tile line 3, 15 ft. 10 in. spiral riveted pipe, 2650 ft. 8-10 in tile pipe, 1 brick well; 231 cu. yd. rip-rap protection at discharge pipes of pumping plant Work to be done jointly by said districts consists of 4,000 cu.yd. rock excav. from channel of Otter Creek. Commissioners reserve right to let work as a whole or in sections. C. H. Kreiling, Havana, Ill., engr. .

Ia., Des Moines—Drainage—Until Jan. 19, by F. J Alber, aud. Polk Co., building D. D. 26. Work includes widening, straightening and deepening Mud Creek in southeastern section of county, and constructing cut-off comprising 12,000 cu.yd., 150 ft. rock rip rap along Des Moines River, 1 rein.-con. culvert with iron and steel gate and levee comprising 18,700 cu.yd.

Mo., Marshall—Drainage—Until Jan. 17, by V. V. Hoff, atty, Marshall, building 21 mi. drainage ditch, involving 1,721,000 cu.yd. excav., for Salt Fork D. D. C. Potter, secy. Elliott & Harman Eng. Co., 144 Fredonia St., Peoria, Ill., engrs.; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Brooklyn**—Dredging—E. Riegelmann, boro. pres., let contract dredging Gowanus Canal from its head to Hamilton Ave., to New Jersey Shipbuilding & Dredging Co., 50 Broad St., New York City, $26,865. Noted Jan. 1.

★**Mich., Saginaw**—Drainage—Saginaw Co. let contract opening, deepening and widening 6 mi. Marsh Creek Drain, 35 ft. wide, Swan Creek and Freemont Twps., to Williams Constr. Co., Sandusky. About $23,000.

★**Tex., Fredericksburg**—Drainage—Gillespie Co. let contract building rein.-con. drainage structures on 17.61 mi. Highway 9, involving 34,387 lb. reinforcing steel, 409.5 cu.yd. Class A, 25.5 cu.yd. Class B, 207.36 cu.yd. Class AA and 42.05 cu.yd. Class BB concrete, to W. E. Dozier, Dam Blvd., Austin, $20,366.

★**B. C., Matsqui**—Excavation—Comrs. Matsqui D.D. let contract excavating new and clearing old drainage ditches, to Northern Constr. Co., foot Carwall St., Vancouver. About $35,000; cost plus percentage basis.

Industrial Works

PROPOSED WORK

Mass., South Boston (Boston P. O.)—J. Starr et al, 103 Federal St., New London, Conn., plan to build rein.-con. warehouse, on siding of New York, New Haven & Hartford R.R. About $2,000,000. Architect not selected.

Conn., Hartford—See "Buildings."

Conn., Manchester — Fitzgerald Bros., Maple St., plan to build 1 story, 65 x 104 ft., brick, concrete and steel garage, concrete flooring and foundation, on Main St. About $25,000. Private plans.

Conn., New Haven—Alexander & Links, 138 State St., plan to convert present 4 story building into ice plant. Architect not selected.

N. Y., Brooklyn—Lockwood, Greene & Co., archts. and engrs., 101 Park Ave., New York City, receive bids about Jan. 23, building 3 story, 175 x 200 ft, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on 2nd Ave. and 51st and 52nd Sts., here, for Bemis Bros. Bag Co., c/o architects. About $500,000.

N. Y., College Point (Flushing P. O)—R. G. Cory, archt and engr., 39 Cortlandt St., New York City, soon lets contract building 4 story, brick and steel factory, rein.-con. flooring, concrete foundation, here, for J. B. Kleinert Rubber Co, 725 Bway, New York City. About $150,000.

N. Y., Long Island City—J H. Baker, archt. and engr, 9 Jackson Ave, receives bids about Jan. 28, building 1 story, 100 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Mott and Harris Aves, for J. J. Daly, c/o architect. About $25,000. Noted Jan. 1

N. Y., New York—G and E Blum, archt. and engr., 505 5th Ave, preparing plans for 3 story, brick and steel garage, concrete foundation, on 19th St. and Ave. A. About $80,000. Owners name withheld.

N. Y., Syracuse—Brown, Lipe-Chaoin Co., 110 Seneca St., plans to build 6 story, 70 x 300 ft. rein.-con. addition to plant, rein.-con. flooring, concrete foundation, on West Fayette St. About $300,000. Architect and engineer not selected.

N. Y., Syracuse—Globe Malleable Iron & Steel Co., 101 Greenway Ave., plans to build 1 story mill construction addition to plant. About $750,000. Architect and engineer not selected.

N. J., Elmora (Elizabeth P. O.)—Amer. Type Founders Co., Communipaw Ave, Jersey City, plans to build 1 story steel plant, on 200 x 2300 ft. site, here. Architect not selected.

N. J., Trenton—Ajax Rubber Co., Breunig Ave., plans to build 3 story, 60 x 350 ft brick and steel plant. About $39,000 H. M. Baer. 101 Park Ave, New York City, engr. and archt.

N. J., Trenton—Amer. Bridge Co., Warren St., plans to build 200 x 600 ft. main building, two 80 ft. cranes with 200 ft. runways, 60 x 225 ft. pattern shop, 40 x 40 ft. hospital and addition to forge shop. About $1,500,000. Private plans.

N. J., Trenton—Crescent Insulated Wire & Coil Co., Taylor St., plans to build 1 story, 50 x 125 ft., steel and concrete factory. About $40,000. J. O. Hunt, **114** North Montgomery St., archt.

Pa., Chester—See "Buildings."

Pa., Easton—McCormick Co., engrs. and archts., 41 Park Row, New York City, preparing plans for brick, steel and rein.-con. plant, here. About $100,000. Owners name withheld.

Pa., Lewistown—Viscose Co., Marcus Hook, plans to construct concrete and steel plant, to include 5 buildings, also houses for employees, here. About $2,000,000. Ballinger & Perrot, 17th and Arch Sts., Phila., engrs. and archts.

Pa., Scranton—M. K. Edgar, Bd. Trade Bldg., plans to build 6 story, 140 x 320 ft., rein.-con., brick and steel plant, rein.-con. flooring, on Lock Ave. About $1,000,000. Architect not selected.

Pa., South Scranton (Scranton P. O.)—Heath Silk Co, Connell Bldg., plans to build 3 story, 50 x 200 ft., brick and steel mill, rein.-con. flooring, rock foundation, on Maple and Meadow Aves. About $90,000. G. N. Edson, Connell Bldg., archt.

Pa., Wilkes-Barre — Diamond Drug Co. plans to build 3 story, 22 x 180 ft., rein.-con. and brick factory, rock foundation, on Northampton St. About $170,000. Private plans.

Md., Locust Point (Baltimore P O.)—W. P. Tanner-Gross Co, 25 Beaver St., New York City, plans to build flour mill and warehouse, at foot of Lawrence St., here. About $1,000,000.

N. C., Gastonia—C. B Armstrong and others plan to build yarn mill, probably brick. About $200,000. Engineer not selected.

Industrial Works (Continued)

N. C., Mt. Holly—Alsace Mfg. Co. recently incorporated, purchased plant of Mt. Holly Mfg. Co. and plans to improve and build addition to same. About $50,000. Engineer not selected.

Ala., Birmingham—French Dry Cleaning Co., 1810 3rd Ave., plans to build plant on 6th Ave. between 14th and 15th Sts. About $75,000.

La., Monroe—See "Waterworks."

La., New Orleans—General Amer. Tank Car Corp., Ind. Harbor, Chicago, plans to build plant along Mississippi River, above here. About $1,000,000. M. Epstein, pres.

Tenn., Memphis—Iten Biscuit Co., 1202-24 Capitol Ave., Omaha, Neb., soon lets contract building 6 story, 292 x 450 ft., rein.-con. bakery, on Florida St. near Carolina Ave., here. About $500,000. J. Iten, pres.

Ky., Louisville—City Mill & Lumber Co., 901 Fehr Ave., plans to build 100 x 240 ft. mill and 100 x 350 ft. lumber shed. About $60,000. C. L. Killinger, mgr.

O., Cleveland—Grieble & Eberling, archts. and engrs., 517 Sloan Bldg., soon let contract building 1 and 2 story, 120 x 134 ft., concrete, steel and brick garage and work shop, rein.-con. flooring, concrete foundation, on East 21st St. and Chester Ave., for Bissinger Magneto Co., 2352 Euclid Ave. About $60,000.

O., Cleveland—Champion Forge & Machine Co., East 71st St. and Union Ave., having plans prepared by E. McGeorge, archt. and engr., 1900 Euclid Ave., for 3 story, 60 x 120 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation. About $100,000.

O., Cleveland—W. S. Ferguson Co., archts., 1900 Euclid Ave., soon lets contract building 1 story, 111 x 202 ft., brick and steel factory, rein.-con. flooring, concrete and brick foundation, on East 91st St., for Draper Mfg. Co., 3603 East 82nd St. About $75,000. C. T. Draper, pres. and genl. mgr.

O., Cleveland—L. Sands Co., 5047 Sweeney Ave., having plans prepared by E. McGeorge, archt. and engr., 1900 Euclid Ave., for 2 story, 60 x 80 ft., steel and brick factory addition, brick foundation, on East 55th St. and Sweeney Ave. About $50,000. L. Sands, pres.

O., Dayton—Carroll Eng. Co., 2nd and Ludlow Sts., plans to build 2 story, 150 x 250 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Xenia Ave. About $125,000. Architect not selected.

O., Macedonia—Pyrite Brick Co. acquired site and plans to build 1 story, brick and steel plant. About $250,000. P. Schneider, c/o Builders' Exch., Rose Bldg., Cleveland, mgr. Private plans.

O., Springfield—Kelly-Springfield Motor Truck Co., Burt St., plans to build 1 story, 60 x 80 ft. and 2 story, 65 x 100 ft. machine shops, also 3 story, 50 x 80 ft. office building, all rein.-con., rein.-con. flooring, concrete foundation, on Sheridan and Burt Sts. About $100,000. Private plans.

Mich., Detroit—Commerce Motor Car Co., Mackie Ave., having plans prepared by F. J. Winter, archt., Dime Bank Bldg., for 1 story, rein.-con., brick and steel factory, concrete foundation, on Solvey and Mackie Aves. About $75,000.

Mich., Detroit—Detroit Graphite Co., 12th St., having plans prepared by E. R. Dunlap, archt., 709 Hammond Bldg., for 2 story, brick, concrete and steel factory, rein.-con. flooring, concrete foundation, on Linsdale Ave. About $30,000.

Mich., Saint Ignace—Cunning & Mulcrone having plans prepared by F. E. Parmalee, archt., Iron Mountain, for 2 story, 24 x 60 ft., brick and steel garage. About $75,000.

Ill., Chicago—R. G. Pierce, archt., 10 South La Salle St., soon receives bids building 1 story, 75 x 80 ft., concrete and brick factory, concrete foundation, on East 94th St. and Commercial Ave., for United States Graphite Co., 80 East Jackson Blvd. About $25,000. N. Ronneberg, 10 South La Salle St., engr.

Wis., Marshfield—Farmers Barn Equipment Co., c/o M. Sell, Two Rivers, plans to build 3 story, 60 x 250 ft., brick, rein.-con. and steel plant, brick and concrete foundation, on 8th St., here. About $50,000. Architect not selected.

Wis., Milwaukee—H. W. Voelz, archt. and engr., 86 Michigan St., preparing plans for 2 story, 70 x 115 ft. dairy, rein.-con. and brick, rein.-con. flooring, concrete foundation. About $75,000. Owners name withheld.

Wis., Oostburg — Badger Raincoat Co., Port Washington, purchased old factory, here, and plans to raze part of same, and build 4 story, 60 x 120 ft. rein.-con. and brick addition, brick foundation. About $25,000. Architect not selected; probably private plans.

Wis., Sheboygan—See "Buildings."

Wis., Waterford—L. L. Tindall having plans prepared by M. F. White, archt., 683 29th St., Milwaukee, for 2 story, 60 x 190 ft., brick, rein.-con. and steel garage, rein.-con. flooring, concrete foundation, on Main St. About $50,000.

Kan., Atchison—Blair Elevator Co., 10th and Main Sts., having plans prepared by Sherman Eng. Co., engrs., New York Life Bldg., Kansas City, Mo., for elevator with 1,000,000 bu. capacity, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $650,000.

Kan., Wichita—Sinclair Refining Co. having plans prepared for oil refinery, to include 1 story, 30 x 90 ft. machine shop, 33 x 80 ft. garage and 2 story, 55 x 180 ft. main building, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $230,000. Private plans. Noted Aug. 14.

Neb., Lincoln—Gooch Milling & Elevator Co., 6 and South Sts., having plans prepared by Sherman Eng. Co., engrs., 1019 New York Life Bldg., for 70 x 90 ft. flour mill, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $250,000. Owner purchasing material.

Mo., Joplin—Company being organized to build oxide zinc factory. About $300,000. Address J. Leopold, secy., Chamber of Commerce. Architect not selected.

Mo., Kansas City—Goodenow-Brookfield Knitting Co., 418 Archibald Ave., having plans prepared by Tarbet & Gornall, archts., 507 Republic Bldg., and Hedrick & Huff, engrs., 506 Interstate Bldg., for 2 story, 56 x 140 ft., rein.-con., brick and terra cotta mill, on Archibald Ave. and Mill Creek Blvd.

Okla., Hobart—City having plans prepared by V. V. Long & Co., engrs., 1300 Concord Bldg., Oklahoma, for electric light plant, on Main St. Election soon to vote on $135,000 bonds for project. Noted Aug. 14.

Col., Seibert—Town soon receives bids building electric light and power plant. About $40,000. R. D. Salisburry, 1415 East Colfax Ave., Denver, engr.

Wash., Yakima—Bd. Dir. Yakima Co. Agricultural Union plans to build 2 or 3 story, concrete addition to cold storage plant, on North 1st St. About $100,000. Architect not selected.

Cal., Gridley—Libby, McNeill & Libby, 38 South Dearborn St., Chicago, having plans prepared by W. J. Miller, archt., 417 Market St., San Francisco, for 1 story, 160 x 660 ft., cannery, here, brick and concrete. About $335,000.

Cal., Los Angeles—W. J. Saunders, archt., 219 Laughlin Bldg., soon receives bids building 3 story, 50 x 140 ft., rein.-con. warehouse and factory, on Hewitt and Palmetto Sts., for Barker Bros., 726 South Bway.

Cal., Mayfield—Bayside Canning Co., Alviso St., San Jose, having plans prepared by C. S. McKenzie, archt., Bank of San Jose Bldg., San Jose, for 1 story, brick and concrete warehouse, here. About $50,000.

Cal., San Jose—Bayside Canning Co., Alviso St., having plans prepared by C. S. McKenzie, archt., Bank of San Jose Bldg., for 1 story, rein.-con. storage building, on San Jose St. About $70,000.

N. B., Milltown—Canadian Cotton, Ltd., soon receives bids building 1 story, 186 x 410 ft., brick and steel weaving factory. About $50,000.

Ont., Petawawa—Dept. Pub. Wks., Ottawa, having plans prepared and receives bids in spring building forestry experimental station, here. About $200,000. R. H. Campbell, Journal Bldg., Ottawa, dir.

Ont., Sarnia—Lake Huron Steel Corp. plans to build plant with 100,000 tons annual capacity. Work includes docks, ore-handling devices, furnaces, etc. About $10,000,000. S. A. Howard, Sarnia, engr.

Ont., Toronto—See "Miscellaneous."

B. C., Vancouver—Britannia Wire Factory soon lets contract building 2 story, 120 x 200 ft. factory on Industrial Island. About $100,000. Architect not selected.

BIDS DESIRED

S. C., Darlington — Until Jan. 20, by Darlington Bldg. Co., constructing 2 story, 100 x 200 ft. tobacco stemmery and machine building, brick.

O., Cincinnati—Until Jan. 13, by S. Hannaford Sons, archts., 6th and Vine Sts., building 1 story, 40 x 100 addition to plant, for Witt Cornice Co., Winchell Ave.

O., Cleveland—W. S. Ferguson Co., archts., 1900 Euclid Ave., receiving bids building 8 story, 92 x 119 ft., concrete, steel and brick garage, rein.-con. flooring, concrete foundation, on Huron Rd. and East 12th St., for G. A. Tenbush, Union Bldg. About $500,000.

Ind., Indianapolis—J. C. Lewellyn, archt., 38 South Dearborn St., receiving bids building 2 story, 61 x 97 ft., rein.-con., brick and steel warehouse, concrete foundation, here, for Advance Rumely Co., Laporte. About $50,000.

Mich., Yale—Until Jan. 15, by H. H. Lane, engr. and archt., 2320 Dime Bank Bldg., Detroit, building 3 story, 60 x 300 ft., brick and steel addition to mill, for Yale Woolen Mills. About $100,000.

Ill., Chicago—See "Buildings."

Ill., Downers Grove—W. G. Uffendell, archt., 39 South La Salle St., receiving bids building 2 story, 66 x 130 ft., brick and timber factory, concrete foundation, for Mohr Mfg. Co. About $35,000.

Kan., Hugoton—See "Waterworks."

Alta., Edmonton—Until March 1, by Marshall-Wells Co., Lake Ave. S., Duluth, and German & Jenssen, archts. and engrs., Exch. Bldg., Duluth, building 3 story, 100 x 150 ft., concrete, steel and brick warehouse and office, rein.-con. flooring, concrete foundation, here. About $375,000.

PRICES AND CONTRACTS AWARDED
(★Indicates award of contract)

★Mass., Lowell—Lowell Weaving Co. let contract building 3 and 4 story, 142 x 394 ft. spinning mill, 7 story, 90 x 120 ft. storehouse and 1 story, 45 x 90 ft. power house, rein.-con., rein.-con. flooring, concrete foundation, on Bway., to Aberthaw Constr. Co., School St., Boston. About $1,000,000.

★Conn., Bristol—T. P. O'Brien, 39 Main St., let contract building 1 story, 85 x 101 ft., brick and steel garage, concrete flooring and foundation, to W. J. Kelleher, 398 South St. About $25.000.

★Conn., Saugatuck — Dolge Disinfecting Co., Westport, let contract building 1 and 2 story, 50 x 100 ft., brick and steel factory, rein.-con. flooring, concrete foundation, here, to Barney-Ahlers, 110 West 40th St., New York City. About $35,000.

★N. Y., Brooklyn—Kirsch & Hersel, 214 Scholes St., will build 1 and 2 story, 50 x 217 ft. brick and steel plant, rein.-con. flooring, concrete foundation, on Flushing Ave. About $30,000. Work will be done by day labor.

★N. Y., Brooklyn — Knoor Bros., 1116 Wyckoff Ave., will build 1 story, 80 x 90 ft., brick and steel foundry, rein.-con. flooring, concrete foundation, on Cooper Ave. and Long Island R.R. About $30,000. Work will be done by day labor.

★N. Y., Brooklyn—Manifold Supply Co., 188 3rd Ave., will build 2 story, 80 x 100 ft., brick and steel factory and office, rein.-con. flooring, concrete foundation, at 172 3rd Ave. About $65,000. Work will be done by day labor.

★N. Y., Long Island City—Standard Steel Car Co., 1920 Bway., New York City, let contract building 4 story, brick, steel and rein.-con. garage and service station, rein.-con. flooring, concrete foundation, on South Jane St. from William to Ely Aves., here, to L. Gold, 44 Court St., Brooklyn. About $150,000.

★N. Y., New York—L. Gold, 44 Court St., Brooklyn, will build brick and steel garage, rein.-con flooring, concrete foundation, on 55th St. and 10th Ave., here. About $100,000. Work will be done by day labor.

★N. Y., New York—J. Jordis, c/o W. Koppe, archt. and engr., 935 Intervale Ave., will build 1 story, 100 x 175 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Whitlock and Leggett Aves. About $50,000. Work will be done by day labor.

Industrial Works (Continued)

★**N. Y., New York**—S. Kinkelstein, c/o W. Koppe, archt. and engr., 935 Intervale Ave., will build 6 story, 90 x 100 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Leggett and Whitlock Aves. About $170,000. Work will be done by day labor.

★**N. Y., New York**—Mildon Realty Co., 362 West 23rd St., will build 2 story, 75 x 92 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 447-451 West 17th St. About $25,000. Work will be done by day labor.

★**N. Y., New York**—One Hundred Sixty-third St. Garage Corp., 1411 Grand Blvd. and Concourse, will build 1 story, 100 x 160 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 163rd St. and Washington Ave., Bronx Boro. About $50,000. Work will be done by day labor.

★**N. Y., New York**—Rosewater Realty Corp., 51 Chambers St., will build 5 story, 75 x 90 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Prospect Ave. and 169th St. Bronx Boro. About $85,000. Work will be done by day labor.

★**Pa., Overbrook**—M. Wood let contract building 3 story, 65 x 100 ft., concrete, steel and brick garage, to A. James, Union Ave., Bala. About $30,000.

★**Pa., Phila**—J. Frederick, Inc., 5th St. and Rising Sun Lane, let contract building 3 story, 80 x 100 ft., concrete, steel and brick plant, to A. R. Raff Co., 1635 West Thompson St. About $75,000.

★**Pa., Phila.,**—Wicaco Machine Screw Co., 7th and Wood Sts., let contract building 2 and 3 story, 47 x 82 x 274 ft., concrete and brick factory and office, on Louden and Steenton Sts., to Barclay, White & Co., 1713 Sansom St.

★**Md., Sparrows Point**—Bethlehem Steel Corp. let contract building 1 story, 50 x 92 ft., brick and steel box factory, here, to Hughes-Foulkrod Co., Commonwealth Trust Bldg., Phila. About $35,000.

★**Md., Westport**—McNamara Bros., Kloman St., let contract building 1 story, 80 x 200 ft., steel and brick addition to tank and boiler factory, cement flooring, concrete foundation, to W. Taylor, 2826 Edmondson Ave., Baltimore. About $50,000.

★**Va., Richmond**—Rennie Dairy Co., 7th and Leigh Sts., let contract building 2 story, 45 x 70 ft. dairy, including storage rooms, brick, concrete flooring, concrete foundation, on West 7th St., to J. C. Beasley, North 9th St. About $67,000.

★**N. C., Greensboro**—Rucker Warehouses, Inc. let contract building 1 story, brick addition, to J. L. Crouse, Greensboro. About $50,000.

★**Ga., Augusta** — Hollingsworth Candy Co., 825 Telfair St., let contract building 5 story, brick and terra-cotta factory, to West Constr. Co., Atlanta. About $90,000.

★**Tenn., Memphis**—Connecticut Pie Co., 100 South 4th St., let contract building 2 story bakery concrete and brick, to Sims & Nichols, Memphis. About $25,000.

★**O., Cincinnati**—Cincinnati Shaper Co., Elam and Garrard Sts., let general contract building 2 story, 90 x 236 ft., concrete and brick addition, to Fisher-De Vore Constr. Co., Blymyer Bldg. About $75,000.

★**O., Cleveland**—W. J. Carter, engr. and archt., Illuminating Bldg., let contracts to Boldt Constr. Co., 6110 Euclid Ave., building 3 story, 55 x 160 ft. factory, at 4415 Hough Ave., cost $75,000; 3 story, 60 x 120 ft. factory, at 1787 East 40th St., $75,000; also 1 story, 45 x 211 ft. addition to warehouse, at 5017 Perkins Ave., $50,000; all brick and steel, brick foundation, for Amer. Stove Co., 5017 Perkins Ave.

★**O., Cleveland**—Champion Machine & Forge Co., 3725 East 78th St., let contract building 1 story, 73 x 160 ft., steel and brick addition, rein.-con. flooring, brick foundation, to King Bridge Co., foot East 69th St. About $50,000.

★**O., Cleveland**—Chilcothe-Sargent Co., 723 Prospect Ave., let contract building 1 story, 100 x 100 ft., steel and brick factory, brick foundation, on East 21st St. and Superior Ave., to Drummond-Miller Co., 4500 Euclid Ave. About $60,000.

★**O., Cleveland**—Eaton Axle Co., 10017 Euclid Ave., let contract building 300 x 450 ft. factory and 40 x 80 ft. power house, both 1 story, steel and brick, brick foundation, on East 140th St., along tracks of New York Central R. R., to Crowell-Lundoff-Little-Bicknell Co., 5716 Euclid Ave. About $600,000.

★**O., Cleveland**—Keetch Knitting Mills Co., 2101 Superior Ave., let contract building 2 story, 60 x 147 ft., concrete, steel and brick addition to factory, rein.-con. flooring, concrete foundation, to W. Dunbar Co., 8201 Cedar Ave. About $100,000.

★**O., Columbus** — Columbus Heating & Ventilating Co., 425 West Town St., let contract building 2 story, 100 x 120 ft. addition to factory, saw tooth construction, rein.-con. flooring, concrete foundation, to State Constr. Co., 11 West State St. About $35,000.

★**O., Dayton**—Buick Sales Co., 130 North Main St., let contract constructing 2 story, 75 x 200 ft., rein.-con. and brick garage and sales building, rein.-con. flooring, concrete foundation, on South Main St., to Ferro Concrete Constr. Co., Traction Bldg., Cincinnati. About $150,000.

★**O., Delphos**—Glamorgan Tire & Rubber Corp. let contract building 1 story, 60 x 300 ft., steel and brick factory, rein.-con. flooring, concrete foundation, to H. K. Ferguson Co., 6523 Euclid Ave., Cleveland. About $75,000.

★**Mich., Detroit**—Barton Auto Top Co., Woodward Ave., let contract building 1 story, 50 x 300 ft., brick and steel garage, concrete flooring, brick foundation, on Rich St., to Stokes & Whittingham, 424 Penobscot Bldg. About $30,000.

★**Mich., Detroit** — Bemb-Robinson Co., 286 East Jefferson Ave., let contract building 2 story, brick, steel and concrete addition to service station, rein.-con. flooring, concrete foundation, on Larned St., to Hazleton & Clark, Book Bldg. About $70,000.

★**Ill., Chicago**—Exel Motor Co., c/o H. Raeder, archt., 20 West Jackson Blvd., let contract building 1 story, 370 x 500 ft., rein.-con. and brick factory, concrete foundation, on Menard and Dickens Aves., to H. A. Peters Co., 19 South La Salle St. About $300,000.

★**Ill., Chicago** — Palatine Commercial Corp., 1114 Milwaukee Ave., let contract building 2 story, 75 x 125 ft., rein.-con. and brick warehouse,, rein.-con. flooring, concrete foundation, on Haddon and Milwaukee Aves., to Mutual Constr. Co., 127 North Dearborn St. About $85,000.

★**Ill., Clearing** (Chicago P. O.)—P. J. Kalman & Co., 29 South La Salle St., Chicago, let contract building 1 story, 164 x 176 ft. addition to factory, mill construction, concrete foundation, to Industrial Bldg. Co., 38 South Dearborn St., Chicago. About $45,000.

★**Ill., Peoria**—Advance Rumely Co., Laporte, Ind., let contract building 2 story, 147 x 200 ft., rein.-con., steel and brick warehouse, concrete foundation, here, to W. M. Allen & Son Co., 929-32 Jefferson Bldg. About $100,000.

★**Wis., Green Bay**—Swift & Co., Union Stock Yards, Chicago, let contract building 3 story, 50 x 80 ft., branch house rein.-con. and brick, rein.-con. flooring, concrete foundation, on Dousman St., here, to T. Stark & Co., 217 West Water St., Milwaukee. About $60,000.

★**Kan., Ottawa**—Ottawa University let contract building 2 story, 60 x 80 ft., brick, rein.-con. and steel, heating plant, rein.-con. flooring, concrete foundation, to N. B. Beeler, Ottawa. Cost plus percentage basis.

★**Neb., Omaha**—M. E. Smith & Co., 9th and Farnam Sts., let contract building 9 story, 100 x 132 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, on 10th and Douglas Sts., to J. Stewart & Co., 30 Church St., New York City. About $500,000; cost plus percentage basis.

★**Mo., Kansas City**—Central Electrotype Co., 708 Baltimore Ave., let general contract building 4 story, 70 x 84 ft., rein.-con., brick and terra cotta printing plant, to G. M. Bliss Constr. Co., 526 Lothrop Bldg. About $75,000.

★**Mo., Kansas City**—G. W. Neff, 1505 Genesee St., let general contract building 3 story, 120 x 142 ft., rein.-con., stone and brick warehouse, rein.-con. flooring, on 5th St. and Grand Ave., to Kansas City Constr. Co., 822 Commerce Bldg. About $100,000.

★**Tex., Dallas**—Advance Rumely Co., Laporte City, Ind., let contract building 2 story, 100 x 200 ft., brick, rein.-con. and steel warehouse, concrete foundation, here, to Hedrick Constr. Co., Southwestern Life Bldg. About $125,000.

★**Tex., Mineral**—Crazy Well Water Co. let contract building 1 and 5 story, 130 x 160 ft., mill construction factory, concrete foundation, to Industrial Bldg. Co., 38 South Dearborn St., Chicago. About $125,000.

★**Cal., Fresno**—L. S. Cohh & Co., Inc., let contract constructing 2 story, 75 x 150 ft., rein.-con. garage and sales building, concrete foundation, on Tuolumne and Van Ness Aves., to R. F. Felchin & Co., Rowell Bldg.

★**Cal., Los Angeles**—Mathews Paint Co., 219 South Los Angeles St., let contract building 2 story, 99 x 99 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, on San Fernando Rd., to J. V. McNeil, 736 H. W. Hellman Bldg. About $40,000. Noted Aug. 21.

★**Cal., Los Angeles**—Peerless Laundry Co., 5821 Woodlawn Ave., let contract building 1 story, 50 x 235 ft., laundry, brick, concrete foundation, on Woodlawn and Slausen Aves., to Bavin & Bunch, 173 East Jefferson St. About $47,000.

★**Cal., San Francisco**—C. H. Lovell and others let contract building 3 story, brick factory, on 19th and Bryant Sts., to W. C. Duncan & Co., Sharon Bldg. About $52,000.

★**B. C., Victoria**—Canadian Natl. Ry., Ottawa, let contract building machine shop, turn table and round house, mill construction, concrete foundation, to Robertson & Partners, Metropolitan Bldg., Vancouver. About $30,000.

Buildings

PROPOSED WORK

Me., Biddeford—Bank—T. M. James, archt., 3 Park St., Boston, Mass., soon lets contract building 1 story, 40 x 100 ft., brick and stone, concrete and tile flooring, concrete foundation, on Main St., for 1st Natl. Bank. About $50,000.

Mass., Greenfield—High School—Town having plans prepared by Patton & Blair, archts., 579-5th Ave., New York City for 3 story, brick, concrete and steel. About $400,000. H. Richardson, 23 Pleasant St., chn. Noted Jan. 1.

Mass., Springfield—Synagogue—Congregation Kadimah, 25 Lenox St., soon lets contract building 2 story, 57 x 81 ft., brick and steel, concrete foundation, on Piney Pl. About $50,000. M. Ehrlich, chn. B. E. Geckler, 335 St. James Ave., archt. Noted July 3.

Mass., Worcester—Colleges—College of Holy Cross, College St., plans to build 2 additions on campus. About $500,000. Architect not selected.

Conn., Bristol—Church—St. Stanislow Church Society plans to build 1 story brick and steel church on West St. About $75,000. G. Barthlouski, pastor.

Conn., Hartford—Office, etc.—Frasse Steel Wks., 45 Blvd., having plans prepared by S. Wagner, archt., 7 East 42nd St., New York City, for 2 story, brick, concrete and steel addition to be used as office and manufacturing plant, on Capitol Ave. About $50,000.

Conn., New Britain—Business—Besse. Leland & Co., 25 Main St., plans to build 4 story, brick and steel, on Main St. About $60,000. Architect not selected.

Conn., New Britain—Store and Offices—Raphael's Department Store, 382 Main St., plans to construct brick store and office building, on West Main St. About $50,000. Architect not selected.

Conn., New Britain—Temple—Masonic Order, Eton Pl., plans to build brick and steel temple, on West Main St. About $50,000. R. J. Dixon, chn.

Conn., New Britain—Theatre and Business—S. Shurberg, et al, 55 Franklin St., plan to construct brick theatre and business building, on Main St. Architect not selected.

Conn., Wallingford—Armory—Connecticut Military Emergency Bd., Hartford, having plans prepared by W. P. Crabtree, archt., 272 Main St., New Britain, for armory on North Main St., here. About $100,000.

N. Y., Brooklyn — Bathhouse — H. J. Nurick, archt. and engr., 792 Bway., New York City, preparing plans for 4 story, 60 x 100 ft., brick, steel and stone, brick foundation, on St. Johns Pl., here. About $85,000. Owners name withheld.

N. Y., Far Rockaway—School—Bd. Educ., 500 Park Ave., New York City, having sketches made by C. B. J. Snyder, archt. and engr., Municipal Bldg., New York City, for brick and steel addition to P. S. 39, brick foundation, here. About $200,000.

Buildings (Continued)

N. Y., New York—Exchange—New York Curb Market Assn., Wall St., plans to build brick, steel and stone, brick foundation, on Trinity Pl. and Greenwich St. About $700,000. Starrett & Van Vleck, 8 West 40th St., archts. and engrs.

N. Y., New York—School—Bd. Educ., 500 Park Ave., having plans prepared by C. B. J. Snyder, archt. and engr., Municipal Bldg., for 5 story, 60 x 193 ft., brick and steel, brick foundation, on Fox St. and Leggett Ave., Bronx Boro. About $250,000.

N. Y., Rockaway Beach (Far Rockaway P. O.)—School—Bd. Educ., 500 Park Ave., New York City, having sketches made by C. B. J. Snyder, archt. and engr., Municipal Bldg., New York City, for brick and steel addition to P. S. 44, brick foundation, here. About $300,000.

N. J., Jersey City—Theatre—Standard Theatre Co., c/o E. C. Horn & Sons, engrs. and archts., 1476 Bway., New York City, soon lets contract building brick and steel, on Central Ave. and Sherman Pl., here. About $250,000.

N. J., New Brunswick—Schools—Bd. Educ. plans to build new high and grade schools. About $180,000.

N. J., Ocean Grove—Hotel—John Bros. plan to build 6 story, brick and steel, brick foundation. About $150,000. C. W. Brazen, 1133 Bway., New York City, engr. and archt.

N. J., Westwood—School—Bd. Educ. plans to build 2 and 3 story, brick and steel, brick foundation. About $125,000. Rasmussen & Wayland, 1133 Bway., New York City, archts. and engrs.

Pa., Barnesboro—Theatre and Offices—J. F. Smith plans to build 2 story, 58 x 100 ft., brick and stone, on Caroline St. and Philadelphia Ave. About $50,000. F. A. Hersh and F. J. Shollar, Commerce Bldg., Altoona, archts.

Pa., Bethlehem — Memorial—Lehigh Alumni Assn., Lehigh University, having plans prepared by T. Visscher and J. Burley, engrs. and archts., 363 Lexington Ave., New York City, for 2 story, 80 x 160 ft., brick and steel, here. About $350,000. W. R. O'Keson, secy.

Pa., Chester—Office—Cochrane Estate plans to construct 18 story, brick and steel. About $450,000. C. W. Brazer, 1133 Bway., New York City, engr. and archt.

Pa., Chester—Theatre, Office and Warehouse—C. W. Brazer, engr. and archt., 1133 Bway., New York City, preparing plans for brick, steel and stone. About $750,000. Owners name withheld.

Pa., Juniata—Bank and Office—First Natl. Bank, 630 4th Ave., plans to build 2 story, 40 x 104 ft., brick, on 4th Ave. and 7th St. About $50,000. F. A. Hersh and F. J. Shollar, Commerce Bldg., Altoona, archts.

Pa., Media—Office and Bank—Media Title & Trust Co., 11 South St., plans to build brick, steel and stone. About $300,000. C. W. Brazer, 1133 Bway., New York City, engr. and archt.

Pa., Phila.—Cafe—R. E. White, engr. and archt., Pennsylvania Bldg., receives bids about Feb. 1 building Chateau Belmont, 1 story, 100 x 250 ft., stone, in Fairmount Park, for W. J. Ostheimer, Widener Bldg. About $300,000.

Pa., Phila.—Church — Logan Baptist Church, Broad and Rochland Sts., having plans prepared by C. S. Adams, archt., 1509 Arch St., for stone church, on 13th and Ruscomb Sts. About $50,000.

Pa., Phila.—Library—City having plans prepared by H. Trumbaar, engr. and archt., Land Title Bldg., for 2 and 3 story, 200 x 330 ft., brick and stone, on 19th, 20th, Vine and Wood Sts. About $3,000,000.

Pa., Scranton—Schools—Bd. Educ. plans to build John Marshall School, 2 story, 80 x 80 ft., brick and steel, rock foundation, on Van Buren St., cost, $115,400; 3 story, 120 x 150 ft., brick and steel, rein.-con. flooring, rock foundation, on Madison St., $402,300; 2 story, 30 x 40 ft., brick and steel, rein.-con. flooring, rock foundation, in central section of city, $66,000; 3 story, 260 x 300 ft., junior high school, to include auditorium, gymnasium and manual training shops, brick and steel, rein.-con. flooring, rock foundation, on Mulberry St., $546,200; 3 story, 110 x 110 ft. technical high school, brick and steel, rein.-con. flooring, rock foundation, on Wyoming Ave., $277,700; 3 story, 100 x 115 ft., brick and steel, rock foundation, on Providence Rd., $277,350. Architect not selected.

Pa., Shenandoah — Hospital — Locust Mountain Hospital Assn. plans to build 3 story, 30 x 50 ft., brick and timber, rock foundation, on Wipple Rd. About $70,000. Architect not selected.

Md., Baltimore—Synagogue—Har Zion congregation having plans prepared by L. Levi, archt. and engr., Real Estate Trust Bldg., Phila., for 1 story, 55 x 159 ft., stone, on West North Ave. About $100,000.

D. C., Washington — Church — Roman Catholic Diocese had plans prepared by Maginnis & Walsh, archts., 100 Boylston St., Boston, for 1 story, 150 x 420 ft., stone, with 380 ft. tower, concrete foundation, on University grounds.

Va., Clifton Forge—Hotel—Clifton Forge Hotel Co. having plans prepared by C. M. Robinson, archt., 508 Times Dispatch Bldg., Richmond, for 7 story, 50 x 180 ft., concrete and brick. About $100,000.

Va., Richmond—Art Gallery—Confederate Memorial Institute Assn. having plans prepared by Baskerville & Lambert, archts., 914 Travelers' Bldg., for 1 story, limestone and brick, concrete footings, on Blvd. Ave. About $75,000.

Va., Williamsburg—Hotel—F. G. Linekin and others plan to build 3 story, 50 room hotel, here. Cost to exceed $50,000. Architect not selected.

W. Va., Charleston—Temple and Auditorium—Scottish Rite and Beni-Kedam Temple, Ancient Arabic Order Nobles of Mystic Shrine, purchased 120 x 300 ft. site on Kanawha St. and plans to build combined temple and auditorium. About $500,000. J. C. Ruffner, recdr.

N. C., Winston-Salem—Hotel—W. E. Stoddart, archt. and engr., 9 East 40th St., New York City, preparing sketches for 9 story, brick, steel and stone, brick foundation. About $1,000,000. Owners name withheld.

Ala., Birmingham — School—Bd. Educ. Jefferson Co., plans to build elementary school and high school at Powderly. About $75,000. E. B. Erwin, supt.

Ala., Mobile—Theatre—U. Roos, F. H. Roos, and T. R. R. Weaver, c/o Crown Theatre, 266 Dauphin St., having plans prepared for 2½ story, 66 x 210 ft. About $250,000.

Miss., Greenville — Hospital — King's Daughters have drive under way to raise $250,000 to build modern hospital, here. Address L. Percy, Greenville. Architect not selected.

Miss., Jackson—Schools—Bd. Educ. having plans prepared by E. J. Hull, archt., Jackson, and receives bids about Feb. 15, building three, 2 story, brick and stone. About $200,000. E. L. Bailey, secy.

Miss., Ruleville—Store—D. Neely receives bids in spring building 2 story, brick and concrete, on Main St. About $100,000.

La., Alexandria—School—Rapides Parish School Bd. plans to build (20 room), brick. About $90,000. Favrot & Livaudais, Perrin Bldg., New Orleans, archts.

La., Mansfield — Church — First Baptist Church plans to build 3 story, 48 x 125 ft. brick, wood flooring, J. V. Rives, Jr., secy. J. P. Annan, 1319 Fairfield Ave., Shreveport, archt.

La., Monroe—Hotel—Ouachita Hotel Co. plans to build (150 room) fireproof hotel, concrete and tile flooring. Cost between $400,000 and $500,000. Mann & Stern, 335 Gazette Bldg., Little Rock, Ark., archts.

Tenn., Memphis—Laboratory—University of Tennessee College of Medicine, 718 Union St., plans to build laboratory, on Madison Ave. About $100,000. H. A. Morgan, Nashville, pres.

Ky., Ashland—Store—B. W. Williamson Hardware Co. plans to build 3 story, 82 x 142 ft., brick and stone, concrete flooring. J. W. King, Gaylord Bldg., archt.

Ky., Lexington — Theatres — Phoenix Amusement Co. increased capital stock from $200,000 to $600,000 and plans to build theatres. J. B. Elliott, pres.

O., Cincinnati—Mercantile—Crown Tailoring Co., Walsh Bldg., plans to build 6 story, at 624 Vine St. S. S. and G. H. Godley, Neave Bldg., archts.

O., Cincinnati—Office—Atlas Natl. Bank Co., Walnut St., having plans and specifications prepared by Tietig & Lee, archts., 4th Natl. Bank Bldg., for 10 story, 76 x 100 ft., on Walnut St.

O., Cleveland—Bath House—City having preliminary plans prepared by F. H. Batz, city archt., for 2 story, 70 x 70 ft., concrete, steel and brick, concrete foundation, in 7th Ward. About $60,000.

O., Cleveland—Commercial—H. F Neighbors, 2708 Euclid Ave., plans to build 3 story, 84 x 160 ft., concrete, steel and brick, concrete foundation, at 2708 Euclid Ave. About $100,000. W. S. Ferguson, 1900 Euclid Ave., archt.

O., Cleveland — Commercial—Syndicate, c/o I. Glueck, 214 Williamson Bldg., plans to build 6 or 8 story, 40 x 139 ft., concrete, steel and brick, concrete foundation, on East 12th St. near Euclid Ave. About $300,000. Architect and engineer not selected.

O., Lakewood (Cleveland P. O.)—Commercial and Theatre—C. A. Cotabish, c/o Natl. Carbon Co., West 117th St. and Madison Ave., Cleveland, having plans prepared by S. H. Weis, archt., Schofield Bldg., Cleveland, for 3 story, 200 x 460 ft., concrete, steel and brick, concrete foundation, at 13606 Detroit Ave. About $300,000.

O., Springfield — Office — See "Industrial Works."

O., Springfield—School—Bd. Educ. having plans prepared by Hall & Lethley, archts., 807 Fairbanks Bldg., for 2 story, brick. About $75,000.

O., West Park—Club House—German-Hungarian Club, c/o W. O. Freyburg, archt., 1619 Cook Ave., Lakewood, having preliminary plans prepared for 2 story, 64 x 120 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Lorain Ave. near West 117th St. About $80,000.

O., Dayton—School—W L. Jaekle, archt., 1300 U. B. Bldg., soon lets contract building 2 story, 60 x 130 ft., rein.-con. brick and stone, rein.-con. flooring, on Heck Ave., for St. James Parish, Edgemont. About $150,000.

O., Dayton — Store and Office—S. S. Kresge Co., South Main St., plans to build 5 story, 70 x 160 ft., rein.-con. and tile or brick, rein.-con. flooring, concrete foundation. About $200,000. Architect not selected.

O., Kenton—Theatre—Kenton Amusement Co. plans to build 2 story, 60 x 225 ft., rein.-con. and brick, rein.-con flooring, concrete foundation, on Main St About $125,000. W. W. Bowers, pres.

Mich., Allegan—High School—Bd. Educ. receives bids about spring, building 3 story, 100 x 158 ft., rein.-con., brick, steel and concrete, concrete foundation About $150,000. J. D. Chubb, 109 North Dearborn St., Chicago, archt.

Mich., Detroit—School and Hospital—Michigan Hospital School for Crippled Children, Grand River Ave., plans to build 3 or 4 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Grand River Ave. About $650,000.

Mich., Muskegon — Hotel — Occidental Hotel, c/o E. R. Sweet, 3r St., plans to build 8 story, 132 x 140 ft., rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation, on 3rd St. near Western Ave. About $1,000,000. Architects name withheld.

Mich., Pontiac — Hotel--Great Lakes Hotel Syndicate having plans prepared by W. W. Alschleger, archt., Chicago, for 8 story, rein.-con., brick, steel and terra cotta, rein.-con. flooring, concrete foundation. About $750,000.

Mich., Saint Ignace—Hotel—Cunning & Mulcrone having plan prepared by F. E. Parmalee, archt., Iron Mountain, for 3 story, 70 x 136 ft., brick and steel. About $130,000.

Mich., Strathmoor—School—School Dist. 4, c/o H. H. Hart, soon lets contract building 2 story, 90 x 110 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $125,000. Butterfield & Butterfield, 1113 David Whitney Bldg., Detroit, archts.

Ill., Chicago — Temple — C. Hatzfield, archt., 7 South Dearborn St., preparing plans for 5 story, 104 x 117 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on 64th and Green Sts. About $250,000. Owner's name withheld.

Wis., Cedar Grove—Church—First Presbyterian Church plans to build 2 story, 60 x 210 ft., brick, rein.-con and tile, brick foundation, on Main St. About $50,000. Architect not selected. J B. Huenink, chn.

Wis., Clintonville — Hotel — Clintonville Advance Assn. preparing plans for 7 story, 60 x 150 ft., brick, rein.-con. and steel, brick foundation. About $75,000. Private plans. E. Felschow, pres.

Wis., Lake Mills — Bank — Greenwood State Bank having plans prepared by A. Moorman & Co., archts., Chamber of Commerce Bldg., St. Paul, for 2 story, 50 x 70 ft., brick, rein.-con. and steel, brick foundation, on Main St. About $75,000. G. Greenwood, cashier.

Buildings (Continued)

Wis., Manitowoc — Soldiers Memorial — Manitowoc Co. plans to build 70 x 250 ft., rein.-con. and brick, brick foundation. About $100,000. Architect not selected.

Wis., Milwaukee—Exchange—A. C. Eschweiler, archt. and engr., Goldsmith Bldg., soon lets contract building 3 story. 40 x 60 ft., concrete and brick addition, rein.-con. flooring, concrete foundation, on Wright St for Wisconsin Telephone Co., 418 Bway. About $50,000.

Wis., Milwaukee — Mercantile — Amer. Household Supply Co., 1838 Fond du Lac Ave., plans to build 5 story, 70 x 120 ft., rein.-con. and brick addition, rein.-con. flooring, concrete foundation. About $75,000. Architect and engineer not selected.

Wis., Sheboygan—Office, etc.—Honold & Globe Mfg. Co., c/o C. Honold, 821 Pennsylvania Ave., plans to build office and machine shop, brick, rein.-con. and tile, brick foundation, on Pennsylvania Ave. About $50,000. Architect not selected.

Wis., Two Rivers—High School—Bd. Educ. having preliminary plans prepared and receives bids in summer, building rein.-con. high school, concrete foundation. About $200,000. J. D. Chubb, 109 North Dearborn St., Chicago, archt.

Ia., Amelia—School—Bd. Educ. Consolidated Dist. plans to build 3 story, brick, rein.-con. and steel, rein.-con. flooring, brick foundation. About $175,000. W. Gordon, Hubbell Bldg., Des Moines, archt.

Ia., Hinton—School—Bd. Educ. Consolidated Dist. voted $130,000 bonds to build brick, rein.-con. and steel school, rein.-con. flooring, brick and concrete foundation. Beuttler & Arnold, Sioux City, archts.

Ia., Ottumwa—School—City voted $800,000 bonds to build school. Architect not selected. Noted Sept. 25.

Ia., Sioux City—Hotel—Betz Bros. having plans prepared by Colby & Westerlind, archts., 202 Grain Exch. Bldg., for 8 story, 60 x 60 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $200,000.

Ia., Sioux City — Temple — Masonic Bldg. Comn. plans to build 3 story, 100 x 150 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $400,000. Architect and engineer not selected.

Ia., Whiting—School—Bd. Educ. Consolidated Dist. having plans prepared by Beuttler & Arnold, archts., Sioux City, for 2 story. 60 x 150 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $165.000. Noted July 17.

Ia., Wiota—School—Bd. Educ. Consolidated Dist. having plans prepared by Porter & Schreiber, archts., Brandeis Theatre Bldg., Omaha, Neb., for 2 story, 75 x 90 ft., brick, concrete and steel, concrete foundation. About $80,000.

Minn., Lafayette—School—F. V. Quist, clk. School Dist. 66, rejected bids received Dec. 22, building 2 story, 64 x 90 ft., brick. About $65,000.

Minn., Newport—Cottages—Farmers Terminal Packing Co., 920 Commerce Bldg., St. Paul, plans to build fifty 1 and 1½ story cottages, various sizes, here. About $200,000. H. Edmunds, secy. Private plans.

Minn., St. Paul—Hotel—J. Sanford, 486 Otis St., having plans prepared by M. Fitzpatrick, archt., 17 West 9th St., for 12 story, 122 x 240 ft., rein.-con. and brick, on Summit Ave. About $2,000,000.

Minn., Willmar—Bank—First Natl. Bank having plans prepared by C. W. Smith, archt., 528 Andrus Bldg., Minneapolis, for 2 story, 71 x 150 ft., rein.-con. and stone, at 200 5th St., S. About $56,000.

Kan., Valley Falls—School—Bd. Educ plans to build 2 story, brick, concrete and steel, concrete foundation. About $62,000. W. E. Glover, Topeka, archt.

Kan., Wichita—Club—Elks Club plans to build 10 story, 50 x 150 ft., on North Topeka Ave. About $350,000. Architect and engineer to be selected at once.

Neb., Chappell—Hotel—Chappell Hotel Co having plans prepared by J C. Pederson, archt., Gering, building 6 story, (60 room) brick, steel and concrete, concrete foundation. About $68,000.

Neb., Lincoln—School—Bd. Educ. soon receives bids building 2 story, 70 x 134 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $90,000. Fiske & Meginnis, 533 Bankers Life Bldg., archts.

Neb., Loup City—Courthouse—Sherman Co. having plans prepared by W. F. Gernandt, archt., 634 Keeline Bldg., Omaha, for rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $150,000.

Neb., Omaha—School—Chinese Missionary Society, 5035 Bedford Ave., plans to build school. About $500,000. Architect not selected.

S. D., Ipswich—Grade and High School—Bd. Educ. having plans prepared by Edwins & Edwins, archts., 911 Northwestern Bank Bldg., Minneapolis, for 2 story, 75 x 120 ft., brick. About $100,000.

N. D., Lisbon—Church—Slifer & Abrahamson, archts., Endicott Bldg., St. Paul, preparing plans for 1 story, 50 x 120 ft., brick and stone. About $60,000 Owners name withheld.

Mont., Helena — College — Mount St. Charles College, Capitol Hill, plans to build 4 story, 65 x 156 ft. addition, also 113 x 161 ft. "H" shaped wing, on Benton Ave. Total cost $300,000. Link & Haire, Power Bldg., archts.

Mo., Kansas City—Business—Mutual Drug Co., 1200 West 9th St., Cleveland, O., soon receives bids building 4 story, 50 x 115 ft., rein.-con., brick and terra cotta, on 20th and Main Sts., here. About $100,000. J. C. Sunderland, 313 Interstate Bldg., archt. Hedrick & Huff, 506 Interstate Bldg., engrs.

Mo., Kansas City—Church—Morning Star Baptist Church, c/o P. T. Drotts and E O. Brostrom, archts., 212 Reliance Bldg., having plans prepared for 2 story, 65 x 90 ft. brick, stone and terra cotta, rock foundation, on 23rd and Vine Sts.

Mo., Kansas City—Church—Swedish Baptist Church, 42nd and Pasco Sts., having plans prepared by P. T. Drotts and E. O. Brostrom, archts., 212 Reliance Bldg., for 2 story, 65 x 90 ft., brick and terra cotta, rock foundation, on Bway. and Schafer St. About $50,000. J. G. Oster, pastor.

Mo., Sedalia — City Hall — City voted $100,000 bonds to build city hall. N. S. Nelson, clk.

Tex., Dallas—Office—A. C. Bosson, archt. and engr., 366-5th Ave., New York City, receives bids about Jan. 15, building 10 story, brick and steel, brick foundation, for Magnolia Petroleum Co., Great Southwestern Life Bldg. About $1,000,000.

Tex., Dallas — Theatre — Loew's Enterprises, 1492 Bway., New York City, having plans prepared by T. W. Lamb, archt., 644 8th Ave., New York City, for brick and steel, brick foundation, here. About $300,000.

Okla., Carnegie — School — City having plans prepared by R. W. Shaw, archt., Beck Bldg., Enid, for brick school. About $50,000.

Okla., Grandfield — High School — Bd. Educ. having plans prepared by Tonini & Bramblett, archts, 417 Terminal Bldg., Oklahoma, for 2 story, brick, concrete and steel, concrete foundation. About $75,000.

Okla., Marlow—School—Bd. Educ. having plans prepared by Tonini & Bramblett, archts., 301 Terminal Bldg., Oklahoma, for 2 story, brick, concrete and steel, concrete foundation. About $60,000.

Nev., Reno—Hotel — Bankers Finance Corp. having plans prepared by Ferris & Malsberry, archts., Reno, for 6 story, fireproof hotel, on Belle Isle. About $500,000. R. L. Goetz, pres.

Nev., Winnemucca—Hotel—G. Wingfield, 219 Court Reno, and others, plan to build 5 story (110 room) hotel. Engineer not selected.

Cal., Alameda—Church—Shea & Minton, archts., 244 Kearney St., San Francisco, soon let contract building rein.-con. church, at 1913 San Antonio Ave., for St. Joseph's Catholic Church. About $100,000.

Cal., Calexico—Hotel—Calexico Hotel Co., recently incorporated, plans to build 3 story, (50 room) hotel. About $350,000. F. F. Weed, C. W. Brockman and others, incorporators. Architect not selected.

Cal., Cupertino—School—Cupertino Union High School Dist. having plans prepared by C. S. McKenzie, archt., Bank of San Jose Bldg., San Jose, for school, here. About $75,000.

Cal., Del Monte—Bath House—Del Monte Bath House Co. having plans prepared by P. V. Tuttle, archt., 565 Lighthouse Ave., Pacific Grove, for frame and cement bath house, two hundred and twenty-five 2 and 3 room frame cottages, also for converting boat house into power house and extending pleasure pier. About $500,000. Work will be done by day labor under supervision of C. L. Lyon, New York City.

Cal., Healdsburg—Bank—F. H. Meyer, archt., Bankers' Investment Bldg., San Francisco, soon receives bids building 1 story, 60 x 100 ft., concrete, brick and hollow tile, on West and Powell Sts., for Healdsburg Natl. & Savings Bank. About $100,000.

Cal., Long Beach — Church — Wilshire Presbyterian Church having plans prepared by R. H. Orr, archt., 1301 Van Nuys Bldg., for church on 3rd and Western Aves. About $60,000.

Cal., Los Angeles—Church—Highland Park Presbyterian Church having plans prepared by A. G. Lindley, archt., 904 Wright & Callender Bldg., for 80 x 90 ft., concrete, brick and artificial stone addition, on Monte Vista St. About $50,000.

Cal., Los Angeles—Library—University of Southern California having plans prepared by J. Parkinson, archt., 420 Title Insurance Bldg., for rein.-con. and brick, rein.-con. flooring, concrete foundation, on 35th St and University Ave. About $100,000.

Cal., Murrietta—Office, etc.—Murrietta Hot Springs Co. plans to construct office building, bathhouse and dining room, concrete and timber, concrete foundation. About $75,000. Architect not selected.

Cal., Pomona—Fire Station and Jail—City voted $95,000 bonds to build fire station and jail. C. E. Bayley, city engr.

Cal., San Bernardino—Hall of Records—Bd. Supervs., San Bernardino Co. plans election to vote on $250,000 bonds to build 2 story, 104 x 111 ft., adjacent to courthouse. H. E. Jones, 404 Katz Bldg., archt.

Cal., Tahoe—Hotel, etc.—A. Baldwin, Arcadia, plans to construct 5 story hotel, (160 rooms) also casino and farm buildings, concrete and local granite, at Lake Tahoe. About $2,000,000. Architect not selected.

Que., Montreal — Hotel — Windsor Hotel, Ltd., Dominion Sq., plans to build 8 story, 50 x 100 ft., concrete and brick, concrete foundation, on Windsor, Cypress and Stanley Sts. About $350,000.

Ont., Ottawa—Memorial Hall, etc.—City Council having plans prepared and soon receives bids building memorial hall, cost $700,000; police station, $300,000; fire hall, $150,000. W. E. Noffke, Union Bank Bldg., archt., A. J. Macallum, City Hall, engr.

B. C., Vancouver—Theatre—T. W. Lamb, archt., 644 8th Ave., New York City, preparing plans for brick and steel, here. About $300,000. Owners name withheld.

BIDS DESIRED

N. Y., Newton (Flushing P. O.)—School—Until Jan. 12, by Bd. Educ., 500 Park Ave., New York City, building brick, steel and stone addition, brick foundation, on Etna Pl., Chicago and Parcell Sts. About $400,000. C. B. J. Snyder, Municipal Bldg., New York City, archt. and engr.

N. Y., New York—School—Until Jan. 22, by Bd. Educ., 500 Park Ave., building P. S. 130, 5 story, 59 x 112 ft., brick and steel, brick foundation, at 201-207 Hester St. About $375,000. C. B. J. Snyder, Municipal Bldg., archt. and engr. Noted Sept. 11.

Md., Hagerstown—Until Jan. 22, by A. J. Klinkhart, C. E. Koontz and F. J. Mark, associated archts., Y. M. C. A. Bldg., building 4 story, 81 x 174 ft., concrete, steel and brick building, concrete foundation, for Y. M. C. A. About $200,000. C. E. Steele, Hagerstown, secy.

O., Canton—Hotel—Until Feb. 2, by E. L. Smith, c/o C. Firestone, archt., Renkert Bldg., constructing 8 story, concrete, steel and brick, rein.-con. flooring, concrete foundation. About $400,000.

O., Cleveland—Commercial—Huron Rd. Co., c/o Grieble & Eberling, archts. and engrs., 517 Sloan Bldg., receiving bids constructing 4 story, 60 x 180 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, at 640 Huron Rd. About $250,000.

O., Cleveland—School—Until Jan. 26, by Bd. Educ., building addition, consisting of two 1 story, 55 x 150 ft., concrete, steel and brick wings, rein.-con. flooring, concrete foundation, on St. Clair Ave. and Royal Rd. About $150,000. W. R. McCormack, East 6th St. and Rockwell Ave., archt.

O., Napoleon—High School—Until Jan. 20 by Bd. Educ., building 3 story, 100 x 150 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation. About $350,000. McLaughlin & Hulsken, Savings Bldg., Lima, archts.

Mich., Detroit—Church—Until Jan. 20, by Van Leyen, Schilling & Keough, engrs. and archts., Union Trust Bldg., building 2 story, 75 x 125 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on McClellan Ave., for Nativity Church. About $175,000. F. Heidenrich, pastor.

Buildings (Continued)

Mich., Detroit—Office—Until Jan. 15, by A. H. Gould & Son, engrs. and archts., 610 Empire Bldg., constructing 12 story, 93 x 160 ft., rein.-con., brick and steel, rein.-con. and wood flooring, concrete foundation, on Clifford and Columbia Sts., for United Brotherhood Maintenance Way Employees & Railway Shop Laborers, c/o W. Dorey, chairman, 27 Putnam Ave. About $500,000.

Mich., Flint—Home—Until Jan. 15, by Van Leyen, Schilling & Keough, archts. and engrs., Union Trust Bldg., Detroit, building 2 story, 40 x 82 ft., brick, steel and stone, wood and tile flooring, on Beach St., for St. Michael's Parish. About $50,000.

Ill., Chicago — Sales — A. S. Alschuler, archt., 28 East Jackson St., receiving bids constructing 3 story, 200 x 400 ft., rein.-con. and brick, sales and service building, rein.-con. flooring, concrete foundation, on Michigan Ave. near 22nd St., for Hudson Motor Co. of Illinois, 1615 South Michigan Ave. About $300,000.

Ill., Chicago—Sales—C. Hatzfield, archt., 7 South Dearborn St., receiving bids for masonry work for 4 story, 75 x 125 ft., rein.-con. and steel, concrete foundation, on Milwaukee and Kedzie Aves. About $150,000. Owner's name withheld.

Ill., Roseland (Chicago P. O.)—Bank—C. Hatzfield, archt., 7 South Dearborn St., Chicago, receiving bids building 2 story, 50 x 125 ft., rein.-con., steel and brick, concrete foundation, here, for Roseland State Savings Bank. About $60,000.

Wis., Oconomowoc—High School—Until Feb. 9, by Bd. Educ., building 3 story, 80 x 100 ft., concrete and brick, rein.-con. flooring, concrete foundation. About $200,000. Parkinson & Dockendorff, Linker Bldg., La Crosse, archts. and engrs.

Wis., West Allis (Milwaukee P. O.)—High School, Auditorium and Gymnasium—Until Jan. 10, by Bd. Educ., completing 2 story, concrete and brick, rein.-con. flooring, concrete foundation. About $130,000. R. A. Messmer & Bro., Majestic Bldg., Milwaukee, archts and engrs.

Ia., Morley—School—Until Jan 21, by W. E. Moon, secy. Bd. Educ., building school. W. J. Brown, 201-3 Amer. Trust Bldg., Cedar Rapids, archt.

Ia., Sac City—School—Until Feb. 3, by Bd. Educ., building 3 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. Ashby, Ashby & Schulze, 178 West Jackson Blk., Chicago, archts. Noted June 12.

Minn., Duluth—School—Until Feb. 15, by J. T. McNicholas, bishop Catholic Diocese of Duluth, 4th St. W., building superstructure for 2 story, 100 x 150 ft., rein.-con. and stone, rein.-con. flooring, on 28th Ave. E., contract for concrete foundation will be let separately. Total cost $150,000.

Minn., Minneapolis — Auditorium and Gymnasium—Until Jan. 25, by Church of Ascension building 3 story, 70 x 140 ft., rein.-con. and brick, on 18th and Bryant Aves., N. About $100,000. Bertrand & Chamberlain, 640 Northwestern Bank Bldg., archts.

Minn., Minneapolis — School — Until Jan. 12, by Bd. Educ., building 3 story, 61 x 163 ft., rein.-con. and brick addition to Calhoun School, on Girard Ave. About $200,000.

Minn., Virginia—Courthouse—Until Feb. 1, (change of date), by Comrs. St. Louis Co. (Duluth), building 2 story, 80 x 120 ft., concrete, brick and tile, here. About $250,000. Croft & Boerner, Palace Bldg., Minneapolis, archts. and engrs.

Neb., Columbus—Courthouse—Until Feb. 17, by Bd. Supervs. Platte Co. building 4 story, 70 x 160 ft. rein.-con., steel and brick rein.-con. flooring, rock foundation. About $225,000. C. Wurdeman, Columbus, archt.

Mont., Lewistown—High School—Until Jan. 15, by Bd. Trustees Fergus Co., building 3 story, high school. About $150,000. Link & Haire, Lewistown, archts. Noted June 26.

Okla., Sapulpa—Hospital—City receiving bids building 2 story, 35 x 75 ft., brick, concrete and steel, concrete foundation. About $55,000. G. B. Steck, clk. C. A. Popkin, 417 Berryhill Bldg., archt. Noted April 10.

Wash., Olympia—Office and Courthouse—Until Jan. 29, by State Capital Comn., Olympia, constructing 3 office buildings and courthouse, here, all brick, steel and stone. About $500,000. Wilder & White, 50 Church St , New York City, archts. and engrs.

Alta., Calgary—Office—Until Feb. 5, by Dept. Pub. Wks., Ottawa, building 11 story, 154 x 160 ft., concrete, brick and stone, rein.-con. flooring, concrete foundation, on 1st St., E. here. About $400,000. R. C. Wright, c/o Dept. Pub. Wks., Ottawa, archt.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Conn., Ansonia—Armory—State Armory Comn., Hartford, let contract building 3 story, 100 x 150 ft. brick and rein.-con., rein.-con. flooring, concrete foundation, on State and North Cliff Sts., to M. Durrschmidt, Derby. About $150,000.

★Conn., Hartford—Store—Bliss, Hill & Steiger let contract building 6 story, brick and steel, brick foundation, to Wise & Upson, 36 Pearl St.

★Conn., Hartford—Store—C. H. Talcott, 19 Woodland St., let contract building 5 story, 50 x 134 ft., brick and steel, brick foundation, on Main St., to Wise & Upson, 36 Pearl St. About $125,000. Incorrectly noted in our issue of Dec. 20.

★Conn., New Britain—Church—Swedish Bethany Church, Main and Walnut Sts., let contract building 1 story, 70 x 120 ft. brick and steel, concrete foundation, on Franklin Sq., to Leavitt & Hayes, 9 Court St. About $100,000. Noted Sept. 11.

★Conn., New Britain—Stores and Offices —B. Stein, et al, 27 Winthrop St., let contract building 2 or 3 story, brick, concrete foundation,, on West Main and Washington Sts., to B. Stein Bldg. Co., 27 Winthrop St. About $50,000.

★N. Y., Brooklyn—Office—See "Industrial Works."

★N. Y., New York—Bank and Office—Gotham Natl. Bank, 1819 Bway., will build 22 story, 85 x 100 ft., brick, steel and stone, brick foundation, at 303 West 59th St. About $3,000,000. Work will be done by day labor.

★N. Y., New York—Sales, etc.—S. B. Bowman Automobile Co., 225 West 49th St., let contract building 3 story, 100 x 200 ft., brick, rein.-con. and steel, salesrooms, service station and garage, rein.-con. flooring, concrete foundation, on Bway., 131st and 132nd Sts., to Standard Concrete Steel Co., 105 West 40th St.

★N. Y., New York—Store and Loft—S. Weil, 194 Franklin St., let contract building 9 story, 60 x 100 ft. brick and steel, brick foundation, at 502-508 Canal St., to J. H. Taylor Constr. Co., 110 West 40th St.

★N. Y., New York—Theatre—S. S. and L. Shubert, 225 West 44th St., let contract building brick and steel, brick foundation, on 49th St., west of Bway., to E. Margolies, 19 East 33rd St. About $500,000.

★N. J., Atlantic City—Bank—Atlantic Natl. Bank let contract making alterations and building brick, steel and stone addition, concrete foundation, on Atlantic and Penn Aves., to Hoggson Bros., 405 5th Ave., New York City. About $200,000.

★N. J., Pennsgrove—Hall and Fire House —Boro let contract building 2 story, 40 x 95 ft., concrete and brick, to E. J. Kreitzburg, Broad and Arch Sts., Phila.

★Pa., Phila.—Bank—Mutual Trust Co., Bourse Bldg., let contract building 1 story, 23 x 96 ft., brick and stone, on Market and 60th Sts., to F. B. Davis & Son, 240 North 16th St. About $50,000.

★Pa., Phila.—Hospital—Misericodia Hospital, 54th St. and Cedar Ave., will build 6 story, 44 x 112 ft., brick, stone and terra cotta. About $300,000.

★Pa., Phila.—Office—See "Industrial Works."

★Pa., Phila.—Sales and Service—Neel Cadillac Co. let contract building 7 story, 150 x 330 ft., rein.-con., brick and terra cotta, on 25th St., Penn., Olive and Fairmont Aves., to Ballinger & Perrot, 17th and Arch Sts. About $1,000,000.

★Pa., Pottstown—Memorial and Library —Hill School let contract building 2 story, 48 x 120 ft., stone, on High and Madison Sts., to W. E. Hale, 1636 Ludlow St., Phila. About $100,000. Noted July 17.

★Pa., Steelton—Bank—Peoples Bank will build 1 story, 36 x 80 ft., stone and granite, on Front and Locust Sts. About $100,000. Work will be done by day labor.

★Va., Richmond—Theatre—Carneal & Johnston, archts. and engrs., 707 Chamber of Commerce Bldg., let contract to J. W. Atkinson, 410 North 23rd St., building 1 story, 94 x 123 ft., on 8th and Broad Sts., for Vincent & Wells Co. About $150,000.

★Ala., Gadsden — Bank — First Natl. Bank let contract remodeling building, to G. W. Muller Bank Fixture Co., Lakewood Ave., Atlanta. About $200,000.

★Miss., Long Beach—School—Gulf Park College let contract constructing 3 story, dormitory and 2 story administration building, hollow-tile and stucco to Chevalier & Fursten, Biloxi. About $140,000.

★La., Baton Rouge—Theatre—Columbia Theatre, 3rd St., let contract building 64 x 129 ft., brick, steel and concrete, concrete flooring, to W. A. Prather, c/o owner. About $50,000.

★O., Canton—Hotel and Lodge—Pythian Castle Bldg. Co. let contract constructing 7 story, 75 x 115 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, to Drummond-Miller Co., 4500 Euclid Ave., Cleveland. About $350,000.

★O., Cleveland—Auditorium—City let contract fireproofing 4 story, 210 x 370 ft., concrete, rein.-con. flooring, on East 6th St. and St. Clair Ave., to Natl. Concrete Fireproofing Co., Citizens Bldg., $441,000. Total cost, $1,500,000. Incorrectly noted in our issue of Jan. 1.

★O., Cleveland—Bank—Woodland Ave. Savings & Trust Co., East 55th St. and Woodland Ave., let contract remodeling 1 story, to Uhl & Jasper Co., 1900 Euclid Ave. About $50,000.

★O., Cleveland—Commercial—Conelly Co., 513 Cuyahoga Bldg., let contract building 3 story, 25 x 76 ft., steel, terra-cotta and brick, brick foundation, on Superior Ave. and East 12th St., to Windsor Constr. Co., Swetland Bldg. About $50,000.

★O., Cleveland—Office and Stores—East 9th St. Theresa Co., c/o Grieble & Eberling, archts. and engrs., 517 Sloan Bldg., let contract building 8 story, 100 x 120 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 9th St. and Theresa Court, to Bolton-Pratt Constr. Co., Columbia Bldg. About $500,000.

★O., Cleveland—Sales—Cleveland Motor Sales Co., 1628 Euclid Ave., let contract building 2 story, 75 x 150 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 40th St. and Prospect Ave., to E. Paulsen, Erie Bldg. About $100,000.

O., Cleveland — School — Bd. Educ. received lowest 3 bids building 2 story, 75 x 242 ft., concrete, steel and brick addition. rein.-con. flooring, concrete foundation, on Warner Rd., from Schirmer-O'Hara Co., 2031 Euclid Ave., $158,800; Tenbusch-Parker Co., 304 Union Bldg., $172,500; Natl. Concrete Fireproofing Co., Citizens Bldg., $181,000.

★O., Cleveland—Theatre and Office—Euclid-17th Co., c/o J. Laronge Co., 214 Williamson Bldg., let contract constructing 1 and 4 story, 125 x 260 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Euclid Ave. and East 17th St., to Fleischman Constr. Co., 1838 East 17th St. About $500,000.

O., Dayton — Sales — See "Industrial Works."

★Mich., Highland Park (Detroit P. O.)— —School—Bd. Educ., La Belle Ave., let contract building 2 story, 40 x 90 ft., rein.-con., brick and steel addition, rein.-con. flooring, concrete foundation, on Hamilton Blvd., to Bryant & Detwiler Co., Dime Bank Bldg., Detroit. About $140,000.

★Ia., Macksburg — School—Bd. Educ. Consolidated Dist. let contract building 3 story, 55 x 98 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $70,000. W. E. Hulse & Co., 210 Masonic Temple, Des Moines, archts.

★Ia., Stennett—School—Bd. Educ. Consolidated Dist. let contract building 2 story, 44 x 81 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to N. D. Garmer, 1237 West 39th St., Des Moines, $53,960.

★Minn., Austin—Jail—Comrs. Mower Co. let contract building 2 story, 44 x 50 ft., rein.-con. and brick addition, to N. Wagner, Austin, $59,094.

★Minn., Duluth—B. C. Wade, secy. Y. M. C. A., 3rd Ave. E., let contract building 3 story, 75 x 113 ft , brick, rein.-con. flooring, concrete foundation, on Central Ave., to E. J. Zauffts, 5810 Wadena St., $98,250.

★Minn., Minneapolis—Lodge and Office—Highland Lodge, I O. O. F., let contract building 3 story, 64 x 90 ft., on Lyndale Ave., to Carlsted Bros., 512 Builders Exch. About $50,000, cost plus percentage basis.

Buildings (Continued)

★**Minn., St. Paul** — Store — Emporium Mercantile Co., 7th and Robert Sts., let contract building 6 story, 145 x 160 ft., rein.-con. and steel addition, to J. Leck Co., 316 7th St., Minneapolis. About $600,000.

★**Kan., Ottawa**—Library, Science Hall and Dormitories—Ottawa University let contracts to N. B. Beeler, Ottawa, building 1 story, 58 x 106 ft., library, cost $60,000, 2 story, 75 x 110 ft., ward science hall, $75,000, and two 2 story dormitories, $75,000 each, all brick, rein.-con. and steel, rein.-con. flooring, concrete foundation.

Neb., McCook—Hotel—Keystone Hotel Co. let contract building 100 room, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to Gedney Constr. Co., Hastings. About $200,000; cost plus percentage basis.

★**Mo., Kansas City**—Sales—Kelley-Reppert Motor Car Co., 404 Admiral Blvd., let general contract building 2 story, 82 x 96 ft., rein.-con., brick and terra cotta, on Admiral and Locust Sts., to E. L. Winn Constr. Co., 105 Ry. Exch. Bldg., cost plus percentage basis; reinforcing steel, to Corrugated Bar Co., 1503 Waldheim Bldg.; structural steel, to Havens Structural Steel Co., Kansas City.

★**Okla., Cleveland** — High School — Bd. Educ. let contract building 2 story, 68 x 126 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to Manhattan Constr. Co., 3rd and Fondulac Sts., Muskogee. About $126,800.

★**Cal., Arcadia**—School—Bd. Educ. let contract building 1 story, 60 x 180 ft., brick and tile to Daniels & Farris, 916 Herkimer St, Pasadena, $52,715.

★**Cal., Fresno**—Sales—See "Industrial Works."

★**Cal., Los Angeles**—Church—Hollywood Congregational Church let contract building 2 story, 56 x 120 ft., hollow tile, concrete foundation, on Sycamore Ave., and Hollywood Blvd., to Houghton & Anderson, 143 Rose St. About $50,000.

★**Cal., Modesta**—High School—Bd. Educ. let contract building 1 story, 126 x 164 ft., rein.-con. addition, on 1st and H Sts., to McLeran & Peterson, Sharon Bldg., San Francisco. About $74,000. Noted Sept. 25.

Cal., Oakland—Hospital—Bd. Supervs. Alameda Co. received bids Dec. 22, constructing 4 story, 132 x 144 ft. service building and two 40 x 140 ft. ward buildings, with connecting corridors, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on 14th Ave. and Vallecito Pl., from Clinton Constr. Co., 140 Townsend St., $546,000; R. Frost, 264 Howard St., $548,780; K. E. Parker Co., 519 California St., $565,000. Contractors all of San Francisco.

★**Cal., San Diego**—Store—Holzwasser, Inc., Bway., let contract building 8 story, 100 x 100 ft., rein.-con. and brick, concrete foundation, on 5th St. and Bway., to Lange & Bergstrom, Timken Bldg. About $300,000.

★**Cal., San Francisco**—Club House—Bd. Missions, South, 805 Crocker Bldg., let contract building 3 story, brick, on McCoppin St. and Elgin Park, to C. Stockholm & Son, Monadnock Bldg. About $65,000.

Federal Government Work

PROPOSED WORK

Wash., Seattle—Dredging—U. S. Engr. Office, War Dept., Wash., D. C., plans to dredge channel at entrance to Port Gamble Harbor, here, 2,500 ft. long, 28 ft. deep and 150 ft. wide. About $24,000.

Cal., Sacramento — Post Office — Treas. Dept., Wash., D. C., received no bids Dec. 29, extending and remodeling, here. J. A. Wetmore, superv. archt.

BIDS DESIRED

R. I., Newport—Laundry—Spec. 4081—Until Jan. 14, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building laundry, concrete foundation, concrete frame and floor construction, brick exterior walls, etc., here. About $60,000; $10 deposit required for plans and spec.

R. I., Newport—Torpedo Storage Racks—Spec. 4060—Until Jan. 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building crane runway, crane and racks, at Torpedo Storehouse, Gould Island Naval Sta., here. About $20,000; $10 deposit required for plans and spec.

N. Y., New York—Roof—Spec. 4113—Until Feb. 25, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building new roof, supported on present purline, on Bldg. 29, Navy Yard, here. About $32,000; $10 deposit required for plans and spec.

N. Y., Staten Island—Aerial Defense Station—Until Jan. 10, (change of date), by Constr. Quartermaster, 39 Whitehall St., New York City, furnishing labor and material for building barracks and quarters, mess hall, post exchange, administration building, etc., at Air Coast Defense Station, here. About $500,000. Noted Jan. 1.

N. Y., Tompkinsville—Steel Body—Until Jan. 12, by Supt. of Lighthouses, for 1 steel body for type LW acetylene buoy with skeleton steel superstructure.

Pa., Phila.—Experimental Shop—Until Jan. 13, by H. J. Lumsden, officer in charge of construction, Frankfort Arsenal, building experimental shop, here; advertised in this issue.

D. C., Wash.—Quay Wall—Spec. 4112—Until Jan. 21, by Bureau Yards & Docks, Navy Dept., completing quay wall at Navy Yard, here; $10 deposit required for plans and spec.

Tenn., Memphis—Concrete Mixer, Hoisting Engine, Clam Shell Bucket, Conveyor, Elevator, etc.—Until Jan. 21, by Mississippi River Comn., 1st and 2nd Dists., Custom House, furnishing and delivering; advertised in this issue.

Wash., Puget Sound—Engine Room Extension—Spec. 4024—Until Jan. 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building extension to central power plant, here, 59 ft. long, 42 ft. 1½ in. wide, concrete footings, foundation walls and basement floor, brick wall above operating floor, etc. About $40,000; $10 deposit required for plans and spec. Noted Aug. 28.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Phila.** — Cranes — Spec. 4092 — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building 2 traveling hammerhead cranes for fitting out piers at Navy Yard, here, and 1 at Norfolk, Va., to McMyler Interstate Co., Bedford, O. $138,875 (205 days).

D. C., Wash.—Electric Traveling Cranes—Spec. 4094—Bureau Yards & Dcks, Navy Dept., received bids Dec. 30, furnishing and installing two 15-ton electric traveling bridge cranes with 5-ton auxiliary in proof shop, at Navy Yards, from Whiting Fdry. Equipment Co., Harvey, Ill., $25,050 (135 days); Pawling & Harnischfiger, 38th St. and Natl. Ave., Milwaukee, Wis., $24,900 (150 days); Manning, Maxwell & Moore, 119 West 40th St., New York City, $25,231 (115 days).

★**Va., Alexandria**—Partitions—Spec. 4098—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building partitions for offices, storerooms and dispensary, at Naval Torpedo Assembly Plant, here, to Hyde & Baxter, Wash., D. C., $24,490.

★**S. C., Charleston**—Heating—Spec. 4091—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract heating torpedo storehouse Bldg. 101 and constructing boiler house additon to same building at Naval Ammunition Depot, here, to J. R. Proctor, Inc., 74 Cortlandt St., New York City, $6,846 (75 days).

★**Fla., Pensacola** — Heating System—Spec. 4071—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing heating system at Torpedo Storehouse and constructing additional building with brick chimney, at Naval Ammunition Depot, here, to J. W. Eley, 11 West Intendencia St., $6,720 (75 days).

Ky., Louisville—Remodeling Post Office-Treas. Dept., Wash., D. C., received lowest 3 bids Dec. 23, remodeling Post Office, here, from W. MacDonald Constr. Co., Odd Fellows Bldg., St. Louis, $11,267; J. P. Casey Co., 115 South Dearborn St., Chicago, $11,646; Sanford, Vaughn & Son, Louisville, $16,488, Rommel Bros., 919 East Bway., $17,345.

★**Ill., Rock Island**—Building—U. S. Government let contract constructing new building, brick and concrete walls, concrete foundation, and 2 traveling cranes, at Arsenal, here, to H. W. Horst, Co., Horst Bldg. About $150,000.

★**Wash., Puget Sound**—Dredging—Spec. 4110—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract dredging at Receiving Ship Pier, here, to Erickson Constr. Co., 25 Downs Bldg., Seattle, $0.90 per cu.yd.

★**Cal., San Diego**—Buildings—Spec. 4047—Pub. Wks. Office, San Diego, let contract constructing 1 story central building, cover 30,000 sq.ft. floor space, consisting of power house at center with ell shaped east and west wings for housing utilities, at Marine Corps Base, to Lange & Bergstrom, Timken Bldg., $209,000 (180 days).

Cal., San Diego—Coal Hopper—Spec. 4105—Pub. Wks. Officer, San Diego, received bids Dec. 20, furnishing coal hopper for Naval Fuel Depot, from F. W. Stefgen, $3,259 (30 days), California Iron Wks., foot of 7th St., $3,750 (40 days).

P. R., Point Borinquen—Light Station—Comr. of Light Houses, Wash., D. C., received bids Dec. 17, furnishing labor and material building, here, from F. D. Rexach, San Juan, $54,220 (4 months), P. Clark, New York City, $93,000 (10 months), W. R. Taylor, Norfolk, Va., $132,785 (15 months).

Miscellaneous

PROPOSED WORK

Swimming Pool—Pittston, Pa.—City plans to build community swimming pool. About $25,000. W. F. McHugh, clk.

Garbage Incinerator—Monroe, La.—City having plans prepared for garbage incinerator, capacity 2 tons per hour. Bonds for $12,000 voted for project. W. G. Kirkpatrick, city engr.

Stockyard Improvements — Memphis, Tenn.—Dixie Natl. Stockyards Co. doubled capitalization and plans to construct several buildings. About $50,000. F. D. Fuller, Bank of Commerce Bldg., pres.

Grand Stand—Akron, O.—Akron Exhibition Co., Doyle Block, having preliminary plans prepared by Osborn Eng. Co., engrs. and archts., 2848 Prospect Ave., Cleveland, for concrete, steel and brick grand stand, rein.-con. flooring, concrete foundation, on East Market St. About $200,000. F. W. Doyle, pres.

Swimming Pool—West Park, O.—E. T. Miller, c/o W. S. Tyler Co., East 36th St. and Superior Ave., having plans prepared by Best & Hoefler, engrs, 6523 Euclid Ave., Cleveland, for 30 x 90 ft., concrete and terra cotta swimming pool. About $15,000.

Garbage Disposal Plant—Flint, Mich.—City having plans prepared for garbage disposal plant, brick, concrete and steel, also rendering plant, water tank, trackage and cars. About $60,500. F. D. King, clk. J. Shoecraft, city engr.

Road Machinery, Etc.—Wisconsin—The following amounts have been appropriated by various counties to purchase road machinery during 1920:
Bayfield Co., $6,243.
Columbia Co., 1 scarifier, 8 graders, 10 plows, 12 slip scrapers, $18,000.
Douglas Co., $10,000.
Dunn Co., stone crusher and 14 patrolmen's outfits, $9,000.
Florence Co., truck, wheelers, scrapers, plows and other machinery.
Fond du Lac Co., $10,000.
Kenosha Co., road drags, small graders, small tractor and large truck, $10,000.
Kewaunee Co., tractor engine, $600.,
La Crosse Co., quarry equipment, trucks, crushers and building machinery shed, $15,000.
Lafayette Co., 40-80 tractor, 14 ft. blade grader, patrol graders and road planes, $5,000.

Manitowoc Co., 6 small graders and other equipment, $8,000.
Marathon Co., cooking and sleeping cars, wheelers, dump wagons, graders, tractor and small tools, $16,000.
Monroe Co., 8 patrolmen's outfits and other tools, $7,000.
Oconto Co., $5,000.
Ozaukee Co., 2 or 3 tractors, 2 or 3 trucks and 6 or 7 small blade graders, $10,000.
Pepin Co., $3,000.
Portage Co., gravel loader and other equipment, $2,000.
Richland Co., heavy tractor and grader $8,000.
Rock Co., $10,000.
Sawyer Co., graders, scrapers and building machine shed, $6,500.
Shawano Co., 8 graders and other small equipment, $10,000.
Walworth Co., $5,000.
Washington Co., $13,000.
Waupaca Co., $15,000.
Waushara Co., $4,000.

Road Machinery—Ft. Atkinson, Wis.—City plans to purchase road machinery and patrolmen's outfits. About $10,000. R. D. Royce, Ft. Atkinson, engr.

Miscellaneous (Continued)

Road Machinery, etc.—Port Washington, Wis.—Comrs. Ozaukee Co. appropriated $10,000, to purchase road machinery, 3 tractors with graders, etc. J. H. Mueller, Thiensville, engr.

Pier—Santa Monica, Cal.—City voted $75,000 bonds to repair concrete pleasure pier, involving 130 concrete piles, etc. J. A. Morton, city engr. Noted May 8.

Garbage Incinerator — Toronto, Ont. — Oakoal Co., King St., E., has offered city $15,000 a year for its garbage, proposing to build plant and make same into fuel briquettes.

Sea Wall, etc.—Toronto, Ont.—City plans to build precast mass concrete sea wall on wood piles, from Humber River to Eastern Gap, brick and steel warehouse, at foot of York St., large bathhouse, wood construction amusement park at Sunnyside, improve beach at Scarboro, and complete Sunnyside Blvd., tar bound macadam on concrete base. About $4,000,000. E. L. Cousins, Harbor Bldg., engr.

BIDS DESIRED

Turbo Generator, Condenser, Etc.—Clarksdale, Miss.—Until Jan. 13, by City Comrs., furnishing f.o.b. Clarksdale, one 1,500 K. W. Turbo generator, condenser and necessary cooling apparatus and one boiler feed pump to furnish 110 gal. water per min. against 200 lb. pressure. W. S. Bobo, city engr.

Amusement Park—Detroit, Mich.—Until Jan. 12, by L. Kamper, engr. and archt., 752 Book Bldg., furnishing and building structural steel framework for addition to amusement park, including merry-go-round, etc., on Field and Jefferson Aves., for A. F. West, c/o architect. About $10,000.

Cement—Minneapolis, Minn.—Until Jan. 16, by K. E. Alexander, city purch. agt., furnishing 100,000 bbls. portland cement. Cost $2.72 per sack car load lots; $2.90 local delivery.

Paving Blocks—Minneapolis, Minn.—K. E. Alexander, city purch. agt., receiving bids furnishing 200,000 sq.yd. 3½ in., creosoted, yellow pine paving blocks. About $2.50 per ft.

Sewer Pipe, Fire Hydrants, Valves, Etc. —Minneapolis, Minn.—K. E. Alexander, city purch. agt., receiving bids furnishing sewer pipe, various sizes, 50 fire hydrants, fifty 6 in., twelve 8 in. and six 12 in. gate valves, and 50 tons waterworks castings. About $22,000.

Asphalt Paving Plant—St. Paul, Minn.—H. W. Austin, city purch. agt., receiving bids for asphalt paving plant, 400,000 lbs. asphaltic concrete, daily capacity. About $25,000.

Asphalt Road Oil—St. Paul, Minn.—Until Feb. 2, by G. Ries, aud. Ramsey Co., furnishing 150,000 gal. 40-50 per cent asphalt road oil. R. R. Godfrey, co. surv.

Water Pipes—St. Paul, Minn.—Until Jan. 12, by H. W. Austin, city purch. agt., furnishing 880 ft. 6 in., 320 ft. 12 in. and 400 ft. 16 in. Class B c.i. water pipe, all 12 ft. lengths. About $50,000.

Cement—Hartford, Wis.—Until Jan. 10, by C. Johnson, engr., Kewaskum, furnishing 84,000 bbls. portland cement, for Washington Co.

Grandstand—West Allis (Milwaukee P. O.) Wis.—Until Jan. 19, by Wisconsin Dept. Agriculture, Capitol, Madison, building 456 ft. rein.-con. and hollow tile addition to grandstand, at State Fair Park, here. About $100,000. A. C. Clas, Colby-Abbot Bldg., Milwaukee, archt.

Cement, Etc.—Petaluma, Cal.—Until Jan. 14, by W. W. Felt, Jr., clk. Sonoma Co., (Santa Rosa) furnishing 41,050 bbl. cement and various quantities and sizes of corrugated metal culvert pipe, f.o.b., Petaluma.

Wood Pipe—Guelph, Ont.—Until Jan. 19, by City Manager, furnishing 1,500 ft. 8 in., 1,500 ft. 12 in. and 15 M ft. 24 in. wood pipe, to be used in the construction of water supply conduit. F. McArthur, city engr.; advertised in this issue.

Phase Generators — Winnipeg, Man.—Until Jan. 26, by Com. on Fire, Water, Light & Power, for supplying, delivering and erecting on foundations supplied by Corp. in its Power House, Point du Bois, two 3 phase generators for direct connection to double re-action turbines and for spare parts for same, also for 1 additional or extension set, ordered furnished and installed under the same conditions. C. J. Brown, clk.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contrait)

★Elevated Railways—New York, N. Y.—Pub. Serv. Comn., 49 Lafayette St., let contract improving part of White Plains Ry., to D. C. Serber, 1123 Bway., $49,187 and completing construction of 239th St. route, to Bainbridge Constr. Co., 52 Vanderbilt Ave., $155,288. Noted Jan. 1.

BARGE CANAL WORK, COHOES, N. Y.

Terminal Contr. 36-A

Bids were received by L. Nixon, supt. pub. wks., Capitol, Albany, for constructing extension to existing dock wall and freighthouse at Cohoes, from (A) Holler-LaDue Corp., Holland Bldg., Albany (awarded contract); (B) Lathrop, Shea & Henwood Co., 428 Ellicott Sq., Buffalo; (C) Troy Public Works Co., City Natl. Bank Bldg., Utica; (D) W. F. Martens, 245 Cutler Bldg., Rochester. The unit bids of the lowest 3 bidders were as follows:

	A	B	C
Cofferdams, pumping, bailing and draining (lump sum)	$7,300.00	$9,000.00	$8,500.00
13,500 cu.yd. excavation	1.20	1.25	1.50
2.5 M.ft b.m. sawed lumber	90.00	90.00	90.00
452 lin.ft. wooden fence	.50	.60	.50
850 cu.yd. second-class concrete	12.00	14.50	13.07
200 lb. structural steel	.10	.10	.10
2 placing snubbing posts	10.00	10.00	10.00
200 lin.ft. placing nosing	.30	.30	.30
35 placing fender fastenings	.40	.40	.40
Painting freight house (lump sum)	140.00	168.00	140.00
440 cu.yd. gravel surfacing	2.25	2.00	2.00
240 cu.yd. third-class riprap	4.25	4.50	4.50
Carpenter work (lump sum)	3,000.00	3,600.00	3,300.00
Electric lighting system (lump sum)	250.00	300.00	250.00
Extended totals	$39,666	$44,838	$46,600

BARGE CANAL WORK, NEW YORK, N. Y.

Terminal Contr. 45

Bids were received by L. Nixon, supt. pub. wks., Capitol, Albany, for constructing barge canal terminal at Hallett's Cove, Borough of Queens, from (A) Mohawk Dredge & Dock Co., Inc., Herkimer, (awarded contract); (B) Fox-Reynolds Co., Inc., 81 East 125th St., New York City; (C) Lathrop & Shea Co., New Haven, Conn. The unit bids were as follows:

	A	B	C
Removing old material (lump sum)	$2,000 00	$1,800.00	$1,700.00
Cofferdams, pumping, bailing and draining (lump sum)	16,000.00	17,171.00	20,500.00
63,000 cu.yd. excavation	1.70	1.40	2.75
23,000 lin.ft. foundation and bracing piles	.70	.85	.80
100 fender piles	30.00	30.00	32.00
2,500 lin.ft. round timber	.60	.40	.50
180 M.ft.b.m. sawed lumber	100.00	128.00	130.00
2,500 cu.yd. first-class concrete	16 00	19.50	18.00
2,400 cu.yd second-class concrete	14.00	16.00	16.00
13,000 lb. iron and steel fastenings	.09	.08	.09
1,100 fender fastenings	1 75	1.50	1.75
9,000 lb. iron castings	.08	.08	.08
80 pile shoes	2.00	1.50	2.00
5,200 cu.yd. riprap	2.50	2 00	3.60
500 cu.yd. stone filling	2.50	3 00	2.75
Extended totals	$255,275	$257,141	$349,170

ROAD WORK—DULUTH, MINN.

Commissioners of St. Louis Co. received bids building 15 mi. of Div. 2, State Job 1, from (A) S. J. Groves & Sons Co., 105 Kasota Bldg., Minneapolis, (awarded contract); (B) A. Guthrie Co., St. Paul. The unit bids were as follows:

	A	B
89.32 acres clearing (lump sum)	$6,252.40	$7,200.00
78.76 acres grubbing (lump sum)	9,845.00	19,000.00
161,881.6 cu.yd. excavation	79	.85
8,936.7 cu.yd. loose rock excavation	1 35	1 50
2,420 cu.yd. solid rock excavation	5.00	2.50
5.48 acres off-takes clearing	125.00	....
3.46 acres off-takes grubbing	240 00	....
31,538 cu.yd. hand ditching (earth)	65	.85
210 cu.yd. hand ditching (loose rock)	1.35	1.50
308,773.8 ft. overhaul (per 100 ft.)	.01½	.01½
471 cu.yd. rock piled in grub	1 35	.75
31,187 sq.yd. special plowing	.20	.10
112 cu.yd. stone riprap end walls	5.00	8.00
11,700 ft. 6-in. tile drains (3 ft.)	.50	.50
6,000 ft. 6 in. tile drains (4 ft.)	.60	60
7,500 ft. stone drains (2 ft.)	.50	.50
707.5 lin.ft. 18 in. pipe	.40	.50
1,432.5 lin.ft. 24-in. pipe	.45	60
290 lin.ft. 32-in. pipe	.50	75
47.5 lin.ft. 36-in. pipe	.55	.90
92.5 ft. 48-in. pipe	.60	1.25
638.3 ft. hauling from cars	1.00	1.00
120 lin.ft. 12-in. pipe	25	50
225 lin.ft. 15-in. pipe	30	50
130 lin.ft. 42-in. pipe	45	1.00
1,520 cu.yd. loading and hauling (1 mi.)	1 25	1 50
1,906 cu.yd. mile haul	60	75
Shaping and compacting (men)	60	....
Shaping and compacting (teams)	1.00	....
Extended totals	$221,085	$240,857

★Shed and Piers—New York, N. Y.—Dept. Docks, Pier "A," North River, let contract building shed at 18th St. Pier, East River, and reconstructing pier at foot of 25th St., East River, to Associated Contractors, Inc., 17 West 42nd St., $214,811.

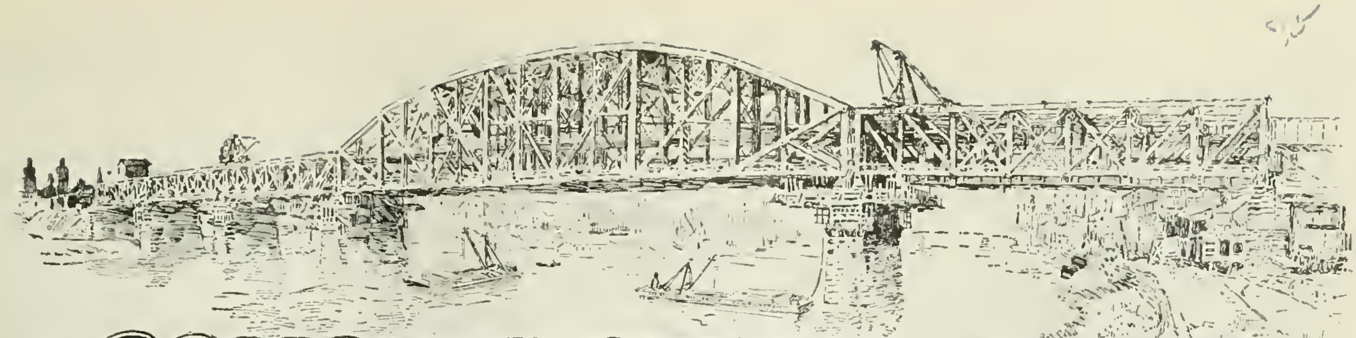
★Hoisting Machinery—Memphis, Tenn.—City let contract furnishing machinery for hoisting from river to warehouse, 100 ft. vertical lift, to Link Belt Co., 910 South Michigan Ave., Chicago. About $25,000.

★Foundation—Minneapolis, Minn.—State Fair Assn. let contract building foundation for 1 story, 140 x 240 ft., stock barn, at State Fair Grounds, to C. Ash & Son, 202 Maria Ave., St. Paul, $29,289.

Breakwater—Milwaukee, Wis.—Sewerage Comn. received bids Dec. 18, building breakwater at east side of Jones Island, involving (a) 118,000 lin.ft. round piles, (b) 1,100 tons steel sheet piles, (c) 140 M. B. M. timber, (d) 74 ton tie rods, bolts, etc., (e) 23,000 tons stone, (f) 170,000 cu.yd. excav., from E. E. Gillen Co., Wells Bldg., (a) $0.47 per lin.ft., (b) $78, (c) $160, (d) $340, (e) $3.15, (f) $0.44, total cost, $336,070; Great Lakes Dredge & Dock Co., 216 West Water St., (a) $0.61, (b) $115, (c) $200, (d) $260, (e) $2.95, (f) $0.47, $393,470; Greiling Bros. Co., 100 Blk. East Walnut St., Green Bay, (a) $0.60, (b) $150, (c) $200, (d) $280, (e) $3.55, (f) $0.48, $447,770.

★Waterworks Machinery—Lamar, Col.—City let contract for waterworks machinery, to Hendrie & Bolthoff, 1639-17th St., Denver. About $41,000.

★Revetment Wall and Arches—Owen Sound, Ont.—Town Council let contract building revetment wall and arches, involving 750 ft. piling, concrete, etc., to N. B. Horton, Owen Sound. About $86,000.



CONSTRUCTION NEWS

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Jan. 19	Shenoygan, Wis.	Jan. 1
Jan. 19	Corydon, Ia.	Jan. 8
Jan. 19	Guelph, Ont.	Jan. 15
Jan. 27	Avoca, Ia. Adv. Jan. 1.	Jan. 1
Jan. 27	Versailles, Ky.	Jan. 15
Jan. 30	Hugoton, Kan.	Jan. 8
Feb. 3	Mc. Cammon, Idaho	Jan. 15
Feb. 10	Toronto, Ont.	Jan. 1
Feb. 12	Douglas, Ariz.	Jan. 8
Feb. 15	Washta, Ia.	Jan. 15
Feb. 17	Jacksonville, N. C.	Jan. 15

SEWERS

Jan. 19	Buffalo, N.Y.	Jan. 8
Jan. 20	Yuma, Ariz.	Jan. 8
Jan. 20	Broken Bow, Neb.	Jan. 15
Jan. 20	Senatobia, Miss. Adv. Jan. 8.	Jan. 8
Jan. 20	Brookhaven, Mass.	Jan. 8
Jan. 27	Edgefield, S. C.	Jan. 8
Jan. 29	Oxford Junction, Ia.	Jan. 15
Feb. 2	Kokomo, Ind.	Dec. 16
Feb. 2	Elmhurst, Ill.	Jan. 8
Feb. 12	Ashley (Wilkes Barre P. O.), Pa.	Jan. 15
Feb. 20	Carnegie, Okla.	Jan. 8

BRIDGES

Jan. 19	Florence, Ariz.	Jan. 1
Jan. 19	Jackson, N. C.	Jan. 8
Jan. 20	Aspermont, Tex.	Jan. 8
Jan. 26	Wilmington, Del.	Jan. 8
Jan. 27	Dublin, Ga.	Jan. 8
Feb. 7	Covington, Ind.	Jan. 15
Feb. 7	San Carlos, Ariz.	Jan. 15
Feb. 7	Bethlehem, Pa.	Dec. 11
Feb. 10	Schenectady, N. Y. Adv. Jan. 15.	Jan. 15
Feb. 25	Bethlehem, Pa.	Jan. 8

STREETS AND ROADS

Bids Close		See Eng. News-Record
Jan. 19	Finch, Ont.	Dec. 4
Jan. 19	Tombstone, Ariz.	Jan. 1
Jan. 19	Spring Lake, N. J.	Jan. 1
Jan. 19	Baldwin, Mich.	Jan. 15
Jan. 19	Duluth, Minn.	Jan. 15
Jan. 20	Arkansas	Jan. 15
Jan. 20	Waycross, Ga	Jan. 15
Jan. 20	Washington, Ga.	Jan. 8
Jan. 20	Ventura, Cal.	Jan. 8
Jan. 20	Warren, Minn.	Jan. 8
Jan. 21	Brooklyn, N. Y.	Jan. 15
Jan. 21	Arkansas	Jan. 15
Jan 22	New York, N. Y.	Jan. 15
Jan. 22	Texas	Jan. 15
Jan. 22	Wichita Falls, Tex. Adv. Jan. 1.	Jan. 1
Jan. 22	Wichita Falls, Tex.	Jan. 8
Jan. 22	Indiana	Jan. 15
Jan. 22	Wisconsin	Jan. 15
Jan. 22	Wichita Falls, Tex.	Jan. 15
Jan. 23	Ohio	Jan. 8
Jan. 23	Ionia, Mich.	Jan. 15
Jan. 23	Jackson, Mich.	Jan. 15
Jan. 23	Ohio	Jan. 15
Jan. 24	Williamson, W. Va.	Jan. 15
Jan. 25	George, Ia.	Jan. 15
Jan. 26	Wayne, W. Va.	Jan. 15
Jan. 27	Montgomery, Ala. Adv. Jan. 1.	Jan. 1
Jan. 27	Howell, Mich.	Jan. 1
Jan. 27	Pennsylvania	Jan. 8
Jan. 27	Montgomery, Ala.	Jan. 8
Jan. 28	St. Louis, Mo.	Dec. 11
Jan. 28	Indiana	Jan. 15
Jan. 29	Pella, Ia.	Jan. 1
Jan. 29	New Jersey,	Jan. 15
Jan. 29	Jackson, Mich.	Jan. 15
Jan. 30	Hudson, Mich.	Jan. 8
Jan. 30	Charlotte, Mich.	Jan. 15
Jan. 30	Tawas City, Mich.	Jan. 15
Jan. 30	New York, N. Y. Adv. Jan. 15.	Jan. 15
Jan. 31	Hillsboro, Tex.	Jan. 15
Feb. 2	St. Paul, Minn.	Jan. 8
Feb. 2	Clay, W. Va.	Jan. 15
Feb. 2	Potosi, Mo.	Jan. 15
Feb. 2	Flint, Mich.	Jan. 15
Feb. 3	St. Louis, Mo.	Jan. 15
Feb. 3	Liberty, Mo.	Jan. 15
Feb. 4	Indiana	Jan. 15
Feb. 5	Continental, O.	Jan. 15
Feb. 5	Sedalia, Mo.	Jan. 15
Feb. 5	Charles Town, W. Va.	Jan. 15
Feb. 6	Huntersville, Mo.	Jan. 15
Feb. 10	Meadowville, Pa.	Jan. 15
Feb. 18	Fayetteville, Ark.	Jan. 15
Feb. 24	Montgomery, Ala. Adv. Jan. 8.	Jan. 8

RAILWAYS

Feb. 17	Ontario	Jan. 15

EXCAVATION AND DREDGING.

Jan. 19	Des Moines, Iowa	Jan 8
Jan. 19	Wapello, Ia.	Jan. 15
Jan. 20	Tompkinsville, N. Y.	Jan. 15
Jan. 27	Lewiston, Ill.	Jan. 8
Jan. 30	Fergus Falls, Minn.	Jan. 15
Jan. 31	Crawfordsville, Ind.	Jan. 15
Feb. 6	Bemidji, Minn.	Jan. 15
Feb. 15	Benjamin, Utah	Jan. 1

INDUSTRIAL WORKS

Jan. 17	Coatesville, Pa.	Jan. 15
Jan. 17	Hoboken, N. J.	Jan. 15
Jan. 19	Yuma, Colo.	Jan. 1
Jan. 19	Holestrung (Phila. P. O.) Pa.	Jan. 15
Jan. 20	Detroit, Mich.	Jan. 15
Jan. 20	Casper, Wyo.	Jan. 15
Jan. 20	Darlington, S. C.	Jan. 8
Jan. 20	Greenville, Miss.	Jan. 15
Jan. 25	Shopiere, Wis.	Jan. 1
Jan. 30	Flint, Mich.	Jan. 15
Feb. 1	Pocatello, Idaho	Jan. 1
Feb. 3	Sumter, S. C.	Jan. 15
Mar. 1	Edmonton, Alta	Jan. 8

BUILDINGS

Bids Close		See Eng. News-Record
Jan. 19	Lowell, Mass.	Dec. 11
Jan. 19	South Orange, N. J	Jan. 1
Jan. 19	Trumbull, Conn.	Jan. 15
Jan. 20	Three Rivers, Que.	Dec. 26
Jan. 20	Webster, S. D.	Jan. 1
Jan. 20	Napoleon, Ohio	Jan. 8
Jan. 20	Detroit, Mich	Jan. 8
Jan. 20	Texarkana, Ark.	Jan. 15
Jan. 20	Hominy, Okla	Jan. 15
Jan. 20	Tomah, Wis.	Jan. 15
Jan. 20	Swampscott, Mass.	Jan. 15
Jan. 20	New York, N. Y.	Jan. 15
Jan. 20	Detroit, Mich	Jan. 15
Jan. 20	Chicago, Ill.	Jan. 15
Jan. 21	Morley, Ia.	Jan. 8
Jan. 21	Portage la Prairie, Man.	Jan 15
Jan. 22	Hagerstown, Md.	Jan. 8
Jan. 23	Woodbine, Ia.	Jan. 15
Jan. 23	Bay City, Mich.	Jan. 15
Jan. 25	Minneapolis, Minn.	Jan. 8
Jan. 25	Phila., Pa.	Jan. 15
Jan. 26	Cleveland, Ohio	Jan. 8
Jan. 27	Cheyenne, Wyo.	Jan. 1
Jan. 27	Chester, Pa.	Jan. 15
Jan. 27	Webster, S. D.	Jan. 15
Jan. 28	Olympia, Wash.	Jan. 15
Jan. 28	Barnes City, Ia.	Jan. 15
Jan. 30	Vercheres, Que.	Jan. 15
Jan. 30	Watertown, S D	Jan. 15
Feb. 1	Grand Island, Neb.	Jan. 15
Feb. 1	Mitchell, S. D. Adv. Dec. 28.	Dec. 20
Feb. 1	Duluth, Minn.	Dec. 26
Feb. 1	Salt Lake City, Utah	Jan. 1
Feb. 1	Virginia, Minn.	Jan. 8
Feb. 2	Independence, Cal.	Jan. 1
Feb. 2	Canton, Ohio	Jan. 8
Feb. 2	Holdenville, Okla.	Jan. 15
Feb. 3	Sac City, Iowa	Jan. 8
Feb. 3	McKinley, Minn.	Jan. 15
Feb. 5	Calgary, Alta.	Jan. 8
Feb. 9	Oconomowoc, Wis.	Jan. 8
Feb. 13	Dayton, Ia.	Jan. 15
Feb. 17	Columbus, Neb.	Jan. 8
Feb. 19	Manitowoc, Wis.	Jan. 15
Feb. 19	Johnson City N. J. Adv. Jan 15.	Jan. 15
Feb. 20	Salt Lake City, Utah	Jan. 1
Mar. 1	Racine, Wis.	Jan. 1
Mar. 1	Carlton, Ont.	Jan. 15
Mar. 1	Montreal, Que.	Jan. 15
Mar. 1	Alpena, Mich	Jan. 15
May 15	Syracuse, N. Y.	Dec. 11

FEDERAL GOVERNMENT WORK

Jan. 20	Bridge—Be[illegible] Mont.	Dec. 26
Jan. 20	Additional Buildings—Dawson Springs, Ky.	Jan. 1
Jan. 20	Well-Ft.-H.-G.-Wright, N. Y.	Jan. 8
Jan. 21	Engine Room Extension — Spec. 4024—Puget Sound, Wash.	Jan. 8
Jan. 21	Removing and Rebuilding—Spec. 4109 — Hampton Roads, Va.	Jan. 1
Jan. 21	Dispensary—Spec. 4101—Norfolk, Va.	Jan. 1
Jan. 21	Concrete Mixer, Hoisting Engine, Clam Shell Bucket, Conveyor, Elevator, Etc.—Memphis, Tenn. Adv. Jan. 8.	Jan. 8
Jan. 21	Completing Storage Plant—Spec. 4115—Washington, D. C.	Jan. 15
Jan. 26	Dredging—New York, N. Y. Adv. Jan. 1.	Jan. 1
Jan. 26	Bridge—Alaska	Jan. 15
Jan. 28	Torpedo Storage Racks — Spec. 4060—Newport, R. I.	Jan. 15
Jan. 28	Laundry — Spec. 4981 — Newport, R. I.	Jan. 15
Jan. 28	Quay Wall—Spec. 4112—Wash., D. C.	Jan. 15
Jan. 29	Dredging—New Orleans, La. Adv. Jan. 1.	Jan. 1
Feb. 2	Tower and Dwelling—Rincon, P. R. Adv. Dec. 11	Dec. 11
Feb. 3	Road Work — Brevard, N. C.	Jan. 15
Feb. 5	Clay—Cape Henry, Va. Adv. Jan. 15.	Jan 15
Feb. 9	Dredging — Providence, R. I.	Jan 15
Feb. 11	Repairing Dry Dock—New York, N. Y.	Jan. 15
Feb. 11	Building Extension—Spec. 4024—Puget Sound, Wash.	Jan. 15
Feb. 12	Side Wheel Steamboat — St. Louis, Mo. Adv. Jan. 15.	Jan. 15
Feb. 25	Roof — Spec. 4113 — New York, N. Y.	Jan. 8

MISCELLANEOUS

Jan. 19	Dumping Equipment — Pennsylvania	Jan. 1
Jan. 19	Gate Valves and Fire Hydrants—Whittier, Cal.	Jan. 1
Jan. 19	Grandstand — West Allis (Milwaukee P. O.), Wis.	Jan. 8
Jan. 19	Wood Pipe—Guelph, Ont.	Jan. 8
Jan. 20	Cranes—St. Louis, Mo.	Jan. 15
Jan. 21	Breakwater — Meteghan, N. S.	Jan. 1
Jan. 21	Garbage Disposal — Rochester, N. Y.	Jan. 15
Jan. 22	Piers — Stapleton, S. I., N. Y.	Jan. 15
Jan. 22	Pipes, Valves, etc. — St. Louis, Mo.	Dec. 11
Jan. 26	Phase Generators—Winnipeg, Man.	Jan. 8
Jan. 26	Drilling Well — Vandalia, Mo.	Jan. 15
Jan. 28	Electric Wiring, etc.—Binghamton, N. Y. Adv. Jan. 15.	Jan. 15
Feb. 2	Asphalt Road Oil—St. Paul, Minn.	Jan. 8
Feb. 10	Breakwater — Schenectady, N. Y. Adv. Jan. 15.	Jan. 15

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. Y., Chester—Village plans to build new reservoir, filter plant, 16 in. main, etc.

N. J., Haledon (Paterson P. O.)—City plans to build new reservoir, filter plant, 16 in. main, etc.

N. C., Shelby—Ella Mfg. Co. plans to build water-works and sewerage system. J. E. Sirrine, Greenville, engr.

Ala., Roanoke — City plans to extend waterworks. About $25,000. G. B. Walker, mayor.

Wis., Madison—City plans to install 8,000,000 gal. capacity water pump and two 200-H.P. boilers with automatic furnaces. About $150,000.

Wis., Markesan—City plans to improve waterworks and sewerage system. About $55,000.

Wis., Stanley—City had plans prepared for waterworks and sewer extensions, to include 500 gal. motor driven centrifugal pump.

Wis., Stratford—City plans to improve waterworks and sewerage system. About $40,000.

Wis., Tomahawk—City had plans prepared for 2 centrifugal pumps, 150 to 500 gal. per minute capacity.

Ia., Cherokee—State Bd. Control, State Hospital, Des Moines, having plans prepared for improving water-works system, here, including pipe line, pump house, reservoir and pumping machinery. About $70,000. W. E. Buell, Davidson Bldg., Sioux City, engr.

Okla., Altus—City having revised plans prepared and receives bids about Feb. 1, improving waterworks system. About $50,000. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs. Noted Sept. 18.

Okla., Hugo—City voted $75,000 bonds to build filtration plant. Engineer not selected.

Okla., Oilton—City voted $40,000 bonds to extend waterworks system. Engineer not selected.

Okla., Oilton—City voted $40,000 bonds to extend water-works system, to include installation of 2 new wells and air light system. Engineer not selected.

Cal., Modesto—City voted $49,000 bonds to sink and equip well and extend water distributing system. G. H. Freitas, city engr.

Cal., San Fernando—City voted $165,000 bonds to purchase and improve privately owned water-works system. About $125,000 will be expended to sink wells, build reservoir and reconstruct and add to distributing system. A. L. Sonderegger, Central Bldg., Los Angeles, engr.

Ont., London—Town having plans prepared and receives bids in March, for concrete reservoir, 10,000,000 gal. capacity. About $100,000. E. V. Buchanan, Hydro Bldg., engr. Noted July 17.

Alta., Calgary—City voted $272,316 bonds to extend water-works system and build dam over Elbow River.

BIDS DESIRED

Ky., Versailles—Until Jan. 27, by city constructing waterworks, power and filtration plant, also laying 31,800 ft. pipe line. H. C. Taylor, mayor; advertised in this issue.

Ia., Washta—Until Feb. 15, by city, improving water-works system, including pipe line, well, pump house, rein.-con. reservoir, distribution system, etc. About $22,000. G L. Strivers, clk. W. E. Buell, Davidson Bldg., Sioux City, engr.

Idaho, McCammon—Until Feb. 3, by village, furnishing labor and material for building 5 mi. 4 and 8 in. wood (machine banded) water supply line. W. J. McAughey, chairman Bd. Trustees; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Pa., Erie—City let contract building 5,000,000 gal. rein.-con. covered reservoir and pipe line to Halfhill Constr. Co., 217 Dollar Bank Bldg., Youngstown, O. About $181,900.

O., Canton—W. I. Zink, dir. Pub. Serv., received bids building 1 story, 30 x 96 ft., brick and concrete pump house, from K. Huff, $24,000; Melbourne Bros., $38,000; both of Canton. Noted Jan. 1.

★O., Cleveland—E. Shattuck, comr. purchases, let contract installing 20,000,000 gal. high service centrifugal pump, to Dravo-Doyle & Co., Citizens Bldg., $74,250.

O., Cleveland Heights (Warrensville P. O.)—See "Sewers."

★Mich., Detroit—City will lay 1,750 ft. 6 in. water mains in Brimson, Muirland and Radcliff Aves., 4,280 ft. 8 in. mains in Olympia, Lyford and Hull Aves. and 365 ft. 12 in. mains in Livernois Ave. Work will be done by day labor under supervision of Bd. Water Comrs.

★Wis., Rio—W. Collins, village clk., let contract furnishing and laying 9,556 ft. 6-8 in. c.i. pipe, to C. H. Phillips, Waupaca; 18 hydrants and valves, to R. D. Wood Co., 400 Chestnut St., Phila.; 40,000 gal. elevated tank, on 80 ft. tower, to Wausau Iron Wks., Wausau; one 10 ft. well, to W. L. Thorne, Platteville; one 150 gal. deep well pump, to Wisconsin Fdry. Co., 623 East Main St., Madison; one 15 H.P. engine, Fairbanks-Morse Co., 141 West Water St., Milwaukee. Total cost, $30,000.

★Kan., Solomon—City let general contract for extending water-works system, to C. H. Everett, Hutchinson, $63,597; tower and tanks, Pittsburg-Des Moines Steel Co., Des Moines, $8,346. Noted Jan. 1.

★Okla., Collinsville—City let contract for labor for improving water-works system, to Standard Paving Co., 512 Robinson Bldg., Tulsa, $27,900; filtration equipment, to Pittsburg Filter Co., Rialto Bldg., Kansas City, Mo., $93,000; pumps and equipment, to Merkle Mchy. Co. Interstate Bldg., Kansas City, Mo., $1,675.

★Wash., Seattle—Bd. Pub. Wks. let contract building water mains in 24th Ave. N., involving 3,100 ft. 8 in. c.i. pipe, to Scalzo & Co., Seattle, $13,460.

★Cal., Arcadia—City let contracts furnishing and laying 8,250 ft. 16 in. riveted steel pipe, including fittings, to Los Angeles Mfg. Co., 2500 Lenard St., Los Angeles, cost $13,000; building rein.-con. reservoir, 220 ft. long, 150 ft. wide, 12½ ft. deep, involving 720 cu.yd. concrete, 32 tons reinforcing steel, 28,200 sq.ft. wire mesh and 66,000 ft. lumber for roof, to Kluseman & Elser, Cucamonga, $27,434. Noted Aug. 21.

★Cal., Pasadena—Water Dept. will lay mains to Annandale dist., build concrete and earth dam and install booster pump. About $125,000, $15,000 and $10,000 respectively. Work will be done by day labor.

Sewers

PROPOSED WORK

N. C., Shelby—See "Water-works."

S. C., Chester—City plans to build 4 mi. sewerage system in Baldwin Cotton Mills Village. J. E. Sirrine, Greenville, engr.

Fla., St. Petersburg—City voted $25,000 bonds to extend sewerage system.

Fla., Tallahassee — See "Streets and Roads."

O., Cleveland—Comrs. Cuyahoga Co. retained R. W. Pratt, engr., Hippodrome Bldg., to prepare preliminary surveys of outlying suburbs to determine location of sewer line. About $15,000,000.

Mich., Detroit—City received no bids Dec. 30, building 70 ft. rein.-con. sewer outlet in Mt. Elliott Ave., to consist of 4 parallel cylinders, 5 ft. diam. About $25,000. Work will be readvertised. C. W. Hubbell, city engr. Noted Jan. 1.

Wis., Markesan—See "Waterworks."

Wis., Stanley—See "Waterworks."

Wis., Stratford—See "Waterworks."

Kan., Halstead—See "Streets and Roads."

N. D., Minot—City having plans prepared by F. Bass, engr., Minneapolis, Minn., and receives bids about Feb. 15 for sewage disposal plant. E. J Thomas, city engr.

Okla., Hugo—City voted $10,000 bonds to extend sewerage system. Engineer not selected.

Okla., Miami—City plans to build sewers in East and North East Sts. About $41,600. Engineer will be selected at once.

Cal., Modesto—City voted $75,000 bonds to build trunk storm sewerage system; $30,000 for sewage disposal plant and $35,000 to extend sanitary sewerage system. G H. Freitas, city engr.

Alta., Calgary—City voted $350,000 bonds to build sewage disposal plant.

BIDS DESIRED

N. Y., Brooklyn—Until Jan. 21, by E. Riegelmann, boro. pres., furnishing labor and material for building sewers in Bay 31st St. between Benson and Bath Aves., Bay 32nd St. from Benson to Bath Aves., Delamere Pl. from Ave. K. to Ave. L with temporary connection from Ave. L southerly about 90 ft.

Pa., Ashley (Wilkes-Barre P. O.)—Until Feb. 12, by Councilmen, building 1 mi. sewer in Ward St. and Careyo Patch, involving 5,280 ft. 14 in. terra cotta pipe. About $11,000. J. A. Boyle, Wilkes-Barre, engr.

N. C., Jacksonville—Until Feb. 17, by town, furnishing material and constructing sewerage system and water-works, involving 11,000 ft. vitr. clay pipe, 12,000 ft. c.i. and w.i. water mains, 60,000 gal. tank on tower, 60,000 gal. concrete reservoir, steam electric generating and pumping equipment and appurtenances. L. S. Ward, mayor; advertised in this issue.

Ia., Oxford Junction—Until Jan. 29, by City, building sewers in main streets, involving 19,337 ft. 6-12 in. vitr. pipe sewer. About $30,000. M. Ischirgi & Sons, Trust Bldg., Cedar Rapids, engrs.

Neb., Broken Bow—Until Jan. 20, by city building sewers and sewage disposal plant. Work involves 12,003 ft. 8-15 in. tile pipe and 44 manholes. About $101,400. Grant, Fulton & Letton, 505 Bankers Life Bldg., Lincoln, engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., received bids Jan. 6, building sewers and appurtenances in (a) Pierce Ave., (b) Laurel Hill Ave., 2nd Ward, (c) 87th Ave., 4th Ward, from E. W. Fitzpatrick, 244 Jackson Ave., (a) $995, (b) $2,819; Green Contg. Co., 734 Vernon Ave., Astoria, (a) $1,024, (b) $3,378, (c) $3,822; T. Welsh, (a) $1,078, (b) $4,479; F. L. Paino, Woodhaven, (a) $1,213, (b) $2,756, (c) $4,335; H. J. Mullen, Woodhaven, (c) $3,252; J. H. Johnson, (c) $3,832. Noted Jan. 1.

★N. Y., New York—H. Bruckner, pres. Bronx Boro., let contract to McLoughlin & Buckley, 337 East 134th St., laying sewers in West 238th St., Sedgwick and Van Cortland Aves., $12,282, in East 174th St., Walton and Mt. Eden Aves., $3,462; to DiMenna & DeBaso, 270 East 149th St., Britton St., Bronx Park and White Plains Rds., $11,269.

★O., Cleveland Heights (Warrensville P. O.)—Kangesser Realty Co., Park Bldg., Cleveland, let contract building 16,350 ft. 8-24 in. vitr. pipe sewer, 30 brick manholes, 55 catch basins and 8210 ft. 4-8 in. c.i. water main, in Taylor Park, to A. Marra, 2276 East 105th St., Cleveland, $74,285. Noted Jan. 1.

★Mich., Grosse Pointe (Detroit P. O.)—City let contract building storm sewers in Jefferson Ave. with outlet into Lake St. Clair, involving 1,100 ft. 36 in. rein.-con. and 2,490 ft. 15-24 in. vitr. pipe, to G. R. Cooke, 1260 Penobscot Bldg., Detroit, (Work to be done under supervision of M. L. Brown & Son, 823 Chamber of Commerce Bldg., engrs.) About $28,000.

★Mich., Muskegon—City let contract furnishing labor and material laying 1,930 ft. 12-48 in. rein.-con. or segmental block sewer in Western Ave. Special Sewer Dist. 30, to G. Pontroelli, Chicago, $78,514; driving 100 piles in lake, furnishing and placing 980 ft. 48 in. steel pipe with flanged joints, etc., in Sect. 2, Western Ave. Sewer outlet, to N. P. Nelson, Muskegon, $14,120.

★Ia., Boyden—City let contracts laying 19,000 ft. 28 in. sewer pipe and 3,200 ft. 4 in. water pipe, to Dearborn Constr. Co., Waterloo Savings Bldg., Waterloo, $35,279 and $3,921 respectively; sewage disposal plant, to Ward & Weighton, 516-17 Davidson Bldg., Sioux City, $12,200.

★Wash., Seattle—Bd. Pub. Wks. rejected bids received Dec. 26, building 1,990 ft. 8 in. concrete or clay pipe sewers in 50th Ave. S. and 5,041 ft. 8 in. rein.-con. pipe sewers in 12th Ave. W. Cost about $21,052 and $21,425 respectively. Work will be done by day labor.

★Cal., Los Angeles—See "Streets and Roads."

Bridges

PROPOSED WORK

Me., Portland—City plans to repair Vaughn Bridge. About $40,000. E. M. Hunt, City Bldg., street comr.

Mass., Wareham—Wareham and Bourne Twps. Bridge Comn. having plans prepared by Fay Spofford & Thorndike, engrs., 15

Bridges (Continued)

Beacon St., Boston, for concrete and steel bridge at Cohasset Narrows. About $300,000.

O., Whitewater—Hamilton Co. (Cincinnati) plans to build new bridge to replace old suspension bridge over Whitewater River, here. About $140,000. A. G. Gast, co. engr.

Mich., Detroit—City plans to build 2,100 ft. ornamental bridge across Elmwood Cemetery, connecting Kerchival Ave. and Chestnut St. C. W. Hubbell, city engr.

Wisconsin—State Highway Comn., Madison, made surveys and preparing plans for building Brewster Bridge, 20 ft. long, 24 ft. wide, Sugar Creek and Lafayette Twps., Walworth Co.; Dutchman's Creek Bridge, 16 ft. long, 20 ft. wide, Parkland Twp., Douglas Co.; Meinke Bridge, 16 ft. long, 24 ft. wide, Packwaukee Twp., Gable Bridge, 16 ft. long, 24 ft. wide, Springfield Twp., Marquette Co.; Heyr Bridge, 10 ft. long, 20 ft. wide, Kniter Bridge, 8 ft. long, 20 ft. wide, Walsh Bridge, 24 ft. long, 20 ft. wide, Perronne Bridge, 14 ft. long, 20 ft. wide, Termaat Bridge, 24 ft. long, 20 ft. wide, Hasche Bridge, 8 ft. long, 20 ft. wide, all Herman Twp., Phipps Bridge, 12 ft. long, 20 ft. wide, Mitchell Twp., Brehn Bridge, 12 ft. long, 20 ft. wide, Gratman Bridge, 12 ft. long, 20 ft. wide, both Wilson Twp., all in Sheboygan Co.; all to have rein.-con. spans and concrete abutments.

Wisconsin—State Highway Comn., Madison, prepared plans for bridges in following counties:

Bayfield Co., Arrhanius Bridge, Lincoln Twp., 40 ft. long, 16 ft. wide, truss span, concrete abutments, cost $3,900.

Douglas Co., Wagner Bridge, Lakeside Twp., 30 ft. long, 20 ft. wide, rein.-con. span, concrete abutments, Crawford Bridge, Amnicon Twp., 30 ft. long, 20 ft. wide, rein.-con. span, concrete abutments, both to have wood piles under foundations.

Juneau Co., O'Shea Bridge, Necedah Twp., 40 ft. long, 24 ft. wide, rein.-con. span, concrete abutments, $6,300.

Kewaunee Co., Brey Bridge, Ahnapee Twp., 70 ft. long, 16 ft. wide, truss span on tubular steel abutments.

Pierce Co., Schober Bridge, Rock Elm Twp., 12 ft. long, 16 ft. wide, rein.-con. span, concrete abutments, $1,600; Carson Bridge, Salem Twp., 60 ft. long, 16 ft. wide, $7,200.

Waukesha Co., Mill Race Bridge, Mukwonago Village, 30 ft. long, 24 ft. wide, rein.-con. span, concrete abutments, $7,000.

Wis., Evansville—City having plans prepared building two 40 ft. rein.-con. span bridges, each to have 16 ft. roadway, also 500 ft. rein.-con. core wall for dam. About $25,000. Parsons & Orbert, 627 M. & M. Bank Bldg., Milwaukee, engrs.

Wis., Mauston—Juneau Co. plans to build 2 bridges in Necedah Village, cost $7,500, 1 in Plymouth Twp., $3,750 and 1 in Fountain Twp., $5,000, all concrete. A. V. Robison, New Lisbon, comr.

Wis., Milwaukee—City plans to build rein.-con. span bridge on American Ave. About $10,000. D. McKeith, City Hall, supt. bridges and bldgs.

Wis., Sheboygan—See "Streets and Roads."

Wis., Waukesha—Waukesha Co. plans to build Okauchee Bridge, Oconomowoc Twp., cost $6,000, Mukwonago Bridge, Mukwonago Village, $8,000 and Oconomowoc River Bridge, Summit Twp., $6,000, all concrete.

Minn., Faribault—Rice Co. plans to build 70 ft. rein.-con. bridge, 24 ft. roadway and sidewalks, over Cannon River, Morristown Twp. About $20,000. W. P. Chapman, Faribault, engr.

Minn., Grand Rapids—Itasca Co. plans to build steel bridge over Mississippi River, Unogarned Twp., consisting of four 60 ft. spans with 1 lift, concrete foundation. About $35,000. O. J. Lidberg, Grand Rapids, engr.

Minn., Litchfield—Meeker Co. plans to build 90 ft. steel span bridge over Crow River, Cosmos Twp. About $12,000. R. P. McNamara, Litchfield, engr.

Kan., Garden City—Finney Co. rejected bids building 500 ft. rein.-con girder bridge, 20 ft. wide. R. J. Ruckel, Garden City, engr. Noted Jan. 8.

Tex., Groesbeck — See "Streets and Roads."

Alta., Calgary—City voted $155,978 bonds to build bridge.

BIDS DESIRED

N. Y., Schenectady—Until Feb. 10, by E. S. Walsh, supt. pub. wks., Capitol, Albany, for constructing abutments and approaches of Schnectady-Scotia Bridge, rein.-con.; advertised in this issue.

Ind., Attica—Until Feb. 7, by Comrs. Fountain Co., (Covington) constructing 985½ ft. rein.-con. bridge over Wabash River, here, to have 6 spans on concrete piers, 20 ft. roadway and two 5 ft. sidewalks. H. W. Newlin, aud.; advertised in this issue.

Minn., Ada—Until Feb. 10, by D. E. Fulton, aud. Norman Co. (Ada) and H. W. Welte, aud. Polk Co. (Crookston), building 2 concrete and steel bridges, 1 concrete culvert and 1 combination culvert and bulkhead, over Judicial Ditch 57, involving 1,640 ft. 15 in. corrugated culvert pipe About $11,000.

Ariz., San Carlos—Until Feb. 7, by T. Maddock, state engr., Phoenix, building bridge across Gila River, near here; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Reading**—Berks Co. let contract building 1,586 ft. rein.-con. bridge, 60 ft. wide, on Bingaman St., over Schuylkill River, Schuylkill Canal and Phila. & Reading R. R., to have 13 arch and 3 flat spans, rein.-con. slab approaches, 39 ft. roadway and two 10 ft. 6 in. sidewalks, to Whittaker & Diehl, Union Trust Bldg., Harrisburg, $699,860.

★**Wis., Prairie du Sac**—State Highway Comn., Madison, let contract furnishing labor and materials building 1,428 ft. plate girder bridge, over Wisconsin River, to Kelly-Atkinson Co., 189 West Madison St., Chicago. About $157,500. Plans include fifteen 79 ft. plate girder spans, double leaf bascule to give 70 ft. clear opening and two 79 ft. plate girder approach spans carrying bascules, concrete piers and abutments. Work involves 500 tons structural and 55 tons reinforcing steel, 2,400 cu.yd. Class A concrete, 205 sq.yd. paving, 500 cu.yd. riprap, etc.

Kan., Leavenworth—Leavenworth Co. received bids Jan. 5, building 2 bridges on Fort to Fort Highway, Bridge Sect., Project 13B, one 35 ft. rein.-con. "T" girder and one through girder, with three 40 ft. spans, from J. T. Constant, Lawrence, $22,493; C. C. Clark, Topeka, $23,764; F. Luttjohann, 1122 West 2nd St., Topeka, $24,629.

★**Arkansas** — State Highway Comn., Little Rock, let contract building 10 steel bridges, 19 ft. wide, on Little Rock and Hot Springs Highways, over Broady, Fourchebayou, Hurricane, William and Big Creeks, North Fork, Alum Fork and Middle Fork of Saline River, to Illinois Steel Bridge Co., Jacksonville, Ill., $97,675; concrete piers, to Oliver Constr. Co.

★**Wash., Cashmere**—Comrs. Chelan Co. (Wenatchee) let contract building 500 ft. bridge over Wenatchee River, near here, consisting of 5 concrete arches with concrete retaining walls, involving 1,820 cu.yd. concrete, 2,000 cu.yd. earth approach and fill, and 90,600 lbs. reinforcing steel, to Bailey & Davenport, Wenatchee, $59,800.

Oregon—State Highway Comn., Portland, received bids building 80 ft. steel span with 280 lin.ft. rein.-con. viaduct over North Yamhill River on McMinnville-West Dayton Rd., Yamhill Co., involving 750 cu.yd. Class "A" and 350 cu.yd. Class "B" concrete, 125,000 lb. reinforcing steel, 60,000 lb. structural steel, 3,100 lin.ft. wooden piling and 724 lin.ft. concrete handrail, from Stebbinger Bros., 626 Bway, $47,499; J. F. Clarkson, 608 Yeon Bldg., $54,201; Union Bridge Co., foot of Fenwick-Kenton Sts., $58,592. Contractors all of Portland.

Ore., Astoria—State Highway Comn. received bids Dec. 20, building double leaf trunnion bascule bridge over Youngs Bay, here, (1) bascule bridge for combined highway and railroad traffic, including 1,580 lin.ft. timber trestle approach for highway, 42,600 lin.ft. foundation piling, 750 cu.yd. class "A," 1,500 cu.yd. class "B" and 4,950 cu.yd. "D" concrete (Tremie concrete for cofferdam seal and pier base), 425 cu.yd. counterweight concrete, 120,000 lb. reinforcing steel, 6,700 lin.ft. protection piling, 1,000,000 lb. structural steel, 125,000 lb. machinery, necessary signal lights, motors, pumps, and electrical equipment; (2) bascule bridge for highway traffic only with 1,580 ft. timber trestle approach span, 20,000 lin.ft. foundation piling, 500 cu.yd. class "A," 700 cu.yd. class "B" and 2,500 cu.yd. class "D" concrete (Tremie concrete for cofferdam seal and pier base), 5,000 lin.ft. protection piling, 70,000 lb. reinforcing steel, 485,000 lb. structural steel, 65,000 lb. machinery, 225 cu.yd. counterweight concrete, necessary electrical equipment, pumps, signal lights, etc.; (3) bascule bridge for highway traffic only with 300 ft. permanent approach, steel plate girder, concrete floor and foundation, 1,220 lin.ft. timber trestle approach, 29,000 lin.ft. foundation piling, 750 cu.yd. class "A," 1,000 cu.yd. class "B" and 3,000 cu.yd. class "D" concrete, 225 cu.yd. counterweight concrete, 1,000 lin.ft. protection piling, 117,000 lb. reinforcing and 695,000 lb. structural steel, 65,000 lb. machinery, 750 lin.ft. concrete handrail, pumps, signal lights, motors and electrical equipment from, D. M. Stevenson, Astoria, (1) $521,139, (2) $341,435, (3) $410,379; Northwestern Bridge & Iron Co., foot of Sheridan St., Portland, (1) $535,618, (2) $353,353, (3) $422,893; R. Wakefield, Worcester Bldg., Portland, (1) cost plus percentage basis. Gilpin Constr. Co., Astoria, (2) $311,502, (3) $373,282.

★**Ont., Burlington**—Halton Co. let contract building high level bridge over Sixteen-Mile Creek, to McLeod, Ltd., Kent Bldg., Toronto. About $110,000.

Structural Steel

PROPOSED WORK

N. H., North Stratford—See "Industrial Works".

N. Y., Brooklyn—See "Buildings".

N. Y., New York—See "Buildings".

Pa., Johnstown—See "Buildings".

Mich., Pontiac—See "Buildings".

Kan., Salina—See "Buildings."

BIDS DESIRED

Ark., Texarkana—See "Buildings".

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Long Island City**—See "Industrial Works".

★**N. J., Harrison** — See "Industrial Works".

★**Pa., Chester**—See "Buildings".

★**Pa., Essington**—See "Industrial Works".

★**Mich., Jackson**—See "Industrial Works".

★**Okla., Oklahoma**—See "Buildings."

Reinforced Concrete

PROPOSED WORK

N. H., North Stratford—See "Industrial Works".

N. Y., Rochester—See "Buildings".

Mich., Pontiac—See "Buildings".

Ia., Waterloo—See "Buildings."

Kan., Salina—See "Buildings".

Kan., Wichita—See "Industrial Works."

Tex., Mineral Wells—See "Buildings".

Ore., Portland—See "Industrial Works".

BIDS DESIRED

S. D., Watertown. See "Buildings".

Ark., Texarkana—See "Buildings".

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Long Island City**—See "Industrial Works".

★**N. J., Harrison** — See "Industrial Works".

Pa., Essington—See "Industrial Works".

★**Mich., Jackson**—See "Industrial Works".

★**Cal., Bakersfield**—See "Buildings".

Streets and Roads

PROPOSED WORK

Mass., Boston—Dept. Pub. Wks. having plans prepared for widening Tremont and Boylston Sts. T. F. Sullivan, comr.

N. Y., New York—H. Bruckner, pres. Bronx Boro., rejected bids received Dec. 30, repaving roadway of Bronx and Pelham Parkways, sheet asphalt. Work will be readvertised. About $84,200.

N. J., Bayonne—City plans to widen and grade Avenue C, from 54th St. to Morris Canal, new blue stone set in concrete and rein.-con.

N. J., North Bergen—(Weehawken P. O.)—Town Council plans to grade, pave, curb, gutter and flag South St. Cost to exceed, $20,000.

Pa., Reading—Comrs. Berks Co. authorized $350,000 bond issue to improve highways.

Streets and Roads (Continued)

Pa., Sunbury—City plans to build 3 boulevards (probably brick) to develop new residential section on Packers Island, one 1½ mi. long, 80 ft. wide, and two 1½ mi. long, 40 ft. wide. W. Mann, Sunbury, engr.

W. Va., Franklin—Comrs. Pendleton Co rejected bids received Dec. 29, grading 4.17 mi. Franklin Petersburg Rd., 26 ft. wide, involving 22,000 cu.yd. excav., drainage and protection structures. About $26,000.

Ga., Adel—Comrs. Cook Co. soon let contract paving, grading and draining 14.79 mi. Natl. Highway, Federal Aid Project 90, involving 86,787 sq.yd. paving. About $275,000. H. S. Jandon Eng. Co., Elberton, engrs.

Fla., Arcadia—DeSoto Co. voted $180,000 bonds to build roads in Dist. 3.

Fla., Bronson—Levy Co., Cedar Keys Dist., voted $100,000 bonds to construct highway to join main road at Chiefland.

Fla., Tallahassee—City voted $212,000 bonds to build roads and sewerage system.

Fla., Tampa. — Hillsboro Co., Dist. 5, election Jan. 27, to vote on $170,000 bonds to construct 42 mi. shell roads.

Ala., Birmingham—Jefferson Co. election Feb. 16, to vote on $5,000,000 bonds to build roads.

Miss., Moss Point—City plans to grade, improve, pave and maintain hard surfaced streets. About $25,000. C. M. Fairley clk.

Miss., Port Gibson—Claiborne Co. voted $50,000 bonds to build roads.

O., Cleveland—Cuyahoga Co. soon lets contract grading, draining and paving Hall Rd. from Coe Ridge to North River Rd., involving 17,000 cu.yd. earth and 1,700 cu.yd. sewer trench excav., 30,000 sq.yd waterbound and 30,000 sq.yd. penetration macadam, and 1,270 ft. 10 in. corrugated and 30,000 ft. 4 in. vitr. sewer pipe. About $100,833. W. A. Stinchcomb, co. engr.

Ind., Indianapolis—Marion Co. soon lets contract improving Rinne Rd. from Sunset Ave. to Broad Ripple, cost $159,218; Bohrman Rd., Warren Twp., $22,738; Borchert Rd., Center Twp., $50,272; Collins Rd., Franklin Twp., $43,170; Schofield Rd., Center Twp., $156,085; Ryan Rd. from 30th St. to speedway, $80,105; Clark Rd., Franklin Twp., $7,784; Schilling Rd., Franklin Twp., $32,635; Strange Rd., Lawrence Twp., $111,511; also widening Lee Rd., Center and Perry Twps., from 14 to 24 ft., $101,863, all concrete. J. J. Griffith, co. engr.

Mich., Adrian—Bd. Rd. Comrs. Lenawee Co. soon lets contract surfacing, shaping, draining and grading 1 mi. Rd. 3, 12 ft wide, Ridgeway Twp., involving 7,040 sq.yd. 7 in. waterbound macadam or 4 in. waterbound macadam with 3 in. gravel top, cost $22,000, also 7,775 mi. Rd. 7, from Blissfield to Berkey, involving 72,980 sq.yd. waterbound macadam.

Mich., Marshall — Comrs. Calhoun Co. soon let contract grading, shaping and surfacing 4.417 mi. Trunk Line Rd. from Lee Twp. to Paved Way, 9 ft. wide, involving 23,320 sq.yd. Class B gravel. About $50,000.

Mich., St. Johns—Clinton Co. soon lets contract grading, draining and surfacing 1.484 mi. State Trunk Line Rd. 21-2, 16 ft. wide, involving 5,107 cu.yd. earth excav., 13,932 sq.yd. gravel and 54 cu.yd. concrete.

Wisconsin—State Highway Comn., Madison, plans to cement concrete surface, grade and drain Greenfield Ave. Rd., 20 ft. wide, commencing at east limits of City of Waukesha, thence in easterly direction through Waukesha Twp. and on town line between New Berlin and Brookfield, to county line between Waukesha and Milwaukee Counties. About $231,000. State and Federal Government will appropriate $138,600, and county, $92,400.

Wis., Antigo—Langlade Co. adopted county and state aid road construction program, involving clearing, grading and draining, total cost, $97,229, including Federal Aid Project 1, Ackley Twp., cost $45,000 and Federal Aid Project 2, Neva Twp., $15,000. C. Olsen, Elcho, comr.

Wis., Black River Falls—Jackson Co. plans to grade and gravel surface Black River Falls-Disco Rd., Albion Twp., cost $2,255, Black River Falls-Disco Rd., Alma Twp., $1,127, Alma Center-Fairchild Rd., Cleveland Twp., $1,353, Fairchild-Price Rd., Cleveland Twp., $1,353, Curran Rd. running east, Curran Twp., $1,127, Galesville-Black River Falls Rd., Franklin Twp., $1,127, Price-Osseo Rd., Garfield Twp., $1,127, Hixton-Alma Center Rd., Garfield Twp., $1,127 Bolger Rd., Garden Valley Twp., $1,127, Bolger Rd., Irving Twp., $2,255, Snake Hollow Rd., Melrose Twp., $1,127, Millston-Knapp Rd., Millston Twp., $2,255; grade and surface Taylor-Melrose Rd., Franklin Twp., $1,127, Knapp-Bear Bluff Rd., Knapp Twp., $1,127; gravel surface Oak Ridge Rd., Manchester Twp., $1,127; build concrete bridge over Perry Creek, Brockway Twp., $8,721. W. Tibbitts, comr.

Wis., Green Bay—Brown Co. adopted county and state aid road construction program, involving grading, draining, gravel, concrete and crushed stone surfacing. About $31,200. G. J. Cormirr, comr.

Wis., Green Lake—Green Lake Co. adopted county and state aid road and bridge construction program, involving grading and gravel surfacing. About $19,661. D. C. Williams, comr.

Wis., Hudson—St. Croix Co. adopted county and state aid road and bridge construction program, involving grading, draining and surfacing, total cost, $28,130, including Larding Hill Rd., Somerset Twp., cost $13,530. J. Caffrey, Hammond, comr.

Wis., Juneau—Dodge Co. adopted county and state aid road construction program, involving grading, draining and surfacing. About $58,099.

Wis., La Crosse—La Crosse Co. adopted county and state aid road and bridge construction program, involving grading and macadam surfacing, total cost, $47,244, including Burnham Valley Rd., Burns Twp., cost $10,136 and Mindoro-Burr Oak Rd. and Fisher Bridge, Farmington Twp., $10,136. J. Hintgen, comr.

Wis., Lancaster—Grant Co. adopted county and state aid road and bridge construction program, involving grading and gravel surfacing. About $49,209

Wis., Manitowoc—Manitowoc Co. voted $279,000 bonds to grade and pave 7.8 mi. various roads, 18 ft. wide, 2 course rein.-con. Engineer not selected.

Wis., Mauston—Juneau Co. adopted county and state aid road construction program, involving grading, concrete and clay surfacing, total cost, $510,717, including Madison-Monroe Rd., 18 ft. wide, New Glarus, Washington and Mt. Pleasant Twps., cost $311,000, Monroe—Argyle Rd., 18 ft. wide, Monroe Twp., $19,000, Railroad St., 18 ft. wide, Monticello Village, $14,000, New Glarus-Blanchardville Rd., 16 ft. wide, New Glarus Twp., $150;000. E. L. Edwards, Monroe, comr.

Wis., Menomonie—Dunn Co. adopted county and state aid road and bridge construction program, involving grading, draining and gravel surfacing. About $25,150. F. Stewart, comr.

Wis., Neillsville—Clark Co. plans to grade, drain and surface Abbotsford-Stanley Rd., Withee Twp., cost $4,307, Neillsville County Farm Rd., Pine Valley Twp., $2,400, Neillsville County Farm Rd., Weston Twp., $400, Ackerman Globe Rd., Pine Valley Twp., $5,800, Neillsville-Hatfield Rd., Levis Twp., $1,500, Michael Theis Rd., Mentor Twp., $1,500; surface Neillsville-Withee Rd., Weston Twp., $4,037, Neillsville-Withee Rd., Warner Twp., $115, Neillsville-Withee Rd., Longwood Twp., $140, Neillsville-Marshfield Rd., Fremont Twp., $4,037, Neillsville-Marshfield Rd., Lynn Twp., $182; grade and drain York Center and Granton Rds., York Twp., $2,500, Longwood and Thorp Rds., Longwood Twp., $1,500. W. C. Thoma, co. highway comr.

Wis., Oconto—Oconto Co. adopted county and state aid road construction program, involving grading, draining and gravel surfacing. About $14,874. P. Peetz, comr.

Wis., Oshkosh—Winnebago Co. adopted county and state aid road and bridge construction program, involving grading, concrete and macadam surfacing, total cost, $49,815, including Oshkosh-Neenah Rd., Algona Twp., cost $13,430. J. Binning, comr

Wis., Port Washington—Ozaukee Co. adopted county and state aid road and bridge construction program, involving grading, draining and gravel surfacing. About $23,680. J. H. E. Mueller, Thiensville, comr.

Wis., Rhinelander—Oneida Co adopted county and state aid road and bridge construction program, involving grading, draining and gravel surfacing. About $54,381. E. E. Parker, comr.

Wis., Richland Center—Richland Co. adopted county and state aid road construction program, involving grading, and concrete paving. About $21,957. A. Rundell, clk.

Wis., Shawano—Shawano Co. adopted county and state aid road and bridge construction program, involving grading, draining and gravel surfacing. About $84,591 W. F. Meyers, comr.

Wis., Sheboygan—Sheboygan Co. having plans prepared for grading and paving 1.2 mi. Sheboygan Falls, Hingham, Sheboygan and Plymouth Rds., 16-18 ft. wide, rein.-con., also building necessary culverts, bridges, etc., on same. About $42,000. G. W. Ubbelohde, co. engr.

Wis., Sheboygan—Sheboygan Co. plans to concrete surface Sheboygan-Plymouth Rd., Sheboygan Falls and Plymouth Twps., cost $15,000, Milwaukee Rd., Cedar Grove Village, $5,250, road beginning at easterly limits of Kohler Village, thence westerly, $2,949, beginning at ice track extension on Butler St. and west on 1st St., Random Lake Village, $2,000; grade, drain and gravel surface Russell Rd., Rhine Twp., and Elkhart Lake Village, $3,000, Sheboygan Falls and Hingham Rds., Lima Twp., $27,024, Sheboygan-Fond du Lac Rd., Greenbush Twp., $4,000, Elkhart Lake-Franklin Rd., Herman Twp., $4,823, road beginning in Sect. 16, thence southerly, Lima Twp., $2,000, road beginning at town line, thence southwesterly, Lyndon Twp., $7,000, road beginning in center Sect. 27, thence westerly, Mitchell Twp., $5,000, beginning at south city limits of Plymouth, thence southerly, Plymouth Twp., $2,147, road beginning at town line, thence westerly, Rhine Twp., $50, beginning at southwest corner Sect. 16, thence westerly, Scott Twp., $2,000, incompleted roads, Sheboygan Twp., $1,377; grade, culvert and concrete surface road beginning at town line, thence easterly, Sherman Twp., $2,000; grade and concrete surface Rhine St., extending southerly, Elkhart Lake Village, $2,000. G. W. Ubbelohde, Sheboygan, comr.

Wis., Sparta—Monroe Co. plans to grade and gravel surface road beginning at Meyers Hill, extending thence easterly, Clifton Twp., $3,500, road beginning at Trunk Highway 21, extending southerly, Wilton Twp., $3,526; grade and drain road beginning at overhead railroad crossing, extending thence southerly, Ridgeville Twp., $1,350, Coles Valley and Schultz Hill Rds., Adrian Twp., $1,050, roads on county system of state highways, Wellington Twp., $1,050, incompleted roads, thence northerly Sheldon Twp., $2,736, road beginning on South line and extending northerly, Scott Twp., $1,050; surface road beginning at end of macadam pavement extending southerly, Ontario Village, $269; build culverts on Rocky Run Project, Glendale Twp., $200, road commencing at east end of incompleted work, thence northeasterly, Byron Twp., $600; grade, drain and shale surface Sparta-Camp Robinson Rd., Angelo Twp., $2,034, beginning at end of incompleted roads, Lafayette Twp., $1,050, roads on county system of prospective state highways, Lincoln Twp., $900, Tomah-Glendale Rd., thence easterly, Oakdale Twp., $1,500, commencing at end of incompleted roads, thence easterly, La Grange Twp., $2,034. C. H. Millard, comr.

Wis., Superior — Douglas Co. adopted county and state aid road and bridge construction program, involving grading and gravel surfacing, total cost, $40,654, including Grand Ave. Rd., Amnicon and Hawthorne Twps., cost $14,279. C. J. Morisset, Superior (East End), comr.

Wis., Waukesha—Waukesha Co. adopted county and state aid road construction program, involving grading and graveling. About $19,517.

Wis., Wautoma—Waushara Co. adopted county and state aid road and bridge construction program, involving grading, and gravel surfacing. About $13,951. F. Grimm, comr.

Wis., West Bend—City plans to grade, pave and build sidewalks with combined curbs and gutters on 2.9 mi. Water, Wisconsin and Cedar Sts., 18 ft. wide, 2 course rein.-con. About $35,000. Engineer not selected.

Wis., Whitehall—Trempealeau Co. adopted county and state aid road construction program, involving grading, draining and gravel surfacing. About $55,634. E. F. Rotering, Arcadia, comr.

Minn., Albert Lea—Freeborn Co. plans to gravel 11 mi. Federal Aid Project 61, from western county line east toward here, 24 ft. wide. About $55,000. E. V. H. Brown, Albert Lea, engr.

Minn., Benson—Swift Co., plans to grade 5 mi. road north of De Graff, 24 ft. wide. About $25,000. L. R. Johnson, Benson, engr.

Minn., Blue Earth—Faribault Co. plans to gravel 17 mi. road from here to Winnebago, 24 ft. wide. About $65,000. R. J. Short, Blue Earth, engr.

Minn., Crookston—Polk Co. plans to grade and gravel 20 mi. road from Grand Fork to Fischer, 24 ft wide. About $120,000. E. H. Harding, Crookston, engr

Streets and Roads (Continued)

Minn., Crookston—Polk Co. plans to pave 1.4 mi. road from here to Farm School, 18 ft. wide. About $40,000. Bids will be received on all types of pavement. E. H. Harding, Crookston, engr.

Minn., Mantorville—Dodge Co. plans to grade and gravel 9.5 mi. road from Hayfield west to county line, 24 ft. wide. About $57,000. R. D. Jorgens, Hayfield, engr.

Minn., Marshall—Lyon Co. plans to grade and gravel 25 mi. road from Minnesota through Cottonwood to Yellow Medicine, 24 ft. wide. About $150,000. D. W. Webster, Marshall, engr.

Minn., Morris—Stevens Co. plans to grade 5 mi. road south of Chokio and Alberta, 24 ft. wide. About $25,000. W. A. Hunt, Morris, engr.

Minn., Redwood Falls—Redwood Co. plans to gravel 10 mi. road from here south, 24 ft. wide. About $45,000. J. A. Myron, Redwood Falls, engr.

Minn., Rochester—Olmsted Co. plans to gravel 14 mi. road from Eyota east to county line, 24 ft. wide. About $68,000. G. H. Smith, Rochester, engr.

Minn., Thief River Falls—Pennington Co. plans to grade 4.5 mi. State Rd. 7, south from northern county line, 24 ft. wide. About $22,500. G. H. Martz, St. Hilaire, engr.

Minn., Wabasha—Wabasha Co. plans to gravel 21 mi. Federal Aid Projects, 18 and 21, from Kellogg south to county line, 24 ft. wide. About $110,000. C. M. Matthies, Wabasha, engr.

Minn., Winona—Winona Co. plans to grade 4.5 mi. road north of Elba, 18 and 24 ft. wide, cost $52,000; also 4.5 mi. Federal Aid Project 96, from Lewiston to Stockton, 24 ft. wide, $32,000. H. B. Childs, Winona, engr.

Kan., Halstead—City soon receives bids paving and building sewers in main streets, involving 30,600 sq.yd. vertical fibre brick or asphalt, 9,945 lin.ft. 6 in. concrete curb and gutter, 5,430 lin.ft. 8 in. concrete curb and gutter, 1,850 ft. 12-24 in. sewers, 8 manholes, etc. About $75,000. Ruckel Eng. Co., Hutchinson, engrs.

Missouri—State Highway Dept., Jefferson City, plans to build 20.7 mi. St. Joseph-Atchinson Rd., Buchanan Co., involving 223,000 cu.yd. excav., 2¼ per cent rock, 218,592 sq.yd. concrete surfacing, 18 ft. wide, 55 culverts, 3,200 lin.ft. guard rail, 10,000 lin. ft. underdrain, one 40 ft., one 50 ft. and one 55 ft. steel span bridge, cost $818,661; 3.22 mi. Kings Highway, Cape Girardeau Special Rd. Dist., Cape Girardeau Co., 964 cu.yd. excav., 12½ per cent rock, 33,658 sq. yd. sub base, 11 culverts and 1 bridge, $102,531; 9.73 mi. Nevada-Springfield Rd., Filley Special Rd. Dist., Cedar Co., 18,170 cu.yd. earth and 1,000 cu.yd. rock excav., 37,333 lin.ft. grading, 51,000 sq.yd. gravel surfacing, 9 ft. wide, 15 new culverts and extensions to 14 old ones, $43,679; 8.58 mi. Jefferson Highway, Jackson Twp. Bd., Gentry Co., 57,000 cu.yd. earth excav., 80,540 sq.yd. bituminous macadam surfacing, 16 ft. wide, 19 culverts, $181,537; 40 mi. Springfield-Memphis Rd., County Court, Howell Co., 129,440 cu.yd. earth and 1,500 cu.yd. rock excav., 158,400 lin.ft. grading, 105,600 sq.yd. 5 in. and 105,600 sq.yd. 10 in. gravel surfacing, 9 ft. wide, 59 culverts, 740 lin.ft. 15 in. concrete pipe, 185 sq.yd. riprap, 2 concrete bridges consisting of three 16 ft. spans, 1 viaduct with one 36 ft. and two 20 ft. concrete spans, and 1 double 12 x 13 ft. concrete subway, $208,000, and 8.5 mi. Huntsville-Keytesville Rd., County Court, Randolph Co., 72,562 cu.yd. earth excav., 10 culverts, one 48 ft. steel span and one 70 ft. steel span with 30 ft. approach, $49,555; all 24 ft wide

Mo., Clayton—St. Louis Co. Court soon receives bids improving 12 mi. St. Charles Rock Rd., concrete, 20 ft. wide from St. Louis city limits to Lackland Rd. and 18 ft. wide from there to St. Charles Bridge, excepting 3,400 ft. brick to be used on hill leading into Missouri River bottoms; 6 mi. Gravois Rd. from Weber Rd., 1 mi. south of St. Louis, and extending to western end of Kennerly Hill, concrete, 20 ft. wide to Kennerly Rd. and 18 ft. wide to end of Kennerly Hill; 16 mi. Manchester Rd. from North and South Rds. to Pond, 1 mi. west of Ellisville and within 7 mi. Franklin Co., 20 ft. wide, concrete: 7 mi. Lemay-Ferry Rd. from city limits to county line, 20 ft. wide, concrete. Total cost about $2,000,000. W. C. Wlbring, Clayton, engr.

Mo., St. Joseph—Buchanan Co. had plans prepared resurfacing 1.4 mi East Savannah Rd., 18 ft. wide, bituminous macadam or asphaltic concrete. About $21,000. G D Mohler, 1522 South 25th St., engr.

Mo., St. Louis—Bd. Pub. Serv. soon receives bids paving with (1) brick, (2) asphalt, (3) bitulithic, (4) wood block, (5) concrete, on 1,010 ft. Childress Ave. from West Park to Clayton Aves. (including grading of sidewalk spaces), 30 ft. wide, (1) $10,850, (2) and (3) $10,000 each; 1,410 ft. Glasgow Ave. from Kossuth Ave. and 25th St. to 22nd and Penrose Sts., 32 ft. wide, (1) $7,700, (2) and (3) $7,000 each; 7,850 ft. Carr St. from 14th St. to Jefferson Ave., 30 ft. wide, (1) $73,550, (2) $67,950, (3) $67,350, (4) $84,100; alley in Blk. 5,624 between Chippewa St., Spring, Bamberger and Gravios Aves., 2,220 ft. long, 15 ft. wide, (1) $6,800, (5) $4,600; alley in Blk. 2927 between Bowen and Fillmore Sts., 900 ft. long, 15 ft. wide, (1) $3,650, (5) $2,500; alley in Blk. 2999 from Kraus to Haven Sts., 602 ft. long, 15 ft. wide, (1) $2,600, (5) $1,750; alley in Blk. 4048-A from Columbia to Botanical Aves., 2,318 ft. long, 14 ft. wide, (1) $7,650, (5) $5,300. C. E. Smith, city engr.

Tex., Groesbeck—Limestone Co. plans to improve 7.064 mi. Highway 7 from Freestone Co. line to Tehuacana, 9 ft. wide. Work involves 1 acre clearing and grubbing, grading and surfacing road with crushed rock, building rein.-con drainage structures, 399 cu.yd. concrete and 27,173 lb. reinforcing steel.

Tex., Groesbeck—Limestone Co. plans to improve 11.87 mi. Highway 14 from Freestone Co. line to Navasota River, 9 ft. wide. Work involves 4 acres clearing and grubbing, grading and surfacing road with crushed rock, 710 cu.yd. concrete, 42,525 lb. reinforcing steel, one 70 ft. steel truss bridge over Tehuacana Creek and one 60 ft. over Plummers Creek. Fred P. Holt, Mexia, engr.

Tex., Wharton—Wharton Co. rejected bids received Dec. 22, draining and surfacing with bituminous topping, 6.4 mi. Highway 3, from Colorado Co. line west, 16 ft. wide, involving 4.715 mi. road machine work, 15,015 cu.yd. gravel, 18,869 cu.yd. unclassified earth excav., 1,680 cu.yd. ditching, 226 cu.yd. Class "A" concrete, 14,014 lb. reinforcing steel, 60,070 sq.yd. bituminous treatment and 76 lin.ft. pile trestle, cost $91,870; 5.9 mi. Highway 3, from San Barnard River west, 16 ft. wide, 4.395 mi. grade work, 281 sq.yd. Class A concrete, 13,210 cu.yd. unclassified earth excav., 61,055 sq.yd. bituminous treatment, 22,975 lb. reinforcing steel, 288 lin.ft. pile trestle, $97,623. D. B. King, Wharton, engr.

Okla., Bixby—City having plans prepared paving 6 blocks main streets, 30 to 60 ft. wide, concrete. About $100,000. Hughes Eng. Co., 304 Bank of Commerce Bldg., Tulsa, engrs.

Okla., Waurika—City having plans prepared paving 60 blocks main streets, 24 ft. wide, concrete. About $400,000. H. G. Olmsted & Co., 415 Oil Exch., Oklahoma, engrs.

Colorado—State Highway Dept. plans to pave and drain 2.727 mi. road between Ft. Morgan and Brush, Federal Aid Project 38. Work involves 28,800 sq.yd concrete, 3,900 cu.yd. earth excav., 733 cu.yd. gravel surface and shoulders, 53 cu.yd. concrete and 379 lb. reinforcement for concrete culverts. About $102,678. J. E. Maloney, engr.

Col., Denver—City plans to pave 12 blocks in Alley Paving Dist. 58, involving 13,520 sq.yd. 2 course concrete on earth sub-grade. 1,400 cu.yd. earth excav. and 24 manholes. About $31,913. J. B. Hunter, city engr.

New Mexico—State Highway Comn, Capitol Bldg., Santa Fe, soon lets contract building State Rd. 1, Sect. 2, known as New Mexico Federal Aid Project 1-B, Colfax Co., located between Raton and point 14.37 mi. south. Work involves 46,270 cu.yd. Class 1 excav., 37,862 cu.yd. Class 1 borrow, 23,914 sta.yd. overhaul, 22,386 cu.yd. 1 course gravel surfacing, 686 lin.ft. corrugated iron culverts, 64.51 cu.yd. Class A and 133.26 cu.yd. Class B concrete, 24.21 lb. expanded metal reinforcement, 267.5 lb. ½ in. square reinforcing bars, also 2,672 lin.ft. wooden piling, 18.01 M. ft. substructure and 39.717 M. ft. superstructure lumber for bridges. L. A. Gillett, state highway engr.

Oregon—State Highway Comn., Portland, rejected bids gravel surfacing 2.5 mi. Canyon Sect. Baker-Cornucopia Highway, Baker Co., involving 5,500 cu.yd. crushed or screened gravel. About $10,000. Work will be readvertised. H. Nunn, Salem, state highway engr.

Cal., Modesto—City voted $100,000 bonds to pave streets and intersections. G. H. Freitas, city engr.

Cal., San Diego—City soon receives bids improving 35 blocks A, B, Ash, Beech and Cedar Sts., involving 5 in. concrete paving, cement curbs, gutters, etc. About $100,000. F. A. Rhodes, city engr.

Ont., Almonte—City plans to build 4½ mi. granolithic concrete sidewalk, 5 ft. wide. About $22,000. W. Aitken, city engr. Noted Jan 1.

BIDS DESIRED

Connecticut—Until Feb. 6, by C. J. Bennett, comr State Highway, improving 32.2 mi. Hartford-New London Trunk Line, Federal Aid Project 4, 18 ft. wide; advertised in this issue.

New York—Until Jan. 30, by F. S. Greene, State Highway Comn., Capitol, Albany, improving and completing 3 mi. highway, Cattaraugus Co., 4.95 mi. Dutchess Co., 3.77 mi. Erie Co., 8.34 mi. Livingston Co., 2.38 mi. Niagara Co., 5.38 mi. and 5.03 mi. Oneida Co., 1.14 mi. and 1.65 mi. Orange Co, 4.65 mi. and 0.65 mi. Oswego Co., 4.6 mi. and 11.16 mi. St. Lawrence Co., 5.24 mi. Schoharie Co., 5.5 mi. Tioga Co., 0.84 mi. and 3.17 mi. Ulster Co., 5.13 mi. Warren Co., 7.6 mi. Washington Co., 4.13 mi. Westchester Co., 9.63 mi. Yates Co.; advertised in this issue.

N. Y., Brooklyn—Until Jan. 21, by E. Riegelmann, boro. pres., regulating and grading, curbing and laying sidewalks, on DuPont St. from Franklin St. to westerly side of West and Commercial Sts., Ave. T from East 13th to East 14th Sts., 21st St. from 76th to 77th Sts., 71st St. from 21st Ave. to Bay Parkway, Ave. R from Stillwell Ave. to 8th St., 56th St. from New Utrecht to 14th Aves., 85th St. from Narrows Ave. to Colonial Rd., regulating and paving with permanent asphalt on 6 in. concrete foundation, roadway of Jackson St. from Kingsland to Morgan Aves., Ave. T from East 13th to East 14th Sts., 21st Ave. from 76th to 77th Sts., 13th Ave. from New Utrecht Ave. to 57th St., 56th St. from New Utrecht to 14th Aves.

N. Y., New York—Until Jan. 22, by Dept. Park, Municipal Bldg., furnishing all labor and material for repaving roadway of Eastern Blvd. from Bronx and Pelham Parkway to southerly approach to bridge over East Chester Bay, Bronx Boro., sheet asphalt and asphalt blocks on concrete foundation.

New Jersey—Until Jan. 29, by State Highway Comn., Trenton, building State Highway Route 13, Sect. 4, Kingston to Princeton, Mercer Co., involving 18,627 sq. yd. concrete surface. A. L. Grover, ch. clk.; advertised in this issue.

Pa., Meadville—Until Feb. 10, by A. D. Andrews, city clk., paving and curbing 29 streets, brick with cement grout and soft filler, involving 72,777 sq.yd. brick pavement, 48,486 lin.ft. concrete curbs and gutters, 1,764 lin.ft. header, 1,732 lin.ft. tire steel curb protection and 2,712 lin.ft. 6 x 24 in. curbs; advertised in this issue.

W. Va., Charles Town—Until Feb. 5, by C. A. Johnson, clk. Jefferson Co., paving 6 mi. Harpers Ferry Rd., 16 ft. wide, bituminous macadam.

W. Va., Clay—Until Feb. 2, by Comrs. Clay Co., improving 2 mi. Clay-Wallback Rd., 20 ft. wide, involving 18,000 cu.yd. excav., and drainage structures. About $30,000. J. Chase, co. engr.

W. Va., Wayne—Until Jan. 26, by F. H. Fry, clk. Wayne Co., grading and draining 6 mi. Wayne-East Lynn Rd., Federal Aid Project 51. H. A. Levering, co. engr.

W. Va., Williamson—Until Jan. 24, by E. Boggs, clk. Mingo Co., building road on Pigeon Creek, beginning at intersection of Rd. 4 (Williamson Burch Rd.) with Rd. 10, at mouth of Little Buffalo Creek on Pigeon Creek, thence up Pigeon Creek to Sta. 264, total length 8 mi.; advertised in this issue.

Ga., Waycross—Until Jan. 20, by city, for 17,000 sq.yd. paving and 3 mi. curbing. About $60,000.

Ohio—Until Jan. 23, by State Highway Comn., Columbus, grading, building bridges and culverts and paving with concrete or monolithic brick, 2.019 mi. Sect. A-2, Paulding-Hicksville Rd., cost $58,639, 2.997 mi. Sect. A-2, Paulding-Ft. Wayne Rd., concrete $83,785, monolithic brick $107,796 and 2.023 mi. Sect. G, Paulding-Woodburn Rd., Paulding Co, $58,967; 5.069 mi. Sect. A, Springfield-Urbana Rd, Cuyahoga Co., $214,536.

O., Continental—Until Feb. 5, by Clerk, paving Main St. from Forest to Park Sts.; Rice Rd. from 3rd St. to Toledo, St. Louis & Western R.R.; Oak St. from Main to

Streets and Roads (Continued)

Chicago & St. Louis R.R. to Ash St.; Maple St. from 5th to 7th Sts.; 5th St. from Maple to Vento Sts.; Sugar St. from 4th to Main Sts., involving 11,175 cu.yd. grading, 1,325 lin.ft. 10-12 in. pipe sewer, 13,015 lin.ft. straight, 863 lin.ft. circular and 230 lin.ft. marginal curb and 18,417 sq.yd. asphalt, brick or cement pavement, etc.

Indiana—By Bd. Co. Comrs. building roads in following counties:

Jan. 22, Allen Co., Ft. Wayne, 16,012 ft. road, Wayne Twp., known as Eby Rd.; 28,215 ft. road. Jackson Twp., known as Townley Rd. A C. McCoy, aud

Jan. 28, Allen Co., Ft. Wayne, 5,677 ft. road, Springfield, Maumee and Scipio Twps., known as Bartell Junction Rd. A. C. McCoy, aud.

Feb. 4. Whitley Col, Columbia City, gravel road, Troy Twp., known as F. Martin Rd., 33,032 ft. gravel road, Smith Twp., known as Ira Parish Rd. W. K. Burwell, aud.

Indiana—By Bd. Co. Comrs. building roads in following counties:

Jan. 20, Benton Co., Fowler, 15,830 ft. gravel road, Center Twp., known as M Duffy Rd. W. Mankey, aud.

Allen Co., Wayne, 15,050 ft. stone road, Perry Twp., known as Hillegas 4 Rd.; 15,538 ft. stone road Pleasant Twp., known as Smith Rd. A. C. McCoy, aud.

Feb. 2, Jay Co., Portland, 14,625 ft. crushed limestone road, Pike Twp., known as G. Lyons Rd. H. Martin, aud.

Jackson Co., Brownstown, 2,228 ft. concrete road. Driftwood Twp., known as A. M. Singer et al Rd. A. Luedtke, aud.

Starke Co., Knox, road in Railroad Twp., known as Pingel Rd.; road in Wayne Twp., known as Prucha Rd.; road in Washington Twp., known as Coup and McVey Rd.; road in Davis Twp., known as Roney Rd. C. W. Weninger, aud.

Spencer Co., Rockport, road in Carter Twp., known as Rd. 4, of J. Kelley et al, system. R. W. Richard, Jr., aud.

Warren Co., Williamsport, 13,263 ft. gravel road, Prairie Twp., known as F. O. Young Free Gravel Road. W. H. Stephens, aud.

Feb. 3, Bartholomew Co., Columbus, 1¾ mi. crushed stone road, Rockcreek Twp., known as Dunn Rd.; 2,120 ft. crushed stone road between Hawcreek and Clifty Twps., known as Morrison Rd.; 1,285 ft. crushed stone road between Hawcreek and Clifty Twps., known as Pittman Rd. R. Henderson, aud.

Fountain Co., Covington, stone and gravel road. Richland, Wabash, Jackson, Shawnee, Troy, Cain and Mill Creek Twps., known as B. Frazier, A. Ingersoll, J. Cunningham, C. W. Lusk, J. Loeb, S. La Taurette, S. Boatman and A. Jones Rds. H. W. Newlin, aud.

Feb. 17, Bartholomew Co., Columbus, 5,125 ft. macadam road, Jackson Twp., known as Herring Rd. R. Henderson, aud.

Mich., Baldwin—Until Jan. 19, by Clerk Ellsworth Twp., Lake Co., surfacing and slag graveling 2.536 mi. State Trunk Line Rd. 63-1, 16 ft. wide, involving 23,803 sq. yd. gravel.

Mich., Charlotte—Until Jan. 30, by Rd. Comrs. Eaton Co., surfacing with cement concrete or bituminous concrete 6.582 mi. State Trunk Line Rd. 16-3, 18 ft. wide, involving 69,505 sq.yd. surfacing material.

Mich., Flint—Until Feb 2, by Bd. Rd Comrs. Genessee Co., grading, draining and surfacing 5.447 mi. State Trunk Line Rd. 21-3, Sect. B, 18 ft. wide, involving 24,414 cu.yd. earth excav., 57,516 sq.yd. vitr. brick, 5,432 sq.yd. asphalt, 57,516 sq.yd. concrete, 57,516 sq.yd. bituminous concrete, 5,964 lbs. steel, etc.

Mich., Ionia—Until Jan. 23, by Road Comrs. Ionia Co., improving 4.895 mi. State Trunk Line Rd. 39-2, involving 25,690 cu.yd. earth excav., 226 cu.yd. concrete and 3,836 lb. steel; 4.472 mi. State Trunk Line Rd. 39-3, involving 37,395 cu.yd. earth excav., 223 yd. concrete, 4,950 lin.ft. guard rail and 3,632 lb. steel.

Mich., Jackson—Until Jan. 23, by A. W. D. Hall, city mgr., paving various streets, involving 4,380 sq.yd. brick and 150,000 sq.yd. sheet asphalt or asphaltic concrete pavement, 85,000 ft. combined curbs and gutters and 50,000 sq.yd. excav.; advertised in this issue.

Mich., Jackson—Until Jan. 29, by Rd. Comrs. Jackson Co., grading, draining and surfacing with concrete, bituminous concrete or brick 4.538 mi. State Trunk Line Rd. 14-2A, 18 ft. wide, involving 21,077 cu.yd earth excav., 47,920 sq.yd. surfacing material, 7,487 lb. steel, 132 cu.yd. 1 : 2 : 4, 128 cu.yd 1 : 2½ : 5 and 109 cu.yd. 1 : 3 : 6 concrete, 935 lin.ft 12 in. encased tile, etc

Mich., Tawas City—Until Jan. 30, by Rd. Comrs. Iosco Co., grading, draining and surfacing 4.992 mi. State Trunk Line Rd 10-26, 16 ft. wide, involving 46,864 sq.yd gravel, 16,000 cu.yd. earth excav., 6,539 lb. reinforcing steel. 74 cu.yd. 1 : 2 : 4 and 170 cu.yd. 1 : 3 : 6 concrete.

Wisconsin—Until Jan. 22, by State Highway Comn., La Crosse, surfacing 0.88 mi. La Crosse-Sparta Rd., 18 ft. wide Federal Aid Project 107, Monroe Co., involving 2,615 cu.yd. earth, 1,237 cu.yd. rock and 35 cu.yd. borrow excav., 23 cu.yd. Class A concrete and 9,284 sq.yd. concrete surface; 2.88 mi. Prairie du Chien Rd., 18 ft. wide, Federal Aid Project 136, Vernon Co., 11,714 cu.yd. earth, 3,855 cu.yd rock and 149 cu.yd. borrow excav., 140 cu.yd. Class A concrete, 29,559 sq.yd. concrete surface, etc.

Ia., George—Until Jan. 25, by city, for 20,000 sq.yd. concrete, sheet asphalt, brick or wood block pavement. About $100,000. W. E. Buell, Davidson Bldg., Sioux City, engr.

Minn., Duluth—Until Jan. 19, by city, paving 1,900 ft. 27th Ave. east from 5th to 6th Sts.; 6th St. from Lincoln Park to Winnipeg Ave., and Winnipeg Ave. from 6th to Devonsbire Sts., 24 ft. wide, involving 4,245 lin.ft. 5 in. concrete curbs, 411 lin.ft. concrete heads, 4,350 cu.yd. earth and 300 cu.yd. rock excav., 6,506 sq.yd. concrete, etc. About $38,887. E. K. Coe, city engr.

N. D., Grafton—City receiving bids for 40 blocks of paving. Alternate bids on various types. C. L. Pillsbury Co., 813 Metropolitan Life Bldg., Minneapolis, engrs.

Mo., Huntsville—Until Feb. 6, by Clerk Randolph Co., improving State Rd. Project 22, including grading, constructing culverts and concrete or vitr. brick pavement, 18 ft. wide, and other incidental work on 1.66 mi. state road from Moberly south; advertised in this issue.

Mo., Liberty—Until Feb. 4, by Clerk Clay Co., improving State Rd. Project 25 and Sect. A State Rd. Project 6, including grading, constructing culverts and bridges, broken stone base and bituminous macadam surface, 16 ft. wide, on 13.05 mi. state road from here to Excelsior Springs and on 10.52 mi. road from North Kansas City to Nashua; advertised in this issue.

Mo., Potosi—Until Feb. 2, by Clerk Washington Co. improving State Rd. Project 31, including grading, constructing culverts and gravel surfacing, 16 ft. wide, and any incidental work on 3.53 mi. state road from north line of Potosi Special Rd. Dist. south; advertised in this issue.

Mo., St. Charles—Until Feb. 3, by Clerk St. Charles Co., improving State Rd. Project 28, work includes constructing bituminous macadam surface course, 16 ft. wide, grading earth shoulders, and other incidental work on 1.66 mi. National Old Trails Rd., near Harvester; advertised in this issue.

Mo., Sedalia—Until Feb. 5, by Clerk Pettis Co., improving State Rd. Project 23. Work includes building bituminous macadam surface course, 16 ft. wide, grading earth shoulders, constructing concrete culverts, and other incidental work on 5.31 mi. state road between here and Smithton; advertised in this issue.

Arkansas—Until Jan. 20, by Comrs. Rd. Impvt. Dist. 2, Howard Co., at office of State Highway Comn., Little Rock, building 64.4 mi. road, Sect. 1, involving 3 acres clearing and grubbing 75,310 cu.yd. embankment, 590 lin.ft. 18-36 in. pipe, 152.9 cu.yd. concrete, 63,320 lb. reinforcing metal, 23,505 cu.yd. gravel, 120 lin.ft. truss span; Sect. 2, 11 acres clearing and grubbing, 92,150 cu.yd. embankment, 1,300 lin.ft. 18-36 in. pipe, 24,560 lb. reinforcing steel, 31,930 cu.yd. gravel, 64 lin.ft. I-beam span, 350 lin.ft. truss span; Sect. 3, 79 acres clearing and grubbing, 198,600 cu.yd. embankment, 3,960 cu.yd. solid rock and 17,650 cu.yd loose excav., 3,894 lin.ft. 18-36 in. pipe, 3,023 cu.yd. concrete, 107,230 lb. reinforcing metal, 151 lin.ft. I-beam span, 340 lin.ft truss span, 34,030 cu.yd. stone and 6,836 cu.yd. gravel; Sect. 4, 24 acres clearing and grubbing, 12,980 cu.yd. embankment, 1,805 cu.yd loose rock, 13,913 cu.yd stone, 1,602 lin.ft. 18-36 in. pipe, 30,190 lb reinforcing steel and 180 lin.ft. truss span. Carter & Knock, 803-7 A. O U. W. Bldg., Little Rock, engrs.

Arkansas—Until Jan. 21, by Comrs. Dardanelle Rd Impvt. Dist., Yell Co., at office of State Highway Comn., Little Rock, building 31.59 mi. road, involving 31.7 acres clearing and grubbing, 211,760 cu.yd earth embankment, 7,660 cu.yd loose rock and 1,910 cu.yd solid rock excav., 3,958 lin.ft 18-36 in. pipe, 1,267 cu.yd. concrete, 69,750 lb. reinforcing metal, 250 lin.ft. I-beam spans, 490 lin.ft. truss spans, 222,430 sq.yd. asphaltic surface, (penetration method), and 1,040 cu.yd. concrete in bridge abutments.

Ark., Fayetteville—Until Feb. 18, by J. English, chairman comn., at office of Hamilton & Shreve, engrs., Fayetteville, constructing 62 mi. gravel macadam road; advertised in this issue.

Texas—Until Jan. 22, by R. J. Winsdrow, engr., State Highway Dept., Austin, building 8.8 mi Federal Aid Rd. Project 3, 20 ft. wide, concrete, cost $80,000; 4.68 mi. Highway 22, Federal Aid Project 61, 20 ft. wide, $40,000.

Tex., Hillsboro—Until Jan. 31, by R. T. Burns, judge Hill Co., grading and surfacing with crushed rock, 11.75 mi. Kings Trail, Highway 6, 18 ft. wide, also building rein.-con. bridges and culverts on same, involving 23,051 cu.yd. earth and 100 cu. yd. rock excav., 273 cu.yd. Class A concrete for culverts, 394 cu.yd. Class A and 311 cu.yd. Class B concrete for bridges, 77,839 lb. reinforcing steel. County to furnish 27,873 cu.yd. gravel. About $170,572. Bryant & Huffman, Littlefield Bldg., Austin, engrs.

Tex., Wichita Falls—Until Jan. 22, by M. M. Murphy, aud. Wichita Co., grading, surfacing and draining 10 mi. Highway 5, from here to Iowa Park, 16 and 18 ft. wide, concrete. Work involves 17 acres clearing and grubbing. About $483,212. J. M. Isbell, Wichita Falls, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Brooklyn—E. Riegelmann, boro. pres., received bids Jan. 7, regulating and repaving (a) Hegeman St., (b) Louisiana Ave., (c) 70th St., (d) 81st St., from Uvalde Asphalt Paving Co., 1 Bway., New York City, (a) $4,508, (b) $10,041, (d) $12,507; Sicilian Asphalt Paving Co., 41 Park Row, New York City, (a) $4,635, (b) $10,312, (d) $12,851; Consolidated Asphalt Paving Co., 529 9th St., (a) $4,688, (b) $10,457, (d) $12,999; C. Gallagher, (c) $2,895; Grimm Constr. Co., 170 McKinley Ave., (c) $2,992. Noted Jan. 1.

★New Jersey—State Highway Comn., Broad St. Bank Bldg., Trenton, let contract building State Highway Route 4, Sect. 3, Broadway to Scott Ave., Perth Amboy, to L. J. Sieling, 211 Broad St., Red Bank, $73,481.

★Pa., Luzerne (Wilkes-Barre P. O.)—City let contract to Goeringer Constr. Co., Main St., Wilkes-Barre, paving and curbing 1,066 sq.yd. Market St., cost $5,969; 832 sq.yd. Northampton St., $4,665; 3,366 sq.yd. Union St., $11,579; 6,000 sq.yd. North Main St., $20,000; 2,352 sq.yd South Main St., $8,091; 500 sq.yd. North Washington St., $1,720; 500 sq.yd Pennsylvania Ave., $1,720; 3,600 sq.yd. Barney St., $7,000; 3,500 sq.yd. Kidder St., $6,000; 3,550 sq.yd. Wood St., $8,772, and 3,500 sq.yd. South St., $6,000. Work involves 42,000 lin.ft. blue stone curbing, 3,000 cu.yd. earth excav., 22,000 sq.yd. sheet asphalt and 1,899 sq.yd. Hastings asphalt block

W. Va., Fayetteville—Comrs. Fayette Co. received only bid from Johnson & Dougher, White Sulphur Springs, for paving 7.75 mi. James River Rd. and Kanawha Turnpike, 9 ft. wide, involving 4,000 cu.yd. earth excav., $1.25 per cu.yd., 41,000 sq.yd. bituminous macadam, $2.08, 23,000 sq.yd. broken stone and shoulders, $0.70. Total cost $107,130.

★S. C., Bamberg—City Council let contract paving 1.5 mi. sidewalks on Railroad Ave. from Main St. to last railroad crossing east, to Ryan Eng. Co., Columbia. About $15,000.

★Ala., Montgomery—City let contract paving Morgan Ave., vibrolithic concrete, to Jamison & Hallowell, 835 North Court St. About $26,000.

★Ind., Greenfield—Comrs. Hancock Co. let contracts graveling and grading 2¼ mi. H Hawkins Rd., 1 mi. J. Lain Rd. and 2¾ mi. H. W. Eikman Rd., to Hawkins & Rigdon; paving 1¼ mi W. Babe Rd., waterbound macadam, to Big Four Stone Co.; paving, grading, draining and curbing F. E. White and Gibbs Rds., concrete, to E G Gant

★Mich., Ann Arbor—Comrs. Washtenaw Co let contract grading and draining 8.198 mi. Federal Aid Project 35, Sect. B, involving 53,760 cu.yd. earth excav., 1,125 lin.ft. 12 in. encased tile, 244 cu.yd concrete and 5,340 lb. reinforcing steel, to C. J. Snyder & Sons, Ann Arbor. $47,602

Streets and Roads (Continued)

★Mich., Gaylord—Otsego Co. let contract grading, draining and surfacing 9.169 mi. State Trunk Line Rd. 18-4, 16 ft. wide, involving 37,376 cu.yd. earth excav., 86,064 sq.yd. gravel, 784 lin.ft. 12 in. encased tile, 242 yd. concrete, 4,250 lin.ft. guard rail and 2,880 lb. reinforcement, to Midland Constr. Co., Midland, $131,414.

★Ia., Manson—City let contract paving 10 blocks various streets, 25 ft. wide, involving 100,000 sq.yd. concrete, to Krage & Jensen, Sioux City, $5.65 per sq.yd.

★Minn., Luverne—W. Bauer, city recdr., let contract paving 100 blocks, 18 ft. wide, concrete, to Hanlon & Okes, 338 Lumber Exch. Bldg., Minneapolis, $2.88 per cu.yd.

★Kan., Hutchinson—City let contracts paving Poplar St., to Stamey Mackey Constr. Co., Hutchinson, $145,709; Ave. A from Pershing to Nelson Sts. and 3rd Ave. from Main to Poplar Sts., to H. Shears & Sons, Hutchinson, $37,885 and $27,914 respectively.

Kan., Leavenworth—Leavenworth Co. received bids Jan. 5, building 4.416 mi. Fort to Fort Highway, Federal Aid Project 13, Sect. C, 18 ft. wide, concrete, also necessary bridges and culverts on same, from Missouri Valley Bridge Co., Leavenworth, $215.397; Cook & O'Brien, Ry. Exch. Bldg., Kansas City, Mo., $221,227; J. M. McGuire Constr. Co., Leavenworth, $226,438.

★Kan., Oswego—Labette Co. let contract grading 10.52 mi. Ozark Trail, Federal Aid Project 2, Sect. C, 16 ft. wide, to Cook & O'Brien, Ry. Exch. Bldg., Kansas City, Mo., $44,692. Work involves 58,000 cu.yd. earth and 461 cu.yd. rock excav., 664 ft. 24-30 in. concrete pipe and 34 ft. 40 in. tile pipe.

Tex., Athens—Henderson Co. received bids grading, surfacing and draining 11.66 mi. Highway 19, Canton-Palestine Rd., from W. Burk & Co., Jacksonville, $107.615, and Smith Bros., Crockett, $123,548. Work involves 11.1 acres clearing and grubbing, 15,915 cu.yd. gravel, 64,343 cu.yd. earth excav. and 849 cu.yd. concrete.

★Tex., Denton—Comrs. Denton Co. let contract improving 10.034 mi. Highway 40 from here to Garza, to McElwrath & Rogers, Corsicana, $106,376. Work involves 17 acres clearing and grubbing, grading and surfacing road with gravel, constructing rein.-con. drainage structures, etc.; 20,923 cu.yd. road gravel to be furnished by county.

Tex., Jasper—Jasper Co. received bids improving 1 mi. Highway 7, from city limits, east 1 mi., from H. F. Blond, Center, $25,344, and Smith Bros., Crockett, $25,939. Work involves surfacing road with gravel and building concrete drainage structures, 13,182 lb. reinforcing steel and 135.3 cu.yd. Class A concrete.

Tex., San Angelo—Tom Green Co. received bids Nov. 16, building 26.5 mi. Highway 4, from here to Schleicher Co. line, 18 ft. wide, involving 49,180 cu.yd. crushed stone, 2,950 cu.yd. cover material and 88,525 gal. asphalt topping, from W. T. Montgomery, 802 Alamo Bank Bldg., San Antonio, (work complete), $217,984; C. B. Metcalfe, San Angelo, (excluding asphalt topping), $167,908; H. R. Hicks, Eldorado, (excluding asphalt topping), $188,804.

★Tex., San Antonio—Bexar Co. let contract surfacing 67,927 sq.yd. Highway 9, known as Boerne Stage Rd., 16 ft. wide, 1 in. cold Uvalde Rock asphalt, also building rein.-con. drainage structures, involving 8,567 lb. reinforcing steel and 55 cu.yd. Class A and 46 cu.yd. Class B concrete, to Uvalde Rock Asphalt Co., Swearingen Bldg., $44,080, 10.62 acres clearing and grubbing and 7.236 mi. grading and gravel surfacing, on above road, will be done by day labor, cost $26,215. Noted Jan. 1.

★Okla., Blackwell—City let contract paving 6 blocks main streets, 25 ft. wide, 2½ in. vertical fibre brick, to M. A. Swatek & Co., 412 Security Bldg., Oklahoma, $31,651.

★Okla., Broken Arrow—City let contract paving 5 blocks main streets, 25 ft. wide, 1 course concrete, to J. H. Hamilton, Bartlesville. About $40,000.

★Ariz., Yuma—City let contract paving 5,000 lin.ft. 2nd Ave., concrete, to L. M. White and C. M. Miller, Yuma, $76,161.

Ore., Portland—City Council received bids grading and building concrete sidewalks and curbs, on (a) 76th St. from East Glisan to Halsey Sts., (b) East 88th St. from Foote to East Taylor Sts., (c) paving East 72nd St. from East Alder to East Stark Sts., (d) East Alder St. from East 27th to East 28th Sts., (e) 62nd St. S. E. from Foster to Powell Valley Rds., (f) Ramona Ave., et al, (g) East 8th St. from Ainsworth to Dekum Aves., (h) East 58th St. from East Everett to East Burnside Sts., (1) asphaltic concrete No. 1, 2 in. top, (2) asphaltic concrete No. 1, (3) concrete No. 3, (4) asphaltic concrete No. 1 and asphaltic concrete redress No. 1, 2 in. top, M from M. Hansen & Co., Portland, (a) $9,028, (b) $9,918; Municipal Paving Plant, Portland, (c1) $1. per sq.yd., $7,401, (d1) $1.10 per sq.yd., $1,494, (f2) $1. per sq.yd., $57,322; Warren Constr. Co., Journal Bldg., (c1) $1.49 per sq.yd., $8,858, (d1) $1.44 per sq.yd., $1,798, (e2) $1.53 per sq.yd., $15,888, (f4) $1.39 per sq.yd., $73,259, (g2) $13,383, (h1) $1.49 per sq.yd., $10,694; Star Sand Co., Bd. Trade Bldg., (d3) $2.25 per sq.yd., $1,783; S. Simonsen, 841-East 10th St. No., (e3) $2.25 per sq.yd., $15,511; United Contg. Co., Northwest Bank Bldg., (g3) $13,030.

Ore., Portland—City Council received bids improving (a) East 18th St. from Alberta to Emerson Sts., (b) Clatsop Ave. from East 11th to East 13th Sts., (c) Glenn Ave. from Holman to Jarrett Sts., (d) East 31st St. from Alberta to Prescott Sts., (e) Webster St. from Kerby St. to Michigan Ave., (f) East 29th St. from Prescott to Alberta Sts., (g) Ainsworth Ave. from East 17th to East 10th Sts., (h) building sewer in East 2nd St. from point 50 ft. south of East Madison to East Salmon Sts., (1) asphaltic concrete, (2) concrete No. 3 in roadway, (3) asphaltic concrete No. 1, 2 in. top in roadway, (4) asphaltic concrete No. 1, 2 in. top, (5) asphaltic concrete No. 1, (6) concrete No. 3, (7) cement pipe, from Municipal Paving Plant, Portland, (a1) $1.10, per sq.yd., total, $6,601, (b4) $1.10 per sq.yd., $3,173; Warren Constr. Co., Journal Bldg., (a1) $1.47 per sq.yd., $8,274, (b3) $1.46 per sq.yd., $4,014, (c5) $1.47 per sq.yd., $9,099, (d5) $1.41 per sq.yd., $10,831, (e1) $1.43 per sq.yd., $10,319, (f5) $1.44 per sq.yd., $11,100, (g4) $1.42 per sq.yd., $33,719; S. Simonsen, 841 East 10th St., (a) $8,060, (c6) $2.25 per sq.yd., $3,426; United Contg. Co., Northwest Bank Bldg., (b2) $2.55 per sq.yd., $4,487, (d6) $2.25 per sq.yd., $12,512, (f) $13,019; Star Sand Co., Bd. Trade Bldg., (d6) $2.25 per sq.yd., $10,667, (f6) $2.25 per sq.yd., $11,050; Hahn & Rebman, Portland, (e6) $10,006; Dyoub & Joseph, Portland, (h7) $3,766; Azar & Co., Portland, (h7) $3,766; Elliott & Scoggins, McKay Bldg., (h7) $3,766.

★Ore., The Dalles—City let contract paving ½ mi. West 6th St. viaduct, to United Constr. Co., Northwest Bank Bldg., Portland, $9,285. City will furnish crushed rock.

Cal., Long Beach—City received bids improving Perris Ave., involving 93,808 sq.ft. 4 in. crushed rock and oil paving, from F. Hoffman, 111 East 12th St., $0.15 per sq.ft., total $14,021; P. A. Thomas, Long Beach, $0.158 per sq.ft., $14,822; Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, $0.21 sq.ft., $19,700.

★Cal., Los Angeles—City let contract to G. R. Curtis, 2440 East 26th St., improving Temple St., involving 341,023 sq.ft. grading at $0.05½ sq.ft., 341,023 sq.ft. Warrenite paving, $0.25½, 1,275 sq.ft. asphalt, $0.35; 9,011 sq.ft. rough grading, $0.05; 9,011 sq.ft. finish grading, oiling and rolling, $0.05; 9,370 lin.ft. cement curbs, $0.50; 26,013 sq. ft. cement walks, $0.18; 11,055 sq.ft. concrete gutters, $0.26; 2,376 sq.ft. granite block gutters, $0.60; sanitary sewer, $500; 210 lin.ft. house connection sewers, $2.50; storm sewers, $17,350; catch basins and drain, $790. Total, $139,910. Noted Jan. 8.

★Cal., Los Angeles—Los Angeles Co. let contract improving 8.5 mi. streets in Graham Rd. Imprt. Dist. 151, involving 19,200 cu.yd. excav., 88,450 ft. cement curbs and 438,100 sq.ft. cement walks, to D. L. Gaskill, 326 Hermosa Ave., Long Beach, $114,730. Noted Jan. 8.

★Cal., Ventura—Bd. Supervs. Ventura Co. let contract for 179,440 sq.ft. concrete and asphalt pavements, 3,393 cu.yd. excav. and 11,215 lin.ft. shaping roadbed, etc., to Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles. About $36,700.

Railways

PROPOSED WORK

Ontario—Canadian Pacific Ry., Windsor St., Montreal, receives bids about March 15, building 90 mi. double track from Guelph to London. About $500,000. A. Williams, London, supt.

BIDS DESIRED

Ontario—Until Feb. 17, by T. L. Church (mayor), chairman, Bd. Control, Toronto, furnishing labor and materials for building 3½ mi. double track electric railway from St. Clair Ave. to Mt. Pleasant Rd. About $1,500,000. R. C. Harris, city clk.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★California—Palo Verde Joint Levee Dist., Blythe, let contract building ¾ mi. roadbed, laying 5 mi. track and hauling and placing 10,000 cu.yd. rock revetment on levee, to Tuoby Bros., North West Bank Bldg., Portland, Ore.; cost plus percentage basis.

Excavation and Dredging

PROPOSED WORK

Cal., San Francisco — Excavation — City plans to extend harbor area by removing Rincon Hill, involving 3,000,000 cu.yd. earth excav. About $3,500,000.

BIDS DESIRED

N. Y., Tompkinsville—Dredging—Until Jan. 20, by M. Hurlburt, comr. dock, Pier A, Battery Pl., New York City, furnishing labor and material for removing old piers, bulkheads and platforms and dredging at Piers 9, 10 and 11, between Grant and Wave Sts., Richmond Boro.

Ind., Crawfordsville—Ditch—Until Jan. 31, by W. S. Harding, drainage comr. Montgomery Co., building 5,992 ft., E. Dynes et. al. Ditches.

Ia., Wapello—Drainage—Until Jan. 19, by F. G. Wright, aud. Louisa Co., acting for and on behalf of D. D. 17, furnishing labor and materials building complete drainage pumping plant, consisting of two 10 in. centrifugal pumps driven by oil engines. V. E. Thompson, Wapello, engr.

Minn., Bemidji—Ditches—Until Feb. 6, by A. D. Johnson, aud. Beltrami Co., building Judicial Ditches 25 and 30, 14 mi. long. About $53,000. J. C. Burke, Bemidji, engr.

Minn., Fergus Falls—Ditch—Until Jan. 30, by W. Lincoln, aud. Otter Tail Co., building Ditch 68, 12.9 mi. long, involving 242,509 yd. excav., 9.2 acres clearing, 5 bridges, 6 culverts; also constructing 1.7 mi. road. E. W. Kibby, 616 Plymouth Bldg., Minneapolis, engr.

Ark., Lewisville—Channels and Levees—Until Jan. 20, by Bd. Dir., Long Prairie D. D., constructing drainage channels and levees, involving 1,300,000 cu.yd. earth. C. S. Christian, 423 State Natl. Bank Bldg., Texarkana, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Ia., Des Moines—Drainage—Bd. Suprvs. Polk Co. let contract building 15 mi. open ditch work and straightening and deepening Skunk River Channel, Elkhart, Washington and Ft. Des Moines Twps., involving 1,151,360 cu.yd. dry earth excav., to R. S. Morrow & Son, Omaha, Neb., $0.1979 per cu.yd. Total cost, $300,000.

Industrial Works

PROPOSED WORK

N. H., North Stratford—Warner Sugar Refining Co., 79 Wall St., New York City, plans to build several rein.-con. and steel refineries, here. About $1,000,000. Private plans.

Vt., Lunenburg—Fitzdale Paper Mills, Fitzdale, having preliminary sketches made by C. F. Hardy, archt. and engr., 309 Bway., New York City, for 1 story, rein.-con. and steel power house, rein.-con. flooring, concrete foundation, here. About $1,000,000.

Vt., St. Johnsbury—Cary Maple Sugar Co. having preliminary plans prepared by Webster & Libby, engrs., 534 Congress St., Portland, Me., for rein.-con. and steel factory and boiler house, on Portland St. About $150,000.

Mass., Boston—Goodyear Tire & Rubber Co., 61 Brookline Ave., plans to build 5 story, 60 x 150 ft. brick and concrete storehouse, on Brookline Ave. About $100,000. Private plans.

Mass., Cambridge—Boston Paper Board Co., 161 Albany St., Boston, having plans prepared by Blackall, Clapp & Whittemore, archts., 20 Beacon St., Boston, for brick and concrete storage plant, here.

Mass., East Springfield (Springfield P. O.)—F. F. Storms, 50 Spruceland Ave., Springfield, plans to build 1 story, brick and steel forge shop, concrete flooring and foundation, on Roberts Rd., here. About $25,000. Private plans

Industrial Works (Continued)

Mass., Everett — Burk & Bottomley, archts., 34 School St., Boston, soon let contract building 1 story, 50 x 150 ft., brick and concrete addition to plant, concrete flooring and foundation, on Bway., here, for Reliable Shoe & Slipper Co., 117 Friend St., Boston. About $30,000.

Mass., Holyoke—Magna Automobile Co., 2 Division St., plans to build brick and concrete garage and showroom, concrete flooring and foundation, on Northampton St. About $75,000. Architect not selected.

Mass., Springfield—H. L. Sprague, archt., 310 Main St., soon receives bids altering and building 1 story, 50 x 60 ft., brick and concrete addition to forge shop, concrete flooring and foundation, on Walter St., for Moore Drop Forgery Co., 38 Walter St. About $25,000.

Mass., Whitinsville—Whitins Machine Wks. having plans prepared by J. D. Leland, archt., 185 Devonshire St., Boston, for 5 story, 90 x 400 ft., brick and concrete addition to factory, rein.-con. flooring, concrete foundation.

Mass., Worcester—Curtis & Marble Machine Co., 72 Cambridge St., having plans prepared by Lockwood, Greene & Co., engrs., 60 Federal St., Boston, for 3 story, 75 x 85 ft., brick and steel addition to plant, concrete foundation. About $45,000.

R. I., Pawtucket—L. B. Fogarty, 348 Central Ave., plans to build 2 story, 70 x 100 ft., concrete garage, concrete flooring, on Bway. About $35,000.

R. I., Providence—J. H. Higgins, 198 Globe St., had plans prepared by Page & Page, archts., 87 Weybosset St., for 2 story, 64 x 245 ft., brick and concrete garage, concrete flooring and foundation, on Bway.

Conn., Bridgeport—Bridgeport Screw Co., Union Ave., having plans prepared by Fletcher-Thompson, Inc., engrs., 1089 Broad St., for 2 story, 60 x 150 ft. and 1 story, 50 x 100 ft. rein.-con. factory, on Central Ave. About $100,000.

Conn., Bridgeport—United Illuminating Co., 84 Temple St., New Haven, having plans prepared by Westcott & Mapes, engrs., 207 Orange St., New Haven, for brick, rein.-con. and steel power station, (30,000 kw. capacity), rein.-con. flooring, brick, rock and concrete foundation, on Congress St., here. About $1,500,000. Incorrectly noted in a previous issue.

Conn., Hartford—Bd. Water Comrs., Main St., having plans prepared by R. F. Barker, archt., 43 Ann St., for 2 story, brick, concrete and steel garage. Cost to exceed $25,000. Noted Jan. 1.

Conn., Hartford—F. D'Esopo, 647 Main St., having plans prepared by B. S. Clark, archt., 54 Morningside St., for 3 story, 58 x 102 ft. brick and steel garage, rein.-con. flooring, concrete foundation, on Albany Ave. and Bedford St. About $70,000.

Conn., Hartford—Hart & Hegeman Mfg. Co., 342 Capitol Ave., having plans prepared by Greenwood & Noerr, archts., 847 Main St., for 4 story, 52 x 181 ft., rein.-con. addition to factory. About $150,000.

Conn., Hartford — Hartford Auto Club Garage Co., 36 Pearl St., having plans prepared by C. F. Luce, archt., 36 Pearl St., for 7 story, 150 x 150 ft., brick, rein.-con. and steel garage, on Hicks and South Ann Sts. About $500,000

Conn., New Haven—P. Russo, c/o C. E. Joy, archt., 113 Church St., having plans prepared for 3 story, 80 x 80 ft., brick and mill construction factory, on Franklin St. About $45,000.

Conn., New London—L. H. Goddard, archt., 86 State St., soon receives bids building 1 story, 65 x 75 ft., brick and rein.-con. garage, concrete flooring and foundation, on Golden St., for Standard Garage Co., 41 Golden St. About $50,000.

Conn., Oakville—Fletcher-Thompson Inc., engrs., 1089 Broad St., Bridgeport, soon receives bids building 1 story, 60 x 150 ft., brick and steel addition; also 4 story, 60 x 140 ft. rein.-con. plant, rein.-con. flooring, concrete foundation, for Antoyre Co. About $20,000 and $200,000 respectively.

Conn., Shelton—Fletcher-Thompson, Inc., engrs., 1089 Broad St., Bridgeport, soon receives bids building 1 story, 40 x 75 ft., rein.-con. addition to printing plant, for Premier Potter Printing Press Co. About $60,000.

Conn., South Norwalk—Daynor Realty Co., c/o J. C. Schaeffler, archt. and engr., 40 West 32nd St., New York City, having sketches made for 4 story, 40 x 120 ft., rein.-con. and steel addition to factory, rein.-con. flooring, concrete foundation, on Day St., here.

N. Y., Brooklyn—Shampan & Shampan, archts. and engrs., 50 Court St., preparing plans for 4 story, 40 x 100 ft. brick and steel laundry, rein.-con. flooring, concrete foundation, at 835-849 Myrtle Ave. About $150,000. Owners name withheld.

N. Y., Brooklyn—H. A. Weinstein, archt. and engr., 32 Court St., preparing plans for 4 story, 40 x 100 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Jerome and Livonia Aves. About $35,000. Owners name withheld.

N. Y., New York—J. Bleiweiss, 107 West 29th St., having plans prepared by G. F. Pelham, archt. and engr., 200 West 72nd St., for altering 4 story, brick and steel laundry, rein.-con. flooring, at 114 West 29th St. About $40,000.

N. Y., New York—M. Brand & Sons, 874 1st Ave., having plans prepared by McCabe & Blagge, archts., 952 Main St., Bridgeport, Conn., for 2 story, 75 x 100 ft., brick, concrete and steel factory and garage, on 1st Ave. and 48th St. About $75,000.

N. J., Jersey City—Air Reduction Sales Co., Pacific Ave., plans to build 4 story, concrete plant, here. Cost to exceed $124,000.

N. J., Trenton—Mercers Motors Co., Whiteheads Rd., receives bids about Jan. 22, altering and building 1, 2 and 3 story, concrete, brick and steel additions to factory. About $200,000. Day & Zimmerman, 611 Chestnut St., Phila., engrs. and archts.

N. J., Trenton—Original Trenton Cracker Co., 15 South Stockton St., had plans prepared by Fowler & Seaman, archts., 317 Broad St. Bank Bldg., for 1 story, 97 x 105 ft. factory, on Calhoun St. About $60,000.

Pa., Clarks Summit—Connell & Erben Body Co. plans to build 2 story, 40 x 110 ft., brick and timber factory, rein.-con. flooring, rock foundation. About $50,000. Architect not selected.

Pa., Kingston (Wilkes-Barre P. O.)—A. E. Fromber Bros., Passaic, N. J., plan to build 2 story, 50 x 90 ft. brick and rein.-con. mill, rock foundation, on Slocum St., here, to include recreation rooms and cafeteria. About $90,000. D. A. Morgan, Connell Bldg., Scranton, archt.

Pa., Olyphant—Mid Valley Silk Co. having plans prepared by G. Westcott, archt., 119 Wyoming Ave., for 2 story, 70 x 150 ft., concrete and brick mill, concrete foundation, on Main St. About $40,000.

Pa., Scranton—H. G. Smith & Co., Vine St., plans to build 2 story, 90 x 160 ft., brick and steel factory, rein.-con. flooring, rock foundation, on Walnut St. and Wyoming Ave. About $90,000. Architect not selected.

Md., Baltimore—Steinmetz Electric Motor Car Co., chartered with $2,000,000 capital stock plans to build assembling plant here.

Md., Baltimore—Whitaker Paper Co., 115-37 Guilford Ave., plans to build 8 story, 60 x 200 ft., concrete and steel warehouse, concrete foundation, on Guilford Ave. and Saratoga St. About $500,000.

Ga., Port Wentworth—Port Wentworth Terminal Corp. plans to build creosoting plant on 30-acre riverfront site. About $1,000,000. W. Minot, pres.

Ga., West Point—West Point Mfg. Co. plans to build 3 story, 100 x 250 ft. addition to Langdale Mill. Robert & Co., Candler Bldg., Atlanta, archts.

Fla., Jacksonville—N. P. Cannon, Atlanta, Ga., and others plan to build casket factory, on Palmetto Ave., here. About $250,000.

Miss., Yazoo City—A. W. Johnson, Clinton, plans to build ginnery, here. About $40,000.

Ky., Louisville—Belknap Hardware & Mfg. Co., 2nd and Washington Sts., plans to build 12 to 15 story, 204 x 288 ft. warehouse. Cost between $1,500,000 and $1,750,000. W. Heyburn, pres. Graham, Anderson, Probst & White, Ry. Exch. Bldg., Chicago, archts.

Ky., Louisville—Goodyear Tire & Rubber Co., Market St., Akron, O., plans to build 2 story, 50 x 175 ft. factory, here. About $50,000.

O., Cincinnati—Vacalstyle Music Co., East 6th St., plans to build 3½ story, 102 x 216 ft., rein.-con. and brick factory, on Springfield Pike. About $200,000. B. De Camp, 701 Gerke Bldg., archt.

O., Cleveland—Cleveland Ry., Leader-News Bldg., having preliminary plans prepared by D. Morrow, archt. and engr., 4500 Euclid Ave., for 2 story, 52 x 122 ft., concrete, steel and brick sub-station, rein.-con. flooring, concrete foundation, on West 117th St. and Lorain Ave. About $250,000. G. W. Radcliffe, genl. mgr.

O., Cleveland—Cleveland Welding Machine Co., West 117th St. and Berea Rd., soon lets contract building 1 story, 42 x 106 ft., steel and brick shop and welding room, brick foundation. About $50,000. Private plans.

O., Cleveland—Freeman Motor Co., Union Bldg., plans to build 1 story, steel and brick factory, in western section of city. About $75,000. J. H. Albrecht, mgr. Architect and engineer not selected.

Ind., Lafayette—Chicago, Indianapolis & Louisville Ry. (Monon Route) plans to construct 2 story, brick, freight and office building. About $40,000. D. J. Clark, Lafayette, div. supt.

Mich., Grand Rapids—P. Lindhout, archt., 817 Lake Drive, soon lets contract building 2 story, rein.-con., brick and steel addition to bakery and storehouse, rein.-con. flooring, brick foundation, for Sonneveld Bros., 815 Leonard St. About $40,000.

Mich., Muskegon—Superior Seating Co., Getty Ave., soon lets contract building 3 story, 100 x 320 ft. addition to factory, including dry kilns, storage rooms and separate power plant, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Getty and Dales Aves. About $250,000. Private plans.

Ill., Chicago—Chicago Coated Board Co., 11 South La Salle St., plans to build plant on Cottage Grove Ave. and 138th St. About $3,000,000.

Ill., Chicago—W. E. Dee & Co., 30 North La Salle St., acquired 40,000 sq.ft. land on Normal Ave. and 37th St. and plans to build factory.

Ill., Clearing (Chicago P. O.)—Superior Oven Co., c/o L. B. Beardslee & Co., 38 South Dearborn St., Chicago, acquired 50,000 sq.ft. land on 66th St. and 57th Ave. and plans to build factory.

Wis., Milwaukee—Jewett & Sherman Co., 287 Bway., purchased 6 story building on Florida St., and plans to remodel and equip same for own use. About $100,000.

Wis., Milwaukee—Nash Sales Co., 455 Bway., plans to build 4 story, 120 x 120 ft., rein.-con. and brick garage and salesroom, rein.-con. flooring, concrete foundation. About $100,000. Private plans.

Wis., Milwaukee—Sewerage Comn. retained W. J. Sands, consult. engr., 1338 Wells Bldg., to prepare plans for electric power plant, on Jones Island. Cost, including equipment between $850,000 and $1,700,000; all depending upon type of equipment used.

Wis., Sheboygan—Badger State Tanning Co., South Water St. and Maryland Ave., having plans prepared by Juul & Smith, archts., Imig Bldg., for 4 story, 60 x 250 ft., brick, rein.-con. and steel tannery, brick foundation, on South Water St. Cost between $50,000 and $60,000.

Wis., Sheboygan—Standard Oil Co., Wells St., Milwaukee, prepared plans for two 2 story, 60 x 95 ft., filling stations, brick and stucco, concrete foundation, on Columbus Rd. and 15th St., here. Private plans.

Ia., Mason City—Webster Potter Lumber Co., Waucoma, plans to build brick, concrete and steel mill, concrete foundation, here. About $100,000. Architect and engineer not selected.

Kan., Rosedale—Rushton Baking Co., 814 Southwest Blvd., had plans prepared by E. O. Brostrom and P. T. Drotts, archts., 212 Reliance Bldg., for 2 story, 40 x 70 ft., rein.-con. and brick, bakery, rock foundation. About $50,000. H. A. Knoble, 411 Reliance Bldg., engr.

Kan., Wichita—Red Star Milling Co., 1901 North Emporia St., having plans prepared by Sherman Eng. Co., archts. and engrs., New York Life Bldg., Kansas City, Mo., for rein.-con. mill and elevator, concrete foundation. About $750,000.

Neb., Alliance—Alliance Packing Co. plans to build plant. About $750,000. R. E. Plum, pres. Architect not selected.

Industrial Works (Continued)

Neb., Lincoln—State Bd. Agriculture receives bids about Feb. 1, for 2 story, 174 x 255 ft. cattle barn, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $100,000. J. H. Craddock & Co., Elks Bldg., Omaha, archts.

Okla., Norman—City voted $125,000 bonds to build electric light and power plant. Engineer and architect not selected.

Ore., Eugene—Mutual Creamery Co., 551 West 3rd St. S., plans to build 2 story factory, here. About $50,000. A. Jensen, vice pres. Architect not selected.

Ore., Marshfield—B. Ostlind plans to build 1 story, 212 x 450 ft. concrete and frame plant, concrete foundation, on coal bank. About $50,000. Architect not selected.

Ore., Pendleton—Umatilla Motor Sales Corp. plans to build 2 story, 100 x 150 ft., garage, 45 x 85 ft. display room, 30 x 90 ft. shop, etc., concrete, concrete foundation, on College and Court Sts. About $60,000. O. E. Holdman, pres. Private plans.

Ore., Portland—Amer. Can. Co., Failing Bldg., plans to build 2 or 3 story, brick and concrete factory, concrete foundation, on 26th and Wilson Sts. About $1,000,000. F. P. Kendall, local mgr. Architect not selected.

Cal., Fresno—San Joaquin Light & Power Corp., H and Tulare Sts., plans to build 150 x 225 ft., brick, machine shop and garage, on 1st Ave.

Cal., San Jose—A. F. Castle, c/o Bush & Wallace, engrs., Bank of San Jose Bldg., having plans prepared for 2 story, rein.-con., freight depot. About $50,000.

Que., Chambly — Bennett, Ltd., 59 St. Henry St., Montreal, had plans prepared by T. Pringle & Sons, Ltd., archts., Coristine Bldg., Montreal, and soon receives bids building 3 story, 40 x 100 ft. concrete, steel and brick factory, concrete foundation. About $150,000.

Que., Sherbrooke—Howard Pulp & Paper Co., Montreal, preparing plans and receives bids in spring building mill along bank of St. Francis River, here. Cost, including machinery, $750,000.

BIDS DESIRED

Conn., Manchester—A. E. Fiske, archt., Johnson Blk., receiving bids building 1 story, 78 x 100 ft. brick and steel garage, concrete flooring and foundation, on East Centre St., for Williams & Stephens Auto Co., 361 Center St. About $35,000.

N. J., Hoboken—Until Jan. 17, by Lockwood-Green, archts. and engrs., 101 Park Ave., New York City, building rein.-con. and steel factory, rein.-con flooring, concrete foundation, here, for H. R. Mallinson, Wooleslsy Ave., Long Island City, N. Y. About $200,000.

Pa., Coatesville—Until Jan. 17, by B. R. Stevens, archt., 1737 Filbert St., Phila., building 2 story, 80 x 126 ft., rein.-con. and brick factory, for Breuninger Bros., 338 East Lincoln St.

Pa., Holmesburg Junction (Phila. P. O) —Until Jan. 19, by L. B. Rothchild, archt., 1225 Sansom St., building 1 and 2 story, 90 x 400 ft., and 40 x 100 ft., concrete, brick and steel factory for Bessemer Motor Truck Co.

Pa., Phila.—A. C. Borzner, archt., 717 Walnut St., receiving bids building 2 story, 67 x 120 ft., brick and limestone, garage and hall, on Bainbridge and 16th Sts., for Hotel Brotherhood of U. S A. About $32,000.

S. C., Sumter—Until Feb. 3, by L. D. Jennings, mayor, and Bd. Comrs., constructing 85 x 100 ft. brick and concrete power house, 45 ft. high; advertised in this issue.

Miss., Greenville—Until Jan. 20, by J. R. Scott & Co., archts., Grand Opera House Bldg., constructing 5 story, rein.-con. plant, for Henderson & Baird Hardware Co.

O., Canton—Canton Ice Delivery Co., 601 4th St., receiving bids building 1 and 2 story, 81 x 113 ft., brick and steel plant, brick foundation, on Navarre Rd. About $80,000. A. C. Bishop, 427 Guardian Bldg., Cleveland, archt.

O., Dayton—Peckham Coal & Ice Co., Daller and Chapel Sts., receiving bids building 1 story, 112 x 137 ft., steel and brick plant, rein.-con. flooring, concrete foundation, on Linden Ave. About $50,000. A. C. Bishop, 127 Guardian Bldg., Cleveland, archt.

Mich., Detroit—Until Jan. 20, by Baxter, O'Dell & Halpin, archts., 1024 Hammond Bldg., constructing 3 story, 100 x 120 ft., rein.-con., brick and steel garage, rein.-con flooring, concrete foundation, on Congress St., for Bemb-Robinson Co., Jefferson Ave., About $90,000.

Mich., Flint—Until Jan. 31, by VanLeyen, Schilling & Keough, engrs. and archts., 201 Walsh Bldg., constructing 1 story, 30 x 248 ft., rein.-con. storage building, rein.-con. flooring, concrete foundation, for Catsman Coal Co., Industrial Ave. About $35,000.

Minn., Minneapolis—Magney & Tusler, archts., Builders Exch., receiving bids building 4 story, 100 x 140 ft., rein.-con and brick factory, on 5th St. N., for Schurmeier Mfg. Co., 320 East 9th St., St. Paul. About $150,000.

Wyo., Casper—Until Jan. 20, by Dubois & Goodrich, archts., Townsend Bldg., constructing 2 story, 70 x 75 ft., brick and frame warehouse, concrete foundation, for A H. Cobb. About $25,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Augusta**—Lockwood, Greene & Co., engrs., 60 Federal St., Boston, Mass., let contract to H. P. Cummings Constr. Co., Fidelity Bldg., Portland, building 6 story, 65 x 135 ft., rein.-con. storage plant, rein.-con. flooring, concrete foundation, for Edwards Mfg. Co., Water St. About $100,000.

★**Me., Portland** — Hannaford Bros., Commercial St., let contract building refrigerating plant, to Landers Eng. Co., 102 Exchange St. About $150,000.

★**Mass., Dorchester** (Boston P. O.)—G. Lawley & Son Corp., Neponset, let contract building 1 story, 70 x 200 ft., frame and steel storage plant, on Ericson St., to Wilson & Tomlinson, 79 Milk St., Boston About $30,000.

★**Mass., Dorchester** (Boston P. O.)—S. Simons, 2 Mascoma St., Roxbury, will build 1 story, 50 x 180 ft., brick and concrete garage, concrete flooring and foundation, on Dorchester Ave. Work will be done by day labor.

★**Mass., Everett** (Boston P. O.)—MacNaughton & Robinson, archts., 101 Tremont St., Boston, let contract to Blake & Pope, 15 Beacon St., Boston, building 1 story, 40 x 180 ft., brick and mill construction addition to plant, rein.-con. flooring, concrete foundation, on Elmway, for Cameron Appliance Co., 48 Waters Ave. About $30,000. Noted Jan. 1.

★**Mass., Fall River** — Keoghs Storage Warehouse Co., 555 Davol St., let contract building 1 story, brick and concrete garage, concrete flooring and foundation, to J. A Hughes, 113 Borden St. About $30,000.

★**Mass., Fitchburg**—Simonds Mfg. Co., 35 North St., let contract building 4 story, 60 x 110 ft., brick and concrete addition to plant, rein.-con. flooring, concrete foundation, to E. D. Ward Co., 82 Foster St., Worcester.

★**Mass., Holyoke**—Amer. Writing Paper Co., 9 Main St., will build 1 story, 90 x 92 ft., brick and steel addition to Mill No. 3, "Albion Paper Co. Div.," concrete flooring and foundation. About $25,000. Work will be done by day labor.

★**Mass., Holyoke**—Century Machine Co. let contract building 2 story, 50 x 90 ft. and 1 story, 150 x 150 ft. brick and steel factory, concrete flooring and foundation, on Main St., to Casper Ranger Constr. Co., 20 Bond St. About $150,000. Noted Jan. 1.

★**Mass., Holyoke**—Natl. Blank Book Co., Riverside St., let contract building 2 story, 88 x 180 ft., brick and mill construction addition to factory, to Casper Ranger Constr. Co., 20 Bond St.

★**Mass., Monroe Bridge**—Monroe Bridge Paper Co. let contract building 1 story, rein.-con. and brick plant, rein.-con. flooring, concrete foundation, to G H. Stebbins, North Adams. About $25,000.

★**Mass., New Bedford**—K. C. Richmond, engr., Grosvenor Bldg., Providence, R. I., let contract to J. W. Bishop Co., 109 Foster St., Worcester, building 1 story, 240 x 400 ft., brick, concrete and steel addition to cording plant and 1 story, 133 x 318 ft. addition to weave shed, rein.-con. flooring, concrete foundation, for Beacon Mfg. Co. About $300,000.

★**Mass., North Abington**—See "Buildings."

★**Mass., Peabody**—A E. Bump, engr., 60 North Market St., Boston, let contract to Evatt Constr. Co., 161 Devonshire St., Boston, building 4 story, 70 x 180 ft., brick and concrete storehouse, concrete flooring and foundation, for Natl. Calf Skin Co., Webster St. About $200,000. Noted Jan. 1.

★**Mass., Taunton**—General Electric Co., Weir St., let contract building 1 story, 100 x 200 ft., brick and steel addition to plant, concrete flooring and foundation, to Cunningham & Son Co., 23 Central St., Lynn. About $70,000.

★**Mass., Three Rivers**—Otis Co., let contract building 1 story, brick and mill construction weave shed, concrete foundation, at Palmer Mills, here, to Flynt Bldg. & Constr. Co., 356 Main St., Palmer. About $75,000.

★**R. I., Pawtucket**—W. H. Haskell Mfg. Co., Main St., let contract building 2 story, 80 x 160 ft., brick machine shop, concrete foundation, to F. T. Ley, Co., Inc., 499 Main St., Springfield About $100,000.

★**R. I., Phenix**—Phenix Lace Mills let contract building 1 story, 60 x 120 ft., brick and mill construction addition to plant, stone foundation, to McMahon Bros., Arctic. About $25,000.

★**N. Y., Brooklyn** — H. Goldberg, c/o S. Millman, archt., 26 Court St., will build 1 and 2 story, 100 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Bedford and Park Aves. About $42,000. Work will be done by day labor.

★**N. Y., Brooklyn**—J. Hauben, c/o S. Millman, archt., 26 Court St, will build 1 story, 99 x 100 x 100 x 120 ft., brick and steel garage, rein.-con flooring, concrete foundation, on Fulton St. and Highland Pl. About $50,000. Work will be done by day labor.

★**N. Y., Brooklyn**—F. Kantor, c/o S. Millman, archt., 26 Court St., will build 1 story, 100 x 150 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Junius St. between Pitkin and Blake Aves. About $25,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Lincoln Hygeia Ice Co., 95 William St., New York City, will build 2 story, 100 x 125 ft., brick and steel plant, rein.-con. flooring, concrete foundation, on Pacific St. and Carlton Ave. About $100,000. Work will be done by day labor.

★**N. Y., Brooklyn**—J. Scholl, c/o S. Millmann, archt., 26 Court St., will build 1 story, 100 x 150 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Bedford Ave. and Montgomery St. About $50,000. Work will be done by day labor.

★**N. Y., Brooklyn**—J. Wilson, c/o S. Millmann, archt., 26 Court St., will build 1 story, 100 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 19th St. and 10th Ave About $35,000. Work will be done by day labor.

★**N. Y., Coney Island**—S. Rosenberg, c/o S. Millman, archt., 26 Court St., Brooklyn, will build 1 story, 80 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Neptune Ave. and 21st St. About $25,000. Work will be done by day labor.

★**N. Y., Long Island City**—L. Gold, 44 Court St., Brooklyn, will build 1 story, 100 x 200 ft. brick and steel garage, rein.-con flooring, concrete foundation, on Jackson Ave. between 21st and 22nd Sts. About $65,000. Work will be done by day labor.

★**N. Y., Long Island City**—G. Piel Co., 29 13th St., Brooklyn, let contract constructing 6 story, 150 x 200 ft. rein.-con. and steel industrial building, rein.-con. flooring, concrete foundation, on 7th, 8th, Washington and Pierce Aves., to J. C. Lyon & Son Co., 2010 Bway., New York City.

★**N. Y., Mineola**—Knickerbocker Ice Co., 1480 Bway., New York City, will build 1 story, brick, rein.-con. and steel plant, rein.-con. flooring, concrete foundation, here. About $110,000. Work will be done by day labor.

★**N. Y., New York**—Advance Novelty Candy Mfg. Co., 511 East 72nd St., let contract building 4 story, 100 x 225 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on 138th St. and Willow Ave., to L. Gold, 44 Court St., Brooklyn. About $500,000.

★**N. Y., New York**—East 32nd St. Garage Corp., 874 6th Ave., will build 2 story, 90 x 96 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 145-151 East 32nd St. About $50,000. Work will be done by day labor.

Industrial Works (Continued)

★**N. Y., New York**—Park & Tilford, 529 West 42nd St., will build 2 story, 75 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 537 West 43rd St. About $60,000. Work will be done by day labor.

★**N. Y., New York**—R. A. Stewart & Co., Inc., 201 Bway., will build 25 x 78 ft., brick and steel factory and store, rein.-con. flooring, concrete foundation, at 80 Duane St. About $45,000. Work will be done by day labor.

★**N. Y., New York**—M. Stone, 358 Kosciusko St., Brooklyn, will alter 4 story, brick and steel garage, rein.-con. flooring, at 154-156 East 53rd St., here. About $75,000. Work will be done by day labor.

★**N. Y., Poughkeepsie**—Federal Bearings Co., Inc., Fairview St., let contract building 3 story, rein.-con. addition to plant, rein.-con. flooring, concrete foundation, to F. T. Ley & Co., Inc., 499 Main St., Springfield, Mass.

★**N. J., East Rutherford** (Rutherford P. O.)—Flintkote Co. let contract building 1 story, 50 x 240 ft., brick and steel, storage plant, rein.-con. flooring, concrete foundation, to Eyrich & Ward, 105 West 40th St., New York City.

★**N. J., Elizabeth**—Simmons Co., Pearl St., Kenosha, Wis., let contract building brick and steel factory, warehouse, power house, etc., concrete foundation, here, to P. Reisens Sons, 1018 Humboldt Ave., Milwaukee. About $300,000.

★**N. J., Harrison**—Driver-Harris, Middlesex St., let contract constructing 6 story, 80 x 200 ft. factory and 3 story, 50 x 100 ft. addition to shipping building and factory, rein.-con. and steel, rein.-con. flooring, concrete foundation, to E. N. Waldron, Market St., Newark.

★**N. J., Trenton**—Amer. Steel & Wire Co., Hamilton Ave., let contract building 1 story, 60 x 100 ft. mill, to J. H. Morris, 137 East State St. About $25,000.

★**Pa., Duryea** (Pittston P. O.)—Bloomsburg Silk Co., c/o Lockwood-Green, archts. and engrs., 101 Park Ave., New York City, let contract building 2 story, 50 x 100 ft., rein.-con. and steel mill, rein.-con. flooring, concrete foundation, to Barret Eng. Corp., Real Estate Bldg., Scranton. About $35,000.

★**Pa., Essington**—Westinghouse Electric Mfg. Co., Union Bank Bldg., Pittsburgh, let contract building rein.-con. and steel addition to factory, here, to Westinghouse-Church-Kerr, 37 Wall St., New York City. About $2,000,000.

★**Pa., Phila.** — Colonial Mills Co., 219 North 3rd St., let contract building 1 story, 20 x 35 ft. and 50 x 55 ft., rein.-con. and brick power house, on Lena and Armat Sts., to W. Dalton, 1215 Filbert St. About $25,000.

★**Pa., Phila.**—Crescent Ice & Coal Co., 52nd and Woodland Sts., let contract building 1 story, 100 x 145 ft., brick plant, on Powers Lane and Island Rd., to W. F. Koelle & Co., 26th and Oxford Sts. About $35,000.

★**Pa., Phila.**—C. E. Dearnley Bros., Main St., let contract building 3 story, 80 x 225 ft., rein.-con. factory, on Boynton and Chelton Sts., to Hughes-Foulkes Co., Commonwealth Trust Bldg. About $90,000.

★**Pa., Phila.**—Franklin Process Co., 291 Promenade St., Providence, R. I., let contract building 2 story, 75 x 103 ft., brick and steel addition to plant, here, concrete foundation, to J. W. Bishop Co., 109 Foster St., Worcester, Mass. About $45,000.

★**Pa., Phila.**—J. T. Lewis & Bros., Lafayette Bldg., let contract building 1 story, 120 x 150 ft., brick and steel factory, coal pocket, (300 ton capacity) and ash pocket, on Aramingo and Cumberland Aves., to Turner Constr. Co., 1713 Sansom St. About $100,000.

★**Md., Baltimore**—Rice Baking Co., 318-24 North Gay St., let contract building 3 story, 25 x 88 ft., brick and hollow tile addition to bakery, concrete foundation, to C. L. Stockhausen Co., Gay and Water Sts. About $50,000.

★**Md., Sparrows Point**—Bethlehem Shipbuilding Corp. let contract building 1 story, 41 x 111 ft., rein.-con. and brick, control house, concrete foundation, to Singer-Pentz Co., 600 Equitable Bldg., Baltimore. About $75,000.

★**N. C., Greensboro**—Blue Bell Overall Co let contract building 2 story, 60 x 235 ft. concrete factory, to W P. Rose, Greensboro. About $125,000

★**N. C., Stanley**—Lola Mfg. Corp. let contract building 1 story, 78 x 278 ft. brick mill, to J. A. Gardner, Charlotte.

★**Ga., Atlanta**—White Auto Co., East 79th St. and Clair Ave., Cleveland, let steel contract for 1 and 2 story, brick, steel and concrete garage and display room, rein.-con. flooring, concrete foundation, here, to King Bridge Co., foot of East 69th St., Cleveland. Total cost, $150,000.

★**Ga., Augusta**—G. S. Lombard, 631 11th St., let contract building 3 story, 41 x 185 ft. concrete garage, to Carter & Manning. About $100,000.

★**Ala., Langdale**—West Point Mfg. Co., West Point, Ga., let contract building 2 and 3 story, 104 x 640 ft., brick and mill construction addition, here, to West Point Iron Wks., West Point, Ga.

★**Ky., Louisville**—Puritan Cordage Co., 1564 Story St., let contract building 150 x 200 ft. factory, to A. Markham & Co., 434 South Floyd St. About $125,000.

★**O., Cleveland**—Cleveland Rubber Mold & Machine Co., East 17th St. and Euclid Ave., let contract building 1 story, steel and brick factory, brick foundation, on Warner Rd., to Moss Iron Wks., Leader-News Bldg. About $200,000.

★**O., Cleveland**—G. J. Eckerck, Permanent Bldg., will build 1 and 2 story, 40 x 130 ft., steel and brick, garage and store, rein.-con. flooring, brick foundation, at 9706 Euclid Ave. About $50,000. Work will be done by day labor.

★**O., Cleveland**—T. Knight, The Arcade, let contract building 1 story, 50 x 100 ft., steel and brick factory, brick foundation, on Scranton Rd. and Fairfield Ave., to Lehder Constr. Co., 126 Engineers' Bldg. About $25,000.

★**O., Cleveland**—J. S. Kohn, Engineers' Bldg., let contract constructing 3 story, 54 x 112 ft., rein.-con., steel and brick warehouse and showrooms, rein.-con. flooring, concrete foundation, on East 14th St., to Bolton-Pratt Co., Columbia Bldg. About $100,000.

★**O., Cleveland**—G. S. Rider & Co., archts and engrs., Century Bldg., let contract to J. Gill & Sons, Citizens Bldg., constructing 12 story, 200 x 885 ft., concrete, steel and brick storage warehouse, rein.-con. flooring, concrete foundation, for Sheriff St. Market & Storage Co., East 4th St. and Bolivar Rd. About $1,000,000.

★**O., Cleveland**—Westinghouse Electric & Mfg. Co., West 54th St., will build 1 story, 128 x 165 ft., frame addition to foundry, at 1228 West 48th St. About $50,000. Work will be done by day labor.

★**O., Salem**—Mullens Body Co. let contract building concrete and steel factory, rein.-con. flooring, concrete foundation, to Stone & Webster, 120 Bway., New York City. About $500,000.

★**Mich., Adrian**—State Industrial Home for Girls will build 1 story, 36 x 75 ft., rein.-con., brick and steel, laundry, rein.-con. flooring, concrete foundation, here. About $25,000. Work will be done by day labor under supervision of A. H. Gould & Son, 610 Empire Bldg., Detroit, engrs. and archts.

★**Mich., Detroit**—R. H. Fyfe, Woodward Ave., let contract constructing 2 story, 40 x 150 ft., rein.-con. and brick garage and sales building, rein.-con. flooring, concrete foundation, to F. M. Stokes, Penobscot Bldg. About $160,000.

★**Mich., Detroit**—Hudson Motor Car Co., 2901 East Jefferson Ave., let contract building 4 story, 82 x 584 ft., rein.-con. and brick plant, rein.-con. flooring, concrete foundation, to United States Structural Co., Book Bldg.

★**Mich., Detroit**—Kahn Realty Co., Marquette Bldg., let contract building 2 story, 145 x 184 ft., rein.-con., brick and steel garage, concrete foundation, on Cass Ave., to O. Misch Co., Chamber Commerce Bldg.

★**Mich., Detroit**—Selik Bros., 652 24th St., will build 2 story, 70 x 80 ft., brick and steel addition to machine shop, brick foundation. About $30,000 Work will be done by day labor.

★**Mich., Detroit** — Sibley Lumber Co., Kercheval ad Beaufait Aves., let steel contract building 3 story, 157 x 160 ft., brick, steel and concrete factory, rein.-con. and wood flooring, concrete foundation, to Russell Wheel & Fdry Co, Chene St. About $100,000

★**Mich., Detroit**—Stroh Products Co., 253 Elizabeth St., E., let contract building 3 story, 22 x 85 ft. concrete and steel plant, rein.-con. and cork flooring, brick foundation, on Hastings and East Elizabeth Sts., to Pine Munnicke, Marquette Bldg.

★**Mich., Detroit**—Studebaker Corp., Brush and Piquette Aves., let contract building 4 story, 200 x 250 ft., rein.-con. and brick addition to factory, rein.-con. and wood flooring, concrete foundation, to A. J. Smith Constr. Co., Campau Bldg. About $300,000.

★**Mich., Detroit** — Timken-Detroit Axle Co., Clark Ave., let contract building 2 story, 60 x 290 ft., brick and steel addition to factory, wood flooring, to Wisconsin Bridge & Iron Co., 1362 Penobscot Bldg. About $60,000.

★**Mich., Detroit**—Western Gear Mfg. Co., 1040 Scotten Ave., let contract building 1 story, 40 x 80 ft., brick and steel plant, concrete foundation, on Scotten Ave., to Lundblad Co., Penobscot Bldg. About $25,000.

★**Mich., Detroit**—J. Wynne, 821 Ford Bldg., will build 1 and 2 story 60 x 140 ft., brick and steel garage, concrete foundation, on Roosevelt and Grand River Aves. About $30,000. Work will be done by day labor.

★**Mich., Fenton**—New Egyptian Portland Cement Co. will build 1 story, 66 x 150 ft., rein.-con. storage plant, rein.-con. flooring, concrete foundation. About $30,000. Work will be done by day labor.

★**Mich., Jackson** — Sparks — Withington Co., 622 Swetland Bldg., Cleveland, let contract building 1 and 2 story, brick, steel and concrete additions to factory, rein.-con. flooring, concrete foundation, to C. F. Bennett, 1714 Columbus Rd., Cleveland. About $300,000.

★**Mich., Kalamazoo**—Fuller Sons Mfg. Co., Pitcher St., let contract building 4 story, 65 x 75 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Pitcher and Prouty Sts., to Byers Bros. Constr. Co., 3 McNair Bldg. About $75,000.

★**Mich., Saginaw**—Saginaw Table & Cabinet Co., Wheeler St., let contract building 2 story, 61 x 112 ft. and 62 x 234 ft., brick, concrete and steel factory, concrete foundation, to O. W. Jenkins Co., Wheeler St. About $125,000.

★**Mich., Vassar**—J. C. Green Fdry. Co. let contract building 1 story, 60 x 160 ft., brick, concrete and steel foundry, to Kern Bros., Frankenmuth. About $30,000.

★**Ill., Chicago**—Boyle Ice Co., 136 West Lake St., let contract building 1 story, 125 x 175 ft., brick and timber plant, concrete foundation, at 855 Larrabee St., to Menke-Thielberg Co., 139 North Clark St. About $65,000.

★**Wis., Sheboygan**—Honold & Globe Mfg. Co., 821 Pennsylvania Ave., let contract constructing 2 story, 48 x 120 ft., brick, rein.-con. and steel, foundry and cupola building, rein.-con. flooring, concrete foundation, on Erie Ave., to Verhulst Bros., 1615 Erie St. About $60,000. Noted Jan. 8 under "Buildings."

★**Ia., Davenport** — Amer. Hominy Co., 1400-15 Fletcher Savings & Trust Bldg., Indianapolis, Ind., let contract building 1 story, 50 x 75 ft., rein.-con. and brick, storage plant and elevator, rein.-con. flooring, rock and concrete foundation, on Pine St., to Deverell Spencer & Co., 514-15 Garrett Bldg., Baltimore. About $150,000.

★**Ia., Des Moines**—Pittsburg-Des Moines Steel Co. will build 1 story, 135 x 300 ft. steel shop, concrete foundation; cost, including cranes and steel fabricating equipment, $100,000. Work will be done by day labor.

★**Ia., Newton**—Automatic Washing Machine Co. let contract building 4 story, 50 x 148 ft., brick, rein.-con. and steel, factory and boiler house, rein.-con. flooring, concrete foundation, to A. H. Neumann & Co., Hubbell Bldg., Des Moines. About $180,000; cost plus percentage basis.

★**Neb., Omaha**—Nebraska Telephone Co., 19th and Douglas Sts., let contract building 3 story, 100 x 150 ft. and 1 story, 105 x 132 ft., rein.-con., warehouse and garage, rein.-con. flooring, concrete foundation, to F. P. Gould & Son, 1137 City Natl. Bank Bldg. About $400,000.

★**Mo., St. Louis**—Century Electric Co., 19th and Pine Sts., let contract building rein.-con. and steel factory, rein.-con. flooring, concrete foundation, to Stone & Webster, 120 Bway., New York City. About $500,000.

Industrial Works (Continued)

★Mo., St. Louis—E. D. Hunkins, 4044 Washington Ave., will build 1 story, 50 x 244 ft., brick garage and repair shop, rein.-con. flooring, at 3628 Washington Ave. About $32,000. Work will be done by day labor.

★Mo., St. Louis—Hussman R. & S. Co., 911 North Bway., let contract building 2 story, 129 x 260 ft., concrete and brick factory, rein.-con. flooring, at 2405-11 Leffingwell Ave., to A H. Haesseler Bldg. & Contg. Co., Wainwright Bldg. About $90,000.

★Mo., St. Louis—Natl. Lead Co., 5550 Manchester Ave., let contract building 1 story, 47 x 57½ ft., concrete furnace room, concrete flooring and pits, also concrete bunker, at 5556 Manchester Ave., to Chaplaine Constr. Co., Post-Dispatch Bldg. About $25,000.

★Tex., Dallas—Campbell-Stone Bread Co., 30th and Troost Sts., Kansas City, Mo., let general contract remodeling old building and constructing 2 story, 69 x 119 ft. bakery, brick and rein.-con., here, to Fogel Constr. Co., 619 Reliance Bldg., Kansas City, Mo. About $125,000.

★Okla., Tahlequah—City let contracts building electric light and power plant, to A. M. Byrnes, Fayetteville, Ark., $13,149; steam and electric equipment, to Smith & Whitney, Southwestern Life Bldg., Dallas, Tex., $59,477; distributing system, including whiteway, to Empire Electric Co., 419 West Okmulgee St., Muskogee, $39,200.

★Ore., Portland.—Montgomery Ward & Co., 581 Upshur St., let contract building 1st unit of 8 story, brick and concrete mail order house, on Guild Ave., to Wells Bros. Co., 53 West Jackson Blvd., Chicago. About $1,350,000.

★Cal., Emeryville (Oakland P. O.)—Amer. Rubber Mfg. Co., Park Ave. and Watt St., let contract building 2 story, rein.-con. and brick factory and power house, concrete foundation, to R. W. Littlefield, 565 16th St., Oakland. About $100,000.

★Cal., Los Angeles—Buttress & McClellan, 205 North Los Angeles St., let contract building 1 story, 90 x 400 ft., brick and steel factory, concrete foundation, on Santa Fe Ave., to Austin Co., Cleveland, O. About $70,000.

★Cal., Porterville—Ulmer Mchy. Co. let contract building 1 story, 110 x 120 ft., brick and steel machine shop, concrete foundation, to Austin Co., Cleveland, O. About $25,000.

★Cal., San Francisco—D Hamburger, 130 Sutter St., and others, let contract building 3 story, brick factory, concrete foundation, on 6th and Clara Sts., to A. W. Lawson, 180 Jessie St. About $66,500.

★Que., Montreal—Dominion Glass Co., 285 Beaver Hall Hill, let contract building 3 story, 52 x 52 ft., steel and brick factory, concrete foundation, on Wellington St., to Church Ross & Co., 10 Cathcart St., $25,500. Noted March 13.

★Que., Montreal—A. Harriss, 100 Christophe Colomb St., let contract building 4 story, 42 x 100 ft., steel and brick factory, rein.-con. flooring, concrete foundation, to R. E. Edwards, New Birks Bldg. About $45,000.

★B. C., Vancouver—Canadian Carbonate Co., 1050 Hamilton St., let contract building 1 story, 60 x 95 ft. brick and timber factory, concrete foundation, on 11th Ave. and Yew St., to Baynes & Howe, 836 Howe St. About $23,000.

Buildings

PROPOSED WORK

Mass., Allston (Boston P. O.)—Clubhouse—Brighton-Allston Post 17, Amer. Legion, Old Court House, Brighton, plans to build brick and steel, here. About $50,000. W. P. Doherty, commander.

Mass., Amherst — Dormitory—Massachusetts Agricultural College plans to build dormitory, on campus. About $80,000. Architect not selected.

Mass., Ashburoham—Hotel—H. C. Rideout, Maukeag Inn, had plans prepared by Woodbury & Stuart, archts., 581 Boylston St., Boston, for altering and building large frame addition, rock or concrete foundation.

Mass., Boston—Hotel—J. L. Damon, Jr., 295 Kent St., Brookline, plans to build hotel on Eliot and Carver Sts., here. Architect not selected.

Mass., Boston—Mercantile—J. H. Lyons, 15 State St., having plans prepared by F. A. Norcross, archt., 46 Cornhill St., for 5 story, 35 x 110 ft. brick and mill construction, concrete foundation, on Stanhope St.

Mass., Boston — Office — Massachusetts Bonding & Insurance Co., 77 State St., having plans prepared by Desmond & Lord, archts., 15 Beacon St., for 8 story, 95 x 120 ft., brick and concrete, on Arlington St.

Mass., Braintree (Boston P. O.)—Bank—Braintree Natl. Bank, Elm St., rejected bids building 1 story, 26 x 70 ft., brick and granite, on Main St. About $50 000. E. T. Nolte, 120 Monatiquot Ave., archt. Project postponed indefinitely.

Mass., Danvers—Gymnasium—St. John's Preparatory College plans to build brick, concrete and steel, on campus. Architect not selected.

Mass., Everett—High School—City plans to build high school on Bway. E. L. Sweeter, City Hall, chairman bldg. com. Architect not selected.

Mass., Holyoke—Church—Second Baptist Church, South St., plans to alter church. About $50,000. Architect not selected.

Mass., Holyoke—Church—Second Congregational Church, Appleton St., soon receives bids rebuilding church destroyed by fire in the spring. Contract was awarded to Casper Ranger Constr. Co., for entire new building but was rescinded. About $75,000. Allen & Collens, 40 Central St., Boston, archts.

Mass., Lynn—School—Lynn Hebrew Society, 61 Monroe St., plans to build 2 story, brick and steel, on Blossom St. Cost to exceed $50,000. Architect not selected.

Mass., Middleboro—Library—Town plans to build 2 story. About $50,000. Architect not selected.

Mass., Springfield — Hotel — Bridgway Hotel, Bridge St. and Bway., having plans prepared by Huestis & Huestis, archts., 145 Chestnut St., for brick, concrete and steel addition. About $150,000.

Mass., Wakefield—Library—Town having plans prepared by Hartwell, Richardson & Driver, archts., 27 State St., Boston, for brick and stone. Cost to exceed, $50,000. Address, H. M. Dolbeare, c o Wakefield Daily Item.

Mass., Wellesley (Boston P. O.)—College and Tower—F. J. Untersee, archt., 585 Boylston St., Boston, soon lets contract building 4 story, 110 x 190 ft., brick and stone, concrete flooring and foundation, on Worcester St., for Academy of the Assumption, Wellesley Hills.

Mass., Whitinsville — Housing—Whitin Machine Wks. having plans prepared by J. D. Leland, archt., 185 Devonshire St., Boston, for 75 brick and timber houses for workmen. About $350,000.

Mass., Winthrop (Boston P O.)—City Hall—City having plans prepared by Newhall & Blevins, archts., 9 Park St., Boston, for 2 story, 150 x 150 ft., brick. About $200,000.

R. I., Providence—Hotel—Bowman & Wallick, c/o Warren & Wetmore, archts., 16 East 47th St., New York City, having sketches made for 17 story, brick, steel and stone, brick foundation, here About $3,000,000.

Conn., Bridgeport — Hospital — Theodore Roosevelt Memorial Hospital and Dispensary, c/o L. Smirnow, 385 Noble Ave., plans to build 3 story, brick and steel. About $50,000. Architect not selected.

Conn., Hartford — Business—Manternach Co., 74 Union Pl., having plans prepared by A. R. Ellis, archt., 36 Pearl St., for 3 story, 50 x 108 ft., brick and steel, on High St. About $50,000.

Conn., Hartford — Church — Our Lady of Sorrows Church, 85 New Park Ave., having plans prepared by O'Connell & Shaw, archts., 18 Boylston St., Boston, for 1 story, brick, stone or granite, concrete foundation. About $60,000. H. Galvin, pastor.

Conn., Highwood (New Haven P. O.)—Church—St. John the Baptist Church, 782 Dixwell Ave., New Haven, having plans prepared by J. A. Jackson, archt., 1123 Bway., New York City, for 1 story, 52 x 135 ft., brick and steel, here.

Conn., Manchester—Business—W. Rubinow, 997 Main St., plans to build 4 story, brick, concrete and steel, on Main and Maple Sts. About $90,000.

Conn., New London—Lodge and Society—United Societies, Inc., c/o L. E. Conway, archt., Goldsmith Bldg., having plans prepared for 3 story, 40 x 80 ft., brick and steel, concrete foundation, on Hempstead St. About $50,000.

Conn., Meriden — Business — Griswold, Rochmond & Glock Co., 2 West Main St., having plans prepared by D. Bloomfield, archt., 129 State St., for 2 story, 120 x 150 ft., brick and steel, concrete foundation, on West Main and South Grove Sts. About $100,000.

Conn., New Britain—Church—German Baptist Church, 95 South Burritt St., plans to build 1 story, brick and steel, on Bassett St. About $50,000. Architect not selected. F. Wilkens, pastor.

Conn., New Britain—School—Bd. Educ. plans to build 3 story, brick, concrete and steel, on Tremont St. About $350,000. Architect not selected.

Conn., Seymour—School—East Hartford Dist. having preliminary plans prepared by Johnson & Burns, archts., Hartford, for 2 story, 62 x 124 ft., with 42 x 57 ft. ell, brick and terra cotta, rein.-con. foundation, here. About $200,000.

Conn., Torrington—Store—W. W. Mertz Co., 84 Main St., plans to alter and build 2 story addition. About $100,000. Architect not selected.

Conn., Waterbury—Armory—State Military Emergency Bd., Capitol, Hartford, having plans prepared by L. A. Walsh, archt., 51 Leavenworth St., for brick, concrete and steel, on Field St., here. About $400,000. Noted Sept. 11.

N. Y., Albany—Bank—Commercial Trust Co., c/o York & Sawyer, archts. and engrs., 50 East 41st St., New York City, having plans prepared for altering present building, here. About $100,000.

N. Y., Brooklyn—Schools—Bd. Educ., 500 Park Ave., New York City, plans to build 4 story, on 86th St. and 2nd Ave., cost $350,000; 5 story, on 62nd St. and Ft. Hamilton Ave., $400,000; 5 story, on 70th St. and 18th Ave., $400,000; 5 story, on Nostrand Ave. and Sandford St., $400,000; 3 story, on East 92nd St. and Ave. L, $200,000; 4 story, on Newport St. and Stone Ave., $450,000; 5 story, on Saratoga and Livonia Aves., $450,000, P. S. 181, 5 story, on New York and Tilden Aves., $500,000; also 4 story addition to P. S 136, on 4th Ave. and 31st St., $400,000; 4 story, to P. S. 16, on Wilson St. near Bedford Ave., $400,000; 4 story, to P. S. 67, $350,000, all brick and steel, brick foundations. C. B. J. Snyder, Muncipal Bldg., New York City, archt. and engr.

N. Y., Brooklyn—Y. M. H. A., 63 Morton St., plans to build 4 story, 100 x 150 ft., brick and steel building, brick foundation, on Bway. and Rodney St. About $300,000. H. J. Rosenson, pres. Architect or engineer not selected.

N. Y., Jamaica—School—Bd. Educ., 500 Park Ave., New York City, plans to build 4 story, brick and steel, brick foundation, on Liberty, Bryant and Jerome Aves., here. About $400,000. C. B. J. Snyder, Municipal Bldg., New York City, archt. and engr.

N. Y., Long Island City—School—Bd. Educ., 500 Park Ave., New York City, plans to build 3 story, brick and steel, brick foundation, on Pierce Ave. and Briell St., here. About $300,000. C. B. J. Snyder, Municipal Bldg., New York City, archt. and engr.

N. Y., Maspeth (Flushing P. O.)—School—Bd. Educ., 500 Park Ave., New York City, plans to build 2 story, brick and steel addition to P. S. 72, brick foundation, on Maspeth Ave., here. About $150,000. C. B. J. Snyder, Municipal Bldg., New York City, archt. and engr.

N. Y., New York—Bank and Office—Three Hundred Thirty West 95th St. Corp., 170 Bway., having plans prepared by McKim, Mead & White, archts. and engrs., 101 Park Ave., for altering 4 story, brick, steel and stone, on 5th Ave. About $250,000.

N. Y., New York—Bank, Offices and Stores—Corn Exch. Bank, 13 Willian St., having sketches made by S. E. Gage, archt. and engr., 28 East 49th St., for 3 story, 50 x 100 ft., brick and steel, brick foundation, at 525-527 Bway. About $175,000.

N. Y., New York—Hotel—Allerton House Corp., 143 East 39th St., having sketches made by A. L. Harmon, archt. and engr., 3 West 29th St., for 14 story, brick and steel, brick foundation, on Lexington Ave. and 57th St. About $1,500,000.

N. Y., New York—Hotel—Silver Lunch Co., c/o B. H. and C. N. Whinston, archts. and engrs., 2 Columbus Circle, soon lets contract altering brick and steel, on 52nd St. and Bway. About $150,000.

Buildings (Continued)

N. Y., New York—School—Bd. Educ., 500 Park Ave., rejected bids building P. S. 59, 4 story, 92 x 194 ft., brick and steel, brick foundation, on Bathgate Ave. and 182nd St., Bronx Boro. About $420,000. Work will be readvertised. C. B. J. Snyder, Municipal Bldg., archt. and engr. Noted Jan. 1.

N. Y., New York—Studio—Jackson Film Studios Corp., 1431 Bway., having sketches made by H. J. Krapp, archt. and engr., 116 East 16th St., for 180 x 224 ft. rein.-con. brick and steel, rein.-con. flooring, concrete foundation, on Westchester and Jackson Aves.

N. Y., Ogdensburg—Hotel—W. A. Bell, and others plan to purchase, alter and build brick additions to Seymour Hotel. About $100,000.

N. Y., Rochester—High School—City soon lets contract building 3 story, 304 x 321 ft., brick, rein.-con. flooring, concrete and rock foundation, at Wilson Park. About $1,500,000. E. S. Gordon, Sibley Blk., archt. Engineer not selected.

N. Y., Rochester—J. F. Jackson, archt. and engr., 47 West 34th St., New York City, receives bids about Jan. 24, altering brick and steel building for Y. M. C. A., 2 West 45th St., New York City. About $75,000.

N. Y., White Plains—High School—Bd. Educ. having preliminary sketches made by Tooker & Marsh, archts. and engrs., 101 Park Ave., New York City, for brick, steel and stone, brick foundation. About $125,000.

N. J., Belleville (Newark P. O.)—School—Bd. Educ. plans to build 14 room school, on Joraleman and Passaic Aves. About $90,000. C. G. Jones, 280 Bway., New York City, archt.

N. J., Jersey City—Library—City plans to build library on Clinton and Bergen Aves. About $50,000.

N. J., Madison—High School—City voted $300,000 bonds to purchase 10 acre site on Main St. and build high school.

N. J., North Bergen (Weehawken P. O.)—Schools—Bd. Educ. plans to build 2 new schools. Cost to exceed, $400,000.

N. J., Seaside Park — Casino — City rejected bids building casino, swimming pool, dock, etc. A. H. Moses, engr., 136 South 4th St., will prepare new plans. Work will be readvertised. Cost to exceed $10,000. Noted Jan. 1.

N. J., Trenton—Bank—First Natl. Bank, 30 East State St., plans to build bank. About $100,000. Architect not selected.

N. J., Trenton—Theatres—Trent Theatre Bldg. Co., 17 North Warren St., plans to build 2 theatres. One to cost $500,000 and other $1,000,000. W. Reade, genl. mgr. Architect not selected.

Pa., Johnstown — Bank — United States Natl. Bank receives bids about March building 12-18 story, 60 x 110 ft., stone, brick and steel, on Franklin St. Cost to exceed $500,000. Dennison & Hirons, 475 5th Ave., New York City, ch. archt. H. M. Rogers, Johnstown, resident archt. Noted June 12.

Pa., Lehighton—Home—I. O. O. F. plan to build 3 story, 50 x 80 ft., rein.-con., brick, steel and marble, tile floors, rock foundation, on Main St. About $80,000. Architect not selected.

Pa., Luzerne (Wilkes-Barre P. O.)—Community Hall—City having plans prepared by G. F. Schroeder, archt., Weitzenkorn Bldg., Wilkes-Barre, for 3 story, 50 x 90 ft., concrete and steel, rock foundation, on Bennett St. About $100,000.

Pa., Pottsville — Station—Pennsylvania R. R., Broad St. Sta., Lehigh Valley R. R., 228 South 3rd St., and Phila. & Reading R. R., Reading Terminal, all of Phila., plan to build 3 story, 70 x 100 ft., concrete, brick, steel, granite, marble and limestone, rock foundation, on Market St., here. About $175,000. A. C. Shand, ch. engr. of former. Architect not selected.

Pa., Phila.—Hotel—Hotel Majestic, Broad and Girard Sts., having plans prepared by Hewitt & Ash, archts., 520 Walnut St., altering brick and steel hotel, on Broad and Stiles Sts. Cost to exceed $50,000.

Pa., Shenandoah — Hospital — Locust Mountain Hospital Assn. plans to build 3 story, 30 x 50 ft., brick and timber, rock foundation, on Wipple Rd. About $70,000. Architect not selected.

Md., Baltimore—Cathedral—Diocese of Maryland, c/o B. Goodhue, archt. and engr., 2 West 47th St., New York City, having plans prepared for brick, steel and stone, brick foundation, here. About $5,000,000.

Md., Hagerstown — Bank and Office — Maryland Surety & Trust Co., 83 North Washington St., plans to construct bank and office building. About $250,000. Simon, Brittain & English, Magee Bldg., Pittsburgh, archts.

N. C., Durham — Dormitory—Durham Hosiery Mills plan to build 4 story, dormitory, to include swimming pool, gymnasium, dining room, auditorium, etc. About $250,000. Milburn-Heister & Co., Union Savings Bank Bldg., Wash., D. C., archts.

N. C., Wilmington — Church — Trinity Methodist Episcopal Church plans to build church. About $75,000. W. J. Wilkins, Wilmington, archt.

Ga., Atlanta—Office—B. J. Massell, Healy Bldg., plans to build 5 story office building on 55 x 105 ft. site, on Walton and Cone Sts. About $200,000.

Ala., Mobile—Theatre—J. H. and C. B. King, 264 Dauphin St., plans to build 66 x 210 ft. (1,750 seating capacity), brick, rein.-con. flooring, concrete foundation. About $250,000. E. H. Slater, 101 Tuttle Ave., archt.

Miss., Jackson—Temple—Masonic Temple Assn. plans to build 4 story temple. About $300,000. B. J. Smith, chairman bldg. com.

Tenn., Knoxville—Theatre—Signal Amusement Co. plans to build 75 x 150 ft., concrete and steel, on Clinch Ave. About $225,000. C. W. and G. L. Rapp, 190 North State St., Chicago, archts.

Tenn., Memphis—Club—Colonial Country Club plans to rebuild club recently destroyed by fire. About $125,000. S. M McDonald, pres. Architect not selected.

Ky., Lexington—Office—D. T. Bohon Co., 226½ East Main St., plans to build 2 story, brick. Cost between $75,000 and $100,000.

Ky., Louisville—Bank—Central Trust Co. plans to remodel building, marble and tile flooring. About $70,000. I. Veihe-Naess, 64 Van Buren St., Chicago, archt.

O., Cincinnati—Store—Alms-Doepke Co., Main and Hunt Sts., plans to build 6 story, 155 x 200 ft., on Sycamore St. Architect and engineer not selected.

O., Cleveland—Hotel—Estates & Investment Co., c/o G. A. Tenbusch, 1836 Euclid Ave., plans to build 4 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, at 1906 East 105th St. About $250,000. Architect's name withheld

O., Lorain—School—Bd. Educ., having preliminary plans prepared by F. C. Warner, archt., Hippodrome Annex Bldg., Cleveland, for 1 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on 4th and Hamilton Sts. About $250,000.

O., Youngstown — Hospital — Aultman Hospital Assn. having plans prepared by W. W. Sabin, archt., 1900 Euclid Ave., Cleveland, for 3 story, 50 x 125 ft., concrete, steel and brick addition, rein.-con. flooring, concrete foundation, on Clarendon Ave. About $125,000. W. L. Alexander, secy.

O., Youngstown — Hospital—Youngstown Hospital Comn. having revised plans prepared by C. F. Owsley, archt., Mahoning Bank Bldg., for 3 story, concrete, steel and brick. About $300,000. Former bids rejected.

Ind., Indianapolis — Office — Indianapolis Security Co., 305 Law St., plans to build 10 story, on Market and Delaware Sts. About $1,000,000. F. K. Sawyer, pres.

Mich., Detroit—Club House—J G. Kastler, archt., 523 Chamber of Commerce Bldg., preparing plans for 2 story, 75 x 110 ft., rein.-con. and brick, concrete foundation, on Farnsworth and Field Aves. About $80,000. Owner's name withheld.

Mich., Detroit—Theatre and Office—Riviera Theatre Co., c/o C. H. Crane and E. G. Kiehler, archts., Huron Bldg., plans to build 2 story, 50 x 185 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Grand River and Linsdale Aves. About $200,000. W. C. Quimby, pres.

Mich., Mt. Pleasant—School—Bd Educ having plans prepared by T. Van Damme, archt., Gratiot Ave., for 2 story, brick, steel and concrete, brick foundation. About $75,000. Noted June 19.

Mich., Pontiac — Hotel — Great Lakes Hotel Syndicate having plans prepared by W. W Alschleger, archt., 111 West Washington St., Chicago, for 8 story, 100 x 125 ft., rein.-con., brick, steel and terra cotta, rein.-con. flooring, concrete foundation, here. About $750,000.

Ill., Chicago—Chapel—University of Chicago, 134 South La Salle St., having plans prepared by B. Goodhue, engr. and archt., 2 West 47th St., New York City, for 100 x 100 ft., steel, brick and stone, here. About $1,500,000.

Ill., Niles (Chicago P. O.)—Infirmary., Superintendent's House, Etc.—St. Hedwig's Infirmary having plans prepared by E. Brielmaier & Sons, Co., archts., University Bldg., Milwaukee, for 3 story, 46 x 100 ft. infirmary, 2 story, 34 x 50 ft. superintendent's house and 1 story, 50 x 125 ft. printery, all brick and concrete, concrete foundation. About $150,000.

Wis., Bloomington—Schools—Bd. Educ. having sketches made by J. R. and E. J. Law, archts., New Strand Theatre Bldg., Madison, for 2 story, brick and tile, grade and high school. About $75,000.

Wis., Cedar Grove—Church—First Presbyterian Church having plans prepared by Juul & Smith, archts., Imig Bldg., Sheboygan, for 2 story, 70 x 145 ft., concrete, tile and brick, concrete foundation, on Main St. About $75,000. J. B. Huenink, chairman. Noted Jan. 8

Wis., Evansville — High School — Bd. Educ. having plans prepared by Perkins, Fellows & Hamilton, archts., 814 Tower Court, Chicago, for 2 story, brick, rein.-con. and steel. About $95,000.

Wis., Lancaster—School—Bd. Educ. having plans prepared by Parkinson & Dockendorff, archts., Linker Bldg., La Crosse, for school About $150,000. Noted Sept. 11.

Wis., Madison—Dormitory—Dominican Sisters, 2209 Monroe St., having plans prepared by A. Kelsey, archt., 1950 Chestnut St., Phila, for 4 story, 60 x 200 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation on Monroe St About $150,000.

Wis., Menasha — School — St. Mary's Catholic Church plans to build 3 story, brick and concrete, rein.-con. flooring, concrete foundation. About $65,000. J. Hummel, 568 Appleton St., pastor. E. Brielmaier & Sons Co., University Bldg., Milwaukee, archts.

Wis., West Allis (Milwaukee P. O.)—Church—Methodist Episcopal Church, 637 61st Ave., plans to build brick, concrete foundation, on Summit St About $60,000. Architect not selected

Ia., Davenport—Administration—Palmer School of Chiropractic, Brady St., plans to build 4 story, 75 x 135 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $120,000. Clausen & Kruse, 316 Central Office Bldg., archts. and engrs.

Ia., Emmetsburg — School—Bd. Educ. Consolidated Dist. voted $110,000 bonds to build brick school. Architect and engineer not selected

Ia., Lovila—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 1 story, 57 x 88 ft., brick and stone, concrete foundation. About $60,000. W. F. Gaddis, secy.

Ia., Ollie—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 2 story, 58 x98 ft., brick, rein.-con. and stone, concrete foundation. About $100,000. J. D. Ridgeway, secy.

Ia., Waterloo—High School—City voted $600,000 bonds to build brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. W. B. Ittner, Bd. Educ. Bldg., St. Louis, archt.

Ia., West Branch—School—Bd. Educ. Consolidated Dist. voted $150,000 bonds to build brick school. Proudfoot, Bird & Rawson, Hubbell Bldg., Des Moines, archts.

Minn., Fergus Falls—Church—English Lutheran Church having plans prepared by Dennis & Knowles, archts., Fergus Falls, for 1 story, 90 x 164 ft., rein.-con. and brick. About $65,000.

Minn., Fergus Falls—Theatre and Office—J. B. Clinton, Duluth, and W B. Wray, Crookston, plan to build 2 story, 50 x 130 ft., rein-con. and brick, here. About $60,000 Architect not selected.

Kan., Atchison—School—Bd. Educ. rejected bids building Lincoln School, 2 story, 88 x 90 ft., brick, rein.-con. and steel, concrete foundation. About $65,000. R. J. Kaaz, 719 Kansas Ave., archt.

Kan., Independence — Bank—Commercial Natl Bank receives bids about Feb. 1 building 6 story, 70 x 110 ft., brick, rein.-con and steel, rein.-con. flooring, concrete foundation. About $150,000. Weary & Alford, 1907 South Michigan Ave., Chicago, archts.

Kan., Kansas City—Church—St. Rose of Lima Church, 2300 North 8th St., having plans prepared by W E. Harris, archt.,

Buildings (Continued

2110 North 5th St., Kansas City, for 1 story, 80 x 123 ft., brick, concrete and stone, rock foundation, on 8th St. and Quindaro Blvd. About $60,000. W. Michel, pastor.

Kan., Salina—Schools—Bd. Educ. having plans prepared and receives bids about Feb. 15, for 2 schools, brick, rein.-con. and steel, rein.-con flooring, concrete foundation. About $225,000. W. T. Schmitt, 1634 West 10th St., Oklahoma, Okla., archt.

Kan., Salina—Temple—Masonic Lodge having plans prepared by W. T. Schmitt, archt., 1634 West 10th St., Oklahoma, Okla., for 5 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $700,000. Noted July 3.

Wyo., Thermopolis—High School—Hot Springs Co. voted $100,000 bonds to build 2 story school. W. E. Mordant, Thermopolis, archt.

Mont., Billings — Theatre — Woods & Snidow plan to build theatre, on Bway. About $150,000. Link & Haire, 317 Electric Bldg., archts.

Mont., Bozeman—Lodge and Office—Knights of Pythias Lodge receives bids about March 1, building 3 story, 56 x 140 ft. About $90,000. Westgate Co., Gallatin Blk., archt.

Mont., Lewistown—Church—First Methodist Church plans to build church. About $150,000. Architect not selected.

Mont., Livingston—Hotel—A. Cline receives bids about Feb. 1, building 4 story, brick hotel. About $125,000. Link & Haire, 317 Electric Bldg., Billings, archts.

Mont., Miles City—Office—Colony Co. receives bids about March 1, building 5 story. About $225,000. Link & Haires, 317 Electric Bldg., Billings, archts.

Mo., St. Louis—Bank—Eighth Federal Reserve Bank plans to build 65 x 145 x 269 ft., on Locust St. between Bway. and 4th St. About $2,000,000. Architect and engineer not selected.

Mo., St. Louis—Clubhouse—Normandie Golf Club, Laclede Gas Bldg., plans to build 2 story, 100 x 275 ft., on St. Charles Rd. About $75,000. J. B. Smutz, pres. Architect and engineer not selected.

Mo., St. Louis—Hotel—J. M. Hirsbstein, archt., 5777 De Giverville St., soon receives bids building 8 story, 49 x 109 ft., on 18th and Chestnut Sts., for D. Isreal, 5129 Enright St. About $350,000.

Mo., St. Louis—Store—M. Goldman, c/o Goldman Bros., 1104-08 Olive St., plans to build 6 story, 25 x 109 ft. addition, at 1102 Olive St. Work involves wrecking 3 story existing building. About $300,000. Architect and engineer not selected.

Tex., Ft. Worth—Club and Office—Ft. Worth Club, 7th and Main Sts., plans to build 12 story, on 7th and Throckmorton Sts. About $1,500,000. Architect not named.

Tex., Mineral Wells — Hotel — Mineral Wells Hotel Co., c/o C. A. MacDonald, archt., Security Bldg., Tulsa, Okla., having plans prepared for 10 story, 44 x 175 ft. and 84 x 160 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $350,000.

Okla., Altus—Memorial Hospital and Convention Hall—City plans to build 2 story, brick, concrete and steel, concrete foundation. About $85,000. Hawk & Parr, Security Bldg., Oklahoma, archts.

Okla., Ardmore—High School—Bd. Educ. having plans prepared by J. B. White, Ardmore, for junior high school, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation About $240,000.

Okla., Enid—Clinic—Enid Clinic Assn. plans to build 3 or 4 story, 62 x 130 ft. Cost to exceed $750,000. Architect to be selected at once.

Okla., Enid—Theatre—W. S. Billings, 1502 West Bway., having preliminary plans prepared by C. Boller & Bros., archts., 508 Ridge Bldg., Kansas City, Mo., for 2 story, 75 x 185 ft., concrete, brick and tile. About $125,000.

Okla., Norman—Dormitory—State Bd. Affairs, Oklahoma, soon receives bids buildings 3 story, 100 x 140 ft., dormitory, on State University grounds, here. About $115,000. C. A. Poplin, 417 Berryhill Bldg., Sapulpa, archt. Noted Aug. 7.

Okla., Shawnee—Stations—City election Feb. 4, to vote on $100,000 bonds to improve fire department and build new central station and 2 other stations. Engineer not selected.

Okla., Vinita—Church—First Methodist Episcopal Church plans to build brick and steel church, concrete foundation. About $75,000. Architect to be selected at once.

Idaho, Nampa—Hotel—Dewey Palace Hotel Co., Dewey Palace Sq., plans to build 3 story, brick addition, on 11th Ave. and 1st St. About $150,000. Tourtellotte & Hummel, McKay Bldg., Portland, archts.

Nev., Carson—Court House—Ormsby Co. receives bids in March, building stone and steel court house. About $50,000. F. J. DeLongchamps, Nixon Bldg., Reno, archt.

Nev., Carson—Memorial—State Bldg. Administration plans to construct Heroes Memorial Building, here, stone and steel. Cost, including heating equipment, $80,000. F. J. DeLongchamps, Nixon Bldg., Reno, archt.

Nev., Lovelock—Court House—Pershing Co. receives bids in March, building court house. About $60,000. F. J. DeLongschamps, Nixon Bldg., Reno, archt.

Ariz., Chandler — School — Union High School Dist. rejected bids received Dec. 27, constructing group 3 buildings, brick, concrete foundation. Allison & Allison, archts., Hibernian Bldg., will revise plans, omitting 1 building. Original cost, $130,000. Additional bonds will be voted for project.

Ore., Astoria—Business—Lovell Auto Co. plans to build 2 story, 100 x 125 ft., on Duane St. About $100,000. N Staples, mgr. Private plans

Ore., Portland — Business — Ballou & Wright, 800 Bway., having plans prepared by Sutton & Whitney, archts., Lewis Bldg., for 5 story, 100 x 100 ft., rein.-con., on 10th and Flanders Sts. About $75,000.

Ore., Portland—Exchange—Pacific Telephone Co., 352 Oak St., having plans prepared for 2 story, brick, on Stanton St. About $100,000.

Cal., Bakersfield—High School—Kern Co. Union High School Dist. voted $200,900 bonds to purchase additional ground and construct school, containing machine shop, study hall, library and domestic science department. Architect not selected.

Cal., Fresno—Office—Fresno City Water Co. having plans prepared by E. Mathewson, archt., 428 Cory Bldg., for 6 story office, on Fresno and D Sts. About $250,000

Cal., Glendale—Hospital—Glendale Memorial Hospital Assn. had preliminary plans prepared by C. W. Kent & Son, archts., 131 South Brand Blvd., for 58 x 60 ft., brick, administration building and several ward buildings, concrete foundation, on Piedmont Park Tract. About $75,000.

Cal., Glendale (Los Angeles P. O.)—Theatre—W. C. Goodno, 397 South El Molino Ave., Pasadena, plans to build 75 x 140 ft., at 124 South Brand Blvd., here. About $50,000. Architect not selected.

Cal., Salinas—Store and Office—Farmers Mercantile Co. having plans prepared by Bush & Wallace, engrs., Bank of San Jose Bldg., San Jose, for 2 story, 145 x 150 ft., rein.-con., concrete foundation. About $85,000.

Cal., San Francisco—Aquarium—City having plans prepared by T. Ronnberg, engr., and L. P. Hobart, archt., Crocker Bldg., for concrete and brick, in Golden Gate Park. About $250,000.

Cal., Susanville—High School—Bd. Educ. having plans prepared by R. D. Taylor, archt., Susanville, for 2 story, concrete or stone addition to high school. Election soon to vote on $75,000 bonds for project.

Cal., Visalia—Theatre—Crescent Theatre Co., Pantages Theatre Bldg., San Francisco, having plans prepared by A. W. Cornelius, archt., Merchants Natl. Bank Bldg., San Francisco, for theatre, on Locust St., here. About $125,000.

N. F., St. John's — Hospital — Salvation Army plans to build hospital, here. About $100,000. H. E. Cowan, secy.

Que., Verdun — Memorial Hall — Bogne Lodge, L. O. L., 4th Ave., receives bids in spring, building 2 story, 50 x 110 ft., brick and steel, concrete foundation. About $50,000. Architects name withheld.

Ont., Clinton — School — Town Council plans to build school here. About $100,000. A. T. Cooper, mayor.

Ont., Perth—Hospital—City having plans prepared for 3 story, 75 x 100 ft., concrete, steel and brick, concrete foundation. About $150,000. I. T. Conway, mayor.

Alta., Calgary—Hospital—City voted $155,000 bonds to build hospital.

BIDS DESIRED

Mass., Boston—Store and Loft—Waldorf System, Inc., 615 Washington St., receiving bids altering 45 story, 50 x 200 ft., concrete building. About $50,000. Stuckert & Co., 1420 Chestnut St., Phila., archts. and engrs.

Mass., Swampscott—School—Until Jan. 20, by School Comn., building 1 story, 70 x 164 ft., brick and timber, concrete foundation, at Machon. Former bids rejected. About $50,000. W. H. McLean, 110 Tremont St., Boston, archt.

Conn., Trumbull—Schools—Until Jan. 19, by L. D. Christie, twp. secy., 252 Middle St., Brideport, building 1 story, 60 x 125 ft., in Long Hill Dist., and 1 story, 60 x 125 ft., Nichols Dist., brick and concrete, rock or concrete foundation. About $50,000 each. W. H. McLean, 110 Tremont St., Boston, archt.

N. Y., Johnson City—School—Until Feb. 19, by Bd. Educ. of Union Free School Dist. 5, Union Twp., Broome Co., building grade school, here. F. B. White, clk.; advertised in this issue.

N. Y., New York—School—Until Jan. 20 (change of date), by Bd. Educ., building P. S. 130, 5 story, 59 x 112 ft., brick and steel, brick foundation, at 201-207 Hester St. About $375,000. C. B. J. Snyder, Municipal Bldg., archt. and engr. Noted Jan. 8.

Pa., Chester—Bank—Until Jan. 27, by B. R. Stevens, archt, 1737 Filbert St., Phila., building 1 story, 13 x 26 ft., concrete, brick, stone and marble addition, for 1st Natl. Bank, 5th and Market Sts. About $50,000.

Pa., Phila.—Dance Hall—See "Industrial Works."

Pa., Phila.—Schools—Until Jan. 25, by Bd. Educ., 19th and Chestnut Sts., building schools on 9th and Oregon Sts. and on 70th and Buist Sts., 3 story, 115 x 165 ft., concrete and brick. About $450,000 each.

Pa., Villanova—Academy—J. J Kennedy, archt., Ford Bldg., Wilmington, Del., receiving bids altering and building 3 story, 70 x 168 ft., brick and stone addition to present academy, on campus, for Villanova College. Cost to exceed $50,000.

Pa., Windber—Theatre—H. L. Reinhold, Jr., archt., 1513 Walnut St., Phila., receiving bids building 2 story, 60 x 150 ft., concrete and brick, for Windber Theatre Corp. Cost to exceed $50,000.

O., Akron—Church—St. Paul's Evangelical Church receiving bids building 1 story, 42 x 96 ft., brick, steel and stone, brick and concrete foundation. About $75,000. R. H. Hinsdale, 601 Bangor Bldg., Cleveland, archt.

O., Cleveland—Bank—Walker & Weeks, archts., 1900 Euclid Ave., receiving bids building 2 story, 50 x 85 ft., brick, steel and stone, rein.-con. flooring, brick foundation, on East 140th St. and Kinsman Rd., for Woodland Ave. Savings & Trust Co., East 55th St. and Woodland Ave. About $60,000.

Mich., Alpena—Hall—Until March 1, by A. H. Gould & Son, engrs. and archts., 610 Empire Bldg., Detroit, constructing 2 story, 107 x 172 ft., rein.-con., brick, steel and stone, rein.con. flooring, concrete foundation, on City Hall Square, for Amer. Legion. About $60,000. C. P. Harris, chn

Mich., Bay City—High School—Until Jan. 23, by F. F. Price, business mgr. Bd. Educ., building senior high school Perkins, Fellows & Hamilton, 814 Tower Court, Chicago, archts.

Mich., Detroit—Office—Until Jan. 20, by S. E. Remey, archt., 503 Whitney Office Bldg., constructing 6 story, 48 x 55 ft., rein.-con., brick, steel and terra cotta, rein.-con. flooring, concrete foundation, on Hastings and Erskine Sts., for H Sheftel. About $100,000.

Ill., Chicago—School—Until Jan. 20, by Bd. Educ., building 3 story, 132 x 175 ft., rein.-con., steel, brick and stone, concrete foundation, on Augusta St. and North Laramie Ave. About $350,000. J. Howatt, 7 South Dearborn St., engr., A. F. Hussander, 7 South Dearborn St., archt.

Wis., Manitowoc—Theatre—Until Feb. 1, by W. T. Raeuber, archt., Teitgen Bldg., constructing 2 story, 100 x 125 ft., brick, tile and steel, brick foundation, for George Bros. Co., South 8th St. Cost between $100,000 and $150,000.

Wis., Tomah—School—Until Jan. 20, by Bd. Educ., building 2 story, 60 x 90 ft., brick, tile, rein.-con. and steel, rein.-con. flooring, brick foundation. About $60,000. H. C. Haueser, Colby-Abbot Bldg., Milwaukee, archt.

Ia., Barnes City—School—Until Jan. 28, by Bd. Educ., building 2 story, 59 x 89 ft., brick, concrete and steel, concrete foundation. About $60,000. E. A. Payne, Carthage, Ill., archt.

Ia., Dayton—High School—Until Feb. 13, by Bd. Educ., or W. E. Hulse & Co., archts., 310 Masonic Temple, Des Moines, for 3 story, 55 x 86 ft., rein.-con., brick and stone, concrete foundation. About $80,000.

Buildings (Continued)

Ia., Woodbine—School—Until Jan. 23 (change of date) by Bd. Educ. Consolidated Dist., building 2 story, 56 x 86 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. W. E. Hulse & Co., 210 Masonic Temple, Des Moines, archts.

Minn., McKinley—School—Until Feb. 3, by F. A. Wolstrom, clk. Bd. Educ., Gilbert, building 3 story, 75 x 150 ft., brick and steel, rein.-con. flooring, concrete foundation, here, for Independent School Dist. 18, Gilbert. About $150,000.

Kan., Wellington—Auditorium and Memorial—Until Feb. 1, by C. L. Boller & Bro., archts., 508 Ridge Bldg., Kansas City, Mo., for 1 and 2 story 110 x 160 ft., brick, rein.-con. and steel, concrete foundation, for city. About $150,000.

Neb., Grand Island—School—Until Feb. 1, by Roman Catholic Church, c/o Bishop Duffy, building 2 story, 60 x 115 ft. brick, concrete and steel, concrete foundation. About $60,000. H. W. Brinkman, Emporia, Kan., archt.

Neb., Kearney—Dormitory—State Bd. Educ., c/o H. E. Reisch, secy., Chadron, receiving bids constructing 3 story, 64 x 160 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $100,000. J. H. Craddock & Co., Elks' Bldg., Omaha, archts.

Neb., Peru—Science Hall—State Bd. Educ., c/o H. E. Reisch, secy., Chadron, receiving bids constructing 3 story, 62 x 132 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, here. About $80,000. J. H. Craddock & Co., Elks' Bldg., Omaha, archts.

S. D., Watertown—High School—Until Jan. 30, by Bd. Educ., building 3 story, 151 x 178 ft., brick and rein.-con. About $350,000. Tyrie & Chapman, Auditorium Bldg., Minneapolis, archts. C. L. Pillsbury & Co., Metropolitan Life Insurance Bldg., Minneapolis, engrs.

S. D., Webster—School—Until Jan. 27, by Bd.Educ., building 2 story 94 x 140 ft., brick and rein.-con. About $145,000. O. Magnus, clk. Edwins & Edwins, 911 Northwestern Bank Bldg., Minneapolis, archts.

Ark., Texarkana—Hotel—Until Jan. 29, by Texarkana Hotel Co. building 7 story, rein.-con., brick and steel, rein.-con flooring, concrete foundation. About $600,000. Mann & Stern, 708 A. O. U. W. Bldg., Little Rock, archts.

Okla, Holdenville — Courthouse — Until Feb. 2, by Hughes Co., building 3 story, 88 x 96 ft., brick, concrete and steel, concrete foundation. About $150,000. Layton, Smith & Forsyth, 701 Majestic Bldg., Oklahoma, archts. Noted Aug. 14.

Okla., Hominy—School—Until Jan. 20, by Bd. Educ., building 2 story, 65 x 76 ft., brick, concrete and steel, concrete foundation. About $75,000. M. Jayne, 1st Natl. Bank Bldg., Oklahoma, archt.

Wash., Olympia—Administration—Until Jan. 28, by State Capitol Bldg. Assn., constructing administration state office building, 3 story, 75 x 219 ft., stone and marble. This is 2nd unit in proposed new capitol group. About $588,000. Wilder & White, Tacoma, archts.

Que., Montreal—Until March 1, by Y. M. C. A. (Grand Trunk R.R. Branch) constructing 3 story, 50 x 75 ft., stone, steel and brick building, concrete foundation, on Wellington St. About $100,000. Address, architect c/o Secretary Y. M. C. A., Drummond St., Montreal.

Que., Vercheres—School—Until Jan. 30, by Roman Catholic School Comrs., building 3 story, 50 x 75 ft., steel and brick, concrete foundation, on Notre Dame St. About $50,000. L. W. Dupre, 15 St. Lawrence Blvd., Montreal, archt.

Ont., Carlton Place—School—Until March 1, by R. W. Bate, archt., Carlton Pl., building 2 story, 50 x 75 ft., steel and brick, concrete foundation, for Pub. School Comn. About $60,000.

Man., Portage la Prairie—Post Office—Until Jan. 26, by Dept. Pub. Wks., Ottawa, altering and building additions to post office, here. R. S. Desrochers, secy.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Lewiston**—Bank—Lewiston Trust Co. let contract building 2 story, 50 x 110 ft., brick, steel and stone, concrete flooring and foundation, to E. A. Abbott Co., 3 Park St., Boston. About $60,000.

★**Vt., Hartford**—Schools—School Comn. let contract building 1 room addition and 60 x 130 ft. brick school, concrete foundation, to J. H. Murphy, 13 Bond St., Boston. About $50,000.

★**Mass., Boston**—Office—Hancock Mutual Life Insurance Co. let contract building 10 story, 25 x 250 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation, on Stuart St., to L. P. Soule & Son, Boylston St. About $2,500,000.

★**Mass., Boston**—Sales—M. and A. I. Rudnick, 40 Court St., will build rein.-con., brick and stone, rein.-con. flooring, concrete foundation, on Commonwealth Ave. About $1,000,000. Work will be done by day labor.

Mass., Lynn—School—Pub. Bldg. Dept., received bids Dec. 30, building 1 story, 60 x 110 ft., brick and steel, concrete foundation, on Ontario St., from C. S. Cunningham Co., 3 Essex St., $47,218; K. Swanson, 133 Euclid Ave., $49,000.

★**Mass., Malden** (Boston P. O.)—Bank—Malden Savings Bank, Main St., let contract building 1 story, 45 x 100 ft., brick and mill construction, tile flooring, concrete foundation, to Gasgione & Goodard, Inc., 43 Tremont St., Boston. Noted Jan. 1.

★**Mass., Malden** (Boston P. O.)—School—Hebrew Free School, 19 Boylston St., will build 2 story, 65 x 65 ft., brick and mill construction, concrete or rock foundation. About $50,000. Work will be done by day labor under supervision of S. S. Eisenberg, archt. 203 Bway., Chelsea.

★**Mass., Millers Falls**—School—Montague Twp. let contract building 1 story (6 room), brick and steel, rein.-con. flooring, concrete foundation, here, to Thomas Bros., City Road, Turners Falls. About $50,000.

★**Mass., North Abington**—Office, etc.—L. A. Crossett, Inc., 58 Lincoln St., Boston, let contract building 3 story, 50 x 100 ft. office and administration building and 1 story, 40 x 80 ft. garage, brick and terra cotta blocks, concrete foundation, to E. A. Abbott Co., 3 Park St., Boston. About $65,000.

★**R. I., Providence**—Bank—Citizens Savings Bank, 846 Westminster St., let contract building 1 story, 50 ft. high, brick and limestone, rein.-con. flooring, concrete foundation, to Williams & Merchant, Inc., 86 Weybosset St. About $150,000. Noted Sept. 11.

★**R. I., Providence**—Business—W. G. Richards, archt., 17 Exchange St., let contract to Soren & Kelman, 230 Saratoga St., for 3 story, 80 x 100 ft., brick and concrete, concrete foundation, on North Main St., for J. Marcus & Bro., 210 North Main St. About $50,000. Noted Aug. 14.

★**Conn., Bridgeport**—Home, etc.—Salvation Army, 82 Elm St., let contract building 2 story, 50 x 61 ft., brick and terra cotta, concrete flooring and foundation, to T. J. Pardy Constr. Co., 1484 Seaview Ave. About $50,000.

★**Conn., West Haven** (New Haven P. O.)—Grade School—School Bd. let contract building 2 story, 45 x 137 ft., brick and stone addition, concrete foundation, on Noble St., to C. W. Murdock, 185 Church St., New Haven. About $100,000.

★**Conn., Willimantic** — Bank — Windham Natl. Bank, 779 Main St., let contract altering and building brick and steel addition, concrete foundation, to G. C. Irwin & Co., 94 West Brookline St., Boston. About $50,000.

N. Y., Newtown (Flushing P. O.)—School—Bd. Educ., 500 Park Ave., New York City, received bids Jan. 12, altering and building brick, steel and stone addition, brick foundation, on Etna Pl., Chicago and Parcell Sts., from D. E. Connors, 15 West 91st St., New York City, $794,000; T. Dwyer, Bway. and 216th St., New York City, $799,000; T. A. Clarke Co., 122 Livingston St., Brooklyn, $887,000. Noted Jan. 8.

★**N. Y., New York** — Exchange — New York Telephone Co., 15 Dey St., let contract building 4 story, 100 x 145 ft., brick, steel and stone, brick foundation, on Troutman Ave., to Gillies-Campbell, 103 Park Ave. About $200,000. Noted June 12.

★**N. Y., New York**—Office—C. H. Gillespie, archt., 1123 Bway., let contract to J. H. Deeves, 103 Park Ave., building 6 story, 32 x 100 ft., brick, steel and stone, brick foundation, at 47-49 Beaver St., for Importers & Exporters Insurance Co., 17 South William St. About $75,000.

★**N. Y., New York**—Office—McReynolds Realty Corp., 26 West 31st St., will build 12 story, 60 x 100 ft., brick and steel, brick foundation, at 52-54 New St. Work will be done by day labor.

★**N. Y., New York**—Store—See "Industrial Works."

★**N. J., Atlantic City**—School—Holy Spirit Roman Catholic Church let contract building 2 story, 80 x 138 ft., brick, stone and terra cotta, to M. Melody & Son, 1645 North Broad St., Phila. About $175,000. Noted Aug. 28.

★**N. J., Camden**—Club House—Ottawa Tribe of Red Men, c/o W. W. Sharpley, archt., 1713 Sansom St., Phila., let contract building 3 story, 40 x 145 ft., rein.-con., brick and limestone, to Willis—Ludwich & Co., 1708 Sansom St., Phila. About $140,000.

★**N. J., Trenton**—Sales—Packard Motor Car Co., 103 South Clinton Ave., let contract building 1 story, 115 x 200 ft., brick and steel, on Brunswick Ave., to G. E. Caiazzo, 12 Bayard St. About $60,000.

★**Pa., Chester**—Office—Cochrane Estate let contract building 18 story, brick and steel, to Ward Bros. Constr. Co., Chester. About $450,000. Noted Jan. 8.

★**Pa., Lock Haven**—Bank—Lock Haven Trust & Safe Deposit Co., East Main St., let contract building brick, steel and stone, here, to Hoggson Bros., 485 5th Ave., New York City. About $300,000.

★**Pa., Milton**—Dwellings—Milton Housing Co. let contract building 2 story, frame, and frame and shingle dwellings, concrete foundation, to H. A. Moore Co., Bway. About $300,000.

★**Pa., Phila.**—School—West Phila. Catholic High School, 49th and Chestnut Sts., let contract building 3 story, 49 x 125 ft., stone, to Doyle & Co., 1519 Sansom St. About $155,000.

★**Pa., Scranton**—Community Hall—C. Schoen Silk Corp., Petersburg, let contract building 2 story, 47 x 90 ft., brick and steel, rock foundation, on Myrtle and James Aves., here, to Hagen Lumber Co., Hickory and Mattes Sts. About $50,000.

★**Pa., Waynesboro**—Bank—People's Natl. Bank let contract building 2story, 43 x 114 ft., brick, concrete, stone and granite, concrete flooring, stone and concrete foundation, to Cogswell-Koether Co., 406 Park Ave., Baltimore, Md. About $110,000.

★**O., Cleveland**—School—Bd. Educ. let contract building 2 story, 75 x 242 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Warner Rd., to Schirmer-O'Hara Co., 2031 Euclid Ave. About $158,800. Noted Jan. 8.

★**O., Fairport** (Fairport Harbor P. O.)—School—Bd. Educ. let contract building 2 story, 124 x 137 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on 3rd and Vine Sts., to Kaiser & Co., Bellaire. About $169,000. Noted Jan. 1.

★**O., Parma**—Schools—Bd. Educ. let contract building three 1 story, 60 x 118 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, to C. Petersen, 642 Engineers' Bldg., Cleveland. $269,700.

★**O., Youngstown**—Church—St. John's Greek Orthodox Church let contract building 1 story, 42 x 54 ft., brick, steel and stone, brick foundation, on Woodland Ave., to J. Meinhart, Youngstown. About $50,000.

★**Ind., Indianapolis**—Arsenal Technical School—Bd. Educ. let general contract building 3 story, 68 x 440 ft., brick, steel and concrete, rein.-con. flooring, concrete foundation, to J. A. Schumacher Co., 818 East St. Clair St., $559,000; heating, ventilating and plumbing, to Frey Bros., 31 West Michigan St., $126,818; electric wiring, to Sanborn Electric Co., 309-11 North Illinois St., $12,500.

★**Mich., Detroit**—Schools—Bd. Educ., 50 Bway., let contract for (1) masonry work, (2) carpentry work, (3) heating, ventilating, etc., building 2 story, 85 x 134 ft., rein.-con., brick and steel, on Vancourt and Milford Aves., to Culbertson & Kelly, 809 Ford Bldg., (1) $122,877; Harcus & Co., 774 Russell St., (2) $34,581; J. W. Partlan, 51 Park Pl., (3) $53,800; Field School, Agnes and Field Aves.; J. Bollin, 906 Bellevue Ave., (1) $31,000; E. Thiede, 287 Berlin St., (2) $9,790; W. J. Rewoldt, 506 Owen Bldg., (3) $18,274; Davison School, Roman Ave., Culbertson, Kelly, (1) $129,212; H. M. Martens Co., 221 Moffat Bldg., (2) $36,637; O'Connor Bros., 34 Roland Bldg., (3) $89,590.

★**Ill., Chicago**—Church — Albany Park Presbyterian Church, 4819 North Kedzie Ave., let contract building 2 story, 55 x 95 ft., brick and stone, concrete foundation, on St. Louis Ave. and Ainslee St., to J. Christensen, 1250 East 69th St. About $75,000.

★**Ill., Homewood**—Club—Calumet Country Club, 95th St. and Cottage Grove Ave., let contract building 2 story, stucco and tile rein.-con. flooring, concrete foundation, on 175th St. and Dixie Highway, to Dahl-Stedman Co., 11 South La Salle St. About $75,000.

Buildings (Continued)

★**Wis., Manitowoc**—Theatre—T. Joritzka, 1307 Marshal St., let contract building 2 story, 60 x 152 ft., brick, rein.-con. and steel, concrete foundation, to Blake Constr. Co., 627 South River St., Appleton.

★**Kan., Haven**—High School—Bd. Educ. let contract building 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to E. Staedelin & Son, Medford, Okla., $63,580.

★**Neb., Omaha** — Stores—Burgess-Nash Co., 16th and Harney Sts., let contract building 8 story, 88 x 152 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on 17th and Harney Sts., to J. Stewart & Co., 30 Church St., New York City. About $900,000; cost plus percentage basis.

★**Wyo., Sheridan**—School Bldg.—Central School Bd. let contract building 3 story semi.-fireproof school, to N. A. Pearson, Sheridan. About $128,500.

★**Tex., Hallettsville**—School and Auditorium—Independent School Dist. let contract building 1 story, (12 room), rein.-con. and brick, to R. Smith, Austin, $60,415. Noted June 26.

★**Tex., Houston** — Store — Harris-Hahlo Co., Houston, let contract building 6 story, 58⅓ x 100¾ ft. department store, brick and terra cotta, on Main St. and Texas Ave., to Horton & Horton, McKinney and Velasco Sts. About $350,000.

★**Tex., Houston**—Store—H. C. House let contract building 6 story, 95 x 100 ft., rein.-con. flooring, clay foundation, on Texas and Main Sts., to Horton & Horton, McKinney and Velasco Sts. About $350,000.

★**Tex., San Antonio**—Seminary—San Antonio Catholic Diocese let contract building 3 story, 100 x 155 ft., to J. C. Dielmann Co., 306 East Commerce St. About $142,000.

★**Okla., Oklahoma** — Theatre — United Theatre Co., c/o J. H. Cooper, will build 2 story, 75 x 140 ft., brick and steel, rein.-con. flooring, concrete foundation. Total cost, $250,000. Work will be done by day labor. Steel contract, let to St. Joseph Structural Steel Co., St. Joseph, Mo., $30,000.

★**Cal., Bakersfield**—Store—E. W. Hopkins let contract building 6 story, rein.-con., rein.-con. flooring, concrete foundation, to Lindgren Co., Monadnock Bldg., San Francisco. Hochheimer & Co., lessee.

★**Que., Cap de la Madeleine**—School—Roman Catholic School Comn. let contract building 3 story, 75 x 100 ft. concrete, steel and brick, rock foundation, to U. R. Rosseau, Hochelaga Bank Bldg. About $84,000. Noted July 10.

Federal Government Work

PROPOSED WORK

N. H., Portsmouth—Boiler and Stoker—Spec. 4124—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install, here. About $37,000.

Mass., Boston—Electric Traveling Crane—Spec. 4123—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install one 5-10 ton electric traveling bridge crane and build extension to foundry, here. About $15,000.

Mass., Boston—Garage—Treas. Dept., Wash., D. C., plans to build 2 story garage and repair shop, here. J. A. Wetmore, superv. archt.

N. Y., Buffalo — Radio Building — Spec. 4108—Bureau & Docks, Navy Dept., Wash., D. C., soon receives bids constructing frame radio building on concrete foundations with exterior walls covered with wood siding, asphalt shingles roofs, wood floors, sash and doors, heating, electric lighting and power, etc., on army land near Lighthouse Depot Grounds, here. About $9,000; $10 deposit required for plans and spec.

Pa., Phila.—Seaplane Hangars—Spec. 4121—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to dismantle 3 seaplane hangars at Brunswick, Ga., and reerect same, here. About $37,500.

O., Toledo — Remodeling Post Office — Treas. Dept., Wash., D. C., rejected bids received Dec. 30, remodeling, here. J. A. Wetmore, superv. archt.

Mich., Detroit—Radio Building—Spec. 4120—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to construct radio building, at Wind Mill Point, here. About $9,000.

Mo., St. Louis—Earth and Levee Work—Mississippi River Comn., 1311 Internatl. Life Bldg., rejected only bid received Dec. 26, building 260,000 cu.yd. earthwork, 172,000 cu.yd. hydraulic fill in old barrow pits and 88,000 cu.yd. on application for levee enlargement, Hunt D. D., Ill.

Cal., San Diego — Buildings — Bureau Yards & Docks, Navy Dept. rejected bids constructing central building, industrial group of marine post, power house, etc., on "Dutch Flats," here. About $220,000.

Cal., San Diego—Distributing System and Power Plant Equipment—Spec. 4118—Bureau Yards & Docks, Navy Dept., plans to install distributing system and power plant equipment, at Marine Corps Base, here. About $150,000.

Cal., San Diego—Fuel Oil Storage Plant—Spec. 4102—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids building 50,000 gal. fuel oil storage plant, steel tanks with appurtenant piping valves, heating coils, sludge pump and other accessories, at Marine Corps Base, here. About $15,000; $10 deposit required for plans and spec.

Cal., San Diego—Repairing Coaling Wharf—Spec. 4117—Bureau Yards & Docks, Navy Dept., plans to repair coaling wharf, here. About $4,000.

Cal., San Francisco—Altering Buildings—Spec. 4116—Bureau Yards & Docks, Navy Dept., Wash., D. C., and Pub. Wks. Office, Navy Yard, Mare Island, soon receive bids altering double quarters, dormitory and mess hall and constructing new double quarters, at Naval Radio Sta., Yerba Buena Island, here. About $23,000; $10 deposit required for plans and spec.

H. T., Heeia—Radio Buildings—Spec. 4122—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to construct, here. About $22,000. Bids will be opened at local yard.

BIDS DESIRED

R. I., Newport—Laundry—Spec. 4081—Until Jan. 28, (change of date), by Bureau Yards & Docks, Navy Dept., Wash., D. C., building, here. About $60,000; $10 deposit required for plans and spec. Noted Jan. 8.

R. I., Newport—Torpedo Storage Racks—Spec. 4060—Until Jan. 28 (change of date), by Bureau Yards & Docks, Navy Dept., Wash., D. C., building crane runway, crane and racks at Torpedo Storehouse, Goulds Island Naval Sta., here. Noted Jan. 8.

R. I., Providence—Dredging—Until Feb. 9, by U. S. Engr. Office, dredging in Stamford Harbor, Conn.; advertised in this issue.

N. Y., New York—Repairing Dry Dock—Spec. 4014—Until Feb. 11, by Bureau Yards & Docks, Navy Dept., repairing dry dock No. 4, here. About $100,000; $10 deposit required for plans and spec. Noted July 31.

D. C., Wash.—Completing Storage Plant—Spec. 4115—Until Jan. 21, by Bureau Yards & Docks, Navy Dept., completing storage plant for fuel oil at Navy Yard. About $50,000; $10 deposit required for plans and spec.

D. C., Wash.—Quay Wall—Spec. 4112—Until Jan. 28 (change of date), by Bureau Yards & Docks, Navy Dept., completing, here; $10 deposit required for plans and spec. Noted Jan. 8.

Va., Cape Henry—Clay—Until Feb. 5, by U. S. Engr. Office, Custom House, Norfolk, furnishing clay at Ft. Story, here; advertised in this issue.

N. C., Brevard—Road Work—Until Feb. 3, by V. M. Peirce, acting dist. engr., Bureau Pub. Rds., U. S. Dept. of Agriculture, Wash., D. C., improving 10.14 mi. Pisgah Rd., Pisgah Natl. Forest, involving clearing and grubbing, 13,000 cu.yd. rock and 64,000 cu.yd. common excav., 61.1 cu.yd. class "A" concrete, 5,300 lb. reinforcing steel, 1,848 cu.yd. cement rubble and 560 cu.yd. dry rubble masonry, 1,572 lin.ft. 18 in. and 502 lin.ft. 36 in. corrugated metal pipe in place, 103 M ft. truss bridge material in place and 29,400 lb. rods, plates and hardware material for truss bridge in place.

S. C., Paris Island—Lining Drydock—Spec. 3979—Until Feb. 4, by Bureau Yards & Docks, Navy Dept., Wash., D. C., lining drydock with concrete; $10 deposit required for plans and spec. Noted June 26.

Mo., St. Louis—Side Wheel Steamboat—Until Feb. 12, by Secy. Mississippi River Comn., 1311 International Life Bldg., constructing and delivering side wheel steamboat; advertised in this issue.

Wash., Puget Sound—Building Extension Spec. 4024—Until Feb. 11 (change of date), by Bureau Yards & Docks, Navy Dept., Wash., D. C., building extension to central power plant, here. About $40,000; $10 deposit required for plans and spec.

Alaska—Bridge—Until Jan. 26, by C. E. Cole, genl. purch. agt., Alaskan Eng. Comn., Seattle, Wash., furnishing and building steel bridge, here, consisting of one 504 ft. through span.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Fitchburg—Remodeling Post Office—Treas. Dept., Wash., D. C., received lowest 3 bids Jan. 5, remodeling, here, from, W. F. Stewart, New York City, $6,970; J. McDonald Constr. Co., Boston, $13,362; Handley & Cavanaugh, Fitchburg, $14,661.

N. Y., S. I., New Dorp—Barracks and Quarters, etc.—U. S. Constr. Quartermaster, 39 Whitehall St., New York City, received bids Jan. 10, furnishing labor and material for constructing barracks, quarters, mess hall, post exchange, administration building, etc., here, from North Eastern Constr. Co., 225 5th Ave., $958,000; Post & McCord, 101 Park Ave., $970,000, both contractors of New York City.

N. Y., Stapelton — Electric Elevators — Treas. Dept., Wash., D. C., received bids Dec. 30, installing 2 electric elevators in kitchen and mess hall, at U. S. Marine Hospital, here, from Otis Elevator Co., Wash., $13,345 (120 days), A. B. See Electric Elevator Co., 220 Bway., New York City, $15,675 (185 days), Kaestner & Hecht Co., 500 Throop St., Chicago, $16,128 (120 days).

N. J., Cape May—Dirigible Hangar—Spec. 4080—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Jan. 7, altering and building addition to dirigible hangars, 708 ft. long, 155 ft. wide and 113 ft. high from floor to center pin of arch, at Naval Air Sta. and dismantling 100,000 cu.ft. capacity gas holders at Montauk, L. I. and transferring and storing same here, (1) work complete, from Associated Contractors, Inc., 17 West 42nd St., New York City, (1) $772,930, (2) $20, (3) $0.20, (4) $100, (5) $3,000, (6) $8,000, (7) $9,000, (8) $200; Stang & Mitchell, Real Estate Trust Bldg., Phila., (1) $787,000 (270 days), (2) add $28.50 deduct $12, (3) add $1.10, (4) add $105, (5) deduct $6,500, (6) add $7,100, (7) $9,000, (8) $600; Hughes-Foulkrod Co., 1406 Commonwealth Trust Bldg., Phila., (1) $883,344 (270 days), (2) add $33 deduct $9, (3) add $0.90, (4) $42, (5) $12,012, (6) deduct $8,360, (7) deduct $11,880, (8) deduct $600.

★**Pa., Easton**—Electric Freight Lift—Treas. Dept., Wash., D. C., let contract installing electric freight lift, at Post Office, here, to Otis Elevator Co., Wash., $7,807.

Pa., McKeesport—Remodeling Post Office—Treas. Dept., Wash., D. C., received bids Jan. 8, remodeling, here, from Brieck Bros., McKeesport, $11,872; G. E. Wright Co., Chicago, $12,600; W. McDonald Constr. Co., 428 Odd Fellows Bldg., St. Louis, Mo., $15,454.

★**Pa., Phila.**—Boiler Repairs—Treas. Dept., Wash., D. C., let contract repairing boiler, at U. S. Mint, here, to J. F. Swan, 10th St. and Duncannon Ave., $6,778.

★**Del., Wilmington**—Dredging—U. S. Engr. Office, Old Federal Bldg., let contract dredging in Cooper River, N. J., to Amer. Dredging Co., Mariners & Merchants' Bldg., Phila., Pa. About $9,500.

Md., Annapolis—Water Tanks and Tower—Spec. 4103—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Jan. 7, building one 2,000 and one 12,000 gal. steel water tanks with 67 ft. steel tower and appurtenances at Naval High Power Radio Sta., Greenbury Point, here, (net price and time for entire work, but modified as permitted in paragraph 27 of spec.), from Chicago Bridge Co., 30 Church St., New York City, $5,550 (155 days); Pittsburg Des Moines Steel Co., 959 Munsey Bldg., Wash., $5,100 (175 days); McNamara & Co., Cloman and Clair Sts., Baltimore, $6,766.

D. C., Wash.—Buildings—Constr. Quartermaster, received bids Dec. 31, building incinerator and can washing plant, at barracks, from Morse-Boulger Destructor Co., 39 Cortlandt St., New York City, $11,525; Borge Incinerator Corp., Flat Iron Bldg., New York City, $15,199; H. S. Hatton, Wash., $16,139.

Federal Government (Continued)

D. C., Wash.—Sewers—Dist Comrs. received bids Jan. 5, building (a) sewer "A", (b) sewer "B", (c) sewer "C", (d) sewer "D", from W. F. Brenizer Co., 101 New York Ave., N. E., (a1) $2.50, (a2) $30, (a3) $1.65, (a4) $1.30, (b1) $2.25, (b2) $30, (b3) $1.30, (c1) $4, (c2) $35, (c3) $3, (d1) $2.50, (d2) $32, (d3) $1.60, (d4) $1 45; W. F. Cush, 3rd and R Sts., N. E., (a1) $2.95, (a2) $25, (a3) $1.74, (a4) $1.45, (b1) $2 85, (b2) $25, (b3) $1.40, (c1) $4 35, (c2) $25, (c3) $1.80, (d1) $2.95, (d2) $25, (d3) $1.74, (d4) $1.60; A. McCandlish Co., Wash., (a1) $2.50, (a2) $30, (a3) $1.75, (a4) $1.25, (b1) $2.50, (b2) $30, (b3) $1.25, (c1) $3.50, (c2) $30, (c3) $1.50, (d1) $2.75, (d2) $30, (d3) $1.75, (d4) $1.50; G. Hyman, 220 F St., N. W., (b1) $2.25, (b2) $30, (b3) $0.90, (d1) $3, (d2) $30, (d3) $1.50, (d4) $1 25; B. Pizzimento, Pitman, N. J., (b1) $4, (b2) $27, (b3) $2.85, (c1) $8.50, (c2) $27, (c3) $2.75, (d1) $4.50, (d2) $27, (d3) $3, (d4) $2.75.

★**Va., Norfolk**—Pattern Shop—Spec. 4041—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building 4 story pattern shop, 233 ft. long, 126 ft. wide and 78 ft. 3 in. high to top of parapet, at Navy Yard, here, to Boyle Robertson Constr. Co., 601 Evans Bldg., Wash., D. C., $384,981 (240 days)

★**Va., Yorktown**—Buoys—Spec. 4068—Bureau Yards & Docks, Navy Dept., Wash., D. C. let contract furnishing 4 mooring buoys, here, to S. J. Smith, Gloucester Point, $6,576 (120 days). Noted Jan. 8.

★**W. Va., Wheeling**—Lock Gates—U. S. Engr. Office, Wash., D. C., let contract furnishing and erecting lock gates for Dams 23, 25 and 27, Ohio River, to Milwaukee Bridge Co., 1400-34th St., Milwaukee, $191,465. Noted Jan. 1.

S. C., Paris Island—Buildings—Spec. 4079—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Jan. 7, constructing 4 steel frame and 5 wood frame buildings, at Marine Aviation Field, here, (1) work complete, excepting oil storage shed, concrete floor for hangars and storehouse, machine and erecting shop and garage, preparation of subgrade for concrete floors is not omitted from (1), concrete roads and ramps and work as specified in paragraphs 142 and 168, inclusive, earth roads and ramps and work as specified in paragraphs 169 and 175 inclusive, from Newport Contg. Eng. Co., Silsby Bldg., Newport News, Va., (1) $91,900, (2) $150, (3) $2,200, (4) $16,700, (5) $4,800, (6) add $0.75 deduct $0.55; McLean Contg. Co., Fidelity Bldg., Baltimore, Md., (1) $99,640 (150 days), (2) $4,200, (3) $21,500, (4) $19,300, (5) $850, (6) add $2.10 deduct $1.50; C. Meades, 38 Park Row, New York City, (1) $172,200 (150 days), (2) $9,000, (3) $27,000, (4) $22,000, (5) $6,000, (6) add $2 deduct $1. Noted Jan. 1.

★**Ga., Savannah**—Dredging—U. S. Engr. Office, Savannah, let contract dredging in Savannah Harbor, to J. Emile, Duval Bldg., Jacksonville, Fla. About $94,500.

★**Ala., Florence**—Air Compressors—U. S. Engr. Office, Wash., D. C., let contract installing 2 air compressors, here, to Worthington Pump & Machy. Corp., 115 Bway., New York City, $29,450.

Ky., Ashland—Alterations to Post Office—Treas. Dept., Wash., D. C., received only bid Jan. 6, altering post office here, from G. E. Wright, Inc., Chicago, $2,489.

Ky., Dawson Springs—Additional Buildings—Treas. Dept., Wash., D. C., received supplemental bids Jan. 5, constructing 3 additional buildings, here, (1) infirmary, (2) infirmary and administration, (3) infirmary, administration and nurses' quarters, from Dawson Springs Constr. Co., Dawson Springs, (1) $302,000, (2) $380,000, (3) $531,000; King Lumber Co., Charlottesville, Va., (1) $305,000, (2) $399,800, (3) $559,800. Noted Jan. 1.

★**Ky., Louisville**—Remodeling Post Office—Treas. Dept., Wash., D. C., let contract remodeling 3rd floor of Post Office, here, to W. McDonald Constr. Co., 128 Odd Fellows Bldg., St. Louis, Mo., $11,267. Noted Jan. 8.

O., Springfield—Freight Lift—Treas. Dept., Wash., D. C., received bids Jan. 8, installing at Post Office, here, from Otis Elevator Co., Wash., $4,400; Otis Elevator & Machine Co., Jefferson and Curtis Sts., Columbus, $1,500; A. B. See Elevator Co., 220 Bway., New York City, $4,840

O., Springfield—Remodeling Post Office—Treas. Dept., Wash., D. C., received bids Jan. 8, remodeling, here, from G E Wright, Inc., Chicago, $9,700; W. McDonald Constr. Co., 128 Odd Fellows Bldg., St Louis, Mo., $11,234; D. Gordon Bldg & Constr Co., Burnet St. and Northern Ave., Cincinnati, $24,000.

★**Mo., St. Louis**—Earth and Levee Work—Mississippi River Comn., 1311 International Life Bldg., let contract building 450,000 cu.yd. earthwork, 327,000 cu.yd. hydraulic fill in old borrow pits and 123,000 cu.yd. levee enlargement, Sny Island, D. D., Ill., to La Crosse Dredging Co., 405 Plymouth Bldg., Minneapolis, Minn. About $69,930.

Mo., St. Louis — Remodeling Plumbing, Electric Work, etc.—Treas. Dept., Wash., D. C., received bids Jan. 5, remodeling, plumbing, electric work, etc., in U. S. Appraisers Stores, here, from S. W. Rittenhouse, Wash., D. C., $42,729; W. Wilby, Selma, Ala., $42,975; W. McDonald Constr. Co., 428 Odd Fellows Bldg., $56,789.

Utah, Santa Clara—Bridge—Dept. of Interior, Office of Indian Affairs, Wash., D. C., received bids Jan. 8, building steel highway bridge over Santa Clara River, Shivwits Indian Reservation at point about 65 mi. from Modena, (1) for bridge structure including 3471 cu.yd. of filling in approaches complete as specified, from R. M. Kearns Bldg. Corp., 41 Cortlandt St., New York City, for bridge complete using local gravel and lumber complete as specified, $27,595 (120 days); J. J. Bruke & Co., 303 Atlas Blk., Salt Lake City, furnishing all material necessary to complete 75 ft. pony riveted steel span with wood floor on rein.-con. Shivwits Indian Reservation, near Santa Clara, according to plans and spec. submitted by bidder, $18,600; R. L. Jones, Cedar City, (bridge only,) $14,600 (180 days).

★**Cal., San Francisco**—Refrigerating Plant—Treas. Dept., Wash., D. C., let contract installing, here, to York-California Constr. Co., York, Pa. About $13,400.

Miscellaneous

PROPOSED WORK

Band Stand—Somerville (Boston P. O.), **Mass.**—City plans to build memorial band stand on Central Hill. About $50,000. R. L. Rice, 296½ Bway., chairman.

Tower—Wellesley (Boston P. O.), **Mass.**—See "Buildings."

Park—Trenton, N. J.—City Comn. plans to build park along Delaware River, from Lalor St. to State House, about 1 mi. long. About $12,000.

Park — Vandergrift, Pa. — City voted $50,000 bonds to build park, athletic field, grandstand, playgrounds, etc. Blum-Weldin Co., St. Nicholas Blk., Pittsburgh, engrs.

Cast Iron Pipe—Detroit, Mich.—Corp. Purchases & Supplies, Municipal Court Bldg., soon lets contract furnishing 10,098 tons c.i. bell and spigot water pipe, 8080 tons 6-8 in. Class B and 2,918 tons 12-24 Class C pipe.

Road Machinery — Waukesha, Wis.—Waukesha Co. appropriated $20,000 to purchase machinery, including patrolmen's outfits. C. J. Hahn, Delafield, comr.

Park—Hugo, Okla.—City voted $40,000 bonds to build park. Architect not selected.

Drydock — Portland, Ore. — City having plans prepared by G. B. Hegart, ch. engr., Pub. Dock Comn., for 15,000 ton drydock, consisting of 5 pontoons, 3,000 ton capacity each, similar to large docks of Skinner & Eddy Shipbuilding Co., Seattle. About $800,000.

Gas Pipe Lines—Redding, Cal.—Pacific Gas & Electric Co., 445 Sutter St., San Francisco, plans to build 10,340 ft. 2-6 in gas pipe line, here. About $18,000 W G Moores, Redding, dist. mgr.

Hydro System—Amaranth, Man.—Town having plans prepared for hydro system with distributing power and lighting stations at Laurel and Waldemar, Ont E. Hamilton, Laurel, clk.

Dam — Calgary, Alta. — See "Waterworks."

BIDS DESIRED

Electric Wiring, Etc.—Binghamton, N. Y.—Until Jan. 28, by State Hospital Comn., Capitol, Albany, renewing electric wiring, in main building and for laundry equipment, at Binghamton State Hospital, here. E. S. Elwood, secy. L. F. Pilcher, state archt.; advertised in this issue.

Garbage Disposal — Rochester, N. Y. — Until Jan. 21, by Bd Contract & Supply, constructing garbage disposal plant, including 2 buildings and other miscellaneous work. About $100,000. F. L. Fisher, city engr

Breakwater—Schenectady, N. Y.—Until Feb. 10, by E. S. Walsh, supt. Pub. Wks., Capitol, Albany, protecting breakwaters at Cleveland Terminal, Contr. 28-A; advertised in this issue.

Piers—Stapleton, S. I., N. Y.—Until Jan 22, by M. Hurlburt, comr. dock, Pier "A," foot of Battery Pl., New York City, furnishing labor and material for building at individual prices one or more of Piers 6, 7, 8, 9, 10 and 11, Richmond Boro.

Cranes—St. Louis, Mo.—Until Jan. 20, Bd. Pub. Serv., City Hall, for 2 double gantry cranes with 1 monorail telphers or four 2 rail trolleys for North Market St Municipal Dock.

Drilling Well—Vandalia, Mo.—Until Jan 26, by city, drilling deep well, 15 in. diam., 1,200-1,500 ft. deep W. S. Waters, mayor

Pipe—Guelph, Ont.—Until Jan. 19, by F. McArthur, city engr., furnishing and delivering, f.o.b., 1,500 ft. 8 in., 1,500 ft. 12 in. and 15,000 ft. 24 in. wood stave pipe. About $100,000. Noted Jan. 1.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Foundation — Boston, Mass.**—Goodyear Tire & Rubber Co., Brookline Ave., let contract pile foundation for 5 story, 60 x 160 ft. storehouse, to Raymond Concrete Pile Co., 80 Boylston St.

Track Repairs, etc.—Brooklyn, N. Y.—E. Riegelmann, boro. pres., received lowest 3 bids Dec. 30, improving part of Eastern Parkway Rapid Transit R.R., from Holbrook, Cabot & Rallins, 52 Vanderbilt Ave., New York City, $199,485; C. Meade, $225,768; Terry & Tench, Grand Central Terminal, New York City, $261,000.

Stone, etc.—Long Island City, N. Y.—M. E. Connolly, pres. Queens Boro., received bids Jan. 8, furnishing and delivering (a) 29,000 cu.yd. broken stone, (b) 5,000 cu.yd. sand grit, (c) 10,000 cu.yd. sand, (d) 70,000 asphalt paving blocks, (e) 600,000 gal. road oil, cold application, (f) 200,000 gal. road oil, hot application, (g) 700 ton asphaltic cement, (h) 190,000 gal. road surfacing, (i) 846 lin.ft. 12 in. c.i. pipe, from C. H. and R. C. Peckworth, 529 Hudson St., New York City, (a) $99,528; T. F. Touhy Co., 89 Main St., Flushing, (a) $100,050, (b) $13,200, (c) $22,100; Peace Bros., 20 Main St., Flushing, (a) $104,400; Newton Supply Co., Varick Ave., Brooklyn, (c) $22,500; Hastings Paving Co., 17 Battery Pl., New York City, (d) $6,020; Texas Co., 17 Battery Pl., New York City, (e) $37,020, (f) $13,880, (h) $11,235; Warner-Quinlan Co., 79 Wall St., New York City, (e) $38,820, (f) $12,940, (g) $15,589, (h) $10,470; Standard Oil Co., 26 Bway., New York City, (h) $13,125; J. Fox & Co., 253 Bway., New York City, (i) $2,652. Noted Jan. 1.

★**Filter System—Phila., Pa.**—City let contract extending Queen Lane filter system, to E Fay & Son, 2 South Mole St., $367,734

★**Heating, Ventilating and Refrigerating Systems—Pittsburgh, Pa.**—Allegheny Co. let contract building heating, ventilating and refrigerating systems in courthouse, jail and morgue, to L. G. Emery Co., New Castle, $123,329.

★**Cement — Detroit, Mich.** — Rd. Comrs. Wayne Co. let contract furnishing 125,000 bbl. portland cement, to Wolverine Portland Cement Co., Coldwater, $2.67 less $0.15 each for sacks, less 5 per cent.

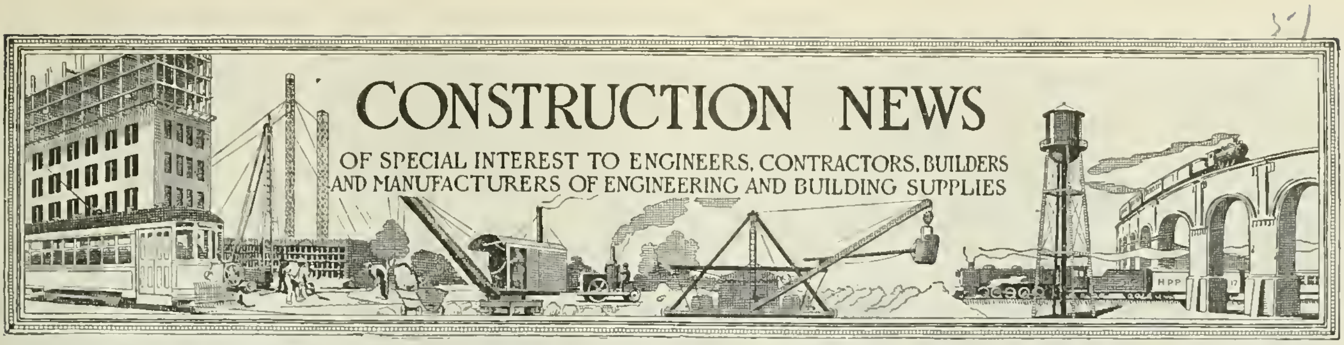
★**Coal Dock and Loading Pockets — Grand Rapids, Mich.**—Kent Fuel Co., 1230 Taylor Ave., let contract building rein.-con coal dock and loading pockets, including conveyor and electrically operated loading machine, to A. W. Morgan, Grand Rapids.

★**Electric Pumps—Sault Ste Marie, Mich.**—City let contract furnishing and installing 4 electrically driven centrifugal pumping units for pumping station, to Allis Chalmers Mfg. Co., West Allis, Milwaukee, $11,707

★**Transmission Line—Plummer, Idaho**—City let contract building electric transmission line from here to Washington Water Power Co. line, at Tekoa, Wash., to R. H Mercer, Plummer, $11,975.

★**Fire Protection System—Livermore, Cal.**—Bd. Supervs. Alameda Co., (Oakland) let contract building fire protection system at Arroyo Sanitorium, involving 3,300 ft. 6-8 in. pipe, 14 hydrants, switchboard and wing, etc., to Schultz Constr. Co., 46 Kearny St., San Francisco. $14,384.

★**Retaining Wall—San Francisco, Cal.**—City and San Francisco Co. let contract building retaining wall on Army St between Evans Ave. and Iowa St., involving 1,500 cu.yd excav., 25,200 sq.yd mass concrete and 52 tons reinforcing bars, to Healy & Tibbetts Constr Co., 9 Main St., $40,257



CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Jan. 27	Avoca, Ia. Adv. Jan. 1.	Jan. 1
Jan. 27	Versailles, Ky.	Jan. 15
Jan. 30	Hugoton, Kan.	Jan. 8
Feb. 3	McCammon, Idaho	Jan. 15
Feb. 4	Elyria, Ohio.	Jan. 22
Feb. 10	Toronto, Ont.	Jan. 1
Feb. 12	Douglas, Ariz.	Jan. 8
Feb. 15	Washta, Ia.	Jan. 15
Feb. 17	Jacksonville, N. C.	Jan. 15

SEWERS

Bids Close		See Eng. News-Record
Jan. 27	Long Island City, N. Y.	Jan. 22
Jan. 27	Edgefield, S. C.	Jan. 8
Jan. 28	Brooklyn, N. Y.	Jan. 22
Jan. 29	Oxford Junction, Ia.	Jan. 15
Feb. 2	Kokomo, Ind.	Dec. 16
Feb. 2	Elmhurst, Ill.	Jan. 8
Feb. 12	Ashley (Wilkes Barre P. O.), Pa.	Jan. 15
Feb. 20	Carnegie, Okla.	Jan. 8

BRIDGES

Bids Close		See Eng. News-Record
Jan. 26	Wilmington, Del.	Jan. 8
Jan. 27	Dublin, Ga.	Jan. 8
Jan. 28	Strawberry, Point, Ia. Adv. Jan. 22.	Jan. 22
Jan. 29	Groesbeck, Tex.	Jan. 22
Feb. 2	Eufaula, Okla.	Jan. 22
Feb. 3	New Jersey	Jan. 22
Feb. 5	Colorado	Jan. 22
Feb. 5	Astoria, Ore.	Jan. 22
Feb. 7	San Carlos, Ariz.	Jan. 15
Feb. 7	Bethlehem, Pa.	Dec. 11
Feb. 10	Schenectady, N. Y. Adv. Jan. 15.	Jan. 15
Feb. 16	Ray Junction, Ariz.	Jan. 22
Feb. 17	Nutley, N. J.	Jan. 22
Feb. 25	Bethlehem, Pa.	Jan. 8

STREETS AND ROADS

Bids Close		See Eng. News-Record
Jan. 26	Wayne, W. Va.	Jan. 15
Jan. 26	Hartshorne, Okla.	Jan. 22
Jan. 27	Montgomery, Ala. Adv. Jan. 1.	Jan. 1
Jan. 27	North Carolina	Jan. 22
Jan. 27	Howell, Mich.	Jan. 1
Jan. 27	Pennsylvania	Jan. 8
Jan. 27	Long Island City, N. Y.	Jan. 22
Jan. 27	Montgomery, Ala.	Jan. 8
Jan. 28	Colby, Kan.	Jan. 22
Jan. 28	Cherokee, Ia.	Jan. 22
Jan. 28	St. Louis, Mo.	Dec. 11
Jan. 28	Indiana	Jan. 15
Jan. 28	Strawberry, Okla.	Jan. 22
Jan. 29	Groesbeck, Tex.	Jan. 22
Jan. 29	Pella, Ia.	Jan. 1
Jan. 29	New Jersey,	Jan. 15
Jan. 29	Jackson, Mich.	Jan. 15
Jan. 30	Hudson, Mich.	Jan. 8
Jan. 30	Franklin, W. Va.	Jan. 22
Jan. 30	Humphrey, Neb.	Jan. 22
Jan. 30	Charlotte, Mich.	Jan. 15
Jan. 30	Tawas City, Mich.	Jan. 15
Jan. 30	New York, N. Y. Adv. Jan. 15.	Jan. 15
Jan. 31	Hillsboro, Tex.	Jan. 15
Jan. 31	Manitowac, Wis.	Jan. 22
Feb. 2	St. Paul, Minn.	Jan. 8
Feb. 2	Clay, W. Va.	Jan. 15
Feb. 2	El Centro, Cal.	Jan. 22
Feb. 2	Upland, Cal.	Jan. 22
Feb. 2	Potosi, Mo.	Jan. 15
Feb. 2	Flint, Mich.	Jan. 15
Feb. 2	Marlow, Okla.	Jan. 22
Feb. 2	Marshall, Tex.	Jan. 22
Feb. 2	Helena, Mont.	Jan. 22
Feb. 2	Ionia, Mich	Jan. 22
Feb. 2	Corsicana, Tex.	Jan. 22
Feb. 3	St. Louis, Mo.	Jan. 15
Feb. 3	Liberty, Mo.	Jan. 15
Feb. 3	Bristol, W. Va.	Jan. 22
Feb. 3	Fresno, Cal.	Jan. 22
Feb. 3	Georgetown, Del.	Jan. 22
Feb. 3	Michigan	Jan. 22
Feb. 3	Chelsea, Okla.	Jan. 22
Feb. 4	Jackson, Mich.	Jan. 22
Feb. 4	Indiana	Jan. 15
Feb. 4	Michigan	Jan. 22
Feb. 5	Clarinda, Ia.	Jan. 22
Feb. 5	North Carolina	Jan. 22
Feb. 5	Ouray, Cal.	Jan. 22
Feb. 5	Continental, O.	Jan. 15
Feb. 5	Sedalia, Mo.	Jan. 15
Feb. 5	Charles Town, W. Va.	Jan. 15
Feb. 5	Denison, Ia.	Jan. 22
Feb. 5	Postville, Ia	Jan. 22
Feb. 6	Huntersville, Mo.	Jan. 15
Feb. 6	Wisconsin	Jan. 22
Feb. 9	La Grange, Tex.	Jan. 22
Feb. 9	Salem, N. J.	Jan. 22
Feb. 9	New Mexico	Jan. 22
Feb. 10	Meadowville, Pa.	Jan. 15
Feb. 10	Waterloo, S. C.	Jan. 22
Feb. 11	New Mexico	Jan. 22
Feb. 18	Fayetteville, Ark.	Jan. 15
Feb. 21	St. Johns, Mich.	Jan. 22
Feb. 24	Montgomery, Ala. Adv. Jan. 8.	Jan. 8
Mar. 2	Charleston, W. Va.	Jan. 22

RAILWAYS

Bids Close		See Eng. News-Record
Feb. 17	Ontario	Jan. 15

EXCAVATION AND DREDGING.

Bids Close		See Eng. News-Record
Jan. 27	Lewiston, Ill.	Jan. 8
Jan. 29	Valley Falls, Kan.	Jan. 22
Jan. 30	Fergus Falls, Minn.	Jan. 15
Jan. 31	Crawfordsville, Ind.	Jan. 15
Feb. 6	Bemidji, Minn.	Jan. 15
Feb. 15	Benjamin, Utah	Jan. 1

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
Jan. 26	Phila., Pa.	Jan. 22
Jan. 26	New York, N. Y.	Jan. 22
Jan. 29	Phila., Pa.	Jan. 22
Jan. 30	Flint, Mich.	Jan. 15
Feb. 1	Pocatello, Idaho	Jan. 1
Feb. 3	Sumter, S. C.	Jan. 15
Mar. 1	Edmonton, Alta.	Jan. 8
Mar. 1	Cedar Rapids, Ia.	Jan. 22

BUILDINGS

Bids Close		See Eng. News-Record
Jan. 24	Phila., Pa.	Jan. 22
Jan. 25	Phila., Pa.	Jan. 15
Jan. 26	Cleveland, Ohio	Jan. 8
Jan. 26	New York, N. Y.	Jan. 22
Jan. 26	Moline, Ill.	Jan. 22
Jan. 27	Cleveland, Ohio.	Jan. 22
Jan. 27	Cheyenne, Wyo.	Jan. 1
Jan. 27	Chester, Pa.	Jan. 15
Jan. 27	Webster, S. D.	Jan. 15
Jan. 28	Detroit, Mich.	Jan. 22
Jan. 28	Olympia, Wash.	Jan. 15
Jan. 28	Barnes City, Ia.	Jan. 15
Jan. 30	Vercheres, Que.	Jan. 15
Jan. 30	Watertown, S. D.	Jan. 15
Jan. 31	Racine, Wis.	Jan. 22
Jan. 31	San Bernardino, Cal.	Jan. 22
Feb. 1	Grand Island, Neb.	Jan. 15
Feb. 1	Mitchell, S. D. Adv. Dec. 28.	Dec. 20
Feb. 1	Duluth, Minn.	Dec. 26
Feb. 1	White Sulphur Springs, W. Va.	Jan. 22
Feb. 1	Salt Lake City, Utah	Jan. 1
Feb. 1	Virginia, Minn.	Jan. 8
Feb. 2	Independence, Cal.	Jan. 1
Feb. 2	Canton, Ohio	Jan. 8
Feb. 2	Holdenville, Okla.	Jan 15
Feb. 3	Sac City, Iowa	Jan. 8
Feb. 3	McKinley, Minn.	Jan 15
Feb. 5	Calgary, Alta.	Jan. 8
Feb. 9	Oconomowoc, Wis.	Jan 8
Feb. 9	Woodbine, Ia.	Jan. 22
Feb. 13	Dayton, Ia.	Jan. 15
Feb. 15	Westmount, Que.	Jan. 22
Feb. 16	Halifax, N. S.	Jan. 22
Feb. 17	Aurelia, Ia.	Jan. 22
Feb. 17	Columbus, Neb.	Jan. 8
Feb. 19	Manitowoc, Wis.	Jan. 15
Feb. 19	Johnson City, N. J. Adv. Jan. 15.	Jan. 15
Feb. 20	Salt Lake City, Utah	Jan. 1
Feb. 24	East Orange, N. J.	Jan. 22
Mar. 1	Racine, Wis.	Jan. 1
Mar. 1	Carlton, Ont.	Jan. 15
Mar. 1	Detroit, Mich.	Jan. 22
Mar. 1	Montreal, Que.	Jan. 15
Mar. 1	Alpena, Mich.	Jan. 15
May 15	Syracuse, N. Y.	Dec. 11

FEDERAL GOVERNMENT WORK

Bids Close		See Eng. News-Record
Jan. 26	Dredging—New York, N. Y. Adv. Jan. 1.	Jan. 1
Jan. 26	Steam Engines, etc.—Yuma, Col.	Jan. 22
Jan. 27	Tar—Trenton, N. J.	Jan. 22
Jan. 28	Torpedo Storage Racks — Spec. 4060—Newport, R. I.	Jan. 15
Jan. 28	Laundry — Spec. 4081 — Newport, R. I.	Jan. 15
Jan. 28	Quay Wall—Spec. 4112—Wash., D. C.	Jan. 15
Jan. 28	Sewers—Wash., D. C.	Jan. 22
Jan. 28	Completing Storage Plant —Spec. 4115—Wash., D. C.	Jan. 22
Jan. 29	Dredging—New Orleans, La. Adv. Jan. 1.	Jan. 1
Feb. 2	Tower and Dwelling—Rincon, P. R. Adv. Dec. 11.	Dec. 11
Feb. 3	Road Work — Brevard, N. C.	Jan. 15
Feb. 5	Clay—Cape Henry, Va. Adv. Jan. 15.	Jan 15
Feb. 5	Extension to Post Office — Ft. Worth, Tex.	Jan. 22
Feb. 9	Dredging — Providence, R. I.	Jan. 15
Feb. 9	Remodeling Post Office and Courthouse—Waco, Tex.	Jan. 22
Feb. 10	Mixer—Monroe, Mich.	Jan. 22
Feb. 11	Repairing Dry Dock—New York, N. Y.	Jan. 15
Feb. 11	Building Extension—Spec. 4024—Puget Sound, Wash.	Jan. 15
Feb. 11	Theodolites—Wash, D. C. Adv. Jan. 22.	Jan. 22
Feb. 11	Fuel Oil Storage Plant—Spec. 4102 — San Diego, Cal.	Jan. 22
Feb. 11	Altering Building — Spec. 4116—San Francisco, Cal.	Jan. 22
Feb. 11	Dispensary—Spec. 4101—Norfolk, Va.	Jan. 22
Feb. 11	Dredging—Phila, Pa.	Jan. 22
Feb. 12	Side Wheel Steamboat — St. Louis, Mo. Adv. Jan. 15.	Jan. 15
Feb. 14	Seaplane Hangars, etc. — Hampton, Roads, Va.	Jan. 22
Feb. 14	Lock and Dam—Pittsburgh, Pa. Adv. Jan. 22.	Jan. 22
Feb. 18	Remodeling and Extending —Sacramento, Cal.	Jan. 22
Feb. 18	Radio Building—Spec. 4107 Milwaukee, Wis.	Jan. 22
Feb. 20	Portland Cement—Florence, Ala. Adv. Jan. 22.	Jan. 22
Feb. 25	Roof — Spec. 4113 — New York, N. Y.	Jan. 8

MISCELLANEOUS

Bids Close		See Eng. News-Record
Jan. 26	Freight Sheds—Stapleton, S. I., N. Y.	Jan. 22
Jan. 26	Phase Generators—Winnipeg, Man.	Jan. 8
Jan. 26	Drilling Well — Vandalia, Mo.	Jan. 15
Jan. 26	Bridge Materials—Blackfoot, Idaho	Jan. 22
Jan. 26	Wires and Cables—Milwaukee, Wis.	Jan. 22
Jan. 26	Hydrants, etc.—Milwaukee, Wis.	Jan. 22
Jan. 27	Paving Materials—Detroit, Mich.	Jan. 22
Jan. 28	Cement Lumber, etc. — Newton Ia.	Jan. 22
Jan. 28	Portland Cement, etc. — Brooklyn, N. Y.	Jan. 22
Jan. 28	Electric Wiring, etc.—Binghamton, N. Y. Adv. Jan. 15.	Jan. 15
Jan. 29	Grand Stand—West Allis (Milwaukee P. O.), Wis.	Jan. 22
Feb. 2	Asphalt Road Oil—St. Paul, Minn.	Jan. 8
Feb. 6	Coal Pocket — Corning, N. Y.	Jan. 22
Feb. 10	Breakwater — Schenectady, N. Y. Adv. Jan. 15.	Jan. 15
Feb. 12	Asheville, N. C.	Jan. 22

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. C., Asheville—City Comrs. will sell $350,000 bonds Feb. 2, to improve waterworks system. G. C. Hunter, secy-treas.

O., Youngstown—City plans to extend waterworks system. Bonds for $600.000 voted for project. M. Knowles, Inc., Jones Law Bldg., Pittsburgh, engr.

Kan., Topeka—City plans to build filtration plant, to have 10,000,000 gal. capacity. About $100,000. Engineer will be selected at once.

Neb., North Platte—City plans to increase water supply and extend mains. About $100,000. Engineer not selected.

Mont., Helena—City plans election in spring to vote on $125,000 bonds to build 6 to 7 mi. pipe line from Rimini to intake reservoir on Ten Mile Creek. J. H. McCleod, Helena, engr.

Okla., Carnegie—City Clerk soon receives bids improving water supply, to include construction of deep wells and 100,000 gal. surface reservoir, involving 5,000 cu.yd. earth excav. About $24,000. V. V. Long & Co., 1300 Colcord Bldg., Oklahoma, engrs.

Ore., Enterprise—City voted $120,000 bonds to extend waterworks system, including laying c.i. or wood water mains and branches. O. J. Roe, recdr.

Ore., Milton—City voted $5,000 bonds to build waterworks system. S. D. Peterson, city atty.

Ore., Scio—City plans to build cyclopean or rubble masonry dam, flume and timber headgate, taking 47 second ft. of water from Thomas Creek for pumping, light and power plant. Cost $38,427. A. G. Prill, mayor.

BIDS DESIRED

O., Elyria—Until Feb. 4, by H. A. Beck, dir. safety-serv., building 4½ mi. force main, involving (1) 23,800 lin.ft. excav. and backfill, including 21,500 cu.yd. earth and 3,300 cu.yd. detached boulders, rock and shale, (2) 23,800 lin.ft. steel and c.i. pipe and specials, valves and appurtenances, (3) 6,700 lb. manhole frames and covers, (4) 8,000 lb. miscellaneous cast iron and steel, (5) 560 cu. yd. concrete masonry, (6) 27 M brick, (7) 7,200 lb. steel reinforcement. Bids will be received on any or all items. M. Knowles, Inc., B. F. Jones Bldg., Pittsburgh, engrs.; advertised in this issue.

Mich., Detroit—Until Feb. 17, by Bd. Water Comrs., 232 East Jefferson Ave., building foundation and sub-structure for low lift pumping station. H. S. Starkey, secy.; advertised in this issue.

Okla., Chelsea—See "Streets and Roads."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Kan., Galena—City let general contract extending water-works system, to Ray & Son, Baxter Springs, $20,940; pumping equipment, to Merkle Mchy Co., 508 Interstate Bldg., Kansas City, Mo., $5,958; pipe to Amer. Cast Iron Pipe Co., Scarritt Bldg., Kansas City, Mo., $3.521.

★Wyo., Casper—City let contract building water-gallery in bed of Platte River at pumping station intakes, also building and revising pumping station, etc., to W. F. Henning, Casper. Work involves 5,000 cu. yd. earth excav., 90 cu.yd. rein.-con., 1 steel headgate and complete electric light fixtures. About $47,650.

★Okla., McAlester — City will improve waterworks system. Bonds for $125,000 voted for project. Work will be done by day labor.

Cal., Alpaugh—Supervs. Tulare Co. (Visalia), received only bid building distributing system, Water-works Dist. 1, from T. Haverty Co., 8th and Maple Sts., Los Angeles, 6,048 ft. 2 in. c.i. pipe @ $0.58 per ft., 5,206 ft. 3 in., $0.99, 1,899 ft. 4 in. $0.94, 1,705 ft. 6 in., $1,4685, 2,000 ft. ¾ w.i. pipe, $0.09, 1,360 ft. 12 in. concrete pipe, $1.10, concrete stand pipe, $115, concrete circular pit, $1,600, trenching and backfilling, $0.12 per lin.ft., removing present pump, motor, etc., $1,500.

Cal., Manhattan Beach (Manhattan P.O.)—City received bids uncovering, recaulking with lead and recovering 10 mi. water pipe, from T. Haverty Co., 8th and Maple Sts., Los Angeles, $48,250, or cost plus 12½ per cent; Foundation Co., Holbrook Bldg., San Francisco, cost plus 10 per cent; Fleming Constr. Co., Pomona, cost plus 10 per cent.

★Cal., Santa Barbara—City let contract furnishing and laying 2,000 ft. continuous wood stave pipe from chlorination tunnel to surge chamber site at south portal of Mission tunnel, to Redwood Mfg. Co., 822 East 3rd St., Los Angeles, $10,772.

Cal., Whittier—City received bids furnishing and erecting boilers and generators, from Terry & Carpenter, Sterling boilers, $18,070, Murray pump, $48,893, Kerr turbine and Allis-Chalmers generator, $16,911, switchboard $2,400, total, $81,274; T. Haverty Co., 8th and Maple Sts., Los Angeles, Foster boilers, $15,250, Ludlow engine, $57,900, Kerr turbine and Allis-Chalmers generator, $14,800, swithchboard, $2,321, total, $90,221; furnishing and erecting pump and boiler, from Bryon Jackson Iron Wks., 336 East 3rd St., Los Angeles, $6,854, T. Haverty Co., 8th and Maple Sts., Los Angeles, $8,470, C. Terry, $8,588.

Sewers

PROPOSED WORK

Mass., Arlington—City having plans prepared by Massachusetts State Bd. Health, State House, Boston, for 18,500 ft. 22 x 25 in. concrete sewer, over right of way to drain areas adjacent to Mystic Lakes. About $307,700

O., Garfield Heights—Village having surveys made and receives bids about June 1, building sewer in Bway. R. Hecker, 905 Leader-News Bldg., Cleveland, engr.

Minn., Duluth—J. A. Farrell, city comr., soon lets contract laying 3,100 ft. sewer in 4th alley from 44th to 45th Aves., W., and in 45th Ave., W., to Traverse Alley, thence to 49th Ave., W., involving 436 ft. 8 in. and 2,641 ft. 20 in. concrete pipe. About $15,267. E. K. Coe, city engr.

Mont., Havre—City plans to build sewage disposal plant and necessary sewer connections. About $80,000. C. W. Swearingen, Havre, engr.

Wash., Spokane—City plans to build vitr. or cement sewers in Altamount Dist. and Union Park. About $68,500. A. D. Butler, city engr.

Ore., Klamath Falls—City adopted resolution to issue $50,000 bonds to build trunk and branch sewerage system, vitr. or cement pipe, in Mills Addition. J. Cleghorn, city engr.

BIDS DESIRED

N. Y. Brooklyn—Until Jan. 28, by E. Riegelmann, boro. pres., furnishing all labor and material for building sewers in Lincoln Rd. from Nostrand Ave. to point 500 ft. east of Nostrand Ave., East New York Ave. from point 500 ft. east of Nostrand to Utica Aves., New York Ave. and Midwood St., Troy, Schenectady and Utica Aves. between East New York Ave. and Rutland Rd., 15th Ave. from 36th to 37th Sts., 37th St. from 15th Ave. to West St., also building sewer basin in northeast corner of Jackson St. and Debevoise Ave.

N. Y., Long Island City—Until Jan. 27, by M. E. Connolly, pres. Queens Boro., building automatic electric pumping station and appurtenances at Genesee St. and North Conduit Ave., to lay temporary pressure pipe in North Conduit Ave. from Genesee St. to Sutter Ave., in Sutter Ave. from North Conduit Ave. to Elderts Lane, temporary drain in Sutter Ave. from Elderts Lane to Railroad Ave.; building sewer and appurtenances in Birch St. from Jamaica Ave. to point 230 ft. south of Jamaica Ave., 4th Ward; Haydock St. from Queens to Franconia Aves., Franconia Ave. from Haydock to Idaho Sts., 3rd Ward.

N. J., Nutley—Until Feb. 17, by Town Clerk, building main sewer, involving 1,830 lin.ft. rock tunnel, 1,720 lin.ft. 30-48 in. concrete pipe, etc. G. B. R. Symonds, town engr.; advertised in this issue.

Ia., Postville—Until Feb. 6, by W. Shepherd, town clk., building storm sewers involving 3,770 lin.ft. 21-36 in. vitr. sewer pipe, except larger sizes may be segment block pipe, 12 manholes. A. R. Coffeen, Decorah, engr; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Brooklyn—E. Riegelmann, boro. pres., received lowest 3 bids Jan. 14, repairing sewer in Johnson St. between Leonard and White Sts., from Booth & Flynn, Ltd., 17 Battery Pl., $145,412; J. F. Cogan Co., 233 Bway., 164,493; North Atlantic Constr. Co., $169,890. Contractors all of New York City. Noted Jan. 8.

★Wyo., Casper—City let contract building sanitary sewerage system in Dist. 1, 2b and 3b, to W. F. Henning, Casper. Work involves 11,000 ft. 8 in. and 1,395 ft. 12 in. vitr. pipe, five hundred thirty-two 8 x 6 in. wyes, 64 manholes and 12 flushers.

Col., Denver—City let contract supplying and installing 8 in. vitrified pipe in Sub Dist. 18, West and South Side Sewer to Gordon Constr. Co., Century Bldg., Denver, involving 19,000 ft. 8 in. vitr. pipe. About $24,158.

Bridges

PROPOSED WORK

Conn., Hartford—New York, New Haven & Hartford R.R., New Haven, plans to build rein.-con. bridge, at Clayton Crossing, between here and New Britain. About $75,000. E. Gagel, New Haven, ch. engr.

O., Dayton—Montgomery Co. plans to build 700 ft. bridge, 20 ft. wide, consisting of three 230 ft., rein.-con. arch or steel spans, over Miami River on Bway., here. About $200,000. P. S. Bookwalter, co. surv.

O., Fremont—City plans to build 400 ft. concrete arch bridge, 40 ft. wide, 2 or 3 spans, on State St. About $200,000. L. H. Wisner, Fremont, engr.

S. D., Yankton—Dirs. Meridian Highway Bridge Co. will select engineers Jan. 27, to build bridge over Missouri River. About $1,500,000.

Ore., Oregon City—Clackamas Co. plans to spend $50,000 to build bridges. C. H. Compton, co. roadmaster.

Ore., Portland—Dept. Pub. Wks. soon lets contract building 306 ft. timber trestle, 10 ft. roadway, over channel connecting Columbia Slough. About $10,000. S. C. Pier, purch. agt.

Ore., Roseburg—Douglas Co. plans to expend $20,000 for bridges. E. H. Lenox, clk.

BIDS DESIRED

New Jersey—Until Feb. 3, by State Highway Comn., Broad St. Bank Bldg., Trenton, furnishing and building 117,000 lb. steel plate girder superstructure, Bridge O, Route 9, Sect. 2, 69 ft. span, 30 ft. wide. Hunterdon Co.; also bridges on Route 6. Mullica Hill-Woodstown Sect., Salem and Gloucester Counties, incased I-beam Bridge 69, 31 ft. 6 in. span, 30 ft. wide, incased I-beam Bridge 35, 32 ft. span, 30 ft. wide, concrete slab Bridge 70, 12 ft. span, 30 ft. wide, widening present box Culvert 71, 8 ft. span, 30 ft. wide, and reinforcing present brick arch with concrete, 10 ft. span, 30 ft. wide; advertised in this issue.

Ark., Little Rock—Until Mar. 2, by Comrs. Bway.-Main St. Bridge Dist., Pulaski Co., Southern Trust Bldg., constructing 2 rein.-con. bridges over Arkansas River. G. W. Donaghey, chairman; advertised in this issue.

Tex., Groesbeck—Until Jan. 29, by J. E. Bradley, judge Limestone Co., building one 70 ft. steel truss bridge and nine 20 ft. concrete slab bridges over Navasota River, involving 358 cu.yd. rein.-con. 500 cu.yd. concrete and 163 tons structural steel. About $33,648. F. P. Holt, Mexia, engr. Noted Jan. 15.

Okla., Eufaula—Until Feb. 2, by Simpson Twp. Bd., Stidham, building two 100 ft. steel span bridges over North Fork Canadian River, here. About $25,000. G. W. Mitchell, Eufaula, engr.

Col., Avondale—Until Feb. 5, by State Highway Comn., Denver, building 424 ft. bridge, 20 ft. roadway, over Huerfano River, between here and Fowler, to have five 80 ft. concrete arch spans, fill and gravel surfaced approaches. Work involves 93,345 lb. reinforcing steel, 2,882 cu.yd. rein.-con., 2,000 cu.yd. earth approach and fill. About $101,169. J. E. Maloney, state engr.

Ariz., Ray Junction (Kelvin P. O.)—Until Feb. 16 (change of date), by E. G. Dentzer, secy. Highway Comn. Pinal Co., (Florence) building 45 ft. clear span bridge, on Kelvin-Hayden Rd., near here; advertised in this issue. Noted Jan. 1.

Ore., Astoria—Until Feb. 5, by State Highway Comn., Portland, building 1 double leaf trunnion bascule bridge on Columbia River Highway over Youngs Bay, near here, involving 58,000 lin.ft. piling, 446 M ft. timber, 1,172 cu.yd. Class "A." 331 cu.yd. Class "B" and 2,550 cu.yd. Class "D" concrete, 75,500 lb. reinforcing and 470,000 lb. structural steel, 65,000 lb. machinery, etc. H. Nunn, Salem, state highway engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Michigan—State Highway Dept., Lansing, let steel contract building State Trunk Line Bridge 318, 140 ft. long, 18 ft. wide, over Pine River, Rudyard Twp., to have 60 ft. deck-plate girder, and two 40 ft. I-beam approach spans, involving 50 tons steel, to Brookville Bridge Co., Brookville, O., $6,700, building two 24 ft. abutments and two 9 ft. piers to support bridge spans, involving 221 cu.yd. rein.-con., to G. Anderson, Marquette, $10,524; steel contract building State Trunk Line Bridge 319, 140 ft. long, 18 ft. wide, over west branch Pine

Bridges (Continued)

River to have 60 ft. deck-plate girder with two 40 ft. I-beam approach spans, two 24 ft. concrete abutments and two 9 ft. concrete piers ,to Brookville Bridge Co., Brookville, $6,700.

★**Wash., Doty**—Lewis Co. let contract building 2 bridges over Chehalis River, near here, wood and steel spans with pile abutments, to N. C. Sears, Winlock, $11,995.

★**Cal., Fresno**—Bd. Supervs. Fresno Co. let contract building 4 new rein.-con. bridges and repairing 7, to J. E. Mitchell, Fresno, $36,272.

Structural Steel

PROPOSED WORK

Mass., Boston—Bank—See "Buildings."

Conn., Hartford—See "Industrial Works."

N. Y., Brooklyn—Recreation Center—See "Buildings."

N. Y., New York—Bank and Office—See "Buildings."

Md., Baltimore—Office—See "Buildings."

Md., Baltimore—Theatre—See "Buildings."

S. C., Greenville—Bank and Office—See "Buildings."

O., Cleveland—Office—See "Buildings."

Mich., Detroit—Church—See Buildings.'

Mich., Detroit—Temple—See "Buildings."

Ill., Streator—See "Industrial Works."

Kan., Wichita—See "Industrial Works."

Neb., Omaha—Bank and Office—See "Buildings."

Tex., Marshall—See "Streets and Roads."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Conn., Waterbury**—Bank—See "Buildings."

★**N Y., Newton** (Flushing P. O.)—School—See "Buildings."

★**N. Y., New York**—Hotel—See "Buildings."

★**N. Y., New York**—Office—See "Buildings."

★**N. Y., New York**—Theatre and Office—See "Buildings.'

★**N. J., Bloomfield** — See "Industrial Works."

★**O., Cleveland**—See "Industrial Works."

★**Ill., Chicago**—Loft—See "Buildings."

★**Mo., Kansas City**—Office, etc.—See "Buildings."

★**Mo., Kansas City**—See "Industrial Works."

★**Cal., Los Angeles**—Office and Stores—See "Buildings."

★**Cal., Los Angeles**—Theatre and Office—See "Buildings."

★**Cal., Oakland**—Hospital—See "Buildings."

★**Cal., San Francisco**—Bank and Office

Reinforced Concrete

PROPOSED WORK

Mass., Boston—Bank—See "Buildings."

Conn., Hartford—See "Industrial Works."

Md., Baltimore—Theatre—See "Buildings."

O., Cleveland—Office—See "Buildings."

Mich., Detroit—Temple—See Buildings."

Mich., Detroit—Church—See "Buildings."

Mich., Flint—See "Industrial Works."

Mich., Grosse Pointe (Detroit P. O.)—Club House—See "Buildings."

Ill., Chicago—See "Industrial Works."

Kan., Wichita—See "Industrial Works."

Cal., Oakland—See "Industrial Works."

BIDS DESIRED

O., Cleveland—Jail—See "Buildings."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—Bank—See "Buildings."

★**N. J., Bloomfield**—See "Industrial Works."

★**N. J., Hilton** (Dover P. O.)—See "Industrial Works."

★**Va., Danville**—See "Industrial Works."

★**O., Cleveland**—Commercial—See "Buildings."

★**O., Cleveland**—See "Industrial Works."

★**Mo., Kansas City** — See "Industrial Works."

★**Mo., St. Louis**—See "Industrial Works."

★**Cal., Los Angeles**—Office and Stores—See "Buildings."

★**Cal., Los Angeles**—Theatre and Office—See "Buildings."

★**Cal., Oakland**—Hospital—See "Buildings."

★**Cal., San Francisco**—Bank and Office—See "Buildings."

★**Cal., Ukiah**—See "Miscellaneous."

★**Ont., Windsor**—School—See "Buildings."

Streets and Roads

PROPOSED WORK

Mass., Boston—City having plans prepared by City Planning Bd., engrs., City Hall, for widening Exchange St., to 54 ft. Bill has been presented to State Legislature asking for $1,500,000 for project.

Conn., New Haven—City plans to pave various streets with bituminous macadam, sheet asphalt and concrete. About $150,000. F. L. Ford, city engr.

Del., Dover—Kent Co. plans to grade, drain and pave 55,440 ft. road from here to Felton, 16 ft. wide, involving 98,650 sq.yd. concrete. C. M. Upham, c/o State Highway Dept., Dover, engr.

Del., Georgetown—Sussex Co. plans to grade, drain and pave 13,200 ft. road from Ellendale toward Greenwood, involving 20,530 sq.yd. concrete, 11,616 ft. road from Five Points to Lewes, 18,070 sq.yd. concrete, 24,550 ft. road from Roxana to Millville, 20,000 cu.yd. earth excav. and 39,000 sq.yd. bituminous macadam, 21,120 ft. road from Laurel to Georgetown, 32,850 sq.yd. concrete, 13,200 ft. road from Greenwood toward Ellendale, 20,530 sq.yd. concrete, all 14 ft. wide; 31,680 ft. road from Harbeson to Five Points, 56,320 sq.yd. concrete, 21,120 ft. road from Milton to Harbeson, 37,540 sq.yd. concrete, 52,800 ft. road from Milford to Milton, 93,870 sq.yd. concrete, 26,400 ft. road from Five Points to Rehoboth, 47,000 sq.yu concrete, all 16 ft. wide. C. M. Upham, c/o Highway Dept., Dover, engr.

Del., Wilmington—New Castle Co. plans to grade, drain and pave 31,680 ft. road from Blackbird to Middletown, involving 56,320 sq.yd. concrete; 34,640 ft. road from Summit Bridge to Red Lion, 63,360 sq.yd. concrete; 21,120 ft. Naaman's Rd. between Phila. Pike and Faulk Rd., 37,550 sq.yd. concrete; 18,480 ft. road from Red Lion to St. Georges, 32,850 sq.yd. concrete; 18,480 ft. road from Mt. Pleasant to Boyd's Corner, 32,850 sq.yd. concrete; 15,840 ft. from Odessa to Blackbird, 28,160 sq. yd. concrete; 15,840 ft. road from Blackbird to Smyrna, 28,160 sq.yd. concrete; all 16 ft wide. C. M. Upham, c/o State Highway Dept., Dover, engr.

Md., Baltimore—R. K. Compton, chn. Paving Comn., 214 East Lexington St., soon receives bids paving Ellwood Ave. from Eastern Ave. to Boston St., Lancaster St. prom President to Caroline Sts., Chester St from Pratt St. to waterfront, O'Donnell St. from Eastern to Ellwood Aves., Bolton St. from Biddle to Preston Sts., Light St. from Weyler to Wells Sts., Russell St. from Bush St. to Fremont Ave., and Barney St. from Hanover to Light Sts., total length 3 mi., sheet asphalt on concrete base. About $450,000 available for project.

W. Va., Berkeley Springs—Morgan Co. voted $250,000 bonds to build 17 mi. Class "A" road from Paw Paw to Bath, Capon Dist. F. L. Hawkins, co. engr.

North Carolina—State Highway Comn., Raleigh, plars to top soil 10 mi. road from Yanceyville (Caswell Co.) to Alamance Co. line, sand clay 10 mi. road, Rowan Co., 8 mi. Tyrell Co. and 10 mi. Hoke Co., gravel 13 mi. Clay Co., 10 mi. Henderson Co. and 18 mi. Surrey Co. About $40,000. W. S. Fallis, state highway engr.

North Carolina—State Highway Comn., Raleigh, rejected bids received Jan. 3, hard surfacing 8 mi. road, 16 ft. wide, Graham Twp., Alamance Co. W. S. Fallis, state highway engr.

O., Cleveland—Comrs. Cuyahoga Co. received no bids grading, draining and paving Hall Rd. from Coe Ridge to North Ridge Rd., involving 17,000 cu.yd. earth and 1,700 cu.yd. sewer trench excav., 30,000 sq.yd. waterbound and 30,000 sq.yd. penetration macadam, and 1,270 ft. 10 in. corrugated and 30,000 ft. 4 in. vitr. sewer pipe. About $100,833. Work will be readvertised. W. A. Stinchcomb, co. engr.

O., Cleveland—Elworthy-Helwick Co., 630 Williamson Bldg., having surveys made grading, building sewers, water mains and sidewalks on Lake Shore Rd. About $200,000. L. Jackson, Beckman Bldg., engr.

O., Cleveland—S. H. Kleinman Realty Co., Natl. City Bldg., having surveys made grading and building sidewalks on 5,000 ft. Euclid Ave., past Coit Rd. About $80,000. F. A. Pease Eng. Co., 804 Marshall Bldg., engrs.

O., Dayton — Montgomery Co. plans to grade and gravel 3,700 ft. Hoover Ave. from Lynam St. to Dayton. Toledo & Chicago R.R., 30 ft. wide, involving 25,000 cu.yd. earth excav. and 8,200 sq.yd. gravel surfacing. About $20,000. P. S. Bookwalter, co. surv.

O., Lakewood (Cleveland P. O.)—Nye & Cam, The Arcade, Cleveland, soon let contract grading Onondaga Park, involving 15,000 cu.yd. earth excav. About $12,000. W. H. Evers, 332 The Arcade, Cleveland, engr.

O., Xenia—City plans to pave and build sewers in various streets, brick, concrete or sheet asphalt. About $140,000. K. Riddle, Xenia, engr.

Mich., Detroit—City soon lets contract grading and paving Canfield Ave. from McClellan to Pennsylvania Aves., Craig from Trombly to Milwaukee Aves., Ferry Ave. from Baldwin to VanDyke Aves., Gladstone Ave. from La Salle Blvd to Linwood Ave., Green Ave., from Fort to Chatfield Sts., Hancock Ave. from J. Campau to Mt. Elliott Aves., Holmur Ave. from Joy Rd. to Collingwood Ave., Highland Ave. from 12th St to Wabash Ave., Indiandale Ave. from 12th St. to Ellen Ave., Kanter Ave. from Elmwood to Moran Sts., Lakeview Ave. from Kercheval to Charlevoix Aves. and Naples St. from Harper St. to Piquette Ave., 26 ft. wide, asphaltic concrete surface on 6 in. concrete base, Berea or Medina curbstone, concrete curb setting, involving 22,743 cu.yd. excav., 27,821 ft. curbing, 42,600 sq.yd. paving, 794 cu.yd. concrete and 2,041 lin.ft. retaining stone. C. W. Hubbell city engr.

Mich., Grand Rapids—City having estimate prepared for grading and paving 2,700 ft. Ridge St. from Buchanan Ave. to North and South Quarter line, 18 ft. wide, involving 5,400 sq.yd. concrete. About $21,230. G. J. Wagner, city engr.

Mich., Munising—Rd. Comrs. Alger Co. soon let contract shaping, grading, draining and surfacing 6.51 mi. State Trunk Line Rd. 25-9, 16 ft. wide, involving 61,108 sq.yd. waterbound macadam, 156 cu.yd. concrete, 1,675 lb. steel, etc.; grading and draining 1.785 mi. State Trunk Line Rd. 25-10, 24 ft. wide, involving 27,900 cu.yd. eath excav., 365 cu.yd. concrete and 11,905 lb. steel.

Wis., Grand Rapids — Wood Co. adopted county and state aid road and bridge construction program, involving grading and gravel surfacing. About $61,335. E. Morris, comr.

Minn., Duluth—City soon lets contract paving 4,675 ft. Jefferson St. from 22nd Ave. E. to 32nd Ave. E., 24 ft. wide, involving 13,112 sq.yd. asphalt, 9,121 lin. ft. concrete curbing, 400 ft. concrete heading, 10,407 cu.yd. earth and 515 cu.yd. rock excav., 801 ft. 3 in. drain tile, 1,760 ft. 12-18 in. sewer pipe, and 264 ft. 28 in. cement pipe. About $88,691. E. K. Coe, city engr.

Neb., Albion—City having plans prepared and receives bids about Feb. 1, for 70,000 yd. concrete pavement. About $200,000. W. E. Standeven, 414 Bee Bldg., Omaha, engr.

Neb., Auburn—City having plans prepared by Grant, Fulton & Letton, engrs., 505 Bankers Life Bldg., Lincoln, paving 7,500 ft. Dists. 5, 6 and 7, 25 ft. wide, involving 30,000 sq.yd. concrete and 15,000 lin.ft. concrete curbing. About $120,000.

Neb., David City — City receives bids about Feb. 1, paving 4,300 ft. in Dists. 9 and 10, 25 ft. wide, involving 11,000 sq.yd. concrete. 8,600 lin.ft. concrete curbing and guttering. About $40,000. Grant, Fulton & Letton, 505 Bankers Life Bldg., Lincoln, engrs.

Neb., McCook—City had plans prepared by Archer & Stevens, engrs., 609 N. Eng. Bldg., Kansas City, Mo., paving 40 blocks, 25 ft. wide, involving 50,000 sq.yd. asphaltic concrete. About $60,000.

South Dakota—State Highway Comn., Pierre, plans to improve 21 mi. Webster Aberdeen Mobridge Rd., Brown Co., involving 128,500 cu.yd. earth excav., 37,800 cu.yd.

Streets and Roads (Continued)

gravel surfacing, 1,800 lin.ft. corrugated culverts, 775 cu.yd. concrete and 46,000 lb. reinforcing steel for culverts, one 24 ft. span concrete slab bridge, etc. cost $182,567; 16.8 mi. Woonsocket-Wessington Springs-Gann Valley Highway, Federal Aid Project 38, Jerauld Co., 75,000 cu.yd. earth excav., 16,800 cu.yd. gravel surfacing, 1,500 lin.ft. corrugated culverts, 420 cu.yd. concrete and 33,000 lb. reinforcing steel for culverts, 24 ft. concrete slab bridge, etc., $99,253; 15.7 mi. Mitchell-Tripp Rd., Federal Aid Project 39, Davison Co., 74,000 cu.yd. earth excav., 28,550 cu.yd. gravel surfacing, 1,500 lin.ft. corrugated culverts, 375 cu.yd. concrete and 24,000 lb. reinforcement for culverts, one 32 ft. span steel truss bridge, etc., $114,904; 17.55 mi. Salem-Sioux Falls Rd., Federal Aid Project 40, McCook Co., 78,500 cu.yd. earth excav., 26,325 cu.yd. gravel surfacing, 1,450 lin.ft. corrugated culverts, 462 cu.yd. concrete and 30,000 lb. steel reinforcement for culverts, one 32 ft. and one 50 ft. span steel truss bridges, etc., $128,440; 24.4 mi. Britton Sisseton Highway, Federal Aid Project 41, Marshall and Roberts Counties, 146,400 cu.yd. earth excav., 30,840 cu.yd. gravel surfacing, 3,700 lin.ft. corrugated culverts, 700 cu.yd. concrete and 30,000 lb. reinforcement for culverts, etc., $177,288; 18.95 mi. Mitchell-Tripp Rd., Federal Aid Project 43, Hutchinson Co., 77,000 cu.yd. earth excav., 34,110 cu.yd. gravel surfacing, 450 cu.yd. concrete and 27,000 lb. steel reinforcement for culverts, one 50 ft. span steel truss bridge, etc., $149,635.

Mo., Joplin—J. J. McAfee, city engr., receives bids about April, building 6 concrete highways out of here, for Joplin Special Rd. Dist. Bonds for $500,000 sold for project.

Tex., Eldorado—Schleicher Co. having plans prepared grading and draining 30 mi. Highway 4, from Tom Green Co. line to Sutton Co. line 16 ft. wide, involving 6 mi. crushed rock surfacing, 40 acres clearing and grubbing, 130,000 cu.yd. earth, 15,000 cu.yd. loose rock and 15,000 cu.yd. solid rock excav., 39,700 lb. reinforcing steel and 757 cu.yd. concrete. About $195,000. C. C. Smith, Eldorado engr.

Tex. Marshall—Harrison Co. had plans prepared scarifying, grading, gravel surfacing and draining 19.03 mi Highway 11, from here to county line, 16 ft. wide, involving 11 acres clearing and grubbing, 133,212 cu.yd. unclassified earth excav., 78,466 lb reinforcing steel and 1,234 cu.yd. concrete. About $284,684. G. A. Duren, Marshall, engr.

Tex., Waco—McLennan Co. rejected bids received Jan. 2, surfacing and draining 0.38 mi. Highway 7, known as Waco-Springfield Rd., 15 ft. wide, involving 3,283 sq.yd. 1 course rein.-con., 752 cu.yd. earth excav., 3,506 lb. reinforcing steel and 104 cu.yd. concrete, cost $15,767; 0.63 mi. Highway 31, known as Wacoaxtell Rd., 15 ft. wide, 5,483 sq.yd. 1 course rein.-con., 1,136 cu. yd. earth excav., 986 cu.yd. ditching, 4,438 lb. reinforcing steel and 144 cu.yd. concrete, $26,128. Work will be readvertised. M. Hannah, Waco, engr.

Okla., Wilburton—City having preliminary plans prepared by V. V. Long & Co., engrs., 1300 Colcord Bldg., Oklahoma, paving 8 blocks principal streets, 30 ft. wide. Cost between $60,000 and $75,000.

Colorado—State Highway Dept., Denver, plans to build 2.496 mi. Federal Aid Project 77, between Grand Junction and Palisade, Mesa Co. Work involves 26,160 sq.yd. concrete, 4,866 cu.yd. earth excav., 976 lin.ft. 15-18 in. corrugated metal culverts, etc. About $99,798. J. E. Maloney, state highway engr.

Colorado—State Highway Dept., Denver, soon lets contract paving 1.161 mi. Federal Aid Project 31, between Denver and U. S. A. Genl, Hospital 31. Work involves 12,259 sq.yd. concrete, 2,440 cu.yd. earth excav., 964 sq.yd. overhaul, 309 sq yd. gravel shoulders, 128 cu.yd. concrete headwalls and 118 lin.ft. 24 in. corrugated metal pipe. Cost including cement, $43,604. State to furnish cement cost, $11,419. J. E. Maloney, state highway engr.

Col., Denver—City plans to pave 10 blocks, 48 ft. wide, in East Denver Paving Dist. 3, involving 18,900 sq.yd. asphaltic concrete on concrete base, 2,000 sq.yd. concrete curbing, 135 sq.yd. concrete alley paving, etc. About $60,546. J. B. Hunter, city engr.

Wash., Goldendale—Klickitat Co. received no bids Jan. 7, clearing, grading, draining, graveling and paving 25 mi road in Trout Lake Rd Impvt. Dist. 3, involving 133,000 sq.yd concrete, 120,000 cu.yd. earth and 25,000 cu.yd. rock excav., 22,000 cu.yd. gravel surfacing. About $450,000. Work will be readvertised.

Wash., Port Orchard—City Council plans to grade and gravel Taylor St. from Cline to Sidney Sts., 40 ft. wide. Cost to exceed $10,000. W. A. McLeod, clk.

Wash., Vancouver—City and Clarke Co. having tentative plans prepared for paving connecting strip between main section of city and East 11th St. through Garrison grounds, concrete. About $33,000. R. E. Brady, city clk.

Ore., Astoria—Clatsop Co. will appropriate $15,000 to repair roads, $15,000 for Tillamook Rd., $30,000 for market roads, $25,000 for Melville Seaside Rd. and $60,000 for Olney Rd. J. C. Clinton, clk.

Ore., Enterprise—City voted $50,000 bonds to pave 35 blocks of side streets and alleys, asphaltic concrete, bitulithic or concrete. L. C. Kelsey, 410 Selling Bldg., Portland, engr.

Ore., Eugene—Lane Co. having preliminary plans prepared building and improving 17.5 mi. Eugene-Loraine Rd., cost $119,000, 6 mi. Eugene-Handleyville-Gillespies Corners Rd., $48,000, 16.5 Cottage Grove-Loraine Rd. south to county line, $186,000, 12 mi. Lowell-Reserve Rd., $84,000, all crushed rock macadam; 3 mi. Bear Creek Rd., from Pacific Highway near Junction City to coast road near Blachley, $34,000, 10 mi. Alvadore-Smithfield Rd., $50,000, 3 mi. Elmira Rd. from Alvadore to Harpole Schoolhouse, $27,000, 2 mi. Crow-North County Line Rd., from end of Elmira Rd. to Noti, $10,000, 8 mi. McKenzie Branches, $40,000, 8 mi. Thurston-Blue River Rd., $50,000, 9 mi. Coburg-North County Line Rd., $54,000, 13.5 mi. Haydens Bridge-Wendling Sect. Mohawk Rd., $81,000, 4 mi. road from Haydens Bridge to Camp Creek, $30,000, 11 mi. Irving-Junction City Sect. of Elmira-Prairie Rd., $77,000, all gravel macadam; 25 mi. road from Blachley to Pacific Highway, $403,000, road from Florence to Reserve Line, $60,000, 47 mi. Cascade Forest Reserve-Summit on east end, $642,000, Pacific Highway-West Sect. of Ferguson Rd., $10,000, 18 mi. road from East Forest Line near Deadwood to Blachley, $270,000, 30 mi. road from West to East Forest lines, $525,000, road from Wild Cat Creek Forks to Cushman, $25,000, 10.5 mi. Cottage Grove London Springs-Coast Fork River Rd., $103,500, Glenada-South County Line Rd., $15,000, 10 mi. Cottage Grove-Sharp's Creek Rd., $70,000, Loraine-Wild Cat Creek Forks Sect. of Loraine-Siuslaw Rd., $25,000. 7 mi. Cloverdale Rd. from Pacific Highway south of Creswell to Coast Fork Bridge on Loraine-Goshen Rd., $49,000, Springfield-Lowell-Jasper Rd., $25,000, 10 mi. Goshen-Lowell Rd., $70,000, 3.5 mi. road from Junction City to Ferry at Harrisburg, $21,000. F. Jenkins, W. T. Jordan, C. M. Young and others, members of finance com.

Ore., Oregon City—Clackamas Co. plans to spend $20,000 to pave various roads and $36,000 to grade and gravel market roads. C. H. Compton, co. roadmaster.

Ore., Portland—City plans to improve Farragut St., et al, concrete or asphaltic concrete pavement, concrete or artificial sidewalks and curbs. About $11,834. O. Laurgaard, city engr.

Ore., Roseburg—Douglas Co. plans to gravel market roads, cost $23,000; grade, pave and gravel, county roads, $84,000. M. B. Germond, roadmaster

Cal., San Bernardino—City soon receives bids paving oiling and rock screen surfacing 9th St., involving 65,730 sq.ft. 4 in. concrete and 1,194 lin.ft. cement curbs. W. L. Brown, city engr.

Cal., San Bernardino—City having plans prepared stripping, rolling and laying 2 in. Warrenite surface on 1,960 ft. 3rd St., 54 ft. wide. W. L. Brown, city engr.

Cal., San Francisco—City soon lets contract improving Valley St., between Castro and Noe Sts., involving 1,341 lin.ft. concrete curbing, 460 lin.ft. concrete guttering, 11,043 sq ft. artificial stone sidewalks, 4,240 cu.yd. earth excav., 392 sq yd. vitr. brick, 515 sq.yd. kiln marked vitr. brick and 1,971 sq.yd. asphaltic concrete. About $20,000. M. M. O'Shaughnessy, city engr.

Ont., Meaford—City voted $50,000 by law for 18,000 sq.yd. concrete pavement with curbs and gutters. Engineer not selected.

BIDS DESIRED

N. Y., Long Island City—Until Jan. 27, by M. E. Connolly, pres. Queens Boro., regulating and paving with permanent sheet asphalt on concrete foundation, Pierce Ave. from 5th to 7th Aves., 6th Ave. from Graham to Pierce Aves., 1st Ward, grading and curbing both sides and flagging southerly side of Pierce Ave., recurbing 6th Ave., building receiving basin and appurtenances on northerly corner Pierce and 7th Aves., regulating, grading, curbing, laying sidewalks and paving with sheet asphalt on concrete foundation, building retaining wall and guard rail on Sandol St. from Millwood to Cooper Aves., 2nd Ward; regulating and grading sidewalk space, curbing and laying sidewalks, on easterly side of 22nd St. from New Haven to Brookhaven Aves., regulating and grading sidewalks and gutter spaces and laying sidewalks on easterly side of Beach 22nd St. from Cornaga Ave. to Far Rockaway Blvd., 5th Ward; west side of 77th St. from 88th Ave. to Rockaway Blvd., 77th St. from Jamaica to 88th Aves., 4th Ward; regulating, grading, curbing and laying sidewalks, 91st Ave. from Brooklyn Boro. line to 84th St., 84th St. from 91st Ave. to 90th Rd., 4th Ward.

N. J., Salem—Until Feb. 9, by Rd. Comn., Bd. Freeholders Salem Co., rebuilding Penn Grove-Pennsville Rd., Sect. 3, Lower Penns Neck Twp., involving 12,713 sq.yd. concrete; advertised in this issue.

Del., Georgetown—Until Feb. 3, by Sussex Co., building 12,144 ft. road from Blades to Concord, involving 16,500 sq.yd. concrete, and 17,100 cu.yd. earth excav.; 17,952 ft. road from Coverdale Cross Rds. to Jacob's School, 24,500 sq.yd. concrete and 28,800 cu.yd. earth excav.; 24,180 ft. road from Georgetown to Harbeson, 37,600 sq.yd. concrete and 17,000 cu.yd. earth excav., all 14 ft. wide. C. M. Upham, c/o State Highway Dept., Dover, engr.

Va., Bristol—Until Feb. 3, by R. W. Rigsby, city mgr., paving various streets, involving 20,000 yd. sheet asphalt, 5000 lin.ft. concrete curb, 1000 yd. brick gutter, 3000 cu.yd. excav., necessary sewers, etc. About $65,000. R. L. Morrision, Bristol, engr.

W. Va., Charleston—Until Mar. 2, by Comrs. Kanawha Co., paving 2.6 mi. Elk River Rd., 16 ft. wide. About $138,000. Former bids rejected. F. G. Burdette, Charleston, engr.

W. Va., Franklin—Until Jan. 30, by Comrs. Pendleton Co., grading 4.17 mi. Franklin-Upper Tract, 22 ft. wide, involving 22,000 cu.yd. excav., etc. About $29,000. G. Boggs, co. clk.

W. Va., Grantsville—Until Feb. 27, by Comrs. Calhoun Co., grading 4.5 mi. Arnoldsburg-Spencer Rd., 24 ft. wide, involving 35,000 cu.yd. excav., etc. About $39,000. E. Starcher, Grantsville, engr.

North Carolina—Until Jan. 27, by Div. Office State Highway Comn., Greensboro, hard surfacing 1½ mi. Federal Aid Project 22, Alamance Co., cost $50,000; top soil 8.28 mi. Federal Aid Project 85, Davie Co., $40,000; 10.68 mi. Federal Aid Project 91, $50,000 and 10.85 mi. Federal Aid Project 92, $50,000 both Surry Co.; all 16 ft. wide. W. S. Fallis, state highway engr.

North Carolina—Until Feb 5, by State Highway Comn., Raleigh building 10 mi. Nashville-Rocky Mountain Rd., 16 ft. wide, Ashe Co. About $400,000. W. S. Fallis, state highway engr.

S. C., Walterboro—Until Feb. 10, by town, for 5,000 cu.yd. grading, 20,500 sq.yd. paving and 15,800 lin.ft. curbing. Tomlinson Eng. Co., Columbia, engrs. J. D. Glover, mayor; advertised in this issue.

Indiana—By Bd. Co. Comrs. building roads in following counties:

Jan. 29, Vanderburgh Co., Evansville, repairing Free Turnpikes. W. Copeland, aud.

Jan. 30, Kosciusko Co., Warsaw, concrete road, Clay Twp., known as F. Minear et al Rd.; concrete road Tippecanoe Twp. known as M. Strombeck et al Rd.; concrete road, Washington Twp., known as R. Leifer et al Rd.; gravel road, Jackson Twp., known as J. Ulrey et al Rd.; concrete road, Seward Twp., known as J. B. Richards et al Rd. T. T. Nye, aud.

Feb. 2, Jay Co., Portland, 15,800 ft. crushed limestone road, Green Twp., known as M. H. Spahr Rd.; 5,040 ft. crushed limestone road, Jefferson Twp., known as Bechdolt Rd. H. Martin, aud.

Washington Co., Salem, 19,627 ft. road, Franklin and Gibson Twps., known as Little York and New Philadelphia Rd.; 23,761 ft. road, Jefferson Twp., known as Branaman Ridge Rd.; 20,730 ft. road, Vernon and Howard Twps., known as Mt. Carmel Rd. E. E. Batt, aud.

Spencer Co., Rockport, road in Grass Twp. R. W. Richards, Jr., aud.

Benton Co., Fowler, 10,815 ft. gravel road, Richland Twp., known as A. E. Stuart Rd.; 10,633 ft. gravel road, Richland Twp., known as G. H. Hart et al Rd.; 10,820 ft. gravel road, York Twp., known as E. Strong Rd. W. Mankey, aud.

Jackson Co., Brownstone, concrete work on Chris Orr Rd., Vernon Twp. A. Luedtke, aud.

Streets and Roads (Continued)

Vermillion Co., Newport, 78,075 ft. concrete road, Vermillion, Helt and Clinton Twps., known as J. D. Sturm et al Rd. L. F. Wright, aud.

Ripley Co., Versailles, crushed stone road, Delaware Twp., known as H. Jobst Rd.; crushed stone road, Adams Twp., known as U. S. Shiring Rd., crushed stone road, Jackson Twp., known as A. Meyer Rd. W. D. Robinson, aud.

Clark Co., Jeffersonville, crushed limestone road, Carr Twp., known as H. Schubnell Rd. T. L. Stoner, aud.

Hendricks Co., Danville, constructing Grant Hornaday et al Rd. C. M. Havens, aud.

Feb. 3, White Co., Monticello, 13,089 ft. brick road, Union Twp. F. E. Vinson, aud.

Warrick Co., Booneville, 19,008 ft. broken rock and gravel road, Greer Twp., known as Susott Rd.; 18,419 ft. broken rock and gravel road, Boone Twp., known as Yankeetown Rd.; rock and gravel road, Ohio Twp., known as Slaughter Ave. Rd.; rock and gravel road, Campbell Twp., known as Lost Hill Rd.; rock and gravel road, Ohio Twp., known as Ditney Hill Rd. W. A. Campbell, aud.

Boone and Hendricks Counties, Lebanon, ¾ mi. gravel road, known as D. M. Clark et al free gravel Rd. I. Stephenson, aud.

Warrick Co., Boonville, rock and gravel road, Boone Twp., known as Booneville and Elberfeld Rd. W. A. Campbell, aud.

Rush Co., Rushville, 11,283 ft. macadam road between Union, Washington and Center Twps., known as G. H. Meyer Rd.; 14,870 ft. macadam road, Walker Twp., known as T. K. Mull et al Rd.; 14,268 ft. macadam road, Walker Twp., known as J. M. Wissing et al Rd.; crushed stone road, Anderson Twp., known as W. B. Crane et al Rd. W. H. McMillin, aud.

Grant Co., Marion, 6,275 ft. gravel road, Pleasant Twp., known as S. A. Pulley Rd. A. D. Hunt, aud.

Feb. 4, Allen Co., Ft. Wayne, 14,933 ft. road, Lafayette Twp., known as Aboit Rd.; 13,822 ft. road, Lafayette Twp., known as Sheldon Rd. A. C. McCoy, aud.

Michigan—Until Feb. 4, by F. F. Rogers, state highway comr., Lansing, improving roads in Jackson, Wayne and Branch Counties; advertised in this issue.

Michigan—Until Feb. 3, by State Highway Dept., Div. Office, Port Huron, surfacing 3.068 mi. Assessment Dist. Rd. 150, 9 ft. wide, Sanilac Co., involving 16,200 sq.yd. gravel.

Mich., Ionia—Until Feb. 2, by Rd. Comrs. Icnia Co., grading, draining and surfacing 3.971 mi. Assessment Dist. Rd. 96, 16 ft. wide, involving 12,819 cu.yd. earth excav., 37,271 sq.yd. gravel, 37,271 sq.yd. stone gravel, 5,492 lb. steel, 212 cu.yd. concrete, 889 lin.ft. 12 in. encased tile. Alternate proposals for 666 lin.ft. 12 in. corrugated pipe.

Mich., Jackson—Until Feb. 4, by Rd. Comrs. Jackson Co., grading, draining and surfacing 9.546 mi. Federal Aid Project 35, Sects. C, D, E and G, 18 and 20 ft. wide, involving 42,740 cu.yd. earth excav., 102,164 sq.yd. concrete on concrete base, 96,602 sq.yd. bituminous concrete, 292 cu.yd. concrete, 4,192 lb. steel, 1,206 lin.ft. 12 in. encased tile. Alternate bids on 738 lin.ft. 12 in. corrugated pipe.

Mich., St. Johns—Until Feb. 21, by Clinton Co., grading, shaping and surfacing with Class "B" gravel 5.548 mi. Assessment Dist. Rd., 9 ft. wide, involving 29,040 sq.yd. gravel. About $60,000.

Wisconsin—Until Feb. 6, by State Highway Comn., Citizens Natl. Bank Bldg., Grand Rapids, improving 1.63 mi. Mauston-Elroy Rd., Federal Aid Project 108, Juneau Co., involving 24,302 cu.yd. earth excav., 660 cu.yd. ditching excav., 207 cu.yd. Class "A" concrete, etc.; 0.94 mi. Adams and Bridge St., Federal Aid Project 161, New Lisbon Twp., 6,688 cu.yd. earth excav., 46 cu.yd. Class "A" concrete, 9,208 lin.ft. concrete curbing and guttering, 20,632 sq.yd. concrete surfacing, 72 lin.ft. 12 in. tile.

Wis., Manitowoc—Until Jan. 31, by A. H. Zander, clk. Bd. Pub. Wks., paving various streets, involving 80,000 sq.yd. concrete.

Ia., Cherokee—Until Jan. 28, by city, concrete surfacing 80,000 sq.yd. of streets.

Ia., Cherokee—Until Jan. 28, by Cherokee Co., for concrete surfacing 11,500 sq.yd. country road leading from here. H. R. Bates, Cherokee, engr.

Ia., Clarinda—Until Feb. 5, by city, for 36,000 sq.yd. concrete paving, 25 ft. wide, and 37,000 lin.ft. concrete curbing. About $130,000. H. Traxler, Clarinda, engr.

Ia., Denison—Until Feb. 5, by city, paving 7 blocks main streets, 25 ft. wide, involving 25,000 cu.yd. earth excav., 90,000 sq.yd. 7 in. concrete and 69,000 lin.ft. concrete curb and gutter. About $350,000. Mayne Eng. Co., 207 Pearl St., Council Bluffs, engrs.

Ia., Postville—Until Feb. 5, by W. Shepherd, town clk., for 31,430 sq.yd. pavement and 14,150 ft. curb and gutter, also 10,116 sq.yd. pavement and 7,002 ft. curb and gutter, to be let in separate contracts. Alternate bids will be received on brick, concrete, asphaltic concrete or bitulithic; advertised in this issue.

Ia., Strawberry Point—Until Jan. 28, hy G. Scofield, town clk., for 40,000 yd. pavement and 17,000 ft. curbing and guttering, brick block, vertical fibre brick, asphaltic concrete and bitulithic, all on portland cement concrete base. H. R. Green, 634 Cedar Rapids Savings Bank Bldg., Cedar Rapids, town engr.; advertised in this issue.

Ia., Woodbine—City receiving bids for 51,500 yd. concrete paving, 9,000 yd. grading and 26,346 ft. curbing and guttering. Former bids rejected. About $150,000. Huff, Schmidt & Logan, Woodbine, engrs.

Kan., Colby—Until Jan. 28, by city, for 30,200 yd. paving and 14,800 ft. 8-10 in. tile sewers in principal streets. About $170,000. O. E. Noble, Norton, Engr.

Neb., Broken Bow—Until Jan. 27, by F. M. Skillman, city clk., paving Dist. 1. C. S. Tooley, mayor, advertised in this issue.

Neb., Humphrey—Until Jan. 30, by city, for 30,000 yd. concrete or asphaltic concrete pavement. About $120,000. W. E. Standeven, 414 Bee Bldg., Omaha,, engr.

Neb., Utica—City receiving bids paving 4,000 ft. main streets, Dist. 1, 25 ft. wide, involving 8,000 lin.ft. concrete curbing and guttering and 15,400 sq.yd. asphalt or concrete. About $45,000. Grant, Fulton & Letton, 505 Bankers Life Bldg., Lincoln, engrs.

Tex., Corsicana—Until Feb. 2, by H. E. Traylor, judge Navarro Co., grading, draining and surfacing 11.66 mi. Highway 14 from here to Rice and beyond, 16 ft. wide, involving 13.48 acres clearing and grubbing, 142,621 cu.yd. earth and 1,813 cu.yd. bridge excav., 23,754 cu.yd. gravel, 13,312 lin. ft. concrete piling, 404,285 lb. reinforcing steel, 3,516 cu.yd. concrete, etc. About $323,824. C. Chappell, Corsicana, engr.

Tex., Groesbeck—Until Jan. 29, by J. E. Bradley, judge Limestone Co., improving 7.064 mi. Highway 7, from Freestone Co. line to Tehuarana Creek, 9 ft. wide, involving 284 cu.yd. structural excav., 399 cu.yd. concrete and 27,173 lb. reinforcing steel, cost $69,359; 11.87 mi. Highway 14, from Freestone Co. line to Navasota River, 9 ft. wide, 780 cu. yd. structural and 240 cu.yd. rock excav., 710 cu.yd. concrete, $126,836. F. P. Holt, Mexia, engr. Noted Jan. 15.

Tex., La Grange—Until Feb. 9 (change of date), by J. P. Ehlinger, judge Fayette Co., grading, draining and gravel surfacing 11.27 mi. Highway 3, from Gonzales to Flatonia, thence to Schulenburg, 16 ft. wide, involving 35,837 cu.yd. unclassified earth excav., 181,224 lb. reinforcing steel, 2,354 cu.yd. concrete, etc. Cost $144,827. A. Schlafli, Schulenberg, engr.

Tex., Marshall—Until Feb. 2, by W. H. Strength, judge Harrison Co., grading, gravel surfacing and draining 19.03 mi. Highway 11 from here west to county line, 16 ft. wide, involving 11 acres clearing and grubbing, 1,234 cu.yd. concrete, 78,466 lbs. reinforcing steel and 17,100 lbs. structural steel. About $284,683. G. A. Duren, Marshall, engr.

Okla., Chetsea—Until Feb. 3, by city, paving 25,000 yd. and laying 6,000 ft. sewers in Main St. About $150,000. Archer & Stevens, New England Bldg., Kansas City, Mo., engrs.

Okla., Hartshorne—Until Jan. 26, by City Clerk, for 2,000 lin.ft. concrete curbing, 2,000 lin.ft. concrete guttering, 3,000 cu.yd. earth excav., and 11,000 sq.yd. concrete. About $30,000. V. V. Long & Co., 1300 Colcord Bldg., Oklahoma, engrs.

Okla., Marlow—Until Feb. 2, by G. L. Orr, city clk., paving 8 blocks principal streets, 60 ft. wide, involving 30,000 sq.yd. asphaltic concrete on 5 in. concrete base, 3,000 lin.ft. conerete curbing and 3,000 lin.-ft. guttering. About $75,000. V. V. Long & Co., 1300 Colcord Bldg., Oklahoma, engrs.

Okla., Sapulpa—City receiving bids paving 5 blocks, Dist. 53, 25 ft. wide, involving 20,000 sq.yd. asphaltic concrete. About $70,000. R. N. Whittlesey, Sapulpa, engr.

Col., Ouray—Until Feb. 5, by Comrs. Ouray Co., grading and draining 1.155 mi. Federal Aid Project 65, 18 ft. wide, from Ouray to Silverton, involving 4,032 cu.yd. earth, 16,222 cu.yd. rock and 1,874 cu.yd. tunnel excav., 1,875 cu.yd. earth surfacing, 180 lin.ft. 15-24 in. concrete metal culverts, 1 concrete slab bridge., etc. About $67,776.

New Mexico—Until Feb. 9, by State Highway Comn., Capitol Bldg., Santa Fe, building 9.563 mi. State Rd. 1, Sect. 1, known as New Mexico Federal Aid Project 26, Bernalillo Co., involving 17,343 cu.yd. Class "1" excav., 35,148 cu.yd. Class "1" borrow, 826,236 yd. overhaul, 1,609 lin.ft. 18-36 in. corrugated metal pipe, 343 cu.yd. concrete, 2,176 lbs. expanded metal reinforcement, 1,322 lbs. square and 952 lbs. round reinforcing bars, 27 lin. ft. 2 in. pipe railing, 126,117 sq.ft. metal reinforcement, 15,793 cu.yd. 1 course cement concrete pavement, 12,467 cu.yd. concrete foundation, 89,764 sq. yd. top course bituminous concrete and 89,764 sq.yd. bitulithic pavement. Three separate bids will be received on 3 types of pavement, i.e. (1) 1 course cement concrete, (2) concrete foundation with bituminous concrete top course, (3) concrete foundation with bitulithic top course. L. A. Gillett, state highway engr.

New Mexico—Until Feb. 11, by State Highway Comn., Capitol Bldg., Santa Fe, building 11.676 mi. State Rd. 4, Sect. 2, known as New Mexico Federal Aid Project 19 Luna Co., involving 1,602 cu.yd. Class "1" excav., 58,364 cu.yd. Class "1" borrow, 13,472 cu.yd. 1 course gravel surfacing, 528 lin.ft. 24 and 30 in. corrugated metal culvert, 198 cu.yd. concrete, 3,020 lb. reinforcing bars and 72 lin.ft. 2 in. w.i. pipe railing. L. A. Gillett, state highway engr.

Wash., Montesano—Until Feb. 2, by E. Baker, aud. Grays Harbor Co., widening, clearing, grubbing, grading and gravel surfacing section Copalis Crossing Pacific Rd. from Carlisle northwesterly 4.7 mi. to Aloha, also section of Aberdeen-Markham Co. Rd. from point ¼ mi. northeasterly of Markham easterly about 4 mi; advertised in this issue.

Cal., El Centro—Until Feb. 2, by Supervs. Imperial Co, paving 26 mi. road, concrete, asphaltic concrete or concrete with asphaltic surface.

Cal., Fresno—Until Feb. 3, by D. K. Branwell, clk. Fresno Co., paving 3 roads, involving 11,000 cu.yd. excav., 12,000 cu.yd. concrete or asphaltic concrete base and 816,000 sq.ft. patented top.

Cal., Upland—Until Feb. 2, by City Clerk paving 4 mi. Euclid Ave., concrete. About $100,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Conn., Hamden—City let contract paving 2½ mi. highway, concrete, to Sperry Eng. Co., 82 Church St., New Haven. About $100,000.

★Pennsylvania—State Highway Dept., Harrisburg, let contracts building roads in counties as follows:

Bradford Co., 19,216 ft., Route 15, Wysex and Rome Twps., to T. H. Gill Co., 2nd Mutual Bldg., Binghamton, N. Y., $150,568.

Clearfield Co., 39,911 ft. 1 course rein.-con., Route 57, Sect. 1, Boggs and Bradford Twps., Wallaceton Boro., Warren Bros., 142 Berkeley St., Boston, $415,451.

Elk Co., 25,563 ft. 1 course rein.-con., Route 59, Horton and Ridgway Twps., Warren Bros., Boston, $285,721.

Erie Co., 10,600 ft. 1 course rein.-con., Mill Creek Twp., C. H. Fry Constr. Co., Erie, $70,527.

Lawrence Co., 11,625 ft. 1 course rein.-con., Route 265, North Beaver Twp., M. J. Scanlon, New Castle, $124,957.

Montgomery Co., 8,598 ft., Route 198, between Hatfield and Lansdale, Fish-Rutherford, Inc., Phila., $73,008.

Westmoreland Co., 57,688 ft., Route 69, from Jeannette to New Kensington, Hempfield, Salem and Washington Twps., Delmont Boro., Warren Bros., Boston, $668,986.

Lackawanna Co., 5,708 ft. 1 course rein.-con., Route 365, Clarks Summit and Clarks Green, T. W. Reilly, Lancaster, $54,080.

Tioga Co., 3,641 ft., State Highway Route 103, Knoxsville Boro., R. J. Delong, 764 West Edwin St., Williamsport, $49,500.

★W. Va., Fayetteville—Comrs. Fayette Co. let contract grading and draining 7.75 mi. road, Nuttall Dist., to Johnson & Dougher, Fayetteville, $107,130.

★W. Va., Hamlin—Lincoln Co. let contract grading Hamlin West Hamlin Rd., to J. M. Randish, Princeton, $38,810. Work involves 41,000 cu.yd. excav.

★Ga., Thomasville—Comrs. Thomas Co. let contract paving and grading 26,000 sq.yd. Dixie Highway, Federal Aid Project 99, to Kreis & Waldrop, Knoxville, Tenn., $74,976.

★O., Cleveland—Comrs. Cuyahoga Co. let contract building Drake Rd. from Wooster Pike to Hunt Rd., involving 16,000 sq.yd. waterbound macadam, 4,000 cu.yd. earth excav. and 450 ft. 10 in. corrugated and 500 ft. 4 in. vitr. tile pipe, to U. G. Denner, Berea, $37,797. Noted Jan. 8.

Streets and Roads (Continued)

★Ind., Indianapolis—Marion Co. let contract improving Schofield Rd., brick, to G. McNamara, Indianapolis, $154,071; Ryan Rd., asphalt, to Mansfield Eng. Co., 1011 Fletcher Saving & Trust Bldg., $77,350; Clark Rd., gravel, to G. McCray, Indianapolis, $6,949; Schilling Rd., gravel, to G. McCrea, Indianapolis, $31,750; Strange Rd., concrete, to W. Mahoney, Lafayette, $111,485.

★Michigan—State Highway Dept., Lansing, let contract building Assessment Dist. Rd. 127, to Bd. Rd Comrs. Ionia Co. (Ionia). Work involves 21,838 cu.yd. earth excav., 56,171 sq.yd. gravel, 359 cu.yd. concrete, 6,470 lb. steel, and 626 lin.ft. 12-18 in. corrugated pipe. About $47,000.

Ill., Chicago—Bd. Local Impvts. received bids Jan 9, paving:

(1) Alley between West 46th, West 47th, Honore and Lincoln Sts.

(2) Alley between West 46th, West 47th, Wood and Honore Sts.

(3) Alley between West 46th, West 47th, Paulina and Hermitage Sts.

(4) Alley between Marshfield Ave., West 46th, West 47th and Paulina Sts.

(5) Alley between Rockwell St., Wilson, Sunnyside and Maplewood Aves.

(6) Alley between Lawrence and Leland Aves., Winthrop St. and Chicago, Milwaukee & St. Paul R.R. tracks.

(7) Alley between Le Moyne St., North, Harding and Crawford Aves.

(8) Alley between Hirsch Blvd., Potomac Ave., Oakley and Claremont Sts.

(9) Alley between East 68th, East 69th, Dante and Harper Sts.

(10) Alley between Chicago Ave., Huron, Spaulding and Christiana Sts.

(11) Alley between Erie and Paulina Sts., Centennial Pl. and Ashland Ave.

(12) Alley between Ravenswood Ave., School, Melrose and Paulina Sts.

(13) Alley between West 57th. West 58th, Green and Peoria Sts.

(14) Alley between Chicago and Haynes Aves., Rice and Robey Sts.

(15) Long Ave. from Fullerton Ave. to Altgeld St.

(16) Nelson St. from Western Ave. to point 100 ft. east of Oakley Blvd.

(17) East 102nd St. from Ave. N to Indianapolis Ave.

(18) South Morgan St. from West 81st to West 83rd Sts., West 81st and West 82nd Sts. from Morgan St. to first alley east.

(19) Eddy and Cornelia Sts. from Cicero to Long Aves., Newport St. from Laramie to Long Aves., Lavergue, Laramie and Lockwood Aves. from Roscoe to Addison Sts., from R. R. Anderson & Co., 1841 West Lake St., (1) $5,778, (2) $6,492, (3) $4,700, (4) $5,656, (5) $4,411, (6) $3,865, (8) $4,144, (10) $3,625, (11) $2,587, (12) $3,476, (13) $3,086, (14) $5,352.

Contg. & Material Co., 3219 South Michigan Ave., (1) $6,228, (2) $6,952, (3) $5,116, (4) $6,079, (9) $7,495, (12) $3,916, (13) $3,622, (17) $32,202.

J. Dillon & Co., 179 West Washington St., (1) $6,287, (2) $7,012, (3) $5,178, (4) $6,141, (7) $7,617, (8) $4,650, (9) $7,439, (10) $4,132, (11) $3,295

J. A. Ross & Co., 4561 Armitage Ave., (5) $4,161, (8) $4,040, (10) $3,670, (12) $3,370, (14) $5,447.

P. J. O'Brien & Co., 29 South La Salle St., (5) $4,822, (6) $4,559, (7) $7,415, (11) $3,373, (14) $5,958.

Central Paving Co., 179 West Washington St., (6) $4,513, (7) $7,567, (9) $7,511, (13) $3,575, (17) $33,258.

Amer. Asphalt Paving Co., 133 West Washington St., (15) $9,774, (16) $12,874, (18) $26,658, (19) $207,137.

R. F. Conway Co., 133 West Washington St., (15) $9,841, (16) $12,509, (18) $26,844 (19) $207,337

White Paving Co., 17 North La Salle St., (15) $9,965, (16) $12,386, (18) $27,191, (19) $204,589.

Calumet Coal & Trading Co., 9,022 Commercial Ave., (17) $30,885. Noted Jan. 8.

★Neb., Aurora—City let contract for $71,470 sq.yd. Class "D" brick paving and 41,851 lin.ft. concrete curbing, to Chapin Colglazier Constr. Co., Omaha, $346,103.

★Neb., Blair—City let contract paving 33,935 ft. main streets, 25 ft wide, involving 78,823 sq.yd concrete, to Western States Constr. Co., Omaha, $288,043.

★Tex., Athens—Henderson Co. let contract grading, surfacing and draining 11 66 mi. Highway 1[illegible], Canton-Palestine Rd., 16 ft. wide, to Williams, Burk & Co., Jacksonville, $107,6[illegible]5; cost plus 10% for engineering and contingencies, total cost, $118,377. Work involves 11 1 acres clearing and grubbing, 15,[illegible]5 cu yd gravel, 64 313 cu yd. earth excav, 110 cu.yd ditching and 849 cu.yd. concrete.

★Tex., Tyler—Smith Co. let contract building Porters Bluff Rd. from here to Van Zandt Co., 3.94 mi. concrete and 4.78 mi. gravel, to Harris & Powell, Tyler, $100,065. Work involves 3.45 acres clearing and grubbing, 35,604 sq.yd. concrete pavement, 388 cu.yd. Class "A" concrete, 41,448 cu.yd. earth excav. County will furnish 19,035 lb. steel and 582 bbl. cement. Total cost, $177,670.

★Oklahoma., McAlester—City let contract paving 4 blocks West Grand Ave., 25 ft. wide, concrete, to J. W. Rooks, Comanche and A Sts., $43,815.

Wash., Seattle—Bd. Pub. Wks. received bids Dec. 26, building 1½ mi. roadbed, near Damnation Creek, into Skagit River Valley, in connection with proposed hydro-electric plant, from Mandric Constr. Co., 504 1st Ave. W., $67,907; Grant-Smith Co., Henry Bldg., $79,759; C. J. Johnson, 302 Malden St., $79,633. Noted Jan. 1.

★Wash., Wenatchee—Chelan Co. let contract grading 2 mi. highway from Monitor to Cashmere, involving 47,000 cu.yd. earth and 14,000 cu.yd. rock excav., to Burke & Sengfelder, Wenatchee, $61,150.

Ore., Portland—City Council received bids paving 65th St., S. E., from United Contg. Co., Northwest Bank Bldg., asphaltic concrete No. 1, $1.50 per sq.yd., total, $26,657; Warren Constr. Co., Journal Bldg., $1.51 per sq.yd., $26,875.

★Cal., Dixon—City let contract improving 23 blocks Warrenite pavement, concrete and cement gutters, etc., to Ransome-Randle Co. Sacramento, $151,508. Noted Jan. 8.

★Cal., Los Angeles—City let contract improving 2 blocks Norton Ave., to G. R. Curtis, 2440 East 26th St., involving 68,455 sq.ft. grading @ $0.03½ per sq.ft., 68,455 sq.ft. asphalt paving, $0.18½, 2,400 sq.ft. concrete gutters, $0.25, storm drain, $700, total $17,480.

Cal., Visalia—Bd. Supervs. Visalia Co., received lowest bid paving 6 mi. road between Poplar and Woodville, involving 5,922 cu.yd. concrete paving and 308.74 cu. yd. concrete for culverts, bridges, etc., from Concrete Pipe & Constr. Co., Porterville, $65,909 and $4,940 respectively.

Railways

PROPOSED WORK

Texas—Houston, Richmond, San Antonio Traction Co. has been granted charter to build interurhan line from Houston to San Antonio, via Richmond, Yoakum and Gonzales. About $1,000,000. H. A. Halverton, 2319 Shearn St., Houston, pres. Houston Guadalupe Water Power Co. will operate same.

Oregon—Port of Astoria Comn., Astoria, approved plans for financing proposed construction of belt line railroads from terminus of Belt Line to mouth of Walluski River, cost $175,000, from mouth of Walluski River to Miles Crossing and Bridge, $280,000. R R. Bartlett, Astoria, port engr.

Excavation and Dredging

PROPOSED WORK

Okla., Muskogee—Drainage—Muskogee Co. having plans prepared for drainage system. About $100,000. T. P. Clonts, 2110 Garland St., engrs.

Wash., Sequim—Irrigation—Macleay-Lindsay Irrigation Dist. preparing plans for system to irrigate 13,000 acres west of Dungeness River, involving main canal, laterals, flood gates, etc. About $260,000.

Ore., Astoria—Dredging—Port of Astoria Comn. having preliminary plans prepared for dredging Youngs Bay Port Dock to Wilsons, cost $15,000; Port Docks Piers 4, 5 and 6, $200,000; Wilsons to Walluski, $385,000. R. R. Bartlett, Astoria, engr.

BIDS DESIRED

Kan., Valley Falls—Drainage—Until Jan. 29, by Jefferson Co., for drainage work in D. D. 1, involving 506,855 cu.yd. dry earth excav. and 25,850 cu.yd. earth embankment About $150,000. H. B. Walker, Manhattan engr.

Industrial Works

PROPOSED WORK

Mass., Boston—W. B. Rice Estate, c/o L. C. Greenleaf, archt., 101 Tremont St., Boston, having plans prepared for 1 story, brick and concrete garage and machine shop, on Tremont and Whittier Sts. About $150,000.

Mass., South Boston (Boston P O)—Housman & Son, 150 West 4th St., plans to build 1 story, 40 x 60 ft., brick and mill construction storehouse, concrete foundation, on 4th St. About $30,000. J. A. Tuck, 34 School St., Boston, archt.

Mass., West Springfield (Springfield P. O.)—McClintock & Craig, engrs. and archts., 33 Lyman St., Springfield, soon receive bids building large 1 story, brick and steel power house, rein.-con. flooring, concrete foundation, on Cold Springs Ave., for Gilbert & Barker Mfg. Co.

Mass., Williamansett (Holyoke P.O.)—Rauch & Lang, Inc., Cleveland, O., soon lets contract building 80 x 300 ft. brick and steel plant, rein.-con. flooring, concrete foundation, here. Private plans.

Mass., Worcester—J. F. Kennedy, 6 Hitchcock Rd., plans to build 2 story, 60 x 131 ft., concrete and mill construction plant, concrete foundation, on James St. About $35,000. E. A. Chapin, 310 Main St., archt.

R. I., Providence—Imperial Knife Co., c/o G. A. Zunner, archt., 756 Main St., Hartford, Conn., having plans prepared for 2 story, 98 x 202 ft., brick and mill construction factory, concrete foundation, on Center St.

Conn., Hartford—Billings & Spencer Co., Park and Laurel Sts., having plans prepared by Greenwood & Noerr, engrs., 847 Main St., for 75,000 sq.ft. rein.-con. and steel addition to tool and office building, rein.-con. flooring, concrete foundation. About $250,000.

Conn., Hartford—G. Zunner, archt., 756 Main St., soon lets contract building 4 story, 35 x 50 ft., brick and mill construction warehouse, concrete foundation, for G. Freedman, 121 Windsor St. About $50,000. Noted Aug. 28.

Conn., Windsor—Gen. Electric Co., Lynn, Mass., receives bids about Jan. 24, building 3 story, 67 x 200 ft., brick, steel and concrete addition to plant, here, concrete foundation. Private plans.

N. Y., Maspeth (Flushing P. O.)—R. M. Krause, 37 Compton Terrace, Jamaica, L. I., having plans prepared by Timmis & Chapman, archts. and engrs., 315 5th Ave., New York City, for 1 story, 150 x 180 ft., brick and steel plant, rein.-con. flooring, concrete foundation, on Metropolitan Ave. and Vincent St., here. About $35,000.

N. Y., Newtown (Flushing P. O.)—G. E. Fletcher, Union Turnpike and Queens Blvd., having plans prepared by G. Strehan, archt. and engr., 112 West 42nd St., New York City, for 1 story, 100 x 150 ft., brick and steel garage, rein.-con. flooring, concrete foundation. About $40,000.

N. Y., New York—Zipkes, Wolff & Kudroff, archts. and engrs., 25 West 42nd St., receives bids about Feb. 3, altering 5 story, brick and steel factory, rein.-con. flooring, concrete foundation, for B. and C. Mfg. Co., 294 Church St. About $25,000.

N. Y., New York—New York Pie Baking Co., 82 Sullivan St., having sketches made by Schwartz & Gross, archts. and engrs., 347 5th Ave for altering and building addition to 3 story, brick and steel factory and bakery. About $150,000.

N. Y., Ogdensburg—Coopers Brass Wks., Inc., having plans prepared by Williams & Johnston, archts., Ogdensburg, for factory. About $100,000. R. J. Donahue, Ogdensburg, dir.

N. J., Athenia—Magor Car Co. soon receives bids building 1 story, 40 x 60 ft., rein.-con. and brick power house, rein.-con flooring. About $35,000. N. Schoonover, 31 Clinton St., Newark, engr. J. S. Pigott, 665 Broad St., Newark, archt.

N. J., Newark—Levin & Ruderman, c/o E. V. Warren, archt., 31 Clinton St., soon receive bids building 2 story, 50 x 150 ft., brick garage, rein.-con. and terra cotta flooring, on Clinton Ave. About $60,000.

Pa., Dalton—Scranton & Binghamton R.R., 227 Wyoming Ave., Scranton, having plans prepared for 48 x 70 ft., rein.-con. addition to power house, rock foundation, here, to include three 500 h.p. boilers and 15,000 volt electric units. About $95,000. Private plans.

Pa., Hazleton—Wilkes-Barre & Hazleton R.R., Pennsylvania Ave., Wilkes-Barre, plans to build 2 story, 30 x 100 ft., brick and steel freight house, rein.-con. flooring, concrete foundation, on West Broad St. About $50,000. Architect not selected.

Pa., Phila.—A. Hoffman, c/o L. B. Rothchild, archt., 1225 Sansom St. having plans prepared for 6 story, 58 x 125 ft., brick and concrete service and sales building, at 1603 Vine St. About $100,000.

Pa., Phila.—P. S. Tyre, engr and archt., 1509 Arch St, receives bids about Feb. 1, constructing 2 story, 75 x 214 ft. service building, brick and stone, on 34th and Chestnut Sts., for Universal Motor Agency, 3438 Ludlow St Cost to exceed $50,000.

Industrial Works (Continued)

Pa., Scranton—A. Brawer Silk Co., Dunmore, plans to build 2 story, 80 x 150 ft., brick mill, rein.-con. flooring, rock foundation, on Filmore Ave. and Academy St. About $60,000. Architect not selected.

Pa., Scranton—A. O. Dewitt Auto Co., Wyoming Ave., having plans prepared for 2 story, 90 x 170 ft., rein.-con. garage, rein.-con. flooring, concrete foundation, on Wyoming Ave. About $100,000. Private plans.

Pa., Scranton—Scranton Stove Wks., Jefferson Ave. and New York St., plans to build 3 story, 50 x 90 ft., brick and steel addition to works. rein.-con. flooring, rock foundation. About $80,000. Architect not selected.

Md., Baltimore—D. Miller Co., 26 Hopkins Pl., plans to build steel and brick addition to wholesale house. About $100,000.

Md., Baltimore—T. I. Swartz, 24 Hopkins Pl., having plans prepared by B. Frank, archt., 328 North Charles St., and J. Posey, engr., Fidelity Bldg., for 6 story, 23 x 60 ft., brick warehouse, stone and cement foundation, at 22 Hopkins Pl. About $50,000.

Va., Richmond—Simmons Co. soon receives bids building 2 story, 100 x 160 ft., rein.-con. and steel factory, on Hull St. About $90,000. W. T. Gordon, mgr. M. D. Hetherington, Chicago, archt.

Tenn., Knoxville—J. G. Sterchi, 420 South Gay St., plans to build 12 story, 75 x 140 ft., rein.-con. and terra cotta warehouse and store, concrete foundation, on Gay St. About $225,000. R. F. Graf & Sons, Knoxville, archts.

O., Cincinnati—Ahrens Fox Fire Engine Co., Cook and Alfred Aves., receives bids about Feb. 1, constructing 3 story, 75 x 80 ft. storage building, on Alfred Ave. Rendigs, Panner & Martin, Palace Theatre Bldg., archts.

O., Cleveland—Automatic Rim Co., 506 Hippodrome Bldg., plans to build 1 story, steel and brick factory, on West 116th St. near Madison Ave. About $100,000. J. B. Harris, genl. mgr. Architect to be selected soon.

O., Cleveland—J. Bassiches, Society for Savings Bldg., having plans prepared by A. Sharowsky, archt., 2045 Marlowe Ave., Lakewood, for 1 story, 40 x 120 ft., steel and brick factory, brick foundation, on Orange Ave. and East 22nd St. About $25,000.

O., Cleveland—Forbes Chocolate Co., 5100 Superior Ave., having plans prepared by G. S. Rider & Co., archts. and engrs., Century Bldg., for 2 story, 100 x 200 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, on Euclid Ave. and Ivanhoe Rd. About $250,000.

O., Cleveland—Mau-Sherwood Supply Co., 1616 West 3rd St., plans to build 1 or 2 story, steel and brick factory, brick foundation, on Lima Ave. About $100,000. Architect and engineer not selected.

O., Cleveland—Realty Syndicate Co., 309 Williamson Bldg., having plans prepared by S. W. Weis, archt., 1032 Schofield Bldg., for 3 story, 116 x 250 ft., concrete, steel and brick garage, rein.-con. flooring, concrete foundation, on East 79th St. and Hough Ave. About $400,000. F. N. Riley, secy.

O., Cleveland—Western Novelty Mfg. Co., 5119 Euclid Ave., having plans prepared by Best & Hoefler, archts., 6532 Euclid Ave., for 2 story, 50 x 130 ft., steel and brick factory, brick foundation, on Cedar Ave. and East 30th St. About $25,000.

O., Cleveland—Westinghouse Electric Co., West 54th St., having plans prepared by H. H. Lane, archt., Dime Bank Bldg., Detroit, for 4 story, 80 x 120 ft., steel and brick warehouse, concrete foundation.

O., Dayton—Burnett-Larsch Co., Monument & Webster Sts., plans to build 5 story, 60 x 180 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation. About $150,000. Private plans.

O., Dayton—Dayton & Troy Traction Co., 415 East 1st St., plans to build 1 story, 60 x 300 ft., rein.-con. warehouse and freight depot, rein.-con. flooring, concrete foundation, on Pond St. About $90,000. Private plans.

O., Dayton—S. H Rothenberg Tobacco Co., Taylor St., plans to build 2 story, 50 x 200 ft., rein.-con. and brick warehouse, rein.-con flooring, concrete foundation, on East 2nd St. About $75,000. Architect not selected.

O., Newark—M. Peterman, archt., 321 East Gay St., Columbus, receives bids about Feb. 1, building 2 story, 50 x 125 ft., fireproof factory, here, for Newark Stamping & Fdry. Co. About $25,000.

Mich., Detroit—Blue Valley Creamery, 168 Selden Ave., having plans prepared by H. S. Angell, archt., 722 Free Press Bldg., for 2 story, 36 x 38 ft., brick and steel addition to creamery, rein.-con. and wood flooring, concrete foundation. About $25,000.

Mich., Detroit—H. H. Lane, engr. and archt., Dime Bank Bldg., soon lets contract building 1 story, 200 x 250 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Franklin St., for Crowley Milner Co., c/o F. J. Whitney, Grand River Ave.

Mich., Detroit—C. W. Brandt, archt., Kresge Bldg., soon lets contract building 2 story, 60 x 100 ft., brick, concrete and steel warehouse, concrete foundation, for J. Roth, Clifford St. About $40,000.

Mich., Detroit—Westinghouse Electric Co., Dime Bank Bldg., having plans prepared by H. H. Lane, archt., Dime Bank Bldg., constructing 5 story, 60 x 100 ft., brick and steel warehouse, concrete foundation, on Labrosse and 6th Sts.

Mich., Flint—Independent Cold Storage Co., 120 West Kearsely St., plans to build 3 story, rein.-con. and brick storage plant, rein.-con. flooring, concrete foundation, on Industrial Ave. About $300,000. Architect's name withheld.

Mich., Hamtramck (Detroit P. O.)—G. J. Haas, archt., Kresge Bldg., Detroit, soon lets contract building 1 story, 40 x 100 ft., brick and concrete garage, rein.-con. flooring, concrete foundation, on Conant Ave., for J. W. Keister, 976 Rivard St., Detroit. About $25,000.

Mich., Kalamazoo—See "Buildings."

Mich., Kalamazoo — Clarage Fan Co., North and Porter Sts., plans to build 1 story, 28 x 170 ft. and 66 x 70 ft. additions to foundry, and 1 story, 50 x 60 ft. addition to pattern shop, brick, concrete and steel, rein.-con. flooring, concrete foundations. About $100,000. Private plans.

Ill., Chicago — Chicago Reedware Mfg. Co., 1523 Carroll St., having plans prepared by Davidson & Weiss, archts., 53 West Jackson St., for 1 story, 200 x 350 ft., brick factory, concrete foundation, on Grand Ave. and Franklin Blvd. About $165,000.

Ill., Chicago—Ludgin & Leviton, archts., 53 West Jackson St., receives bids about Jan. 31, building 2 story, 100 x 100 ft., concrete, steel and brick plant, concrete foundation, on Halsted and 76th Sts., for Englewood Dyeing & Cleaning Co., 6343 Halsted St. About $40,000.

Ill., Chicago—Kewanee Boiler Co., Kewanee, purchased site on Washington and Green Sts., here, and plans to build 10 story. 100 x 100 ft., fireproof warehouse and salesroom. About $500,000. Architect not selected.

Ill., Chicago—Lorette Corset Co., 510 Throop St., having plans prepared by R. T. Newberry, archt., 108 South La Salle St., for 2 story, 125 x 250 ft., rein.-con. and brick factory, rein.-con. flooring, on Crawford and Barry Aves. About $300,000.

Ill., Chicago—H. O. Reno Co., 123 Madison St., having plans prepared by P. T. Johnston, archt., 1254 Pratt St., for 4 story, 125 x 150 ft., rein.-con., brick and terra cotta, publishing plant, rein.-con. flooring, concrete foundation, on Lincoln and Wrightwood Aves. About $225,00.

Ill., Streator—Central Glass Casket Co., 133 West Fort St., Detroit, plans to build 2 story steel addition to factory, concrete foundation, here. About $300,000. Private plans.

Wis., Wilwaukee—Van Ryn & Dc Gelleke, archts. and engrs., Caswell Blk., receive bids about Jan. 28, building 1 story, 90 x 200 ft. brick and steel machine shop, rein.-con. flooring, concrete foundation, on 30th St., for Doelger & Kirsten, 505 Cedar St.

Ia., Cedar Rapids—Rude Auto Co. plans to build 4 story, brick, rein.-con. and steel garage and office, rein.-con. flooring, concrete foundation. About $175,000. Architect to be selected at once.

Ia., Sioux City—Leeds Grain Belt Cereal Co. plans to build 6 story, 50 x 120 ft., rein.-con. and brick mill, rein.-con. flooring, concrete foundation. About $200,000. Engineer not selected.

Kan., Atchison—D. Miller, 926 Santa Fe St., had plans prepared by R. J. Kaaz, archt., 719 Kansas Ave., for 2 story, 75 x 100 ft., brick, rein.-con. and steel garage, rein.-con. flooring, concrete foundation. About $70,000.

Kan., Wichita—Coleman Lamp Co., 220-24 North St. Francis Ave., plans to build four 4 story, 64 x 140 ft., brick, rein.-con. and steel factories, rein.-con. flooring, concrete foundation, on 2nd and St. Francis Sts. About $250,000 each. Architect not selected.

Kan., Wichita—Kansas Milling Co., 715 East 13th St., having plans prepared by Nordyke-Marmon Co., engrs., Kentucky Ave. and Morris St., Indianapolis, Ind., for 6 story, 42½ x 100 ft., brick, rein.-con. and steel mill, rein.-con. flooring, concrete foundation, on 13th St. About $300,000.

Neb., McCook—J. J. Gragg Auto Co. having plans prepared for 2 story, 90 x 140 ft rein.-con., brick and steel garage, rein.-con. flooring, concrete foundation. About $75,000. Private plans.

Mo., St. Louis—J. D. Howe, 5811 De Giverville St., plans to build 3 story, 117 x 250 ft., concrete, steel and brick factory, rein.-con. flooring, on Natl. Bridge Rd About $120,000. Architect not selected.

Wash., Wenatchee—Midway Motor Co. plans to build 2 story, 100 x 120 ft., concrete or brick garage, on Wenatchee and Yakima Aves. About $75,000. Architect not selected.

Wash., Yakima—Gibson Bros. plan to build 5 story, concrete packing plant, concrete foundation, on Yakima Ave. About $100,000. Private plans.

Ore., Astoria—W. H. Goodnough and associates plan to build 2 or 3 story pulp and paper plant frame and concrete, (50 tons daily capacity). About $500,000. Private plans.

Ore., Hillsboro—Ray & Son, Sherlock Bldg., Portland, having plans prepared by E. E. McClaran, archt., Lumber Exch. Bldg., Portland, for 2 story, 86 x 370 ft., hollow tile construction cannery, concrete foundation, here. About $60,000.

Cal., Oakland—Great Western Milling Co., 9th and Alameda Sts., Los Angeles, having plans prepared by Strong & Scott Mfg. Co., engrs., 413 South 3rd St., Minneapolis, Minn., for rein.-con. mill, on water front, here. About $500,000.

Cal., Oakland—Natl. Ice & Coal Storage Co., Postal Telegraph Bldg., San Francisco, preparing plans for 1 story, rein.-con. plant, on North 1st St. About $250,000.

BIDS DESIRED

Mass., Springfield—H. L. Sprague, archt., 310 Main St., receiving bids building 2 story, 71 x 195 ft. and 48 x 271 ft., brick and steel plant, 1st floor rein.-con., concrete foundation, on Warwick Ave., for Cheney-Bigelow Wire Wks.

N. Y., New York—Hospital—Until Jan. 26, by Bd. Trustees, Bellevue and Allied Hospitals, at office of General Medical Supt., 415 East 26th St., for all labor and material, for new boiler plant at Fordham Hospital, Crotona Ave. and Southern Blvd., Bronx Boro. J. W. Brannan, pres.

Pa., Phila.—Until Jan. 29, by L. B. Rothchild, archt., 1225 Sansom St., constructing 6 story, 58 x 125 ft., brick and concrete. service and sales building, on 16th and Vine Sts., for A. Hartman, c/o architect. About $100,000. Noted Jan. 22.

Pa., Phila.—Until Jan. 26, by Lachman & Murphy, archts., 358 Drexel Bldg., constructing 4 story, 50 x 60 ft., rein.-con., brick and slow burning construction warehouse, on Griscom and Frankfort Aves., for Hub Furniture Co., 2205 South St. About $50,000.

Del., Wilmington—C. E. Oelschlager, archt. and engr., 1615 Walnut St., Phila., receiving bids building 2 story, 131 x 250 ft., concrete, brick and terra cotta service station, on 10th and Union Sts., here. About $50,000. Owner's name withheld

Md., Baltimore—Bentalow Garage Co. receiving bids building 1 story, 145 x 172 ft., brick garage, on Bentalow St. and Lafayette Ave. Former contract rescinded. About $40,000. G. Weil, 2409 Lanvale St., pres.

O., Cleveland—J. L. Weinberg, archt., Bangor Bldg., receiving bids building 3 story, 40 x 65 ft., steel and brick factory, brick foundation, at 4021 Bway., for Krause-Windograd Co., Bangor Bldg. About $25,000.

O., Cleveland—E. McGeorge, archt., 1900 Euclid Ave., receiving bids building 2 story, 60 x 80 ft., steel and brick factory, brick foundation, for L. Sands Co., East 55th St. and Sweeney Ave. About $50,000. Noted Jan. 8.

O., Warren—Until March 1, by H. M Lane Co., engrs., 701 Owen Bldg., Detroit, building 2 story, 100 x 200 ft., rein.-con. and steel foundry, rein.-con. flooring, concrete foundation, for Genl. Fire Extinguisher Co. About $350,000.

Ill., Chicago—M. J. Morehouse, archt., 343 South Dearborn St., receiving bids building 3 story, 120 x 165 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on Ravenswood and Leland Aves., for Johnson Fare Box Co., 236 South Robey St. About $125,000.

Industrial Works (Continued)

Ill., Chicago—Schmidt, Garden & Martin, archts., 104 South Michigan Ave., receiving bids building 2 story, 80 x 140 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, at 2641 Ogden Ave., for Garden City Plating & Mfg. Co., 1430 South Talman Ave. About $50,000.

Ill., Chicago—Standard Sash & Door Co., 5819 South Racine Ave., receiving bids building 2 and 3 story, 50 x 130 ft., brick and timber factory and garage, concrete foundation, at 5813 South Racine Ave. About $75,000. A. G. Lund, 453 West 63rd St., archt.

Ia., Cedar Rapids—Until March 1, by Ideal Yeast Co., 1025 South 4th St., building 2 story, 70 x 100 ft., brick factory, rein.-con. flooring, concrete foundation. About $60,000. Hatton & Holmes, Cedar Rapids, archts.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Biddeford**—Saco Lowell Mills Co., 77 Franklin St., let contract building 5 story, 88 x 300 ft., rein.-con. storehouse, rein.-con. flooring, concrete foundation, to Aberthaw Constr. Co., 27 School St., Boston. About $400,000.

★**Mass., Holyoke**—G. P. B. Alderman & Co., archts., Alderman Bld., let contract to M. J. Walsh & Son, 1412 Dwight St., building 1 story, brick and mill construction factory, stone foundation, on Sargent St. About $30,000. Owner's name withheld.

★**Mass., Pittsfield**—General Electric Co. will build 1 story, 80 x 400 ft., brick, rein.-con. and steel addition to enameling plant, rein.-con. flooring, concrete foundation, on Morningside St. Work will be done by day labor. Noted Jan. 1.

Mass., Springfield—H. L. Sprague, archt., 310 Main St., received lowest bid from E. J. Pinney, 264 Main St., altering and building 1 story, 50 x 60 ft., brick and concrete addition to forge shop, concrete flooring and foundation, on Walter St., for Moore Drop Forging Co., 39 Walter St. About $60,000. Noted Jan. 15.

★**Mass., West Medford** (Boston P. O.)—Warner & Childs Paper Co. let contract building 4 story, 100 x 225 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, on Boston Ave., to W. M. Bailey Co., 88 Broad St., Boston.

★**Mass., Woburn**—Crescent—Leather Co. let contract building two 3 story, 50 x 240 ft., brick and mill construction tanneries, concrete foundation, to Fritz Constr. Co., 62 Maywood St., Boston. About $175,000.

★**Mass., Worcester**—Main-Park Motors Co., 6 Barton Pl., let contract constructing 1 story, brick, concrete and steel garage, showroom and sales building, rein.-con. flooring, concrete foundation, on Main St., to W. Haynes, 374 Washington St., Boston. About $150,000.

★**Conn., Montowese**—Eastern Terminal Co., 103 Federal St., New London, let contract building 1 story, 475 x 1000 ft., frame warehouse, concrete flooring and foundation, on Quinnipiac Ave., to Aberthaw Constr. Co., 27 School St., Boston. Cost between $75,000 and $100,000.

★**N. Y., Brooklyn**—Amblake Realty Co., 361 Stone Ave., will build 1 story 100 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Atlantic and Rochester Aves. About $25,000. Work will be done by day labor.

★**N. Y., Brooklyn**—B. and L. Contg. Co., 375 Greene Ave., will build 1 story, 100 x 104 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Greene and Franklin Aves. About $35,000. Work will bo done by day labor.

★**N. Y., Brooklyn**—S. Blum, c/o Dorfman, archt., 26 Court St., will build 1 story, 100 x 250 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Classon and Myrtle Aves. About $50,000. Work will be done by day labor.

★**N. Y., Brooklyn**—J. H. Eckhoff, 835 Union St., will build 1 story, brick and steel garage, rein.-con. flooring, concrete foundation, on Bedford Ave. About $50,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Ex Lax Mfg. Co., 29 De Kalb Ave., let contract building 4 story, 50 x 100 ft., brick and steel factory, rein.-con. flooring, concrete foundation, at 431-433 Atlantic Ave., to M. Shapiro & Son, 52 Vanderbilt Ave., New York City. About $40,000.

★**N. Y., Brooklyn**—J. Levine, c/o H. A. Weinstein, archt. and engr., 32 Court St., will build 4 story, 40 x 100 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Jerome and Livonia Aves. About $35,000. Work will be done by day labor. Noted Jan. 15.

★**N. Y., Brooklyn**—R. W. J. Pohl, 200 Montague St., let contract building 1 story, 131 x 142 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Ocean Ave. and Ave. H, to Pohl-Abbott Constr. Co., 200 Montague St. About $175,000.

★**N. Y., New York**—J. Bashein, c/o Moore & Landseidel, archts. and engrs., 3rd Ave. and 148th St., will build 1 story, 100 x 175 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Southern Blvd. and Longwood Ave. About $40,000. Work will be done by day labor.

★**N. Y., New York**—J. Levy, c/o Zipkes, Wolff & Kudorff, archts. and engrs., 25 West 42nd St., will alter 5 story, brick and steel factory, rein.-con. flooring, at 215 West 29th St. About $25,000. Work will be done by day labor.

★**N. Y., New York**—Sloane Estate, 316 East 65th St., let contract building 10 story, 75 x 100 ft., brick, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on 39th St. and 8th Ave., to F. T. Ley, 19 West 44th St.

★**N. J., Bloomfield**—Amer.-La France Fire Engine Co., 250 West 54th St., New York City, let contract building 1 story, 150 x 500 ft., brick and steel factory, rein.-con. flooring, concrete foundation, to Foundation Co., 233 Bway., New York City. About $350,000. Noted Jan. 1.

★**N. J., Hilton** (Dover P. O.)—H. Boker & Co., Inc., 101 Duane St., New York City, let contract building plant, including 3 story, 70 x 135 ft. factory, 1 story, 65 x 136 ft. shop, 2 story, 40 x 110 ft. storage building and 1 story, 55 x 70 ft. shop, rein.-con. and brick, rein.-con. flooring, on Burnett Ave., to De Kimpe Constr. Co. New York Ave., Union Hill, About $300,000.

★**N. J., Hoboken**—Chocolate Menier, 1127 Clinton St., let contract building 1 story, 100 x 113 ft., rein.-con. addition to factory, to Eustice Bros., 40 Clinton St., Newark. Before job is completed may decide to add several stories.

★**N. J., Newark**—Celluloid Co., 290 Ferry St., let contract building 3 story, 40 x 50 ft., concrete, brick and steel factory addition, on Charles St., to Eustice Bros., 40 Clinton St.

★**Pa., Olyphant**—Mid Valley Silk Co. let contract building 2 story, 51 x 152 ft., brick mill, rein.-con. flooring, rock foundation, on Main St., to G. A. Westcott Co., Wyoming Ave., Scranton. About $81,000. Noted Jan. 15.

★**Pa., Phila.**—Colonial Ice Cream Co., 855 North 4th St., let contract building 3 story, 50 x 100 ft., brick and concrete garage, on 47th and Orianna Sts., to F. W. Mark Constr. Co., Commercial Trust Bldg. About $30,000.

★**Md., Baltimore**—Lucas Bros., 221 East Baltimore St., let contract building 5 story, 30 x 104 ft., brick addition to printing and book binding plant, concrete and stone foundation, on Water St., near Calvert St., to W. Ferguson & Bros., 214 Clay St. About $38,000; cost plus percentage basis.

★**Md., Baltimore**—Merin Bros. and J. Schloss Garage Co., 1119 Watson St., will build 3 story, 50 x 75 ft., brick garage, concrete and brick foundation, at 1503-7 Guilford Ave. About $40,000. Work will be done by day labor.

★**Md., Baltimore**—L. Miller, 5 Lloyd St., let contract building 2 story, 45 x 50 ft. dairy and cold storage plant, concrete and brick, concrete foundation, at 5-9 Lloyd St., to G. Schnader, 2023 McElderry St. About $50,000.

★**Md., Baltimore**—Mutual Chemical Co. of Amer., Block and Wills Sts., let contract building 2 story, 100 x 200 ft., concrete and brick addition to plant, concrete and brick foundation, at 1348 Block St., to Morrow Bros., 1201 Fidelity Bldg. About $60,000.

★**Md., Baltimore**—Varsity Underwear Co., Eastern Ave., and Port St., let contract building 5 story, 71 x 100 ft., rein.-con. and brick addition to factory, rein.-con. flooring, concrete foundation, to Price Constr. Co., 210 Maryland Trust Bldg. About $75,000.

★**Md., Baltimore**—M. D. Williamson, 212 East 20th St., will build 1 and 2 story, 40 x 50 x 175 ft., brick garage, cement flooring, concrete foundation, at 1720-24 East Fayette St. About $45,000. Work will be done by day labor.

★**Md., Westport**—Carr-Lowrey Glass Co. let contract building 1 story, 66 x 136 ft., steel factory, concrete flooring and foundation, to West Constr. Co., 907 Amer. Bldg. About $75,000.

★**Va., Danville**—Riverside & Dan River Cotton Mills Co. let contract building 4 story, 133 x 800 ft., rein.-con. spinning mill, rein.-con. flooring, concrete foundation, to Aberthaw Constr. Co., 27 School St., Boston. About $2,000,000.

★**O., Cincinnati**—Diem & Wing, Eggleston and Lock Sts., let contract building 5 story, 30 x 70 ft. factory, to J. and F. Harig, 111 Odd Fellows Temple.

★**O., Cincinnati**—Rapid Electrotype Co., Canal, Race and Elm Sts., let contract building 2 story, 100 x 215 ft., brick factory, rein.-con. flooring, on McMicken St. between Race and Elm Sts., to L. Schrieber Sons Co., Ivanhoe Rd. About $125,000.

★**O., Cincinnati** — S. Hannaford Sons, archts., 6th and Vine Sts., let contract to D. Meinken, 2126 Western Ave., building 1 story, 40 x 100 ft., addition to plant, for Witt Cornice Co., 2118 Winchell Ave. Noted Jan. 8.

★**O., Cleveland**—Bender Body Co., West 65th St. and Denison Ave., will build 3 story, 133 x 359 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, on Barberton Ave. and West 62nd St. About $300,000. Former bids rejected. Work will be done by day labor.

★**O., Cleveland**—City Ice Delivery Co., East 20th St. and Euclid Ave., let contract constructing 1 story, 20 x 70 ft. and 20 x 24 ft., steel and brick storage building and tank room, brick foundation, at 6201 Scoville Ave., to Hunkin-Conkey Constr. Co., Century Bldg. About $50,000.

★**O., Cleveland** — Cleveland Welding Machine & Mfg. Co., West 117th St. and Berea Rd., let contract building 1 story, 42 x 100 ft., steel and brick shop and welding room, brick foundation, to Webber Co., 1609 West 25th St. About $50,000. Noted Jan. 15.

★**O., Cleveland**—Clover Meadow Creamery Co., 1827 East 55th St., let contract building 2 story, 32 x 110 ft., concrete, steel and brick storage building, rein.-con. flooring, concrete foundation, to Bolton-Pratt Co., Columbia Bldg. About $50,000.

★**O., Cleveland**—W. S. Lougee, archt., 500 Marshall Bldg., let contract to H. H. Walker Co., c/o Builder's Exch., Rose Bldg., constructing 2 story, 104 x 116 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, for Colonial Woolen Mills Co., 6409 Barberton Ave. About $70,000.

★**O., Cleveland**—International Steel Tube Co., Leader-News Bldg., let contract building 1 story, 80 x 100 ft., steel mill, on East 140th St. and Miles Ave., to H. K. Ferguson Co., 6532 Euclid Ave. About $150,000.

★**O., Cleveland**—Natl. Carbon Co., West 117 St. and Madison Ave., let contract constructing 1 story, 120 x 180 ft., steel and brick furnace building, brick foundation, to Crowell, Lundorff, Little, Bicknell Co., 5716 Euclid Ave. About $200,000.

★**O., Cleveland**—Standard Parts Co., East 11th St. and Walnut Ave., let contract building 1 story, 167 x 168 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, at 1281 West 70th St., to Austin Co., 106-112 Euclid Ave. About $75,000.

★**O., Columbus**—Amer. Azo Oxide Co., St. Louis, purchased 40 acre site on Windsor Ave., here, and will construct plant consisting of 6 or 7 various sized buildings; principal structure to be furnace building which will be erected at once, other units later. Foundations for several buildings have been completed. About $1,500,000. Work will be done by day labor.

★**O., Columbus**—O. Darst, archt., Brunson Bldg., let contract to E. H. Latham Co., 60 East Broad St., building 2 story, 38 x 100 ft. and 35 x 60 ft., brick and concrete additions to factory and office, for Columbus Dental Co., 634 Wagner St. About $75,000.

★**O., Mansfield**—Roderick-Lean Mfg. Co., 366 Park Ave. E., let contract building 2 story, 80 x 480 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, to H. K. Ferguson Co., 6532 Euclid Ave., Cleveland. About $200,000.

★**O., Warren**—Goheen Mfg. Co. let contract building 5 story, 50 x 125 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, to Craig-Curtiss Co., 1031 Guardian Bldg., Cleveland. About $200,000.

★**Mich., Detroit**—Detroit Butcher Supply Co., Bellevue Ave., let contract building 2 story, 84 x 200 ft., concrete, brick and steel factory, rein.-con. and wood flooring, concrete foundation, on Bellevue Ave. near Mack St., to Moore & Brown, Penobscot Bldg. About $50,000.

★**Mich., Detroit** — Detroit Graphite Co., 12th St., let contract building 1 and 2 story, 60 x 300 ft., concrete, brick and steel factory, rein.-con. flooring, concrete foundation, on Linsdale Ave., to A. W. Kutsche & Co., 817 Ford Bldg. About $50,000. Noted Jan. 8.

Industrial Works (Continued)

★**Mich., Detroit**—Detroit Grey Iron Fdry. Co., Wight St., let contract building 2 story, 135 x 150 ft., rein.-con. and steel foundry, rein.-con. flooring, concrete foundaton to J. L. Kolley, 3563 Jefferson Ave.

★**Mich., Detroit**—Nash Distributing Co., Woodward Ave., let contract building 2 story, 71 x 200 ft., rein.-con., brick and steel garage and sales room, rein.-con. and tile flooring, concrete foundation, to Lennane Bros., Union Trust Bldg. About $90,000.

★**Mich., Detroit**—Timken-Detroit Axle Co., Fort St., W., let contract building 1 story, 60 x 170 ft., brick and steel addition to factory, creosoted block flooring, concrete foundation, to Walbridge-Aldinger Co., 2356 Penobscot Bldg. About $35,000.

★**Ill., Chicago**—D. S. Klafter, archt., 64 West Randolph St., let general contract to B. O. Aarrold, 2631 North Avers Ave., building 1 story, 125 x 200 ft. foundry, 2 story, 30 x 85 ft. warehouse and 2 story, 60 x 65 ft. office, brick and stone, brick foundation, on Loomis and 21st Sts., for H. Kramer & Co., 1330 West 21st St. About $165,000.

★**Ill., Chicago**—J. S. Lovejoy, c/o J. P. Cowing, archt., 30 North La Salle St., let contract building 1 story, 120 x 150 ft. brick and timber addition to factory, on 29th and La Salle Sts., to P. Lotz, 56 East Randolph St. About $75,000.

★**Ill., Chicago** — Reichel & Drews, 559 West Lake St., let contract building 1 story, 100 x 170 ft., brick machine shop, brick foundation, at 450 North Ashland Ave., to C. C. Todd, 4543 North Hamilton Ave. About $35,000.

★**Ill., Clearing** (Chicago P. O.)—Winchester Repeating Arms Co. let contract building 1 and 2 story, 60 x 210 ft., brick and timber factory, concrete foundation, to Industrial Bldg. Co., 38 South Dearborn St., Chicago. About $40,000.

★**Wyo., Casper**—Natl. Supply Co. let contract building 2 story, 84 x 114 ft., rein-con. warehouse, rein.-con or wood flooring, to Larson & Jourgenson, Casper. About $35,000.

★**Mo., Kansas City**—See "Buildings."

★**Mo., Kansas City**—Midland Flour Milling Co., 630 New Life Bldg., let contract building 2 story, 42 x 150 ft., rein.-con., steel and brick warehouse, rein.-con. flooring, concrete foundation, with tanks 90 ft. high and 20 ft. diam., to Eberhard Constr. Co., Salina, Kan. About $250,000; cost plus percentage basis.

★**Mo., Kansas City**—Milwaukee Corrugating Co., 36th Ave. and Burnham St., Milwaukee, Wis., let general contract building 2 story, 163 x 238 ft., rein.-con. and brick warehouse, concrete foundation, here, to G. M. Bliss Constr. Co., 526 Lathrop Bldg. About $175,000.

★**Mo., Kansas City**—Snower Mfg. Co., 900 Washington St., will build 6 story, 58 x 81 ft., rein.-con., terra cotta and brick factory, on 18th St. and Baltimore Ave. About $90,000. Work will be done by day labor under supervision of McKickmie & Trask, archts., 725 Bloyd Bldg. Contract for concrete work let, to H. Stiver, 402 Shukert Bldg.

★**Mo., St. Louis**—Bayer Steam Soot Blower Co., 2828 La Salle St., let contract building 1 story, 100 x 200 ft., brick machine shop, concrete flooring, at 4065 Park Ave., to J. J. Kjar, Wainwright Bldg. About $30,000.

★**Mo., St. Louis**—D. A. Blanton Co., 2nd and Spruce Sts., let contract building 2 story, 73 x 151 ft., concrete factory, on South 1st and Spruce Sts., to Kellerman Constr. Co., Interstate Life Bldg. About $50,000

★**Mo., St. Louis**—Burdeau Real Estate Co., 801 Chestnut St., let contract building 1 story, 100 x 130 ft., brick garage and store, at 2928-36 Locust St., to B. J. Charleville, 810 Chestnut St. About $35,000.

★**Mo., St. Louis**—Burkhart Mfg. Co., 4900 North 2nd St., let contract building 1 story, 55 x 100 ft., concrete factory, at 358 Prairie Ave., to Grewe Constr. Co., Century Bldg. About $30,000.

★**Mo., St. Louis**—Emerson Electric Co., 2100 Washington St., let contract building 8 story, 129 x 150 ft., rein.-con. and brick factory, rein.-con. flooring, on Washington and St. Charles Sts., to Murch Bros. Constr. Co., Ry. Exch. Bldg. About $400,000.

★**Wash., Seattle**—Lake Union Dry Dock & Machine Wks., 1703 Westlake St., N., will build 1 story, 40 x 80 ft. ship repair plant and machine shop, on Lake and Union Sts. About $100,000. Work will be done by day labor.

★**Ore., Portland**—Carman Mfg. Co., Macadam St., let contract building 3 story, 80 x 140 ft. frame addition to factory, to J. Quinn, Builders Exch. About $33,000.

★**Ore., Portland**—Portland Stove Wks., Derby St. and Columbia Blvd., let contract rebuilding 1 story, 100 x 400 ft. plant, to S. Synnes, 33 West Winchell St. About $50,000.

★**Cal., El Segundo**—Standard Oil Co., 200 Bush St., San Francisco, let contract improving and building additions to refinery, here, to Foundation Co., Holbrook Bldg., San Francisco. About $2,000,000.

★**Cal., Los Angeles**—Barker Bros., 730 South Bway., will build 1 story, 40 x 130 ft., 60 x 130 ft. 70 x 130 ft. and 80 x 130 ft., rein.-con. additions to warehouses on Palmetto St. About $100,000. Work will be done by day labor.

★**Cal., Los Angeles**—Keystone Iron & Steel Wks., 973 North Main St., let general contract building Unit C of new plant, including 2 story, 100 x 367 ft., rein.-con. and hollow tile machine shop and warehouse, rein.-con. flooring, concrete foundation, on Sante Fe Ave., to Pozzo Constr. Co., 421 Macy St. About $84,000.

★**Cal., Visalia**—R. L. Hickley, 1107 Highland Ave., Los Angeles, let contract building 2 story, 100 x 400 ft., packing house and 1 story, 50 x 60 ft. box factory, rein.-con., concrete foundation, to H. P. Siberell, 224 West Milford St., Glendale., (Los Angeles P.O.) About $75,000.

Buildings

PROPOSED WORK

Vt., Bennington—Library—Town plans to build 2 story, 50 x 90 ft., granite and marble concrete flooring and foundation, on Silver St. About $50,000.

Mass., Arlington Heights (Boston P. O.) — Church — Park Ave Congregational Church, 206 Appleton St., plans to build 1 story, brick, on Park Ave. About $75,000. Architect not selected.

Mass., Boston—Bank—Federal Reserve Bank, 53 State St., had plans prepared by C. R. Sturgis, archt., 120 Boylston St., for 5 story 100 x 110 ft., concrete, steel and stone, concrete foundation, on Pearl and Franklin Sts. About $5,000,000.

Mass., Boston — Mercantile — Snider & Druker, 18 Tremont St., plans to build 10 story, rein.-con., on Lincoln St. Work will probably be done by day labor. Architect not selected.

Mass., Boston — School — School Comn. preparing plans for 3 story, brick, concrete foundation, on Maxwell and Selden Sts. About $400,000.

Mass., Cambridge—Church—Notre Dame de Petre, c/o C. R. Greco, archt., 8 Beacon St., Boston, plans to build 1 story, 75 x 190 ft., brick and steel, on Harvey St.

Mass., East Boston (Boston P. O.)—School —School Comn., Boston, having plans prepared by C. Loring, archt., 7 Water St., Boston, for 3 story, 16 room brick, here. About $270,000.

Mass., Florence (Northampton P. O.) — Housing—Nonotuck Silk Co. plans to build several 2 story, frame houses for workmen. About $100,000. Architect not selected.

Mass., Framingham—Gymnasium—Civic Impvt. Assn. plans to build gymnasium. About $100,000. Architect not selected.

Mass., Northampton — Dormitory—Smith College, Inc., College Hall, having plans prepared by J. W. Ames, archt., 15 Exchange St., Boston, and K. S. Putnam, associated archt., 78 Main St., for brick dormitory group. About $700,000.

Mass., Northampton—Gymnasium—Smith College, Inc., College Hall, plans to build brick, concrete and steel, gymnasium and swimming pool, on campus. About $175,000. Architect not selected.

Mass., Northampton — Theatre — F. H. Roberts, 6 Crafts Ave., plans to build 1 story, brick and steel. About $100,000. Architect not selected.

Conn., Hartford — Bathhouse — Bldg. Comn., Municipal Bldg., receives bids about Feb. 1, constructing 1 story, 52 x 66 ft., brick and rein.-con., rein.-con. flooring, concrete foundation, on Connecticut Blvd. About $50,000. E. T. Wiley, 754 Pratt St., archt. Noted May 8.

Conn., Torrington—Store—W. W. Mertz Co., 84 Main St., receives bids about March 1, altering and building 2 story, 50 x 150 ft., brick and stone addition, concrete foundation. About $100,000. Private plans. Noted Jan. 15.

Conn., Wallingford — Armory — W. P. Crabtree, archt., 272 Main St., New Britain, receives bids in February, building 3 story, 38 x 75 ft. and 75 x 150 ft., brick concrete foundation, on North Main St., to include gymnasium, bowling alleys, etc., for Connecticut Military Emergency Bd., Hartford. About $300,000. Noted Jan. 8.

N. Y., Brooklyn—Courthouse—E. Riegelmann., boro. pres., soon lets contract building 3 story, 52 x 75 ft., brick and steel, brick foundation, at 109-115 Schermerhorn St. About $90,000. W. P. Bannister, 67 Wall St., New York City, archt. and engr.

N. Y., Brooklyn—Recreation Center—Brooklyn Jewish Center, 881 Eastern Parkway, having sketches made by L. A. Abramson, archt. and engr., 46 West 46th St., New York City, for 3 story, 125 x 187 ft., brick, steel and stone, brick foundation, on Eastern Parkway. About $750,000.

N. Y., New York—Bank and Office—McKim, Mead & White, archts. and engrs., 101 Park Ave., receive bids about Jan. 26, altering 4 story, brick, steel and stone, on 5th Ave., for 330 West 95th St., Corp., 170 Bway. About $250,000. Noted Jan. 15.

N. Y., New York—Office—Powers-Weight Rosengarten Co., 145 Front St., plans to build 50 x 60 ft., brick and steel, brick foundation, at 27-31 Depeyster St. About $100,000. Architect and engineer not selected.

N. Y., New York—School—Bd. Educ., 500 Park Ave., having plans prepared by C. B. J. Snyder, archt. and engr., Municipal Bldg., for P. S. 60, 5 story, brick and steel, brick foundation, on Dawson St. and Rogers Pl., Bronx Boro. About $500,000.

N. Y., New York—Stores and Offices—S. Levingson, archt. and engr., 405 Lexington Ave., preparing plans for 5 story, 25 x 100 ft., brick and steel, brick foundation, at 131 West 33rd St. About $85,000. Owner's name withheld.

N. Y., New York—Store and Office—G. H. Pelham, archt. and engr., 220 West 72nd St., preparing plans for altering 4 story, brick and steel, at 414 4th Ave. About $60,000. Owner's name withheld.

N. Y., New York—Synagogue—Huntspoint Talmud Torah, c/o Rouse & Goldstone, archts. and engrs., 512 5th Ave., having plans prepared for 75 x 100 ft., brick, steel and stone, brick foundation, on Simpson St. About $250,000.

N. Y., Rochester—High School—Bd. Educ. plans to build Monroe Jr. High School, on Alexander St., 3 story, 304 x 321 ft. About $1,500,000. E. S. Fisher, City Hall, engr.

Pa., Phila. — Sales — See "Industrial Works."

Pa., Phila.—Theatre—H. C. Hodgens, archt., 130 South 15th St., receives bids about Jan. 29, building 1 story, 72 x 190 ft., concrete and steel, on Frankford Ave., near Oxford Lane, for W. Freihofer, 20th and Indiana Sts. About $125,000.

Pa., Philipsburg — Hotel — G. S. Idell, archt., 1705 Chestnut St., Phila., preparing plans and receives bids about Feb. 1, building 6 story, 80 x 100 ft., brick and stone. Cost to exceed $100,000.

Md., Baltimore—Office—United States Fidelity & Guaranty Co., Calvert and Redwood Sts., preparing plans for 12 story, 44 x 92 ft., steel, brick and stone, concrete foundation, on Calvert St., to be connected with present building by ornamental bridge over Mercer St. and tunnel under street bed. About $500,000. Private plans.

Md., Baltimore — Theatre — Hippodrome Co., Eutaw and Baltimore Sts., plans to build 3 or 4 story, 150 x 200 ft., concrete, steel and brick, concrete foundation, on Charles St. and North Ave. About $1,000,000. M. Leow, pres. Architect to be announced soon.

S. C., Greenville — Bank and Office — Farmers & Merchants Bank having plans prepared by Mowbray & Uffinger, archts. and engrs., 56 Liberty St., New York City, for 16 story, brick, steel and stone, concrete foundation. About $1,000,000.

O., Bellevue—School—Bd Educ. soon lets contract building 2 story, 70 x 90 ft., rein.-con. and brick, rein.-con. flooring, rock foundation, in Thompson Twp. About $80,000. O. D. Howard, 8 East Broad St., Columbus, archt.

O., Caldwell—High School—Bd. Educ. had plans prepared and receives bids about March, building 2 story, 65 x 95 ft., fireproof. About $70,000. F. S. Rusk, 16 South 3rd St., Columbus, archt.

O., Cincinnati—Church and Parish—Bethlehem Methodist Church, Walnut Hills, soon lets contract building 2 story, 59 x 125 ft. church and 2 story 51 x 111 ft. parish house, rein.-con., steel, brick and stone, on Woodburn St., near Fairfax Ave. About $150,000. Bodenstein & Surman, 2nd Natl. Bank Bldg., archts. Former bids rejected.

Buildings (Continued)

O., Cincinnati—School—Bd. Educ., Denton Bldg., plans to build 4 story addition to Oakley School, Madison Rd., to include 14 rooms and gymnasium. About $500,000. S. Hannaford, 6th and Vine Sts., archts.

O., Cincinnati—Store—Rollman & Sons. 5th and Vine Sts., plan to construct 12 story, 100 x 125 ft., on site of present building. About $1,000,000. Architect not selected.

O., Cincinnati — Theatre — Columbia Amusement Co., 7th Ave. and 47th St., New York City, having plans prepared by H. W. McElfatrick, eng. and archt., 701 7th Ave., New York City, for brick, steel and stone, brick foundation, on 7th St., near Main St. About $400,000.

O., Cleveland — Commercial — Koblitz Plumbing & Heating Co., 1310 Huron Rd., having plans prepared by Lehman & Schmitt, archts., Electric Bldg., for 4 story, 140 x 240 ft., brick, steel and terra cotta. rein.-con. flooring, concrete foundation, on Euclid Ave. About $200,000.

O., Cleveland—Office—Business Woman's Club of Cleveland, 1648 East 70th St., plans to build concrete, steel and brick, concrete foundation. About $500,000. Architect and engineer not selected.

O., Cleveland — Temple — Anshe-Emeth-Beth Tephito Congregation having preliminary plans prepared by A. F. Janowitz, archt., Permanent Bldg., for 1 and 2 story, 150 x 245 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 105th St. and Drexel Ave. About $500,000. N. Silverman, rabbi.

O., Columbus—Office—M. Peterman, archt., 321 East Gay St., receives bids about Feb. 1, building 2 story, 62 x 89 x 93 ft., concrete, brick and stucco, on Young and State Sts., for C. F. Clark. About $50,000.

O., Columbus—School—Bd. Educ. having plans prepared by D. Riebel & Sons, archts., New 1st Natl. Bank Bldg., for 2 story, irregular shaped, concrete and brick, in Linden Heights. About $165,000.

O., Dayton—Business and Office—L. T. Cooper, 301 East 1st St., plans to build 54 x 195 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on West 2nd St. About $200,000. Architect not selected.

O., Dayton—Store—W. F. Oelman & Co., 4th and Main Sts., plan to remodel 5 story, brick and steel, brick foundation. About $200,000, Peters, Herman & Brown, 1129 Reibold Bldg., archts.

O., East Cleveland (Cleveland P. O.)—Hospital—East Cleveland Hospital Comn., 727 Rockwell Ave., plans to build 3 story, 90 x 250 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Euclid and Strathmore Aves. About $250,000. Architect to be selected soon.

O., Fairpoint—School—Bd. Educ. Wheeling Twp. having plans prepared by F. S. Rusk, archt., 16 South 3rd St., Columbus, for 2 story, 49 x 80 ft., brick, here. About $60,000.

O., Hartford (Croton P. O.)—School—Hartford Centralized School Bd. having plans prepared by F. S. Rusk, archt., 16 South 3rd St., Columbus, for 2 story, 60 x 110 ft., fireproof. About $90,000.

O., Parma—Schools—Bd. Educ. rejected bids building three 1 story, 60 x 118 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation. About $250,000. Work will be readvertised. Architect not selected. Incorrectly noted in our issue of Jan. 15.

Mich., Detroit—Church—Church of the Visitation, Wilson and Lawrence Aves., plans to build 2 story, brick, steel and concrete, rein.-con. flooring, concrete foundation, on Burlingame and Webb Sts. About $250,000. J. J. Lynch, pastor. Architect not selected.

Mich., Detroit—Commercial—Campus Realty Co., c/o G. J. Gnau, 1103 Dime Bank Bldg., plans to build 60 x 100 ft. brick, concrete and steel, rein.-con. flooring, concrete foundation, on Cadillac Square. Architect not selected.

Mich., Detroit — Commercial — Smith, Hincham & Grylls, engrs. and archts., 710 Washington Arcade, soon let contract altering and building 1 story, 20 x 120 ft., brick, steel and concrete addition, brick foundation, for King Blair Co., 236 Woodward Ave. About $50,000.

Mich., Detroit — Commercial — Williams Bros., 322 Woodward Ave., having plans prepared by Smith, Hinchman & Grylls, engrs. and archts., 710 Washington Arcade, for 4 story, 40 x 120 ft., rein.-con. brick and steel, rein.-con. flooring, concrete foundation, on Woodward Ave. About $60,000.

Mich., Detroit—Office—R. H. Marr, archt., Kresge Bldg., soon lets contract building 3 story, 75 x 130 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Howard St., for R. L. Polk Co., 19 Howard St. About $60,000.

Mich., Detroit—Temple—Masonic Temple Assn., Lafayette Blvd., had plans prepared by G. D. Mason, archt., 80 Griswold St., and will receive bids in spring for 4 and 6 story, 190 x 210 ft. and 6 story, 140 x 190 ft., rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation, on 2nd Ave. and Bagg St. About $4,000,000. J. S. Stringham, chn Bldg. Comn.

Mich., Grand Rapids—High School—Bd. Educ. plans to build 3 story, 225 x 250 ft. rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Plainfield Ave., to include coal storage and power plants. H. H. Turner, 234 Division Ave., N., archt.

Mich., Grosse Pointe (Detroit P. O.)—Club House—Grosse Pointe Golf Club, c/o Stratton & Snyder, archts., Union Trust Bldg., Detroit, having plans prepared for 2 or 3 story, brick and stone, wood flooring, concrete foundation. About $350,000.

Mich., Kalamazoo—Sales, etc.—Bermingham-Proesser Co., 402 East Kalamazoo Ave., having plans prepared by Billingham & Cobb, engrs. and archts., 403 Telegraph Press Bldg., for 3 story, 66 x 125 ft., sales and storage building, rein.-con., brick and steel, rein.-con. flooring, brick foundation, on East Frank St. About $80,000.

Mich., Three Rivers—School—T. H. Andrews, secy. School Dist. 1, Lockport Twp. and Three Rivers, soon lets contract building 2 story, rein.-con. brick and steel, rein.-con. and wood flooring, concrete foundation, here. About $175,000.

Ill., Chatsworth—High School—Bd. Educ. receives bids about April or May, building 2 story, brick. About $100,000. W. W. Day, 527 Main St., Peoria, archt.

Ill., Chicago—Office—See "Industrial Works."

Ia., Cedar Rapids—Office—See "Industrial Works."

Ia., Des Moines—Office—A. H. Blank, Iowa Bldg., having plans prepared by Vorse, Kraetsch & Kraetsch, archts., 911 S. & L. Bldg., for 2 story, 66 x 120 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on 7th and Grand Aves. About $100,000.

Ia., Goose Lake—School—Bd. Educ. Consolidated Dist. plans to build 4 story, 50 x 85 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $60,000. P. Harksen, RFD 1, Clinton, secy. C. A. Dieman, 408 Granby Bldg., Cedar Rapids, archt.

Ia., Ottumwa — Business — Ottumwa Courier Co. plans to construct business building. About $175,000. Architect will be selected at once.

Ia., Ottumwa—Club—Wapello Club plans to build brick club. About $75,000. Architect will be selected at once.

Ia., Welton—School—Bd. Educ. Consolidated Dist. plans to build 3 story, 50 x 85 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. Bonds for $65,000 voted for project. D. O. Oberholser, RFD 1, DeWitt, secy. C. A. Dieman, 408 Granby Bldg., Cedar Rapids, archt.

Minn., Duluth—Hospital—Sister Superior of Sisters of Benedictine receives bids about Feb. 15, building 5 story, 40 x 200 ft., addition to St. Marys Hospital, 3rd St. E., rein.-con. and brick, rein.-con. flooring, concrete foundation, for Catholic Diocese of Duluth, 3rd St. and 5th Ave. E. About $200,000. F. H Ellerbe, Endicott Bldg., St. Paul, engr. and archt.

Kan., Lyndon—Courthouse—Osage Co. rejected bids received Jan. 8, building 3 story, 84 x 100 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $200,000. W. E. Hulse & Co., Hutchinson, archts.

Neb., Chadron—Schools—Bd. Educ. having plans prepared by E. Davis, archt., Lincoln, for Grade School and High School, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $50,000 and $175,000 respectively.

Neb., Omaha—Bank and Office—Amer. Bank Bldg., 18th and Farnam Sts., had plans prepared by J. A. McDonald, archts., 908 Omaha Natl Bank Bldg., for 20 story, 90 x 133 ft., steel stone and brick, rein.-con. flooring, concrete foundation, on 19th and Farnam Sts. About $1,500,000.

Neb., Omaha—Theatre—World Realty Co., c/o Sun Theatre, 1410 Farnam St., plans to build 5 story, 110 x 132 ft., rein.-con., brick and steel, rein.-con flooring, concrete foundation, on 15th and Douglas Sts. About $500,000.

Neb., West Point—School—Bd. Educ. having plans prepared by E. Davis, archt., Lincoln, for 2 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $100,00.

Wyo., Casper—Temple—Dubois & Goodrich, archts., Towsend Bldg., receive bids about April 1, building 3 story, 50 x 120 ft., labor temple, steel and brick, on 4th and Wolcott Sts. About $90,000. Owner's name withheld.

Mo., Carthage—Hotel—Stock Co., c/o A. Marks, secy. Chamber of Commerce, and Shepard & Wiser, archts., 301 R. A. Long Bldg., Kansas City, soon let contract building 4 story, 75 x 90 ft., rein.-con., brick and stone, concrete foundation. About $140,000. Truscon Steel Co,. Bryant Bldg., Kansas City, engrs.

Mo., •Columbia—Dormitories—University of Missouri plans to build 2 dormitories and tower, 125 ft. high, on campus. About $500,000. L. M. Defoe, chairman of memorial com., University of Missouri. Architect not selected.

Mo., Kansas City—Church—Central Presbyterian Church, c/o C. A. Gould, chn. Finance Com., 901 Harrison St., having plans prepared by Shepard & Wiser, archts. and engrs., 301 R. A. Long Bldg., for 1 story, rein.-con. and stone, rock foundation, on Armour Blvd. and Campbell St. About $200,000.

Mo., Kansas City—Store—Rothschild & Sons, c/o L. Rothschild, 10th and Main Sts., having plans prepared by F. E. McIlvain, archt. and engr., 1001 Orear-Leslie Bldg., for 4 story, 23 x 124 ft., rein.-con., brick and terra cotta.

Mo., Marceline—Temple and Bank—Masonic Bldg. Co. having plans prepared by J. O. Hogg, archt., New York Life Bldg., Kansas City, for 3 story, 50 x 120 ft., concrete, steel and brick, concrete foundation. About $60,000.

Okla., Ft. Gibson—Bank—Citizens Natl. Bank having plans prepared by H. C. Valeur & Co., archts., 705 Phoenix Bldg., Muskogee, for 1 story, 25 x 55 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $55,000.

Wash., Hoquiam—Theatre—H. Newman acquired site adjoining Eagles Bldg. and plans to build 1 story, 95 x 100 ft., concrete and brick. About $100,000. Architect's name withheld.

Wash., Spokane — Church — Central Methodist Church has appointed committee to make preliminary plans for location and construction of 2 story, brick or stone. Cost between $200,000 and $250,000. J. M. Walters, pastor. Architect not selected.

Wash., Spokane—Store—E. S. Burgan & Son, 1108 Division St., plans to build 6 story, 108 x 142 ft., concrete and terra cotta, concrete foundation. About $100,000. Private plans.

Ore., Prineville — Hotel—M. McDowell plans to build 3 story (100 room), probably brick. About $75,000. A. M. Standish, The Dalles, archt.

Cal., Los Angeles—Hospital—Los Angeles Orthopædic Foundation, Auditorium Bldg., having preliminary plans prepared by E. L. Mayberry, archt., 468 Pacific Electric Bldg., for 3 story, rein.-con. on Hope St. About $100,000. H. H. Baskerville, pres.

Cal., Turlock—High School—Bd. Educ. having plans prepared by W. H. Weeks, archt., 75 Post St., San Francisco, for high school. About $200,000.

Ont., Windsor—Bank and Office—Bank of Hamilton, Hamilton, plans to build 10 story, rein.-con. brick and stone, rein.-con. flooring, concrete foundation, on Quellette Ave. and Chatham St., here. About $750,000.

B. C., Vancouver—Theatre—C. E. Royal and associates, 292 Hastings St. E., having sketches drawn by Gillingham & Korner, archts., 422 Richards St., for 4 story, 120 x 175 ft., on Robson and Hornby Sts. About $300,000.

BIDS DESIRED

N. Y., New York—Hospital—Until Jan. 26, by Bd. Trustees, Bellevue and Allied Hospitals, at office of General Medical Supt., 415 East 26th St., for all labor and material for constructing temporary wards at Fordham Hospital, Crotona Ave. and Southern Blvd., Bronx Boro. J. W. Brannan, pres.

N. Y., New York—Loft—Until Feb. 1, by Euvrard, Sambach & Euvrard, archts. and engrs., 29 Cleveland Pl., building 7 story, brick and steel, brick foundation, at 48-50 West 36th St. About $100,000. Owner's name withheld.

Pa., Phila.—Office—Until Jan. 24, by C. E. Oelschlager, engr. and archt., 1615 Walnut St., for 15 story, 40 x 131 ft., concrete and brick addition, for Medical Arts Bldg., 16th and Walnut Sts.

Buildings (Continued)

Del., Wilmington—Sales—Gomery & Schwartz, 128 North Broad St., Phila., receiving bids building 2 story, 71 x 123 ft., concrete, brick and terra cotta, on Delaware Ave. and Tatnall St., here. About $50,000. C. E. Oelschlager, 1615 Walnut St., Phila., archts. and engrs.

W. Va., White Sulphur Springs—Hotel—Until Feb. 1, by Greenbrier Hotel Co. building 4 story, 81 x 112 ft. addition. Elzner & Anderson, Citizens Natl. Bank Bldg., Cincinnati, O., engrs.

O., Cleveland—Clubhouse—Until Jan. 27, by Cleveland Columbia Bldg. Co., 507 Williamson Bldg., constructing 3 story, 63 x 85 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, at 3422 Euclid Ave. About $100,000. F. S. Fish, 427 Erie Bldg., archt.

O., Cleveland—Jail—Until Feb. 17, by Cuyahoga Co. Jail Comm., building superstructure for 4 story, concrete, brick and stone, on West 3rd St. and Lakeside Ave., here. About $3,500,000. W. S. Lougee, 500 Marshall Bldg., archt.

Ind., Clinton—Theatre—J. E. Pridmore, archt., 38 South Dearborn St., Chicago, receiving bids for 1 story, 50 x 160 ft., rein.-con., brick and steel, concrete foundation, for Standard Theatre Co.

Mich., Detroit—Commercial—Until Jan. 28, by Walsh & O'Dell, archts., Chamber of Commerce Bldg., constructing 3 story, 62 x 143 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Woodward Ave., for Walker Bros. Catering Co., 29 Farmer St. About $80,000.

Mich., Detroit—Lodge—Until March 1, by A. Clubb, archt., 26 Goebel Bldg., constructing 3 story, 60 x 80 ft., rein.-con., brick and steel, concrete foundation, on Mack Ave., for Acacia Lodge, F. & A. M. About $60,000.

Ill., Moline—Bank—Until Jan. 26, by Cervin & Horn, archts. and engrs., Safety Bldg., Rock Island, building superstructure for 8 story, 54 x 85 ft., rein.-con. and brick, for Moline Trust Savings Bank, 5th Ave. and 15th St. About $300,000. Noted Jan. 1.

Wis., Racine—Hall—Until Jan. 31, by Bd. Pub. Wks., remodeling city hall. About $75,000. A. A. Guilbert, Robinson Blk., engr.

Ia., Aurelia—School—Until Feb. 17, by Bd. Educ., Consolidated Dist., building 3 story, 75 x 166 ft., brick and stone, rein.-con. flooring, concrete foundation. About $175,000. W. Gordon, 319 Hubbell Bldg., Des Moines, archt.

Ia., Woodbioe—School—Until Feb. 9, (change of date) by Bd. Educ. and W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, building 3 story, 59 x 81 ft., brick, rein.-con. and stone, concrete foundation. About $100,000. E. E. Higgins, secy. Noted Jan. 15.

Minn., Minoeapolis—Theatre—J. E. Pridmore, archt., 38 South Dearborn St., Chicago, receiving bids building 1 story, 100 x 165 ft., rein.-con. and steel, concrete foundation, here, for Industrial Investment Co., 807 Hennepin Ave. About $125,000.

Mont., Helena—Temple—Until Feb. 2, by S. McKennan, secy. Algeria Masonic Temple, Union Bank Bldg., constructing 1 story temple, on Neil and Brinton Aves. About $200,000. Link & Haire, Power Bldg., archts. Noted July 31.

Okla., Haskell—Bank—First Natl. Bank receiving bids building 2 story, 50 x 70 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $60,000. M. F. Hardin, 504 Equity Bldg., Muskogee, archt.

Okla., Pauls Valley—Dormitory—State Bd. Pub. Affairs, Oklahoma, receiving bids building 2 story, 50 x 80 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $60,000. M. F. Hardin, 504 Equity Bldg., Muskogee, archt.

Cal., San Bernardino—School—Until Jan. 31, by Bd. Educ., building 14 room brick school. About $115,000. H. E. Jones, Katz Bldg., archt.

N. S., Halifax—Hospital—Until Feb. 15, by Comr. Wks. & Mines, Provincial Government, building 3 story, 60 x 220 ft. with two 30 x 100 ft. wings, brick and concrete, concrete foundation, on Tower Rd. About $220,000.

Que., Montreal—Synagogue—Until Jan. 31, by L. Cohen, engr., 29 Rosemount Ave., Westmount, building 50 x 100 ft. concrete, steel and brick, concrete foundation, on St. Antonie and Kensington Sts., for Congregation Shaav Hashomagin. About $150,000.

Que., Westmount—Bank—Until Feb. 15, by Merchants Bank of Canada, 205 St. James St., Montreal, building 2 story, 50 x 90 ft., brick, steel and concrete, concrete foundation, on Sherbrooke and Metcalfe Sts., here. About $75,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Vt., Brattleboro**—Bank—Hutchins & French, archts, 6 Beacon St Boston, let contract to Pellett & Skinner, 102 Main St., altering brick bank on Main St., for Vermont Natl. Bank. About $50,000.

★**Mass., Boston**—Bank—Merchants Natl. Bank, 28 State St., let contract building 5 story, 54 x 80 ft., concrete addition, on State St., to A. C. Whitney, Post Office Sq. About $300,000.

★**Mass., Boston**—Office—New England Telephone & Telegraph Co., 119 Milk St., let contract building 3 story, 80 x 100 ft., concrete and brick, rein.-con. flooring, concrete foundation, on Essex St., to I. F. Woodbury & Co., Summer St. About $100,000.

★**Mass., Boston**—Parish Hall—Roman Catholic Diocese of Boston, 85 Regent St., Roxbury, let contract building 2 story, 40 x 60 ft., brick addition, on Gove St., here, to J. J. Flynn, Dorchester. About $50,000.

★**Mass., Worcester**—Sales, etc.—See "Industrial Works."

★**Conn., Meriden**—Y. M. C. A., 21-23 Colony St., let contract constructing 4 story, 138 x 140 ft., brick and rein.-con. building, rein-con. flooring, concrete foundation, on West Main St., to H. Wales Lines Co., 134 State St. About $325,000.

★**Conn., Waterbury** — Bank—Waterbury Natl. Bank, Grand and Field Sts., let contract building 4 story, 66 x 89 ft., brick, concrete and steel, to Irwin & Leighton, 126 North 12th St., Phila. About $500,000.

★**N. Y., Newton** (Flushing P. O.)—High School—Bd. Educ., 500 Park Ave., New York City, let contract altering and building brick, steel and stone addition, brick foundation, on Etna Pl., Chicago and Parcell Sts., to D. E. Connors, 15 West 91st St., New York City, $794,000. Noted Jan. 15.

★**N. Y., New York**—Bank—Federal Reserve Bank, 15 Nassau St., let contract building brick, steel, marble and stone, brick foundation, on Maiden Lane, Nassau, Liberty and William Sts., to M. Eidlitz, 30 East 42nd St. About $2,500,000.

★**N. Y., New York**—Church—J. G. Rogers, archt. and engr., 367 Lexington Ave., let contract to Miller-Reed, 103 Park Ave., building 1 story, 40 x 65 ft., brick, steel and stone, brick foundation, on University Ave., for Featherbed Lane Presbyterian Church, c/o architect. About $50,000.

★**N. Y., New York**—Hotel—One Hundred Forty-five West 55th St., Corp., Inc., 1 West 67th St., let contract building 15 story, 80 x 100 ft., brick, steel and stone, brick foundation, at 139-145 West 55th St., to F. T. Ley, 19 West 44th St. About $750,000. Noted Jan. 1.

★**N. Y., New York**—Loft—Starrett & Van Vleck, archts. and engrs., 8 West 40th St., let contract to L. Cheavilier, Weehawken, N. J., altering 5 story, brick and steel, brick foundation, at 48-50 West 47th St., for W. H. Wise & Sons, 56 West 45th St. About $50,000.

★**N. Y., New York**—Office—T. A. Gillespie, 50 Church St., let contract building 12 story, brick, stone and steel, brick foundation, at 5-7 Dey St., to G. A. Fuller, 175 5th Ave. About $1,000,000.

★**N. Y., New York**—Theatre and Office—M. Loew Enterprise, 1492 Bway., let contract building 16 story, 50 x 120 x 180 ft., brick, steel and stone, brick foundation, on Bway and 45th St., to Fleischmann Constr. Co., 531 7th Ave. About $1,000,000. Noted Sept. 11.

★**N. Y., Rochester**—High School—Bd. Educ. let masonry contract building Madison Junior High School, at Wilson Park, 3 story, 304 x 321 ft., brick, rein.-con. flooring, concrete and rock foundation, to A. Frederick & Son Co., Lake Ave., $824,973; carpentry, to J. Luther & Sons Co., 87 Stillson St., $232,500; electrical work, to Wheeler-Green Electric Co., 29 St. Paul St., $41,973; heating and power, to Barr & Creelman Co., 72 Exchange St., $162,000. Noted Jan. 15.

★**N. J., East Orange**—Store—R. H. Muir, Inc., Main St., let contract altering and building 2 story, brick and steel addition, concrete foundation, on Main and Prospect Sts., to E. A. Abbott Co., 3 Park St., Boston. About $100,000.

★**N. J., Princeton**—Theatre—Princeton Theatre Co., Nassau St., let contract building 1 story, 30 x 70 ft., concrete and brick, on Nassau St., to Matthews Constr. Co., Alexander St. About $50,000.

★**Va., Lexington**—Dormitory—Washington & Lee University will build 2 story, 39 x 68 ft., and 25 x 65 ft., brick, concrete foundation, on college grounds. About $125,000. Work will be done by day labor.

Va., Williamsburg—School—H. D. Cole, clk Bd. Educ., received bids Jan. 6, building 2 story, 84 x 88 ft., brick, concrete foundation, on Main St., from R. V. Richardson Constr. Co., 515 Marshall St., Hampton, $55,970; Harwood & Mosse, Silsby Bldg., Newport News, $60,650; W. P. Thurston Co., Merchants Bank Bldg., Richmond, $79,400.

★**N. C., Farmville**—School—Bd. Educ. let contract building 2 story, brick, to J. W. Stout, Stanford. About $150,000.

O., Cleveland — Commercial — D. R. Hanna, Leader-News Bldg., let contract building 16 story, 107 x 199 ft., concrete, steel, brick and stone, rein.-con. flooring, concrete foundation, at 1402 Euclid Ave., to J. Gill & Sons, Citizens Bldg. About $2,875,000.

★**O., Flat Rock**—School—Bd. Educ. Thompson Twp. Rural School Dist. let contract building 3 story, 80 x 90 ft., brick, in Thompson Twp., to E. E. Beckett, 674 South Ohio Ave., Columbus. About $82,000.

★**O., Upper Sandusky**—School—O. Gottfried, clk. Bd. Educ. of Salem Twp. Rural School Dist., let contract building 2 story, 75 x 80 ft., brick, in Salem Twp., to C. M. Kress, Upper Sandusky. About $70,000.

★**Mich., Detroit**—Bank—Dime Savings Bank, Griswold and State Sts., let contract building 2 story, 30 x 75 ft., brick, steel and granite, rein.-con. flooring, concrete foundation, on Chene St., to Walbridge-Aldinger Co., 2356 Penobscot Bldg. About $50,000. Noted Sept. 25.

★**Ill., Chicago**—Club—Hamilton Club, 20 South Dearborn St., let contract building 10 and 11 story, 85 x 102 ft., steel, tile, terra cotta and brick addition, to Wells Bros. Constr. Co., 53 West Jackson St. About $500,000.

★**Ill., Chicago**—Loft—Chicago Tribune, 1 South Dearborn St., let contract building 15 story, 100 x 300 ft., steel, tile, brick and terra cotta, concrete foundation, at 431 North Michigan Ave., to R. C. Wieboldt, 1534 West Van Buren St. About $2,500,000.

★**Ill., Chicago**—Office—Penn & Kaplan, Division and California Sts., let contract building 1 and 2 story, 168 x 184 ft., brick, concrete foundation, to H. Lipman, c/o Dubin & Eisenberg, archts., 139 North Clark St. About $75,000.

★**Wis., Milwaukee**—Store—Boston Store, 4th and Grand Ave., let contract building 8 story, 90 x 100 ft., rein.-con. and brick addition, rein.-con. flooring, concrete foundation, on 4th St. and Sycamore Ave., to S. M. Siesel, 86 Michigan Ave. About $900,000. Cost plus percentage basis.

Ia., Bondurant—School—Bd. Educ. received bids Jan. 14, building 2 story, 63 x 105 ft., brick and steel, rein.-con. flooring, concrete foundation, from J. E. Tusant & Sons Co., 583-7th St., $76,164; E. Marxer Co., 1233-5th St., $79,000; N. D. Garmer, 1229 39th St., $79,690. Contractors all of Des Moines. Noted Jan. 1.

★**Ia., Macksburg**—School—Bd. Educ. let contract building 3 story, 58 x 100 ft., brick and stone, rein.-con. flooring, concrete foundation, to Hintz Constr. Co., Creston. About $57,500.

★**Minn., Hibbing**—School—C. C. Alexander, supt. School Dist. 18 let contract building 3 story, 74 x 150 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, in Ansley Addition, to H. Watue, 3rd St., $215,213.

★**Mo., Kansas City**—Office, Etc.—J. M. Clark, 414 Dwight Bldg., let general contract constructing 14 story, 98 x 132 ft., concrete, steel and brick office building and garage, rein.-con. flooring, on 11th and Cherry Sts., to J. S. Black Masonry & Constr. Co., 508 Wright Bldg. About $1,250,000.

★**Mo., St. Louis** — Mercantile — J. H. Forbes Tea & Coffee Co., 9th and Clark Sts., let contract building 5 story, 90 x 120 ft., concrete and brick, on Clark and 10th Sts., to S. S. Callin, Clayton. About $200,000.

★**Mo., St. Louis**—Mercantile—Halwe Investment Co., 3128 Locust St., let contract building 4 story, 90 x 120 ft., rein.-con. and brick, rein.-con. flooring, at 2805 Locust St., to A. D. Gates Constr. Co., Chemical Bldg. About $250,000.

★**Mo., St. Louis**—Mercantile—J. A. Hutcheson, 712 Olive St., let contract building 2 story, 100 x 134 ft., brick and tile, on Locust and North Garrison Sts., to A. Campbell, 6435 Wellsmar St. About $90,000.

Buildings (Continued)

★Mo., St. Louis — Mercantile — Lindell Real Estate Co., 3rd Natl. Bank Bldg., let contract altering 7 story mercantile building, at 804 Washington St., to Murch Bros. Constr. Co., Ry. Exch. Bldg. About $53,000.

★Okla., Duncan — Courthouse — Stephens Co. let contract building 4 story, 70 x 84 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to Manhattan Constr. Co., 3rd and Fondulac Sts., Muskogee. About $139,700.

★Cal., Los Angeles—Office and Stores—Pacific Mutual Life Insurance Co., 6th and Olive Sts., let contract building 12 story, 170 x 218 ft., concrete brick and steel, rein.-con. flooring, concrete foundation, on 6th St. and Grand Ave., to Pacific Marine & Constr. Co., 510 Wright & Callender Bldg., cost plus percentage basis; furnishing and erecting structural steel, to Llewellyn Iron Wks., 1100 North Main St. Total cost, $2,500,000. Noted Aug. 7.

★Cal., Los Angeles—Store—F. B. Silverwood, 6th St. and Bway., let general contract building 5 story, 77 x 119 ft., concrete, steel, stone and terra cotta, rein.-con. flooring, concrete foundation, to C. J. Kubach Co., 701 Merchants Natl. Bank Bldg. About $200,000. Steel contract let to Llewellyn Iron Wks., North Main and Ord Sts.

★Cal., Los Angeles—Store, etc.—Goodyear Tire & Rubber Co. of California, 6401 Central Ave., will build 2 story, 126 x 126 ft., store and rooming house, 2 story, 126 x 126 ft., store and apartment house, 60 frame and stucco bungalows and 800 hollow tile and concrete block houses, on Ascot Park property. About $3,000,000. Work will be done by day labor under supervision of J. E. Polsey, 1718½ Roosevelt Ave.

★Cal., Los Angeles—Theatre and Office—Ackerman & Harris, 281 O'Farrell St., San Francisco, western representatives for M. Loew, New York City, will build 12 story, 170 x 170 ft., rein.-con., brick and steel, on 7th and Bway. Sts., here. Contract for structural steel let to Llewellyn Iron Wks., North Main and Ord Sts. Total cost, $1,500,000.

★Cal., Modesto—Store—Thompson Co. let general contract building 2 story, rein.-con., concrete foundation, to J. Ulrich, Modesto. About $90,000.

★Cal., Oakland—Hospital—Alameda Co. let contract building rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on 14th Ave. and Vallecito Pl., to Clinton Constr. Co., 140 Townsend St., San Francisco. About $546,000. Work includes 4 story, 132 x 144 ft. service building, two 40 x 140 ft., ward buildings and connecting corridors. Noted Jan. 8.

★Cal., San Francisco—Bank and Office—First Federal Trust Co., Post and Montgomery Sts., let contract building 3 story, rein.-con., brick and steel, on Montgomery St., to J. E. Scully, Flood Bldg. About $300,000.

★Cal., San Francisco — Hospital — St. Francis Hospital Assn. let general contract building 6 story, rein.-con. and brick, concrete foundation, on Bush St., to I. W. Colburn, 180 Jessie St., $71,250; grading, to A. J. Reeder, Sharon Bldg., $10,990; concrete work, to Mission Concrete Co., 180 Jessie St., $91,000; plumbing and heating, to C. Peterson Co., 730 Larkin St., $39,231 and $17,124 respectively; brick and terra cotta work, to A. W. Lawsen, 180 Jesse St., $8,750.

★Ont., Windsor—School—Bd. Educ. let contract building 3 story (20 room), rein.-con. and brick, rein.-con. flooring, concrete foundation, to S. Dinsmore, 7 Royal Bank Bldg. About $400,000.

Federal Government Work

PROPOSED WORK

Mass., Boston—Extension to Buildings—Spec. 4053—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids constructing extension to Bldg. 420, 40 ft. wide, 470 ft. long, and altering Bldgs. 42B and 42E, at Navy Yard, here; $20 deposit required for plans and spec.

R. I., Newport—Officers' Quarters—Spec. 4130—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $15,000.

N. J., Lakehurst—Power Plant and Distributing System — Spec. 4128 — Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $550,000.

N. C., Thomasville—Post Office—Treas. Dept., Wash., D. C., rejected bids received Dec. 18, furnishing labor and material for building, here. Noted Jan. 1.

S. C., Charleston—Seaplane Hangar—Spec. 4127—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to transfer from Brunswick, Ga., and reerect here. About $10,000.

Mich., Detroit—Radio Building—Spec. 4120—Bureau Yards & Docks, Navy Dept., Wash., D. C., and Pub. Wks. Office Naval Training Dists. 9, 10 and 11, Great Lakes, soon receives bids constructing 2 story, wood frame radio building, 25 ft. 8 in. long, 24 ft. 8 in. wide, concrete footings, brick veneer on exterior walls, asphalt shingle roof covering, plastered interiors, plumbing, electric lighting, power and heating systems, at Wind Mill Point, here. Noted Jan. 15.

Cal., San Diego—Distributing System and Power Plant Equipment—Spec. 4118—Bureau Yards & Docks, Navy Dept., Wash., D. C., and Pub. Wks. Office, Timken Bldg., soon receives bids furnishing and installing complete power plant and electric generating equipment including piping and accessories and distributing systems for electricity and steam at Marine Corps Base, here. About $150,000; $10 deposit required for plans and spec. Noted Jan. 15.

Cal., San Diego—Lighting Fixtures—Spec. 4129—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install at Marine Barracks, here. About $10,000.

Cal., San Francisco—Stone—U. S. Engr. Office, War Dept., Wash., D. C., rejected bids furnishing stone for jetties at entrance to Humboldt Bay, 1st Dist., here. Noted Jan. 1.

Cal., Vallejo—Electrify Causeway and Build Spurs—U. S. Navy Yard, Mare Island, plans to electrify causeway and build several spurs for handling freight. About $47,500 appropriated for project. Work will probably be done by day labor.

BIDS DESIRED

Pa., Phila.—Dredging—Until Feb. 18, by U. S. Engr. Office, 815 Witherspoon Bldg., dredging in Delaware River, Philadelphia Harbor; advertised in this issue.

Pa., Pittsburgh—Lock and Dam—Until Feb. 14, by U. S. Engr. Office, Pittsburgh, building lock and dam 4, Allegheny River, near Natrona; advertised in this issue.

Pa., Pittsburgh—Remodeling Post Office and Courthouse—Until Feb. 16, by Treas. Dept., Wash., D. C., remodeling here. J. A. Wetmore, superv. archt.

D. C., Wash.—Completing Storage Plant—Spec. 4115—Until Jan. 28 (change of date), by Bureau Yards & Docks, Navy Dept., completing storage plant for fuel oil at Navy Yard. About $50,000; $10 deposit required for plans and spec. Noted Jan. 15.

D. C., Wash.—Sewers—Until Jan. 28, by C. W. Kutz, dist. comr., 509 Dist. Bldg., constructing 300 lin.ft. 10 in. pipe sewer.

D. C., Wash.—Theodolites—Until Feb. 11, by Supt. U. S. Coast and Geodetic Survey, 204 New Jersey Ave. S. E., building two 8 in. theodolites; advertised in this issue.

Va., Hampton Roads—Seaplane Hangars, etc.—Until Feb. 14, by F. C. Peters, Constructing Quartermaster, Langley Field, building 2 seaplane hangars and altering and extending existing dirigible hangar; advertised in this issue.

Va., Norfolk—Dispensary—Spec. 4101—Until Feb. 11 (change of date), by Bureau Yards & Docks, Navy Dept., Wash., D. C., building, here. About $25,000. Noted Jan. 1.

Ala., Florence—Portland Cement—Until Feb. 20, by U. S. Engr. Office, Florence, furnishing 400,000 bbls. portland cement; advertised in this issue.

Wis., Milwaukee—Radio Building—Spec. 4107—Until Feb. 18, by Bureau Yards & Docks, Navy Dept., Wash., D. C., constructng radio building, frame, 24 ft. wide, 26 ft. long, concrete foundations, stucco on exterior walls, plaster on interior walls and ceiling, terra cotta shingle tile roofing, wood sash and doors, at Navy grounds, McKinley Park, here. About $9,000; $10 deposit required for plans and spec.

Tex., Ft. Worth—Extension to Post Office—Until Feb. 5, by Treas. Dept., Wash., D. C., building extension to workroom at Post Office, here. J. A. Wetmore, superv. archt.

Tex., Waco—Altering Post Office and Courthouse—Until Feb. 9, by Treas. Dept., Washington, D. C., altering here. J. A. Wetmore, superv. archt.

Cal., Sacramento—Remodeling and Extending—Until Feb. 18, by Treas. Dept., Wash., D. C., remodeling and building extension to Post Office and Court House, here. J. A. Wetmore, superv. archt. Noted Jan. 8.

Cal., San Diego—Fuel Oil Storage Plant—Spec. 4102—Until Feb. 11, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building 50,000 gal. fuel oil storage plant, etc., at Marine Corps Base, here. About $15,000; $10 deposit required for plans and spec. Noted Jan. 15.

Cal., San Francisco—Altering Building—Spec. 4116—Until Feb. 11, by Bureau Yards & Docks, Navy Dept., Wash., D. C., altering double quarters, dormitory and mess hall and constructing new double quarters, at Naval Radio Sta., Yerba Buena Island, here. About $23,000; $10 deposit required for plans and spec. Noted Jan. 15.

Alaska—Bridge—Until May 3, by C. E. Dole, purch agt., Alaska Eng. Comn., Seattle, Wash., building steel bridge at Hurricane Gulch, south approach includes one 50 ft. deck plate girder span, one 120 ft. deck truss span, riveted; main body, one 384 ft. deck spandrel arch, 2 hinged; north approach, one 120 ft. deck truss span, riveted; one 240 ft. steel viaduct of 60 ft. spans and 30 ft. towers. Alaska Eng. Comn. will build piers and foundation.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. J., Cape May—Dirigible Hangar—Spec. 4080—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract altering and building addition, here, to Associated Contractors, 17 West 42nd St., New York City. About $772,930. Noted Jan. 15.

Pa., Phila.—Extending Launching Ways—Spec. 4099—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids extending launching ways, Slip No. 3, here, from Government Force Div. of Pub. Wks. Dept., Phila., (1) $9,645 (50 days), (1a) $13,091 (50 days), (2) $33, (2a) $46, (3) $.60, (3a) $.84; Latta & Roberts, Drexel Bldg., (1) $15,750 (60 days), (2) add $33, deduct $20, (3) add $1, deduct $.10; McLean Contg. Co., 1412 Fidelity Bldg., Baltimore, Md., (1) $14,500 (60 days), (2) add $28, deduct $18, (3) add $.60, deduct $.04.

★D. C., Wash.—Electric Traveling Cranes—Spec. 4094—Bureau Yards & Docks, Navy Dept., let contract furnishing and installing two 5 ton electric traveling bridge cranes with 5 ton auxiliary in proof shop, at Navy Yards, to Pawling & Harnishfeger Co., 38th St. and Natl. Ave., Milwaukee, Wis. About $24,900. Noted Jan. 8.

D. C., Wash.—Main Interceptor—Dist. Comrs., Dist. Bldg., received bids building Sect. 11, Anacostia Main Interceptor, under tracks of Phila., Baltimore and Washington R.R.,

(1) for ordinary excavation, including excavations for manholes and disposal of material by removal and refilling of trenches all sheeting and shoring, bridging and fencing, and removal of same; all pumping and bailing, all protection and restoration of buildings, fences, existing sewers, water mains, gas mains, electric conduits, and pavements, streets, roads and railroads and other structures affected thereby, including also accommodations of travel and all other incidental work.

(2) for concrete masonry "B" in place, including all centers, forms and setting of iron work, etc. and all incidental work.

(3) for vitrified brick masonry laid, including all form setting of ironwork, etc. and all incidental work.

(4) for sewer brick masonry laid, including all forms, setting of ironwork, etc. and all incidential work from W. F. Brenizer Co., 101 New York Ave., N. E., (1) $10, (2) $42, (3) $40, (4) $35; Adam McCandlish, Wash., (1) $8, (2) $38, (3) $55, (4) $40; W. F. Cush, 3rd and R Sts., N. E., (1) $6.75, (2) $23, (3) $48, (4) $60.

★Va., Norfolk—Quay Wall—Spec. 4044—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building, here, to H. P. Converse, 31st St. and Colonial Ave. About $250,634 (300 days). Noted Jan. 1.

★Ia., Grundy Center—Grundy Co. let contracts building several rein.-con. bridges and culverts, involving 900 cu.yd. rein.-con., to F. Fuller & Sons, Grundy Center, $27,800; several steel truss bridges on rein.-con. foundations, with rein.-con flooring and several rein.-con. slab and girder bridges, to A. Olson Constr. Co., 401 Black Hawk Natl. Bank Bldg., Waterloo, $98,825.

★Mo., St Louis—Floating Terminal—U. S. R.R. Administration Wash., D. C., let contract building floating terminal, 280 ft. long, 75 ft. wide, to Dubuque Iron Wks., Dubuque, Ia. About $280,000.

Federal Government Work (Continued)

Wash., Alderton—Comrs. Pierce Co. (Tacoma) received bids building 85 ft. steel bridge, concrete flooring, between here and Sumner, from D. W. Rutherford, Municipal Dock, $37,250; Illinois Steel Co., $42,800; Jarvis & Ward, $39,750; contractors all of Tacoma.

★**Ore., Eugene**—Roads—U. S. Dept. of Agriculture, Bureau Pub. Rds., 204 Post Office Bldg., Portland, let contract building 15 mi. McKenzie River Natl. Forest Rd. from Blue River to Belknap Springs, involving 47 acres clearing, 43 acres grubbing, 6,000 cu.yd. rock and 44,000 cu.yd. common excav., 900 lin.ft. log or pipe culvert, to Sims & Carlson, Spokane, Wash. About $97,000.

★**Ore., Portland**—Dredge Hull—U. S. Engr. Office let contract building one wooden dredge hull with house, 1st Dist., to Scandia Shipbuilding Co., Marshfield, $12,883.

★**Cal., Benicia**—Roads—U. S. Government, Wash., D. C., will build 6 mi. waterbound macadam and dirt roads at Benicia Arsenal Grounds, here. About $46,000. Work will be done by day labor. Address E. P. O'Hern, commandant.

★**Cal., Los Angeles**—Dredging—U. S. Engr. Office, 725 Central Bldg., let contract dredging in San Diego Harbor, here, to United Dredging Co., Los Angeles, $411,584.

★**P. R., Point Borinquen**—Light Station—Comr. of Lighthouses, Wash., D. C., let contract furnishing labor and material building, here, to F. P. Rexach, San Juan, $54,220 (4 months). Noted Jan. 8.

Miscellaneous

PROPOSED WORK

Pier—Portland, Me.—State Pier Comn., Augusta, plans to build concrete and steel pier, here. About $2,000,000. Fay, Spofford & Thorndike, 15 Beacon St., Boston, engrs.

Tanks—Boston, Mass.—W. F. Schrafft & Sons Corp., 160 Washington St., soon receives bids building four 7 x 15 x 16 ft., concrete and steel lined storage tanks, concrete foundation. About $20,000. Private plans.

Swimming Pool—Northampton, Mass.—See "Buildings."

Raising Elevation of Dam—Watertown, N. Y.—Black River Regulating Dist. plans to expend $250,000 to raise elevation of Stillwater Dam, 7 ft., concrete. Address J. V. Baron, Sherman Bldg.

Water Meters—Detroit, Mich.—City soon lets contract furnishing Water Bd. with seventeen thousand ⅝ in., six thousand ¾ in., two thousand 1 in., two hundred 1½ in. and two hundred 2 in. water meters. Quantity may be increased 50 per cent if requirement demand it. T. H. Keisen, 232 Jefferson Ave., engr.

Drydock—Astoria, Ore.—Port of Astoria Comn. having preliminary plans prepared for drydock. About $1,000,000. R. R. Bartlett, Astoria, engr.

Gravel—Astoria, Ore.—Clatsop Co. soon lets contract furnishing clean gravel, (free from clay, sand or hard material), ¼-1 in., passing a 2 in. ring, not less than 30 per cent by volume passing a ¾ in. ring, 2,600 cu.yd. to be delivered before April 10, at Lewis and Clark Bridge, 2,000 cu.yd. delivered before March 1, at Warrenton and 2,600 cu.yd. before April 10, at Tucker Creek Bunker. Cost to exceed $10,000. J. C. Clinton, clk.

Road Machinery—Astoria, Ore.—Clatsop Co. plans to purchase road construction machinery, including 2 steam shovels and 2 concrete mixing plants. About $40,000. J. C. Clinton, clk.

Portland Cement—Astoria, Ore.—Clatsop Co. soon lets contract furnishing and delivering at Port Dock, 3,000 bbl. portland cement on or before March 1, 8,500 bbl. between March 15 and April 10, 12,000 bbl. between April 15 and May 15. H. H. Hackett, co. roadmaster.

Machinery and Tools, etc.—Oregon City, Ore.,—Clackamas Co. plans to spend $40,000 for machinery and tools and $10,000 for engineering expenses. C. H. Compton, co. roadmaster.

Cast Iron Pipe — Portland, Ore. — City soon lets contract furnishing 5,000 lb. c.i. special castings, fifty 6 in. and ten 12 in. gate valves, 200 adjustable c.i. gate boxes, 300 tons 12 in., 25 tons 4 in., 250 tons 8 in. and 100 tons 6 in. c.i. pipe and 200 12 x 24 ft. c.i. covers and frames. Cost to exceed, $10,000. S. C. Pier, purch. agt.

Pipe Line—Fair Oaks, Cal.—Fair Oaks Irrigation Dist. plans election to vote on $20,000 bonds to build new pipe lines. G. L. Camden, secy.

BIDS DESIRED

Portland Cement, etc.—Brooklyn, N. Y.—Until Jan. 28, by E. Riegelmann, boro. pres., furnishing and delivering 6,000 bbls. portland cement, 2,800 net tons limestone or other suitable inorganic dust, 1,500 cu.yd. paving gravel, 2,000 cu.yd. 1½ in. gravel for concrete, 99,400 ft. b. m. lumber, 400,000 gal. asphalt road oil, 200,000 gal. tar road surfacing material, 500 tons paving pitch, 12,000 cu.yd. asphalt sand, 6,000 cu.yd. paving sand, 2,000 cu.yd. sand and grit mixture, 5,000 cu.yd. binder stone.

Coal Pocket—Corning, N. Y.—Until Feb. 6, by Steuben Coal & Supply Co., building 40 x 70 ft., rein.-con. coal pocket, rock foundation, 49 ft. high, on Main Rd. About $50,000. G. A. Wescott, Wyoming Ave., Scranton, Pa., archt.

Freight Sheds—Stapleton, S. I. N. Y.—Until Jan. 26, by M. Hurlburt, comr. docks, Pier "A," foot of Battery Pl., New York City, furnishing labor and material for building part or all of series of new freight sheds and appurtenances on Piers 6, 7, 8, 9, 10 and 11.

Stadium—East Orange, N. J.—Until Feb. 24, by F. T. Dugan, secy Bd. Educ., designs and proposals for building concrete stadium on Ashland Field, 7,500-10,000 seating capacity; advertised in this issue.

Asphaltic Cement and Tar—Trenton, N. J.—Until Jan. 27, by Bd. Freeholders Mercer Co., furnishing 24,000 gal. asphaltic cement for hot applications, also 12,000 gal. tar for hot and 24,000 gal. tar for cold applications. About $10,000. G. R. Hutchinson, dir. road repair.

Laying Pipe Line, etc.—Asheville, N. C.—Until Feb. 12, by G. C. Hunter, secy.-treas., furnishing 3,263 tons 16 in. bell spigot c.i. pipe, 21.3 tons special castings, 51,300 lin.ft. 16 in. c.i. pipe, 58 tees and bends, 16 in. B M. Lee, city engr.; advertised in this issue.

Pumps—Detroit, Mich.—A. Kahn, Marquette Bldg., receiving bids furnishing 2 multistage motor-driven centrifugal pumps, capacity 300 gal. per min., 375 ft. head, 60 h.p. motors, 2 multistage motor-driven centrifugal pumps, 200 gals. per min. capacity against 200 ft. head, 20 h.p. motors, and 1 motor-driven centrifugal pump, 500 gal. per min. capacity, 400 ft. head, 100 h.p. motor, 240 volt.

Paving Material—Detroit, Mich.—Until Jan. 27, by Dept. Purchases & Supplies, Municipal Courts Bldg., furnishing (1) 75,000 bbls. portland cement, (2) coal tar paving pitch filler and Tarvia to fill requirements for year, (3) 20,000 cu.yd. washed bank sand and 10,000 cu.yd. gravel for concrete. Separate bids on three items.

Hydrants, etc.—Milwaukee, Wis.—Until Jan. 26, by Central Bd. Purchases, City Hall, furnishing one hundred 5 in. hydrants, f.o.b. Milwaukee, 35,000 lb. liquid chlorine, ten 2 in., fifty 3 in., twenty 4 in. and twenty-five 6 in. special or topping valves, six 4 in., one hundred 6 in., twenty-five 8 in., fifteen 12 in. and eight 16 in. gate valves, f.o.b. Milwaukee, five hundred ⅝ in., five hundred ¾ in., one hundred 1 in. corporation cocks, five hundred ¾ in., five hundred 1 in. and one hundred 1¼ in. curb cocks, five hundred ⅝ in., three hundred ¾ in., one hundred 1 in., one thousand ⅝ in., six hundred ¾ in. and two hundred 1 in. meter cocks and couplings.

Wires and Cables—Milwaukee, Wis.—Until Jan. 26, by Central Bd. Purchases, City Hall, furnishing wires and cables for portion of city's street lighting system now under construction. About $50,000.

Grandstand—West Allis, Wis., (Milwaukee P. O.)—Until Jan. 29 (change of date), by Wisconsin Dept. of Agriculture, Capitol, Madison, building 456 ft. rein.-con. and hollow tile addition to grandstand, at State Fair Park, here. About $100,000. A. C. Clas, Colby-Abbot Bldg., Milwaukee, engr. Noted Jan. 8.

Cement, Lumber, etc.—Newton, Ia.—Until Jan. 28, by Bd. Supervs. Jasper Co., for 8,000 to 10,000 bbls. cement, 7 car loads full sawed fir lumber, 4 car loads red cedar piling and 60 tons reinforcing bars. R. McMurray, co. engr.

Steam Engines, etc.—Yuma, Col.—Until Jan. 26, by city, furnishing, 1 steel smoke stack, one 250 h.p. and one 125 h.p. steam engines, two 200 h.p. steam boilers, 2 alternators for d.c. to above engines, switch board and instruments, feedwater pumps and feed water heater, piping, gages and other necessary appurtenances. R. D. Salisbury, Denver, engr.

Bridge Materials — Blackfoot, Idaho — Until Jan. 26, by R. M. Fisher, clk. Bingham Co., for one hundred and twenty-eight 2½ in. ells, 39,734 lb. ⅝ in. square twisted reinforcing bars, 316,575 lb. I-beams and channels without holes, one hundred and ninety-two 2½ in. flanges, one hundred and ninety-two 2½ in. T's, sixty-four 2½ in. crosses, left hand and 4,094 ft. 2½ in. black pipe. Cost will exceed $10,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Dam — Rutland, Vt.**—Vermont Hydro-Electric Corp. let contract building rein.-con. dam, 100 ft. high, to Natl. Eng. Corp., 40 Central St., Boston. About $400,000.

★**Coal Breaker—Carbondale, Pa.**—Murrin Coal Co., Fallbrook St., let contract building 60 x 170 ft., rein.-con. and steel coal breaker, rock foundation, 85 ft. high, on Carbondale Trail, to G. A. Westcott, Wyoming Ave., Scranton. About $106,000. Noted Sept. 18.

★**Swimming Pool—West Park, O.**—E. C. T. Miller, c/o W. S. Tyler Co., East 36th St. and Superior Ave., Cleveland, let contract building 30 x 90 ft., rein.-con. and terra cotta swimming pool, to Windsor Constr. Co., Swetland Bldg., Cleveland. About $25,000. Noted Jan. 8.

Paving Material—Detroit, Mich.—Comr. Purchases & Supplies, Municipal Courts Bldg., soon lets contract furnishing 10,000 lin.ft. Medina or Berea curbstone and 20,000 sq.ft. granite paving block.

Valves—Detroit, Mich.—Fire Dept. received bids furnishing 400 double nozzle steamer fire and 400 6 in. gate valves, from Flower Valve Mfg. Co., Clayton and Parkinson Sts., $62,960; A. P. Smith Mfg. Co., Norman St. East Orange, N. J., $65,280; R. D. Wood & Co., 400 Chestnut St., Phila., $66,240

★**Pipe—Seattle, Wash.**—Bd. Pub. Wks. let contract furnishing 2,200 ft. 78 in. penstock pipe to form a part of pipeline from impounding dam at Cedar Falls to proposed 15,000 kw generating power house, to Williamette Iron & Steel Wks., 462 North Front St., Portland, $174,447.

★**Dock — Portland, Ore.** — Crown Mills, Park and Oak Sts., let contract building 100 x 106 ft. dock, on Front St., between 9th and 10th Sts., to L. H. Hoffman, Gasco Bldg. About $30,000.

★**Gas Distributing System—Avalon, Cal.**—City let contract furnishing 6,715 ft. 4 in. and 3,700 ft. 6 in. c.i. pipe and fittings for municipal gas works, to Waterworks Supply Co., $10,657; gate valves, to Crane Co., 321 East 3rd St., Los Angeles, $494; trenching, laying and backfilling for above, to R. F. Ware, 431 Union Oil Bldg., Los Angeles, $3,477.

★**Fire Protection System—Livermore, Cal.**—Bd. Supervs. Alameda Co. let contract building fire protection system at Arroyo Sanitorium, to Schultz Constr. Co., 46 Kearny St., San Francisco, $14,384. Noted Jan. 15.

Pipe—Los Angeles, Cal.—Bd. Pub. Serv. Comn. received bids furnishing 40,000 ft. 6 in. pipe, from Lacy Mfg. Co., 1000 North Main St., $0.58 per lin.ft. for riveted steel, U. S. Steel Corp., $0.57 per lin.ft. for welded pipe.

Bulkhead, etc.—San Francisco, Cal.—State Harbor Comn., Ferry Bldg., received bids building (1) bulkhead wharf in front of Pier 5, (2) connecting concrete bulkhead wharves at Piers 3 and 7, (3) timber depressed track extension along Pier 5, from Healy-Tibbitts Constr. Co, 9 Main St., (1) $54,248, (2) $39,470, (3) $15,183; Hannah Bros., 180 Jessie St., (1) $59,295, (2) $44,000, (3) $17,295; A. S. Kitchen, San Francisco, (1) $59,970, (2) $46,000, (3) $13,970.

★**Dam.—Ukiah, Cal.**—Snow Mountain Water & Power Co. let contract building concrete and masonry dam, 100 ft. high, 650 ft. long and 109 ft. wide, at top in Gravelley Valley, to W. A. Kraner, Balboa Bldg., San Francisco. About $1,000,000.

C. I. Pipe—Whittier, Cal.—City received bids furnishing pipe and fittings (a) 20 in. c.i. pipe, (b) freight thereon, (c) 24 in. c.i. pipe, (d) freight thereon, (e) 24 in. special strength pipe, (f) freight thereon, (g) 20 in. special strength pipe, (h) freight thereon, from Amer. Cast Iron Pipe Co., Citizens Natl. Bank Bldg., Los Angeles, (a) $127,334, (b) $49,911, (c) $147,335, (d) $57,790, (e) $145,964, (f) $46,794; U. S. Cast Iron Pipe Co., 215 West 7th St., Los Angeles, (a) $127,627, (g) $145,964, (h) $50,556.

OFFICIAL PROPOSALS

Bids: Jan. 30.

Improvement of Highways

STATE COMMISSION OF HIGHWAYS
Albany, N. Y.

Sealed proposals will be received by the undersigned at their office, No. 53 Lancaster Street, Albany, N. Y., at one o'clock p. m. on Friday, the 30th day of January, 1920, for the improvement or completion of the following highways:

Cattaraugus	(one highway: 3.00)
Dutchess	(one highway: 4.95)
Erie	(one highway: 3.77)
Livingston	(one highway: 8.34)
Niagara	(one highway: 2.38)
Oneida	(two highways: 5.38 & 5.03)
Orange	(two highways: 1.14 & 1.65)
Oswego	(two highways: 4.65 & 0.65)
St. Lawrence.	(two highways: 4.60 & 11.16)
Schoharie	(one highway: 5.24)
Tioga	(one highway: 5.50)
Ulster	(two highways: 0.84 & 3.17)
Warren	(one highway: 5.13)
Washington	(one highway: 7.60)
Westchester	(one highway: 4.13)
Yates	(one highway: 9.63)

Maps, plans, specifications, estimates and proposal forms may be obtained at the office of the Commission in Albany, N. Y., and at the office of the division engineers in whose division the roads to be improved are located. The addresses of the division engineers and the counties of which they are in charge will be furnished upon request.

Special attention of bidders is called to "GENERAL INFORMATION FOR BIDDERS" in the itemized proposal, specifications and contract agreement.

FRED'K STUART GREENE,
IRVING V. A. HUIE, Commissioner.
Secretary.

Bids: Feb. 3.

Construction Power House

Sumter, S. C.

Sealed proposals will be received by the Mayor and Board of Commissioners of the City of Sumter, S. C., at the City Hall in Sumter, S. C., until 3 p.m., Feb. 3, 1920, for the construction of a power house for electric light plant.

The work will consist of the following:

Brick and concrete, fireproof power house, approximately 100 ft. x 85 ft. x 45 ft. high.

Coal bunker.

Boiler foundations, and brick-lined concrete smoke flue.

Machinery foundations.

All bids must be upon blank forms provided.

Each bid must be accompanied by a certified check for not less than 5 per cent of the amount of the bid, as evidence of good faith.

Specifications, Instructions to Bidders and Form of Proposal may be obtained from the Engineer at Durham, N. C.

Plans and contract will be on file at the Clerk's office in Sumter, and at the office of the Engineer in Durham, N. C.

The right is reserved to reject any and all bids.

Engineer: L. D JENNINGS,
GILBERT C WHITE, Mayor.
Durham, N. C.

The publication of an advertisement on this page is an official notice that bids are wanted from other than local bidders.

It is also a guarantee that maximum competition is invited because Engineering News-Record is the *one* nationally recognized medium for Proposal advertising. Its Searchlight Section is read each week by nearly every worth-while contractor in this country who bids on public work outside his own city.

Official Proposals reaching our office in first mail Wednesday morning (9 o'clock) can usually be published in the issue out the next day. Special price for Official Proposals, $3.60 an inch.

Bids: Jan. 24.

Road Work

Williamson, W. Va.

Sealed proposals will be received by the Clerk, of the County Court of Mingo County, West Virginia, until two o'clock p. m. on the 24th day of January, 1920, for the construction of the following section of road, to wit:

A section of road on Pigeon Creek in said County beginning at the intersection of Road No. 4 (Williamson Burch Road) with Road No. 10, at the mouth of Little Buffalo Creek on said Pigeon Creek, thence up Pigeon Creek according to location ot road made by L. C. Linkous, County Road Engineer, to station 264, about one mile above the residence of E. E. Musick on said Creek, making a total distance of about 8 miles.

Plans, specifications and estimates of quantities may be examined at the County Road Engineer's Office, Williamson, W. Va., at the Division Road Engineer's Office, Huntington, W. Va., and at the office of the State Road Commission, Charleston, W Va.

Proposals will be received only on the standard State forms prepared by the State Road Commission which may be obtained from the Division Engineer's Office, Huntington, W. Va.

A certified check of not less than Fifteen Hundred Dollars ($1,500.00), payable to G T. Blankenship, Sheriff, must accompany each proposal.

The right is reserved to reject any and all bids.

Dated the 7th day of January, 1920.
THE COUNTY COURT OF MINGO
COUNTY,
By ALEX BISHOP, President.
Attest:
ELIHU BOGGS, Clerk.
L. C. LINKOUS,
County Road Engineer.

Bids: Feb. 18.

Macadam Road

WASHINGTON COUNTY ROAD
DISTRICT NO. 3
Fayetteville, Ark.

Sealed bids will be received by Jas. English, Chmn. of Commission, at the office of the Engineers, Hamilton & Sherve, Fayetteville, Ark., until 2 p.m., Feb. 18, 1920, and there will be publicly opened and read, for the construction of 62 miles of gravel macadam road.

The approximate quantites are as follows:

82.2	acres clearing and grubbing;
153,333	cu.yd. excavation, unclassified;
5,000	cu.yd. excavation, solid rock:
17.8	miles Class A, (machine grader work);
6.0	miles Class B, (machine grader work);
2,340	cu.yd Class A concrete, reinforced in culverts;
520	cu.yd. Class B concrete, plain in headwalls;
1,200	cu.yd. Class B concrete, plain in bridge abutments;
	Alternate Concrete Bid.
1,140	cu.yd. Class A concrete reinforced in box culverts;
2,520	cu.yd. Class C concrete, cement rubble masonry;
400	cu.yd. Class B concrete, plain in bridge abutments:
618	lin.ft. I-beam steel bridges, 10 to 30 ft. spans;
290	lin.ft. steel truss bridges, 60 to 80 ft. spans;
54,480	B. M. bridge flooring in place:
4,536	lin.ft. plain concrete pipe, furnishings only:
4,536	lin.ft. plain concrete pipe, unloading, hauling and placing only;
96,120	cu.yd. native gravel macadam, hauling and placing first mile:
192,240	additional cubic yards, mile haul;

Separate bids may be submitted for any one or all of the following items:

Steel trusses and short spans erected.

Plain concrete pipe, f.o.b. cars, any station on the O & C. C. Ry., in Washington County.

All classes of concrete or cement rubble masonry either in box culverts, headwalls or bridge abutments.

Plans and specifications are on file at the office of the Engineers, Hamilton & Shreve, Fayetteville, Ark., and the office of the County Clerk, Courthouse, Fayetteville, where they may be seen; or they may be obtained from the Engineers on payment of $10. Estimate sheets showing quantities may be had upon request from the Engineers.

A certified check to the amount of 3 per cent of the bid must accompany all proposals. Check to be made to the order of the Chairman of the District. Usual rights reserved.

Successful bidders will be required to execute satisfactory bond for 25 per cent of the amount of the contract.

Board of Washington County Road Imp. District No. 3.

JAS. ENGLISH, Chm
Fayetteville, Arkansas.
HAMILTON & SHREVE, Engineers,
Fayetteville, Arkansas.

CONSTRUCTION NEWS

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Feb. 2	Ft. Wayne, Ind.	Jan. 29
Feb. 3	McCammon, Idaho	Jan. 15
Feb. 4	Elyria, Ohio.	Jan. 22
Feb. 4	Aberdeen, N. C.	Jan. 29
Feb. 10	Toronto, Ont.	Jan. 1
Feb. 12	Douglas, Ariz.	Jan. 8
Feb. 15	Washta, Ia.	Jan. 15
Feb. 17	Jacksonville, N. C.	Jan. 15
Feb. 24	Detroit, Mich.	Jan. 29

SEWERS

Bids Close		See Eng. News-Record
Feb. 3	Jersey City, N. J.	Jan. 29
Feb. 4	Brooklyn, N. Y.	Jan. 29
Feb. 5	Redwood Falls, Minn.	Jan. 29
Feb. 12	Ashley (Wilkes Barre P. O.), Pa.	Jan. 15
Feb. 20	Carnegie, Okla.	Jan. 8

BRIDGES

Bids Close		See Eng. News-Record
Feb. 3	New Jersey	Jan. 22
Feb. 3	Detroit, Mich.	Jan. 29
Feb. 4	Albany, Ga.	Jan. 29
Feb. 5	Colorado	Jan. 22
Feb. 5	Astoria, Ore.	Jan. 22
Feb. 5	Oregon	Jan. 29
Feb. 7	Quitman, Ga.	Jan. 29
Feb. 7	Duncan, Ariz.	Jan. 29
Feb. 7	San Carlos, Ariz.	Jan. 15
Feb. 7	Bethlehem, Pa.	Dec. 11
Feb. 10	Schenectady, N. Y. Adv. Jan. 15.	Jan. 15
Feb. 13	Blue Earth, Minn.	Jan. 29
Feb. 16	Ray Junction, Ariz.	Jan. 22
Feb. 16	Olivia, Minn.	Jan. 29
Feb. 17	Nutley, N. J.	Jan. 22
Feb. 20	Marinette, Ariz.	Jan. 29
Feb. 25	Bethlehem, Pa.	Jan. 8

STREETS AND ROADS

Bids Close		See Eng. News-Record
Feb. 2	St. Paul, Minn.	Jan. 8
Feb. 2	Clay, W. Va.	Jan. 15
Feb. 2	El Centro, Cal.	Jan. 22
Feb. 2	Upland, Cal.	Jan. 22
Feb. 2	Potosi, Mo.	Jan. 15
Feb. 2	Flint, Mich.	Jan. 15
Feb. 2	Marlow, Okla.	Jan. 22
Feb. 2	Marshall, Tex.	Jan. 22
Feb. 2	Helena, Mont.	Jan. 22
Feb. 2	Ionia, Mich.	Jan. 22
Feb. 2	Corsicana, Tex.	Jan. 22
Feb. 2	Buffalo, N. Y.	Jan. 29
Feb. 2	Wheaton, Ill.	Jan. 29
Feb. 3	St. Louis, Mo.	Jan. 15
Feb. 3	Liberty, Mo.	Jan. 15
Feb. 3	Bristol, W. Va.	Jan. 22
Feb. 3	Fresno, Cal.	Jan. 22
Feb. 3	Georgetown, Del.	Jan. 22
Feb. 3	Michigan	Jan. 22
Feb. 3	Chelsea, Okla.	Jan. 22
Feb. 3	Davenport, Ia.	Jan. 29
Feb. 4	Indiana	Jan. 29
Feb. 4	New Mexico	Jan. 29
Feb. 4	Indianapolis, Ind.	Jan. 29
Feb. 4	Long Island City, N. Y.	Jan. 29
Feb. 4	New York, N. Y.	Jan. 29
Feb. 4	Jackson, Mich.	Jan. 22
Feb. 4	Indiana	Jan. 15
Feb. 4	Michigan	Jan. 22
Feb. 5	Clarinda, Ia.	Jan. 22
Feb. 5	North Carolina	Jan. 22
Feb. 5	Ouray, Cal.	Jan. 22
Feb. 5	Continental, O.	Jan. 15
Feb. 5	Sedalia, Mo.	Jan. 15
Feb. 5	Charles Town, W. Va.	Jan. 15
Feb. 5	Denison, Ia.	Jan. 22
Feb. 5	Postville, Ia	Jan. 22
Feb. 5	Redwood Falls, Minn.	Jan. 29
Feb. 5	Indiana	Jan. 29
Feb. 5	Cooper, Ia.	Jan. 29
Feb. 6	Laurens, S. C.	Jan. 29
Feb. 6	Huntersville, Mo.	Jan. 15
Feb. 6	Wisconsin	Jan. 22
Feb. 9	La Grange, Tex.	Jan. 22
Feb. 9	Salem, N. J.	Jan. 22
Feb. 9	New Mexico	Jan. 22
Feb. 9	Willmar, Minn.	Jan. 29
Feb. 9	Akron, O.	Jan. 29
Feb. 9	Wenatchee, Wash.	Jan. 29
Feb. 9	Port Lavaca, Tex.	Jan. 29
Feb. 9	Kingston, Ont.	Jan. 29
Feb. 10	New Mexico	Jan. 29
Feb. 10	Elk River, Minn.	Jan. 29
Feb. 10	Waterloo, Ia.	Jan. 29
Feb. 10	Hopkins, Minn.	Jan. 29
Feb. 10	Michigan, Ia.	Jan. 29
Feb. 10	Meadowville, Pa.	Jan. 15
Feb. 10	Waterloo, S. C.	Jan. 22
Feb. 10	Sanford, Fla.	Jan. 29
Feb. 10	Pipestone, Minn.	Jan. 29
Feb. 10	Frederick, Okla. Adv. Jan. 29.	Jan. 29
Feb. 11	New Mexico	Jan. 22
Feb. 11	Indiana	Jan. 29
Feb. 11	St. James, Minn.	Jan. 29
Feb. 11	Independence, Ia.	Jan. 29
Feb. 12	Centerville, Ia.	Jan. 29
Feb. 13	New Jersey Adv. Jan. 29.	Jan. 29
Feb. 14	Phila., Pa.	Jan. 29
Feb. 15	Bixby, Okla.	Jan. 29
Feb. 16	Minneapolis, Minn.	Jan. 29
Feb. 17	Pennsylvania	Jan. 29
Feb. 18	Freehold, N. J.	Jan. 29
Feb. 18	Fayetteville, Ark.	Jan. 15
Feb. 21	St. Johns, Mich.	Jan. 22
Feb. 24	Montgomery, Ala. Adv. Jan. 8.	Jan. 8
Feb. 24	Le Sueur Center, Minn.	Jan. 29
Mar. 1	Livingston, Mont. Adv. Jan. 29.	Jan. 29
Mar. 2	Charleston, W. Va.	Jan. 22
Mar. 2	Winfield, Ia.	Jan. 29
Mar. 6	Brainerd, Minn.	Jan. 29
Mar. 8	Okmulgee, Okla.	Jan. 29

RAILWAYS

Bids Close		See Eng. News-Record
Feb. 17	Ontario	Jan. 15

EXCAVATION AND DREDGING.

Bids Close		See Eng. News-Record
Feb. 6	Bemidji, Minn.	Jan. 15
Feb. 13	Bemidji, Minn.	Jan. 29
Feb. 15	Benjamin, Utah	Jan. 1
Feb. 16	Olivia, Minn.	Jan. 29
Feb. 16	Seattle, Wash.	Jan. 29
Feb. 17	Marshall, Minn.	Jan. 29

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
Jan. 31	Syracuse, N. Y.	Jan. 29
Jan. 31	Long Island City, N. Y.	Jan. 29
Feb. 3	Sumter, S. C.	Jan. 15
Feb. 10	Kingston (Wilkes Barre P. O.)	Jan. 29
Feb. 20	Scranton, Pa.	Jan. 29
Feb. 24	Wilkes Barre, Pa.	Jan. 29
Feb. 27	Wilkes-Barre, Pa.	Jan. 29
Mar. 1	Edmonton, Alta.	Jan. 8
Mar. 1	Cedar Rapids, Ia.	Jan. 22
Mar. 6	Estevan, Sask. Adv. Jan. 29.	Jan. 29
Mar. 15	Wakefield, Mass.	Jan. 29

BUILDINGS

Bids Close		See Eng. News-Record
Feb. 2	Canton, Ohio	Jan. 8
Feb. 2	West Hartford, Conn.	Jan. 29
Feb. 2	Independence, Cal.	Jan. 1
Feb. 2	Holdenville, Okla.	Jan. 15
Feb. 3	Sac City, Iowa	Jan. 8
Feb. 3	McKinley, Minn.	Jan. 15
Feb. 3	Deer Creek, Minn.	Jan. 29
Feb. 4	Trenton, N. J.	Jan. 29
Feb. 5	Calgary, Alta.	Jan. 8
Feb. 5	Hugo, Okla.	Jan. 29
Feb. 6	Morley, Ia.	Jan. 29
Feb. 6	Gaza, Ia.	Jan. 29
Feb. 6	Pittsburgh, Pa.	Jan. 29
Feb. 7	Blencoe, Ia.	Jan. 29
Feb. 9	Oconomowoc, Wis.	Jan. 8
Feb. 9	Woodbine, Ia.	Jan. 22
Feb. 10	Mt. Pleasant, Ia.	Jan. 29
Feb. 11	Tomah, Ga.	Jan. 29
Feb. 13	Dayton, Ia.	Jan. 15
Feb. 13	Woodbine, Ia.	Jan. 29
Feb. 13	Cotter, Ia.	Jan. 29
Feb. 14	Chandler, Ariz.	Jan. 29
Feb. 15	Westmount, Que.	Jan. 22
Feb. 16	Peru, Neb.	Jan. 29
Feb. 16	Halifax, N. S.	Jan. 22
Feb. 16	Kearney, Neb.	Jan. 29
Feb. 16	Northfield, Minn.	Jan. 29
Feb. 16	Chadds Ford, Pa.	Jan. 29
Feb. 17	Beaver, Ia.	Jan. 29
Feb. 17	Ypsilante, Mich.	Jan. 29
Feb. 17	Waseca, Minn.	Jan. 29
Feb. 17	Aurelia, Ia.	Jan. 22
Feb. 17	Columbus, Neb.	Jan. 8
Feb. 19	Cleveland, O.	Jan. 29
Feb. 19	Manitowoc, Wis.	Jan. 15
Feb. 19	Johnson City, N. J. Adv. Jan. 15.	Jan. 15
Feb. 20	Racine, Wis.	Jan. 29
Feb. 20	Calamas, Ia.	Jan. 29
Feb. 20	Salt Lake City, Utah	Jan. 1
Feb. 23	Wilkes-Barre, Pa.	Jan. 29
Feb. 24	East Orange, N. J.	Jan. 22
Mar. 1	Racine, Wis.	Jan. 1
Mar. 1	Carlton, Ont.	Jan. 15
Mar. 1	Detroit, Mich.	Jan. 22
Mar. 1	Montreal, Que.	Jan. 15
Mar. 1	Alpena, Mich.	Jan. 15
Mar. 15	Hibbing, Minn.	Jan. 29
May 15	Syracuse, N. Y.	Dec. 11

FEDERAL GOVERNMENT WORK

Bids Close		See Eng. News-Record
Feb. 3	Road Work — Brevard, N. C.	Jan. 15
Feb. 4	Extension to Building — Spec. 4053—Boston, Mass.	Jan. 29
Feb. 5	Clay—Cape Henry, Va. Adv. Jan. 15.	Jan 15
Feb. 5	Extension to Post Office — Ft. Worth, Tex.	Jan. 22
Feb. 9	Dredging — Providence, R. I.	Jan. 15
Feb. 9	Road Work—Gila, Ariz.	Jan. 29
Feb. 9	Remodeling Post Office and Courthouse—Waco, Tex.	Jan. 22
Feb. 10	Mixer—Monroe, Mich.	Jan. 22
Feb. 11	Repairing Dry Dock—New York, N. Y.	Jan. 15
Feb. 11	Building Extension—Spec. 4024—Puget Sound, Wash.	Jan. 15
Feb. 11	Theodolites—Wash, D. C. Adv. Jan. 22.	Jan. 22
Feb. 11	Fuel Oil Storage Plant—Spec. 4102 — San Diego, Cal.	Jan. 22
Feb. 11	Altering Building — Spec. 4116—San Francisco, Cal.	Jan. 22
Feb. 11	Dispensary—Spec. 4101—Norfolk, Va.	Jan. 22
Feb. 11	Dredging—Phila, Pa.	Jan. 22
Feb. 12	Side Wheel Steamboat — St. Louis, Mo. Adv. Jan. 15.	Jan. 15
Feb. 14	Seaplane Hangars, etc. — Hampton, Roads, Va.	Jan. 22
Feb. 14	Lock and Dam—Pittsburgh, Pa. Adv. Jan. 22.	Jan. 22
Feb. 17	Roadway — Washington, D. C. Adv. Jan. 29.	Jan. 29
Feb. 18	Remodeling and Extending —Sacramento, Cal.	Jan. 22
Feb. 18	Radio Building—Spec. 4107 Milwaukee, Wis.	Jan. 22
Feb. 20	Portland Cement—Florence, Ala. Adv. Jan. 22.	Jan. 22
Feb. 25	Roof — Spec. 4113 — New York, N. Y.	Jan. 8

MISCELLANEOUS

Bids Close		See Eng. News-Record
Feb. 2	Asphalt Road Oil—St. Paul, Minn.	Jan. 8
Feb. 2	Equipment — Hackensack, N. J.	Jan. 29
Feb. 2	Material — Hackensack, N. J.	Jan. 29
Feb. 2	Scarifier and Road Oil — Bloomfield, N. J.	Jan. 29
Feb. 2	Lumber, Piling, etc. — Sigourney, Ia.	Jan. 29
Feb. 2	Lumber, Piling, etc. — Primghar, Ia.	Jan. 29
Feb. 3	Floating Plant—Philadelphia, Pa.	Jan. 29
Feb. 3	Lumber, Piling — Clinton, Ia.	Jan. 29
Feb. 3	Lumber, Piling, Steel, etc. —Winterset, Ia.	Jan. 29
Feb. 3	Lumber, Steel, etc. — Osage, Ia.	Jan. 29
Feb. 3	Sewer Machine & Mixer —Detroit, Mich.	Jan. 29
Feb. 3	Grader and Crushers — Little Falls, Minn.	Jan. 29
Feb. 4	Tractors, etc. — Yankton, S. D.	Jan. 29
Feb. 4	Cement, Steel, etc. — Red Oak, Ia.	Jan. 29
Feb. 4	Lumber, Cement—Waukon, Ia.	Jan. 29
Feb. 6	Coal Pocket — Corning, N. Y.	Jan. 22
Feb. 4	Road Materials—New York, N. Y.	Jan. 29
Feb. 4	Motor Trucks—New York, N. Y.	Jan. 29
Feb. 6	Dam—Flint, Mich.	Jan. 29
Feb. 6	Steel, etc. — Northwood, Ia.	Jan. 29
Feb. 10	Piers—Detroit, Mich.	Jan. 29
Feb. 10	Transformer Station—New York, N. Y.	Jan. 29
Feb. 10	Breakwater — Schenectady, N. Y. Adv. Jan. 15.	Jan. 15
Feb. 12	Asheville, N. C.	Jan. 22
Feb. 13	Coal Handling Equipment Akron, O.	Jan. 29
Feb. 17	Lumber, Steel, etc. — Muscatine, Ia.	Jan. 29

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. Y., Endicott—Endicott Waterworks Co. has been authorized to increase capital stock from $50,000 to $300,000 to finance extension of system in West Endicott.

N. Y., Johnson City—City voted $250,000 bonds to improve water supply system to include 9 mi. pipe line from Silver Lake to here.

O., Cleveland—See "Streets and Roads."

Ill., Matton — City having plans prepared improving and extending waterworks system, involving 20 mi. 6-16 in. c.i. mains, 250 fire hydrants, 120 valves and valve boxes, filter system, boilers and pumping machinery, etc. C. L. James, supt. of water and light.

Neb., Page—City voted $15,000 bonds to improve waterworks system. Engineer not selected.

Okla., Atoka—City having plans prepared for waterworks system, including tower and tank. About $30,000. W. P. Danford, Atoka, engr.

Idaho, Harrison—City plans to build waterworks system, cost $36,000 also install electric lighting plant, $6,500.

Ariz., Prescott—City voted $350,000 bonds to build water storage and distributing system. C. M. Shau, city engr.

Ore., Fossil—Butte Creek Land, Livestock & Lumber Co. plans to install waterworks system, to include one 10 in. centrifugal pump, concrete dam and 2 flumes. About $5,000.

Ore., Gold Hill—City voted $25,000 bonds to improve and extend waterworks system.

Cal., Davis—City receives bids in February for 2 drilled wells with 2 pumps of 500 gal. capacity per minute, operated by motors, 100,000 gal. tank on 100 ft. tower, auxiliary fire pressure pump of 1,000 gal. per minute, 25 fire hydrants and distributing system of 2-6 in. metal pipe. About $75,000. Galloway & Markwart, 1st Natl. Bank Bldg., San Francisco, engrs. Noted Sept. 25.

Cal., Manhattan Beach (Manhattan P. O.)—City rejected bids received recaulking 10 mi. of water pipes. Work will be readvertised. V. H. Staheli, Manhattan Beach, engr. Noted Jan. 22.

BIDS DESIRED

N. C., Aberdeen—Until Feb. 4, by City Comrs., improving waterworks and sewerage system. About $40,000. J. B. McCrary Constr. Co., 3rd Natl. Bank Bldg., Atlanta, Ga., engrs.

N. C., Aberdeen—Until Feb. 10, by J. T. Johnson, mayor, furnishing labor and material building waterworks and sewerage system, including 1 brick building, one 150 GPM triplex pump, one 10 hp. oil engine, one 60,000 gal. tank on 75 ft. steel tower, 1,950 lin.ft 8 in. and 10,376 lin.ft. 6 in. c.i. pipe, 4¼ tons special castings, 6,375 lin.ft. 1½ in. galvanized iron pipe, 2,820 ft. 10 in. and 14,615 ft. 8 in. sewers and 1 sewerage tank, etc. J. B. McCrary Co., 3rd Natl. Bank Bldg Atlanta, Ga., engrs.

Ga., Macon—Until Feb. 16, by Bd. Water Comrs., for rein.-con. reservoir, 1,500,000 gal. capacity.

Ind., Ft. Wayne—Until Feb. 2, by Bd. Pub. Wks., furnishing 30 ton 12 in., 160 ton 8 in. and 430 ton 6 in. c.i. pipe, twelve hundred ⅝ in. curb cocks, six hundred ⅝ in., five hundred ¾ in., three hundred 1 in. and twelve 1½ in. corporation cocks, twenty-four 1½ in. tee handle gate valves, 1 ton wiping solder, three 12 in., eighty-four 6 in. and twelve 4 in. gate valves; double bell, and 96 complete valve boxes, etc.

Mich., Detroit—Until Feb. 24, by H. S. Starkey, secy. Bd. Water Comrs., furnishing and laying 20,930 lin.ft. steel water pipe, etc.; advertised in this issue.

Sask., Estevan—See "Industrial Works".

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Summit Hill**—Summit Hill Water Co. let contract for 2 deep well pumps and motors, to Keystone Driller Co., 170 Bway., New York City, $9,100; 2 buildings, piping, etc., to R. F. Riebe, Lansford, $7,141.

★**N. C., Wadesboro**—See "Sewers."

★**O., Canton**—W. I. Zink, dir. Bd. Pub. Serv., let contract building 1 story, 47 x 96 ft., concrete, steel and brick pumping station, to Keller-Huff Co., Canton, $24,900. Noted Jan. 15.

O., Euclid—Village received bids Jan. 12, building water mains in Lamb, Pond, Brewer and Fuller Aves., involving 73,585 ft. 6-8 in. c.i. pipe, from J. B. Lynn, 1566 East 38th St., Cleveland, $40,269, Curro Bros., 1977 East 26th St., Cleveland $40,660.

★**O., Euclid**—See "Sewers."

★**Neb., Chadron**—City let contract building 75,000 gal. concrete lined reservoir and laying 27,400 ft. 10-14 in. wood or c.i. pipe, to M. F. Morrissey & Co., Chadron. About $100,000.

★**Ore., Heppner**—City let contract building waterworks system, to Geist Bros., Pendleton, $24,528. Work involves 10 mi. 8 in. concrete pipe, 3 mi. 8 in. wood pipe and 1 mi. 8 in. iron pipe.

Sewers

PROPOSED WORK

N. Y., Rye—Bd. Village Trustees rejected bids received Nov. 24, furnishing labor and material building sanitary sewers and sewage disposal units, involving 31,100 ft. 8 in. and 580 ft. 15 in. vitr. pipe sewers, 7,100 ft. 6-16 in. iron pipe, siphon and force mains, also 1 pumping station complete, etc. About $300,000. Work will be readvertised. G. E. Hill, 45 7th Ave., New York City, engr. Noted Jan. 1.

O., Cleveland—See "Streets and Roads."

O., Columbus—City plans to build 6,000 ft. 10 in. sewer in Nashoba Ave. from alley north of Sullivan Ave. to Dorean Ave. H. A. Maetzel, city engr.

Mo., St. Louis — Natural Bridge Impvt. Assn. submitted plan to Bd. Pub. Serv. for building sewer along Natural Bridge Rd. in the new industrial district, also widening Natural Bridge Rd. from 60 to 100 ft. About $350,000. Address W. T. Jones, 4471 Pine St.

Okla., Wilburton—City having preliminary plans prepared by V. V. Long & Co., engrs., 1300 Colcord Bldg., Oklahoma, building 6-12 in. sewer pipe, sewage disposal plant and 13,000 ft. flow line and main extensions. About $100,000.

Wash., Tacoma—City having plans, specifications and estimates prepared for construction of intercepting sewer from all trunk sewers in central and southern parts of city to deep water in sound, also building system trunk sewers. About $3,000,000. J. C. Manley, city engr.

Ore., Arlington—City voted $15,000 bonds to build sewerage system and $5,000 to extend electric light system.

Cal., Turlock—City voted $60,000 bonds to build sewers in various streets.

BIDS DESIRED

N. Y., Brooklyn—Until Feb. 4, by E. Riegelmann, boro. pres., furnishing labor and material building sewers in 76th St. from 20th to 21st Aves., 77th St. from 20th to 21st Aves.

N. J., Jersey City—Until Feb. 3, by F. A. Dolan, city clk., building sewers in Virginia, Ege and Clarke Aves. from point 110 ft. west of Mallory Ave. to Bennett St.; Yale Ave. from point 110 ft. west of Mallory Ave. to Water St.; Bennett St. from Virginia to Clarke Aves. and in Water St. to connect with sewer in Claremont Ave.

N. C., Aberdeen—See "Waterworks."

Minn., Redwood Falls—Until Feb. 5, by L. P. Wolff, engr., Guardian Life Bldg., St. Paul, building storm sewers here, involving 4,475 lin.ft. 8-27 in. pipe, 12 manholes, 45 No. 1 and 27 No. 2 inlets, 1,744 lin.ft. 8 and 10 in. inlet connections and 2 outlet retaining walls. About $60,000.

N. D., Minot—Until Feb. 15, by A. D. Hagenstein, city clk., building storm sewers in 35 blocks. About $285,000. F. H. Bass, 515 6th St., Minneapolis, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Brooklyn**—E. Riegelmann, boro. pres., let contract repairing sewer in Johnson St. between Leonard and White Sts., to Booth & Flynn, Ltd., 17 Battery Pl., New York City, $145,412. Noted Jan. 22.

N. Y., Brooklyn—E. Riegelmann, boro. pres., received bids Jan. 21, building sewers in (a) Bay 31st St., (b) Bay 32nd St., (c) Delamere Pl., from P. J. McCauley, 934 Halsey St., (a) $7,912, (b) $7,097, (c) $5,342; Ajax Drainage Co., 60 Herkimer St., (a) $8,329, (b) $7,462, (c) $7,183; Murphy Bros., 8856 26th Ave., (a) $8,813, (b) $7,157; C. Petracca, 803 Kent Ave., (a) $9,221, (b) $6,852, (c) $6,331; Tomassetti Co. 1133 60th St., (a) $9,527, (b) $7,700, (c) $5,758. Noted Jan. 15.

★**N. C., Wadesboro**—City let contract installing sewerage and waterworks systems to Blankenship & McCelland Co., Latta Arcade, Charlotte. About $40,000.

★**O., Cleveland**—City let contract constructing twelve 8 x 50 ft. concrete grit chambers, 1 story, 150 x 150 ft. pump house, brick flow channels, etc., involving 15,000 cu.yd. excav., 250 tons reinforcing steel and 17,480 cu.yd. concrete, on East 140th St., to Amer. Constr. Co., Marion Bldg., $312,932.

O., Euclid—Villago received bids Jan. 12, building sewer in Cut Rd., involving 7,050 ft. 12-18 in. vitr. pipe and 8 manholes, from B. W. Ernest, 14011 Woodworth Rd., $18,728; Curro Bros., 1977 East 26th St., $19,090; J. B. Lynn, 2566 East 28th St., $20,002; contractors all of Cleveland.

★**O., Euclid**—Village let contracts building 12-18 in. vitr. pipe sewers and 6 in. c.i. water mains in Coulter Ave., to A. C. Hattendorf, 13601 6th Ave., Cleveland, cost $5,769 and $4,580 respectively, building sidewalks on Coulter Ave., to Cleveland Stone Co., Union Bldg., Cleveland, $3,382; also laying 6 in. water mains in Ormiston Ave., to Whitaker & Lynn, 1314 East 88th St., Cleveland, $3,930.

★**O., Toledo**—D. H. Goodwillie, dir. pub. serv., let contract building Contr. 1 of Ten Mile Creek Intercepting Sewer, from Bayview Park, 3 mi. along Manhattan Blvd., involving 18,000 ft. 10 ft. pipe, to Graham & Henderson, Cleveland, $585,770.

★**Ind., Evansville**—Park Bd. let contract extending Baker Ave. sewer through Garvin Park, to J. L. Newman, 1701 East Illinois St. About $22,666.

Sewers (Continued)

★**Minn., Little Falls**—A. Johnson, city clk., let contract building 2,252 ft. sewers, to W. Fraser, Guardian Life Bldg., St. Paul. About $18,000.

Ore., Portland—City received bids building trunk sewerage system in (a) East 13th St., (b) East 33rd and Stafford Sts., from Jacobsen-Jensen Co., 407 Stanton St., (a) $93,539, (b) $251,487, both cement pipe.

Bridges

PROPOSED WORK

Maine—See "Railways".

Me., Belfast—City and State plan to build cement bridge, with electrically operated draw, over Passadumkeag River. About $275,000.

Conn., Bridgeport—City plans to repair bridge over Pequonnock River, on Congress St. About $40,000. J. A. Courtade, dir. pub. wks.

N. Y., Massena—City voted $215,000 bonds to build concrete and steel bridge over Grasse River, west of power house of St. Lawrence River Power Co.

N. J., Newark—Essex-Hudson Co. Bridge Comn. retained Hodge & Baird, 149 Bway., New York City, as consulting engineers, for building bridge between here and Jersey City. Noted June 19.

Pa., Aberdeen (Moscow P. O.)—Comrs. Dauphin Co. (Harrisburg), plan to build 60-ft. single span, rein.-con. arch bridge, 20 ft. wide, over Conewago Creek. About $10,000. C. M. Hershey, 14 South 2nd St., Harrisburg, engr.

Pa., Bellaire—Comrs. Dauphin Co., (Harrisburg), plan to build 60-ft. single span, rein.-con. arch bridge, 20 ft. wide, over Conewago Creek, here. About $10,000. C. M. Hershey, 14 South 2nd St., Harrisburg, engr.

Pa., Harrisburg—Comrs. Dauphin Co. (Harrisburg) plan to build 35 ft. single span, rein.-con. arch bridge, 20 ft. wide, over Manada Creek, at Sand Beach. About $10,000. C. M. Hershey, 14 South 2nd St., engr.

Pa., Middletown—Comrs. Dauphin Co. (Harrisburg) plan to build rein.-con. arch bridge, 30 ft. wide, over Conewago Creek, on State Highway between here and Elizabethtown, to have two 30 ft. spans, and 150 ft. wing walls. About $22,000. C. M. Hershey, 14 South 2nd St., Harrisburg, engr.

Mich., St. Clair—City and China Twp. having plans prepared by W. H. Adams, engr. Vinton Bldg., Detroit, for 200 ft. bridge, 20 ft. wide, over Pine River, near here.

Ia., Marshalltown—City plans to build bridge, 106 ft. long, 25 ft. roadway with 6 ft. walks, concrete arch, steel plate girders with concrete foundation and floor. About $35,000. O. G. Herm, city engr.

Ont., Brantford—City having plans prepared for 1,100 ft. rein.-con. and steel bridge, 48 ft. wide, on Lorne Ave. About $211,000. T. H. Jones, city engr.

BIDS DESIRED

Ga., Albany—Until Feb. 4, by Comrs. Dougherty Co., building bridge over Flint River, here. Work involves 470,000 lb. steel, 2,950 cu.yd. Class "A" and 4,300 cu. yd. Class "B" concrete, 14,150 cu.yd. spandrel and approach, 2,180 cu.yd. pavement on 5 in. base and 3,883 sq.yd. brick pavement. About $175,000. Garrett & Slack, Bell Bldg., Montgomery, Ala., engrs.

Ga., Quitman—Until Feb. 7, (change of date), by Comrs. Brooks Co., building 10 concrete bridges between here and Moultrie, involving 1066 cu.yd. excav., 1340 ft. wood piling, 2304 lin.ft. concrete piling, 747 cu.yd. Class "A" and 602 cu.yd. Class "B" concrete and 100,341 lb. reinforcing steel. Garrett & Slack, Bell Bldg., Montgomery, Ala., engrs. About $100,000.

Mich., Detroit—Until Feb. 3, by F. F. Rogers, 220 Wayne Co. Bldg., constructing 2 rein.-con. abutments for State Reward Bridge R-5, 20 ft. wide, over River Rouge, Redford Mills, Redford Twp., involving 520 cu.yd. rein.-con. About $10,000.

Ia., Centerville—See "Streets & Roads."

Minn., Blue Earth—Until Feb. 13, by J. L. Herring, aud. Faribault Co., building Bridge 3130, 60 ft. deck girder, 22 ft. wide, Bridge 3131, two 30 ft. spans, 20 ft. wide, Bridge 3132, 18 ft. span, 24 ft. wide. About $11,500. R. J. Short, Blue Earth, engr.

Minn., Olivia—Until Feb. 16, by A. O. Schmidt, aud. Renville Co., building 4 concrete and steel, and 8 pile and timber bridges. About $14,000. F. M. Shepherd, Olivia, engr.

Ariz., Duncan—Until Feb. 7, by T. Maddock, state engr., Phoenix, building 60 ft. span steel bridge (Federal Aid Project 13), over Railroad Wash, near here, on Clifton-Franklin Highway, to have concrete floor on rein.-con. abutments; advertised in this issue.

Ariz., Marinette—Until Feb. 20, by T. Maddock, state engr., Phoenix, building concrete arch bridge (Federal Aid Project 10), over Agua Fria River, near here; advertised in this issue.

Oregon—Until Feb. 5, by State Highway Comn., Portland, building one 100 ft. concrete arch bridge with approaches over Mosier Creek near Mosier, Wasco Co.; one 90 ft. steel superstructure over Kilchis River near Juns, Tillamook Co.; one 60 ft. Howe truss span over Polo Creek near Brogan, Malheur Co.; one 60 ft. steel span over Dry Creek near Blue Mountain, Umatilla Co.; one 75 ft. concrete arch over Dry Canyon, near Mosier, Walso Co. and one concrete viaduct and box culvert near Adams, Umatilla Co. H. Nunn, Salem, state highway engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Minn., Duluth**—St. Louis Co. let contract building 140 ft. steel truss span bridge, 20 ft. roadway, concrete flooring, over St. Louis River on Miller Trunk Rd., involving 256 cu.yd. rein.-con., 158,000 lb steel and 1224 lin.ft. wooden piling, to Wausau Iron Wks., Wausau, Wis., $20,974; also building 150 ft. bridge consisting of 100 ft. central pin connected steel span with two 25 ft approach spans, 18 ft. roadway, over Little Forks River on Miller Trunk Rd., involving 80 cu.yd. rein.-con., 79,000 lb. steel and 320 lin.ft. wooden piling, to Minneapolis Bridge Co., 1035 Metropolitan Life Bldg., Minneapolis, $11,800.

★**Minn., Moorhead**—A. O. Houglum, aud. Clay Co., let contract building Bridge 3215, 128 ft. long, 18 ft. wide, consisting of 80 ft. truss span with concrete fill, two 23 ft. I beam spans with rein.-con. approaches, to M. S. Anderson, Hillsboro, $15,150. Noted Jan. 8.

★**Minn., Owatonna**—C. J. Servatius, city clk., let contract building 120 ft., rein.-con. bridge, 50 ft. wide between rails, over Straight River on Bridge St., consisting of three 40 ft. spans, deck girder type, 34 ft. roadway and two 8 ft. sidewalks, to J. Moline & Sons, Minneapolis, $31,852.

★**Wash., Auburn** — Comrs. King Co. (Seattle) let contract building 160 ft. steel span bridge, 20 ft. wide, to replace Lee Hill Bridge, near here, to J. M. Nichols, Auburn, $23,323. Noted Jan. 1.

★**Wash., Fall City** — Comrs. King Co. (Seattle) let contract building bridge over Raging River, here, pony truss span, 96 ft. long, 20 ft. wide, to J. A. Vatne, Seattle, $12,830. Noted Jan. 1.

★**N. S., Annapolis**—Provincial Government, Halifax, let contract building 1329 ft. bridge, over Annapolis River, involving 849 tons steel, to Maritime Bridge Co., New Glasgow. About $156,000.

★**Ont., Acton**—Trafalgar Twp. let contract building 650 ft. concrete and steel bridge, 20 ft. wide, concrete flooring, here, to Norman McLeod Co., Kent Bldg., Toronto. About $120,000.

★**B. C. Erickson**—Pub. Wks. Dept., Victoria, will build bridge over Goat River, near here, 248 ft. long, 16 ft. wide, involving 100,000 ft. timber, 20 cu.yd. concrete and 16 tons steel. About $16,000. Work will be done by day labor.

Structural Steel

PROPOSED WORK

N. Y., Albany—Hotel—See "Buildings."

N. Y., Brooklyn—Hospital—See "Buildings."

N. Y., Massena—See "Bridges."

N. Y., New York—Office—See "Buildings."

N. J., Bayonne—Club—See "Buildings."

N. J., Verona (Montclair P. O.)—See "Industrial Works."

Pa., Media—Office and Bank—See "Buildings."

O., Elyria—Bank and Office—See "Buildings."

Mich., Detroit—Theatre—See "Buildings."

Mich., Lansing—See "Industrial Works."

Ill., Calumet (Chicago P. O.)—See "Industrial Works."

Ia., Boone—Theatre—See "Buildings."

Okla., Oklahoma—Office—See "Buildings."

BIDS DESIRED

Conn., West Hartford — Schools — See "Buildings."

N. Y., Syracuse—See "Industrial Works."

Ill., Chicago—Hotel—See "Buildings."

Ariz., Duncan—See "Bridges."

PRICES AND CONTRACTS AWARDED

★**Mass., New Bedford**—Business—See "Buildings."

★**N. Y., Albany**—See "Industrial Works."

★**N. Y., New York**—See "Industrial Works."

★**N. Y., New York**—Loft—See "Buildings."

★**N. Y., New York**—Office—See "Buildings."

★**N. Y., Rye**—Club and Hotel—See "Buildings."

★**N. J., Jersey City**—Theatre—See "Buildings."

★**N. J., Passaic**—See "Industrial Works."

★**O., Cleveland**—See "Industrial Works."

★**N. S., Annapolis**—See "Bridges."

Reinforced Concrete

PROPOSED WORK

R. I., Westerly—See "Industrial Works."

N. Y., Brooklyn—See "Industrial Works."

N. Y., Massena—See "Bridges."

N. Y., Schenectady—Office—See "Buildings."

N. J., Verona (Montclair P. O.)—See "Industrial Works."

Pa., Aberdeen (Moscow P. O.) — See "Bridges."

Pa., Harrisburg—Offices—See "Buildings."

Pa., Harrisburg—See "Bridges."

Pa., Middletown—See "Bridges."

Md., Baltimore—See "Industrial Works."

O., Elyria—Bank and Office—See "Buildings.

Mich., Detroit—Theatre—See "Buildings."

Mich., Lansing—See "Industrial Works."

Wis., Manitowoc—City Hall—See "Buildings."

Wis., Racine—High School—See "Buildings."

Ia., Boone—Theatre—See "Buildings."

Okla., Oklahoma—Office—See "Buildings."

BIDS DESIRED

N. Y., Syracuse—See "Industrial Works."

Pa., Wilkes-Borre—See "Industrial Works."

Mich., Detroit—See "Bridges."

Ill., Chicago—Hotel—See "Buildings."

Minn., Hibbing—Recreation—See "Buildings."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Ariz., Marinette—See "Bridges."

★**Mass., Fall River** — See "Industrial Works."

★**Mass., New Bedford** — Business — See "Buildings."

★**N. Y., Albany**—See "Industrial Works."

★**N. Y., New York**—See "Industrial Works."

★**N. Y., New York**—Office—See "Buildings."

★**N. J., Passaic**—See "Industrial Works."

Reinforced Concrete (Continued)

★**Pa., Phila**—Salesroom and Office—See "Buildings."

★**O., Cleveland**—See "Industrial Works."

★**Ill., Chicago**—Hotel—See "Buildings."

★**Neb., Lincoln**—See "Industrial Works."

Streets and Roads

PROPOSED WORK

Pennsylvania—L. S. Sadler. state highway comr., Harrisburg. rejected bids improving State Route 10, Oakland Twp., Susquehanna Co.

Pa., Phila.—City soon lets contract grading portions Allengrove, Bridge, Large, Rutland, Wakeling, Beaumont, Litchfield, Buist, Cedar, Columbia, Ditman, Gillespie, Montague, Fairhill, 6th, 7th, Felton, Lancaster, Locust, St. Vincent, Oakley; 17th and 50th Sts.; asphalt paving portions Ashdale, Bellfield, Braddock, Broad, Elmwood, Fairhill, Fishers, Florence, Grays, Herbert, I. Lebanon, Louden, Oakland, Oregon, Paschall, Passyunk, Ross, Somerville, Willard, Wingohocking, 4th and 61st Sts., Marlyn Rd. and Widener Pl.; vitr. block paving portions Cliveden, Magnolia and Spencer Sts. About $545,000. F. C. Dunlap, ch. of Bureau Highways.

Pa., Pittsburgh—City soon lets contracts extending Washington Blvd., along riverfront of Highland Park to intersection with Butler St., cost $465,000; improving Plaza entrance to Schenley Park, (Forbes St.,) $120,000; widening Ferry St. also 2nd Ave. from Grant to Ferry Sts., $60,000 and $200,000 respectively.

W. Va., Charleston—Comrs. Kanawha Co. rejected bids building 2.6 mi. Elk River Rd. R. F. Burdette, co. engr.

W. Va., Logan—Comrs. Logan Co. had plans prepared improving 2½ mi. Monitor Junction-Omar Rd. About $107,000. J. N. Smith, co. engr.

W. Va., Wayne—Comrs. Wayne Co. having plans prepared improving 2.8 mi. Lavellett-Camp Creek Rd., 22 ft. wide, involving 35,000 cu.yd. excav. and drainage structures. About $47,000. H. R. Levering, co. engr.

Fla., Panama City—City voted $300,000 bonds to build 30,000 sq.yd. road. F. S. Parrigan, Lexington, Ky., engr.

O., Cleveland—Cedar Heights Land Co., 220 Erie Bldg., plans to build sidewalks on Cedar Brook Rds. 2 and 4, involving 150,000 sq.ft. 5 ft. x 2½ in. sandstone or bluestone flagging on cinder base. F. A. Pease Eng. Co., 804 Marshall Bldg., engrs.

O., Cleveland—Knight-Morris-Gibbs Co., Wurlitzer Bldg., plans to grade, build sidewalks, sewers and water mains in Memphis and Ridge Rds. About $100,000. Engineer not selected.

Ind., Indianapolis—Marion Co. received no bids improving Rinne Rd., asphalt, cost $159,218, Borchert Rd., brick, $50,272, Voyles Rd., $127,765, Lee Rd., $101,863, Collins Rd., $43,170 and Behring Rd., $22,738, all concrete. J. J. Griffith, co. engr.

Mich., Pontiac—City having estimates prepared paving Edison St. from Fairgrove to Chamberlain Sts., Whittemore St. from Paddock to Jessie Sts. and Carter St. from Pine to Willow Aves., 24 ft. wide, brick or concrete. About $50,000. H. H. Barnett, city engr.

Illinois—State Highway Comn., Springfield, plans to build following roads during 1920: Chicago, Elgin, Rockford and East Dubuque Rd., road from Rockford to Beloit, Rushville, Beardstown, Ashland and Alexander Rd., road from Kankakee to Momence, road from Ottawa to Streator, road from Bloomington to Joliet, road from Moline to Sheffield, Moline, Prophetstown and Morrison Rd., Burlington, Monmouth, Galesburg, Sheffield, Princeton and DePue Rd., Peoria, Bloomington and Champaign Rd., Peoria, Mt. Sterling and Quincy Rd., Quincy, Pittsfield, Springfield, Decatur, Urbana and Danville Rd., road from Danville to Marshall, road from Effingham to Fairfield, road from Duquoin to Benton, Carbondale, Marion, Harrisburg and Shawneetown Rd., road from Mt. Vernon to Marion, East St. Louis, Mt. Vernon and Albion Rd., Vandalia, Ashley and Centralia Rd., road from Carbondale to Cairo, total length 1,000 mi., cement concrete, asphaltic concrete and brick, cost $30,000,000; also 400 mi. Federal Aid roads from Chicago through La Salle, Joliet, Henry, Peoria, Springfield, Carlinville, Edwardsville and St. Louis contracted for last year, but not completed. C. Older, ch. highway engr.

Ill., Herrin—Bd. Local Impvts. soon lets contract improving Paving Dist. 4, involving 19,995 sq.yd. 2 course rein.-con. R. A. Rollo, Murphysboro, engr.

Ia., Davenport—Scott Co. plans to grade 50 mi. and pave 21 mi. brick or concrete. J. Malloy, co. engr.

Ia., Des Moines—City plans to pave 7,511 sq.yd. 47th St. from University St. to College Ave., vitr. brick, wood block, asphalt or concrete on concrete base. About $30,000. K. C. Kastberg, city engr.

Minn., Alexandria — Douglas Co. plans to grade and gravel 10 mi. road from here to Osakis, 24 ft. wide. About $30,000. A. Webster, Alexandria, engr.

Minn., Austin—Mower Co. plans to gravel 24.5 mi. road from west county line to Grand Meadow, 24 ft. wide. About $125,000. A. C. White, Austin, engr.

Minn., Jackson—Jackson Co. plans to pave 5 mi. road north and west from here, 18 ft. wide, asphaltic concrete or concrete. About $150,000. W. M. Richmond, Jackson, engr.

Minn., Little Falls—Morrison Co. plans to grade and gravel 14 mi. road from here to Fort Ripley, 24 ft. wide. About $84,000. A. H. Fenn, Little Falls, engr.

Minn., Long Prairie—Todd Co. plans to grade and gravel 17 mi. road from eastern county line, through Grey Eagle and Burtrum, to southern county line, 24 ft. wide. About $85,000. A. H. Graves, Long Prairie, engr.

Minn., Mahnomen—Mahnomen Co. plans to grade 7 mi. State Rd. 5, 24 ft. wide. About $40,000. H. R. Chapin, Mahnomen, engr.

Minn., Montevideo—Chippewa Co. plans to grade and gravel 15 mi. road from here to Swift Co. line, 24 ft. wide. About $90,000. F. O. Nelson, Montevideo, engrs.

Minn., Park Rapids—Hubbard Co. plans to grade and gravel 24 mi. road from here east, 24 ft. wide. About $144,000. C. E. Spencer, Park Rapids, engr.

Minn., Pine City—Cass Co. plans to grade and gravel 30 mi. road from Cass Lake to Ball Club, 24 ft. wide. About $100,000. A. W. Moulster, Pine River, engr.

Minn., Warren — Marshall Co. plans to grade 18.5 mi. road from Stephen east. 24 ft. wide. About $80,000. J. A. Lindsay, Warren, engr.

Minn., Willmar—Kandiyohi Co. plans to grade 10 mi. road north of here, 24 ft. wide. About $60,000. H. L. Wadell, Willmar, engr.

Neb., Lincoln—City receives bids in February, repaving with asphalt 17,000 sq.yd. "O" St., 4 500 sq.yd. 9th St. and 12,000 sq.yd. various other streets; repairing with brick 12,000 sq.yd. 14th St. and 7,000 sq.yd. "R" St.; paving with brick, 8,500 sq.yd. "O" St. and 12,000 sq.yd. Holdrege St., paving with asphalt, 1,300 sq.yd. Maple St., 500 sq.yd. Rosylin St., 8,000 sq.yd. Wood St., 2,300 sq.yd. "S" St., 14,000 sq.yd. 35th St., 2,700 sq.yd. 26th St., 1,600 sq.yd. 34th St., 3,500 sq.yd. Summer St., 1,700 sq.yd. Farm St., 8,500 sq.yd. "D" St. and 1,200 sq.yd. Ryons St. G. W. Bates, city engr.

Montana—State Highway Comn., Helena, plans to build 61 mi. gravel surfaced road east and west through Hill Co., 16 ft. wide, cost $210,000; 26 mi. from Havre to Box Elder, 16 ft. wide, $90,000. J. N. Edy, Helena, engr.

Missouri—State Highway Dept., Jefferson City, plans to build 8.17 mi. Stanberry-Albany-King City Rd., Cooper Twp. Rd., Gentry Co., involving 111,455 cu.yd. earth excav., 86,275 sq.yd. gravel surfacing, 18 ft. wide, 10,000 lin.ft. guard rail. 26 culverts, one 30 ft., one 70 ft. and one 100 ft. steel span bridges and one 50 ft. low concrete pile trestle, cost $186,314; 4.5 mi. Preston-Collins Rd., Preston Special Rd. Dist., Hickory Co., 10,000 cu.yd. earth excav., 23,760 sq.yd. 2 course gravel surfacing, 9 ft. wide, and 10 culverts, $15,548; 5.5 mi. Monticello-Lewistown Rd., Lewistown Special Rd. Dist., Lewis Co., 16,893 cu.yd earth excav., 51,628 sq.yd. gravel surfacing, 16 ft. wide, on 7 in. Telford base and 11 culverts, $55,000; 10.5 mi. Hannibal-West Ely Division of Pikes Peak Ocean-to-Ocean Highway, Marion Co., 26,630 cu.yd. earth excav., 98,560 sq.yd. 8 in. gravel surfacing, 16 ft. wide, 16 culverts, two 40 ft. and one 60 ft. steel span bridges, $64,514; 4.5 mi. Caruthersville-Hayti-Kennett Rd., Little Prairie Twp. Special Rd. Dist., Pemiscot Co., 23,760 lin.ft. grading, 42,241 sq.yd. gravel surfacing, 16 ft. wide, 5 culverts and one 30 ft. span bridge, $42,619; 19 mi. Kings Highway, County Court, New Madrid Co., 100,320 lin.ft. grading, 178,346 sq.yd. gravel surfacing, 12 culverts, one 40 ft., two 50 ft. and one 60 ft. steel span bridges, $190,000; all 24 ft. wide.

Mo., Doniphan—Ripley Co. plans to resurface 11 mi. intercounty-seat highway out of here, 20 ft. wide. About $50,373. Commissioners of district have submitted project to State Highway Comn. for approval. J. T. Johnson, Doniphan, engr.

Okla., Lawton—City having plans prepared by S. A. Jeyner, engr. Lawton, for 2 mi. concrete paving. About $200,000.

Okla., Tulsa—Tulsa Co. receives bids in March, concrete paving and grading 28 mi. highway, 18 ft. wide, to include 11 mi. draining. D. W. Patton Co., Tulsa, engrs.

Utah, Tremonton—City plans to pave Main St., 53 ft. wide, 2 in. bituminous topping on 6 in. base, or 7 in. plain concrete slab. About $50,000. O. H. Roskelley, Brigham, engr.

Wash., Montesano—Comrs. Gray Harbor Co. having preliminary plans prepared paving 3 mi. road from Aberdeen to Hoquiam, 40 ft. wide, concrete. About $50,000. Hoquiam and Aberdeen will appropriate toward cost of project. N. Thrift, Aberdeen, city clk.

Wash., Spokane—Spokane Co. plans to grade, drain and pave following roads during 1920: 4½ mi. Cheney Rd. (south), cost $45,000, 2.8 mi. Day Rd. east of Colbert, $22,000, 2.72 mi. Otis Orchard Rd., $26,000, 11 mi. road along Whitman Co. line to Fairfield via Latah, $110,000, 5½ mi. Wild Rose Prairie-Monroe Rd., $55,000, 5.15 mi. Rockford-Mt. Hope Rd., $50,000; will also appropriate $80,000 to get Federal aid on Apple Way and $80,000 to city to improve Staffords Addition and Ft. Wright Rd. Total cost, $750,000. A. R. Scott, co. engr.

Wash., Sunnyside—Town plans to build 2 mi. 5 ft. sidewalk on various streets.

Cal., Brawley—City soon receives bids paving Main, G and F Sts., involving 316,000 sq.ft. 6 and 7 in. unsurfaced concrete. About $130,000. Former contract rescinded. G. R. Wade, city engr. Noted Jan. 8.

Cal., Marysville—Yuba Co. having plans prepared macadamizing 5 mi. road, 16 ft. wide, in Dist. 10. L. B. Cook, co. engr.

Cal., Taft—City rescinded contract let to Romanite Paving Co., improving 4th St. Above action taken at request of contractor. New bids will probably be received.

Cal., Visalia—City having plans prepared for 2½ mi. concrete paving. L. H. Gadsby, city engr.

Ont., Almonte—City plans to build 3 mi. granolithic concrete walks. Bonds for $20,000 voted for project. W. Watchorn, Almonte, engr. Noted Jan. 15.

BIDS DESIRED

Mass., Newton (Boston P. O.)—Until Feb. 18, by G. E. Stuart, West Newton, building 4000 ft. Dudley Rd. from Boylston to Brookline Sts., 30 ft. wide, involving 14,100 sq. yd. bituminous macadam. About $20,000. E. H Rogers, City Hall, West Newton, engr.

N. Y., Buffalo—Until Feb. 2, by Dept. Pub. Wks., paving Moreland St. from Bailey Ave. to Greene St., Schuchle St. from Northland to Delevan Aves., Kirkpatrick St. from Bailey Ave. to Delaware, Lackawanna & Western R.R. tracks, Humber St. from Delevan Ave. to Sussex St., Vanderbilt St. from Greene to North Ogden Sts., all 26 ft. wide. A. W. Kreinheder, comr.

N. Y., Long Island City—Until Feb. 4, by M. E. Connolly, pres. Queens Boro., regulating, grading, curbing, laying sidewalks where necessary and paving with asphalt on 6 in. concrete foundation, Epsilon Pl. from Myrtle to Cooper Aves., 2nd Ward; regulating, grading, curbing and laying sidewalks, crosswalks and gutters, Kingsland Ave. from 51st St. to Peartree Ave., 2nd Ward; regulating and grading sidewalk space and laying sidewalks, on northerly side of 93rd Ave. from Elderts Lane to 75th St., 4th Ward.

N. Y., New York—Until Feb. 4, by H. H. Curran, pres. Manhattan Boro., repairing asphalt pavements in railroad area when and where directed by chief engineer, involving 50,000 sq.yds. sheet asphalt.

SEWAGE TREATMENT WORKS—CLEVELAND, OHIO

Bids were received by Dept. of Pub. Serv. for constructing easterly sewage treatment works, Contract 29, (A, B, C, bids opened Dec. 16th and rejected), (A. and B, bids opened Jan. 16th), from (A) Amer. Constr. Co. Marion Bldg. (awarded contract); (B) McHugh Bros., West 37th St.; (C) Masters-Mullen Constr. Co., Electric Bldg. The unit bids were as follow:

	A	B	C	A	B
Removing existing buildings (lump sum)	$2,500 00	9,500 00	3,000.00	$2,500 00	$9,500.00
1,150 cu.yd. removing existing concrete and brick masonry	15 00	10 00	13.20	15 00	10.00
25M.ft.b.m. removing existing timber work	15 00	30.00	330.00	15.00	45.00
16 tons removing miscellaneous iron work, piping and valves	25 00	160.00	22.00	30.00	150 00
13,000 cu.yd. excavation, Class "A"	2 50	3.35	2.75	2 50	2 50
800 cu.yd. excavation, Class "B"	4 00	20 50	6.50	5.00	15 00
50 cu.yd. foundation cushion	4 50	6.40	4.40	6.00	6 40
500 lin.ft. wood piles	80	4.00	1.30	1.00	4.00
1M ft.b.m. timber caps, stringers and grillage	150 00	390 00	220 00	150.00	390.00
215 cu.yd. concrete, Class "A"	23 00	21.50	20.80	18 00	22.60
2,925 cu.yd. concrete, Class "B"	26 00	24.75	26 50	26.00	26.50
570 cu.yd. concrete, Class "C"	26.00	32 70	40 00	30.00	32.00
25 bbl. additional Portland cement	3.00	5 00	5.50	3.00	5 00
1,000 sq.yd. special surfacing of concrete	1 25	3 20	2.30	1 50	2.75
500 sq.yd. waterproofing of concrete	1.00	1 75	2 20	80	1.75
1,000 lin.ft. expansion joints	1.00	1 12	1 10	1 00	1 12
500,000 lb. steel reinforcement	.06$\frac{1}{10}$	05½	07¼	05	.05¼
25 tons bell and spigot cast iron pipe	130 00	112 00	121 00	150.00	120 00
1 ton flanged cast iron pipe	160.00	310 00	190 00	225 00	290 00
3 tons bell and spigot standard specials	250 00	280 00	220 00	250 00	280 00
1 ton flanged standard specials	290.00	400 00	260 00	320 00	325 00
2 ton special specials	320.00	510 00	330 00	370.00	425 00
140 lin.ft. 2-in. galvanized iron pipe	70	.80	1 20	.70	90
200 lin.ft. 1½ in. galvanized iron pipe	60	.65	1 15	.60	.70
40 lin.ft. 1-in. (or smaller) galvanized iron pipe	40	50	1 10	.45	.50
18 1-in. gate valves	2 60	10 00	2 75	2 80	6.00
3 1½-in. gate valves	4 50	12 00	4.00	4.75	8.00
6 2-in. gate valves	6 00	15 00	5 75	6 80	12 00
3 3-in. gate valves	16.00	18 00	10.00	16 50	15.00
1 4-in. gate valve	21 00	30 00	13 00	21 50	25 00
1 24-in. gate valve	380 00	355 00	385 00	375 00	355 00
20 6-in. shear gates	25.00	65 00	35 00	25 00	23 00
1 8-in. shear gate	30 00	95 00	49 00	29 00	50.00
24 6-in. sluice gates	90 00	90 00	95 00	100 00	70 00
3 15-in. sluice gates and gate stands	240 00	190 00	260.00	235.00	190 00
2 adjustable valve-boxes and covers	15 00	15 00	13 00	13 50	15 00
380 lin.ft. 1-rail iron pipe railing	2 50	1 50	3.30	2 00	3.00
265 lin.ft. 2-rail iron pipe railing	3 25	2 00	3 85	2 80	3.75
Setting sluice gate castings (lump sum)	450 00	2,000 00	5,000 00	.....	....
210 sq.ft. vault lights	2 25	6 50	3 60	2 75	4 00
440 sq.ft. brick invert	3.20	5 00	4 40	4 00	5 00
10 cu.yd. miscellaneous brick masonry	25.00	110 00	44 00	30.00	110 00
29,000 lb. miscellaneous cast iron work	.20	22	.20	.20	.26
18 tons miscellaneous wrought iron and steel work	315 00	250.00	385 00	350 00	460.00
4M ft.b.m. miscellaneous woodwork	4 00	250 00	385 00	250.00	250.00
For entire work and materials, if any, the actual cost of such work and materials as determined by engineer, plus 15 per cent of such cost:					
Laboratory, screen and grit chamber building (lump sum)	....	76,740 00	89,000 00	55,000.00	79,036.00
60 cu.yd. brick masonry in building	35.00	150 00	44 00	50.00	90.00
Plumbing and gas fitting (lump sum)	3 450 00	3,200 00	6,000 00	3,800.00	4,150 00
Electric wiring for light and power (lump sum)	11,250 00	9,500 00	12,000.00	5,000.00	11,200 00
Steam heating equipment (lump sum)	3,300 00	3,200 00	11,500 00	10,000.00	12,570.00
Pumping equipment (lump sum)	11,720 00	10,025.00	6,500.00	10,000.00	10,225 00
Industrial equipment (lump sum)	3,000 00	1,800.00	1,400.00	3,000.00	1,800 00
Drainage (lump sum)	3,500.00	1,575 00	6,700.00	1,700.00	3,000 00
Roadways (lump sum)	5,000 00	14,250 00	11,500.00	5,000.00	14,250.00
40 cu.yd. gravel walks	7 00	6 40	9 00	7.00	6.40
500 cu.yd. loam	6.00	4 50	5 50	7 00	5 00
1,000 sq.yd. sodding	70	2 25	.60	1 00	2 25
1 acre seeding	150 00	150 00	195 00	150 00	150.00
2 fire hydrants	90 00	125 00	135 00	90.00	125 00
Extended totals	$258,957	$380,068	$400,481	$312,933	$388,057

Streets and Roads (Continued)

New Jersey—Until Feb. 13, by State Highway Comn., Trenton, building State Highway Route 2, Sect. 2, Roebling to Bordetown, Burlington Co., involving 47,451 sq.yd. concrete surface; advertised in this issue.

N. J., Freehold—Until Feb. 18 (change of date), by W. M. Bergen, dir. Bd. Freeholders Monmouth Co., rebuilding Rumson Rd., Sects. 1A and 1B, Shrewsbury Twp., involving 11,942 sq.yd. warrenite surface and 2,127 cu.yd. concrete foundation; advertised in this issue. Noted Jan. 8.

Pennsylvania—Until Feb. 17, by State Highway Dept., Harrisburg, repaving 52,042 lin.ft. road in Adams Co., 44,168 ft. Bradford Co., 31,663 ft. Butler Co., 20,643 ft. Cameron Co., 4,541 ft. Chester Co., 4,604 ft. Clarion Co., 4,108 ft. Clinton Co., 3,169 ft. Elk Co., 4,243 ft. Huntingdon Co., 16,886 ft. Luzerne Co., 21,775 ft. Potter Co., 40,014 ft. Schuylkill Co., 57,712 ft. York Co., all rein-con., 31,269 ft. McKeon Co., either rein.-con. or monolithic vitr. brick and 46,100 ft. Venango Co., rein.-con. on hillside vitr. brick; advertised in this issue.

Pa., Phila.—Until Feb. 14, by Bureau Highways, repaving various streets. About $500,000.

W. Va., Spencer—Until Feb. 20, by Comrs. Roane Co. paving 3 mi. road from Kanawha Co. line to Walton, 16 ft. wide, involving 28,000 sq.yd. concrete. About $67,000. H. R. Muldoon, co. engr.

S. C., Lauren—Until Feb. 6, by Comrs. Lauren Co. topsoiling 14 mi. Piedmont Highway from Lauren to Fountain Inn, Federal Aid Project 84, 28 ft. wide, involving 174 cu.yd. concrete for culverts, and 55,000 cu.yd. earth excav. About $80,000. J. R. Pennell, state highway engr.

Ga., Madison—Until Feb. 16, by Morgan Co., paving, grading and draining 11.35 mi. Natl. Highway, Federal Aid Projects 70 and 110. About $400,000. H. W. Morgan, Atlanta, engr.

Ga., Waycross—Until Feb. 20, by Comrs. Ware Co., building 7.064 mi. Dixie Highway from here to Braganza, 16 ft. wide, involving 66,848 sq.yd. paving, 33,850 cu.yd. excav. and 161 cu.yd. concrete. About $225,000. E. V. Camp, Atlanta, engr.

Fla., Sanford—Until Feb. 10, by Seminole Co. improving 33 mi. road, macadam. About $125,000. F. Williams, Stanford, engr.

Miss., Greenville—Until March 1, by City Council, for 53,130 sq.yd. pavement, 23,780 lin.ft. curb and gutter, 9,810 lin.ft. straight curb and 26,690 cu.yd. excav. Bids will be accepted on concrete and tarvia, concrete or gravel base; advertised in this issue.

Miss., New Albany—Until Feb. 4, by Bd. Supervisors Union Co., building 23 mi. road between Tupelo and Memphis, involving 40,000 cu.yd. gravel in place. X. A. Kramer, Jackson, state highway engr.

O., Akron—Until Feb. 9, by E. A. Zeisloft, dir. pub. serv., paving East Ave. from Wooster to Maple Sts., involving 9,800 cu.yd. grading, 11,000 lin.ft. stone curb, 53,600 sq.ft. concrete sidewalks 15,250 sq.yd. brick or asphalt and 1,750 sq.yd. hillside brick pavement, West Exchange St. from Bowery to Maple Sts., 5,200 cu.yd. grading, 1,000 lin.ft. stone curb, 37,000 sq.ft. concrete sidewalks and 14100 sq.yd. brick or stone pavement; advertised in this issue.

Indiana—By Bd. Co. Comrs. building roads in following counties:

Feb. 4, Huntington Co., Huntington, 2 roads in Clear Creek Twp. J. E. Shideler, aud.

Shelby Co., Shelbyville, 15,820 ft. gravel road, Jackson Twp., known as W. Heck et al Rd. W. W. Leslie, aud.

Whitely Co., Columbia City, gravel road, Troy Twp., known as F. Martin Rd.; 30,729 ft gravel road, Thorncreek Twp., known as D. Jagger Rd.; 12,193 ft. gravel road, Columbus and Washington Twps., known as Cox and Keiser Rd.; 1,538 ft. gravel road, Columbus Twp., known as C. W. Johnson Rd.; 10,730 ft. gravel road, Thorncreek Twp., known as F. M. Grable Rd.; 15,400 ft. gravel road, between Aetna and Troy Twps., known as A. Brossman et al Rd.; 22,500 ft. gravel road, Smith Twp., known as W. Crabill et al Rd.; 3,965 ft. gravel road, Thorncreek and Columbia Twps., known as J. Schuman et al Rd.; 26,667 ft. gravel road, between Jefferson and Washington Twps., known as J. Kerch and E. Sheets Rd.; 10,761 ft. gravel road, Jefferson Twp., known as C. E. Kiser et al Rd. 4. W. K. Burwell, aud.

Feb. 5, Vanderburgh Co., Evansville, gravel road, Knight Twp., known as New Green River Rd.; rock and gravel road in Center Twp., known as Headen Rd.; rock and gravel road, between Pigeon and Knight Twps., known as Morgan Ave. Rd.; rock and gravel road, German Twp., known as Hartig and Heneise Rd. W. Copeland, aud.

Feb. 10, Posey Co., Mt. Vernon, 2,975 ft. gravel road, Center Twp., known as J. M. Causey Rd.; 6 roads in Robison Twp., 2,700 ft. gravel road, known as 3A, J. L. Schneider et al system of roads, 10,500 ft. road, known as 3, J. L. Schneider et al system of roads, 2,645 ft. road, known as 2, J. L. Schneider et al system of roads, 2,296 ft. road, known as 1B, J. L. Schneider et al system of roads, 8,000 ft. road, known as 1A, J. L. Schneider et al system of roads, and 10,966 ft. road, known as 4, J. L. Schneider et al system of roads; gravel road, known as 1, Warren-Wade Co. Rd.;

Streets and Roads (Continued)

gravel road, known as 2, Warren-Wade Co. Unit Rd. M. F. Robison, aud.

Feb. 11, Allen and Whitley Counties, Ft. Wayne, 28,980 ft. gravel road, between Allen and Whitley Counties, known as Pequignot Rd. A. C. McCoy, aud.

Ind., Indianapolis—Until Feb. 4, by city, paving Capitol Ave. from Mobile to South Sts., 40 ft. wide, wood block on 6 in. gravel concrete base, cost $43,286; 36th St. from Central Ave. to Pennsylvania St., 24 ft. wide, $13,823; Yale St. from 10th to 16th Sts., wood block, asphalt, bituminous concrete or brick, $34,204; resurfacing and widening New York St., from Indiana Ave. to Alabama St., 50 ft. wide, wood block asphalt, bituminous concrete or brick, $56,468; paving Ewing St. from 10th to 16th Sts., wood block asphalt, bituminous concrete or brick and building 5,358 lin.ft. curbing, $31,829. F. C. Lingenfelter, city engr.

Michigan—Until Feb. 10, by F. F. Rogers, state highway engr., Lansing, grading, shaping, draining and surfacing 14.211 mi. Telegraph Rd., Federal Aid Rd. 42, 18 ft. wide. Wayne Co. Sects. C and D involve 93.4 cu.yd. concrete, 1,173 lb. steel, 530 ft. encased culverts, 15,916 cu.yd. earth excav., 945 yd. station overhaul, 48,977 sq.yd. concrete or bituminous concrete, etc., Sects. C and G, 199.2 cu.yd. concrete, 3,019 lb. steel, 747 ft. encased culverts, 16,824 cu.yd. earth excav., 53,187 sq.yd. concrete or bituminous concrete on concrete base, etc.

Ill., Wheaton—Until Feb. 2, by Bd. Local Impvts., paving 6,222 sq.yd. Chicago Ave. and 13,946 sq.yd. Main, Hale, Wheaton, Evergreen, Indiana and Illinois Sts. L. J. Ruddock, city engr.

Ia., Centerville—Until Feb. 12, by Comrs. Appanoose Co., grading 11 mi. Federal Aid Project, involving 101,000 cu.yd. excav., also building 9 box culverts, 5 I-beam spans, 2 pony truss spans, 21 circular concrete culverts, etc.

Ia., Davenport—Until Feb. 3, by city, grading, paving, curbing and excavating,

1311 ft. Lombard St. from Marquette to Washington Sts., 37 ft. wide, involving 2630 lin.ft. concrete curbing and guttering, cost $20,719.

1135 ft. LeClaire St. from Pleasant to Rusholme Sts., 30 ft. wide, 2319 lin.ft. concrete curbing and guttering, $14,514.

2773 ft. Middle Rd. from Fernwood Ave. to city limits, 18 ft. wide, $16,580.

1815 ft. Pleasant St. from Myrtle to Washington Sts., 24 and 30 ft. wide, 3741 lin.ft. concrete curbing and guttering, $21,272.

1184 ft. Sheridan St. from alley north of Central Park Ave. to 30th St., 24 ft. wide, 3158 lin.ft. concrete curbing and guttering, $16,070.

1219 ft. Spring St. from East River to 13th Sts., 24 ft. wide, 2502 lin.ft. concrete curbing and guttering, $12,710.

1808 ft. 6th St. from Washington St. to Wilkes Ave., 30 ft. wide, 3665 lin.ft. concrete curbing and guttering, $23,758.

1560 ft. Pershing Ave. from Locust to Rushholme Sts., 30 ft. wide, 3373 lin.ft. concrete curbing and guttering, $19,782.

834 ft. Washington St. from 7th to 10th Sts., 24 ft. wide, 1742 lin.ft. concrete curbing and guttering, $11,166.

1263 ft. Columbia Ave. from Brady St. to Arlington Ave., 30 ft. wide, 2635 lin.ft. concrete curbing and guttering, $31,449.

5530 ft. Brady St. from 32nd St. to city limits, 18 ft. wide, 11,060 lin.ft. concrete curbing and guttering, $31,708.

1023 ft. Bridge Ave. from High St. to Denison Ave., 30 ft. wide, 2073 lin.ft. concrete curbing and guttering, $13,740.

1381 ft. Brady St. from 29th to 32nd Sts., 37 ft. wide, 2766 lin.ft. concrete curbing and guttering, $20,420.

1823 ft. Davenport Ave. from Denison Ave. to 29th St., 24ft. wide, 3712 lin.ft. concrete curbing and guttering, $19,191.

1318 ft. Harrison St. from end of paving to 32nd St., 30 ft. wide, 2642 lin.ft. concrete curbing and guttering, $17,289.

971 ft. 11th St. from Spring St. to Mississippi Ave., 24 ft. wide, 2180 lin.ft. concrete curbing and guttering, $16,674.

1252 ft Locust St. from Division to Pacific Sts., 30 ft. wide, 2,682 lin.ft. concrete curbing and guttering, $16,955.

2449 ft. Waverly Rd. from Telegraph Rd. to point 1165 ft. north and 1300 ft. west, 18 ft. wide, $26,386.

5770 ft. Harrison St. from 32nd St. to north city limits, 18 ft wide, 1000 lin.ft. concrete curbing and guttering, $31,012.

3622 ft. Hickory Grove Rd from Division St. to north city limits, 18 ft. wide, 4031 lin.ft., concrete curbing and guttering, $37,617.

1050 ft. Jefferson Ave. from Central Park Ave. to 29th St., 24 ft. wide, 2208 lin.ft. concrete curbing and guttering, $10,431.

4376 ft. Locust St. from railroad bridge to point 4100 ft. west, 20 ft. wide, 2753 lin.ft. concrete curbing and guttering, $35,440.

1071 ft. Tremont Ave. from Rusholm St. to Central Park Ave., 24 ft. wide, 2287 lin.ft. concrete curbing and guttering, $11,528.

779 ft. Arlington Ave. from Columbia Ave. to 29th St., 30 ft. wide, 1586 lin.ft. concrete curbing and guttering, $10,038.

Portions of Adams St., $2,248; Boies Ave., $4,835; Carey Ave., $8,330; Christie St., $4,585; Central Park Ave., $4,200; Dover Court, $6,139; 8th St., $3,979; 42nd St., $7,695; Howell St., $2,804; High St., $3,360; Iowa St., $7,723; Judson St., $4,876; Pleasant St., $3,461; Rushholme St., $2,860; 13th St., 4,264; 12th St. from Gaines to Brown Sts., $3,480; 12th St. from Farnam St. to Grand Ave., $5,545; 10th St., $2,256; Vine St., $4,935; Washington St., $5,846; Wilkes Ave. from 3rd to 5th Sts., 8,186; Wilkes Ave. from 6th to 7th Sts., $4,142. R. E. Sawistowsky, city engr.

Ia., Independence—Until Feb. 11, by Auditor Buchanan Co., for 84,000 cu.yd. concrete pavement and 20,000 yd. excav.

Ia., Kingsley—City receiving bids paving 8 blocks various streets, concrete. About $250,000. T. H. Johnson, Sioux City, engr.

Ia., Waterloo—Until Feb. 10, by Auditor Black Hawk Co., grading, draining and paving 17.1 mi. Grant Highway, 18 ft. wide, involving 85,000 lin.ft. 6-10 in. tile and 50,000 cu.yd. earth excav. C. M. Fisher, co. engr.; advertised in this issue.

Ia., Winfield—Until March 2, by city, paving 2 mi. main streets, 24 ft. wide, vertical fibre bridk, rein.-con., asphaltio concrete or vitr. brick. H. R. Green, 634 Cedar Rapids Savings Bldg., Cedar Rapids, engr.

In One Month
[JANUARY]
We printed
more than
3000 Items
in Construction

Watch
these Columns
through
FEBRUARY

Minn., Brainerd—Until March 6, by C. W. Mahlum, aud. Crow Wing Co., building 2 mi. State Rd. 2, Job 2001, 18 ft. wide, involving 21,794 sq.yd. paving, 4,459 cu.yd. excav., 2,585 ft. 12 and 18 in. storm sewer, etc. Bids will be received on all types of pavement. About $80,000. C. M. Hetl, Brainerd, engr.

Minn., Elk River—Until Feb. 10, by Comrs. Sherburne Co., paving 10 mi. road from here to Big Lake, 18 ft. wide, concrete, brick or asphalt. About $300,000. F. W. Nickerson, Elk River, engr.

Minn., Hopkins—Until Feb. 10, by E. A. Close, city recdr., paving 9 blocks 12th and Excelsior Aves., involving 10,333 sq.yd. paving, 3,527 sq.yd. excav., 550 lin.ft. header, 636 lin.ft. circular and 2,330 lin.ft. straight curb. Bids will be received on all types of pavement. About $150,000. P. W. Shaffer & Co., New York Life Bldg., Minneapolis, engrs.

Minn., Lesueur Center—Until Feb 24, by S. McMillen, aud. Lesueur Co., building 7.7 mi. Federal Aid Project 89, State Rd. 5, 24 ft. wide, involving 95,000 cu.yd. grading, 175,000 cu.yd. overhaul and 52,020 lin.ft. tile drain. About $100,000. R. F. Nichols, Lesueur Center, engr.

Minn., Minneapolis—Until Feb. 16, by A. P. Erickson, aud. Hennepin Co., grading and graveling 12 mi. Lyndale Ave., 30 ft. wide, involving 282,338 cu.yd. excav., 500,000 cu.yd. side excav., and 6,108,668 cu.yd. overhaul. About $370,000. E. E. Terrell, co. surv.

Minn., Moorhead—H. G. Price, city clk., receiving bids paving various streets, 24 ft. wide, involving 96,000 cu.yd. earth excav., 5,974 ft. 8 in. tile, 2,500 lb. new castings, 34,413 lin.ft. straight and 4,950 lin.ft. curved concrete curbing, 1,455 lin.ft. headers, 5,950 lb. reinforcing steel and 57,863 sq.yd. 1 course concrete, bituminous concrete, bitulithic, creosoted wood block or vitr. brick pavement. About $175,000.

Minn., Pipestone—Until Feb. 10, by T. A. Bailey, aud. Pipestone Co., building 11 mi. State Rds. 1 and 2, Federal Aid Project 82, 18 ft. wide, involving 56,101 cu.yd. excav., 46,404 lin.ft. 6 in. tile drain and 102,470 sq.yd. concrete paving; also building 1 mi. Rd. 2002, involving 3,041 cu.yd. excav., 11,785 sq.yd. concrete paving and 2,880 lin.-ft. tile drain. About $360,000. E. Keeler, Pipestone, engr.

Minn., Redwood Falls—Until Feb. 5, by H. W. Ward, city recdr., paving 24 blocks, involving 10,480 cu.yd. grading, 11,490 lin.-ft. curbing and 36,244 sq.yd. concrete, asphaltic concrete, brick or creosoted wood block. About $100,000. L. P. Wolff, Guardian Life Bldg., St. Paul, engr.

Minn., St. James—Until Feb. 11, by A. G. Countryman, aud. Watonwan Co., building 10 mi. Federal Aid Project 107, State Rd. 8, 18 ft. wide, involving 15,938 lin.ft. tile drain and 95,687 sq.yd. paving; also building 5 mi. Job 2001, 24 ft. wide, 21,900 lin. ft. 6 in. tile drain and 53,811 sq.yd. paving. About $410,000. T. J. Buhl, St. James, engr.

Minn., Willmar—Until Feb. 9, by S. Nelson, aud. Kandiyohi Co., paving 10 mi. State Rd. 6, Federal Aid Project 31, 18 ft. wide, involving 116,400 sq.yd. concrete, asphaltic concrete or brick, and 30,000 ft. 6 in. drain tile. About $300,000. H. L. Waddell, Willmar, engr.

Mont., Livingston—Until March 1, by H. M. Shelver, city clk., improving various streets, involving 38,098 cu.yd. excav., 175,533 sq.yd. pavement, 1,282 lin.ft. corrugated gutter pipe and 12,356 lin.ft. attached curb. Bids will be received on any or all of following types of pavement vitr. brick, wood block, concrete, plain or reinforced, asphaltic concrete (Topeka mix) on cement concrete base or crushed rock base, Warrenite-bitulithic on bases of cement concrete, bituminous concrete or compressed broken stone; advertised in this issue.

Tex., Port Lavaca—Until Feb. 9, by R. H. Hamilton, judge Calhoun Co., improving 10.312 mi. road from here to Victoria Co. line, involving 89,055 cu.yd. shell surfacing, etc., 4.616 mi. Port Lavaca-Witnebert Gate Rd., 43,533 cu.yd. mud shell surfacing, etc. Lone Star Eng. Co., San Antonio, engrs.

Okla., Bixby—Until Feb. 15, by city, paving 6 blocks, 30-60 ft. wide, concrete. About $100,000. Hughes Eng. Co., 304 Bank of Commerce Bldg., Tulsa, engrs. Noted Jan. 15.

Okla., Frederick—Until Feb. 10, by City Council, for 29,700 sq.yd. paving and 15,000 lin.ft. curb, together with grading, manholes, catch basins, inlets, sewers, etc. Alternate bids will be received on vitr. brick, cement concrete, asphaltic concrete, sheet asphalt, rock asphalt and bitulithic; advertised in this issue.

Okla., Okmulgee—Until March 8, by city, resurfacing 4 blocks main streets, 25 ft. wide, involving 46,000 cu.yd. 3 in. vitr brick. About $150,000. T. P. Paxton, Okmulgee, engr.

New Mexico—Until Feb. 4, by State Highway Comn., Capitol Bldg., Santa Fe, building 5.09 mi. State Rd. 13, from border to Picacho Hills, Sect. 1, known as Sect. B New Mexico Federal Aid Project 20, Lincoln Co., involving 7,404 cu.yd. excav., 2,901 cu.yd. Class "1" borrow, 5,845 yd. overhaul, 10,655 cu.yd. surfacing of top soil, 820 lin.ft. 18-36 in. corrugated metal culverts, 100 cu.yd. Class "B" concrete and 79.5 cu.yd. grouted cobblestone spillway. L. A. Gillett, state highway engr.

New Mexico—Until Feb. 10, by State Highway Comn., Santa Fe, building .572 mi. State Rd. 8, Sect. 1, Federal Aid Project 16, Santa Fe Co., which includes Santa Cruz Bridge and connecting road. Work involves 67 cu.yd. Class "1" excav., 4,607 cu.yd. Class "1" borrow, 477 cu.yd one course gravel surfacing, etc. L. A Gillett, state highway engr.

Streets and Roads (Continued)

Wash., Wenatchee—Until Feb. 9, by Comrs. Chelan Co., grading 2,000 ft. Chelan-Manson Highway, involving 2,000 cu.yd. earth and 11,500 cu.yd. rock excav., and 90 lin.ft. culvert pipe. F. M. Berry, co. engr.

Ont., Kingston—Until Feb. 9, by W. A. McLean, deputy minister Pub. Highways Dept., clearing, grubbing, earthwork, rock work, constructing concrete structures, etc., on ¼ mi. Provincial Highway (Long Grass Swamp), 24 ft. wide, 5 mi. east of here. About $100,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Brooklyn**—E. Riegelmann, boro. pres., let contract regulating and repaving Louisiana Ave., Hegeman and 81st Sts., to Uvalde Asphalt Paving Co., 1 Bway., New York City, $10,041, $4,508 and $12,507 respectively; 70th St., to C. Gallagher, $2,895. Noted Jan. 15.

N. Y., Brooklyn—E. Riegelmann, boro. pres., received bids Jan. 21, regulating and grading, (a) Dupont St., (b) Ave. T, (c) 21st St., (d) 71st St., (e) Ave. R, (f) 56th St., (g) 85th St., (h) paving with asphalt, Jackson St., (i) Ave. T, (j) 21st St., (k) 13th Ave., (l) 56th St., from J. Jennings, 15 Van Siclen Ave., (a) $2,578, (e) $6,793, (g) $4,559; Grimm Constr. Co., 460 Harold Ave., (a) $2,600, (b) 2,666, (c) $1,784, (d) $4,899, (e) $7,009, (f) $2,900; Scott Bros., 1045 Bedford Ave., (a) $2,868, (b) $3,282, (c) $2,040, (d) $5,214, (e) $6,984, (f) $3,157, (g) $7,402; C. Gallagher, Woodhaven, L. I., (b) $2,244, (c) $1,773, (d) $4,854, (f) $2,498; Castle Bros., Johnson Pl., (b) $2,281, (c) $1,689, (d) $4,529, (e) $5,162, (g) $5,814; L. Mangeri, 190 31st St., (d) $5,002, (e) $6,793, (g) $5,005; J. J. Guinan, 2314 Gravesend Ave., (b) $2,755, (c) $2,055, (d) $5,581, (e) $7,578, (f) $2,898, (g) $8,240; Uvalde Asphalt Paving Co., 1 Bway., New York City, (h) $16,796, (i) $5,679, (j) $5,587, (k) $14,290, (l) $8,468; Consolidated Asphalt Paving Co., 52 9th St., (h) $17,349, (i) $5,194, (j) $5,695, (k) $14,837, (l) $8,810; Sicilian Asphalt Paving Co., 41 Park Row, New York City, (h) $17,000, (i) $5,640, (j) $5,740, (k) $14,819, (l) $8,648. Noted Jan. 15.

N. Y., New York—Dept. Parks, Municipal Bldg., received bids Jan. 22, furnishing all labor and material for repaving roadway of Eastern Blvd. from Bronx and Pelham Parkway to southerly approach to bridge over Eastchester Bay, Bronx Boro., from Union Paving Co., Bway. and 112th St., $63,165; Asphalt Constr. Co., 2197 Madison Ave., $62,941, Uvalde Asphalt Paving Co., 1 Bway., $67,450. Noted Jan. 15.

★**Pennsylvania**—L. S. Sadler, state highway comr., Harrisburg, let contract building 13,592 ft. State-aid Highway, 16 ft. wide, Daugherty and New Sewickley Twps., Beaver Co., 1 course rein.-con. and Hillside vitr. brick, to R. B. Markley, Rochester, $150,771; 15,000 ft. from northeast line of Easton to Tatamy Boro. line, rein.-con., Northampton Co., to Smith-McCormick Co. and McInerney & McNeal, Inc., Easton, $165,526.

★**O., Lakewood** (Cleveland P. O.)—Nye & Camp, The Arcade, let contract grading Onondaga Park, involving 15,000 cu.yd. excav., to C. Outzen, Clagg Rd. About $13,000. Noted Jan. 22.

★**Michigan**—State Highway Dept., Lansing, let contract grading, draining and surfacing 4.052 mi. State Trunk Line Rd. 13-2, 16 ft. wide, Mecosta Co., to Mecosta Co. Rd. Comn., Big Rapids, involving 17,953 cu.yd. earth excav. @ $0.55 per cu.yd., 1,900 yd. earth overhaul, $0.03, six hundred eight lin.ft. 12 in. encased tile culverts, $1.90, 92.4 cu.yd. 1:2:4 concrete, $20, 87.8 cu.yd. 1:3:6 concrete, $18 cu.yd., 3,979 lb. steel reinforcement, $0.09, 1,575 lin.ft. guard rail, $0.65, catch basins, $75 each, 200 lin. ft. vitr. tile, $2 and 42,262 sq.yd. slag gravel surface, $1.05, total $60,935; 1.484 mi. State Trunk Line 21-2, 16 ft. wide, Clinton Co., to V. Allen, Ovid, $17,397, involving 5,107 cu.yd. earth excav., 13,932 sq.yd. gravel and 53 cu.yd. concrete.

Ia., Des Moines—City received bids paving 12,155 sq.yd., center St. from 31st. to 44th Sts., asphaltic concrete on concrete base, from Mid-West Paving Co., 615 S.W. 9th St., Des Moines, $45,460; J. Horrabin & Co., 1422 Walnut St., $46,067; Des Moines Asphalt Paving Co., 2nd and New York Aves., $46,797.

Ia., Des Moines—City let contract paving 6th Ave. from Madison to Aurora Sts., involving 6,300 sq.ft. vitr. brick on concrete base with asphalt filler, to Wright Constr. Co., 211 Flynn Bldg., $27,968.

★**Ia., Des Moines** — City let contract paving 926 ft. 40th St. between University and Forest Aves., 36 ft. wide, involving 3,704 sq.yd. asphaltic concrete on concrete base, to J. Horrabin & Co., 1422 Walnut St., $14,038.

★**Ia., Montezuma**—City let contract for 30,000 sq.yd. 1 course 7 in. rein.-con. pavement, to Capital Constr. Co., 920 Cherry st., Des Moines, $3.81 per sq.yd.

★**Idaho**—State Highway Comn., Boise, let contract grading and graveling 5.2 mi. Bliss Shoshone Rd., to S. C. Comerford, Gooding. About $24,000.

★**Washington**—J. Allen, state highway engr., Olympia, let contract grading and draining 28 mi. Central Washington Highway from Connell to Lind, Franklin and Adams Counties, to Mitchell Bros., 127 Mission St., Spokane, $88,607; grading and building concrete bridge on 8.5 mi. Inland Empire Highway from Delaney to Dodge, Columbia Co., to Fitzgerald & Stanton, Great Falls, $67,152.

★**Wash., Seattle**—Bd. Pub. Wks. let contract building 1½ mi. roadbed, near Damnation Creek, into Skagit River Valley, in connection with proposed hydro-electric plant, involving 21,702 cu.yd. earth and 15,800 cu.yd. solid rock excav., to Mandric Constr. Co., 504 1st Ave. W., $67,907. Noted Jan. 22.

★**Wash., Vancouver** — City let contract grading and paving Railroad Ave. from 13th to 26th Sts., concrete, to Puget Sound Eng. Co., Vancouver. About $21,000. Noted Jan. 8.

★**Ore., Portland**—City received bids improving Jarrett St. et al., from Municipal Paving Plant, asphaltic concrete No. 1, $1.75 per sq.yd., total $19,136; United Contg. Co., Northwest Bank Bldg., asphaltic concrete, $2.30 per sq.yd., $22,606; Cochran Bros., concrete No. 3, $2.25 per sq.yd. $23,470. Contractors all of Portland.

★**Cal., Long Beach**—Bd. Pub. Wks. let contract improving Perris Ave., involving 93,808 sq.ft. 4 in. crushed rock and oil paving, to F. Hoffman, 11 East 12th St., $14,021. Noted Jan. 15.

★**Cal., Riverside**—Bd. Supervs. Riverside Co. rejected only bid improving 1⅞ mi. Route 18, Div. B, Indio Rd. Dist., involving 1,217 cu.yd. excav., 9,391 lin.ft. shaping roadbed and 89,452 sq.ft. 5 in. oil macadam paving. Work will be done by day labor. A. C. Fulmor, co. engr.

★**Cal., Visalia**—Bd. Supervs. Tulare Co. let contract building 6 mi. highway from Woodville to Poplar, involving 13,200 cu.yd. excav. and 5,922 cu.yd. concrete, to Concrete Pipe & Constr. Co., Porterville, $60,915. Noted Jan 22.

Railways

PROPOSED WORK

Maine—L. Maddocks and citizens of Boothbay Harbor, plan to build railway from Boothbay Harbor to South Newcastle, connecting with Maine Central R.R., also build bridge from both sides of harbor to proposed station. About $200,000.

Pennsylvania—Citizens Electric Co., Valley View, plans to grade, cinder roadbed and lay 20 mi. track from Ashland to Klingertown, involving 24 grade crossings, 10,000 poles, 40 mi. rail, 100 lb. 50 ft. rails, electric trolley line, etc. About $350,000. Engineer not selected.

Missouri—United Rys. Co. of St. Louis, 3869 Park Ave., plans to extend Lee line from Lee and Taylor Aves. west on Lee Ave. to Euclid Ave., north to Carter Ave., thence across proposed viaduct over Terminal R.R. Belt line to Bircher Rd., and Kingshighway, thence over contemplated cutoff to intersection of Ruskin and Lillian Aves. to Jennings Station Rd., to connect with extension of City Limits line, 3 mi. long, cost $225,000; Tower Grove line west from 59th and Arsenal Sts. to Jamison Ave., thence south to Marquette Ave. looping back over Ivanhoe Ave. to Arsenal St., 1¾ mi. long, $131,000; Taylor Ave. line south over Kingshighway from Manchester Ave. to connect with Southampton tracks, ⅞ mi. double track, $65,000; Natural Bridge line west from Kingshighway to Pine Lawn to connect with City Limits line at terminus of Ferguson and Kirkwood divisions, $131,200; Olive-Maryland line north on Kingshighway to Waterman Ave to connect with University line, ½ mi. long. $45,000. E. D. Smith, c/o company, engr.

Excavation and Dredging

PROPOSED WORK

Minn., St. Peter—Drainage—W. H. Holz, aud. Nicollet Co., having plans prepared building drainage system to cover 11,000 acres, in Lake Prairie and Traverse Twps., involving 3 mi. open ditch. About $300,000. H. W. Daniels, St. Peter, engr.

Wash., Walla Walla—Irrigation—W. F. Crowe, atty., filed application with State Hydraulic Engineer for water rights to irrigate 72,000 acres, water to be taken from Touchet River at Bolles, carried through 12 ft. canal on to Eureka Flat. Work involves concrete tunnel, excavation of main channel, laterals, flood gates, etc. About $2,000,000.

Ore., Lostine — Irrigation — South Fork Ditch Co. plans to take 6.68 second ft. of water from Lostine River for irrigation of 534 acres, near here; will also build canal 8 ft. wide, timber and rock dam and timber headgate. About $20,000.

BIDS DESIRED

Minn., Bemidji—Ditches—Until Feb. 13, (change of date) building Judicial Ditches 25 and 30, 14 mi. long, involving 505,000 cu.yd. excav., 54.52 acres clearing at $40 per acre and 135.44 acres at $25 per acre, and one 3 span pile and timber bridge at $1,000. Total cost, $53,566. J. C. Burke, Bemidji, engr. Noted Jan. 15.

Minn., Marshall—Ditches—Until Feb. 17, by R. D. Houdersheldt, aud. Lyon Co., building County Ditch 46, involving 900 ft. 24 in. sewer pipe and 20,500 ft. 6-24 in. drain tile, cost $11,816; also building Ditch 18, consisting of (1) 22,400 lin. ft. main open ditch, involving 100,557 cu.yd. excav., cost $13,072, (2) branches 2-9 and 10 flood water inlets, with all laterals. 53,030 lin.ft. 6-24 in. drain tile and 3 bulkheads, $25,361, branches 10-14, 69,015 ft. 6-30 in. drain tile and 1 bulkhead, $36,620. total cost $75,054.

Minn., Olivia—Ditch—Until Feb. 16, by A. O. Schmidt, aud. Renville Co., building Ditch 24, involving 80,562 ft. 6-42 in. tile drain and 52 ft. 10 and 12 in. corrugated galvanized iron pipe. About $61,895. T. M. Sheperd, Olivia, engr.

Wash., Seattle—Drainage—Until Feb. 16, by C. H. Kiehl, 406 Central Bldg., building new channel for Mercer Slough, to improve area 2 mi. long and ½ mi. wide, involving 51,500 cu.yd. earth excav.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New York—Excavation—G. A. Whalen, comr. plants & structures, Municipal Bldg., received bids Jan. 15, excavating and dredging at site of Eastchester Bridge, from P. T. Cox Contg. Co., 154 Nassau St., $28,700; Mohawk Dredging & Dock Co., Astoria, L. I., $29,400; S. S. Jones, $36,000. Noted Jan. 8.

N Y., Tompkinsville—Dredging—M. Hurlburt, comr. docks, Pier "A", Battery Pl., New York City, received bids Jan. 20, furnishing labor and materials for dredging and removing old pier at Arrietta St., from M. Cummings, 17 State St., New York City, $515,500 and $70,000 respectively, at Grant and Wave Sts, from F. E Jones, Battery Pl., New York City, $384,000 and $55,000 respectively. Noted Jan. 15.

★**Cal., Redlands**—Irrigation—Redlands & Yucaipa Land Co. let contract furnishing 22,215 ft. 4 in. No. 16 U. S. gauge single riveted, double dipped, 3,030 ft. 6 in. No. 16 and 5,550 ft. 8-18 in. No. 14 U. S. gauge double riveted, double dipped water pipe, etc., for 1st section of irrigation system, in Yucaipa Valley, near here, to Western Pipe & Steel Co., 444 Market St., San Francisco, $28,984; 36,650 ft. 4 in. No. 16 U. S. gauge single riveted, double dipped, 15,585 ft. 6 in No. 16 and 5,540 ft. 12 in. No. 14 U. S. gauge double riveted, double dipped water pipe, etc., from 2nd section, to Los Angeles Mfg. Co., 2500 Leonard St., Los Angeles, $30,361. No bids received hauling pipe 10 mi., trenching, back filling, etc., and this work will be done by day labor. About $12,000 and $15,000 respectively.

★**Cal, Willows**—Dredging—Glenn-Colusa Irrigation Dist. let contract dredging and enlarging canals, to Shattuck-Edinger Co., 525 Market St., San Francisco. About $1,000,000.

Industrial Works

PROPOSED WORK

Me., Portland—J. C. and J. H. Stevens, archts., 187 Middle St., soon receive bids building 4 story, brick and rein-con. factory, rein.-con. flooring, on Forest Ave., for A. S. Hinds, West St. About $500,000.

Mass., Malden (Boston P. O.)—C. H. Moss, 48 Grass St., preparing plans for 1 story, 50 x 100 ft., brick and concrete factory, concrete foundation, on Pearl St. About $40,000.

Mass., New Bedford—Continental Wood Screw Co., Mt. Pleasant St., soon receives bids building 2 story, 52 x 80 ft. and 30 x 40 ft., brick, concrete and steel addition to factory, rock foundation. About $45,000. C. Hammond & Son, 179 North Water St., archts.

Mass., Newton Upper Falls—Saco Lowell Shops, Oak St., having plans prepared by Lockwood, Greene & Co., engrs., 60 Federal St., Boston, for brick and rein.-con. foundry. About $125,000.

Mass., Roxbury—M. Nigroch, c/o J. A. Tuck, archt., 34 School St., Boston, having plans prepared for 1 story, 110 x 115 ft., brick and concrete garage, concrete flooring and foundation, on Walnut Ave., here. About $35,000.

Mass., South Boston (Boston P. O.)—Eastern Terminal Co., c/o J. E. Starr, 103 Federal St., New London, Conn., purchased site here and plans to build terminal storehouse. About $2,000,000. Engineer not selected.

R. I., Providence—C. H. Lockwood, archt., 171 Westminster St., soon receives bids building 1 story, 96 x 320 ft., brick and concrete service station, concrete flooring and foundation, on Reservoir Ave., for Federal Truck Sales Co., 276 West Exch. St. About $100,000.

R. I., Westerly—Ninigret Mills Co., Canal St., having plans prepared by C. T. Main, archt. and engr., Devonshire St., Boston, and soon receives bids for 4 story, 135 x 500 ft., brick and mill construction mill. About $600,000.

R. I., Westerly—F. P. Sheldon & Sons, engrs., 1008 Hospital Trust Bldg., Providence, soon receive bids building 4 story, 106 x 108 ft. mill, 1 story, 150 x 350 ft. weave shed and 1 story, 120 x 120 ft. warehouse, all brick and timber, concrete foundation, on Mechanic St., here, for Lorraine Mfg. Co., 547 Mineral Springs Ave., Pawtucket. About $300,000.

Conn., Hartford — Berenson & Moses, archts., 1086 Main St., receive bids about Feb. 15, building 4 story, 65 x 177 ft. brick, rein.-con. and steel warehouse, rein.-con. flooring, concrete foundation, on Winthrop St., for Hartford Cooperage Co., 119 Portland St. About $200,000.

Conn., Hartford—F. C. Walz, archt., 348 Trumbull St., receives bids about Feb. 15, building 2 story, 60 x 150 ft., brick, concrete and steel garage, rein-con. flooring, concrete foundation, on South Main St. About $65,000. Owner's name withheld.

Conn., Windsor Locks—J. R. Montgomery Co. soon lets contract building 2 story, 80 x 200 ft., rein.con., steel sash and mill construction factory, concrete foundation. About $100,000. Ford, Buck & Sheldon, 60 Prospect St., Hartford, archts. and engrs.

N. Y., Albany—Iroquois Door Co., 629 Exch. St., Buffalo, plans to build frame storage plant on west side Mill St., here. Cost between $50,000 and $60,000.

N. Y., Albany—Twin-Energy Motors, recently incorporated, having plans prepared by W. H. Van Guysling, archt., 1 Clinton Sq., for 3 story, brick factory. About $1,000,000. Address, W. H. Schneider, 142 State St.

N. Y., Albany—U. S. High Speed Tool Corp., Toledo, O., plans to build 4 story factory, near here. D. H. Friedman, 741 Madison Ave., pres.

N. Y., Brooklyn—Amer. Safety Razor Co., 303 Jay St., soon lets contract building 5 story, 75 x 140 ft. and 1 story, 25 x 125 ft., factory, 2 story, 45 x 50 ft. garage and 1 story, 25 x 50 ft., boiler house, rein-con., rein-con. flooring, concrete foundation, on Lawrence, Johnson and Jay Sts. W. Higginson, 18 East 40th St., New York City, archt.

N. Y., Buffalo—Johnson Rim & Parts Co. plans to build brick and steel factory, at 2600 Delaware Ave. About $25,000.

N. Y., Carthage—West End Paper Co., West End Ave., Carthage Sulphite Pulp & Paper Co., Front St. et al, plan to build central power station to develop 18,000 to 20,000 h.p. Cost between $250,000 and $300,000.

N. Y., East Syracuse—Selflock Nut & Bolt Co., 190 North State St., Chicago, purchased site here and plans to build fireproof factory, and install machine tool equipment. About $400,000. Address R. W. Romine, 208 Comstock Ave., Syracuse.

N. Y., Little Falls—Wool Products Co., 337 Engine St., Watertown, purchased Rockton Knitting Mills, on Mohawk St., here, and plans to alter and build additions to same. Cost between $75,000 and $85,000. M. J. Stabins, pres.

N. Y., Massena—J. J. Taylor, Water St., plans to build mill construction plant to replace one recently destroyed by fire. Cost including equipment, $100,000.

N. Y., New York—D. Wortman, archt. and engr., 114 East 28th St., receives bids about Feb. 15, building 9 story, 50 x 103 ft., brick, steel and concrete warehouse, rein.con. flooring, concrete foundation, at 108-110 West 107th St., for Chelsea Fireproof Storage Warehouse, 426 West 26th St. About $125,000.

N. Y., New York—J. M. Felson, archt. and engr., 1133 Bway., soon lets contract building 25 x 100 ft., brick and steel addition to factory, rein.-con flooring, concrete foundation, for Natl. Gum & Mica Co., 12 West End Ave.

N. Y., Oneida—G. Taylor & Co., 110 Madison St., plans to rebuild flour mill and install new machinery and equipment. Cost between $150,000 and $175,000.

N. Y., Utica—Sherman Sales Co., Inc., 516 John St., plans to build concrete garage on Elizabeth and Mary Sts. Cost between $75,000 and $80,000. S. Sherman, pres.

N. Y., Watertown—Mohican Co., 280 Bway., New York City, purchased Smith Bldg., here, and plans to alter and convert same into bakery. Cost between $60,000 and $70,000. Address, F. Munsey, c/o owners.

N. Y., Watertown—Sinclair Refining Co., Tivoli St., Albany, purchased site on Bradley St., here and plans to build tanks, warehouse, shipping facilities, etc. Cost between $80,000 and $100,000. Address, P. E. Potter, c/o owners.

N. J., Hoboken—J. C. Schaeffer, engr. and archt., 40 West 32nd St., New York City, receives bids about Feb. 16, building 6 story, 135 x 135 ft. factory, also 3 story, 20 x 80 ft. foundry, rein.-con. and steel, rein.con. flooring, concrete foundation, for White Metal Mfg. Co., 1006 Clinton St. Noted Jan. 1.

N. J., Trenton—Mercer Motor Co., White head Rd., soon lets contract building 1 story, 80 x 400 ft., brick and steel addition to plant. About $50,000. Day & Zimmerman, 611 Chestnut St., Phila., engrs.

N. J., Verona (Montclair P. O.)—Eagle Rock Mfg. Co. having plans prepared by Lockwood-Green Co., engrs. and archts. 101 Park Ave., New York City, for 2 story 40 x 350 ft, rein.-con. and steel factory, rein.-con. flooring, concrete foundation. About $250,000.

Pa., Ashley (Wilkes-Barre P. O.)—R. West Knitting Co., Manhattan St., plans to build 2 story, 60 x 180 ft., brick factory, rein.-con. flooring, rock foundation, on Manhattan St. About $50,000. Architect not selected.

Pa., Bloomsburg—Columbia Silk Throwing Co. having plans prepared by C. J. Schmidtt and G. F. Schroeder, archts., Weitzenkorn Bldg., Wilkes-Barre, for 1 story, 100 x 109 ft., brick and steel mill, rock foundation, here. About $50,000.

Pa., Frankfort Jct. (Phila. P. O.)—Belmont Packing & Rubber Co., 133 North 2nd St., Phila., plans to build 2 story, 120 x 120 ft., brick and concrete factory, here. About $60,000. C. P. Berger, South Pennsylvania Sq. Bldg., Phila., archt.

Pa., Johnstown — Lee-Strauss Co., 232 Levergood St., plans to build 3 or 5 story, 55 x 100 ft., brick and concrete plant, rein.-con. flooring, concrete foundation, on Levergood St. About $150,000. H. M. Rodgers, Trust Bldg., archt.

Pa., Marietta—Star Silk Co., South 5th St., Shamokin, plans to build 2 story, 40 x 130 ft., brick and timber mill, concrete foundation, on Shamokin Rd., here. About $50,000. Architect not selected.

Pa., Phila.—Sales and Service—See "Buildings."

Pa., Phila.—W. B. McCullough, c/o C. E. Oelschlager, engr. and archt., 1615 Walnut St., having plans prepared for 2 story, 36 x 100 ft., brick and concrete service station, at 250 North Juniper St. About $50,000.

Pa., Wilkes-Barre—G. Gildersleeve, Gildersleeve St., soon lets contract building 2 story, 45 x 225 ft., concrete, brick and steel garage, rein-con. flooring, concrete foundation, on South Main St. About $100,000. T. Atherton, Jr., Coal Exch. Bldg., archt.

Md., Baltimore—Locke Insulator Co., Victor, N. Y., preparing plans for plant, consisting of two 1 and 2 story concrete and brick buildings, concrete and brick foundations, and 24 kilns, on Light St. and Ferry Bar, here. About $1,000,000. Private plans.

Md., Baltimore—Lyon, Conkling & Co., Inc., 13-19 Balderston St., acquired site between McComas and Donaldson Sts., and plans to build large plant.

Md., Curtis Bay (Baltimore P. O.)—Kennedy Corp., Charles and Wells Sts., Baltimore, plans to build concrete and steel plant here, to include 4 open-hearth melting furnaces fired by fuel oil and 7 annealing furnaces using powdered coal. J. P. Kennedy, pres.

O., Alliance—Koch Bros., 436 East Main St., having plans prepared by Albrecht, Wilhelm & Kelly, archts., 1836 Euclid Ave., Cleveland, for 2 story, 91 x 113 ft., steel and brick garage, brick foundation. About $50,000.

O., Cincinnati—Amer. Diamolt Co., 419 Plum St., had plans prepared by G. Drach, archt., Union Trust Bldg., for 3 story, 53 x 55 ft. grain dryer, concrete, rein-con. flooring at Riverside. About $25,000. J. Fleischman, pres.

O., Cincinnati—H. Hake, archt., Telephone Bldg., completed preliminary sketches for large steel plant, to be located on a site now being negotiated for, near here. Buildings and furnaces will cover 15 to 20 acres and 400 additional acres will be needed for storage and railroad facilities. Cost about $15,000,000. Owners name withheld.

O., Cleveland—G. S. Rider & Co., archts., Century Bldg., soon let contract building 1 story, 30 x 240 ft., steel and brick addition to factory, brick foundation, on Locust Ave. and West 112th St., for Cleveland Heater Co., 1905 West 112th St. About $100,000.

O., Columbus—E. E. Pruitt, archt., 209 South High St., soon lets contract building 3 story, 62 x 120 ft., rein.-con. warehouse, on 5th & McKee Sts., for Whitsit Realty Co., 80 North Broad St. About $100,000.

O., Greenfield—J. A. Harps Mfg. Co., South 5th St., plans to build 1 story, 100 x 200 ft., brick and steel factory. About $60,000. J. A. Harps, pres. H. Hake, Telephone Bldg., Cincinnati, engr.

O., Hamilton—City election Feb. 10, to vote on $650,000 bonds to build electric light plant.

O., Lima—Union Tank Line Co. purchased 130 acre site adjoining Solar Refinery, here, and plans to build tank manufacturing plant, 25,000 tanks per year capacity. W. A. Barstow, pres.

O., Willoughby—Thor Tire & Rubber Co., 802 Society for Savings Bldg., Cleveland, plans to build 1 and 2 story, 82 x 180 ft., concrete, steel and brick factory and office, rein.-con. flooring, concrete foundation, on Main St., along tracks of New York Central R.R., here. About $150,000. Engineer's name withheld.

Ind., Gary—Sanitarium—See "Buildings."

Mich., Lansing—Novo Engine Co., 702 Porter St., plans to build 1 and 2 story, rein.-con., brick and steel foundry, rein.-con. flooring, concrete foundation, on Porter St. About $250,000. Architect not selected.

Ill., Calumet (Chicago P. O.)—Commonwealth Edison Co., 72 West Adams St., Chicago, having plans prepared by Marshall & Fox, archts., 721 North Michigan Ave., and Sargent & Lundy, engrs., 72 West Adams St., both of Chicago, for steel and stone power plant, bungalow type of construction, here. Cost between $10,000,000 and $12,000,000.

Ill., Chicago—Jackson Express & Van Co., 3611 West 22nd St., having plans prepared by G. S. Kingsley, archt., 109 North Dearborn St., for 6 story, 75 x 175 ft., rein.-con., brick and terra cotta warehouse, rein.-con. flooring, concrete foundation, on Madison St. and 60th Ave. About $150,000.

Industrial Works (Continued)

Ill., Chicago—P. Gerhardt, archt., 64 West Randolph St., soon lets contract constructing 1 and 2 story, 50 x 200 ft. steel, brick, tile and terra cotta, service and sales building, concrete foundation, on Sheridan Rd. at Irving Park Blvd., for H. Winston, 749 North Michigan Ave. About $100,000.

Wis., Milwaukee—J. E. and Erwin Uhlen, c/o Schlitz Brewing Co., 3rd St., having plans prepared by A. W. Hoffmann, archt. and engr., 410 Berlin Arcade, for 1 story, 50 x 150 ft., brick, concrete and steel factory, rein.-con. flooring, concrete foundation, on Port Washington Rd. About $50,000.

Minn., Mesaba—D. C. Jackling and Haydon & Stone, 25 Broad St., New York City, plan to build 10 concentration plants, at various points on Mesaba Iron Range; first plant to cost $3,000,000, total cost $30,000,000. D. E. Woodbridge and W. G. Swart, 808 Sellwood Bldg., Duluth, engrs.

Kan., Elgin—North Amer. Refining Co. plans to build oil refinery. About $350,000. Architect and engineer not selected.

Neb., Omaha—C. G. Powell, 2051 Farnam St., having plans prepared by G. L. Fisher, archt., 1604 City Natl. Bank Bldg., for 4 story, 45 x 132 ft. auto supply plant, brick and steel. Cost between $125,000 and $140,000.

Neb., Omaha—J. Latenser & Sons, archts., 632 Bee Bldg., soon let contract building 3 story, 126 x 136 ft. rein.-con. warehouse, rein.-con. flooring, concrete foundation, on 8th and Jackson Sts., for Trimble Bros., 11th and Howard Sts. About $200,000.

Tex., Goose Creek—Gulf Production Co. plans to build electric power plant, to include 2 large electric power stations and transmission systems, to furnish power to operate oil wells. Cost, including plant, power lines and motors, $500,000. Architect and engineer not selected.

Tex., Stephensville—Al—Texas Refining & Holding Co. plans to build oil refinery with 2,500 bbl. capacity, on 20 acre site outside city limits, along St. Louis & San Francisco R.R. About $400,000. Architect and engineer not selected.

Okla., Pawhuska—Osage Mutual Oil & Refining Co. plans to build oil refinery, with 1,500 bbl. daily capacity, on prairie along tracks of Midland Valley R.R. About $200,000. Architect and engineer not selected.

Wash., Vancouver — Rasmussen-Grace Co., archts., Bates Bldg., Portland, receives bids about Feb. 15, building 2 story, concrete, brick and tile storage plant, concrete foundation, for Columbia Dairy Products Co., Vancouver. About $75,000.

Ore., Oregon City—L. Hall & Son plan to build 1 story, 105 x 132 ft., concrete garage and service station, concrete foundation, on Main St. and Railroad Ave. About $50,000. Private plans.

Ore., Portland—Oregon Pipe Organ Co., Piedmont, having plans prepared by E. Bergholtz, archt., 807 Spalding Bldg., for 2 story, 75 x 100 ft., concrete and hollow tile factory, here. About $35,000.

Ore., Portland—Palmolive Co. plans to build 2 story copro mill, concrete and frame, concrete foundation, (100 tons daily capacity), to replace one recently destroyed by fire. About $50,000. C. A. Painton, mgr. Private plans.

Ore., Wasco—H. S. Wall has filed application with P. A. Cupper, state engr., Salem, for 500 second ft. water to be taken from John Day River near Early for development of 600 hp. power plant; will also construct canal 20 ft. wide, concrete headgate and install turbine water wheel. About $57,150.

Cal., Chino — Chino Walnut Growers Assn. plans to build packing house, concrete foundation. About $25,000. Architect not selected.

Cal., Fresno — Richter Bottling Wks., Mono St. and Bway., preparing plans for 2 story, 85 x 125 ft., rein.-con. addition to plant. About $75,000.

Ont., Galt—City having plans prepared by H. H. Angus, engr., 23 River St., Toronto, installing heating plant in hospital here. Bond for $30,000 voted for project.

BIDS DESIRED

Mass., Wakefield—Until March 15, by Lee & Hewett, archts. and engrs., 1123 Bway., New York City, building 3 story, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, here, for Heywood Bros. & Wakefield Co., Gardner. About $150,000.

ROADWORK—NEW JERSEY

Bids were received by State Highway Commission, Trenton, for constructing State Highway Route 4, Sect. 3, Broadway to Scott Ave., Perth Amboy, from (A) Louis J. Sciling, 211 Broad St., Red Bank; (B) R. Sangiovanni, 78 Hoyt St., Newark; (C) T. H. Riddle, 102 Church St., (D) New Brunswick; East Jersey Bridge Co., Perth Amboy, $84,453; (E) C. H. Winans, Elizabeth, $89,249; (F) Utility Constr. Co., New Brunswick, $93,264, (G) O. G. Julian Eng. & Constr. Co., 20 Nassau St., New York City, $96,752. The unit bids of the lowest bidders were as follows:

	A	B	C
11,058 cu.yd. excavation	$1 60	$1.18	$1.66
100 cu.yd. stone	2.00	3.65	4.00
9,702 sq.yd. concrete pavement	2 50	3.15	2.80
4,000 lb. reinforcing rods	.08	.11	.12
18,670 sq.yd. macadam shoulders	1.00	1.45	1.00
18,670 sq.yd. bituminous macadam	1 00	85	1 00
1,345 lin.ft. curbs and gutters	1 40	1 75	1 50
730 lin. ft. paved gutters	1 00	2.00	1.00
895 sq.yd. concrete surface	1 56	3 26	2.40
1,752 ft. pipe, 6-in. diameter	1.30	1.15	1.50
2,676 ft. pipe, 8-in. diameter	1 40	1 20	1 60
856 ft. pipe, 10-in. diameter	1.50	1.45	1 75
205 ft. pipe, 12-in. diameter	1 60	1.55	1 85
28 ft. 12-in. concrete drain	3.00	2.56	3.00
224 ft. 15-in. concrete drain	3.30	2 87	3 50
100 ft. 20-in. concrete drain	4 50	3 75	5 25
72 ft. 18-in. concrete drain.	3 50	3.45	4.15
20 ft. 24-in. concrete drain	4.00	6 00	6.00
662 ft. relaying pipe, 18-24 in.	1.25	1.45	1.75
7 basins	80.00	135.00	125.00
2 inlets	.90	1.35	1.25
580 cu yd. sidewalks	20.00	19.00	25.00
375 ft. guard rails	2.00	2 75	2.50
275 ft. timber	.60	1.15	1.75
Total.	$73,481	$78,246	$83,832

N. Y., Long Island City—Until Jan. 31, by Queens Tool & Die Co., 136 West Ave., building 2 story, 48 x 50 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on 5th and Washington Aves. About $40,000. W. Sposser, 211 12th Ave., archt. and engr.

N. Y., Syracuse—Until Jan. 31, by Syracuse Washing Machine Co., Main St., building 4 story, 200 x 250 ft., factory and 80 x 100 ft. moving picture auditorium, rein-con. and steel, rein-con. flooring, rock foundation. About $1,000,000. Private plans.

Pa., Kingston (Wilkes-Barre P. O.)—Until Feb. 10, by Crane Silk Co., 416 West Elm St., building 2 story, 50 x 125 ft., concrete, brick and steel mill, rein-.con. flooring, rock foundation, on Rutter Ave. About $75,000. G. S. Welch, Coal Exch. Bldg., Wilkes-Barre, archt.

Pa., Scranton—Until Feb. 20, by Scranton Dress Co., South Webster Ave., building 3 story, 100 x 125 ft., brick and steel factory, rein.-con. flooring, rock foundation, on South Webster Ave. and Hickory St. About $150,000. Private plans. F. W. Borgenicht, pres.

Pa., Wilkes-Barre—Until Feb. 27, by H. A. Maier, archt., Coal Exch. Bldg., constructing 3 story, 40 x 100 ft., brick and steel warehouse, rock foundation, at 75 South Pennsylvania Ave. About $50,000. Owner's name withheld.

Pa., Wilkes-Barre—Until Feb. 24, by G. S. Welch, archt., Coal Exch. Bldg., constructing 3 story, 200 x 225 ft., rein-con. mill, rein.-con. flooring, rock foundation, on Pennsylvania Ave., for Suplan Silk Corp. About $500,000.

Ill., Chicago—Schmidt, Garden & Martin, archts., 104 South Michigan Ave., receiving bids building 2 story, 50 x 250 ft., rein.-con. and brick addition to plant, rein.-con. flooring, concrete foundation, for Chicago Solder Co., 218 North Union Ave. About $100,000.

Wis., Milwaukee—Pelton Steel Co., 672 Kinnickinnic Ave., receiving bids building 1 story, 60 x 100 ft., brick and steel addition to foundry, concrete foundation. About $35,000. Judell & Bogner, 1st Wisconsin Natl. Bank Bldg., archts. and engrs.

Ore., Hillsboro—E. E. McClaren, archt., Lumber Exch. Bldg., Portland, receiving bids building 2 story, 86 x 370 ft. cannery, hollow tile, here, for Ray & Son, Sherlock Bldg., Portland. About $60,000. Noted Jan. 22.

Sask., Estevan—Until March 6, by Lignite Utilization Bd., 2 Youville Sq., Montreal, furnishing material and labor for constructing group of industrial buildings, including 29 x 50 ft. office and laboratory, 16 x 44 ft. car house, 15 x 20 ft. crusher building, two raw lignite bins, 40 ft. high x 25 ft. diam., 40 x 84 ft. dryer building, 55 x 84 ft. carbonizer building, 42 x 55 ft. briquette building, 16 x 80 ft. briquette bin, 48 x 100 ft. power house, and 15 x 42 ft. and 15 x 60 ft. coal sheds, also building concrete reservoir, water tank on 70 ft. steel tower. R. A. Ross, chn.; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★ Indicates award of contract)

★Me., Portland—U. A. Towle, 623 Forest Ave., let contract building 1 story, 110 x 110 ft., brick and timber garage, concrete flooring and foundation, to Brown & Berry, 501 Press Bldg. About $35,000.

★Mass., Allston (Boston P. O.)—C. G. Hewes Leather Co., Boston, let contract building 3 story, 90 x 180 ft., brick and stone storehouse, concrete foundation, on Braintree St., to R. H. Marston Co., 185 Devonshire St., Boston.

★Mass., Boston—H. L. Hildreth Co., 67 Batterymarch St., let contract building 2 story, 85 x 180 ft., brick addition to factory, concrete foundation, on Albany St., to McDonald Constr. Co., 44 Bromfield St. About $60,000.

★Mass., Fall River—Amer. Thread Co., Kerr St., let contract building 5 story, 100 x 275 ft., rein.-con. addition to mill, rein.-con. flooring, to Aberthaw Constr. Co., 27 School St., Boston. About $700,000.

★Mass., Fall River—Chase Mills, Rodman St., let contract building 1 story, 51 x 100 ft. addition to picker plant, to Beattie & Cornell, 33 North Quarry St. About $30,000.

★Mass., Salem—Park Bros. Co., 190 Bridge St., let contract building 3 story, 50 x 140 ft., frame addition to plant, concrete foundation, to Pitman & Brown Co., Washington St. About $35,000.

★Mass., Worcester—Curtis & Marble Machine Co., 72 Cambridge St., let contract building 3 story, 75 x 85 ft., brick and steel addition to plant, concrete foundation, to E. F. Miner Bldg. Co., 25 Foster St. About $45,000. Noted Jan. 15.

★R. I., Providence—Swiss Cleansing Co., Elmwood Ave., let contract constructing 2 story, 40 x 70 ft., brick addition to plant and 1 story, 40 x 80 ft. shipping building, concrete flooring and foundation, to Williams & Merchant, Inc., 86 Weybosset St. About $25,000.

★Conn., Westport—Dolge Chemical Co., let contract building 1 story, rein.-con. and steel plant, rein.-con. flooring, concrete foundation, to Barney-Ahlers, 110 West 40th St., New York City. About $40,000.

★N. Y., Albany—Witherbee, Sherman & Co., 2 Rector St., New York City, will build 1 story, fertilizer plant, rein.-con. and steel, rein.-con. flooring, concrete foundation, at Westerlo Isle. About $1,000,000. Work will be done by day labor. Noted Sept. 25.

★N. Y., Brooklyn—Levine Realty & Mortgage Corp., 215 Montague St., will build 1 story, 100 x 125 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on St. Marks and Classon Aves. About $35,000. Work will be done by day labor.

Industrial Works (Continued)

★**N. Y., Brooklyn**—B. M. Maltz, c/o B. W. Dorfman, archt., 26 Court St., will build 5 story, brick and steel factory, rein.-con. flooring, concrete foundation, on Grand Ave. and Dean St. About $200,000. Work will be done by day labor.

★**N. Y., Brooklyn**—T. F. Martin, 16 Court St., will build 1 story, 100 x 150 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Malbone St. near Bedford Ave. About $40,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Merhinger Sheet Metal Wks., 315 East 97th St., New York City, let contract building 1 story, 125 x 150 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Flushing and Wyckoff Aves., here, to P. Guthy, 956 Bway. About $55,000.

★**N. Y., Brooklyn**—Skalberg Realty Co., 714 Bway., will build 2 story, 100 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Bedford and Park Aves. About $25,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Wallace & Co., Washington Ave., let contract building 6 story, 60 x 100 ft., rein.-con. factory, on Washington and Park Aves., to Turner Constr. Co., 244 Madison Ave., New York City. About $125,000.

★**N. Y., Long Island City**—G. W. Anderson, 221 West 17th St., New York City, let contract building 2 story, 75 x 100 ft. brick and steel factory, rein.-con. flooring, concrete foundation, on Washington St. and 9th Ave., here, to Gabler Constr. Co., 402 Hudson St., New York City. About $60,000.

★**N. Y., New York**—Marcus & Goldstein, Inc., 175 East 96th St., will build 1 story, 100 x 151 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 159 East 119th St. About $50,000. Work will be done by day labor.

★**N. Y., New York**—E. J. Nathan, Jr., 128 Bway., let contract constructing 2 story, 77 x 106 ft., brick and steel factory and store building, rein-con. flooring, concrete foundation, on 7th Ave. and 27th St., to G. R. Davis & Co., 30 East 42nd St. About $850,000.

★**N. Y., New York**—Regulus Realty Co., Inc., 3295 Bway., will build 1 story, 99 x 200 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 158th St. along tracks of New York Central R.R. About $60,000. Work will be done by day labor.

★**N. Y., New York**—L. Schurmacher, 1128 Bway., will build 2 story, 75 x 130 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 1st Ave. About $25,000. Work will be done by day labor.

★**N. Y., New York**—Summit Holding Corp., Inc., 295 Alexander Ave., will build 1 story, 100 x 125 ft., brick and steel garage, rein-con. flooring, concrete foundation, on 137th St. and Lincoln Ave. About $25,000. Work will be done by day labor.

★**N. Y., Poughkeepsie**—DeLaval Separator Co., foot of Pine St., let contract constructing 1 story, 150 x 150 ft. brick and steel power machine building, rein.-con. flooring, to J. W. Ferguson Co., United Bank Bldg., Paterson, N. J.

★**N. Y., Sag Harbor**—Sahy Watch Co., let contract building 4 story, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, to Barney Ahlers, 110 West 40th St., New York City. About $50,000.

★**N. Y., Syracuse**—Tompkins Bros. Co., 583 South Clinton St., let contract building 1 story, 72 x 288 ft. mill construction factory with 40 x 120 ft. wing, at 619 Oneida St., to Owego Bridge Co., University Blvd. About $35,000.

★**N. Y., Utica**—Utica Cutlery Co., 820 Hickory St., let contract building 3 story, 55 x 200 ft., rein.-con. addition to factory, to Griffith & Pierce, 618 Charlotte St. About $125,000.

★**N. J., Milford**—Warren Mfg. Co. let contract constructing 1 story, 47 x 163 ft., brick addition to plant, also 40 x 150 ft. storage and 68 x 236 ft. machine buildings, both 1 story, brick and concrete, concrete flooring, to J. W. Ferguson Co., United Bank Bldg., Paterson.

★**N. J., Passaic**—Passaic Cotton Mills, Brighton Ave., let contract building 1 story, 100 x 700 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, to F. T. Ley, 19 West 44th St., New York City. About $750,000.

★**N. J., Trenton**—A. V. Mannings Sons, 20 South Broad St., let contract building 8 story, 47 x 90 ft., concrete and steel storage house, on Bank St., to Burton & Burton, Mechanics Bldg. About $80,000.

★**N. J., Trenton**—Princeton Worsted Co., 115 Fair St., let contract building 2 story, 60 x 125 ft., brick and steel addition to factory, to T. D. Priory, 196 Pennington St. About $35,000.

★**Pa., Forty Fort** (Kingston P. O.)—Passaic Silk Co. let contract building 1 story, 137 x 137 ft., brick and steel mill, rein.-con. flooring, rock foundation, on Simpson and Durkee Sts., to O. J. Behren & Sons, Blackman St., Wilkes-Barre. About $37,800.

★**Pa., Parsons** (Wilkes-Barre P. O.)—Leon-Ferenbach Silk Co. let contract building 2 story, 50 x 112 ft., slow burning mill construction addition to plant, also 20 x 40 ft. silk vault, to J. W. Ferguson, United Bank Bldg., Paterson, N. J.

★**Pa., Phila.**—Quaker City Motor Parts Co., Tioga and Richmond Sts., will build 1 and 2 story, 27 x 122 ft. and 46 x 58 ft., brick and steel garage, at 2512 North Broad St. About $25,000. Work will be done by day labor.

★**Pa., Pittsburgh**—W. B. McLean Mfg. Co., 729 Herron Ave., let contract building 2 story, 32 x 93 ft., brick factory, to J. H. Fullman Co., East End Trust Bldg. About $25,000.

★**Pa., Pittsburgh**—Pittsburgh Valve Constr. Co., 26th St., let contract building 1½ story, 27 x 84 ft., brick and concrete factory, on 26th St., to G. Stuart, Oliver Bldg. About $70,100.

★**Md., Baltimore**—Lion Bros., 35-37 South Poppleton St., let contract building 2 story, 58 x 80 ft., concrete and brick factory, concrete foundation, on Poppleton and Hollins Sts., to Price Constr. Co., 210 Maryland Trust Bldg. About $50,000; cost plus percentage basis.

★**Va., Richmond**—Laburnum Corp., 10th and Main Sts., let contract building 2 story, 65 x 139 ft., steel and brick garage, rein.-con. flooring, concrete foundation, on West Broad St., to J. T. Wilson, Mutual Bldg. Cost to exceed $50,000; cost plus percentage basis.

★**Va., Richmond**—Simmonds Co. let contract building 2 story, 100 x 160 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on 4th and Hull Sts., to E. L. Bass & Bros., 708 Bainbridge St. About $90,000; cost plus percentage basis.

★**N. C., Charlotte**—Elizabeth Milling Co., Realty Bldg., let contract building brick addition to flour mill, to J. A. Jones, Realty Bldg. About $125,000.

★**N. C., Winston-Salem** — P. H. Hanes Knitting Co. let contract building 6 story, 85 x 210 ft. cotton mill, rein.-con., to Southern Ferro Concrete Constr. Co., Winston-Salem. About $225,000.

★**O., Cincinnati**—Baldwin Piano Co., Gilbert Ave., let contract building 7 story, 84 x 370 ft., fireproof factory, to Ferro Constr. Co., Richmond and Harriet Sts. About $1,000,000.

★**O., Cincinnati**—Collins Ice Cream Co., 2911 Woodburn Ave., let contract building factory, on Elismore Ave., to Concrete Block Co., Cincinnati. About $75,000.

★**O., Cleveland**—Amer. Stove Co., 4700 Perkins Ave., let contract constructing 4 story, 55 x 124 ft., steel and brick warehouse and office building, brick foundation, at 4415 Perkins Ave., to Boldt Constr. Co., 6110 Euclid Ave. About $100,000.

★**O., Cleveland**—Astrup Awning Mfg. Co., 2937 West 25th St., let contract building 1 story, 50 x 100 ft., steel and brick garage, brick foundation, to Natl. Concrete Fireproofing Co., 1315 Citizens Bldg. About $50,000.

★**O., Cleveland**—W. S. Ferguson Co., engrs., 1900 Euclid Ave., let contract to G. A. Rutherford Co., 2797 Prospect Ave., building 1 story, 111 x 202 ft., steel and brick factory, brick foundation, on East 92nd St. and Union Ave., for Draper Mfg. Co., 3603 East 82nd St. About $75,000. Noted Jan. 8.

★**O., Cleveland**—Forest City Machine & Forge Co., 5101 Lakeside Ave., let contract building 1 story, 70 x 100 ft., steel and brick factory, brick foundation, to Serv. Constr Co., 6110 Euclid Ave. About $25,000.

★**O., Cleveland**—E. McGeorge, archt., 1900 Euclid Bldg., let contract to S. W. Emerson Co., 1900 Euclid Ave., constructing one 120 x 160 ft. and one 180 x 240 ft. factory buildings, both 3 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 79th St. and Woodland Ave., for Van Dorn Wks., 2685 East 79th St. About $600,000.

★**O., Lorain**—Thew Automatic Shovel Co. let steel contract for two 1 story, 75 x 200 ft., steel and brick shops, brick foundations, to Pittsburgh-Des Moines Bridge Co., Des Moines, Ia. About $150,000.

★**O., St. Bernard**—Jarecki Chemical Co. let contract building 2 story, 150 x 500 ft. factory, to Austin Constr. Co., 16112 Euclid Ave., Cleveland. About $500,000.

★**Ind., Indianapolis**—Advance Rumely Co., Capitol Ave. and Georgia St., let general contract building 2 story, 100 x 200 ft. brick warehouse, to C. J. Wacker, 627-8 Law Bldg., electrical work to Hatfield Electric Co., 102 South Meridian St. About $55,000.

★**Ind., Indianapolis**—C. Fairbanks, Terre Haute, let contract building 1 story, 60 x 75 ft., brick and steel factory, on Division St., here, to W. P. Jungclaus Co., 825 Massachusetts Ave. About $30,000.

★**Mich., Detroit**—Office, etc.—See "Buildings."

★**Mich., Detroit**—Amer. Electrical Heater Co., Woodward and Burroughs Sts., let contract building 23 x 32 ft., brick and concrete assembling room and 1 story, 60 x 417 ft., brick and steel addition to factory and boiler house, rein-con. flooring, concrete foundation, on Commercial and Dequindre Sts., to C. Keller, 210 Moran St. About $35,000.

★**Mich., Detroit**—Detroit Baking Co., 4th St., will alter and build 3 story, 60 x 90 ft., brick and steel addition to plant. About $50,000. Work will be done by day labor under supervision of H. H. Lane, engr., 2320 Dime Bank Bldg.

★**Mich., Detroit**—M. J. Schneider, 601 Dix Ave., let contract building 1 story, 50 x 130 ft., rein.-con., brick and steel service station and garage, rein.-con. flooring, concrete foundation, on Dix Ave., to D. Spicer, 420 Free Press Bldg. About $25,000. Noted Jan. 1.

★**Mich., Yale**—Yale Woolen Mills Co. will build 3 story, 60 x 300 ft., brick and steel mill, brick foundation. About $100,000. Work will be done by day labor under supervision of H. H. Lane, 2320 Dime Bank Bldg., Detroit, engr. Noted Jan. 8.

★**Ill., Chicago**—B. P. Miller, 10855 South Michigan Ave., let contract constructing 2 story, 105 x 128 ft., service and sales building, brick, concrete foundation, on Michigan Ave. and 109th St., to Van Etten Bros., 143 East 111th St. About $75,000.

★**Wis., Racine** — Amer. Skein & Fdry. Co., Lakeside, let contract building 1 story, 100 x 230 ft., brick and steel foundry, concrete foundation, to Nelson & Co., Robinson Blk. About $40,000.

★**Wis., West Allis**—Milwaukee Stamping Co., 64th and Pollen Aves., let contract building 3 story, 80 x 140 ft., brick and concrete factory, rein.-con. flooring, concrete foundation, to W. F. Tubesing Co., 139 Chestnut St., Wauwatosa. About $50,000.

★**Ia., Des Moines**—Hawkeye Tire & Rubber Co., 215 East 3rd St., let contract building 3 story, 80 x 280 ft., brick, concrete and steel factory, rein.-con. flooring, concrete foundation, to J. M. Benson, 422 V. N. B. Bldg. About $300,000.

★**Ia., Newton**—Matag Co., let contract building 4 story, 80 x 300 ft., brick and concrete factory, rein.-con. flooring, concrete foundation, to A. H. Neumann & Co., 519 Hubbell Bldg., Des Moines. About $250,000.

★**Minn., Minneapolis**—Magney & Tusler, archts., Builders Exch., let contract to P. A. Swenson, 547 Laurel Ave., St. Paul, building 4 story, 100 x 140 ft., rein.-con. and brick factory, on 5th St., here, for Schurmeier Mfg. Co., 320 East 9th St., St. Paul. About $150,000. Noted Jan. 15.

★**Mo., St. Louis**—Garrett & Co., Inc., 882 3rd Ave., Brooklyn, N. Y., let contract building 2 story, 120 x 380 ft., rein.-con. and brick factory, rein.-con. flooring, rock foundation, on Union and Brown Sts., here, to Fruin Colnon Constr. Co., Merchants Laclede Bldg. About $700,000.

★**B. C., Vancouver**—See "Miscellaneous."

★**B. C., Vancouver**—Britannia Wire Rope Co., c/o Gibsons Ltd., 101 Water St., let contract building 1 story, 120 x 200 ft factory, on Industrial Island, to Dominion Constr. Co. Ltd., 509 Richard St. About $10,000.

Buildings

PROPOSED WORK

Me., Portland—Theatre—A. W. Pease, archt., Fidelity Bldg., soon lets contract building 2½ story, brick and steel, concrete foundation, here, for Maine Theatres, Inc., Central Blk., Rockland. About $150,000.

Mass., Boston—Office—Desmond & Lord, archts., 15 Beacon St., receive bids about Feb. 20, building 8 story, 95 x 125 ft., concrete, concrete foundation, on Arlington St., for Massachusetts Bonding & Insurance Co., 77 State St. Noted Jan. 15.

Mass., Fall River—Parish—St. Mark's Episcopal Church, having plans prepared by C. C. Coveny, archt., 184 Boylston St., Boston, and receives bids in spring building 2 story, terra cotta and stucco. About $50,000.

Mass., Lynn—Club—City plans to build clubhouse. About $300,000. Architect not selected. W. H. Creamer, mayor.

Mass., New Bedford—Business—I. Sher, 98 Hillman St., plans to build 3 or 4 story, brick, and rein.-con. on Acushnet Ave. About $75,000.

Mass., Northampton—Church—Methodist Church Society, 18 Franklin St., plans to build 1 story church. Cost between $50,000 and $75,000. M. E. Choate, pastor. Architect not selected.

Mass., North Beverly (Beverly P. O.)—School—Bd. Educ., Beverly, plans to build school on Conant St., here. About $150,000. Architect not selected.

Mass., Palmer — Parochial School — St. Peter and Paul Society, Three Rivers, plans to build 6 room parochial school and assembly hall, at Four Corners. About $75,000. A. S. Krzywda, pastor. Architect not selected.

Mass., Quincy—Hall—City plans to build 1 story, brick, concrete and steel memorial hall. About $150,000. Architect not selected.

Mass., Quincy—High School—Bd. Educ. having plans prepared by J. E. McLaughlin, archt., 88 Tremont St., Boston, for 3 story, brick, concrete and steel addition, on Hancock St.

Mass., Shelburne Falls — School—Shelburne Twp. plans to build 2 story, on Ashley St., here. About $50,000. J. D. Harvey, chn. Architect not selected.

Mass., South Deerfield — Church — St. James Roman Catholic Church, North Main St., having plans prepared by J. W. Donohue, archt., 476 Main St., Springfield, for altering present church. About $50,000. P. H. Gallen, pastor.

Mass., Springfield—Bank and Office—Chicopee Natl. Bank, 480 Main St., plans to build brick and concrete. About $500,000. Architect not selected.

Mass., Springfield — Business — W. R. Welser, 700 State St., plans to construct business building on Dwight and Bridge Sts. About $200,000. Architect not selected.

Mass., Springfield — School —Bd. Educ. having plans prepared by R. B. Warner, archt., 168 Bridge St., for 2 story, brick and steel vocational school, on Spring St. About $200,000.

Mass., Wakefield—Office—Lee & Hewett, archts. and engrs., 1123 Bway., New York City, receive bids about March 15, building 2 story, 60 x 80 ft., brick, limestone and steel, concrete foundation, here, for Heywood Bros. and Wakefield Co., Gardner.

Mass., Wakefield — High School — Town having plans prepared by F. I. Cooper Corp., archts., 33 Cornhill St., Boston, for 3 story, 210 x 250 ft., brick and steel, concrete flooring and foundation, on Main St. About $450,000.

Mass., West Springfield (Springfield P. O.)—Parochial School—St. Louis Roman Catholic Society, 61 Main St., plans to build 2 story, brick and steel. About $75,000. A. Brault, pastor. Architect not selected.

Mass., Weymouth (Boston P. O.)—Memorial Hall — War Memorial Comn. having plans prepared by H. F. Kellogg, archt., 93 Federal St., Boston, for brick and steel. About $125,000.

Mass., Winthrop (Boston P. O.)—Memorial, etc.—Town plans campaign to raise $100,000 to construct memorial building, to include clubrooms, assembly hall, etc. Newhall & Blevins, 9 Park St., Boston, archts.

Mass., Winthrop (Boston P. O.)—School—Town plans to build school on Almont St., to replace one recently destroyed by fire. F. A. Douglas, supt. of schools. Architect not selected.

R. I., Elmwood (Providence P. O.)—Recreation — Gorham Mfg. Co., Reservoir Ave., Providence, plans to build 2 story, here. About $200,000. Private plans.

R. I., North Smithfield (Woonsocket P. O.)—Housing—Jenks & Ballou, archts., 1035 Grosvenor Bldg., Providence, soon receive bids building ten 2 story, 24 x 38 ft., houses for workmen, timber, rock and concrete foundation, here, for Andrews Mills Co., Branch Village. About $50,000.

Conn., Hartford — Hospital — Hartford Hospital, 20 Hudson St., plans to construct additions to hospital group. About $500,000. Architect not selected.

Conn., New Britain—Hotel—Chamber of Commerce, c/o H. H. Pease, appointed committee to purchase site and vote on preliminary drawings for brick and limestone hotel. About $400,000.

Conn., New Haven — Educational — Yale University having plans prepared by Delano & Aldrich, archts., 126 East 38th St., New York City, constructing educational building, on campus. About $300,000.

Conn., Norwich—Theatre—H. S. Goldfaden and G. Greenberger plan to build 3 story theatre on Bway. About $150,000.

Conn., South Manchester—Office—M. Gormain, Main St., plans to build 2 story, 30 x 100 ft., brick, concrete foundation. About $55,000. A. E. Fiske, Johnson Bldg., archt.

Conn., Stamford—Club—F. Urso, archt., 453 West Main St., soon lets contract building 2 story, 60 x 110 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation, on South St., for Italian Social Institute, Inc., 76 South St. About $100,000.

N. Y., Albany—Hotel—J. D. Keeler, c/o Warren & Wetmore, achts. and engrs., 10 East 47th St., New York City, having plans prepared for 14 story, brick, steel and stone, concrete foundation, on Bway, and Maiden Lane.

N. Y., Brooklyn—Hospital—Kings Co. Hospital, Clarkson St., having sketches made by Helmle & Corbett, archts. and engrs., 189 Montague St., for altering and building brick, steel and stone addition to hospital. About $3,000,000.

N. Y., Brooklyn—Office and Salesroom—Studebaker Corp., Main and Bronson St., South Bend, Ind., having plans prepared by Tooker & Marsh, archts. and engrs., 101 Park Ave., New York City, for 4 story, brick and steel, rein.-con. flooring, on Bedford Ave. and Sterling Pl., here. About $150,000.

N. Y., Brooklyn—Synagogue—McCarthy & Kelly, archts. and engrs., 16 Court St., receives bids about Feb. 10, building 1 story, brick and steel synagogue, brick foundation, at 1607 Ave. R, for Temple Shaari Torah, c/o architects. About $175,000.

N. Y., Glens Falls—Hospital—Trustees Warren Co., (Lake George) having plans prepared by Tooker & Marsh, archts. and engrs., 101 Park Ave., New York City, for 2 story, brick and steel, brick foundation, near here. About $125,000.

N. Y., New York—Office—Clinton & Russell, archts. and engrs., 32 Liberty St., preparing sketches for 108 x 115 ft., brick, steel and stone, concrete foundation. on 38th and 39th Sts., near 5th Ave. About $2,225,000. Owner's name withheld.

N. Y., New York—Office—C. P. H. Gilbert, archt. and engr., 1123 Bway., preparing sketches for 30 story, brick, steel and stone, brick foundation. Owners name withheld.

N. Y., New York—Offices—State Bank, 376 Grand St., having plans prepared by H. R. Mainzer archt. and engr., 105 West 40th St., for altering 10 story, brick and steel, at 280 5th Ave. About $50,000.

N. Y., Rochester — Theatre — Regorson Corp., 65 East Ave., plans to build rein.-con. theatre, 4,000 seating capacity, at 108-110 Clinton Ave. S. Cost between $200,000 and $250,000. G. E. Simpson, pres.

N. Y., Rochester—Theatre and Office—G. E. Simpson, 41 Darwin St., plans to construct brick office and theatre building (4,000 seating capacity), to include roof garden and restaurant, on Clinton Ave., S. About $1,000,000. Architect and engineer not selected.

N. Y., Schenectady—Office—General Electric Co., River Rd., having plans prepared by Harris & Richards, archts., Drexel Bldg., Phila., for 6 story, 50 x 200 ft., brick and concrete, here. About $300,000.

N. J., Bayonne—Club—Knights of Columbus, Star of Sea Council, c/o G. A. McCabe, engr. and archt., 96 5th Ave., New York City, having sketches prepared for brick, steel and stone, brick foundation, on Ave C. About $250,000. Noted May 8.

N. J., Deal Beach—Hotel—H. I. Cobb, engr. and archt., 1465 Bway., New York City, preparing sketches for 6 story, brick, steel and stone, brick foundation, on Deal Lake. About $1,000,000. Owners name withheld.

N. J., Kaighns Point (Camden P. O.)—Ferry House—Phila. & Reading Ry., 12th and Market Sts., Phila., plans to build brick and concrete ferry house, here, to replace one destroyed by fire. About $1,000,000. A. Herald, 502 Phila. & Reading R.R. Bldg., Phila., archt.

N. J., Newark—Theatre—Loews Enterprises, 1492 Bway., New York City, plans to build brick and steel, (3,000 seating capacity), brick foundation, on Broad St. About $400,000. Architect not selected.

N. J., Passaic—Y. M. C. A., 2 West 45th St., New York City, having sketches prepared by J. F. Jackson, engr. and archt., 47 West 34th St. New York City, for brick and steel building, here. About $250,000.

N. J., Tenafly—Bank—First Natl. Bank of Tenafly, Washington St., having plans prepared by Holmes & Winslow, engrs. and archts., 110 West 40th St., New York City, for 1 story, 100 x 100 ft., brick, steel, marble and stone, brick foundation. About $50,000.

Pa., Allentown — Church — Immanuel Evangelical Congregation plans to build 1½ story, 50 x 100 ft., brick, steel and limestone, tile flooring, rock foundation, on Main St. About $100,000. Architect not selected.

Pa., Altoona — Schools — Logan Twp. School Dist. election Feb. 20 to vote on $75,000 bonds to build two 2 story, brick schools in Greenwood and South Lakemont, Blair Co. J. M. Edwards, 203 Duncansville Ave., Llyswen (Altoona), secy.

Pa., Chester—Church—A. W. Brazer, 1133 Bway., New York City, and Frohn & Robb, Chester, archts., receive bids about May 1, building brick, steel and stone, brick foundation, here, for 1st Presbyterian Church. About $125,000.

Pa., Chester—Church—C. W. Brazer, engr. and archt., 1133 Bway., New York City receives bids about May 1, building brick, steel and stone, brick foundation, on 8th and Butler Sts., for Trinity Methodist Episcopal Church. About $100,000.

Pa., Harrisburg — Courthouse — Comrs. Dauphin Co. having plans prepared by C. H. Lloyd, archt., Telegraph Bldg., changing front of present building, also constructing new one, 6 story, structural steel, brick and stone, on Court St.

Pa., Harrisburg—Offices—State plans to build two 4 story, brick, steel, rein.-con. and stone, concrete foundation, on State Capitol grounds. About $3,000,000. A. W. Brunner, 101 Park Ave., New York City, engr. and archt.

Pa., Luzerne (Wilkes-Barre P. O.)—Memorial—City plans to build 3 story, 60 x 75 ft., brick and steel, rein.-con. flooring, rock foundation, on Main St. About $90,000. Architect not selected.

Pa., Media—Office and Bank—C. W. Brazer, engr. and archt., 1133 Bway., New York City, receives bids about May 1, building brick, steel and stone, brick foundation, here, for Media Title & Trust Co., 11 South St. About $300,000. Noted Jan. 8.

Pa., Phila.—Hospital—Chestnut Hill Hospital, 8815 Germantown Ave., having

Buildings (Continued)

plans prepared by J. P. Simms, archt., 1627 Sansom St., for hospital, (250 bed), on Chestnut Hill. Cost to exceed, $100,000.

Pa., Phila.—Sales and Service—C. Kahn, Morris Bldg., soon lets contract altering 2 story, 25 x 150 ft., brick and stone, at 1419 North Broad St. About $50,000. L. B. Rothchild, 1225 Sansom St., archt.

Pa., Phila.—Sales and service—L. J. Kolb, 901 North Broad St., having plans prepared by H. B. Weldon, archt., Fuller Bldg., for 1 and 2 story, 40 x 160 ft. and 25 x 160 ft., concrete and brick. Cost to exceed $50,000.

Pa., Phila.—Store—Hardwich & Magee, 1220 Market St., having plans prepared by Ballinger & Perrot, archts., 17th and Arch Sts., for alterations to brick and steel. Cost to exceed $50,000.

Pa., Pittsburgh—Bank and office—Mellon Natl. Bank, 514 Smithfield St., having plans prepared by Trowbridge & Livingston, engrs. and archts., 527 5th Ave., New York City, for 4 story, 120 x 130 ft., brick, stone and steel, brick foundation, on Smithfield St. between 5th Ave. and Oliver St.

Pa., Pittsburgh—University—University of Pittsburgh, Bigelow and Parkman Sts., plans to build 3 story, 52 x 300 ft. addition. About $250,000. B. Jannsen, Century Bldg., archt.

Pa., Pittston—Hall—Knights of Columbus, Council 372, plans to build 3 story, 40 x 50 ft., brick and steel, rein.-con. flooring, on Charles St. About $70,000. Architect not selected.

Pa., Scranton — Synagogue — Ahavath Sholem Congregation, Providence, Pa., plans to build 1½ story, 50 x 100 ft., brick, limestone and marble, tile flooring, rock foundation, on North Main Ave., here. About $100,000. Architect not selected.

Pa., Wilkes-Barre—Armory—State and Luzerne Co. having plans prepared by T. H. Atherton, archt., Coal Exch. Bldg., constructing 4 story, 90 x 100 ft., brick, steel and stone, rock foundation, on Market St., along Susquehanna River. About $350,000.

Pa., Williamsport—Bank—Susquehanna Trust & Deposit Co., 118 West 4th St., plans to build 2 story, 80 x 140 ft., stone, brick and concrete, on Arch and West 3rd Sts. About $50,000. A. E. Eschenbach, secy. Architect not selected.

Md., Baltimore — Bank — Merchants-Mechanics 1st Natl. Bank, South and Water Sts., plans to build 2 story, 48 x 100 ft., granite addition. J. B. Ramsey, pres. Parker, Thomas & Rice, 1109 Union Trust Bldg., archts.

Md., Baltimore—Church and Parsenage—Patterson Memorial Methodist Episcopal Church having plans prepared by W. H. Emory, Jr., archt., 615 Munsey Bldg., for 2 story, brick, concrete and stone foundation, on Hanover and Clement Sts. About 100,000. L. Allen, 1407 Hanover St., pastor.

Md., Baltimore—Hotel—H. Nickel, c/o Folly Theatre, Baltimore St. and Fallsway, having plans prepared by J. Freund, archt., 1307 St. Paul St., for 5 story, 50 x 120 ft., steel and brick, concrete foundation, on Baltimore and Front St. About $150,000.

Va., Norfolk—Synagogue—Beth El Congregation, c/o Herts & Robinson, archts. and engrs., 331 Madison Ave., New York City, having plans prepared for brick, steel and stone, brick foundation, here. About $250,000.

Va., Petersburg—Church and Sunday School—Market St. Methodist Church plans to build 1 story church and Sunday School, on Market Street. About $200,000. G. C. Wright, Washington St., chairman Bldg. Com. Architect not selected.

Va., Richmond — Church and Sunday School—St. John's Lutheran Church, 8th and Marshall Sts., having plans prepared by M. E. Ruehrmund, archt. and engr., Allison Bldg., for 1 story, on Lumbardy and Monument Sts. About $200,000.

Va., Roanoke—School—H. C. Richards, archt., 1713 Sansom St., Phila., receives bids about Feb. 1, building 3 story, brick, 29 rooms, for Bd. Educ. About $175,000.

W. Va., Huntington—Schools—Bd. Educ. retained Meanor & Handloser, archts., Huntington, to prepare plans for South Junior High School; R. M. Bates, archt., 1st Natl. Bank Bldg., for 12 room addition to Simms School and W. F. Diehl, archt., R and P Bldg., for 8 room addition to Miller School. Above schools to be built under $405,000 bond issue recently voted. C. L. Wright, Supt.

N. C., Charlotte — Hospital — Charlotte Sanitarium plans to build 24 room brick addition. About $50,000. L. L. Hunter, Commercial Bank Bldg., archt.

N. C., Cherryville—School—Bd. Educ. plans to build 2 story school. About $60,000. W. G. Rogers, Trust Bldg., Charlotte, archt.

N. C., Lincolnton — Courthouse — Comrs. Lincoln Co. plan to build 3 story brick. About $200,000. J. A. Salter, Raleigh, archt.

N. C., Mt. Airy—Hotel—Blue Ridge Inn plans to alter and build 3 story, 50 room brick addition. About $65,000. W. C. Northrup, Winston-Salem, archt.

Tenn., Knoxville—Store—D. Briscoe Estate plans to build 3 story, 180 x 200 ft., steel, brick and stone, on North Gay St. About $150,000. Architect not selected.

Tenn., Knoxville—Store—J. F. Walker & Co., 31 Market Sq., plans to build 4 story, 20 x 130 ft., steel and brick, concrete and brick foundation, on Market St. About $50,000. C. Brackney, Knoxville, archt.

Tenn., Marysville—Bank and Office—First Natl. Bank plans to build 5 story, 60 x 165 ft., on Main St. About $100,000. Architect not selected. T. N. Brown, pres.

Ky., Ft. Mitchell—Church and School—Church of Blessed Sacrement plans to build

---

SEWER—TOLEDO, OHIO

Bids were received by D. H. Goodwillie, Pub. Serv. Dir., for building Contr. 1 of Ten Mile Creek Intercepting Sewer, from (A) Graham & Henderson, Cleveland (awarded contract); (B) Harris & Tansey; (C) Layman, Donnelly & Gallagher; (D) Booth & Flinn. The unit bids of the lowest 3 bidders were as follows:

	A	B	C
15,850 lin.ft. 72-in. mono. concrete sewer tunnel (reg.)	30.00	32.00	34.75
1,225 lin.ft. 72-in. mono. concrete sewer tunnel (opt.)	30.00	45.00	.....
1,440 lin.ft. 66-in. mono. concrete sewer tunnel (reg.)	30.00	31.00	34.75
15,850 lin.ft. 72-in. mono. concrete sewer tunnel (reg.)	30.00	32.00	34.75
1,225 lin.ft. 72-in. mono. concrete sewer open cut (reg.)	38.00	45.00	38.00
1,400 lin.ft. 66-in. mono. concrete sewer tunnel (reg.)	30.00	31.00	34.75
15,850 lin.ft. 72-in. vit. segment blk. sewer tunnel (alt.)	33.00	33.00	33.75
1,225 lin.ft. 72-in. vit. segment blk. sewer tunnel (opt.)	33.00	46.00	36.00
1,400 lin.ft. 66-in. vit. segment blk. sewer tunnel (alt.)	33.00	32.00	33.75
15,850 lin.ft. 72-in. vit. segment blk. sewer tunnel (alt.)	33.00	33.00	33.75
1,225 lin.ft. 72-in. vit. segment blk. sewer open cut (alt.)	38.00	46.00	36.00
1,400 lin.ft. 66-in. vit. segment blk. sewer tunnel (alt.)	33.00	32.00	33.75
15,850 lin.ft. 72-in. conc. segment blk. sewer tunnel (alt.)	......	33.00	......
1,225 lin.ft. 72-in. conc. segment blk sewer tunnel (opt.)	....	32.00	....
1,400 lin.ft. 66-in. conc. segment blk. sewer tunnel (alt.)	....	32.00	....
15,850 lin.ft. 72-in. conc. segment blk sewer tunnel (alt.)	....	33.00	....
1,225 lin.ft. 72-in. conc. segment blk sewer open cut (alt.)	....	46.00	....
1,400 lin.ft. 66-in. conc. segment blk. sewer tunnel (alt.)	....	32.00	....
15,850 lin.ft. 72-in. brick sewer tunnel (alt.)	....	44.00	36.75
1,225 lin.ft. 72-in. brick sewer tunnel (opt.)	....	57.00	38.00
1,400 lin.ft. 66-in. brick sewer tunnel (alt.)	....	43.00	36.75
15,850 lin.ft. 72-in. brick sewer tunnel (alt.)	....	44.00	36.75
1,225 lin.ft. 72-in. brick sewer open cut (alt.)	....	57.00	38.00
1,400 lin.ft. 66-in. brick sewer tunnel (alt.)	....	43.00	36.75
1,020 ft. of dth. standard manholes, concrete (reg.)	17.00	12.00	14.00
1,020 ft. of deth. standard manholes, brick (alt.)	17.00	12.00	14.00
28 standard manhole frames and covers (reg.)	25.00	30.00	30.90
100 cu.yd. additional excavation open cut, 20-25 ft. deep (reg.)	3.00	2.00	3.50
100 cu.yd. additional excavation open cut, 25-30 ft. deep (reg.)	4.00	2.00	5.00
200 cu.yd. additional earth excavation tunnel (reg.)	5.00	1.00	8.00
20 cu.yd. rock excavation (reg.)	8.00	10.00	10.00
50 cu.yd. additional Class "A" concrete (reg.)	17.00	15.00	15.00
200 cu.yd. additional Class "B" concrete (reg.)	15.00	10.00	12.00
20 cu.yd. additional brick masonry (reg.)	25.00	30.00	30.00
120M ft.b.m. sheeting and timbering left in place (reg.)	50.00	50.00	50.00
5M ft.b.m. lumber in foundations (reg.)	50.00	.02	50.00
200 ft. piles (reg.)	1.50	1.00	50
1,000 lb. additional steel reinforcement (reg.)	.06	.10	05
50 lin.ft. 10-ft. vitrified pipe (reg.)	.60	2.00	80
100 lin.ft. 12-in. vitrified pipe (reg.)	.90	2.50	1.00
20 lin.ft. 15-in. vitrified pipe (reg.)	1.30	3.50	1.20
20 lin.ft. 18-in. vitrified pipe (reg.)	1.80	3.50	2.40
20 lin.ft. 20-in. vitrified pipe (reg.)	2.15	3.50	2.60
20 lin.ft. 24-in. vitrified pipe (reg.)	3.00	4.00	3.80
500 cu.yd. special tamping (reg.)	.75	1.00	1.00
Extended total with monolithic concrete all in tunnel and concrete manholes	$585,770.00	$630,395.00	....
Extended total with monolithic concrete all in tunnel and brick manholes	585,770.00	630,395.00	....
Extended total with monolithic concrete in tunnel and open cut and concrete manholes	595,570.00	630,395.00	$674,772.00
Extended total with monolithic concrete in tunnel and open cut and brick manholes	595,570.00	630,395.00	674,772.00
Extended total with vit. segment block all in tunnel and concrete manholes	641,195.00	648,870.00	655,072.00
Extended total with vit. segment block all in tunnel and brick manholes	641,195.00	648,870.00	655,072.00
Extended total with vit. segment block in tunnel and open cut and concrete manholes	647,320.00	648,870.00	655,072.00
Extended total with vit. segment block in tunnel and open cut and brick manholes	647,320.00	648,870.00	655,072.00
Extended total with concrete seg. block all in tunnel and concrete manholes	....	648,870.00	....
Extended total with concrete seg. block all in tunnel and brick manholes	....	648,870.00	....
Extended total with concrete seg. block in tunnel and open cut and concrete manholes	....	648,870.00	....
Extended total with concrete seg. block in tunnel and open cut and brick manholes	....	648,870.00	....
Extended total with brick sewer all in tunnel and concrete manholes	....	852,095.00	709,272.00
Extended total with brick sewer all in tunnel and brick manholes	....	852,095.00	709,272.00
Extended total with brick sewer in tunnel and open cut and concrete manholes	....	852,095.00	709,272.00
Extended total with brick sewer in tunnel and open cut and brick manholes	....	852,095.00	709.272.00

Buildings (Continued)

church and school. H. McClorney, 506 4th Natl. Bank Bldg., Cincinnati, O., archt.

O., Bascom—School—Bd. Educ. Hopewell Twp., Rural School Dist., having plans prepared by O. D. Howard, archt., 8 East Broad St., Columbus, for 2 story, 70 x 80 ft., brick and stone, in Hopewell Twp.

O., Buckland—School—Bd. Educ. having preliminary plans prepared by P. T. Cahill and Fulton & Taylor, archts., Hippodrome Bldg., Cleveland, for 2 story, concrete, steel and brick, rein.-con. flooring, concrete foundation. About $125,000.

O., Canton—School—Bd. Educ. having plans prepared by Kling, Zenk & Kling, archts, West Federal St., Youngstown, for 2 story, 62 x 91 ft. About $100,000. R. Kyle, R. F. D. 2, pres.

O., Cleveland—Bank—Guardian Savings & Trust Co., Guardian Bldg., plans to remodel 2 story, 83 x 286 ft., at 10300 Euclid Ave. About $50,000. H. C. Roberts, vice pres. Architect not selected.

O., Cleveland—Bank—Guardian Savings & Trust Co., 633 Euclid Ave., plans to remodel 1 story bank, including granite or stone interior walls, About $100,000. Walker & Weeks, 1900 Euclid Ave., archts.

O., Cleveland—Church—St. Phillips Episcopal Church having plans prepared by C. Long, archt., 618 City Hall, for 1 story, 30 x 62 ft., brick and stone, brick foundation, on West 33rd St. and Denison Ave. About $50,000. G. Bailey, 3425 Highview Ave., pastor.

O., Cleveland—Commercial and Theatre—S. C. Crobaugh, Illuminating Bldg., plans to build 2 story, steel and brick, brick foundation, on Euclid and Superior Aves. About $200,000. Architect not selected.

O., Cleveland—Hospital—Cleveland Maternity Hospital, c/o W. C. Ball, 3735 Cedar Ave., plans to build 3 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on Euclid Ave. and University Circle. About $200,000. A. Garfield, 915 Natl. City Bldg., archt.

O., Cleveland—Temple—Knesseth Isreal congregation, c/o M. Moskowitz, 2179 East 83rd St., having plans prepared by M. Altschuld, archt., 5136 Euclid Ave., for 2 story, 41 x 90 ft., steel and brick, brick foundation, on East 105th St. and Columbia Ave. About $50,000.

O., Cleveland—Theatre and Commercial—J. Spielman, Engineer's Bldg., having revised plans prepared by M. Altschuld, archt., 5136 Woodland Ave., for 1 and 2 story, 45 x 150 ft., steel and brick, brick foundation, on East 119th St. and Kinsman Rd. About $80,000.

O., Cincinnati—Hospital—Jewish Hospital Co., Harvey Ave., having plans prepared by A. Feckheimer, archt., Union Trust Bldg., for addition to hospital.

O., Dayton—Clubhouse—Fraternal Order of Eagles, 320 South Main St., plans to build 2 story, 75 x 150 ft., steel and brick addition, brick foundation, to include auditorium and assembly hall. About $75,000. Architect not selected.

O., Elyria—Bank and Office—Elyria Savings and Trust Co. having preliminary plans prepared by Walker & Weeks, archts. and engrs., 1900 Euclid Ave., Cleveland, for 12 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on Broad and Court Sts. About $1,000,000.

O., Sandusky—Commercial—S. S. Kresge Co., Kresge Bldg., Detroit, having plans prepared by C. W. Brandt, archt., Kresge Bldg., Detroit, for 3 story, 50 x 150 ft., steel and brick, here. About $55,000.

Ind., Gary—Sanitarium—Comrs. Lake Co., Hammond, soon receive bids constructing 1 and 2 story, 72 x 247 ft. irregular shaped brick and rein.-con. administration building, one 60 x 143 ft., four 56 x 169 ft., one 45 x 94 ft. and one 39 x 158 ft. frame and stucco pavilions, all 1 story, 1 story, 22 x 35 ft., brick and timber garage and 1 story, 22 x 35 ft. brick and timber mortuary, etc., here. About $300,000. J. N. Coleman, 6257 St. Lawrence Ave., Chicago, archt.

Ind., Ft. Wayne—Bd. Educ. having plans prepared for new South Side High School, (seating capacity 1200). South Side Grade School, new grade school on east side and new one in Driving Park addition to city; also for alterations to 3 or 4 other buildings. H. J. Collier, Jr., business mgr. Architects name withheld.

Ind., Ft. Wayne—School—Bd. Educ. soon lets contract building addition to Franklin School. About $100,000.

Mich., Detroit—Commercial—B. F. Mortenson, 1119 Dime Bank Bldg., plans to build 4 story, 130 x 200 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Lafayette Ave. and 6th St. Architect not selected.

Mich., Detroit—Store and Office—Detroit Leaf Pipe Wks., West Larned St., purchased site adjoining present building, and plans to construct 4 or 5 story, 45 x 50 ft., concrete, brick and steel, concrete foundation. About $50,000. Architect not selected.

Mich., Detroit—Theatre—H. S. Koppin, Breitmeyer Bldg., having plans prepared by C. H. Crane and E. G. Kiehler, archts., Huron Bldg., for 2 story, 100 x 120 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Catherine and St. Antoine Sts. About $250,000.

Mich., Detroit—Theatre—C. H. Miles, Griswold St., having plans prepared for 2 story, 120 x 163 ft., rein.-con. brick, steel, stone and terra cotta, rein.-con. flooring, concrete foundation, on Grand River and Roosevelt Aves. About $1,000,000. Architects name withheld.

Mich., Muskegon—School—Bd. Educ. having plans prepared by H. H. Turner, archt., 1234 Division Ave., N., Grand Rapids, for 2 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Acorn St. About $145,000.

Ill., Chicago—Hotel—H. Emerman, c/o B. L. Steif, archt., 30 North La Salle St., having plans prepared for 12 story, 115 x 130 ft., rein.-con., terra cotta and brick, rein.-con. flooring, concrete foundation, at 918 Wilson Ave. About $1,500,000.

Ill., Chicago—Office and Sales—Philadelphia Storage Battery Co., 1621 South Michigan Ave., plans to build 2 story, 100 x 200 ft., at 3830 South Michigan Ave. About $100,000. Architect not announced.

Wis., Manitowoc—City Hall—City plans to build 4 story, 60 x 250 ft., rein.-con., steel and brick, brick foundation, on 8th St. About $250,000. A. Zander, city clk.

Wis., Milwaukee—Bank, etc.—Park Savings Bank, 3323 Lisbon Ave., having plans prepared by Rosman & Wierdsma, archts. and engrs., 424 Jefferson St., for 7 story, 60 x 110 ft., brick and concrete, rein.-con. flooring, concrete foundation. About $200,000.

Wis., Milwaukee—Natatorium—City plans to build natatorium. About $100,000 appropriated for project. C. E. Mailig, City Hall, archt.

Wis., Milwaukee—Temple Emanu-El, 41 4th St., plans to build brick and concrete, rein.-con. flooring, concrete foundation, on Kenwood Blvd. About $250,000. Architect and engineer not selected.

Wis., Racine—High School—Bd. Educ. having plans prepared by Perkins, Fellows & Hamilton, archts., 814 Tower Ct., Chicago, for brick and concrete, rein.-con. flooring, concrete foundation. About $500,000. J. J. Moritz, secy

Ia., Beaver—School—Bd. Educ. having plans prepared by Keffer & Jones, archts., 204 Masonic Temple, Des Moines, for 3 story, 43 x 73 ft., rein.-con. stone and brick, rein.-con. flooring, concrete foundation. K. Shadle, secy.

Ia., Boone—Theatre—A. H. Blank, 326 Iowa Bldg., Des Moines, having plans prepared by Vorse, Kraetsch & Kraetsch, archts., 911 S. & L. Bldg., Des Moines, for remodeling hotel into theatre, concrete, steel and brick, rein.-con. flooring. About $500,000.

Ia., Climax—School—Bd. Educ. plans to build concrete, brick and steel, concrete foundation. About $65,000. W. Gordon, Hubbell Bldg., Des Moines, archt.

Ia., Des Moines—Temple—Secy. of State Executive Council having plans prepared by Proudfoot, Bird & Rawson, archts., 810 Hubbell Bldg., and others, for temple of justice, on State Capitol Grounds, bedford stone. Cost to exceed $1,000,000.

Ia., Jamieson—School—J. I. Weekley, secy. Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 1 story, 54 x 70 ft., brick, wood flooring, concrete foundation. About $50,000.

Ia., Lake Park—Bank—Lake Park State Bank having plans prepared by W. J. Brown, archt., Amer. Trust Bldg., Cedar Rapids, for 1 story, 31 x 91 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $60,000.

Ia., Pocahontas—Bank—Farmers Trust & Savings Bank having plans prepared by E. O. Broaten, archt., Mason City, for 2 story, 26 x 133 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $50,000. G. Schneiders, cashier.

Ia., St. Mary's—School—School Bd. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 2 story, 56 x 86 ft., rein.-con. and brick, concrete foundation. About $75,000. W. C. McClary, clk.

Minn., Elgin—High School—Bd. Educ. having plans prepared by Pass & Willcox, archts., Ekle Bldg., Mankato, for 2 story, 92 x 93 ft., brick, stone and hollow tile. About $60,000. J. C. Kettner, clk.

Minn., St. Paul—Dormitory—Hamline University, Snell and Capitol Aves., having plans prepared by F. H. Ellerbe, archt., Endicott Bldg., for 3 story, 50 x 125 ft., rein.-con and brick. About $100,000. J. W. Wheeler, secy.

Kan., Leavenworth—Temple and Clubhouse—Abdallay Shrine plans to build 3 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $300,000. Architect not selected.

Kan., Wichita—Church—United Congregational Church having plans prepared by Sheppard & Wiser, archts., Kansas City, Mo., for 2 story, 125 x 150 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on 1st and Clifton Sts. About $100,000.

Neb., Gering—Courthouse—Scott Bluff Co. plans to build 3 story, 68 x 112 ft., brick, stone and terra cotta, rein.-con. flooring and foundation. About $190,000. W. N. Bowman Co., Central Savings Bank Bldg., Denver, Col., archts.

Neb., Lincoln—Club—Sheridan Heights Lincoln Co. Club having plans prepared by Fiske & Meginnis, archts., 533 Bankers Life Bldg., for 2 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $150,000.

Mo., Cape Girardeau—Schools—Bd. Educ. plans to build 2 story, 45 x 70 ft. vocational art school and 2 story, 65 x 130 ft. ward school, rein.-con., brick and stone, concrete foundations. Cost $30,000 and $55,000 respectively. J. H. Felt & Co., 800 Grand Ave., Temple, Kansas City, archts.

Okla., Clinton—Sanitarium—State Bd. Pub. Affairs, Oklahoma, plans to build brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. E. J. Peters, Shawnee, archt.

Okla., Healdton—High School—Bd. Educ. plans to build 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. Bonds for $110,000 voted for project. Tonini & Bramblett, 417 Terminal Bldg., Oklahoma, archts.

Okla., Oklahoma—Office—C. M. Bassett, El Paso, Tex., plans to build 21 story, 75 x 140 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, here. About $2,000,000. Architect to be selected at once.

Okla., Okmulgee—Grade School—Bd. Educ. having plans prepared by Smith, Rea, Lovitt & Seuter, archts., Okmulgee, for 1 story, 100 x 175 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $90,000.

Okla., Okmulgee—Sales—Fordson Tractor Co. having plans prepared by Smith, Rea, Lovitt & Senter, archts., Okmulgee, for 2 story, 77 x 100 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $75,000.

Okla., Temple—Store—B. & O. Mercantile Co. having plans prepared by H. G. Olmsted & Co., archts., Oklahoma, for 2

Buildings (Continued)

story, 150 x 250 ft., concrete, steel and brick, concrete foundation. About $125,000.

Okla., Tipton—School—Bd. Educ. having plans prepared by Tonini & Bramblett, archts., Oklahoma, for 2 story, concrete, steel and brick, concrete foundation. About $55,000.

Ariz., Jerome—Schools—Trustees Jerome School Dist. having plans prepared by Lescher & Kibbey, archts., Bank of Arizona Bldg., Phoenix, for 2 schools. About $200,000.

Cal., Bakersfield — Auditorium — Bd. Supervs. Kern Co. purchased site and will vote on bonds to build memorial auditorium on Truxton Ave., for Amer. Legion. About $500,000. C. H. Biggar, Bakersfield, archt.

Cal., Calexico—Hotel—Calexico Hotel Assn. having plans prepared by R. Swearingen, archt., Calexico, for hotel. About $300,000. Noted Jan. 8.

Cal., Chino — Schools — School Trustees having plans prepared by Davis, Withey & Davis, archts., 3215 West 6th St., Los Angeles, for addition of auditorium to high school and 2 room addition to grammar school, concrete and brick. About $150,000.

Cal., Diouba — Church — First Baptist Church having plans prepared by N. F. March, archt., 211 Bway. Central Bldg., Los Angeles, for hollow tile church, concrete foundation, 750 seating capacity. About $60.000.

Cal., El Centro—School—School Trustees having plans prepared by D. W. Wells, archt., 126 East 7th St., for 8 room, brick or concrete addition to McKinley School. About $150,000. J. L. Travers, secy.

Cal., Kingsburg — High School — Uuion High School Dist. voted $75,000 bonds to build high school.

Cal., Los Angeles — Auditorium, etc. — Trustees Al Malikal Temple, c/o M. H. Flint, Trust & Savings Bldg., plan to construct building, on Jefferson St., to contain auditorium, 10,000 seating capacity, banquet room, 3,000 seating capacity, lodge room, etc. About $1,000,000.

Cal., Pasadena — Laboratory — Throop College of Technology plans to build rein.-con. and hollow tile, concrete foundation. on East California St. About $150,000. B. G. Goodhue, 2 West 47th St., New York City, archt.

Cal., Salinas—Theatre—Brown Bros. having plans prepared by A. W. Cornelius, archt., Merchants Natl. Bank Bldg., San Francisco, for rein.-con theatre. About $125,000.

Cal., San Pedro—Theatre and Office—F. O. Adler, proprietor Victoria Theatre, plans to construct 3 story, 100 x 125 ft. theatre and office building on 6th St. Architect not selected.

Cal., Turlock—Schools—Bd. Educ. having plans prepared by W. H. Weeks, archt., 75 Post St., San Francisco, for brick and concrete high school, cost $200,000 and 2 brick grammar schools, $89,000.

Que., Montreal—Church—St. Augustin congregation plans to build 50 x 100 ft. stone, steel and brick, concrete foundation, at North End. About $200,000. Architect not selected.

Que., Montreal — Gymnasium — Lower Canada College, Royal Ave., Notre Dame de Grace, plans to build concrete and steel. About $60,000. A. Allan, 102 Chomedy St., engr.

Que., Hull—School—School Bd. having plans prepared by C. Brodeur, archt., Hull, for school on Wright St. About $125,000.

Que., Hull—Technical School—School Bd. plans to build technical school. About $95,000. R. Belanger, secy. Architect not selected.

Ont., Ottawa — Hospital — City having plans prepared by Stevens & Lee, archts., 2 College St., Toronto, for 7 story civic hospital, on Carling Ave., to include building to accommodate 500 beds, nurses home and medical school, etc. About $1,500,000.

B. C., Vancouver—Office—J Storey, 518 Beatty St., soon lets contract building 4 story, 50 x 120 ft., rein.-con., brick and tile, concrete foundation. About $50,000. P. P. Brown, 410 London Bldg., engr. W. T. Whiteway, 1406 Dominion Bldg., archt.

BIDS DESIRED

Conn., West Hartford (Hartford P. O.)—Schools—Until Feb. 2, by I. A. Allen, Jr., archt., 904 Main St., Hartford, building group of brick, steel and stone, rein.-con. flooring, concrete foundation, for Amer. School for Deaf, 65 Garden St., Hartford. About $350,000. Noted Aug. 21.

N. J., Trenton—School—Until Feb. 4, by Bd. Educ., Hamilton Twp., building 2 story, 36 x 105 ft., on South Broad St. About $60,000. W. A. Robinson, Groveville, clk. W. A. Klemann, 1st Natl. Bank Bldg., archt.

Pa., Chadds Ford—School—Until Feb. 16, by Comrs. Chester and Delaware Counties, building 2 story, 150 x 150 ft., rein.-con. and brick, here. V. T. Ritter, North Amer. Bldg., Phila., archt.

Pa., Chester — Hospital — Ballinger & Perrot, engrs. and archts., 17th and Arch Sts., Phila., receiving bids building 3 story, 37 x 207 ft., brick, rein.-con. flooring, for Surgical Hospital.

Pa., Pittsburgh—School—Until Feb. 6, by E. V. Denick, archt., House Bldg., constructing 4 room brick, on Washington and McLaughlin Rds., for Upper St. Clair Twp., Pub. School Bd.

Pa., Plaios (Wilkes-Barre P. O.)—School—Until Feb. 23, by School Bd., building 2 story, 70 x 130 ft., concrete, brick and steel, on Moffitt St. About $150,000. A. Reilly, Bennett Bldg., Wilkes-Barre, archt.

O., Cleveland — Theatres and Stores — Until Feb. 19, by Gordon Sq. Co., West 65th St. and Detroit St., building 3 story, 150 x 260 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation. About $500,000. B. H. Prack, Keystone Bldg., Pittsburgh, archt.

Mich., Muskegon — Hotel — Holabird & Roche, archts., 104 South Michigan Ave., Chicago, receiving bids building 8 story, 54 x 140 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, for Occidental Hotel Co., Western Ave. and 3rd St. About $200,000. Noted Jan. 8.

Mich., Ypsilanti—School—Until Feb. 17, by H. X. Wilder, secy. Bd. Educ., building 2 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $150,000. Robinson & Campau, 715 Michigan Trust Bldg., archts.

Ill., Chicago—Hotel—Holabird & Roche, archts., 104 South Michigan Ave., receiving bids for masonry work in connection with 3 story, 160 x 180 ft., rein.-con., steel, brick and terra cotta addition, on Clark and Randolph Sts., for Hotel Sherman Co. Contract for steel work let, to Stroebel Steel Co., 53 West Jackson St. Total cost, $500,000.

Ill., Chicago — Sales—See "Industrial Works."

Ill., Chicago—Sales—D. S. Klafter, archt., 64 West Randolph St., receiving bids building 4 story, 50 x 125 ft., brick and timber, concrete foundation for C. Schmalhaussen, 2448 Michigan Ave. About $150,000.

Wis., Racine—Schools—Until Feb. 20, by Bd. Educ., building McKinley school, 2 story, 52 x 70 ft. and 96 x 264 ft., also 2 story addition to Franklin school, both brick and concrete, rein.-con. flooring, concrete foundation. About $230,000 and $200,000 respectively. J. J. Moritz, secy. A. A. Guilbert, Robinson Bldg., archt.

Wis., Tomah—High School—Until Feb. 11, by Bd. Educ., building 3 story, 50 x 80 ft. addition to manual training high school and 30 x 55 ft. boiler house, brick, concrete foundation. About $60,000. H. C. Haeuser, Colby-Abbot Bldg., Milwaukee, archt. Noted Jan. 15.

Ia., Beaver—School—Until Feb. 17, by Keffer & Jones, archts., 201 Hubbell Bldg., Des Moines, building 2 story 38 x 60 ft., brick, rein.-con. and steel, rein.-con. flooring, for Bd. Educ. About $50,000.

Ia., Blenco — School — Until Feb. 7, by Bd. Educ., building 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $75,000. W. E. Hulse & Co., 210 Masonic Temple, Des Moines, archts.

Ia., Calamus—School—Until Feb. 20, by C. A. Dieman & Co., archts., 408 Granby Bldg., Cedar Rapids, building 3 story, 65 x 85 ft., brick, rein.-con. and stone, rein.-con. flooring, for Bd. Educ. About $50,000.

Ia., Cooper—High School—Until Feb. 5, by Bd. Educ. and W. E. Hulse & Co archts. 210 Masonic Temple, Des Moines, building 3 story, 55 x 86 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation About $90,000.

Ia., Cotter—School—Until Feb. 13, by Bd. Educ. Consolidated Dist., building 2 story, brick, concrete and steel, concrete foundation.. About $60,000. Eckland & Co., McKinnie Bldg., Moline, Ill., archts.

Ia., Gaza—School—Until Feb, 6 (change of date), by Bd. Educ., building 3 story, 55 x 86 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $75,000. W. E. Hulse & Co., 210 Masonic Temple, Des Moines, archts.

Ia., Morley—School—Until Feb. 6 (change of date), by Bd. Educ., building 2 story, 43 x 135 ft., brick, concrete and steel, concrete foundation. About $60,000. W. J. Brown, 201-3 Amer. Trust Bldg., Cedar Rapids, archt. Noted Jan. 8.

Ia., Mt. Pleasant—High School—Until Feb. 10, by Bd. Educ., building brick, concrete and steel, concrete foundation. About $65,000. G. L. Lockhart, Endicott Bldg., St. Paul, archt.

Ia., Woodbine—School—Until Feb. 13, by Bd. Educ. Consolidated Dist., building 2 story, 56 x 86 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. W. E. Hulse & Co., 210 Masonic Temple, Des Moines, archts.

Minn., Deer Creek—High School—Until Feb. 3, by Bd. Educ., building 2 story, 70 x 120 ft., brick and Kasota stone. About $61,000. Foss & Foss, St. Cloud, archts.

Minn., Hibbing—Recreation—Until March 15, by V. L. Power, mayor, building 2 and 3 story, 200 x 300 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, in Central Division. About $375,000. Halstead & Sullivan, Palladio Bldg., Duluth, archts. and engrs.

Minn., Mankato—School—Bd. Educ. receiving bids building 2 story, 40 x 50 ft., rein.-con and brick addition, on Belgrade Ave. About $60,000. G. Pass & Son, Mankato, archts.

Minn., Morton—School—Bd. Educ. receiving bids building 2 story, 40 x 90 ft., rein.-con., brick and stone. About $65,000. K. T. Snyder, Plymouth Bldg., Minneapolis, archt.

Minn., Northfield — Science Hall — Until Feb. 16 (change of date), by N. E. Mohn, archt., 596 Endicott Bldg., St. Paul, constructing 3 story, 73 x 186 ft., rein.-con., brick and stone, for St. Olaf's College. About $200,000. Noted Jan. 1.

Minn., Waseca—Hospital—Until Feb. 17, by H. C. Gerlach, archt., Mankato, building 2 story, 60 x 100 ft., rein.-con. and brick, here. About $80,000. Terry-Schulte Eng. Co., Endicott Bld., St. Paul, engrs Owner's name withheld.

Kan., Topeka—Hotel—Until March 1, by J. F. W. Renker, 822 Kansas Ave., building 10 story, 100 x 155 ft., rein.-con., brick, and steel, rein.-con. flooring, concrete foundation. About $700,000. Smith, Rea & Lovitt, Finance Bldg., Kansas City, Mo., archts.

Neb., Kearney—Dormitory—Until Feb. 16, by State Bd. Educ., c/o H. E. Reisch, secy., Chadron, building 3 story, 64 x 160 ft. rein.-con, steel and brick, rein.-con. flooring, concrete foundation, here. About $100,000. J. H. Craddock & Co., Elks Bldg., Omaha, archts.

Neb., Peru—Science Hall—Until Feb. 16, by State Bd. Educ., c/o H. E. Reisch, secy., Chadron, building 3 story, 62 x 132 ft. rein.-con, steel and brick, rein.-con. flooring, concrete foundation, here. About $80,000. J. H. Craddock & Co, Elks Bldg., Omaha, archts.

Mo., Carthage—Hotel—Stock Co., c/o Chamber of Commerce, receiving bids building 4 story, 75 x 90 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on 4th and Howard Sts. About $140,000. Shepard & Wiser, R. A. Long Bldg., Kansas City, archts.

Tex., Lubbock—Hospital—Until Feb. 16, by Lubbock Sanitarium, building two 2 story, 35 x 85 ft. rein.-con. and brick additions. About $50,000. Rose & Peterson, Kansas City, Kan., archts. and engrs.

Okla., Hugo—Church—Until Feb. 5, by Methodist Episcopal Church, building 2 story, 70 x 108 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $80,000. W. H. King, secy. bldg. com. Hawk & Parr, 501 Security Bldg., Oklahoma, archts. Noted Aug. 14.

Buildings (Continued)

Ariz., Chandler—Schools—Until Feb. 14, by Bd. Educ., constructing administration, domestic science, commercial and science buildings, brick, concrete foundation. About $150,000. Noted Jan. 15.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Me., Biddleford—Bank—T. M. James, archt., 3 Park St., Boston, let contract to J. E. Nelson Co., 7 Water St., Boston, building 1 story, 40 x 100 ft., brick and stone, concrete flooring and foundation, on Main St., for 1st Natl. Bank. About $50,000. Noted Jan. 8.

★Me., Lewiston—Sales—Lewiston—Buick Co. let contract constructing 3 story, 95 x 130 ft., brick and rein.-con., rein.-con. flooring, concrete foundation, on Sabattus and Main Sts., to F. T. Ley & Co., Inc., 185 Devonshire St., Boston. About $150,000.

★Mass., Clinton—Office and Recreation—Lancaster Mills Co. let contract building 2 story, 40 x 80 ft., brick, to G. A. Fuller Constr. Co., State St., Boston. About $100,000.

★Mass., Fall River—Hotel—Hotel Mohican, North Main St., will build 4 story, 48 x 120 ft., brick addition. About $125,000. Work will be done by day labor.

★Mass., New Bedford—Business—W. T. Cornell, Bedford St., Fall River, let contract building 10 story, 50 x 62 ft., brick, rein.-con. and steel, on 6th and Union Sts., here, to F. T. Ley Co., Inc., 495 Main St., Springfield. About $300,000.

★Mass., Springfield — **Business**—G. A. Whitney Estate, 310 Main St., let contract altering business building on Bway. and Worthington St., to E. F. Carlson Co., 310 Main St. About $50,000.

★R. I., Newport — School — St. George School, Purgatory Rd., let contract building 3 story, 58 x 130 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation, to Williams & Merchant, Inc., 87 Weybosset St., Providence. About $175,000.

★Conn., Waterbury — Theatre — J. L. Fernandez, 24 West Porter St., will build 3 story, 50 x 160 ft., brick and concrete, concrete foundation, on East Main St. About $50,000. Work will be done by day labor.

★N. Y., Brooklyn—Asylum—Jewish Orphan Asylum, c/o E. M. Adelsohn, archt. and engr., 1778 Pitkin Ave., will build 3½ story, 60 x 100 ft., brick, steel and stone, brick foundation, on Dumont Ave. between Elton and Linwood Sts. About $120,000. Work will be done by day labor.

N. Y., Brooklyn—Courthouse—E. Riegelmann, boro. pres. received lowest 3 bids Jan. 21, for general and electric work, building 3 story, 52 x 75 ft., brick and steel, brick foundation, at 109-115 Schemerhorn St., from G. F. Driscoll Co., 548 Union Ave., $163,950, Fox, Reynolds Co., 81 East 125th St., New York City, $154,931, T. A. Clark Co., 122 Livingston St., $187,300; plumbing and gasfittings, from T. E. O'Brien Inc., 6311 5th Ave., $10,697, Altman Plumbing Co., 219 East 25th St., New York City, $11,850, J. A. Graf, 971 DeKalb Ave., $11,932; heating and ventilating from Cillia & Goeghagan, 537 West Bway., New York City, $8,179, Miller & Brady, 217 East 35th St., New York City, $8,297, W. J. Olvany, 177 Christopher St., New York City, $8,459. Noted Jan. 22.

★N. Y., Brooklyn—Home and Hospital—Brooklyn Hebrew Home & Hospital for Aged, Howard and Dumont Aves., will build 4 story, 90 x 100 ft., brick and steel addition, brick foundation. About $100,000. Work will be done by day labor. Noted Aug. 28.

★N. Y., Brooklyn—Synagogue—Congregation Bikur Cholem, Fulton St. and Shepard Ave., will build 2 story, 50 x 85 ft., brick, steel and stone, brick foundation, on Arlington Ave. and Bradford St. About $100,000. Work will be done by day labor.

★N. Y., Brooklyn — Theatre — A. A. Schwartz, 815 Flatbush Ave., will build 1 story, 100 x 200 ft., brick and steel, brick foundation on Kings Highway and Coney Island Ave. About $350,000. Work will be done by day labor.

N. Y., New York—Hospital—Bd. Trustees Bellevue and Allied Hospitals, at office of General Medical Supt., 415 East 26th St., received bids for general contract for building temporary wards at Fordham Hospital, Crotona Ave. and Southern Blvd., from Rangeley Constr. Co., 405 Lenox Ave., $44,998, T. Dwyer, Bway. and 212th St., $47,000; plumbing, etc., from Altman Plumbing Co., 802 2nd Ave., $4,865, Egan Co., Inc., 32 Old Bway., $5,725; heating, from Chute, Thornton & Bailey, 2 East 13th St., $20,800, Kings Co. Heating & Ventilating Co., 40 Boerum Pl., Brooklyn, $21,000, Johnson Heating Co., $25,640. Noted Jan. 22.

588

Contracts

for buildings costing more than $25,000 each and exclusive of residence construction were let

in January

and all were noted in these pages. This work will aggregate

$150,000,000

In spite of the high prices and the small dollar there is a lot of work bound up in 588 contracts averaging more than a quarter of a million each.

Watch These Pages

★N. Y., New York—Hotel—Silver Lunch Co., c/o R. H. and C. N. Whinston, archts. and engrs., 2 Columbus Circle, will alter brick, steel and stone, on 52nd St. and Bway. About $150,000. Work will be done by day labor. Noted Jan. 15.

★N. Y. New York—Loft—L. K. Schwartz, 110 West 40th St., let contract building 10 story, 41 x 98 ft., brick, steel and stone, brick foundation, at 41-43 West 28th St., to Barney-Ahlers, 110 West 40th St. About $250,000.

★N. Y., New York—Office—Mfrs. Cloak & Suit Trade, 136 Madison Ave., will build 16 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, on 36th and 38th Sts., 7th and 8th Aves. About $8,000,000. Work will be done by day labor. Noted Jan. 1.

★N. Y., New York—Office—Round Hill Merchantile Co., 98 Bleeker St., let contract building 10 story, brick, steel and stone, brick foundation, on 19th St. and 4th Ave., to W. Crawford, 7 East 42nd St. About $5,000,000.

★N. Y., New York—Offices and Stores—Sidem Bldg. Co., c/o B. H. and C. N. Whinston, archts. and engrs., 2 Columbus Circle, will build 5 story, 25 x 100 ft., brick and steel, concrete foundation, at 117 West 33rd St. About $135,000. Work will be done by day labor.

★N. Y., New York—Office—Textile Bldg., Inc., 15 West 55th St., let contract building 16 story, 164 x 197 ft., brick, steel and stone, brick foundation, at 285-293 5th Ave., to G. Backer Constr. Co., 33 East 33rd St. About $3,000,000.

★N. Y., New York—Office—L. L. Winkleman & Co., 62 Broad St., let contract altering brick, steel and stone, brick foundation, to F. F. French Co., 299 Madison Ave. About $100,000.

N. Y., New York—School—Bd. Educ., 500 Park Ave., received lowest 3 bids Jan. 20, building P. S. 130, 5 story, 59 x 112 ft., brick and steel, brick foundation, at 201-207 Hester St., from J. Fallon, 225 5th Ave., $374,000; Frymier & Hanna, 25 West 45th St., $374,400; J. MacArthur, 6022 Ormond Pl., Brooklyn. $385,273. Noted Jan. 15.

★N. Y., New York—Store—See "Industrial Works."

★N. Y., Rye—Club and Hotel—J. E. Bowman, Hotel Biltmore, New York City, let contract building brick, steel and stone, brick foundation, here, to G. A. Fuller, 175 5th Ave., New York City. About $2,000,000. Noted June 12.

★N. J., Edgewater—Laboratory—Barrett Co., 17 Battery Pl., New York City, let contract building 2 story, 25 x 73 ft., with 27 x 50 ft. "L", rein.-con., here, to Turner Constr. Co., 244 Madison Ave., New York City.

★N. J., Jersey City—Theatre—Standard Theatre Co., c/o S. C. Horn Sons, engrs. and archts., 1476 Bway., New York City, will build brick and steel, brick foundation, on Central Ave. and Sherman Pl. About $250,000. Work will be done by day labor under supervision of architects. Noted Jan. 8.

★N. J., Trenton—Club House—Magyar Congregation, Genesee St., let contract building 2 story, 60 x 100 ft., brick and concrete, on Genesee St., to F. R. Parker, 327 Calhoun St. About $60,000.

★Pa., Harrisburg—Bank—Allison Hill Trust Co., 13th and Market Sts., let contract building 1 story, 40 x 100 ft., steel and marble, to A. Lebo, care of owner.

★Pa., Hazleton—Home—State Hospital let general contract building 3 story, 30 x 45 ft., nurses home, brick and steel, rein.-con. flooring, brick foundation, on Vine St., to J. Eroh, Broad St. About $60,400.

★Pa., Phila.—Salesroom and Office—Bigelow-Willeys Co., 304 North Broad St., let contract building 10 story, 95 x 120 ft., concrete, brick and stone, on Broad and Vine Sts., to J. N. Gill, Otis Bldg. About $500,000. Noted Jan. 1.

★O., Canton—School—Bd. Educ. let contract building 3 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, to R. H. Evans & Co., Columbus Savings & Trust Co., Columbus. About $900,000.

★O., Cleveland—Office—See "Industrial Works."

★O., Cleveland—Temple—Masonic Temple Bldg. Co., Rockefeller Bldg., let contract buiding 6 story, 130 x 300 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, at 3515 Euclid Ave., to Masters & Mullen Constr. Co., Electric Bldg. About $750,000.

O., East Cleveland (Cleveland P. O.)—School—Bd. Educ. plans to build 2 story, concrete, steel, brick and stone, rein.-con. flooring, concrete and brick foundation. About $200,000. Architect to be selected soon.

★O., Perry—School—Bd. Educ. let contract building 2 story, 74 x 132 ft., concrete, steel and brick, to Keyser & Bros. Co., Bellaire. About $150,000.

★Mich., Detroit—Bank—Dime Savings Bank, Fort and Griswold Sts., let contract building 1 story, 40 x 74 ft., rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation, on Holbrook St., to Walbridge-Aldinger Co., 2356 Penobscot Bldg. About $50,000.

★Mich., Detroit—Jail—Wayne Co., c/o W. F. Moeller, County Bldg., let contract building 2 story, brick and steel addition, rein.-con. flooring, brick foundation, on Clinton St., to Culbertson & Kelly Co., Ford Bldg., $51,085.

★Mich., Detroit—Office etc.—Houghten-French Co., Mack Ave., let contract building 2 story, 75 x 100 ft., office and garage, brick and steel, brick and concrete foundation, on Mack Ave. and Conners Creek, to P. H. Piper, 208 Sun Bldg. About $45,000.

★Ill., Chicago—Hotel—Shore View Hotel Co., c/o J. Johnston, archt., 1254 Pratt Blvd., let contract building 8 story, 60 x 145 ft., rein.-con., brick and terra cotta

Buildings (Continued)

rein.-con. flooring, concrete foundation, at 4910 Sheridan Rd., to Olson-Carson Co., 7417 Rhodes Ave. About $800,000.

★Ill., Chicago—Sales— See "Industrial Works."

★Ill., Springfield — Bank — Springfield Marine Bank, 114 South 6th St., let contract building brick, steel, stone and marble, to Hoggson Bros., 485 5th Ave., New York City. About $500,000.

★Wis., Milwaukee — Exchange — A. C. Eschweiler, archt., Goldsmith Blk., let concrete contract building 3 story, 40 x 60 ft., brick and concrete addition, rein.-con. flooring, concrete foundation, to Clos Constr. Co., 721 Cramer St., masonry contract, to Grunewald & Dunlop, 818-18th St. Total cost, $50,000. Noted Jan. 8.

★Wis., West Allis (Milwaukee P. O.)—High School—Bd. Educ. let contract completing high school, to Kroening Constr. Co., 67th and Natl. Aves., $169,780 or cost plus 10 per cent basis. Noted Jan. 8.

★Ia., Storm Lake—School—Bd. Educ. let contract building 2 story, 70 x 105 ft., brick and stone, rein.-con. flooring, concrete foundation, to W. F. Kucharo & Co., 622 Hubbell Bldg., Des Moines. About $70,000.

★Ia., Waterloo—Theatre—Palace Theatre Co., 508 Sycamore St., let contract building 1 story, 68 x 128 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation to Currie & Simpson Co., Waterloo. About $150,000.

★Minn., East Grand Forks—Schools—G. A. Noonan, secy. School Dist. 3, let contract constructing 3 story, 118 x 145 ft. grade and high school, and 1 story, 39 x 114 ft. industrial building, concrete and brick, concrete foundation, to J. C. Nelson & Son, 17 6th St., S., Minneapolis. About $290,000.

Minn., Minneapolis—School—Bd. Educ. received bids Jan. 12, building 3 story, 61 x 163 ft., rein.-con. and brick addition to Calhoun School, on Girard Ave., from F. N. Hegg, 2942 Nicollet Ave., $168,767; Madsen & Peterson, Builders Exch., $180,000; J. Peterson, 3152 10th Ave. S., $183,200. Noted Jan. 8.

★Minn., Minneapolis—Theatre—Kees & Colburn, archts., Plymouth Bldg., let contract to Splady, Albee & Haagenson, 1022 Plymouth Bldg., constructing 1 story, 100 x 140 ft., rein.-con., steel, terra cotta and brick, on Nicollet Ave. and 14th St., for Hamm, Finkelstein & Ruben, Palace Theatre. About $175,000.

★Neb., Beatrice—Business—Le Poidevin let contract remodeling 3 story, brick, steel and concrete, concrete foundation, to W. B. Gilbert, Beatrice. About $60,000; cost plus percentage basis.

★Neb., Columbus — Church — Lutheran Church let contract building 2 story, 54 x 90 ft., concrete, brick and steel, concrete foundation, to J. Kaaz Mfg. Co., 12th and Main Sts., Atchison, Kan. About $55,000.

★Neb., Omaha—Display and Sales—C. A. Tucker and L. J. Dunn, 26th and Farnam Sts., let general contract building 4 story, 75 x 148 ft. rein.-con., rein.-con. flooring, concrete foundation, on 18th and Howard Sts., to W. J. Assemach Co., Omaha. About $250,000.

★Wash., Seattle—Hospital—Mason—Blackford—Dowling Clinic let contract building 6 story, 44 x 100 ft., rein.-con., brick and tile, on Terry and Spring Sts., to Douyan & Chrisman, Hoge Bldg. About $225,000.

★Ore., Coquille—School—Bd. Educ. let contract building 2 story, 76 x 142 ft., brick and concrete school and auditorium, to A. E. Sykes, Venable Hotel, Portland, $49,133

★Cal., Catalina Island (Wilmington P. O.)—Hotel—W. Wrigley, 5 North Wabash Ave., Chicago, will build 3 story, 176 x 217 ft., stucco and timber, concrete foundation, here. About $100,000. Work will be done by day labor under supervision of D. M Renton, Avalon, supt.

★Cal., Los Angeles—Store and Loft—Sun Drug Co., 927 South Los Angeles St., let contract building 2 story, 75 x 115 ft., rein.-con., concrete foundation, on 6th St. and Bway., to J. V. McNeill, 736 H. W. Hellman Bldg. About $100,000.

★Cal., Madera—High School—Trustees Union High School Dist. let contract constructing 2 story, rein.-con., concrete foundation, to R. W. Brown, Madera. About $66,000.

Federal Government Work

PROPOSED WORK

N. H., Portsmouth—Chimney—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build radial brick chimney. About $13,000.

N. Y., Rockaway L. I.—Anchoring Gas Tank—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to anchor gas tank, here. About $2,750.

Pa., Phila—Drainage System-Spec. 4131—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install drainage system around heads of drydock 3 and 4. About $40,000.

Mo., St. Louis — Remodeling plumbing, electric work, etc.—Treas. Dept., Wash., D. C., rejected bids received Jan. 5, remodeling, in U. S. Appraisers Stores, here. Noted Jan. 15.

Cal., San Diego—Kite balloon and seaplane hangars —Bureau Yards & Docks, Navy Dept., Wash., D. C., preparing plans for 2 kite balloon and 3 seaplane hangars, here. About $111,000.

BIDS DESIRED

Mass., Boston—Extension to Building—Spec. 4053—Until Feb. 4, by Bureau Yards & Docks, Navy Dept., Wash., D. C., constructing extension to foundry and machine shop, Bldg. 42, at Navy Yard, here. Estimated cost, $160,000; $20 deposit required for plans and spec. Noted Jan. 22.

D. C., Wash.—Roadway—Until Feb. 17, by Secy. Bd. Comrs., 509 Dist. Bldg., laying small granite block roadway. C. W. Kutz, comr.; advertised in this issue.

Ariz., Gila—Road Work—Until Feb. 9, by Bureau Pub. Rds., U. S. Dept Agriculture, Room 218 Luna-Strickler Bldg., Albuquerque, N. M., building 6.56 mi. Salt River-Pleasant Valley Rd., Sect. 2B, 20 ft. wide, grouted stone pavement, work involves 12,314 cu.yd. common earth and 4,642 cu.yd. rock excav., 12.4 M ft. bridge trestling in place, etc. About $30,000. E. S. Wheeler, dist. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Fitchburg — Remodeling Post Office—Treas. Dept., Wash., D. C., let contract remodeling, here, to W. F. Stewart, 501 West 178th St., New York City, $6,970. Noted Jan. 15.

★N. Y., New York—Repairs and additions to motor launch—U. S. Engr. Office, War Dept., Wash., D. C., let contract repairing and building additions to motor launch, here, to Down Boat & Shipbuilding Corp., Clason Point. About $2,690.

★N. Y., Stapleton—Electric elevators—Treas. Dept., Wash., D. C., let contract installing 2 electric elevators, here, to Otis Elevator Co., Wash., D. C., $12,520. Noted Jan. 15.

★Pa., McKeesport — Remodeling Post Office—Treas. Dept., Wash., D. C., let contract remodeling, here, to Brieck Bros., McKeesport, $$11,872. Noted Jan. 15.

★Md., Annapolis — Water tanks and tower—Spec. 4103—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building 2 water tanks and tower at High Power Radio Sta., Greenbury Point, here, to Pittsburg, Des Moines Steel Co., 959 Munsey Bldg., Wash., D. C., $5,100 (175 days). Noted Jan. 15.

★D. C., Wash.—Sewers—Dist. Comrs., 511 Dist. Bldg., let contract building sewer, to W. F Brenizer Co., 101 New York Ave., N. E. About $10,000 Noted Jan. 15.

Va., Camp Eustis—Drainage Channel—W. R. Richards, camp utility officer, received bids Jan. 5, building 7,200 ft. drainage channel between York and James Rivers, 14 ft. wide, 4-10 ft. deep, and 7,200 ft. long, also small concrete bridge, involving (a) 4 acres clearing, (b) 19,000 cu.yd. excav., (c) 130 cu.yd. concrete in place, (d) 40 lin.ft. w.i. pipe railing, (e) 500 lin.ft. foundation piles, from Glasser Eng. & Constr Co., 31 Liberty St., New York City, (a) $50 per acre, (b) $.75 per cu.yd., (c) $27 per cu.yd., (d) $2 per lin.ft., (e) $1 per lin. ft., total $18,540; W. P. Thurston Co., Merchants Bank Bldg., Richmond, (a) $225, (b) $1.10, (c) $35, (d) $2, (e) $2, total, $27,430; Hampton Rds. Constr. Co., Newport News, (a) $400, (b) $1.24, (c) $30, (d) $2.50, (e) $.40, total, $29,360

Va., Hampton Roads—Removing and rebuilding—Spec. 4109—Bureau Yards & Docks, Navy Dept., Wasch., D. C., received bids Jan 21, removing Bldg. "D" from Ford Shipbuilding Plant, River Rouge, Mich. and rebuilding at Naval Operating Base, here, (1) work complete, from S. J. Smith & Co., Gloucester Point, (1) $33,000 (80 days), (3) $26,509 (45 days), (4) deduct $1,000; Mansfield & Savage, 135 William St., New York City, (1) $39,823 (100 days), (2) $17,950 (50 days), (3) $21,873 (50 days), (4) deduct $300. Noted Jan. 1.

★S. C., Paris Island—Building Extension—Spec. 4079—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract constructing 4 steel frame and 5 wood frame buildings at Marine Aviation Field, here, to Newport Contg. & Eng. Co., Silsby Bldg., Newport News, Va. About $94,900 (150 days). Noted Jan. 15.

Ky., Dawson Springs—Additional Buildings—Treas. Dept., Wash., D. C., received lowest 3 bids Jan. 20, constructing 19 additional buildings exclusive of mechanical equipment, at U. S. Public Health Sanitarium, here, from Dawson Springs Constr. Co., Dawson Springs, $1,121,479; Northeastern Constr. Co., 101 Park Ave., New York City, $1,166,475; W. D. Lovell, 1415 Southeast 8th St., $1,177,198. Noted Jan. 1.

Ky., Dawson Springs — Mechanical equipment—Treas. Dept., Wash., D. C., received lowest 3 bids Jan. 20, for mechanical equipment including small power plant and equipment in 19 additional buildings, at U. S. Public Health Sanitarium, here, from S. W. Rittenhouse, Wash., $381,530; Thompson Bros., 125 North 5th St., Phila., $416,045; E. A. Clegg & Co., 110-112 South 1st St., Louisville, $427,378.

★O., Springfield — Remodeling Post Office—Treas. Dept., Wash., D. C., let contract remodeling, here, to G. E. Wright, Inc., Chicago About $9,700. Noted Jan. 15.

Miscellaneous

PROPOSED WORK

Transmission Line—Dunkirk, N. Y.—Niagara & Erie Power Co., Lamphere St., plans to build second 3-ph. 60,000-volt transmission line from here to Athol Springs substation.

Transmission Line—Morristown, N. Y.—Brier Hill—St. Lawrence Co. Electric Light & Power Co., Inc., Brier Hill, plans to build high tension transmission line from Brier Hill to here, a distance of 4 mi. About $32,000.

Pavilion—Wilburtha, N. J.—L. Schmidt, River Rd., Trenton, plans to build 1 story, 45 x 140 ft., concrete and brick pavilion, along River Rd., here. About $50,000. R. A. Schumann, 932 Lamberton St., Trenton, archt.

Piers—Woodcliffe, N. J., (Weehawken P. O.)—Weehawken Dry Dock Co., foot Baldwin Ave., Weehawken, and Lord Constr. Co., 105 West 40th St., New York City, plan to build five 50 x 1,200 ft., concrete and steel piers along Hudson River, here.

Tract Development—Granville, O.—Dennison University plans to develop 200 acre tract recently added to campus, including roadways, probable stadium, athletic fields, etc. About $50,000. C. W. Chamberlain, pres. A. Brunner, Boston, Mass, archt. and engr.

Subway—Detroit, Mich.—City rejected bid received Jan. 17, building rein.-con. subway and approaches for street traffic to Belle Isle Park, under Jefferson Ave. Work will be readvertised immediately. Esselstyn, Murphy & Hanford, 810 Marquette St., engrs. Noted Jan. 1.

Ornamental Light Posts—Sheridan, Wyo.—City plans to install 66 ornamental posts on Main St., equipped with 215-watt nitrogen lamp. About $10,000. J. Bibb, mgr. If plans mature posts will be installed by Sheridan Co. Electric Co.

Portland Cement — Sacramento, Cal. — State Highway Dept., 515 Forum Bldg., soon receives bids furnishing portland cement, pro rated over 4 year period, subject to market fluctuations, in lots of 500,000, 750,000 and 1,000,000 bbls.

Pier—Santa Monica, Cal.—City soon receives bids repairing municipal pleasure pier, to have creosoted wooden piles to support deck, etc. About $75,000 available. Olmsted & Gillelen, Hollingsworth Bldg., Los Angeles, engrs. Noted Jan. 8.

Miscellaneous (Continued)

Road Supplies—Ottawa, Ont.—City plans to purchase 500 tons limestone dust, 50,000 paving bricks, 10,000 bbl. cement, 150,000 tons broken stone, 1,500 pieces brasswork for house services, such as curb cocks couplings, etc., 1—75 hp. electric motor and oil pump for road oil work.

BIDS DESIRED

Motor Trucks—New York, N. Y.—Until Feb. 4, by H. H. Curran, pres Manhattan Boro., furnishing and delivering one 3½ ton and eleven 2½ ton motor trucks.

Road Materials—New York, N. Y.—Until Feb. 4, by H. H. Curran, pres. Manhattan Boro., furnishing and delivering 1,200 tons asphalt paving cement, 25,000 bags portland cement, 4,000 cu.yd. paving sand, 5,000 cu.yd. paving grit, 3,000 cu.yd. coarse aggregate for concrete, 620,000 wood paving blocks, 45,000 new granite paving blocks, 100 cords mixed wood, 20,000 cu yd. asphalt wearing surface sand, Grade B, 9,000 cu. yd. ⅝ in. binder stone, 900,000 gal. refined asphalt, 6,000 tons limestone dust, 60,000 gal. gasolene, 150,000 second hand granite paving blocks.

Transformer Station—New York, N. Y.—Until Feb. 10, by New York Edison Co., Irving Pl. and 15th St., building 3 story, 45 x 75 ft. rein-con. and steel transformer station, rein.-con. flooring, concrete foundation, at 421-423 East 6th St. About $60,000. W. Whitehill, 32 Union Sq., archt. and engr.

Scarifier and Road Oil—Bloomfield, N. J.—Until Feb. 2, by D. F. Peck, town clk., furnishing scarifier, also furnishing and spreading 40,000 gal. road oil on streets within limits of town, for year ending Dec. 31, 1920. Alternate bids, non-asphaltic oil, asphaltic oil containing 40-50% asphalt, or asphaltic oil, containing over 60% asphalt.

Equipment—Hackensack, N. J.—Until Feb. 2, by J. M. Harkness, clk. Bd. Freeholders Bergen Co., furnishing automatic loader-electric power, automatic loader-gasoline engine, two 2½-ton dump trucks—pneumatic tires in front and solids on rear, ½ yd. concrete mixer, adjustable road drag, 2 steerable reversible road machines—6 ft. blades, one 10 ton gasoline motor roller with scarifier attached and gas storage tank on wheels, 1 water wagon, 1 trailer for tar kettles (4 wheels, rubber tires), 1 wheeled scraper, one 1,000 gal. steel tank.

Road Material—Hackensack, N. J.—Until Feb. 2, by J. M. Harkness, clk. Bd. Freeholders Bergen Co., furnishing 1 car interlocking C 1 culvert pipe, 1 car rein.-con. culvert pipe, 2 cars Bermudez Lake asphalt 55-56 penetration, 1 car 120-130 penetration asphalt, 20 cars 60-70 penetration asphalt and 2 cars soft coal.

Floating Plant—Phila., Pa.—Until Feb. 3, by Dept. Wharves, Docks & Ferries, Bourse Bldg., emergency work of repairing floating plant. About $15,000.

Hoisting Engine and Steam Shovel—Memphis, Tenn.—J. J. Ross, 380 Randolph Bldg., receiving bids furnishing one 8 x 10 in. or 10 x 12 in. hoisting engine and ¾ yd. steam shovel, caterpillar drive.

Coal Handling Equipment—Akron, O.—Until Feb. 13, by E. A. Zeisloft, dir. Bd. Pub. Serv., furnishing and erecting coal handling equipment, including (1) 1 locomotive crane and bucket, (2) suspended coal bunker and weighing larry, (3) motor-driven portable coal crusher. Bids may be made on any or all of the items. G. G. Dixon, engr.; advertised in this issue.

Sewer Machine and Mixer—Detroit, Mich.—Until Feb. 3, by J. A. Martin, comr. purchases and supplies, furnishing sewer digging machine, steam or gasoline driven, 48-72 in. trench and 24 ft. depth capacity, also batch concrete mixer.

Sinking Piers, etc.—Detroit, Mich.—Until Feb. 10, by Bd. Rd. Comrs., Wayne Co., sinking four 90 ft. pneumatic caisson piers, also fabricating and erecting steel supporting girders. E. N. Hines, chairman, advertised in this issue.

Dam—Flint, Mich.—Until Feb. 6, by F. D. King, city clk., rebuilding Hamilton Dam; advertised in this issue.

Mixer—Monreoe, Mich—Until Feb. 10, by F. M. Kressbach, city clk., for concrete batch mixer; advertised in this issue.

Boiler and Stack—Milwaukee, Wis.—Cahill & Douglas, engrs., 217 West Water St., receiving bids for 150 h.p. high pressure tubular boiler and 100 ft. steel stack, for Barnett Woolen Mills Co., 200 Muskego Ave.

Lumber and Piling—Clinton, Ia.—Until Feb. 3, by Comrs. Clinton Co., furnishing 120 M ft. lumber and 5,600 ft. piling.

Lumber, Steel, etc.—Muscatine, Ia.—Until Feb. 17, by Comrs. Muscatine Co., furnishing lumber, reinforcing steel, corrugated culverts and concrete pipe.

Steel, etc.—Northwood, Ia.—Until Feb. 6, by Comrs. Worth Co., furnishing 80,000 lb. reinforcing steel and 2,000 ft. corrugated culverts.

Lumber, Steel, etc.—Osage, Ia.—Until Feb. 3, by Comrs. Mitchell Co., furnishing 75 M ft. lumber, 10,000 lb. reinforcing steel and 5,000 ft. corrugated culverts.

Lumber, Piling, etc. — Primghar, Io. — Until Feb. 2, by Comrs. O'Brien Co., furnishing lumber, piling, corrugated culverts and concrete pipe.

Cement, Steel, etc.—Red Oak, Ia.—Until Feb. 4, by Comrs. Montgomery Co., furnishing 600 bbl. cement, 50,000 lb. reinforcing steel, 800 ft. corrugated culverts, 4,800 ft. concrete pipe and 500 tons sand and gravel.

Lumber, Piling, etc.—Sigourney, Ia.—Until Feb. 2, by Comrs. Keokuk Co., furnishing 104 M. ft lumber, 3,700 ft. piling and 4,670 ft. corrugated culverts.

Lumber, Cement—Waukon, Ia.—Until Feb. 4, by Comrs. Allamakee Co., furnishing 1,273 M. ft. lumber and 2,500 bbl. cement.

Lumber, Piling, Steel, etc.—Winterset, Ia.—Until Feb. 3, by Comrs. Madison Co., furnishing 283 M. ft. lumber, 4,000 ft. piling, 40,000 lb. reinforcing steel, 9,000 ft. corrugated culverts and 2,000 ft. concrete pipe.

Graders and Crusher—Little Falls, Minn.—Until Feb. 3, by B. Y. McNairy, aud. Morrison Co., furnishing one 12 ft. blade grader, 1 elevator grader and 1 stone crusher, bin and screen complete.

Tractors, etc.—Yankton, S. D.—Until Feb. 4, by Auditor Yankton Co. furnishing three 15 h.p. road tractors, two 2-ton steel dump bodies with band hoists for Nash quad trucks, 4 drags, 1 portable sand and gravel loader.

Wharf—Shenacadie, N. S.—Until Feb. 9, Dept. Pub. Wks., Ottawa, building pile and timber wharf, 30 ft. wide, 15 ft. high and 340 ft. long. Work involves 100 spruce or hemlock piles and 200 creosoted piles. About $60,000. A. Lafleur, Ottawa, engr.

Road Machinery—Toronto, Ont.—Until Feb. 2, by W. A. McLean, Dept. Highways, for two ¾ yd. steam shovels, 40 railway breaker plows, 40 heavy hand plows, 300 drag scrapers, 100 wheel scrapers and 6 horse graders. About $80,000. G. Hogarth, engr.

Coal Wharf — Williams Head, B. C.—Until Feb. 9, by Dept. Pub. Wks., Ottawa, repairing 8 x 130 ft. coal wharf, here. About $25,000. A. Lafleur, Ottawa, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Tanks—Fall River, Mass.—Fall River Electric Light Co., 85 North Main St., let contract building concrete storage tanks, concrete foundation, to J. Crowe Co., Inc., 486 2nd St. About $10,000.

★Carousel—Hartford, Conn.—S. A. De Waltoff, 67 California St., West Haven, will build carousel, at Capitol Park, here. About $15,000. Work will be done by day labor.

★Track Repairs, etc.—Brooklyn, N. Y.—E. Riegelmann, boro. pres., let contract improving part of Eastern Parkway Rapid Transit R.R., to Holbrook, Cabot & Rallins, 52 Vanderbilt Ave., New York City, $199,485. Noted Jan. 15.

Boiler Pumps, etc.—New York, N. Y.—Bd. Trustees, Bellevue and Allied Hospitals, at Office of General Medical Supt., 415 East 26th St., received bids for boiler pumps, etc., for boiler plant at Fordham Hospital, Crotona Ave. and Southern Blvd., from Chute, Thornton & Bailey, 2 East 13th St., $36,500, Kings Co. Heating & Ventilating Co., 40 Boerum Pl., Brooklyn, $38,750, Johnson Heating Co., $46,524; building boiler plant, from J. L. Brennan, 223 West 167th St., $2,750, Rangeley Constr. Co., 405 Lenox Ave., $2,998, T. Dwyer, Bway. and 212th St., $4,140. Noted Jan. 22 under "Industrial works."

Garbage Disposal—Rochester, N. Y.—Bd. Pub. Wks. received only bid Jan. 21, building and equipping garbage reduction plant, from C. O. Bartlett and Snow Co., French and Winter Sts., Cleveland, O., $648,280. Noted Jan. 15.

Freight Sheds—Stapleton, S. I. N. Y.—M. Hurlburt, comr. docks, Pier "A", foot of Battery Pl., New York City, received bids Jan. 26, building part or all of series of new freight sheds and appurtenances on Piers 6, 7, 8, 9, 10 and 11, here, from Bethlehem Steel Co., 111 Bway., $2,577,950, Snare & Triest, 233 Bway., $2,587,447, Post & McCord, 101 Park Ave., $2,602,843; plumbing, etc., from Egan Co., Inc., 32 Old Bway., $93,962, C. H. Darmstadt Co., 352 West 53rd St., $97,851, J. D. Duffy, 315 East 23rd St., $102,454. Contractors all of New York City. Noted Jan. 22.

Piers—Stapleton, S. I. N. Y.—M. Hurlburt, comr. docks, Pier "A," foot of Battery Pl., received bids furnishing labor and material for building piers 6, 7, 8, 9, 10 and 11, Richmond Boro., from Terry & Tench, Grand Central Terminal, New York City, $3,252,570; Smith, Houser & McIsaac, 18 East 41st St., New York City, $3,526,093; Piers 6 and 7, from H. P. Converse, Boston, $559,125 and $557,800 respectively; Snare & Triest, 233 Bway., New York City, $575,810 and $574,275 respectively; Pier 9, from B. L. Cronin, 573 Clinton St., Brooklyn, $482,651; Pier 10 and 11, from G. B. Spearin, 90 West St., New York City, $706,900 and $717,707 respectively; Pier 11, D. C. Serber, 1123 Bway., New York City, $503,280. Noted Jan. 15.

★Asphalt Plant—Trenton, N. J.—City Comn. let contract building 1 story, 50 x 75 ft., asphalt plant, brick, on Brunswick Ave., to N. A. K. Bugbee Co., 206 East Hanover St. About $11,000.

★Reflooring—Donora, Pa.—Washington and Westmoreland Counties let contract reflooring 1,578 ft. bridge, 30 ft. wide, between here and Webster, to have 24 ft. roadway and 6 ft. sidewalk, treated white oak, to Farris Eng. Co., Empire Bldg., Pittsburgh. About $55,000.

Cranes — Detroit, Mich. — Bd. Water Comrs., 232 Jefferson Ave., received bids furnishing two 20-ton locomotive cranes, 8 wheel, steam operated standard gage, from Orton & Steinbrenner Co., 608 South Dearborn St., Chicago, $24,860; McMyler Interstate Co., Bedford, O., $27,590.

Trench Excavators—Detroit, Mich.—Bd. Water Comrs., 232 Jefferson Ave., received bid furnishing 2 wheeled type trench excavators, from Buckeye Traction Co., Findlay, O., $10,000; Pawling & Harnischfeger Co., 38th St. and Natl. Ave., Milwaukee, $14,000.

★Rolling Mill Equipment—New Ulm, Minn.—Eagle Rolling Mill Co. let contract furnishing rolling mill equipment, including boilers, crane and coal handler, to J. G. Robertson, 2542 University Ave., St. Paul. About $35,000.

Asphalt Paving Plant—St. Paul, Minn.—H. W. Austin, city purch. agt., received bids Jan. 12, for asphalt paving plant, 400,000 lb. daily capacity, from Barber Asphalt Paving Co., Metropolitan Bank Bldg., Minneapolis, $17,225; Hetherington-Berner, Kentucky Ave. and White River, Indianapolis, Ind., $19,580. Noted Jan. 8.

Gate Valves—St. Paul, Minn.—City received bids Jan. 12, furnishing c. i. gate valves, from Bingham & Taylor, Ellicott Sq., Buffalo, $12,045; Central Fdry. Co., 90 West St., New York City, $14,772.

★Portland Cement—Astoria, Ore.—Clatsop Co. let contract furnishing and delivering 23,500 bbl. cement, to G. W. Sanborn & Sons, Astoria, $3.16 per bbl. net; 6,100 cu.yd. sand, to Callender Navigation Co., Astoria, $3 per cu.yd. Noted Jan. 22.

★Pipe — Los Angeles, Cal. — Bd. Pub. Serv. Comn. let contract furnishing 40,000 ft. 6 in. riveted steel pipe, to Lacy Mfg. Co., 1,000 North Main St., $0.58 per ft. Noted Jan 22.

★C. I. Pipe—Whittier, Cal.—City let contract furnishing 48,786 ft. 4-24 in. Class "B" c.i. pipe, to U. S. Cast Iron Pipe Co., 215 West 7th St., Los Angeles. About $185,248. Noted Jan. 22.

Machinery — Toronto, Ont. — Provincial Government let contract for 2 road rollers, to Sawyer-Massey Co., North Wellington St., Hamilton, $10,000; 6 stone crushers, to Climax Road Mchy. Co. Burton St., Hamilton, $18,000; 2 road rollers, to Wateraus Engine Works Co., South Market St., Brantford, $10,000.

★Drydock, etc.—Vancouver, B. C.—Coughlan & Sons, Front and Columbia Sts., will build drydock and repair plant. About $3,750,000. Work done by day labor.

OFFICIAL PROPOSALS

Bids: Feb. 10.

Canal Improvements

STATE OF NEW YORK
OFFICE OF SUPERINTENDENT OF
PUBLIC WORKS

Albany, N. Y.

Sealed proposals will be received by the undersigned at his office in the Capitol at Albany, N. Y., until twelve o'clock noon of Tuesday, February 10th, 1920, at which place and hour they will be publicly opened and read, for improving the New York State canals pursuant to the provisions of Chapter 147 of the Laws of 1903, and amendatory and supplementary laws, and Chapter 735 of the Laws of 1917 and Chapter 634 of the Laws of 1919, as follows:

—1—

Schenectady-Scotia Bridge
Abutments and Approaches

This contract will provide for constructing the abutments and approaches of a reinforced concrete bridge, to extend from the junction of State street and Washington avenue in the city of Schenectady, across the Barge canal terminal channel, Van Slyck island, the Barge canal main channel, Hog Island and the Scotia channel, to a point about three hundred feet north of the junction of Schonowee avenue and Mohawk avenue in the village of Scotia.

The construction of all roadway pavements, concrete sidewalks and curbs supported on new fill, track work, trolley wires and feeders, lamps and wiring, drains and other inicdental work, will not form a part of this contract; also, a gap will be left in the Scotia approach to provide for the maintenance of traffic for electric cars, vehicles and pedestrians.

Contract plans, sheets 1 to 7 inclusive.

All work must be completed before the expiration of fifteen months after the date of signing the contract.

Also, for the construction of Barge canal terminals pursuant to the provisions of Chapter 746 of the Laws of 1911, and of the acts amendatory thereof, as follows:

—2—

TERMINAL CONTRACT NO. 28-A

For protecting the breakwaters at the Cleveland terminal.

Contract plans, sheets 1 and 2.

Plans may be seen and detailed specifications, engineer's estimates of quantities, proposal blanks, form of contract and bonds required and other information for proposers may be had at the office of the Superintendent of Public Works at Albany, N. Y., at the office of the Assistant Superintendent of Public Works for the Eastern Division, Wedgeway Building, Schenectady, N. Y., at the office of the Assistant Superintendent of Public Works for the Middle Division at Syracuse, N. Y., at the office of the Assistant Superintendent of Public Works for the Western Division at Rochester, N. Y., and at the canal office, Spauldings' Exchange, Buffalo, N. Y.

Copies of detailed plans or drawings may be obtained from the State Engineer and Surveyor at Albany, N. Y., upon payment to him of the cost of producing them.

Monthly estimates will be paid of ninety per centum (90 per cent) of the work done at the contract price. Every proposal for said work must be accompanied by a money deposit in the form of a draft or certified check upon some good banking institution in the city of Albany or New York, issued by a national or state bank or trust company (in the case of terminal contract), in good credit within the state payable at sight to the Superintendent of Public Works for five per centum (5 per cent) of the amount of the proposal.

The person whose proposal shall be accepted will be required to execute a contract and furnish bonds within ten days from the date of notice of award delivered to him or them in person or mailed to the address given in the proposal.

Upon execution of the contract and approval of bonds, the certified check or draft will be returned to the proposer unless the same shall have been presented for collection prior to such time, in which case the amount of the deposit will be refunded by the Superintendent of Public Works.

The deposits of bidders other than the one to whom the award of contract shall be made will be returned immediately after the award has been made.

The bond required for the faithful performance of each contract shall be in such sum as shall be fixed by the Superintendent of Public Works, which sum shall not be less than twenty per centum (20 per cent) of the estimated cost of the work, according to the contract price, and an additional bond, known as the labor bond, in the sum of ten per centum (10 per cent) of the amount of the estimated cost of the work according to the contract price, will be required as security that the contractor will pay in full at least once in each month all laborers employed by him upon the work specified to be done in the contract.

In the event that more than one surety company is offered as surety on said bonds co-insurance only will be accepted.

Each proposal must be addressed to the Superintendent of Public Works, Albany, N. Y., and must be endorsed on the envelope with the name of the construction for which the proposal is made.

Award, if made, will be made to the person or persons whose proposal shall be lowest in cost to the state for doing the work, and which shall comly with all provisions required to render it formal. Before any award shall be made the lowest bidder will be required to satisfy the Superintendent of Public Works of his ability to provide suitable equipment and materials for the proper performance of the work.

The right is reserved to reject all proposals and readvertise and award the contract in the regular manner if, in the judgment of the undersigned, the interests of the state will be enhanced thereby.

EDWARD S. WALSH,
Superintendent of Public Works.

Bids: Feb. 9.

Road Work

Salem, N. J.

Sealed bids will be received by the Road Committee of the Board of Chosen Freeholders of the county of Salem for the reconstruction of the Penn Grove-Pennsville Road, 3rd Section, in the township of Lower Penn's Neck in the County of Salem, with a concrete surface; requiring 12,713 square yards of concrete; at the Court House in Salem, N. J., on Monday, February 9th, 1920, at 11 A.M.

Plans and specifications may be inspected by prospective bidders during business hours at the office of H. B. Keasbey, County Engineer, Salem, N. J., and bidders will be furnished with a copy thereof and any other information desired upon request to said engineer.

COUNTY OF SALEM
IRVIN G. OCHS,
Clerk.

Bids: Feb. 24.

Erection of Grandstand or Stadium

East Orange, N. J.

WANTED.—Designs and proposals for the erection of a concrete grandstand or stadium on Ashland Field in the City of East Orange, N. J., same to seat 7,500 to 10,000 persons. Builders must submit their own designs with a guaranteed estimate for the work in accordance with general specifications which can be had on application to the Secretary of the Board of Education. Designs and proposals must be submitted on Feb. 24, 1920, at 8 o'clock p.m.

The Board reserves the right to accept or reject any or all designs and proposals.

THE BOARD OF EDUCATION
of East Orange in the County of Essex.
By FRED T. DUGAN, Secretary.
Jan. 14, 1920.

Bids: Feb. 17.

Main Sewer Construction

Nutley, N. J.

Sealed bids for constructing a main sewer will be received by the Town Clerk, Town of Nutley, N. J., at 8:15 p.m., Feb. 17, 1920, at which time they will be publicly opened and read by the Board of Commissioners.

The work proposed consists of the following approximate items.

1,830 lineal feet of rock tunnel with the minimum section to permit construction, lined with vitrified tile segmental block and underdrained with 12" vitrified tile pipe.
1,520 lineal feet of 30" reinforced concrete pipe.
200 lineal feet of 48" reinforced concrete pipe.
9 manholes, four of which are of special design.

The rock tunnel is through a brown sandstone, which has been quarried for building purposes. The tunnel passes into an abandoned quarry hole, which may be used as a location for the construction plant. Four headings may be worked on the tunnel, two at the extreme ends and two in the quarry hole. No trouble is anticipated from water in the tunnel.

Bids based on other designs for the tunnel section will be considered.

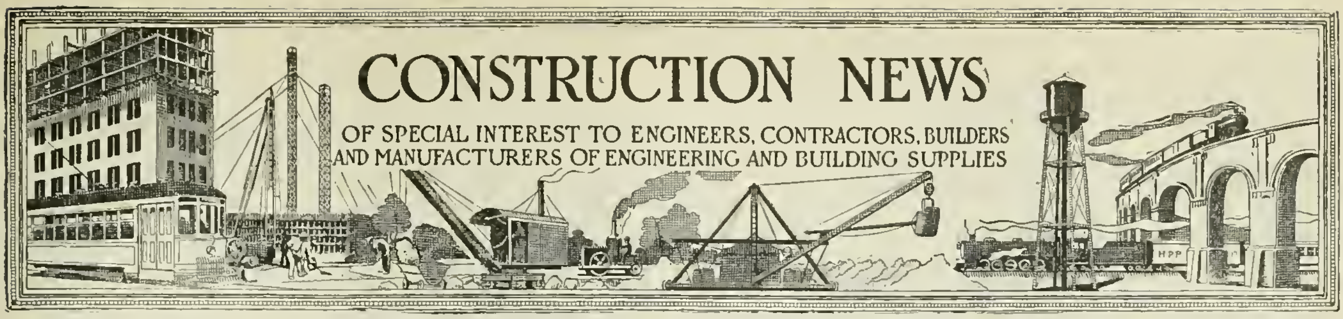
The amount of time to complete the work must be stated, and will be one of the factors in awarding the contract.

Plans, Specifications, Information for Bidders, Forms of Proposal, Agreement and Bond, can be obtained from the Town Engineer on payment of $10, which will be refunded on the return of the set in good order.

A certified check for $4,000 must accompany each bid, and a bond for the full amount of the bid will be required for the faithful performance of the work.

The Board of Commissioners reserves the right to reject any or all proposals, and to accept any proposal which they deem to be most favorable to the interests of the Town of Nutley. Due consideration will be given to the experience, and the amount of equipment available for this work, of the bidders.

EMIL DIEBITSCH,
Mayor and Commissioner of Streets
and Public Improvements.
G R. B. SYMONDS, Town Engineer.



CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

UPS AND DOWNS OF THE MARKET

PIG IRON AND STEEL—General increase of $3 to $7. Heavy and strengthening demand for iron and steel products. Scarcity of steel over country, and shortages of cars, coal and labor.

RAILWAY TIES—Advanced about 10c. in San Francisco.

STEEL PIPE—No change.

CAST IRON PIPE—Up $5 in New York, $3 in Chicago, $10 in St. Louis, $5 in San Francisco.

CLAY DRAIN TILE—Up $10 for 3-in to $60 for 8-in. in Chicago.

SEWER PIPE—Up 1.5c. for 3-in. to 75c. for 36-in. in Chicago; increases in Boston, St. Poul, Los Angeles, Cincinnati, Detroit, Baltimore, and New York.

ROAD OILS—Sharp increase in New York, St. Louis and Chicago.

ASPHALTUM—New York, up $8 for asphaltum in bulk, and $12 in packages; San Francisco, $1.25 rise; Kansas City, $3 rise.

PAVING STONE—Up 65c. for dressed, 60c. for common, in Chicago; up 30c. in St. Paul.

SAND—Practically no stock in New York; $1.50 quoted for spring deliveries. Prices advanced in Kansas City, St. Paul, Los Angeles, Baltimore and Montreal. Price doubled (from $1 to $2) in Boston.

GRAVEL—Up to 40c. to 50c. in Kansas City and Boston; 1½-in. gravel advanced 25c. in St. Paul.

CRUSHED STONE—Official prices in New York remain same as last month, but an advance of 25c. is asked for spring deliveries. Increases in Boston, St. Paul, Atlanta, Los Angeles and Montreal.

LIME—Increases in Chicago, St. Louis, Boston, Cincninati, St. Paul, Baltimore and Montreal. Sharp decrease ($10) in hydrated, in San Francisco.

PORTLAND CEMENT—Increases of 20c. in San Francisco, 45c. in Cincinnati

REINFORCING MATERIALS—Expanded metal lath increased in price $2 to $5 in Chicago, St. Louis and San Francisco; up $1 in New York. Increase of 30c. on bars rolled from billets, San Francisco. No changes in triangle mesh.

COMMON BRICK—The remarkable advance continues. New York quotations are $25, alongside dock, $30.45, delivered Manhattan; increase of $2.50 and $5.65, respectively. Up $2 in Chicago and St. Louis. Increases of $1 to $3.50 in St. Paul, Cincinnati, Detroit. The price in Boston has risen $8, present quotation being $35 per M.

HOLLOW TILE—Quotations are again available in New York: $166.70 and $222,30 per M. for 4-in. and 6-in. partition tile. Increases in Kansas City and Baltimore.

STRUCTURAL MATERIAL—San Francisco: All except plates up 40c.; last month's prices maintained elsewhere.

RIVETS—Increases of 25c. per 100 lb., Chicago and San Francisco. Manufacturers well sold up for first quarter, and present prices are firm on the basis of $4.15 for large structural and ship rivets.

NAILS—Quoted in Pittsburgh at $3.25 to $4.50 per keg for wire; New York warehouse quotes $7.50. Prices again available in Chicago: $4.15 for wire, $7 for cut. Montreal reports $4.95 for wire, $5 for cut.

PREPARED ROOFINGS—Raw materials and stocks scarce, with high prices prevailing. Remarkably high prices have not checked the demand for roofings, the effect being seemingly the reverse. Increase on prepared roofings is 50c. per sq. over prices quoted two months ago. Asbestos-saturated felt rose from $156 to $170 per ton. Shingles, red and green slate finish, are $7.25 per square, against $6 a month ago, Philadelphia. Tar felt (14 lb. per square) advanced from $70 to $84; asphalt felt up from $68 to $88 per ton.

SHEETS—The first column in this item shows the official prices of the U. S. Steel Corporation, but large premiums are paid for even fair delivery. Warehouses have boosted prices in St. Louis, San Francisco and New York.

LINSEED OIL—Chicago and New York report a 10-cent decrease since Jan. 1. Montreal price is $2.92 per gal.

WHITE AND RED LEAD—General increase of ½c. per lb.

LUMBER—Douglas fir up $3 on all sizes, San Francisco. Southern pine up $8 to $12 in New York; up $15 in Chicago. Increase throughout country almost general, although there has apparently been a remarkably sharp drop of $14 to $18 in heavy timbers in St. Paul. In Kansas City, 2-in. t. and g. pine advanced $25 per M., from $55 to $80. Arthur H. Campbell, managing director of the Campbell, MacLaurin Lumber Co., Ltd., Montreal, writes that it is his "understanding that during 1919 only 45 per cent of the normal cut of lumber was manufactured on the North American continent."

LABOR—Wages changed only in Boston and St. Paul.

Price advances are indicated by **heavy type**; declines by *italics*

PIG IRON—Quotations compiled by The Matthew Addy Co.:

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	**$43 60**	$36 60
Northern Basic	**39 80**	34 00
Southern Ohio No. 2	**42 80**	36 55
NEW YORK, tidewater delivery		
2X Virginia (silicon 2.25 to 2.75)	**47 65**	39 40
Southern No. 2 (silicon 2.25 to 2.75)	**47 70**	41 40
BIRMINGHAM		
No. 2 Foundry	**40 00**	33 00
PHILADELPHIA		
Eastern Pa	**44 00***	38 10*
Virginia No. 2	**42 00***	39 10*
Basic	**41 50†**	34 60†
Grey Forge	**41 50***	34.60*
CHICAGO		
No. 2 Foundry Local	**42 25**	36 25
No. 2 Foundry Southern	**45 00**	33 00
PITTSBURGH, including freight charge from the Valley		
No. 2 Foundry Valley	**42 40**	....
Basic	**41 90**	34 40
Bessemer	**42 40**	35 40
MONTREAL		
Silicon 2.25 to 2.75%	**40.00**	....

* F. o. b. furnace. † Delivered.

RAILWAY SUPPLIES

STEEL RAILS—The following quotations are per ton f. o. b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Current	One Year Ago	Current	One Year Ago
Standard bessemer rails	$45.00	$55.00	$45 00	$65 00
Standard openhearth rails	47.00	57 00	47 00	67 00
Light rails, 8 to 10 lb	2 58½*	3 13½	2.585*	3 13½*
Light rails, 12 to 14 lb	2.54*	3.09*	2 54*	3.09*
Light rails, 25 to 45 lb	2.45*	3.00	2.45*	3.00*

* Per 100 lb.

RAILWAY TIES—For fair-sized orders, the following prices per tie hold:

		7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago	Plain	$1 48	$1 33
San Francisco	Douglas Fir—Green	1 74	1 24
San Francisco	Douglas Fir—Creosoted	3.36	2 38

Prices per tie at Missouri mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0.70	No. 1	$0.55
No. 2	.80	No. 2	.65
No. 3	.90	No. 3	.75
No. 4	.98		
7x9x8 white oak			1.05
7x9x8 red oak (No. 4)	$0.80	No. 5	.87

Note.—Add 36c. each for treatment.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh				
	Current	One Year Ago	Chicago	St. Louis	San Francisco
Standard spikes, 9/16-in. and larger	$3.35	$3.70	*$3.62*	$4 44	$5 65
Track bolts	4.90-5 00	4 90	*4.62*	Premium	6.65
Standard section angle bars	*2.75*	.	*3.02*	Premium	4 60

PIPE

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh: basing card of National Tube Co. for steel pipe, Cardry A. M. Byer's Co. for iron, both dated Mar. 21, 1919.

BUTT WELD

Inches	Steel Black	Galvanized	Inches	Iron Black	Galvanized
⅛, ¼ and ⅜	50½%	24%	¾ to 1½	30%	23½%
½	54½%	40%			
¾ to 3	57½%	44%			

LAP WELD

Inches	Steel Black	Galvanized	Inches	Iron Black	Galvanized
2	50½%	35%	2	32½%	18½%
2½ to 6	53½%	41%	2½ to 6	34½%	21½%

BUTT WELD, EXTRA STRONG PLAIN ENDS

Inches	Steel Black	Galvanized	Inches	Iron Black	Galvanized
⅛, ¼ and ⅜	46½%	29%	¾ to 1½	39½%	24½%
½	51½%	39%			
¾ to 1½	55½%	43%			

LAP WELD, EXTRA STRONG PLAIN ENDS

Inches	Steel Black	Galvanized	Inches	Iron Black	Galvanized
2	48½%	37%	2	33½%	20½%
2½ to 4	51½%	40%	2½ to 4	35 %	23½%
4½ to 6	50½%	39%	4½ to 6	34½%	22½%

Malleable fittings. Class B and C, banded from New York stock, sell at list plus 22½% off. Cast iron, standard sizes, net.

STEEL—From warehouses at the places named the following discounts hold for steel pipe:

	Black		
	New York	Chicago	St. Louis
¾ to 3 in. butt welded	47%	57.5%	45%
2½ to 6 in. lap welded	42%	53.5%	41½%

	Galvanized		
	New York	Chicago	St. Louis
¾ to 3 in. butt welded	31%	44%	30½%
2½ to 6 in. lap welded	27%	41%	27½%

Malleable fittings, Class B and C, from New York stock sell at +12½% list prices. Cast iron, standard sizes, 10% off.

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York						
	Current	One Month Ago	One Year Ago	Chicago	St. Louis	San Francisco	Dallas
4 in	$70.30	$65.30	$70.70	$72 80	$71 00	$88.55	$70 30
6 in. and over	67.30	62.30	67.70	69.80	68 00	85.55	67.30

Gas pipe and 16-ft. lengths are $2 per ton extra.

CLAY DRAIN TILE—The following prices are per 1000 lin.ft.:

	New York					
Size, In.	Current	One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$35 00	$35 00	$22.50	$60 00	......	$33.44
4	51.00	51.00	27 00	80 00	$45.00	50 16
5	65.00	65 00	45 00	100 00	65 00	62.70
6	90.00	90 00	55 00	120 00	90.00	83 60
8	130.00	130 00	100.00	180 00	150.00	133.76

SEWER PIPE—The following prices are in cents per foot for carload lots:

	New York					
Size, In.	Current Delivered	Year Ago Not Del.	St. Louis	Chicago	San Francisco	Dallas
3	$0.18	$0.117	....	$0.135	...	$0.15
4	.18	.117	....	.135	$0.16	.15
5	.27	.1755	.	.2025	20	.21
6	.27	.1755	$0 16	.2025	24	21
8	42	.273	.21	.315	34	30
10	62	.4095	.29	.4725	47	.42
12	80	.5265	.37	6075	64	.54
15	1 23	.702	56	81	1 00	78
18	1.78	.975	91	1.225	1 35	1 02
20	2 13	1 17	1 14	1 35	1.80	1 38
22	2 84	1 56	1 46	1 80	....	1 80
24	3 20	1 755	1 56	1 925	2.24	2.70
27		260	1 90	3 25	..	3 30
30	....	288	2 57	3 75	.....	4 20
33	...	378	3 09	4 50	......	4 025
36	..	4 305	3.37	5 10	......	4 80

	3	5	8	12	24	36
Boston	$0 126	$0 189	$0 294	$0 567	$1 89	$5 0225
St. Paul	.125	*166*	295	.495	*1 85*	*4.35*
Denver	12	.18	27	.45	1 65	..
Seattle	..	......	.36	....	....	
Kansas City	.12	.18	.25	50	1 80	4 60
Los Angeles	0975*	1525*	27	48	60*	....
New Orleans			40 per Cent off			
Cincinnati	123	1845	287	5535	1 845	
Atlanta	......	..	34	55	2 00	
Montreal			50 per cent off			
Detroit	12	18	28	54	2 07	5 2275
Baltimore	114	171	266	513	1 71	

* 4-in , 6-in., 30-in. respectively.

ROAD AND PAVING MATERIALS

ROAD OILS—Following are prices per gallon in tank cars 8000 gal. minimum f.o.b. place named:

	Current	One Month Ago
New York, 45-65% asphalt	$0 09	$0.04½
New York, liquid asphalt	09	.06
New York, binder	095	.06½
New York, flux		.04¾
St. Louis, 40% asphalt	065	.0424
Chicago, 40-50% asphalt	07	055
Chicago, 60-70% asphalt	.0725	.0575
Dallas, 40-50% asphalt	.07	.07
Dallas, 60-70% asphalt	08	.08
Dallas, 75-90% asphalt	.10	10
San Francisco, asphalt base, per bbl	2 25	2.25

ASPHALTUM—Price per ton in packages and bulk in carload lots:

	Brand	Package	Bulk
New York	Texaco	$30 00	$25 00
Chicago	Mexican	24.25	17.75
San Francisco	California	17.00	13.75
Dallas	Texaco and Mexican	32.00	30.00
Seattle	D grade	25.00	.....
Denver	California	38.00	.....
St. Paul	Mexican	24 00	21 00
Kansas City	Mexican	28 00	24 00
Atlanta	Standard	25.00	20.80
New Orleans	....	16.50	.....
St. Louis	Stanolind	*23.25**	*17.75*
Baltimore	Manco	43.00	.....
Los Angeles	D grade	....	15.00
Montreal	.	.....	19 00

*f.o.b. Whiting, Ind ; freight to St. Louis $2.90 per ton

PAVING STONE—

Chicago	About 4x8x4 dressed	$3 10	sq.yd
	About 4x8x4 common	2 80	sq.yd.
San Francisco	Basalt block 4x7x8	65.00	per M
Kansas City	Granite	3.00	sq.yd.
Boston	5-in. granite	110.00	per M
St. Paul	Sandstone	2.47	sq.yd.
Atlanta	Granite	2.00	sq.yd.
Detroit	Granite, small	4.10	sq.yd.
Baltimore	Common	2.30	sq.yd.
Montreal	Granite	5.90	sq.yd.

FLAGGING—

New York	Bronx	$0.21	sq.ft.
	Manhattan	.22	sq.ft.
	Queens, 5 ft. square	.23	sq.ft.
	5x20-in. cross-walk	.75	lin.ft.
Chicago	18 in. wide	.70	lin.ft.

WOOD BLOCK PAVING—	Size of Block	Treatment	Per Sq.Yd.
New York	3½	16	$3.35
New York	4	16	3 65
Chicago	4	16	4.50
Chicago	3½	16	3.50
Chicago	City specifications		5 00
St. Louis	3½	16	2 90
St. Louis	4	16	3.32
Seattle	4	16	2.55
Kansas City	4	16	3.00
St. Paul	3½	..	2 75
Atlanta	3½	16	2 30
New Orleans	3½	16	2 63
New Orleans	4	16	3 00
Dallas	3½	18	2.92
Dallas	4	18	2.98
Baltimore	3½	16	3 60
Montreal	4	16	4.60

CONSTRUCTION MATERIALS

SAND AND GRAVEL—Price for cargo or carload lots is as follows, per cu.yd.:

	Gravel					
	1½ In.		¾ In.		Sand	
	Current	One Yr. Ago	Current	One Yr. Ago	Current	One Yr. Ago
New York	$2.00	$2 00	$2.00	$2.00	$1.25	$1 25
Denver	1.60	1 55	1.60	1.55	1.25	1.10
Chicago	2.00	2.00	2.00	1 40	2.00	1 10
Kansas City	3.00	2.15	3.50	2.60	1.25	1.00
St. Louis	1.78	1.76	1.82	1.82	1.68	1.68‡
Seattle, per ton	1.25	1.25	1.25	1.25	1.25	1.25
Dallas	3.50	2.00	3.50	2.00	2.25	1.35
St Paul	1.50	1.25	1.35	1.35	.75	.60
Cincinnati	....	1.35‡	....	....	1.30	1.35‡
San Francisco	1 15	1.20	1.15	1.20	1.15	1.20
Boston	2 00	2.75	2.00	2.75	2.00	1.25
New Orleans	2 40	4.00	2.40	1.80	1.20	1.88
Los Angeles	1 50	1.25	....	1.50	1.00	1.10
Atlanta, per ton	2 25	....	2.25	....	1.15	...
Detroit	2 50	....	2.00	....	2.50	....
Baltimore	1 54	....	1.75	....	.65-75	....
Montreal, per ton	1 20	....	....	....	1.40	....

* Fine white sand, Pacific & Ottawa, per ton $6.
† Kaw River sand is $1.75 per yd. ‡ per ton.

CRUSHED STONE—Price for cargo or carload lots is as follows, per cu.yd.:

	1½ In.		¾ In.	
	Current	One Year Ago	Current	One Year Ago
New York	$1.75	$1.70	$1.85	$1 85
Chicago	2.00	1 60	2.00	1.70
St. Louis	1.65	1 25	1 65	1.25
Dallas	2.90	2 05	2.90	2.05

CRUSHED STONE—Continued

San Francisco	1 15	1.20	1 15	1.20
Boston	3 00 (del)	1 75	3 00 (del)	1.75
St. Paul (lime)	1 50†	1.15	1.60	1.25
Denver	.	.	1.60	1.55
Kansas City	2 25	1.70	2.35	1 80
Seattle	2 00	1 50	2 00	1.50
Atlanta	2 85*	3.36	2 95*	....
New Orleans	4 00	..	4 35	1.28
Los Angeles	1 50	1 50	1 50	1.60
Detroit	1 75	....	1 75	....
Baltimore	1 25	....	1.50	....
Montreal	*1 75**	....	*2.00**	....

* Per ton. † Limestone, traprock, $1.60 and $1.80 per ton for 1½ and ¾-in.

LIME -Warehouse prices:

	Hydrated per Ton Finished	Hydrated per Ton Common	Lump per 200-Lb. Barrel Finished	Lump per 200-Lb. Barrel Common
New York	$17.50	$14 50	$2 75*-at plant-	$2 55*
Kansas City	25 50	21 00	2 40	2 30
Chicago	20 50	*14 50*	2 25	1.50
St. Louis	22 00	18 00	.	2 00
Boston	24 00	19 00	4 00*	3 50*
Dallas	30 00		2 75	
Cincinnati	16 20	13.20	12.95‡	10 70‡
San Francisco	*20 00*	*16.00*	.....	2.30
St. Paul	24 00	*19 00*	1.60†	1 50
Detroit	20.00	18 00	2.00*	1 80*
Seattle	27 00	.	2.85†	2 80†
Los Angeles	2 75†	2.20†	2.75†	2.00†
Baltimore	21 00	16 95	....	*10.65‡*
Montreal	25 00	25 00	15.00‡	15 00‡
Atlanta	22 50	....	.....	.....

* 300-lb. barrels. †Per 180-lb. barrel. ‡ Per ton.
NOTE—Refund of 10c. per barrel.

NATURAL CEMENT—Price to dealers for 500 bbl. or over, f. o. b., exlusive of bags:

	Current	One Year Ago
St. Paul (Austin)	$1 50	$1 93
Kansas City (Ft. Scott)	1 70	1 70
New Orleans	2.52	3 52
Atlanta (Magnolia)	1.90	..
Cincinnati (Louisville)	1 35	1.80

PORTLAND CEMENT—Current prices are for barrels in carload lots, without bags, to contractors:

	Current	One Month Ago Without Bags	One Year Ago With Bags
New York (del.)	$2.80*	$2 80	$4.00
Jersey City (del.)	2.47	2 47	3.64
Boston	2.42	2.42	3.67
Chicago	2.00	2.00	3.05
Pittsburgh	2.05	2.05	3.15
Cleveland	2 32	2.32	3.32
Detroit	2.08	2.08	3.28
Indianapolis	2.27	2.27	3.22
Toledo	2.12	2.12	3.22
Milwaukee	2 11	2.11	3.16
Duluth	2 10	2.10	3.20
Peoria	2.12	2.12	3.16
Cedar Rapids	2.18	2.18	3.28
Davenport	2.14	2.14	3.24
St. Louis	2.20	2.20	3.30
San Francisco	2.63	2.43	3.48
New Orleans	2.36	2.36	3.77
St. Paul	2.22	2.22	3.40
Denver	3.12	3.12	3.67
Kansas City	2.36	2.36	3.30
Seattle	2.68	2.68	3.33
Dallas	2.03	2.03	2.93
Atlanta	2.70	2.70	....
Cincinnati	2 80	2.35	2.80
Los Angeles	2.78	2.78	3.68
Baltimore	2 45	2.45	
Detroit	2.23	2 23	
Montreal	3 45†	2 50	

NOTE—Bag charge is generally 15c. each. *Delivered Manhattan, The Bronx or Brooklyn. †Including bags

TRIANGLE MESH—Price per 100 sq ft. in carload lots:

PLAIN 4-INCH by 4-INCH MESH

Style Number	Sectional Area Square Inches per Ft. Width	Pittsburgh	New York	Chicago	St. Louis	Dallas	San-Francisco
032	0 032	$0.92	$1 16	$0 98	$0 99	$1.13	$1.32
049	0 049	1.18	1.48	1.26	1 26	1.43	1 67
068	0.068	1.44	1.86	1 53	1 56	1 79	2 06
093	0 093	1.85	2 39	1.97	2 00	2 41	2.65
126	0.126	2.28	3.02	2.43	2.47	2 92	3 28
153	0 153	2 72	3 59	2.90	2.95	3.48	3 93
180	0 180	3.12	4 13	3.33	3.39	3 99	.....
245	0 245	4 12	5.44	4 40	4 47	5 27	...
287	0 287	4 76	6.29	5.08	5.16	6 10	6.86
336	0 336	5.52	7 30	5.89	5.99	7.06	.....
395	0.395	6.40	8.45	6.83	6.94	8.19	.....

PAVING

Style Number	Sectional Area Square Inches per Ft. Width	Pittsburgh	New York	Chicago	St. Louis	Dallas	San-Francisco
036P	0.036	$0.71	$0 92	$0.76	$1.77	$0.80	.....
053P	0.053	1.00	1.28	1.06	1.08	1.12	.....
072P	0 072	1 26	1.66	1.34	1.37	1.46	.....
097P	0 097	1.62	2.12	1.73	1.76	1.88	.....
049R	0 049	1 00	1.28	1.06	1 08	1.12	.....
067R	0 067	1 26	1 65	1.34	1 37	1 46	.....
089R	0 089	1.62	3 11	1 73	1 76	1.88	.....

Made in 16-, 20-, 24-, 28-, 32-, 36-, 40-, 44-, 48-, 52- and 56-in. width in rolls 150-, 200- and 300-ft. lengths. Galvanized is about 10% higher.

EXPANDED METAL LATH—Prices in carload lots per 100 yd. for painted are as follows:

Gage	Weight	New York Current Carloads	New York Current Less Carloads	Chicago	St. Louis	San Francisco	Dallas
27	233	$29 10	$30.20*	$31.10	$31.00	$36 00	$32.75
26	250	30.45	31.65*	32 45	32 00		34.50
25	300	31.90	33.00*	33.90	.. .	39.00	36.75
24	340	33.50	34.65*	33.50	35.00	44 00	39.25
22	450	36 60	37.80*	......	......	......	43.30

About 10% additional for smaller quantities.
* Delivered on job. NOTE—New York price rises very shortly.

BARS, CONCRETE REINFORCING—Following quotations are per 100 lb.:

ROLLED FROM BILLETS

		Warehouse, Uncut					
In.	Mill Pittsburgh	New York Current	New York One Year Ago	Chicago	St. Louis	Dallas	San Francisco
¾ and larger	$2.35	$3.52	$4 17	$3 37	$3.25	$4 75	$4 90
⅝	2.40	3.57	4.23	3 42	3.30	4 80	4 95
½	2.45	3.62	4.27	3.47	3.35	4.95	5.00
⅜	2.60	3.77	4.42	3.62	6.50	5.00	5.15
¼	2.85	4.02	4.67	4.87	...	5.05	5.40

Twisted bars cut to length take extra of 29½c. per 100 lb.

ROLLED FROM RAILS

	Chicago	St. Louis	Dallas		Chicago	St. Louis	Dalla
¾ in. and larger	$3.00	$3.65	$4.25	⅜	$3.25	$3.90	.....
⅝	3.05	3.70	4.30	¼	3.50		
½	3.10	3.75	.				

BRICK—To contractors price per 1000 in cargo or carload lots is as follows:

	Common Current	Common One Month Ago	Common One Year Ago	Paving Brick	Paving Block
New York	$25 00	$24 70	$14 00	No Quotations	
Chicago	14 00	12.00	11.00	41 00	47 00
St. Louis, salmon	14 00	12.00	12.00	29 00	.. .
Denver, salmon	14.00†	14.00†	9.50	.....	38.00
Dallas	18.57	18 57	16.07	27.30	.....
San Francisco	12.50	12.50	12.00	.....	.....
Boston	35 00	27.00	16.53 17.00	45.00	.....
St. Paul	20 00	14.50	10.25	.....	40.00
Kansas City	20.00	18.00	13.00	44.50	.....
Seattle	15.00	15.00	15.00	.....	42.00
Cincinnati	19.00	17.00	16.50-17 00	36.00	.....
Montreal (del.)	17.50	17.50	.....	55.00‡	.....
Detroit	21.00	20.00	.....	40.00	.....
Baltimore (del.)	18 00-22.00	20 00	.....	25.00	45.00

*Hard brick $17.50 in St. Louis. †Hard red is $16 in Denver. ‡Not delivered.

HOLLOW TILE—Price per block in carload lots for hollow building tile:

	New York Current	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas	Factory Perth Amboy, N. J.
4x12x12	166 70†	$0.11925	$0.12	$0.08	$0.1125	$0.1088	147.80†
6x12x12	222 30†	.159	.17	.105	.15	09	197.10†
8x12x12	....	......	.2198	.15	....	.1152	295.60*
10x12x12	....	....	.2565	.173	....	.2546	369.50*
12x12x12	....	....	.3175	.208	....	.3082	443.40*

*Nateo XXX. These prices subject to 5% cash discount in 15 days from date of shipment. † Partition tile

	4x12x12	8x12x12	12x12x12
Boston	$0.15	$0 25	$0.44
St. Paul	.087	.158	.248
Cincinnati	.101	.18925	.2864
Kansas City	.0786	.15	.205
Denver	.12	.18	.25
Seattle	.09	.175	.30
Atlanta	.115	.19	.28
Los Angeles	.082	.154	...
New Orleans	.165	.22	.325
Detroit	.106	.197	.282
Baltimore	.115	.25	.32
Montreal	.19	.28	.35

STRUCTURAL MATERIAL—Following are base prices f.o.b. mill, Pittsburgh, together with quotations per 100 lb. from warehouses at places named:

	Mill Pittsburgh	New York Current	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in	$2.45	$3.47	$4 27	$3.54	$3.47	$4.85	$5.5
Channels, 3 to 15 in	2.45	3 47	4 27	3.54	3.47	4.85	5.50
Angles, 3 to 6 in., ¼ in. thick	2.45	3.47	4.27	3.54	3.47	4.85	5.50
Tees, 3 in. and larger	2.45	3.52	4.27	3.54	3.47	4.85	5.50
Plates	2.65	3.67	4.52	3.54	3.67	5 15	5.70
							5

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

		Warehouse					
	Mill Pittsburgh	New York Current	New York One Yr. Ago	Chicago	St. Louis	San Francisco	Dallas
¾ in. and larger	$4.20	$5.00	$5.675	$4.97	$4.99	$6.40	$7.50

CONE HEAD BOILER

	Mill Pittsburgh	New York Current	New York One Yr. Ago	Chicago	St. Louis	San Francisco	Dallas
¾ in. and larger	4.30	5.10	5.775	5.07	5.09	6 50	7.50
⅝ and $\frac{11}{16}$	4.45	5.25	5.925	5.22	5.24	6 75	7.50
½ and $\frac{9}{16}$	4.70	5.60	6.275	5.27	5.49	7.00	7.75

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	New York	Chicago	San Francisco	Dallas	Montreal
Wire	$4 50	$7 50	$4 15	$5 50	$6.90	$4 95
Cut	....	8.00	7.00	6.90	6.40	5.00

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

	1-Ply		2-Ply		3-Ply	
	c.l.	l.cl.	c.l.	l.cl.	c.l.	l.c.
No. 1 grade	$2 00	$2 25	$2 50	$2 75	$3.00	$3.25
No. 2 grade	1.70	1.95	2 15	2 40	2 50	2.75

Asbestos asphalt-saturated Felt (14 lb. per square) costs $170 per ton f.o.b. Erie.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $3 00 per roll in carload lots and $3.25 for smaller quantities.

Shingles, red and green slate finish, cost $7.25 per square in carloads; $7.50 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

	Carload Lots		Less Than Carload Lots	
	N. Y.	Chicago	N. Y.	Chicago
Tar felt (14 lb. per square of 100 sq.ft.)	$84 00	$82.00	$86.00	$84 00
Tar pitch (in 400-lb. bbl.)	21.00	18.00	22 00	19.00
Asphalt pitch (in barrels)	34.00	34.00	37.50	37.50
Asphalt felt	88.00	88.00	90 00	90.00

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill:

	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York	
Blue Annealed					Current	One Yr. Ago
No. 10	3 55 4.00	4 64	5.27	7 05	5.32 6 00	5.17
No. 12	3.60 4 05	4 69	5.32	7.10	5 37 6.05	5.22
No. 14	3 65 4 10	4.74	5.37	7.15	5.67-6.10	5.27
No 16	3 75-4 20	4.84	5.47	7.25	5.77-6.20	5.37
Black						
*Nos. 18 and 20	4 15 4 65	5.24	6.30	7.60	6 80 7.30	6.02
*Nos. 22 and 24	4 2 4 70	5.29	6.35	7.65	6 85 7 35	6.07
*No. 26	4 25 4 75	5.34	6 40	7.70	6 90 7.90	6.12
*No. 28	4 35 4.85	5.69	6.50	7.80	7.00-8 00	6.22
Galvanized						
No. 10	4 70 5 20	5.79	7 00	..	6 75 7 00	6.57
No. 12	4.80 5.30	5.89	7 10	8 15	6 80 7 05	6.62
No. 14	4 80 5.30	5.89	7.10	8 15	6 85 7.10	6.67
Nos. 18 and 20	5 20-5 70	6.19	7 40	8 45	7.15 7.40	6.97
Nos. 22 and 24	5 25-5 75	6.34	7.55	8.60	7 30 7.55	7.12
*No. 26	5 40-5.90	6.04	7 70	8 75	7.45 7 70	7 27
*No. 28	5.70 6 20	7.04	8 00	9.05	7.75-9.00	7.57

*For painted corrugated sheets add 30c per 1000 lb. for 5 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 15c., all gages.

LINSEED OIL—These prices are per gallon:

	New York		Chicago	
	Current	One Year Ago	Current	One Year Ago
Raw in barrel (5 bbl.)	*$1.80*	$1.49	*$1 98*	$1.66
5-gal cans	*2.00*	1.74	*2.23*	1.86

WHITE AND RED LEAD—Base price per pound:

	Red				White	
	Current		1 Year Ago		Current	1 Yr. Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100-lb. keg	14 50	16.00	13.00	14.50	14.50	13.00
25 and 50-lb. kegs	14 75	16.25	13.25	14 75	14.75	13 25
12½-lb. keg	15 00	16.50	13.50	15.00	15.00	13.50
5-lb. cans	16 50	18.00	15 00	16 50	16.50	15.00
1-lb. cans	17.50	19.00	15.00	17.50	17.50	16.00

500 lb. lots less 10% discount; 2000 lb. lots less 10-2½% discount.

LUMBER

San Francisco—Prices of rough Douglas fir No. 1 common, in more than carload lots:

Lumber Prices in Yards at San Francisco

	6-8-12 and 14 Ft.	10-16-18 and 20 Ft.	22 and 24	25 to 32 Ft.
3x3 and 4	$40 00	$40 50	$41 50	$43 50
3x6 and 8	41 00	41 50	42.50	44 50
4x4-6 and 8	41 50	42 50	43 50	45 50
3x10 and 12	41 50	42 50	43 50	45 50
3x14	42 00	43 00	44.00	46.60
4x10 and 12	41 50	42 50	43.50	45.50
4x14	42.50	43 50	44.50	46.56

	24 Ft. and Under	25 to 32 Ft.	33 to 40 Ft.
6x10	$41 00	$43 00	$44 00
6x14	42 50	44 50	45 00
8x10	41 00	43 00	44 00
8x14	42 50	4 50	

New York, Chicago and St. Louis

	Southern Pine				Yellow Pine	
	New York*		Chicago		St. Louis	
	20 Ft. and Under	22-24 Ft.	20 Ft. and Under	22-24 Ft.	20 Ft. and Under	22-24 Ft.
3x 4 to 8x 8	$58 00	$59 00	$70 00	$71.00	$44.00	$45.00
3x10 to 10x10	62 00	63 00	72.00	73.00	48.00	49.00
3x12 to 12x12	66 00	67 00	75 00	76.00	52.00	53.00
3x14 to 14x14	73 00	74 00	80.00	81 00	57.00	58.00
3x16 to 16x16	80.00	81 00	85.00	86 00	63.50	64.50
3x18 to 18x18	86 00	87 00	90.00	91 00	68.00	69.00
4x20 to 20x20	96 00	97 00	..	.....	......	......

* Prices from Lumbermen's Bureau

Over 24 ft.—Add $1 for each additional 2 ft. in length up to 40 ft. for sizes 12 x 12 and under; for sizes over 12 x 12 add $2. For merchantable add $2 to sizes 10 x 10 and under. For prime add $2 to the price of merchantable for all sizes.

Other Cities

	8 x 8-In. x 20-Ft. and Under				12 x 12-In. 20 Ft. and Under	
	P.	Fir	Hemlock	Spruce	P.	Fir
Boston	$75.00	$65.00	$65.00	$60.00	$110.00	$100.00
Kansas City	53.00	52.25	52.25	52.25	64.00	52 25
Seattle	.....	31.00	.....	....	.....	31.00
New Orleans	45.00	.....	......	......	48.00	......
St. Paul	*60.00*	59.00	59.00	46.00	*42.00*	*56.00*
Atlanta	62.50	64.50	66.00	76.00	79.50	82.00
Baltimore	53.10	......	....	......	62 00	......
Cincinnati	55.00	55.00	55 00	......	62 50	60.00
Montreal	73.00	68.00	65.00	60.00	73.00†	73.00
Los Angeles*	.....	59 50	58.00	.....	.....	51.00
Denver	.....	47.50	.....	.....	.....	49 00

	1-In. Rough, 10 In. x 16 Ft. and Under			2-In. T. and Gr. 10 In. x 16 Ft.	
	P.	Fir	Hemlock	P.	Fir
Boston	$70.00	$60 00	$60.00	$80.00	$65.00
Kansas City	115.25	89.75	89.75	117.25	92.75
Seattle	.....	33.00	.....	.....	36.00
New Orleans	54.00	.....	.....	55.25	.....
St. Paul	*53.00*	*53.00*	53.00	*68.00*	*57.50*
Atlanta	85.00	90.00	......	77.50	87.50
Baltimore (box)	45-46.00	....	....	45-50.00	......
Cincinnati	60 00	57 00	60 00	60 00	55.00
Montreal	65.00	65 00	65.00	66.00	66.00
Los Angeles*	..	57.00	56 00	..	....
Detroit	52.00	.. .	...	54 00	...
Denver	.....	48 00	48.00	....	47.00

* Base price, 2x4 in., is $53, Los Angeles

† Montreal—Up to 32 ft.; over which, $3.00 per M. increase up to 30 ft.

Dallas—Yellow pine. Price per M:

2x4 to 2x12—12, 14 and 16	$57.00
2x4 to 2x12—10, 18 and 20	59.00
2x4 to 2x12—22 and 24	64.00
4x4, 4x6, 6x6, 8x8 and 3x8	57.50
8x00, 10x00 and 3x10	60.00
12x12 and 3x12	65.00

FREIGHT RATES

On finished steel products in the Pittsburgh district, including plates, structural shapes, merchant steel, bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc., the following freight rates are effective in cents per 100 lb.:

Boston	$0 30	New Orleans	$0.38½
Buffalo	.17	New York	.27
Chicago	.27	Pacific Coast (all rail)	1.25*
Cincinnati	.23	Philadelphia	.24½
Cleveland	.17	St. Louis	.24
Denver	.99	St Paul	.49½
Kansas City	.59	Detroit	.33
		Baltimore	.33

Note—Add 3% transportation tax. * Minimum carload, 80,000 lb.

CONTRACTORS' SUPPLIES

STEEL SHEET PILING—The following price is base per 100 lb. f. o. b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$2.55	$2.55	$4-$5

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid	14c.	13c.	15c	15c.
Hollow	17c.			22c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Hercules red strand, all constructions	20%
Patent flattened strand, special and cast steel	20%
Patent flattened strand, iron rope	5%
Plow steel round strand rope	35%
Special steel round strand rope	30%
Cast steel round strand rope	22½%
Iron strand and iron tiller	5%
Galvanized iron rigging and guy rope	+12%

San Francisco: Galvanized, less 5%, bright, less 25%.
Chicago, +17½ on galvanized, 35 off on bright.

MANILA ROPE—For rope smaller than ⅝-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅝-in., 8 ft., ¾-in., 6; ⅞-in., 4½; 1-in., 3⅓; 1⅛-in., 2 ft. 10 in.; 1¼-in., 2 ft. 4 in. Following is price per pound for ⅝-in. and larger, in 1200-ft. coils:

Boston	$0.30	Kansas City	$0.26½
New York	.26	New Orleans	.25½
Chicago	.26½	Los Angeles	.28½
St. Paul	.27½	Seattle	.25
San Francisco	.24	St. Louis	.26
Atlanta	.29½	Montreal	.32
Denver	.27½	Detroit	.26
Cincinnati	.27½	Baltimore	.25
Birmingham	.32		

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder.

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	80%	Black Powder
New York	.....	$0.27	$0.30	.....	$2.20
Boston	$.225	.245	.25	$.35	2.40
Kansas City	.185	.2275	.2525	.29	2.35
New Orleans	.2375*	.2275	.2475	.....	
Seattle	.1675	.1925	.2125	.2775	2.10
Chicago	.215	.24	.2825	.325	2.25
St. Paul	.185	.2275	.2525	.....	2.25
St. Louis	.185	.2275	.2325	.2950	1.80
Denver	.1725	.215	.24	.2825	2.25
Dallas	.....	.....	.288	.342	2.75
Los Angeles	.25	.30	.35	.275	2.95
Atlanta	.22	.245	.265	.....	2.55
Baltimore	.19	.23¼	.2875	.30	2.35
Cincinnati	.1875	.2075	.2275	.....	2 20
Montreal	.28	.31	.34	.38	3.90

* For 50%.

POLES—For plain pine poles, delivered New York, the price is as follows:

10-in. butts, 5-in. tops, length 20-30 ft.	$9.00
12-in. butts, 6-in. tops, length 30-40 ft.	11.50
12-in. butts, 6-in. tops, length 41-50 ft.	12.50
14-in. butts, 6-in. tops, length 51-60 ft.	20.00
14-in. butts, 6-in. tops, length 61-71 ft.	22.50

	Dallas
6-in. x 20-ft.	$4.60
6-in. x 30-ft.	7.10
8-in. x 30-ft.	8.45
8-in. x 35-ft.	10.38

Note—At the present time it is almost impossible to give accurate prices on poles. The above are only nominal.

OLD MATERIAL—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and St. Louis the quotations are per net ton and cover delivery at the buyer's works, including freight transfer charges.

	New York	Chicago	St. Louis
No. 1 railroad wrought	$28.00	$26.00	$27.00
Stove plate	25.00	30.00	25.00
No. 1 machinery cast	32.00	37 00	34.00
Machine shop turnings	15.00	12.00	14.50
Cast borings	18.00	15.00	16.50
Railroad malleable cast	25.00	29.00	24.00

SHIP SPIKES—Current prices per 100 lb.

	San Francisco		Seattle
In.	Galv.	Black	Black
¼	$9.20	$8.50	$8.55
⅜	8.75	6.75	8.25
½	8.60	6.60	8.30

Pittsburgh base, $3.85 to $4 per 100 lb.

LABOR RATES AND CONDITIONS THROUGHOUT THE COUNTRY

S means scarce; E, enough; P, plentiful

Cities	Brick-layers	Car-penters	Hoisting Engineers	Hod Carriers	Pile Drivers	Structural Iron Workers	Common Labor	Remarks
Atlanta	$0.90S	$0.60-75P	$0.50-65P	$.40-.45P	$0.60-.65	$0.75	$0.35P	Atlanta—Great activity in construction. Crushed stone scarce.
Baltimore	1 00E	.80-90E	.87½E	.46-.54E	.74P	.87½E	.35-.45E	Baltimore—No change in wage schedules expected until April
Boston	1.25S	1.00	1.00	.85	1.25	1.00	.62½S	Boston—Labor of all kinds very scarce.
Cincinnati	1.25S	.75	.75	.65	.50	875P	.50S	Cincinnati—Common labor scarce.
Cleveland	1.00S	.90S	1.00E	.57½E	.80E	1.00E	.57½E	
Dallas	1.00E	.87½S	.87½E	.37½-.40S	......	.75S	.35S	Dallas—Common labor very scarce.
Denver	1.00E	1.00E	.87½E	.72	......	.87½E	.56¼E	Denver—It is predicted that soon there will be more work than men.
Detroit	1.10E	.85E	.90-1.00E	.65-70E	.90P	.85-.90E	.60-.65S	Detroit—All trades busy. No strikes. Common labor scarce.
Kansas City	1.00	.85	.90	.68¾	.77	.90	.57½	Kansas City—Carpenters demanding $1.00 an hour by May 1
Los Angeles	.87½E	.75E	.75P	.56-.75S	.75P	.75P	.50-.62½E	Los Angeles—Resident construction active.
Montreal	.80	.75	.65S	.50-55S	.55P	.45-.55S	.30-.45S	Montreal—Good labor scarce account of exodus of foreigners, who comprise 75 per cent of Canadian labor.
New Orleans	.87½S	.75	1.00	.68¾	.80-1.00	.75	.30-.35	
New York	1.08	1.00	1.12½	.57½	1.00	1.08	.68¾	New York—Agreement effective Jan. 1, expected to hold until Dec. 31, 1921.
Pittsburgh	1.00	.90	.90	.60	.60	1.00	.40-.45S	Pittsburgh—No strikes.
St. Louis	1.00	.87½	1.00-1.12½	.70	.80-.92½	.90	.45-.60	St. Louis—Skilled labor, 50c. to 75c. Bricklayers on sewers, $1.00.
St. Paul	1.25	.87½	.112½	.65	.80	.85	.70	St. Paul—Wages of most trades are higher than last month.
San Francisco	1.25E	1.00E	1.00E	.87½E	1.00E	1.00E	.45-.50E	San Francisco—All lines busy.
Seattle	1.12	.93½	.94	.75-.83	.90	1.00	.75S	Seattle—Surplus of labor.

WATCH PROPOSALS

on following page

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Feb. 10	Toronto, Ont.	Jan. 1
Feb. 12	Douglas, Ariz.	Jan. 8
Feb. 15	Washta, Ia.	Jan. 15
Feb. 16	Lancaster, Cal.	Feb. 5
Feb. 17	Ada, Okla.	Feb. 5
Feb. 17	Jacksonville, N. C.	Jan. 15
Feb. 17	Lockport, Ill.	Feb. 5
Feb. 24	Detroit, Mich.	Jan. 29

SEWERS

Feb. 9	New York, N. Y.	Feb. 5
Feb. 11	Monona, Ia.	Feb. 5
Feb. 12	Ashley (Wilkes Barre P. O.), Pa.	Jan. 15
Feb. 16	Davis, Okla	Feb. 5
Feb. 17	Lockport, Ill.	Feb. 5
Feb. 17	Ada, Okla.	Feb. 5
Feb. 20	Carnegie, Okla.	Jan. 8
Feb. 24	Bryan, Tex.	Feb. 5
Mar. 1	Lebanon, Pa.	Feb. 5
Mar. 1	Livingston, Mont.	Feb. 5

BRIDGES

Feb. 7	Bethlehem, Pa	Dec. 11
Feb. 10	Detroit, Mich.	Feb. 5
Feb. 10	Schenectady, N. Y.	Jan. 15
	Adv. Jan. 15 to Feb. 5.	
Feb. 13	Blue Earth, Minn.	Jan. 29
Feb. 13	Calgary, Alta.	Feb. 5
Feb. 16	Ray Junction, Ariz.	Jan. 22
Feb. 16	Olivia, Minn.	Jan. 29
Feb. 17	Nutley, N. J.	Jan. 22
Feb. 17	Joliet, Ill.	Feb. 5
Feb. 17	Fayetteville, N. Y.	Feb. 5
Feb. 19	Elizabeth, N. J.	Feb. 5
Feb. 20	Tulsa, Okla.	Feb. 5
Feb. 20	Marinette, Ariz.	Jan. 29
	Adv. Jan. 29 and Feb. 5.	
Feb. 25	Bethlehem, Pa.	Jan. 8
Feb. 25	Ishpeming, Mich.	Feb. 5
Feb. 27	Kingston, N. Y.	Feb. 5
	Adv. Feb. 5.	

STREETS AND ROADS

Bids Close		See Eng. News-Record
Feb. 7	Weston, W. Va.	Feb. 5
Feb. 9	La Grange, Tex.	Jan. 22
Feb. 9	Salem, N. J.	Jan. 22
	Adv. Feb. 5.	
Feb. 9	New Mexico	Jan. 22
Feb. 9	Willmar, Minn.	Jan. 29
Feb. 9	Akron, O.	Jan. 29
Feb. 9	Wenatchee, Wash.	Jan. 29
Feb. 9	Port Lavaca, Tex.	Jan. 29
Feb. 9	Kingston, Ont.	Jan. 29
Feb. 9	Texas	Feb. 5
Feb. 9	Duluth, Minn.	Feb. 5
Feb. 9	New York, N. Y.	Feb. 5
Feb. 10	Philadelphia, Pa.	Feb. 5
Feb. 10	Michigan	Feb. 5
Feb. 10	Colorado	Feb. 5
Feb. 10	New Mexico	Jan. 29
Feb. 10	Elk River, Minn.	Jan. 29
Feb. 10	Waterloo, Ia.	Jan. 29
Feb. 10	Hopkins, Minn.	Jan. 29
Feb. 10	Michigan, Ia.	Jan. 29
Feb. 10	Meadowville, Pa.	Jan. 15
Feb. 10	Waterloo, S. C.	Jan. 22
	Adv. Jan. 29 and Feb. 5.	
Feb. 10	Sanford, Fla.	Jan. 29
Feb. 10	Pipestone, Minn.	Jan. 29
Feb. 10	Frederick, Okla.	Jan. 29
	Adv. Jan. 29.	
Feb. 10	Waseca, Minn.	Feb. 5
Feb. 10	Pipestone, Minn.	Feb. 5
Feb. 11	Illinois	Feb. 5
Feb. 11	New Mexico	Jan. 22
Feb. 11	Indiana	Jan. 29
Feb. 11	St. James, Minn.	Jan. 29
Feb. 11	Independence, Ia.	Jan. 29
Feb. 11	Snyder, Tex.	Feb. 5
Feb. 11	Manning, Ia.	Feb. 5
Feb. 12	Centerville, Ia.	Feb. 5
Feb. 12	Madisonville, Tex	Feb. 5
Feb. 12	Centerville, Ia.	Jan. 29
Feb. 12	Wisconsin	Feb. 5
Feb. 13	Wisconsin	Feb. 5
Feb. 13	Michigan	Feb. 5
Feb. 13	New York, N. Y.	Feb. 5
Feb. 13	New Jersey	Jan. 29
	Adv. Jan. 29 and Feb. 5.	
Feb. 14	Phila., Pa.	Jan. 29
Feb. 14	Michigan	Feb. 5
Feb. 14	Port Huron, Mich	Feb. 5
Feb. 14	Rochester, Ind.	Feb. 5
Feb. 15	Bixby, Okla.	Jan. 29
Feb. 16	Noblesville, Ind.	Feb. 5
Feb. 16	Minneapolis, Minn.	Jan. 29
Feb. 16	Seattle, Wash.	Feb. 5
Feb. 16	Lancaster, Ont.	Feb. 5
Feb. 17	Wisconsin	Feb. 5
Feb. 17	Santa Ana, Cal.	Feb. 5
Feb. 17	Pennsylvania	Jan. 29
	Adv. Jan. 29 and Feb. 5.	
Feb. 17	Columbus, Ind.	Feb. 5
Feb. 17	Michigan	Feb. 5
Feb. 17	Davenport, Ia.	Feb. 5
Feb. 18	Menomonee, Wis.	Feb. 5
Feb. 18	Ft. Wayne, Ind.	Feb. 5
Feb. 18	Seneca, Kan.	Feb. 5
Feb. 18	Freehold, N. J.	Jan. 29
Feb. 18	Cornwall, Ont.	Feb. 5
Feb. 18	Fayetteville, Ark.	Jan. 15
	Adv. Jan. 29 and Feb. 5.	
Feb. 20	Spencer, W. Va.	Feb. 5
Feb. 20	Lebanon, Ind.	Feb. 5
Feb. 21	St. Johns, Mich.	Jan. 22
Feb. 24	Montgomery, Ala.	Jan 8
	Adv. Jan. 8.	
Feb. 24	Le Sueur Center, Minn.	Jan. 29
Feb. 24	Michigan	Feb. 5
Feb. 26	Gaylord, Minn.	Feb. 5
Feb. 26	Laurel, Del.	Feb. 5
	Adv. Feb. 5.	
Mar. 1	Livingston, Mont.	Jan. 29
	Adv. Jan. 29.	
Mar. 2	Charleston, W. Va.	Jan. 22
Mar. 2	Winfield, Ia.	Jan. 29
Mar. 2	South Euclid, O.	Feb. 5
Mar. 2	Ft. Scott, Kan.	Feb. 5
Mar. 2	Ft. Scott, Kan.	Feb. 5
Mar. 3	Pennsylvania	Feb. 5
	Adv. Feb. 5.	
Mar. 4	Hutchinson, Kan.	Feb. 5
Mar. 6	Leavenworth, Kan.	Feb. 5
Mar. 6	Brainerd, Minn.	Jan. 29
Mar. 8	Okmulgee, Okla	Jan. 29
Mar. 9	Fredonia, Kan.	Feb. 5
Mar. 10	Eureka, Kan.	Feb. 5

RAILWAYS

Feb. 17	Ontario	Jan. 15

EXCAVATION AND DREDGING.

Feb. 10	Sioux City, Ia.	Feb. 5
Feb. 11	Bloomfield, Mo.	Feb. 5
Feb. 13	Bemidji, Minn.	Jan. 29
Feb. 15	Benjamin, Utah	Jan. 1
Feb. 16	Olivia, Minn.	Jan. 29
Feb. 16	Seattle, Wash	Jan. 29
Feb. 17	Marshall, Minn.	Jan. 29
Feb. 17	Ft. Gratiar (Port Huron P. O.), Mich.	Feb. 5
Feb. 18	Dresden, Tenn	Feb. 5
Feb. 18	York, Ont.	Feb. 5
Feb. 21	Havana, Ill.	Feb. 5

INDUSTRIAL WORKS

Feb. 7	Phila., Pa.	Feb. 5
Feb. 9	Bridgeport, N. Y.	Feb. 5
Feb. 9	Beaumont, Tex.	Feb. 5
Feb. 10	Kingston (Wilkes Barre P. O.), Pa.	Jan. 29
Feb. 13	Detroit, Mich	Feb. 5
Feb. 14	Cleveland, O.	Feb. 5
Feb. 16	Vandalia, Ill.	Feb. 5
Feb. 19	Ashley, Pa.	Feb. 5
Feb. 20	Scranton, Pa.	Jan. 29
Feb. 24	Wilkes Barre, Pa.	Jan 29
Feb. 27	Wilkes-Barre, Pa	Jan 29
Feb. 27	Forty Fort, Pa.	Feb. 5
Mar. 1	Taylor, Pa.	Feb 5
Mar. 1	Edmonton, Alta	Jan. 8
Mar. 1	Cedar Rapids, Ia.	Jan 22
Mar. 6	Estevan, Sask.	Jan 29
	Adv. Jan. 29	
Mar. 15	Wakefield, Mass	Jan. 29
Mar. 17	Larrabee, Ia.	Feb. 5

BUILDINGS

Feb. 9	Oconomowoc, Wis.	Jan 8
Feb. 9	Woodbine, Ia.	Jan. 22
Feb. 9	Ada, Minn.	Feb. 5
Feb. 9	Jacksonville, Fla	Feb. 5
Feb. 9	Tallahassee, Fla.	Feb. 5
Feb. 10	Berkeley, Cal.	Feb. 5
Feb. 10	Pipestone, Minn.	Feb. 5
Feb. 10	Chisholm, Minn.	Feb. 5
Feb. 10	Mt. Pleasant, Ia	Jan. 29
Feb. 11	Tomah, Ga.	Jan 29
Feb. 11	Montreal, Que.	Feb. 5
Feb. 13	Dayton, Ia.	Jan. 15
Feb. 13	Woodbine, Ia.	Jan. 29
Feb. 13	Cotter, Ia.	Jan. 29
Feb. 14	Chandler, Ariz.	Jan. 29
Feb. 14	Sandusky, O	Feb. 5
Feb. 14	Tenafly, N. J.	Feb. 5
Feb. 14	Montreal, Que.	Feb. 5
Feb. 15	Westmount, Que.	Jan. 22
Feb. 15	Clear Lake, Wis.	Feb 5
Feb. 15	Owen, Wis.	Feb. 5
Feb. 15	Scranton, Pa.	Feb. 5
Feb. 16	Peru, Neb.	Jan. 29
Feb. 16	Halifax, N. S.	Jan. 22
Feb. 16	Kearney, Neb	Jan. 29
Feb. 16	Northfield, Minn.	Jan. 29
Feb. 16	Chadds Ford, Pa.	Jan. 29
Feb. 16	Trenton, N. J.	Feb. 5
Feb. 16	Baltimore, Md	Feb 5
Feb. 16	Mayetta, Kan.	Feb. 5
Feb. 16	Long Beach, Cal.	Feb. 5
Feb. 17	Pocahontas, Ia.	Feb. 5
Feb. 17	Belleville, N. J.	Feb. 5
Feb. 17	Beaver, Ia.	Jan. 29
Feb. 17	Ypsilante, Mich.	Jan. 29
Feb. 17	Waseca, Minn.	Jan. 29
Feb. 17	Aurelia, Ia.	Jan. 22
Feb. 17	Columbus, Neb.	Jan. 8
Feb. 16	Pine Bluff, Ark.	Feb. 5
Feb. 19	Lovilia, Ia.	Feb. 5
Feb. 19	Cleveland, O.	Jan. 29
Feb. 19	Manitowoc, Wis.	Jan. 15
Feb. 19	Johnson City, N. J.	Jan 15
	Adv. Jan. 15.	
Feb. 20	Ashland, Ky.	Feb. 5
Feb. 20	Racine, Wis.	Jan. 29
Feb. 20	Redford, Mich.	Feb. 5
Feb. 20	Calamas, Ia.	Jan 29
Feb. 20	Salt Lake City, Utah	Jan. 1
Feb. 23	Wilkes-Barre, Pa.	Jan. 29
Feb. 23	Brooklyn, N. Y	Feb. 5
Feb. 24	East Moline, Ill.	Feb. 5
Feb. 24	East Orange, N J.	Jan. 22
Feb. 24	Ithaca, N. Y.	Feb. 5
	Adv. Feb. 5	
Feb. 25	Desloge, Mo.	Feb. 5
Mar. 1	Racine, Wis.	Jan. 1
Mar. 1	Topeka, Kan.	Jan. 29
Mar. 1	Carlton, Ont.	Jan. 15
Mar. 1	Detroit, Mich.	Jan. 22
Mar. 1	Montreal, Que.	Jan. 15
Mar. 1	Alpena, Mich.	Jan. 15
Mar. 1	Arco, Minn.	Feb. 5
Mar. 1	Minneapolis, Minn.	Feb. 5
Mar. 15	Hibbing, Minn.	Jan. 29
May 15	Syracuse, N. Y.	Dec. 11
Mar. 16	Washta, Ia.	Feb. 5
Mar. 20	Redford, Mich.	Feb. 5
Apr. 1	Dodson, Mont.	Feb. 5

FEDERAL GOVERNMENT WORK

Feb. 9	Dredging — Providence, R. I.	Jan. 15
	Adv. Jan. 29 and Feb. 5.	
Feb. 9	Road Work—Gila, Ariz.	Jan. 29
Feb. 9	Remodeling Post Office and Courthouse—Waco, Tex.	Jan. 22
Feb. 10	Mixer—Monroe, Mich.	Jan. 22
Feb. 11	Repairing Dry Dock—New York, N. Y.	Jan. 15
Feb. 11	Building Extension—Spec. 4024—Puget Sound, Wash.	Jan. 15
Feb. 11	Theodolites—Wash, D. C.	Jan. 22
	Adv. Jan. 22.	
Feb 11	Fuel Oil Storage Plant—Spec. 4102 — San Diego, Cal.	Jan. 22
Feb. 11	Altering Building — Spec. 4116—San Francisco, Cal.	Jan. 22
Feb. 11	Dispensary—Spec. 4101—Norfolk, Va.	Jan. 22
Feb. 11	Towers—Washington, D. C.	Feb. 5
Feb. 11	Life Boat House—Detroit, Mich.	Feb. 5
Feb. 12	Side Wheel Steamboat — St. Louis, Mo.	Jan. 15
	Adv. Jan. 15 to Feb. 5.	
Feb. 14	Seaplane Hangars, etc. — Hampton, Roads, Va.	Jan. 22
	Adv. Jan. 29 and Feb. 5.	
Feb. 14	Lock and Dam—Pittsburgh, Pa.	Jan. 22
	Adv. Jan. 22 to Feb. 5.	
Feb. 16	Road Work— New Mexico.	Feb. 5
Feb. 17	Roadway — Washington, D. C.	Jan. 29
	Adv. Jan. 29.	
Feb. 18	Remodeling and Extending —Sacramento, Cal.	Jan. 22
Feb. 18	Dredging—Phila., Pa.	Jan. 22
Feb. 18	Radio Building—Spec. 4107 Milwaukee, Wis.	Jan. 22
Feb. 18	Radio Building—Spec. 4120 —Detroit, Mich.	Feb 5
Feb. 18	Radio Building—Spec. 4108 —Buffalo N. Y.	Feb. 5
Feb. 20	Structural Steel, Forgings, Steel Castings, etc.—Wheeling, W. Va.	Feb. 5
Feb. 20	Portland Cement—Florence, Ala.	Jan. 22
	Adv. Jan. 29 and Feb. 5.	
Feb 23	Post Office Alterations — Washington, Ga.	Feb. 5
Feb 24	Post Office Alterations — San Antonio, Tex.	Feb. 5
Feb. 25	Roof — Spec. 4113 — New York, N. Y.	Jan. 8
Feb. 25	Remodeling Post Office — Des Moines, Ia.	Feb. 5
Feb. 28	Structural Steel — Marietta, O.	Feb. 5
	Adv. Feb. 5	

Federal Government Work (Continued)

Bids Close		See Eng. News-Record
Feb. 28	Lock and Abutment—Addison, Ky. Adv. Feb. 5	Feb. 5
Mar. 3	Distributing System and Power Plant Equipment—Spec. 4118 — San Diego, Cal.	Feb. 5
Mar. 3	Lighting Fixtures — Spec. 4129—San Diego, Cal.	Feb. 5

MISCELLANEOUS

Bids Close		See Eng. News-Record
Feb. 10	Piers—Detroit, Mich.	Jan. 29
Feb. 10	Transformer Station—New York, N. Y.	Jan. 29
Feb. 10	Breakwater — Schenectady, N. Y. Adv. Jan. 15 to Feb. 5.	
Feb. 10	Road Oil—New Ulm, Minn..	
Feb. 10	Asphalt Plant, Steam Melting Kettle, Etc.—Johnstown, Pa.	Feb. 5
Feb. 11	Refuse Asphalt Crusher—Baltimore, Md.	Feb. 5
Feb. 11	Manholes, Sewer Inlet, etc.—Baltimore, Md.	Feb. 5
Feb. 11	Gasoline Locomotive — Baltimore, Md.	Feb. 5
Feb. 12	Asheville, N. C. Adv. Jan. 22 to Feb. 5.	Jan. 22
Feb. 13	Coal Handling Equipment Akron, O.	Jan. 29
Feb. 14	Flume and Conduit Materials—Attalia, Wash.	Feb. 5
Feb. 16	Paving Materials — San Antonio, Tex.	Feb. 5
Feb. 17	Lumber, Steel, etc. — Muscatine, Ia.	Jan. 29
Feb. 20	Seawall—Scituate, Mass.	Feb. 5
Feb. 24	Hydrants and Valve Covers —York, Ont.	Feb. 5
Mar. 1	Culvert, Pipe—Harrisburg, Pa.	Feb. 6
Mar. 2	Building Materials — Lockport, Ill.	Feb. 5

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. Y., Phelps—City plans election in March to vote on $12,000 bonds to expand and improve waterworks system.

N. C., St. Pauls—City having plans prepared by Carolina Eng. Co., engrs., 412 Southern Bldg., Wilmington, building waterworks system. About $50,000.

N. C., Sylva—City plans to build waterworks system, to include intake dam, one 300,000 gal. and one 200,000 gal. concrete reservoirs and 27,600 ft. 6-8 in. c.i. pipe. About $75,000. Cox & Son, engrs.

O., Cleveland Heights (Warrensville P. O.)—See "Sewers."

Kan., Arkansas City—City having plans prepared improving waterworks system, building distributing reservoir, and power unit for pumps and meters. About $61,000. E. B. Wilkinson, Arkansas City, engr.

Kan., Augusta—City plans to build reservoir, flow line and dam, 6 mi. from here. About $200,000. Engineer to be selected at once.

Kan., Mound Valley—City having plans prepared building new waterworks system. About $65,000. H. G. Olmsted & Co., Oil Exch. Bldg., Oklahoma, engrs.

Kan., Preston—City voted $31,000 bonds to improve water-works system. W. B. Rollins & Co., Ry Exch., Kansas City, Mo., engrs.

Mo., Holden—City having plans prepared improving waterworks system. About $150,000. Archer & Stevens, 609 New England Bldg., Kansas City, engrs.

Okla., Madill—City voted $350,000 bonds to build water supply system from Mill Creek, 9 mi. north of here, including rein.-con. dam, pumping station, filtration plant, elevated tank and extension of water mains. This amount together with $60,000 previously voted makes $410,000 available for work. Johnson & Benham, Firestone Bldg., Kansas, City, Mo., engrs.

Okla., Pryor Creek—City having preliminary plans prepared installing modern gravity rapid sand filter plant, with 750,000 gal. daily capacity, two 75 kw. motor driven centrifugal pumps and 8 mi. 200 kw. 6,600 volt transmission line and transformers at end of line. Bonds for $75,000 to be voted for project. V. V. Long & Co., 1300 Colcord Bldg., Oklahoma, engineers.

Ore., Cooston—Eugene and Coos Bay Land Co. has filed application with P. A. Cupper, state engr., Salem, for permission to appropriate 3 sec.ft. of water from Willanche Creek laterals to build water plant, here, for Crawford Point Water, Light & Power Co. About $75,000.

Ont., Courtright—Town passed by-law for $20,000 to build waterworks system, including deep wells, pumping machinery, pumphouse, mains and steel tank. R. G. Stewart, clerk.

Ont., Dresden—Town passed by-law for $20,000 to build waterworks system, including deep wells, pumps, pumphouse, and mains. J. T. Bridgewater, clk. Engineer not selected.

Ont., Ottawa—City plans to build new water mains and service pipes. About $50,000. A. F. Macallum, city engr.

Ont., Weston—Town plans to install gasoline driven fire pump as standkey; capacity 750 Imperial gal. against about 300 ft. head, 3 stage, driven by 150 hp. marine engine. Cost between $8,000 and $10,000. E. A. James Co., 36 Toronto St., Toronto, engrs.

BIDS DESIRED

Ill., Lockport—Until Feb. 17, by city, building water mains, involving 12,910 lin. ft 4-8 in. c. l. pipe, 12,910 lin. ft. excav. and backfilling, thirty-three 4-8 in. gate valves and boxes, and thirteen 4 in. hydrants. P. Yost, clk. Bd. Local Impvts.

Okla., Ada—Until Feb. 17, by City Comrs., building rein.-con. reservoir, with 2,000,000 gal. capacity pumping station, cover over Byrds Mill Springs, levee and protection work for penstock, also complete system of water mains, sewage disposal tanks, etc. Johnson & Benham, Firestone Bldg., Kansas City, Mo, engrs.

Okla., Tonkawa—City receiving bids improving waterworks system and testing for underground in filtration gallery. About $75,000. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs.

Cal., Lancaster—Until Feb. 16, by A. M. McPherron, secy. Bd. Supervs., Los Angeles Co., building (1) distributing system, involving 3, 4 and 6 in. machine banded redwood pipe and 2 in. lap welded metal pipe, (2) well and pit, (3) 75,000 gal. steel tank on 90 ft. steel tower, (4) vertical plunger pump with motor to lift 170 gal. per min., (5) trenching and backfilling, (6) pump house, in Dist. 4. About $30,000. W. Davidson, Hall of Records, Los Angeles, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., received lowest 3 bids Jan. 27, building automatic electric pumping station at Genesee St., (1) Sect. "A," (2) Sect. "B," from Fox & Renalls, 87 East 125th St., New York City, (1 and 2) $177,281; J. L. Siegretta, 6103-18th Ave., (1 and 2) $224,000; Ajax Drainage Contg. Corp., 60 Herkimer St., Brooklyn, (2) $227,000. Noted Jan. 22 "under "Sewers."

★Minn., Duluth—G. P. Phillips, city comr., let contract building water and gas mains in Jefferson St. from 22nd to 24th Aves., E, and from 26th to 28th Aves., E., involving 2,030 ft. metal water and gas pipes, 900 cu.yd. excav. and 750 cu.yd. rock trenching, to Norquist & Berg, 924 10th Ave., E., $13,222.

★Kan., Cheney—City let contracts improving waterworks system as follows: tower and tank, to Pittsburgh-DesMoines Steel Co., Des Moines, Ia., $7,500; pump, Lutweiler Pump Co., Rochester, N. Y., $4,000; valves and hydrants, Ludlow Valve Mfg. Co., 510 R. A. Long Bldg., Kansas City, Mo., Contract for pipe to be let later. Noted Jan. 1.

Sewers

PROPOSED WORK

Mass., Reading — Metropolitan Dist. Comn., 18 Tremont St., Boston, soon lets contract building open trench for intake and pump well for Reading Extension, involving 1,364 ft. 16 in. c.i. sewer pipe, 1,500 cu.yd. earth and 3,300 cu.yd. rock trenching, etc. About $20,000. F. D. Smith, Boston, dist. engr.

N. Y., Rochester—City passed ordinance to build outlet sewer in Maple Ave. and Field St. About $50,800. C. A. Poole, city engr.

N. Y., Rochester — See "Streets and Roads."

N. C., Cherryville—City having plans prepared by Carolina Eng. Co., engrs., 412 Southern Bldg., Wilmington, building sewerage system and disposal plant. About $75,000.

N. C., St. Pauls—City having plans prepared by Carolina Eng. Co., engrs., 412 Southern Bldg., Wilmington, building sewerage system and disposal plant. About $50,000.

O., Cleveland Heights (Warrensville P.O.)—F. A. Pease Eng. Co., engrs. Marshall Bldg., Cleveland, soon lets contract building sewer and water mains in Cedar Brook Allotment 4, involving 11,160 ft. 6-18 in. vitr. pipe, 4,100 ft. 6 in. c. i. pipe, 15 manholes and 18 catch basins, for Rapid Transit Land Co., 220 Erie Bldg., Cleveland. About $50,000.

Wis., Milwaukee—City having plans prepared laying 4,000 ft. 72 in. rein.-con. sewer pipe in Spring Ave. G. Stahl, city engr.

Ia., West Branch—City plans to install sanitary sewerage system. About $35,000. M. Tschirgi & Sons, 712 Amer. Trust Bldg., Cedar Rapids, engrs.

Mo., Jefferson City—See "Streets and Roads."

Tex., Nacona—City plans to lay 38,000 ft. tile sewer and build sewage disposal plant in business and principal residential streets. About $39,000. Engineer not selected.

Ore., Marshfield—City Council having plans prepared for building concrete sewerage system in Mill Slough. About $275,000. E. K. Burton, city engr.

Ore., Portland—City plans to build sewer in Chautauqua Blvd., to include catch-basins, lampholes, manholes, sewer service pipes and branches, vitr. or cement pipe. About $10,565. O. Laurgaard, city engr.

Ont., London—City plans to build 2¼ mi. sewers and sewage disposal plant. About $310,000. H. A. Brazier, city engr.

Ont., Owen Sound—City plans to build 16,000 ft. 8-20 in. vitr. tile storm sewers. About $25,000. D. H. Fleming, city engr.

Ont., Toronto—City plans to build 3 mi. 5-8 ft. sanitary sewers, brick, in Lansdowne Ave. About $65,454. R. C. Harris, city engr.

BIDS DESIRED

N. Y., New York—Until Feb. 9, by H. H. Curran, pres. Manhattan Boro., building receiving basin on north side of West 34th St., 372 ft. west of westerly curb line of 5th Ave. and on southerly side of West 34th St.

Pa., Lebanon—Until March 1, by City Council, building sanitary sewers in Dist. 3, involving 43,000 lin.ft. 6-18 in. vitr. pipe, 16,000 lin.ft. house laterals, etc. D. M. Sharp, city clk.; advertised in this issue.

Ill., Lockport—Until Feb. 17, by city, building sewers, involving 14,400 lin.ft. 8-18 in. double strength sewer pipe, 60 lin. ft. 12 in. iron pipe, 14,460 lin.ft. excav. and backfilling, 43 manholes, 60 catch basins, and 10 Miller discharge automatic flush tanks. P. Yost, clk. Bd. Local Impvts.

Ia., Monona—Until Feb. 11, by H. S. Rittenhouse, town clk., building sanitary sewerage systems in Sects. A, B and C, Dists. 1 and 2, involving 37,948 ft. 8-15 in. vitr. sewer pipe, manholes, bulkheads, etc. J. G. Thorne, town engr.

Tex., Bryan—Until Feb. 24, by city, building supplemental sewerage system. Plans prepared by J. C. Nagle, head Civil Eng. Dept., A. and M. College.

Okla., Ada—Until Feb. 17, by city, furnishing labor and material for building Sanitary Lateral Sewer Dists. 8, 9 and 10. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs.

Okla., Davis—Until Feb. 16, by T. L. Green, engr., Miami, installing complete sanitary sewerage system and disposal plant in 7 blocks. About $78,000.

Mont., Livingston—Until March 1, by H. M. Shelver, city clk., furnishing and laying 7,700 lin.ft. 10 in., 1,100 ft. 12 in. and 1,800 ft. 8 in. sewer pipe.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Brooklyn—E. Riegelmann, boro. pres., received lowest 3 bids Jan. 28, building sewer in Lincoln Rd., etc., from J.

Sewers (Continued)

O'Leary, $86,619; C. Petracca, 803 Kent Ave., $98,342; E. Galladi, $98,020. Noted Jan. 22.

★**N. Y., Brooklyn**—E. Riegelmann, boro. pres. let contract building sewers in Bay 31st St. and Delamere Pl., to P. J. McCauley, 934 Halsey St., $7,912 and $5,342 respectively; in Bay 32nd St., to C. Petracca, 803 Kent Ave., $6,852. Noted Jan. 29.

N. Y., Long Island City—M. E. Connolly, received bids Jan. 27, laying sewers in (a) Birch St., (b) Cox Pl., (c) Haydock St., from H. J. Mullen, Fulton St., Jamaica, (a) $1,089; T. Welsh, Astoria, (a) $1,190, (b) $7,107, (c) $7,700; Peace Bros., 20 Main St., Flushing, (a) $1,427, (b) $8,374, (c) $8,087; F. L. Paino, Richmond Hill, (b) $5,434; C. Petracca, 803 Kent Ave., Brooklyn, (b) $6,255, (c) $7,075; Green Contg. Co., Long Island City, (b) $8,192, (c) $7,485. Noted Jan. 22.

Mich., Detroit—City received bids building 70 ft. rein.-con. sewer outlet in Mt. Elliott Ave., from Lennane & McIlvenna, Book Bldg., $49,900, and J. Wagner, Penobscot Bldg., $133,000. Noted Jan. 15.

★**Kan., Hanover**—City let contract installing sewers in 8 blocks, to Empire Constr. Co., 3233 McGee St., Kansas City, Mo., $64,774.

Bridges

PROPOSED WORK

Conn., New Haven—City had plans prepared by F. L. Ford, city engr., building structural steel bridge over West River on Whalley Ave., 60 ft. wide, consisting of two 40 ft. concrete spans. About $50,000.

W. Va., Winfield—Putnam Co. soon lets contract building 65 ft. span, steel bridge over Eighteen Mile Creek, Union Dist., 14 ft. wide, 5 x 18 ft. pillars at base, 2 x 16 ft. at top, 15 ft. above low water mark; 45 ft. span bridge over Five and Twenty Mile Creek, Teays Valley Dist., 14 ft. wide, 5 x 18 ft. pillars at base, 2 x 16 ft. at top, 13 ft. above low water. J. S. Parkins, road engr.

Fla., Jacksonville—City having plans prepared by Harrington, Howard & Ash, engrs., Orear-Leslie Bldg., Kansas City, Mo., building, 200 ft. concrete and steel viaduct over Jacksonville Terminal yards, at Lee St. Viaduct, 40 ft. wide. About $300,000.

Fla., Palm Beach—City having plans prepared by Harrington, Howard & Ash, engrs., Orear-Leslie Bldg., Kansas City, Mo., building 1,800 ft. rein.-con. highway bridge over Lake Worth, from here to West Palm Beach, 20 ft. wide, with rein.-con. arches. About $250,000.

Minn., Minneapolis—Hennepin Co. plans to build 140 ft. concrete bridge, 60 ft. concrete girder, concrete abutments, over Grays Bay. About $35,000. E. E. Terrell, co. surv.

Wash., Goldendale—R. E. Crooks, aud. Klickitat Co., soon lets contract building 112 ft. Wood Howe truss or steel bridge, over White Salmon River, in Sect. 11, Twp. 4. Cost to exceed $20,000. C. W. Spalding, co. engr.

Ore., Enterprise—Wallowa Co. having plans prepared for building steel bridge over Grande Ronde River in connection with construction of Enterprise-Lewiston Highway. About $50,000. W. Huyette, Lewiston, Idaho, promoter of plans.

Ore., Eugene—City making preliminary plans for holding special election to vote on $50,000 bonds to build 40 ft. concrete bridge, with approaches, over mill race on East 8th St. and for purchase and improvement of aviation field. G. Stearn, city recdr.

N. B., Edmunston—A movement is on foot to build 1,100 ft. bridge over St. John River between here and Madawaska, Me. About $250,000, half of which will be borne by state of Maine. Dominion Govt. has appropriated $250,000 toward cost.

Ont., Chatham—See "Excavating and Dredging."

BIDS DESIRED

N. Y., Fayetteville—Until Feb. 17, by E. S. Walsh, Pub. Wks. Supt., Capitol, Albany, building through plate girder bridge and improving Limestone Creek, here. Work involves 3,600 cu.yd. excav., 1,800 cu.yd. forming embankment, 8 M. ft. sheeting and bracing, 12 M. ft. triple lap sheet piling, 3,500 lin.ft. foundation piles, 600 cu.yd. 2nd class concrete, 170,000 lb. structural steel, 180 lin. ft. w.i. lattice railing, 20 lin.ft. w.i. pipe railing, also maintaining highway traffic, repairing macadam pavement, removing old bridge, etc. About $34,500. F. M. Williams, Telephone Bldg., Albany, state engr. and surv.

N. Y., Kingston—Until Feb. 27, by F. S. Greene, state highway comr., 55 Lancaster St., Albany, building bridge to carry Rd. 5599 over Roudout Creek, here, consisting of 1 suspension span, 705 ft. long and 2 anchor spans, each 220 ft. long, with necessary anchorages, towers, concrete floor and stiffening trusses, involving 3,182,000 lb. structural steel and castings, 567,000 lb. steel cables and suspenders, 3,350 cu.yd. concrete, 100,000 lb. steel reinforcement, etc.; advertised in this issue.

N. J., Elizabeth—Until Feb. 19, by Bd. Freeholders Union Co., building new lift Strauss Trunnion Bascule type bridge, over Elizabeth River, at South Front St. J L. Bauer, co. engr.; advertised in this issu

W. Va., Clarksburg—Until Feb. 19, by city, constructing 5 rein.-con. bridges, three 119 ft long, each consisting of one 100 ft. span; one 225 ft. long, two 100 ft. spans and one 86 ft. long, one 48 ft. span. D. H. Hamrick, clk., advertised in this issue.

Mich., Detroit—Until Feb. 10, by Bd. Comrs. Wayne Co., 220 County Bldg., building Dix Ave. bascule bridge foundations crossing River Rouge, to include sinking 4 pneumatic caisson piers, 90 ft. long and fabricating and erecting steel supporting girders. E. N. Hines, chn.

Mich., Ft. Gratiot (Port Huron P. O.)—See "Excavation and Dredging."

Mich., Ishpeming—Until Feb. 25, by Supt. Co. Rd. Comn. Marquette Co., Court House, building single track 24 ft. span rein.-con. arch bridge, 14 ft. wide, near here, to carry tracks of Lake Superior & Ishpeming Ry. over proposed Marquette-Negaunee Rd. About $20,000.

Ill., Havana—See "Excavation and Dredging."

Ill., Joliet—Until Feb. 17, by W. H. Smith, supt. of highways, Will Co., building Wilmington Bridge over Kankakee River, Wilmington Twp., consisting of 7 rein.-con. arches with open spandrels, 20 ft. roadway with 5 ft. sidewalk on each side, height over all 28 ft. 6 in., involving 2,760 cu.yd. concrete, 136,330 lb. reinforcing steel, 5,290 sq.ft. reinforcing wire mesh, etc. About $86,500. G. F. Burch, c/o Division of Highways, Springfield, bridge engr.

Okla., Tulsa—Until Feb. 20, by Comrs Tulsa Co., building 3 bridges here. D. W. Patton, co. engr.

Alta., Calgary—Until Feb. 13, by J. M. Miller, city clk., for building rein.-con. bridge consisting of five 115 ft. spans, 42 ft. roadway. About 250,000. C. W. Craig, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Wis., Kewaunee**—Kewaunee Co. let contract building Brandle Bridge, to have three 40 ft. concrete girders, to F. Wulf, Algoma. About $30,989.

★**Tex., Stonewall**—T. B. Hardin, judge Stonewall Co., let contract building 160 ft. steel truss span bridge, over Salt Fork of Brazos River, 18 ft. wide, to Austin Bros. Bridge Co., 1815 Coombs St., Dallas, $12,851. Noted Jan. 8.

Streets and Roads

PROPOSED WORK

New York—State Highway Comn, Capitol, Albany, received no bids Jan. 30, improving roads in following counties:

Ulster Co., 3.17 mi. Rosendale Village, Rd. 1419;

Dutchess Co., 4.95 mi. Fishkill Plains-Pokeepsie, Part 2, Rd. 1529;

Washington Co., 7.6 mi. Whitehall-Fair Haven, Rd. 1542;

St. Lawrence Co., 4.6 mi. Gouverneur-Edwards, Part 2, Rd. 1389;

Oneida Co., 5.38 mi. Holland-Patent-Frenchville, Part 2, Rd. 1546;

Schoharie Co., 5.24 mi. Cobleskill-Sharon Springs, Part 2, Rd. 1467;

Livingston Co., 8.34 mi. Conesus-Wayland, Rd. 1321A;

Cattaraugus Co., 3 mi. Leon-Wesley, Part 1, Rd. 1480. Noted Jan. 15.

N. Y., Rochester—City passed ordinance to pave, grado and build sewers in Hillside Ave., Edgar St. and Bengal Terrace. About $80,000. C. A. Poole, city engr.

Pennsylvania—State Highway Dept., Harrisburg, received no bids building roads in following counties: Crawford Co., 18,619 ft 1 course rein.-con. and Hillside vitr. brick or 2 course rein.-con. and Hillside vitr. brick, Route 82, Vernon Twp., and 18,514 ft. 1 course rein.-con., Route 89, East Mead Twp.; Warren Co., 12,012 ft. 1 course rein.-con., Route 93, Tidioute Boro., 40,485 ft. 1 course rein.-con., Route 279, Farmington and Sugar Grove Twps. and 22,287 ft. 1 course rein.-con. and Hillside vitr. brick, Farmington and Pine Grove Twps.; Westmoreland Co., 32,047 ft. 1 course rein.-con. and Hillside vitr. brick, Route 68, Derry Twp. Noted Jan. 8.

Pa., Pittsburgh—City passed ordinance authorizing repaving River Ave. from Pindan St. to Herrs Island Bridge approach, cost $50,000; Liberty Ave. from Winebiddle St. to Center Ave., $44,000; Butler St. from 47th to 62nd Sts., $187,500; Liberty Ave. from Stanwix to 11th Sts., $100,000; Liberty Ave. from 44th to Main Sts., $96,000; Main St. from Penn to Liberty Aves., $20,500; Preble Ave. from Westhall St. to Sands Way, $17,000; all vitr. brick on concrete foundation. N. S. Sprague, city engr.

Del., Wilmington—New Castle Co. to build 31,200 ft. road from here to Hair's Corner, 18 ft. wide, involving 62,400 sq.yd. concrete. C. M. Upham, c/o State Highway Dept., Dover, engr.

Virginia—State Highway Comn., Richmond, soon lets contract building 2.58 mi. road from Accomac to Tasley, Project 38, Accomac Co., 1.62 mi. road from Petersburg to Ritchie's Store, Project 40, Dinwiddie Co., 5.35 mi. road from Suffolk to Wilroys, Project 59, Nansemond Co., 11 mi. road from Fleming's Corner to Virginia Beach, Project 74, Princess Anne Co., all 16 ft. wide, 6 in. concrete; also 4.45 mi. road from Point of Rocks to Lucketts, Project 51, Louden Co., 16 ft. wide, waterbound or bituminous macadam. G. P. Coleman, state highway comr.

W. Va., Wellsbarg—Comrs. Brooke Co. soon let contract improving 0.8 mi. Mechling Hill Rd., cost $10,000, and 3.9 mi. from Follansbee to Eldersville, $38,000; both 16 ft. wide, bituminous macadam, 3 in. top, 8 in. broken stone base. G. W. Steenrod, Wellsburg, engr. County will furnish and apply biuminous top.

N. C., St. Pauls—City having plans prepared by Carolina Eng. Co., engrs., 412 Southern Bldg., Wilmington, improving various streets. About $25,000.

O., Cleveland—W. H. Evers Eng. Co., engrs., 332 The Arcade, soon lets contract paving streets in Ernadale Park, involving 1,825 sq.yd. 2 in. bituminous surfacing on 6 in. concrete base, for Ernadale Park Co., c/o engr. About $12,000.

O., Lakewood (Cleveland P. O.)—W. H. Evers Eng. Co., engrs, 332 The Arcade, soon lets contract building sidewalk in Onondaga Park and on Franklin and St. Charles Aves., involving 42,000 sq.ft. 2½ in. stone flagging, for city. About $10,000.

Mich., Port Horon—Comrs. St. Clair Co. having plans and estimates prepared for improving 13 mi. road Assessment Dist. 1,017, 18 ft. wide, Port Huron, Kimball, St. Clair, Columbus and Casco Twps., to include grading, draining and surfacing with Class "F" asphaltic concrete, also building bridges and culverts.

Wisconsin—State Highway Comn., Madison, rejected only bid received Jan. 22, surfacing 0.88 mi. La Crosse-Sparta Rd., 18 ft. wide, Federal Aid Project 107, Monroe Co. Work will be readvertised. Noted Jan. 15.

Wisconsin—State Highway Comn., Madison, received no bids Jan. 22, surfacing 2.88 mi. Viroqua-Prairie du Chien Rd., 18 ft. wide, concrete, Federal Aid Project 136, Vernon Co. Work will probably be readvertised in spring. Noted Jan. 15.

Wis., Superior — Douglas Co. voted $1,200,000 bonds and plans to improve following roads: paving Grand Ave. from easterly limits of city, near Bear Creek Bridge, southerly and southeasterly to Spalding Ave., concrete, and grading from 18th St. east and south to near Middle River station on D. S. S. & A. Ry., cost $150,000; grading Pattison Ave. from Black River Falls to Patzau Rd. and from south line of Sect. 18, 45-14 to south county line, $118,000; graveling Dewey Rd. from Pattison Ave. westerly to state line, $60,000; Union St. from city limits to Interstate Bridge, $20,000; Black River Rd. from 4 corners west and south to southwest corner of Sect. 36, 47-15, $25,000; Lakeside Rd. from Itasca Rd. east to Maple Rd., $69,000; Spaulding Ave. from South Range to 18th st., $8,000; Bardon Ave. from end of Tower Ave. to Roths Corner, $20,000. Will also construct Lakeside Bridge toward which it will appropriate $11,500 and roads and bridges in Hawthorne, Brule and Superior Twps. and Lake Nebagamon and Solon Springs Villages, and appropriate $15,000 toward cost, rest of which will be borne by state. Total cost, $496,500. C. J. Morisset, East End (Superior P. O.), comr.

Streets and Roads (Continued)

Wis., Green Lake—Green Lake Co. Bd. passed resolution authorizing $115,000 bond issue to be voted (in addition to referendum bond issue of $900,000 passed in December) for road work. D. C. Williams, comr.

Wis., Port Washington—City having plans prepared grading and paving 1.1 mi. Holy Cross-Dacada and Green Bay Rds., 16 ft. wide, 1 course rein.-con., also building necessary bridges and culverts on same. About $29,000. J. H. E. Mueller, Thiensville, engr.

Wis., Racine—W. O. Thomas, highway comr. Rd. & Bridge Comn.. Racine Co., soon lets contract paving 4 mi. 12th St. Rd., 18 ft. wide, involving 11,491 cu.yd. earth excav., 42,280 sq.yd. 1 course concrete and 206 cu.yd. concrete in culverts. Wisconsin Highway Comn., Madison, engrs.

Wis., Sheboygan—City Council passed resolution to pave 7 blocks Michigan Ave., from 4th to 8th Sts., 20 ft. wide, 1 course concrete, also building sidewalks with combination curb and gutter. About $11,000. C. U. Boley, city engr.

Wis., Waupaca—City Council soon lets contract paving 1,228 ft. South Main St. and 2,874 ft. West Fulton St. Alternate bids will be received on 1 and 2 course concrete, asphaltic concrete and vitr. brick. F. A. Housman, clk.

Wis., West Bend—Washington Co. State Rd. and Bridge Com. soon lets contract paving 4.83 mi. road 12 mi. south of here, involving 18,783 cu.yd. earth and 17 cu.yd. borrow excav., 51,311 sq.yd. 18 ft. concrete surfacing, 347 cu.yd. concrete in culverts, etc. County to furnish cement. C. Pick, secy.

Wis., West Bend—Washington Co. soon lets contract grading and paving 1.4 mi. West Bend Co. and State Aid Rd., 16 ft. wide, also building culverts and bridges on same, involving 51,311 sq.yd. concrete. About $30,000. C. Johnson, Kewaskum, engr.

Wis., West Bend—C. Pick, chn. Rd. & Bridge Comn., Washington Co., soon lets contract paving 4.83 mi. Milwaukee-West Bend Rd., 18 ft. wide, involving 51,311 sq.yd. 1 course concrete, 18,783 cu.yd. earth and 17 cu.yd. borrow excav., 347 cu.yd. concrete in culverts, etc. Wisconsin Highway Comn., Madison, engrs.

Ia., Des Moines—City plans to pave about 3,000 sq.yd. 11th St. from Vine St. to tracks of Chicago, Burlington & Quincy RR., cost $15,000; 625 ft. 26th St. from Clark St. to point 625 ft. north, 33 ft. wide, involving 2,300 sq.yd. pavement, $11,000; both vitr. brick on concrete base and asphalt filler. K. C. Kastberg, city engr.

Ia., Des Moines—Polk Co. had plans prepared paving 4.45 mi. White Pole Rd. from west city limits to county line, 20 ft. wide, involving 52,242 sq.yd. vitr. brick or concrete and 7,140 cu.yd. dry earth excav., cost $200,000; 2.77 mi. Indianola Rd. from south city limits to county line, 20 ft. wide, 32,552 sq.yd. vitr. brick or concrete and 4,437 cu.yd. dry earth excav., $140,000; paving 6.57 mi. and grading 5.81 mi. Ankeny Rd. from here to north city limits, 20 ft. wide, 76,940 sq.yd of either monolithic brick, asphalt filled brick and single or double course or concrete and 23,486 cu.yd. dry earth excav., $300,000. F. O. Laing, co. engr.

Ia., Des Moines—Polk Co. plans to pave 10,000 cu.yd. Roosevelt Dr. and Wilson and Mattern Aves., asphaltic concrete, cost $40,000; 56,146 sq.yd. East 28th, East 30th, Maury, C. B. and Q. Sts., $225,000; 15,195 sq.yd. Southwest 21st St. from Chicago, Burlington & Quincy R.R. tracks to city limits, brick on 6 in. concrete base, $70,000. K. C. Kastberg, city engr.

Ia., Esterville—City plans to pave 6 mi. various streets, 25 ft. wide, asphaltic concrete. Engineer to be selected at once.

Minn., Aitkin—Aitkin Co. plans to grade and gravel 12 mi. road from Hill City south, 24 ft. wide. About $72,000. F. J. O'Hara, Aitkin, engr.

Minn., Minneapolis—Hennepin Co. having plans prepared for widening from 20 to 40 ft. and paving 3.8 mi. Superior Blvd. from city limits to Wayzata, involving concrete or macadam surfacing and 40,000 sq.yd. grading, cost $200,000; also paving 4½ mi. Rockford Rd., $60,000. E. E. Terrell, co. surv.

Minn., Minneapolis—Hennepin Co. plans to build 8½ mi. Rockford Rd., 30 ft. wide, involving 65,000 cu.yd. grading. About $75,000. E. E. Terrell, co. surv.

Neb., Kearney—City plans to pave 3 mi. road, 40 ft. wide. About $100,000. C. O. Swan, clk. H. W. Kibbey, Kearney, engr.

Mont., Dillon—Beaverhead Co. election April 23, to vote on $100,000 bonds to build various roads. Federal Government will appropriate toward cost. J. N. Edy, c/o State Highway Dept., Helena, engr.

Missouri—State Highway Dept., Jefferson City, plans to build 24 mi. Poplar Bluff, Corning, Arkansas Rd., involving 42,000 cu.yd. excav., 126,720 sq.yd. gravel surfacing, 9 ft. wide, 52,000 lin.ft. grading, 50 culverts, four 30 ft., one 35 ft., one 40 ft. and one 50 ft. span bridges, cost $268,323; 10.25 mi. Poplar Bluff-Cairo Rd., 6,000 cu.yd. excav., 52,800 lin.ft. grading, 47,520 sq.yd. gravel and 6,600 sq.yd. concrete surfacing, 9 ft. wide, five 40 ft. and one 60 ft. span bridges, $110,845, both in Butler Co.; 10.62 mi. Springfield-Eldorado Springs Rd., Bear Creek Special Rd. Dist., Cedar Co., 1,000 cu.yd. rock and 12,740 cu.yd. earth excav., 36,960 lin.ft. grading, 50,688 cu.yd. gravel surfacing, 9 ft. wide, and 28 culverts, $30,750; 8.22 mi. Jefferson Highway, Parkville Special Rd. Dist., Platte Co., 99,000 cu.yd. excav., 7 per cent rock, 86,803 sq.yd. brick surfacing, 18 ft. wide, 43 culverts, 6,000 lin.ft. guard rail, 10,000 lin. ft. 4 in. under drain and one 90 ft. concrete arch bridge, $462,485; 5.5 mi. London-Perry Rd., 8,960 cu.yd. earth excav. and 29,040 sq.yd. gravel surfacing, 9 ft. wide, $21,780, 7 mi. London-Perry Rd., 9,696 cu.yd. earth excav. and 36,960 sq.yd. gravel surfacing, 9 ft. wide, $27,720, both in Ralls Co.; 2.25 mi. Hollister-Ridgedale Rd, Hollister-Ridgedale Special Rd. Dist., 20,985 sq.yd. gravel surfacing, 16 ft. wide, $4,848, 11.03 mi. Springfield-Hollister Rd., Boston Roadway Special Rd. Dist., 320 cu.yd. rock and 7,979 cu.yd. earth excav., 36,697 lin.ft. grading, 18,645 sq.yd. gravel surfacing, 16 ft. wide $20,344, both in Taney Co.; 31 mi. Piedmont-Marble Hill Rd., Wayne Co., 131,500 cu.yd. excav., 5 per cent rock, 68,640 sq.yd. gravel surfacing, 16 ft. wide, 80 culverts, one 60 ft. and one 100 ft. steel span bridges, $110,979.

Mo., Jefferson City—City soon receives bids paving and building sewers in 10 blocks, Dist. 4, 25 ft. wide, involving 130,000 sq.yd. asphalt macadam resurfacing and 104,000 sq.yd. vitr. brick. About $300,000. L. F. Brown, Jefferson City, engr.

Tex., Boerne—Kendall Co. rejected bids received Jan. 3, grading, gravel surfacing and applying bituminous topping on 5.788 mi. Highway 9, from here to Bexar Co. line, 16 ft. wide, involving 2 acres clearing and grubbing. About $40,930. F. H. Dillon, Boerne, engr.

Tex., Denton—Denton Co. having plans and surveys prepared for grading, gravel surfacing and draining 15.099 mi. Highway 40, from here, north to county line, 15 ft. wide, involving 52,000 cu.yd. earth and 3,100 cu.yd. rock excav., 108,707 lb. reinforcing steel, 29,530 cu.yd. gravel, 932 cu.yd. Class "A" and 303 cu.yd. Class "B" concrete, etc. About $244,060. Bryant & Huffman, Littlefield Bldg., Austin, engrs.

Tex., Groesbeck—J. E. Bradley, judge Limestone Co., soon lets contract gravel surfacing and draining 9.755 mi. Highway 7, from near Tehuacana through Cooledge to Navasota River, 9 ft. wide, involving 2.1 acres clearing and grubbing, 51,497 lbs. reinforcing steel, 601 cu.yd. concrete, 1,184 cu.yd. gravel, etc. About $97,160. F. P. Holt, Mexia, engr.

Tex., Houston—Harris Co. plans to apply bituminous topping on 3.12 mi. Highway 3, known as Houston-Crosby Rd., 16 ft. wide, involving 12,833 gal. asphalt and 513 cu.yd. cover material. About $10,945. Howe & Wise, 211 1st Natl. Bank Bldg., engrs.

Tex., Houston—Harris Co. had plans prepared scarifying, grading and surfacing 5.66 mi. Highway 12, from South Pacific R.R. to Ft. Bend Co., 16 ft. wide, involving 1,000 cu.yd. gravel, 1,524 tons shell and 2 M. b. m. lumber. About $12,351. Howe & Wise, 211 1st Natl. Bank Bldg., engrs.

Tex., Liberty—C. N. Smith, judge Liberty Co., rejected bids received Jan. 16, grading, gravel surfacing and draining 8.518 mi. Highway 35, from Cleveland to Montgomery Co., line, 16 ft wide, involving 6.16 acres clearing and grubbing, 11,282 cu.yd. earth and 175 cu.yd. structural excav., 29,120 lin.ft. guard fence, etc. About $120,252. Work will be readvertised. H. O. Compton, Liberty, engr.

Tex., Livingston—Polk Co. plans to grade and gravel surface 20 mi. Highway 35, Sect. A, 12 ft. wide, involving 97 acres clearing and grubbing. About $153,395. W. C. Youngs, Livingston, engr.

Tex., Marshall—W. H. Strength, judge Harrison Co., soon lets contract grading, gravel surfacing and draining 20.42 mi. Highway 11, from here east to county line, 16 ft. wide, involving 8 acres clearing and grubbing, 1.66 mi. scarifying, 84,105 lbs. reinforcing steel, 1,533 cu.yd. concrete, 114,188 lbs. structural steel, etc. About $331,255. G. A. Duren, Marshall, engr.

Tex., Richmond — Ft. Bend Co., Archer Dist., voted $200,000 bonds and had preliminary surveys prepared for building Highway 36 and laterals. C. H. Chernoskey, co. judge.

Tex., Weatherford—E. A. Swofford, judge Parker Co., soon lets contract grading, gravel surfacing and draining 15,066 mi. Highway 1, from here to Tarrant Co. line, involving 32.2 acres clearing and grubbing, 82,136 cu.yd. earth, 6,695 cu.yd. rock and 1,562 cu.yd. structural excav., 99,777 lbs. reinforcing steel, 1,138 cu.yd. Class "A" and 475 cu.yd. Class "B" concrete, 141,422 sq.yd. bituminous macadam, 2 course asphalt treatment, etc. About $291,072. O. Leonard, Weatherford, engr.

Okla., Stroud—City had plans prepared paving 10 blocks main streets, 25 ft. wide, asphaltic concrete or brick. About $75,000. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs.

Utah, Ogden—Weber Co. plans to build overhead crossing at Riverdale, 25 ft. wide, also bridge on Weber River in connection with same. About $25,000. Address I. R. Browning, Salt Lake City, state road engr.

Washington — State Highway Comn., Olympia, plans to pave with concrete on 5 mi. Pacific Highway between Renton and Kent, King Co., 5 mi. between Muck Creek and Ohon Valley, Pierce Co., 6 mi. between, Plumb Station and Tenini and 2 mi. near Grand Mound, Thurston Co., 3 mi. between Marysville and Silvana north of Everett, also 1 mi. north from Silvana and 2 mi. south from Stanwood, Snohomish Co. averaging 20 ft. wide, 3 mi. Olympic Highway from Mason and Thurston county lines to Kamilche and 2 mi. from Shelton south, Mason Co., 18 ft. wide, 2 mi Sunset Highway from Cashmere toward Wenatchee, 18 ft. wide, Chelan Co., and 4 mi. between Spokane and Idaho state line, 20 ft. wide, Spokane Co., 5 mi. Inland Empire Highway between Donaldson and Granger, Yakima Co., and 8 mi. between Walla Walla and Dixie, Walla Walla Co., both 20 ft. wide; grub, grade and surface with gravel or crushed rock on 4 mi. Olympia Highway between New Kamilche and Shelton, Mason Co., 4 mi. between Montesano and Satsop and 4 mi. from Lake Quinault west, Grays Harbor Co., the latter to be surfaced with gravel or plank, 8 mi. Natl. Park Highway from intersection with Pacific Highway 4 mi west of Ethel, Lewis Co., 3 mi. Ocean Beach Highway between Coal Creek and Stella, Cowlitz Co. and 4 mi. west from Skamania, Wahkiakum Co., 5 mi. Sunset Highway east from Palmer, Douglas Co., 10 mi. Inland Empire Highway between Rosa and Selah, Yakima and Kittitas Counties, 12 mi. between Pomeroy and Clarkston, Garfield Co., 10 mi. between Chewelah and Springdale, Stevens Co., 4 mi. between Kennewick and Richland, Benton Co., 2 mi. North Bank Highway east from Washougal, Clarke Co., 2 mi. from Skamania east and 5 mi. from Stevenson, Skamania Co., 2 mi. between Underwood and White Salmon, Skamania and Klickitat Counties, 6 mi. North Central Highway between Wilson Creek and Marlin, Grant Co., 5 mi. Chelan-Okanogan Highway between Malott and Okanogan, Okanogan Co., 3 mi. State Rd. 4 east from Malott, Okanogan Co., 1½ mi. north from Wilbur, Lincoln Co., 6 mi. State Rd. 5 between Kosmos and Randle, Lewis Co., 7 mi. State Rd. 22 from Kettle Falls south, Stevens Co. Cost about $3,547,000. J. Allen, state highway engr.

Ore., Astoria—Clatsop Co. plans to pave 1.25 mi. Warrenton-Flavel Rd., 18 ft. wide, Warrenton Twp., concrete or waterbound macadam. About $25,000. J. C. Clinton, clk.

Ore., Enterprise—Wallowa Co. having plans prepared building 70 mi. Enterprise-Lewiston Highway. County to pay $200,000 and balance of cost to be borne by Federal Government and State. Total cost, $728,000. W. Huyette, Lewiston, Idaho, promoter of plans.

Ore., Hood River—City Council plans to pave Oak St. from 10th St. to Cascade Ave., concrete or bitulithic. About $10,000.

Que., Perce—Gaspé Co. plans to build 40 mi. new road, 15 ft. wide from Cascapedia St. to Federal Mines, waterbound mac-

Streets and Roads (Continued)

adam. About $200,000. Federal Zinc & Lead Co., 120 St. James St., Montreal, engrs.

Ont., Chatham—Township plans to build 3 roads leading out from here, total length 9 mi., 24 ft. wide, bituminous macadam. About $165,000. L. A. Pardo, County Bldg., engr.

Ont., Stratford—City plans to pave 3 mi. Albert, Brunswick, Church, Dours, Douglas, Trinity, Mowat, and West Gore Sts., asphalt or bitulithic on concrete base, concrete curb and gutter, 24-40 ft. wide. About $150,000. A. B. Manson, engr.

Ont., Toronto—City plans to pave Roxton Rd. and Willshire Ave. with asphalt, about $25,420 and $16,960 respectively; Willow Ave., waterbound macadam, $21,595; total length 1¾ mi., 28-36 ft. wide. R. C. Harris, city engr.

BIDS DESIRED

N. Y., New York—Until Feb. 9, by H. H. Curran, pres. Manhattan Boro., reregulating, regrading and repaving roadway of 34th St. from Park to Madison Aves., sheet asphalt on concrete foundation, also relocating fire hydrants.

N. Y., New York—Until Feb. 13, by Park Bd., at office of Dept. of Parks, Municipal Bldg., furnishing all labor and material for repaving with sheet asphalt and asphalt blocks on concrete foundation, roadway of Eastern Blvd. from north-easterly approach to bridge over Eastchester Bay, to point 500 ft. north of Split Rock Rd., Pelham Bay Park, Bronx Boro.

Pennsylvania—Until March 3, by State Highway Dept., Harrisburg, paving roads in Adams, Armstrong, Cambria, Crawford, Delaware, Fayette, Greene, Lawrence, Warren and Westmoreland Counties. L. S. Sadler, state highway comr.; advertised in this issue.

Pa., Phila.—Until Feb. 10, by Dept. Pub. Wks., (Schedule A), paving with asphalt portions of Broad, Hutchinson, Landsdowne, Limekiln, Windsor, 6th, 16th, 43rd, 26th and 24th Sts. and Warrington Ave.; (Schedule B) repaving Courtland, Emerald, Landsdowne, Ludlow, Norris, Tioga and 34th Sts., Erie and Girard Aves.; (Schedule C) Woodland Ave., redressed granite block; (Schedule D) Columbia Ave., wood block; (Schedule E) improving Adams Ave.; (Schedule F) improving Ridge Ave.; (Schedule G) curb and footway work.

Del., Laurel—Until Feb. 26, by City Council and H. K. Fooks, mayor, draining, grading, curbing and paving various streets. H. W. Hatton, 2406 Washington St., Wilmington, consult. engr.; advertised in this issue.

W. Va., Spencer—Until Feb. 20, by Comrs. Roane Co. improving 2.2 mi. Spencer-Walton Rd., 16 ft. wide, involving 20,400 sq.yd. concrete surface, cost $46,000; 1.5 mi. Tanners Run Rd., 14 ft. wide, involving 12,300 sq.yd. concrete paving and 10,000 cu.yd. excav. About $35,000. H. R. Muldoon, Spencer, engr.

W. Va., Weston—Until Feb. 7, by Comrs. Lewis Co., paving 2,400 ft. Murphy's Creek Rd., 15 ft. wide, concrete, involving 21,400 cu.yd. excav., also building necessary drainage structures. About $13,000. W. K Spaur, Weston, engr.

Ga., Brunswick—Until Feb. 26, by P. E. Twitty, clk. Bd. Comrs. Rds. & Revenues of Glynn Co., building 6 mi. of Federal Aid Project 80, involving 35,147 sq.yd. brick concrete, or asphalt concrete pavement; advertised in this issue.

O., South Euclid—Until March 2, by village, grading and building sidewalks on 5,700 ft. Green Rd. About $18,000. F. A. Pease Eng. Co., Marshall Bldg., engrs.

Indiana—By Bd. Co. Comrs. building roads in following counties:

Feb. 14, Fulton Co., Rochester, 4 gravel roads, known as D. Kopp Rd., A. Crabb Rd., T. F. Neff Rd. and P. Thorstenson Rd. J. L. McClung, aud.

Feb. 16, Hamilton Co., Noblesville, 2 roads, known as T. McKinney et al Rd. and W. Duckwall et al Rd. H. O. Cottingham, aud.

Feb. 16, Marion Co., Indianapolis, concrete road, Washington Twp., known as W. D. Haverstick et al Rd L. K. Fesler, aud.

Feb. 17, Bartholomew Co., Columbus, 5,125 ft. macadam road, Jackson Twp, Decatur Co. and Rockcreek Twp., known as Herring Rd. R. Henderson, aud.

Feb. 18, Allen Co., Ft. Wayne, Schlaudroff Rd., Adams Twp., 2.83 mi. concrete. A. C. McCoy, aud.

Feb. 20, Boone Co., Lebanon, gravel road, Eagle Twp. I Stephenson, aud

Michigan—Until Feb. 13, by F. F. Rogers, state highway comr., at office of Rd. Comrs. Berrien Co., St. Joseph, for grading and surfacing 5.049 mi. Federal Aid Project 24-A1, 16 or 18 ft. wide, involving 53,120 sq.yd. concrete or bituminous concrete, or 47,217 sq.yd. waterbound or bituminous macadam, 265 stations (100 ft.) fine grading, etc.; 5.921 mi. State Trunk Line Rd. 11-10, 16 or 18 ft. wide, involving 61,840.2 sq.yd. concrete or bituminous concrete, or 54,969.1 sq.yd. waterbound or bituminous macadam, 970 lin.ft. 12-15 in. encased tile culverts, 153.3 cu.yd. 1:2:4 and 305.4 cu.yd. 1:3:6 concrete, etc.

Michigan—Until Feb. 14, by F. F. Rogers, state highway comr., at office of Bd. Rd. Comrs. Berrien Co., St. Joseph, grading, draining and surfacing 2.701 mi. State Trunk Line Rd. 58-1, 16 or 18 ft. wide, involving 25,356 sq.yd. concrete, bituminous concrete, waterbound or bituminous macadam, 9,190 cu.yd. earth excav., 63.5 cu.yd. 1:3:6 and 315 cu.yd. 1:2:4 concrete, 2,059 lb. steel, 1,810 ft. 4-8 in. land tile, 357 lin. ft. 12 in. encased tile, etc.; 1.230 mi. State Trunk Line Rd. 11-11, 20 ft. wide, 3,233 cu.yd. earth excav., 14,171 sq.yd. concrete or bituminous concrete, 52 lin.ft. 12 in. encased tile, 66 cu.yd. 1:2:4 concrete, etc.

Michigan—Until Feb. 24, by F. F. Rogers, state highway comr., Lansing, grading, draining and surfacing 5.646 mi. Assessment Dist. Rd. 50, 16 ft. wide, Lenawee and Monroe Counties, involving 52,997 sq.yd. stone gravel or waterbound macadam, 7,315 cu.yd. earth excav., 442 ft. 12 and 18 in. incased tile, 7,036 lb. of steel reinforcement, 174 cu.yd. 1:2:4 and 262 cu.yd. 1:3:6 concrete. Alternate proposals on 108 lin.ft. corrugated pipe.

Michigan—Until Feb. 17, by F. F. Rogers, state highway comr., at office of Bd. Rd. Comrs. Livingston Co., Howell, grading, draining and surfacing 2.857 mi. Sect. A and 3.162 mi. Sect. B, State Trunk Line Rd. 16-1, 18 ft. wide, Livingston and Oakland Counties. Sect. A involves, 30,170 sq.yd. concrete or bituminous concrete, 10,102 cu.yd. earth excav., 328 lin.ft. 12 in. encased tile, 38.7 cu.yd. 1:2:4 and 33.3 cu.yd. 1:3:6 concrete, 1,368 lbs. reinforcement, etc., Sect. B, 33,880 sq.yd. concrete or bituminous concrete, 5,380 cu.yd. earth excav., 231 lin.ft. 12 in encased tile, 37.4 cu.yd. 1:2:4 and 13.8 cu.yd. 1:3:6 concrete, 5,164 lbs. reinforcement, etc.

Mich., Port Huron—Until Feb. 14, by W. W. Cox, eng. and mgr., Rd. Comn., St. Clair Co., grading, draining and surfacing with Class "B" gravel or Class "C" gravel top, 5.76 mi. road in Cottrellville Twp., 9 ft. wide, involving 30,460 sq.yd. gravel, 126 cu.yd. 1:2:4 and 133 cu.yd. 1:3:6 concrete, 4,925 lbs. reinforcing steel, 17,000 cu.yd. earth excav., 373 ft. 12-24 in. drain pipe, etc.; 6.5 mi. in Mussey and Lynn Twps., 16 ft. wide, involving 60,236 sq.yd. gravel, 173 cu.yd. 1:2:4, 90 cu.yd. 1:2½:5 and 190 cu.yd. 1:3:6 concrete, 11,181 lbs. reinforcing steel, 21,133 cu.yd. earth excav., 323 lin.ft. 12-24 in. drain pipe, etc.

Illinois—Until Feb. 11, by State Highway Comn., Springfield, building 22,987 ft. Sect. A, State Bond Issue Route 1, 17,782 ft. Sect. B, 28,098 ft. Sect. C and 28,380 ft. Sect. D, all 16 ft. wide, Edgar Co.; 32,992 ft. Sect. E, 16 ft. wide, Edgar and Clark Counties; 22,158 ft. Sect. F, 16 and 18 ft. wide, Clark Co.; 27,197 ft. Sect. 8, State Bond Issue Route 10, and 22,000 ft. Sect. 9, both 18 ft. wide, Piatt Co.; 35,860 ft. Sect. 10, 18 ft. wide, Piatt and Macon Counties; 22,200 ft. Sect. 11 and 25,752 ft. Sect. 12, 18 ft. wide, Macon Co.; 28,243 ft. Sect. 10, State Bond Issue Route 5, 18 ft. wide, Kane Co.; 38,435 ft. Sect. 11, 18 ft. wide, McHenry Co.; 7,361 ft. Lincoln Highway, 16 and 20 ft. wide, Lee Co. Alternate bids will be received on portland cement concrete, 4 in. monolithic brick, 3 in. monolithic brick, bituminous concrete with binder course and bituminous concrete without binder course. C. Older, ch. highway engr.; advertised in this issue.

Wisconsin—Until Feb. 12, by State Highway Comn., 601 Wilner Bldg., Green Bay, surfacing 2.91 mi. Green Bay-Oconto Rd., Federal Aid Project 139, 18 ft. wide, involving 9,381 cu.yd. earth and 11 cu.yd. borrow excav., 56 cu.yd. Class "A" concrete, 30,750 sq.yd. concrete, etc.; 0.75 mi. State Aid Portion—Sta. 155-0 to 195-0, 2,719 cu.yd. earth and 13 cu.yd. borrow excav., 35 cu.yd. Class "A" concrete, 8,328 sq.yd. concrete, etc.; 5 mi. Green Bay-Menomonie Rd., known as State Aid Application 13 (1920), 16 ft. wide, concrete, 19,175 cu.yd. earth excav., 248 cu.yd. Class "A" concrete in culverts, 54 cu.yd. Class "A" concrete in bridges and 47,083 sq.yd. concrete; all in Brown Co.

Wisconsin—Until Feb. 13, by State Highway Comn., 208 Stephenson Bldg., Milwaukee, surfacing 4.72 mi. Town Line Rd., Federal Aid Project 115, Walworth Co., 18 ft. wide, involving 35,500 cu.yd. earth excav., 295 cu.yd. Class "A" concrete, 49,852 sq.yd. concrete, etc.

Wisconsin—Until Feb. 17, by State Highway Comn., Div. Office 6, 213 South Barstow St., Eau Claire, surfacing 1.9 mi. Eau Claire-Osseo Rd., Federal Aid Project 111, Eau Claire Co., 18 and 24 ft. wide, involving 5,591 cu.yd. earth and 1,931 cu.yd. borrow excav., 15,248 sq.yd. concrete, 7,345 sq.yd. rein.-con with integral curb and gutter, etc.; 2.73 mi. Hudson-Menomonie Rd., Federal Aid Project 126, St. Croix Co., 18 ft. wide, 20,150 cu.yd. earth excav., 21 cu.yd. Class "A" concrete, 29,033 sq.yd. concrete, etc.

Wis., Chilton—City receiving bids grading and paving 30,000 sq.yd. Madison, State and Grant Sts., 18 ft. wide. About $60,000. Alternate bids will be received on sheet asphalt, asphaltic concrete, rein.-con. or vitr. brick. J. Donohue, North 8th St., Sheboygan, engr.

Wis., Menomonie—Until Feb. 18, by Bd. Pub. Wks., furnishing all labor and material for paving West Crescent St. from Main St. to Bway., 6th Ave. from West Crescent to 2nd Sts., 2nd St. from West Crescent to Main Sts., 3rd St. from West Crescent St. to Wilson Ave., (excluding intersection of Main St.), 4th St. from Main St. to Wilson Ave. and 5th St. from Main St. to Wilson Ave., involving 13,000 sq.yd. rein.-con. and 3,000 lin.ft. curb and gutter, together with necessary excavating. P. Yost, clk.

Ia., Centerville—Until Feb. 12, by Comrs. Appanoose Co., grading 5½ mi. Waubonsie Trail, 18 ft. wide, involving 101,393 cu.yd. earth excav. About $60,000. J. B. McNeal, Centerville, engr.

Ia., Davenport—Until Feb. 17, by city, resurfacing with asphaltic concrete or repaving with new brick or relaying old brick on 1,433 ft. Front St. from Richey to Perry Sts., 50 ft. wide, cost $36,200; 5,995 ft. 4th St. from East River to Warren Sts., 55-56 ft. wide, $141,499; 3,344 ft. East River St. from Bridge Ave. to Mound St., 50 ft. wide, $49,500; 1,205 ft. 11th St. from Mound St. to Hillcrest Ave., 40 ft. wide, $16,760; 380 ft. Harrison St. from Front to 2nd Sts., 66 ft. wide, $11,121; 2,311 ft. 2nd St. from Warren to Fillmore Sts., 56 ft. wide, $48,556; 640 ft. Pershing Ave. from 2nd to 4th Sts., 55 ft. wide, $13,696; 4,075 ft. Locust St. from Harrison St. to Carey Ave., 37 ft. wide, $54,000. R. E. Sawistowsky, city engr.

Ia., Manning—Until Feb. 11, by P. H. Jones, town clk., paving, curbing and guttering about 5½ mi. various streets, 26-40 ft. wide, involving 66,000 lin.ft. artificial concrete curbing, 17,000 cu.yd. earth excav. and 88,000 sq.yd. concrete, sheet or asphaltic concrete pavement. D. L. Erickson, 2727 Ryans St., Lincoln, Neb., engr.

Minn., Duluth—Until Feb. 9, by city, paving 3300 ft. Raleigh St. from Central to Grand Aves. and Central Ave. to 63rd Ave. W., 42 ft. wide, from 63rd Ave., W., to Grand Ave., 30 ft. wide, involving 15,963 sq.yd. concrete, 5,885 lin.ft. curbing, 720 lin.ft. gutter, 4,250 cu.yd. excav., etc. About $63,187. E. K. Coe, city engr.

Minn., Fairibault—Until March 2, by F. M. Kaiseratt, aud. Rice Co., building 5.4 mi. road, 24 ft. wide, involving 40,970 cu.yd. excav. and 1,227 lin.ft. 15-24 in. culverts, cost $60,000; 3.8 mi. Federal Aid Project 126, 18 ft. wide, 26,818 cu.yd. excav., 867 lin.ft. 15-24 in culverts, two 50 ft. girder span bridges and 39,701 sq.yd. concrete, asphaltic concrete or brick, $90,000. W. P. Chapman, Faribault, engr.

Minn., Gaylord—Until Feb. 26, by Comrs. Sibley Co., paving 9 mi. Federal Aid Project 74, State Rd. 1, 24 ft. wide, involving 53,498 cu.yd. excav., 2,400 lin.ft. guard rail and 1,017 lin.ft. portable culvert pipe. About $160,000. G. F. Mellen, Gaylord, engr.

Minn., Gaylord—Until Feb. 26, by F. Hoppenstedt, aud. Sibley Co., building 1 mi. Federal Aid Project 116, State Rds. 6 and 8, 24 ft. wide, involving 68,000 cu.yd. excav., 2,000 cu.yd. riprap, 1,755 cu.yd. gravel surfacing and 105 ft. port culvert pipe. About $20,000. G. F. Mellen, Gaylord, engr. Noted Jan. 8.

Minn., Pipestone—Until Feb. 10, by S. W. Funk, city clk., paving various streets, involving 5,643 lin.ft. 7 in. rein-con. curbing, 1,038 cu.yd. grading and 4,901 sq.yd. paving. Alternate bids will be received on grading and paving with or without integral curbs and screened gravel. About $60,000. L. P. Wolff, Guardian Life Bldg., St. Paul, engrs.

Streets and Roads (Continued)

Minn., Waseca—Until Feb. 10, by J. Madigan, city clk., paving 4,420 sq.yd. North 1st St. and 8,040 sq.yd. North 2nd St., 30 ft. wide, concrete. Separate bids for each street. About $100,000. J. W. Bruska, Waseca, engr.

Kan., Eureka—Until March 10, by Comrs. Greenwood Co., paving 5.858 mi. Reece Rd., Federal Aid Project 38-A, 18 ft. wide, concrete or bituminous macadam, also building necessary bridges and culverts on same. About $235,000. R. L. Marlin, Eureka, engr.

Kan., Ft. Scott—Until March 2, by Comrs. Bourbon Co., grading and paving 6.054 mi. Kansas City Rd., Federal Aid Project 5, Sect. A, 16 ft. wide, bituminous macadam, also building necessary bridges and culverts on same. About $129,000. B. Boyle, Ft. Scott, engr.

Kan., Ft. Scott—Until March 2, by Comrs. Bourbon Co., paving 4 mi. Ft. Scott-Wichita Rd. and 5 mi. Kansas City Rd., both Federal Aid Projects, 16 ft. wide, bituminous macadam, 2½ in. penetration method. B. Boyle, Ft. Scott, engr.

Kan., Fredonia—Until March 9, by Comrs. Wilson Co., gravel surfacing and grading 24.834 mi. Capitol Highway, Federal Aid Project 43, 16 ft. wide, also building necessary bridges and culverts on same. About $580,000. C. P. Donald, Fredonia, engr.

Kan., Hutchinson—Until March 4, by Comrs. Reno Co., paving and grading 14.983 mi. Santa Fe Trail, Federal Aid Project 27, Sects. C, D, E, H, 18 ft. wide, brick, also building necessary bridges and culverts on same. About $800,000. D. E. Gilmer, Hutchinson, engr.

Kan., Leavenworth—Until March 6, by Comrs. Leavenworth Co., grading and paving 4.416 mi. Fort to Fort Highway, Federal Aid Project, Sects. B and C 18 ft. wide, concrete, also building necessary bridges and culverts on same. About $202,000. L. C. Clarke, Leavenworth, engr. Former bids rejected. Noted Jan. 15.

Kan., Seneca—Until Feb. 18, by Comrs. Nemaha Co., grading 8 mi. Woodlawn Rd., 26 ft. wide, also building necessary bridges and culverts on same. About $126,500. L. P. Price, Seneca, engr.

Neb., Norfolk—Until March 1, by city, paving 9,244 ft. streets, Class "A" and "B" Sects., 25 ft. wide, involving 18,488 lin.ft. concrete curb and gutter, 1,957 cu.yd. earth excav. and 34,409 sq.yd. asphaltic concrete or concrete. Estimated cost of Class "A" Sect., asphaltic concrete, $134,907, concrete, $126,199; Class "B" $129,682 and $117,491. H. H. Tracy, Norfolk, engr.

Texas—Until Feb. 9, by R. J. Windrow, c/o State Highway Comn., Austin, gravel surfacing 11.3 mi. Federal Aid Project 37, about 20 ft. wide. About $50,000.

Tex., Madisonville—Until Feb. 12, by J. M. Roberts, judge Madison Co., grading and draining 20.267 mi. Highway 32, from county line to county line, 24 ft. wide, involving 36.6 acres clearing and grubbing, 17,900 lin.ft. machine work, 32,685 cu.yd. unclassified earth excav., 149,025 lbs. reinforcing steel, 2,150 cu.yd. Class "A" and 50 cu.yd. Class "B" concrete, etc. About $118,000. P. A. McCarthy, Lufkin, engr.

Tex., Snyder—Until Feb. 11, by W. S. Adamson, judge Scurry Co., grading, surfacing and draining 21.523 mi. Highway 7, known as Snyder-Sweetwater Rd., 12 ft. wide, involving 13.5 acres clearing and grubbing, 11.15 mi. gravel, 138,797 cu.yd. unclassified earth excav., 20,274 lb. reinforcing steel, 196 cu.yd. Class "A" and 242 cu.yd. Class "B" concrete, etc. About $100,000. H. E. Elrod Co., 209½ Lane St., Dallas, engr. Former bids rejected. Noted Jan. 8.

Colorado—Until Feb. 10, by State Highway Comn., Denver, draining and gravel surfacing 5.672 mi. Federal Aid Project 91, from Trinidad to Hoehme, 24 ft. wide, Las Animas Co., involving 232 lin.ft. 15 in. corrugated metal culverts, 22,510 cu.yd. earth and 100 cu.yd. rock excav., 3,102 cu.yd. borrow, 7,408 cu.yd. gravel surfacing, 506 cu.yd. concrete culverts and headwalls, 13,661 yd. overhaul and 23,851 lb. reinforcing steel. About $59,826. J. E. Maloney, ch. engr.

Wash., Seattle—Until Feb. 16, by Comrs. King Co., paving 2.5 mi. Permanent Highway 11-E from Auburn to Black Diamond, 18 ft. wide, involving 27,493 sq.yd. (1) brick or (2) concrete, Cost (1) $101,000, (2) $74,000. S. J Humes, co. engr.

Cal., Santa Ana—Until Feb. 17, by Bd. Supervs. Orange Co., draining and paving 2¾ mi. Orangethorpe Ave., concrete. J. L. McBride, co. engr.

Ont., Cornwall—Until Feb. 18, by W. A. McLean, Parliament Bldgs., Toronto, laying 5,000 cu.yd. 3 in. crushed stone on 2 mi. road. About $11,000. G. Hogarth, engr.

Ont., Lancaster—Until Feb. 16, by W. A. McLean, Dept. Pub. Highways, Toronto, furnishing and laying 6,000 tons 3 in. crushed stone on provincial highway in township. About $12,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

New York—State Highway Comn., Capitol, Albany, received bids Jan. 30, improving roads in following counties: (a1) Orange Co., 1.14 mi. Balmville-Newburgh, Rd. 1538, (a2) 1.65 mi. Walden Village, Orange Ave., Main and Montgomery Sts., Rd. 1539;

(b) Ulster Co., .84 mi. Saugerties Village, Ulster Ave., Market and Main Sts., Rd. 1540;

(c) Westchester Co., 4.13 mi. Mt. Kisco-Katonah, Rd. 1533;

(d) Warren Co., 5.13 mi. Chestertown-Hague, Part 3, Rd. 1228A;

(e) St. Lawrence Co., 11.6 mi. Depeyster-Ogdensburg, Rd. 1388;

(f1) Oswego Co., 4.65 mi. Palermo-Mexico Part 1, Rd. 1526. (f2) .65 mi. Minetto-Fulton, Rd. 451-A;

(g) Tioga Co., 5.5 mi. Richford-Harford Mills, Rd. 1452;

(h) Yates Co., 9.63 mi. Rushville-Potter-Middlesex-Overacker Corners, Rd. 1352;

(i) Erie Co., 3.77 mi. Alton-Cowlesville, Rd. 1537;

(j) Niagara Co., 2.35 mi. Hendelville-Lockport, Part 2, Rd. 773A, from Spoor Lasher Co., Inc., 56 Market St., Poughkeepsie, (a1) $40,238.

Schunnemunk Constr. Co., Highland Mills, (a2) $65,840.

D. Schoentag, Saugerties, (b) $46,962.

Lounsbury & Sons Co., Peekskill, (o) $179,304.

J. W. Flynn, Waterford, (d) $109,659.

A. F. McConville, Ogdensburg, (e) $35,829.

Spellman-Oliver Co., Lake St., Chateaugay, (e) $97,213.

Pathfinder Constr. Co., West Side, Fulton, (f1) $104,838.

W. J. Semper, Watertown, (f1) $108,630.

G. C. Hill, Fulton, (f2) $16,498.

Hendrickson-McCabe Constr. Co., Syracuse, (f2) $16,936.

J. A. Culkin, Oswego, (f2) $17,302.

Greenfield Constr. Co., 89 Main St., Hornell, (g) $97,416; (h) $138,518.

D. W. Robbins, Inc., Utica, (g) $100,766.

P. H. Murray, Cutler Bldg., Rochester, (h) $138,832.

Felton Constr. Co., Buffalo, (i) $123,506.

Cold Spring Constr. Co., Ellicott Sq., Buffalo, (i) $125,002.

Public Serv. Contg. Co., Niagara Falls, (j) $80,476. Noted Jan. 15.

★N. Y., Brooklyn—E. Riegelmann, boro. pres. let contract to J. J. Jennings, 15 Van Siclen Ave., regulating and grading, Dupont St., cost $2,578, 85th St., $4,559; to C. Gallagher, Woodhaven, L. I., Ave. T, $2,244, 56th St., $2,498; to Castle Bros., Johnson Pl., 21st St., $1,689, 71st St., $4,529, Ave. R, $5,162; to Uvalde Asphalt Paving Co., 1 Bway., New York City, paving Jackson Ave., $16,796, 21st St., $5,587, 13th Ave., $14,290; to Consolidated Asphalt Paving Co., 52-9th St., Ave. T, $5,194; to Sicilian Asphalt Paving Co., 41 Park Row, New York City, 56th St., $8,648. Noted Jan. 29.

N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., received bids Jan. 27, regulating and grading, etc., (a) 91st St., (b) Beach 22nd St., (c) 77th St., (d) regulating and paving with asphalt, Pierce Ave., (e) Sandol St., from Scott Bros., 329 East 29th St., Brooklyn, (a) $17,388, (c) $2,475; J. Marcio, 2978 Atlantic Ave., Brooklyn, (a) $17,919, (c) $2,875; Grimm Constr. Co., Richmond Hill, (a) $18,390, (c) $2,775; R. A. Hess, Corona, (b) $1,278; Peace Bros., 20 Main St., (b) $1,690; C. Kurth, 812 Forest Ave., Brooklyn, (a) $18,466, (c) $2,250; Uvalde Asphalt Paving Co., 1 Bway., New York City, (d) $17,684, (e) $5,823; Consolidated Asphalt Paving Co., 52 9th St., Brooklyn, (d) $18,222, (e) $6,065; Cleveland Trinidad Paving Co., Flushing Ave., Brooklyn, (d) $18,533; Sicilian Asphalt Paving Co., 41 Park Row, New York City, (d) $20,510, (e) $6,630. Noted Jan. 22.

★Pennsylvania—L. S. Sadler, state highway comr., Harrisburg, let contract building 31,200 ft. road between Bath and Northampton, 18 ft. wide, Northampton Co., to A. McMullen Co., Finance Bldg., Phila., $231,883; 15,000 ft. rein. con. highway between Easton and Tatamy, Northampton Co., to McInerney & McNeal, Inc., Bank Bldg., Easton, $165,326; 13,592 ft. in Daugherty and New Sewickley Twps., Beaver Co., to R. B. Markley, Rochester, $150,771.

Pennsylvania — State Highway Dept., Harrisburg, let contract building section State-Aid Highway in North Sewickley Twp., Beaver Co., extending out from Zelienople, involving 5,443 ft. 1 course rein.-con., to W. S. Morrison, New Brighton, $55,940.

★Pennsylvania—State Highway Dept., Harrisburg, received bids Jan. 27, paving in counties as follows:

Armstrong Co., 10,610 ft. 1 course rein.-con., Route 188, Sect. 1, Kiskiminetas Twp., from Summit Constr. Co., Akron, O., $119,284.

Beaver Co., 3,055 ft. vitr. brick, Center Twp., J. C. Devine Co., Alliance, O., $38,622.

Butler Co., 28,188 ft. 1 course rein.-con., Route 309, Forward and Adams Twps. and Callery Boro., S. Gamble Co., Glass St., Carnegie, $302,047, J. Marburger & Sons, Evans City, $308,878; 18,778 ft. 1 course rein.-con., Route 251, Fairview Twp., Petrolia and Karns City Boros., Burns Bros., 343 East Washington St., New Castle, $211,684; C. E. Walter, Mill and Washington Sts., Butler, $219,621.

Cambria Co., 24,207 ft. 1 course rein.-con., Route 222, Richland and Stone Creek Twps., W. Gindlesberger, Giestown, $308,111; Porquato Bros., Windber, $374,079.

Carbon Co., 23,420 ft. 1 course rein.-con., Lehigh Twp., Sterling Constr. Co., 28 Spring St., Lodi, N. J., $201,335; Freeland Constr. Co., Freeland, $202,763, O. Morgan, 307 Coal Exch. Bldg., Wilkes Barre, $232,607.

Clearfield Co., 13,027 ft. 1 course rein.-con. and Hillside vitr. brick, Route 60, Sandy Twp., Burnside Constr. Co., P. O. Box 61, Clearfield, $129,260, Minns Bros., DuBois, $136,295, T. W. Munro & Co., DuBois, $136,815; 7,291 ft. 1 course rein.-con., Route 59, Brady Twp., Johnson & Kearns, DuBois, $69,794, Minns Bros., DuBois, $73,079, R. Swan, Jr., 400 Aiken Ave., Pittsburgh, $76,268.

Dauphin-Perry Counties, 41,753 ft. 1 course rein.-con., Route 195, Reed and Watts Twps. and New Buffalo Boro., MacArthur Bros., 120 Bway., New York City, $481,715; U. G. I. Contg. Co., 1401 Arch St., Phila., $629,585; Crawford Paving Co., 2620 E. St., N. W., Wash, D. C., $690,943.

Fayette Co., 6,467 ft. 1 course rein.-con., Route 363, Henry Clay Twp., C. R. McIntyre, Fairchance, $65,633, Petriello Bros. Co., Brownsville, $76,567; 14,496 ft. 1 course rein.-con. and Hillside vitr. brick, Route 247, Perry and Jefferson Twps., Strawn Contg. Co., 524 Fayette Title & Trust Bldg., Uniontown, $193,481, Petriello Bros. & Co., Brownsville, $226,402.

Greene Co., 10,620 ft. 1 course rein.-con., Route 111, Center Twp., J. F. Norris, Somerset, $151,103; 12,581 ft. 1 course rein.-con., Route 256, Center Twp., Burgess & Dorrier, Scottsville, $182,398, E. E. Morris and T. R. Huffman, Waynesburg, $201,798.

McKean Co., 14,800 ft. 1 course rein.-con., Route 210, Eldred Twp., H. E. Bunce, 125 Fulton St., Olean, N. Y., $135,923.

Northampton Co., 20,164 ft. 1 course rein.-con., Route 165, Plainfield and Washington Twps. and Pen Argyl Boro., MacArthur Bros., Co., 120 Bway., New York City, $201,284; Freeland Constr. Co., Freeland, $202,578; H. B. Sproul Constr. Co., 218 Adams Ave., Scranton, $226,812.

Potter Co., 5,033 ft. 1 course rein.-con., Route 101, Roulette Twp., Horn & Devling, Main St., Galeton, $50,485; Tyne & Willey, 407 Savings Bank Bldg., Binghampton, N. Y., $56,905; G. Metzger, Jr., 12 East 4th St., Emporium, $66,592; 7,892 ft. bituminous surface course or 1 course rein.-con., Route 101, Roulette Twp., Horn & Devling, Main St., Galeton, $112,503; Tyne & Willey, Binghampton, N. Y., $114,565; G. Metzger, Jr., Emporium, $117,961.

Schuylkill Co., 39,500 ft. 1 course rein.-con. and Hillside vitr. brick, Route 290, Rush and Ryon Twps., Cease, Picton & Harrison, 442 Miners Bank, Wilkes-Barre, $550,383; J. W. Bell and A. T. Moran, Shenandoah, $565,406; H. E. Baton, 1713 Samson St., Phila., $604,890.

Venango Co., 3,419 ft. 1 course rein.-con., Route 89, Plum Twp., Wilt & Frazier, Franklin. $50,581.

Warren Co., 2,080 ft. 1 course rein.-con. Route 88, Warren Boro., J. P. Morrissey 309 Central Ave., Dunkirk, N. Y., $36,636, E. T. Beck, 116 St. Clair St., Warren $37,980; P. B. Colyon, 332 Park Ave. Dunkirk, N. Y., $38,989.

Streets and Roads (Continued)

Westmoreland Co., 9,184 ft. 1 course rein.-con. and Hillside vitr. brick, Route 68, Salem and Unity Twps., J. C. Mickey, 1610 Ligonier St., Latrobe, $135,751; Mitchell & Byers, Mt. Pleasant, $137,866; 38,433 ft. 1 course rein.-con. and Hillside vitr. brick, Route 188, Lower Burrell and Allegheny Twps., and Arnold Boro., State Constr. Co., 2nd Ave. and 5th St., New Kensington, $446,448; Leechburg Constr. Co., Leechburg, $481,912 Noted Jan. 8.

Pa., Phila.—City received bids Jan. 30, grading and paving 17th St., from V, $704, Q, $994, B, $1,096; Lancaster Ave., from D, $21,779, A, $25,977; Columbia Ave., from C, $1,210, D, $1,393, A, $2,296; Buist Ave., from C, $10,261, A, $11,605, K, $12,216; Cedar Ave., from C, $3,443, L, $3,946, A, $4,080; Beaumont and Litchfield Sts., from I, $421, A, $887; Large and Allengrove Sts., from E, $11,376, F, $13,243, W, $16,060; Wakeling, Rutland and Bridge Sts., from B, $703, F, $920, H, $963; 50th Sts., from D, $5,770, A, $8,590, C, $10,677; Ditman, Gillespie and Montague Sts., from E, $6,280; Felton St., from A, $1,353, O, $1,404; Locust St., from C, $4,551, A, $4,813, 1, $5,664; St. Vincent and Oakley Sts., from E, $2,379, P, $2,736, H, $2,788; Passyunk Ave., from T, $96,354, S, $103,300; Ross St., from U, $4,032, T, $5,162; Fairhill St., from T, $3,501, U, $3,534; I St., from U, $10,722, S, $11,223, T, $11,584; 4th St., from S, $17,552, V, $17,638, T, $18,541; Broad St., from S, $401,437, R, $491,926, V, $502,333; Louden St., from V, $6,840, S, $6,890, T, $7,332; Hortter St., from V, $5,061, T, $5,408; Widener St., from V, $4,192, T, $4,213; Braddock St., from V, $5,103, T, $5,529; Ashdale St., from V, $3,037, T, $3,083; Fairhill St., from V, $6,068, T, $6,393; Herbert St., from V, $3,211, T, $3,230; Wingohocking St., from V, $5,304, T, $5,538; Willard St., from T, $2,014, V, $2,058; 61st St., from T, $6,859, V, $6,958, R, $7,355; Oakland St., from V, $5,896, T, $6,082; Paschall Ave., from V, $9,150, T, $9,455, S, $9,555; Somerville Ave., from S, $10,156, V, $10,546, T, $10,819; Elmwood Ave., from V, $87,036, R, $92,360, S, $94,208; Bellefield Ave., from V, $15,210, S, $16,397, T, $16,466; Oregon Ave., from T, $16,447, V, $16,508, S, $17,862; Lebanon Ave., S, $13,232, V, $13,756, T, $14,281; Fishers Ave., from V, $8,470, S, $8,807, T, $8,969; Florence Ave., from V, $15,768, T, $16,598, S, $17,215; Grays Ave., from V, $9,889, S, $10,132, T, $10,234; Marlyn Rd., from V, $11,983, T, $11,989, R, $12,278; Cliveden Ave., from V, $13,837, S, $15,693, Y, $16,653; Magnolia St., from V, $5,914, S, $6,453, Y, $6,617; Spencer St., from S, $7,463, Y, $7,680. Following is key to low bidders: (A) E. A. Mullen, 5512 Vine St., (B) F. Mark Contg. Co., 2820 North 21st St., (C) T. P. Lee, 5629 Cherry St., (D) T. F. Reilly, 50th and City Aves., (E) I. K. David, 6100 North 20th St., (F) D. Duffey, (G) McNichol Paving & Contg. Co., 1923 Cherry St., (H) T. L. Flanagan, 1204 East Montgomery St., (I) J. J. McHugh, Lehigh and Emerald Sts., (J) S. Bent, Franklin Trust Bldg., (K) Empire Eng. Co., Inc., 2214 Chestnut St., (L) E. P. Gorman, 5037 Walnut St., (M) Curtis Bros., Longshore St., (N) E. McGee, (O) L. Mullen, (P) R. P. Bennis, Estate of, Chew and Price Sts., (O) A. Peoples, 25th and Callowhill Sts., (R) Phila. Paving Co., 51st and Grays Sts., (S) Mack Paving & Contg. Co., Nicetown Lane and C St., (T) Barber Asphalt Paving Co., 30th and Price Sts., (U) Eastern Paving Co., Colonial Trust Bldg., (V) Estate of D. McMahon, Germantown and Chelton Sts., (W) T. Connor, 3329 North 5th St., (Y) Cunningham & Murray, 1345 Arch St. Noted Jan. 29.

★**W. Va., Wayne**—Comrs. Wayne Co. let contract improving 5.9 mi. Wayne-East Lynn Rd., to Wayne Constr. Co., Wayne, $115,663. Work involves 63,000 cu.yd. grading and drainage structures.

★**W. Va., Williamson**—Comrs. Mingo Co. let contract building 8 mi. along Pigeon Creek, 20 ft. wide, involving 90,000 cu.yd excav., grading and drainage structures, to Clay & Doyle, Huntington, $108,410.

★**Ga., Washington**—Comrs. Wilkes Co. let contract grading, paving and draining 5.2 mi. Athens and Augusta Highway, involving 49,152 sq.yd. concrete, to Meador Constr. Co., Healy Bldg., Atlanta, at $174,878.

★**Fla., Jacksonville**—City let contract paving Kings Rd., Myrtle Ave., Bay, Evergreen Enterprise Moncrief and 7th Sts., vitr. brick on concrete base, to J. Y. Wilson, Clark Bldg. About $263,620.

★**Ohio**—State Highway Comn., Columbus, let contracts building roads in following counties:

Adams Co., Sect. "R" Cincinnati-West Union Rd., 6.255 mi., grading, constructing bridges and culverts and paving with waterbound macadam, S. R. Edgerton & J. O. McManus, West Union, $125,100.

Franklin Co., Sect. "Q-2" Columbus-Sandusky Rd., 1.02 mi., grading, constructing bridges and culverts and paving with bituminous macadam, S. M. Billiter & Oliver Bros., Cincinnati, $30,543.

Lorain Co., Sect. "S" Oberlin-Norwalk Rd., .75 mi., grading, constructing bridges and culverts and paving with brick, A. J. Baltes, Norwalk, $21,874.

Mahoning Co., Sect. "Y" Canfield-Poland Rd., 1.88 mi., grading, constructing bridges and culverts and paving with macadam, J. J. Hill and J. D. Darrow, Struthers, $38,307.

Perry Co., Sect. "P" Logan-New Lexington Rd., .10 mi., grading, constructing bridges and culverts and paving with monolithic brick, E. N. Turner, Logan, $6,848. Noted Jan. 8.

O., Cleveland—Cedar Heights Land Co., 220 Erie Bldg., received bids building sidewalks on Cedar Brook Rds. 2 and 4, involving 150,000 sq.ft. 5 ft. x 2½ in. sandstone or bluestone flagging on cinder base, from Cleveland Stone Co., Union Bldg., $40,735; Ohio Quarries Co., Citizens Bldg., $42,050. Noted Jan. 29.

★**O., Cleveland Heights** (Warrenville P. O.)—Village let contract improving East Monmouth and Crest Rds., involving 9,565 sq.yd. asphalt, 30,898 cu.yd. grading, 4,630 ft. sandstone curbing and 6,470 ft. sandstone sidewalk, to Cleveland Trinidad Paving Co., The Arcade, $51,681.

★**Michigan**—State Highway Dept., Lansing, let contract grading and draining 3.006 mi. State Trunk Line Rd. 24-3, 24 ft. grade, Newago Co., to F. Hill, 415 Warren Ave., Big Rapids, $16,942. Noted Jan. 1.

Wisconsin—State Highway Comn., Green Bay, received bids paving Oshkosh Appleton Rd., Federal Aid Project 116, involving (a) 18,245 cu.yd. earth excav., (b) 34 cu.yd. borrow excav., (c) 174 cu.yd. concrete in culverts and (d) 66,242 sq.yd. 18 ft concrete surfacing, from McGucken Constr. Co., Milwaukee, (a) $1.25 per cu. yd., (b) $2 per cu.yd., (c) $25 per cu.yd., (d) $2.97 per cu.yd., total cost, $223,975; Carvey-Weyenberg Constr. Co., 812 College St., Appleton, (a) $1.18, (b) $1.18, (c) $28, (d) $3.05, $228,493; G. M. Gross, (a) $1.25, (b) $1.25, (c) $27, (d) $3.12, $234,235.

★**Wisconsin** — State Highway Comn., Green Bay, let contract paving Manitowoc-Sheboygan Rd., Federal Aid Project 123, to Zendala Cement Co., Manitowoc, involving 15,470 cu.yd. earth excav., at $1 per cu.yd.; 144 cu.yd. borrow excav., $1; 309 cu.yd. concrete in culverts, $22; 41,110 sq. yd. 18 ft. concrete surfacing, $2.40 and 422 cu.yd. ditching, $1; total cost, $121,515.

★**Ia., Des Moines**—City let contract grading and paving Center St. from 31st to 44th Sts., involving 12,155 sq.yd. asphaltic pavement on bituminous concrete sub-base, to Mid-West Paving Co., 615 Southwest 9th St., at $45,460. Noted Jan. 29.

★**Ia., Rockford**—City let contract paving 4 blocks main streets, 25 ft. wide, involving 10,861 lin.ft. concrete gutter and 16,630 sq.yd. asphaltic concrete, to Moore-Young Constr. Co., Waterloo, at $3.23 per cu.yd.

★**Minn., Duluth**—City let contract paving 4660 ft. Jefferson St. from 22nd Ave. E, to 32nd Ave. E., 24 ft. wide, asphalt, to D. H. Clough & Co., 914 East 1st St., $92,603. Noted Jan. 22.

★**Minn., Duluth**—City let contract paving 1,900 ft. 27th Ave. from 5th to 6th Ave. and Winnipeg Ave. from 6th to Devonshire Sts., 24 ft. wide, to J. McDonald, c/o E. K. Coe, city engr., $35,683. Noted Jan. 15.

★**Minn., Minneapolis** — A. P. Erickson, aud. Hennepin Co., let contract grading and graveling ½ mi. Rd. 55A, on Dan Patch Line, near Bloomington, involving 38,000 sq.yd. approaches to Savage River Bridge, to Rogers, Curtis & Frederick, Globe Bldg., $29,943.

★**Kan., Abilene**—Dickenson Co. let contract paving 4 mi. Bee Line Rd., Federal Aid Project 29, Sect B, 18 ft. wide, concrete, also building bridges and culverts on same, involving 17,000 cu.yd. earth excav., 11,840 sq.yd. concrete, 6 tons steel, etc., to R. Queal, 4219 Paseo St., Kansas City, Mo., $208,489; 4.54 mi. Golden Belt Highway, Federal Aid Project 32, 18 ft. wide, concrete, also building bridges and culverts on same, 40,000 cu.yd. earth excav., 48,000 sq.yd concrete, 5 tons steel, etc., Ziegler & Dalton, Junction City, $226,855.

★**Ark., Jonesboro**—Comrs. Craighead Co. let contract grading Brookland and Lester Rds. to Roach & Co. About $100,000.

★**Okla., Eufaula**—City let contract paving 5 blocks Main St., Dist. 2, 25 ft. wide, 6 and 7 in. concrete, to Comstock & Smedley, 431 Iowa Bldg., Tulsa. About $32,000. Noted Jan. 8.

★**Arizona, Tombstone**—Bd. Supervs. Cochise Co. let contract building 4 mi. Sect. A, Bisbee-Douglas Highway Federal Aid Project 11, 18 ft. wide, involving 47,137 sq.yd. concrete paving @ $2.40, to McPeak, Dillon & Co., 2415 Grammercy Park, Los Angeles, $101,376; 4.4637 mi. Sect. B, 18 ft. wide, 42,240 sq.yd. concrete paving $2.09, to G. H. Oswald, Douglas, Ariz., $98,516. State to furnish cement.

★**Wash., Tacoma**—Pierce Co. let contract building 5.6 mi. road, 24 ft. wide, involving 34,479 cu.yd. earth, 25,060 cu.yd. loose and 46,286 cu.yd. rock excav., to Grant-Smith Co., Henry Bldg., Seattle, $223,750.

California—State Highway Comn., 515 Forum Bldg., Sacramento, received only bid Jan. 19, building Federal Aid Project 37, Route 10, Div. 6, Sect. E, between Oil King School and Huron Rd., Fresno Co., from J. G. Donovan, Los Angeles, $248,935. Work involves 74,200 cu.yd. excav. @ $1.05 per cu.yd., 11,720 cu.yd. Class "A" portland cement concrete (pavement), $14, 40 cu.yd. Class "A" portland cement concrete (culverts and monuments), $25, corrugated metal pipe: 1,222 lin.ft. 12 in. $1, 198 lin.ft. 18 in. $1.50 and 296 lin.ft. 24 in. $2. Federal Aid Project 39, Route 26, Div. 7, Sect. G, Riverside Co., from C. D. Soteras, Los Angeles, $254,938. Work involves 3,700 cu.yd. excav., $0.98, 15,600 cu.yd. Class "A" portland cement concrete (pavement), $13.95, 20 corrugated metal pipe: 188 lin.ft. 18 in., $1.35 and 64 ft. 24 in. $1.60. Route 23, Div. 6, Sect. A, between Indian Allotment and Division Creek, Inyo Co., from (a) C. D. Soteras, Los Angeles, $22,467, (b) J. L. Conner, Los Angeles, $26,950. Work involves 13,000 cu.yd. excav., (a) $1.49, (b) $1.80, 65 cu.yd. Class "A" portland cement concrete (culverts and monuments), (a) $28, (b) $30, corrugated metal pipe: 528 lin.ft. 12 in. (a) $1, (b) $1.25, 216 lin. ft. 18 in. (a) $1.20, (b) $1.50 and 216 ft lin.ft. 24 in. (a) $1.45, (b) $2, etc.

Excavation and Dredging

PROPOSED WORK

Ill., East St. Louis—Drainage—East Side Levee and Sanitary Dist. preparing plans for drainage canal to run along foot of bluffs. Cost $2,000,000; this is part of $10,000,000 project to drain East St. Louis and eliminate Cahokia Creek. H. S. Kramer, pres.

Mont., Helena—Irrigation—Helena Valley Irrigation Project, Lewis & Clark Counties, plans to irrigate 40,000 acres. Work involves 45 mi. canals and purchase of 2 pumping plants now being operated. About $600,000. A. W. Verharen, 18 Kohrs Bldg., engr.

Mo., Marshall—Drainage—Salt Fork D. D. rejected bids received Jan. 17, building 21 mi. drainage ditch, involving 1,731,000 cu.yd. excav. About $700,000. Elliott & Harmon Eng. Co., 144 Fredonia St., Peoria, Ill., engrs. Noted Jan. 8.

Wash., Entiat—Irrigation—Entiat Reclamation Dist., recently organized, plans to build concrete canal, 7 mi. long, volume carrying capacity of 1000 miners inches of water, to irrigate flat lands in Entiat Flat. Bonds for $60,000 will be voted for project.

Ore., Tumalo—Irrigation—Tumalo Irrigation Dist., represented by F. N. Wallace, filed application with P. A. Cupper, state engr., Salem, to appropriate 50,000 acre ft. water to be taken from west fork of Deschutes River and stored in Crane Prairie Reservoir for irrigation of 12,500 acres in district; will also build canals, laterals, floodgates and flumes. About $50,000.

Ont., Chatham—Dredging—Chatham and Dover Twps. had plans prepared and will receive bids about March, for dredging 19 mi. of Little Bear Creek Drain, also building several concrete bridges. Work involves 600,000 yd. floating dredge work and 1,000 cu.yd. concrete. About $150,000. A. McArthur, Tupperville, clk. G. McCribbin, engr.

BIDS DESIRED

Tenn., Dresden—Drainage—Until Feb. 18, by Judge of Weakley Co., building drainage system, including (1) Main Canal, Sect 1, involving 1,626,000 cu.yd. excav. and 316 acres clearing, Sect. 2, 1,685,000 cu.yd. excav. and 288 acres clearing, total length, 35 mi., (2) Cypress Creek Lateral, 73,600 cu.yd. excav. and 21 acres clearing, (3) Cain Creek Lateral, 24,400 cu.yd. excav. and 10 acres clearing, (4) Richland Creek

Excavation and Dredging (Continued)

Lateral, 34,450 cu.yd. excav. and 11 acres clearing, (5) Harris Fork Lateral, 63,900 cu.yd. excav. and 16 acres clearing, for North Fork D. D. 2, Obion and Weakley Counties. Bids will be received on all work or any part thereof. C. E. Keiser, Union City, secy. Bid Directors.

Mich., Ft. Gratiot (Port Huron P. O.)—Excavation—Until Feb. 17, by Ira D. Chase, constructing Doe Creek Drain, Sect. 1,800 rods long, 3-12 ft. wide at bottom, 6.77 feet deep and 24.22 ft. wide at top of cut; Sect. 2,560 rods long, 3 ft. wide at bottom, 4.93 ft. deep and 17.79 ft. wide at top of cut. Work involves 4 rein.-con. bridges, 16 x 24 ft., 16 x 18 ft. and two 12 x 22 ft.

Ill., Havana—Drainage—Until Feb. 21, by Comrs. Garden Special D.D., at office of Clerk of Mason Co., improving open ditch drains, involving 110,000 cu.yd. excav.; also building 5 steel bridges and repairing existing ones. Separate bids may be submitted for excav. and bridges. J. B. Barnes, secy.

Ia., Sioux Rapids—Channel—Until Feb. 10, by Bd. Supervs. Buena Vista Co., Storm Lake, for open ditch work in channel change of Sioux River, here. Bids will be received on channel with 30 ft. bottom width to extreme river grade for about 1,000 ft., in 2 parts, involvnig 13,000 cu.yd. excav.; channel with 70 ft. bottom width to partial depth and narrow channel in bottom, same length as above, involving 18,000 cu.yd. excav. A. H. Cunningham, co. drainage engr.

Ia., Storm Lake—Drainage—Until Feb. 10, by Bd. Supervs. Buena Vista Co., improving D.D. 20, by cleaning out 13,800 ft. main open ditch, involving 30,000 cu. yd. excav. and furnishing and laying 1,534 ft. 30 in. and 2 028 ft. 28 in. tile in open ditch, filling 3,562 ft. old open ditch, involving 24,000 cu.yd. excav. A. H. Cunningham, co. drainage engr.

Mo., Bloomfield—Ditches—Until Feb. 11, by S. Wilson, civil engr. of D.D. 31, known as A. H. Graham et al D.D., Stoddard Co., building ditches and clearing right-of-way of said district, in sections of 1 mi. each or as a whole. B. Wilson, co. clk.

Ont., East Gwillimbury — Excavation — Until Feb. 18, by E. A. James Co., Ltd., 36 Toronto St., Toronto, for 60,000 cu.yd. excav. About $45,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Wis., Milwaukee** — Excavation—Standard Oil Co., Brumder Bldg., let contract excavating for proposed 4 story, 75 x 150 ft., rein.-con. and brick office and service building, to A. Manger Constr. Co., 332 Layton Bldg. See "Buildings" under proposed work.

★**Ia., Sidney**—Drainage—H. C. Swanson, aud. Fremont Co., let contract draining and building East Nishnabotna Ditch 4, with laterals A and B, to E. G. & L. E. Sternberg, Creston, $129,271. Work includes 10.64 mi. main ditch, 24 ft. wide, involving 72,000 cu.yd. dry earth excav, lateral A, 3,900 ft. long, 4 ft. wide, 6,000 cu.yd. earth excav. and lateral B, 6,500 ft. long, 4 ft. wide, 7,000 cu.yd. earth excav.

Industrial Works

PROPOSED WORK

Mass., Boston—Commercial Brewery, Charlestown, having plans prepared by P. J. Griffin, archt., c/o owners, for 1 and 2 story, 50 x 110 ft., brick garage, concrete foundation, on Cambridge St. About $75,000.

Conn., Hartford—Bryant & Chapman, Woodland St., having plans prepared by C. N. Flagg & Co., archts. and engrs., State St., Meriden, for power plant.

Conn., Hartford—City plans to build machine and repair shop and office. About $60,000. J. L. Purcell, chn. bldg. comn. Architect not selected.

Conn., Hartford — A. Goldstein having preliminary plans prepared by F. Walz, archt., 348 Trumbull St, for 2 story, 101 x 119 ft., brick and steel garage and service station, rein.-con. flooring, concrete foundation, on Maple Ave. About $100,000.

Conn., Hartford—G. E. Johnson, 51 Russ St., having plans prepared by B. A. Sellew, archt., 756 Main St., for 2 story, 50 x 125 ft., brick factory, concrete foundation, on New Park Ave. About $65,000.

N. Y., Brooklyn—Brooklyn Retail Butchers Corp., 3285 Fulton St, plans to build 3 story, 130 x 135 ft., brick and steel ice and storage plant, rein.-con. flooring, concrete foundation, on Atlantic Ave. and Ft. Greene Pl. About $400,000. A. Rosen, pres. Architect and engineer not selected.

N. Y., Buffalo—Auto Club Garage, Inc., 518 Rhode Island St., plans to build brick addition to garage. About $25,000.

N. Y., Buffalo—Bison Ice & Coal Co., Inc. plans to build 2 story, brick ice plant, at 200-216 Rapin Pl. About $50,000.

N. Y., Buffalo — Buffalo Porcelain & Enameling Co. plans to build 2 story, concrete and steel factory, at 1927 Elmwood Ave. About $25,000.

N. Y., Buffalo—C. Clink Packing House Co., 50 Depot St., plans to alter and build addition to brick packing house. About $30,000.

N. Y., Buffalo—Klinck & Schaller, Inc., plan to build 2 story, brick and concrete abbatoir, at 640 Howard St. Cost between $60,000 and $65,000.

N. Y., Clayton—Taggarts Paper Co., Sherman Bldg., Watertown, purchased 100 acre site, at Steeles Point, here, with waterfront on St. Lawrence River and adjacent to New York Central R.R. tracks, and plans to build wood preparing plant, dockage facilities, terminal, storage and loading conveyors, etc. About $100,000.

N. Y., New York—Western Electric Co., 195 Bway., having plans prepared by McKenzie, Voorhies & Gmelin, archts. and engrs., 1123 Bway., for 8 story, 200 x 325 ft., rein.-con. and steel warehouse, rein.-con. flooring, concrete foundation, on Hudson, West Houston and Greenwich Sts.

N. Y., New York—Zipkes, Wolff & Kudroff, archts. and engrs., 25 West 42nd St., preparing plans for brick and steel factory, rein.-con. flooring, concrete foundation. About $150,000. Owner's name withheld.

N. Y., Potsdam—H. N. Clark plans to build 3 story, 36 x 68 ft., concrete and steel garage, on Water St. About $25,000.

N. Y., Rochester—Michaels, Stern & Co., 87 Clinton Ave., N., plans to build 62 x 140 ft. brick and frame factory, on Smith St. About $55,000.

N. Y., Rye—W. E. Peet having plans prepared by Ewing & Allen, archts. and engrs., 101 Park Ave., New York City, for 1 story, brick and steel garage, rein.-con. flooring, concrete foundation. About $25,000.

N. Y., Seneca Falls—Hammer & Nearpass plan to build 3 story, 100 x 140 ft., steel and concrete garage on Fall and South Walnut Sts. Cost between $75,000 and $90,000. Address W. Hammer.

N. Y., Watertown—International Paper Co., Hinde & Dauche Paper Co., and other property owners adjacent to Sewalls Island plan to build hydro-electric plant, here. About $1,000,000.

N. Y., Watertown—Taggarts Bros. Co., 595-597 Main St. W., plans to build brick and concrete factory, adjacent to present plant. Cost between $80,000 and $100,000.

N. J., Newark—Genl. Lead Batteries Co., 123 West 56th St., New York City, having plans prepared by Timmins & Chapman, engrs. and archts., 315 5th Ave., New York City, for 5 story, brick and steel factory, rein.-con. flooring, on Lester Ave. and Chapel St. About $150,000.

N. J., Trenton—Union Electrical Porcelain Co., Hamilton and Clark Sts., plans to build plant to replace one destroyed by fire with loss of $90,000. Architect not selected. T. A. Mackenzie, 1404 Greenwood Ave., pres.

Pa., Erie—Hayes Mfg. Co., 12th and Liberty Sts., having plans repared by E. McGeorge, engr. and archt., 1900 Euclid Ave., Cleveland, for 2 story, brick and steel forge shop, brick foundation. About $75,000.

Pa., Phila.—Standard Crown Co., c/o Mills & Van Kirk, engrs. and archts., Harrison Bldg., having plans prepared for 1 story, 62 x 200 ft. factory, with 16 x 20 ft. wing, brick and slow burning construction, steel sash, on Hope and Palmer Sts. About $35,000.

Md., Baltimore—F. E. Beall. archt., 1335 North Gilmor St., soon lets contract building 1 story, 189 x 222 ft., concrete, steel and brick garage, concrete and brick foundation, on Reistertown Rd. near Gordon St., for Dean's Garage Co., 554 Equitable Bldg. About $45,000.

Md., Baltimore—Smith & May, archts., 1133 Calvert Bldg., receive bids about Feb. 15, building 8 story, 45 x 150 ft., concrete and brick addition to printing plant, concrete foundation, for Falconer Co., Gay and Water Sts. About $100,000. H. Massart, 328 North Charles St., structural engr. C. L. Reeder, Park Ave. and Saratoga St., consult. engr.

Md., Baltimore—International Bedding Co., Guilford Ave. and Chase St., having plans prepared by J. Freund, archt., 1307 St. Paul St., for 6 story, 86 x 110 ft., brick and concrete factory, concrete foundation. About $175,000. H. M. Taylor, mgr.

Md., Baltimore—C. D. Pruden Co., Warren and Dock Sts., in joint operation arrangement with Blaw-Knox Co., Freeport Rd., Hoboken, Pa., plans to build 1 story, concrete and steel addition to plant concrete foundation, here. About $150,000. Private plans.

Md., Fairfield (Baltimore P. O.)—Globe Shipbuilding & Dry Dock Co., Fidelity Bldg., Baltimore, preparing plans for ship building and repair plant, to include six or seven 1 and 2 story, (various sized), concrete, steel and brick buildings, concrete and stone foundations, railroad switches, ship berths, dry docks, etc., on waterfront, here. About $5,000,000.

Va., Danville—Piedmont Hardware Co., 554 Craghead St., soon lets contract constructing 3 story, 50 x 175 ft., fireproof storage building and store, on Main St. Cost to exceed $50,000.

Va., Richmond—Patrick-Young Co., 9th and Byrd Sts., having plans prepared by C. L. Brooks Eng. Co., Moultrie, Ga., for brick and concrete packing building, on Hermitage Rd. and Leigh St. About $150,000.

Ala., Birmingham — Ridgeway Paper Stock Co, 1619 Ave. E, plans to build 100 x 250 . mill construction paper mill. About $250,000.

Tenn., Knoxville — Anderson, Dulin & Varnell Co. plans to build 10 story, 90 x 100 ft., rein.-con. warehouse, rein.-con. flooring, concrete foundation, on Gay St. About $200,000. Architect not selected.

Ky., Riverside—Standard Oil Co., 424-30 West Bloom St., Louisville, having plans prepared building addition to refinery at Riverside Sta. About $2,000,000. Private plans. A. K. Whitelaw, local mgr.

O., Cincinnati—Alms & Doepke Co., 12th and Sycamore Sts., having plans prepared by S. S. and G. H. Godley, archts., Neave Bldg., and soon receives bids building 2 story, 34 x 167 ft., brick and concrete warehouse, at 319 East 12th St.

O., Cleveland—W. S. Ferguson Co., archts., 403 Long Ave., soon lets contract building 2 story, 75 x 100 ft., concrete steel and brick factory, rein.-con. flooring, concrete foundation, on East 37th St. and Payne Ave., for Auer Register Co., 403 Long Ave. About $100,000.

O., Cleveland—E. McGeorge, archt. and Engr., 1900 Euclid Ave., soon lets contract building 3 story, 60 x 120 ft., concrete, steel and brick addition to factory, rein.-con. flooring, concrete foundation, for Champion Machine & Forge Co., East 71st St. and Union Ave. About $75,000. Noted Jan. 8.

O., Cleveland—Cleveland Electric Illuminating Co., 75 Public Sq., having plans prepared by S. M. Gallaher, archt. and engr., 408 Illuminating Bldg., for 1 story, concrete, steel and brick boiler house, rein.-con. flooring, concrete foundation, at foot East 70th St. About $100,000.

O., Cleveland—Cleveland Ry. Co., Leader-News Bldg., plans to build 1 story, concrete, steel and brick substation, rein.-con. flooring, concrete foundation, in Denison-Lorain Dist. About $200,000. L. P. Crocelius, 700 Leader-News Bldg., engr.

O., Cleveland—Cleveland Ry. Co., Leader-News Bldg., plans to build 1 story, concrete, steel and brick substation, rein.-con. flooring, concrete foundation, near Euclid Ave. and East 105th St. About $200,000. L. P. Crocelius, 700 Leader-News Bldg., engr.

O., Cleveland—Christian, Schwarzenberg & Gaede, archts, and engrs., 1900 Euclid Ave., soon let contract building 3 story, 164 x 290 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, on East 105th St. and Elk Ave., for Green-Haas-Schwartz Co., 1967 East 57th St. About $400,000.

O., Cleveland—L & M Axle Co., Colonial Arcade, having plans prepared by H. E. Shimmen, archt., 2031 Euclid Ave., for 2 story, 90 x 180 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, on East 49th St. About $100,000.

O., Columbus—Cole Motor Sales Co., 781 North High St., having plans prepared by C. L. Inscho, archt., Brunson Bldg., for 2 story, 47 x 252 ft., rein.-con. and terra cotta garage and salesroom, on East Broad St. About $120,000.

O., Columbus—German-Amer. Publishing Co, 201 Hartman Bldg., soon lets contract

Industrial Works (Continued)

building 5 story, 50 x 62 ft., brick and concrete printing plant, on East Main St. About $55,000. J. Goldsmith, Wheeler Bldg., archt.

O., Dayton—Dayton Rubber Mfg. Co., West River St., plans to build 1 story, 70 x 200 ft., rein.-con. addition to plant, rein.-con. flooring, concrete foundation. About $35,000. Private plans.

O., Dayton—Delco-Light Co., East 1st St., plans to build 2 story, rein.-con. and brick power and heating plant, rein.-con. flooring, concrete foundation, on Keowee and Pitt Sts. About $75,000. A. Pressler, 329 East 1st St., engr.

O., Dayton—C. F. Sheffer, 221 Northwestern Ave., soon lets contract building 2 story, 70 x 150 ft., rein.-con. and brick dry cleaning plant, concrete foundation, on South Main St. About $25,000.

Mich., Marysville—Detroit Edison Co., David Whitney Bldg., having plans prepared by Smith, Hinchman & Grylls, engrs., 710 Washington Arcade, Detroit, for 2 story, rein.-con., brick and steel power plant, rein.-con flooring, concrete foundation to include steam electric generating unit, 30,000 kw., at Bunce Creek Sta. About $2,000,000. Noted Aug. 28.

Mich., Port Huron—A. B. Parfet, Military St., plans to build 2 story, 100 x 250 ft., rein.-con., brick and steel service and sales station, rein.-con. flooring, concrete foundation. About $100,000. Architect not selected.

Ill., Chicago—Kewanee Boiler Co., Kewanee, having preliminary sketches prepared by S. N. Crowen, archt., 30 North La Salle St., for 10 story, 100 x 100 ft., rein.-con. and brick warehouse and salesroom, rein.-con. flooring, concrete foundation, on Washington and Green Sts. here. About $500,000. Noted Jan. 22.

Ill., Chicago — Monighan Machine Co., 2036 West Carrol Ave., having plans prepared by A. P. Weber, archt., 111 West Washington St., for 110 x 504 ft., steel plant, concrete foundation, on Belleplaine Ave., Augusta and Kilpatrick Sts. About $250,000.

Wis., Hartford—City having plans prepared by A. H. Martin, engr., Grand Ave., Milwaukee, for 1 story, 60 x 110 ft., brick, rein.-con. and steel power house, rein.-con. flooring, brick foundation, on Main St. W. Radke, clk.

Wis., Menomonee Falls—Farley Candy Co., 720 North Franklin St., Chicago, and Menomonee Falls, plans to build 1 story, 300 x 800 ft., brick and steel factory, rein.-con. flooring, concrete foundation. About $300,000. Probably private plans.

Wis., Sheboygan Falls—White Wagon Wks. plans to build 4 story, 60 x 250 ft., brick, rein.-con. and steel factory, rein.-con. flooring, brick foundation, on Main St. About $40,000. Architect not selected.

Ia., Des Moines—R. E. Bales, secy. Executive Council, State House, plans to construct heating plant and warehouse, on Capitol Grounds, main building, 5 story, 65 x 175 ft., with 80 x 80 ft. wing, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation About $400,000. Canfield Eng. Co., 406 Flynn Bldg., engr.

Ia., Sioux City—Sioux City Soap Co., 302 Grain Exch., plans to build fireproof factory. Architect and engineer not selected.

Kan., Hutchinson—A. E. Kirk having plans prepared by W. E. Glover, archt., 609 Kansas Ave., Topeka, for 3 story, 66 x 165 ft., brick, rein.-con. and steel garage, rein.-con. flooring, concrete foundation. About $250,000.

Kan., Hutchison—McArthur Packing Co. plans to build brick packing plant. About $100,000. Architect not selected.

Kan., Topeka—Page Milling Co., North Topeka, having plans prepared by C. D. Suthbert, archt., 735 Kansas Ave., for 3 story, 50 x 160 ft., brick, rein.-con. and steel garage, rein.-con. flooring, concrete foundation, at 912 Kansas Ave. About $55,000.

Mont., Dillon—Beaverhead Co. election April 23, to vote on $50,000 bonds to build central heating plant for county courthouse, high school, dormitory and other buildings. W. E. Chapman, co. engr.

Tex., Houston—Finger & Cato, archts., 601 Kress Bldg., soon let contract building 4 story, 42 x 84 ft., brick, rein.-con. and tile ice plant and factory, rein.-con. flooring, clay foundation, for W. H. Irvin, Hemphill and Railroad Sts. About $50,000.

Tex., Houston—Keen & Woolf Refining Co., 317 Beatty Bldg., having plans prepared building oil refinery, to include several buildings and 5 stills, brick, rein.-con. and steel, rein.-con. flooring, on site 8 mi. from here, near Clinton. About $300,000. A. Peterson, c/o company, ch. engr.

Tex., Houston—Lucey Mfg. Co., Mason Bldg., plans to build foundry and forge and machine shops. About $1,000,000 Private plans.

Tex., Houston—Texas Union Packing Co., 210 Beatty Bldg., having plans prepared by W. H. Knehaus, engr., 412 South Dearborn St., Chicago, for packing plant, on Ship Channel, to consist of several brick, rein.-con. and steel buildings. About $100,000.

Tex., Quannuh—Four States Oil & Refinery Co. plans to build 1 story refinery, on 1 acre site south of here. About $400,000. Architect and engineer not selected.

Tex., Ranger—International Oil & Refining Co. plans to build refinery. About $300,000. Architect and engineer not selected.

Tex., Ranger—Olda-Clark Refining Co. plans to build refinery. About $250,000. Architect and engineer not selected.

Okla., Ada—W. E. Harvey having plans prepared by C. P. Neider, archt., Empress Theatre Bldg., Oklahoma, for 2 story, 50 x 140 ft. brick, rein.-con. and steel garage, rein.-con. flooring, concrete foundation. About $55,000.

Okla., Beggs—Kre-Ko Refining Co., Bristow, plans to build 1 story refinery, on site 1 mi. north of here. About $400,000. E. W. King, pres.; F. Peters, secy.; J. D'Aroy, genl. mgr. Foster & Gilmore, Tulsa, archts. and engrs.

Wash., Spokane—Centennial Mills, Ltd., 817 Howard St., plans to build grain elevator, steel and cement, 1,000,000 bu. capacity, in eastern part of city. About $500,000. Private plans.

Ore., Bend—L. L. Fox plans to build 1 story, 100 x 140 ft. garage, stone and concrete flooring, concrete foundation. About $50,000. Private plans.

Ore., Bend—W. H. Manwaring, Marshfield, plans to build 1 story, cut stone service station, on 70 x 125 ft. site on Greenwood Ave. About $50,000. W. R. Speck, local rep. Private plans.

Ore., Eugene—Lang & Co., 1 1st St., Portland, plans to build 1 story, 90 x 128 ft. warehouse with 10 x 128 ft. loading platform, concrete and frame, on 4th St. About $75,000. Private plans.

Cal., Long Beach—California Cotton Products Co. plans to build mill on Obispo and Anaheim Sts. About $75,000. R. G. Swaffield, 1st Natl. Bank Bldg., secy. Architect not selected.

Cal., Los Angeles—Cohen & Meyer, c/o G. LaBarr, archt., 500 Stimson Bldg., having plans prepared for 1 story, 77 x 172 ft., brick garage, rein.-con. flooring, concrete foundation, on Grand Ave. About $55,000.

N. S., Halifax—Canadian Natl. Ry. plans to build new engine terminal at Fairview. Work involves grading, buildings, track laying, etc. About $1,500,000. J. C. Beckwith, Moncton, N. B., engr. constr.

N. S., Halifax—Nova Scotia Water Power Comn. plans to develop water power at Sheet Harbor on Atlantic coast, about 80 mi. east of Halifax, from which electricity will be distributed to New Glasgow, Trenton, Stellarton and Westville in Picton Co. Work involves about 50 mi. of transmission line. K. H. Smith, engr.

Alaska, Petersburg—City voted $25,000 bonds to build light and power plant.

Alaska, Port Chatham—Pacific Sea Products Assn., Seattle, Wash., plans to build 2 story cold storage plant, frame and concrete, here. About $100,000. Private plans. O. O. Hyatum, pres.

BIDS DESIRED

N. Y., Bridgeport—Until Feb. 9, by Ballinger & Perrot, archts. and engrs., 17th and Arch Sts., Phila., building 1 story, 105 x 340 ft., brick, concrete and steel factory, for Salts Textile Co.

Pa., Ashley (Wilkes-Barre P. O.)—Until Feb. 19, by R. West Knitting Co., Manhattan St., building 1 story, 50 x 100 ft., brick mill, rein.-con. flooring, rock foundation. About $50,000. C. R. Rineheiner, 10 Airy St., Wilkes-Barre, archt.

Pa., Forty Fort (Kingston P. O)—Until Feb. 27, by Victory Throwing Co., building 3 story, 50 x 125 ft., brick mill, rein.-con. flooring, rock foundation, on Butler St. About $500,000. Private plans.

Pa., Phila.—Until Feb. 7, by Neubauer & Supourtz, archts., 929 Chestnut St., for 1 story, 36 x 115 ft. and 92 x 100 ft., brick, stone, steel and concret garage, on Belfield Ave. and Broad St., for Crosstown Realty Co., c/o architects. About $35,000.

Pa., Taylor—Until March 1, by Taylor Silk Co., building 1 story, 65 x 130 ft., frame and stucco silk mill, rock foundation, on Taylor Rd. About $50,000. E. H. Davis and G. M. D. Lewis, Union Natl. Bank Bldg., Scranton, associate archts.

O., Cleveland—Until Feb. 14, by Complete Roofing Co., 4711 Payne Ave., building 1 story, 50 x 80 ft., steel and brick factory and warehouse, brick foundation. About $50,000. Private plans.

Mich., Detroit—Until Feb. 13, by Dept. Pub. Wks., building 2 story, 58 x 121 ft., rein.-con., brick, steel and stone steam power plant, rein.-con. flooring, concrete foundation, to include 190 ft. brick stack and mechanical equipment, on Macomb and Clinton Sts., to heat city buildings in vicinity of Municipal Courts Bldg. and Receiving Hospital. Esselstyne, Murphy & Hanford, 810 Marquette Bldg., engrs.

Ill., Chicago—G. M. Posner, 327 South La Salle St., receiving bids building 1 story, 125 x 125 ft., steel and brick machine shop, concrete foundation, on Wolfram St. and Western Ave. About $50,000. B. L. Steif, 30 North La Salle St., archt.

Ill., Vandalia—Until Feb. 16, by City Clerk, building electric lighting and power plant, including (1) concrete foundations and floors, rein.-con. walls, and concrete machinery foundations, (2) rein.-con. chimney and foundation, (3) one 300 hp. water tube boiler, breeching, grates, fittings, etc., (4) dismantling, moving and re-erecting old boilers with new breeching, (5) steam engine, to operate 300 kva. generator, (6) one 300 kva. direct connected generator and one 15 kw. exciter, (7) dismantling, moving and re-erecting present engine and generator, (8) switchboard and erection complete, (9) station wiring and line connections, (10) feed water heater, separator, pump exhaust head, pipe work and covering. Bids will be received on work as a whole or on any section or combination of sections thereof. Fuller & Beard, Chemical Bldg., St. Louis, Mo., engrs.

Wis., Menomonee Falls—Schumann Motor Co. receiving bids building 1 story, 75 x 150 ft., brick and steel garage and repair shop, concrete flooring and foundation. About $50,000. Herbst & Kuenzli, Caswell Blk., Milwaukee, archts. and engrs.

Kan., Emporia—State Bd. Administration receiving bids building 1 story, 82 x 110 ft. power plant, with 35 x 40 ft. brick stack, also rein.-con. tunnel connecting buildings, brick, concrete and steel, concrete foundation. About $70,000. J. A. Kimball, mgr. E. L. Gamble, 1415 Fillmore St., Topeka, archt.

Tex., Beaumont—Until Feb. 9, by Ford Agency, 509-11 Colorado St., Austin, building 2 story, 120 x 140 ft., brick, rein.-con. and steel garage and warehouse, rein.-con. flooring, brick foundation, on Franklin and Pearl Sts. About $80,000. H. F. Kuehne, Littlefield Bldg., Austin, archt.

Okla., Sand Springs—A. C. Spitzagel, Tulsa, receiving bids building 1 story, 72 x 322 ft., concrete, brick and steel factory, concrete foundation, here. About $60,000. D. Eichenfeld, 307 South Elwood St., Tulsa, archt.

Ont., Quebec — Until Feb. 25, by A. Sande, consult. engr., 313-15 Lister Bldg., Hamilton, Ont., constructing buildings for 200 ton sulphite pulp mill in Bay de Chaleur, grading, excav., paving, sewage and water supply for townsite in connection with mill, also 150 houses; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston** — Simbroce Co., 161 Devonshire St., let contract building 1 story, 60 x 200 ft., brick and concrete factory, concrete foundation, at 270 Baker St., to Simpson Bros. Co., 166 Devonshire St. About $70,000.

★**Mass., North Andover** (Lawrence P. O.) —Davis Thurber Machine Co., let contract building 4 story, 60 x 200 ft. brick and concrete addition to factory, rein.-con. flooring, concrete foundation, to Aberthaw Constr. Co., 27 School St., Boston. About $150,000.

★**Mass., Somerville** (Boston P. O.)—Prospect Hill Bottling Co., 163 Cross St., let contract building 2 story, 59 x 199 ft., brick and concrete factory, concrete foundation, to McGahey & O'Connor, Central St., Cambridge. About $100,000.

Industrial Works (Continued)

★**R. I., Providence** — Eastern Terminal Corp., 103 Federal St., New London. Conn., let contract building 2 story, 80 x 500 ft., rein.-con. warehouse, rein.-con. flooring, on Smithfield Ave., here, to Aberthaw Constr. Co., 27 School St., Boston. About $200,000.

★**N. Y., Brooklyn**—Humbert & Andrews, 646 Dean St., will build factory on Vanderbilt Ave. and Bergen St., also one 1 story, on Dean St., both brick and steel, rein.-con. flooring, concrete foundation. About $120,000 and $75,000 respectively. Work will be done by day labor under supervision of T. Bennett, archt. and engr., 79th St. and 5th Ave

★**N. Y., Brooklyn**—Standard Oil Co., 26 Bway., New York City, let contract building 1 story, 50 x 90 ft., rein.-con. and steel power house, on Calyer and Kingsland Aves, here, to C. C. Woodruff, 213 10th St., Long Island City. About $26,000.

★**N. Y., Buffalo**—Phila. Rubber Co., 37th and Reed Sts., Phila., let contract building 2 factories, power plant, garage and office, brick, steel and concrete, rein.-con. flooring, concrte foundation, here, to Austin Co., 16112 Euclid Ave., Cleveland, O. About $1,000,000.

★**N. Y., Long Island City**—L. Gold, 44 Court St., Brooklyn, will build 2 story, 75 x 180 ft., brick and steel service station, rein.-con. flooring, concrete foundation, on Henry and William Sts., here. About $75,-000. Work will be done by day labor.

★**N. Y., New York**—Bowman Realty Co., 225 West 49th St., will build 4 story, 100 x 200 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Bway. between 131st and 132nd Sts. About $330,000. Work will be done by day labor.

★**N. Y., New York**—Brooklyn Bridge Fish Freezing & Storage Co., 24-26 Vandewater St., will alter 8 story brick and steel warehouse, rein.-con. flooring. About $25,000. Work will be done by day labor.

★**N. Y., New York**—W. L. Byrns, c/o E. Wilbur, archt. and engr., 507 5th Ave., will build 3 story, 50 x 100 ft., brick and steel garage, concrete foundation. About $35,000. Work will be done by day labor.

★**N. Y., New York**—T. Klein Constr. Co., Inc., 652 West 185th St., will build 1 story, 199 x 385 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 5th and Madison Ave., 136th and 137th Sts. About $150,000. Work will be done by day labor.

★**N. Y., New York**—Le Bash Garage Co., 30 East 42nd St., will build 1 story, 100 x 185 ft., brick and steel garage, concrete foundation, on Whitlock Ave. and 156th St. About $30,000. Work will be done by day labor.

★**N. Y., New York**—William St. Realty Corp., 19 Cedar St., will alter 6 story, brick and steel printing plant, rein.-con. flooring, at 182 William St. About $55,000. Work will be done by day labor.

★**N. Y., Utica**—Bowen Mfg. Co., 401 Columbia St., let contract building 1 story, 102 x 225 ft., brick factory, to Kimberly Constr. Co., Mayno Bldg. About $29,000.

★**N. J., Clifton** (Passaic P. O.)—Clifton Textile Co., 128 Hackensack Plank Rd., will construct factory consisting of six 1, 2 and 3 story, 250 x 350 ft., rein-con. and steel buildings. About $600,000. Work will be done by day labor under supervision of Scott & Prescott, engrs. and archts., 34 East 23rd St., New York City.

★**N. J., Hoboken**—H. R. Mallinson, Woolesley Ave., Long Island City, N. Y., let contract building rein.-con. and steel factory, concrete foundation, here, to Hegeman-Harris Co., 33 West 42nd St., New York City. About $200,000. Noted Jan. 15.

★**N. J., Jersey City**—W. M. Crane Co., Garfield Ave., let contract building 2 or 3 story, concrete and brick foundry, to Ballinger & Perrot, 17th and Arch Sts., Phila. Cost between $200,000 and $300,000.

★**N. J., Newark**—Norton, Bird & Whitman, 501 5th Ave., New York City, will build 3 story, 35 x 45 x 85 x 130 ft., rein.-con. and steel garage, rein.-con. flooring, concrete foundation, here. Work will be done by day labor.

★**Pa., Bristol**—Bristol Printing Co., 206 Mill St., let contract building 3 story, 60 x 90 ft. plant, to A. DiRenzo, Beaver and Mansion Sts. About $40,000.

★**Md., Baltimore**—A. H. Kuhlemann Co., 2961 Frederick Ave., let contract building 3 story, 75 x 200 ft., concrete, steel, brick and stone factory, concrete and rock foundation, to W. L. & G. H. O'Shea, 29 Bway., New York City. About $100,000.

★**Md., Baltimore**—E. C. Wilson, Park Ave. and Laurens St., let contract building 4½ story, 110 x 164 ft., brick warehouse, stone foundation, on Dickson St. and Lafayette Ave., to Rullman & Wilson, Lafayette Ave. east of Mt. Royal Ave. About $50,000.

★**Va., Petersburg**—Index Appeal & Evening Progress let contract building 2 story, 75 x 100 ft., brick publishing plant, rein.-con. flooring, concrete foundation, on Tabbe St., to Harrison Constr. Co., Union and Washington Sts. About $90,000; cost plus percentage basis.

★**Va., Richmond**—Cheek-Neal Coffee Co., 1011 East Cary St., let contract building 4 story, 70 x 100 ft., rein.-con. warehouse, on 2nd and Hull Sts., to J. T. Wilson, Mutual Bldg. About $80,000.

★**N. C., Winston-Salem**—P. H. Hanes Knitting Co. let contract building 6 story, 80 x 200 ft., rein.-con. and brick knitting mill and dye house, rein.-con. flooring, concrete foundation, to Southern Ferro Concrete Co., Trust Co. of Georgia Bldg., Atlanta, Ga. About $300,000; cost plus percentage basis.

★**Tenn., Chattanooga** — Thatcher Spinning Co., 2714 East 18th St., let contract building rein.-con. and steel addition to plant, rein.-con. flooring, concrete foundation, to Turner Constr. Co., 244 Madison Ave., New York City. About $1,200,000.

★**O., Cincinnati**—Jerecki Chemical Co., Broermann Ave., let contract building 1 story, 120 x 350 ft., concrete, steel and brick factory, reln.-con. flooring, concrete foundation, to Austin Co., 16112 Euclid Ave., Cleveland. About $300,000.

★**O., Cincinnati**—Sayers & Scovill Co., Gest and Summers Sts., let contract building 3 story, 80 x 380 ft., rein.-con. factory, on Spring Grove Ave., to Ferro Concrete Constr. Co., Richmond and Harriet Sts. About $417,000.

★**O., Cleveland**—Cleveland Worm Gear Co., 1669 East 40th St., let contract building 1 story, 130 x 160 ft., steel and brick factory, brick foundation, on East 41st St. and Payne Ave., to Austin Co., 16112 Euclid Ave. About $75,000.

★**O., Cleveland**—Crucible Steel Forge Co., 6600 Grant Ave., let contract for concrete work for 1 stor,y 60 x 900 ft., steel and brick rolling mill, annealing plant and machine shop, rein.-con. flooring, concrete foundation, on Grant Ave., to Masters-Mullen Constr. Co., Electric Bldg. About $500,000. Noted Jan. 1.

★**O., Columbus**—F. O. Schoedinger, 142 North 3rd St., let contract building 5 story, 81 x 149 ft., rein.-con. warehouse, at 356 Mt. Vernon Ave., to D. W. McGrath & Sons, New Trust Natl. Bank Bldg. About $75,000.

★**Ind., Indianapolis**—Indianapolis Power & Light Co., let contract building 1 story, brick and steel extension to power house, brick foundation to H. K. Ferguson Co., 6532 Euclid Ave., Cleveland. About $75,000.

★**Ind., Marion**—Western Drop Forge Co., let contract building 1 story,, brick and steel factory, to H. K. Ferguson Co., 6532 Euclid Ave., Cleveland, O. About $80,000.

★**Ill., Chicago**—Lindstrom, Smith & Co., 1104 South Wabash Ave., let contract building 1 story, 130 x 250 ft., brick factory, concrete foundation, on Lake St. and Kedzie Ave., to J. Rodatz, 209 South La Salle St. About $125,000.

★**Ill., Chicago**—L. O. Bouchard, archt., 64 West Randolph St., let contract to Schmidt Bros. Constr. Co., 125 North Clark St., building 4 story, 60 x 70 ft., rein.-con., brick and terra cotta printing plant, rein.-con. flooring, concrete foundation, at 1855 North Halsted St., for Premier Lithographing Co., c/o archt. About $80,000.

★**Wis., Milwaukee**—Westinghouse Lamp Co., 165 Bway., New York City, let contract building 4 story, rein.-con. and steel addition to factory, rein.-con. flooring, concrete foundation, here, to Stone & Webster, 120 Bway., New York City. About $400,-000.

★**Wis., Milwaukee**—G. Ziegler Co., 362 Florida St., let masonry contract for 7 story, 80 x 112 ft., rein.-con. and brick addition to factory, rein.-con. flooring, concrete foundation, on Florida St., to R. L. Reisinger Co., 425 East Water St., carpentry to Buestrin Constr. Co., 567 East Water St. Total cost, $250,000.

★**Wis., Sheboygan**—Vollrath Co., West Michigan Ave., let contract building 1 story, rein.-con. and steel power plant, rein.-con. flooring, concrete foundation, to Westinghouse, Church, Kerr & Co., Inc., 37 Wall St., New York City. About $200,000.

★**Ia., Des Moines**—J. J. Doty Publishing Co. let contract building 3 story, 65 x 130 ft., brick and steel publishing house, concrete foundation, on 3rd and Chestnut Sts., to J. E. Tusant & Son, 583 7th St. About $65,000; cost plus percentage basis.

★**Ia., Newton**—Newton Publishing Co., let contract building 1 story, 56 x 130 ft., brick, concrete and steel plant, concrete foundation, to W. W. Smith, Chicago. $50,790.

★**Kan., Larned** — Associated Mill & Elevator Co., c/o H. C. Nunn, 1019 New York Life Bldg., Kansas City, Mo., let contract building concrete elevator, rein.-con. flooring, concrete foundation, here, to Lehrack Eng. & Constr. Co., 412 Amer. Bank Bldg., Kansas City, Mo. About $250,-000; cost plus percentage basis.

★**Kan., Wichita**—Red Star Milling Co., 1901 North Emporia St., let contract building 9 story, 60 x 170 ft., brick, rein.-con. and steel mill and elevator, rein.-con. flooring, concrete foundation, to G. H. Seidhoff Constr. Co., 126 East 1st St. About $750,000, cost plus percentage basis. Noted Jan. 15.

★**Neb., Lincoln**—Gooch Milling & Elevator Co., 6th and South Sts., let contract building 7 story, 70 x 90 ft. flour mill, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to G. Tobin, Lincoln. About $250,000; cost plus percentage basis.

★**Neb., Lincoln**—State Bd. Agriculture let contract building 2 story, 174 x 255 ft., rein.-con., brick and steel cattle barn, rein.-con. flooring, concrete foundation, to W. J. Assenmacher, Orpheum Bldg. About $100,000; cost plus percentage basis.

★**Mo., Kansas City**—A. B. C. Fireproof Storage Co., 8th and Frost Sts., let general contract building 6 story, 62 x 100 ft., rein.-con., brick and terra cotta warehouse, at 3129 Prospect Ave., to J. R. Vansant Constr. Co., 413 Dwight Bldg. About $100,000; cost plus percentage basis.

★**Mo., Leadwood**—St. Joseph Lead Co., 61 Bway., New York City, let contract building 1 story, rein.-con., steel and brick power house, rein.-con. flooring, concrete foundation, here, to Stone & Webster, 120 Bway., New York City. About $700,000.

★**Tex., Abilene**—Abilene Gas & Electric Co. let contract building central station, to W. C. Hedrick Constr. Co., Southwestern Life Bldg., Dallas. About $110,000.

★**Tex., Houtson**—S. Westheimer, 1219 Prairie Ave., let contract building 5 story, 53 x 100 ft., rein.-con. warehouse, rein.-con. flooring, on Prairie and Caroline Sts., to Amer. Constr. Co., 411 Gulf Bldg. About $60,000.

★**Tex., Longview**—Longview Ice & Light Co. let contract building ice plant, to W. C. Hedrick Constr. Co., Southwestern Life Bldg., Dallas. About $50,000.

★**Okla., Frederick**—Frederick Oil & Refining Co. let contract building brick and rein.-con refinery, rein.-con. flooring, to A. H. Kruse, Frederick. About $100,000; cost plus percentage basis.

★**Wash., Kennewick**—Columbia, Yakima Storage Co., let contract constructing 2 stone storage buildings, rein.-con. flooring, concrete foundation, to J. S. Geneva Co., Jefferson, Ia. About $80,000.

★**Ore., Cottage Grove**—G. Harvey Lumber Co. will build 1 story, frame and concrete sawmill (45,000 ft. daily capacity), in Pass Creek Canyon. About $25,000. Work will be done by day labor.

★**Que., St. Hyacinthe**—Manhasset Mfg. Co., 1406 Turks Head Bldg., Providence, R. I., let contract building 3 story, 110 x 200 ft. factory, on Main St., to Bishop Constr. Co., 42 St. Sacrament St., Montreal. About $125,000.

Buildings

PROPOSED WORK

Mass., Lowell — High School — School Comn., rejected bids received Jan. 19, building 3 story, 186 x 289 ft. addition to Lowell High School, on Kirk St. About $750,000. Work will be readvertised. H. L. Rourke, 525 Hildredth Bldg., engr. and archt.

Mass., Roxbury (Boston P. O.)—Gymnasium—Y. M. H. Assn. having plans prepared by J. F. Krokyn, archt., c/o owners, for 3 story, 50 x 100 ft., brick, concrete foundation, on Seaver St. About $60,000.

R. I., Providence—Schools—Bd. Contr. & Supply plans to build primary and grammar schools. About $500,000. Private plans.

Buildings (Continued)

N. Y., New York—Club—W. H. Gompert, archt. and engr., 171 Madison Ave., receives bids about Feb. 14, building 9 story, brick, steel and stone, brick foundation, on 49th St. and Lexington Ave., for International Sporting Club, c/o architect. About $600,000.

N. Y., New York—Office—Kelly-Springfield Tire Co., 200 West 57th St., having plans prepared by E. Necarsulmer, archt. and engr., 507 5th Ave., for 17 story, 100 x 104 ft., brick and steel, concrete foundation, on 7th Ave. and 57th St. About $2,000,000.

N. J., Pennsville—School—C. R. Peddle, archt., 136 South 4th St., Phila., receives bids about Feb. 26, building 2 story, 75 x 125 ft., rein.-con. and brick, for Bd. Educ. About $100,000.

Pa., Phila.—Hospital—Stewartson & Page, archts., 318 Walnut St , receive bids about Feb. 26, building 4 story, brick and concrete addition to Children's Hospital, 18th and Fitzwater Sts. About $100,000.

Md., Baltimore—Office—Standard Oil Co., Pratt and South Sts., having plans prepared by C. N. Friz, archt., 814 Lexington Bldg., for 6 story, 90 x 140 ft., steel, brick and stone, concrete foundation, on Courtland and Franklin Sts. About $500,000. E. A. Holbein, mgr.

Md., Baltimore — School — St. Martin's Catholic Church, Fayette St. and Fulton Ave., having plans prepared by F. Baldwin, archt., 328 North Charles St., for 3 story, 78 x 80 ft., concrete, steel and brick, stone and concrete foundation. About $100,000.

Va., Roanoke—High School—Bd. Educ. having plans prepared by H. C. Richards, archt., 1713 Sansom St., Phila., for 3 story, brick and stone, on Park St. About $450,000.

Ga., Griffin—Weave Shed—Rushton Cotton Mills having plans prepared by Lockwood, Greene & Co., archts. and engrs., Healy Bldg., Atlanta, for 1 story, 200 x 220 ft., rein.-con and brick, rein.-con. flooring, concrete foundation. About $225,000.

Ala., Birmingham — Temple—Birmingham Masonic Temple Assn. having plans prepared by W. T. Warren, archt., Empire Bldg. and H. B. Wheelock, archt., Steiner Bldg., for 190 x 400 ft., on 7th Ave. from 18th to 19th Sts. N., including 2 auditoriums. About $1,000,000. W. B. Itner, Bd. Educ. Bldg., St. Louis, Mo., consult. archt.

O., Cleveland — Church — Epworth Memorial and Euclid Ave. Methodist Episcopal Churches, c/o A. Sweitzer, pastor, East 55th St. and Prospect Ave., have been consolidated and plan to build 1 story, brick, steel and stone, brick and concrete foundation, on East 107th St. and East Blvd. About $100,000. Architect not selected.

O., Cleveland—Clubhouse—City Club of Cleveland, c/o F. Hayes, Hollenden Hotel, seeking site and plans to build concrete, steel and brick, rein.-con. flooring, concrete foundation. About $200,000. Architect not selected.

O., Cleveland — Commercial — East End Chamber of Commerce, 10708 Superior Ave., had plans prepared by T. G. Perren, archt., 912 Marshall Bldg., for 8 story, 80 x 120 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 105th St. and Superior Ave. About $100,000.

O., Cleveland—Commercial—Sixth St. Huron Rd. Co., c/o Grieble & Eberling, archts., 517 Sloan Bldg., having revised plans prepared and soon receives bids building 8 story, 80 x 178 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, at 640 Huron Rd. About $350,000.

O., Cleveland—Hotel—S. Cowan, Society for Savings Bldg., having plans prepared by S. H. Weiss, archt., 1032 Schofield Bldg., for 4 story, 140 x 240 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 105th St. and Ansel Rd. About $400,000.

O., Columbus — Store—Morehouse-Martens Co., South High St., having plans prepared by F. L. Packard, archt., New Hayden Bldg., for 7 story, 91 x 187 ft., concrete, steel and brick. About $450,000.

Mich., Detroit—Lodge—Detroit Lodge Loyal Order of Moose, 40-42 Congress St., plans to build 3 story, rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation, on Cass Ave. and Elizabeth St. About $500,000. Architect not selected.

Ill., Chicago—Hotel—H. J. Schlacks, 721 North Michigan Ave., plans to build 8 story, 100 x 200 ft., rein.-con., brick and terra cotta, rein.-con. flooring, concrete foundation, on Chestnut St. and Delaware Pl. About $2,000,000. Private plans.

Ill., Chicago — Sales — See "Industrial Works."

Wis., Milwaukee—Office, Etc.—Standard Oil Co., Brumder Bldg., soon receives bids constructing 4 story, 75 x 150 ft., rein.-con. and brick office and service building, rein.-con. flooring, concrete foundation, on 4th St. About $350,000. A. D. Koch, 1045 Wells Bldg., archt. Noted Sept. 11.

Wis., Milwaukee—Police Station—City election in April to vote on $250,000 bonds to build police station. This amount, together with $250,000 recently voted, will make $500,000 available for work. C. E. Malig, City Hall, archt.

Wis., Racine—Store—S. Sklute, 434 Main St., having plans prepared by A. Anis, archt., 139 North Clark St., Chicago, for 7 story, 70 x 238 ft., brick and concrete or brick and mill construction, concrete foundation, on Main St.

Ia., Cedar Rapids—High Schools— Bd. Educ. voted $1,500,000 bonds to build 5 junior high schools, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. Architect will be selected at once.

Ia., Davenport—Apartment Hotel—Hillcrest Apartment Hotel Co. soon receives bids building 8 story, 128 x 152 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, on 6th and Brady Sts. About $800,000. R. France, Chicago, archt. Clausen & Kruse, 316 Central Office Bldg., engrs.

Ia., Davenport — Temple — Clausen & Kruse, archts., 316 Central Office Bldg., soon receive bids building 3 story, 150 x 160 ft., brick, rein.-con. and steel, rein-con. flooring, brick and concrete foundation, for New Masonic Temple Assn. About $800,000. Lieberman-Klein & Hein, Chicago, engrs. Noted Sept. 18.

Ia., Waterloo—High School—Bd. Educ. receives bids about March, building 3 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $600,000. W. B. Ittner, Bd. Educ. Bldg., St. Louis, archt. Noted Jan. 15.

Minn., Duluth—Office—Duluth Builders Exch., 201 Glencoe Bldg., plans to build 10 story, 100 x 140 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on 1st St. W. About $750,000. Architect and engineer not selected.

Mont., Billings—High School—City election April 3 to vote on $600,000 bonds to build 2 story, brick, stone or concrete high school. Architect not selected.

Mo., Kansas City — Temple—Ivanhoe Bldg. Co., 33rd St. and Woodland Ave., having plans prepared by Smith, Rea & Lovitt, archts. and engrs., 602 Finance Bldg., for 4 story, 93 x 144 ft., rein.-con., brick and terra cotta, concrete foundation, on Linwood and Park Sts. About $400,000. G. McClanahan, pres.

Tex., Houston—Auditorium—First Baptist Church, Fannin St. and Walker Ave., having plans prepared by J. A. Bruner, archt., Phila., for 1 story, 105 x 140 ft., with two 10 story, 105 x 250 ft. wings, on Lamar St. between Main and Fannin Sts. About $1,000,000.

Tex., Houston — Club—Thalin Club retained W. Watkins, archt., 1110 Scanlon Bldg., to prepare plans for 11 story, 96 x 96 ft., rein.-con. and brick, rein.-con. flooring, on Fannin and Walker Sts. About $700,000.

Tex., Houston—Hospital—Baptist Hospital, Lamar Ave. and Smith St., receives bids about March 1, building 3 story, 54 x 100 ft., 7 story, 75 x 75 ft. and 5 story, 65 x 100 ft., rein.-con. and brick, rein.-con flooring, clay foundation, on Lamar Ave. and Smith St. About $600,000. R. D. Steele, 510 1st Natl. Bank Bldg., archt.

Tex., Houston—Office and Opera House—N. Esperson, 1611-12 Carter Bldg., plans to build 16 story, 50 x 50 ft. office, with 1 story opera house in rear on Main St., between Rusk and Walker Sts. About $1,500,000. Adams & Adams, Gibbs Bldg., San Antonio, archts.

Wash., Spokane — Bank — Exch. Natl. Bank, 606 Riverside Ave., having plans prepared by J. A. Zittel, archt., Jamieson Bldg., for 4 story, 96 x 115 ft., stone, on Howard St. and Riverside Ave. About $750,000.

Cal., Stockton—Schools—Bd. Educ. plans election Feb. 28 to vote on $250,000 bonds to build high school and $950,000 bonds for grammar schools.

Ont., Toronto—School—Bd. Educ. plans to build 2 and 3 story additions to various schools in city. About $1,500,000. W. W. Pearse, 155 College St., mgr.

Ont., Windsor—Hotel—Border Cities Hotel Co., 17 Ouellette Ave., having plans prepared by Esenwein & Johnson, archts., Ellicott Sq., Buffalo, N. Y., for 10 story, rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $1,000,000.

BIDS DESIRED

N. Y., Brooklyn—Synagogue—Until Feb. 23, by McCarthy & Kelly, archts., 16 Court St., building 1 story, brick, steel and stone, brick foundation, at 1607 Ave. L, for Temple Shaari Torah, c/o architects. About $175,000. Noted Jan. 29.

N. Y., Ithaca—Laboratory—Until Feb. 24, by C. D. Bostwick, compt., New York State College of Agriculture, Cornell University, building laboratory for Economic Investigation of Insects, here; advertised in this issue.

N. Y., Watertown—Hotel—Woodruff Hotel, Public Sq., receiving bids remodeling present hotel. About $250,000. J. B. Taylor, pres.

N. J., Belleville (Newark P. O.)—Until Feb. 17, by Bd. Educ., Washington Ave. and Holmes St., building Pub. School 7, Joralemon St. and Passaic Ave. J. J. Turner, dist. clk. C. G. Jones, 280 Bway., New York City, archt. Noted Jan. 15.

N. J., Tenafly—Bank—Until Feb. 14, by Holmes & Winslow, archts. and engrs., 110 West 40th St., New York City, building 1 story, 100 x 100 ft., brick, stone and steel, brick foundation, for First Natl. Bank, Washington St. About $50,000. Noted Jan. 29.

N. J., Trenton—Club House—Until Feb. 16, by W. W. Slack, archt., St. Regis Bldg., constructing 3 story, 60 x 120 ft., brick, stone and steel, on State St., for Carteret Club, Commonwealth Bldg. About $125,000.

Pa., Scranton—Office—Until Feb. 15, by Scranton Gas & Water Co., 115 Wyoming Ave., building 3 story, 80 x 100 ft., steel, stone, marble and granite, rein.-con. flooring, rock foundation. About $200,000. G M. D. Lewis, and E. H. Davis, Union Bank Bldg., associate archts.

Md., Baltimore—Church—Until Feb. 16, by G. N. MacKenzie and Wyatt & Nolting, archts., 1012 Keyser Bldg., constructing 1 and 2 story, 100 x 250 ft., stone, stone and concrete foundation, on Calverton Rd. and Poplar Grove St., for Summerfield Methodist Episcopal Church. About $75,000. O. G. Robinson, 2875 West Lafayette Ave., pastor.

Fla., Jacksonville—Hospital—Until Feb. 9, by J. B. Hodges, chn., State Bd. Control, Tallahassee, building hospital here.

Fla., Tallahassee—College—Until Feb. 9, by J. B. Hodges, chn. State Bd. Control, constructing additional buildings at Florida State College for Women. Edwards & Sayward, 609 Chamber of Commerce Bldg., Atlanta, Ga., archts.

Ky., Ashland—Store—Until Feb. 20, by F. L. Packard, archt., New Hayden Bldg., Columbus, O., building 4 story, 50x143 ft brick and concrete, on Principal St., for Field Furniture Co. About $100,000.

O., Sandusky—Commercial—Until Feb. 14, by C. W. Brandt, archt., Kresge Bldg., Detroit, constructing 3 story, 50 x 150 ft., steel and brick, here, for S. S. Kresge, Kresge Bldg., Detroit. About $55,000. Noted Jan. 29.

Mich., Owosso — Hospital—Owosso Memorial Hospital receiving bids building 4 story, 42 x 132 ft., concrete, brick and steel, concrete foundation. About $200,000. S. D. Butterworth, Tussing Bldg., Lansing, archt.

Mich., Redford—Church—Until March 20, by W. E. N. Hunter and N. C. Sorensen, archts., Chamber of Commerce, Detroit, building 1 story, 60 x 150 ft., rein.-con., brick, steel and stone, rein.-con. and tile flooring, concrete foundation, on Grand River Ave., for Redford Methodist Episcopal Congregation. About $150,000.

Mich., Redford—School—Until Feb. 20, by C. W. Brandt, archt., Kresge Bldg., Detroit, constructing 8 rein.-con., brick and steel buildings, rein.-con. flooring, concrete foundation, on Grand River Ave., for Michigan State Auto School, Woodward Ave. About $2,000,000.

Buildings (Continued)

Ill., East Moline—Bank—Until Feb. 24, by H. C. Eckland & Co., archts. and engrs., Moline, remodeling and building 2 story, 40 x 60 ft., rein.-con., steel and brick addition, for State Bank of East Moline, 800 15th Ave. About $50,000.

Wis., Clear Lake—High School—Until Feb. 15, by W. L. Albans, archt., 347 Endicott Bldg., St. Paul, building 2 story, 53 x 94 ft., rein.-con. and brick, for Bd. Educ. About $60,000.

Wis., Owen—School—Until Feb. 15, by V. F. Shereda, clk., Bd. Educ., building 2 story, 63 x 81 ft., brick. About $50,000. W. L. Alban, Endicott Bldg., Minneapolis, archt.

Ia., Boone—Theatre---A. H. Blank, 326 Iowa Bldg., Des Moines, receiving bids remodeling hotel into theatre, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, here. About $500,000. Vorse, Kraetsch & Kraetsch, 911 S & L Bldg., Des Moines, archts. Noted Jan. 29.

Ia., Larrabee—School—Until March 17, by Bd. Educ., building 3 story, 64 x 126 ft., brick, rein.-con. and steel, rein.-con. flooring, brick and concrete foundation. About $125,000. W. E. Hulse & Co., 210 Masonic Temple, Des Moines, archts.

Ia., Lovilia—School—Until Feb. 19, by Bd. Educ., building 1 story, 57 x 88 ft., rein.-con. and brick, concrete foundation. About $60,000. W. F. Gaddis, secy. W. E. Hulse & Co., 210 Masonic Temple, Des Moines, archts. Noted Jan. 15.

Ia., Orange City—Gymnasium and Dormitory—Northwestern Classical Academy receiving bids building 3 story, 50 x 80 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $80,000. Beuttler & Arnold, Grain Exch. Bldg., Sioux City, archts.

Ia., Pocahontas—Bank—Until Feb. 17, by Farmers Trust & Savings Bank, building 2 story, 25 x 133 ft. rein.-con. and brick, rein-con. flooring, concrete foundation. About $50,000. G. Schneider, cashier. Noted Jan. 29.

Ia., Washta—School—Until March 16, by Bd. Educ., building 3 story, 58 x 102 ft., rein.-con. and brick, concrete foundation. About $100,000. W. E. Hulse & Co., 210 Masonic Temple, Des Moines, archts. J. K. McGonigae, secy.

Minn., Ada—High School—Until Feb. 9, by Bd. Educ., building 3 story, 84 x 136 ft., brick. About $80,000. A. Harvey, clk. Foss & Foss, St. Cloud, archts.

Minn., Arco—School—Until March 1, by Consolidated School Dist. 70, building 2 story, 60 x 140 ft., brick and stone, with 50 x 72 ft. wing. About $60,000. W. Macomber, 411 Essex Bldg., Minneapolis, archt. C. F. Tweed, Metropolitan Bank Bldg., Minneapolis, engr.

Minn., Chisholm—School—Until Feb. 10, by E. Drew, supt. Bd. Educ., building 3 story, 72 x 147 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on 1st Ave. About $200,000. W. T. Bray, Exch. Bldg., Duluth, archt. and engr.

Minn., Fergus Falls—Church—Dennis & Knowles, archts., Fergus Falls, receiving bids building 1 story, 90 x 164 ft., rein.-con. and brick, for 1st English Lutheran Church. About $65,000. Noted Jan. 15.

Minn., Minneapolis—Stock Barn—Until March 1, by C. H. Johnston, archt. and engr., Capital Bank Bldg., St. Paul, constructing 1 story, 140 x 240 ft., rein.-con. and steel, at fair grounds, for State Fair Assn. About $300,000.

Minn., Pipestone—Hospital—Until Feb. 10, by P. O. Moe, archt., New York Life Bldg., Minneapolis, constructing 2 story, 43 x 120 ft., rein.-con., brick and tile, for city About $80,000. Noted Jan. 1.

Kan., Mayetta—School—Until Feb. 16, by Bd. Educ., building 2 story, 60 x 80 ft., concrete, brick and steel, concrete foundation. About $55,000. H. D. Pampel, 404 Finance Bldg., Kansas City, archt.

Kan., Oberlin—High School—Until Feb. 20, by Bd. Educ., building 2 story, 64x68 ft., brick, concrete and steel, concrete foundation. About $60,000. G. J. Pearcy, Mankato, architect.

S. D., Brookings—High School—Until Feb. 17, by P. J. Erie, clk Bd. Educ., building 2 story, 152 x 176 ft., brick and rein.-con. About $200,000. Tyrie & Chapman, Auditorium Bldg., archts., C. L. Pillsbury Co., Metropolitan Life Bldg., engrs.; both of Minneapolis.

Mont., Dodson—High School—Until April 1, by G. E. Ellinger, archt., Havre, building 2 story, 66x92 ft. brick, in School Dist. 2. About $50,000.

1777

of the 3063 items
printed in the

Construction News
Section

in January were on

building projects

There were

972 tips on proposed work
163 requests for bids
588 contracts awarded

Watch these pages

Mo., Desloge—School—Until Feb. 25, by Bd. Educ., building 3 story, 83 x 114 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $90,000. R. H. Sanneman, Reserve Bank Bldg. Kansas City, archt.

Mo., Joplin—Mercantile—Smith, Rea & Lovitt, archts. and engrs., Finance Bldg., Kansas City, receiving bids building 5 story, 75x120 ft., rein.-con. and brick, concrete foundation, for Joplin Supply Co., 4th and Walls Sts. About $175,000.

Ark., Pine Bluff—Church—Until Feb. 16, by Bldg. Com., constructing church here, for First M. E. Church South. J. A. Baylor, 1115 4th Ave., Louisville, Ky, archt.

Cal., Berkeley—High School—Until Feb. 10, by Bd. Educ., building 3 story, 64 x 301 ft. and 80 x 301 ft. high school and roof garden, rein.-con., rein.-con. flooring, concrete foundation, on Grove and Milvia Sts. and Bancroft and Channing Ways. About $400,000.

Cal., Long Beach—School—Until Feb. 16, by Bd. Educ., Long Beach Bank Bldg., constructing 2 story, rein.-con. and hollow tile, on Daisy Ave. About $85,000. W. H Austin, 1st Natl. Bank Bldg., and J. C. Austin, Baker-Detwiler Bldg., Los Angeles, archts.

Que., Montreal—Bank—Until Feb. 11, by Royal Bank of Canada, St. James St., building 2 story, 45 x 70 ft. concrete, steel and brick, concrete foundation, on Wellington St. About $70,000.

Que., Montreal—Theatre—Until Feb. 14, by D. Peogantes 303 Esplanade Ave., for 60 x 125 ft., concrete, steel and brick, concrete foundation, at Mt. Royal and Charles Aves. About $60,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—Office—A. R. Rosenthal, 1035 O. S. Bldg., let contract building 11 story, 100 x 120 ft., rein.-con., rein.-con. flooring and foundation, on Atlantic Ave., to Gascoigne & Lindenthal, 43 Tremont St. About $1,000,000; cost plus percentage basis.

★**Conn., Ansonia**—Bank—Mowbray & Uffinger, archts. and engrs., 56 Liberty St., New York City, let contract to E. Diebitch, 383 Madison Ave., New York City, building 1 story, 50x100 ft., brick, steel and stone, brick foundation, for Ansonia Natl. Bank, 165 Main St. About $75,000.

★**Conn., Hartford**—Restaurant, Etc.—See "Miscellaneous."

★**Conn., Meriden**—Office and Sales—Meriden Gas Light Co., Colony St., let contract building 2 story, 48 x 100 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation, on West Main St., to L. A. Miller, 22 Church St. About $125,000.

★**N. Y., Brooklyn**—Club—Knights of Columbus, Dougan Council, c/o T. Bennett, archt. and engr., 79th St. and 5th Ave., will build 2 story, 60 x 100 ft., brick and steel, brick foundation, on 4th Ave. and 78th St. About $65,000. Work will be done by day labor.

★**N. Y., Buffalo**—Office—See Industrial Works."

★**N. Y., New York**—Bank and Office—Natl. Park Bank, 432-434 Madison Ave., let contract altering brick, steel and stone, brick foundation, to M. Eidlitz, 30 East 42nd St. About $600,000.

★**N. Y., New York**—College—New York University, University Heights, let contract constructing 2 and 3 story buildings, to include 100 x 270 ft. engineering building and two 55 x 120 ft. library buildings, brick, steel and stone, brick foundation, to J. Lowry, Jr., 8 West 40th St. About $500,000. Noted June 19.

★**N. Y., New York**—Loft—L. and H. Kovner, 3 West 29th St., will alter brick and steel loft building, at 53 West 25th St. About $100,000. Work will be done by day labor.

★**N. Y., New York**—Office—Fiske Rubber Co., Chicopee Falls, Mass., let contract building 20 story, 64 x 150 ft., brick, steel and stone, concrete foundation, at 1765 Bway., here, to F. T. Ley Co., 19 West 44th St. About $3,000,000.

★**N. Y., New York**—Office—State Bank, 376 Grand St., let contract altering 10 story, brick, steel and stone, brick foundation, at 280 5th Ave., to H. H. Oddie, 12 East 44th St. About $50,000. Noted Jan. 29.

★**N. Y., New York**—School—Bd. Educ., 500 Park Ave., let contract building P. S. 130, 5 story, 59 x 112 ft., brick and steel, brick foundation, at 201-207 Hester St., to J. Fallon, 225-5th Ave. About $374,000. Noted Jan. 29.

★**N. Y., New York**—Store and Office—H. Fischel, 51 Chambers St., will alter brick and steel store and office building. About $50,000. Work will be done by day labor.

★**N. Y., New York**—Stores and Showroom—Childs Co., 200 5th Ave., let contract building 2 story, 25 x 100 ft., brick and steel, brick foundation, at 377 5th Ave., to C. L. Frazer, 103 Park Ave. About $80,000.

★**N. Y., New York**—Theatre—M. Loew's Enterprises, 1492 Bway., let contract building 1 story, 102x189 ft., brick and steel, brick foundation, on Bway. and 83d St., to Fleischmann Constr. Co., 531 7th Avenue.

★**N. Y., Woodlawn**—School—Bd. Educ. let contract building 4 room brick addition, to Morris & Allan, Bldrs. Exch., Buffalo. About $50,000.

★**N. J., Plainfield**—Theatre—S. Schwartz, 220 Bway.; New York City, let contract building 2 story, 100 x 150 ft., brick and steel, brick foundation, on Front St. near Waterbury Ave., to M. Shapiro, 52 Vanderbilt Ave., New York City. About $250,000.

★**N. J., Trenton**—Church—Second Presbyterian Church, Mercer and Market Sts., let contract building 1 and 2 story, 50 x 100 ft., stone, to W. R. Ivins, 717 Greenwood Ave.; cost plus percentage basis.

★**Pa., Phila.**—Office—Evening Bulletin, Juniper and Arch Sts., let contract building 7 story, 87 x 147 ft., brick, steel, stone and terra cotta addition, to Doyle & Co., 1519 Sansom St. Cost to exceed $500,000.

★**D. C., Washington**—Hotel—F. C. Lewen, c/o Carrere & Hastings, archts., 52 Vanderbilt Ave., New York City, will build 12 story, 200 x 200 ft., brick, steel and stone, concrete foundation, here. About $1,000,000. Work will be done by day labor.

★**Va., Richmond**—Bank—Bank of Commerce & Trusts, 9th and Main Sts., let contract building 2 story, 30x60 ft., brick, concrete foundation, at 517 Hull St., to J. T. Wilson, Mutual Bldg. About $75,000; cost plus percentage basis.

★**Va., Williamsburg**—School—H. D. Cole, clk. Bd. Educ., let contract building 2 story, 84x88 ft., brick, concrete foundation, on Main St., to R. V. Richardson Constr. Co., 515 Marshall St., Hampton, $55,970. Noted Jan. 22.

★**O., Cincinnati**—School—Bd. Educ, Denton Bldg., let contract building 3 story, 135 x 300 ft., rein.-con. and brick, on 7th and Carr Sts., to D. Meinken & Co., 2126 Western Ave. About $800,000. Noted Jan. 1.

★**O., Cleveland**—Office and Hospital—Amer. Steel & Wire Co., Jones Rd., will build 2 story, 36 x 61 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, at 2514 Bway. About $50,000. Work will be done by day labor.

O., Cleveland—School—Bd. Educ. received bids Jan. 26, building addition, consisting of two 1 story, 55 x 110 ft., concrete, steel and brick wings, rein.-con. flooring, concrete foundation, on St. Clair Ave. and Ruple Rd., from H. F. Jurgens Co., 1,530

Buildings (Continued)

Clarence Ave., Lakewood, $140,000; C. Peterson, Engineers Bldg., $153,359; Tenbusch-Parker Co., Union Bldg., $153,752. Noted Jan. 8.

★**O., Columbus**—Store and Dance Hall—H. H. Hennick, 1824 North High St., let contract building 2 story, 46 x 100 ft., concrete and brick, to Federal Constr. Co., Hartman Bldg. About $60,000.

★**O., Middletown**—Bank and Office—Werner & Atkins, archts., Mitchell Bldg., Cincinnati, let contract to J. R. Stevens & Co., 106 Odd Fellows Temple, building 7 story, 50 x 120 ft., rein.-con., on Middletown Ave., for First & Merchants Natl. Bank, 3rd and Main Sts. About $450,000.

★**Ill., Chicago**—Synagogue and Community—Bnai Abraham Zion congregation, c/o A. L. Levy, archt., 111 West Washington St., let masonry contract for 1 story, 85 x 110 ft. snyagogue and 2 story, 25 x 126 ft. community house, steel, brick and stone, concrete foundation, on Washington Blvd. and Karlow Ave., to Kadeshewitz & Buchel, 1342 Independence Pl. About $225,000. Noted Aug. 7.

Ill., Lockport — Penitentiary — See "Miscellaneous."

★**Ill., Moline**—Store—C. D. Wyman, 11th Ave. and 8th St., let contract building 4 story, 56 x 125 ft., steel, brick and terra cotta, rock foundation, on 5th Ave. and 14th St., to A. Carlson & Co., 411 Peoples Bank Bldg. About $125,000.

Wis., Kenosha—Court House and Jail—Kenosha Co. received bids Jan. 10, building (a) court house, (b) jail, 4 story, 114x154 ft., brick, rein.-con. and steel, concrete foundation, from Fleischer Constr. Co., Plymouth Bldg., Minneapolis, (a) $854,000, (b) $45,000; Madsen Constr. Co., 848 Builders' Exch., Minneapolis, (a) $916,500, (b) $91,500; Klarquist & Son, 750 Security Bldg., Minneapolis, (a) $898,050, (b) $105,000.

★**Ia., Bondurant** — School — Bd. Educ. let contract building 2 story 63 x 105 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, to J E. Tusant & Sons Co., 583 7th St., Des Moines, $76,164.

★**Ia., Burlington** — Temple — Masonic Temple Assn. let contract building 3 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, on 5th and Washington Sts., to J. H. Hunzinger & Co., 29 North Governor St., Iowa City. About $200,000; cost plus percentage basis. Noted Jan. 1.

★**Ia., Davenport**—Store—Bon Ton Co., 101 East 2nd St., let contract remodelling 3 story, 80 x 150 ft. building, on 2nd and Brady Sts., to Central Eng. Co., 711 Putnam Bldg. About $60,000.

★**Ia., Goldfield**—Bank—Farmers Savings Bank let contract building 2 story, 27 x 80 ft., brick, rein.-con. and steel, rein.-con. flooring, brick and concrete foundation, to Lytle Co., Masonic Bldg., Sioux City. About $55,000; cost plus percentage basis.

★**Ia., Maquoketa**—Bank—First Natl. Bank let contract building 1 story, 48 x 80 ft., brick, concrete and steel, concrete foundation, to Lytle Co., Masonic Bldg., Sioux City. About $75,000; cost plus percentage basis.

★**Minn., Duluth**—Medical and Clinic—F. M. Trumbull, secy. United Holding Co., 504 Providence Bldg., let contract constructing 2 story, 74 x 140 ft., brick, rein.-con. flooring, concrete foundation, on 1st St. and 10th Ave., to Bowman Bldg. Co. About $125,000; cost plus percentage basis.

★**Minn., Minneapolis**—School—Bd. Educ. let general contract building 3 story, 61 x 163 ft., rein.-con. and brick addition to Calhoun School, on Girard Ave., to F. N. Hegg, 2942 Nicollet Ave., $168,767. Noted Jan. 29.

★**Minn., Minneapolis**—Theatre and Office—Industrial Investment Co., 807 Hennepin Ave., let contract building 12 story, 200 x 230 ft., rein.-con. and granite, on 8th St. and Hennepin Ave., to C. W. Lundquist, 715 15th Ave., N. E. About $400,000; cost plus percentage basis.

★**Kan., Independence** — Bank—Commercial Natl. Bank let contract building 6 story, 70x140 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to Brewster Bros., Independence. About $150,000; cost plus percentage basis. Noted Jan. 15.

★**Kan., Kansas City**—Sales—R. P. Rice Motor Sales Co., 951 Central Ave., let general contract building 3 story, 55 x 126 ft., brick, terra cotta, stone and rein.-con., concrete foundation, on 4th St and Minnesota Ave., to J. R. Vansant Constr. Co., 413 Dwight Bldg., Kansas City, Mo., terra cotta contract, to Western Terra Cotta Co., Kansas City. Total cost, $120,000.

★**Neb., Crofton**—Bank—Farmers Savings Bank let contract building 1 story, 25 x 100 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to Lytle Co., 101 Masonic Bldg., Sioux City, Ia. About $55,000; cost plus percentage basis.

★**Neb., Ord.**—Court House—Valley Co. let contract building 3 story, 78 x 101 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to H. Ohlsen & Sons Co., David City, $198,821.

★**Neb., University Place**—School—Bd. Educ. let contract building 2 story, 60 x 80 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to C. C. Bickel, Lincoln. About $60,000.

★**Mo., Kansas City**—Business — Mutual Drug Co., 1200 West 9th St., Cleveland, O., let general contract building 4 story, 50 x 115 ft., rein.-con., brick and terra cotta, concrete foundation, on 20th and Main Sts., here, to H. Stiver, 402 Shukert Bldg. About $100,000.

★**Mo., Kansas City** — Office — T. C. Bourke, 3520 Bway., let general contract building 10 story, 100 x 115 ft., rein.-con., stone and terra cotta, concrete and rock foundation, on 19th and Walnut Sts., to Fogel Constr. Co., Reliance Bldg.

★**Tex., Dallas**—Office—Magnolia Petroleum Co., Great Southwestern Life Bldg., let contract building 10 story, brick and steel, concrete foundation, to T. C. Wills, 286 5th Ave., New York City. About $1,000,000.

★**Tex., Port Arthur**—Office—Gulf Refining Co. let contract building 6 story, 76 x 123 ft., brick, rein.-con. and steel, rein.-con. flooring, pile foundation, to Amer. Constr. Co., 411 Gulf Bldg., Houston. About $475,000.

★**Okla., Tulsa**—Business—Robinson Parker Co., Wheeling and Oklahoma Sts., will build 3 story, 120x140 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, at 210 North Main St. About $100,000. Work will be done by day labor.

★**Cal., Long Beach**—Store and Office—Pickerell & Scott, 139 Pine Ave., let contract building 2 story, 50 x 150 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Pine Ave., to C. T. McGrew, 1345 West Ocean Ave. About $100,000.

Federal Government Work

PROPOSED WORK

N. Y., Buffalo—Repairing Pier and Breakwater—U. S. Engr. Office, 540 Federal Bldg., having plans prepared for repairing West Pier and breakwater, in Dunkirk Harbor.

D. C., Wash.—Skylights—Spec. 4100—Bureau Yards & Docks, Navy Dept., soon receives bids building skylights for Bldg. 32, here. About $6,000; $10 deposit required for plans and spec.

. **Va., Hampton Roads**—Sewerage System—Spec. 4133—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build sewerage system in Unit "V", here. About $20,000.

Va., Yorktown — Aviation Facilities—Spec. 4132—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $47,000.

S. C., Paris Island — Seawall, Roads, Curbs, Gutters, etc. — Spec. 4101 — Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids building 2062 lin.ft. concrete seawall, 2,000 lin.ft. concrete roads, 15 and 18 ft. wide, 13,000 lin ft. concrete curbs and gutters, sewer and drains, at Marine Barracks, here. About $86,000; $10 deposit required for plans and spec.

Tenn., Nashville—Steel Hull—U. S. Engr. Office, 4th and 1st Natl. Bank Bldg., soon receives bids building steel hull for derrick boat, for Cumberland River locks.

O., Cincinnati—Repairing Breach—U. S. Engr. Office, 415 Customhouse, plans to repair breach in breakwater in Dam 3 and protect river below dam, in Muskingum River, 2nd Dist.

O., Cleveland—Dredging—U. S. Engr. Office, Federal Bldg., having plans prepared for dredging in Huron Harbor. About $35,000.

Ore., Chemawa—Heating Plant—U. S. Government, Wash., D. C., appropriated $15,000 for installing heating plant at Salem Indian Training School, here.

Cal., Mare Island—Alterations to Quarters—Spec. 4134—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to alter Quarters No. 1, at Marine Barracks, here. About $5,925. Address all inquiries to local yard.

Cal., San Diego—Storehouse and Hangars—Spec. 4087—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids building storehouse "D," 100 x 300 ft and three hangars, "A" 75 x 112 ft., "B" 66 x 140 ft. and "C" 66 x 200 ft., at Naval Air Sta., here. Government will furnish all materials for "B" and "C" except for downspouts, gutters, concrete work and painting, and structural steel only for "A" and "D." About $111,000; $10 deposit required for plans and spec.

BIDS DESIRED

N. Y., Buffalo—Radio Building—Spec. 4108—Until Feb. 18, by Bureau Yards & Docks, Navy Dept., Wash., D. C., constructing, here. About $9,000; $10 deposit required for plans and spec. Noted Jan. 16.

D. C., Wash.—Towers—Until Feb. 11, by Chief Signal Officer of Army, furnishing two 200 ft. towers for radio station, (Proposal P. R. 2013-1CP).

W. Va., Wheeling—Structural Steel, Forgings, Steel Castings, etc.—Until Feb. 20, by U. S. Engr. Office, 305 Post Office Bldg., furnishing and delivering trestles and horses for Dams 6, 8, 9, 10 and 11, in Kanawha River. About $15,000.

Ga., Washington—Post Office Alterations—Until Feb. 23, by Treas. Dept., Wash., D. C., for various changes in post office, here. J. A. Wetmore, superv. archt.

Ky., Addison—Lock and Abutment—Until Feb. 28, by U. S. Engr. Office, 425 Customhouse, Louisville, building lock and abutment for Dam 44, Ohio River, here; advertised in this issue.

O., Marietta—Structural Steel—Until Feb. 28, by U. S. Engr. Office, 305 Post Office Bldg., Wheeling, W. Va., furnishing and delivering structural steel for machine shop at U. S. Repair Sta., here; advertised in this issue.

Mich., Detroit—Life Boat House, etc.—Until Feb. 11, by U. S. Coast Guard Headquarters, Treas. Dept., Wash., D. C., building life boat house and accessories for Sta. 253, Middle Island.

Mich., Detroit—Radio Buildings—Spec. 4120—Until Feb. 18, by Bureau Yards & Docks, Navy Dept., Wash., D. C., constructing, here. About $9,000; $10 deposit required for plans and spec. Noted Jan. 22.

Ia., Des Moines—Remodeling Post Office—Until Feb. 25, by Treas. Dept., Wash., D. C., remodeling, here. J. A. Wetmore, superv. archt.

Tex., San Antonio—Post Office Alterations—Until Feb. 24, by Treas. Dept., Wash., D. C., altering Post Office and Courthouse, here. J. A. Wetmore, superv. archt.

New Mexico—Road Work—Until Feb. 16, by Bureau Pub. Rds., U. S. Dept. of Agriculture, 212 Luna-Strickler Bldg., Albuquerque, building 6.72 mi. highway, in Lincoln Natl. Forest, Lincoln Co., 20 ft. wide, involvng 11,531 cu.yd. common and 1,197 cu.yd. rock excav. About $30,000. E. S. Wheeler, dist. engr.

Cal., San Diego—Distributing System and Power Plant Equipment—Spec. 4118—Until March 3, by Bureau Yards & Docks, Navy Dept., Wash., D C., furnishing and installing complete power plant and electric generating equipment, including piping and accessories and distributing systems for electricity and steam, at Marine Corps Base, here. Noted Jan. 22.

Cal., San Diego—Lighting Fixtures—Spec. 4129—Until March 3, by Bureau Yards & Docks, Navy Dept., Wash., D. C., furnishing and installing electric, gas and combination lighting fixtures in 6 buildings at Marine Barracks, here. About $9,000; $10 deposit required for plans and spec. Noted Jan. 22.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**R. I., Newport**—Crane Runway, Crane and Racks—Spec. 4060—Bureau Yards & Docks, Navy Dept., Wash., D C., let contract building, for torpedo storehouse, here, to Mansfield & Savage, 135 William St., New York City, $25,285 (75 days). Noted Jan. 15.

N. Y., Tompkinsville—Steel Body—Superintendent of Lighthouses, received bids Jan. 12, furnishing 1 steel body for type LW acetylene buoy with skeleton steel superstructure, from C. Hegewals Co., $1,999 (200 days); Union Boiler & Mfg. Co., $2,400 (200 days); Internal. Engine Wks., Inc., 90 West St., New York City, $3,000 (180 days). Noted Jan 8.

Federal Government Work (Continued)

D. C., Wash.—Completing Storage Plant —Spec. 4115—Bureau Yards & Docks, Navy Dept., received bids Jan. 28, completing storage plant for fuel oil at Navy Yard, from Mansfield & Savage, 135 William St., New York City, $18,574 (100 days); Hyde & Baxter, 711 13th St, N. W., $18,800 (100 days); McHard Barton Co., 171 Madison Ave., New York City, $18,720 (100 days). Noted Jan. 22.

D. C., Wash.—Quay Wall—Spec. 4112—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Jan. 28, completing here, (1) work complete, from McLean Contg. Co., 1415 Fidelity Bldg., Baltimore, Md., (1) $54,747 (150 days); Hyde & Baxter, 711 13th St., (1) $67,900 (150 days), (3) $11,000 (20 days), (4) $11,700 (50 days); McHard Barton Co., 171 Madison Ave., New York City, (2) $48,485 (150 days); (3) $15,000 (30 days); (4) $18,890 (75 days). Noted Jan. 15.

★Va., Norfolk — Dredging —U S. Engr. Office, War Dept., Wash., D. C., let contract dredging in Pagan River, here, to W. H. French Dredging & Wrecking Co., Arcade Bldg., $6,806.

★Mich., Detroit—Dredging—U. S. Engr. Office, Federal Bldg., let contract dredging and rock excavating in Livingstone Channel, Detroit River, involving 98,000 cu.yd. limestone rock and 345,000 cu.yd. place measurement of earth, to Empire Eng. Co., Inc., 6 Church St., New York City, $600,760. Incorrectly noted in a previous issue.

★ Utah, Saata Clara—Bridge—Dept. of Interior, Office of Indian Affairs, Wash., D. C., let contract building steel highway bridge over Santa Clara River, Shivwits Indian Reservation, at point about 65 mi. from Modena, to R. L. Jones, Cedar City, $14,600. Noted Jan. 15.

Miscellaneous

PROPOSED WORK

Road Material—Hartford, Conn.—Wise & Upson, 36 Pearl St., will rent or purchase for March 1, ½ yd. electric driven concrete mixer, 50 hp. double driven electric hoist, 3 phase, 220 volt, 60 cycle.

Heating—West Hartford (Hartford P. O.) **Conn.** — Ford, Buck & Sheldon, engrs., 60 Prospect St., Hartford, receive bids about March 1, furnishing and installing steam heating plant, involving 125 lb. pressure h.r.t. boilers and 20,000 sq. ft. radiation, for Amer. School for Deaf, 65 Garden St., Hartford. About $60,000.

Tunnels, etc.—Ossining, N. Y.—C. F. Rattigan, supt. prisons, soon receives bids building underground pipe tunnels, installing heating mains, underground electric work, sewer and water connections and water supply, at Sing Sing Prison. About $400,000.

Scarifier—Trenton, N. J.—G. R. Hutchinson, co. rd. dir., Bd. Freeholders, Mercer Co., will purchase Buffalo-Springfield patented scarifier.

Swimming Pool—Chester, Pa.—R. E. White, archt., Pennsylvania Bldg., Phila., preparing plans for swimming pool and general recreation center for employees of company (name withheld), here. About $25,000.

Ship Berths, Drydocks, Railroad Switches, Etc. — Fairfield, Md. — See "Industrial Works."

Motor Trucks—Cleveland, O.—E. Shattuck, city pur. agt., soon lets contract furnishing five 1½-ton motor trucks.

Cement--Fond du Lac, Wis—P. Schrooter, chn. Rd. & Bridge Comn., Fond du Lac Co., soon lets contract furnishing 60,000 bbls. portland cement.

Rock Drilling Outfit—Green Bay, Wis.—W. M. Conway, Courthouse, plans to purchase compressed air rock drilling outfit.

Road Roller—Milwaukee, Wis.—Wisconsin Constr. Co., 1000 Humboldt Ave., is in the market for 10 ton road roller.

Dam—Augusta, Kan.—See "Waterworks."

Transmission Line—Coats, Kan.—City having plans prepared building 13 mi. electric transmission line from here to Pratt. About $24,000. G. L. Wright, city clk. W. B. Rollins & Co., 209 Ry. Exch. Bldg., Kansas City, Mo., engrs.

Truck—Ft. Scott, Kan.—D. P. Thomas, genl. mgr. Ft. Scott Cement Co., is in the market for 3½ or 5 ton capacity truck, with dump body, to haul stone from quarries.

Road Mixer—Hepler, Kan.—J. E. Owens is in the market for concrete road mixer and 1 sack machine and power loader.

Dam—Madill, Okla.—See "Waterworks."

Aviation Field — Eugene, Ore. — See "Bridges."

Channel—Marshfield, Ore.—State had preliminary plans prepared by A. Powers, drainage engr., Oregon Agricultural College, Corvallis, for building connecting channel, 4,000 ft. long, 30 ft. wide, 6 ft. deep at low water, 60 ft. deep at highest point, to connect Isthmus Inlet and Beavers Slough. About $125,000.

Trackage Bunkers—Portland, Ore.—Pub. Dock Comn. having plans prepared by G. B. Hegardt, engr., c/o owners, for level trackage bunkers equipped with conveyor belts and chutes for handling bulk sulphur and coal, 10,000-20,000 ton daily capacity, at St. Johns Terminal. Cost to exceed $10,000.

Dike—St. Helens, Ore.—Property owners Sauvies Island making preliminary plans for forming diking district and constructing dike, 31 mi. long, 13 ft. high, to drain 15,000 acres in Multnomah and 25,000 acres in Columbia Counties. About $75,000. J. W. Hunt, St. Helens, clk., Columbia Co.

Breakwater—Port Maitland, N. S.—Dept. Pub. Works, Ottawa, Ont., plans to build stone filled, native timber crib breakwater. About $200,000. C. E. W. Dodwell, dist. engr.

Motor Tracks—Toronto, Ont.—Bids will soon be received by A. Wilson, street comr., for 8 or 10, 2 to 5 ton motor trucks and trailers. About $50,150. R. C. Harris, city engr.

BIDS DESIRED

Seawall—Scituate, Mass.—Until Feb. 20, by Dept. Pub. Wks., Room 413, State House, Boston, building seawall, here, involving 5,000 cu.yd. dry earth excav. and 680 cu.yd. concrete. About $10,000. W. F. Williams, 413 State House, Boston, engr.

Culvert Pipe—Harrisburg, Pa.—Until March 1, by L. S. Sadler, state highway comr., furnishing culvert pipe for maintenance work of department; advertised in this issue.

Asphalt Plant, Steam Melting Kettle, Etc. —Johnstown, Pa.—Until Feb. 10, by M. L. Masterson, supt. of highways, furnishing and erecting one 800 sq.yd., 3 unit asphalt plant, one 3,000 gal. portable steam melting kettle, one combination 40 hp. boiler with 25 hp. engine, and 5 ton tandem steam or motor roller. Bids will be received for any or all with or without approved air lift and running trucks.

Gasoline Locomotive — Baltimore, Md. — Until Feb. 11, by Bd. Awards, furnishing and delivering one 3 ton gasoline locomotive complete, to Highways Engineer's Dept., f.o.b. Bolton Yard, Pennsylvania R.R. G. F. Wieghardt, highways engr.; advertised in this issue.

Manhole, Sewer Inlet, etc. — Baltimore, Md.—Until Feb. 11, by Bd. Awards, furnishing and delivering manhole, sewer inlet and similar iron castings, to Highways Engineer's Dept., at Franklin St. Storage Yard, near Calverton Rd., or any other storage yard of department. G. F. Wieghardt, highways engr.; advertised in this issue.

Refuse Asphalt Crusher—Baltimore, Md. Until Feb. 11, by Bd. Awards, furnishing 1 refuse asphalt crusher., G. F. Wieghardt, highways engr.; advertised in this issue.

Building Materials—Lockport, Ill.—Until March 2, by J. Lambert, pres. Penitentiary Comn., Rookery Bldg., Chicago, for materials to be used in connection with building of cellhouse, cold storage and supply warehouse, laundry, etc., at new Illinois State Penitentiary near here, as follows: (1) architectural terra cotta, (2) architectural iron, (3) plumbing, (4) structural steel, (5) sheet metal, (6) heating, (7) insulation, (8) refrigeration equipment, (9) freight elevator, (10) cell fronts and locking device, (11) pressed brick, (12) reinforcing rods, (13) portland cement. Proposals must be divided as above mentioned; advertised in this issue.

Road Oil, Asphalt, Pitch and Tar— —Minneapolis, Minn.—K. E. Alexander, city pur. agt., receiving bids furnishing 1,000,000 gal. road oil, cost $0.08 per gal.; 400 tons asphalt, $28 per ton; 1,500 tons pitch, $24 per ton; 1,000 tons tar, $0.11 per gal.

Road Oil—New Ulm, Minn.—Until Feb. 10, by W. P. Back, city clk., furnishing 100,000 gal. road oil. Cost about $0.08 per gal.

Paving Materials—San Antonio, Tex.—Until Feb. 16, by F. Fries, city clk., furnishing f.o.b. 100,000 cu.yd. gravel for construction of macadam base, 40,000 cu. yd. crushed rock, 20,000 cu.yd. sand and 400 tons reinforcing steel on bridges. R. L. Dalton, city purchasing agt.

Flume and Conduit Materials — Attalia, Wash.—Until Feb. 14, by Bd. Dirs. Attalia Irrigation Dist., furnishing and installing flume and conduit materials, involving 1,540 lin.ft. No. 120 metal flume, 3,500 lin.ft. 48 in. concrete pipe and 1,800 lin.ft. 20 in. concrete or wood stave pipe. E. V. Baron, Attalia, engr.; advertised in this issue.

Slide Gates—San Francisco, Cal.—Until March 3, by Bd. Pub. Wks., City Hall, furnishing and delivering six 47 x 90 in. slide gates (Contr. 66), for outlet system of Hetch Hetchy Dam. About $120,000; advertised in this issue.

Slide Gates—San Francisco, Cal.—Until March 24, by Bd. Pub. Wks., City Hall, furnishing and delivering six 33 in. x 42 in. slide gates (Contr. 67), for outlet system of Hetch Hetchy Dam. About $130,000; advertised in this issue.

Valves — San Francisco, Cal. — Until March 10, by Bd. Pub. Wks., City Hall, furnishing and delivering six 5 ft. balanced valves, needle type (Contr. 68), for outlet system of Hetch Hetchy Dam. About $155,000; advertised in this issue.

Valves — San Francisco, Cal. — Until March 31, by Bd. Pub. Wks., City Hall, furnishing and delivering six 3 ft. balanced valves, needle type, (Contr. 69), for outlet system of Hetch Hetchy Dam. About $75,000; advertised in this issue.

Miscellaneous Supplies—Hamilton, Ont. —Until Feb. 23, by C. G. Booker, mayor and chn. Bd. Control, City Hall, for furnishing broken stone and screenings, limestone dust, asphalt, asphalt sand, sand and gravel, vitr. brick, creosoted wooden blocks, lumber, sewer pipe, sewer brick lime, castings, (ordinary) hydrants, valves, extension boxes, hardware, lead pipe, pig lead, road oil, lubricating oil, flux, fuel oil, gasoline, concrete and garbage duck covers, rubber boots, rubber hose, bass brooms, sectional sweepers and portland cement. S. H. Kent, city clk.; advertised in this issue.

Hydrants and Valve Covers—York, Ont. —Until Feb. 24, by Twp. Council, furnishing 250 hydrants and 250 round c.i. valve covers and frames. About $30,000. F. Barber, 40 Jarvis St., Toronto, twp. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Swimming Pool, Etc.—Hartford, Conn. —S. A. DeWaltoff, Savin Rock, New Haven, will build swimming pool, dance hall and restaurant, at Capitol Park, here. Work will be done by day labor.

★Garbage Disposal—Rochester, N. Y.—City let contract building and equipping garbage reduction plant, to C. O. Bartlett and Snow Co., French and Winter Sts., Cleveland, O. About $645,780. Noted Jan. 29.

Hydrants, Couplings, etc. — Milwaukee, Wis.—Central Bd. Purchases received only bid furnishing one hundred 5 in. hydrants, from I. D. Wood Co., Phila., @ $78.50 each; also furnishing (1) corporation cocks, (a) five hundred ⅝ in., (b) five hundred ¾ in., (c) one hundred 1 in., (2) curb cocks, (a) five hundred ¾ in., (b) five hundred 1 in., (c) one hundred 1¼ in., (3) meter cocks, (a) five hundred ⅝ in., (b) three hundred ¾ in., (c) one hundred 1 in., (4) couplings, (a) one thousand ⅝ in., (b) six hundred ¾ in., (c) two hundred 1 in., from Rundle-Spence Mfg. Co., 63 2nd St., (1a) $1.10, (1b) $1.40, (1c) $2.15, (2a) $1.50, (2b) $2.25, (2c) $2.85, (3a) $1.40, (3b) $1.75, (3c) $2.50; H. Mueller Mfg. Co., 179 West Washington St., Chicago, (1a) $1.27, (1b) $1.62, (1c) $2.20, (2a) $1.40, (2b) $2.12, (2c) $3.51, (3a) $1.08, (3b) $1.33, (3c) 2.31, (4a) $0.27, (4b) $0.43, (4c) $0.64; Glauber Brass Mfg. Co., 4,917 Superior St., Cleveland, (1a) $1.47, (1b) $1.85, (1c) $2.95, (2a) $1.70, (2b) $2.65, (2c) $3.35, (3a) $1.15, (3b) $1.60, (3c) $2.40, (4a) $0.35, (4b) $0.37, (4c) $0.53. Noted Jan. 22.

★Air Pumping Unit, Etc.—Sheboygan Falls, Wis.—City let contract furnishing 1 air pumping unit, piping, compressor motor and receiver, automatic control, 1 centrifugal pump, 450 gal. per min., connected to motor of proper design and power, to Indiana Air Pump Co., 812 Indiana Pythian Bldg., Indianapolis, $10,824.

★Dam—Corydon, Ia.—City let contract building earth fill dam with concrete face wall, involving 17,500 cu.yd. earth and 3,500 cu.yd. concrete, to Phelps & Son, Knoxville. About $76,000.

★Plumbing, Heating, etc.—Portland, Ore. —Wells Bros. Contg. Co., 53 West Jackson Blvd., Chicago, let contract furnishing and installing plumbing, heating and mechanical equipment in building of Montgomery Ward Co., here, to Dausch-Weber Heating & Eng. Co., Oregon Bldg. About $150,000. Noted Jan. 15 under "Industrial Works."

OFFICIAL PROPOSALS

Bids: Feb. 18.

Macadam Road

WASHINGTON COUNTY ROAD DISTRICT NO. 3

Fayetteville, Ark.

Sealed bids will be received by Jas. English, Chmn. of Commission, at the office of the Engineers, Hamilton & Sherve, Fayetteville, Ark., until 2 p.m., Feb. 18, 1920, and there will be publicly opened and read, for the construction of 62 miles of gravel macadam road.

The approximate quantites are as follows:

82.2	acres clearing and grubbing;
163,333	cu.yd. excavation, unclassified;
5,000	cu.yd. excavation, solid rock;
17.8	miles Class A, (machine grader work);
6.0	miles Class B, (machine grader work);
2,340	cu.yd. Class A concrete, reinforced in culverts;
520	cu.yd. Class B concrete, plain in headwalls;
1,200	cu.yd. Class B concrete, plain in bridge abutments;

Alternate Concrete Bid.

1,140	cu.yd. Class A concrete reinforced in box culverts;
2,520	cu.yd. Class C concrete, cement rubble masonry;
400	cu.yd. Class B concrete, plain in bridge abutments;
618	lin.ft. I-beam steel bridges, 10 to 30 ft. spans;
290	lin.ft. steel truss bridges, 60 to 80 ft. spans;
54,480	B. M. bridge flooring in place;
4,536	lin.ft. plain concrete pipe, furnishings only;
4,536	lin.ft. plain concrete pipe, unloading, hauling and placing only;
96,120	cu.yd. native gravel macadam, hauling and placing first mile;
192,240	additional cubic yards, mile haul;

Separate bids may be submitted for any one or all of the following items:

Steel trusses and short spans erected.

Plain concrete pipe, f.o.b. cars, any station on the O & C. C. Ry., in Washington County.

All classes of concrete or cement rubble masonry either in box culverts, headwalls or bridge abutments.

Plans and specifications are on file at the office of the Engineers, Hamilton & Shreve, Fayetteville, Ark., and the office of the County Clerk, Courthouse, Fayetteville, where they may be seen; or they may be obtained from the Engineers on payment of $10. Estimate sheets showing quantities may be had upon request from the Engineers.

A certified check to the amount of 3 per cent of the bid must accompany all proposals. Check to be made to the order of the Chairman of the District. Usual rights reserved.

Successful bidders will be required to execute satisfactory bond for 25 per cent of the amount of the contract.

Board of Washington County Road Imp. District No. 3.

JAS. ENGLISH, Chm.
Fayetteville, Arkansas.
HAMILTON & SHREVE, Engineers,
Fayetteville, Arkansas.

The publication of an advertisement on this page is an official notice that bids are wanted from other than local bidders.

It is also a guarantee that maximum competition is invited because Engineering News-Record is the *one* nationally recognized medium for Proposal advertising. Its Searchlight Section is read each week by nearly every worth-while contractor in this country who bids on public work outside his own city.

Official Proposals reaching our office in first mail Wednesday morning (9 o'clock) can usually be published in the issue out the next day. Special price for Official Proposals, $3.60 an inch.

Bids: Mar. 2.

Bridge Construction

Little Rock, Ark.

Sealed proposals for the construction of two reinforced concrete arch bridges across the Arkansas River at Main Street and Broadway Street in the City of Little Rock, State of Arkansas, will be received by the Commissioners of the Broadway-Main Street Bridge District of Pulaski County, Ark., at the Director's Room of the Southern Trust Company, in the Southern Trust Building, in the City of Little Rock, Ark., until 2:30 o'clock p.m., Tuesday, March 2, 1920, and will at that time and place be publicly opened and read.

The proposed work consists of the following:

MAIN STREET BRIDGE

Thirteen reinforced concrete arch spans with roadway 40 feet wide between curbs and two 8-foot sidewalks. Total length of improvement will be approximately 2,000 feet; and will contain about 34,000 cubic yards of concrete and 1,300,000 pounds of reinforcing steel.

BROADWAY STREET BRIDGE

This structure will be of the same width as given for the Main Street Bridge and will consist of five reinforced concrete arch spans and 1,700 lineal feet of approaches. The approximate quantities are: concrete, 27,500 cubic yards; reinforcing steel, 2,000,000 pounds.

The river piers and abutments for both bridges are to be sunk to bed rock by the pneumatic process.

Bidders may bid upon the substructure and superstructure separately for one or both bridges, or for both bridges complete.

The contractor may build the substructure for both bridges at same time, or he may complete the substructure for the Broadway Street Bridge first, and then build the substructure for the Main Street Bridge as he may see fit. It will be practicable to build all of the Main Street piers up to the spring line of the arches without interfering with the old bridge or the traffic thereon. In any case, the old bridge shall not be removed nor the traffic over it disturbed until the Broadway Street Bridge is opened for traffic.

The district will have ample funds available to pay in cash for all work as performed.

All bids shall be placed in envelopes, to be supplied by the Engineers and each bid must be accompanied by a certified check on a solvent bank in the sum of not less than two and one-half (2½) per cent of the amount of the bid, made payable to the order of the Broadway Main Street Bridge District. No certified check, however, shall be for a sum less than $5,000.

All bids shall be upon proposal blanks sealed and then marked thereon, "Proposal for Broadway-Main Street Bridges."

The successful bidder will be required to give a bond in the amount of not less than one-third of the total amount of his contract, which bond shall be executed by a surety company to be approved by the Broadway-Main Street Bridge Commissioners.

Plans and specifications may be seen at the office of the Bridge District in Little Rock. Copies of the plans and specifications for the Main Street Bridge may be secured from Luten, Roberts & Titus, Consulting Engineers, Indianapolis, Ind., and for the Broadway Street Bridge from Hedrick & Hedrick, Consulting Engineers, 506 Interstate Building, Kansas City, Mo.

A deposit of twenty dollars will be required for the plans and specifications for each bridge, fifteen dollars of which will be refunded upon the return of the papers.

The Commissioners reserve the right to reject any or all bids.

GEORGE W. DONAGHEY, Chairman.
JUSTIN MATTHEWS, Secretary.
MOORHEAD WRIGHT, J. R. VINSON,
HERMAN KAHN, F. W. ALLSOPP,
Commissioners,
Broadway-Main Street Bridge
District of Pulaski County,
Arkansas.

Bids: Feb. 12.

Laying Pipe Line Etc.

Asheville, N. C.

Sealed proposals will be received at the office of the Secretary-Treasurer until eleven a.m., February 12, 1920, for furnishing, f.o.b. cars at Asheville, N. C., about 3,263 tons of 16-in. bell and spigot cast-iron pipe, and about 21.3 tons of special castings. Also for furnishing f.o.b. cars Asheville, N. C., about 51,300 lin.ft. of 16-in. cast-iron pipe and about 58 tees and bends, 16-inch.

Also for furnishing and laying the above 16-in. pipe and specials, the city in each case paying railroad freight.

Also for laying the above 16-in. pipe and specials, the city furnishing same to the Contractor, f.o.b. cars at Biltmore, Axalea or Swannanoa Stations.

Certified check for $2,000.00 to accompany each bid.

The city reserves the right to reject any or all bids or parts of same.

Plans and specifications can be examined at the office of the City Engineer, Asheville, N. C.

Prospective bidders can obtain a copy of the specifications by applying to B. M. Lee, City Engineer and inclosing one dollar and fifty cents ($1.50) to pay for same.

107

CONSTRUCTION NEWS

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Feb. 16	Lancaster, Cal.	Feb. 5
Feb. 16	Elmhurst, Ill.	Feb. 12
Feb. 17	Ada, Okla.	Feb. 5
Feb. 17	Jacksonville, N. C.	Jan. 15
Feb. 17	Lockport, Ill.	Feb. 5
Feb. 24	Detroit, Mich.	Jan. 29
Feb. 24	Quimby, Ia.	Feb. 12

SEWERS

Feb. 16	Davis, Okla.	Feb. 5
Feb. 17	Lockport, Ill.	Feb. 5
Feb. 17	Ada, Okla.	Feb. 5
Feb. 20	Carnegie, Okla.	Jan. 8
Feb. 24	Bryan, Tex.	Feb. 5
Mar. 1	Minot, N. D.	Feb. 12
Mar. 1	Lebanon, Pa.	Feb. 5
	Adv. Feb. 5 and 12.	
Mar. 1	Livingston, Mont.	Feb. 5
Mar. 2	Kendallville, Ind.	Feb. 12

BRIDGES

Feb. 16	Ray Junction, Ariz.	Jan. 22
Feb. 16	Olivia, Minn.	Jan. 29
Feb. 17	Nutley, N. J.	Jan. 22
Feb. 17	Joliet, Ill.	Feb. 5
Feb. 17	Muscatine, Ia.	Feb. 12
Feb. 17	Fayetteville, N. Y.	Feb. 5
Feb. 19	Elizabeth, N. J.	Feb. 5
	Adv. Feb. 5 and 12.	
Feb. 20	Tulsa, Okla.	Feb. 5
Feb. 20	Marinette, Ariz.	Jan. 29
	Adv. Jan. 29 and Feb. 5.	
Feb. 20	Beloit, Wis.	Feb. 12
Feb. 20	Philadelphia, Pa.	Feb. 12
Feb. 24	Seattle, Wash.	Feb. 12
Feb. 24	Wyoming	Feb. 12
Feb. 25	Bethlehem, Pa.	Jan. 8
Feb. 25	Ishpeming, Mich.	Feb. 5
Feb. 26	Dayton, O.	Feb. 12
Feb. 27	Kingston, N. Y.	Feb. 5
	Adv. Feb. 5 and 12.	
Mar. 10	Springfield, Mass.	Feb. 12
	Adv. Feb. 5 and 12.	
Mar. 15	Connecticut	Feb. 12
	Adv. Feb. 12.	
Mar. 23	O'Brien, Wash.	Feb. 12

STREETS AND ROADS

Bids Close		See Eng. News-Record
Feb. 14	Phila., Pa.	Jan. 29
Feb. 14	Michigan	Feb. 5
Feb. 14	Port Huron, Mich.	Feb. 5
Feb. 14	Rochester, Ind.	Feb. 5
Feb. 15	Bixby, Okla.	Jan. 29
Feb. 16	Noblesville, Ind.	Feb. 5
Feb. 16	Minneapolis, Minn.	Jan. 29
Feb. 16	Seattle, Wash.	Feb. 5
Feb. 16	Lancaster, Ont.	Feb. 5
Feb. 16	Des Moines, Ia.	Feb. 12
Feb. 16	Marksville, La.	Feb. 12
Feb. 16	Albion, Neb.	Feb. 12
Feb. 17	Humphrey, Neb.	Feb. 13
Feb. 17	Wisconsin	Feb. 5
Feb. 17	Santa Ana, Cal.	Feb. 5
Feb. 17	Pennsylvania	Jan. 29
	Adv. Jan. 29 to Feb. 12.	
Feb. 17	Columbus, Ind.	Feb. 5
Feb. 17	Michigan	Feb. 5
Feb. 17	Davenport, Ia.	Feb. 5
Feb. 17	Marshall, Minn.	Feb. 12
Feb. 18	Lincoln, Neb.	Feb. 12
Feb. 18	Detroit, Mich.	Feb. 12
Feb. 18	Illinois	Feb. 12
Feb. 18	Fort Lee, N. J.	Feb. 12
Feb. 18	Menomonee, Wis.	Feb. 5
Feb. 18	Ft. Wayne, Ind.	Feb. 5
Feb. 18	Seneca, Kan.	Feb. 5
Feb. 18	Freehold, N. J.	Jan. 29
Feb. 18	Cornwall, Ont.	Feb. 5
Feb. 18	Fayetteville, Ark.	Jan. 15
	Adv. Jan. 29 and Feb. 5.	
Feb. 19	Brooklyn, N. Y.	Feb. 12
Feb. 20	Spencer, W. Va.	Feb. 5
Feb. 20	Lebanon, Ind.	Feb. 5
Feb. 20	Lincoln, Neb..	Feb. 12
Feb. 21	St. Johns, Mich.	Jan. 22
Feb. 23	Tuscon, Ariz.	Feb. 12
Feb. 24	Lincoln, Neb.	Feb. 12
Feb. 24	Washington	Feb. 12
Feb. 24	Anniston, Ala.	Feb. 12
Feb. 24	Montgomery, Ala.	Jan. 8
	Adv. Jan. 8.	
Feb. 24	Le Sueur Center, Minn.	Jan. 29
Feb. 24	Michigan	Feb. 5
Feb. 25	Madison, Minn.	Feb. 25
Feb. 26	Gaylord, Minn.	Feb. 5
Feb. 26	Laurel, Del.	Feb. 5
	Adv. Feb. 5 and 12.	
Feb. 26	Slayton, Minn.	Feb. 12
Feb. 26	Michigan	Feb. 12
Feb. 26	Arizona	Feb. 12
Feb. 27	Ohio	Feb. 12
Mar. 1	Cortland, N. Y.	Feb. 12
Mar. 1	Louisiana	Feb. 12
Mar. 1	Livingston, Mont.	Jan. 29
	Adv. Jan. 29.	
Mar. 1	Mitchell, S. D.	Feb. 12
	Adv. Feb. 12.	
Mar. 1	Buckhannon, W. Va.	Feb. 12
Mar. 2	Charleston, W. Va.	Jan. 22
Mar. 2	Winfield, Ia.	Jan. 29
Mar. 2	South Euclid, O.	Feb. 5
Mar. 2	Ft. Scott, Kan.	Feb. 5
Mar. 3	Pennsylvania	Feb. 5
	Adv. Feb. 5 and 12.	
Mar. 4	Hutchinson, Kan.	Feb. 5
Mar. 4	Fairmont, W. Va.	Feb. 12
Mar. 6	Leavenworth, Kan.	Feb. 5
Mar. 6	Brainerd, Minn.	Jan. 29
Mar. 8	Okmulgee, Okla.	Jan. 29
Mar. 8	Fayetteville, W. Va.	Feb. 12
Mar. 9	Fredonia, Kan.	Feb. 5
Mar. 10	Eureka, Kan.	Feb. 5
Mar. 12	Clinton, N. J.	Feb. 12

RAILWAYS

Feb. 17	Ontario	Jan. 15
Mar. 1	Maine	Feb. 12

EXCAVATION AND DREDGING.

Feb. 15	Benjamin, Utah	Jan. 1
Feb. 16	Olivia, Minn.	Jan. 29
Feb. 16	Seattle, Wash.	Jan. 29
Feb. 17	Marshall, Minn.	Jan. 29
Feb. 17	Ft. Gratiot (Port Huron P. O.), Mich.	Feb. 5
Feb. 18	Dresden, Tenn.	Feb. 5
Feb. 18	York, Ont.	Feb. 5
Feb. 18	Tompkinsville, N. Y.	Feb. 12
Feb. 21	Havana, Ill.	Feb. 5
Feb. 28	Little Falls, Minn.	Feb. 12
Mar. 8	Cooper, Tex.	Feb. 12

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
Feb. 14	Cleveland, O.	Feb. 5
Feb. 16	Vandalia, Ill.	Feb. 5
Feb. 16	Philadelphia, Pa.	Feb. 12
Feb. 16	Madison, Wis.	Feb. 12
Feb. 19	Ashley, Pa.	Feb. 5
Feb. 20	Scranton, Pa.	Jan. 29
Feb. 22	Olyphant, Pa.	Feb. 12
Feb. 24	Wilkes Barre, Pa.	Jan. 29
Feb. 27	Wilkes-Barre, Pa.	Jan. 29
Feb. 27	Forty Fort (Kingston P. O.), Pa.	Feb. 5
Mar. 1	Taylor, Pa.	Feb. 5
Mar. 1	Edmonton, Alta.	Jan. 8
Mar. 1	Cedar Rapids, Ia.	Jan. 22
Mar. 6	Estevan, Sask.	Jan. 29
	Adv. Jan. 29 to Feb. 12.	
Mar. 15	Wakefield, Mass.	Jan. 29
Mar. 17	Larrabee, Ia.	Feb. 5
Mar. 20	Saco, Mo	Feb. 12

BUILDINGS

Feb. 14	New York, N. Y.	Feb. 12
Feb. 14	Sandusky, O.	Feb. 5
Feb. 14	Tenafly, N. J.	Feb. 5
Feb. 14	Montreal, Que.	Feb. 5
Feb. 15	Westmount, Que.	Jan. 22
Feb. 15	Clear Lake, Wis.	Feb. 5
Feb. 15	Owen, Wis.	Feb. 5
Feb. 15	Scranton, Pa.	Feb. 5
Feb. 16	Peru, Neb.	Jan. 29
Feb. 16	Halifax, N. S.	Jan. 22
Feb. 16	Kearney, Neb.	Jan. 29
Feb. 16	Northfield, Minn.	Jan. 29
Feb. 16	Chadds Ford, Pa.	Jan. 29
Feb. 16	Trenton, N. J.	Feb. 5
Feb. 16	Baltimore, Md	Feb 5
Feb. 16	Mayetta, Kan.	Feb. 5
Feb. 16	Pine Bluff, Ark.	Feb. 5
Feb. 16	Long Beach, Cal.	Feb. 5
Feb. 17	Pocahontas, Ia.	Feb. 5
Feb. 17	Belleville, N. J.	Feb. 5
Feb. 17	Beaver, Ia.	Jan. 29
Feb. 17	Ypsilante, Mich.	Jan. 29
Feb. 17	Waseca, Minn.	Jan. 29
Feb. 17	Aurelia, Ia.	Jan. 22
Feb. 17	Columbus, Neb.	Jan. 8
Feb. 17	Beaver, Ia.	Feb. 12
Feb. 17	Wyandotte, Mich.	Feb. 12
Feb. 18	Hartford, Conn.	Feb. 12
Feb. 18	Durant, Ia.	Feb. 12
Feb. 19	Lovilia, Ia.	Feb. 5
Feb. 19	Cleveland, O.	Jan. 29
Feb. 19	Manitowoc, Wis.	Jan. 15
Feb. 20	Ashland, Ky.	Feb. 5
Feb. 20	Racine, Wis.	Jan. 29
Feb. 20	Redford, Mich.	Feb. 5
Feb. 20	Calamas, Ia.	Jan. 29
Feb. 20	Salt Lake City, Utah	Jan. 1
Feb. 20	Ecorse, Mich.	Feb. 12
Feb. 20	St. Marys, Ia.	Feb. 12
Feb. 20	Jamaica, N. Y.	Feb. 12
Feb. 21	Middletown, Conn.	Feb. 12
Feb. 23	Wilkes-Barre, Pa.	Jan. 29
Feb. 23	Brooklyn, N. Y.	Feb. 5
Feb. 24	East Moline, Ill.	Feb. 5
Feb. 24	East Orange, N. J.	Jan. 22
Feb. 24	Ithaca, N. Y.	Feb. 5
	Adv. Feb. 5	
Feb. 25	Desloge, Mo.	Feb. 5
Feb. 25	Pittsburgh, Pa.	Feb. 12
Feb. 25	Marshalltown, Ia.	Feb. 12
Feb. 28	Montreal, Que.	Feb. 12
Feb. 29	Victoria, B. C.	Feb. 12
Mar. 1	Racine, Wis.	Jan. 1
Mar. 1	Topeka, Kan.	Jan. 29
Mar. 1	Carlton, Ont.	Jan. 15
Mar. 1	Detroit, Mich.	Jan. 22
Mar. 1	Montreal, Que.	Jan. 15
Mar. 1	Alpena, Mich.	Jan. 15
Mar. 1	Arco, Minn.	Feb. 5
Mar. 1	Minneapolis, Minn.	Feb. 5
Mar. 4	Columbus, O.	Feb. 12
Mar. 15	Hibbing, Minn.	Jan. 29
Mar. 15	Landrienne, Que.	Feb. 12
May 15	Syracuse, N. Y.	Dec. 11
Mar. 16	Washta, Ia.	Feb. 5
Mar. 20	Redford, Mich.	Feb. 5
Apr. 1	Dodson, Mont.	Feb. 5

FEDERAL GOVERNMENT WORK

Bids Close		See Eng. News-Record
Feb. 14	Seaplane Hangars, etc. — Hampton, Roads, Va. Adv. Jan. 29 and Feb. 5.	Jan. 22
Feb. 14	Lock and Dam—Pittsburgh, Pa. Adv. Jan. 22 to Feb. 12.	Jan. 22
Feb. 16	Road Work— New Mexico.	Feb. 5
Feb. 17	Roadway — Washington, D. C. Adv. Jan. 29.	Jan. 29
Feb. 18	Remodeling and Extending —Sacramento, Cal.	Jan. 22
Feb. 18	Dredging—Phila., Pa. Adv. Feb. 5 and 12.	Jan. 22
Feb. 18	Radio Building—Spec. 4107 Milwaukee, Wis.	Jan. 22
Feb. 18	Radio Building—Spec. 4120 —Detroit, Mich.	Feb. 5
Feb. 18	Radio Building—Spec. 4108 —Buffalo N. Y.	Feb. 5
Feb. 20	Structural Steel, Forgings, Steel Castings, etc.—Wheeling, W. Va.	Feb. 5
Feb. 20	Portland Cement—Florence, Ala. Adv. Jan. 29 to Feb. 5.	Jan. 22
Feb. 23	Post Office Alterations — Washington, Ga.	Feb. 5
Feb. 24	Post Office Alterations — San Antonio, Tex.	Feb. 5
Feb. 25	Roof — Spec. 4113 — New York, N. Y.	Jan. 8
Feb. 25	Remodeling Post Office — Des Moines, Ia.	Feb. 5
Feb. 26	Condenser Body, etc. — Charleston, S. C. Adv. Feb. 12.	Feb. 12
Feb. 28	Structural Steel — Marietta, O. Adv. Feb. 5 and 12.	Feb. 5
Feb. 28	Lock and Abutment—Addison, Ky. Adv. Feb. 5 and 12.	Feb. 5
Mar. 2	Riprap Stone—Baltimore, Md.	Feb. 12
Mar. 3	Distributing System and Power Plant Equipment—Spec. 4118 — San Diego, Cal.	Feb. 5
Mar. 3	Alterations to Post Office and Customhouse — Oswego, N. Y. Adv. Feb. 12.	Feb. 12
Mar. 3	Lighting Fixtures — Spec. 4129—San Diego, Cal.	Feb. 5
Mar. 11	Dredging—Galveston, Tex.	Feb. 12
Mar. 11	Dredging and Rock Removal—New York, N. Y. Adv. Feb. 12.	Feb. 12
Mar. 29	Post Office and Customhouse—Apalachicola, Fla.	Feb. 12

MISCELLANEOUS

Feb. 16	Paving Materials — San Antonio, Tex.	Feb. 5
Feb. 16	Lumber, Piling, etc.—Iowa City, Ia.	Feb. 12
Feb. 17	Lumber, Steel, etc. — Muscatine, Ia.	Jan. 29
Feb. 17	Lumber, Cement, etc. — Greenfield, Ia.	Feb. 12
Feb. 17	Road Materials — New York, N. Y.	Feb. 12
Feb. 17	Auto Trucks—Cape May Court House, N. J.	Feb. 12
Feb. 18	Cement—Milwaukee, Wis.	Feb. 12
Feb. 18	Levee—New Orleans, La.	Feb. 12
Feb. 18	Valves—Milwaukee, Wis.	Feb. 12
Feb. 18	Portland Cement—Ontario.	Feb. 12
Feb. 20	Seawall—Scituate, Mass.	Feb. 5
Feb. 20	Castings, Waterpipe, etc.—Milwaukee, Wis.	Feb. 12
Feb. 20	Centrifugal Boiler, Feed Pump—Cleveland, O.	Feb. 12
Feb. 20	Portable Asphalt Plant—Detroit, Mich.	Feb. 12
Feb. 23	Sewer Pipe, Cement and Asphalt—Lansing, Mich.	Feb. 12
Feb. 24	Hydrants and Valve Covers —York, Ont.	Feb. 5
Mar. 1	Culvert, Pipe— Harrisburg, Pa. Adv. Feb. 5 and 12.	Feb. 5
Mar. 2	Building Materials — Lockport, Ill. Adv. Feb. 5 and 12.	Feb. 5
Mar. 15	Ornamental Light Standards—Cleveland, O.	Feb. 12
Mar. 16	Deep Well Pumping Equipment—Lockport, Ill.	Feb. 12

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

W. Va., Elkins—City plans to build new pumping station and filtration plant. About $130,000.

N. C., Jacksonville—City plans to build waterworks and sewerage system. About $60,000. Architect not selected.

N. C., Lexington—Mayor rejected bids received Jan. 20, improving waterworks system, including brick and concrete pumping station, filter house, filter tube, concrete auxiliary station, concrete coagulating basin, 500,000 gal. concrete storage reservoir, 3½ mi. c.i. pipe line, etc. G. C. White, Durham, engr. Noted Dec. 26.

O., Ashland—City having plans prepared by R. W. Pratt, engr., Hippodrome Bldg., Cleveland, for 1 story, 40 x 60 ft., concrete, steel and brick superstructure for filtration plant, involving filter equipment, piping, valves, etc. About $60,000.

O., Grafton—Village receives bids about April 15, building waterworks system, including 18 x 20 ft., concrete block pump house, 4-8 c.i. pipe, etc. About $35,000. R. W. Pratt, Hippodrome Bldg., Cleveland, engr.

O., Lebanon—City plans to build waterworks system. About $125,000. E. M. Chace, Union Central Bldg., Cincinnati, engr.

Ill., Wauconda—City plans to build waterworks system, involving 6-8 in. mains, 26 hydrants, meters, deep well pumping equipment, etc. Cost $33,569. J. L. Pickens, Kankakee, engr.

Wis., Brillion—Village had plans prepared improving waterworks system, to include 320 tons 6-8 and 10 in. and 35 tons 4 in. c.i. pipe, 7 tons specials, 25 hydrants, 26 valves, artesian well about 800 ft. deep, 12 in. hole at top, 80,000 gal. steel and 90 ft. steel tower. About $35,000. J. Donohue, North 8th St., Sheboygan, engr. Noted Jan. 1. W. G. Schlee, clk.

Wis., Sheboygan Falls—Village plans to extend waterworks system, to include 485 ft. 4 in., 3,000 ft. 6 in. and 1,100 ft. 8 in. pipe, hydrants and valves. Bonds for $25,000 voted for project. Owner will do own piping. J. Donohue, North 8th St., Sheboygan, engr.

Utah, Soldier Summit—City having plans prepared for waterworks system. H. C. Means Investment Co., Soldier Summit, engrs.

Ore., Canby—City plans to build pump house and install new pumping machinery. About $7,500. Election April 19, to vote on bonds to cover cost.

Ore., Enterprise—City receives bids in March building and extending waterworks system, including laying c.i. or wood water mains and branches. About $120,000. O. J. Roe, recdr. Noted Jan. 22.

Ore., Lebanon—Lebanon Electric Light & Water Co. plans to double size power plant by building new plant on west side of Main St. and north side of canal, to include 3 mi. flume. 2 water wheels, concrete dam, dredging channel, concrete bridge over canal and new pumping equipment and electric generators.

Cal., Long Beach—City voted $500,000 bonds to improve waterworks system, including reservoir, pumping equipment and mains, also $75,000 bonds to buy sites and build fire stations. A DeRuiz, city engr.

Cal., Los Banos—City having plans and specifications prepared for tank, tower, fire mains, hydrants, etc., also moving present plant. About $103,000. C. E. Sloan, Nevada Bank Bldg., San Francisco, engr.

Cal., Pittsburg—City voted $140,000 bonds for waterworks system.

Ill., Elmhurst—Until Feb. 16, by city, building system of water mains, involving 69,180 lin.ft. 4-12 in. c.i. pipe, 142 fire hydrants, two hundred and twenty 4-12 in. gate valves and 600 lead water connections. E. Hancock, 2047 Ogden Ave., Chicago, engr.; advertised in this issue.

Ia., Quimby—Until Feb. 24, by O. F. Parker, town clk., furnishing labor and material for building waterworks system, to include water tower, distribution system, pumping machinery and pump house. A. J. Clark, mayor; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. C., Forest City—Town let contract installing waterworks system, to W. A. Bennett, Rocky Mountain, about $20,900.

★O., Akron—H. S. Morse, dir. pub. serv., let contract furnishing and laying 4.1 mi. 48 in. lock-bar steel pipe force main, between Cuyahoga River Pumping Station and crossing of Cuyahoga River south of Kent. Contr. 164, to P. F. Connolly Co., 411 Pemberton Sq. Bldg., Boston, $611,660.

★Mich., Detroit—Bd. Water Comrs. will lay 2,780 ft. 6 in. water pipe in Lawton, Pingree and Grove Aves. and 3,385 ft. 8 in. in Fairview, Grinnell, Lenox and Verdun Aves. Work will be done by day labor.

★Mich., Pontiac—City Water Comn. will build extensions to water mains with gate valves, hydrants, etc. Work will be done by day labor under supervision of Water Dept. forces. About $300,000. Cast iron pipe will be purchased by city.

★Cal., Whittier—City let contract furnishing 2 electrically driven centrifugal pumps, for new waterworks system, to Byron Jackson Iron Wks., 336 East 2nd St., Los Angeles, $6,855.

★Ont., Guelph—City let contract building 1,500 ft. 8 in., 1,500 12 in. and 15,000 ft. 24 in. machine banded wood stave pipe, to Pacific Coast Pipe Co., 1551 Granville St., Vancouver, B. C. About $100,000.

Sewers

PROPOSED WORK

Mass., Holyoke—City plans to extend 1000 ft. Northampton St. sewer through Woods tract. About $95,000. T. J. MacCarthy, city engineer.

N. Y., Rochester — Common Council adopted ordinances to build sewers in Thurston Rd., West and Gardner Aves., cost $34,000; grade, build walks and sewers in Schenk Ave., $8,100; curb and build sewer in Maple St., $6,100. C. A. Poole, city engr.

O., Grafton—Village receives bids about Apr. 15, building sewerage system and sewage disposal plant, involving 2 concrete sedimentation tanks, 8-15 in. vitr. pipe, manholes, etc. About $30,000. R. W. Pratt, Hippodrome Bldg., Cleveland engr.

Ill., Wauconda—City plans to build sanitary and storm sewers, involving 10-24 in. pipe. About $34,742. J. L. Pickens, Kankakee, engr.

Wis., Chilton—City having plans prepared excavating and laying vitr. pipe sewers and paving Madison, State, Court and Grand Sts. About $30,000. J. Donohue, North 8th St., Sheboygan, engr.

Wash., Rosalia—Village Council retained D. P. Wood, engr., 429 1st St., Spokane, to prepared plans, specifications and estimates for sewerage system, involving concrete or vtr. pipe. About $20,000.

Ore., Portland—City plans to build sewers in East 71st St. from Hassalo to East Glisan Sts., Pacific St. from East 70th to East 71st St., cost $6,476; Brooklyn St. from 35th to 38th Sts., $3,574; Stockton St. from Oberlin to Lombard Sts., $1,021; Girard St. from Newman to Haven Sts., $2,100; also build sewerage system with catch basins, manholes, lampholes, sewer service and branch pipes, in East 13th St. from Holman St. to sewer in 13th St. near north line of Morse St., Lenore St. from Durham Ave. to sewer in 13th St., Durham Ave. from East 11th to Lenore St., East 11th St. from Ainsworth to Durham Aves., Holman St. from East 12th to 13th Sts., East 13th St. from Killingsworth Ave. to Holman St., Ainsworth Ave. from East 10th to East 13th Sts., East 12th St. from Killingsworth to Ainsworth Aves., East 11th St. from Killingsworth to Ainsworth Aves., Durham Ave., Morton and Vulcan Sts., Killingsworth Ave. and Jarrett St., $47,803, all vitr. or cement pipe. O. Lourgaard, city engr.

Ore., Portland—City Council soon lets contract building sewerage systems, to include catchbasins, lampholes, manholes, sewer service and branch pipes, cement or vitr. pipe, in East 29th St. and Ainsworth Ave.; Wygant and East 29th Sts.; East 72nd and East Taylor St. About $50,000. O Laurgaard, city engr.

Sewers (Continued)

Cal., Blythe—City retained Olmsted & Gillelen, engrs., 1112 Hollingsworth Bldg., Los Angeles, to prepare plans building sewage system in main streets. Cost between $25,000 and $50,000. A. E. Norton, clk.

Cal., Burbank—City retained Koebig & Koebig, engrs., 841 Title Insurance Bldg., Los Angeles, to prepare plans for sewerage system in main streets. Cost between $100,000 and $150,000. Bonds to be voted for project.

Cal., Long Beach—City having plans and estimates prepared for storm sewerage system for entire city. About $500,000. A. DeRuiz, city engr. Bonds will be voted for project.

Cal., Pittsburg—City voted $20,000 bonds for sewerage system, also $20,000 for storm sewers.

Ont., Ottawa—City plans to build 20,000 ft. vitr. tile sewer. About $50,000. A. F. Macallum, City Hall, engr.

BIDS DESIRED

Pa., Phila.—See "Bridges."

Ind., Kendallville—Until March 2, by O. E. Michaelis, city clk., furnishing material and constructing sewers as follows: Resolution 49, storm water sewer in Garden, Diamond, East, Railroad, Rush, Williams, Oak, Richmond and Harris Sts. and Sheridan St. Alley cost $35,425; resolution 50, sanitary sewer in and along Railroad St. and highway; $2,320; Resolution 51, sanitary sewer in Wayne St. thence north in alley to Grove St., west in Grove St. northerly along alley, $1,448; advertised in this issue.

N. D., Minot—Until March 1, by Bd. City Comrs., building sewage disposal plant, involving 15,000 cu.yd. excav. and filling, 3,000 cu.yd. concrete, 221 tons reinforcing and structural steel, 50 tons c.i. pipe, 16 gate valves, 80M ft. b.m. lumber, 15,000 ft. vitr. sewer pipe, etc. A. G. Hagenstein, city aud.; advertised in this issue.

CONTRACTS AND PRICES AWARDED

(★Indicates award of contract)

N. Y., Brooklyn—E. Riegelmann, boro. pres., received lowest 3 bids Feb. 4, building sewers in 76th and 77th Sts. from 20th to 21st Aves., from Ajax Drainage Co., 60 Herkimer St., $7,529; J. Jennings, 15 Van Siclen Ave., $7,943; Murphy Bros., 8856-26th St., $8,247. Noted Jan. 29.

★**O., Hamilton**—City let contract building 24 in. vitr. pipe storm sewer in Lincoln Park Addition, to W. M. Davis, $13,292.

★**Mich., Detroit**—City let contract building 70 ft. rein.-con. sewer outlet in Mt. Elliott Ave., to Lennane & McIlvenna, 1205 Book Bldg., $49,900. Noted Feb. 5.

★**Minn., Duluth**—J. A. Farrell, city comr., let contract building 3,100 ft. sanitary sewer in 4th alley from 44th Ave. to 45th Ave., W., and in 45th Ave.W., to Traverse Alley, thence to 49th Ave., W., to Boise & Hedburg, 313 North 21st Ave., W., $14,041. Noted Jan. 22.

★**Neb., Broken Bow**—City let contract laying storm and sanitary sewers, and building disposal plant, to Smith & Chambers, Scotts Bluff. About $167,000.

Ore., Portland—City received bids building sewers in (a) Jordan St. from Lombard to Butler Sts., (b) Willamette Blvd. from 556 ft. northwest of Reno St. to sewer in Reno St., (c) Nevada St. from 1st to Corbett Sts., (d) Glenn Ave. from North St. to Ainsworth Ave., from E. Sandberg, 74 East 24th St., N., (a) $3,135, (d) $2,628, both vitr. pipe; Azar & Co., (a) cement pipe, $3,348; J. Keating, (a) $3,447, (b) $2,063, both cement pipe; J. Albert, (c) cement pipe $810. Contractors all of Portland.

Ore., Portland—City Council received bids building sewers in (a) Minnesota and Ainsworth Aves., (b) Webster and East 12th Sts. sewerage system, (c) Albina Ave., (d) Mississippi and Ainsworth Aves. sewerage systems, from Azar & Co., (a) $20,475, (b) $23,402, (d) $11,938; Jacobsen-Jensen Co., 407 Stanton St., (a) $22,270, (c) $82,107; J. Keating, (a) $22,228, (b) $26,806; Hopkins & Andrews, (b) $27,037; Elliott & Scoggin, McKay Bldg., (d) $13,159, all cement pipe. Contractors all of Portland.

Bridges

PROPOSED WORK

Pa., Harrisburg—Dauphin Co. having plans prepared by C. M. Hershey, co. engr., building 240 ft. 3 span rein.-con. (earth filled) arch bridge over Swatara Creek, 24 ft. wide, at Union Deposit. About $50,000.

Fla., Miami—City having preliminary plans prepared by Harrington, Howard & Ash., engrs., Orear-Leslie Bldg., Kansas City, Mo., building 250 ft. concrete and steel bridge with bascule span, over Miami River on Ave. G, 30 ft. roadway. About $100,000.

Ill., Danville—City having plans prepared by Harrington, Howard & Ash, engrs., Orear-Leslie Bldg., Kansas City, Mo., for Gilbert St. Memorial Bridge, 1400 ft. long, 30 ft. roadway, rein.-con. with concrete arches. About $250,000.

Wisconsin—State Highway Comn., Madison, prepared plans for bridges in following counties:—

Asbland Co., Ensinger Bridge, White River twp.

W. E. Dillon, Highbridge, Comr.

Bayfield Co., Peterson Bridge, Barksdale Twp., Barksdale.

Bridge and Sioux River Bridge, Bayview Twp. J. Friberg, Washburn, comr.

Clark Co., Owen Bridge, Green Grove and Longwood Twps. W. C. Thoma, Neillsville, comr.

Douglas Co., Carroll Bridge, Superior Twp. C. J. Morrisset, Superior, comr.

Jefferson Co., Allen Bridge, Koshkonong Twp., R. D. Royce, Ft. Atkinson, comr.

Juneau Co., Fowler Bridge, Plymouth Twp., Moulten Bridge, Fountain Twp. A. V. Robison, New Lisbon, comr.

Lafayette Co., Gough Bridge, Seymour Twp, G. H. Priestley, Darlington, comr.

Oconto Co., Johnson, Havilik and Demeny 2 Bridges, Morgan Twp., Bowen and Christy Brook Bridges, Gillette Twp., Blazek Bridge, Spruce Twp., Middle Bridge, Suring Twp., South Branch 2 and Waupee Bridges, Armstrong Twp. P. Peetz, Oconto, comr.

Racine Co., Lewis Bridge, Mt. Pleasant Twp, W. O. Thomas, Court House, Racine, comr.

Rock Co., Brown Bridge, Fulton Twp. and Schumacher Bridge, Janesville Twp. C. E. Moore, Janesville, comr.

Vernon Co., Main St. 1 and 2 bridges, Stark Twp. A. Ristow, Viroqua, comr.

Washington Co., Mayfair Bridge, Jackson and Polk Twps. C. Johnson, Kewaskum, comr. All concrete and rein.-con. spans.

Wis., Milwaukee—City will have new plans prepared building 267 ft. steel bascule bridge, 64 ft. wide, on State St. About $350,000. D. McKeith, supt. Bridges & Bldgs., engr.

Ont., Pefferlaw—Comrs. York Co., York, plan to build bow string arch through bridge over Black River here, 90 ft. long, 20 ft. roadway, involving 250 cu.yd. rein.-con., 400 cu.yd. concrete, 8 tons reinforcing steel and 550 cu.yd. stone. About $20,000. E. A. James, 57 Adelaide St., E., Toronto, engr.

BIDS DESIRED

Mass., Springfield—Until March 10, by Comrs. Hampden Co., building highway bridge between here and West Springfield over Connecticut River and over yard of New York, New Haven and Hartford R.R., here, 80 ft. wide throughout, river bridge 1,200 ft. long, consisting of 7 rein.-con. arch spans, piers and abutments faced with granite; also viaduct over railroad yard, 300 ft. long with 9 rein.-con. spans. Fay, Spofford & Thorndike, 15 Beacon St., Boston, engrs.; advertised in this issue.

Connecticut—Until March 15, by State Highway Dept., Hartford, building double leaf steel bascule span of bridge over Housatonic River between Milford and Stratford Twps., involving 1,440,000 lb. structural steel, 33,000 lb. steel rails, 25,000 lb. reinforcing steel, 700 sq.yd. creosoted block pavement, 2,250 sq.ft. concrete sidewalk slabs, etc. C. J. Bennett, state highway comr. Waddell & Son, 35 Nassau St., New York City, consult. engrs.; advertised in this issue.

Pa., Phila.—Until Feb. 20, by Bureau of Surveys, building Schedule "A," bridge on line of 49th St. over Phila., Baltimore & Washington R.R., with paving, grading and other appurtenant work, cost $120,000; Schedule "B," main sewer in Bigler St. from Delaware River to Severn St., $350,000; Schedule "C," inlets, manholes, wellholes, laterals, branch sewer, etc., $30,000.

O., Dayton—Until Feb. 26, by Comrs. Montgomery Co., building 220 ft. bridge, 20 ft. wide, consisting of 2 steel truss spans, over Stillwater River, Butler Twp. About $18,000. P. S. Bookwalter, co. surv.

Wis., Beloit—Until Feb. 20, by G. E. Heebink, city engr., furnishing all labor and material for building 240 ft. rein.-con. arch bridge, 66 ft. wide, consisting of 4 spans, across Rock River on East Grand Ave., here. About $200,000.

Ia., Muscatine—Until Feb. 17, by Auditor Muscatine Co., building 1 slab bridge, 18 ft. long, 20 ft. wide, also rein.-con. box culverts, varying in size from 2 x 2 ft. to 6 x 12 ft., involving 1,004 cu.yd. rein.-con. About $19,574. County will furnish steel. F. P. G. Halbfass, co. engr.

Nebraska—See "Streets and Roads."

Neb., Omaha—See "Streets and Roads."

Wyoming—Until Feb. 24, by D. S. McCalman, supt. State Highway Dept., Capitol Bldg., Cheyenne, constructing bridges and culverts in various counties.

Wash., O'Brien—Until March 23, by Comrs. King Co. (Seattle), building 122 ft. steel span bridge, 20 ft. wide, concrete piers, here, involving 60 cu.yd. concrete, 35 tons steel, 1,700 lin.ft. wooden piling and 43 M ft. lumber. About $12,000. S. J. Humes, co. engr.

Wash., Seattle—Until Feb. 24, by Comrs. King Co., building 240 ft. steel span bridge, 20 ft. wide, concrete piers, over Snoqualmie River, to be known as Novelty Bridge, involving 540 cu.yd. concrete, 88 tons steel, 11,000 lin.ft. wooden piling and 132M ft. lumber, cost $47,000; also 126 ft. steel span bridge, 20 ft. wide, concrete piers, at Orillia, involving 350 cu.yd. concrete, 54 tons steel, 1,400 lin.ft. wooden piling and 35M ft. lumber, $21,000. S. J. Humes, co. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Tex., Groesbeck—J. E. Bradley, judge Limestone Co., received bids Jan. 29, building rein.-con. bridges and culverts on Highway 7, east and west of Navasota River, to include 1 bridge over 20 ft. span and five 20 ft. span slab bridges, from McCall-Moore Eng. Co., 308-9 Amicable Bldg., Waco., $40,811; Potts & Prentice, Waco, $50,224. Work involves 131 cu.yd. dry and 227 cu.yd. wet structural excav., 29,580 lb. steel, 627 cu.yd. 1 : 2 : 3 rein.-con., 297 cu.yd. 1 : 2½ : 5 and 160 cu.yd. 1 : 2 : 4 concrete. Noted Jan. 22.

Structural Steel

PROPOSED WORK

Mass., Boston—Theatre and Office—See "Buildings."

Pa., Lock Haven — See "Industrial Works."

Pa., Scranton—See "Industrial Works."

O., Cleveland—See "Industrial Works."

O., Cleveland—Theatre—See "Buildings."

O., Middletown — Hotel—See "Buildings."

Wis., Milwaukee—See "Bridges."

Tex., Cooper—See "Streets & Roads."

Tex., Dallas—Office—See "Buildings."

Tex., San Angelo—See "Streets and Roads."

CONTRACTS AND PRICES AWARDED

(★Indicates award of contract)

★**N. Y., Elmira**—See "Industrial Works."

★**N. Y., Long Island City**—Offices and Lofts—See "Buildings."

★**N. Y., Long Island City**—See "Industrial Works."

★**N. Y., New York**—Office—See Buildings."

★**N. Y., New York**—Restaurant and Stores—See "Buildings."

★**N. Y., Jersey City**—Bank and Office—See "Buildings."

★**Mich., Detroit**—Office—See "Buildings."

★**Ill., Chicago**—See "Industrial Works."

Reinforced Concrete

PROPOSED WORK

Mass., Boston—Theatre and Office—See "Buildings."

Pa., Lock Haven—See "Industrial Works."

Pa., Scranton—See "Industrial Works."

O., Cleveland—See "Industrial Works."

O., Cleveland—Theatre—See "Buildings."

O., Middletown—Hotel—See "Industrial Works."

Ill., Chicago—See "Industrial Works."

Tex., Cooper—See "Streets & Roads."

Reinforced Concrete (Continued)

Tex., Tyler—See "Streets and Roads."

Cal., Los Angeles—Church and Community House—See "Buildings."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Elmira**—See "Industrial Works."

★**N. Y., Long Island City**—"Se Industrial Works."

★**N. Y., Long Island City**—Offices and Lofts—See "Buildings."

★**N. Y., New York**—Office—See "Buildings."

★**N. J., Jersey City**—Bank and Office—See "Buildings."

★**O., Marietta**—See "Industrial Works."

★**Ill., Chicago**—See "Industrial Works."

★**Cal., Los Angeles**—Office and Store—See "Buildings."

Streets and Roads

PROPOSED WORK

N. Y., Lyons—City plans to build new road. About $42,000.

N. Y., Rochester—See "Sewers."

Pa., Phila.—City rejected bids received Jan. 30, grading Buist Ave., Felton and Locust Sts., also paving Elmwood Ave. and Sommerville St. Noted Feb. 5.

Pa., Scranton—City plans to pave Wheeler Ave., from Ridge Row to Pine St., 40 ft. wide, asphalt on concrete base. About $50,000. W. Schunk, city engr.

Del., Georgetown—Sussex Co. rejected only bid received Feb. 3, building 3.40 mi. road from Coverdale Cross Rds. to Jacob's School, Contr. C. S. 6, 14 ft. wide, involving 28,800 cu.yd. earth excav. and 24,500 sq.yd. concrete. C. M. Upham, c/o State Highway Dept., Dover, engr. Noted Jan. 22.

W. Va., Elkins—City plans to improve High St. and other main streets, 30 ft. wide. About $109,000.

S. C., Columbia—City Council having plans prepared widening 9 blocks from Scoot St. to City limits, 6 ft. wider.

S. C., Columbia—Richland Co. plans to issue $2,000,000 bonds to build roads.

Ga., Albany—City soon lets contract paving 16 blocks involving about 50,000 yd. About $162,000. R. J. Edgerly, Albany, engr.

Fla., Daytona—City Council and J. B. McCrary Eng. Corp., engrs., Third Natl. Bank Bldg., Atlanta, Ga., receive bids about April 1, for improving 10 mi. various streets, vitr. brick, asphalt, concrete or bituminous concrete, 15 ft. wide. About $450,000. Noted Sept. 18.

Ohio—State Highway Comn., Columbus, received no bids Jan. 23, building roads in following counties:

Cuyahoga Co., Sect. "Bedford" Akron-Cleveland Rd., .61 mi., grading and paving with brick, $50,988.

Erie Co., Sect. "A" Lima-Sandusky Rd., 3.051 mi., grading, constructing bridges and culverts and paving with concrete, $108,070

Hardin Co., Sect. "E" Findlay-Kenton Rd., 2.08 mi., grading, constructing bridges and culverts and paving with asphaltic concrete, $70,437.

Henry Co., Sect. "D-1" Bryan-Napoleon Rd., .903 mi. grading, constructing bridges and culverts and paving with rein.-con. and waterbound macadam, $29,486.

Sect. "C" Bryan-Napoleon Rd., 2.396 mi. grading, constructing bridges and culverts and paving with rein.-con. and waterbound macadam, $62,117.

Huron Co., Sect. "L" Norwalk-Plymouth Rd., 2.58 mi, grading, constructing bridges and culverts and paving with concrete. $52.136.

Portage Co., Sects. "T. U. V. and W" Ravenna-Warren Rd,, 8.483 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $217,814

Trumbull Co., Sect. "H" Niles-Ashtabula Rd., 5.14 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $150,957.

Sect. "K" Niles-Ashtabula Rd., 5.69 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $92,679. Noted Jan. 8.

O., Dayton—City plans to pave 600 ft. Mt. Vernon Ave. from Fountain to Niagara Aves., 30 ft. wide, involving 2000 sq.yd. concrete and 1200 lin.ft. cement curbing. About $11 800. F. O Eichelberger, city engr.

O., Delphos—City plans to pave 3 streets, involving 30,268 sq.yd. sheet asphalt, brick wood block or concrete. About $100,000. C. J. Semon, city engr.

O., Steubenville—City plans to pavo 2 mi. Oakmont, Maple Pl. and Claire Sts., vitr. brick or concrete. About $43,111. G. McConnell, Steubenville, engr.

O., Washington Court House—City soon receives bids grading and paving Water St., involving 12,000 sq.yd. brick, sheet asphalt or bituminous macadam. About $65,000. B. R. Jacobs, city engr.

Mich., Detroit—Dept. Pub. Wks. had plans prepared and soon receives bids grading and paving with 1 course concrete, "T" alley between Vinewood, West Grand Blvd., Dix and Toledo Aves., 20 ft. wide;

Alley between Ironwood, Beechwood, Spokane and Maplewood Aves., 17 ft. wide;

Alley between 4th, 3rd, Stimson and Brainard Sts., 16.9 ft. wide;

"T" alley between Van Dyke, Palmer, Gratiot and Parker Aves., 20 ft. wide;

"L" alley between Woodward Ave., John R St., Westminster Ave. and Arden Park, 20 ft. wide;

Alley between Riopelle, Orleans, Macomb and Clinton Sts., 20 ft. wide;

Alloy between Northfield, Ironwood, Oregon and Vancouver Aves., 18 ft. wide;

"H" alley between National, Trumbull, Butternut and Elm Aves., 18 and 20 ft. wide;

Alley south of and parallel to Grand River Ave. from Elm St. N., 18 ft. wide;

Alley between 10th St., Trumbull Ave., Fort St. and Lafayette Ave., 20 ft. wide;

Alley between 14th, 15th, Magnolia and Linden Sts., 20 ft. wide;

Alley between Alexanderine and Leland, parallel to Brush St., 18 ft. wide;

Alley between Maxwell, Seminole, Mack and Sylvester Aves., 20 ft. wide;

Alley between 14th, Wabash, Grand River and Forest Aves., 20 ft. wide;

Alley between Stanton, 16th, Stanley and Antoinette Sts., 20 ft. wide;

Alley between Parker, Maxwell, Kercheval and Durrand Sts., 18 ft. wide;

Alley between John R., Brush, Melbourne and Euclid Aves., 19 ft. wide;

Alley between Cameron, Richmond, Custer and Clay Aves., 20 ft. wide;

Alley between Bryan St., Glynn Court, Hamilton and Boston Blvds., 18 ft. wide;

Alley between Merril Ave., Hamilton Blvd., Delaware and Seward Aves., 16 ft. wide;

Alley between Radford, Holmur, Montgomery and Vicksburg Aves., 18 ft. wide;

Alley between Ellery, Mt. Elliott, Benson and Heidelberg Aves., 20 ft. wide;

Alley between McKinley, Roosevelt, Buchanan and Hancock Aves., 20 ft. wide;

Alley between Grandy, Jos. Campau, Forest and Hancock Aves., 20 ft. wide;

Alley between Grandy, Jos. Campau, Harper and Piquette Aves., 20 ft. wide.

C. W. Hubbell, city engineer.

Wisconsin—State Highway Comn., Stephenson Bldg., Milwaukee, soon lets contract paving 3.59 mi. Fond du Lac-Milwaukee Rd., Fond du Lac Co., 18 ft. wide, 1 course concrete.

Wis., Juneau—Dodge Co. plans to surface road beginning at point 300 ft. east of Chicago & North Western Ry. tracks on Beaver Dam-Horicon Rd. and extending westerly, concrete cost $78,000; grading, able will construct, $60,000. Grading, drain-Highways commencing at old macadam in Oak Grove Twp. and extending southeasterly toward Hustisford, $225,000, beginning north of Beaver Dam and extending northeasterly toward Waupun, $110,000; beginning at Dodge and Washington Co. line and extending north-westerly toward Theresa, $150,000, beginning at south county line west of Hubbleton and extending westerly toward Portland, $140,000. Road 6, north and south through Randolph, beginning at Northwestern R.R. track south of Randolph and extending as far as money available will construct, $60,000 Grading, draining and gravel surfacing Portland-Danville Rd., $24,000; Ashipun-Hartford Rd. beginning at end of old macadam and extending northeasterly, $16,100; Richwood Rd. Richwood Twp., State Trunk Highway 29, $25,000. E. T. Klug, comr.

Wis., Manitowoc—Comrs. Manitowoc Co. will receive bids about Feb. 15, paving 4 mi. Manitowoc-Sheboygan Rd., 18 ft. wide, concrete. About $130,000. W. Conway, Green Bay, div. engr.

Wis., West Bend—C. Heipp, city clk., soon lets contract paving various streets, involving 18,000 sq.yd. rein.-con., integral 2,500 ft. type "A" and 754 ft. type "B" curbing, 3,800 lin.ft. combined concrete curb and gutter and 4,300 cu.yd earth excav.

Neb., Alliance—City having plans prepared by Grant, Fulton & Letton, engrs., 505 Bankers Life Bldg., Lincoln, for paving Dist. 3, Box Butte St., from 5th to 10th Sts., also side streets, 30 and 68 ft. wide, involving 11,000 lin.ft. curbing and guttering and 17,000 sq.yd. vertical fibre brick. About $90,000.

Mont., Deer Lodge—City plans to pave Missouri Ave. from 4th to Claggett Sts., Dist. 47, cost $33,105; Milwaukee Ave. from 4th to Claggett Sts., Dist. 48, $33,105; Main St. south of St. Mary's Ave., Dist. 44, $71,852; Missouri Ave. from 1st to Main Sts., Dist. 45, $16,529; Milwaukee Ave. from 1st to Main St., Dist. 46, $18,806; all concrete. G. Kearney, Deer Lodge, engr.

Mo., Albany—Gentry Co. having plans prepared paving 33 mi. Federal Aid Project 32, through Athens, Jackson and Huggins Twps., 18 ft. wide, concrete. Leslie-Barnes Eng. Co., Amer. Natl. Bank Bldg., St. Joseph, engineers

Mo., Jefferson City—City plans to pave 1 block Carter Ave. from McCarty to Miller Sts., involving 1,600 sq.yd. asphaltic macadam, Main St. from Brooks St. to city limits, 20,000 sq.yd. asphaltic macadam; 1 block Havana St. from Main to McCarty Sts., 1,900 cu.yd. excav., 1,550 sq.yd. asphaltic macadam, curbing and paving; 1 block High St. from Bway to Mulberry St., 40 ft. wide, 3,000 sq.yd. vitr. brick; 1 block Harrison St. from Main to Water Sts.., 3,000 sq.yd. vitr. brick; 1 block Bolivar St. from Main to Water Sts., 54 ft. wide, 2,985 sq.yd. vitr. brick; 1 block Main St. from Harrison to Bolivar St., 56 ft. wide, 3,095 sq.yd. vitr. brick; 1 block Bway. from High to Main Sts., 3,317 sq.yd. vitr. brick, 3 blocks Madison St. from High to Dunklin Sts., 11,198 sq.yd. vitr. brick. L. F. Brown, city engr.

Mo., Maryville—Nodoway Co. having plans prepared paving 38 mi. Jefferson Highway, 18 ft. wide, concrete. Leslie-Barnes Eng. Co., Amer. Natl. Bank Bldg., St. Joseph, engineers.

Mo., Platte City—Platte Co. having preliminary plans prepared paving 26 mi. Jefferson Highway, 18 ft. wide, probably concrete. Leslie-Barnes Eng. Co., Amer. Natl. Bank Bldg., St. Joseph, engineers.

Mo., Rockport—Atchison Co. having plans prepared grading 50 mi. state road, north and south, 18 ft. wide. About 100,000. Leslie-Barnes Eng. Co., Amer. Natl. Bank Bldg., St. Joseph, engineers.

Mo., Savannah—Andrews Co. having plans prepared grading and building bridges on 26 mi. Jefferson Highway, 18 ft. wide. About $75,000. Leslie-Barnes Eng. Co., Amer. Natl. Bank Bldg., St. Joseph, engineers

Tex., Cooper—Delta Co. having plans prepared grading, surfacing and draining 11.3 mi. Highway 19, from here to Lamar Co., 16 ft. wide, involving 20 acres clearing and grubbing, 6,673 cu.yd. crushed rock and gravel, 61,350 cu.yd. earth excav., 1,534 cu.yd. concrete paving, 77,548 lb. reinforcing and 196,604 lb. structural steel, 588 cu.yd. 1:2:4 and 608 cu.yd. 1:2½:5 cu.yd. concrete. About $306,500. Cock & Nagle, Cooper, engrs.

Tex., San Angelo—Tom Green Co. having plans prepared grading, draining and surfacing with waterbound macadam, 41 mi. Highway 9, known as Sterling City-Merita Rd., 16 ft. wide, involving 50 acres clearing and grubbing, 57,143 cu.yd. unclassified earth, 2,000 cu.yd. rock and 500 cu.yd. structural excav., 80,000 lb. reinforcing steel, 500 cu.yd. 1: 2: 3, 900 cu.yd. 1: 2: 4 and 500 cu.yd. 1: 2½: 5 concrete, etc. About $315,206. J. E. Beavers, San Angelo, engr.

Tex., Tyler—Smith Co. having plans prepared grading, surfacing and draining 24.6 mi. Highway 15, from here to Gregg Co., 16 ft. wide, involving 45 acres clearing and grubbing, 4,500 cu.yd. gravel, 125,000 cu.yd. earth excav and 2,300 cu.yd. concrete in culverts. About $245,000. D. K. Caldwell, Tyler, engr.

Tex., Wichita Falls—M. M. Murphy, aud. Wichita Co., rejected only bid received Jan. 22, grading, surfacing and draining 10 mi. Highway 5, Electra Rd., toward Iowa Park, 16 and 18 ft. wide, involving 17 acres clearing and grubbing, 11,938 cu.yd. unclassified earth excav., 286 cu.yd. Class "A" and 579 cu.yd. Class "B" concrete, 68,186 sq.yd. 1 course pavement, 31,741 lb. reinforcing steel, etc. About $483,212. Work will be readvertised. J. M. Isbell, Wichita Falls, engr. Noted Jan. 15.

Idaho, Montpelier — City voted $18,000 bonds to grade, drain and pave various streets with concrete. B. L. Cruisshank, clk.

Streets and Roads (Continued).

Ore., Enterprise—City receives bids in March paving 35 blocks of side streets and alleys, concrete, asphaltic concrete or bitulithic. About $50,000. L. C. Kelsey, 410 Selling Bldg., Portland, engr. Noted Jan. 22.

Ore., Portland—City soon lets contract improving East 7th St. from Sherrett to Leo Aves.; Emerson St. from Denver to Interstate Aves.; Calhoun St. from Central Ave. to Hudson St.; Hudson St. from Buchanan to Barr Sts.; Central Ave. to Buchanan to Burr Sts.; Gay St. from Killingsworth Ave. to Jessup St.; Woolsey St. from Lombard St. to Willis Blvd.; asphaltic concrete pavement on crushed rock base or concrete 3; East 29th St. from Ainsworth Ave. to Holman St., crushed rock macadam, gravel macadam, asphaltic concrete 1 on crushed rock base or concrete 3. Cost to exceed $50,000. O. Laurgaard, city engr.

Ore., Portland—City Council plans to grade, drain, pave and build concrete curbs on Woodward Ave. from East 21st to East 26th Sts., 25th St. from Tibbetts to Taggart Sts. Cost $16,526. O. Lauregaard, city engr.

Cal., Hanford—City Clerk soon receives bids paving various streets, 1½ in. bitulithic surface on asphaltic concrete base, cement curbs, gutters, etc. E. M. Lynch, Central Bldg., Los Angeles, engr. Work will be done under supervision of B. Duffield, Hanford.

Cal., Pittsburg—City voted $125,000 bonds for street improvements.

Ont., Galt—City plans to lay macadam pavement on Beverly and Wellington Sts. and Gladstone Ave., cement sidewalks on 1st Ave. and Middleton St. Total length 2½ mi., 24 to 38 ft. wide. Citizens will vote on by-law for $60,000 for work. W. H. Fairchild, City Hall, engr.

Ont., Stratford—City having plans prepared for paving with granolithic concrete, sidewalks of Front, Romeo, Dover, Mowat, Albert, Louise, Hamilton, Douro, Church, Whitlock, Douglas, Elm, Chestnut, King, Frederick, Nelson, Home and McNab Sts. and Avondale Ave., total length 5-7 mi. 4-6 ft. wide. Cost between $30,000 and $50,000. A. B. Manson, City Hall, engr.

Ont., Strathroy—City plans to pave 1 mi. on Carrie and Caradoc Sts., 28-34 ft. wide, bitulithic on concrete base, integral concrete curb and gutter. Work involves 10,000 lin.ft. concrete for curb and gutter, and 10.000 sq yd. bitulithic concrete. About $40,000. E. A. James Co., 36 Toronto St., Toronto, engrs.

BIDS DESIRED

N. Y., Brooklyn—Until Feb. 19, by E. Riegelmann, boro. pres., regulating and grading Liberty Ave. from Forbell Ave. to Brooklyn and Queens Boro. lines, regulating and paving with permanent asphalt on 6 in. concrete foundation, roadway of Linden Ave. from East 34th St. to Brooklyn Ave., 63rd St. from 5th to 6th Aves., 12th Ave. from 49th St. to New Utrecht Ave., regulating, grading, curbing and laying sidewalks, on 12th Ave. from 49th St. to New Utrecht Ave., fencing lots on north side of 75th St. and on south side of 74th St. between 17th and 18th Aves. and at 4 other locations; also furnishing and delivering 450,000 gal. refined asphalt in liquid form, 50 tons of 2,000 lb. each, refined asphalt in containing packages.

N. Y., Cortland—Until March 1, by Bd. Pub. Wks., repaving section of North Main St., involving 4.400 sq.yd. vitr. brick or block, 800 lin.ft. cement curb and gutter, 225 lin.ft. resetting sandstone headers, 20 cu.yd. portland cement concrete; Main St., involving 6,600 sq.yd. vitr. brick or block, 800 lin.ft. cement curb and gutter, 300 lin. ft. resetting sandstone headers, 400 lin.ft. 15-18 in. vitr. pipe, 30 cu.yd. portland cement concrete, etc. D. B. Coleman, city engr.; advertised in this issue.

N. J., Clinton—Until March 12, by C. B. Merritt, pres. Bd. Mgrs. New Jersey Reformatory for Women, building 2,209 sq.yd. macadam road, 20 ft., in Hunterdon Co., here. About $10,000. W. G. Thompson, Trenton, engr.

N. J., Ft. Lee—Until Feb. 18, by Mayor, for extraordinary repairs and rebuilding of 6,600 ft. Palisade Ave., 20 ft. wide ,with 2 shoulders, 8 ft. wide each side, bituminous surface on macadam foundation, advertised in this issue.

W. Va., Buckannon—Until March 1, by Comrs. Upshur Co., building 9.36 mi. road, 16 ft. cement concrete pavement, on certain streets in city and on 2 roads leading out from here, involving 74,000 sq.yd. 6-8 in. pavement, 47,000 cu.yd. grading, etc. C. Bisu, co. engr.; advertised in this issue.

W. Va., Fairmont—Until March 4, by Comrs. Marion Co, building 20.5 mi. brick, concrete and bituminous macadam roads, Paw Paw, Lincoln and Grant Dists. A. G. Martin, Fairmont, clk; advertised in this issue.

W. Va., Fayetteville—Until March 8, by C. E. Mahan, clk., Fayette Co., grading and draining 7 mi. road from Hico to Ansted, Mt. Cove Dist. and 6 mi. road from Prince to Hemlock, Quinnimont Dist. J. K. McGratt, Fayetteville, engr.; advertised in this issue.

W. Va., Fayetteville—Until March 8, by C. E. Mahan, clk., Fayette Co., grading and draining (Sect. 1) 3.1 mi. road from Deepwater to concrete bridge near Robson; (Sect. 2) 2.5 mi. from Kingston to Lykens Branch; (Sect. 3) 2.5 mi. from Lykens Branch to Paint Creek Mt.; (Sect. 4) 3.1 mi. from Paint Creek Mt. to Johnson's Fork of Loup Creek. P. Konrad, Fayetteville, engr.; advertised in this issue.

Ala., Anniston—Until Feb. 24, by State Highway Dept., Montgomery, improving 4 mi. State Trunk Rd. 29, between Camp McClellan and Jacksonville, 18 ft. wide, involving 8,417 cu.yd. water bound macadam, 37,688 sq.yd. bituminous surface and 16,723 lb. reinforcing steel. About $100,000. W. S. Kelly, state highway engineer.

Louisiana—Until March 1, by Highway Dept. of Bd. State Engrs., 736 Maison Blanche Annex, New Orleans, building De Ridder-Lake Charles Highway, Beauregard Parish, Sect. A, 12.04 mi.; Sect. B, 12.35 mi.; Sect. C, 10.36 mi. D. Buie, state highway engr.; advertised in this issue.

La., Marksville—Until Feb. 16, by Highway Comn. Avoyelles Co., grading, draining, bridging and gravel surfacing Cottonport - Plaucheville, Plaucheville - Dupont, Plaucheville-Choupique and Hickory-Bodoc Highways, total length about 15 mi. J. W. Joffron, chn. W. E. Atkinson, consult. engr.

Ohio—Until Feb. 27, by State Highway Comn., Columbus, building roads in following counties:

Cuyahoga Co., Sect. "Bedford" Akron-Cleveland Rd., .61 mi. grading, constructing bridges and culverts and paving with brick, cost $50,938.

Belmont Co., Sect. "E" Athens-Morristown Rd., 4 454 mi. grading, constructing bridges and culverts and paving with waterbound macadam, $102,591.

Fulton Co., Sect. "P & Q-1" Bryan-Wauseon Rd., 6.191 mi., grading, constructing bridges and culverts and paving with concrete, $179,840.

Sect. "K-2" Archbold-Fayette Rd., .999 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $15,563.

Guernsey Co., Sect. "K" Cambridge-Coshocton Rd., .2 mi., grading and paving with hillside brick, $10,354.

Hamilton Co., Sect. "B" Cincinnati-Louisville Rd., 2.723 mi., grading, constructing bridges and culverts and paving with semi-monolithic brick, concrete, warrenite or bitoslag, $156,700.

Sect. "A" Glendale-Milford Rd., 2.59 mi., grading, constructing bridges and culverts and paving with concrete, semi-monolithic brick, warrenite or bitoslag, $129 898.

Hancock Co., Sect. "D" Findlay-Ottawa Rd., building bridge, $2,690.

Huron Co., Sect. "L" Norwalk-Plymouth Rd., 2.58 mi., grading, constructing bridges and culverts and paving with concrete, $52,136.

Holmes Co., Sect. "J-2" Columbus-Millersburg Rd., .75 mi., grading, $5,808.

Sect "I" Mansfield-Millersburg Rd., 2.49 mi., grading, constructing bridges and culverts, $24,555.

Medina Co., Sect. "H-1" Cleveland-Hinckley-Medina Rd., 1.49 mi., grading, constructing bridges and culverts and paving with rein.-con., $63,989.

Trumbull Co., Sect. "H" Niles-Ashtabula Rd., 5.14 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $115,039.

Sect. "K" Niles-Ashtabula Rd., 5.69 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $98,048.

Washington Co., Sect. "J-2" Marietta-Caldwell Rd., 3.97 mi., grading, constructing bridges and culverts and paving with plain concrete, $165,166.

Michigan—Until Feb. 26, by F. F. Rogers, state highway comr., at office of Rd. Comrs. Jackson Co., 132 West Ganson St., Jackson, building 9.546 mi. Federal Aid Rd. 35, Ann Arbor-Jackson Rd., Sects. C, D, E and G, 18 and 20 ft. wide, bituminous concrete; also 4.538 mi. State Trunk Line Rd. 14-2, Sect. A, 18 ft. wide, Blackman Twp., to include shaping, draining and surfacing, etc.; advertised in this issue.

Mich., Detroit—Until Feb. 18, by C. W. Hubbell, engr., 2348 Penobscot Bldg., grading and paving 1 mi. Craigmoor and Fairfield Aves., 26 ft. wide, involving 11,150 sq.yd. 2 in. asphaltic concrete on 6 in. concrete base, and 10,000 lin.ft. stone or concrete curbing, for Lincolnshire Land Co.

Illinois—Until Feb. 18, by State Highway Comn., Springfield, building 24,031 ft. Sect. 24, State Bond Issue Route 2, Fayette Co., 25,454 ft. Sect. 25; Fayette and Marion Counties, 23,212 ft. Sect. 26; 23,827 ft. Sect. 27, 22,923 ft. Sect. 28, 18,311 ft. Sect. 29, Marion Co., 21,040 ft. Sect. 30; Marion and Washington Counties, 23,938 ft. Sect. 31; 17,369 ft. Sect. 32; 14,137 ft. Sect. 33; Washington Co., 37,556 ft. Sect. 1; State Bond Issue Route 8, Knox and Warren Counties, all 18 ft. wide, 20,505 ft. Sect. El; Peoria-Henry Federal Aid Highway, 5,250 ft. Sect. Gl-15d; 16 and 18 ft. wide, Marshall Co., 24,300 ft. Sect. Dl; 16 ft. wide, Peoria and Marshall Counties. Alternate bids will be received on portland cement concrete, 4 in. monolithic brick, 3 in. monolithic brick, bituminous concrete with or without binder course. C. Older, ch. highway engr.; advertised in this issue.

Ia., Des Moines—Until Feb. 16, by Aud. Polk Co., paving 9.32 mi. Jefferson Highway, north and south from here, 18 and 20 ft. wide, involving 27,800 sq.yd. excav., 108,715 sq.yd. pavement, 6,490 lin.ft. tiling and 6 tile intakes. F. O. Laing, Des Moines, engr.

Minn., Madison—Until Feb. 25, by city, for 40,000 sq.yd. paving. About $200,000. Bids will be received on all types of pavement. J. W. Schaffer & Co., New York Life Bldg., Minneapolis, engrs.

Minn., Marshall—Until Feb. 17, by A. G. Bumford, city recdr., paving various streets, Sect. 1, involving 38,733 sq yd. paving, 17,858 lin.ft. curbing, grading, etc., Sect. 2, 9,203 sq.yd. paving, 3,621 lin.ft. curbing, grading, etc. Bids will be received on all types of pavement. L. P. Wolff, 1000 Guardian Bldg., St. Paul, engr.

Minn., Minneapolis—Until Feb. 16, by Comrs. Hennepin Co., grading and graveling highway approaches to Lyndale Ave. Bridge over Minnesota River, Contract 2, involving 60,000 cu.yd. earth work and possibility of 200,000 cu.yd. sluicing and pumping. A. P. Erickson, co. aud.

Minn., Slayton—Until Feb. 26, by Murray Co., building State Rds. 5 and 6, Federal Aid Project 75, 24 ft. wide, involving 90,906 cu.yd. grading, 2,350 ft. guard rail, 165,128 ft. 6 and 8 in. tile, 747 ft. 12 and 18 in. concrete culvert pipe, 89,462 cu.yd. graveling and 93.482 lin.ft. reshaping. About $80,000. P. L. Minder, Slayton, engr.

Nebraska—Until Feb. 17, by State Dept. Pub. Wks., Lincoln, grading and constructing culverts on 1.4166 mi. road from Schuyler S., Colfax Co., Federal Aid Project 58, involving 8,870 cu.yd. earth excav., 14 960 sq.yd. concrete pavement 7 in. thick, 416.87 cu.yd. plain concrete in cut off walls, 128 lin.ft. 18 in., 24 lin.ft. 24 in. and 24 lin.ft. 48 in. pipe, 14.42 cu.yd. 1:2:4 concrete in culvert headwalls; 12.83 mi. center street road, Douglas Co. Federal Aid Project 78, involving 128,524 cu.yd. earth excav., 80 lin.ft. 24 in. sewer pipe, 464 lin.ft. 18 in., 624 lin.ft. 24 in., 60 lin.ft. 30 in., 216 lin.ft. 38 in. and 24 lin.ft. 48 in. pipe, 78.54 cu.yd. 1:2:4 concrete in culverts, 102.25 cu.yd. 1:2:4 concrete in culvert headwalls and 7,620.4 lin.ft. wooden guard rails; 10.29 mi on "Q" St. road, Douglas Co., Federal Aid Project 100, involving 77,133 cu.yd. earth excav., 572 lin.ft. 24 in., 144 lin.ft. 30 in., 36 lin.ft. 36 in. and 120 lin.ft. 48 in. pipe, 155.94 cu.yd. 1:2:4 concrete in culverts, 70.55 cu.yd. 1:2:4 concrete in culvert headwalls and 4,648 lin ft. wooden guard rails. G. E. Johnson, state engr.

Nebraska—Until Feb. 18, by State Dept. Pub. Wks., Lincoln, grading and constructing culverts, on 19.7 mi. of Central City Rd., Belgrade, Project 50 A and B Federal Aid road, involving 5,017.5 cu.yd. miles hauling earth or clay, 139,841 cu.yd. earth excav., 19,135 sq.yd. manipulation surfacing, 7.52 lin.ft. 18 in., 48 lin.ft. 24 in., 120 lin.ft. 30 in. and 36 lin.ft. 36 in. pipe, 169 cu.yd. 1:2:4 concrete in box culvert, 50.92 cu. yd. 1:2:4 concrete in culvert headwall and 1,455 lin.ft. wooden guard rails; on 17.87 mi. Geneva and Belvidere Rd., Federal Aid Project 75, 112,669 cu yd. earth excav., 1,014 lin.ft. 18 in., 192 lin.ft. 24 in. and 16 lin.ft. 30 in. pipe, 112.34 cu.yd. 1:2:4 concrete in culverts, 68.67 cu.yd. 1:2:4 concrete in culvert headwalls and 1,096 lin.ft. wooden guard rails; on 7.27 mi. of Belvidere and Hebron Rd., Federal Aid Project 40, 150 lin.ft. 24 in., 716 lin.ft. 12 in. and 128 lin. ft. 18 in. pipe, 55.86 cu.yd. 1:2:4 concrete in culvert, 50.05 cu.yd. 1:2:4 concrete in

Streets and Roads (Continued)

culvert headwalls and 150 lin.ft. wooden guard rails; on 3.01 mi. of Hall Co., Federal Aid Project 104, involving 20,980 cu. yd. earth excav., 64 lin.ft. 18 in. and 128 lin.ft. 24 in. pipe, 10.91 cu.yd. 1:2:4 concrete in culvert headwalls. G. E. Johnson, state engr.

Nebraska—Until Feb. 20, by State Dept. Pub. Wks., Lincoln, grading and constructing culverts on 9.98 mi. Holdrege Platte River Rd., Federal Aid Project 52, involving 41,947 cu.yd. maipulating surfacing, 680 lin.ft. 18 in., 24 lin.ft. 24 in., 24 lin.ft. 30 in. and 8 lin.ft. 48 in. pipe, 45.67 cu.yd. concrete 1:2:4 in. culvert headwalls; grading, constructing culverts and bridges on 1.477 mi. road from Falls City, S., Federal Aid Project 123, 51,526 cu.yd. earth excav., 44 lin.ft. 24 in., 68 lin.ft. 36 in. and 88 lin. ft. 48 in. pipe, 11.42 cu.yd. 1:2:4 concrete in culvert headwalls, 1,380 lin.ft. wooden guard rail, one 100 ft. steel span bridge, 3.22 ft. span approaches and one 6 0ft. steel span on concrete abutments. G. E. Johnson, state engr.

Neb., Albion—Until Feb. 16, by F. M. Sillik, city clk., improving streets in Dist. 4, involving 37,900 sq.yd. paving, 19,020 lin.ft. curbing and guttering, 4,250 lin.ft. class "B" and 250 lin.ft. class "C" curbing, 70 lin.ft. class "D" gutter section, etc., cost between $155,000 and $195,000; Dist. 5, 15,730 sq.yd. paving, 6,170 lin.ft. curbing and guttering, 2,399 lin.ft. class "B" and 120 lin.ft. class "C" curbing, 30 lin.ft. class "D" gutter section, etc., cost between $64,000 and $78,000. Bids will be received on rein. monolithic concrete, asphaltic concrete on concrete base, sheet asphalt pavement on cement concrete base and brick on cement concrete base. W. E. Standeven, 619 Peters Trust Bldg., Omaha, engineer.

Neb., Humphrey—Until Feb. 17, by J. A. Zavadil, village clk., improving Dist. 2, involving 11,045 sq.yd. paving, 4,432 lin.ft. curbing and guttering, 971 lin.ft. class "C" curbing, 232 lin.ft. class "E" guttering, etc.; Dist. 3, 14,286 sq.yd. paving, 8,977 lin.ft. curbing and guttering, 1,534 lin.ft. class "C" curbing, 220 lin.ft. class "E" guttering, etc. Bids will be received on monolithic rein.-con., asphaltic concrete on concrete base, sheet asphalt on concrete base and brick pavement on concrete base. Cost between $50,000 and $60,000.

Neb., Omaha—Until Feb. 24, by F. Dewey, co. clk., grading and constructing culverts on 1.93 mi. road, Federal Aid Project 35, involving 13,886 cu.yd. earth excav., 288 lin.ft. 18 in., 315 lin.ft. 24 in. and 40 lin.ft. 30 in. pipe culverts, 19.73 cu.yd. concrete in culverts, 35.38 cu.yd. concrete in headwalls and 1,310 lin.ft. wooden guard rails. G. E. Johnson, Lincoln, state engr.

S. Dak., Mitchell — Until March 1, by T. Eastcott, city aud., for 65,778 lin.ft. curb or curb and gutter and 153,596 sq.yd. concrete, asphaltic concrete, wood block, sheet asphalt, bitulithic or tarvia pavement; advertised in this issue.

Mo., Mound City—City receiving bids paving 6400 ft. main streets, 24 ft. wide, involving 17,000 sq.yd. concrete. About $60,000. Leslie-Barnes Eng. Co., Amer. Natl. Bank Bldg., St. Joseph, engineers.

Arizona—Until Feb. 26, by T. Maddock, engr., State Highway Dept., Phoenix, building 6 mi. Holbrook-St. John's Highway, in Petrified Forest, Federal Aid Project 3, 20 ft. wide, involving 400 cu.yd. concrete and 16,180 cu.yd. unclassified earth excav. About $35,000.

Ariz., Tucson—Until Feb. 23, E. G. Bush, secy. Highway Comn. Pima Co., grading and gravel surfacing 14.5 mi. road from Popago Indian Reservation to Tucson-Nogales Highway. L. E. Barkr, New City Hall, engr.

Washington—Until Feb. 21, by State Highway Comn., Olympia, grading, draining and paving with concrete, 4.5 mi. Post Rd., Project 19, from Renton to Kent, 20 ft. wide, King Co., also 4.1 mi. Sunset Highway, Post Rd., Project 50, from Greenacres to Idaho State line, Spokane Co. J. Allen, state highway engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., received bids Feb. 4, paving with asphalt, Epsilon Pl., from Sicilian Asphalt Paving Co., 41 Park Row, New York City, $14,964, Uvalde Asphalt Paving Co., 1 Bway., New York City, $15,566, Consolidated Asphalt Paving Co., 52 9th St., Brooklyn, $15,615; regulating and grading Kingland Ave., from Peace Bros., Flushing, $11,156, R. A. Hess, Corona, $15,083, J. Marcio, 2978 Atlantic Ave., Brooklyn, $15,820; 93rd St., from C. Kurth, 812 Forest Ave., Brooklyn, $440, H. J. Mullen, Jamaica, $484. Noted Jan. 29.

N. Y., New York—H. H. Curran, pres. Manhattan Boro., received bids Feb. 4, repairing asphalt pavement in railroad area when and where directed, from J. L. Brustar, Harlem River and 150th St., $154,600; Sicilian Asphalt Paving Co., 41 Park Row, $165,500; Uvalde Asphalt Paving Co., 1 Bway., $163,000. Noted Jan. 29.

★New Jersey—State Highway Comn., Trenton, let contract building Route 13, Sect. 4, from Kingston to Princeton, Mercer Co., 18 ft. wide, involving 18,627 sq.yd. concrete, to Utility Constr. Co., 5 Spring St., New Brunswick, $104,234. Noted Jan. 15.

★Pa., Philadelphia—City let contracts grading 17th St., to Estate D. McMahon, Germantown and Chelton Sts., $704; 50th St. and Lancaster Ave., to T. F. Reilley, 50th St. and City Ave., $5,768 and $21,779, respectively; A St., to F. Mark Constr. Co., 2820 North 21st St., $703; Cedar and Columbia Aves., to T. P. Lee, 5629 Cherry St., $2,453 and $1,209, respectively; Beaumont St., to J. J. McHugh, Lehigh and Emerald Sts., $421; St. Vincent, Fairhill and Montague Sts., also Large, Allengrove, Wakeling, Rutland and Bridge Sts., to I. K. Davis, 6100 North 20th St., $2,379, $7,321, $6,280 and $11,369, respectively; paving Fairhill, 61st, Broad, Oregon, Passyunk and Willard Sts., to Barber Asphalt Paving Co., 230 North 30th St., $3,501, $6,859, $201,043, $16,450, $96,354 (award held pending question of legal onening) and $2,014, respectively; Fairhill, Florence, Herbert, Hortter, I, Londen, 4th, Ashdale, Braddock, Oakland, Ross, Widener and Wingbocking Sts., Fishers, Grays and Paschall Aves., Marlyn and Bellefield York Rds., to Eastern Paving Co., Colonial Trust Bldg., $6,068, $16,094, $3,211, $5,051, $10,722, $6,840, $17,637 $3,037, $5,103, $5,896, $5,012, $4,192, $5,304, $8,470, $9,889, $9,150, $11,983 and $15,221 respectively, Lebanon St., to Mack Paving & Constr. Co., Nicetown Lane and Luzerne St., $13,332; paving with vitr. block Cliveden Ave. and Magnolia St., to Estate D. McMahon, Germantown and Chelton Sts., $13,837 and $5,914, respectively; Spencer St., to Mack Paving & Constr. Co., Nicetown Lane and Luzerne St., $7,463. Noted Feb. 5.

★Del., Georgetown—Sussex Co. let contract building 2.30 mi. road from Blades to Concord, Contr. C. S. 7, to T. S. Holt, Federalsburg, Md., cost $79,958; 4.65 mi. road from Roxana to Millville, Contr. C. S. 11, involving 20,000 cu.yd. earth excav. and 39,000 sq.yd. bituminous macadam, and 4.58 mi. road from Georgetown to Harbeson, Contr. C. S. 10, to Empire Constr. Co., Empire Bldg., Philadelphia $124,838 and $113,070, respectively; all 14 ft. wide. Noted Jan. 22.

★N. C., Greenville—Pitt Co. let contract paving 15 mi. highways, to T. H. Gill & Co., Binghamton, N. Y.

★N. C., Monroe—Union Co. let contract graveling 25 mi. Jackson Highway, to Porter & Boyd, Charlotte; about $300,000; cost plus percentage basis.

★Fla., Jacksonville—City let contract paving 65,000 sq.yd. various streets, brick, to J. Y. Wilson, Clark Bldg. About $350,000.

Wis., Manitowoc—A. H. Zander, city clk., received only bid Jan. 31, paving various streets, involving 80,000 sq.yd. concrete, from Manitowoc Constr. Co. (formerly Murphy Constr. Co.) 826 South 8th St., cement concrete pavement @$2.74 per sq. yd., curbs and gutters, $0.90 per lin.ft., old curb reset, $0.15 per lin.ft., grading, $1.10 per sq.yd., extras 15 per cent. Noted Jan. 11.

★Ia., Ames—State Highway Comn., let contract for 11,500 sq.yd., 1 course concrete paving on roads through grounds of State Institution for Feeble Minded, to Bryant Paving Co., 807-12 Black Hawk Bldg., Waterloo, $44,275.

Ia., Charles City—City received bids paving various streets, involving 61,000 sq.yd. (a) concrete, (b) bituminous concrete, or (c) asphaltic concrete, from Bryant Asphalt Co., Waterloo, (a) $3.71 per sq.yd., (b) $4.21, (c) $3.92; Wright Constr. Co., 211 Flynn Bldg., Des Moines, (a) $3.61, (b) $4.03, (c) $3.71; Midwest Paving Co., 615 Southwest 9th St., Des Moines, (a) $3.69, (b) $4.27, (c) $3.91

★Ia., Cherokee — City let contract for 80,000 sq.yd. asphaltic paving on various streets, to Bryant Asphalt Co., 807-12 Black Hawk Bldg., Waterloo. About $316,000. Noted Jan. 22.

★Ia., Pella—City let contract paving various streets, involving 79,000 sq.yd. vitr. brick on concrete base, to J. C. Blunk, Ottumwa. About $320,000. Noted Jan. 1.

Ia., Valley Junction—City received bids paving various streets, involving 28,000 sq. yd. concrete, asphalt or asphaltic concrete, from Empire Constr. Co., 208 Flynn Bldg., Class "A" concrete @$3.75 per sq.yd., "B" $3.55; Des Moines Asphalt Co., 11th and Vine Sts., asphalt $4.04 sq.yd., asphaltic concrete $3.86; Lytton Constr. Co., Class "A" concrete $3.51 sq.yd., Class "B" $3.50 sq.yd. Contractors all of Des Moines.

★Neb., Broken Bow—City let contract paving 148 blocks, involving 80,000 lin.ft. curbing and guttering, 70,000 cu.yd. earth excav., 30,000 sq.yd. vitr. brick and 130,000 sq.yd. asphalt, to A. H. Read Co., Omaha. About $700,000.

★Wyo., Casper—City let contract building Paving Dists. 10 and 14, comprising 2nd and 4th Sts., bitulithic pavement, to Warren Constr. Co., Box 521, $228,494.

Tex., Groesbeck — J. E. Bradley, judge Limestone Co., received bids Jan. 29 (a) grading, surfacing and building rein.-con. drainage structures on 7.064 mi. Highway 7, from Freestone Co. to Tehuacana Creek, 9 ft. wide, also clearing and grubbing 5 acres, (b) necessary drainage structures only, on above road, (c) grading, surfacing and building rein.-con. drainage structures on 11.87 mi. Highway 14, from Freestone Co. to Navasota River, 9 ft. wide, involving 3.8 acres clearing and grubbing, 12,547 cu. yd. earth and 1,236 cu.yd. rock excav., 62,671 lb, reinforcing and 56,110 lb. structural steel, 638 cu.yd. Class "A" and 321 cu.yd. Class "B" concrete, etc., (d) necessary rein.-con. drainage structures on above road, from Womack Constr. Co., Sherman, (a) $50,300, (c) $108,090; McElwrath & Rogers, Corsicana, (a) $53,317, (c) $120,750; McCall-Moore Eng. Co., 308-9 Amicable Bldg., Waco, (b) $37,654; Potts & Prentice, Waco, (d) $13,793. Noted Jan. 22.

Tex., Hillsboro—Hill Co. received bids Jan. 31, grading, gravel surfacing and draining 11.75 mi. Highway 6, from here to McLennan Co., 16 ft. wide, from Hicks & Smith, San Angelo, $115,322; McElwrath & Rogers, Corsicana, $122,734; Healey Constr. Co., Dallas, $131,955. Work involves 23,051 cu.yd. earth and 100 cu.yd. rock excav., 1,034 sq.yd. excav. for bridges, 27,873 cu.yd. gravel (to be furnished by county), 273 cu.yd. Class "A" concrete for culverts, 394 cu.yd. Class "A" for bridges, 311 cu.yd. Class "B" concrete, etc.

Tex., Weatherford—E. A. Swofford, judge Parker Co., received bids (a) applying surface treatment of either (1) asphalt, in place, 2 course treatment, including furnishing material, heating, hauling, etc., (2) tar in place, prime coat, furnishing material, heating, etc., on 15.066 mi. Highway 1 from here to Tarrant Co. line, 18 ft. wide, (b) grading, draing and surfacing with crushed rock, 15.066 mi. Highway 1, from here to Parker Co., 18 ft. wide, from J. E. Ward, 520 East 13th St., Dallas, (a1) $49,586, (a2) $55,619; Healey Constr. Co., Dallas, (a1) $65,394, (a2) $65,294, (b) $188,641; Womack Constr. Co., Sherman, (b) $180,376; Smith Bros., Crockett, (b) $199,817. Noted Feb. 5.

Tex., Wichita Falls—M. M. Murphy, aud. Wichita Co., received only bid Jan. 22 improving 4.68 mi. Lake Rd., 18 ft. wide, from L. E. Whitham & Co., Wichita Falls, $134,447. Work involves 4,358 cu.yd. grading, 490 cu.yd. earth excav. and 46,448 sq. yd. concrete pavement. About $100,000. J. M. Isbell, Wichita Falls, engr. Noted Jan. 1.

★Wash., Seattle—Bd. Pub. Wks. let contract improving 41st Ave. N., et al, involving 13,200 cu.yd. earth excav., 7,470 lin.ft. concrete sidewalk, 570 sq.yd. concrete crosswalks and 800 cu.yd. gravel roadway, to Coluccio & Erickson, Seattle, $73,172.

Ore., Portland—City Council received bids improving (a) Montana Ave. from Fremont to Prescott Sts. and from Blandena to Prescott Sts., (b) Kearney St. from east line of 15th to west line of 15th St., (c) East 47th St. from north line of East Stark St. to south line East Glisan St., (1) concrete No. 3, (2) asphaltic concrete No. 1, 2 in. top, 4 in. crushed rock base, (3) asphaltic concrete No. 2 in roadway, 2 in. top on 4 in. crushed rock base, (4) stone block pavement in track, (5) asphaltic concrete No. 1, 2 in. top, 4 in. crushed rock base in roadway, from S. Simonsen, 841 East 10th St., N., (a1) $2.30 per sq.yd., total, $32,301; United Contg. Co., North-

Streets and Roads (Continued)

west Bank Bldg., (a2) $1.50 per sq.yd., $31,724; Warren Constr. Co., Journal Bldg., (b3) $2.50 per sq.yd., (b4) $7 per sq.yd., $1,417, (c5) $2.20 per sq.yd., $36,483.

★Cal., Bakersfield — City let contract grading, oiling, curbing, guttering and building sidewalks, on O St. et al, Dist. 49, to F. W. Nightbert, Bakersfield, $11,107; grading, curbing and guttering N St. et al. Dst. 48, 1½ in. warrenite surface on 3 in. asphaltic concrete base, to Federal Constr. Co., Call-Post Bldg., San Francisco, $20,478.

★Cal., Carmel—City let contract grading and graveling Casanova and Carmelo Sts., to S. Ruthven, Monterey, $11,867.

★Cal., Fresno—Bd. Supervs. Fresno Co. let contract improving 5.35 mi. Blackstone Ave., involving 8,260 cu.yd. excav., 7,005 cu.yd. asphaltic concrete base and 453,782 sq.ft. Warrenite surface; also 11.99 mi. Elm Ave., 21,550 cu.yd. excav., 15,670 cu. yd. asphaltic concrete base and 1,014,014 sq.ft. Warrenite surface, to Thompson Bros., 1514 H St., $96,078 and $228,661 respectively.

★Cal., Fresno—Bd. supervs. Fresno Co. let contract to H. Crummey, Hearst Bldg., San Francisco, improving 6.01 mi. Sect. A, Route 33, involving 7,500 cu.yd. excav., @ $1.45 per cu.yd., 7,815 cu.yd. 5 in. asphaltic concrete base and 506,320 sq.ft. 1½ in. Warrenite surface, @ $0.25 per sq.ft., etc.; total. $139,455; 2 mi. Sect. A, Route 32, involving 1,700 cu.yd. excav., $1.65 per cu.yd., 2,630 cu.yd. asphaltic concrete on 5 in. base and 170,375 sq.ft. 1½ in. Warrenite surface, $0.272 per sq.ft., $46,762; 2.45 mi. Sect. "A," Route 31, involving 12,900 cu.yd. excav., $1 per cu. yd., 3,210 cu.yd. asphaltic concrete on 5 in. base and 207,805 sq.ft. 1½ in. Warrenite surface, $0.274 per sq.ft., etc.; total $73,563. All above roads near Coalinga.

★Cal., Gridley—City let contract paving 30 blocks various streets, to Clark & Henery Constr. Co., 13th and 14th Sts., Sacramento. About $167,000.

Cal., Los Angeles—Bd. Supervs. Los Angeles Co. received only bid improving 12,680 lin.ft. Francisquito Ave., near Puente, involving 12,700 lin.ft. shaping roadbed, 3,150 cu.yd. excav., 740 bbls. oil, 207 cu.yd. concrete in dips, 720 lb. reinforcing steel, 272 ft. 12-18 in. corrugated iron pipe, from G. T. McLain, 1184 North Berendo St. About $29,000.

Cal., San Francisco—City received bids improving Hearst Ave. between Detroit and Baden Sts., involving 2,470 lin.ft. concrete curbing, 14,950 sq.ft. artificial stone sidewalks, 774 cu.yd. earth excav. and 4,373 sq. yd. asphalt, 75 lin.ft. 10 in. culverts, etc., from Federal Constr. Co., Call Bldg., $19,823; C. B. Eaton, 407 11th St., $21,888; Flinn & Treacy, 1 Montgomery St., $22,146.

Cal., San Francisco—Bd. Pub. Wks. received bids improving Hearst Ave. between Edna and Detroit Sts., involving 466 sq.yd. vitr. brick, 1533 sq.yd. asphalt, 1,200 lin.ft. concrete curbing, 7,200 sq.ft. artificial stone sidewalk, 114 cu.yd. earth excav., from Federal Constr. Co., Call Bldg., $9,613; C. B. Eaton, 407-11th St., $10,285; Flinn & Tracy, 1 Montgomery St., $10,337.

★Cal., Santa Rosa—Bd Supervs. Sonoma Co. let contract grading and paving with 5 in. macadam 3.7 mi. Peteluma-Sonoma Rd., 16 ft. wide, to A. J Fairbanks, Willits, $23,152.

★Cal., Tulare—City let contract paving Inyo, Bush and J Sts., 4 in. concrete, 20 ft. wide with 5 ft. dirt shoulders on either side, to A. H. Vaughn, San Francisco, $23,762. Noted Jan. 1.

Cal., Vallejo—City received lowest bid Jan. 12, improving Hichborn St., from R. J. Blano, Vallejo, $39,195. Noted Jan. 1.

★Cal., Ventura—Bd. Supervs. Ventura Co. let contracts to Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, improving 29,520 lin.ft. Vineyard Ave., Wood Rd. et al, 16 ft. wide, near Oxnard, involving 5,440 cu.yd. excav. @$0.75 per cu.yd. 29,520 lin.ft. shaping roadbed, $0.16, 18½ cu.yd. concrete in culverts, $15, 2,382 sq.yd. concrete paving, $8, 3,038 cu.yd. concrete in pavement, $5.40, 1,000 lb. reinforcing steel, $0.11, 120 ft. 12 in., $2.50 and 30 ft. 18 in. metal pipe, $3, total $48,498; 26,435 lin.ft. Telephone Rd., involving 8,850 cu.yd. excav., $0.85, 26,435 lin.ft. shaping roadbed, $0.16, 5,245 cu.yd. concrete in pavement, $4.90, 75 cu.yd. concrete in culverts, $15, 1,310 cu yd. concrete in storm ditch, $7.90, 28 ft. 18 in. metal pipe, $2.70, and 9,530 lb. reinforcing steel, $0.11, total $49,593. County furnishes cement, sand and gravel.

★Cal., Ventura—Bd. Supervs. Ventura Co., let contract to T. E. Hill & Co., 1011 Washington Bldg., Los Angeles, improving 8 mi. road between Santa Paula and Ojai, involving 86,000 cu.yd. excav. @ $0.86 per cu.yd., 20,950 lin.ft. shaping roadbed, $0.20 per lin.ft., 4,125 cu.yd. Class "A" concrete pavement, $6.16 per cu.yd., 368 cu. yd. Class "B" concrete in culverts and bridges, $13.98 per cu.yd., 310 ft. 18 in. metal pipe, $3.65 per ft., 324 ft. 24 in., $4.45 per ft., 100 ft. 30 in. $6.10 per ft., 162 ft. 36 in., $7.46 per ft., 21,800 lb. reinforcing steel, $0.11 per lb., total, $115,494. Noted Jan. 8.

Railways

PROPOSED WORK

Ohio—Aluminum Fdry. Co., East 79th St., Cleveland, soon lets contract building single track railroad siding and switch, 1500 ft. long, involving 1500 ft. steel rails, earth evcav., etc. About $20,000.

California—Bd. Pub. Wks., San Francisco, will petition Bd. Supervs. to appropriate $6,000 for estimate on proposed extension of municipal railway from Laguna Honda Sta. to beach. M. M. O'Shaughnessy, city engr.

California — See "Miscellaneous under Berkeley."

BIDS DESIRED

Maine—Until March 1, by Atlantic Shore Ry., Sanford, building branch track from River St. to plant of Goodall Mfg. Co., to be used in connection with operations of company. About $50,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Ohio—Eaton Axle Co., 10017 Euclid Ave., Cleveland, let contract building single track railroad siding and switch, 1500 ft. long, to H. L. Carr, Frederick Bldg. About $20,000.

Excavation and Dredging

PROPOSED WORK

O., Cleveland—Dredging—City soon lets contract dredging Cuyahoga River, involving 85,000-180,000 cu.yd. excav. About $30,000. R. Hoffman, city engr.

Minn., Granite Falls—Ditch—G. H. Wilson, aud. Yellow Medicine Co., soon receives bids building Ditch No. 19, 1½ mi. long, consisting of main ditch and 6 tile branches. About $15,000. J. H. Johnson, Conby, engr.

Ore., Joseph — Irrigation — Mountain Sheep Irrigation Dist., Wallowa Co., represented by A. W. Schaupp, Joseph, filed plans with P. Cupper, state engr., Salem, for district development to include 8,000 acres irrigation and building flumes, laterals and flood gates. Water to be taken from Little Sheep and Big Sheep Creeks. About $125,000.

Cal., Colusa — Irrigation — Delta Farms Co. having plans prepared for rehabilitating irrigation system. About $200,000. L. K. Moulton, Colusa, engr.

Cal., Long Beach—Channels—J. F. Collins, city harbor engr., recommended that city widen and deepen channels and turning basin, extend jetties and construct wharves, cost $2,496,390. Two alternate plans suggested, one not including extension of jetties, cost $1,443,350 and other not including widening 2 channels, $1,904,590. H. C. Waughop, city clk.

Cal., Porterville—South Tule Independent Ditch Co. retained G. B. Sturgeon, engr., 1st Natl. Bank Bldg., San Francisco, to prepare plans for storage reservoir, probably earth, and irrigation water distributing system, probably earth canals, etc. About $80,000.

Cal., Stockton—Excavation—City Council had preliminary plans prepared for new harbor, involving widening channel from 200 to 1,250 ft., building wharves, etc. About $4,000,000. S. A. Judd, Stockton, engr. A. L. Banks, city clk.

Ont., Kingston — Dredging — See "Miscellaneous."

BIDS DESIRED

N. Y., Tompkinsville—Dredging—Until Feb. 18, by Hurlburt, comr. docks, Pier "A," foot of Battery Pl., New York City, furnishing labor and material for removing waterfront structures and dredging at Piers 6, 7, 8, 9, 10 and 11, Richmond Boro.

Minn., Little Falls—Ditch—Until Feb. 28, by Comrs. Morrison Co., building Ditch 25, involving 21,823 cu.yd. excav. About $11,000. A. J. Fenn, Little Falls, engr.

Ark., Wynne—Drainage—Until Feb. 20, by Cross Co. constructing draining system in D. D. 3, consisting of (Sect. 1) main and lateral ditches, 1, 2 and 3, involving 923,000 cu.yd. earth and extending over distance of 29 mi.; (Sect. 2) building lateral ditches 4, 5 and 6, involving 515,000 cu.yd. earth and extending over distance of 24½ mi., also hauling and laying 3,000 ft. 18 in. corrugated iron pipe. Newson Eng. Co., Wynne, engineers.

Tex., Cooper—Excavation—Until March 2, by O. W. Finley Eng. Co., engrs., 1221½ Main St., Dallas, clearing 130 acres of right-of-way, grubbing 133 acres, building 12 mi. embankment or 139,700 cu.yd. earth work and 1,430 acres of floodway clearing, for L. E. Jones, H. Tirey, C. E. Mahaffey, A. J. Potter and J. W. Hunt, owners, all of Cooper.

B. C. Chilliwack—Drainage—Until Feb. 25, by Comrs. Sumas Dyking Dist., c/o Land Settlement Bd., Victoria, building drainage and dyking system (earthwork and bridge contract) in vicinity of Sumas Lake, in municipalities of Sumas and Chilliwack. About $1,500,000. F. N. Sinclair, Old Courthouse, New Westminster, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Cal., Los Angeles—Excavation—L. Phillips, et al, c/o Pacific Mutual Life Insurance Co., 6th and Olive Sts., let contract excavating 110 x 205 ft. site to depth of 18 ft. for new building, to J. A. Hill, 695 South Westmoreland St. Cost to exceed $10,000.

★Cal., Tranquitity — Irrigation — Tranquility Irrigation Dist. let contract to J. E. Johnson, Tracy, for (a) 133,000 cu.yd. earthwork reconstructing ditches in Sect. 1, @ $.27 per cu.yd., (b) 120,000 cu.yd. excav. and embankment for new canals in Sect. 2, $.38 per cu yd., and (c) 30,000 cu. yd. excav. in Fresno slough, $.55 per cu.yd., total cost $98,010.

Industrial Works

PROPOSED WORK

Mass., Newton Upper Falls—Lockwood Greene & Co., engrs., 60 Federal St., Boston, receives bids about March 1, building 2 story, 200 x 350 ft., brick and steel foundry, concrete foundation, here, for Saco-Lowell Shops, 77 Franklin St., Boston. Noted Jan. 29.

N. Y., Avon—G. J. Gillies Co., Rochester, plans to build 2 story, 50 x 150 ft. brick factory, here, cost between $40,000 and $50,000; also plans to install transmission and box making machinery, $40,000.

N. Y., Brooklyn—Amer. Mfg. Co., Noble and West Sts., having plans prepared by W. Higginson, archt. and engr., 18 East 41st St., New York City, for 2 story, 150 x 440 ft., brick and steel warehouse, rein.-con. flooring, concrete foundation, at 24 Greenpoint Ave. About $155,000. A. Gratz, pres.

N. Y., Brooklyn—J. Barrington, 148 Greenpoint Ave., having plans prepared by P. Tillion & Sons, archts. and engrs., 103 Park Ave., New York City, for 4 story, 50 x 100 ft., rein.-con. and steel storage warehouse, rein.-con. flooring, concrete foundation, on Meserole St. and Manhattan Ave. About $60,000.

N. Y., Buffalo—Rome Wire Co., Railroad St., Rome, purchased site on Kensington and Clyde Aves., here, and plans to construct several large additional buildings. H. T. Dyett, president.

N. Y., Geneseo—Rochester Ry. & Light Co., 34 Clinton Ave., N., Rochester, plans to build flour and grain mill here, to replace Big Tree Mill recently destroyed by fire. Loss between $90,000 and $100,000.

N. Y., Geneva—Geneva Auto Co., 145 Castle St., plans to build 2 story concrete addition, adjacent to present garage. Cost between $40,000 and $50,000. L. A. Cooper, mgr.

N. Y., New York—L. Dryer, 303 Greenwich St., having sketches made by G. McCabe, archt. and engr., 96-5th Ave., for 2 story, 50 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 217-219 West 18th St. About $30,000.

N. Y., New York—A. G. Koenig, archt. and engr., 405 Lexington Ave., receives bids about Feb. 17, building 3 story, 88x90 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on 170th St. and 3d Ave., for Heintz & Seigel, 3582 3d Ave. About $65,000.

N. Y., Rochester—A. H. Boyce, 160 East Ave. plans to build 2 story, 64 x 195 ft., brick garage, machine shop and salesroom, at 360 East Ave. About $40,000.

Industrial Works (Continued)

N. Y., Rochester—Starter & Ignition Serv. Co., 437 Main St. E., plans to build 1 and 2 story, 53 x 150 ft., brick factory. About $30,000.

N. Y., Rochester—Smith, Hinchman & Grylls, archts. and engrs., 710 Washington Arcade, Detroit, Mich., receive bids about Feb. 20, building 3 story, 121 x 253 ft., brick, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Campbell St., for Yawman & Erbe Co., Campbell St.

Pa., Exeter (Pittston, P. O.)—Exeter Machine Wks. plan to build 2 story, 50 x 150 ft., brick and steel foundry, rein.-con. flooring, concrete foundation, on New St. About $70,000. Architect not selected.

Pa., Gouldsboro—Reiling Silk Co., Inc., having plans prepared by Y. L. Hancock, Jr., archt., Mears Bldg., Scranton, for 1 story, 100 x 100 ft., mill construction mill, rock foundation, on Main St. About $50,000.

Pa., Johnstown — Johnstown Terminal Warehouse, Johnstown Trust Bldg., plans to build 5 story, 132 x 250 ft., concrete and steel warehouse, rein.-con. flooring, concrete foundation, on Maple St. About $300,000. W. Steele & Sons Co., 16th and Arch Sts., Phila., engrs. and archts.

Pa., Lock Haven—Pennsylvania Paper Co. plans to build 3 story, 100 x 300 ft., rein.-con. and steel mill, rein.-con. flooring, rock foundation. About $3,000,000. Architect not selected.

Pa., Phila.—Ace Metal Co., 716 South 11th St., will have plans prepared by Neubauer & Supourtz, archts., 929 Chestnut St., for alterations to warehouse. About $50,000.

Pa., Phila.—J. Blood & Bros., Trenton and Allegheny Sts., having plans prepared by Clark & Dudnick, engrs. and archts., Drexel Bldg., for 3 story, concrete and brick factory, on Janney and Clearfield Sts. About $60,000.

Pa., Pittsburgh—W. A. Balch, archt., 756 Woodward Ave., Detroit, preparing plans for 5 story, 57 x 224 ft., brick, rein.-con., stone and steel garage and service station, rein.-con. flooring, concrete foundation. About $200,000. Owner's name withheld.

Pa., Scranton—E. H. Davis and G. M. D. Lewis, associate archts., Union Natl. Bank Bldg., preparing plans for 5 story, 100 x 110 ft., rein.-con. and steel factory, rein.-con. flooring, rock foundation, on Wyoming Ave. About $300,000. Owners name withheld.

Pa., Scranton—E. H. Davis and G. M. D. Lewis, associated archts., Union Natl. Bank Bldg., preparing plans for 3 story, 55 x 150 ft. rein.-con., and steel factory, rein.-con. flooring, rock foundation, on Washington Ave. About $175,000. Owners name withheld.

Pa., Scranton—Jones Mfg. Co. having plans prepared by F. A. Nelson, archt., Connell Bldg., for 3 story, 40 x 90 ft., mill construction factory, rock foundation, on Pennsylvania Ave. About $35,000.

Pa., Scranton—C. B. Scott Co., Lackawanna Ave., having plans prepared by F. A. Nelson, archt., Connell Bldg., for 3 story, 60 x 80 ft., rein.-con. and steel warehouse, rein.-con. flooring, rock foundation, on Lackawanna Ave. About $50,000.

Pa., Scranton—Temko Garment Co., Pittston Ave., having plans prepared by L. Reisman, archt., Miller Bldg. for 3 story, 30 x 90 ft., mill construction addition to factory, rock foundation, on Pittston Ave. About $30,000.

Pa., Wilkes Barre—Saba Ice Cream Cone Co. having preliminary plans prepared by C. R. Rinehimer, archt., 10 Airy St., Wilkes Barre, for 2 story, 50 x 50 ft., brick factory, rein.-con. flooring, rock foundation, on Bank St. About $30,000.

S. C., Columbia—State Legislature will appropriate $50,000 for repairs and installation of heating plants in several buildings on campus of University of South Carolina.

Ga., Griffin—Rushton Cotton Mills having plans prepared by Lockwood, Greene Co., archts. and engrs., Healy Bldg. Atlanta, for 1 story, 200 x 220 ft., rein.-con. and brick weave shed, rein.-con. flooring with wood covering, concrete foundation. About $225,000.

La., Monroe—N. C. McGowan, Shreveport, plans to build carbon black plant in Monroe gas field district, about 17 mi. from here. About $250,000.

La., Shreveport—Foursome Oil Co., plans to build 5,000 bbl. refinery here. About $600,000. R. E. Seaman, pres.

O., Cincinnati—Cincinnati Planer Co., North St., having plans prepared by Zettel & Rapp, archts., Mercantile Library Bldg., for 2 story, 39 x 120 ft. addition to factory.

O., Cleveland—Buckeye Brass Co., 6410 Hawthorne Ave., having plans prepared by A. Sogg, archt., 319 Hippodrome Bldg., for 30 x 110 ft. foundry and 75 x 75 ft. furnace room, 1 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on Ashland Rd. About $50,000.

O., Cleveland—Creswell Realty Co., Union Bldg., having revised plans prepared by W. S. Ferguson Co., archts. and engrs., 1900 Euclid Ave., for 8 story, 100 x 125 ft., concrete, steel and brick garage, rein.-con. flooring, concrete foundation, on Huron Rd. and East 12th St. About $500,000.

O., Cleveland—Duesenberg Motor & Auto Corp., c/o L. M. Rankin, Highland Motor Corp., Kansas City, Mo., plans to build 1 story, 300 x 350 ft., steel and brick plant, on East 152nd St. along tracks of Nickel Plate R.R., here. About $500,000. Engineer's name withheld.

O., Cleveland—Natl. Bronze & Aluminum Fdry Co., East 79th St., having plans prepared by J. Schmehler, archt., c/o owner, for 1 story, 50 x 150 ft., concrete, steel and brick foundry, concrete foundation, on East 88th St. and Kinsman Rd. About $60,000.

O., Cleveland—H. H. Lane, archt. and engr., 2320 Dime Bank Bldg., Detroit, soon lets contract building 4 story, 80 x 120 ft., steel and brick warehouse, here, for Westinghouse Electric Co., West 54th St. About $80,000. Noted Jan. 22.

O., Columbus—G. R. Bassett, archt., Central Natl. Bank Bldg., receives bids about Feb. 15, building 3 story, 60 x 188 ft., concrete brick and terra cotta garage and salesroom, at 94 Broad St., for Ohio Auto Sales Co., 772 North High St. About $150,000.

O., Dayton—Master Tire & Rubber Co. plans to build 6 story, 75 x 130 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, on Leo St. About $200,000. J. J. Black Constr. Co., c/o owners, archts. and engineers.

Mich., Bay City—Wilson Body Co. having plans prepared by Esselstyn. Murphy & Hanford, archts. and engrs., 810 Marquette Bldg., Detroit, for 3 story, 250 x 350 ft. brick, rein.-con. and steel addition to factory, to include refuse incinerator, rein.-con. flooring, concrete foundation.

Mich., Detroit—Detroit Belt Lacer Co., 27 A St., having plans prepared by L. Scisorek, archt., 225 Farwell Bldg., for 2 story, brick and steel factory, brick foundation. About $35,000.

Mich, Detroit—Pharo Mfg. Co., 1336 Woodward Ave., plans to build 1 story, 60 x 150 ft., brick and steel factory, with 2 story, 30 x 60 ft. office and 18 x 22 ft. boiler house, concrete flooring and foundation. About $30,000. Brown & Preston, 406 Empire Bldg.. architects.

Mich., Detroit—Superior Sand & Gravel Co., 726-730 Dime Bank Bldg., had plans prepared by Brown & Preston, archts., 406 Empire Bldg., for 2 story, 48 x 80 ft., brick, rein.-con. and steel warehouse, rein.-con. flooring, concrete foundation, on Lycaste Ave. and Detroit River. About $25,000.

Mich., Detroit—F. J. Whitney, 304 Chamber of Commerce, had plans prepared by H. H. Lane, engr., 2320 Dime Bank Bldg., for 2 story, 65 x 100 ft., brick, steel and timber warehouse, concrete foundation, on 6th and Labrosse Sts. About $55,000.

Mich., Lansing—City Light & Water Bd. plans to build steam electric power plant, 1st unit 10,000 kw., with necessary turbine and boilers, brick, rein.-con. and steel. Ultimate capacity to be 40,000 kw. About $500,000. G. G. Crane, city mgr. Noted June 26.

Ill., Chicago—Columbia Colortype Co., 2141 Calumet Ave., having plans prepared by A. S. Alschuler, archt., 28 East Jackson St., for 7 story, 120 x 175 ft., rein.-con., brick and terra cotta printing plant, rein.-con. flooring, concrete foundation, on 21st St. and Calumet Ave. About $650,000.

Ill., Chicago—Flexible Steel Lacing Co., 522 South Clinton St., having plans prepared by W. G. Carnegie, archt., 189 West Washington St., for 1 story, 200 x 200 ft., brick factory, concrete foundation, on Polk St. and Belt Line R.R. About $200,000.

Wis., Cudahy—Federal Rubber Co., Packard Ave., having plans prepared by G. B. Allen, archt. and engr., 424 Jefferson St., Milwaukee, (also Hartford, Conn.), for three 6 story, 160 x 220 ft., brick and steel factory buildings, mill flooring, concrete foundation.

Wis., Milwaukee—Boston Store, 4th and Grand Aves., plans to build 14 story, 75 x 150 ft., brick and concrete warehouse, rein.-con. flooring, concrete foundation, on 4th Ave. Architect not selected.

Wis., Milwaukee—H. A. Kulas, archt. and engr., 883 Windlake Ave., preparing plans for 2 story, 50 x 80 ft. factory, with 20 x 50 ft. boiler house, brick and mill construction, concrete foundation. Owner's name withheld.

Wis., Milwaukee—J. Ruesch, 485 Bway., soon lets contract building 3 story, 30 x 120 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on Bway. About $40,000. Private plans.

Wis., St. Francis (Milwaukee, P. O.)—Milwaukee Electric Ry. and Light Co., Pub. Serv. Bldg., having preliminary plans prepared by R. H. Pinkley, engr., for 185 x 400 ft. brick, steel and concrete power house, rein.-con. flooring, concrete foundation. Cost between $500,000 and $700,000.

Wis., Saukville—H. J. Cary having plans prepared by W. F. Hilgen, archt., Cedarburg, for 1 and 2 story, 36 x 370 ft. brick and mill construction cannery, concrete foundation. Noted Jan. 1.

Wis., Saukville—Ozaukee Heater Co. having plans prepared by W. F. Hilgen, archt., Columbia St., Cedarburg, for 1 story, 36 x 100 ft., rein.-con. and brick foundry, rein.-con. flooring, brick foundation. About $50,000. H. Cary, pres.

Wis., Waukesha—Waukesha Cement Tile Co., 102 Main St., plans to build 1 story, 132 x 136 ft., concrete factory, rein.-con. flooring, concrete foundation. About $45,000. Architect not selected.

Wis., Waukesha—Waukesha Furniture Co., 311 Sherman Ave., Ft. Atkinson, having plans prepared by J. G. Shodron, archt., Ft. Atkinson, for 1 story, 150 x 150 ft., concrete and steel factory. rein.-con. flooring and concrete foundation.

Wis., Waukesha—J. H. Wolf, 110 East Main St., having plans prepared for 1 story, 50 x 150 ft., brick and steel garage and repair shop, rein.-con. flooring, concrete foundation. About $25,000.

Minn., Minneapolis—Northwestern Catalogue Co., 800 Phoenix Bldg., postponed indefinitely building 4 story, 100 x 120 ft., rein.-con. and brick warehouse. About $100,000. Noted Sept. 11.

Minn., Newton (St. Paul P. O.)— Farmers Terminal Packing Co., Commerce Bldg., St. Paul, plans to build stock yards on 20 acre site, here, to include frame or brick sheds, concrete or brick paving, wire fencing, wooden posts, etc. About $120,000. Private plans.

Minn., St. Paul—Twin City Mission Furniture Co., 489-491 St. Peter St., having plans prepared by M. A. Wright, archt., 600 Pittsburgh Bldg., for 3 story, 54 x 142 ft., brick and timber warehouse, on 22nd and Hampden Aves. About $60,000.

Mont., Missoula—Security Warehouse & Transfer Co., 734 West Cedar St., plans to build 2 story, 75 x 150 ft., concrete and brick warehouse, on West Cedar St. About $50,000. Architect's name withheld.

Mo., Bethany—C. Hacker & Son having plans prepared by R. & E. R. Meier, archts., Lincoln Bldg., St. Joseph, for 2 story, 82 x 100 ft., rein.-con., steel and brick garage, rein.-con. flooring, concrete foundation. About $60,000.

Ariz., Phoenix—Chambers Transfer Co. having plans prepared by Lescher & Kibby, archts., Bank of Arizona Bldg., for 50 x 135 ft., concrete, brick and timber warehouse. About $50,000.

Ariz., Phoenix—C. D. Davis, c/o Lescher & Kibby, archts., Bank of Arizona Bldg., having plans prepared for 2 story, 75 x 137 ft., brick bakery, on 3rd Ave. About $50,000. Vance Bros., Mesa, lessee.

Wash., Bellingham—Whatcom Co. Dairymen's Assn. plans to build 2 story, brick and frame factory. About $300,000. Private plans.

Wash., Seattle—Gladstone Co., Hoge Bldg., plans to build 2 story, 65 x 120 ft. factory, at 2200 Western Ave. About $50,000.

Industrial Works (Continued)

Cal., Long Beach—J. A. Rominger, 116 Locust Ave., et al organized Toasted Products Co., with $100,000 capital stock, and plans to build factory on Harbor Channel 2. About $70,000. Architect not selected. Company will purchase complete equipment for plant.

Cal., Los Angeles—California Walnut Growers Assn., 1326 East 7th St., having plans prepared by A. C. Martin, archt., 430 Higgins Bldg., for 7 story, 100 x 150 ft., rein.-con. and brick warehouse, rein.-con. flooring, concrete foundation, on 7th and Mill Sts. Cost between $150,000 and $200,000.

Cal., Stockton—P. Rossier, Bank of Italy Bldg., C. N. Gill, Yosemite Bldg., San Francisco, et al, organized California Tractors, Inc., with $500,000 capital stock and plans to build tractor factory, on site already purchased.

Cal., Turlock—G. W. Hume Co. plans to build new fruit packing and canning plant. About $50,000.

Cal., Turlock—Stanislaus Co. Fig Growers Assn. and A. C. Braden Preserving Co., 449 South Raymond Ave., Pasadena, plan to build 60 x 125 ft. packing plant. About $100,000.

Ont., Brantford—Dominion Steel Products Co. plans to build 1 story, 60 x 80 x 100 ft. foundry, concrete, steel and brick, concrete foundation. About $150,000. Archt. and engr. not selected.

Ont., London—Greene-Swift Co., Talbot St., having plans prepared by W C. Murray, archt., Dominion Savings Bldg., for 3 story, 100 x 148 ft. clothing factory rein.-con., flooring. About $125,000.

Ont., Ottawa—Dom. Govt. having plans prepared by R. C. Wright, archt., c/o Dept. Pub. Wks, altering and building additions to building occupied by Printing Bureau, on St. Patrick St. About $25,000.

Ont., Strathroy — Andrews Wire Co., Strathroy, plans to build 2 story, 60 x 125 ft. factory. About $50,000.

Ont., Sudbury—Imperial Oil Co., Ltd., Imperial Oil Bldg., Toronto, plans to build 2 or 3 story warehouse and distributing station, rein.-con., steel and brick. rein.-con. flooring, concrete or stone foundation. About $200,000. Architect and engineer not selected.

Ont., Toronto—Canadian Natl. Carbon Co., 265 Adelaide St. W., plans to build factory. About $100,000. L. McCarthy, pres.

Ont., Windsor—Wood Hydraulic Hoist & Body Co., 1028 Bellevue Ave., Detroit, Mich., plans to build factory on Howard Ave. and Tecumseh Rd.

B. C., Victoria—Canadian Pacific Ry., Winnipeg, Man., plans to build steamship depot on Belleville St. About $150,000. J. G. Sullivan, Winnipeg, ch. engr.

BIDS DESIRED

Me., Saco—Until March 20, by Garland Mfg. Co., building 4 story, brick storehouse. About $50,000.

Conn., Hartford—See "Buildings".

Pa., Olyphant—Until Feb. 22, by M. W. Harris, Valley St., building 4 story, 50 x 100 ft., brick and timber warehouse, rock foundation. About $50.000. L. Reisman, Miller Bldg., Scranton, archt.

Pa., Phila.—Until Feb. 16, by Heacock & Hobansen, engrs. and archts., Bailey Bldg., constructing 4 story, 40 x 90 ft., rein.-con. and brick warehouse, at 810 Queen St., for Hagy Waste Wks., 836 South Swanson St. About $100,000.

Ill., Chicago—H. C. Miller, archt., 112 West Adams St., receiving bids building 3 story, 120 x 140 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, at 1701 West Superior St., for Kroeck Paper Box Co., 220 Institute Pl. About $175,000.

Wis., Madison—Until Feb. 16, by J. G. D. Mack, state ch. engr., building 1 and 2 story, 52 x 72 ft., brick, concrete and steel shop in power plant, rein.-con. flooring, concrete foundation, at State Capitol. A. Peabody, Madison, state archt.

Cal., Berkeley—See "Miscellaneous."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Farmington Falls**—Dingley Thomas Co. let contract building 2 story, 100x 200 ft., timber factory, rein.-con. flooring, brick foundation, to O. P. Stewart, Farmington. About $35,000.

★**Mass., Boston**—W. C. Welch Co. let contract building 2 story, 40 x 100 ft., mill construction factory, boiling house, fire room and garage, at Roberts Crossing, to R. F. Morrison Co., City Sq. Bldg. Cost plus percentage basis.

★**Mass., Holyoke**—Amer. Braiding Co., 193 High St., let contract building 6 story, 103 x 105 ft., mill construction factory, on Race and Appleton Sts., to P. J. Kennedy Co., 464 Maple St. About $225,000.

★**Mass., Holyoke**—W. Skinner Sons, Appleton St., let contract building 5 story, 90 x 200 ft., mill construction and brick factory, on Bond St., to Casper Ranger Constr. Co., 20 Bond St. About $225,000.

★**N. Y., Brooklyn**—F. Berlenbach, 32 Suydam St., will build 3 story, 75 x 100 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Flushing Ave. About $65,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Coca Cola Bottling Co., 339 East 46th St., New York City, let contract altering and building 1 story, brick extension to factory, rein.-con. flooring, brick foundation, on Atlantic Ave., here, to Brady-Butler Co., 18 West 34th St. About $50,000.

★**N. Y., Brooklyn**—R. Dreyer, 826 Manhattan Ave., will build 1 story, 90 x 100 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Meserole St. About $25,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Eye Brand Confectionery Co., 239 Alabama Ave., let contract building 2 story, 50 x 100 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Georgia and Belmont Aves., to H. Gordon, 26 Adelphi St. About $45,000.

★**N. Y., Brooklyn**—L. Malkin, 1182 Liberty Ave., will build 2 story, 50 x 90 ft., brick and steel shop, rein.-con. flooring, concrete foundation. About $40,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Modica & Catalbiano, 268 Jefferson St., will build 1 story, 100 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on DeKalb and Irving Aves. About $25,000. Work will be done by day labor.

★**N. Y., Brooklyn**—L. Oxfeld, 2563 Stone Ave., will build 1 story, 75 x 100 ft., brick and steel garage, rein.con. flooring. concrete foundation, on Ormond Pl. and Putnam Ave. About $30,000. Work will be done by day labor.

★**N. Y., Brooklyn**—D. Perlman, 13 Pennsylvania Ave., will build 1 story, 125 x 125 ft., brick and steel garage and showroom, rein.-con. flooring, concrete foundation, on Crown St. and Bedford Ave. About $40,000. Work will be done by day labor.

★**N. Y., Brooklyn**—M. Riley, 427 Baltic St., will build 1 story, 75 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Baltic and Bond Sts. About $30,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Schrupski & Masulovitch, c/o L. Allmendinger, archt., 20 Palmetto St., will build 3 story, 55 x 75 ft., brick and steel bakery, rein.-con. flooring, brick foundation, on South 2nd St. About $25,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Todd Shipyards, Inc., Van Brunt and Beard Sts., let contract building 1 story, 80 x 125 ft., brick and steel shop, on Henry and Bryant Sts., to D. Ryan, 201 18th St. About $40,000.

★**N. Y., Brooklyn**—Union Elton Co., 1784 Pitkin Ave., will build four factories, each 4 story, 40 x 90 ft., brick and steel, rein.-con. flooring, concrete foundation, at 2402-2430 Atlantic Ave. About $200,000. Work will be done by day labor.

★**N. Y., Brooklyn** (Ridgewood)—L. Mundet & Sons, 59 Pearl St., New York City, will build 4 story, 200 x 200 ft., brick, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on King and Ferris Sts., here. About $400,000. Work will be done by day labor.

★**N. Y., Buffalo**—Dunlap Rubber Co., 1808 Bway., New York City, let contract building twelve 1 and 2 story, rein.-con. and steel factories, rein-con. flooring, concrete foundation, here, to Foundation Co., 233 Bway., New York City. About $20,000,000.

★**N. Y., Elmira**—Genl. Electric Co., Hulett Bldg., let contract building 1 story, 110 x 560 ft., brick, concrete and steel foundry, rein.-con. flooring, concrete foundation, to H. K. Ferguson., 6532 Euclid Ave., Cleveland, O. About $300,000.

★**N. Y., Long Island City**—Loft, Inc., 400 Broome St., New York City, will build 8 story, 35 x 100 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Vernon Ave. Work will be done by day labor.

★**N. Y., Long Island City**—Metropolitan Life Insurance Co., 1 Madison Ave., New York City, let contract building 5 story, 50 x 400 ft., rein.-con. and steel printing plant, rein.-con. flooring, concrete foundation, on Court St. and Thompson Ave., here, to Turner Constr. Co., 244 Madison Ave., New York City. About $1,000,000.

★**N. Y., New York**—Forty-Eighth St. Co., 241 West 43d St., will build 8 story, 100 x 100 ft., brick and steel printing plant, rein.-con. flooring, concrete foundation, at 331 West 44th St. About $400,000. Work will be done by day labor.

★**N. Y., New York**—C. Hubert, 56 West 45th St., let contract building 3 story, 75 x 100 ft., brick and steel factory, rein.-con. flooring, concrete foundation, at 305 West 43rd St., to Gabler Constr. Co., 402 Hudson St. About $85,000.

★**N. Y., New York**—Interborough Rapid Transit, 165 Bway., will build 1 story, 50 x 90 ft., brick and steel power house, rein.-con. flooring, concrete foundation, on Westchester Ave. (Bronx Boro.). About $50,000. Work will be done by day labor.

★**N. Y., New York**—Standard Lithographing Co., 1100 Brook Ave., will build 6 story, 50 x 118 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Brook Ave. and 167th St. About $75,000. Work will be done by day labor.

★**N. Y., New York.**—D. Stevenson Brewing Co., 10th Ave. and 39th St., let contract building 6 story, brick and steel storage plant, concrete foundation, at 501-503 West 39th St., to H. H. Vought, Grand Central Terminal. About $90,000.

★**N. Y., Syracuse**—Brown-Lipe-Chapin Gear Co., Marcellus St., let contract building 5 story, 70 x 297 ft., rein.-con. addition to plant, on Ontario St., to Dupont Eng. Corp., Wilmington, Del. About $800,000.

★**N. Y., Syracuse**—Syracuse Washer Corp., 507 East Water St., let contract building factory on 200,000 sq.ft. site on North Clinton St., to Ford, Bacon & Davis, 115 Bway., New York City. About $1,000,000.

★**N. J., Athenia**—Magor Car Co. let contract building 1 story, 40 x 60 ft., brick and steel power house, rein.-con. flooring, concrete foundation, to W. Hassen, 625 Main St., Passaic. About $35,000. Noted Jan. 22.

★**N. J., Newark**—C. W. Oathont, 2 Stratford Pl., let contract building 3 story, 100 x 185 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Highland St., to Tucker & Lewis, 101 Park Ave., New York City. About $135,000.

★**Pa., Coatesville**—B. R. Stevens, archt., 1737 Filbert St., Phila., let contract to W. Elliott, Coatesville, building 2 story, 80 x 126 ft., rein.-con. and brick factory, for Breuinger Bros., 338 East Lincoln St. Noted Jan. 15.

★**Pa., Phila.**—T. Potter Son Co., Inc., 2nd and Erie Sts., let contract building 3 story, 48 x 91 ft., brick addition to plant, to H. Brockelhurst, 512 West Norris St. About $40,000.

★**Pa., Pittston**—T. W. Bentley Silk Co. let contract building 3 story, 72 x 110 ft., brick mill, rein.-con. flooring, rock foundation, on Main St., to T. Palmer Constr. Co., Mears Bldg., Scranton. About $75,000.

★**Pa., Scranton**—S. Hien, Pittston Ave., let contract building 1 story, 40 x 400 ft., brick, steel and concrete garage, rock foundation, to A. Johnson Co., Scranton. About $41,000.

★**Pa., Scranton**—Standard Throwing Co. let contract building 2 story, 60 x 150 ft., brick, rein.-con. and steel mill, rein.-con. flooring, rock foundation, on Race and Brown Sts., to J. Palumbo Co., Scranton. About $39,000.

★**Pa., Wilkes-Barre**—Bennett Estate let contract building 3 story, 60 x 100 ft., brick, timber and mill construction garage and store, rock foundation, on North Main St., to Walbour & Barney, New Franklin St. About $49,000.

★**Pa., Wilkes-Barre**—J. Thomas Co., Stanton St., let contract building 1 story, 60 x 150 ft., brick, steel and stone garage and factory, rein.-con. flooring, rock foundation, to I. Saba, Stanton St. About $42,000.

Industrial Works (Continued)

★**O., Cleveland** — Friedman-Blau-Farber Co., East 37th St. and Perkins Ave., let contract building 6 story, 57 x 85 x 127 ft., steel and brick addition to factory, to Craig-Curtiss Co., Guardian Bldg. About $200,000.

★**O., Columbus**—Stribling & Lum, archts., 85 North High St., let contract to A. H. Leibrand, 262 Donaldson St., building 1 story, 111 x 157 ft., concrete and brick factory, on Hanford St., for Ohio Wax Paper & Printing Co., 22nd and Frebis Sts. About $45,000; cost plus percentage basis.

★**O., Columbus**—O. G. Roberts, 177 North 4th St., let contract building 1 story, 37 x 120 ft., concrete and brick garage and salesroom, at 594 East Long St., to Knox & Phillip. Builders and Traders Exch. About $55,000.

★**O., Columbus**—P. B. Whitsit Co., 80 West Broad St., let contract building 3 story, 62 x 120 ft., concrete and brick warehouse, on 5th St., to E. E. Pruitt, 308 South High St. About $75,000. Noted Jan. 29.

★**O., Dayton**—Peckham Coal & Ice Co., Daller St., let contract building 1 story, 100 x 100 ft., steel and brick plant, rein.-con. flooring, brick foundation, on Linden Ave., to A. C. Bishop Constr. Co., Guardian Bldg., Cleveland. About $50,000. Noted Jan. 15.

★**O., Dayton**—M. M. Smith Realty Co., 703 Conover Bldg., let contract building 2 story, 60 x 150 ft., rein.-con. and brick garage, rein.-con. flooring, concrete foundation, on West 3rd St., to Frank Hill Smith Co., Inc., Reibold Bldg. About $60,000.

★**O., Marietta**—Safe-Cabinet Co. let contract constructing six 1-4 story, rein.-con. and brick factory buildings, rein.-con. flooring, concrete foundation, to J. Lowes, Schwind Bldg., Dayton. About $8,000,000.

★**Mich., Detroit**—A. E. Harley, archt., Kresge Bldg., let contract to J. A. Moynes & Co., 231 Milwaukee Ave., building 3 story, 76 x 180 ft., brick, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Russell St., for I. Applebaum, 2023 Dime Bank Bldg. About $100,000.

★**Mich., Detroit**—Gray Electric Co., 70 State St., let contract building 2 story, 31 x 132 ft., brick and rein.-con. factory, rein.-con. flooring, concrete foundation, on Jones St., to J. H & A. Haberkorn, 380 14th Ave. About $30,000.

Mich., Lansing—Federal Drop Forge Co. let contract building 1 story, 60 x 120 ft. forge plant, also 60 x 140 ft. dye shop, and trimming department, boiler house, etc., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to Cristman Const. Co., South Bend, Ind.

★**Mich., Lansing**—Novo Engine Co., 702 Porter St., let contract building 2 story, 120 x 200 ft., rein.-con., brick and steel foundry, rein.-con., flooring, concrete foundation, on Porter St., also 1-story, 90 x 280 ft. machine shop, to Christman Constr. Co., South Bend, Ind. Total cost $250,000.

★**Ill., Chicago**—Agar Provision Co., 310 North Green St., let contract building 4 story, 125 x 190 ft., rein.-con., steel and brick factory, rein.-con. flooring, concrete foundation, on Fulton and Green Sts., to Wells Bros. Constr. Co., 53 West Jackson St. About $400,000.

★**Ill., Chicago** — Republic Flow Meters Co., 565 West Washington St., let contract building 2 story, 75 x 125 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, at 2240 Diversey Parkway, to Wells Bros. Constr. Co., 53 West Jackson St. About $85,000.

★**Ill., Chicago**—Tuthill Spring Co., 760 West Polk St., let contract building 1 and 2 story, 210 x 420 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on 31st St. and Kilbourne Ave., to C. B. Johnson & Son, 111 West Washington St. About $225,000.

★**Ill., Chicago**—William Davies Co., Ltd., 4101 South Union Ave., let contract building 6 story, 100 x 130 ft., rein.-con., steel and brick plant, rein.-con. flooring, concrete foundation, on Union Ave. and 41st St., to Wells Bros. Constr. Co., 53 West Jackson St. About $300,000.

★**Wis., Milwaukee**—P. Schwab Co., 16th and Canal Sts., let contract building 1 story, 60 x 200 ft., brick and steel boiler shop, rein.-con. flooring, concrete foundation, on Canal St., to Riesen Bros. Co., 86 Michigan St. About $50,000.

★**Wis., St. Francis** (Milwaukee, P. O.)—Nash Motors Co., Kenosha, let contract building 1 story, 150 x 600 ft. brick and steel assembling plant, rein.-con. flooring, concrete foundation, here, to Northwestern Bridge & Iron Co., 32nd and Hopkins Sts., Milwaukee. About $150,000.

★**Neb., Omaha**—Paxton & Gallagher Co. let contract building 4 story, 58 x 132 ft., rein.-con. and brick warehouse and office, rein.-con. flooring, concrete foundation, on 9th and Jones Sts., to J. Black Masonry & Constr. Co., Wright Bldg., St. Louis, Mo. About $100,000; cost plus percentage basis.

★**Mo., St. Louis**—Whistle Co., Inc., 2918 Locust St., let contract building 2 story, 24 x 58 ft., brick factory, to E. H. Paulus Constr. Co., Wainwright Bldg. About $40,000.

★**Tex., Houston**—Finger & Cato, archts., 601 Kress Bldg., let contract to T. Tellepson, 2714 Park Pl., at $46,018, building 4 story, 42 x 84 ft. ice plant and ice cream factory, rein.-con., rein.-con. flooring, clay foundation for W. H. Irvin, Hemphill and Railroad Sts. Noted Feb. 5.

★**Ore., Portland**—Eagle Flouring Mills Co. will build 1 story, 108 x 132 ft., rein.-con. warehouse, at St. Johns Terminal. About $50,000. Work will be done by day labor under supervision of J. E. Case, St. Johns Terminal.

★**Cal., Los Angeles**—Hollywood Auto Transfer & Storage Co., 1724 North Cohuenga Ave., let contract building 4 story, 95 x 150 ft., rein.-con. storage plant, rein.-con. flooring, concrete foundation, to Leonardt & Peck, 721 H. W. Hellman Bldg. About $70,000.

★**Cal., Los Angeles**—Pacific Mutual Life Insurance Co., 6th and Olive Sts., let contract building 2 story, 33 x 60 ft., rein.-con. underground garage, on Grand Ave. to Olive St. north of 6th St., to Scofield Eng. Constr. Co., 510 Wright & Callender Bldg. About $125,000.

★**Cal., Santa Ana**—Holly Sugar Co. let contract building 2 story, 60 x 100 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, near here, to Leonardt & Peck, 721 H. W. Hellman Bldg., Los Angeles. About $70,000; cost plus percentage basis.

★**Ont., Windsor**—Burroughs Adding Machine Co., Ltd., McDougal Ave., let contract building 3 story, rein.-con., steel and brick factory and office building, rein.-con. flooring, concrete foundation, to Canadian Stewart Co., Windsor. About $300,000.

Buildings

PROPOSED WORK

Me., Belfast—High School—City Bldg. Com. receives bids in March, building 3 story, 150 x 200 ft., timber and steel, rein.-con. flooring, brick foundation. About $85,000.

Mass., Boston — Theatre and Office — Olympia Theatres, Inc., 35 Piedmont St., plans to build about 11 story, 88 x 300 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, on Washington and Milk Sts. About $1,000,000. G. U. Crocker, pres.

Conn., Bristol — Clubhouse — Knights of Columbus, Palos Council, 2 High St., having preliminary plans prepared for clubhouse. About $60,000. Address W. J. Tracy, 13 North Main St. Architect not selected.

Conn., Bristol—School—Bd. Educ. having sketches made by C. W. Crabtree, archt., New Britain, for building brick school, concrete foundation, on King St. About $50,000.

Conn., Hamden (New Haven P. O.)—Schools—Bd. Finance voted to build 2 schools. About $129,000. Architect not selected.

Conn., Hartford—Church—St. Anthony Roman Catholic Church, care of F. A. Pallotti, 877 Main St., purchased 130 sq. ft. site on Talcott St. and plans to build church. About $100,000. Architect not selected

Conn., Hartford — Hospital — Bd. Health applied for $50,000 appropriation to build isolation hospital. Address, C. P. Botsford. Architect not selected

Conn., Hartford—Hotel—T. C. Hardie, care of Hotel Garde, 366 Asylum St., having preliminary plans prepared by F. C. Walz, archt., 348 Trumbull St., for remodeling and building 30x60 ft. addition. About $75,000.

Conn., Hartford—Office—E. M. Stone, archt. and engr., 327 Trumbull St., preparing preliminary plans for 9 story, rein.-con. and steel, rein.-con. flooring, concrete foundation, at 55 Pratt St. Owner's name withheld.

Conn., Hartford—Office—Travelers Insurance Co., Main St., having preliminary plans prepared for 12 story office building. J. L. Wray, pres. Architect not selected.

Conn., Hartford—Theatre and Stores—A. Cutler, 1008 Capitol Ave., having preliminary plans prepared by F. Walz, archt., 348 Trumbull St., for theatre and store building. About $50,000.

Conn., Meriden — Church — Mt. Carmel Italian Roman Catholic Church, Springdale Ave., having preliminary plans prepared by Marchetti & D'Avino, archts., 756 Main St., Hartford, for brick, limestone or granite. About $100,000. D. Ricco, pastor.

Conn., New Haven—Laboratory and Experiment Station—State Bd. Health, 308 Church St., Hartford, and Bilderbeck & Langden, archts., Manwaring Bldg., New London, receive bids about March 1, building 3 story, 51 x 111 ft., brick, stone or concrete, rein.-con. flooring, concrete foundation, on Highland St., here. About $125,000.

Conn., West Hartford (Hartford P. O.)—Fire Station—Bd. Comrs., South Fire Dist., having sketches made for fire station. About $50,000. D. E. Ahern, comr. Architect's name withheld.

N. Y., Brooklyn—Church and School—R. E. Reilly, archt. and engr., 477 5th Ave., New York City, receives bids about Feb. 18, altering 3 story, brick and steel, at 127 North 1st St., for Church of Our Lady of Consolation. About $60,000. C. E. McDonald, president.

N. Y., Brooklyn—Office and Salesroom—Tooker & Marsh, archts. and engrs., 101 Park Ave., New York City, receive bids about March 15, building 4 story, brick, steel and stone, rein.-con. flooring, concrete foundation, on Bedford Ave. and Sterlig Pl., here, for Studebaker Corp., Main and Bronson Sts., South Bend, Ind. About $150,000. Noted Jan. 29.

N. Y., Buffalo—Laboratory—University of Buffalo, 24 High St., plans to build 2 story, brick addition. About $68,000.

N. Y., Massena—Theatre—North Counties Realty Co., Inc., plans to build brick and concrete theatre on Burney property in Main St. Cost between $50,000 and $60,000.

N. Y., New York—Bank and Office—Canadian Bank of Commerce, 16 Exchange St., having sketches made by A. F. Gilbert, archt. and engr., 80 Maiden Lane, altering 8 story building and constructing 2 story addition to same, brick and steel. About $500,000.

N. Y., New York—Hospital—Beth David Hospital, 1326 Lexington Ave., having plans prepared by L. A. Sheinart, archt. and engr., 194 Bowery, for 6 story, 40 x 73 ft., brick, steel and stone, brick foundation, at 1322-1324 Lexington Ave. About $50,000.

N. Y., New York—Loft—B. H. and C. N. Whinston, archts. and engrs., 2 Columbus Circle, receive bids about Feb. 14, building three 5 story, brick and steel, brick foundation, at 117-121 West 33rd St., for 121 West 33rd St. Corp., c/o architects. About $150,000.

N. Y., New York — Office — Clinton & Russell, archts. and engrs., 32 Liberty St., preparing sketches for altering 6 story, brick, steel and stone, at 118 William St. About $55,000. Owner's name withheld.

N. Y., New York—Office—R. Dunther and R. Law, Inc., 25 Broad St., having sketches made by A. F. Gilbert, archt. and engr., 80 Maiden Lane, for 7 story, 40 x 50 ft., brick, steel and stone, concrete foundation, at 131 Cedar St. About $160,000.

N. Y., Niagara Falls — Church—St. Joseph's Parish, 1413 Pine Ave., plans to build 50 x 70 x 122 ft., brick and stone, with 96 ft. steeple. Cost between $60,000 and $70,000. A. Billerio, pastor.

N. Y., Norfolk—High School—Bd. Educ. plans to build 2½ story, 16-20 room, brick high school to replace one recently destroyed by fire. Cost between $60,000 and $75,000. Address E. S. McDonald, Massena

Buildings (Continued)

N. Y., Peekskill—School and Gymnasium—St. Mary Community having plans prepared by C. P. H. Gilbert, archt. and engr., 1123 Bway., New York City, building brick, steel and stone, brick foundation. About $325,000.

N. Y., Rochester—Sales—See "Industrial Works."

N. Y., Syracuse—Church—Greek Orthodox Church plans to build church on Harrison St. About $75,000. P. Zaharis, pres. Architect and engineer not selected.

N. Y., Syracuse—Sanitarium—Onondaga Co. having plans prepared by M. L. King, archt. and engr., Snow Bldg., for tuberculosis sanitarium at Hoppers Glen. About $150,000.

N. Y., Watertown—Business—Buck Terminal Inc. plans to construct 2 story, 50x250 ft., concrete, at 241-253 State St. Cost between $90,000 and $100,000. R. J. Buck, pres.

N. Y., White Plains—High School—Tooker & Marsh, archts. and engrs., 101 Park Ave., New York City, receive bids about March 15, building brick and steel high school, brick foundation, for Bd. Educ. of White Plains. About $125,000. Noted Jan. 15.

N. J., Atlantic City—Church—St. Augustine Protestant Episcopal Church having plans prepared by F. R. Watson, archt., 1211 Walnut St., Phila., for 1 story, 40 x 130 ft., brick and stone, here.

N. J., Camden—Church—Holy Name Catholic Church plans to build church on 5th and Vine Sts. About $100,000. T. J. Whelan, pastor.

N. J., Flemington—Bank—Hunterdon Co. Natl. Bank having plans prepared by W. A, Klemann, archt., 1st Natl. Bank Bldg., altering and improving bank. About $50,000.

N. J., Jersey City—School—St. Aloysius Church, West Side Ave., having plans prepared by W. T. Fanning, archt., 5 Colt St., Paterson, for new school.

N. J., Trenton—Club House—Trenton Country Club plans to build 2 story addition to club house on Asylum Rd. About $90,000. W. M. Dickinson, 145 East Hanover St., pres.

N. J., Trenton—Theatres—Estate B. F. Keith, Palace Theatre, New York City, purchased site on West State St. and plans to build theatre. About $1,000,000. Architect not selected.

N. J., Verona (Montclair P. O.)—School—Bd. Educ. plans to build 6 room school, to include auditorium. About $90,000.

N. J., Westfield—School—Bd. Educ. having plans prepared by Wilder & White, engrs. and archts., 50 Church St., New York City, for 2 story, brick, steel and stone, brick foundation, here. About $75,000.

Pa., Allentown—Chapel—St. Elizabeth's Protestant Episcopal Church having plans prepared by F. R. Watson, archt., 1211 Walnut St., Phila., for 1 story, 45 x 60 ft., stone and stucco. Cost to exceed $50,000.

Pa., Altoona—High School—City receives bids about June 1, building 3 story, 200 x 250 ft., rein.-con. and steel junior high school and power plant, rock foundation, on 14th St., 5th and 6th Aves. About $880,000. C. M. Piper, secy. school dist. Architect and engineer to be named March 1.

Pa., Bethlehem—Bank—Bethlehem Natl. Bank plans to build 5 story, 40 x 150 ft., brick and steel, rock foundation. About $150,000. Architect not selected.

Pa., Blakely—Schools—Bd. Educ. having plans prepared by E. H. Davis and G. M. D. Lewis, associate archts., Union Bank Bldg., Scranton, for 2 story, 50 x 80 ft., brick and timber grade school, rock foundation, on Blakely Ave., cost $60,000; also 2 story, 40 x 90 ft., brick and timber high school, rock foundation, on Main St. About $60,000.

Pa., Carbondale—Bank—Miners & Mechanics Bank, 9-11 North Main St., having plans prepared for 2 story, 40 x 90 ft., brick, rein.-con. flooring, rock foundation, on Main St. About $80,000. Private plans.

Pa., Carbondale — Theatre — A. Chellino, South Main St., plans to build 2 story, 50 x 150 ft., brick and steel, rock foundation, on South Main St. About $60,000. Architect not selected.

Pa., Cresson—Bank—C. Wenderoth, pres. Farmers Deposit Bank, receives bids about Mar. 1, building 2 story, 25 x 65 ft., concreto and brick, concrete foundation on Front St. About $55,000. Architect not selected.

Pa., Hazleton—Store, etc.—S. Rosin, Wyoming St., having plans prepared by L. Reisman, archt., Miller Bldg., and receives bids about Feb. 14, for 3 story, 40 x 75 ft., brick and steel store and warehouse, rock foundation. About $50,000.

Pa., Hungtingdon — Dormitory — G. E. Braumbaugh, archt., Real Estate Trust Bldg., Phila., receives bids in spring building 3 story, 27 x 32 x 38 x 85 ft., brick, on Campus, for Juniata College.

Pa., Lee Park (Wilkes-Barre P. O.)—Church—Baptist Tabernacle Church having plans prepared for 1½ story, 30 x 100 ft., stone, limestone and brick rock foundation, on Division and Regent Sts. About $80,000. Private plans.

Pa., Phila. — Cafe—W. J. Ostheimer, Widener Bldg., having plans revised by R. E. White, engr. and archt., Pennsylvania Bldg., for 1 story, 50 x 125 ft., stone, to be known as "Chateau Belmont," in Fairmount Park. Noted Jan. 8.

Pa., Phila.—Church—St. Francis Assisi Church, West Logan and Green Sts., having sketches drawn by F. F. Durang, archt., 1220 Locust St., for stone church. Cost to exceed $50,000.

Pa., Phila. — Church,— Third Christian Church, Oxford and 61st Sts., will have plans prepared by Druckenmiller & Williams, archts., 1537 Chestnut St., for 1 story, 110 x 112 ft., brick addition. Cost to exceed $50,000.

Pa., Phillipsburg—Hotel—G. S. Idell, archt., 1705 Chestnut St., Phila., receives bids about Feb. 17, for 6 story, 80 x 100 ft., brick and stone, for Phillipsburg Hotel Corp.

Pa., Reading—Mercantile—S. S. Kresge Co., Kresge Bldg., Detroit, Mich., having plans prepared by J. E. Mills & Son, archts., 1305 Kresge Bldg., altering and building 4 story, 50 x 270 ft., rein.-con. brick and steel addition, concrete foundation, here. About $100,000.

Pa., Scranton—Office—Maccar Truck Co., Gilligan St., having plans prepared by E. H. Davis and G. M. D. Lewis, associate archts., Union Natl. Bank Bldg., for 1 story, 40 x 65 ft., brick and steel, rock foundation. About $50,000.

Pa., Scranton — School—Welfare League having plans prepared by E. H. Davis and G. M. D Lewis, associate archts., Union Natl. Bank Bldg., for 1 story, 100 x 100 ft., frame and stucco private school, rock foundation on Wabash St. About $85,000.

Pa., Scranton—Store—E. H. Davis and G. M. D. Lewis, associate archts., Union Natl. Bank Bldg., preparing plans for 5 story, 25 x 110 ft., brick and steel, rein.-con. flooring, rock foundation. About $125,000. Owner's name withheld.

Pa., Scranton—Store—M. T. Rielly, Lackawanna Ave., having plans prepared by L. P. Turon, archt., Post Office Bldg., Pittston, for 3 story, 30 x 90 ft., brick and steel, rock foundation. About $50,000.

Pa., Scranton—Store—J. M. Temko, Adams Ave., having plans prepared by L. Reisman, archt., Miller Bldg., and receives bids about Feb. 14, building 3 story, 40 x 80 ft., brick, rock foundation. About $50,000.

Pa., Shickshinny — Bank — First Natl. Bank plans to build 3 story, 50 x 100 ft., brick, steel, limestone, marble and granite, on Main and Union Sts. About $100,000. Architect not selected.

Pa., Wilkes-Barre — Engine House—City plans to build 3 story, 50 x 90 ft., mill construction, rock foundation, on North Washington St. About $50,000. Architect not selected.

Md., Baltimore—Bank—Mercantile Trust & Deposit Co., Calvert and Redwood Sts., having revised plans prepared by Trowbridge & Livingston, archts., 527 5th Ave., New York City, for altering rein.-con. and steel, concrete foundation. About $60,000.

Md., Baltimore—Sales—Wilson Nash Motors Co., 138 West Mt. Royal Ave., having plans prepared by Owens & Sisco, archts., 1605 Continental Bldg., for 3 story, 120 x 150 ft., concrete and brick, concrete foundation on Oliver St. and Maryland Ave. about $50,000.

Md., Baltimore—Theatre—Wilson Theatre Co., 418 East Baltimore St., having plans prepared by E. G. Blanke, archt., 213 North Calvert St., alternating and building a 3 story, 140 x 200 ft., rein.-con., brick and steel addition, concrete foundation, on Gay and Fayette Sts.

Md., Timonium—Exhibit—Maryland State Fair & Agricultural Society, c/o F. R. Lane, South and Water Sts., Baltimore, having plans prepared by Mottu & White, archts., 324 North Charles St., Baltimore, for 1 and 2 story, 100 x 250 ft., concrete, concrete foundation, at fair grounds, here. About $100,000.

Md., Upper Marlboro—Bank—Eastern Shore Trust Co., Cambridge, plans to build 2 story, 35 x 45 ft., brick and stone, stone and concrete foundation, here. About $50,000. R. L. Harris,, 1133 Calvert Bldg., Baltimore, archt.

Va., Danville—School—Riverside and D River Cotton Mills having plans prepared by E. R. James, archt., Danville, for 2 story, 60 x 140 ft., brick. About $50,000.

Va., Danville—Temple and Office—Danville Masonic Chapter plans to construct 6 or 10 story temple and office building, on Main St. About $150,000. Architect not selected.

Va., Franklin—Theatre—W. N. Diehl, archt., Law Bldg., Newport News, preparing plans for 35 x 105 ft., stucco and brick, here. Owner's name withheld.

Va., Harrisonburg—Hotel—J. M. Kavanaugh and C. M. Robertson, archt., Times Dispatch Bldg., soon receive bids building 6 story, 40x100 ft., brick addition to Kavanaugh Hotel, concrete foundation, on Main St. Cost to exceed $50,000.

Va., Martinsville—Hotel—L. E. Steven soon receives bids building 3 story, 40 x 82 ft., brick, to be known as Hotel Hamilton. About $50,000. E. R. Jones, Dudley Bldg., Danville, archt.

Va., Richmond—Church—Randolph Baptist Church having plans prepared by H. L. Cain, archt., 12 North 9th St., for 2 story, 88x95 ft., brick, on Randolph and Beverly Sts. About $50,000. W. E. Robertson, 302 Randolph St., pastor.

N. C., Charlotte—Office—Clark Publishing Co. plans to build 4 story, 40 x 100 ft. office building. About $75,000. J. E. Sirrine, Greenville, S. C., archt.

N. C., Snow Hill—School—J. B. Debisam, school supt., receives bids about Mar. 1, for 2 story, 47 x 107 ft. About $50,000. Bradbury & Barlow, Greenville, archts.

Ala., Tuscaloosa—Bank and Office—Merchants Bank & Trust Co. plans to build 8 or 10 story, 80 x 132 ft., on Greensboro Ave. and Broad St. Architect and engineer not selected.

O., Bloomville—School—Bd. Educ. having plans prepared by Glass & Austin, archts., Grand Theatre Bldg., Columbus, for 2 story, 80 x 126 ft., brick and stone. About $110,000.

O., Cincinnati—Store—Rollman & Sons, 5th and Vine Sts., having plans prepared by Reliance Eng. Co., engrs., 4th Natl. Bank Bldg., for 10 story, 100 x 125 ft. About $1,000,000. Noted Jan. 22.

O., Cleveland—Church—St. Paul's Episcopal Church plans to build 1 story, steel, brick and stone. About $200,000. W. R. Breed, East 40th St. and Euclid Ave., pastor. Architect not selected.

O., Cleveland—Church—Second Presbyterian Church plans to build 1 story, brick, steel and stone. About $100,000. P. F. Sutphen, 2525 Stratford Ave., pastor. Architect not selected.

O., Cleveland—Commercial—W. S. Ferguson Co., engrs., 1900 Euclid Ave., receives bids about Feb. 26, building 6 story, 100 x 200 ft., concrete, steel, brick and terra cotta, rein.-con. flooring, concrete foundation, on East 61st St. and Euclid Ave., for G. A. Tenbusch, Union Bldg. About $400,000.

O., Cleveland—Commercial—W. Koehl, archt., 906 Park Bldg., soon lets contract building 2 story, 50 x 130 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, for West Center Sales Co., West 30th St. and Lorain Ave. About $50,000.

Buildings (Continued)

O., Cleveland — Commercial — J. White, c/o R. H. Hinsdale, archt., Bangor Bldg., having plans prepared for 3 story, 60 x 79 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Eddy Rd. and Durant Ave. About $50,000.

O., Cleveland — Exchange — Cleveland Telephone Co., Engineers Bldg., had plans prepared by A. N. Symes, engr., Engineers Bldg., for 2 story, 97 x 145 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Dille Rd. About $250,000.

O., Cleveland—Hotel—G. A. Tenbusch, Union Bldg., having plans prepared by W. S. Ferguson Co., archts., 1900 Euclid Ave., for 4 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, at 1906 East 105th St. About $250,000.

O., Cleveland—Police Station—City plans to build 2 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 37th St. and Orange Ave. About $100,000. F. H. Betz, 604 City Hall, archt.

O., Cleveland — Sanitarium — Windsor Sanitarium Co., 4416 Windsor Ave., plans to build 2 story, 60 x 94 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Cedar Rd. About $75,000. F. W. Striebinger, 1900 Euclid Ave., archt.

O., Cleveland — School — St. George's Church, c/o J. E. Potter, archt., 947 Leader-News Bldg., having plans prepared for 2 story, 90 x 140 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 67th St. and Superior Ave. About $100,000.

O., Cleveland—School and Church—St. Joseph's Roman Catholic Society, Boston, Mass., plans to build parochial school and church, on 114th St. and St. Clair Ave., here. About $150,000. J. W. Bell, Aspinwall Ave., Boston, pastor. C. R. Greco, 8 Beacon St., Boston, archt.

O., Cleveland—Theatre—Haddam Impvt. Co., c/o Ulmer & Berne, Hippodrome Bldg., having plans prepared by Rapp & Rapp, archts., 190 North State St., Chicago, for 1 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 105th St. and Euclid Ave. About $400,000,

O., Columbus — Office — North High Realty Co., 7th Ave. and Scotch St., having plans prepared by Richards, McCarty & Bulford, archts., Hartman Bldg., for 5 story, 96 x 187 ft., concrete, steel and brick, on East Broad St. About $200,000.

O., Columbus—Sales—G. R. Bassett, archt., Central Natl. Bank Bldg., receives bids about Feb. 15, building 2 story, 70 x 140 ft., brick for Ohio Motor Car Co., 1160 West Broad St. About $50,000.

O., Columbus — Salesroom — See "Industrial Works."

O., Columbus—Store—J. M. Caren & Co., 171 North High St., having plans prepared by Stribling & Lum, archts., 85 North High St., for 4 story, 30 x 80 ft. brick and terra cotta addition. About $60,000.

O., Kent—High School—Bd. Educ. receives bids about April 1, building 3 story, 100 x 200 ft., concrete and brick. About $250,000. Mills & Millspaugh, 67 East Long St., Columbus, archts.

O., Lakewood (Cleveland P. O.)—School —Bd. Educ., Warren Rd., plans to build 2 story, concrete, steel and brick addition to Franklin School, rein.-con. flooring, concrete foundation. About $75,000. C. W. Hopkinson, 900 Rose Bldg., Cleveland, archt.

O., Lakewood (Cleveland P. O.)—School —Bd. Educ., Warren Rd., plans to build 2 story, concrete, steel and brick addition to Harrison School, rein.-con. flooring, concrete foundation. About $75,000. C. W. Hopkinson, 900 Rose Bldg., Cleveland, archt.

O., Lakewood (Cleveland P. O.)—School —Bd. Educ., Warren Rd., plans to build Lincoln School, 2 story, concrete, steel and brick, rein.-con. flooring, concrete foundation. About $300,000. C. W. Hopkinson, 900 Roso Bldg., Cleveland, archt.

O., Lakewood (Cleveland P. O.)—School —Bd. Educ., Warren Rd., plans to build 2 story, concrete, steel and brick addition to McKinley School, rein.-con. flooring, concrete foundation. About $75,000. C. W. Hopkinson, 900 Roso Bldg., Cleveland, archt.

O., Middletown — Hotel — Middletown Hotel Co. having plans prepared by F. L. Packard, archt., New Hayden Bldg., Columbus, for 7 story, 50 x 150 ft., concrete, steel and brick, on Main St. About $400,000.

O., Oxford—Dormitory—Diltoe, Fahnestock & Farber, archts., 18 West 7th St., Cincinnati, rejected bids received Jan. 15, building rein.-con. and stone, for Miami University. About $300,000. W. Franz, 1703 Union Trust Bldg., Cincinnati, engr. Plans will be revised and work readvertised.

O., Parma—Schools—Bd. Educ. having revised plans prepared by C. W. Bates, archt., Natl. Bank Bldg., Wheeling, W. Va., for three 1 story, 60 x 120 ft., concrete, steel and brick, rein.-con. flooring, concrete foundations. About $400,000. All former bids rejected. Noted Jan. 22.

O., Shaker Heights (Cleveland P. O.)—School—Bd. Educ. plans to build 2 story, concrete, steel and brick, rein.-con. flooring, concrete foundation. Bonds for $300,000 voted for project. Address C. A. Palmer, 10111 Euclid Ave., Cleveland, Architect and engineer not selected.

Mich., Atlas—Hospital—City having preliminary plans prepared by Van Leyen, Schilling & Keough, archts. and engrs., 1115 Union Trust Bldg., Detroit, for 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $150,000.

Mich., Benton Harbor—Community House —Congregation of Good Samaritan, c/o H. S. Gray, 8-10 Sonner & Gray Bldg., plans to build 2 story, brick and steel, concrete foundation. About $100,000. Architect not selected.

Mich., Detroit — Lodge — Detroit Lodge Loyal Order of Moose, 40-42 Congress St., plans to build 3 story, rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation, on Cass Ave. and Elizabeth St. About $500,000. Architect not selected.

Mich., Detroit—Theatre and Offices—C. F. Clippert, et al, 2051 West Grand Blvd., having plans prepared by C. W. & G. L. Rapp, archts., 190 North State St., Chicago, for 2 story, 130 x 200 ft., brick, steel, rein.-con. and terra cotta, rein.-con. flooring, concrete foundation, on Grand River Ave. and West Grand Blvd. About $2,000,000.

Mich., Pontiac—Jail—Bd. Supervs, Oakland Co., having plans prepared by F. D. Madison, archt., Royal Oak, for 3 story, 46 x 176 ft., rein-con., brick, steel and stone addition, rein.-con. flooring, concrete foundation, on Wayne and Warren Sts. About $275,000.

Ill., Chicago—Loft—Curt. Teich & Co., 1745 Irving Park Blvd., plans to build 3 story, 85 x 150 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Bway. and Lafayette St. About $150,000. Architect not selected.

Ill., Herrin—Temple—Miners Union plans to build 4 story labor temple, here. About $175,000. N. S. Spencer & Son, 37 West Van Buren St., Chicago, archts.

Wis., Hartford—Lodge—A. F. & A. M. Lodge, c/o Secy., plans to build 3 story, 00x150 ft., brick, rein.-con. and steel, brick and concrete foundation. About $60,000. Architect not selected.

Wis., Manitowoc—Business—Manitowoc Realty Co. plans to build 5 story, 60x150 ft., brick, rein.-con. and steel, brick foundation, on Leup's Addition. About $60,000. Architect not selected.

Wis., Manitowoc—Poor Farm House—Bd. Comrs. Manitowoc Co., c/o J. Lorfeld, chn., Cleveland, plans to build 3 story, brick, rein.-con. and steel, brick foundation. About $50,000. Architect not selected.

Wis., Milwaukee—Sales—J. Heil, 26th and Montana Aves., plans to construct 4 story, 100 x 120 ft., rein.-con. and brick auto sales building, rein.-con. flooring, concrete foundation, on Bway. Architect and engineer not selected.

Wis., Milwaukee — School — Herbst & Kuenzli, archt., Caswell Blk., soon let contract building 2 story, 80 x 100 ft., brick and concrete, rein.-con. flooring, concrete foundation, on Maple St., for St. Anthony's Catholic Church, 4th Ave. About $90,000.

Wis., Racine—Church and School—Trinity Lutheran Church, 1218 Albert St., having plans prepared by W. C. Weeks, archt., 720 Ontario Ave., Sheboygan, for 1 and 2 story, 90 x 100 ft., brick and tile, rein.-con. flooring, concrete foundation, on Albert St. About $80,000. F. Eseman, pastor.

Wis., Rice Lake—Hospital—Methodist Hospital Assn., c/o F. E. Bauchop, plans to build 4 story, 60x250 ft., brick, rein.-con. and tile, brick foundation, on North Main St. About $100,000. Architect not selected.

Wis., Sheboygan — Theatre—Mikadow Amusement Co., 1110 Washington St., having plans prepared by S. F. Kadow, archt., 451 Mitchell St., Milwaukee, for 1 story, 70 x 200 ft., brick, rein.-con. and tile, brick foundation. About $100,000. J. Kadow, pres. Noted Jan. 1.

Wis., South Milwaukee—Bath House—A. C. Clas. archt., Colby-Abbot Bldg., Milwaukee, soon lets contract building 1 story, 100 x 210 ft., rein.-con. and stucco, rein.-con. flooring, concrete foundation, for Milwaukee Co. Park Bd., 419 East Water St., Milwaukee. About $50,000.

Wis., South Milwaukee — School — Bd. Educ. plans to build 2 story, brick, concrete foundation. About $65,000. Architect and engineer not selected.

Wis., West Allis (Milwaukee P. O.)—City Hall—City having plans prepared by R. A. Messmer & Bro., archts. and engrs., Majestic Bldg., for 2 story, 60x100 ft., brick and concrete, rein.-con. flooring, concrete foundation, on Greenfield Ave. About $90,000.

Ia., Cedar Rapids—Consistory—Consistory Fidelity Co., c/o C. H. Cogswell, 601-603 Amer. Trust Bldg., plans to construct brick consistory building. About $125,000. Architect not selected.

Ia., Cedar Rapids—Hotel—Allison Hotel Co., 325 1st Ave., having plans prepared by Stevens Eng. Co., archts., Cedar Rapids, for 4 story, 80 x 140 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, on 4th St. and 1st Ave. About $300,000.

Ia., Danville—School—Independent Consolidated School Dist. plans to build 2 story, rein.-con. and steel, wood flooring. About $75,000. Architect not selected.

Ia., Eldora—Bank—Hardin Co. Natl. Bank plans to build 1 story, fireproof bank. About $60,000. Architect and engineer not selected.

Ia., Fairfield—Church—Methodist Episcopal Church plans to build brick church. About $80,000. Architect to be selected at once.

Ia., Hayesville—School—Bd. Educ. Consolidated Dist., having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 1 story, 56 x 86 ft., rein.-con. and brick, concrete foundation. About $60,000. R. G. H. Richardson, secy.

Ia., Jamison—School—Bd. Educ., Consolidated Dist., having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 2 story, 54 x 70 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation. About $55,000.

Ia., Jefferson—School—Bd. Educ Consolidated Dist. plans to build 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $70,000. W. Gordon, Hubbell Bldg., Des Moines, archt.

Ia., Linby — School — Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 2 story, 56 x 86 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $70,000. C. W. Edwards, secy.

Ia., Mason City—Nurses Home—Park Hospital Assn. having plans prepared by E. O. Broaten, archt., Mason City, for 4 story, 32 x 102 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $150,000.

Ia., Mason City—School—Bd. Educ. voted $75,000 bonds to build school. Architect and engineer not selected.

Ia., Mediapolis — School — Independent School Dist. plans to build 2 story, rein.-con., steel, brick and stone, wood flooring. About $80,000. Architect not selected.

Ia., Middletown — School — Independent Consolidated School Dist. plans to build 2 story, brick and stone, wood flooring. About $60,000. Architects not selected.

Buildings (Continued)

Ia., Oskaloosa—Armory—Memorial Armory Assn. plans to build semi-fireproof memorial armory. About $60,000. Architect not selected.

Ia., Ottumwa—School—Bd. Educ. plans to build brick, rein.-con. and steel school, rein.-con. flooring, concrete foundation. About $700,000. Croft & Boerner, 833 Palace Bldg., Minneapolis, archts. G. L. Kerns, Ottumwa, associate archt.

Ia., Pleasant Grove (New London P. O.)—School—Independent School Dist. plans to build 2 story, tile, rein.-con. flooring. About $80,000. Architect not selected.

Ia., Sperry—School—Consolidated Independent School Dist. plans to build 2 story, rein.-con. and steel. About $80,000. Architect not selected.

Ia., Sutherland—School—Bd. Educ. plans to build 3 story, 66 x 140 ft., brick and steel. About $80,000. Keffer & Jones, 201 Hubbell Bldg., Des Moines, archts.

Ia., Washingtnn—Memorial Hall—City plans to build brick memorial hall, concrete foundation. About $70,000. Architect and engineer not selected.

Ia., Webster City—Hotel—Commercial Club soon receives bids building 3 story, 70 x 118 ft., rein.-con. and brick. About $100,000. Private plans.

Ia., Welton—School—Bd. Educ. Consolidated Dist., soon receives bids building 3 story, 50x85 ft., brick, concrete and steel, concrete foundation. About $65,000. C. A. Dieman & Co., 408 Granby Bldg., Cedar Rapids, archt. Noted Jan. 22.

Ia., Yarmouth—School—Consolidated Independent School Dist. plans to build 2 story, rein.-con. and steel, wood flooring. About $80,000. Architect not selected.

Ia., Zearing—School—Consolidated Independent School Dist. having plans prepared by W. L. Pedicord, archt., Iowa Falls, for 2 story, 72 x 96 ft., brick, stone and tile. About $80,000.

Minn., Blooming Prairie—High School—Bd. Educ. soon lets contract building 2 story, 80 x 120 ft., rein.-con. and brick, with 50 x 64 ft. wing. About $150,000. Jacobson & Jacobson, Owatonna, archt. F. Tustison, Auditorium Bldg., Minneapolis, engr.

Minn., Kinney — School — Independent School Dist. 35, Buhl, soon lets contract building 2 story, 152 x 216 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, here. About $250,000. A. W. Kerr & Co., Matheson Bldg., Virginia, archts. and engrs.

Minn., Minneapolis—School—Northwestern Bible Training School, 6 11th St., S., having plans prepared by Long, Lamoreaux & Long, archts., Andrus Bldg., for 5 story, 44 x 132 ft., rein.-con. and brick addition, on Harmon Pl. About $250,000.

Minn., St. Paul—Sanitarium—A. H. Wheeler, archt., 416 Globe Bldg., preparing plans for sanitarium midway between here and Minneapolis, to include mud, Turkish and Russian baths; and 1 story, 40 x 75 ft. swimming pool; centre section 3 story, 86 x 88 ft., concrete and brick, with two 2 story, 25 x 46 ft. wings. About $125,000. Owner's name withheld.

Kan., Ft. Scott—Ft. Scott—Memorial—City election in April to vote on $250,000 bonds to build 2 story memorial on National Ave.

Kan., Garden City—Church—First Christian Church plans to build 2 story, brick, concrete and steel, concrete foundation. About $60,000. Smith, Beattie & Co., Nelson Bldg., Hutchinson, architects.

Kan., Liberat—Hotel—Lorentz, Schmidt & Co., 121 North Market St., Wichita, preparing plans building 4 story, 75 x 140 ft., rein.-con., brick and steel, concrete foundation. About $200,000. Owner's name withheld.

Kan., McPherson — Church—Church of Brethren plans to build church. About $75,000. Architect to be selected at once.

Kan., Parsons—High School—Bd. Educ. having plans prepared by T. W. Williamson & Co., archts., Central Natl. Bank Bldg., Topeka, building 2 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $175,000.

Neb., Osceola—Courthouse—Village receives bids about March 15, for 3 story, 72 x 98 ft., rein.-con., rein.-con. flooring, concrete foundation. About $150,000. W. E. Gernandt, 634 Keeling Bldg, Omaha, archt.

S. D., Watertown—Church—Scandinavian Lutheran Church hvaing plans prepared by P. O. Moe, archt., New York Life Bldg., Minneapolis, for 1 story, 46 x 80 ft., brick, tile and stone. About $55,000.

Mont., Bozeman — High School and Auditorium—Bozeman School Dist. voted $60,000 bonds to build 2 story addition to Emerson Junior High School, to include auditorium, brick, stone or concrete. Architect not selected. Address Bd. Educ.

Mont., Butte—Schools—School Dist. 1 election April 3, to vote on $1,250,000 bonds to build following schools: new uptown high school at South Main St. between Porphyry and Gold Sts., cost $450,000; southside high and junior high school combined, $400,000; grade school in northwest section and 1 in southwest section, $150,000 each; also grade school to replace Jefferson school on new site 2 blocks from present location, $90,000. W. Smith, Butte, archt.

Mont., Dillon — Dormitory—Beaverhead Co. election April 23, to vote on $70,000 bonds to build dormitory for high school. Architect not selected.

Mont., Lewistown — High School—Bd. Trustees Fergus Co. rejected bids received Jan. 15, building high school. Work will be postponed for present. Link & Haire, 317 Electric Bldg., archts. Noted Jan. 8.

Mont., Malta—High School—G. E. Ellinger, archt., Havre, receives bids about April 1, building 2 story, 67 x 124 ft., for School Dist. 14. About $60,000.

Mont., Miles City—High School—Custer Co. election April 23, to vote on $250,000 bonds to build 2 story, concrete, brick or stone, in small town near here. Architect not selected.

Mo., Chillicothe—Memorial Hall—Livingston Co. Memorial Bldg. Assn. being organized to build memorial hall, here. About $200,000. C. F. Adams, pres. Architect not selected.

Mo., Kansas City — Church — Central Presbyterian Church, c/o C. A. Gould, chairman Finance Com., 901 Harrison St., soon receives bids building 1 story, brick and stone, rein.-con. flooring, concrete foundation, on Campbell St. and Armour Blvd. About $250,000. Shepard & Wiser, 301 R. A. Long Bldg., archts. Noted Jan. 22.

Mo., Kansas City—Sales—Wight & Wight, archts. and engrs., 1st Natl. Bank Bldg., soon receive bids building 1 story, 49x115 ft., rein.-con. and brick, concrete foundation, on 16th and Grand St., for E. W. Shields Estate, Bd. Trade Bldg. About $50,000.

Mo., Mexico—Theatre—Orpheum Theatre Co. plans to build 4 story, rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $100,000. S. C. Thompson, mgr. Archt. not selected.

Ark., Blytheville—Hotel—Chamber of Commerce promoting plans to build 6 story, 100 x 140 ft., brick and concrete. About $350,000. C. P. Browning, secy.

Tex., Dallas—Office—Reilly & Hall, engrs. and archts., 749 5th Ave., New York City, preparing plans for 20 story, brick, steel and stone, concrete foundation, here. About $2,500,000. Owner's name withheld.

Tex., Kenedy—High School—Ind. School Dist. voted $60,000 bonds to build 3 story high school. R. C. Cameron, San Antonio, archt.

Tex., Waco — University—Baylor University soon lets contract building 4 story, 40 x 210 ft., with two 40 x 113 ft. "Ls," rein.-con. and brick, rein.-con. flooring. About $400,000. B. D. Eastwood, 405 Praetorian Bldg., archt.

Tex., Wharton—Bank—Wharton Bank & Trust Co. having plans prepared by A. C. Finn, archt., 201 Foster Bldg., for 1 story, 40 x 87 ft. bank. About $50,000.

Okla., Ada — Courthouse—Pontotoc Co. voted $200,000 bonds to build courthouse. Architect and engineer not selected.

Okla., Frederick—Hotel—Frederick Hotel Co., c/o Commerce Club, plans to build fireproof hotel. About $200,000. Architect and engineer not selected.

Okla., Guthrie—Consistory and Dormitories—Scottish Rite Consistory having plans prepared by Hawk & Parr, archts., Security Bldg., Oklahoma, for 3 story, 208 x 253 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $1,000,000. Noted Aug. 7.

Okla., Nowata — Temple—Masonic Sincerity Lodge plans to build. About $60,000. Architect and engineer not selected.

Okla., Pawhuska—Bank—Citizens Natl. Bank plans to build bank. About $100,000. Architect and engineer not selected

Okla., Ponca City—Church—Presbyterian Church having plans prepared by Butler & Saunders, archts., Kennedy Bldg., for 1 story, brick, concrete and steel, concrete foundation. About $60,000.

Okla., Tulsa—Club—City Club plans to build 2 story, 40 x 70 ft. club house. About $100,000. Architect and engineer not selected. A. Campbell, pres.

Okla., Tulsa—Hospital—R. V. Smith, 502 Daniel Bldg., under auspices of Lions Club, has started campaign to raise $1,000,000 to build hospital for county. Architect and engineer not selected.

Okla., Tulsa—Mission—Mission of Redeeming Love, 109 East 2nd St., having plans prepared by Layton & Smith, archts. and engrs., 701 Majestic Bldg., Oklahoma, for 4 story, 25 x 140 ft., at 107 South Boston St. About $60,000.

Okla., Woodward — Church — Methodist Episcopal Church having plans prepared by U. G. Charles & Co., archts., 601 Schweiter Bldg, Wichita, Kan., for 2 story, 60 x 80 ft., brick, concrete and steel, concrete foundation. About $52,000.

Idaho, Boise — Lodge — Boise Masonic Lodge plans to build 2 story, stone, brick, rein.-con., stone and concrete foundation. About $100,000. Architects' name withheld.

Idaho, Idaho Falls — Bank — Anderson Bros. Bank having plans prepared by Wight & Wight, archts., 400 First Nat'l Bank Bldg., Kansas City, Mo., for 1 story, 70 x 94 ft., rein.-con. and brick, concrete foundation. About $175,000.

Ariz., Phoenix—Church—Methodist Episcopal Church South Congregation having plans prepared by Lescher & Kibbey, archts., Bank of Arizona Bldg., for 60 x 130 ft., concrete and brick, concrete foundation, on North Central Ave. About $100,000.

Wash., Spokane — Lecture, Dormitory, Etc.—Bd. Trustees of Whitworth Presbyterian College, Spokane Estates, plans to construct lecture building, cost $100,000, dormitory, $75,000, and central heating plant, $75,000; 1 and 2 stories, probably brick. A. Beatie, pres. Architect not selected.

Wash., Tacoma—Church—Bd. Trustees of United Presbyterian Church plans to build 1 story, stone, Gothic Tudor type. About $50,000. F. Shaw, chn. Architect not selected.

Wash., Yakima—Lodge—Local Lodge of Knights and Ladies of Security plans to build 1 story, brick or stone. About $50,000. Architect not selected.

Ore., Astoria—Civic Center—City voted $300,000 bonds to establish civic center to include central building and improvement of grounds. E. G. Gearhart, auditor.

Ore., Forest Grove—Home—W. C. Knighton, archt., U. S. Bank Bldg., Portland, receives bids in March, building 2 story, 83 x 134 ft., brick or stone, for Oregon Masonic and Eastern Star Lodge. About $100,000.

Ore., Portland — Barracks — Salvation Army, Union Depot, plans to build 1 or 2 story, 75 x 100 ft., brick or concrete, on 6th and Ankeny Sts. About $150,000. T. W. Scott, c/o Salvation Army, Seattle, mgr. Architect not selected.

Ore., Portland—Nursery—A. Kerr Nursery, 29-14th St., having plans prepared by Johnson, Parker & Wallwork, archts., U. S. Bank Bldg., and soon receives bids building 2 story, 50 x 125 ft., brick, on East 22nd St and Sandy Blvd. About $50,000.

Ore., Portland—Lodge— B. P. O. E., 329 Stark St., plans to build 6 story, brick and concrete, on Bway. and Stark St. About $500,000. Architect not selected.

Buildings (Continued)

Ore., Prineville—Business—M. Standish, archt., The Dalles, preparing plans for 2 story, brick or tile business block. About $50,000. Owner's name withheld.

Ore., Redmond—High School—Bd. Educ. plans to build 2 story, brick or concrete. About $50,000. M. Standish, The Dalles, architect.

Ore., Roseburg — Sanitarium — Ruiter Sanitarium Co. plans to construct sanitarium on Bonaday site, to include 2 story, 50 room administration building with lobby, swimming pool and auditorium, hollow tile construction; also twenty-five 1 story, frame cottages. About $250,000. R. D. McFarland, Boston, Mass., architect.

Cal., Anaheim—Auditorium, Gymnasium, etc.—Trustees Union High School Dist. retained J. F. Walker, archt., 1st Natl. Bank Bldg., to prepare plans for auditorium, gymnasium and domestic science department additions to high school. About $150,000.

Cal., Atascadero — Hotel — Atascadero Colony plans to build 2 or 3 story, 100 room, hollow tile hotel on 8 acre central site. Cost between $400,000 and $500,000. E. G. Lewis, manager.

Cal., Calexico—Bath House—J. Cox, mgr. of bath house at Venice, purchased 3 acre site here and plans to build 100 x 100 ft., concrete and brick.

Cal., Fresno—Theatre—Kinema Investment Co. plans to build theatre at 1317 J St. About $200,000. E. Kehrlin, Fresno, pres.

Cal., Fullerton—School—Bd. Educ. having plans prepared by C. M. Winslow, archt., 1134 Van Nuys Bldg., Los Angeles, for additions to group of high school buildings. Bonds will be voted for project. About $200,000.

Cal., Hughson—School—Trustees Hughson Union High School Dist. soon receive bids building 2 story, brick and hollow tile. About $90,000. H. Y. Davis, Stockton, archt.

Cal., Los Angeles—Church and Community House—St. James and St. Barnabas Parishes (Episcopal Church) having plans prepared by B. G. McDougall. archt., 301 Alta Bldg., San Francisco, for rein.-con., on Wilshire Blvd. About $250,000. J H. Johnson, 415 South Grand Ave., bishop.

Cal., Los Angeles—Y. M. C. A., 715 South Hope St., having plans prepared by F. Rasche, archt., 5751 Hollywood Blvd., for 2 story, 100 x 170 ft., hollow tile, on Hudson Ave. About $100,000. D. E. Luther, genl. secy.

Cal., Los Angeles—Gymnasium and Assembly Hall—Bd. Educ., 731 Security Bldg., having plans prepared by Marsh & Howard, archts., Bway. Central Bldg., for 2 story, 100 x 125 ft., brick, on Jefferson High School site. About $50,000.

Cal., Moorpark—School—Trustees Union High School Dist. plan election to vote on $85,000 bonds to build school. Architect not selected.

Cal., Santa Ana—School—Trustees Santa Ana Union High School Dist. soon receive bids building rein.-con., brick and hollow tile, rein.-con. flooring, concrete foundation, to include 64 x 154 ft. auditorium and class room, 26 x 65 ft. gymnasium, 45 x 64 ft. shop, also altering existing buildings. About $110,000. N. F. Marsh, Bway. Central Bldg., Los Angeles, archt.

Cal., San Bernardino—Memorial— City Council plans election May 4 to vote on $150,000 bonds to construct memorial building for Amer. Legion quarters, in Pioneer Park. About $150,000. Architect not selected. J. H. Osborn, city clk.

Cal., San Francisco Memorial—A. B. Spreckels, 4 Pine St., having plans prepared by G. A. Applegarth. archt., Claus Spreckels Bldg., for concrete and brick memorial building (to be replica of French Palace of Legion of Honor at Paris) on Alta Plaza. About $350,000.

Cal., San Francisco—Office and sales—L. Lewin, 112 California St., having plans prepared by MacDonald & Kahn, engrs., Rialto Bldg., for 6 story, 46 x 137 ft., rein.-con., on California St., near Front St., also 3 story, rein.-con. auto sales, on Van Ness Ave. and Jackson St.

Cal., San Francisco—Sales—Howard Auto Co., 1595 Van Ness Ave., having plans prepared by MacDonald & Kahn, engrs., Rialto Bldg., for 4 story, rein.-con. addition, on California St., near Van Ness Ave.

Cal., San Jose—Schools—City election on March 9, to vote on $400,000 bonds to build high school, and $300,000 for grammar schools. Address, Secy. Bd. Educ.

Cal., Pasadena—Hall—Throop College of Technology, East California St., soon receives bids building 1 story. rein.-con. hall for art exhibitions, on campus. About $75,000. B. G. Goodhue, 2 West 47th St., New York City, archt.

Cal., Pittsburg—City Hall—City voted $75,000 bonds to purchase site and build city hall.

Cal., Red Bluff—Court House—Bd. of Supervs. Tehama Co. retained G. C. Sellon & Co., archts., Mitau Bldg., Sacramento, to prepare plans for court house. Bonds for $200,000 voted for project. H. G. Kuhn, co. clk. Noted July 24.

Cal., San Pedro—Hospital—Harbor Hospital Assn. plans to build hospital. About $75,000. E. A. Mills, c/o Southwestern Shipbuilding Co., pres. Architect not selected.

Cal., Santa Paula—Bank—First Natl. Bank having plans prepared by J. Parkinson, archt., 420 Title Insurance Bldg., Los Angeles, for 1 story, 48 x 114 ft., brick and stone, concrete foundation, here. About $60,000.

N. S., Halifax—Business Block—Butler Bros. plan to enlarge and remodel their business block at Cogswell and Gottingen Sts. About $100,000.

Que., Granby—Bank—Bank of Montreal, 109 St. James St., Montreal, plans to build 2 story, 50 x 75 ft., concrete, steel and brick, concrete foundation, on Principal and Dufferin Sts. About $75,000. Private plans.

Que., Hull—Technical College—Comn. des Ecoles Techniques de Hull having plans prepared by C. Brodeur, archt., City Hall, for 3 story, 100 x 125 ft., concrete, steel and brick, on Wright St. About $150,000. Romeo Laford, Hull, engr.

Que., Landrienne — School — Catholic School Comn. having plans prepared by C. Brodeur, archt., City Hall, Hull. for 3 story, 50 x 50 ft., concrete, steel and brick, concrete foundation, on Main St. About $50,000.

Que., Montreal—Store—John Murray Co., Ltd., 433 St. Catherine St. W., plans to build 4 story, 77 x 120 ft. About $200,000.

Que., Wrightsville — School — Catholic School Comn., Hull, having plans prepared by C. Brodeur, archt., City Hall, Hull, for 3 story, 50 x 75 ft., concrete, steel and brick, concrete foundation, on Notre Dame St., here. About $60,000.

Ont., Belleville — Collegiate — Bd. Educ. plans to build 3 story concrete, steel and brick, concrete foundation. About $350,000. A. McGee, chn. Archt. not selected

Ont., Hamilton—Store—Stanley Mills & Co., King St., E., plans to alter and build 3 story addition to hardware store on King St., E. About $60,000. V. K. Stratford, Sun Life Bldg., engr.

Ont., London—School—Bd. Educ. having plans prepared by L. V. Carrothers, archt., Hydro Offices, for two 3 story, 100 x 185 ft., concrete and brick, in South London. About $275,000.

Ont., Ottawa — Store — John Bambrick, George and William Sts., plans to build store building, on George St. About $60,000. Architect not selected.

Ont., Ottawa—School—Bd. Educ. having plans prepared by W. C. Beattie, archt., Elgin St., for 2 story, rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $250,000.

Ont., Ottawa—Schools—Pub. School Bd. plans to build 4 story, rein.-con., on York St., about $300,000; 4 room addition to Evelyn Ave. School, $100,000; 6 room and gymnasium addition to Mutchmor St. School, $150,000; new manual training, domestic science, gymnasium, and 4 room addition to Cambridge St. School, $175,000; 8 room and gymnasium addition to Breeze Hill School, $200,000. W. C. Beattie, architect.

Ont. Saulte Ste. Marie—Schools—School Bd. plans to build new technical school, to cost about $222,500, also addition to present high school, $190,000; both brick and steel, concrete flooring and foundation.

Ont., Toronto — Church and Sunday School—Westminster Presbyterian Church, 47 Bloor St., E., having plans prepared by Wickson & Gregg, archts., Temple Bldg., for 1 and 2 story, concrete, steel and brick, concrete foundation. About $165,000.

Ont., Toronto — Church — St. Clair Ave. Methodist Church, St. Clair Ave., plans to build 1 story, with balcony, brick and stone, wood flooring and concrete foundation. About $125,000. Architect not selected. Address, F. L. Barker, 18 Oriole Gardens.

Ont., Toronto—Stores—F. T. Burgess, 36 Langley Ave., having plans prepared by W. H. Howard, archt., 98 Langford Ave., for fourteen 2 story buildings, on Danforth Ave., brick, wood flooring and concrete foundation. About $84,000.

Ont., Toronto—Theatre—Loews Theatre Syndicate, Yonge St., plans to build rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on St. Clair Ave. Cost between $100,000 and $200,000. Archt. not selected.

Ont., Windsor—Post Office—Dominion of Canada having plans prepared by A. Wright, archt., Dept. Pub. Wks., Parliament Bldgs., Ottawa, for two 2 story post offices, rein.-con., concrete and brick, rein.-con. flooring, concrete foundation. About $100,000.

B. C., Vancouver—Natatorium—City having plans prepared by Shork & Thompson, archts., London Bldg., for rein.-con. and brick, rein.-con. flooring and concrete foundation, on English Bay. About $260,000. A. S. Wooten, 602 Dawson Bldg., engr.

Alaska, Petersburg—School—City voted $50,000 bonds to build 2 story stone school.

BIDS DESIRED

Conn., Hartford—Office, Etc.—Until Feb. 18, by Berenson & Moses, archts., 1086 Main St., building 4 story, 65 x 177 ft., office and storage plant, on Winthrop St., for L. White, 119 Portland St. About $200,000.

Conn., Middletown—Armory—Until Feb. 21, by State Military Emergency Bd., Hartford, building armory, here. Payne & Griswold, Manwaring Bldg., New London, archts. and engineers.

N. Y., Jamaica—School—Until Feb. 20, by C. B. J. Snyder, archt. and engr., Municipal Bldg., New York City, building P. S. 50, on 101st and Liberty Aves. and Liverpool and Allendale Sts., here, for Bd. Educ., 500 Park Ave., New York City.

N. Y., New York—Stores and Offices—Until Feb. 14, by H. A. Jacobs, archt. and engr., 320 5th Ave., building 6 story, 25 x 100 ft., brick and steel, brick foundation, at 675 5th Ave., for H. D. Downs, 552 3rd Ave. About $85,000.

Pa., Phila.—Store—Magaziner & Eberhard, archts., 603 Chestnut St., receiving bids building 3 story, 34 x 141 ft., brick and stone, at 829 Arch St., for Schwartz & Noble, 311 South 5th St. Cost to exceed $50,000.

Pa., Pittsburgh—School—Until Feb. 25, by P. W. Irwin and W. N. Zortman, associate archts., 409 Renshaw Bldg., constructing high school in Avalon Boro., Allegheny Co.

O., Columbus—Church—Welsh Presbyterian Church, O and Long Sts., receiving bids building 2 story, 69 x 115 ft., stone and brick, on Miami Ave. between Broad and Long Sts. About $100,000. H. Holbrook, 615 Outlook Bldg., architect.

O., Columbus—Hospital—Unti March 4, by Comrs. Franklin Co., building 2 story, concrete, brick and stone, with 2 wings, on infirmary grounds. W. H Tremaine, 602 Chamber of Comerce Bldg., archt.

Mich., Ecorse—School—Until Feb. 20, by G. W. Graves, archt., 43 John R. St., Detroit, building 2 story, 96 x 200 ft., brick, steel and stone, rein.-con. flooring, concrete foundation, on Webster and State Sts., for St. Francis Xavier Parish. Noted July 31.

Mich., Wyandotte—High School—Until Feb. 17, by Bd. Educ. building 2 story, 150 x 350 ft., brick and concrete, rein.-con.,

Buildings (Continued)

flooring, concrete foundation, on Superior St. About $40,000. B. G. Wetzel & Co., 2317 Dime Bank Bldg., Detroit, archt. Noted June 26.

Ia., Beaver—School—Until Feb. 17, by Bd. Educ., building 3 story, 43 x 73 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $50,000. K. Shadle, secy. Keffer & Jones, 204 Masonic Temple, Des Moines, archts. Noted Jan. 29.

Ia., Durant—Until Feb. 18, by Independent School Dist. furnishing labor and material for building addition to public school. A. H. Ebeling, 1106 West 15th St., Davenport, archt.

Ia., Marshalltown—City Hall—Until Feb. 25, by city, building 2 story, 40 x 116 ft., brick, rein.-con. and stone, rein.-con. flooring, concrete foundation, on North Center St. About $75,000. A. McMahon, city clk. H. E. Reimer, Marshalltown, archt.

Ia., St. Mary's—School—Until Feb. 20, by Bd. Educ., building 2 story, 56 x 86 ft., rein.-con. and brick, concrete foundation. About $75,000. W. C. McClary, clk. W. E. Hulse, 210 Masonic Temple, Des Moines, archt. Noted Jan. 29.

Minn., Virginia—Church—Until March 1, by L. W. Gade, chn. Bldg. Com., constructing 2 story, 100 x 140 ft., brick and stone, rein.-con. flooring, concrete foundation, on Main St., for Presbyterian Church. About $75,000. Hewitt & Brown, 716 4th Ave. S., Minneapolis, archts. and engrs.

Que., Montreal—Hospital—Until Feb. 28, by L. A. Herdt, 335 Mountain St., for 4 story, 100 x 100 ft., concrete and brick, concrete foundation, on Sherbrooke St., E. About $500,000. A. L. Caron, 168 St. Catherine Rd., archt.

B. C., Vancouver—Office—Until March 1, by Ceferly, Rounsepell & Co., 739 Hastings St. W. for 2 story, 26 x 120 ft. rein.-con. brick and tile, on Hastings St., W. About $50,000. Sharpe & Thompson, London Bldg., archts. P. P. Brown, 410 London Bldg., engr.

B. C., Victoria—Store—Until Feb. 29, by H. E. Burbridge, for 8 story, rein.-con. and plain concrete, on Douglas and Fishgourd Sts., for Hudson Bay Co., Vancouver. About $500,000.

CONTRACTS AND PRICES AWARDED

(★Indicates award of contract)

★**Mass., Boston**—Office—W. H. Ballard & Co., 250 Washington St., let contract building 12 story, brick, rein.-con. flooring, rock foundation, to W. A. and H. A. Root, Washington St. About $500,000.

★**Conn., Bridgeport**—Theatre—Schnee & Schnee, Security Bldg., will build brick and steel theatre, brick foundation. About $70,000. Work will be done by day labor.

★**N. Y., Arverne**—Hotel—A. Messer, 66 East 104th St., New York City, let contract building 3 story, 80 x 100 ft., brick, steel and stone, brick foundation, on Cedar Ave., here, to Carucci & Wolpert, 186 Remsen St., Brooklyn.

★**N. Y., Brooklyn**—Bathhouse—Schumer Baths, Inc. c/o H. Nurick, archt. and engr., 772 Bway., will build 4 story, 80 x 100 ft., brick, steel and stone, rein.-con. flooring, concrete foundation, on St. John's Pl. About $85,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Showroom—See "Industrial Works."

★**N. Y., Coney Island**—Hotel, Restaurant and Theatre—World Merchandise Corp., 536 Bway., New York City, will alter brick, steel and stone, hotel, theatre and restaurant, on Surf Ave., here. About $55,000. Work will be done by day labor.

★**N. Y., Long Island City**—Offices and Lofts—Astoria Light & Power Co., Shore Rd., Astoria, let contract building brick, steel and stone, concrete foundation, on Van Alst Ave., here, to Bartlett-Hayward Co., 100 Bway., New York City. About $1,000,000.

★**N. Y., New York**—Hotel—Hotel Plaza Operating Co., 1-13 West 59th St., let contract altering 18 story, 150 x 200 ft., brick, steel and stone, to G. A. Fuller, 175 5th Ave. About $2,500,000. Noted Aug. 14.

★**N. Y., New York**—Loft—Krim Realty Corp., 430 7th Ave., will alter 5 story, brick and steel, at 15-17 Rector St. About $50,000. Work will be done by day labor.

★**N. Y., New York**—Office—Amer. Surety Co., 100 Bway., let contract building 21 story, brick, steel and stone, concrete foundation, at 96 Bway., to Cauldwell-Wingate, 331 4th Ave. About $1,500,000.

★**N. Y., New York**—Office—Bway.-Park Pl. Co., 233 Bway., wil alter brick, steel and stone office building. About $96,000. Work will be done by day labor.

★**N. Y., New York**—Office and Store—Krim Realty Co., 430 7th Ave., will alter 2 story, brick and steel, at 126 West 36th St. About $50,000. Work will be done by day labor.

★**N. Y., New York**—Restaurant and Stores—Exch. Buffet Corp., 52 William St., let contract building 2 story, brick and steel, brick foundation, at 17-23 John St., to Cauldwell-Wingate, 331 4th Ave. About $250,000.

★**N. Y., New York**—Stores—C. Davies, c/o Moore & Landseidel, archts., 148th St. and 3rd Ave., let contract building 1 story, 70 x 145 ft., brick and steel, brick foundation, on Burnside and Walton Aves., to P. Murphy, 371 East 144th St. About $55,000.

★**N. Y., New York**—Stores—C. Davies c/o Moore & Landseidel, archts. and engrs., 148th St. and 3rd Ave., let contract building 1 story, 85 x 115 ft., brick and steel, brick foundation, on Elm Pl., to P. Murphy, 371 East 144th St. About $70,000.

★**N. Y., New York**—Store—Realty Mgrs., Inc., 200 Bway., will build 1 story, 20 x 300 ft., brick and steel, brick foundation, on Jerome and Davidson Aves. About $200,000. Work will be done by day labor.

★**N. Y., New York**—Theatre—C. Davies, 51 East 42nd St., let contract building 100 x 125 ft., brick and steel, brick foundation, on Burnside Ave. and Walton St., to P. Murphy, 371 East 144th St. About $200,000.

★**N. Y., New York**—Theatre—S. S. and L. Shubert, Inc., 225 West 44th St., let contract constructing brick, steel and stone, brick foundation, on 8th Ave. between 54th and 55th Sts., to E. Margolies, 19 East 63rd St. About $500,000.

★**N. J., Hightstown**—Dormitory—Peddie Institute let contract building 3 story, 56 x 56 ft., brick and stone, to A. J. Robinson, 15 West 38th St. About $70,000.

★**N. J., Jersey City**—Bank and Office—First Natl. Bank let contract building 10 story, brick, steel and stone, concrete foundation, on Exch. Pl., to J. Lowry, Jr., 8 West 40th St., New York City. About $1,000,000.

★**Pa., Gallitzin**—Bank—First Natl. Bank of Gallitzin let contract building 2½ story, 60 x 80 ft., brick and concrete, rein.-con. flooring, concrete foundation, on Main St., to Griswold Bldg. Co., 101 Park Ave., New York City. About $50,000.

★**Pa., Scranton**—Store—Kaufman Bros., Lackawanna Ave., let contract building 3 story, 42 x 100 ft. and 2 story, 40 x 75 ft., brick and steel, rein.-con. flooring, rock foundation, on Lackawanna Ave., to Stender Bros., Providence Rd. and Albright St. About $51,000.

★**Pa., Wilkes-Barre**—Church—St. Anthony Syrian Greek Church, Dana St., let contract building 1½ story, 30 x 80 ft., steel, stone and marble, to I. Saba, Stanton St. About $52,700.

★**Pa., Wilkes-Barre**—Store—See "Industrial Works."

★**Va., Lynchburg**—Sales—Apperson Lee Motor Co., 10th and Church Sts., let contract building 3 story, 80 x 130 ft., concrete and brick, on 5th and Main Sts., to W. T. Jones, 216 10th St. Cost to exceed $50,000.

N. C., Gastonia—Store and Office—Natl. Realty Co. let contract building 3 story, brick, on Main St., to H. B. Potillo, Gastonia. About $60,000.

★**Ga., Griffin**—Mills—Griffin Mfg. Co. let contract building 2 mills, one 2 story, 100 x 220 ft., brick, steel and timber, about $80,000; other 2 story, 75 x 170 ft., rein.-con., about $70,000, to R. M. Walker Co., Grant Bldg., Atlanta; cost plus basis.

★**Ala., Birmingham** — Theatre — J. G. Whitfield will build 2 story, 50 x 140 ft. brick theatre on 4th Ave. between 17th and 18th Sts. About $75,000. Work will be done by day labor.

★**La., New Orleans**—Office—United Fruit Co., c/o Deboll & Owen, Ltd., Interstate Bank Bldg., let contract building 10 story, brick, stone and steel, concrete foundation, to G. A. Fuller, 175 5th Ave., New York City. About $550,000.

★**Ky., Ft. Mitchell**—Church and School—Church of Blessed Sacrament let contract for 2 story, to Carl Bros. Co., Cincinnati, O.

★**O., Cleveland**—School—Bd. Educ. let contract building addition, consisting of two 1 story, 55 x 110 ft., concrete, steel and brick wings, rein.-con. flooring, concrete foundation, on St. Clair Ave. and Ruple Rd., to H. F. Juergens Co., 1530 Clarence Ave., Lakewood About $140,000. Noted Feb. 5.

★**O., Columbus**—Salesroom—See "Industrial Works."

★**O., Middletown**—Business—C. E. Oeden, archt., Knights of Pythias Bldg., let contract to J. Lowes, Schwind Bldg., Dayton, constructing 2 story, 60 x 110 ft., brick, steel and stone, tile and concrete flooring, brick foundation, on 3rd and Clinton Sts., for Lewis Bros., Main St. About $50,000.

★**O., Springfield**—Theatre—Regent Theatre Co., South Limestone St., let contract building 2 story, 65 x 120 ft., steel and brick, concrete foundation, to J. A. Poss. About $65,000.

★**Mich., Ann Arbor**—Hospital—University of Michigan let contract building 6 story, 35 x 420 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, with 35 x 112 ft. and 35 x 88 ft. wings, also 3 story, 56 x 153 ft. administration building with 51 x 254 ft. surgical and 44 x 58 ft. demonstration wings, on East Anne St., to Thompson-Starrett Co., 702 Lincoln Bldg., Detroit. About $1,000,000, cost plus percentage basis.

★**Mich., Detroit**—Commission—J. Turnbull, c/o Mildner & Eisen, archts., 924 Hammond Bldg., let contract building 2 story, 45 x 100 ft., brick, rein.-con. and steel skeleton construction, rein.-con. flooring, concrete foundation, on Adelaide St., to Brown-Hutchinson Co., 85-91 Meldrum St. About $50,000.

★**Mich., Detroit** — Hotel — B. Robinson, Penobscot Bldg., let general contract building 5 story, 80 x 100 ft. rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Abbott St., to Shank & Co., 38 South Dearborn St., Chicago, Ill.; steel contract to Whitehead & Kales, Beecher Ave., and M. C. Ry., Detroit. About $350,000.

★**Mich., Detroit** — Hotel — B. Robinson, Penobscot Bldg., let contract building 8 story, 144 x 200 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Woodward Ave., to Shank & Co., 38 South Dearborn St., Chicago, Ill. About $900,000.

★**Mich., Detroit**—Office—First & Old Detroit Natl. Bank, Ford Bldg., let contract building 24 story, 169 x 186 ft., rein.-con., brick, steel, stone and terra cotta, rein.-con. flooring, concrete foundation, on Woodward Ave. and Cadillac Sq., to Foundation Co., 233 Bway., New York City. About $4,000,000.

★**Mich., Grand Rapids**—Mercantile-Knott Realty Co., Commerce Ave., let contract building 5 story, 50 x 100 ft., brick and steel, concrete foundation, on Commerce Ave. and Island St., to Owen, Ames, Kimball Co., Michigan Trust Bldg. About $75,000.

★**Mich., Strathmoor**—School—School Dist. 4 let contract building 2 story, 90 x 110 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to J. Finn & Co., East Fort St., Detroit. About $125,000. Noted Jan 8.

Wis., Racine—City Hall—Bd. Pub. Wks. received bids Jan. 31, remodelling city hall, from Michie Constr. Co., 300 Camp Bldg., Milwaukee, $105,000, and A. C. Kappel, 300 6th St., $106,893. Noted Jan. 22.

Neb., Omaha — Office — See "Industrial Works."

★**Ariz., Solomonville** — School — School Trustees let contract building 6 room, brick, concrete foundation, to Gratz Brown, Safford at $53,118.

★**Cal., Long Beach**—School—Bd. Educ. let general contract building 2 story grade school, on 15th St. between Linden and Atlantic Sts., to J. F. Atkinson, 1118 Story Bldg., Los Angeles, $87,677.

Buildings (Continued)

★Cal., Los Angeles—Office and Store—L. Phillips et al, c/o Pacific Mutual Life Insurance Co., 6th and Olive Sts., let contract building 12 story, 110 x 205 ft., rein.-con. (to include 352 offices), to Scofield Eng. Constr. Co., 510 Wright & Callender Bldg. About $1,500,000; cost plus percentage basis.

★Cal., Oakland — Department Store—Manheim & Mayor, 1314 Clay St., let contract building 2 story, rein.-con., on Bway., to Barrett & Hilp, Sharon Bldg., San Francisco. About $75,000.

★Cal., Sacramento—Sales—Moeller Bros., 1906 M. St., let contract building 3 story, 80 x 160 ft., rein.-con. and brick, on 12th and K Sts., to McGillvray Constr. Co., Forum Bldg. About $100,000.

Federal Government Work

PROPOSED WORK

Me., Mt. Desert Island—Seawall—Spec. 4136—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids building wood frame seawall, concrete foundation and radio ground system at Naval Transmitting Sta., here; $10 deposit required for plans and spec.

Md., Baltimore—Underwater Bracing—Supt. Lighthouses soon receivee bids installing new underwater bracing, York Spit Light Sta., Va.

Va., Petersburg—Conduit—U. S. Engr. Office, 15 Customhouse, Norfolk, soon receives bids building flushing conduit, here.

N. C., Moorehead—Completing Wire Protecting System—Spec. 4073—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids completing wire protecting system, cleaning hangars and building wood stave tank, here. About $10,500; $10 deposit required for plans and spec.

S. C., Charleston—Docking and Repairing Vessel—Supt. Lighthouses soon receives bids docking and repairing Brunswick Light Vessel, 84.

La., New Orleans—Lighthouse Tender—Supt. Lighthouses soon receives bids furnishing labor and material to completely construct, equip and deliver 65 ft. twin screw wooden lighthouse tender "Aster."

La., New Orleans—Rock—Supt. Lighthouses soon receives bids furnishing and delivering in place around Horn Island Light Sta., Miss., about 400 tons ballast or other approved rock.

Idaho—Road Work—Bureau Pub. Rds Missoula, plans to build 4.27 mi. North and South Highway from Ilo west, Lewis Co., involving 30,000 cu.yd. excav., cost $56,000; 4.26 mi. Gooding Rupert Highway, Jerome Co., 24,000 cu.yd. excav., both crushed rock surface, $94,000; 16 mi. Idaho Central Highway between Arco-Howe, Butte Co., gravel surface, 46,600 cu.yd. excav., $90,000.

Cal., San Francisco—Stone—U. S. Engr. Office, War Dept., Wash., D. C., soon receives bids furnishing stone for jetty structures at Humbolt Harbor and Bay, here. Former bids rejected. Noted Jan. 22.

BIDS DESIRED

N. Y., New York—Dredging and Rock Removal—Until March 11, by U. S. Engr. Office, 39 Whitehall St., for dredging and rock removal in Hudson River, here; advertised in this issue.

N. Y., Oswego—Alterations to Post Office and Customhouse—Until March 3, by Treas. Dept., Wash., D. C., altering, here. J. A. Wetmore, supervising architect.

Md., Baltimore — Riprap Stone — Until March 2, by Supt. Lighthouses, placing riprap stone around Neuse River and Brant Island Shoal Light Stations, N. C.

S. C., Charleston—Condenser Body, etc.—Until Feb. 26, by Supt. of Lighthouses, building new c.i. condenser body and main engine back columns for Light Vessel 94; advertised in this issue.

Fla., Apalachicola—Post Office and Customhouse—Until March 29, by Treas. Dept., Wash., D. C., building, here. J. A. Wetmore, supervising architect.

Tex., Galveston—Dredging—Until March 11, by U. S. Engr. Office, Trust Co. Bldg., Post Office and Tremont St., dredging Houston Ship Channel; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Boston—Extension to Building—Spec. 4063—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Feb. 4, constructing extension to foundry in Bldg. 42-C and altering machine shop in Bldgs. 42-B and 42-E, at Navy Yard, here, (1) work complete, from Fox Reynolds Co., 81 East 125th St., New York City, (1) $224,244 (210 days); Coleman Bros., 1 Marginal St., Chelsea, (1) $174,000 (210 days), (2) add $10, deduct $5, (3) add $3, deduct $2, (4) add $30, deduct $20, (5) add $18, deduct $14, (6) $32,000, (7) $1,800, (8) $750. Noted Jan. 29.

★R. I., Newport—Laundry—Spec. 4081—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building, here, to R. M. Kearns, 41 Cortlandt St., New York City, $45,637 (120 days). Noted Jan. 15.

★N. Y., New York—Dredging—U. S. Engr. Office, 39 Whitehall St., let contract dredging in Hudson River Channel, New York Harbor, to F. E. Jones, 17 Battery Pl. About $375,000. Noted Jan. 1.

★D. C., Wash.—Completing Fuel Oil Storage Plant—Spec. 4115—Bureau Yards & Docks, Navy Dept., let contract completing, here, to Mansfield & Savage, 135 William St., New York City, $18,574, (100 days). Noted Feb. 6.

★D. C., Wash.—Quay Wall—Spec. 4112—Bureau Yards & Docks, Navy Dept., let contract completing, here, to McHarg-Barton Co., 171 Madison Ave., New York City, at $51,535 (150 days). Noted Feb. 5.

D. C., Wash.—Sewers—Dist. Comrs., 509 Dist. Bldg., received only bid building special deep service sewer at 9th St. and Mt. Vernon Sq., (1) ordinary excav. per cu.yd., (2) sewer brick masonry, cu yd., (3) 10 in. diam. pipe sewer, per lin.ft. from W. F. Cush, 3rd and R Sts., N.E., (1) $4, (2) $30, (3) $1.80.

★Va., Hampton Roads—Removing and Rebuilding—Spec. 4109—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract removing Bldg. "D" from Ford Shipbuilding Plant, River Rouge, Mich. and reerecting same at Naval Operating Base, here, to Hyde & Baxter, 711 13th St., N. W., Wash., D. C., $62,782 (100 days).

★La., New Orleans — Dredging — U. S. Engr. Office, Customhouse, let contract dredging canal between Mermentau and Calcasieu Rivers, to Lake Arthur Dredging Co., 998 Pearl St., Beaumont, Tex. About $144,000. Noted Jan. 1.

S. C., Paris Island—Lining Drydock—Spec. 3979—Bureau Yards & Docks, Navy Dept., Wash., D. C., received only bids Feb. 4, lining drydock with concrete, here, (1) work complete, from Newport Contg. & Eng. Co., Silsby Bldg., Newport News, Va., (1) $46,755 (180 days), (2) deduct $25, (3) deduct $35, (4) add $700. Noted Jan. 15.

★Ky., Dawson Springs—Infirmary, etc.—Treas. Dept., Wash., D. C., let contract building infirmary, 6 amulant quarters and 1 semi-amulent quarter, for Public Health Serv. Sanitarium, here, to Dawson Springs Constr. Co., Munsey Bldg., Wash., D. C., $680,668.

★Ky., Dawson Springs — Mechanical Equipment—Treas. Dept., Wash., D. C., let contract installing mechanical equipment in 7 buildings, to S. W. Rittenhouse, 1316 Harvard St., Wash., D. C., $53,742.

Tex., Ft. Worth—Extension to Post Office—Treas. Dept., Wash., D. C., received bids Feb. 6, building extension to workroom at Post Office, here, from W. P. Thurston, Merchants Natl. Bank, Richmond, Va., $33,000; Regan Constr. Co., Baltimore, Md., $33,195; W. D. Lovell, Minneapolis, Minn., $40,100. Noted Jan. 22.

Tex., Galveston—Yellow Pine Piles—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract furnishing yellow pine piles for building seawall extension, to Reliance Tie & Piling Co., 1113 Carter Bldg., Houston. About $10,710.

★Cal., San Diego—Coal Hopper—Spec. 4105—Pub. Wks. Office, San Diego, let contract furnishing coal hopper for Naval Fuel Depot, to California Iron Wks., foot of 7th St., $2,605 (42 days). Noted Jan. 8.

Cal., Somesbar—Road Work—Dist. Engr., Bureau Pub. Rds., 886 Mills Bldg., San Francisco, received lowest bid improving 9.5 mi. Klamath River Rd, involving 130,700 cu.yd. unclassified excav., 600 cu.yd. dry rubble masonry, 970 sq.ft. log cribbing, 258 lin.ft. timber bridging, 2328 ft. corrugated iron pipe, clearing, grubbing, surfacing, etc., also 16.6 mi., involving 248,600 cu.yd. unclassified excav., 871 cu.yd. dry rubble masonry, 4760 sq.ft. log cribbing, 766 lin.ft. timber bridging, 4750 lin. ft. corrugated metal pipe, etc., from J. A. Fairbanks, Willits, $139,658 and $276,819 respectively.

Miscellaneous

PROPOSED WORK

Transmission Line—Hornell, N. Y.—Wayne Power Co., Sodus, plans to build high tension transmission line from here to Wallace, distance of 30 mi. Cost between $35,000 and $40,000.

Transmission Line—Oneida, N. Y.—Adirondack Electric Power Corp., 16½ Lenox Ave., plans to extend transmission line from here to Munnsville and Stockbridge. Cost between $12,000 and $15,000.

Park—Plymouth, Pa. — Boro. plans to build park, to include trees, lagoons, tennis courts, golf course, swimming beach, etc., on Susquehanna River. About $50,000. Engineer not selected.

Caterpillar Tractor — Cleveland, O. — Comrs. Cuyahoga Co. is in the market for caterpillar tractor.

Steam Shovel—Cleveland, O.—S. Rockwell, 921 Citizens Bldg., is in the market for steam shovel, traction type.

Incinerator—Bay City, Mich.—See "Industrial Works."

Grandstand—Jackson, Mich.—Jackson Co. Fair Assn., Court House, soon receives bids building 71 x 224 ft., timber grandstand at Fair Grounds. About $35,000. H. R. Graf, 502 Carter Bros. Bldg., archt.

Road Machinery—Baraboo, Wis.—Sauk Co. appropriated $10,000 to purchase road machinery. E. H. Groth, comr.

RAILWAY MATERIALS FOR BRAZIL

The State-owned railroad of Brazil known as "A Estrada de Ferro de Carlos Barbosa a Alfredo Chaves" needs quantities of materials of various kinds. The Chief Engineer has given the following statement of materials required by the railway:

Railway construction machinery, locomotives, etc: Excavating machinery (steam or electric shovels); rock drills (compressed air or electric); picks, shovels, bars, etc.; rails ar. dump cars for removing earth and rock; cableways and buckets for removing earth and rock; explosives, cement; steel rails weighing 28 to 40 kilogrammes per meter, with all accessories; bridge-steel girders for spans from 20 to 200 meters; locomotives, passenger and freight, gauge 1 meter, minimum radius on curves 160 meters, heaviest climb 18 millimeters per meter, and track of rails weighing 30 kilogrammes per meter; freight cars, boxes and flats; trucks, complete for one-meter gauge; passenger coaches, one-meter gauge; railway automobiles, one-meter gauge, for line service; tools for track-laying and maintenance of way; rail saws and drills; turntables, switches; telegraphic and telephonic equipment, including line material. Machinery for electric power, no belt transmission: Machine tools for railroad shops, lathes, drills, planers, machine hammers, etc., for cutting and drilling iron and steel; compressed air installation for painting and riveting; grindstones, ventilators; woodworking machinery; furnaces for melting iron and other materials; cranes and winches for handling heavy pieces in the shops; hand tools for stonemasons, blacksmiths, carpenters and electricians; clocks, time-keeping and night-watchmen's; pumps, compression and centrifugal (for electric or steam power); steam engines (stationary); gas engines (gasoline and kerosene); electric motors, dynamos and accumulators; surveying instruments, transits, levels, etc.; drafting materials, drawing instruments, paper, inks, tables, etc.; blue-printing equipment, complete; stone-crushing machinery; railroad scales (car and locomotive); and all material for the construction, maintenance and operation of a railroad.

Miscellaneous (Continued)

Road Machinery, etc.—Dodgeville, Wis.—Iowa Co. appropriated $10,000 to purchase road machinery, to include patrolmen's graders and other small tools. C. Wonn, Dodgeville, comr.

Water Pipe and Castings—Milwaukee, Wis.—J. H. Fowles, secy. Sewerage Comn., soon lets contract furnishing 25 tons standard Class "A" c.i. water pipe and 3 tons special castings, 18 in. diam.

Grandstand—West Allis, Wis. (Milwaukee P. O.)—Wisconsin Dept. of Agriculture, Capitol, Madison, received no bids Jan. 29, building addition to grandstand, at State Fair Park, here. About $100,000. Work is indefinitely postponed. A. C. Class, Colby-Abbot Bldg., Milwaukee, engr. Noted Jan. 22.

Lumber, Cement, etc.—Keosauqua, Ia.—Van Buren Co. soon lets contract furnishing 120 M ft. of lumber, 1,500 bbl. cement, 40,000 lb. reinforcing steel, 1,500 tons concrete mixture, 8,800 lb. hardware and 25 gal. paint. J. W. Earley, Keosauqua, engr.

Riprap—Woodland, Wash.—Cowlitz Co. (Kalama) plans to riprap banks of Lewis River at Robinson's Bend, 2 mi. east of here. About $35,000. F. M. Lane, Woodland, engr.

Dam—Lebanon, Ore. — See "Waterworks."

Ship Terminal—Berkeley, Cal.—Pacific Port Terminal Co., c/o F. F. Cresson, Jr., engr., 50 Church St., New York City, plans to build ship terminal, to include piers, bulkheads, sheds, 1 story warehouse, railroads, etc., on waterfront. About $2,000,000.

Transmission Line, etc.—Newport Beach, Cal.—Southern California Edison Co., 120 East 4th St., Los Angeles, plans to build auxiliary transmission line from here to San Juan Capistrano, about 20 mi., cost $30,000, also brick and concrete sub-station, here, $20,000.

Street Cleaning Apparatus—Pittsburg, Cal.—City voted $7,500 bonds to purchase street cleaning apparatus.

Wharf—Pittsburg, Cal.—City voted $40,000 bonds to build wharf.

Hydro System—Havelock, Ont.—Hydro-Electric Comn. 190 University Ave., Toronto, plans to reconstruct hydro electric lighting and power system; also install 300 house service meters. About $28,000. F. A. Gaky, engr.

Harbor Improvements—Kingston, Ont.—Dom. Govt. plans to dredge outer entrance of harbor works and enlarge basin to 25 ft. Project includes complete layout of railway trackage and yards, dock and grain elevator with capacity of 2,400,000 bu. About $2,500,000. W. A. Bowden, Dept. Rys. & Canals, Ottawa, engr.

Water Meters—Ottawa, Ont.—City plans to expend about $25,000 for water meters. A. F. Macallum, engr.

Asphalt Plant, Road Roller, Etc.—Sarnia, Ont.—City plans to purchase asphalt plant, roller and other equipment. About $35,000. J. A. Baird, City Hall, engr.

Street Flusher—Windsor, Ont. — City plans to purchase a motor driven street flusher. Cost between $10,000 and $15,000. Stephan Lusted, clk. M. E. Brian, engr.

BIDS DESIRED

Road Materials—New York, N. Y.—Until Feb. 17, by H. Bruckner, pres. Bronx Boro., furnishing and delivering 500 cu.yd. white quartz washed paving gravel, 50 tons paving pitch, 20,000 gal. bituminous road surfacing material, 300,000 gal. asphalt road oil, 300,000 gal. tar road oil, 3,000 bags portland cement, 5,500 cu.yd. asphalt wearing surface sand, 3,000 cu.yd. binder stone, 500 ton asphaltic cement, 7,000 cu.yd. ½-in. broken trap rock stone, 3,000 cu.yd. broken trap rock stone screenings, 6000 cu.yd. fine sand, 5,000 cu.yd. sand grits special, and forage.

Auto Trucks, Etc.—Cape May Court House, N. J.—Until Feb. 17, by I. Fitch, clk. Bd. Chosen Freeholders of Cape May Co., furnishing (a) seven 2½ tons auto trucks equipped with hydraulic lift steel dump bodies (b) one 5 or 7 passenger auto, sedan model; advertised in this issue.

Levee—New Orleans, La.—Until Feb. 18, by Bd. State Engrs., 213-215 New Orleans Court Bldg., building Victoria Levee, St. Charles Parish, on left bank of Mississippi River, involving 125,000 cu.yd. excav.

Centrifugal Boiler Feed Pumps—Cleveland, Ohio.—Until Feb. 20, by E. Shattuck, city pur. agt., furnishing two 850 gal. per min. centrifugal boiler feed pumps. Cost to exceed $10,000. R. Hoffman, city engr.

Ornamental Light Standards—Cleveland, O.—Until March 15, by city, furnishing ornamental light standards for Edgewater Park Lighting System. About $50,000. W. E. Davis, City Hall, engr.

Portable Asphalt Plant—Detroit, Mich.—Until Feb. 20, by G. Engle, comr. pub. wks., furnishing 1 stationary or portable asphalt plant with capacity of 2,000-3,000 sq.yd. 2 in. (compacted) sheet asphalt pavement per day of 9 hours; advertised in this issue. Noted Jan. 1.

Sewer Pipe, Cement and Asphalt—Lansing, Mich.—Until Feb. 23, by J. A. Parsons, city clk., furnishing segmental block sewer pipe, sizes up to and including 30 in., cement and asphalt; advertised in this issue.

Deep Well Pumping Equipment—Lockport, Ill.—Until March 16, by J. Lambert, pres. Penitentiary Comn., Rookery Bldg., Chicago, for deep well pumping equipment, at new Illinois State Penitentiary, near here. Zimmerman, Saxe & Zimmerman, 64 East Van Buren St., Chicago, engrs.; advertised in this issue.

Castings, Water Pipe, etc.—Milwaukee, Wis.—Until Feb. 20, by Central Bd. Purchases, furnishing 50 tons special castings 3 ways, 4 ways, curves, 4-16 in. diam.; 300 ton 6 in., 200 tons 8 in. and 250 tons 12 in. water pipe, all Class "C;" 29,889 lbs. 24 in. Class "C" flanged pipe, 7 and 12 ft. lengths; 124,039 lbs. 16 and 24 in. Class "C," bell and spigot pipe, 12 ft. and short lengths; 17,046 lbs. specials.

Cement—Milwaukee, Wis.—Until Feb. 18, by Central Bd. Purchases, City Hall, furnishing 9,000 bbls. portland cement.

Valves—Milwaukee—Until Feb. 18, by Central Bd. Purchases, furnishing special or tapping valves for Water Dept. No bids received Jan. 26.

Lumber, Cement, etc.—Greenfield, Ia.—Until Feb. 17, by Auditor Adair Co., furnishing 80,376 ft. lumber, 2,504 ft. piling, 2,200 bbl. cement, 2,700 tons concrete mixture, 48,000 lb. reinforcing and 6,182 lb. structural steel. C. H. Lehmkuhl, Greenfield, engr.

Lumber, Piling, etc.—Iowa City, Ia.—Until Feb. 16, by Auditor Johnson Co., furnishing 219,516 ft. lumber, 6,600 ft. piling and 24,101 lbs. I beams, f.o.b. A. F. Fischer, Iowa City, engr.

Portland Cement—Toronto, Ont.—Until Feb. 18, by W. A. McLean, deputy minister, Dept. Pub. Highways, for furnishing from 4-8,000 bbls. portland cement f.o.b. railway stations convenient to Ottawa Prescott Highway; 3-5,000 bbls. for stations convenient to Provincial Highway from Prescott, easterly to Bainsville; 3-7,000 bbls. for stations convenient to Provincial Highway from Johnstown to Pickering, and from St. Davids to London, 1-3,000 bbls. according to specifications and f.o.b. mill.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Track—Phila., Pa.—City Transit Co., 12th and Chestnut Sts., let contract building 5½ mi. double track for Frankford "L", involving 3,000 cu.yd. mass concrete, 1,000,000 ft. b.m. ties, 2,000 tons ballast, 2,000 tons rails, to Snare & Triest, Penna. Bldg. About $520,000.

★Lead Cable—Cleveland, O.—E. Shattuck, city pur. agt., let contract furnishing 3,700 ft. lead cable, to J. Roebling Sons Co., 701 St. Clair Ave., $9,500.

Steam Heating Plant—Cleveland, O.—E. Shattuck, city pur. agt., received only bid building heating plant for bathhouse (now under construction), from Ohio Heating & Pipe Bending Co., 1063 West 11th St., $33,153.

★Pipe—Kalamazoo, Mich.—City Water Dept. let contract furnishing 350 tons c.i. water pipe, to Lynchburg Fdry Co., Peoples Gas Bldg., Chicago. About $23,000.

★Sand and Gravel—Detroit, Mich.—Wayne Co. Rd. Comn. let contract to Detroit Greenville Gravel Co., Brighton, furnishing 50,000 tons sand @ $0.65 per ton and 50,000 tons gravel @ $0.85 per ton.

Water Pipe—St. Paul, Minn.—H. W. Austin, city pur. agt., received bids Jan. 12, furnishing 635 tons c.i. water pipe, various sizes and lengths, from Natl. Cast Iron Pipe Co., Chicago, $68.50 per ton; United States Iron Pipe & Fdry Co., 122 South Michigan Ave., Chicago, $69.30 per ton. Noted Jan. 8.

★Gas System—Huntington Beach, Cal.—City Trustees let contracts constructing gas distributing system as follows; trenching and laying pipe, to R. F. Ware, Union Oil Bldg., about $24,000; furnishing c.i. pipe, to U. S. Cast Iron Pipe Co., 215 West 7th St.; furnishing w.i. pipe, to General Fire Extinguisher Co., 439 East 3rd St., $14,000. Contractors all of Los Angeles.

★Bulkhead, etc.—San Francisco, Cal.—State Harbor Comn., Ferry Bldg., let contract building connecting bulkhead wharves at Piers 3 and 7, to Healy-Tibbits Constr. Co., 9 Main St., $39,470; timber depressed track extension along Pier 5, to A. Kitchen, 110 Market St., $13,970. Noted Jan. 22.

Are You Watching
THE PROPOSALS
On Pages 103 and 104

OFFICIAL PROPOSALS

Bids: Mar. 10.

Reinforced Concrete Bridge

CONSTRUCTION OF A BRIDGE ACROSS
THE CONNECTICUT RIVER
FOR THE
COUNTY OF HAMPDEN,
MASSACHUSETTS

Springfield, Massachusetts.
February 2, 1920.

In pursuance of a report of the Special Commission acting under and by virtue of Chapter 252, General Acts of 1915 for Commonwealth of Massachusetts, confirmed by the Supreme Judicial Court for said Commonwealth, sealed bids for building a highway bridge between Springfield and West Springfield across the Connecticut River and over the yard of the New York, New Haven and Hartford Railroad in Springfield, together with certain constructions on the approaches there to in West Springfield, will be received by the County Commissioners of Hampden County at their office, Court House, Springfield, Massachusetts, until 2:00 P.M. on Wednesday, March 10, 1920, at which time and place the bids will be publicly opened and read aloud.

The bridge, which will be 80 feet in width throughout, includes a river bridge approximately 1,200 feet in length, divided into seven arch spans of reinforced concrete, the piers and abutments being faced with granite; and a viaduct over the railroad yard about 300 feet in length, consisting of nine spans of reinforced concrete construction.

Bidders will be required to qualify as to past performances and ability to furnish adequate plant. Each bid must be accompanied by a properly certified check for Fifty Thousand (50,000) Dollars. A bond in the sum of One Million (1,000,000) Dollars will be required for the faithful performance of the contract.

A more complete description of the work to be done is given in Notice to Bidders, forms of Bid, oCntract, Bond, the Specifications, and the Contract Drawings accompanying the same.

Copies of the foregoing may be inspected at the office of the County Commissioners at Springfield, and may be obtained from the Engineers, Fay, Spofford and Thorndike, 15 Beacon Street, Boston, Massachusetts, on and after February 9, 1920.

A deposit of One Hundred (100) Dollars is required for a complete set of Notice to Bidders, forms of Bid, Contract, Bond, the Specifications and the Contract Drawings, one-half of which deposit will be refunded upon their return in good condition to the Engineers on or before March 13, 1920.

Receipt of bids will be subject to the conditions stated in said Notice to Bidders.

The right is reserved to reject any or all bids.

CHARLES C. SPELLMAN,
Chairman.
GEORGE W. BRAY,
WILLIAM H. ENSIGN,
County Commissioners of the
County of Hampden.
FAY, SPOFFORD AND THORNDIKE,
Engineers.
15 Beacon Street, Boston,
Massachusetts.

The publication of an advertisement on this page is an official notice that bids are wanted from other than local bidders.

It is also a guarantee that maximum competition is invited because Engineering News-Record is the *one* nationally recognized medium for Proposal advertising. Its Searchlight Section is read each week by nearly every worth-while contractor in this country who bids on public work outside his own city.

Official Proposals reaching our office in first mail Wednesday morning (9 o'clock) can usually be published in the issue out the next day. Special price for Official Proposals, $3.60 an inch.

Bids: Mar. 2.

Bridge Construction

Little Rock, Ark.

Sealed proposals for the construction of two reinforced concrete arch bridges across the Arkansas River at Main Street and Broadway Street in the City of Little Rock, State of Arkansas, will be received by the Commissioners of the Broadway-Main Street Bridge District of Pulaski County, Ark., at the Director's Room of the Southern Trust Company, in the Southern Trust Building, in the City of Little Rock, Ark., until 2:30 o'clock p.m., Tuesday, March 2, 1920, and will at that time and place be publicly opened and read.

The proposed work consists of the following:

MAIN STREET BRIDGE

Thirteen reinforced concrete arch spans with roadway 40 feet wide between curbs and two 8-foot sidewalks. Total length of improvement will be approximately 2,000 feet; and will contain about 34,000 cubic yards of concrete and 1,300,000 pounds of reinforcing steel.

BROADWAY STREET BRIDGE

This structure will be of the same width as given for the Main Street Bridge and will consist of five reinforced concrete arch spans and 1,700 lineal feet of approaches. The approximate quantities are: concrete, 27,500 cubic yards; reinforcing steel, 2,000,000 pounds.

The river piers and abutments for both bridges are to be sunk to bed rock by the pneumatic process.

Bidders may bid upon the substructure and superstructure separately for one or both bridges, or for both bridges complete.

The contractor may build the substructure for both bridges at same time, or he may complete the substructure for the Broadway Street Bridge first, and then build the substructure for the Main Street Bridge as he may see fit. It will be practicable to build all of the Main Street piers up to the spring line of the arches without interfering with the old bridge or the traffic thereon. In any case, the old bridge shall not be removed nor the traffic Bridge is opened for traffic.
over it disturbed until the Broadway Street

The district will have ample funds available to pay in cash for all work as performed.

All bids shall be placed in envelopes, to be supplied by the Engineers and each bid must be accompanied by a certified check on a solvent bank in the sum of not less than two and one-half (2½) per cent of the amount of the bid, made payable to the order of the Broadway Main Street Bridge District. No certified check, however, shall be for a sum less than $5,000.

All bids shall be upon proposal blanks sealed and then marked thereon, "Proposal for Broadway-Main Street Bridges."

The successful bidder will be required to give a bond in the amount of not less than one-third of the total amount of his contract, which bond shall be executed by a surety company to be approved by the Broadway-Main Street Bridge Commissioners.

Plans and specifications may be seen at the office of the Bridge District in Little Rock. Copies of the plans and specifications for the Main Street Bridge may be secured from Luten, Roberts & Titus, Consulting Engineers, Indianapolis, Ind., and for the Broadway Street Bridge from Hedrick & Hedrick, Consulting Engineers, 506 Interstate Building, Kansas City, Mo.

A deposit of twenty dollars will be required for the plans and specifications for each bridge, fifteen dollars of which will be refunded upon the return of the papers.

The Commissioners reserve the right to reject any or all bids.

GEORGE W. DONAGHEY, Chairman.
JUSTIN MATTHEWS, Secretary.
MOORHEAD WRIGHT, J. R. VINSON,
HERMAN KAHN, F. W. ALLSOPP,
Commissioners,
Broadway-Main Street Bridge
District of Pulaski County,
Arkansas.

Bids: Feb. 19.

Bridge Construction

Elizabeth, N. J.

Sealed proposals will be received by the Committee of the Board of Chosen Freeholders of the County of Union at the Court House, Elizabeth, N. J., at 2:30 p.m., on Thursday, Feb. 19, 1920, for the following described work.

New lift bridge of the Strauss Trunnion Bascule type over the Elizabeth River at South Front Street, Elizabeth, N. J.

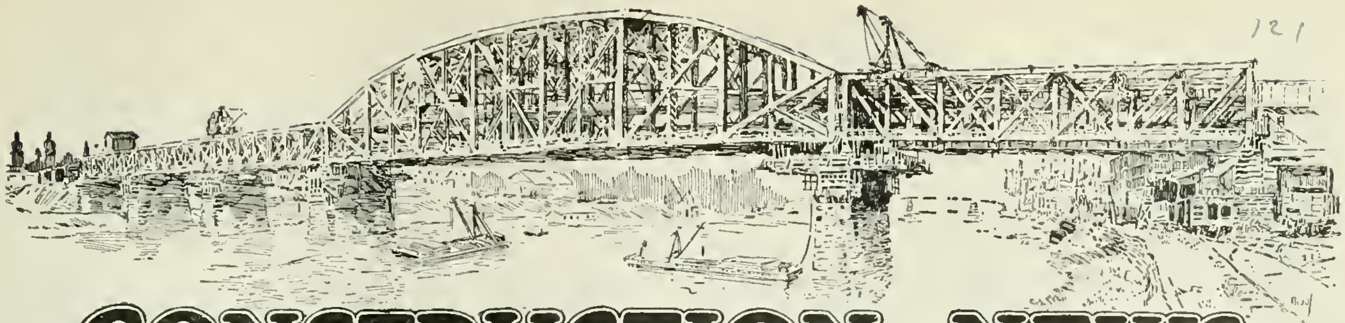
Plans and specifications for this work may be examined at the office of the County Engineer, 120 Broad Street, Elizabeth, N. J.

Each bidder must submit with the bid a certificate from a surety company stating that such surety company will provide the contractor with a bond in the sum, and with such conditions as are required by the specifications.

Each bid must be accompanied with a certified check for five (5) per cent) of the bid, but not less than $50, as required by the specifications.

The Board reserves the right to reject any or all bids.

JACOB L. BAUER,
County Engineer.



CONSTRUCTION NEWS

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Feb. 24	Detroit, Mich.	Jan. 29
Feb. 24	Quimby, Ia.	Feb. 12
Feb. 24	Wauconda, Ill.	Feb. 19
Mar. 1	Baker, Mont.	Feb. 19
Mar. 5	Akron, O.	Feb. 19
Mar. 10	Burlington, N. C.	Feb. 19

SEWERS

Feb. 24	Bryan, Tex.	Feb. 5
Feb. 25	Boston, Mass.	Feb. 19
Feb. 26	Dexter, Ia.	Feb. 19
Mar. 1	Baker, Mont.	Feb. 19
Mar. 1	Pontiac, Mich.	Feb. 19
Mar. 1	Minot, N. D.	Feb. 12
Mar. 1	Lebanon, Pa.	Feb. 5
	Adv. Feb. 5 to 19.	
Mar. 1	Livingston, Mont.	Feb. 5
Mar. 2	Columbus, O.	Feb. 19
Mar. 2	Kendallville, Ind.	Feb. 12
	Adv. Feb. 19.	
Mar. 4	Stanton, Ia.	Feb. 19
Mar. 8	Rutland, Vt.	Feb. 19
	Adv. Feb. 19.	
Mar. 10	Burlington, N. C.	Feb. 19
Mar. 23	Toledo, O.	Feb. 19

BRIDGES

Feb. 24	Port Huron, Mich.	Feb. 19
Feb. 24	Wyoming	Feb. 12
Feb. 24	Thermopolis, Wyo.	Feb. 19
Feb. 24	Wisconsin	Feb. 19
Feb. 24	Green Lake, Wis.	Feb. 19
Feb. 24	Phila., Pa.	Feb. 19
Feb. 25	Bethlehem, Pa.	Jan. 8
Feb. 25	Ishpeming, Mich.	Feb. 5
Feb. 25	Ingersoll, Ont.	Feb. 19
Feb. 26	Menomonie, Wis.	Feb. 19
Feb. 26	Dayton, O.	Feb. 12
Feb. 27	Kingston, N. Y.	Feb. 5
	Adv. Feb. 5 to 19.	
Feb. 27	Chatham, Ont.	Feb. 19
Mar. 1	Washington	Feb. 19
Mar. 2	Hawkinsville, Ga.	Feb. 19
Mar. 2	Dinuba, Cal.	Feb. 19
Mar. 4	Stanton, Ia.	Feb. 19
Mar. 5	Cincinnati, O.	Feb. 19
Mar. 5	Kenosha, Wis.	Feb. 19
	Adv. Feb. 19.	
Mar. 6	Forest Lake, Minn.	Feb. 19
Mar. 8	Bronxville, N. Y.	Feb. 19
	Adv. Feb. 19.	
Mar. 10	Springfield, Mass.	Feb. 12
	Adv. Feb. 5 to 19.	
Mar. 15	Connecticut	Feb. 12
	Adv. Feb. 12.	
Mar. 23	O'Brien, Wash.	Feb. 12

STREETS AND ROADS

Bids Close		See Eng. News-Record
Feb. 23	Michigan	Feb. 19
Feb. 23	Charles City, Ia.	Feb. 19
Feb. 24	Lincoln, Neb.	Feb. 12
Feb. 24	Washington	Feb. 12
Feb. 24	Anniston, Ala.	Feb. 12
Feb. 24	Montgomery, Ala.	Jan. 8
	Adv. Jan. 8.	
Feb. 24	Le Sueur Center, Minn.	Jan. 29
Feb. 24	Michigan	Feb. 5
Feb. 24	Michigan	Feb. 19
Feb. 24	Florala, Ala.	Feb. 19
Feb. 24	Washington, Ga.	Feb. 19
Feb. 24	Valdosta, Ga.	Feb. 19
Feb. 25	Wisconsin	Feb. 19
Feb. 25	Edgerton, Wis.	Feb. 19
Feb. 25	Bronson, Fla.	Feb. 19
Feb. 25	Madison, Minn	Feb. 25
Feb. 25	Illinois	Feb. 19
Feb. 26	Brunswick, Ga.	Feb. 19
Feb. 26	Gaylord, Minn.	Feb. 5
Feb. 26	Laurel, Del.	Feb. 5
	Adv. Feb. 5 and 12.	
Feb. 26	Slayton, Minn.	Feb. 12
Feb. 26	Michigan	Feb. 19
Feb. 26	Michigan	Feb. 12
Feb. 26	Arizona	Feb. 12
Feb. 26	Menomonie, Wis.	Feb. 19
Feb. 27	Vanceboro, N. C.	Feb. 19
Feb. 27	Indiana	Feb. 19
Feb. 27	Arkansas	Feb. 19
Feb. 27	Ohio	Feb. 12
Mar. 1	Cortland, N. Y.	Feb. 12
Mar. 1	Louisiana	Feb. 12
	Adv. Feb. 19.	
Mar. 1	Livingston, Mont.	Jan. 29
	Adv. Jan. 29.	
Mar. 1	Mitchell, S. D.	Feb. 12
	Adv. Feb. 12.	
Mar. 1	Buckhannon, W. Va.	Feb. 12
	Adv. Feb. 19.	
Mar. 1	Washington	Feb. 19
Mar. 1	Michigan	Feb. 19
Mar. 1	Indiana	Feb. 19
Mar. 1	Montesano, Wash.	Feb. 19
Mar. 1	Kingman, Ariz.	Feb. 19
Mar. 1	Michigan	Feb. 19
Mar. 1	Washington	Feb. 19
Mar. 1	Caruthersville, Mo.	Feb. 19
Mar. 1	Osceola, Ark.	Feb. 19
Mar. 1	Braxton, W. Va.	Feb. 19
Mar. 1	Alexandria, Ont.	Feb. 19
Mar. 2	Charleston, W. Va.	Feb. 19
Mar. 2	Elkins, W. Va	Feb 19
Mar. 2	Montana	Feb. 19
Mar. 2	Indiana	Feb. 19
Mar. 2	Montgomery, Ala.	Feb. 19
Mar. 2	Pennsylvania	Feb. 19
Mar. 2	Charleston, W. Va.	Jan. 22
Mar. 2	Winfield, Ia.	Jan. 29
Mar. 2	South Euclid, O.	Feb. 5
Mar. 2	Ft. Scott, Kan.	Feb. 5
Mar. 2	Columbus, O.	Feb. 19
Mar. 2	Tennessee	Feb. 19
Mar. 2	Washington	Feb. 19
Mar. 2	Woodland, Cal.	Feb. 19
Mar. 2	East Liverpool, O.	Feb. 19
Mar. 2	Albert Lea, Minn.	Feb. 19
Mar. 3	Albert Lea, Minn.	Feb. 19
Mar. 3	Pennsylvania	Feb. 5
	Adv. Feb. 5 to 19.	
Mar. 3	Indiana	Feb. 19
Mar. 3	Stockton, Cal.	Feb. 19
Mar. 4	Waterloo, Ia.	Feb. 19
Mar. 4	Dallas, Tex.	Feb. 19
Mar. 4	Hutchinson, Kan.	Feb. 5
Mar. 4	Fairmont, W. Va.	Feb. 12
Mar. 6	Leavenworth, Kan.	Feb. 5
Mar. 6	Brainerd, Minn.	Jan. 29
Mar. 6	Indiana	Feb. 19
Mar. 7	Michigan	Feb. 19
Mar. 8	Okmulgee, Okla.	Jan. 29
Mar. 8	Fayetteville, W. Va.	Feb. 12
	Adv. Feb. 19.	
Mar. 8	Waco, Tex.	Feb. 19
Mar. 8	Bronxville, N. Y.	Feb. 19
	Adv. Feb. 19.	
Mar. 8	Reno, Nev.	Feb. 19
Mar. 8	Waco, Tex.	Feb. 19
Mar. 8	Wauseon, O.	Feb. 19
Mar. 9	Plymouth, Wis.	Feb. 19
Mar. 9	Greenville, Ga.	Feb. 19
Mar. 9	Michigan	Feb. 19
Mar. 9	Marlington, W. Va.	Feb. 19
Mar. 9	Fredonia, Kan.	Feb. 5
Mar. 10	Eureka, Kan.	Feb. 5
Mar. 10	Michigan	Feb. 19
Mar. 12	Clinton, N. J.	Feb. 12
Mar. 12	Montana	Feb. 19
Mar. 15	Connecticut	Feb. 19
Mar. 15	Buncombe, N. C.	Feb. 19
Mar. 15	Asheville, N. C.	Feb. 19
Apr. 1	St. Thomas, Ont.	Feb. 19
Apr. 3	Lawrence, Kan.	Feb. 19
Apr. 8	Savannah, Ga.	Feb. 19

RAILWAYS

Bids Close		See Eng. News-Record
Mar. 1	Maine	Feb. 12

EXCAVATION AND DREDGING.

Feb. 24	Crookston, Minn.	Feb. 19
Feb. 26	Windom, Minn.	Feb. 19
Feb. 27	Waseca, Minn.	Feb. 19
Feb. 28	Little Falls, Minn.	Feb. 12
Mar. 2	Cooper, Tex.	Feb. 12
Mar. 2	Tacoma, Wash.	Feb. 19
Mar. 10	Waverly, Ia.	Feb. 10
Mar. 16	Ft. Madison, Ia.	Feb. 19

INDUSTRIAL WORKS

Feb. 24	Wilkes Barre, Pa.	Jan. 29
Feb. 24	Indianapolis, Ind.	Feb. 19
Feb. 27	Wilkes-Barre, Pa.	Jan. 29
Feb. 27	Forty Fort (Kingston P. O.), Pa.	Feb. 5
Feb. 27	Long Island City, N. Y.	Feb. 19
Mar. 1	Taylor, Pa.	Feb. 5
Mar. 1	Edmonton, Alta.	Jan. 8
Mar. 1	Cedar Rapids, Ia.	Jan. 22
Mar. 6	Estevan, Sask.	Jan. 29
	Adv. Jan. 29 to Feb. 12.	
Mar. 15	Wakefield, Mass.	Jan. 29
Mar. 17	Larrabee, Ia.	Feb. 5
Mar. 20	Saco, Me.	Feb. 12
Sept. 1	Hutchinson, Kan.	Feb. 19

BUILDINGS

Feb. 23	Wilkes-Barre, Pa.	Jan. 29
Feb. 23	Brooklyn, N. Y.	Feb. 5
Feb. 23	West Allis (Milwaukee P. O.), Wis.	Feb. 19
Feb. 24	East Moline, Ill.	Feb. 5
Feb. 24	East Orange, N. J.	Jan. 22
Feb. 24	Ithaca, N. Y.	Feb. 5
Feb. 24	West Point, Neb.	Feb. 19
Feb. 24	Baldwin, Kan.	Feb. 19
Feb. 24	Owen, Wis.	Feb. 19
Feb. 24	Newark, N. J.	Feb. 19
	Adv. Feb. 5	
Feb. 24	Meriden, Conn.	Feb. 19
Feb. 25	Desloge, Mo.	Feb. 5
Feb. 25	Pittsburgh, Pa.	Feb. 12
Feb. 25	Marshalltown, Ia.	Feb. 12
Feb. 25	Newark, N. J.	Feb. 19
Feb. 25	Randall, Ia.	Feb. 19
Feb. 28	Montreal, Que.	Feb. 12
Feb. 27	Buckingham, Ia.	Feb. 19
Feb. 28	Centerville, Minn.	Feb. 19
Feb. 29	Victoria, B. C.	Feb. 12
Mar. 1	Racine, Wis.	Jan. 1
Mar. 1	Topeka, Kan.	Jan. 29
Mar. 1	Carlton, Ont.	Jan. 15
Mar. 1	Detroit, Mich.	Jan. 22
Mar. 1	Oakmont, Pa.	Feb. 19
Mar. 1	Northville, Mich.	Feb. 19
Mar. 1	Montreal, Que.	Jan. 15
Mar. 1	Alpena, Mich.	Jan. 15
Mar. 1	Arco, Minn.	Feb. 5
Mar. 1	Minneapolis, Minn.	Feb. 5
Mar. 2	Valdosta, Ga.	Feb. 19
Mar. 3	Marcy, N. Y.	Feb. 19
Mar. 3	Phila., Pa.	Feb. 19
Mar. 4	Columbus, O.	Feb. 12
Mar. 4	Manly, Ia.	Feb. 19
Mar. 4	Ollie, Ia.	Feb. 19
Mar. 4	Salinas, Cal.	Feb. 19
Mar. 5	Fowler, Cal.	Feb. 19
Mar. 6	Winslow, Me.	Feb. 19
Mar. 8	Norwich, N. Y.	Feb. 19
Mar. 8	Cheyenne, Wyo.	Feb. 19
Mar. 10	Welton, Ia.	Feb. 19
Mar. 10	Sewal, Ia.	Feb. 19
Mar. 15	Saco, Me.	Feb. 19
Mar. 15	Hibbing, Minn.	Jan. 29
Mar. 15	Landrienne, Que.	Feb. 12
Mar. 15	Brookfield, Mo.	Feb. 19
Mar. 16	Osceola, Neb.	Feb. 19

Bids Close		See Eng. News-Record
Mar. 16	Washta, Ia.	Feb. 5
Mar. 20	Redford, Mich.	Feb. 5
Apr. 1	Dodson, Mont.	Feb. 5
Apr. 1	Dayton, O.	Feb. 19

FEDERAL GOVERNMENT WORK

Feb. 23	Post Office Alterations — Washington, Ga.	Feb. 5
Feb. 24	Post Office Alterations — San Antonio, Tex.	Feb. 5
Feb. 25	Roof — Spec. 4113 — New York, N. Y.	Jan. 8
Feb. 25	Grading, Paving, etc. — Wash., D. C.	Feb. 19
Feb. 25	Remodeling Post Office — Des Moines, Ia.	Feb. 5
Feb. 26	Condenser Body, etc. — Charleston, S. C. Adv. Feb. 12.	Feb. 12
Feb. 28	Structural Steel — Marietta, O. Adv. Feb. 5 to 19.	Feb. 5
Feb. 28	Lock and Abutment—Addison, Ky. Adv. Feb. 5 to 19.	Feb. 5
Mar. 1	Administration Buildings, Quarters, etc.—New Dorp, N. Y.	Feb. 19
Mar. 2	Riprap Stone—Baltimore, Md.	Feb. 12
Mar. 3	Distributing System and Power Plant Equipment—Spec. 4118 — San Diego, Cal.	Feb. 5
Mar. 3	Alterations to Post Office and Customhouse — Oswego, N. Y. Adv. Feb. 12.	Feb. 12
Mar. 3	Lighting Fixtures — Spec. 4129—San Diego, Cal.	Feb. 5
Mar. 5	Changes and Repairs—Cincinnati, O.	Feb. 19
Mar. 8	Electric Dumbwaiter — Rome, N. Y.	Feb. 19
Mar. 8	Remodeling Post Office — Rome, N. Y.	Feb. 19
Mar. 11	Dredging—Galveston, Tex. Adv. Feb. 19.	Feb. 12
Mar. 11	Dredging and Rock Removal—New York, N. Y. Adv. Feb. 12 and 19.	Feb. 12
Mar. 15	Electric Elevator — Hartford, Conn.	Feb. 19
Mar. 17	Dredging and Excavating—Buffalo, N. Y.	Feb. 19
Mar. 29	Post Office and Customhouse—Apalachicola, Fla.	Feb. 12

MISCELLANEOUS

Feb. 23	Sewer Pipe, Cement and Asphalt—Lansing, Mich.	Feb. 12
Feb. 24	Hydrants and Valve Covers —York, Ont.	Feb. 5
Feb. 24	Tractors—Long Island City, N. Y.	Feb. 19
Feb. 24	Road Material — St. George, S. I., N. Y.	Feb. 19
Feb. 25	Tractors and Steam Engine—Brooklyn, N. Y.	Feb. 19
Feb. 25	Pipes—Woodstock, Ont.	Feb. 19
Feb. 26	Water Meters — Detroit, Mich.	Feb. 19
Feb. 27	Pier—Santa Monica, Cal.	Feb. 19
Feb. 28	Hydro-electric Equipment—Wilson, N. C.	Feb. 19
Mar. 1	Repairing Wood Trestle of Water Tank — Hoffmans Island, N. Y.	Feb. 19
Mar. 1	Culvert Pipe—Harrisburg, Pa. Adv. Feb. 5 and 12.	Feb. 5
Mar. 1	Road Drags, Bin and Loader—Long Prairie, Mich.	Feb. 19
Mar. 2	Water Pipe—Phila., Pa.	Feb. 19
Mar. 2	Building Materials — Lockport, Ill. Adv. Feb. 5 and 12.	Feb. 5
Mar. 2	Road Oil, etc.—Milwaukee, Wis.	Feb. 19
Mar. 2	Underground Cables, etc.—Milwaukee, Wis.	Feb. 19
Mar. 5	Wharf—Skeena, B. C.	Feb. 19
Mar. 9	Tunnels, etc. — Ossining, N. Y.	Feb. 19
Mar. 10	Steam Power and Water Gas Plant Equipment—Tallahassee, Fla.	Feb. 19
Mar. 15	Ornamental Light Standards—Cleveland, O.	Feb. 12
Mar. 16	Deep Well Pumping Equipment—Lockport, Ill.	Feb. 12

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

Conn., Harwinton—Bd. Water Comn., 255 Main St., Bristol, receives bids about March 1, building 60,000,000 gal. earth and concrete reservoir, here. D. F. Crowley, 192 Main St., Bristol, engr. Noted in a previous issue under "Bristol."

N. C., Hertfort—City having preliminary plans prepared by J. B. McCrary Eng. Corp., engrs., Citizens & Southern Bank Bldg., Atlanta, Ga., for improving waterworks and sewerage systems, also paving various streets. About $200,000 will be spent for project.

O., Akron—E. A. Zeisloft, dir. pub. serv., receives bids about March or April, building addition to purification plant, including 20,000,000 gal. filters, 3,000,000 gal. coagulation basin and 1 story, 80 x 140 ft., brick superstructure, involving 23,000 cu.yd. excav. and 5,000 cu.yd. concrete, Contr. 170; laying 32 mi. 6-20 in. pipe Contr. 171-177. G. G. Dixon, engr.

Mich., Ferndale (Royal Oak P. O.)—City plans to install 25 fire hydrants with necessary valves and connections. About $15,000. G. Jerome, 1331 Majestic Bldg., Detroit, engr.

Kan., Abilene — City plans to improve waterworks system, to include extending water mains and building 100,000 gal. tank on 80 ft. tower. About $40,000. Engineer not selected.

N. D., Cooperstown—City plans to install complete waterworks system, including mains, wells, etc. About $25,000 Dakota Eng. & Constr. Co., Valley City, engr.

N. D., Mayville—City plans to install water softening and purifying plant. About $10,000. T. R. Atkinson, Bismarck, engr.

N. D., Northwood—City having surveys made for complete water system, including mains, wells, etc. About $30,000. A. Hall, Devil's Lake, engr.

Mont., Lewistown—City election April 23, to vote on $100,000 bonds to improve waterworks system. R. P. Longshore, 820 Corcoran St., engr.

Mont., Ryegate—City voted $15,000 bonds to improve waterworks system. C. A. Renshaw, Roundup, engr.

Utah, Salt Lake City—City plans election to vote on $3,300,000 bonds to increase water supply. S. Q. Cannon, city engr., H. K. Burton, waterworks supt.

Ore., Portland—See "Excavation and Dredging."

Ore., Vale—City Council adopted resolution to purchase 2 acre tract on Bully Creek, south of here, and build permanent well and pump house, also purchase and lay 2,640 ft. 8 in. c.i. pipe. Cost between $5,000 and $8,000.

Cal., Glendale—City having plans prepared extending water-works system and building power generating plant. About $260,000. H. B. Lynch, 314 South Brand Blvd., Glendale, and W. S. Jones, Claremont, engrs.

Cal., Orange—City plans election to vote on $12,000 bonds to sink well and install pump. D. G Wettlin, clk. W. J. Richardson, water supt.

Cal., Tujanga—Haines Canyon Water Co. having plans prepared for 2 earth reservoirs with 10 in. connecting pipe line and motor driven pumps. About $17,000. H. B. Lynch, 314 South Brand Blvd., Glendale, engr.

BIDS DESIRED

N. C., Burlington—Until March 10, by E. B. Horner, mayor, and Bd. of Aldermen, constructing waterworks system, including 1,700,000 gal. capacity earth embankment raw water and 500,000 gal. rein.-con. clear water reservoirs, 15,000 ft. force main c.i. or wood pipe, 12 in., coagulating basin, filter plant, centrifugal pumps, filter apparatus, valves, pipe etc. J. L. Ludlow, Winston-Salem, engr.; advertised in this issue.

O., Akron—Until March 5, by E. A. Zeisloft, dir. pub serv., improving waterworks system, Contr. 161, grading storage yard site, involving 30,000 cu.yd. excav.; Contr. 182, 3,300 tons 4-20 in. c.i. pipe and specials; Contr. 185, four hundred 6-16 in. gate valves; Contr. 186, 75 cutting-in sleeves and valves; Contr. 188, five hundred 6-8 in. hydrants; Contr. 190, 500,000 gal elevated steel tank on 70 ft. tower. G. G. Dixon, engr. Advertised in this issue.

Ill., Wauconda—Until Feb. 24, by E. H Dahms, village clk., building 10 in. deep well and furnishing pumping plant equipment. About $8,000. J. J. Pickens, Kankakee, engr. Noted Feb. 12.

Mont., Baker—Until March 1, by W. R. McDonald, city clk., improving water system in Impvt. Dist. 13. Separate bids will be received on Sect. 1, to include c.i. pipe and special castings f.o.b. cars to here. Sect. 2, complete installation, hauling and laying c.i. pipe and hauling and setting hydrants and valves. G. E. Hough, mayor. Burns & McDonnell, Interstate Bldg., Kansas City, Mo., engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Kan., Ft. Scott—Fire & Water Bd. let contract laying 7,850 ft. 48 in. concrete pipe on Kansas side to connect gap in 3rd flow line between Quindaro Pumping Station and Kaw River Tunnel, to Lock Joint Pipe Co., 165 Bway., New York City. About $145,225.

★Tex., Breckenridge—C. M. Wallace et al let contract constructing impounding reservoir to be used as temporary supply for city water, to include earthen dam, 600 ft. long and excavation work, to Dalton & Campbell, 1915½ Main St., Dallas. About $25,000.

★Okla., Henryetta — City let contract improving waterworks system, to Merkle Mchy. Co., Interstate Bldg., Kansas City, Mo. About $182,000.

Cal., Manhattan Beach (Manhattan P. O.)—City received bids relaying and recaulking with lead 10 mi. water mains, from W. D. Walsh, 1235 Dewey St., Los Angeles; Fleming Constr. Co., Pomona; Foundation Co., Holbrook Bldg., San Francisco, all cost plus 10%. Noted Jan. 29.

Sewers

PROPOSED WORK

N. Y., Batavia—City had revised plans prepared for gravity sewage disposal system to replace present pumping system. About $200,000. A. Clark, city engr.

Pa., Altoona—City plans election May 18 to vote on increasing bonded indebtedness by $450,000, $330,000 to be used for extending and rebuilding eastern section of sewerage system. H. G. Hinkle, city mgr. F. D. Hain, 203 Coleridge Ave., Llyswen, engr.

N. C., Graham—City plans to construct sewerage system. About $150,000. R. L. Holemes, mayor. Engineer not selected.

N. C., Hertford—See "Waterworks."

O., Cleveland Heights (Warrensville P. O.)—Village receives bids about May 1, building vitr. pipe sewer in Ardmore Subdivision. About $125,000. F. A. Pease Eng. Co., 804 Marshall Bldg., Cleveland, engr.

Mich., Fremont—City plans to build sewage disposal plant. About $65,000. J. R. Rumsey, 700 Innes St., Grand Rapids, engr.

N. D., Cooperstown—City plans to build complete sewerage system, including disposal plant, etc. About $25,000. Dakota Eng. & Constr. Co., Valley City, engr.

Mont., Ryegate—City voted $15,000 bonds to build sewerage system. C. A. Renshaw, Roundup, engr.

Okla., Okemah—City having plans prepared for building main sewers and sewage disposal plant. About $90,000. V. V. Long & Co., 1300 Colcord Bldg., Oklahoma, engrs.

Idaho, Malad—City soon lets contract building sewerage system in Dist. 3, involving 5,400 ft., 8-12 in. pipe, also laying 2,800 ft. 18 in. vitr. tile, 2,300 ft. open canal sewer and 30 x 50 ft. rein.-con. septic tank in Dist. 1. J. H. Giles, engr.

Cal., Pittsburgh—City having plans prepared for storm and sanitary sewers, vitr. or concrete pipe. About $20,000 each. G. T. Oliver, Pittsburgh, engr. Noted Feb. 12.

BIDS DESIRED

Vt., Rutland—Until March 8, by D. D. Snyder, comr. Pub. Wks., building sewers and paving West and Wales Sts., involving 2,700 cu.yd. excav., 880 lin.ft. 42 in. and 270 lin.ft. 54 in. monolithic or rein.-con. pipe, 350 lin.ft. 27 in. and 140 lin.ft. 30 in. rein.-con. or vitr. pipe, 200 lin.ft. 12 in. vitr pipe, 4,770 lin.ft. granite or concrete curbing, 8,500 sq.yd. sheet asphalt and

Sewers (Continued)

2,925 sq.yd. vitr. shale block on 6 in. concrete foundation or 2,650 cu.yd. rein.-con. pavement and appurtenant work; advertised in this issue.

Mass., Boston—Until Feb. 25, Comr. Pub. Wks., building 900 ft. oval sewer outlet, 17 ft. diam., brick invert, at Stony Brook. About $150,000. T. F. Sullivan, City Hall, engr.

N. C., Burlington—Until March 10, by city, constructing 9½ mi. sewers, 8-15 in. diameter, and appurtenances. J. L. Ludlow, Winston-Salem, engr. E. B. Horner, mayor; advertised in this issue.

Ala., Montgomery — See "Streets and Roads."

O., Toledo—Until March 23, by D. H. Goodwille, dir. pub. serv., building contr. 2 of Ten Mile Creek Intercepting Sewer, involving 9,785 ft. 57 in. 3,160 ft. 54 in. and 1,015 ft. 30 in. circular sewer, 2,915 ft. 8-18 in. vitr. pipe sewers, 2 inverted siphons, one 30 in. creek crossing, drop manholes, etc. Alternate bids will be received on concrete, segment blocks, concrete pipe and brick; advertised in this issue.

Mich., Pontiac—Until March 1, by Citizens Development Co. building 14,000 lin. ft. 8-10 in. sanitary sewer, 8,000 lin.ft. 10-30 in. storm sewer, man holes, catch basins and inlets. W. B. Anderson, Suite 1, Pontiac Savings Bank Bldg., pres.; advertised in this issue.

Mich., Port Huron—Until Feb. 24, by G. C. Wanless, supt. Dept. Streets & Pub. Impvts., trenching, laying vitr. crock lateral sewers with manholes and connections, and backfilling complete. 16th St. from Gillett St. to northern limits, Michigan St., from Stanton to Merchant Sts. and streets of Avery Farm Plat, involving 8-12 in. pipe. About $14,000. E. R. Whitmore, city engr.

Ia., Dexter—Until Feb. 26, by H. H. Hough, town clk., building sanitary sewerage system and disposal plant, involving 25,000 ft. 8-12 in. pipe. T. S. De Lay, Creston, consult. engr. Noted Aug. 21.

Ia., Stanton—Until March 4, by L. V. E. Peterson, town clk., building sanitary sewerage system and sewage disposal plant, involving 15,000 ft. 8-12 in. pipe. T. S. De Lay, Creston, consult. engr.

Minn., Forest Lake—Until March 6, by J. C. Boehm, village clk., building sanitary sewerage system, involving 32,000 ft. 8-15 in. pipe. About $40,000. Druar & Smith, Globe Bldg., Minneapolis, engrs.

Mont., Baker—Until March 1, by W. R. McDonald, city clk., furnishing all labor and material for building sanitary sewer mains, outfall and sewage treatment plant, also constructing sanitary sewer laterals in Impvt. Dists. 10, 11 and 12. G. E. Hough, mayor. Burns & McDonnell, 402 Interstate Bldg., Kansas City, Mo., engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Reading — Metropolitan Dist. Comn., 18 Tremont St., Boston, let contract building 1,364 ft. 16 in. c.i. pipe sewer through Reading and Wakefield, to Bruno & Petitti, 18 Tremont St., Boston, $70,179. Noted Feb. 5.

★Ga., Atlanta—City will lay 7,565 lin.ft. of 8 and 15 in. vitr. sewer pipe in Spring, Baker, Emandel, Candler, 4th, Leach, Warner, and Oliver Sts., Baltimore Blk., West Peachtree Pl. and Allene Ave. About $15,512. Work will be done by day labor under supervision of H. L. Collier, ch. of constr.

★O., Cleveland—Elger Estate, c/o F. Landor, engr., Blackstone Bldg., let contract building sewer and water mains in West 152nd St., involving 700 ft. 15 in. vitr. pipe, 700 ft. 6 in. c.i. pipe and 8 manholes, to Sprague & Burkhardt, 12011 Woodland Ave. About $10,000.

★Kan., Colby—See "Streets & Roads."

★Ariz., Yuma—C. F. Stanley, city recdr., let contract laying 69,830 ft. 4-20 in. vity. pipe in sewer Dist. 3, 6 mi. 20 in. concrete pipe outfall, sewage pumping unit, concrete pump house and 52 manholes, to G. B. Benson & Sons, Stimson Bldg., Los Angeles, $91,324 Noted Jan. 8.

Bridges

PROPOSED WORK

N. Y., Corning—City election Feb. 24, to vote on $300,000 bonds to build 7 span concrete bridge across Chemung River.

Ind., Anderson — Bd. of Wks. adopted plans and specifications for 426 ft. bridge over White River on 9th St., to have 5 spans.

Wisconsin—State Highway Comn., Madison, made surveys and preparing plans for building Black Bridge, Excelsior Twp., Sauk Co., 120 ft. long, 20 ft. wide, steel truss with concrete abutments. E. H. Groth, Baraboo, comr.

Wisconsin—State Highway Comn., Madison, preparing plans for building bridges in following counties:

Forest Co., Otter Creek Bridge, Caswell Twp., 30 ft. long, 20 ft. wide. F. Rogers, Crandon, comr.

Lafayette Co., Shullsburg Bridge, Shullsburg Village, 45 ft. long, 24 ft. wide; Scott Bridge, Monticello Twp., 8 ft. long, 24 ft. wide. G. H. Priestley, Darlington, comr.

Polk Co., Cameron Bridge, Lincoln Twp., 12 ft. long, 16 ft. wide. C. Nystrom, Balsam Lake, comr.

Shawano Co., Horn Bridge, Angelica Twp., 40 ft. long, 20 ft. wide; Gripp Bridge, Hartland Twp., 14 ft. long, 20 ft. wide; Town Line 2 Bridge, Barteleme and Senece Twps., 45 ft. long, 20 ft. wide; Mill Creek Bridge, Pella Twp., 30 ft. long, 24 ft. wide; Green Valley Bridge, Green Valley Twp., 30 ft. long, 20 ft. wide; Pulchinicki Bridge, Angelica Twp., 12 ft. long, 20 ft. wide. W. F. Meyer, Shawano, comr.

Waupaca Co., Mellon Bridge, Weyanwega Twp., 10 ft. long, 24 ft. wide; Middlestadt Bridge, Lind Twp., 10 ft. long, 24 ft. wide; Kirke Bridge, Lind Twp., 14 ft. long, 24 ft. wide. All bridges to be rein.-con. with concrete abutments.

Mont., Belt—Cascade Co. plans to build 100 ft. rein.-con. arch bridge, over Belt Creek. About $25,300. Federal Government has been asked to appropriate toward cost. J. N. Edy, c/o State Highway Dept., Helena, engr.

Mont., Lewistown—City election April 23, to vote on $10,000 bonds to build several bridges of short spans. R. P. Longshore, 820 West Corcoran St., engr.

Utah, Salt Lake City—Comrs. Salt Lake Co. having plans prepared by Ware & Treganza, archts., Utah Savings & Trust Bank, and Frank Allen, structural engr., building 800 ft., rein.-con. memorial bridge over Parleys Canyon. About $300,000 Noted Dec. 4.

Wash., Goldendale—R. E. Crooks, aud. Klickitat Co., soon lets contract building 80 ft. steel span over Wood Gulch Creek, in Sect. 9, Twp. 3N. C. W. Spalding, co. engr.

Ont., York—York Co. having plans prepared by E. A. James engr., 57 Adelaide St. E., Toronto, for bowstring arch through bridge on Don Mills Rd., 90 ft. long, 20 ft roadway, 6 ft. sidewalk. Work involves 300 cu.yd. concrete, 450 cu.yd. rein.-con., 8½ tons reinforcing steel, etc. About $20,000.

BIDS DESIRED

N. Y., Bronxville—Until March 8, by Bronx Parkway Comn., West Fondfield Rd., building driveway bridge on Bronx Blvd., 300 ft. south of Gun Hill Rd. and one about 60 ft. north of Gun Hill Rd. J. Downer, engr. and secy.; advertised in this issue.

Ga., Hawkinsville—Until March 2, by Morgan Thompson, chn., Bd. Comrs. Rd. & Revenues, Pulaski Co., and Garrett & Slack, engrs., Bell Bldg., Montgomery, Ala., building 3 rein.-con. and steel bridges and 1 concrete culvert. About $180,000.

O., Cincinnati—Until March 5, by Comrs. Hamilton Co., building steel superstructure for bridge over Whitewater River to replace suspension bridge in Whitewater Twp., Spec. 20-S; also building concrete pier and concrete girders and floor, Spec. 20-T.

Wis., Kenosha—Until March 5, by Street Assessment Com., City Hall, furnishing labor and material for building rein.-con. bascule bridge, on Main St., over Harbor, here, consisting of 4 arch spans, varying in length from 40-60 ft., 2 girder spans, 19 and 30 ft., approaches aggregating 230 lin.ft. and Strauss trunnion bascule span 167 ft. center to center of trunnions Plans also include building and maintaining temporary foot bridge, dismantling and removing present sub-structure and removing present suepr-structure on to substructure to be furnished by city, at Middle St. crossing of north branch of harbor on Washington Island. J. G. Joachim, B. C. Brennan and I. R. Turkelson, com.; advertised in this issue.

Wis., Menomonie—Until Feb. 26, at Dunn Co. Court House, building following county and State aid bridges:

Colfax Twp., Spaulding Bridge 8 ft. long, 20 ft. wide, rein.-con. slab, involving 45.5 cu.yd. concrete, 7,370 lb. steel.

Rock Creek Twp., Swan Bridge, 30 ft. long, 16 ft. wide, concrete deck girder, 142.2 cu.yd. concrete, 7,370 lb. steel, etc.; Schluck Bridge, 30 ft. long, 16 ft. wide, concrete deck girder, 121.3 cu.yd. concrete, 6,940 lb. steel, etc.; Larson Bridge, 30 ft. long, 16 ft. wide concrete deck girder, 142.2 cu.yd. concrete, 7,370 lb. steel, etc.

Lucas Twp., Velstine Bridge, 16 ft. long, 16 ft. wide, 67 cu.yd. concrete, 3,900 lb. steel; Hall Bridge, 10 ft. long, 16 ft. wide, 48 cu.yd. concrete and 2,150 lb. steel; Hagerty Bridge, 12 ft. long, 16 ft. wide, 58.2 cu.yd. concrete and 3,010 lb. steel; all three to have concrete slabs; Sippel Bridge, 6 ft. long, 6 ft. wide, concrete box culvert, 33.3 cu.yd. concrete, 1,740 lb. steel, etc.

Otter Creek Twp., Green Bridge, 20 ft. long, 20 ft. wide, concrete deck girder, 84 cu.yd. concrete, 5,640 lb steel, etc. F. Stewart, co. highway comr.

Minn., Albert Lea — See "Streets and Roads."

Wyo., Thermopolis—Until Feb. 24, by State Highway Comn., Capitol, Cheyenne, building 320 ft. bridge, 30 ft. wide, at Big Horn Hot Springs Reserve, consisting of four 68 ft. rein.-con. arch spans, with 20 ft. roadway, and two 5 ft. sidewalks, involving about 1,300 cu.yd. rein.-con., 75 tons steel, 4,080 lin.ft. wooden piling, 600 lin.ft. cofferdam, etc. About $75,000. Marsh Eng. Co., East 7th and Vine Sts., Des Moines, engr.

Washington—Until March 1, by State Highway Comn., Olympia, building rein.-con. T-beam bridge, consisting six 28 ft. spans, over Mud Bay, on Olympia Highway, west of Olympia, Thurston Co. J. Allen, state highway engr.

Cal., Dinuba—Until March 2, by Bd. Supervs. Tulare Co., Visalia, building rein.-con. arch bridge over Kings River. About $50,000.

Ont., Chatham—Until Feb. 27, by L. A. Pardo, chm., Comrs. Kent Co., for concrete abutments for 80 ft. steel bridge over Duffis Creek. About $15,000. G. G McGeorge, Chatham, engr. Steel contract already awarded.

Man., Wheatland—Until Feb. 28, by John A. Dyer, R.R. 1, building rein.-con. bridge and culvert north of Sect. 5-11-21W. and north of Sect. 11-11-21W.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Schenectady—E. S. Walsh, supt. Pub. Wks., Capitol, Albany, received bids Feb 10, building abutments and approaches of Schenectady-Scotia Bridge over Mohawk River, extending from State St. and Washington Ave., here to point 300 ft. north of junction of Schonowee and Mohawk Aves., Scotia Village, from D. Bennett & Son, Schenectady, $234,593; Amer. Pipe & Constr. Co. 112 North Broad St., Phila., $255,633. Noted Jan. 15.

★Pa., Phila.—Dept. Pub. Wks. let contract building rein.-con. and steel bridge over tracks of Pennsylvania R.R., on Oxford St., to M. & J. B. McHugh Co., 892 North Markoe St. About $80,000.

Pa., Williamsport—Lycoming Co. received bids building 40 ft. concrete, single span bridge, 20 ft wide, over Larry's Creek, between Newberry and Jersey Shore, from W. J. & J. T. Gephart, Williamsport, $43,960; G. W. Rockwell, Williamsport, $44,995; F Rockwell, Williamsport, $52,500.

★Ga., Albany—Dougherty Co. let contract building concrete and steel bridge over Flint River, to C. G. Kershaw Contg., Woodward Bldg., Birmingham, Ala., at $263,204.

★Wisconsin — State Highway Comn., Green Bay, let contract building Whitehouse Bridge, Richmond and Wascott Twps., Shawano Co., to J. Young & Bro., Oconto, $21,989.

★Utah, St. George—Washington Co. let contract building 109 ft. steel span bridge, 22 ft. wide, concrete piers and approaches; over Santa Clara River on Shinwitz Indian Reservation, to Randall Jones, Cedar City. About $14,600

Oregon—State Highway Comn., Portland, received bids Feb. 5, building (a) building 110 ft. concrete arch with approaches over Mosier Creek, involving 650 cu.yd. Class "A" and 10 cu.yd. Class "B" concrete, 82,000 lb. reinforcing steel, etc., (b) 90 ft. steel superstructure over Kilchis River near Juno, 90,000 lb. structural steel, (c) one 60 ft. steel span over Dry Creek near Blue Mountain, 12,000 lb. metal reinforcement, 58,000 lb. structural steel, 120 cu.yd. Class "A" concrete, etc., (d) one 75 ft. concrete arch over Dry Canyon, 359 cu.yd. Class "A" concrete, 49,000 lb. reinforcing steel etc., (e) concrete viaduct and box culvert near Adams, 300 cu.yd. Class "A" concrete, 29,000 lb. reinforcing steel, from A. Guthrie, Sherlock Bldg., Portland, (a) $48,813; Lindstrom & Feigensen, Wor-

Bridges (Continued)

cester Bldg., Portland, (a) $42,762, (d) $23,837; J. F. Clarkson, 608 Yeon Bldg., Portland, (a) $53,943, (d) $28,190; Pacific Foundation Co., Northwest Bank Bldg., Portland, (b) $10,332, (c) $10,864; Union Bridge Co., foot of Fenwick-Kenton, Portland, (c) $13,007, (d) $36,778, (e) $17,571; Ryner-Dickie Co. Adams, (e) $13,628. Noted Jan. 29.

★**Ore., Astoria**—State Highway Comn., Portland, let contract building 1 double leaf trunnion bascule bridge over Youngs Bay, on Columbia River Highway, near here, to Gilpin Constr. Co., Astoria, $308,-621. Noted Jan. 22.

Structural Steel

PROPOSED WORK

N. Y., New York — Exchange — See "Buildings."

N. Y., New York—Offices, Showroom, Cafeteria—See "Buildings."

N. J., Jersey City — See "Industrial Works."

N. J., Morris Plains—Psychopathic—See "Buildings."

O., Cleveland — Hospital — See "Buildings."

O., Cleveland—Theatre and Commercial—See "Buildings."

Mich., Detroit—Office—See "Buildings."

BIDS DESIRED

Mich., Bay City—See "Industrial Works."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**O., Cleveland**—See "Industrial Works."

★**Mich., Detroit**—Office—See "Buildings."

Reinforced Concrete

PROPOSED WORK

N. Y., New York — Exchange — See "Buildings."

N. Y., New York—Office—See "Buildings."

N. Y., New York—Offices, Showroom, Cafeteria—See "Buildings."

N. J., Jersey City—See "Industrial Works."

O., Cleveland—Hospital—See "Buildings."

O., Cleveland—Theatre and Commercial —See "Buildings."

O., Middletown—Hotel—See "Buildings."

Mich., Detroit—Office—See "Buildings."

Wis., Milwaukee—Home—See "Buildings."

Tex., Houston—Office, etc.—See "Buildings."

BIDS DESIRED

O., Dayton—Store—See "Buildings."

Mich., Bay City—See "Industrial Works."

Wis., Sheboygan—Bank and Office—See "Buildings."

Cal., Dinuba—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**O., Cleveland**—See "Industrial Works."

★**Mich., Detroit**—Office—See "Buildings."

Streets and Roads

PROPOSED WORK

N. Y., Rochester—City adopted ordinance to pave West High Terrace. About $18,-750. C. A. Poole, city engr.

N. J., North Bergen—Town Council plans to improve Grand Ave., from Secaucus Rd. to Highpoint Ave. About $20,000.

N. J., Paterson—City receives bids about April 15, paving Main St. from Slater St. to Erie R.R., cost $87,115; Bway. from New York, Susquehanna & Western R.R. to East 33rd St., $102,465; Ellison Pl. from East 18th to East 22nd Sts., $22,480; Spruce St. from Ellison to Oliver Sts, $24,100; Madison Ave. from Ellison St. to New York, Susquehanna & Western R.R., $6,472; Union Ave. from Paterson to Hamburg Ave., $41,450. H. J. Harder, city engr.

N. J., Toms River—Bd Freeholders Ocean Co. plans to build 5 mi. cement road from Lakewood to Laurelton, 18 and 20 ft. wide. About $200,000. J. M. Abbott, Toms River, engr.

Pennsylvania — State Highway Dept., Harrisburg, rejected bids received Oct. 31, building section State Route 366, Stewart and Wharton Twps., Fayette Co; also bids received Jan. 27, Route 89, Plum Twp, Venango Co. (this project will be readvertised); Route 247, Perry and Jefferson Twps., Fayette Co.; Route 3, Sect. 1, Center Twps., Greene Co., Route 222, Sect. 1, Scalp Level Boro., Richland and Stony Creek Twps., Cambria Co., Route 188, Kiskimentas Twp., Armstrong Co. Noted Feb. 5.

Pa., Johnstown — City Council receives bids after March 15, grading, curbing and paving Franklin and Plainfield Aves., also building sanitary sewer, Seibert alley between Somerset St. and Morrison Ave. and opening Roxbury Ave. between Derry and Wonder Sts. M. L. Massterton, supt. of highways.

Pa., Scranton—City plans to pave 3,700 ft. Harrison Ave., from tracks of Delaware, Lackawanna & Western R.R. to Myrtle St., 32 ft. wide, brick on concrete base. About $40,000. W. Schunk, city engr.

Pa., Wilkes-Barre—City having plans prepared grading and paving 3,000 ft. Nicholson St. from Hazle Ave. to city line, 25 ft. wide, involving 835 sq.yd. vitr. brick on concrete base, cost $20,000; 1,800 ft. Grant St. from Moyallen to Stanton Sts., 32 ft. wide, 500 sq.yd. asphalt on 1 course concrete base, $10,000, also South Franklin St. from Brook to Division Sts. and Lehigh St. from Park Ave. to Mead St., involving 3,800 sq.yd. asphalt. B. K. Finch, city engr.

W. Va., Buckhannon—Comrs. Upshur Co. soon receive bids improving 3.8 mi. class "A" road from Buckhannon to Lawrence, vitr. brick. About $110,000. W. C. West, co. engr.

W. Va., Parkersburg—Comrs. Wood Co. having plans prepared by B. Woodyard, engr., Parkersburg, surfacing 2 mi. Stanton-Parkersburg Pike, 16 ft. wide, involving 19,000 sq.yd. concrete and 12,000 cu.yd. excav. About $70,000.

W. Va., Parkersburg—Comrs. Wood Co. plan to improve 8 mi. road, brick and asphalt. About $193,740. L. G. Merrill, Parkersburg, engr.

W. Va., Wheeling—Comrs. Ohio Co. soon receive bids improving 1,000 ft. Zane St. on National Rd., 30 ft. wide, brick on concrete base. About $15,000. W. O. McCluskey, co. engr.

W. Va., Wheeling—Comrs. Ohio Co. having plans prepared by W. O. McClusky, engr., for paving 1 mi. National Pike, 18 ft. wide, involving 10,000 sq.yd. concrete. About $37,000.

N. C., Hertford—See "Waterworks."

Ga., Atlanta—City plans to pave, Edgewood, Confederate and Lucille Aves., Collins, Currier and Simpson Sts., involving 41,352 sq.yd. concrete; Jackson, Gray, Sydney, Everhart, Ellis and Rankin Sts., Kirkwood, Boniventure, Highland, North and Jones Aves., involving 29,494 sq.yd. bituminous macadam, Simpson, and Washington Sts. and Greenwood Ave. involving 13,934 sq.yd. asphalt coat. About $198,-697. H. L. Collier, ch. of constr.

O., Cleveland Heights (Warrensville P. O.)—Village receives bids about May 1, grading, draining, paving and curbing 26tb St., asphalt, concrete or brick block on concrete base. About $700,000. F. A. Pease Eng. Co., 804 Marshall Bldg., Cleveland, engrs.

O., Lakewood (Cleveland P. O.)—City receives bids in spring, grading, draining and paving Chesterland, Fries, Lincoln Riverway and Wyandotte Aves., total length 2 mi., concrete or brick block on concrete base. About $100,000. E. A. Fisher, City Hall, engr.

O., Wellsville—City Council receives bids about April, paving 2 mi. streets. J. N. George, East Liverpool, engr.

Indiana—State Highway Comn., Indianapolis, plans to build 25 mi. road between Gary and Michigan City to be known as Indiana-Dunes Highway. About $1,000,000. L. H. Wright, chn.

Michigan—F. F. Rogers, state highway comr. Lansing, soon lets contract grading, draining and surfacing 1.002 mi. State Trunk Line Rd. 11-31, 16-18 ft. wide, Berrien Co, involving 10,562 sq.yd. concrete, or bituminous concrete, 4,644 cu.yd. earth excav., 9,389 sq.yd. waterbound macadam, 110 lin.ft. 12 in. encased tile, 19.1 cu.yd. 1:2:4 and 49.2 cu.yd. 1:3:6 concrete, 1,306 lb. reinforcement, etc.

Michigan—State Highway Dept., Lansing, soon receives bids building 16.614 mi. Federal Aid Project 38, 18 ft. wide, Fort Gratiot Turnpike, St. Clair Co., 21.892 mi. Federal Aid Project 43, Casnovia Rd., Muskegon Co.; also 10.058 mi. Federal Aid Project 41, Saginaw Rd., Oakland Co., all 18 ft. wide, cement or bituminous concrete. F. F. Rogers, state highway comr.

Michigan—State Highway Dept., Lansing, plans to grade, drain and surface with gravel 5.509 mi. State Trunk Line Rd. 21-1, 16 ft. wide, Clinton Co.; 22.505 mi Michigan Federal Aid Project 44, 9.163 mi. with 16 ft. gravel and 13.342 mi. with 18 ft. concrete or bituminous concrete, also 10.482 mi State Trunk Line Rd. 34-1, 18 ft. wide, from Blissfield to Adrian, Lenawee Co; 4.033 mi. State Trunk Line Rd. 11-23, 18 ft. wide, Mason Co., 4.331 mi. State Trunk Line Rd. 19-11, 18 ft. wide, Macomb Co.; surfacing only 7.039 mi. Federal Aid Project 32, 16 ft. wide, Allegan Co., all these roads to be surfaced with cement or bituminous concrete.

Michigan—State Highway Dept., Lansing, plans to grade, drain and surface with cement or bituminous concrete, 3.716 mi. State Trunk Line Rd. 53-1, 18 ft. wide, Macomb Co., also 13.965 mi. State Trunk Line Rd. 23-3, Sects. A, B and C, 18 ft. wide, Hillsdale Co.

Mich., Charlotte—Bd. Comrs. Eaton Co. rejected bids received Jan. 30 grading, draining and surfacing with cement or bituminous concrete 6.582 mi. State Trunk Line Rd. 16-3, 18 ft. wide. Noted Jan. 15.

Mich., Detroit—City soon lets contract grading, placing retaining plank and paving with 1 course concrete Alley 1,108 between Duboise, Chene, Forest and Hancock Aves., 20 ft. wide, involving 215 cu.yd. earth excav. and 693 sq.yd. paving; Alley 1,109 between Cass, Forest and Hancock Aves., 15 ft. wide, 154 cu.yd. excav. and 590 sq.yd. paving; Alley 1,110 between Trumbull and Brooklyn Aves., Pine and Spruce Sts., 18 and 20 ft. wide, 527 cu.yd. excav. and 1,710 sq. yd. paving. C. W. Hubbell, city engr.

Mich., River Rouge—City soon receives bids grading, curbing and paving with concrete reinforced with armor plate protection joints, 10,000 ft. Maple and Burke Aves., and Pine and Henry Sts., 24-30 ft. wide, involving 25,000 sq.yd. concrete. About $100,000. G. Jerome, 1331 Majestic Bldg., Detroit, engr.

Mich., West Branch—Ogemaw soon lets contract grading, draining and surfacing 3.054 mi. Assessment Dist. Rd. 1, 9 ft. wide, involving 16,128 sq.yd. gravel, 16,976 cu.yd. earth excav., etc.

Ill., East Moline—City soon receives bids paving 2,992 ft. 10th St., 19th and 20th Aves., 20 ft. wide, involving 5,830 sq.yd. vitr. brick, on concrete base, 5,984 lin.ft. concrete curbing and guttering. About $39,000. B. L. Warnes, city engr.

Kansas—State Highway Dept., Topeka, plans to expend $8,000,000 to build roads (Federal Aid Projects), in following counties:

Allen Co., 4 mi., brick, concrete or macadam.

Anderson Co., 7.5 mi., gravel.

Barton Co., 22 mi., concrete.

Bourbon Co., 16 mi., bituminous macadam.

Chase Co, 4 mi., brick or concrete.

Cherokee Co., 10 mi., concrete.

Cloud Co., 7 mi., concrete or gravel.

Doniphan Co., 6 mi., brick or concrete.

Douglas Co., 32 mi., concrete.

Finney Co., 28 mi, brick, concrete or gravel.

Ford Co., 28 mi., brick.

Franklin Co., 8 mi., brick or concrete.

Gray Co., 6 mi., gravel.

Hamilton Co., 8 mi., gravel.

Jackson Co., 6 mi., brick, concrete or bituminous macadam.

Jefferson Co., 6 mi., brick, concrete or bituminous macadam.

Johnson Co., 6 mi., bituminous macadam resurfacing.

Kearney Co., 8 mi., gravel.

Labette Co., 6mi., gravel.

Leavenworth Co., 17 mi, concrete.

Linn Co., 6 mi., waterbound macadam.

Lyon Co., 15.5 mi., brick or concrete.

Marshall Co., 19 mi., concrete or macadam.

Meade Co., 6 mi., earth.

Miami Co., 9 mi., bituminous macadam.

Mitchell Co., 7 mi., concrete.

Montgomery Co., 12 mi., macadam or gravel.

Morris Co., 8 mi., bituminous macadam.

Neossh Co., 12 mi., gravel.

Ottawa Co., 5 mi., brick or concrete

Reno Co., 15 mi., brick.

Saline Co., 12 mi., concrete or bituminous macadam.

Sedgwick Co., 4.5 mi., concrete or bituminous macadam.

Shawnee Co., 14 mi., brick concrete or macadam.

Sumner Co., 3.5 mi., brick or concrete.

Wyandotte Co., 9 mi., concrete.

Nebraska—State Dept. Pub. Wks., Lincoln, soon lets contract grading and constructing culverts on 7.58 mi. of St. Paul Grand Island Rd, Federal Aid Project 60, involving 74,498.6 sq.yd surfacing, 48 lin.ft. 18 in. and 24 lin.ft. 30 in. pipe, 39 cu.yd. 1-2-4 con-concrete in culverts, 8.75 sq.yd. 1-2-4 concrete in culvert headwalls and 75 lin.ft. wooden guard rails; 16.22 mi. of Orleans-Franklin Rd., Federal Aid Project 71, involving 118,364 cu yd earth excav., 6,133 sq.yd. sand surfacing, 469.8 sq.yd. concrete

Streets and Roads (Continued)

pavement, 292 lin.ft. 18 in., 52 lin.ft. 24 in., 24 lin.ft. 30 in. 32 lin.ft. 36 in. and 52 lin.ft. 48 in. pipe, 371.48 cu.yd. 1-2-4 concrete in culverts, 58.71 cu.yd. 1-2-4 concrete in culvert headwalls, 5,464 lin.ft. wooden guard rails; 17.968 mi. Lisco-Oshkosh Rd., Federal Aid Project 82-A, involving 118,199 cu.yd. earth excav., 125,739 sq.yd. surfacing, 460.5 sq.yd. concrete pavement 6 in. thick, 228 lin.ft. 18 in., 212 lin.ft. 24 in., 128 lin.ft. 30 in. and 24 lin.ft. 36 in. pipe, 65.58 cu.yd. 1-2-4 concrete in culverts, 916 lin.ft. wooden guard rails and 252 cu.yd hand placed rip rap; 31.87 mi. from Broken Bow E. to county line Federal Aid Project 22, involving 234,659 cu.yd. earth excav., 49,179 sq. yd. surfacing, 2,029 sq.yd. concrete pavement 7.33 in. thick, 8,063 lin.ft. wooden guard rails, 966 lin.ft. 18 in., 726 lin.ft. 24 in., 24 lin.ft. 30 in. and 82 lin.ft. 36 in. pipe, 159.81 cu yd. 1-2-4 concrete in culvert headwalls and 766.07 cu.yd. 1-2-4 concrete in culverts. Culverts to be paid out of county funds G. E. Johnson, state eng.

Neb., Lincoln—City soon lets contract repaving 4,300 ft. O St. from 16th to 27th Sts., Dist. 79, 2-17 ft. roadway, involving 16,140 sq.yd. of either sheet asphalt, $35,000 or 3 in. brick, $43,800; 2,300 ft. 14th St. from Vine to Claremont Sts., Dist. 72, 40 ft. wide, 8,300 sq.yd. vitr. brick and 760 lin.ft. oak headers, $36,000; paving, curbing and guttering 804 ft. 26th St. from Randolph to J Sts., Dist. 333 and Roselyn St., Dist. 445, 24 and 30 ft. wide, 1,935 sq.yd. asphaltic concrete, 560 sq.yd. asphalt, 131 sq.yd. concrete, 1,582 lin.ft. curbing, and guttering, 179 lin.ft. curbing and 23 cu.yd. earth excav., $10,250; 1,027 ft. Farms Ave., Dist. 382, and Maple St., Dist. 351, 23 and 25 ft. wide, 2,070 lin.ft. curbing and guttering, 2,410 sq.yd. asphaltic concrete and 290 cu.yd. earth excav., $10,100; 685 ft. Summer St., from 24th to 25th Sts., and 24th St. from Garfield to Summer Sts., Dist. 436, 25 and 40 ft. wide, 130 lin.ft. curbing and guttering, 100 sq.ft. cement sidewalk and 1,800 sq.yd. asphaltic concrete, $7,000; 1,200 ft. Charleston St., Dist. 394, 30 ft. wide, 2,500 lin.ft. curbing and guttering or 2,650 lin.ft. curbing, 150 sq. yd. concrete, 4,100 sq.yd. sheet asphalt, $15,500 or 4,620 sq.yd. 3 in. brick, $20,000. G. W. Bates, city engr.

N. D., Grand Forks—City having plans prepared paving Dists. 10, 16, and 21, 24-30 ft. wide. About $350,000. C. S. Giles, city engr.

Wyo., Casper—City having preliminary plans prepared paving Boyer, Ross, Market, Marion, and West 3rd Sts., involving 16,000 sq yd. bitulithic pavement on concrete base, together with necessary substructures and concrete curbs and walks. Wheeler & Worthington, Room 7, Townsend Bldg., engrs.

Mont., Miles City—Custer Co. election April 23, to vote on $350,000 bonds to build roads. Federal Government will be asked to appropriate toward cost. J. N. Edy, c/o State Highway Dept., Helena, engr.

Missouri—State Highway Dept., Jefferson City, plans to build 13 mi. Greenville-Poplar Bluff Rd., 24 ft. wide, Butler Co., involving 38,000 cu.yd. earth and 2,000 cu.yd rock excav., 10 mi. grading, 66,000 sq.yd. gravel and 2,640 sq.yd. concrete surfacing, 9 ft. wide, 27 culverts and one 30 ft. span bridge, cost $80,344; 10.46 mi. Jefferson Highway, 24 ft. wide, Athens Twp. Bd., Gentry Co., 138,600 cu.yd. earth and 1,400 cu.yd. rock excav., 98,188 sq.yd. gravel surfacing, 16 ft. wide, 47 culverts, 1,050 lin.ft. guard rail, $210,947; 8.1 mi. Preston-Collins Rd.,Weaubleau Special Rd. Dist., 31,360 cu.yd. earth and 640 cu.yd. rock excav., 76,035 sq.yd. 2 course gravel surfacing, 16 ft. wide, and 21 culverts, $56,141; 6.7 mi. Springfield-Sedalia Rd., Cross Timbers Special Rd. Dist., 20,000 cu. yd. earth and 400 cu.yd. rock excav., 35,376 sq.yd. 2 course gravel surfacing, 9 ft. wide, 22 culverts, one 30 ft. concrete girder span and one 20 ft. concrete slab span, $36,245, both 24 ft. wide, Hickory Co.; 2.1 mi. Washington Park Blvd.-Kansas City Rd., 32 ft. wide, Jackson Co., 75,200 cu.yd. earth and 4,800 cu.yd. rock evcav., 40,000 cu.yd. borrow, 42 culverts and one 110 ft. concrete arch bridge, $129,059; 4 mi. Joplin-Springfield Rd., 24 ft. wide, Jasper Co., 1,500 cu.yd. earth excav., 21,120 lin.ft. grading, 42,240 sq.yd. concrete paving, 18 ft. wide, and 2 culverts, $88,000; 22 mi. Springfield-Joplin Rd., Mt. Vernon Special Rd. Dist., 24 ft. wide, Lawrence Co., 22,560 cu.yd. earth excav., 43,180 sq.yd. 10 in. and 154,885 sq yd. 5 in. gravel surfacing, 16 ft. wide, 87,000 lin.ft. grading and 29 culverts, $83,000; 6.7 mi. La Belle-Lewistown Rd., La Belle Special Rd. Dist., 22,400 cu.yd. earth excav., 62,891 sq.yd. 10 in. gravel surfacing, 16 ft. wide, 10 culverts and one 28 ft. span concrete bridge, $68,016. 4.25 mi. La Belle-Monticello Rd., Lewistown Special Rd. Dist., 14,500 cu.yd. earth excav., 39,893 sq.yd. 10 in. gravel surfacing, 16 ft. wide, 6 culverts and one 20 ft. concrete span bridge, $44,654, both 24 ft. wide, Lewis Co.: 4.5 mi. London-Perry Rd., 6,192 cu.yd. earth excav. and 23,760 sq.yd. 10 in. gravel surfacing, 9 ft. wide, $17,820, 13 mi. Red Ball Route, 58,998 cu.yd. earth excav., 68,640 sq.yd. 6 in. gravel surfacing, 9 ft. wide, 8 culverts and one 65 ft. steel truss bridge, $51,480, both 26 ft. wide, Ralls Co.: 2.27 mi. Hollister-Branson Rd., Branson-Kirbyville Special Rd. Dist., 2,940 cu.yd. earth and 599 cu.yd. rock excav., 3,984 lin.ft. grading, 16,595 sq.yd. gravel surfacing, 16 ft. wide, 182 lin.ft. 15-24 in. vitr. pipe culverts, 206 cu.yd. dry and 46 cu.yd. cement rubble masonry, 1,990 ft. b. m. timber, 3,120 lb. rein. steel and 1,745 lin.ft. 12 x 14 in. coping wall, $10,490, 1.83 mi. Hollister-Branson Rd., Hollister-Kirbyville Special Rd. Dist., 8,421 cu.yd. earth and 655 cu.yd. rock excav., 2,482 lin. ft. grading, 17,059 sq.yd. gravel surfacing, 16 ft. wide, 105 lin.ft. 15 and 24 in. vitr. pipe culverts, 422 cu yd. rubble masonry, 4,050 lb. rein. steel and 1,800 lin.ft. 12 x 14 in. coping wall, $13,020, both 20 ft. wide, Taney Co.

Okla., Okemah—City having plans prepared paving 25 blocks Dists. 1 and 2, 24 ft. wide, brick. About $400,000. V. V. Long & Co., 1300 Colcord Bldg., Oklahoma, engr.

Idaho., American Falls—Power Co. plans to gravel 19.2 mi. Idaho-Pacific Highway to Pocatello-American Falls, involving 55,400 cu.yd. excav. About $159,863. Wm. J. Hall, comr. Pub. Wks., Boise, engr County will apply to Federal Government for appropriation toward cost.

Idaho, Coeur D'Alene—Kootenai Co. plans to gravel 12.5 mi. North and South Highway from Harrison to Beauty Bay, involving 100,000 cu.yd. excav. About $197,990. Wm J. Hall, comr. Pub. Wks., Boise, engr. County will apply to Federal Government for appropriation toward cost.

Idaho, St. Maries—Benewah Co. plans to gravel 10.9 mi. North and South Highway to St. Maries-Kootenai Co. line, involving 305,000 cu yd., excav. About $197,806. Wm. J. Hall, comr. Pub. Wks., Boise, engr. County will apply to Federal Government for appropriation toward cost.

Utah—State Highway Comn., Salt Lake City, Utah Co., soon lets contract paving 4.7 mi. State Rd. from Payson to Spanish Fork, 18 ft. wide, 2 in. bituminous topping on 5 in. concrete base or 7 in. plain concrete. I. R. Browning, State Capitol, Salt Lake City, engr.

Wash., Yakima—Comrs. Yakima Co. soon let contract paving 1 mi. Buenna Rd., near Toppenish, concrete or gravel macadam. About $10,000. W. C. Marion, co. engr.

Cal., Lakeport—City Trustees soon receive bids improving 23 blocks of Main St., involving 28,386 sq.ft. sidewalks and 6,446 lin.ft. curbs, both cement.

Cal., Pittsburg—City having plans prepared grading, paving with concrete and cement Railroad Ave., Black Diamond and 3rd Sts. About $125,000. G T. Oliver, Pittsburg, engr. Noted Feb. 12.

Cal., Santa Monica—City plans opening and widening Main St., involving grading, paving, curbing, etc. About $250,000. J. A. Morton, city engr.

Que., Hull—Town soon lets contract graveling about 20 mi. road, including Deschenes, Mountain, Iron Mines, Klock, and Eardley Rds., also road between 6th and 7th Sts. About $150,000. Dept. of Rds., Quebec, engr.

BIDS DESIRED

Vt., Rutland—See "Sewers."

Connecticut—Until March 15, (change of date) by C. J. Bennett, state highway comr., Hartford, improving 32.2 mi. Hartford-New London Trunk Line, Federal Aid Project 4, 18 ft. wide; advertised in this issue. Noted Jan 15.

N. Y., Bronxville—Until March 8, by Bronx Parkway Comn., West Pondfield Rd., paving Bronx River Parkway Dr. between Crane Rd., Scarsdale and Woodland Pl., White Plains. Bids will be received on asphalt block, bituminous concrete, bituminous macadam and Warrenite-bitulithic, all on concrete base. J. Downer, engr. and secy.; advertised in this issue.

Pennsylvania—Until March 2, by L. S. Sadler, state highway comr., Harrisburg, rebuilding roads in following counties:

Cambria Co., 23,740 ft. 1 course rein.-con. and Hillside vitr. brick, Route 53, Allegheny and Cambria Twps.

Chester and Delaware Counties, 19,417 ft. 1 course rein.-con., Route 133, Westtown, Willistown and Edgmont Twps.

Crawford Co., 24,774 ft., Route 82, West Fellowfield Twp. and 22,659 ft. Route 207, West Mead Twp., both bituminous surface course on concrete foundation or 1 course rein.-con.

Fayette Co., Route 117.20,996 ft., Dunbar Twp. and 18,480 ft. North Union Twp., both 1 course rein.-con. and Hillside vitr. brick.

Greene Co., 13,811 ft. 1 course rein.-con. and Hillside vitr. brick, Route 268, Jefferson Twp.

Indiana Co, 25,030 ft. 1 course rein.-con. and Hillside vitr. brick, Routes 223 and 314.

Jefferson Co., 14,385 ft. 1 course rein.-con. and Hillside vitr. brick, Route 64, Union Twp.

Lancaster Co., 28,576 ft. 1 course rein.-con., Route 129, East and West Donegal, Mt. Joy, Ralpho, East and West Hempfield Twps.

Northumberland Co, 11,549 ft. 1 course rein.-con., Route 182, Ralpho Twp.

Potter Co, 8,358 ft. bituminous surface course on concrete foundation, or 1 course rein.-con., Route 236, Shinglehouse Boro.

Warren Co., 12,012 ft. 1 course rein.-con., Application 973-4 and Route 93, Tidioute Boro

Pa., Phila.—Until Feb. 24, by Dept. Pub. Wks., grading portions Buist, Felton and Locust Sts.; paving with asphalt Edgemont, Hurley, Lippincott, Pechin, Philadelphia, Plum, Shields, Somerville, 13th, 21st and Westford Sts.; with vitr. block Erringer Pl.; with granite block Scotts St.; repaving with asphalt Clearfield, Jasper and Susquehanna Sts.; with redressed granite block 5th, Frankford, Front, Kensington, Germantown, Passyunk and Vine Sts.; with wood block Susquehanna St.; also repairing asphalt pavements and repaving over trenches and openings in asphalt and streets. J C. Winston, dir. Noted Feb. 12.

W. Va., Braxton—Until March 1, by Comrs. Braxton Co., building 7.7 mi. road, from McNutt to Salt Lick Bridge Rd., 26 ft. wide, involving 62,668 cu.yd. excav. and drainage structures. About $80,000. R. M. Cavendish, Sutton, engr.

W. Va., Charleston—Until Mar. 2, by Comrs. Kanawha Co., grading 2.6 mi. Elk River Rd., 26 ft. wide, involving 60,000 cu.yd. excav. and drainage structures. About $75,000. F. G. Burdette, 509 Columbia Ave., co. engr.

W. Va., Elkins—Until March 2, by T. Pritt, clk., Randolph Co., constructing 5¾ mi. Beverly Bond Issue Rd., involving 16 ft. tarvia pavement, and 6½ mi. involving 9 ft. macadam pavement; also grading and draining 3 mi. Elkins and Parsons Rd. F. A. Parsons, co. rd. engr.

W. Va., Elkins—Until March 2, by Comrs. Randolph Co., building 3 mi. Parson-Elkins Rd., 20 ft. wide, involving 25,000 cu.yd. excav. About $27,000. F. A. Parsons, engr.

W. Va., Marlinton—Until March 9, by Comrs. Pocahontas Co., improving 6,800 ft. Marlinton-Edray Rd., 16 ft. wide, involving 12,200 sq.yd. bituminous macadam. About $15,000. F. Baxter, Marlinton, engr.

N. C., Asheville—Until March 15, by Comrs. Buncombe Co., improving 6 mi. road from Croggy to Turkey Creek, 18 ft. wide, Topeka asphalt over old macadam and concrete curbing.

N. C., Vanceboro—Until Feb. 27, by city, improving 14,000 sq.yd. various streets, brick. About $60,000. R. R. Eagle, Newbern, engr.

Ga., Brunswick—Until Feb. 26 by Bd. Comrs. Rd. & Revenues, Glynn Co., for paving 6 mi. on Dixie Highway. Work involves 35,147 sq.yd. standard type paving, 25 72 cu.yd. class "B" concrete, etc. E. R. Conant Courthouse, project engr.

Ga., Greenville—Until March 9, by C. L. Davis, chn. and engr., Bd. Comrs. Rds. & Revenues of Meriwether Co., building 4.33 mi. of sand clay road between Stations 299-50 and 528-00, Federal Aid Project 16 known as Greenville and Lutherville Rd. Work involves 5041 cu.yd. common and 54.17 cu.yd. rock excav., etc. About $25,000. H. G. Smith, La Grange, div. engr.

Ga., Savannah—Until Apr. 8, by Comrs. Chatham Co, for constructing, paving and draining road to Tybee. Work involves paving 16 mi. public highway with live oyster shells. Advertised in this issue.

Streets and Roads (Continued)

Ga., Valdosta—Until Feb. 24, by L. M. Stanfill, chn., Bd Comrs. Lowndes Co. and Kiver & Kackley, engrs., 4th St and 1st Blk., Nashville, Tenn. for paving Natl. Highway, 4.98 mi. long, 16 ft. wide, involving 48,940 sq.yd. of either asphalt macadam, Finley method, Kentucky rock asphalt, asphaltic concrete, cement concrete, bituminous macadam or Willite method. About $100,000.

Fla., Bronson—Until Feb. 25, by Levy Co. building 16 mi. road, 18 ft. wide, $100,000 bonds voted for project. D. F. Thomas, Gainsville, engr.

Ala., Florala—Until Feb. 24, by City Council and J. B. McCrary Eng. Corp., Citizens & Southern Bank Bldg., Atlanta, Ga., hard surfacing sections of 5th St. and 5th Ave., 22½ ft. wide, involving 22,000 sq. yd. concrete sidewalk and 17,000 sq.yd. vitr. brick, asphalt, concrete or bituminous concrete. About $80,000.

Ala., Montgomery—Until March 2, by J. L. Cobbs, city treas., paving Mulberry St. between Park Pl. and Carter Hill Rd., Semmes St. between Court and Goode Sts., both gravel, also constructing sanitary sewers on Mulberry St. from Park Pl. to 2nd St., thence west on 2nd St. to alley between Walnut St. and Forest Ave., thence south on said alley to 3rd St., thence west on 3rd St., to Forest Ave. and Belleair Dist.; advertised in this issue.

Tennessee—Until March 2, by Dept. of Highways, Nashville, grading, draining and paving 50 mi. State Highway 1, 18 ft. wide, Grainger, Hawkins and Sullivan Counties, involving 438,478 sq.yd. paving. About $1,500,000. W. P. Moore, ch. engr.

O., Columbus—Until March 2, by W. H. Duffy, dir. pub. serv., grading, draining, curbing and paving 1,125 ft. Ebner St., from Forest to Whittier Sts., 24 ft. wide, asphalt or brick, cost $16,609; 430 ft. Ebner St. from Whittier to Siebert Sts., 21 ft. wide, asphalt or brick, $5,367; alley west of Kellogg Ave. from Grove St. to 2nd alley north, 408 ft. long, 14 ft. wide, brick or concrete, $3,120; alley west of 17th Ave. from Bryden Rd. to Rich St., 294 ft. long, 15 ft. wide, brick or concrete, $2,250; 2nd alley north of Grove St. from Cleveland to Kellogg Aves., 500 ft. long, 15 and 20 ft. wide, brick or concrete, $2,108.

O., East Liverpool—Until March 2, by city, paving St. Clair Ave. from Horn Switch to Cemetery gate, involving 15,000 sq.yd. brick on concrete base. J. N. George, city engr.

O., Wauseon—Until March 8, by J. C. King, city clk., paving Chestnut St. from Fulton St. to Shoop Ave., involving 2,035 cu.yd. grading, 1,452 lin.ft. 8 and 10 in. pipe sewer, 3,240 lin.ft. straight and 126 lin.ft. circular curb, 3,366 lin.ft. 4 in. drain tile and 4,698 sq.yd. concrete pavement; Elm St. from Shoop to Elwood Aves., 628 cu.yd. grading, 640 lin.ft. 8 and 10 in. pipe sewer, 1,160 lin.ft. straight and 94 lin.ft. circular curb, 1,254 lin.ft. 4 in. drain tile and 1,544 sq.yd. macadam pavement. G. Champe, Toledo, civil engr.

Indiana — By Bd. Co. Comrs. building roads following counties: Feb. 27, Jay Co., Portland, 12,628 ft. S. M. Milligan et al Rd., stone, Bearcreek Twp. H Martin, aud.

Allen Co., Ft. Wayne, 3 mi. Lapp Rd., gravel, between Milan and St. Joseph Twps. A. C. McCoy, aud.

Waren Co., Williamsport, 10,711 ft. O. B. Johnson Rd. and 10,586 ft. Borders and Coffelt Rd., gravel, Prairie Twp., 13,008.8 ft. H. Brutus Rd., Warren Twp., 1,898 ft. W. W. Siddens Rd., 2,445.5 ft. A. M. Loring Rd. and 1,462.5 ft. C. C Hoover Rd., Kent Twp., 10,739.5 ft. W. T. Brown et al Rd., Liberty Twp. 14,505 ft. J Frasch et al Rd., Adams Twp., 11,930 ft. J. C. Hazlet et al Rd., Pine Twp. W. H. Stephens, aud

Spencer Co, Rockport, roads to Grass Twp. R. W. Richards, Jr., aud.

Clark Co., Jeffersonville, H. Schubnell Rd., crushed limestone, Carr Twp. T. L Stoner, aud.

Franklin Co., Brookville, 2.76 mi. R. Moffett et al Rd., Whitewater Twp. F. X. Stebert, aud

Hendrick Co., Danville, E. Brewer et al Rd. and H D. Bartholomew et al Rd., Franklin Twp., J H. Airhart et al Rd., Brown Twp., R. Pierson et al Rd. and D. A Surber et al Rd., Middle Twp., C. E. Wilson et al Rd. and J L. Wilson et al Rd., Marion Twp., C. Cutrell et al Rd., Washington Twp. C. A. White, aud.

Washington Co., Salem, 20,730 ft Mt Carmel Rd., Vernon and Howard Twps., 19,627 ft., Little York and New Philadelphia Rd., Gibson Twp., 23,761 ft. B. Ridge Rd., Jefferson Twp. E. E. Batt, aud.

March 2, Wabash Co., Wabash, 7,140 ft. Lake Rd., Kentucky rock asphalt road. Pleasant Twp., 2.05 mi. A. Bechtold Rd., Chester Twp., 14,211 ft. Ogan Rd, macadam, and 10,130 ft. O. L. Hayes Rd, Waltz Twp., 15,840 ft. Crowe Rd., Liberty Twp. B. Banister, aud.

Harrison Co., Corydon, 13,232 ft. C. E. Jacobs Rd., Hette Twp., S. C. Mauck, aud.

La Grange Co., La Grange, 61,176 ft. C. H. Caton et al Rd., county unit road 1, Springfield and Bloomfield Twps. J. S. Moere, aud.

Delaware Co., Muncie, 15,020 ft. E. S. Meyers et al Rd., gravel, Liberty Twp., 3,905 ft. German Reeves Rd., bituminous macadam, Center Twp. J. P. Fragoo, aud.

Jefferson Co., Madison, 9,230 ft. E. Lanham or Lost Fork Rd., crushed or napped stone, Milton Twp. C. S. Dibler, aud.

March 3, Allen Co., Ft. Wayne, 21,955 ft. Scharpenberg Rd., stone, between Adams and Jefferson Twps. A. C. McCoy, aud.

March 6, Hamilton Co., Noblesville, A. Henry Rd, Wayne Twp., A. G Osborn Rd., Washington Twp., A. J. Brock Rd., Noblesville Twp., A. Overdorf Rd., Jackson Twp., O. H. Robinson Rd, Jackson Twp. H. O. Cottingham, aud.

Michigan—Until Feb. 26, by F. F. Rogers, state highway comr., at office of Clerk, Midland Co., Midland, grading, draining and surfacing 1.345 mi. State Trunk Line Rd. 20-2, 16 ft. wide, involving 7,900 sq.yd. 2 course gravel surface, 4,720 sq.yd. special gravel, 1,422 cu.yd. earth excav., 4,702 lb. steel reinforcement, etc.; 3.016 mi. Sect. A and .588 mi. Sect. B, State Trunk Line Rd. 20-8, 16 ft. wide, Sect. A, 28,311 sq.yd. gravel, 5,957 cu.yd. earth excav., 2,534 lb. steel reinforcement and Sect. B, 5,515 sq.yd. gravel, 859 cu.yd. earth excav., etc.; 3.920 mi. State Trunk Line Rd. 20-5, 16 ft. wide, 36,800 sq.yd. gravel, 1,114 cu.yd. earth excav, 2,264 lb. steel reinforcement, etc.

Michigan—Until March 1, by F. F. Rogers, state highway comr., at office Bd. Rd. Comrs. Ionia Co., Ionia, grading, draining and surfacing 1.003 mi. State Trunk Line Rd. 44-2, 16 ft, wide, involving 9,411 sq.yd. gravel, 6,549 cu.yd. earth excav., etc.

Michigan—Until March 7, by F. F. Rogers, state highway comr., at Dist Office State Highway Comn., Port Huron, grading, draining and surfacing State Trunk Line Rd. 38-3, Sects. A and B, 16 ft. wide, Lapeer and Tuscola Counties, involving 65,088 sq.yd. gravel, 23,534 cu.yd. earth excav., etc.

Michigan—Until March 9, by F. F. Rogers, state highway comr., at office of Bd. Rd. Comrs. Sanilac Co., Sandusky, grading, draining and surfacing .902 mi. State Trunk Line Rd. 38-2, 20 ft. wide, Brown City, involving 11,251 sq.yd. concrete, 3,091 cu.yd. earth excav., 507 lb. steel reinforcement, etc.

Michigan—Until March 10, by F. F. Rogers, state highway comr., at office Bd. Rd. Comrs. Genesee Co., Flint, grading, draining and surfacing 5.447 mi. State Trunk Line Rd. 21-3, 18 ft. wide, involving 57,516 sq.yd. vitr. brick, concrete or bitumious concrete, 24,414 cu.yd. earth excav., 5,964 lb. steel reinforcements, etc.

Michigan—Until Feb. 23, by F. F. Rogers, state highway comr., Lansing, fine grading, shaping and paving 6.582 mi. State Trunk Line Rd. 16-3, Sects. A and B, 18 ft. wide, Delta and Oneida Twps., Eaton Co., involving 69,505 sq.yd. concrete or bituminous macadam, 347.53 stations fine grading and 1,530 lin.ft. guard rail. Noted Feb. 19.

Michigan—Until March 1, by F. F. Rogers, state highway comr., at office of Bd. Rd. Comrs. Ionia Co., Ionia, grading, draining and surfacing 1.646 mi. State Trunk Line Rd. 66-2, 16 ft. wide, involving 15,372 sq.yd. gravel, 4,399 cu.yd. earth excav., etc.

Michigan—Until Feb. 24, by F. F. Rogers, state highway comr., at office of Bd. Rd. Comrs. Hillsdale Co., (Hillsdale), grading, draining and surfacing 9.845 mi State Trunk Line Rd. 14-19, Sects. A and B, 16 ft. wide, Lenawee and Hillsdale Counties. Sect A involves 47,797 sq.yd. stone gravel, concrete, bituminous concrete, waterbound or bituminous macadam, 22,226 lin.ft. earth excav., etc.; Sect. B, 47,422 sq.yd. same types of pavement and 18,296 cu.yd. earth excav., etc.

Illinois—Until Feb. 25, by State Highway Comn., Springfield, building 5 mi. Sect. 16, State Bond Issue Route 5, Winnebago Co., 6.1 mi. Sect. 17, Winnebago and Stephenson Counties, 4.49 mi. Sect. 18 and 1.67 mi. Sect. 19, Stephenson Co., 3.58 mi. Sect. 13, State Bond Issue Route 10, 3.63 mi Sect. 14 and 3.95 mi Sect. 15, Macon Co., 5.24 mi. Sect 1, State Bond Issue Route 28, and 1.73 mi. Sect 2, Knox Co., all 18 ft. wide. Alternate bids will be received on Portland cement concrete, 3 or 4 in. monolithic brick, and bituminous concrete with or without binder course. C. Older, ch. highway engr.; advertised in this issue.

Wisconsin—Until Feb. 24, by State Highway Comn., Court House, Green Lake, grading and paving .61 mi. Washington St., 18 ft. wide, Berlin, Federal Aid Project 157, Green Lake Co., involving 2,119 cu.yd. earth excav., 12.6 cu.yd. Class "A" concrete in culverts, 116 cu.yd. Class "A" concrete structures over 20 ft. in span, 6,389 sq.yd. concrete surfacing, etc.

Wisconsin—Until Feb. 25, by State Highway Comn., Court House, La Crosse, grading and paving 1.95 mi. Alma-Mondovi Rd., 16 ft. wide, Federal Aid Project 135, Buffalo Co., involving 2.2 acres clearing and grubbing, 16,487 cu.yd. earth and 3,506 cu.yd. borrow excav., 251 cu.yd. Class "A" concrete, 18,599 sq.yd. concrete surfacing, etc. J. Reinhart, Nelson, comr.

Wis., Edgerton—Until Feb. 25, by J. J. Leary, city clk., grading and paving 1.5 mi. Victoria Rd., Doty and Fulton Sts., 18 ft. wide. Alternate bids will be received on rein.-con., asphaltic concrete and combined curb and gutter. Cost between $30,000 and $40,000. W. F. Reichardt, Watertown, engr.

Wis., Edgerton—Until Feb. 25, by G. Blanchard, city clk., paving various streets, involving 22,000 sq.yd. 1 course concrete or asphaltic concrete and 11,693 lin.ft. combined cement curb and gutter. W. F. Rinehart, Watertown, engr.

Wis., Green Lake—Until Feb. 24, by Green Lake Co. State Rd. & Bridge Com., grading and paving 3.16 mi. Green Lake-Berlin Rd., Sta. 0 to 167, involving 4,220 cu.yd. earth excav. and 29,663 sq.yd. concrete surfacing; 4.08 mi. Green Lake-Berlin Rd., Sta. 167 to 394, 5,390 cu.yd. earth excav. and 38,247 sq.yd. concrete surfacing. D. C. Williams, co. highway comr. Noted Feb. 5.

Wis., Menomonie—Until Feb. 26, at Dunn Co. Court House, building following roads:

Grant Twp., Colfax-Sand Creek Rd., 2,900 ft., involving 2,200 cu.yd. grading, 725 cu.yd. clay and gravel surfacing, 36.3 cu.yd. concrete in culverts, etc.

Colfax Twp., Colfax-Menomonie Rd., 3,200 ft., 800 cu.yd. clay and gravel surfacing, 25.2 cu.yd. concrete in culverts and 2,295 cu.yd. grading.

Downing Village, Downing-Boyceville Rd., 5,400 ft., 4,545 cu.yd. grading, 1,500 cu.yd. gravel surfacing, etc.

Hay River Twp., Wheeler-Prairie Farm Rd., 5,300 ft., 2,100 cu.yd. grading, 1,160 cu.yd. clay surfacing and 29.7 cu.yd. concrete in culverts.

Otter Creek Twp., Wheeler-Sand Creek Rd., 4,200 ft., 3,110 cu.yd. grading, 620 cu.yd. clay surfacing and 10 cu.yd. concrete in culverts. F. Stewart, co. highway comr.

Wis, Plymouth—Until March 9, by H. Luedtke, city clk., improving 11 streets, involving 25,000 sq.yd. paving, 13,000 lin. ft. cement curb and 8,500 cu.yd. earth excav. Bids will be received on rein.-con., vitr. brick, sheet asphalt or asphaltic concrete. J. Donohue, 606 North 8th St., Sheboygan, engr.

Ia., Charles City—Until Feb. 23, by city, paving various streets, involving 61,000 sq. yd. concrete, asphaltic concrete or bituminous concrete. Former bids rejected. About $240,000. Noted Feb. 12.

Ia., Waterloo—Until March 4, by Auditor Black Hawk Co., paving 17.1 mi. Grant Highway, 18 ft. wide, Federal Aid Project 62, involving 50,000 cu.yd. earth excav. C. M. Fisher, co. engr.; advertised in this issue.

Minn., Albert Lea—Until March 3, by F. Tavis, and Freeborn Co., building 10 mi. State Rd. 4 Federal Aid Project 121, 24 ft. wide, involving 85,000 cu.yd. excav., 1,300 ft. concrete pipe culverts, 13,300 cu.yd gravel surfacing, 1 single span concrete bridge, etc. About $45,000.

Minn., Albert Lea—Until March 2, by F. Tavis, aud. Freeborn Co., improving 12 mi. State Aid Rd. 3, Job 2003, 24 ft. wide, involving 135,000 cu.yd. excav., 1,600 ft concrete culvert pipe and 17,000 cu.yd. gravel surfacing; State Rd. 6, Federal Project 61, Div. 2, 7,000 cu.yd. gravel surfacing. About $56,000.

Kan., Lawrence—Until April 3, by G. C. Brune, clk. Douglas Co., paving, curbing and building sidewalks on north approach to Kansas River Bridge and extending 553 ft. to south curb line of Locust St.

Montana—Until March 2, by State Highway Dept., Helena, grading, paving and draining 9.11 mi Butte-Anaconda Rd., Silver Bow Co., 18 ft. wide. Alternate bids will be received on 1 course portland cement concrete, portland cement concrete base with Topeka type bituminous top and portland cement concrete base with bitulithic type bituminous top. J. N. Edy, state highway engr.; advertised in this issue

Streets and Roads (Continued)

Montana—Until March 12, by State Highway Dept., Helena, grading, paving and draining 4.91 mi. Yellowstone Trail running northwest from Bozeman, Gallatin Co., Federal Aid Project 44, involving 34,000 cu.yd. common excav., 51,628 sq.yd. paving, 235 cu.yd. concrete structures and 15,900 lb. reinforcing steel. Alternate bids will be received on 1 course portland cement concrete, portland cement concrete. base be received on 1 course portland cement concrete base and bitulithic top. J. N. Edy, state highway engr.; advertised in this issue.

Mo., Caruthersville—Until March 1, by J. M. McGinnis, city clk., for 6,400 sq.yd. vibrolithic paving, covering 3 separate sections of streets; advertised in this issue.

Arkansas—Until Feb. 27, by Comrs. Arkansas and Missouri Highway Dist., Jackson Co., at office of State Highway Comn., Little Rock, building 44.32 mi. road, involving 81 acres clearing and grubbing, 355,820 cu.yd. unclassified, and 500 cu.yd. loose rock excav., 3,000 cu.yd. overhauling, 901 cu.yd. class "A," 266 cu.yd. class "B," 296 cu.yd. class "C," and 90 cu.yd. class "A" concrete, 611 lin.ft. 18-24-36 in. pipe, 160 lin.ft. steel truss and 60 lin.ft. I-beam steel bridges, 58,500 lb. reinforcing metal, etc. Bowman Eng. Co., Newport, engrs., advertised in this issue.

Ark., Osceola—Until March 1, by Comrs. Mississippi Co., improving 50 mi. Blytheville-Manilla-Leachville Rd. Impvt. Dist., 14-20 ft. wide, involving 308,666 sq.yd. gravel, 185,760 cu.yd. grading, 151,913 sq.yd. 6 in. concrete, 44.1 acres clearing and 14.7 acres grubbing, 203 cu.yd. plain and 305 cu.yd. concrete, 16.5 tons steel, 2,967 lin.ft. 12-36 in. culverts, etc. Pride & Fairley, Blytheville, engrs.

Tex., Dallas—Until March 4, by C. E. Gross, aud. Dallas Co., building 11.3 mi. Dallas-Denton Rd., 18 ft. wide, involving 480 acres grading, clearing and grubbing, 41,381 cu.yd. unclassified excav., 795.46 cu. yd. Class "A" and 322.64 cu. yd. Class "B" concrete, 105,102 lb. reinforcing steel, etc. Alternate bids will be received on 6 in. waterbound macadam base, 2 in. bituminous concrete surface, 5 in. concrete base, 2 in. bituminous concrete surface, 6 in. side, 8 in. center, 1:6 concrete pavement; advertised in this issue.

Tex., Dallas—Until March 4, by C. E. Gross, aud. Dallas Co., building 8.9 mi. Scyene Rd., 18 ft. wide, involving 734 acres grading, clearing and grubbing, 53,506 cu. yd. unclassified and 260,063 cu.yd. rock excav., 1,137.44 cu.yd. Class "A" and 703.59 cu.yd. Class "B" concrete, 166,563 lb. reinforcing steel, etc. Alternate bids will be received on macadam surface, 6 in. side, 8 in. center and 1:6 concrete; advertised in this issue.

Tex., Waco—Until March 8, by J. P. Alexander, judge McLennan Co., surfacing and building rein.-con. drainage structures on .38 mi. Highway 7, known as Waco-Springfield Rd., 15 ft. wide, 1 course rein.-con. About $16,000. M. Hannah, Waco, engr. Noted Jan. 22.

Tex., Waco—Until March 8, by J. P. Alexander, judge McLennan Co., paving and draining .63 mi. Highway 31, known as Waco-Axtell Rd., 15 ft. wide. About $26,130. M. Hannah, Waco, engr. Noted Jan. 22.

Nev., Reno—Until March 8, by J. E. Sullivan, city clk., for (Bid 1), 400,000 sq.ft. cement concrete pavement; (Bid 2), 635,000 sq.ft. cement concrete pavement; (Bid 3), 115,000 sq.ft. sheet asphalt pavement; (Bid 4), 235,000 sq.ft. bitulithic pavement on cement concrete base; (Bid 5), 145,000 sq.ft. bitulithic pavement on rock macadam base; (Bid 6), 90,000 sq.ft. bitulithic pavement on concrete base.

Nev., Reno—Until March 8, by J. E. Sullivan, city clk., for (Bid 1) 103,135 sq. ft. cement concrete walks, 7,440 lin.ft. cement concrete curb and gutter, and 810 lin. ft. cement concrete gutter; (Bid 2) 31,540 sq.ft. cement concrete walks and 13,121 lin. ft. cement concrete curb and gutter.

Ariz., Kingman—Until March 1, by Bd. Supervs. Mohave Co., paving Oatman-Gold Rds. Highway, Federal Aid Project 5, involving 21,395 cu.yds. excav. and incidental structures. T. Maddock, State House, Phoenix, state engr.

Washington—Until March 1, by State Highway Comn., Olympia, grading, draining and paving 3.8 mi. Inland Empire Highway from Walla Walla to Buroker, Post Rd. Project 40, concrete, Walla Walla Co. J. Allen, state highway engr.

Washington—Until March 1, by State Highway Comn., Olympia, grading, draining and paving with concrete 4.5 mi. Natl. Park Highway from Muck Creek to Ohop Valley, Pierce Co., 6.2 mi. Pacific Highway from Plumb Station to Tenino, Thurston Co., also clearing, grading and draining 4 mi. Olympic Highway from Montesano to Brady, Grays Harbor Co. J. Allen, state highway engr.

Washington—Until March 2, by State Highway Comn., Olympia, clearing, grading, draining and surfacing with crushed rock, 1.5 mi. Ocean Beach Highway, Skamokawa northwest, Wahkiakum Co. J. Allen, state highway engr.

Washington—Until Feb. 24, by State Highway Comn., Olympia, grading, draining and paving 4.1 mi. Sunset Highway from Greenacres to Idaho State line, Post Rd. 50, concrete. Cost to exceed $50,000. J. Allen, state highway engr.

Wash., Montesano—Until March 1, by E. Baker, aud. Grays Harbor Co., widening, clearing, grubbing, grading, and gravel surfacing section Copalis Crossing Pacific Rd. from Carlisle northwesterly 4.7 mi. to Aloha; advertised in this issue.

Cal., Stockton—Until March 3, by Bd. Supervs. San Joaquin Co., grading and paving with oil macadam 8.4 mi. road between Ripon and Manteca. About $87,000.

Cal., Woodland—Until March 2, by Bd. Supervs. Yolo Co., building 1,077 mi. asphalt road on concrete base, from Coils Corner to Knights Landing (1st unit under $1,000,000 bond issue). Noted Jan. 1.

Ont., Alexandria — Until March 1, by S. MacDonnell, town clk., building asphalt penetration roads in township.

Oot., St. Thomas—Until Apr. 1, by A. McCormick, engr., City Hall, for paving 1¼ mi. on Talbot and St. Catherines Sts., concrete or asphalt. About $38,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New York—H. H. Curran, pres. Manhattan Boro., received bids Feb. 9, regulating, regrading and repaving roadway of 34th St. from Park to Madison Aves., sheet asphalt on concrete foundation, from Cleveland-Trinidad Paving Co., Flushing Ave., Brooklyn, $21,842; Uvalde Asphalt Paving Co., 1 Bway., $24,049; J. L. Brustarr, Harlem River and 150th St., $24,072. Noted Feb. 5.

N. Y., New York—Park Bd., Municipal Bldg., received bids Feb. 13, furnishing labor and material repaving with sheet asphalt and asphalt blocks on concrete foundation, roadway of Eastern Blvd., from Asphalt Constr. Co., 1 Madison Ave., $72,299, J. E. Goffney, 440 East 94th St., $75,214, Uvalde Paving Co., 233 Bway., $76,155. Noted Feb. 5.

N. Y., New York—Dept. Parks, Municipal Bldg., let contract repaving roadway of Eastern Blvd. from Bronx and Pelham Parkway to southerly approach to bridge over Eastchester Bay, Bronx Boro., to Union Paving Co., 2875 Bway., $63,165. Noted Jan. 29.

★New Jersey—State Highway Comn., Trenton, let contract concrete surfacing 47,451 sq.yd. State Highway Route 2, Sect. 2, from Roehling to Bordentown, 18 ft. wide, to R. Sangiovanni, 78 Hoyt St., Newark, $372,669. Noted Jan. 29.

★Pennsylvania—State Highway Dept., Harrisburg, let contract building 39,500 ft. Route 290, from Hometown to Vulcan, 20 ft. wide, Rush and Ryon Twps., Schuylkill Co., involving 46,000 sq.yd. rein.-con. and 40,000 sq.yd. vitr. brick, to Cease-Picton-Harrison Co., 2nd Natl. Bank Bldg., Wilkes-Barre, $550,384; 23,420 ft. Application 1012, extending from Weatherly, 18 ft. wide, Lehigh Twp., Carbon Co., rein.-con., to Sterling Constr. Co., Inc., Main Rd., Lodi, N. J., $201,334; 5,950 ft. Route 247, extending out of Connellsville, to W. J. Wilkey, Uniontown, $63,323. Noted Feb. 5.

★Pa., Phila.—City let contracts (Schedules A and B) paving and repaving following streets with asphalt, to Barber Asphalt Paving Co., 30th and Race Sts., Limekiln Pike, $22,690, Warrington Ave., $10,324, Windsor St., $5,148, 6th St., $6,739, 7th St., $8,015, 24th St., $44,754, 26th St., $5,245, 43rd St., $15,760, Emerald St., $14,550, Erie Ave., $33,134, Landsdowne St., $81,583, Ludlow St., $6,378, Norris St., $44,414, Tioga St., $8,080 and 34th St., $8,065; Union Paving Co., 30th and 1st Sts., Girard St., $41,654, Broad St., $48,380; (Schedule C) to Cunningham & Murray, 1345 Arch St., repaving Woodland Ave., redressed granite block, $51,129; (Schedule D), J. Meehan & Son, 915 West Dauphin St., repaving Columbia Ave, wood block, $62,846; (Schedule E) Barber Asphalt Paving Co., 30th and Race Sts., improving Adams Ave., $57,358; (Schedule G) M. & J. B. McHugh, Leheigh and Emerald Sts., curb and footway work in 1st Dist., $33,016, in 3rd Dist., $21,102. Noted Feb. 5.

★North Carolina—State Highway Comn., Raleigh, let contract to W. E. Graham, Mt. Ulla, topsoiling 8 mi. road from Mocksville to Davie line, Davie Co., cost $39,979; 10.60 mi. from Mt. Airy to Stokes Co. line, $67,500, 10.82 mi. Dobson-Mt. Airy Rd., $83,500, both in Surry Co.; concrete surfacing 8.74 mi. Central Highway, 16 ft. wide, Almance Co., to Powell Paving & Contg. Co., Columbia, S. C., $263,799.

★Ga., Columbus—City let contract paving 70,000 sq.yd. streets, vitr. brick, to Campbell Constr. Co., Columbus.

★Ga., Waycross—City let contract paving 18,000 sq.yd. streets, to Pittman Constr. Co., Atlanta. Paving brick furnished by Southern Clay Mfg. Co., Volunteer State Life Bldg., Chattanooga, Tenn. About $100,000.

★O., Ashtabala—City let contract paving Gulf and Runkle Sts., involving 2,731 cu.yd. earth excav., 4,304 sq.yd. vitr. brick on 6 in. concrete base, 3,201 lin.ft. cement curbing and 2,000 lin.ft. 3 in. cement sidewalk, 2,844 ft. 4 in. drain tile and 1,377 ft. 8-15 in. sewer tile, to F. P. Fitzgerald, 304 Main St., $25,448.

★O., Lakewood (Cleveland P. O.)—W. H. Evers Eng. Co., engrs., 332 The Arcade, Cleveland, let contract to Cleveland Stone Co., 1836 Euclid Ave., Cleveland, building sidewalks on St. Charles and Franklin Aves., involving 42,500 sq.ft. 2½ in. stone flagging, for Nye & Camp, The Arcade. About $26,000. Noted Feb. 5.

Ind., Indianapolis — F. C. Lingenfelter, city civil engr., received bids improving, (a) Capitol Ave. from Mobile to South Sts., wooden block, (b) 3,813.83 ft. New York St. from Indiana to Alabama Aves., asphalt, (c) 1,604 ft. Capitol Ave. from McCarthy to Ray Sts., asphalt, (d) 2,208 ft. Tecumseh St. from St. Clair to 10th Sts., bituminous concrete, (e) 2,512.71 ft. 34th St. from College Ave. to Fall Creek Parkway, (f) 4,876.6 ft. Gale St. from 10th to 16th Sts., (g) 2,180.87 ft. Euclid Ave. from Michigan St. to 2nd alley north, (h) 2,322.82 ft. 36th St. from Central Ave. to Pennsylvania St. (i) 2,150.65 ft. Gray St. from Washington to New York St., last five (1) asphalt (2) bituminous concrete, from Indiana Asphalt Paving Co., 25th St. and Lake Erie & Western R.R., (a) $52,000, (b) $56,072, (d) $10,674; Marion County Constr. Co., 1,600 South West St., (a) $51,400, (c) $12,061; J. N. Morgan & Son, (b) $56,668, (e-1) $19,587, (e-2) $18,941, (h-1) $12,427, (h-2) $13,123; Mansfield Eng. Co., 1011-14 Fletcher Trust & Savings Bldg., (b) $56,483; Consolidated Constr. Co., 827 Law Bldg., (d) $9,719; Union Asphalt Constr. Co., 308 Amer. Central Life Bldg., (f-1) $30,448, (f-2) $28,641, (g-1) $12,774, (g-2) $12,022, (i-1) $12,390, (i-2) $11,687; Amer. Constr. Co., 108 North Delaware St., (h-1) $12,776, (h-2) $12,712.

★Ind., Indianapolis—Comrs. Wabash Co. let contract building 10.6 mi. Vernon Rd., concrete, to J. C. O'Conner & Sons, Ft. Wayne, $439,218.

★Ind., Terre Haute—Comrs. Vigo Co. let contract building 6 mi. Le Roy Church Rd., concrete, to Carpenter Constr. Co., $209,737; 6 mi. H. J. Foulkes Rd., concrete and brick, to Foulkes Constr. Co., 705 Ohio St., $264,900.

★Michigan—State Highway Dept., Lansing, let contracts grading and surfacing 4.534 mi. Sect. A and 2.732 mi. Sect. B, State Trunk Line Rd. 23-1, also 2.243 mi. State Trunk Line Rd. 23-2, 18 ft. wide, Branch Co., to Kalamazoo Paving Co., 1304 Southwest St., Kalamazoo, $141,229, $85,769 and $89,894 respectively.

★Michigan—State Highway Dept., Lansing, let contract grading, draining and surfacing with gravel 2.213 mi. State Trunk Line Rd. 11-2, 16 ft. wide, Manistee Co., involving 18.7 cu.yd. 1:2:4 and 17.2 cu.yd. 1:3:6 concrete, 654 lb. steel reinforcement, 138 lin.ft. 12 in. encased tile, etc., to Bd. Rd. Comrs. Manistee Co., Manistee, $18,028.

Mich., Detroit—City received bids grading, curbing and paving with asphaltic concrete on 6 in. concrete base, (a) Canfield Ave., (b) Craig Ave., (c) Ferry Ave., (d) Gladstone Ave., (e) Green Ave., (f) Hancock Ave., (g) Holmur Ave., (h) Highland Ave., (i) Indiandale Ave., (j) Kanter Ave., (k) Lakeview Ave., (l) Naples St., (1) Amherst or Berea curb (2) concrete curb, from Detroit Asphalt Paving Co., 20 McGraw Bldg., (a1) $1,155, (a2) $10,473, (b1) $8,197, (b2) $7,641, (c1) $8,393, (c2) $7,790, (d1) $9,807, (d2) $9,137, (e1) $35,534, (e2) $33,062, (f1) $49,305, (f2)

Streets and Roads (Continued)

$46,389, (g1) $44,094, (g2) $41,065, (h1) $10,549, (h2) $9,811, (i1) $8,343, (i2) $7,775, (j1) $11,130, (j2) $10,349, (k1) $24,152, (k2) $22,301, (l1) $7,765, (l2) $7,292; W. B. Brady Constr. Co., 1972 Grand River Ave., (a1) $11,592, (a2) $10,913, (b1) $8,339, (b2) $7,786, (c1) $8,668, (c2) $8,080, (d1) $9,964, (d2) $9,297, (e1) $36,486, (e2) $34,028, (f1) $50,378, (f2) $47,478, (g1) $44,437, (g2) $41,425, (h1) $10,823, (h2) $10,090, (i1) $8,593, (i2) $8,028, (j1) $11,378, (j2) $10,602, (k1) $25,286, (k2) $23,446, (l1) $8,069, (l2) $7,599; Cleveland Trinidad Paving Co., 2940 Woodward Ave., (a1) $11,483, (a2) $10,757, (b1) $8,486, (b2) $7,895, (c1) $8,694, (c2) $8,068, (d1) $10,156, (d2) $9,442, (e1) $36,533, (e2) $33,902, (f1) $50,205, (f2) $47,102, (g1) $45,203, (g2) $41,980, (h1) $10,724, (h2) $9,939, (i1) $9,486, (i2) $7,882, (j1) $11,549, (j2) $10,718, (k1) $25,129, (k2) $23,160, (l1) $7,976, (l2) $7,473. Noted Jan. 22.

★**Mich., Ionia**—Rd Comrs. Ionio Co. let contract grading and draining 4.472 mi. State Trunk Line Rd. 39-3, 24 ft. grade, involving 37,395 cu.yd. earth excav., 574 lin. ft. 12-15 in. encased tile, 3,632 lb. reinforcement. 80 cu.yd. 1:2:4 and 143 cu.yd. 1:3:6 concrete, to I. Butzer, Hart, $28,721. Noted Jan. 15.

★**Mich., Jackson**—City let contract grading, paving and curbing 2½ mi. various streets, to Brooks Constr. Co., 2104 Miner St., Ft. Wayne, Ind. About $97,500. Noted Jan. 15.

★**Ill., East Moline**—City let contract to D. J. Ryan Constr. Co., 41 1st Natl. Bank Bldg., Davenport, paving 10th, 11th, 12th and 13th Sts., involving 12,120 sq.yd. asphaltic concrete on concrete base, 9,220 lin.ft. concrete curbing and guttering and 3,520 cu.yd. earth excav., cost $49,874; also 17th St. from 13th to 18th Aves., 4,540 sq.yd. asphaltic concrete, 3,495 lin.ft. concrete curbing and guttering and 3,520 cu.yd. earth excav., cost $19,683.

★**Wisconsin** — State Highway Comn., Grand Rapids. let contract paving Adam and Bridge Sts., City of New Lisbon, Federal Aid Project 161, to F. Bossert, Grand Rapids, involving 6,688 cu.yd. earth excav., @ $.75 per cu.yd., 46 cu.yd. concrete in culverts, (including 12 in. tile), $28.00, 20,632.1 sq.yd. concrete surfacing, $1.15, 9,207.6 lin. ft. combined curb and gutter, $.45, special catch basin set in curb, $30.00, cost of material, not included in prices bid, $29,230, total cost, $63,525.

★**Wis., Racine**—City let contract building 12th St. Rd., to J. Griffith, 1425 Owen Ave., involving 11,490 cu.yd. earth excav., @ $1.20 per cu.yd., 83 cu.yd. concrete in culverts, $24.50, 42,280 sq.yd. concrete surfacing with joints, $1.74½, 42,280 sq.yd. concrete surfacing without joints, $1.73, 1,060 lin.ft. guard rail, $.60, 575 ft. tile drain, $.70, extras, 20% total cost (with joints in concrete surfacing), $90,645, (without joints), $90,011.

Wis., West Bend—Washington Co. Rd. & Bridge Comn. received bids Feb. 5, paving with concrete, Milwaukee-West Bend Rd., Federal Aid Project 1, involving (a) 18,783 yds. excav., (b) 17 cu.yd. borrow excav., (c) 51,311 sq.yd. concrete pavement, (d) 347.6 cu.yd. concrete in culverts, (e) 1,978 ft. guard rail, from Vanderboom Constr. Co., 115 19th St., Milwaukee, (a) $1.22 per yd., (b) $2.00, (c) $2.27, (d) $25.00, (e) $.80; Froemming Bros., 1326 Humboldt Ave., Milwaukee, (a) $1.34, (b) $1.34, (c) $2.38, (d) $22.00, (e) $.70.

★**Ia., Denison**—City let contract paving various streets, involving 69,254 lin.ft. combined curb and gutter and 89,900 sq.yd. 6 in. gravel (not reinforced), to Akin & Flutter, Corning, @ $3.49 per sq.yd. Noted Jan. 22.

★**Ia., Strawberry Point**—City let contract paving 40,000 sq.yd. streets (various widths), vitr. brick on concrete base, to Ford Paving Co., 208 2nd Ave., Cedar Rapids, @ $1.60 per sq.yd.

★**Minn., Warren**—J. R. Naeseth, clk., let contract grading, paving and curbing 20 blocks, bitulithic, to Bitulithic & Contg. Co., Ltd., Winnipeg, Man., $116,938. Noted Jan. 8.

★**Kan., Colby**—City let contract for 30,-200 yds. paving and 14,800 ft. sewers, to Gordon Constr. Co., Century Bldg., Denver, Colo. About $170,000; cost plus percentage basis. Noted Jan. 22.

★**Neb., Randolph**—City let contract improving 20 blocks, Bway., Wayne, Nebraska, Hughson and Pierce Sts., 24 and 50 ft. wide, brick, to J. O. Beebe, Omaha. About $175,000.

Tex., Groesbeck—J. E. Bradley, judge Limestone Co., received bids grading, gravel surfacing and draining 9.755 mi. Highway 7, from point near Tehuacana through Cooledge, 9 ft. wide, from Womack Constr. Co., Sherman, $75,629; McElwrath & Rogers, Corsicana, $83,919. Noted Feb. 5

★**Tex., Hillsboro**—R. T. Burns, judge Hill Co., let contracts surfacing 11.75 mi. road from here to McLennan Co. line, to Hicks & Smith, San Angelo, $115,321; 7 mi. Cleburn Rd. north from here to McElwrath & Rogers, Corsicana, $52,905; both roads gravel, same to be furnished by county. Noted Jan. 15.

★**Idaho**—State Highway Comn., Boise, let contract grading and graveling 12.5 mi. Pacific Highway in Glenn Ferry Highway Dist., Ada Co. involving 20,075 cu.yd. screened gravel surfacing, 7,495 cu.yd. gravel surfacing, (rim of bank), 5,385 cu. yd. common borrow, 28,721 cu.yd. common excav., 627 cu.yd. rock excav., etc., to F. Powell, Boise, at $92,516.

Utah—State Highway Comn., Salt Lake City, received only one bid Jan. 27, grading 13 mi. state road from Castle Rock to Wyoming line, Summit Co., 20 ft. wide, gravel or shale surface, from J. L. Griffin, Salt Lake City, at $31,214.

★**Ariz., Florence**—Bd. Supervs. Pinal Co. let contracts grading, building culverts and draining 12 mi. Oracle-Mammoth Highway, to Littlejohn & Singleton, Phoenix, $91,935; grading and draining 30 mi. Florence-Casa Grande Highway, to R. Twohy & Son, Phoenix, $96,003. Noted Jan. 1.

★**Ariz., Tombstone**—T. Maddock, state engr., c/o Bd. Supervs. Cochise Co., let contract building Benson-Vail Highway, Sect. D, Federal Aid Project 18, to Goodman & Merrill, Tombstone, $11,935. Noted Jan. 1.

★**Wash., Seattle**—Bd. Pub. Wks. let contract grading and paving West 65th St., et al, involving 25,900 sq.yd. 7 in. concrete, 870 lin.ft. armored curbing and 8,300 cu.yd. earth excav., to Fiorito Bros., Seattle, $100,179.

★**Wash., Yakima**—Yakima Co. let contract grading 2.1 mi. Naches Rd., to R. M. Hardy, Yakima, cost $52,218; grading and hard surfacing ½ mi. Nob Hill Blvd., to Yakima Paving Co., Yakima, $14,516.

Oregon—State Highway Comn., Portland, received bids gravel surfacing 4.4 mi. Canyon Sect. Baker-Cornucopia Highway, between Richland and Robinette, involving 10,000 cu.yd. screened gravel or crushed rock, from S. C. Oxman, Baker, $36,200; A. J. McGarry, Rainier, $38,665; S. B. Sturgill, Keating, $44,745.

★**Ore., Portland**—Comrs. Multnomah Co. let contract grading and clearing site for new hospital on Marquam Hill, to P. Sueter, Portland. About $23,350.

Ore., Portland—City Council received bids paving, grading and building sidewalks on (a) Gay St., (b) portions of Calhoun and Hudson Sts., and Central Ave., (c) East 29th St., (d) Emerson St., (e) Woolsey St., (f) East 7th St., (1) asphaltic concrete, 2 in. top, 4 in. crushed rock base, (2) concrete No. 3, (3) asphaltic concrete No. 1, (4) asphaltic concrete, from United Contg. Co., Northwestern Bank Bldg., (a1) $2.30 per sq.yd., total, $7,482, (d) $10,266; S. Simonsen, 841 East 10th St., N, (a2) $2.25 per sq.yd. $6,814, (b) $7,225, (c) $5,082; Hahn & Rebman, (b) $7,622, (d) $10,044; J. Grieder, (b) $7,605; Municipal Paving Plant, (d1) $1.75 per sq.yd., $8,219, (f3) $1.80 per sq.yd., $31,530; Cochran Bros., (e2) $2.35 per sq.yd., $14,508; Warren Constr. Co., Journal Bldg., (c) $5,305, (f4) $2.25 per sq.yd., $33,454. Noted Feb. 12.

★**California**—State Highway Comn., Forum Bldg., Sacramento, let contracts to C. D. Soteras, Black Diamond Bldg., Los Angeles, constructing 7.5 mi. Route 23, Div. 6, Sect. A, Indian Allotment to Division Creek, Inyo Co., also 14.3 mi. Route 26, Div. 7, Sect. G, Riverside Co. Noted Feb. 5

★**Cal., Los Angeles**—City let contract improving Norton Ave., involving 103,551 sq.ft. grading @ $0.03 per sq.ft., 103,551 sq.ft. asphalt paving, $0.21, 3,014 sq.ft. concrete gutters, $0.26, storm drain, $2,510, house connection sewers, $1.75 per ft., 78 sq.ft. granite block gutter, $0.65, to Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., $28,372.

★**Cal., Oakland**—City let contract improving 3,200 ft. Porter and Suter Sts. from 35th to 38th Aves., Octavia and Abbey Sts. from Suter to Porter Sts. and Loma Vista Ave. from Quigley to Porter Sts., 40 ft. wide, to Bates & Borland, Bway. and 12th St., $33,016. Noted Jan. 8.

★**Cal., Riverside**—Bd. Suprvs. Riverside Co. let contract improving 1 mi. Short St. and Railroad Ave., involving 1,303 cu.yd. concrete paving, 898 cu.yd. excav. and 5,280 lin.ft. shaping roadbed, to R. T. Shea & Co., Riverside, $11,500.

★**Cal., San Francisco**—City let contract improving Hyde and Fulton Sts. to Bos & O'Brien, Hearst Bldg., $28,870.

★**Man., Tuxedo**—Town let contract grading and constructing new roads to Carter, Halls & Aldinger, 1010 Union Bank Bldg., Winnipeg. About $27,000.

Railways

PROPOSED WORK

West Virginia—Morgantown & Wheeling Ry., Morgantown, plans to build 30 mi railroad. T. F. Barrett, Mannington, pres. R. E. Kerr, engr.; advertised in this issue

Excavation and Dredging

PROPOSED WORK

Mont., Park City—Excavation—Italian Ditch Co. soon lets contract excavating 16,-000 cu.yd. and building 1 headgate, in Stillwater Co. B. C. Lillis, 239 Clark Ave., Billings, engr.

Utah, Manti—Drainage—San Pete Co. D. D. No. 1 voted $100,000 bonds for construction of drainage system.

Ore., Portland—Irrigation—J. P. Newell, Spalding Bldg., filed application with P. Cupper, state engr., Salem, for authority to appropriate 80,000 acre ft. water for irrigation. Concrete reservoir will be constructed in Big Marsh Creek Channel. About $10,000.

BIDS DESIRED

Ia., Ft. Madison—Ditches—Until March 16, by R. A. Gardner, aud. Lee Co., completing ditches in Green Bay Levee and D. D., Sect. 2 involving 100,000 cu.yd. excav., etc., Sect. 3, 8,000 cu.yd. excav., etc.; advertised in this issue.

Ia., Waverly—Drainage—Until March 10, by Bd. Supervs. Bremer Co., Court House, building D. D. 5, consisting of main ditch, involving 12,920 ft. tile, 5 sub-main ditches, etc. C. A. Cool, co-engr., F. Boedeker, co. aud.; advertised in this issue.

Minn., Crookston—Ditch—Until Feb. 24, by H. J. Welte, aud. Polk Co., building Ditch 126, involving four 12 ft. rein.-con. span bridges, 13 rein.-con. box culverts and 354 lin.ft. 12-48 in. pipe culvert. About $14,400. S. Steenerson, Crookston, engr.

Minn., Waseca—Ditch—Until Feb. 27, by T. Peterson, aud. Waseca Co., building Main No. 2, Ditch 15, involving 50,215 ft. 6-40 in. tile, 26 surface water inlets and 1 concrete bulkhead. Cost $74,627.

Minn., Windom—Ditch—Until Feb. 26, by S. A. Brown, aud. Cottonwood Co., building Judicial Ditch 1, involving 105,900 ft. 6-42 in. tile, retaining wall, intakes, excav., etc. Cost $108,032. A. Anderson, Westbrook, engr.

Wash., Tacoma—Dredging—Until March 2, by Port Comn., dredging, building concrete bulkhead, filling, planking bulkhead and repropping; 1st unit of port project, about $2,500,000. E. Kloss, secy.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Kan., Valley Falls**—Drainage—Comrs. Jefferson Co. let contract building D.D. 1, to Yole & Raegan, Chicago, involving 25,850 cu.yd. earth embankment, @ $0.26 per cu.yd. and 506,855 cu.yd. earth excav., $0.23½, total cost, $150,000. Noted Jan. 22.

★**Cal., Marysville**—Canal—Cordura Irrigation Dist. let contract building 6 mi. main irrigation canal, involving 35,000 cu.yd. excav., 10,000 cu.yd. embankment and 8 drainage structures, to J. A. Huntington, Oroville, $23,744. Noted Jan. 1.

Cal., Marysville—Flumes—Cordura Irrigation Dist. received only bid building two 74 in. semi-circular metal flumes, 1,050 ft. and 3,100 ft. long respectively, on timber trestles and concrete footings, from Jenkins & Wells, 36th and Y Sts., Sacramento, $31,548. Noted Jan. 1.

Cal., Palms—Excavation—Bd. Freeholders Los Angeles Co., Los Angeles, received bids excavating 4 mi. flood channel for Ballona Creek, 150 ft. wide, 4-5 ft. deep, near here, in 3 sections, involving (1) 50,-000, (2) 90,000, (3) 30,000 cu.yd. earthwork respectively, dragline, scraper and shovel work, from Ross Constr. Co., Point Loma, $0.374 per cu.yd. for all, total $65,670; United Dredging Co., Central Bldg., Los Angeles, $0.194, $83,980; P. L. Burr, 512 Mission St., San Francisco, (1) $0.59, (2) $0.645, total $87,550.

Industrial Works

PROPOSED WORK

Mass., East Springfield (Springfield P. O.)—Westinghouse Electric Co., 6905 Susquehana St., Pittsburgh, Pa., soon lets contract building 1 story, rein.-con. and steel machine shop, rein.-con. flooring, concrete foundation, here. About $360,000.

Conn., Bridgeport—F. L. Mills Co., 617 State St., having plans prepared by Fletcher-Thompson, Inc., engrs., 1089 Broad St., for 2 story, 100 x 150 ft., brick and concrete service and sales building, on Fairfield Ave. About $100,000.

Conn., Hartford—A. R. Ellis, archt., 36 Pearl St., soon lets contract building 3 story, 52 x 105 ft., brick and concrete factory, concrete foundation, on Union Pl., for Manternach Co., 74 Union Pl. Cost between $65,000 and $75,000.

N. Y., Albany—Allen & Arnink Garage, Hudson Ave., plans to build 2 story, 37 x 70 ft., brick addition to garage. About $75,000.

N. Y., Brooylyn—Empire Biscuit Co., 30 Waverly Ave., soon lets contract building 4 story, 50 x 100 ft., brick and steel factory, rein.-con. flooring, concrete foundation, at 28 Waverly Ave. About $100,000. Dodge & Morrison, 135 Front St., New York City, archts. and engrs.

N. Y., Brooklyn—H. Figge, 285 Atlantic Ave., having plans prepared by J. Cherry, archt. and engr., Grand Central Terminal, New York City, for 4 story, brick and steel garage, rein.-con. flooring, concrete foundation, on Pacific St. About $60,000.

N. Y., Brooklyn—Parfitt Bros., archts. and engrs., 26 Court St., soon let contract building 2 story, brick and steel extension to garage, rein.-con. flooring, concrete foundation, at 241 Waverly Ave., for W. P. Jones, c/o architects.

N. Y., Niagara Falls—Kimberly & Clark Co., Neenah, Wis., soon receives bids building paper mill on Royal Ave, here. Cost between $175,000 and $200,000.

N. Y., Rochester—H. Connolly Co. plans to build 2 story, 40 x 100 ft., brick addition to factory, at 43 Elizabeth St.

N. Y., Rochester—Northwest Fdrys., Inc., Curlew and Villa Sts., having plans prepared by J. H. Oberlies, archt., Rochester, building 2 story, 197 x 250 ft., brick foundry, on Villa and Valentine Sts. Cost between $125,000 and $150,000.

N. Y., Rochester—Selden Motor Co., Probert St., plans to build 2 story, 100 x 140 ft., brick and rein.-con. addition to plant. About $58,000.

N. Y., Syracuse—Oberdorfer Brass Co., Water St., plans to build 1 story, 280 x 440 ft., brick, rein.-con. and steel factory, at Messina Springs. About $350,000. M. L. King, Snow Bldg., archt. and engr.

N. Y., Tuckahoe (Yonkers P. O.)—Hodgman Rubber Co. soon lets contract building 5 story, 60 x 150 ft., rein.-con. and steel addition to factory, rein.-con. flooring, concrete foundation. About $200,000. W. L. Stoddart, 9 East 40th St., New York City, archt. and engr.

N. Y., Woodhaven (Jamaica P. O.)—Merritt Hosiery Co., c/o Block & Hesse, archts. and engrs., 18 East 41st St., New York City, soon lets contract building 4 story, 60 x 180 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on 104th St., here.

N. J., Atlantic City—See "Buildings."

N. J., Glassboro—State plans to build 2 story, 42 x 79 ft., brick power house for proposed Normal School, to include 26 x 79 ft. brick coal bunker, 16 x 32 ft., concrete and steel water tank, fire pump, three 360 hp. boilers and 2 generators. About $100,000. F. H. Bent, 142 West State St., Trenton, archt.

N. J., Jersey City—Continental Can Co. having plans prepared by Francisco & Jacobus, archts. and engrs., 511 5th Ave., New York City, for 4 story, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on 15th, 16th, Cole and Monmouth Sts. About $750,000.

N. J., South River—Boro. Pres. receives bids about March 1, building 1 story, 55 x 100 ft., brick and steel power house, rein.-con. flooring, concrete foundation. About $125,000. Goss, Bryce & Johnson, 55 Liberty St., New York City, engrs.

N. J., Trenton—State plans to build 1 story, 34 x 81 ft., brick laundry, concrete foundation, at Home for Girls. About $35,000. F. H. Bent, 142 West State St., archt.

N. J., Union Hill (Weehawken P. O.)—Hasco Textile Co. plans to build 2 story brick factory, on Franklin St. About $60,000.

N. J., Wharton — Wharton Steel Co. plans to build 3 new blast furnaces, involving tearing down old structures and excavating for new ones. Cost between $1,000,000 and $1,500,000.

Pa., Fernwood—W. Lupkin, 1208 Arch St., Phila., having plans prepared by J. T. Hochstra, archt., 1713 Sansom St., Phila., for 1 story brick garage, here. About $25,000.

Pa., Phila.—Apperson Motor Car Co., Broad and Race Sts., having plans prepared by E. H. Yardley, archts., 1713 Sanson St., for 6 story, 75 x 100 ft., brick and terra cotta service and sales building, on Girard and Broad Sts.

Md., Baltimore—T. White, c/o Continental Trust Co., Baltimore and Calvert Sts., having plans prepared by J. F. Fletcher, archt., Lexington Bldg., for 7 story, rein.-con steel industrial building; to be erected in 4 units with total floor space of 225,000 sq.ft. About $1,000,000.

N. C., Belmont—Linford Mills, Inc., plan to build yarn mill. About $500,000. Engineer not selected.

N. C., Belmont—Perfection Spinning Mill plans to build yarn mill. Engineer not selected.

N. C., Gastonia—Adams-Spencer Spinning Mill, Inc., plans to build yarn mill. About $75,000. Engineer not selected.

N. C., Gastonia—Priscilla Spinning Co. plans to build yarn mill here. About $500,000. Engineer not selected.

N. C., Spindale—K. S. Tanner plans to build 2 story yarn mill, about $50,000; also cotton mill, about $75,000. J. E. Sirrine, Greenville, S. C., engr.

N. C., Troy—Aileen Cotton Mills plans to build cotton mill. About $200,000. Engineer not selected.

La., Lake Charles—Lake Charles Impliment Co. having plans prepared by F. W. Steinamn & Son, archts., Beaumont, Tex., for 2 story, 80 x 92 ft. warehouse, rein.-con., brick and timber. About $30,000

Tenn., Knoxville—F. M. Houser plans to remodel laundry on State St. Cost between $25,000 and $50,000.

Tenn., Knoxville—Knoxville Ice & Cold Storage Co., 613 McGhee St., plans to build rein.-con. addition to plant. About $30,000.

Tenn., Knoxville—V. H. McLean plans to build 3 story, 100 x 135 ft., rein.-con garage, concrete foundation. About $100,000. Architect not selected.

O., Cincinnati—Billboard Publishing Co., Opera Pl., plans to build factory, on Gilbert Ave. About $250,000. W. H. Donaldson, pres. Architect not selected.

O., Cincinnati—Mac Leod Co., Bogen St., plans to construct two 3 story factory buildings, one 38 x 95 ft. and one 28 x 60 ft. Stewart & Stewart, 519 Main St, archts.

O., Cleveland—Colonade Co., Rockefeller Bldg., having plans prepared by Howell & Thomas, archts., 2032 Euclid Ave., for 2 story, 67 x 130 ft., concrete, steel and brick bakery and cafeteria, concrete and brick foundation, on East 107th St. and Euclid Ave. About $50,000. R. W. White, pres.

O., Cleveland—Eilert Beverage Co., 2539 Lorain Ave., soon lets contract building 2 story, 60 x 110 ft., concrete, steel and brick bottling plant, rein.-con. flooring, concrete foundation, on Sackett Ave. About $50,000. A. C. Bishop, 427 Guardian Bldg, archt. and engr.

O., Cleveland—Fisher Body Co, Oakland and Piquette Aves., Detroit, plans to build 6 story, 120 x 1,300 ft., rein.-con., steel and brick factory, rein.-con. flooring, concrete foundation, on Coit Rd., here. A. Kahn, Marquette Bldg., Detroit, archt.

O., Cleveland—Jones Gear Co., Way Side Rd., plans to build 1 story, concrete, steel and brick factory, concrete foundation. About $75,000. Architect and engineer not selected.

O., Cleveland—Ohio Fibre Container Co., 209 Williamson Bldg., plans to build 2 story, concrete, steel and brick addition to factory, on East 103rd St. and Harvard Ave. About $75,000. Private plans.

O., Cleveland — Perfection Rubber Co., 2097 Columbus Rd., preparing plans for 2 story, 100 x 110 ft., concrete, steel and brick factory, concrete foundation, on Brook Park Rd. About $60,000. Private plans.

Ind., Indianapolis—Reedy Elevator Co., 1026-42 Kentucky Ave., plans to build 1 story, 44 x 200 ft., brick and concrete factory on South New Jersey St., between Merrill and South Sts. About $25,000.

Ind., Indianapolis—Van Briggle Chemical Co. receives bids about March 1, building plant on 16th St. and Capitol Ave. About $125,000. C. E. Bacon, 1110 Odd Fellows Bldg., archt.

Mich., Charlotte—Charlotte Chair Co having plans prepared by G. T. Appleyard, archt., 429 Houseman Bldg., Grand Rapids, for 3 story, 48 x 95 ft., brick and timber factory, brick foundation. About $30,000.

Mich., Detroit—Braun Lumber Co., Davison Ave. and Grand Trunk Ry., plans to build 1 story, concrete and steel factory, concrete foundation. About $75,000. Engineer not selected.

Mich., Detroit—M. W. Sales & Co., East Jefferson Ave., having plans prepared by Esseltyn, Murphy & Hanford, archts. and engrs., 810 Marquette Bldg., warehouse, for 3 story, 80 x 190 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on 3rd Ave.

Mich., Jackson—Marshall Auto Co., 125 East 3rd St., plans to build 2 story, 50 x 183 ft., rein.-con., brick and steel garage, rein.-con. flooring, concrete foundation, on 3rd St. About $50,000. G. H. Swift, 105 Armory Blk., Flint, archt.

Mich., Northville—See "Buildings."

Wis., Milwaukee—Geuder, Paeschke & Frey, St. Paul Ave. and 15th St., having plans prepared by Cahill & Douglas, engrs., 217 West Water St., for 1 story, 75 x 100 ft., brick, concrete and steel power plant, rein.-con. flooring, concrete foundation, on St. Paul Ave. About $150,000.

Wis., Milwaukee — Milwaukee Printers Roller Co., 214 Greenbush St., having plans prepared by C. J. Keller & Son, archts, Majestic Bldg., for 1 or 3 story, 60 x 100 ft., brick and concrete addition to factory, rein.-con. flooring, concrete foundation.

Kan., Salina—Office, etc.—See "Buildings."

Wyo., Casper — Natrona Co. Tribune plans to build 2 story, 50 x 100 ft., brick and timber publishing house and storerooms, concrete foundation, on East 2nd St About $70,000. Garbutt & Weidner, Oil Exch. Bldg., archts.

Tex., Houston—Office, etc.—See "Buildings."

Okla., Pawhuska—Le Flore Oil & Gas Co., Tulsa, plans to build refinery. About $300,000. Engineer not selected.

Idaho, Payette—Masonic Bldg. Com., Washoo Lodge No. 28, A. F. & A. M. plans to build 1 story, 60 x 140 ft. garage, concrete, concrete foundation. About $50,000. D. C. Chase, chn.

Utah, Paragoonah — City having plans prepared building 500 k.w. electric light plant. L. M. Winsor, Logan, engr.

Wash., Seattle — I. Hinckley, 1004 3rd Ave., plans to build 2 story, 120 x 121 ft., brick and terra cotta factory, rein.-con. flooring, on Westlake Ave. and Highland Dr. About $40,000. Ivey & Riley, Boston Blk., archts.

Wash., Seattle—Moran Mfg. Co., 1220 1st Ave. S., plans to build 2 story, 60 x 120 ft., heavy timbered addition to plant, on 1st Ave., S. and Forest St. About $25,000. Rietze, Stoey & Duffy, Seaboard Bldg., engrs.

Ore., Sheridan—Oregon Fruit Growers Assn. having preliminary plans prepared for 1 story, frame and concrete packing plant. About $50.000. J. O. Holt, pres Private plans

Cal., Bakersfield—San Joaquin Light & Power Co., H and Tulare Sts., Fresno, plans to build power plant, 35 mi. west of here. About $6,000,000.

Cal., Banning—City granted franchise to Twin Cities Gas Co., recently organized by Union Natl. Bank, Pasadena, et al, to rebuild and enlarge old gas plant and distributing system. About $27,500. J. M. Berkley, Hollingsworth Bldg., Los Angeles, engr. Work will probably be done by day labor.

Cal., Meridian—Alameda Sugar Co., 310 Sansome St, San Francisco, plans to build refinery here. About $1,500,000. Architect not selected.

Cal., Ventura—Shell Oil Co. plans to build refinery on Gosnell lease, near here. About $60,000. Engineer not selected.

Ont., London—McClary Mfg. Co., 333-343 Wellington St. having plans prepared by J. M. Moore, archt., 423 Richmond St. for 2 story, 85 x 185 ft. gas range factory, on Trafalgar St. About $60,000.

Ont., Ottawa—Dominion Loose Leaf Co., Wellington St., having plans prepared by Richards & Abra, archts., 126 Sparks St., for 4 story, 66 x 200 ft., rein.-con., stone and brick printing factory on Albert St. About $400,000.

Industrial Works (Continued)

BIDS DESIRED

Me., Skowhegan—Until March 15, by Central Maine Power Co., building power house and dam and installing 5 turbine water wheels, each to develop 4,300 hp. About $100,000. J. A. Leonard, Skowhegan, engr.

N. Y., Long Island City—Until Feb. 27, by Lockwood-Greene Co., archts. and engrs., 101 Park Ave., New York City, building 2 story, 125 x 207 ft., rein.-con. and steel, mill, rein.-con. flooring, concrete foundation, for H. R. Hallison, c/o architects. About $225,000.

Pa., Phila.—See "Buildings."

N. C., Wilson—Until Feb. 28, by Bd. Comrs., for constructing hydro-electric development here, including concrete dam, abutments, head works, power house transformer station and about 4 mi. of 13,000 volt transmission line. T. A. MacEwan, 1216 Realty Bldg., Charlotte, engr.; advertised in this issue.

Ind., Indianapolis—Until Feb. 24, by G. C. Hitt, business dir., Bd. School comrs., Meridian and Ohio Sts., building shop units of Arsenal Technical Schools. D. A. Bohlen & Son, 1001 Majestic Bldg., archts.

Mich., Bay City—A. E. Munger, archt., 420 Shearer Bldg., receiving bids building 3 story, 250 x 350 ft., rein.-con., brick and steel addition to factory, rein.-con. flooring, concrete foundation, for Wilson Body Co., Bay City. About $500,000. Noted Feb. 12.

Ill., Chicago—A. L. Levy, archt., 111 West Washington St., receiving bids building 1 story, 75 x 150 ft., brick garage, concrete foundation, on Van Buren and Loomis Sts., for W. Browar, c/o architect. About $30,000.

Ill., Chicago—Fergeson Landar Co., 418 South Clinton Ave., receiving bids building 2 story, 50 x 150 ft., mill construction factory, concrete foundation, on Austin and Hermitage Aves. About $50,000. J. P. Cowing, 30 North La Salle St., engr.

Kan., Hutchinson—Until Sept. 1, by Barton Salt Co., building 1 story, 80 x 280 ft., concrete and lumber warehouse. About $50,000. C. H. Humphreys, pres.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**R. I., Central Falls** (Pawtucket P. O.)—Rhode Island Glass Co., 801 Broad St., let contract building 3 story, 90 x 100 ft., steel storage plant, concrete foundation, to Central Constr. Co., Slater Bldg., Pawtucket. About $45,000.

★**R. I., Providence**—L. E. Danforth, 76 Dorrance St., will build 3 story, 90 x 100 ft., brick and granite factory and office, concrete foundation, on Willard Ave. About $125,000. Work will be done by day labor.

★**R. I., Providence**—F. J. P. Riley, c/o T. S. McLaughlin, archt., 507 Union Trust Bldg., let contract building 2 story, 85 x 120 ft., rein.-con. garage, rein.-con. flooring, concrete foundation, on Olive St., to T. F. Cullinan Co., 101 Blackstone St. About $75,000.

★**Conn., Derby**—Derby & Ansonia Brewing Co., Derby Ave., let contract building 2 story, 33 x 100 ft., brick and steel ice plant, concrete foundation, to M. A. Durrschmidt, Main St. About $25,000.

★**Conn., Derby**—Derby Gas Co., 22 Elizabeth St., let contract building 2 story, 42 x 100 ft., brick, concrete and steel boiler house, rein.-con. flooring, concrete foundation, on Housatonic Ave., to M. A. Durrschmidt, Main St. About $35,000.

★**Conn., Hartford**—D. Freeman, Windsor St., will build 4 story, 35 x 50 ft., warehouse. About $50,000. Work will be done by day labor. Noted Jan. 22.

★**N. Y., Brooklyn**—Kop Spear Device Co., 330 Utica Ave., will build two 1 story, 50 x 100 ft., brick and steel shops, rein.-con. flooring, concrete foundation, on Van Sinderen Ave. About $25,000. Work will be done by day labor.

★**N. Y., Brooklyn** — Lind-Leff Realty Corp., 1592 Eastern Parkway, will build 1 story, 85 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 119 Lexington Ave. About $35,000. Work will be done by day labor.

★**N. Y., Brooklyn**—J. Rubin & Son, 142 Greene Ave., will build 3 story, 100 x 100 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Grand and Park Aves. About $50,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Schwartzbach & Sterallo, 2 Park Ave., let contract building 2 story, 60 x 100 ft., brick and steel garage and factory, rein.-con. flooring, concrete foundation, on Tillery and Navy Sts., to Ettinger Constr. Co., 44 Court St. About $65,000.

★**N. Y., Brooklyn**—Talbonsore Realty Corp., 1404 Eastern Parkway, will build 1 story, 50 x 60 x 70 x 107 x 150 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Adams St. About $40,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Talbonsore Realty Corp., 1404 Eastern Parkway, will build 1 story, 100 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Warren St. and 4th Ave. About $25,000. Work will be done by day labor.

★**N. Y., Long Island City**—L. I. Loft Corp., 87 Sunswick St., will build 4 story, 50 x 175 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Van Alst Ave. About $95,000. Work will be done by day labor.

★**N. Y., New York**—H. L. Schraffts Co., 157 West 54th St., let contract building 4 story, brick and steel factory, rein.-con. flooring, concrete foundation, at 161 West 64th St., to Bethlehem Eng. Co., 527 5th Ave. About $140,000. U. S. Battery Co., lessee.

★**N. Y., Rochester**—Sargent & Greenleaf Co., Court St., let contract constructing 1 story, 185 x 214 ft. factory, 1 story, 40 x 128 ft., foundry and power plant and 2 story, 40 x 214 ft., office building, brick, concrete and steel, on Norton St., to Gorsline & Swan Constr. Co., Powers Bldg.

★**N. Y., Syracuse**—Onondaga Milk Producers Assn. let contract building 100 x 100 ft., brick plant, at 806 Burnet Ave., to W. J. Burns Co., Keith Theatre Bldg. About $150,000.

★**N. J., Trenton** — Mercer Motor Co., Whitehead Rd., let contract building 1 and 2 story, 40 x 73 ft. and 80 x 400 ft., brick and steel shop and office building, to Standard Constr. Co., 1713 Sansom St., Phila. About $200,000. Noted Jan. 15.

★**N. J., Trenton**—J. Stokes Rubber Co., Taylor St., let contract building 2 story, 70 x 100 ft. factory, to N. A. K. Bugbee Co., 206 East Hanover St. About $35,000.

★**Pa., Holmesburg** (Phila. P. O.)—Bessemer Motor Truck Co. let contract building 1 and 2 story, 90 x 400 and 40 x 100 ft., concrete, brick and steel factory, to E. E. Hollenback, 1804 Brandywine St., Phila. Noted Jan. 15.

★**Pa., Phila.**—Friedberger & Arson, 18th and Courtland Sts., let contract building 3 story, 74 x 100 ft., brick and concrete addition to factory, at Courtland and Gratz Sts., to W. Steele & Sons Co., 16th and Arch Sts. About $100,000.

★**Md., Baltimore**—Backus Motor Sales Co., 10 East North Ave., let contract building 1 story, 100 x 100 ft., concrete and brick addition to garage, concrete foundation, to Consolidated Eng. Co., 243 Calvert Bldg. About $25,000.

★**Md., Baltimore**—Trustees Johns Hopkins Hospital, Fidelity Bldg., let contract building 6 story, 60 x 150 ft., rein.-con. and brick addition to warehouse, concrete foundation, at 536-42 West Pratt St., to Price Constr. Co., 210 Maryland Trust Bldg. About $150,000; cost plus percentage basis.

★**Va., Danville**—Crowell Auto Co., 542 Craghead St., let contract building 2 story, 110 x 176 ft., brick garage, to J. A. Jones, Realty Bldg., Charlotte, N. C. About $125,000.

Va., Danville—Heard & Chesterman, archts., Danville, let contract to J. P. Pettyjohn & Co., 212 8th St., Lynchburg, building 3 story, 90 x 170 ft., concrete and brick warehouse, here. About $75,000. Owner's name withheld.

★**Va., South Boston**—Willingham Tobacco Co. let contract building 3 story, rein.-con. and brick warehouse, on Main St., to J. A. Jones, Realty Bldg., Charlotte, N. C. About $100,000.

★**Ga., Athens**—Joseph Costa Co. let contract building 3 story, 50 x 100 ft. ice cream factory, concrete and brick, rein.-con. flooring and concrete foundation, to Foundation Co., Citizens & Southern Bank Bldg., Atlanta. About $60,000; cost plus basis.

★**O., Cleveland**—J. Bassiches, Society for Savings Bldg., let contract building 1 story, 40 x 120 ft., steel and brick factory, brick foundation, on East 22nd St. and Orange Ave., to City Iron Wks., 2921 East 72nd St. About $30,000.

★**O., Cleveland**—B. Fenlger, Society for Savings Bldg., let contract building 1 story, 50 x 150 ft., steel and brick warehouse, brick foundation, on East 66th St. and Wodland Ave., to I. Brugnone, 3505 Woodland Ave. About $50,000.

★**O., Cleveland**—W. S. Ferguson Co., archts. and engrs., 1900 Euclid Ave., let contract to E. Paulsen Co., 508 Erie Bldg., constructing 2 story, 75 x 100 ft., concrete, steel and brick factory, concrete foundation, on Payne Ave. and East 37th St., for Auer Register Co., Long Ave. About $75,000. Noted Feb. 5.

★**O., Cleveland**—Harshaw-Fuller-Goodwin Co., 1001 Newburg Ave., let contract building 2 story, 30 x 95 ft., steel and brick addition, to Hunkin-Conkey Constr. Co., Century Bldg. About $25,000.

★**O., Cleveland**—Natl. Bronze & Aluminum Co., 2539 East 79th St., let contract building 1 story, 150 x 201 ft., concrete, steel and brick factory, concrete foundation, at 8904 Laisy Ave., to H. K. Ferguson Co., 6532 Euclid Ave. About $60,000.

★**O., Cleveland**—Penton Publishing Co., 1136 Chestnut Ave., let contract building 9 story, 135 x 135 ft., concrete, brick and terra cotta printing plant, rein.-con. flooring, concrete foundation, on West 3rd St. and Lakeside Ave., to S. W. Emerson Co., 1900 Euclid Ave. About $700,000.

★**O., Cleveland**—E. McGeorge, engr. and archt., 1900 Euclid Ave., let contract to King-Griffin Co., 641 B of L. E. Bldg., constructing 2 story, 60 x 80 ft., brick addition to factory, brick foundation, on East 55th St. and Sweeney Ave., for L. Sands Co., 5407 Sweeney Ave. About $50,000. Noted Jan. 22.

★**O., Cleveland**—W. W. Sly Mfg. Co., West 47th St. and Train Ave., let contract building 2 story, 115 x 220 ft., steel and brick erecting shop, brick foundation, to A. A. Lane Constr. Co., 1836 Euclid Ave. About $60,000.

★**O., Cleveland**—J. T. Tractor Co., Bangor Bldg., let contract constructing 1 story, 58 x 125 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, on Fairfield Ave., to Du Perow Constr. Co., Plymouth Bldg. About $60,000.

★**O., Cleveland**—Union Paper & Twine Co., 127 St. Clair Ave., let contract rebuilding 4 story, concrete, brick and terra cotta warehouse, rein.-con. flooring, on West 2nd St. and St. Clair Ave., to Walther Constr. Co., Amer. Trust Bldg. About $75,000.

★**O., Springfield**—Westcott Motor Car Co., Warder and Spring Sts., let contract building 2 story, 30 x 70 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, on Lagonda Ave., to Concrete Steel Constr. Co., High St. About $35,000.

★**O., Toledo**—Standard Oil Co. of Ohio, East Ohio Gas Bldg., Cleveland, let contract building 1 story, 63 x 204 ft., concrete, steel and brick boiler house, rein.-con. flooring, concrete foundation, here, to J. Stewart & Co., 30 Church St., New York City. About $100,000.

★**Ind., Indianapolis**—See "Buildings."

★**Ind., Indianapolis**—C. E. Bacon, archt., 617 Merchants Bank Bldg., let contract building 4 story, 100 x 190 ft., rein.-con. and steel warehouse, at 205-19 West South St., to W. P. Jungclaus Co., 825 Massachusetts Ave. About $154,500.

★**Ind., Indianapolis** — U. S. Corrugated Fiber Box Co. let contract building 3 story, 100 x 160 ft., rein.-con. factory on Roosevelt and Martindale Aves., to C. J. Wacker, 628 Law Bldg. About $125,000.

★**Ind., Indianapolis**—Vonnegut Machinery Co., 43-45 South Meridian St., let contract building 2 story, 95 x 300 ft., rein.-con. warehouse on West South and Mechanics Sts., to C. J. Wacker, 628 Law Bldg. About $200,000.

★**Mich., Detroit**—Monarch Fdry. Co., 895 Greenwood Ave., let contract building 1 story, 100 x 200 ft., steel foundry (standard Austin type 4), concrete foundation, on Herrick St., to Austin Co., 1954 Penobscot Bldg. About $75,000. Noted Sept. 18.

★**Mich., Detroit** — Sewell Cushion Wheel Co., 1296 Gratiot Ave., will build 2 story, 60 x 200 ft., brick and steel dry kilns, rein.-con. flooring, concrete foundation, on Harper Ave. About $40,000. Work will be done by day labor.

★**Mich., Detroit**—Superior Sand & Gravel Co., 726 Dime Bank Bldg., let contract building 2 story, 48 x 80 ft., rein.-con., brick and steel warehouse, rein.-con. flooring, concrete foundation, on Lycaste Ave. and Detroit River, to M. Krausman, Penobscot Bldg. About $25,000. Noted Feb. 12.

★**Mich., Detroit** — F. J. Whitney, 304 Chamber of Commerce, will build 2 story, 65 x 100 ft., brick and steel warehouse, concrete foundation, on 6th and Labrosse Sts. About $55,000. Work will be done by day labor under supervision of R. H. Lane, engr., 2320 Dime Bank Bldg. Noted Feb. 12.

Industrial Works (Continued)

★Mich., Grand Rapids—Toleda Plate & Window Glass Co., 19 Ottawa Ave., let contract building 2 story, 123 x 130 ft., brick and steel warehouse and office, rein.-con. flooring, concrete foundation, on Ottawa Ave., to C. Hoertz & Sons, 659 Bridge St. About $95,000.

★Ill., Chicago—C. Lange & Bros. Co., 2740 Armitage Ave., let contract constructing 4 story, 75 x 125 ft., rein.-con., brick and terra cotta service and sales building, rein.-con. flooring, concrete foundation, on Milwaukee and Kedzie Aves., to G. Kehl & Son Co., 1225 North Maplewood St. About $135,000.

★Ill., Chicago—A. Plamondon Mfg. Co., 24 North Clinton St., let steel contract for 1 story, 100 x 500 ft., steel and brick machine shop and factory, brick foundation, on 52nd St and Western Ave., to Overland Constr. Co., 29 South La Salle St Total cost $250,000.

★Wis., Milwaukee—Downing Box Co., 3rd St. and Vienna Ave., let contract building superstructure for 1 story, 120 x 300 ft., brick and concrete factory, rein.-con. flooring, on 3rd St., to Hansen Constr. Co., 511 1st Natl. Bank Bldg. Noted Sept. 4.

★Wis., Milwaukee—Pelton Steel Co., 672 Kinnicinnic Ave., let general contract building 1 story, 60 x 100 ft., brick and steel addition to foundry, concrete foundation, to Yunker Bros., 615 37th Ave., steel to C. Hennecke Co., 1353 North Pierce St., total cost, $50,000. Noted Jan. 29.

★Wis., Milwaukee — T. L. Smith Co., 32nd and Hadley Sts., let contract building 1 story, 50 x 270 ft., brick and steel shop, concrete foundation, on 32nd St., to Klug & Smith, 40 Mack Blk. About $75,000.

★Wis., Milwaukee—Van Ryn & DeGelleke, archts. and engrs., Caswell Blk., let contract to E. S. Steigerwald Co., 3607 Vliet St., building 1 story, 90 x 200 ft., brick and steel machine shop, rein.-con. flooring, concrete foundation, on 30th St., for Doelger & Kirsten, 505 Cedar St.; cost $75,000. Noted Jan. 22.

★Wis., South Milwaukee—Schartow Mfg. Co, 1221 Frederick Ave., Racine, let contract building 1 story, 90 x 300 ft., brick and mill construction factory, concrete foundation, to C. B. Danielson, 638 Mineral St, Milwaukee. About $60,000.

★Ia., Davenport—H. J. Frank Fdy. & Mchy. Co., 2nd St., let contract building 1 story, 80 x 100 ft., brick and steel addition to foundry, with 40 x 40 ft. cupola addition, at 1748 West 2nd St., to Axel, Carlson & Co., 411 Peoples Bank Bldg., Moline, Ill. About $26,000.

★Mo., Joplin—Sorber—Kuhn Auto Supply Co., 512 Joplin St., let contract building 1 story, 75 x 120 ft., rein.-con. motor winding plant, rein.-con. flooring, concrete foundation, at 501-5 Wall St., to Stroup & Wooten, 501 Wall St. About $30,000.

★Cal., Oakland—R. Dalziel Co., 215 Washington St., let contract building 4 story, rein.-con. warehouse, on 2nd St., to Palmer & Peterson, Monadnock Bldg., San Francisco. About $175,000.

Buildings

PROPOSED WORK

R. I., Woonsocket—Housing—Nyanza Mills, 159 Singleton St., having plans prepared by Lockwood, Greene & Co., archts. and engrs., 60 Federal St., Boston, for 25 houses for workmen. About $100,000.

Conn., Bridgeport—Sales—See "Industrial Works."

Conn., Hartford—Hospital—St. Francis Hospital, Woodland St., having preliminary plans prepared building addition to hospital. About $300,000. Architect not selected.

Conn., Hartford—Lodge—Sons of Temperance Society plan to build 4 story, 60 x 150 ft., brick and stone, concrete foundation. About $100,000. A. E. Fiske, Johnson Bldg., South Manchester, archt.

Conn., Meriden—Sanitarium—City having preliminary plans prepared building Undercliff Sanitarium. About $200,000. Architect not reported.

Conn., New Britain—Home—New Britain Children's Home, 81 Garden St., plans to build 3 story, 96 x 266 ft., brick and concrete, concrete foundation, at Radcliffe Heights. About $350,000. Architect's name withheld.

Conn., New Britain—Store and Offices—Raphaels Department Store, 382 Main St., having plans prepared by C. C. Palmer, archt., 272 Main St., for 3 story, 65 x 150 ft., brick and steel, on West Main St. About $75,000. Noted Jan. 8.

N. Y., Brooklyn—School—Bd. Educ., 500 Park Ave., New York City receives bids about March 4, building P. S. 181, 5 story, brick and steel, concrete foundation, on New York and Tilden Aves., here. About $500,000. C. B. J. Snyder, Municipal Bldg., New York City, archt. and engr. Noted Jan. 15.

N. Y., Jamaica—Office—Title Guarantee & Trust Co., 176 Bway., New York City, having sketches made by Severance & Van Allen, archts. and engrs., 111 East 40th St., New York City, for 2 story, brick, steel and stone addition, at 350 Fulton St., here. About $60,000.

N. Y., Long Island City—Office—Title Guarantee & Trust Co., 176 Bway., New York City, having plans prepared by Severance & Van Allen, archts. and engrs., 111 East 40th St., New York City, for brick, steel and stone, brick foundation, on Hunter Ave. and Queensboro Bridge Plaza, here. About $100,000.

N. Y., New York—Exchange—New York Telephone Co., 15 Dey St., having plans prepared by McKenzie, Voorhies & Gmellin, archts. and engrs., 1123 Bway., for 5 story, brick, steel and stone, concrete foundation, on 30th St. and 2nd Ave. About $1,000,000.

N. Y., New York—Office—Munson Steamship Line, 82 Beaver St., having plans prepared by K. M. Murchison, archt. and engr., 101 Park Ave., for 25 story, 22 x 144 x 160 ft., brick, concrete foundation, on Pearl St. between Beaver and Wall Sts. About $2,000,000.

N. Y., New York—Offices, Showroom and Cafeteria—R. A. Gershee, c/o F. P. Kelly, archt. and engr., 477 5th Ave., having sketches made for 25 story, 25 x 100 ft., brick, steel and stone, concrete foundation, at 138 West 43rd St. About $2,000,000.

N. Y., New York—Office—F. E. Vitolo, archt. and engr., 56 West 45th St., preparing plans for 10 story, brick, steel and stone, concrete foundation, on Franklin St. and West Bway. About $200,000. Owners name withheld.

N. Y., New York—Schools—Bd. Educ., 500 Park Ave., receives bids about March 4, building P. S. 61, 5 story, at Crotona Park and Charlotte Ave., cost $500,000; P. S. 62, 5 story, 230 x 280 ft., at Southern Blvd. and Liggett St., $600,000; P. S. 38, 5 story, 120 x 195 ft., at St. Anns Ave. and Hagney Pl., $500,000, all brick and steel, concrete foundation, in Bronx Boro. C. B. J. Snyder, Municipal Bldg., archt. and engr.

N. Y., New York—Stores, Showrooms and Lofts—J. H. Scheier, archt. and engr., 25 West 42nd St., receives bids about Feb. 20, altering 3 story, brick and steel, at 15-19 East 30th St., for H. Finkelstein, c/o architect. About $80,000.

N. Y., Syracuse—Office—Syracuse-Center Real Estate Co., 647 South Warren St., plans to build 1 and 2 story, 40 x 100 ft., brick, rein.-con. and steel, concrete foundation, on South Salina St. About $50,000. W. C. Moulton, Union Bldg., archt. and engr.

N. J., Atlantic City—Sales and Service—P. S. Tyre, archt. and engr., 1509 Arch St., Phila., soon lets contract building 1 story, 95 x 218 ft., brick and stone, on Ventnon and Boston Sts., for Packard Motor Co., Atlantic City.

N. J., Morris Plains—Psychopathic—State plans to build two 3 story, 88 x 230 ft., brick, stone and steel, at State Insane Asylum. About $400,000. F. H. Bent, 142 West State St., Trenton, archt.

N. J., New Brunswick—Horticultural—State plans to build 3 story, 60 x 160 ft., brick and stone. About $75,000. F. H. Bent, 142 West State St., Trenton, archt.

N. J., Trenton—Arena—N. A. K. Bugbee, 231 West State St., plans to build 1 story, and gallery, 76 x 150 ft., steel, concrete, brick and stucco, on Stockton St. About $75,000. R. G. Consolloy, 311 Commonwealth Bldg., archt. Steel to be furnished by owner.

Pa., Altoona—Fire Station—City plans election May 18, to decide whether bonded indebtedness can be increased by $450,000, $75,000 to be used for 2 story, 50 x 100 ft., fire station, brick, rock and concrete foundation. H. G. Hinkle, city mgr.

Pa., Merion Station—Community—Merion War Tribute Assn., 811 Land Title Bldg., Phila., having plans prepared by Karcher & Smith, archts. and engrs., 34 South 17th St., Phila., for concrete and brick community building, here. Cost to exceed $50,000.

Pa., Phila.—Office and Stores—Kellet Eng. Serv., Otis Bldg., having plans prepared by Simon & Simon, archts., 249 South Juniper St., for 4 story, 70 x 125 ft., brick and stone, on Sansom and 16th Sts. About $150,000.

Pa., Windber—Hospital—Windber Hospital having plans prepared by H. L. Reinhold, Jr., archt., 1513 Walnut St., Phila., for two 2 story, 35 x 90 ft. and 30 x 50 ft., brick buildings, here.

Del., Middletown—School—W. E. Hance, archt., 1619 Chestnut St., Phila., soon lets contract building 2 story, 100 x 140 ft., limestone, for Bd. Educ. About $100,000.

N. C., Asheville—Hospital—Mission Hospital plans to build addition to hospital. About $150,000. Architect not selected.

S. C., Westminster — Hospital — Oconee Hospital Assn. having plans prepared by S. D. Trowbridge, archt., Forsyth Bldg., Atlanta, Ga., for 2 story, 43 x 81 ft., hollow tile and brick. About $75,000.

Ga., Atlanta—Dormitory—Georgia School of Technology having plans prepared by S. D. Trowbridge, archt., Forsyth Bldg., for 3 story, 41.6 ft. x 170 ft., hollow tile and brick veneer, on Luckie St. About $140,000.

La., Jennings—High School—City soon lets contract building one 3 story, 166 x 224 ft. and one 2 story, 58 x 73 ft., concrete, brick and timber. About $260,000. F. W. Steinman & Son, Beaumont, Tex., archts.

O., Cincinnati—Church—Second Church of Christ Scientist had preliminary plans prepared by A. N. Robinson, archt., Candler Bldg., Atlanta, Ga., for 2 story, 90 x 120 ft., rein.-con. brick and terra cotta, on Clifton and Probasco Aves., here. About $175,000.

O., Cincinnati—Store—E. H. Dornette, archt., 2nd Natl. Bank Bldg., receives bids about March 1, constructing 3 story, 23 x 90 ft., steel and brick addition, for Hanke Bros., Main St.

O., Cleveland—Bathhouse—City purchased site on Starkweather Ave., opposite Lincoln Park, and plans to build 2 story, 76 x 76 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation. About $100,000. F. H. Betz, 604 City Hall, city archt.

O., Cleveland—Cafeteria—See "Industrial Works."

O., Cleveland—Commercial—E. P. & J. L. Dowling, Williamson Bldg., plan to build 6 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 14th St. and Caton Court. About $250,000. Architect and engineer not selected.

O., Cleveland — Commercial — C. Neuburger, c/o Statler Hotel, Euclid Ave. and East 12th St., plans to build 2 or 8 story, 75 x 200 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Euclid Ave. near East 32nd St. About $200,000. Architect's name withheld.

O., Cleveland—Commercial—F. N. Riley, 309 Williamson Bldg., having plans prepared by J. M. Dyer, archt., Amer. Trust Bldg., for 4 story, 116 x 240 ft., concrete, steel and brick, concrete and brick foundation, on East 79th St. and Hough Ave. About $250,000

O., Cleveland — Hospital — Babies' Dispensary and Hospital, 2,500 East 35th St., having plans prepared by A. Garfield, archt., 915 Natl. City Bldg., for 7 story, 60 x 120 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Adelbert Rd. and Euclid Ave. About $600,000.

O., Cleveland—Hospital—St. Luke's Hospital, 6,606 Carnegie Ave., having preliminary plans prepared by Hubbell & Benes, archts., 4500 Euclid Ave., for 6 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on Fairmount Blvd. About $750,000.

O., Cleveland — Temple — Labor Lyceum Co., 2460 East 9th St., plans to build 8 story, concrete, steel and brick, concrete foundation, on East 18th St. near Prospect Ave. About $300,000. W. S. Lougee, Marshall Bldg., archt.

O., Cleveland—Theatre and Commercial—Detroit-Lake Ave. Co., Sloan Bldg., soon receives bids building 6 story, 190 x 232 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Detroit and Lake Aves. About $600,000. Architect's name withheld.

★O., Dayton—Hotel—Ware Hotel Co., West 5th St., plans to build 5 story, 40 x 190 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on West 5th St. About $200,000. R. J. Paul, mgr. Architect not selected.

O., Dayton—Store—J. Thal, 123 South Main St., plans to build 3 story, 33 x 180 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $175,000. Architect not selected.

Buildings (Continued)

O., Middletown—Hotel—Middletown Hotel Co., Main St., having revised plans prepared by F. L. Packard, archt., New Hayden Bldg., Columbus, for 5 story, 80 x 175 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Main and 2nd Sts. About $300,000.

O., Middletown—Theatre and Office—Liberty Theatre Co. plans to build 2 story, 100 x 100 ft., steel, brick and terra cotta, concrete foundation, on 3rd and Bway. About $100,000. F. J. Hughes & Co., 411 U. S. Bldg., archts.

O., Springfield—Church—Church of Christ Scientist, West Mulberry St., plans to build 2 story, 100 x 100 ft., stone, steel and brick, rein.-con. flooring, concrete foundation, on South Main St. About $75,000. A. A. Honeywell, 218 City Natl. Bank Bldg., Kokomo, Ind., archt.

O., Springfield—Office—J. Bauer Real Estate Co., East Main St., plans to build 2 story, 45 x 170 ft., concrete, steel and stone, concrete foundation. About $50,000. W. K. Shilling, Springfield, archt.

O., Springfield—Store—S. S. Kresge Co., High St., having plans prepared by Hall & Lethly, archts., 807 Fairbanks Bldg., for 4 story, 50 x 130 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Main St. About $150,000.

O., Springfield—Temple—Masonic Temple Co., Bushnell Bldg., plans to build 3 story, rein.-con., steel and brick. About $250,000. W. E. Copenhaver, pres. Architect not selected.

Ind., Indianapolis—Church—First United Brethren Church having plans prepared by Rubush & Hunter, archts., 430 Amer. Central Life Bldg., building church at Walnut St. and Parke Ave. About $100,000.

Ind., Indianapolis—Sales, etc.—Indiana Motors Co., 425 North Meridian St., plans to build 4 story, 120 x 200 ft. auto sales and service station, at 1135-41 North Meridian St. About $125,000.

Ind., Richmond—High School—City Council plans election to vote on $350,000 bonds to build high school in West Richmond.

Ind., Terre Haute—Hospital—Vigo Co. having plans prepared by Shrouds-McCormick Co., archts., Terre Haute, building hospital 8 mi. north of here. About $52,000.

Mich., Detroit—Church—Detroit Baptist Union, 1105 Vinton Bldg., plans to construct 2 story, 64 x 120 ft., brick, steel and stone, concrete foundation, on Jefferson Ave. and Lakewood Blvd. About $125,000. D. R. Wells, 435 Woodward Ave., archt.

Mich., Detroit—Lodge—Loyal Order of Moose, Lodge 160, plans to build 2 story, 100 x 130 ft., brick and steel, concrete foundation, on Cass Ave. and Elizabeth St. About $250,000. Baxter, O'Dell & Halpin, 1024 Hammond Bldg., archts. Address A. Entenza, 401 Chamber of Commerce. Noted Feb. 12.

Mich., Detroit — Mercantile — C. F. J. Barnes, archt., Kresge Bldg., plans to build 3 story, 50 x 100 ft., brick, steel and terra cotta, brick foundation, on Grand River Ave. and Joy Rd. About $60,000. Owners name withheld.

Mich., Detroit—Mercantile—Book Estate, Book Bldg., having plans prepared by Giaver, Dinkleberg & Ellington, engrs., Book Bldg., for remodeling and building 5 story, 60 x 95 ft., rein.-con., brick and steel addition, rein.-con. flooring, concrete foundation, on Grand River Ave. and Washington Blvd. About $75,000.

Mich., Detroit — Office — Standard Accident Insurance Co., 34 Fort St., W., having plans prepared by A. Kahn, archt., Marquette Bldg., for 8 story, rein.-con. brick, steel and stone, rein.-con. flooring, concrete foundation, on Bagg St. and Cass Park. About $500,000.

Mich., Detroit—School—Bd. Educ., 50 Bway., having plans prepared by Malcomson, Higginbotham & Palmer, archts., 405 Moffat Bldg., for 2 story, 90 x 150 ft., rein.-con. brick and steel, rein.-con. flooring, concrete foundation, on Charles Ave., N. About $200,000.

Mich., Flint—School—St. Michael's Parish, 6th St., having plans prepared by VanLeyen, Schilling & Keough, engrs. and archts., 1,115 Union Trust Bldg., Detroit, for 2 story, 62 x 245 ft., rein.-con., brick and steel, concrete foundation, on 6th St. About $250,000. A. Donnegon, pastor.

Mich., Northville—Barn, etc.—L. A. Young, 93 Rhode Island Ave., Detroit, having plans prepared by C. W. Brandt, archt., Kresge Bldg., Detroit, for 150 x 350 ft. frame barn, containing race course and amphitheatre, concrete foundation, also 2 story, 30 x 50 ft., brick and concrete garage, at country estate here. About $200,000.

Mich., St. Clair — Church — St. Mary's Church plans to build 2 story, 78 x 92 ft., rein.-con. brick and steel addition, rein.-con. and terrazzo flooring, concrete foundation. About $55,000. E. Kromenaker, pastor. P. Dederichs, 1205 Chamber of Commerce, Detroit, archt.

Ill., Chicago—Office—Illinois Society of Architects, 19 South La Salle St., appointed committee headed by D. H. Burnham, 209 La Salle St., to plan and finance large office building to house architects, engineers, contractors and material dealers.

Ill., Marion—Courthouse—Bd. Supervs. Williams Co. having plans prepared by N. S. Spencer & Sons, archts., 37 Van Buren St., Chicago, for 3 story, 80 x 100 ft., rein.-con., brick and stone, rein.-con. flooring, concrete foundation, here. About $250,000.

Wis., Kohler—School—Bd. Educ. having plans prepared by Brust & Phillip, archts., 405 Bway., Milwaukee, for 2 story, brick, rein.-con. and part steel addition, brick foundation, on Main St. Cost between $40,000 and $50,000.

Wis., Manitowoc—Armory—City plans to build 3 story, 60 x 180 ft., brick, rein.-con. and steel. About $125,000. A. Zander, clk. Architect not selected.

Wis., Milwaukee—Home—Wisconsin Advancement Assn. for Blind, 630 40th St., plans to build brick and concrete home, rein-con. flooring, concrete foundation. About $500,000. Architect not selected.

Wis., Milwaukee—Sales—Osmond Motor Car Co., 503 Bway., plans to build 3 or 4 story, rein.-con. and brick, rein.-con. flooring, concrete foundation, on Bway. About $100,000. Architect not selected.

Wis., Milwaukee—Store—E. Schuster & Co., 12th and Vliet Sts., having plans prepared by Brust & Philipp, archts., Free Press Bldg., for 3 story, rein.-con. and brick addition, rein.-con. flooring. About $200,000.

Wis., Sheboygan—Bank and Office—Security Natl. Bank, 529 North 8th St., soon receives bids building 4 story, 60 x 110 ft., brick, rein.-con. and tile, brick foundation, on Center and 8th Sts. About $250,000. Private plans. Noted Aug. 28.

Wis., Stevens Point—Bank—First Natl. Bank having plans prepared by Childs & Smith, archts., 64 East Van Buren St., Chicago, for 2 story, 42 x 90 ft., stone, rein.-con. flooring, concrete foundation. About $100,000.

Ia., Grinnell—High School—Bd. Educ. plans to build 2 story, steel and Bedford stone. About $300,000. W. Ray, secy. Architect not selected.

Ia., Griswold — School — Consolidated School Dist. plans to build 2 story, brick and Bedford stone. About $60,000. J. Christian, secy. Architect not selected.

Ia., Parson—School—Consolidated School Dist. plans to build 2 story, brick. About $60,000. J. A. Cain, secy. Architect not selected.

Minn., Minneapolis—Business—Bureau of Engraving, 17 South 6th St., having preliminary sketches prepared for 4 story (ultimately 8 story), 100 x 130 ft., rein.-con. and brick, on 12th St. and Mary Pl. About $200,000. Architect's name withheld.

Minn., Minneapolis—Theatre—Orpheum Theatre Co., 21 South 7th St., preparing sketches for 4 story, rein.-con., brick and stone, on Hennepin Ave. and 9th St. About $800,000. Private plans.

Minn., Morton—School—Bd. Educ. rejected bids received building 2 story, 40 x 90 ft., rein.-con., brick and stone (same exceeded appropriation). About $65,000. K. T. Snyder, Plymouth Bldg., Minneapolis, archt. Work will be readvertised. Noted Jan. 29.

Minn., Renville—School—Bd. Educ. having preliminary plans prepared by Croft & Boerner, archts., 833 Palace Bldg., Minneapolis, for 2 story, rein.-con and brick, About $250,000 A. R Holmberg, clk.

Minn., Willmar—Hotel—C. W. Burdick having plans prepared by Bell & Kinports, archts., 909 Andrus Bldg., Minneapolis, for 4 story, 51 x 75 ft. addition, rein.-con. and mill construction. About $60,000.

Kan., Hutchinson — Temple — Masonic Order plans to build 165 x 191 ft., on 9th and Main Sts. About $350,000. Architect not selected.

Kan., Salina—Office, etc.—Standard Oil Co., Neodesha, plans to build new office, garage and warehouse, on side of present office, here. About $150,000; also build 2 service stations to cost $10,000 each, and improved station already installed, $5,000.

Neb., Kearney—Auditorium—City plans election Feb. 24, to vote on $100,000 bonds to construct auditorium. C. O. Swan, clk.

Neb., St. Paul—School—Bd. Educ. had plans prepared by W. Mampe, archt., Sheidley Bldg., Kansas City, Mo., for 2 story, 70 x 110 ft., concrete, steel and brick, concrete foundation. About $80,000.

Neb., Stromberg—Hotel—V. Anderson et al plan to build rein.-con. steel and brick hotel, rein.-con flooring, concrete foundation. About $75,000. Architect not selected.

S. D., Huron—Court House—Beadle Co. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 4 story, 95 x 120 ft., rein.-con., with Carthage stone exterior. About $400,000.

S. D., Ipswich—Grade and High School—J. Owens, clk., Bd. Educ., soon lets contract building 2 story, 75 x 120 ft., brick. About $100,000. Edwins & Edwins, 911 Northwestern Bank Bldg., Minneapolis, Minn., engrs. Noted Jan. 8.

S. D., Onida—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 2 story, 56 x 86 ft., rein.-con. and brick. About $100,000.

N. D., Dickinson—School—Bd. Educ. plans to build school in eastern part of town. About $80,000. Architect not selected.

Mo., Jefferson City—Church—Parish Com. of Immaculate Conception Church soon lets contract building 1 story, 40 x 125 ft., brick or stone, stone foundation, on McCarty St. and Clark Ave. About $60,000. S. A. Moberly, archt.

Mo., Jefferson City—Theatre—R. Armstrong plans to build 1 story, 66 x 165 ft., concrete and brick, rein.-con. flooring, concrete foundation, on High St. About $113,000. Miller & Sessinghaus, Jefferson City, archt.

Tex., Houston—Office, etc.—C. D. Hill & Co., archts., 315 Binz Bldg., soon let contract building 2 story, (portion to be 3 story, with tower), 113 x 330 ft. and 79 x 100 ft. rein.-con. and brick office and warehouse, rein.-con. flooring, for Peden Iron & Steel Co., 700 North San Jacinto St. About $350,000.

Okla., Enid — Church — First Methodist Episcopal Church plans to build church. About $150,000. Architect not selected.

Okla., Okmulgee—Hotel—Smith, Rea, Lovitt & Sauter, archts., 304 Parkinson Bldg., (also 602 Finance Bldg., Kansas City, Mo.,) receive bids in April building 9 story, 100 x 140 ft. rein.-con. and brick, on 3rd and Morton Sts., for Creek Hotel Co. About $750,000. J. H. Rebold, pres.

Okla., Tulsa—Club House—Petroleum Club plans to build 6 story club house. About $250,000. Architect not selected.

N. M., Gallup—Schools—Bd. Educ. soon receives bids building concrete and brick high school, and 5 room frame, brick, and concrete grammar school. About $140,000. C. L. Wilson, 207 Amer. Natl. Bank Bldg., Monrovia, Cal., archt.

N. M., Lordsburg—Court House—Bd. Supervs. Hidalgo Co. plans to build concrete, brick, and stone. About $100,000. C L Wilson, 207 Amer Natl. Bank Bldg., Monrovia, Cal., archt.

Wash., Seattle—Church—Westminster Presbyterian Church, Bway, and East Columbia St. having preliminary plans prepared by R. H. Orr, archt., 1301 Van Nuys Bldg., Los Angeles, for brick and terra cotta, on 126 x 140 ft. site, here. About $125,000.

Wash., Spokane — Cathedral, Memorial Chapel and Parish House—All Saints Cathedral, 1122 1st St., plans to build 90 x 120 ft., stone cathedral, memorial chapel and 3 story parish house, on Jefferson and Sprague Sts. About $200,000. Whitehouse & Price, Hutton Bldg., archts.

Ore., Bend—Office—J. B. Miner plans to build 1 story, 75 x 140 ft. office, to include 7 x 75 ft arcade, twenty-one 12 ft. interior court rooms, concrete. About $50,000. T. A. Thomas, Bend, archt.

Ore., Eugene—Hotel—Osburn Hotel Co. plans to build 2 story brick addition. About $50,000. J. Hunzicher, Eugene, archt.

Ore., LaGrande—Hotel—N. K. West having plans prepared by Tourtellotte & Hummel, archts., McKay Bldg., Portland, and soon receives bids building 4 story, brick and stone. About $80,000.

Cal., Chico—Hospital—N. T. Enloe plans to build rein.-con. hospital, on Esplanade Ave. About $75,000, Architect not selected.

Buildings (Continued)

Cal., Glendale—Schools—Trustees Glendale School Dist. soon lets contract building concrete and hollow tile school on Bway., also brick addition to Wilson School, both 2 story, concrete foundation. About $100,000. Jeffrey & Schaefer, 1106 Kerckhoff Bldg., Los Angeles, archts.

Cal., Independence — Courthouse — Bd. Supervs. Inyo Co. rejected bids received Feb. 2, and will have plans revised by W. H. Weeks, archt., 75 Post St., San Francisco, for 2 story, rein.-con. and terra cotta, here. About $150,000. Noted Jan. 1.

Cal., La Canada—Country Club—F. P. Flint having plans prepared by M. Hunt, arct., 1107 Hibernian Bldg., Los Angeles, for 1 story, 265 x 300 ft., concrete and stucco, concrete foundation, here. About $75,000.

Cal., Martinez—High School—Trustees Alhambra Union High School soon receive bids building 2 story, brick or rein.-con. About $125,000. A. A. Cantin, 68 Post St., San Francisco, archt. Noted Aug. 14.

Cal., Moorpark—School—Trustees Moorpark Union High School Dist. having plans prepared by M. M. Marston, archt., H. W. Hellman Bldg., Los Angeles, for school. About $60,000. Noted Feb. 12.

Cal., Orange—City Hall—City plans election to vote on $80,000 bonds to build city hall. D. G. Wettlin, clk. Anderson & Farrell Palace Theatre Bldg., Long Beach, archts.

Ont., Kitchener—Collegiate Institute—Kitchener-Waterloo Collegiate Bd., Frederick St., having plans prepared by S. B. Coon & Sons, archts., 810 Excelsior Life Bldg., Toronto, for 3 story concrete, steel and brick, rein.-con. flooring, concrete foundation. About $500,000.

Ont., Ottawa—Auditorium and Lodge Rooms—Knights of Columbus, 1121 Wellington St., having plans prepared by Millson & Burgess, archts., 209 Sparks St., for 3 story, 60 x 80 ft. steel and brick, rein.-con. flooring, concrete foundation. About $80,000.

Ont., Ottawa—Office—Bd. Trade plans to build office building, including store, club rooms, etc. About $400,000.

Ont., Ottawa—Theatre—Canadian Famous Players Corp., Toronto, plans to build theatre on Queen St. About $500,000. Architect not selected.

Ont., St. Marys—Theatre—Allen Bros., Allen Theatre, Toronto, have purchased Deckson Blk. on Queen St., and are having plans prepared by W. G. Murray, archts., Dominion Savings Bldg., London, for remodeling same into theatre. About $75,000.

Ont., Toronto—Office—Percy Hermont, Hermont Bldg., Dundas St., having plans prepared by Brown & McConnell archts., Manning Chambers, for 6 story, 40 x 80 ft., steel and brick, rein.-con. flooring, concrete foundation. About $80,000.

BIDS DESIRED

Me., Saco—Bank—Until March 15, by Saco & Biddeford Savings Institute, building 5 story, 100 x 150 ft., brick. About $500,000.

Me., Winslow—School—Until March 6, by School Bd., building 2 story, 50 x 90 ft. brick and concrete, concrete flooring and foundation. About $50,000. Bunker & Savage, Augusta Trust Bldg., archts.

Conn., Meriden — Business — Until Feb. 24, by D. Bloomfield, archt., 129 State St., building 2 story, 120 x 150 ft., brick and steel, concrete foundation, for Griswold, Richmond & Glock Co., 2 West Main St. About $100,000. Noted Jan. 15.

N. Y., Marcy—Hospital, etc.—Until March 3, by State Hospital Comn., Capitol, Albany, building mortuary and tuberculosis pavilion, at Utica State Hospital, here. About $50,000. L. F. Pilcher, Albany, state archt. Noted Jan. 1, under "Utica."

N. Y., Norwich—Schools—Until March 8, by Bd. Educ., building brick, steel and stone high and grade schools, brick foundation. About $250,000. Tooker & Marsh, 101 Park Ave., New York City, archts. and engrs.

N. J., Newark—Engine House—Until Feb. 25, by J. F. Monahan, dir. Pub. Parks & Pub. Property, building Engine House 28, on North 6th St.

N. J., Newark—Police Station—Until Feb. 24, by J. F. Monahan, dir. Dept. Parks & Pub. Property, consisting 3rd Precinct Bldg., Market and Read Sts.

Pa, Edgehill—Locker House—P. S. Tyre, archt. and engr., 1509 Arch St., Phila., receiving bids building 2 story, 36 x 78 ft., with two 21 x 44 ft. wings, stone and stucco, for North Hill Country Club, Edgehill. Cost to exceed $50,000.

Pa., Oakmont—High School—Until March 1, by Oakmont Boro. School Dist., building two 3 room additions to high school. M. W. Bottomfield, secy.

Pa., Phila.—Sales and Service—H. T. Saunders, 31 South 18th St., receiving bids building 1 and 2 story, 40 x 160 ft. and 25 x 160 ft., brick and concrete, at 901 North Broad St., for L. J. Kolb, West School Lane, Germantown. About $50,000. Noted Jan. 29.

Pa., Phila. — School — Until March 3 (change of date), by Bd. Educ., building schools on 9th and Oregon Sts. and 70th and Buist Sts. 3 story, 115 x 165 ft., concrete and brick. Cost between $400,000 and $500,000 each. Noted Jan. 15.

Ga., Monroe—Schools—Until Feb. 28, by City Council, building George Tucker School, at Stubbs Ave. and 4th St., colored School, Washington St. and Powers Alley, and Southside School, Jackson and Prune Sts. About $217,000. J. W. Smith, city archt.

Ga., Valdosta—Dormitory—Until Mar. 2, by Trustees South Georgia State Normal College, building 2 story, 56 x 250 ft., hollow tile and stucco. About $75,000. Edwards & Sawgard, Chamber of Commerce Bldg., Atlanta, archts.

O., Cleveland—Bank—Woodland Ave. Savings & Trust Co., East 55th St. and Woodland Ave., receiving bids building 2 story, 50 x 100 ft., steel and brick addition, brick foundation, on East 89th St. and Buckeye Rd. About $60,000. Walker & Weeks, 1900 Euclid Bldg., archts.

O., Cleveland—Temple—Knesseth-Isreal congregation, c/o M. Altschuld, archt., Stoneman Bldg., receiving bids constructing 1 story, 41 x 90 ft., steel and brick, brick foundation, on East 105th St. and Columbia Ave. About $50,000. Noted Jan. 22.

O., Cleveland—Theatre—Pauled Realty Corp., c/o Keith Theatre Co., 1564 Bway., New York City, receiving bids building 1 story, 93 x 165 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 105th St. and Euclid Ave., here. About $500,000. Rapp & Rapp, 1900 North State St., Chicago, archts. and engrs.

O., Dayton—Store—Until Apr. 1, by Ludlow Bldg. Co. and L. Traxler Co., 31 South Main St., constructing 6 story, 140 x 150 ft., rein.-con. and tile or brick, rein.-con. flooring, concrete foundation, on 4th and Ludlow Sts. About $600,000. Schenk & Williams, Mutual Home Bldg., Archts.

O., Lorain—School—Until March 8, by E. Bruell, clk. Bd. Educ., building school on Louisiana Ave. and D St. Perkins, Fellows & Hamilton, 814 Tower Court, Chicago, archts., advertised in this issue.

O., Massillon—School—W. Filberth, clk. Bd Educ., receiving bids building 2 story, 70 x 95 ft., concrete and brick. About $125,000. O. D. Howard, 8 East Broad St., Columbus, archt.

Ind., Indiana Harbor—Bank—K. M. Vitzthum & Co., archts., 21 East Van Buren St., Chicago, Ill., receiving bids for 1 story, 25 x 125 ft., brick and timber, concrete foundation, for Citizens Trust & Savings Bank, Indiana Harbor. About $75,000.

Mich., Northville — Sanitarium — Until March 1, by C. Freiburger, secy. Bd. Health, 233 St. Antoine St., building Tuberculosis Sanitarium, to include 3 story, 41 x 144 administration building; 50 x 165 ft. main building with two 3 story, 38 x 182 ft. employees building; 1 story 48 x 87 ft. building; 2 story, 38 x 128 ft. nurses' home; 2 story, 38 x 83 ft. and 38 x 84 ft. ambulant group; 2 story, 28 x 36 ft. laboratory; 2 story, 34 x 143 ft. and 21 x 33 ft. employees building; 1 story, 48 x 87 ft. power plant; 1 story, 40 x 120 ft. laundry, all rein.-con. and brick, rein.-con. flooring, concrete foundation. Stratton & Snyder, 1103 Union Trust Bldg., Detroit, archts.

Wis., Milwaukee—Sales, etc.—Wisconsin State Rubber Co., 181 4th St., receiving bids constructing 3 story 50 x 100 ft., brick and concrete sales and service building, rein.-con. flooring, concrete foundation, on 4th St. About $80,000. M. Tullgren & Sons, 425 East Water St., archts.

Wis., Owen — School — Until Feb. 24, (change of date), by V. F. Shereda, clk. Bd. Educ., building 2 story, 63 x 81 ft., brick and stone. About $50,000. W. L. Alban, Endicott Bldg., Minneapolis, archt. Noted Feb. 5.

Wis., West Allis (Milwaukee, P. O.)—Schools—Until Feb. 23, by Bd. Educ., building three 2 story, brick ward schools, concrete foundation. About $60,000 each. Lesser & Schutte, Majestic Bldg., Milwaukee, archts.

Ia., Buckingham—School—Until Feb. 27 by W. A. Speer, secy. Bd. Educ., Geneseo Independent Consolidated Dist., Geneseo Twp., Tama Co., building 2 story, 48 x 89 ft., brick, steel and stone. About $60,000. H. E. Reimer, Kibby Bldg., Marshalltown, archt.

Ia., Ollie—School—Until March 4, by Bd. Educ. Consolidated Dist., building 2 story, 56 x 98 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $85,000. W. E. Hulse & Co., Masonic Temple, Des Moines, archts. Noted Jan. 15.

Ia., Randall—School—Until Feb. 25, by Bd. Educ., Consolidated Dist., building 2 story, 59 x 95 ft., brick, hollow tile and steel. H. B. Hanson, secy. T. Thorson, Forest City, archt.

Ia., Sewal—School—Until March 10, by A. A. Andrews, secy. Bd. Educ. Consolidated Independent Dist., building school. Martin & Sutherland, Storm Lake, archts.

Minn., Centerville—School—Until Feb. 28, by Bd. Educ., building 2 story, 50 x 62 ft., concrete, brick and tile. About $50,000. G. E. Burque, clk. Magney & Tusler, Builders Exch., Minneapolis, archts.

Neb., Osceola—Court House—Until March 16, by Comrs. Polk Co., building 3 story, 64 x 98 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. W. F. Gernandt, Keeline Bldg., Omaha, archt. Noted Feb. 12.

Neb., West Point—High School—Until Feb. 24, by Bd. Educ., for 2 story, 80 x 175 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. E. Davis, 515 Security Mutual Bldg., Lincoln, Neb., archt.

Wyo., Cheyenne — School—Until March 8, by Bd. Trustees School Dist. No. 1, building 2 story, 71 x 80 ft., concrete, brick, and timber, on 27th, 28th and Warren Sts. About $80,000. Wm. Dubois, Haynes Bldg., archt.

Mo., Brookfield—School—Until March 15, by Bd. Educ., building 2 story, rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $90,000. M. S. Martin, Hannibal, archt.

Mo., Carthage—Hotel—Stock Co., c/o A. Marks, secy. Chamber of Commerce, rejected bids received building 4 story, 94 x 75 ft., rein.-con. brick, concrete foundation. About $140,000. Shepard & Wiser, 301 R. A. Long Bldg., Kansas City, archts. Truscon Steel Co., Bryant Bldg., Kansas City, engrs. Noted Jan. 29.

Tex., Port Arthur—School—Until March 16, by Bd. Educ., building 6 and 16 room grade schools. W. B. Ittner, Bd. Educ. Bldg., St. Louis, Mo., archt.; advertised in this issue.

Idaho, Boise—Tourtellotte & Hummel, archts., McKay Bldg., Portland, Ore., receiving bids constructing 4 story, 87 x 100 ft., brick and stone building, for Y. M. C. A. About $50,000.

Cal., Fowler—School—Until March 5, by Trustees Fowler High School, building 4 hollow tile and concrete schools. About $150,000.

Cal., Salinas—School—Until March 4, by Trustees Salinas Union High School, building 2 story, rein.-con. About $250,000. E L. Vandellan, clk. Noted Aug. 7.

Ont., Ingersoll—School—Until Feb. 25, by W. G. Murray, archt., Dominion Savings Bldg., London, for 2 story, rein.-con. steel and brick, rein.-con. flooring, concrete foundation. About $125,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Chisholm**—School—T. G. O'Connell, archt., 18 Boylston St., Boston, let contract to J. A. Benoit, 9 Pleasant St., Biddeford, building 3 story, 52 x 75 ft., brick, 2nd class construction Parochial School, rock and concrete foundation, for St. Rose Roman Catholic Society. About $50,000.

★**Mass., Boston**—Bank—Federal Reserve Bank, 53 State St., let contract building 5 story, concrete, steel and stone, rein.-con. flooring, concrete foundation, on Pearl and Milk Sts., to L. P. Soule & Co., 80 Boylston St. About $4,500,000, cost plus percentage basis. Noted Jan. 22.

R. I., Lonsdale (Pawtucket P. O.)—School—Lincoln Twp. received bids building 2 story, 56 x 110 ft. with 45 x 70 ft. ell, brick and steel, concrete foundation, here, from A. F. Smiley, 308 Main St., Pawtucket, $82,000; R. F. Collinge, Lonsdale, $84,300.

★**R. I., Providence**—Office—See "Industrial Works."

Buildings (Continued)

★**N. Y., Brooklyn — Court House** — E. Riegelmann, boro. pres., let contract building 3 story, 52 x 75 ft., brick, steel and stone, brick foundation, at 101-115 Schermerhorn St., to G. F. Driscoll Co., 548 Union Ave. About $163,950. Noted Jan. 29.

★**N. Y., Brooklyn**—Office—Kraslow Bldg. Co., Inc., 190 Montague St., will build 12 story; brick, steel and stone, concrete foundation, at 180-186 Montague St. About $1,000,000. Work will be done by day labor.

★**N. Y., New Rochelle**—Office—R. C. H. Realty Corp. let contract building 2 story, 50 x 150 ft., rein.-con. clearing house, to Turner Constr. Co., 244 Madison Ave., New York City. About $100,000.

★**N. Y., New York**—Loft—E. A. Cohan, 206 Bway., will alter 5 story, brick and steel, at 16 Maiden Lane. About $50,000. Work will be done by day labor.

★**N. Y., New York**—Offices—Bway. & 13th St. Corp., c/o H. Regelmann, archt. and engr., 100 East 14th St., will alter four brick and steel buildings, on 30th St. between Bway. and 6th Ave. About $50,000. Work will be done by day labor.

★**N. Y., New York**—Store—B. Altman & Co., 5th Ave. and 34th St., let contract building 8 story, 60 x 100 ft., brick, steel and stone, brick foundation, at 1-3 East 35th St. Work will be done by day labor.

★**N. Y., New York**—Store and Office—H. D. Downs, 552 3rd Ave., let contract building 6 story, 25 x 100 ft., brick, steel and stone, concrete foundation, at 675 5th Ave., to J. G. Deisler, Inc., 105 West 40th St. About $85,000. Noted Feb. 12.

★**N. Y., New York**—Studio—Jackson Film Corp., 1431 Bway., will build 180 x 224 ft., brick, steel and rein.-con., rein.-con. flooring, concrete foundation, on Westchester and Jackson Aves., Bronx. Work will be done by day labor. Noted Jan. 15.

★**N. J., Lakewood**—Hotel—P. Reisberger will build 3 story, brick, terra cotta and stucco, on Forest Ave. and 6th St. About $55,000. Work will be done by day labor.

★**N. J., Trenton**—Sales—See "Industrial Works."

★**Pa., Johnstown** — High School — Johnstown School Dist. let general contract constructing 2 wings, namely, manual arts and domestic buildings, of group of 6 for W. A. Cochran School, concrete, brick and steel, rock foundation, to Gilpatrick-Dawson Constr. Co., Empire Bldg., Pittsburgh, $187,440; heating to Swank Hardware Co., Johnstown, $30,224.

★**Pa., Phila.**—Sales and Service—C. Kahn, Morris Bldg., let contract altering 2 story, 25 x 150 ft., brick and stone, at 1419 North Broad St., to Hogg Constr. Co., Denckla Bldg. About $50,000. Noted Jan. 29.

★**D. C., Washington**—Hotel—D. Chandler, archt. and engr., 753 5th Ave., New York City, let contract to W. Crawford, 7 East 42nd St., New York City, building 7 story, brick, steel and stone, concrete foundation, here, for War Work Council, Natl. Bd. of Y. M. C. A., 347 New Yok City. About $800,000.

★**Va., Richmond**—Cathedral—C. M. Robinson, archt., Times Dispatch Bldg., let contract to J. C. Beazley, Real Estate Bldg., constructing cathedral, for Scottish Rite Cathedral. About $150,000.

★**W. Va., Huntington** — Business — Huntington Drug Co., 216-20 8th Ave., let contract building 5 story, on 7th Ave., to Arnold Co., C. & R. Shops. About $100,000.

★**N. C., Manning**—Hotel—Lafaye & Lafaye, archts., Columbia let contract building 2 story, brick and tile, here, to Jackson Constr. Co., 1730½ Main St., Columbia. Owners name withheld.

★**Ga., Atlanta**—Store—Silver Bros. Co., 395 Bway., New York City, let contract building 3 story, 50 x 175 ft., brick and steel, at 87 Whitehall St., to W. P. Francis, Atlanta. About $175,000.

★**O., Bellefontaine**—Bank—Bellefontaine Natl. Bank let contract remodeling 1 story, brick and stone, brick foundation, to A. R. Filson, Bellefontaine. About $50,000.

★**O., Bellevue** — School — Bd. Educ. let contract building 3 story, 80 x 90 ft., rein.-con. and brick, rein.-con. flooring rock foundation, in Thompson Twp., to Willing Bros., Bellevue. About $120,000. Noted Jan. 22.

★**O., Cleveland**—Clubhouse—Al Koran Temple, East 6th St. and Superior Ave., let contract remodeling 2 story clubhouse, at 3515 Euclid Ave., to J. H. Chaney & Son Co., Hippodrome Annex Bldg. About $50,000.

★**O., Cleveland**—Sales—Whitworth Bros., c/o G. King, archt., Permanent Bldg., let contract building 3 story, 66 x 122 ft., rei.-con., steel and brick, rein.-con. flooring, concrete and brick foundation, on Chestnut St. near East 12th St., to Piscopi Bros., Murray Hill Rd. About $75,000.

★**O., Cleveland**—Theatre and Commercial —K. Spielman, 4727 Woodland Ave., let contract building 2 story, 50 x 166 ft., concrete, steel and brick, rein.-con. flooring, concrete and brick foundation, on East 119th St. and Kinsman Rd., to J. Bursky, 3,418 East 119th St. About $85,000. Noted Jan. 29.

★**O., Dayton**—Store—Reed Furniture Co., 111 East 3rd. St., let contract building 3 story, 83 x 120 ft., rein.-con., brick and terra cotta, rein.-con. flooring, concrete foundation, on West 5th St., to J. Boren & Sons, Louie St. About $250,000. Noted Aug. 7.

★**O., Dayton**—Store—A. Schantz Estate, Ludlow St., let contract building 2 story, 44 x 100 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on West 5th St., to J. Lowes, Schwind Bldg. About $75,000.

★**Ind., Indianapolis** — Sales — Advance Rumely Thrasher Co., Laporte, let general contract building 3 story, 65 x 120 ft. brick and mill construction addition at 140 South Capitol St., here, to C. J Wacker, cost $41,550.

★**Ind., Indianapolis**—Sales—F. Hatfield Co., 535 North Capitol Ave., let contract building 3 story, 84 x 195 ft., rein.-con. and brick sales building and garage on Capitol Ave. and Emmet St., to C. J. Wacker, 625 Law Bldg. About $150,000.

★**Mich., Detroit**—Office—United Brotherhood of Maintenance of Way Employees & Railway Shop Laborers, 27 Putnam Ave., let contract building 12 story, 93 x 160 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Clifford and Columbia Sts., to W. H. Mueller, 1711 Ford Bldg. About $500,000. Noted Jan. 8.

★**Mich., Marquette**—Theatre—Delft Theatres, Inc., let contract building 1 story, 82 x 127 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation, to Foster Constr. Co., Caswell Blk., Milwaukee. About $150,000.

★**Ill., Chicago**—Sales—See "Industrial Works."

★**Ill., Roseland**—Bank—Roseland State Savings Bank let contract building 2 story, 50 x 125 ft., rein.-con., steel and brick, concrete foundation, to A. V. Daegling, 9000 Houston Ave., South Chicago. About $60,000.

Ia., Welton—School—Until March 10, by Bd. Educ. Consolidated Dist., building 3 story, 50 x 85 ft., brick and steel, concrete foundation. About $65,000. C. A. Dieman & Co., Granby Bldg., Cedar Rapids, archts. Noted Feb. 12.

Minn., Coleraine — Housing — See "Hibbing."

Minn., Ely—Housing—See "Hibbing."

Minn., Eveleth—Housing—See "Hibbing."

Minn., Hibbing—Housing—Until March 1, by S. S. Rumsey, ch. engr. for Oliver Mining Co., Wolvin Bldg., Duluth constructing 110 frame dwellings, concrete foundations, to house employees, at Hibbing, Eveleth, Coleraine and Ely. About $540,000.

Kan., Baldwin—School—Until Feb. 24, by Bd. Educ., building 2 story, 56 x 90 ft., brick, rein.-con. and stel, rein.-con. flooring, concrete foundation. About $70,000. W. E. Hulse & Co., Hutchinson, archts.

★**S. D., Watertown**—High School—Bd. Educ. let contract building 3 story, 151 x 178 ft., rein.-con., to Gray Const. Co., Watertown, at $356,669. Noted Jan. 15.

★**S. D., Webster**—School—Bd. Educ. let contract building 2 story, 94 x 140 ft., brick and rein.-con. to Lawrence Const. Co., 544 Builders' Exch., Minneapolis, Minn. About $183,200. Noted Jan. 15.

★**Wash., Olympia** — Administration — State Capitol Bldg. Assn. let contract constructing 3 story, 76 x 220 ft., stone and marble, to Pratt & Watson, Tacoma, $823,170. This is 2nd unit in proposed new capitol group. Noted Jan. 15.

★**Wash., Olympia**—Office—State Capitol Bldg. Assn. let contract building 3 story, 75 x 219 ft., stone and marble, to Pratt & Watson, Tacoma, $823,170. This is 2nd unit in new Capitol group. Noted Jan. 8.

★**Cal., Los Angeles**—Country Club—Wilshire Country Club, Wilshire Blvd., let contract building 2 story, frame and stucco, concrete foundation, to Davidson Constr. Co., 1445 East 6th St. About $130,000, cost plus percentage basis.

Cal., San Francisco—Library—City and San Francisco Co. received bids building 1 story, on Powell St., from McLevan & Peterson, Hearst Bldg., $48,800, Cameron & Disston, Hearst Bldg., $51,500, and W. Goericke, Sharon Bldg., $51,700; 1 story, on Sacramento and May Sts., from Barrett & Hilp, Sharon Bldg., $59,749, J. H. Johnson, 180 Jessie St., $62,247 and McLevan & Peterson, Hearst Bldg., $64,300. Both rein.-con. and brick, concrete foundation. Noted July 24.

Cal., South San Francisco—City Hall—City received bids building 2 story, rein.-con. (a) terra cotta facing, (b) cement plaster facing from Larsen-Simpson, Co., Crocker Bldg., San Francisco, (a) $92,259, (b) $82,259; Hayes-Oser Co., San Francisco, (a) $103,957, (b) $90,057; Lange & Bergstrom, Sheldon Bldg., San Francisco, (a) $116,687, (b) $106,687. Noted July 3.

★**Que., Montreal**—Store—McClary Mfg. Co., 23 Wellington St., let contract building 4 story, 101 x 101 ft., rein.-con. concrete flooring and foundation, on Wellington and Grey Nuns Sts., to J. Shearer & Co., St. Patrick St. About $120,000.

Federal Government Work

PROPOSED WORK

Tex., El Paso—Hospital—Constr. Div., War Dept., Federal Government plans to build base hospital and zone supply warehouse. About $1,100,000 and $1,000,000 respectively. A. Chamberlain, constr. quartermaster, San Antonio, will be in charge of work.

BIDS DESIRED

Conn., Hartford — Electric Elevator — Until March 15, by Treas. Dept., Wash., D C., remodeling electric passenger elevator at Post Office and Customhouse, here. J. A. Wetmore, superv. archt.; advertised in this issue.

N. Y., New Dorp—Administration Buildings, Quarters, etc.—Until March 1, by Constr. Quartermaster, 39 Whitehall St., New York City, furnishing labor and material constructing administration buildings, quarters, barracks, mess hall, post exchange, etc., for Air Seacoast Defense Sta., here.

N. Y., Buffalo—Dredging and Excavating —Until March 17, by U. S. Engr. Office, 540 Federal Bldg., dredging and rock excavating in Black Rock Channel; advertised in this issue.

N. Y., Rome—Electric Dumbwaiter—Until March 8, by Treas. Dept., Wash., D. C., installing electric dumbwaiter, in Post Office, here. J. A. Wetmore, superv. archt; advertised in this issue.

N. Y., Rome—Remodeling Post Office—Until March 8, by Treas. Dept., Wash., D. C., remodeling (except lift), here. J. A. Wetmore, supervising architect; advertised in this issue.

D. C., Wash.—Grading, Paving, etc.—Until Feb. 25, by Dist. comrs., 509 Dist. Bldg., grading, paving and improving roads and avenues in district; advertised in this issue.

O., Cincinnati—Changes and Repairs—Until March 5, by Treas. Dept., Wash., D. C., for changes and repairs to main building at Marine Hospital, here. J. A. Wetmore, superv. archt.; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

R. I., Providence.—Dredging—U. S. Engr. Office received lowest 3 bids Feb. 9, dredging 521,000 cu.yd. in Stamford Harbor, Conn. and 1,337 cu.yd. boulders, from Amer. Pipe & Constr. Co., 112 North Broad St., Phila., $130,535; T. A. Scott Co., Inc., 292 Pequot Ave., New London, Conn., $133,745; Bay State Dredging & Contg. Co., 62 Condor St., East Boston, Mass., and C. P. Bickell Co., Inc., 30 Church St., New York City, each $170,660. Noted Jan. 15.

N. Y., New York—Repairing Dry Docks—Spec. 4014 Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Feb. 11, blocking and repairing floor of Dry Dock 4, at Navy Yard, here, (1) work complete, from Fox-Reynolds Co., 31 East 125th St., (1) $137,000 (120 days), (2) $60, (3) $40; E. F. Monahan, 195 Hasting St., Manhattan Beach, (1) $167,900 (110 days), (2) $15, (3) $18.75; Hyde & Baxter, 711 13th St. N. W., Wash., D. C., (1) $188,384 (120 days), (2) $30, (3) $25. Noted Jan. 15.

Va., Norfolk—Dispensary—Spec. 4101—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Feb. 11, altering and building additions, here, (1) work complete from J. L. Robertson Constr. Co., Lafayette Ave., Baltimore, Md., (1) $30,571 (120 days), (2) $1,674, (3) $762; Boyle Robert-

Federal Goverment (Continued)

son Constr. Co., 601 Evans Bldg., Wash., D. C., (1) $31,463 (120 days), (2) deduct $300, (3) deduct $1,550; Fanning & Quinn, Law Bldg., (1) $36,000 (120 days). Noted Jan. 22.

Tex., Waco—Remodeling Post Office and Courthouse—Treas. Dept., Wash., D. C., received bids Feb. 9, remodeling, here, from G. E. Wright, Inc., Chicago, $8,100; Regan Constr. Co., Baltimore, Md., $9,854; W. P. Thurston Co., Merchants Natl. Bank Bldg., Richmond, Va., $11,800. Noted Jan. 22.

Miscellaneous

PROPOSED WORK

Colonnade—Kearny, N. J. (Arlington P. O.)—Town plans to build Victory Colonnade. About $50,000. W. B. Ross, clk.

Stone Crushing Machinery — Lambertville, N. J.—West Anwell Twp. plans to purchase stone crushing machinery. About $4,500. T. G. Kitchen, 42 North Union St., engr.

Park—Pittston, Pa.—City plans to build 100 acre memorial park, to include 1 story frame gymnasium, monument, tennis courts, golf courses, trees, etc. About $90,000. Engineer not selected.

Lighting System — Woodberry, Ga. — Town plans to install lighting system. About $15,000. J. B. McCrary Co., 3rd Natl. Bank Bldg., Atlanta, engrs.

Wires and Cables—Milwaukee, Wis.—Central Bd. Purchases, City Hall, soon lets contract furnishing 600,000 ft. wires and cables for street lighting system. Former bids rejected. Noted Jan. 22.

Transmission Line—Meriden, Kan.—City voted $22,000 bonds to build electric transmission line from here to Topeka. W. B. Rollins & Co., Ry. Exch. Bldg., Kansas City, Mo., engrs.

Dam—Twin Falls, Idaho—Twin Falls-Bruneau Recl. Dist. plans to build concrete dam, 90 ft. high, 500 ft. long at lower base, and 5,280 ft. long at top. Cost to exceed $50,000.

Dam, etc.—Portland, Ore.—E. G. Hopson, 205 Central Bldg., filed application with P. A. Cupper, state engr., Salem, for 1,400 second ft. of water to be taken from Metolius River, Crook Co., for commercial light and power purposes, to include construction of 50 x 500 ft. cyclopean dam, concrete semicircular canal and headgate, turbines, and installation of electric generators for development of 18,000 theoretical h.p. About $1,300,000.

Road Material — Halifax, N. S. — Nova Scotia Highway Bd. is in the market for 40 motor trucks, 10 tractors, 12 heavy type road graders, 50 light graders (2 horse), ten 10-ton steam rollers with scarifier attachment, 6 portable drilling outfits and 10 mechanical loaders.

Lavatories and Press—Ottawa, Ont.—City plans to build lavatories and press on Exhibition Grounds. About $50,000. A. F. Macallum, City Hall, engr. Architect not selected.

Road Machinery—Ottawa, Ont.—Carleton Co. plans to purchase one 12 ton steam roller, one 450 gal. water wagon, one stone crusher, steam drills, traction (steam) for driving crusher and one oil distributor with heater. Patterson & Byrne, 71½ Sparks St., engrs.

BIDS DESIRED

Tractors and Steam Engine—Brooklyn, N. Y.—Until Feb. 25, by E. Riegelmann, boro. pres., furnishing and delivering 4 tractors and furnishing, delivering and erecting 1 steam engine.

Repairing Wood Trestle of Water Tank—Hoffmans Island, N. Y.—Until March 1, by L. E. Cofer, health officer, Port of New York, Rosebank, S. I., repairing wood trestle of water tank at Quarantine Station, here. L. F. Pilcher, Capitol, Albany, state archt. Advertised in this issue.

Tunnels, etc. — Ossining, N. Y. — Until March 9, by C. F. Rattigan, supt. prisons, Capitol, Albany, building underground tunnels and installing underground heating mains, sewer and water connections and underground electric work, at Sing Sing Prison, here. About $400,000. Noted Feb. 5.

Tractors—Long Island City, N. Y.—Until Feb. 24, by M. E. Connolly, pres. Queens Boro., furnishing and delivering 3 tractors to Bur. of Highways.

Road Materials—St. George, S. I., N. Y.—Until Feb. 24, by C. D. Van Name, pres. Richmond Boro., furnishing and delivering 15,000 gal. liguid fuel oil, 100,000 gal. bituminous material, 900 cu.yd. 1½ in. broken stone, 400 cu.yd. screenings, 150 cu. yd. broken stone chips, 50 cu.yd. ⅜ in. broken stone of trap rock, 900 cu.yd. grits, in Dist. 1; 800 cu.yd. 1½ in. broken stone, 500 cu.yd. screenings, 100 cu.yd. broken stone clip, 50 cu.yd. ¾ in. broken stone of trap rock, 700 cu.yd. grits, Dist. 2; 2,000 cu.yd. 1½ in. broken stone, 750 cu.yd. screenings, 100 cu.yd broken stone chips, 50 cu.yd. ¾ in. broken stone of trap rock, 450 cu.yd. grits, Dist. 3.

Water Pipe—Phila., Pa.—Until March 2, by Dept. Pub. Wks., furnishing c.i. water pipe and specials for Bureau of Water. Cost to exceed $10,000.

Dam, etc.—Wilson, N. C.—See "Industrial Works."

Steam Power and Water Gas Plant Equipment—Tallahassee, Fla.—Until March 10, by Bd. Comrs., furnishing and erecting steam and gas plant apparatus. A. H. Williams, city clk.; advertised in this issue.

Water Meters—Detroit, Mich.—Until Feb. 26, by J. A. Martin, comr., Municipal Courts Bldg., furnishing Dept. Purchases & Supplies with fifty 3 in., twenty 4 in. and twenty 6 in. water meters.

Underground Cable, etc.—Milwaukee, Wis.—Until March 1, by Central Bd. Purchases, City Hall, furnishing underground cables, to include 12,000 ft. of 11 pairs of conductors, composed of 19 pairs of No. 14 B & S and 1 pair No. 10 B & S gauge, also 2,400 ft. of 21 pairs of conductors composed of 20 pairs of No. 14 B & S and 1 pair of No. 10 B & S gauge.

Road Oil, etc.—Milwaukee, Wis.—Until March 2, by Central Bd. Purchases, City Hall, furnishing 50,000 gal. heavy road oil, 26,000 gal. medium light surfacing oil, 50,000 gal. medium bituminous road surfacing material and 200,000 gal. bituminous road surfacing material.

Road Drags, Bin and Loader—Long Prairie, Minn.—Until March 1, by city, furnishing road drags, gravel bin and loader.

Portland Cement, Liquid Asphalt, Fluxing Oil, Etc.—St. Paul, Minn.—H. W. Austin, city purch. agt., receiving bids furnishing 1,740 bbl. Portland cement; also 1,000 tons liquid asphalt in tank cars, 200 tons Trinidad Lake asphalt and 40 tons fluxing oil.

Crushed Rock—Reno, Nev.—Until Feb. 23, by J. E. Sullivan, city clk., furnishing 5,000 cu.yd. crushed rock. H. C. Chism, city engr.

Pier—Santa Monica, Cal.—Until Feb. 27, by City Comrs., repairing pleasure pier, involving 21,570 lin.ft. creosoted wood piles, 64 M ft. b.m. treated and 64 M ft. b.m. untreated lumber, 14,000 lbs. w.i. straps, 58,000 lbs. 1½ in. tile rods, 1,600 lbs. turnbuckles, replacing concrete piles with timber piles, etc. About $75,000. Noted Jan. 29.

General Supplies—Ottawa, Ont.—Until Feb. 24, by Bd. Control, for 2,900 gal. oil-coal, black, and machine, 20,000 gal. fuel oil, 500 lb. grease, 200 boxes axle grease, six 4 in., forty 6 in. and two 12 in. gate valves; 300 tons asphalt, 4,000 gal. flux-oil, 270 M. ft. b.m. lumber, 1,500 pieces brass work (house service), 24,000 lb. lead pipe, 20,000 lb. pig lead, 5,000 tons asphalt filler, and 6,250 bbl. cement. A. F. Macallum, city engr.

Pipe—Woodstock, Ont.—Until Feb. 25, by F. J. Ure, engr., City Hall, for furnishing 10,000 ft. of vitr. sewer pipe as follows: 600 ft. of 12-15 in. and 9,400 ft. of 21-36 in. About $25,000.

Wharf—Skeena, B. C.—Until Mar. 5, by R. C. Desrochers, secy., Dept. Pub. Wks., Ottawa, building wharf at Stewart Dist.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Bulkhead — Quincy, Mass. — Bethlehem Shipbuilding Corp., Ltd., Fore River, let contract building 550 ft. concrete and wood and 250 ft. concrete bulkheads, to Rollins Constr. Corp., 90 West St., New York City.

★Standpipe—Noroton Heights, Conn.—Noroton Water Co., Railroad Ave., Noroton, let contract building 500,000 gal. steel standpipe, here, to Tippet & Wood, Phillipsburg, N. J.

★Arch—Stamford, Conn.—City Memorial Comn. let contract building stone arch in St. Johns Park, to W. E. Williams, 967 East Main St. About $50,000.

Road Materials—New York, N. Y.—H. H. Curran, pres. Manhattan Boro., received bids Feb. 4, furnishing and delivering (a) 1,200 tons asphalt paving cement, (b) 25,000 bags portland cement, (c) 4,000 cu.yd. paving sand, (d) 5,000 cu.yd. paving grit, (e) 3,000 cu.yd. coarse aggregate, (f) 620,000 wood paving blocks, (g) 45,000 new granite blocks, (h) 100 cords mixed wood, (i) 20,000 cu.yd. asphalt wearing surface, (j) 9,000 cu.yd. ¾ in. binder stone, (k) 900,000 gal. refined asphalt, (l) 600 tons limestone, (m) 60,000 gal. gasolene, from Warner, Quinlan Co., 79 Wall St., (a) $33,876, (k) $9,423; Texas Co., 17 Battery Pl., (a) $44,256; J. A. McCarthy, 551 Exterior St., (b) $20,250; Manhattan Sand Co., 418 East 49th St., (c) $7,600, (d) $17,500, (e) $9,700; Lenox Sand Gravel Co., Hudson River and 157th St., (c) $7,720, (e) $10,125; Lannigan Bros., (e) $7,800, (d) $18,450; Phoenix Sand & Gravel Co., 21 East 40th St., (d) $17,750; Calvin, Tompkins Co., (e) $8,700; Amer. Creosoting Co., 17 Battery Pl. (f) (heavy oil) $37,618, (light) $38,547; J. Meehan & Sons, (g) $5,805; Booth Bros., 206 Bway., (g) $6,188; Rockport Granite Co., 13 Park Row, (g) $6,255; Clarke & Wilkins Co., 511 West 34th St., (h) $2,000; C. W. Crane, 17 Battery Pl., (i) $26,000; New York Trap Rock Co., 101 Park Ave., (j) $19,350, (l) $57,120; Standard Oil Co., 26 Bway., (m) $14,700. Noted Jan. 29.

Breakwater—Schenectady, N. Y.—E. S. Walsh, supt. Pub. Wks., Capitol, Albany, received lowest bids Feb. 10, for protecting breakwater at Cleveland Terminal. Contr. 28-A, from E. Dawley, Cleveland, $13,360; W. F. Martens, 245 Cutler Bldg., Rochester, $16,084; Munger & Lansing, 420 Waiting Blk., Syracuse, $18,945. Noted Jan. 15.

Asphalt Plant, Steam Melting Kettle, Boiler, etc.—Johnstown, Pa.—City received bids furnishing (a) one 8 sq.yd. 3 unit asphalt plant, (b) one 3,000 gal. portable steam melting kettle, (c) 1 combination 40 hp. boiler with 25 hp. engine, (d) one 5 ton tandem steam or motor roller, from Warren Bros., 142 Berkeley St., Boston, (a) $10,000; Barbour Asphalt Co., 230 North 30th St., Phila., (a) $8,000, (d) $2,925; Austin Western Road Mfg. Co., (d) $3,650; Buffalo Springfield Rolling Co., (d) $2,975*; Good Roads Mfg. Co., Union Arcade, Pittsburgh, (d) $2,900. Noted Feb. 5.

★Motor Trucks—Cleveland, O.—E. Shattuck, city pur. ag., let contract furnishing five 1½ ton motor trucks, to Rolf Motor Truck Co., 1518 Oregon Ave., $12,400. Noted Feb. 5.

★Cast Iron Water Pipe—Detroit, Mich.—Water Bd. let contract to U. S. Cast Iron Pipe & Fdry. Co., 122 South Michigan Blvd., Chicago, furnishing c.i. water pipe as follows: 8,080 tons 6-8 in. Class "B" @ $67 per ton, 1,913 tons 12-16 in. Class "C", $66.50 and 1,005 tons 25 in. Class "C", $64.00.

★Cement—Detroit, Mich.—Dept. Pub Wks. let contract furnishing 25,000 bbls. portland cement, to Wabash Portland Cement Co., 1824 Ford Bldg., $2.95 per bbl., less $0.05 per bbl. for payment within 10 days

★Cranes, Trench Excavators, etc.—Detroit, Mich.—City let contract furnishing two 20 ton 8 wheel steam operated, standard gauge locomotive cranes, to Orton & Steinbrenner Co., 608 South Dearborn St., Chicago, $24,860; 2 wheel type trench excavators, to Buckeye Traction Ditcher Co., Findlay, O., $10,000; 1 ladder type trench excavator to cut from 60 in. to 72 in. wide and 14 ft. deep, also one to cut 41 in. wide and 11½ ft. deep, to F. C. Austin Co., Inc., Railway Exch. Bldg., Chicago, $15,860 and $8,975 respectively; one 5 ton caterpillar tractor, to Holt Mfg. Co., West Washington St., East Peoria, Ill., $3,900. Noted Jan. 29.

★Hydrants and Valves—Detroit, Mich.—Fire Dept. let contract furnishing 400 double nozzle steamer fire hydrants and four hundred 6 in. gate valves to Flower Valve Mfg. Co., Clayton and Parkinson Sts., $62,960. Noted Jan. 22.

★Riding Rink—Detroit, Mich. — Cross Country Riding Club, 414 Taylor Rd., let contract building frame and stucco riding rink, with 83 ft. span timber roof trusses, concrete foundation, raised turf riding track, on Hamilton Blvd. and Seven Mile Rd., to Walbridge & Aldinger Co., 2356 Penobscot Bldg. About $50,000.

★Underpinning, etc.—Detroit, Mich.—Book Estate let contract underpinning, shoring and excavating for 5 story, 60 x 95 ft. building, on Washington Blvd. and Grand River Ave., to L. P. Friestedt Co., Tribune Bldg., Chicago. About $15,000.

★Water Meters—Detroit, Mich.—Water Bd. received bids furnishing 25,000 water meters, from Gamon Meter Co., 282 South St., Newark, N. J., $224,950; Washington Pump & Machy. Co., Chicago, $257,200; Thomson Meter Co., 110 Bridge St., Brooklyn, N. Y., $266,600. Noted Jan. 22.

OFFICIAL PROPOSALS

Bids: Feb. 27.

Bridge Construction

STATE COMMISSION OF HIGHWAYS
ALBANY, N. Y.

Kingston, N. Y.

NOTICE TO CONTRACTORS.—Pursuant to the provisions of Chapter 30, Laws of 1909, and the several amendments up to and including Chapter 623, Laws of 1919, sealed proposals will be received by the undersigned at No. 53 Lancaster St., Albany, N. Y., at 1 o'clock p.m. on Friday, the 27th day of February, 1920, for the construction of a bridge to carry Road No. 5599 over Rondout Creek at Kingston, Ulster County, N. Y.

The bridge is designed for one suspension span, 705 feet long, and two anchor spans each 220 feet long, with the necessary anchorages, towers, concrete floor and stiffening trusses. A partial list of principal items follows:

3,182,000	lb. structural steel and castings.
567,000	lb. steel cables and suspenders.
3,350	cu.yd. concrete.
100,000	lb. steel reinforcement.

Shafts for the anchorages are being constructed under a previous contract.

Plans, specifications and proposal forms may be obtained and estimates seen at the office of the Commission in Albany, N. Y.

Special attention of bidders is called to "Information for Bidders" in the itemized proposal.

Proposals must be presented in a sealed enevelope endorsed on the outside: "Proposal for the construction of the Rondout Creek Bridge, Contract 5599-C." Each proposal must be accompanied by cash or a certified check payable to the order of the State Commission of Highways for an amount equal to at least 3 per cent of the amount of the proposal. The retention and disposal of such cash or check by the State Commission of Highways shall conform with subdivision 2, Section 130 of the Highway Law, as amended by Chapter 623, Laws of 1919.

The successful bidder will be required to execute the contract and comply in all respects with Section 130 of the Highway Law, as amended by Chapter 623.

The right is reserved to reject any or all bids.

FREDERICK STUART GREENE,
IRVING V. A. HUIE, Commissioner.
Secretary.

The publication of an advertisement on this page is an official notice that bids are wanted from other than local bidders.

It is also a guarantee that maximum competition is invited because Engineering News-Record is the *one* nationally recognized medium for Proposal advertising. Its Searchlight Section is read each week by nearly every worth-while contractor in this country who bids on public work outside his own city.

Official Proposals reaching our office in first mail Wednesday morning (9 o'clock) can usually be published in the issue out the next day. Special price for Official Proposals, $3.60 an inch.

Bids: Mar. 10.

Reinforced Concrete Bridge

CONSTRUCTION OF A BRIDGE ACROSS
THE CONNECTICUT RIVER
FOR THE
COUNTY OF HAMPDEN,
MASSACHUSETTS

Springfield, Massachusetts.
February 2, 1920.

In pursuance of a report of the Special Commission acting under and by virtue of Chapter 252, General Acts of 1915 for Commonwealth of Massachusetts, confirmed by the Supreme Judicial Court for said Commonwealth, sealed bids for building a highway bridge between Springfield and West Springfield across the Connecticut River and over the yard of the New York, New Haven and Hartford Railroad in Springfield, together with certain constructions on the approaches there to in West Springfield, will be received by the County Commissioners of Hampden County at their office, Court House, Springfield, Massachusetts, until 2:00 P.M. on Wednesday, March 10, 1920, at which time and place the bids will be publicly opened and read aloud.

The bridge, which will be 80 feet in width throughout, includes a river bridge approximately 1,200 feet in length, divided into seven arch spans of reinforced concrete, the piers and abutments being faced with granite; and a viaduct over the railroad yard about 300 feet in length, consisting of nine spans of reinforced concrete construction.

Bidders will be required to qualify as to past performances and ability to furnish adequate plant. Each bid must be accompanied by a properly certified check for Fifty Thousand (50,000) Dollars. A bond in the sum of One Million (1,000,000) Dollars will be required for the faithful performance of the contract.

A more complete description of the work to be done is given in Notice to Bidders, forms of Bid, oCntract, Bond, the Specifications, and the Contract Drawings accompanying the same.

Copies of the foregoing may be inspected at the office of the County Commissioners at Springfield, and may be obtained from the Engineers, Fay, Spofford and Thorndike, 15 Beacon Street, Boston, Massachusetts, on and after February 9, 1920.

A deposit of One Hundred (100) Dollars is required for a complete set of Notice to Bidders, forms of Bid, Contract, Bond, the Specifications and the Contract Drawings, one-half of which deposit will be refunded upon their return in good condition to the Engineers on or before March 13, 1920.

Receipt of bids will be subject to the conditions stated in said Notice to Bidders.

The right is reserved to reject any or all bids

CHARLES C. SPELLMAN,
Chairman.
GEORGE W. BRAY,
WILLIAM H. ENSIGN,
County Commissioners of the
County of Hampden.
FAY, SPOFFORD AND THORNDIKE,
Engineers.
15 Beacon Street, Boston,
Massachusetts.

Bids: March 8, 1920.

Stone-Faced Reinforced-Concrete Bridges

BRONX PARKWAY COMMISSION

Bronxville, N. Y.

Sealed bids for the construction of two driveway bridges in Bronx Boulevard over the Bronx River near Williamsbridge Station of the Harlem Division, New York Central Railroad, will be received by the Bronx Parkway Commission at its office, West Pondfield Road, Bronxville, N. Y. until 11:30 a.m., March 8, 1920.

One bridge is located in Bronx Boulevard about 300 ft. south of Gun Hill Road and consists of a duplex stone-faced, reinforced, arched bridge with a span length of 70 ft. for the duplex arches and a total width, including well opening between the duplex spans, of from 94 ft. to 101 ft.

One bridge is located in Bronx Boulevard about 60 ft. north of Gun Hill Road and consists of a duplex stone-faced, reinforced, arched bridge with a span length of 45 ft. for the duplex arches and a total width, including well opening between the duplex spans, of 92 ft.

Pamphlets containing information for bidders, form of proposal, specifications and contract drawings will be issued to intending bidders on and after February 18, 1920, by the Bronx Parkway Commission at the above address and may be obtained by depositing $5.00 for each set of pamphlets, including drawings.

BRONX PARKWAY COMMISSION
By JAY DOWNER,
Engineer and Secretary

Dated: Bronxville, N. Y., Feb. 9, 1920.

Bids: March 3, 10, 24, 31.

Hetch Hetchy Dam—Outlet System

San Francisco, Cal.

Sealed proposals will be received at the office of the Board of Public Works, City Hall, San Francisco, between 2 and 3 o'clock p.m., on the dates stated below, for furnishing and delivering valves for the Outlet System of the Hetch Hetchy Dam.

The material required is covered by four contracts, as follows:

CONTRACT No. 66—Six 47 in. x 90 in. Slide Gates. Estimated price, $120,000. March 3, 1920.
CONTRACT No. 67—Six 33 in. x 42 in. Slide Gates. Estimated price, $130,000. March 24, 1920.
CONTRACT No. 68—Six Five-foot Balanced Valves (needle type). Estimated price, $155,000. March 10, 1920.
CONTRACT No. 69—Six Three-foot Balanced Valves (needle type). Estimated price, $75,000. March 31, 1920.

Very heavy bronze castings are a special feature of Contracts Nos. 67 and 68.

Specifications, plans and proposal forms may be obtained from the City Engineer, City Hall, San Francisco, on deposit of $10 per copy. They may be examined at the New York or Chicago offices of *Engineering News-Record*.

M. M. O'SHAUGHNESSY, City Engineer.

CONSTRUCTION NEWS

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Mar. 1	Cisco, Tex.	Feb. 26
Mar. 1	Baker, Mont.	Feb. 19
Mar. 2	Hopkins, Minn.	Feb. 26
Mar. 5	Akron, O.	Feb. 19
	Adv. Feb. 19 and 26.	
Mar. 5	Mansfield, Wash.	Feb. 26
Mar. 10	Burlington, N. C.	Feb. 19
	Adv. Feb. 19 and 26.	
Mar. 20	Paterson, N. J.	Feb. 26

SEWERS

Bids Close		See Eng. News-Record
Mar. 1	Baker, Mont.	Feb. 19
Mar. 1	Pontiac, Mich.	Feb. 19
Mar. 1	Minot, N. D.	Feb. 12
Mar. 1	Lebanon, Pa.	Feb. 5
	Adv. Feb. 5 to 19.	
Mar. 1	Livingston, Mont.	Feb. 5
Mar. 2	Billings, Mont.	Feb. 26
Mar. 2	Columbus, O.	Feb. 19
Mar. 2	Kendallville, Ind.	Feb. 12
	Adv. Feb. 19.	
Mar. 3	New York, N. Y.	Feb. 26
Mar. 4	Cleveland, O.	Feb. 26
Mar. 4	Stanton, Ia.	Feb. 19
Mar. 8	Rutland, Vt.	Feb. 19
	Adv. Feb. 19 and 26.	
Mar. 10	Burlington, N. C.	Feb. 19
Mar. 10	Kilbourn, Wis.	Feb. 26
Mar. 12	Elk Point, S. D.	Feb. 26
Mar. 15	Cleveland Heights, O.	Feb. 26
Mar. 22	Stratford, Conn. (Bridgeport P. O.)	Feb. 26
	Adv. Feb. 26.	
Mar. 23	Toledo, O.	Feb. 19
	Adv. Feb. 19 and 26.	
Apr. 8	Milwaukee, Wis.	Feb. 26
	Adv. Feb. 26	

BRIDGES

Bids Close		See Eng. News-Record
Mar. 1	Washington	Feb. 19
Mar. 2	Hawkinsville, Ga.	Feb. 19
Mar. 2	Dinuba, Cal.	Feb. 19
Mar. 3	Cairo, Ga.	Feb. 26
Mar. 4	Stanton, Ia	Feb. 19
Mar. 4	Fort Garry, Manitoba	Feb. 26
Mar. 5	Cincinnati, O.	Feb. 19
Mar. 5	Kenosha, Wis.	Feb. 19
	Adv. Feb. 19.	
Mar. 5	Denver, Col.	Feb. 26
Mar. 6	Forest Lake, Minn.	Feb. 19
Mar. 8	Bronxville, N. Y.	Feb. 19
	Adv. Feb. 5 to 26.	
Mar 8	Framingham, Mass.	Feb. 26
Mar. 9	Cornwall, Ont.	Feb. 26
Mar. 10	Reno, Nev.	Feb. 26
Mar. 10	Springfield, Mass.	Feb. 12
	Adv. Feb. 19 and 26.	
Mar. 12	Thomaston, Ga.	Feb. 26
Mar. 15	New Jersey	Feb. 26
Mar. 15	Connecticut	Feb. 12
	Adv. Feb. 12 to 26.	
Mar. 23	O'Brien, Wash	Feb. 12

STREETS AND ROADS

Bids Close		See Eng. News-Record
Mar. 1	Cortland, N. Y	Feb. 12
Mar. 1	Louisiana	Feb. 12
	Adv. Feb. 19 and 26.	
Mar. 1	Livingston, Mont.	Jan. 29
	Adv. Jan. 29.	
Mar. 1	Mitchell, S. D.	Feb. 12
	Adv. Feb. 12.	
Mar 1	Buckhannon, W. Va	Feb. 12
	Adv. Feb. 19	
Mar. 1	Washington	Feb. 19
Mar. 1	Michigan	Feb. 19
Mar. 1	Indiana	Feb. 19
Mar. 1	Montesano, Wash.	Feb. 19
Mar. 1	Kingman, Ariz.	Feb. 19
Mar. 1	Washington	Feb. 19
Mar. 1	Caruthersville, Mo.	Feb. 19
Mar. 1	Osceola, Ark.	Feb. 19
Mar. 1	Braxton, W. Va.	Feb. 19
Mar. 1	Alexandria, Ont.	Feb. 19
Mar. 1	Pontiac, Mich.	Feb. 26
Mar. 1	Buckhannon, W. Va.	Feb. 26
Mar. 1	Mitchell, S. D.	Feb 26
Mar. 1	Indiana	Feb. 26
Mar. 1	Nacogdoches, Tex.	Feb. 26
Mar. 1	North Carolina	Feb. 26
Mar. 2	North Carolina	Feb. 26
Mar. 2	Port Huron, Mich.	Feb. 26
Mar. 2	Idaho	Feb. 26
Mar. 2	New York, N. Y.	Feb. 26
Mar. 2	Indiana	Feb. 26
Mar. 2	Parkersburg, W. Va.	Feb. 26
Mar. 2	Charleston, W. Va.	Feb. 19
Mar. 2	Elkins, W. Va	Feb 19
Mar. 2	Montana	Feb. 19
Mar. 2	Indiana	Feb. 19
	Adv. Feb. 19 and 26.	
Mar. 2	Montgomery, Ala.	Feb. 19
Mar. 2	Pennsylvania	Feb 19
Mar. 2	Charleston, W. Va.	Jan. 22
Mar. 2	Winfield, Ia.	Jan. 29
Mar. 2	South Euclid, O.	Feb 5
Mar. 2	Ft. Scott, Kan.	Feb 5
Mar. 2	Columbus, O.	Feb. 19
Mar. 2	Tennessee	Feb. 19
Mar. 2	Washington	Feb 19
Mar. 2	Woodland, Cal.	Feb. 19
Mar. 2	East Liverpool, O	Feb. 19
Mar. 2	Albert Lea, Minn.	Feb. 19
Mar. 2	Montana	Feb. 26
Mar. 2	Concord, N. C.	Feb. 26
Mar. 3	Albert Lea, Minn.	Feb. 19
Mar. 3	Pennsylvania	Feb. 5
	Adv. Feb. 5 to 19.	
Mar. 3	Indiana	Feb. 19
Mar. 3	Stockton, Cal.	Feb. 19
Mar. 3	Indiana	Feb. 26
Mar. 3	Sioux Falls	Feb. 26
Mar. 3	Albert Lea, Minn.	Feb 26
Mar. 4	Goldendale, Wash.	Feb. 26
Mar. 4	New York, N. Y.	Feb. 26
Mar. 4	Fairmont, W. Va.	Feb 26
Mar. 4	Waterloo, Ia.	Feb 19
	Adv. Feb. 19 and 26.	
Mar. 4	Dallas, Tex.	Feb. 19
	Adv. Feb. 19 and 26.	
Mar. 4	Hutchinson, Kan.	Feb. 5
Mar. 4	Fairmont, W. Va.	Feb. 12
	Adv. Feb. 19 and 26.	
Mar. 5	Moultrie, Ga.	Feb. 26
Mar. 5	Rochester, Minn.	Feb. 26
Mar. 5	Colorado	Feb 26
Mar. 6	Halifax, N. S.	Feb. 26
Mar. 6	Leavenworth, Kan.	Feb. 5
Mar. 6	Brainerd, Minn.	Jan. 29
Mar. 6	Indiana	Feb 19
Mar. 6	Indiana	Feb 26
Mar. 6	Ventura, Cal.	Feb 26
Mar. 7	Michigan	Feb 19
Mar. 8	Okmulgee, Okla.	Jan 29
Mar. 8	Fayetteville, W. Va.	Feb 12
	Adv. Feb. 19.	
Mar. 8	Waco, Tex.	Feb 19
Mar. 8	Bronxville, N. Y	Feb 19
	Adv. Feb. 19 and 26.	
Mar. 8	Reno, Nev.	Feb. 19
Mar. 8	Wauseon, O.	Feb. 19
Mar. 8	El Centro, Cal.	Feb. 26
Mar. 8	Texas	Feb. 26
Mar. 9	Plymouth, Wis.	Feb. 19
Mar. 9	Greenville, Ga.	Feb 19
Mar. 9	Michigan	Feb 19
Mar. 9	Corsicana, Tex.	Feb. 26
Mar. 9	Colorado	Feb 26
Mar. 9	Marlinton, W. Va.	Feb. 26
Mar. 9	Bridgeton, N. J.	Feb 26
Mar. 9	Marlinton, W. Va.	Feb. 26
Mar. 9	Fredonia, Kan.	Feb. 5
Mar. 9	Ontario	Feb. 26
Mar. 10	Eureka, Kan	Feb 5
Mar. 10	Michigan	Feb 19
Mar. 12	Clinton, N. J.	Feb 12
Mar 12	Montana	Feb. 19
	Adv. Feb. 19 and 26.	
Mar. 12	Montana	Feb. 26
Mar. 12	Michigan	Feb. 26
Mar. 13	Angleton, Tex.	Feb. 26
Mar. 13	Michigan	Feb. 26
Mar. 13	Humbolt, Tenn.	Feb. 26
Mar. 13	Freeport, Tex.	Feb. 26
Mar. 15	Connecticut	Feb. 19
Mar. 15	Buncombe, N. C.	Feb. 19
Mar. 15	Asheville, N. C.	Feb. 19
Mar. 15	Madison, S. D.	Feb. 26
Mar. 16	Billings, Mont.	Feb. 26
Mar. 16	Pocahontas, Ia.	Feb. 26
	Adv. Feb. 26.	
Mar. 17	Delaware	Feb. 26
Mar. 23	Pennsylvania	Feb. 26
Mar. 24	Pennsylvania	Feb. 26
Apr. 1	St. Thomas, Ont.	Feb. 19
Apr. 1	Daytona, Fla.	Feb. 26
Apr. 1	Ingersoll, Ga.	Feb. 26
Apr. 3	Lawrence, Kan.	Feb. 19
Apr. 8	Savannah, Ga.	Feb. 19
	Adv. Feb. 19 and 26.	

RAILWAYS

Bids Close		See Eng. News-Record
Mar. 1	Maine	Feb 12

EXCAVATION AND DREDGING.

Bids Close		See Eng. News-Record
Mar 1	Des Moines, Ia.	Feb. 26
Mar. 2	Cooper, Tex.	Feb. 12
Mar. 2	Tacoma, Wash.	Feb 19
Mar. 8	Sioux City, Ia.	Feb. 26
Mar. 10	Waverly, Ia.	Feb. 10
Mar. 16	Ft. Madison, Ia.	Feb. 19
	Adv. Feb. 19 and 26.	

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
Mar. 1	Taylor, Pa.	Feb. 5
Mar. 1	Edmonton, Alta.	Jan. 8
Mar. 1	Cedar Rapids, Ia.	Jan. 22
Mar. 4	Detroit, Mich.	Feb. 26
Mar. 5	Detroit, Mich.	Feb. 26
Mar. 6	Estevan, Sask.	Jan. 29
	Adv. Jan. 29 to Feb. 12.	
Mar. 11	Emporia, Kan.	Feb 26
Mar. 15	Providence, R. I.	Feb. 26
Mar. 15	Wakefield, Mass.	Jan 29
Mar. 15	Grand Forks, N. D.	Feb 26
Mar. 17	Larrabee, Ia.	Feb. 5
Mar. 20	Saco, Me.	Feb 12
Sept. 1	Hutchinson, Kan.	Feb 19

BUILDINGS

Bids Close		See Eng. News-Record
Mar. 1	Racine, Wis.	Jan. 1
Mar. 1	Mt. Vernon, N. Y	Feb 26
Mar 1	Topeka, Kan.	Jan 29
Mar 1	Carlton, Ont.	Jan. 15
Mar. 1	Detroit, Mich.	Jan. 22
Mar. 1	Oakmont Pa.	Feb 19
Mar 1	Northville, Mich.	Feb. 19
Mar 1	Montreal, Que.	Jan 15
Mar 1	Alpena, Mich	Jan 15
Mar 1	Arco, Minn	Feb 5
Mar 1	Minneapolis, Minn.	Feb 5
Mar 1	Bloomfield, N. J.	Feb 26
Mar. 1	Virginia, Minn.	Feb 26
Mar. 1	Bixby, Okla	Feb 26
Mar. 1	Hoboken, N. J.	Feb 26
Mar. 1	Detroit, Mich.	Feb. 26
Mar. 1	Dalhart, Tex	Feb [illegible]
Mar 1	Franklin, Ind	Feb [illegible]
Mar 1	Bridgeton, Ind.	Feb 26
Mar 2	Valdosta, Ga.	Feb 19
Mar 3	Phila., Pa	Feb 19
Mar. 3	New York, N. Y	Feb 26
Mar. 3	Forty Fort (Kingston P. O.), Pa.	Feb 26
Mar. 4	Atlantic City, N. J	Feb 26
Mar. 4	Pemberton, Minn.	Feb. 26
Mar 4	Columbus, O.	[illegible] 12

Bids Close		See Eng. News-Record
Mar. 4	Manly, Ia.	Feb. 19
Mar. 4	Ollie, Ia.	Feb. 19
Mar. 4	Salinas, Cal.	Feb. 19
Mar. 5	Fowler, Cal.	Feb. 19
Mar. 5	Blooming Prairie, Minn.	Feb. 26
Mar. 6	Winslow, Me.	Feb. 19
Mar. 6	Martensdale, Ia.	Feb. 26
Mar. 8	Lorain, O. Adv. Feb. 19 and 26.	Feb. 19
Mar. 8	Norwich, N. Y.	Feb. 19
Mar. 8	Cheyenne, Wyo.	Feb. 19
Mar. 8	Long Beach, Cal.	Feb. 26
Mar. 8	Homestead, Pa.	Feb. 26
Mar. 8	Missoula, Mont.	Feb. 26
Mar. 9	Union, N. J.	Feb. 26
aMr. 10	Pasadena, Cal.	Feb. 26
Mar. 10	Deer Lodge, Mont.	Feb. 26
Mar. 10	Welton, Ia.	Feb. 19
Mar. 10	Sewal, Ia.	Feb. 19
Mar. 10	Springfield, Mass.	Feb. 26
Mar. 10	Reedsburg, Wis.	Feb. 26
Mar. 15	Saco, Me.	Feb. 19
Mar. 15	Hibbing, Minn.	Jan. 29
Mar. 15	Hamilton, Ont.	Feb. 26
Mar. 15	Landrienne, Que.	Feb. 12
Mar. 15	Brookfield, Mo.	Feb. 19
Mar. 16	Oseeola, Neb.	Feb. 19
Mar. 16	Washta, Ia.	Feb. 5
Mar. 17	Marey, N. Y. Adv. Feb. 26.	Feb. 26
Mar. 20	Redford, Mich.	Feb. 5
Mar. 20	Ayshire, Ia.	Feb. 26
Apr. 1	Dodson, Mont.	Feb. 5
Apr. 1	Dayton, O.	Feb. 19
Apr. 15	Delmont, S. D.	Feb. 26

FEDERAL GOVERNMENT WORK

Mar. 1	Administration Buildings, Quarters, etc.—New Dorp, N. Y.	Feb. 19
Mar. 2	Riprap Stone—Baltimore, Md.	Feb. 12
Mar. 3	Distributing System and Power Plant Equipment—Spec. 4118 — San Diego, Cal.	Feb. 5
Mar. 3	Alterations to Post Office and Customhouse — Oswego, N. Y. Adv. Feb. 12.	Feb. 12
Mar. 3	Seawall — Spec. 4035 — Mt. Desert Island, Me.	Feb. 26
Mar. 3	Storehouse and Hangars—Spec. 4087 — San Diego, Cal.	Feb. 26
Mar. 3	Lighting Fixtures — Spec. 4129—San Diego, Cal.	Feb. 5
Mar. 5	Changes and Repairs—Cincinnati, O.	Feb. 19
Mar. 8	Electric Dumbwaiter — Rome, N. Y.	Feb. 19
Mar. 8	Remodeling Post Office — Rome, N. Y. Adv. Feb. 19 and 26.	Feb. 19
Mar. 9	Steam Heating System — Phila., Pa.	Feb. 26
Mar. 10	Completing Fire Protection System — Morehead City, N. C.	Feb. 26
Mar. 10	Tower and Tank — Cape Vincent, N. Y. Adv. Feb. 26.	Feb. 26
Mar. 11	Steel Lock Gates — Nashville, Tenn.	Feb. 26
Mar. 11	Dredging—Galveston, Tex. Adv. Feb. 19 and 26.	Feb. 12
Mar. 11	Dredging and Rock Removal—New York, N. Y. Adv. 12 to 26.	Feb. 12
Mar. 15	Electric Elevator — Hartford, Conn.	Feb. 19
Mar. 15	Extending and Remodeling —Chattanooga, Tenn.	Feb. 26
Mar. 16	Remodeling Plumbing, Electric Work, etc.—St. Louis, Mo.	Feb. 26
Mar. 17	Dredging and Excavating—Buffalo, N. Y. Adv. Feb. 19 and 26.	Feb. 19
Mar. 18	Lighting Fixtures — New York, N. Y.	Feb. 26
Mar. 25	Conduit—Petersburg, Va. Adv. Feb. 26.	Feb. 26
Mar. 25	Seawall, Roads, Curbs, Gutters, etc.—Spec. 4104—Paris Island, S. C.	Feb. 26
Mar. 25	Skylights — Spec. 4100 — Wash., D. C.	Feb. 26
Mar. 29	Post Office and Customhouse—Apalachicola, Fla.	Feb. 12
May 3	Bridge—Alaska Adv. Jan. 22.	Jan. 22

MISCELLANEOUS

Bids Close		See Eng. News-Record
Mar. 1	Repairing Wood Trestle of Water Tank — Huffmans Island, N. Y.	Feb. 10
Mar. 1	Culvert Pipe—Harrisburg, Pa. Adv. Feb. 5 and 12.	Feb. 5
Mar. 1	Road Drags, Bin and Loader—Long Prairie, Mich.	Feb. 19
Mar. 1	Runway, etc.—Long Island City, N. Y.	Feb. 26
Mar. 1	Pumping Equipment — Dresden, Ont.	Feb. 26
Mar. 1	Asphalt Paving Plant — St. Paul, Minn.	Feb. 26
Mar. 1	Sewer Pipe and Brick — St. Paul, Minn.	Feb. 26
Mar. 1	Cement, Vitrified Brick — St. Paul, Minn.	Feb. 26
Mar. 1	Tarvia B-Crushed Stone, Sand—Millburn, N. J.	Feb. 26
Mar. 2	Mile Posts, Signs, etc.—Wisconsin	Feb. 26
Mar. 2	Sweepers—Cleveland, O.	Feb. 26
Mar. 2	Bridge Material —Anamosa, Ia.	Feb. 26
Mar. 2	Water Pipe—Phila., Pa.	Feb. 19
Mar. 2	Trucks—Cape May Court House, N. J.	Feb. 26
Mar. 2	Building Materials — Lockport, Ill. Adv. Feb. 5 and 12.	Feb. 5
Mar. 2	Road Oil, etc.—Milwaukee, Wis.	Feb. 19
Mar. 2	Underground Cables, etc.—Milwaukee, Wis.	Feb. 19
Mar. 3	San Francisco, Cal. Adv. Feb. 5 to 26.	Feb. 5
Mar. 4	Filling—Cleveland, O.	Feb. 26
Mar. 5	Garbage Pereulator, Treating Sand—Cleveland, O.	Feb. 26
Mar. 5	Crane and Truck—Cleveland, O.	Feb. 26
Mar. 5	Running Gears, etc. — Cleveland, O.	Feb. 26
Mar. 5	Wharf—Skeena, B. C.	Feb. 19
Mar. 5	Road Roller and Grader—Altoona, Pa.	Feb. 26
Mar. 6	Coal Storage and Conveyor —Detroit, Mich.	Feb. 26
Mar. 9	Tunnels, etc. — Ossining, N. Y.	Feb. 19
Mar. 10	Steam Power and Water Gas Plant Equipment—Tallahassee, Fla. Adv. Feb. 19 and 26.	Feb. 19
Mar. 15	Ornamental Light Standards—Cleveland, O.	Feb. 12
Mar. 16	Deep Well Pumping Equipment—Lockport, Ill.	Feb. 12
Mar. 17	Cement and Flag—Dover, Del.	Feb. 26
Mar. 17	Cement—Dalaware	Feb. 26

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. Y., Jamestown—City voted $400,000 bonds to extend and improve waterworks system. Address Bd. Water & Lighting Comrs.

N. Y., Port Dickinson (Binghamton P. O.)—City plans election in March to vote on $10,000 bonds to extend waterworks system.

W. Va., Elkins—City retained Roberts Eng. Co., engrs., Charleston, to submit estimate for improving waterworks, streets and sewers. About $650,000.

O., Dayton—City plans to furnish and lay 7,260 ft. 16 in. water mains from Brown and Union Sts. to Campbell and Stewart Sts., also 10,400 ft. 24 in and 6,200 ft. 12 in. pipe mains. About $150,000. F. O. Eichelberger, city engr.

Kan., Erie—City having plans prepared improving waterworks system in various streets. About $60,000. Burns & McDonnell, Interstate Bldg., Kansas City, Mo., engrs.

Mont., Billings—City election April 5, to vote on $50,000 bonds to repair and extend waterworks system. E. M. Sneckenberger, city engr.

Mont., Hamilton—City election April 5, to vote on $7,500 bonds to extend waterworks system. Engineer not selected.

Mont., Hardin—City election April 5, to vote on $6,800 bond to extend water-works system. C. M. Squire, city clk.

Wash., Wenatchee—City plans to improve waterworks system, to include extending main canal and building branch lines, c.i. or wood pipe. About $125,000. Noted Sept. 4.

Ore., Klamath Falls—See "Excavation and Dredging."

Cal., Gridley—City voted $15,000 bonds to extend water-works system, involving replacing w.i. pipes in downtown section with c.i. pipe and using old pipe to extend system.

Ont., Acton—Town having plans prepared by E. A. James Co., engrs., 1004 Excelsior Life Bldg., Toronto, for pumphouse and 60,000 gal. concrete or steel tank.

Ont., London—Utilities Comrs. having plans prepared for new 10,000,000 gal. reservoir and 5 mi. 6 and 10 in. c. i. mains. About $500,000. Work done by day labor under supervision of E. V. Buchanan, engr., Hydro Offices.

BIDS DESIRED

Minn., Hopkins—Until March 2, by A. Close, village receiver, building 750 ft. deep well and pumping machinery. About $20,000. J. W. Shaffer, 501 New York Life Bldg., Minneapolis, engr.

N. D., Fessenden—Until March 1, by City Council, building water system, including 125,000 gal. storage reservoir, 40,000 gal. elevated tank and 2 mi. water mains. About $50,000. T. R. Atkinson, Bismarck, engr.

Tex., Cisco—Until March 1, by J. M. Williamson, mayor, improving waterworks system, to include rein.-con. dam, 125 ft. high. Bonds for $500,000 voted for project. H. E. Elrod, city engr.

Wash., Mansfield—Until March 5, by town, building pumping plant to connect with 4 in. discharge pipe (already installed) 200 gal. per minute capacity. C. O. Allen, city clk.

Ont., Port Dalhousie—Until March 1, by T. O. Johnson, clk., for installing gravity water supply system. About $50,000. R. W. Angus, 402 Excelsior Life Bldg., Toronto, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Long Island City**—M. E. Connolly, pres. Queens Boro., let contract building automatic electric pumping station at Genessee St., Sect. A and B, to Fox & Renalls, 87 East 125th St., New York City, $177,281. Noted Feb. 5.

★**N. C., Asheville**—City let contract furnishing and laying 10 mi. 16 in. c.i. water pipe, to Kelly & Wilson, Asheville, $349,826.

Mich., Detroit—Water Bd. received bids furnishing labor and material building rein.-con. substructure for low lift pumping station, involving 24,000 cu.yd. earth excav., 7,600 cu.yd. rein.-con., 28,800 lin.ft. concrete piling, 160 cu.yd. mass concrete, 310 tons reinforcing steel, etc., from Walsh Constr. Co., 114½ West 3rd St., Davenport, Ia., $2.40 per lin.ft. for foundation piles in place, plus $268,850 for labor material, etc.; Raymond concrete Pile Co., Empire Bldg., $2.25 per ft. for piles, plus $340,000; Foundation Co., 209 South LaSalle St., Chicago, cost plus fee of $25,000, plus rental charge of $15,000, total $369,000. Noted Jan. 22.

★**Mich., Detroit**—Water Bd. will lay 5,255 ft. 8 in. water mains in Beuna Vista, Belfast, Chambers and Olympia Aves., Epworth Blvd. and Diversity Pl., 1,220 ft. 6 in. in Carbondale, Waldo and Barton Aves. and 1,080 ft. 12 in. in Central and Mack Aves. Work will be done by day labor.

★**Ia., Avoca**—City let contract building water tank and tower, to Pittsburgh-Des Moines Steel Co., Des Moines, $13,730. Noted Jan. 1.

★**Col., Rock River**—City let contract improving waterworks and sewerage systems, to J. S. Schwartz, 1015 Boulder St., Colorado Springs. About $23,000 and $7,000 respectively.

★**Mont., Great Falls**—City let contract extending water-works system, involving 1,560 tons c.i. pipe, to Amer. Cast Iron Pipe Co., Birmingham, Ala., $131,026.

Sewers

PROPOSED WORK

Pa., Plains (Wilkes Barre P. O.)—City plans to build sewerage system, to include 20 mi. excavating and placing c. i. sewer lines in all streets. About $400,000. Engineer not selected.

W. Va., Elkins—See "Waterworks"

BIDS DESIRED

Conn., Stratford (Bridgeport P. O.)—Until March 22, by Bd. Sewer Comrs., furnishing material and labor building 15.6 mi. 8-24 in. pipe sewer, including manholes and flushing manholes complete. F. S. Beardsley, chn.; advertised in this issue.

N. Y., New York—Until March 3, by H. H. Curran, pres., Manhattan Boro., building sewer in 26th St. from bulkhead line of East River to Madison Ave., also reconstructing sewer in Madison Ave. from East 25th to East 31st St.

Sewers (Continued)

N. C., Burlington—Until March 10, by city, constructing and furnishing, 9½ mi. 8-15 in. sewers. J. L. Ludlow, Winston-Salem, engr.

O., Cleveland—Until March 4, by city building sewer in Burke Brook across East 55th St., involving 230 ft. 6-6 ft. 3 in. rein.-con. pipe, 170 ft. 6 in. tile pipe, 320 cu. yd. earth trenching, etc. About $13,000.

O., Cleveland Heights—Until March 15, by village, building sewers and water mains in Cumberland Ave. from Lee to Mayfield Rds. F. A. Pease Eng. Co., 804 Marshall Bldg., Cleveland, engrs.

Wis., Kilbourn—Until March 10, by A. Luettgerodt, city clk., laying 2,000 ft. 8-12 in. vitr. pipe sewers in Washington St. and building 12 x 50 ft. septic tank. Cost between $18,000 and $20,000. Parsons & Orbert, 627 M & M Bank Bldg., Milwaukee, engrs.

Wis., Milwaukee—Until April 8, by Sewerage Comn., furnishing and installing fine screen plant for sewage disposal plant. T. C. Hatton, City Hall, ch. engr.; advertised in this issue.

Wis., Racine—Until Feb. 28, by Bd. Pub. Wks., building sewers in 9 streets, involving 15,322 ft. 8-24 in. pipe, 36 manholes and 58 catch basins. P. H. Connolly, city engr.

S. D., Elk Point—Until March 12, by M. R. Hendrix, city aud., constructing sanitary sewer and sewage lift station, involving 28,700 ft. 8 in. pipe. About $47,000. W. L. Bruce, Yankton, engr.; advertised in this issue.

N. D., Fessenden—Until March 1, by City Council, building 3 mi. sewers. About $50,000. T. R. Atkinson, Bismarck, engr.

Mont., Billings—Until March 2, by city, building 7½ mi. 15-72 in. storm sewers in various streets. E. M. Sneckenberger, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. Y., Brooklyn—E. Riegelmann, boro. pres., let contract building sewer in Lincoln Rd., etc., to J. O'Leary, $86,619; 76th and 77th Sts., to Ajax Drainage Co., 60 Herkimer St., $7,529. Noted Feb. 5 and 12.

★N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., let contract laying sewer in Birch St., to H. J. Mullen, Fulton St., Jamaica, $1 089; Cox Pl., to F. L. Paino, Richmond Hill, $5,434; Haydock St., to C. Petracca, 803 Kent Ave., Brooklyn, $7,075. Noted Feb. 5.

★Col., Rock River—See "Waterworks."

Ore., Portland—City received bids building sewerage systems to include catchbasins, lampholes, manholes, sewer service and branch pipes, in (a) Wygant and East 29th Sts., (b) East 72nd and East Taylor Sts., (c) 29th St. and Ainsworth Ave., (d) East 47th St. from point 75 ft. south of South Glisan St. to sewer in East 47th St. at East Couch St., (1) cement, (2) concrete, from J. Keating, (a1) $23,011, (b1) $8,323, (c1) $6,967; E. Sandberg, (b1) $6,969; Elliott & Scoggin, McKay Bldg., (b1) $7,819; Mehemarie & Co., (d1) $2,669; J. Albert, (d2) $2,688. Noted Feb. 12.

Bridges

PROPOSED WORK

O., Cleveland—Cuyahoga Co. plans to build 60 ft. concrete bridge, on Solon Rd., Chagrin Falls Twp. About $60,000. E. G. Jraus, clk. W. A. Stinchcomb, City Hall, engr.

Mont., Mondak—Roosevelt Co. plans to build Seins Bridge, over Poplar River, on Poplar-Flaxville Rd., 40 ft. steel span on concrete abutments. About $15,400. Federal Government asked to appropriate toward cost. J. N. Edy, c/o State Highway Dept., engr.

Wash., Spokane—Spokane Co. having plans prepared rebuilding 400 ft. steel bridge, 20 ft. wide. A. R. Scott, co. engr.

Oregon—State Highway Comn., Portland, rejected bids received Feb. 5, building 75 ft. concrete arch over Dry Canyon, Wasco Co., involving 350 cu. yd. Class "A" concrete, 49,000 lb. reinforcing steel, etc. Work will be readvertised. H. Nunn, Salem, state highway engr. Noted Feb. 19.

Cal., San Diego—See "Streets and Roads."

Ont., Hamilton—Dominion Government, Ottawa, plans to build steel bridge, 150 ft. long, 50 to 60 ft. wide, over canal. About $75,000. R. B. De Corrweau, Parliament Bldg., Ottawa, engr.

Ont., York—York Co. having plans prepared by E. A. James, engr., 57 Adelaide St. E., Toronto, building following bridges: Unionville, 40 ft. span beam; Schomberg, one 15 ft. slab, and one 24 ft. beam; Islington, deck for 58 ft. beam span; Dyke, 20 ft. arch; Sherwood, 16 ft. slab. Work involves 800 cu.yd. rein.-con., 600 cu.yd. concrete and 1,200 cu.yd. stone. About $29,000.

Man., Morris—Rural Municipality of Morris having plans prepared by M. A. Lyons, engr., New Parliament Bldgs., Winnipeg, building cantilever bridge, steel superstructure on concrete abutments over Red River, 450 ft. channel span, 18 ft. wide. About $90,000.

BIDS DESIRED

Mass., Framingham—Until March 8, by Comrs. Pub. Wks., removing iron bridge on Central St. over Sudbury River and building concrete foundations and rein.-con. superstructure, appurtenances and sidewalks, 90 ft. long excluding approaches and 41.25 ft. wide. F. W. Meserve, chn. J. J. Van Valkenburgh, engr.; advertised in this issue.

New Jersey—Until March 15, by State Highway Comn., Broad St. Bank Bldg., Trenton, furnishing and building 117,000 lb. steel plate girder, superstructure, Bridge "O," Route 9, Sect. 2, 30 ft. wide, with 69 ft. span, Hunterdon Co.; also bridges on Route 6, Mullica Hill-Woodstown Sect., Salem and Gloucester Counties, incased I-beam Bridge 69, 31 ft. span, 30 ft. wide, incased I beam Bridge 35, 32 ft. span, 30 ft. wide, concrete slab Bridge 70, 12 ft. span, 30 ft. wide, widening present box culvert 71, 8 ft. span, 30 ft. wide, reinforcing present brick arch with concrete, 10 ft. span, 30 ft. wide. A. L. Grover, ch. clk.; advertised in this issue. Noted Jan. 22.

N. C., Concord—See "Streets & Roads."

Ga., Cairo—Until March 3, by Comrs. Grady Co., building bridge over Big Tired Creek, 4 mi. west of here. Work involves 354 cu.yd. Class "A" concrete, 1,856 lin.ft. rein.-con. piling, 37,446 lb. reinforcing steel, 433 sq.yd paving, etc. About $40,000. F. Mitchell, 2nd Dist., Thomasville, engr.

Ga., Thomaston—Until March 12, by State Highway Dept., Walton Bldg., Attanta, building steel bridge, 500 ft. long and 16 ft. wide, over Flint River, 18 mi. from here, involving 438.7 cu.yd. rein.-con. 133.8 cu.yd. concrete, 130¾ tons structural steel, 13,543.5 lb. rein. steel, 29,873.8 cu.yd. borrow 39.5 cu.yd. common excav., etc. About $81,000. W. R. Neal, Walton Bldg., Atlanta, engr.

Ind., Anderson — Until March 29, by Comrs. Madison Co, constructing rein.-con. arch bridge over White River, on 9th St., to consist of five 80 ft. earth filled arches, total length face to face of abutments, 424 ft., brick roadway 30 ft. wide between curbs and two 6 ft. sidewalks. H. P. Hardie, aud.; advertised in this issue.

Col, Denver—Until March 5, by J. E. Maloney, engr. State Highway Comn., building bridges over Platte River, between Hillrose and Merino, Bridge 1 to have two 50 ft. spans, 106 ft. over all; Bridge 2 to have twelve 50 ft. spans, 636 ft. over all. Work involves 1,983 cu yd. rein.con., 10,464 lin.ft. wooden piling, 44,783 cu.yd. excav. and 217,797 lb. reinforcing steel, etc. Cost including cement $98,326.

Nev., Reno—Until March 10, by E. H. Beemer, clk. Washoe Co., building 170 ft. bridge, 34 ft. wide, over Truckhoe River, consisting of one 120 ft. rein-con arch, etc. C. R. Hill, Reno, engr.

Ont., Cornwall—Until Mar. 9, by W. A. McLean, c/o Dept. Pub. Highways, Toronto, building steel bridge, 170 ft. long, 30 ft. wide, over River Aux Raisin, on Provincial Highway. About $30,000.

Man., Ft. Garry—Until Mar. 4, by Secy.-Treas. of Rural Municipality of Ft. Garry building rein.-con. arch bridge, 100 ft. clear span, 24 ft. roadway. About $35,000. M. A. Lyons, Parliament Bldgs., Winnipeg, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Boston—City received bids Feb. 18, building, paving, etc., 1,200 ft. bridge on Warren Ave., 85 ft. wide, involving 170 wood piles, 800,000 ft. lumber, from V. Grande, Boston, $210,000; Rowe Constr. Co., Brighton, $224,798; W. H. Ellis & Son, 479 Meridian St., $241,372.

★N. Y., Schenectady—E. S. Walsh, supt. Pub. Wks., Capitol, Albany, let contract building abutments and approaches of Schenectady-Scotia Bridge, to D. Bennett & Son, 413 McClellan St., $234,953. Noted Feb. 19.

Pa., Phila.—Bu. Surveys received bids Feb. 20 for structural iron work, building bridge on 49th St. over Phila., Baltimore & Washington R.R., from E. H. Vare, 1120 Race St., $87,000; Monaghan & Losse, 3016 Chestnut St., $117,836; R. Fish, Phila., $127,500. Noted Feb. 12.

★Del., Wilmington—City let contract building Washington St. Memorial Bridge, 770 ft. long, 72 ft. wide, concrete and steel, to Walsh Constr. Co., Herald Bldg., Syracuse, N. Y., at $747,743.

★Ind., Attica — Comrs. Fountain Co. (Covington) let contact building rein.-con. bridge over Wabash River, here, to consist of 6 spans on concrete piers, two 5 ft. sidewalks, and 20 ft. roadway, total length 986 ft. 6 in., to Stanish & Allen, Chicago, $272,540.

Mich., Detroit — Comrs. Wayne Co. received bids Feb. 10, sinking 4 pneumatic piers to 90 ft. depth and fabricating and erecting steel supporting girders for bridge over River Rouge, Dix Ave., from Standish & Allan, 220 South State St., Chicago, $104,688; Missouri Valley Bridge & Iron Co., Pennsylvania Ave., Leavenworth, Kan., $120,000; Foundation Co., 209 South La Salle St., Chicago, $111,379. Noted Feb. 5.

★Ariz., Florence—Pinal Co. Highway Comn. let contract building concrete arch bridge with two 100 ft. spans and 130 ft. concrete retaining wall, near Ray, also moving 200 ft steel bridge and adding 155 ft. span near Winkleman, to Topeka Bridge & Constr. Co., Stormont Bldg., Topeka, Kan., $72,000. Noted Jan. 1.

★Oregon—State Highway Comn., Portland, let contract building viaduct and culvert near Adams, Umatilla Co., to Ryner-Dickie, Adams, cost $13,628; 110 ft. concrete arch with approaches over Mosier Creek, to Lingstrom & Feigensen, 608 Yeon Bldg., Portland, $53,943; 90 ft. steel superstructure over Kilchis River near Juno, to Pacific Foundation Co., Northwest Bank Bldg., Portland, $10,332. Noted Feb. 19.

Structural Steel

PROPOSED WORK

N. Y., Niagara Falls—Theatre—See "Buildings."

N. J., Newark—Theatre—See "Buildings."

Ia., Ft. Dodge—High School—See "Buildings."

Cal., San Francisco—Theatre—See "Buildings."

BIDS DESIRED

Wis., St. Francis (Milwaukee, P. O.)—See "Industrial Works."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. Y., New York—Office—See "Buildings."

★N. J., Jersey City—See "Industrial Works."

★Md., Baltimore—Hotel—See "Buildings."

★Ia., Cedar Rapids — See "Industrial Works."

Reinforced Concrete

PROPOSED WORK

Mass., Brockton—See "Industrial Works."

Mass., Brookline (Boston P. O.)—Hotel—See "Buildings."

Mass., Cambridge — Hotel — See "Buildings."

Conn., Bridgeport—See "Miscellaneous."

N. Y., Niagara Falls—Theatre—See "Buildings."

Ill., Elgin—See "Industrial Works."

Wis., Fond du Lac—Bank and Office—See "Buildings."

Ia., Ft. Dodge—High School—See "Buildings."

Tex., Houston—See "Industrial Works."

Cal., San Francisco—Theatre—See "Buildings."

Reinforced Concrete (Continued.)

BIDS DESIRED

Wis., St. Francis (Milwaukee, P. O.)—See "Industrial Works."

N. D., Grand Forks—See "Industrial Works."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Lowell—Memorial Hall—See "Buildings."

★N. Y., New York—Office—See "Buildings."

★N. J., Jersey City—See "Industrial Works."

★Md., Baltimore—Hotel—See "Buildings."

★Mich., Detroit—See "Miscellaneous."

★Mich., Detroit—See "Industrial Works."

★Ill., Chicago—Sales and Office—See "Buildings."

★Ia., Cedar Rapids—See "Industrial Works."

Streets and Roads

PROPOSED WORK

Mass., Boston—City having plans prepared paving and widening Charles St. About $350,000. A. Kelly, executive secy. City Planning Bd.

N. Y., Binghamton—City Council adopted ordinances to pave State St. from Eldredge to Chenango Sts., Bevier St., from Chenango to State Sts., Floral Ave. from Main St. to city line, also macadam pavement on Bellevue Ave. from Main St. to Grand Blvd. About $50,000. A. L. LaRoche, comr. Dept. Pub. Wks.

Pennsylvania—L. S. Sadler, state highway comr., Harrisburg, rejected bids received Feb. 17, paving roads in Canton Boro., Canton and Troy Twps., Bradford Co., and Conoquenessing and Butler Twps., Butler Co. Noted Jan. 29.

W. Va., Charles Town—Comrs. Jefferson Co. rejected bids received Feb. 5, resurfacing 5.61 mi. Charles Town-Harpers Ferry Rd., 16 ft. wide, involving 52,350 sq.yd. bituminous macadam and 6,000 cu.yd. excav. Work will probably be done by day labor.

W. Va., Elkins—See "Water-works."

W. Va., Wheeling—City soon receives bids improving 25,000 sq.yd. 15th, 22nd, 23rd, Virginia, Market and Lind Sts. Bids will be received on brick and asphalt on concrete base, asphaltic resurfacing and Warrenite. H. Conrad, city engr.

O., Bellaire—City Council soon receives bids paving 3 mi. Jefferson and other streets, 40 ft. wide, vitr. brick, asphalt or asphaltic concrete. About $300,000. H. C. Althar, Bellaire, engr.

O., Cleveland—City receives bids in spring, grading, paving and draining Superior Ave. from East 12th to East 55th Sts., stone. About $150,000. R. Hoffman, city engr. E. Shattuck, purch. agt.

O., Cleveland—City soon lets contract furnishing, laying, re-laying and repairing sidewalks in Northerly, Southerly and Westerly Dists., involving 175,000 ft. stone or 113,000 ft. cement. About $125,000. R. Hoffman, city engr.

O., Cleveland—Comrs. Cuyahoga Co. plan to grade, pave, curb, drain and build sewers in 8 mi. Marcelline Ave., from Brecksville to Akron, cost $375,000; 6 mi. Pearl Rd., through Summit Co., $300,000, both vitr. brick on concrete base. W. A. Stinchcomb, City Hall, engr.

Michigan—State Highway Comn., Lansing, plans to grade, drain and gravel surface 11.75 mi. Assessment Dist. Rd. 352, 15 ft. wide, Tonia Co.; 4.0389 mi State Trunk Line Rd. Rd. 28-6A, 16 ft. wide, involving 37,289 sq.yd. gravel, Gogebic Co.; 2.509 mi. State Trunk Line Rd. 11-18, 16 ft. wide, 23,553 sq.yd gravel, Benzie Co.; 9,309 ft. State Trunk Line Rd 21-4, 20 ft. wide, 20,688 sq.yd. concrete or bituminous concrete; line grading and surfacing 5.983 mi. Federal Aid Project 2, 16 ft. wide, 56,162 sq.yd. concrete, Allegan Co.

Ia., Ft. Dodge—Comrs. Webster Co. having plans prepared and receive bids in March, grading 7 mi. Grant Highway, 24 ft. wide. About $30,000. L. B. Stephenson Co., Ft Dodge, engr.

Ia., Sac City — City plans to pave 48 streets and alleys, in Dists. 1, 2 and 3, About $30,480, $48,450 and $38,250 respectively W. L. Fahey, Sac City engr

Minn., Aitkin—Aitkin Co. plans to grade and gravel 20 mi. road north from here, 24 ft. wide. About $85,000. F. J. O'Hara, Aitkin, engr.

Minn., Bemidji—Baltrami Co. plans to grade and gravel 10 mi. Baudette, east and west, 24 ft. wide. About $50,000. J. C. Burke, Bemidji, engr.

Minn., Duluth—City soon lets contract paving 2,800 ft. 8th St. from 40th Ave. W., to 46th Ave. W., 24 ft. wide, involving 7,450 sq.yd. concrete, 4,752 lin.ft. concrete curb, 1,765 cu.yd. earth and 3 cu.yd. rock excav., cost $37,257; 900 ft. 7th St. from 18th Ave. to 19th Ave. E., 24 ft. wide, 2,370 sq.yd. concrete, 1,624 lin.ft. concrete curb, $13,313; 1,000 ft. 7th St. from 46th Ave. W., to Central Ave., 24 ft. wide, 2,720 sq.yd. concrete, 1,732 lin.ft. concrete curb, 3,140 cu. yd earth and 10 cu.yd. rock excav., $15,520. E. K. Coe, city engr.

Minn., Foley—Comrs. Benton Co. plan to grade and pave 17 mi. road from Sauk Rapids to Morrison Co. line, 18 and 24 ft. wide. About $150,000. J. L. Tierney, Foley, engr.

Minn., Ortonville—Clinton Co. plans to grade and gravel 9 mi. road from Clinton Co. to north county line. 24 ft. wide. About $54,000. L. P. Zimmerman, Ortonville, engr.

Kan., Atchinson—Atchinson Co. having plans prepared grading 50 mi. North and South State Rds., 18 ft. wide. L. Barnes Eng. Co., St. Joseph, Mo., engrs.

Mont., Billings—City plans to pave Clark, Yellowstone, Wyoming and Lewis Aves. About $175,000. E. M. Sneckenberger, city engr.

Mont., Glasgow — Vallet Co. election April 23, to vote on $200,000 bonds to build various roads. Federal Government will be asked to appropriate toward cost. J. N. Edy, c/o State Highway Dept., Helena, engr.

Mont., Malta—Phillips Co. election April 23, to vote on $250,000 bonds to build roads. Federal Government will appropriate toward cost. J. N. Edy, c/o State Highway Dept., Helena, engr.

Mont., Roundup—City plans to build Impvt. Dist. 36, to include paving 1st, 2nd and 3rd Sts., and 2nd and 3rd Aves. About $65,000. F. Quinnel, Roundup, engr.

Missouri—State Highway Dept., Jefferson City, rejected bids building 13.07 mi. Liberty-Excelsior Springs Rd., Clay Co., 24 tf. wide, bituminous macadam on broken stone base, cost $296,120; 1.75 mi. Six Mile Lane, Moberly Special Rd. Dist., Randolph Co, 26 ft. wide, concrete or vitr. brick on concrete base, cost $50 845 and $50,987 respectively; 1.66 mi. Natl. Old Trails Rd., St. Charles Co., 24 ft. wide, bituminous macadam, $20,649. Noted Dec. 11.

Missouri—State Highway Dept., Jefferson City, received no bids Feb. 4, paving 10 52 mi. Sect. A, Jefferson Highway, Clay Co., involving 74,423 cu.yd. earth, 5,624 cu.yd. rock and 2,521 cu.yd. borrow excav., 98,889 sq.yd bituminous macadam surfacing on 5 in. broken stone base, cost $249,494; 5.3 mi. Southern Highway, Sedalia Special 12 mi. Rd. Dist., Pettis Co., 28,042 lin.ft. grading and 49,852 sq.yd. bituminous macadam on broken stone base, $55,236; 3 53 mi. DeSoto-Potosi-Caledonia Rd., Potosi Special Rd. Dist., Washington Co., 11,572 cu.yd earth, 692 cu.yd. rock and 316 cu.yd. borrow excav., 24,178 sq yd. 3 in. and 8,970 sq.yd 6 in. gravel surfacing, $13,096. Noted Dec. 4 and 11.

Mo., Maryville—Nodaway Co. having plans prepared grading 38 mi. State Line Rd, 18 ft. wide. About $120,000, Leslie-Barnes Eng. Co., Amer. Natl Bank Bldg., St. Joseph, engrs.

Mo., Platte City—Comrs. Platte Co soon let contract grading 26 mi. Jefferson Highway, 18 ft. wide. Leslie-Barnes Eng. Co., Amer. Natl. Bank Bldg., St Joseph, engrs. Noted Feb. 12.

Ark., Marion—Comrs. Crittenden Co. receives bids about May 1, grading 6 mi., 24 ft. wide, and graveling 4 mi., 14 ft wide, Rd. Impvt. Dist. 7, involving 35,000 sq.yd gravel and 80,000 cu.yd. grading. Morgan Eng. Co., Goodwyn Institute, Memphis, Tenn., engrs.

Okla., Walters—City having plans prepared paving 56 blocks of various streets, 24 ft wide, asphaltic concrete. About $500,000. Peckham, Sutton & James, 225½ West Grand Ave., Oklahoma, engrs

Col., Gunnison—Gunnison Co plans to reconstruct Blue Mesa Rd., on Rainbow route, from Cebolla to Cimarron. About $90,000. County will appropriate $22,500 toward cost: Federal Government $45,000, and state $22,500.

Wash., Cle-Elum—Kittitas Co. election soon to vote on $40,000 bonds to build concrete highway between here and Roslyn. Total cost $63,000; about $23,000 available.

Wash., Davenport—Lincoln Co. plans to expend $40,000 for maintenance and $40,000 for construction of permanent highways, $65,000 for rural roads and bridges, $30,000 for improvements in road districts and $450,000 for Donahue roads. J. L. Thayer, Davenport, engr.

Wash., Ritzville—Adams Co. plans to expend $1,000,000 for road work during year. About 20 mi. will be constructed by force account and 77 mi. on contract plan. Project also includes about 40 mi. permanent highways. F. R. Hewitt, co. engr.

Wash., Yakima—Comrs. Yakima Co. plan to expend $1,000,000 to pave roads with concrete or macadam, to include 14 mi. Inland Empire Highway and 10 mi. branch roads. W. C. Marion, co. engr.

Oregon—State Highway Comn., Salem. plans to appropriate $883,460 to grade, gravel and improve county market roads, to be apportioned as follows: Baker Co., $32,112; Benton Co., $13,265; Clackamas Co., $35,159 matched by county fund of $30,000; Clatsop Co., $36,417, county fund, $40,000; Columbia Co., $16,152, county fund $26,919; Coos Co., $28,255; Crook Co., $6,041, county fund $10,000; Curry Co., $5,842; Deschutes Co., $10,665, county fund, $10,080; Douglas Co., $33,607; Gilliam Co., $17,185; Grant Co., $10,005, county fund, $16,675; Harney Co., $15,460, county fund, $12,920; Hood River Co., $11,415; Jackson Co., $33,031, county fund, $45,500; Jefferson Co., $6,206, county fund, $10,000; Josephine Co., $9,981; Klamath Co., $21,244; Lake Co., $14,788; Lane Co, $42,026; Lincoln Co., $11,229; Linn Co., $36,481, county fund. $36,000; Malheur Co., $16,452; Marion Co., $50,750, county fund, $52,300; Morrow Co., $16,856; Multnomah Co., $99,044; Polk Co., $15,862; Sherman Co., $18,376; Tillamook Co., $26,469, county fund, $21,058; Umatilla Co., $59,088; Union Co., $31,127, county fund, $25,939; Wallowa Co, $20,967; Wasco Co., $21,957, county fund, $18,297; Washington Co., $27,253, county fund, $34,987; Wheeler Co., $7,668; Yamhill Co., $25,015, county fund, $31,269. H. Nunn, state highway engr.

Ore., Portland — City plans to grade, drain and pave with asphaltic concrete or macadam Terrace Dr. from East Ravensview Dr. to west line of 17th St, cost, $5,944; improve Locust St. et al, $3,316; drain and build vitr. or cement sewer, in 40th Ave., S. E. and 58th St., S. E., $1,696. O. Laurgaard, city engr.

Cal., Martinez — Bd. Supervs. Contra Costa Co. soon receives bids improving 8.48 mi. Franklin Canyon Rd. 8 ft. strip asphaltic concrete in center and two 8 ft. strips at sides; 7.3 mi. Bryant to San Pablo Dam Rd., also 3.26 mi. Bay Point to Avon Highway Rd., both 18 ft. wide, concrete. R. R. Arnold, Martinez, engr.

Cal., San Diego—City plans to grade and pave 10,620 ft. Merlin, Hollywood and Radio Drives, Tyrant, Orange and Mallard Sts., 24 ft. wide, decomposed granite, involving 13,246 cu.yd. earth excav., 9,925 cu.yd earth embankment, 661 ft. 12-36 in. cement pipe, 338 ft. Redwood box culverts, also 26 ft. wooden frame pile bridge. About $21,000. F. A. Rhodes, city engr.

Ont., Hagersville—Haldimand Co. soon lets contract supplying material, hauling, levelling, rolling, sprinkling and finishing 15 mi. 16 ft., 7½ mi. 10 ft. macadam road About $500,000. D. W. McBurney, Hagersville, engr.

Ont., London—City plans to construct about 5-6 mi. concrete walks with integral curb and gutter. About $50,000. H. A. Brazier, city engr.

Ont., Ottawa—Carleton Co. plans to repair 26 mi. Russell, Metcalfe, Bowesville Richmond and Montreal Rds About $80,000. Patterson & Byrne, 71½ Sparks St engrs.

BIDS DESIRED

N. Y., New York—Until March 2, by H. Bruckner, pres. Bronx Boro., regulating, grading, setting curb, laying sidewalks, and crosswalks, building inlets, receiving basins, drains, culverts, approaches and guard rails, in Olmstead Ave. from Westchester to Starling Aves., Havemeyer Ave from Westchester to Turnbull Aves., Allerton Ave. from White Plains Rd to Pearsall Ave., for full width of 100 ft and grading Allerton Ave., for 60 ft width, from Pear-

Streets and Roads (Continued)

sall Ave., to New York, Westchester & Boston R. R., Fox St., from Leggett Ave. to East 156th St., Stearns St. between Glover and Parker Sts., Sedgwick Ave. from Jerome Ave. to West 169th St., East 243d St. from White Plains Rd. to Barnes Ave., repaving with granite blocks on concrete foundation strip 24 ft. wide centrally located between headers set in concrete shoulders. Boston Rd. from White Plains Rd. to city line; also building sewers and appurtenances in Montgomery Ave. between West Tremont and summit south of Popham Aves., Fox St. between Leggett Ave. and East 156th St., Montgomery Pl. between Maclay and East Tremont Aves.

N. Y., New York—Until March 4, by Park Bd., at office of Dept. Parks, Municipal Bldg., paving where directed with cement, certain walks in Central Park. D. F. Gallatin, pres.

N. J., Bridgeton—Until March 9, by City Council, paving various streets and avenues, sheet asphalt or concrete. C. P. Corey, city clk.; advertised in this issue.

Pennsylvania—Until March 23, by State Highway Dept., Harrisburg, repaving 43,573 ft. rein.-con. road, Bradford Co.; 26,061 ft. rein.-con., Butler Co.; 21,658 ft. bituminous surface course on concrete foundation or rein-con., Centre Co.; 35,492 ft. bituminous surface course on concrete foundation or rein.-con., Erie Co.; 9,432 ft. rein.-con., Fayette Co.; 31,269 ft. rein.-con or monolithic vitr. brick, McKean Co.; 48,465 ft. rein.-con., Mercer Co.; 41,441 ft. also 37,455 ft. rein.-con. and Hillside vitr. brick, Monroe Co.; 29,865 ft. rein.-con., Montgomery Co.; 20,545 ft. also 21,300 ft. bituminous surface course on concrete foundation or rein.-con., Northumberland Co.; 15,686 ft. bituminous surface course on concrete foundation or rein.-con., Tioga Co. and 50,025 ft. rein.-con. and Hillside vitr. brick, Venango Co.; advertised in this issue.

Pennsylvania—Until March 24, by State Highway Dept., Harrisburg, repaving 46,150 ft. rein.-con road, Adams Co.; 28,554 ft. rein.-con. and Hillside vitr. brick, Beaver Co.; 31,663 ft. rein.-con., Butler Co.; 19,950 ft. rein.-con. and bituminous macadam on Telford base, Carbon Co; 47,700 ft. bituminous surface course on concrete foundation or rein.-con., Crawford Co.; 27,328 ft. rein.-con., Delaware Co.; 21,268 ft. rein.-con., Erie Co.; 15,323 ft. rein-con. and Hillside vitr. brick, Fayette Co.; 44,165 ft. rein.-con., Franklin and Adam Counties; 1,910 ft. bituminous surface course on concrete foundation or rein.-con., Huntingdon Co.; 29,409 ft. bituminous surface course on concrete foundation or rein.-con., Lycoming Co.; 14,800 ft. rein.-con., McKean Co.; 34,902 ft. rein.-con., Northampton Co.; 26,300 ft. rein.-con., Northumberland Co.; 10,790 ft. rein.-con. Schuylkill Co.; 19,061 ft. rein.-con. and Hillside vitr. brick, Venango Co.; advertised in this issue.

Delaware — Until March 17, by State Highway Dept., Dover, building 3.43 mi. road from Mt. Pleasant to Boyds Corner, Contr. CN1; 3.36 mi. Naamans Creek Rd., Contr. CN2; 4.53 mi. road from Upham, ch. engr.; advertised in this issue.

W. Va., Marlinton—Until March 9, by Comr. Pocahontas Co. paving 1¼ mi. road from Marlinton to Campbelltown, vitr. brick. About $25,000. H. Kramer Barlow, engr

W. Va., Buckhannon—Until March 1, by Comrs. Upshur Co. paving 3.1 mi. Buckhannon-Weston Rd., 2 mi. French Creek Rd., 1.2 mi. Cemetery Rd., ½ mi. Marion St. and grading 1.61 mi. Buckhannon-Clarksburg Rd. About $223,800. W. C. West, co. engr.

W. Va., Fairmont—Until March 4, by Comrs. Marion Co., improving 2.2 mi Kilarm Rd. at Everson Sta., involving 15,000 cu.yd. excav. and 15,500 sq.yd. bituminous macadam. About $28,000 S. B Miller, Fairmont, engr.

W. Va., Fairmont—Until March 4, by Comrs. Marion Co., improving 1.41 mi. Watson Rd., 16 ft wide, involving 9,533 sq.yd. concrete, 3,800 sq.yd. brick on concrete base and 7,000 cu.yd. excav., cost $51,000; 1.42 mi. Boothville Rd., 14 ft wide, 11,700 sq.yd. concrete and 5,000 cu.yd excav., $35,000 and .56 mi. Grafton Rd., 16 ft. wide, 4,666 sq.yd. concrete and 1,500 cu.yd. excav., $12,000. S. B. Miller, Fairmont, engr.

W. Va., Parkersburg—Until March 2, by Mayor and City Council, grading, curbing and paving various streets, involving 14,230 sq.yd. sheet asphalt, 27,650 sq.yd. concrete and 11,050 sq.yd. brick pavement, 12,300 lin.ft. concrete curbing and 10,000 cu.yd excav. L. G. Merrill, city engr.; advertised in this issue.

North Carolina—Until March 2, by Div. Office State Highway Comn., Greensboro, sand, clay or graveling 12 mi. Concord-Albemarle Rd., 16 ft. wide. About $60,000 W. S. Fallis, Raleigh, state highway engr.

North Carolina—Until March 1, by Div. Office State Highway Comn., Asheville, hard surfacing 6 mi. Asheville-Marion Rd., cost $300,000, sand clay or graveling 12 mi. Central Highway, $60,000, 5 mi. Wilmington-Asheville Highway, asphalt on concrete base, $250,000, 5.93 mi. County Rd., concrete on topeka base, $185,000, all 16 ft. wide. W. S. Fallis, Raleigh, state highway engr.

N. C., Concord—Until March 2, by Div. Office State Highway Comn., Greensboro, top soiling, clearing, excavating and building small concrete bridges on 8.98 mi. road, 16 ft. wide. About $35,000. W. S. Fallis, state highway engr.

Ga., Moultrie—Until March 5, by city for 40,000 sq.yd. paving and 10,000 sq yd. concrete sidewalks. About $140,000 O. H. Lang, city engr.

Fla., Daytona—Until April 1, by city paving and draining 10 mi. various streets, 15, 20, 24 and 30 ft. wide. About $450,000. J. B McCrary Co., 3rd Natl. Bank Bldg., Atlanta, Ga., engrs.

Tenn., Humbolt—Until March 13, by city, paving and draining 50,000 sq.yd. various streets. About $150,000. J H. Weatherford, 64 Porter Bldg., Memphis, engr.

Indiana—By Bd. Co. Comrs. building roads in following counties:

March 1, Crawford Co., English, 15,448 ft. W. F. Boss Rd., Whiskey Run Twp. O. D. Tadlock, aud.

Ripley Co., Versailles, J. W. Hyatte et al Rd. and H. Laswell et al Rd., macadam, Johnson Twp., J. S. Hull et al Rd., Otter Creek Twp. W. D. Robinson, aud.

Newton Co., Kentland, M. G. Barker et al Rd., macadam, Jackson Twp. S. R. Sizelove, aud.

Putnam Co., Greencastle, 1,138 ft. E. E. Layne et al Rd., macadam. R. E. Knoll, aud.

Decatur Co., Greensburg, 9,435 ft. F. Scott et al Rd., macadam. J. C. Barbe, aud.

Franklin Co., Brookville, 11,220 ft. G. W. Krieges Rd., Ray Twp. and 4,688 ft. W. Horstman Rd., crushed stone, Metamore and Salt Creek Twps., 6,877 ft. J. C. Morin Rd., concrete, Brookville Twp. F. X. Siebert, aud.

March 2, Sullivan Co., Sullivan, 14,786 ft. J. Latshaw et al Rd., Haddon Twp. and 12,172 ft. T. M. Douthitt et al Rd., rock, Jefferson Twp. F. M. Daniels, aud.

Marshall Co., Plymouth, K. M. Bessinger et al Rd. and A. C. Berry et al Rd., gravel, Bourbon Twp. Z. M. Tanner, aud.

Adams Co., Decatur, H Kruckeberg Rd., Union Twp. and A. R. Wolfe Rd., macadam, Union and Root Twps. J. Mosure, aud.

Gibson Co., Princeton, D. Busing et al Rd., gravel, Johnson Twp. J. H. Armstrong, aud.

Carroll Co., Delphi, J. H. Shoff Rd., gravel, Monroe Twp. R. C. Davidson, aud.

Gibson Co., Princeton, J. Emerson Rd. and J. M. Montgomery Rd., stone and gravel, Montgomery Twp. J. H. Armstrong, aud.

Boone Co., Lebanon, E. Schooler et al Rd., Eagle Twp., S. J. Saunders et al Rd., Worth Twp., D. W. Reed et al Rd., Jefferson Twp., C. F. Shera et al Rd., Center and Jackson Twps., A. Perkins et al Rd., Clinton Twp., G. O. Cook et al Rd., Worth Twp., T. R. Jones et al Rd., Jefferson Twp., J. F. Hart et al Rd., between Center and Jefferson Twps., A. Sheets et al Rd., Eagle Twp., T. W. Padgett et al Rd., Marion Twp. and C. A. Davis et al Rd., gravel, Center Twp. I. Stephenson, aud.

Pulaski Co., Winamac, 1¾ mi. C. Kain Rd., White Post and Jefferson Twps., 31,770 ft. J. E. Lackey Rd., Cass and White Post Twps. and 1 mi. C. Leslin Rd., gravel, Rich Grove Twp. J. C. Howe, aud.

Cass Co., Logansport, G. W. Calloway Rd., Jefferson Twp. and E. L. Flory Rd., Clay Twp. H. M. Gardner, aud.

Delaware Co., Muncie, 7,635 ft. S. H. Dragoo Rd., bituminous macadam, Center Twp., 14,790 ft. A. E. Thornburg Rd., gravel, Liberty Twp. J. P. Dragoo, aud.

March 3, Miami Co., Peru, J. Pritz et al Rd., Union Twp., N. Wilson et al Rd., between Erie, Richland and Peru Twps., J. Thomas et al Rd., Deer Creek Twp., G. W. Thomas et al Rd., Washington Twp. and A. Stehle et al Rd., Peru Twp. C. Wolf, aud.

Huntington Co., Huntington, W. H. Deemer et al Rd., Clear Creek and Warren Twps. J. E. Shideler, aud.

March 6, Whitley and Noble Counties, Columbia City, 13,678 ft. D. M. Pence et al Rd., gravel. W. K. Burwell, aud.

Bartholomew Co., Columbus, 1,285 ft. Pittman Rd. and 2,120 ft. Morrison Rd., crushed stone, between Hawcreek and Clifty Twps., 10,630 ft. F. Hoeltke Rd., gravel, Harrison Twp. R. Henderson, aud.

Michigan—Until March 13, by F. F. Rogers, state highway comr., at office of Bd. Rd. Comrs. Alpena Co., Alpena, grading, draining and surfacing 2.014 mi State Trunk Line Rd. 10-8A, 16 ft. wide, involving 5,424 cu.yd. earth excav., 18,904 sq.yd. gravel, 268 lin.ft. 12-15 in. encased tile, etc.; 1 991 mi. State Trunk Line Rd. 10-7A, 16 ft. wide, 6,450 cu.yd. earth excav., 18,685 sq.yd. gravel, 234 lin.ft. 12-15 in. encased tile, 1,343 lb. reinforcing steel, etc.

Michigan—Until March 12, by F. F. Rogers, state highway comr., at office of Rd. Comrs. Berrien Co., St. Joseph, fine grading and surfacing with bituminous or cement 5.049 mi. Federal Aid Rd. 24-A1, 18 ft. wide. Former bids rejected. Noted Feb. 5.

Mich., Pontiac—Until March 1, by W. B. Anderson, Pontiac Savings Bank Bldg., grading, shaping and surfacing 17,250 ft. in Citizens Development Co. Subdivision, 16 ft. wide, involving 30,667 sq.yd. 6 in. gravel. Separate bids on 30,000 lin.ft. concrete sidewalks, 5 ft. wide and 4 in. deep.

Mich., Port Huron—Until March 2, by W. W. Cox, engr.-mgr. Rd. Comr., St. Clair Co., grading, shaping, draining and surfacing with Class "B" gravel or Class "C" gravel top, 5.76 mi. road in Cottrellville Twp., 9 ft. wide. Noted Feb. 5.

Minn., Albert Lea — Until March 3, by Auditor Freeborn Co. constructing 22 mi. road, involving 220,000 earth excav. and 30,000 yd. gravel. E. V. H. Brown, highway engr.

Minn., Rochester—Until March 5, by L. J. Fiegel, aud. Olmstead Co., improving 14 mi. Federal Aid Project 97, State Rd. 1, 24 ft. wide, involving 136,320 cu. yd earth excav., 1,600 cu. yd. loose rock, 3,887 cu. yd solid rock excav., etc. About $68,000. Noted Jan. 15.

Ia., Pocohantas — Until March 16, by Comrs. Pocohantas Co., grading 27 sections roads, involving 139,000 cu. yd. excav. A L. Thornton, co. engr.; advertised in this issue.

S. D., Brookings—G. H. Stoddard, city aud., receiving bids for 1,700 cu.yd. grading, 49,000 sq yd. paving, etc. About $160,000. L. P. Wolff, Guardian Life Bldg., St. Paul, Minn., engr.

S. D., Madison—Until March 15, by City Comrs., paving Egan Ave. from north side railway track to 4th St., south; Center St. from Lincoln Ave. to Highland Ave., total length, 16 blocks. Bids will be received on concrete, creosoted wood block, sheet asphalt, bitulithic and asphaltic concrete. C. A. Trimmer, city engr.

S. D., Mitchell—Until March 1, by T. Eastcott, city aud., for 153,596 sq.yd. concrete asphaltic concrete, wood block, sheet asphalt, bitulithic or tarvia pavement; 65,778 lin.ft. curb, or curb and gutter.

S. D., Sioux Falls—Until March 3, by city, paving 936 sq.yd. 17th St.; 13,500 sq. yd. 1st Ave.; 6,140 sq.yd. 10th St.; 18,030 sq.yd 13th St.; 9,237 sq.yd. Duluth Ave.; 8,644 sq.yd. Center Ave.; 6,160 sq.yd. 25th St.; 2,686 sq.yd. 5th St.; 10,675 sq.yd. 3rd St.; 3,910 sq.yd. Menlo Ave.; 7,992 sq.yd. 20th St.; 2,172 sq.yd. 15th St.; 14,000 sq. yd. 18th St.; 14,000 sq.yd. Walts Ave.; 3,175 sq.yd. 17th St.; 1,495 sq.yd. 12th St.; 10,150 sq.yd. 6th St.; 10,870 sq.yd. 19th St.; 19,530 sq.yd. 14th St. W. C. Lupe, aud.

N. D., Wahpeton—Until March 1, by City Council, paving, curbing and guttering 2nd St. from main line Great Northern Ry. to Nicholas Ave.; 4th St. from Montana to Territorial Aves.; Montana and Ohio Aves. from center of alley running north and south between 3rd and 4th Sts., to center of alley running north and south between 4th and 5th Sts.; Delaware Ave. from 4th St. to center of alley running north and south between 4th and 5th Sts.; Utah Ave. from 4th St. to center of alley running north and south between 3rd and 4th Sts.; Michigan, Pembina, Wisconsin. Iowa and Territorial Aves. from center of alley running north and south between 3rd and 4th Sts. to center of alley running north and south between 4th and 5th Sts.; 5th St. from Washington to Territorial Aves.; Washington, Montana, Ohio, Delaware, Michigan, Pembina, Wisconsin, Iowa and Territorial

Streets and Roads (Continued)

Aves. from center of alley running north and south between 4th and 5th Sts. to center of alley running north and south between 5th and 6th Sts. Bids will be received on brick sheet asphalt, bituminous concrete, portland cement, concrete or creosoted wood block, on concrete foundation. L. W. Burdick, city engr.

Montana—Until March 2, by State Highway Dept., Helena, gravel surfacing 24 mi. Sect. A, Yellowstone Trail, Federal Aid Project 53, Yellowstone Co., involving 520 cu.yd. concrete, 53,000 cu.yd. earth excav., 26,800 cu.yd. gravel, 23,000 lb. reinforcing steel, etc. Former bids rejected. J. N. Edy, state highway engr.

Montana—Until March 12, by State Highway Comn., Helena, grading and graveling 2 mi. Hinsdale-Thoeny Rd., Valley Co., involving 7,600 cu. yd. excav., cost $12,400; grading 13.6 mi. Baker-Ekalaka Rd., Carter Co., 65,200 cu. yd. excav., $54,000.

Mont., Billings—Until March 16, by city, paving 6,676 sq.yd. Broadwater Ave. and other avenues. About $26,000. E. M. Sneckenberger, city engr.

Texas—Until March 8, by R. J. Windrow, engr., c/o State Highway Dept., Austin, building 1.01 mi. Highways 3 and 7, Federal Aid Project 110, 20 ft. wide, concrete. Cost to exceed $10,000.

Tex., Angleton—Until March 13, by C. D. Jessup, judge Brazoria Co., grading and building pile trestle and rein.-con. drainage structures on 9.44 mi. Highway 36, from Jones Creek through Freeport to Quintana Rd., 16 ft. wide, involving 260 cu. yd. 1:2:4 cu.yd. concrete, 21,197 lb. reinforcing steel and 28,618 cu. yd. earth excav. About $156,671. W. A. Randle, Freeport. engr. Noted July 3.

Tex., Corsicana—Until March 9, by H. E. Traylor, judge Navarro Co., grading, gravel surfacing and building concrete trestle and rein.-con. drainage structures on 11.66 mi. Highway 14, from here to Rice and beyond, 16 ft. wide. Work involves 13.48 acres clearing and grubbing, 144,434 cu. yd. excav., 3,426 cu. yd. 1:2:4 and 90 cu. yd. 1:2½:5 concrete. 404,285 lb. reinforcing steel. About $323,824. C. Chappell, Corsicana, engr.

Tex., Nacogdoches—Until March 1, by I. D. Parmley, clk. Nacogdoches Co., grading, gravel surfacing and building rein.-con. and steel bridges and rein.-con. culverts on 18.64 mi. Highway 21, from here to Cherokee Co. line, Federal Aid Project 144, 16 ft. wide. Work involves 147 acres clearing and grubbing, 101,485 cu. yd. earth and 1,143 cu.yd. structural excav., 462 cu. yd. Class "A" and 559 cu. yd. Class "B" concrete, 224,410 lbs. structural and 61,586 lbs. reinforcing steel, etc. About $233,774. L. Acker, Nacogdoches, engr.

Colorado—Until March 9, by State Highway Comn., Denver, grading and draining 2.759 mi. Federal Aid Project 78, between Red Cliff and Minturn, 18 ft. wide. 34,496 cu. yd. combined earth and 14,262 cu. yd. solid rock excav., 14,505 cu. yd. earth borrow, 9 acres clearing, 262 cu. yd. concrete headwalls, 1,061 cu. yd. cement rubble retaining wall, etc. About $114,490. J. E. Maloney, state highway engr.

Colorado—Until March 5, by State Highway Comn., Denver, gravel surfacing and draining 5.86 mi. Federal Aid Project 23, between Delta and Montrose, 24 ft. wide, involving 8,114 cu. yd. combined earth excav., 1,410 cu. yd. earth borrow, 31,824 yd. overhaul, 9,167 cu. yd. gravel surfacing, 109 cu. yd. concrete, 3,735 lb. reinforcing steel, two 10 ft. concrete slab bridges, one 6 ft. concrete slab bridge, etc.; cost $45,012; paving 1.568 mi. Federal Aid Project 34, Sects. A and B, 18 ft. wide, 16,560 sq. yd. concrete, 2,830 cu. yd. combined earth excav., 1,147 cu. yd. earth borrow, 409 cu. yd. gravel surfacing, 21 cu. yd. concrete culvert headwalls, etc., (cement to be furnished by state); cost, including cement, $68,582; paving 1.161 mi. Federal Aid Project 31, between Denver and U. S. A. General Hospital No. 21, 18 ft. wide, 12,269 sq. yd. concrete, 2,440 cu. yd. combined earth excav., 964 yd. overhaul, 309 cu. yd. gravel shoulders, 128 cu. yd. concrete headwalls, etc. (State to furnish cement $11,410) Cost, including cement, $13,604 J. E. Maloney, state highway engr.

Idaho, Boise—Until March 2, by Comrs. Ada Co., paving with either concrete or bituminous concrete, 12.9 mi. Boise-Star Rd., 18 ft. wide. J. McGrath, chn.

Wash., Goldendale—Until March 4, by Comrs. Klickitat Co., improving 25 mi. Troutlake Rd., 1 course concrete, standard bitulithic on 2 course crushed rock base, water or oil bound macadam or 2 course crushed rock surface, also 11 mi. Horseshoe Bend Rd., 2 course crushed rock surface. R. E. Crooks, co. clk.

Wash., Yakima—Yakima Co. receiving bids paving Mabton Rd. from Sunnyside to Mabton, 18 ft. wide, concrete or bitulithic. W. C. Marion, co. engr.

Cal., El Centro—Until March 8, by Bd. Supervs. Imperial Co., paving 26 mi. in 4 sections. About $650,000. Noted Jan. 22.

Cal., Ventura—Until March 6, by L. E. Hallowell, co. clk., Ventura Co., grading and paving 6 mi. Cammarillo Rd., concrete or asphaltic concrete, also 4 mi. Bartsdale Rd., concrete.

N. S., Halifax—Until March 6, by city, ditching and macadamizing 17 mi. road from Halifax to St. Margaret's Bay, 18 ft. wide. About $60,000. J. W. Roland, Halifax, engr.

Ontario—Until March 9, by Dominion Government, Parliament Bldgs., Toronto, clearing, grubbing and doing necessary rock and concrete work on 7 mi. road 20 ft. wide, in Darlington Twp., 6 mi. road 20 ft. wide, Tyenginada Twp. About $30,000 and $25,000 respectively. G. Hogarth, Parliament Bldgs., Toronto, engr.

Ont., Ingersoll—Until April, 1, by F. W. Farncombe, engr., London, paving Main St., concrete. About $25,000.

Ont., St. Thomas—Until March 1, by J. D. Curtis, chn. Bd. Wks., for 13,000 sq.yd. asphalt pavement on concrete base, with curb and gutter, track foundations, etc. About $45,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Newton (Boston P. O.)—G. E. Stuart, comr. streets, West Newton, received bids Feb. 18, building road, 24 ft. wide, involving 14,000 sq.yd. bituminous macadam, from E. C. Sargent, Quincy, $33,601; Linberg & Street, 294 Wash. St., Boston, $34,788; Simpson Bros., 166 Devonshire St., Boston, $37,935.

Conn., New Haven—City received bids paving Newhall St., involving 7,700 sq.yd. concrete, from C. W. Blakeslee & Sons, 58 Waverly St., $20,200; R. D. Daley & Co., 6 Church St., $20,575.

★Conn., New Haven—City let contract to C. W. Blakeslee & Sons, 58 Waverly St., paving Newhall St., involving 7,800 sq.yd. bituminous macadam, cost $16,916. Auburn St., 3,750 sq.yd. bituminous macadam, $8,068, Putnam St., 3,800 sq.yd. asphalt, $6,788, Orchard St., 8,200 sq.yd. asphalt, $14,934; to R. D. Daley Co., 6 Church St., East Rock Rd., 4,000 sq.yd. bituminous macadam, $8,802, Canner St., 7,000 sq.yd. bituminous macadam, $15,214, Quinnipiac Ave., 13,900 sq.yd. concrete, $30,023.

N. Y., Brooklyn—E. Riegelmann, boro. pres., received bids Feb. 19, regulating and grading (a) Liberty Ave., regulating and paving, (b) Linden Ave., (c) 63rd St., (d) 12th St., regulating, grading, curbing, etc., (e) 12th St., fencing lot on northeast side (f) 75th St., from Scott Bros., 329 East 29th St., (a) $1,884; Grimm Constr. Co., Richmond Hill, (a) $4,616, (e) $1,072; H. J. Mullen, Woodhaven, (a) $4,804; Consolidated Asphalt Co., 52 9th St., (b) $12,770, (c) $13,665, (d) $3,594; Uvalde Asphalt Paving Co., 1 Bway., New York City, (b) $13,082, (c) $13,967, (d) $3,691; L. Mangeri, 190 31st St., (e) $1,049; J. Jennings, Belle Harbor, (a) $5,087, (e) $1,211; J. A. Lee, 454 East 49th St., (f) $807; O. Metz, 119 Palmetto St., $882; C. L. Dooley, 257 Adelphi St., (e) $1,453. Noted Feb. 12.

★N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., let contract paving Espilon Pl., etc., to Sicilian Asphalt Paving Co., 41 Park Row, New York City, $14,964; regulating and grading Kingland Ave., to Peace Bros., Flushing, $14,456; 93rd St., to C. Kurth, 812 Forest Ave., Brooklyn, $440. Noted Feb. 12.

★N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., let contract regulating and grading 91st St., to Scott Bros., 329 East 29th St., Brooklyn, $17,388; Beach 22nd St., to R. A. Hess, Corona, $1,278; 77th St., to C. Kurth, 812 Forest Ave., Brooklyn, $2,250; regulating and paving Pierce Ave., to Consolidated Asphalt Paving Co., 52 9th St., Brooklyn, $18,222; Sandol St., to Uvalde Asphalt Paving Co., 1 Bway., New York City, $5,823 Noted Feb. 5.

★N. Y., New York—H. H. Curran, pres. Manhattan Boro., let contract regrading and paving roadway of 34th St. from Park to Madison Aves., to Cleveland-Trinidad Paving Co., Flushing Ave., Brooklyn, $21,812 Noted Feb. 19.

★N. Y., New York—H. H. Curran, pres. Manhattan Boro., let contract repairing asphalt pavement in railroad area when and where directed, to J. L. Brustar, Harlem River and 150th St. About $154,600 Noted Feb. 12.

★N. Y., New York—Park Bd., at office of Dept. of Parks, Municipal Bldg., let contract repaving with sheet asphalt and asphalt blocks on concrete foundation, roadway of Eastern Blvd., to Asphalt Constr. Co., 1 Madison Ave., $72,299. Noted Feb. 19.

Pennsylvania—State Highway Dept., Harrisburg, received bids Feb. 17, repaving roads in counties as follows:

Adams Co., 52,042 ft. 1 course rein.-con. from G. Merdinger, E. P. Wilbur Trust Bldg., Bethlebem, $511,606; Langthorn Co., Inc., 2 West 45th St., New York City, $812,760.

Bradford Co., 44,168 ft. 1 course rein.-con., Trinidad Asphalt Paving Co., Larksville, $452,,406.

Butler Co., 31,663 ft. 1 course rein.-con., from C. E. Walter, Mill and Washington Sts., Butler, $337,058; S. D. Foster, Farmers Bank Bldg., Pittsburgh, $340,788.

Cameron Co., 20,643 ft. 1 course rein.-con., from G. Metzger, Jr., 12 East 4th St., Emporium, $272,592; Fish, Young & Parks, 441 Hansberry St., Phila., $359,033.

Chester Co., 4,541 ft. 1 course rein.-con., from Hill Constr. Co., 1604 Real Etate Trust Bldg., Phila., $36,137; F. G. Mayers Co., Inc., 1218 Chestnut St., Phila., $41,939; D. E. O'Connell & Son, Norwood, $42,606.

Clarion Co., 4,604 ft. 1 course rein.-con., from L. H. Hileman Constr. Co., Inc., 217 First Natl. Bank Bldg., New Kensington, $53,176.

Clinton Co., 4,108 ft. 1 course rein.-con., from Hughes & Phillips, Clearfield, $71,282.

Elk Co., 3,169 ft. 1 course rein.-con. from Minns Bros., De Bois, $45,774; L. T. Haughton, Waterford, $46,050; C. A. McDonald, 26 South Franklin St., De Bois, $46,916.

Huntingdon Co., 1,243 ft. 1 course rein.-con. from J. F. Norris, Somerset, $42,717; Finn & Son, Inc., Mapleton Depot, $48,060; E. H. and L. J. Brua, Hollidaysburg, $48,489.

Luzerne Co., 16,886 ft. 1 course rein.-con., from B. G. Coon Constr. Co., 274 Union St., Luzerne, $217,292; Trinidad Asphalt Paving Co., Larksvillc, $219,081; H. B. Sproul Constr. Co., Inc., 218 Adams Ave., Scranton, $227,927.

Potter Co., 21,775 ft. 1 course rein.-con., from J. C. Bradley & Co., Wellsboro, $274,621; Tyne & Willey, 407 Savings Bank, Binghampton, N. Y., $276,676.

Schuylkill Co., 40,011 ft. 1 course rein.-con., from Schuylkill and Blythe Twps. and Tamqua Boro., from M. A. Mangan, 102 South Center St., Pottsville, $373,032, for quantities used in Tamqua Boro., $3,475; H. B. Sproul Constr. Co., 218 Adams Ave., Scranton, $546,793; quantities used in Tamqua Boro., $5,509; Bell & Moran, Shenandoah, $553,357, quantities used in Tamqua Boro., $4,679.

York Co., 31,956 ft. 1 course rein.-con., from Weller Constr. Co., Inc., 816 14th St. N. W., Wash., D. C., $290,372; Continental Contg. Co., 66 Knickerbocker Bldg., Baltimore, $297,299; G. A. and F. M. Wagman, Dallastown, $299,999.

York Co., 25,756 ft. 1 course rein.-con., from Comerford Constr. Co., 539 Real Estate Bldg., Philadelphia., $255,068; J. Gowl & Co., 1539 Filbert St., Phila., $313,454. Noted Jan. 29.

★Pennsylvania—L. S. Sadler, state highway comr., Harrisburg, let contract improving 5,033 ft. road, Roulette Twp. 2, Potter Co., to Horn & Devling, Main St., Galeton, $112,503; 5,900 ft. Jenner Twp., Somerset Co., to F. H. Ziegler, Somerset, $48,448.

★Pennsylvania—State Highway Dept., Harrisburg, let contract improving 5,467 ft. State Highway Route 363, Henry Clay Twp. Fayette Co., to C. R. McIntyre, Fairchance, $66,121; 9,181 ft. State Highway Route 68, Sect. 3, Salem and Unity Twps., Westmoreland Co., to J. C. Mickey, Latrobe, $135,752; 10,700 ft. State Aid Application 717, Thornbury Twp., Deleware Co., to Sutton & Corson, 9th and Simpson Sts., Ocean City, N. J., $92,829 All 1 course rein.-con.

Streets and Roads (Continued)

★W. Va., Franklin—Comrs. Pendleton Co. received no bids Jan. 30, improving 4.17 mi. Franklin-Petersburg Rd., involving 22,000 cu.yd. excav. and drainage structures. About $30,000. Work will be done by day labor.

★W. Va., Weston—Comrs. Lewis Co. let contract improving 2,400 ft. River Rd., 16 ft. wide, involving 4,000 sq.yd. concrete and 1,400 cu.yd. excav., to D. Rich, Weston, $14,981.

★New Orleans—City let contracts to Bancroft & Ross, Tulane Ave. and Jefferson Davis Parkway, sub-surfacing 1,300 ft. Rampart St., 40 ft. wide cost $15,415, 2,382 ft. Front St., 36 ft. wide, $23,275, 840 ft. Clio St., 28 ft. wide, $8,253, 1,770 ft. Baronne St., 40 ft. wide, $21,480, 525 ft. Sycamore St., 22 ft. wide, $8,993; to Blum & McNamara, 304 Marine Bank Bldg., sub-surfacing 1,360 ft. Girod St., from St. Charles to Rampart Sts., 29 ft. wide, $14,826; to A. P. Boh & Co., 4441 Banks St., sub-surfacing 750 ft. Girod St. from Water to South Peters Sts., 29 ft. wide, $5,940, 330 ft. Bank Pl., 16½ ft. wide, $3,750, 860 ft. Common St., 26 ft. wide, $2,923, 1,550 ft. Gravier St., 28 ft. wide, $6,130, 370 ft. Lafayette St., 27 ft. wide, $21,680, 790 ft. Natchez St., 19 ft. wide, $6,931, 5,040 ft. Magazine St., 40 ft. wide, $12,431; to H. W. Bond & Bro., 1019 Constantinople St., sub-surfacing 2,470 ft. Birch St., 22 ft. wide, $33,683, 1,300 ft. Poeyfarre St., 27 ft. wide, $20,879; to Chickamonga Quarry & Constr. Co., 1st Natl. Bank Bldg., Chattanooga, Tenn., paving Magazine St., involving 8,410 sq.yd. wood block, $63,835; to Craven & Lang, 1015 Hibernia Bank Bldg., paving Rampart St., involving 3,550 sq.yd. bitulithic, $17,105, St. Bernard Ave., 22,400 sq.yd. bitulithic, $102,451, Sycamore St., 1,300 sq.yd bitulithic, $6,170, Baronne St., 5,200 sq.yd. bitulithic, $24,098, Clio St., 1,700 sq.yd. bitulithic, $9,223, Orleans St., 3,150 sq.yd. bitulithic, $14,928, Poeyfarre St., 3,730 sq.yd. bitulithic, $19,855, Girod St., 3,560 sq.yd. bitulithic, $14,835, sub-surfacing 630 ft. Esther St., 22 ft. wide, $4,878, 630 ft. Irma St., 22 ft. wide, $4,874, 6,604 ft. Tchoupitoulas St., 40 ft. wide, $27,254, 630 ft. Felicia St., 22 ft. wide, $3,337, 1,590 ft. Notre Dame St., 22 ft. wide, $28,207, paving Poydras St., involving 9,650 sq.yd. Trinidad asphalt, $37,247, sub-surfacing same, $13,586, paving Barracks St., 4,980 sq.yd bitulithic, $23,338, sub-surfacing same, $19,305, paving St. Peter St., 3,510 sq.yd. bitulithic, $16,711, sub-surfacing same, $23,648, paving St. Ann St., 4,380 sq.yd. bitulithic, $20,761, sub-surfacing same, $16,134; to T. Egan & Sons, 4330 Canal St., sub-surfacing 1,780 ft. Julia St., 40 ft. wide, $18,079, 515 ft. Constance St. from Julia to St. Joseph Sts., 24 ft. wide, $3,120, 560 ft. Constance St. from Howard Ave. to Calliope St., 24 ft. wide, $3,937; to M. J. Flynn, 7820 Spruce St., paving Birch St., involving 5,580 sq.yd. concreting gravel, $16,009, Esther St., 1,020 ft. concreting gravel, $3,170, Felicia St., 1,020 sq.yd. concreting gravel, $3,155, Front St., 9,080 sq.yd. small granite block, $75,630, Irma St., 1,020 sq.yd. concreting gravel, $3,155, South Peters St., 18,120 sq.yd. wood block $139,934, Tchoupitoulas St., 26,400 sq.yd. wood block, $202,824; to Grasser Contg. Co., Hennen Bldg., sub-surfacing 4,070 ft. South Peters St., 40 ft. wide, $47,072; to Jamison & Hallowell, Montgomery, Ala., paving Girod St., involving 2,870 sq.yd. wood block, $21,559, Julia St., 8,940 sq.yd. small granite block, $70,813, Notre Dame St., 4,070 sq.yd. wood block, $31,335; to C. W. Kreher, 300 South Clark St., sub-surfacing 1,305 ft. Orleans St., 24½ ft. wide, $13,641; to T. O. Hotard, 320 Opelousas St., paving Banks Pl., involving 610 sq.yd. wood block, $4,856, Common St., 2,660 sq.yd. wood block, $20,262, Gravier St., 4,750 sq.yd. wood block, $38,306, Lafayette St., 1,380 sq.yd. wood block, $14,000, Natchez St., 1,500 sq.yd. wood block, $11,324; to M. Mitchell, 2646 Banks St., sub-surfacing 8,180 ft. St. Bernard Ave., 22 ft. wide, $50,855. Noted Sept. 18.

★Ind., Evansville—Comrs. Vanderburg Co. let contract building New Green River Rock Rd., Knight Twp., to Stinchfield & Reichart, Evansville, $10,844.

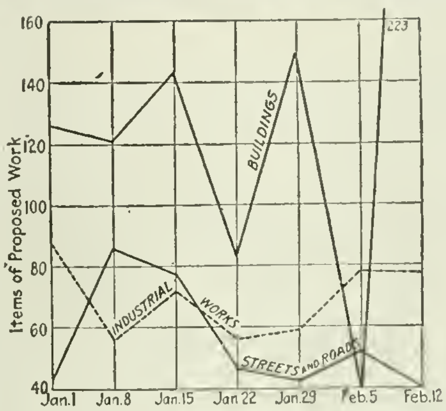
★Ind., Plymouth—Comrs. Marshall Co. let contract building Hagg Rd., gravel, West and Polk Twps., to Becker-Enyart Co., Plymouth. About $145,900.

Michigan—State Highway Dept., Lansing, received only bid Feb. 10, grading, shaping and draining 14.211 mi. Telegraph Rd., Federal Aid Rd. 42, 18 ft. wide, Wayne Co., from Closser Bros., River Rouge, $121,384. Work involves 67,263 cu.yd. earth excav. at $0.98, 837 lin.ft. 12 in. encased tile culverts, $3.50, 599 lin.ft. 15 in. encased tile culverts, $4, 250 lin.ft. 12 in. vitr. tile, $2, 634.4 cu.yd. 1:2:4 concrete $27, 598.1 cu.yd. 1:2½:5 concrete $26, 650 cu.yd. 1:5:6 concrete $25, and 6,200 lb. reinforcing steel, $0.075. Noted Jan. 29.

★Michigan—Street Highway Dept., Lansing, let contract grading, draining and surfacing 3.884 mi. State Trunk Line Rd. 14-2. Sects. B and C, 16 ft. wide, Jackson and Ingram Counties, to Meredith & Van Patten, Allen, $72,766. Work involves 19,328 cu.yd. excav. at $0.85 per cu.yd., 18,168 yd. station overhaul, $0.03, 340 lin.ft. 12 in. encased tile, $1.75, 36 lin.ft. 15 in. encased tile, $2.25, 85.1 cu.yd. 1:2:4 concrete, $22.50, 124.4 cu.yd. 1:3:6 concrete, $18.50, 4,674 lb. reinforcing steel, $.075, 30,464 sq.yd. gravel surfacing, $1.30, etc.

★Mich., Grand Rapids—City let contract grading, shaping and paving Fulton St. from Straight Ave. to John Ball Park, involving 16,000 sq.yd. sheet asphalt on concrete base, brick paving between rails, to McDermott & Cooper, 324 Widdiecomb Bldg., $78,562; Thomas Ave. from Griggs to Benton Sts., 5,000 sq.yd. concrete, to A. Haan, 436 St. James Ave., $21,160.

Wisconsin—State Highway Comn., Madison, received bids building (a) Monroe-Monticello Rd., Federal Aid Project 80, Green Co., involving 8,532 cu.yd. earth and 2,500 cu.yd. rock excav., 72,256 sq.yd. concrete surfacing, 23,900 bbl. cement, etc., (b) Horicon-Beaver Dam Rd., Federal Aid Project 150, Dodge Co., 32,392 cu.yd. earth and 2,147 cu.yd. borrow excav., 68,127 sq.yd. concrete surfacing, 23,192 bbl. cement, etc., (c) Watertown-Hubbleton Rd., Application 9, Jefferson Co., 785 cu.yd. earth excav. and 4,030 sq.yd. concrete surfacing, (d) Watertown-Hubbleton Rd., Application 10, Jefferson Co., 3,570 cu.yd. earth excav., 10,800 cu.yd. concrete surfacing and 25 cu.yd. concrete in bridges, (e) Watertown Plank Rd., Federal Aid Project 72, Dodge and Jefferson Counties, 18,365 cu.yd. earth and 72 cu.yd. borrow excav., 37,334 sq.yd. concrete in culverts, etc., from Froemming Bros., Milwaukee, (a) $242,688; McGucken Constr. Co., Milwaukee, (b) $265,836; E. L. Bartlett, Watertown, (c) $11,869, (d) $36,093, (e) $143,418; Lehman Bros., Watertown, (c) $8,846.



Highway and Building Prospects

Noted in these pages since January 1

Wisconsin—State Highway Comn., Madison, received only bid Feb. 13, paving Town Line Rd., 18 ft. wide, 1 course concrete, from R. R. Birdsall, 1108 Park Ave., Racine, involving 17,900 bbl. cement, at $2.30 per bbl., 900 cu.yd. ditching, $1.20, 35,500 cu.yd. excav., $1.20, 49,852 sq.yd. pavement, $2.12, 204 cu.yd. concrete in culverts, $25, 303 cu.yd. concrete in bridges, $39, 108 balusters, $2.50, 4,605 ft. guard rail, $70; Fond du Lac-Milwaukee Rd., 18 ft. wide, from Garvey-Weyenberg Constr. Co., 812 College St., Appleton, 38,125 sq.yd. concrete, $2.10, 220 cu.yd. ditching, $1.35, 205.8 cu.yd. Class "A" concrete, $27, 125 lin.ft. 12 in. vitr. pipe, $1.25, 14,786 cu.yd. earth excav., $1.35

★Ia., Valley Junction—City let contract paving various streets, involving 4,000 sq.yd. Class "A" concrete, to Lytton Constr. Co., Des Moines. About $14,040. Noted Feb. 12.

★Ia., Woodbine—City let contract paving, curbing and guttering and building sewers in various streets, to E. A. Wickham & Co., 19 Scott St., Council Bluffs, $99,854, $24,459 and $20,041 respectively. Noted Jan. 22.

Minn., Duluth—City received bids Feb. 2, paving 9,500 ft. Grand Ave. from 59th Ave. W., to 84th Ave. W., 42 ft. wide, 59th Ave. W, to 71st Ave. W, 18 ft. wide, 71st Ave. W, to 84th Ave. W, 18 ft. wide, from Olson & Johnson, c/o City Engr's. Office, $141,956; D. H. Clough Co., 914 East 1st St., $144,570. Work involves 34,148 sq.yd. concrete, 9,845 lin.ft. concrete curb, 1,775 lin.ft. concrete border gutter, 10,890 cu.yd. earth and 95 cu.yd. rock excav., 9,000 ft. 3 in. drain tile.

★N. D., Grafton—City let contract paving 40 blocks, bitulithic, to J. O'Connor Co., Fargo, $4.76 per yd.

★Mo., Kansas City—City let contracts to J. O'Connor & Son, 437 Spruce St., paving Norledge Pl. from Towndale Ave. to Belmont Blvd., involving 4,138 sq.yd. concrete, $3.52 per sq.yd., total cost $14,566; Bellaire Ave. from Gladstone St. to Norledge Pl., 3,481 sq.yd. concrete, $3.47, $12,079; to D. T. Brosnahan, 3233 Karned Blvd., Oakley Ave. from 27th to 31st Sts., 8,181 sq.yd. concrete, $3.64, $29,779, all to have 1:2:3½ concrete, 6 in. at center and 9 in. at curb.

Tex., Weatherford—E. A. Swofford, judge Parker Co., let contracts grading, hauling, placing, spreading, etc. with crushed rock and building rein.-con. drainage structures on 15.066 mi. Highway 1, from here to Tarrant Co. line, 18 ft wide, to Womack Constr. Co., Sherman, $180,376; surfacing same with asphaltic topping, to J. E. Ward, 520 East 13th St., Dallas, $49,586. Noted Feb. 12.

★Colorado—State Highway Comn., State Museum Bldg., Denver, let contract draining and gravel surfacing 5.672 mi. Federal Aid Project 91, and portion of State Highway 29, to Pople Bros., Trinidad.

★New Mexico—State Highway Comn., Santa Fe, let contract building 9.563 mi. Federal Aid Project 26, Bernalillo Co., cement concrete, to Lee Moor Contg. Co., 302 Two Republics Bldg., El Paso, Tex., $313,546; 1.71 mi. Tijeras Canyon Co-operative Forest Aid Project, Bernalillo Co., to F. D. Shuffebarger, Albuquerque, $6,875; grading, surfacing and draining 5.09 mi. Federal Aid Project 20-B, Lincoln Co., to Burgess & LaRoe, Palestine, Tex., $49,843; building Federal Aid Project 46, Santa Fe Co., which includes Santa Cruz Bridge and connecting road, to G. S. Exon, Espanola, $10,326.

★Wash., Davenport—Comrs. Lincoln Co. let contracts grading and building culverts on 7 mi. Permanent Highway 2, 16 and 26 ft. wide, to Triangle Constr. Co., Ritzville, $33,809; surfacing with crushed gravel, to Root & Joslin, Spokane, $29,440. Work involves 14,720 cu.yd. gravel, 42,826 cu.yd. earth, 1,707 cu.yd. rock and 967 cu.yd. loose excav.

Wash., Ephrata—Grant Co. let contract grading and gravel surfacing 7¾ mi. Permanent Highway 2, Sect. D, 16 ft. wide, involving 23,650 cu.yd. earth excav., to R. H. Nelson, Hartline. About $35,800.

★Cal., Brawley—City let contract paving 2 mi. 8th, East and West Main Sts., concrete, to D. H. Ryan, East San Diego, $133,900. Noted Jan. 29.

Cal., Fresno—Fresno Co. let contract paving 9.536 mi. Reedley-Parlier Rd., asphaltic concrete with warrenite surface, etc., to Federal Constr. Co., Call-Post Bldg., San Francisco, $200,790. Noted Jan. 22.

Cal., Holtville—City Trustees received bids paving 8 streets, Sects. A, B and C, bituminous base, Warrenite surface, cement curbs, corrugated iron culverts, etc., from G. H. Oswald, 366 East 58th St., Los Angeles, (a) $59,871, (b) $57,152, (c) $13,939; G. R. Daley, McNeece Bldg., San Diego, (a) $60,660, (b) $58,586, (c) $13,517; Federal Constr. Co., Call-Post Bldg., San Francisco, (a) $73,388. Noted Jan. 8.

★Cal., Los Angeles—Bd. Supervs. Los Angeles Co. let contract improving 12,680 ft. Francisquito Ave., 22 ft. wide, to G. T.

Streets and Roads (Continued)

McLain, 1184 North Berendo St. About $29,000. County to furnish crushed rock. Noted Feb. 12.

★**Cal., Los Angeles**—City let contracts to E. Schelling, Lankershim, improving Clementina Ave., involving 45,290 sq.ft. finish grading at $0.05 per sq.ft., 15,290 sq.ft. asphalt paving, $0.28, 340,593 sq.ft rough grading, $0.05, 340,593 sq.ft. finish grading, oiling and rolling, $0.06, 15,307 lin.ft. cement curbs, $0.60, 81,643 sq.ft. cement walks, $0.18, 33,794 sq.ft. concrete gutters, $0.25, 3 storm drains, $3,785, etc., total, $88,554; Cove Ave, 10,980 sq.ft. grading and concrete paving, 1,073 lin.ft. cement curbs and 2,400 sq.ft. cement walks, $13,146.

★**Cal., Martinez**—Contra Costa Co. let contract grading and paving 12 mi. road between Walnut Creek and Dublin and 6 mi. road between Martinez and Bookston, 20 ft. wide, concrete and asphaltic concrete, to F. Rolandi, 550 Montgomery St., San Francisco, $272,676 and $156,827 respectively.

Cal., Riverside—City reecived lowest bid paving 1 mi. Magnolia Ave., oil macadam, to include concrete culverts and cement pipe drains, from City Comrs., $32,363.

★**Cal., San Francisco**—City let contracts to Federal Constr. Co., Call Bldg, improving Hearst Ave. between Edna and Detroit Sts., $9,613, also between Detroit and Baden Sts., $19,823. Noted Feb. 12.

★**Cal., Santa Cruz**—Santa Cruz Co. let contract paving 5 mi. Watsonville-Chittenden Rd., involving 17,390 cu yd. excav. and paving, to J. Kann, Oakland, $18,005. Noted July 26.

★**Cal., Upland**—City let contract improving 14 blocks Euclid Ave., to H. H. Lienau, Redlands, $107,486. Work involves 551,190 sq.ft. resurfacing with 1½ in. oil and rock screenings at $0 28, 37,148 lin.ft. cement curbs, $0.22, 574,600 sq.ft. 4 in. concrete paving, $0.1425, 340 lin.ft. culverts, $2,000. Noted Jan. 22.

Ont., London—City plans to pave 78,000 sq yd. various streets. Work will be done by day labor under supervision of H. Brazier, city engr.

Railways

BIDS DESIRED

Ontario—Until April 1, by C. Forrester, c/o Grand Trunk Ry., London, relaying with 100 lb. rails line from London to Sarnia.

Excavation and Dredging

PROPOSED WORK

Mont., Boston — Irrigation — Crow Creek Irrigation Dist. plans to irrigate 60,000 acres near here. About $2,400,000. M. J. Steers, Radersburg, engr.

Idaho, Blackfoot—Irrigation, etc.—Upper Snake River Valley property owners, represented by G. F. Hill, having plans prepared for construction of concrete storage reservoir, at Table Rock, above Heise Hot Springs, for irrigation of valley land, will also construct main canals, laterals, floodgates, etc. About $1,500,000

Wash., Twisp—Irrigation—Twisp Irrigation Dist. plans to build system to irrigate 6,000 acres of hill land, involving high line ditch, laterals, flumes and flood gates. About $30,000. J S. Allen, Spokane, promoter.

Ore., Klamath Falls—Irrigation—Enterprise Irrigation Dist. filed $10,000 bond certification with State Irrigation Securities Comn., Salem, for irrigating 23,000 acres in Klamath Co. and building pumping plant, flumes, laterals and floodgates.

Cal., Knightsen—Irrigation — Knightsen Irrigation Dist. organized to supply water to 8,500 acres, work involves distributing system and probably independent water supply Cost between $250,000 and $300,000. H. W. Heidon, dir.

Cal., Merced—Irrigation—Merced Irrigation Dist. having investigations and report prepared on project to divert, store and distribute waters of Mercer River for irrigating 173,000 acres. About $5,000,000. E. G. Adams, secy. J B Galloway, San Francisco, ch engr

BIDS DESIRED

Ia., Des Moines—Drainage—Until March 1, by F. J. Alber, aud. Polk Co., building D D 26. Work includes widening, straightening and deepening Mud Creek and constructing cut-off, levee, etc. Noted Jan. 8.

Ia., Sioux City—Drainage—Until March 8, by W. M. Pritchard, aud. Woodbury Co., repairing and improving Sects. 14 to 20 and 1 and 7 of main ditch and laterals of Farmers' Ditch D D 1, involving 180,569 cu. yd. excav.

Tex., New Braunfels—Excavation—J. Landa receiving bids excavating for spillway at Landa Dam, here, involving 15,000 cu.yd.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., New York**—Excavation—G. A. Whalen, comr. Plant & Structures, Municipal Bldg., let contract excavating and dredging at site of Eastchester Bridge, to P. T. Cox Contg. Co., 154 Nassau St. About $28,700. Noted Jan. 29.

N. Y., Tompkinsville—Dredging—M. Hurlburt, comr. docks, Pier "A," foot of Battery Pl., New York City, received bids Feb. 18, (a) removing waterfront structures at Piers 6, 7, 8, 9, 10 and 11, Richmond Boro., (b) dredging at same place, from Riverside Contg. Co., 39 Cortland St., (a) $33,318; A. M. Hazell, Inc., 39 Cortland St., (a) $44,793; B. S. Cronin, 573 Clinton St., Brooklyn, (a) $46,000; Morris & Cummings, 17 State St., (b) $628,800; P. S. Ross, 135 Bway., (b) $657,000. Contractors all of New York City. Noted Feb. 12.

★**O., Cleveland**—Excavation—City let contract dredging Cuyahoga River, involving 85,000 to 180,000 cu.yd. excav., to Great Lakes Dredge & Dock Co., Williamson Bldg. $0.345 per cu.yd. Noted Feb. 12.

★**Cal., Long Beach**—Dredging—Belmont Pier Tract Co. let contract dredging 700,000 cu. yd. from Allamitos Bay, and filling old canal and low lands, to United Dredging Co., Central Bldg., Los Angeles, $0.144.

★**Cal., Long Beach**—Dredging—Huntington Land & Impvt. Co., Los Angeles, let contract for 700,000 cu. yd. dredging, to United Dredging Co., Central Bldg., Los Angeles. About $100,000.

★**Cal., Marysville**—Flumes—Cordura Irrigation Dist., Ellis Bldg., let contract building two 76.4 in. semi-circular metal flumes, 1,050 ft. and 3,100 ft. long, frame substructure with concrete footings, to Jenkins & Wells, 36th and 6th Sts., Sacramento, $31,548. Noted Feb. 19.

★**Cal., Palms**—Excavation—Bd. Supervs. Los Angeles Co., let contract excavating channel, 150 ft. wide, 4-5 ft deep, for Ballona Creek, involving 170,000 cu. yd. earth excav., to Ross Constr. Co., Point Loma, $0.374 per cu. yd., total $65,670. Noted Feb. 19.

Industrial Works

PROPOSED WORK

Mass., Boston—L. C. Greenleaf, archt., 101 Tremont St., receives bids about March 1, building 1 story, brick and concrete garage and machine shop, concrete flooring and foundation, on Tremont St., for W. B. Rice Estate, c/o architect. About $150,000. Noted Jan. 22.

Mass., Boston J. L. Berry, archt, 40 Central St., soon receives bids building 3 story, 50 x 80 ft., rein.-con. storage plant, concrete foundation, on St. Stephens St., for B. F. Wood Music Co., 246 Summer St About $70,000

Mass., Brockton—Jenks & Ballow, engrs., 1035 Grosvenor Bldg., Providence, R. I., soon receive bids building 1 story, 60 x 400 ft., rein.-con. and mill construction factory, concrete foundation, for G E. Keith Co., 23 Station Rd. About $350,000.

Mass., Cambridge—G. F. Snell, 96 Winthrop St. had plans prepared by C. R. Greco, archt., 8 Beacon St., Boston, for 2 story, 62 x 70 ft, brick and steel garage, concrete flooring and foundation, on Boylston St. About $30,000.

Mass., Chelsea (Boston P. O) S. S Eisenberg, archt, Exch. Bldg., soon receives bids building 2 story, 100 x 120 ft., rein.-con. garage, rein.-con. flooring, concrete foundation, on Pearl St, for F. A. Glazier, 107 Addison St. About $65,000.

Mass., Dedham—Haven & Crosby, archts., 40 Court St., Boston, soon receive bids building 2 story, 45 x 140 ft., brick and concrete addition to factory, concrete foundation, on Maverick St., here, for Dedham Finishing Co. About $40,000.

Mass., Everett (Boston P. O.)—Bunker Hill Shoe Co., Bway., plans to build 4 story, 90 x 100 ft., brick and mill construction factory. About $90,000. Burk & Bottomley, 34 School St., Boston, archts.

Mass., Quincy (Boston P. O.)—Bethlehem Shipbuilding Corp. soon lets contract building 3 story, 50 x 220 ft., concrete and steel shop, rein.-con. flooring, concrete foundation, at Fore River. About $75,000. Private plans.

Mass., Worcester—J. A. Jollette, archt., 419 Grafton St., soon receives bids building 1 story, 65 x 125 ft., brick and steel garage, concrete flooring and foundation, on West Boylston St., for J. A. Allen, care of architect. About $25,000

Mass., Worcester—Worcester Bulck Co., 803 Main St., plans to construct rein.-con. service station and sales building, on Shrewsbury St. A. H. Bowditch, 14 Bromfield St., Boston, archt.

Conn., Hartford—Nielsens Garage, 40 Temple St., plans to build 2 story, 50 x 140 ft., brick and rein.-con. garage, concrete flooring and foundation, on Maple St. About $50,000. H. H. Beokinstin, 1026 Main St., archt.

Conn., Meriden—Meriden Auto Sta., 41 West Main St., soon lets contract building 1 story, 70 x 80 ft., brick and concrete garage and service station, concrete flooring and foundation. About $30,000. Orr & Del Grella, 956 Chapel St., New Haven, archts.

Conn., New Britain — A. G. Hawker, 8 Elm St., had plans prepared by Hine & Brumbaum, archts., 242 Main St., for 1 story, 55 x 100 ft., brick and concrete garage and service station, concrete flooring and foundation. Cost between $25,000 and $30,000.

Conn., New Britain — M. Sicklick, 117 Willow St., plans to build 1 story, 60 x 150 ft., brick and concrete garage, concrete flooring and foundation, on Arch St. About $40,000. F. C. Walz, 348 Trumbull St., Hartford, archt.

Conn., New Haven — J. V. Capuano, 65 Wallace St., plans to build 1 story, 65 x 140 ft., brick and concrete garage, concrete flooring and foundation, on Chapel St. About $30,000. H. S. Cannicci, 42 Church St., archt.

Conn., New Haven—O. B. Horth & Co., 67 Franklin St., plans to build 1 story, 40 x110 ft., brick and mill construction addition to plant, concrete flooring and foundation. About $25,000. Shiner & Appel, 185 Church St., archts.

Conn., Plainville—Standard Steel & Roller Bearing Co. having preliminary plans prepared for 1 story factory. About $75,000

Conn., South Manchester — E. J. Holl, Cheney Bldg., plans to build 1 story, 80 x 106 ft., brick and concrete garage, concrete flooring and foundation, at Keebet Court About $25,000. A. E. Fiske, 709 Main St., archt.

Conn., South Manchester—Stephens-Williams Co., 361 Center St., soon receives bids building 1 story, 80 x 195 ft., brick and steel garage and showrooms, concrete foundation, on Center St. About $60,000 A. E. Fiske, Johnson Bldg, archt.

Conn., Westbrook—Knothe Bros. Co., 121 5th Ave., New York City, plans to build 2 story, 54 x 150 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, here. About $120,000. Fletcher, Thompson, Inc., 1089 Broad St., Bridgeport, engrs.

N. Y., Binghamton—Dunn & McCarthy Shoe Co., 30 Charlotte St., plans to build brick addition to factory. About $50,000

N. Y., Buffalo—J Dold Packing Co, 715 William St, plans to build 2 story, concrete and steel repair shop, at 341 Howard St. About $35,000

N. Y., Buffalo—Donner-Union Coke Corp, 105 Beacon St., plans to build brick and steel service station, also brick, frame and concrete, first aid station, at 175 Abbott Rd About $25,000.

N. Y., Jamestown—City voted $250,000 bonds to enlarge electric lighting plant Address Bd Water & Lighting Comrs.

Industrial Works (Continued)

N. Y., Long Island City—New York & Queens Electric Light & Power Co., Bridge Plaza, soon lets contract altering 3 story, 35 x 100 ft., brick and steel garage, rein.-con. flooring, on Hamilton Ave. near Harris Ave. About $25,000. Private plans.

N. Y., New York—A. Klinghoffer, 259 West 30th St., having plans prepared by L. A. Shelnart, archt. and engr., 194 Bowery, for 2 story, 65 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 1-9 Old Bway. About $75,000.

N. Y., Potsdam—A. Kuyle, Monticello, plans to build hydro-electric plant, here.

N. Y., Rochester — Virginia-Carolina Chemical Co. plans to build concrete and steel factory, on Lyell Ave. and Barge Canal. About $500,000.

N. Y., Watertown—H. H. Babcock Co., Factory Sq., plans to build power house, generator and tail race. About $100,000.

N. J., West Hoboken—F. A. Ringler, 39 Barclay St., New York City, soon lets contract building 1 story, 100 x 130 ft., brick and steel warehouse, rein.-con. flooring, concrete foundation, on Palisade Ave. About $40,000. R. Berger & Son, 309 Bway., New York City, archts. and engrs.

Pa., Doranceton (Wilkes Barre P. O.)—Duplan Silk Corp., Wilkes Barre, having plans prepared by G. Welch, archt., Coal Exch. Bldg., Wilkes Barre, for 3 story, 100 x 300 ft., brick ad steel addition to mill, rein.-con. flooring, rock foundation, here. About $400,000.

Pa., Hazleton — Hazleton Produce Co., South Laurel St., plans to build 3 story, 40 x 120 ft., rein.-con., brick and steel warehouse. rein.-con. flooring, rock foundation. About $60,000. Architect not selected.

Pa., Kingston—Kingston Silk Co. plans to build 2 story, 50 x 100 ft., brick and steel mill, rein.-con. flooring, rock foundation, on Market St. About $65,000. Architect not selected.

Pa., Wilkes Barre—Vulcan Iron Wks., 730 South Main St., having plans prepared by E. D Rineheimer, engr., Carlisle St., for 90 x 200 ft. shop 40 ft. high, concrete, brick and steel, on Hazle Ave. About $130,000.

Md., Curtis Bay (Baltimore P. O.) — Sterno Corp., recently organized with $2,000,000 capital stock, secured 37 acre site on waterfront, here, and plans to build plant for manufacture of heating devices. About $1,500,000. C. Haner, Jr., c/o U. S. Industrial Alcohol Co., Curtis Bay, resident dir.

La., New Orleans—Simms Oil Co. plans to build 20,000 bbl. refinery here at tidewater terminus, 280 mi. 8 in. pipe line from here to Sibley, also install 7 pumping stations at 40 mi. intervals. About $12,000,000. C. B. Deming, vice. pres. Engineer not selected.

O., Cincinnati—Fischer Specialty Mchy. Co., 2076 Reading Rd., plans to build 100 x 200 ft. factory, on McMillan St. About $100,000. Architect not selected.

O., Cleveland—A. Kahn, archt., Marquette Bldg., Detroit, receives bids about March 4, building 7 story, 120 x 130 ft., brick, rein.-con. and steel plant, on Coit Rd., for Fisher Body Co., Oakland and Piquette Aves. Noted Feb. 19.

O., Cleveland—F. J. Gatch, Guardian Bldg., plans to construct 1 story, 140 x 200 ft., brick, concrete and steel garage and commercial building rein.-con. flooring, concrete foundation, on Euclid Ave. near East 65th St. About $100,000. Architect and engineer not selected.

O., Hamilton—City having plans prepared for light plant. Bonds for $650,000 voted for project.

Mich., Detroit—H H. Lane, archt. and engr., 2320 Dime Bank Bldg., preparing plans for 2 story, 60 x 100 ft., concrete, brick and steel, service and sales building, rein-con. flooring, concrete foundation, on 2nd Ave. About $30,000. Owners name withheld.

Mich., Detroit—C. E. Smith & Co., 708 Empire Bldg., had plans prepared by E. R. Dunlap, archt., 709 Hammond Bldg., for 2 story, 100 x 200 ft., rein.-con., brick and steel garage and salesroom, rein.-con flooring, concrete foundation, on John R. St. and Edmund Pl. About $60,000.

Ill Chicago—Foell Supply Co., 331 West 22nd Pl., plans to build 3 story, packing plant, on 47th St. near Kedzie Ave. About $200,000. Architect not announced.

Ill., Chicago—E. O. Reed Co., Inc., 2956 North Leavitt St., plans to build factory on Fletcher St. along tracks of St. Paul R.R. About $175,000. Architect not announced.

Ill., Elgin—Elgin Natl. Watch Co., 10 South Wabash Ave., Chicago, having plans prepared by Postle & Fisher, archts., 140 South Dearborn St., for several 4 story buildings, rein.-con., brick, rein.-con. flooring, concrete foundation, adjoining present plant. About $1,000,000.

Wis., Sheboygan—Leverenz Shoe Co., c/o C. Leverenz, 222 Huron Ave., had plans prepared for 3 story, 50 x 70 ft., brick, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on North 8th St. About $40,000. Private plans.

Wis., West Bend—West Bend Lithia Co. having plans prepared by Federal Eng. Co., archts. and engrs., Stephenson Bldg., Milwaukee, for 2 story, 35 x 80 ft., rein.-con. and brick plant, rein.-con. flooring, concrete foundation.

Kan., Hiawatha—Hiawatha Light, Power & Ice Co. plans to improve plant and construct ice storage building, brick and steel, concrete foundation. About $50,000.

Kan., Topeka — Beatrice Creamery Co., 2d and Polk Sts., having plans prepared building 3 story, brick, concrete and steel addition to creamery, concrete foundation. About $100,000. Private plans.

Neb., Aurora—Sandin Auto Co. having plans prepared by Gabe & Helleberg, archts., Columbus, for 1 story, 120 x 211 ft. rein.-con., brick and steel garage, rein.-con. flooring, concrete foundation. About $60,000.

Neb., Columbus—Gottberg Auto Co. having plans prepared by Gabe & Helleberg, archts., Columbus, building 2 story, 90 x 132 ft., rein.-con., brick and steel garage, rein.-con. flooring, concrete foundation. About $80,000.

Tex., Houston—Japanese Cotton Trading Co., Grain and Cotton Exch. Bldg., Ft. Worth, plans to build rein.-con. warehouse and 50,000 bale compress along tracks of Houston Belt R. R. About $300,000. Architect and engineer not selected.

Okla., Oklahoma — New State Shirt & Overall Co. having plans prepared by C. P. Nieder, archt., Oklahoma, for 3 story, 80 x 190 ft., rein-con. factory, rein.-con. flooring. About $140,000.

Okla., Sand Springs—Tulsa Stove & Fdry. Co., plans to build 1 story, 72 x 320 ft. addition to foundry, south of here. About $50,000. Architect and engineer not selected.

Okla., Tulsa—Robinson Packer Co., 226 East 3rd St., plans to build 2 story, 90 x 130 ft. factory, at 209-217 North Main St. About $100,000. O. K. Eysenbach, pres. Architect and engineer not selected.

Okla., Tulsa—Universal Motor Car Co., Cameron and North Main Sts., plans to build 2 story, 140 x 200 ft. machine and repair shop, on 2nd and Frankfort Sts. About $150,000. E. M. Vanderslice, pres. Architect and engineer not selected.

Wash., Entiat — Entiat Fruit Growers League plans to build 4 story, 110 x 210 ft., rein.-con. packing plant and warehouse. About $50,000. G. H. Keith, Hutton Bldg., Spokane, archt.

Wash., Spokane—Spokane Co. having plans prepared by A. Rigg. archt., Peyton Bldg., for rein.-con. garage. About $35,000.

Wash., Vancouver — Columbia Dairy Products Co. leased Star Brewery plant and plans to convert same into cold storage plant About $100,000. Previous plans abandoned. Rasmussen, Grace Co., Bates Bldg., archts. Noted Jan. 29.

Ore., Portland—Meier & Frank Co., 5th and Morrison Sts., having plans prepared by Sutton & Whitney, archts., Lewis Bldg., for 10 story, flat slab, rein.-con. warehouse. About $1,000,000.

Cal., Burbank—A. Burbank Motor Co., Marsh-Strong Bldg., Los Angeles, retained F. R. Dorn, archt., Marsh-Strong Bldg., Los Angeles, to prepare plans for three 1 story, 50 x 165 ft., brick and timber factory buildings, concrete foundation. Cost including equipment, $125,000.

Cal., Davis — University of California, Berkeley, having plans prepared by W. C. Hays, archt., 1st Natl. Bank Bldg., San Francisco, for 1 story, rein.-con. creamery, on University Farm. About $100,000.

Cal., Los Angeles—Eno Tire & Rubber Co., 1026 South Los Angeles St., plans to build 1 story, 188 x 195 ft., brick and hollow tile factory, concrete foundation on Slawson Ave. Architect not selected.

Que., Quebec—P. L. Lortie, Ltd., 138 Bridge St., plans to build 2 story, 100 x 160 ft. garage, brick, steel and timber, rein.-con. flooring, concrete foundation, on St. Paul St. About $80,000. A. Bastien, 138 St. Anne St., engr.

BIDS DESIRED

R. I., Providence—Until March 15, by T. C. Hermann, archt., 17 Exchange St., building 1 story, 60 x 160 ft., brick garage and service station, concrete flooring and foundation, on Elmwood and Lenox Aves., for W. L. Wilcox, 322 Bway. About $35,000.

N. J., Hoboken—Until March 1, by J. C. Schaffler, engr. and archt., 40 West 32nd St., New York City, building 6 story, 135 x 135 ft., also 3 story, 20 x 80 ft. foundry. rein.-con. and steel, rein.-con. flooring, concrete foundation, for White Metal Mfg. Co., 1006 Clinton St. Noted Jan. 29.

Pa., Phila.—Mills & Van Kirk, archts. and engrs., Harrison Bldg., receiving bids building 1 story, 62 x 200 ft. and 16 x 20 ft., brick and steel factory, on Hope and Palmer Sts., for Standard Crown Co. About $35,000. Noted Feb. 5.

Mich., Detroit—Until March 4, by L. Scisorek, archt., 225 Farwell Bldg., constructing 2 story, brick and steel factory, brick foundation, on A St., for Detroit Belt Lacer Co., 27 A St. About $35,000. Noted Feb. 12.

Mich., Detroit—Until March 5, by Brown & Preston, archts., 406 Empire Bldg., constructing brick and steel factory, with 2 story, 36 x 60 ft. office building and 18 x 22 ft. boiler house, concrete foundation, for Pharo Mfg. Co., 1336 Woodward Ave. About $30,000. Noted Feb. 12.

Ill., Chicago—G. S. Kingsley, archt., 109 North Dearborn St., receiving bids building 6 story, 75 x 175 ft., rein-con., brick and terra cotta warehouse, rein.-con. flooring, concrete foundation, on Madison St. and 60th Ave., for Jackson Express & Van Co., 3611 West 22nd St. About $175,000. Noted Jan. 29.

Wis., St. Francis (Milwaukee P. O.)—Milwaukee Electric Ry. & Lighting Co., Pub. Serv. Bldg., Milwaukee, receiving bids constructing five 1 story, brick, concrete and steel power plant buildings, rein.-con. flooring, concrete foundation. About $500,000; cost plus percentage basis. R. H Pinkley, c/o owner, archt. Noted Feb. 12.

Kan., Emporia—Until March 11, by State Bd. Administration, Topeka, building 1 story, 82 x 110 ft. power plant, with 35 x 40 ft. brick stack, brick, concrete and steel, concrete foundation. About $70,000. R. L. Gamble, 1415 Fillmore St., Topeka, archt. J. A. Kimball, mgr. Noted Feb. 5.

N. D., Grand Forks—Until March 15, by Industrial Comm of North Dakota, Bismarck, building flour mill, 2,000 to 3,000 bbl. daily capacity, 1,500,000 bu. capacity elevator and 8 story, 40 x 160 ft. office building, rein.-con. and mill construction. About $1,500,000. C. L. Pillsbury Co., 805 Metropolitan Life Bldg., Minneapolis, Minn., engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Dorchester—(Boston P. O.)—Mason Regulator Co., 1190 Adams St., let contract building 2 story, frame addition to factory, concrete foundation, to J. T Scully Foundation Co., 1st St., East Cambridge. About $30,000.

★Mass., Roxbury—M. Nigroch, c/o J. A Tuck, archt., 34 School St., Boston, will build 1 story, 110 x 115 ft., brick garage, concrete flooring and foundation, on Walnut Ave. About $35,000. Work will be done by day labor under supervision of architect. Noted Jan. 29.

★Mass., Springfield—H. L. Sprague, archt. 310 Main St., let contract to L. S. Wood, 14 Stockbridge St., building 2 story, 71 x 195 ft. and 48 x 271 ft., brick and steel plant, concrete foundation, on Warwick Ave., for Cheney-Bigelow Wire Wks. About $100,000. Noted Jan. 22.

★Conn., Bridgeport—Bd. Contr. & Supply let contract building 1 story, 146 x 200 ft., brick and rein.-con. garage, rein.-con. flooring, concrete foundation, on Madison Ave., to Eastern Eng. & Constr. Co., 886 Main St. About $150,000

Industrial Works (Continued)

★Conn., Bridgeport—Bridgeport Castings Co., 250 North Ave., let contract building 1 story, 134 x 198 ft., brick and steel foundry, concrete flooring and foundation, on North Ave., to T. J. Pardy Constr. Co., 1484 Seaview Ave. About $70,000.

★Conn., Bridgeport — Bridgeport Screw Co., Union Ave., let contract building 2 story, 60 x 150 ft. rein.-con. factory and 2 story, 49 x 101 ft., brick and steel addition to factory, rein.-con. flooring, concrete foundation, on Central Ave., to Levering & Garrigues Co., 552 West 23d St., New York City. About $100,000. Noted Jan. 15.

★Conn., Bridgeport—Ballinger & Perrot, archts. and engrs., 17th and Arch Sts., Phila., let contract to Schwarz Bros. Co., 95 River St., building 1 story, 105 x 340 ft., brick, concrete and steel weave shed, rein.-con. flooring, concrete foundation, on Kossutb St., for Salts Textile Mfg. Co. About $150,000. Noted Feb. 5 under "Bridgeport N. Y."

★Conn., Hartford—G. I. Whitehead, 1 Crescent St., let contract building 2 story, 50 x 100 ft., brick and concrete garage, concrete flooring and foundation, on New Britain Ave., to W. T. Ryan & Son, 149 Barker St. About $35,000.

★Conn., Meriden—International Silver Co., 48 State St., let contract building 1 story, 42 x 130 ft., brick and mill construction addition to factory, rein.-con. flooring, concrete foundation, on Brooks St., to J. H. Grozier Co., 756 Main St., Hartford. About $25,000.

★Conn., South Norwalk—Daynor Realty Co., care of J. C. Schaeffler, archt. and engr., 40 West 32nd St., New York City, let contract building 5 story, 43 x 210 ft., brick and concrete factory, concrete flooring and foundation, on Day St., here, to Dillon & Wiley, 214 West 34th St., New York City. About $150,000. Noted Jan. 15.

★Conn., Stamford—Yale & Towne Mfg. Co., 548 Pacific St., let contract building 6 story, 50 x 202 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, to Amer. Concrete Steel Co., Clinton St., Newark, N. J. About $360,000.

★Conn., West Hartford (Hartford P. O.) —M. Cobn, 63 Orange St., Hartford, let contract building 1 story, 52 x 195 ft., concrete garage, rein.-con. flooring, concrete foundation, on Prospect Ave., to W. J. Sexton Co., 847 Main St., Hartford. About $60,000.

★Conn., Windsor—General Electric Co., Lynn, Mass., let contract building 3 story, 60 x 200 ft., brick, concrete and steel addition to factory, rein.-con. flooring, concrete foundation, to W. M. Bailey, 88 Broad St., Boston. About $80,000. Noted Jan. 22.

★Conn., Windsor Locks—J. R. Montgomery Co. let contract building 2 story, 80 x 200 ft., rein.-con. and steel sash construction, dye house, rein.-con. flooring, concrete foundation, to B. Bartlett, 43 Ann St., Hartford. About $75,000. Noted Jan. 29.

★N. Y., Amsterdam—Shuttleworth Bros. Co. let contract building 6 story, 62 x 300 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, to Turner Constr. Co., 244 Madison Ave., New York City. About $400,000.

★N. Y, Brooklyn—I. Gootzeit, 9 Wayne Ave., Middle Village, L. I., will build 5 story, 75 x 100 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Decatur St. and Myrtle Ave. About $65,000 Work will be done by day labor.

★N. Y., Brooklyn—Langbein Bros., 285 Flatbush Ave., will build 1 story, 100 x 175 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Chester Ave. About $55,000. Work will be done by day labor.

★N. Y., College Point (Flushing P. O.)—Amer. Hard Rubber Co. will build 120 x 130 ft., brick and steel factory, rein.-con flooring, concrete foundation. Work will be done by day labor.

★N. Y., Lockport—Covert Gear Co., Grand St., let contract building 3 story, addition to plant, to Curran-Swartout Co., Rochester. About $250,000.

★N. Y., New York—I. Dietelbaum, c/o S. B. Eisendrath, archt. and engr. 18 East 41st St., will build 1 story, brick and steel garage, rein.-con. flooring, concrete foundation, at 513-515 West 130th St. About $35,000. Work will be done by day labor.

★N. Y., Woodhaven (Jamaica P. O.)—Merritt Hosiery Co., c/o Block & Hesse, archts. and engrs., 18 East 41st St., New York City, let contract building 4 story, 60 x 180 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on 104th St., to Barney-Ahlers, 110 West 40th St., New York City. Noted Feb. 19.

★N. J., Jersey City—Continental Candy Co. let contract building 4 story, brick and steel factory, rein.-con. flooring, concrete foundation, on 15th, 16tb, Cole and Monmouth Sts., to R. W. Grange, 527 5th Ave., New York City. About $250,000. Noted Feb. 19.

★N. J., Treoton—Blakely Laundry Co., 11 South Warren St., let contract building 1 story, 125 x 200 ft., brick, steel and concrete laundry, on North Montgomery St., to N. A. K. Bugbee Co., 206 East Hanover St. About $125,000.

★Pa., Phila.—Hotel Brotherhood United States America, care of A. C. Borzner, archt., 717 Walnut St., let contract building 2 story, 67 x 120 ft., brick and limestone garage and hall, on Bainbridge and 16th Sts., to F. F. Trent, care of architect. About $32,000. Noted Jan. 15.

★Pa., Wilkes-Barre — Sheldon Axle Co., 221 Conyngham St., let contract building 1 story, 100 x 220 ft., brick plant, rein.-con. flooring, concrete foundation, on Beaumont St., to J. Curtis & Co., Hill St. About $61,000.

★Md., Hagerstown—D. A. Stickel & Son, 67 West Baltimore St., let contract building 4 story, 50 x 60 ft., rein.-con. and steel warehouse, concrete flooring, concrete foundation, on West Baltimore St., to Deverell, Spencer & Co., 514 Garrett Bldg., Baltimore. About $60,000.

★Ga., Atlanta—Crane Co., 31 Garnett St., let contract building 4 story, 100 x 100 ft. rein.-con. warehouse, rein.-con. flooring on Washington St., to Griffin Constr. Co., Candler Bldg. About $120,000.

★O., Cincinnati—W. Stacey Storage Co., 2333 Gilbert Ave., let contract building 5 story, 60 x 120 ft., concrete, steel and brick storage plant, on Gilbert Ave., to Roche Constr. Co., Johnston Bldg. About $125,000.

★O., Columbus—German-Amer. Publishing Co., 201 Hartman Bldg., let contract building 5 story, 50 x 62 ft., concrete and brick plant, on East Main St., to E. Elford, Commercial Bldg. About $55,000. Noted Feb. 5.

★O., Columbus—H. C. Godman Co., 31 North 4th St., let contract building 3 story, 45 x 187 ft., brick and concrete factory, on Thurman Ave., to H. H. Carr, 2582 West Broad St. About $100,000.

★O., Dayton—Computing Sale Co., 448 Huffman Ave., let contract building 5 story, 50 x 75 ft. rein.-con. and brick factory, rein.-con. flooring, concrete foundation, to F. H. Smith, 1035 Reibold Bldg. About $100,000.

★O., Dayton—Dodge Bros. Auto Sales Co. let contract constructing 3 story, 60 x 100 ft., rein.-con. and brick garage and sales building, rein.-con. flooring, concrete foundation, to F. H. Smith, 1035 Reibold Bldg. About $80,000. Noted Nov. 27.

★O., Dayton—Natl. Cash Register Co., Main and K. Sts., let contract building 2 story, 60 x 350 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on South Main St., to Davies, Chism, & Davies, Columbus. About $85,000. Noted Aug. 21.

★O., Norwood—Allis-Chalmers Co., Forest Ave., let contract building 3 story, brick and concrete addition to factory, on Forest Ave., to H. C. Hazen Constr. Co., 2070 Reading Rd., Cincinnati. About $75,000.

★Mich., Detroit—Detroit Gear & Machine Co., Franklin St., let contract building 3 story, 67 x 70 ft. and 73 x 133 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, on Woodbridge St., to Walbridge-Aldinger Co., 2356 Penobscot Bldg.

★Mich., Detroit—Morgan & Wright (U. S. Rubber Co.), Jefferson and Bellevue Sts., let contract building 2 story, 81 x 90 x 275 ft., rein.-con. and brick, power house, rein.-con. flooring, concrete foundation, on Jefferson St., to Stone & Webster, Book Bldg., About $1,000,000.

★Mich., Saginaw—Lufkin Rule Co., Hess Ave., let contract building 1 story, 115 x 219 ft., brick and steel factory, concrete flooring and foundation on Hess Ave. and Prescott St., to Cooper-Widenmann Constr. Co., 1430 Penobscot Bldg. Detroit. About $100,000.

★Wis., Milwaukee—Herbst & Kuenzli, archts. and engrs., Caswell Blk., let contract to P. Nogtegaal, 11 32nd St., building 1 story, 157 x 200 ft., rein.-con. and brick garage, rein.-con. flooring, concrete foundation, on Prospect Ave., for R. & S. Realty Co., 409 Ry. Exch. Bldg. About $80,000. Noted Jan. 1.

★Ia., Cedar Rapids—Pennick & Ford, Inc. will reconstruct factory buildings destroyed by explosion, also construct several new buildings, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $5,000,000. Work will be done by day labor under supervision of R. H. Dyer, supt.

★Kan Hutchinson—R. Seibold Candy Co. let contract building 4 story, 42 x 113 ft., brick, concrete and steel factory, concrete foundation, to Stamey-Mackey Constr. Co., Hutchinson. About $55,000; cost plus percentage basis.

★Neb., Omaha—Trimble Bros., 11th and Howard Sts., let contract building 3 story, 126 x 136 ft. rein.-con. warehouse and office, rein.-con. flooring, concrete foundation, on 8th and Jackson Sts., to G. Parsons, 616 Keeline Bldg. About $200,000.

★Tex., Houston — Houston Mill & Elevator Co. let contract building elevator, 500,000 bu. capacity, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation to Burrell Eng. Co., Security Bldg., Kansas City, Mo. About $40,000; cost plus percentage basis.

★Tex., Plainview — Harvest Queen Mill & Elevator Co. let contract building 225,000 bu. capacity elevator, rein.-con. brick and steel, rein.-con. flooring, concrete foundation, to Burrell Eng. Co., Security Bldg., Kansas City, Mo. About $150,000; cost plus percentage basis.

★Ore., Hillsboro—E. E. McClaren, archt., Lumber Exch. Bldg., Portland, let contract to C. H. Rice, Oak Grove, building 1 story, 86 x 370 ft. cannery, hollow tile, here, for Ray & Son, Sherlock Bldg., Portland. Cost between $55,000 and $60,000 Noted Jan. 29.

★Cal., Los Angeles—C. Ray Production Co., 1425 Fleming St. let contract building 70 x 130 ft. addition to plant, to include steel, glass and wood stage, brick, hollow tile and concrete offices, electrical generating plant, etc., to Nance Constr Co., 846 Linden St. About $50,000; cost plus percentage basis.

★Cal., Oakland—Natl. Ice & Cold Storage Co., 2d and Market Sts., let contract building 1 story, rein.-con. plant, on North 1st St., to Nelson & Forsytb, Union Savings Bank Bldg. About $200,000. Noted Jan. 22.

★Ont., Peterboro—Canadian Aladdin Co., Canadian Pacific Ry. Bldg., Toronto, let contract building 3 story, 60 x 80 ft., brick, concrete and steel factory, rein.-con. flooring, concrete foundation, to Dickie Constr. Co., Ryrie Bldg., Toronto. About $125,000.

Buildings

PROPOSED WORK

Me., Augusta — Home — State Hospital Comn. had plans prepared by H. S. Coombs, archt., 11 Lisbon St., Lewiston, for 3 story. home for nurses, brick and stone, rein.-con flooring, stone foundation. About $100,000.

Me., Bath—Club—Amer. Legion, (R. H. Smith Post 21), plans to build club home. About $75,000. W. P. Oakes, commander. Architect is not selected.

N. H., Concord—Theatre—J. Cohn, 226 Weybosset St., Providence, R. I., plans to build brick and concrete theatre, on North Main St., here. About $200,000. Architect not selected.

N. H., Laconia—High School—Bd Educ. having plans prepared by P. S. Avery, archt., 95 Milk St., Boston, for 2 story, 70 x 180 ft. brick and steel. About $225,000.

Mass., Boston—Church and Community—Dixie & Smilie, archts., 585 Boylston St., soon let contract building 2 story, 40 x 150 ft., brick, rock or concrete foundation, on Madison and Warwick Sts., for 4th Negro Methodist Episcopal Society, 36 Williams St., Roxbury. About $50,000.

Mass., Boston—Hospital—F. J. Cotton, 520 Commonwealth Ave., plans to build brick and concrete hospital on Pond and Allerton Sts. About $150,000. Architect not selected

Mass., Boston — School — Suffolk Law School, Beacon St., having plans prepared

Buildings (Continued)

by Fay, Spofford & Thorndike, archts., 15 Beacon St., for 3 story, brick and stone, concrete foundation, on Temple St. About $150,000.

Mass., Brookline (Boston P. O.)—Hotel—Beacon Associates had plans prepared by J. J. Smith, archt., Old South Bldg., Boston, for 5 story, 200 x 400 ft., brick, concrete and stone, concrete foundation, on Beacon St. About $1,000,000.

Mass., Cambridge — Hotel — Barnard Constr. Co., 1783 Massachusetts Ave., plans to build 8 story, 50 x 200 ft., brick, concrete and steel, on Church St. About $275,000. C. R. Greco, 8 Beacon St., Boston, archt.

Mass., Chicopee—Theatre—W. H. Cone, Hampden St., plans to build 1 story, brick and steel. About $60,000. R. B. Warner, 168 Bridge St., Springfield, archt.

Mass., Framingham—Theatre—Blackall, Clapp & Whittemore, archts., 20 Beacon St., Boston, soon receive bids building 2 story, 145 x 200 ft., brick and concrete, concrete flooring and foundation, for St. George Theatre. About $300,000.

Mass., Holyoke — Club — Amer. Legion, (J. S. Begley Post), plans to construct club and social building. About $100,000. Architect not selected.

Mass., Holyoke—Temple—Masonic Temple Society, 280 High St., plans to build 3 story, brick and steel, on Chestnut St. About $125,000. G. P. B. Alderman & Co., Mills-Alderman Bldg., archts.

Mass., Lowell—Hotel—O'Connell & Shaw, archts., 18 Boylston St., Boston, soon receive bids building 7 story, 80 x 100 ft., rein.-con., rein.-con. flooring and foundation, on Middle St., for F. E. Harris, c/o Hotel Harisonia, 21 Central St. About $175,000.

Mass., Northampton—Theatre and Business—C. F. Atkinson, c/o Frank & Wilcox, archts., 1148 Old South Bldg., Boston, plans to build 1 and 2 story, 85 x 190 ft., brick and wood, concrete foundation, on King St. About $150,000.

Mass., Pittsfield—School—City plans to build 6 room brick grammar school, in Lakewood Dist. About $75,000. L. A. Merchant, mayor. Architect not selected.

Mass., Quincy—City Hall—City plans to build 3 story, brick and concrete addition, on Hancock St. About $150,000. W. Chapman, 15 Ashburton Pl., Boston, archt.

Mass., Worcester—Business—B. Press, 1 Granite St., plans to build 5 story, 85 x 90 ft., brick and steel, on Pearl St. About $75,000. E. T. Chapin, 310 Main St., archt.

Mass., Worcester—Church—St. Joseph Roman Catholic Society, 34 Wall St., plans to build brick and steel, on Hamilton St. About $125,000. J. C. Allaro, rector.

Mass., Worcester—Sales—See "Industrial Works."

Conn., Allingtown — Home — Home for Italian Orphans and Aged, c/o Della, Valle & Vece, archts., 865 Chapel St., New Haven, plans to build home, here. About $150,000.

Conn., Bridgeport—Convent and Community—St. Charles Roman Catholic Society 399 Ogden St., plans to build brick and steel, on Stillman St. About $75,000. P. J. McGivney, pastor. Architect not selected.

Conn., Bristol—School—W. P. Crabtree, archt., 272 Main St., New Britain, soon receives bids building brick school, concrete foundation, on King St., East Bristol, for Bd. Educ.

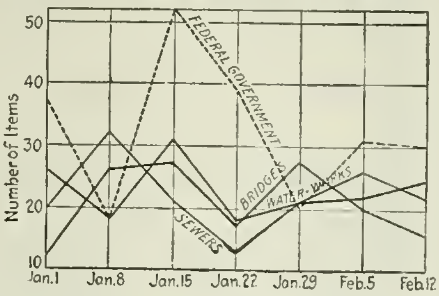
Conn., Hamden (New Haven P. O.)—School—Town plans to build 2 story, brick and steel, on Pine St. About $65,000. F. W. Dietter, 1262 Whitney Ave., chn, Architect not selected.

Conn., Hartford—High School—South School Dist. having plans prepared by Whiton & McMahon, archts., 36 Pearl St., for 3 story with 2 ells, brick and stone, concrete foundation, on Maple Ave. and Benton St. About $1,250,000.

Conn., South Manchester—Business—F. Donahue, 30 Florence St., plans to build 3 story, brick and steel, on Main St. About $50,000. A. E. Fiske, 709 Main St., archt.

Conn., Manchester — Society — Swedish Society, c/o A. E. Fiske, archt., 709 Main St., plans to build 2 story, 50 x 150 ft., brick and steel, on Bissell St. About $50,000.

Conn., Mt. Carmel (New Haven P. O.)—School—Hamden Twp. plans to build 2 story, on Woodruff St., here. About $65,000. F. W. Dietter, 1262 Whitney Ave., Hamden, chn. Architect not selected



Construction News on Public Work

Published in Engineering News-Record Issues of 1920

These pages tell you what's moving in the Construction World

Conn., New Britain—School—School Bd. plans to build additions to schools. About $525,000. Architect not selected.

Conn., Seymour—High School—Johnson & Burns, archts., 174 Bond St., Hartford, receive bids about March 1, building 2 story, 62 x 124 ft. with 42 x 57 ft. ell, brick and terra cotta, rein.-con. foundation, here, for East Hartford Dist. About $150,000. R. C. Clark, Seymour St., supt. Noted Jan. 15.

Conn., South Manchester—Business—A. Hausmann, Bissell and Spruce Sts., plans to build 3 story, 44 x 110 ft., brick, limestone and steel, on Main St. About $50,000. A. E. Fiske, 709 Main St., archt.

Conn., South Manchester—Offices—F. Donohue, 30 Florence St., having preliminary plans prepared by A. E. Fiske, archt., Johnson Bldg., for office building on Main St. About $60,000.

Conn., South Manchester—Showroom—See "Industrial Works."

Conn., South Manchester—Stores and Offices—J. C. Sharon having plans prepared by A. E. Fiske, archt., Johnson Bldg., and receives bids in spring building 3 story, 40 x 100 ft., brick and concrete, concrete flooring, on South Main St. About $60,000.

Conn., South Manchester—Stores and Offices—J. Sheehan, Bissell St., having plans prepared by A. E. Fiske, archt., Johnson Bldg., for 3 story, 40 x 110 ft., brick, concrete foundation, on Main St. About $60,000.

Conn., Torrington—School—School Bldg. Comn. plans to build 2 story, 8 room addition to North School on Pythian Ave. and Elm St. Cost between $80,000 and $90,000. W. E. Hunt, 197 Water St., archt.

Conn., Torrington—Schools—School Bldg. Comn. plans to build 1 story, 2 room addition to school on Migeon Ave. and 2 story, 4 room addition to school on Riverside Ave., brick and steel. About $60,000. W. E. Hunt, 197 Water St., archt.

Conn., Torrington—School—Town School Bldg. Comn. plans to build 2 story, 8 room addition to Southwest School, on High St. and Litchfield Ave. About $90,000. W. E. Hunt, 197 Water St., archt.

Conn., Waterbury—School—St. Francis Xavier Roman Catholic Society, 625 Baldwin St., plans to build brick and steel. About $75,000. J. J Egan, pastor. Architect not selected.

Conn., Waterville (Waterbury P. O.)—School—St. Michael Roman Catholic Society, Main St., plans to build 2 story, brick and steel. About $60,000. D. P. O'Donnell, pastor. Architect not selected.

N. Y., Buffalo—Club—Buffalo Club, 388 Delaware Ave., purchased Ganson Property adjacent on Delaware Ave. and plans to build addition to club house. About $600,000.

N. Y., Jamestown—School—Bd. Educ. had plans prepared by J. O. Betelle, archt., 44 Park Pl., Newark, N. J., for 3 story, brick and stone, on East 2nd St., here. About $800,000.

N. Y., New York—Hospital—L. A. Sheinart, archt. and engr., 194 Bowery, receives bids about March 15, building 6 story, 40 x 73 ft., brick, steel and stone, brick foundation, at 1322-1324 Lexington Ave., for Beth David Hospital, 1326 Lexington Ave. About $50,000. Noted Feb. 12.

N. Y., New York—Office—J. S. Bache & Co., 42 Bway., having plans prepared by H. I. Cobb, archt. and engr., 1465 Bway., altering 5 story, brick, steel and stone, at 31-33 Bway. About $100,000.

N. Y., New York—Stores and Lofts—E. Friedman, 3rd Ave. and 119th St., having plans prepared by Buchman & Kahn, archts. and engrs., 56 West 45th St., for 5 story, brick and steel, brick foundation, on 120th St. and 3rd Ave.

N. Y., Niagara Falls—Theatre—Niagara Cataract Theatre Co., 31 Falls St., plans to build 4 story, 110 x 132 ft., brick, concrete and steel. Cost between $475,000 and $500,000.

N. Y., Syracuse—Police Station—City plans to build 2 police stations. About $150,000. W. W. Nickolson, comr. pub. safety. Architect not selected.

N. Y., Syracuse—Temple—Labor Temple Assn. plans to build labor temple on East Fayette St. About $75,000. H. M. Woodard, secy. Trades Assembly. Architect and engineer not selected.

N. J., Belleville (Newark P. O.)—School—Bd. Educ. rejected bids received Feb. 17 building P. S. 17, Joralemon St. and Passaic Ave. C. G. Jones, 280 Bway., New York City, archt. and engr. Noted Feb. 5.

N. J., Newark—Theatre—Loews Enterprises, 1492 Bway., New York City, having plans prepared by T. W. Lamb, archt. and engr., 644 8th Ave., New York City, for brick and steel, brick foundation, on Broad St. About $400,000. Noted Jan. 29.

Ga., Atlanta — Exchange — A. Samuels, Third Natl. Bank Bld., soon lets contract building 4 story, 50 x 100 ft. film exchange on Walton St., brick and steel. About $60,000. A. F. N. Everett, Walton Bldg., archt.

Ga., Duluth—School—City having plans prepared by W. Chase, archt and engr., Atlanta Trust Co. Bldg., Atlanta, for 2 story, 80 x 107 ft. brick and concrete, brick foundation.

O., Brunswick—School—Bd. Educ. having plans prepared by F. S. Rusk, archt., 16 South 3rd St., Columbus, for 2 story, 50 x 60 ft., concrete and brick. About $50,000. A. F. Root, clk.

O., Cincinnati—Infirmary—H. M. Price, archt., soon lets contract building 3 story, 38 x 100 ft., brick and concrete addition, on Maple and Knott Aves., for Orthodox Jewish Home. About $70,000. Noted Aug. 14

O., Cleveland—Club—B'nai B'rith Club, 7103 Euclid Ave., plans to build 2 story, rein.-con., brick and steel, concrete foundation. About $100,000. M. Ozersky, treas. Engineer and architect not selected.

O., Cleveland—Commercial—Guarantee Bldg. Co., Union Bldg., having plans prepared by M. Weis, archt., 618 Union Bldg., for remodeling 3 story, 60 x 200 ft., brick and stone, on East 55th St. and Prospect Ave. About $50,00.

O., Cleveland—Sales, etc.—Guarantee Bldg. Co., Union Bldg., having plans prepared by M. Weis., 618 Union Bldg., for 4 story, 60 x 150 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on East 55th St. and Prospect Ave. About $150,000.

O., Kenmore—Theatre—Henry & Murphy, archts., 523 2nd Natl. Bank Bldg., Akron, preparing plans for 2 story, brick, concrete and steel, brick and concrete foundation. About $60,000. Mayer & Velentine, Bangor Bldg., Cleveland, engrs. Owners name withheld.

O., Toronto—School—City voted $100,000 bonds to build grade school.

O., Xenia—School—Bd. Educ. plans to build 3 story, rein.-con. and brick, rein.-con. flooring, concrete foundation, on East

Buildings (Continued)

Church St. About $200,000. F. W. Dodds, pres.

Mich., Detroit—Church—Detroit Baptist Union, 1105 Vinton Bldg., having plans prepared for 2 story, 84 x 90 ft., brick, steel and stone, on Grand River and Clarendon Aves. About $80,000.

Mich., Detroit—Church—Spier & Gehrke, archts., 1317 Chamber Commerce Bldg., preparing plans for 2 story, 90 x 100 ft., rein.-con., brick and steel, concrete foundation, on East Side. About $100,000. Owners name withheld.

Mich., Detroit—Sales—See "Industrial Works."

Mich., Durand—School—Bd. Educ. having plans prepared by Van Leyen, Schilling & Keough, archts. and engrs., Union Trust Bldg., Detroit, for 2 story, 16 room, rein.-con., brick and steel, concrete foundation. About $150,000.

Mich., Hamtramck (Detroit P. O.)—Hospital—City retained A. E. Harley, archt., 435 Woodward Ave., Detroit, to prepare plans for 2 story, concrete, brick and steel, rein.-con. flooring, concrete foundation. About $150,000.

Wis., Fond du Lac—Bank and Office—Commercial Natl. Bank having plans prepared by S. Lovell, archt., 30 North Michigan Ave., Chicago, for 6 story, 66 x 105 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $250,000.

Wis., Milwaukee—Sales—J. Heil, 26th and Montana Aves., plans to build 4 story, 100 x 125 ft., brick and concrete, rein.-con. flooring, concrete foundation, on Bway. About $100,000. Klug & Smith, 40 Mack Blk., archts. and engrs. Noted Feb. 12.

Wis., Milwaukee—Sales—Nash Sales Co., 455 Bway., having plans prepared by M. Tullgren & Sons, archts. and engrs., 425 East Water St., for 4 story, 120 x 120 ft. rein.-con. and brick, rein.-con. flooring concrete foundation, on Bway. About $180,000. Noted Jan. 15, under "Industrial Works."

Wis., Milwaukee—Sales—Wisconsin-Oakland Co., 525 Jefferson St., having plans prepared by A. C. Eschweiler, archt., Goldsmith Bldg., for 3 story, 100 x 120 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Oneida St. About $100,000.

Wis., Oconomowoc—Sanitarium—Oconomowoc Health Resort having plans prepared by H. C. Haeuser, archt., Colby-Abbot Bldg., Milwaukee, for 4 story, 30 x 40 ft., rein.-con. and brick addition, rein.-con. flooring, concrete foundation. About $50,000.

Wis., Tomah — High School, etc.—Bd. Educ. rejected bids received Feb. 11, building 2 story addition to high school and boiler house About $60,000. H. C. Haeuser, Colby-Abbot Bldg., Milwaukee, archt. Noted Jan. 29.

Ia., Ames—Hotel—Sheldon Munn Hotel Co. plans to build 4 story fireproof hotel, on Main St. About $150,000. Architect not selected.

Ia., Ayrshire—School—Bd. Educ. having plans prepared by Martin & Sutherland, archts., Storm Lake, for 2 story, 70 x 98 ft., brick, concrete and steel, concrete foundation. About $80,000.

Ia., Barnum—School—Bd. Educ. plans to build 2 story, semi-fireproof school About $60,000. Architect and engineer not selected.

Ia., Bayard—School—Bd. Educ. having plans prepared by M. B. Cleveland, archt., 603 1st Natl. Bank Bldg., Waterloo, for 2 story, 90 x 140 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation About $150,000.

Ia., Buckeye—School—Bd. Educ having plans prepared by W. L. Pedicord, archt., Iowa Falls, for 2 story, 69 x 90 ft., brick, concrete and steel, concrete foundation. About $65,000.

Ia., Burnside—School—Bd Educ plans to build school. About $75,000. Architect and engineer not selected.

Ia., Cedar Rapids — Club — Knights of Columbus, Jim Blk., plans to build 2 story fireproof club house, concrete foundation About $100,000. Architect and engineer not selected.

Ia., Delta—School—Bd Educ. plans to build 2 story semi-fireproof school. About $80,000. Architect and engineer not selected

Ia., Ft. Dodge—High School—Bd. Educ. having plans prepared by W. B. Ittner, archt., Bd. Educ. Bldg., St. Louis, Mo., for 3 story, 190 x 260 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $650,000.

Ia., Gowrie—School—Bd. Educ. plans to build 2 story, semi-fireproof school. About $80,000. Architect and engineer not selected

Ia., Haskins—School—Bd. Educ. plans to build 2 story semi-fireproof school. About $70,000. Architect and engineer not selected.

Ia., Lamont—School—Bd. Educ. having plans prepared by Keffer & Jones, archts., Masonic Bldg., Des Moines, for 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000.

Ia., Lytton—School—Bd. Educ. plans to build 2 story, semi-fireproof school. About $60,000. Architect and engineer not selected.

Ia., Maynard—School—Bd. Educ. plans to build 2 story, 38 x 150 ft., brick, concrete and steel, rein.-con. flooring concrete foundation. About $150,000. Netcott & Netcott, Black Bldg., Waterloo, archts.

Ia., Monticello—Church—St. John's German Lutheran Church plans to build brick church. About $65,000. A. Ide, pastor. Architect not selected.

Ia., Mt. Pleasant—Hospital—Henry Co. Hospital Assn. having plans prepared by G. L. Lockhart, archt., Endicott Bldg., St. Paul, Minn., for 2 story, 50 x 100 ft., rein.-con. and brick, About $100,000

Ia., Nevinville—School—Bd. Educ. soon lets contract building 2 story, 50 x 60 ft., brick, concrete and steel, concrete foundation. About $55,000. W. E. Hulse & Co., Masonic Temple, Des Moines, archts.

Ia., Ottumwa—Club House—Wapello Club having plans prepared by G. M. Kerns, archt., Ottumwa, for 1 story, 50 x 90 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $75,000. Noted Jan. 22.

Ia., Ottumwa—Y. M. C. A. having plans prepared by B. Janssen, archt., Century Bldg., Pittsburgh, Pa., for 3 story, 99 x160 ft., brick, rein-con. and steel, rein.-con. flooring, concrete foundation. About $130,000. G. M. Kerns, Ottumwa, associated archt.

Ia., Paton—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts, 210 Masonic Temple, Des Moines, for 2 story, 56 x 97 ft., rein.-con. and brick, concrete foundation. About $100,000. J. Miller, secy.

Ia., Searsboro—School—Bd. Educ. having plans prepared by Keffer & Jones, archts., Masonic Bldg., Des Moines, for 2 story, 70 x 96 ft., brick, concrete and steel, concrete foundation. About $70,000.

Ia., Sheldon — School — Roman Catholic Church having plans prepared by Damon & O'Meara, archts., 8th and Central Sts., Ft. Dodge, for 2 story, 36 x 98 ft, brick, concrete and steel, rock and concrete foundation. About $55,000.

Ia., Shelby—School—Bd. Educ. had plans prepared by J. Latenser & Sons, archts., 632 Bee Bldg., Omaha, Neb, and soon receives bids for 3 story, 122 x 192 ft., rein.-con., rein.-con. flooring, brick foundation. About $200,000

Ia., Waterloo—Grade School—Bd. Educ. plans to build 2 story, brick grade school. About $125,000. M. B. Cleveland 601 1st Natl. Bank Bldg., archt.

Ia., Vetter—School—Bd. Educ. plans to build 2 story, semi-fireproof school. About $60,000. Architect and engineer not selected

Ia., Zion (Spaulding, P. O.) School - Bd. Educ, Union Twp., c/o C. F. Hayden RFD 1, Creston, having plans prepared by W. E. Hulse & Co., archts., Masonic Temple, Des Moines, for 2 story, 60 x 80 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000

Kan., Atlanta—School—Bd. Educ having plans prepared by S. S. Voight, archt., 4th Natl. Bank Bldg., Wichita, for 2 story, 68 x 78 ft., brick, concrete and steel, concrete foundation. About $55,000.

Kan., Lecompton — School — City voted $90,000 bonds to build school. Architect and engineer not selected.

Kan., Liberal—Grade School—Bd. Educ. having plans prepared by Smith, Beattie & Co., archts., Nelson Bldg., Hutchinson, for 2 story, 50 x 75 ft., brick, rein.-con and steel, rein.-con. flooring, concrete foundation. About $55,000.

Kan., Liberal—High School—Bd. Educ. having plans prepared by Smith, Beattie & Co, archts., Nelson Bldg., Hutchinson, for 3 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation About $170,000.

Kan., McPherson—Science Hall—McPherson College having plans prepared by Mann & Gerow, archts., Hutchinson, for 4 story, 54 x 128 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $125,000. H. A. Noble, Kansas City, Mo., engr. Noted Aug. 14.

Kan., Perry—High School—City voted $65,000 bonds to build semi-fireproof high school. Architect not selcted.

Kan., Sabetha—High School—Bd. Educ. plans to build brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $125,000. T. W. Williamson & Co., 418 Central Natl. Bank Bldg., Topeka, archts.

Kan., Wichita—Bank-Union Natl. Bank plans to build build addition, on Douglas Ave. About $100,000. Architect and engineer not selected.

Kan., Wichita—Hotel and Theatre—Maple Theatre having plans prepared by C. Boller, archt. and engr., 508 Ridge Bldg., Kansas City, Mo., for 6 story, 150 x 150 ft., on South Emporia Ave. About $650,000. A. Ford, proprietor.

Neb., Alliance—Church—Methodist Episcopal Church having plans prepared by J. R. Smith, archt., Nebraska State Bank Bldg., Lincoln, for 1 story, 75 x 75 ft. concrete, brick and steel, concrete foundation. About $70,000.

Neb., Columbus—Hospital—C. D. Evans plans to build 3 story, 30 x 87 ft. concrete, brick and steel, concrete foundation. About $80,000. Gabe & Helleberg, Columbus, archts.

Neb., Columbus—School—Bd. Educ. having plans prepared by Gabe & Helleberg, archts., Columbus, building 2 story, 57 x 68 ft. rein.-con., brick and steel, rein-con. flooring, concrete foundation. About $65,000.

Neb., Omaha—High School—Bd. Educ., c/o W. E Bourke, City Hall, having plans prepared by F. W. and E. B. Clark, archts., 683 Paxton Blk., constructing two 1 story, 50 x 100 ft. shops, two 4 story, 72 x 120 ft. and 72 x 168 ft. instruction buildings, 75 x 75 ft. gymnasium, 90 x 170 ft. auditorium, 90 x 150 ft. armory, 3 story, 75 x 75 ft. domestic science building, 2 story, 72 x 318 ft. mechanics dept., and 4 story 72 x 138 ft. administration building, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on 33rd and Burt Sts. About $1,500,000.

Neb., Stromsburg — Church — Methodist Episcopal Church having plans prepared by J. R. Smith, archt., Nebraska State Bank Bldg., Lincoln, for 1 story, 64 x 75 ft., brick, rein.-con. and steel, rein.-con flooring, concrete foundation. About $55,000.

S. D., Aberdeen—Schools—City election March 16, to vote on $350,000 bonds to build junior high and grade school, and $150,000 bonds for additions to 4 grade schools.

S. D., Miller—Church—Presbyterian Congregation, having plans prepared by A. R. Van Dyck, archt., 403 Soo Line Bldg., Minneapolis, Minn., for 36 x 96 ft., brick About $50,000. M J. Halbower, chn bldg. com.

N. D., Bismarck—School—Bd. Educ. having plans prepared by A. Van Horn, archt., building 8 room brick. About $62,000.

N. D., Grafton—Refectory—Keith & Kurke, archts, Equity Bldg., Fargo, N. D., soon let contract building 2 story, 58 x 160 ft., here, for State Bd. Administration, Bismarck. About $85,000.

Wyo., Lusk—Masonic Lodge—Masonic Lodge plans to build 2 story, 50 x 100 ft. About $50,000. Architect not selected.

Mont., Helena—Schools—City election in May to vote on $225,000 bonds to build Hawthorne School, replace old part of Central school and construct auditorium in high school.

Mo., Boonville — Gymnasium — Kemper Military Academy having plans prepared

Buildings (Continued)

by T. W. Bast, archt., Sedalia, for 2 story, 100 x 250 ft., brick and steel, concrete foundation. About $150,00.

Okla., Chandler—Theatre—Hoover & Stetmund plan to build theatre, on Court House Plaza. About $175,000. Architect and engineer not selected.

Okla., Chickasha—School—St. Joseph's Academy having plans prepared by Monnot & Reid, archts., 409 Empire Bldg., Oklahoma, for 2 story, 60 x 100 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $90,000.

Okla., Covington—Hotel—Covington Hotel Co. plans to build 2 story, 50 x 100 ft., brick. About $65,000. Architect and engineer not selected.

Okla., Frederick—Temple—Akdar Lodge plans to build 3 story, hollow tile and brick. About $50,000. Architect and engineer not selected.

Okla., Tulsa—Office—W. M. Thompson, J. N. Thompson, 1172 North Cheyenne St., R. H. Hughes, 412 Robinson Bldg. and R. B. Thompson, Oklahoma, plan to build 12 story, 50 x 140 ft., on Boston and 5th Sts. About $500,000.

Col., Denver—High School—Bd. Educ. Berthoud Dist. voted $85,000 bonds to build high school.

N. M., Las Vegas—High School—City voted $100,000 bonds to build new high school.

N. M., Silver City—Hotel—Silver City Natl. Bank having plans prepared by J. J. Frauenfelder, archt., 1116 Story Bldg., Los Angeles, Cal., for 6 story, 102 x 146 ft., rein.-con. and terra cotta, concrete foundation.

Wash., Centralia — School — Bd. Educ. plans to build Lincoln School, 2 story, brick or concrete. About $55,000. Architect not selected.

Wash., Everett—Store and Office—C. W. Wiley plans to build 3 story, brick, on Hewitt Ave. About $50,000. Architect not selected.

Wash., Port Angeles—Hotel—Tourtellotte & Hummel, archts., McKay Bldg., preparing plans for 4 story, 75 x 120 ft., concrete. About $95,000. Owners name withheld.

Wash., Rockford — High School — Bd. Educ. having plans prepared by G. H. Keith, archt., Hutton Bldg., Spokane, for 2 story, brick concrete or stone, here. About $60,000.

Wash., Seattle—Store—N. M. Carman, Cheasty Bldg., plans to build 2 story, 108 x 173 ft., concrete, on Pine St. and 4th Ave. About $225,000. J. E. Ryan, Hoge Bldg., archt.

Wash., Spokane—Detention Home—Spokane Co. having plans prepared by A. Rigg, archt., Peyton Bldg., for juvenile detention home, brick and rein.-con. About $100,000.

Wash., Tacoma—Church—Holy Rosary Church Bldg. Com. soon lets contract building 2 story, brick and concrete or stone, on South 13th and Delin Sts. About $120,000. Lundberg & Mahon, Provident Bldg., archts.

Wash., Vancouver—Club, Gymnasium, etc.—Amer. Legion, (Smith-Reynolds Post) plans to build 2 story, brick or concrete club, to include gymnasium, banquet room, tennis courts, etc., on 14th St. and Bway. About $60,000. D. Nichols, Blurock Bldg., archt.

Ore., Portland—Court House—Multnomah Co. plans to build 2 story, 40 x 100 ft., rein.-con. addition. About $60,000.

Cal., Anaheim—School—Trustees Orangethorpe School Dist. having plans prepared by J. F. Walker, archt., 1st Natl. Bank Bldg., for 1 story, 6 room, hollow tile, concrete foundation. About $52,000.

Cal., Glendale (Los Angeles P. O.) — Theatre—W. C. Goodno, 397 South El Molino Ave., Pasadena, having plans prepared by A. F. Priest, archt., 615 Fay Bldg., Los Angeles, for 2 story, 75 x 180 ft., brick and terra cotta, on Brand Blvd. About $50,000. Noted Jan. 15.

Cal., Hanford—High School—Trustees Hanford Union High School Dist., retained Coates & Traver, archts., Rowell Bldg., Fresno, to prepare plans for high school Bond for $350,000 voted for project.

Cal., Hermosa Beach — Pavilion — City election Feb. 28 to vote on $125,000 bonds to build 2 story, irregular shaped concrete and stucco. Preliminary plans prepared by H. C. Howard, archt., 619 Bway. Central Bldg., Los Angeles.

Cal., Lodi—School—City voted $90,000 bonds to build 1 story, hollow tile and concrete. Architect not selected.

Cal., Los Angeles—Market and Hall—J S. Torrance, Washington Bldg., having plans prepared by Dodd & Richards, archts., 905 Brack-Shops Bldg., for 2 story, 120 x 155 ft., rein.-con. and terra cotta, concrete foundation, on Spring St. near 9th St.

Cal., Los Angeles—Sales and Stores—H. L. Arnold, 7th and Grand Ave., soon receives bids building 1 and 2 story, 210 x 220 ft., rein.-con., brick and hollow tile, concrete foundation, on 7th, Figueroa and Orange Sts. T. B. Keim, Jr., Haas Bldg., archt.

Cal., Oakland — Schools — City voted $8,500,000 bonds to build schools. C. W. Dickey, Everson Bldg., supervising archt.

Cal., Pomona—High School—City plans election to vote on $250,000 bonds to build high school. E. T. Keiser. chn. Bd. Educ. Architect not selected.

Cal., Richmond—Theatre—A. W. Cornelius, archt., Merchants Natl. Bank Bldg., San Francisco, soon receives bids building 1 story, rein.-con., brick and steel, here for Turner & Dahnken. San Francisco. About $125,000.

Cal., Roseville—School—City voted $55,000 bonds to build 7 room school.

Cal. San Francisco—Offices—Matson Navigation Co. 120 Market St. having plans prepared by Bliss & Faville, archts., Balboa Bldg., for 10 to 15 story. About $1,600,000.

Cal., San Francisco—Theatre—Turner & Dahnken havng plans prepared by A. W. Cornelius archt., Merchants Bank Bldg., for 305 x 310 ft., rein.-con. brick and steel, on 4th St. About $750,000.

Cal., Willows—Hotel—Willows Impvt. Corp., c/o G. L. Briggs, plans to build hotel, on Butte and Walnut Sts. About $215,000. Architect not selected.

N. B., St. John—Hotel—Ross & McDonald, archts., 1 Belmont Ave., Montreal, preparing plans for 8 story hotel. About $1,000,000. Owners name withheld.

Que., Quebec—**Hotel**—Canadian Pacific Ry., Windsor St., Montreal, having plans prepared for large extension to Chateau-Frontenac Hotel. About $2,000,000. D. H. Mapes, Windsor St., Montreal, engr.

Ont., Kingston — Theatre — Paramount Theatres, Ltd., Temple Bldg., Toronto, plans to build 1 and 2 story, brick, concrete and steel, rein.-con. flooring, concrete foundation. About $350,000. Architect not selected.

BIDS DESIRED

Mass., Springfield—High School—Until March 10, by Bd. Educ., building 2 story, 116 x 186 ft., brick and steel, rein.-con. flooring, concrete foundation, on Spring St. About $200,000. R. B. Warner, 168 Bridge St., archt. Noted Jan. 29.

N. Y., Marcy—Hospital, etc.—Until March 17, (change of date) by State Hospital Comn., Capitol, Albany, building mortuary and tuberculosis pavilion, at Utica State Hospital, here. About $50,000. L. F. Pilcher, Albany, state archt. Noted Feb. 19.

N. Y., Mt. Vernon—School—Until March 1, by 1st Baptist Church of Mt. Vernon, building 3 story, brick, steel and stone, brick foundation. About $60,000. Private plans.

N. Y., New York—School—Until March 3, by C. B. Snyder, archt. and engr., Municipal Bldg., constructing P. S. 38, on St. Anns Ave., Rae St., Carr St. and Hagney Pl., (Bronx Boro.), for Bd. Educ., 500 Park Ave. About $500,000. Noted Feb. 19.

N. J., Atlantic City—Church—Until March 4, by F. R. Watson, archt., 1211 Walnut St., Phila., building 1 story, 40 x 130 ft., brick, stone and hollow tile, for St. Augustines Church. Noted Feb. 12.

N. J., Bloomfield—Comfort Station—Until March 1, by D. F. Peck, city clk., building comfort station, on Broad St. and Bay Ave.

N. J., Union—School—Until March 9, by Bd. Educ., building 2 story, brick, steel and stone, brick foundation. About $60,000. Rasmussen & Waylan, 1133 Bway, New York City, archts. and engrs.

Pa., Forty Fort (Kingston P. O.)—School—Until March 3, by Bd. Educ., building 2 story, 40 x 100 ft., brick and timber, rock foundation, on Dana St. About $50,000. Noted Jan. 1.

Pa., Homestead—School—Until March 8, by Bd. Educ., building junior high school. W. H. Langham, secy.

Pa., Phila.—School—F. F. Durang, archt., 1220 Locust St., receiving bids building 3 story, 70 x 125 ft., concrete and stone, for Corpus Christi Parochial School, 28th and Allegheny Sts. About $150,000.

N. C., Snow Hill—School—Until March 1, by Bd. Educ. furnishing labor and material, building 2 story, 57 x 109 ft. with 1 story, 42 x 51 ft. wing, brick and tile. J. E. Debnam, supt.

Ind., Bridgeton—School—Until March 1, by H. C. Plank, twp. trustee, Howe, building 1 story, 70 x 140 ft. brick. About $75,000. A. M. Strauss, 705 Schoaff Bldg., Ft. Wayne, archt. Suider & Rotz, 703 Merchants Bank Bldg., Ft. Wayne, engrs.

Ind., Frankton—School—Until March 1, by W. H. Boone, twp. trustee, Elwood, building 2 story, brick grade school. About $65,000. E. E. Dunlap Co., 616 Citizens Bank Bldg., Kokomo, archts.

Ind., Valparaiso—Theatre and Office—H. L. Newhouse, archt., 4630 Prairie Ave., Chicago, receiving bids building 2 story, 75 x 80 ft., rein.-con., brick and steel, concrete foundation, for G. G. Shaner & Sons Co. About $100,000.

Mich., Detroit—Sales—Until March 1, by A. Kahn, archt., Marquette Bldg., constructing 95 x 209 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Jefferson Ave. and St. Antoine St., for Packard Motor Car Co., East Grand Blvd. About $176,000.

Mich. Detroit—Office — See "Industrial Works."

Ill., Chicago—Office and Salesroom—W. P. Whitney, archt., 38 South Dearborn St., receiving bids building 2 story, 100 x 200 ft., rein.-con. and brick, at 3830 South Michigan Ave., for Phila. Storage Battery Co. 1621 South Michigan Ave. About $100,000.

Wis., Reedsborg—High School—Until March 10, by Bd. Educ., building 2 story, brick addition, rein.-con. flooring, concrete foundation. About $60,000. J. R. and E. J. Law, Gay Bldg., Madison, archts.

Ia., Ayrshire—School—Until March 20, by Bd. Educ., building 2 story, 70 x 98 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $120,000. Martin & Sutherland, Storm Lake, archts.

Ia., Martensdale—School—Until March 6, by Bd. Educ., building 3 story, 56 x 86 ft., rein.-con. and brick, concrete foundation. About $50,000. J. M. Archer, secy. W. E. Hulse & Co., 210 Masonic Temple, Des Moines, archts.

Minn., Blooming Prairie—High School—Until March 5, by Bd. Educ. building 2 story, 80 x 120 ft. with 50 x 64 ft. wing, rein.-con., brick and terra cotta. About $150,000. B. Melby, clk. F. Tustison, Auditorium Bldg., Minneapolis, engr. Jacobson & Jacobson, Owatonna, archts.

Minn., Pemberton—School—Until March 4, by Bd. Educ., building 2 story school in Independent School Dist. About $50,000. J. Krause, Mankato, clk. Pass & Son, Ekle Bldg., Mankato, archts.

Minn., St. Cloud (Waite Park)—School—W. C. Schier, clk. Bd. Educ. Dist. 152, receiving bids building 1 story, 100 x 110 ft. rein.-con. and brick grade school. About $90,000. Foss & Foss, St. Cloud, archts.

Minn., Virginia—Court House—Until March 1, by W. H. Borgen, treas. St. Louis Co., building 2 story, 79 x 120 ft., rein.-con., brick and stone addition, rein.-con. flooring, concrete foundation, on Central Ave. About $225.000. Croft & Boerner, Lonsdale Bldg., Duluth, archts. and engrs. Noted Jan. 8.

Neb., Omaha—Theatre, Stores, etc.—Ames Realty Co., 2406 Ames Ave., receiving bids building 3 story, 125 x 133 ft. rein.-con. and steel, rein.-con. flooring, concrete foundation, on 25th and Ames Aves. About $200,000. E. S. Dodds, 716 Brandeis Theatre Bldg., archt.

S. D., Delmont—School—Bd. Educ. receiving bids building 2 story, 57 x 68 ft.,

Buildings (Continued)

concrete, steel, and brick, concrete foundation. About $65,000. Gabe & Helleberg, Columbus, Neb., archts.

S. D., Ipswich—Grade and High School—Until March 15, by J. Owens, clk. Bd. Educ., building 2 story, 75 x 120 ft., brick. About $100,000. Edwins & Edwins, 911 Northwestern Bank Bldg., Minneapolis, Minn., archts.

S. D., Winner—Grade School—Until April 15, by Bd. Educ., building 2 story, 57 x 68 ft., brick and stone. About $65,000. Grabe & Helleberg, Columbus, Neb., archts.

N. D., Grand Forks—Office—See "Industrial Works."

Mont., Deer Lodge—Court House—Until March 10, by Comrs. Powell Co., building 3 story, 80 x 110 ft. About $100,000. Arnold & Van House, 701 Daly Bank Bldg., Butte, archts. Noted Sept. 18.

Mont., Missoula—High School—Until March 8, by Bd. Trustees Missoula Co. High School, building 3 story addition. About $125,000. O. Bakke, Gibson Bldg., archt.

Tex., Dalhart—Court House—Until March 1, by Comrs. Dallam Co., building 3 story, 76 x 90 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $175,000. Mann & Gerow, Hutchinson, Kan., archts. H. A. Noble, Reliance Bldg., Kansas City, Mo., engrs. Noted Jan. 1.

Okla., Bixby—School—Until March 1, by Bd. Educ., Dist. 23, building 2 story, 87 x 118 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $85,000. H. O. Valeur & Co., 705 Phoenix Bldg., Muskogee, archts. Noted Jan. 1.

Okla., Chickasha—Business and Lodge—J. W. Comer receiving bids building 5 story, 75 x 165 ft., brick and steel, concrete foundation. About $165,000. E. H. Eads, 1st Natl. Bank Bldg., archt

Cal., Long Beach—School—Until March 8, by Bd. Educ. building 10 room brick addition to high school. Austin & Austin, 1st Natl. Bank Bldg., archts.

Cal., Pasadena—Laboratory and Hall—Until March 10, by Throop College of Technology, East California St., building laboratory, also 1 story hall, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $150,000 and $75,000 respectively. Noted Jan. 29 and Feb. 12.

Ont., Hamilton—Post Office—Until March 15, by Dept. Pub. Wks., Ottawa, building 3 story, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $800,000. R. Corriveau, Parliament Bldg., Ottawa, engr.

Ont., Ingersoll—School—Until Feb. 28, by J. J. McLeod, secy. Bd. Educ., building 2 story, rein.-con. and brick, concrete and tile flooring, concrete foundation. About $120,000. W. G. Murray, Dominion Savings Bldgs., London, archt.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Beverly** — Church — Methodist Episcopal Society let contract building 2 story, 51 x 100 ft., brick and stone, wood flooring, stone foundation, to W. H. Cann, 253 Rantoul St. About $50,000.

★**Mass., Boston**—Mercantile—Snider & Druker, 18 Tremont St., let contract building 6 story, 54 x 58 ft., brick and rein.-con., rein.-con. flooring, concrete foundation, on South St., to H. Hurwitz, 1259 Boylston St. About $75,000.

★**Mass., Boston** — Restaurant — Liberty Restaurant, c/o E. S. Bailey, archt., 33 Cornhill St., let contract converting building into restaurant, on Boylston St., to J. A. Sutherland, 1 Elliot Sq., Roxbury. About $100,000.

★**Mass., Boston** — Store — S. S. Kresge Co., Kresgo Bldg., Detroit, let contract building 6 story, 90 x 90 ft., brick and steel, wood flooring, concrete foundation, on Washington and Temple Sts., here, to G. A. Fuller Co., 710 Bd. Trade Bldg. About $400,000.

★**Mass., Braintree** (Boston P. O.)—Bank—Braintree Natl. Bank, Elm St., let contract building 1 story, 28 x 68 ft., brick and stone, concrete foundation, to C. C. Temple, 40 Court St., Boston. About $60,000, cost plus percentage basis. Noted Jan. 15.

★**Mass., Lowell**—Memorial Hall—City let contract building 2 story, 150 x 150 ft., brick and concrete, on River St., to G. Drapeau, Lowell. About $750,510.

★**Mass., Swampscott**—School—Town let contract building 2 story, 90 x 100 ft., brick, concrete and mill construction, concrete and rock foundation, to C. H. Cunningham & Son Co., 23 Central Ave., Lynn. About $90,000.

★**Mass., Worcester**—Hospital—Trustees St. Vincents Hospital, Vernon St., let contract building 4 story, 46 x 120 ft. with 45 x 60 ft. ell, addition, brick, concrete and steel, rein.-con. flooring, concrete foundation, to J. C. and J. M. Buckley, Inc., 128 Vernon St. About $200,000.

★**Conn., Ansonia**—Theatre and Business—I. J. Hoffman, 42 Jackson Ave., let contract building 3 story, 80 x 150 ft., brick, concrete and steel, rein.-con flooring, concrete foundation, on Main and Water Sts., to Sperry & Drake Co., 113 Church St., New Haven. About $175,000. Noted Jan. 1.

★**Conn., Bristol**—Church—St. Stanislaw Kostka Church let contract building 1 story, 50 x 130 ft., brick and limestone, concrete foundation on West St., to A. Perreault, 33 North Main St. About $50,000. Noted Jan. 8.

★**Conn., Trumbull** — Schools — L. D. Christie, twp. secy., 252 Middle St., Bridgeport, let contract building two 1 story, 60 x 125 ft. schools, one in Long Hill Dist. and other in Nichols Dist., to Schwarz Bros. Co., 95 River St., Bridgeport. About $90,000. Noted Jan. 15.

★**N. Y., Albany**—Hotel and Restaurant—J. Farnum, State and James Sts., let contract altering hotel and restaurant, to W. G. Sheehan Constr. Co., DeWitt St. About $60,000.

★**N. Y., Brooklyn**—Theatre—T. W. Lamb, archt. and engr., 644 8th Ave., New York City, let contract to J. Auer, 648 Lexington Ave., New York City, building brick and steel, brick foundation, on Bway. and Gates Ave., for Loew's Enterprises, 1492 Bway., New York City. About $300,000. Noted Jan. 1.

N. Y., Jamaica—School—C. B. J. Snyder, archt. and engr., Municipal Bldg., New York City, received lowest 3 bids Feb. 20, building P. S. 50, on 101st and Liberty Aves. and Liverpool and Allendale Sts., here, from J. McArthur, 22 Ormond Pl., Brooklyn, $523,000; Frymier & Hanna, 25 West 45th St., New York City, $573,900; T. A. Clark Co., 122 Livingston St., Brooklyn $599,500. Noted Feb. 12.

★**N. Y., New York**—Bank—Pacific Bank, Madison Ave. and 28th St., let contract altering brick, steel, stone and marble, to C. Money, 228 West 36th St. About $50,000.

★**N. Y., New York** — Office — R. Goelet Estate, 1492 Bway., let contract altering brick, steel and stone office building, to Mulcahy & Kissell, 1431 Bway. About $100,000.

★**N. Y., New York** — Office — Munson Steamship Line, 82 Beaver St., let contract building 25 story, 22 x 144 x 160 ft., brick, steel and stone, concrete foundation on Pearl St. between Beaver and Wall Sts., to G. A. Fuller Co., 175 5th Ave. About $2,000,000. Noted Feb. 19.

★**N. Y., New York**—Office—Powers Weight & Rosengarten Co., 145 Front St., let contract building 50 x 60 ft., brick, steel and stone, concrete foundation, at 27-31 Depeyster St., to W. S. Patten, 52 Vanderbilt Ave. About $100,000. Noted Jan. 22.

★**N. Y., New York**—Theatre—Consolidated Amusement Enterprises, care of Arena Theatre, 8th Ave. and 40th St., will build brick and steel, brick foundation, on West 50th St. and 8th Ave. About $130,000. Work will be done by day labor.

★**N. Y., Watertown**—Theatre—A. W. Johnson, archt. and engr., 469-5th Ave., New York City, let contract to E. V. Anderson, 39 Market St., Poughkeepsie, building brick, steel and stone theatre, brick foundation, here, for Columbia Realty Bldg. Co., Poughkeepsie. About $200,000.

★**N. J., Trenton**—School—Bd. Educ. Hamilton Twp. let contract building 2 story, 36 x 105 ft., brick, on South Broad St., to J. H. Morris, Broad St. Bank. About $60,500.

★**Pa., Phila.** — Hall — See "Industrial Works."

★**Pa., Phila.**—Office and Stores—Stanley Co. of America, 1214 Market St., let contract building 2 story, 40 x 117 ft., brick and terra cotta, on Chestnut and 52nd Sts., to Keystone State Constr. Co., Franklin Bank Bldg. About $75,000.

★**Md., Baltimore**—Hotel—Hotel Caswell, Baltimore and Hanover Sts., let contract building 6 story, 35 x 250 ft. brick, concrete and steel addition, concrete foundation, to J. H. Miller, Inc., Eutaw and Franklin Sts. About $750,000. Noted July 17.

O., Cleveland—Bath House—City, c/o E. Shattuck, purch. agt., received bids building 2 story, 76 x 76 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation, on St. Clair Ave., masonry and carpentry from W. Moore Co., 1264 West 4th St., $39,970, Kelly & Demarest, Amer. Trust Bldg., $53,900; plumbing, from P. J. Turnbull Co., West 25th St., $48,880.

★**Ill., Chicago**—Sales and Office—Splitdorff Electric Co., 1466 South Michigan Ave., let contract building 5 story, 60 x 200 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, to G. A. Fuller Co., 140 South Dearborn St. About $300,000.

★**Ia., Cooper**—High School—Bd. Educ. let contract building 3 story, 55 x 86 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to L. W. Brown, Le Mars. About $85,000. Noted Jan. 29.

★**Ia., Dayton**—School—Bd. Educ. let contract building 3 story, 55 x 86 ft., rein.-con. and brick, concrete foundation, to W. F. Kucharo & Co., 622 Hubbell St., Des Moines, $64,730.

Ia., Gaza—High School—Bd. Educ. let contract building 3 story, 55 x 86 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to L. W. Brown, Le Mars. About $70,000. Noted Jan. 29.

★**Ia., Lemars**—School—Western Union College let contract building 3 story, 58 x 100 ft., rein.-con. and brick, concrete foundation, to L. W. Brown, Le Mars. About $80,000.

★**Ia., Storm Lake**—Bank—Citizens Natl. Bank let contract building 2 story, 25 x 100 ft., brick, rein.-con. and steel, rein.-con flooring, concrete foundation, to T. Parks, Storm Lake. About $75,000; cost plus percentage basis.

★**Ia., Waterloo**—School—Bd. Educ. let contract building 1 story, 78 x 100 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to Currie Simpson Constr. Co., Waterloo, $66,150.

*__Ia., Whiting__—School—Bd. Educ. let contract building 2 story, 60 x 150 ft., brick rein.-con and steel, rein-con. flooring, concrete foundation. About $165,000. Buettler & Arnold, Grain Exch. Bldg., Sioux City, archts. Noted Jan. 8.

★**Minn., Chisholm**—School—E. Drew, supt Bd. Educ. let general contract building 2 story, 100 x 100 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, to Naufts & Bergstrom, 416 Columbia Bldg., Duluth, $228,950. Noted Feb. 5.

★**Minn., Deer Creek**—High School—Bd. Educ. let contract building 2 story, 70 x 120 ft., to J. H. Fisch, Barnesville. About $57,400. Noted Jan. 29.

★**Minn., Mankato**—School—Bd. Educ. let contract building 2 story, 40 x 50 ft. addition, to J. B. Nelsen Constr. Co., Mankato, $55,590. Noted Jan. 29.

★**Minn., McKinley**—School—Bd. Educ. let contract building 3 story, 75 x 150 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to H. Fawcett, 31 Mesaba Blk., Duluth, $124,513. Noted Jan. 15.

★**Kan., Garden City** — Church — First Christian Church let contract building 1 story, brick, concrete and steel, concrete foundation, to Barthoff & Welch, Garden City. About $55,000. Noted Feb. 12.

Neb., Omaha — Office — See "Industrial Works."

★**Neb., Omaha**—Office—Insurance Exch., Brandeis Theatre Bldg., let general contract building 12 to 14 story, rein.-con. brick and steel, rein.-con. flooring, concrete foundation, on 17th and Dodge Sts., to Home Builders, 18th and Dodge Sts. About $1,000,000.

★**Mont., Helena** — Lodge — Algeria Masonic Temple let contract building lodge, on Neill and Benton Aves, to Lense & Leigland, Great Falls. About $248,000. Noted Jan. 22.

Buildings (Continued

★Wash., Vancouver—Sales—Shattuck & Sleret will build 1 story, 100 x 100 ft., brick and concrete, on 10th and Washington Sts. About $50,000. Work will be done by day labor. Universal Auto Co., lessee.

★Cal., Berkeley — High School — Bd. Educ. let concrete contract building 3 story, 64 x 301 ft. and 80 x 301 ft. high school and roof garden, to K. E. Parker, 519 California St., San Francisco, $126,750, masonry, to White & Gloor, 448 Monadnock Bldg., San Francisco, $8,580; carpentry and millwork, to W. Sorenson, 3219 Ellis St., $82.429; plumbing, to Scott Co., 243 Minna St., San Francisco, $13,675; electrical work, to F. E. Newberry Electrical Co., Lick Bldg. San Francisco, $21,800; heating and ventilating, to W. K. Nottingham, 1005 Webster St., Oakland, $11,999. Noted Feb. 5.

★Cal., Healdsburg — Bank — Healdsburg Natl. & Savings Bank let contract building 1 story, 60 x 100 ft. on West and Powell Sts., to Hayes-Oser Co., Call-Post Bldg., San Francisco. About $100,000. Noted Jan. 8.

★Cal., Los Angeles—Mausoleum—W. A Clark, Jr., c/o R. D. Farquhar, archt., 427 Security Bldg., let contract for exterior marble work, building rein.-con., marble and mosaic mausoleum, bronze gates, at Hollywood Cemetery, to Georgia Marble Co., Tate, Ga., $133,000. Concrete work will be done by day labor. Total cost, $175,000.

★Cal., Pomona—Y. M. C. A. let contract building 3 story, 122 x 162 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, to F. D. Somers, 2650 Sante Fe Ave., Los Angeles. About $120,000; cost plus percentage basis

★Cal., San Bernardino — School — Bd. Educ. let contract building 1 story, 144 x 170 ft., rein.-con. and marble, rein.-con. flooring, concrete foundation, at Base Line, to L. C. Waldman Riverside, $82,121. Noted Jan. 22.

★Cal., South San Francisco—City Hall and Jail—City Trustees let contract building 2 story, rein.-con. and cement, to Larsen-Sampson Co., Crocker Bldg., San Fransisco, $82,259. Noted Feb. 19.

Federal Government Work

PROPOSED WORK

Va., Alexandria—Sidewalk—Spec. 4140—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $2,600.

Ga., Savannah — Radio Building and Mast—Spec. 4139—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to construct, here. About $6,000. Bids will be opened at local yard.

La., New Orleans—Rock—Supt. Lighthouses soon receives bids furnishing and placing 1,800 ton rock around Sand Island Lighthouse, Ala.

Cal., San Diego—Hospital—Bureau Yards & Docks, Navy Dept., Wash., D. C., receives bids in April, building hospital at Balboa Park, here. About $500,000 available.

Alaska, Juneau—Dwellings and Septic Tank—Spec. 4144—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build 4 apartment dwellings and septic tank, here. About $16,000. Bids will be opened at Puget Sound, Wash.

Alaska, Ketchican—Power House and Dormitory—Spec. 4143—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $17,000. Bids will be opened at Puget Sound, Wash.

BIDS DESIRED

Me., Mt. Desert Island—Seawall—Spec. 4135—Until March 3, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building wood frame seawall, concrete foundation, etc., at Naval Transmitting Sta., here; $10 deposit for plans and spec. Noted Feb. 12.

N. Y., Cape Vincent—Tower and Tank—Until March 10, by Comr. of Fisheries, Wash., D. C., furnishing and building steel tower and wooden tank, at fisheries sta., here; advertised in this issue.

N. Y., New York—Lighting Fixtures—Until March 18, by Treas. Dept., Wash., D. C., furnishing and installing standard lighting fixtures in U. S. Assay Office, here. J. A. Wetmore, superv. archt.

Pa., Phila.—Steam Heating System—Until March 9, by H. J. Lumsden, constr. officer, Frankford Arsenal, installing steam heating system; advertised in this issue.

D. C., Wash. — Skylights—Spec. 4100—Until March 25, by Bureau Yards & Docks, Navy Dept., constructing 2,000 sq. ft. skylight on slate roof of Bldg. 32, here. About $6,000. Noted Feb. 5.

Va., Petersburg—Conduit—Until March 25, by U. S. Engr. Office, Custom House, Norfolk, building rein.-con. conduit in Appomattoc River, here; advertised in this issue.

N. C., Moorehead City—Completing Fire Protection System—Until March 10, by Bureau Yards & Docks, Navy Dept., Wash., D. C., completing fire protection system, cleaning, riveting and painting 2 hangars and building wood stave tank, here. About $10,500; $10 deposit required for plans and spec.

S. C., Paris Island—Seawall, Roads, Curbs, Gutters, etc—Spec. 4104—Until March 25, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building 2062 lin. ft. concrete seawall, 2,000 lin. ft. concrete roads, 15 and 18 ft. wide, 13,000 lin.ft. concrete curbs, gutters, sewers and drains, at Marine Barracks, here. About $86,000; $10 deposit required for plans and spec. Noted Feb. 5.

Tenn., Chattanooga—Extending and Remodeling—Until March 15, by Treas. Dept., Wash., D. C., building extension and remodeling Post Office and Courthouse, here. J. A. Wetmore, superv. archt.

Tenn., Nashville—Steel Lock Gates—Until March 11, by U. S. Engr. Office, 4th and 1st Natl. Bank Bldg., for steel lock gates for Lock "E," Cumberland River; advertised in this issue

Mo., St. Louis — Remodeling Plumbing, Electric Work, etc.—Until March 16, by Treas. Dept., Wash, D. C., remodeling, in U. S. Appraisers Stores, here. Former bids rejected. J. A. Wetmore, superv. archt. Noted Jan. 29.

Cal., San Diego—Storehouse and Hangars—Spec. 4087—Until March 3, by Bureau Yards & Docks, Navy Dept., Wash., D. C., and at Pub. Wks. Office, here, building storehouse and 3 hangars. About $111,000. Noted Feb. 5.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Boston—Electric Traveling Cranes—Spec. 4123—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids installing one 10 ton and one 5 ton electric traveling bridge crane for flash yard and constructing extension to foundry, Bldg. 42-C, at Navy Yard, here, (1) work complete, from Whiting Fdry. Equipment Co., 157th St and Lathrop Ave., Harvey, Ill, (1) $13,500 (135 days), (2) $7.280 (135 days), (3) $6.625 (135 days); Chesapeake Iron Wks., Coleman and Clare Sts., Baltimore, Md., (1) $16.250 (150 days), (2) $8 750 (150 days), (3) $7.500 (150 days); Milwaukee Electric Crane & Mfg. Co., 60th St. and Greenfield Ave., Milwaukee, Wis., (1) $13-900 (120 days), (2) $7.300 (120 days), (3) $6,600 (120 days). Noted Jan. 15.

★Mass., Boston—Extension to Foundry—Spec. 4053—Bureau Yards & Docks, Navy Dept., let contract buildings, here, to Coleman Bros., 1 Marginal St., Chelsea. About $174,000 (210 days). Noted Feb. 12.

N. Y., Buffalo — Radio Building — Spec. 4108—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Feb. 18, constructing, here, from Savage Constr. Co., 101 Cumber Ave., $14,900 (120 days); King Lumber Co., Charlottesville, Va., $19,400 (May 1); Hyde & Baxter, 711 13th St. N. W., Wash., D. C., $19,445 (120 days). Noted Feb. 5.

★N. Y., New York—Steel Catamarans—U. S. Engr. Office, War Dept., Wash., D. C., let contract for steel catamarans for dredging in San Juan Harbor, Porto Rico, to Greenlie Halliday Co., 499 Water St. About $46,000.

Pa., Pittsburgh—Remodeling Post Office and Courthouse—Treas. Dept., Wash., D. C., received bids Feb. 16, remodeling, here, from North Side Constr. Co., 6939 Hamilton St., $14,400; Robinson & James, Wilkensburg, $14,870; G. E. Wright, Inc., 1461 Monadnock Blk., Chicago, $16,800. Noted Jan. 22.

D. C., Wash.—Coast Guard Stations—Commandant U. S. Coast Guard, Wash., received bids building coast guard stations 252 and 253, from Huron Contg. Co., Alpena, Mich. About $12,930 (150 days) and $18,119 (150 days) respectively.

D. C., Wash.—Incinerator and Can Washing Plant—Constr. Quartermaster, Washington Barracks, received bids building incinerator and can washing plant, (1) work complete, from Sparks Crematory Constr. Co., 216 Walnut St., Memphis, Tenn., (1) $10,520, (2) $2.70, (3) $16.20, (4) $.02, deduct $200 for changes in doors (120 days); Morse, Bulger Destructor Co., 39 Cortlandt St., New York City, (1) $13,825, (2) $2.25, (3) $17, (4) $.015 (90 days); Borge Incinerator Corp., Flatiron Bldg., New York City, (1) $15,199, (2) $4, (3) $20, (4) $.04 (120 days)

★Va., Norfolk—Dispensary—Spec. 4101—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract altering and building additions, here, to R. M. Kearn, 41 Cortlandt St., New York City, $24.738 (120 days). Noted Feb. 19.

★Ala., Florence—Barges—U. S. Engr. Office, War Dept., Wash., D. C., let contract building 10 barges for Wilson Dam, to Murnan Shipbuilding Corp., foot of Dauphin St., Mobile, $7,468.

★Ala., Florence—Gantry Cranes—U. S. Engr. Office, War Dept., Wash., D. C., let contract building 2 gantry cranes, to Cleveland Crane & Eng. Co., Wickliffe, O. About $68,750.

★Tenn., Nashville—Steel Hull — U. S. Engr. Office, 4th and 1st Natl. Bank Bldg., let contract building steel derrick boat hull, to Howard Ship Yard & Dock Co., Jeffersonville, Ind., $14,973. Noted Feb. 5.

Mich., Detroit—Radio Buildings—Spec. 4120—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Feb. 18, constructing, here. (1) work complete, from Hyde & Baxter, 711 13th St. N. W., Wash., D. C., (1) $19,831 (120 days); King Lumber Co., Charlottesville, Va., (1) $19,870 (May 1), (2) add $1,500, (3) deduct $200. Noted Feb. 5.

Wis., Milwaukee—Radio Building—Spec. 4107—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Feb. 18, constructing radio buildings at Navy Grounds, McKinley Park, from King Lumber Co., Charlottesville, $19,400 (May 1); Hyde & Baxter, 711 13th St., N. W., Wash., D. C., $20,680 (120 days). Noted Jan. 22.

★Tex., Ft. Worth—Extension to Post Office—Treas. Dept., Wash., D. C., let contract building extension to work room at Post Office, here, to W. P. Thurston Co., Merchants Natl. Bank, Richmond, Va., $16,100.

★Tex., Galveston—Repairing Bridge—U. S. Engr. Office, War Dept., Wash., D. C., let contract repairing bridges on intracoastal waterway, to A. M. Hazell & Connerat Quist Co., Galveston. About $11,450.

★Tex., Waco — Remodeling Post Office and Courthouse—Treas. Dept., Wash., D. C., let contract remodeling, here, to G. E. Wright, Inc., 1461 Monadnock Blk., Chicago, $8,100. Noted Feb. 19.

★Wash., Puget Sound—Building Extension—Spec. 4024—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract constructing "A" engine room, for central power plant, here, to Swensson & Co., 4099 Arcade Bldg., Seattle. About $45,800 (125 days). Noted Jan. 15.

Cal., Sacramento—Post Office Alterations—Treas. Dept., Wash., D. C., received only bid Feb. 18, altering Post Office and Courthouse, here, from King Lumber Co., Charlottesville, Va. About $173,000. Noted Jan. 22.

Cal., San Diego—Fuel Oil Storage Plant—Spec. 4102—Pub. Wks. Office, San Diego, received bids Feb. 11, building 50,000 gal. fuel oil storage plant, at Marine Corps Base, here, from F. W. Steffgan, 1040 2d St., $14,807 (120 days); T. Haverty Co., 8th St. and Maple Ave., Los Angeles, $14-890 (120 days); W. Slater Co., 2314 Santa Fe Ave., Los Angeles, $17,800. Noted Jan. 22.

Cal., San Francisco—Altering Building—Spec. 4116—Pub. Wks. Office, San Francisco, received bids Feb. 11, altering 3 buildings and constructing new double quarters, (1) work complete, from Schultz Constr. Co., 46 Kearny St., (1) $36,685, (2) $34 285 (120 days); Button & Button, 1536 Exford St., Berkeley, (1) $48,104, (2) $44,284 (120 days) Noted Jan. 22.

Miscellaneous

PROPOSED WORK

Greenhouse—Dorchester, Mass. (Boston P. O.)—Park & Recreation Dept., 33 Beacon St., Boston, plans to build greenhouse in Franklin Park. About $60,000.

Foundation—Bridgeport, Conn.—Westcott & Mapes, Inc., engrs., 207 Orange St., New Haven, soon let contract building concrete pile foundation for power plant on East Main St., here, for United Illuminating Co., 84 Temple St., New Haven. Total cost, $3,000,000. Noted Jan. 15 under "Industrial Works"

Generator and Tail Race—Watertown, N. Y.—See "Industrial Works."

Motor Truck—Cleveland, O.—City soon lets contract furnishing one 2 ton motor truck, one 5 ton dump truck, and six 3½ ton dump trucks. Cost to exceed $10,000.

Breakwater—Milwaukee, Wis.—Sewerage Comn. soon lets contract building pile and timber breakwater, involving 170,000 cu.yd. excav. and 2,400 ft. steel sheet piling. Former bids rejected. T. C. Hatton, city engr. Noted Jan. 8.

Bulkhead—Astoria, Ore. — Sanitary Recl. Comn. plans to issue $200,000 bonds to build bulkheads for reclamation work along water front and $300,000 to reclaim land behind bulkheads. G. T. McClean, engr.

Dam, etc.—Portland, Ore.—E G. Hopson, 205 Central Bldg., filed application with P. A. Cupper, state engr., Salem, for 1,200 second ft. of water to be taken from Metolius Creek, Crook Co., for power purposes, to include construction of 20 x 650 ft. rockfill and concrete dam, concrete circular canal and headgate, and installation of electric generators for development of 43,000 h.p. About $1,500,000.

BIDS DESIRED

Runway, etc.—Long Island City, N. Y.—Until March 1, by M. E. Connolly, pres. Queens Boro., constructing building and runway, furnaces, appurtenances and chimney of Jamaica Destructor, 4th Ward.

Steam Tractor—Newark, N. Y.—J. Goosen, 28 East Ave., is in the market for 12 hp. steam tractor and tank.

Trucks—Cape May, N. J.—Until March 2, by Bd. Freeholders, Cape May Co., furnishing one to three 2½ tons auto trucks with hydraulic lift steel dump bodies. I Fitch, clk.; advertised in this issue.

Tarvin B. and Crushed Stone, Sand—Millburn, N. J.—Until March 1, by Township Comn., furnishing 30,000 gal. Tarvia B, 1,000 tons crushed stone and 500 tons Morris Co. sand. M. R. Silance, twp. clk.

Road Roller and Grader—Hollidaysburg, Pa—Until March 5, by T. W. Tobias, comptroller Blair Co., furnishing one 10 ton combination road roller, convertible to hauling or grading engine or power for crusher and 1 complete engine grader and scarifier. Bids must contain complete specifications and photo of each article, also length of time for delivery at Hollidaysburg or Altoona.

Cement—Delaware—Until March 17, by State Highway Dept., Dover, furnishing 25,000 bbl. cement.

Cement and Slag—Dover, Del.—Until March 17, by State Highway Dept., furnishing 25,000 bbl. cement and 10,000 tons slag. C. M. Upham, ch engr.; advertised in this issue.

Crane and Truck—Cleveland, O.—Until March 5, by E. Shattuck, city purch. agt., furnishing 1¾ yd. grab bucket locomotive crane and one 2-ton truck for City Infirmary.

Filling—Cleveland, O.—Until March 4, by city, filling in 75,000 cu.yd. of slag or sand fill in East 55th St. trestle across Burke Brook, between Orey and Brown Aves. R Hoffman, city engr.

Garbage Perculator, Treating Tank, etc.—Cleveland, O.—Until March 5, by city, furnishing 1 garbage perculator, one 4 x 24 in. treating tank and 1 condenser for garbage reduction plant. C. Smith, city engr.

Running Gears, etc.—Cleveland, O.—Until March 5, by E. Shattuck, city purch agt., furnishing 12 special running gears used on garbage collection wagons, five 2½-ton trailers for hauling garbage, five 5-ton trucks with dump bodies and 12 special steel boxes used on garbage collection wagons.

Sweepers—Cleveland, O.—Until March 2, by city, furnishing 2 motor driven street and 2 motor driven curb sweepers. Cost to exceed $10,000.

Coal Storage and Conveyor—Detroit, Mich.—Until March 6, by F. W. Wiedmaier, archt., 42 Campau Bldg., building 200 x 200 ft. rein.-con. coal storage bin, with 40 x 192 ft. pockets, concrete foundations, also installing handling equipment, several electric motors, belt and bucket conveyors for elevating and distributing coal.

Mile Posts, Signs, etc.—Wisconsin—Until March 2, by State Highway Comn., Madison, furnishing 2,500 mile posts, 700 direction signs, 300 patrol signs and 500 danger signs, for marking State Trunk Highway System, also 1,200 to 1,500 cedar posts.

Bridge Materials—Anamosa, Ia.—Until March 2, by Comrs. Jones Co., furnishing 150 M ft. 3 x 12 in. 16 ft. bridge plank and 1,650 lin. ft. 12 and 15 in. corrugated pipe.

Coal Pockets—Rochester, Minn.—Rochester Ice Co., Wagoner Blk., receiving bids building 1 story coal pockets. About $50,000. W. F. Caustin, secy. F. H. Ellerhs, Endicott Bldg., St. Paul, architect.

Asphalt Paving Plant—St. Paul, Minn.—Until March 1, by H. W. Austin, city purch. agt., asphalt paving plant, with 400,000 lb. daily capacity. About $25.000. Noted Jan. 29.

Cement and Vitrified Brick—St. Paul, Minn.—Until March 1, by H. W. Austin, city purch. agt., furnishing 37,493 bbl. portland cement and 14,804 sq.yd. vitr. brick for paving.

Pitch Filler—St. Paul, Minn.—Until March 1, by H. W. Austin, city purch. agt. furnishing 812,930 lb. pitch filler.

Sewer Pipe and Brick—St. Paul, Minn.—Until March 1, by H. W. Austin. city purch. agt., furnishing 4,098 lin.ft. 12-18 in. sewer pipe and 45,770 lin.ft. sewer brick.

Pumping Equipment—Dresden, Ont.—Until March 1, by F. W. Farncomb, engr., Dominion Savings Bldg., London, installing electrical pumping equipment in waterworks. Town plans to remodel present steam operated plant into one operated by hydro-electric power. About $30,000.

Asphalt, Crushed Stone, etc. — London, Ont.—City receiving bids for 800 tons asphalt, 4,000 tons crushed stone, 20,000 bbl. cement, excavating machine and back filling and tamping machine. H. Brazier, city engr.

Road Supplies—London, Ont.—City receiving bids for refined asphalt, road oil, Portland cement, limestone dust, broken stone, vitr.. land and concrete tile, iron castings and general supplies. About $250,000. H. A. Brazier, city engr.

Steam Shovel, Tractor, etc. — London, Ont.—City receiving bids for 1 steam shovel, 1 caterpillar tractor, 1 crusher and washer, 3,000 ft. heavy aerial cableway, 5,000 bbl. cement steel reinforcing. E. V. Buchanan, Hydro Offices Engr.

Road Building Plant, Traction Engines, etc.—Napanee, Ont.—W. G. Wilson, secy. Lennox and Addington Counties is in the market for 1 complete road building plant for macadam roadwork, to include road roller, stone crusher with screens, 2 traction engines, etc.

Wharf—Stewart, B. C.—Until March 5, by Dept. Pub. Wks., Ottawa, Ont. building pile and timber wharf here. Work involves about 7.500 lin.ft. creosoted fir wood pilings and 1 stiff leg derrick, capacity 4.000 lb. About $34.000. E. La-

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Tanks—Boston, Mass.—W. E. Schrafft & Sons Corp., 160 Washington St., let contract building four 7 x 15 x 16 ft. concrete and steel storage tanks, to Simpson Bros. Corp., 166 Devonshire St. About $20,000. Noted Jan. 22.

Seawall—Scituate, Mass.—Dept. Pub. Wks., State House, Boston, received bids Feb. 20, building concrete seawall, here, from W. H. Connor, Middleboro, $10,120; O. R Mann, South Hanover, $11,396; J. Williams & Co., 306 Hanover St., Boston, $14,170. Noted Feb. 5.

★Tanks—New Haven Conn.—Gulf Refining Co., 57 Russell St., will build four 10 x 25 x 40 ft. steel and concrete storage tanks. Work will be done by day labor.

Asphalt—Brooklyn, N. Y.—E Riegelmann, boro. pres., received only bid Feb. 19, furnishing and delivering 150,000 gal. and 2,000 lb. refined asphalt, from Warner-Quinlan Co., 79 Wall St., New York City, $53,450. Noted Feb. 12 under "Streets and Roads."

★Stone, etc.—Long Island City, N. Y.—M E. Connolly, pres Queens Boro., let contract furnishing and delivering 29,000 cu.yd broken stone to C H and R T Peckworth, 529 Hudson St., New York City, $99,528; 5,000 cu.yd. sand grit and 10,000 cu.yd. sand, to T. F. Toughy Co., 89 Main St., Brooklyn, $13,200 and $22,100 respectively; 70,000 asphalt paving blocks, to Hastings Paving Co., 17 Battery Pl., New York City, $6,020; 600,000 gal. cold road oil, to Texas Co., 17 Battery Pl., New York City, $37,020; 200,000 gal. hot road oil, 700 ton asphalt cement and 190,000 gal. road surfacing, to Warner-Quinlan Co., 79 Wall St., New York City, $12,940, $15,589 and $10,470 respectively; 846 lin.ft. 12 in. c.i. pipe, to J. Fox & Co., 256 Bway., New York City, $2,652. Noted Jan. 15.

★Road Materials—New York, N. Y.—H. H. Curran, pres. Manhattan Boro., let contract furnishing and delivering 1,200 tons asphalt paving cement and 900,000 gal. refined asphalt, to Warner-Quinlan Co., 79 Wall St., $33,876 and $9.423 respectively; 25,000 bags portland cement, to J. A. McCarthy, 551 Exterior St., $20,250; 4,000 cu.yd. paving sand, 5,000 cu.yd. paving grit and 3,000 cu.yd. course aggregate, to Manhattan Sand Co., 418 East 39th St., $7,600, $17,500 and $9,700 respectively; 620,000 wood paving blocks, to Amer. Creosoting Co., 17 Battery Pl. (heavy), $37,618 (light), $38,547; 45,000 new granite blocks, to J. Meehan & Sons, $5,805; 100 cords mixed wood, to Clark & Wilkins, 511 West 34th St., $2,000; 20,000 cu yd. asphalt wearing surface, to C. W. Crane, 17 Battery Pl., $26,000; 9,000 cu.yd. ⅝ in. binder stone and 1,600 ton limestone, to New York Trap Rock Co., 101 Park Ave., $19,350 and $57,120 respectively; 60,000 gal. gasoline, to Standard Oil Co., 26 Bway., $14,700. Noted Feb. 19.

Road Materials—New York, N. Y.—H. Bruckner, pres. Bronx Boro, received bids Feb. 17, furnishing and delivering (a) 500 cu. yd. white quartz, (b) 50 ton paving pitch, (c) 20,000 gal. bituminous road surfacing, (d) 300,000 gal. asphalt road oil, (e) 300,000 gal. tar road oil, (f) 3,000 bags portland cement, (g) 3,000 cu. yd. binder stone, (h) 500 ton limestone, (i) 500 ton asphaltic cement, (j) 1½ in. screening, (k) 600 cu. yd. fine sand, (l) 5,000 cu. yd. sand grit, (m) forage, from Lannigan Bros., 165th St., (a) $2.400, (k) $1,410, (l) $18-400; Lenox Sand & Gravel Co., Hudson River and 157th St., (a) $2,460, (k) $1,470, (l) $17.500; Barrett Co, 17 Battery Pl., (b) $1,250, (c) $3,800, (e) $33,000; Warner Quinlan Co., 79 Wall St., (d) $29,970, (i) $14.750; Texas Co., 17 Battery Pl., (d) $32,940; Atlantic Refining Co., 291 Bway., (d) $34,310; Tar Products Co., (e) $35,850; W. A. Mallett Co., 110 Westchester Sq., (f) $2.385; J. A. McCarthy, 551 Exterior St., (f) $2,550; Calvin, Tompkins Co., 17 Battery Pl., (g) $8,850; New York Trap Rock Co., 101 Park Ave., (g) $9,750, (h) $5,600, (j) $29,089; Watson Contg. Co., East Tremont Ave. and Westchester Creek, (i) $31.000; Bronx Hay & Grain Co., Inc., 2846 Webster Ave., (m) $3,693; G. N Rheinhardt & Co., 973 Brook Ave., (m) $3,788. Noted Feb. 12.

★Platforms—Phila., Pa.—City let contract building platforms and connecting passages of stations on Frankford "L" line, York and Dauphin Sts. and Girard Ave., to F. I. Boas, Phila. About $130,000.

★Cement—Wheeling, W. Va.—City let contract furnishing 25,000 bbl. cement, to Wheeling Building Material Co., Peninsula St, $2.23 per bbl.; 8,000 bbl., to Wheeling Wall Plaster Co., 27th and Market Sts., $2.83 per bbl.

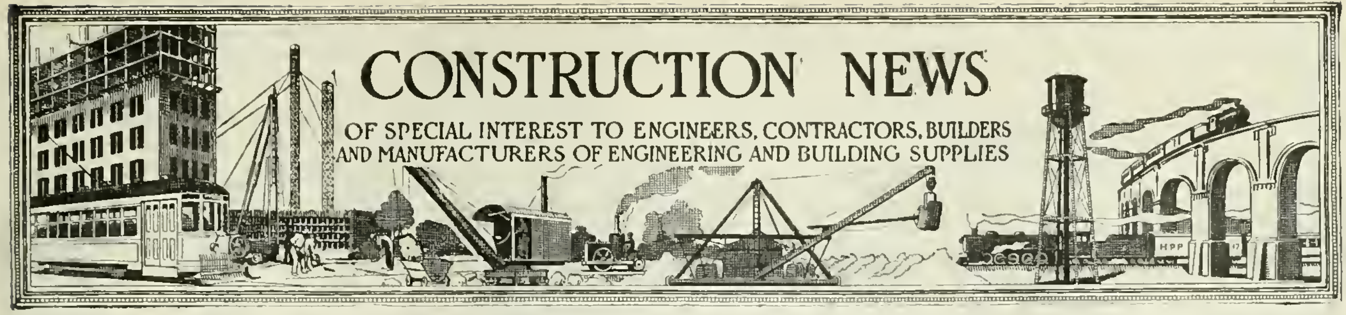
Loading Platform—Detroit, Mich.—City receives only bid building 30 x 180 ft. loading platform, rein.-con. slab on concrete foundation, at 24th St. garbage plant, with 400 ft. spur track, from W. E. Lennane, Union Trust Bldg., $37,800.

★Subway—Detroit, Mich.—Dept Pub. Wks. let contract building rein.-con. subway and approaches for street traffic to Belle Isle Park, under Jefferson Ave. to Candler Dock & Dredge Co., 305 Moffat Bldg., $360,190. Noted Jan. 29.

★Cast Iron Pipe and Hydrants—Pontiac, Mich.—City let contract furnishing 833 tons 8 in. and 1,444 tons 6 in. c.i. pipe, to Amer. Cast Iron Pipe Co, 512-1st Natl. Bank Bldg., Chicago, $159,845; furnishing hydrants, gate valves and special castings to Flower Valve Co. Clayton and Parkinson Sts., Detroit, $18,297. Noted Feb 12 under "Waterworks."

★Coal Plant and Sand House—Sydney, N. S.—Dept Railways & Canals, Ottawa let contract building 250 ton mechanical coaling plant and sand house, to Williams & Wilson, Inspector St., Montreal $25,355 and $3,875 respectively

★Pipe—Acton, Ont.—Town let contract furnishing 20,000 ft. 6 and 8 in c i pipe, to Gartshore-Thompson Co Stuart St., Hamilton $83 per to



CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

UPS AND DOWNS OF THE MARKET

PIG IRON AND STEEL—General increase of $1 to $3 since Feb. 1, and about $15 since last November. Car shortage still acute.

RAILWAY MATERIALS—No change in prices of rails, ties or supplies.

PIPE—Discount on steel pipe and iron pipe has dropped 3½ points (higher price). Cast iron pipe advanced in Chicago and in San Francisco. Sewer pipe advanced in Chicago, from 1¾c. for 3@4 in. to 40c. for 36-in.; advanced also in Detroit and Baltimore.

ASPHALTUM—Advances in Denver and Kansas City.

SAND—New York price for spring delivery is $1.25, as during 1919. Increases in Denver, San Francisco and Los Angeles.

GRAVEL—Advances in Kansas City, Cincinnati and New Orleans. Decreases of 5 to 15c. in Baltimore and Montreal. New York prices until July 1 are $2.25 for gravel, both sizes, and $2.75 for ready mixed (2 parts gravel and one part sand). Producers used to quote a year ahead, but labor uncertainty has caused a change of policy, to six months.

CRUSHED STONE—Spring prices in New York are quoted as $1.85@$1.95 for 1½-in., $2@$2.10 for ¾-in., with predictions of a feast or a famine for stone dealers. Other advances in San Francisco, Atlanta and Baltimore. Southern quarries reported filled up with orders.

LIME—Up $7.20 per ton, hydrated, in Detroit, lump up 85c. per 180-lb. bbl. Slight advances in Baltimore and Kansas City.

PORTLAND CEMENT—Up in Detroit and Montreal; steady elsewhere.

REINFORCING MATERIALS—Expanded metal lath up $3 per ton in New York. No change in triangle mesh.

COMMON BRICK—Advance of $2.50 in San Francisco. No changes elsewhere. In New York price remains $25, with practically no brick available, on account of difficulties in transportation.

HOLLOW TILE—Advances in Chicago, Boston, New Orleans and Detroit.

STRUCTURAL MATERIAL—General increase in warehouse prices. Mill prices remain the same as last month, except that tank plates are quoted at $2.65@$2.90 instead of $2.65, for indefinite deliveries. In a few cases, mills have accepted orders for delivery in three or four months, at prices ranging from $3.50@$4, at mill.

RIVETS—Demand active, with mill price up 30c., to $4.50, for structural rivets. Warehouse prices up $1, in New York; 25c. in San Francisco.

PREPARED ROOFINGS—Only change was in price of tar felt, from $84 to a new level of $89 per ton, in carload lots, New York.

STEEL SHEETS—Despite attractive premiums offered for prompt delivery, the car shortage causes large stocks of sheets to accumulate at the mills. Prices depend largely upon whether buyer is a regular customer at the mill. Warehouse advances in New York and San Francisco.

LUMBER—Douglas fir up $2, all sizes, San Francisco. Southern pine, in New York, is quoted by Lumberman's Bureau at $63 for 3 x 45, 20 ft. and under, $101 for 4 x 20, which are advances of $5 over last month's quotations. Advances in New Orleans, St. Paul, and Detroit, with startling increases in Baltimore and Denver.

LABOR—General increase in Denver. Situation steady. Common labor generally scarce. Ralph J. Reed, of Los Angeles, advises that common labor is scarce, and that plasterers receive $10 a day. Agreement reached in St. Louis on Feb. 28, whereby 5,200 building laborers, concrete workers and painters will receive increases effective Mar. 1.

Price advances are indicated by **heavy type**, declines by *italics*

PIG IRON—Quotations compiled by The Matthew Addy Co.:

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	**$44.60**	$43.60
Northern Basic	**42.80**	39.80
Southern Ohio No. 2	**43.80**	42.80
NEW YORK, tidewater delivery		
2X Virginia (silicon 2.25 to 2.75)	47 65	47.65
Southern No. 2 (silicon 2.25 to 2.75)	47.70	47.70
BIRMINGHAM		
No 2 Foundry	**41.00**	40.00
PHILADELPHIA		
Eastern Pa	**45.35-45.65***	44.00*
Virginia No. 2	43 25*	42.00*
Basic	43 00†	41.50†
Grey Forge	42.50*	41.50*
CHICAGO		
No. 2 Foundry Local	**43.00**	42.25
No 2 Foundry Southern	**46.60**	45.00
PITTSBURGH, including freight charge from the Valley		
No. 2 Foundry Valley	**43.65**	42.40
Basic	**42.90**	41.90
Bessemer	**43.40**	42.40
MONTREAL		
Silicon 2.25 to 2.75%	**43.25**	40.00

* F. o. b. furnace. † Delivered.

RAILWAY SUPPLIES

STEEL RAILS—The following quotations are per ton f. o. b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Current	One Year Ago	Current	One Year Ago
Standard bessemer rails	$45 00	$55 00	$45.00	$65.00
Standard openhearth rails	47.00	57.00	47.00	67.00
Light rails, 8 to 10 lb	2.58½*	3 13½	2.585*	3.13½*
Light rails, 12 to 14 lb	2.54*	3.09*	2.54*	3.09*
Light rails, 25 to 45 lb	2.45*	3.00	2.45*	3 00*

* Per 100 lb

RAILWAY TIES—For fair-sized orders, the following prices per tie hold:

		7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago	Plain	$1.48	$1.33
San Francisco	Douglas Fir—Green	1.74	1 24
San Francisco	Douglas Fir—Creosoted	3.36	2.38

Prices per tie at Missouri mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0.70	No. 1	$0.55
No. 2	.80	No. 2	.65
No. 3	.90	No. 3	.75
No. 4	.98		
7x9x8 white oak			1.05
7x9x8 red oak (No. 4)	$0.80	No. 5	.87

Note.—Add 36c. each for treatment.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard spikes, 9/16-in. and larger	$3.35	$3 70	$3.62	$4.44	$5.65
Track bolts	4.90-5.00	4.90	4 62	Premium	6 65
Standard section angle bars	2.75	....	3.02	Premium	4 90

PIPE

STEEL AND IRON—The following discounts are to jobbers for carload lots on the Pittsburgh basing card, discounts on steel pipe, applying as from January 14, 1920, and on iron pipe from January 7, 1920:

BUTT WELD

Inches	Black	Galv.	Inches	Black	Galv.
⅛, ¼ and ⅜	47	20½	⅛ and ¼	1	+25
½	51	36½	⅜	25½	+ 1½
¾ to 3	54	41½	½	29½	11½
			¾ to 1½	34½	18½
			2 and 2½	33½	17½

LAP WELD

Inches	Black	Galv.	Inches	Black	Galv.
2	47	34½	1¼	24½	9½
2½ to 6	50	37½	1½	31½	17½
7 to 12	47	33½	2	28½	14½
13 and 14	37½	...	2½ to 6	30½	17½
15	35	...	7 to 12	27½	14½

BUTT WELD, EXTRA STRONG, PLAIN ENDS

Inches	Black	Galv.	Inches	Black	Galv.
⅛, ¼ and ⅜	43	25½	¼	+7	+40
½	48	35½	⅜	23½	6½
¾ to 1½	52	39½	½	28½	15½
2 to 3	53	40½	¾ to 1½	34½	19½
			2 and 2½	34½	19½

LAP WELD, EXTRA STRONG, PLAIN ENDS

Inches	Black	Galv.	Inches	Black	Galv.
2	45	33½	1¼	21½	6½
2½ to 4	48	36½	1½	27½	13½
4½ to 6	47	35½	2	29½	16½
7 to 8	43	29½	2½ to 4	31½	19½
9 to 12	38	24½	4½ to 6	30½	18½
			7 to 8	22½	10½
			9 to 12	17½	5½

STEEL—From warehouses at the places named the following discounts hold for steel pipe:

	Black New York	Black Chicago	Black St. Louis
¾ to 3 in. butt welded	47%	54%	45%
2½ to 6 in. lap welded	42%	50%	41½%

	Galvanized New York	Galvanized Chicago	Galvanized St. Louis
¾ to 3 in. butt welded	31%	40½%	30½%
2½ to 6 in. lap welded	27%	37½%	27½%

Malleable fittings, Class B and C, from New York stock sell at + 23% list prices. Cast iron, standard sizes, **net**.

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York Current	New York One Month Ago	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
4 in	$70 30	$70.30	$65.70	$75 80	$71.00	$92.55	$70 30
6 in. and over	67.30	67.30	62.70	72.80	68.00	89.55	67.30

Gas pipe and 16-ft. lengths are $2 per ton extra.

CLAY DRAIN TILE—The following prices are per 1000 lin.ft.:

Size, In.	New York Current	New York One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$35.00	$35 00	$22.50	$60 00	......	$33.44
4	51.00	51.00	27 00	80 00	$45 00	50 16
5	65.00	65 00	45 00	100 00	65.00	62.70
6	90 00	90 00	55 00	120 00	90 00	83.60
8	130.00	130.00	100.00	180.00	150.00	133.76

SEWER PIPE—The following prices are in cents per foot for carload lots:

Size, In.	New York Current Delivered	New York Year Ago Not Del.	St. Louis	Chicago	San Francisco	Dallas
3	$0.18	$0.117	....	$0 15	......	$0.15
4	.18	.117	....	.15	$0.16	.15
5	.27	.1755	....	.225	.20	.21
6	.27	.1755	$0.16	.225	.24	.21
8	.42	.273	.21	.35	.34	.30
10	.62	.4095	.29	.525	.47	.42
12	.80	.5265	.37	625	.64	.54
15	1.23	.702	.56	.90	1.00	.78
18	1 78	.975	.91	1.25	1.35	1 02
20	2 13	1.17	1.14	1.50	1.80	1.38
22	2 84	1.56	1.46	2 00	......	1.80
24	3.20	1.755	1.56	2 25	2.24	2.70
27	....	2.73	1.90	3 50	......	3.30
30	....	3.024	2.57	4 00	......	4.20
33	....	3.96	3 09	4 75	......	4 025
36	....	4.51	3.37	5.50	......	4.80

	3	5	8	12	24	36
Boston	$0 126	$0.189	$0.294	$0.567	$1.89	$5 0225
St. Paul	.125	.167	.295	.495	1.87	4 37
Denver	....	.....	.29	.50	1 75	......
Seattle	....	.....	.3825	68..	......	2.375
Kansas City	No prices obtainable					
Los Angeles	.0975*	.1525*	27	48	.60*	......
New Orleans	45 per cent. off					
Cincinnati	59 per cent off					
Atlanta	....	....	.34	.55	2.00	....
Montreal	55 per cent. off					
Detroit	.125	.185	.29	565	2.20	5.575
Baltimore	.168	.232	.392	.756	2.52	.....

* 4-in., 6-in., 30-in. respectively.

ROAD AND PAVING MATERIALS

ROAD OILS—Following are prices per gallon in tank cars 8000 gal. minimum f.o.b. place named:

	Current	One Month Ago
New York, 45-65% asphalt (at terminal)	$0.09	$0.09
New York, liquid asphalt... (" ")	.09	.09
New York, binder (" ")	.10	.095
New York, flux (" ")	....	.....
St. Louis, 40% asphalt	.065	.065
Chicago, 40-50% asphalt	.07	.07
Chicago, 60-70% asphalt	.0725	.0725
Dallas, 40-50% asphalt	.07	.07
Dallas, 60-70% asphalt	.08	.08
Dallas, 75-90% asphalt	.10	.10
San Francisco, asphalt base, 42 gal. per bbl.	2.25	2.25

ASPHALTUM—Price er ton in packages (350-lb. bbls. or 425-lb. drums), and in bulk in carload lots:

	Package	Bulk
New York	$30 00	$25 00
Chicago	24 25	17.75*
San Francisco	17 00	13.75
Dallas	32 00	30 00
Seattle	25.00	.....
Denver	40.00	36 00
St. Paul	24.00	21.00
Kansas City	34 00	26.00
Atlanta	25 00	20.80
New Orleans	16 50	.....
St. Louis	23.25*	17.75
Baltimore	43.00	.....
Los Angeles	.....	15.00
Montreal	.....	19 60
Detroit	49 00	42.25

* F. o. b. Whiting, Ind.; freight to St. Louis $2.90 per ton.

PAVING STONE—

New York	5-in. granite	$130.00	per M
Chicago	About 4x8x4 dressed	3.10	sq.yd.
	About 4x8x4 common	2.80	sq.yd
San Francisco	Basalt block 4x7x8	'65.00	per M
Kansas City	Granite	3.00	sq.yd.
Boston	5-in. granite	110.00	per M
St. Paul	Sandstone	2.47	sq.yd.
Atlanta	Granite	2.00	sq.yd
Detroit	Granite, 26½ blocksper sq. yd.	2.85	sq.yd.
Baltimore	Common	2.30	sq.yd.
Montreal	Granite	5.90	sq.yd.

FLAGGING—

New York	Bronx	$0.24	sq.ft.
	Manhattan	.25	sq.ft.
	Queens, 5 ft. square	.24	sq.ft
	6x20-in. cross-walk	.80	lin.ft.
Chicago	18 in. wide	.70	lin.ft..

WOOD BLOCK PAVING—	Size of Block	Treatment	Per Sq.Yd.
New York	3½	16	$3.35
New York	4	16	3.65
Chicago	4	16	4.50
Chicago	3½	16	3.50
Chicago	City specifications		5.00
St. Louis	3½	16	2.90
St. Louis	4	16	3.32
Seattle	4	16	2.55
Kansas City	4	16	3.00
St. Paul	3½	..	2.75
Atlanta	3½	16	2.30
New Orleans	3½	16	2.63
New Orleans	4	16	3.00
Dallas	3½	18	2.92
Dallas	4	18	2.98
Baltimore	3½	16	3.60
Montreal	4	16	4.60

CONSTRUCTION MATERIALS

SAND AND GRAVEL—Price for cargo or carload lots is as follows, per cu.yd.:

	Gravel 1½ In. Current	Gravel 1½ In. One Yr. Ago	Gravel ¾ In. Current	Gravel ¾ In. One Yr. Ago	Sand Current	Sand One Yr. Ago
New York	$2 25	$2.00	$2.25	$2.00	$1 25	$1 25
Denver	1.80	1 60	1.80	1 60	1 40	1 10
Chicago	2.00	2 00	2.00	1 40	2 00	1 10
Kansas City	3.25	2 50	3.75	3 00	1.25	1 00
St. Louis	1 78	1 76	1.82	1 82	1.68	1 68‡
Seattle, per ton	1 25	1 25	1.25	1 25	1.25	1 25
Dallas	3 50	2.00	3.50	2.00	2.25	1 35
St. Paul	1.50	1.25	1.35	1.35	.75	.60
Cincinnati	.	1 35‡	....	....	1 30	1.35‡
San Francisco	1 50	1 20	1.50	1 15	1.50	1 15
Boston	2 00	2 75	2.00	2.75	2.00	2.00
New Orleans	2 55	4.00	2.40	1 80	1.35	1.88
Los Angeles	1 50	1.25	....	1 50	1.00	1.10
Atlanta, per ton	2.25	....	2.25	2 40	1 15	
Detroit	2 50	....	2 00	....	1.85	
Baltimore	1 40‡	...	1.60‡	....	.65-75	
Montreal, per ton	1.15	.	....	...	1 40	

* Fine white sand, Pacific & Ottawa, per ton $6.
† Kaw River sand is $1.75 per yd ‡ per ton.

CRUSHED STONE—Price for cargo or carload lots is as follows, per cu.yd.:

	1½ In.		¾ In.	
	Current	One Year Ago	Current	One Year Ago
New York	$1.85-1.95	$1.70	$2@2.10	$1.85
Chicago	2.00	1.60	2.00	1.70
St. Louis	1.65	1.35	1.65	1.37
Dallas	2.90	2.25	2.90	2.25
San Francisco	1.50	1.15	1.50	1.15
Boston	3.00 (del)	3.00	3.00 (del)	3.00
St. Paul (lime)	1.50†	1.15	1.60	1.25
Denver	3.75	1.60	3.75	1.60
Kansas City	2.25	1.70	2.35	1.80
Seattle (Del.)	3.50	1.50	3.50	1.50
Atlanta	3.10*	2.60	....	2.60
New Orleans	4.00	....	4.35	1.28
Los Angeles	1.50	1.50	1.50	1.60
Detroit	1.75	....	1.75	....
Baltimore	1.50	....	1.50	....
Montreal	1.75*	....	2.00*	....

* Per ton. † Limestone; traprock, $1.60 and $1.80 per ton for 1½ and ¾-in.

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 200-Lb. Barrel	
	Finished	Common	Finished	Common
New York	$17.50	$14.50	$2.75*-at plant-	$2.55*
Kansas City	26.00	25.00	2.50	2.40
Chicago	20.50	14.50	2.25	1.50
St. Louis	22.00	18.00	...	2.00
Boston	24.00	19.00	4.00*	3.50*
Dallas	30.00	.....	2.75	
Cincinnati	16.20	13.20	12.95‡	10.70‡
San Francisco	20.00	16.00	....	2.30
St. Paul	24.00	19.00	1.60†	1.50
Detroit	27.20		2.85†	1.80*
Seattle	30.00	.....	2.80†	2.80†
Los Angeles	2.75†	2.20†	2.75†	2.00†
Baltimore	21.35	16.50	....	10.65‡
Montreal	25.00	25.00	15.00‡	15.00‡
Atlanta	22.50	.....	.....	.....
New Orleans		22.00	.....	2.40

* 300-lb. barrels. †Per 180-lb. barrel. ‡ Per ton.
NOTE—Refund of 10c. per barrel.

NATURAL CEMENT—Price to dealers for 500 bbl. ur over, f. o. b., exclusive of bags:

	Current	One Year Ago
St. Paul (Austin)	$1.50	$1.63
Kansas City (Ft. Scott)	1.75	1.30
New Orleans	2.52	2.52
Atlanta (Magnolia)	1.90	....
Cincinnati (Louisville)	2.25	1.50

PORTLAND CEMENT—Current prices are for barrels in carload lots, *without* bags, to contractors:

	Current Without Bags	One Month Ago	One Year Ago With Bags
New York (del.)	$2.80*	$2.80	$3.45
Jersey City (del.)	2.47	2.47	3.62
Boston	2.42	2.42	3.57
Chicago	2.00	2.00	3.05
Pittsburgh	2.05	2.05	3.15
Cleveland	2.32	2.32	3.32
Detroit	2.08	2.08	3.28
Indianapolis	2.27	2.27	3.22
Toledo	2.12	2.12	3.22
Milwaukee	2.11	2.11	3.16
Duluth	2.10	2.10	3.20
Peoria	2.12	2.12	3.16
Cedar Rapids	2.18	2.18	3.28
Davenport	2.14	2.14	3.24
St. Louis	2.20	2.20	3.30
San Francisco	2.63	2.63	3.60
New Orleans	2.36	2.36	3.77
St. Paul	2.22	2.22	3.40
Denver	2.82	3.12	3.67
Kansas City	2.36	2.36	3.30
Seattle	2.78	2.68	3.13
Dallas	2.03	2.03	2.93
Atlanta	2.70	2.70	3.75
Cincinnati	3.00	2.80	2.80
Los Angeles	2.78	2.78	3.68
Baltimore	2.90	2.45	....
Montreal	3.48†	3.45†	....

NOTE—Bag charge is generally 15c. each. *Delivered Manhattan, The Bronx or Brooklyn. †Including bags.

TRIANGLE MESH—Price per 100 sq.ft. in carload lots:

PLAIN 4-INCH by 4-INCH MESH

Style Number	Sectional Area Square Inches per Ft. Width	Pittsburgh	New York	Chicago	St. Louis	Dallas	San-Francisco
032	0.032	$0.92	$1.16	$0.98	$0.99	$1.13	$1.32
049	0.049	1.18	1.48	1.26	1.26	1.43	1.67
068	0.068	1.44	1.86	1.53	1.56	1.79	2.06
093	0.093	1.85	2.39	1.97	2.00	2.41	2.65
126	0.126	2.28	3.02	2.43	2.47	2.92	3.28
153	0.153	2.72	3.59	2.90	2.95	3.48	3.93
180	0.180	3.12	4.13	3.33	3.39	3.99	.....
245	0.245	4.12	5.44	4.40	4.47	5.27	....
287	0.287	4.76	6.29	5.08	5.16	6.10	6.86
336	0.336	5.52	7.30	5.89	5.99	7.06	.
395	0.395	6.40	8.45	6.83	6.94	8.19	..

PAVING

Style Number	Sectional Area Square Inches per Ft. Width	Pittsburgh	New York	Chicago	St. Louis	Dallas	San-Francisco
036P	0.036	$0.71	$0.92	$0.76	$1.77	$0.80	...
053P	0.053	1.00	1.28	1.06	1.08	1.12	...
072P	0.072	1.26	1.66	1.34	1.37	1.46	....
097P	0.097	1.62	2.12	1.73	1.76	1.88	..
049R	0.049	1.00	1.28	1.06	1.08	1.12	..
067R	0.067	1.26	1.65	1.34	1.37	1.46	.
089R	0.089	1.62	3.11	1.73	1.76	1.88	....

Made in 16-, 20-, 24-, 28-, 32-, 36-, 40-, 44-, 48-, 52- and 56-in. width in rolls 150-, 200- and 300-ft. lengths. Galvanized is about 10% higher.

EXPANDED METAL LATH—Prices in carload lots per 100 yd. for painted are as follows:

		New York Current					
Gage	Weight	Carloads	Less Carloads	Chicago	St. Louis	San Francisco	Dallas
27	233	$32.10	$32.20*	$31.10	$33.00	$36.00	$32.75
26	250	33.45	33.65*	32.45	34.00	...	34.50
25	300	34.90	35.00*	33.90	.....	39.00	36.75
24	340	36.50	36.65*	33.50	37.00	44.00	39.25
22	450	39.60	39.80*	......	.....	....	43.30

* Delivered on job.

BARS, CONCRETE REINFORCING—Following quotations are per 100 lb.:

ROLLED FROM BILLETS

		Warehouse, Uncut					
		New York					
In.	Mill Pittsburgh	Current	One Year Ago	Chicago	St. Louis	Dallas	San Francisco
¾ and larger	$2.35	$3.52	$4.12	$3.37	$3.50-4.00	$4.75	$5.30
⅝	2.40	3.57	4.18	3.42	3.55-4.05	4.80	5.35
½	2.45	3.62	4.23	3.47	3.65-4.10	4.95	5.40
⅜	2.60	3.77	4.38	3.62	3.75-4.25	5.00	5.55
¼	2.85	4.02	4.62	4.87	4.00-4.50	5.05	5.80

Twisted bars cut to length take extra of 29½c. per 100 lb.

ROLLED FROM RAILS

	Chicago	St. Louis	Dallas		Chicago	St. Louis	Dallas
¾ in. and larger	$3.00	$3.50	$4.25	⅜	$3.25	$3.75	.
⅝	3.05	3.55	4.30	¼	3.50		
½	3.10	3.60	....				

BRICK—To contractors price per 1000 in cargo or carload lots is as follows:

	Common			Paving	
	Current	One Month Ago	One Year Ago	Brick	Block
New York	$25.00	$25.00	$15.00	No Quotations	
New Orleans	22.50			23.50	
Chicago	14.00	14.00	12.00	41.00	47.00
St. Louis, salmon	16.00	14.00	12.00	31.00	
Denver	17.00	14.00	12.00	....	.
Dallas	18.57	18.57	16.07	27.30	....
San Francisco	15.00	12.50	12.50	......	...
Boston	35.00	35.00	18.00	50.00	55.00
St. Paul	20.00	20.00	10.25	.....	40.00
Kansas City	20.00	20.00	13.00	44.50	....
Seattle	15.00	15.00	15.00	.....	44.00
Cincinnati	19.00	19.00	16.50-14.00	36.00	...
Montreal (del.)	17.50	17.50	.....	55.00‡	.....
Detroit	21.00	21.00	.....	40.00	.....
Baltimore (del.)	18.00-22.00	18.00-22.00	.....	28.00	45.00

*Hard brick $18.50 in St. Louis. ‡Not delivered.

HOLLOW TILE—Price per block in carload lots for hollow building tile:

	New York						
	Current	One Year Ago	Chicago	St. Louis	San Francisco	Dallas	Factory Perth Amboy, N. J.
4x12x12	166.70†	$0.11925	$0.1326	$0.08	$0.1125	$0.1088	147.80†
6x12x12	222.30†	.159	.1858	.105	.15	.09	197.10†
8x12x12	....	....	.2388	.15	....	.1152	295.60*
10x12x12	....	....	.2786	.173	....	.2546	369.50*
12x12x12	....	....	.345	.208	....	.3082	443.40*

*Natco XXX. These prices subject to 5% cash discount in 15 days from date of shipment. † Partition tile.

	4x12x12	8x12x12	12x12x12
Boston	$0.20	$0.40	$0.55
St. Paul	.087	.158	.248
Cincinnati	.101	.18925	.2864
Kansas City	No prices obtainable		
Denver	.12	.185	.....
Seattle	.09	.175	.30
Atlanta	.115	.19	.28
Los Angeles	.082	.154	
New Orleans	[illegible]	.24	.36
Detroit	[illegible]	.275	.325
Montreal	[illegible]	28	.35

STRUCTURAL MATERIAL—Following are base prices f.o.b. mill, Pittsburgh, together with quotations per 100 lb. from warehouses at places named:

	Mill Pitts-burgh	New York Cur-rent	New York 1 Yr. Ago	St. Louis	Chi-cago	San Fran-cisco	Dallas
Beams, 3 to 15 in.	$2.45	$3.97	$4.07	$4.04	$3.97	$5.40	$5.50
Channels, 3 to 15 in.	2.45	3.97	4.07	4.04	3.97	5.40	5.50
Angles, 3 to 6 in., ¼ in. thick	2.45	3.97	4.07	4.04	3.97	5.40	5.50
Tees, 3 in. and larger	2.45	4.02	4.12	4.04	4.02	5.40	5.50
Plates	2.65	4.17	4.27	4.24	4.17	6.30	5.75

RIVETS—The following quotations are per 100 ib.:

STRUCTURAL

	Mill Pittsburgh	Warehouse New York Current	Warehouse New York One Yr. Ago	Warehouse Chi-cago	Warehouse St. Louis	Warehouse San Fran-cisco	Warehouse Dallas
¾ in. and larger	$4.50	$6 00	$5.67	$4.97	$5.44	$6.65	$7.50
CONE HEAD BOILER							
¾ in. and larger	4.60	6 10	5 77	5 07	5.54	6.75	7.50
⅝ and $\frac{11}{16}$	4.75	6.25	5 92	5 22	5.54	7 00	7.50
½ and $\frac{9}{16}$	5.00	6.00	6.27	5.27	5.54	7.25	7.75

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	New York	Chicago	San Francisco	Dallas	Montreal
Wire	$4.50	$7.50	$4.15	$5.50	$6.90	$4 95
Cut	....	8.00	7.00	6.90	6.40	5.00

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

	1-Ply c.l.	1-Ply l.cl.	2-Ply c.l.	2-Ply l.cl.	3-Ply c.l.	3-Ply l.c.
No. 1 grade	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25
No. 2 grade	1.70	1.95	2.15	2.40	2.50	2.75

Asbestos asphalt-saturated Felt (14 lb. per square) costs $170 per ton f.o.b. Erie.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $3.00 per roll in carload lots and $3.25 for smaller quantities.

Shingles, red and green slate finish, cost $7.25 per square in carloads; $7 50 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

	Carload Lots N. Y.	Carload Lots Chicago	Less Than Carload Lots N. Y.	Less Than Carload Lots Chicago
Tar felt (14 lb. per square of 100 sq.ft.)	$89.00	$87.00	$91.00	$89.00
Tar pitch (in 400-lb. bbl.)	21.00	18.00	22.00	19.00
Asphalt pitch (in barrels)	34.00	34.00	37.50	37.50
Asphalt felt	88.00	88.00	90.00	90.00

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Fran-cisco	New York Current	New York One Yr. Ago
No. 10	3.55 4.00	5.59	5.27	7.50	5.57-6.80	5.17
No. 12	3.60 4.05	5.59	5.32	7.55	5.62-6.85	5.22
No. 14	3 65-4 10	5.59	5.37	7.60	5 67 6.90	5.27
No. 16	3 75 4.20	....	5.47	7.70	5.77-7.00	5.37
Black						
*Nos. 18 and 20	4.15-4.80	5.59	6.30	7.85	6.80 7 30	6.02
*Nos. 22 and 24	4 20 4.85	6.60	6.35	7.90	6.85 7 35	6.07
*No. 26	4 25 4.90	6.60	6.40	7.95	6.90 7.90	6.12
*No. 28	4 35 5.00	6.60	6.50	8.05	7.00 8 00	6.22
Galvanized						
No. 10	4 70 6.00	8.10	7.00	8.60	7 50 9 00	6.57
No. 12	4.80 6.10	8.20	7.10	8.60	7 60 9.10	6.62
No. 14	4 80 6.10	8.20	7.10	8.60	7.60- 9 10	6.67
Nos. 18 and 20	5 10 6.40	8.65	7 40	8.90	7.90 9.40	6 97
Nos. 22 and 24	5 25 6 55	8.80	7 55	9.05	8 05 9.55	7 12
*No. 26	5 40 6.70		7 70	9.20	8 20- 9.70	7.27
*No. 28	5 70 7 00	9 35	8.00	9 50	8.50 10.00	7.57

*For painted corrugated sheets add 30c. per 1000 lb. for 5 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 15c., all gages.

LINSEED OIL—These prices are per gallon:

	New York Current	New York One Year Ago	Chicago Current	Chicago One Year Ago
Raw in barrel (5 bbl.)	$1 80	$1 49	$1.98	$1 66
5-gal. cans	2 00	1 74	2 23	1 86

WHITE AND RED LEAD—Base price per pound:

	Red Current Dry	Red Current In Oil	Red 1 Year Ago Dry	Red 1 Year Ago In Oil	White Current Dry and In Oil	White 1 Yr. Ago Dry and In Oil
100-lb. keg	14.50	16.00	13.00	14.50	14.50	13.00
25 and 50-lb. kegs	14 75	16.25	13.25	14.75	14.75	13.25
12½-lb. keg	15.00	16.50	13.50	15.00	15.00	13.50
5-lb. cans	16.50	18.00	15.00	16.50	16.50	15.00
1-lb. cans	17.50	19.00	16.00	17.50	17.50	16.00

500 lb. lots less 10% discount; 2000 lb. lots less 10-2½% discount.

LUMBER

San Francisco—Prices of rough Douglas fir No. 1 common, in more than carload lots:

Lumber Prices in Yards at San Francisco

	6-8-12 and 14 Ft.	10-16-18 and 20 Ft.	22 and 24	25 to 32 Ft.
3x3 and 4	$42.00	$42.50	$43.50	$45.50
3x6 and 8	43.00	43.50	44.50	46.50
4x4-6 and 8	43.50	44 50	45.50	47.50
3x10 and 12	43.50	44.50	45.50	47.50
3x14	44.00	45 00	46.00	48.00
4x10 and 12	43.50	44 50	45.50	47.50
4x14	44.50	45.50	46.50	48.50

	24 Ft. and Under	25 to 32 Ft.	33 to 40 Ft.
6x10	$43 00	$45 00	$46 00
6x14	44.50	46.50	47.00
8x10	43 00	45 00	46.00
8x14	44.50	46 50	47.50

New York, Chicago and St. Louis

	Southern Pine New York* 20 Ft. and Under	Southern Pine New York* 22-24 Ft.	Southern Pine Chicago 20 Ft. and Under	Southern Pine Chicago 22-24 Ft.	Yellow Pine St. Louis 20 Ft. and Under	Yellow Pine St. Louis 22-24 Ft.
3x 4 to 8x 8	$63.00	$64.00	$70.00	$71.00	$52.50	$53.50
3x10 to 10x10	67.00	68.00	71.00	73.00	57.50	58.50
3x12 to 12x12	71 00	72.00	75.00	76.00	60.00	61.00
3x14 to 14x14	78.00	79.00	80.00	81.00	65.00	66.00
3x16 to 16x16	85.00	86.00	85.00	86.00	67.50	68.50
3x18 to 18x18	91 00	92.00	90.00	91.00	72.50	73.50
4x20 to 20x20	101 00	102 00	. .	...	......	.....

* Prices from Lumbermen's Bureau

Over 24 ft.—Add $1 for each additional 2 ft. in length up to 40 ft. for sizes 12 x 12 and under; for sizes over 12 x 12 add $2. For merchantable add $2 to sizes 10 x 10 and under. For prime add $2 to the price of merchantable for all sizes.

Other Cities

	8 x 8-In. x 20-Ft. and Under P.	8 x 8-In. x 20-Ft. and Under Fir	8 x 8-In. x 20-Ft. and Under Hemlock	8 x 8-In. x 20-Ft. and Under Spruce	12 x 12-In. 20 Ft. and Under P.	12 x 12-In. 20 Ft. and Under Fir
Boston	$75.00	$65.00	$65.00	$60.00	$110.00	$100.00
Kansas City	53.00	52.25	52.25	52.25	64.00	52.25
Seattle	....	31.00	.....	.....	.....	31.00
New Orleans	55.00	......	......	......	65.00	......
St. Paul	62.00	61.00	61.00	47.50	43.00	58.00
Atlanta	62.50	64.50	66.00	76.00	79.50	82.00
Baltimore	75.00	.....	......	......	87.50	.. ...
Cincinnati	55.00	55.00	55.00	......	62.50	60.00
Montreal	73.00	68.00	65.00	60.00	73.00†	73.00
Los Angeles*	....	59.00	58.00	.....	.....	51.00
Denver	.....	65 00	65.00	65 00	. ...	66 00

	1-In. Rough, 10 In. x 16 Ft. and Under P.	1-In. Rough, 10 In. x 16 Ft. and Under Fir	1-In. Rough, 10 In. x 16 Ft. and Under Hemlock	2-In. T. and Gr. 10 In. x 16 Ft. P.	2-In. T. and Gr. 10 In. x 16 Ft. Fir
Boston	$70.00	$60.00	$60.00	$80.00	$65.00
Kansas City	115.25	89.75	89.75	117.25	92.75
Seattle	.....	35.00	.....	....	36.00
New Orleans	60.00	.....	.....	65.00	.....
St. Paul	54.00	54.00	53.00	64.50	58.50
Atlanta	85.00	90.00	......	77.50	87.50
Baltimore (box)	60-65 00	...	.....	60-65 00	.....
Cincinnati	60 00	58.00	60.00	55.00	55.00
Montreal	65.00	65 00	65 00	66.00	66.00
Los Angeles*	. .	57.00	56 00	.....	...
Detroit	51 00	.	.	56.00	..
Denver		62 00	62 00	140 00	127 50

* Base price, 2x4 in., is $53, Los Angeles

† Montreal—Up to 32 ft ; over which, $3.00 per M. increase up to 30 ft

Dallas—Yellow pine. Price per M:

	January Prices
2x4 to 2x12—12, 14 and 16	$57.00
2x4 to 2x12—10, 18 and 20	59.00
2x4 to 2x12—22 and 24	64.00
4x4, 4x6, 6x6, 8x8 and 3x8	57 00
8x00, 10x00 and 3x10	60.00
12x12 and 3x12	65.00

FREIGHT RATES

On finished steel products in the Pittsburgh district, including plates, structural shapes, merchant steel, bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc., the following freight rates are effective in cents per 100 lb.:

Boston	$0.30	New Orleans	$0.38½
Buffalo	.17	New York	.27
Chicago	.27	Pacific Coast (all rail)	1.25*
Cincinnati	.23	Philadelphia	.24½
Cleveland	.17	St. Louis	.24
Denver	.99	St. Paul	.49½
Kansas City	.59	Detroit	.33
		Baltimore	.33

Note—Add 3% transportation tax * Minimum carload, 80,000 lb.

CONTRACTORS' SUPPLIES

STEEL SHEET PILING—The following price is base per 100 lb. f. o. b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$2.55@$3 65	$2.55	$3.50

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Hercules red strand, all constructions	20%
Patent flattened strand, special and cast steel	20%
Patent flattened strand, iron rope	5%
Plow steel round strand rope	35%
Special steel round strand rope	30%–10% and 5%
Cast steel round strand rope	22½%
Iron strand and iron tiller	5%
Galvanized iron rigging and guy rope	+12%

San Francisco: Galvanized, less 5%, bright, less 25%.
Chicago, +12½ on galvanized, *30* off on bright.

MANILA ROPE—For rope smaller than ⅝-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅝-in., 8 ft., ¾-in., 6; ⅞-in., 4½; 1-in., 3½; 1⅛-in., 2 ft. 10 in.; 1¼-in., 2 ft. 4 in. Following is price per pound for ⅝-in. and larger, in 1200-ft. coils:

Boston	$0.30	Kansas City	$0.26½
New York	.26	New Orleans	.25½
Chicago	.26½	Los Angeles	.28½
St. Paul	.27½	Seattle	.31
San Francisco	.24	St. Louis	.26½
Atlanta	.29½	Montreal	.32
Denver	.27½	Detroit	.26
Cincinnati	27½	Baltimore	.25
Birmingham	32		

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb keg for black powder.

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	80%	Black Powder
New York	.....	$0.31¼	$0.34¼	.....	$2.30
Boston	$.225	245	25	$.35	2.40
Kansas City	.235	.26	.385	.3275	2.35
New Orleans	.....	.2275	*.255*	.....	2.90
Seattle	*.1425*	*.185*	*.21*	.315	*1.90*
Chicago	.215	.24	.2825	.325	2.25
St. Paul	.185	.2275	.2525	.2950	2.25
St. Louis	.2175	.26	.285	.295	1.90
Denver	.205	.2475	.2725	.315	2.50
Dallas	.....	.....	.288	.342	2.75
Los Angeles	.25	.30	.35	.275	2.95
Atlanta	.22	.245	.265	.....	2.55
Baltimore	.225	.2675	.3075	.325	2.35
Cincinnati	.215	.26	.26	.....	2 20
Montreal	.28	.31	.34	.38	3.90

POLES—For plain pine poles, delivered New York, the price is as follows:

10-in. butts, 5-in. tops, length 20-30 ft.	$9.00
12-in. butts, 6-in. tops, length 30-40 ft.	11.50
12-in. butts, 6-in tops, length 41-50 ft.	12.50
14-in. butts, 6-in. tops, length 51-60 ft.	21.00
14-in. butts, 6-in. tops, length 61-71 ft.	23.50

	Dallas
6-in. x 20-ft	$4.60
6-in. x 30-ft	7 10
8-in. x 30-ft	8.45
8-in. x 35-ft	10.38

Note—At the present time it is almost impossible to give accurate prices on poles. The above are only nominal.

OLD MATERIAL—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and St. Louis the quotations are per net ton and cover delivery at the buyer's works, including freight transfer charges.

	New York	Chicago	St. Louis
No. 1 railroad wrought	$28.00	$26.00	$28.50
Stove plate	25.00	31.00	34.00
No. 1 machinery cast	32.00	38.75	39.00
Machine shop turnings	15.00	13.85	16.50
Cast borings	18.00	*14.25*	16.50
Railroad malleable cast	25.00	30.00	28.50
Re-rolling rails	33 00	32 00	32 50
Relaying rails	50 00	40@50	45@50

SHIP SPIKES—Current prices per 100 lb.

	San Francisco		Seattle
In.	Galv.	Black	Black
¼	$9.20	$8.50	$8.55
⅜	8.75	6.75	8.25
½	8.60	6.60	8.30

Pittsburgh base, $3.85 to $4 per 100 lb.

LABOR RATES AND CONDITIONS THROUGHOUT THE COUNTRY

S means scarce; E, enough; P, plentiful

Cities	Bricklayers	Carpenters	Hoisting Engineers	Hod Carriers	Pile Drivers	Structural Iron Workers	Common Labor	Remarks
Atlanta	$0.90S	$0.60–75P	$0.50–65P	$.40–.45P	$0.60–.65	$0 75	$0 35S	Atlanta—Great activity in construction. Common labor scarce.
Baltimore	1 00E	80–90E	87½E	.46–.54E	.74P	1.00E	.35–.45E	Baltimore—Structural iron workers receive $1, an advance of 12½c., other changes expected May 1.
Boston	1.25S	1 00	1 00	.85	1.25	1 00	62½S	Boston—Labor of all kinds very scarce.
Cincinnati	1.25S	.75	.75	.65	.50	875P	50S	Cincinnati—Common labor scarce.
Cleveland	1.00S	90S	1 00E	.57½E	80E	1 00E	57½E	
Dallas	1.00E	.87½S	.87½E	.37½–.40S	......	75S	35S	Dallas—Common labor very scarce.
Denver	1.12½E	1.12½E	1 00E	.68¾–.75	......	1.00E	.50E	Denver—General increase. Double pay for overtime.
Detroit	1.10E	.85E	.90–1.00E	.65–70S	.90P	85–.90E	60–.65S	Detroit—All trades busy. Common labor scarce.
Kansas City	1.00	85–.87½	90	.68¾	.77	.90	.57½	Kansas City—Usual demand for increase on May 1, 1920.
Los Angeles	1.15	.75E	.75P	.56–.75S	.75P	.75P	.50–.62½E	Los Angeles—Resident construction active.
Montreal	.80	75	65S	.50–55S	.55P	45–.55S	.45S	Montreal—Good labor scarce account of exodus of foreigners, who comprise 75 per cent. of Canadian labor
New Orleans	70–.80E		.60–.80E	.75E–.50E		.70E–.93¾E	.35–.40E	
New York	1.08	1 00	1.12½	.57½	1.00	1.08	.68¾	New York—Agreement effective Jan. 1, expected to hold until Dec. 31, 1921.
St. Louis	1.00	.87½	1.00–1.12½	.70	.80–.92½	.90	.45–.60	St. Louis—Agreement reached on Feb. 28, whereby building laborers, painters and concrete workers will receive increases. Laborers, from 57½c to 69c.
St. Paul	1.25	.87½	.112½	.65	1.80	.85	.70	St. Paul—All trades busy. Common labor scarce.
San Francisco	1.25E	1.00E	1.00E	.87½E	1.00E	1.00E	.45–.50E	San Francisco—All lines busy.
Seattle	1.12	.93¾	.94	.75–.80	.90	1.00	.75S	

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Mar. 10	Burlington, N. C.	Feb. 19
	Adv. Feb. 19 and 26.	
Mar. 15	San Fernando, Cal.	Mar. 4
Mar. 17	Elyria O.	Mar. 4
Mar. 18	Mayville N. D.	Mar. 4
Mar. 20	Paterson, N. J.	Feb. 26
Mar. 23	Ashton, Idaho	Mar. 4
Mar. 25	Jewett, O.	Mar. 4
	Adv. Mar. 4.	

SEWERS

Mar. 8	Rutland, Vt.	Feb. 19
	Adv. Feb. 19 and 26.	
Mar. 8	Leeds, N. D.	Mar. 4
Mar. 8	Cooperstown, N. D.	Mar. 4
Mar. 8	Wauseon, O.	Mar. 4
Mar. 8	Hamilton, O.	Mar. 4
Mar. 8	New York, N. Y.	Mar. 4
Mar. 10	Burlington, N. C.	Feb. 19
Mar. 10	Kilbourn, Wis.	Feb. 26
Mar. 12	Elk Point, S. D.	Feb. 26
Mar. 15	Cleveland Heights, O.	Feb. 26
Mar. 18	Michigan	Mar. 4
Mar. 18	El Monte, Cal.	Mar. 4
Mar. 22	Stratford, Conn. (Bridgeport P. O.)	Feb. 26
	Adv. Feb. 26.	
Mar. 23	Toledo, O.	Feb. 19
	Adv. Feb. 19 and 26.	
Mar. 25	Wake Forest, N. C.	Mar. 4
Mar. 27	Dayton, O.	Mar. 4
Apr. 8	Milwaukee, Wis.	Feb. 26
	Adv. Feb. 26.	

BRIDGES

Mar. 10	Reno, Nev.	Feb. 26
Mar. 10	Springfield, Mass.	Feb. 12
	Adv. Feb. 19 and 26.	
Mar. 10	Coopersville, Mich.	Mar. 4
Mar. 11	Ceresco, Mich.	Mar. 4
Mar. 12	Thomaston, Ga.	Feb. 26
Mar. 15	New Jersey	Feb. 26
Mar. 15	Connecticut	Feb. 12
	Adv. Feb. 12 to 26.	
Mar. 15	Greenfield, Ind.	Mar. 4
Mar. 17	Ontario	Mar. 4
Mar. 17	Bismark, N. D.	Mar. 4
Mar. 17	Visalia, Cal.	Mar. 4
Mar. 18	Wayne, W. Va.	Mar. 4
Mar. 18	Elizabeth, N. J.	Mar. 4
Mar. 19	Duluth, Minn.	Mar. 4
Mar. 22	Michigan	Mar. 4
Mar. 23	O'Brien, Wash.	Feb. 12
Mar. 26	Middlebourne, W. Va.	Mar. 4
Apr. 2	Tamaqua, Pa.	Mar. 4

STREETS AND ROADS

Bids Close		See Eng. News-Record
Mar. 6	Weston, W. Va.	Mar. 4
Mar. 7	Michigan	Feb. 19
Mar. 8	Okmulgee, Okla.	Jan. 29
Mar. 8	Fayetteville, W. Va.	Feb. 12
	Adv. Feb. 19.	
Mar. 8	Waco, Tex.	Feb. 19
Mar. 8	Bronxville, N. Y.	Feb. 19
	Adv. Feb. 19 and 26.	
Mar. 8	Reno, Nev.	Feb. 19
Mar. 8	Wauseon, O.	Feb. 19
Mar. 8	El Centro, Cal	Feb. 26
Mar. 8	Texas	Feb. 26
Mar. 8	Nevada	Mar. 4
Mar. 8	Fargo, N. D	Mar. 4
Mar. 8	Newton, Ia.	Mar. 4
	Adv. Mar. 4.	
Mar. 9	Georgetown, Tex.	Mar. 4
Mar. 9	Maryland	Mar. 4
	Adv. Mar. 4.	
Mar. 9	Deseronto, Ont.	Mar. 4
Mar. 9	Owatonna, Minn.	Mar. 4
Mar. 9	New Haven, Conn.	Mar. 4
Mar. 9	Aitkin, Minn.	Mar. 4
Mar. 9	Plymouth, Wis.	Feb. 19
Mar. 9	Greenville, Ga.	Feb. 19
Mar. 9	Michigan	Feb. 19
Mar. 9	Corsicana, Tex.	Feb. 26
Mar. 9	Colorado	Feb. 26
Mar. 9	Marlinton, W. Va.	Feb. 26
Mar. 9	Terrell, Tex.	Mar. 4
Mar. 9	Bridgeton, N. J.	Feb. 26
Mar 9	Marlinton, W. Va.	Feb. 26
Mar. 9	Fredonia, Kan.	Feb 5
Mar. 9	Ontario	Feb. 26
Mar. 10	Eureka, Kan.	Feb 5
Mar 10	Wisconsin	Mar. 4
Mar. 10	Michigan	Feb. 19
Mar. 10	La Grange, Tex.	Mar. 4
Mar. 10	Napa, Cal.	Mar. 4
Mar. 10	Madison, Wis.	Mar. 4
Mar. 10	St. Johns, Mich.	Mar. 4
Mar. 11	Marion, Ia.	Mar. 4
Mar. 11	Brooklyn, N. Y.	Mar. 4
Mar. 11	Madison, Wis.	Mar. 4
Mar. 11	Towson, Md.	Mar. 4
Mar. 12	Center City, Minn.	Mar. 4
Mar. 12	Montana	Mar. 4
Mar. 12	Clinton, N. J.	Feb. 12
Mar 12	Montana	Feb. 19
	Adv. Feb. 19 and 26.	
Mar. 12	Montana	Feb. 26
Mar. 12	Michigan	Feb. 26
Mar. 12	Slayton, Minn.	Mar. 4
Mar. 12	Fresno, Cal.	Mar. 4
Mar. 12	Michigan	Mar. 4
Mar. 12	Morgantown, W. Va.	Mar. 4
Mar. 12	Montevideo, Minn.	Mar. 4
Mar. 12	Cornwall, Ont.	Mar. 4
Mar. 12	Michigan	Mar. 4
Mar. 13	Angleton, Tex.	Feb. 26
Mar. 13	Michigan	Feb. 26
Mar. 13	Humbolt, Tenn.	Feb. 26
Mar. 13	Freeport, Tex.	Feb. 26
Mar. 15	Connecticut	Feb. 19
Mar. 15	Manchester, Conn.	Mar. 4
Mar. 15	Dayton, O.	Mar. 4
Mar 15	Buncombe, N. C.	Feb. 19
Mar. 15	Asheville, N. C.	Feb. 19
Mar. 15	Madison, S. D.	Feb. 26
Mar. 15	Augusta, Ga.	Mar. 4
	Adv. Mar. 4.	
Mar. 16	Billings, Mont.	Feb. 26
Mar. 16	Pocahontas, Ia.	Feb. 26
	Adv. Feb. 26.	
Mar. 16	Phila., Pa.	Mar. 4
Mar. 16	Ontario	Mar. 4
Mar. 17	Delaware	Feb. 26
Mar. 17	Mason City, Ia.	Mar. 4
Mar. 17	Granite Falls, Minn.	Mar. 4
Mar. 17	Monroe, Ga.	Mar. 4
Mar. 18	Wayne, W. Va.	Mar. 4
Mar. 18	New York	Mar. 4
	Adv. Mar. 4.	
Mar. 18	Wabasha, Minn.	Mar. 4
Mar. 18	Charles City, Ia.	Mar. 4
Mar. 18	Michigan	Mar. 4
Mar. 19	Montana	Mar. 4
	Adv. Mar. 4.	
Mar. 19	Marietta, Ga.	Mar. 4
Mar. 20	Carlsbad, N. M.	Mar. 4
Mar. 22	Michigan	Feb. 26
Mar. 23	Pennsylvania	Feb. 26
Mar. 23	Montgomery, Ala.	Mar. 4
Mar. 23	Wilmington, Del.	Mar. 4
	Adv. Mar. 4.	
Mar. 24	Pennsylvania	Feb. 26
Mar. 26	Middlebourne, N. C.	Mar. 4
Mar. 29	Washington	Mar. 4
Mar. 31	Madison, W. Va.	Mar. 4
Apr. 1	Flandreau, S. D.	Mar. 4
Apr. 1	Richmond, Ky.	Mar. 4
Apr. 1	St. Thomas, Ont.	Feb. 19
Apr. 1	Daytona, Fla.	Feb. 26
Apr. 1	Ingersoll, Ga.	Feb. 26
Apr. 3	Lawrence, Kan.	Feb. 19
Apr. 5	Washington	Mar. 4
Apr. 6	Geneva, N. Y.	Mar. 4
Apr. 8	Savannah, Ga.	Feb. 19
	Adv. Feb. 19 and 26.	

EXCAVATION AND DREDGING

Mar. 8	Sioux City, Ia.	Feb. 26
Mar. 10	Waverly, Ia.	Feb. 10
Mar. 11	Marks, Miss.	Mar. 4
Mar. 11	Jersey City, N. J.	Mar. 4
Mar. 15	Stapleton, N. Y.	Mar. 4
Mar. 16	Ft. Madison, Ia.	Feb. 19
	Adv. Feb. 19 and 26.	
Mar. 16	Elbow Lake, Minn.	Mar. 4
Mar. 26	Pittsfield, Ill.	Mar. 4

INDUSTRIAL WORKS

Mar. 8	Detroit, Mich.	Mar. 4
Mar. 8	Wilkes Barre, Pa.	Mar. 4
Mar. 10	Detroit, Mich.	Mar. 4
Mar. 10	Marysville, Mich.	Mar. 4
Mar. 11	Emporia, Kan.	Feb. 26
Mar. 15	Providence, R. I.	Feb. 26
Mar. 15	Wakefield, Mass.	Jan. 29
Mar. 15	Grand Forks, N. D.	Feb. 26
Mar. 15	Detroit, Mich.	Mar 4
Mar. 17	Larrabee, Ia.	Feb 5
Mar 20	Saco, Me.	Feb. 12
Mar. 25	Trenton, N. J.	Mar. 4
Sept. 1	Hutchinson, Kan.	Feb. 19

BUILDINGS

Bids Close		See Eng. News-Record
Mar. 6	Belmont, Mass.	Mar. 4
Mar. 8	Lorain, O.	Feb. 19
	Adv Feb. 19 and 26.	
Mar. 8	Norwich, N. Y.	Feb. 19
Mar. 8	Cheyenne, Wyo.	Feb. 19
Mar. 8	Long Beach, Cal.	Feb 26
Mar. 8	Homestead, Pa.	Feb. 26
Mar. 8	Missoula, Mont.	Feb 26
Mar. 8	Racine, Wis.	Mar 4
Mar. 8	Arlington, Tex.	Mar. 4
Mar. 8	Detroit, Mich.	Mar. 4
Mar. 8	Kokomo, Ind.	Mar. 4
Mar. 9	Union, N. J.	Feb. 26
Mar. 10	Whitby, Ont.	Mar. 4
Mar. 10	Duluth, Minn.	Mar. 4
Mar. 10	Detroit, Mich.	Mar. 4
Mar. 10	Cincinnati, O.	Mar. 4
Mar. 10	Fort Wayne, Ind.	Mar. 4
Mar. 10	Spadra, Cal.	Mar. 4
Mar. 10	Pasadena, Cal.	Feb. 26
Mar. 10	Deer Lodge, Mont.	Feb. 26
Mar. 10	Big Rapids, Mich.	Mar. 4
Mar. 10	Welton, Ia.	Feb. 19
Mar. 10	Ford City (Wyandotte P. O.)—Mich.	Mar. 4
Mar. 10	Sewal, Ia.	Feb. 19
Mar. 10	Springfield, Mass.	Feb. 26
Mar. 10	Reedsburg, Wis.	Feb. 26
Mar. 10	Flint, Mich.	Mar. 4
Mar. 10	Culbertson, Mont.	Mar. 4
Mar. 10	Ninnekah, Okla.	Mar. 4
Mar. 11	Kokomo, Ind.	Mar. 4
Mar. 11	Scranton, Pa.	Mar. 4
Mar. 12	Cass Lake, Minn.	Mar. 4
Mar. 12	Brooklyn, N. Y.	Mar. 4
Mar. 15	Olean, N. Y.	Mar. 4
Mar. 15	Lake Dark, Ia.	Mar. 4
Mar. 15	Rose Creek, Minn.	Mar. 4
Mar. 15	Mankato, Minn.	Mar. 4
Mar. 15	Saco, Me.	Feb. 19
Mar. 15	Hibbing, Minn.	Jan. 29
Mar. 15	Hamilton, Ont.	Feb. 26
Mar. 15	Landrienne, Que.	Feb. 12
Mar. 15	Brookfield, Mo.	Feb. 19
Mar. 15	Tuscalloosa, Ala.	Mar. 4
Mar. 15	Caldwell, Idaho	Mar. 4
Mar. 15	Wiota, Ia.	Mar. 4
Mar. 15	Glidden, Ia	Mar. 4
Mar. 16	Cushing, Ia.	Mar. 4
Mar. 16	Ellwood City, Pa.	Mar. 4
Mar. 16	Osceola, Neb.	Feb. 19
Mar. 16	Austin, Minn.	Mar. 4
Mar. 16	Washta, Ia.	Feb. 5
Mar. 17	Marcy, N. Y.	Feb. 26
	Adv. Feb. 26.	
Mar. 17	Spooner, Wis.	Mar. 4
Mar. 18	Menasha, Wis.	Mar. 4
Mar. 20	Redford, Mich.	Feb. 5
Mar. 20	Ayshire, Ia.	Feb. 26
Mar. 20	Keewatin, Minn.	Mar. 4
Mar. 21	Fergus Falls, Minn.	Mar. 4
Mar. 21	Forest Lake, Minn.	Mar. 4
Mar. 23	Columbus, O.	Mar. 4
Mar. 23	Gallup, N. M.	Mar. 4
Mar. 24	Olds, Ia.	Mar. 4
Mar. 25	St. Cloud, Minn.	Mar. 4
Mar. 25	Elgin, Minn.	Mar. 4
Mar. 29	Marion, O.	Mar. 4
Mar. 30	Waubun, Minn.	Mar. 4
Mar. 31	Thomaston, Me.	Mar. 4
Mar. 31	Denison, Tex.	Mar. 4
Apr. 1	Rockford, Ill.	Mar. 4
Apr. 1	Dodson, Mont.	Feb. 5
Apr. 1	Dayton, O.	Feb. 19
Apr. 1	Lament, Ia.	Mar. 4
Apr. 1	Lafayette, Minn.	Mar. 4
Apr. 1	Providence, R. I.	Mar. 4
Apr. 8	Fresno, Cal.	Mar. 4
Apr. 15	Riverton, Wyo.	Mar. 4
Apr. 15	Wheatland, Wyo.	Mar. 4
Apr. 15	Delmont, S. D.	Feb. 26

FEDERAL GOVERNMENT WORK

Mar. 8	Remodeling Post Office — Rome, N. Y.	Feb. 19
	Adv. Feb. 19 and 26.	
Mar. 8	Radio Building and Mast—Spec. 4139—Savannah, Ga.	Mar. 4
Mar. 9	Steam Heating System — Phila., Pa.	Feb. 26
Mar. 10	Completing Fire Protection System — Morehead City, N. C.	Feb. 26
Mar. 10	Tower and Tank — Cape Vincent, N. Y.	Feb. 26
	Adv. Feb. 26.	
Mar. 10	Radio Building—Spec. 4120 —Detroit, Mich.	Mar. 4
Mar. 10	Radio Building—Spec. 4107 —Milwaukee, Wis.	Mar. 4
Mar. 11	Steel Lock Gates — Nashville, Tenn.	Feb. 26
Mar. 11	Dredging—Galveston, Tex.	Feb. 12
	Adv. Feb. 19 and 26.	
Mar. 11	Dredging and Rock Removal—New York, N. Y.	Feb. 12
	Adv. 12 to 26.	
Mar. 15	Electric Elevator — Hartford, Conn.	Feb. 19
Mar. 15	Structural Steel Shapes, Plates, Rivets, Bolts, etc. —Ketchikan, Alaska	Mar. 4
Mar. 15	Extending and Remodeling Chattanooga, Tenn.	Feb. 26
Mar. 16	Remodeling Plumbing, Electric Work, etc.—St. Louis, Mo.	Feb. 26
Mar. 17	Dredging and Excavating—Buffalo, N. Y.	Feb. 19
	Adv Feb. 19 and 26.	

Bids Close		See Eng. News-Record
Mar. 18	Lighting Fixtures — New York, N. Y.	Feb. 26
Mar. 22	Tanks — Port Townsend, Wash.	Mar. 4
Mar. 22	Straighten Channel, etc.—Collinsville, Cal.	Mar. 4
Mar. 25	Conduit—Petersburg, Va. Adv. Feb. 26.	Feb. 26
Mar. 25	Dormitory and Dairy Barn —Ardmore, Okla.	Mar. 4
Mar. 26	Changes in Approaches and Lobby Vestibule Doors — Harrisburg, Pa Adv. Mar. 4.	Mar. 4
Mar. 27	Building Extension—Tulsa, Okla.	Mar. 4
Mar. 29	Post Office and Customhouse—Apalachicola, Fla.	Feb. 12
Apr. 8	Rock—New Orleans, La. Adv. Mar. 4.	Mar. 4
May 3	Bridge—Alaska Adv. Jan. 22.	Jan. 22

MISCELLANEOUS

Mar. 1	Repairing Wood Trestle of Water Tank — Hoffmans Island, N. Y.	Feb. 19
Mar. 1	Culvert Pipe—Harrisburg, Pa. Adv. Feb. 5 and 12.	Feb. 5
Mar. 6	Truck—West Allis (Milwaukee P. O.), Wis.	Mar. 4
Mar. 9	Road Oil—Madison, Wis.	Mar. 4
Mar. 9	Tunnels, etc. — Ossining, N. Y.	Feb. 19
Mar. 10	Steam Power and Water Gas Plant Equipment—Tallahassee, Fla. Adv. Feb. 19 and 26.	Feb. 19
Mar. 10	Wharf—Kenora, Ont.	Mar. 4
Mar. 10	Boardwalk—San Francisco, Cal.	Mar. 4
Mar. 10	Road Materials—New York, N. Y.	Mar. 4
Mar. 12	Dam—Rochester, N. Y.	Mar. 4
Mar. 15	Ornamental Light Standards—Cleveland, O.	Feb. 12
Mar. 16	Deep Well Pumping Equipment—Lockport, Ill.	Feb. 12
Mar. 16	Steam Shovel—Cambridge, Minn.	Mar. 4
Mar. 16	Stone—Ont., Toronto	Mar. 4
Mar. 17	Centrifugal Pumps—West Chester, Pa.	Mar. 4
Mar. 17	Road Tractor—St. Cloud, Minn.	Mar. 4
Mar. 17	Cement—Delaware	Feb. 26
Mar. 17	Cement and Flag—Dover, Del.	Feb. 26
Mar. 18	Repairing Municipal Pier—Newport News, Va. Adv. Mar. 4.	Mar. 4
Mar. 23	Fire Escapes, etc—Ossining, N. Y. Adv. Mar. 4.	Mar. 4
Mar. 29	Dam—Decatur, Ill.	Mar. 4

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. C., Burlington—See "Sewers."

Ala., Talladega — City plans to issue $500,000 bonds to install new waterworks.

Minn., Cambridge—Village having plans prepared by Druar & Smith, engrs., Globe Bldg., St. Paul, for laying 4,500 ft. water piping. About $24,000. E. Lindahl, clk.

Minn., Lamberton—City having surveys made by Druar & Smith, engrs., Globe Bldg., St. Paul, extending waterworks system. About $40,000.

Tex., Calallen—W. S. Rankin, Corpus Christi, soon lets contract furnishing, f.o.b. cars, here, labor and material for placing 13,700 sq.yd. concrete lining and necessary grading, to complete settling basins now under construction at water works plant, here, owned by city of Corpus Christi.

Okla., Frederick — City voted $140,000 bonds to improve waterworks system. Engineer not selected.

Okla., Wilburton—City having plans prepared improving waterworks system, to include new reservoir, flow line and main extensions. About $160,000. V. V. Long & Co., Colcord Bldg., Oklahoma, engrs.

Wash., Connell—Town Council plans to build waterworks system, involving installation of pumping plant, c.i. or wooden mains, drilling one 10 or 12 in., 250 ft. well, and one 250 ft. well. About $8,000. C. K. Bell, town clk.

Wash., Kelso—City plans to purchase Kelso Water Co's plant and will construct new water mains and laterals, c.i. or wooden pipe. About $40,000. U. G. Jackson, city engr.

Ore., Portland—City plans to improve waterworks system by removing steel standpipe from Vernon Dist. to St. Johns, build steel combination or concrete standpipe, cost $150,000; also install 175 ton c.i. pipe in various streets which will also be hard-surfaced and remove old Vernon storage tank. Total cost, $500,000. F. Randlett, ch. engr. Water Bureau.

Cal., Huntington Park (Los Angeles P. O.) —City voted $160,000 bonds to sink wells, install pumps, build 1,000,000 gal. rein.-con. reservoir, replace and extend mains, and acquire privately owned plant. F. E. Trask, 616 Union Oil Bldg., Los Angeles, engr.

Cal., Lancaster—A. M. McPherron, secy. Bd. Supervs. Los Angeles Co., returned bids received Feb. 16 for water system unopened because of errors in proceedings. New proceedings will be started. Noted Feb. 5.

BIDS DESIRED

N. J., Paterson—Until March 20, by Passaic Water Co., 156 Ellison St., laying 12,000 ft. ¼ x 30 in. steel pipe; advertised in this issue.

N. C., Wake Forest—Until March 25, by Mayor, building 5 mi. 6-10 in. c.i. pipe, valves, hydrants, pumping station, tower tank, etc., also building sewerage system, involving 2 mi. 8 in. vitr. pipe. W. M. Piott, Durham, engr.

O., Elyria—Until March 17, by H. A. Beck, dir. Service-Safety, installing 4½ mi. force main from present waterworks, including excavation of trench and laying pipe (which has been secured under separate contract). Work involves 23,800 lin. ft. excav. and backfilling, 6,700 lb. manhole frames and covers, 8,000 lb. c.i. and steel, 560 cu.yd. concrete masonry, 27,000 cu.yd. brick masonry, and 7,200 lb. steel reinforcement, under Contr. 1; transporting 1,420 tons steel and c.i. pipe, specials, valves and appurtenances, Contr. 2; laying 23,800 lin.ft. pipe, Contr. 3; advertised in this issue. Noted Jan. 22.

O., Jewett—Until March 25, by village, building waterworks plant, involving deep well pumps, housing for same, concrete or steel reservoir and 2½ mi. c.i. or wood pipes. G. H. Collins, pres. Bd. Trustees of Pub. Affairs; advertised in this issue.

N. D., Cooperstown—Until March 8, by City Council, building complete waterworks system, including combined well and rein.-con. reservoir, 100,000 gal. capacity; 1 brick pump house; 100 gal. per min. pump; 500 gal. per min. pump, water softening plant, 3,470 ft., 8 in. c. i. pipe, 14,750 ft., 6 in. c i. pipe, 21 hydrants, steel stand tower and tank, etc. About $79,000. Dakota Eng. & Constr. Co., Valley City, engrs.

N. D., Mayville—Until March 8, by City Council, installing water softening and filtration plant. About $25,000. T. R. Atkinson, Bismarck, engr. Noted Feb. 19.

Idaho, Ashton—Until March 23, by city, building water works system, trunk line sewer, disposal plant and lateral district. About $120,000. Cotton & Wilson, Idaho Falls, engrs.

Cal., San Fernando—Until March 15, by City Clerk, building cement lined reservoir, 200 ft. square. Noted Jan. 15.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Pa., McKees Rocks—Ohio Valley Water Co. let contract building rein.-con. reservoir, to Dravo Contg. Co., Diamond Bank Bldg., Pittsburgh.

★N. C., Jacksonville—City let contract constructing 12,500 ft. c.i. water mains, to A. H. Guion & Co., Gastonia, $18,100.

★O., Cleveland Heights (Warrensville P. O.)—See "Sewers."

★O., Euclid—See "Sewers."

★Ill., East Moline—See "Sewers."

★Okla., Ada—City let contracts building Sect. A, rein.-con. reservoir and pumping station, 2,000,000 gal. capacity, to J. E. Nelson & Son, 118 North La Salle St., Chicago, $49,939; Sect. C, distributing system of water mains, to J. S. Terry, Poteau, $46,252. Noted Feb. 5.

★Ore., Monmouth—City let contract building 12 mi. pipe line from Teal Creek in T. S.S., R.6.W., also small concrete diversion dam for headworks across Teal Creek, to C. T. Parker, Oregon City, $15,625.

★Cal., Manhattan Beach (Manhattan P. O.)—City rejected bids recaulking with lead 10 mi. water mains. About $30,000. Work will be done by day labor. Noted Feb. 19.

Sewers

PROPOSED WORK

Mass., West Springfield (Springfield P. O.) —City plans to build sewerage system. About $100,000.

N. Y., Rochester—City plans to install sanitary sewers in Brighton Terrace and Gould St. About $18,300. C. A. Poole, city engr.

N. Y., Syracuse—City plans to lay about 5,000 ft. 90 in. rein.-con. sewer pipe in Tompkins, Spencer, et al Sts., west to Onondaga Lake. About $400,000. G. D. Holmes, City Hall, engr.

N. C., Burlington—City voted $195,000 bonds to extend sewerage and water works systems. E. B. Horner, mayor.

O., Middletown—City plans to build Bull Run storm and sanitary sewer, involving 5,000 ft. 48-70 in. rein.-con. and 18-24 in. vitr. pipe. About $100,000. W. Morrison, city engr.

Mich., Detroit — City Council ordered plans and estimates made for trenching and laying 8-12 in. vitr. crock lateral sewers with special connections, manholes, etc., in Lateral Sewer 3,191, in block between Hilger, Lycaste and Mack Aves.; 3,197, Van Dyke, Erwin, Auburn and Badger Aves.; 3,234, alley south of Mack Ave., Hart Ave. and alley east of Hart Ave.; 3,238, Braden, Martin, Horatio and Ironside Sts.; 3,247, Cascade, Broadstreet, Joy and Dumont Aves.; 3,248, Rohns, Vinton, Bessemore and Georgia Aves.; 3,249, Rohns, Vinton, Peter Hunt and Bessemore Aves.; 3,252, Buckingham Bedford, Stratford and Warren Aves.; 3,255, between existing sewers, Livernois St., alley south of Webb St. And Elmhurst Ave.; 3,263, Braden, Martin, McGraw and Pittsburg Aves. C. W. Hubbell, city engr.

Mich., Milford—Village Council ordered plans and estimates prepared by C. W. Hubbell, engr., 2348 Penobscot Bldg., Detroit, for complete sewerage system, including vitr. sewers and disposal works. About $100,000.

Mich., Oakwood (Oxford P. O.)—City plans to lay 1,800 ft. 8-12 vitr. sewer pipe in Lincoln and Eddy subdivision. About $15,000. H. L. Russell, 505 Moffat Bldg., Detroit, engr.

Ill., East Moline—City rejected bids received building 2,880 lin.ft. 8 in. vitr. pipe sewer and 4,283 lin.ft. 6 and 8 in. c.i. water mains, in Ahrenshield Addition, Watertown Dist. About $17,864. B. L. Warnes, Manufacturers State Bank Bldg., engr.

Ia., Ames—City had plans prepared and soon receives bids building sewerage disposal plant, to include pumping plant, Imhof tank, sludge bed, trickling filters and outfall sewers. About $100,000. P. F. Hopkins, mgr. Dept. Eng.

Minn., Austin—City having plans prepared building 13,000 lin.ft. intercepting sewer, also sewage disposal plant, 3,500,000 gal. daily capacity. A. B. Overland, city engr.

Minn., Cambridge—Village having plans prepared building 20,000 ft. additional sewers. About $38,000. E. Lindahl, clk. Druar & Smith, Globe Bldg., St. Paul, engrs.

Minn., Elmore—D. R. McQuarrie, town clk., rejected bids received Dec. 12, building sanitary sewers, involving 9,550 ft. 8-15 in. sewers, 13,550 lin.ft. trench work and 19 manholes. About $15,000. Work will be readvertised.

Minn., Plainview—Village having plans prepared extending sewerage system, involving 25,000 ft. sewers. About $65,000. M. Duerre, clk. Druar & Smith, Globe Bldg., St. Paul, engrs.

Mont., Forsyth—City plans to lay 540 ft. 12 in. and 4,460 ft. 15 in. sewer in various streets, also build complete sewage disposal plant, manholes and specials. Bonds for $40,000 voted for project.

Ore., Hillsboro—City plans to build sewerage system in northern and eastern section to include laying main trunk pipe and laterals, vitr. or cement. About $80,000. S. O. Levack, engr.

Sewers (Continued)

BIDS DESIRED

N. Y., New York—Until March 8, by H. H. Curran, pres. Manhattan Boro., for bids, agreement, bond and spec. building sewer in 26th St. from hulkhead line of East River to Madison Ave. and rebuilding sewer in Madison Ave. from East & 25th to East 31st Sts., etc.

N. C., Wake Forest—See "Waterworks."

Ala., Montgomery—See "Streets and Roads."

O., Dayton—Until March 27, by Comrs. Montgomery Co., building sanitary sewers in Dist. 1, involving 6,000 ft. 6 in. and 43,170 ft. 8 in. vitr. pipe, 12,000 ft. 5 in. tile, 49,185 ft. 6-22 ft. trenching, 145 manholes, 28 flush tanks, 30M ft. b. M-sheeting and 700 ft. lead pipe. About $150,000 Cellarius & Dressler, 1001 Commercial Bldg., engrs.

O., Hamilton—Until March 8, by F. J. Sloat, dir. pub. serv., building sanitary sewers in Symmes Ave. from railroad to Dixie Highway, thence to city limits, involving 8-12 in. vitr. pipe, house connections, manholes and flush tanks. About $35,000. G. Weaver, city engr.

O., Wauseon—Until March 8, by J. C. King, city clk., trenching and laying 1,520 ft 8-10 in. vitr. crock sewers in Elm and Chestnut Sts. About $12,000. G. Champe, Toledo, engr.

N. D., Cooperstown—Until March 8, by City Council, building complete sewerage system, to include 27,550 ft. 8 to 12 in. pipe, 53 manholes, 2 lampholes, rein.-con. septic tank and sewage lift. About $56,000. Dakota Eng. & Constr. Co., Valley City, engrs. Noted Feb. 19.

N. D., Leeds—Until March 8, by City Council, building complete sewerage system, including pipes and septic tank. Cost to exceed, $25,000. T. R. Atkinson, Bismarck, engr.

Idaho, Ashton—See "Water Works."

Cal., El Monte—Until March 18, by City Clk., building sewerage system, involving 26,000 ft. 8-18 in. vitr. or cement pipe and concrete Imhoff tank. About $55,000. Noted Jan. 8.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Boston—Comr. Pub. Wks. received bids Feb. 25, building 900 ft. rein.-con. horseshoe type outfall sewer conduit, 17 ft. diam., in Stony Brook Park, from W. R. Trap Rock Co., West Roxbury, $107,527; P. W. Hill Co., 97 Proctor St., $112,288; C. and R Constr. Co., School St., $122,760. Noted Feb. 19.

★N. J., Nutley—Town let contract main sewer, Quarry Sect., to Snare & Triest, 8 West 40th St., New York City, $132,439. Noted Jan. 22.

★Pa., Ashley (Wilkes-Barre P. O.)—City let contract excavating and laying 18,000 ft. 16-18 in. terra cotta pipe, in Careys Patch, 3rd Ward, to C. F. Goeringer, South Washington St., Wilkes-Barre, $67,594. Noted Jan. 15.

★N. C., Jacksonville—City let contract laying 11,100 ft. 8 in. vitr. sewers, to A. H. Guiont & Co., Gasonia, $18,950,

★O., Cleveland Heights (Warrensville P. O.)—F. A. Pease Eng. Co., engrs., Marshall Bldg., Cleveland, let contract to Hadded-Hall Co., Schofield Bldg., Cleveland, constructing sewers and water mains in Cedar Brook Allotment 4, for Rapid Transit Land Co., 220 Erie Bldg., Cleveland, cost $41,386. Noted Feb. 5.

★O., Euclid—Village let contract building 7,050 ft. 12-18 in. vitr. pipe sewers in Cutt Rd., to B. W. Ernest, 14011 Woodworth Rd., $18,728; 2,080 ft. 12-18 in. vitr. pipe sewers and 23,585 ft. 6-8 in. c.i. water mains in Fuller, Lamb, Pond and Brewer Aves., to Curro Bros., 1977 East 26th St., Cleveland, $40,669. Noted Jan. 29.

Mich., Port Huron—City received bids trenching, laying vitr. crock sewer, etc. in Avery Farm Plat, from J. Kaumier, $14,079, C. Mugovero, $15,362, A. C. Sturman, $19,137, all of Port Huron; sewers in Michigan and 16th Sts., from J. Kaumier, $1,695 and $1,800 respectively. Noted Feb. 19

★Ill., East Moline—City let contract to Moline Heating & Constr. Co., 16th St. and 4th Ave., Moline, building 1,307 lin.ft. 8 in. vitr. pipe sewer and 1,334 lin.ft. 6 in. c.i. water mains, in Center Addition, Watertown Dist., cost $5972; also 3,117 ft. 8 in. vitr. tile sewer and 2,183 lin.ft. c.i. water mains, in McNeil Addition, Watertown Dist., $13,700.

Bridges

PROPOSED WORK

Conn., Westville (New Haven P. O.)—F. L. Ford, city engr., New Haven, soon lets contract building bridge over West River, on Whalley Ave., here, consisting of two spans, 40 ft. long, 60 ft. wide, encased in concrete. About $50,000. Noted Feb. 5 under "New Haven."

N. Y., Corning—City voted $300,000 bonds to build concrete and steel bridge over Chemung River, on Pine St. Noted Feb. 19.

Mich., Highland Park (Detroit P. O.)—Ford Motor Co. having plans prepared for rein.-con. and steel viaduct to carry street traffic over Detroit Terminal tracks, at plant on Oakland Ave. W. G. Mayo, company engr. and L. C. Whitsit, city engr., preparing plans.

Wisconsin—State Highway Comn., Madison, had plans prepared for bridges in counties as follows:—

Barron Co., Barron Bridge, Barron Twp., concrete span. E. Gleason, Cumberland, comr.

Bayfield Co., Soo River Bridge, Bayview Twp., plate girder. J. Friberg, Washburn. comr.

Douglas Co., Little Brule Bridge, Brule Twp., Beardsley Bridge, Nebagamon Village, both rein.-con. slabs. C. J. Morisset, East End, (Superior, P. O.), comr.

Lafayette Co., Torkelson Bridge, Gratiot Twp., 96 ft. long, 20 ft. wide, steel truss, Rasque Bridge, Elk Grove Twp., rein.-con. span, Skervis Bridge, Shullsburg Twp., rein.-con. span. G. H. Priestley, Darlington, comr.

Sheboygan Co., Kruter Bridge, Herman Twp., rein.-con. G. W. Ubbelohde, comr. All bridges to have concrete abutments.

Wis., Racine—City plans to build steel bascule bridge, on State St. About $250,000. Strauss Bascule Bridge Co., 104 South Michigan Ave., Chicago, engrs.

Wis., Racine—City plans to build steel and concrete viaduct, on West 6th St., cost $150,000; rein.-con. bridge, on Milmine St., $50,000. Klug & Smith, 40 Mack Blk., Milwaukee, engrs.

Ia., Des Moines—Polk Co. soon lets contract building 80 ft. steel truss bridge, 18 ft. wide, on concrete abutments with concrete flooring, and 22 smaller bridges and culverts involving 200 cu.yd. rein.-con., 43,600 lb. structural steel, 15,480 lb. steel bars and 1,376 lin.ft. wooden piling. About $12,000 and $25,000 respectively. F. O. Laing, co. engr.

Ia., Sac City—Sac. Co. soon lets contract building 1 double 100 ft. span high truss, one 85 ft. pony truss, two 24 ft., one 26 ft., 40 ft. and 42 ft. I beam skew span bridges and two 6 x 6 ft. box culverts, 16 and 18 ft. roadways, involving 1,406 cu.yd. rein.-con., 262,972 lb. structural and 82,544 bar steel, 5,170 lin.ft. wooden piling, 300 lin.ft. cofferdam. About $65,000. W. D. Maxwell, co. engr.

Minn., Grand Rapids—Itasca Co. plans to build Bridge 3303, consisting of three 75 ft. rein.-con. truss spans, here. About $25,000. H. A. Leseur, Grand Rapids, engr.

Idaho, Boise—See "Streets and Roads."

Wash., Rockford—Comrs. Spokane Co. (Spokane) having plans, specifications and estimates prepared for construction of concrete bridge across Rock Creek. About $20,000. H. J. Doolittle, Rockford, constr. engr.

Cal., Elkhorn (Woodland P. O.)—Yolo Co., (Woodland) and Sacramento Co. (Sacramento) plan to build bridge across Sacramento River, here. Cost to exceed $50,000.

Cal. Red Bluff—Bd. Supervs. Tehama Co. rejected bids building bridge over Singer Creek. About $16,000. Plans may be revised and work readvertised. Noted Jan 8

Cal., Red Bluff—H. G. Kuhn, clk. Bd. Supervs. Tehama Co., receives bids in April, building Squaw Hill Bridge, rein.-con., 680 ft. long, 20 ft wide, to have concrete trestle, one 256 ft. swing span and two 160 ft. approach spans, invoving 500 cu.yd. rein.-con., 500 cu.yd. concrete, 200 tons steel, 6,000 lin.ft. wooden piling and 3 cofferdams About $150,000. J. B. Leonard, 57 Post St., San Francisco, engr.

BIDS DESIRED

N. J., Elizabeth—Until March 18, by Bd. Freeholders Union Co., building new lift Strauss trunnion bascule type bridge, over Elizabeth River, at South Front St. J. L. Bauer, co. engr.; advertised in this issue. Noted Feb. 5

Pa., Tamaqua—Until April 2, by J. E. Schlottman, controller Schuylkill Co., Pottsville, building new concrete Bridge 134, over Little Schuylkill River, on road from here to Hazleton; advertised in this issue.

W. Va., Middlebourne—Until March 26, by Tyler Co., constructing one 20 ft. concrete girder, one 16 ft. concrete slab, 1 concrete girder with two 30 ft. and one 50 ft spans, over Badger Run. About $11,000. G. F. Cooke, Middleborne, engr.

W. Va., Wayne—Until March 18, by Comrs. Wayne Co., constructing superstructures for four 140 ft. span bridges over Twelve Pole Creek. H. A. Levering, co. road engr.

Fla., Bunnell—See "Streets a Roads".

Ind., Greenfield—Until March 15, by Comrs. Hancock Co. constructing and repairing about 12 bridges. C. Boone, co. engr.

Mich., Ceresco—Until March 11, State Highway Comn. and Rd. Comrs. Calhoun Co. (Marshall), building State Reward Bridge 53, over Kalamazoo River, to have two 50 ft., concrete spans, 20 ft. roadway, involving 883 cu.yd. rein.-con.

Mich., Coopersville—Until March 10, by State Highway Comn., Lansing, building Trunk Line Bridge 240, 18 ft. wide, over Deer Creek, east of here, to have two 40 ft. concrete girders, 20 ft. roadway, two 15 ft. rein.-con. abutments and one 15 ft. pier, involving 378 cu.yd. rein.-con. Cost to exceed $10,000.

Mich., Grand Rapids—Until March 18, by F. F. Rogers, state highway comr., and Denver Twp. Bd., at district office State Highway Comn., Mauray Bldg., constructing State Reward Bridge 22, 70 ft. long, 18 ft. wide, over White River, 1 mi. from Hesperia, to have two 35 ft. concrete girders with 18 ft. roadway and two 13 ft. plain concrete abutments, with one 13 ft. pier, involving 338 cu.yd. rein.-con.

Mich., Port Huron—Until March 22, by State Highway Comn, at Dist. Office, 1-2 Majestic Bldg., constructing Federal Aid Bridge 1, on Federal Aid Project 38, 110 ft. long, 20 ft. wide, over Belle Creek, Columbus Twp., St. Clair Co., to have plain concrete abutments, 5½ in. concrete floor slab with 3 in. wearing surface, also fabricating and erecting 110 ft. low truss, involving 568 cu.yd. rein.-con. and 135,240 tons steel; Federal Aid Bridge 2, on Federal Aid Project 38, 110 ft. long 20 ft. wide over Pine River, St. Clair Twp. and Co., to have 2 plain concrete abutments, 5½ in. concrete floor slab with 3 in. wearing surface, also fabricating and erecting 110 ft. low truss, involving 405 cu.yd. rein.-con. and 135,240 tons steel. Noted Jan. 28.

Wisconsin—State Highway Comn., Madison, had surveys made and preparing plans for building bridges in counties as follows:

Ashland Co., White River Twp., Ensinger Bridge, plate girder span; Anderson Bridge, I beam span. W. E. Dillon, Highbridge, comr.

Clark Co., Iron Grove and Longwood Twps., Owen Bridge, 120 ft. long, 18 ft. wide, riveted truss span. W. O. Thoma, Neillsville, comr.

Oconto Co., Pensaukee Twp., Atkins Creek Bridge, 90 ft. long, 20 ft. wide, steel truss span, Atkins Creek Bridge, 8 ft. long, 20 ft. wide, concrete slab, Beaver Creek Bridge, concrete slab, Hunt Bridge, concrete slab; Abrams Twp., Swift Creek Bridge, concrete slab, Trunk Line No. 1 Bridge, concrete slab, Trunk Line No. 2 Bridge, concrete slab, Trunk Line No. 3 Bridge, concrete slab. P. Peetz, Oconto, comr.

Racine Co., Yorkville Twp., Vivyan Bridge, I-beam span with removable top; Dover Twp., Edwards Bridge, deck girder; Mt. Pleasant Twp., Peck Bridge, concrete slab. W. O. Thomas, Court House, Racine, comr. Vernon Co., Stark Twp., Main St. Bridge No. 1, 90 ft. long, 20 ft. wide, steel truss span. A. Ristow, Viroqua, comr. All bridges to have concrete abutments.

Ia., Marshalltown—Until April 5, by O. G. Herm, city engr., building concrete Rainbow Arch bridge, or rein.-con. truss bridge, over Linn Creek, on South 3rd Ave. Marsh Eng. Co., 205 Masonic Temple, Des Moines, engrs.; advertised in this issue. Noted Jan. 29.

Minn., Duluth—Until March 19, by W. H. Borgen, treas. St. Louis Co., building 52 concrete and steel bridges, 15 to 160 ft. long, 18 ft. wide, on various county roads. About $100,000. O. A. Rold, co. engr.

N. D., Bismarck—Until March 17, by State Highway Comn. and Bd. Comrs. of Burleigh and Morton Counties, at office of State Highway Comn., here, building 4 main piers of Missouri River Bridge between here and Mandan, Project 100, involving

Bridges (Continued)

7,173 cu. yd. 1:2:4 concrete, 1,868 cu. yd. rubble concrete, 8,430 cu. yd. excav., 78 ton fabricated structural steel and 88 ton reinforcing steel; advertised in this issue.

Cal., Visalia—Until March 17, by G. R. Prestidge, clk. Tulare Co., building 320 ft. rein.-con. bridge over Kings River, west of Kingsburg, with 512 ft. approach. L. Moye, Visalia, engr.

Ontario—Until March 17, by W. A. McLean, deputy minister of highways, Toronto, constructing rein.-con. culverts on Provincial Highway from Toronto to Kingston, in Leeds, Escott, Lansdowne, Cornwall and Charlottenburg Twps., also on Provincial Highway from Toronto to Niagara, in Grantham, Niagara, Richmond, Ernesttown, Kingston, Brighton, Murray, Hamilton and Haldimand Twps. About $300,000 G. Hogarth, Parliament Bldgs., Toronto, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Conn., Warehouse Point**—Comrs. Hartford Co., Hartford, let contract building steel bridge from here to Windsor Locks, to Berlin Constr. Co., Berlin. About $325,000. Noted July 31.

★**Ga., Dublin**—Comrs. Lauren Co. let contract building 4 concrete and steel bridges on Dixie Highway, to R. B. Wright, Macon, $66,409.

★**O., Springfield**—Ohio Electric Ry., North Fountain Ave., let contract building 150 ft. span truss bridge, 18 ft. wide, over Mad River, in Clark Co., to Brookville Bridge Co., Brookville. About $30,000.

★**Mich., Detroit**—Wayne Co., 220 County Bldg., will build 2 abutments for State Reward Bridge R-5, 20 ft. wide, Redford Mills, Redford Twp., involving 520 cu yd. rein.-con. Work will be done by day labor. Noted Jan. 29.

★**Ill., Wilmington**—Will Co. let contract building 572 ft., rein.-con. arch bridge, 33 ft. wide, consisting of seven 68 ft. spans, involving 2,810 cu.yd. rein.-con., 68 tons steel, 53 cu.yd. brick rail and 970 lin. ft. cofferdam. to M. & P. Constr. Co., Rockport, Ind., $82,987.

★**Wis., Darlington**—City let contract building rein.-con bridge, to Freeport Bridge Co., Freeport, Ill., $35,589.

Ia., Centerville—Comrs. Appanoose Co. received bids Feb. 12, building (1) Group "A," 18 box culverts, 26-45 ft. long, 2-3 ft. wide, involving 205 cu.yd. rein.-con. and 12,885 lb. steel, (2) Group "B," 14 concrete culverts, one 20 ft. and one 30 ft. span I beam bridge, 20 ft. roadway, 551 cu.yd. rein.-con., 1,888 lin.ft. wooden piling, 19,270 lb. structural steel and 31,615 lb. steel bars, (3) Group "C," 2 box culverts, one 16 x 32 ft. I beam span, one 20 x 60 ft. and one 18 x 80 ft. Pony truss span, 621 cu.yd. rein.-con., 3,344 lin.ft. wooden piling, 89,870 lb. steel and 47,360 lb. steel bars, (4) Group "D," one 8 x 8 x 38 ft. box culvert, one 20 x 24 ft. and two 16 x 20 ft. I beam spans, 489 cu.yd. rein.-con., 432 lin.ft. wooden piling, 19.420 lb. structural steel and 26,910 lb. steel bars, from I. W. Manson & Son, Centerville, (1) $13,368; B. S. Staley, Centerville, (2) $25.894, (4) $21,563; Phelps & Son, Knoxville (2) $28,142 (3) $44.934; Iowa Bridge Co., 712 Hubbell Bldg., Des Moines, (3) $44,990; Pittsburg-Des Moines Steel Co., 9th and Tuttle Sts., Des Moines, (3) $45,000, (4) $23,000. Noted Jan. 29.

★**Tex., Groesbeck**—J. E. Bradley, judge Limestone Co., let contracts to McCall-Moore Eng. Co., 308-9 Amicable Bldg., Waco, building rein.-con. bridges and culverts on Highway 7, near Tehuacana, through Cooledge to Navasota River, $20,482; 2 concrete slab bridges and rein.-con. culverts, on Highway 7, from Navasota River, to McLennan Co., $40,147; one 70 ft. steel truss bridge over Tehuacana Creek, one 60 ft. steel truss bridge over Plummers Creek, constructing rein.-con. culverts and removing 6 concrete culverts, on 11.87 mi. Highway 14, $37,654; steel truss bridge and 20 concrete slab bridges, over Navasota River, involving 163 ton structural steel, $29,637. Noted Jan. 22 and Feb. 12 under "Streets and Roads."

Tex., La Grange—J. P. Ehlinger, judge Fayette Co., received bids Feb. 9, building bridges and culverts on Highway 3, involving 185,086 lb. reinforcing steel. 1,165 cu.yd. Class "A" and 787 cu.yd. Class "B" concrete, from J. L. Robertson-Montgomery Constr. Co., San Antonio, $66,208; McCall-Moore Eng. Co., 308-9 Amicable Bldg., Waco, $81,777. Noted Jan. 22, under "Streets and Roads."

★**Okla., Minco**—H. Wood, comr. State Highway Dept., Oklahoma, let contract building steel bridge, Federal Aid Project 17, between here and Union City, on South Canadian River, to have eight 144 ft. spans, concrete flooring, rein.-con. abutments and piers, to Topeka Bridge & Constr. Co., Stormont Bldg., Topeka, Kan., $233,480.

★**Ariz., Duncan**—T. Maddock, state engr., Phoenix, let contract building 60 ft. steel span bridge, over Railroad Wash., on Clifton Highway near here, (Federal Aid Project 13), concrete floor, rein.-con. abutments, to Midland Bridge Co., 504 Ry. Exch., Kansas City, Mo. Bid $35,600 on plans and specifications and $37,173 on own plans and specifications; not yet determined which will be accepted. Noted Jan. 29.

★**Cal., Red Bluff**—Tehama Co. let contract building bridge between here and Los Molinos, to C. E. McCarthy, Red Bluff. $11,485.

Structural Steel

PROPOSED WORK

Mass., Boston—Office—See "Buildings."

Pa., Harrisburg — School — See "Buildings."

Pa., Newtown Square Home—See "Buildings."

O., Akron — Hotel and Theatre — See "Buildings."

O., Cleveland—School—See "Buildings."

O., Cleveland—See "Industrial Works."

Mich., Lansing—School—See "Buildings."

Mich., River Rouge—School—See "Buildings."

Ill., Chicago—See "Industrial Works."

Wis., Manitowoc—See "Industrial Works."

BIDS DESIRED

Mich., Flint—School—See "Buildings."

Minn., Duluth—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Vt., Lunenburg** — See "Industrial Works."

★**N. Y., Brooklyn**—Hospital—See "Buildings."

O., Barberton—See "Industrial Works."

★**O., Cleveland**—See "Industrial Works.'

★**Mich., Detroit**—See Industrial Works."

★**Mich., Grand Rapids** — Theatre — See "Buildings."

★**Ill., Chicago**—Hotel—See "Buildings."

★**Ill., Chicago**—Theater—See "Buildings."

★**Wis., Milwaukee** — See "Industrial Works."

Reinforced Concrete

PROPOSED WORK

N. H., Somersworth—See "Industrial Works."

Mass., Boston—Office—See "Buildings."

Mass., West Springfield (Springfield P. O.)—See "Industrial Works."

N. J., Jersey City—See "Industrial Works."

Pa., Harrisburg—School—See "Buildings."

Pa., Phila.—Home—See "Buildings."

O., Akron—Hotel and Theatre—See "Buildings."

O., Cleveland—See "Industrial Works."

O., Cleveland—School—See "Buildings."

Mich., River Rouge—School—See "Buildings."

Wis., Manitowoc — See "Industrial Works."

Cal., Oakland—See "Industrial Works."

Cal., Sacramento—Irrigation—See "Excavation and Dredging."

BIDS DESIRED

Mich., Ceresco—See "Bridges."

Mich., Coopersville—See "Bridges."

Mich., Flint—School—See "Buildings."

Ill., Rockford—Office—See "Buildings."

Minn., Duluth—See "Bridges."

Minn., Keewatin—High School—See "Buildings."

Minn., Nashwauk—High School—See "Buildings."

Cal., Fresno—School—See "Buildings."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Vt., Lunenburg**—See "Industrial Works."

★**Mass., Boston**—Theatre—See "Buildings."

★**Mass., Newton Upper Falls**—See "Industrial Works."

★**O., Barberton**—See "Industrial Works."

O., Cleveland—See "Industrial Works."

★**O., Cleveland**—See "Industrial Works."

★**Mich., Birmingham** — Clubhouse — See "Buildings."

★**Mich., Detroit**—See "Bridges."

★**Mich., Grand Rapids**—Theatre—See "Buildings."

★**Ill., Chicago**—Hotel—See "Buildings."

★**Ill., Chicago**—Theatre—See "Buildings"

★**Ill., East St. Louis**—Hotel—See "Buildings."

★**Wis., Darlington**—See "Bridges."

★**Wis., Milwaukee** — See "Industrial Works."

★**Cal., Los Angeles**—See "Industrial Works.'

Streets and Roads

PROPOSED WORK

R. I., Woonsocket — City appropriated $30,000 to straighten and widen Cumberland St.

Conn., West Haven (New Haven P. O.) —Boro. appropriated $150,000 to build oads. J. L. Sherman, 1st selectman.

N. Y., Rochester—City plans to pave Winton Rd. S., cost $66,500; Ketchum St., $11,200. C. A. Poole, city engr.

N. Y., Syracuse—City ordered New York Rys. to pave between tracks on Cortland, Seymour, North Salina, et al Sts., 6½ mi long. About $280,000. H. C. Allen, city engr.

N. J., Harrison — Hudson Co. (Jersey City) plans to take over and improve 1 mi. Passaic Ave., granite block. Cost to exceed $25,000.

N. J., West New York—Bd. Freeholders Hudson Co. (Jersey City) plans to take over and improve Hudson River Rd., granite block. Cost to exceed $10,000.

W. Va., Spencer—Comrs. Roane Co. rejected bids received Feb. 20, paving 3 mi. Spencer-Walton Rd., involving 28,160 sq.yd. concrete. About $67,000 H. R. Muldoon, co. engr. Noted Jan. 28.

W. Va., Spencer—Comrs. Roane Co. received no bids Feb 20, improving 2.2 mi road from here to Walton involving 20,650 sq.yd. concrete. H. R. Muldoon, Spencer, engr. Noted Feb. 5.

N. C., Marshall—Comrs. Madison Co. plan to grade and top soil 12 mi. Marshall Ivy Gap Rd., 16 ft. wide. About $50,000. W. M. Peyton. Asheville, engr.

N. C., Wilmington—City plans to pave 7 blocks Princess St., 30 ft. wide, brick or bitulithic. Cost between $30,000 and $50,000.

Ga., Jesup—Wayne Co. election April 7, to vote on $200,000 bonds to build road from Appling Co. line to Glynn Co. line.

Ga., Marietta—City Council soon receives bids paving, curbing, draining and building sidewalks on 6 mi. road, 24-40 ft. wide, involving 100,000 sq.yd. vitr. brick, asphalt concrete or bituminous concrete, 12 mi. granite curbing, concrete sidewalks, etc. Cost between $350,000 and $500,000. Election soon to vote on bonds for project. K T Thomas, Forsyth Bldg., Atlanta, engr.

Miss., Clarksdale—City soon lets contract for 36,000 sq.yd. asphaltic concrete pavement on present gravel base. W. Bobo, city engr.

Ohio—State Highway Comm., Columbus, received no bids Feb. 27, building roads in following counties:

Belmont Co., Sect. "E" New Athens-Morristown Rd., 4.454 mi., grading, constructing bridges and culverts and paving with waterbound macadam.

Fulton Co., Sects. "P" and "Q-1" Bryan-Wauseon Rd., 6.191 mi., grading, constructing bridges and culverts and paving with concrete.

Sect "K-2" Archbold-Fayette Rd., .999 mi., grading constructing bridges and culverts and paving with waterbound macadam.

Guernsey Co., Sect. "K" Cambridge-Coshocton Rd., 2 mi., grading, constructing bridges and culverts and paving with Hillside brick.

Hamilton Co., Sect. "A" Glendale-Milford Rd., 2.59 mi., grading, constructing bridges and culverts and paving with concrete, semi-monolithic brick, warrenite or bitoslag.

Streets and Roads (Continued)

Medina Co., Sect. "H-1" Cleveland-Hinckley Rd., 1.49 mi., grading, constructing bridges and culverts and paving with rein.-con.

Trumbull Co., Sect. "H" Niles-Ashtabula Rd., 5.14 mi., grading, constructing bridges and culverts and paving with bituminous macadam.

Sect. "K" Niles. Ashtabula Rd., 5.69 mi., grading, constructing bridges and culverts and paving with bituminous macadam. Noted Feb. 12.

O., Akron—E. A. Zeisloft, dir. Bd. Pub. Serv., rejected bids received Feb. 9, paving West Exchange St. from Bowery St. to west line lot 60, Balch Allotment. Noted Jan. 29.

O., Dayton—Comrs. Montgomery Co. plan to surface 1 mi. road, 18 ft. wide, Clay Twp., involving 3,000 cu.yd. gravel or crushed stone. About $10,000. P. S. Bookwalter, co. surv.

O., Xenia—Comrs. Greene Co. plan to pave 7 mi. Jamestown and Cedarville Pike, involving 125,000 sq.yd. bituminous macadam surfacing, 30 ft. wide. About $450,000.

Michigan—State Highway Dept., Lansing, soon receives bids grading, draining and surfacing .799 mi. State Trunk Line Rd 27-7 20 ft. wide, Harbor Beach, 1.745 mi. State Trunk Line Rd. 31-5, 18 and 20 ft wide, Sebewaing, 1.446 mi. State Trunk Line Rd. 31-3, 18 and 20 ft. wide, Pigeon, .506 mi. State Trunk Line Rd. 31-2, 20 ft. wide, Bad Axle, Huron Co., 1.161 mi. State Trunk Line Rd. 10-11, 18 ft. wide, Standish, Arenac Co.; 1 mi. State Trunk Line Rd. 46-3, 18 ft. wide, Breckenridge, Gratiot Co.; 3.352 mi. State Trunk Line Rd. 16-4, 16 ft. wide, Ionia Co.; 2.558 mi. State Trunk Line Rd. 12-13, 16 ft. wide, Mackinac Co.; 6.29 mi. State Trunk Line Rd. 20-7, 16 ft. wide, Clare Co.; 11.006 mi. Assessment Dist. Rd. 232, 12 ft. wide, Livingston and Shiawassee Counties; 2.967 mi. State Trunk Line Rd. 63-2, 16 ft. wide, Osceola Co.; 5.92 mi. State Trunk Line Rd. 14-1, 18 ft. wide, Clinton Co.; 3.052 mi. State Trunk Line 18-5 15 ft. wide, 5.47 mi. State Trunk Line Rd. 18-6, 15 ft. wide, and 1.25 mi. State Trunk Line Rd., 18-12, 16 ft. wide, Ogemaw Co.

Michigan—State Highway Dept., Lansing, having plans and estimates prepared for grading, draining and surfacing 7 mi. road, St. Clair and Macomb Counties, 12 or 16 ft. wide, Class "B" gravel, Class "C" slag or stone with gravel top.

Michigan—State Highway Dept., Lansing, soon receives bids grading, draining and surfacing 7.446 mi, Assessment Dist Rd. 273, 16 ft. wide, Clinton and Shiawassee Counties, gravel; 4.772 mi. Assessment Dist. Rd. 321, 16 ft. wide, Monroe and Washtenaw Counties, stone gravel or waterbound macadam.

Mich., Detroit—City soon receives bids grading and paving with sheet asphalt on 6 or 8 in. concrete base, Medina, Amherst or other curb stone, Chalmers Ave., cost $36,860, Wilde Ave., $17,110, Hindle St., $10,980, Leland St., $19,560, Duncan St., $10,730, Beniteau Blvd., $15,550, Colfax Ave., $26,840, Dundee Ave., $22,570, Field Ave., $72,410, Spring St., $6,990, Wilson Ave., $7,170, Palmer St., $10,430, Kendall Ave., $21,270, Yellowstone Ave., $19,340, Heckla Ave., $6,340, Lane Ave., $29,100, Whitfield Ave., $10,660, McDonald Ave., $27,650, Vernor Ave., $11,280, Lafayette Ave., $30,660, 29th St., $10,580, Jackson St., $59,090, Otis St., $29,640, Edward St., $29,880, Bushey St., $11,470, Waldo St, $44,760; paving with sheet asphalt on 8 in. concrete base, Medina curb stone, Engel Ave., $3,600, LeMay Ave., $3,740, Concord Ave., $18,360. C. W Hubbell, city engr.

Mich., Detroit—City having plans prepared grading, shaping, curbing, draining and surfacing with concrete Glenwood and Gratiot Aves., Minnie and Jenkinson Sts., 24 ft. wide; Rawlins, Moak, Court, 4th and Corner Sts., Pine Grove Ave. and Crescent Pl., 30 ft. wide; Michigan St., 34 ft. wide. E. R. Whitmore, city engr.

Mich., Hamtramck (Detroit P. O.)—Village Council ordered plans and estimates prepared for grading, shaping, paving and curbing 4,000 ft. Joseph Campau Ave. from Holbrook to Carpenter Aves., 60 ft. wide, creosoted wood block, asphalt or concrete on concrete base. G Jerome, 1331 Majestic Bldg., Detroit, engr.

Ia., Dakotah—Comrs. Humboldt Co. soon let contract building 1.85 mi. roads, involving 23,208 cu.yd. excav., 15,933 sq.yd. paving, 3,588 lin.ft tile drains and 772 cu.yd. gravel surfacing. L. D. Snyder, Dakotah, engr.

Ia., Emmetsburg—Comrs. Palo Alto Co. soon let contract building 11.05 mi. highways, 9 mi., 9 ft. wide, balance, 18 ft. wide, involving 3,220 cu.yd. excav., 68,437 sq.yd. paving and 62,415 lin.ft. tiling. T. R. Martin, Emmetsburg, engr.

Ia., Garner—H. V. Reed, town clk., soon lets contract for 83,500 sq.yd. vitr. brick, asphalt, bituminous concrete, Class "A" or Class "B" concrete and 60,300 lin.ft. curbing and guttering. About $275,000. J. G. Thorne, 317 Howes Blk., Clinton, engr.

Ia., Ottumwa—Comrs. Wapello Co. soon let contract grading and draining 10½ mi. roads, involving 135,924 cu.yd. excav. C. Wyman, Ottumwa, engr.

Ia., Pocahontas—Comrs. Pocahontas Co. soon let contract graveling 11 mi. roads, involving 16,525 cu.yd. gravel. A. L. Thornton, Pocahontas, engr.

Minn., Albert Lea—City plans to pave 40,000 sq.yd. various streets, 50 ft. wide. About $50,000. C. J. Dudley, city clk.

Minn., Ortonville—City having surveys made paving 12 blocks, 50 ft. wide. About $60,000. Bids will be received on all types of pavement. Druar & Smith, Globe Bldg., St. Paul, engrs.

Minn., Plainview—Village having plans prepared for 3 mi. paving. Bids will be received on all types of pavement. About $155,000. M. Duerre, village clk. Druar & Smith, Globe Bldg., St. Paul, engrs.

Minn., Winona—A. Buerlen, aud. Winona Co., receives bids about March 15, graveling 6 mi. road from Minnesota City to Minneiska, also hard surfacing 3 mi. road from Stockton to Lewistown, 24 ft. wide. About $100,000. H. B. Childs, Winona, engr. Noted Jan. 15.

South Dakota—State Highway Comn., Pierre, plans to grade, gravel and construct drainage structures on 7.95 mi. Kadoka-Martin Rd., 16 ft. wide, Jackson and Washabaugh Counties, involving 31,800 cu.yd. earth excav., 7,950 cu.yd. gravel surfacing, 300 lin.ft. corrugated culverts, 270 cu.yd. concrete, 18,000 lb. reinforcing steel, cost $45,967; 9.6 mi. Clear Lake-Milbank Rd., 24 ft. wide, Devel Co., 43,000 cu.yd. earth excav, 900 lin.ft. corrugated culverts, 355 cu.yd. concrete, 26,200 lb. reinforcing steel, $63,155; 6 mi. Clear Lake-Milbank Rd., 24 ft. wide, Grant Co., 24,000 cu.yd. earth excav., 9,000 cu.yd. gravel, 600 lin.ft. corrugated culverts, 435 cu.yd. concrete, 30,000 lb reinforcing steel, $46,623; grading and constructing drainage structures on 16 mi. Burke-Dallas Rd., 36 ft. wide, Gregory Co., 74,000 cu.yd. earth excav., 1,450 lin.ft. corrugated culverts, 705 cu.yd. concrete, 45,000 lb. reinforcing steel, 1,000 lin.ft. wooden guard rail, $69,289; grading, graveling and constructing drainage structures on 13.1 mi. Onida-Gettysburg Rd. 16 ft. wide, Sully Co., and constructing one 60 ft. steel truss bridge, involving 53,710 cu.yd. earth excav., 13,100 cu.yd. gravel surfacing, 860 lin.ft. corrugated culverts, 310 cu.yd. concrete, 26,000 lb. reinforcing steel, $74,662. F. S. Peck, state highway engr.

North Dakota—State Highway Comn., Bismarck, plans to expend $2,266,045 to build 713.8 mi. roads in following counties: Barnes Co., grading and building culverts on 50.5 mi. road; Benson Co., 21 mi.; Burke Co., 38 mi.; Divide Co., 20 mi.; Eddy Co., 4 mi.; Emmons Co., 25.5 mi.; Foster Co., 14.9 mi.; Grand Forks Co., 23 mi.; Grant Co., 23 mi.; Golden Valley Co., 19.3 mi.; Griggs Co., 6½ mi.; Hettinger Co., 28.5 mi.; Kidder Co., 3.7 mi.; La Moure Co., 23 mi.; McIntosh Co., 12 mi.; McLean Co., 29 mi.; Mountrail Co., 24 mi.; Nelson Co., 5.5 mi.; Pembina Co., 6 mi.; Pierce Co., 21.6 mi.; Ramsey Co., 21½ mi.; Richland Co., 98 mi.; Sargent Co., 37 mi.; Stark Co., 5.5 mi.; Steele Co., 8.5 mi.; Stutsman Co., 46.5 mi.; Traill Co., 19.5 mi.; Ward Co., 89 mi.; Wells Co., 21 mi.; Williams Co., 37.5 mi.

N. D., Devil's Lake—City plans to pave 6 blocks, 28 ft. wide, in residential section. About $50,000. Atkinson & Hall. Devil's Lake, engrs.

N. D., Wahpeton—City Council soon lets contract paving, curbing and guttering Dists. 1, 2, 4 and 5, 26 to 30 ft. wide, vitr. brick, wood block, asphalt, portland cement and bituminous concrete on concrete base. About $150,000. L. W Burdick, city engr.

Wyo., Buffalo—City plans to pave Main, Fort, 1st, Bennett and Lobban Sts., involving 39,000 sq.yd. bitulithic or rein.-con. on concrete base. About $150,000. Gerharz-Jacqueth Eng. Co., Kalispell, Mont., and E. O. Eder, Buffalo, engrs.

Mont., Hysham—Treasure Co. election April 23, to vote on $135,000 bonds to build roads. J. N. Edy, c/o State Highway Dept., Helena, engr.

Mont., Roundup—City plans to pave 2 mi. various streets, bitulithic. About $80,000 C. A. Springmyer, city aud.

Missouri—State Highway Dept., Jefferson City, plans to build 7.48 mi. Nevada-Springfield Rd., 24 ft. wide, Linn Twp. Special Rd. Dist., Cedar Co., involving 13,409 cu.yd. earth excav., 39,495 sq.yd. gravel surfacing, 9 ft. wide, and 10,434 cu.yd. machine grading, cost $22,976; 5.16 mi. Clinton-Osceola Rd., 24 and 26 ft. wide, Clinton Twp. Bd., Henry Co., 51,926 cu.yd. earth excav., 30,980 sq.yd. chats surfacing, 16 ft. wide, and 19,600 sq.yd. concrete surfacing, 18 ft. wide, 7 culverts and 5 bridges, $125,387; 4.54 mi. Preston-Collins Rd., 24 ft. wide, Hermitage Special Rd. Dist., Hickory Co., 13,000 cu.yd. earth and 1,300 cu.yd. rock excav., 18,691 sq.yd. 2 course and 5,280 sq.yd. 1 course gravel surfacing, 9 ft. wide, 14 culverts and 1 bridge, $25,424; 2.6 mi. Joplin-Carthage Rd., Carterville Special Rd. Dist., 26 ft. wide, 6,670 cu.yd. earth excav., 27,456 sq.yd. concrete surfacing, 18 ft. wide and two culverts, $79,425; 7.6 mi. Jefferson Highway, 24 ft. wide, Carthage Special Rd. Dist., 2,000 cu.yd. earth excav., 6,000 cu.yd. machine grading, 6,336 sq.yd. 7 in. concrete surfacing and 63,360 sq.yd. 3 in. gravel resurfacing, 18 ft. wide, culverts, etc., $31,277; 6.6 mi. Joplin-Carthage Rd., Carthage Special Rd. Dist. 24 ft. wide, 16,000 cu.yd. earth and 2,500 cu.yd. rock excav., 70,000 sq.yd. concrete surfacing, 16 ft. wide, 600 lin.ft. guard rail and 12 culverts, $231,138, all in Jasper Co.; 8.78 mi. Old Wire Rd., 24 ft. wide, Lebannon Rd. Dist., Laclede Co., 10,034 cu.yd. earth and 300 cu.yd. rock excav., 17,560 cu.yd. machine grading, 82,413 sq.yd. 5 in. gravel surfacing, 16 ft. wide, 400 lin.ft. guard rail, 288 lin.ft. 15 in. vitr. pipe, 1 bridge consisting of two 20 ft. spans, 17 culverts, etc., $53,564; 4.76 mi. Oasis Rd., 20 ft. wide, Oasis Special Rd. Dist., Taney Co., 12,690 cu.yd. earth and 150 cu.yd. rock excav., 14,950 lin.ft. grading, 27 culverts, 1 bridge, also moving one 3 span bridge, $24,000; 28.31 mi. St. Louis-Springfield Rd., 24 ft. wide, Texas Co., 40,710 cu.yd. earth and 1,500 cu.yd. rock excav., 40,000 cu.yd. machine excavation, 152,720 sq.yd. 10 in. gravel surfacing, 9 and 16 ft. wide, 120 lin.ft. 18 in. vitr. pipe, 74 new culverts, extensions to 35 old culverts, repairs to abutments of 2 old bridges, one 30 ft. concrete bridge, one concrete bridge consisting of two 20 ft. spans and 2 concrete bridges, two 40 ft. spans each, $136,950.

Mo., St. Joseph—City having plans prepared paving 4 blocks 10th St. from Hickory to Atchison Sts., 25 ft. wide, asphaltic concrete. About $60,000. C. O. Judson, city engr.

Mo., St. Louis—Buchanan Co. had plans prepared building 6.5 mi. Agency Rd. from Saxton Rd. to Agency, 18 ft. wide, concrete, asphaltic concrete or bituminous macadam. About $195,000. J. D. Mohler, 1522 South 25th St., engr.

Ark., Marked Tree—Bd. Comrs. Ozark Trail Rd. Impvt. Dist. receives bids about June 1, grading 10 mi. road, 24 ft. wide and graveling 3 mi. road, 14 ft. wide, involving 25,000 sq.yd. gravel and 100,000 cu.yd. grading.

Tex., Ft. Davis—Jeff Davis Co. voted $100,000 bonds to build Highway 1. Total cost, $165,000. State Highway Dept. will appropriate $65,000 toward cost. B. H. Grierson, Ft. Davis, engr.

Tex., Hillsboro—Aquila Rd. Dist., Hill Co., voted $105,000 bonds to build roads. Bryant & Huffman, 211-217 Littlefield Bldg., Austin, engrs.

Tex., Rockport—Aransas Co. voted $100,000 bonds to build roads, including Bayside Rd., total cost, $150,000 State and Federal Government will appropriate $50,000 toward cost. J. G. Lott, Rockport, state resident engr.

Okla., Altus—City voted $150,000 bonds to pave 30 blocks, to include East and West Bway., North and South Main, East Commerce and North Hudson Sts. Engineer not selected.

Okla., Chickasha—City voted $200,000 bonds to pave 10 mi. various streets. Engineer not selected.

Idaho—W. J. Hall, comr. Dept. Pub Wks., Boise, soon lets contract constructing 8.4 mi. Greer Hill Section of Clearwater State Highway, Clearwater Co. About $100,000.

Streets and Roads (Continued)

Idaho—State Highway Comn., Boise, plans to gravel 7 mi. Malad Valley Highway, Oneida Co., involving 26,000 cu.yd. exav., cost $49,997; 21.8 mi. Idaho-Utah Highway from Oxford to Franklin, Franklin Co., 60,000 cu.yd. excav., $160,000; grading 4 mi. Lewis and Clark Highway from Spaulding to Arrow Jct., Nez Perce Co., 20,500 cu.yd. excav., one 110 ft. steel span bridge over Potlach Creek, $97,000. Federal Government has been asked to appropriate toward cost. W. J. Hall, comr. pub. wks.

Ore., Astoria—Port of Astoria Comn. and Clatsop Co. plan to build road from South 11th St. to connection of Nehalem Rd., Williamsport. Port also plans to build bulkhead and sand fill and bear ⅔ of cost; county plans to pave with gravel macadam, concrete or asphaltic concrete and pay ⅔ of cost. Total cost, $75,000. H. N. Hackett, co. roadmaster.

Ore., Bend—Town Council plans to pave 8,000 ft. of various streets in business section, concrete. About $64,000. J. H. Haner, clk.

Ore., Forest Grove—City plans to pave 29 blocks main streets, concrete, bitulithic or asphaltic concrete on crushed rock base. Cost to exceed $10,000. W. P. Dyke, city recdr.

Ore., Portland—Comrs. Multnomah Co. soon let contract improving St. Johns River Rd. from Delay St. to Williamete Blvd., waterbound macadam. Cost to exceed $10,000. R. W. Hoyt, chn.

Cal., Holtville—City rejected bids paving various streets, Sects. A and B. I. B. Robinson, clk. Noted Feb. 26.

Cal., Napa—City plans election to vote on $150,000 bonds to pave, grade and curb various streets. H. H. Thompson, city clk.

Cal., Riverside—City Council soon receives bids paving 1 mi. Mangolia Ave., oiled macadam. City Attorney ruled that contract let to City Comrs. was invalid. Noted March 4.

Cal., Santa Ana—Bd. Supervs. Orange Co. received no bids Feb. 17, concrete paving 2¾ mi. Orangethorpe Ave. Work will be readvertised. Noted Feb. 5.

Cal., Yuba City—Bd. Supervs. Sutter Co. soon lets contract building 4 mi. Yuba City-Nicolaus Rd., from here to Oswald, involving 8,400 cu.yd. excav., 4,450 cu.yd. Class "A" portland cement concrete pavement (Alternative "A"). 20 cu.yd. Class "A" portland cement concrete (culverts), 530 lin.ft. 12 in. corrugated metal pipe, 35,600 sq.yd. asphaltic concrete foundation and Warrenite wearing surface (Alternative "B"), and 5,950 cu.yd. macadam pavement (Alternative "C"). County will furnish cement concrete (fine and coarse), broken stone and screenings for macadam, reinforcing steel, corrugated metal pipe and portland cement. A. B. Brown, clk.

BIDS DESIRED

Conn., Manchester—Until March 15, by Bd. Selectment, at office of Hall of Records, South Manchester, building concrete walks, curbing, radius and drive corners, etc. About $30,000. W. B. Rogers, secy.

Conn., New Haven—Until March 9, by Bd. Pub. Wks., furnishing, applying hot asphalt under pressure and covering with crushed stone and slag 200,000 sq.yd., more or less, old waterbound macadam pavements; repairing 6,500 sq.ft. cement concrete sidewalks, 2,000 sq.ft. tar concrete sidewalks, 500 sq.ft. cement concrete driveways, 200 sq.ft. tar concrete driveways, 2,000 sq.ft. tar concrete top dressed sidewalks, 200 sq.ft. tar concrete top dressed driveways; also laying 5,000 sq.yd. cement concrete and 2,000 sq.ft. tar concrete sidewalks, 1,000 sq.ft. cement concrete and 200 sq.ft. tar concrete driveways, 20 cu.yd. cement concrete copings and steps. F. L. Ford, city engr.

New York—Until March 18, by F. S. Greene, state highway comr., Capitol, Albany, improving and completing 5.85 mi. highway, Chautauqua Co., 5.38 mi. and 5.03 mi. Oneida Co., 4.05 mi. Onondago Co., 4.65 mi., 1.99 mi. and 0.95 mi. Ontario Co., 4.82 mi. Orleans Co., 3.3 mi. and 5.42 mi. Oswego Co., 5.86 mi., 13.09 mi. and 4.6 mi. St. Lawrence Co., 0.5 mi. Schenectady Co., 7.6 mi. and 6.98 mi. Washington Co., 3 mi. Wayne Co., 4.13 mi. Westchester Co., 3.55 mi. Wyoming Co., 3.1 mi. Franklin Co., 2.02 mi. Seneca Co.; advertised in this issue.

BRIDGE—SCHENECTADY, N. Y.

Bids were received by E. S. Walsh, Supt. Pub. Wks., Capitol, Albany, for constructing abutments and approaches for Schenectady-Scotia bridge over Mohawk River, from (A) Engineer's Estimate; (B) DuBois Bennett & Son, Schenectady (awarded contract); (C) Amer. Pipe & Constr. Co., 112 North Broad St., Phila. The unit bids were as follows:

	A	B	C
Schenectady Abutment and Approach:			
Cofferdams, pumping, bailing and draining (lump sum)	$500.00	$1,000 00	$1,000 00
3,080 cu.yd. foundation excavation	1 00	70	1 30
2,600 cu.yd. borrow excavation	60	90	1 10
5,450 cu.yd. forming embankment	.20	20	20
336 concrete piles, furnished and placed	30 00	55.00	60 00
8 concrete piles, tested	100.00	200.00	130 00
8.3 M.ft.b.m. sheeting and bracing	60 00	70 00	90 00
78 cu.yd. balustrade concrete	40 00	55 00	60 00
560 cu.yd. first-class concrete	18 00	21 50	22 50
2,610 cu.yd. second-class concrete	12 00	12.00	13 50
88,000 metal reinforcement	05	06	.06
84 cu.yd. lining	1 50	2 00	1 75
880 sq.ft. bush hammered surface	10	.10	.12
15,700 sq.ft. carborundum rubbed surface	05	.05	.06
6,400 sq.ft. sidewalk finish	.15	13	.15
230 lin.ft. metal curb bar	.30	30	30
4,000 sq.ft. waterproofing membrane	.15	.23	.18
Sub-total	$69,156.00	$83,739 00	$91,539 00
Deduct amount to be paid to State for materials in building removed	100 00	300 00	100.00
Total	$69,056.00	$79,739.00	$90,539 00
Scotia Abutment:			
Cofferdams, pumping, bailing and draining (lump sum)	$500 00	$750 00	$600 00
2,670 cu.yd. foundation excavation	1 00	70	1 30
2,600 cu.yd. forming embankment	20	0 20	.20
370 concrete piles furnished and placed	35 00	55 00	60.00
8 concrete piles tested	100 00	200 00	130.00
25 cu.yd. balustrade concrete	40 00	55 00	60.00
1,360 cu.yd. first-class concrete	18 00	20 00	22 30
2,030 cu.yd. second-class concrete	12 00	12 00	13 50
93,000 lb. metal reinforcement	05	06	.06
400 cu.yd. first-class rip-rap	3 50	4 25	4.50
900 sq.ft. bush hammered surface	10	10	.12
5,400 sq.ft. carborundum rubbed surface	,05	.05	.06
1,000 sq.ft. sidewalk finish	15	.13	.15
150 lin.ft. metal curb bar	.30	.30	.30
Total	$73,885	$85,839	$95,071
Scotia Approach:			
60,500 cu.yd. borrow excavation	$0.60	$0 85	$0 87½
55,000 cu.yd. forming embankment	.20	20	20
1,740 sq.yd. second-class stone paving	3.00	3 50	4 00
300 cu.yd. lining	1.50	2.00	1 75
Sub-total	$52,970.00	....	....
Deduct amount to be paid to State for materials in buildings removed	3,000 00	....	....
Total	$49,970	$66,015	$69,023
Extended grand totals	$192,911	$234,593	$255,633

N. Y., Brooklyn—Until March 11, by Park Bd., Municipal Bldg., New York City, furnishing labor and material repairing roadway pavement on parkways and park roads, sheet asphalt and concrete.

N. Y., Geneva—Until April 6, by H. K. Seybolt, supt. Bd. Pub. Wks., paving Poultenay St. from High to Hamilton Sts., South Exchange St. from Washington St. to Standard Oil Co. property, West North St. from Castle St. to Lehigh Valley R.R. bridge, brick, asphalt, concrete and bitulithic. Cost between $35,000 and $40,000.

Pa., Phila.—Until March 16, by Dept. Highways, City Hall, grading and paving 4.1 mi. various streets, granite, vitr. block and asphalt. About $200,000.

Del., Wilmington—Until March 23, by President of Levy Court, New Castle Co., building rein.-con. roadway, 21 ft. wide, and sidewalks, 6½ ft. wide, on Augustine or old Baltimore & Ohio Bridge, 875 ft. long, over Brandywine Creek, here. Work involves 1,120 cu.yd. 1:2:4 concrete, 2,300 sq.yd. asphalt paving, 11,000 lb. rod reinforcement, 1,800 lin.ft. hand railing, etc. C. E. Grubb, co. engr.; advertised in this issue.

Maryland—Until March 9, by State Rds. Comn., 601 Garrett Bldg., Baltimore, oiling 90.96 mi. Div. 1, in Dorchester, Somerset, Wicomico and Worcester Counties, involving 169,945 gal. oil; 46.78 mi. Div. 2, Cecil, Kent, Queen Anne's, Talbot and Caroline Counties, 94,179 gal.; 21.65 mi. Div. 3, Prince George, Charles and St. Mary's Counties, 44,150 gal.; 53.17 mi. Div. 4, Baltimore and Harford Counties, 109,845 gal.; 69.25 mi. Div. 5, Frederick, Carroll, Howard and Montgomery Counties, 134,393 gal.; 73.89 mi. Div. 6, Garrett, Allegany, Washington and Frederick Counties, 139,198 gal. F. H. Zouck, chn.; advertised in this issue.

Md., Towson—Until March 11, by Comrs. Baltimore Co., building 2 mi. Hanover Highway from end of concrete ½ mi. north of Woodensburg to Fowblesburg, 16 ft. wide, concrete, 8 in. thick in center, 6 in. on sides.

W. Va., Madison—Until March 31, by Comrs. Boone Co. improving 25 mi. roads, Sherman Dist., involving 110,000 cu.yd. excav. and drainage structures. J. P. Blundon, Madison, engr.

W. Va., Middlebourne—Until March 26, by Comrs. Tyler Co., improving 1.2 mi. Middlebourne-Salem Rd., 16 ft. wide, involving 11,00 sq.yd. bituminous macadam and 9,000 cu.yd. excav. G. F. Cooke, Middlebourne, engr.

W. Va., Morgantown—Until March 12, by Comrs. Monongalia Co. improving 6.67 mi. Fairmont Pike, 16 ft. wide, involving 57,870 cu.yd. concrete pavement, 35,000 cu.yd. excav., etc. About $200,000. L. M. Cox, Morgantown, engr.

W. Va., Wayne—Until March 18, by Comrs. Wayne Co., constructing 2.6 mi. Lavalett-Camp Creek Class A Rd., Federal Aid Project. H. A. Levering, co. road engr.

W. Va., Weston—Until March 6, by Comrs. Lewis Co. paving 2 mi. Weston-Gilmer Co. Rd., involving 18,000 sq.yd. brick on concrete base. W. K. Spam, Weston, engr.

N. C., Lenoir—Until March 8, by Caldwell Co. Rd. Comn., top soiling, grading and draining 6.58 mi. Yodkin Valley Rd., 16 ft wide. About $25,000. S. B. Howard, Lenoir, engr.

Ga., Augusta—Until March 15, by Streets and Drain Com. paving Stovall, Winter, Wingfield, Heath, Reynolds, 10th and 12th Sts., Johns, Anthony and Milledge Rds., Kings Way and Glenn Ave., involving 50,025 sq.yd. paving, 12,460 cu.yd. excav., 9,200 lin.ft. granite or concrete curb. Bids will be received on all classes of paving. W. H. Wise, city engr., advertised in this issue.

Ga., Marietta—Until March 19, by J. R. Miller, clk. Cobb Co., paving 3.4 mi. Dixie Highway from here through Smyrna, 18 ft. wide, involving 35,950 sq.yd. vitr. brick, asphalt or concrete, 7,059 cu.yd. earth and

Streets and Roads (Continued)

448 cu.yd. rock excav., 695 ft. 5-30 in. pipe, 35,950 ft. wood curb, etc. Cost between $85,000 and $140,000, depending on type of pavement selected. K. T. Thomas, Forsyth Bldg., Atlanta, engr.

Ga., Monroe—Until March 17, by Bd. Comrs. Rds. & Revenues, Walton Co., furnishing labor and material building 9.25 mi. road between here and Social Circle, involving 4.39 acre clearing and grubbing, 2,065 lin.ft. 15-24 in. D. S. V. C. pipe, 134 cu.yd. Class "B" concrete headwalls, 45,749 cu.yd. earth excav. and borrow, 32,000 cu.yd. top soil surfacing, 9.25 mi. grassing slopes, etc.; also building 34 ft. bridge, involving 10,620 lb. reinforcing steel, 35 cu.yd. Class "A" and 39 cu.yd. Class "B" concrete, etc. T. C. Aycock, chn. Garrett & Slack, Bell Bldg., Montgomery, Ala., engrs.

Fla., Bunnell—Until March 15, by Comrs. Flagler Co. clearing, grubbing and grading 40 mi. road and constructing 700 ft bridges, etc., in Haw Creek Special Rd. and Bridge Dist. G. Moody, chn.

Ala., Montgomery—Until March 23, by J. L. Cobbs, city treas. paving with graveling Goode St. from Jefferson Davis Ave. to Early St., including necessary curbing, gutterings, inlets, etc. also constructing concrete storm sewer on Goode St. from point near Hannon St. to Genetta Ditch.

Ky., Richmond—Until April 1, by L. P. Evans, mayor, paving 63,000 sq.yd. various streets; advertised in this issue.

O., Dayton—Until March 15, by H. P. Martin, dir. Bd Pub. Serv., oiling 60 mi. gravel and macadam streets, involving 300,000 gal oil. About $30,000.

Indiana—By Bd. Co. Comrs. building roads in following counties:

March 3, Allen Co., Ft. Wayne, 21,955 ft. Scharpenberg Rd., stone, between Adams and Jefferson Twps. A. C. McCoy, aud.

March 6, Hamilton Co., Noblesville, A. G. Osborn Rd., Washington Twp., A. Henry Rd., Wayne Twp. and A. J. Brock Rd., Noblesville Twp. H. O. Cottingham, aud.

Tippecanoe Co., Lafayette, 1 mi. R. Stewart et al Rd., gravel, Tippecanoe Twp., 2.46 mi. R. M. Maitlen et al Rd., Wayne Twp., .79 mi. W. E. Bryant et al Rd., Lauramie Twp., .23 mi. R. H. Wagoner et al Rd., Washington Twp., 2.91 mi. I. Guinn et al Rd., Perry Twp., and .43 mi. E. McDonald et al Rd., Washington Twp. J. C. Doyle, aud.

Fulton Co., Rochester, O. M. Powell Rd. between Allen Twp., Miami Co. and Rochester Twp., Fulton Co., F. Dillman Rd., between Perry Twp., Wabash Co. and Henry Twp., Fulton Co. J. L. McClung, aud.

Hamilton Co., Noblesville, A. Overdorf Rd., Jackson Twp. H. O. Cottingham, aud.

March 7, Daviess Co., Washington, 3 mi. U. G. Bixler et al Rd. and 3 mi. T. Cochran et al Rd., Washington Twp., 3 mi. A. McCall et al Rd., Bogard Twp. D. I. Myers, aud.

March 15, Grant and Miami Counties, Peru, C. N. Wales et al Rd. and Mawhinney Shaw et al Rd., gravel and stone between Richland Twp., Grant Co. and Jackson Twp., Miami Co. C. Wolf (Peru), aud. Miami Co.

March 16, Marion Co., Indianapolis, W. H. Roberts et al Rd., Center and Washington Twps., C. Borchert et al Rd., Center Twp., J. W. Behrmann et al Rd., Warren Twp., C. H. Rinne et al Rd., and C. P. Wright et al Rd., Washington Twp. L. K. Fesler, aud.

March 19, Marion and Morgan Counties, Indianapolis, W. J. Jennings et al Rd., gravel. L. K. Fesler, aud.

March 20, Grant Co., Marion, C. H. Oliver Rd., gravel, Monroe Twp. A. D. Hunt, aud.

Bartholomew Co., Columbus, 4,213 ft. J. M. Perry Rd., gravel, Harrison Twp. R. Henderson, aud.

Rush Co., Rushville, 51,238 ft. S. Offutt et al Rd., concrete, and F. Goddard et al Rd., macadam, Richland Twp. W. H. McMillin, aud.

Michigan—Until March 18, by F. F. Rogers, state highway comr., at office of Comrs. Muskegon Co., Muskegon, grading, draining and surfacing 13.956 mi. Federal Aid Project 43, 18 ft. wide, involving 147,375 sq.yd. concrete, etc.

Michigan—Until March 22, by State Highway Dept., at Dist. Office (Escanaba), grading and surfacing 3.44 mi. Federal Aid Project 3, Sect. B, 16 and 18 ft. wide, involving 35,335 sq.yd. concrete and 180 lin. ft. fine grading.

Michigan — Until March 12, by F. F. Rogers, state highway comr., at office of Rd. Comrs. Menominee Co., Menominee, grading, draining and surfacing 4.156 mi. State Trunk Line Rd. 15-1B, 16 ft. wide, involving 38,997 sq.yd. stone gravel, 12,846 cu.yd earth excav., 3,225 lb. steel reinforcement, etc.; 3.295 mi. State Trunk Line Rd. 15-1A, 16 ft. wide, 30,802 sq.yd. stone gravel, 8,184 cu.yd. earth excav., 2,647 lb. steel reinforcement, etc.

Michigan—Until March 12, by F. F. Rogers, state highway comr., at office of Bd. Rd. Comrs. Berrien Co., St. Joseph, grading, draining and surfacing 5.921 mi. State Trunk Line Rd. 11-10, 18 ft. wide, involving 61,840 sq.yd. concrete, bituminous concrete or macadam, 25,698 cu.yd. earth excav., 153.3 cu.yd. 1:2:4 and 305 cu.yd. 1:3:6 concrete, 7,485 lb. steel reinforcement, 970 lin.ft. 12-15 in. encased tile, alternate bid on 694 lin.ft. 12 in. corrugated pipe, etc. Former bids rejected. Noted Feb. 5.

Mich., St. Johns—Until March 10, by Comrs. Clinton Co., grading, draining and surfacing 10.779 mi. Assessment Dist. Rd. 4, 16 ft. wide, involving 55,163 cu.yd. earth excav., 10,123 sq.yd. gravel, 1,350 lin.ft. 12 in. encased tile, 208.88 cu.yd. 1:2:4 and 452.12 cu.yd. 1:3:6 concrete, 13,410 lb. steel, etc.; 5.548 mi. Assessment Dist. Rd. 6, 21,673 cu.yd. earth excav., 29,293 sq.yd. gravel, 718 lin.ft. 12-20 in. encased tile, 4,882 lb. steel reinforcement, 96.4 cu.yd. 1:2:4 and 127.6 cu yd. 1:3:6 concrete. L. E. Belknap, St. John, engr.

Wisconsin—Until March 10, by State Highway Comn., Madison, grading and paving 0.76 mi. Ableman-Reedsburg Rd., Federal Aid Project 61, Sauk Co., involving 4,977 cu.yd. earth excav., 34.3 cu.yd. Class "A" concrete in culverts, 196 cu.yd. Class "A" concrete (Bridge Sta. 37), 182 sq.yd. Class "E" concrete (Bridge floor), 52,600 lb. structural steel, 11,151 sq.yd. featheredge gravel surfacing, 26 ft. wide, etc.; 2.7 mi. Madison-Sauk City (Springfield Hill) Rd., Federal Aid Project 12, Dane Co., 1.5 acres clearing and grubbing, 14,600 cu.yd. earth, 3,000 cu.yd. loose rock and 700 cu.yd. solid rock excav., 2,000 cu.yd. Class "A" concrete, etc.; 3.31 mi. Monroe-Monticello Rd., Federal Aid Project 80, Green Co., South End—Sta. 28-0 to 202-40, 5,738 cu.yd. earth and 2,333 cu.yd. rock excav., 35 cu.yd. Class "A" concrete and 36,613 sq.yd. concrete surfacing, 17 ft. wide, 3.43 mi. Monroe-Monticello Rd., Federal Aid Project 80, North End—Sta. 202-0 to 382-0, 1,570 cu.yd. earth excav. and 35,670 sq.yd. concrete surfacing, 18 ft. wide; 1.4 mi. Monroe-Argyle Rd., State Aid Application 475 (1919), Green Co., (estimate includes extension of 1,000 ft. east from Sta. 0-0 into Monroe), 5,000 cu.yd. unclassified excav., 70 cu.yd. Class "A" concrete, 14,400 sq.yd. concrete surfacing, 18 ft. wide, etc.

Wis., Madison—Until March 11, by Bd. Pub. Wks., furnishing labor and material improving and paving with sheet asphalt, Elmside Blvd. from Atwood to Center Aves., Schiller Court from Oakridge Ave. to Lake Monona, Division St. from Oakridge to La Follette Aves., La Follette Ave. from Dunning to Waubesa Sts., Waubesa St. from La Follette Ave. to Chicago, Milwaukee & St. Paul R.R. tracks, Jackson St. from Atwood Ave. to Chicago & Northwestern Ry. right of way, Center Ave. from Dunning to Division Sts., Evergreen Ave. from Atwood to Oakridge Aves., Washington Ave. from Bedford to Park Sts., Park St. from Washington to Ridgewood Aves., University Ave. from Charter St. to Breese Terrace, Keys Ave. from Leonard St. to Commonwealth Ave., Leonard St. from West Lawn to Commonwealth Aves. O. S. Norsman, city clk.

Wis., Sheboygan—Bd. Pub. Wks. receiving bids grading and paving 2.1 mi. North 12th St., Center, Pennsylvania and Maryland Aves., 20 ft. wide, 1 course rein.-con., with combined curbs and gutters. About $75,000. C. U. Boley, city engr.

Ia., Charles City—Until March 18, by Comrs. Floyd Co. building 11.54 mi. highways, involving 47,791 sq.yd excav., 131,034 sq.yd. paving and 52,452 lin.ft. tile drains G. H. Elliott Charles City, engr.

Ia., Marion—Until March 11, by Comrs. Linn Co., building highways, involving 6,800 lin ft. concrete curbing and 70,341 sq.yd. paving. R W. Gearhart, Cedar Rapids, engr.

Ia., Mason City — Until March 17, by Comrs. Cerro Gordo Co., building 26.14 mi. highways, involving 73,097 cu.yd. excav., 299,444 sq.yd paving, 5,294 lin.ft curbing and 67,934 lin.ft. tile drain R E. Robertson, Mason City, engr.

Ia., Newton—Until March 8, by city. paving and curbing 40,000 sq.yd. various streets, brick, asphalt, asphaltic concrete, bitulithic and concrete. R. B. Davis, city clk.; advertised in this issue.

Ia., Primghar—Until March 19, by Comrs. O'Brien Co., building 22.5 mi. highways, involving 66,635 cu.yd. excav., 237,500 sq. yd paving and 60,300 lin.ft. tile drains. J. C. Kerrigan, Primghar, engr.

Minn., Aitkin—Until March 9, by H. C Beecher, aud. Aitkin Co., building State Rd. 3, Federal Aid Project 86, involving 6.63 acres clearing, 8.6 acres grubbing, 46,578 cu.yd. earth excav., 5,520 cu.yd. hand ditch, 13,053 cu.yd. gravel, 55,762 lin.ft. shaping and compacting, 115 cu.yd. concrete in bridges, 6,162 lb. reinforcing steel, 2 temporary crossings and removing 2 old bridges. F. J. O'Hara, Aitkin, engr.

Minn., Austin—Until March 16, by O. J. Simmons, aud. Mower Co., paving State Rd. Job 2002, involving 26,174 cu.yd. excav., 21,910 cu.yd. overhaul, 100 cu.yd. hand ditching, 800 lin.ft. guard rail, 825 ft. 12-24 in. culverts, 120 lin.ft. replacing culverts and 29.4 mi. haulage, cost $14,000; State Rd. Job 2003, involving 8,000 sq.ft. clearing, 12,304 cu.yd. earth excav., 5,920 cu.yd. overhaul, 100 cu.yd. hand ditching, 1,020 lin.ft. guard rail, 292 ft. 12-24 in. culverts and 15.8 ton miles hauling, cost $13,500. A. C. White, Austin, engr.

Minn., Center City—Until March 12, by A. F. L. Stromgren, aud.Chisago Co., building State Rds. 2 and 5 and part of State Rd. 1. Separate bids on each of 4 divisions, total of 19.03 mi.; (a) 13.7 acres clearing, 12.4 acres grubbing, 153,464 cu.yd. overhaul, 16,921 lin ft. guard rail, 23,780 lin.ft. 6 and 10 in. tile drain, 2,402 lin.ft. culverts, 19,363 cu.yd. surfacing and 905.19 sq.yd. paving; (b) separate bids for furnishing 2,402 lin.ft. sectional concrete or corrugated metal culverts, 12-30 in. diam.; (c) separate bids building Bridge 2064-10 ft. extension on present bridge, Bridge 3238 20 ft. span on present abutments. W 66 culvert 35 ft. long, 36.22 cu yd. rein.-con., W66 culvert, 45 ft. long, 43.74 cu.yd. concrete, W66 culvert. 500 ft. long, 385.9 cu.yd. rein.-con. W44 culvert 70 ft. long, 40.98 cu.yd. rein.-con.; (d) furnishing 10,202 cu.yd. trap rock dust and 9,161 cu.yd. gravel.

Minn., Granite Falls—Until March 17, by auditor Yellow Medicine Co., grading 2 mi. road, 24 ft. wide, Federal Aid Project 105. About $12,000. N. S. Thayer, Granite Falls, engr.

Minn., Montevideo—Until March 12, by Auditor Chippewa Co. graveling 12 mi. road, 24 ft. wide, Federal Aid Project 122. About $70,000. F. O. Nelson, Montevideo, engr.

Minn., Owatonna—Until March 9, by G. Griffin, aud. Steele Co., paving Federal Aid Project 100, involving 70,929 cu.yd. excav., 4,900 lin.ft. guard rail, 3,000 lin ft. 8 in. and 4,000 lin.ft. 12 in. tiling and 83,314 sq.yd. concrete, asphaltic concrete or brick, also building State Bridge 3304, 50 ft. rein. con. girder span, 785 lin.ft. P-1 culverts and 449 cu.yd standard rein.-con. culverts.

Minn., Slayton—Until March 12, by B. Teitema, city clk., paving 15 blocks, 18 ft. wide. Bids will be received on all types of pavement. About $150,000. J W. Shaffer & Co., 501 New York Life Bldg., Minneapolis, engrs.

Minn., Wabasha—Until March 18, by G. J. Ginther, aud. Wabasha Co., building 1.51 mi. State Rd. 1, Federal Aid Project 125, 24 ft. wide, involving 6,783 cu.yd. earth and 27,423 cu.yd. rock excav., 7,312 lin.ft guard rail, 1,718 cu.yd. riprap, 868 lin.ft. portable culvert material, 1,812 cu.yd. gravel surfacing and 3 rein.-con. culverts. About $16,000.

Minn., Worthington—W. H. Buchan, village clk., receiving bids paving various streets, involving 20,000 cu.yd. grading, 75,000 sq.yd. paving and 48,000 lin.ft. curbing. Bids will be received on all types of pavement. L. P. Wolff, Guardian Life Bldg., St. Paul, engr.

S. D., Flandreau—Until April 1, by town clerk, paving 3 mi. streets, 50 ft. wide, involving 30,000 sq.yd. various types of pavement. About $90,000. L. P. Wolff, Guardian Life Bldg., St Paul, Minn., engr.

N. D., Fargo—Until March 8, by City Council, paving 13th St. from 5th to 13th Aves., 8th, 9th, 10th, 11th and 12th Ave. from 9th to 13th St., 6th Ave. several blocks north, 28 to 30 ft. wide. Cost to exceed $150,000. T. Jacobson, city engr.

Montana—Until March 12, by State Highway Comn., Helena, gravel surfacing 2.8 Belgrade-Hulline Sta., Federal Aid Project 10, Gallatin Co., involving 6,000

Streets and Roads (Continued)

cu.yd. excav., 5,180 cu.yd. gravel, 27,000 lb. structural steel and one 50 ft. span bridge; 25.3 mi. Baker and Ekalaka Rd., Federal Aid Project 48, Fallon Co., 131,431 cu.yd. excav., 198,759 sta.yd. overhaul, 1,760 ft. culvert pipe and 34,300 ft. B.M. timber; 6 mi. Red Trail, (unfinished portions), Federal Aid Project 61, 25,000 cu. yd. excav. and 7,000 cu.yd. gravel and scoria. J. N. Edy, state highway engr.

Montana—Until March 19, by State Highway Comn., Helena, paving, grading and draining 9.376 mi. road running from city limits of Silver Bow Co. line, Federal Aid Project 68, involving 31,003 cu.yd. excav., 98,763 sq.yd. paving, 540 cu.yd. concrete in structures, 40,000 lb. reinforcing steel in structures, 10,000 lb. reinforcing steel in pavement and 4 8 M ft. lumber in guard rails. Alternate bids will be received on 1 course Portland cement concrete, Portland cement concrete base and Topeka type top and Portland cement concrete base and bitulithic top. J. N. Edy, state highway engr.; advertised in this issue.

Mo., St. Joseph — Until March 19, by Buchanan Co., grading, building culverts and paving 10.71 mi. state road from here, southwardly towards Faucett, concrete, asphaltic concrete or vitr. brick. J. D. Mohler, 1522 South 25th St., engr.

Tex., Georgetown — Until March 9, by Comrs. Williamson Co., grading and draining 5 mi. Granger-Laneport Rd., extending eastward from Granger. S. A. Nicols, co. engr.

Tex., Liberty—Until March 10, by C. N. Smith, judge Liberty Co., grading, surfacing and draining 8 518 mi. Highway 35, Cleveland-Montgomery Co. Rd., 16 ft. wide, involving 6.16 acres clearing and grubbing, 17,153 cu.yd. gravel, 40,859 cu.yd. unclassified earth and 234 cu.yd. structural excav., 3,733 lb. reinforcing steel, 45.5 cu.yd. 1:2:3 and 118.5 cu.yd. 1:3:6 concrete, 1,260 lin.-ft creosoted piling and 232,893 ft. creosoted timber in trestle. About $120,252. H. O. Compton, Liberty, engr. Noted Feb. 5.

Tex., Terrell—Until March 9, by J. Trueheart, city secy., improving West Moore Ave., from Rockwall to Pacific Aves., 6 in. course concrete with integral curb.

N. M., Carlsbad—Until March 20, by D. F. Sellards, city clk., improving various streets, to include 18,000 cu.yd. grading, 49,441 sq.yd. reinforced cement concrete, asphaltic concrete, Topeka mix or Warren's bitulithic paving, 25,556 lin.ft. combined concrete curb and gutter, small amount storm sewer. About $230,656. F. L. Hancock, city engr.; advertised in this issue.

Nevada—Until March 8, by C. C. Cottrell, state highway engr., Carson City, constructing State Highway on west side of Walker Lake in Mineral Co., from Cotton Wood Creek to point 9.47 mi. north.

Washington—Until April 5, by State Highway Comn., Olympia, paving 2 mi. Pacific Highway from Grand Mound to Thurston Co. line, 20 ft wide, Thurston Co. Cost to exceed $25,000. J. Allen, state highway engr.

Washington—Until March 29, by State Highway Comn., Olympia, paving 3 mi. Olympia Highway from Kamilche to Thurston Co. line, 18 ft. wide, concrete, Mason Co. About $50,000. J. Allen, c/o State Highway Dept., engr.

Cal., Fresno—Until March 12, by D. M. Barnwell, clk. Fresno Co., improving Route 22, Sect. A and Route 23, Sect. A, near Fowler, involving 10,446 cu.yd. excav., 9,818 cu.yd. concrete or asphaltic concrete paving and 636,160 sq.ft. Topeka or Warrenite surface. C. Jensen, Cory Bldg., co. engr.

Cal., Napa—Until March 10, by J. A. Daley, clk. Napa Co., concrete paving road north from here. O. H. Buckman, Napa, engr

Ontario—Until March 16, by W. A. McLean, deputy minister highways, Toronto, clearing, grubbing, constructing concrete structures and doing necessary earthwork on 7 mi. road, 20 ft. wide, Louth Twp. About $150,000. G. Hogarth, Parliament Bldgs., Toronto, engr.

Ont., Cornwall—Until March 12, by A. I. MacDonnell, clk. Stormont Co., constructing water bound macadam roads in Stormont, Dundas and Glengarry Counties, (1) Rd. 9 from Finch Village west 3 mi., 16 ft. wide; Rd. 12 from Finch Village south 1½ mi., 14 ft. wide; (2) Rd. 12 from Newington south 1¼ mi., 14 ft. wide; (3) Rd. 11 from Provincial Highway, Aultsville, north 2½ mi., 14 ft. wide; (4) Rd. 28, Chesterville, 1 mi., 16 ft. wide; (5) Rd. 3 from Inkerman Sta. north and west 1 mi., 14 ft. wide; (6) Rd. 19 from Lancaster west 2½ mi., 14 ft. wide; (7) Rd. 25 from Provincial Highway, north through Bainsville, 1½ mi., 14 ft. wide.

Ont., Deseronto—Until March 9, by W. A. McLean, deputy minister of highways, Toronto, clearing, grubbing, and doing necessary earthwork on 5 mi. road, 20 ft. wide, Richmond Twp. About $100,000. G. Hogarth, Parliament Bldgs., Toronto, engr.

Ont., Exeter — Until March 20, by J. Senior, city clk., paving 1¼ mi. Main St., 29 ft. wide, involving 20,000 cu.yd. concrete. About $85,000. T. R. Patterson, Goderich. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Conn., New Haven—City received bids paving (a) Temple St. from Chapel to Elm Sts., involving 3,000 sq.yd. asphalt on existing brick base, (b) Temple St. from Chapel St. to Congress Ave., 4,800 sq.yd. sheet asphalt on concrete base and taking up present brick pavement and widening streets, (c) Chapel St. from York to Norton Sts., involving (1) 22,300 sq.yd. pavement with brick headers, (2 alternate) without brick headers (3) 100 tons excess binder, (4) 2,280 cu.yd. concrete foundation, (5) 1,060 cu.yd. excess excav., (6) 6,800 lin.ft. curb set, from Union Paving Co., (a) $6,150, (c1) $2,20 per sq.yd., (c2) $2.05 per sq.yd., (c3) $10.50, (c4) $10 per cu.yd., (c5) $2 per cu.yd., (c6) $0.40 per lin.ft., total $77,750, alternate $74,405; D. V. H. Webb & Co., New Haven, (a) $5,915, (c1) $2.35, (c2) $1.88, (c3) $9, (c4) $10, (c5) $1.75, (c6) $0.30, total $80,000, alternate $69,519; C. W. Blakeslee & Sons, 58 Waverly St., (a) $5,530, (b) $15,300, (c1) $2 32, (c2) $1.90, (c3) $9, (c4) $11.50, (c5) $1.80, (c6) $0.25, total $82,464, alternate $73,098.

★Conn., New Haven—City let contract to C. W. Blakeslee & Sons, 58 Waverly St., improving 3,500 sq.yd. York St. from George to South Sts., paving $1.75 per sq. yd., curbing $0 20 per lin.ft., binder $8 per ton, excav., $2 per cu.yd, total cost, $6,600; to Union Paving Co., 15,500 sq.yd. Columbus Ave. from Howard to Congress Aves., paving $1.78 per sq yd., curbing,, $0.20 per lin.ft., excess binder, $10 per ton, excess excav., $2 per cu.yd., $28,000; both sheet asphalt on existing concrete base.

★N. Y., Brooklyn—E. Riegelmann, boro. pres., let contract regulating and grading Liberty Ave., to Scott Bros., 329 East 29th St., New York City, $1,884; Linden Ave. and 63rd St., to Consolidated Asphalt Paving Co., 52 9th St, $12,770 and $13,665 respectively; 12th St., to Uvalde Asphalt Paving Co., 1 Bway., New York City, $3,691; regulating, grading and curbing 75th St., to L. Mangeri, 190 31st St., $1,049; fencing lot northeast side 75th St., to J. A. Lee, 454 East 49th St., New York City, $807. Noted Feb. 26.

Pennsylvania—L. S. Sadler, state highway comr., Harrisburg, let contract paving 33,433 ft. State Highway Route 188, 16-18 ft. wide, to State Constr. Co., 2nd Ave. and 5th St., New Kensington, $446,451. Noted Feb. 5.

★Pennsylvania — State Highway Dept., Harrisburg, let contract grading and filling 16,886 ft. River Rd., Lincoln Highway, 28 ft. wide, Luzerne Co., bituminous concrete, to B. G. Coon Constr Co., Miners Bank Bldg., Wilkes-Barre, $217,292. Noted Feb. 26.

★Pennsylvania — State Highway Dept., Harrisburg, let contract building 4,604 ft. Highway Route 64, Strattonville Boro, Clarion Co., 1 course rein.-con., to L. H. Hileman Constr. Co., 1st Natl. Bldg., New Kensington, $53,146; 4,541 ft. State Highway Route 131, West Grove Boro, Chester Co., 18 ft. wide, rein.-con., to Hill Constr. Co., Phila., $36,128. Noted Jan. 29.

★Pa., Phila.—Dept. Highways, City Hall, let contracts to Mack Paving & Constr. Co., Nicetown Lane and C St., grading Erringer Pl., $8,929 and Westford Rd. $6,714, repaving Clearfield St., $8,816 and Jasper St., $20,755; to Eastern Paving Co., Colonial Trust Bldg., grading 21st St., $9,379, Plain St., $6,086, Lippincott Ct., $5,151, Hurley St., $5,421, Edgemont St., $14,337; to Union Paving Co., 30th St., grading 13th St., $27,892, repaving Susquehanna St. from Broad to 19th Sts., $40,178, Susquehanna St. from Memphis to Cedar Sts., $7,201, rebuilding with redressed granite block 5th St., $56,608, Frankford Ave., $82,480, Vine St., $66,145, Kensington Ave., $96,522, repaving asphalt streets, $300,000; to Barber Asphalt Paving Co., Land Title Bldg., grading Somerville Ave., $ 10,730, Shields St., $5,411, Phila.-Ellena St., $4,165, Pechin St., $4,704, repaving trenches and openings in asphalt streets, $52,220; to J. J. McHugh, 1130 South Penn Square, repaving with asphalt Susquehanna St. from Cedar to Almond Sts., $18,856; to T. P. Lee, 5629 Cherry St., grading Locust St., $4,780, Buist Ave., $11,544; to L. A. Muller, Phila., grading Felton St., $1,309. Noted Feb. 19.

W. Va., Spencer—Comrs. Roane Co. received only bid improving 1.5 mi. Tanners Run Rd., involving 12,300 sq.yd. concrete and 9,197 cu.yd. excav., from Spencer Brick Co., Spencer, $47,600. Noted Feb. 5.

★W. Va., Wellsburg—Comrs. Brooke Co. let contract furnishing and applying asphaltic material on 3.9 mi. Follansbee-Eldersville Rd., and 0.8 mi. Mechling Hill, to Atlantic Refining Co., at 0.18 per gal.; surfacing above with bituminous macadam will be done by county forces.

★W. Va., Wheeling—Comrs. Ohio Co. let contract improving ⅛ mi. Zane St., 40 ft. wide, to Coss & Otto, Wheeling, $20,352.

★North Carolina—State Highway Comn., Raleigh, let contract building 8.8 mi. Rocky Mountain Rd., 16 ft. wide, topeka surface on 5 in. concrete base, to R. G. Lassiter, Co., Raleigh, $318,783. Noted Jan. 22.

★N. C., High Point—City let contract improving Centennial Ave. and East Washington St., involving 15,000 sq.yd. 2 in. bitulithic, to R. G. Lassiter, Raleigh. About $30,800.

★La., Eunice—City let contract paving and graveling principal streets, to H. Durio, Opelousas. About $213,000.

Ohio—State Highway Comn., Columbus, received bids Feb. 27, building roads in following counties:

Cuyahoga Co., Sect. "Bedford" Cleveland-Akron Rd., .61 mi., grading, constructing bridges and culverts and paving with brick, from L. Garrett Constr. Co., Kent, $50,988.

Hamilton Co., Sect. "B" Cincinnati-Louisville Rd., 2.72 mi., grading, constructing bridges and culverts and paving with concrete, Gradison Constr. Co, Cincinnati, $113,500; paving with warrenite-bitulithic, Nugent & Hines, $156,496; Hindel & Sullivan, Cincinnati, $156,570; paving with bito-slag, Scully Bros., Cincinnati, $156,660; Hindel & Sullivan, Cincinnati, $156,700.

Hancock Co., Sect "D" Findlay-Ottawa Rd., constructing bridge, S. Jacobs & Son, Findlay, $2,605; P. Alge, Arlington, $2,610.

Holmes Co., Sect. "J-2" Columbus-Millersburg Rd., 2.49 mi., .76 mi., grading and constructing culverts, Ryan Stone & Constr. Co., Maumee, $4,568; C. M. Cooper, Kilbuck, $5,750.

Sect. "1" Mansfield-Millersburg Rd., 2.49 mi., grading and constructing bridges and culverts, Miller & Rathrock, Ada, $23,871; Lee, Griggs & Anderson, Millersburg, $24,545.

Washington Co., Sect. "J-2" Marietta-Caldwell Rd., 3.97 mi., grading, constructing bridges and culverts and paving with plain concrete, S. A. Palmer, Marietta, $165,168. Noted Feb. 12.

★O., Akron—E. A. Zelsloft, dir. Bd. Pub. Serv., let contract paving East Ave. from Wooster Ave. to Maple St., to V. Olson Contg. Co., 507 Mahoning Bank Bldg., Youngstown, $142,539. Noted Jan. 29.

★O., Cincinnati—City let contract grading, building curbs and gutters and paving 1,630 ft. Rulison Ave., 30 ft. wide, bituminous macadam, to J. Roebel Constr. Co., $22,231; paving 2,100 ft. Bantry, Glen, Dante and Kennedy Aves., 25 ft. wide, concrete, to Gradison Constr. Co.; both contractors of Cincinnati.

★O., Cleveland Heights (Warrensville P. O.)—Cedar Heights Land Co., 220 Erie Bldg., Cleveland, let contract building sidewalks on Cedar Brook Rds. 2 and 4, involving 150,000 sq.ft. 5 ft. x 2½ in. sandstone flagging on cinder base, to Cleveland Stone Co, Union Bldg., $40,735. Noted Feb. 5 under "Cleveland."

★Ind., Indianapolis—City let contract to Union Asphalt Constr. Co., 329 Lemcke Bldg., paving 2,180 ft. Euclid Ave., from Michigan St. to 2nd alley north, cost $12,022, 4,876 ft. Gale St. from 10th to 16th Sts., $28,641, 2,150 ft. Gray St. from Washington to New York Sts., $11,687; to Indiana Asphalt Paving Co., 25th St. and Lake Erie & Western R.R., widening and surfacing 3,813 ft. New York St. from Alabama St. to Indiana Ave., $56,072.

Streets and Roads (Continued)

★Michigan—State Highway Dept., Lansing, let contract grading, draining and surfacing 2.701 mi. State Trunk Line Rd. 58-1, 16 ft. wide, also 1.002 mi. State Trunk Line Rd. 11-31, 18 ft. wide, Berrien Co., to Marsman & Green, 47 Union Ave. N. E., Grand Rapids, $88,907 and $36,961 respectively; 2.857 mi. State Trunk Line Rd. 16-1A, 18 ft. wide, Oakland Co., also 3.163 mi. State Trunk Line Rd. 16-1B, 18 ft. wide, Livingston Co., Artificial Stone Co., Eaton Rapids, $103,981 and $110,695, respectively; grading and draining 14.211 mi. Federal Aid Project 42, Wayne Co., Closser Bros. Excavating Co., 102 18th St., Detroit, $122,-993. Noted Feb. 5, 19 and 26.

★Michigan — State Highway Dept., Lansing, let contract grading and draining 4,982 mi. State Trunk Line Rd. 39-2, 24 ft. grade, Ionia Co., involving 23,690 cu.yd. earth excav., 720 lin.ft. 12-15 in. encased tile, 3,836 lb. steel reinforcement, 100.9 cu.yd. 1:2:4 and 126.4 cu.yd. 1:3:6 concrete, to I. Butzer, Hart, $24,046.

★Mich., Detroit—City let contracts grading shaping, setting retaining plank and paving with 1 course concrete Ally 1,120, to R. J. Powelson Co., 1577 Iriquois Ave., $8,068; Alleys 1,121, 1,122 and 1,125, to Otis Cement Constr. Co., 806 Hammond Bldg., $6,789, $7,398 and $6,093 respectively; Alleys 1,123 and 1,124, to J. Porath, 1131 McKinley Ave., $2,979 and $9,163 respectively.

★Mich., Detroit—City let contracts to Otis Cement Constr. Co., 806 Hammond Bldg., grading, placing retaining plank and paving with 1 course concrete Alleys 1,108½, cost $2,947, 1,110, $6,985, 1,112, $3,877, 1,113, $3,285, 1,115, $3,723, 1,117, $3,959, 1,118, $1,241; to R. J. Powelson Co., 1577 Iriquois Ave., 1,109, $2,385, 1,114, $2,380, 1,116, $6,324, 1,119, $4,972; to R. Porath, 1131 McKinley Ave., 1,111, $10,407. Noted Feb. 19.

★Mich., Detroit—Dept. Pub. Wks. let contracts to Detroit Asphalt Paving Co., 20 McGraw Bldg., grading paving and curbing Canfield Ave., $10,473; Craig Ave., $7,641; Ferry Ave., $7,790; Gladstone Ave., $9,136; Green Ave.,$33,062; Hancock St., $46,388; Holmur Ave., $41,065; Highland Ave., $9,811; Indiandale Ave., $7,775; Kanter Ave., $10,-349; Lakeview Ave., $22,301; Naples St., $7,292. Noted Feb. 19.

★Mich., Tawas City—Comrs. Iosco Co. let contract grading, draining and surfacing 4.992 mi. State Trunk Line Rd. 10-26, 16 ft. wide, to W. T. Hill, Whittemore, $90,507. Noted Jan. 15.

Wisconsin — State Highway Comn., Milwaukee, received only bid Feb. 13, building Town Line Rd., Federal Aid Project 115, Walworth Co., from R. R. Birdsall Co., Racine, involving 35,500 cu.yd. earth excav, at $1.20, 204 cu.yd. concrete in culverts, $25, 307.3 cu.yd. concrete in bridges, $39, 49,852.8 sq.yd. concrete surfacing, $2.12, 17,950 bbl. cement (based on mill price, $1.95 per bbl.), $2.30, 4,605 lin.ft. guard rail, $0.70 total cost, $211,091. Noted Feb. 5.

Wisconsin—State Highway Comn., Milwaukee, received bids building Fond du Lac-Milwaukee Rd., Federal Aid Project 154, Fond du Lac Co., from Garvey-Weyenberg Co., 812 College St., Appleton, involving 14,786 cu.yd. earth excav., $1.35, 142.7 cu. yd. concrete in culverts, $27, 63.1 cu.yd. concrete in bridges, $27, 13,725 bbl. cement in place, $2.50 and $2.65, 38,125 cu.yd. concrete exclusive of cement, $2.10, 920 lin.ft. guard rail, $0.75, 2,740 lb. steel, $0.06, 220 cu.yd. ditching, $1.35, 125 ft. 12 in. vitr. pipe, $1.25, 3 catch basins, $15, total cost, $141,245. Noted Feb. 12.

★Wis., Manitowoc—City let contract grading aod paving 6 mi. 8th St. and various other streets, 18 ft. wide, involving 80,-519 sq.yd. concrete, to Manitowoc Constr. Co., Manitowoc, paving, $2.74 per sq.yd., excavation, $1.10 cu.yd., curb and gutter, $0.90 lin.ft., total cost, $207,023. Noted Sept. 4.

★Wis., West Bend—Bd. Pub. Wks. let contract paving various streets, to Schneider Contg. Co., Menasha, involving 4,300 yd. excav., at $0.95 per yd., 1,800 yd. rein.-con., $2.49, 2,500 ft. type "A" integral curb, $0.40, 2,500 ft. type "B" integral curb, $0.20 and 3,800 ft combined curb and gutter, $0.92.

Ia., Des Moines—Polk Co. received bids Feb. 16, paving (a) 2.77 mi. Indianola Rd., 20 ft. wide, involving 31,775 sq.yd. concrete and 4,315 cu.yd. earth excav., (b) 6.57 mi. Ankeny Rd., 20 ft. wide, (c) 12,600 ft. Carlisle Rd., 20 ft. wide, from T Carey & Sons, 509 Youngerman Bldg., (a) $145,070, (c) $12,600; Wright Constr. Co., 211 Flynn Blk., (a) $148,911, (b) $351,751; Capital Constr. Co., 920 Cherry St., (a) $150,096, (b) $363,057; O'Rourke Eng. Co., 1215 Mulberry St., (b) $352,465; S. Bowers, Ames, (c) $10,450; J. C. Parquette, 2347 Capitol Ave., (c) $11,200. Noted Feb. 5.

★Minn., Duluth—City let contract paving 950 ft. 7th St. from 17th to 19th Aves.W, 24 ft. wide, involving 2,370 sq.yd. concrete and 1,624 lin.ft. 5 in. concrete curbing, to C. R. McLean, 307 1st Natl. Bank Bldg., $12,932; 1,000 ft. 7th St. from 46th Ave. W., to Central Ave., 24 ft. wide, 2,720 sq. yd. concrete, 1,732 lin.ft. 5 in. concrete curbing, 3,150 cu.yd. earth and rock excav., to E. Olson, 1124 20th Ave. W., $13,332; 2,800 ft. 8th St. from 40th to 46th Aves. W., 24 ft. wide, 7,450 sq.yd. concrete, 4,752 lin. ft. 5 in. concrete curbing, 1,768 cu.yd. earth and rock excav., to A. N. Nelson, 1014 East 6th St., $32,187; building sidewalks on streets on lines east of 12th Ave. W., 6 to 12 ft. wide, involving 62,000 sq.ft. 1 course and 20,000 sq.ft. 2 course concrete, 450 ft. 3-18 in. sewer pipe, to A. A. Bodin, 408 Columbia Bldg., $23,072; streets west 12th Ave. W., 6 to 12 ft. wide, 40,000 sq.yd. 1 course and 10,000 sq.ft. 2 course concrete, 500 ft. 3-18 in. sewer pipe, to N. Anderson, 224 9th Ave. E., $14,580.

★Minn., Hopkins—E. A. Close, city recdr., let contract paving 9 blocks 12th and Excelsior Aves., to Schruth-Welsh Co., 704 1st Natl.-So. Line Bldg., Minneapolis, at $4.21 per sq.yd. Noted Jan. 29.

★Minn., Minneapolis—Comrs. Hennepin Co. let contract grading and graveling 12 mi. Lyndale Ave., 30 ft. wide, involving 500,000 cu.yd. side excav., 282,338 cu.yd. excav., and 6,108,668 cu.yd. overhauling, to A. Guthrie & Sons, 366 Jackson St., St. Paul, $371,820.

★Minn., Moorhead—H. G. Price, city clk., let contract paving various streets, 24 ft. wide, to W. E. Kennedy, Fargo, N. D. About $250,000. Noted Jan. 29.

★Minn., Pipestone—City let contract improving various streets, involving rein.-con. curbing, to Campbell Constr. Co., 3050 Hennepin Ave., Minneapolis; grading 95c.; paving $3.17; straight curbing 85c. radius curbing $1.00. Total cost about $60,000.

★N. D., Devil's Lake—City let contract paving 40 blocks, 28 ft. wide, involving 70,000 sq.yd. bitulithic, to Haggart Constr. Co., 60 Bway., Fargo. About $400,000 (including engineer's fee, etc.). Noted Jan. 8

Tex., Madisonville—J. M. Roberts, judge Madison Co., received bids Feb. 12, grading and draining 20.257 mi. Highway 32, from Leon to Walker Counties, 20 ft. wide, from J. Skelton, Houston, $120,812; Cook & Harrington, Crockett, $134,091; Smith Bros., Crockett, $146,708. Noted Feb. 6.

Tex., Wichita Falls—M. M. Murphy, co. aud., received bids (a) paving 8.8 mi. Highway 2, 18 ft. wide, concrete, (b) grading and paving 10 mi. Highway 5, from here to Iowa Park, 16 and 18 ft. wide, 1 course rein.-con., (c) grading and surfacing Highway 22, Lake Rd., 18 ft. wide, course concrete, involving 46,448 sq.yd. concrete and 4,358 cu.yd. grading, from Wichita Co., c/o County Judge, (a) $453,429, (b) $568,-045, (c) $182,726; Dunnegan Constr. Co., Shenandoah, (a) $538,429, (b) $661,986. Noted Jan 8 and Feb. 12.

★Okla., Bartlesville—Washington Co. let contract paving 7 mi. Federal Aid Project 15, 16 ft. wide, concrete, to J. Lantry, 303 Bank of Commerce Bldg., Tulsa, $248,002.

★Colorado—State Highway Comn., Denver, let cootracts to C. C. Madsen, Chamber Commerce Bldg., Denver, paving 1.962 mi. Federal Aid Project 33, south from Ft. Collins, cost $47,779, 1.182 mi. Federal Aid Project 36, between Longmont and Denver, $30,393, 0.799 mi. Federal Aid Project 37 east from Boulder, $33,572; to Orman Constr. Co., Pueblo, paving 2.496 mi. Federal Aid Project 77, between Grand Jct. and Palisade, $97,740; to O'Dell Bros., Trinidad, grading aod draining 1.155 mi. Federal Aid Project 65, between Ouray and Silverton, $83,288. Noted Jan. 1.

★Wash., Bellingham—Comrs. Whatcom Co. let contract paving 8 mi. Laurel-Lynden Road, involving 79,700 sq.yd. with concrete, to Skagit Const. Co., Mt. Vernon. About $204,819.

Wash., Chehalis—Lewis Co. received bids clearing, grubbing, grading and surfacing with concrete 5 mi. Winlock-Cowlitz-Toledo Rd., 18 ft. wide, from Albers & Son, Chehalis, $184,124; T. M. Morgan, Everett, $198,786, Alfred, James & Hendricks, Chehalis $200,000.

★Wash., Port Townsend—Comrs. Jefferson Co. let contract grading and surfacing 2 mi Permanent Highway 4-B, gravel, to J. H. Coyne, Port Townsend. About $25,200.

★Wash., Seattle—Comrs. King Co. let contract paving 2.5 mi. Permanent Highway 11-E from Auburn to Black Diamond, 18 ft., 20 ft. wide at curves, involving 27,-493 sq.yd. concrete, to R. G. Stevenson, 1327 Ewing St. About $69,500. Noted Feb. 5.

★Wash., Yakima—Comrs. Yakima Co. let contract paving 1 mi. Buena Rd., near Toppenish, concrete, to Standard Asphalt Paving Co N., 517 Lincoln St., Spokane, $131,-950. Noted Feb. 19.

★California—State Highway Dept., 515 Forum Bldg., Sacramento, will grade and drain 8.3 mi. road between Gravel Wash, Imperial Co. and southern boundary, 24 ft. wide. About $70,000. Work will be done by day labor. A. B. Fletcher, state highway engr.

★Cal., Holtville—City let contract paving various streets, Sect. C, bituminous base and Warrenite surface, to G. R. Daley, McNeece Bldg., San Diego, $13,516. Noted Feb. 26.

Cal., Long Beach—City received bid paving alleys in blocks 45, 72, 73, 74 and 75, from Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, 50,538 sq.ft 5 in. Warrenite paving at $0.20⅜ per sq.ft., total $10,310; 15 blocks 7th St., Fairchild-Gilmore-Wilton Co., 5 in. concrete paving, $0.22 per sq.ft. $82,000; G. S. Benson & Sons, Stimson Bldg., Los Angeles, $0.23½ per sq ft., $92,000.

★Cal., Martinez—City let contract paving Smith St., et al, concrete with Warrenite surface, cement curbs, etc., to J. T. Sayles, Martinez, $134,957.

★Cal., Riverside—City let contract paving 1 mi. Magnolia St., to City Comrs.; $32,363. A. Braunschweiger, city engr. Noted Feb. 26.

Railways

New York—New York State Rys., Syracuse, has been ordered by city to lay 6½ mi. track and ties. About $350,000. B. E. Tilton, genl. mgr.

Michigan — See "Miscellaneous," under Detroit.

California — Nevada County Narrow Gauge R.R., Nevada City, plans to extend its line 28 mi. into timber regions of Sierra Nevada, near Comptonville, Yuba Co. Cost to exceed, $200,000.

Quebec—Quebec Central Ry., Wellington St., Sherbrooke, plans to build 25 mi. line from Lac Frontiere, Montmagny Co. to St. Pamphile, L'Islot Co. About $600,000. J. Walsh, Sherbrooke, ch. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Ontario—Grand Trunk Ry., McGill St., Montreal, will relay 85 mi. track between London and Paris, and London and Sarnia, 100 lb. rails. About $425,000. Work will be done by day labor.

Excavation and Dredging

PROPOSED WORK

Wash., Yakima—Lining Canal—Yakima Irrigation Dist. plans to line Hubbard Irrigation Canal, 7,000 ft. long, vitr. clay segments. About $25,000.

Ore., Prineville—Irrigation—Bd. Dirs. Ochoco Irrigation Dist. plans to vote additional $100,000 bonds to complete Ochoco dam and build distribution system structures to include highline pumping plant, office and warehouse. Total cost $1,350,000.

Cal. Sacramento—Canal—Excelsior Water Mining Co., Forum Bldg., plans to build 24 mi. canal from present Madola Reservoir on Deer Creek, Nevada Co., for irrigating 22,000 acres in Sacramento Co. About $1,-900,000.

Cal., Sacramento—Irrigation—A. Givar, Forum Bldg., plans to build 4.8 mi pipe line and pump house, to include one 20 in. and one 10 in. electrically driven, centrifugal pumps for diversion of 35 cu. ft. per second from Feather River for agricultural purposes. About $65,000.

Excavation and Dredging (Continued)

Cal., Sacramento—Irrigation—South Feather Land & Water Co., Forum Bldg., having preliminary plans prepared building system, including concrete dam for diversion of water from South Fork Feather River for irrigation of 30,000 acres in Sacramento and Placer Counties. About $1,000,000.

BIDS DESIRED

N. Y., Stapleton—Dredging—Until March 15, by M. Hurlburt, comr. docks, Pier "A", foot of Battery Pl., New York City, furnishing labor and material for removing waterfront structures and dredging at Piers 15, 16, 17 and 18, between Canal St., here and Townsend Ave., Clifton; also Piers 12 and 13 between Congress and Water Sts., here, Richmond Boro.

N. J., Jersey City—Ditches—Until March 11, by Hudson Co. Mosquito Comn., 665 Newark Ave., building 50,000 ft. new drainage ditches and cleaning and repairing 100,000 ft. old drainage ditches, in Salt Marsh Meadows. Cost to exceed. $20,000. L. E. Jackson, secy.

Miss., Cleveland — Excavation — Until March 8, by Comrs. Pace D.D., of Boliver Co., Shelby Bldg., excavating Ditches 1-9 inclusive, involving 341,704 cu.yd. excav. W. W. Boone, engr. Pace D.D.

Miss.,—Drainage Marks—Until March 11, by Bd. Drainage Comrs. Quitman Co. for work in Newsum Lake D. D. Work includes 10 mi. levee, involving 54,000 cu.yd. excav., lateral ditches "C" and "D", 690,000 cu.yd. excav. also hauling and placing 300 lin.ft. corrugated metal culvert pipe with flood gates. R. T. M'Pherson, secy.

Ill., Pittsfield—Excavation—Until March 26, by E. T. Perkins Eng. Co., engrs., 38 South Dearborn St., Chicago, for completion of ditches and levees in Valley City Drainage & Levee Dist., Pike Co., divided as follows: Sect. 1, levee (12-15 ft. high, suitable for drag line and same drag line working upon embankment constructed by dipper dredge) 700,000 to 900,000 cu. yd., Sect. 2, levee (9-12 ft. high, suitable for drag line) 300,000 to 380,000 cu. yd., Sect. 3, ditches (bottom widths 8-20 ft., suitable for dipper dredge or drag line) 230,000 to 245,000 cu. yd., Sect 4, ditches (4-12 ft., suitable for small drag line) 140,000 to 180,000 cu. yd., Sect. 5, Muck ditch (suitable for drag line) 35,000 cu. yd., Sect. 6, 200 acres clearing and 60 acres grubbing. W. Severns, chn.; advertised in this issue.

B. C., Prince Rupert—Dredging—Until Mar. 18, by Dept. Pub. Wks., Ottawa, dredging Metlakatla Bar near here. Work involves 72,000 yd. floating dredgwork, sand, gravel and boulders. About $50,000. K. Cameron, c/o Dept. Pub. Wks., Ottawa, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. Y., Tompkinsville — Dredging — M. Hurlburt, comr. docks, Pier "A," foot of Battery Pl., New York City, let contract removing waterfront structure at Piers 6, 7, 8, 9, 10 and 11, Richmond Boro., to Riverside Contg. Co., 39 Cortlandt St., New York City, $33,318, dredging at above places, to Morris & Cummings, 17 State St., New York City, $628,880. Noted Feb. 26.

★Ga., Cummings—Excavation—Big Creek D D., let contract building 14 mi. main channel and 5½ mi. lateral involving 538,000 cu.yd. excav., to Northern Constr. Co., Cummings. About $70,000.

Industrial Works

PROPOSED WORK

Me., Waterville—Waterville Mfg. Co. plans to build 1 and 2 story, 80 x 300 ft., rein.-con. plant, rein.-con. flooring, concrete foundation. About $125,000. Green & Wilson, 74 Main St., engrs.

N. H., Somersworth—Great Falls Mfg. Co., Main St., had plans prepared by Lockwood Greene Co., archts. and engrs., Brewer Bldg., Boston, for 4 story, 144 x 1850 ft., rein.-con. mill, rein.-con. flooring, concrete foundation. About. $4,500,000.

Vt., St. Johnsbury—A. H. McLeod Milling Co. having plans prepared by G. W. and H. A. Lane, engrs., Exeter, N. H., for concrete addition to plant. About $50,000.

Mass., Allston (Boston P. O.)—Pacific Kimono Co., 33 Edinboro St., Boston, plans to build 2 story, brick and mill construction factory, on Lincoln St., here. About $35,000. Sorge & Holmes, 120 Tremont St., Boston, archts.

BRIDGE—WILMINGTON, DEL.

Bids were received by Washington St. Bridge Comn., Jan. 26th, for constructing Memorial Bridge over Brandywine Creek on Washington St., (1) 72 ft. wide, (2) 82 ft. wide, from (A) Walsh Constr. Co., World Herald Bldg., Syracuse, N. Y., and Davenport, Ia., (awarded contract for 72 ft. bridge); (B) Bush, Roberts & Schaefer, 1 Madison Ave., New York City, and McCormack Bldg., Chicago. The unit bids were as follows:

(1)

	A	B
Removing old bridge (lump sum)	$30,000.00	$42,984.00
2,612 cu.yd. earth excavation	7.00	8.00
465 cu.yd. rock excavation	8.00	12.00
900 cu.yd. dredged excavation	7.00	6.00
8,980 cu.yd. concrete, class "A"	34 00	28.65
2,550 cu.yd. concrete, class "B"	25.50	24.30
5,725 cu.yd. concrete, class "C"	20 00	21.30
146,400 sq.ft. surface finish carborundum rubbed	.10	.07
1,650 lin.ft. surface finish concrete	10.00	16.00
28,600 sq.ft. sidewalk and curb finish	.12	.18
932,000 lb. reinforcing steel	.07	.085
450 lin.ft. 10-in. c.-i. drain pipe	3 10	5.15
415 lin.ft. 8-in. c.-i. drain pipe	2 40	4.00
100 lin.ft. 6-in. c.-i. drain pipe	2 00	2.10
15 c.-i. catch basin casting, etc	90.00	50.00
3 c.-i. planhole frame, etc	110.00	35.00
1,500 sq.ft. copper flashing	.75	65
2,104 lin.ft. curb protection bar	.35	.45
1,750 lin.ft. 2½-in. galvanized metal conduit	1.20	1.05
1,800 lin.ft. 2-in. galvanized metal conduit	1 00	.80
16 bronze lighting fixtures	700 00	920.00
16 c.-i. lamp post, single lighting fixture	150 00	270.00
6 c.-i. lamp post, double lighting fixture	310.00	605 00
4 bronze memorial tablets	1,100.00	1,270.00
4 bronze name plates	355 00	430 00
34,000 sq.ft. waterproofing	.30	28
3,515 sq.yd. paving, 3-in. asphalt block	8.00	9.00
3,515 sq.yd. paving, 3-in. wood block	9 00	7 60
2,350 sq.yd. paving track, 3½-in. asphalt block	11.00	12 00
2,350 sq.yd. paving track, 3½-in. wood block	9.90	11 60
1,940 lin.ft. single track	10 75	8.00
5,635 lin.ft. one-way t.c. vitrified duct	.25	.30
8 bronze anchor bolts	4.50	3 75
Price for old bridge (lump sum)	13,000 00	5.00
Extended totals asphalt block paving	$747,743	$763,363
Extended totals wood block paving	748,673	757,503

(2)

	A	B
Removing old bridge (lump sum)	$30,000.00	$42,984 00
2,850 cu.yd. earth excavation	7.00	3.00
575 cu.yd. rock excavatio	8.00	12.00
900 cu.yd. dredged excavation	7 00	6.00
9,680 cu.yd. concrete, class "A"	35 00	28 65
2,580 cu.yd. concrete, class "B"	26 50	24.30
5,940 cu.yd. concrete, class "C"	21.00	21 30
Surface finish granite comp	.15	.40
153,000 sq.ft. surface finish carborundum rubbbed	.10	.07
1,650 lin.ft. surface finish concrete	10 00	16.00
28,600 sq.ft. sidewalk and curb finish	.12	.18
1,000,000 lb. reinforcing steel	.07	.085
450 lin.ft. 10-in. c.-i. drain pipe	3.10	5 15
415 lin.ft. 8-in. c.-i. drain pipe	2.40	4.00
100 lin.ft. 6-in. c.-i. drain pipe	2.00	2.10
15 c.-i. catch basin casting, etc	90.00	50 00
3 c.-i. plan hole frame, etc	110.00	35.00
1,600 sq.ft. copper flashing	.75	.65
2,104 lin.ft. curb protection bar	.35	.45
1,750 lin.ft. 2½-in. galvanized metal conduit	1.20	1.05
1,800 lin.ft. 2-in. galvanized metal conduit	1 00	.80
16 bronze lighting fixtures	700 00	920.00
16 c.-i. lamp post, single lighting fixture	150 00	270.00
6 c.-i. lamp post, double lighting fixture	310 00	605.00
4 bronze memorial tablets	1,100 00	1,270 00
4 bronze name plates	355 00	430 00
41,000 sq.ft. waterproofing	30	.28
4,365 sq.yd. paving, 3-in. asphalt block	8 00	9.00
4,365 sq.yd. paving, 3-in. wood block	9 00	7 60
2,350 sq.yd. paving track, 3½-in. asphalt block	11.00	13.00
2,350 sq.yd. paving track, 3½-in. wood block	9.90	11.60
1,940 lin.ft. single track	10.75	8.00
5,635 lin.ft. one-way t.c. vitrified duct	.25	.30
8 bronze anchor bolts	4 50	3.75
Price for old bridge (lump sum)	13,000.00	5 00
Extended totals asphalt block paving	$811,749	$810,217
Extended totals wood block paving	$813,529	800,816

Mass., Boston—A. H. Bowditch, archt., 44 Bromfield St., soon receives bids building 5 story, 60 x 150 ft., brick and rein.-con. storehouse, rein.-con. flooring, concrete foundation, for Goodyear Tire & Rubber Co., 61 Brookline Ave. About $100,000. Noted Jan. 15.

Mass., Boston—M. J. Mastrangelo, archt. and engr., 2 North Sq., soon receives bids building 3 story, 30 x 70 ft., brick and concrete printing plant, concrete foundation and flooring, on Massachusetts Ave., for Rush Printing Co., 21 Bromfield St. About $25,000.

Mass., Cambridge — Tuck & Gilman, archts., 34 School St., Boston, soon let contract building 2 story, 50 x 200 ft., brick and mill construction storage shed, rein.-con. flooring, concrete foundation, on Portland St., for Massachusetts Lime & Cement Co., 252 Bridge St. About $50,000.

Mass., Charlestown (Boston P. O.)—Crosby Steam Gauge & Valve Co., 40 Central St., Boston, having plans prepared by Lockwood, Greene & Co., engrs., 60 Federal St., Boston, for 1 story, 48 x 104 ft., brick and steel extension to foundry, here. About $32,000.

Mass., East Boston (Boston P. O.)—M. J. Mastrangelo, archt. and engr., 2 North Sq., preparing plans for 2 story, 70 x 175 ft., brick and concrete garage, concrete flooring and foundation, on Curtis St. About $50,000. Owners name withheld.

Mass., Middleboro—C. T. Main, engr., 201 Devonshire St., Boston, soon lets contract building 1 story, 70 x 140 ft. and 1 story, 36 x 50 ft., brick and steel weave shed, rein.-con. flooring, concrete foundation, also 25 x 50 ft. office, for Nemasket Worsted Mill Co. About $50,000.

Mass., Roxbury (Boston P. O.)—J. A. Tuck, archt., 34 School St., Boston, soon lets contract building 2 story, 95 x 150 ft., rein.-con. garage, concrete flooring and foundation, on Warren St. About $60,000. Owner's name withheld.

Mass., Roxbury (Boston P. O.)—Tuck & Gilman, archts., 34 School St., Boston, soon receive bids building 3 story, 42 x 51 ft., brick and concrete factory, rein.-con. flooring, concrete foundation, on Blue Hill Ave., for L. Garber, c/o architects. About $38,000.

Industrial Works (Continued)

Mass., Springfield—Packard Motor Car Co., 832 State St., having plans prepared for 2 story, 100 x 200 ft., brick and steel garage and showroom, rein.-con. flooring, concrete foundation. About $150,000. Private plans.

Mass., West Springfield (Springfield P. O.)—Gilbert & Barker Mfg. Co., Cold Springs Ave., soon lets contract constructing 1 story, 80 x 400 ft. foundry, 2 story, 100 x 150 ft. and I story, 160 x 180 ft. storehouses, 1 story, 40 x 80 ft. zinc building and 1 story, 160 x 230 ft. sheet metal building, all brick and rein.-con., rein.-con. flooring, concrete and brick foundation. About $750,000. McClintock & Craig, 33 Lyman St., Springfield, archts. and engrs. Noted Jan. 22.

Mass., Worcester—Worcester Machine Wks., 25 Bartlett St., plans to build brick and steel addition to factory. About $150,000.

R. I., Pawtucket—H. L. Murphy, Randall St. and West Ave., plans to build 1 story, 50 x 125 ft., concrete garage. About $25,000.

R. I., Pawtucket—E. C. Wightman, 400 Bway., plans to build I story, 100 x 100 ft., concrete garage, concrete flooring and foundation, on Bway. and Lupine St. About $30,000. Private plans.

R. I., Providence—D. Annotti, 568 Bway., plans to build 1 story, 60 x 150 ft., concrete garage, concrete flooring and foundation. About $25,000.

R. I., Providence—Autocar Sales & Serv. Co., 302 Pearl St., plans to build 1 story, 120 x 165 ft., concrete and steel garage and service station, rein.-con. flooring, concrete foundation, on Adelaide Ave. About $75,000. Private plans.

R. I., Providence—Chandler Motor Co. of Rhode Island, 212 Broad St., plans to build I story, 50 x 100 ft., brick and concrete garage and service station, concrete flooring and foundation on Pearl St. About $25,000. G. Henshaw, 87 Weybosset St., archt.

R. I., Providence—E. J. Sullivan, 56 Larch St., plans to build 1 story, 50 x 100 ft., brick, concrete and steel garage, concrete flooring and foundation, on Pine St. About $25,000. B. S. D. Martin, 86 Weybosset St., archt.

R. I., Warren—Jenks & Ballou, engrs. 1035 Grosvenor Bldg., Providence, soon let contract building 2 story, 110 x 200 ft., brick and mill construction addition to mill, concrete foundation, on Cutler St., for Mt. Hope Spinning Mill. About $100,000.

Conn., East Hartford (Hartford P. O.)—E. S. Goodwin, S. G. Harrison and others, having preliminary plans prepared for factory. About $50,000. Architect not selected.

Conn., Hartford—F. C. Walz, archt., 348 Trumbull St., soon lets contract building 2 story, 60 x 150 ft., brick, concrete and steel garage, concrete flooring and foundation, on South Main St., for R. J. Kinsella, c/o architect. About $70,000.

Conn., New Haven—I. Mitery, 691 State St., plans to build 1 story, brick and steel garage, concrete flooring and foundation, on State St. About $25,000. C. H. Abramowitz, 12 Church St., archt.

Conn., Thamesville (Norwich P. O.)—Winchester Woolen Mills plan to build 1 story, 40 x 200 ft., brick and steel addition to plant. About $35,000. Private plans.

Conn., Windsor Locks—J. R. Montgomery & Co. plans to build 6 story, 62 x 65 ft., brick and rein.-con. addition to factory About $75,000. Ford, Buck & Sheldon, Inc., 60 Prospect St., Hartford, archts. and engrs.

N. Y., Ogdensburg—Williams & Johnston, archts., Ogdensburg, soon receive bids building 1 story, 73 x 289 ft. factory, 70 x 130 ft. foundry and 25 x 45 ft. garage, concrete and stucco finish, on Green St. About $100,000. Owner's name withheld.

N. J., Jersey City—Amer. Can Co., Communipaw Ave., plans to build concrete addition to plant. About $500,000.

N. J., Trenton—Niedt-Ertel Motor Co., 350 South Broad St., plans to build 3 story, 75 x 100 ft., brick, concrete and steel garage and show room, on South Broad St. About $74,000. R. G. Sonsolloy, Commonwealth Bldg., archt.

Pa., Johnstown—W. S. Smith receives bids in March building 2 story, 110 x 150 ft., brick garage and service station, rein.-con. flooring, rock foundation, on Somerset and Franklin Sts. About $100,000. Architect not selected. Cambria Auto Co., 230 Bedford St., lessee.

Pa., Phila.—Keystone Auto Top Co., 1412 Fairmont St., having plans prepared by L. B. Rothchild, archt., 1225 Sansom St., for 4 story, 80 x 110 ft., concrete and brick addition to factory.

Pa., Wilkes-Barre—Epstine Produce Co., Northampton St., having plans prepared for 2 story, 40 x 210 ft., rein.-con. and steel warehouse, rein.-con. flooring, rock foundation, on Northampton St. About $100,000. Private plans.

Pa., Wilkes-Barre—Sheldon Axle Co., 221 Conyngham Ave., plans to build 3 story, 100 x 200 ft., brick and steel plant, rein.-con. flooring, rock foundation, on Beaumont St. About $200,000. Architect not selected.

Del., Wilmington—Automobile Supply Co., c/o Greisler & Abramson, archts. and engrs., Lafayette Bldg., soon lets contract building 3 story, 40 x 70 ft., concrete and brick service station, on 12th and French Sts. About $50,000.

N. C., Gastonia—W. H. Adams et al have formed company with $1,500,000 capital stock and plan to build cotton mill., steel and brick, rein.-con. flooring, concrete foundation, along tracks of Piedmont & Northern Ry. Architect not selected.

S. C., Gaffney—W. C. Hawrick plans to build cotton mill. About $500,000. J. E. Sirrine, Greenville, engr.

S. C., Greenville—Greenville Iron Wks. plans to build 50 x 120 ft. machine shop and 54 x 130 ft. foundry, combination steel and frame construction. J. E. Sirrine, Greenville, engr.

S. C., Walhalla—Keowee Yarn Mills plans to build addition to mill. About $200,000. J. E. Sirrine, Greenville, engr.

Ga., West Point—Larrett Cotton Mills plan to build 1 story, 80 x 300 ft. mill J. E. Sirrine, Greenville, S. C., engr.

Ala., Selma—Purity Ice & Creamery Co. organized with $165,000 capital stock plans to build ice plant, creamery and ice cream manufacturing plant. S. F. Hobbs, pres.

La., New Orleans—Go-Ro Co. Inc., 826 Baronne St., plans to build 1 story, 110 x 328 ft. factory, brick and steel. About $75,000. N. G. Goreau, 826 Baronne St., engr. Architect not selected.

La., Ruston—Russell Petroleum Co., plans to build 1,200 bbl. refinery. About $120,000. Engineer not selected.

O., Canton—T. C. Smith having plans prepared by Albrecht-Wilhelm & Kelly, archts., Union Bldg., Cleveland, for 1 story, 66 x 200 ft., rein.-con., brick and steel garage, rein.-con. flooring, concrete foundation, on East 4th St. About $50,000.

O., Cincinnati—Davis Welding Co., 1543 Queen City Ave., plans to build factory on Borden St. About $150,000. Architect to be selected at once.

O., Cincinnati—K. Kiefer Machine Co., Martin St., having plans prepared by Elzner & Anderson, archts., Citizens Bank Bldg., for 2 story, 50 x 150 ft., brick and concrete factory, on Martin St.

O., Cincinnati—Until March 10, by B. L. Baldwin, archt., 1202 2nd Natl. Bank Bldg., building 1 story, 40 x 175 ft. factory, on Spring Grove Ave. for Warner Elevator Co.

O., Cleveland—Beckman Co., 3167 Fulton Rd., plans to build 2 story, 200 x 200 ft., rein.-con., steel and brick weaving factory, rein.-con. flooring, concrete foundation, on Fulton Rd. and West 33rd St. About $400,000. Lockwood-Green & Co., Bangor Bldg., engrs. and archts.

O., Cleveland—Buckeye Brass Co., 6410 Hawthorne Ave., soon lets contract building 1 story, 30 x 110 ft. and 75 x 75 ft. foundry and furnace room, brick and steel, brick foundation, on Ashland Rd. About $60,000. N. W. Carl, secy. A. Sogg, 319 Hippodrome Bldg., archt. Noted Feb. 12.

O., Cleveland—Cleveland Automobile Co., East 131st St., having plans prepared by E. McGeorge, archt. and engr., 1900 Euclid Ave., for 1 story, 80 x 80 ft. heat treating plant, concrete, steel and brick, rein.-con. flooring, concrete foundation, on London Rd About $60,000.

O., Cleveland—Cleveland Automobile Co., East 131st St., having plans prepared by E. McGeorge, archt. and engr., 1900 Euclid Ave., for 2 story, 80 x 240 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, on London Rd About $150,000.

O., Cleveland—Cleveland Steel Barrel Co., 9612 Meech Ave., soon lets contract building 1 story, 60 x 120 ft., concrete and brick factory, rein-con. flooring, concrete foundation, on Meech Ave. About $60,000. Christian, Schwarzenberg & Gaede, 1900 Euclid Ave., archts. and engrs.

O., Cleveland—United States Gypsum Co., 1714 Merwin Ave., plans to build 2 story, brick, steel and concrete factory, rein.-con. flooring, concrete foundation. About $100,000 P. A. Ryder, supt. Private plans.

O., Cleveland—Windsor Constr. Co., Swetland Bldg., plans to build rein.-con., brick and steel garage, rein.-con. flooring, concrete foundation, on Summer Ave. About $100,000. Private plans.

O., Columbus—C. L. McKee, 52 East Gay St., had plans prepared by C. W. Bellows, archt., 69 Ruggery Bldg., for 2 story, 47 x 180 ft., concrete, brick and terra cotta, service station, on North 4th St. About $50,000.

O., Dayton—Natl. Auto Sales Co., 127 East 4th St., plans to construct 3 story, 50 x 180 ft., rein.-con. and brick garage and salesroom, rein.-con. flooring, concrete foundation, at 117 North St. Clair St. About $75,000. Architect not selected.

Ind., Evansville—Evansville Paper Box Mfg. Co., Main and Water Sts., plans to build 2 story, 75 x 150 ft., brick factory. About $35,000. Architect not selected.

Ind., Evansville — Liquid Carbonic Co., Heidelback Ave. and Indiana St., having plans prepared by C. Shopbell & Co., archts., Furniture Bldg., for 2 story, 80 x 150 ft., brick factory. About $50,000.

Ind., Ft. Wayne—Maier Hide & Fur Co., 126 West Columbia St., having plans prepared by G. Mahurin, archt., 519 Lincoln Life Bldg., constructing 1 story, 150 x 160 ft., rein.-con., brick and tile warehouse, concrete flooring, on Clay and Columbia Sts. About $50,000.

Ind., Indianapolis — Acme Aluminum & Brass Wks., 420 South Harding St., having plans prepared and soon receives bids building factory, 50,000 sq.ft. floor space. About $70,000.

Ind., Kokomo—Dennis White Auto Co. had plans prepared and soon receives bids building 3 story., 78 x 144 ft. garage and sales room, on Bucklye and Jackson Sts. McGraw & Stevenson, 320 Kokomo Trust & Savings Bldg., archts.

Mich., Detroit—See "Miscellaneous."

Ill., Chicago — Steel Sales Corp., 129 South Jefferson St., plans to build 1 story, 400 x 600 ft. plant, on Crawford Ave. and 35th St. About $250,000. Architect not selected.

Wis., Manitowoc — Wisconsin Aluminum Products Co., 16th and Franklin Sts., plans to build 4 story, 60 x 250 ft., brick, rein. con. and steel factory, brick foundation, on 8th St. About $250,000. Architect not selected.

Wis., Milwaukee—Columbia Realty Co., 236 Bway., soon lets contract building I story, 110 x 225 ft., brick and mill construction factory, concrete foundation, on 33rd St. About $100,000. Leiser & Holst, Brumder Bldg., archts.

Wis., Oostburg—Dutch Canning Co., c/o B. Huenink, plans to build 4 story, 50 x 70 ft., brick, rein.-con. and steel addition to factory, brick foundation, on Main St. Architect not selected.

Wis., West Bend — Schmidt & Storck Wagon Co., Mill Sts., having plans prepared by Buemming & Guth, archts., 521 Jackson St., Milwaukee, for 1 story, 100 x 300 ft., brick and concrete factory, concrete foundation. Noted Jan. 1.

Ia., Newton—Chicago, Rock Island & Pacific Ry., La Salle St. Sta., Chicago, having plans prepared for 1 story, 50 x 200 ft., brick, concrete and steel round house, concrete foundation, here. About $50,000. Private plans. .

Kan., Rosedale—Cleveland Steel Barrel Co., 9612 Meech Ave., Cleveland, having plans prepared by Brostrom & Drotts, archts., 400 Reliance Bldg., Kansas City, Mo., and soon lets contract for 1 and 2 story, 80 x 290 ft. and 45 x 80 ft., rein.-con., steel, brick and stone factory, concrete foundation, at 630 Southwest Blvd About $80,000.

Kan., Wichita—Johnston & Larimer Dry Goods Co., 619 East Douglas Ave., plans to build 5 story, 75 x 140 ft., warehouse and factory on South St. Francis Ave. About $100,000.

Mo., St. Louis—H. D. Lee Mercantile Co., 410 North 18th St., plans to build factory. About $150,000. L. Klasky, local mgr. Architect not selected.

Mo., St. Louis—Lehmann Machine Co., 606 South Bway., plans to build 2 story, 110 x 195 ft., brick and terra cotta factory, monitor type construction, concrete foundation, on La Salle St. and Grand Ave. About $150,000 Private plans.

Industrial Works (Continued)

Mo., St. Louis—Wiedmer Eng. Co., engrs., Syndicate Trust Bldg., soon receives bids constructing 3 story, 180 x 200 ft., brick factory, rein.-con. flooring, on Forest Ave. and Sarah St., for Dorris Motors Corp., Sarah St. and Lacledo Ave. About $350,000.

Tex., Houston—Baylor University, 5th and Speight Sts., having plans prepared by B. D. Easterwood, archt., 405 Praetorian Bldg., Waco, for 1 story, rein.-con. and brick power house. About $100,000.

Tex., Houston—C. Bender & Sons, 617 Willow St., having plans prepared by C. D. Hill & Co., archts., 315 Binz Bldg., for 3 story, 100 x 100 ft. warehouse, on Congress and Caroline Sts. About $70,000.

Tex., Houston—Lone Star Steel & Bridge Co., 214 Carter Bldg., plans to build large concrete and steel plant, on Harrisburg Blvd. along tracks Municipal R.R. Architect and engineer not selected.

Okla., Claremore—E. B. Rankin Oil & Refining Co. plans to build refinery, 1,500 bbl. capacity, here. About $150,000. Address E. B. Rankin, 508 South Division St., Sapulpa. Engineer not selected.

Okla., Shawnee—City voted $100,000 bonds to build repair shop for fire dept. and remodel fire fighting apparatus. Engineer will be selected soon.

Nev., Reno—State Highway Dept., Carson City, having plans prepared by C. C. Cottrell, state highway engr., building machine and repair shops on 4 acre site in eastern part of city. Cost to exceed, $30,000.

Ore., Eugene—Lane Co. Fair Assn. plans to build 1 story, 30 x 200 ft. frame and concrete exhibit barn, on Fair Grounds. About $50,000. Architect not selected.

Ore., Grants Pass—H. Smith plans to build 1 story, 100 x 100 ft., concrete garage on H and 5th Sts. About $50,000. Private plans.

Ore., Prineville — See "Excavation and Dredging."

Cal., Oakland—Palmolive Co., 42 4th St., Milwaukee, Wis., plans to build rein.-con. and brick factory, concrete foundation, here. About $400,000. Architect not selected.

Cal., Torrance—Torrance Packing Co. having plans prepared by E. E. Horstman, archt., Torrance, for 1 story, 90 x 200 ft., packing plant, timber, reni.-con. flooring, concrete foundation. About $50,000.

Cal., Ukiah—California Grape Products Co. plans to build brick and timber factory. About $100,000. Architect not selected.

Que., Hull—Natl. Bread Co., Ltd., plans to build 3 story bakery, rein.-con. and brick. About $100,000. Architect not selected.

Ont., Brockville — Machineries & Foundries Ltd., receives bids in spring building foundry. About $150,000.

BIDS DESIRED

Mass., Rockland—J. W. Beal, archt., 62 Sumner St., Boston, receiving bids building 1 story, 140 x 145 ft., brick, concrete and mill construction garage, concrete flooring and foundation, on West Water St., for H B. Vesper, c/o architect. About $60,000.

Conn., Stamford—Emmens & Abbott, archts., Washington Bldg., receiving bids building 2 story, 40 x 100 ft. factory with two 12 x 21 ft. ells, rein.-con., concrete flooring and foundation, on Guernsey St., for Dentz & Artenberg, Inc., Main St. About $40,000.

N. J., Trenton—Until March 25, by E. A. Wilson, archt., 1208 Chestnut St., Phila., building 2 story, 50 x 100 ft., brick and stone factory, on Adeline and Beatty Sts., for Bayuk Bros. Co., 3rd and Spruce Sts., Phila.

Pa., Wilkes Barre—Until March 10, by Knapp & Bosworth, archts., Odd Fellows Bldg., constructing 1 story, 50 x 100 ft. brick factory, rein.-con. flooring, rock foundation, on South State St., for Keystone Bolt Co., State St. About $25,000.

Md., Forest Park (Baltimore P. O.)—E. H. Browne, archt., 219 Courtland St., Baltimore, receiving bids building 1 story, 116 x 136 x 143 ft., brick and terra cotta garage, rein.-con flooring, concrete foundation, on Liberty Heights and Berwyn Aves., for Forest Park Garage, Inc., Berwyn Ave. About $60,000.

Ind., Kendallville—Kendallville Fdry. Co. receiving bids building 1 story, brick and steel foundry. About $30,000. Private plans.

Mich., Detroit—Until March 8, by H. H. Lane, archt. and engr., 2320 Dime Bank, building 2 story, 60 x 100 ft., rein.-con., brick and steel service station, rein.-con. flooring, concrete foundation, on 2nd Ave., for Deford Motor Co., 817 Cass Ave.

Mich., Detroit — Until March 8, by A. Kahn, archt., Marquette Bldg., building 2 story, 100 x 172 ft., rein.-con., brick and steel factory and office, rein.-con. flooring, concrete foundation, on Hancock Ave., for C. W. Hall Lamp Co., Hancock and Rivard Sts. About $170,000.

Mich., Detroit—Until March 15, by Brown & Preston, archts., 406 Empire Bldg., building 3 story, 100 x 120 ft., rein.-con. brick and steel factory, rein.-con flooring, concrete foundation, on East Larned and St. Aubin Sts., for Superior Machine & Eng. Co., 51 East Fort St. About $100,000.

Mich., Marysville — Until March 10, by Smith, Hinchman & Grylls, archts. and engrs., 710 Washington Arcade, Detroit, for 1 and 2 story, 380 x 420 ft., brick and steel foundry, rein.-con. flooring, concrete foundation, on Michigan Ave. and Cuttle Rd., for Genl. Aluminum & Brass Co., Boulevard and St. Aubin St. About $500,000. Noted Jan. 1.

Ill., Chicago—Matchless Metal Polish Co., 840 West 49th Pl., receiving bids building 2 story, 100 x 125 ft., brick and timber factory, concrete foundation at 49th Pl. and Halsted St. About $75,000. A. G. Lund, 453 West 63rd Pl., archt.

Minn., Duluth—Until March 10, by G. P. Phillips, comr. Duluth Water & Light Dept., Commercial Club Bldg., constructing 3 story, 50 x 140 ft., brick and tile storage and office building, rein.-con. flooring and foundation, on West Frost St. About $100,000. Holstead & Sullivan, Palladio Bldg., engrs.

Ore., Portland—Claussen & Claussen, archts., Macleay Bldg., receiving bids building 3 story, 60 x 100 ft., concrete frame and heavy mill construction factory, on 18th and Thurman Sts., for Bergman Shoe Mfg. Co., 761 Thurman St. About $50,000.

Cal., Los Angeles — California Walnut Growers Assn., 1326 East 7th St., receiving bids building 7 story, 100 x 150 ft., rein.-con. and brick warehouse, on 7th and Mill Sts. About $175,000. A. C. Martin, 430 Higgins Bldg., archt. Noted Feb. 12.

Ont., Hamilton—Firestone Tire & Rubber Co., 81 Adelaide West St., Toronto, receiving bids for 4 story rein.-con. and brick factory, rein.-con. flooring, concrete foundation, to have 350,000 sq.ft. floor space. About $350,000. H. Prack, 50 Bay St., Toronto, archt. and engr

PRICES AND CONTRACTS AWARDED

(★Indicates Award of contract)

★N. H., Goffstown—U. S. Bobbin & Shuttle Co. let contract building 3 story, 50 x 100 ft., brick and mill construction factory, concrete foundation, to C. A. Golden, 64 Concord St., Manchester. About $50,000.

★Vt., Burlington—G. S. Blodgett Co., Inc., 190 Bank St., will build 3 story, 55 x 125 ft. storehouse, terra cotta, hollow tile and stucco, on South Champlain St. About $70,000. Work will be done by day labor.

★Vt., Lunenburg—Fitzdale Paper Mills, Fitzdale, will build 1 story, rein.-con. and steel power house, rein.-con. flooring, concrete foundation, here. About $1,000,000. Work will be done by day labor. Noted Jan. 15.

★Mass., Boston—J. D. McLeod, 890 Hunt Ave., Roxbury, let contract altering factory on Milk St., to N. Fritz Constr. Co., 62 Maywood St., Roxbury. About $30,000.

★Mass., Boston—Mason Regulator Co., 1605 Hyde Park Ave., let contract building 2 story, 40 x 80 ft., brick and concrete addition to factory, concrete foundation, on Medway St., to J. T. Scully Co., Water St. About $75,000.

★Mass., Boston—J. L. Berry, archt., 40 Central St., let contract to Evatt Constr. Co., 161 Devonshire St., building 3 story, 50 x 80 ft., concrete storage plant, rein.-con. flooring, concrete foundation, on St. Stephens St., for B. F. Wood Music Co., 246 Summer St. About $70,000. Noted Feb. 26.

★Mass., Chicopee — Dwight Mfg. Co., Front St., let contract building 5 story, 72 x 314 ft., brick and mill construction addition to plant, concrete foundation, to Casper Ranger Constr. Co., 20 Bond St., Holyoke. About $500,000.

★Mass., Gardner—Nichols & Stone Co., Logan St., let contract building 3 story, 90 x 150 ft., brick and mill construction factory, concrete foundation, to N. E. Frizell, Gardner. About $80,000.

★Mass., Holyoke—W. Skinner & Sons, 208 Appleton St., let contract raising roof of present plant and building 1 story, 60 x 260 ft., brick and timber addition to plant, on Dwight St., to Casper Ranger Constr. Co., 20 Bond St. About $35,000.

★Mass., Hyde Park (Boston P. O.)—Kapo Mfg. Co., 188 Providence St., will build 2 story, 132 x 140 ft., concrete block addition to factory, concrete foundation. About $70,000. Work will be done by day labor.

★Mass., Lee—Smith Paper Co., Mill St., let contract constructing two 2 story, 50 x 140 ft., brick and mill construction mills rein-con. flooring, brick, rock and concrete foundation, to Lynch Bros. Brick Co., Holyoke. About $60,000 each.

★Mass., Lynn—General Electric Co. let contract building 3 story, 60 x 100 ft., concrete and steel addition to plant, concrete foundation, to C. W. Wright, 23 Central Ave. About $50,000.

★Mass., Newton Upper Falls — Saco-Lowell Shops, 77 Franklin St., Boston, let contract building 1 story, 200 x 335 ft., brick and rein.-con. foundry, rein.-con. flooring, concrete foundation, to H. Nawn Contg. Co., 82 Savin St., Boston. About $450,000. Noted Feb. 12.

★Mass., Revere (Boston P. O.)—O. F. Farley, Jr., 27 State St., Boston, let contract building 1 story, rein.-con. garage, rein.-con. flooring, concrete foundation, to F. T. Ley & Co., Inc., 185 Devonshire St., Boston. About $45,000.

★Mass., Salem—Hygrade Lamp Co. let contract building 2 story, brick and mill construction addition to storage plant, concrete foundation, on Bridge St., to E. H. Porter Co., Wallis St., Peabody. About $30,000.

★Mass., West Springfield (Springfield P. O.)—Container Realty Co., Ft. Wayne, Ind., let contract building 2 story, brick and concrete factory, concrete foundation, on Packett Rd., here, to S. M. Green Co., 293 Bridge St., Springfield. About $75,000.

★Mass., Worcester — Simplex Player Action Co., 10 Blackstone St., let contract building 5 story, 80 x 150 ft., brick and rein.-con. plant, rein.-con. flooring, concrete foundation, on Summer and Charles Sts., to W. Daniels & Sons, Worcester. About $150,000.

★R. I., West Barrington—Rhode Island Lace Wks. let contract building 2 story, 50 x 390 ft., rein.-con. addition to factory, concrete foundation, to F. F. Johnsberg Co., 16 Central St., Boston. About $125,000.

★Conn., Danbury—Danbury Roller Bearing Co., c/o Sunderland & Watson, archts., 248 Main St., let contract building 2 story, 55 x 85 ft., brick and steel factory, concrete foundation, to L. F. Sweeney, Montgomery St. About $25,000.

★Conn., Fairfield—Bullard Eng. Wks., Inc. let contract building 1 story, 90 x 210 ft., brick and concrete forge shop, concrete flooring and foundation, on Brewster St., to J. R. Sheehan, 211 State St., Bridgeport. About $85,000.

★N. Y., Brooklyn—G. and G. Constr. Co., 1399 St. Johns Pl., will build 1 story, 100 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 40th St. and 3rd Ave. About $35,000. Work will be done by day labor.

★N. Y., Brooklyn—Hygrade Homes Co., Inc., 1203 Atlantic Ave., will build 1 story, 75 x 175 ft., brick and steel garage, brick foundation, on Dean St. near Classon Ave. About $45,000. Work will be done by day labor.

★N. Y., Brooklyn—Parfitt Bros., archts. and engrs., 26 Court St., let contract to W. L. and G. H. O'Shea, 29 Bway., New York City, building 2 story, brick and steel extension to garage, rein.-con. flooring, concrete foundation, at 241 Waverly Ave., for W. P. Jones, c/o architects. Noted Feb. 19.

★N. Y., Long Island City—Lehigh Silk Hosiery Co., 220 5th Ave., New York City, let contract building 7 story, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, here, to L. Gold, 44 Court St., Brooklyn. About $1,000,000. Noted Sept. 11.

★N. Y., Syracuse—S. Ellman Co., 105 Canal St., let contract building 2 story, 80 x 195 ft., concrete and steel factory, to C. J. Haley, Watertown. About $75,000.

★Pa., Phila.—Lerrich & Woldow, 707 Walnut St., will build two 2 story, 150 x 200 ft., brick factories, on Silver and Amber Sts. About $60,000 each. Work will be done by day labor.

★Pa., Phila.—W. B. McCullough, c/o C. E Oelschlager, archt., 1615 Walnut St., let contract building 2 story, 36 x 100 ft., brick and concrete garage and service station, at 250 North Juniper St., to D.

Industrial Works (Continued)

Heawood, 1507 Wood St. About $30,000. Noted Jan. 29.

★Pa., Phila.—Model Mills Co., Ontario and 1 Sts., let contract building 4 story, 60 x 160 ft., concrete factory, to W. Steele & Sons Co., 16th and Arch Sts. About $150,000.

★Md., Baltimore—Smith & May, archts., 1133 Calvert Bldg., let contract to Consolidated Eng. Co., 243 Calvert Bldg., constructing 8 story, 45 x 150 ft., concrete and brick addition to printing plant, concrete foundation, for Falconer Co., Gay and Water Sts. About $100,000. Noted Feb. 5.

★Md., Baltimore—Reus Bros. Co., 146 West Mt. Royal Ave., let contract building 1 story, 100 x 240 ft., rein.-con., steel and brick factory, concrete foundation, on Kate Ave. along tracks Western Maryland R.R., to Consolidated Eng. Co., 243 Calvert Bldg. About $75,000.

★Md., Baltimore—T. I. Swartz, 24 Hopkins Pl., let contract building 6 story, 23 x 60 ft., brick warehouse, concrete and stone foundation, at 22 Hopkins Pl., to C. L. Stockhausen Co., Gay and Water Sts. About $50,000. Noted Jan. 22.

★Md., Westport (Baltimore P. O.)—Consolidated Gas, Electric Light & Power Co., Lexington Bldg., Baltimore, will build 1 story, 75 x 150 ft., steel, concrete and brick power house, concrete foundation, here. About $60,000. Work will be done by day labor.

★S. C., Sumter—Town let contract building lighting and ice plant, to Tucker & Laxton, Realty Bldg., Charlotte, N. C.; cost plus fee of $8,000, said fee to be increased by $2,000 if total cost including fee is less than $100,000.

★Ga., Atlanta—Corrugated Paper Products Inc., let contract building 2 story, 150 x 185 ft. rein.-con. and stone factory, rein.-con. flooring, rock foundation, on Stephens St., to Massell Constr. Co., 305 Healey Bldg., Atlanta. About $60,000. Work will be done by day labor.

★O., Barberton—Diamond Match Co. let contract building 4 story, 125 x 175 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, to Turner Constr. Co., 244 Madison Ave., New York City. About $475,000.

★O., Cincinnati—F. E. Bullerdick, Dempsey St., let general contract building 2 story, 100 x 150 ft. factory, on Hopple St., to Ferro Constr. Co., Richmond and Harriet Sts. About $100,000.

★O., Cleveland—Amer. Scrap Metal Co., 2681 East 40th St., let contract constructing 1 story, 40 x 120 ft., brick and steel factory and storage building, at 9108 Woodland Ave., to J. Miller, 2381 East 46th St. About $25,000.

★O., Cleveland—Amer. Stove Co., 4700 Perkins Ave., let contract building 2 story, 233 x 265 ft. enameling plant, concrete, steel and brick, rein.-con. flooring, concrete foundation, at 4100 Hough Ave., to Boldt Constr. Co., 6110 Euclid Ave. About $150,000.

★O., Cleveland—Brown Body Corp., 3147 Superior Ave., let contract building 1 story, 60 x 170 x 260 ft. and 3 story, 100 x 170 ft. rein.-con., brick and steel, factory, rein.-con. flooring, concrete foundation, on 90th St and Maywood Ave., to H. K. Ferguson Co., 6532 Euclid Ave. About $500,000.

★O., Cleveland—Champion Forge & Machine Co., East 71st St. and Union Ave., let contract building 3 story, 60 x 120 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, to C. Peterson Co., 4500 Euclid Ave. About $100,000.

★O., Cleveland—Cleveland Home Brewing Co., 2501 East 61st St., let contract building 1 story, 30 x 135 ft. and 30 x 50 ft., brick, steel and concrete, ice plant and boiler room addition, to F. W. Ruple Constr. Co., 4500 Euclid Ave. About $60,000.

★O., Cleveland—Creswell Realty Co., Union Bldg., let contract building 8 story, 100 x 125 ft., rein.-con., brick and steel, garage, rein.-con. flooring, concrete foundation, on Huron Rd. and East 12th St., to Tenbusck Parker Co., 301 Union Bldg. About $500,000.

★O., Cleveland—Federal Packing Co., West 65th St., having plans prepared by Miller & James, archts. and engrs., Bangor Bldg., for 2 story, 40 x 70 ft. cold storage plant, brick, steel and concrete, concrete foundation, on East 4th St. and Bolivar Rd. About $50,000. Work will be done by day labor.

★O., Cleveland — J. Kronberger, 3737 West 25th St., let contract constructing 1 story, 74 x 86 ft., brick and steel garage and commercial building, at 3737 West 25th St., to Complete Constr. Co., 227 West Superior Ave. About $50,000.

★O., Cleveland—Landesman-Herscheimer Co., 1323 West 9th St., let contract building 1 story, 40 x 110 ft., brick and steel addition to factory, at 1323 West 9th St., to G. W. Feaga Co., 5927 Euclid Ave. About $40,000.

★O., Cleveland—Ohio Cut Stone Co., Citizens Bldg., let contract building 1 story, 84 x 160 ft., frame plant, at 2066 Random Rd., to Central States Eng. Co., 1312 Citizens Bldg. About $27,000.

★O., Cleveland—Otis Steel Co., Leader-News Bldg., let steel contract constructing five 1 story mill buildings, 40 x 400 ft., 80 x 400 ft., 90 x 400 ft. and two 75 x 400 ft., brick, concrete and steel, concrete foundation, on Jennings Rd., to Amer. Bridge Co., 30 Church St., New York City. Total cost, $500,000.

★O., Cleveland—A. and F. Weiss, 1111 Bolivar Rd., let contract building 3 story, 90 x 92 ft., rein.-con., brick and steel warehouse, rein.-con. flooring, concrete foundation, at 5062 Cedar Ave., to G. W. Hale, 400 Erie Bldg. About $60,000.

★O., Cleveland—West Steel Castings Co., 811 East 70th St., let contract building 1 story, 100 x 150 ft., concrete, steel and brick foundry, rein.-con. flooring, concrete foundation, on East 70th St. and St. Clair Ave., to S. W. Emerson Co., 1900 Euclid Ave. About $75,000.

★O., Cleveland—Wilberite Roofing Co., 3327 Broadview Rd., let contract building 1 story, 40 x 100 ft. and 40 x 300 ft., brick and steel additions to factory, concrete flooring, brick and concrete foundation, on Broke Park Rd., to G. W. Hoffman, 3327 Broadview Rd. About $75,000.

★O., Columbus—Felber Biscuit Co., Grant Ave., let contract building 6 story, 62 x 100 ft. bakery, brick and concrete, to R. H. Evans & Co., Columbus Savings & Trust Bldg. About $150,000.

★O., Lorain—Thew Automatic Shovel Co. let general contract for two 1 story, 75 x 200 ft., steel shops, to Donnelly Constr. Co., 200 Oberlin Ave. About $150,000.

★Ind., Kokomo—Pittsburgh Plate Glass Co., Vaile Ave., let contract building extensions to plant, to Stone & Webster, 120 Bway, New York City. About $2,000,000.

Mich., Detroit—Dept. Pub. Wks. received only bid building 2 story, 58 x 121 ft., rein.-con., brick, steel and stone power house with mechanical equipment, to heat city buildings in vicinity of Municipal Courts Bldg., to include two 300 hp. and one 1,600 hp. boilers, one 150 kw. motor generator, feed water heater, underfeed stokers, coal and ash handling conveyors, from G. A. Fuller Co., Penobscot Bldg., about $238,750 for building and $250,004 for equipment cost plus fixed fee of $20,000.

★Mich., Detroit—C. F. Smith Co., West Grand Blvd., let masonry contract building 2 story, 66 x 70 ft., brick, steel and concrete factory, to DeLisle & Cooper, 37 Campau Bldg., carpentry work, to Yatzek & Wonderlick, 400 Penobscot Bldg. Total cost over $40,000.

★Ill., Chicago — Concrete Steel Co., 53 West Jackson St., let contract building 1 story, 80 x 100 ft., brick factory, brick foundation, on Central Ave. and 31st St., to J. Shedden & Co., 106 North La Salle St. About $25,000.

★Ill., Chicago—M. Espert, 236 North Clark St., let contract building 2 story, 100 x 100 ft., rein.-con. and brick garage, rein.-con flooring, concrete foundation, on Cass St. and Grand Ave., to McKeown Bros., 112 West Adams St. About $65,000.

★Ill., Chicago—Johnson Fare Box Co., 236 South Robey St., let contract building 2 story, 120 x 165 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on Ravenswood and Leland Aves., to G. F. Meyne, 127 North Dearborn St. About $125,000.

★Ill., Chicago—Natl. Tea Co. 2715 West North Ave., let masonry contract building 1 story, 100 x 140 ft., rein.-con. and brick garage, concrete foundation, on Larrabee and Hobbie Sts., to F. Dakelstein Sons, 3648 Walton St. About $70,000.

★Ill., Chicago—F. H. Winston, 749 North Michigan Ave., let contract constructing 1 and 2 story, 50 x 200 ft., service and sales building, steel, tile, brick and terra cotta, concrete foundation, on Sheridan Rd and Irving Park Blvd., to O. Young, 3117 North Springfield St. About $100,000.

★Ill., Moline—Williams White & Co., 3rd Ave. and 8th Sa., let steel contract for 1 story, 110 x 325 ft., steel and brick foundry, on 43rd St., 3rd and 4th Aves., to McClintic-Marshall Constr. Co., Oliver Bldg., Pittsburgh.

★Ill., Rock Island—Rock Island Register Co. let contract constructing 4 story, 73 x 115 ft., mill construction plant, rein.-con. flooring, on 25th St. and 5th Ave., to H. W. Horst Co., Horst Bldg. About $70,000.

★Wis., Madison — Gisholt Machine Co., 1315 East Washington Ave., let contract building 1 story, 100 x 200 ft., brick and steel addition to foundry, concrete foundation, to Worden-Allen Co., Port Washington Rd., Milwaukee. About $80,000.

★Wis., Milwaukee — Milwaukee Rolling Mill Co. let contract building 1 story, 380 x 425 ft., concrete and steel mill, concrete foundation, to Northwestern Bridge & Iron Co., 32nd and Hopkins Sts. About $400,000.

★Wis., Racine—J. I. Case Plow Wks., Mead St., will build 4 story, 120 x 140 ft., brick and concrete warehouse, rein.-con. flooring, concrete foundation. Work will be done by day labor.

★Minn., Minneapolis—Red River Lumber Co., 807 Hennepin Ave., let contract building 2 story, 100 x 135 ft., brick and stone garage, on Franklin and Lyndale Aves., to Farnam Constr. Co., 641 Plymouth Bldg. About $50,000.

★Mo., St. Louis—Mississippi Glass Co., 4070 North 1st St., let contract building 1 story, 83 x 104 ft., concrete and brick factory, at 83-91 Angelica St., to Unit Constr. Co., Title Guarantee Bldg. About $26,000.

★Mo., St. Louis—Traffic Motor Truck Co., 5200 North 2nd St., let contract building 1 story, 100 x 145 ft., concrete and brick machine shop, at 5303 North 2nd St., to Murch Bros., Ry. Exch. Bldg. About $25,000.

★Mo., St. Louis—United Drug Co., 63 Leon St., Boston, Mass., let contract building 1 story, 45 x 80 ft., brick boiler house, at 3941 Kingshighway, here, to Westlake Constr. Co., Ry. Exch. Bldg. About $25,000.

★Tex., Austin—Ford Agency, 509-11 Colorado St., let contract building 2 story, 120 x 140 ft., rein.-con. and brick garage, rein.-con. flooring, on Franklin and Pearl Sts., to T. Gibson, Beaumont, $88,117. Noted Feb. 5.

★Tex., Houston—Japanese Cotton Trading Co., Grain and Cotton Exch. Bldg., Ft. Worth, let contract building 1 story, 310 x 750 ft. concrete warehouse and compress, along tracks of Houston Belt R.R., here, to B. F. and C. M. Davis Co., Reynolds Bldg., Ft. Worth. About $200,000. Noted Feb. 26.

★Idaho, Moscow—P. Miller Milling Co. let contract building 1 story, 300,000 bu. capacity, rein.-con., grain elevator, to Alloway & George, Old Natl. Bank Bldg., Spokane, Wash. About $50,000.

★Ore., Eugene — Mutual Creamery Co. will build 60 x 140 ft. brick creamery, cement flooring, to be 1st unit of 2 story plant. Total cost about $100,000. Work will be done by day labor under supervision of Bldg. Com.

★Cal., Los Angeles—Grand Central Garage Co., 6th and Olive Sts., let contract building 8 story, 168 x 180 ft., rein.-con. and brick garage, on 5th St. and Grand Ave., to Stanton, Reed & Hibbard, 622 Metropolitan Bldg. About $400,000.

★Cal., Los Angeles—Southern Pacific Ry., 65 Market St., San Francisco, let contract rebuilding 1 story, 163 x 173 ft., brick and steel shop, asphalt flooring, in railroad yards, here, to Standard Constr. Co., Call Bldg., San Francisco. About $60,000.

★Cal., San Francisco—P. J. Gartland, 21st and Guerero Sts., will build 3 story, rein.-con. and brick garage and salesroom, concrete foundation, on 11th and Market Sts. Work will be done by day labor.

★Que., Montreal—Benson & Hedges, Ltd., 171 St. James St., let contract building 3 story, 30 x 108 ft., brick and steel factory, to D. G. Loomis & Son, 1200 St. Patrick St. About $35,000.

Buildings

PROPOSED WORK

Me., Caribou — School — French Roman Catholic Society, R.F.D. 6, plans to build brick. About $50,000. A. Laventiere, pastor. Architect not selected.

Mass., Boston—Bank and Office—Harris-Forbes Co., 35 Federal St., plans to build 11 story, on Federal and Congress Sts. About $4,000,000. Architect not selected.

Mass., Boston—Office—Chamber of Commerce plans to build 11 story, brick, rein.-con. and steel, concrete foundation, on 185 x 185 ft. site, on Federal and Congress Sts. About $4,000,000. Architect not selected.

Buildings (Continued)

Mass., Boston—Sales—N. B. Smith, 30 Fairmount St., Brookline, plans to construct large concrete sales building, on Brookline and Burlington Aves., here. A. H. Bowditch, 44 Bromfield St., archt.

Mass., Dorchester (Boston P. O.)—Theater and Business—H. Norman, c/o Funk & Wilcox Co., archts., 1148 Old South Bldg., Boston, having plans prepared for 1 and 2 story, 60 x 210 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete, brick and rock foundation, on Bluehill Ave. and Livingstone St. About $200,000.

Mass., East Hampton — School — Notre Dame French Roman Catholic Society plans to build 2 story, brick and steel, on Pleasant St. About $60,000. Architect not selected.

Mass., Florence—Housing—Florence Mfg. Co. plans to build several 1 and 2 story houses for workmen, on Bridge Rd. About $200,000. Private plans.

Mass., Haverhill—Library—Library Bd. having plans prepared by C. D. White, archt., 191 Merrimac St., for 4 story, brick, concrete and steel addition, rein.-con flooring, concrete foundation, on Summer St. Cost to exceed $50,000.

Mass., Hyannis—Memorial Hall—Town had plans prepared by J. Purdon, archt., 8 Beacon St., Boston, for 2 story, 80 x 150 ft., brick, concrete foundation, on Main St. About $200,000.

Mass., Manchester—Hall—Town plans to build memorial hall. About $70,000. E. F. Knight, chn. com. Architect not selected.

Mass., Northampton—Hospital—G. F. Newton, archt., 6 Beacon St., Boston, soon lets contract building 2 story, 175 x 200 ft., brick and steel; brick and concrete foundation for Lathrop Home, 236 South St. About $250,000

Mass., North Uxbridge—School—Church of Good Shepherd plans to build 2 story, brick and steel, on Linwood and Maple Sts. About $60,000. Architect not selected.

Mass., Springfield—Church—South Congregational Society, 130 School St., having plans prepared by Cram & Ferguson, archts., 15 Beacon St., Boston, altering and building addition to church on Maple St. About $50,000. J. G. Gilkey, rector.

Mass., Springfield—Showroom—See "Industrial Works."

Mass., Springfield—Theatre—S. Z. Poli Co., 24 Church St., New Haven, having plans prepared by T. W. Lamb, archt., 644 8th Ave., New York City, for brick, concrete and steel, on Main and Worthington Sts., here. About $450,000.

Mass., Williamstown—High School—Town plans to build brick and steel. About $150,000. R. V. Howard, supt. schools. Architect not selected.

Mass., Winthrop (Boston P. O.)—School—Bd. Educ. having plans prepared by W. M. Bacon, archt., 27 Kilby St., Boston, for 2 story, 10 room, brick and steel, on Almont St. About $100,00. A. S. Smith, Field Rd., chn. Noted Jan. 29.

Mass., Winthrop (Boston P. O.)—School—Town plans to build 2 story, brick and steel addition, on Shirley St. About $80,000. A. S. Smith, Field Rd., chn. Brainerd & Leeds, 89 Franklin St., Boston, archts.

Mass., Worcester—Church—Bethel Methodist Episcopal Society, 20 Bluff St., plans to build brick church, on Park St. About $50,000. E. H. Crampton, pastor. Architect not selected.

R. I., Warwick—School—School Comn. having plans prepared by W. R. Walker & Son, archts., 17 Custom House St., Providence, for grammar school, on State Rd. About $50,000.

Conn,, Bridgeport — Hotel — Maloney & Krokstedt, archts., 925 Main St., preparing plans for 6 story, brick and rein.-con. About $300,000. Owners name witbheld.

Conn., Bridgeport—Theatre—J. W. Northrup, archt., 211 State St., soon lets contract building 1 story, 41 x 150 ft., concrete and steel, concrete flooring and foundation, for A. Nigosian, 1173 Barnum Ave. About $50,000.

Conn., Hartford — Hospital — Abraham Jacob Jewish Hospital, c/o Berenson & Moses, archts. and engrs., 1026 Main St., plans to build hospital. About $150,000.

Conn., Hartford—Professional—W. Heimovitch having plans prepared by W. B. Becker, archt., Wethersfield, for several story addition to present building and constructing new 8 story, concrete and steel, rein.-con. flooring, concrete foundation, on Ann St. About $200,000.

Conn., New Britain—Home and School—New Britain Children's Home, 81 Garden St., having plans prepared by W. P. Crabtree, archt. and engr., 272 Main St., for 3 story, 96 x 266 ft., brick and terra cotta, concrete foundation, at Rackliffe Heights. About $350,000 Noted Feb. 19.

Conn., Orange — School — Western Dist. having plans prepared by D. E. Smith, archt., 207 Orange St., New Haven, for 2 story, 8 room, brick and steel, on Seaview Ave. About $70,000.

Conn., Tariffville — School — Bd. Educ. Simsbury Twp. having plans prepared by Smith & Bassette, archts., 36 Pearl St., Hartford, for 2 story, 6 room, on Winthrop St., here. About $50,000. Noted Aug. 7.

Conn., Thomaston—High School—Town plans to build brick and steel, on Grand St. About $150,000. Architect not selected.

Conn., Torrington—Church—E. H. Waterbury, archt., 60 Main St., soon lets contract altering and building 1 story, 36 x 50 ft. and 30 x 60 ft., brick and stone addition, rock foundation, on Prospect St., for Calvary Baptist Church. About $50,000. W. T. Aiken, pastor.

Conn., Torrington—Church—J. A. Jackson, archt., 1133 Bway., New York City, soon lets contract building 1 story, 125 x 130 ft., brick and steel, concrete foundation, on Union St., for St. Mary Polish Roman Catholic Society. About $125,000. J. Kowalski, pastor.

N. Y., Binghamton — Clubhouse, etc. — Binghamton Catholic Lyceum plans to build clubhouse, gymnasium and auditorium in central part of city. About $150,000. P. S. Williams, executive secy.

N. Y., Binghamton—Hotel—Hotel Bennett, 182 Washington St., had tentative plans prepared by H. S. Gardner, archt., Ackerman Bldg., for 3 story, addition. Cost between $150,000 and $175,000. H. Rubin. chn. blg. com.

N. Y., Brooklyn—Asylum—Judea Orphan Asylum Assn., 505 Lafayette Ave., having plans prepared by E. W. Adelsohn, archt. and engr., 1778 Pitkin Ave., for group of 1 and 2 story buildings, brick, steel and stone, brick foundation, on 100 x 400 ft. plot on Dumont Ave., New Lots Rd., Elton and Linwood Aves. .About $280,000.

N. Y., Brooklyn—Church and School—R. E. Reilly, archt. and engr., 477 5th Ave., New York City, soon lets contract altering 3 story, brick and steel, at 127 North 1st St., for Church of Our Lady of Consolation. About $60,000. C. E. McDonald, pres. Noted Feb. 12.

N. Y., Canastota—Bank—State Bank of Canastota having plans prepared by I. V. Van Duzer, archt., Canastota, altering and building addition to bank. Cost between $50,000 and $60,000. M. DeLano, pres.

N. Y., Fredonia—High School—Bd. Educ. plans to build Junior High School. Cost between $200,000 and $250,000. W. B. Blaisdell, supt.

N. Y., Lancaster — High School — City voted $250,000 bonds to build high school.

N. Y., New York—Asylum—Hebrew Orphan Asylum, c/o E. Necarsulmer, archt. and engr., 507 5th Ave., having sketches prepared for brick, steel and stone, brick foundation, on 225th St. and Boston Post Rd. About $500,000.

N. Y., New York—Lofts, Showroom and Stores—J. H. Sheier, archt. and engr., 25 West 42nd St., receives bids about March 11, altering brick, steel and stone, on 6th Ave. between 20th and 21st Sts., for U. S. Realty Impvt. Co., c/o architect. About $300,000.

N. Y., New York—Office—E. Maurer, 80 Maiden Lane, having plans prepared by A. F. Gilbert, archt. and engr., 80 Maiden Lane, altering 5 story, brick, steel and stone, on Fulton and Front Sts.

N. Y., New York—Office—L. A. Sheinart, archt. and engr., 194 Bowery, preparing plans for 8 story, 25 x 50 ft., brick, steel and stone, brick foundation, on 7th Ave. About $75,000. Owner's name withheld.

N. Y., New York—Stores and Offices—Cammeyer Shoe Co., 47 West 34th St., having plans prepared by Rouse & Goldstone, archts. and engrs., 512 5th Ave., for 6 story, 50 x 100 ft., brick, steel and stone, brick foundation, on 5th Ave.

N. Y., Rochester—Bank—Natl. Bank of Commerce, 32 State St., purchased site adjacent to present property and plans to build bank. Cost between $250,000 and $300,000. T. J. Swanton, pres.

N. J., Jersey City—Police Station—City having plans prepared by J. T. Rowland, Jr., archt., 100 Sip Ave., and soon receives bids for new Police Station at Boland and Montgomery Sts. Cost to exceed $100,000. Noted April 24.

N. J., Trenton—Hotel—C. F. Hildebrecht, 19 West State St., having plans prepared by W. Haskin, archt., 241 South Warren St., building 4 story, 50 x 240 ft., brick, concrete and steel. About $250,000.

N. J., Trenton—Salesroom—See "Industrial Works."

N. J., West Hoboken—Theatre—Roosevelt Theatre Corp. plans to build new theatre at Summit Ave. and Courtlandt St. Cost to exceed $75,000.

Pa., Harrisburg — High School — School Dist., 123 Chestnut St., plans to build 4 story, brick, concrete and steel addition, rein.-con. flooring, on Walnut St. About $300,000. D. D. Hammelbaugh, secy. C. H. Lloyd, Telegraph Bldg., archt.

Pa., Harrisburg — Theatres — Wilmer & Vincent, 323 Walnut St., plan to build 6 theatres in residential section (and remodel 2 theatres in centre of city. About $400,000. C. F. Hopkins, local mgr. Architect not selected.

Pa., Harrisburg—Theatre and Apartment—Wilmer & Vincent, 323 Walnut St., plan to construct theatre, 3,000 seating capacity, and apartment building, to contain store rooms and 26 apartments, on Locust St. About $400,000. C. F. Hopkins, local mgr. Architect not selected.

Pa., Hazleton—Church—St. Peters Episcopal congregation plans to build addition to church on Chestnut St. About $60,000. Brigham, Coveney & Bisbee, 184 Boylston St., Boston, archts.

Pa., New Castle—High School—Bd. Educ. soon receives bids building Junior High School, consisting of two 2 story wings, one 59 x 340 ft. and one 144 x 232 ft., brick, stone, steel and tile, on Cunningham St. Plans include separate 100 x 200 ft. building for shops, modern shop construction. W. G. Eckles, L S. & T. Bldg., archt.

Pa., Newtown Square—Home—Dunwoody Home for Convalescents, c/o C. W. Brazer, archt. and engr., 1133 Bway, New York City, having plans prepared for 2 and 3 story, 50 x 288 ft., brick, steel and stone, brick foundation, here. About $250,000.

Pa., Phila. — Home — Seamens Institute, Front and Queen Sts., having plans prepared by Ballinger & Perrot, archts. and engrs., 329 South Broad St., for concrete and brick, on 2nd and Walnut Sts. Cost to exceed, $500,000.

Pa., Scranton—College—Scranton Business College, Jefferson Ave., having plans prepared for 4 story, 40 x 82 ft., brick, steel and stone addition, rein.-con. flooring, rock foundation, at 305-307 Jefferson Ave. About $150,000. J. H. Seeley, pres. Private plans.

Pa., Spangler — Nurses Home, etc. — Miners Hospital Assn. receives bids about April 1, constructing 2 story, 36 x 78 ft. nurses home, 2 story, 64 x 68 ft. isolation ward and 3 story, 40 x 60 ft. wing to main building, all brick, rock foundation. About $55,000.

Pa., White Haven—Office—Wilmot Eng. Co., Main Ave., having plans prepared by G. F. Schroeder and C. J. Schmitt, archts., Weitzenkorn Bldg., Wilkes-Barre, for 3 story, 40 x 80 ft., steel and brick, rock foundation, on Main Ave. About $50,000.

Md., Baltimore—Office—Levering Coffee Co., 102 Commerce St., having plans prepared by Smith & May, archts., 1133 Calvert Bldg., for 4 story, 60 x 70 ft., brick, stone and brick foundation, on South St. About $50,000.

N. C., Wilmington — Sunday School — Church of the Covenant plans to build 2 story, granite, school. About $80,000. Architect not selected.

Ga., Atlanta — Nurses Home — Georgia Baptist Hospital, 92 Luckie St., having plans prepared by Burge, Stevens & Conklin, archts., Natl. City Bldg., for 4 story 57 x 150 ft. hollow tile, brick and steel. About $150,000.

Fla., Jacksonville—Theatre—L. D. Joel plans to build 1 story, 63 x 105 ft., on West Adams St. About $100,000. Architect not selected.

O., Akron—Hotel and Theatre—Seiberling Hotel Co. having preliminary plans prepared by G. B. Post & Sons, archts., 1109 Schofield Bldg., for 20 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $5,000,000.

O., Bexley—School—Bd. Educ. having plans prepared by O. D. Howard, archt., 8 East Broad St., Columbus, for 2 story, 80 x 125 ft., concrete and brick, on Main St. About $200,000.

O., Brookville—School—Bd. Educ. plans to build brick and rein.-con. school, rein.-con flooring, concrete foundation. J. A. Maysilles, supt. Bonds for $250,000 voted for project.

Buildings (Continued)

O., Cleveland—Church—St. Mathews Church, 1421 East 81st St., plans to build 1 story, brick, steel and stone, brick foundation. About $75,000. Architect not selected.

O., Cleveland—Commercial—De Klyn Co., 5809 Euclid Ave., plans to remodel 1 story, 66 x 90 ft., brick, steel and marble, at 1706 Euclid Ave. About $50,000. J. DeKlyn, pres. Architect not selected.

O., Cleveland—Commercial—C. G. Hale, 340 Leader News Bldg., plans to build 5 story, rein.-con., brick and steel, concrete foundation, on Superior Ave. near East 12th St. About $150,000. Architect's name withheld.

O., Cleveland — Commercial — H. M. Strauss, 820 Natl. City Bldg., plans to build rein.-con., brick and steel, rein.-con. flooring, concrete foundation, at 6520 Euclid Ave. About $100,000. Architect not selected.

O., Cleveland — Commercial — Windsor Constr. Co., Swetland Bldg., having plans prepared and soon receives bids building 3 story, 60 x 170 ft., brick, steel, concrete and terra cotta, rein.-con. flooring, brick and concrete foundation, on Superior Ave. and East 12th St. About $75,000. Best & Hoeflar, Vickers Bldg., archts.

O., Cleveland—Commercial and Theatre—S. W. Manheim & Co., 719 Natl. City Bldg., plans to build rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on East 125th St. and Superior Ave. About $100,000. Architect not selected.

O., Cleveland—Office and Club—International Ladies' Garment Workers Union, 305 Superior Bldg., plans to build 5 story, rein.-con., brick and steel, brick and concrete foundation, on Superior Ave. About $100,000. M. Parlstein, chn. Architect not selected.

O., Cleveland — Sales, etc. — Guarantee Bldg. Co., Union Bldg., soon lets contract building 4 story, 60 x 150 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on East 65th St. and Prospect Ave. About $150,000. Noted Feb. 26.

O., Cleveland—School—Bd. Educ. having plans prepared by W. R. McCormack, archt., East 6th St. and Rockwell Ave., for 1 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Parkgate Ave. About $500,000.

O., Cleveland — Theatre and Store — M. Froelich, 1807 East 82d St., having plans prepared by G. Steffens, archt., Williamson Bldg., for 1 story, 40 x 150 ft., brick and steel, brick foundation, on East 152d St. and St. Clair Ave. About $50,000.

O., Columbus—Office—R. L. Wirtz, 2080 Iuka Ave., having plans prepared by E. E. Pruitt, archt., No. 209 South High St., for 4 story, 62 x 131 ft., concrete, steel and brick, on East State St. About $250,000.

O., Columbus — School — Bd. Educ. soon lets contract building 2 story, irregular shaped, concrete and brick. About $165,000. D. Riebel & Sons, New 1st Natl. Bank Bldg., archts. Noted Jan. 22.

O., Dayton—Clubhouse—Miami Golf Club having plans prepared by Schenk & Williams, archts., Mutual Home Bldg., for 2 story, brick, steel and stucco, concrete foundation, on Kidder Estate. About $150,000.

O., Dayton—Hospitals—Dist. Tuberculosis Hospital, c/o Comrs. Montgomery Co. plans to construct 2 story, 50 x 90 ft. administration building, brick and steel, also children's hospital, frame, for Montgomery Co. About $75,000. H. W. Germann, 1100 Schwind Bldg., archt.

O., Dayton — Sales — See "Industrial Works."

O., Hamilton—Lodge—Hamilton Lodge of Knights of Pythias, Main St., having plans prepared for remodeling and building concrete and brick addition. About $50,000.

O., Lafferty—School—Bd. Educ. having plans prepared by F. S. Rusk, archt., 16 South 3rd St., Columbus, for 2 story, 50 x 80 ft., concrete and brick, here. About $70,000.

O., Massillon—Commercial—C. P. L. McLain having plans prepared by Albrecht, Wilhelm & Kelly, archts., Union Bldg., Cleveland, for 2 story, 40 x 130 ft., brick, concrete and steel, rein.-con. flooring, brick and concrete foundation. About $60,000.

O., Massillon—School—Bd. Educ. having plans prepared by Albrecht, Wilhelm & Kelly, archts., Union Bldg., Cleveland, for 2 story, 76 x 80 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on State St. About $100,000.

SUBWAY AND APPROACHES—DETROIT, MICH.

Bids were received Feb. 7, by city, for constructing subway section of Detroit approach to Belle Isle Bridge from (A) Candler Dock & Dredge Co., 305 Moffit Bldg., (awarded contract); (B) T. E. Currie, 20 McGraw Bldg.; (C) Peckham Constr. Co.; (D) Marble Palma Co., 368 Monroe St., $419,240. The unit bids of the lowest 3 bidders were as follows:

	A	B	C
25,000 cu.yd. all dry excavation except for footings	$2.40	$2.35	$3.00
2,300 cu.yd. all dry excavation for footings	3.80	2.75	3 50
100 cu.yd. wet excavation	6 00	3.00	5.50
Constructing and maintaining temporary trestle (lump sum)	25,500 00	39,000.00	40,000 00
Alteration to public sewer (lump sum)	5,000 00	2,500.00	3,000 00
Drainage system (lump sum)	23,700 00	11,053.00	11,000 00
16 catch basins	100.00	60.00	60 00
5 manholes	300 00	210.00	150.00
10,000 lin.ft. concrete piles	2.90	2.50	2 67
700 lin.ft. wood piles	.75	90	80
1,600 cu.yd. concrete for all footings under approach wall and anchor walls	16 00	11 00	13.00
120 cu.yd. concrete in 4-in. slab protecting waterproofing	30.00	35.00	28.00
400 cu.yd. concrete for footings under columns	16.75	12.00	14 00
1,850 cu.yd. concrete in columns, floor slabs, longitudinal and transverse girders and anchor walls	20.10	29 00	22.00
1,100 cu.yd. concrete in approach retaining walls	20.75	25 00	22.00
1,800 lin.ft. concrete parapet wall around ramp, including coping on walls	9.10	8 60	9.00
230 lin.ft. concrete parapet wall around stairway openings	10.00	6.00	6 00
7,100 sq.ft. floor in foot passageways in subway	.30	35	.50
180,000 lb. reinforcing steel, 1¼ in. and over	.06	072	.075
220,000 lb. reinforcing steel under ¾ in	.06	.073	.08
45,000 lb. structural steel	.075	.08	.075
Electrical conduits, outlet, junction boxes, etc. (lump sum)	6,000.00	3,000 00	2,978.00
Concrete treads and risers of stairways (lump sum)	1,500.00	944.00	2,000 00
25,000 sq.ft. fabric waterproofing	.30	21	.20
17,000 sq.ft. waterproofing two-brush coats	.05	.08	.08
32,000 sq.ft. rubbing exposed concrete surface	.03	.12	.06
20 concrete lamp posts	25.00	75.00	50.00
Iron guard rail in subway and galvanized pipe rail on stairs (lump sum)	4,000 00	7,800.00	9,000.00
2,200 lin.ft. concrete curbing "A"	1.00	1.00	1.00
2,100 lin.ft. concrete curbing "B"	3.00	1.65	1.50
2,100 lin.ft. concrete curbing "C"	2.00	1 75	2.00
12,000 sq.yd. concrete paving base	2.21	2.70	2.50
200 lin.ft. taking up, redressing and resetting curb stone	2.00	1 05	1.00
Extended totals	$360,190	$370,987	$380,483

O., Massillon—School—Bd. Educ. having plans prepared by Albrecht, Wilhelm & Kelly, archts., Union Bldg., Cleveland, for 76 x 90 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on Cherry St. About $100,000.

O., Middletown—Chamber Commerce—Middletown Chamber Commerce plans to build 2 story, 50 x 160 ft., rein.-con., stone and terra cotta, rein.-con. flooring, concrete foundation, on Main St. About $150,000. D. E. Smith, secy. Architect not selected.

O., Orrville—School—Bd. Educ. having plans prepared by O. D. Howard, archt., 8 East Broad St., Columbus, for 2 story, 75 x 125 ft., concrete and brick. About $200,000.

O., Painesville—School—Bd. Educ. having plans prepared by P. W. Bates, archt., Natl. Bank Bldg., Wheeling, W. Va., for 2 story, brick, steel and concrete. About $200,000.

O., Seville—Bank—Seville Savings Bank Co. soon receives bids for 1 story, 24 x 53 ft., concrete, brick and steel, brick foundation. About $50,000. R. H. Hinsdale, Bangor Bldg., Cleveland, archt.

O., West Park — Church — Cleveland Deciples congregation having plans prepared by C. E. Towsley, archt., 4500 Euclid Ave., for 1 story, 50 x 82 ft., brick and stone, brick foundation, on West 119th St. and Lorain Ave. About $50,000.

O., Willoughby—School—Bd. Educ. having plans prepared by P. W. Bates, archt., Natl. Bank Bldg., Wheeling, W. Va., for 2 story, brick, steel and concrete. About $125,000.

Ind., Indianapolis — Church—First Baptist Church, Mermont and Meridian Sts., plans to build 1 story brick and timber. About $50,000. W. H. Garns, 818 Fletcher Bldg., archt.

Ind., Lake Wawasee — Hotel—Wawasee Inn Hotel Co. having plans prepared by A. M. Strauss, archts., 705 Shoaff Bldg., Ft. Wayne, for 2 story, 80 x 220 ft. stucco and frame, tile and wood flooring. About $150,000.

Mich., Detroit — Bank — Central Savings Bank, Majestic Bldg., soon lets contract constructing 2 story, 40 x 66 ft., concrete, brick and steel, concrete flooring and foundation, on Gratiot and Jos. Campau Aves. About $50,000. L. Kamper, Book Bldg., archt.

Mich., Kalamazoo—Sales and Service—Moulton & Dalgleish, West Main St., had plans prepared by C. A. Fairchild & Sons, archts., 150 South Burdick St., for 2 story, 70 x 100 ft., brick, steel and stone, rein.-con. flooring, concrete foundation, on West Main St.

Mich., Lansing—School—State Bd. Educ. having plans prepared by York & Sawyer, archts. and engrs., 50 East 41st St., New York City, for 1, 2, 3 and 5 story industrial school buildings, brick, steel and stone, brick foundation. About $3,000,000.

Mich., Napoleon—School—L. G. Palmer, secy. Bd. Educ., soon lets contract building 2 story, brick and steel, brick foundation. About $75,000. L. H. Field, Jr., S. H. Camp Bldg., Jackson, archt.

Mich., Port Huron—Hospital—City plans to build 2 or 3 story, rein.-con., brick and steel, concrete foundation, on Kearney and Stone Sts. About $125,000. Architect not selected.

Mich., River Rouge—School—Bd. Educ. having plans prepared by VanLeyen, Schilling & Keough, archts. and engrs., Union Trust Bldg., Detroit, for 3 story, rein.-con. brick and steel, rein.-con. flooring, concrete foundation, on Dearborn Rd. About $750,000.

Ill., Chicago—College—Armour Institute of Technology, 3300 Federal St., acquired 80 acre site on 75th St. and Yates Ave., and plans to construct a group of buildings. Cost about $5,000,000.

Ill., Cragin (Chicago P. O.)—School—St. Stanislaus congregation, 2312 North Lorel Ave., Chicago, having plans prepared by E. Brielmaier & Sons Co., archts., University Bldg., Milwaukee, Wis., for 2 story, concrete and brick, rein.-con. flooring, concrete foundation, here. About $60,000.

Ill., East St. Louis — Theatre — Erco Amusement Co. plans to build 95 x 150 ft. theatre on State and Collinsville Aves. About $125,000. Address J. Erber, Erber Theatre, pres. Architect not selected.

Ill., Rockford—Office—Brown Bldg. Corp., South Main and Chestnut Sts., plans to build 6 story, 66 x 156 ft., rein.-con. and brick, on South Main St. About $200,000

Wis., Granville — Church and School — Herbst & Kuenzli, archts., Caswell Blk., Milwaukee, receive bids about March 7, building 1 and 2 story, 50 x 100 ft. and 50 x 112 ft., concrete and stone, rein.-con. flooring concrete foundation, here, for St. Catharine Catholic Church, Route 11, North Milwaukee. R. Bertram, pastor.

Wis., Milwaukee — Bank — Amer. Exch. Bank, Plankinton Arcade, having plans prepared by Kirchoff & Rose, archts., Majestic Bldg., for 2 story, 40 x 90 ft., brick and concrete, rein.-con. flooring, concrete foundation, on 5th Ave. and Mitchell St. About $75,000.

Wis., Milwaukee—Bank and Office—Amer. Exch. Bank, Plankinton Arcade, plans to build 12 story, brick and concrete, rein.-con flooring, concrete foundation, on Grand Ave Kirchhoff & Rose, Majestic Bldg., archts

Wis., Ohkosh—Church—Auler & Jensen, archts., F. R. A. Bldg., soon let contract building 50 x 100 ft., brick and tile, con-

Buildings (Continued)

crete foundation, for 1st English Lutheran Church, 606 11th St. About $60,000.

Wis., Richland Center—Bank—First Natl. Bank having prepared by A. Moorman & Co., archts., 501 Minnesota St., St. Paul, for 50 x 80 ft., brick and stone. About $75,000. C. T. Thompson, cashier.

Wis., Sheboygan — High School — City plans to build 3 story, 100 x 150 ft., brick, rein.-con. and steel, brick foundation, on North 9th and Jefferson Sts. About $250,000. Architect not selected.

Wis., Sheboygan—School—City plans to build 4 story, 60 x 200 ft., brick, rein.-con. and steel, brick foundation, on South 12th St. and Union Ave. Cost between $60,000 and $75,000. C. U. Boley, city engr. Architect not selected.

Wis., South Milwaukee—Bath House—A. C. Clas, archt., Colby-Abbot Bldg., Milwaukee, rejected bids received Feb. 13, building 1 story, 100 x 210 ft., concrete and stucco, concrete foundation, here, for Milwaukee Co. Park Bd., 419 East Water St., Milwaukee. About $60,000.

Ia., Belmond—Bank—State Bank of Belmond having plans prepared by A. Moorman & Co., archts., Chamber of Commerce Bldg., St. Paul, Minn., for 1 story, 40 x 50 ft., brick. About $50,000. J. Berg, cashier,

Ia., Newton—Hotel—Newton Hotel Co. plans to build brick hotel, concrete foundation. About $60,000. Architect and engineer not selected.

Ia., Rippey—School—Bd. Educ. having plans prepared by Proudfoot, Bird & Rawson, archts., Hubbell Bldg., Des Moines, for 2 story, 60 x 98 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $80,000.

Ia., Sioux City—Science Hall and Dormitory—Morningside College plans to build brick science hall and dormitory. About $150,000 and $100,000 respectively. Architect and engineer not selected.

Ia., West Branch—School—Bd. Educ. having plans prepared by Proudfoot, Bird & Rawson, archts., Hubbell Bldg., Des Moines, for 2 story, 60 x 125 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $150,000. Noted Jan. 15.

Minn., Birchdale—School—Bd. Educ. having plans prepared by W. P. Torry, archt., Duluth, for 1 story, 32 x 94 ft. with 30 x 36 ft. wing, rein.-con. and brick. About $80,000.

Minn., Buhl—Grade School—Bd. Educ. having plans prepared by A. W. Kerr & Co., archts., Virginia, for a 1 story, 24 x 93 ft. with 23 x 52 ft. wing, rein.-con. About $100,000. M. D. Aygard, supt.

Minn., Kettle River—School—Bd. Educ. having plans prepared by F. A. Schweiger, archt., Moose Lake, for 2 story, 59 x 68 ft., rein.-con. and brick. About $65,000. F. Anderson, clk.

Minn., Mantorville — School — Bd. Educ. having plans prepared by K. T. Snyder, archt., 933 Plymouth Bldg., Minneapolis, for 1 story, 50 x 87 ft., brick and stone. About $50,000. J. F. Martin, clk.

Minn., Minneapolis — Business — Hamm, Hamm Realty Co., 7th and St. Peters Sts., St. Paul, having plans prepared by Toltz, King & Day, archts., 1410 Pioneer Bldg., St. Paul, for 2 story, 110 x 110 ft., rein.-con., on Nicollet Ave. and 10th St. About $180,000.

Minn., Minneapolis — High School — Bd. Educ. having sketches made for 2 story, 225 x 225 ft. rein.-con., on Monroe St., N. About $500,000. Private plans.

Minn., Olivia—High School—Bd. Educ. having plans prepared by W. L. Alban, archt., 347 Endicott Bldg., St. Paul, for 3 story, 63 x 150 ft., brick and rein.-con. About $200,000. G. Peterson, clk.

Minn., Redfield — Bank — Redfield Natl. Bank having sketches made by C. H. Johnston, archt., Capital Life Bldg., St. Paul, for 2 story, 50 x 100 ft., rein.-con., brick and Bedford stone. About $60,000.

Minn., Rochester — Sanatorium — J. E. Crewe, 12 West 4th St., having plans prejared by F. H. Ellerbe, archt., Endicott Bldg., St. Paul, for 3 story, rein.-con. and brick. About $150,000.

Minn., Sacred Heart—High School—Bd. Educ. having plans prepared by W. L. Alban, archt., 347 Endicott Bldg., St. Paul, for 3 story, 60 x 164 ft., rein.-con. and brick. About $160,000. H. Evenson, clk.

Minn., St. Louis Park — Club House —Minneapolis Golf Club, 103 Spruce Pl., soon lets contract building 1 story, 64 x 145 ft. About $75,000. J. A. Hunte, pres. Brown & Fraser, 145 Security Bldg., Minneapolis, archts.

Minn., St. Paul — Hospital — St. Mary's Hospital having plans prepared by F. H. Ellerbe, archt., Endicott Bldg., for 6 story, 45 x 140 ft., rein.-con., brick and hollow tile, on 5th Ave. E. About $200,000.

Minn., Wabasso—School—Bd. Educ. having plans prepared by K. T. Snyder, archt., 933 Plymouth Bldg., Minneapolis, for 2 story, 75 x 90 ft., brick and stone. About $75,000. R. A. Yeistikow, clk.

Minn., Waubun—School—Bd. Educ. having plans prepared by Foss & Foss, archts., St. Cloud, for 2 story, 100 x 100 ft., rein.-con. and brick. About $80,000.

Kan., Atchison—Memorial Hall—Atchison Co. soon lets contract building 2 story, 110 x 160 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation. About $125,000. R. and E. R. Meier, 2526 Jule St., St. Joseph, Mo., archts. Noted Aug. 14.

Kan., Eldorado—Temple—Masonic Order having plans prepared by Washburn & Stookey, archts., Ottawa, for 3 story, 42 x 147 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $75,000.

Kan., Holcomb—School—Bd. Educ. having plans prepared by Mann & Gerow, archts., Hutchinson, for 2 story, 100 x 130 ft., brick, rein.-con. and steel, rein.-con. flooring, brick and concrete foundation. About $125,000.

Neb., Scottsbluff — School — City voted $100,000 bonds to build school. Architect not selected.

S. D., Albee—School—Bd. Educ. having plans prepared by K. T. Snyder, archt., 933 Plymouth Bldg., Minneapolis, for 2 story, 60 x 110 ft., brick and stone. About $70,000.

S. D., Erwin—School—Bd. Educ. having revised plans prepared by K. T. Snyder, archt., 933 Plymouth Bldg., Minneapolis, Minn., for 2 story, 100 x 134 ft., brick and stone. About $150,000.

S. D., Rapid City—Hall—State Bd. Educ., Pierre, having plans prepared by F. H. Ellerbe, archt., Endicott Bldg., St. Paul, Minn., for 3 story, brick and rein.-con., Engineering Hall on College grounds here, for South Dakota School of Mines. About $100,000.

S. D., Sioux Falls—College—Diocesan College having plans prepared by E. S. Lundie, archt., 530 Endicott Bldg., St. Paul, Minn., for college, to include 3 story, 10 room, class building, 2 story dormitory and 1 story gymnasium and power plant; rein.-con., brick and stone. About $500,000.

N. D., Hankinson—School—City voted $75,000 bonds to build school.

Wyo., Casper—Church, etc.—Presbyterian Church having plans prepared by Dubois & Goodrich, archts., Townsend Bldg., for brick, steel and rein.-con. church, also manse and garage, on Wolcott St. About $95,000.

Mont., Big Timber—Dormitory—Sweetgrass Co. election April 23, to vote on $60,000 bonds to dormitory for high school. Architect not selected.

Mont., Bozeman — High School—City voted $60,000 bonds to repair Hawthorne, Irving and Longfellow Schools and build auditorium and gymnasium at Emerson School. F. F. Willson, Owenhouse Bldg., archt. Noted Feb. 12.

Mont., Missoula — Grade Schools—City election April 3, to vote on $205,000 bonds to build grade schools to replace Willard and Whittier Schools and new one in southeastern part of city. About $60,000 each and $25,000 for new site. Architect not selected.

Mont., St. Ignatius — Grade Schools — School Dist. 28 election April 23, to vote on $100,000 bonds to build two 2 story, 8 room, brick grade schools. J. Hanson, Ronan, supt. Architect not selected.

Mo., Fulton—Academy-Holmes & Flinn, archts., 8 South Dearborn St., receives bids in March, building 3 story, 65 x 140 ft., brick and timber, concrete foundation, for William Woods College. About $125,000.

Mo., Marceline—Temple and Bank—Masonic Bldg. Co. soon lets contract constructing 3 story, 50 x 120 ft., concrete, steel and brick, concrete foundation About $60,000. J. O. Hogg, New York Life Bldg., Kansas City, archt.

Mo., St. Louis—Home—Central Baptist Church, Taylor Ave. and Westminster Pl., plans to build home, on Grand Ave. and Delmar Blvd. About $250,000. Address W. L. Bohnenkampf, Bd. Deacons, Central Church.

Mo., St. Louis—Hotel—Catherine Springer Home for Girls, 417 Locust St., conducting capaign to raise $300,000 to build hotel for working girls. About $160,000 now available for project. Address W. R. Chivvis.

Mo., St. Louis—Hotels—Y. W. C. A., 1411 Locust St., conducting campaign to raise $500,000 to build 2 hotels for working girls, one in western section of city and the other in downtown district. Cost $250,000 each; $325,000 now available. Address W. K. Bixby, Kingshighway and Lindell Blvd.

Mo., St. Louis—Mercantile—J. A. Hutchinson, 712 Olive St., plans to build 3 story, 80 x 139 ft., on Locust St. and Ewing Ave. About $125,000. Architect not selected.

Okla., Altus—Auditorium and City Hall—City having plans prepared by Hawk & Parr, archts. and engrs., 501 Security Bldg., Oklahoma, for auditorium and city hall About $50,000.

Okla., Altus — Hospital — City having plans prepared by Hawk & Parr, archts., 501 Security Bldg., Oklahoma, for hospital. Bonds for $50,000 voted for project.

Okla., Anadarko—School—Bd. Educ. having plans prepared by Tonini & Bramblett, archts., Terminal Bldg., Oklahoma, for 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $125,000.

Okla., Norman — Chapter House—Phi Gamma Delta Fraternity of University of Oklahoma plans to build chapter house on university campus. About $75,000. Engineer and architect not selected.

Okla., Oklahoma—Station—City election soon to vote on $750,000 bonds to build union station to accommodate all railways entering here. Architect and engineer not selected.

Okla., Pawhuska—Hotel—Admiral Bldg. Co. plans to construct 200-room hotel. About $75,000. Architect will be selected soon.

Okla., Tulsa — High School — City voted $850,000 bonds to construct addition to high school and 5 new school buildings. Architect and engineer not selected.

Nev., Lovelock — School — School Dist. having plans prepared by G. C. Sellon & Co., archts., 1005 8th St., Sacramento, Cal., for 1 story, brick. About $65,000.

Wash., Mount Vernon—Sales—R. W. Stevens plans to build 1 story, 48 x 100 ft., tile and concrete. About $50,000. Private plans. Mitchell-Grant Agency, lessee.

Wash., Pasco — Hospital — Sisters of St. Joseph plan to build 4 story, fireproof hospital. About $150,000. Beezer Bros., Seaboard Bldg., Seattle, archts.

Ore., Albany—Community Center—Linn Co. plans to build 2 story, brick or concrete, to include swimming tank, library and gymnasium. About $50,000. Architect not selected.

Ore., Bend — Theatre — O'Donnell Bros., Roseburg, plan to build 2 story, 50 x 135 ft., brick (1,500 seating capacity), 26 x 28 ft. lobby and 30 x 30 ft. stage, here. About $50,000. L. A. Thomas, archt.

Ore., Pendleton—Theater and Store—Pendleton Amusement Co. soon receives bids building 2 story, 100 x 100 ft., brick, cast stone and concrete. About $90,000. Rasmussen-Grace Co., Bates Dock Bldg., Portland, archts.

Ore., Portland—Courthouse—Multnomah Co. plans to construct 1 story, stone and marble annex, adjoining present building. About $100,000. M. H. Whitehouse, Ry. Exch. Bldg., archt.

Ore., Prineville — Office — See "Excavation and Dredging."

Ore., Salem — Hospital — Bldg. Comn. Deaconess Hospital plans to construct 2 or 3 story, 120 x 136 ft., brick, adjoining present building, on Oak and Winter Sts About $50,000. F. B. Wedtl, pres. Private plans.

Cal., Calistoga — School — Trusteees retained N. R. Coulter, archt., 46 Kearney St., San Francisco, to prepare plans for 1 story, rein.-con. About $75,000.

Cal., Chico—Hospital—N. T. Enloe soon receives bids building 3 story, concrete and timber, concrete foundation. About $75,000. C. Cole, Waterland-Breslauer Bldg., archt. Noted Feb. 19.

Cal., Dinuba—High School—Town voted $120,000 bonds to construct rein.-con. and brick, concrete foundation, to include manual training and domestic science building. Architect not selected.

Cal., Lincoln—School—City plans to build grade school. Bonds for $50,000 voted for project. Architect not selected.

Cal., Los Angeles — Bank and Offices — Security Trust & Savings Bank, 5th and Spring Sts., having plans prepared by J. Parkinson, archt., 420 Title Insurance Bldg., for 3 story, 95 x 105 ft., concrete,

Buildings (Continued)

brick and terra cotta, concrete foundation, on Hollywood Blvd. Cost to exceed $50,000.

Cal., Napa—Theatre and store—J. Knox et al, having plans prepared by Reid Bros., archts., 105 Montgomery St., San Francisco, for 1 story, brick and concrete, here. About $90,000.

Cal., Redding—School—School Dist. having plans prepared by G. C. Sellon & Co., archts., Mitau Bldg., Sacramento, for school. Election soon to vote on $100,000 bonds for project.

Cal., Redlands—Dormitory, etc.—Redlands University retained N. F. Marsh, archt., 211 Bway. Central Bldg., Los Angeles, for 2 story, rein.-con. dormitory and 2 smaller buildings, concrete foundation, on campus. About $120,000.

Cal., Riverside—City Hall—City election April 6 to vote on $200,000 bonds to build city hall. Preliminary estimates prepared by A. Braunschweiger, city engr., and G. S. Wilson, archt., Virginia Bldg.

Cal., San Francisco—Office — McDermott Estate, c/o B. G. McDougall, archt., 381 Bush St., having plans prepared for 2 story, concrete and brick, concrete foundation, on Battery and Halleck Sts. About $125,000.

Cal., San Francisco—Sales—H. O. Harrison Co., 1200 Van Ness Ave., plans to construct 4 or 5 story, 120 x 275 ft., on Polk and O'Farrell Sts. Architect not selected.

Cal., Vallejo—Schools—City election May 1 to vote on $500,000 bonds to build high school and 4 elementary schools.

Cal., Willows — Hotel — Willows Impvt., Co., c/o G. L. Briggs, having plans prepared by A. Moore, archt., Kohl Bldg., San Francisco, for 4 story, brick and stone, concrete foundation, on Butte and Walnut Sts. About $215,000.

Que., Quebec—Commercial—C. J. Lockwell, 35 St. Peter St., having plans prepared by J. A. Morrissette, archt., 60 Mountain Hill, for 4 story, 64 x 86 ft., brick and steel, on Crown and N. D. Des Enges Sts.; also one 3 story, 58 x 80 ft., brick and steel, on St. John St.

Ont., Ottawa — Hospital — City plans to build addition to hospital, on Templeman St. About $50,000. A. F. Macullum, city engr. Architect not selected.

BIDS DESIRED

Me., Thomaston—Dining Hall and Kitchen —Until March 31, by F. J. Ham, state warden, Augusta, building 2 story, 40 x 240 ft., brick and concrete, rein.-con. flooring, brick and concrete foundation, at State Prison, here. About $50,000. Bunker & Savage, Augusta Trust Bldg., Augusta, archts. and engrs.

Mass., Belmont—School—Until March 6, by School Comn., building 3 story, 72 x 86 ft., brick and steel, concrete foundation. About $75,000. H. T. Underwood, 46 Cornhill St., Boston, archt.

R. I., Providence—Hotel—Until April 1, by Warren & Wetmore, archts., 16 East 47th St., New York City, building 19 story, brick, steel and stone, on Dorrence and Eddy Sts., here, for J. E. McBowman and L. C. Wallick, Biltmore Hotel, New York City. About $3,000,000. Noted Jan. 15.

N. Y., Brooklyn—School—Until March 12, by C. B. J. Snyder, archt. and engr., Municipal Bldg., New York City, building P. S. 181, 5 story, brick and steel, concrete foundation, on New York Ave. and East 34th St. between Tilden and Snyder Aves., for Bd. Educ., 500 Park Ave., New York City. About $500,000. Noted Feb. 19.

N. Y., Olean—Bank—Until March 15, by Mowbray & Uffinger, archts. and engrs., 56 Liberty St., New York City, building 5 story, brick, steel, stone and marble addition, brick foundation, for Exch. Natl. Bank.

Pa., Ellwood City—School—Until March 16, by W. J. Moore, secy. Bd. Educ., Central School Bldg., Lawrence Ave., constructing school:—general building construction, Contr. 832, plumbing, Contr. 832-M, Div. P, heating (steam plenum system), Contr. 832-M, Div. H., electric installation, Contr. 832-M, Div. E. E. Stotz, 213 6th Ave., Pittsburgh, archt.

Pa., Scranton—School—Until March 11, by W. Scranton, Monroe and Linden Sts., building 1 story, 85 x 185 ft., brick, timber and stucco, private school, rock foundation, on Clay Ave. and Poplar St. About $100,000. E. H. Davis and W. G. D. Lewis, Union Bank Bldg., archts.

Pa., Steelton—Laboratory—C. P. Turner, ch. engr. Bethlehem Steel Co., receiving bids building 2 story, 50 x 100 ft., brick and concrete. Cost to exceed $50,000. Bisgel & Sinkler, Otis Bldg., Phila., archts.

Ala., Tuscaloosa—School—Until March 15, by Bd. Educ., building 2 story, 75 x 120 ft., on University grounds. About $80,000. D. O. Whilldin, Title Bldg., Birmingham, archt.

O., Marion—School—Until March 29, by Bd. Educ., building 2 story, 70 x 90 ft., concrete and brick, on Grand Ave. About $100,000. H. J. Merchant, clk. O. D. Howard, 8 East Broad St., Columbus, archt.

Mich., Big Rapids—Gymnasium—Until March 10, by W. H. Rowe, secy. Bd. Educ., building 2 story, 60 x 90 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation, to include concrete swimming pool. About $50,000. Robinson & Campau, 715 Michigan Trust Bldg., Grand Rapids, archts.

Mich., Detroit—Office See "Industrial Works."

Mich., Detroit—Theatre—Until March 8, by I. M. Lewis, archt., Congress Bldg., for 2 story, 50 x 120 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Livingston and Hasting Sts., for E. Baron, Hastings St. About $60,000.

Mich., Flint—School—Until March 10, by Van Leyen, Schilling & Keough, archts. and engrs., Union Trust Bldg., for 2 story, 62 x 245 ft., rein.-con., brick and steel, concrete foundation, for St. Michaels Parish, 6th St. About $250,000.

Mich., Ford City (Wyandotte P. O.)—High School—Until March 10, by W. B. Bearendt, secy. Bd. Educ. Dist. 1, building 2 story, 129 x 148 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Main St. About $200,000. J. G. Kastler & Co., 523 Chamber of Commerce, Detroit, archts.

Ill., Rockford—Office—Until April 1, by Welfley & Eliel, archts., Stewart Bldg., for 8 story, 66 x 150 ft., rein.-con. and brick, rein.-con. flooring, on North Main St., for Phoenix Bldg. Corp., Brown Bldg. About $450,000.

Wis., Menasha — High School — Until March 18, by Bd. Educ., building 2 story, 65 x 90 ft. and 60 x 100 ft. additions, brick and concrete, rein.-con. flooring, concrete flooring. About $200,000. Van Ryn & De Gelleke, Caswell Blk., Milwaukee, archts.

Wis., Milwaukee — Business — Leiser & Holst, archts., Brumder Bldg., receiving bids building 2 story, 50 x 150 ft., brick and concrete, rein.-con. flooring, concrete foundation, for C. Schefft & Sons, 849 3rd St. About $50,000.

Wis., Racine — Bank and Office — Until March 8, by Racine City Bank, 1106 14th St., building 2 story, 40 x 90 ft., brick and concrete, rein.-con flooring, concrete foundation. About $80,000. Van Ryn & De Gelleke, Caswell Blk., Milwaukee, archts. Noted June 5.

Wis., Spooner—School—Until March 17, by Bd. Educ., building 2 story, 60 x 134 ft., stone. About $75,000. W. C Crocker, clk. W. L. Alban, 347 Endicott Bldg., St. Paul, archt.

Ia., Cushing—School—Until March 16, by Bd. Educ., building 2 story, rein.-con., brick and stone, concrete foundation. About $80,000. W. E. Hulse Co., Inc., 210 Masonic Temple, Des Moines, archts.

Ia., Glidden—School—Until March 15, by Bd. Educ., building 2 story, 76 x 162 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $140,000. W. Gordon, Hubbell Bldg, Des Moines, archt.

Ia., Lake Park—Bank—Until March 15, by Lake Park State Bank, building 1 story, 31 x 91 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $55,000. W. J. Brown, Amer. Trust Bldg., Cedar Rapids, archt. Noted Jan. 29.

Minn., Cass Lake—High School—Until March 12, by Bd. Educ., building 2 story, 86 x 130 ft., rein.-con. and brick. About $100,000. D. V. Wardner, clk. E. F. Broomhall, Alworth Bldg., Duluth, archt.

Minn., Duluth — Office — See "Industrial Works."

Minn., Forest Lake—High School—Until March 21, by Bd. Educ., building 3 story, 80 x 120 ft., brick. About $100,000. Foss & Foss, St. Cloud, archts.

Minn., Lafayette—School—Until April 1, by F. V. Quist, clk. Bd. Educ., building 1 story, 60 x 80 ft. brick and stone. About $50,000. K. T. Synder, 933 Plymouth Bldg., Minneapolis, archt.

Minn., Nashwauk — High School — Until March 20, by R. M. Blackburn, clk. Bd. Educ., building 3 story, 160 x 174 ft., rein.-con., brick and tile, rein.-con. flooring, concrete foundation. About $400,000. W. T. Bray, Torrey Bldg., Duluth, engr.

Minn., St. Cloud — Court House — Until March 25, by N. Thomey, aud. Stearnes Co., building 4 story, 100 x 140 ft. rein.-con., graphite and marble. About $600,000. Toltz, King & Day, 1410 Pioneeer Bldg., St. Paul, archts.

Minn., Waubun—School—Until March 30, by Bd. Educ., building 2 story, 100 x 110 ft., brick. About $70,000. Foss & Foss, St. Cloud, archts.

Wyo., Riverton—School—Until April 15, by Dubois & Goodrick, archts., Townsend Bldg., Casper, building 2 story, brick, for Bd. Educ. About $100,000.

Wyo., Wheatland—Temple—Until April 15, by Dubois & Goodrich, archts., Townsend Bldg., Casper, building 2 story, 50 x 140 ft., brick, for Masonic Lodge. About $60,000.

Tex., Arlington—Art—Until March 8, by Bd. Dir., Agricultural and Mechanical College of Texas, College Station, constructing mechanics arts building, for Grubbs Vocational College, here. About $60,000. W. B. Bizzell, pres. Noted Aug. 21.

Tex., Denison—Until March 31, by Bd. Dirs. and Bldg. Com. Y. M. C. A., constructing 3 story building. J. E. Morris, secy.

N. M., Gallup—Schools—Until March 23, by W. R. Cregar, clk. Bd. Educ., building high school and 5 room grammar school, rein.-con. and brick, rein.-con. flooring, concrete foundation. About $140,000 available for both. C. L. Wilson, 207 Amer. Natl. Bank Bldg., Monrovia, Cal., archt. Noted Feb. 19.

Cal., Fresno—High School—Until April 8, by Bd. Educ., constructing group of buildings for high school, brick and rein.-con., rein.-con. flooring, concrete foundation. About $1,200,000. Segregated bids wanted for various portions of work. Noted July 24.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Vt., Lunenburg — Housing — Fitzdale Paper Co., Fitzdale, will construct seventy-five 2 story, wood houses and recreation buildings for workmen, brick and concrete foundation, here. About $400,000. Work will be done by day labor.

★Mass., Boston—Theatres—Loews Theaters, Inc., 1493 Bway., New York City, let contract building 3 story, 180 x 200 ft., brick and concrete, rein.-con. flooring, rock foundation, on Massachusetts Ave., here, to Fleischman Co., 531 7th Ave., New York City. About $1,500,000.

★Mass., Framingham.—Theatre—St. George Theatre, c/o Blackall, Clapp & Whittemore, archts., 20 Beacon St., Boston, let masonry contract building 2 story, 145 x 200 ft., brick and concrete, rein.-con. flooring, concrete foundation, on Concord St., to G. C. Irwin & Co., 94 West Brookline St., carpentry work, to Churchill Co., 143 Harrison Ave. Both contractors of Boston. About $300,000. Noted Feb. 26

★R. I., Woonsocket — Housing — Nyanza Mills, 159 Singleton St., let contract building twenty-five 2 story, frame houses for workmen, concrete and rock foundation, to Eastern Constr. Co., 660 Winter St. About $100,000. Noted Feb. 19.

★Conn., West Hartford (Hartford P. O.) —School—I. A. Allen, Jr., archt., 904 Main St., Hartford, let contract to Portens-Walker Co., 13 Forest St., Hartford, constructing group of school buildings, brick, steel and stone, rein.-con. flooring, concrete foundation, on North Main St., here, for Amer. School for Deaf, 65 Garden St., Hartford. About $350,000. Noted Jan. 29.

★N. Y., Brooklyn—Hospital—Israel Hospital, Inc., 1246-42nd St., will build 3 story, 115 x 180 ft., brick and steel, brick foundation, at 4801-10th Ave. About $410,000. Work will be done by day labor.

★N. Y., Coney Island—Theatre—G. Gordon, care of McCarthy & Kelly, archts. and engrs., 16 Court St. Brooklyn, will build 1 story, 80 x 114 ft., brick and steel, brick foundation, on 31st St. and Surf Ave., here. About $125,000. Work will be done by day labor.

★N. Y., Johnson City—School—Bd. Educ. let general contract building Theodore Roosevelt School, on Floral Ave. and Elizabeth St., to Mitchell & Co., O'Neil Bldg., Binghamton, $238,900; heating and ventilating to M. E. Lewis, 79 State St., Binghamton, $31,906; plumbing, to Cunningham & Utley, Johnson City, $22,985; general electrical wiring, to Blanding Electric Co., 141 State St., Binghampton, $8,200. Election March 30, to vote on $120,000 additional bonds.

★N. Y., New York—Office and Loft—Circle Concrete Co., 570 5th Ave., will build 18 story, 60 x 100 ft., brick, concrete and steel, concrete foundation, at 49-53 West 15th St. About $500,000. Work will be done by day labor

Buildings (Continued)

★**N. Y., New York** — Office — C. Platon Realty Corp., c/o Shape, Bready & Peterkin, archts. and engrs., 220 West 42d St., let contract building 12 story, 70 x 75 ft., brick, steel and stone, concrete foundation, on Broad and Front Sts., to C. L. Frazer, 103 Park Ave.

★**N. Y., New York**—Stores—J. J. Healy, Columbus Ave. and 66th St., will build ten 1 story, brick and steel, brick foundation, on Amsterdam Ave. between 147th and 148th Sts. About $80,000. Work will be done by day labor.

★**N. J., East Orange**—Bank—Savings & Investment Trust Co., 15 South Orange Ave., let contract building 2 story, 65 x 135 ft., brick and stone, concrete foundation, to R. A. Howie, Newark. About $150,000; cost plus percentage basis.

★**N. J., Plainfield**—Y. M. C. A., 2 West 45th St., New York City, let contract building 3 story, brick and steel, here, to C. Flocken, 681 Newark Ave., Elizabeth. Noted Jan. 1.

★**Pa., McKeesport**—Y. M. C. A., 2 West 45th St., New York City, let contract building 4 story, 112 x 170 ft., brick and steel, brick foundation, on Sinclair and Ringold Sts., to Schultz, Schreiner & Clyde, May Bldg., Pittsburgh.

★**Pa., Phila.**—Bank—Kensington Natl. Bank, Frankford Ave. and Girard St., let contract building 3 story, 35 x 50 ft., brick addition, to A. R. Raff, 1635 Thompson St. About $75,000.

Pa., Phila.—Loft—A. J. Sauer & Co., archts. and engrs., Denckla Bldg., received bids building 6 story, 54 x 112 ft., brick and concrete, on Florist and 13th Sts., from F. G. Stewart, 1619 Sansom St., M. Melody & Son, 1645 North Broad St. and Cramp & Co., Denckla Bldg. Owner's name and amount of bid withheld.

★**Pa., Scranton** — Store and Office — C. Ball, Lackawanna Ave., let contract building 3 story, 50 x 70 ft., brick and timber, rock foundation, on Adams Ave., to E. A. Fuller Co., 1616 Dickson Ave. About $51,000.

★**Md., Baltimore**—School—St. Martin's Catholic Church, Fayette St. and Fulton Ave., let contract building 3 story, 78 x 80 ft., concrete, steel and brick, stone and concrete foundation, to Frainie Bros. & Haigley, 18 Clay St. About $100,000. Noted Feb. 5.

★**Md., Baltimore** — Theatre — Pearce & Schech, 218 East Lexington St., let contract building 1 and 2 story, 45 x 150 ft., brick, stone foundation, on South Bway., to L. Schoenlein, 2217 Baltimore St. About $50,000; cost plus percentage basis.

★**Md., Hagerstown**—Y. M. C. A. will build 4 story, 81 x 174 ft., concrete, steel and brick, concrete foundation. About $200,000. Work will be done by day labor. Former bids rejected. Noted Jan. 8.

★**Md., Westminster**—Chapel and Dormitory—Westminster Theological Seminary let contract building 3 story, 48 x 105 ft., brick, stone foundation, to C. Hunter, Court St. About $50,000; cost plus percentage basis.

★**N. C., Hickory**—Office—City let contract building 2 story, to Elliott Bldg. Co., Hickory. About $118,000.

★**Ga., Atlanta**—Store—F. and G. Adair, Healey Bldg., let contract building 3 story, 62 x 90 ft., brick and timber, on Forsyth St., to Miles & Bradt, 4th Natl. Bank Bldg. About $70,000. Work will be done by day labor.

★**Ga., Blythe**—School—Bd. Educ. let contract building 2 story, 75 x 88 ft., hollow tile and stucco, to C. H. Van Ormer, Augusta. About $50,000, cost plus basis.

★**La., Jennings**—Schools—City let contract building 3 story, 166 x 224 ft. high school and 2 story, 58 x 73 ft. elementary school, brick and timber, concrete foundations, to Caldwell Bros., New Orleans, $214,500 and $41,500 respectively.

O., Columbus—Hospital—Until March 23, by Richards, McCarthy & Bulford, archts., Hartman Bldg., constructing 4 story, 40 x 200 ft., with 2 wings 20 x 60 ft. and 40 x 150 ft., brick and concrete, on Livingston Ave., for Children's Hospital. About $350,000. F Copeland, pres. Noted Aug. 7.

★**O., Euclid**—School—Hopkins School Assn. let contract building 1 story, 80 x 300 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on Mayfield Rd., to Crowell & Little, Marion Bldg., Cleveland. About $200,000.

Ind., Ft. Wayne—School—Until March 10, by J. C. Collier, business mgr., Bd. Educ. building 2 story, brick, stone and steel, cement flooring, in East End. About $75,000. G. Hahurin, 519 Lincoln Life Bldg., archt.

Ind., Kokomo—School—Until March 8, by O. S. Flora, trustee, Russiaville Twp., building 2 story, brick and concrete, near here. About $50,000. E. E. Dunlap Co., 616 Citizens Bank Bldg., archts.

★**Ill., Chicago**—Hotel—Hotel Sherman Co. let general contract building 3 story, 160 x 180 ft., rein.-con. brick, steel and terra cotta addition, on Clark and Randolph Sts., to J. Griffiths & Sons, 112 West Adams St. About $500,000.

★**Ill., Chicago** — Theatre—Balaban & Katz, 3535 West 12th St., let general contract building 2 story, 170 x 170 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on State and Lake Sts., to W. J. Newman Co., Kilpatrick Ave. and Rice St. About $1,500,000.

★**Ill., East St. Louis**—Hotel—Amer. Hotel Bldg. Corp. let contract building 14 story, 120 x 150 ft., rein.-con., brick and terra cotta, on Missouri Ave. and 5th St., to Selden-Breck Constr. Co, 1932 North Bway., St Louis. About $1,600,000.

★**Ill., Moline** — Bank — Moline Trust & Saving Bank, 15th St. and 5th Ave., let contract building superstructure for 8 story, 54 x 85 ft., rein.-con., brick and steel, rein.-con. flooring, the Bergstedt Constr. Co., Moline. About $236,000.

★**Mich., Birmingham** — Clubhouse — Oakland Hills Country Club let contract building 3 story, (300 compartments), wood construction, concrete foundation, at Oakland Hills, to J. Finn & Son, 2375 Woodward Ave., Detroit. About $350,000.

★**Mich., Detroit**—Commercial—Williams Bros., 322 Woodward Ave., let contract building 4 story, 40 x 120 ft., rein.-con. brick, steel and stone, rein.-con. flooring, concrete foundation, on Woodward Ave., to DeLisle & Cooper, Campau Bldg. Noted Jan. 22.

★**Mich., Detroit**—Office—Sinclair Refining Co., 727 Waterman Ave., let contract building 2 story, 40 x 100 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, to J. Finn & Sons, 2375 Woodward Ave. About $50,000.

Mich., Detroit—School—Until March 10, by C. A. Gadd, secy. Bd. Educ., 50 Bway., building 2 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on St. Antoine St. between Palmer and Ferry Aves. About $200,000. Malcolmson, Higginbotham & Palmer, 405 Moat Bldg., archts.

★**Mich., Ferndale** (Royal Oak P. O.)—School—Dist. 9, Royal Oak Twp., let contract building 2 story, rein.-con., brick and steel, concrete foundation, on Woodward Ave. and Nine Mile Rd., to M. B. Hungerford, Pontiac. About $90,000; cost plus fee of $7,000.

★**Mich., Grand Rapids**—Theatre—Regent Theatre Co., Bond St., will build 3 story, 100 x 100 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Crescent and Bond Sts., to include roof garden, 90 ft. high. About $300,000. Work will be done by day labor under supervision of G. M. Lindsey & Co., engrs., 2321 Dime Bank Bldg., Detroit,

Mich., Muskegon — Hotel — Occidental Hotel Co., Weston Ave. and 3rd St., let general contract building 8 story, 54 x 140 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, to Strom-Johnson Constr. Co., Grand Rapids. About $200,000. Noted Jan. 29.

★**Mich., Owosso**—Hospital—City let contract building 2 story, brick, concrete and steel, concrete foundation, on West King St., to C. H. Mailiskey & Son, Owosso, $127,264. Noted Feb. 5.

★**Wis., Eau Claire**—Church—First Congregational Church let contract building 1 story, concrete foundation, on 3rd St. and Bway., to Hoeppner-Bartlett Co., 414 Grand Ave., E. About $150,000. Noted May 22.

★**Wis., Milwaukee**—Sales, etc.—Wisconsin State Rubber Co., 181 4th St., let masonry contract for 3 story, 50 x 100 ft., brick and concrete, rein.-con. flooring, concrete foundation, on 4th St., to E. Grether, 1121 2nd St., concrete, to T. Stark & Co., 217 West Water St. Total cost, $75,000. Noted Feb. 19.

★**Wis., Milwaukee** — School — Herbst & Kuenzli, archts., Caswell Blk., let contract to E. Steigerwald & Sons, 2303 Galena St., building 2 story, 80 x 100 ft., brick and concrete, rein.-con. flooring, concrete foundation, on 4th Ave. and Maple St., for St. Anthony's Catholic Church. About $90,000. Noted Feb. 12.

★**Wis., Stevens Point** — Bank — Citizens Natl. Bank let contract building 35 x 110 ft., brick and stone, concrete foundation, to A. Moorman & Co., 501 Minnesota St., St. Paul. About $100,000.

Ia., Aurelia—School—Bd. Educ. received bids Feb. 17, building 3 story, 75 x 166 ft., brick and stone, rein.-con. flooring, concrete foundation, from W. J. Zitterell Co., Inc., Webster City $207,322; M. M. Moen, Mason City, $207,800; W. F. Kucharo, 622 Hubbell Bldg., Des Moines, $211,980. Noted Jan. 22.

★**Ia., Cotter**—School—Bd. Educ. let contract building 2 story, brick, concrete and steel, concrete foundation, to Western Constr. Co., Earlham. About $61,000. Noted Jan. 29.

★**Ia., Des Moines** — Store — Delco Light Products Co., 1200 Locust St., let contract building 2 story, 44 x 170 ft., brick and steel, concrete foundation, on 15th and Locust Sts., to A. H. Neumann & Co., 519 Hubbell Bldg. About $50,000; cost plus percentage basis.

Ia., Lamont—School—Until April 1, by Bd. Educ., building 2 story, 70 x 98 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. Keffer & Jones, Masonic Temple, Des Moines, archts. Noted Feb. 26.

★**Ia., Mt. Pleasant** — High School — Bd. Educ. let contract converting Y. M. C. A. building into high school, to McDonald Constr. Co., 752 Builders Exch. Bldg., Minneapolis. About $56,000. Noted Jan. 29.

Ia., Olds—School—Until March 24, by Bd. Educ., building 2 story, 70 x 106 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $120,000. Keffer & Jones, Masonic Temple, Des Moines, archts.

Ia., Wiota—School—Until March 15, by Bd. Educ., building 2 story, 75 x 90 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $80,000 Porter & Schreiber, Peters Trust Bldg Omaha, Neb., archts. Noted Jan. 8.

★**Minn., Ada**—High School—Bd. Educ. let contract building 3 story, 84 x 136 ft., brick, to J. H. Fisch, Barnesville, $89,400. Noted Feb. 5.

Minn., Crookston — Hospital — Bethseda Hospital Assn. receiving bids building 4 story, 35 x 60 ft., rein.-con., brick and tile. Sund & Dunham, 514 Essex Bldg., Minneapolis, archts. Rose & Harris, 471 Auditorium Bldg., Minneapolis, engrs.

Minn., Elgin—High School—Until March 25, by Bd. Educ., building 2 story, 92 x 93 ft., brick, and tile. About $60,000. J. C. Keetner, clk. Pass & Son, Mankato, archts. Noted Jan. 29.

Minn., Fergus Falls — Church — Until March 21, by Norwegian Lutheran Church, building 48 x 80 ft., brick. About $80,000. Foss & Foss, St. Cloud, archts.

Minn., Keewatin—High School—Until March 20, by R. M. Blockburn, clk. School Dist. 9, Itasca Co., Nashwauk, building 3 story, 160 x 174 ft., rein.-con., brick and tile, rein.-con. flooring, concrete foundation, here. About $400,000. W. T. Bray, Torrey Bldg., Duluth, archt.

Minn., Mankato—Dormitory—Until March 11, by State Bd. Control, St. Paul, building 3 story, 50 x 100 ft., rein.-con. and brick, at Normal School. About $100,000. C. H. Johnston, Capital Life Bldg., St. Paul, archt.

Minn., Rose Creek—School—Until March 15, by Bd. Educ. building 2 story, 56 x 80 ft., rein.-con. and brick. About $50,000. Alden & Harris, 1011 New York Life Bldg., St. Paul, archts.

Minn., St. Paul—School—Bd. Educ. received bids building Groveland School, 3 story, 60 x 140 ft. (general contract) from Lauer Bros., Chestnut St., $116,000 plus 9%; W. Baumeister, 1204 Pioneer Bldg., $119,000 plus 5½%; plumbing, heating and ventilating, from M. J. O'Neal, 60 East 6th St., $29,668.

★**Minn., St. Paul**—School—Bd. Educ. will build Gaultier School, 3 story, 67 x 117 ft., rein.-con. and brick, on Edwards St. About $100,000. Work will be done by day labor.

★**S. D., Brookings**—High School—Bd. Educ. let contract building 2 story, 152 x 175 ft., to Wold-Mark Constr. Co., Brookings. Cost plus basis. (No book.)

★**Wyo., Casper**—Bank—Dubois & Goodrich, archts., Townsend Bldg., let contract building 2 story, 50 x 140 ft., brick and terra cotta tile, to Riverton Constr. Co., Riverton. About $30,000, cost plus percentage. Owner's name withheld.

★**Mont., Conrad**—Store—Conrad Mercantile Co. let contract building 2 story, 84 x 140 ft., brick and concrete, on 4th Ave. and Main St., to Lease & Leigland, Great Falls. About $150,000.

Mont., Culbertson—High School—Until March 10, by School Dist. 17, building high school. F. F. Moon, clk. Noted June 26.

Buildings (Continued)

★Mo., Kansas City—Bank and Office—Gate City Natl. Bank, 10th St. and Grand Ave., let contract building 4 story (ultimately 10 story), 50 x 115 ft., rein.-con., brick and terra cotta, at 1109 Grand Ave., to Fogel Constr. Co., Reliance Bldg. About $250,000; cost plus percentage basis.

Okla., Ninnekah—School—Until March 10, by Bd. Educ., building 2 story, 57 x 243 ft., brick, concrete and steel, concrete foundation. About $60,000. E H. Eads, Sayers Bldg., Chickasha, archt.

Idaho, Caldwell—Lodge—Until March 15, by Tourtellotte & Hummel, archts 215 Overland Bldg., Boise, building 2 story, 45 x 120 ft., concrete, on 32 acre site on Canyon Hill, for I. O. O. F. Grand Lodge of Idaho. About $60,000. P. F. Horne, secy. Noted Dec. 11.

★Idaho, Lewiston—Hospital—Sister St. Joseph having plans prepared by Beezer Bros., archts., Seaboard Bldg., Seattle, Wash., for 4 story, concrete, brick or stone. About $150,000. Work will be done by day labor under supervision of architects.

Ariz., Phoenix—Theatre and Office—D. Goldberg and associates, Alvarado and Coronado Sts., plan to build 6 story, 105 x 200 ft., concrete, steel and terra cotta, on 1st and Washington Sts. Lyman & Place, Tucson, archts.

Ore., Portland—Fire and Comfort Station—City Purch. Dept. received bids building 3 story, fire and comfort station, brick, on 4th and Taylor Sts., from T. Muir, $57,142 and $24,864 respectively; A. Guthrie & Co., Sherlock Bldg., $56,222 and $23,539 respectively.

Ore., Oregon City—Church and Store—Tourtellotte & Hummell, archts., McKay Bldg., Portland, received bids from Hopkins & Andrews, Bway. Bldg, Portland, $51,634, W. R. Griffith, Oregon City, $58,141, E. B. White, Oregon City, $56,000, building 2 story, 64 x 119 ft. and 31 x 64 ft. rear addition, brick and tile, for Methodist Church.

★Cal., Long Beach—School—Bd. Educ. let contract building 2 story, 9 room, brick and rein.-con., rein.-con. flooring, concrete foundation, on Atlantic Ave., to J. D. Sherer, 1466 West 1st St., $62,260.

★Cal., Long Beach—Stores, Cafeteria, etc.—H. S. Callahan, 855 Elm Ave. let contract building 2 story, irregular shaped, brick and steel, concrete foundation, on West Ocean Blvd., to C. T. McGrew, 1345 West Ocean Ave. About $80,000.

★Cal., Los Angeles — Bank — Security Trust & Savings Bank, 5th and Spring Sts., let contract altering and building 2 story, rein.-con., brick and steel addition, on 7th St. and Grand Ave., to G. M. Easton, 436 West 39th St., $87,800.

★Cal., Sacramento—Theatre—Harris & Klein, 281 O'Farrell St., San Francisco, let contract remodeling theatre at 1203 J St., to Matthews Constr. Co., Forum Bldg. About $60,000.

★Cal., San Francisco—Library—City and San Francisco Co. let contract building 1 story, rein.-con. and brick, concrete foundation, on Powell St., to McLevan & Peterson, Hearst Bldg., $46,594; 1 story, rein.-con. and brick, concrete foundation, on Sacramento and Clay Sts., to Barrett & Hilp, Sharon Bldg., $56,329. Noted Feb. 19

★Cal., San Francisco—Sales—L. Lewin, 907 Rialto Bldg., let contract building 3 story, rein.-con., on Jackson St. and Van Ness Ave., to McDonald & Kahn, Rialto Bldg. About $60,000.

Cal., San Francisco — Sales — See "Industrial Works."

Cal., Spadra—Grammar School—Until March 10, by Bd. School Trustees, building rein.-con. and brick. Cost to exceed, $50,000. R. M. Fryer, Los Angeles, clk. Allison & Allison, 1405 Hibernian Bldg. Los Angeles, archts.

Ont., Whitby—School Until March 10, by Secretary Bd. Educ. building 2 story, brick and steel, concrete flooring and foundation. About $60,000. Chapman, Oxley & Bishop, Harbor Bldg., Toronto, archts.

Federal Government Work

PROPOSED WORK

N. Y., New York—Post Office—Treas. Dept., Wash., D. C., having sketches made by J. H. Scheier, consult. engr., 25 West 42nd St., for 4 story, 125 x 200 ft., brick, steel and stone, brick foundation, here About $4,000,000. J A. Wetmore, superv archt.

W. Va., Charleston—Electric Substation and Equipment—Bureau Yards & Docks, Navy Dept., Wash., D C., plans to build outdoor electric substation and install equipment to be furnished by Government, at Naval Ordnance Plant, here; $10 deposit required for plans and spec.

O., Cincinnati—Power House—U. S. Engr. Office, Cincinnati, rejected bids building power house at Dam 35, Ohio River. Noted Jan. 1.

Wis., Waukesha—Hospital—Pub. Health Serv., New Jersey Ave. and B St. S. E., Wash., D. C., plans to build here.

Cal., Mare Island—Freight Shed—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $60,000. Bids will also be opened at local yard.

Cal., Mare Island—Remodeling Barracks Buildings—Spec. 4147—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to remodel 2 story barracks building, 500 ft. long, with two wings, 26 ft. wide, 2 wings 44 ft. long and 33 x 54 ft. kitchen extension, Bldg. 53, at Marine Reservation, Navy Yard, here; $10 deposit required for plans and spec.

Cal., Sacramento—Remodeling Post Office and Courthouse—Treas. Dept., Wash., D. C., rejected bids received Feb. 18, remodeling, here. J. A. Wetmore, superv. archt. Noted Feb. 26.

BIDS DESIRED

Pa., Harrisburg—Changes in Approaches and Lobby Vestibule Doors—Until March 26, by Treas. Dept., Wash., D. C., for changes at U. S. Post Office and Courthouse, here. J. A. Wetmore, superv. archt; advertised in this issue.

Ga., Savannah—Radio Building and Mast—Spec. 4139—Until March 8, at local yards, constructing radio building and mast. About $6,000. Noted Feb. 26.

La., New Orleans—Rock—Until April 8, by Supt. Lighthouses, furnishing and placing 1,800 ton rock around Sand Island Lighthouse, Ala.; advertised in this issue. Noted Feb. 26.

Mich., Detroit — Radio Building — Spec. 4120—Until March 10, by Bureau Yards & Docks, Navy Dept., Wash., D. C., constructing at Windmill Point, here. Noted Feb. 26.

Wis., Milwaukee—Radio Building—Spec. 4107—Until March 10, by Bureau Yards & Docks, Navy Dept., Wash., D. C., constructing at McKinley Park, here. Noted Feb. 26.

Okla., Ardmore — Dormitory and Dairy Barn—Until March 25, by Dept. of Interior, Office of Indian Affairs, Wash., D. C., furnishing material and labor building brick dormitory and dairy barn, here.

Okla., Tulsa—Building Extension—Until March 27, by Treas. Dept., Wash., D. C., constructing extension to U. S. public buildings, here J. A. Wetmore, superv. archt.

Wash., Port Townsend — Tanks — Until March 22, by Treas. Dept., Wash., D. C., building concrete tanks at Quarantine Sta., here. J. A. Wetmore, superv. archt

Cal., Collinsville—Straighten Channel,-etc.—Until March 22, by U. S Engr. Office, 240 Montgomery St., San Francisco, straigtening channel of Sacramento River and building flood water inlet, involving 6,000,000 cu.yd. material to be removed to Sherman Island.

Alaska, Ketckikan — Structural Steel Shapes, Plates, Rivets, Bolts, etc.—Until March 15, by Supt. Lighthouses, furnishing about 10,000 lb. galvanized structural steel shapes, etc., to build Favorite Reef, Priest Rock and Killisnoo Harbor Lights.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. Y., Buffalo—Radio Building—Spec 1108—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract constructing, here, to W. F. Martens, 245 Cutler Bldg., Rochester, $10,913 (65 days) Noted Feb 26.

★N. Y., New York—Repairs to Electric Freight Elevator—Treas. Dept., Wash., D C., let contract repairing, at Appraisers Stores, here, to Otis Elevator Co., Metropolitan Bank Bldg., Wash., D. C., $2,985.

N. Y., New York—Roof—Spec. 4113—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Feb. 25, building roof, supported on present purline, on Bldg. 29, at Navy Yard, here, (1) work complete, from C. Meades & Co., 38 Park Row, (1) $34,200 (60 days); Diamond & London, 12 Bergen St., Brooklyn, (1) $39,657 (60 days), (2) $27,953 (60 days); Hyde & Baxter, 711 13th St. N. W., Wash., D. C., (1) $49,300 (150 days). Noted Jan. 8.

D. C., Wash.—Grading, Paving, etc.—Dist. Comrs. 509 Dist. Bldg., received bids Feb. 25, grading, paving and improving streets and avenues, (1) grading per cu.yd., (2) 6 x 20 granite or bluestone, (3) 8 x 8 granite setting, per lin.ft., (4) granite block, trap rock, or old asphalt block gutters, per sq.yd., (5) vitr. block gutters on gravel base, per sq.yd., (6) vitr. block gutters on 4 in. concrete base, per sq.yd., (7) cement curb, gutter not included, per lin.ft. (8) 1 in. cement gutter 6 in. curb not included, per lin.ft., (9) cement gutter 2 ft. wide, curb not included, per lin.ft., (10) cement roadway 6 in. thick, per cu.yd., (11) loading and hauling crushed stone from piles to roadway and spreading, per ton, from Baltimore Contg. Co., 206 North Greene St., Baltimore, Md., (1) $1.54 macadam, $1.18 concrete, (3) $.68, (4) $1.95 macadam, (7) $.98, (8) $1.18 macadam, (10) $2.44, (11) $1.25 macadam; G. B. Mullin, 3303 11th Ave. N. W., (1) $1.04, (2) $.52, (3) $.54, (5) $1.45, (6) $2.47, (7) $.79, (10) $2.39; Maloney Paving Co., Baltimore, Md., (1) $1.50, (2) $.75, (3) $.90, (4) $1.20, (7) $.79, (10) $2.39. Noted Feb. 19.

D. C., Wash.—Skylights—Spec. 4100—Bureau Yards & Docks, Navy Dept., received lowest 3 bids Feb. 25, constructing 2,000 sq.ft. skylight on slate roof of Bldg. 32, here, from H. H. Robertson Co., 1st Natl. Bank Bldg., Pittsburgh, Pa., $2,360 (80 days) alternate $3,270 (80 days); J. D. Thompson Co., 2611 Pennsylvania Ave., $3,161 (25 days); New Brunswick Cornice Wks., 8 Jellin St., New Brunswick, N. J., $4,900 (60 days). Incorrectly noted in our issue Feb. 26.

S. C., Paris Island — Seawall, Roads, Curbs, Gutters, etc.—Spec. 4104—Bureau Yards & Docks, Navy Dept., Wash., D. C. received bids Feb. 25, building 2,062 lin. ft. concrete seawall, 2,000 lin. ft. concrete roads, 15 and 18 ft. wide, 13,000 lin. ft. concrete curbs, gutters, sewers and drains, at Marine Barracks, here. (1) work complete, from Waterfront & Foundation Constr. Co., 51 Broad St., Charleston, (1) $116,886 (135 days), (2) $67,529 (135 days), (3) $49,357 (135 days), (4) $10, (6) $12.50, (7) $.50; Newport Contg. & Eng. Co., Law Bldg., Newport News, Va., (1) $167,790 (180 days), (2) $114,950 (180 days), (3) $52,840 (180 days), (4) add $27, deduct $17, (5) add $1, (6) add $.35, deduct $20, (7) add $1.25, deduct $.70. Incorrectly noted in our issue "Feb. 26."

Ia., Des Moines—Remodeling Post Office—Treas. Dept., Wash., D. C., received bids Feb. 25, remodeling, here, from J. A. Benson Constr. Co., 422 Valley Natl. Bank Bldg., $13,619; J. A. Tusant & Son Co., 583 7th St., $15,807; G. E. Wright, Inc., 1461 Monadnock Bldg., Chicago, $18,400. Noted Feb. 5.

Tex., San Antonio—Post Office Alterations—Treas. Dept., Wash., D. C., received bids Feb. 24, altering Post Office and Courthouse, here, from G. E. Wright, Inc., 1461 Monadnock Bldg., Chicago, $29,600; W. P. Thurston Co., Merchants Natl. Bank, Richmond, Va., $30,000. Noted Feb. 5.

Okla., Lawton—Ponton Boats and Appurtenances—U. S. Engr. Office, War Dept., Wash., D. C., let contract for 9 ponton boats and appurtenaces, here, to Stewart-Davit & Equipment Corp., 17 Battery Pl., New York City, $17,308.

★Cal., San Diego—Fuel Oil Storage Reservoir—Spec. 4102—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building, here, to F. W. Steffgen, 1040 2d St., $14,807 (120 days). Noted Feb. 26.

Miscellaneous

PROPOSED WORK

Bowl—New Haven, Conn.—Yale University plans to finish upper portion of "bowl" to enlarge seating capacity About $250,000

Road Materials—Brooklyn, N. Y.—E. Riegelmann, boro. pres. rejected bids received Jan. 28, furnishing and delivering 2,000 cu.yd 1½ in. gravel and 2,000 cu.yd sand and grit mixed. Work will be readvertised Noted Jan. 22.

Ash Incinerator—Jersey City, N. J.—City Comn. plans to build ash incinerator. Cost to exceed, $200,000. F A. Dolan, city clk.

Pump—Monessen, Pa.—City soon receives bids furnishing deep well pump. Chester & Fleming, Union Bank Bldg., Pittsburgh, engrs

Miscellaneous (Continued)

Steel Bars and Lumber—New Orleans, La.—A. Perrilliatt, ch. engr. Bd. Port Comrs., 922 Gravier St., soon receives bids for furnishing reinforced steel bars and lumber for rat-proofing docks, here. About $3,000,000.

Steel Crane Runway—Cleveland, O.—E. McGeorge, engr., 1900 Euclid Ave., receives bids about March 5, for 200 ft. steel crane runway extension, for Johnston & Jennings Co., Addison Rd. About $15,000.

Swimming Pool—Cleveland, O.—City plans to build rein.-con. swimming pool in Kingsbury Park. About $40,000. F. H. Betz, 604 City Hall, archt.

Terminal Warehouse—Detroit, Mich.—Detroit Terminal Warehouse Co., 524 Book Bldg., plans to build terminal warehouse along tracks of intersecting railroads, to have 14,000,000 sq.ft. floor space. Work includes railway yards, storage yards for coal, etc., with handling devices. About $10,000,000. Engineer's name withheld.

Separation of Grades—Hamtramck, Mich., (Detroit P. O.)—Council ordered tentative plans and estimates prepared by G. Jerome, engr., 1331 Majestic Bldg., Detroit. for separation of all grade crossings along Michigan Central R.R. and Grand Trunk R.R. tracks, to include 10 proposed overhead crossings. Plans will probably be made to conform to system of grade separations as proposed by city of Detroit.

Water Pipe, etc.—Milwaukee, Wis.—Central Bd. Purchases, City Hall, soon lets contract furnishing 300 tons 6 in., 200 tons 8 in. and 250 tons 12 in. Class "C" water pipe. Former bids rejected. Noted Feb. 12.

Bridge Materials—Sac City, Ia.—Sac Co. soon lets contract furnishing 28,000 ft. lumber, 22.5 ton steel reinforcing bars, 3,120 ft. 12 in. corrugated iron culvert pipe, 1,200 ft. 15 in. corrugated iron culvert pipe, 360 ft. 20 in. corrugated iron pipe. Alternate bids will be taken on rein.-con. pipe in lieu of last 3 items. About $20,000. W. D. Maxwell, co. engr.

Road Equipment—Fargo, N. D.—Haggart Constr. Co., 60 Bway., plans to purchase road equipment. About $60,000.

Swimming Tank, etc.—Albany, Ore.—See Buildings."

Bulkhead—Astoria, Ore.—See "Streets and Roads."

Portland Cement — Sacramento, Cal. — State Highway Dept., Forum Bldg., received no bids furnishing 500,000, 750,000 and 1,000,000 bbl. portland cement. Noted Jan. 29.

Pumps—San Fernando, Cal.—City soon receives bids furnishing distributing system pumps and other equipment in connection with proposed waterworks improvements. A. L. Sonderegger, Central Bldg., Los Angeles, archt. Noted Jan. 29. under "Waterworks."

Storage Bins—Montreal, Que.—G. Hall Co., 211 McGill St., soon receives bids building 1 story, 18 x 148 ft. storage bins, on Oak St., concrete and steel. About $12,000.

Gas Mains—Eastview, Ont.—Ottawa Gas Co., 35 Sparks St., Ottawa, receives bids in spring for extending gas mains from here to Ottawa. About $30,000. A. A Dion, Ottawa, engr.

Sand Driers and Drum—London, Ont.—City having plans prepared by H. A. Brazier, city engr., for new sand driers and sand drum in paving plant. About $9,000.

BIDS DESIRED

Road Materials—New York, N. Y.—Until March 10, by H. H. Curran, pres. Manhattan Boro., furnishing and delivering 1,000 ton asphalt paving cement, 12,000 bags portland cement, 2,000 cu yd. paving sand. 2,500 cu.yd. paving grit. 2,000 cu.yd. coarse aggregate for concrete, 310,000 wood paving blocks, 450,000 gal. refined asphalt, 6,000 ton limestone dust, 4,500 cu.yd. ¾ in. binder stone, 1,000 ton coal tar paving cement

Fire Escapes, etc.—Ossining, N. Y.—Until March 23, by C. F. Rattigan, supt. state prisons, Capitol, Albany, building fire escapes, pipe tunnels, heating work, additional underground heating mains, etc., sanitary work, sewerage and water supply systems, electric work, underground electric conduit feeder system and pump house for Sing Sing Prison here. L. F. Pilcher, Capitol, Albany, state archt.; advertised in this issue.

Filter Equipment—Springdale, Pa.—West Penn Power Co. receiving bids on filter equipment for 1,000,000 gal. filtration plant. Chester & Fleming, Union Bank Bldg., Pittsburgh, engrs.

Centrifugal Pumps—West Chester, Pa.—Until March 17, by Water Comn. furnishing centrifugal pump and electric motor, also necessary electrical attachments for pumping water at Milltown Pumping Sta. J. L. Meredith, Jr., chn.; advertised in this issue.

Repairing Municipal Pier — Newport News, Va.—Until March 18, by F. A. Hudgins, city clk., furnishing materials and doing following work at Municipal Pier: (1) driving and fastening 165 creosoted pine piles, 40 ft. long, (2) driving and working 12 creosoted pine bollard piles, 40 ft. long, (3) driving and fastening 52 creosoted pine fender piles, 35 ft. long, (4) driving and fastening in place 6 corner clusters of twelve 45 ft. creosoted pine piles. (5) installing 980 lin.ft. creosoted chocks. (5) miscellaneous repairs to cap logs, etc., (7) 1 cluster of six 40 ft. cluster piles at shore end of stem of pier, (8) also installing complete about 250 lin.ft. standard city bulkhead with returns. G. L. Smith. chn.; advertised in this issue.

Concrete Mixer and Timber Cutting Saws—Cleveland, O.—Tenbusch-Parker Co., 304 Union Bldg., receiving bids for 1 concrete mixer and 1 timber cutting saw.

Electrical Pumping Unit, Etc.—Ravenna, O.—Until March 12, by A. S. Helbig, dir. Bd. Pub. Serv., furnishing 2,000 g. p. m. electrical pumping unit with pipe and electrical connections.

Dam—Decatur, Ill.—Until March 29, by city, building earth and concrete dam, 1,900 ft. long on center line at top, with height of about 28.5 ft. near center, concrete screen chamber, gates, conduits, concrete overflow spillway, etc. Pearse & Greeley, 39 West Adams St., Chicago, engrs.; advertised in this issue.

Road Oil—Madison, Wis.—Until March 9, by E. F. Dunn, city aud., furnishing about 80,000 gal. asphaltic road oil.

Truck—West Allis (Milwaukee, P. O.)—Wis.—Until March 6, by A. Wichner, clk. Bd. Pub. Wks., furnishing 1 ton truck, complete, for water dept.

Steam Shovel—Cambridge, Minn.—Until March 16, by F. A. Norell, aud. Isanti Co., furnishing 1 steam shovel, caterpillar tractor type, ½ and ¾ yd. capacity.

Road Tractor—St. Cloud, Minn.—Until March 17, by N. Thomey, aud. Stearns Co., furnishing road tractor, gasoline or oil burner, 30 to 60 hp. on draw bar.

Boardwalk—San Francisco, Cal.—Until March 10, by city, building boardwalk, with hand rail, on Great Highway, involving 3,800 lin.ft. plank, 15 ft. wide, 10,431 lin.ft. plank, 10 ft. wide, 2,275 lin.ft. hand rail. 2,600 lin.ft. piles, 10,000 ft. step and extra construction and 3,000 footings About $116,000. M. M. O'Shaughnessy, city engr.

Wharf—Kenora, Ont.—Until March 10, by R. C. Desrochers, secy. Dept. Pub. Wks., Ottawa, constructing wharf at Rideout Bay, District of Port Arthur and Kenora

Stone Crushers, Tarvia and Asphalt Tanks—Perth, Ont.—W. A. Moore, secy. Lanark Co. receiving bids for 2 complete stone crushers, also tarvia and asphalt tanks. About $60,000.

Crushed Stone—Ont., Toronto—Until Mar. 16, by W. A. McLean, deputy minister of highways, supplying 4,000 cu.yd. loose measurement, 3 in. stone, dumped as directed on Provincial Highway, between west boundary Mathilda Twp., and west boundary of Iroquois Village, distance of 1½ mi., also 6,000 cu.yd. dumped as directed from east boundary of Iroquois Village easterly 3 mi.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Breakwater—Cleveland, N. Y.—E. S. Walsh, supt. Dept. Pub. Wks., Capitol, Albany, let contract protecting breakwater at Cleveland Terminal. Contr. 28-A. to E. Dawley, Cleveland, $13,260. Noted Feb. 10 under "Schenectady."

Tractors—Long Island City, N. Y.—M. E. Connolly, pres. Queens Boro., received only bid Feb. 24, furnishing and delivering 3 tractors, from J. H. Conell. $2,391. Noted Feb. 19.

★Boiler Pumps—New York, N. Y.—Bd. Trustees, Bellevue and Allied Hospitals, at office of General Medical Supt., 415 East 26th St., let contract for boiler pumps, etc., for boiler plant at Fordham Hospital, Crotona Ave. and Southern Blvd., to Chute, Thorston & Bailey Corp., 2 East 13th St., $36,500. Noted Jan. 29.

Road Material—St. George, S. I., N. Y.—C. D. Van Name, pres. Richmond Boro., received bids Feb. 24, furnishing and delivering (a) 100,000 gal. bituminous material for road surfacing, (b) broken stone, screening, trap rock, Dist. 1, 2 and 3, (c) grits for Dist. 1, 2 and 3, from Barrett Co., 17 Battery Pl., New York City, (a) $11,000; J. E. Donovan, 2205 Richmond Terrace, Port Richmond, (b) $5,555, $5,800 and $12,760 respectively, (c) $3,870, $3,080 and $2,035 respectively; J. Johnson, 455 Bway., West New Brighton, (b) $5,270, $5,'55 and $12,035 respectively; (c) $3,960. $3,185 and $2,137 respectively. Noted Feb. 19.

★Freight Sheds—Stapleton, S. I., N. Y.—M. Hurlburt, comr. docks, Pier "A," foot of Battery Pl., New York City, let contract building new freight sheds and appurtenances on Piers 6, 7, 8, 9, 10 and 11, here, to Bethlehem Steel Bridge Corp., 111 Bway., New York City, $2,577,950. Noted Jan. 29.

★Piers—Stapleton, S. I., N. Y.—M Hurlburt, comr. docks, Pier "A" foot of Battery Pl., New York City, let contract furnishing labor and material building Piers 6, 7, 8, 9, 10 and 11, Richmond Boro., to Terry & Tench, Grand Central Terminal, New York City, $3,252,570. Noted Jan. 29.

Centrifugal Feed Water Pumps—Cleveland, O.—E. Shattuck, city purch. agt., received bids Feb. 20, furnishing 2 centrifugal water pumps, 850 gal. per min. capacity, from Dravo-Doyle Co., Citizens Bldg., cost $9,850 and $10,598; J. Sheldon Engine Co., Toledo, $10,820 and $11,024. Noted Feb. 12.

★Flasher and Paver—Detroit, Mich.—Dept. Pub. Wks. let contract furnishing 2 motor driven street flushers, 5-6 ton chassis equipped with 1,500 gal. flusher units as manufactured and licensed under Otto-fy patent 795,059, to Springfield Eng. Co., Springfield, O., $17,013; 1 Rex 14 E paver, concrete mixer on traction wheels, capacity 20 cu.ft. dry mix, boom and bucket, to Contractors' Equipment Co., 192 15th St.

★Loading Platform, Spur Tracks, etc.—Detroit, Mich.—Dept. Pub. Wks. will build 30 x 180 ft. rein.-con. loading platform on concrete foundation, also 400 ft. spur tracks and switches at 24th St. garbage plant Work will be done by day labor. Noted Jan. 8 and Feb. 26.

★Elevator—Palmyra, Ill.—Duncan Grain Co. let contract constructing 21,000 bu capacity rein.-con. grain elevator, to Burrell Eng. & Constr. Co., 327 South LaSalle St., Chicago. About $16,500.

★Elevator—Red Bud, Ill.—G. Teihold Milling Co. let contract constructing 30,000 bu. capacity rein.-con. grain elevator, to Burrell Eng. & Constr. Co., 327 South La Salle St., Chicago. About $11,000.

★Breakwater—Milwaukee, Wis.—Sewerage Comn. let contract building pile and timber breakwater, at east side Jones Island, to Great Lakes Dredging & Dock Co., West Water St., $275,930. Noted Feb. 26.

Cement—Milwaukee, Wis.—Central Bd Purchases, City Hall, received only bid Feb. 18, furnishing 9,000 bbl. portland cement, from Western Lime & Cement Co., 125 East Water St. Noted Feb. 12.

Valves—Milwaukee, Wis.—Central Bd. Purchases, City Hall, received only bid Feb. 18, furnishing special or tapping valves, from Chapman Valve Mfg. Co., 111 West Washington St., Chicago, 2 in., $21.90; 3 in., $27; 4 in., $31.75; 6 in., $46.25. Noted Feb. 12.

Wire and Cable—Milwaukee, Wis.—Central Bd. Purchases, City Hall, received bids Feb. 20, furnishing wire and cable for street lighting system, from Kerite Insulated Wire & Cable Co., 122 South Michigan Ave., Chicago. (1) 50,000 ft. at $0.24½. (2) 275,000 ft., $0.19½. (3) 12,000 ft., $0.35¼. Noted Feb. 19.

★Cement—Minneapolis, Minn.—City let contract furnishing 100,000 bbl. portland cement, to P. G Speakes, 2845 2nd Ave., S, $2.87 sacked; $2.52 paper bags and $2.22 bulk.

★Road Oil—New Ulm, Minn.—W. P. Backer, city clk., let contract furnishing 100,000 gal. road oil, to Alden Speare's Sons' Co., 63 South Water St., Chicago. $0.055 f.o.b. Port Naches, Tex. Noted Feb. 5.

★Elevator — Caldwell, Idaho—Holt Seed Co. let contract building rein.-con. seed and grain elevator, 68,000 bu. capacity, to Burrell Eng. & Constr. Co., 327 South La Salle St., Chicago, Ill. About $70,000.

★Steel—Tacoma, Wash. — Scandinavian Amer. Bank, 1023 Pacific St., let contract for 2,100 tons steel, to be used in construction of 16 story bank building, to Bethlehem Fabricated Steel Co., Lehigh Ave., Bethlehem, Pa. About $200,000.

★Hydrants—York, Ont.—Twp. Council let contract for 250 hydrants, to Bawden Machine Co, 163 Sterling Rd., Toronto $25,250.

OFFICIAL PROPOSALS

Bids: March

Construction of Bridges

STATE OF NEW JERSEY
STATE HIGHWAY COMMISSION
TRENTON

Trenton, N. J.

Notice is hereby given that sealed bids will be received by the State Highway Commission of New Jersey for the construction of the following:

Furnishing and erecting 117,000 lb. steel plate girder, superstructure, bridge "O," route No. 9, section No. 2, span 69 ft., width 30 ft., Hunterdon County.

The following bridges on route No. 6, Mullica Hill-Woodstown Section, Salem and Gloucester Counties:

Incased I beam bridge No. 69, span 31 ft., 6 in., width 30 ft.

Incased I beam bridge No. 35, span 32 ft., width 30 ft.

Concrete Slab Bridge No. 70, Span 12 ft., width 30 ft.

Widening of present box culvert No. 71, span 8 ft., width 30 ft.

Reinforcing present brick arch with concrete, No. K, span 10 ft., width 30 ft.

Bids for the above will be opened and read in public at the office of the State Highway Commission, Broad St. Bank Bldg., Trenton, on Monday, March 15, 1920, at 10:30 a.m.

Drawings, specifications and form of bid, contract and bond for the proposed work will be on file in the office of the State Highway Department at Trenton, the office of C. A. Mead, Bridge Engineer, 790 Broad St., Newark; the office of J. A. Williams, Division Engineer, Camden; and the office of Chas. Temperley, Division Engineer, Washington, N. J.; and may be inspected by prospective bidders. Plans and specifications for bridges on route No. 6 will be furnished on deposit of ten ($10.00) dollars upon application to the Division Engineer, 503 Market St., Camden, and at the office of the Division Engineer, 7 West Washington St., Washington, N. J., for bridges on route No. 9. Bids must be made on the standard proposal forms in the manner designated therein and as required by the specifications, same to be enclosed in sealed envelopes bearing the name and address of bidder and number and location of bridge on the outside, addressed to

STATE HIGHWAY COMMISSION,
Broad Street, Bank Bldg.,
Trenton, N. J.

and must be accompanied by a certified check for not less than ten (10%) per cent of the amount of the bid, and be delivered at the above place on or before the hour named. Copies of standard proposal form will be furnished on application.

Each bidder must accompany his bid with a certificate from a surety company, duly authorized to do business in this State, stating that such surety company will provide said bidder with a bond in such sum as is required in, and in accordance with the provisions of said specifications, conditioned for the faithful performance of the provisions of the contract and specifications.

By order of the State Highway Commission.

A. LEE GROVER,
Chief Clerk.

The publication of an advertisement on this page is an official notice that bids are wanted from other than local bidders.

It is also a guarantee that maximum competition is invited because Engineering News-Record is the *one* nationally recognized medium for Proposal advertising. Its Searchlight Section is read each week by nearly every worth-while contractor in this country who bids on public work outside his own city.

Official Proposals reaching our office in first mail Wednesday morning (9 o'clock) can usually be published in the issue out the next day. Special price for Official Proposals, $3.60 an inch.

Bids: March 24.

Road Construction

Harrisburg, Pa.

Pennsylvania State Highway Department, Harrisburg, Pa. Sealed proposals will be received at the State Capitol until 10 a.m., March 24, 1920, when bids will be publicly opened and scheduled, and contracts awarded as soon thereafter as possible, for the reconstruction of the following pavements:

46,150 feet of Reinforced Concrete in Adams County. ....

28,554 feet of Reinforced Concrete and Hillside vitrified brick in Beaver County.

31,663 feet of Reinforced Concrete in Butler County.

19,950 feet of Reinforced Concrete and bituminous macadam on a Telford base in Carbon County.

47,700 feet of either bituminous surface course on a concrete foundation or Reinforced Concrete in Crawford County.

27,328 feet of Reinforced Concrete in Delaware County.

21,268 feet of Reinforced Concrete in Erie County.

15,323 feet of Reinforced Concrete and Hillside vitrified brick in Fayette County

44,165 feet of Reinforced Concrete in Franklin and Adams Counties.

1,910 feet either bituminous surface course on a concrete foundation or Reinforced Concrete in Huntingdon County.

29,409 feet of either bituminous surface course on a concrete foundation or Reinforced Concrete in Lycoming County.

14,800 feet of Reinforced Concrete in McKean County. ....

34,902 feet of Reinforced Concrete in Northampton County.

26,300 feet of Reinforced Concrete in Northumberland County; 10,790 feet of Reinforced Concrete in Schuylkill County.

19,061 feet of Reinforced Concrete and Hillside vitrified brick in Venango County

Bidding blanks and specifications may be obtained free and plans upon payment of $2.50 per set, upon application to the State Highway Department, Harrisburg. No refund for plans returned. They can also be seen at office of State Highway Department, Harrisburg, 1001 Chestnut Street, Philadelphia, and 904 Hartje Building, Pittsburgh, Pa.

LEWIS S. SADLER,
State Highway Commissioner.

Bids: April 8.

Construction of Road to Tybee

THE COMMISSIONERS OF CHATHAM
COUNTY AND EX-OFFICIO JUDGES
SAVANNAH, GEORGIA
FEBRUARY 9th, 1920

Savannah, Ga.

Sealed proposals will be received by the County Commissioners of Chatham County and Ex-officio Judges, Georgia, until Thursday, April 8th, 1920, and publicly opened by them at their office at that time at 12:30 o'clock P.M., for furnishing labor, equipment, and material for constructing, draining and paving the Road to Tybee, Georgia.

The nearest railroad stations are at Savannah, Georgia, and Tybee Island, Georgia.

The work will consist of constructing and paving with live oyster shells approximately sixteen (16) miles of public highway with the necessary bridges, culberts, pipes, headwalls and drains.

Plans and Specifications are on file in this office, and in the office of the County Engineer, County Court House, Savannah, Georgia, where they can be inspected.

Copies may be obtained at the office of the Commissioners of Chatham County and Ex-officio Judges, Chatham County, Georgia, upon payment of Fifty ($50.00) Dollars for the plans. Specifications are furnished without cost.

Proposals must be submitted on regular forms which will be supplied by the Engineer, and must be accompanied by a certified check, money deposit, or bidders bond, in the sum of 5% of the amount of said bid.

The successful bidder will be required to give bond for an amount equal to the amount of each contract, and will not be acceptable unless the surety is a Surety Company satisfactory to Chatham County Commissioners and with an established agency in Chatham County, through which such bond must be obtained. Such bond must be made on forms as prescribed by the County.

PAYMENT: The Contractors will be paid each month for work done the previous month and on a basis of 85% of the Engineer's estimate and in accordance with the rules governing the payment of County Bills.

The right is reserved to reject any or all bids and waive all formalities.

BY ORDER OF:

OLIVER T. BACON, C. C. C.
A. B. MOORE, C. C. C.
ALBERT WYLLY, C. C. C.
HARVEY GRANGER, C. C. C.
ARTHUR W. SOLOMON, C. C. C.
(L. S.)
G. REUBEN BUTLER, Clerk, C. C. C.

CONSTRUCTION NEWS

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Mar. 15	Scotland, S. D.	Mar. 11
Mar. 17	Elyria O.	Mar. 4
Mar. 18	Mayville N. D.	Mar. 4
Mar. 18	Sheboygan Falls, Wis.	Mar. 11
Mar. 20	Paterson, N. J.	Feb. 26
Mar. 22	Ferndale (Royal Oak P. O) Mich.	Mar. 11
Mar. 23	Ashton, Idaho	Mar. 4
Mar. 23	Platte, S. D. Adv. Mar. 11	Mar. 11
Mar. 25	Jewett, O. Adv. Mar. 4.	Mar. 4
Apr. 1	Punxsutawney, Pa.	Mar. 11
Apr. 2	Akron, O. Adv. Mar. 11.	Mar. 11
Apr. 3	Clarksburg, W. Va.	Mar. 11
Apr. 12	Defiance, O. Adv. Mar. 11.	Mar. 11

SEWERS

Bids Close		See Eng. News-Record
Mar. 15	Centerville, Ia.	Mar. 11
Mar. 15	Cambellport, Wis.	Mar. 11
Mar. 16	Monterey, Cal.	Mar. 11
Mar. 16	Duluth, Minn.	Mar. 11
Mar. 16	Kohler, Wis.	Mar. 11
Mar. 18	Michigan	Mar. 4
Mar. 18	El Monte, Cal.	Mar. 4
Mar. 18	Miami, Fla.	Mar. 11
Mar. 22	Stratford, Conn. (Bridgeport P. O.) Adv. Feb. 26.	Feb. 26
Mar. 22	Rutland, Vt. Adv. Mar. 11.	Mar. 11
Mar. 22	Passaic, N. J.	Mar. 11
Mar. 23	Toledo, O. Adv. Feb. 19 and 26.	Feb. 19
Mar. 23	Libertyville, Ill. Adv. Mar. 11.	Mar. 11
Mar. 24	Woodstock, Ont.	Mar. 11
Mar. 24	Lafayette, Ind. Adv. Mar. 11.	Mar 11
Mar. 25	Wake Forest, N. C.	Mar. 4
Mar. 25	Edgerton, Wis.	Mar. 11
Mar. 25	Clarksburg, W. Va.	Mar. 11
Mar. 26	Charleston, W. Va.	Mar. 11
Mar. 27	Dayton, O.	Mar. 4
Apr. 8	Milwaukee, Wis. Adv. Feb. 26.	Feb. 26

BRIDGES

Bids Close		See Eng. News-Record
Mar. 15	New Jersey	Feb. 26
Mar. 15	Connecticut Adv. Feb. 12 to 26.	Feb. 12
Mar. 15	Greenfield, Ind.	Mar. 4
Mar. 15	Walkerton, Ont.	Mar. 11
Mar. 17	Ontario	Mar. 4
Mar. 17	Bismark, N. D.	Mar. 4
Mar. 17	Visalia, Cal.	Mar. 4
Mar. 17	Darlington, Wis.	Mar. 11
Mar. 18	Wayne, W. Va.	Mar. 4
Mar. 18	Hesperia, Mich.	Mar. 11
Mar. 18	Parkville, W. Va.	Mar. 11
Mar. 18	Elizabeth, N. J.	Mar. 4
Mar. 19	Duluth, Minn.	Mar. 4
Mar. 19	York, Ont.	Mar. 11
Mar. 19	Crystal, Mich.	Mar. 11
Mar. 22	Michigan	Mar. 4
Mar. 23	Oregon	Mar. 11
Mar. 23	O'Brien, Wash.	Feb. 12
Mar. 23	Detroit, Mich.	Mar. 11
Mar. 25	Kingston, N. Y. Adv. Mar. 11.	Mar. 11
Mar. 26	Middlebourne, W. Va.	Mar. 4
Mar. 26	Walkerton, Ont.	Mar. 11
Mar. 26	Shannonville, Ont.	Mar. 11
Mar. 29	Washington	Mar. 11
Mar. 31	Asbury Park, N. J.	Mar. 11
Mar. 31	Little Rock, Ark.	Mar. 11
Apr. 2	McKee, Pa.	Mar. 11
Apr. 2	Tamaqua, Pa.	Mar. 4
Apr. 2	Salina, Kan.	Mar. 11
Apr. 3	Fairfield, Kan.	Mar. 11
Apr. 7	Cherokee, Kan.	Mar. 11
Apr. 8	Girard, Kan.	Mar. 11

STREETS AND ROADS

Bids Close		See Eng. News-Record
Mar. 13	Freeport, Tex.	Feb. 26
Mar. 15	Connecticut	Feb. 19
Mar. 15	Manchester, Conn.	Mar. 4
Mar. 15	Dayton, O.	Mar. 4
Mar. 15	Detroit, Mich.	Mar. 11
Mar. 15	Buncombe, N. C.	Feb. 19
Mar. 15	Asheville, N. C.	Feb. 19
Mar. 15	Madison, S. D.	Feb. 26
Mar. 15	Augusta, Ga. Adv. Mar. 4.	Mar. 4
Mar. 15	Greensberg, Pa.	Mar. 11
Mar. 15	Mount Vernon, Mo.	Mar. 11
Mar. 15	Cooper, Tex.	Mar. 11
Mar. 15	Long Island City, N. Y.	Mar. 11
Mar. 16	Billings, Mont.	Feb. 26
Mar. 16	Pocahontas, Ia. Adv. Feb. 26.	Feb. 26
Mar. 16	Phila., Pa.	Mar. 4
Mar. 16	Ontario	Mar. 4
Mar. 16	Jersey City, N. J.	Mar. 11
Mar. 16	Wheeling, W. Va.	Mar. 11
Mar. 16	Ontario	Mar. 11
Mar. 16	Davenport, Ia.	Mar. 11
Mar. 16	Jersey City, N. J.	Mar. 11
Mar. 17	Houston, Tex.	Mar. 11
Mar. 17	Delaware	Feb. 26
Mar. 17	Mason City, Ia.	Mar. 4
Mar. 17	Granite Falls, Minn.	Mar. 4
Mar. 17	Monroe, Ga.	Mar. 4
Mar. 18	Wayne, W. Va.	Mar. 4
Mar. 18	Brooklyn, N. Y.	Mar. 11
Mar. 18	New York Adv. Mar. 4.	Mar. 4
Mar. 18	Wabasha, Minn.	Mar. 4
Mar. 18	Charles City, Ia.	Mar. 4
Mar. 18	Michigan	Mar. 4
Mar. 18	Olean, N. Y.	Mar. 11
Mar. 18	North Bergen, N. J.	Mar. 11
Mar. 18	Ottumwa, Ia.	Mar. 11
Mar. 19	Montana	Mar. 11
Mar. 19	Ft. Wayne, Kan.	Mar. 11
Mar. 19	York, Ont.	Mar. 11
Mar. 19	Montana Adv. Mar. 4.	Mar. 4
Mar. 19	Marietta, Ga.	Mar. 4
Mar. 19	St. Joseph, Mo.	Mar. 11
Mar. 19	Independence, Mo.	Mar. 11
Mar. 19	Michigan	Mar. 11
Mar. 19	Jacksonville, Fla.	Mar. 11
Mar. 20	Washington	Mar. 11
Mar. 20	Carlsbad, N. M.	Mar. 4
Mar. 22	Michigan	Feb. 26
Mar. 22	Danville, Mo.	Mar. 11
Mar. 22	Port Huron, Mich.	Mar. 11
Mar. 22	Michigan	Mar. 11
Mar. 22	Oakland, Cal.	Mar. 11
Mar. 22	Pennsylvania	Mar. 11
Mar. 23	Sedalia, Mo.	Mar. 11
Mar. 23	Pennsylvania	Feb. 26
Mar. 23	Montgomery, Ala.	Mar. 4
Mar. 23	Wilmington, Del. Adv. Mar. 4.	Mar. 4
Mar. 23	Ontario	Mar. 11
Mar. 24	Pennsylvania	Feb. 26
Mar. 25	Elizabeth, N. J.	Mar. 11
Mar. 25	Clarksburg, W. Va	Mar. 11
Mar. 25	Wheeling, W. Va.	Mar. 11
Mar. 26	Middlebourne, N. C.	Mar. 4
Mar 26	Jacksonville, Fla.	Mar. 11
Mar. 26	Michigan	Mar. 11
Mar. 26	Bethany, Mo.	Mar. 11
Mar. 29	New Jersey	Mar. 11
Mar. 29	Washington	Mar. 4
Mar. 29	North Carolina	Mar. 11
Mar. 31	Freehold, N. J.	Mar. 11
Mar. 31	Madison, W. Va.	Mar. 4
Apr. 1	Flandreau, S. D.	Mar. 4
Apr. 1	Richmond, Ky.	Mar. 4
Apr. 1	St. Thomas, Ont.	Feb. 19
Apr. 1	Daytona, Fla.	Feb. 26
Apr. 1	Ingersoll, Ga.	Feb. 26
Apr. 2	Salina, Kan.	Mar. 11
Apr. 3	Lawrence, Kan.	Feb. 19
Apr. 3	Fairfield, Kan.	Mar. 11
Apr. 5	Washington	Mar. 4
Apr. 5	Cleveland Heights, O. (Warrensville P. O.)	Mar. 11
Apr. 6	New York, N. Y. Adv. Mar. 11.	Mar. 11
Apr. 6	Geneva, N. Y.	Mar. 4
Apr. 6	Arkansas	Mar. 11
Apr. 6	Ft. Scott, Kan.	Mar. 11
Apr. 7	Cherokee, Kan.	Mar. 11
Apr. 8	Girard, Kan.	Mar. 11
Apr. 8	Savannah, Ga. Adv. Feb. 19 and 26.	Feb. 19
Apr. 9	Ft. Scott, Kan.	Mar. 11
Apr. 20	Colfax, Wash.	Mar. 11

EXCAVATION AND DREDGING

Bids Close		See Eng. News-Record
Mar. 15	Stapleton, N. Y.	Mar. 4
Mar. 16	Ft. Madison, Ia. Adv. Feb. 19 and 26.	Feb. 19
Mar. 16	Elbow Lake, Minn.	Mar. 4
Mar. 22	Caledonia, Ont.	Mar. 11
Mar. 26	Pittsfield, Ill.	Mar. 4

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
Mar. 15	Providence, R. I.	Feb. 26
Mar. 15	Grand Rapids, Mich.	Mar. 11
Mar. 15	Cleveland, O.	Mar. 11
Mar. 15	Flint, Mich.	Mar. 11
Mar. 15	Wakefield, Mass.	Jan. 29
Mar. 15	Grand Forks, N. D.	Feb. 26
Mar. 15	Detroit, Mich.	Mar. 4
Mar. 17	Larrabee, Ia.	Feb. 5
Mar. 17	Saukville, Wis.	Mar. 11
Mar. 17	Aurora, Neb.	Mar. 11
Mar. 20	Saco, Me.	Feb. 12
Mar. 25	Trenton, N. J.	Mar. 4
Sept. 1	Hutchinson, Kan.	Feb. 19

BUILDINGS

Bids Close		See Eng. News-Record
Mar. 13	Phila., Pa.	Mar. 11
Mar. 15	Cleveland, O.	Mar. 11
Mar. 15	Manitowoc, Wis.	Mar. 11
Mar. 15	Buchanan, Mich.	Mar. 11
Mar. 15	Lake Dark, Ia.	Mar. 4
Mar. 15	Rose Creek, Minn.	Mar. 4
Mar. 15	Mankato, Minn.	Mar. 4
Mar. 15	Saco, Me.	Feb. 19
Mar. 15	Hibbing, Minn.	Jan. 29
Mar. 15	Hamilton, Ont.	Feb. 26
Mar. 15	Landrienne, Que.	Feb. 12
Mar. 15	Brookfield, Mo.	Feb. 19
Mar. 15	Tuscalloosa, Ala.	Mar. 4
Mar. 15	Caldwell, Idaho	Mar. 4
Mar. 15	Grand Island, Neb.	Mar. 11
Mar. 17	Wiota, Ia.	Mar. 4
Mar. 15	Glidden, Ia	Mar. 4
Mar. 15	Cleveland, O.	Mar. 11
Mar. 16	Cushing, Ia.	Mar. 4
Mar. 16	Ellwood City, Pa.	Mar. 4
Mar. 16	Osceola, Neb.	Feb. 19
Mar. 16	Austin, Minn.	Mar. 4
Mar. 16	Washta, Ia.	Feb. 5
Mar. 16	Desloge, Mo.	Mar. 11
Mar. 16	Cleveland, O.	Mar. 11
Mar. 16	Mangum, Okla.	Mar. 11
Mar. 17	Marcy, N. Y. Adv. Feb. 26.	Feb. 26
Mar. 17	Spooner, Wis.	Mar. 4
Mar. 17	Charleston, W. Va.	Mar. 11
Mar. 18	Menasha, Wis.	Mar. 4
Mar. 18	Washta, Ia.	Mar. 11
Mar. 18	Watertown, Wis.	Mar. 11
Mar. 19	New York, N. Y	Mar 11
Mar. 19	Phila., Pa	Mar. 11
Mar. 20	Redford, Mich.	Feb. 5
Mar. 20	Ayshire, Ia.	Feb. 26
Mar. 20	Keewatin, Minn.	Mar. 4
Mar. 21	Fergus Falls, Minn.	Mar. 4
Mar. 21	Forest Lake, Minn.	Mar. 4
Mar. 22	Newark, N. J.	Mar 11
Mar. 22	Passaic, N. J.	Mar. 11
Mar. 22	Summit, N. J.	Mar. 11
Mar. 22	Haysville, Ia.	Mar. 11
Mar. 23	Linby, Ia.	Mar. 11
Mar. 23	Columbus, O.	Mar. 4
Mar. 23	Gallup, N. M.	Mar. 4
Mar. 23	Cushing, Ia.	Mar. 11
Mar. 24	Olds, Ia.	Mar. 4
Mar. 24	Erie, Pa.	Mar. 11
Mar. 25	St. Cloud, Minn.	Mar. 4
Mar. 25	Elgin, Minn.	Mar. 4

Bids Close		See Eng. News-Record
Mar. 25	Newark, N. J.	Mar. 11
Mar. 26	Grand Meadows, Ia.	Mar. 11
Mar. 28	St. Marys, Ia.	Mar. 11
Mar. 28	Jamison, Ia.	Mar. 11
Mar. 29	Marion, O.	Mar. 4
Mar. 29	Roselle, N. Y.	Mar. 11
Mar. 30	Waubun, Minn.	Mar. 4
Mar. 30	Fairfield, Ia.	Mar. 11
Mar. 31	Thomaston, Me.	Mar. 4
Mar. 31	Denison, Tex.	Mar. 4
Apr. 1	Rockford, Ill.	Mar. 4
Apr. 1	Dodson, Mont.	Feb. 5
Apr. 1	Dayton, O.	Feb. 19
Apr. 1	Lamont, Ia.	Mar. 4
Apr. 1	Lafayette, Minn.	Mar 4
Apr. 1	Providence, R. I.	Mar. 4
Apr. 7	Detroit, Mich.	Mar. 11
Apr. 8	Fresno, Cal.	Mar. 4
Apr 11	Kearney, Neb.	Mar. 11
Apr. 15	Riverton, Wyo.	Mar. 4
Apr. 15	Wheatland, Wyo.	Mar. 4
Apr. 15	Delmont, S. D.	Feb. 26

FEDERAL GOVERNMENT WORK

Mar. 15	Electric Elevator — Hartford, Conn.	Feb. 19
Mar. 15	Structural Steel Shapes, Plates, Rivets, Bolts, etc. —Ketchikan, Alaska	Mar. 4
Mar. 15	Extending and Remodeling —Chattanooga, Tenn.	Feb. 26
Mar. 16	Remodeling Plumbing, Electric Work, etc.—St. Louis, Mo.	Feb. 26
Mar. 16	Tunnel—Phila., Pa. Adv. Mar. 11.	Mar. 11
Mar. 17	Dredging and Excavating—Buffalo, N. Y. Adv. Feb. 19 and 26.	Feb. 19
Mar. 17	Seawall—Spec. 4135—Mt. Desert Island, Me	Mar. 11
Mar 17	Buoys—Spec. 4068—Yorktown, Va.	Mar. 11
Mar. 18	Lighting Fixtures — New York, N. Y.	Feb. 26
Mar. 22	Tanks — Port Townsend, Wash.	Mar. 4
Mar. 22	Straighten Channel, etc.—Collinsville, Cal.	Mar. 4
Mar. 24	Drainage System — Spec. 4131—Norfolk, Va.	Mar. 11
Mar. 25	Conduit—Petersburg, Va. Adv. Feb. 26.	Feb. 26
Mar. 25	Dormitory and Dairy Barn —Ardmore, Okla.	Mar. 4
Mar. 26	Changes in Approaches and Lobby Vestibule Doors — Harrisburg, Pa. Adv. Mar. 4.	Mar. 4
Mar. 27	Building Extension—Tulsa, Okla.	Mar. 4
Mar. 29	Post Office and Customhouse—Apalachicola, Fla.	Feb. 12
Mar. 31	Mechanical Equipment and Piping—Spec. 3708—Wash., D. C.	Mar. 11
Apr. 1	Dredging — Providence, R. I. Adv. Mar. 11.	Mar. 11
Apr.5	Building and Repairing Jetty—Wilmington, Del. Adv. Mar. 11.	Mar. 11
Apr. 8	Rock—New Orleans, La. Adv. Mar. 4.	Mar. 4
May 3	Bridge—Alaska Adv. Jan. 22.	Jan. 22

MISCELLANEOUS

Bids Close		See Eng. News-Record
Mar. 12	Dam—Rochester, N. Y.	Mar. 4
Mar. 15	Ornamental Light Standards—Cleveland, O.	Feb. 12
Mar. 15	Asphaltic Oil Pumps — Toronto, Ont.	Mar. 11
Mar. 15	Standard Motor Pumper — Niagara Falls, Ont.	Mar. 11
Mar. 15	Road Material — Long Island City, N. Y.	Mar. 11
Mar. 15	Pipe—Detroit, Mich.	Mar. 11
Mar. 16	Deep Well Pumping Equipment—Lockport, Ill.	Feb. 12
Mar. 16	Steam Shovel—Cambridge, Minn.	Mar. 4
Mar. 16	Stone—Toronto, Ont.	Mar. 4
Mar. 17	Centrifugal Pumps—West Chester, Pa.	Mar. 4
Mar. 17	Road Tractor—St. Cloud, Minn.	Mar. 4
Mar. 17	Road Rollers—Baltimore, Md.	Mar. 11
Mar. 17	Cement—Delaware	Feb. 26
Mar. 17	Cement and Flag—Dover, Del.	Feb. 26
Mar. 17	Gasoline Tanks — Toronto Ont.	Mar. 11
Mar. 17	Steam Shovel, Scum Drain, Curb Stop and Roadway Boxes, Road Rollers—Baltimore, Md.	Mar. 11
Mar. 18	Repairing Municipal Pier—Newport News, Va. Adv. Mar. 4	Mar. 4
Mar. 19	Road Rollers, Crushers, etc.—Cornwall, Ont.	Mar. 11
Mar. 22	Crushed Stone—Toronto, Ont.	Mar. 11
Mar. 22	Collection and Removal of Refuse—Providence, R. I. Adv. Mar. 11.	Mar. 11
Mar. 23	Weightometers New Orleans, La. Adv. Mar. 11.	Mar. 11
Mar. 23	Wharf—Sober Island—Halifax, N. S.	Mar. 11
Mar. 23	Road Oil—Toronto, Ont.	Mar. 11
Mar. 23	Fire Escapes, etc—Ossining, N. Y. Adv. Mar. 4.	Mar. 4
Mar. 24	Gasoline Driven Wagon Loaders—Toronto, Ont.	Mar. 11
Mar. 29	Dam—Decatur, Ill.	Mar. 4
Mar. 30	Dam—New Westminister, B. C.	Mar. 11
Apr. 20	Centrifugal Sewage Pump —Toronto, Ont.	Mar. 11

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

Conn., Waterbury — City appropriated $20,000 to extend c.i. watermains. R. A. Cairns, city engr.

Mich., Mt. Clemens—City having plans prepared for rein.-con. reservoir, 1,000,000 gal. capacity, on site of present waterworks and one of 500,000 gal. capacity, on east side of river, both to be 8 ft. underground with superstructure 8 ft. high. J. Irwin, city engr.

Mich., Muskegon—City rejected bids furnishing and installing 10,000,000 gal. reciprocating pumping unit. Work will be readvertised. Hoad & Decker, Ann Arbor, engrs.

Ill., Highland Park—City having plans and estimates prepared building filtration plant, also extending distributing system and installing 5,000,000 gal. additional pumping equipment. Alvord & Burdick, 8 South Dearborn St., Chicago, engrs.

S. D., Blunt—City soon lets contract building waterworks system. About $30,000. Dakota Eng. Co., Mitchell, engrs.

S. D., Bryant—City soon lets contract building tower and tank for waterworks system. Dakota Eng. Co., Mitchell, engrs.

S. D., Kadoka—City soon lets contract building waterworks system. About $42,000. Dakota Eng. Co., Mitchell, engrs.

S. D., Scotland—Until March 15, by city, building watermains in various streets. Dakota Eng. Co., Mitchell, engrs.

N. D., Leeds—City Council soon lets contract building 50,000 gal. steel tank on steel tower, 100 ft. 8 in., 6,280 ft. 6 in., and 800 ft. 4 in. c.i. mains, 23,000 gal. rein.-con. reservoir, 1 triplex pump with d c. motor, 1 heater house and heater, 12 hydrants and 100 ft. 8 in. sewer pipe. T. R. Atkinson, Bismarck, engr. Noted Jan. 12, 1919.

N. D., Mayville—City Council soon lets contract building extensions in Watermain Dist. 1, involving 4,462 ft. 4 in. and 2,362 ft. 6 in. c.i. mains and 4 hydrants. T R. Atkinson, Bismarck, engr.

Idaho, Bellevue—City plans to build gravity water system, involving 6,000 ft. 8 in. and 1,027 ft. 10 in. pipes. About $11,000. A. J. Wiley, Idaho Bldg., Boise, engr.

Ore., Reedsport — City voted $100,000 bonds to purchase and construct waterworks system, to include 5 mi. c.i. or wood pipe line from Clear Lake, to here. J. K. Cavers, recdr.

Cal., Hayward—City plans to purchase plant of Hayward Water Co., and having tentative plans prepared for improving same, to include replacing steam pumping plant with electric pumping station, extending water mains and laterals, wood or c.i. pipe. About $100,000. M. B. Templeton, clk.

Ont., Eastview—Bd. Control, Ottawa receives bids in spring extending water mains, here. About $25,000. A. F. Macallum, City Hall, Ottawa, engr.

BIDS DESIRED

Pa., Punxsutawney—Until April 1, by Consolidated Water Co. at office of M. Knowles, Inc., engrs., 1200 Jones Bldg., Pittsburgh, building rein.-con. reservoir, ½ mi. from Lindsey Sta. of Buffalo, Rochester & Pittsburgh R.R., near here, involving 2,930 cu.yd. excav., 720 cu.yd. concrete masonry and 105,000 lb. steel reinforcement; advertised in this issue.

W. Va., Clarksburg—Until April 3, by Water Bd., building one 600,000 gal. settling basin, intake chamber and laying c.i. water mains. Fuller & McClintock, 170 Bway., New York City, engrs.; advertised in this issue.

Tenn., Ripley—Until April 2, by Mayor and Aldermen, remodeling waterworks, electric light and ice plants. C. H. Jenks, Union City, engr.; advertised in this issue.

O., Akron—Until April 2, by E. A. Zeisloft, dir. Bd. Pub. Serv., laying 41,000 ft. 6-16 in. c.i. water pipe, with appurtenant work involving 24,000 cu.yd. trench excav. in unimproved streets, 6 ft. deep and suitable for trench machine work. G. G. Dixon, engr.; advertised in this issue.

O., Defiance—Until April 12, by Director Pub. Serv., building and completing water filtration and water softening plant, 2,000,000 gal. per day, including rein.-con. mixing chamber, settling basin, filter units, clear water basin, and other concrete items appurtenant to filtration plant; brick chemical and filter house, together with all appurtenant excav., grading, etc.; altering present pumping station building; laying c.i. water mains to connect pumping station, settling basins and filter house, laying terra cotta sewer pipe; installing filter equipment, chemical feed and control apparatus, sludge removal apparatus including pipes, valves, gauges, meters, etc.; furnishing and delivering 5 centrifugal pumps, 2,000,000 to 4,000,000 gal. daily capacity, complete with motors and gas engines mounted on common base with pumps; erecting 50,000 gal. steel elevated tank and tower for wash water storage, furnishing and erecting power and lighting wiring; installing heating and plumbing equipment. N. S. Hill, Jr., and S. F. Ferguson, 112·19th St., New York City, consulting engrs.; advertised in this issue.

Mich., Ferndale (Royal Oak P. O.)—Until March 22, by G. Jerome, engr., 1331 Majestic Bldg., Detroit, furnishing and laying fifty 3-way and fifty 1-way fire hydrants, together with 15,000 ft. 6 in. c.i. water pipe. About $70,000. Bids will be received for furnishing material and for furnishing and laying complete. Noted Feb. 19.

Wis., Sheboygan Falls—Until Mar. 18, by city, furnishing materials and laying extensions to waterworks, involving 1100 ft. 8 in., 2000 ft. 6 in., and 485 ft. 4 in. Class "B" c.i. pipe. About $25,000. Separate bids will be received on labor and material. J. Donahue, North 8th St., engr.

S. D., Platte—Until Mar. 23, by C. F. Slate, city aud., building watermains in various streets; advertised in this issue.

S. D., Raymond—City soon lets contract building waterworks system. About $30,000. Dakota Eng. Co., Mitchell, engrs.

Que., Lennoxville—Town Council receiving bids extending waterworks, involving wood and c.i. pipe. About $75,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

O., Cleveland—See "Sewers."

Mich., Detroit—Bd. Water Comrs. received bids Feb. 24, furnishing labor and material laying 20,930 lin.ft. 48 in. steel water pipe, to be laid in 6-ft. wide trench with depths from 9 to 13 ft., from J. Porath, 34 McGraw Bldg., $\frac{7}{16}$-in. riveted steel at $28.44, total $595,285, ½-in. at $30.24, $632,886; Gillespie Contg. Co., New York City, $\frac{7}{16}$-in. lock bar steel, $34.95, $731,503 and ½-in. $36.17, $757,038; Electric Welding Co. of Amer., 764 Court St., Brooklyn, N. Y., $\frac{7}{16}$-in. steel welded $36.85, $771,270 and ½-in. $38.60, $807,898. Noted Jan. 29.

★**Mich., Detroit**—City let contract building low lift pumping station substructure, involving 28,000 lin.ft. rein.-con. piles, 24,000 cu.yd. excav., 310 tons steel, etc., to Walsh Constr. Co., 114½ West 3rd St., Davenport, Ia., $268,850 plus $2.40 per lin. ft for concrete piles. Noted Feb. 26.

★**Cal., Blythe**—City Trustees let contract furnishing and erecting 80 ft. steel tower and 50,000 gal. steel tank, on foundation provided by city, to Chicago Bridge & Iron Wks., 215 West 7th St., Los Angeles, $6,700; furnishing 8 fire hydrants, to Waterworks Supply Co., 215 West 7th St., Los Angeles, $58 each. No bids received for drilling well.

Cal., Burlingame—City received bids furnishing and installing 2 pumps for waterworks system, from Simonds Mchy. Co., 117 New Montgomery St., San Francisco, $11,107; L. E. Penniman, San Mateo $12,581

Sewers

PROPOSED WORK

Conn., Derby—City plans to lay 1,300 ft. 48 in. concrete, segment block or monolithic concrete sewer pipe. V. B. Clark, city engr.

Conn., Waterbury—City appropriated $25,000 to build sewers in various streets. R. A. Cairns, city engr.

Ind., Bloomington—City having plans prepared by Alvord & Burdick, engrs., 8 South Dearborn St., Chicago, enlarging sewage disposal plant.

Ill., Kewanee—City plans to build sewage disposal plant. Alvord & Burdick, 8 South Dearborn St., Chicago, engrs.

Ill., Rockford—City having plans and specifications prepared building intercepting sewers and sewage disposal plant. Alvord & Burdick, 8 South Dearborn St., Chicago, engrs.

Ia., Des Moines—F. Jeffries, city clk., soon lets contract building Contr. 1 of Northeast Sanitary Sewerage System, involving 12,205 ft. 10-22 in. sewer pipe, 39 manholes and 1 single unit electric sump pump, cost $35,000; Contr. 2, 100,000 ft. 10-12 in. sewer pipe and 306 manholes, $275,000. K. C. Kastberg, city engr.

S. D., Arlington—City soon lets contract building 5 mi. sewerage system. Dakota Eng. Co., Mitchell, engrs.

S. D., Bryant—City soon lets contract building 4 mi. sewerage system. Dakota Eng. Co., Mitchell, engrs.

N. D., Mayville—City Council soon lets contract building extensions in Sewer Dist. 1, involving 1,820 ft. 12 in., 4,880 ft. 8 in., and 125 ft. 6 in. vitr. pipe, 21 catchbasins, etc. About $20,000. A. T. Atkinson, Bismarck, engr.

Mo., Columbia—City having plans, specifications and estimates prepared improving sewerage system, including (a) sewage treatment plant at Flat Branch trunk sewer outlet, (b) sewer mains in various parts of city, (c) relocation of portion of Flat Branch trunk line, (d) reconstruction of old Cameron septic tank, (e) preliminary treatment plant at Bear Creek outlet. C. Brown, city engr.

Ore., Portland—City Council adopted resolution to build sewerage system in Vancouver Ave. from Webster St., to Columbia Slough, Wehster St. from point 304 ft. east of center line of Vancouver Ave., Sumner St. from point 362 ft. east of center line of Vancouver Ave., View St. from point 336 ft. east of center Vancouver Ave., Emerson St. from point 267 ft. west of center of Vancouver Ave., Killingsworth Ave. from point 215 ft. west and 120 ft. east of center line of Vancouver Ave., Jessup St. from point 130 ft. west, Jarrett St. from point 170 ft. west and 120 ft. east of Vancouver Ave., Portland Blvd. from west line of Williams Ave. and center line of Kerby St. extended north to proposed sewer in Vancouver Ave., in alley between Williams Ave. and Moore St. from center line of Emerson St. to proposed sewer in Portland Blvd., Emerson St. from point 10 ft. east from west line of Moore St. and 35 ft. west from west line of Williams Ave., Jessup St., Jarrett St., Ainsworth Ave. to sewer in Williams Ave., Moore St. Alley, in Ainsworth Ave. from center Moore St., Williams Ave. from point 112 ft. south of Sumner St. to proposed sewer in Sumner St., cost $106,930; Lombard St. from Interstate to Albina Aves., Mississippi Ave. from point 197 ft. south of north line of Lombard St. to proposed sewer in Lombard St., Minnesota Ave. from point 192 ft. south of north Lombard St., Interstate Ave. from point 15 ft. south of north line of Killingsworth Ave. to Lombard St., Killingsworth Ave. from center Concord St. and in Church St. from point 25 ft. east of East Concord St. to Interstate Ave., Jarrett St. from center Concord St., Simpson St. from point 282 ft. west of Concord St. extended north to sewer in Interstate Ave., in Concord St. from point 118 ft. south of center line of Simpson St. to proposed sewer in Simpson St., in Colfax St. from point 464 ft. west of center Concord St. to Interstate Ave., in Concord St. from point 172 ft. south and 110 ft. north of center line of Colfax St. to proposed sewer in Colfax St., $92,472. O. Laurgaard, city engr.

Ore., Portland—City Council received no bids building sewer in East 76th St. from East Burnside to East Glisan St. and trunk sewer in East 12th St., vitr. or cement pipe. Cost to exceed $10,000. O. Laurgaard, city engr.

Cal., Biggs—City plans to build sewerage system in Main St., vitr. or cement pipe. About $45,000.

Cal., Fresno—City Council adopted resolutions to build sewer lateral in Blk. 388, and Y's for every 25 ft. frontage on Yolo St. through Blk. 388, also construct cement sidewalks on C St. from Fresno to Amador Sts. About $10,000. C. Dillon, clk.

Cal., Sacramento—City Council approved plan to build sewers in South Oaks Tract. Cost to exceed, $10,000. F. C. Miller, city engr.

Cal., Vallejo—City Council plans election to vote on $63,000 bonds to build sewers in various streets. A. E. Edgecumbe, clk.

BIDS DESIRED

Vt., Rutland—Until March 22 (change of date), by D. D. Snyder, comr. Pub. Wis., building sewers and paving West and Wales St., involving 2,700 cu.yd. sewer excav., 1,150 lin.ft. 42-54 in. monolithic or rein.-con. pipe sewer, 490 lin.ft. 27-30 rein.-con. or vitr. pipe. 200 lin.ft. 12 in. vitr. pipe, 4,770 lin.ft. granite or concrete curbing, 8,500 sq.yd. sheet asphalt, 2,925 sq.yd. vitr. shale block on 6 in. concrete base or 2,125 cu.yd. rein.-con. pavement and appurtenant work; advertised in this issue. Noted Feb. 19.

N. J., Passaic—Until March 22, by Passaic Valley Sewerage Comrs., 820 Essex Bldg., Newark, building Sect. 28 of Kearny-East Newark-Harrison Branch Intercepting Sewer, in Kearny and Harrison Twps. and East Newark Boro., Hudson Co. Alternate bids under (a) tunnel method:

(1) excavation in earth, rock or earth and rock together, in compressed air tunnel, for 36-in. x 48-in. masonry sewer, including furnishing and use of partial circumferential metallic reinforcement plates, anchor bolts, etc., and excavating and refilling of all permanent and temporary shafts, etc.; and all appurtenant work, 3,293 linear feet.

(2) appears only under the open trench method.

(3) appears only under the open trench method.

(4) concrete masonry, in tunnel lining and shafts, manholes, and elsewhere, made with portland cement mortar, including all setting of iron and steel, and all appurtenant work, 2,600 cubic yards.

(5) brick masonry, in tunnel lining and in shafts, manholes and elsewhere, laid with portland cement mortar, including all appurtenant work, 80 cubic yards.

(6) excavation and refilling for special structures connecting local sewers and all appurtenant work, lump sum.

(7) furnishing and installing sewage regulating apparatus, lump sum.

(8) furnishing and installing tide gates, lump sum.

(9) steel, for concrete reinforcement, in place, 40,000 pounds.

(b) Open trench method.

(1) earth excavation and refilling, in trench, for 33-inch circular concrete sewer, including all appurtenant work, 1,060 linear feet.

(2) earth excavation and refilling, in trench, for 36-inch circular masonry sewer, including all appurtenant work, 2,233 linear feet.

(3) rock excavation, in trench, 50 cubic yards.

(4) concrete masonry, with portland cement mortar, in place, in trench, and all appurtenant work, 1,900 cubic yards.

(5) brick masonry and appurtenant work, manholes and elsewhere, laid with portland cement mortar, 80 cubic yards.

(6) excavation and refilling for special structures connecting local sewers and all appurtenant work, lump sum.

(7) furnishing and installing sewage regulating apparatus, lump sum.

(8) furnishing and installing tide gates, lump sum.

(9) steel, for concrete reinforcement, in place, 40,000 pounds. J. H. Quigg, clk.

W. Va., Charleston—Until March 26, by B. H. Hill, city mgr., building Upper Glen Elk Sewerage System, involving 16,000 lin. ft. 8-60 in, pipe; 6th Ave. Sewerage System, 8,000 lin.ft. 8-48 in. pipe; Kentucky St. Sewer Extension, 1,000 lin.ft. 24-42 in. pipe. E. Bruce, city engr.; advertised in this issue.

W. Va., Clarksburg—Until March 25, by city, building sewers in various streets, involving 5 mi. 6-42 in. vitr. and concrete pipe, 70 manholes and 100 storm water inlets and catch basins. C. F. Mebus, City Hall, consult. engr. D. H. Hamrick, city clk.; advertised in this issue.

Fla., Miami—Until March 18, by City Council, building sewers in Storm Sewer Impvt. Dist. 25 and Sanitary Sewer Impvt. Dists. 26, 27, 28, 29 and 30. W. B. Moore, city clk.

Tenn., Ripley—Until April 2, by Mayor and Aldermen, building sanitary sewerage system. C. H. Jenks, Union City, engr.; advertised in this issue.

Ind., Lafayette—Until March 24, by Bd. Pub. Wks, laying 267 ft. 84 in., 340 ft. 78 in. and 1,708 ft. 72 in. segment block, rein.-con. or monolithic concrete sewer pipes. About $68,578. H. F. Kessener, city engr.; advertised in this issue.

Ill., Libertyville—Until March 23, by Bd. Local Impvts., building complete storm water sewerage system, also extending water mains, involving, 1,215 lin.ft. 42 in. vitr. segment block and 41,976 lin.ft. 12-36 in. vitr. tile pipe sewer, 122 concrete manholes, 6 ft. deep, 770 lin.ft. 6 in. c.i. water pipe (to have 5½ ft. cover), 2 hydrants and one 6 in. gate valve. Separate bids will be received on water pipe. W. H. Studer, Libertyville, engr.; advertised in this issue.

Wis., Campbellsport—Until March 15, by J. M. Kohler, city clk., excavating and laying 6,000-7,000 ft. 8 in. vitr. sewer pipe in Main St. About $25,000.

Wis., Edgerton—Until March 25, by G. W. Blanchard, city clk., furnishing labor and material for building 8 in. sanitary sewers in Crossover, Albion and Victoria Rds., East Fulton, Chamberlain and Doty Sts., Roosevelt, Wilson and Pershing Aves. W. F. Reichardt, Watertown, engr.

Wis., Kohler—Until Mar. 16, by city, building additional sewers and water mains in Main St., involving 1,347 ft. 10 in., 4,600 ft. 8 in., and 335 ft. 6 in. pipe and sewage pump station complete. About $25. J. Donahue, North 8th St., Sheboygan, engr.

Ia., Centerville—Until March 15, by city, furnishing and laying 20,300 ft. 8-12 in. sanitary sewers and building sewage disposal plant. R. O. Stephenson, clk.

Ia., Durant—City let contracts laying 5 mi. sewer pipe for new sewerage system, to Independent Constr. Co., 304 Lane Bldg., Davenport, $71,000; disposal plant, to Harness Bros. Co., Ottumwa, $16,665.

Minn., Duluth—Until March 16, by J. A. Farrell, city comr., building sewer in West Kent Rd. Div., involving 5,220 ft. 8-18 in. concrete pipe, 3,675 cu.yd. earth and 200 cu.yd. rock trenching. Cost $17,926. E. K. Coe, city engr.

Cal., Monterey—Until March 16, by A. Kay, city clk., building 250 ft. 8-in. vitr. sewer in David Ave., from Lilly to Newton Sts., 1,775 ft. 6 in. vitr. sewer in Lilly St. from point 130 ft. southerly from Hoffman to David Aves., installation of one hundred thirty-two 4 in. Y branches, connections, etc. Cost to exceed, $10,000.

Ont., Woodstock—Until March 24, by J. Morrison, city clk. building 2 mi. trunk sewer and 1,500,000 gal. sewage disposal plant, rein.-con. About $150,000. F. J. Ure & Sons, Woodstock, engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Boston—Comr. Pub. Wks. let contract building 900 ft. rein.-con. horseshoe type outfall sewer conduit, 17 ft. diam., in Stony Brook Park, to West Roxbury Trap Rock Co., West Roxbury, $107,527. Noted March 4.

N. Y., New York—H. Bruckner, pres. Bronx Boro., reecived bids March 2, building sewers in (a) Montgomery Ave., (b) Fox St., (c) Maclay Ave., from Russiano & Lauri, (a) $10,820, (b) $6,231, (c) $2,683; S. McBride, 2904 Valentine Ave., (a) $12,015; M. Delbalso, 1434 Bryant Ave., (a) $14,164, (b) $8,111, (c) $3,638; Clemente Contg. Co., 1195 Spofford St., (b) $7,771; M. Dimenna, 2336 Cambrelling Ave., (c) $3,383. Noted Feb. 26, under "Streets and Roads."

Pa., Lebanon—City received bid March 1, building sanitary sewers in Dist. 3, from J. U. Fritchey & Son, Lancaster, $388,965. Noted Feb. 5.

O., Cleveland—City received bids building 230 ft. 6 ft. rein.-con. sewer in Burk Brook across East 55th St., from W. P. Gibbons, 340 Leader-News Bldg., $11,852; W. McDowell, 10319 Miles Ave., $13,335; J. Duff, 603 Marshall Bldg., $14,325.

O., Cleveland—Saeltzer-Brown Co., 6511 Detroit Ave., received bids building 1,800 ft. 12-18 vitr. pipe sewer and 1,800 ft. 8 in. c.i. water mains, in East 94th St. and Garfield Park Blvd., from N. Salem, 638 Bradley Court, $47,772; George Bros., 1148 Bolivar Rd., $48,500.

★Mich., Port Huron—City let contracts trenching and laying 3,180 ft. lateral sewers in Avery Farm Plot, 300 ft. in Michigan St. and 500 ft. in 16th St., to J. Kaumier, Port Huron, $14,079, $1,695 and $1,780 respectively. Noted March 4.

★Minn., Marshall—A. G. Bunford, city recdr., let contract building sewers in various streets, involving 2,804 lin.ft. 10-30 in. sewers, 10 manholes, 36 No. 1 and 51 No. 2 inlets, and 2,198 lin.ft. 8, 10 and 13 in. inlet connections, to Coolsaet Bros., Marshall, $31,490.

Sewers (Continued)

Ore., Portland — City Council received bids building sewerage system in East 33rd and Stafford Sts., from F. Shea, vitr. pipe, $246,306; East 76th St. from Halsey St. to Bway., from Dyoub & Joseph, cement, $1,237, J. Albert, cement, $1,415.

Bridges

PROPOSED WORK

O., Lima—City plans to build 2 steel truss bridges over Ottawa River, on Elm and North Sts. About $85,000. V. C. Miller, city engr.

Wis., Beloit—G. E. Heebink city engr., rejected bid received Feb. 20, building 240 ft. rein.-con. arch bridge, 66 ft. wide, to have 4 spans. Noted Feb. 12.

Minn., Rochester—Olmsted Co. plans to build Bridge 3229, consisting of two 24 x 40 ft. rein-con., deck girder spans with sidewalk, cost $16,000; Bridge 3230, one 22 x 30 ft., rein.-con. girder, $11,000. G. H. Smith, Rochester, engr.

Mont., Noxon—Sanders Co. (Thompson Falls), plans to build bridge on concrete piers and abutments over Clarks Fork of Columbia River, here, to have four 210 ft. riveted steel spans, 18 ft. wide. About $90,000. Federal Government has been asked to appropriate toward cost. J. N. Edy, Helena, engr.

Idaho—See 'Streets and Roads."

Cal., Eureka—Bd. Supervs. Humboldt Co. soon lets contract building rein.-con. bridge over Jacoby Creek, on State Highway between here and Arcata. About $20,000.

Cal., Oakdale—See "Miscellaneous."

Cal., Oroville—Bd. Supervs. Butte Co. authorized building bridges on Sam Boyles Rd., near Durham, and on road west of Nelson, repairing bridge on west branch of Mud Creek, Little Rock Bridge, 1 on Cohasset Rd. and 1 at Palermo, building Culverts Nos. 1, 2 and 3 on Hicks Lane, near Chico, also various ones on Hasselbusch Rd. and 1 on Valambrosia Ave., near Chico. Cost to exceed $25,000. M. C. Polk, co. engr. Work will probably be done by day labor.

Cal., Yreka—See "Streets and Roads."

BIDS DESIRED

N. Y., Kingston—Until March 25, by F. S. Greene, state highway comr., 55 Lancaster St., Albany, building bridge to carry Rd. 5599 over Rondout Creek, here, consisting of 1 suspension span, 705 ft. long and 2 anchor spans, each 220 ft. long, with necesary anchorages, towers, concrete floor and stiffening trusses, involving 3,214,000 lb. structural steel and castings, 507,000 lb. steel cables and suspenders, 3,392 cu.yd. concrete, 100,000 lb. steel reinforcement, etc.; advertised in this issue. Noted Feb. 5.

N. J., Asbury Park—Until March 31, by Bd. Freeholders Monmouth Co., Freehold, building Bridge N16, over Deal Lake on Main St., here. W. M. Bergen, dir.; advertised in this issue.

Pa., McKee—Until April 2, by T. W. Tobias, comptroller Blair Co. (Hollidaysburg), building 66 ft. vehicular and pedestrian rein-.con. and steel bridge, 52 ft. wide, to replace present 20 ft. wide bridge over Pennsylvania R.R. tracks, 150 ft. south of McKee Sta., to have steel girders and single rein.-con. pier, involving 1,000 cu.yd. earth approach and fill. About $50,000. Blair Co., Pennsylvania R.R. and State, each to bear one-third cost.

W. Va., Clarksburg—Until March 18 (change of date), by city, constructing 5 rein.-con bridges, three 119 ft. long, each consisting of one 100 ft. span, one 225 ft. long, two 100 ft. spans, one 86 ft. long, one 48 ft span. C. F. Mebus, City Hall, consult. engr. D. H. Hamrick, city clk.; advertised in this issue.

Mich., Crystal—Until March 19, by F. F. Rogers, state highway comr. and Rd. Comrs. Montcalm Co., (Stanton), building State Reward Bridge 48, 45 ft. long, 18 ft. wide, over Fish Creek, 2 mi. from here, concrete girder and two 11 ft. plain abutments, involving 210 cu.yd. rein.-con.

Mich., Detroit—Until March 23, by Comrs. Wayne Co. and State Highway Comn., 220 County Bldg., constructing State Reward Bridge 5, to have one 100 ft. low truss span, 24 ft. wide and two 5 ft. sidewalks, over Rouge River at Redford Mills, Redford Twp., involving 196,100 ton steel; State Reward Bridge 7, to have one 100 ft. low truss span, 24 ft. wide, over River Rouge on Plymouth Detroit Rd. Noted March 4.

Mich., Hesperia—Until March 18, by F. F. Rogers, state highway comr. and Comrs. Newfield and Greenwood Twps., Oceana Co., at dist. office of State Highway Dept., Murray Bldg., Grand Rapids, building State Reward Bridge 8, 70 ft. long, 18 ft. wide, over White River, 1½ mi. southwest of here, to have two 35 ft. concrete girders with two 13 ft. plain concrete abutments and one 13 ft. pier, involving 338 cu.yd. rein.-con.

Wis., Darlington—Until March 17, by G. H. Priestley, highway comr. La Fayette Co., building following bridges:

Gough Bridge, Seymour Twp., 10 x 24 ft. span, involving 61 cu.yd. concrete and 2,940 lb. steel.

Driver Bridge, Willow Springs Twp., 24 x 35 ft. span, 178 cu.yd. concrete and 13,600 lb. steel.

Rasque Bridge, Elk Grove Twp., 24 x 40 ft. spao, 183 cu.yd. concrete and 15,570 lb. steel.

Shullsburg Bridge Shullsburg Village, 24 x 45 ft. span, 195 cu.yd. concrete and 20,430 lb. steel.

Skervis Bridge, Shullsburg Twp., 20 x 24 ft. span, 113 cu.yd. concrete and 5,900 lb. steel.

Torkelson Bridge, Gratiot Twp., 20 x 96 ft. span, 304 cu.yd. concrete and 54,310 lb. steel.

Scott Bridge, Monticello Twp., 8 x 24 ft. span, 56 cu.yd. concrete and 2,180 lb. steel. All bridges rein.-con., except Torkelson, which is steel truss. Noted Feb. 19 and March 4.

Kan., Cherokee—Until April 7, by Bd. Comrs. Cherokee Co., building concrete slab bridges, on Federal Aid Project 36, Sect. B, to include two 20 ft. spans, and four 20 ft. spans, all with 20 ft. roadway. Work involves 1,156.9 cu.yd. rein.-con., 9.3 ton steel, 575 cu.yd. earth and 86 cu.yd. rock excav. About $10,000. C. M. Cooper, Columbus, engr.

Kan., Fairfield—Until April 3, by Bd. Comrs. Jefferson Co., building bridges on Federal Aid Project 48, Sect. I, to include one 30 ft. and one 40 ft. through girder spans, 20 ft. roadways, involving 281 cu.yd. rein.-con., 10.3 ton steel, 260 cu.yd. earth excav., cost $10,000; building bridges and culverts with spans up to 20 ft., on Federal Aid Project 48, Sect. H, involving 535 cu.yd. rein.-con., 15.09 ton steel, 1,436 lin.ft. rein.-con. pipe, etc., $30,000. E E Clark, Oskaloosa, engr

Kan., Girard—Until April 8, by Bd. Comrs. Crawford Co., building bridges on Federal Aid Project 40, Sect. G, to include five 30 ft. T girder spans, one 10 ft., one 11 ft. and one 13 ft. slab spans, all 20 ft. roadways. Work involves 853.7 cu.yd. rein.-con. 23.13 ton steel, 2,792.6 cu.yd. excav., 6,624 lb. steel, etc. About $30,000. W. J. Arnold, Girard, engr.

Kan., Salina—Until April 2, by Bd. Comrs. Salina Co., building 1 T girder bridge on Federal Aid Project 45, Sect. E, to have three 40 ft. spans, with 20 ft. roadway. Work involves 419.5 cu.yd. rein.-con., 18.8 ton steel, 250 cu.yd. excav. and 2,640 lb. steel rockers and plates. About $20,000. W. H. Cost, Salina, engr.

Kan., Salina—Until April 2, by Bd. Comrs. Salina Co., building bridges on Federal Aid Project 44, Sect. E, to include two 10 ft. spans, 28 ft. roadway, 10 x 10 ft. box culverts, 40 ft. roadway, 130 ft. Pratt truss 1,072 cu.yd. rein.-con., 62.2 ton steel, 11,400 cu.yd. excav., 47.1 ton structural steel, etc. W. H. Cost, Salina, engr.

Ark., Little Rock—Until March 31, by Comrs. Bway.-Main St. Bridge Dist., 213 West 2nd St., building substructure of bridges over Arkansas River, one on Main St. and other on Bway. G. W. Donaghey, chn. J. Matthews, secy.; advertised in this issue.

Washington—Until March 29, by State Highway Comn., Olympia, building 80 ft. rein.-con. arch bridge, over South Slough on Pacific Highway, Snohomish Co. J. Allen, state highway engr.

Oregon—Until March 23, by State Highway Comn., Portland, building two 40 ft. wooden truss spans bridge over Bear Creek, two 105 ft. wooden truss spans over Dry Creek, and five 120 ft. wooden truss spans, Crook Co., involving 1,400 cu.yd. Class "B" concrete, 640 lin.ft. wooden piling, 1,200 cu.yd. earth excav., 15,500 lb. metal reinforcement, 710 lin.ft. approach trestle, cost $25,000; crossing over Oregon, Washington R.R. & Navigation Co. tracks, near Dillon, Wasco Co., involving 420 cu.yd. Class "A" concrete, 66,000 lb. metal reinforcement, 330 lin.ft. concrete handrail, 150 cu.yd. earth excav., $10,000; bridge over Pole Creek and 1 over Canyon Creek, Malheur Co., involving 100 cu.yd. Class "B" concrete, 150 cu.yd. earth excav., 1,200 lb. metal reinforcement, 185 lin.ft. timber trestle, one 75 ft. wooden truss span, $10,000; viaduct near Seufert, involving 580 cu.yd. Class "A" and 20 cu.yd. Class "B" concrete, 250 cu.yd. earth excav., 110,000 lb. metal reinforcement, 425 lin.ft. concrete handrail, $20,000; crossing over Oregon, Washington R.R. and Navigation Co. track near Big Eddy, involving 260 cu.yd. Class "A", 25 cu.yd. Class "B" concrete, 250 cu.yd. earth excav., 47,000 lb. metal reinforcement, 235 lin.ft. concrete handrail, 100 lin.ft. timber approach, $10,000; also building bridge in Prineville, involving 80 cu.yd. Class "A" concrete, 80 cu.yd. earth excav., 8,000 lb. metal reinforcement, 60 lin.ft. concrete handrail, $10,000; and 1 steel span over Santiam River between Mehama and Lyons, involving 200 cu.yd. Class "A" and 60 cu.yd. Class "B" concrete, 29,000 lb. metal reinforcement, 325,000 lb. structural steel, $50,000. H. Nunn, Salem, state highway engr.

Ont., Shannonville—Until March 26, by W. A. McLean, deputy minister, Dept. Pub. Highways, Toronto, for supply, erection and field painting of steel superstructure of 80 ft. bridge over Salmon River, here.

Walkerton, Ont.—Until March 15, by F. B. James, engr. Bruce Co., for new bridge across Teeswater River on Brant and Greenock Twp. line, alternate bids on (1) concrete abutements, pier and rein.-con. span, (2) 105 ft. span steel through truss.

Ont., Walkerton—Until March 26, by F. B. James, engr. Bruce Co., building (1) 105 ft. span bridge across Teeswater River, Culross Twp., (2) 120 ft. span bridge across Sauble River Amabel Twp., (3) 25 tons steel reinforcing rods.

Ont., York—Until March 19, by E. A. James, engr., 57 Adelaide St. E., Toronto, for arch truss bridge on Don Mills Rd., 90 ft. span, 20 ft. roadway, and two 5 ft. sidewalks. Work involves 300 cu.yd. rein-con., 450 cu.yd. concrete, 8½ tons reinforcing steel and 500 cu.yd. stone. About $20,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. C., Concord**—City let contract building concrete bridge on Concord Albermarle Rd., to J. E. Lane, Alta Vista, Va. About $47,000.

O., Columbus—Comrs. Franklin Co. receive bids about April 15, building 900 ft., rein.-con. bridge, 24 ft. wide, over Scioto River, on Greenlawn Ave. About $375,000. C. C. Lattimer, co. engr.

★**O., Tiffin** — City let contract building 110 ft. steel bridge over Rocky Creek, on East Perry St., to Roberts Supply Co., 419-21 Opera Blk., Lima, $17,650.

★**Illinois**—State Highway Dept., Springfield, let contract building one 300 ft., steel span bridge, 9 box and 12 entrance culverts, on Sect. V, Project 8, Springfield-East St. Louis Highway, Macoupin Co., to Herrick Constr. Co., Carlinville, $18,658. Work involves 1,238 cu.yd. concrete, 124,090 lb. reinforcing and 81,420 lb. structural steel, and 3,630 lin.ft. untreated piles.

Ia., Des Moines—Comrs. Polk Co. received bids March 1, building (a) 80 ft. steel truss bridge on concrete abutment, with concrete flooring, (b) 18 box culverts, from 3-10 ft. long, 3-4 ft. wide, one 16 x 18 ft. skew slab bridge, one 18 x 30 ft. I beam span bridge and one 20 x 40 ft. concrete deck girder bridge, involving 1,175 cu.yd. rein.-con., 12,290 lb. structural steel, 76,180 lb. steel bars and 2,496 lin.ft. wooden piling, from G. F. Lambert, 405 Utica Bldg., (a) $11,450, (b) $42,110; Koss Constr. Co., 2818-5th St., (a) $13,893, (b) $48,015; N. M. Stark & Co., 1215 Mulberry St., (a) $14,000, (b) $45,870. Noted March 4.

★**Minn., Blue Earth**—J. L. Herring, aud. Faribault Co., let contract building Bridges 3130, 3131 and 3132, to Babcock Bros., Winnebago, $25,637. Noted Jan. 29.

★**Minn., Roseau**—Roseau Co. let contract building 132 ft. 4 span bridge, timber piles, plank floors, over Roseau River, to Mattson & Norquist, Roseau, $15,789.

★**Tex., La Grange**—J. P. Ehlinger, judge Fayette Co., let contract building rein.-con. bridges and culverts on Highway 3, from Gonzales Co. to Flatonia, Schulenburg and beyond, to Montgomery, Robertson Constr. Co., Alamo Bank Bldg., San Antonio, $66,208. Noted March 4.

★**Wash., Seattle**—Comrs. King Co. let contract to Jarvis & Ward, Seattle, building Bridge "A," 140 ft. steel span, 20 ft. wide, at Maple Valley, involving 196 cu.yd. concrete, 44 tons steel, 5,000 lin.ft. wooden piling, 11 M ft. lumber, etc., cost $21,970; Bridge "B," 140 ft. long, 20 ft. wide, at Maple Valley, 180 cu.yd. concrete 43 tons steel, 3,500 lin.ft. wooden piling, 106 M ft. lumber, etc., $20,725; also 126 ft. steel span, 20 ft. wide, 187 cu.yd. rein.-

Bridges (Continued)

con., 36 tons steel. 2,000 lin.ft. wooden piling, 53 M ft. lumber, etc., $15,190.

Cal., Red Bluff—Bd. Supervs. Tehama Co. receives bids in spring building 210 ft. rein.-con. bridge, 21 ft. wide, over Mill Creek, cost $30,000; 720 ft. rein.-con bridge, 21 ft. wide, over Thomes Creek, $61,000; 240 ft. bridge over Bank Creek, 21 ft. wide, $30,000. W. F. Luning, co. engr., Weeks & Day, 933 Phelan Bldg., San Francisco, consult. engrs.

Structural Steel

PROPOSED WORK

Mass., Boston—Theatre—See "Buildings".

Conn., Middletown—Laboratory—See "Buildings."

R. I., Pawtucket—Theatre—See "Buildings."

N. Y., New York—School—See "Buildings."

N. Y., New York—Theatre—See "Building."

N. J., Trenton—See "Industrial Works."

Pa., Erie—Bank—See "Buildings."

Pa., Phila.—Office—See "Buildings."

Pa., Pittston—Coal Breaker—See "Miscellaneous."

O., Cleveland—High School—See "Buildings."

O., Cleveland—Office—See "Buildings."

Mich., Detroit—Hotel—See "Buildings."

Mich., Lansing—Theatre and Arcade—See "Buildings."

Ia., Cedar Rapids—Schools—See "Buildings."

Ia., Des Moines—Exchange—See "Buildings."

Kan., Wichita—Theatre and Hotel—See Steel "Buildings."

Ont., Hamilton—See "Buildings."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., East Springfield** (Springfield P. O.)—See "Industrial Works."

★**La., New Orleans**—Bank and Office—See "Buildings."

★**O., Cleveland**—Commercial—See "Buildings."

★**O., Cleveland**—Commercial—See "Buildings."

Mich., Detroit—Technical School—See "Buildings."

★**Ill., Waukegan**—See "Industrial Works."

Neb., Grand Island—High School—See "Buildings."

★**Neb., Norfolk**—Hotel—See "Buildings."

★**N. Y., New York**—Loft—See "Buildings."

★**Pa., Williamsport**—Hotel and Stores—See "Buildings."

Mich., Detroit—See "Bridges."

Reinforced Concrete

PROPOSED WORK

Mass., Boston—Theatre—See "Buildings."

R. I., Pawtucket—Theatre—See "Buildings."

Conn., Middletown—Laboratory—See "Buildings."

N. J., Trenton—See "Industrial Works."

Pa., Erie—Bank—See "Buildings."

Pa., Phila.—Office—See "Buildings."

Pa., Pittston—Coal Breaker—See "Miscellaneous."

O., Cleveland—High School—See "Buildings."

Mich., Detroit—Hotel—See "Buildings."

Mich., Highland Park (Detroit P. O.)—Hospital—See "Buildings."

Mich., Lansing—Theatre and Arcade—See "Buildings."

Wis., Carrollville—See "Industrial Works."

Ia., Cedar Rapids—Schools—See "Buildings."

Ia., Des Moines—Exchange—See "Buildings."

Kan., Wichita—Theatre and Hotel—See "Buildings."

Ariz., Phoenix—See "Buildings."

Cal., Eureka—See "Bridges."

Cal., Sacramento—See "Industrial Works."

Ont., Hamilton—See "Buildings."

BIDS DESIRED

Mich., Crystal—See "Bridges."

Mich., Detroit—Technical School—See "Buildings

Mich., Hesperia—See "Bridges."

Neb., Grand Island—High School—See "Buildings."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Portland**—See "Industrial Works."

★**N. H., Somersworth**—See "Industrial Works."

★**Mass., East Springfield** (Springfield P. O.)—See "Industrial Works."

★**Mass., Fitchburg**—See "Industrial Works."

★**N. J., Jersey City**—See "Industrial Works."

★**Pa., Williamsport**—Hotel and Stores—See "Buildings."

★**D. C., Washington**—Office and Store—See "Buildings."

★**O., Cleveland**—Commercial—See "Buildings."

★**Mich., Detroit**—See "Waterworks."

★**Ill., Wankegan**—See "Industrial Works."

★**Neb., Norfolk**—Hotel—See "Buildings."

Streets and Roads

PROPOSED WORK

Mass., Millbury—City plans to repave 1 mi. Providence St. About $40,000. W. B. Harris, selectman.

N. Y., Seneca Falls—Village Bd. adopted ordinances to pave Water St., 250 ft. rock faced brick and 200 ft. rein.-con., Walnut St. from Fall to Water Sts., rock faced brick. About $10,000. S. S. Smith, village engr.

N. J., Newark—Dept. Street Impvt., City Hall, receives bids about April 15, paving Bergen St. from Lyons St. to Weequahic Ave., involving 1,200 sq.yd. concrete; Huntington Terrace from Hawthorne to Renner Aves., 5,800 sq.yd.; Verona Ave. from Degraw Ave. to Beaumont Pl., 800 sq.yd.; Thomas Ave. from Dorson to Pacific Sts., 1,500 sq.yd.; 8th Ave. from Nevins to Clifford Sts., involving 1,000 sq.yd. reclipped granite; resurfacing Academy St. from Broad St. to point 175 ft. west. 600 sq.yd. 3 in. asphalt block.

Del., Laurel—City Council received no bids Feb. 26, grading and paving 7,500 ft. Market, West, Pine and 6th Sts., 18 ft. wide, involving 15,000 sq.yd. concrete, 14,600 lin.ft. plain and rein.-con. curbing and 3,500 cu.yd. earth excav. Work will be readvertised. H. H. Hatton, 2406 Washington St., Wilmington, engr. Noted Feb. 5.

W. Va., Moundsville—Marshall Co. voted $200,000 bonds to build roads in Clay Dist. A. Purdy, co. engr.

Ala., Jasper—City receives bids about April 1, paving principal streets, with asphaltic concrete, sheet asphalt, bitulithic, vitr. brick or Portland cement concrete. About $300,000. R. L. Totten, Jefferson Co. Bank Bldg., Brimingham, engr.

O., Cleveland—E. McGeorge, engr., 1900 Euclid Ave., soon receives bids building 500 ft. driveway, involving excavation, filling and 150 ft. concrete sewer, for Chandler Motor Car Co., East 131st St. and St. Clair Ave. About $20,000.

O., East Cleveland (Cleveland P. O.)—Town plans to pave 1,000 ft. Lee Rd. from Euclid Ave. to Terrace Rd., 24 ft. wide, brick or asphalt. About $15.000. M. Garnett, Town Hall, engr.

Mich., Dearborn—City having plans prepared for laying 50,000 lin.ft. 6 in. cement concrete sidewalks. About $40,000. C. W. Hubbell, 2348 Penobscot Bldg., Detroit, engr.

Mich., Hillsdale—City plans to shape and surface Main St., involving 7.636 sq.yd. vitr. brick, asphalt or asphaltic concrete. About $35.000. W. J. La Barre, clk.

Ill., Wheaton—Bd. Local Impvts. soon lets contract paving 6,222 sq.yd. Chicago Ave. and 13,946 sq.yd. Main, Hale, Wheaton, Evergreen, Indiana and Illinois Sts. L. J. Ruddock, city engr.

Wis., Janesville—Rock Co. Highway Com., at office of County Clerk, soon lets contract grading and paving 55,629 lin.ft. Janesville-Edgerton Rd., Application 6, involving 111,751 sq.yd. concrete, 31,917 cu. yd. earth, 1,304 cu.yd. solid rock and 668 cu.yd. borrow excav., 350.8 cu.yd. concrete in culverts, 143 cu.yd. concrete in bridges, etc. Separate bids will be received on first 6,500 ft. of road next to Edgerton. All material will be furnished by county. C. E. Moore, comr.

Wis., Racine—Racine Co. State Rd. & Bridge Com., at office of W. O. Thomas, highway comr., soon lets contract grading and paving Main St., from south city limits, ¾ mi. to north village limits, Union Grove Village, involving 1,605 sq.yd. concrete surfacing, 12,018 sq.yd. rein.-con. surfacing, 5,608 lin.ft. curb and gutter, 4,357 cu.yd. grading, etc.; 12th St., Federal Aid Project 3, involving 11,220 cu.yd. grading, 30,092 sq.yd. concrete surfacing, 69 cu.yd. concrete in culverts, one 16 ft. I-beam bridge, etc. (bids on both exclusive of cement); grading and paving with cement Mygatts Rd. to Hedke's Corners, involving 3,400 cu. yd. excav., 14,430 sq.yd. 7 and 8 in. surfacing, 55.7 cu.yd. Class "A" concrete in culverts, etc.

Minn., Aitkin—Aitkin Co. plans to grade and gravel 8 mi. road from Malmo to Glenn, 24 ft. wide. About $40,000. F. J. O'Hara, Aitkin, engr.

Minn., Albert Lea—Freeborn Co. plans to grade and gravel 15 mi. road from here east to county line, 24 ft. wide. About $90,000. E. V. H. Brown, Albert Lea, engr.

Minn., Albert Lea—Freeborn Co. plans to grade and gravel 13 mi. road from here southeast to county line, 24 ft. wide. About $78,000. E. V. H. Brown, Albert Lea, engr.

Minn., Bemidji—Beltrami Co. plans to gravel 10 mi. road from Wilton north, 24 ft. wide, cost $30,000; also grade and gravel 8 mi. road from Farley to Tenstrike and north, 24 ft. wide, $48,000. S. D. Snyder, Bemidji, engr.

Minn., Blue Earth—Faribault Co. plans to grade and gravel 9 mi. road from here to Elmore, 24 ft. wide. About $54,000. R. J. Short, Blue Earth, engr.

Minn., Brainerd—Crow Wing Co. plans to grade 18 mi. road from Crosby north, 24 ft. wide, cost $60,000; also pave 3 mi. road from Deerwood to Crosby, 18 ft. wide. Bids will be received on all types of pavement. About $90,000. C. L. Motl, Brainerd, engr.

Minn., Caledonia—Houston Co. plans to grade and gravel 22 mi. road from here to La Crescent, 24 ft. wide. About $132,000. C. D. Conzett, Caledonia, engr.

Minn., Cambridge—Isanti Co. plans to grade and gravel 14 mi. road from here to north county line, 24 ft. wide. About $84,000. P. M. Torrell, Cambridge, engr.

Minn., Carlton—Carlton Co. plans to grade and gravel 20 mi. road from here to Pine Co. line, 24 ft. wide. About $120,000. P. D. Mold, Carlton, engr.

Minn., Chaska—Carver Co. plans to grade and gravel 11 mi. road from here to Norwood, 24 ft. wide. About $66,000. W. H. Tischer, Waconia, engr.

Minn., Duluth—City soon lets contract paving 3,200 ft. 54th Ave. E., from London Rd. to Wyoming and Glendale Sts., 24 ft. wide, involving 10,440 sq.yd. gravel, 7,145 lin.ft. concrete curbing and guttering. 1,500 ft. 3 in. drain tile and 3,304 ft. 12-24 in. sewer pipe. About $45,488. E. K. Coe, city engr.

Minn., Elbow Lake—Grant Co. plans to grade and gravel 15 mi. road from here south, 24 ft. wide. About $90,000. W. E. Burgess, Elbow Lake, engr.

Minn., Fairmont—Martin Co. plans to grade and gravel 16 mi. road from Truman through Fairmont to Imogene, 24 ft. wide. About $96,000. G. A. Taber, Fairmont, engr.

Minn., Fergus Falls—Ottertail Co. plans to grade and gravel 11 mi. road from Perham south, 24 ft. wide. About $66,000. A. L. Flygare, Fergus Falls, engr.

Minn., Foley—Benton Co. plans to grade and gravel 8 mi. road from Sauk Rapids to Mille Lacs Co. line, 24 ft. wide. About $48,000. J. L. Tierney, Foley, engr.

Minn., Glenwood—Pope Co. plans to grade and gravel 15 mi. road from Starbuck to Glenwood and north county line, 24 ft. wide. About $90,000. F. M. Shepherd, Glenwood, engr.

Minn., Grand Rapids—Itasca Co. plans to grade and gravel 15 mi. road from Northome south, 24 ft. wide. About $90,000. H. A. LeSueur, Grand Rapids, engr.

Minn., Hallock—Kittson Co. plans to grade and gravel 13 mi. road from here to Bronson, 24 ft. wide. About $78,000. J. E. Disbington, Hallock, engr.

Minn., Hastings—Dakota Co. plans to grade and gravel 16 mi. road from here to Farmington, 24 ft. wide. About $96,000. C. L. Methven, Hastings, engr.

Minn., Hutchinsnn—McLeod Co. plans to grade and gravel 15 mi. road from here to Stewart, 24 ft. wide. About $90,000. I. C. Chirstlieb, Hutchinson, engr.

Streets and Roads (Continued)

Minn., Ivanhoe — Lincoln Co. plans to grade and gravel 28 mi. road north and south through here, 24 ft. wide. About $168,000. J. C. West, Ivanhoe, engr.

Minn., Little Falls — Morrison Co. plans to pave 11 mi. road from here to Royalton, 18 ft. wide. About $300,000. Bids will be received on all types of pavement. J. E. Viner, Little Falls, engr.

Minn., Mankato—Blue Earth Co. plans to grade 10 mi. road from here to St. Clair, 24 ft. wide. About $45,000. N. Moe, Mankato, engr.

Minn., Mantorville—Dodge Co. plans to grade and gravel 10 mi. State Rd. 5 from intersection of State Rd. 1 to north county line, 24 ft. wide, cost $60,000; also 10 mi. road West Concord east to intersection of State Rd. 3, 24 ft. wide, $60,000. R. D. Jorgens, Hayfield, engr.

Minn., Marshall—Lyon Co. plans to grade and gravel 18 mi. road from Lincoln Co. line southeast to Marshall, 24 ft. wide. About $108,000. C. W. Anderson, Marshall, engr.

Minn., Montevideo—Chippewa Co. plans to grade and gravel 10 mi. road from Clara City to Raymond, 24 ft. wide. About $60,000. F. O. Nelson, Montevideo, engr.

Minn., Mora—Kanabec Co. plans to grade and gravel 17 mi. road from Mora to Isanti Co. line, 24 ft. wide. About $102,000. R. G. Streetly, Mora, engr.

Minn., Ortonville—Big Stone Co. plans to gravel 6 mi. road from here east, 24 ft. wide, cost $20,000; also grade 7 mi. road from Beardsley to north county line, 24 ft. wide, $28,000. L. P. Zimmerman, Ortonville, engr.

Minn., Park Rapids—Hubbard Co. plans to grade and gravel 9 mi. road from here to Arago, 24 ft. wide. About $54,000. R. A. Dahms, Park Rapids, engr.

Minn., Pipestone—T. A. Bailey, aud. Pipestone Co., rejected bids received Feb. 10, building 11 mi. State Rds. 1 and 2, Federal Aid Project 82, also 1 mi. Rd. 2,202, all 18 ft. wide. About $360,000. Noted Jan. 29.

Minn., Pipestone—Pipestone Co. plans to grade 12 mi. road from here northeast, 24 ft. wide. About $36,000. E. Keeler, Pipestone, engr.

Minn., St. James—A. G. Countryman, aud. Wantonwan Co., rejected bids received Feb. 11, building 10 mi. Federal Aid Project 107, State Rd. 8, 18 ft. wide, also 5 mi. State Rd. Job 2,001, 24 ft. wide. About $410,000. T. J. Buhl, St. James, engr. Noted Jan. 29.

Minn., Slayton — Murray Co. plans to grade and gravel 18 mi. road from here to Fulda, 24 ft. wide. About $108,000. G. Tabor, Slayton, engr.

Minn., Slayton—Murray Co. rejected bids received Feb. 26, building State Rds. 5 and 6, Federal Aid Project 75, 24 ft. wide. About $80,000. Work may be done by day labor. Noted Feb. 12.

Minn., Two Harbors—Lake Co. plans to grade and gravel 20 mi. road from Beaver Bay to Schroeder, 24 ft. wide. About $120,000. H. C. Hanson, Two Harbors, engr.

Minn., Walker—Cass Co. plans to grade and gravel 20 mi. road from Hackensack to Longville, 24 ft. wide, cost $120,000; 24 mi. road east and west through Motley and Pillager, 24 ft. wide, $144,000. A. W. Moulster, Pine River, engr.

Minn., Warren—Marshall Co. plans to grade 10.5 mi. road from Argyle west to river, 24 ft. wide. About $40,000. H. R. Lindsey, Warren, engr.

Minn., Willmar—Kandiyohi Co. plans to pave 10 mi. road east and west of here, 18 ft. wide. About $300,000. Bids will be received on all types of pavement. H. L. Wadell, Willmar, engr.

Minn., Windon—Cottonwood Co. plans to grade 13 mi. road from Storden south to county line, 24 ft. wide. About $50,000. D. R. Savage, Windom, engr.

Mont., Cut Bank—Glacier Co. election April 23, to vote on $100,000 bonds to build roads. J. N. Edy, c/o State Highway Dept., Helena, engr.

Tex., Crockett—Comrs. Houston Co. plan to build 107 mi. highways. About $575,000 available for project. Wilder & O'Neal, Mt. Pleasant, engrs.

Tex., Port Lavaca — Calhoun Co. voted $100,000 bonds to build roads. Lone Star Eng. Co., Natl. Bank of Commerce Bldg., Austin, engrs.

Tex., Port Lavaca — R. H. Hamilton, judge Calhoun Co., soon lets contract improving 10.312 mi. Highway 3, from Calhoun Co. to Victoria Co. line, 16 ft. wide, involving 5,739 cu.yd. mud shell surfacing, road machine work, preparation of road bed, etc. About $31,679. Former bids rejected. Lone Star Eng. Co., Natl. Bank of Commerce Bldg., Austin, engrs. Noted Jan. 29.

Tex., Seguin—Guadalupe Co. soon lets contract building highway, involving 28,653 sq.yd. bituminous surface treatment, ¾ in. thick. J. B. Williams, co. judge.

Idaho—State Highway Comn. Boise, plans to pave 2.85 mi. Twin Buttes Highway between Idaho Falls and Arco, 16 ft. wide, Bonneville Co., cost $93,850; surface with crushed rock, 5.35 mi. Gooding-Rupert Highway between Wendell and Gooding, 16 ft. wide, also 1 50 ft. steel span bridge, Gooding Co., $53,000; gravel 9.75 mi. Teton Highway from Victor to Driggs, 16 ft. wide, Teton Co., $90,000; grade 20 mi. North and South Highway from Weiser to Cambridge, 26 ft. wide, Washington Co., $194,940. Federal Government has been asked to appropriate toward cost. W. J. Hall, comr. pub. wks.

Ariz., Phoenix—City voted $40,000 bonds to pave streets near proposed high school.

Wash., Chehalis—Comrs. Lewis Co. soon let contract grading and paving 4 mi. Newaukum-Boistfort Rd., concrete. Cost to exceed $50,000. E. Knight, aud.

Wash., Davenport—Comrs. Lincoln Co. soon let contract building 4 mi. Permanent Highway 3-A from Harrington east and south, involving 28,000 cu.yd. excav., 7,600 cu.yd. gravel surfacing and 800 ft. culvert pipe. J. L. Thayer, Davenport, engr.

Wash., Seattle—Bd. Pub. Wks. received no bids Feb. 20, paving Wilson Ave., et al, involving 145,000 cu.yd. earthwork and subgrade, 15,400 lin.ft. armored concrete curb, 4,450 sq.yd. 1 course 6 in. and 50,200 sq.yd. 1 course 7 in. concrete paving. About $376,234. Work will be readvertised. A. H. Dimock, city engr.

Cal., Colusa—City Trustees plan to improve Webster and Parkhill St. from School House to State Highway, also 9th St. from Clay to Webster Sts. About $30,000.

Cal., Fresno—City plans to improve portions of Boles Ave. and Sarah St., involving grading, cement concrete curbing, oiling roadway, draining, etc. About $10,000. C. Dillon, city clk.

Cal., Fresno—City adopted resolution to pave portions White Bridge Ave., 16 ft. wide, and B St., 20 ft. wide, 1½ in Warrenite bitulithic mastic surface on 4 in. cement concrete base, oil dirt shoulders and drainage culvert pipes. Cost to exceed $10,000. C. Dillon, city clk.

Cal., San Francisco—City soon lets contract improving Quesada Ave. between Railroad Ave. and Newhall St., involving 2,063 sq.yd. asphaltic concrete, 1,233 sq.yd. concrete, 1,406 lin.ft. concrete curbing, 9,800 sq.ft. artificial stone sidewalks, 2,175 cu.yd. excav., 1,079 lin.ft. armored and 42 lin.ft. unarmored concrete coping, 361 lin. ft. 8 in. vitr. salt-glazed, ironstone pipe sewer and 22 lin.ft. 10 in. vitr., salt-glazed, ironstone pipe culverts, etc. About $20,320. M. M. O'Shaughnessy, city engr.

Cal., Santa Cruz—City plans to improve Laurel St. Extension between Pacific and Riverside Aves., concrete. Cost to exceed $10,000. S. A. Evans, clk.

Cal., Santa Rosa—City Council adopted resolution to improve portions of Wallace and Howard Sts., 3 in. asphaltic concrete pavement, concrete curbing and guttering. About $10,000 each. R. P. Smith, city engr.

Cal., Santa Rosa—W. W. Felt, Jr., clk. Sonoma Co., soon lets contract grading 1.73 mi. highway from Healdsburg to Napa Co. line, Sect. B, Road Dist. 4, involving 64,728 cu.yd. excav., etc. About $38,900.

Cal., Vallejo—City Council plans election to vote on $200,000 bonds to improve various streets. A. E. Edgecumbe, clk.

Cal., Vallejo—City rejected bids received Jan. 12, improving Hichborn St., et al. Work will probably be subdivided and readvertised. A. E. Edgecombe, clk. Noted Feb. 12.

Cal., Yreka—Bd. Supervs. Siskiyou Co. plans election to vote on $1,050,000 bond issue to build 150 mi. bituminous macadam roads and 1,650 lin.ft. steel and rein.-con. bridges. H. J. Sarter, Yreka, engr.

BIDS DESIRED

N. Y., Brooklyn—Until March 18, by Park Bd., Municipal Bldg., New York City, furnishing labor and material resurfacing old walks, Prospect Park with sheet asphalt.

N. Y., Long Island City—Until March 15, by M. E. Connolly, pres. Queens Boro., regulating, grading and paving with asphalt blocks on concrete foundation, Anable St. from Jackson Ave. to point 270 ft. south, 1st Ward; regulating, grading sidewalk and gutter spaces, curbing and laying sidewalks, on 88th Ave. from 80th to 85th Sts., 'th Ward; regulating and curbing 46th St. from Jackson to Astoria Aves., 2nd Ward; regulating, grading, curbing and laying sidewalks on Gunther St. from Alburtis Ave. to 51st St., 2nd Ward.

N. Y., New York—Until April 6, by E. S. Walsh, supt. Pub. Wks., Capitol, Albany, paving Barge Canal terminal piers at West 53rd St. and Greenpoint, Cont. 19-P.; advertised in this issue.

N. Y., Olean—Until March 18, by Comrs. Pub. Wks., building brick pavement on concrete foundation with necessary sanitary and storm sewers and appurtenances in 13th St. from West Henley and Reed Sts., 14th St. from West Henley to West Sullivan Sts., 15th St. from West State to West Sullivan Sts., Irving St. from South 4th to South 11th Sts., South 7th St. from West Henley to West Green Sts., South 8th St. from West Henley St. to Raceway, **total length** about 27,579 sq.yd., (Group 4); Center St. from Main St. to 4th Ave., 1st Ave. from Front to Genesee Sts., 2nd Ave. from Front to Genesee Sts., 3rd Ave. from School to Genesee Sts., 4th Ave. from School to Center Sts., total length about 11,900 sq.yd., Coleman St. from North Union to North 4th Sts., 3,290 sq.yd. long (Group 6). S. M. Gaylor, comr. Pub. Wks.; advertised in this issue.

New Jersey—Until March 29, by State Highway Comn., Broad St. Bank Bldg., Trenton, building State Highway Route 8, Sect. 3, White's Bridge to Blodmingaaie, Passaic and Morris Counties, involving 12,800 sq.yd. concrete surface, also Sect. 4, Charlottesburg to South Mills, 45,000 sq.yd. concrete surface. A. L. Grover, ch. clk.; advertised in this issue.

N. J., Elizabeth—Until March 25, by Bd. Freeholders Union Co., improving Mountain or Westfield Ave. (Central Sect.), Mountainside Boro., involving 10,208 sq.yd. concrete on 6 in. foundation. B. King, clk.; advertised in this issue.

N. J., Freehold—Until March 31, by Bd. Freeholders Monmouth Co., rebuilding Matawan Freehold Rd., Sect. 3, Matawan and Marlboro Twps. W. M. Bergen, dir.; advertised in this issue.

N. J., Jersey City—Until March 16, by City Comrs. regulating and paving Tonnele Ave., from Hudson Blvd. to point 120 ft. north of Magnolia Ave. and from south block line of Bway. to Newark Ave., asphalt over present stone block pavement, also that portion from point 120 ft. north of Magnolia Ave. to south block line of Bway., granite block on concrete base. F. A. Dolan, clk.

N. J., Jersey City—Until March 16, by city, improving Fleet St., old Belgian block pavement. About $10,000. C. A. Van-Keuren, city engr.

N. J., North Bergen (Weehawken P. O.) —Until March 18, by Town Council, improving South St. granite block. Cost to exceed $10,000. Noted Jan. 15.

Pennsylvania—Until March 22, by L. S. Sadler, state highway comr., Harrisburg, furnishing and applying bituminous material for maintenance work of State Highway Dept.

W. Va., Clarksburg—Until March 25, by city, laying 32,000 sq.yd. vitr. brick and 30,000 sq.yd. sheet asphalt or asphaltic concrete paving, all on cement concrete base, also 35,000 ft. concrete curbing. C. F. Mebus, City Hall, consult. engr. D. H. Hamrick, city clk.; advertised in this issue.

W. Va., Warwood (Wheeling P. O.)—Until March 25, by C. O. Ephlin, city mgr., for 25,000 sq.yd. brick, concrete, warrenite and asphaltic concrete paving.

W. Va., Wheeling—Until March 16, by H. C. Crago, city clk., improving 43,000 sq. yd. 15th, 22nd, Virginia, Market, Pennsylvania, Florida, et al Sts., brick, asphalt, Warrenite asphaltic resurfacing and asphaltic concrete. About $643,500. H. A. Conrad, city engr. Noted Feb. 26.

North Carolina—Until March 29, by State Highway Comn., at Div. Office, Greensboro, hard surfacing 6.7 mi. road, 16 ft. wide, Durham Co., cost, $190,000, gravel surfacing 12.6 mi. road, 16 ft. wide, Chatham Co. W. S. Fallis, Raleigh, engr.

Fla., Jacksonville—Until March 19, by City Comn., furnishing labor and material improving various streets, involving 41,480 sq.yd. asphaltic concrete and 26,212 sq.yd. block pavement. F. M. Edwards, city engr.

Fla., Jacksonville—Until March 26, by City Comn., furnishing labor and material improving various streets, involving 9,800

Streets and Roads (Continued)

sq.yd. vitr. brick on cement sand base and 9,830 sq.yd. vitr. brick on concrete base. F. M. Edwards, city engr.

Ohio—Until March 26, by State Highway Comn., Columbus, building roads in following counties:

Clermont Co., Sect. "I" Cincinnati-West Union Rd. 2.542 mi. grading, constructing bridges and culverts and paving with bituminous or waterbound macadam, cost $70,606.

Sect. "L" Cincinnati-West Union Rd. 4.821 mi. grading, constructing bridges and culverts and paving with bituminous or waterbound macadam, $149,891.

Erie Co., Sect. "A" Lima-Sandusky Rd., 3.051 mi. grading, constructing bridges and culverts and paving with concrete, $108,070.

Fairfield Co., Sect. "C" Baltimore-Reynoldsburg Rd., 2.39 mi. grading, constructing bridges and culverts and paving with waterbound gravel, $38,794.

Hardin Co., Sect. "E" Findlay-Kenton Rd., 2.08 mi., grading, constructing bridges and culverts and paving with asphaltic concrete, $79,664.

Henry Co., Sect. "C" Bryan-Napoleon Rd., 2.396 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $68,142.

Sect. "D-1" Bryan-Napoleon Rd., .904 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $32,863.

Jackson Co., Sect. "A" Portsmouth-Oak Hill Rd., 2.478 mi., grading, constructing bridges and culverts and paving with bituminous or waterbound macadam, $49,187.

Lorain Co., Sect. "N" Cleveland-Sandusky Rd., 2.688 mi., grading, constructing bridges and culverts and paving with monolithic brick, bituminous concrete or rein.-con., $122,361.

Portage Co., Sects. "T," "U," "V" and "W" Ravenna-Warren Rd., 10.473 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $230,499.

Wayne Co., Sect. "F" and "G-1" Columbus-Wooster Rd., 3 mi., grading, constructing bridges and culverts and paving with monolithic brick, bituminous macadam or concrete, $109,228.

Sect. "F" Cleveland-Wooster Rd., 4.08 mi., grading, constructing bridges and culverts and paving with monolithic brick (brick to be furnished by state), concrete or bituminous macadam, $133,270.

O., Cleveland—Until March 17, by city, building 75,000 sq.ft. cement sidewalk in Northerly and Southerly Dists. About $50,000. R. Hoffman, city engr.

O., Cleveland Heights (Warrensville P. O.)—Until April 5, by village, grading and building 5,700 ft. 2½ in. sandstone sidewalk on Cumberland Rd. from Mayfield to Lee Rds. F. A. Pease Eng. Co., Marshall Bldg., Cleveland, engrs.

Michigan—Until March 26, by F. F. Rogers, state highway comr., at office of Bd. Rd. Comrs. Ogemaw Co., West Branch, grading, draining and surfacing 3.052 mi. State Highway Dept. 18-5, 15 ft. wide, involving 26,858 sq.yd. gravel, 10,773 cu.yd. earth excav., 1,499 lb. steel reinforcement 56.3 cu.yd. 1:2:4 and 56.6 cu.yd. 1:3:6 concrete, 483 lin.ft. 12-15 in. encased tile culverts, alternate bids on 306 lin.ft. 12 in. corrugated pipe; 5.470 mi. State Trunk Line Rd. 18-6, 15 ft. wide, involving 48,020 sq.yd. gravel, 33,198 cu.yd. earth excav., 5,152 lb. steel reinforcement, 71.6 cu.yd. 1:2:4 and 179.9 cu.yd. 1:3:6 concrete, 254 lin.ft. 12-15 in. encased tile, etc.

Michigan—Until March 22, by F. F. Rogers, state highway comr., at office of State Highway Dept., 601 Murray Bldg., Grand Rapids, grading, draining and surfacing 3.25 mi. Assessment Dist. Rd. 300, 16 ft. wide (except 1,226 lin.ft. which will be 55 ft.), Barry and Kent Counties, involving 28,059 sq.yd. gravel, 34,350 sq.yd. concrete, 15,082 cu.yd. earth excav., 711 lin.ft. 12-15 in. encased tile, 2,026 lb. steel, 67 cu.yd. 1:2:4 and 63.7 cu.yd. 1:3:6 concrete, etc. Alternate bids for stone gravel except on portions 55 ft. wide.

Michigan—Until March 19, by F. F. Rogers, state highway comr., at office of Rd. Comrs. Gogebic Co., Bessemer, grading, draining and surfacing 3.393 mi. State Trunk Line Rd. 12-18, 16 ft. wide, involving 31,660 sq.yd. concrete, 17,311 cu.yd. earth excav., 5,194 lb. steel reinforcement, 268 lin.ft. 15-24 in. encased tile, 125.5 cu.yd. 1:2:4 and 137 cu.yd. 1:3:6 concrete, etc.

Mich., Detroit—Until March 15, by C. W. Hubbell, engr., 2348 Penobscot Bldg., grading, shaping and draining 5,000 ft. streets in Lincolnshire Subdivision, involving 11,150 sq.yd. 2 in. asphaltic concrete on 6 in. concrete base, and 10,000 lin.ft. stone or concrete curbing. About $60,000.

Mich., Port Huron—Until March 22, by Dist. Engr., Majestic Bldg., constructing Federal Aid Rd. 38 (also known as Assessment Dist. Rd. 1,017) consisting of 8.156 mi. Sect. A and 8.459 Sect. B, 18 ft. wide, concrete or bituminous concrete. Noted Feb. 5.

Ia., Davenport—Until March 16, by city, paving, curbing and guttering 1,381 ft. Brady St., from 29th to 32nd Sts., involving 2,765 lin.ft. curb and gutter, 1,365 cu.yd. earth excav. and 5,327 sq.yd. asphalt or concrete; 5,769 ft. Harrison St. from 32nd St. to north city limits, 11,419 sq.yd. asphalt or concrete, 2,114 cu.yd. earth excav., etc.; 1,318 ft. Harrison St. from 32nd St. to end of paving, 4,381 sq.yd. asphalt or concrete, 2,641 lin.ft. concrete curb and gutter, 1,158 cu.yd. earth excav., etc.; 1,130 ft. 11th St. from Spring St. to Mississippi Ave., 3,033 sq.yd. asphalt or concrete, 2,539 lin.ft. concrete curb and gutter, 3,571 cu.yd. earth excav., etc.; 320 ft. Christie St. from East 11th to East 12th Sts., 1,001 sq.yd. asphalt or concrete, 645 lin.ft. concrete curb and gutter, 352 cu.yd. earth excav., etc.; 1,822 ft. Davenport Ave. from Denison Ave. to 29th St., 4,613 sq.yd. asphalt or concrete; 3,711 lin.ft. concrete curb and gutter, 1,327 cu.yd. earth excav., etc., 198 ft. Adams St. from 10th to 11th Sts., 493 sq.yd. asphalt or concrete, 1,285 cu.yd. earth excav.; 778 ft. Arlington Ave. from Columbia Ave. to 29th St., 2,052 sq.yd. asphalt or concrete, 1,610 lin.ft. concrete curb and gutter, 574 cu.yd. earth excav. 5,529 ft. Brady St. from 32nd St. to city limits, 11,059 sq.yd. asphalt or concrete, 2,048 cu.yd. earth excav., etc. R. E. Earl, city engr.

Ia., Ottumwa—Until March 18, by city, for 11,143 sq.yd. brick or concrete paving, 7,643 sq.yd. brick resurfacing and 5,448 lin.ft. curb. J. T. Brady, city engr.

Kan., Cherokee—Until April 7, by Comrs. Cherokee Co., grading and paving 7.04 mi. Crestline Rd., Federal Aid Project 36, Sect. A, 18 ft. wide, also building necessary bridges and culverts on same, involving 44,646 cu.yd. earth and 7,344 cu.yd. rock excav., 74,384 sq.yd. concrete, 8.43 ton steel, etc. About $350,000. C. M. Cooper, Columbus, engr.

Kan., Fairfield—Until April 3, by Comrs. Jefferson Co., grading and hard surfacing 10.72 mi. Williamstown-Nortonville Rd., Federal Aid Project 48, Sect. C, 18 ft. wide, involving 113,739 sq.yd. vertical fibre brick, concrete, bituminous concrete or bituminous macadam, 72,726 cu.yd. earth and 2,180 cu.yd. rock excav., 2.3 ton steel, etc. About $670,000. C. E. Clark, Oskaloosa, engr.

Kan., Ft. Scott—Until April 9, by B. Boyle, engr., Bourbon Co., hard surfacing 5 mi. Federal Aid Project 3, 16 ft. wide, bituminous macadam; 6½ mi. Federal Aid roadway, 16 ft. wide, bituminous macadam; 1¾ mi. Garland Spur, 16 ft. wide, bituminous macadam.

Kan., Ft. Scott—Until April 6, by Comrs. Bourbon Co., grading and paving 3.64 mi. Kansas City Rock Rd., Federal Aid Project 5, Sect. B, 17 ft. wide, also building necessary bridges and culverts on same, involving 16,629 cu.yd. earth and 731 cu.yd. rock excav., 34,171 sq.yd. bituminous macadam, 72.3 cu.yd. concrete, 0.27 ton steel sets, cost $90,000; 6.533 ci. Ft. Scott-Pittsburg Rd., Federal Aid Project 6, Sect. A, 16 ft. wide, 54,190 cu.yd. earth and 145 cu.yd. rock excav., 65,659 sq.yd. bituminous macadam, 382.1 cu.yd. concrete, 13.66 ton steel, etc., $205,000. B. Boyle, Ft. Scott, engr.

Kan., Ft. Wayne—Until March 19, by Comrs. Allen Co., grading and paving 0.92 mi. Ft. Scott-Wichita Rd., Federal Aid Project 18, 18 ft. wide,, also building necessary bridges and culverts on same, involving 9,717 sq.yd. concrete, 5,916 cu.yd. earth excav., 103.8 cu.yd. concrete and 4.68 ton steel, cost $45,000; 128 mi. Humboldt-Elsmore Rd., 16 ft. wide, 120,867 sq.yd. waterbound macadam, 38,970 cu.yd. earth and 287 cu.yd. rock excav., 31 ton steel, etc., $300,000; 4 mi. King of Trails Rd., 16 ft. wide, 21,736 cu.yd. earth and 751 cu.yd. rock excav., 37,576 sq.yd. gravel, 402 cu.yd. concrete, 19.4 ton steel, etc., $80,000; 4.97 mi. Iola-Geneva Rd., 14 ft. wide, 22,673 cu.yd. earth and 734 cu.yd. rock excav., 40,676 sq.yd. gravel on macadam base, 274 cu.yd. concrete, 9.4 ton steel, etc., $100,000. A. Stroup, Iola, engr.

Kan., Girard—Until April 8, by Comrs. Crawford Co., grading and paving 2.98 mi. Commercial Highway Federal Aid Project 40, Sects. H and I, 18 ft. wide, also building necessary bridges and culverts on same, involving 31,929 sq.yd. vertical fiber brick, 39,248 cu.yd. earth excav., 244 cu.yd. concrete, 5.73 ton steel, 375 lin.ft. rein.-con. pipe, etc. About $195,000. W. J. Arnold, Girard, engr.

Kan., Salina—Until April 2, by Comrs. Salina Co., grading and hard surfacing 5.25 mi. Meridian Highway, Federal Aid Project 44, 18 ft. wide, also building necessary bridges and culverts on same, involving 55,994 sq.yd. vertical fiber brick or concrete, 32,236 cu.yd. earth excav., 366.7 cu.yd. concrete, 1,686 ton steel, etc. About $360,000. W. H. Cost, Salina, engr.

Kan., Salina—Until April 2, by Comrs. Salina Co., grading and hard surfacing 7.011 mi. Meridian Highway, Federal Aid Project 45, 18 ft. wide, involving 44,188 cu.yd. earth and 435 cu.yd. rock excav., 74,130 sq.yd. vertical fibre brick, concrete or bituminous macadam, 1,808 cu.yd. concrete, 4.05 ton steel, etc. About $390,000. W. H. Cost, Salina, engr.

Montana—Until March 19, by State Highway Comn., Helena, gravel surfacing 9 mi. Black Trail, Wibaux Co., cost $48,000; grading 3.31 mi. Three Forks-Helena Rd., Federal Aid Project 12, Broadwater and Gallatin Counties, also building 200 ft. steel bridge over Jefferson River, involving 16,000 cu.yd. excav., 103,000 lb. steel in superstructure, 23,860 lb. steel tubular piers. J. H. Edy, state highway engr.

Mo., Bethany—Until March 26, by Harrison Co., building 9.6 mi. Jefferson Highway, 24 ft. wide, involving 407 cu.yd. barrow, 63,583 cu.yd. earth and 400 cu.yd. rock excav., 20,182 sq.yd. 1 course cement concrete paving, 10 ft. wide, with bituminous macadam shoulders, 3 ft. wide, 12,109 sq.yd. broken stone base, 27,245 gal. bitumen, 859 cu.yd. concrete masonry, 34,269 lb. reinforcement for masonry, 575 lin.ft. 15-24 in. clay pipe culvert, 1,032 lin.ft. timber piles, also raising 1 old bridge. About $149,872.

Mo., Danville—Until March 22, by Montgomery Co., building 8.24 mi. Natl. Old Trails Rd., New Florence Special Rd. Dist., 24 ft. wide, involving 43,516 lin.ft. grading, 43,516 sq.yd. plain macadam paving, 9 ft. wide, 376 cu.yd. concrete masonry, 17,610 lb. reinforcement for masonry, 267 lin. ft. 12-18 in. vitr. clay pipe culvert. Cost $56,357. Noted Jan. 1 under "Missouri."

Mo., Independence—Until March 19, by Jackson Co., at Kansas City, building 2.5 mi. Raytown Rd., 26 ft. wide, involving 6,705 cu.yd. earth and 6,705 cu.yd. rock excav., 12,000 lin.ft. grading, 1,970 lb. reinforcement for masonry. Alternate bids will be received on (1) 28,067 sq.yd. bituminous surface course, Spec. "B" or "C", 4,067 sq.yd. broken stone base and 2,000 cu.yd. additional material for reconstructed base course, (2) 28,607 sq.yd. 1 course plain cement concrete paving, 2,667 sq.yd. broken stone base course and 1 cu.yd. additional material for reconstructed base course, cost $105,369 and $102,738 respectively.

Mo., Mount Vernon—Until March 15, by Lawrence Co., building 22 mi. Springfield-Joplin Rd., Mount Vernon Special Rd. Dist., 24 ft. wide, involving 7,039 cu.yd. borrow, 23,379 cu.yd. earth and 1,000 cu.yd. rock excav., 84,850 lin.ft. grading, 199,361 sq.yd. 4 and 6 in. gravel surfacing, 16 ft. wide, 373 cu.yd. concrete masonry, 55,389 lb. reinforcement for masonry. Cost $86,441.

Mo., St. Joseph—Until March 19, by Buchanan Co., building 11.2 mi. Jefferson Highway, 30 ft. wide, involving 45,242 cu.yd. earth excav., 127 cu.yd. concrete masonry and 2,800 lb. reinforcement for masonry. Alternate bids will be received on (1) 113,363 sq.yd. 1 course concrete paving, 18 ft. wide, (2) 100,799 sq.yd. bituminous surface course, Spec. "B," 18 ft. wide, and 113,363 sq.yd. combination cement concrete header curbing and base course, (3) 94,513 sq.yd. vitr. brick surface course, bituminous filled, 16 ft. wide, and 100,799 sq.yd. combination cement concrete header curbing and base course, cost $349,326, $387,161 and $496,887 respectively.

Mo., Sedalia—Until March 23, by Pettis Co., building 5.3 mi. Southern Highway, 24 ft. wide, Sedalia Special 12 mi. Rd. Dist., involving 28,042 lin.ft. grading, 49,852 sq.yd. reconstructed base course, 900 cu.yd. additional material for reconstructed base course, 4,629 sq.yd. broken stone base course, 49,852 sq.yd. stone and 112,167 gal. asphalt for bituminous macadam surface course, and 1,000 lb. reinforcement for concrete masonry, cost $61,864.

Ark., Hope—Until April 6, by Comrs. Impvt. Dist. 1, c/o A. L. Betts, secy., draining, grading, curbing and paving various streets, involving 3,500 lin.ft. 8-21 in. vitr. clay pipe storm sewers, 9 manholes, 21 storm sewer inlets, 6,600 cu.yd. grading, 4,400 lin.ft. concrete curb, 20 cu.yd. concrete steps and 28,800 sq.yd. paving. Bids will be received on 3 in. vertical fibre brick, rein.-con. and asphaltic concrete. E. F. Petersen, 422 State Natl. Bank Bldg., engr.; advertised in this issue.

Tex., Cooper—Until March 15, by Clerk Delta Co., gravel surfacing 11.31 mi. Highway 19, from point 1 mi. east of here to Lamar Co. line, involving 4.9 acres clearing and grubbing, 66,932 cu.yd. earth embankment, 14,134 cu.yd. earth overhaul, 1,310 cu.yd. concrete, 638.59 cu.yd. Class "A",

Streets and Roads (Continued)

728.04 cu.yd. Class "B" and 34.28 cu.yd. Class "C" concrete, 87,413 lb. reinforcing steel, etc. Cock & Nagle, Cooper, engrs. Noted Feb. 12

Tex., Houston—Until March 17, by C. H. Bryan, judge Harris Co., scarifying, grading and surfacing 5.56 mi. Highway 12, from Southern Pacific R.R. to Ft. Fend Co., 16 ft. wide. About $12,350. Howe & Wise, 211 1st Natl. Bank Bldg., engrs. Noted Feb. 5.

Washington—Until March 20, by State Highway Comn, Olympia, clearing, grading, draining and surfacing with gravel 7.72 mi. Inland Empire Highway from Chewelah to Valley, also 6 mi. from Olson to Springdale, Stevens Co., 2 mi. Navy Yard Highway from Clifton to Holyoke Creek, Mason Co.; grading, draining and paving with concrete 3.75 mi. Inland Empire Highway from Burker to Dixie, Walla Walla Co. J. Allen, state highway engr.

Wash., Colfax—Until April 20, by Comrs. Whitman Co., building 5.54 mi. Improved Rd. 8, from Seltice to Tekoa, involving 12,869 cu.yd. crushed rock. T. Mead, Colfax, engr.

Cal., Oakland—Until March 22, by Bd. Supervs. Alameda Co., improving Mt. Eden Rd., from East 14th St. to Washington Twp. line, in Eden Twp., involving 71,111 sq.yd. concrete, 15,000 cu.yd. earth excav., 80,000 lb. reinforcing steel, 12,000 lin.ft. guard rail, 600 cu.yd. concrete for culverts, bridges, etc., 200,000 sq.ft. reinforcing mesh, 1,200 lin.ft. 6 in. drain tile, 1,200 lin.ft. 12-24 in. corrugated iron culverts, 160 lin.ft. rein-con. concrete culverts, etc About $205,000. P. H. Haviland, co. surv.

Ontario—Until March 16, by W. A. McLean, deputy minister Dept. Pub. Highways, Toronto, for clearing, grubbing, earth and rock work, and building concrete structures and other necessary work on Provincial Highway, Pittsburg Twp.; earth work, etc., on Provincial Highway, East and West Whitby Twps.

Ontario—Until March 23, by W. A. McLean, deputy minister, Dept. Pub. Highways, Toronto, concrete pavement 2.8 mi. Provincial Highway, Brantford Twp.

Ont., York—Until March 19, by E. A. James, engr., 57 Adelaide St. E., Toronto, paving 7 mi. of Weston Rd., 16-20 ft wide, to include 3 mi. waterbound macadam pavement and 4 mi. bituminous bound macadam or asphaltic concrete. About $140,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Cortland**—City Council let contract repaving Main St., to Tyne & Willey, Binghamton, $53,544.

N. Y., New York — H. Bruckner, pres. Bronx Boro., received bids March 2, regulating, grading, curbing, etc., (a) Olmstead Ave., (b) Havemeyer Ave., (c) Allerton Ave., (d) Fox St., (e) Stearnes St., (f) Sedgwick Ave., (g) East 243rd St., (h) repaving with granite blocks, Boston Rd., from F. Gasperini, 1964 Honeywell Ave., (a) $6,951, (b) $40,753, (g) $9,376; M. Delbalso, 1434 Bryant Ave., (a) $7,010, (b) $42,641, (c) $74,256, (d) $20,359, (e) $6,345, (g) $10,255; Conett Constr. Co., (a) $7,049, (e) $6,377; F. Snyder, (b) $40,763, (e) $6,170, (f) $130,440; La Mura Contg. Co., 218th St., (c) $65,990, (f) $107,667; I. F. Cavaluzzo, (b) $45,298, (c) $65,994, (d) $20,429; Russiano & Lauri, (d) $20,704; Spadero Contg. Co., 827 East 217th St., (b) $44,122, (c) $80,007, (e) $5,806, (f) $115,138; S. McBride, 2904 Valentine Ave., (f) $118,406; F. Manna, (g) $9,205; Burnside Contg. Co., 270 Burnside Ave., (a) $8,465, (b) $53,782, (c) $94,968, (e) $7,344, (f) $135,915, (h) $340,508; Leonard Paving Co., 233 Bway., (h) $346,187; O'Rourke Contg. Co., 150 Nassau St., (h) $346,666. Noted Feb. 26.

N. Y., New York—Park Bd., at office of Dept. Parks, Municipal Bldg., received lowest 3 bids March 4, paving certain walks in Central Park with cement, from F. Roeber Co., 507 5th Ave., $28,140; T. Dironma, 33 Evelyn Pl., $33,300; F. Gradwohl Eng. Co., 280 Madison Ave., $31,680. Noted Feb. 26.

N. Y., Syracuse—City received bids March 2, paving (1) 31,380 sq.yd. Manlius St., (a) bituminous concrete, (b) asphalt, (c) vitr. brick, (2) Manlius St. between tracks of New York State Rys., (a) vitr. brick, 7 in. track, (b) 9 in. track, from J. H. Gallup, Union Bldg., (1a) $187,908, (1b) $191,220, (1c) $240,900, (2a) $41,200, (2b) $41,758; G. B. Dickison, Union Bldg., (1a) $173,373, (1b) $176,961, (1c) $220,293, (2a) $39,089, (2b) $39,275.

★**W. Va., Buckhannon** — Comrs. Upshur Co. let contract improving 3.8 mi. Weston Rd., 16 ft. wide, involving 15,200 cu.yd. excav. and 29,155 sq.yd. concrete pavement, to E. J. Knepfel & Sons, 5 East 4th Newport St., Newport, Ky., $118,036. Noted Feb. 19.

★**W. Va., Charleston**—Comrs. Kanawha Co. let contract improving 2.6 mi. Elk River Rd., 26 ft. wide, involving 63,700 cu.yd. excav. and drainage structures, to Duncan Constr. Co., Marlinton, $88,183. Noted Feb. 19.

★**W. Va., Sutton**—Comrs. Braxton Co. let contract building 6.9 mi. McNutt Salt Lick Bridge Rd., involving 62,668 cu.yd. excav. and drainage structures, to C. F. McQueen, Charleston, $79,590. Noted Feb. 19.

★**North Carolina**—State Highway Comn., Raleigh, let contract to Asheville Constr. Co., Asheville, graveling 12 mi. highway, 16 ft. wide, from Brevard to Henderson Co. line, Transylvania Co., cost $150,000; paving with asphalt macadam 5¼ mi. Black Mt. Rd., 16 ft. wide, Buncombe Co., to H. C. McCrary Co., 119 Kenyon St., Knoxville, Tenn., $131,000.

★**N. C., Concord**—City let contract building 9 mi. Concord-Albemarle Rd., 16 ft. wide, to Gibson Constr. Co., Knoxville, Tenn. About $68,000.

Louisiana—State Highway Dept., Maison Blanche Bldg., New Orleans, received bids constructing gravel road in Lafayette and New Iberia Parishes, involving (1) 8,957 cu.yd. excav., (2) 20,164 cu.yd. borrow, (3) 8,972 cu.yd. gravel surface, (4) 2,232 cu. yd. concrete culvert, (5) 71.6 cu.yd. concrete in bridges, etc., from Peterman & Lonstalot Constr. Co., New Orleans, (1) $0.50, (2) $0.50, (3) $1.75, (4) $35, (5) $45, total cost $41,296; Cooper Bros., New Orleans, (1) $0.48, (2) $0.48, (3) $1.75, (4) $40, (5) $40, total cost $41,472.

★**Ohio**—State Highway Comn., Columbus, let contracts grading, building bridges and culverts and paving roads in following counties:

Cuyahoga Co., .61 mi. Sect. "Village of Bedford" Akron-Cleveland Rd., brick, to L. Garrett Constr. Co., Kent., cost $50,988.

Hamilton Co., 2.72 mi. Sect. "B" Cincinnati-Louisville Rd., Warrenite, Nugent & Hines, Harrison, $156,496.

Hancock Co., building bridge on Sect. "D" Findlay-Ottawa Rd., S. Jacobs & Son, Findlay, $2,605.

Holmes Co., .76 mi. Sect. "J-2" Columbus-Millersburg Rd., C. M. Cooper, Killbuck, $5,750.

2.49 mi. Sect. "I" Mansfield-Millersburg Rd., Miller & Rathrock, Ada, $23,871.

Washington Co., 3.97 mi. Sect. "J-2" Marietta-Caldwell Rd., concrete, S. A. Palmer, Marietta, $165,168. Noted Mar. 4.

O., Cleveland—City received bids building 175,000 sq.ft. stone sidewalk in Northerly, Southerly and Westerly Dists., from Ohio Quarries Co., Citizens Bldg., $50,608; Cleveland Stone Co., 1836 Euclid Ave., $54,574; building cement sidewalk in Westerly Dist., from M. P. Platten, Engineers Bldg., $18,304. Noted Feb. 26.

O., South Euclid—Village received bids March 2, grading and building 5,700 ft. 2½ in. sandstone sidewalk on Green Rd. from Mayfield Rd. to point 5,700 ft. north, from Ohio Quarries Co., Citizens Bldg., $17,515; Cleveland Stone Co., 1836 Euclid Ave., $18,250. Noted Feb. 5.

Ind., Indianapolis — F. C. Lingenfelter, city engr. received lowest 3 bids improving and resurfacing (a) 1,985 ft. College Ave. from 46th to 51st Sts., 32 ft. wide, (b) 609 ft. Boulevard Pl. from 42nd to 43rd Sts., 40 ft. wide, (c) 1,356 ft. College Ave. from 25th to 28th Sts., 22 ft. wide, (d) 2,465 ft. College Ave. from 11th to 16th Sts., 22 ft. wide, (e) 2,149 ft. 16th St. from Alabama St. to Senate Ave., (f) 1,613 ft. North St. from Ft. Wayne to Massachusetts Aves., 38 ft. wide, (1) asphalt, (2) bituminous concrete, from Indiana Asphalt Paving Co., 25th St. and Lake Erie & Western Ry., (a1) $38,186, (a2) $36,769, (c1) $11,820, (e1) $22,213, (f1) $21,560; Mansfield Eng. Co., 1011 Fletcher Saving & Trust Bldg., (a2) $36,597, (b1) $12,595, (b2) $12,132, (c1) $11,501, (d1) $22,525, (e1) $22,438, (f1) $20,848; Amer. Constr. Co., 314 Castle Hall Bldg., (a1) $38,033, (a2) $36,480, (e1) $22,060; J. N. Morgan & Son, 711 Lemcke Bldg., (c1) $11,874, (d1) $19,642; Union Asphalt Constr. Co., 329 Lemcke Bldg., (d1) $22,744.

★**Illinois**—State Highway Dept., Springfield, let contract grading and shaping Sect. V, Project 8, Springfield-East St. Louis Highway, Macoupin Co., involving 12,357 cu.yd. borrow, 32,829 cu.yd. earth and 100 cu.yd. rock excav., to D. Gahan, Chatham Rd., Springfield, $34,755.

★**Ill., Chicago**—Bd Local Impvts. let contract to J. A. Ross Co., 4561 Armitage Ave., paving alley between Rockwell St., Wilson, Sunnyside and Maplewood Aves., $4,161, alley between Hirsch Blvd., Potomac Ave., Oakley and Claremont Sts., $4,040; J. Dillon & Co., alley between East 68th, East 69th, Dante and Harper Sts., $7,439; Amer. Asphalt Paving Co., 133 West Washington St., Long Ave. from Fullerton Ave. to Altgeld St., $9,774, South Morgan St. from West 81st to West 83d Sts., West 81st and West 82d Sts. from Morgan St. to first alley east, $26,658; White Paving Co., 17 North La Salle St., Nelson St. from Western Ave. to point 100 ft. east of Oakley Blvd., $12,386. Eddy and Cornelia Sts. from Cicero to Long Aves., Newport St. from Laramie to Long Aves., Lavergne, Laramie and Lockwood Aves. from Roscoe to Addison Sts., $204,589; Calumet Coal & Trading Co., 9022 Commercial Ave., East 102d St. from Ave. N. to Indianapolis Ave., $30,885. Noted Jan. 22.

★**Wisconsin** — State Highway Comn., Madison, let contracts paving Green Bay-Oconto Rd., Federal Aid Project 139, Brown Co., to Jergenson Constr. Co., Denmark, $93,000; Mauston-Elroy Rd., Federal Aid Project 108, Juneau Co., to E. F. McCarthy, Grand Rapids, $27,890; Birch St., (Eau Claire), Eau Claire Co., 30 ft. wide, concrete, to A. Larson Co., 414 Main St., Eau Claire, $16,741. Noted Jan. 22 and Feb. 5.

Wisconsin—State Highway Comn., Grand Rapids, received bids Feb. 14, paving (1) Washington St. Rd., Federal Aid Project 157, Green Lake Co., involving (a) 2,119 cu.yd. earth excav., (b) 12 cu.yd. concrete in culverts, (c) 116 cu.yd. concrete in bridges, (d) 6,389 sq.yd. concrete surfacing, (e) 455 lin.ft. guard rail, (2) Green Lake-Berlin Rd., from Sta. 167 to Sta. 394, involving (a) 5,380 cu.yd. excav., (b) 38,247 sq.yd. concrete surfacing, (c) 13,114 bbl. cement, (3) Green Lake-Berlin Rd., Sta. O to Sta. 167, Green Lake Co., involving (a) 4,220 cu.yd. earth excav., (b) 29,663 sq.yd. concrete surfacing, (c) 10,171 bbl. cement, from A. Kramp, Berlin, (1a) $1.05 per cu.yd., (1b) $25 per cu.yd., (1c) $28 per cu.yd., (1d) $2.65 per sq.yd., (1e) $0.60 per lin.ft., total cost, $22,992, (2a) $0.98, (2b) $2.80, $112,374; M. Martin, Berlin, (1a) $1, (1b) $22, (1c) $26, (1d) $2.58, (1e) $0.60, $22,169, (3a) $1.02, (3b) $2.86, $89,141; Lampert Constr. Co., Oshkosh, (2a) $1.18, (2b) $2.04, (2c) $2.90, $122,403, (3a) $1.18, (3b) $2.04, (3c) $2.90, $94,988; Wilson — Johnson, Appleton, (2a) $1.15, (2b) $2, (2c) $2.68, $117,827; McGucken Constr. Co., 425 East Water St., Milwaukee, (3a) $1.20, (3b) $2.02, (3c) $2.55, $90,919. Noted Feb. 19.

Wisconsin—State Highway Comn., Div Office, 213 South Barstow St., Eau Claire, received bids Feb. 17, paving Eau Claire-Osseo Rd., Federal Aid Project 111, Eau Claire Co., involving (a) 5,591 cu.yd. borrow excav., (b) 19.31 cu.yd. concrete in culverts, (c) 15,248.6 sq.yd. concrete surfacing, (d) 100 ft. 10 in. pipe, (e) 56 ft. 12 in. pipe, (f) 874 ft. 18 in. pipe, (g) 10 catch basins, (h) 127.9 cu.yd. concrete in retaining wall, (i) 7,800 bbl. cement in place, (j) 15,248.6 sq.yd. reni.-con., from Cast Stone Constr. Co., 419½ South Barstow St., Eau Claire, (a) $1.15, (b) $0.75, (c) $1.99, (d) $1.12, (e) $1.25, (f) $3.50 (g) $52, (h) $28, (i) $2.94, (j) $2.10, total cost, $83,464; Universal Eng. Co., Eau Claire, (a) $1.18, (b) $0.90, (c) $2.06, (d) $1.05, (e) $1.30, (f) $3.20, (g) $23, (h) $28, (i) $3.14, (j) $2.30, $87,947. Noted Feb. 5.

Wis., West Bend — Washington Co. Rd. and Bridge Comn. received bid Feb. 26, paving, with 1 course concrete, Milwaukee-West Bend Rd., from Vanderboom Constr. Co., 115 19th St., Milwaukee, grading at $1.32, pavement, (without cement, sand stone), $1., pavement (with cement in place), $2.74, culverts, $28., guard rail, $.80. Noted Feb. 19.

★**Ia., Des Moines** — Comrs. Polk Co. let contracts building 12,600 ft. Carlisle Rd. south of city limits, 20 ft. wide, involving 17,500 cu.yd. dry earth excav., to S. Bowers, Ames, $10,450; 6.57 mi. Ankeny Rd. from north city limits, 20 ft. wide, 76,940 sq. yd. Class "A" concrete paving and 23,486 cu.yd. dry earth excav., to Wright Constr. Co., 211 Flynn Bldg., $351,751; 2.77 mi. Indianola Rd. from south city limits, 20 ft. wide, 31,775 cu.yd. Class "A" concrete paving and 4,315 cu.yd. dry earth excav., to T. Carey & Sons, 509 Youngerman Bldg., $145,070. Noted March 4.

★**Minn., Duluth**—City let contract paving 1,475 ft. 36th Ave., E. from Superior to 4th Sts., 24 ft. wide, involving 3,193 yd. concrete, 2,693 lin.ft. concrete curbing and 3,840 cu.yd. earth and rock excav., to Johnson & Stromgren, 1031 East Seventh St., $22,526.

★**Kan., Ft. Scott**—Comrs. Bourbon Co. let general contracts paving 4 mi. Ft.

Streets and Roads (Continued)

Scott-Wichita Rd., Federal Aid Project 33, A, 16 ft. wide, 2½ in. tarvia top on 8 in. base, to Maley & Kelley Constr. Co., Kansas City, Mo., $27,290 per mi.; 5 mi. road known as Kansas City Rd., Federal Aid Project 5, A, 16 ft. wide, 2½ in. tarvia top on 8 ion. base, to Thogmartin & Gardner, Ft. Scott, $25,625 per mi.

★**Nebraska** — State Dept. Pub. Wks., Lincoln, let contract grading Falls City South Rd., Federal Aid Project 123, to S. M. Aldrich, Auburn, $36,271, culvert and bridge work, to Monarch Eng. Co., Falls City, $25,753; grading Holdredge Platte River Rd., Federal Aid Project 52, to Houston & Gilland, Kearney, $48,349, culvert work, to Mid-State Const. Co., Hastings, $4,753.

★**Nebraska** — State Dept. Pub. Wks., Lincoln, let contracts building (a) road from Broken Bow east to county line, Custer Co., Federal Aid Project 22, (b) Schuyler South Rd., Colfax Co., Federal Aid Project 58, (c) Q St. Rd., Douglas Co., Federal Aid Project 100, (d) Center St. Rd., Douglas Co., Federal Aid Project 78, (e) Orleans-Franklin Rd., Franklin and Harlan Counties, Federal Aid Project 71, (f) Geneva and Belvidere Rd., Federal Aid Project 75, (g) road in Hall Co., Federal Aid Project 104, (h) St. Paul Grand Island Rd., Howard Co., Federal Aid Project 60, (i) Sect. 1, road in Merrick Co., Sect. 2, in Nance Co., Federal Aid Project 50 A-B, (j) Belvidere and Hebron Rd., Thayer Co., Federal Aid Project 40, (1) grading work, (2) culverts, to E. Peterson Co., 1217-18 W. O. W. Bldg., Omaha, (a1) $160,475, (Sect. 1, i1) $39,268; to Adamson & Welch, Fullerton, (Sect. 2, i2) $45,480; to Allied Contractors, Inc., Omaha, (a2) $58,162; to Roberts Constr. Co., 510-11 1st Natl. Bldg., Lincoln, (b1) $76,759; to J. E. Turner, Omaha, (c1) $44,418, (d1) $70,447; to Central Bridge & Constr. Co., Wahoo, (c2) $19,903, (d2) $22,748; to Western Bridge Contg. Co., Omaha, (e2) $52,575, (i2) $16,301; to Cook-O'Brien Co., 305 Ry. Exch. Bldg., Kansas City, Mo., (e1) $142,648; to Phelan-Shirley Co., 306 South 24th St., Omaha, (f1) $69,041; to Artificial Stone Co., Burning, (f2) $12,162, (j2) $7,603; to Hall Co., Grand Island, (g1) $9,457; to Mid-State Constr. Co., Hastings, (g2) $1,260, (h2) $2,533; to C. J. Hysham, Omaha, (j1) $29,108. Noted Feb. 12-19.

★**Montana** — State Highway Comn., Helena, let contract grading 0.54 mi. Federal Aid Project 29, Missoula Co., to Rich, Markhus & Crowe, Ronan, $30,880.

★**Tex., La Grange**—J. D. Ehlinger, judge Fayette Co., let contract grading 11.27 mi. Highway 3, from Gonzales Co. to Flatonia, Schulenburg, etc., 16 ft. wide, involving 10 acres clearing and grubbing and 35,837 cu.yd. unclassified earth excav., to Fayette Co., c/o County Judge, $19,087. Noted Jan. 22.

Tex., Snyder—W. S. Adamson, judge Scurry Co., received bids Feb. 11, grading, surfacing and draining 21.423 mi. Snyder-Sweetwater Rd., 12 ft. wide, from Scurry Co., Snyder, $105,132; Snyder Bros., Miami, $114,285; A. H. Webster, Amarillo, $128,156. Noted Feb. 5.

★**Tex., Wichita Falls**—M. M. Murphy, aud. Wichita Co., let contracts to Wichita Co., c/o J. P. Jones, co. judge, paving 8.814 mi. Highways 2 and 5, Federal Aid Project 3, 18 ft. wide, involving 64,425 sq.yd. 8 in. rein.-con. and 28,913 sq.yd. 7 in. rein.-con., $453,017 (county to furnish gravel, cement, etc., cost $29,579); grading and paving and building rein.con. bridges and culverts on 10 mi. Highway 5, Federal Aid Project 119, 16 and 18 ft. wide, involving 10 acres clearing and grubbing, 286 cu.yd. Class "A" and 579 cu.yd. Class "B" concrete, 11,938 cu.yd. unclassified excav., 19,360 lb. I beams, 31,741 lb. reinforcing steel, 37,677 sq.yd. 1 course plain concrete and 67,186 sq.yd. 1 course rein.-con., $568,045; both contract prices include 10 per cent for engineering and contingencies. Noted March 4.

★**New Mexico** — State Highway Comn., Santa Fe., let contract building State Rd. 8, Sect. 1, Federal Aid Project 46, Santa Fe Co., including Santa Cruz Bridge and connecting road, to G. S. Exon, Espanola, $10,326.

★**New Mexico** — State Highway Comn., Capitol Bldg., Santa Fe, let contract building 11.676 mi. State Rd. 4, Sect. 2, known as New Mexico Federal Aid Project 19, Luna Co., to Lee Moor Constr. Co., 302 Two Republics Bldg., El Paso, Tex., $62,783. Noted Jan. 22.

Wash., Chehalis—Comrs. Lewis Co. received bids paving 5 mi. Winlock Sect. of Pacific Highway, 16 ft. wide, concrete, from Albers & Son, Chehalis, $184,124; T. M. Morgan, Everett, $198,786; Alred, James & Hendricks, Centralia, $200,000.

★**Wash., Seattle**—Bd. Pub. Wks. let contract grading and paving Fullerton Ave. et al, involving 8,370 sq.yd. 6 in. concrete, 6,550 lin.ft. armored concrete curbing, 2,500 cu.yd. earth excav., and 3,000 lin.ft. 3 in. tile drain, to Coluccio & Erickson, Seattle, $44,799.

★**Ore., Astoria**—Clatsop Co. will pave 1.25 mi. Warrenton-Flavel Rd., 16 ft. wide. About $10,000. Work will be done by day labor. Noted Feb. 5.

Ore., Portland—City Council received bids paving (a) Chautauqua Blvd. from Willis Blvd. to Lombard Ave., (b) Sherrett Ave. from East 9th to East 17th Sts., (c) East Lincoln St., (d) East 16th St. from Alberta St. to Killingsworth Ave., (e) grading and constructing concrete sidewalks on portions of East 45th St. from Halsey St. to Bway., (1) concrete No. 3, (2) asphaltic concrete No. 1, 2 in. top on crushed rock base, (3) asphaltic concrete No. 1, 2 in. top on 4 in. crushed rock base, (4) concrete No. 3 in roadway, (4) in track, from Hahn & Rebman, (a1) $2.20 per sq.yd., total $18,426, (e) $2,479; Star Sand Co., foot of Randolph St., (a1) $2.30 per sq.yd., $18,192; United Contg. Co., Northwest Bank Bldg., (a2) $2.30 per sq.yd., $18,923, (b3) $2.35 per sq.yd., $23,440, (c4) $2.24 per sq.yd., (c5) $2.35 per sq.yd., $11,891, (d3) $2.24 per sq.yd., $11,878; S. Simonsen, 841 East 10th St., N., (b1) $2.25 per sq.yd., $23,118, (c1) $2.25 per sq.yd., $11,867; J. Grieder & Co., (e) $2,468; M. Hanson & Co., (e) $2,624. Contractors all of Portland.

★**Cal., Long Beach**—City let contracts to Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, improving 7th St., involving 308,000 sq.ft. plain 5 in. concrete pavement at $0.22 per sq.ft., 2,163 lin.ft. cement curbs, $0.55, 894 sq.ft. concrete gutters, $0.25, 9,654 sq.ft. cement walks, $0.18, 37 culverts $9,100, house connecting sewers $1,360 and public sewer, $314, total $81,685; paving alleys in blocks 45, 72, 73, 74 and 75, involving 50,358 sq.ft. 5 in. Warrenite at $0.204, $10,310. Noted March 4.

★**Cal., Los Angeles**—Bd. Pub. Wks. let contract building Avenue 50 and Baltimore Ave., involving 51,100 sq.ft. grading, oiling, and rolling, cost $0.25 per ft.; 2,285 ft. cement curbing, $0.60; 10,230 sq.ft. cement walks, $.20; 4,738 sq.ft. concrete gutter, $0.27; rein.-con. pipe culvert, $550; wood retaining wall, $350, etc., to G. H. Oswald, 366 East 58th St., $18,371.

★**Cal., Petaluma**—City let contract improving 1.6 mi. 3rd and Main Sts., involving 11,715 lin.ft. cement curbing, 6,800 cu. yd. earth excav., 5,852 cu.yd. concrete, 746 ft. 24-36 in. corrugated iron culverts, etc., to W. A. Dontanville, Acampo, $51,357. City furnishes sand, cement, crushed rock and reinforcing steel.

★**Cal., Petaluma**—City let contract improving and paving 1.6 mi. 3rd and Main Sts., to W. A. Dontonville, Acampo, $51,357. City will furnish materials. Noted July 31.

Cal., San Francisco—City received bids Feb. 18 improving Circular Ave. between Sunnyside and Santa Rosa Aves., involving 156 sq.yd. vertical brick fibre, 5,904 sq.yd. asphaltic concrete, 3,664 lin.ft. concrete curbing, 16,660 sq.ft. artificial stone sidewalks, 745 cu.yd. earth excav., 200 lin. ft. 10 in. culverts, etc., from Federal Constr. Co., Call Bldg., $33,091, Raisch Impvt. Co., 46 Kearny St., $32,950; Madrid St. between France and Italy Aves, 402 sq.yd. asphaltic concrete, 966 sq.yd. concrete, 571 lin.ft. concrete curbing, 4,400 sq.ft. artificial stone sidewalks, 3,088 cu.yd. earth excav., 92 lin.ft. 10 in. vitr., salt-glazed, ironstone pipe culverts and pipe sewer, etc., from Eaton & Smith, 407 11th St., $18,643. Raisch Impvt. Co., 46 Kearny St., $18,874, Flinn & Treacy, Call Bldg., $19,498.

★**Cal., Santa Cruz**—Santa Cruz Co. let contract grading and concrete paving 6.48 mi. road west from Watsonville, 18 ft. wide, to J. A. Marshall and J. S. Baker, Berkeley, $144,954.

★**Cal., Santa Rosa**—City will pave 10th St. from Mendocino to B Sts. and Humboldt St. from Benton to Johnson Sts. About $20,000. Work will be done by day labor, owing to lack of bids.

★**Cal., South Pasadena**—City let contract improving Orange Grove Ave., involving 165,000 sq.ft. grading, at $0.02½ per sq.ft., 165,000 sq.ft. 5 in. concrete paving, $0.19½ and 6,031 lin.ft. cement curbs, $0.50 ft., to H. E. Cox, 304 Slavin Bldg., Pasadena, total $41,200.

Que., Hull—Town let contract graveling 20 mi. road including Deschenes, Mountain Iron Mines, Klock and Eardley Rds., also road between 6th and 7th Sts., to M. Buccarelli, Chapleau, Ont., $159,600.

Railways

PROPOSED WORK

Ohio—Cleveland Ry., Leader-News Bldg., Cleveland, seeking permission from city to build single track railway on West 117th St. from Lake Erie to Thrush Ave., involving earth excav., crushed stone ballast, mass concrete, steel or concrete poles, etc. About $300,000. L. P. Crocelius, 650 Leader-News Bldg., engr.

Oregon—Owens Lumber Co., San Francisco and Brookings Lumber Co., St. Louis, Mo., making preliminary plans for railway from Grants Pass, Ore. to Crescent City, Cal., a distance of 100 mi. About $2,000,000.

California—Western Pacific Ry., 729 K St., Sacramento, having tentative plans prepared for 30 mi. extension of standard gauge railway from Sacramento to Newcastle, via Fairoaks and Orangevale. About $1,000,000. J. S. Spelman, div. supt.

Ontario—Town of Brockville receives bids in spring building siding from Grand Trunk Ry. tracks to property of Machineries & Foundries, Ltd. About $10,000. G. K. Dewey, clk.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Oregon**—See "Miscellaneous."

Excavation and Dredging

PROPOSED WORK

Ind., New Harmony — Drainage — White River Levee Assn. plans to build system, to reclaim 25,000 acres, involving 2,000,000 cu. yd. excav. Alvord & Burdick, 8 South Dearborn St., Chicago, engrs.

Minn., Bemidji—Ditch—Beltrami Co. had surveys made and plans to build Ditch 42, 94 mi. long, in Twps. 150 and 159. Aoout $170,000. W. M. Everts, Bemidji, engr.

Minn., Granite Falls — Ditches — Yellow Medicine Co. rejected bids received Feb. 16, building Ditches Nos. 14, 15 and 21, cost $51,516, $46,681 and $19,083 respectively. Work will be readvertised. J. Norgaard, Granite Falls, engr.

Ariz., Phoenix—Ditches—Salt River Valley Users Assn. adopted report of D. W. Murphey, engr., 606 South Hill St., Los Angeles, recommending sinking of 33 wells, installing pumps and constructing open cut and closed drainage ditches for removing ground water from lands. Association will vote on proposal in April.

Wash., Kent—Canal—Comrs. King Co., (Seattle) having tentative plans prepared for 6.5 mi. main canal from Mill Creek, also 15 mi. lateral ditches. About $149,000. S. Humes, Seattle, engr.

Wash., White Bluffs—Irrigation—White Bluffs Irrigation Dist. making tentative plans for development of district comprising 60,000 acres of land. Plans include relining old Hanford Canal with concrete, developing Priest Rapids into 700,000 hp. plant in high water, 400,000 hp. in low water, excavation of branch canals and laterals, and building concrete dam, flood gates, etc. Cost to exceed $1,000,000. Engineer not selected.

Cal., Alturas—Irrigation—Bd. Dirs. Hot Spring Valley Irrigation Dist. having tentative plans prepared for irrigation of valley land, involving concrete reservoirs, earth and concrete lined canals, flumes, headgates, etc. About $100,000.

Cal., Marysville—Irrigation—State Irrigation Dist. Bond Comr., Forum Bldg., Sacramento, approved $400,000 bond issue proposed by Cordua Irrigation Dist., Yuba Co., and Anderson-Cottonwood Dist., Shasta Co., improve and extend existing canals and laterals to serve 37,400 acres.

Cal., Modesto—Dam—See "Turlock."

Cal., Oakdale—Dam—Oakdale Irrigation Dist. had estimates prepared (same to be submitted to State Engineer for approval) for dam in Stanislaus River, near Melones, to impound 96,000 acre-ft. cost $956,000; valves, $78,650; 600 ft. spillway, $271,600; concrete bridge, $11,700; crane and track, $4,000; wagon road, $15,000; equipment, $40,000; camp and warehouse, $5,000; hauling freight, $15,000; dwelling, $3,000; enlarging canal, $144,000; reservoir site, $60,000; contingencies, $146,000, total $1,750,000. B. Smith, Oakdale, engr.

Cal., Olinda—Canals—Happy Valley Irrigation Dist. plans to extend canals, complete construction of Messelbeck Dam and excavate Hoover Tunnel. Bonds for $100,000 will be sold for project.

Cal., Paradise—Irrigation—Paradise Irrigation Dist. voted $144,000 bonds to complete all necessary work to insure operation of irrigation system, including acquisition

Excavation and Dredging (Continued)

of additional water rights, building of canals and flood gates. Engineer not selected. Noted Sept. 4.

Cal., Stockton—Reclamation—State Recl. Bd. approved plans for reclamation work in Mildred Island Dist., including building of drainage canals, extending levee system and installing new pumping equipment. About $300,000.

Cal., Turlock—Dam—Turlock Irrigation Dist. voted $2,570,000 for reservoir sites and Don Pedro Dam, $1,028,000 for hydroelectric plant and transmission lines and $510,000 for main irrigation canal, laterals and drainage ditches; Modesto Irrigation Dist., Modesto, voted $1,180,000 for Don Pedro Dam, $181,000 for hydroelectric plant, $150,000 for enlarging its main canal, $190,000 for extending drainage system and $298,400 for electric power distributing system. Dam will probably be arch masonry type, 280 ft. high, 1,000 ft. long, 177 ft. thick at bottom and 16 ft thick at top, in Tuolumne River, Tuolumne Co., 40-60 mi. east of here and Modesto; hydroelectric plant will develop 16,000 hp. and 12,000 kw., main canal will be 40-60 mi. long. First work will probably be construction of 8 mi. railway from Rosasco to site of dam. Work will be done jointly by both districts. P. F. Jones, Modesto, ch. engr., for Modesto Irrigation Dist., A. J. Wiley, Idaho Bldg., Boise, Idaho, consult. engr.

BIDS DESIRED

Ont., Vankleek Hill—Excavation—Until March 22, by J. H. Methot, clk. Caledonia Twp., R.R. No. 2, Vankleek Hill, construction of Cross Creek drainage work, involving 60,681 cu.yd. earth and 339 cu.yd. rock excav. About $33,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Minn., Waseca—Ditch—T. Peterson, aud. Waseca Co., received no bids Feb. 27, building Ditch No. 15, Main 2, involving 50,215 ft. 6-40 in. tile, 26 surface water inlets and 1 concrete bulkhead. Cost $74,627. Work will be readvertised. Noted Feb. 19.

★**Cal., Modesto**—Canal—Modesto Irrigation Dist. let contract lining with cement 2,000 lin.ft. Lateral No. 1, to H. H. Webb, 602 15th St., Modesto, $0.07¾ per sq.ft. Noted Aug. 14.

★**Cal., Williams**—Excavation—Williams Irrigation Dist. will excavate 521,000 cu.yd. earthwork for canals, build rein.-con. bridges over canals, 3 pump houses, 2 of which will be relift stations, and install pumps requiring 3,600 hp. from motors. About $250,000. E. C. Mills, Willows, engr. Work will be done by day labor.

Industrial Works

PROPOSED WORK

Me., Rockland—Rockland & Rockport Lime Corp. plans to rebuild factory recently destroyed by fire. Loss $100,000. Private plans.

Vt., Brattleboro—Dunham Bros. having plans prepared by H. W. Colby, archt. and engr., 46 Cornhill St., Boston, for 3 story, 65 x 300 ft., brick and terra cotta warehouse, concrete foundatioo, on Baine St. About $125,000.

Mass., Brockton—Puritan Shoe Mfg. Co.; 263 North Main St., having plans prepared by Tuck & Gilman, archts. and engrs., 34 School St., Boston, for 5 story, 70 x 200 ft., brick and concrete factory, concrete foundation. About $175,000.

Mass., Cambridge—Lever Bros. Co., Portland St., having plans prepared by C. T. Main, archts. and engrs., 201 Devonshire St., Boston, for 6 story, rein.-con. addition to factory.

Mass., East Springfield — Storms Drop Forging Co., 168 Bridge St., soon lets contract building 1 story, brick and concrete forge plant, concrete flooring and foundation, on Roberts Rd. About $25,000. Private plans.

Mass., Greendale (Worcester P. O.)—Norton Co., Barbers Crossing, Worcester, had plans prepared for 6 story, 75 x 150 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, here. About $250,000. Private plans.

Mass., Marlboro—Lapham & Powning plans to build 2 story, 60 x 300 ft., brick and steel factory. About $100,000. Private plans.

Mass., North Adams—H. W. Clark Biscuit Co., 185 Ashland St., soon lets contract building 4 story, 90 x 110 ft., concrete and steel addition to factory, rein.-con. flooring, concrete foundation. About $150,000. W. Higginson, 13 Park Row, New York City, engr.

Mass., North Weymouth (Boston P. O.)—Edison Electric Illuminating Co., 70 State St., Boston, plans to build 1 story, brick, concrete and steel electric plant. Private plans.

Mass., Roxbury (Boston P. O.)—Trimont Mfg. Co., 55 Armory St., soon receives bids building 3 story, 40 x 240 ft., brick and mill construction factory, concrete foundation. About $100,000. Private plans.

Mass., South Braintree (Boston P. O.)—G. F. Shepard, archt., 78 Devonshire St., Boston, soon lets contract building 1 story, 70 x 100 ft., brick and steel factory, concrete flooring and foundation, for Rice & Hutchins, Inc., 10 High St., Boston. About $35,000.

Mass., Springfield—Diamond Match Co., 98 Friend St., Boston, plans to build rein.-con. and steel factory. About $500,000. Architect not selected.

Mass., Westfield—F. Schmidt, 24 School St., having plans prepared for 1 story, brick garage, concrete flooring, on Church St. About $30,000. Private plans.

R. I., Providence—Narragansett Electric Lighting Co., 800 Turks Head Bldg., soon lets contract building brick and steel extension to power plant, rein.-con. flooring, concrete foundation, on South St. About $700,000. Private plans.

R. I. Woonsocket — Farrar Lumber Co. had plans prepared by O. H. Drouin, archt., 6 Buell Bldg., for 2 story, 60 x 100 ft. lumber shed, 1 story office and 1 story lime and concrete shed, brick and timber, concrete flooring and foundation. About $25,000.

Conn., Bridgeport—Berkshire Steel Products Co., plans to build 2 story, 23 x 28 x 54 x 138 ft., brick and steel warehouse, concrete foundation, on Railroad Ave. About $35,000. Private plans.

Conn., East Hartford (Hartford P. O.)—Chamber of Commerce plans to build brick factory. About $50,000. Address E. E. King, 118 Governor St. Architect not selected.

Conn., Meriden—Miller Bros. Cutlery Co., 464 Pratt St., soon lets contract building 4 story, 50 x 90 ft., brick and mill construction addition to factory, concrete foundation. About $50,000. W. T. Arnold, 105 Elm St., archt.

Conn., Middletown—Coles Co., 138 Main St., plans to build 3 story, 40 x 200 ft., concrete and mill construction warehouse and grain elevator, concrete foundation, on Union St. About $60,000. J. E. Stevens, 53 Devonshire St., Boston, archt. and engr.

N. Y., Buffalo—General Drop Forge Co., 1738 Elmwood Ave., having plans prepared by E. McGeorge, archt. and engr., 1900 Euclid Ave., Cleveland, O., for 60 x 100 ft., brick and steel forge shop, brick foundation. About $75,000.

N. Y., Buffalo—General Drop Forge Co., 1738 Elmwood Ave., having plans prepared by E. McGeorge, archt. and engr., 1900 Euclid Ave., Cleveland, O., for 1 story, 100 x 100 ft., brick and steel heat treating plant, brick foundation. About $75,000.

N. Y., Medina—H. J. Heinz Co., 1062 Main St. N. S., Pittsburgh, Pa., plans to build 2 story, 171 x 275 ft. bottling plant, here, stone. Cost between $90,000 and $100,000.

N. Y., Newton Falls—Newton Falls Paper Co., B & L Bldg., Watertown, having plans prepared by C. E. Eaton, archt., Sherman Bldg., Watertown, for 1 story, 103 x 270 ft. concrete and steel machine room, here. Cost between $75,000 and $85,000. F. L. Moore, pres.

N. Y., Rochester—Rochester Gas & Electric Corp. plans to improve and build additions to electric department, cost $852,100, gas department, $327,100, steam department $55,000. Company has applied to Pub. Serv. Comn., 2nd Dist., for permission to issue $500,000 additional stock to help defray above expenses.

N. Y., Salamanca—Kendall Refining Co., Kendall Ave., Bradford, Pa., plans to construct 2 story, 30 x 40 ft. storage plant and office building, brick, also three 12,000 gal. steel tanks, on Broad St., here. Cost between $50,000 and $60,000.

N. Y., Schenectady—General Electric Co., River Rd., plans to build 1 story, 206 x 600 ft., rein.-con. and steel shop, concrete foundation, on Central Ave. About $700,000. Private plans.

N. J., Trenton—W. Hankin, archt., 241 South Warren St., receives bids about March 14, building 6 story, 67 x 155 ft., rein.-con. and steel, for H. D. Lee Mercantile Co., 13 East State St. About $300,000.

Pa., Allentown—City plans to build 2 story, 40 x 100 ft., brick and steel garage, rein.-con. flooring, rock foundation, on Main St. About $50,000. Architect not selected.

Pa., Erie—Hays Mfg. Co. soon lets contract building 3 story, 57 x 115 ft., brick and steel factory, brick foundation. About $150,000. E. McGeorge, 1900 Euclid Ave., Cleveland, O., archt. and engr. Noted Feb. 5.

Pa., Phila.—Hagy Waste Wks., 836 South Swanson St., rejected bids received Feb. 16, building 4 story, 40 x 90 ft., rein.-con. and brick warehouse, at 810 Queen St. Noted Feb. 12.

Pa., Pittston—Pennsylvania Coal Co. plans to build 40 x 40 ft. electric power plant, 30 ft. high, brick and steel, stone foundation. About $200,000.

Pa., Scranton—Maccar Truck Co., Gilligan St., plans to build 2 story, 100 x 660 ft., brick and steel factory, rein.-con. flooring, rock foundation, on Providence Rd. Architect not selected.

Md., Baltimore—Federal Motors Co., 803 Low St., purchased Grasshopper Hill, north of North Ave. and east of Mt. Royal Ave., and plans to build 150 x 300 ft. garage.

Md., Baltimore—H. Kloff, Central Ave. and Gough St., having plans prepared by J. C. Spedden, archt., 2715 Harlem Ave., for 3 steel and brick warehouses, 1 story, 100 x 250 ft., 2 story, 100 x 100 ft. and 4 story, 45 x 90 ft., concrete foundations, on Paca and Stockholm Sts. About $200,000.

Md., Canton (Baltimore P. O.)—Baltimore Copper Smelting & Rolling Co., 4th Ave. and 5th St., prepared plans building 1 story, 204 x 330 ft., steel and brick rolling mill, concrete foundation, on 3rd Ave. and 1st and 2nd Sts. About $130,000. Private plans.

D. C., Washington—Hatton & Co., archts., 12th and U Sts., receives bids about April building 3 story, 54 x 110 ft., concrete and brick printing plant, on 9th and U Sts., for Murray Bros. Printing Co., 1731 7th St., N. W. About $50,000.

Va., Norfolk—Norfolk Shipbuilding & Dry Dock Corp., 494-526 Argyle Ave., plans to construct 7 or 8 buildings, machine shop, also wharves, docks, etc. Cost to exceed $100,000. Neubauer & Supourtz, 929 Chestnut St., Phila., engrs.

La., Mansfield—Associated Producing & Refining Corp. plans to build 10,000 bbl. oil refinery, here. About $1,000,000. M. Burns, pres. Engineer not selected.

Tenn., Knoxville—C. Rodgers plans to build 2 story, 80 x 95 ft., steel and brick garage and salesroom, concrete foundation, on West Main St. Cost to exceed, $50,000.

O., Cleveland—Aetna Rubber Co., 815 East 79th St., plans to build 1 or 2 story, 100 x 130 ft., steel and brick factory, brick foundation. About $100,000. H. Kappler, mgr. Architect and engineer not selected.

O., Cleveland—Cataract Motor Sales Co., 8818 Bway., plans to construct 3 story, 80 x 250 ft., concrete, steel and brick garage and sales building, rein.-con. flooring, concrete foundation, at 8807 Bway. About $100,000. Architect not selected.

O., Cleveland—Cleveland Ry., Leader-News Bldg., plans to build 1 story, concrete, steel and brick substation, rein.-con. flooring, concrete foundation, on East 130th St. and Woodland Ave. About $75,000. D. W. Morrow, 4500 Euclid Ave., engr.

O., Cleveland—D. W. Morrow, archt., 4500 Euclid Ave., soon lets contract constructing 2 story, 54 x 130 ft. sand dryer building, brick, concrete and steel, rein.-con. flooring, concrete foundation, on Harvard Ave. near East 55th St., for Cleveland Ry., Leader-News Bldg. About $50,000. J. Stanley, pres.

O., Cleveland—Demco Machine Tool Co., 706 Frankfort Ave., plans to build 1 story, concrete, steel and brick factory, concrete foundation. About $75,000. C. H. Loew, secy. Architect not selected.

O., Cleveland—Euclid Fdry. Co., c/o Hullett & Stanton, archts., 226 Superior Ave., having plans prepared for 1 story, 125 x 140 ft., steel and brick foundry, brick foundation, on St. Clair Ave. along tracks of New York Central R.R. About $75,000.

O., Cleveland—T. Knight, Superior Arcade, plans to build 1 story, 42 x 100 ft., steel and brick factory, brick foundation, on West 95th St. and Detroit Ave. About $30,000. Private plans.

O., Cleveland—W. Taylor Sons Co., 630 Euclid Ave., plans to build 130 x 150 ft., concrete, steel and brick warehouse, rein.-con. flooring, concrete foundation, on east 17th St. and Superior Ave. About $100,000. C. H. Strong, vice pres. Architect not selected

Industrial Works (Continued)

O., New Philadelphia—Weiss-McClung Co. plans to build 1 and 3 story, concrete, steel and brick factory, rein.-con. flooring, concrete foundation. About $300,000. W. F. Ferguson Co., 1900 Euclid Ave., Cleveland, engrs.

O., Willoughby—Thor Tire & Rubber Co., 802 Society for Savings Bldg., Cleveland, having plans prepared by H. H. White, archt. and engr., 802 Society for Savings Bldg., Cleveland, for 1 and 2 story, steel and brick factory, concrete foundation, on Main St. along tracks of New York Central R.R., here. About $100,000. Noted Jan. 29.

Ind., Hammond—La Salle Steel Co., 2243 South Halsted St., plans to construct 3 steel and concrete buildings, on 800,000 sq.ft. site, on north side. About $1,000,000.

Mich., Battle Creek—Clerk Equipment Co., Buchanan, having plans prepared by Billingham & Cobb, archts. and engrs., 403 Telegraph-Press Bldg., Kalamazoo, for 1 story, 100 x 450 ft. and 50 x 450 ft., brick and steel factory, concrete foundation, with detached power plant and 2 story office building, along tracks of Michigan Central Ry.

Mich., Hamtramck (Detroit P. O.)—Dodge Bros., Jos. Campau Ave., had plans prepared by Smith, Hinchman & Grylls, archts. and engrs., 710 Washington Arcade, for 8 story, 77 x 266 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on Conant Ave.

Mich., Pontiac—Grand Trunk Ry., Brush St., plans to build 1 story roundhouse, 50 engine capacity, rein.-con., brick and steel, concrete foundation, near Johnson St. F. P. Sissons, Brush St. Depot, div. engr.

Wis., Barton—Woodford Eng. Co. having plans prepared by Condron Co., archts. and engrs., 53 West Jackson St., Chicago, for 2 story, 45 x 120 ft., brick, rein.-con. and steel machine shop, rein.-con. flooring, brick foundation, on Main St. About $52,000.

Wis., Belgium—Whitney-Hubing Shoe Co., c/o N. Hubing, having plans prepared by H. J. Esser, archt., Camp Bldg., Milwaukee, for 3 story, 55 x 120 ft., brick, rein.-con. and steel factory, rein.-con. flooring, brick foundation, on Main St. About $40,000.

Wis., Carrollville—H. J. Esser, archt., Camp Bldg., Milwaukee, soon lets contract building superstructure for 3 story, 357 x 500 ft., rein.-con. and brick factory, rein.-con. flooring, for U. S. Glue Co. About $500,000.

Wis., Sheboygan—Jenkins Machine Co., c/o A. Studevan, 8th St., having plans prepared by Juul & Smith, archts., Imig Bldg., remodeling and building 1 and 2 story, 150 x 200 ft. addition to machine shop and office, brick, rein.-con. and steel, rein.-con. flooring, brick foundation, on North 8th St. About $50,000.

Ia., Davenport—Nelson Mfg. Co., 1st and Brady Sts., plans to build 1 story, 96 x 140 ft., brick, rein.-con. and steel warehouse, rein.-con. flooring, on East 2nd St. Architect not decided.

Ia., Marshalltown—Neilsen Butter & Ice Cream Co. having plans prepared by H. E. Reimer, archt., Marshalltown, for 2 story, 50 x 58 ft., brick and steel plant, concrete foundation. About $65,000.

Minn., St. Paul—Twin City Mission Furniture Co., 489-91 St. Peter St., having revised plans prepared by M. A. Wright, archt., 600 Pittsburg Bldg., for 3 story, 54 x 142 ft., brick and timber warehouse, on 22nd St. and Hampden Ave. About $60,000. Former bids rejected. Noted Feb. 12.

Kan., Coffeyville—Kansas Oil Refining Co. plans to build oil refinery, 2 mi. south of here. About $500,000. H. R. Heal, genl. mgr. Architect and engineer not selected.

Kan., Topeka—Atchison, Topeka & Santa Fe Ry., 80 East Jackson Blvd., Chicago, having plans prepared by J. Yonkers, archt., Park Ridge, Chicago, for addition to freight station and 2 story heating plant, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, here. About $60,000 and $85,000 respectively.

Kan., Wichita—Watkins Mfg. Co. plans to build 2 story factory, on 1st and Water Sts. About $50,000. E. A. Watkins, pres. Architect and engineer not selected.

N. D., Fargo—Pub. Serv. Garage Co. soon receives bids building 2 story, 140 x 200 ft. steel, tile, stone and rein.-con. garage. About $125,000. Brasseth & Rosatti, 105½ Bway., archts.

N. D., Fargo—J. C. Vincent soon receives bids building 4 story garage, on 3rd and Northern Pacific Aves. About $80,000. Kurke & Keith, Equity Bldg., archts.

Tex., Houston—Armour Auto Agency, Preston and Washington Sts., had plans prepared by C. Barglebough, 721 1st Natl. Bank Bldg., El Paso, and L. R. Whitson, Dallas, archts., for 3 story, 100 x 154 ft., warehouse and salesroom building, rein.-con. and brick, rein.-con. flooring, on Louisiana and Preston Sts. About $150,000.

Tex., Houston—Bering Cortes Co., 802-6 Prairie Ave., having preliminary sketches made for 2 story, 150 x 250 ft. warehouse, on North Main St. Jones & Tabor, 506 Binz Bldg., archt.

Tex., Houston—Magnolia Petroleum Co., Mason Bldg., soon lets contract building 2 story, 60 x 100 ft., rein.-con. and brick filling station, on McKinney and Fanning Sts. About $150,000. A. C. Finn, 201 Foster Bldg., archt.

Tex., Orange—Mogul Oil & Refining Co. plans to build refinery, 10,000 bbl. capacity. About $1,000,000. Engineer and architect not selected.

Okla., Cement—Excel Tool Co., Garber, plans to build 1 story factory and shop, here. About $50,000. Architect and engineer not selected.

Okla. Kingfisher—Oklahoma Mill Co. plans to build 7 story, 36 x 100 ft. flour mill, rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $200,000. Architect and engineer not selected.

Okla., Oklahoma—J. B. Rolater, 309 Mercantile Bldg., plans to build 3 story storage house, at 121 West 1st St. About $60,000. Architect and engineer not selected. Firestone Tire & Rubber Co., lessee.

Idaho, Boise—Idaho Candy Co., 412 South 8th St., having plans prepared by Tourtellotte & Hummel, archts., Overland Bldg., for 2 story, 100 x 130 ft. factory. About $50,000.

Wash., Vancouver—Northwestern Electric Co., Portland, Ore., making surveys near Yacolt-Yale Bridge, here, for location of electric power plant and dam. About $5,000,000.

Wash., Walla Walla—City plans to build 1,000 kw. hydro-electric plant based on 50 sec. ft. water. About $381,000. E. B. Hussey, Alaska Bldg., Seattle, engr.

Ore., Baker—Basche-Sage Hardware Co plans to build 1 story, 75 x 80 ft., concrete and steel addition to warehouse, on Court St. About $50,000. Private plans.

Ore., Roseburg—Oregon Growers Assn. plans to clear and grade site adjoining present plant and build 2 story, brick, frame and concrete packing plant. About $50,000. Private plans.

Cal., Sacramento—California Packing Corp., 6th and G Sts., having plans prepared by P. Bush, engr., 101 California St., San Francisco, for 2 story, brick warehouse and 1 story, brick and concrete boiler house. About $80,000.

Cal., Sacramento—Sacramento Meat Canning & Packing Co. plans to build concrete and brick plant, concrete foundation, on 10th St., near Sacramento River. About $500,000. Architect not selected.

Ont., Clinton—J. J. Merner, Seaforth, receives bids about April 1, for 3 story, 40 x 60 ft. flax mill, concrete, steel and timber, concrete foundation.

Ont., Hawkesbury—Hopkins & Plaunt, Renfrew, plans to build 3 story, flour mill, concrete and steel, concrete and stone foundation. About $50,000.

Ont., Sault Ste. Marie—Natl. Electro-Products Ldt., 83 Church St., Toronto, plans to build 1 story, rein.-con., factory, rein.-con. flooring, concrete foundation. About $25,000. Private plans.

BIDS DESIRED

Mass., Dorchester (Boston P. O.)—N. Douglas, archt. and engr., 307 Howard St., Cambridge, receiving bids building 1 story, 98 x 128 ft., rein.-con. garage, concrete flooring and foundation, on Dorchester Ave., for Mutrie Auto Express Co. About $45,000.

O., Cleveland—Until March 15, by Akron Spark Plug Co., Akron, building 1 story, 60 x 125 ft., brick and steel addition to factory, on Woodlawn Ave., here. About $30,000. A. F. Janowitz, Permanent Bldg., archt.

Mich., Flint—Until March 15, by G. H. Swift, archt., 105 Armory Blk., building 2 story, 50 x 183 ft., rein.-con., brick and steel garage, rein.-con. flooring, concrete foundation, on East 3rd St., for Marshall Auto Co., 125 East 3rd St.

Mich., Grand Rapids—Until March 15, P. Lindhout, archt., 817 Lake Drive, building 3 story, 50 x 100 ft., rein.-con., brick and steel plant, rein.-con. and wood flooring, concrete foundation, for W. H. Spears, c/o architect. About $80,000.

Ill., Chicago—A. S. Alschuler, archt., 28 East Jackson St., receiving bids building 7 story, 120 x 175 ft., rein.-con., brick and terra cotta, printing plant, rein.-con. flooring, concrete foundation, on 21st St. and Calumet Ave., for Columbia Colortype Co., 2141 Calumet Ave. About $650,000. Noted Feb. 12.

Ill., Chicago—P. Gerhardt, archt., 64 West Randolph St., receiving bids building 6 story, 150 x 165 ft., brick and timber factory, concrete foundation, on Milwaukee Ave. and Caton St., for Tennerstedt Mfg. Co., 1936 West North Ave. About $500,000.

Wis., Racine—Racine Mfg. Co., 6th and Mead Sts., receiving bids building 1 story, 100 x 150 ft., brick and concrete dry kiln, concrete foundation, on Mead St. Private plans.

Wis., Saukville—Until March 17, by Saukville Canning Co., c/o H. J. Cary, building 2 story, 36 x 376 ft., brick, rein.-con. and steel plant, rein.-con. flooring, brick foundation, on Main St. About $40,000. W. F. Hilger, Cedarburg, archt.

Minn., Minneapolis—Cootey Co., 325 3rd St. S., receiving bids building 4 story, 80 x 120 ft., rein.-con. and brick printing plant, on 6th St. and 7th Ave. S. About $175,000. A. Rose, 500 Builders Exch. Bldg., archt. and engr.

Kan., Topeka—Trefry Motor Co., 1014 Kansas Ave., receiving bids building 2 story, 25 x 150 ft., rein.-con., steel and brick garage, rein.-con. flooring, concrete foundation. About $100,000.. W. E. Glover, Topeka, archt.

Neb., Aurora—Until March 17, by Sandin Auto Co., building 2 story, 120 x 211 ft., rein.-con., steel and brick garage, rein.-con. flooring, concrete foundation. About $60,000. Grabe & Helleberg, Columbus, archts. Noted Feb. 26.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Portland**—T. A. Huston & Co., 26 Main St., Auburn, let contract building 7 story, 110 x 120 ft., rein.-con. bakery, rein.-con. flooring, concrete foundation, on Forest St., to H. P. Cummings Constr. Co., Fidelity Bldg. About $500,000.

★**N. H., Somersworth**—Great Falls Mfg. Co., Main St., let contract building 4 story, 140 x 600 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, to Aberthaw Constr. Co., 27 School St., Boston. About $1,500,000. Noted March 4.

★**Mass., Boston**—G. T. McLauthlin & Co., 120 Fulton St., will build 5 story, 39 x 100 ft., brick and mill construction addition to factory, concrete foundation, on North St. About $50,000. Work will be done by day labor.

★**Mass., Boston**—United Drug Co., 93 Leon St., Roxbury, let contract building 2 story, brick and concrete storage plant, rein.-con. flooring, concrete foundation, on Benton St., to F. T. Ley & Co., Inc., 24 Milk St. About $35,000.

★**Mass., Cambridge** (Boston P. O.)—Little, Brown & Co., 34 Beacon St., Boston, let contract building 3 story, 66 x 90 ft., brick and steel storage plant, concrete foundation, on Blackstone St., here, to N. Fritz Constr. Co., 62 Maywood St., Roxbury. About $40,000.

★**Mass., Cambridge**—Massachusetts Lime & Cement Co., 252 Bridge St., East Cambridge, will build 2 story, 50 x 200 ft., brick and mill construction storage shed, concrete foundation, on Portland St. About $50,000. Work will be done by day labor. Noted March 4.

★**Mass., East Boston** (Boston P. O.)—A. De Stefano, Everett St., will build 2 story, brick and steel ice plant, concrete foundation. About $30,000. Work will be done by day labor.

★**Mass., East Springfield** (Springfield P. O.)—Westinghouse Electric Mfg. Co., 6905 Susquehanna St., Pittsburgh, Pa., will build 1 story, 100 x 1,000 ft., rein.-con. and steel machine shop, rein.-con. flooring, concrete foundation, on Page Blvd., here. About $360,000. Work will be done by day labor. Noted Feb. 19.

★**Mass., Fall River**—King Philip Mills, 372 Kilbourn St., let contract building 2 story, 48 x 80 ft., brick, concrete and steel boiler house, concrete flooring and foundation, to McNally Constr. Co., 86 North Main St. About $50,000.

★**Mass., Fitchburg**—Crocker-Burbank Co. let contract building 1 story, rein.-con. addition to factory, rein.-con. flooring, concrete foundation, to Aberthaw Constr. Co., School St., Boston. About $300,000; cost plus percentage basis.

★**Mass., Lynn**—T. Kelly & Co., 629 Summer St., let contract building 1 story, 40 x

Industrial Works (Continued)

175 ft. rein.-con. addition to factory, rein.-con. flooring, concrete foundation, on Linden St., to C. H. Cunningham & Sons Co., 23 Cetral St. About $35,000.

★**Mass., Malden** (Boston P. O.)—C. H. Moss, 48 Grace St., let contract building 1 story, 50 x 100 ft., brick and concrete factory, concrete flooring and foundation, on Pearl St., to McDuffie & Sullivan, 26 Meridian St. About $25,000. Noted Jan. 29.

★**Mass., Norfolk Downs** (Boston P. O.)—Vedoe-Paterson Co., 167 Oliver St., Boston, let contract building 1 story, 50 x 120 ft., brick and concrete machine shop, concrete flooring and foundation, here, to Canter Constr. Co., 6 Beacon St., Boston. About $25,000.

★**Mass., Roxbury**—Drake Bros. Co., 85 Savin St., let contract building 3 story, 50 x 104 ft., brick and mill construction addition to bakery, rein.-con. flooring, concrete foundation on Quincy St., to Blake & Pope Co., 15 Beacon St., Boston. About $50,000.

★**Mass., Springfield**—Brightwood Laundry Co., Talcott Ave., let contract building 1 story, 60 x 120 ft., brick and mill construction laundry, power room and garage, concrete foundation, to L. Thaddia, Agawam. About $25,000.

★**Mass., Springfield**—Country Club Soda Co., Emery St., let contract building 4 story, 50 x 104 ft., brick and frame addition to factory, mill constructed floors, concrete foundation, to F. T. Ley & Co., Inc., 499 Main St. About $45,000.

★**R. I., Pawtucket**—Amer. Lace Wks., Main St., let contract building 1 story, 50 x 150 ft., brick and mill construction additon to plant, rein.-con. flooring, concrete foundation, to F. G. Rowley, 26 Central St. About $25,000.

★**R. I., Pawtucket**—L. B. Fogarty, 348 Central Ave., let contract building 2 story, 70 x 110 ft., concrete block garage, rein.-con. flooring, concrete foundation, on Bway., to H. I. Mathewson, 30 High St. About $30,000. Noted Jan. 15.

★**R. I., Providence**—Estate of R. G. Davis, 236-240 Meeting St., will build 3 story, 50 x 135 ft., concrete and steel garage and service station addition, concrete flooring and foundation. About $70,000. Work will be done by day labor. Noted Aug. 7.

★**R. I., Providence**—Joslin Mfg. Co., 610 Manton Ave., let contract building 3 story, 60 x 140 ft., brick and steel factory, concrete foundation on Tobey St., to H. I. Mathewson, 30 High St., Pawtucket. About $70,000.

★**Conn., Norwalk**—H. Jacobs & Sons, Belden Ave., will convert building on Day St. into factory. About $35,000. Work will be done by day labor.

★**Conn., Stamford**—Carlisle Tire Corp., 251-4th Ave., New Rork City, let contract building 1 story, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Fairfield Ave., here, to Wells Consir. Co., 237-5th Ave., New York City. About $250,000.

★**Conn., Westbrook**—Knothe Bros. Co. 124 5th Ave., New York City, let contract building 2 story, 54 x 150 ft., rein.-con. factory, concrete flooring and foundation, to H. Wales Lines Co., 134 State St., Meriden. About $120,000. Noted Feb. 26.

★**N. Y., Brooklyn**—L. Bernstein, c/o S. Millman, archt., 26 Court St., will build 1 story, 150 x 250 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Myrtle Ave. between Bway. and Lewis Ave. About $75,000. Work will be done by day labor.

★**N. Y., Brooklyn**—M. Friedman, c/o P. Caplan, archt., 16 Court St., will build 1 story, 100 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 33rd St. About $35,000. Work will be done by day labor.

★**N. Y., Brooklyn**—L. Gold, 44 Court St., will build 6 story, 50 x 140 ft., brick, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Pearl and Tillery Sts. About $300,000. Work will be done by day labor.

★**N. Y., Brooklyn**—W. A. Henchel, 424 75th St., will build 1 story, 190 x 200 ft., brick and steel garage, rein.-con. flooring, brick foundation, on 8th Ave. between 44th and 45th St. About $40,000. Work will be done by day labor

★**N. Y., Brooklyn**—Hudson Bag Co., 77 Washington St., will build 2 story, 200 x 265 ft., brick and steel factory and warehouse, rein.-con. flooring, concrete foundation, on Bogert, Scholes and Meserole Sts. About $130,000. Work will be done by day labor.

★**N. Y., Brooklyn**—A. Kaplan, 718 St. Marks Ave., will build 1 story, 138 x 180 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Atlantic and Franklin Aves. About $75,000. Work will be done by day labor.

★**N. Y., Brooklyn**—A. Margolin, c/o S. Millman, archt., 26 Court St., will build 1 story, 100 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 10th Ave. and 19th St. About $25,000. Work will be done by day labor.

★**N. Y., Brooklyn**—A. Margolin, c/o S. Millman, archt., 26 Court St., will build 1 story, 100 x 150 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 63rd St. About $40,000. Work will be done by day labor.

★**N. Y., Brooklyn**—H. Schnittman, c/o P. Caplan, archt. and engr., 16 Court St., will build 3 story, 42 x 100 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Gravesend Ave. and Cortelyou Rd. About $45,000. Work will be done by day labor.

★**N. Y., Coney Island**—Estate of J. and M. Hennot, 44 Court St., Brooklyn, will build 1 story, 105 x 175 ft., brick and steel garage, rein.-con. flooring, brick foundation, on Coney Island Ave., here. About $30,000. Work will be done by day labor

N. Y., Jamaica—M. E. Connolly, pres. Queens Boro., Long Island City, received bids March 1, building distributing system at Destructor, here, from Kelly & Kelley, Lawrence St., Brooklyn, $194,000; F. Droesch, Woodhaven, $250,346.

★**N. Y., Long Island City**—Interstate Land Holding Co., c/o J. J. Gloster, archt. and engr., 44 Court St., Brooklyn, let contract building 3 story, 100 x 100 ft., brick, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on 14th St. and Governor Pl., to L. Gold, 44 Court St., Brooklyn. About $150,000.

★**N. Y., New York**—Natl. Gum & Mica Co., 12 West End Ave., let masonry contract building 25 x 100 ft., brick and steel addition to factory, rein.-con. flooring, concrete foundation, to V. Valentine Contg. Co., 2163 Creston Ave. Balance of work will be done by day labor under supervision of J. M. Felson, archt. and engr., 1133 Bway. Noted Jan. 29.

★**N. Y., New York**—Prince & Mulberry Garage Corp., 299 Bway., will build 1 story, 95 x 100 ft., rein.-con. and steel garage, rein.-con. flooring, concrete foundation, at 249 Mulberry St. About $40,000. Work will be done by day labor.

★**N. Y., New York** — Tremont-Webster Bldg. Co., Grand Concourse and 187th St., will build 1 story, 100 x 220 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Webster Ave. and 166th St. About $70,000. Work will be done by day labor.

★**N. Y., New York**—V. Valentine, 2165 Creston Ave., will build 1 story, 75 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 307 East 97th St. About $25,000. Work will be done by day labor.

★**N. Y., Watertown**—Bagley & Sewall Co., Sewalls Island, let contract building 1 story, 100 x 235 ft. brick and steel machine shop, on East Moulton St., to Austin Cons'r. Co., 217 Bway., New York City. Cost between $75,000 and $100,000.

★**N. J., Belleville**—Sweeney Lithograph Co., 251 West 19th St., New York City, let contract building 2 story, 80 x 150 ft., brick and timber factory, on Courtland St., to A. C. Windsor, 263 Washington Ave., Newark. About $60,000.

★**N. J., Jersey City**—Whitlock Cordage Co., Communipaw Ave., let contract building 4 story, rein.-con. plant, to J. W. Ferguson Co., United Bank Bldg., Paterson. About $500,0000.

★**N. J., Newark**—G. J. Downes & Co., 344 Mulberry St., let contract building 3 story, 65 x 90 ft., concrete and brick factory, on Elizabeth and Punyon Aves., to Salmond Bros., 526 Elm St., Arlington, $60,000.

★**N. J., Newark**—G. T. Loures Co. let contract building 3 story, brick factory, on Runyon St., to Salmon Bros., Sylvan Ave. About $60,000.

★**Pa., Kingston** (Wilkes-Barre P. O.)—Crane Bros., Inc., let contract building 2 story, 80 x 100 ft., brick and steel mill, rein.-con. flooring, rock foundation, on Wyoming St., to Shephard Constr. Co., South Main St., Wilkes-Barre. About $50,000.

★**Pa., Lester**—Westinghouse Electric & Mfg. Co., 165 Bway., New York City, let contract erecting 4 steel and terra additions to present plant, here, to Westinghouse, Church & Kerr Co., 37 Wall St., New York City.

★**Pa., Phila.**—Proctor & Schwartz, Tabor Rd. and 6th St., will build 4 story, 77 x 150 ft., rein.-con. addition to factory. About $150,000. Work will be done by day labor.

★**Pa., Wilkes-Barre**—Economy Automobile Co., South Main St., let contract building 2 story, 50 x 225 ft., brick and steel garage, rein.-con. flooring, rock foundation, on South Main St., to J. Curtis & Co., Hickory St. About $90,000.

★**D. C., Washington**—S. Kluft, 1308 7th St. N. W., let contract constructing storage building, to J. C. Herbert, 1744 Naylor St. About $35,000.

★**N. C., Clinton**—Clinton Cotton Warehouse Co. let contract building warehouse, to Liberty Eng. & Constr. Co., 604 Murchison Bank Bldg., Wilmington. About $45,000.

★**N. C., Clinton**—T. F. Ferrell let contract building 2 story, 30 x 126 ft., brick and concrete warehouse and store, to Liberty Eng. & Constr. Co., 604 Murchison Bank Bldg., Wilmington.

★**O., Cleveland**—Champion Machine & Forge Co., 3695 East 78th St., let contract building 1 story, 80 x 240 ft., steel and brick forge shop, brick foundation, at 3725 East 78th St., to C. Peterson & Co., 4500 Euclid Ave. About $75,000.

★**O., Cleveland**—Eilert Beverage Co., 2539 Lorain Ave., let contract building 2 story, 60 x 110 ft., steel and brick addition, rein.-con. flooring, brick foundation, on Sackett Ave., to H. F. Juergens, 1530 Clarence St. About $60,000. Noted Feb. 19.

★**O., Cleveland**—J. L. Weinberg, archt., Bangor Bldg., let contract to J. Meckler, 9604 Adams Ave., building 3 story, 42 x 68 ft., steel and brick factory, brick foundation, at 4021 Bway., for Krause-Winograd Co., Bangor Bldg. About $50,000. Noted Jan. 22.

★**O., Cleveland**—Natl. Builders Co., 1787 West 11th St., let contract building 1 and 2 story, concrete, steel and brick factory and warehouse, rein.-con. flooring, concrete foundation, on Park Ave., to W. Dunbar Co., 8201 Cedar Ave. About $75,000. Noted Jan. 1.

★**O., Cleveland**—Patterson Sargent Co., East 36th St. and Superior Ave., let contract building 2 story, 37 x 120 ft., steel and brick addition to warehouse, to S. W. Emerson Co., 1900 Euclid Ave. About $50,000.

★**O., Cleveland**—M. D. Shanman, 2110 Woodland Ave., let contract building 4 story, 35 x 155 ft., steel and brick factory, brick foundation, to A. Sharowsky, 2045 Marlowe Ave., Lakewood. About $50,000.

★**O., Cleveland**—Standard Wire & Spring Co., 5915 Bonna Ave., let contract building 2 story, 90 x 145 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, on Superior Ave. and East 39th St., to A. A. Lane Constr. Co., 1836 Euclid Ave. About $100,000.

★**O., Cleveland**—W. S. Tyler Co., East 36th St. and Superior Ave., let contract building 1 story, 83 x 132 ft., brick and steel factory, at 1395 East 34th St., to C. Curtis Co., 1031 Guardian Bldg. About $50,000.

★**O., Dayton**—Allsteel Ridewell Tire & Rubber Co., Lindsey Bldg., let contract building 3 story, steel and brick factory, rein.-con. flooring, concrete foundation, to Osborn Eng. Co., 2848 Prospect Ave., Cleveland. About $100,000. Noted Dec. 26.

★**O., Greenville**—Jeffreys Co. let contract building 2 story, 60 x 180 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, to Concrete Constr. Co., High St., Springfield. About $50,000.

★**Ill., Pullman**—Pullman Co., 79 East Adams St., let contract building 1 story, 45 x 160 ft. and 60 x 170 ft., rein.-con. and brick factories, concrete foundation, on 104th St. and Erickson Ave., to E. W. Sproul Co., 2001 West 39th St. About $175,000.

★**Ill., Waukegan**—H. W. Johns-Mansville Co., 201 Clybourn St., Milwaukee, let contract constructing about 6 rein.-con., steel and brick factory buildings, various sizes, rein.-con. flooring, concrete foundations, here, to Raulf Co., Patton Bldg., Milwaukee. Cost between $5,000,000 and $6,000,000; cost plus percentage basis.

★**Wis., Colfax** — J. C. Jacobson, engr., Metallurgical Bank Bldg., Minneapolis, let contract to Siems, Helmers & Schaffner, 514 Guardian Life Bldg., St. Paul, building power house, diversion dam and headrace, on Red Cedar River, for Colfax Electric Co. About $100,000.

★**Wis., Milwaukee**—Kiel Furniture Co., 32nd and Center Sts., let contract building 3 story, 70 x 190 ft., brick and rein.-con.

Industrial Works (Continued)

factory, rein.-con. flooring, on Center St., to H. Schmitt & Son, 430 Farwell Ave. About $70,000. Noted Nov. 20.

★Wis., Milwaukee—Koehring Machine Co., 31st St. and Concordia Ave., let contract building 2 story, 45 x 120 ft., concrete garage and pattern shop, rein.-con. flooring, concrete foundation, to W. M. Tuckwell, 86 Michigan Ave. About $30,000.

★Wis., Sheboygan—Sheboygan Fdry. Co. let contract building 1 story, 50 x 180 ft., brick, rein.-con. and steel foundry, rein.-con. flooring, concrete foundation, on South 18th St. and Union Ave., to M. Stubenrauch, South 14th St. About $70,000.

★Minn., Duluth—German & Jenssen, archts. and engrs., Exch. Bldg., let contract to Jacobson Bros., 410 Columbia Bldg., constructing 2 story, 80 x 300 ft., brick warehouse and storage building, rein.-con. foundation, for Duluth Corrugating & Roofing Co., South 1st Ave., E. and Sutphin St. About $45,000.

★Idaho, Blackfoot—Bills Auto Co. let contract building 2 story, 75 x 125 ft. garage, to D. A. Jenkins, $70,000.

★Wash., Colfax—H. I. Willis and J. H. Mohney will build 1 story, 130 x 150 ft., brick garage, on Mill St. About $50,000. Work will be done by day labor.

★Ore., Astoria—See "Miscellaneous."

★Ore., Astoria—S. Lovell & N. Staples let contract building 2 story, 100 x 125 ft., brick, cement and rein.-con. garage, rein.-con. flooring, on Duane St., to Gilpin Constr. Co., Astoria. About $70,000.

★Cal., Los Angeles—W. I. and T. P. Putman, 3548 South Vermont Ave., let contract building 1 story, 120 x 200 ft., brick garage, concrete foundation, on Figueroa and Jefferson Sts., to H. G. Grimwood, 748 West 7th St., Los Angeles. About $60,000; cost plus percentage basis.

★Que., Montreal—Montreal Tramways Co., Tramway Bldg., let contract building 70 x 90 ft. power sub-station, on Cote St., to Raymond Concrete Pile Co., 10 Cathcart St. About $45,000.

★Que., Montreal—Natl. Breweries Ltd., Chaboiller Sq., let contract building 3 story, 30 x 100 ft. brewery, brick and steel, rein.-con. flooring, concrete foundation, to Atlas Constr. Co., 37 Belmont St. About $35,000.

★Que., Three Rivers—Natl. Shipbuilders Corp. let wood piling contract erecting 95 x 340 ft., shipbuilding plant, on River Rd., to Raymond Concrete Pile Co., 10 Cathcart St., Montreal, $100,000.

Buildings

PROPOSED WORK

N. H., Durham—Dormitory—New Hampshire College of Agriculture plans to build brick dormitory, for women, on campus. About $60,000. Architoct and engineer not selected.

Mass., Attleboro—Bank and Office—First Natl. Bank, Main St., plans to build brick, concrete and steel. About $100,000. W. R. Walker & Son, 17 Custom House St., Providence, R. I., archts. and engrs.

Mass., Boston—Business—Mitchell—Woodbury Co., 560 Atlantic Ave., plans to build 10 story, concrete and steel, on Park Sq. Architect not selected.

Mass., Boston—Office—Reynolds Bldg. Trust having plans prepared by Parker, Thomas & Rice, archts., 110 State St., for 8 story, 47 x 70 ft., concrete and stone, rein.-con. flooring, concrete foundation, on Winter St. About $500,000.

Mass., Boston—Theatre, etc.—Mowll & Rand, archts., 50 Bromfield St., preparing plans for 2 story, 150 x 260 ft., orick and concrete, on Commonwealth Ave. About $450,000. Owners name withheld.

Mass., Boston—Theatre—Olympic Theatres, Inc., Mason Bldg., having plans prepared by Rand & Mowll, archts., 50 Bromfield St., for 8 story, 88 x 300 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, on Washington St. About $1,000,000.

Mass., Chestnut Hill (Boston P. O.)—College — Boston College, University Heights, having plans prepared by Maginnis & Walsh, archts. and engrs., 100 Boylston St., Boston, for 5 story, steel, concrete and stone, chemistry and physics building, on campus.

Mass., Chicopee — School — Church of Nativity plans to build brick. About $60,000. W. Smard, pastor. Architect not selected.

Mass., Dorchester (Boston P. O.)—Church—St. Paul Roman Catholic Society, 1 Lingard St., plans to build 1 story, brick and stone. Cost will exceed $100,000. J. J. Farrell, pastor. Maginnis & Walsh, 100 Boylston St., Boston, archts.

Mass., Greendale (Worcester P. O.)—Housing—Norton Co., Barbers Crossing, Worcester, plans to build one hundred 2 story, houses for workmen, on Indian Hill, here. About $500,000.

Mass., Greenfield — Church — Polish Roman Catholic Society plans to build brick. About $75,000. A. T. Novak, pastor. Architect or engineer not selected.

Mass., Lynn—Society—Knights of Columbus plans to build brick and steel, on North Common St. About $100,000. J. Cotter, chn. Architect not selected.

Mass., Lynn—Temple—Masonic Society plans to build brick and steel, on Broad St. About $150,000. Address A. W. Pinkham, c/o Natl. City Bank. Architect not selected.

Mass., North Beverly (Beverly P. O.)—School—Bd. Educ. having plans prepared by Ashton & Huntress, archts. and engrs., 477 Essex St., Lawrence, for 2 story, brick and steel, on Conant St., here. About $150,000. J. A. Torrey, chn. Noted Jan. 29.

Mass., Roxbury — Temple—Congregation Mishkan Tefila, 74 Elm Hill Ave., plans to build brick and steel, on Seaver St. About $60,000. E. J. Brody, chn. Architect not selected.

Mass., Springfield—Church—Park Memorial Baptist Society, 47 Filgrade Ave., plans to build 1 story, brick, on Forest Park Ave. About $75,000. B. Franklin, pastor. Architect not selected.

Mass., Springfield—Hotel—P. H. Faber, c/o The Oaks, 31 Thompson St., receives bids about April 1, building 4 story, brick and steel addition, concrete foundation, on State and Thomson Sts. About $200,000. Associated Architectural Co., 145 State St., archt.

Mass., Winchester — Church — First Church of Christ, Scientist, 47 Ames St., Cambridge, plans to build 1 story, brick, here. About $50,000. E. S. Foster, pastor. Architect not selected.

R. I., Barrington—Housing—Rhode Island Lace Wks. plans to build several 1 and 2 story, brick and frame, houses for workmen. About $100,000. F. F. Johnsberg Co., 16 Central St., Boston, archts. and engrs.

R. I., Pawtucket—Theatre— J. T. Payne, Payne Block, plans to build 2 and 3 story, 110 x 115 ft., brick, concrete and steel, on Broad St. About $375,000. J. F. O'Malley, 75 Westminster St., Providence, archt.

Conn., Middletown — Laboratory — Wesleyan University, 374 High St., having plans prepared by H. Bacon, archt. and engr., 101 Park Ave., New York City, for 2 story, brick, steel and stone, rein.-con. flooring, brick foundation. About $500,000.

Conn., Milford — Church — St. Mary Roman Catholic Society, 32 Broad St., plans to build 1 story, on Bridgeport Ave. About $50,000. P. H. McClean, pastor. Architect not selected.

Coon., New London—Bank—Natl. Bank of Commerce, 166 State St., having plans prepared by T. M. James, archt., 3 Park St., Boston, for brick and steel. About $100,000. Noted June 19.

Conn., Norwich—Business—J. M. Thayer, 32 Church St., plans to build 4 story, 61 x 70 ft., rein.-con. addition, hardwood flooring over concrete foundation, on Bath and Franklin Sts. About $50,000.

Conn., Southington—Club—Amer. Legion, Kiltonic Post 72, plans to build clubhouse. About $100,000. Architect not selected.

N. Y., Albany—Bank—York & Sawyer, archts. and engrs., 50 East 41st St., New York City, receive bids about March 22, altering brick, steel and stone, for Commercial Trust Co., c/o architects. About $100,000. Noted Jan. 15.

N. Y., Arcade—School—Bd. Educ. having sketches made by Tooker & Marsh, archts. and engrs., 101 Park Ave., New York City, for brick, steel and stone, brick foundation. About $125,000.

N. Y., Little Falls—School—Bd. Educ. having sketches made by Tooker & Marsh, archts. and engrs., 101 Park Ave., New York City, for brick, steel and stone, brick foundation. About $125,000.

N. Y., New York—Club—Society of Professional Automobile Engineers, Bway. and 67th St., having plans prepared by W. Haefel, archt. and engr., 229 West 42nd St., for 5 story, 55 x 100 ft., brick, steel and stone, brick foundation, at 153 West 64th St.

N. Y., New York—Office—Merchants & Shippers Insurance Co., 49 Wall St., having sketches made by C. H. Higgins, archt. and engr., 19 West 44th St., for 12 story, brick, steel and stone, concrete foundation, at 14 South William St.

N. Y., New York—Office and Loft—J. H. Sheier, archt. and engr., 25 West 42nd St., preparing sketches altering brick, steel and stone, on 47th St. About $100,000. Owners name withheld.

N. Y., New York—School—Bd. Educ., 500 Park Ave., having plans prepared by C. B. J. Snyder, archt. and engr., Municipal Bldg., for 5 story, 70 x 145 x 145 ft., brick, steel and stone, brick foundation, on 87th St. About $470,000.

N. Y., New York—Theatre—Sheriden Realty Co., c/o Reilly & Hall, archts. and engrs., 749 5th Ave., having plans prepared for 152 x 202 ft., brick, steel and stone, brick foundation, on Sheriden Sq. About $500,000.

N. Y., Rochester—Hotel—United Hotels Co. plans to build 12 story, 40 x 100 ft., addition to Hotel Seneca, at 13 and 15 Cortland St. F. Dudley, Buffalo, pres.

N. Y., Salamanca—Office—See "Industrial Works."

N. Y., Southhold — School — Tooker & Marsh, archts. and engrs., 101 Park Ave., New York City, receive bids about April 12, building brick, steel and stone, brick foundation, for Bd. Educ. About $75,000.

N. J., Montclair—Clubhouse—Montclair Golf Club, c/o H. P. Knowles, archt. and engr., 52 Vanderbilt Ave., New York City, having plans prepared for 3 story, 50 x 220 ft., brick, steel and stone, brick foundation. About $200,000.

N. J., Trenton—Church—Pilgrim Presbyterian Church, Liberty and Woodland Sts., plans to build 1 story and tower, 94 x 134 ft. and 36 x 36 ft., steel and stone, on South Broad St. About $80,000. C. W. Bolton & Son, Witherspoon Bldg., Phila., archt.

N. J., Summit—High School—Until Mar. 22, Bd. Educ., Lincoln School, repairing brick High School. About $50,000. R. S. Shapter, 23 Maple St., archt.

N. J., Tenafly—Bank—First Natl. Bank, Washington St., rejected bids received Feb. 14, building 1 story, 100 x 100 ft., brick, steel and stone, brick foundation. About $50,000. Noted Feb. 5.

N. J., Trenton—Theatre—W. J. Vernon, St. Regis Bldg., soon receives bids constructing 1 and 2 story, 130 x 200 ft., concrete and steel, on Perry St. About $500,000. W. W. Slack & Son, St. Regis Bldg., archts.

N. J., Vineland—School—Sacred Heart Parish soon lets contract building 2 story, 60 x 120 ft., brick and stone. About $100,000. Berry & Cummiskey, Real Estate Trust Bldg., Phila., archts.

Pa., Chadds Ford—School—Comrs. Chester and Delaware Counties receive bids about March 16, building 2 story, 150 x 150 ft., rein.-con. and brick, here. V. T. Ritter, North Amer. Bldg., Phila., archt.

Pa., Chester—Lodge—V. T. Ritter, archt., North Amer. Bldg., Phila., receives bids about March 16, building 6 story, 150 x 180 ft., brick and stone, on 9th and Sproul Sts., for Tall Cedar Lodge About $65,000.

Pa., Dorranceton (Kingston P. O.)—Rectory—Grace Episcopal Church having plans prepared by Studevant & Foster, archts., Coal Exch. Bldg., Wilkes-Barre, for 3 story, 40 x 40 ft., brick and stucco, rock foundation, on Butter St. About $50,000.

Pa., Erie—Bank—Second Natl. Bank of Erie, having plans prepared by Stoddard & Hopkinson, archts. and engrs., Spencerian Bldg., Cleveland, O., for 1 story, 60 x 130 ft., steel, stone, concrete and marble or granite. About $400,000.

Pa., Girardville—Clubhouse—Girardville Soldier Legion plans to build 2 story, 40 x 80 ft., brick and steel, rock foundation, on Main St. About $50,000. Architect not selected.

Pa., Hazleton—High School—School Bd. plans to build 2 story, 100 x 100 ft., brick and steel, rock foundation, on Hazleton Heights. About $200,000. Architect not selected.

Pa., Hazelton—Y. M. C. A., 120½ West Broad St., plans to build 3 story, 50 x 70 ft. brick and steel, rock foundation, on West Broad St. About $50,000. Architect not selected.

Pa., Larksville (Wilkes-Barre P. O.)—School—St. John's Church plans to build 3 story, 50 x 100 ft., brick and timber, rock foundation, on Nesbitt St. About $100,000. Architect not selected.

Pa., Phila.—Office—Atlantic Refining Co., 3144 Passyunk St., soon lets contract building 20 story, 80 x 120 ft., brick, steel and stone, concrete foundation, on Broad and Spruce Sts. About $1,000,000. C. Gilbert, 244 Madison Ave., New York City, archt. and engr.

Buildings (Continued)

Pa., Scranton—Store—Belmont Store Co. plans to build 5 story, 40 x 80 ft., brick and steel, rein.-con. flooring, rock foundation, on Wyoming Ave. About $100,000. Architect not selected.

Pa., Wilkes-Barre—Bank—Dime Bank Title & Trust Co., 23 West Market St., plans to build 2 story, 40 x 80 ft., brick, rock foundation, on Market and Franklin Sts. About $50,000. Architect not selected.

Md., Cumberland—Salvation Army receives bids about May, constructing 4 story, steel and brick building. About $50,000. Address G. M. Woods, Box 109.

Md., Hagerstown—Church, Sunday School and Parsonage—Washington Sq. Methodist Episcopal Church, 538 Washington Ave., plans to build 1 story, 80 x 175 ft., brick. About $50,000. A. J. Klinkart, 54 Washington St., archt.

Md., Trappe—School—Talbot Co. School Bd., Easton, having plans prepared by F. Ross, archt., Easton, for 2 story, 60 x 80 ft., brick and terra cotta, brick and stone foundation, here. About $50,000. M. Wright, chn.

D. C., Washington—Bank and Office—Federal Natl. Bank, 14th and G Sts., N. W., having plans prepared by A. P. Clarke, Jr., archt., 816 14th St., N. W., for brick and stone. About $500,000.

D. C., Washington—Clubhouse—Racquet Club of Washington, Southern Bldg., receives bids about April, building 7 story, 50 x 81 ft., brick and stone. J. H. de Sibour, Hibbs Bldg., archt.

Ga., Savannah—Exhibit, etc.—State Fair Bd. having plans prepared by H. C. Holbrook, archt., Outlook Bldg., Columbus O., for three 100 x 200 ft., one 250 x 250 ft., and four 30 x 90 ft. exhibit buildings, five 30 x 72 ft. barns, concrete and timber and one 60 x 400 ft. grand stand, concrete and steel, on State Fair Grounds.

Tenn., Knoxville—Salesroom—See "Industrial Works."

O., Akron—Office—J. K. Katsary, archt., Erie Bldg., Cleveland, preparing plans for 2 story, 64 x 114 ft., concrete, steel and brick addition, rein.-con. flooring, concrete foundation, on Main St. About $50,000. Owner's name withheld.

O., Cleveland — Clubhouse — Brooklyn Catholic Club, 4419 Pearl Rd., plans to build 2 story, 70 x 200 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Pearl Rd. and Leopold Ave. About $100,000. M. Rosseau, 1775 Wickford Rd., archt.

O., Cleveland—Clubhouse and Gymnasium—St. Stanislas Church, 3649 East 65th St., now conducting campaign to raise $60,000 to build 2 story, 41 x 80 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation. W. C. Jansen, Electric Bldg., archt.

O., Cleveland — Commercial — Cleveland Trust Co., East 9th St. and Euclid Ave., plans to build 4 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, at 2717 Euclid Ave. About $300,000. A. A. McCaslin, vice pres. Architect not selected.

O., Cleveland—Office—Cleveland Discount Co., Rockefeller Bldg., plans to build 20 story, 80 x 200 ft., concrete steel and brick, rein.-con. flooring, concrete and brick foundation, on Superior Ave. near East 9th St. About $4,000,000. Walker & Weeks, 1900 Euclid Ave., archts.

O., Cleveland — Sales—See "Industrial Works."

O., Cleveland—High School—Bd. Educ. having plans prepared by W. R. McCormack, archt., East 6th St. and Rockwell Ave., for 3 story, 200 x 400 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 117th St. and "The Speedway." About $600,000.

O., Cleveland — School — St. Joseph's Church, 11122 Aspinwall Ave., having plans prepared by C. Greco, archt., Guardian Bldg., for 3 story, 80 x 145 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on St. Clair Ave. between East 144th and 146th Sts. About $300,000. J. W. Bell, pastor. Noted Feb. 12.

O., Cleveland — School — St. Stanislas Church, 3649 East 65th St., having plans prepared by W. C. Jansen, archt., Electric Bldg., for 3 story, concrete, steel and brick, rein.-con. flooring, concrete foundation. About $250,000.

O., Cleveland—Theatre and Commercial—M. Silverberg, 9305 Hough Ave., having preliminary plans prepared by F. J. Prochaska, archt., 11111 Buckeye Rd., for 2 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 152nd St. and St. Clair Ave. About $100,000.

O., Columbus—High School—Bd. Educ. having plans prepared by D. Riebel & Sons, archts., New 1st Natl. Bank Bldg., for 5 story, with 3 wings, in Victory Park. Election April 20, to vote on $1,000,000 bonds for project.

O., Linden (Columbus P. O.)—School—Bd. Educ., Columbus, rejected bids received March 1, building 2 story, irregular shaped, concrete and brick, here. About $165,000. D. Riebel & Sons, New 1st Natl. Bank Bldg., Columbus, archts. •Noted Jan. 1.

O., Springfield — Business — Fraser Real Estate Co., Limestone St., plans to build 3 story, 50 x 140 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on West High St. About $75,000. Architect not selected.

O., Springfield—Temple—Trades & Labor Assembly, 138 West High St., plans to build 3 story, 75 x 150 ft., concrete and brick, rein.-con. flooring, concrete foundation. About $125,000. Architect not selected.

Mich., Ann Arbor—Dormitory—University of Michigan, c/o Secy. Bd. Regents, plans to build 4 story, rein.-con. and brick, rein.-con. flooring, concrete foundation, on State and Maynard Sts About $200,000. A. Kahn, Marquette Bldg., Detroit, archt.

Mich., Detroit—Bank—Bank of Detroit, Penobscot Bldg., having plans prepared by L. Kamper, archt., Book Bldg., for 2 story, 50 x 65 ft., brick, steel and stone, concrete foundation, on Michigan Ave. and 31st St. About $75,000.

Mich., Detroit—Clubhouse—Detroit Yacht Club, c/o G. Jerome, 1331 Majestic Bldg., plans to build 3 story, brick and frame addition, on Belle Isle. About $125,000. Architect's name withheld.

Mich., Detroit — Commercial — Hannan Real Estate Exch., 1 McGraw Bldg., plans to build 5 story, 53 x 141 ft., rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation, on Woodward Ave. and Sibley St. About $200,000. Architect's name withheld.

Mich., Detroit—Fire Station — Bd. Fire Comrs., Larned St, plans to build 2 story, 50 x 80 ft., rein-con., brick and steel, rein.-con. flooring, concrete foundation, on Seven Mile Rd., near Woodward Ave. About $65,000. G. J. Finn, secy. Architect's name withheld.

Mich., Detroit—Hotel—B. B. Jacobs, et al, Penobscot Bldg., having tentative plans prepared for 10 story, 90 x 160 ft., rein.-con., brick and steel addition, rein.-con. flooring, concrete foundation, on Park Blvd. and Elizabeth St. About $1,000,000. Architect's name withheld.

Mich., Detroit—Office—Dept. Pub. Wks. plans to build 4 story, rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation, on site of present city hall, Woodward and Michigan Aves. Architect not selected.

Mich., Hamtramck (Detroit P. O.)—Fire Station—Village having plans prepared by A. A. Harley, archt., 435 Woodward Ave., Detroit, for 2 story, 40 x 75 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on east side of village. About $50,000.

Mich., Highland Park (Detroit P. O.)—Hospital—Detroit Osteopathic Hospital, c/o P. H. Gray, plans to build 5 story, 75 x 155 ft., rein.-con., brick and stone, concrete foundation, on Highland and 3rd Aves. About $250,000. Architect's name withheld.

Mich., Lansing—Theatre and Arcade—Arcade Theatre Co., South Washington Ave., having plans prepared by J. Eberson, archt., 64 East Van Buren Ave., Chicago, for 2 story, 109 x 165 ft., rein.-con., brick, steel and terra cotta, rein.-con. flooring, concrete foundation. About $450,000. W. S. Butterfield, mgr.

Ill., Chicago—Bank and Office—Sheridan Trust & Safe Deposit Co., 4738 Bway., plans to build 12 story, 138 x 147 ft., on Bway. and Lawrence Ave. About $1,000,000. Marshall & Fox, 721 North Michigan Ave., archts.

Wis., Milwaukee — Convent — St. Marys Convent having plans prepared by E. Brielmaier & Sons Co., archts., University Bldg., for 4 story, brick and rein.-con. addition, rein.-con. flooring, concrete foundation. About $65,000.

Wis., Owen—Asylum—Clark Co. having plans prepared by Claud & Starck, archts., Badger Bldg., Madison, for 3 story, brick tile and concrete. About $350,000. W. G. Royer, chn. comm.

Wis., Sheboygan—Office—See "Industrial Works."

Ia., Cedor Rapids—Schools—Bd. Educ. having plans prepared by Rugh & Zalesky, archts., 811 Security Bldg., for 5 brick, rein.-con. and steel schools, rein.-con. flooring, concrete foundation. About $1,500,000. Noted Feb. 5.

Ia., Des Moines—Exchange—Iowa Telephone Co., 7th and High Sts., plans to build 3 story, rein.-con., brick and steel, tile and cement flooring. About $300,000. G. B. Prinz, Omaha Natl. Bank Bldg., Omaha, Neb., archt.

Ia., Ellston—School—Bd. Educ. plans to build 2 story, brick, concrete and steel, concrete foundation. About $85,000. Keller & Jones, Masonic Bldg., Des Moines, archts.

Ia., Farrar—School Dist. plans to build 2 story, 90 x 110 ft., brick, rein.-con. and steel. About $90,000. Architect and engineer not selected.

Ia., Forest City—Memorial—City voted $60,000 bonds to construct memorial building. Architect and engineer not selected.

Ia., Morning Sun—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 2 story, rein.-con. and brick, rein.-con. flooring, concrete foundation. About $200,000. O. F. Boller, secy.

Ia., Pockwood—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 2 story, 58 x 99 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $125,000. N. E. Oliver, secy.

Minn., Duluth—Stores and Office—Ham, Ruben & Finkelstein, West 2nd St., receives bids about April 15, building 2 story, 200 x 800 ft., rein.-con., brick and tile, rein.-con. flooring, concrete foundation, on 2nd Ave., W, and 1st St. About $175,000. Holstead & Sullivan, Palladio Bldg., archts. and engrs.

Minn., Hancock—High School—Bd. Educ. soon receives bids building 2 story, concrete, brick and tile. About $100,000. A. A. Roberts, clk. S. Jacobson, 403 Endicott Bldg., St. Paul, archt.

Minn., Hill City—School—Bd. Educ. plans to build 2 story, rein.-con. and brick addition, to include gymnasium, community room, showers, lockers, etc. About $50,000. Architect not selected.

Minn., Minneapolis—Hotel—W. Weisman, 508 Nicollet Ave., having sketches made converting 4 story, 90 x 97 ft. concrete business building, on Washington and Hennepin Aves., into hotel. About $125,000. Architect not selected.

Minn., Waseca—Hospital—H. C. Gerlach & Son, archts., Mankato, rejected bids received Feb. 17, building 2 story, 60 x 100 ft., rein.-con. and brick, here, for city. About $80,000. Work will be readvertised. Terry-Schultz Eng. Co., Endicott Bldg., St. Paul, engrs. Noted Jan. 29.

Kan., Chanute—School—Bd. Educ. plans to build rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $90,000. A. T. Simmons, Bloomington, Ill., archt.

Kan., Holyrood—School—Bd. Educ. having plans prepared by F. G. McCune, archt., Wichita, for 3 story, 75 x 110 ft., concrete, brick and steel, concrete foundation. About $75,000.

Kan., Pawnee Rock—School—Bd. Educ. having plans prepared by Smith, Beattie & Co., archts., Hutchinson, for 2 story, concrete, brick and steel, concrete foundation. About $70,000.

Kan., Wichita—Theatre and Hotel—A. Ford having plans prepared by C. Boller & Bros., archts., Ridge Bldg., Kansas City, Mo., for 6 story, 150 x 150 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $650,000.

S. D., Elks Point—Church—Lutheran congregation having plans prepared by P. O. Moe, archt., 616 New York Life Bldg., Minneapolis, for 41 x 84 ft. brick and tile. About $55,000.

N. D., Grafton—Hospital—Grafton Deaconess Hospital soon lets contract building 3 story, 38 x 128 ft. stucco and hollow tile. About $70,000. J. B. De Rema, Grand Forks, archt.

Mo., Kansas City—Sales and Office—J. C. Sunderland and W. A. Besecke, archts., 313 Interstate Bldg., receive bids about March 15, building 5 story, 50 x 117 ft., rein.-con., brick and terra cotta, concrete foundation, on 23rd and Grand Sts., for Frederick Realty Investment Co., 1019 Walnut St. About $150,000. Hedrick & Huff, 506 Interstate Bldg., engrs.

Mo., Mexico — Hotel — Hoxey Hotel Co. having plans prepared by B. C. Elliott, archt., Mexico, for 4 story, 71 x 110 ft., rein.-con., steel and brick addition, rein.-con. flooring, concrete foundation. About $200,000.

Okla., Duncan—High School—City election April 16, to vote on $250,000 bonds to build high school. Architect and engineer not selected.

Buildings (Continued)

Okla., Durant—School—State Bd. Pub. Affairs, Oklahoma City, having plans prepared by Jewell & Hicks, archts. 19½ West Main St., Oklahoma City, for 2 story, brick, here. About $100,000. Engineer not selected.

Okla., Muskogee — Temple — Bedouin Shrine, 6th and Boston Sts., having plans prepared by H. O. Valeur & Co., archts., 705 Phoenix Bldg., for 125 x 210 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $300,000.

Okla., Oklahoma City — Hotel — Classen Highlands Co. having plans prepared by Layton, Smith & Forsythe, archts., 701 Majestic Bldg., for 4 story, 100 x 175 ft., rein.-con., on Classen Blvd. and Shartel Ave. About $600,000. A. H. Classen, pres.

Okla., Wewoka—School—City voted $50,000 bonds to build school. Architect and engineer not selected.

Idaho, Gooding — Dormitory — Gooding College having plans prepared by Tourtellote & Hummel, Overland Bldg., Boise, for 3 story, 40 x 120 ft. About $80,000.

Idaho, Moscow—Church—First Methodist Church plans to build 2 story, stone addition adjoining present church, including auditorium and Sunday School rooms. About $50,000. Private plans.

Idaho, Orofino—Crustaline Lime Co. plans to build plant. About $100,000.

Idaho, Sandpoint — High School—School Dist. having plans prepared by Whitehouse & Price, archts., Hutton Bldg., Spokane, Wash. for 3 story school here. About $150,000.

Ariz., Flagstaff—Schools—Bd. Educ. retained N. F. Marsh, archt., 211 Broadway, Central Bldg., Los Angeles, Cal., to prepare plans for group of rein.-con. high school buildings and addition to grammar school. Election soon to vote on bonds for project. Cost not yet determined.

Ariz., Phoenix—High School—City voted $460,000 bonds to construct manual arts building gymnasium and 2 story, 65 x 165 ft., liberal arts building, with two 35 x 36 ft. wings, brick or concrete. Lescher & Kibbey, archts., Bank of Arizona Bldg., have prepared preliminary plans.

Ariz., Phoenix—Hotel—Jordan, Grace & Phelps soon receive bids building 9 story, 179 x 300 ft., on Central Ave. About $1,200,000. Postle & Fletcher, 140 South Dearborn St., Chicago, Ill., archt. M. T. Grier, Castle Hot Springs Hotel, lessee. Noted June 24.

Ariz., Phoenix—Offices—C. Korrick, 841 North 2nd Ave., having plans prepared by L. M. Fitzhugh, archt., 210 Noll Bldg., for 4 story, 123 x 130 ft., rein.-con and brick, rein.-con. flooring, on 3rd Ave. and Washington St. About $250,000.

Wash., Pullman—Dormitory—Stock company being organized under auspices of Chamber of Commerce to build 2 story, probably brick, on lot near campus of Washington State College. About $75,000. Architect not selected.

Wash., Toppenish—Bank—First Natl Bank having plans prepared by Doyle & Merriam, archts., Natl. Bank Bldg., Seattle, for 1 story, 25 x 100 ft., masonry. About $50,000.

Wash., Yakima—Church—Bldg. Com. of 1st Congregational Church plans to build 1 story, brick. About $50,000. Architect not selected.

Ore., Klamath Falls — School—Sacred Heart Church plans to build 2 story, brick or concrete. About $50,000. J. Dreher, trustee. Architect not selected.

Ore., La Grande—School—City plans election in April to vote on $130,000 bonds to purchase site and build 2 story, brick or concrete. A. C. Hampton, supt. schools. Architect not selected.

Ore., Marshfield—Hospital—Mercy Hospital Assn. plans to build 2 or 3 story, brick or cement. About $100,000. Private plans.

Ore., Medford—Temple—Methodist Episcopal Church plans to build 2 story, brick and concrete, in central part of city. Cost between $100,000 and $150,000. J. R. Sasnett, pastor. Private plans.

Ore., Portland—Business—M. Palley having plans prepared by W. W. Lucius, archt., Lewis Bldg., and soon receives bids building 2 story, 100 x 120 ft., brick, concrete and tile, concrete foundation, on Lownsdale and Alder Sts. About $50,000.

Cal., Berkeley—School—Bd. Educ. soon receives bids building 2 story, concrete and brick, concrete foundation, on Prince and King Sts. About $200,000. W. H. Ratcliff, Jr., 1st Natl. Bank Bldg., archt.

Cal., Calexico—Church—Calexico Methodist Episcopal Church having plans prepared by A. G. Lindley, archt., 904 Wright & Callender Bldg., Los Angeles, for 2 story church, 700 seating capacity, stucco and frame, concrete foundation. About $50,000.

Cal., Chico—Station—Sacramento Northern R.R., Sacramento, plans to build 2 story, brick and concrete. About $60,000. W. J. O'Conner, dir. Architect not selected.

Cal., Dinuba — High School—Trustees Dinuba Union High School Dist. having plans prepared by E. J. Kump, archt., Rowell Bldg., Fresno, for hollow tile high school, concrete foundation, to have science hall, gymnasium, manual training building and additional class rooms. About $112,000. Noted March 4.

Cal., El Centro—Hotel—B. L. Vaughn having plans prepared by N. H. Beer, archt El Centro, for 4 or 5 story (100 room), rein.-con. addition to Barbara Worth Hotel. Cost to exceed $75,000.

Cal., Fresno—Hotel and Store—D. Kalyjian, 2232 Tulare St., having plans prepared by L. H. Nishkian, arch.t Monadnock Bldg., for 2 story, 50 x 135 ft., rein.-con. and brick, on North J St. About $60,000.

Cal., Kingsburg—High School—Trustees Kingsburg Union High School Dist. having plans prepared by A. Johnson, archt., Kingsburg, for 2 story, brick. About $75,000. Noted Jan. 29.

Cal., LaHabra — School — Trustees LaHabra School Dist. having plans prepared by Jeffery & Schaefer, archts., 1106 Kerchkoff Bldg., Los Angeles, for group of hollow tile buildings. About $80,000.

Cal., Long Beach—Hotel and Bath House—Seaside Investment Co. having revised plans prepared by A. B. Benton, archt., 114 North Spring St., Los Angeles, for 4 story, 250 x 340 ft., rein.-con., concrete foundation, on ocean front.

Cal., Los Angeles—Theatre and Office—A. Calney had sketches made by W. Richards, engr., and W. J. Dodd, archt., 905 Brack-Shops Bldg., for 12 story, rein.-con. on 6th and Olive Sts. About $1,500,000.

Cal. San Pedro—Hotel—D. Ferris, G. L. Moore, T. Jones and G. B. Harrison had sketches prepared by Train & Williams, archts., 226 Exch. Bldg., Los Angeles, for 7 story, 150 x 200 ft., containing 300 rooms, on 7th St. between Beacon and Palos Verdes Sts. About $1,250,000.

Cal., San Pedro—Theatre and Store—F. O. Adler, c/o Victoria Theatre, having plans prepared by Smith & Pennell, archts., 621 Investment Bldg., Los Angeles, for 1 and 2 story, 105 x 125 ft., rein.-con., brick and hollow tile, rein.-con. flooring, concrete foundation, on 6th St. Cost between $75,000 and $100,000. Noted Jan. 29.

Cal., Vallejo—School—City election May 5 to vote on $500,000 bonds to improve grade and high school districts. W. H. Weeks, archt., 75 Post St., San Francisco, has prepared preliminary plans and estimates for brick or concrete structures, concrete foundations.

Que., Grandmere—School—School Comrs. soon receive bids constructing rein.-con. school. About $200,000.

Ont., Belleville—School—Bd. Educ. having plans prepared by B Jarvis, archt., 64 Gloucester St., Toronto, for 2 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $100,000.

Ont., Hamilton—Theatre—J. and J. J. Allen, Richmond and Victoria Sts., Toronto, plan to build 1 and 2 story rein.-con., steel and brick, rein.-con. flooring, concrete foundation on King and William Sts. About $500,000. Architect and engineer not selected.

Ont., Sudbury—School—High School Bd. having plans prepared by P. J. O'Gorman, archt , Sudbury, for 3 story, 20 room concrete, steel and brick, rein.-con. flooring, rock foundation. About $200,000.

Ont., Toronto — School—Separate School Bd., 67 Bond St., having plans prepared by C. J. Reade, archt., 67 Bond St., for 2 story, 6 room rein.-con , steel and brick, rein.- con. flooring, concrete foundation, on 174 Beverly St. About $75,000.

BIDS DESIRED

R. I., Providence—Home—W. R. Walker & Son, archts. and engrs., 17 Custom House St., receiving bids building 3 story, brick and steel, on Westminster and Summer Sts., for Salvation Army, c/o architects.

Conn., Bridgeport—Bowling Alley—C. J. Lewis, 166 Fairfield Ave., receiving bids altering front of present building and constructing 3 story, 67 x 87 ft. brick and steel addition in rear. About $100,000. Davis & Dane, 1024 Main St., archts. and engrs.

Conn., Bridgeport—Club—W. J. Skinner, archt., 1188 Main St., receiving bids building 2½ story, brick and steel, concrete foundation. for University Club, 232 Golden Hill St. About $75,000. Noted Sept. 11.

N. Y., New York—Nurses Home—Until March 19, by Dept. Pub. Charities, Municipal Bldg., furnishing labor and material altering and building addition to nurses home, at Metropolitan Hospital, Blackwells Island. B. S. Coler, comr.

N. Y., Schenectady—Office—General Electric Co., River Rd., receiving bids building 6 story, 50 x 200 ft., brick and concrete. About $300,000. Harris & Richards, Drexel Bldg., Phila., archts. Noted Jan, 29.

N. J., Newark—School—Until March 25, by Bd. Educ. Essex Co., building 3 story, 79 x 86 ft., brick and concrete addition to Franklin School. J. H and W. C. Ely, 784 Broad St., archts.

N. J., Newark—Store and Office—Until March 22, by L. E. Denslow, archt. and engr., 44 West 18th St., New York City, for 2 story, brick and steel, brick foundation, on West Market, Canal and Broad Sts., for United Cigar Stores, 44 West 18th St., New York City. About $65,000. Noted Nov. 27.

N. J., Roselle—School—Until March 29, by Rasmussen & Wayland, archts. and engrs., 1133 Bway., New York City, building 2 story, brick, steel and stone, brick foundation, for Bd. Educ. About $60,000. Noted Sept. 25.

Pa., Erie—High Schools—Until March 24, by Bd. Educ., building Academy and East Junior High Schools. Bonds for $597,000 voted for project. R. F. Scobell, bus. mgr.

Pa., Phila.—Office—Until March 13, by P. A. Davis, archt., 1713 Sansom St., building 1 story, 32 x 50 ft., brick and limestone, at 1809 East Allegheny St., for Potts & Thomson, 2521 Frankford St.

Pa., Phila.—Rectory—Until March 13, by G. I. Lovatt, archt., 416 Walnut St., building 3 story, 40 x 90 ft., stone, on Broad and Duncanon Sts., for Holy Child Roman Catholic Church.

Pa., Phila.—Store—Until March 19, by Clark & Dudnick, archts. and engrs., Drexel Bldg., constructing 3 story, 42 x 60 ft., rein.-con., brick, stone and terra cotta, on 5th and South Sts., for H. Krengel.

Md., Cumberland—Store—G. F. Sansbury, archt., Citizens Natl. Bank Bldg., receiving bids building 4 story, 69 x 84 ft., rein.-con., steel and brick, concrete foundation, for McMullen Bros. Co., Inc., Baltimore St. About $125,000.

Va., Roanoke—School—Until March 16, by H. C. Richards, archt., 1713 Sansom St., Phila., building 3 story, brick and stone, on 12th and Parke Sts., here, for Bd. Educ. About $175,000.

W. Va., Charleston—Office—Until March 17, by C. H. Higgins, archt., 18 West 44th St., New York City, building 7 story, 100 x 150 ft., brick, rein.-con. and steel, on Virginia and McFarland Sts., for Abney, Barnes & Co., 812-18 Virginia St. Noted Dec. 25.

O., Cleveland—Commercial—Until March 20, by M. Vicsak, 2790 East 125th St., building 2 story, 40 x 107 ft., brick, brick foundation, at 12525 Buckeye Rd. About $50,000. W. Markovitz, 10827 Bryant Ave., archt.

O., Cleveland—Hall—Until March 16, by city, furnishing and setting exterior granite work on 4 story, 180 x 420 ft., fireproof, on East 6th St. and St. Clair Ave. Total cost, $3,000,000. F. H. Betz, 604 City Hall, archt.

O., Cleveland—Hotel—Until March 15, by Estates & Investment Co., Union Bldg., receiving bids building 4 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, at 1906 East 105th St. About $250,000. W. S. Ferguson Co., 1900 Euclid Ave., archts. and engrs. Noted Jan. 15.

O., Cleveland—Theatre—Until March 15, by G. Steffens, archt., Williamson Bldg., building 1 story, 40 x 150 ft., brick and steel, brick foundation, on East 152nd St. and St. Clair Ave., for M. Froelich, 1807 East 82nd St. About $50,000. Noted March 4.

O., Piqua—School—Until March 3[illegible], by Hall & Lethly, archts., 807 Fairbanks Bldg., Springfield, building 2 story, 100 x 120 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, in western part of city, here, for Bd. Educ., City Bldg. About $100,000.

Mich., Buchanan—School—Until March 15, by I. S. Rice, secy. Bd. Educ, building 2 story, brick, stone and steel, concrete foundation About $200,000. R. A. LeRoy, 122 Pratt Blk., Kalamazoo, archt.

Mich., Detroit—Technical School—Until April 7, by Bd. Educ., 50 Bway. Ave., building 7 story, 250 x 350 ft., rein.-con., brick and steel addition, ren.-con. floorng, concrete foundaton, on 2nd Ave. About $2,500,000. Bids will be received for entire building or in 3 separate parts.

Mich., Iron River—Church—Assumption Catholic Congregation receiving bids building brick and steel, concrete foundation. About $50,000. J. Kulzcyk, pastor. E. Brielmaier & Sons Co., University Bldg., Milwuakee, Wis., archts.

Buildings (Continued)

Wis., Manitowoc—Lodge—Until March 16, by Juul & Smith, archts., Imig Bldg., Sheboygan, building 2 story, 54 x 78 ft., brick, concrete and steel, brick foundation, on Marshall St., for Knights of Columbus, 8th and Commercial Sts. About $50,000.

Wis., Watertown—Home—Until March 18, by Lutheran Home for Feeble Minded, 800 Main St., building 2 story, 60 x 106 ft., brick and rein.-con. addition, rein.-con. flooring, concrete foundation. About $80,000. R. A. Messner & Bro., Majestic Bldg., Milwaukee, archts. Noted Nov. 20.

Ia., Cushing—School—Until March 23, by Bd. Educ., building 3 story, 56 x 126 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. W. E. Hulse & Co., 210 Masonic Temple, Des Moines, archts.

Ia., Fairfield—High School—Until March 30, by Bd. Educ. building 3 story, 75 x 122 ft. rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $100,000. W. Gordon, Hubbell Bldg., Des Moines, archt.

Ia., Grand Meadow—School—Until March 26, by Bd. Educ., building 2 story, 55 x 75 ft., brick, concrete and steel, concrete foundation. About $65,000. E. D. Harvey, secy. W. W. Beach Co., Sioux City, archts.

Ia., Hayesville—School—Until March 22, by Bd. Educ., building 1 story, 56 x 86 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $60,000. R. G. H. Richardson, secy. W. E. Hulse & Co., 210 Masonic Temple, Des Moines, archts. Noted Feb. 12.

Ia., Jamison—School—Until March 28, by J. L. Weekley, secy. Bd. Educ., building 1 story, 54 x 70 ft., brick and stone, concrete foundation. About $50,000. W. E. Hulse & Co., 210 Masonic Temple, Des Moines, archts. Noted Jan. 29.

Ia., Linby—School—Until March 23, by Bd. Educ., building 2 story, 56 x 86 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $70,000. C. W. Edwards, secy. W. E. Hulse & Co., 210 Masonic Temple, Des Moines, archts. Noted Feb. 12.

Ia., St. Mary's—School—Until March 28 (change of date), by Bd. Educ., building 2 story, 56 x 86 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $75,000. W. C. McClary, clk. W. E. Hulse & Co., 210 Masonic Temple, Des Moines, archts. Noted Feb. 12.

Ia., Washta—School—Until March 18 (change of date), by Bd. Educ., building 3 story, 58 x 102 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $100,000. J. K. McGonigae, secy. W. E. Hulse & Co., 210 Masonic Temple, Des Moines, archts. Noted Feb. 5.

Neb., Grand Island—High School—Until March 15, by Bd. Educ. building 3 story, 60 x 80 ft., rein.con., brick and steel, rein.-con. flooring, concrete foundation. About $400,000. O. R. Kirschke, Grand Island, archt. Noted Aug. 7.

Neb., Grand Island—School—Until March 15, by Roman Catholic Church building 2 story, 60 x 115 ft., concrete and brick concrete foundation. About $60,000. H. W. Brinkman, Emporia, Kan., archt. Noted Jan. 15.

Neb., Kearney—Dormitory—Until April 11, by H. E. Reisch, secy. State Bd. Educ., Kearney, building 3 story, 64 x 160 ft., rein.-con., brick and stone, concrete flooring. About $100,000. J. H. Craddock & Co., Elks Bldg., Omaha, archts.

Mo., Desloge—School—Until March 16, by Bd. Educ. and R. H. Sanneman, archt., Reserve Bank Bldg., Kansas City, constructing 3 story, 83 x 114 ft., rein.-con., brick and stone, concrete foundation. About $80,000. Former bids rejected. Noted Feb. 5.

Okla., Mangum—High School and Auditorium—Until March 16, by Bd. Educ. and city, building 2 story, 80 x 114 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $140,000. Hawk & Parr, 501 Security Bldg., Oklahoma, archts.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Vt., Newport—Bank—Orleans Trust Co., 39 Main St., will build 2 story, brick and steel, rein.-con. flooring, concrete foundation, on Main St. About $75,000. Work will be done by day labor.

★Mass., Brookline (Boston P. O.)—Hotel—Co-Partner Assn., Old South Bldg., Boston, let contract building 4 and 8 story, 200 x 400 ft., 500 room brick and stone, concrete foundation, on Beacon St., to F. T. Ley, Devonshire St., Boston. About $1,200,000. Noted Feb 26.

★Mass., Fall River—Business—S. S. Kresge Co., Kresge Bldg., Detroit, Mich., let contract building 2 story, 84 x 133 ft., brick, concrete and steel rein.-con. flooring, concrete foundation, on South Main St., here, to G. A. Fuller Co., 131 State St., Boston. About $75,000.

★Mass., Williamstown—Memorial Hall—Williams College let contract building 3 story, 100 x 150 ft., brick and stone, concrete foundation, on campus, to Joslin & Macdonald, 161 Devonshire St., Boston. About $500,000.

★Conn., New Haven—Loft, Office, etc.—Brown & Von Beren, archts. and engrs., 185 Church St., let contract to C. W. Murdock, 185 Church St., building 8 story, 60x70 ft., brick and stone, concrete foundation, on Meadow and Commerce Sts., for J. Kilfeather, 120 Meadow St. About $125,000.

★Conn., Torrington — School — School Bldg. Comn. let contract building 2 story, 8 room, brick and steel addition to North School, brick and concrete foundation, on Pythian Ave., to Torrington Bldg. Co., 197 Water St. About $90,000. Noted Feb. 26.

★Conn., Waterbury—Theatre—S. Z. Poli Co., 24 Church St., New Haven, will build 120 x 190 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation, on East Main St., here. About $500,000. Work will be done by day labor. Noted Jan. 1.

★N. Y., Jamaica—School—C. B. J. Snyder, archt. and engr., Municipal Bldg., New York City, let contract to J. MacArthur, 22 Ormond Pl., Brooklyn, building P.S. 50, brick, steel and stone, on 101st St. and Liberty Ave., here, for Bd. Educ., 500 Park Ave., New York City. About $523,000. Noted Feb. 26.

★N. Y., New York—Loft—Selmark Bros., 122 West 34th St., let contract building 5 story, brick and steel, brick foundation, at 119 West 33rd St., to Weprin & Glaser, 22 East 105th St. About $75,000.

★N. Y., New York—Loft—J. Ober, c/o B. H. and C. N. Whinston, archts. and engrs., 2 Columbus Circle, let contract building 5 story, brick and steel, brick foundation, at 138 West 34th St., to Weprin & Glaser, 22 East 105th St. About $50,000.

★N. Y., New York—Loft—B. H. and C. N. Whinston, archts. and engrs., 2 Columbus Circle, let contract to Weprin & Glaser, 22 East 105th St., building 5 story, brick and steel, brick foundation, at 121 West 33rd St., for J. Ober, c/o architects. About $75,000. Noted Feb. 12.

★N. Y., New York—Loft—Sloane Estate, Inc., let contract building 2 story, 84 x 90 ft., brick, steel and stone, brick foundation, at 234-242 West 39th St., to F. T. Ley, 19 West 44th St. About $300,000.

N. Y., New York—School—C. B. J. Snyder, archt. and engr., Municipal Bldg., received bids March 3, building P. S. 38, on St. Anns Ave., Hagney Pl., Rae and Carr Sts., from Frymier & Hanna, 25 West 45th St., $834,000; T. Dwyer, Bway. and 216th St., $854,000; T. A. Clark Co., $854,300. Noted Feb. 26.

N. Y., New York—Store and Loft—M. F. Holmes, c/o C. E. Birge, archt. and engr., 29 West 34th St., let contract building 8 story, 35 x 100 ft., brick, steel and stone, concrete foundation, at 43 West 57th St., to R. H. MacDonald, 29 West 34th St. About $115,000.

★Pa., Phila.—Sales, etc.—L. J. Kolb, c/o H. B. Weldon, archt. and engr., Fuller Bldg., let contract constructing 1 and 2 story, 40 x 160 ft. and 25 x 160 ft., sales and service building, brick and concrete, at 901 North Broad St., to Potts Bros. & Cooperson, 129 North 11th St. About $90,000.

★Pa., Williamsport—Hotel and Store—Williamsport Hotel Co., c/o Bd. Trade, let contract building 9 story, 100 x 150 ft., rein.-con., brick and steel, rein.-con. flooring, rock foundation, on 4th and Pine Sts., to H. L. Steves & Co., 30 North Michigan St., Chicago. About $800,000.

★Md., Baltimore — Bank — Natl. Exch. Bank, Baltimore and Liberty Sts., let contract altering and building 2 story, 40 x 80 x 80 ft., concrete, brick and stone addition, concrete and stone foundation, to Cogswell-Koether Co., 406 Park Ave. About $100,000.

★Md., Baltimore—Theatre—D. Schwaber, 809 Pennsylvania Ave., let contract building 1 story, 92 x 200 ft., rein.-con. and brick, concrete foundation, at 811-819 Pennsylvania Ave., to Singer-Pentz Co., 600 Equitable Bldg. About $50,000.

★D. C. Washington—Office and Store—A. E. Walker Co., 813 15th St., let contract building 5 story, 104 x 135 ft., concrete, tile and terra cotta, on 17th and L Sts., N. W., to E. H Mosher, 539 Munsey Bldg. About $300,000.

★D. C., Washington—Store—J. P. Walker let contract building rein.-con. store, on Connecticut Ave., to Boyle-Robertson Constr. Co., Evans Bldg. About $50,000.

★D. C., Washington — Theatre — M. F. Murphy, 12th and D Sts., N. E., let contract building 2 story, brick and terra cotta, to W. P. Lipscomb, Dist. Natl. Bank Bldg. About $85,000.

★Va., Roanoke — Hotel — Viscose Co., Marcus Hook, Pa., let contract building 3 story, concrete and brick, here, to C. J. Phillips, Roanoke. About $300,000.

★N. C., Zebulon—Office and Store—Zebulon Drug Co. let contract building 2 story, rein.-con., to Liberty Eng. & Constr. Co., 604 Murchison Bank Bldg., Wilmington. About $50,000.

★Ga., Atlanta—Montag Bros., 10 Nelson St., let contract building 80 x 165 ft. rein.-con. and steel factory, on Marietta St., to W. Z. Williams Co., Georgia Cas. Bldg., Macon. About $200,000.

★La., New Orleans—Bank and Office—Hibernia Bank & Trust Co., Carondelet and Gravier Sts., let contract building 16 story, brick, steel and stone, concrete foundation, to G. A. Fuller, 175 5th Ave., New York City. About $2,000,000.

La., New Orleans—Hotel—Pontchartrain Hotel Co., Whitney Bldg., received bids March 3, building 14 story, steel and concrete, on University Pl., from G. A. Fuller, Liberty Bank Bldg., Selden-Breck Constr. Co., 1932 North Bway., St. Louis, Mo. About $2,000,000.

★O., Cleveland—Bank—Pearl St. Savings Trust Co., West 25th St. and Clark Ave., let carpentry contract remodeling 1 story, to H. Waterson, 4500 Euclid Ave. About $50,000.

★O., Cleveland—Commercial—Sixth St.-Huron Rd. Co., c/o Grieble & Eberling, archts. and engrs., 517 Sloan Bldg., let contract building 8 story, 80 x 178 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Huron Rd. and East 6th St., to Richley Constr. Co., Racine Bldg. About $500,000. Noted Feb. 5.

★O., Cleveland—Commercial—Van Aken & Strock Co., 6532 Euclid Ave., let contract building 8 story, 85 x 185 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, at 4300 Euclid Ave., to A. W. Kilbourne Co., 6532 Euclid Ave. About $500,000.

★O., Cleveland—Commercial—See "Buildings."

★Ill, Chicago—School and Church—Immaculate Conception congregation, 44th and Fairfield Sts., let masonry contract for 2 story, brick, rein.-con. flooring, concrete foundation, to J. Daleo, 4111 South Richmond St.; carpentry, to J. Jonkantus, 3134 South Rockwell St. Total cost about $100,000.

★Wis., Middleridge (Bangor, P. O.)—Church—St. Peters Catholic Church let contract building 46 x 114 ft., brick and steel, concrete foundation, to J. Arenz & Son, La Crosse. About $50,000. Noted Nov. 27.

★Wis., Racine — Schools — Bd. Educ. received only bid building McKinley School, 2 story, 52 x 70 ft. and 96 x 264 ft., brick and concrete, rein.-con. flooring, concrete foundation, from Michie Constr. Co., Camp Bldg., Milwaukee, $314,735; 2 story addition to Franklin School, from A. C. Koppel, 300 6th St., $224,333. Noted Jan. 29.

★Ia., Aurelia—School—Bd. Educ. let contract building 3 story, 75 x 166 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, to W. J. Zitterell & Co., Inc., Webster City, $207,322. Noted March 4.

★Ia., Calamus—School—C. A. Dieman & Co., archts., 408 Granby Bldg., Cedar Rapids let contract to Braun Bros., Dubuque, building 3 story, 65 x 86 ft., brick, concrete and steel, concrete foundation, for Bd. Educ., $66,238. Noted Jan. 29.

Ia., Marshalltown — Municipal — City received bids Feb. 25, building 2 story, 40 x 116 ft., rein.-con., brick and stone, rein.-con. flooring, concrete foundation, on North Center St., from Western Constr. Co., Earlham, $87,800; J. W. Hopp Constr. Co., 403 Granby Bldg., Cedar Rapids, $90,000; W. F. Block, Marshalltown, $97,526. Noted Feb. 12.

★Minn., Arco — School — Consolidated School Dist. 70 let contract building 2 story, 60 x 140 ft., brick and stone, to H. Glassberg, 1412 South 7th St., Minneapolis. About $60,000; cost plus percentage basis. Noted Feb. 6.

Minn., Richfield — School — Independent School Dist. 143 received bids building 3 story, 57 x 174 ft., brick and hollow tile, with 73 x 90 ft. wing, from J. and W. A. Elliot, 906 Lumber Exch., $87,275; Madsen & Peterson, 646 Builders Exch., $90,237; Elvin & Grahn, 638 Plymouth Bldg., $97,900; contractors all of Minneapolis.

★Minn., St. Paul—Hotel—Minor Hotel Co. let contract building 12 story, 100 x 100 ft., rein.-con. and steel, on 4th and Roberts Sts., to F. N. Hegg, 2942 Nicollet Ave.,

Buildings (Continued)

Minneapolis. About $1,500,000; cost plus percentage basis.

★**Minn., Waite Park**—School—Bd. Educ., Dist. 152, let contract building 1 story, 100 x 110 ft., rein.-con. and brick, to A. B. Drygas, St. Cloud. About $90,000; cost plus perentage basis. Noted Feb 26 under "St. Cloud."

★**Kan., Topeka** — Bank — Central Natl. Bank, 700 Kansas Ave., let contract remodeling rein.-con., brick and steel, to J. M. Leeper, State House. About $100,000; cost plus percentage basis.

★**Neb., Norfolk**—Hotel—Norfolk Hotel Co. let contract building 4 story, rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on 4th St. and Norfolk Ave., to H. L. Stevens & Co., 30 North Michigan Ave., Chicago. About $500,000; cost plus percentage basis.

★**Neb., Westpoint**—School—Bd. Educ. let contract building 2 story, 81 x 175 ft., brick, rein.-con. flooring, brick, rock and concrete foundation, to H. Ohlsen & Son, David City, $198,113. Noted Feb. 19.

★**Tex., La Porte**—College—St. Mary's Seminary let contract constructing 4 story, 50 x 150 ft., rein.-con. and brick college, rein.-con. flooring, also 2 smaller buildings and water tower, to Coyle Bros., 3628 S ½ St., Galveston. About $100,000. F. B. Moore, S. P. Bldg., Houston, engr.

★**Okla., Pawhuska**—Office—Southwestern Bell Telephone Co., Boatmen's Bank Bldg., St. Louis, Mo., let contract building 3 story, 50 x 100 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to Reinhart & Donovan, 721 Insurance Bldg., Oklahoma City. About $50,000.

★**Col., Grand Junction**—High School—Bd. Educ. let contract building 2 story, 51 x 111 ft. addition to present high school, to R. C. Whitlock, Pueblo, $53,225.

★**Col., Rocky Ford**—Bank—First Natl. Bank let contract building brick and stone, tile flooring, to J. H. Peck, Colorado Springs. About $57,000.

★**Ariz., Chandler** — High School—Bd. Educ. let contract building high school, to J. W. Tucker, Phoenix, $93,100.

★**Ariz., Flagstaff** — School — State Bd. Educ., Phoenix, let contract building 2 story, 45 x 115 ft., rein.-con. and sandstone, rein.-con. flooring, concrete foundation, to Edwards, Wildey & Dixon Co., 515 Black Bldg., Los Angeles, $97,983.

★**Wash., Spokane**—Store—E. S. Burgan & Son, 1108 Division St., let contract building 6 story, 106 x 142 ft., rein.-con. and terra cotta, concrete foundation, to Alloway & George, Old Natl. Bank Bldg. About $200,000. Noted Jan. 22.

★**Cal., Alameda**—Church—St. Joseph's Catholic Church let contract building 70 x 167 ft., rein.-con., rein.-con. flooring, concrete foundation, to J. J. Leonard, Builders' Exch., San Francisco, $70,591. Noted Jan. 8.

Cal., Glendale (Los Angeles P. O.) — School—Bd. Educ. received bids building 1 story, 8 room, concrete and hollow tile, on Bway., from Edwards, Wildey & Dixon Co., 515 Black Bldg., $78,634; Los Angeles Planing Mill Co., 1812 Industrial St., $89,119; Willard-Brent Co., Baker Detwiler Bldg., $90,000, all in Los Angeles. Noted Feb. 19.

★**Cal., San Pedro**—Bank and Office—First Natl. Bank of San Pedro let contract building 5 story, 50 x 100 ft., rein.-con., brick, hollow tile and terra cotta, rein.-con. flooring, concrte foundation, on 6th and Palos Verdes Sts., to Foss Designing & Bldg. Co., 45 North Euclid Ave., Pasadena. About $150,000; cost plus percentage basis.

★**Cal., Turlock**—School—High School Bd. let contract building 1 story, concrete and brick, concrete foundation, to O. C. Holt, Irwin, $65,971.

Cal., Whittier—Hospital—City received bids building 2 story, brick and frame, concrete foundation, from Wopschall Bros., 100 East Colorado St., Pasadena, $66,574; J. F. Atkinson, Story Bldg., Los Angeles, $70,000. Noted June 19.

★**Que., Montreal**—Office—Can Amusement Co., Sohmer Bldg., let contract buildig 10 story, 43 x 60 ft. rein.-con. and terra cotta, concrete foundation, on Mayor St., to Anglin Norcross Co., 65 Victoria St. About $120,000.

Federal Government Work

PROPOSED WORK

N. Y., New York—Channel—U. S. Engr. Office, 39 Whitehall St., will submit specifications for channel, 20 ft. deep, 300 ft. wide, up to Nairn Linoleum Wks., at Kearny.

N. Y., New York—Dredging—U. S. Engr. Office, 39 Whitehall St., will have specifications made for maintenance dredging in Keyport Harbor, N. J.

N. Y., New York—Dredging—U. S. Engr. Office, 39 Whitehall St., will have specifications mad for maintenance dredging in Shrewsbury River, N. J.

N. J., Passaic—River Improvement—U. S. Engr. Office, 39 Whitehall St., New York City, will have plans prepared for improving Passaic River from Montclair and Greenwood Lake R.R. Bridge to Garfield Bridge.

Pa., Phila. — Roof—Spec. 4152—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to construct on Bldg. 35, here. About $6,300.

Pa., Phila.—Roof Covering—Spec. 4153—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to cover roof of Bldg. 350, 160x 350 ft., pitch, tar, impregnated felt, gravel or slag; $10 deposit required for plans and spec.

Pa., Pittsburgh—Lock—U. S. Engr. Office, 2111 Farmers Bank Bldg., plans to build Lock 5, in Allegheny River. About $860,100.

Pa., Pittsburgh—Lock and Dam—U. S. Engr. Office, Pittsburgh, rejected bids received Feb. 14, building Lock and Dam No. 4, Allegheny River, near Natrona. Noted Jan. 22.

D. C., Wash., Steel Hull—U. S. Engr. Office, War Dept., will have specifications made for steel hull to replace wooden one of U. S. Dredge "Grosselete."

Va., Hampton Roads—Reinforcing Trusses—Spec. 4150—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to reinforce 6 trusses in Hangar 1, here. About $5,000.

S. C., Charleston—Radio Tower with Foundation—Spec. 4149—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build 300 ft., here. About $17,000.

Ky., Louisville—Lock and Dam—U. S. Engr. Office, 425 Custom House, preparing plans for Lock and Dam 44.

Ky., Louisville — Power House — U. S. Engr. Office, 425 Custom House, plans to build at Dam 48.

O., Cincinnati—Power House, etc.—U. S. Engr. Office, 415 Custom House, plans to complete power house and Dam 39.

Wis., Milwuakee—Dredging and Repairing Breakwaters—U. S. Engr. Office, Federal Bldg., approved specifications for dredging, repairing and rip rapping 1,000 ft. south breakwater, in Ludington Harbor. Cost $110,788.

Alaska, Sitka—Wharf, Etc.—Spec. 4151—Bureau Yards & Docks, Navy Dept., Wash,. D. C., plans to build at Jafronski Island, here. About $16,000.

BIDS DESIRED

Me., Mt. Desert Island—Seawall—Spec. 4135—Until March 17, (change of date), by Bureau Yards & Docks, Navy Dept., Wash., D. C., building at Naval Transmitting Sta., here; $10 deposit required for plans and spec. Noted Feb. 26.

R. I., Providence—Dredging—Until April 1, by U. S. Engr. Office, dredging in Connecticut River below Hartford; advertised in this issue.

Pa., Phila.—Tunnel—Until March 16, by H. J. Lumsden, officer in charge of constr. Frankford Arsenal, building tunnel to small arms ammunition, general storehouses, etc.; advertised in this issue.

Del., Wilmington—Building and Repairing Jetty—Until April 5, by U. S. Engr. Office, Old Federal Bldg., building and repairing jetty at mouth of Mispillion River, here; advertised in this issue.

D. C., Wash.—Mechanical Equipment and Piping—Spec. 3708—Until March 31, by Bureau Yards & Docks, Navy Dept., installing mechanical equipment and piping, here. About $200,000; $10 deposit required for plans and spec. Noted Aug. 21.

Va., Norfolk — Drainage System — Spec. 4131—Until March 24, by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing drainage system around heads of drydock 3 and 4, here. About $4,000. Noted Jan. 29 under "Philadelphia."

Va., Yorktown—Buoys—Spec. 4068—Until March 17, by Bureau Yards & Docks, Navy Dept., Wash., D. C., furnishing 4 mooring buoys, here. About $7,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New Dorp—Administration Buildings, Quarters, etc.—Constr. Quartermaster, 39 Whitehall St., New York City, received lowest 3 bids March 1, furnishing labor and material constructing, for Air Seacoast Defense Sta., here, from Rangeley Constr. Co., 56 West 39th St., $839,000; North Eastern Constr. Co., 101 Park Ave., $850,929; Post & McCord, 101 Park Ave., $894,000. Contractors all of New York City. Noted Feb. 19.

N. Y., Oswego—Alterations to Post Office and Customhouse—Treas. Dept., Wash., D. C., received bids March 3, altering, here, from E. Tery Co., Phila., $27,480; King Lumber Co., Charlottesville, Va., $44,700. Noted Feb. 12.

★**N. J., Dover**—Shell Loading Plant—A. Niles, commanding officer, Picatinny Arsenal, let contract furnishing labor for constructing 1 story, 52 x 109 ft., hollow tile, concrete and steel addition to Bldg. 117, concrete foundation, to W. H. Sutherland, Syndicate Trust Bldg., St. Louis, Mo. About $135,000. Government will furnish all material.

Pa., Phila.—Dredging—U. S. Engr. Office, 815 Witherspoon Bldg., received bids Feb. 18, dredging in Delaware River, Phila. Harbor, involving 1,173,000 cu.yd. excav., from Amer. Dredging Co., Mariner & Merchant Bldg., $0.443 per cu.yd.; Arundel Corp., 409 Finance Bldg., $0.78; Great Lakes Dredge & Dock Co., 17 Battery Pl., New York City, $0.79. Noted Jan. 22.

★**Pa., Pittsburgh**—Concrete Mixers, Derricks, etc.—U. S. Engr. Office, War Dept., Wash., D. C., let contract to Beckwith Machine Co., Arch St. and Park Way, furnishing concrete mixers, cost $6,922, steel derrick, $6,210, hoisting engines, $5,011, swinging engines, $1,420, material bins, $2,661, scale boxes, $888, tilting buckets, $552; to Factory Products Co., Bucyrus, O., 15 ton locomotive cranes, $13,863, 25 ton locomotive cranes, $47,000; to Houston Stanwood & Gamble Co., 3rd St. and Phila. Cove, Cincinnati, O., boilers, $10,338; to Amer. Hoist & Derrick Co., Farmers Bank Bldg., clamshell buckets, $8,960; to Harris Pump & Supply Co., 320 2nd Ave., pumps, $17,642; to Cleveland Rock Drill Co., 3734 East 78th St., Cleveland, O., rotating hammerdrills and bits, $479; to Westinghouse Tracting Brake Co., Westinghouse Bldg., air compressor, $710; to Sonners, Filter & Todd Co., Pittsburgh, sawmill, etc., $2,219; to Hazel Wood Dock Co., House Bldg., barges, $13,904. Above awards have been made in connection with Lock and Dam 4, Allegheny River.

★**Pa., Pittsburgh** — Remodeling Post Office and Court House—Treas. Dept., Wash., D. C., let contract remodeling, here, to North Side Constr. Co., 5939 Hamilton Ave. About $14,400. Noted Feb. 26.

★**Md. Annapolis**—Electric Lighting Lines—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building for Marine Corps Barracks, Old Rifle Range, near here, to Baltimore & Annapolis Electric R.R. Co., 105 Liberty St., Baltimore, $3,162 (180 days).

★**D. C., Wash.**—Grading, Paving, etc.—Dist. Comrs., 509 Dist. Bldg., let contract grading, paving and improving streets and avenues, to G. B. Mullen, 3303 11th St. N. W., grading $1.04 per cu.yd.; concrete curbing $.52 per lin.ft.; 8 x 8 granite setting, $.54 per lin.ft. vitr. block on gravel base, $1.45 per sq.yd.; vitr. block on concrete base, $2.47 per sq.yd.; cement curbing, $.79 per lin.ft.; cement roadway, $2.39 per cu.yd.; Maloney Paving Co., 644 B St. N. W., cobble and granite block, $1.20 per sq.yd.; cement gutters, $.75 per lin.ft.; hauling stone, $1.40 per ton. Noted March 4.

★**D. C., Wash.**—Skylights—Spec. 4100—Bureau Yards & Docks, Navy Dept., let contract constructing 2,000 sq.ft. skylight on slate roof of Bldg. 32, here, to J. H. Robertson Co., Equitable Bldg., Baltimore, Md. About $2,960 (80 days). Noted March 4.

W. Va., Wheeling—Structural Iron Castings, etc.—U. S. Engr. Office, 305 Post Office Bldg., received bids Feb. 20, furnishing and delivering 140,000 lb. structural iron castings in 2 lots to be used on Locks 6, 8, 9, 10 and 11, Kanawha River, from Francesca Constr. Co., Chicago, $15,591; C. Hegewald Co., New Albany, Ind., $16,989; C. Ward Eng. Co., South Side, Charleston, $23,998. Noted Feb. 5.

Cal., San Diego—Distributing System and Power Plant Equipment—Spec. 4118—Bureau Yards & Docks, Navy Dept., received bids March 3, furnishing and installing, here, (1) work complete, from J. W. Danforth & Co., 72 Ellicott St., Buffalo, N. Y., (1) $198,930 (180 days), (2)

Federal Government Work (Continued)

$31,200 (150 days), (3) $77,150 (150 days), (4) $92,000 (180 days), (5) add $565, (6) add $1,806, (7) deduct $9,700, (8) deduct $825, (9) deduct $25,000, (10) deduct $9,000; Stewart Eng. Corps., 61 Bway., New York City, (1) $268,000 (135 days), (2) $48,750 (125 days), (3) $127,600 (135 days), (4) $126,700 (135 days), (5) $750, (6) $1,500, (7) $7,000, (8) $650, (9) $19,500, (10) deduct $6,400. Noted Feb. 5.

Cal., San Diego—Lighting Fixtures—Spec. 4129—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids March 3, furnishing and installing, in 6 buildings at Marine Barracks, here, from Reading Electric Chandelier Wks., 503 Penn St., Reading, Pa., $9,876; Croker Electric Co., 1270 Broad St., New York City, $11,800 (120 days); Keyline Co., 312 High St., Cleveland, O., $13,751 (time as specified). Noted Feb. 5.

Cal., San Diego—Repairing Coaling Wharf—Spec. 4117—Bureau Yards & Docks, Navy Dept., let contract repairing, here, to Johnson & Caston, 965 5th St. About $4,880 (60 days). Noted Jan. 15.

Miscellaneous

PROPOSED WORK

Retaining Wall—Waterbury, Conn.—City appropriated $30,000 to build concrete retaining wall at Fulton Park. R. A. Cairns, city engr.

Road Materials—New York, N. Y.—H. H. Bruckner, pres. Bronx Boro., rejected bids received Feb. 17, furnishing and delivering 500 cu.yd. white quartz gravel, 50 ton paving block, 500 ton limestone dust, 500 ton asphaltic cement, 600 cu.yd. fine sand and 5,000 cu.yd. sand grit. Noted Feb. 26.

Tanks—Salamanca, N. Y.—See "Industrial Works."

Coal Breaker—Pittston, Pa.—Pennsylvania Coal Co. plans to build 50 x 200 ft., 90 ft. high, rein.-con. and steel, concrete foundation. About $750,000. Architect not selected.

Grand Stand—Akron, O.—Akron Exhibition Co., Doyle Blk., soon lets contracts building 1 story, concrete, steel and brick, rein.-con. flooring, concrete foundation. About $200,000. Osborn Eng. Co., 2848 Prospect Ave., Cleveland, engrs. Noted Jan. 8.

Car Barns—Cleveland, O. — Cleveland Ry., Leader-News Bldg., plans to build 1 and 2 story, concrete, steel and brick car barn, rein.-con. flooring, concrete foundation, on Bessemer Ave. and East 79th St., cost $200,000; also 1 story, concrete, steel and brick addition to car barn, rein.-con. flooring, concrete foundation, on Detroit Ave., $200,000. D. W. Morrow, 4500 Euclid Ave., archt.

Incinerating Plants—Cleveland, O.—A. Bernstein, dir. Bd. Pub. Serv., having preliminary sketches prepared for four 1 story, concrete, steel and brick incinerating plants, rein.-con. flooring, concrete foundation. About $500,000. Engineer not selected.

Loading Platform — Cleveland, O. — Chandler Motor Car Co., East 131st St. and St. Clair Ave., having plans prepared by E. McGeorge, archt. and engr., 1900 Euclid Ave., for 1 story, 20 x 100 ft., concrete loading platform. About $50,000.

Steam Roller, Cooking Tanks, Storage Tank and Steam Boilers—Cleveland, O.—City soon receives bids furnishing 1 steam roller with belting and shafting, eight 14 x 50 ft. cooking tanks, 3½ tons capacity each, one 5,000 gal. gasoline storage tank and two 125 hp. steam boilers. Cost to exceed $10,000. C. Smith, city engr.

Pavilion and Dock—Detroit, Mich.—Dept. Parks & Blvds., 822 Farwell Bldg., will build frame structure at Belle Isle, on site of former pavilion and dock, which was destroyed by storm. About $30,000. Work will probably be done by day labor under supervision of Dept. Parks & Blvds.

Tunnel—Hamtramck (Detroit P. O.), Mich.—Dodge Bros., Jos. Campau Ave., had plans prepared by Smith, Hinchman & Grylls, engrs., 710 Washington Arcade, Detroit, for 900 ft. rein.-con. and steel tunnel under railroad tracks, to have 10 x 17 ft. double barrel section, encased steel supporting columns for overhead slab, rein.-con retaining walls for open portals at each end and concrete foundation. About $40,000.

Grand Stand — Topeka, Kan. — Kansas Free Fair Assn., Fair Grounds, plans to build rein.-con., rein.-con. flooring, concrete foundation. About $75,000. Architect not selected.

Flume—Priest Rapids, Idaho—C. W. Beardmore plans to construct 6 mi. frame flume with 619 ft. fall, for conveying logs down Lightning Creek Valley from Pack River to mill, here. About $40,000. C. W. Wilson, engr.

Gravity Slide — Spokane, Wash. — Natl. Amusement Co. plans to build steel and frame gravity slide, to replace old scenic railway, at Natatorium Park. About $40,000. C. Page, Denver, engr.

Ferris Wheel—Spokane, Wash.—F. Albi secured concession and plans to build steel ferris wheel, in Natatorium Park. About $10,000.

Steamer Dock—Vancouver, Wash.—City having plans prepared building 1st unit of new steamer dock, 964 ft. frontage, concrete and steel with frame wood piling, including 100 x 500 ft. warehouse. About $130,000. A. C. Shumway, Vancouver, engr.

Dam, etc.—Enterprise, Ore.—A. J. McInturff & Son filed application with P. A. Cupper, state engr., Salem, to take 100 second ft. of water from Wallowa River to develop 682 theoretical hp. and build diversion works to include concrete dam with wasteway, steel and concrete headgate, tapered steel tunnel pipe. About $57,700.

Dam, etc.—Portland, Ore.—C. J. Schnabel, chamber Commerce, Bldg., filed application with P. A. Cupper, state engr., Salem, to take 600 second ft. water from Santiam River for manufacturing and lighting power plant, 6,511.3 theoretical hp., also build diversion works, to include masonry or concrete dam, 122 ft. high, 440 ft. long at top, 550 ft. long at bottom, masonry or concrete headgate, canal and steel pipe line. About $800,000.

Sand and Cement—Petaluma, Cal.—City soon receives bids furnishing and delivering 4,800 ton sand and 5,000 bbl. cement.

BIDS DESIRED

Collection and Removal of Refuse—Providence, R. I.—Until March 22, by city, collecting and removing swill and house offal. W. C. Pelkey, clk.; advertised in this issue.

Road Materials—Long Island City, N. Y.—Until March 15, by M. E. Connolly, pres. Queens Boro., furnishing and delivering to Bureau Highways, 29,000 cu.yd. broken stone, 5,000 cu.yd. sand, 100,000 hard wood paving blocks, 100,000 oak key paving blocks, 500 net ton lime.

Road Rollers—Baltimore, Md.—Until March 17, by Bd. Awards, furnishing and delivering three 10 ton motor driven macadam road rollers and one 8 ton motor driven tandem road roller, to Highways Engineer's Dept., f.o.b. Bolton Yard, Pennsylvania R.R. G. F. Wieghardt, highways engr.; advertised in this issue.

Steam Shovel, Scum Drain, Curb Stop and Roadway Boxes, Road Rollers—Baltimore, Md.—Until March 17, by Bd. Awards, furnishing 1 Type A Erie steam shovel, 515 lin.ft. cast stone scum drain, curb stop and roadway valve boxes, also three 10 ton motor-driven, macadam road rollers and one 8 ton, motor-driven, tandem road roller.

Weightometers—New Orleans, La.—Until March 23, by Bd. Port Comrs., Suite 200, New Orleans Court Bldg., for 3 weightometers for weighing coal on moving belts, for use in coal handling plant. A. Perrilliat, 1 Canal St., ch. engr.; advertised in this issue.

Pipe—Detroit, Mich.—Until March 15, by J. A. Martin, comr. purchases & supplies, Municipal Courts Bldg., furnishing 10-36 in. vitr. and cement sewer pipe, elbows, specials, etc. for 1920 requirements. C. W Hubbell, city engr.

Wharf—Sober Island, N. S.—Until March 23, by R. E. Desrochers, secy. Dept. Pub. Wks., Ottawa, building extension to wharf here.

Steam Road Rollers, Crushers, etc. — Cornwall, Ont.—Until March 19, by A. I. MacDonnell, clk., Stormont Co., supplying steam road rollers, crushers, dump wagons and other road equipment for Stormont, Dundas and Glengarry Counties. About $20,000. J. G. Cameron, Finch, Ont., engr.

Motor Pumper, etc.—Niagara Falls, Ont.—Until March 15, by W. J Seymour, city clk., furnishing standard-built motor pumper, 100-110 hp., rotary pump of 600 imperial gal. capacity, chemical tank, 35 gal. capacity, sewell cushion wheels and standard equipment.

Asphaltic Oil Pumps—Toronto, Ont.—Until March 15, by W. A. McLean, deputy minister, Dept. Pub. Highways, for furnishing 4 asphaltic road oil pumps.

Centrifugal Sewage Pump—Toronto, Ont.—Until April 20, by Mayor Church, for supply and erection of 40,000,000 imperial gal. electric driven centrifugal sewage pump, low lift. About $20,000. R. C. Harris, city engr.

Crushed Stone — Toronto, Ont. — Until March 22, by W. A. McLean, deputy minister, Dept. Highways, for supply f.o.b. quarry of 150,000 tons crushed stone, prior to Jan. 1, 1921.

Gasoline Tanks — Toronto, Ont. — Until March 17, by W. A. McLean deputy minister, Dept. Pub. Highways, Toronto, supplying one to five horse-drawn steel gasoline tanks, 400 gal. capacity, for storing and moving gasoline. Bidders will quote prices f.o.b. factory.

Wagon Loaders—Toronto, Ont.—Until March 24, by W. A. McLean, deputy minister, Dept. Pub. Highways, Toronto, supplying 2 gasoline driven mechanical wagon loaders, one f.o.b. Cainsville and one f.o.b. Beamsville.

Road Oil—Toronto, Ont.—Until March 23, by W. A. McLean, deputy minster, Dept. Pub. Highways, for supply of 25 to 40 tank car lots, and 300 to 600 bbl. 50 per cent asphaltic road oil, prior to Oct. 1.

Dam — New Westminster, B. C. — Until March 30, by R. C. Desrochers, secy. Dept. Pub. Wks., Ottawa, for construction of dam from Devils Run Island to Nicomen Island, Fraser River.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Seawall—North Scituate, Mass.—Dept. Pub. Wrks., State House, Boston, let contract building seawall, here, involving 300 cu.yd. dry earth excav. and 680 cu.yd concrete, to W. H. Connor, Middleboro, $10,120. Noted Feb. 26 under "Scituate."

★Foundation—Bridgeport, Conn.—Westcott & Mapes, Inc., engrs., 207 Orange St., New Haven, let contract to C. W. Blakeslee & Sons, 58 Waverly St., New Haven, building concrete pile foundation for power plant, on East Main St., here, for United Illuminating Co., 84 Temple St., New Haven. Noted Feb. 26.

Manhole Heads and Covers—Brooklyn, N. Y.—E. Riegelmann, boro. pres., received bids March 3, furnishing and delivering manhole heads and covers for 1920, from Flockhart Fdry. Co., 60 Polk St., Newark, N. J., $9,378; E. E. Buhler, 103 Park Ave., New York City, $9,809; J. Fox & Co., 253 Bway., New York City, $11,054.

★Road Materials—Brooklyn, N. Y.—E. Riegelmann, boro. pres., let contract furnishing and delivering 6,000 bbl. portland cement, to M. M. Canda, 121-8th Ave., $15,900; 2,800 ton limestone, to New York Trap Rock Co., 101 Park Ave., New York City, $19,012; 1,500 cu.yd. paving gravel, to J. J. Guinan Contg. Co., 2310 Gravesend Ave., $5,850; 99,400 ft. bm. lumber, to Cross, Austin & Ireland, 1246 Grand St., $10,225; 500 ton paving pitch, to Barrett Co., 17 Battery Pl., New York City, $11,650; 12,000 cu.yd. asphalt sand, to H. W. Young, 55 Hicks St., $21,120; 6,000 cu.yd. paving sand, to C. A. Meyers Contg. Co., Stagg St., Newton Creek, $11,100; 5,000 cu.yd. binder stone, to Calvin Tompkins Co., 30 Church St., New York City, $13,200. Noted Jan. 22.

★Road Materials—New York, N. Y.—H. Bruckner, pres. Bronx Boro., let contract furnishing and delivering 20,000 gal. bituminous road surfacing material and 300,000 gal. tar road oil, to Barrett Co., 17 Battery Pl., $3,800 and $33,000 respectively; 300,000 gal. asphalt and road oil, to Texas Co., 17 Battery Pl., $32,910; 3,000 bags Portland cement, to W. A. Mallett Co., 110 Westchester Sq., $2,385; 5,500 cu.yd asphalt wearing surface sand, to Calvin, Tompkins Co., 17 Battery Pl., $8,850; 3,000 cu.yd. binder stone, to New York Trap Rock Co., 101 Park Ave., $5,600; 7,000 cu.yd. 1½ in. broken trap rock, etc., to Lannigan Bros.' 165th St $1,110. Noted Feb. 26.

Pipe—Phila. Pa.—Waterworks Dept. received bids furnishing (a) 6-12 in. bell and spicket pipe, (b) 48-60 in. pipe, (c) 6 in. flange pipe, (d) 6-20 in. bell and spicket pipe, (e) 36-60 in. bell and spicket pipe, (f) 6-20 in flange specials, (g) bell and spicket pipe conforming to drawings, (h) bell and spicket specials, from R. D. Wood & Co., 10 Chestnut St., (a, c, g and

Miscellaneous (Continued)

h) $96,450; U. S. Cast Iron & Fdry. Co., Morris Bldg., (c and f) $9,979; Donaldson Iron Fdry., Eramus, (d) $4,900; Camden Iron Fdry., Ft. of Elm St., Camden. N. J., (b) $17,420.

★Amusement Beach — Sparrows Point, Md.—Sandy Beach Amusement Co., c/o R. F. Grigor. genl. mgr., 702 Lexington Bldg., Baltimore, let contract building amusement beach on Chesapeake Bay, below here, including pavilion, restaurants, miniature dips, boardwalks, landscape work, etc., to Zarro-Unger Constr. Co., Pittsburgh, Pa. About $250,000.

★Cast Iron Pipe—Baltimore, Md.—Bd. Awards let contract furnishing c.i. water pipe, to United States Cast Iron Pipe & Fdry. Co., East Burlington St., Burlington, N. J., $252,346.

Ash Wagons — Cleveland, O. — City received bids furnishing 50 ash wagons, from W. H. Gabriel Carriage & Wagon Co., 480 Bway., $11,900, $15,900 and $16,900; W. M. Pattison Supply Co., 717 Rockwell Ave., $15.250, $16.650 and $17,600.

Fill—Cleveland, O.—City received bids filling in trestle on East 55th St., involving 75,000 cu.yd. earth, from Ohio Iron & Supply Co., 352 Leader-News Bldg., $27,000; C. H. McAllister, Cleveland, $56,250; R. E. Carey Co., West 114th St., $58,500.

★Grandstand—Cleveland, O.—Cleveland Baseball Co., East 66th St. and Lexington Ave., let contract building 1 story, steel and concrete addition to grandstand, rein.-con. flooring and concrete foundation, to Walsh Constr. Co., Citizen's Bldg. About $50,000.

Motor and Dump Trucks—Cleveland, O.—City received bids furnishing 40 motor trucks with dump bodies, from Cataract Motor Sales Co., 8818 Bway., $45,473, Mall Motor Co., 623 Superior Ave., $45.676; furnishing (1) one 5 ton (2) two 3½ ton and (3) four 3½ ton dump trucks with special body, from White Co., East 79th St. and St. Clair Ave. (1) $4,875, (2) $4,300, (3) $4,506. Noted Feb. 26.

Rotary Dryer—Cleveland, O.—City received bids furnishing steam or hot air rotary dryer, from Ohio Machine & Boiler Co., 1501 University Rd., $12,350; J. D. Farasy Co., East 37th St. and Erie R.R., $13,500; C. O. Bartlett & Snow Co., French and Winter Sts., $13,500.

Street Flushers—Cleveland, O.—City received bids furnishing 2 motor driven street flushers, from Tiffin Wagon Co., Tiffin, $16,377; White Co., East 79th St. and St. Clair Ave., $16,673; A. L. Englander Co., Euclid Ave., $18,663.

★Grain Elevator—Grafton, O.—Bennett Milling Co. let contract building rein.-con. grain elevator, 110,000 bu. capacity, to Burrell Eng. & Constr. Co., 327 South La Salle St., Chicago. About $35,000.

★Grain Elevator — Chelsea, Mich. — W. Bacon-Holmes Co., Main St., let contract building rein.-con. grain elevator, 40,000 bu. capacity, to Burrell Eng. & Constr. Co., 327 South La Salle St., Chicago. About $15,000.

★Hoist and Crane—Detroit, Mich.—Dept. Purchases & Supplies let contract furnishing one 2-motor monorail hoist, 2-ton capacity, hoisting speed 25 ft. per minute, 30 ft. lift. trolley motor with traveling speed not less than 150 ft. per minute, to Detroit Hoist & Machine Co., Clay Ave., $1,060; one 3½ ton gasoline driven crane, to F. C. Austin Co., Ry. Exch. Bldg., Chicago, $10,557.

★Manhole Frames and Covers, etc.—Detroit, Mich.—Dept Purchases & Supplies let contract furnishing manhole frames, and covers. grates, curb boxes, miscellaneous castings, etc., to East Jordon Iron Wks., East Jordan, $30,843.

★Pavilion—Detroit, Mich.—A. F. West, Tuller Hotel, let contract building 2 story, 100 x 120 ft., steel addition to amusement pavilion, concrete foundation, on Jefferson and Field Aves., to include merry-go-round, etc., to Whitehead & Kales, Beecher St. About $20,000.

★Paving Block and Limestone—Detroit, Mich.—Dept. Purchases & Supplies let contract furnishing f.o.b. Detroit, 20,000 sq.yd., granite paving blocks, 26½ blocks to sq.yd., to Wisconsin Granite Co., 11 La Salle St., Chicago, at $2.85 per sq.yd., total $57,000; 10,000 ton ½, 1 and 1½ in. crushed limestone, to Solvay Process Co., Delray, at $7.50 per net ton, and 10,000 ton, to France Stone Co., Monroe, $7.50.

BRIDGE—ASTORIA, ORE.

Bids were received Feb. 5, by State Highway Comn., Portland, for constructing Youngs Bay Bridge over Columbia River, from (A) Gilpin Constr. Co., Astoria, (awarded contract); (B) D. M. Stephenson, Portland; (C) North Western Bridge & Iron Co., foot Sheridan St., Portland; (D) J. F. Clarkson, 501 Yeon Bldg., Portland, $340,563. The unit bids of the lowest 3 bidders were as follows:

	A	B	C
31,000 lin.ft. piling	$0 47	$0 50	$0 50
430 M.ft.b.m. lumber	69.00	68 75	78 00
3,080 lin.ft. handrail	1.90	1 90	3 00
1,540 lin.ft. fire protection system	2.50	2 50	3.00
1,540 lin. ft. electric conduits	2.80	2 50	2.00
54 cast iron drains	5 00	6 25	5 00
1,570 cu.yd. excavation	20 00	23 75	22.00
1,172 cu.yd. class "A" concrete	26 90	24 70	25 00
106 cu.yd. class "B" concrete	21 00	20 00	20 00
2,550 cu yd class "D" concrete	18.00	17 50	20 00
21,000 lin.ft. foundation piling	60	75	70
57,500 lb. reinforcing steel	.065	06¼	.06
84,400 lb. furnishing and erecting structural steel, grillages and anchc bolts in substructure	11	115	10
10 lb. oak bumping blocks	20 00	15 00	10 00
6,000 lin.ft. piling in protection pier	37	50	.50
16 M.ft.b.m. lumber in protection pier	72 00	70.00	80 00
560 lin.ft. dolphin chains	60	65	.50
4 test piles	100 00	65 00	50 00
100 ladder rungs	60	50	30
20 lin.ft. steel ladders	2 00	1 50	1.50
48 lin.ft. 6-in. galvanized pipe conduit	4 00	3 25	5 00
170 lin.ft. gas pipe handrail	4 00	2 25	2 00
513 lb. curb angles	10	125	.10
48 sq.yd. suspended ceiling	2 00	2.50	1.00
4 houses, finish in operator's houses	400 00	500 00	500 00
Plumbing (lump sum)	750 00	1,000 00	900 00
386,000 lb. furnishing and erecting all structural steel for superstructure not included under Item 13	12	125	11
65,000 lb. machinery	40	.425	40
225 cu.yd. concrete in counterweight	18 00	17.50	20.00
9,000 lb. reinforcing steel in counterweight	07	06¼	06
16,000 lb. scrap steel rails in counterweight	.03	03	03
Electrical equipment (lump sum)	18,000 00		
2 roadway gates	850 00	1,000 00	900 00
1 Meneely fog bell	.	125 00	600.00
2 pit pumps with motors	850 00	750 00	1,000.00
2 test blocks	10 00	13 00	10 00
150 balance blocks	2 00	1 30	1.50
365 sq.yd. roadway floor on moving leaves	11.00	11 75	13.00
Extended totals	$308,621	$318,669	$324,669

Paving Material—Detroit, Mich.—Dept. Purchases & Supplies, Municipal Courts Bldg., received bids furnishing 1,000,000 paving bricks, from Metropolitan Paving Brick Co., Renkert Bldg., $40 per M. Hocking Valley Paving Brick Co., Nelsonville, O., $40, Thomas Bros., 406 Empire Bldg., $41; 10,000 lin.ft. Berea curbstone, rough, from Cleveland Stone Co., 1836 Euclid Ave., $0.49 per lin.ft f.o.b. Detroit; 20,000 sq.yd. granite paving blocks, from Wisconsin Granite Co., 11 South La Salle St., Chicago, $2.85 per sq.yd. of 26½ blocks; asphalt in tank cars f.o b. Detroit, from Atlantic Refining Co., 3144 Passyunk Ave., Phila., petroleum asphalt $22 per ton Carson Petroleum Co., 208 South La Salle St., Chicago, refined Mexican asphalt, $24, Texas Co., 332 South Michigan St., Chicago, Texico asphalt, $27.75. U. S. Asphalt & Refining Co., 90 West St., New York City, Aztec asphalt, $23.90, Warner Quinlan Co. 79 Wall St., New York City, $24.93, Barber Asphalt Paving Co. Land Title Bldg., Phila., refined Lake asphalt, $42.19. Noted Jan. 22.

★Water Meters — Detroit, Mich — Dept. Purchases & Supplies let contract furnishing twenty-five thousand ⅝-2 in. water meters, to Gamon Meter Co., 282 South St., Newark, N. J., $224,950. Noted Feb. 19.

★Water Gates — St. Paul, Minn. — H. W. Austin city purch. agt., let contract furnishing c.i. water gates, various sizes, to Iowa Valve Co., Des Moines, Ia., $28,053.

★Water Pipe—St. Paul, Minn.—H. W. Austin, city purch. agt., let contract furnishing 880 ft. 6 in., 320 ft. 12 in. and 400 ft. 16 in. c.i. water pipe, 12 ft. lengths, to Natl. Cast Iron Pipe Co., Chicago. $68.50 per ton. Noted Feb. 12.

★Subway — Dishman, Wash. — Comrs. Spokane Co. (Spokane) let contract building subway under tracks of Oregon, Washington Navigation & Railroad Co., here, involving (1) 14,100 cu.yd. excav., 2,764 lb. reinforced steel, 1,912 cu.yd. plain and rein.-con., (2) 898 lin.ft. concrete curb. 2,030 sq. yd. 1 course concrete. 7½ in. thick, and 882 lin.ft. 3 ft. 6 in. sidewalks. to J. C. Broad, Jamieson Bldg., Spokane. (1) $41,965 (Railroad to pay ⅔ of cost), (2) $6,465, total cost $48,430.

★Wharf, etc.—Astoria, Ore.—G. W. Sanborn Co. let contract building 500 ft. wharf, 125 ft. railway extension from railroad to pier head line. two 50 x 110 ft. slips, 40 x 75 ft. pier and warehouse, to Gilpin Constr. Co., Astoria. About $70,000.

★Pipe — Blythe, Cal. — City Trustees let contract furnishing 3,500 ft. 14 in. at $0.61 per ft., 4.550 6 in., $0.87 and 610 8 in., $1.11, 14 gauge riveted steel pipe and fittings, to Los Angeles Mfg. Co., 2500 Leuard St., Los Angeles, total $7,000; 15,000 ft. 2 in. black asphaltum dipped standard screw pipe, at $20.20 per 100 ft. f.o.b. Los Angeles. to Pacific Pipe & Supply Co., 1002 Santa Fe Ave., Los Angeles, $4.380.

★Asphaltum—Petaluma, Cal.—City Council let contract furnishing asphaltum for street improvements, to Standard Oil Co., $13 per ton of 2,000 lb.

★Bulkhead Wharf—San Francisco, Cal.—State Bd. Harbor Comn., Ferry Bldg., let contract building wood pile and cement bulkhead wharf in front of Pier 27, connecting existing bulkhead wharves at Piers 25 and 29 and constructing pile wharf connecting Piers 25 and 27, to Healy-Tibbits Constr. Co., 9 Main St., $38.717. State furnishes creosoted piles and cement.

Pier—Santa Monica, Cal.—City Comn. received bids Feb. 27, repairing rein.-con. pleasure pier, from W. Ledbetter, Pacific Electric Bldg., Los Angeles, $76,500; San Francisco Bridge Co., Nevada Bank Bldg., San Francisco, $79.500; Mercereau Bridge & Constr. Co., Paicfic Electric Bldg., Los Angeles, $81,000. Noted Feb. 19.

★Swimming Pool, Etc.—Whittier, Cal.—Trustees High School let contract building 40 x 100 ft., rein.-con. swimming pool and 20 x 80 ft., frame and stucco locker and dressing room building, to E. M. Wheatland, 116 West Philadelphia St., $12,955.

Road Supplies — Ottawa, Ont. — City Council let contracts to T. S. Kirby Co., Ltd., 213 Sussex St., for vitr. clay pipe, $13,570, broken stone for Dist. "A," $15,434, "B," $4.940, "C," $16,550, "D," $6,366, and asphalt filler, $6.50 per ton; Wright & Co., 35 Garneau St., Hull, Que., for cement, $0.86 per 100 lb.; Brick & Tile Co., 136 Bank St., for brick, $22 per M.; H. Dupuis & Son, 273 Laurier Ave., Hull, Que., for sand, Dist. "A," $1.68, "B," $1.67, "C," $1.87, "D," $2; Imperial Oil Co., Ltd., Catherine St., for refined asphalt, $37 per ton, package $29 per ton, and asphalt flusc, $0.17 per imperial gal.; Victoria Fdry. Co., 44 Booth St., for ordinary castings, $4.90 per 100 lb.; T. Lanson & Sons, for special pipe castings, $6.48 per 100 lb.; McKinley & Northwood, 56 Rideau St., for lead pipe, $13.50 per 100 lb.; Canada Metal Co., 50 Brennan St., Montreal, Que., pig lead, $11 per ton.

OFFICIAL PROPOSALS

Bids March 23:

Construction, Heating, Sanitary and Electric Work

Ossining, N. Y.

Sealed proposals for Construction Work, Fire Escape; Construction Work, Pipe Tunnels; Heating Work, Additional Underground Heating Mains, etc.; Sanitary Work, Sewerage and Water Supply Systems, and Electric Work, Underground Electric Conduit Feeder System and Pump House for Sing Sing Prison, Ossining, N. Y., will be received by Hon. Charles F. Rattigan, Superintendent of State Prisons, Capitol, Albany, N. Y., until 12 o'clock noon, on Tuesday, March 23, 1920, when they will be publicly opened and read. Proposals shall be enclosed in an envelope furnished by the State Architect, sealed and addressed and shall be accompanied by a certified check in the sum of five (5) per cent of the amount of the proposal.

The contractors to whom the awards are made will be required to furnish surety company bond in the sum of fifty (50) per cent of the amount of contract within thirty (30) days after official notice of award of contract and in accordance with the terms of Specifications Nos. 3466, 3453, 3439, 3441 and 3443.

The right is reserved to reject any or all bids.

Drawings and specifications may be examined and inspected at the Office of the Superintendent of Prisons, Capitol, at the office of the Warden of Sing Sing Prison, Ossining, N. Y.; at the New York Office of the Department of Architecture, Room 618 Hall of Records Building, and at the Department of Architecture, Capitol, Albany, N. Y.

Drawings and specifications and blank forms of proposal may be obtained at the Department of Architecture, Capitol, Albany, N. Y., upon reasonable notice to, and in the discretion of, the State Architect, L. F. Pilcher, Capitol, Albany, N. Y.

Dated: Feb. 26, 1920.

Bids: March 26.

Drainage Work

Chicago, Ill.

Sealed bids will be received in the office of the Engineer, Edmund T. Perkins Engineering Company, 1210-38 South Dearborn Street, Chicago, Illinois, until Friday, March 26, 2 p.m., for the completion of levees and ditches in the Valley City Drainage and Levee District, Pike County, Illinois, according to plans and specifications on file with the Board of Commissioners of said District divided as follows:

SECTION 1. Levee (average height, 12 feet to 15 feet, suitable for large drag line and same drag line working upon embankment constructed by dipper dredge) 700,000 to 900,000 cubic yards.

SECTION. 2. Levee (average height 9 feet to 12 feet, suitable for drag line) 300,000 to 380,000 cubic yards.

SECTION 3. Ditches (bottom width 8 feet to 20 feet, suitable for dipper dredge or drag line) 230,000 to 245,000 cubic yards.

SECTION 4. Ditches (bottom width 4 feet to 12 feet, suitable for small drag line) 110,000 to 180,000 cubic yards.

SECTION 5. Muck ditch (suitable for drag line) 35,000 cubic yards.

SECTION 6. Clearing 200 acres, grubbing 60 acres.

About 1,000,000 cubic yards of the levee construction here described is suitable for hydraulic dredge and if thought advisable by the Commissioners, the specifications will be modified to provide for construction in that manner.

In letting contract greater consideration will be given to the contractor who can complete the levees enclosing the district in the shortest period of time.

The Board of Commissioners shall award the contract or contracts for the work to the lowest responsible bidder or bidders therefor, bids to be submitted, received and acted upon separately as to the levees, main drain and each of the laterals, exercising their own discretion as to letting such work separately, as a whole or by sections as here divided and reserving the right to reject any and all bids and readvertise the letting of the work.

Each person bidding on the work shall deposit a proposal bond or a certified check for 10 per centum of the amount of the proposal, not in any event, however, to exceed ten thousand dollars. Said deposit will be returned to the bidder if his bid is unsuccessful and, if successful, retained as a guarantee only of his good faith in entering in said contract.

The successful bidder will be required to execute a bond in an amount equal to 50 per centum of the estimated cost of the work and, upon the execution of such bond, the deposit originally made with his bid shall be returned to him.

Payments for the work will be based on monthly estimates, 10 per centum being retained until contract is completed.

Special facilities for seeing the work will be provided by addressing the Edmund T. Perkins Engineering Company, 1210-38 South Dearborn Street, Chicago, Illinois.

Plans and specifications will be furnished by Edmund T. Perkins Engineering Company, 1210-38 South Dearborn Street, Chicago, Illinois, upon deposit of $10, which deposit will be refunded upon return of the plans and specifications in good order, within ten days after awarding of contract.

THOMAS MEEHAM,
HARRY EDWARDS,
Commissioners.

WILLIAM SEVERNS,
Chairman.

The publication of an advertisement on this page is an official notice that bids are wanted from other than local bidders.

It is also a guarantee that maximum competition is invited because Engineering News-Record is the *one* nationally recognized medium for Proposal advertising. Its Searchlight Section is read each week by nearly every worth-while contractor in this country who bids on public work outside his own city.

Official Proposals reaching our office in first mail Wednesday morning (9 o'clock) can usually be published in the issue out the next day. Special price for Official Proposals, $3.60 an inch.

Bids: Mar. 19.

Paved Road Construction Federal Aid Project No. 68

Helena, Mont.

1. Bids will be received by the Executive Committee of the State Highway Commission up until 2:00 P.M., March 19th, 1920, at its office in the Capitol, Helena, Montana, for the construction of grade work, drainage structures, and paving of 9.376 miles of road running from the city limits to Silver Bow County line, known as Federal Aid Project No. 68.

2. Plans, specifications, bid blanks, etc., can be secured for $10.00 deposit, $8.00 of which will be refunded upon the return of same in good condition to the Chief Engineer.

Estimated quantities are:

31,003	cu.yds. excavation.
98,763	sq.yds. paving.
540	cu.yds concrete in structures.
40,000	lbs. reinforcing steel in structures.
4.8M	F.B.M. Lumber in guard rails.
10,000	lbs. Reinforcing steel in pavement.

3. The following types of pavement are approved:

a. One course Portland cement concrete.
b. Portland cement concrete base, with Topeka type top.
c. Portland cement concrete base, with Bitulithic top.

4. Certified check of five per cent (5%) is required with the bid. Ninety per cent (90%) paid on progress estimate. State furnished cement.

By order of Executive Committee, State Highway Commission.

JOHN N. EDY,
Chief Engineer.

H. A. TEMPLETON,
Secretary.

Bids: Mar. 22.

Sewer Construction

Stratford, Conn.

Pursuant to a resolution adopted the twenty-third day of February the Board of Sewer Commissioners of the Town of Stratford, Conn., will receive at its meeting, to be held on the 22nd day of March, at 8 P.M., sealed proposals for furnishing materials and doing all other work required to complete the construction of about fifteen and six tenths ($15\frac{6}{10}$) miles of pipe sewers from eight (8) to twenty-four (24) inches in diameter with manholes, and flushing manholes, complete.

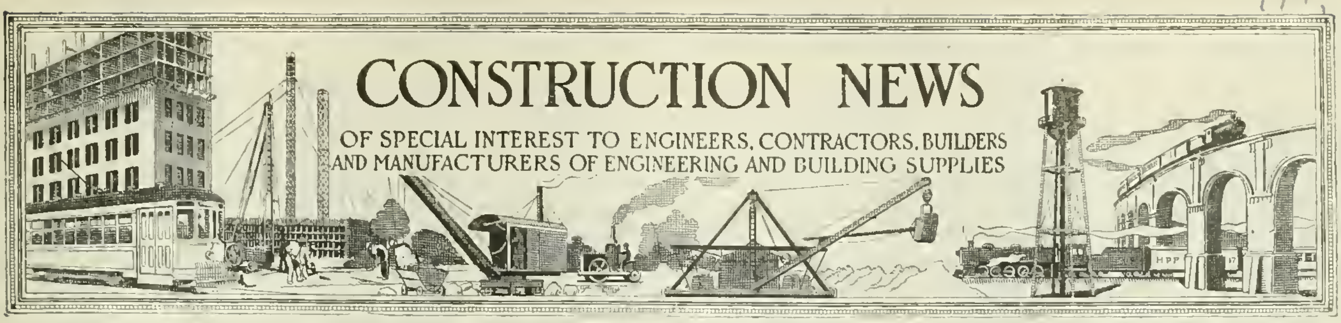
Plans may be seen and specifications and forms of proposals obtained at the office of the Board of Sewer Commissioners, Town of Stratford, Conn., or at the office of Clyde Potts, 30 Church Street, New York City.

Plans may be taken away upon the payment of Ten Dollars ($10.00), the same to be refunded if the plans are returned within twenty (20) days, in good condition.

Each bid must be accompanied by a certified check on a solvent bank for $5,000.

The Board of Sewer Commissioners reserves the right to reject any and all proposals, and to waive any informality in the proposals received, and to accept any proposal which they deem to be most favorable to the interests of the Town.

F. S BEARDSLEY, Chairman
PAUL GOODELL, Secretary



CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Mar. 20	Paterson, N. J.	Feb 26
Mar. 22	Ferndale (Royal Oak P. O.), Mich.	Mar. 11
Mar. 23	Ashton, Idaho	Mar. 4
Mar. 23	Platte, S. D. Adv. Mar. 11	Mar. 11
Mar. 24	East Columhus, O.	Mar. 18
Mar. 25	Windsor, Que.	Mar. 18
Mar. 25	Jewett, O. Adv. Mar. 4.	Mar. 4
Apr. 1	Punxsutawney, Pa.	Mar. 11
Apr. 2	Akron, O. Adv. Mar. 11.	Mar. 11
Apr. 3	Clarksburg, W. Va.	Mar. 11
Apr. 12	Defiance, O. Adv. Mar. 11.	Mar. 11
May 1	Montreal, North Que.	Mar. 18

SEWERS

Bids Close		See Eng. News-Record
Mar. 22	Stratford (Bridgeport P. O.), Conn. Adv. Feb. 26.	Feb. 26
Mar. 22	Rutland, Vt. Adv. Mar. 11.	Mar. 11
Mar. 22	Passaic, N. J.	Mar. 11
Mar. 23	Toledo, O. Adv. Feb. 19 and 26.	Feb. 19
Mar. 23	Libertyville, Ill. Adv. Mar. 11.	Mar. 11
Mar. 23	Detroit, Mich.	Mar. 18
Mar. 24	Woodstock, Ont.	Mar. 11
Mar. 24	Lafayette, Ind. Adv. Mar. 11.	Mar. 11
Mar. 24	East Columbus, O.	Mar. 18
Mar. 25	Wake Forest, N. C.	Mar. 4
Mar. 25	New York, N. Y.	Mar. 25
Mar. 25	Edgerton, Wis.	Mar. 11
Mar. 25	Clarksburg, W. Va.	Mar. 11
Mar. 26	Ellsworth, Minn.	Mar 18
Mar. 26	Charleston, W. Va.	Mar. 11
Mar. 26	Detroit, Mich.	Mar. 18
Mar. 27	Dayton, O.	Mar. 4
Mar. 29	Buffalo, N. Y.	Mar. 18
Mar. 29	Huntington, Ind.	Mar. 18
Apr. 1	Carlisle, Pa.	Mar. 18
Apr. 5	Huntingburg, Ind.	Mar. 18
Apr. 8	Milwaukee, Wis. Adv. Feb. 26.	Feb. 26
Apr. 12	Elmhurst, Ill.	Mar. 18
Apr. 13	Woodbury, N. J	Mar. 18

BRIDGES

Bids Close		See Eng. News-Record
Mar. 22	Michigan	Mar. 4
Mar. 23	Oregon	Mar. 11
Mar. 23	O'Brien, Wash.	Feb. 12
Mar. 23	Detroit, Mich.	Mar. 11
Mar. 23	West Point, Ga.	Mar. 18
Mar. 25	Kingston, N. Y. Adv. Mar. 11.	Mar. 11
Mar. 26	Middlebourne, W. Va.	Mar. 4
Mar. 26	Walkerton, Ont.	Mar. 11
Mar. 26	Shannonville, Ont.	Mar. 11
Mar. 29	Washington	Mar. 11
Mar. 31	Asbury Park, N. J.	Mar. 11
Mar. 31	Little Rock, Ark.	Mar. 11
Apr. 1	Tyendinago, Ont.	Mar. 18
Apr. 2	McKee, Pa.	Mar. 11
Apr. 2	Tamaqua, Pa.	Mar. 4
Apr. 2	Salina, Kan.	Mar. 11
Apr. 3	Fairfield, Kan.	Mar. 11
Apr. 6	Duluth, Minn.	Mar. 18
Apr. 7	Cherokee, Kan.	Mar. 11
Apr 7	Paterson, N. J.	Mar. 18
Apr. 8	Girard, Kan.	Mar. 11
Apr. 14	Milton, Fla.	Mar. 18
Apr. 14	Careyville, Fla.	Mar. 18
Apr. 20	Newton, Ga.	Mar. 18

STREETS AND ROADS

Bids Close		See Eng. News-Record
Mar. 20	Flemingburg, Ky.	Mar. 18
Mar. 20	Indiana	Mar. 18
Mar. 22	Michigan	Feb 26
Mar. 22	Danville, Mo.	Mar. 11
Mar. 22	Port Huron, Mich.	Mar. 11
Mar. 22	Michigan	Mar. 11
Mar. 22	Saginaw, Mich.	Mar. 18
Mar. 22	Michigan	Mar. 18
Mar. 22	Oakland, Cal.	Mar. 11
Mar. 22	Pennsylvania	Mar. 11
Mar. 22	Des Moines, Ia.	Mar. 18
Mar. 22	Fayetteville, N. C.	Mar. 18
Mar. 22	Pittsburgh, Pa.	Mar. 18
Mar. 22	Hillsdale, Mich.	Mar. 18
Mar. 22	Canal Winchester, O.	Mar. 18
Mar. 22	Montague, Tex.	Mar. 18
Mar. 22	Rutland, Vt.	Mar. 18
Mar. 23	Wyoming	Mar. 18
Mar. 23	Wisconsin	Mar. 18
Mar. 23	Janesville, Wis.	Mar. 18
Mar. 23	Sedalia, Mo.	Mar. 11
Mar. 23	Pennsylvania	Feb. 26
Mar. 23	Montgomery, Ala.	Mar. 4
Mar. 23	Wilmington, Del. Adv. Mar. 4	Mar. 4
Mar. 23	Indiana	Mar 18
Mar. 23	East Grand Forks, Minn.	Mar. 18
Mar. 23	Ontario	Mar. 11
Mar. 24	Pennsylvania	Feb. 26
Mar. 24	Colorado	Mar. 18
Mar. 24	Wisconsin	Mar. 18
Mar. 24	Brooklyn, N. Y.	Mar. 18
Mar. 25	New York, N. Y.	Mar. 18
Mar. 25	Davenport, Ia.	Mar. 18
Mar. 25	Wisconsin	Mar. 18
Mar. 25	Elizabeth, N. J	Mar. 11
Mar. 25	Clarksburg, W. Va	Mar. 11
Mar. 25	Wheeling, W. Va.	Mar 11
Mar. 26	Middlebourne, N C.	Mar 4
Mar 26	Jacksonville, Fla.	Mar 11
Mar. 26	Michigan	Mar 18
Mar. 26	Wisconsin	Mar. 18
Mar. 26	Michigan	Mar. 11
Mar. 26	Bethany, Mo.	Mar. 11
Mar. 26	Spokane, Wash.	Mar. 18
Mar. 27	Fort Collins, Colo.	Mar. 18
Mar. 29	New Jersey	Mar 11
Mar. 29	Washington	Mar 4
Mar. 29	North Carolina	Mar. 11
Mar. 29	Dallas, Tex.	Mar. 18
Mar. 29	Morgantown, W. Va	Mar. 18
Mar. 29	Buffalo, N Y.	Mar. 18
Mar. 29	Winfield, W. Va	Mar 18
Mar. 30	Elizabeth, W. Va.	Mar. 18
Mar. 30	De Graff, O.	Mar 18
Mar. 30	Maryland	Mar. 18
Mar. 30	Spokane, Wash.	Mar. 18
Mar. 30	Mora, Minn.	Mar. 18
Mar. 31	Hillsboro, Tex.	Mar. 18
Mar. 31	Harrison, Mich.	Mar. 18
Mar. 31	Clayton, Mo.	Mar. 18
Mar. 31	Freehold, N. J	Mar. 11
Mar. 31	Madison, W Va.	Mar. 4
Mar. 31	Little Falls, Minn.	Mar. 18
Mar. 31	Rhode Island Adv. Mar. 18.	Mar. 18
Apr. 1	Fergus Falls, Minn.	Mar. 18
Apr. 1	Carrollton, Ga.	Mar. 18
Apr. 1	Flandreau, S. D.	Mar. 4
Apr. 1	Richmond, Ky.	Mar 4
Apr. 1	St. Thomas, Ont.	Feb. 19
Apr. 1	Daytona, Fla.	Feb. 26
Apr. 1	Ingersoll, Ga.	Feb. 26
Apr. 2	Winchester, Ky.	Mar. 18
Apr. 2	Tennessee	Mar. 18
Apr. 2	Salina, Kan.	Mar. 11
Apr. 3	Lawrence, Kan.	Feb. 19
Apr. 3	Fairfield, Kan.	Mar. 11
Apr. 5	Washington	Mar. 4
Apr. 5	Cleveland Heights (Warrensville P. O.), O.	Mar. 11
Apr. 5	Colorado	Mar. 18
Apr. 5	Long Prairie, Minn.	Mar. 18
Apr. 5	Grand Forks, N. D.	Mar. 18
Apr. 5	California	Mar. 18
Apr. 5	Mayo, Fla.	Mar. 18
Apr. 5	Pt. Pleasant, W. Va.	Mar. 18
Apr. 5	Indiana	Mar. 18
Apr. 5	Seattle, Wash.	Mar. 18
Apr. 6	Duluth, Minn.	Mar. 18
Apr. 6	Indiana	Mar. 18
Apr. 6	Greenfield, Ind.	Mar. 18
Apr. 6	New York, N. Y. Adv. Mar. 11.	Mar. 11
Apr. 6	Geneva, N. Y.	Mar. 4
Apr. 6	Arkansas	Mar 11
Apr. 6	Ft. Scott, Kan.	Mar. 11
Apr. 7	Cherokee, Kan.	Mar 11
Apr. 7	La Grange, Ga.	Mar. 18
Apr. 8	Somerville, N. J.	Mar. 18
Apr. 8	Girard, Kan.	Mar. 11
Apr. 8	Elkins, W. Va.	Mar. 18
Apr. 8	Savannah, Ga. Adv. Feb. 19 and 26.	Feb. 19
Apr. 9	Ft. Scott, Kan.	Mar. 11
Apr. 10	Grafton, N. D.	Mar. 18
Apr. 10	Hot Springs, Ark.	Mar. 18
Apr 12	Van Horn, Tex.	Mar. 18
Apr. 14	Mays Landing, N. J.	Mar. 18
Apr 20	Meade, Kan.	Mar. 18
Apr. 20	Colfax, Wash.	Mar. 11

EXCAVATION AND DREDGING

Bids Close		See Eng. News-Record
Mar. 22	Caledonia, Ont.	Mar. 11
Mar. 25	St. Joseph, Mo	Mar. 18
Mar 25	New York, N. Y.	Mar. 18
Mar. 26	Pittsfield, Ill.	Mar. 4
Mar. 29	Pine City, Minn.	Mar. 18
Mar. 30	Buffalo, N. Y.	Mar. 18
Mar. 30	Oxnard, Cal.	Mar. 18
Apr. 1	Fairfield, Ill.	Mar. 18
Apr. 3	Madisonville, Ky.	Mar. 18

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
Mar 20	Saco, Me.	Feb. 12
Mar. 20	Welch, W. Va.	Mar. 18
Mar. 24	Cleveland, O.	Mar. 18
Mar. 25	Trenton, N. J.	Mar. 4
Sept 1	Hutchinson, Kan.	Feb. 19
Apr 1	Allentown, Pa.	Mar. 18
Apr. 12	South River, N. J.	Mar. 18

BUILDINGS

Bids Close		See Eng. News-Record
Mar. 19	New York, N. Y	Mar 11
Mar. 19	Phila., Pa	Mar. 11
Mar. 20	Redford, Mich.	Feb. 5
Mar. 20	Ayshire, Ia	Feb. 26
Mar. 20	Keewatin, Minn.	Mar 4
Mar. 21	Fergus Falls, Minn.	Mar. 4
Mar. 21	Forest Lake, Minn.	Mar. 4
Mar. 22	Whiting, Ind.	Mar. 18
Mar. 22	Hermosa Beach, Cal.	Mar. 18
Mar. 22	Newark, N. J.	Mar 11
Mar. 22	Cleveland, O.	Mar. 18
Mar. 22	New York, N. Y.	Mar. 18
Mar. 22	Passaic, N. J.	Mar. 11
Mar. 22	Summit, N. J.	Mar. 11
Mar. 22	Haysville, Ia.	Mar. 11
Mar 23	Baltimore, Md.	Mar. 18
Mar. 23	Linby, Ia.	Mar. 11
Mar. 23	Columbus, O.	Mar. 4
Mar. 23	Gallup, N. M.	Mar 4
Mar. 23	Cushing, Ia.	Mar. 11
Mar. 24	Olds, Ia.	Mar. 4
Mar. 24	Wichita, Kan.	Mar. 18
Mar. 24	Detroit, Mich.	Mar. 18
Mar. 24	Erie, Pa.	Mar. 11
Mar. 25	St. Cloud, Minn.	Mar. 4
Mar. 25	Boonton, N. J.	Mar. 18
Mar. 25	London, Ont.	Mar. 18
Mar. 25	Elgin, Minn.	Mar. 4
Mar. 25	Newark, N. J.	Mar. 11
Mar. 25	Detroit, Mich.	Mar. 18
Mar. 26	Grand Meadows, Ia.	Mar. 11
Mar. 26	Halfway (Detroit P. O.), Mich.	Mar. 18
Mar. 26	Seattle, Wash.	Mar. 18
Mar. 26	Stanwood, Ia.	Mar. 18
Mar. 27	Le Mars, Ia.	Mar. 18
Mar. 28	St. Marys, Ia.	Mar. 11
Mar. 28	Jamison, Ia.	Mar. 11
Mar. 29	Marion, O.	Mar. 4
Mar. 29	Roselle, N. Y.	Mar 11
Mar. 29	Minneapolis, Minn	Mar. 18
Mar. 30	Ellensburg, Wash.	Mar. 18
Mar. 30	West Branch, Ia.	Mar. 18
Mar. 30	Waubun, Minn.	Mar. 4
Mar. 30	Fairfield, Ia.	Mar. 11
Mar. 30	Lake Park, Ia.	Mar. 18
Mar. 31	Thomaston, Me.	Mar. 4
Mar. 31	Denison, Tex.	Mar. 4
Mar. 31	Grand Rapids, Mich.	Mar. 18
Apr. 1	Rockford, Ill.	Mar 4
Apr. 1	Willmar, Winn.	Mar. 18
Apr. 1	Kettle River, Minn.	Mar. 18
Apr. 1	Bluffton, Ind.	Mar. 18
Apr. 1	Groton, S. D.	Mar. 18
Apr. 1	Dodson, Mont.	Feb. 5
Apr. 1	Dayton, O.	Feb. 19
Apr. 1	Lamont, Ia.	Mar. 4
Apr. 1	Lafayette, Minn.	Mar 4
Apr. 1	Providence, R. I	Mar 4

Bids Close		See Eng News-Record
Apr. 2	Fairpoint, O.	Mar. 18
Apr. 5	Bertha, Minn.	Mar. 18
Apr. 6	Olds, Ia.	Mar 18
Apr. 7	Huntington, Ind.	Mar. 18
Apr. 7	Detroit, Mich.	Mar. 11
Apr. 7	Zion (Spaulding P. O.), Ia.	Mar. 18
Apr. 8	Fresno, Cal.	Mar. 4
Apr. 9	Southhold, N. Y.	Mar. 18
Apr. 11	Kearney, Neb.	Mar. 11
Apr. 15	Riverton, Wyo.	Mar. 4
Apr. 15	Coleraine, Minn.	Mar. 18
Apr. 15	Wheatland, Wyo.	Mar. 4
Apr. 15	Delmont, S. D.	Feb. 26

FEDERAL GOVERNMENT WORK

Mar. 22	Tanks — Port Townsend, Wash.	Mar. 4
Mar. 22	Straighten Channel, etc.—Collinsville, Cal.	Mar. 4
Mar. 22	Dredging—San Francisco, Cal.	Mar. 18
Mar. 23	Steel Inspection—Honolulu, H. T.	Mar. 18
Mar. 24	Drainage System — Spec. 4131—Norfolk, Va.	Mar. 11
Mar. 25	Conduit—Petersburg, Va. Adv. Feb. 26.	Feb. 26
Mar. 25	Dormitory and Dairy Barn —Ardmore, Okla.	Mar. 4
Mar. 26	Changes in Approaches and Lobby Vestibule Doors — Harrisburg, Pa. Adv. Mar. 4.	Mar. 4
Mar. 27	Building Extension—Tulsa, Okla.	Mar. 4
Mar. 29	Post Office and Customhouse—Apalachicola, Fla.	Feb. 12
Mar. 29	Mess Hall and Dormitory—Wash., D. C.	Mar. 18
Mar. 31	Grading—Wash., D. C.	Mar. 18
Mar. 31	Store Houses—Spec. 4084 —New Orleans, La.	Mar. 18
Mar. 31	Mechanical Equipment and Piping—Spec. 3708—Wash., D. C.	Mar. 11
Apr. 1	Dredging — Providence, R. I. Adv. Mar. 11.	Mar. 11
Apr. 5	Building and Repairing Jetty—Wilmington, Del. Adv. Mar. 11.	Mar. 11
Apr. 6	Portland Cement — Louisville, Ky. Adv. Mar. 18.	Mar. 18
Apr. 7	Kitchen Equipment—Spec. 4097—San Diego, Cal.	Mar. 18
Apr. 8	Rock—New Orleans, La. Adv. Mar. 4.	Mar. 4
Apr. 9	Steel, Sheet Piling—Louisville, Ky. Adv. Mar. 18.	Mar. 18
Apr. 10	Vicksburg, Miss.	Mar. 18
Apr. 15	Detroit, Mich.	Mar. 18
Apr. 16	Lock—Pittsburgh, Pa. Adv. Mar. 18.	Mar. 18
Apr. 21	Barracks — Spec. 4086 — Kaukau, H. T.	Mar. 18
May 3	Bridge—Alaska Adv. Jan. 22.	Jan. 22

MISCELLANEOUS

Bids Close		See Eng. News-Record
Mar. 22	Crushed Stone—Toronto, Ont.	Mar. 11
Mar. 22	Collection and Removal of Refuse—Providence, R. I. Adv. Mar. 11.	Mar. 11
Mar. 22	Water Tube Boilers, etc.—Elyria, O.	Mar. 18
Mar. 22	Repair Dredge—Montreal, Que.	Mar. 18
Mar. 22	Crane Runway—Cleveland, O.	Mar. 18
Mar. 22	Transmission Line—Meriden, Kan.	Mar. 18
Mar. 22	Tarvia—Scranton, Pa.	Mar. 18
Mar. 22	Dust—New York, N. Y.	Mar. 18
Mar. 23	Road Material—Niagara Falls, N. Y.	Mar. 18
Mar. 23	Asphaltic Cement—Niagara Falls, N. Y.	Mar. 18
Mar. 23	Weightometers New Orleans, La. Adv. Mar. 11.	Mar. 11
Mar. 23	Wharf—Sober Island—Halifax, N. S.	Mar. 11
Mar. 23	Road Oil—Toronto, Ont.	Mar. 11
Mar. 23	Fire Escapes, etc—Ossining, N. Y. Adv. Mar. 4.	Mar. 4
Mar. 24	Gasoline Driven Wagon Loaders—Toronto, Ont.	Mar. 11
Mar. 24	Girder Rail Crossing—Baltimore, Md.	Mar. 18
Mar. 24	Crushed Stone, Gravel and Sand—Baltimore, Md.	Mar. 18
Mar. 24	Vitrified Granite, Asphalt and Creosoted Wood Blocks —Baltimore, Md.	Mar. 18
Mar. 24	Road Material—Brooklyn, N. Y.	Mar. 18
Mar. 25	Road Material—New York, N. Y.	Mar. 18
Mar. 25	Coal Tar—Cincinnati, O.	Mar. 18
Mar. 25	Concrete Reservoir—Windsor, Que.	Mar. 18
Mar. 26	Portable Rock Crusher and Elevator — Alexandria, Minn.	Mar. 18
Mar. 26	Trap Rock and Portland Cement—Holyoke, Mass.	Mar. 18
Mar. 29	Dam—Decatur, Ill.	Mar. 4
Mar. 30	Dam—New Westminister, B. C.	Mar. 11
Apr. 5	Gravel Screening and Loading Plant — Minneapolis, Minn.	Mar. 18
Apr. 7	Fire Alarm System—Central Islip, N. Y. Adv. Mar. 18.	Mar. 18
Apr. 20	Centrifugal Sewage Pump —Toronto, Ont.	Mar. 11

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. Y., Gowanda — City plans to build rein.-con. reservoir, lay 3-4 mi. pipe and connect 5 or 6 springs of gravity system. F. K. Wing Co., 1314 Prudential Bldg., Buffalo, engrs.

N. Y., Rochester—Common Council plans to issue $100,000 bonds to extend water mains and $50,000 to purchase lands to protect citys water supply at Hemlock and Canadice Lakes. C. A. Poole, city engr.

N. Y., Tonawanda—City election April 13, to vote on $50,000 bonds to lay water pipes in Chestnut, 1st, Tonawanda, Niagara, Maine, Grove and Hill Sts. B. Hinkey, city engr.

S. C., Eau Claire (Columbia P. O)—Town plans to build waterwork system, to include 60,000 gal. capacity elevated tank and 6 mi. water pipes. W. J. Eliott, chn. T. K. Legare, Columbia, consult. engr.

Tenn., Rogersville — T. J. Price, chn. Waterworks, soon lets contract building waterworks system, involving 15,500 ft. 4 and 6 in. c.i. pipe, 10,800 ft. 2 in. galvanized iron pipe, seventy-six 2-6 in. valves and 32 fire hydrants and specials. J. N. Ambler, Richmond, Va., engr.

Ky., Ashland—City plans election in fall to vote on $235,000 bonds to install additional water supply. Alvord & Burdick, 8 South Dearborn St., Chicago, engrs.

O., Ashland — City soon lets contract building superstructure for 1 story, 32 x 54 ft., concrete, brick and steel filtration plant. About $60,000. R. W. Pratt Co., Hippodrome Bldg., Cleveland, engrs.

O., Linden Heights—Village having plans prepared by Jennings-Lawrence Co., engrs., Hartmann Bldg., Columbus, for waterworks system. Election April 27, to vote on $150,000 bonds for project.

Wis., Kewaskum—See "Sewers."

Kan., Arcadia—City having preliminary plans prepared improving water-works and sewerage systems. About $65,000. J. Taylor, clk. W. B. Rollins & Co., 209 Ry. Exch. Bldg., Kansas City, Mo., engrs.

Kan., Haven—City having preliminary plans prepared improving water-works system. Bonds for $45,000 voted for project. G. H. Thorp, clk. W. B. Rollins & Co., 209 Ry. Exch. Bldg., Kansas City, Mo., engrs.

Kan., La Cygne—City plans to improve waterworks system. About $50,000. Black & Veatch, Interstate Bldg., Kansas City, Mo., engrs.

Neb., Culbertson—City election March 23 to vote on $11,560 bonds to extend waterworks.

Mo., Fayette — City voted $70,000 bonds to improve waterworks system Engineer not selected.

Okla., Devol—City having plans prepared for extending waterworks and sewerage systems, for distance of 75 blocks. About $75,000 appropriated for project.

Okla., Haskell — Town voted $25,000 bonds to build water mains, fire plugs and sewers. F. N. Shoemaker, clk.

Okla., Medford—City voted $25,000 bonds to improve waterworks system. Engineer not selected.

Okla., Walter — City voted $125,000 bonds to improve waterworks and sewerage systems. Engineer not selected.

N. M., Estancia—City election April 6 to vote on $50,000 bonds to install water works system, including tank, tower, pump, engine and mains. B. H. Calkins, engr

Wash., Selah—Town voted $15,000 bonds to build reservoir on hilltop with gravity line to town. Total cost $30,000; balance to be made up from local improvement taxes. N. A. Gilman, Yakima, engr.

Ore., Bend—Bend Water, Light & Power Co. plans to build 30,000 gal. concrete reservoir and install auxiliary pumping and sterilization plant to include 1,500 g.p.m. pump. About $12,000.

Cal., Lakeport—Snow Mountain Water & Power Co. plans to build dam on Gravelly Dam site, 73,000 acre ft. capacity. State R.R. Comn., Sacramento has approved issuance of $1,500,000 stock to defray expenses.

Cal., Orange—City voted $12,000 bonds to sink and equip well. W. J. Richardson, supt. waterworks. Noted Feb. 19.

Ont., Islington—Town having plans prepared by E. A. James Co., Ltd., engrs., 31 Toronto St., Toronto, for complete waterworks system, (supply from springs). Work involves 20,000 ft. 6-8 in. c.i. pipe, water tank and centrifugal electric operated pumps, 500 Imperial gal. per min. About $85,000.

BIDS DESIRED

O., East Columbus—Until March 24, by M. Devore, village clk., building water mains in 4th, 5th, 6th, 7th, 9th, 10th, 11th, Rarig and Cassidy Aves., also alley east of Rarig Ave. Separate bids will be received for each street.

Neb., Minden—Until March 20, by J. M. Markussen, city clk., furnishing labor and material rebuilding and extending waterworks and lighting plant. About $37,000.

Que., Montreal North—Until May 1, by City Council, extending waterworks system. Work involves 10,000 ft. 6 in. wood or c.i. pipe, hydrants and valves. About $45,000. F. C. Labarge, 30 St. James St., Montreal, engr.

Que., Windsor—Until March 25, by J. A. Lagasse, secy.-treas., constructing concrete reservoir.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★O. Toledo—Standard Oil Co. of Ohio, High St., let contract building 1 story, 30 x 52 ft., concrete, steel and brick pumping station, to J. Stewart & Co., 30 Church St., New York City. About $25,000.

★Mich., Detroit—Water Bd. let contract furnishing labor and material laying 20,930 lin.ft. 48 in. steel pipe line, to J. Porath, 34 McGraw Bldg., $31.94 per lin.ft., total $668,504. Noted March 11.

Mich., Muskegon—City received bids furnishing and installing new reciprocating pumping unit, 15,000,000 gal. daily capacity, from Allis-Chalmers Co., West Allis, Milwaukee, Wis., $64,900; Worthington Pump & Mchy. Co., 115 Bway., New York City, $70,750; Hooven, Owens & Rentschler, 4th and Heaton Sts., Hamilton, O., $81,445. Noted March 11.

★Col., Fleming—City let contract building waterworks system, here, to Orman Constr. Co., Pueblo, $25,722.

★Ariz., Phoenix—City let contract furnishing materials and laying 32 mi. 36 in. redwood stove pipe line for Verde Gravity Water System, to Redwood Mfg. Co., Pittsburgh, Cal. and Pacific Tank & Pipe Co., Trust & Savings Bldg., Los Angeles. Both bids amounted to $845,000, equally divided.

★Wash., Seattle—Bd. Pub. Wks. let contract building water mains in Nickerson St., involving 2,956 ft. 8 and 20 in. c.i. pipe, to F. Agostino, 1335 21st St., S., $34,368.

★Cal., Burlingame—City Trustees let contract furnishing and installing 2 pumping units, to Simonds Mchy. Co., 117 New Montgomery St., San Francisco, $11,110. Noted March 11.

Sewers

PROPOSED WORK

R. I., Newport—City appropriated $10,900 to build new sewers in various streets. S. J. Easton, city engr.

Conn., Wethersfield — City appropriated $100,000 to build sewers.

N. J., Dover — City voted on $450,000 bonds to build sanitary sewerage system. G. Jenkins, Dover, engr.

N. C., Graham—City soon receives bids installing 2 pumping stations and laying 12 mi. 8-18 in. vitr. and ½ mi. 4-16 in. c.i. sewers in various streets. About $100,000. Norcross & Kels, Atlanta, Ga., engrs.

Tenn., Rogersville — Waterworks Com. soon lets contract extending sewerage system, involving 11,859 ft. 6-12 in. vitr. pipe, 21 manholes, 1 double alternating and 5 flush tanks, etc. J. N. Ambler, Richmond, Va., engr.

Sewers (Continued)

O., Battimore—Village plans to build 2 mi. 8-12 in. sewers in principal streets. About $35,000. Jennings-Lawrence Co., Hartmann Bldg., Columbus, engrs.

O., Miamisburg—City baving plans prepared building sanitary sewerage system, involving 30,000 ft. 6-24 in. vitr. pipe, manholes, flush tanks, etc. About $80,000. Cellarius & Dressler, 1001 Commerical Bldg., Dayton, engrs.

O., Worthington—Village plans to build sewerage system and sewage disposal plant, involving 3 mi. 8-18 in. sewers, Imhoff tank, etc. About $100,000. Jennings-Lawrence Co., Hartmann Bldg., Columbus, engrs.

Mich., Pleasant Ridge (Detroit P. O.)—City having plans preared for sewage disposal plant and 8-12 in. vitr. storm sewers in Oakland and Elm Park Sts. and streets in vicinity of Woodward Ave. C. W. Hubbell, 2348 Penobscot Bldg., Detroit, engr.

Wis., Kewaskum—City election soon to vote on $20,000 bonds to build sanitary sewers in Main St., and extensions to waterworks system. J. Donohue, North 8th St., Sheboygan, engr.

Neb., Lincoln—City plans to install additional intercepting sewers and sewage disposal plant. Alvord & Burdick, 8 South Dearborn St., Chicago, engrs.

Neb., Long Pine—City soon lets contract furnishing labor and material building sewerage system. About $48,000. T. S. Heck, clk. W. E. Standeven, Peters Trust Bldg., Omaha, engr.

N. D., Cando—Town plans to build sewerage system and sewage disposal plant. About $60,000. Atkinson & Hall, Devils Lake, engrs.

Wyo., Cheyenne—City soon receives bids building 9.2 mi. 12-27 in. sanitary sewers and 5.2 mi. 24-84 in. storm sewers. Cost to exceed, $600,000. J. A. Whiting, engr.

Okla., Devol—See "Waterworks."

Okla., Walter—See "Waterworks."

N. M., Estancia—City election April 6 to vote on $10,000 bonds to install septic tank and outfall sewer. B. H. Calkins, engr.

Cal., Biggs—City voted $45,000 bonds to build sewerage system, including 1 main trunk sewer line, laterals, branches, vitr. or concrete pipe, and sewage disposal plant.

Cal., Harnford—City soon lets contract building rein.-con. storm sewers in West 9th, Redington, Bush, Douty, Ivy and 3rd Sts., including catchbasins, lamp holes, etc. Cost to exceed 10,000. O. C. Williams, clk.

Cal., Los Gatos—City soon receives bids building sewerage system in Ashler, North Santa Cruz, North Tait and North Wilde Aves., vitr. or cement pipe. Cost to exceed $20,000. M. O. Winning, clk.

Cal., Marysville—City plans to sell $17,955 bonds to build 6 in. sewer in B St., involving grading, construction of concrete catch basins, curbs and gutters. E. B. Stanwood, clk.

Cal., Turlock—City Trustees having plans prepared for sewage disposal plant. Cost to exceed $10,000. A. M. Jensen, Fresno, engr. Noted Jan. 29.

Cal., Vallejo—See "Streets and Roads."

Ont., Ottawa—Bd. Control soon receives bids building 9, 12 and 18 in tile sewers in various streets. About $45,937. A. F. Macallum, city engr.

Ont., Port Dover—City having surveys made by E. A. James Co., engrs., 36 Toronto St., Toronto, for building 5,000 ft. 8-15 in. vitr. tile sanitary sewers in Main St. About $18,000.

Ont., Toronto—City had plans prepared for 3 mi. brick and concrete trunk sewer in Macdonnell Ave. through South Parkdale to Lake Ontario, cost, $334,250; general sewers and outlets, $347,725. R. C. Harris, city engr.

BIDS DESIRED

N. Y., Buffalo—Until March 29, by city, laying 806 ft. 20 ft. vitr. tile sewer pipe in Narragansett St., 609 ft. 12 ft. and 680 ft. 10 in. vitr. tile in West Northrup Pl., 190 ft. 12 ft. and 380 ft. 10 ft. vitr. tile in Longville St., 1,280 ft. 18 ft., 450 ft. 15 ft. and 443 ft. 12 ft. vitr. tile in Lower Terrace. G. H. Norton, city engr.

N. Y., New York—Until March 25, by H. Bruckner, pres. Bronx Boro., building sewers and appurtenances in West 260th St. between Bway. and Fieldston Rd., Review Pl. between Van Cortlandt Park S. and West 239th St., West 239th St. between Review Pl. and Putnam Ave., W., Putnam Ave. W. from West 239th St. to point about 170 ft. south, West 174th St. between University and Montgomery Aves.

N. J., Woodbury—Until April 13, by C. S. Davis, city clk., altering and extending 3½ mi. 8-24 in. vitr. pipe sewer lines, manholes, branches and all appurtances, including rehabilitation of concrete at Broad St. Woodbury Creek Crossing; advertised in this issue.

Pa., Carlisle—Until April 1, by W. W. Daron, boro. secy., building 1,150 ft. sanitary sewer, for Sewer Comn.; advertised in this issue.

Pa., Pittsburgh — See "Streets and Roads."

O., East Columbus—Until March 24, by M. Devore, city clk., building 28,000 ft. 6-12 in. sewers in principal streets. Jennings-Lawrence Co., Hartmann Bldg., Columbus, engrs.

Ind., Huntingburg—Until April 5, by city, constructing sanitary sewers and sewage disposal plant, involving 42,304 lin.ft. 8-15 in. sewer pipe, 109 manholes and 3 flush tanks. About $62,970. M. L. Katter, clk.; advertised in this issue.

Ind., Huntington—Until March 29, by Bd. Pub. Wks. building sewerage system, involving 5,768 ft. 12-18 in. vitr. tile pipe with connections. About $36,700. H. I. Young, clk.

Mich., Detroit—Until March 26, by Dept. Pub. Wks., furnishing labor and material (except manhole covers and rings), trenching and laying sewer in Lateral 3,144, 659 ft. long, 12-15 in. vitr. crock pipe; Lateral 3,194, 1,546 ft. long, 12-18 in. pipe; Lateral 3,197, between VanDyke, Erwin, Auburn and Badger Aves., 1,536 ft. long, 12-18 in. pipe; Lateral 3,199, 1,538 ft. long, 12-18 in. pipe; Lateral 3,234, between Mack and Hart Aves., 180 ft. long, 10 in. pipe; Lateral 3,247, between Cascade, Broadstreet, Joy and Dumont Aves, 2,933 ft. long, 12-24 in. pipe; Lateral 3,249, between Rohns, Vinton, Peter Hunt and Bessemore Aves., 1,568 ft. long, 12-18 in. pipe. C. W. Hubbell, city engr.

Mich., Detroit—Until March 23, by Dept. Pub. Wks., furnishing labor and material building 2,310 ft. sewer in Burlingame Ave. from Belleterre to Otsego Aves., sizes varying from 24 in. crock to 3 x 4 ft. 6 in. egg shape section, brick, vitr. segmental block or rein.-con. pipe; 3,645 ft. arm in Shoemaker Ave. from Hamilton Ave. to Connors Creek, 4-6 ft. cylinder, etc., brick, segmental block or rein.-con.; 797 ft. arm in Henry St. from 2nd to Grand River Aves., 3 x 4 ft. 6 in., egg shape, brick, vitr. segment block or rein.-con., monolithic plain concrete may be used where construction is open cut. C. W. Hubbell, city engr.

Ill., Elmhurst—Until April 12, by city, building sewerage system and sewage disposal plant, involving (A) 7,938 lin.ft. 36-66 in. vitr. tile segmental block sewer, 1 Portland cement concrete outlet abutment, 1 special and 24 concrete manholes, 34 concrete catch basins, cost $81,000; (B) 43,981 lin. ft. 12-30 in. vitr. tile pipe sewer, 365 lin.ft. c.i. pipe sewer, 100 cu.yd. concrete around tile pipe under rail roads, 1 special and 156 concrete manholes, 291 concrete catch basins, 2 concrete outlet abutments, $116,000; (C) 1 concrete settling tank, 1 concrete dosing chamber, 1 concrete grit chamber, 2 sand sludge beds, 4 sand filter beds, 1 concrete pump pit with pumping equipment, 300 lin.ft. vitr. tile pipe sewer, 700 lin.ft. 2 in. galvanized iron water pipe, 75 lin.ft. 8 in. c.i. pipe, 1 concrete outlet abutment, $42,000. Bids will be received on one or more sections of the work. E. Hancock, 2047 Ogden Ave., Chicago, engr.; advertised in this issue.

Minn., Ellsworth—Until March 26, by E. A. Meester, village recdr., building sanitary sewers and sewage disposal plant, involving 15,000 ft. 8-15 in. pipe, disposal tank, sludge bed, by-pass and outlets. About $40,000. Druar & Smith, Globe Bldg., St. Paul, engrs

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New York—H. H. Curran, pres. Manhattan Boro., received bids March 8, building sewer in East 26th St. and rebuilding sewer in Madison Ave., from Booth & Flynn, Ltd., 17 Battery Pl., $843,297; W. Caccia, $1,210,400. Noted March 4.

O., Cleveland—Saeltzer-Brown Co., 6511 Detroit Ave., let contract building 1,800 ft. 12-18 in. vitr. pipe sewer and 1,800 ft. 8 in. c.i. water mains, in East 94th St. and Garfield Park Blvd., to N. Salem, 638 Bradley Court, $47,772. Noted March 11.

Mich., Detroit—City received bids furnishing labor and material for trenching and laying 3,935 ft. Lateral Sewer 3,255 between Livernois, Webb and Elmherst Aves., from Western Constr. Co., 1208 Ford Bldg., $13,488, Lennane Bros., Union Trust Bldg., $13,834, Liberty Constr. Co., Penobscot Bldg., $13,872; 1,004 ft. Lateral 3,191 between Hilger, Lycaste and Mack Aves., from Liberty Constr. Co., $4,937, W. W. Carpenter & Son, 53 Harrison St., $5,982, W. Blanck & Co., 330 Longfellow Ave., $8,900; 1,617 ft. Lateral 3,248 between Rohns, Vinton, Bessemore and Georgia Aves., from N. Mancini, 256 Hague Ave., $7,245, W. Blanck & Co., $11,937, Lennane Bros., $14,883; 11,072 ft. Lateral 3,252 between Buckingham, Bedford, Stratford and Warren Aves., from Liberty Constr. Co., $37,580. Noted March 4.

Mich., Pontiac—Citizens Development Co. received bids buliding 22,000 ft. storm and sanitary sewers in East Blvd. and Citizens Development Co. Subdivision, from C. Johnson, Birmingham, $79,046; R. D. Baker, Penobscot Bldg., Detroit, $84,119; Lennane & McIlvenna, Book Bldg., Detroit, $84,600. Noted Feb. 19.

Wis., Chilton—City received bids excavating and laying (a) 1,420 ft. 10 in. pipe, (b) 1,235 ft. 12 in., (c) 2,140 ft. 15 in. (d) 1,080 ft. 18 in., (e) 270 ft. 24 in., from J. Van Doesellaar, 1712 North 2nd St., Sheboygan, (a) $1.19, (b) $1.52, (c) $1.75, (d) $2.52, (e) $3.31; Cornelissen Co., 73 Lincoln St., Sheboygan, (a) $1.20, (b) $1.45, (c) $1.55, (d) $2.45, (e) $3.23; W. F. Ribbens, Main St., Mayville, (a) $1.21, (b) $1.49, (c) $1.86, (d) $2.49, (e) $3,31. Noted Feb. 12.

Wis., Racine—Bd. Pub. Wks. received only bid Feb. 28, building sewers in 9 streets, involving 15,322 ft. 8-24 in. pipe, etc., from P. D. Johnson, 944 Washington Ave. About $60,000. Noted Feb. 26.

★N. D., Minot—Bd. City Comrs. let contract building sewerage system and sewage disposal plant, to G. W. Kewper, Minot. About $244,000.

★Okla., Ada—City let contracts building sewerage system, Sect. D, to include main, sanitary and storm sewers, to J. E. Hanson, Tulsa, $26,026; Sect. E, sewage disposal plant, to Yates & Gallamore, Ada, $46,936. Noted Feb. 5.

Bridges

PROPOSED WORK

N. H., Manchester—City plans to expend $830,000 to build 2 concrete and steel bridges.

N. Y., Lyons—Town Bd. plans to build steel bridges on Montezuma and Water Sts. About $28,000.

N. J., Newark—Erie R.R., 50 Church St., New York City, having plans prepared by Strauss Bascule Bridge Co., engrs., 104 South Michigan Ave., Chicago, for 180 ft. Strauss single leaf double track railroad bridge, over Passaic River.

Ill., Danville—H. H. Edwards, city engr., receives bids about April, building 1,110 ft. rein.-con. bridge, 30 ft. roadway and two 6 ft. sidewalks. About $250,000. Herrington, Howard & Ash, Orear-Leslie Bldg., Kansas City, Mo., consult. engrs. Noted Feb. 12.

Wis., Racine—City had preliminary plans prepared building 133 ft. Strauss double leaf highway bridge, over Root River, here. Election April 6, to vote on bonds to cover cost.

Minn., Grand Rapids—Comrs. Itasca Co. having plans prepared by Strauss Bascule Bridge Co., engrs., 104 South Michigan Ave., Chicago, for 64 ft. Strauss single lean highway bridge over Mississippi River.

S. D., Yankton—Meridian Highway Bridge Co. plans to build steel railroad and highway bridge. About $1,250,000. D. B. Gurney, pres. Harrington, Howard & Ash, O'Drear Leslie Bldg., Kansas City, Mo., consult. engrs.

N. D., Mott—E. C. Roberts, aud. Hettinger Co., soon lets contract building rein.-con. bridge over Cannon Ball River, Mott Twp., Federal Aid Project 105, to have three 50 ft. spans, and involves 512 cu.yd. Class B excav., 77,784 lb. reinforcing steel, 2535 lb. c.i. rockers, 981 lb. steel rocker plates, 382.67 cu.yd. 1:2:4 and 218 cu.yd. 1:2½:5 concrete, etc. W. H. Robinson, c/o State Highway Comn., Bismarck, engr.

Mont., Lavina—Musselshell Co. (Roundup) plans to build 140 ft. steel span bridge 18 ft. wide, over Musselshell River, near here, to have concrete abutments with channel change. About $15,000. Federal Government has been asked to appropriate toward cost. J. N. Edy, c/o State Highway Dept., Helena, engr.

Mo., Independence—Jackson Co. soon lets contract widening Kansas City Rys. bridge over Rock Creek, 28 ft. on each side for full length of 110 ft., involving 541 cu.yd. concrete masonry and 117,579 lb. reinforcement. Cost $20,525.

Bridges (Continued)

Okla., Pond Creek—Grant Co. plans to build cement bridge, across Salt Fork River, north of here. About $225,000. Engineer not selected.

Okla., Watts—Adair Co. (Stilwell) election April 15, to vote on $16,000 bonds to build steel bridge, across Illinois River, here.

Wash., Olympia—State Highway Comn., rejected bids received March 1, building rein.-con. I-beam bridge, consisting of six 28 ft. spans, over Mud Bay, near here, involving 574 cu.yd. concrete, 45,000 lb. steel and 3,000 lin. ft. wooden piling. About $30,500. J. Allen, state highway engr. Noted Feb. 19.

Cal., Healdsburg—Bd. Supervs. Sonoma Co., (Santa Rosa), having plans prepared for 465 ft. rein.-con. arch bridge, 22 ft. wide, without sidewalks, and 34 ft. wide with sidewalks over Russian River, involving 3,200 cu.yd. rein.-con., 180 ton steel and 2,000 cu.yd. earth aproach and fill. About $100,000 available for project. L Aldrich, co. engr.

Ont., Toronto—City had plans prepared by R. C. Harris, city engr., for 2 bridges, 500 ft. long, 45 ft. wide, both steel trestles or steel arches with concrete decks, car tracks and sidewalks, over Rosedale Ravine, one on South Glen Rd. and other on North Glen Rd. About $409,160 and $635,685 respectively.

B. C., Victoria—City, Provincial Government, (Ottawa) and Canadian Pacific Ry., Union Sta., Toronto, Ont., plans to build railway and highway bridge over Inner Harbor, on Johnson St., here.

BIDS DESIRED

N. J., Paterson—Until April 7, by Bd. Freeholders Passaic Co., building new rein.-con. arch bridge over Passaic River, between Pennington and West Side Parks. J. M. Morrison, clk.; advertised in this issue.

Pa., Pittsburgh—See "Streets and Roads."

W. Va., Morgantown—See "Streets and Roads."

N. C., Fayetteville—Until March 22, by Bd. Alderman furnishing labor and material building 3 rein.-con. box culverts, involving 100 cu.yd. concrete and 2,000 lb. steel. E. C. Derby, city engr.

Ga., Newton—Until April, 20, by Bd. Comrs. Rds. and Revenues, Baker and Mitchell Counties, furnishing labor, material, equipment etc., for construction of bridge over Flint River, Federal Aid Project No. 89. Work involves, 133 cu.yd. Class "B" concrete for bents and footings, 329 cu.yd. Class "A" concrete for piers, 8 steel cylinders for piers, 13,607 lb. reinforcing steel, two 120 ft. fixed spans and one 90 ft. vertical lift span complete, including machinery and counterweights, 448 lin.ft. steel trestle, erected complete and 50,000 ft. floor lumber and nailing strips, furnished and placed. Barrett & Slack, Bell Bldg., Montgomery, Ala., engrs.

Ga., West Point—Until March 23, by Bd. Comrs Rds. and Revenues, Troup Co., (Lagrange), furnishing labor, material, equipment, etc., for construction of bridge over Chattahoochee River, here. Contr. 1 involves, removing of present bridge, 400 cu.yd. rip rap, 130 cu.yd Class "A" concrete for piers, 70 cu.yd. Class "B" concrete for abutments and 15,200 lb. reinforcing steel; Contr. 2, erecting two steel spans, 139 ft. long, and one steel span 154 ft. 10½ in. long, one 21½ ft. and one 28 ft. approach spans and 1,100 lin.ft. pipe rail, including bolts and fittings; Contr. 3, 359 cu.yd. Class "A" concrete floor, 39,800 lb. reinforcing steel, 980 lin.ft curbing taken up and reset, 1,520 cu.yd. earth fill, 750 sq.yd. concrete sidewalk, 2,788 sq.yd. vitr. brick pavement and electrical work complete. About $200,000.

Fla., Careyville—Until April 14, by State Rd. Dept., Tallahassee, building bridge over Choctawhatchee River, near here, consisting of two 75 ft. and one 120 ft. approach spans, swing span or overhead counterweight bascule lift span, etc. Work involves 85,000 cu.yd earth embankment, 20,000 lin. ft. wood trestle piles, 321,000 ft timber trestle, 7,000 lin.ft. wood foundation piles, 1,100 cu.yd. concrete piers and 450,000 lb. structural steel. C. A. Browne, state highway engr.; advertised in this issue.

Fla., Milton—Until April 14, by State Rd Dept. Tallashassee, building 338 ft. bridge, 18 ft roadway, 6 ft. walk, over Black River, here. C. A. Browne, state highway engr.; advertised in this issue.

Minn., Duluth—Until April 6, by W. H Borgen, aud. St. Louis Co., building Bridge D-3-35-1, 20 ft. concrete slab, on Lismore Rd., cost $6,000; Bridge B 1-3-1, 1 x 6 ft concrete box on Howard-Gnesen Rd., $6,000; Bridge D-3-31-1, 16 ft. concrete slab, Lakewood Rd., $2,000; remodeling Bridge E-4-32-1, State Rd. 4, $10,000. R. W. Acton, co. engr.

Wyoming—See "Streets and Roads."

Ont., Tyendinaga—Until April 1, by W. A. McLean, deputy minister, Dept. Pub Highways, Toronto, for supply, erection and field painting of steel superstructure of 44 ft. bridge over Sucker Creek on Provincial Highway, here. About $12,000. G. Hogarth, Parliament Bldgs. Toronto, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Framingham—Bd. Comrs. Pub. Wks. received bids March 8, removing iron bridge on Central St. over Sudbury River and building concrete foundations, rein.-con. superstructure, appurtenances and sidewalks, 90 ft. long excluding approaches, and 41.25 ft. wide, involving 580 cu.yd. rein.-con. and 520 cu.yd. earth approach and fill, from H. C. Shiels, 1077 Columbus Ave., Boston, $31,862; Hynes & Haley, 87 Weybosset St., Providence, R. I., $34,900; Framingham Constr. & Supply Co., Framingham, $35,989. Noted Feb. 26.

★Pa., Uniontown—Fayette Co. let contract building Bridges 71, 72 and 115, to Genl. Contg. Co., Uniontown, $10,358, $6,853 and $4,872 respectively.

★O., Dayton—Comrs., Montgomery Co let contract building 220 ft. bridge, 20 ft. wide, consisting of 2 steel truss spans, over Stillwater River, Butler Twp., to A. S. Fox, 259 4th St., Arcade, $18,895. Noted Feb. 12.

★Wis., Black River Falls—Jackson Co. State Rd. and Bridge Comn. let contracts to O. N. Tormoen, Blair, building Tucker Bridge, Albion Twp., $2,597; Wyss Bridge, Irving Twp., $3,555; Cheese Factory Bridge, Alma Twp., $3,230; Halpin Bridge, Alma Twp., $1,733.

Wis., Kenosha—Street Assessment Comn., City Hall, received bids March 5, building Main St. Bridge, from Greiling Bros. Co., Green Bay, $494,181; Worden-Allen Co., Port Washington Rd., Milwaukee, $523,000; Great Lakes Dredge & Dock Co., 104 South Michigan Ave., Chicago, $624,000. Cost will be borne by city and Chicago & Northwestern Ry. Noted Feb. 19.

★Wis., Mauston—Juneau Co. let contracts to C. S. Simpson, 690 Franklin St., Appleton, building Moulton Bridge, $4,952; O'Shea Bridge, $5,136; Second Necedah Bridge, $6,491; Fowler Bridge, $3,743. Noted Jan. 15 and Feb. 12.

★Wis., Viroqua—Vernon Co. State Rd. and Bridge Comn. let contracts building Reedstown Bridge, to La Crosse Bridge Co., La Crosse, $14,372; Schaller Bridge, Hillsboro Twp., to Continental Bridge Co., 53 West Jackson St., Chicago, $1,590; Viroqua Bridge, to Worden-Allen Co., Port Washington Rd., $1,807; La Farge Bridge and Henry Bridge, Viroqua Twp., to Clinton Bridge Co., Clinton, $7,198 and $2,093 respectively.

★Wis., Waukesha—Waukesha Co. State Rd. and Bridge Com. let contract building Oconomowoc River Bridge, to Whitewater Bridge Co., Whitewater, $3,850; Mill Race Bridge, to Boortz & Wolfe, Waukesha, $6,737. Noted Jan. 15.

★Ia., Centerville—Comrs. Appanoose Co. let contracts building Group "A", including 18 box culverts, 26-45 ft. long, 2-3 ft. wide, to I. W. Manson & Son, Centerville, $13,368; Group "B", 14 concrete box culverts, 2-5 ft. wide, to B. S. Staley, Centerville, $25,894. Noted March 4.

★Minn., Faribault—F. M. Kaiseratt, aud. Rice Co., let contract building culverts and 2 bridges on Federal Aid Project 126, to Widell Co., Mankato, $27,790.

★Ark., Fayetteville—Comrs. Washington Co let contract building bridge on macadam highway, to Kirkham Constr. Co., Springfield, Mo. About $60,000

★Col., Sterling—State Highway Comn., Denver, let contract building two bridges over Platte River between Hillrose and Merino, known as Federal Aid Project 41, to A. R. Mackey, Sterling, $78,389. Noted Feb. 26

Ariz., Marinette—Maricopa Co received bids building rein.-con. arch bridge, Federal Aid Project 10, over Agua Fria River, near here, from Western Building & Constr. Co., Marsh-Strong Bldg., Los Angeles, $48,182, not including cement and steel; Midland Bridge Co., 504 Ry. Exch., Kansas City, Mo., cost plus 16%.

Cal., Sacramento—Bd Supervs. Sacramento Co. received only bid building rein.-con. bridge, on Edson Ave., near Benali, from Jenkins & Wells, 36th and Y Sts., $21,442

★Que., Batiscan—Provincial Government, Quebec, let steel contract building superstructure of 1,211 ft. bridge over Batiscan River, here, to MacKinnon Steel Co., Ltd., Drummond St., Sherbrooke, cost $186,000; foundation, to J. Gosselin Ltd., Quebec. Work involves 900 tons steel.

★Ont., Chatham—Kent Co. let contract building concrete abutments for 80 ft. steel bridge over Duffis Creek, to C. Hubbell, Chatham. About $15,165. Work involves 400 cu.yd. concrete.

★Ont., York—Toronto and York Rds. Comn., 57 Adelaide St., E., Toronto, let contract building 4 rein.-con. bridges, to Ritchie Constr. Co., Beamsville, Ont., and 1 bridge, to Lewis Constr. Co., Ltd., St. James Chambers, Toronto. About $14,161 and $6,222 respectively. Work involves 1,068 cu.yd. rein.-con. and 900 cu.yd. stone. Owners will furnish 41,490 lb. reinforcing steel.

Structural Steel

PROPOSED WORK

N. H., Manchester—See "Bridges."

Mass., Andover—Memorial—See "Buildings."

N. Y., Brooklyn—See "Industrial Works."

N. Y., New York—Loft—See "Buildings."

N. Y., New York—Office—See "Buildings."

N. Y., New York—Theatre—See "Buildings."

Pa., Easton—See "Buildings."

N. C., High Point—Hotel—See "Buildings."

O., Cleveland—Commercial—See "Buildings."

O., Cleveland—See "Industrial Works."

O., Warren—Office—See "Buildings."

Mich., Detroit—Church—See "Buildings."

Mich., Flint—Clubhouse—See "Buildings."

Mich., Flint—High School—See "Buildings."

Mich., Sagniaw—High School—See "Buildings."

Ill., Chicago—See "Industrial Works."

Wis., Manitowoc—High School—See "Buildings."

Wis., Manitowoc—See "Industrial Works."

Minn., Minneapolis—See "Industrial Works."

S. D., Yankton—See "Bridges."

BIDS DESIRED

O., Cleveland—Theatre and Stores—See "Buildings."

Mich., Detroit—Office—See "Buildings."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Springfield—See "Industrial Works."

★N. Y., Brooklyn—Loft—See "Buildings."

★Pa., Pittsburgh—Office—See "Buildings."

★Ind., Kokomo—See "Industrial Works."

★Mich., Detroit—See "Industrial Works."

★Ill., Chicago—See "Industrial Works."

★Cal., San Francisco—Theatre—See "Buildings."

Reinforced Concrete

PROPOSED WORK

N. H., Manchester—See "Bridges."

Mass., Andover—Memorial—See "Buildings."

Mass., Boston—See "Industrial Works."

N. Y., Alden—Home and Hospital—See "Buildings."

N. Y., Brooklyn—See "Industrial Works."

N. Y., New York—Office—See "Buildings."

N. Y., Silver Creek—School—See "Buildings."

Pa., Cambria (Johnstown P. O.)—Hospital—See "Buildings."

O., Cleveland—Commercial—See "Buildings."

O., Cleveland—See "Industrial Works."

O., Dayton—See "Industrial Works."

Ind., Logansport—Hotel—See "Buildings."

Mich., Detroit—Church—See "Buildings."

Mich., Flint—Clubhouse—See "Buildings."

Reinforced Concrete (Continued)

Mich., Flint—High School—See "Buildings."

Mich., Saginaw—High School—See "Buildings."

Mich., Saginaw—Mercantile—See "Buildings."

Ill., Chicago—See "Industrial Works."

Ill., Danville—See—"Bridges."

Wis., Manitowoc—High School—See "Buildings."

Wis., Manitowoc—See "Industrial Works."

Wis., Milwaukee—Hospital—See "Buildings."

Wis., Milwaukee—See "Industrial Works."

Minn., Minneapolis—See "Industrial Works."

Minn., Minneapolis—Office—See "Buildings."

Cal., Healdsburg—See "Bridges."

Cal., Stockton—Schools—See "Buildings."

BIDS DESIRED

O., Cleveland—Theatre and Stores—See "Buildings."

O., Warren—Office—See "Buildings."

Mich., Detroit—Office—See "Buildings."

Ill., Chicago—See "Industrial Works."

Minn., Coleraine—High School—See "Buildings."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Portland**—See "Industrial Works."

★**Mass., Brockton**—See "Industrial Works."

★**Mass., Springfield**—See "Industrial Works."

★**N. Y., Brooklyn**—Loft—See "Buildings."

★**Pa., Chester**—See "Miscellaneous."

★**Pa., Pittsburgh**—Office—See "Buildings."

★**Ind., Kokomo**—See "Industrial Works."

★**Mich., Detroit**—See "Industrial Works."

★**Ill., Chicago**—See "Industrial Works."

Cal., Sacramento—See "Bridges."

★**Cal., San Francisco**—Theatre—See "Buildings."

Streets and Roads

PROPOSED WORK

Vt., Bennington—City voted $85,000 bonds to build 4 mi. cement and concrete road from here to North Bennington.

R. I., Newport—City appropriated $53,825 to build new highways. Work will probably be done by day labor. S. J. Easton, city engr.

Conn., Bridgeport—City plans to pave Seawall Dr., at Seaside Park. About $50,000. J. A. McElroy, city engr.

N. Y., Buffalo—City plans to build concrete sidewalks, concrete base, 26 ft. wide. About $30,000. G. H. Norton, city engr.

N. Y., Rochester—Common Council passed ordinance to pave Clinton Ave. N., cost $56,000; Rochester Ry. & Light Co. will appropriate $39,600 toward cost; Hollenbeck St., $61,000. C. A. Poole, city engr.

N. Y., Syracuse—City plans to improve 780 ft. Gifford St. from Geddes St. to Wilbur Ave., 34 ft. wide, cost $21,940, 620 ft. Grand Ave. from Geddes St. to Delaware Ave., 27 ft. wide, $15,120, 2,750 ft. Cortland Ave from Englewood Ave. to city line, 35 ft. wide, $104,160, 1,600 ft. Cortland Ave. from South to Onondaga Sts., 34 ft. wide, $37,720, vitr. brick, asphalt or bituminous concrete, 515 ft. Comstock Ave. between East Genesee and Madison Sts., 27 ft. wide, $18,860, granite block or sandstone. H. C. Allen, city engr.

N. J., Trenton—City plans to pave with asphalt and granite block Nassau St., cost $11,500, West End Ave., $21,000, Laurel Ave., $14,000, Taylor St., $25,000, Calhoun St., $14,000, Warren St., $11,000, East Canal St., $15,400, and Sanhican Drive, $12,500; repave with asphalt and granite block, Bellevue Ave., $24,000, Quarry St., $6,500, West Hanover St., $16,500, Lafayette St., $3,500, North Clinton St., $40,000, Liberty St., $19,000. A. Swan, clk.

W. Va., Grantsville—Comrs. Calhoun Co. received no bids Feb. 27, grading 4.5 mi. Arnoldsburg-Spencer Rd., involving 35,000 cu.yd. excav. About $39,000. A. N. Allen, Grantsville, engr. Noted Jan. 22.

W. Va., Philippi—Comrs. Barbour Co. having plans prepared by C. Swecker, engr., Philippi, improving 2 mi. Belington Philippi Rd., 16 ft. wide, involving 18,700 sq.yd. bituminous macadam and 10,000 cu.yd. excav. About $56,000.

W. Va., Union—Monroe Co., Wolf Creek Dist., voted $79,000 bonds to build roads. J. L. Wehmeyer, Union, engr.

W. Va., Wayne—Comrs. Wayne Co. having plans prepared and receive bids about May 1, grading and draining 3 mi. Lavaleete-Buffalo Rd., 26 ft. wide. About $30,000. H. A. Levering, Wayne, engr.

Ala., Gadsden—City plans to pave Forrest Ave. About $76,000.

O., Covington—Village plans to grade, pave and curb 3 sections High St., (1) 1,700 ft. long, 30 ft. wide, (2) 2,700 ft. long, 38 ft. wide, (3) 2,200 ft. long, 26 and 30 ft. wide, all brick, asphalt or concrete. Total cost, $75,000. Jennings-Lawrence Co., Hartmann Bldg., Columbus, engrs.

O., Pataskala—Village plans to grade, curb and pave 861 ft. Town St., 24 ft. wide, involving 2,380 sq.yd. asphalt, cost $16,000; 2,470 ft. Main St., 30 and 40 ft. wide, 10,500 sq.yd. asphalt, $40,000; 198 ft. Depot St., 34 ft. wide, 740 sq.yd., asphalt, $6,000. Jennings-Lawrence Co., Hartman Bldg., Columbus, engrs.

Mich., Pleasant Ridge (Royal Oak P. O.)—City having plans prepared by C. W. Hubbell, engr., 2348 Penobscot Bldg., Detroit, grading, draining and surfacing ½ mi. Oakland and Elm Aves., double roadway 25 ft., asphaltic concrete or sheet asphalt on concrete base, concrete curb and cement concrete sidewalks. About $25,000.

Mich., Schoolcraft—C. L. Davis, village clk., soon lets contract grading, shaping, draining and surfacing 800 ft. State Trunk Line Rd., involving 679 sq.yd. concrete, 1,445 lin.ft. concrete curbing and guttering, 4,000 sq.ft. cement sidewalks, 200 cu.yd. earth excav., etc. About $10,000

Wisconsin—State Highway Comn., Madison, rejected bids received March 10, building Monroe-Argyle Rd., Application 475 (1919) County Farm Rd., Green Co., involving 5,000 cu.yd. earth excav., 70 cu.yd. concrete in culverts, 14,400 sq.yd. concrete surfacing, exclusive of cement, 4,925 bbl. cement, etc., Ableman-Reedsburg Rd., Federal Aid Project 61, Sauk Co., involving 4,977 cu.yd. earth excav., 34 cu.yd. concrete in culverts, 196 cu.yd. concrete in bridges, 182 cu.yd. concrete in bridge flooring, 11,151 sq.yd. gravel surfacing, 52,600 lb. structural steel, etc. Noted March 4.

Wis., Mayville—City having plans prepared grading and paving Main St., 18-20 ft. wide, rein.-con. or asphalt, also sidewalks with combined curb and gutter. Cost between $25,000 and $30,000. J. Donohue, North 8th St., Sheboygan, engr.

Wis., Park Falls—City having plans prepared grading and paving 1 to 1.5 mi. Main St., 18 ft. wide, asphalt or concrete, also building sidewalks with combined curbs and gutters. Cost between $25,000 and $50,000. W. F. Reichardt, Watertown, engr.

Ia., Davenport—City plans to excavate, grade, curb and pave with asphaltic concrete, brick or concrete, Sheridan St. from Grant to 29th Sts. About $10,062. R. E. Earl, city engr.

Ia. Davenport—City plans to repave with new brick, resurface with asphaltic concrete or relay with old brick, 1st St. from Main to Perry Sts., cost $10,848; resurface with asphaltic concrete, repave with new brick or relay with old brick, Harrison St. from 1st to 2nd Sts., $11,121; excavate, grade, curb and pave with asphaltic concrete, brick or concrete, 6th St. from Washington to Division Sts. and 8th St. from Le Claire to Farnam Sts., $15,045 and $4,666 respectively. R. E. Earl, city engr.

Ia., Davenport—City soon lets contract excavating and paving 4,100 ft. Locust St. from Chicago, Rock Island & Pacific Bridge to 4,100 ft. west, involving 9,239 sq.yd. asphalt, concrete or vitr. brick, 8,752 lin.ft. concrete edging, 1,701 cu.yd. earth and 1,364 cu.yd. stone excav., etc., 2,449 ft. Waverly Rd. from Telegraph Rd. to 1,165 ft. north and 1,300 ft. west, involving 4,898 sq.yd. asphalt, concrete or vitr. brick and 952 cu.yd. earth excav.; excavating, paving, curbing and guttering 743 ft. 13th St., from Scott to Gaines Sts., involving 1,771 sq.yd. asphalt, concrete or vitr. brick, 1,504 lin.ft. concrete curbing and guttering, 570 cu.yd. earth evcav., etc., 1,815 ft. Pleasant St. from Myrtle to Washington Sts., involving 5,277 sq.yd. asphalt, concrete or vitr. brick, 3,741 lin.ft. concrete curbing and guttering, 1,316 cu.yd. earth excav., etc., 763 ft. Middle Rd. from Fernwood Ave. to 763 ft. west, involving 2,967 sq.yd asphalt, concrete or vitr. brick, 1,518 lin.ft. curbing, 746 cu.yd. earth excav., etc., 1560 ft. Pershing Ave. from Locust to Rusholme Sts., involving 3,872 sq.yd. asphalt, concrete or vitr. brick, 3,183 lin.ft. concrete curbing and guttering, 1,706 cu.yd. earth excav., etc., 1,071 ft. Tremont Ave. from Rusholme St. to Central Park., involving 2,743 sq.yd. asphalt, concrete or vitr. brick, 2,300 lin.ft. concrete curbing and guttering, 799 cu.yd. earth excav., etc., 250 ft. 10th St. from Mississippi Ave. to Adams St., involving 758 sq.yd. asphalt, concrete or vitr. brick, 558 lin.ft. concrete guttering, 178 cu.yd. earth excav., etc., 2,311 ft. 2nd St. from Filmore to Warren Sts., involving 11,567 sq.yd. vitr. brick, 4,546 lin.ft. old curb reset, 4,546 lin.ft. concrete guttering and 3,497 cu.yd. earth excav., 640 ft. Wilkes Ave. from 3rd to 5th Sts., involving 2,050 sq.yd. asphalt, concrete or vitr. brick, 1,332 lin.ft. concrete curbing and guttering, 552 cu.yd. earth excav., etc., 658 ft. Iowa St. from Columbia Ave. to 29th St., involving 2,099 sq.yd. asphalt or concrete, 498 cu.yd. earth excav., 782 lin.ft. curbing and guttering, etc., 320 ft. Judson St. from 11th to 12th Sts., involving 926 sq.yd. asphalt, or concrete on concrete base, 320 lin.ft. curbing, 1,288 cu.yd. earth excav., etc., 320 ft. Howell St. from 4th to 5th Sts., involving 648 sq.yd. asphalt or concrete, 640 lin.ft. curbing and guttering, 200 cu.yd. earth excav., etc., 1,252 ft. Locust St. from Division to Pacific Sts., involving 5,176 sq.yd. asphalt, concrete or vitr. brick, 2,550 lin.ft. curbing and guttering, 1,288 cu.yd. earth excav., etc. R. E. Earl, city engr. Noted Jan. 29.

Minn., Aitkin—Aitkin Co. plans to grade and gravel 6 mi. road from Mille Lacs Lake, north, 24 ft. wide. About $40,000. F. J. O'Hara, Aitkin, engr.

Minn., Bemidji—Beltrami Co. plans to grade and gravel 8 mi. road from Kelliher north, 24 ft. wide, cost $48,000; 14 mi. road from Spooner south, 24 ft. wide, $84,000. S. D. Snyder, Bemidji, engr.

Minn., Elk River—Sherburne Co. plans to grade and gravel 9.5 mi. road from here to 2.5 mi. beyond Big Lake, 18 and 24 ft. wide. About $65,000. H. E. Chard, Elk River, engr.

Minn., Faribault—F. M. Kaiseratt, aud. Rice Co., rejected bids received March 2, building 3.8 mi. Federal Aid Project 126, 18 ft. wide. About $90,000. Work will be readvertised. W. P. Chapman, Faribault, engr. Noted Feb. 5.

Minn., Gaylord—Sibley Co. plans to gravel 22 mi. road from here to Renville Co. line, 24 ft. wide. About $50,000. C. H. Patterson, Gaylord, engr.

Minn., Luverne—Rock Co. plans to grade and pave 3 mi. road near here, 18 and 24 ft. wide. About $40,000. D. E. Davuson, Luverne, engr.

Minn., Montevideo—Chippewa Co. plans to grade 10 mi. road from Clara City west, 24 ft. wide. About $42,000. F. O. Nelson, Montevideo, engr.

Minn., Morris—Stevens Co. plans to grade and gravel 35 mi. road northeast and west of here to county line, 24 ft. wide. About $210,000. W. A. Hunt, Morris, engr.

Minn., Owatonna—Steele Co. plans to grade and pave 7 mi. road from Clinton Falls south through here, 18 and 24 ft. wide. About $42,000. C. O. Harholdt, Owatonna, engr.

Minn., St. James—Watonwan Co. plans to pave 14 mi. road, 18 ft. wide. About $270,000. T. J. Buhl, St. James, engr.

Minn., Shakopee—Scott Co. plans to grade and gravel 27 mi. road from Savage to New Prague, 24 ft. wide. About $165,000. D. Childs, Shakopee, engr.

Minn., Walker—Cass Co. plans to grade and gravel 28 mi. road from Pine River to Longville, 24 ft. wide. About $168,000. A. W. Moulster, Pine River, engr.

Minn., Warren—Marshall Co. plans to grade 5.5 mi. road from Holt to Thief River, 24 ft. wide. About $28,000. H. R. Lindsey, Warren, engr.

Minn., Waseca—Waseca Co. plans to grade and gravel 25 mi. road from north county line through here to New Richland, 24 ft. wide. About $150,000. J. W. Hruska, Waseca, engr.

Minn., Wykoff—City having plans prepared for 12,000 sq.yd. paving. About $60,000. Bids will be received on all types of pavement. J. W. Shaffer, 501 New York Life Bldg., Minneapolis, engrs.

N. D., Mott—E. C. Roberts, aud. Hettinger Co., soon lets contract building 9.5 mi. road, from New England east and north to Stark Co. line, Federal Aid Project 38,

Streets and Roads (Continued)

involving 45,549 cu.yd. Class B excav., 57.53 cu.yd. 1 : 2 : 4, and 95 cu.yd. 1 : 2½ : 5 concrete, 360 ft. rein.-con. pipe culverts and 5,620 lb. reinforcing steel. About $19,250. W. H. Robinson, c/o Highway Comn., Bismarck, engr.

Wyo., Sheridan—City soon receives bids paving Brooks, West Loucks, West Burkitt, Smith, Park, East Loucks, East Brundage, East Works, North Maine and North Gould Sts.; Linden, Wyoming, Coffeen and Sheridan Aves., involving 60,000 sq.yd. rein.-con., asphaltic concrete on bitulithic pavement. E. C. Gwillim, Sheridan, engr.

Montana—State Highway Dept., Helena, plans to gravel surface 15.8 mi. Townsend-Helena Rd., Broadwater Co., Federal Aid Project 97. About $79,126. J. N. Edy, state highway engr.

Mont., Red Lodge—City plans to pave Bway., concrete or bitulithic. About $118,000. G. C. Pruett, Miles City, engr.

Mo., Independence—Jackson Co. soon lets contract building 2.1 mi. Washington Park Blvd., 16 ft. each side of railroad track, involving 53,409 cu.yd. borrow, 60,305 cu.yd. earth and 4,268 cu.yd. rock excav., 250,155 cu.yd. overhaul, 63 cu.yd. Class C concrete masonry, 330 cu.yd. rubble masonry, 3,957 lb. reinforcement for concrete masonry and 4,203 lin.ft. 15-18 in. rein.-con pipe culvert. Cost $124,094.

Texas—R. M. Hubbard, chn. State Highway Comn., Austin, soon lets contract gravel surfacing 11.06 mi. Highway 6, Federal Aid Project 113, Hill Co. About $55,000. R. J. Windrow, state highway engr.

Tex., Honey Grove—City soon lets contract furnishing labor and material for 18,750 sq.yd. paving, 7,000 ft. combined curb and gutter, 6,900 cu.yd. excav. and 4,000 sq.ft. sidewalk. H. Exall-Elrod Co., 209½ Lane St., Dallas, engrs. ,

Tex., Kingsville — Kleberg Co. having plans prepared grading, surfacing with caliche and gravel and building rein.-con. drainage structures on 19.6 mi. Highway 12, from Nueces Co. south to county line, 16 ft. wide, involving 40 acres clearing and grubbing, 12,377 cu.yd. earth, 100 cu.yd. rock and 1,706 cu.yd. structural excav., 342,658 lb. reinforcing steel, 2,149 cu.yd. Class "A," 818 cu.yd. Class "B" and 4.6 cu.yd. Class "C" concrete, etc. About $430,000. H. C. Porter, Kingsville, engr.

Okla., Ada—Pontotoc Co. voted $30,000 bonds to build highway between here and Allen. Engineer not selected.

Okla., Cushing—City having plans prepared for 10,000 sq.yd. concrete and 50,000 sq.yd. brick paving, in various streets. C. A. Wood, Stillwater, engr.

Okla., Hugo—City voted $350,000 bonds to build roads. Engineer not selected.

Okla., Marlow—City voted $40,000 bonds to build several miles of new sidewalks. Engineer will be selected soon.

Okla., Miami—Ottawa Co. voted $40,000 bonds to extend Miami-Afton Highway to Delaware Co. line, concrete, also extend road from Afton to Craig Co. line. Engineer not selected.

Okla., Muskogee—City having plans prepared paving various streets. Bonds for $200,000 voted for project. H. H. White, city engr.

Okla., Oklahoma — Oklahoma Co. election March 30, to vote on $750,000 bonds to build roads. Engineer not selected.

Okla., Stilwell—Comrs. Adair Co. having plans prepared by State Highway Engr., Oklahoma, building 18 mi. state road from here to south line of Adair Co. Bonds for $550,000 voted for project.

Washington — State Highway Comn., Olympia, rejected only bid received March 3, clearing, grading, draining and paving 4 mi. Olympic Highway from Montesano to Brady, Grays Harbor Co., involving 160.15 cu.yd. concrete, 21,070 cu.yd. earth excav., 44,340 cu.yd. overhaul and 15,400 lb. reinforcing steel. J. Allen, state highway engr.

Wash., Colfax—Whitman Co. soon lets contract building 7.6 mi. Sect. A and 7.6 mi. Sect. B, Improved Rd. 4, from here to Diamond, involving 35,778 cu.yd. crushed rock. T. Mead, Colfax, engr.

Wash., Newport—Pend O'Reille Co. receives bids about April 5, building 1 mi. Permanent Highway 5, gravel surface. About $10,000. J. C. Stegner, Newport, engr.

Wash., Newport—Pend O'Reille Co. receives bids about June 1, building 1.1 mi. Permanent Highway 6 near Metaline Falls, gravel surface. About $10,000. J. C. Stegner, Newport, engr.

Wash., Seattle—Comrs. King Co. soon receive bids widening and surfacing 6.03 mi. Fenton-Maple Valley Rd., 20 ft. wide, involving 56,000 cu.yd. earth excav. and 9,500 cu.yd. gravel. About 65,000. S. J. Humes, Seattle, engr.

Cal., Martinez—City rescinded contract let to J. T. Sayles, Martinez, improving Smith St., owing to flaw in announcement for bids. Work will be readvertised. Noted March 4.

Cal., Modesto—Bd. Supervs. Stanislaus Co. rejected bid surfacing with bitucrete 10 mi. Modesto-Empire and Crows Landing Rds., 18 ft. wide. Bids will probably be readvertised.

Cal., Napa—Bd. Supervs. Napa Co. having surveys made for widening roads between St. Helena and Chiles, and between Pope Valley and Aetna Springs, to 20 ft. width, and reducing grades to maximum of 7 per cent. Cost to exceed $20,000. J. A. Daley, clk.

Cal., Nevada City—Bd. Supervs. Nevada Co. soon lets contract paving 24 mi. county highway between Grass Valley and Auburn, 20 ft. wide. About $100,000.

Cal., San Diego—City plans to improve Laurel, Curlew, Union, Brant and Kalmia Sts., 52 ft. wide, involving ¾ in. asphaltic oil and rock screenings wearing surface on 4 in. bituminous base, 4-16 in. c.i. water mains, together with service connections, fire hydrants, etc., and sewer laterals. About $60,000. F. A. Rhodes, city engr.

Cal., Santa Cruz — Bd. Supervs. Santa Cruz Co. soon receives bids building 8 mi. Santa Cruz-Chittenden Rd., from point 7.09 mi. east of here to Aptos. Cost to exceed, $50,000. H. H. Miller, clk.

Cal., Turlock—City passed resolution to pave Line St. from South Bway. to West Main Sts., 1½ in. warrenite bitulithic surface on 4 in. concrete base, concrete gutters. Cost to exceed $10,000. A. P. Ferguson, clk.

Ontario—Dept. Pub. Highways, Toronto soon receives bids paving 126 mi. Talbot Rd. from Windsor to St. Louis, 16 mi. road from St. Thomas to London, 105.5 mi. Maidstone to Lambeth, 141 mi. St. Thomas to Niagara Falls, 27 mi. Jarvis to Hamilton, 27 mi. Hamilton to Chatsworth, 64.5 mi. Arthur to Kincardine, 62.7 mi. Sarnia to Rd. 11, 77 mi. Stratford to Brampton, 32 mi. Hamilton to Kitchener, 47.5 mi. Stratford to London, 42.5 mi. Stratford to Goderich, 37 mi. from Toronto to Hamilton, Dundas St., 102.4 mi. Cooksville to Owen Sound, 55 mi. Brantford to Severn River, 11.8 mi. Toronto to Rouge River, 36.5 mi. Whitby to Lindsay, 26.8 mi. Port Hope to Peterboro, 102 mi. Kingston to Ottawa, 69.5 mi. Ottawa to Point Fortune, 89 mi. Ottawa to Pembroke, asphalt, concrete, waterbound macadam and bituminous macadam. About $6,000,000. G. Hogarth, c/o highways, engr.

Ont., Galetta—Carleton Co. plans to expend $180,000 to build waterbound macadam roads, and $60,000 to repair former toll roads. S. McLure, Galetta, engr.

Ont., Ottawa—City plans to resurface and repair asphalt pavement on Clarence St. between Sussex and Parent Sts., cost $14,000, Laurier Ave. between Elgin St. and Laurier Ave. bridge, $6,000; asphalt pavement on Wellington St. between westerly limit of property acquired by Dominion Government and Pooley's Bridge and upon said bridge, $37,000; new concrete sidewalks and asphalt pavement on Somerset St. between Bank and Bay Sts., $40,000.

Ont., Windsor—City election March 22 to vote on $40,000 bonds to pave 150,000 sq.ft. granolithic concrete sidewalks. M. E. Brian, city engr.

BIDS DESIRED

Vt., Rutland—Until March 22, by D. D. Snyder, comr. Pub. Wks., for 2,925 sq yd. brick paving.

Rhode Island—Until March 31, by State Bd. Pub. Rds., State House, Providence, improving 15,480 ft. Putnam Pike, Gloucester Twp., Sect. 1, beginning at bridge in Chepachet Village and extending 11,180 ft. west, Sect. 2, beginning 2.4 mi. west of above section and extending 4,300 ft. west involving 10,000 cu.yd. earth and 1,000 cu.yd. ledge excav., 7,400 cu.yd. stone and 800 cu.yd. gravel foundation, 2,000 lin.ft. sub drain, 6,200 ton crushed stone, 31,200 sq.yd. bituminous concrete surface, etc.; 2.57 mi. East Main Rd., Portsmouth and Middletown Twps., beginning 1,200 ft. north of Union Meeting House Lane, Portsmouth, and extending south, involving 12,000 cu.yd. earth excav., 7,400 cu yd. stone foundation, 7,800 ton crushed stone, 74,500 gal. bituminous macadam to be furnished by State; advertised in this issue.

N. Y., Brooklyn—Until March 24, by E. Riegelmann, boro. pres., regulating and paving with permanent asphalt on 6 in. concrete foundation, roadway of Bay 32nd St. from Bath to Bensons Aves., regulating and grading Stillwell Ave. from Neptune to Canal Aves., regulating, grading and curbing Stillwell Ave. from Neptune to Surf Aves.

N. Y., Buffalo—Until March 29, by G. H. Norton, city engr., paving 1,737 ft. Vanderbilt St., 26 ft. wide, involving 5,071 sq.yd. German rock on concrete base, 3,254 lin.ft. Medina sandstone curbing, 3,058 cu.yd. earth excav. About $26,045.

N. Y., Buffalo—Until March 29, by city, paving 1,300 ft. Grove Ave., 26 ft. wide, involving 1,965 cu.yd. earth excav., 2,528 lin.ft. Medina sandstone curbing, 3,760 sq.yd. vitr. brick or asphalt on concrete base, cost, $19,500; 1,511 ft. Eller Ave., 26 ft. wide, 2,231 cu.yd. earth excav., 2,964 lin.ft. Medina sandstone curbing, 4,377 sq.yd. vitr. brick or asphalt on concrete base, $22,665; 563 ft. Manitoba St., 26 ft. wide, 881 cu.yd. earth excav., 1,046 lin.ft. Medina sandstone curbing, 1,640 sq.yd. vitr. brick or asphalt on concrete base, $8,000; 956 ft. Blake St., 26 ft. wide, 1,295 cu.yd earth excav. 1,892 lin.ft. Medina sandstone curbing, 2,767 sq.yd. vitr. brick or asphalt on concrete base, $14,340; 667 ft. Trenton Ave., 26 ft. wide, 1,294 lin.ft. Medina sandstone curbing, 1,936 sq.yd. vitr. brick or asphalt on concrete base, $10,000. G. H. Norton, city engr.

N. Y., New York—Until March 25, by H. Bruckner, pres. Bronx Boro., paving with sheet asphalt on cement concrete foundation and adjusting curb, roadway of Willow Ave. from 132nd to 138th Sts., with bituminous concrete on cement concrete foundation, East 169th St. from Clay to Teller Aves., with sheet asphalt on concrete foundation, from teller to Grant Aves., with bituminous concrete and cement concrete foundation, Baker Ave. from White Plains Rd. to Garfield St., with granite blocks on sand foundation, East 141st St. from Rider to Park Aves., also regulating, grading, setting curb, laying sidewalks and crosswalks, building receiving basins, inlets, drains, culverts, approaches and guard rails, Hunt Ave. from Morris Park to Bronxdale Aves., Rhinelander Ave. from Hunt Ave. to White Plains Rd., Rhinelander Ave. from Hunt to Bronxdale Aves.

N. Y., New York—Until March 25, by H. H. Curran, pres. Manhattan Boro., regulating and repaving with granite blocks on concrete foundation, roadway of Catharine St. from Cherry to Oaks Sts., Monroe to Madison Sts. and Henry to Division Sts.

N. Y., New York—Until March 25, by G. A. Whalen, comr. Plants & Structures, Municipal Bldg., reconstructing portions of pavement on Queens approach and plaza of Queensboro Bridge.

N. J., Mays Landing—Until April 14, by Bd. Freeholders Atlantic Co., at meeting room of board, 523 Guarantee Trust Bldg., Atlantic City, building 8.094 mi. Pleasantville-Mays Landing Rd., involving 32,052 cu.yd. evcav., 94,967 sq.yd. 2 in. bituminous pavement on 6 in. concrete base, etc. F. W. Willetts, clk.; advertised in this issue.

N. J., Somerville—Until April 8, by Bd. Freeholders Somerset Co., building concrete road in Bernards Twp., involving 25,505 sq.yd. paving on earth and old macadam foundation. F. W. Remsen, dir.; advertised in this issue.

Pa., Pittsburgh — Until March 22, by Dept. Pub. Wks., grading, regrading, paving, repaving, curbing and otherwise improving East Ohio St. from Heinz St. to city line at Millvale Boro., Mount Oliver St. from South 18th to point 50 ft. north of Loyal Way; grading, paving and curbing Eberhardt Ave. from Froman St. to property line of easterly terminus, Blackhawk St. from Pocono St. to city line; building sewer in 26th St. from point 350 ft. northwest of Spruce Way to Allegheny River; resurfacing roadways in Highland Park; rebuilding retaining wall, Mansfield Ave. and Washington Playground along Bedford Ave.; structural repairs to Millvale Ave. Bridge, over Pennsylvania R.R.; constructing iron fence in Westinghouse Park, along Pennsylvania R.R. J. Swan, dir.

Maryland—Until March 30, by State Rds. Comn., 601 Garrett Bldg., Baltimore, grading and paving 1 mi. Monroe St. from Mosher St. to Elgin Ave. and Elgin Ave. from Monroe St. to Pennsylvania Ave., sheet asphalt, Baltimore City, Contr. BC-29-B. F. H. Zouck, chn.; advertised in this issue.

Maryland—Until March 30, by State Rd. Comn., Baltimore, resurfacing .90 mi. Baltimore-Washington Blvd. from Patapsco River Bridge to Elkridge Church, Howard Co., Contr., BW-B, sheet asphalt with 2 in. cobble shoulder along each side; 1.46 mi.

Streets and Roads (Continued)

Baltimore-Washington Blvd. from Bladensburg to D. C. Line, Prince George's Co., Contr. BW-C, sheet asphalt with 2 ft. concrete shoulder along each side. F. H. Zouck, chn.; advertised in this issue.

W. Va., Elizabeth—Until March 30, by Comrs. Wirt Co. improving 4 mi. Parkersburg-Elizabeth Rd., 26 ft. wide, involving 31,000 cu.yd. excav. About $35,000. I. P. Thorn, clk.

W. Va., Elkins—Until April 8, by Comrs. Randolph Co. improving 5.75 mi. Beverly Rd., 16 ft. wide, involving 53,970 sq.yd. bituminous macadam and 47,000 cu.yd. excav. No bids received March 2. About $125,000. F. A. Parsons, co. engr. Noted Feb. 19.

W. Va., Morgantown—Until March 29, by Monongalia Co. Court building 6.67 mi. road, involving 42,000 cu.yd. unclassified excav., 1,000 cu.yd. overhauling, 11,600 cu. yd. rein.-con. paving, 62,600 sq.yd. expanded metal reinforcing for pavements, 2,500 lb. reinforcing steel bars, 2,033 lin.ft. 12-24 in. vitr. tile culverts, 1,000 lin.ft. tile drain, etc.; advertised in this issue.

W. Va., Pt. Pleasant—Until April 5, by Comrs. Mason Co. improving 4.5 mi. Mason City-New Haven Rd., 16 ft. wide, involving 40,000 sq.yd. gravel macadam and 15,000 cu.yd. excav. About $55,000. B. E. McCowen, Mason City, engr.

W. Va., Winfield—Until March 29, by Comrs. Putnam Co. improving 2 mi. Teays Valley Rd., near Kanawha Co. line, 16 ft. wide, involving 18,700 sq.yd. concrete or bituminous macadam and 10,000 cu.yd. excav., cost, $48,000; 2 mi. Teays Valley Rd., near Mt. Vernon School, 16 ft. wide, involving 18,700 sq.yd. concrete or bituminous macadam and 12,000 cu.yd. excav. About $50,000. G. H. Davis, Hurricane, engr.

Ga., Carrollton—Until April 1, by Bd. Comrs. Rds. and Revenues Carroll Co., furnishing labor, material, equipment etc., for constructing 12.5 mi. sand clay road between sta. O to 420 and 570 to 791, Federal Aid Project No. 20, on Carrollton-Bowdon Rd. Work involves 5.33 acres clearing and grubbing, 83,552.8 cu.yd. common excav. and borrow, 558 cu.yd. rock excav., 1,057 lin.ft. 15-24 in. terra cotta pipe and 10 lin.ft. 24 in. c.i. pipe, 111.7 cu.yd. Class "B" concrete headwalls and bridges, 62,856 ft. lumber placed, 1,808 lb. sheet steel, etc. W. M. Robinson, chn.

Ga., La Grange—Until April 7, by Bd. Comrs. Rds. and Revenues, Troup Co., (La Grange) furnishing labor, material, equipment, etc., constructing 13.24 mi. sand clay road, between sta. 61 and 760, on La Grange-West Point Rd. Work involves 35.65 acres clearing and grubbing, 2,120 lin.ft. 15-24 in. pipe, 135.04 cu.yd. Class "B" concrete headwalls, 112.59 cu.yd. Class "A" concrete culverts, 7,882 lb. reinforcing steel culverts, 90,777 cu.yd. excav. and borrow, 1,400 cu.yd. solid rock excav., 33,000 cu.yd. top soil, 44 cu.yd. Class "A" and 146.4 cu.yd. Class "B" concrete in bridges, 16,308 lb. reinforcing steel in bridges, etc. W. T. Tuggle, clk.

Fla., Mayo—Until April 5, by Comrs. La Fayette Co. building 30 mi. hard surfaced road. C. A. Howell, ch.

Miss., Indianola—Until April 5, by Rd. Comrs. Supervs. Dist. 4, Sunflower Co., grading roads 3, 6, 7, 12, 14, 15, 16 and 17; graveling roads 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16 and 17. W. C. Hudson, Grenada, engr.; advertised in this issue.

Tennessee—Until April 2, by Dept. Highways, Nashville, building 20.466 mi. State Highway 1, Lewis and Lawrence Counties, involving 85,505 cu.yd. excav. and 32,324 lb. steel bars; 8.314 mi. State Highway 23 between Morristown and Hamblen-Jefferson Co. line, 78,544 sq.yd. bituminous macadam surface course, 61,400 sq.yd. reconstructed base and 78,544 sq.yd. broken stone base; 5.666 mi. State Highway 35, between Alamo and Bells, 52,968 sq.yd. bituminous macadam surfacing, 23,878 cu.yd. excav. and 52,968 sq.yd. broken stone or gravel base. W. P. Moore, ch. engr.

Ky., Flemingsburg—Until March 20, by R. Cassidy, engr. Fleming Co., building 7,000 ft. Caywood and Clark Dirt Rd. 5, 14 ft. wide, macadam.

Ky., Winchester—Until April 2, by city, improving 75,000 sq.yd. various streets, asphalt, vitr. brick or concrete. G. T. Horine, city engr.; advertised in this issue.

O., Canal Winchester—Until March 22, by G. M. Herbst, village clk., grading, draining and paving High St. from Columbus to Oak Sts., involving 3,214 cu.yd. grading, 6,597 sq.yd. brick, concrete or some form of asphaltic pavement, 104 lin.ft. circular and 1,402 lin.ft. straight curb, and 1,110 lin.ft. 6 in. tile drain. Jennings-Lawrence Co., Hartmann Bldg., Columbus, engr.

O., De Graff—Until March 30, by W. J. Gessener, village clk., grading, curbing and paving 1,061 ft. Main St., 38 ft. wide, asphalt or concrete, cost, $17,000; 660 ft. Hayes St., 38 ft. wide, concrete, brick or asphalt, $3,000; 3,700 ft. Miami St., 18 and 24 ft. wide, brick, concrete or asphalt, $48,000. Jennings-Lawrence Co., Hartman Bldg., Columbus, engrs.

Indiana — By Bd. Co. Comrs. building roads in following counties:

March 20, Rush Co., Rushville, F. Goddard et al Rd., macadam, Richland Twp. W. H. McMillen, aud.

March 23, Allen Co., Ft. Wayne, 11,510 ft. Matthews No. 3 Rd., stone, Eel River Twp. A C. McCoy, aud.

April 5, Switzerland Co., Vevay, 15,830 ft., G. Scott et al Rd., stone, York Twp. W. A. Reeves, aud.

1750 Contracts were let

in the first 11 weeks of 1920, valued at $382,000,000. None of these jobs was for less than $10,000 and a number exceeded a million each, and all were noted in the Construction News Section of Engineering News-Record.

Did you win one of those contracts?

Are you following up the proposals *printed for your benefit* every week?

In a few months many of these proposals will become CONTRACTS LET.

Are you going to be one of the successful contractors?

Jackson Co., Brownstown, 6,900 ft. H. F. Ahlert et al Rd., gravel, Redding Twp. A. Luedtke, aud.

Warren Co., Williamsport, 15,152 ft. R. Silva et al Rd., gravel, Kent Twp.; 14,505 ft. J. Frasch et al Rd., Adams Twp.; 10,739 ft. W. Brown et al Rd., Liberty Twp.; 11,930 ft. J. C. Hazlet et al Rd., Pine Twp. W. H. Stephens, aud.

Jasper Co., Rensselaer, C. Spencer et al Rd., Milroy Twp.; J. E. Thomas et al Rd., Newton Twp.; E. S. Thornton et al Rd., Newton Twp.; G. L. Thornton et al Rd., Newton and Marion Twps.; R. V. Halstead et al Rd., Newton Twp.; L. E. Harrington et al Rd., Union Twp.; Erwin et al Rd., Union Twp.; C. L. Hensler et al Rd., Jordan and Carpenter Twps.; J. E. Murpby et al Rd., Union, Newton and Marion Twps.; J. F. Payne et al Rd., Barkley Twp. S. C. Robinson, aud.

April 6, Harrison Co., Corydon, H. Fessel Rd., stone, Morgan Twp.; J. Alstot Rd., Jackson Twp. S. C. Mauck, aud.

Warrick Co., Boonville, F. Phillips et al Rd., rock, Skelton Twp.; A. Fisher et al Rd., Campbell Twp. W. A. Campbell, aud.

Starke Co., Knox, Roney and Raschka Rd., Railroad and California Twps. C. W. Weninger, aud.

★**Indiana**—Bd. Co. Comrs. let contracts building J. Latshaw et al Rd., Sullivan Co., to Gorse Lovelace & Son, Shelburn, cost $22,800; Pierson et al Rd., Hendricks Co., to D. H. Fatout, Indianapolis, $22,000; Barker Rd., macadam, Newton Co., to B. F. Roberts, Rensselaer, $19,546; J. C. Fella et al Rd., Grass Twp., Spencer Co., to F. Burgman, Chrisney, $78,975; C. E. Jacobs Rd., stone, Hette Twp., Harrison Co., to Miller Bros., Mauckport, $14,200; R. Moffett et al Rd., Whitewater Twp., Franklin Co., to L. J. Bacon, Cedar Grove, $26,647; New Philadelphia and Little York Rds., Franklin and Gibson Twps., Washington Co., to T. Ratts, Salem, $21,081; C. H. Caton et al County Unit Rd., Springfield and Bloomington Twps., La Grange Co., to W. C. Meneeley, Frankfort, $133,639; Sects. A and B, J. D. Sturm et al Rd., concrete, Helt and Clinton Twps., Vermillion Co., to C. W. Clark, $240,000; Sect. C, to C. E. Gerard, $146,200; Sect. D, to S. B. Royse, $69,500; Scharpenberg Rd., Adams and Jefferson Twps., Allen Co., to Heckler & Lindemuth, Ft. Wayne, $73,989; Lake Rd., Kentucky rock asphalt, Pleasant Twp., Wabash Co., to Grossicht Constr. Co., North Manchester, $29,999; A. Bechtold Rd., concrete, Chester Twp., to J. P. O'Conner, Ft. Wayne, $63,770; J. E. Lackey Rd., Cass and White Twps., Pulaski Co., to T. Reimenschneider, Winamac, $41,868; C. Kain Rd., White Post and Jefferson Twps., to C. Horsel, Monterey, $14,996.

Michigan—Until March 22, by F. F. Rogers, state highway comr., at dist. office of State Highway Dept., 1-2 Majestic Bldg., Port Huron, grading, draining and surfacing 16.614 mi. Federal Aid Project 38, Sects. A and B, 18 ft. wide, St. Clair Co. Sect. A involves 37,979 cu.yd. earth excav., 150 yd. sta. overhaul, 1,257 lin.ft. 12-15 in. encased tile culvert, 600 lin.ft. 12-30 in. vitr. tile drain, 85,884 sq.yd. concrete pavement, 12,253 lb. steel reinforcement, 282.4 cu.yd. 1:2:4 and 418.7 cu.yd. 1:3:6 concrete, etc., alternate bids, 745 lin.ft. 12-15 in. corrugated metal culvert, 85,884 sq.yd. bituminous concrete pavement; Sect. B, involves 50,381 cu.yd. earth excav., 995 yd. sta. overhaul, 909 lin.ft. 12-15 in. encased tile culvert, 88,728 sq.yd. concrete pavement, 29,488 lb. steel reinforcement, 360.3 cu.yd. 1:2:4, 267.8 cu.yd. 1:2½:5 and 346.3 cu.yd. 1:3:6 concrete, etc., alternate bids, 648 lin. ft. 12-15 in. corrugated metal culvert and 88,728 sq.yd. bituminous concrete pavement. Noted Feb. 19.

Michigan — Until March 26, by F. F. Rogers, state highway comr., at office of Bd. Rd. Comrs. Berrien Co., St. Joseph, grading, draining and surfacing .829 mi. State Trunk Line Rd. 58-2, 20 ft. wide, involving 9,624 sq.yd. vitr. brick, concrete or bituminous concrete; 1.23 mi. State Trunk Line Rd. 11-11, 20 ft. wide, involving 14,171 sq.yd. concrete or bituminous concrete, 3,233 cu.yd. earth excav., 66 cu.yd. 1:2:4 concrete, etc. Noted Feb. 5.

Mich., Harrison—Until March 31, by J. W. Wilson, clk. Clare Co., grading, shaping, draining and surfacing 2½ mi. State Reward Rd., 12 ft. wide, involving 17,600 sq.yd. gravel. About $50,000.

Mich., Hillsdale—Until March 22, by W. J. LaBarre, city clk., shaping, draining and paving 2,800 ft. Main St., 26 ft. wide, involving 7,636 sq.yd. vitr. brick, sheet asphalt or asphaltic concrete. About $50,000. Noted March 11.

Mich., Saginaw—Until March 22, by Bd. Rd. Comrs. Saginaw Co., grading, draining and surfacing Rd. 27, 12 ft. wide, 2.99 mi. waterbound macadam and .98 mi. bituminous macadam or concrete; 1.2 mi. Rd. 38, 18 ft. wide, bituminous macadam or concrete; 3.054 mi. Rd. 39, 12 ft. wide, stone or shale gravel; 5.009 mi. Rd 40, 12 ft. wide gravel or stone gravel; 1.947 mi. Rd. 41, 12 ft. wide, stone gravel or waterbound macadam. R. W. Roberts, 210 Schriners Bldg., engr.

Wisconsin—Until March 23, at div. office of State Highway Dept., Stephenson Bldg., Milwaukee, grading and paving 3.04 mi. Milwaukee-Madison Rd., Federal Aid Project 110, Waukesha Co., involving 13,005 cu. yd. earth and 145 cu.yd. borrow excav., 134 cu.yd. Class "A" concrete, 31,562 sq.yd. concrete, 31,562 sq.yd. concrete surfacing, 18 ft. wide, etc.; Geneva Rd., Federal Aid

Streets and Roads (Continued)

Project 162, Kenosha Co., 21,200 cu.yd. earth excav., 202 cu.yd. Class "A" concrete, 31,768 sq.yd. concrete surfacing, 18 ft. wide, etc.

Wis., Janesville—Until March 23, by Bd. Pub. Wks., furnishing labor and material for improving following streets:

North 1st St. from North Main to North Bluff Sts., involving 275 cu.yd. excav. and 1,176 sq.yd. paving.

West Milwaukee St. from Academy St. to Chicago & Northwestern Ry tracks, at Center Ave., Center Ave. from West Milwaukee to Center Sts., involving 1,675 cu.-yd. excav., 6,752 sq.yd. paving, 1,329 lin.ft. combined cement curb and gutter and 98 lin.ft. cement gutter flag.

Pleasant St. from Court St. Bridge to Franklin St., South Franklin St. from Pleasant to West Milwaukee Sts., North Franklin St. from West Milwaukee to West Bluff Sts., Corn Exch. from West Milwaukee to North Franklin Sts., involving 1,775 cu.yd. excav., 6,619 sq.yd. paving exclusive of 1,009 sq.yd. to be paved by Street Ry Co., 600 sq.yd. paving relaid, 673 lin.ft. combined cement curb and gutter and 2,798 lin.ft. cement gutter flag.

South Bluff St. from Court to East Milwaukee Sts., North Bluff St from East Milwaukee to North 1st Sts., involving 800 cu.yd. excav., 3,281 sq.yd. paving, 158 lin.ft. combined cement curb and gutter and 1,271 lin.ft. cement gutter flag.

East St. from Oakland Ave. to Wells St., involving 200 cu.yd. excav., 1,732 sq.yd. paving and 1,155 lin.ft. combined cement curb and gutter.

Racine St. from South Main St. to Racine St. Bridge, Galena St. from South Kranklin St. to Racine St. Bridge, Galena St. from Franklin to Jackson Sts., involving 950 cu.yd. excav., 3,890 sq.yd. paving and 338 lin.ft. combined cement curb and gutter.

South Franklin St. From Galena St to Western Ave., Western Ave. from Jackson St. to Chicago & Northwestern Ry. tracks, at Franklin St., involving 1,600 cu.yd. excav., 6,472 sq.yd. paving, exclusive of about 503 sq.yd. paving to be laid by Street Ry. Co. and 931 lin.ft. combined cement curb and gutter.

Dodge St. from South Franklin to South River Sts., involving 275 cu.yd. excav., 1,131 sq.yd. paving and 514 lin.ft. cement gutter flag.

North Franklin St. from West Bluff St. to Mineral Point Ave., Mineral Point Ave. from North River to Washington Sts., Madison St. from Jackson St. to Mineral Point Ave., involving 2,300 cu.yd. excav., 9,326 sq.yd. paving, exclusive of about 41 sq.yd. to be laid by Street Ry. Co., 1,015 lin.ft. combined cement curb and gutter and 1,972 lin.ft. cement gutter flag.

South Jackson St. from West Milwaukee St. to Jackson St. Bridge, North Jackson St. from West Milwaukee St. to Mineral Point Ave., involving 6,200 cu.yd. excav., 25,305 sq.yd. paving, exclusive of about 865 sq.yd. paving to be laid by Street Ry. Co., 490 lin.ft. combined cement curb and gutter and 5,494 lin.ft. cement gutter flag.

Center Ave. from Center St. to Center Ave. Bridge, involving 3,050 cu.yd. excav., 12,487 sq.yd. paving, 983 lin.ft. combined cement curb and gutter and 3,282 lin.ft. integral curb.

Wisconsin—Until March 24, at div. office of State Highway Dept., Wilner Bldg., Green Bay, grading and paving 7.82 mi. Pembine-Niagara Rd., Federal Aid Project 129, Marinette Co., involving 26 acres clearing and grubbing, 48,869 cu.yd. earth, 2,445 cu.yd. borrow and 3,940 cu.yd. rock excav. and 138 cu.yd. Class "A" concrete; 5.02 mi. Appleton-Shawano Rd., Federal Aid Project 117, Shawano Co., 2.23 acres clearing and grubbing, 32,430 cu.yd. earth and 563 cu.yd. borrow excav., 235 cu.yd. Class "A" concrete in culverts, 215 cu.yd. Class "A" concrete in bridges, 44,167 sq.yd. gravel surfacing, etc.

Wisconsin—Until March 25, at div. office of State Highway Dept., Court House, Rhinelander, grading and paving Eagle River-Woodruff Rd., Federal Aid Project 146, Vilas Co., involving 17,236 cu.yd earth and 903 cu.yd. borrow excav., 54 cu.yd. Class "A" concrete in culverts, one 65 ft. and one 70 ft. steel truss bridge, 85,000 lb. steel, 49,903 cu.yd. surfacing, etc.; 9.5 mi. Woodruff-Fifield Rd., Federal Aid Project 165 Vilas Co., 57.65 acres clearing and grubbing, 50,803 cu.yd. earth and 2,587 cu.yd borrow excav., etc.; 5.51 mi. Fifield-Radisson Rd., Federal Aid Project 130, Price Co., 33.37 acres clearing and grubbing, 45,741 cu.yd. earth excav., 362 cu.yd. Class "A" concrete, etc.; 4.6 mi. Rhinelander-Eagle River Rd., Federal Aid Project 170, Oneida Co., involving 10,919 cu.yd. earth and 606 cu.yd. borrow excav., 170 cu.yd. Class "A" concrete, 41,020 sq.yd. gravel surfacing, etc.; 4.47 mi. Pelican-Crandon Rd., Federal Aid Project 73, Forest Co., 1.82 acres clearing and grubbing, 13,167 cu.yd. earth excav., 3,685 cu.yd. gravel, 80 cu.yd. Class "A" concrete, 62,823 sq.yd. gravel surfacing, etc.; 3.18 mi. Crandon-Laona Rd., Federal Aid Project 155, Forest Co., 13.5 acres clearing and grubbing, 14,239 cu. yd. earth excav., 95 cu.yd. Class "A" concrete, 44,797 sq.yd. feather edge gravel surfacing, etc.

Wisconsin—Until March 26, at div. office of State Highway Dept., Citizens Natl. Bank Bldg., Grand Rapids, grading and paving 5.45 mi. Appleton-Waupaca Rd., Federal Aid Project 70, Waupaca Co., involving 16,006 cu.yd. earth and 360 cu.yd. borrow excav., 308 cu.yd. Class "A" concrete, 57,448 sq.yd. concrete surfacing, 18 ft. wide, etc.; 2.32 mi. Portage-Stevens Point Rd., Federal Aid Project 133, Waushara Co., 11,340 cu.yd. earth excav., 29 cu.yd. Class "A" concrete, 21,768 sq.yd. surfacing, 16 ft. wide, etc.; 4.5 mi. Kilbourn-Friendship Rd., Federal Aid Project 131, Adams Co., 0.05 acres clearing and grubbing, 17,215 cu.yd. earth, 1,083 cu.yd. rock and 19 cu.yd borrow excav., 379 cu.yd. Class "A" concrete, 42,221 sq.yd. surfacing, 18 ft. wide, etc.

Wis., Janesville—Until March 23, by C. V. Kerch, city engr., paving various streets, involving 15,145 sq.yd. vitr. brick or 3 in. fibre brick, 63,620 sq.yd sheet asphalt, brick, asphaltic concrete or rein.-con.

Ia., Davenport—Until March 25, by Auditor Scott Co., building 21.70 mi. rural highways, involving 632,900 cu.yd. trenching and shoulders, 54,335 cu.yd. earth, 9,442 cu.yd. loose rock and 262 cu.yd. solid rock excav., 228,114 sq.yd. paving and 37,400 lin-ft. tiling. J. M. Malloy, Davenport, engr.

Ia., Des Moines—Until March 22, by City Council, paving South West 21st St. (Bloomfield Rd.) from end of present pavement to Watrous Ave., involving 9,333 sq.yd. No. 1 vitr. brick or block on Portland cement concrete foundation, with asphaltic filler. J. P. Maher, clk.

Minn., East Grand Forks—Until March 23, by A. N. Briggs, city clk., paving various streets in Dists. 2 and 3, involving 8,600 cu.yd. grading,, 40,000 sq.yd. cement concrete, bitulithic and asphaltic concrete, 9,140 lin ft. curbing. About $70,000.

Minn., Fergus Falls—Until April 1, by W. Lincoln, aud. Otter Tail Co., building ½ mile State Rd. 1, Job 1908, 24 ft. wide, involving 21,922 cu.yd. excav., 5,875 lin.ft. guard rail, 287 lin.ft. 15-24 in. concrete culverts, cost $11,000; 8.45 mi. Federal Aid Project 160, Job 2002, 24 ft. wide, 44,000 cu. yd. excav., 8,100 lin.ft. guard rail, 610 lin.ft. 15 and 18 in. concrete culverts, 5,500 cu.yd. clay surfacing and one 60 ft. concrete bridge, $30,000; 9 mi. Federal Aid Project 159, Job 2001, 24 ft. wide, 33,000 cu. yd. excav., 7,500 lin.ft. guard rail, 742 lin.ft. 15-24 in. concrete culverts, $27,000. A L. Flygard, Fergus Falls, engr.

Minn., Little Falls—Until March 31, by B. Y. McNairy, aud. Morrison Co., building 8 mi Federal Aid Project 24, State Rd. 3, Job 4, 24 ft. wide, involving 36,794 cu.yd. excav., 22,176 cu.yd. overhaul, 1,540 lin.ft. guard rail, 1,006 cu.yd. gravel surfacing, 44,300 lin.ft. shaping and compacking, etc. About $26,000. J. E. Viher, Little Falls, engr.

Minn., Long Prairie—Until April 5, by E. M. Berg, aud. Todd Co., building 13.5 mi. Federal Aid Project 98, 24 ft. wide, involving 84 acres clearing and grubbing, 71,745 cu.yd. excav., 62,321 cu.yd. overhaul bridges, culverts, etc. About $100,000 A. M. Graven, Long Prairie, engr.

Minn., Mora—Until March 30, by A. V. Sander, aud. Kanabec Co., building 16 mi. Federal Aid Project 91, State Rd. 2, 24 ft. wide, involving 98,131 cu.yd. excav., 5,323 cu.yd. hand ditching, 6,650 lin.ft. guard rail, 26,857 cu.yd. gravel surfacing, three 55 ft. rein.-con. spans and Bridge 3154. About $96,000. R. G. Streetly, Mora, engr.

★**Minn., Redwood Falls**—H. W Ward, city recdr., let contract to Johnson, Drake & Piper, 905 Plymouth Bldg., Minneapolis, paving 24 blocks, 18 ft. wide, involving, reinforced crushed stone, at $3.65 per sq-yd. Noted Jan. 29.

Minn., Winona—Until March 25, by A. Baeuerlen, aud. Winona Co., building Federal Aid Project 8, State Rd. 1, 24 ft. wide, involving 9 acres clearing, 12 acres grubbing, 63,671 cu.yd. earth, 22,700 cu.yd. loose rock and 11,700 cu.yd. solid rock excav., 36,270 cu.yd. overhaul, 100 cu.yd. riprap, etc., also Bridges 2,865, 2,866, and 3,044, each 30 ft. concrete span, and Bridge 3,043, 16 ft. span. About $110,000. H. B. Childs, Winona, engr

Kan., Meade—Until April 30, by Comrs. Meade Co., grading 5,309 mi. Kansas-California Highway, Federal Aid Project 42, Sects. A and B, 24 ft. wide, also building necessary bridges and culverts on same. Sect. A involves 112 cu.yd. concrete, 4.3 ton steel and 445 cu.yd earth excav., Sect. B., 643 cu.yd. concrete, 410 cu.yd. earth excav. and 22.73 ton steel. About $50,000 M. Black, Meade, engr.

Mo., Clayton—Until March 31, by Clerk St. Louis Co., grading and paving 4,229 ft. Big Bend Rd. from Manchester Rd. to bridge over River des Peres, 2 course concrete, 21 ft. wide. W. Elgring, highway engr

Mo., Jefferson City—Until April 5, by city, paving (1) 1 block Madison St. from High to McCarty Sts., 55 ft. wide, involving 2,796 sq.yd. vertical fibre brick on 4 in. cement concrete base; (2) 1 block Bway. from High to Main Sts., 60 ft. wide, 3,317 sq.yd. vetrical fibre brick on 4 in. cement concrete base, (3) 1 block Harrison St. from Main to Water Sts., 48 ft. wide, 2,227 sq.yd. vertical fibre brick on 4 in. cement concrete base, (1) 1 block High St. from Bway. to Mulberry St., 40 ft. wide, 2,260 sq.yd. vertical fibre brick on 4 in. cement concrete base, (5) 1 block Havana St. from Main to McCarty Sts., 1,900 cu.yd. earth excav., 1,300 lin ft. curbing and guttering and 1,550 sq.yd. asphalt macadam; scarifying, harrowing, rolling and paving, (6) Main St. from Brooks St. to city limit, 16,600 sq.yd. 3 in. asphaltic macadam, (7) Clark Ave. from McCarty to Miller Sts., 1,480 sq.yd. 3 in. asphaltic macadam. L. F. Brown, city engr. Noted Feb. 12.

Wyoming—Until March 23, by D. S. McCalman, supt. State Highway Dept., Capitol Bldg., Cheyenne, building 2.407 mi. Federal Aid 60, Medicine Bow, Carbon Co.; 4.012 mi. Federal Aid 55, Lincoln Highway from Evanston west, Uinta Co.; 7.169 mi. Federal Aid 56, Yellowstone Highway, Converse Co.; 9.476 mi. Federal Aid 73, Yellowstone Highway, Cheyenne-Greeley Rd., Laramie Co.; 4.281 mi. Federal Aid 68, Yellowstone Highway, Hot Springs Co.; 43.9 mi. Federal Aid 49, Lincoln Highway, Sweetwater Co.; 72 ft. long, Federal Aid Bridge 77, over Haymakers Gulch, 5 mi. from Riverton, Fremont Co., to have two 36 ft. spans; 6.084 mi. Federal Aid 63, Yellowstone Highway, Park Co.; 21.617 mi. Federal Aid 44 and 59, Lincoln Highway, from Medicine Bow River west to crossing of Hanna-Elk Mountain Rd., Carbon Co.; 3.562 mi. Federal Aid 57, Yellowstone Highway, from Orin Jct. to McKinley, Converse Co.

Ark., Hot Springs—Until April 10, by Bd. Comrs. Street Impvt. Dist. 47, c/o J. B. Foote, secy., Security Bank, for 38,563 sq.yd. various kinds of pavements, 13,331 lin.ft. integral curbing and guttering, 7,935 lin.ft. guttering, 3,482 cu.yd. excav., 3,500 lin.ft. 12-30 in. No. 1 tile and 170 lin.ft. concrete arch, etc. G. C. Smith, Hot Springs, engr.; advertised in this issue.

Ark., Hot Springs—Until April 10, by Bd. Comrs. Street Impvt. Dist. 44, c/o J. B Foote, secy., Security Bank, for 8,600 cu.yd. grading, 39,653 sq.yd. paving, 8,829 lin.ft. curbing and 1,150 lin. ft. 12-24 in. pipe, etc. Fordyce & Feild, Hot Springs, engrs.; advertised in this issue.

Ark., Hot Springs—Until April 10, by Bd. Comrs. Street Impvt. Dist. 48, c/o J. B. Foote, secy., Security Bank, for 5,840 cu.yd. grading, 22,267 sq.yd. paving, 8,354 lin.ft. curbing, 1,052 cu.yd. rein.-con. in culvert, etc. Fordyce & Feild, Hot Springs, engrs.; advertised in this issue.

Tex., Dallas—Until March 29, by Comrs. Dallas Co., grading, draining, etc., 11.3 mi. Dallas-Denton Rd., 18 ft. wide, involving 4.8 acres clearing and grubbing, 41,381 cu.yd. excavating, 45,214 cu.yd. overhaul in drainage structures, 795.45 cu.yd. Class "A" and 322.64 cu.yd. Class "B" concrete, 105,102 lb. reinforcing steel, cost to exceed $300,000; 8.9 mi. Dallas-Seyene Rd., 18 ft. wide, involving 7.34 acres clearing and grubbing, 53,500 cu.yd. earth and 260,063 cu.yd. rock excav., 1,137.44 cu.yd. Class "A" and 703.59 cu.yd. Class "B" concrete, 166,593 lb. reinforcing steel, etc., cost to exceed $300,000. W. J. Powell Co., Dallas, engrs Noted Feb. 9.

Tex., Hillsboro—Until March 23, by Comrs. Hill Co., improving 59 mi. highways, 8 ft. wide, involving 1,200 cu.yd. concrete drainage structures, 270,000 cu.yd. grading and 50,500 cu.yd. gravel surfacing. About $250,000. Bryant & Huffman, Austin, engrs.

Tex., Montague—Until March 22, by Montague Co., grading, surfacing with local gravel and building concrete drainage structures on 2 mi. Highways 2 and 2D, 20 ft. wide, involving 100 cu.yd. 1:2:4 concrete, 8,000 lin.ft. embankment and 1,000 cu.yd. excav., cost $50,000; 8.08 mi. Merid-

Streets and Roads (Continued)

ian Highway 2 from Bowie west to county line, 18 ft. wide, 542.81 cu.yd. concrete, 49,357 cu.yd. embankment, 14,350 cu.yd. earth and 1,950 cu.yd. rock excav., 26,975 lb. reinforcing steel, etc., $250,000; also grading, building drainage structures and surfacing with local gravel and sand clay mixture 7.47 mi. Highway 2d, 18 ft. wide, 410 cu.yd. concrete, 14,500 cu.yd. earth and 1,398 cu.yd. rock excav., 31,000 cu.yd. embankment, 15,753 lb. reinforcing steel, etc., $200,000. J. R. Hill, Bowie, engr.

Tex., Van Horn—Until April 12, by Comrs. Culberson Co., improving roads, involving 30,200 cu.yd. surfacing, hauled ¼ mi., including loading and unloading, 11,300 cu.yd. material, hauled additional ¼ mi., 35,000 cu.yd. surface ditch excav.

Colorado—Until March 24, by State Highway Comn., Denver, gravel surfacing 5.86 mi. Federal Aid Project 23, between Delta and Montrose, 24 ft. wide, involving 8,114 cu.yd combined earth excav., 1,410 cu.yd. earth borrow, 31,824 yd. overhauling, 9,167 cu.yd. gravel surfacng, 109 cu. yd. concrete, 3,735 lb. reinforcing steel, two 10 ft. concrete slab bridges, etc. About 45,012. Former bids rejected. J. E. Maloney, state highway engr. Noted Feb. 26.

Colorado—Until April 5, (change of date) by State Highway Comn., Denver, grading 2.759 mi. Federal Aid Project 78, between Red Cliff and Minturn, 18 ft. wide, 34,496 cu.yd. combined earth and 14,505 cu.yd. earth borrow, 9 acres clearing, 262 cu.yd. concrete headwall, 1,061 cu.yd. cement rubble retaining wall, 818 lin. ft. 24 in. corrugated metal culverts, 11,939 yd overhaul. About $114,490. J. E. Maloney, state highway engr. Noted Feb. 26.

Colo., Fort Collins—Until March 27, by city, constructing 4,900 sq.yd 6 in. rein.-con. pavement, 678 cu.yd. earth excav., 610 lin.ft. concrete gutter, 672 lin.ft. concrete curb and gutter and other incidentals. W. B. Cheek, asst. comr. wks. and city engr.; advertised in this issue.

Wash., Seattle—Until April 5, by Comrs. King Co. paving and grading 4.47 mi. Hollywood-Redmond Rd., 18 ft. wide, also redecking bridge, involving 7,500 cu.yd. earth excav., 48,889 sq.yd. concrete or brick and 30,000 ft. lumber for redecking. Cost $131,417 for 1 course and $180,306 for monolithic brick. S. J. Humes, Seattle, engr.

Wash., Spokane — Until March 30, by Comrs. Spokane Co. macadamizing, grading, etc. 7.5 mi. Cheney Rd. and Day Mt. Spokane Rd. About $100,000. A. R Scott, Spokane, engr

Wash., Spokane — Until March 26, by Comrs. Spokane Co. macadamizing, grading, etc. 13 mi. Whitman Co. Rd., north of Fairfield. About $150,000. A. R Scott, Spokane, engr.

California—Until April 5, by State Highway Dept., 515 Forum Bldg., Sacramento, paving 15.7 mi. road between Redding and southerly boundary of Shasta Co., 15 ft. wide, involving 70,000 cu.yd. excav. without classification, 15,300 cu.yd. Class "A" Portland cement concrete (pavement), 730 cu. yd. Class "A" Portland cement concrete (culverts and monuments), 1,740 lin.ft. 12-24 in. corrugated metal pipe, 10 mi. new property fences, etc.; 10 7 mi. road between Woodland and Zamora, 15 ft. wide, Yolo Co., involving 35,000 cu.yd. excav. without classification, 13,800 cu.yd. Class "A" Portland cement concrete (pavement), 150 cu. yd. Class "A" Portland cement concrete (culverts and monuments), 477 lin.ft. 18-24 in. corrugated metal pipe, 1,150 lin.ft. guard rail, etc. Department furnishes reinforcing steel, corrugated metal pipe, Portland cement, material for new property fences, sand and coarse aggregate for concrete.

Cal., Martinez—Contra Costa Co. received bids building 7.3 mi. Sect. 1, Div. 19 of highway system between Bryan Sta., on San Pablo Creek, to vicinity of East Bay Water Co., from Bates & Borland, Oakland Savings Bank, Oakland, $103,784; Ransome-Randall Co., Oakland, $103,816; W. J. Schmidt, Berkeley, $113,244.

★Cal., Modesto—City let contract paving Elmwood Ave., 5th and 14th Sts., to Standard Paving Co., 9th and N Sts., $0.18½ per sq.ft., total to exceed $10,000.

N. B., Grand Forks—Until April 5, by City Council, paving sidewalks during April 1, 1920 and April 1, 1921, cement mixture. C. S. Giles, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Brooklyn—Park Bd., Municipal Bldg., New York City, received bids March 11, furnishing labor and material repairing roadway pavement on parkways and park roads, from Sicilian Asphalt Paving Co., 41 Park Row, New York City, $10,575; Consolidated Asphalt Paving Co., 52 9th St., $10,850; Uvalde Asphalt Paving Co., 1 Bway., New York City, $11,200. Noted March 4.

N. Y., Long Island City—M. E Connolly, pres. Queens Boro., received bids March 15, regulating, grading and paving (a) Anable St., (b) 88th St., (c) 46th St., (d) Gunther Ave., from Hastings Paving Co., 20 Broad St., New York City, (a) $7,470; C. A. Meyers, foot of Stagg St., Brooklyn, (a) $8,553; C. Kurth, (b) $3,560; Grimm Constr. Co., (b) $3,772; J. Marcio, (b) $3,803, (c) $3,321; Scott Bros., (b) $3,844, (d) $6,499; R. A. Hess, Inc., (c) $3,429, (d) $6,319; Peace Bros., 20 Main St., Flushing, (c) $3,780, (d) $7,172; Tuchy & Upton, Inc., (d) $6,762. Noted March 11.

★N. Y., New York—H. Bruckner, pres. Bronx Boro. let contract regulating, grading, curbing, etc., Olmstead and Havemeyer Aves., to F. Gasperini, 1964 Honeywell Ave., $6,951 and $40,753 respectively; Allerton and Sedgwick Aves., to La Mura Contg. Co., 218th St., $65,990 and $107,667 respectively; Fox St., to M. Delbalso, 1434 Bryant Ave., $20,359; Stearns St., to Spadero Contg. Co., 827 East 217th St., $5,806; Boston Rd., to Burnside Contg. Co., 270 Burnside Ave., $340,508. Noted March 11.

N. J., Newark—City received bids paving 8,500 sq.yd. Washington St., (a) sheet asphalt, (b) asphalt block, (c) new granite block, (d) reclipped granite block, from Standard Vitulithic Co., 154 Frighijser St., (a) $70,085; M. I. Demarest, Sewaren, (b) $75,378, (c) $99,438; Newark Paving Co., 133 1st St., (d) $82,276.

★Pennsylvania — State Highway Dept., Harrisburg, let contract building 30,180 ft. Route 309, Forward and Adams Twps., Butler Co., 1 course rein.-con., to S. Gamble Co., Carnegie, $302,047; 18,778 ft. Route 251, Fairview Twp., Petrolia and Karnes City Boros., Butler Co., Burns Bros., 525 South Mill St., New Castle, $211,685; 3,169 ft. Route 99 and State Aid Application 415, St. Marys Boro., Elk Co., Minus Bros., DuBois, $45,774. Noted Feb. 5 and 26

★W. Va., Marlinton—Comrs. Pocahontas Co. rejected bids received March 9, improving 1.3 mi. Marlinton-Edray Rd., 16 ft. wide, involving 12,090 sq.yd. bituminous macadam. Work will be done by day labor. Noted Feb 19.

W. Va., Weston—Comrs. Lewis Co. received only bid paving 2 mi. Weston-Gilmer Rd., involving 18,700 sq.yd. brick and 10,000 cu.yd. excav., from J. Fusey, Weston. About $126,000. Noted March 5.

★Ga., Valdosta—Comrs. Loundes Co. let contract paving 4.89 mi. Natl. Highway from Ashley to Withlacoochee River, 16 ft. wide, involving 45,940 sq.yd. concrete and 9,397 cu.yd. earth excav., to Nichols Contg. Co., Trust Co. of Georgia Bldg., Atlanta, $159,799.

★Michigan—State Highway Dept., Lansing, let contracts grading and paving 6.582 mi. State Trunk Line Project 16-3, Sects. A and B, 18 ft. wide, Eaton Co., involving 1,530 lin.ft. guard rail at $1.15 per lin.ft., 69,505 sq.yd. cement concrete, $2.75, to F. J. Leonard & Co., Charlotte, $199,155; grading, draining and surfacing 4.793 mi. State Trunk Line Rd. 14-19, Sect. A, 16 ft. wide, Hillsdale and Lenawee Counties, involving 22,226 cu.yd. earth excav., $0.90, 44,797 sq.yd. bituminous macadam, $2.25, 1,322 lin. ft. 12 in. encased tile, $1.85, 52 lin ft. 15 in. encased tile, $2.25, 136.5 cu.yd. 1:2:4 and 21.6 cu.yd. 1:3:6 concrete, $22 and $20 respectively, 1,490 lb. steel reinforcement, $0.07 lb., etc., also 5.052 mi. Sect. B, 14,636 cu.yd. earth excav., $0.80, to Kelly Constr. Co., Bryan, O., $130,472 and $106,701 respectively; 1.345 mi. State Trunk Line Rd. 20-2, 16 ft. wide, Midland Co., to C. W. McKinney, Averill, $17,447; 3.016 mi. Sect. A and .388 mi. Sect. B, State Trunk Line Rd. 20-8, 16 ft. wide, Midland Co., also 3.92 mi. State Trunk Line Rd. 20-5, 16 ft. wide, involving 11,144 cu.yd. earth excav., $0.70, 263 lin.ft. 12 in. encased tile, $1.50, 46 lin.ft. encased tile, $2.09, 36,800 sq.yd. gravel surface, $1.15; 51.9 cu.yd. 1:2:5 and 74.8 cu.yd. 1:3:6 concrete, $30 and $25 respectively, 2,264 lb. steel reinforcement, $0.10 lb., etc., to Midland Constr. Co., Midland, $47,397 and $55,409 respectively; 5.646 mi. Assessment Dist. Rd. 50, 16 ft. wide, Lenawee and Monroe Counties, to W. H. Knapp Co., Monroe, $114,068; 1.619 mi. State Trunk Line Rd. 66-2, 16 ft. wide, Ionia Co., also 1.003 mi. State Trunk Line Rd. 44-2, 16 ft. wide, to Bd. Rd. Comrs. Ionia Co., Ionia, $14,013 and $12,932 respectively. Noted Feb. 5 and 19.

Mich., Detroit—City received bids paving with asphaltic concrete, natural lake asphalt on 8 in. concrete base, Berea or Amherst curb, (a) Engel Ave., (b) Lemay St., (c) Dundee Ave., (d) Hecla Ave., (e) Kendall Ave., (f) Lane Ave., (g) Palmer Ave., (h) Vernor Ave., (i) Whitfield Ave. (j) Yellowstone Ave., from W. B. Brady Constr. Co., 1972 Grand River Ave., (a) $3,951, (b) $3,876, (c) $22,667, (d) $7,930, (e) $23,363, (f) $32,335, (g) $11,228 (h) $12,518, (i) $10,499, (j) $18,830; Cleveland Trinidad Paving Co., 2940 Woodward Ave., (a) $3,846, (b) $3,788, (c) $24,243, (d) $7,731, (e) $22,509, (f) $32,535, (g) $11,101, (h) $12,011, (i) $11,030, (i) $17,691; Detroit Asphalt Paving Co., 20 McGraw Bldg., (a) $3,658, (b) $3,615, (c) $22,989, (e) $22,610, (f) $30,020, (g) $10,558, (h) $11,344, (i) $10,605, (j) $19,019. Noted March 4.

Mich., Howell—Bd. Supervs. Livingston Co. received bids grading, shaping and surfacing with concrete 2.857 mi. Grand River Rd. at county line, 18 ft. wide, from Artificial Stone Co., Eaton Rapids, $103,007; R. D. Baker, Penobscot Bldg., Detroit, $127,640; A. J. Smith Constr. Co., Campau Bldg., Detroit, $138,021.

★Wisconsin — State Highway Comn., Madison, will build Monroe-Monticello Rd. (South End), Sta. 28-0 202-40, Federal Aid Project 80, Green Co., involving 5,738 cu.yd. earth and 2,333 cu.yd. rock excav., 35 cu.yd. concrete culverts, 11,300 bbl. cement, 36,613 sq.yd. concrete surfacing, exclusive of cement. Work will be done by day labor under supervision. Noted March 4.

★Wisconsin — State Highway Comn., Madison, let contract to G. E. Fitton, 838 East Johnson St., Madison, building Madison-Souk City Rd. (Springfield Hill), Federal Aid Project 12, Dane Co., involving 14,600 cu.yd. earth excav., at $0.87 per cu.yd.; 700 cu.yd. rock excav., $2.00; 1.5 acres clearing and grubbing, $200, 220 cu. yd. concrete in culverts,(1) local materials, $24; (2) shipped in materials, $26.50; 3,000 cu.yd. loose rock, $1.25; total cost, with (1) $24,432; (2) $24,982; to Webb & Dixon, Albany, Monroe-Monticello Rd., (North End), Sta. 202-40 to 382-0, Federal Aid Project 80, Green Co., involving 1,570 cu.yd. earth excav., $1.65; 35,670 sq.yd. concrete surfacing, exclusive of cement, $2.01; 11,700 bbl. cement, $2.65; total cost, $105,292. Noted March 4.

★Wis., Chilton—City let contract paving various streets, with concrete, to F. P. Caughlin Co., 30 North La Salle St., Chicago, $124,494. Noted Feb. 5

★Wis., Milwaukee—Bd. Pub. Wks. let contracts paving 33 alleys with concrete (each item signifies 1 alley) to Dean Constr. Co., 82 Wisconsin St., (item 1) involving 53 yd. grading, at $1.75 per yd., 855 sq.yd. paving, $2.33, 855 sq.yd. old paving removed, $0.58, (item 2) 32 yd. grading, $2.00, 478 yd. old paving, removed, $0.58, 478 yd. new paving, $2.38, (item 13) 73 yd. grading, $1.75, 1,329 yd. old paving removed, $0.57, 1,329 yd. new paving, $2.31, (item 14), 633 yd. grading, $1.85, 1,305 yd. paving, $2.13, (item 15), 227 yd. grading, $1.85, 49 yd. old paving, removed, $0.50, 963 yd. new paving, $2.31, (item 18), 248 yd. grading, $1.85, 309 yd. paving, $2.37, (item 21), 240 yd. grading, $2.00, 46 yd. old paving, removed, $0.60, old walks removed, $0.35, 674 yd. paving, $2.43; to Milwaukee Genl. Constr. Co., 857 8th Ave., (item 3), 52 yd. grading, $1.65, 711 yd. old paving, removed, $0.60, 711 yd. new paving, $2.37, (item 10), 395 yd. grading, $1.73, 1,336 yd. paving, $2.37, (item 19), 540 yd. grading, $2.55, 686 yd. paving, $2.43, (item 20), 80 yd. grading, $1.85, 529 yd. paving, $2.37; to F. Schomann, 779 28th St., (item 4), 18 yd. grading, $1.00, 260 yd. old paving, removed, $0.60, 260 yd. new paving, $2.15, (item 5), 34 yd. grading, $1.00, 533 yd. old paving, removed, $0.60, 533 yd. new paving, $2.15, (item 7), 80 yd. grading, $2.00, 476 yd. paving, $2.15, (item 8), 92 yd. grading, $2.00, 526 yd. paving, $2.15, (item 9), 67 yd. grading, $2.00, 675 yd. paving, $2.15, (item 22), 194 cu.yd. grading, $1.00, 1,413 yd. paving, $2.40; to O. Bodemann, 801 Winnebago St., (item 6), 305 yd. grading, $1.55, 854 sq.yd. paving, $2.00, (item 16), 405 yd. grading, $1.55, 785 yd. paving, $2.00, (item 17), 336 yd. grading, $1.55, 1,658 yd. paving, $2.00, (item 24), 342 yd. grading, $1.50, 1,226 yd. paving, $2.00; Ryback & Sadowski, 1092 2nd Ave., (item 11), 876 yd. grading, $1.75, 995 yd. paving, $2.39, (item 12), 1,478 yd. grading, $1.75, 1,599 yd. paving, $2.36, (item 28), 430 yd. grading, $1.80, 1,684 yd. paving, $2.45; Blodgett-Clayton Constr. Co., 204 Grand Ave., (item 23), 197 yd. grading, $1.94, 120 sq.ft. old walks removed, $0.15, 33 sq.ft. new walks, $0.24, 1,162 yd. paving, $2.37, (item 25), 533 yd. grading, $1.84, 1,959 yd. paving, $2.37; to F. Banaszak, 1335 4th Ave., (item 26), 496 yd. grading, $1.66, 1,234 yd. paving, $2.37, (item 27), 22 yd. grading, $1.85, 672 yd. paving, $2.37; to

Streets and Roads (Continued)

Retzlaff, Froemming & Bluhm, 948 4th St., (item 29), 943 yd. grading, $1.75, 2,293 yd. paving, $2.30, (item 30), 82 yd. grading, $1.75, 715 yd. paving, $2.30, (item 31), 400 yd. grading, $1.75, 2,164 yd. paving, $2.30, (item 32), 445 yd. grading, $1.75, 1,620 yd. paving, $2.30; to Froemming Bros., 1326 Humboldt Ave., (item 33), 1,405 yd. grading, $1.75, 6 yd. old paving, removed, $0.57, 20 ft. old curb removed, $0.08, 60 sq.ft. old walks removed, $0.05, 2,459 yd. paving, $2.30.

★Ia., Pomeroy—City let contract for 60,000 sq.yd. sheet asphaltic pavement, to McCarthy Impvt. Co., 220½ Main St., Davenport, at $3.99 per sq.yd., total cost, $249,000.

★Minn., Le Sueur Center—S. McMillen, aud. Le Sueur Co., let contract grading 7.7 mi. Federal Aid Project 89, State Rd. 5, 24 ft. wide, to Nolan Bros., 20 North 2nd St., Minneapolis, $66,865; culverts, to Concrete Culvert Co., Winona, $2,493; tiling, to L. G. Wilhelsen, Morgan, $12,835. Noted Jan. 29.

N. D., Grand Forks—City received bids paving (1) Dist. 10, (2) Dist 16, (3) Dist. 20, (a) concrete, (b) bithulic, from J. Dinnie & Co., 314 International Ave., (1a) $255,501, (2a) $9,061, (3a) $190,020; W. E. Kennedy, Fargo, (1b) $301,422, (2b) $10,789, (3b) $222,450; Bithulithic Constr. Co., Winnipeg, (1b) $295,069, (2b) $10,545, (3b) $217,715; Northern Constr. Co., 9 North 8th St., (3a) $189,149.

★Ark., Fayetteville—Comrs. Washington Co. let contract building gravel macadam highway, to Kirkham Constr. Co., Springfield, Mo. About $520,000.

★Tex., Groesbeck—J. E. Bradley, judge Limestone Co., let contract building 12 Henry Exall Highway, known as State Highway 14, to Boyett & Sherman, Houston, $69,448; State Highway 7, 7 mi. Sect. A, to Cook & Arrington, Crockett, $45,201, 9 8 mi. Sect. B, to Mexia Constr. Co., Mexia, $43,491, 11.1 mi. Sect. D, to T. E. Ruby, Buda, $51,300. Noted Feb. 12 and 19.

★Tex., Madisonville—J. M. Roberts, judge Madison Co., let contract grading and draining 20.257 mi. Highway 32 from Freestone Co. line to Walker Co. line, 16 ft. wide, to J. Skelton, Houston, $132,894. Noted March 4.

Tex., Nacogdoches—I. D. Parmley, clk. Nacogdoches Co., received bids March 1, grading, gravel surfacing and building rein.-con. and steel bridges and culverts on 18.64 mi. Highway 21, from here to Cherokee Co. line, 16 ft. wide, from Smith Bros., Crockett, $164,410; L. S. Moore, Lufkin, $166,856; Hayden & Austin, Galveston, $216,694. Noted Feb. 26.

★Tex., Wichita Falls—Comrs. Wichita Co. let contract paving 4.68 mi. Highway 22, Federal Aid Project 61, 18 ft. wide, involving 46,448 sq.yd. concrete and 4,358 cu.yd. grading, to Witchita Co., c/o J. P. Jones, co. judge, $182,726.

★Colorado—State Highway Comn, Denver, let contract paving 1,568 mi. Federal Aid Project 34, Sect. 3 and B, 26 ft. wide, involving 16,560 sq.yd. concrete, 2,830 cu.yd. combined earth excav., 1,147 cu.yd. borrow, 409 cu.yd. gravel surfacing, 21 cu.yd. concrete culvert headwalls, etc. to Engineer's Constr Corp., 807 7th St., Greely, $40,735; 1.161 mi. Federal Aid Project 31, between Denver and U. S. A. General Hospital 21, 18 ft. wide, 12,259 sq.yd. concrete, 2,440 cu.yd. combined earth excav., 964 yd. overhaul, 309 cu.yd. gravel shoulders, 128 cu yd. concrete headwalls etc., to F. C. Dreher Contg. Co., Cooper Bidg., Denver, $29,512. Noted Feb. 26.

★New Mexico—State Highway Comn., Santa Fe, let contract constructing 14.37 mi. Federal Aid Rd. Project 1-B, Colfax Co., to Mishon, Millard & Teyssier, Pueblo, Col., $149,545.

Ariz., Phoenix—Maricopa Co. received bid grading and paving 278 mi. roads, from Warren Bros., 142 Berkeley St., Boston, Mass. About $4,000,000. County to furnish cement, crushed rock and sand.

★Ariz., Tucson—Pima Co. let contract building 5½ mi. Tangue-Verde North Rd., to Goodman & Merrill, excav., $.45 per cu.yd surfacing $1.25 cu.yd., concrete in culverts and bridges $17 cu.yd. County furnishes cement.

Washington — State Highway Comn., Olympia, received only bid March 3, clearing, draining, grading and surfacing with crushed rock 1.5 mi. Ocean Beach Highway northwest from Skamokawa, Wahkiakum Co., from Pacific Bridge Co., foot of Salmon St., Portland, $104,324. Noted Feb. 19.

★Washington — State Highway Comn., Olympia, let contract grading, draining and paving 3.8 mi. Inland Empire Highway from Walla Walla to Buroker, Walla Walla Co., involving 44,590 sq.yd. concrete, 7,000 cu.yd. earth excav. and 798 lb. reinforcing steel, to J. A. Gudgel Co., Kalispell, Mont., $135,291; 6.2 mi. Pacific Highway from Plumb Station to Tenino, Thurston Co., involving 62,750 sq.yd. concrete, 35,800 cu.yd. earth excav. and 2,800 ft. guard rail, to Albertson, Cornell Bros. & Simpson, Tacoma, $235,545. Noted Feb. 19.

★Washington — State Highway Comn., Olympia, let contract grading, draining and paving 4.1 mi. Sunset Highway from Greenacres to Idaho State line, Spokane Co., to C. M. Payne, Spokane, $131,897; paving 4.8 mi. Pacific Highway from Renton to Kent, King Co., involving 55,540 sq.yd. concrete, to Independent Asphalt Paving Co., Seaboard Bldg., Seattle, $137,492. Noted Feb. 12 and 19.

Washington — State Highway Comn., Olympia, received bids March 1, grading, draining and paving with concrete 4.5 mi. Natl. Park Highway from Muck Creek to Ohop Valley, Pierce Co., involving 41,420 sq.yd. concrete, 24,000 cu.yd. earth excav., 17,500 cu.yd. overhaul and 11,500 lb. reinforcing steel, from P. J. McHugh, 3rd St., N., and Mercer St., Seattle, $175,478; D. A. Williams, Tacoma, $197,017. Noted Feb. 19.

★Wash., Davenport—Lincoln Co. let contract building 12.15 mi. Donahue Rd. 2 from Reardan to Edwall, involving (1) 80,000 cu.yd. common and 5,000 cu.yd. rock excav., (2) 22,000 cu.yd. crushed gravel surfacing, (3) 300 cu.yd. concrete 2,500 lin.ft. concrete pipe in culverts and bridges, to Triangle Constr. Co., Ritzville, (1) $61,512, (2) $47,585; H. J. Mattes Lumber Co., Reardan, (3) $15,939.

★Wash., Ephrata—Grant Co. let contract gravel surfacing 8½ mi. Permanent Highway 2-D, to H. R. Nelson, Hartline, $35,800.

★Wash., Mount Vernon—Skagit Co. let contract grading and paving 4 mi. McLean Rd., to J. W. Hoover, Everett, $127,450.

★Wash., Ritzville—Comrs. Adams Co. let contract grading 14 mi. Donohue Rd. 6, near Lind, to McKivor Bros., Ritzville, $46,686; surfacing, to Triangle Constr. Co., Ritzville, $95,348.

Wash., Seattle—Bd. Pub. Wks. received bids March 5, grading Edmonds St., et al. involving 28,200 cu.yd. clearing and grubbing and 144 lin.ft. 24 in. sewer pipe, from Stillwell Bros., Boston Blk., $22,394; M. & M. Constr. Co., Hinckley Blk., $25,639; A. H. Kargin, Builders Exch., $34,494.

★Wash., Seattle—City let contract building sidewalks, sewer pipe, etc., in North and West 80th St., involving 21,430 sq.yd. concrete, 3,000 lin.ft. 3 in. pipe, to J. L. Smith, Seattle, $48,318; paving Beacon Ave., et al. involving 2,400 sq.yd. asphaltic concrete on 6 in. base, to R. G. Stevenson, 1327 Ewing St., $11,111.

★Wash., Seattle—Comrs. King Co. let contract improving 7 mi. Sunnyside-Mabton Highway, bitulithic, to Yakima Paving Co., Yakima, $150,760.

★Wash., Yakima—City let contract paving 2 mi. roads in Terrace Heights Dist., 1 course concrete, to R. M. Hardy, Yakima, $68,807.

★California—State Highway Dept., Forum Bldg., Sacramento, will improve 21 mi. Canyon Highway between La Moine Co. and northern boundary of Shasta Co. About $80,000. Work will be done by day labor.

Cal., Los Angeles — Bd. Supervs. Los Angeles Co. received bids improving 5,316 ft. Cypress Ave., 20 ft. wide, near Covina, involving 2,320 cu.yd. excav. and 11,910 sq.yd. 5 in. concrete paving, from Fleming Constr. Co., 105 North Park St., Pomona, $18,890; G. R. Curtis, 2440 East 26th St., Los Angeles, $19,500; M. T. Shafer & Co., $19,650. County furnishes cement.

★Cal., Martinez—City let contract improving Court, Pine, Talbert and other streets, 5 in. concrete base with Topeka surface, cement curbs, concrete gutters, etc., to Federal Constr. Co., Call-Post Bldg., San Francsico, $146,237.

Cal., Martinez — Contra Costa Co. received bids March 1 building 3.25 mi. concrete base on Sect. 1, Div. 21 of Martinez Bay Point Rd., from G. Cushing, Richmond, $65,558, O'Brien Bros., Martinez, $66,074, Galbraith & James, Richmond, $72,682; 8.18 mi. Div. 10 and 22 of Contra Costa Highway between Martinez and Hercules, from O'Brien Bros. Martinez, $178,892, F. Rolandi, 550 Montgomery St., San Francisco, $208,980.

★Cal., Oakland—City let contract improving Monticello Ave. from Fairfax to Allendale Aves., involving 55,304 sq.ft. grading, 4,015 sq.ft. regrading, 2,396 lin.ft. concrete curbing, 4,471 sq.ft. concrete guttering, 10,830 sq.ft. cement sidewalks, 35,727 sq.ft. oil macadam, 204 lin.ft. 10 in. conduit with concrete covering, 49 lin.ft. rein.-con. culverts, etc., to Hutchinson Co., 444 17th St., $14,389.

★Cal., San Francisco—City let contract improving Baden St., Circular, Hearst and Flood Aves., to Raisch Impvt. Co., 46 Kearney St., $32,950; Madrid St., to Eaton & Smith, 407 11th St., $18,643. Noted March 11.

★Ont., Cayuga—Haldimand Co. let contract paving 22½ mi. road, 10-16 ft. wide, waterbound macadam, to MacConnell & Hicklin, 171 Sherwood Ave., Toronto. About $250,600.

★Ont., Hagersville—Haldimand Co. will build 15 mi. road, 10 ft. wide, waterbound macadam. Work will be done by day labor. $250,600.

Railways

PROPOSED WORK

Quebec—Montreal Tramways Co., Craig St., Montreal, having plans prepared by W. F. Graves, ch. engr., for 370 ft. double track incline railway on concrete foundation, from Park Rd. to top of mountain. About $180,000.

Quebec—Montreal Tramways Co., Craig St., Montreal having plans prepared by W. F. Graves, ch. engr., for extending line from Kelly St., Ahuntsic, to Gouin Blvd., Bordeau, distance of 2¼ mi. About $500,000.

Ontario—Temiskaming & Northern Ontario Ry., 56 Church St., Toronto, made application to Provincial Government, for extending line from North Bay to Parry Sound. About $5,000,000. S. B. Clement, North Bay, ch. engr.

Ontario — City of Toronto having plans prepared by R. C. Harris, city engr., for extending street railway line over Prince Edward Viaduct. Work involves ½ mi. double track with paving on street. About $168,378.

Excavation and Dredging

PROPOSED WORK

N. Y., Buffalo—Drain—City having plans prepared inverting Scajaguada Creek into drain, total length 1 mi, 25.5-33 ft. wide, 14 ft. deep, from 6-10 ft. of excavation must be made in rock. Work involves rein.-con. and vitr. tile pipe. About $1,250,000. G H Norton, city engr.

Ia., Northwood—Drain—C. N. Urdahl, aud. Worth Co., soon lets contract furnishing labor and material building Drain 46, involving 74,500 cu.yd. open ditch, 8 ft. bottom, and 173,890 ft. 5-30 in. tile; Drain 48, involving 80 cu.yd. excav., 76,268 ft. 6-32 in. tile, etc.

Minn., Windom — Ditch—S. A. Brown, aud. Cottonwood Co., rejected bids received Feb. 26, building Judicial Ditch 1, involving 105,900 ft. 6-42 in. tile, etc. A. Anderson, Westbrook, engr. Noted Feb. 19.

Wash., Wenatchee — Irrigation — Okanogan Valley Irrigation Dist. plans to install pumping system, including 1 or more pumps, 25,000 gal. per min. capactiy, capable of lifting water 470 ft. J. S. Peterson, Omak, representative. D. C. Henry, Spalding Bldg., Portland, consult. engr.

Wash., Yakima — Irrigation — Kittitas Irrigation Dist. had plans prepared by E. M. Chandler, ch. engr. for State Reclamation Bd., Olympia, for irrigation system to cover 68,200 acres, water to be taken from Yakima River near Easton, carried by concrete and frame flume across river at Throp into territory east of Ellensburg, cost $9,808,720; another plan includes clearing of 7,500 acres, making total cost of $10,296,020. Work involves leveling, clearing and building flume, laterals, headgates, floodgates, etc.

Ore., Grants Pass — Irrigation — Grants Pass Irrigation Dist. plans to build system to irrigate 8,000 acres, near here. About $106,000. Plans have been approved by P A. Cupper, Salem, state engr.

Cal., Alturas—Canal—Crooks Irrigation Dist. plans to improve system, involving new canals, extensions and laterals. Election soon to vote on $80,000 bonds for project. Engineer not selected.

BIDS DESIRED

N. Y., Buffalo — Dredging — Until March 30, by G. H. Norton, city engr., dredging 125,000 cu.yd., Buffalo Inner Harbor About $60,000.

N. Y., New York—Dredging—Until March 25, by M. Hurlburt, comr. docks, Pier "A", foot of Battery Pl., North River, furnishing labor and material dredging on North and East Rivers, Contr. 1652.

Excavation and Dredging (Continued)

Ky., Madisonville—Ditch—Until April 3. by Bd. Drainage Comrs. Hopkins Co., constructing Otter Creek Ditch 1, involving 107,086 cu.yd. excav., 60 acres clearing and one 20 ft. wooden bridge. J. V. Poole, civil engr.; advertised in this issue.

Ill., Fairfield—Ditch—Until April 1, by Comrs. Leech & Grover D. D. 1, at office of Creighton & Thomas, Fairfield, cleaning out main ditch, 4½ mi. long, involving 30,000 cu.yd. excav. E. W. Black, Fairfield, secy.

Minn., Pine City—Ditch—Until March 29, by A. C. Edin, aud. Pine Co., building Ditch 8, involving 88,671 cu.yd. excav., construction of Bridges 1, 2, 3, 4 and 5 and furnishing and placing 12 culverts. Cost $32,815.

Mo., Halls—Drainage—Cloverdale Drainage Dist. receiving bids widening and repairing 5 mi. and extending 1 mi. levees. About $160,000. Leslie-Barnes Eng. Co., Amer. Natl. Bank Bldg., St. Joseph, engrs.

Mo., St. Joseph—Ditches—Until March 25, by W. B. Hazen, ch. engr. for Platte River D. D. 1 of Buchanan Co., 53 Commercial Blk., building Platte River Ditch, 10.68 mi. long, involving 1,022,684 cu.yd. excav., One Hundred Two River Ditch, 5.48 mi. long, 397,630 cu.yd. excav.; Third Fork Ditch, .95 mi. long, 75,000 cu.yd. excav. W. F. Dyer, Donnell Court, secy.

Cal., Oxnard—Dredging—Until March 30, by Oxnard D. D. excavating by steam shovel or dragline 4½ mi. drainage canal, 10 ft. deep, 8 ft. wide at bottom with 1½ to 1 slope, ocean outlet consisting of two 5 ft. corrugated iron pipes, each 800 ft. long and rein.-con. gate house equipped with automatic closing tide gate. About $185,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Ia., Des Moines—Drainage—F. J. Alber, aud. Polk Co., let contract building D. D. 26, involving 30,700 cu.yd. excav., to Anderson & Empie Co., Marshalltown. Noted Feb. 26.

★Ariz., Gila Bend—Reclamation—Town let contract reclaiming 70,000 acres of land by system of canals in Gila River, to Foundation Co., 253 Bway., New York City. About $700,000. Above project abandoned by Sherer & Crowley.

★Ore., Grants Pass—Canal—Grants Pass Irrigation Dist. let contract building 16 mi. canal, flumes, flood gates, laterals, 4 pumps and pipes, to Shattuck-Edinger Co. About $50,000.

★Cal., Holt—Drainage—State Recl. Bd., Sacramento, let contract draining canals, extending levee system and installing pumping plant, in Recl. Dist. 2,021, Mildred Island Dist., San Joaquin Co., to Olympian Dredging Co., 249-1st St., San Francisco. About $300,000.

Industrial Works

PROPOSED WORK

Vt., Derby Line—Butterfield & Co. having plans prepared by Frost & Chamberlain, archts., 390 Main St., Worcester, Mass., for 3 story, 65 x 200 ft., brick and steel addition to factory. About $100,000.

Mass., Boston—Boston Wool & Merchandise Co., 575 Albany St., Roxbury, having plans prepared by G. F. Shepard, archt., 14 Kilby St., for 8 story, 80 x 200 ft., rein.-con. warehouse, rein.-con. flooring, concrete foundation, on D St., here. About $3,000,000.

Mass., Cambridge — H. Fishman, 208 Prospect St., had plans prepared by Tuck & Gilman, archts. and engrs., 34 School St., Boston, for 1 story, 76 x 107 ft., brick and concrete garage, concrete flooring and foundation, on Prospect St. About $30,000.

Mass., Cambridge—A. R. Hyde & Co., 432 Columbia St., soon lets contract building 2 story, 30 x 115 ft., brick and mill construction factory, concrete foundation. About $25,000. Tuck & Gilman, 34 School St., Boston, archts. and engrs.

Mass., East Boston (Boston P. O.)—Bertelsen & Peterson Eng. Co., 256 Border St., plans to build brick, concrete and steel repair plant, rein.-con. flooring, concrete foundation. About $50,000. Private plans.

Mass., Easthampton — Hampton Mills, plans to build 4 story, brick and rein.-con. addition to factory, on Kingsley Ave., here. Architect not selected.

Mass., Everett (Boston P. O.)— Burk & Bottomley, archts. and engrs., 34 School St., Boston, soon lets contract building 4 story, 90 x 100 ft., brick and mill construction addition to factory, concrete foundation, for Bunker Hill Shoe Co., Bway. About $90,000. Noted Feb. 26.

Mass., Natick—New England Pressed Steel Co. plans to build 1 story, 55 x 85 ft., brick and concrete addition to factory, concrete flooring and foundation. About $25,000. Private plans.

Mass., New Bedford—J. D. Martin, Middle St., plans to build 1 story, 70 x 115 ft., brick and steel garage, rein.-con. flooring, concrete foundation. About $25,000.

Mass., Worcester — Cutting, Carlton & Cutting, archts., 44 Front St., soon receives bids building 1 and 2 story, brick, rein.-con. and steel garage and service station, concrete flooring and foundation, on Park Ave., for H. J. Murch, 731 Main St. About $150,000.

Mass., Worcester—N. Goldsmith, 56 Mechanic St., plans to build 3 story, rein.-con. garage, rein.-con. flooring, concrete foundation, on Washington St. About $125,000. Architect not selected.

Conn., Bridgeport—Eastern Malleable Iron Co., Naugatuck, soon lets contract building 1 story, 80 x 180 ft., brick and concrete foundry, concrete flooring and foundation, on South St., here. About $45,000. Private plans.

Conn., Bridgeport—Liberty Mfg. Co., 166 Elm St., plans to build factory. About $100,000. Architect not selected.

Conn., New London—A. Grippo, 6 Truman St., plans to build 3 story, brick, concrete and steel garage, storage and showroom, on Bank and Truman Sts. About $35,000. Payne & Griswold, Manwaring Bldg., archts.

Conn., New London—Soltz Beef Co., 52 John St., plans to build 1 story, cold storage plant, brick and rein.-con., on Main St. Architect not selected.

Conn., Norwalk—Arnold & Co., Hoyt St., soon lets contract building 1 story, 42 x 90 ft., brick and steel foundry, concrete flooring and foundation. Private plans.

Conn., Thompsonville—Bigelow-Hartford Carpet Co., 58 Main St., plans to build 80 x 200 ft., brick and rein.-con. addition to factory. Architect not selected.

N. Y., Brooklyn—Amer. Numbering Machine Co., 226 Shepard Ave., soon lets contract building 2 story, 50 x 100 ft. brick and steel factory and garage, rein-con. flooring, concrete foundation, on Atlantic Ave. About $40,000. H. G. Dangle, 215 Montague St., archt. and engr.

N. Y., Brooklyn—Brooklyn Retail Butchers Corp., 3285 Fulton St., having plans prepared by J. H. H. Voss, archt. and engr., 154 Nassau St., New York City, for 3 story, 130 x 135 ft., ice and storage plant, rein.-con. and steel, rein.-con. flooring, concrete foundation, on Atlantic Ave. and Ft. Greene Pl. About $400,000. Noted Feb. 5.

N. Y., Buffalo—W. A. Morgan, 33 Gates Circle, plans to build 1 story, 120 x 150 ft., brick and concrete garage, rein.-con. flooring, rock foundation, on West Utica St. J. N. Byers, Jr., 461 Linwood Ave., archt.

N. Y., Lockport—Mitchell-Simpson Garage, 299 Walnut St., plans to build 2 story, brick, concrete and steel garage, to replace one recently destroyed by fire. Cost between $50,000 and $60,000.

N. Y., Long Island City—W. Higginson, archt. and engr., 18 East 41st St., New York City, receives bids about March 20, building 8 story, 85 x 345 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Mount St., here, for H. Lockhart, Jr., 501 5th Ave., New York City.

N. Y., New York—See "Buildings."

N. Y., New York—Standard Oil Co. of New York, 26 Bway., soon lets contract building 2 story, 100 x 125 ft., brick and steel garage and shop, rein.-con. flooring, concrete foundation, at 631 West 46th St. About $95,000. C. A. Ellis, 26 Bway., archt. and engr.

N. J., Bayonne—Nitrate Agencies Co., 85 Water St., New York City, plans to build 1 story factory on lot 179 x 287 ft. on West 1st St., here. About $50,000.

N. J., Trenton — Trenton Steel & Wire Co., Hamilton Ave., having plans prepared by Smith, Boehm & Co., archts., Buffalo, N. Y., for 100 x 200 ft. concrete and steel plant, on Ingham Ave.

Pa., Phila.—Queens-Brooks Co., American and Diamond Sts., having plans prepared by W. E. S. Dyer, archt. and engr., Land Title Bldg., for 5 story, 50 x 200 ft., concrete and brick factory, on 5th St. and Hunting Pl. About $100,000.

Md., Baltimore — Baltimore Storage & Moving Co., 1710 Edmondson Ave., plans to build 6 story, concrete and brick warehouse, concrete foundation, on 26th and Charles Sts. T. H. Vickery, pres.

Md., Baltimore—W. Cook, North and Greenmount Aves., plans to build 1 or 2 story, concrete and brick garage, cement, concrete flooring and foundation, on Carter Pl. and McAllister Court. About $30,000. J. S. Downing, 11 York Court, archt.

Md., Salisbury—Farmers & Planters Co., c/o W. P. Ward, plans to build 1 and 2 story, 70 x 225 ft., steel and brick warehouse, concrete foundation. Private plans.

S. C., Gaffney—Musgrove Mills plans to build 3 story, 107 x 290 ft., cotton mill, rein.-con. J. E. Sirrine, Greenville, engr.

S. C., Greenville—Furman University having plans prepared by J. E. Sirrine, archt., Greenville, for 40 x 60 ft., heating plant, brick.

Ala., Birmingham—Rhodes-Carroll Furniture Co., 2021 2nd Ave., having preliminary plans prepared by H. B. Wheelock, archt., Steiner Bldg., for 3 or 5 story factory. About $50,000.

O., Ashland—See "Waterworks."

O., Cincinnati—Cincinnati Iron & Steel Co., Front St. and Freeman Ave., plans to build 250 x 700 ft., factory. About $200,000.

O., Cincinnati—J. H. McGowan Pump Co., 4th Natl. Bank Bldg., plans to build foundry, 20 tons daily capacity, on Oakley Ave. B. L. Baldwin, 2nd Natl. Bank Bldg., archt.

O., Cincinnati—Standard Silicate Co. acquired 20 acre site on Paddock Rd. and plans to build factory. About $750,000. Architect not selected.

O., Cleveland—Comrs. Cuyahoga Co. plan to build 1 story heating plant, brick, steel and concrete, rein.-con. flooring, concrete foundation, on Lakeside Ave. and West 3rd St. About $200,000. E. G. Krause, clk.

O., Cleveland—Federal Screen & Weatherstrip Co., 10522 Norman Ave., plans to build 1 story factory. About $50,000. J. H. Dietz, mgr. Architect not selected.

O., Cleveland—Interstate Tanning & Mfg. Co., 805 The Arcade, having plans prepared by Carter-Richards-Griffith Co., archts. and engrs., 721 Illuminating Bldg., for 2 story, 80 x 96 ft., rein.-con., steel and brick factory, rein.-con. flooring, concrete foundation, on East 32nd St. and St. Clair Ave. About $75,000.

O., Cleveland—Natl. Acme Co., 7500 Stanton Ave., having plans prepared by G. S. Rider & Co., archts., Century Bldg., for 1 story addition to factory, brick, steel and concrete, rein.-con. flooring, concrete foundation, on East 131st St. and Coit Rd. About $500,000. A. W. Henn, pres.

O., Cleveland—A. E. Russ Machine Co., 208 Schofield Bldg., plans to build 2 story, steel and brick factory, on East 134th St. near St. Clair Ave. About $50,000. A. E. Russ, pres. Architect not selected.

O., Cleveland—W. Taylor Son & Co., 630 Euclid Ave., had revised plans prepared for 10 or 12 story, rein.-con., steel and brick warehouse, rein.-con. flooring, concrete foundation, on East 17th St. and Superior Ave. About $1,500,000. C. H. Strong, mgr. Architect's name withheld. Noted March 11.

O., Dayton — Dairy Eng. Co., Beaver Bldg., plans to construct 1 story, 70 x 160 ft. machine shop, 4 story, 68 x 220 ft. factory and 4 story, 60 x 180 ft. administration building, all rein.-con. and brick, rein.-con. flooring, concrete foundations, on West 2nd St. About $800,000. Architect not selected.

Mich., Detroit—Dean & Sherk, 812 Woodbridge St., having plans prepared by M. R. Burrowes, archt., 435 Woodward Ave., for 3 story, rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on Bellevue and Mack Aves. About $25,000.

Mich., Monroe—Monroe Paper Products Co., West Elm St., having plans prepared by J. Gilmore, archt., Monroe, for 2 story rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, on West Elm St. About $100,000.

Ill., Chicago—Western Bag & Burlap Co., 2433 West 14th St., acquired site on Crawford Ave. and 55th St. and plans to build factory. About $1,000,000. Architect not selected.

Wis., Manitowoc—Aluminum Goods Mfg. Co., 15th and Franklin Sts., plans to build 2 story, 60 x 350 ft. rolling mill, brick, rein.-con. and steel, rein.-con. flooring, brick foundation, on Main St. About $500,000. Lockwood, Greene & Co., 3 Dearborn St., Chicago, engrs.

Wis., Merton—Bark River Canning Co. having plans prepared by J. Menge, Jr., archt., 138 Wright St., Milwaukee, for 1 and 2 story, 120 x 245 ft., brick and timber cannery, concrete foundation. About $100,000.

Wis., Milwaukee — Chicago, Racine & Milwaukee Line, Bway. and Erie Ave., hav-

Industrial Works (Continued)

ing plans prepared by A. S. Hecht, archt. and engr., 64 West Randolph St., Chicago, for 4 story, 120 x 445 ft., rein.-con. and brick, freight terminal, rein.-con. flooring, concrete foundation, on Bway. About $750,000.

Wis., Milwaukee—H. W. Voelz, archt., 86 Michigan St., soon lets contract building 2 story, 70 x 115 ft., rein.-con. and brick dairy, rein.-con. flooring, concrete foundation. About $75,000. Owner's name withheld. Noted Jan. 8.

Wis., Sheboygan—Cigar Box Lumber & Mfg. Co. having plans prepared by Juul & Smith, archts. and engrs., Imig Bldg., for 1 story, 75 x 120 ft., brick, rein.-con. and steel factory, rein.-con. flooring, brick foundation, on 15th St. About $50,000. J. Will, pres.

Wis., Sheboygan—City plans to build 80 x 110 ft. brick warehouse, rein.-con. flooring, also wharf on present harbor site. About $35,000. C. U. Boley, city engr.

Wis., Sheboygan — Leverenz Shoe Co., Alabama Ave., having plans prepared by W. C. Weeks, archt., Ontario Ave., for 3 story, 69 x 148 ft., brick and steel factory, rein.-con. flooring, brick foundation. About $30,000. Noted Feb. 26.

Wis., Sheboygan—Optenberg Iron Works, North 8th St., plans to build 2 story, 60 x 100 ft., brick, rein.-con. and steel foundry and iron works, rein.-con. flooring, brick foundation. Cost between $50,000 and $60,000. Architect not selected.

Wis., Sheboygan—Wisconsin Textile Bi-Products Co., Calumet Rd., having plans prepared by W. C. Weeks, archt., Ontario Ave., for 2 story, 60 x 87 ft. addition to factory, or 60 x 72 ft. new factory, brick, rein.-con. and steel, rein.-con. flooring, brick foundation, on Calumet Rd. About $30,000.

Minn., Minneapolis—See "Buildings."

Minn., Minneapolis—Russell Grader Mfg. Co., 2037 University Ave., S. E., plans to build 1 story, 424 x 600 ft., rein.-con., steel and brick factory, on Kennedy St. near Stinson Blvd. About $250,000. Private plans.

Kan., Lawrence—State, c/o J. A. Kimball, business mgr. Bd. Administration, having prepared by R. L. Gamble, archts., 1415 Fillmore St., Topeka, for 1 story, 76 x 118 ft., brick, rein.-con. and steel power plant, rein.-con. flooring, concrete foundation. About $70,000.

Kan., Ottawa—Baptist University Administration having plans prepared by Washburn & Stockley, archts. and engrs., Ottawa, for 1 story, 50 x 100 ft. power house, on University grounds. About $75,000. S. E. Price, pres.

Kan., Wichita — Johnson Larimer Dry Goods Co., 619 East Douglas Ave., having plans prepared by L. Schmidt & Co., archts., 121 North Market St., for 5 story, brick, rein.-con. and steel factory, rein.-con. flooring, concrete foundation. About $150,000. Noted March 4.

Neb., Scottsbluff—Cornell & Searl Co., 7th and Prospect Sts., Lincoln, having plans prepared by R. A. Bradley & Co., archts., Hastings, for 3 story, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, here. About $100,000.

Mo., Dearborn — Lynch Tire & Rubber Co. having plans prepared by Akron Eng. Co., engrs., Akron, for 2 story, 180 x 240 ft., rein.-con. brick and steel factory, rein.-con, flooring, concrete foundation. About $125,000.

Okla., Ada—A. L. Brown plans to build brick plant. About $75,000. Architect and engineer not selected.

Okla., Enid—City plans to build power house and electric lighting system. About $500,000. Black & Veatch, Interstate Bldg., Kansas City, Mo., engrs.

Okla., Newkirk—Newkirk Ice & Creamery Co. having plans prepared by A Frank, engr., Tulsa, for remodeling 1 story, 50 x 100 ft. plant, along tracks of Santa Fe R.R. About $75,000.

Okla., Oklahoma—Zalondek & Bahn, 607 Colcord Bldg., plans to build factory. About $100,000. W. B. Bahn, pres. Architect and engineer not selected.

Okla., Red Fork — Sunlight Carbon Co. plans to build factory, on 8 acre site near here. About $100,000. Architect and engineer not selected.

Ariz., Safford—Safford Flour Mill Co. plans to build mill, 125 bbl. daily capacity. About $75,000. V Holding, mgr.

Wash., Chehalis—Lewis-Pacific Co. Dairymen's Assn. acquired site on Chehalis Ave. and plans to build 1 story, frame and concrete factory, concrete foundation About $25,000. Architect not selected.

Wash., Olympia — State Capitol Comn. having plans prepared by Wilder & White, archts. and engrs., 50 Church St., New York City, for rein.-con. and brick power house, rein.-con. flooring, concrete foundation. About $100,000.

Cal., Chico—Chico Contg. Co. plans to build 2 story, concrete or brick factory. Cost to exceed, $75,000. Architect not selected.

Cal., Corning—Corning Box Co. plans to build 2 story mill and factory, along tracks of Southern Pacific Ry. About $100,000. E. A. Shook, W. N. Woodson and C. D. Hill, main stockholders.

Cal., Igerna (Weed P. O.)—C. M. Reidy, Klamath Falls, Ore., purchased 5,480 acres timber land, including 20,000,000 ft. standing timber, near here, and will remodel mill and install new machinery. About $40,000. Private plans.

Cal., Santa Rosa — California Packing Corp. plans to construct plant, including group of 1, 2 and 3 story buildings, rein.-con., concrete foundations. About $200,000. P. Bush, 101 California St., engr.

Ont., Aurora—Baldwin Milling Co., Wellington St., plans to build 3 story, mill construction plant, concrete foundation. About $60,000. Engineer and architect not selected.

Ont., Brockville—Abbott, Grant & Co., Ltd., Church St., having plans prepared by B. Dillon, archt., 43 King St. E., for 3 story addition to factory, concrete, brick and steel, concrete foundation. About $70,000.

Ont., Brockville—Machinery & Foundries Ltd., having plans prepared by B. Dillon, archt., 43 King St., E., for 1 story, 60 x 150 ft. foundry, concrete, brick and steel, concrete foundation. About $60,000.

Ont., Haliburton—Malloy & Brian plan to build 2 story, saw mill, wood construction, concrete foundation. About $40,000. Private plans.

Ont., Toronto—Canada Realty Co., Kent Bldg., preparing plans for 3 story, 50 x 80 ft. bakery, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Claremont St. About $70,000. Private plans. Eclipse Bakery Co., Ltd., 850 Yonge St., lessee.

Ont., Toronto—Canada Realty Co., Kent Bldg., preparing plans for 3 story, 50 x 100 ft. box factory, concrete, brick and steel, concrete foundation, on Berkley St. About $60,000. Private plans. Folder Paper Box Co., 136 Victoria St., lessee.

Ont., Toronto—Grinnell Co. Ltd., having plans prepared by H. M. Lane Co. Ltd., engrs., Windsor, for 1 story, 100 x 150 ft. foundry, rein.-con. and steel, rein.-con. flooring, concrete foundation.

BIDS DESIRED

N. J., South River—Until April 12, by Bd. Pub. Wks. building addition to electric generating station. E. B. Hedden, supt.; advertised in this issue. Noted Feb. 19.

Pa., Allentown—Until April 1, by Allen Tire & Rubber Co., 510 Hamilton St., building 3 or 4 story, concrete, brick, and steel factory. About $65,000.

W. Va., Welch—Until March 20, by McDowell Co. Wholesale Co., McDowell Co. Natl. Bank Bldg., constructing 5 story, brick warehouse.

O., Cleveland — Until March 24, by Phoenix Ice Machine Co., 2711 Church Ave., constructing 1 story, 50 x 70 ft., steel and brick storage building. About $50,000. Anders & Reimers, 430 Erie Bldg., archts.

Ill., Chicago—R. C. Ostergren, archt., 155 North Clark St., receiving bids building 1 and 2 story, 150 x 460 ft., rein.-con., steel and brick factory, concrete foundation, on Washtenaw and Belmont Aves., for Alemite Die Casting & Mfg. Co., 341 West Chicago Ave. About $250,000.

Ill., Chicago—A. S. Alschuler, archt., 28 East Jackson St., receiving bids building 12 story, 44 x 120 ft., rein.-con., steel, brick and terra cotta addition to factory, concrete foundation, on Harrison and Wells Sts., for M. Born & Co., 540 South Wells St. About $750,000.

Neb., Minden—See "Waterworks."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Portland**—J. C and J H. Stevens, archts. and engrs., 187 Middle St., let contract to Blackstone & Smith, 185 Middle St., building 4 story, brick and rein.-con. factory, concrete flooring, on Forest Ave., for A S Hinds, West St About $500,000. Noted Jan. 29.

★**N. H., Portsmouth** — Rockingham Co Light & Power Co., 29 Pleasant St., let contract building 2 story, 30 x 50 ft., brick and steel addition to power plant, concrete flooring and foundation, to M. Cashman, 63 Water St., Newburyport, Mass. About $25,000.

★**Mass., Brockton**—Jenks & Ballou, archts. and engrs., 1035 Grosvenor Bldg., Providence, R. I., let contract to G. Howard & Sons Co., 153 Main St., building 4 story, 60 x 400 ft. and 60 x 80 ft., rein.-con., and brick factory, concrete flooring and foundation, for G. E. Keith Co., 23 Station Ave. About $350,000. Noted Feb. 26.

★**Mass., Cambridge**—Clayton & Co., 8 Winter St., Boston, let contract building 1 story, 75 x 150 ft., brick, concrete and steel garage, rein.-con. flooring, concrete foundation, on Blanche St., to Dillaby Fireproofing Co., 101 Tremont St., Boston. About $45,000.

★**Mass., Dedham** — Haven & Crosby, archts. and engrs., 40 Court St., Boston, let contract to F. C. Cutler, 15 Barrows St., Allston, building 2 story, 45 x 140 ft., brick and concrete factory, rein.-con. flooring, concrete foundation, on Maverical St., for Dedham Finishing Co. About $40,000. Noted Feb. 26.

★**Mass., Fitchburg**—Fitchburg Paper Co., 804 Main St., let contract building brick and concrete addition to mill, rein.-con. flooring, concrete foundation, to Casper Ranger Costr. Co., 20 Bond St., Holyoke. About $400,000.

★**Mass., Northampton** — McCallum Hosiery Co., 136 West St., let contract building 3 story, brick and mill construction factory, concrete foundation, to S. M. Green Co., 293 Bridge St., Springfield.,

★**Mass., Springfield**—Diamond Match Co., 111 Bway., New York City, let contract building 2 story, 311 x 468 ft. factory and three 2 story, 55 x 75 ft., 35 x 60 ft. and 55 x 75 ft., storehouses, rein.-con. and steel, rein.-con. flooring, concrete foundation, here, to Turner Constr. Co., 244 Madison Ave., New York City. About $1,000,000.

★**Mass., Springfield**—Moore Drop Forging Co., 38 Walter St., let contract altering and building 1 story, 50 x 60 ft., brick and concrete addition to forge shop, concrete flooring and foundation, to F. T. Ley & Co., Inc., 499 Main St. About $40,000 Noted Jan. 22.

★**Mass., West Dudley**—Burmus Paper Co. let contract building 2 story, 50 x 220 ft., factory, to H. Wales Lines Co., 134 State St., Meriden. About $60,000.

★**Mass., Westfield**—Vitrified Wheel Co., Emery St., let contract building 2 story, 42 x 85 ft., brick factory, concrete foundation, to P. J. Mahoney, 46 Orange St. About $25,000.

★**R. I., Providence**—A. C. Potter, foot of Crary St., let contract building 1 story, 50 x 200 ft., brick and steel garage and service station, concrete flooring and foundation, on Broad and Central Sts., to C. 1. Bigney Constr. Co., 357 Westminster St About $40,000.

★**R. I., Warren**—Jenks & Ballou, engrs., 1035 Grosvenor Bldg., Providence, let contract to W. J. Bishop, Warren, building 2 story, 110 x 200 ft., brick and mill construction addition to factory, concrete foundation, on Cutler St., for Mt. Hope Spinning Mill. About $100,000. Noted March 4.

★**Conn., Hartford** — Hartford Electric Light Co., Main St., let contract building 3 story, 80 x 200 ft., brick, rein.-con. and steel power plant, concrete flooring and foundation, at South Meadows, to Stone & Webster Eng. Corp., 147 Milk St., Boston.

★**Conn., Meriden**—M. B. Schenck & Co., Center St., let contract altering and building 1 story, 50 x 100 ft., brick and steel addition to factory, rock and concrete foundation, on Brittania St., to H. Wales Lines Co., 134 State St About $25,000.

★**Conn., New Haven**—G Cemmino, 237 Wooster St., will build 1 story, 55 x 115 ft., brick and concrete garage, concrete flooring and foundation, on Olive St. About $25,000. Work will be done by day labor

★**Conn., Norwalk** — Rosenwald-Wimpfheimer, Inc., let contract converting electric light plant into factory and building 1 story, brick addition, rein.-con. flooring, concrete foundation, on Wilton Ave. and Cross St., to A. R Malkan & Co., 7 Mechanic St. About $25,000

★**Conn., Stamford** — Stamford Dyewood Co., Cove Rd., let contract altering and building addition to factory, brick, steel and wood, concrete foundation to Vuono Constr. Co., Bank St. Owners have furnished brick and will furnish and erect steel Total cost, $30,000.

Industrial Works (Continued)

★N. Y., Brooklyn—Allied Bldg. Corp., 158 Bway., will build 1 story, 100 x 145 ft., brick and steel garage, rein.-con. flooring, concrete foundation. About $35,000. Work will be done by day labor.

★N. Y., Brooklyn—F. Keim, 411 Troutman St, will build 1 story, 100 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Troutman St. and Wyckoff Ave. About $25,000. Work will be done by day labor

★N. Y., Jamaica — Dictograph Co., Schooley Pl. and Chichester Ave., let contract building 1 story, 50 x 145 ft., brick, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, to Barney-Ahlers Constr. Co., 110 West 40th St., New York City.

★N. Y., Newburgh—Cleveland & Whitehill Co. let contract building 4 story, 100 x 100 ft., brick and rein.-con. addition to factory, to T. C. Desmond Co., 31 Nassau St., New York City. About $100,000.

★N. Y., Rochester—Smith, Hinchman & Grylls, archts. and engrs., 710 Washington Arcade, Detroit, Mich., let contract to White Constr. Co., 17 North La Salle St., Chicago, building 3 story, 121 x 253 ft., brick, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Campbell St., for Yawman & Erbe Co. Noted Feb. 12.

★N. Y., Schenectady—Mica Insulator Co., 46-60 Villa Rd. let contract building 4 story, 50 x 130 ft., and 1 story addition to factory, to Turner Constr. Co., 244 Madison Ave., New York City. About $125,000.

★N. Y., Tuckahoe (Yonkers P. O.) — Hodgman Rubber Co. let contract building 5 story, 60 x 150 ft., rein.-con. and steel addition to factory, rein.-con. flooring, concrete foundation, to Kelly & Kelley, 12th St., Long Island City. About $200,000. Noted Feb. 19.

★N. Y., Watertown—Taggarts Bros. Co., 595-597 Main St., W., will build 1 story, 67 x 200 ft., concrete and steel addition to factory, on West Main St. About $40,000. Work will be done by day labor.

★N. J., Mays Landing — Mays Landing Water & Power Co. let contract building 1 story, 40 x 40 ft. rein.-con. power house, rein.-con. flooring, concrete foundation, to Aberthaw Constr. Co., School St., Boston, Mass. About $50,000.

★N. J., Trenton—Crescent Insulated Wire & Cable Co., Taylor St., let contract building 3 story, 50 x 150 ft., concrete and steel addition to plant, on North Olden Ave., to B. Whitehead, 1430 Riverside Ave. $40,000.

★Pa., Chester—Allison & Co., Law Bldg., let contract building 1 story, 62 x 202 ft., brick and concrete mill, to Chester Contg. & Constr. Co., Otis Bldg., Phila. About $100,000.

★Pa., Johnstown — Women's Memorial Hospital Assn. let contract building 4 story, 160 x 163 ft. power plant and laundry, including 125 ft. chimney, on Franklin St., to C. Schenkemeyer & Son, Johnstown About $40,000.

★Pa., New Hope—New Hope Paper Mill let contract building 2 story, 60 x 144 ft., brick addition to mill, here, to C. R. Randall, 43 North Hermitage Ave., Trenton, N. J. About $25,000.

★Pa., Myerstown—Myerstown Silk Mill Co. let contract building 1 story, 192 x 210 ft., rein.-con. and brick mill, rein.-con. flooring, to C. C. Loose, Myerstown. About $125,000; cost plus percentage basis.

★Pa., Phila.—Amer. Mfg. Co., Noble and West Sts., Brooklyn, N. Y., let contract building 2 story, 110 x 400 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, here, to Turner Constr. Co., 244 Madison Ave., New York City.

★Pa., Phila.—Crosstown Realty Co., c/o Neubauer & Supourtz, archts. and engrs., 929 Chestnut St., let contract building 1 story, 92 x 100 ft. and 36 x 115 ft., concrete, brick, stone and steel garage, on Belfield Ave., to W. G. Uhlers Sons. 1825 South Broad St. About $35,000. Noted Feb. 5.

★Pa., Phila.—Standard Crown Co., Hope and Palmer Sts., let contract building 1 story, 16 x 20 ft. and 62 x 200 ft., brick and steel factory, to A. Chambley, 2057 Summer St. About $35,000. Noted Feb. 26.

★Pa., Shamokin—A. H. Hershner will build 3 story, 30 x 80 ft. brick garage. About $30,000. Work will be done by day labor.

★Pa., Torresdale (Phila. P. O.)—Precision Grinding Wheel Co. let contract building 1 story, 90 x 265 ft., brick and concrete factory, to J. R. Wiggins Co., Otis Bldg., Phila. About $100,000.

★Md., Baltimore—H. F. Hemingway & Co., 2315 Orleans St., let contract building 2 story, 40 x 100 ft., brick and steel packing plant, cement flooring, concrete foundation, on Orleans and Bradford Sts., to C. L. Stockhausen Co., Gay and Water Sts. About $50,000.

★Md., Baltimore — Dewitz & Webb., archts., 232 St. Paul St., let contract to J. Selekman, 1808 North Chester St., building 1 story, 60 x 200 ft., brick garage, cement concrete flooring, concrete foundation, at 814 North Chester St., here, for F. Rob, Raspeburg. About $25,000.

★Ga., Savannah—Diamond Match Co., 111 Bway., New York City, let contract building 4 story, 57 x 196 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, here, to Turner Constr. Co., 244 Madison Ave., New York City.

★O., Cleveland — Cleveland Automobile Co., East 131st St., let contract building 2 story, 80 x 140 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, on London Rd., to J. Gill & Sons, 1301 Citizens Bldg. About $150,000. Noted March 4.

★O., Cleveland—Cleveland Co-operative Stove Co., 6712 Central Ave., let contract building 2 story, 31 x 75 ft., steel and brick foundry, brick foundation, at 2323 East 67th St., to J. Gill & Son, Citizens Bldg. About $50,000.

★O., Cleveland—Osborn Mfg. Co., 5401 Hamilton Ave., let contract building 1 story, 50 x 200 ft. and 50 x 125 ft. factory, brick and steel, at 5401 Hamilton Ave., to J. R. Gloyd Co., 1816 East 33rd St. About $75,000.

★O., Cleveland—Standard Parts Co., 1791 East 11th St., let contract constructing 1 story, 64 x 202 ft., steel and brick storage building, on West 83rd St. north of Lake St., to J. Cassidy, 3401 West 95th St. About $50,000.

★Mich., Detroit—Cadillac Motor Car Co., Woodward Ave., let contract building 4 story, 619 x 79.2 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Clark and Michigan Aves., to Du Pont Eng. Co., 435 Wodward Ave., $2,780,000.

★Mich., Detroit—C. E. Smith & Co., 708 Empire Bldg., let contract constructing 2 story, 100 x 200 ft., rein.-con., brick and steel garage and sales building, rein.-con. flooring, brick foundation, on John R. St., to A. W. Kutsche & Co., 817 Ford Bldg. Noted Feb. 26.

★Ill., Chicago—Jacob Birk Realty Trustees Co., 1325 Webster Ave., let contract building 7 story, 60 x 140 ft., rein.-con. and brick factory, concrete foundation, at 560 West Lake St., to H. Erickesson Co., 139 North Clark St. About $350,000.

★Ill., Chicago—M. C. Clancy, 19 South La Salle St., let contract constructing 2 story, 45 x 165 ft., brick and timber service building, concrete foundation, at 3130 North Michigan Blvd., to B. J. Regnall, 19 South La Salle St. About $50,000.

★Ill., Chicago — Clemetsen Co., 2607 Floureny St., let contract building 3 story, 100 x 300 ft., brick and timber factory, concrete foundation, on Homan and Division Sts., to R. F. Wilson & Co., Market and Randolph Sts. About $200,000.

★Ill., Chicago—Clydesdale Motor Truck Co., 4007 Wabash Ave., let contract constructing 1 story, 120 x 175 ft., rein.-con. and brick service and sales building, concrete foundation, on Calumet Ave. and 23rd St., to B. W. Constr. Co., 10 South La Salle St. About $80,000.

★Ill., Chicago—Darling & Co., 4201 South Ashland Ave., let contract constructing 5 story, 97 x 100 ft. distillation plant, 2 story, 33 x 70 ft. service building and 1 story, 90 x 145 ft. storage building, at 1210 West 45th St., to Stresenreuter Bros., 3020 South Halsted St. About $225,000.

★Ill., Chicago — F. T. Hoyt, 154 West Randolph St., let contract building 1 story, 200 x 400 ft., brick and timber factory, concrete foundation, on 47th St. and Kedzie Sts., to W. McCumber, 140 South Dearborn St.

★Ill., Chicago—C. M. Owens, 2526 Congress St., let contract building 1 story, 125 x 145 ft., brick and timber factory, concrete foundation, at 1512-18 Montana Ave., to B. J. Regnall, 19 South La Salle St. About $60,000.

★Ill., Chicago—Slotwell Mfg. Co., 1021 West Adams St., let contract building 4 story, 100 x 200 ft., mill construction factory, concrete foundation, on Potomac and St. Louis Sts., to R. F. Wilson & Co., Randolph and Market St. About $300,000.

★Wis., Milwaukee—Columbia Knitting & Mfg. Co., 236 Bway., let contract building 1 story, 115 x 220 ft., rein.con. and brick factory, rein.-con. flooring, concrete foundation, on 33rd St., to T. Starks Co., 217 West Water St. About $100,000.

★Wis., Sheboygan—Last Trimming Co. let contract building 2 story, 80 x 145 ft., brick, rein.-con. and steel factory, rein.-con. flooring, brick foundation, on 15th and Georgia Sts., to C. F. Grasse Co., 12th St. About $50,000.

★Wis., Sheboygan—Northfield Co., 18th St. and Martin Ave., let contract (exclusive of electricity, plumbing and painting), building 4 story, 60 x 160 ft., brick, rein.-con. and steel factory, concrete foundation, on North 18th St. and Martin Ave., to H. E. and L. Meier, Michigan Ave. Cost between $30,000 and $50,000.

★Kan., Rosedale—Rushton Baking Co., 814 Southwest Blvd., let contract building rein.-con. and brick addition to bakery, rock foundation, to L. Breitag & Son, 3701 Prospect St., Kansas City, Mo. About $50,000. Noted Jan. 15.

★Kan., Topeka—Beatrice Creamery Co., 2nd and Polk Sts., let contract building 2 story, 85 x 150 ft., brick, concrete and steel addition to creamery, concrete foundation, to G. Senne, 518 Kansas Ave. About $100,000; cost plus percentage basis. Noted Feb. 26.

★Cal., Anaheim—Anaheim Co-operative Orange Assn. will build rein.-con., steel and hollow tile packing house, rein.-con. flooring, on Center St. Work will be done by day labor. S. Evans, supt.

★Cal., Emeryville (Oakland P. O.)—Johnson Electric Washer Co. let contract building 1 story, 120 x 134 ft., brick and steel factory, concrete foundation, on 40th and Adeline Sts., to Austin Co., 16112 Euclid Ave., Cleveland. About $40,000.

★Cal., Emeryville (Oakland P. O.)—Sherwin-Williams Co. let contract building 3 story, 60 x 200 ft., rein.-con. warehouse, to G. Wagner, 251 Kearny St., San Francisco.

★Cal., Los Angeles — F. B. Henderson, c/o C. E. Finkenbinder, archt., 729 Story Bldg., will build 2 story, 100 x 143 ft. brick garage, machine shop and store, concrete foundation, on Western Ave. About $60,000. Work will be done by day labor under supervision of architect.

★Cal., San Francisco—Rey Mfg. Co. let contract building 1 story, 120 x 200 ft., concrete, brick and steel factory, concrete foundation, on Bosworth St., to Austin Co., 16112 Euclid Ave., Cleveland. About $45,000.

★Cal., San Jose—Natl. Axle Co. let contract building 1 story, 90 x 136 ft., brick and steel factory, concrete foundation, on old Luna Park Site, to Austin Co., 16112 Euclid Ave., Cleveland. About $60,000.

★Que., Montreal—Montreal Tramway Co., Tramway Bldg., let contract building 1 story, 46 x 106 ft. power house, concrete, steel and brick, concrete foundation, on Cote St., to F. A. Grothe, 10 Cathcart St. About $67,000.

★Alta., Edmonton—Marshall-Wells Co. let contract building 9 story, 100 x 150 ft. warehouse, rein.-con., steel and brick, rein.-con. flooring, concrete foundation, to Carter, Halls & Aldinger, Union Bank Bldg., Winnipeg, Man. About $400,000.

★B. C., Vancouver—Almonds Ltd., 400 Pender St. E., will build 1 story, 122 x 150 ft. rein.-con. and tile warehouse and garage on Keefer St. About $80,000. Work will be done by day labor.

Buildings

PROPOSED WORK

Mass., Andover — Memorial — Philips Andover Academy plans to build 2 story, brick, steel and concrete, on campus. About $250,000. G. Lowell, 12 West St., Boston, archt. and engr.

Mass., Ashland—Mercantile—Swett Root Beer, Inc., 10 Post Office Sq., Boston, having plans prepared by MacNaughton & Robinson, archts., 101 Tremont St., Boston, for 3 story, 75 x 150 ft., brick and steel, on Pleasant St., here.

Mass., Attleboro—Home and Club—B. P. O. Elks plans to build 2 story, 100 x 100 ft., brick and steel. About $75,000. Architect not selected.

Mass., Boston—Bank and Office—J. C. Spofford, archt., 36 Bromfield St., preparing plans for 11 story, brick and steel, on State and Chatham Sts. About $125,000. Owners name withheld.

Mass., Boston—Business—Andrews, Rantoul & Jones, archts., 50 Congress St., soon

Buildings (Continued)

receive bids building 6 story, 40 x 50 ft., brick, concrete and steel addition, concrete flooring, for Hornblower & Weeks, 60 Congress St. About $50,000.

Mass., Boston—College—Boston College, 688 Boylston St., having plans prepared by Maginnis & Walsh, archts., 100 Boylston St., for 3 story, stone science building, on college grounds, Newton Heights. About $150,000.

Mass., Boston—Office and Business—Henderson & Ross, 148 State St., having plans prepared by MacNaughton & Robinson, archts., 101 Tremont St., for 8 story, brick and terra cotta block on State St.

Mass., Boston—Sales—A. H. Bowditch, archt. and engr., 44 Bromfield St., soon receives bids building 1 story, 115 x 125 ft., brick, stone and concrete, rein.-con. flooring, concrete foundation, on Brookline Ave., for N. B. Smith, 30 Fairmount St., Brookline. About $75,000. Noted March 4.

Mass., Boston—Store and Business—J. P. Reynolds, 30 State St., having plans prepared by Parker, Thomas & Rice, archts. and engrs., 110 State St., for 8 story, concrete and steel, on Winter St. Ginter Co., 39 Congress St., lessee.

Mass., Chicopee—Theatre—Z. Szatrowski, 232 Exchange St., plans to build 60 x 150 ft., brick and steel, concrete and wood flooring, concrete foundation. About $50,000. G. P. Dion, 30 Center St., archt.

Mass., Hamilton—High School—Bd. Selectmen plans to build 2 story, brick and steel, on Union St. About $125,000. Architect not selected.

Mass., Lawrence — Parish — Grace Episcopal Society, Jackson and Gardner Sts., plans to build 2 story, brick and stone, concrete foundation. About $60,000. G. W. Chickering, 6 Beacon St., Boston, archt.

Mass., Lynn—Bank—Central Natl. Bank, Willow St., plans to alter present bank building. About $50,000. Architect not selected.

Mass., Mattapan (Boston P. O.)—Business—L. Lanata, 1653 Blue Hill Ave., plans to build brick and steel, on River and Ashland Sts. About $50,000. Architect not selected.

Mass., New Bedford—Bank—First Natl. Bank, 110 Union St., having plans prepared by Hutchins & French, archts. and engrs., 6 Beacon St., Boston, for brick, concrete and steel, on Union and Pleasant Sts.

Mass., Wenham — School — School Bd. plans to build 2 story, brick addition, on Prospect and Perkins Sts. About $50,000. Architect not selected.

Mass., Williamstown—Library—Cram & Ferguson, archts., 20 Beacon St., Boston, soon let contract building 3 story, 120 x 120 ft., brick and limestone, concrete flooring and foundation, on campus, for Williams College. About $500,000. W. E. Hoyt, treas. Noted May 8.

R. I., Providence — Business — Lederer Realty Corp., 100 Stewart St., plans to build 3 story, brick and steel, on Washington and Clemence Sts. About $50,000. Architect not selected.

R. I., Providence—Business and Office—E. A. Smith, Real Estate Co., Westminster St., plans to build 5 story, brick and steel, on Washington St. Architect not selected.

Conn., Bantam—School—Litchfield Twp. Scbol Comn. plans to build brick, here. About $60,000. Architect not selected.

Conn., Bridgeport — Station — Bd. Park Comn. plans to build 2 story, athletic and comfort station, at Seaside Park, here. About $50,000. Architect not selected.

Conn., Bristol—Schools—Bd. Educ. receives bids about April 2, building 2 story, brick, steel and concrete grammar school, on Burlington Ave., cost $125,000; 3 story, brick steel and stone high school, brick foundation, at Dunbars Meadows, $600,000. W. Potter, 22 East 17th St., New York City, archt. and engr.

Conn., Danielson—School—School Comn. plans to build 2 story, 8 room. About $100,000. Architect not selected.

Conn., Middletown—Armory—State Military Emergency Bd., Hartford, rejected bids received Feb. 21, building armory here. About $150,000. Payne & Griswold, Manwaring Bldg., New London, archts. and engrs. Noted Feb. 12.

Conn., New Britain—Club—World War Veterans, c/o C. C. Palmer, archt. and engr., 272 Main St., plans to build 4 story, 60 x 150 ft., brick, rein.-con. and steel, rock foundation, rein.-con. flooring, on North and Beaver Sts. About $200,000.

Conn., Norwich—Theatre—H. S. Goldfaden, 388 West Main St., had plans prepared by G. E. Pitcher, engr., 65 Bway., for 3 story, brick, concrete and steel, concrete foundation, on Bway. About $150,000. Noted Jan. 29.

Conn., South Manchester—Theatre—J. F. Sullivan, 671 Main St., plans to build brick and steel. About $100,000. Architect not selected.

Conn., Stafford Springs—School—Stafford Twp. plans to build 2 story, brick and steel, here. About $125,000. J. H. Valentine, East Main St., chn. Architect not selected.

Conn., Westport—Fire House, etc.—Town and Y. M. C. A., c/o W. B. Tubby, archt., 81 Fulton St., New York City, had plans prepared constructing 2 story, brick, concrete and steel firehouse and Y. M. C. A. building, rein.-con. flooring, concrete foundation, on State St. About $100,000.

N. Y., Alden—Home and Hospital—Bd. Supervs. Erie Co. soon receives bids constructing twelve 3 story, brick, rein.-con. and cut cast stone buildings, connected by corridors, 600 ft. frontage, 260 ft. deep. About $1,700,000. Speich & Walker, Ellicott Sq. Bldg., Buffalo, archts. G. C. Diehl, Ellicott Sq., Buffalo, engr.

N. Y., Brooklyn—School—School of Our Lady of Lourdes, Aberdeen St., soon lets contract building 4 story, brick, steel and stone addition, brick foundation. About $300,000. J. McMahon, pastor. Helmle & Corbett, 189 Montague St., archts. and engrs.

N. Y., Brooklyn — Store — Abraham & Strauss, 422 Fulton St., having plans prepared by Starrett & Van Vleck, archts. and engrs., 8 West 40th St., New York City, altering 5 story, brick, steel and stone. About $130,000.

N. Y., Buffalo—Store—S. A. Anderson, 440 Main St., plans to build 3 story, 58 x 110 ft., brick and rein.-con., at 442-4 Main St. About $75,000. H. C. Swain, 1377 Delaware Ave., archt

N. Y., Lackawanna—Church and School—St. Patricks Parish plans to build brick, concrete and stone. Cost between $100,000 and $130,000. A. Baker, pastor.

N. Y., New York—Bank—Empire City Savings Bank, 231 West 125th St., having plans prepared by Trowbridge & Livingston, archts. and engrs., 527 5th Ave., for 1 story, 50 x 100 ft., brick, steel and stone, brick foundation.

N. Y., New York—Loft, etc.—E. Dwight, 56 Maiden Lane, having plans prepared by Butler & Rodman, archts. and engrs., 56 West 45th St., altering 8 story, brick and steel loft building and warehouse, on William and John Sts. About $150,000.

N. Y., New York—Loft—Silk Traders, Inc., c/o G. and E. Blum, archts. and engrs., 505 5th Ave., having plans prepared for 12 story, brick, steel and stone, brick foundation, on 4th Ave. About $600,000.

N. Y., New York—Office, etc.—Standard Oil Co. of New York, 26 Bway., soon lets contract building 2 story, 40 x 100 ft., brick and steel office and warehouse, rein.-con. flooring, concrete foundation, at 604 West 46th St. About $60,000. C. A. Ellis, 26 Bway., archt. and engr.

N. Y., New York—Office—Thompson & Binger, archts. and engrs., 280 Madison Ave., preparing plans for 18 story, 75 x 80 ft., brick, steel and stone, concrete foundation, on Franklin and Gold Sts. About $400,000. Owner's name withheld.

N. Y., New York—School—Bd. Educ., 500 Park Ave., having plans prepared by C. B. J. Snyder, archt. and engr., Municipal Bldg., for 4 story, brick, steel and stone, brick foundation, on 176th St. and Audubon Ave. About $200,000.

N. Y., New York—Store—L. M. Gerry, Newport, R. I., having plans prepared by J. B. Snook Sons, archts. and engrs., 261 Bway., altering 8 story, brick, steel and stone, at 20 West 42nd St., here. About $75,000. Stern Bros., lessee.

N. Y., New York—Theatre—M. R. Huntington, 10 East 58th St., having plans prepared by W. J. Cherry, archt. and engr., Grand Central Sta., for 2 story, 85 x 100 ft., brick, steel and stone, brick foundation, on Washington Pl. About $250,000.

N. Y., Olean—Office—Mowbray & Uffinger, archts. and engrs., 56 Liberty St., New York City, soon let contract altering brick, steel and stone, for F. L. Bartlett. About $75,000.

N. Y., Ossining—Grade School—Bd. Educ. receives bids about April 10, building 2 story, bric and steel, brick foundation. About $60,000. W. Potter, 22 East 17th St., New York City, archt. and engr.

N. Y., Silver Creek—School—Town Bd. plans to build 3 story, 150 x 170 ft., brick and concrete. About $300,000. H. S. Horton, Prudential Bldg., Buffalo, archt.

N. J., Jersey City—Club House—Foresters of America, Court 3, Montgomery St., plan to build 4 story, on Bergen Ave. About $100,000. Architect not selected.

N. J., Jersey City — Office — Employers Liability Co., 40 Montgomery St., plans to erect 4 story addition to present building, on Greene St. About $50,000.

N. J., Newark—Market—H. Rosensohn, archt., 188 Market St., preparing plans for 1 story, 75 x 100 ft., concrete and brick, at 253 Prince St. About $50,000. Owner's name withheld.

★**N. J., Newark**—Mercantile—J. L. Feiblem & Co., 738 Broad St., will build 2 story, 80 x 80 ft., concrete and brick, at 870 Broad St. About $50,000. Work will be done by day labor.

N. J., Newark—Office—N. Harris, archt., 21 South Orange Ave., receives bids in June building 24 story, 47 x 178 ft., brick and steel, on Broad St. and Branford Pl., for Osborne Realty Co., 756 Broad St.

N. J., New Brunswick—Hotel—N. Harris, archt., 21 South Orange Ave., Newark, receives bids about April 11, building 12 story, 70 x 200 ft., concrete and brick, on Albany St. Owners name withheld.

N. J., Short Hills — High School — Bd. Educ. Millburn Twp., having plans prepared by Guilbert & Betelle, archts., Aldine Bldg., Newark, for 2 story, 60 x 150 ft., brick or stucco, here.

N. J., Trenton—Fire House—City Com. plans to build new fire headquarters on Perry St. About $150,000. Architect not selected.

Pa., Cambria (Johnstown P. O.)—Hospital—Midvale Steel & Ordnance Co., 14 Wall St., New York City, receives bids about April 1, building 4 story, brick and concrete, rein.-con. flooring, rock foundation, on Prospect St., here, for Cambria Steel Co. About $600,000. J. J. Janessen, Pittsburgh, archt.

Pa., Easton—Y. M. C. A., 347 Madison Ave., New York City, having plans prepared by Martin & Kirkpatrick, archts. and engrs., 130 South 15th St., Phila., for 4 story, brick, steel and stone, brick foundation, here. About $250,000.

Pa., Harrisburg—Schools—School Dist., 123 Chestnut St., having plans prepared by C. H. Lloyd, archt., Telegraph Bldg., for 2 story, rein.-con. and brick addition to Steele School, 5th and Mahantonga Sts., also for group of 4 to 6 buildings for Senior High School, 6th and Division Sts. About $60,000 and $1,250,000 respectively. D. D. Hammelbaugh, secy.

Pa., Johnstown — Store — J. Thomas & Sons Co. plan to build 5 story, 50 x 150 ft., 60 x 130 ft. and 40 x 150 ft., brick and rein.-con. R. T. Dawson, 513 Hartman Bldg., Columbus, O., archt.

Pa., Phila. — Home — Jewish Sheltering Home for Infants, Tabor St. and York Rd., having plans prepared by Magiziner & Eberhard, archts. and engrs., 603 Chestnut St., and soon receives bids for 2 story, 100 x 230 ft., brick. About $50,000.

N. C., High Point—Hotel—High Point Hotel Co. having plans prepared by W. L. Stoddart, archt. and engr., 9 East 40 St., New York City, for 9 story, brick, steel and stone, concrete foundation. About $500,000.

Ga., Columbus — Bank — Mowbray & Uffinger, engrs. and archts., 56 Liberty St., New York City, receive bids about April 12, building brick, steel and stone, brick foundation, for Merchants & Mechanics Bank, 205 Broad St. About $150,000.

Ala., Birmingham—School—Bd. Educ. Jefferson Co. soon receives bids building 1 story, 105 x 129 ft., tile and stucco, at Huegtown. About $50,000. D. D. Whilldin, Title Guarantee Bldg., archt.

Ala., Boaz — Seminary — J. H. Snead Seminary having plans prepared by Magaziner & Eberhard, archts. and engrs., 603 Chestnut St., Phila., for 3 story, 110 x 180 ft., brick. Cost to exceded, $50,000.

Ala., Powderly—High School—Bd. Educ. Jefferson Co. (Birmingham) soon receives bids building 1 story, 250 x 280 ft., brick and tile. About $130,000. D. O. Whilldin, Title Guarantee Bldg., Birmingham, archt.

Ky., Newport—Exchange—Citizens Telephone Co. plans to build 132 x 190 ft., on 6th and Park Aves. H. Hake, Telephone Bldg., archt.

O., Akron—Office and Laborartory—S. & O. Engraving Co., 330 South High St., having plans prepared by Harpster & Bliss, archts., Nantucket Bldg., for 2 story, 40 x 150 ft., concrete, steel and brick, concrete foundation, on High St. About $60,000. Mayer & Valentine, Bangor Bldg., Cleveland, engrs.

O., Cleveland — Commercial — Amer Ukrainian Bldg. & Loan Co., Professor Ave.,

Buildings (Continued)

having plans prepared by W. Markovitz, accht., 10827 Bryant Ave., for 2 story, 90 x 120 ft., steel and brick, on West 10th St. and Professor Ave. About $60,000.

O., Cleveland — Commercial — Cleveland Mortgage Co., Erie Bldg., having plans prepared by Walker & Weeks, archts., 1900 Euclid Ave., remodeling and building 4 story, concrete, steel and brick addition, on East 9th St. and Prospect Ave. About $75,000.

O., Cleveland—Commercial—Exide Battery Co., 5121 Perkins Ave., having plans prepared by Leheman & Schmidt, archts., Electric Bldg., for 2 story, 40 x 200 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 24th St. and Chester Ave. About $75,000.

O., Cleveland — Commercial — Templar Realty Co., 1605 Williamson Bldg., having plans prepared by S. H. Weis, archt., 1032 Schofield Bldg., for 8 story, 80 x 200 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 81st St. and Euclid Ave. About $500,000.

O., Cleveland—School—Bd. Educ., East 6th St. and Rockwell Ave., having plans prepared by W. R. McCormack, archt., East 6th St. and Rockwell Ave., for 3 story, 60 room, brick, concrete and steel, rein.-con. flooring, concrete foundation, on Hopkins Ave., near East 123rd St. About $1,250,000.

O., Columbus—Schools—Bd. Educ. revised building program for 1920 and having plans prepared by D. Riebel & Sons, archts., New 1st Natl. Bank Bldg., for 12 room school on Taylor Ave., 8 room school in Clintonville, 8 room school on Sullivant Ave., 10 room school in Linden, 8 room school on Fulton St., 8 room school on Douglas Ave. and 4 room addition to Milo School. Noted Aug. 21.

O., Dayton—Administration — See "Industrial Works."

O, Glenmont—School—Bd. Educ. having plans prepared by O. D. Howard, archt., 8 East Broad St., Columbus, for 2 story, 75 x 85 ft., concrete and brick, here. About $75,000. S. Jones, clk.

O., Lakewood (Cleveland P. O.)—Theatre—Lakewood Theatre Co., c/o E. Mandelbaum, Sloan Bldg., having plans prepared by T. W. Lamb, archt., 1323 Euclid Ave., for 2 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, at 15015 Detroit Ave. About $200,000.

O., Payne — School — Bd. Educ. having plans prepared by O. D. Howard, archt., 8 East Broad St., Columbus, for 2 story, 85 x 110 ft., concrete and brick, in Benton Twp. About $150,000. L. Birkhold, clk.

O., Ritman—Bank—A. Moorman & Co., archt., Chamber of Commerce, St. Paul, preparing plans for 1 story, 25 x 60 ft., brick and stone, here. About $55,000. Owner's name withheld.

O., Springfield—School—Bd. Educ. plans to remodel and build 3 story, steel and brick addition to Rockaway School, on Ridgewood St. About $50,000. Hall & Lethly, 807 Fairbanks Bldg., archts.

O., Springfield—Schools—City plans election April 27, to vote on $210,500 bonds to build 14 room school, including gymnasium, auditorium, etc., on North Side; $140,000 for 10 room school on East Side; $136,000 for 10 room school on South Side; $95,000 for 8 room school in Snyder Park; $145,000 to remodel old buildings.

O., Warren—Office—Park Land Co., 2nd Natl. Bank Bldg., having plans prepared by R. J. Keich, archt., Western Reserve Natl. Bank Bldg., for 7 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on East Market St. About $300,000.

Ind., Logansport—Hotel—Barret Hotel Co. plans to build 7 story, 52 x 152 ft. rein.-con., marble, tile and brick. About $300,000. C. E. Bacon, Odd Fellows Bldg., Indianapolis, archt.

Mich., Detroit—Church—Holy Redeemer Church, c/o A. Cantwell, Dix Ave., plans to build 2 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Dix and Junction Aves. About $300,000. Architect not selected.

Mich., Detroit — Hotel—R. H. Marr, archt., Kresge Bldg., preparing plans for 5 story, 33 x 136 ft., brick and steel, wood flooring, concrete foundation, on Cass Ave. near Stimson Pl. About $125,000. Owners name withheld.

Mich., Flint — Clubhouse — Knights of Columbus, c/o P. Callahan, chn., plans to build 3 story, 80 x 108 ft., rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation. About $250,000. Van Leyen, Schilling, Keough & Reynolds, Union Trust Bldg., Detroit, archts. and engrs.

Mich., Flint—High School—Bd. Educ. having plans revised by Malcolmson, Higginbotham & Palmer, archts., 405 Moffat Bldg., Detroit, for 2 story, 208 x 287 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $1,250,000.

Mich., Flint—Office—Flint Medical Society, Detroit St., plans to build 5 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on 4th and Detroit Sts. About $200,000. Architcct not selected.

Mich., Flint — Theatre — Van Leyen, Schilling, Keough & Reynolds, archts. and engrs., Union Trust Bldg., Detroit, preparing plans for 2 story, 40 x 130 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Detroit St. About $100,000. Owner's name withheld.

Mich., Mt. Morris — School — Bd. Educ. plans to build 2 story, 8 room, rein.-con., brick and steel, rein.-con. and wood flooring, brick foundation. About $90,000. Van-Leyen, Schilling, Keough & Reynolds, Union Trust Bldg., Detroit, archts. and engrs.

Mich., Saginaw—High School—Bd. Educ., c/o E. C. Oscar, having plans prepared by Cowles & Mutscheller, archts., 1-10 Chase Blk., for 2 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $1,000,000.

Mich., Saginaw — Mercantile — Modart Corset Co., 309 Lapeer Ave., plans to build 4 story, 109 x 134 ft., rein.-con., brick and terra cotta, rein.-con. flooring, concrete foundation, on Lapeer Ave. About $300,000. Cooper Beckbissinger, 114 South Jefferson Ave., archts.

Contractors Wanted

—

3400 Proposals

were printed in this Construction News Section from January 1 to March 11, 1920.

Last week, alone, we announced 380 new items of proposed work.

Many contractors and much equipment are needed to handle the work of the 1920 Construction Season.

Are you ready?

Mich., Saginaw—School—Bd. Educ., c/o C. A. Khuchn, secy., plans to build 2 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, in West Side dist. About $50,000. Cowles & Mutscheller, 1-10 Chase Blk., archts.

Wis., Manitowoc—High School—City plans to construct 3 story, 150 x 290 ft., brick, rein.-con. and steel, brick foundation, on South 8th St. About $1,400,000. Academics building will be first to be constructed cost, $678,000. A. K. Zander, clk. Architect will be selected soon.

Wis., Milwaukee — Hospital — Milwaukee Co. will receive competitive sketches until June 21, for rein.-con. and brick hospital, rein.-con. flooring, concrete foundation, on 25th St. and Grand Ave. About $1,000,000. G. Hampel, clk. A. C. Clas, Colby-Abbot Bldg., advisory archt.

Wis., Milwaukee—Office—Harley-Davidson Motor Co., 3732 Chestnut St., having plans prepared by Federal Eng. Co., engrs. and archts., Stephenson Bldg., for 5 story, rein.-con. and brick, rein.-con. flooring, concrete foundation, on Chestnut St. Cost to exceed $50,000.

Wis., Milwaukee — Theatre — C. Rieger, c/o Iris Theatre, 14th St. and North Ave., plans to build brick and concrete, rein.-con. flooring, concrete foundation, on Wisconsin St. About $250,000. Architect and engineer not selected.

Wis., Sheboygan — Lodge — B. P. O. Elks, c/o A. Pfister, Bank of Sheboygan, plans to build 4 story, 60 x 150 ft., rein.-con. and brick foundation, at 75 Wisconsin Ave. Cost between $60,000 and $100,000. Architect not selected.

Ia., Coburg—School—Bd. Educ. having plans prepared by W. Gordon, archt., Hubbell Bldg., Des Moines, for 2 story, brick, rein-con. and steel, rein.-con. flooring, concrete foundation. About $90,000.

Ia., Green Mountain—School—Bd. Educ. plans to build 2 story, semi-fireproof school. About $80,000. Architect and engineer not selected.

Ia., Hawarden—School—City voted $97,000 bonds to build school. Architect not selected.

Ia., Mt. Pleasant—Hospital—Henry Co. Hospital Assn. soon lets contract building 2 story, 50 x 100 ft., rein.-con. and brick. About $100,000. F. B. Crane, secy. G. L. Lockhart, Endicott Bldg., St. Paul, archt. Noted Feb. 26.

Minn., Brainerd — Church — Presbyterian Church having plans prepared by A. R. Van Dyck, archt., 403 Soo Line Bldg., Minneapolis, for 36 x 90 ft., brick, stone and tile, here. About $50,000. F. A. Hagberg, chn.

Minn., Minneapolis — Office — McMichael Investment Co., 600 Plymouth Bldg., having plans prepared by Kees & Coburn, archts., 246 Plymouth Bldg., for 2 story, 50 x 157 ft., rein.-con. and brick, at 33 7th St., S. About $500,000.

Minn., Minneapolis—Stores, Etc.—Lindsay Co., 3406 University Ave., plans to construct 2 story, 60 x 200 ft., rein.-con. store and light manufacturing building, on University and Bedford Aves. About $130,000. Farham Constr. Co., 641 Plymouth Bldg., archts.

Minn., Robbinsdale—School — Bd. Educ. soon lets contract building 2 story, 90 x 118 ft., fireproof. About $125,000. H. H. Livingston, 55 8th St., Minneapolis, archt.

Minn., St. Paul—Church and Community—Riverview Methodist Episcopal Church, 529 Bidwell St., plans to build 3 story, 90 x 100 ft., rein.-con. and brick, on West George St. About $100,000. A. H. Stem, 601 Endicott Bldg., archt.

Kan., Dodge City — Schools — Bd. Educ. having plans prepared by L. Schmidt & Co., archts., 121 North Market St., Wichita, for 2 story ward school and 3 story high school, brick, concrete and steel, concrete foundation. About $40,000 and $60,000 respectively.

Kan., Havensville — School — Bd. Educ. having plans prepared by T. W. Williamson & Co., archts., 418 Central Natl. Bank Bldg., Topeka, for 2 story, brick, concrete and steel, concrete foundation. About $60,000.

Kan., Wichita—Dormitory—Mt. Carmel Academy plans to build brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $200,000. Architect not selected.

Neb., Ingleside — Hospital, etc. — Bd. Comn. of State Asylum for Insane, Lincoln, having plans prepared by R. A. Bradley & Co., archts., Hastings, for 2 story, 65 x 122 ft. hospital and receiving building, rein.-con. and steel, rein.-con. flooring, concrete foundation, here. About $100,000.

S. D., Groton—School—Town plans to build school. About $170,000.

S. D., Ipswitch—Edmunds Co. plans election soon to vote on $150,000 bonds to build roads.

N. D., Bismarck—Memorial—State Bldg. Comn. plans to construct 3 story, 61 x 100 ft. memorial building, on capitol grounds, Bedford limestone front. About $200,000. Keith & Kurke, Bismarck, archts. Noted June 5.

N. D., Minnewausan — Memorial — City having plans prepared by Keith & Kurth, archts., 211 Equity Bldg., Fargo, for 3 story, 61 x 100 ft. Cost to exceed, $50,000.

Mo., Elvins—School—Bd. Educ. plans to build rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $90,000. J. H. Felt & Co., Grand Ave. Temple, Kansas City, archts.

Mo., Jefferson City — Church — Parish Com. of Immaculate Conception Church rejected bids building 1 story, 40 x 125 ft., brick or stone, stone foundation, on McCarty St. and Clark Ave. About $60,000: S. Abp, Moberly, archt. Noted Feb. 19.

Mo., Leadwood—School—Bd. Educ. plans to build concrete, steel and brick, concrete foundation. About $60,000. J. H. Felt & Co., Grand Ave. Temple, Kansas City, archts.

Buildings (Continued)

Tex., Austin—Theatre—G. W. Littlefield, c/o Amer. Natl. Bank, plans to combine Casino and Queen Theatre, 7th St. and Congress Ave., and remodel same into modern 2 story, 46 x 160 ft. treatre. About $100,000. J. J. Hegman, mgr. Queen Theatre. Architect not selected.

Tex., Waxahachie — Sanitarium — C. H. Page & Bro., archts., Austin Natl. Bank Bldg., Austin, soon let contract building 3 story, 37 x 90 ft., brick, rein.-con., steel and hollow tile, rein.-con. flooring, for Sanitarium Stock Co. Cost to exceed $80,000. E. Holland, secy.

Okla., Grandfield — High School—Bd. Educ. soon lets contract building brick high school. Tonini & Bramblet, 417 Terminal Bldg., Oklahoma, archts. Noted Jan. 8.

Okla., Ideal — Community — Oklahoma Portland Cement Co. plans to build 3 story community house, to contain church, amusement hall and store. About $60,000. Architect and engineer not selected.

N. M., Roswell—College and Hospital—New Mexico Military Institute, North Main St. and College Blvd., having plans prepared by I. H. Rapp, archt., 261 East Palace Ave., Santa Fe, for brick hospital and administration buildings. About $50,000. J. W. Wilson, supt.

Ariz., Mitchell—School—City voted $125,000 bonds to build new grammar school. H. E. Matthews, supt. of schools.

Wash., Bellingham — School — City plans election March 23, to ratify $75,000 bond issue and vote $60,000 additional bonds to build 2 story brick, stone or concrete, to replace Larrabee School. Cost between $60,000 and $75,000.

Wash., Seattle—School—Bd. Educ. having plans prepared by F. A. Naramore, archt., Central Bldg., for school, on Brooklyn Ave. and 15th St., N. E. About $1,200,000.

Ore., Salem — Dormitory — State having plans prepared by W. C. Knighton, archt., U. S. Natl. Bank Bldg., Portland, for brick and wood, brick foundation, for State Institution for Feeble Minded, here. About $50,000.

Cal., Chico—Lodge—Woodmen of World Lodge plans to build 3 story, brick or concrete, concrete foundation. About $75,000. Architect not selected.

Cal., Gridley—High School—Union High School Dist. having preliminary plans prepared for 2 story, brick or concrete. About $200,000.

Cal., Kingsburg — School — Grammar School Dist. having plans and specifications prepared by A. Johnson, archt., Kingsburg, for 2 story, brick, concrete foundation. About $75,000.

Cal., Lodi—Store and Office—V. R. Larson plans to build 3 or 4 story, 80 x 170 ft., concrete and brick, concrete foundation, on School and Pine Sts. About $150,000. Architect not selected.

Cal., Napa—Theatre—Knox, Blunenfeld & Gordon plan to build 2 story, brick or concrete, concrete foundation, on 1st and Randolph Sts. About $150,000. Architect not selected.

Cal., Orange—City Hall—City voted $80,000 bonds to build brick and concrete city hall. D. G. Wettlin, clk. Anderson & Farrell, Palace Theatre Bldg., Long Beach, archts. Noted Feb. 19.

Cal., Richmond — School—City plans to vote on $600,000 bonds for improvements and additions to present schools and erection of several new ones. Cost to exceed $50,000 for each new structure. A. C. Farns, clk.

Cal., Sacramento — Bank and Club — California Natl. Bank, K and 6th Sts., having preliminary plans prepared by C. E. Hemmings, archt., 1203 J St., for 5 story, brick or stone addition, concrete foundation. About $100,000.

Cal., Salinas—Store and Office—Farmers Mercantile Co. plans to build 2 story, 145 x 150 ft., rein.-con., concrete foundation. About $75,000. R. Wychoff and H. C. White, 328½ Main St., archts. Noted Jan. 15.

Cal., San Diego — School — Bd. Educ. Southern Title & Trust Bldg., plans to build 2 high, and several grade schools, also extensions to others. Bonds for $1,075,000 voted for project.

Cal., Selma—High School—Bd. Educ. having plans prepared by A. Johnson, archt., Kingsburg, for 2 story, brick or concrete, concrete foundation. About $100,000. Noted May 22.

Cal., Stockton — Schools — City voted $950,000 bonds to remodel existing schools and construct several 2 story, concrete and brick elementary schools, concrete foundation, cost of each new structure to exceed $50,000, bonds for $325,000 were also voted to remodel and repair high schools, construct several 2 story, fireproof construction buildings, cost of each new structure to exceed $75,000. Noted Feb. 5.

Cal., Tulare—City Hall—City considering plans for building 2 story, brick or stone. About $125,000. Architect not selected.

Cal., Visalia — High School — Trustees High School Dist. having plans prepared by Swartz & Ryland, archts., Rowell Bldg., Fresno, for gymnasium, shops and domestic science buildings for high school. About $110,000.

Que., Montreal—Theatre—Allen Enterprises Ltd., 404 St. Catherine St., plans to build 2½ story, 90 x 175 ft. terra cotta, concrete and brick, rein.-con. flooring, concrete foundation, on Cathcart St. and St. Catherine St. W. About $500,000. Private plans.

Ont., Kingston—Hospital—City Council soon receives bids constructing infectious building at Kingston General Hospital. About $150,000. R. J. McLelland, engr.

Ont., New Toronto—School—Town plans to build 2 story, 8 room, rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $100,000. W. H. Millard, clk. Architect not selected.

Ont., Toronto—Store—T. Eaton Co., Ltd., 190 Yonge St., having plans prepared by W. Steele & Son, archts. and engrs., Ryrie Bldg., for 6 story 60 x 125 ft. rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Queen and Yonge Sts. About $60,000.

BIDS DESIRED

N. Y., New York—School—Until March 22, by C. B. J. Snyder, archt. and engr., Municipal Bldg., constructing P. S. 61, corner Crotona Park E. and Charlotte St., Bronx Boro., for Bd. Educ., 500 Park Ave.

N. Y., Southhold—School—Until April 9, by Bd. Educ., building, brick steel and stone, brick foundation. About $75,000. Tooker & Marsh, 101 Park Ave., New York City, archts. and engrs. Noted March 11.

N. J., Boonton—School—Until March 25, by Bd. Educ. building 2 story, brick, steel and stone, brick foundation. About $90,000.

Md., Baltimore—Office—Until March 23, by Smith & May, archts., 1133 Calvert Bldg., constructing 4 story, 60 x 70 ft., brick and hollow tile, concrete foundation, at 105-7 South St., for Levering Coffee Co., 102 Commerce St. About $50,000. Noted March 4.

W. Va., Charleston — Mercantile — Until March 25 (change of date), by C. H. Higgins, archt., 19 West 44th St., New York City, building 7 story, 100 x 150 ft., brick, rein.-con. and steel, on Virginia and McFarland Sts., for Abney, Barnes & Co., 812-18 Virginia St. Noted March 11.

O., Cleveland—Theatre and Stores—Until March 22, by Gordon Sq. Co., West 65th St. and Detroit Ave., receiving bids building 3 story, 150 x 269 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation. About $300,000. B. H. Prack, Keystone Bldg., Pittsburgh, Pa., archt. and engr.

O., Fairpoint—School—Until April 2, by Bd. Educ., building 2 story, 49 x 80 ft., concrete and brick, in Wheeling Twp. About $60,000. F. S. Rusk, 16 South 3rd St., Columbus, archt. Noted Jan. 22.

Ind., Bluffton—School—Until April 1, by A. Hunt, trustee, Bd. Educ., R.F.D., building 2 story, 72 x 90 ft., brick, stone and steel, high and grade school, near here. About $100,000. Snider & Rotz, 703 Merchants Bank Bldg., Indianapolis, engrs. O. Hoffman, Decatur, archt.

Ind., Huntington—Jail—Until April 7, by Comrs. Huntington Co. building jail on Byron and State Sts. About $65,000. J. E. Shideler, co. aud.

Ind., Whiting—Schools, etc.—Until March 22, by Bd. Educ. furnishing labor and material completing Junior High School, remodeling gymnasium and building 1 story, 8 room, grade school and auditorium. N. W. Spencer & Son, Old Colony Bldg., Chicago, archts.

Mich., Detroit—Bank—Until March 25, L. Kamper, archt., Book Bldg., constructing 2 story, 50 x 65 ft., brick, steel and stone, concrete foundation, on Michigan Ave. and 31st St., for Bank of Detroit, Fort St. About $75,000. Noted March 11.

Mich., Detroit—Bank—Until March 24, by A. Kahn, archt., Marquette Bldg., constructing 2 story, 50 x 83 ft., rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation, on Gratiot and Meldrum Aves., for Bank of Detroit, Fort St. About $90,000.

Mich., Detroit—Office—Until March 24, by A. Kahn, archt., Marquette Bldg., constructing 8 story, 125 x 190 ft., rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation, on Bagg and Cass Aves., for Standard Accident Insurance Co., 34 Fort St., E. About $500,000.

Mich., Grand Rapids — School — Until March 31, by H. N. Morrill, secy. Bd. Educ., City Hall, building new Dickinson School.

Mich., Halfway (Detroit P. O.)—School—Until March 26, by A. Rein, secy, Bd. Educ., building 2 story, 72 x 95 ft., rein.-con. and brick, concrete foundation, on Gratiot Ave.

Ill., Gilmon—School—Until April 1, by Bd. Educ., building 2 story, rein.-con., brick, stone and hollow tile. About $100,000. H. R. Temple, Lincoln Bldg., Champaign, archt.

Wis., La Crosse—School—J. C. Llewellyn, archt., 38 South Dearborn St., Chicago, receiving bids building 3 story, 90 x 153 ft., rein.-con. and brick, concrete foundation, for Bd. Educ. About $200,000.

Ia., Lake Park—School—Until March 30, by School Twp., Silver Lake, building 2 story, brick. About $95,000. T. Strathman, secy.

Ia., Le Mars—Dormitory—Until March 27, by Western Union College, building 2 story, brick, rein.-con. and steel, rein.-con flooring, concrete foundation. About $90,000. W. E. Hulse & Co., Masonic Bldg., Des Moines, archts.

Ia., Olds—School—Until April 6, by Bd. Educ., building 2 story, 62 x 150 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $110,000. Keffer & Jones, 204 Masonic Temple, Des Moines, archts.

Ia., Stanwood—School—Until March 26, by Bd. Educ., building 2 story, 74 x 104 ft., brick, concrete and steel, concrete foundation. About $60,000. H. E Hunter, Security Bldg., Cedar Rapids, archt.

Ia., West Branch—School—Until March 30, by Bd. Educ., building 2 story, 60 x 125 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $150,000. Proudfoot, Bird & Rawson, Hubbell Bldg., Des Moines, archts. Noted March 4.

Ia., Zion (Spaulding, P. O.)—School—Until April 7, Bd. Educ., Union Twp., care of C. F. Hayden, R. F. D. 1, Creston, building 2 story, 60 x 80 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. W. E. Hulse & Co., Masonic Bldg., Des Moines, archts. Noted Feb 26.

Minn., Bertha—High and Grade School—Until April 5, by Bd. Educ., building 2 story, 60 x 68 ft., brick, stone and tile. About $50,000. Foss & Foss, St. Cloud, archts.

Minn., Coleraine — High School — Until April 15, by A. King, secy. Bd. Educ., building 2 story, 200 x 200 ft., rein.-con., brick and tile, rein.-con. flooring, concrete foundation, on Main St. About $500,000. W. T. Bray, Torrey Bldg., Duluth, archt. and engr.

Minn., Kettle River—School—Until April 1, by Bd. Educ., building 2 story, 59 x 68 ft., rein.-con. and brick. About $65,000. F. Anderson, clk. F. A. Schweiger, Moose Lake, engr. Noted March 4.

Minn., Minneapolis—Business—J. Resler, 27 4th St., N., receiving bids building 3 story, 97 x 110 ft., fireproof addition, on 1st Ave. N. About $160,000. F. Van Antwerp, 416 Palace Bldg., archt.

Minn., Minneapolis—School—Until March 29, by Bd. Educ., building Louis Agassiz School, 2 story, 73 x 200 ft., rein.con. and brick, on Harriet Ave. and 38th St. About $150,000. E. H. Enger, c/o Bd. Educ., archt. and engr.

Minn., Minneapolis—School—Until March 29, by Bd. Educ., building Miles Standish School, 2 story, 73 x 200 ft., rein.-con. and brick, on 22nd Ave., S., and East 40th St. About $250,000. E. H. Enger, c/o Bd. Educ., archt. and engr.

Minn., Minneapolis—School—Until March 29, by Bd. Educ., building Minnehaha School, 2 story, 75 x 210 ft., rein.-con. and brick, on 51st St. and 29th Ave., S. About $150,000. E. H. Enger, c/o Bd Educ., archt. and engr.

Minn., Willmar—Bank—Until April 1, by 1st Natl. Bank, building 2 story, 50 x 71 ft., rein.-con. and stone, at 200 5th St., S. About $50,000. C. W. Smith, 528 Andrus Bldg., Minneapolis, archt. Noted Jan. 8.

Kan., Wichita—Church—Until March 24, by United Congregational Church and Shepard & Wiser, archts., R. A. Long Bldg., Kansas City, Mo., for 1 story, 125 x 150 ft., concrete and stone, on 1st and Clifton Sts. About $150,000. Noted Jan. 29.

Neb., O'Neill—Hospital—W. Kellogg receiving bids building 2 story, 102 x 168 ft.,

Buildings (Continued)

rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $120,000. G. W. Burkhead, Sioux City, Ia., archt.

S. D., Groton—High School—Until April 1, by School Bd., building 2 story, 100 x 150 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $200,000. E. F. Broomhall, Alworth Bldg., Duluth, archt. and engr.

N. D., Grafton—Hospital—Until April 10, by Grafton Deaconess Hospital, building 3 story, 38 x 128 ft., stucco and hollow tile. About $70,000. J. B. De Rema, Security Bldg., Grand Forks, archt.

Wash., Ellensburg—Church—Until March 30, by 1st Methodist Episcopal Church, building 3 story, modern church. About $50,000. Baker & Vogel, Seattle, archts.

Wash., Seattle—School—Until March 26, by F. A. Naramore, archt., Central Bldg., building 1 story, 200 x 240 ft., brick, at Highland Park, for Bd. Educ About $275,000.

Cal., Hermosa Beach—Assembly Hall—Until March 22, by Bd. Trustees, building assembly hall. H. C. Howard, 619 Bway. Central Bldg., archt.

Que., Montreal—Bank—Until April 10, by Molson Bank, St. James St., building 2 story, 25 x 50 ft., brick and steel, stone facing, concrete foundation, on Bernard and Park Aves. About $75,000.

Ont., London—Medical Quarters, Nurses Home, etc.—Until March 25, by Dept. Pub. Wks., Ottawa, building 2 story, 30 x 83 ft medical officers quarters, brick and stucco; 3 story, 51 x 120 ft nurses home, brick, and 1 story, 28 x 30 ft. gatekeepers lodge, brick and timber, concrete foundations. About $65,000. R. C. Wright, Dept. Pub. Wks. archt

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Belmont**—School—School Comn. let contract building 3 story, 72 x 86 ft., brick and steel, concrete flooring and foundation, to J. F. Griflin Co., 17 Milk St., Boston. About $120,000. Noted March 4.

★**Mass., Boston**—Office—B. F. Goodrich Rubber Co., 851 Boylston St., let contract altering office building, to J. M. and C. J. Buckley Co., 164 Federal St. About $50,000.

★**Mass., Fitchburg** — Housing — Crocker, Burbank & Co., 545 Westminster St., let contract building ten 2 story, brick and frame houses for workmen, concrete and rock foundation, to Casper Ranger Constr. Co., 20 Bond St., Holyoke. About $75,000.

★**Mass., Norwood** — Stores, Office and Mercantile—B. Davis, 183 Walnut Ave., Roxbury, will build 3 story, brick and concrete, rein.-con. flooring, concrete foundation, here. About $60,000. Work will be done by day labor under supervision of Tuck & Gilman, archts. and engrs., 34 School St., Boston.

★**Mass., Southbridge** — Housing — Amer. Optical Co. will build several 1 and 2 story brick and frame houses for workmen, concrete foundation. About $100,000. Work will be done by day labor.

★**R. I., Barrington**—Housing—Rhode Island Lace Wks. will build several 1 and 2 story, brick and timber houses for workmen, stone and concrete foundation, near here. About $100,000. Work will be done by day labor. Noted March 11.

★**R. I., Pawtucket**—Social, etc.—Congregation Chorth Sholum, c/o Marshak & Hickey, archts., 310 Strand Bldg., Providence, let contract constructing 1 story, 60 x 115 ft., social, educational and religious building, brick and stone, concrete foundation, on Jackson St., to Mahoney & Tucker, 29 Weybosset St., Providence. About $75,000.

★**Conn., Bristol**—Hotel and Restaurant—W. L. Way, North Main St., let contract building 4 story, 50 x 75 ft. and 20 x 20 ft., brick and steel, concrete foundation, to R. A Perreault & Co., 33 North Main St About $50,000.

★**Conn., Greenwich**—Club—Indian Harbor Yacht Club, Putnam Ave., let contract building brick, steel and stone, brick foundation, to C. T. Wills, Inc., 286 5th Ave., New York City. About $160,000.

★**N. Y., Brooklyn**—Loft—Atlantic-Pacific Co., 317 Bradford St., will build six 4 story, 50 x 100 ft., brick, steel and stone, concrete foundation, on Pacific and Sackman Sts. About $300,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Office and Pavilion—Manhattan Beach Co., c/o M. K. Vanderbeck, archt. and engr., 15 Maiden Lane, New York City, let contract building 2 story, 150 x 150 ft. office and 1 story, 100 x 200 ft. bathing pavilion, rein.-con., rein.-con. flooring, concrete foundation, at Manhattan Beach, to Macaday Bldg. Co., 15 Maiden Lane, New York City. About $60,000 and $50,000 respectively.

N. Y., Brooklyn—School—C. B. Snyder, archt. and engr., Municipal Bldg., New York City, received bids March 12, building P. S. 181, 5 story, brick and steel, concrete foundation, on New York Ave. and East 34th St. between Tilden and Snyder Aves., for Bd. Educ., 500 Park Ave., New York City, from T. Dwyer, Bway. and 216th St., New York City, $822,000; T. A. Clark, 122 Livingston St., $828,400; P. Cleary, 115 Marion St., $868,593 Noted March 4.

★**N. Y., New York**—Office—L. Gold, 44 Court St., Brooklyn, will build brick, steel and stone, brick foundation, at 134-136 West 32nd St, here. About $60,000. Work will be done by day labor.

★**N. Y., New York**—Office—New York Central R.R., Grand Central Terminal, let contract building 13 story, brick, steel and stone addition, on Lexington Ave. and 45th St., to J. Stewart & Co., Inc., 30 Church St.

★**N. Y., New York**—Store and Office—R. Barclay, 299 Bway., let contract altering 5 story, brick, steel and stone, to Taylor Contg. Co., 110 West 40th St. About $50,000.

★**N. Y., New York** — Theatre — Sarco Realty Co., 214 West 141st St., will build 100 x 100 ft., brick and steel, brick foundation, on 137th St. and 7th Ave. About $125,000. Work will be done by day labor.

★**N. Y., Schenectady** — Bank — Citizens Trust Co., 434 State St., let contract building brick, steel and stone, brick foundation, to J. McDermott, 436 State St. About $200,000.

★**N. J., Collingswood** (Camden P. O.)—School—St. Johns Roman Catholic Church let contract building 2 story, 100 x 150 ft., stone, on Lee Ave., to P. I. Cox Constr. Co., 154 Nassau St., New York City. About $50,000.

★**Pa., Latrobe** — School — Holy Family Catholic Congregation let general contract building 2 story, 60 x 96 ft., rein.-con. and brick, to E. A. Wehr, Highland Bldg., Pittsburgh. About $61,000.

Pa., Phila.—Schools—Bd. Educ. received bids March 3, building (a) school on 70th and Buist Sts., (b) on 9th and Oregon Sts., from Wark Co., 1737 Filbert St., (a) $505,218, (b) $523,819; Standard Constr. Co., 1713 Sansom St., (a) $515,000, (b) $527,500; M. Melody & Son, 1645 North Broad St., (a) $523,033; M. H. McCloskey, Jr., 1620 West Thompson St., (b) $499,979. Noted Feb. 19.

★**Pa., Pittsburgh** — Office — Pittsburgh Assn. for Improving Condition of Poor, c/o E. P. Mellon, archt. and engr., 52 Vanderbilt Ave., New York City, let contract building 4 story, 60 x 240 ft., rein.-con. and steel, rein.-con. flooring, concrete foundation, to Mellon & Stewart, Oliver Bldg. About $300,000.

★**Ga., Elberton**—Bank and Office—First Natl. Bank let contract building 4 story, rein.-con. rein.-con. flooring, to W. G. Sutherlin, Greenwood, S. C. About $125,000.

★**O., Massillon**—School—W. Filherth, clk. Bd. Educ., let general contract building 2 story, 70 x 95 ft., concrete and brick, to A. F. Wendling Co., Massillon, $126,000; heating, to Huffman & Wolfe, 669 North High St., Columbia, $15,000. Noted Feb. 10.

★**O., Springfield**—Business—S. S Kresge Co., High St., let contract building 4 story, 50 x 130 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on East Main St., to Cogswell Bldg. Co., Springfield. About $150,000. Noted Feb. 19.

★**O., Warren**—Bank—Second Natl. Bank let contract building 1 story, 30 x 60 ft. brick and stone addition, concrete foundation, to G. F. Dalton, 536 East 102nd St., Cleveland. About $50,000.

★**Ind., Ft. Wayne**—Sales—J. E. Koof & Woolling, archts., 406 Pythian Bldg., Indianapolis, let general contract to Indiana Eng. & Constr. Co., Indianapolis, building 3 story, 80 x 150 ft., rein.-con., brick and terra cotta, concrete foundation on Washington and Garfield St., for E. W. Steinhart Co. About $150,000.

★**Mich., Detroit**—Bank—Central Savings Bank, Majestic Bldg., let contract building 2 story, 10 x 66 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Gratiot and Jos. Campau Aves., to Winkler & Auch, 1027 St. Clair Ave. About $50,000. Noted March 4.

★**Mich., Detroit**—Sales—See "Industrial Works."

★**Ill., Chicago**—Sales—See "Industrial Works."

★**Wis., Owen**—School—V. F. Shereda, clk. Bd. Educ. let contract building 2 story, 63 x 81 ft., brick and stone, to W. Weaver, Owen. About $50,000; cost plus percentage basis. Noted Feb. 19

★**Ia., Decorah**—Bank—Natl. Bank let contract building 1 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to A. R Coffeen, Decorah About $60,000; cost plus percentage basis.

★**Minn., Blooming Prairie**—High School—Bd. Educ. let contract building 2 story, 80 x 120 ft. with 50 x 64 ft. wing, rein.-con., brick and terra cotta, to L. P. Jorgenson, 1930 St. Anthony Ave., St. Paul. About $150,000. Noted Feb. 26.

★**Minn., Duluth** — Hospital — Sister of Benedictine let contract to McLeod & Smith, Sellwood, building 6 story, 41 x 140 ft., rein.-con. addition, brick, and rein.-con. flooring, concrete foundation, on 3rd St. and East 5th Ave., for St. Mary's Hospital, 3rd St. and East 5th Ave. Noted Jan. 22.

Minn., Minneapolis—Stock Barn—C. H. Johnston, archt. and engr., Capital Bank Bldg., St. Paul, received bids March 1, constructing 1 story, 140 x 250 ft., rein.-con. and steel, at Fair Grounds, here, from F. Noralnder, 403 Metropolitan Bank Bldg., St. Paul, $334,500; J. Peterson, 3152 10th Ave. S., $335,400; E. M. Klarquist & Son, 748 Security Bldg, $356,300. Noted Feb. 5.

★**Minn., Richfield**—School—Bd. Educ. let contract building 3 story, 57 x 174 ft., brick and hollow tile, with 73 x 90 ft. wing, to J. and W. A. Elliot, 906 Lumber Exch. Bldg., Minneapolis, $87,275. Noted March 11.

★**Neb., St. Paul**—School—Bd. Educ. let contract building 2 story, 70 x 110 ft., concrete, steel and brick, concrete foundation, to E. R. Green, Seward. About $80,000. Noted Feb. 19.

★**Wyo., Casper**—Office—Natl. Supply Co. let contract building 2 story, brick and timber, in Sandbar Dist., to Larson & Jorgensen, Casper. About $50,000.

★**Wyo., Cheyenne**—Bd. Trustees, School Dist. 1, let contract building 2 story, 71 x 80 ft., brick and timber, on 27th, 28th and Warren Sts., to La Fountaine & Larsen, Cheyenne, $64,066. Noted Feb. 19.

★**Mo., Jackson**—High School—Bd. Educ. let contract building 2 story, 48 x 130 ft., concrete, steel and brick, concrete flooring, to L. Penzel, Jackson, $56,438.

★**Mo., Kansas City** — Hotel — Dubinsky Bros., Reserve Bank Bldg., let general contract building 8 story, 48 x 120 ft., rein.-con., brick and terra cotta, concrete foundation, at 1906-8 Main St., to Edelaman-Fleming Constr. Co., 601 Ry. Exch. Bldg. About $150,000.

★**Mo., Kansas City**—Office—Childs Co., 200 5th Ave., New York City, let contract altering 5 story, steel and brick, here, to A. B. Polhemus, 110 West 34th St., New York City. About $100,000.

★**Cal., Cupertino**—High School — Union High School Dist. let contract building 1 story, 10 room, frame and stucco, concrete foundation, near San Jose, to A. Compton, 547 17th St., San Jose. About $75,000.

★**Cal., Glendale**—School—Bd. Educ. let contract building 2 story, 10 room, concrete and hollow tile, concrete foundation, on Bway., to Edwards, Wildey & Dixon Co., 515 Black Bldg., Los Angeles, $78,634 Noted March 11.

★**Cal., Long Beach**—School—Bd. Educ. let contract building 2 story, 9 room, rein.-con., brick, and cement, concrete foundation, on Hill and Atlantic Aves., to J. D. Sherer, 1466 West 1st St., $62,260.

★**Cal., Los Angeles**—Sales—H. L. Arnold, 7th St. and Grand Ave., let contract building 3 story, 211 x 220 ft., rein.-con., brick and terra cotta, rein.-con. flooring, on 7th and Figueroa Sts., to Leonard & Peck, 721 H. W. Hellman Bldg. Noted Feb. 26.

★**Cal., Nevada** — Administration — Bd. Health Nevada Co. let contract constructing 3 story, concrete, concrete foundation, for County Hospital, to C. C. Holt, San Francisco, $51,640.

★**Cal., San Francisco** — Offices — Commercial Union Assurance & California Fire Insurance Co. let general contract building 15 story, steel and concrete, rein.-con. flooring, on Pine and Montgomery Sts., to Walker Constr. Co., Monadnock Bldg., cost $725,000; steel work, to Pacific Rolling Mills Co., 17th and Mississippi Sts., $275,000.

★**Cal., San Francisco** — Sales — Pioneer Motor Co., 307 Golden Gate Ave., let contract constructing 4 story, 120 x 219 ft., rein.-con. auto sales building and garage, on Van Ness Ave. and McAllister St., to Clinton Constr. Co., 140 Townsend St. About $200,000. Noted Dec. 26.

★**Cal., San Francisco**—Theatre—Ackerman & Harris, 281 O'Farrell St., let contract building rein.-con., brick and steel.

Buildings (Continued)

rein.-con. flooring, on Market and Taylor Sts., to Macdonald & Kahn, Rialto Bldg. About $1,500,000.

★**Cal., San Jose**—High School—Cupertino Union High School Dist. let contract building 1 story, plaster and frame, near here, to A. Compton, 547 17th St. About $75,000. Noted Feb. 12.

★**Cal., Whittier** — Hospital — Milhous Memorial Hospital let contract building hospital, to Wopschall Bros., 100 East Colorado St., Pasadena, $66,574.

★**B. C., Coquitlam** — School — Provincial Government, Victoria, let contract constructing three 2 story, 35 x 88 ft. brick and concrete buildings, concrete foundations, for Boys' Training School, here, to Robertson & Partners, 837 Hastings West St., Vancouver. About $140,000.

Federal Government Work

PROPOSED WORK

R. I., Providence—Dredging—U. S. Engr. Office rejected bids received March 8, dredging in Stamford Harbor, Conn. Noted Feb. 19.

Va., Cape Henry—Clay—U. S. Engr. Office, Custom House, Norfolk, rejected bid furnishing clay at Fort Story, here. Noted Jan. 1.

Arizona—Road Work—C. S. Wheeler, dist. engr., Bur. Pub. Rds., U. S. Dept. Agriculture, Albuquerque, N. M., soon lets contract building 5.86 mi. Oracle-Apache Rd., Sect. 3, 20 ft. wide, Pinal Co., involving 50.742 M. ft. trestle bridge material, two 10 ft. and three 20 ft. log bridges with corrugated metal pipe culverts, log culverts, rubble masonry, cost $35,000; 5.4 mi., Sect. 2, Pima Co., 20 ft. wide, involving 47.12 M. ft. trestle bridge material, two 10 ft. and one 20 ft. log bridges with corrugated metal pipe culverts, log culverts, grouted stone pavement, rubble masonry, etc., $30,000.

Cal., Mare Island—Remodeling Barracks Building—Spec. 4147—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids remodeling 2 story barracks building, 500 ft. long, with two 26 x 44 ft. wings and 33 x 54 ft. kitchen extension, to Bldg. 53, at Marine Reservation, Navy Yard, here. About $65,000; $10 deposit required for plans and spec. Noted March 4.

BIDS DESIRED

Pa., Pittsburgh—Lock—Until April 16, by U. S. Engr. Office, 2111 Farmers Bank Bldg., constructing Lock 5, Allegheny River, near Schenley; advertised in this issue. Noted March 11.

D. C., Wash.—Grading—Until March 31, by Dist. Comrs., 509 Dist. Bldg., for 4,610 cu yd. grading. C. W. Kutz, comr.: advertised in this issue.

D. C., Wash.—Mess Hall and Dormitory—Until March 29, by I. Littell, officer in charge, Soldiers Home, building mess hall and dormitory, here. About $600,000.

Miss., Vicksburg — Barges — Until April 10, at office 3rd Mississippi River Dist., P. O. Box 404, building 3 steel barges; advertised in this issue.

La., New Orleans — Storehouses — Spec. 4084—Until March 31, by Bureau Yards and Docks, Navy Dept., Wash., D. C., building 1 story, 50 x 113 ft. storage plant with 1 ton electric traveling bridge crane and 1 story, 50 x 73 ft. shell house, concrete foundation, here. About $48,000; $10 deposit required for plans and spec.

Ky., Louisville—Portland Cement—Until Until April 6, by U. S. Engr. Office, 425 Custom House, furnishing and delivering American Portland cement, Lock 41, Ohio River, advertised in this issue.

Ky., Louisville — Steel Sheet Piling — Until April 9, by U. S. Engr. Office, 125 Custom House, furnishing and delivering steel sheet piling for Lock 41, Ohio River; advertised in this issue.

Mich., Detroit—Dredging—Until April 15, by U. S. Engr. Office, 337 Federal Bldg., dredging in Rouge River; advertised in this issue.

Cal., San Diego—Kitchen Equipment—Spec. 4097—Until April 7, by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing in 6 barracks, here. About $22,000; $10 deposit required for plans and spec.

Cal., San Francisco — Dredging — Until March 22, by U. S. Engr. Office, Fair Bldg., dredging off part of Point from Dos Rios Island and vicinity near mouth of Sacramento River.

H. T., Kaukau—Barracks—Spec. 4086—Until April 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., constructing, here. About $8,500; $10 deposit required for plans and spec.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston** — Electric Traveling Cranes—Bureau Yards and Docks, Navy Dept., Wash., D. C., let contract installing one 10 ton and one 5 ton electric traveling bridge crane for flash yard and extension to foundry Bldg. 42-C, at Navy Yard, here, to Patterson-Kelly Co., East Stroudsburg, Pa., $12,767 (120 days). Noted Feb. 26.

★**N. Y., New York**—Removing Wreck—U. S. Engr. Office, 39 Whitehall St., let contract removing wreck of Schooner "Mary E. Lynch," in Hudson River Channel, 1st Dist. to Merritt & Chapman Derrick & Wrecking Co., 17 Battery Pl., $7,833.

★**N. Y., New York**—Roof—Spec. 4113—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building roof, supported on present purline, on Bldg., 29, at Navy Yard, here, to H. H. Robertson Co., Equitable Bldg., Baltimore, Md., $21,353 (50 days). Noted March 4.

N. Y., Rome — Electric Dumbwaiter — Treas. Dept., Wash., D. C., received only bid March 8, installing electric dumbwaiter in Post Office, here, from Elevator Supplies Co., 1515 Willow Ave., Hoboken, N. J., $2,205. Noted Feb. 19.

N. Y., Rome—Remodeling Post Office—Treas. Dept., Wash., D. C., received bids March 8, remodeling (except lift), here, from L. Carey, Rome, $4,000; Zingerline Bros., Rome, $4,425; G. E. Wright Co., 1461 Monadnock Bldg., Chicago, $6,450. Noted Feb. 19.

7170 items
of Construction
News
were printed in these
pages in the first 11
weeks of 1920, an
average of 650 items
per week.

*Did you profit
from any of these tips?*

★**D. C., Wash.**—Armored Cable—U. S. Engr. Office, War Dept., let contract installing rubber insulated lead covered armored cable, to Standard Underground Cable Co., Westinghouse Bldg., Pittsburgh, Pa., $7,580.

★**D. C., Wash.**—Feeder Panels—U. S. Engr. Office, War Dept., let contract furnishing feeder panels, to General Electric Co., River Rd., Schenectady, N. Y., $2,941.

N. C., Morehead City—Completing Fire Protection System—Spec. 4073—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids March 10, completing fire protection system, cleaning, riveting and painting 2 hangars and building wood stave tank, here, (1) work complete, from F. J. Colenda, Jr., Morehead City, (1) $9,490 (time as specified); Newport Contg. & Eng. Co., Law Bldg., Newport News, Va., (1) $19,638 (100 days), (2) add $3,000, (3) deduct $500, (4) deduct $9,000, (5) $14,238 (100 days); Noland Clifford Co., 322 28th St., Newport News, Va., (1) $14,687 (60 days), (2) add $2,400 (12 days), (3) $750 (5 days), (4) deduct $6,720 (25 days), (5) $9,500 (45 days). Noted Feb. 26.

Tenn., Memphis—Earthwork—Mississippi River Comn., Custom House, received bids building 620,000 cu.yd. earth work in upper St. Francis Levee Dist., (1) 250,000 cu.yd., unit price and total, (2) 370,000 cu.yd., unit price and total, (3) total for 1 and 2, from Roach, Stansell, Lawrence Bros. Co., North Memphis Savings Bank Bldg., (1) $0.35, total $87,500, (2) $0.37, total $136,900, (3) $224,400; G. F. Ramsey, Porter Bldg., (1) $0.35, total, $87,500, (2) $0.35, total, $129,500, (3) $217,000.

O., Cincinnati—Changes and Repairs—Treas. Dept., Wash., D. C., received bids March 5, for changes and repairs to main building at Marine Hospital, here, from D Gordon Bldg. & Constr. Co., Burnett and Northern Ave., $27,000; W. Miller & Sons, 2017 Elm St. $29,998. Noted Feb. 10.

★**O., Marietta**—Structural Steel—U. S. Engr. Office, 305 Post Office Bldg., Wheeling, W. Va., let contract furnishing and delivering structural steel for machine shop, at U. S. Repair Sta., here, to Independent Bridge Co., May Bldg., Pittsburgh, Pa. $6,840. Noted Feb. 5.

Mich., Detroit—Radio Building—Spec. 4120—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids March 10, constructing, at Windmill Point, here, (1) work complete, from W. F. Martens, 245 Coulter Bldg., Rochester, N. Y., (1) $17,250 (80 days); King Lumber Co., Charlottesville, Va., (1) $19,870 (June 1), (2) $21,370, (3) $19,670, (4) $18,380 Noted March 4.

Wis., Milwaukee—Radio Building—Spec. 4107—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids March 10, constructing at McKinley Park, here, (1) work complete, from W. F. Martens, 245 Coulter Bldg., Rochester, N. Y., (1) $18,150 (80 days); King Lumber Co., Charlottesville, Va., (1) $19,400, (2) $18,490. Noted March 4.

★**Mo., St. Louis**—Levee Work—Mississippi River Comn., 1311 International Life Bldg., let contract for levee work in Clear Creek Drainage & Levee Dist., Ill., to J. C. Carroll, Cape Girardeau, $49,200.

★**New Mexico** — Road Work — Bureau Pub. Rds., U. S. Dept. of Agriculture, 212 Luna-Strickler Bldg., Albuquerque, let contract building 6.73 mi. highway, 20 ft. wide, in Lincoln Natl. Forest, Lincoln Co., involving 11,531 cu.yd. common and 1,197 cu.yd. rock excav., to H. E. Williams, El Paso, Tex., $19,998. Noted Feb. 5.

★**Cal., Crescent City**—Breakwater—U. S. Engr. Office, War Dept., Wash., D. C., let contract building breakwater, here, to W. B. Arndt, San Francisco, $181,500.

Cal., San Diego—Distributing System and Power Plant Equipment—Spec. 4118—Pub. Wks. Office, received only bid March 3, furnishing and installing, here, (1) work complete, from T. Haverty Co., 801 Maple St., Los Angeles, (1) $189,650, (2) $31,250, (3) $66,800, (4) $91,600, (5) $560, (6) $620, (7) $8,800, (8) deduct $670, (9) deduct $23,700, (10) deduct $5,000. Noted March 11.

Cal., San Diego—Storehouse and Hangars—Spec. 4087—Pub. Wks. Office, received bids March 3, building storehouse and 3 hangars, "A," "B" and "C," at Naval Air Sta., from Lange & Bergstrom, Sharon Bldg., San Francisco, (1) $115,327 (180 days), (2) $5,356; W. E. Kier Bros., Ft. Rosecrans St., (1) $125,497, (2) $4,942. Noted Feb. 26.

Miscellaneous

PROPOSED WORK

Tarvia and Crushed Stone—Haworth, N. J.—Streets Com. has been authorized to advertise for bids for Tarvia and crushed stone for 1920 work.

Sea Wall—Trenton, N. J.—City Comn. plans to build 17,000 ft. sea wall along Assanpink Creek. About $150,000. Address F. W. Donnelly, mayor.

Cast Iron Pipe, Etc.—Cleveland, O.—E. Shattuck, city purch. agt., soon lets contract furnishing 1,720 tons c.i. pipe with special and miscellaneous castings. About $175,000.

Park Improvements — Lakewood O. (Cleveland P. O.)—City plans to improve park, including playgrounds, tennis courts, baseball grounds, grading, driveways and stone sidewalks. About $38,000. E. A. Fisher, City Hall, engr.

Tract Development—Chicago, Ill.—South Parks Comn. having preliminary plans prepared by L. White, ch. engr., East 57th St. and Cottage Grove Ave., for development of lake shore from Roosevelt Rd. south to East 67th St., involving construction of bulkheads and placing of fills. Finances will be provided out of a $20,000,000 bond issue voted Feb. 24.

Electric Light System—Kohler, Wis.—Village election soon to vote on $12,000 bonds to build and equip electric light system. A. Brotz, village pres. J. Donohue, North 8th St., Sheboygan, engr.

Dock—Milwaukee, Wis.—Chicago, Racine & Milwaukee Line, B'way. and Erie Ave., having plans prepared for 400 ft. rein.-con. and pile dock. A. E. Hecht, 64 West Randolph St., Chicago, engr.

Grain Elevator—Oklahoma, Okla.—Oklahoma City Clearing House Assn., 440 Lee St., plans to build grain elevator. Cost $750,000. Architect and engineer not decided.

Riprap—Woodland, Wash.—Cowlitz Co. (Kalama) soon lets contract riprapling bank of Lewis River at Robinson's Bend, 2 mi. above here, involving 18,000 lin.ft. piling. F. C. Cramer, Kalama, co. engr. Noted Feb. 12.

Pump—Inglewood, Cal.—J. H. Kew, city clk., soon receives bids furnishing centrifugal pump, 400 to 1,200 gal. capacity.

Miscellaneous (Continued)

Olmsted & Gellelen, Hollingsworth Bldg., Los Angeles, engrs.

Boilers—Montreal, Que.—Lignite Bd., 2 Youville Sq., soon lets contract furnishing three 72 in. x 18 ft. horizontal return tubular boilers, 160 lb. per sq.in. working pressure, built to conform to requirements of Saskatchewan, together with usual accessories and necessary iron work. L. Thomson, secy.

Road Roller and Quarry Machinery — Hagersville, Ont.—Haldimand Co. plans to purchase road roller and quarry machinery. W. W. McBurney, Hagersville, engr.

Steam Shovels and Rock Crushers — London, Ont. — City plans to purchase steam shovels and rock crushers. H. A. Brazier, city engr.

Road Roller—Ottawa, Ont.—A. F. Macallum, city engr. receiving bids on one 12½ ton road roller.

BIDS DESIRED

Trap Rock and Portland Cement—Holyoke, Mass.—Until March 26, by Bd. Pub. Wks., furnishing trap rock and portland cement for 1 year.

Tank—Malden Mass. (Boston P. O.)—C. H. Tenney & Co., engrs., 201 Devonshire St., Boston, receiving bids building rein.-con. oil tank, 42 ft. diam., for Malden & Melrose Gas Light Co., 137 Pleasant St.

Road Materials—Brooklyn, N. Y.—Until March 24, by E. Riegelmann, boro. pres., furnishing and delivering 2,000 cu.yd. 1½ in. broken stone, 60,000 wood paving blocks, 2,000 cu.yd. sand and grit mixture.

Fire Alarm System—Central Islip, N. Y.—Until April 7, by State Hospital Comn., Capitol, Albany, building fire alarm system at Central Islip State Hospital, here. L. F. Pilcher, Albany, state archt.; advertised in this issue.

Dust—New York, N. Y.—Until March 22, by H. H. Curran, pres. Manhattan Boro., furnishing and delivering 3,000 ton limestone dust.

Road Materials—New York, N. Y.—Until March 25, by H. Bruckner, pres. Bronx Boro., furnishing and delivering motor gasoline and 5,500 cu.yd. asphalt wearing surface sand and 600 cu.yd. fine sand.

Asphaltic Cement—Niagara Falls, N. Y.—Until March 23, by E. J. Fort, city mgr., furnishing and delivering 250-300 ton asphaltic cement.

Road Materials—Niagara Falls, N. Y.—Until March 23, by E. J. Fort, city mgr., furnishing and delivering 250-350 ton sand, hard grained, moderately sharp and clean, 800-1,200 ton hard clean broken binder stone, 1,000-1,500 ton ½ in. mesh stone screenings, 150-200 ton clean, organic limestone dust, 12,000 gal. fuel oil, 120 ton good bituminous coal, quality without excess of dirt or dust, 1¼ in. lump, 800 gal. kerosine oil, 600 bbl. Portland cement, 10,000 paving brick, 10,000 asphalt block.

Retaining Wall—Pittsburgh, Pa.—See "Streets and Roads."

Tarvia—Scranton, Pa.—Until March 22, by R. W. Allen, dir. Dept. Pub. Wks., furnishing 3,500 gal. Tarvia X and 2,500 gal. Tarvia B, or any other material equally as good.

Crushed Stone, Gravel and Sand—Baltimore, Md.—Until March 24, by Bd. Awards, furnishing and delivering crushed stone, gravel and sand to Highways Engineer Dept. G. F. Weighardt, highways engr.; advertised in this issue.

Girder Rail Crossing—Baltimore, Md.—Until March 24, by Bd. Awards, furnishing and delivering one 159 lb. 9 in. girder rail crossing for Municipal Harber Belt R.R. and Baltimore & Ohio R.R. siding to Torsch Packing Co. plant. G. F. Weighardt, highways engr.; advertised in this issue.

Vitrified, Granite, Asphalt and Creosoted Wood Blocks — Baltimore, Md.—Until March 24, by Bd. Awards, furnishing and delivering vitrified, granite, asphalt and creosoted wood blocks. G. F. Weighardt, highways engr.; advertised in this issue.

Coal Tar—Cincinnati, O.—Until March 25, by E. Von Bargen, city purch. agt., furnishing 50,000 gal. coal tar surface treatment.

Crane Runway—Cleveland, O.—Until March 22, by J. B. Davis & Son, engrs., 876 The Arcade, building 1 story, 61 x 200 ft., steel crane runway, for Union Rolling Mills Co., East 82nd St. and Aetna Rd. About $50,000.

Tractor—Cleveland, O.—J. B. Davis & Son, 876 The Arcade, receiving bids furnishing tractor.

Water Tube Boilers, etc.—Elyria, O.—Until March 22, by H. A. Beck, dir. serv., furnishing three 200 hp. water tube boilers, 3 mechanical stokers, 3 superheaters, 3 soot blowers, economizers and induced draft fan. M. Knowles, Inc., 1200 B. F. Jones Bldg., Pittsburgh, Pa., and 716 Hippodrome Bldg., Cleveland, engrs.; advertised in this issue.

Portable Rock Crusher and Elevator—Alexandria, Minn.—Until March 26, by V. Thomas, aud. Douglas Co., furnishing portable rock crusher and elevator, 12-18 tons hourly capacity.

Gravel Screening and Loading Plant—Minneapolis, Minn.—Until April 5, by A. P. Erickson, aud. Hennepin Co., furnishing 1 portable gravel screening and loading plant. About $1,600.

Portable Gravel Bin, Etc.—St. James, Minn.—A. G. Countryman, aud. Watonwan Co., receiving bids for portable gravel bin with loading outfit, conveyor and screen.

Transmission Line—Meriden, Kan.—Until March 22, by city, building 14 mi. electric transmission line from here to Topeka. W. T. King, clk. W. B. Rollins & Co., 209 Ry. Exch. Bldg., Kansas City, Mo., engrs. Noted Feb. 19.

Rigs and Pipe—San Antonio, Tex.—A. Watts (contractor) 420 Porter St., receiving bids for 1 or 2 medium sized rotary drilling rigs, also pipe of all sizes.

Repairing Dredge—Montreal, Que.—Until March 22, by R. C. Desrochers, secy., Dept. Pub. Wks., Ottawa, for repairs to Dredge 1, (Q&R)

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Foundation — Williamstown, Mass. — Williams College let contract for concrete foundation for 3 story, 120 x 120 ft., brick and limestone library, on campus, to P. A. Smedley, Williamstown. Total cost $500,000. Noted May 8, under "Buildings."

★Bathing Pavilion—Brooklyn, N. Y.—See "Buildings."

Road Materials—Long Island City, N. Y.—M. E. Connolly, pres. Queens Boro., received bids March 15, furnishing and delivering (a) 2,900 cu.yd. broken stone, (b) 5,000 cu.yd. sand, (c) 100,000 wood and 100,000 oak key paving blocks, (d) 500 net ton lime, from Annarock Eng. & Constr. Co., (a) $9,253; Tuchy & Upton, Inc., (a) $10,482; Peace Bros., Inc., 20 Main St., Flushing, (a) $10,540; Kennedy-Smith, Inc., (a) $10,685, (b) $14,350; Newtown Supply Co., Varick Ave., Brooklyn, (b) $14,500; C. H. and R. C. Peckworth, 1170 Bway., New York City, (c) $7,475 and $6,500 respectively; E. E. Buhler Co., 103 Park Ave., New York City, (c) wood paving, $7,700, (d) $12,225. Noted March 11.

Motor Trucks—New York, N. Y.—H. H. Curran, pres. Manhattan Boro., received lowest 3 bids March 12, furnishing and delivering one 3½ ton and eleven 2½ ton motor trucks, from Manhattan Sales Corp., 59 East 59th St., $3,387 and $34,991 respectively; Balbar Auto Corp., $4,430 and $38,230 respectively; Herman Motor Truck Co., $4,400.

Road Materials—New York, N. Y.—H. H. Curran, pres. Manhattan Boro., received bids March 10, furnishing and delivering (a) 1,000 ton asphalt paving cement, (b) 12,000 bag portland cement, (c) 2,000 cu.yd. paving sand, (d) 2,500 cu.yd. paving grit, (e) 2,000 cu.yd. coarse aggregate, (f) 310,000 wood paving blocks, (g) 4,500 cu.yd. binder stone, (h) 1,000 ton coal tar, from Texas Co., 17 Battery Pl., (a) $40,000, J. A. McCarthy, (b) $9,900; J. P. Duffy, 207 East 138th St., (b) $10,200; Manhattan Sand Co., 59 East 59th St., (c) $4,000, (d) $10,825, (e) $8,310; Lannigan Bros., Bronx River and 165th St., (c) $4,100, (d) $11,000, (e) $8,063; Colonial Sand & Stone Co., 615 West 49th St., (c) $4,180, (d) $10,625, (e) $8,560; Calvin & Tompkins, (e) $5,960; Amer. Creosoting Co., 17 Battery Pl., (f) $21,376; New York Trap Rock Co., 101 Park Ave., (g) $9,675; Barrett Co., 17 Battery Pl., (h) $26,900. Noted March 4.

Dam—Rochester, N. Y.—E. S. Walsh, supt. Pub. Wks., Capitol, Albany, received lowest 3 bids building dam over canal on Lexington Ave., here, Barge Canal Constr. 204, from I. M. Ludington Sons Co., Inc., 124 Powers Bldg., $4,500; W. Bailey & Co., 6 Primrose St., $4,864; G. H. Bucklan, 1226 Park Ave., $5,034.

★Dock—Chester, Pa.—Sun Shipbuilding Co., Morton Ave., will build 200 x 600 ft. grading and wet dock, rein.-con. and timber. About $3,000,000. Work will be done by day labor.

★Foundation—Johnstown, Pa.—Women's Memorial Hospital Assn. let contract excavating and building foundation for nurses home, on Franklin St., to J. Napolitano, Johnstown. About $15,000.

Spillway and Dam—Atlanta, Ga.—Capiital City Country Club, Peachtree and Harris Sts., let contract building spillway and dam, to Case & Cothran, Chandler Bldg., $21,660.

★Ash Wagons—Cleveland, O.—E. Shattuck, city purch. agt., let contract furnishing 47 ash wagons, to W. M. Pattison Supply Co., 717 Rockwell Ave., $14,335. Noted March 11.

Trucks and Trailers—Cleveland, O.—E. Shattuck, city purch. agt., received bids furnishing five 5 ton trucks with dump bodies, from Nash Ohio Motor Cars Co., 8920 Euclid Ave., $16,772, White Co., East 79th St. and St. Clair Ave., $25,000; five 2½ ton trailers, from Lee-Loader & Body Co., 2343 South La Salle St., Chicago, $10,380, Troy Wagon & Trailer Co., Troy, $12,250.

★Pavilion—Columbus, O.—Comrs. Franklin Co. let contract building 2 story, 170 x 200 ft., rein.-con. and brick pavilion, at Franklin Co. Tuberculosis Hospital, here, to Davies, Chism & Davies, 601 Chamber of Commerce Bldg., $152,770.

★Tunnel—Detroit, Mich.—Crowley Milner Co., Gratiot and Farmer Sts., let contract building 100 ft. rein.-con. and brick double barreled tunnel under Library Ave., connecting stores, involving dredging, back filling over tunnel and repaving, to G. A. Fuller Co., 540 Penobscot Bldg. Cost to exceed $10,000.

★Spillway and Dam—Flint, Mich.—City let contract raising spillway and rebuilding Hamilton Dam, rein.-con. and timber, to DuBoise Constr. Co., 1519 South Saginaw St., $137,723. Noted Jan. 8.

Road Oil Etc.—Milwaukee, Wis.—Central Bd. Purchases, City Hall, received bids March 2, furnishing 50,000 gal. heavy road oil and 260,000 gal. medium oil, from Standard Oil Co., 105 Wells St., $0.085 per gal.; 450,000 gal. bituminous binder, from Barrett Co., 10 South La Salle St., Chicago, $0.125 per gal. Noted Feb. 19.

Asphalt Paving Plant—St. Paul, Minn.—H. W. Austin, city purch. agt., received bids March 1, furnishing asphalt pave plant, 400,000 lb. daily capacity, from Hetherington & Berner, Kentucky Ave. and White River, Indianapolis, Ind., $26,615; Barber Asphalt Paving Co., 339 Metropolitan Bank Bldg., Minneapolis, $19,650. Noted Feb. 26.

★Pitch Filler—St. Paul, Minn.—H. W. Austin, city purch. agt., let contract furnishing 812,930 lb. pitch filler, to Barrett & Co., 1 19th Ave. S., Minneapolis, $31.60 per ton. Noted Feb. 26.

★Vitrified Brick—St. Paul, Minn.—H. W. Austin, city purch. agt., let contract furnishing 14,804 sq.yd. vitr. brick for paving, to Streator Clay Mfg. Co., Guardian Life Bldg., $1.95 per sq.yd. f.o.b. cars. Noted Feb. 26.

★Elevator—Arkansas City, Kan.—Arkansas City Milling Co. let general contract building elevator, 250,000 bu. capacity, rein.-con., concrete foundation, to include 8 tanks and head house, to Finton Constr. Co., 414 Ridge Arcade, reinforcing steel, to Laclede Steel Co., 228 Scarritt Bldg., both of Kansas City, Mo. Total cost $90,000.

★Elevator — Marysville, Kan. — Larabee Flour Mills Co., Security Bldg., Kansas City, Mo., let contract building elevator, 200,000 bu. capacity, 64 x 64 ft., 100 ft. high, rein.-con., concrete foundation, here, to Finton Constr. Co., 414 Ridge Arcade, Kansas City, Mo. About $100,000.

★Elevator—Clinton, Mo.—Larabee Flour Mills Co., Security Bldg., Kansas City, let contract building 62 x 128 ft. rein.-con. elevator, 100 ft. high, concrete foundation, here, to Finton Constr., Co., 414 Ridge Arcade, Kansas City. About $100,000.

★Sand and Gravel—Marshfield, Ore.—State Highway Comn., Portland, let contract furnishing 20,000 cu.yd. sand and gravel, to company formed by A. K. Peck, M. W. Payne and L. G. Simpson, all of Marshfield. About $10,000.

★Water Pipe—Los Angeles, Cal.—City let contract furnishing 1,500 ton 24 in. riveted steel pipe for water main on 11th and 12th Sts., from Vermont Ave. to Main St., to Lacy Mfg. Co., 1,000 North Main St.

Slide Gates — San Francisco, Cal. — Bd. Pub. Wks. received bids March 3, furnishing and delivering 47 x 90 in. slide gates for outlet system of Hetch Hetchy Dam, from Coffin Valve Co., Neponset St., Boston, $121,000 and $8.50 per day for foreman's services; Pacific Rolling Mill Co., 17th and Mississippi Sts., $137,000 and $15 per day for foreman's services; J. Hindy Iron Wks., 75 Fremont St., $158,000 and $12 per day for foreman's services. Noted Feb. 5.

★Grain Elevator—Stockton, Cal.—Sperry Flour Co., West Weber St., will build rein.-con. grain elevator, rein.-con. flooring, concrete foundation. Cost to exceed $60,000. Work will be done by day labor.

★Harbor Headwalls—Toronto, Ont.—Toronto Harbor Comn., Harbor Bldg., let contracts building harbor headwalls from York to Bay Sts., to Weddell & Saunders, McKinnon Bldg., from Bay to Yonge Sts., Port Arthur Constr. Co., 36 Toronto St. About $1,500,000. Work involves 125,000 cu.yd. rein.-con.

OFFICIAL PROPOSALS

Bids: Mar. 25.

Construction of Bridge

STATE COMMISSION OF HIGHWAYS
ALBANY, N. Y.

Kingston, N. Y.

Pursuant to the provisions of Chapter 30, Laws of 1909, and the several amendments up to and including Chapter 623, Laws of 1919, sealed proposals will be received by the undersigned at No. 53 Lancaster Street, Albany, N. Y., at 1 o'clock p.m., on Thursday, the 25th day of March, 1920, for the construction of a bridge to carry Road No. 5599 over Roundout Creek at Kingston, Ulster County, N. Y.

The bridge is designed for one suspension span, 705 feet long, and two anchor spans each 220 feet long with the necessary anchorages, towers, concrete floor and stiffening trusses. A partial list of principal items follows:

3,214,000 Lbs. structural steel and castings.
567,000 Lbs. steel cables and suspenders.
3,392 cubic yards concrete.
100,000 Lbs. steel reinforcement.

Shafts for the anchorages are being constructed under a previous contract.

Plans, specifications and proposal forms may be obtained and estimates seen at the offices of the Commission in Albany, N. Y.

Special attention of bidders is called to "Information for Bidders" in the itemized proposal.

Proposals must be presented in a sealed envelope endorsed on the outside "Proposal for the Construction of the Rondout Creek Bridge, Contract 5599-C." Each proposal must be accompanied by cash or a certified check payable to the order of the State Commission of Highways for an amount equal to at least three per cent of the amount of the proposal The retention and disposal of such cash or check by the State Commission of Highways shall conform with Subdivision 2, Section 130 of the Highway Law, as amended by Chapter 623, Laws of 1919.

The successful bidder will be required to execute the contract and comply in all respects with Section 130 of the Highway Law, as amended by Chapter 623.

The right is reserved to reject any or all bids.

FRED'K STUART GREENE,
Commissioner.

IRVING V. A HUIE,
Secretary

Bids: Apr. 6.

Paving

Geneva, N. Y.

Sealed bids will be received by the Board of Public Works of the City of Geneva, N. Y., until 7:30 P.M., Tuesday, April 6th, 1920, on the following items for street paving with sheet asphalt, asphaltic concrete, bitulithic, brick and reinforced concrete.

Square yards of pavement	13,500
Excavation, Cubic Yards	5,400
Concrete Curb and Gutter, Lineal Feet	3,300
3" Drain Tile, Lineal Feet	3,300
Resetting stone curb, Lineal Feet	5,700
Vitrified Sewer Tile, Lineal Feet	925
Catch Basins	10

Specifications, blank proposals, plans, etc., may be had by depositing with the Superintendent $5.00, which will be returned upon return of the plans, specifications, etc., in good condition.

H. K SEYBOLT, Superintendent

The publication of an advertisement on this page is an official notice that bids are wanted from other than local bidders.

It is also a guarantee that maximum competition is invited because Engineering News-Record is the *one* nationally recognized medium for Proposal advertising. Its Searchlight Section is read each week by nearly every worth-while contractor in this country who bids on public work outside his own city.

Official Proposals reaching our office in first mail Wednesday morning (9 o'clock) can usually be published in the issue out the next day. Special price for Official Proposals, $3.60 an inch.

Bids: April 6, 1920.

Street Paving for Street Improving District No. 1

Hope, Ark.

Sealed proposals addressed to above Improvement District, care of A. L. Betts, Secretary, for draining, grading, curbing and paving the streets in the said District will be received by the Board of Commissioners of same up to 8 p.m. April 6, 1920, and will be publicly opened and read immediately thereafter.

The work to be done includes the following approximate quantities:

3,500 lin.ft. of vitrified clay pipe storm sewers varying in diam. from 8 in. to 21 in.
9 manholes
21 storm sewer inlets
6,600 cu.yd. of grading
4,400 lin.ft. of concrete curb
20 cu.yd. concrete steps
28,800 sq.yd. of paving.

Bids are desired on any or all of the following types of pavement, towit:

3-in. vertical fiber brick, reinforced concrete and asphaltic concrete; but one only of these types will be used for the entire District. A 4-in and 5-in. concrete base will be used with brick or asphaltic concrete pavements.

All work will be paid for in cash on the monthly estimates by the Engineer.

Certified check required is 3 per cent of total amount of bid.

Complete plans and specifications are on file and may be examined by prospective bidders at the office of the Engineer for the Board, Texarkana, Arkansas, or the Secretary's office, Hope, Arkansas.

Specifications may be had from the Secretary or Engineer upon request, for sum of one dollar, which amount will be refunded upon return of same. Complete plans and specifications, including profiles and cross sections, may be secured from the engineer for the sum of $20.00, of which amount $10.00 will be refunded upon return of same in good condition to the engineer.

The attention of paving contractors is called to the unusually favorable local conditions, and facilities for the efficient and expeditious performance of this work afforded by the location of the District and the railroad facilities available. The District comprises certain streets in the business section only of the city, and the widths of the streets to be paved vary from a maximum of 62 ft. to a minimum of 30 ft., the majority being 40 ft. to 45 ft. The District comprises an area 3½ blocks long by 2½ blocks wide, the main line of the Mo. Pac. Ry. being the north and the Frisco Ry. the west boundaries respectively of same.

The right is reserved to reject any or all bids.

BOARD OF IMPROVEMENT,
By J. P. Brundidge, Chairman.
A. L. Betts, sec'y.
E. F. Petersen, Engineer.

Bids: March 29.

Construction of Highways

STATE OF NEW JERSEY
STATE HIGHWAY COMMISSION

Trenton, N. J.

Notice is hereby given that sealed bids will be received by the State Highway Commission of New Jersey for the construction of the following:

State Highway Route No. 8, Section No. 3, White's Bridge to Bloomingdale, Passaic and Morris Counties, concrete surface, estimated 12,800 square yards.

State Highway Route No. 8, Section No. 4, Charlottesburg to South Mills, Passaic and Morris Counties, concrete surface, estimated 45,000 square yards.

Bids will be opened and read in public at the office of the State Highway Commission, Broad Street Bank Bldg., Trenton, New Jersey, on Monday, March 29, 1920, at 10:30 a.m.

Drawings, specifications and form of bid, contract and bond for the proposed work are on file in the office of the State Highway Department at Trenton, N. J., and at the office of Roy Mulins, Division Engineer, 790 Broad Street, Newark, N. J., and may be inspected by prospective bidders. Plans and specifications will be furnished on deposit of ten dollars ($10.00) upon application to the Division Engineer, 790 Broad Street, Newark, N. J. Bids must be made on the standard proposal forms in the manner designated therein and as required by the specifications, same to be enclosed in sealed envelopes bearing the name and address of bidder and name and section of route on the outside, addressed to

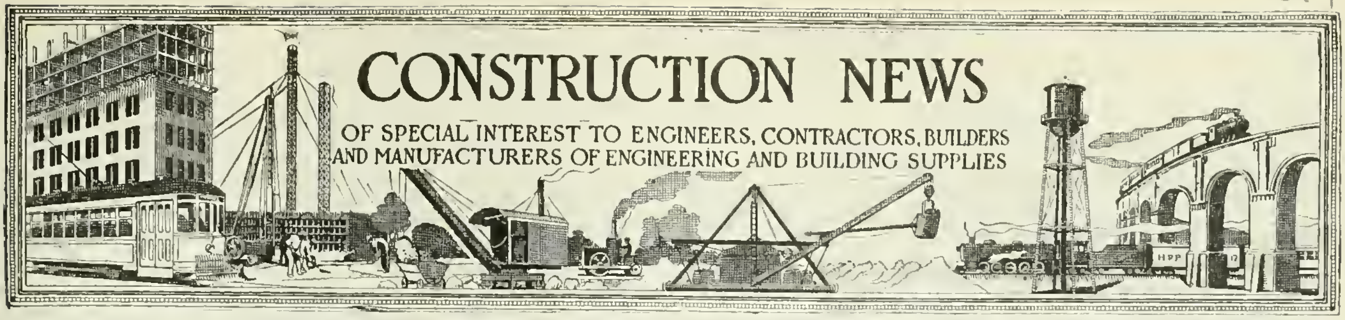
STATE HIGHWAY COMMISSION
Broad Street Bank Bldg.
Trenton, N. J.

and must be accompanied by a certified check for not less than ten per cent (10%) of the amount of the bid, and be delivered at the above place on or before the hour named. Copies of standard proposal form will be furnished on application

Each bidder must accompany his bid with a certificate from a surety company duly authorized to do business in this State, stating that such surety company will provide said bidder with a bond in such sum as is required in, and in accordance with the provisions of said specifications, conditioned for the faithful performance of the provisions of the contract and specifications.

By order of the State Highway Commission.

A LEE GROVER, Chief Clerk.



CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

PROPOSALS

"For proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Mar. 30	Philadelphia, Pa.	Mar. 25
Mar. 31	Moscow, Idaho	Mar. 25
Apr. 1	Punxsutawney, Pa.	Mar. 11
Apr. 2	Akron, O. Adv. Mar. 11.	Mar. 11
Apr. 3	Clarksburg, W. Va.	Mar. 11
Apr. 12	Defiance, O. Adv. Mar. 11.	Mar. 11
May 1	Montreal, North Que.	Mar. 18

SEWERS

Bids Close		See Eng. News-Record
Mar. 29	Buffalo, N. Y.	Mar. 18
Mar. 29	Huntington, Ind.	Mar. 18
Mar. 30	Toledo, O.	Mar. 25
Mar. 31	Humboldt, Tenn.	Mar. 25
Mar. 31	Portland, Ore. Adv. Mar. 25.	Mar. 25
Apr. 1	Portland, Ore. Adv. Mar. 25.	Mar. 25
Apr. 1	Carlisle, Pa.	Mar. 18
Apr. 5	Huntingburg, Ind.	Mar. 18
Apr. 7	Portland, Ore. Adv. Mar. 25.	Mar. 25
Apr. 8	Jackson, Mich.	Mar. 25
Apr. 8	Milwaukee, Wis. Adv. Feb. 26.	Feb. 26
Apr. 12	Elmhurst, Ill.	Mar. 18
Apr. 13	Woodbury, N. J	Mar. 18
Apr. 14	Portland, Ore. Adv. Mar. 25.	Mar. 25
Apr. 21	Portland, Ore. Adv. Mar. 25.	Mar. 25
Apr. 26	Cape Girardeau, Mo.	Mar. 25
Apr. 28	Portland, Ore. Adv. Mar. 25.	Mar. 25
May 5	Portland, Ore. Adv. Mar. 25.	Mar. 25

BRIDGES

Bids Close		See Eng. News-Record
Mar. 29	Washington	Mar. 11
Mar. 30	Chester, S. C.	Mar. 25
Mar. 30	Ballinger, Tex.	Mar. 25
Mar. 30	Waldron, Ark.	Mar. 25
Mar. 30	Salt Lake City, Utah	Mar. 25
Mar. 31	St. Augustin, Que.	Mar. 25
Mar. 31	Asbury Park, N. J.	Mar. 11
Mar. 31	Little Rock, Ark.	Mar. 11
Mar. 31	Warwick, Mass.	Mar. 25
Apr. 1	Tyendinago, Ont.	Mar. 18
Apr. 2	McKee, Pa.	Mar. 11
Apr. 2	Tamaqua, Pa.	Mar. 4
Apr. 2	Salina, Kan.	Mar. 11
Apr. 2	Heflin, Ala.	Mar. 25
Apr. 3	Fairfield, Kan.	Mar. 11
Apr. 6	Duluth, Minn.	Mar. 18
Apr. 7	Cherokee, Kan.	Mar. 11
Apr. 7	Hartland, Mich.	Mar. 25
Apr. 7	Paterson, N. J.	Mar. 18
Apr. 7	Pleasure Bay (Long Branch P. O.), N. J.	Mar. 25
Apr. 8	Girard, Kan.	Mar. 11
Apr. 8	Beamsville, O.	Mar. 25
Apr. 9	Ft. Dodge, Ia.	Mar 25
Apr 9	Kirkland, Ill. Adv. Mar. 25.	Mar. 25
Apr. 13	Georgetown, Tex.	Mar. 25
Apr. 14	Milton, Fla.	Mar. 18
Apr. 14	Careyville, Fla.	Mar. 18
Apr. 15	Louisville, Ill.	Mar. 25
Apr. 20	Newton, Ga.	Mar. 18

STREETS AND ROADS

Bids Close		See Eng. News-Record
Mar. 27	Idaho	Mar. 25
Mar. 29	El Paso, Tex.	Mar. 25
Mar. 29	Brownsville, Tex.	Mar. 25
Mar. 29	New Jersey	Mar. 11
Mar. 29	Washington	Mar. 4
Mar. 29	North Carolina	Mar. 11
Mar. 29	Dallas, Tex.	Mar. 18
Mar. 29	Morgantown, W. Va	Mar. 18
Mar. 29	Buffalo, N. Y.	Mar. 18
Mar. 29	Winfield, W. Va.	Mar 18
Mar. 29	Michigan	Mar. 25
Mar. 29	Marshall, Tex.	Mar. 25
Mar. 29	Wadesboro, N. C.	Mar. 25
Mar. 29	Livingston, Mont	Mar. 25
Mar. 30	Georgetown, Tex.	Mar. 25
Mar. 30	Oklahoma	Mar. 25
Mar. 30	Waldron, Ark.	Mar. 25
Mar. 30	Union, S. C.	Mar. 25
Mar. 30	Elizabeth, W. Va.	Mar. 18
Mar. 30	De Graff, O.	Mar. 18
Mar. 30	Maryland	Mar. 18
Mar. 30	Spokane, Wash.	Mar. 18
Mar. 30	Mora, Minn.	Mar. 18
Mar. 30	Corning, N. Y. Adv. Mar. 25.	Mar. 25
Mar. 30	Cleveland, O.	Mar. 25
Mar. 30	Comanche, Tex.	Mar. 25
Mar. 30	Jersey City, N. J.	Mar. 25
Mar. 31	Massachusetts	Mar. 25
Mar. 31	Baltimore, Md.	Mar. 25
Mar. 31	Salt Lake City, Utah	Mar. 25
Mar. 31	Fayette, Miss.	Mar. 25
Mar. 31	Brooklyn, N. Y.	Mar. 25
Mar. 31	Hillsboro, Tex.	Mar. 18
Mar. 31	Harrison, Mich.	Mar. 18
Mar. 31	Clayton, Mo.	Mar. 18
Mar. 31	Bayfield, Wis.	Mar. 25
Mar. 31	Freehold, N. J.	Mar. 11
Mar. 31	Madison, W. Va.	Mar. 4
Mar. 31	Little Falls, Minn.	Mar. 18
Mar. 31	Rhode Island Adv. Mar. 18.	Mar. 18
Apr. 1	Fergus Falls, Minn.	Mar. 18
Apr. 1	Carrollton, Ga.	Mar. 18
Apr. 1	Flandreau, S. D.	Mar. 4
Apr. 1	New York, N. Y.	Mar. 25
Apr. 1	Long Island City, N. Y.	Mar. 27
Apr. 1	Richmond, Ky.	Mar. 4
Apr. 1	St. Thomas, Ont.	Feb. 19
Apr. 1	Daytona, Fla.	Feb. 26
Apr. 1	Ingersoll, Ga.	Feb. 26
Apr. 1	Tulsa, Okla.	Mar. 25
Apr. 2	Winchester, Ky.	Mar. 18
Apr. 2	Denton, Tex.	Mar. 25
Apr. 2	Michigan	Mar. 25
Apr. 2	Tennessee	Mar. 18
Apr. 2	Salina, Kan.	Mar. 11
Apr. 2	Kingsville, Tex.	Mar. 25
Apr. 2	Birtle, Man.	Mar. 25
Apr. 3	Lawrence, Kan.	Feb. 19
Apr. 3	Fairfield, Kan.	Mar. 11
Apr. 5	Washington	Mar. 4
Apr. 5	Cleveland Heights (Warrensville P. O.), O.	Mar. 11
Apr. 5	Colorado	Mar. 18
Apr. 5	Long Prairie, Minn.	Mar. 18
Apr. 5	Montana	Mar. 25
Apr. 5	Livingston, Tex.	Mar. 25
Apr. 5	Albany, N. Y.	Mar 25
Apr. 5	Fresno, Cal.	Mar. 25
Apr. 5	Grand Forks, N. D.	Mar. 18
Apr. 5	California	Mar. 18
Apr. 5	Mayo, Fla.	Mar. 18
Apr. 5	Pt. Pleasant, W. Va.	Mar 18
Apr. 5	Indiana	Mar. 18
Apr. 5	Seattle, Wash.	Mar. 18
Apr. 5	Idaho	Mar. 25
Apr. 5	Salinas, Cal.	Mar 25
Apr. 5	Martinez, Cal.	Mar 25
Apr. 5	Hemet, Cal.	Mar. 25
Apr. 5	Ellensburg, Wash.	Mar. 25
Apr. 5	Washington	Mar. 25
Apr. 6	Brunswick, Ga. Adv. Mar. 25.	Mar. 25
Apr. 6	South Dakota	Mar. 25
Apr. 6	Michigan	Mar. 25
Apr. 6	Walker, Minn	Mar. 26
Apr. 6	Morris, Minn.	Mar. 25
Apr. 6	Edwardsburg, Ont.	Mar. 25
Apr. 6	Duluth, Minn.	Mar. 18
Apr. 6	Indiana	Mar. 18
Apr. 6	Greenfield, Ind.	Mar. 18
Apr. 6	New York, N. Y. Adv. Mar. 11.	Mar. 11
Apr. 6	Geneva, N. Y.	Mar. 4
Apr. 6	Arkansas	Mar. 11
Apr. 6	Ft. Scott, Kan.	Mar. 11
Apr. 7	Cherokee, Kan.	Mar. 11
Apr. 7	La Grange, Ga.	Mar. 18
Apr. 7	Elbow Lake, Minn.	Mar. 25
Apr. 7	Fredericksburg, Tex.	Mar. 25
Apr. 7	South Dakota	Mar. 25
Apr. 7	Ontario	Mar. 25
Apr. 7	Tucson, Ariz.	Mar 25
Apr. 8	South Dakota	Mar. 25
Apr. 8	Somerville, N. J.	Mar 18
Apr. 8	Girard, Kan.	Mar. 11
Apr. 8	Elkins, W. Va.	Mar. 18
Apr. 8	Savannah, Ga. Adv. Feb. 19 and 26.	Feb. 19
Apr. 8	Ft. Wayne, Ind.	Mar. 25
Apr. 9	Crookston, Minn.	Mar. 25
Apr. 9	South Dakota	Mar. 25
Apr. 9	Ft. Scott, Kan.	Mar. 11
Apr. 9	Independence, Kan.	Mar. 25
Apr. 9	Auburn, Neb.	Mar. 25
Apr. 9	Michigan	Mar. 25
Apr. 10	Grafton, N. D.	Mar. 18
Apr. 10	Hot Springs, Ark.	Mar. 18
Apr. 10	Hazard, Ky.	Mar. 25
Apr. 10	Roanoke, Va.	Mar. 25
Apr. 12	Van Horn, Tex.	Mar. 18
Apr. 12	Salem, N. J.	Mar. 25
Apr. 12	Seattle, Wash.	Mar. 25
Apr. 12	Cailfornia	Mar. 25
Apr. 12	Mt. Clemens, Mich.	Mar. 25
Apr. 13	Pennsylvania	Mar. 25
Apr. 13	Hutchinson, Kan.	Mar. 25
Apr. 14	Mays Landing, N. J.	Mar. 18
Apr. 14	Cottonwood Falls, Kan.	Mar. 25
Apr. 15	Bradford, Pa.	Mar. 25
Apr. 17	Brainerd, Minn.	Mar. 25
Apr. 19	Easton, Md.	Mar. 25
Apr. 19	Grafton, W Va.	Mar. 25
Apr 20	Meade, Kan.	Mar. 18
Apr. 20	Colfax, Wash.	Mar. 11
Apr. 21	Rockwood, Man.	Mar. 25

RAILWAYS

Bids Close		See Eng. News-Record
Apr. 8	Texas Adv. Mar. 25.	Mar. 25

EXCAVATION AND DREDGING

Bids Close		See Eng. News-Record
Mar. 29	Pine City, Minn.	Mar. 18
Mar. 30	Buffalo, N. Y.	Mar. 18
Mar. 30	New York, N. Y.	Mar. 25
Mar. 30	Oxnard, Cal	Mar. 18
Mar. 30	Madella, Minn.	Mar. 25
Mar. 31	Fillmore, Utah	Mar. 25
Apr. 1	Fairfield, Ill.	Mar 18
Apr. 3	Madisonville, Ky.	Mar. 18
Apr 6	Carroll, Ia.	Mar. 25
Apr. 10	Ontario	Mar. 25
Apr 25	Ontario	Mar. 25

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
Mar. 27	Wilkes-Barre, Pa.	Mar. 25
Apr. 1	Ironwood, Mich.	Mar. 25
Apr. 1	Allentown, Pa.	Mar. 18
Apr. 1	Sarnia, Ont.	Mar. 25
Apr. 7	Ft. William, Ont.	Mar. 25
Apr. 8	Halifax, N. S.	Mar. 25
Apr. 12	South River, N. J.	Mar. 18
Sept 1	Hutchinson, Kan.	Feb. 19

BUILDINGS

Bids Close		See Eng. News-Record
Mar. 29	Marion, O.	Mar. 4
Mar. 29	Digby, N. S.	Mar. 25
Mar. 29	North Bennington, Vt.	Mar. 25
Mar. 29	Roselle, N. Y.	Mar 11
Mar. 29	Minneapolis, Minn.	Mar. 18
Mar. 30	New York, N. Y.	Mar. 25
Mar. 30	Ellensburg, Wash.	Mar. 18
Mar. 30	Detroit, Mich.	Mar. 25
Mar. 30	West Branch, Ia.	Mar. 18
Mar. 30	Waubun, Minn.	Mar. 4
Mar. 30	Fairfield, Ia.	Mar. 11
Mar. 30	Lake Park, Ia.	Mar. 18
Mar. 31	Thomaston, Me.	Mar. 4
Mar. 31	Grand Rapids, Mich.	Mar. 25
Mar. 31	Denison, Tex.	Mar. 4
Mar. 31	Grand Rapids, Mich.	Mar. 18
Mar. 31	Wiota, Ia.	Mar. 25
Mar. 31	Pipestone, Minn.	Mar. 25
Apr. 1	Rockford, Ill.	Mar. 4
Apr. 1	Willmar, Winn.	Mar. 18
Apr. 1	Kettle River, Minn.	Mar. 18
Apr. 1	Bluffton, Ind.	Mar. 18
Apr. 1	Groton, S. D.	Mar. 18
Apr. 1	Dodson, Mont.	Feb 5
Apr 1	Dayton, O	Feb 19

Bids Close		See Eng. News-Record
Apr. 1	Lamont, Ia.	Mar. 4
Apr. 1	Lafayette, Minn.	Mar. 4
Apr. 1	Providence, R. I.	Mar. 4
Apr. 1	Greenland, N. H.	Mar. 25
Apr. 1	Geauga Falls, O.	Mar. 25
Apr. 1	Detroit, Mich.	Mar. 25
Apr. 2	Marysville, Kan.	Mar. 25
Apr. 2	Fairpoint, O.	Mar. 18
Apr. 3	Rippey, Ia.	Mar. 25
Apr. 3	Hamtramck (Detroit P.O.), Mich.	Mar. 25
Apr. 5	Bertha, Minn.	Mar. 18
Apr. 5	Etna (Pittsburgh P. O.) Pa.	Mar. 25
Apr. 5	New Brunswick, N. J.	Mar. 25
Apr. 6	Coquitlam, B. C.	Mar. 25
Apr. 6	Olds, Ia.	Mar 18
Apr. 7	Huntington, Ind.	Mar. 18
Apr. 7	Detroit, Mich.	Mar. 11
Apr. 7	Zion (Spaulding P. O.), Ia.	Mar. 18
Apr. 7	Defiance, O.	Mar. 25
Apr. 8	Willow Creek, Mont.	Mar. 25
Apr. 8	Fresno, Cal.	Mar. 4
Apr. 9	Southhold, N. Y.	Mar. 18
Apr. 10	Goose Lake, Ia.	Mar. 25
Apr. 11	Kearney, Neb.	Mar. 11
Apr. 12	Cedar Rapids, Ia.	Mar. 25
Apr. 15	Deer River, Minn.	Mar. 25
Apr. 15	Fergus Falls, Minn.	Mar. 25
Apr. 15	Mt. Morris, Mich.	Mar. 25
Apr. 15	Riverton, Wyo.	Mar. 4
Apr. 15	Coleraine, Minn.	Mar. 18
Apr. 15	Wheatland, Wyo.	Mar. 4
Apr. 15	Delmont, S. D.	Feb. 26
Apr. 19	Gering, Neb.	Mar. 25
Apr. 23	Alden, N. Y.	Mar. 25

FEDERAL GOVERNMENT WORK

Mar. 29	Post Office and Customhouse—Apalachicola, Fla.	Feb. 12
Mar. 29	Mess Hall and Dormitory—Wash., D. C.	Mar. 18
Mar. 31	Grading—Wash., D. C.	Mar. 18
Mar. 31	Storehouses — Spec. 4084—New Orleans, La.	Mar. 18
Mar. 31	Mechanical Equipment and Piping—Spec. 3708—Wash., D. C.	Mar. 11
Mar. 31	Electric Substation and Equipment (Spec. 4148), Charleston, W. Va.	
Mar. 31	Remodeling Barracks Building (Spec. 4147), Mare Island, Cal.	Mar. 25
Mar. 31	Turbo Air Compressor (Spec. 4016), New York, N. Y.	Mar. 25
Apr. 1	Dredging — Providence, R. I. Adv. Mar. 11.	Mar. 11
Apr. 2	Cast Iron Water Pipe — Wash., D. C.	Mar. 25
Apr. 5	Building and Repairing Jetty—Wilmington, Del. Adv. Mar. 11.	Mar. 11
Apr. 5	Cottage, Ft. Meyers, Fla.	Mar. 25
Apr. 6	Portland Cement — Louisville, Ky. Adv. Mar. 18.	Mar. 18
Apr. 7	Kitchen Equipment—Spec. 4097—San Diego, Cal.	Mar. 18
Apr. 8	Rock—New Orleans, La. Adv. Mar. 4.	Mar. 4
Apr. 9	Steel, Sheet Piling—Louisville, Ky. Adv. Mar. 18.	Mar. 18
Apr. 10	Vicksburg, Miss.	Mar. 18
Apr. 15	Detroit, Mich.	Mar. 18
Apr. 15	Electric Freight Elevator, Birmingham, Ala.	Mar. 25
Apr. 15	Lighting Plant and Water Supply System, Charleston, S. C.	Mar. 25
Apr. 15	Steel Hangar, Brooks Field, Tex. Adv. March 25.	Mar. 25
Apr. 15	Boiler Repairs, Cincinnati, O.	Mar. 25
Apr. 16	Lock—Pittsburgh, Pa. Adv. Mar. 18.	Mar. 18
Apr. 16	Rock Excavation, Chicago, Ill. Adv. March 25.	Mar. 25
Apr. 20	Dredging, Tonawanda, N. Y. Adv. March 25.	Mar. 25
Apr. 20	Bombproof Switchboard Building and Bombproof Cover for Casemate, Ft. Monroe, Va. Adv. March 25.	Mar. 25
Apr. 21	Barracks — Spec. 4086 — Kaukau, H. T.	Mar. 1[illegible]
Apr. 23	Dredging, Cleveland, O. Adv. March 25.	Mar. 25
May 3	Bridge—Alaska Adv. Jan. 22.	Jan. 22

MISCELLANEOUS

Bids Close		See Eng. News-Record
Mar. 27	Steel Transmission Towers—Winnipeg, Man.	Mar. 25
Mar. 29	Dam—Decatur, Ill.	Mar. 4
Mar. 29	Automobile Flusher Sprinklers—Montreal, Que.	Mar. 25
Mar. 29	Pier, etc. — New York, N. Y.	Mar. 25
Mar. 30	Limestone, Hollidaysburg, Pa.	Mar. 25
Mar. 30	Broken Stone — Trenton, N. J.	Mar. 25
Mar. 30	Dam—New Westminister, B. C.	Mar. 11
Apr. 2	Road Materials—New York, N. Y.	Mar. 25
Apr. 3	Wood Paving Blocks—New York, N. Y.	Mar. 25
Apr. 5	Gravel Screening and Loading Plant — Minneapolis, Minn.	Mar. 18
Apr. 5	Portland Cement, Idaho	Mar. 25
Apr. 6	Unloading and Hauling Stone Chips, Baltimore, Md.	Mar. 25
Apr. 6	Piers, Stapleton, S. I., N. Y.	Mar. 25
Apr. 7	Fire Alarm System—Central Islip, N. Y. Adv. Mar. 18.	Mar. 18
Apr. 7	Bulkhead and Stone Cribbing, Freehold, N. J.	Mar. 25
Apr. 9	Road Material, Hollidaysburg, Pa.	Mar. 25
Apr. 9	Bridge Lumber and Culvert Pipe, Ft. Dodge, Ia.	Mar. 25
Apr. 12	Breakwater, Toronto Island, Ont.	Mar 25
Apr. 20	Pier Shed, Brooklyn, N. Y. Adv. March 25.	Mar. 25
Apr. 20	Centrifugal Sewage Pump—Toronto, Ont.	Mar. 11
Apr. 21	Aqueduct Tunnels, San Francisco, Cal.	Mar. 25

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. Y., Port Dickioson (Binghamton P. O.)—City voted $10,000 bonds to extend waterworks system at Hillcrest. Noted Feb. 26.

O., Cleveland—City plans to build pumping station, including tunnel and crib in Lake Erie, filter plant and pumping equipment, cost $10,000,000; also install large c.i. water mains in southwest and northeast sections, with several smaller supply mains distributed throughout southern and eastern sections, $800,000. A. V. Ruggles, City Hall, engr.

O., Newburgh Heights (Cleveland P. O.)—See "Sewers."

Mich., Detroit—City soon receives bids building 1 story, 57 x 221 ft., rein.-con., steel and hollow tile superstructure for low lift or booster pumping station, at Waterworks Park. About $100,000. T. A. Leisen, 232 Jefferson Ave., engr. Noted March 11.

Mich., Ironwood—City having plans prepared for addition to ground water supply, to include electrical pumping equipment and 5 mi. c. i. pipe. About $300,000. Alvord & Burdick, 8 South Dearborn St., Chicago, engrs.

Wis., Markesan — E. W. Laper, village clk., soon lets contract building concrete reservoir and pumping station, laying 20,000 ft. water pipe and drilling 10 in. well, 200 to 300 ft. deep.

S. D., Philip—City voted $50,000 bonds to extend waterworks and install sewerage system.

Mont., Conrad—City voted $180,000 bonds to build waterworks system. C. W. Swearingen, Great Falls, engr.

Mont., Harlem—City election April 5 to vote on $15,000 bonds to build filtration plant and c.i. main from pump station to water tower. C. P. Wells, 804 1st Natl Bank Bldg., Great Falls, engr.

Mont., Wolf Point—City election April 10, to vote on $50,000 bonds to build new wells, pumping plant, 200,000 gal. steel storage tank, and 1,000 ft. 6 in. and 3,000 ft. 8 in. water mains. D. Dowell, Wolf Point, engr.

Mont., Wolf Point—City plans to lay 9,000 ft. Class "B" water mains, involving 6,000 cu.yd. excav., etc., in Special Impvt. Dist. 19. Cost to exceed $10,000. S. Dowell, Wolf Point, engr.

Okla., Elk City—City having plans prepared extending waterworks system. About $100,000. H. G. Olmstead & Co., 415 Oil Exch. Bldg., Oklahoma, engrs.

Okla., Pawhuska—City had plans prepared building filtration plant, near present water plant, here, (patterned like one at Tulsa), 2,000,000 gal. daily capacity. About $65,000. State Water Bureau, Oklahoma, engrs.

Col., Fort Morgan—City election April 28, to vote on $35,000 bonds to extend waterworks system.

Utah, Hyrum—City voted $40,000 bonds to build new reservoir and extend present distribution system. T. H. Humpheries, Logan, engr.

Utah, Providence — Town election April 10, to vote on $75,000 bonds to build waterworks system. H. B. Campbell, town pres. T. H. Humpheries, Logan, engr.

Ariz., Glendale—City voted $25,000 bonds to extend and improve waterworks system. H. Hancock, city engr.

Ariz., Prescott — City Council retained J. W. Waara, engr., Prescott, to prepare plans for storage part of new waterworks system, work includes concrete and earth dam and reservoir, wood pipe lines, c.i. mains, etc. J. H. Robinson, clk. Bonds for $350,000 voted for project. Noted Jan. 29.

Cal., Colusa—See "Miscellaneous."

Cal., El Centro—City had plans prepared for series of settling basins. Bonds for $150,000 will probably be voted for project. A. Rice, city engr.

Cal., Monrovia—City having plans prepared for 1,000,000 gal. rein.-con. reservoir, deep wells, pumps and mains. Bonds for $90,000 voted for project. H. S. Gierlich, city engr.

Cal., Williams—City having preliminary plans prepared for waterworks system and sewage disposal plant. About $22,000 and $18,000 respectively. Election soon to vote on bonds for project. A. Givan, Forum Bldg., Sacramento, engr.

Ont., Chatham—City will vote upon bylaw to raise $371,000 to build rapid sand gravity filtration plant with chlorination apparatus. Work involves 20,000 ft. 20 in. c.i. pipe. F. P. Adams, city engr.

Ont., Port Dover—City having estimates made by E. A. James Co., Ltd., engrs., 36 Toronto St., Toronto, for waterworks system, to include 4 mi. 6-10 in. c.i. pipe, pumphouse, steel or concrete reservoir and centrifugal pumps. Water will be taken from either Doanes Springs or Lake Erie. About $100,000.

Ont., York—Town plans to construct 5 mi. 6 in. c.i. water mains in Runnymede Dist. About $95,000. F. Barber, 40 Jarvis St., Toronto, engr.

BIDS DESIRED

Pa., Phila.—Until March 30, by Dept. Pub. Wks., Room 216, City Hall, furnishing and building intake house, screens and various accessories from Queen Lane Pumping Sta., brick, terra cotta and steel, concrete foundations, etc.; safety devices for Queen Lane filters and 6 pumping stations, involving building metal machine guards, 16 gauge perforated metal wire mesh, wire mesh panels, etc.; traveling grate stokers for nine 327 hp. Heine boilers for Torresdale St. and six for 500 hp. Edgemore boilers at Lardners Point Pumping Sta., 2 driving engines for both pumping stations; removing wooden girders, ties and railroad track at Lardners Point Pumping Sta. for distance of 100 ft. east and 142 ft. west, replacing same with steel girders, new stringers and track, etc. (12 in. steel I beam furnished by city); one 3 motor traveling crane, 10 ton capacity, including runway wiring, frackets, etc., at Lardners Point Pumping Sta.

Idaho, Moscow—Until March 31, by City Council, building 300,000 gal. steel storage reservoir on concrete foundation. H. J. Smith, Moscow, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mich., Muskegon**—City let contract furnishing and installing 15,000,000 gal. reciprocating pump for waterworks to Allis-Chalmers Co., West Allis, Milwaukee, Wis., $64,900. Noted March 18.

★**Minn., Hopkins** — Village let contract digging artesian well and installing equipment, to McCarthy Well Co., Wabash and Eastis Sts., St. Paul. About $8,500.

Waterworks (Continued)

★**Mont., Stevensville**—City let contract building new reservoir and extensions to waterworks system, to Standard Const. Co., Golden Rule Bldg., Bozeman, $14,202. Noted Jan. 1.

Sewers

PROPOSED WORK

Mass., Brookline (Boston P. O.)—Town having plans prepared building sewers. About $90,000. H. F. Varney, town engr.

Pa., Phila.—Bureau Surveys soon lets contracts building main sewers in 9th St. from Champlest Ave. to Green Lane, cost $62,500, Ditman St. from Shelmire to Naffle Sts., $62,500, both brick, also 33,513 ft. branch sewers, concrete and brick, $375,000.

Va., Potomac—Town receives bids about April, building 8 mi. 8-12 in. sanitary sewers. Bonds for $60,000 will be voted for project. D. J. Howell & Son, Union Trust Bldg., Washington, D. C., engrs.

S. C., Greenwood—See "Streets & Roads."

O., East Cleveland (Cleveland P. O.)—City having plans prepared building storm sewers in East 131st St., involving 3,000 ft. 18-24 in. vitr. pipe, 8 manholes, etc. Cost to exceed $10,000. M. Garnett, City Hall, engr.

O., Garfield Heights—Village receives bids about June 1, building sewers in East 104th St., Garfield Parkway, Sladden, Robinson, Greenview, Parkview, Russell and Edgepark Aves. About $75,000. R. Hecker, 905 Leader-News Bldg., Cleveland, engr.

O., Hamilton—City plans to build sanitary and storm sewers in various streets east of canal, involving 1,000 ft. 8-12 in. vitr. and 2,000 ft. 48-60 in. rein.-con. or segmental block pipe. About $123,000. F. E. Weaver, city engr.

O., Newburgh Heights (Cleveland P. O.)—Village receives bids about June 1, building sewers and water mains East 41st St., Bridgeview and Alpha Aves., involving 8-20 in. vitr. pipe, 6 and 8 in. c. i. pipe, 10 manholes, etc. About $30,000. R. Hecker, 905 Leader-News Bldg., Cleveland, engr.

Wis., Markesan — E. W. Laper, village clk., soon lets contract laying 19,200 ft. 6, 8 and 10 in. sanitary sewers and building sewage disposal plant.

Kan., Goodland—City plans to build sewers in main streets. About $125,000. Black & Veatch, Interstate Bldg., Kansas City, Mo., engrs.

S. D., Phillips—See "Waterworks."

Tex., Dallas—City plans to lay 500 ft. 12 in. sanitary sewers in alley between Swiss and Easton Sts. from Fitzhugh St. About $15,546. G. D. Fairtrace, city engr.

Ariz., Yuma — G. B. Benson & Sons, Stimson Bldg., Los Angeles, recently awarded contract for building sewers, concrete outfall, sewage pumping unit, etc., in Dist. 3, have refused to sign contract because of imperfect proceedings which would invalidate bonds.

Cal., East San Diego (San Diego P. O.)—See "Waterworks."

Cal., East San Diego (San Diego P. O.)—City defeated $450,000 bond issue to improve sewerage and waterworks systems. Noted May 22.

Cal., El Cerrito—City Trustees plan to sell $80,000 bonds to cover cost of building vitr. storm sewerage system. W. S. Farley, city engr.

Cal., Petaluma — City Trustees plan to alter sewer in 3rd and F Sts to discharge into Thompson Creek, at 1st St., also build sewer in North Main St. Cost to exceed $10,000. L. Green, city engr.

Cal., Selma—City plans election to vote on $65,000 bonds to build 16 in. outfall sewer and septic tank. E. P. Todd, clk.

Cal., Sonoma — City having plans prepared building sewers and paving various streets, concrete or asphalt. Election planned to vote on $57,000 bonds for the project. Howe & Peters, 24 California St., San Francisco, engrs.

Cal., Tracy—See "Streets and Roads."

Cal., Williams—See "Waterworks."

BIDS DESIRED

N. Y., Albany—See "Streets and Roads."

Tenn., Humboldt—Until March 31, by city, building 9 mi. 6-15 in. vitr. sewer pipe with necessary manholes, etc. R. H. McNeely, mayor. J. H. Weatherford, Porter Bldg., Memphis, consult. engr.; advertised in this issue.

O., Toledo—Until March 30, by D. Goodwillie, dir. pub. serv., building sewers in Sylvania Ave., Easterner, Gradolph and Catawba Sts. to Funston St., involving 7,937 ft. 8-24 in. vitr. pipe. About $23,000.

Mich., Jackson—Until April 8, by A. W. D. Hall, city mgr., building Whitney Trunk, Eggleston Trunk, Ganson St. Relief, South Park Ave., New York Alley and Chapin St. sewers (city to furnish pipe for latter), advertised in this issue.

Neb., Auburn—See "Streets and Roads."

Mo., Cape Girardeau—Until April 26, by City Council, building combined sanitary and storm sewerage system, in Dist. 5. About $330,000. A. P. Behrens, clk.; advertised in this issue.

Ore., Portland—Until March 31, by city, building sewers in East 24th St. from Mitchell to Harold Aves., cost $3,300, East 65th and Stanton Sts., $48,436, East 76th St. from Burnside to Glisan Sts., $4,924. O. Laurgaard, city engr.; advertised in this issue.

Ore., Portland—Until April 1, by city, building sewers in East 58th St. from Burnside to Davis Sts., $1,357, East 61st and Sacramento Sts., $7,097. O. Laurgaard, city engr.; advertised in this issue.

Ore., Portland—Until April 7, by city, building sewers in East 13th St., cost $85,120, East 33rd and Stafford Sts., $229,046, East 9th and Morse Sts., $60,435, Vancouver Ave., $106,930, 33rd Ave., S. E. and 60th St., $121,784. O. Laurgaard, city engr.; advertised in this issue.

Ore., Portland—Until April 14, by city, building sewers in Division St. from East 7th to East 9th Sts., cost $2,843, Interstate and Lombard Sts., $92,472, 40th Ave., S. E. from 42nd St., S. E. to 47th St., S. E., $3,541. O. Laurgaard, city engr.; advertised in this issue.

Ore., Portland—Until April 21, by city, building sewers in East 77th St. from Halsey to Oregon Sts., cost $5,483, East 33rd St. from Shaver to Simpson Sts., $30,545, Portland Blvd. and Orient St., $136,388, East 54th St. from Tillamook to Halsey Sts., $6,967, 42nd Ave., S. E. from 42nd St., S. E. to 46th St., S E., $2,604. O. Laurgaard, city engr.; advertised in this issue.

Ore., Portland—Until April 28, by city, building sewers in Holladay Ave. from East 82nd to East 84th Sts., cost $4,330, Magnolia St. and Union Ave., $110,767, 45th St. and private property from Davis to Burnside Sts., $1,634, Ainsworth Ave. and East 31st St., $11,629, East 59th St. from Fremont to Klickitat Sts., $1,731. O. Laurgaard, city engr.; advertised in this issue.

Ore., Portland—Until May 5, by city, building sewers in East 75th St. from Stark to Glisan Sts., cost $10,990, East 86th St. from Burnside to Stark Sts., $5,699, 39th Ave., S. E., from 52nd St., S. E. to 54th St., S. E., $1,626. O. Laurgaard, city engr.; advertised in this isue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mich., Detroit**—City let contract trenching, laying vitr. crock sewers and backfilling Laterals 3,252 and 3,191, to Liberty Constr. Co., Penobscot Bldg., $37,580 and $4,937 respectively; Lateral 3,255, to Western Constr. Co., 1208 Ford Bldg., $13,488; Lateral 3,248, to N. Mancini, St. Aubin Ave., $7,245. Noted March 18.

★**Mich., St. Joseph** — City let contract building sewer in Edgewater Dist., to Allmendinge & Wightman, Benton Harbor, $17,401.

★**Ia., Dexter**—City let contracts building sewers, to J. L. Hansman, 48th and Franklin Sts., Des Moines, involving 1,742 ft. 8 in. pipe, 4-6 ft. cut, $1.08, 6,563 ft. 6-8 ft. cut, $1.23, 3,756 ft. 8-10 ft. cut, $1.33, 3,343 ft. 10-12 ft. cut, $2.43, 660 ft. 12-14 ft. cut, $2.83, 451 ft. 16-18 ft. cut, $4.45; 327 ft. 10 in. pipe, 6-8 ft. cut, $1.48, 364 ft. 10-12 ft. cut, $2.55, 1,000 ft. 12-14 ft. cut, $3.10, 306 ft. 14-16 ft cut, $3.60, 782 ft. 16-18 ft. cut, $4.65, 1,025 ft 18-20 ft. cut, $6.60; 1,733 ft. 12 in. pipe, 4-6 ft. cut, $1.44, 350 ft. 6-8 ft. cut, $1.59, 500 ft. 8-10 ft. cut, $1.72, 500 ft. 10-12 ft. cut, $2.65, 882 ft. 12-14 ft. cut, $3.20, 925 ft. 14-16 ft. cut, $3.73, etc., total cost, $59,396; sewage disposal plant, to F. H. Christenson, Guthrie Center, $12,465. Noted Feb. 19.

★**Ia., Madrid**—City let contract furnishing and laying about 40,000 ft. 8-12 vitr. pipe, to Dearborn Constr. Co., Waterloo, $94,320; building sewage disposal plant, to Ward & Weighton, 516-17 Davidson Bldg., Sioux City, $38,125.

★**Minn., Duluth**—J. A. Farrell, city comr., let contract building sewer in West Kent Rd. Div., including 18th Ave., E., involving 5,220 ft. 8-18 in. concrete pipe, 3,675 cu.yd. earth trenching, etc., to Ecklund, Forsling & Olson, 14 North 58th Ave., W., $16,852. Noted March 11.

★**Minn., Forest Lake**—J. C. Boehm, village clk., let contract building sanitary sewerage system, involving 32,000 ft. 8-15 in. pipe, to Hedburg-Roice Co., 208 West 2nd St., Duluth, $34,353. Noted Feb. 10.

★**Kan., Marysville**—City let contract building sewers in main streets, to Aspland Constr. Co., Tecumseh, Neb., $49,414.

Kan., Salina—City let contract laying 14,800 ft. 8-10 in. sewer pipe and building sewage disposal plant, to Amerman & Snyder, Salina, $18,390.

★**Kan., Troy**—See "Streets & Roads."

★**Cal., Hanford**—City let contract building 6 rein.-con. storm sewers in Bush, Douty, Ivy Sts., et al, 4½ ft. wide, 1 to 2 ft. high, to C. E. Blanchard Co., San Francisco, $85,962. Noted March 18.

Cal., Richmond — See "Streets and Roads."

Bridges

PROPOSED WORK

O., Bellaire—Comrs. Belmont Co. (St. Clairsville) approved plans and soon receive bids building 90 ft., encased steel girder bridge, 50 ft. wide, over McMahon's Creek, here. About $20,000. H. Althar, Bellaire, engr.

Wisconsin—State Highway Comn., Madison, made surveys and is preparing plans building bridges in counties as follows:

Ashland Co., Shing Wak Bridge and Wasky Bridge, Sanborn Twp., both with concrete slabs. W. E. Dillon, Ashland, comr.

Green Co., Roderick Bridge, Dayton Twp., rein.-con. deck girder span. E. L. Edwards, Monroe, comr.

Richland Co., School House Bridge, Dayton Twp., rein.-con. slab span. W. V. Robinson, Richland Center, comr.

Jackson Co., Perry Bridge, Brockway Twp., rein.-con. deck girder span. W. Tibbitts, Black River Falls, comr.

Wood Co., Dingeldine Bridge and Haas Bridge, Arpin Twp., Mill Creek Bridge, Marshfield Twp., Goldsworthy Bridge, Hansen Twp., all with rein.-con. spans. All bridges to have concrete abutments.

Wis., Neillsville—Clark Co. had plans prepared building Owen Bridge, steel truss, 120 ft. long, 18 ft. wide, to have concrete abutments, Green Grove and Longwood Twps. W. C. Thoma, comr. State Highway Dept., Madison, engrs.

Wis., Oconto—Oconto Co. had plans prepared building Beaver Creek Bridge, Atkins Creek Bridge and Hunt Bridge, Pensaukee Twp.; Swift Creek Bridge, Trunk Line 3 Bridge, Trunk Line 2 Bridge and Trunk Line Bridge, Abrams Twp.; all to have rein.-con. spans and concrete abutments. P. Peetz, comr. State Highway Dept., Madison, engrs.

Wis., Oshkosh — Winnebago Co. Bridge and Rd. Com. soon lets contract building Keebler Bridge and Rhyner Bridge, Algoma Twp., Blair Bridge, Menasha Twp., and Barnett Bridge, Omro Twp., all to have concrete spans. P. C. Laabs, secy.

Ia., Boone—Boone Co. having plans prepared building 90 ft. rein.-con. arch bridge, through type roadway suspended from arch ribs, 18 ft. wide, between Jackson and Harrison Twps., involving 373 cu.yd. rein.-con., 12,200 lb. structural steel, 20,700 lb. steel bars, etc., cost $19,000; 80 ft. rein.-con. arch bridge, through type roadway suspended from arch ribs, 18 ft. wide, involving 283 cu.yd. rein.-con., 12,000 lb. structural steel, 18,900 lb. steel bars, etc., $15,000. J. A. Illeman, co. engr.

Kan., McPherson—McPherson Co. soon lets contract building 4 bridges, with spans from 23 to 36 ft. long. A. J. Cederholm, clk.

Mont., Dillon—Beaverhead Co. plans to build 110 ft. steel span bridge, 18 ft. wide, over Beaverhead River (known as Mooney Bridge). About $10,000. W. E. Chapman, Dillon, engr.

Mo., Kansas City—Bd. Park Comrs., c/o T. C. Harrington, secy., plans to build rein.-con. bridge over Brush Creek, on Benton Rd. Election April 6, to vote on $200,000 bonds for project.

Mo., Kansas City—Bd. Pub. Wks., c/o F. E. McCabe, secy., plans to build rein.-con bridge over Blue River, on Washington Park Blvd. Election April 6, to vote on $200,000 bonds for project. R. Waddell, city engr.

Bridges (Continued)

Tex., Georgetown—Comrs. Williamson Co. having plans prepared building several bridges. H. A Hodges, aud. About $250,000.

Cal., Red Bluff—Bd. Supervs. Tehama and Shasta Counties passed resolution to build rein.-con. bridge across South Battle Creek, on highway between counties. Cost to exceed $10,000.

Cal., Redding—See "Red Bluff."

Cal., Sacramento—State Highway Comn., 515 Forum Bldg., having plans prepared for rein.-con. viaduct from 12th St. Bridge over tracks of Western Pacific & Sacramento R.R., replacing old timber trestle. Cost to exceed $10,000. A. B. Fletcher, state highway engr.

Ont., London—City plans to rebuild Dundas St. Bridge over north branch of Thames River, rein.-con. throughout, 200 ft. long, 42 ft. roadway. About $80,000. H. A. Brazier, city engr.

Ont., Toronto—City plans to repair 38 bridges. About $50,000. R. C. Harris, city engr.

BIDS DESIRED

Mass., Warwick—Until March 31, by J. N. Cole, state highway comr., State House, Boston, building 1,200 ft. rein.-con. bridge 22 ft. wide, on State Rd, here. Cost to exceed $10,000. A W Dean, state highway engr.

N. J., Pleasure Bay (Long Branch P. O.)—Until April 7, by Bd. Freeholders Monmouth Co. (Freehold), building bridge over branch of South Shrewsbury River, near here. W. M. Bergen, dir.; advertised in this issue.

S. C., Chester—Until March 30, by Chester Co. Highway Comn., building 60 ft. steel pony truss and 150 ft. through steel Pratt truss bridges on Satuda Rd., involving 33,210 lb. deformed bars, 15,200 ft. white oak, 3,190 lin.ft. untreated piling. R. Pennell, Columbia, state highway engr.

Ala., Heflin—Until April 2, by Comrs. Cleburne Co. building 3 steel bridges over Tallapoosa River, each to have 100 ft. spans, with one or two 25 or 30 ft. approaches; bridge over Big Terrapin Creek, to have 70 ft. span with two 30 ft. approaches. D. S. Baber, chn.

Mich., Hartland—Until March 7, by F. F. Rogers, state highway comr., Lansing, building State Trunk Line Bridge 394, over Ore Creek, 35 ft. concrete girder, 20 ft. wide and 14 ft. abutments, involving 320 cu.yd. concrete.

Ill., Kirkland—Until April 9, by A. Gritzbaugh, town clk., building Pat Smith Bridge over Kishwaukee River, near here, consisting of five 45 ft. rein.-con. girders with 20 ft. roadway, two 17 ft. abutments and four 17 ft. piers, involving 820 cu.yd. concrete. W. C. Miller, supt. highways, De Kalb Co.; advertised in this issue.

Ill., Louisville—Until April 15, by V. Van Dyke, supt. highways, Clay Co., building creosoted timber superstructures for following bridges in Clay Twp.: Black Bridge, 22 ft. span, cost $3,400; Long Bridge, 72 ft. span, 19 ft. turnout, $11,260; Partridge Bridge, 18 ft. span, $2,600; all 13 ft. roadways. Existing concrete substructures to be used in each case.

Ia., Ft. Dodge—Until April 9, by C. A. Snook, aud., Webster Co., building bridges and culverts, here. About $22,541. L. B. Stephenson, co. engr.

N. D., Carrington—Until March 30, by Foster Co., building concrete girder bridge over James River, Federal Aid Project 45, to have two 30 ft. and one 40 ft. span, and involves 100 cu.yd. dry excav., 344 cu.yd wet excav., 319.3 cu.yd. 1:2:4 concrete, 145 cu.yd. 1:2½:5 concrete, 35,881 lb. reinforcing steel, 816 lb. steel rocker plates, 70 gal. asphalt, etc. F. Johnson, aud.

Ark., Waldron—See "Streets & Roads."

Ark., Waldron—Until March 30, by Comrs. Albert Pike Rd. Impvt. Dist., Scott Co., building two 20 ft., eight 25 ft., ten 80 ft., sixteen 40 ft., three 50 ft., seven 60 ft., three 70 ft., four 80 ft., one 100 ft., three 125 ft. and two 140 ft. bridges on 72 mi. road. H. L. Fuller, pres.

Tex., Georgetown—Until April 13, by Williamson Co., building bridge, to have 70 ft. steel truss span and three 22 ft. slab spans on each approach, concrete flooring, piers and abutments, involving 33,000 lb. structural and 33,500 lb. reinforcing steel and 520 cu.yd. concrete. R. A Nichols, Georgetown, engr.

Tex., Marshall—See "Streets & Roads."

Utah, Salt Lake City—Until March 31, by Comrs. Salt Lake Co. building three 60 ft. rein.-con. arch bridges, 21 ft. wide, over Jordan River. About $30,000. G. G. Bywater, 518 E St., engr.

Ontario—Until April 6, by W. A. McLean, deputy minister of highways, Toronto, for excav., construction of concrete structures and other necessary work in Nepean and Edwardsburg Twps. Work involves 1,500 cu.yd. concrete and 3,600 cu.yd. excav. About $30,000. G. Hogarth, Parliament Bldgs., Toronto, engr.

Que., St. Augustin—Until March 31, by municipality, constructing steel or rein.-con. bridge over La Petit Brule. About $25,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Framingham**—Bd. Comrs. Pub. Wks. let contract removing iron bridge on Central St. over Sudbury River and building concrete foundations, rein.-con. superstructure, appurtenances and sidewalks, 90 ft. long, 41.25 ft. wide, to H. C. Shiels, 1077 Columbus Ave., Boston, $31,862. Noted March 18.

Mass., Springfield—Comrs. Hampden Co. received bids March 10, building highway bridge between here and West Springfield over Connecticut River and over New York, New Haven & Hartford R.R. yard, here, 80 ft. wide throughout, river bridge 1,200 ft. long, consisting of 7 rein.-con. arch spans, piers and abutments faced with granite; also viaduct over railroad yard, 300 ft. long with 9 rein.-con. spans, from H. P. Converse & Co., 88 Broad St., Boston, $3,254,883; Holbrook, Cabot & Rollins Corp., 6 Beacon St., Boston, and C W. Blakeslee & Sons, 58 Waverly St., New Haven, $3,775,000; P. McGovern, 73 Tremont St., Boston, $4,167,000. Noted Feb. 12.

★**New Jersey**—State Highway Comn., Broad St., Bank Bldg., Trenton, let contract building Bridge "O," Route 9, to Selbach-Meyer Co., 601 22d St., West New York, $10,705; Bridges 69, 35 and 70, Route 6, to Empire Eng. Co., 2214 Chestnut St., Phila., $21,969, $30,800 and $22,171 respectively; widening box culvert 71, to Weddow & Meyers, 426 Walnut St., Phila., $9,869; reinforcing present brick arch with concrete, No. K, to H. W. Shrimpf, Perth Amboy, $12,760. Noted Feb. 26.

★**N. J., Perth Amboy**—State Highway Dept., Trenton, let contract repairing 160 ft. bridge over Raritan River, 20 ft. wide, between here and South Amboy, to H. W. Schrimpf, Lewis St. About $50,000.

★**Pa., Harrisburg**—Pennsylvania & Reading R.R., Reading Terminal, Phila., let contract building 3,500 ft. rein.-con. bridge, here, to Smith & McCormick, N. N. B. Bldg., Easton.

★**W. Va., Wayne**—Comrs. Wayne Co. let contract constructing superstructures for four 140 ft. span bridges, 16 ft. roadways, to Standard Eng. Co., Toledo, O., $44,049.

★**Mich., Marquette**—State Highway Dept., Lansing, let contract building bridge over proposed Marquette-Negaunee Rd., Sect. 24, near here, to R. L Erichson, Bessemer. About $19,500.

★**Wis., Darlington**—Lafayette Co. State Bridge and Rd. Com. let contracts to Freeport Bridge Co., Freeport, Ill., building Torkelson Bridge, Gratiot Twp., $12,889, Driver Bridge, Willow Springs Twp., $4,589, Rasque Bridge, Elk Grove Twp., $5,289, Shullsburg City Bridge, City of Shullsburg, $4,839, Scott Bridge, Monticello Twp., $1,429; to A. Peterson, Argyle, Skewers Bridge, Shullsburg Twp., $2,599. All bridges to be concrete.

Ia., Knoxville—F. Crawford, aud. Marion Co. received bids March 5, building three 16 x 24 ft. I-beam bridges, 20 ft. roadways and 25 box culverts, from 3 x 3 ft. to 6 x 8 ft., involving 975 cu.yd. rein.-con., 21,528 lb. structural steel, 63,852 lb. steel bars, etc., from Gabriel Constr. Co., Columbus City, $35,600; Phelps & Sons, Knoxville, $42,808; F. E. Marsh & Co., Jefferson, $43,714.

Ia., Sac City—Sac Co. received bids March 4, building (a) 200 ft. span steel high truss bridge, 18 ft. wide, involving 121 cu.yd. rein.-con., 145,400 lb. structural steel, 23,530 lb. steel bars, etc., (b) one 85 ft. structural steel pony truss bridge, 18 ft. wide, involving 267 cu yd. rein.-con., 19,400 lb. structural steel, 22,020 lb. steel bars, etc., both to have concrete flooring, concrete abutments, from Pittsburg-Des Moines Steel Co., 9th and Tuttle Sts., Des Moines, (a) $32,600; Iowa Bridge Co., 712 Hubbell Bldg., Des Moines, (a) $32,000, (b) $15,896; R. I. Harris, Monadnock Blk., Chicago, (a) $35,795; Pickus Eng. & Constr. Co., Davidson Bldg., Sioux City, (b) $16,418; Federal Bridge Co., Equitable Bldg., Des Moines, (b) $16,090. Noted March 4.

Tex., Liberty—Liberty Co. received bids building 1,560 ft. wooden trestle, 15 ft. wide, over East San Jacinto River, on Highway 35, known as San Jacinto Bridge, involving 12,600 lin.ft. creosoted wooden piling, 42,029 ft. creosoted timber and 190,864 ft. untreated timber, from Austin Bros. Bridge Co., 1815 Coombs St., Dallas, $45,456; Walling & Tackaberry, 716 Carter Bldg., Houston, $45,875; Midland Bridge Co., Ship Channel, Fidelity St., Houston, $57,922.

★**Utah, Salt Lake City**—See "Excavation & Dredging."

★**Wash., Seattle**—Comrs. King Co. let contract to C. C. Snyder Co., Pacific Blk., building 240 ft. steel span bridge, 20 ft. wide, concrete piers, over Snoqualmie River, at Novelty, cost $49,136; also building 126 ft. steel span bridge, 20 ft. wide, concrete piers, near Orillia, $22,800. Noted Feb. 12.

Structural Steel

PROPOSED WORK

Mass., Boston—School—See "Buildings."

Mass., Malden (Boston P. O.)—Memorial—See "Buildings."

Mass., Springfield—Club and Social—See "Buildings."

Mass., Springfield—Theatre—See "Buildings."

N. Y., Brooklyn—Theatre—See "Buildings."

N. Y., New York—Hotel—See "Buildings."

N. Y., Watertown—See "Industrial Works."

N. J., Newark—See "Industrial Works."

N. J., Verona—See "Industrial Works."

Pa., Connellsville—See "Industrial Works."

Va., Richmond—Clubhouse—See "Buildings."

O., Cleveland—Commercial—See "Buildings."

O., Cleveland—Store—See "Buildings."

O., Cleveland—Store and Offices—See "Buildings."

Mich., Detroit—Church—See "Buildings."

Mich., Detroit—Seminary—See "Buildings."

Mich., Jackson—See "Industrial Works."

Kan., Topeka—Hospital—See "Buildings."

Okla., Oklahoma—See "Industrial Works."

BIDS DESIRED

Mich., Grand Rapids—School—See "Buildings."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Brooklyn**—See "Industrial Works."

★**N. Y., Buffalo**—Theatre—See "Buildings."

★**N. Y., New York**—Store and Office—See "Buildings."

★**N. J., Jersey City**—See "Industrial Works."

★**O., Akron**—See "Industrial Works."

★**O., Cleveland**—Commercial—See "Buildings."

★**O., Cleveland**—Office—See "Buildings."

★**Wis., Beloit**—See "Industrial Works."

Reinforced Concrete

PROPOSED WORK

Mass., Boston—School—See "Buildings."

Mass., Malden (Boston P. O.)—Memorial—See "Buildings."

Mass., Springfield—Club and Social—See "Buildings."

Mass., Springfield—Theatre—See "Buildings."

N. Y., New York—Hotel—See "Buildings."

N. Y., Watertown—See "Industrial Works."

N. J., Newark—See "Industrial Works."

N. J., Verona—See "Industrial Works."

Pa., Connellsville—See "Industrial Works."

Md., Dukes (Adelina P. O.)—See "Industrial Works."

D. C., Washington—Theatre—See "Buildings."

O., Cleveland—Commercial—See "Buildings."

O., Cleveland—Store—See "Buildings."

Reinforced Concrete (Continued)

O., Cleveland—Store and Offices—See "Buildings."

Mich., Detroit—Church—See "Buildings."

Mich., Detroit—Seminary—See Buildings."

Mich., Jackson—See "Industrial Works."

Minn., St. Paul—Hotel—See "Buildings."

Kan., Topeka—Hospital—See "Buildings."

Okla., Oklahoma — See "Industrial Works."

Wash., Seattle—Office—See "Buildings."

Cal., Los Angeles—Club—See "Buildings"

BIDS DESIRED

N. J., Irvington (Newark P. O.)—See "Industrial Works."

Mich., Grand Rapids — School — See "Buildings."

Mich., Hartland—See "Bridges."

Minn., Minneapolis—Office—See "Buildings."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Lowell** — High School — See "Buildings."

★**N. Y., Brooklyn** — See "Industrial Works."

★**N. Y., New York**—Store and Office—See "Buildings."

★**N. J., Jersey City**—See "Industrial Works."

★**Md., Orangeville** (Baltimore P. O.)—See "Industrial Works."

★**O., Akron**—See "Industrial Works."

★**O., Cleveland**—Commercial—See "Buildings."

★**O., Cleveland**—Office—See "Buildings."

★**O., Dayton**—See "Industrial Works."

★**Ill., Chicago**—See "Industrial Works."

★**Wis., Beloit**—See "Industrial Works."

★**Minn., Owatonna**—High School—See "Buildings."

Streets and Roads

PROPOSED WORK

Mass., Brookline (Boston P. O.)—Town having plans prepared building macadam road on Mason Terrace, 40 ft. wide. About $36,000. H. F. Varney, town engr.

N. Y., Richmond Hill (Jamaica P. O.)—Park Bd., at office of Dept. of Parks, Municipal Bldg., New York City, rejected bids building roadway and walk at Myrtle Ave. entrance of Forest Park, here. About $10,500.

N. J., Mays Landing—Bd. Freeholders Atlantic Co. plans to pave 12 mi. White Horse Pike, etc., 20 ft. wide, concrete. About $450,000. A. H. Nelson, Guarantee Trust Bldg., Atlantic City, engr.

N. J., Jersey City—City plans to improve Hopkins Ave., old Belgian block pavement. Cost to exceed $10,000. F. A. Dolan, clk.

Pennsylvania — State Highway Dept., Harrisburg, rejected bids received Feb. 17, improving 20,643 ft. Route 99, Shippen Twp., Cameron Co.; 4,108 ft. Route 105, Chapman Twp., Clinton Co. Bids were also rejected for building roads in Center Twp., Greene Co.; West Fallowfield Twp., Chester Co.; West Mead Twp., Crawford Co.; Blythe and Schuylkill Twps. and Tamaqua, Schuylkill Co. Noted Jan. 29, Feb. 5 and 19.

Pa., Dubois — T. C. North, city engr., soon receives bids paving various streets, involving 10,830 sq.yd. brick on concrete foundation.

W. Va., Fairmont — Marion Co., election April 24, to vote on $118,000 bonds to build roads in Winfield Dist. A. G. Martin, clk.

W. Va., Fairmont — Marion Co election May 25, to vote on $1,000,000 bonds to build roads. J. M. Oliver, Huntington, engr.

S. C., Greenwood—City election April 13, to vote on $200,000 bonds to improve streets and extend sewerage system. S. B. Sambo, city engr.

O., Cleveland—Cuyahoga Co. plans to build following roads during 1920: Drake, Prospect and Royalton Rds. in Strongsville, Pleasant Valley Rd. in Parma, Brook Park Rd. in Brooklyn Heights, Hall Rd. in Dover, Loyd Rd. in Euclid, Lee Rd. in Warrensville and Center Rd. in Solon. Total cost, $2,000,000. W. A. Stinchcomb, co. engr.

O., Cuyahoga Heights—Village receives bids about June 1, paving Grant Ave. and East 49th St., brick. About $30,000. R. Hecker, 905 Leader-News Bldg., Cleveland, engr.

O., Ironton—City plans to pave 1 mi. Elm and 2nd Sts., brick on gravel concrete base. About $32,527. G Howell, city engr.

O., Wellsville—City Council receives bids about May, paving Chester Ave. from 15th to 220th Sts., vitr. brick. About $60,000. J. George, Wellsville, engr.

Wis., Manitowoc—A. H. Zander, clk. Bd. Pub. Wks., soon lets contract paving various streets, involving 80,000 sq.yd. concrete Former bids rejected. Noted Feb. 12.

Wis., Milwaukee—Clerk Milwaukee Co. soon lets contract paving 2 mi. 77th Ave., 18 ft. wide, involving 11,800 cu.yd. grading, 20,500 sq.yd. concrete, etc. Wisconsin State Highway Comn., Madison, engrs.

Wis., Milwaukee — G. Hampel, clk., Milwaukee Co., soon lets contract grading and paving 0.45 mi. Hawley Rd. "B" from Vliet St. to Watertown Plank Rd., 24 ft. wide, Wauwatosa Twp., involving 6,600 sq.yd. 1 course concrete pavement; 2 mi. Layton Ave. 1, from west city limits of Cudahy to Howell Rd., 18 ft. wide, Lake Twp., involving 21,200 sq.yd. 1 course concrete pavement, 7,200 cu.yd. excav. and 90 cu.yd. culverts; 2 mi. 77th Ave. from Watertown Plank Rd. south to Greenfield Ave., 18 ft. wide, in city and town of Wauwatosa, involving 20,500 sq.yd. 1 course concrete pavement, 11,800 cu.yd. excav., 95 cu. yd. culverts and 85 cu.yd. bridges.

Wis., Wauwatosa—Town plans to grade Hawley Rd. from Watertown Rd. to Vliet St., involving 14,000 cu.yd. earth.

Minn., Austin—Mower Co. plans to grade and gravel 8 mi. road from Brownsdale to north county line, 24 ft. wide, cost $48,000; also grade 4 mi. road from Racine west, 24 ft. wide, $12,000. A. C. White, Austin, engr.

Minn., Bemidji—Beltrami Co. plans to grade 10 mi. road from here to Pupowsky, 24 ft. wide. About $30,000. S. D. Snyder, Bemidji, engr.

Minn., Elbow Lake—Grant Co. plans to grade 5 mi. road. About $15,000. W. E. Burgess, Elbow Lake, engr.

Minn., Elbow Lake—Grant Co., plans to grade and gravel 6 mi. Federal Aid. Project 28, through Ashby, 24 ft. wide. About $36,000. W. E. Burgess, Elbow Lake, engr.

Minn., Glenwood—Pope Co. plans to grade and gravel 3 mi. road near Grove Lake, 24 ft. wide. About $18,000. E. H. Harding, Crookston, engr.

Minn., Granite Falls — Yellow Medicine Co. plans to gravel 6 mi. Federal Aid Project 87 from Clara City west and north to county line, 24 ft. wide. About $18,000. N. S. Thayer, Granite Falls, engr.

Minn., Hastings—Dakota Co. plans to grade and pave 1.5 mi. road from end of Federal Aid Project 23 to Westcott, 24 ft. wide. About $35,000. Bids will be received on all types of pavement. C. L. Methven, Hastings, engr.

Minn., Little Falls—Morrison Co. plans to grade and gravel 16 mi. road from here to Swanville, 24 ft. wide. About $93,000. J. E. Viner, Little Falls, engr.

Minn., Mankato—Blue Earth Co. plans to grade 7 mi. road from Lake Crystal west, 24 ft. wide. About $21,000. N. Moe, Mankato, engr.

Minn., Marshall—Lyon Co. plans to gravel 9 mi. road from here to Redwood, 24 ft. wide. About $27,000. C. W. Anderson, Marshall, engr.

Minn., Olivia—Renville Co. plans to grade and pave 3.8 mi. road from here to Bird Island, 18 and 24 ft. wide. About $42,000. C. E. Stahl, Olivia, engr.

Minn., Owatonna—G. Griffin, aud. Steele Co., rejected bids received March 8, paving 8 mi. Federal Aid Project 100, 18 ft. wide. About $210,000. Noted March 4.

Minn., Park Rapids—Hubbard Co. plans to grade and gravel 8 mi. east and west from Nary, 24 ft. wide. About $48,000. R. A. Dahms, Park Rapids, engr.

Minn., Preston — Fillmore Co. plans to grade and gravel 5 mi. road from Fountain north, 24 ft. wide. About $30,000. W. Dunbar, Preston, engr.

Minn., Rochester—Olmsted Co. plans to grade 14 mi. road from here north to county line, 24 ft. wide. About $42,000. G. H. Smith, Rochester, engr.

Minn., Roseau—Mahnomen Co. plans to grade and gravel 22 mi. road from Bijou south to county line, 24 ft. wide. About $132,000. H. R. Chapin, Roseau, engr.

Minn., Thief River—Pennington Co. plans to grade and gravel 4.5 mi. road from St. Hilaire to Hazel, 24 ft. wide. About $28,000. B. F. Ueland, Thief River, engr.

Minn., Wadena—Wadena Co. plans to grade and gravel 8 mi. road from here north, 24 ft. wide. About $45,000. E. Ward, Wadena, engr.

Minn., Warren — Marshall Co. plans to grade 7.5 mi. road from Thief River east, 24 ft. wide. About $24,000. H. R. Lindsay, Warren, engr.

Minn., Willmar—Kandiyohi Co. plans to grade 8 mi. road south of here, 24 ft. wide. About $24,000. H. L. Wadell, Willmar, engr.

Minn., Winona — Winona Co. plans to grade 10 mi. Federal Aid Project 8 from Minnesota City to Minneiska, 24 ft. wide. About $30,000. H. B. Childs, Winona, engr.

Kan., Arcadia—City having preliminary plans prepared paving various streets. About $70,000 W. B. Rollins & Co., 209 Ry. Exch. Bldg., Kansas City, Mo., engrs.

Mont., Deer Lodge—City receives bids in April, paving Missouri Ave. from 1st to Main Sts., Dist. 45, involving 4,500 sq.yd. paving, 1,300 lin.ft. curb and 8,100 sq.ft. sidewalk, cost $16,500; Main St. south of St. Mary's Ave., Dist. 44, 21,200 sq.yd paving, 8,700 lin.ft. curb and 10,000 sq.ft sidewalk, $72,000; Milwaukee Ave. from 1st to Main Sts., Dist. 46, 1,500 sq.yd. paving, 1,300 lin.ft. curb and 10,000 sq.ft. sidewalk, $16,800; Milwaukee Ave. from 4th to Claggett Sts., Dist. 48, 10,600 sq.yd. paving, 3,700 lin.ft. curb and 3,600 sq.ft. sidewalk, $33,000; Missouri Ave. from 4th to Claggett Sts., Dist. 47, 10,400 sq.yd. paving, 3,800 lin.ft. curb and 2,900 sq.ft. sidewalk, $32,300. Bids will be received on various types of pavement. Noted Feb. 12.

Tex., Angleton—Brazoria Co., election April 24 to vote on $150,000 bonds to build roads.

Tex., Beeville—Bee Co. having plans prepared grading, gravel surfacing and draining 21.99 mi. Highway 11, 16 ft. wide, involving 48.9 acres clearing and grubbing, 19.488 mi. machine grading, 203,195 sq.yd bituminous macadam, 51,016 lb. reinforcing and 62,500 lb. structural steel, 8,310 cu.yd. gravel, 1,153 cu.yd. Class "A" and 458 cu.yd. Class "B" concrete. About $426,548. A. C. Pancoast, Beeville, engr.

Tex., Bonham—Fannin Co. having plans prepared building about 50 mi. State Highways 5 and 11. Bonds for $300,000 voted for project, Federal Government will appropriate about $70,000 toward cost. A. J. Goode, Bonham, engr.

Tex., Brownsville—H. L. Yates, judge Cameron Co., soon lets contract grading, surfacing and raining 3.27 mi. Harlengen-Brownsville Rd., 15 ft. wide, involving 10 acres clearing and grubbing, 28,146 sq.yd. concrete, bituminous concrete or bituminous macadam, with 22,616 lin.ft. concrete curb, 8,093 lb. reinforcing steel, 58 cu.yd. 1:2:4 and 61 cu.yd. 1:2½:5 concrete. Wilder & O'Neal, Mt. Pleasant, engrs.

Tex., Brownsville—Comrs. Cameron Co. soon let contract grading, surfacing and draining 3.106 mi. Highway 12, Federal Aid Project 93, 15 ft. wide, involving 6 acres clearing and grubbing, 21,397 cu.yd. earth excav., 27,333 sq.yd. concrete, bituminous concrete or gravel bituminous, with 21,280 lin.ft. concrete curb on each side, 108 cu.yd. Class "A" and 223 cu.yd. 1:2½:5 concrete. About $115,089. Wilder & O'Neal, Mt. Pleasant, engrs.

Tex., Brownwood—Comrs. Brown Co. having surveys made and plans election to vote on $500,000 bonds to build 80 mi. permanent highways.

Tex., Cameron—Milam Co. plans to build roads in Dists. 2 and 22, cost $25,000 and $10,000 respectively. A. F. Mitchell, Cameron, engr.

Tex., Center—Raines Co. having plans prepared grading, gravel surfacing and draining 22.3 mi. Highway 42 from Wood Co. line to Hunt Co. line, 12 ft. wide, in-

Streets and Roads (Continued)

volving 24.4 acres clearing and grubbing, 131,826 cu.yd. earth excav., 58,830 lb. steel, 390 cu.yd. Class "A" and 324 cu.yd. Class "B" concrete. About $265,738. Axtell & Thurman, Emory, engr.

Tex., Childress—City voted $39,500 bonds to pave various streets, vitr. brick on concrete base.

Tex., Dallas—City plans to grade, curb and pave 1 mi. South Lamar St., 80 ft. wide, bituminous macadam on concrete base. About $400,000. G. D. Fairtrace, city engr.

Tex., Denison—City election April 6 to vote on $244,000 bonds to improve streets, electric lighting system in downtown section and purchase electrical pumping equipment for reservoir, which supplies water for domestic use and fire protection.

Tex., Galveston—Galveston Co. election April 24, to vote on $350,000 bonds to build roads, ($100,000 of which is needed for concrete pavement over reconstructed portion of County Causeway that connects island with mainland.)

Tex., Gilmer—Upshur Co. having plans prepared grading, gravel surfacing and draining 25.9 mi. Highway 11 from Gregg to Camp Counties, 12 ft. wide, involving 40,906 cu.yd. borrow and 32,262 unclassified earth excav., 100,739 lb. reinforcing steel, 860.6 cu.yd. Class "A" and 137 cu.yd. Class "B" concrete. About $228,636. Wilder & O'Neal, Mt. Pleasant, engrs.

Tex., Junction City—Kimble Co. plans to build 65 mi. highway. W. E. Simpson, Hicks Bldg., San Antonio, engr.

Okla., Durant—Bryan Co. voted $900,000 bonds to build roads. Engineer will soon be selected.

Okla., Elk City—City having plans prepared paving 60 blocks, 24 ft. wide. H. G. Olmsted & Co., Oil Exch. Bldg., Oklahoma, engrs.

Okla., Lawton—Comanche Co. plans election soon to vote on $1,000,000 bonds to build 143 mi. roads. Federal Government will appropriate equal amount if election carries.

Idaho, Nampa—City receives bids about June paving 90 blocks. L C. Kelsey, city engr.

Utah, Price—Carbon Co. voted $150,000 bonds to construct hard surfaced roads. Jones & Jones, Price, engr.

Ariz., Glendale—City voted $25,000 bonds to pave streets around city park. H. Hancock, city engr.

Ariz., Phoenix—Highway Comrs. Maricopa Co. rejected bid grading and paving 278 mi. roads. Work will be readvertised. Noted Mar. 18.

Wash., Davenport—Lincoln Co. receives bids about July 1, gravel surfacing 11 mi. Donahue Rd. 3 from Creston to Peach. About $115,000. J. L. Thayer, Davenport, engr. Noted Jan. 1.

Wash., Ellensburg—Kittitas Co. plans to gravel surface 2.32 mi. Permanent Highway 4-D, 12 ft. wide, cost $12,000; 1.54 mi. Permanent Highway 4-C, 12 ft. wide, 10,000; pave 2.4 mi. Permanent Highway 8, 18 ft. wide, concrete, $65,000. H. A. Murray, Ellensburg, engr.

Wash., Ritzville—Comrs. Adams Co. soon let contract surfacing with crushed rock and gravel 9 mi. Donohue Rd. 7, cost $75,000, 1.3 mi. Donohue Rd. 2, cost $42,000; both 16 ft. wide. F R. Hewett, Ritzville, engr.

Wash., Seattle—Bd. Pub. Wks. received no bids Feb. 27, paving Empire Way, et al, involving 180,000 cu.yd. excav., 20,100 lin.ft. armored concrete curb, Type "B," and 44,000 sq.yd. 6 in. concrete paving. About $366,000. Work will be readvertised. A. H. Dimock, city engr.

Oregon—State Highway Comn., Portland, soon lets contract surfacing 8.9 mi. Blalock-Arlington Sect., involving 10,800 cu.yd. crushed gravel and 800 cu.yd. broken stone surfacing, etc., Gilliam Co., 22 mi. Echo-Pendleton Sect., 37,500 cu.yd. crushed gravel and 5,500 cu.yd. broken stone surfacing, etc., Umatilla Co.; grading and surfacing 17.44 mi. road from Deschutes Co. Line to Madras, 26,250 cu.yd. broken stone surfacing, 15,200 cu.yd. excav., Jefferson Co.; grading 8.4 mi. Wallowa Canyon Sect., 238 cu.yd. concrete, 75,000 cu.yd. excav., etc., Wallowa Co.; grading and tunneling Seufert-Deschutes River Sect., 137 cu.yd concrete, one 75 ft. and one 107 ft. tunnels, etc., Wasco Co. H. Nunn, Salem, state highway engr.

Cal., Fresno—C. Dillon, city clk., receives bids about April 30, paving 8 blocks Illinois Ave., bitulithic. C. Murray, city engr.

Cal., Lodi—City having preliminary plans prepared improving Hilborn St. from Cherokee Lane to Eaton Ave., Lockeford St. between Sacramento and Church Sts., Pleasant Ave. from Lodi Ave. to Lockeford St., East Elm St. from Cherokee Lane to Main St. and Elm St. west of Hutchins St. About $10,000. H. S. Clark, clk.

Cal., Long Beach—H. C. Waughop, city clk., receives bids in April improving 5 blocks Golden Ave., involving grading, concrete paving with bituminous surface, cement curbing and sidewalks, concrete guttering, corrugated iron culverts, etc. A. DeRuiz, city engr.

Cal., Los Angeles—A. M. McPherson, clk. Bd. Supervs. Los Angeles Co., receives bids in April improving 4.17 mi. Lancaster-Tierra Bonita Rd., Rd. Impvt. Dist. 155, including grading, surfacing with disintegrated granite and corrugated iron pipe culverts.

Cal., Monterey—City Clerk receives bids in April improving Wave, Spruce, Foam and Ocean Sts., et al, involving grading, oil macadam paving, cement curbing and guttering, catch basins, culverts, bulkhead, etc. Cost to exceed $30,000. E. H. Southworth, city engr.

Cal., Napa—City Council having preliminary plans prepared paving all streets through city which will connect with State Highway. About $150,000. H. A. Harrold, city engr. Noted March 4.

Cal., Oakland—City plans to build 27,463 ft. curbs and gutters on 2nd, 3rd, 5th, 6th, 7th, 8th, 9th, 10th, 11th and 12th Aves., East 14th, East 15th, East 16th, East 17th and East 18th Sts., involving 54,927 lin.ft. concrete curbing, 113,273 sq.ft. concrete guttering, 50 rein.-con. bridges with handholes, 24 rein.-con. bridges without handholes, 784 lin.ft. 8 x 24 in. corrugated iron and concrete culverts, etc. About $55,000. M. Campbell, city engr.

Cal., Oakland — City soon lets contract improving Montana St. from Champion St. to Peralta Ave., involving 36,600 sq.ft. oil macadam, 2,567 lin.ft. concrete curbing, 5,210 sq.ft. concrete guttering, 5,246 cu.yd. earth excav., etc. About $13,200. M. Campbell, city engr.

Cal., Richmond—City Council plans to pave Wall St. from 47th to San Pablo Aves. Cost to exceed $10,000. A. Chapman, city engr.

Cal., Richmond—City Comrs. soon let contract improving Alvarado St., Nevada and Arizona Aves., involving grading, concrete curbing, sidewalks, wing walls and reinforcing steel for curbs, also building 4 in. sewer lateral and branches. Cost to exceed $10,000. A. Chapman, city engr.

Cal., San Francisco—City soon lets contract grading, curbing and paving 41st Ave. between Balboa and Cabrillo Sts., involving 2,667 sq.yd. asphaltic concrete, 1,200 lin.ft. concrete curbing, 4,050 sq.ft. artificial stone sidewalks, and 900 cu.yd. earth excav., cost $10,000; 43rd and 44th Aves. between Lincoln Way and Irving St., 4,800 sq.yd. asphaltic concrete, 2,400 lin.ft concrete curbing, 4,800 sq.ft. vitr. brick guttering, 9,150 sq.ft. artificial stone sidewalks, 1,800 cu.yd. earth excav., 295 lin.ft. 10 in. ironstone pipe culverts, etc., $22,000; Beach St. between Jones and Leavenworth Sts., 1,776 sq.yd. asphalt, 825 lin.ft. granite curbing, 4,529 cu.yd. earth excav., etc., $10,000. M. M. O'Shaughnessy, city engr.

Cal., Tracy—City Trustees plan to pave Lincoln Highway through its incorporate limits, 36-40 ft. wide, 2 in. bituminous wearing surface on 4 in. rock base, sewers will also be installed. Cost to exceed $10,000. A. Larkin, city engr.

Cal., Vallejo—City considering tentative plans for repairing South and North Vallejo Sts., petrolithic or bituminous, improving Virginia and Georgia Sts. wharf approaches, concrete and timber and building sewerage system in northern section of city, vitr. or concrete. About $263,359. Noted Jan. 8 and March 11 under "Sewers."

Cal., Woodland—City soon lets contract improving Marshall Ave. from College to 1st Sts., Hays St. from College to 1st St., 1st St. from Marshall Ave. to Hays St., involving concrete curbing and guttering, paving with 2 in. Warrenite wearing surface on 3 in. asphaltic base and hydraulic concrete base along south line of Marshall Ave. across 1st St. Cost to exceed $10,000.

Que., Montreal—City plans to pave Boulevard Decarie, St. Denis, St. Hubert, Descarrieres, St. Ambroise, St. Paul, Ontario, St. Catherine, Guy, Atwater, Beaumont and Wellington Sts., Western and Park Aves. About $1,161,270. A. E. Doucet, city engr.

Ont., Streetsville—City plans to pave 1 mi. Main St., tar bound macadam. About $25,000.

Ont., Toronto — City plans to repair roads, cost, $180,000, build new asphalt pavements on concrete base, $210,000, pave and drain Runnymeade Rd., asphalt, $19,144, widen and pave Dundas St. from Lansdowne Ave. to Dundas St. Bridge, $65,643, resurface roads in High Park, macadam, $17,962 and round corners on Gerrard St. and Broadview Ave., $20,000. R. C. Harris, city eng.

BIDS DESIRED

Massachusetts—Until March 31, by J. N. Cole, state highway comr., State House, Boston, building 5,700 ft. bituminous macadam road between Danvers and Peabody Twps., 22 ft. wide, cost $10,000; 7,392 ft., 22 ft. wide, Attleboro Twp., $10,000; 6,100 ft. cement concrete, 18 ft. wide, Leicester Twp., $10,000. A. W. Dean, state highway engr.

N. Y., Albany—Until April 5, by Bd. Contr. & Supply, improving Carroll Terrace, 430 ft. west of Delaware Ave., involving 650 cu.yd. excav. for paving, 725 cu.yd. excav. for sewers, 680 ft. 12 in. vitr. pipe, 170 ft. concrete curbing, 5,300 sq yd. concrete sidewalks, 1,390 sq.yd. asphalt concrete paving, cost $15,000; Bradford St. from Ontario to Partridge Sts., 270 cu.yd. excav. for sewer, 200 ft. 12 in. and 240 ft. 6 in. vitr. tile sewer pipe, 1,300 lin.ft. concrete curbing, 3,500 sq.ft. concrete sidewalk, 2,120 sq.yd. concrete pavement or 470 cu.yd. rein.-con. pavement; walks and driveway at fire alarm station on Delaware Ave., $1,000; City Hall grounds, 8,000 sq.ft. concrete sidewalks, 330 sq.ft. concrete driveway, concrete curbing, $3,000; also building sewer in Whitehall Rd., 300 ft. 12 in. vitr. sewer pipe, 250 cu.yd. excav., etc.; Maidenlane St., 175 ft. 3 ft. 6 in. monolithic pipe, 750 cu.yd. excav., $2,500; building connecting sewer in North Pine Ave., 80 ft. 18 in. vitr. sewer pipe, 125 cu.yd. excav., $900.

N. Y., Brooklyn—Until March 31, by E. Riegelmann, boro. pres., regulating and paving roadway of Saratoga Ave. from Livonia Ave. to Newport St., permanent asphalt on 6 in. concrete foundation; also furnishing and delivering 12,000 cu.yd. asphalt sand.

N. Y., Corning—Until March 30, by Bd. Pub. Wks., building 6,737 sq.yd. Hillside block paving W. O. Drake, city engr.; advertised in this issue.

N. Y., Long Island City—Until April 1, by M. E Connolly, pres. Queens Boro., regulating and paving Fairview Ave. from Gates Ave. to Woodbine St., sheet asphalt on 6 in. concrete foundation, paving with preliminary pavement 25th St. from Baxter to Polk Aves., from south to north house line of Fillmore Ave., from south house line of Hayes to Jackson Aves., sheet asphalt on concrete foundation.

N. Y., New York—Until April 1, by H. Bruckner, pres. Bronx Boro., repaving with sheet asphalt on concrete foundation and setting curb on Southern Blvd. from East 182nd St. to Fordham Rd., with granite blocks on sand foundation. Westchester Ave. from Ward to East Tremont Aves., paving with granite blocks on sand foundation and setting curb on Westchester Ave. from East Tremont Ave. to Eastern Blvd.

N. J., Jersey City—Until March 30, by Bd. Comrs., Assembly Chamber, paving VanCleff St. between Stegman St. and point 144 ft. north of Wegman Park, sheet asphalt on concrete foundation. F. A. Dolan, clk.

N. J., Salem—Until April 12, by Bd. Freeholders Salem Co., building 4 mi. Pedricktown-Woodstown Rd., Sect. 2, Pilesgrove Twp. and Woodstown Boro., involving 48,724 sq.yd. gravel surface. E. G. Ochs, clk.; advertised in this issue

Pennsylvania—Until April 13, by State Highway Dept., Harrisburg, paving roads in counties as follows:

Beaver Co., 26,949 lin.ft. rein.-con., also 3,055 ft. vitr. brick.

Crawford Co., 18,121 ft. bituminous surface course on concrete foundation or rein.-con., 18,619 ft. 1 course rein.-con, or 2

Streets and Roads (Continued)

course rein.-con. and 18,514 ft. rein.-con. and Hillside vitr. brick.

Delaware Co., 4,278 ft. bituminous surface course on concrete foundation.

Fayette Co., 18,480 ft. rein.-con., also 14,496 ft. rein.-con. and Hillside vitr. brick.

Huntington Co., 4,243 ft. rein.-con.

Indiana Co., 25,030 ft. rein.-con. and Hillside vitr. brick.

Luzerne Co., 17,673 ft. rein.-con.

Lycoming Co., 52,478 ft. rein.-con.

Mercer Co., 51,874 ft. bituminous surface on concrete foundation or rein.-con.

Schuylkill Co., 38,979 ft. rein.-con.

Tioga Co., 20,942 ft. bituminous surface course on concrete foundation or rein.-con.

Warren Co., 40,485 ft. rein.-con.

Westmoreland Co., 32,047 ft. rein.-con. and Hillside vitr. brick. L. S. Sadler, state highway comr.; advertised in this issue.

Pennsylvania—Until April 14, by State Highway Dept., Harrisburg, paving roads in counties as follows:

Armstrong Co., 10,610 lin.ft. rein.-con.

Cambria Co., 24,207 ft. rein.-con. also 24,431 ft rein.-con. and Hillside vitr. brick.

Crawford Co., 22,675 ft. bituminous surface course on concrete foundation or rein.-con.

Delaware Co., 7,471 ft. rein.-con.

Erie Co., 42,900 ft. bituminous surface course on concrete foundation or rein.-con.

Fayette Co., 26,267 ft. bituminous macadam (penetration method) on broken stone base and Hillside vitr. brick or rein.-con. and Hillside vitr. brick, also 20,996 ft. rein.-con. and Hillside vitr. brick.

Greene Co., 10,620 ft. rein.-con.

Jefferson Co., 14,436 ft. rein.-con. and Hillside vitr. brick.

Lawrence Co., 28,644 ft. rein.-con.

Montgomery Co., 25,911 ft. rein.-con.

Potter Co., 8,358 ft. bituminous surface course on concrete foundation or rein.-con.

Susquehanna Co., 29,974 ft. rein.-con.

Tioga Co., 20,410 ft. bituminous surface course on concrete foundation or rein.-con.

Warren Co., 23,893 ft. rein.-con., also 22,287 ft rein.-con. and Hillside vitr. brick.

Washington Co., 22,845 ft. rein.-con. and Hillside vitr. brick.

Westmoreland Co., 39,440 ft. rein.-con. and Hillside vitr. brick. L. S. Sadler, state highway comr.; advertised in this issue

Pa., Bradford—Until April 15, by E. C. Charlton, city clk., paving various streets, involving 14,000 sq.yd. brick on concrete foundation; advertised in this issue.

Md., Baltimore—Until March 31, by Bd. Awards, paving various streets listed in Contracts Nos. 170, 171 and 174, vitr. brick and sheet asphalt on concrete base. R. K. Compton, engr.

Md., Easton—Until April 15, by Mayor and City Council, building 5,000 lin.ft. concrete curb and gutters. E. G. Kastenhuber, city engr.; advertised in this issue.

Va., Roanoke—Until April 10, by W. P. Hunter, city mgr., for 25,900 lin.ft. curbing, 10,900 lin.ft. gutter, 26,400 sq.yd. 1 course rein.-con. paving, 4,500 sq.yd. brick and granite block paving on concrete base, 5,200 sq.yd. Hillside brick and granite block paving and 19,200 sq.yd. concrete base for sheet asphalt; advertised in this issue.

W. Va., Grafton — Until April 19, by Comrs. Taylor Co. improving 2 mi. Northwestern Pike, 16 ft. wide, involving 18,772 sq.yd. concrete pavement and 12,000 cu.yd. excav. About $62,000. J Sincell, Grafton, engr.

North Carolina—Until March 29, at Div. Office State Highway Comn., Greensboro, top soiling 3.8 mi. road, 16 ft. wide, Federal Aid Project 72. W. S. Fallis, Raleigh, state highway engr

Ga., Brunswick—Until April 6, by Bd. Comrs. Rds. and Revenues of Glynn Co., building 4.2 mi. Federal Aid Project No. 80, involving 39,500 sq.yd. brick, concrete or bituminous concrete, Topeka type, plain cement concrete base. P. W. Twitty, clk.; advertised in this issue.

Miss., Fayette—Until March 31, by Highway Comn., of 1st 3rd and 4th Dist. of Jefferson Co., building 35.2 mi. Federal Aid Project No. 84 between Jackson and Natchez. Work involves 80.6 acres clearing and grubbing, 238,880 cu.yd. excav., 832 cu.yd. concrete, 2,930 lin.ft. culvert pipe, 46,853 lb. reinforcing steel, 266,780 cu.yd. gravel, 100 cu.yd. rock excav. and 7,689 cu.yd. borrow excav.

Ky., Hazard—Until April 10, by city, paving 2½ mi. road. L. Daniel, mayor.

O., Cleveland—Until March 30, by Wight-O'Rourke Co., engrs., Rose Bldg., grading in Lookout Heights Allotment, involving 16,000 cu.yd. earth excav., for Conger-Helper Co., Natl. City Bldg. About $15,000.

Indiana—By Bd. Co. Comrs. building roads in following counties:

April 5, Clay Co., Brazil, W. W. Jones et al Rd., gravel, Posey Twp., H. Mercer et al Rd., stone and gravel, Van Buren Twp., A. M. Pell et al Rd., Van Buren Twp., S. Haddon et al Rd., Jackson Twp., J. R. Benham et al Rd., Harrison Twp., W. H. Lankford et al Rd., Stone, Washington Twp. W. E. Parrish, aud.

Decatur Co., Greensburg, S. Crist et al Rd., crushed stone, Clay Twp., J. C. Barbe, aud.

Clark Co., Jeffersonville, H. Schubnell Rd., crushed limestone and screenings, Carr Twp. T. L. Stoner, aud.

Spencer Co., Rockport, H. Miller et al Rd., gravel, Ohio Twp. R. W. Richards, Jr., aud.

Tipton Co., Tipton, 15,840 ft. Z. E. Darrow Rd., gravel, Madison Twp., 13,266 ft. S. Skinner Rd., concrete, Liberty Twp. C. Grishaw, aud.

Hendricks Co., Danville, L. A. Phillips et al Rd., between Clay and Franklin Twps. C. A. White, aud.

Jennings Co., Vernon, 14,586 ft. J. Keifer Rd., crushed stone, Marion Twp.; 2.717 mi. J. W. Fike Rd., crushed stone, Sand Creek Twp., 2.5647 mi. H. Bergmeier Rd., Spencer Twp. E. Bemish, aud.

Jasper Co., Rensselaer, J. E. Murphy et al Rd., Union, Newton and Marion Twps. S. C. Robinson, aud.

Perry Co., Cannelton, Groves-Rickert Rd., stone, and J. E. Mogan et al Rd., Tobin Twp. T. A. Lasher, aud.

Crawford Co., English, A. L. Temple Rd., crushed limestone, Sterling Twp., J. F. Zimmerman Rd., Patoka Twp., W. T. Bates Rd., Liberty Twp. O. D. Tadlock, aud.

Newton Co., Kentland, O. Doctor et al Rd., macadam, Jackson Twp., H. Troup et al Rd., Washington Twp., J. A. Whaley et al Rd., Washington Twp., P. R. Duclos et al Rd., Beaver Twp., E. H. Kessler et al Rd., macadam, Beaver Twp. S. R. Sizelove, aud.

April 6, Daviess Co., Washington, 3 mi. road, Steele Twp., D. V. Ellis, et al Rd., Steele Twp. D. I. Myers, aud.

Hamilton Co., Noblesville, grading, paving and bridging O. McCarty Rd., White River Twp. H. O. Cottingham, aud.

Adams Co., Decatur, O. N. Tyndall Rd., macadam, Blue Creek Twp., R. Meyer Rd., Jefferson Twp., S. Siegrist Rd., French Twp., F. Stauffer Rd., Monroe Twp., M. L. Smith Rd., Wabash Twp. J. Mosure, aud.

Morgan Co., Martinsville, 5,800 ft. S. Watson Rd., gravel, Madison Twp. H. H. Nutter, aud.

Marshall Co., Plymouth, C. M. Urschel et al Rd., gravel, Tippecanoe Twp., C. Kreiger No. 4 Rd., gravel, Walnut Twp Z. M. Tanner, aud.

Posey Co., Mt. Vernon, W. A. Williams et al Rd., Center Twp., W. E. Harris et al Rd., Bethel Twp., G. J. Waters et al Rd., Robb Twp., J. Seibert, Jr., et al Rd., Smith Twp. M. F. Robison, aud.

Monroe Co., Bloomington, E. Stull et al Rd., Clear Creek Twp., W. V. Freeman et al Rd., Indian Creek Twp. H. Blakely, aud.

White Co., Monticello, B. F. Price et al Rd., gravel, B. Holmes et al Rd., M. B. Spencer et al Rd., J. L. Ackerman et al Rd., crushed stone, all in Union Twp. F. E. Vinson, aud.

Fountain Co., Covington, S. LaFourette et al Rd., gravel, Wabash Twp. H. W. Newlin, aud.

Greene Co., Bloomfield, J. Van Meter Rd., macadam, M. F. Cox Rd. and G. Sullivan Rd. H. Corbin, aud.

Wabash Co., Wabash, J. Kneilley et al Rd., gravel, Paw Paw Twp., Ogan et al Rd., Waltz Twp., O. L. Hayes et al Rd., Waltz Twp., R. Daugherty et al Rd., Liberty Twp., Crowe et al Rd., Liberty Twp., Endsley et al Rd., La Gro Twp. B. Benister, aud.

Hancock Co., Greenfield, 5,440 ft., A. E. Smith Rd., stone, Buck Creek Twp. E. A. Cooper, aud.

Cass Co., Logansport, W. McCloskey Rd., Deer Creek Twp., G. W. Galloway Rd., Jefferson Twp., E. L. Flory Rd., Clay Twp. and C. A. Flory Rd., Miami Twp. H. M. Gardner, aud.

Clinton Co., Frankfort, 4,229 ft., S. M. Douglass Rd., gravel, Union Twp., L. G. Stroup Rd., between Michigan and Warren Twp., 10,402 ft. J. W. Yundt Rd., Owen Twp., J. Smith Rd., Perry Twp., S. Clendenning Rd., Madison Twp. E. Spray, aud.

April 7, Huntington Co., Huntington, E. Smith et al Rd., Jackson Twp. J. E. Shideler, aud.

Ind., Ft. Wayne—Until April 8, by city grading, draining, curbing and paving 7 mi. various streets. About $430,000. F. M. Randall, city engr.

Michigan—Until March 29, by F. F. Rogers, state highway comr., at office of Bd. Rd. Comrs. Iron Co. (Crystal Falls), grading, draining and surfacing 1.042 mi. State Trunk Line Rd. 12-15, 16 ft. wide, involving 9,778 sq.yd. 7 in. macadam base, etc.

Michigan—Until April 2, by F. F. Rogers, state highway comr. at office Bd. Rd. Comrs. Lapeer Co. (Lapeer), grading, draining and surfacing 2.165 mi. State Trunk Line Rd. 21-4, 20 ft. wide, involving 20,688 sq.yd. concrete or bituminous concrete, 4,396 cu.yd. excav., 1,371 lb. steel reinforcement, etc.

Michigan—Until April 2, by F. F. Rogers, state highway comr. at office Bd. Rd. Comrs. Ionia Co. (Ionia), grading, draining and surfacing 3.352 mi. State Trunk Line Rd. 16-4, 16 ft. wide, involving 31,450 sq.yd gravel, 15,473 cu.yd. earth excav., 3,080 lb. steel reinforcement, 489 lin.ft. 12-15 in. encased tile, 81.7 cu.yd. 1:2:4 and 72.6 cu.yd. 1:3:6 concrete, etc.; 1.241 mi. State Trunk Line Rd. 21-6, 16 ft. wide, involving 11,631 sq.yd. gravel, 3,970 cu.yd. earth excav., 232 lin.ft. 12-15 in. encased tile, 31.7 cu.yd. 1:2:4 concrete. Noted March 4.

Michigan—Until April 9, by F. F. Rogers, state highway comrs. at office Bd. Comrs. Huron Co. (Bad Axe), grading, draining and surfacing 1.967 mi. State Trunk Line Rd. 31-4, 16 or 18 ft. wide, involving 20,771 sq.yd. concrete or bituminous concrete, 4,430 cu.yd. earth excav., 18,463 sq.yd. waterbound macadam, 142 lin.ft. 12-18 in. encased tile, 1,706 lb. steel, 44 cu.yd. 1:2:4 and 52.3 cu.yd. 1:3:6 concrete, etc.; .999 mi. State Trunk Line Rd. 19-5, 16 ft. wide, involving 9,377 sq.yd. gravel, 6,496 cu.yd. earth excav., 1,562 lb. steel reinforcement, 28.7 cu.yd. 1:2:4 and 48.2 cu.yd. 1:3:6 concrete, etc.

Michigan—Until April 6, by F. F. Rogers, state highway comr. at office Clerk, Midland Co. (Midland), grading, draining and surfacing 1.515 mi. Assessment Dist. Rd. 343 12 ft. wide, involving 10,666 sq.yd. gravel, 3,306 cu.yd. earth excav., etc.

Michigan—Until April 6 by F. F. Rogers, state highway comr. at office of Bd. Comrs. Muskegon Co. Muskegon, grading, draining and surfacing 0.896 mi. State Trunk Line Rd. 11-6, 20 ft wide, involving 10,479 sq.yd. concrete, 2,674 cu.yd. earth excav., etc.; 1.53 mi. State Trunk Line Rd. 11-8, 20 ft. wide, involving 17,058 sq.yd. concrete or bituminous concrete, 2,074 cu.yd earth excav.; 0.272 mi. State Trunk Line Rd. 11-21, 20 ft. wide, involving 3,169 sq.yd. concrete, 436 cu.yd. earth excav.; 1.08 mi. State Trunk Line Rd. 11-30, 20 ft., wide, involving 12,653 sq.yd. concrete, 4,275 cu.yd. earth excav., etc.

Mich., Mt. Clemens—Until April 12, by Bd. Rd. Comrs. Macomb Co., grading, surfacing and draining 1.331 mi. State Trunk Line Rd 19-11, 18 ft. wide, involving 45,599 sq.yd. concrete or bituminous concrete, 7,214 cu.yd. earth excav., 356 lin.ft. 12-18 in. encased tile, 4,174 lb. steel reinforcement, 103.5 cu.yd. 1:2:4 and 122.4 cu.yd. 1:3:6 concrete, etc.

Wis., Bayfield—Until March 31, by City Clerk, furnishing labor and material building rein.-con. or vitr. block pavement on 5 in. concrete base, or vitr. block pavement on sand base, or asphaltic concrete pavement on 5 in. concrete base, together with combined cement curb and gutter on 1st, 6th, Broad and Front Sts., Manypenny and Washington Aves. H. J. Wachsmuth, mayor.

Minn., Brainerd—Until April 17, by C. W. Mehlum, aud. Crow Wing Co., building 2 mi. State Rd. 2, Job 2001, 18 ft. wide, involving 21,794 cu.yd. paving, 4,458 cu.yd. excav., 2,585 ft. 12 and 18 in. storm sewer, etc. About $80,000. Bids will be received on all types of pavement. Former bids rejected. C. L. Motl, Brainerd, engr. Noted Jan. 29.

Minn., Crookston—Until April 9, by H. J. Welte, aud. Polk Co., paving 1.4 mi. Federal Aid Project 112, County Job 1912, 18 ft. wide, involving 14,316 sq.yd. concrete and 14,320 lin.ft. drain tile. About $40,000. E. H. Harding, Crookston, engr. Noted Jan. 15.

Minn., Crookston—Until April 9, by H. J. Welte, aud. Polk Co., building Federal Aid Project 155, County Job 2001, 24 ft. wide, involving 25 acres clearing, 72,257

Streets and Roads (Continued)

cu.yd. excav., 7,150 cu.yd. hand ditch, 71,259 ft. reshaping, 16,171 cu.yd. gravel, portable culverts, etc. About $65,000. E. H. Harding, Crookston, engr.

Minn., Elbow Lake—Until April 7, by C. M. Nelson, aud. Grant Co., building 6 mi. Federal Aid Project 28, State Rd. 6, involving 81,394 cu.yd. excav., 11,652 lin.ft guard rail, 1,183 lin.ft. portable culvert pipe, loading and hauling 7,314 cu.yd. gravel surface material, 3 rein-con. culverts, cost $36,000; 16 mi. Federal Aid Project 108, State Rds. 2 and 1, 107,511 cu.yd. excav., 8,050 lin.ft. guard rail, 1,146 lin.ft. 12-36 in. portable culverts, loading and hauling 20,065 cu.yd. gravel surfacing material, 1 rein.-con. culvert, $85,000; 5 mi. State Aid Job 20.03, State Rd. 5, 44,902 cu.yd. excav., 2,375 lin.ft. guard rail, 773 lin.ft. 12-36 in. portable culvert, 1 rein.-con. culvert, $30,000; all 24 ft. wide. W. E. Burgess, Elbow Lake, engr.

Minn., Morris—Until April 8, by C. R. Wolthan, aud. Stevens Co., building 17 mi. Federal Aid Project 127, State Rd. 1, 24 ft. wide, involving 109,284 cu.yd. excav., 4,700 lin.ft. guard rail, 1,524 lin.ft. 12-24 in. portable culverts, 20,969 cu.yd. gravel surfacing, etc. About $100,000. W. A. Hunt, Morris, engr.

Minn., Walker—Until April 6, by C. D. Bacon, aud. Cass Co., building State Rd. 6, from ½ north of Motley east to Sta. 558, involving 54,000 cu.yd. excav., 5,000 cu.yd. surfacing, 1,035 lin.ft. 12-36 in. portable culverts; 8,066 mi. Pine River-Jenkins Rd., 13.1 acres clearing, 13.1 mi. grubbing, 58,556 cu.yd. excav., 74,992 cu.yd. overhaul, 4,151 cu.yd. hand ditch, 2,394 lin.ft. guard rail, 1,160 lin.ft. 12-48 in. portable culverts, etc.; Pine River-Remer Rd. from Sta. 6, near Pine River, northeast to Sta. 365, 47,000 cu.yd. excav., 6,000 cu.yd. surfacing, 5,000 yd. mi. overhaul, 692 lin.ft. 12-24 in. portable and 26 lin. ft. 24 in. metal culverts; Walker-Remer Rd. from Sta. 110, near State Sanatorium, east to Sta. 705, 80 acres clearing, 80 acres grubbing, 145,000 cu.yd. excav., 11,000 cu.yd. surfacing, 970 lin.ft. 12-48 in. portable and 219 lin.ft. 18-48 in. metal culverts, 2 concrete culverts; Hackensack-Longville Rd. from Hackensack northeast to Sta. 325, 48,000 cu.yd. excav., 5,000 cu.yd. surfacing, 1,285 lin.ft. 12-48 in. portable and 56 lin.ft. 18 in. metal culverts. Separate bids will be received on each or any one of the above jobs or part thereof.

Kan., Cottonwood Falls—Until April 14, by Comrs. Chase Co., grading 3.712 mi. Santa Fe Trail, Federal Aid Project 47 A-B-H, 18 ft. wide, also building bridges and culverts on same, involving 50,291 sq.yd. concrete, 25,254 cu.yd. earth excav., 15.15 tons steel, 1,136 lin.ft. guard rail, 3,256 lin.ft. concrete gutter, 71.54 tons structural steel, etc. About $321,000. E. L. Hageman, Cottonwood Falls, engr.

Kan., Hutchinson—Until April 13, by Comrs. Reno Co., grading 14.973 mi. Santa Fe Trail, Federal Aid Project 27, Sects. C-D-E, 16 ft. wide, also building bridges and culverts on same, involving 81,140 cu. yd. earth excav., 544 cu.yd. concrete, 120.75 tons steel, 1,582 lin.ft. guard rail, 1,572 lin.ft. tile under drain, etc. About $160,000. D. E. Gilmer, engr. Noted Feb. 5.

Kan., Independence—Until April 9, by Comrs. Montgomery Co., grading and gravel surfacing 3.06 mi. Coffeyville-Cherryvale Rd., Federal Aid Project 37, Sect. B and C, 18 ft. wide, also building bridges and culverts on same, involving 23,409 sq.yd. gravel, 9,997 cu.yd. earth excav., 275.3 cu.yd. concrete, 5.37 ton steel, 136 lin.ft. rein.-con., etc., cost $75,000; 9.876 mi. Ozark Trail, Federal Aid Project 23, 16 ft. wide, involving 31,621 cu.yd. earth and 3,285 cu.yd. rock excav., 92,702 sq.yd. gravel, 605 cu.yd. concrete, 22.2 cu.yd. rein.-con., 15.41 ton steel, etc., $110,000. H. K. Hibbard, Independence, engr. Noted Jan. 1.

Neb., Auburn—Until April 9, by R. M. Armstrong, city clk., grading and paving Dist. 4, involving 3,990 sq.yd. 3 in. brick pavement on 6 in. concrete base, 2,412 lin.-ft. combined curb and gutter, 460 cu.yd. earth excav., 900 lin.ft. 12 in. vitr. sewer pipe, etc. About $26,516. L. S McConnell, engr.

South Dakota—Until April 6, by State Highway Comn., Pierre, graveling 6.58 mi. Presho-Winner Rd., 10 ft. wide, Federal Aid Project 27, Lyman and Tripp Counties, involving 1,800 cu.yd excav., 6,580 cu.-yd. gravel, 525 cu.yd. clay binder, $15,480, grading and building drainage structures on same, 36 ft. wide, involving 106,628 cu-yd. excav., 79,537 yd. overhauling, 135 cu.yd. structure excav., 560 lin.ft. concrete or corrugated iron pipe culvert, 143 cu.yd. Class A and 41 cu.yd. Class B concrete, 11,595 lb. reinforcing and 475 lb. structural steel, $38,800. F. S. Peck, state highway engr.

South Dakota—Until April 8, by State Highway Comn., Pierre, grading and draining 17.75 mi. Parker-Centerville Highway, 36 ft. wide, Federal Aid Project 36, Turner Co., involving 107,164 cu.yd. excav., 28,056 yd. overhauling, 588 cu.yd. structure excav., 1,618 lin.ft. concrete or corrugated iron pipe culvert. 468 cu.yd. Class A, 158 cu.yd. Class B and 46 cu.yd. Class D concrete, 882 lin.ft. wood piling, 17,309 lb. reinforcing and 12,751 lb. structural steel, $86,307. F. S. Peck, state highway engr.

South Dakota—Until April 9, by State Highway Comn., Pierre, graveling 14.11 mi. De Smet-Brookings Highway, 24 ft. wide, Federal Aid Project 26, Kingsbury Co., involving 2,000 cu.yd. excav., 21,165 cu.yd. gravel, cost $43,000, grading and building drainage structures on same, 36 ft. wide, involving 82,287 cu.yd. excav., 22,453 yd. overhauling, 2,192 lin.ft. rip-rap, 490 cu.yd. structure excav., 1,720 lin.ft. rein.-con. or corrugated iron pipe culverts, 500 cu.yd. Class A and 83 cu.yd. Class B concrete, 39,164 lb. reinforcing and 275 lb. structural steel, $74,600; graveling 11.4 mi. De Smet-Brookings Highway, 24 ft. wide, Federal Aid Project 25, Brookings Co. 4,290 cu.yd. excav., 17,690 cu.yd. gravel, 580 cu.yd. clay binder, $42,000, grading and drainage structures on same, 36 ft. wide, 77,824 cu.yd. excav., 29,201 yd. overhauling, 489 cu.yd. structure excav., 1,586 lin.ft. corrugated iron or concrete pipe culverts, 417 cu.yd. Class A and 113 cu.yd. Class B concrete, 31,099 lb. reinforcing and 365 lb. structural steel, $59,700; graveling 8.49 mi. Huron-De Smet Highway, 24 ft. wide, Federal Aid Project 31, Beadle Co., 6,600 cu.yd. excav., 16,035 cu.yd. gravel, 624 cu.yd. clay binder, $35,300, grading and drainage structures on same, 36 ft. wide, 39,498 cu.yd. excav., 14,878 yd. overhauling, 143 cu.yd. structure excav., 636 lin.ft. concrete or corrugated iron pipe culvert, 146 cu.yd. Class A and 48 cu.yd. Class B concrete, 13,454 lb. reinforcing and 303 lb. structural steel, $27,300; graveling 11.14 mi. Madison-Howard Rd., 24 ft. wide, Federal Aid Project 33, Miner Co., 4,160 cu.yd. excav., 70,732 cu.yd. gravel, 1,024 cu.yd. olay binder, $37,000, grading and drainage structures on same, 36 ft. wide, 55,004 cu.yd. excav., 51,476 yd. overhauling, 926 lin.ft. concrete or corrugated iron pipe culvert, 257 cu.yd. structure excav., 280 cu.yd. Class A, 26 cu.yd. Class B and 3 cu.yd. Class D concrete, 576 lin.ft. wood piling, 21,048 lb. reinforcing and 794 lb. structural steel, $41,700; graveling 10.88 mi. Redfield-Watertown Rd., 24 ft. wide, Federal Aid Project 34, Spink Co., 10,700 cu.yd. excav., 19,640 cu.yd. gravel, 1,188 cu.yd. clay binder, $40,000, grading and drainage structures on same, 36 ft. wide, 27,833 cu.yd. excav., 20,301 yd. overhauling, 240 cu.yd. structure excav., 1,602 lin.ft. rein.-con. or corrugated iron pipe culverts, 187 cu.yd. Class A and 109 Class B concrete, 16,758 lb. reinforcing and 745 lb. structural steel, $29,000. F. S. Peck, state highway engr.

South Dakota—Until April 7, by State Highway Comn., Pierre, graveling 7.76 mi. Mitchell-Plankinton Highway, 24 ft. wide, Federal Aid Project 21, Aurora Co., involving 4,200 cu.yd. excav., 11,638 cu.yd. gravel, 272 cu.yd. clay binder, cost $27,500, grading and building drainage structures on same, 36 ft. wide, involving 43,286 cu.yd. excav., 13,729 yd. overhauling, 105 cu.yd. rip-rap, 287 cu.yd. structure excav., 820 lin.ft. concrete or corrugated iron pipe culverts, 167 cu.yd. Class A and 85 cu.yd. Class B concrete, 17,173 lb. reinforcing and 775 lb. structural steel, $41,700; grading and draining 17.52 mi. Tyndall-Lake Andes Rd., 36 ft. wide, Federal Aid Project 28, Charles Mix Co., 79,779 cu.yd. excav., 20,666 yd. overhauling, 145 cu.yd. rip-rap, 452 cu.yd. structure excav., 1,060 lin.ft. concrete or corrugated iron pipe culverts, 373 cu.yd. Class A and 120 cu.yd. Class B concrete, 36,470 lb. reinforcing and 806 lb. structural steel, $62,600. F. S. Peck, state highway engr.

South Dakota—Until April 14, by State Highway Comn., Pierre, graveling 28.07 mi. Aberdeen-Webster Rd. and Yellowstone Trail, Federal Aid Project 22, Day Co., involving 5,575 cu.yd. excav., 33,667 cu.yd. gravel, 269 cu.yd. clay binder, cost $65,400, grading and building drainage structures on same, 36 ft. wide, involving 172,634 cu.yd. earth excav., 87,123 yd. overhauling, 1,971 cu.yd. rip-rap, 2,600 lin.ft tile underdrain, 918 cu.yd. structure excav., 2,260 lin.ft. concrete or corrugated iron pipe culverts, 731 cu.yd. Class A and 178 cu.yd. Class B concrete, 65,310 lb. reinforcing and 625 lb. structural steel, $145,500. F. S. Peck, state highway engr.

South Dakota—Until April 6, by State Highway Comn., Pierre, graveling 7.91 mi. Kadoka-Martin Highway, 10 ft. wide, Federal Aid Project 23, Jackson and Washabough Counties, involving 1,500 cu.yd. excav., 6,578 cu.yd. gravel, 658 cu.yd. clay binder, $15,300; grading and building drainage structures on same, 36 ft. wide, involving 51,181 cu.yd. excav., 14,170 yd. overhauling, 491 cu.yd. structure excav., 424 lin.ft. rein.-con. or corrugated iron pipe culverts, 387 cu.yd. Class A, 57 cu.yd. Class B and 41 cu.yd. Class D concrete, 35,026 lb. reinforcing and 27,930 lb. structural steel, $48,700. F. S. Peck, state highway engr.

South Dakota—Until April 13, by State Highway Comn., Pierre, graveling 15.37 mi. Aberdeen-Ipswich Highway, 18 ft. wide, Federal Aid Project 32, Edmunds Co., involving 5,500 cu.yd. excav., 18,455 cu.yd. gravel, 702 cu.yd. clay binder, cost $40,000, grading and building drainage structures on same, involving 118,492 cu.yd. excav., 29,764 yd. overhauling, 75 cu.yd. rip-rap, 608 cu.yd. structure excav., 1,204 lin.ft. concrete or corrugated iron pipe culvert, 517 cu.yd. Class A, 145 cu.yd. Class B and 27 cu.yd. Class D concrete, 48,560 lb. reinforcing, and 21,313 lb. structural steel, $81,700; grading and drainage on 71.51 mi. and graveling 3.57 mi. Mobridge-Selby Highway, 16-36 ft. wide, Federal Aid Project 20, involving 140,565 cu.yd. excav., 114,653 yd. overhauling, 4,279 cu.yd. gravel, 360 cu.yd. clay binder, 150 cu.yd. rip-rap, 6,600 lin.ft. tile underdrain, 330 cu.yd. structure excav., 1,808 lin.ft. concrete or corrugated iron pipe culvert, 745 cu.yd. Class A and 156 cu.yd. Class B concrete, 50,960 lb. reinforcing and 760 lb. structural steel, $120,000. F. S. Peck, state highway engr.

Montana—Until April 5, by State Highway Comn., Helena, gravel surfacing 8.5 mi. Helena-Bozeman Rd., involving 7,322 sq.yd. concrete or bituminous concrete, 27,200 cu.yd. earth and 1,300 cu.yd. rock excav., 21,212 cu.yd. gravel. Bids will be received on 1 course Portland cement concrete, bituminous concrete Topeka type on Portland cement concrete base and bitulithic on Portland cement concrete base. About $75,000. J. N. Edy, state highway engr.

Mont., Livingston—Until March 29, by city, paving 140 blocks, involving 38,000 cu.yd. excav., 170,533 sq.yd. pavement (vitr. brick, wood block, concrete, asphaltic concrete, bitulithic on concrete base or bitulithic on broken stone base), 12,365 lin. ft. curb, etc. Former bids rejected. C. T. Sackett, city engr. Noted Jan. 29.

Ark., Waldron—Until March 30, by Comrs. Albert Pike Rd Impvt. Dist., Scott Co., hard surfacing 72 mi. road, (less such part on south end as will be built by Natl. Forest in said district), involving 262,470 yd. earth work, 3,140 yd. loose rock, 895 yd. solid rock, 198 acres clearing and grubbing, 1,935 yd. Class A concrete in culverts and 5,541 yd. Class B concrete in culverts and bridge abutments, 264,170 lb. reinforcing steel bars, and 113,750 yd. hauling. H. L. Fuller, pres.

Tex., Comanche—Until March 30, by J. P. Hoff, judge Comanche Co., grading and draining 7.96 mi. Highway 22, Comanche-De Leon Rd., 24 ft. wide, involving 5.4 acres clearing and grubbing, 59,520 cu.yd. earth and 533 cu.yd. rock excav., 47,011 lb. reinforcing steel, 599 cu.yd. 1:2:4, 31 cu.yd. 1:2:3 and 54 cu.yd. 1:2½:5 concrete. About $51,505. L. D. Parks, De Leon, engr.

Tex., Dallas—Until March 29, by C. E. Gross, aud. Dallas Co., building 8.9 mi. Seyene Rd., 18 ft. wide. H. J. Powell, co. engr. Noted Feb. 19.

Tex., Denton—Until April 2, by W. E. Durbin, aud. Denton Co., building 8 mi. highway on Denton-Ft. Worth and Denton-Gainesville Rds., State Highways 40 and 40-A, involving 65,822 cu.yd. earth excav., 100 cu.yd. excav. for bridge foundations, 312 cu.yd. Class "A" and 67 cu.yd. Class "B" and 248 cu.yd. 1:2:3 concrete, 33,000 lb. reinforcing steel, 20,520 cu.yd. gravel base, etc. Bryant & Huffman, Littlefield Bldg., Austin, engrs.

Tex., Denton—Until April 2, by Comrs. Denton Co., gravel or macadam surfacing and building concrete bridges and culverts on 13.4 mi. Denton-Ft. Worth Rd., 11 mi. Denton-Gainesville Rd. and 19 mi. Denton-Sherman Rd. Materials to be furnished by county. W. E. Durbin, co. aud. and Bryant &

Streets and Roads (Continued)

Huffman, Denison and Littlefield Bldg., Austin, engrs.

Tex., El Paso—Until March 29, by J. A. Escajeda, aud. El Paso Co., grading and surfacing with crushed rock or gravel Island Rd. commencing at International Boundary Monument 2 and running southeast to San Elizario Island, about 20 ft. wide. Cost to exceed, $10,000.

Tex., Fredericksburg—Until April 7, by A. H. Kneese, judge Gillespie Co., grading, building and surfacing 17.59 mi. roads, involving 63.26 acres clearing and grubbing, 41,418 cu.yd. earth, 2,998 cu.yd. rock and 33,383 cu.yd. borrow excav., 27,298 cu.yd crushed rock, 9,047 cu.yd. gravel, etc. A. F. Moursund, Fredericksburg, engr.

Tex., Georgetown—Until March 30, by H. A. Hodges, aud. Williamson Co., furnishing and applying ½ to 1 in. bituminous topping on about 10 mi. gravel surfaced road. H. A. Nichols, Georgetown, engr.

Tex., Kingsville—Until April 2, by B. F. Wilson, judge Kleburg Co., grading, surfacing and building rein.-con. bridges and culverts on Highway 12, from Nueces to Reeves Counties, 16 ft. wide, involving 44 acres clearing and grubbing, 12,377 cu.yd. earth, 100 cu.yd. rock and 1,706 cu.yd. structural excav., 342,658 lb. reinforcing steel, 80 ft. 24 in. concrete pipe, 2,140 cu.yd. Class "A," 818 cu.yd. Class "B" and 46 cu.yd. Class "C" concrete. About $130,000. H. C. Porter, Kingsville, engr. Noted March 18.

Tex., Livingston—Until April 5, by E. T. Murphy, judge Polk Co., grading, surfacing and building concrete and steel bridges on 22.07 mi. Highway 35, Livingston-Corrigon Rd., 15 ft. wide, involving 61.1 acres clearing, 46.04 acres grubbing, 58,655 cu.yd. earth excav., 194,216 sq.yd. bituminous macadam, 569.3 cu.yd. 1:2:4: concrete in bridges, 688.83 cu.yd. 1:2:4: concrete in culverts, 95,258 lb. reinforcing steel, 48,553 cu.yd. crushed rock, and 229,700 lb. structural steel in bridges, etc. About $508,638, including 10% for engineering and contingencies. W. C Youngs, Livingston, engr. Noted Feb. 5

Tex., Marshall—Until March 29, by W. H. Strength, judge Harrison Co., building 19.03 mi. Sect. A Marshall-Longview Rd., 4.1 mi. Sects. B and C Marshall-Shreveport Rd. and 16.32 mi. Sect. D Shreveport Rd., 6 in. compacted gravel base, 2 in. crushed stone, with bituminous surface treatment, 16 ft. wide, also building concrete bridges and culverts. Gravel and stone will be furnished by county. G. A. Duren, co. engr. Noted Feb. 5.

Oklahoma—Until March 30, by H. Woods, comr. State Highway Dept., Oklahoma, hard surfacing 10 mi. road from Newkirk to Ponda City. About $250,000.

Okla., Tulsa—Until April 1, by city, furnishing material and labor paving and improving 1st St. from Mitchell to Jones Aves. and from Jones to Lee Aves.; Frisco Ave. from Main to Division St.; Mitchell Ave from Main St. to Blks. 13-14, West Tulsa Addition; Center Ave. from Frico right-of-way to 1st St.; Main St. from Center Ave. to Texas St.; Division St. from Center Ave. to Texas St.; 1st St. from Lee Ave. to Texas St., all streets in West Tulsa. C. F. Burke, aud.

Idaho—Until April 5, by W. J. Hall, state comr. Pub. Wks., Boise, for construction of 77,000 sq.ft. of concrete area ways for new capital buildings wings and 16,000 sq.ft. concrete sidewalks.

Idaho—Until March 27, by W. J. Hall, state comr. pub. wks., Boise, building 5 mi. Gray's Lake State Highway between Idaho Falls and Ammon, Bonneville Co.

Utah, Salt Lake City—Until March 31, by Salt Lake Co. paving with bituminous concrete 1¾ mi. road from Murray to Taylorsville, cost $52,000; 3 mi. road from Draper to Riverton, $90,000; 5 mi. Redwood Rd. extension, $150,000; 1¼ mi. 72nd St. S. extension, $38,000, all 18 ft. wide with 4 ft. shoulders. Alternate bids on 5 in. concrete base, 4 in. crushed rock base and 4 in. block base. G. G. Bywater, C. & C. Bldg., engr.

Ariz., Tucson—Until April 7, by Pima Co. Highway Comn. graveling 24 mi. road northwest from Tucson to county line involving 78,000 cu.yd. earth excav. and borrow, 47,821 cu.yd. gravel surfacing, 3,700 cu.yd. unclassified excav., 2,460 cu.yd. concrete in culverts, bridges and dips, 60,800 lbs. reinforcing steel, etc. Separate bids will be taken for (1) grading, (2) gravel surfacing and (3) furnishing materials (60,800 lbs. reinforced steel and 3,200 bbl. cement). L. E. Barker, engr.

Washington—Until April 5, by State Highway Comn., Olympia, clearing, grading and surfacing with gravel 1.5 mi. State Rd. 5 from Randle west, Lewis Co.; grading and paving 3 mi. Pacific Highway from Marysville north, Snohomish Co; grading, draining and paving 5.7 mi. Inland Empire Highway from Donald to Buena, Yakima Co. J. Allen, state highway engr.

Wash., Ellensburg—Until April 5, by Kittitas Co., paving 690 ft. B St. north of here, 18 ft. wide, concrete. H. A. Murray, Ellensburg, engr.

Wash., Seattle—Until April 12, by King Co., grading 1.75 mi. C. T. Conover Rd. 2, involving 20,000 cu. yd. earth excav. and 2,000 yd. gravel, cost $23,000; grading and graveling 1.75 mi. Redondo Beach Rd., 1,150 cu. yd. earth excav. and 1,900 yd. gravel, $17,000. S. J. Humes, co. engr.

California—Until April 12 (change of date), by State Highway Comn., 515 Forum Bldg., Sacramento, paving 10.7 mi. road between Woodland and Zamora, Yolo Co., and 15.7 mi. between Redding and southerly boundary of Shasta Co. Noted March 18

California—Until April 12, by State Highway Comn., 515 Forum Bldg., Sacramento, paving 13.6 mi. road between Glenwood and Los Gatos, 15 ft. wide, Santa Cruz and Santa Clara Counties, involving 55,700 cu.yd. excav. without classification, 15,915 cu.yd. Class "A" Portland cement concrete (pavement), 95 cu.yd. Class "A' Portland cement concrete (culverts and monuments), 560 lin.ft. 12-24 in. corrugated metal pipe, etc.; 12 mi. road between Oil King School and Huron Rd., 15 ft. wide, Fresno Co., 74,200 cu.yd excav. without classification, 11,720 cu.yd. Class "A" Portland cement concrete (pavement), 40 cu. yd. Class "A" Portland cement concrete (culverts and monuments), 1,716 lin.ft. 12-24 in. corrugated metal pipe, etc.; 11.3 mi. road between Flinn Springs and Ogden Ranch, 15 ft. wide, San Diego Co., 5,400 cu.yd. excav. without classification, 11,570 cu.yd. Class "A" Portland cement concrete (pavement), 160 cu yd. Class "A" Portland cement concrete (culverts and monuments), 336 lin.ft. 18-24 in. corrugated metal pipe, etc.; 25.2 mi road between Dyerville and Fortuna, 15 ft. wide, Humboldt Co., 44,000 cu.yd. excav. without classification, 28,195 cu.yd. Class "A" Portland cement concrete (pavement), 55 cu.yd. Class "A" Portland cement concrete (culverts and monuments), 456 lin.ft. 12-36 in. corrugated pipe, etc. Commission will furnish reinforcing steel, corrugated metal pipe, Portland cement, sand and coarse aggregate for cement. A B. Fletcher, state highway engr.

Cal., Fresno—Until April 5, by D. B. Barnwell, clk. Fresno Co., improving Route 16, Sect. A, involving 1,680 cu.yd. excav., 1,940 cu.yd. concrete or asphaltic concrete base and 125,470 sq.ft. asphaltic concrete or patented surfacing. C. Jensen, Cory Bldg., engr.

Cal., Hemet—Until April 5, by C. N. Dietterich, city clk., improving 2 mi. State, Harvard, Carmalita Sts., et al, 15-42 ft. wide, involving 378,000 sq.ft. 4 in. concrete paving and 2,100 lin.ft. cement curbing. About $70,000. F. W. Stetson, city engr.

Cal., Martinez—Until April 5, by Supervs. Contra Costa Co. paving 2.75 mi. road from Richmond to Giant, concrete and bitulithic, cost $66,000; also building oil macadam road through Bay Point. J. H. Wells, clk

Cal., Salinas—Until April 5, by Bd. Supervs. Monterey Co., grading and paving portion of Iolan-San Lucas Rd T. P Joy, co. clk.

Ontario—Until April 6, by W. A. McLean, deputy minister of Highways, Toronto, for 6 mi. earthwork, concrete structures and other necessary work on Provincial Highway, Edwardsburg Twp. About $130,000. G. Hogarth, Parliament Bldgs., Toronto, engr.

Ontario—Until April 7, by W. A. McLean, deputy minister of highways, Toronto, for 7 mi. of earthwork and other necessary work on Provincial Highway, Niagara Twp. About $100,000. G. Hogarth, Parliament Bldg., Toronto, engr.

Man., Birtle—Until April 2, by W. B. Chapman, secy.-treas., grading 52 mi. road, involving 160,000 cu.yd. earth excav.

Man., Rockwood—Until April 21, by V. W. McFarlane, secy.-treas., grading and ditching 24 mi. road, in Twps. 16 and 17, Ranges 1 and 2, 77 mi. Twp. 16, Ranges 1 and 2, and Twp. 17, Ranges 1, 2 and 3. D. M. Mawhinney, Stonewall, municipal engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Connecticut—C. J. Bennett, state highway comr., Hartford, let contract improving 32.2 mi. Hartford-New London Trunk Line, Federal Aid Project 4, 18 ft. wide, to C. W. Blakeslee & Sons, 58 Waverly St., New Haven, $1,392,385. Noted Feb. 19.

★New York—F. S. Greene, state highway comr., Capitol, Albany, let contracts to Woodcock Todd Constr. Co., Edwards, improving 4.6 mi. Gouverneur-Edwards, Part 2, Rd. 1389, St. Lawrence Co., cost $151,985; to Ring & McConville, Ogdensburg, 5.85 mi. Canton Madrid, Part 2, Rd. 1547, St. Lawrence Co., $176,947; to Spellman-Oliver Co., Lake St., Chateaugay, 13.09 mi. Potsdam-Winthrop, Parts 1 and 2, Rd. 1548, St. Lawrence Co., $402,750; to A. A. McConville, Ogdensburg, 3.1 mi. Malone-Dickson, Part 2, Rd. 1383, Franklin Co., $84,479; to Ribstein-Holter Co., Inc., 16 State St., Rochester, 3.3 mi. Central Sq.-Constantia, Part 2, Rd. 1553, Oswego Co., $64,642, 5.42 mi. Constantia-Cleveland, Rd. 1554, Oswego Co., $127,056, 3 mi. Pittsford-Palmyra Part 4, Rd. 1551, Wayne Co., $93,607, 4.65 mi. Chapin-Palmyra, Part 2, Rd. 1549, Ontario Co., $142,748; to M. C. Soper, Seneca Falls, 2.02 mi. Seneca Falls-Nichols Corners, Rd. 1555, Seneca Co., $58,743; to Hendrickson-McCabe Constr. Co., Syracuse, 0.95 mi. Bristol Center-Bloomfield, Part 2, Rd. 5655, Ontario Co., $36,854; to F. H. Rhody, Albion, 4.82 mi. Barre Center-Elba, Part 1, Rd. 1429, Orleans Co., $168,285. Noted March 4.

New York—F. S. Greene, state highway comr., Capitol, Albany, received bids March 18, improving (a) 5.38 mi. Holland Patent-Frenchville, Part 1, Rd. 1545, Oneida Co., (b) 5.03 mi. Holland Patent-Frenchville, Part 2, Rd. 1546, Oneida Co., (c) 4.05 mi. Scott-Borodino, Part 2, Rd. 1520, Onondaga Co., from J. E. Martin, Utica, (a and b) informal; J. H. Gordon, 91 North Pearl St., Albany, (c) $142,272. Noted March 4.

★N. Y., Brooklyn—Park Bd., Municipal Bldg., New York City, let contract furnishing labor and material repairing parkways and park roads, to Sicilian Asphalt Paving Co., 41 Park Row, New York City, $10,575. Noted March 18.

★N. Y., New York—Park Bd., at office of Dept. Parks, Municipal Bldg., let contract paving certain walks in Central Park, with cement, to F. Roeber Co., 507 5th Ave., $28,140. Noted March 11.

★Pennsylvania — State Highway Dept., Harrisburg, let contract building State Highway Route 127, between Loganville and Hametown, York Co., to Cornerford Constr. Co., Phila., $225,086.

★Md., Baltimore—Bd. Awards let contract paving various streets in north and northeastern sections of city, sheet asphalt, Contr. 169, to P. Flanigan & Sons, Harford Rd. and Baltimore & Ohio R.R., at $2.98 per sq.yd.

★W. Va., Elkins—Comrs. Randolph Co. let contract grading 2 mi. Haddix-Parsons Rd., to W. H. Rhodes, Elkins. About $30,000.

★W. Va., Elkins—Comrs. Randolph Co let contract building 3 mi. Parsons-Elkins Rd., 20 ft. wide, to W. H. Rhodes, Elkins. About $19,000. Noted Feb. 19.

★W. Va., Fairmont—Comrs. Marion Co. let contract improving 6,800 ft. Fairmont Rd., to H. M Leigh, Fairmont, $50,707.

★W. Va., Fairmont—Comrs. Marion Co. let contract improving 7,392 ft. Hunsaker Bridge Rd., Grant Dist., to Monogahela Constr. Co., Fairmont, $55,000; 12,200 ft. road from Teverbaugh to Brisco, to Van Wirt & Bromley, Fairmont, $83,345.

★W. Va., Marlinton—Comrs. Pocahontas Co. rejected bids received March 9, paving 1¼mi. Marlinton-Campbellsville Rd. About $24,000. Work will be done by day labor. Noted Feb. 26.

★W. Va., Spencer—Comrs. Roane Co. let contract improving 1.5 mi. Tanners Run Rd., involving 12,320 sq.yd. concrete, 9,197 cu.yd. excav. and drainage structures, to Hord Constr. Co., Maysville, Ky., $31,682.

★W. Va., Spencer—Comrs. Roane Co. let contract paving 2.2 mi. Spencer-Walton Rd., 16 ft. wide, involving 20,650 sq.yd. concrete, to Hord Constr. Co., Maysville, Ky., $62,985. Noted March 5.

★W. Va., Wayne—Comrs. Wayne Co. let contract improving 2.6 mi. Lavellete Camp Creek, 26 ft wide, involving 31,000 cu.yd.

Streets and Roads (Continued)

excav. and drainage structures, to C. E. Price, Huntington, $50,704. Noted March 4.

★**W. Va., Weston**—Comrs. Lewis Co. let contract paving 2 mi. Polk Creek Rd., to J. Fucey, Weston, $120,607. Noted March 18.

★**W. Va., Wheeling**—City let contract improving various streets with brick, to Mack Mfg. Co., New Cumberland, $36.25 per M.

★**South Carolina**—State Highway Dept., Columbia, let contract top soiling 16½ mi. Dixie Highway from Greenwood to county line, to Battershill & Gregory, Virgilina, Va., $88,807; paving 1¾ mi. above road with concrete, to Genl. Road & Drainage Co., Union Natl Bank Bldg., Columbia, $67,583.

★**S. C., Easley**—City let contract topsoiling and building combination curbs and gutters on 3 mi. streets, involving 72,000 lin. ft. concrete curbing and guttering and 3,000 cu.yd. earth excav., etc., to Greenville Tile Co., Greenville. About $60,000.

★**O., Dayton**—H. P. Martin, dir. pub. serv., let contract oiling 120 mi. gravel and macadam streets, involving 300,000 gal. oil, to Bond Oil Co., Tennessee St. near Reading Rd., $36,750. Noted March 4.

★**Michigan**—State Highway Dept., Lansing, let contracts grading, draining and surfacing 1.991 mi. State Trunk Line Rd. 10-7 A and 2.014 mi. State Trunk Line Rd. 10-8A, both 16 ft. wide, to J. Decker, Rogers, $26,546 and $25,892 respectively. Noted Feb. 26.

★**Mich., Bad Axe**—Rd Comn. Huron Co. let contract grading, shaping, draining and surfacing 5 mi. Atwater Rd., Sheridan Twp., 9 ft. wide, involving 26,500 sq.yd. Class "B" gravel, to McKenzie, Heron, Libkuman & Barnes, Bad Axe, $34,544.

★**Mich., Detroit**—City let contract grading, shaping and paving Dundee Whitfield and Yellowstone Aves., to W. B. Brady Constr. Co., 1972 Grand River Ave., $22,667, $10,499 and $18,830 respectively; Heckla and Kendall Aves., to Cleveland Trinidad Paving Co., 2940 Woodward Ave., $7,731 and $22,509 respectively; Engel, Lane, Palmer and Vernor Aves. and Lemay St., to Detroit Asphalt Paving Co., 201 McGraw Bldg, $3,658, $30,020, $10,557, $11,344 and $3,615 respectively. Noted March 18.

Wis., Janesville—Rock Co. State Rd. and Bridge Com. received bids March 9, grading and paving Janesville-Edgerton Rd., involving (a) 26,156 cu.yd. earth excav., (b) 1,304 cu.yd. rock excav., (c) 386 cu.yd concrete culverts, (d) 99,340 sq.yd. concrete surfacing exclusive of cement, (e) 1,240 lin.ft. guard rail, (f) 615 lin.ft. old guard rail reset, from McCullough & Cheney, Minneapolis, (a) $1.25, (b) $2.90, (c) $32, (d) $1.93, (e) $0.70, (f) $0.40, total cost, $254,498; P. W. Ryan & Sons, 214 Cherry St., Janesville, (a) $1.25, (b) $2.90, (c) $25, (d) $1.94, (e) $0.75, (f) $0.30, $253,438; G. Welsh, Beloit, (a) $1.25, (b) $3.00, (c) $25, (d) $1.89, (e) $1.00, (f) $0.10, $248,010. Noted March 11.

Wis., Madison—Bd. Pub. Wks. received bids March 10, paving (a) Commonwealth Ave. from Monroe to Allen Sts., (b) Virginia Terrace from Rowley Ave. to Rugby Row, (c) Rugby Row from Virginia Terrace to Commonwealth Ave., (d) 7th St. from Washington Ave. to Johnson St., (e) Warren St. from Drake to Erin Sts., creosoted wood block, (f) East Johnson St., concrete, from J. F. Icke, 255 Washington Bldg., (a) $53,930, (b) $12,214, (c) $9,877, (e) $7,995, (f) $44,139; J. R. Cullinane, 618 West Dayton St., (a) $58,000, (b) $12,332, (c) $10,000, (d) $13,589, (e) $7,961, (f) $44,000; N. Quinn, Madison, (c) $10,000, (f) $42,434; O'Dea & Shafer, Madison, (a) $58,075, (d) $13,588, (e) $8,089; Fess & Fess, Madison, (b) $12,078, (d) $13,588.

Wis., Madison—Bd. Pub. Wks. received bids March 11, paving with (a) 5 in. concrete base, (b) 1½ to 2 in. asphalt top, (1) Evergreen Ave. from Atwood to Oakridge Aves., (2) Elmside Blvd. from Atwood to Center Aves., (3) Jackson St. from Atwood Ave. to Chicago, Milwaukee & Northwestern R.R. tracks, (4) La Follette Ave. from Dunning to Waubesa Sts., (5) Lakeland Ave. from Oakridge to Miller Aves., (6) Marquette Ave. from Atwood Ave. to Chicago, Milwaukee & Northwestern R.R tracks, (7) Schiller Court from Oakridge Ave. to Lake Monona, (8) Waubesa St. from La Follette Ave. to Chicago, Milwaukee & Northwestern R.R. tracks, (9) Division St. from Oakridge to La Follette Aves., (10) Center Ave. from Dunning to Division Sts., (11) Keyes Ave. from Leonard St. to Commonwealth Ave., (12) Leonard St. from West Lawn to Commonwealth Aves., (13) Washington Ave. from Bedford to Park Sts., (14) University Ave. from Charter St. to Breese Terrace, (15) Park St. from Washington to Ridgewood Aves., from Fess & Fess, Madison (1a.) $8,026, (10a) $3,767, (15a) $21,896; G. Welch, Beloit, (1b) $5,223, (2b) $2,859, (3b) $7,391, (4b) $8,433, (5b) $3,955, (6b) $5,739, (7b) $2,411, (8b) $1,305, (9b) $8,219, (10b) $2,547, (11b) $2,629, (12b) $2,246, (13b) $30,272, (14b) $19,247, (15b) $11,887; J. R. Cullinane, 618 West Dayton St., (2a) $4,791, (3a) $14,400, (9a) $20,400, (14a) $29,000; N. Quinn, Madison, (4a) $20,500, (8a) $3,600; O'Dea & Shafer, Madison, (5a) $6,233, (6a) $10,487, (13a) $41,820; J. F. Icke, 255 Washington Bldg., (7a) $1,000, (11a) $5,743, (12a) $4,260. Noted March 4.

★**Wis., West Milwaukee** (Milwaukee, P. O.)—Village let contract paving various streets, with concrete, to McGucken Constr. Co., 425 East Water St., Milwaukee, $90,420.

★**Ia., Charles City**—City let contract paving various streets, involving 75,000 sq.yd. asphaltic concrete on concrete base, to Wright Constr. Co., Flynn Bldg., Des Moines. About $310,000. Noted Feb. 19.

★**Ia., Garner**—City let contract improving various streets, involving 100,400 sq.yd. 6 in. single course rein.-con. paving with integral curb, to Empire Constr. Co., 208 Flynn Bldg., Des Moines. About $365,000. Noted March 4.

★**Ia., Newton**—City let contract paving various streets, involving 80,000 sq.yd. asphaltic concrete on concrete base, to McLaughlin Constr. Co., Red Oak. About $320,000. Noted March 4.

★**Ia., Orange City**—City let contract paving 38 blocks, bitulithic, to Ford Paving Co., Cedar Rapids, at $3.99 per sq.yd.

★**Ia., Sac City**—City let contract paving various streets, involving 100,000 sq.yd. 6 in. single course rein.-con., to McLaughlin Constr. Co., Red Oak. About $360,000.

★**Minn., Aitkin** — H. C. Beecher, aud. Aitkin Co., let contract building 10 mi. State Rd. 3, Federal Aid Project 86, 24 ft. wide, to B. Olsen & Co., Aitkin, $63,947. Noted March 4.

★**Minn., Fergus Falls**—See "Excavation and Dredging."

★**Minn., Gaylord**—F. Hoppenstedt, aud. Sibley Co., let contract building 1 mi. Federal Aid Project 116, 24 ft. wide, to J. Cox, 959 Hastings Ave., St. Paul, $48,741; 9 mi. Federal Aid Project 74, State Rd. 1, 24 ft. wide, to Gould & Huntington, Glencoe, $61,000. Noted Feb. 5.

★**Minn., Montevideo**—J. J Stennes, aud. Chippewa Co., let contract graveling 12 mi. Federal Aid Project 122, 24 ft. wide, to Studee & Manton, Excelsior, $65,525 Noted March 4.

★**Minn., Rochester**—Olmsted Co. let contract improving 14 mi. Federal Aid Project 97, State Rd. 1, 24 ft. wide, to Winston Bros., 2516 Wabasha St., St. Paul, $107,983. Noted Feb. 26.

★**Kan., Belle Plaine**—City let contract paving various streets, involving 32,000 sq. yd. concrete, to E. M Eby, Wellington, $69,292.

★**Kan., Independence**—City let contract improving various streets, involving 16,059 sq.yd. pavement, to A. G Sherwood, Independence, $92,999, 21,844 sq.yd., to J. K. Shinn, Independence, $114,955

★**Kan., Troy**—City let contract paving, curbing and guttering and building storm sewers in various streets, to F. Cavender & Co., 612 New England Bldg., Kansas City, Mo., $230,000.

★**Neb., Humphrey**—J. A. Zavadil, village clk., let contract improving Dists. 2 and 3, involving 23,331 sq.yd. vitr. brick, 26,365 lin.ft. curbing and guttering, 2,850 sq.ft. sidewalk and 550 cu.yd. excav., to Western State Constr. Co., 1817 Douglas St., Omaha. Cost between $50,000 and $60,000. Noted Feb. 12.

★**S. D., Mitchell**—Davison Co. let contract for concrete work on Mitchell-Plankington Highway, involving small culverts and concrete head walls, to H. A. Kobes, Mitchell, $12,747.

S. D., Sioux Falls—City receives only bid paving 9 mi. various streets, from Western Asphalt Paving Co., Sioux City. Sheet asphalt on concrete base, $4.58 per sq.yd., sheet asphalt on crushed stone base, $4.38 per sq.yd., asphaltic concrete on concrete base, $1.33 per sq.yd., asphaltic concrete on crushed stone base, $4.13 per sq.yd., grading $1.35 per cu.yd., cement concrete headers, $0.82 per lin.ft., 6 in. drain tile laid, $1.12 per lin.ft., resetting and adjusting manhole, frames and covers, $6.50 each. Noted Feb. 26.

★**Mont., Dillon**—Beaverhead Co. will earth and gravel surface 90 mi. Beaverhead Trail, Butte-Salt Lake Rd., 18 ft. wide. About $150,000. Work will be done by day labor.

★**Mo., Potosi**—Washington Co. let contract building 3.53 mi. Desoto-Potosi-Irondale Rd., Potosi Special Rd. Dist., 24 ft. wide, to W. R. Hanby, Potosi, $13,096. Noted Feb. 26 under "Missouri."

★**Mo., St. Charles**—St. Charles Co. will build 1.66 mi. Natl. Old Trails Rd., 24 ft. wide. About $20,619. Work will be done by day labor. Noted Feb. 26 under "Missouri."

Tex., Georgetown—City will pave 8 blocks in business district, 1 in. bitulithic binding and top dressing on trap rock or granite base. Work will be done by day labor.

Tex., Liberty—C. N. Smith, judge Liberty Co., received bids March 10, grading, surfacing and draining 8.518 mi. Highway 35, Cleveland-Montgomery Rd., 16 ft. wide, involving 6.16 acres clearing and grubbing. 10,370 cu.yd unclassified earth excav., 136.6 cu.yd. Class "A" and 51.7 cu.yd. Class "B" concrete, (10,872 lb. reinforcing steel and 17,153.5 cu.yd. gravel, to be furnished by county), from J. S. Moore & Sons and H. F. Bland, Jasper, $88,657; Haden & Austin, 727 Kress Bldg., Houston, $110,511. Noted March 4.

★**Tex., Nacogdoches**—I. D Parmley, clk. Nacogdoches Co., let contract grading, gravel surfacing and building concrete culverts on 30 mi. road, extending west from here, 18 ft. wide, to Smith Bros., Crockett, $164,410. Noted March 18.

Tex., Port Lavaca—R. J. Hamilton, judge Calhoun Co., received bids March 12, grading and surfacing 10.312 mi. Highway 3, from here to Victoria Co. line, 16 ft. wide, involving 532,557 lin. ft. road machine work, from D. E. Miller, Houston, $35,321; B. S. Davidson, Houston, $49,938; M. M. Cravens, Bellaire, $52,493. Noted March 11.

★**Tex., Seguin**—Guadalupe Co. let contract paving 3.256 mi. Highway 2 from Bexar Co. to Comal Co. lines, 16 ft. wide, trap rock and asphalt ¾ in. thick, to Haden & Austin, 727 Kress Bldg., Houston, $11,318.

Okla., Okmulgee — City received bids March 8, resurfacing various streets, involving 46,000 cu.yd. 3 in. vitr. brick, asphalt filler, from Park & Moran, Okmulgee, $108,132; G. Smith Co., 53 West Jackson St., Chicago, $120,697; J. J. Rooney, Muskogee, $124,201. Noted Jan. 29.

★**Utah, Salt Lake City**—City let contract to Campbell Bldg. Co., Newhouse Bldg., paving 2.3 mi. streets in Gilmer Park, bituminous concrete, 36 ft. wide, also .26 mi. Michigan Ave. between 13th and 15th Sts. S., 42 ft. wide, 2 in. bituminous concrete on 5 in. concrete base, $77,717 and $27,708 respectively.

Utah, Salt Lake City—City received only bid paving and curbing 14,300 ft. 7th St. W. from 9th St. S. to 2d St. N. from Strange & Ballandingham, U. S. & T. Bldg., $107,821.

★**Nevada**—State Highway Comn., Carson City, let contract building 9.47 mi. State Highway on west side of Walker Lake, to Nevada Constr. Co., Hawthorne, $166,889. Noted March 4.

★**Nev., Reno**—City let contract for 635,000 sq.ft. bitulithic pavement, to Clark & Henry Constr. Co., Oehsner Bldg., Sacremento. About $162,000. Noted Feb. 19.

★**Ariz., Tucson** — Pima Co let contract grading and graveling 2¼ mi. Ft. Lowell Rd., to S. V. Faucett, $69,774.

★**Ariz., Tucson** — Pima Co. let contract grading and graveling 14.5 mi. road from Popago Indian Reservation to Twin Buttes, to Littlejohn, Singleton & Murphy, Tucson, $56,712. Noted Feb. 12.

★**Wash., Davenport**—Lincoln Co. let contract building 4 mi. Permanent Highway 3-A east and south of Harrington, involving 28,000 cu.yd. common excav., 800 lin ft. culvert pipe and 7,600 cu.yd. gravel surfacing, to Auld & Toms, Spokane, $39,650. Noted March 11.

Streets and Roads (Continued)

Wash., Seattle—Bd. Pub. Wks. received bids March 13, building 12,000 sq.yd. concrete sidewalk on 21st Ave., S., et al, from Di Julio & Alfonso, $22,605; J. L. Smith, $23,451; C. L. Creelman, $24,655; contractors all of Seattle.

★Wash., Seattle—Bd. Pub. Wks. let contract grading Edmunds St., et al, involving 28,200 cu.yd. earth excav. and 144 lin.ft. 24 in. sewer pipe, to Stillwell Bros., Boston Blk., $22,394. Noted March 18.

★Wash., Seattle—King Co. will grade and build trestle bridge, 1,710 ft. long, on 1 mi. Woodinville-Duvall Rd., involving 34,000 cu.yd. earth excav. and 328 M ft. lumber. About $50,097. Work will be done by day labor. Former bids rejected.

Wash., Waterville—Douglas Co. received bids March 4, grading, draining and paving 2 mi. L. I. D. Rd. 9, 18 ft. wide, involving 23,118 sq.yd. 1 course concrete, from Armstrong & Doust, Spokane, $61,886; Burk & Sengfelder, Wenatchee, $64,543; T. M. Morgan, Everett, $65,404.

★Wash., Wenatchee—Comrs. Chelan Co. let contract grading 4,600 ft. Chelan-Manson Highway, Bond Proposition 2-A, 24 ft. wide, involving 6,867 cu.yd. earth and 10,283 cu.yd. solid rock excav., 5,070 cu.yd. overhaul, etc., to Eagle Transfer Co., Wenatchee, $25,382. Noted Jan. 29.

California — State Highway Comn., 515 Forum Bldg., Sacramento, will grade 13 mi. State Highway between Three Creeks and Redwood Creek, 24 ft. wide, Humboldt Co. About $247,000. Work will be done by day labor.

★Cal., Hanford—City let contract paving Redington and Douty Sts., 1½ in. Warrenite surface on 4 in. bituminous base, to C. E. Blanchard Co., San Francisco, $182,361; Porter St., 1½ in. warrenite surface on 4 in. bituminous base, to Federal Constr. Co., Call-Post Bldg., San Francisco, $21,219.

★Cal., Holtville—City let contract paving Holt, Walnut Sts., et al, 1½ in. Warrenite surface on 2½ and 3½ in bituminous base, to G. H. Oswald, 366 East 58th St., Los Angeles, $112,477. Noted March 4.

★Cal., Martinez—Bd. Supervs. Contra Costa Co. let contract grading and concrete paving 7.3 mi. road in San Pablo Valley, 18 ft. wide, to Bates & Borland, Oakland Savings Bank Bldg., Oakland, $103,784. Noted March 18.

★Cal., Martinez—Contra Costa Co. let contract grading and concrete paving 3.25 mi. road between Avon and Bay Point, 18 ft. wide, to G. W. Cushing, 420 McDonald Ave., Richmond, $65,557; grading 8.48 mi. road between here and Hercules, 20 ft. wide, involving two 8 ft. concrete strips with 4 asphaltic concrete in center, to O'Brien Bros., Martinez, $178,892. Noted March 18.

★Cal., Napa—Bd. Supervs. Napa Co. let contract concrete paving 5.39 mi. road from here to Calistoga, to Galbrath & Jones, Richmond, $94,945.

Cal., Oakland—City received bids March 11 improving Prentiss St., Prentiss Pl. and portions Davis St. and Fruitvale Ave., involving 25,749 sq.ft. oil macadam, 1,644 lin.ft. concrete curbing, 3,779 sq.ft. concrete guttering, 2,500 cu.yd. earth excav., etc., from Hutchinson Co., 444 17th St., $9,174; Oakland Paving Co., 5000 Bway., $9,677; Bates & Borland, Bway. and 12th Sts., $9,856.

★Cal., Salinas — Bd. Supervs. Monterey Co. let contract surfacing Moss Landing-Pajaro Rd., to C. H. Ellison. $12,261.

Cal., San Francisco—City received bids improving Quesada Ave. between Railroad Ave. and Newhall St., from Eaton & Smith, 407 11th St., $23,027; State Impvt. Co., $23,697. Noted March 11.

★Cal., Santa Ana—City let contract paving and grading Fairhaven Ave., Rd. Dist. 4, to Wells & Boessler, Santa Ana, $13,080.

★Cal., Stockton—Bd. Supervs. San Joaquin Co. let contract grading and paving 8 mi. road between Ripon and Manteca, 16 ft. wide, 6 in. oil macadam, to W. Moreing, Stockton, $86,268. Noted Feb. 19.

★Cal., Ventura — Bd. Supervs. Ventura Co. let contract improving 23,823 ft. Grand Ave., through Bardsdale, involving 8,607 cu.yd. excav., 4,716 cu.yd. concrete paving, 212 cu.yd. concrete in culverts, 33 cu.yd. concrete in ditch lining, 12,080 lb. rein.-con., steel etc., to T. E. Hill & Co., 1011 Washington Bldg., Los Angles, $42,002, (county to furnish cement, sand and gravel); 30,930 ft. Camarillo Rd., involving 16,000 cu.yd. excav., 494,880 sq.ft. asphaltic concrete paving, 262 cu.yd. concrete in culverts, 17,000 lb. reinforcing steel, 1,600 ft. timber bridges, etc., to Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, $104,600. Noted Feb. 26.

★Cal., Woodland—Bd. Supervs. Yolo Co. rejected bids received March 2, building 10.77 mi. County Highway, Knights Landing to Coils Corner, concrete, Warrenite wearing surface on concrete base or Warrenite wearing surface on asphalt base. Work will be done by day labor. Noted Feb. 19.

★Cal., Yuba City—Bd. Supervs. Sutter Co. let contract paving 4.01 mi. Yuba City-Riego Rd., 4½ in. concrete, to Federal Constr. Co., Call Post Bldg., San Francisco, $104,600.

Railways

PROPOSED WORK

West Virginia—Eastern Ry., Charleston, plans to build 8½ mi. standard gauge line from Meadow Creek to Rainelle, through coal fields of Gavley Coal Land Co., 100 lb. steel rails. Engineer not selected.

California—T. D. Allin, 101 East Walnut St., Pasadena, W. Mulholland, Los Angeles and F. D. Howell, Chamber of Commerce Bldg., Los Angeles, submitted report to City of Pasadena estimating cost of electric railway between Pasadena and Los Angeles (exclusive of right-of-way), at $3,465,867. H. Dyer, city clk. Noted June 12.

New Brunswick—Canadian Pacific Ry., Windsor St., Montreal, plans to lay 80 mi. line between St. John, N. B., and Megantie, Que. Work includes 50 mi. ballasting and planting 4 mi. spruce hedges where snowdrifts interfere with operation. M. R. Fairbairn, ch. engr.

New Brunswick—D. F. Maxwell, engr. St. Stephen, receives bids about May, building 250 mi. line from St. Stephen to Quebec, Que. Owners name withheld.

Quebec — M. R. Fairbairn, ch. engr., Quebec Colonization Ry., (Canadian Pacific Ry.), Windsor St., Montreal, receives bids in May building 35 mi. line from Mont Laurier to Maniwaki. About $60,000 per mi.

Quebec—Quebec & Lake St. John Ry (Canadian Northern Ry.) Champlain Market Sta., Quebec, plans to build 120 mi. line from Chicoutini to St. Felicien. A. F. Stewart, Toronto, ch. engr.

Quebec — Quebec, Montreal & Southern Ry., 286 St. James St., Montreal, Ltd. survey made by J. MacMartin, consul. engr., Albany, N. Y., for 52 mi. extension from St. Philomene de Fortierville to Levis. About $1,000,000.

Ontario—Hydro Electric Power Comn. of Ontario, University Ave., Toronto, plans to build 35 mi. radial road from Coburg to Campbellford. F. A. Gaby, ch. engr.

British Columbia—M. R. Fairbairn, ch. engr., Kettle Valley Ry., (Canadian Pacific Ry.), Windsor St., Montreal, receives bids in April building 12 mi. railway from Coalmont to Granite Creek. About $480,000.

BIDS DESIRED

Texas—Until April 8, by P. A. McCarthy, ch. engr., Central Texas Electric Ry., 2003-9 Amicable Bldg., Waco, laying tracks, grading, building bridges and surfacing 1st section of Waco-Temple Div., between Waco and Rosenthal, 11 mi. long.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Md., Orangeville (Baltimore P. O.)—See "Industrial Works."

★O., Cleveland—Fisher Body Co., Oakland and Piquette Aves., Detroit, let contract building railroad siding, here, to A. S. Hecker & Co., 1841 East 93rd St About $30,000.

★Nova Scotia—Canadian Natl. Ry., Ottawa, Ont., let contract grading for double track from Springhill Jct. and Maccan, to Dominion Constr. Co., Main St., Moncton, N. B., $155,000; between Truro and Belmont, to Bate McMahon Co., 20 Central Chambers, Ottawa, Ont., $140,922.

★Quebec — Canadian Natl. Ry., Ottawa, Ont., let contract grading for double track between St. Rosalie and Charlotte, to Walters Doheney & Co., 602 McGill Bldg., Montreal. About $61,000.

Excavation and Dredging

PROPOSED WORK

Mo., Skidmore — Drainage — Skidmore Special D. D. plans to build system, including 7½ mi. ditch from here to Maitland. About $70,000. W. B. Hazen, 53 Commercial Bldg., St. Joseph, engr.

Idaho, Preston—Canal, etc.—Franklin Co. Reservoir Co. soon receives bids building main canal to present distribution system and 70 ft. dam to impound 20,000 acre ft. of water. About $200,000. T. H. Humpheries, Logan, engr.

Cal, Yaba City—Canals, etc.—Recl. Dist. 1,600 soon receives bids building canals, levees, pumping plans, etc., involving 5,000,000 cu.yd. earthwork. About $1,800,000. P. H. McGrath, California Fruit Bldg., Sacramento, secy. J. C. Boyd, 803 Forum Bldg., Sacramento, engr.

BIDS DESIRED

N. Y., Ft. Edward—Excavation—Until April 20, by E. S. Walsh, supt. Pub. Wks., Capitol, Albany, completing excavation of Champlain Canal between here and Crockers Reef, Contr. 194 Revised; advertised in this issue.

N. Y., New York—Dredging—Until March 30, by M. Hurlburt, comr. docks, Pier "A", foot of Battery Pl., furnishing labor and material for dredging in Manhattan, Queens and Richmond Boroughs.

Ia., Carroll — Drain — Until April 6, Bd. Supervs. Carroll Co., furnishing material and labor building Drain 87, involving 48,850 ft. 5-28 in. tile; Drain 88, 25,625 ft. 6-22 in. tile. P. Stephany, aud. I. W. Hoffman, Carroll, engr.

Minn., Madella—Ditch—Until March 30, by A. G. Countryman, aud. Watonwan Co. (St. James), building Judicial Ditch 31, consisting of Maine Line, involving 10,700 ft. 8-20 in. tile, Branch 1, 1,400 ft. 8 in. tile, Branch 2, 3,900 ft. 8 and 10 in. tile, Branch 3, 1,100 ft. 8 in. tile, Branch 4, 675 ft. 6 in.; also 1 concrete bulkhead at outlet, 3 surface inlets with grates, etc. About $30,000. T. J. Buhl, St. James, engr.

S. D. Woonsocket—Ditch—Until April 6, by Sanborn Co., building County Ditch 29, involving 33,400 ft. 6-27 in. drain tile, average depth 4.5-12 ft., and 25,925 ft. 8-24 in. sewer pipe, average depth 8-11 ft. E. B. Wilds, Woonsocket, aud.

Utah, Fillmore—Drainage—Until March 31, by D. D. No. 1, Millard Co, building system, involving 158,000 lin.ft. trenching and backfilling, 4 ft. to 7 ft. deep, and 158,000 lin.ft. 517 in. drain tile C. Brown, Walker Bank Bldg., Salt Lake City, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. Y., Stapleton—Dredging—M. Hurlburt, comr. docks, Pier "A," foot of Battery Pl., New York City, let contract removing waterfront structures at piers (a) 15, 16, 17 and 18, (b) 12 and 13, to A. M. Hazell, Inc., 26 Cortland St., New York City, (a) $23,777, (b) $13,279; dredging at same place, to New Jersey Shipbuilding & Dredging Co., 50 Broad St., New York City, $183,380 and $47,880 respectively. Noted March 4.

★Minn., Fergus Falls — Ditch—W. Lincoln, aud. Otter Tail Co., let contract building Ditch 68, 12 mi. long, involving 242,509 cu.yd. excav. and 9 acres clearing, also gravel surfacing 1 mi. road, to Northern Minnesota Drainage Co., Litchfield, $36,043. Noted Jan. 15.

★Utah, Salt Lake City—Canal—City let contract extending East Jordan Canal, 3 mi. long, 24 ft. bottom section, including bridges, syphons, etc., to J. L. Griffith, 2137 South 10th St. E., $49,044.

★Cal., Marysville — Irrigation — Cordua Irrigation Dist. having plans prepared building 9 mi. canals and laterals, involving 32,000 cu.yd. excav. About $20,000. Work will be done by day labor. W. Steel, Marysville, secy. Noted March 4.

★B. C., Vancouver—Dredging—Canadian Pacific Ry., Canadian Pacific Sta., Winnipeg, Man., let contract dredging 600,000 yd. and filling 700,000 yd. on site of new pier, on Boward Inlet, to Pacific Constr. Co., Ltd., 510 Hastings St. W. About $600,000.

Industrial Works

PROPOSED WORK

Mass., Everett (Boston P. O.)— Sexton Can Co., 228 Franklin St., Boston, soon lets contract building 3 story, 80 x 120 ft., brick and mill construction addition to factory, concrete foundation, on Cross St. About $80,000. Private plans.

Mass., Natick—New England Pressed Steel Co. soon receives bids building 1 story, 55 x 85 ft., brick and concrete addition to factory, concrete flooring and foundation. About $25,000. Private plans. Noted March 18.

Mass., New Bedford—Tuck & Gilman, archts. and engrs., 34 School St., Boston, soon receive bids building 1 story, 70 x 115 ft., brick and steel garage, concrete flooring and foundation, for J. D. Martin, Middle St. About $25,000. Noted March 18.

Mass., Quincy (Boston P. O.)—P. S. Yerxa, 1452 Hancock St., having plans prepared by W. H. Taylor, archt., 50 Bromfield St., Boston, for 1 story, brick and concrete garage, on School St. About $40,000.

Mass., Springfield—United Electric Light Co., State St., plans to build brick and steel substation, on Carew and North Sts. Private plans.

Mass., West Roxbury (Boston P. O.)—Water Dept., Brookline, having plans prepared by Strickland & Law, archts., Pemberton Sq., Boston, for 2 story, 40 x 40 ft., brick laboratory, concrete foundation, here About $25,000.

R. I., Providence—W. S. Achorn, Union and Fountain Sts., plans to build 1 story, brick and concrete addition to garage. About $36,000. Private plans.

Conn., Ansonia—Ansonia O. & C. Co., 153 Main St., had plans prepared by Lockwood, Greene & Co., archts. and engrs., 101 Park Ave., New York City, for 2 story, 80 x 125 ft., brick and concrete addition to factory, concrete flooring and foundation. About $100,000.

Conn., Bridgeport—Bershire Steel Products Co. soon receives bids building 2 story, 54 x 138 ft. warehouse, with 23 x 28 ft. ell, brick and steel, concrete foundation, on Railroad Ave. About $35,000. Private plans. Noted March 11.

Conn., New Britain—Landers, Frary & Clark, Commercial St., plans to build 1 story, 50 x 104 ft., brick and mill construction and addition to factory, concrete flooring and foundation. About $25,000. M. J. Unkelbach, 162 Main St., archt.

N. Y., Buffalo—Art Wks. Co., 700 Main St, having plans prepared by R. A. Wallace, archt., Mutual Life Bldg., for 2 story, 75 x 180 ft., brick factory, at 828-836 East Ferry St. About $70,000.

N. Y., Comstock—C. F. Rattigan, supt. state prisons, Albany, soon receives bids building 1 story, 60 x 170 ft., brick shop concrete foundation, at Great Meadow Prison, here. About $50,000.

N. Y., Endicott—Endicott Forging & Mfg. Co. plans to build 2 story, 30 x 60 ft., and 2 story, 46 x 84 ft., brick factories. About $30,000.

N. Y., Harrisville—Diana Paper Co. had plans prepared by C. E. Eaton, engr., 307 Sherman Bldg., Watertown, for 60 x 91 ft., concrete and steel addition to plant. About $40,000.

N. Y., New York—McKenzie, Voorhies & Gmelin, archts. and engrs., 1123 Bway., soon let contract building 8 story, 200 x 335 ft., rein.-con. and steel warehouse, rein.-con. flooring, concrete foundation, on Hudson St., for Western Electric Co., 195 Bway. Noted Feb. 5.

N. Y., Syracuse — Will & Baumer Co., Liverpool, having plans prepared by G. L. Noble, archt. and engr., Union Bldg., for 3 story, 72 x 255 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, on Liverpool Rd., here. About $200,000.

N. Y., Watertown—Beebe's Island Corp. having plans prepared by J. C. White Co., engrs., 215 Thompson St., New York City, for concrete and steel power house, on Beebe's Island, here. About $500,000. C. A. Starbuck, c/o New York Air Brake Co., 165 Bway., New York City, pres.

N. J., Jersey City—City Comn. soon receives bids building power house with mechanical equipment, for City Hospital. Cost to exceed $50,000. F. A. Dolan, clk.

N. J., Newark—Alliance Button Co., Lawrence and Mechanic Sts., having plans prepared by J. Green, archt., 27 Clinton St., for interior alterations to 2 factory buildings, brick. About $50,000.

N. J., Newark—Wright Aeronautical Corp. of Amer., 40 Wall St., New York City, soon lets contract building 2 story, 45 x 200 ft., rein.-con. and steel plant, rein.-con. flooring, concrete foundation, on Meeker Ave. About $350,000. J. Ingle, 527 5th Ave., New York City, archt. and engr.

N. J., Trenton—M. C. Ribsam, Broad and Front Sts., plans to build 3 story, 75 x 100 ft., brick and concrete warehouse, on East Front St. About $100,000. R. A. Schuman, 932 Lamberton St., archt. .

N. J., Verona—Lockwood, Greene Co., Co., archts. and engrs., 101 Park Ave., New York City, receives bids about March 31, building 2 story, 40 x 350 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, for Eagle Rock Mfg. Co. About $250,000. Noted Jan. 29.

Pa., Connellsville—Paragon Motor Co., 404 Century Bldg., Cleveland, having plans prepared by F. G. Hockenthal, engr., 401 Century Bldg., Cleveland, for two 1-story, 60 x 400 ft. and 40 x 540 ft., brick, steel and concrete factory buildings, concrete foundation, here. About $500,000.

Pa., Phila.—See "Buildings."

Md., Baltimore—Shann Motor Co., 3125 Philadelphia Ave., having plans prepared by R. Miller, archt., 330 East 33rd St., for 1 story, 150 x 169 ft., brick garage, cement flooring, concrete foundation. About $30,000

Md., Dukes (Adelina P. O.)—West Virginia Paper & Pulp Co., 200 5th Ave., New York City, having plans prepared by Lockwood, Greene & Co., archts and engrs., 101 Park Ave., New York City, for 3 story, concrete and steel manufacturing buildings, concrete foundations, here. About $300,000.

W. Va., Charleston—Lockwood & Greene, archts., 101 Park Ave., New York City, receives bids about April 5, building 3 story, 52 x 20 ft., rein.-con. and steel mill, rein.-con. flooring, concrete foundation, for Sauquit Silk Mfg. Co.

La., Baton Rouge—Constantin Refining Co., New 1st Natl. Bank, Okla., plans to build 20,000 bbl. oil refinery, 2½ mi. north of here. About $2,000,000. Architect and engineer not selected.

La., Mansfield—Hagan Producing & Refining Co. plans to build oil refinery. About $1,000,000. Architect and engineer not selected.

La., Shreveport — Associated Producing & Refining Co. plans to build oil refinery. About $100,000. Architect and engineer not selected.

La., Shreveport—Great Southern Producing & Refining Co., 1007 Hume-Mansur St., Indianapolis, Ind., plans to build 1500 bbl. oil refinery, here. About $250,000 R. N. Miller, genl. mgr. Engineer not selected.

O., Canton—Timken Detroit Axle Co., Waynesburg Rd. and Belden Ave., having plans prepared by H. M. Lane Co., engrs., 701 Owen Bldg, Detroit, for 1 story, 100 x 150 ft., rein.-con., steel and brick factory, rein.-con. flooring, concrete foundation.

O., Cleveland—A. Brudno, 1261 West 6th St., plans to build 6 story, 42 x 60 ft., steel and brick factory, on West 6th St. near St. Clair Ave. About $75,000 Architect not selected.

O., Columbus—Carroll-Thompson Co., 539 East Long St., having plans prepared by H. J. Dauben, archt., 560 South 3rd St., for 1 story, 150 x 150 ft., concrete and brick service station, on East Long St. About $150,000.

O., Columbus—Bassett & Tresselt, archts., Central Bank Bldg., receive bids about April 15, building 3 story, 60 x 188 ft., concrete, brick and stucco service station, on 9th and Broad Sts., for Ohio Auto Sales Co., 772 North High St. About $150,000. Noted Feb. 12.

O., Dayton—H. Gerstner & Sons, Cincinnati St., plans to build 3 story, 40 x 80 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, on Columbia and Cincinnati Sts. About $25,000.

O., Lorain—J. C. Newman Cigar Co., 3803 Woodland Ave., Cleveland, soon lets contract remodeling brick and timber factory, here. About $35,000. Fulton & Taylor, Hippodrome Bldg., Cleveland, archts.

O., Springfield — Springfield Malleable Iron Co., 37 Bechtle Ave., having plans prepared by Concrete Steel Constr. Co., archts., 415-16 Mitchell Bldg., for 2 story, 80 x 100 ft. steel cleaning room, also welfare building, including recreation rooms, shower baths, etc.; rein.-con. and brick, rein.-con. flooring, concrete foundation. About $40,000.

O., Xenia—Xenia Fdry. & Machine Co. having plans prepared by Pretzinger & Musselman, archts., City Natl. Bank Bldg., Dayton, for 1 and 2 story, 110 x 260 ft., brick and rein.-con. foundry, rein.-con. flooring, concrete foundation, on North West St., here. About $75,000.

Mich., Detroit—Blodgett Eng. & Tool Co., Kerr Bldg., having plans prepared by A. E. Harley, archt., 135 Woodward Ave., for 1 story, rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, on 14th and Dalzelle Sts.

Mich., Detroit—Cable Draper Baking Co., Vermont and Marquette Aves., plans to build 2 story, 90 x 150 ft., concrete, brick and steel garage, rein.-con. flooring, concrete foundation, on Vermont St. and Ferry Park Ave. About $40,000. Pollmar & Ropes, 45 State St., archts.

Mich., Detroit—H. J. Pelavin, 41 Sherman St., plans to build 1 story, 60 x 200 ft., brick and steel garage, concrete foundation, on Erskine St. About $25,000. Private plans.

Mich., Detroit—E. R. Dunlap, archt., 709 Hammond Bldg., soon lets contract building 1 story, 87 x 160 ft., brick, steel and stone garage and sales room, brick foundation, on Cass and Warren Aves., for Stuber Co., 775 Cass Ave. About $50,000.

Mich., Grand Rapids—Hanford Lumber Co., Russell St., having plans prepared by P. Lindout, archt., 817 Lake Drive, for 2 story, 50 x 100 ft., rein.-con. brick and steel factory, rein.-con. flooring. About $45,000.

Mich., Jackson—Michigan Light and Consumers Power Companies, 226 West Main St., plan to build 2 story sub-station, 140,000 volt, 15 kw., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, also single line steel tower transmission line from here to Battle Creek. About $410,000. Private plans.

Mich., River Rouge—Amer. Gypsum Co., Port Clinton, O., having plans prepared by L. Kamper, archt., Book Bldg., Detroit, for 1 story, rein.-con. and steel storage plant, rein.-con. flooring, concrete foundation, on West Jefferson St., to include sheet steel buildings, concrete pockets and 145 ft. rein.-con. tunnel, 7 x 6½ in. section, 14 in. walls. About $75,000.

Wis., Burlington—Burlington Brass Wks. having plans prepared by E. B. Funston, archt. and engr., Robinson Blk., Racine, for 1 story, 100 x 140 ft., brick and steel foundry, concrete foundation.

Wis., Marshfield—Roddis Lumber & Veneer Co. having plans prepared by Cahill & Douglas, engr., 217 West Water St., Milwaukee, for 1 story, brick and concrete power house addition.

Ia., Burlington — E. Showers plans to build 1 story, 100 x 300 ft. brick and steel factory, rein.-con. flooring, concrete foundation, on Des Moines St. About $500,000. N. Ferguson, Burlington, engr.

Minn., Minneapolis—Hennepin Atomized Fuel Co., 520 Security Bldg., preparing plans for 1 and 2 story, 100 x 150 ft. crushing plant, corrugated metal construction, on Bway. and Johnson St., N. E. About $150,000. Private plans.

Minn., Minneapolis — Montgomery & Ward Co., Chicago and Larrabee Sts., Chicago, soon receives bids building 8 story, rein.-con. warehouse, covering 750,000 sq. ft. floor space, on Snelling and University Aves., here. About $2,500,000. W. H. McCaully, care of owner, archt and engr.

Minn., Pelican Rapids—Farmers' Co-operative Creamery Assn. plans to build creamery. About $60,000. C. W Kampfer, 103 Bates Ave., St. Paul, archt

Minn., Rapidan—Rapidan Creamery Co. having plans prepared by A. Schipped, archt., 809 Coughlin-Hickey Bldg., Mankato, for 2 story, 50 x 60 ft. creamery, cement blocks. About $75,000.

Minn., St. Paul—Thompson Yards, Inc., 5th and Roberts Sts., having plans prepared by O. W. Johnson, archt., 2003 Ashland Ave., for 2 story, 98 x 592 ft. factory

Industrial Works (Côntinued)

and 2 story, 51 x 592 ft. crane shed, both mill construction, also 2 story, 51 x 574 ft. warehouse, cement and mill construction, on University Ave. near city limits.

Mo., Carthage—F. H. Lynch Tire & Rubber Co., Kansas City, having plans prepared by Akron Eng. Co., Akron, O., for 2 story, rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, here. About $150,00.

Mo., Sugar Creek—See "Buildings."

Tex., Dallas — Fleishmann Co., 711-13 North Ervay St., preparing plans for 1st unit of factory, to cost $1,000,000, ultimate cost, $1,500,000. Address G. W. Neary, 4630 Munger Ave.

Tex., Texas City—White Oil Corp., 501 5th Ave., New York City, plans to build refinery, 15,000 bbl. capacity, on 800 acre site, here. About $2,000,000. Engineer not selected.

Okla., El Reno—Tompkins Motor Co. preparing plans for 2 story, 50 x 120 ft., brick, concrete and steel garage, concrete foundation. About $70,000. Private plans.

Okla., Enid—R. R. Kisner having plans prepared by R. W. Shaw, archt., Beck Bldg., for 2 story, 50 x 150 ft., brick, concrete and steel garage, concrete foundation. About $55,000.

Okla., Oklahoma — Interstate Compress Co,. Ft. Smith, Tex., plans to build brick, rein.-con. and steel plant, rein.-con. flooring, here About $500,000 Architect and engineer not selected

Cal., Healdsburg—Pacific Evaporating Co, having plans prepared by W. Falch, archt., Hearst Bldg., San Francisco, for 1 story, frame and concrete, fruit dryer, concrete foundation. Cost to exceed $50,000.

Cal., Sacremento—Virden Packing Co., Inc., plans to construct plant, to include group of 1-3 story buildings, concrete and steel, on 110 acre site in western section of city. About $1,500,000. F. F. Atkinson, Mitau Bldg., secy.

Cal., San Francisco—State Bldg. Comn., Sacramento, plans to build 5 story, 60 x 130 ft., rein.-con. and steel warehouse, concrete foundation, on Stewart and Folsom Sts., here. Cost to exceed $50,000. W. G. McMillin, purch. agt

Cal., Wilmington—California Barium & Chemical Co. having plans prepared by A. C. Martin, archt., 430 Higgins Bldg., Los Angeles, for plant, here, to include group of frame buildings. Address J. O. Sword, Higgins Bldg., Los Angeles.

N. M., Clayton—City election April 6, to vote on $60,000 bonds to improve light and power plants.

N. B., Moncton—Moncton Tramways & Electric Co. soon receives bids constructing car barns and machine shop. About $150,000. A. Graves, Tramway Bldg., engr.

Ont., London—Columbia Handle Co., Adelaide St., plans to build 2 story, concrete, brick and steel factory, rein.-con. flooring, concrete foundation. About $25,000. Architect and engineer not selected.

Ont., London—W. A. Jenkins Mfg. Co., 363 Ridout St., plans to build flour mill, concrete and steel, concrete foundation. About $150,000. Architect and engineer not selected.

B. C., Vancouver—Dalton & Eveleigh, archts., Davis Chambers, receive bids about April 8, constructing 1 story, 120 x 175 ft. printing factory, rein.-con., brick and tile, concrete foundation, on Homer and Helmchen Sts., for British Columbia Printing & Litho Ltd., Smitbe and Homer Sts. About $80,000. P. P. Brown, 410 London Bldg., engr.

B. C., Vancouver — Lechie & Co., 220 Cambie St., receives bids about April 1, constructing 4 story, 40 x 110 ft. warehouse, rein.-con., brick and timber, rein.-con. flooring, concrete foundation, on Water St About $60,000. Dalton & Eveleight, Davis Chambers, archts

B. C., Victoria—Sidney Rubber Roofing Co., Sidney plans to build factory, here. Cost including equipment, $200,000. Architect and engineer not selected.

BIDS DESIRED

N. J., Irvington (Newark, P O.)—Vreeland Motor Co., 407 Elizabeth Ave., Newark, receiving bids constructing 1 and 2 story, 282 x 600 ft., 50 x 180 ft. and 200 x 250 ft., concrete and brick factory, office, community and machine shop buildings, on Coit St. About $300,000.

N. J., Newark — Meuller Ecclesiastical Art Wks., 89 Plaine St., receiving bids building 2 and 3 story, 46 x 47 ft. and 18 x 50 ft., hollow tile shop.

Pa., Wilkes-Barre—Until March 27, by A. Freeman, archt. and engr., 29 West 34th St., New York City, building 1 story, brick and steel mill, rein.-con. flooring, concrete foundation, here, for Hess-Goldsmith Co., 83 Waller St. About $200,000.

N. C., Burlington — Norcross & Keis, consult. engrs., 1625 Candler Bldg., Atlanta, Ga., receiving bids building hydro-electric plant 650-hp., on Haw River, near here, involving 2,600 cu.yd. plain concrete, 600 cu.yd. rein.-con., 25 tons structural steel, 750 cu.yd. earth and 500 cu.yd. rock excav., water wheels generator and appurtenances; advertised in this issue.

O., Cleveland—L. N. N. Fdry. Co., 2088 Scranton Rd., receiving bids building 1 story, 35 x 80 ft., concrete, steel and brick addition to foundry, rein.-con. flooring, concrete foundation. About $30,000. G. E. Rudolph, c/o owner, archt

Mich., Ironwood—Until April 1, by Buss Creamery Co. building 2 story, 60 x 80 ft., creamery, brick. A. C. Buss, pres.

Ill., Chicago—Dubin & Eisenberg, archts., 139 North Clark St., receiving bids building 2 story, 95 x 110 ft., brick and timber factory, brick foundation, on Fulton and Wood Sts., for Block Mfg. Co., 1219 West Lake St. About $65,000.

Kan., Wichita — Western Lithographing Co., 125 North Emporia Ave., receiving bids building 7 story, 60 x 140 ft., brick, rein.-con. and steel factory, rein.-con. flooring, concrete foundation. About $200,000. L. Schmidt & Co., 121 North Market St., archts.

N. S., Halifax—Until April 8, by K. H. Smith, secy., Nova Scotia Power Comn., building foundations and superstructures for 2 generating stations, pipe line grades etc. C. H. and P. H. Mitchell, 1003 Hamilton Bank Bldg., Toronto, engrs.

Ont., Ft. William—Until April 7, by city clerk, building 1 story, 80 x 100 ft. car barns, rein.-con., brick and steel, concrete foundations. About $100,000. C. B. Symes, city engr.

Ont., Sarnia—Until April 1, by Watt & Blackwell, archts., Bk. of Toronto Chbrs., London, for 2 story, 40 x 90 ft. woolen mill, rein.-con. for Sarnia Woolen Mills Co. About $25,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston** — Boston & Lockport Stone Co., East Boston, let contract building 1 story, 40 x 100 ft., brick and concrete factory, on Condor St., here, to F. C. Sperry, Cambridge. About $110,000.

★**Mass., Boston**—Columbus Trust Co., c/o W. L. Miner, archt., 46 Cornhill St., let contract building 90 x 160 ft., brick and concrete garage, rein.-con. flooring, concrete foundation, on Tremont St., to Dillaby Fireproofing Co., 101 Tremont St. About $65,000.

★**Mass., Cambridge**—H. Fishman, 208 Prospect St., will build 1 story, 76 x 107 ft., brick and concrete garage, concrete flooring and foundation. About $30,000. Work will be done by day labor under supervision of Tuck & Gilman, archts. and engrs., 34 School St., Boston. Noted March 18.

★**Mass., Cambridge**—A. R. Hyde & Co., 432 Columbia St., will build 2 story, 30 x 115 ft., brick and mill construction addition to factory, concrete foundation. About $25,000. Work will be done by day labor under supervision of Tuck & Gilman, archts. and engrs., 34 School St., Boston. Noted March 18.

★**Mass., Greenfield**—Pray & Siano, Dearfield St., will build 1 story, 55 x 105 ft., brick and concrete garage, concrete flooring and foundation, on Wells St. About $25,000. Owner's name withheld.

★**Mass., North Adams**—Berkshire Coal & Grain Co., 36 Union St., let contract building 80 x 128 ft., brick and timber storage plant, concrete foundation to G. H. Stebbins, North St. About $150,000.

★**Mass., Westfield**—H B. Smith Co., 57 Main St., let contract building 1 story, 80 x 208 ft., brick and concrete storehouse, rein.-con. flooring, concrete foundation, to P. J. Mahoney, 46 Orange St About $45,000.

★**R. I., Westerly**—F. P. Sheldon & Sons, engrs., 1008 Hospital Trust Bldg., Providence, let contract to R. A. Sherman Sons Co., 119 Main St., building 4 story, 106 x 108 ft. mill, 1 story, 145 x 350 ft. weave shed and 1 story, 116 x 120 ft. warehouse, brick and mill construction, concrete and rock foundation, on Mechanic St., here, for Lorraine Mfg. Co., 547 Mineral Springs Ave., Pawtucket. About $400,000. Noted Jan. 29.

★**Conn., Groton**—M. Pollack Co., 12 East 22nd St., New York City, let contract building 3 story, rein.-con. and steel mill, rein.-con. flooring, concrete foundation, here, to H. D. Best, 175 5th Ave., New York City.

★**N. Y., Brooklyn** — Lockwood-Greene Co., archts. and engrs., 101 Park Ave., New York City, let contract to Natl. Eng. Corp., 27 School St., Boston, building 3 story, 175 x 200 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on 2nd Ave., 51st and 52nd Sts., for Bemis Bag Co., c/o architects. About $500,000. Noted Jan. 8.

★**N. Y., Brooklyn**—Levy Bros., c/o Glucroft & Glucroft, archts. and engrs., 729 Flushing Ave., will build 3 story, 25 x 65 ft, brick and steel factory, rein.-con. flooring, concrete foundation, on Hamilton Ave. About $25,000. Work will be done by day labor under supervision of architects.

★**N. Y., Brooklyn**—M. E. Lucki, 21 Suydam St., will build 1 story, 75 x 150 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Utica Ave. About $50,000. Work will be done by day labor.

★**N. Y., Brooklyn**—E. A. Richards, 147 Barbey St., will build 1 story, 90 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Fanchon Pl. and Bushwick Ave. About $43,000. Work will be done by day labor.

★**N. Y., Brooklyn** — Schurmacher Bros., 2583 Fulton St., let contract building 1 story 50 x 90 ft., brick and steel factory, rein.-con. flooring, concrete foundation, at 45 Van Sinderen Ave., to C. Wuttke, 15 Hull St. About $32,000.

★**N. Y., Laurelton** (Jamaica P. O.)—Hathron Homes Co., c/o A. W. Pierce, archt. and engr., 26 Court St., Brooklyn, will build 1 story, 100 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Merrick Rd. About $30,000. Work will be done by day labor.

★**N. Y., Long Island City**—H. R. Mallinson, c/o Lockwood-Greene Co., archts., 101 Park Ave., New York City, let contract building 2 story, 125 x 207 ft., rein.-con. and steel mill, rein.-con. flooring, concrete foundation, to Hegeman-Harris Co., Inc., 33 West 42nd St., New York City. About $225,000.

★**N. Y., New York**—H. Davidowitz, 316 Stanton St., will build 2 story, 200 x 200 ft., brick and steel garage, rein.-con flooring, concrete foundation, at 40 West End Ave. About $100,000. Work will be done by day labor under supervision of L. F. J. Weiher, archt. and engr., 271 West 125th St.

★**N. Y., New York**—A. Guidone, 52 Vanderbilt Ave., will build 1 story, 100 x 100 ft., brick and steel garage, rein.-con., flooring, concrete foundation, on Fordam Rd. About $85,000. Work will be done by day labor.

★**N. Y., New York**—W. Lowe, 2145 Boston Rd., will build 1 story, 100 x 150 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 523 East 70th St. About $30,000. Work will be done by day labor.

★**N. Y., New York**—Standard Oil Co. of New York, 26 Bway., let contract building 2 story, 100 x 125 ft., brick and steel garage and shop, rein.-con. flooring, concrete foundation, at 631 West 46th St., to H. D. Best, 175-5th Ave. About $95,000. Noted March 18.

★**N. Y., Ogdensburg** — Coopers Brass Wks., Inc. let contract building brick and concrete factory, to J. A. Wert, Ogdensburg. About $87,000. Noted Jan. 22.

★**N. J., Jersey City**—Continental Candy Co., 374 Westside Ave., let contract building 8 story, 100 x 200 ft., brick, concrete and steel factory, concrete foundation, to Mitchell & Son Co., 76 Montgomery St. About $300,000.

★**N. J., Newark**—W. V. Egbert Co., Inc., 50 Mechanic St., let contract building 4 story, 50 x 100 ft., concrete and steel warehouse, to Amer. Concrete Steel Co., 31 Clinton St. About $100,000.

★**N. J., South River**—S. Blumenthal & Co. let contract altering concrete and frame mill building, to Rangeley Constr. Co., 56 West 39th St., New York City. About $25,000.

Industrial Works (Continued)

N. J., Trenton—Natl. Porcelain Co., Southard St., received bids March 15, building 2 story, 51 x 72 ft., brick and steel plant, from H. Hughes, 1145 Indiana Ave., $19,310; Trenton Bldg. Corp., 1430 Riverside Ave., $20,975; E. A. Lee, 511 Tyler St., $21,000.

★**N. J., Trenton**—Thermoid Rubber Co., Whitehead Rd., let contract building 1 story, 150 x 200 ft., brick and steel mill, concrete foundation, to N. A. K. Bugbee Co., 206 East Hanover St. About $75,000.

★**N. J., West New York** (Weehawken P. O.)—Gibralter Tire & Rubber Co., 234 4th Ave., New York City, let contract building 1 and 2 story, 90 x 140 ft., rein.-con. brick and steel, factory, rein.-con. flooring, concrete foundation, on Hudson Blvd. and 13th St., to E. J. Ashfield, 350 Fulton St., Brooklyn. About $60,000

★**Pa., Manchester**—Merchant—Evans Co let contract building concrete, brick and steel factory, rein.-con. flooring, concrete foundation, to Austin Co., 16112 Euclid Ave., Cleveland. About $150,000

★**Pa., Phila.**—G. W. Blabon & Co., Nicetown Lane, let contract building 3 story, 85 x 155 ft., concrete warehouse, to W. Steele & Sons Co., 16th and Arch Sts.

★**Md., Baltimore**—Daylight Realty Co., 512 Equitable Bldg., will build 1 story, 189 x 222 ft., concrete and brick garage, concrete and brick foundation, on Reistertown Rd. near Gordon St. About $50,000 Work will be done by day labor.

★**Md., Orangeville** (Baltimore P. O.)—Columbia Graphophone Co., Woolworth Bldg., New York City, let contract to M. A. Long Co., 1523 Munsey Bldg., Baltimore, constructing plant, including 6 story, 260 x 380 ft. cabinet factory, 1 story, 85 x 100 ft. power house, rein.-con., concrete foundations, also 1 story, 76 x 500 ft. dry kiln and 10 mi. track from plant to Baltimore & Ohio and Pennsylvania Railroads. About $2,500,000.

★**W. Va., Charleston** — Libby — Owens, Kanawha City, let contract building addition to power plant, near here, to H. P. Foley Co., 1413 G St. Washington. About $50,000.

★**W. Va., Wheeling**—Globe Automatic Sprinkler Co., 420 1st Natl. Bank Bldg., Cincinnati, let contract building 1 story, 100 x 230 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, here, to Austin Co., 16112 Euclid Ave., Cleveland. About $100,000.

★**O., Akron**—B. F. Goodrich Co., South Main St., let general contract building two 7 story, 80 x 160 ft., concrete, steel and brick additions to factory, rein.-con. flooring, concrete foundations, to T. E. McShaffrey Co., 173 South Forge St. About $1,000,000.

★**O., Cincinnati**—Monitor Stove & Range Co., North Gest St., let contract building factory on Edwards Rd., to Austin & Co., 16112 Euclid Ave., Cleveland. About $1,000,000.

★**O., Cleveland**—Buckeye Brass Co., 6410 Hawthorne Ave., let contract building 30 x 110 ft. foundry, 75 x 75 ft. furnace room and 18 x 35 ft. wash room, all 1 story, steel and brick, brick foundations, on Ashland Rd., to Gometz & Neshkes, 2361 East 61st St. About $75,000.

★**O., Cleveland**—City Machine Co., 5321 St. Clair Ave., let contract building 1 story, 50 x 126 ft., steel and brick addition to machine shop, brick foundation, to W. I. Thompson & Son, 5103 Euclid Ave. About $50,000.

★**O., Cleveland**—Natl Steel Barrel Co., 3860 East 91st St., let contract building 1 story, 125 x 160 ft., concrete, steel and brick addition to factory, rein.-con flooring, concrete foundation, to J. A. Moffett Constr. Co., Union Bldg. About $50,000.

★**O., Cleveland**—Otis Steel Co., Jennings Rd., will build 1 story, 100 x 115 ft., steel and brick machine shop, brick foundation About $50,000. Work will be done by day labor.

★**O., Dayton**—Genl. Motors Co., Taylor St., let contract building 6 story, 120 x 300 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, on 1st and Foundry Sts., to Davies, Chism & Davies, 601 Chamber of Commerce Bldg., Columbus. About $250,000.

★**O., East Cleveland** (Cleveland P. O.)—Natl Lamp Wks. of Genl. Electric Co., Nela Park, let contract building 1 story, 100 x 220 ft., laboratory, concrete, steel and brick, rein.-con. flooring, concrete foundation, in Nela Park, to Austin Co., 16112 Euclid Ave., Cleveland. About $100,000.

★**O., Springfield**—Chaney Mfg. Co., East Pleasant Sts., let contract building 2 story, 40 x 132 ft., rein.-con. and brick addition, to factory, rein.-con. flooring, concrete foundation, to P. R. Yeazell, High St About $30,000.

★**O., Youngstown**—Reliance Wheel Co. let contract building 1 story, 100 x 210 ft., steel and brick factory, brick foundation, to Austin Co., 16112 Euclid Ave., Cleveland. About $150,000.

★**Mich., Detroit**—Dean & Sherk, 812 Woodbridge St., let masonry contract building 3 story, 40 x 60 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on Bellevue and Mack Aves., to Culbertson & Kelly, 814 Ford Bldg. Noted March 18.

★**Mich., St. Clair**—Diamond Crystal Salt Co. let contract building 2 story, 100 x 160 ft., rein.-con. brick and steel warehouse, rein.-con. flooring, concrete foundation, on River front, to J. O'Sullivan & Sons, Pine Grove Ave., Port Huron. About $125,000.

★**Mich., Ypsilanti**—Peninsular Paper Co. let contract building 3 story, 66 x 99 ft., rein.-con. and brick warehouse, rein.-con. flooring, concrete foundation, to G. A. Sauer Co., Ann Arbor. About $70,000. Noted Jan. 1.

★**Ill., Chicago**—Amer. Glue Co., 123 West Kinzie St., let contract building 3 story, 100 x 112 ft., brick and timber factory, concrete foundation, at 3640 Iron St., to E. W. Sproul Co., 2001 West 39th St. About $175,000.

★**Ill., Chicago**—Pheoll Mfg. Co., 5700 Roosevelt Rd., let general contract building 1 story, 115 x 220 ft., brick and timber addition to factory, brick foundation, to E. L. Archbold, 111 West Washington St. About $65,000.

★**Ill., Chicago**—Truco Nut Butter Co., 30 North Michigan Ave., let contract building 4 story, 100 x 112 ft., rein.-con., brick and terra cotta factory, rein.-con. flooring, concrete foundation, on 37th and Iron Sts., to E. W. Sproul Co., 2001 West 39th St. About $250,000.

★**Wis., Beloit**—Beloit Iron Wks. Co. let contract building 1 story, brick, steel and concrete factory, rein.-con. flooring, concrete foundation, to Austin Co., 16112 Euclid Ave., Cleveland. About $350,000.

★**Wis., Menomonee Falls** — Schumann Motor Co. let contract building 1 story, 75 x 150 ft. brick and concrete garage, rein.-con flooring, concrete foundation, to Foster Constr. Co., Caswell Blk., Milwaukee. About $50,000. Noted Feb. 5.

★**Wis., Milwaukee**—Seaman Body Corp., 480 Virginia St., let contract building 1 story 50 x 90 ft., brick and concrete power house, rein.-con. flooring, concrete foundation, on Pt. Washington St., to Klug & Smith, 40 Mack Blk. About $50,000.

★**Minn., Fairmount** — Fairmount Pub. Heating Co. let contract installing vacuum steam heating plant, to W. T. Bain, 216 Water St., Milwaukee, Wis., and J. E. G. Robb, Minneapolis. About $170,000.

★**Minn., Minneapolis**—Berger Mfg. Co., 300 10th Ave., S, will build 1 story, 80 x 112 ft. addition to factory, on Ulysses St. and Bway. About $60,000. Work will be done by day labor.

★**Minn., Minneapolis** — Cooley Co., 325 3rd St., S., let contract building 1 story, 80 x 120 ft, rein.-con. and brick printing plant, on 6th St. and 7th Ave., S., to Fleisher Constr. Co., 608 Builders Exch. About $200,000. Noted March 11.

★**Minn., Minneapolis** — W T. Rawleigh Co., 9 Washington St., Freeport, Ill., let contract building 2 story, 50 x 160 ft., rein.-con. and brick factory, on 10th Ave., N., and 3rd St., here, to C. W. Lundquist Co., 1621 East Hennepin Ave.

★**Mo., Joplin**—Keystone Driller Co. 12th and Illinois Sts., let contract building 1 story, 125 x 140 ft. rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, to Concrete & Steel Constr. Co., 10th and Illinois Sts. About $100,000; cost plus percentage basis.

★**Cal., Los Angeles**—C. Lieb let contract building 2 story, 50 x 140 ft., concrete and brick factory, concrete foundation, on Grand Ave. between 24th and 25th Sts, to Walker & Eisen, 1402 Hibernian Bldg. Cost to exceed $50,000.

★**Cal., Pasadena**—S. Storrow let contract building 2 story, 85 x 140 ft., concrete and brick factory, concrete foundation, on Raymond Ave. near Dayton St., to L. P. Pomeroy, 751 North Catalina St., $38,615.

★**Cal., San Diego**—Spreckels-Savage Tire Co. let steel and iron structural contract building 75 x 660 ft. warehouse, to California Iron Wks., ft. 7th St., $18,000; concrete foundation and floors, to J. F. Over, San Diego, $10,750.

★**B. C., Hatzic**—Farmers Cold Storage Assn. let contract building 2 story, 60 x 150 ft. cold storage plant, mill construction, concrete foundation, to B. Davidson, 1012 Broughton St., Vancouver. About $50,000.

Buildings

PROPOSED WORK

Mass., Boston—Bank—Cosmopolitan Trust Co., 60 Devonshire St., having plans prepared by Mowll & Rand, archts., 50 Bromfield St., altering bank building. About $200,000.

Mass., Boston—Mercantile—Holland System, Inc., 27 Haymarket Sq., plans to build 5 story, 60 x 150 ft., brick and steel, concrete foundation, on Washington and Bennett Sts. About $125,000. W. H. Morton, 308 Boylston St., archt.

Mass., Boston—Office—Gordon & Schuman Syndicate having plans prepared by Mowll & Rand, archts., 50 Bromfield St., for 7 story, on Washington St. About $2,000,000.

Mass., Boston—Office—Salada Tea Co., 155 Berkeley St., had plans prepared by Densmore & LeClear, archts., 88 Broad St., for 8 story, 100 x 200 ft., rein.-con. and stone addition, rein.-con. flooring, concrete foundation.

Mass., Boston — School—Suffolk Law School, 45 Mt. Vernon St., plans to build 8 story, 87 x 110 ft., brick, concrete and steel. About $300,000. Fay, Spofford & Thorndike, 15 Beacon St., archts. and engrs.

Mass., Boston—Theatre and Store—J. C. Kiley, 18 Tremont St., having plans prepared by Mowll & Rand, archts., 50 Bromfield St., for theatre and store building, on Commonwealth and Alston Sts. About $800,000.

Mass., Brookline (Boston P. O.)—Club—Longwood Cricket Club, 27 State St., Boston, having plans prepared by Putnam & Cox, archts., 114 State St., Boston, for 1 and 2 story, concrete club house and swimming pool, on Chestnut Hill, here. About $50,000.

Mass., Dorchester (Boston P. O.)—Lion House—Park Bd., 33 Beacon St., Boston, soon lets contract building 1 story, 35 x 100 ft., brick, concrete and stone, rein.-con. flooring, concrete foundation, at Franklin Park, here. About $60,000.

Mass., Chicopee—Theatre—R. B. Warner, archt., 168 Bridge St., Springfield, soon receives bids building 1 story, brick and steel, rein.-con. flooring, concrete foundation, on Springfield St., for W. H. Cone, c/o architect. About $60,000. Noted Feb. 26.

Mass., Falmouth—Hall—Town Memorial Comn. having plans prepared by R. C. Sturgis, archt., 120 Boylston St., Boston, for memorial hall. About $250,000. G. W. Jones, chn.

Mass., Malden (Boston P. O.)—Memorial—Memorial Com. plans to build brick, concrete and steel. About $300,000. A. Ulrich, 34 Waite St., chn. Architect not selected.

Mass., New Bedford—Theatre—Gordon & Schuman having plans prepared by Mowll & Rand, archts., 50 Bromfield St., Boston, for theatre on Purchase St. About $500,000.

Mass., Newton Center (Boston P. O.)—Church—Trinity Episcopal Church having plans prepared by Peare, Quiner, Nevin & Chickering, archts., 6 Beacon St., Boston, for 2 story, 26 x 40 ft., brick, stone and steel addition.

Mass., Plymouth—Memorial Hall—Town had plans prepared by Little & Russell, archts., 45 Bromfield St., Boston, for 2 story, irregular shaped brick. About $300,000.

Mass., Saugus (Boston P. O.)—Memorial—Town and Amer. Legion plans to con

Buildings (Continued)

struct memorial building. About $50,000. Architect not selected.

Mass., Springfield — Club and Social — Knights of Columbus having plans prepared by J. W. Donahue, archt., 40 Walker Bldg., for brick, concrete and steel, on Elm St. About $400,000. J. M. Sullivan, chn. bldg. com.

Mass., Springfield—Theatre—Fox Amusement Co., 130 West 46th St., New York City, soon receives bids building 107 x 163 ft., brick, concrete and steel, rein.-con. flooring, brick and concrete foundation, on Main St., here. About $500,000. C. H. Crane, 100 Griswold Bldg., Detroit, Mich., archt.

R. I., Manville—Church—St. James Roman Catholic Congregation plans to build 1 story. About $60,000. E. Lessard, pastor. Architect not selected.

Conn., Hartford — Church — St. Anthony Roman Catholic Church, 125 Market St., having plans prepared by O'Connell & Shaw, archts., 181 Boylston St., Boston, for 1 story, brick and steel, on Talcott St. Cost between $100,000 and $125,000. Noted Feb. 12.

Conn., New Britain—Club—Amer. Legion (Eddy Glover Post), plans to build brick and steel. About $100,000. Architect not selected.

Conn., New London—Bank—T. M. James, archt., 3 Park St., Boston, soon lets contract building 2 story, 40 x 100 ft., brick, steel and stone, concrete flooring and foundation, for Natl. Bank of Commerce, 166 State St. Cost between $80,000 and $100,000. Noted March 11.

Conn., Plainville—School—Town plans to build 2 story, brick and steel. About $50,000. W. J. Johnson, 1st selectman. Architect not selected.

Conn., Terryville — School — Plymouth Twp. plans to build brick and steel, on East Main St., here. About $50,000. A. H. Lister, 1st selectman.

N. Y., Albany—Bank—Ogden & Gander, archts., Steuben St., soon receive bids altering and building 4 story, 28 x 50 ft., brick addition, for Natl. Savings Bank, 70-72 State St. About $90,000. J. Manning, pres.

N. Y., Brooklyn — Theatre — Levy Bros., c/o Bedford Theatre, Bedford Ave., having plans prepared by T. W. Lamb, archt. and engr., 644 8th Ave., New York City, for brick, steel and stone, brick foundation, on New Utrecht Ave. and 51st St. About $250,000.

N. Y., Endicott—Church—Orthodox Greek Assn. purchased 50 x 160 ft. site on Arthur Ave. and plans to build brick and stone, cost between $50,000 and $60,000. Address S. Glanakouros.

N. Y., New York—Exchange—New York Telephone Co., 15 Dey St., having sketches made by McKenzie, Voorhies & Gmelin, archts. and engrs., 1123 Bway., for 80 x 192 ft., brick, steel and stone concrete foundation, on 73rd St. between Columbus and Amsterdam Aves. About $1,540,000.

N. Y., New York—Hotel—West 48th St. Realty Co., c/o Gronenberg & Leuchtag, archts and engrs., 303 5th Ave., having plans prepared for 14 story, brick, steel and stone, concrete foundation, on 8th Ave. and 43rd St. About $1,500,000. H. Claman, pres.

N. Y., New York—Office—F. B. Jennings, c/o S. N. Polis, archt. and engr., 50 Church St., having plans prepared for 16 story, (with 5 story tower) brick, steel and stone, concrete foundation, at 7-11 Water St.

N. Y., New York—Stores—Wendell Estate, c/o C. E. Birge, archt. and engr., 29 West 34th St., having plans prepared converting 6 story, brick and steel office building at 181 Bway., into store building. About $65,000.

N. J., East Orange—Hotel—E. V. Warren, archt., Essex Bldg., Newark, preparing plans for 5 story, 70 x 140 ft., brick, on Harrison St. About $500,000. Owner's name withheld.

N. J., Jersey City—Hotel and Theatre—Stonedin Realty Corp., 82 Monticello Ave., plans to build 12 story, on Hudson Blvd. About $200,000.

N. J., Vineland—School—Sacred Heart Parish rejected bids building 2 story, 60 x 120 ft., brick and stone. Noted March 11.

N. J., Westfield—Church—E. Lynch, archt., 341 Fifth Ave., New York City, soon lets contract building 1 story, 65 x 115 ft., brick, steel and stone, brick foundation, here, for Holy Trinity Church, c/o architect. About $100,000.

Pa., Phila.—Hospital—C. A. Ziegler, archt., Bailey Bldg., soon lets contract building 2 story, 30 x 75 ft., brick, on Wingohocking and Broad Sts., for St. Luke's Hospital. Cost to exceed, $50,000.

Pa., Phila.—Office—C. R. Peddle, archt., 136 South 4th St., preparing plans for 3 story, 20 x 95 ft., concrete and brick, at 328 Market St. About $50,000. Owner's name withheld.

Pa., Phila.—Office—M. White and B. Barron, Morris Bldg., soon let contract building 2 story, 27 x 109 ft., concrete, at 1310 North Broad St. About $50,000. L. B. Rothchild, 1225 Sansom St., archt.

Pa., Phila.—Office—C. Williams, 2340 North 32nd St., plans to build 2 and 3 story, 35 x 50 ft. and 16 x 60 ft., brick and concrete, office and garage, on Dauphin and 30th Sts. About $60,000. H. R. Stackhouse, 129 South 5th St., archt.

Md., Baltimore—Theatre—O. B. Wight, archt., 1101 Munsey Bldg., preparing plans for 1 story, 64 x 170 ft., concrete and brick, concrete foundation, at 1600 Druid Hill Ave. About $50,000. Owner's name withheld.

Md., Hamilton (Baltimore P. O.)—Church—Protestant Episcopal Church of Messiah, 215 East Preston St., Baltimore, acquired site on Harford Rd., here, and plans to build 1 story, concrete and stone, concrete and rock foundation. About $60,000. P. Wroth, rector.

Md., Sparrows Point—Office—Bethlehem Shipbuilding Corp. preparing plans for 3 or 4 story, 75 x 200 ft., concrete, steel and brick. About $100,000. Private plans.

D. C. Washington—Church—Greek Community of St. Sophia having revised plans prepared by Donn & Demming, archts., 808 17th St., for brick and limestone church, on 8th and L Sts. About $100,000. Former bids rejected.

D. C., Washington—College—Washington Collegiate Institute having plans prepared by Magaziner & Eberhard, archts. and engrs., 603 Chestnut St., Phila., for group of concrete and brick college buildings, here. Cost to exceed $59,000.

D. C., Washington—Embassy—G. O. Totten, Jr., archt., 803 17th St., N. W., soon receives bids building 3 story, 70 x 100 ft., on 16th St. and Park Rd., for J. B. Henderson, 2200 16th St., N. W. About $150,000.

D. C., Washington—Dormitory—Durham Hosiery Mills Co., Durham, N. C., having plans prepared by Milburn, Heister & Co., archts., Union Savings Bldg., Washington, for 4 story, 90 x 180 ft., hollow tile and stucco, here.

D. C., Washington—Theatre—J. Brylawski, c/o Cosmos Theatre, 919-21 Pennsylvania Ave., N. W., and Nixon & Nirdlinger, 16th and Walnut Sts., Phila., having plans prepared by Zink & Sparklin, Inc., archts., Munsey Bldg., Baltimore, for 3 story, concrete and brick, on 13th and E Sts., here. About $500,000.

D. C., Washington—Theatre—T. Moore, c/o Rialto Theatre, 713 9th St., N. W., having revised plans prepared by Zink & Sparklin, Inc., archts., Munsey Bldg., Baltimore, for 1 story, 35 x 100 ft. and 101 x 150 ft., on 14th St. and Park Rd. About $250,000.

Va., Richmond—Clubhouse—Westmorehead Club, Grace St., having plans prepared by A. C. Bossom, archt. and engr., 680 Sixth Ave., New York City, for 3 story, 80 x 140 ft., brick, steel and stone, brick foundation. About $350,000.

S. C., Charleston—Dormitories, Academic, etc.—State Bldg. Comn., Columbia, plans to construct dormitories, academic buildings, etc., here. About $600,000. Lockwood Greene & Co., 101 Park Ave., New York City, archts.

Ga., Athens—Y. W. C. A., 600 Lexington Ave., New York City, having sketches made by F. B. and A. Ware, engrs. and archts., 1170 Bway., New York City, for brick, steel and stone building. About $50,000.

O., Cleveland—Bank and Commercial—Lake Shore Banking & Trust Co, East 55th St. and St. Clair Ave., having plans prepared by Osborn Eng. Co., archts., 2848 Prospect Ave., for 2 story, 77 x 179 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 79th St. and Euclid Ave. About $100,000.

O., Cleveland—Commercial—Lehman & Schmitt, archts., Electric Bldg., soon let contract building 4 story, 140 x 240 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on East 46th St. and Euclid Ave., for H. D. Koblitz Plumbing & Heating Co., 1310 Huron Rd. About $200,000. Noted Jan. 22.

O., Cleveland — Commercial — Stillman-Redick Co., 905 Society for Savings Bldg., plans to remodel 4 story, on West 9th St. and Superior Ave. About $50,000. Architect not selected.

O., Cleveland—Fire Stations—City plans to build 2 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on Gordon Court, S. W., cost $50,000; 2 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 131st St. and Union Ave., $50,000; also 2 story, concrete, steel and brick fire station and dock, rein.-con. flooring, concrete foundation, on West 3rd St. and Scranton Rd., $50,000. F. H Betz, 604 City Hall, archt.

O., Cleveland—Police Stations—City plans to build 2 story, on East 131st St. and Union Ave., cost $50,000; also 2 story on East 37th St. and Woodland Ave., $100,000; both concrete, steel and brick, rein.-con. flooring, concrete foundations. F. H. Betz, 604 City Hall, engr.

O., Cleveland—Store—W. Taylor & Son Co., Euclid Ave., plans to build 8 or 10 story, 69 x 200 ft., concrete, steel and brick addition, rein.-con. flooring, concrete foundation, on Euclid Ave. near East 6th St. About $500,000. Architect's name withheld.

O., Cleveland—Store and Offices—C. Shane, 2147 Ontario St., having preliminary plans prepared by W S. Lougee, archt., Marshall Bldg., for 12 story, concrete, steel and brick, rein.-con. flooring, concrete foundation. About $750,000.

O., East Palestine—High School—City election April 27, to vote on $200,000 bonds to build high school.

O., Linden (Columbus P. O.)—School—Bd. Educ., Columbus, having revised plans prepared and receives bids about May 1, building 2 story, irregular shaped, concrete and brick, here. D. Reibel & Sons, New 1st Natl. Bank Bldg., Columbus, archts. Noted March 11.

O., Rocky River—Bank—Riverside Savings & Loan Co. plans to build 2 story, concrete, steel and brick, rein.-con. flooring, concrete foundation. About $100,000. J. A. Spitzig, secy. Architect not selected.

Mich., Detroit—Church—Holy Redeemer Church, Dix Ave., having plans prepared by Donaldson & Meier, archts., 1314 Penobscot Bldg., for 2 story, rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation, on Dix and Junction Aves. About $300,000. Noted March 18.

Mich., Detroit — Sales — See "Industrial Works."

Mich., Detroit—Seminary—Sacred Heart Seminary, c/o W. W. Walker, chn., 155 McDougal Ave., plans to build 3 story, rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation, on Linwood Ave. and Joy Rd. About $2,500,000. Architect not selected.

Mich., Flint—Office—Flint Medical Society having plans prepared by Cowles & Mutscheller, archts., 1 Case Blk., Saginaw, for 4 story, 85 x 150 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on 4th and Detroit Sts. About $200,000. Noted March 18.

Mich., Sheboygan—Municipal—City soon lets contract building 2 story, 60 x 120 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $150,000. L. E Berry, clk.

Ill., Chicago—Home—Jewish Day Nursery, 1441 Wickes Park Ave., having plans prepared by Ludgin & Leviton, archts., for 2 story, 60 x 120 ft., brick and stone foundation, on California Ave. and Hirsch Blvd. About $100,000.

Ill., Chicago—Theatre and Hotel—H Schoenstadt, 36 South State St., having preliminary plans prepared by H. E. Newhouse, archt., 4630 Prairie Ave., for 95 x 185 ft., on 51st St. and Blackstone Ave. About $700,000.

Buildings (Continued)

Wis., Kenosha—Business—I. Stern, 901 Market St., and H. Miller, archt., 646 24th St., Milwaukee, receiving bids building 2 story, 46 x 80 ft., brick and concrete, rein.-con. flooring, concrete foundation. About $50,000.

Wis., Milwaukee—Market, Shelters and Comfort Station—City soon lets contract building 1 story, irregular shaped, rein.-con., brick and stucco, rein.-con. flooring, concrete foundation. About $60,000. C. E. Malig, City Hall, archt.

Wis., Milwaukee—Sales—Wisconsin-Oakland So., 525 Jefferson St., soon lets contract building 3 story, 100 x 120 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation, on Oneida St. About $100,000. A. C. Eschmeiler, Goldsmith Bldg., archt. Noted Feb. 26.

Wis., Reedsburg—High School—City rejected bids received March 10 building 2 story, brick addition, rein.-con. flooring, concrete foundation. About $60,000. J. R. and E. Law, Gay Bldg., Madison, archts. Noted Feb. 26.

Ia., Dana—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 2 story, rein.-con. and brick, rein.-con. flooring, concrete foundation. About $100,000. G. Meredith, secy.

Ia., Greenbrier—School—Bd. Educ. plans to build 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. M. B. Cleveland, Waterloo, archt.

Ia., Guss—School—Bd. Educ., Rural Route, Nodaway, having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 2 story, 56 x 86 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, in Nodaway Twp., Taylor Co. About $100,000.

Ia., Le Mars—Church—German Evangelical Church having plans prepared by W. E. Hulse & Co., archts., Masonic Temple, Des Moines, for 2 story, 43 x 80 ft., brick, concrete and steel, concrete foundation. About $60,000.

Ia., Marshallton—Grade School—Bd. Educ. having plans prepared by Tyrie & Chapman, archts., 320 Auditorium Bldg., Minneapolis, for 2 story, 34 x 148 ft., rein.-con., stone and brick. About $100,000. C. E. Shutt, co. supt.

Ia., Mediapolis—School—Bd. Educ. plans to build 2 story, brick, concrete and steel, concrete foundation. About $80,000. Keffer & Jones, Masonic Bldg., Des Moines, archts. Noted Feb. 12.

Ia., Orient—School—Bd. Educ. plans to build brick, concrete and steel, brick foundation. About $90,000. Architect will be selected at once.

Ia., Pella—Community—Pella Central College having plans prepared by Benjamin & Wesmoeff, archts., Grand Rapids, Mich., for 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $60,000.

Ia., Reinbeck—School—Bd. Educ. having plans prepared by Netcott & Netcott, archts., Waterloo, for 2 story, 96 x 140 ft., brick, rein.-con and steel, rein.-con. flooring, concrete foundation. About $225,000.

Ia., Wayland—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., Masonic Temple, Des Moines, for 2 story, 56 x 94 ft., brick, rein.-con. and steel rein.-con flooring, concrete foundation. About $80,000.

Minn., Jordan—Bd. Educ. having plans prepared by K. T. Snyder, archt., 933 Plymouth Bldg., Minneapolis, for 2 story, brick addition, here. About $50,000. P. T. Hunziker, clk.

Minn., Minneapolis—School—Bd. Educ. preparing sketches for remodeling and building 2 story, brick addition, on Clinton Ave. About $120,000.

Minn., Red Wing—Office—Red Wing Advertising Co. having plans prepared by A. F. Gauger, archt., 302 Central Bank Bldg., St. Paul, for 2 story, 40 x 50 ft., brick and timber. About $50,000.

Minn., St. Paul—Hotel—A. H. Heimbach, 467 Roy St., having plans prepared by M. A. Wright, archt., 600 Pittsburgh Bldg., for 6 story, 100 x 134 ft., rein.-con., on Snelling and Sherburne Aves. About $500,000.

Minn., St. Paul—Hotel—Merchants' Hotel, 3rd and Jackson Sts., plans alterations, to include restaurant, 50 new baths, etc. About $100,000. H. L. Stewart, mgr.

Minn., St. Paul—Office—Thompson Yards, Inc., 5th and Robert Sts., having plans prepared by O. W. Johnson, archt., 2003 Ashland Ave., for 3 story, 140 x 160 ft., rein.-con., on University Ave. near city limits.

Kan., Beverly—School—Bd. Educ. plans to build 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $80,000. Architect and engineer not selected.

Kan., Junction City—Temple—Masonic Lodge 7 having plans prepared by C. D. Turnbull, archt., Junction City, remodeling brick, concrete and steel, rein.-con. flooring, concrte foundation. About $150,000.

Kan., Kansas City—Station—Kansas City Terminal Ry., Union Sta., Kansas City, Mo., had plans prepared by Rose & Peterson, archts., Barker Bldg. and A. H. Buckley, associated archt., 823 Gloyd Bldg., Kansas City, Mo., and soon receives bids building 1 story, 34 x 141 ft. passenger station and 23 x 34 ft. head house, rein.-con. and stone, concrete foundation, on 7th St. along tracks of Union Pacific R.R., here. About $100,000.

Kan., Leona—School—Bd. Educ. having plans prepared by T. W. Williamson & Co., arcths., 418 Central Natl. Bank Bldg., Topeka, for 2 story, concrete, steel and brick, concrete foundation. About $60,000.

Kan., Topeka—Hospital—Christ's Hospital Assn., c/o D. Kay, having plans prepared Assn., c/o D. Kay, having plans prepared by R. E. Schmidt, Garden & Martin, archts., 104 South Michigan Ave., Chicago, for brick, rein.-con. and steel, rein.-con flooring, concrete foundation. About $350,000.

Neb., Hastings—Auditorium—City plans to build auditorium. About $175,000. A. T. Bratton, clk. Architect not selected.

Neb., Omaha—Law and Dental—Creighton University, c/o J. F. McCormick, pres., 25th and California Sts., having preliminary plans prepared by J. Latenser & Sons, archts., 632 Peters Trust Bldg., for rein.-con., brick and stone, on 25th and California Sts. About $200,000.

S. D., Sioux Falls—School—City election April 8 to vote on $500,000 bonds to build schools.

N. D., Bismarck—Office—Bismarck Tribune Co. plans to build 2 story, 50 x 150 ft. About $100,000. G. H. Shanley, 511 1st Natl. Bank Bldg., Great Falls, Mont., archt.

N. D., Fargo—Business—Advance Rumley Thresher Co., 508-10 Northern Pacific Ave., having plans prepared by J. C. Llewellyn & Son, archts., Fargo, for 2 story, 100 x 180 ft., on 3rd St., N and Northern Pacific Ave. About $200,000.

Mont., Great Falls—Office and Bank—Knights of Columbus plan to build 6 story, 100 x 150 ft. About $600,000. G. H. Shanley, 511 1st Natl. Bank Bldg., archt.

Mo., Columbia—Hospital—Boone Co. Hospital Bd., c/o H. H. Banks, receives bids about May 1, building 3 story, 40 x 125 ft., rein.-con., brick and stone, concrete foundation. About $175,000. Shepard & Wiser, Long Bldg., Kansas City, archts. and engrs.

Mo., Cainesville—School—Bd. Educ. having plans prepared by H. D. Pumpel, archt., Finance Bldg., Kansas City, for 2 story, 63 x 84 ft., brick and steel, concrete foundation. About $60,000

Mo., Kansas City—Sales—T. H. Mastin & Co., 410 Fidelity Trust Bldg., plans to build 4 story, 100 x 115 ft., on 19th St. and Grand Ave. About $200,000. Architect not selected. Wadell-O'Brien Motor Co., lessee.

Mo., Kansas City—Sales and Office—Maslin Mining & Realty Co., 809 Republic Bldg., having plans prepared by C. P. Schmidt, archt., 305 Shukut Bldg., for 4 story, 100 x 115 ft., on 19th St and Grand Ave. About $200,000. Wadell-O'Brien Motor Co., lessee. Noted March 25.

Mo., Sugar Creek—School, Etc.—Bd. Educ. receives bids about April 2, building 2 story, 63 x 86 ft. school and 1 story, 24 x 50 ft. boiler house, rein.-con. and stone, concrete foundations. About $70,000. A. B. Anderson, 818 New York Life Bldg., Kansas City, archt.

Tex., Dallas—Hotel—A. K. Sternenberg and K. Beall, Chicago, plan to build 1 story (36 rooms), addition to Galloupe Hotel, at 2009-2011 Main St., here. About $60,000. Architect not selected.

Tex., Dallas—Office—Equitable Co., Inc., with $1,000,000 capital stock, plans to construct 12 or 15 story office building. H. B. Terrell, pres.

Tex., Dallas—Sales—Keith-Patterson Motor Co., 2100 Commerce St., having plans prepared for 2 story, 132 x 137 ft., rein.-con., steel, tile and terra cotta, rein.-con. flooring, on Ervay and St. Louis Sts. About $200,000. M. B. Keith, pres. Architect's name withheld.

Tex., Lamesa—School—City voted $150,000 bonds to build school.

Tex., Lockhart—Schools—City election April 3 to vote on $200,000 bonds to build schools.

Tex., Paris—School—City election April 13, to vote on $400,000 bonds to build schools, $325,000 to be used for new buildings.

Okla., Carmen—School—Bd. Educ. plans to build school. About $72,000. Architect and engineer not selected.

Okla., McAlester—Court House—Pittsburg Co. election April 5 to vote on $350,000 bonds to build court house. Architect and engineer not selected.

Okla., Pawhuska—Theatre—C. A. Korn and associates plan to build theatre, on Main St. About $100,000. Architect and engineer not selected.

Okla., Ponca City—Church—Methodist Episcopal Church having plans prepared by Butler & Sanders, archts., 803 Kennedy Bldg., Tulsa, for 1 story, brick, concrete and steel, concrete foundation. About $60,000.

Col., Telluride—High School—Bd. of School Dist. 1 plans election to vote on $90,000 bonds to build new high school.

N. M. Clovis—City Hall—City plans election in April to vote on $50,000 bonds to build new city hall.

Idaho, Jerome—High School—School Dist. receives bids about April 20, building 1 story, modern high school. About $130,000. Wayland & Fennell, Idaho Bldg., Boise, archts.

Idaho, Pocatello—High School—City voted $75,000 bonds to build high school.

Idaho, Rexburg—Theatre and Office—Rexburb Investment Co having plans prepared by Cannon & Fetzer, archts., Templeton Bldg., Salt Lake City, Utah, for 60 x 150 ft. About $200,000.

Utah, Pleasant Grove—High School—Utah Co. School Dist. having plans prepared by Ware & Treganza, archts., Utah Savings & Trust Bldg., Salt Lake City, for first unit of high school, (10 rooms and gymnasium) About $100,000. Total cost $250,000.

Utah, Salt Lake City—Chapel—Mormon Church having plans prepared by Cannon & Fetzer, archts. and engrs., Templeton Bldg., for 8th Ward Chapel, seating capacity 700 to 800, on 5th St., S., and 3rd St., E. About $50,000.

Utah, Salt Lake City—School—Catholic Church having plans prepared by Ware & Treganza, archts., Utah Savings & Trust Bldg., for 2 story, (16 rooms and auditorium,) brick, on Liberty Ave. About $200,000.

Utah, Salt Lake City—School—Granite School Dist., South State St., receives bids about May building 1 story, 8 room, on South State St. About $50,000. Cannon & Fetzer, Templeton Bldg., archts. and engrs.

Ariz., Mesa—School—Mesa School Dist. 4 plans to build 1 story, 10 rooms, brick, concrete foundation. About $125,000.

Wash., Seattle—Office—Medical Bldg., Co., Cobb Bldg., having plans prepared by Bebb & Gould, archts., Cobb Bldg., for 8 story, 120 x 128 ft., concrete and brick, on Madison and Marion Sts. About $450,000.

Wash., Tacoma—Temple—Accepted Scottish Rite Bodies, 731 St. Helens St., having plans prepared by R. Borhek, archt., Natl. Realty Bldg., for 4 story, 130 x 165 ft., brick and sandstone, on Division and South 1st Sts. About $350,000.

Cal., Colexico—School—Bd. Educ. plans election to vote on $150,000 bonds to build addition to 3 schools and construct new school

Buildings (Continued)

Cal., Concord—School—City plans election to vote on $200,000 bonds to build 2 story, brick or concrete. W. Hanlon, supt. schools. Architect not selected.

Cal., Coronado—High School—City voted $125,000 bonds to build new high school.

Cal., Fullerton — Schools — City voted $225,000 bonds to build two 10-12 room schools. Address G. W. Finch, Fullerton.

Cal., Gridley—School—School Trustees retained Woollett & Lamb, archts., Physicians Bldg., Sacramento, to prepare plans fr school. Election soon to vote on $200,000 bonds for project. Noted March 18.

Cal., Hanford—**Schools**—Bd. Educ. having preliminary plans prepared by J. R. Henderson, archt., Tulare, for two 1 story, 8 room, brick foundation. About $115,000.

Cal., Hermosa Beach—Pavilion, etc.—City defeated $125,000 bonds to build pavilion. Noted Feb. 26.

Cal., Lancaster—High School—Trustees Lancaster Union High School Dist. having plans prepared by J. C. Austin, archt., 1125 Baker-Detwiler Bldg., Los Angeles, for concrete and brick. About $200,000.

Cal., Los Angeles — Auditorium — City plans to build auditorium, rein.-con. and steel, 12,500 seating capacity, to have wings for club rooms and museum, also movable stage in center, raised by hydraulic power. About $4,000,000. S L. Weaver, chn. of comn.

Cal., Los Angeles—Club—University Club, Consolidated Realty Bldg., having plans prepared by E. L. Mayberry, engr., 468 Pacific Electric Bldg., and Allison & Allison, archts., 1405 Hibernian Bldg., for 8 story, 65 x 135 ft. club house with 1 story, 60 x 135 ft. garage adjoining rein.-con., rein.-con. flooring, on Hope St., near 6th St. About $400,000.

Cal., Martinez—High School—Alhambra Union High School Dist. rejected bids building 2 story, concrete, concrete foundation. Plans will be revised and new bids called for. Cost to exceed $50,000. A. A. Cantin, 68 Post St., San Francisco, archt. Noted Feb. 19.

Cal., Maxwell—High School—City voted $60,000 bonds to build high school. Woollett & Lamb, Physicians' Bldg., Sacramento, archts.

Cal., Napa—Theatre—M. Loew Co., 1492 Bway., New York City, purchased site on Main St. and plans to build 2 story, 60 x 100 ft., rein.-con., concrete foundation. About $100,000. Architect not selected.

Cal., Oroville — Hospital—Bd. Health plans to build 3 story, concrete hospital, on Robinson St. and 2nd Ave. Cost to exceed $50,000.

Cal., Pasadena—Schools—City plans election to vote on $2,000,000 bonds for elementary schools, $2,000,000 for secondary schools and $500,000 for extensions to high schools.

Cal., Redding—Bank—Northern California Bank had plans prepared by M. G. West Co., archts., 385 Market St., San Francisco, for additions and alterations, brick or concrete. Cost to exceed $50,000.

Cal., Redlands — Hospital — City plans election soon to vote on $150,000 bonds to build new 50 room hospital. C. P. Hook, city clk.

Cal., San Francisco—School—Bd. Educ. soon receives bids building 2 story, rein.-con. and brick, on Harrison St. About $80,000. J Reid, Jr., 1st Natl. Bank Bldg., archt. Noted Aug. 21.

Cal., San Jose — Schools — City voted $400,000 bonds to build high school and $300,000 bonds to build grammar schools. Architect not selected. Noted Feb. 12.

Cal., Santa Ana—Bank and Office—First Natl. Bank had plans prepared by J. Parkinson, archt., 420 Title Insurance Bldg., Los Angeles, for 6 story, 75 x 100 ft., brick, steel and terra cotta, concrete foundation. Noted July 3.

Cal., Sunnyvale—School—Bd. Educ. having plans prepared for 2 story, brick and concrete, concrete foundation. Bonds for $70,000 voted for the project.

Cal., Susanville — High School — Lassen Union High School Dist. having plans prepared by J. G. Howard, archt., 1st Natl. Bank Bldg., San Francisco, for 1 story, stone and frame, here. Bonds for $75,000 voted for project.

Cal., Willows—School—Bd. Educ. having plans prepared by W. H. Weeks, archt., 75 Post St., San Francisco, for 2 story, 20 room, rein.-con. Bonds for $123,000 voted for project.

Ont., London — Collegiate — Bd. Educ., Dundas St., plans to build concrete and brick on Rideout St. About $215,000. L. V. Carrothers, Hydro Officers, archt.

Ont., Ottawa—Barracks—Royal Canadian Mounted Police, Customs Bldg., soon receives bids building barracks for 800 men and stables for horses, etc., at Rockliffe. About $500,000. R. C. Wright, c/o Dept. Pub. Wks., engr.

Ont., Port Colborne—School—School Bd. having plans prepared by C. M. Borter, archt., 102 Main St., Niagara Falls, for 2 story, 6 room, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $70,000.

Ont., Toronto—College—Trinity College, 790 Queen St., W., having plans prepared by Darling & Pearson, archts., 2 Leader Lane, for 2 and 3 story buildings, stone, concrete flooring, stone foundations, on Hoskin St. About $1,000,000.

BIDS DESIRED

N. H., Greenland—School—Until April 1, by town, building 1 story, 55 x 100 ft., school. W. H. MacLean, 110 Tremont St., Boston, archt.

Vt., North Bennington—Library—Until March 29, by Renwick, Aspinwall & Tucker, archts., 8 West 40th St., New York City, building 2 story, 35 x 52 ft., brick, steel and stone, rein.-con. flooring, brick and concrete foundation, for McCullough Pub. Library, c/o architects.

N. Y., Alden—Home and Hospital—Until April 23, by Clerk Bd. Supervs. Erie Co., constructing twelve 3 story, brick, rein.-con. and cut cast stone buildings, connected by corridors, 600 ft. frontage, 260 ft. deep. About $1,700,000. G. C. Diehl, Ellicott Sq., Buffalo, engr. Noted March 18.

N. Y., New York—School—Until March 31, by C. B. J. Snyder, archt. and engr., Municipal Bldg., constructing P S. 62, 5 story, 230 x 280 ft., on Leggett Ave. between Southern Blvd. and Fox St., for Bd. Educ., 500 Park Ave. About $600,000. Noted Feb. 19

N. J., New Brunswick — Horticultural Hall—Until April 5, by State Comrs., 142 West State St., Trenton, building 2 story, 60 x 140 ft., brick and stone, at College Farm, here. About $75,000. Noted Feb. 19.

N. J., South Orange—Theatre and Office—H. Rosensohn, archt., 188 Market St., receiving bids building 3 story, 75 x 150 ft., brick and limestone, on South Orange Ave. and Scotland Rd., for South Orange Theatre Co., 929 Broad St., Newark. About $100,000.

Pa., Etna (Pittsburgh P. O.) — High School—Until April 5, by G. A. Speer, secy. Bd. Educ., building high school. About $200,000.

O., Defiance—School—Until April 7, by Bd. Educ., building 2 story, 150 x 200 ft., brick and stone, in Tiffin Twp. About $75,000. McLaughlin & Hulsken, 610 Savings Bldg., Lima, archts.

O., Geauga Falls — Dance Hall — Until April 1, by Edward Eng. Co., archts., 261 Hippodrome Bldg., Cleveland, building 1 story, 125 x 200 ft., steel and brick, brick foundation, here, for Geauga Lake Amusement Co., c/o engineers. About $50,000.

Mich., Detroit—Church—Until March 30, by D. R. Wells, archt. and engr., 435 Woodward Ave., building 2 story, 64 x 120 ft., on Jefferson Ave. and Lakewood Blvd. and 2 story, 84 x 90 ft., on Grand River and Clarendon Abes., brick, steel and stone. About $125,000 and $80,000 respectively. Noted Feb. 19 and 26.

Mich., Detroit—Temple—Until April 1, by A. Clubb, archt., Goebel Bldg., constructing 2 story, 78 x 120 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Lafayette Ave., for Odd Fellows Assn., c/o H. Kopp, 117 West Fort St. About $150,000.

Mich., Grand Rapids — School — Until March 31, by Bd. Educ., building 2 story, rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation, on Lafayette St. About $250,000. H. N. Morrell, secy.

Mich., Hamtramck (Detroit P. O.) — School—Until April 3, by W. Y. Tyler, secy. School Dist 8, building 2 story, brick, concrete and steel, rein.-con. flooring, concrete foundation, on Playfair and Goodson Aves. About $100,000.

Mich., Mt. Morris—School—Until April 15, by Secretary Bd. Educ., building 2 story, 8 room, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $90,000. Noted March 18.

Ill., Cicero — Bank — Childs & Smith, archts., 64 East Van Buren St., Chicago, receiving bids building 1 story, 75 x 125 ft., brick and stone, concrete foundation, on 22nd st. and Austin Ave., here, for Kaspar State Bank, 1900 Blue Island Ave., Chicago. About $175,000.

Wis., Milwaukee—Station—A. S. Hecht, archt., 64 West Randolph St., Chicago, receiving bids building 4 story, 120 x 440 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Bway., for Chicago, Racine & Milwaukee Line, Bway. and Erie St. About $750,000.

Wis., Racine — School — H. Case, clk., School Dist. 13, 212 5th St., received bids building 2 story, brick and concrete, rein.-con. flooring, concrete foundation, from J. C. Jenson, Route 4, $64,700; Michie Constr. Co., Camp Bldg., Milwaukee, $75,976.

Ia., Boise—Lodge—Masonic Lodge, 213½ North 10th St., having plans prepared by Wayland & Fennell, archts., Idaho Bldg., for 2 story, stone, brick and rein.-con., stone and concrete foundation. About $80,000.

Ia., Cedar Rapids—Until April 12, by Bd. Educ., building 2 story, 62 x 80 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $60,000. H. E. Hunter, Security Bldg., archt.

Ia., Goose Lake—School—Until April 10, by Bd. Educ., c/o P. N. Harksen, pres., RFD 1, Clinton, building 3 story, 50 x 85 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $60,000. C. A. Dieman, 408 Granby Bldg., Cedar Rapids, archt. Noted Jan. 22.

Ia., Rippey—School—Until April 3, by Bd. Educ., building 2 story, 63 x 105 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $100,000. A. E. Jensen, secy. Proudfoot, Bird & Rawson, 810 Hubbell Bldg., Des Moines, archts. Noted March 4.

Ia., Wiota—School—Until March 31, by D. Brooks, secy. Bd. Educ., building 3 story, 75 x 90 ft., brick and stone, brick foundation. About $80,000. Porter & Schreiber, 505 Peters Trust Bldg., Omaha, archts. Noted March 4.

Minn., Deer River—School—Until April 15, by H. E. Wolfe, supt. Bd. Educ., building 2 story, 80 x 110 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $100,000. S. F. Broomhall, Alworth Bldg., Duluth, archt. and engr.

Minn., Fergus Falls — Theatre — Until April 15, by J. B. Clinton, mgr. Clinton Investment Co., Torrey Bldg., constructing 2 story, 50 x 142 ft., brick, rein.-con. flooring and foundation, on Lincoln Ave. About $60,000. W. P. Allred, Fargusson Bldg., Duluth, archt. and engr. Noted Jan. 15.

Minn., Minneapolis — Office — McMichael Investment Co., 600 Plymouth Bldg., receiving bids building 2 story (ultimately 10 story), 50 x 157 ft., rein.-con. and brick, at 33 7th St., S. About $500,000. Kees & Coburn, 245 Plymouth Bldg., archts. Noted March 18.

Minn., Moose Lake—Hotel—Until April 1, by Moose Lake Realty Co. building 3 story, brick. About $75,000. F. A. Schaeiger, Moose Lake, archt.

Minn., Pipestone—Hospital—Until March 31, by P. O. Moe, archt., New York Life Bldg., Minneapolis, constructing 2 story, 43 x 120 ft., rein.-con., brick and tile for city. About $80,000. Former bids rejected. Noted Feb. 5.

Minn., Red Wing—Office—E. H. Ridberg receiving bids building 2 sotry, 40 x 50 ft., brick. About $55,000. A. F. Gauger, 302 Central Bank Bldg., St. Paul, archt.

Kan., Marysville—Church—Until April 2, by United Presbyterian Church, building 2 story, brick, rein.-con. and steel, concrete foundation. About $60,000. C. Boller & Bro., 508 Ridge Bldg., Kansas City, Mo., archts.

Neb., Gering—Court House—Until April 19, by Scott Co. building 3 story, rein.-con. brick and steel, rein.-con. flooring, concrete foundation. About $200,000. W. N. Bow-

Buildings (Continued)

man & Co., Central Saving Bank Bldg., Denver, archts. Noted Jan. 20.

Mont., Willow Creek — School — Until April 8, by Gallatin Co. School Dist. 15, building 2 story, 46 x 140 ft. Bonds for $55,000 voted for project. J. C. Teague, Butte, archt.

N. S., Digby—Station—Until March 29, by M. R. Fairbairn, ch. engr., Dominion Atlantic Ry. (Canadian Pacific Ry.) Windsor St., Montreal, constructing 2 story, 30 x 130 ft., here. About $65,000.

B. C., Coquillam — Administration and Dining Block—Until April 6, by A. E. Foreman, engr., c/o Dept. Pub. Wks., Victoria, constructing 2 story, 75 x 100 ft. administration building and 3 story, 35 x 83 ft. dining block, rein.-con., brick and tile, concrete foundation. About $120,000.

B. C., Prince Rupert—School—Until April 14, by Bd. School Trustees, building 3 story, 12 room, rein.-con., brick and tile, rein.-con. flooring, concrete foundation. About $140,000. J. W. Potter, Prince Rupert, archt.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—Office—T. S. Proctor Estate, 85 Water St., let contract converting 4 story, 100 x 240 ft., brick warehouse, at 177 State St., into office building, to N. Clarke Co., 161 Devonshire St. About $50,000.

★**Mass., Boston** — Office — Progressive Realty Co. let contract converting 6 story, brick and concrete warehouse on South St., to N. Hurwitz, 20 East St. About $60,000.

★**Mass., Boston** — Store — Liggett Drug Co., 50 Washington St., let contract converting 2 story brick and concrete office building on Canal St. into store building, to MacDonald & Joslin, 161 Devonshire St. About $50,000.

★**Mass., Lowell** — High School — School Comn. let contract building 3 story, 186 x 289 ft., brick, concrete foundation, to D. Walker, Lowell. About $1,250,000.

★**Mass., Northampton**—Hospital—E. F Newton, archt., 6 Beacon St., Boston, let contract to D. A. Sullivan, Paradise Rd., building 2 story, 75 x 200 ft., brick and mill construction, brick and concrete foundation, for Lathrop Home, 236 South St. About $250,000. Noted March 4

★**Mass., Springfield** — High School — Bd. Educ. let contract building 2 story, 116 x 186 ft., brick and steel, rein.-con. flooring, concrete foundation, on Spring St., to E. J. Pinney Inc., 264 Main St., $191,166. Noted Feb. 26.

★**Mass., Springfield**—Store—A. Steiger Co., 345 Main St., let contract altering and remodeling building on Bridge St., brick concrete and steel, to E. J. Pinney, Inc., 374 Main St. About $50,000

★**R. I., Providence**—Business—Counting House Corp., South Main St., let contract building 3 story, 42 x 75 ft., brick and concrete, terra cotta blocks and concrete flooring, concrete foundation, to J. W. Bishop Co., Butler Exch. Bldg. About $50,000.

★**N. Y., Brooklyn**—Theatre and Stores—M. Barr, 215 Montague St., will build 1 story, 105 x 110 ft., brick, steel and stone, brick foundation, at 7615 5th Ave. About $85,000. Work will be done by day labor under supervision of Carlson & Wiseman, archts. and engrs., 226 Henry St.

★**N. Y., Buffalo**—Theatre—Lowes Enterprises, 1492 Bway., New York City, let contract building brick, steel and stone, brick foundation, on Washington and Mohawk Sts., here, to Fleischmann Constr. Co., 531 7th Ave., New York City. About $100,000.

★**N. Y., Elmsford** — Club — Knollwood Country Club, c/o C. I Birg, archt. and engr., 331 Madison Ave., New York City, let contract building 2 story, 100 x 100 ft., brick, steel and stone, brick foundation, to C. Money, 228 West 36th St., New York City. About $100,000. Noted Jan. 1.

★**N. Y., Long Island City**—Office—Title Guarantee & Trust Co., 176 Bway., New York City, will build brick, steel and stone, brick foundation, on Hunter Ave., here About $100,000. Work will be done by day labor under supervision of Severence & Van Allen, archts. and engrs., 111 East 40th St., New York City. Noted Feb. 19.

N. Y., Marcy—Hospital, etc.—State Hospital Comn., Capitol, Albany, received bids building tuberculosis hospital, mortuary and laboratory, at Utica State Hospital, here, (general contract) from P. Keeler Bldg Co., 125 Orange St., Albany, $186,270; heating, from T. Breen Co., 411 Lafayette St., Utica, $17,413, H. J. Brandeles, 433 Lafayette St., Utica, $18,425; Mohawk Valley Heating Co., 302 Broad St., Utica, $20,745; sanitary work, from T. Breen Co., 414 Lafayette St., Utica, $15,950; A. J Eckert Co., 103 North Lake St., Albany, $15,960; E. Joy Co., 125 Market St., Syracuse, $19,836. Noted Feb. 26.

★**N. Y., New York**—Office—Barrett Co., 17 Battery Pl., let contract building 16 story, 101 x 122 x 180 ft., brick, steel and stone, concrete foundation, on West and Rector Sts., to G. A. Fuller Co., 175 5th Ave.

★**N. Y., New York**—Office, etc.—Standard Oil Co. of New York, 26 Bway., let contract building 2 story, 40 x 100 ft., brick and steel, concrete foundation, at 604 West 46th St., to H. D. Best, 175 5th Ave. About $60,000. Noted March 18.

★**N. Y., New York**—Store and Office—Fifty-eight West 40th St. Corp., c/o E. Necarsulmer, archt. and engr., 507 5th Ave., let contract building 16 story, 75 x 100 ft., brick, steel and stone, concrete foundation, to Leddy & Moore, 105 West 40th St. About $850,000.

★**N. Y., Norwich**—School—Bd. Educ let contract building brick, steel and stone, brick foundation, to Cummings & Robb, Norwich. About $125,000. Noted Feb. 19.

★**N. Y., Schenectady** — Office — General Electric Co., River Rd., let contract building superstructure for 6 story, 50 x 200 ft., brick and concrete, concrete foundation, to Thompson-Starrett Co., 49 Wall St., New York City, cost plus percentage basis, (material to be furnished by owners); structural steel work, to Amer. Bridge Co., 30 Church St., New York City. Noted March 11.

★**N. J., Newark**—Hotel—A. Levin, Stuyvesant Ave., will build 5 story, 50 x 140 ft., concrete and brick, at 106 Clinton Ave. About $235,000. Work will be done by day labor.

★**Pa., Altoona**—Store—M. Poet & Sons, 1720 Union Ave., let contract building 4 story, rein.-con., brick and steel, rein.-con. flooring, rock foundation, to P. Stadler, engr., 314 Logan Ave., Llyswen (Altoona P. O.). About $51,000. Owner to purchase materials.

★**Pa., Phila.**—Schools—Bd. Educ., Keystone Bldg., let contract building 3 story, 115 x 165 ft., concrete and brick, on 70th and Buist Sts., to Wark & Co., 1737 Filbert St., $505,218; 3 story, 115 x 165 ft., concrete and brick, on 9th and Oregon Sts., to M. H McClockey, Jr., 1620 West Thompson St., $499,979. Noted March 18

★**Md., Baltimore**—Theatre—H. Smith & Sons, Light and Redwood Sts., will build 1 story, 130 x 150 ft., concrete, steel and brick, concrete foundation, at 1532 West Baltimore St. About $60,000. Work will be done by day labor.

★**Md., Howard Park** (Baltimore P. O.)—Church—Howard Park Methodist Episcopal Church, Gwynn Oak Ave., let contract building 1 story, 41 x 87 ft., stone, stone and concrete foundation, on Gwynn Oak Ave., near Milford Ave., to C. L. Stockhausen Co., Gay and Water Sts., Baltimore. About $50,000.

★**D. C., Washington**—Medical—Medical Society of District of Columbia, 1424 Eye St., let contract building 2 story, 50 x 110 ft., brick and stone, on M St., and Connecticut Ave., to W P. Lipscomb, Dist. Natl. Bank Bldg. About $75,000.

★**N. C., Lexington**—High School—Comrs. School Bd let contract building high school, to D. K. Cecil, Lexington. About $75,000.

★**Fla., Jacksonville** — Parish House — Church of Good Shepherd let contract building 2 story, 56 x 136 ft., brick, steel and stone, brick foundation, to Long & Co., 434 East Bay St. About $90,000.

★**Tenn., Knoxville** — Courthouse — Knox Co. let contract building steel and brick addition, rock foundation, on West Main St., here, to A. H. Whisman, 402 North Gay St. About $114,900.

★**O., Cleveland**—Commercial—O. R. Cook, East 46th St. and Prospect Ave., let contract building 5 story, 100 x 104 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, to Craig-Curtiss Co., 1031 Guardian Bldg. About $500,000.

★**O., Cleveland**—Office—Cleveland Discount Co., Rockefeller Bldg., let contract construction 20 story, 80 x 200 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Superior Ave. near East 9th St., to Craig Curtiss Co., 1031 Guardian Bldg. About $1,000,000. Noted March 11.

★**O., Cleveland** — Postal Substation — A. Shmoldt, 1018 East 116th St., let contract building 2 story, 36 x 54 ft., steel and brick, brick foundation, on Pearl and Krather Rds., to J. Woide, 1659 East 86th St. About $50,000.

★**O., Cleveland**—Theatre—A. F. Janowitz, archt., Permanent Bldg., let contract building 1 story, 97 x 200 ft., concrete, steel and brick addition, rein.-con. flooring, concrete foundation, on West 117th St. and Detroit Ave., to H. Dolinsky, 6324 Kinsman Rd. About $75,000. Owner's name withheld.

★**Mich., Detroit** — Bank and Office — Peoples State Bank, Fort St., let contract building 2 story, 60 x 80 ft., concrete, brick and stone, on Hastings and Erskine Sts., to F H. Goddard, 516 Franklin St. About $75,000.

Mich., Detroit—School—Bd. Educ., 50 Bway., received bids March 10 for building 3 story, 100 x 250 ft., rein.-con., brick steel and stone, rein.-con. flooring, concrete foundation, on St. Antoine St and Palmer Ave., masonry work from F. H. Goddard, 516 Franklin St., $336,000, M. Bartholomaei Sons & Co., 466 East Warren Ave., $336,380, Cooper Weidenmann Constr. Co., 1430 Penobscot Bldg., $412,000; carpentry work, from H. M Martens Co., 221 Moffat Bldg., $112,945, E. Thiede, 287 Berlin St., $114,200, Harcus & Co., 774 Russell St., $114,876; heating, ventilating and plumbing, from A. W. Schultz & Co., 380 Rohns St., $143,908, W. J. Rewoldt, 506 Owen Bldg., $154,920, J. W. Partlan, 51 Park Pl., $155,000; electric wiring, from J. H. Busby Co., 36 Cherry St., $16,987, Central Electric Co., 118 Bway. Ave., $17,395, Gray Electric Co., 70 State St., $17,419. Noted March 4.

★**Mich., St. Clair** — Church — St. Mary's Church let contract building 2 story, 78 x 92 ft., rein.-con., brick and steel addition, rein.-con. flooring, concrete foundation, to J. O'Sullivan & Sons, Pine Grove Ave., Port Huron. About $60,000. Noted Feb. 19.

★**Ill., Chicago** — Sales — Halperin Bros., 1571 Milwaukee Ave., let contract building 2 story, 60 x 175 ft., brick and timber, concrete foundation, at 2542 South Michigan Ave., to Finlayson Co., 139 North Clark St. About $75,000.

★**Ill., Chicago** — Store and Office — Walgreen Co., 768 Oakwood Blvd., let contract building 2 story, 50 x 110 ft., rein.-con., rein.-con. flooring and foundation, on 35th St. and Cottage Grove Ave., to A. Brundage, 110 South Dearborn St. About $65,000.

★**Ia., Buckingham**—School—W. A. Speer, secy. Bd. Educ., Geneseo Independent Consolidated Dist., Geneseo Twp., let general contract building 2 story, 48 x 80 ft., brick, steel and stone, to Savanna Constr. Co., Savanna, Ill., $97,500. Noted Feb. 19.

★**Ia., Marshalltown**—Municipal—City let contract building 2 story, 40 x 116 ft., rein.-con., brick and stone, rein.-con. flooring, concrete foundation, on North Center St., to Western Constr. Co., Earlham. About $87,800. Noted March 11.

★**Ia., Martensdale**—School—Bd. Educ. let contract building 3 story, 56 x 86 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, to Cork & Ferrier, Manhattan, Kan., $44,500. Noted Feb. 26.

★**Minn., Cass Lake**—High School—Bd. Educ. let contract building 2 story, 80 x 130 ft., brick and stone, rein.-con. flooring, concrete foundation, on Main St., to E. Jackson, Cass Lake, $95,650.

★**Minn., Cloquet**—High School—Dist. 1, Carlton Co., let contract building 2 story, 80 x 95 ft., brick, rein.-con. flooring, concrete foundation, here, to L. J. Klippen, 1832 East 6th St., $57,162.

★**Minn., Duluth** — Theatre — Clinton & Meyers Co., Torrey Bldg., let contract remodeling interior of 6 story, 100 x 144 ft., rein.-con., steel and brick, on West Superior St., to Carlson & Johnson, Duluth Builders Exch. About $150,000.

★**Minn., Duluth**—Theatre—Kent Investment Co., Grand Ave., let contract building 2 story, 50 x 140 ft., brick and tile, rein.-con. flooring and foundation, to Johnson & Carlson, Duluth Builders Exch., $56,348.

★**Minn., Owatonna** — High School — Bd. Educ. let contract constructing high school, including three 3 story, rein.-con. buildings, to J. Leck & Co., 316 7th St. S., Minneapolis. About $350,000; cost plus percentage basis

★**Minn., St. Paul**—School—Bd. Educ. will build Groveland School, 3 story, 80 x 140 ft., on St. Clair and Cleveland Sts. About $128,000. Work will be done by day labor Former bids rejected. Noted March 1

★**Kan., Oberlin**—Bd. Educ. let contra building 2 story, 64 x 68 ft., brick, concret and steel, concrete foundation, to F. Blanch, Oberlin, $53,871. Noted Feb. 5

★**Kan., Wichita**—Store—C. H. Smyth, 1212 North Lawrence Ave., let contract building 2 story, 50 x 140 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to G. H. Siedhoff Constr. Co., 121 North Market St. About $65,000.

★**Neb., Omaha**—Sales—Ralph & Tyson, 320 South 19th St., let contract building 2 story, 45 x 132 ft., rein.-con., brick and stone, rein.-con. flooring, concrete foundation, on 21st and Harney Sts., to W. P. Deverell, 435 Ry. Exch. Bldg. Cost between $125,000 and $140,000; cost plus percentage basis.

★**N. D., Bismarck**—Bank—First Guarantee Bank let contract building 2 story, 50 x 60 ft., to A. Moorman & Co., 600 Chamber Commerce Bldg., St. Paul, Minn. About $60,000.

★**N. D., Grafton**—Refectory—State Bd. Administration, Bismarck, let contract building 2 story, 58 x 160 ft., here, to T. F. Powers Constr. Co., 419 8th St., Fargo, $82,084.

★**Mont., Missoula**—High School—Missoula Co. let contract building 3 story addition to high school, on Eddy and Higgins Sts., to A. Broadland, Butte, $85,976. Noted Feb. 26.

★**Okla., Norman**—Dormitory—State Bd. Pub. Affairs, Oklahoma, let contract building dormitory, at University of Oklahoma, here, to Krepkie & Schaffer Constr. Co., El Reno, $130,000. Noted Jan. 15.

★**Idaho, Weiser**—High School—Bd. Educ. let contract building high school, to Lowe & Baider, Weiser. About $70,000.

★**Utah, Castle Gate**—School—Carbon Co. School Dist.., (Price,) let contract building 1 story, 8 room, brick, here, to Davidson & Harris, East 2nd South St., Salt Lake City. About $80,000.

★**Utah, Hiawatha**—School—Carbon Co. School Dist, (Price,) let contract building 2 story, 16 room, here, to W. A Larkins, Felt Bldg., Salt Lake City, $120,100.

★**Ariz., Chandler** — High School—Bd. Educ. let general contract building 2 story, brick, to J. W. Tucker, Phoenix, $93,100.

★**Wash., Bremerton**—Store and Office—Keith Furniture Co. let contract building 6 story, 62 x 103 ft., brick and sandstone, on 5th and Pacific Sts., to Keith, Parker & Wood, Bremerton. About $70,000.

★**Wash., Spokane**—Bank—Spokane Savings & Loan Co., 115 Wall St, let contract building 6 story, 50 x 80 ft., concrete, on Sprague and Wall Sts., to Jasper & McClellan, Spokane. About $150,000.

Cal., Long Beach — High School — Bd. Educ. received bids March 8 building 2 story, 138 x 148 ft., brick, concrete foundation, on 17th and Atlantic Sts., from J. W. Davison, 361 Walnut St., $161,128; J. F. Atkinson, Story Bldg., Los Angeles, $166,647; C. T. McGrew, 1345 West Ocean Ave., $166,761. Noted Feb. 26.

★**Ont., Ottawa**—Dept. Pub. Wks. let contract building dairy at experimental farm, to R. Taylor, Ottawa, $29,680.

Federal Government Work

PROPOSED WORK

Mass., Atlantic—Removal of Buildings and Machinery—(Spec. 4106), Bureau Yards & Docks, Navy Dept., Wash., D. C., having plans prepared removing from Quincy to machine and boiler shop annex, here. About $50,000; $10 deposit required for plans and spec.

N. J., Lakehurst—Power Plant and Distributing System — Spec. 4128 — Bureau Yards & Docks, Navy Dept., Wash., D. C., having plans prepared for 36 x 73 ft., brick, concrete and steel power plant, generating capacity three 300 kw., and 50 x 111 ft. boiler installation, 3,000 hp. About $550,000. Noted Jan. 22.

Md., Indian Head — Monorail Hoists—Bureau Yards & Docks, Navy Dept., Wash., D. C., having plans prepared for monorail hoists.

Va., Alexandria—Sidewalk—(Spec. 4140), Bureau Yards & Docks, Navy Dept., Wash., D. C., having plans prepared paving and curbing here. About $2,600; $10 deposit required for plans and spec. Noted Feb. 26.

Va., Hampton Roads—Reinforcing Trusses—(Spec 4150), Bureau Yards & Docks, Navy Dept., Wash., D. C., having plans prepared for reinforcing present end trusses of Seaplane Hangar 1, here. About $5,000; $10 deposit required for plans and spec. Noted March 11.

Va., Hampton Roads—Sewerage System—Spec. 4133, Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids building sewerage system, to consist of 780 ft. 10 in. and 1,150 ft. 8 in. vitr. pipe sewer, 7 manholes and 6 in. connections to buildings at Naval Operating Base, Air Sta., here. About $20,000; $10 deposit required for plans and spec. Noted Feb. 5.

Va., Hampton Roads—Steam Heating and Distributing Systems—Bureau Yards & Docks, Navy Dept., Wash., D. C., having plans prepared for underground steam heating and electric distributing systems at naval operating base, here.

Ill., Great Lakes—Harbor Development—(Spec. 4136), Bureau Yards & Docks, Navy Dept., Wash., D. C., having plans prepared for developing harbor, here. About $1,400,000.

Mo., St. Louis—Side Wheel Steamboat—Secy. Mississippi River Comn., 1311 International Life Bldg., rejected bids building and delivering side wheel steamboat. Noted Jan. 15.

Tex., North Ft. Worth — Deep Well Pumps and Piping—Bureau Yards & Docks, Navy Dept., Wash., D. C., having plans prepared for installing deep well pumps and piping, at naval helium production plant, here.

Wash., Keyport—Storehouses, Garage and Quarters—Spec. 4048. Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids building 24 x 66 ft. war head storehouse, 64 x 117 ft. torpedo storehouses, 28 x 83 ft. garage and three 2 story, 23 x 34 ft. frame quarters for officers. About $88,000; $10 deposit required for plans and spec.

P. I., Guam—Quarters, Power, Pump and Blower Houses—Bureau Yards & Docks, Navy Dept., Wash., D C., plans to build 30 x 38 ft. extension to power house at Agana and 26 x 35 ft. extension at Naval Radio Sta., 12 x 14 ft. extension to pump house, 8 x 16 ft. extension to blower house, 22 x 47 ft. quarters with 18 x 24 ft. wings; $10 deposit required for plans and spec.

BIDS DESIRED

N. Y., New York—Turbo Air Compressor—Spec. 4016—Until March 31, by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing, here. About $60,000; $10 deposit required for plans and spec. Noted Aug. 14.

N. Y., Tonawanda — Dredging — Until April 20, by U. S. Engr. Office, 540 Federal Bldg., Buffalo, dredging extension of deep water channel in Niagara River, here; advertised in this issue.

D. C., Wash.—Cast Iron Water Pipe—Until April 2, by Dist. Comrs., 509 Dist. Bldg., furnishing 171 ton 8 in. c.i. water pipe.

Va., Ft. Monroe — Bombproof switchboard building and bombproof cover for mining casemate. Until April 20, by U. S. Engr. Office, Custom House, Norfolk, building bombproof switchboard building and bombproof cover for mining casemate; advertised in this issue.

W. Va., Charleston—Electric Substation and Equipment—Spec. 4148—Until March 31, By Bureau Yards & Docks, Navy Dept., Wash., D. C., building outdoor electric substation and installing equipment to be furnished by Government, at Naval Ordnance Plant, here. About $40,000; $10 deposit required for plans and spec. Noted March 1.

S. C., Charlestown—Lighting Plant and Water Supply System—Until April 15, by Treas. Dept., Wash., D. C., installing at U. S. Quarantine Sta., here. J. A. Wetmore, superv. archt.

Fla., Ft. Meyers—Cottage—Until April 5, by Comr. Indian Affairs, Wash., D. C., furnishing material and labor building frame, here. Address, L. A Spender, Ft. Meyers, special comr.

Ala., Birmingham—Electric Freight Elevator—Until April 15, by Treas. Dept., Wash., D. C., installing in Post Office and Court House, here. J. A. Wetmore, superv. archt.

O, Cincinnati — Boiler Repairs — Until April 15, by Treas. Dept., Wash., D. C., repairing in P. S. Pub. Bldg., here. J. A. Wetmore, superv. archt.

O., Cleveland—Dredging—Until April 23, by U. S. Engr. Office, Federal Bldg., dredging and removing wharf, in Huron Harbor; advertised in this issue. Noted Feb. 5.

Tex., Brooks Field—Steel Hanger—Until April 15, by Constr. Quartermaster, 307 Calcasieu Bldg., San Antonio, building 125 x 270 ft., steel dirigible hanger, here; advertised in this issue.

Cal., Mare Island—Remodeling Barracks Building—Spec. 4147—Until March 31, by Bureau Yards & Docks, Navy Dept., Wash., D. C., remodeling Bldg. 53, at Marine Reservation, Navy Yard, here. About $35,000; $10 deposit required for plans and spec. Noted March 18.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Me., Mt. Desert Island—Seawall—(Spec. 4135), Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids March 17, building at Naval Transmitting Sta., here, from G. E. Eng. Co., 22 Laight St., New York City, $39,000 (120 days); A. B. and J. R. Hodgkins, 42 Greeley Ave., Bar Harbor, $33,500; M. I. O'Connor, 86 Main St., North Hampton, Mass., $35,900 (120 days). Noted March 11.

Conn., Hartford — Electric Elevator — Treas. Dept., Wash., D. C., received bids March 15, remodeling electric passenger elevator in Post Office and Customhouse, here, from A. B. See Elevator Co., 220 B'way, New York City, $6,100; Otis Elevator Co., Metropolitan Bank Bldg., Wash., D. C., $6,316. Noted Feb. 19.

★**W. Va., Wheeling**—Structural Steel, Forgings, Steel Castings, etc.—U. S. Engr. Office, 305 Post Office Bldg., let contract furnishing and delivering 140,000 lb. structural iron castings in 2 lots to be used on Locks 6, 8, 9, 10 and 11, Kanawha River, to Frandsen Constr. Co., 64 West Randolph St., Chicago, $15,951. Noted March 11.

★**Fla., Boca Grande**—Boat Basin, Gangway, etc.—Treas. Dept., Wash., D. C., let contract repairing at Quarantine Sta., here, to D. W. Ireland, Ft. Meyers, $10 714.

Tenn., Chattanooga—Extending and Remodeling—Treas. Dept., Wash., D. C., received only bid March 15, remodeling and building extension to Post Office and Courthouse, here, from G. E. Wright, Inc., 1461 Monadnock Blk., Chicago, $56,500. Noted Feb. 26.

★**Tenn., Memphis** — Earthwork — Mississippi River Comn., Custom House, let contract building 620,000 cu.yd. earth work in Upper St. Francis Levee Dist., to S. F. Ramsey, Porter Bldg., $217,000. Noted March 18.

Mich., Detroit — Radio Building — Spec. 4120—Pub. Wks. Office, received bids March 10, constructing, at Vindmill Point, (1) work complete from W. M. Bateson. 609½ South Main St., Lima, O., alternate (1) $10,426 (20 days), (4) $8,928 (120 days) alternate $8,751 (120 days); J. P. Cullen & Son, 506 North Main St., Janesville, Wis., (4) $16,028 (time as specified) alternate $16,228; C. M. Davis Co., 1323 Woodward Ave., alternate (1) $21,600 (125 days). Noted March 18.

★**Ill., Chicago** — Hospital — Treas. Dept. Wash., D. C., let contract completing main hospital and constructing 5 auxiliary buildings, including mechanical equipment, elevators, lighting fixtures, outside service lines, covered walks, approach work and tunnel from main building to power house, U. S. Pub. Health Serv. Hospital No. 2, here, to Shank & Co., 30 North La Salle St. and E. Hines, 2431 South Clinton St

Wis., Milwaukee—Radio Building—Spec. 4107—Pub. Wks. Office, received bids March 10, constructing at Navy Grounds, McKinley Park, from J. P. Cullen & Son, 506 North Main St., Janesville, $14,572; W. G. Williams, 352 Jackson St., $15,400 (125 days); J. Edward and A. J. Heinen, 817 14th St., $14,660 (June 1). Noted March 18.

Mo., St. Louis—Remodeling Plumbing—Treas. Dept., Wash., D. C., received bids March 16, remodeling in appraisers stores, here, from W. Wilby, Selma, Ala., $37,500 (180 days); S. W. Rittenhouse, Wash., D. C., $39,814 (175 days). Noted Feb. 26.

Miscellaneous

PROPOSED WORK

Dam and Dike—Clarks Mill, Me. (Hollis Center P. O.)—Clarks Mill Power House Co. having plans prepared by Sawyer & Bean, engrs., 11 Lisbon St., Lewiston, for rein.-con. dam, 500 ft. long, and dike, 100 ft. high.

Swimming Pool—Brookline, Mass. (Boston P. O.)—See "Buildings."

Miscellaneous (Continued)

Road Material—New York, N. Y.—H. H. Curran, pres. Manhattan Boro., rejected bids furnishing and delivering 1,000 ton asphalt paving cement. About $35,500. Noted March 18.

Culvert Pipe — Harrisburg, Pa. — L. S. Sadler, state highway comr., rejected bids received March 1, furnishing culvert pipe for maintenance work of department. Noted Feb. 5.

Track Development—Columbia, S. C.—Columbia Ry. Gas & Electric Co., Arcade Bldg., having surveys and plans made building village covering 80 acres, near here, including 100 dwellings for employees, necessary sewerage and waterworks systems, etc. About $200,000. Tomlinson Eng. Co., L. & R. Bank Bldg., engrs.

Tractors — Cleveland, O. — E. Shattuck, city purch. agt., soon lets contract furnishing 5 tractors. Cost to exceed $10,000.

Cast Iron Pipe, Hydrants, etc.—Markesan, Wis.—E. W Laper, village clk., soon lets contract furnishing 286 ton 4, 6 and 8 in. c.i. pipe, 6½ ton special castings, 34 6 in. hydrants, four 1½ in., five 4 in., twelve 6 in. and four 8 in. valves, 25 valve boxes, one 40,000 gal. tank on 90 ft. steel tower, and 2 motor driven centrifugal pumps.

Motor Driven Equipment—Milwaukee, Wis.—City soon receives bids for motor driven equipment, including 2 street sweepers, 2 gutter sweepers, 2 flushers and sprinklers and 1 catchbasin cleaner.

Aviation Field—Okmulgee, Okla.—J H. Rebold plans to build aviation field, on 40 acre tract near residence, to include 1 large hangar capable of accommodating 15 aeroplanes, also machine house and store house. About $165,000. Engineer not selected.

Harbor Improvement—Aberdeen, Wash.—Grays Harbor Port Comn. having surveys and plans prepared by C. A. Strong, engr., Tacoma, for improvement of harbor, here.

Stadium — Seattle, Wash. — Associated Student Body of University of Washington having plans prepared by Bebb & Gould, archts., Securities Bldg., for memorial stadium, concrete, seating capacity of 60,000. About $600,000. H. Bittman, Securities Bldg., consult. engr.

Swimming Pool—Colusa, Cal.—B. L. McCue, city clk., soon receives bids building 40 x 120 ft. concrete swimming pool, hollow tile or brick filtration plant and frame bathouses. About $38,000. Noted July 31.

Subway—Martinez, Cal.—Comrs. Contra Costa Co. having plans prepared for 200 ft. rein.-con. subway, 28 ft. wide, under Southern Pacific & Santa Fe R.R. tracks, thereby eliminating dangerous grade crossing on new State Highway through city. About $50,000. R. R. Arnold, co. surv.

Scarifier and Steam Roller—Sebastopol, Cal.—Street Dept. plans to purchase scarifier and steam roller. Cost to exceed $1,000. J. S. Saunders, city clk.

Grain Conveyor, etc.—St. John, N. B.—Canadian Pacific Ry., Windsor St., Montreal, Que., plans to build grain conveyor at Sands Pointe also 100,000 gal. steel water tank. About $100,000. M. R. Fairbairn, ch. engr.

Grain Elevator—Port Stanley, Ont.—London & Port Stanley Ry., Colborne St., London, receives bids about May 1, for concrete or steel grain elevator, 20,000 bu. per hour. About $200,000. P. J. Brown, London, engr.

BIDS DESIRED

Pier Shed—Brooklyn, N. Y.—Until April 20, by E. S. Walsh, supt. Pub. Wks., Capitol, Albany, building terminal pier shed, at Gowanus Bay, here, Contr. 219; advertised in this issue.

Pier, etc.—New York, N. Y.—Until March 29, by M. Hurlburt, comr. docks, Pier "A," foot of Battery Pl., furnishing labor and material altering pier at foot of 5th St., East River, and building new freight shed.

Road Materials—New York, N. Y.—Until April 2, by Bd. Purchase, Municipal Bldg., furnishing and delivering highway materials to Dept. Parks, Brooklyn, and tar road oil and tarvia K. P., to Dept. Parks, Bronx. G A Whalen, chn.

Wood Paving Blocks—New York, N. Y.—Until April 3, by Bd. Purchase Municipal Bldg., furnishing and delivering wood paving blocks to Dept Plant & Structures. G A Whalen, chn.

Piers — Stapleton, S. I., N. Y. — Until April 6, by M. Hurlburt, comr. docks, Pier "A," foot of Battery Pl., New York City, building piers 12 and 13, here. About $1,000,000.

Bulkhead and Stone Cribbing—Freehold, N. J.—Until April 7, by Bd. Freeholders Monmouth Co., building bulkhead and stone cribbing, at Galilee and Low Moor. W. M. Bergen, dir.; advertised in this issue.

Broken Stone—Trenton, N. J.—Until March 30, by Bd. Freeholders Mercer Co., furnishing 9,000 tons broken stone. About $13,500.

Limestone — Hollidaysburg, Pa. — Until March 30, by T. W. Tobias, controller Blair Co., furnishing 2,800 ton ¼-⅝ in., clean, tough, durable crushed limestone.

Road Material — Hollidaysburg, Pa. — Until April 9, by T. W. Tobias, controller Blair Co., furnishing or furnishing and applying with motor distributers, 12,000 gal. bituminous material on road between here and Altoona, 11,000 gal. between here and Leamersville and 11,000 gal. between Roaring Spring and Bedford Co. line.

Unloading and Hauling Stone Chips—Baltimore, Md.—Until April 6, By State Rds. Comn., 601 Garrett Bldg., Baltimore, unloading and hauling 9,100 tons stone chips in Dorchester, Somerset, Wicomico and Worcester Counties, Div. 1; 1,700 tons in Cecil, Kent, Queen Anne's, Talbot and Caroline Counties, Div. 2; 2,200 tons in Prince George, Charles and St. Mary's Counties, Div. 3; 6,900 tons in Frederick, Carroll, Howard and Montgomery Counties, Div. 5; 2,500 tons in Garrett, Allegany, Washington and Frederick Counties, Div. 6. F. H. Zouck, chn.; advertised in this issue.

Road Mtchinery, etc. — Grand Rapids, Mich.—Artificial Stone Co. receiving bids for concrete road machinery, to include paver with steam power, pumping outfit and pipe line, etc. (new or used).

Bridge Lumber and Culvert Pipe — Ft. Dodge, Ia.—Until April 9, by C. A. Snook, aud. Webster Co., furnishing 2 carloads of bridge lumber and 5,700 ft. culvert pipe. L. B. Stephenson, co. engr.

Portland Cement—Carson City, Nev.—Until April 5, by C. C. Cottrell, state highway engr., for 70,000 bbl. Portland cement in cloth bags, f.o.b. cement mills.

Aqueduct Tunnels—San Francisco, Cal.—Until April 21, by Bd. Pub. Wks., City Hall, building aqueduct tunnels in mountain division of Hetch Hetchy water supply project in Tuolumne Co., Contr. 77. M. M. O'Shaughnessy, city engr.; advertised in this issue.

Automobile Flusher Sprinklers—Montreal, Que.—Until March 29, by Administrative Comn., for 12 combined automobile flusher sprinklers. A. E. Doucet, dir pub. wks.

Breakwater—Toronto Island, Ont.—Until April 12, by Dept. Pub. Wks., Ottawa, building rubble mound stone breakwater on brushwood fascine mattress, 1,700 ft. long, 7 ft. high, 10 ft. at top, base varying according to depth of water. About $30,000. E. Lafleur, engr.

Steel Transmission Towers — Winnipeg, Man.—Until March 27, by J. M. Leamy, power comr., c/o Manitoba Power Comn., for supply of galvanized steel transmission towers.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Motor Trucks—New York, N. Y.—H. H. Curran, pres. Manhattan Boro., let contract furnishing and delivering one 3½ ton and eleven 2½ ton motor trucks, to Manhattan Sales Corp., 59 East 59th St., $3,387 and $34,991 respectively. Noted March 18.

★Road Materials—New York, N. Y.—H. H. Curran, pres. Manhattan Boro., let contract furnishing and delivering 12,000 bags Portland cement, to J. A. McCarthy, $9,900; 2,000 cu.yd. paving sand, to Manhattan Sand Co., 59 East 59th St., $4,000; 2,500 cu.yd. paving grit, to Colonial Sand & Stone Co., 615 West 49th St., $10,625; 2,000 cu.yd. course aggregate, to Lannigan Bros., Bronx River and 165th St., $8,063; 310,000 wood paving blocks, to Amer. Creosoting Co., 17 Battery Pl., $21,376; 4,500 cu.yd. binder stone, to New York Trap Rock Co., 101 Park Ave., $9,675; 1,000 tons coal tar, to Barrett Co., 17 Battery Pl., $26,900. Noted March 18.

★Dam—Rochester, N. Y.—E. S. Walsh, supt. Pub Wks., Capitol, Albany, let contract building dam over canal on Lexington Ave., here, Barge Canal Contr. 204, to I. M. Ludington Sons Co., 121 Powers Bldg., $4,500. Noted March 18.

Liquid Fuel Oil—St. George, S. I., N. Y.—C. D. Van Name, pres. Richmond Boro., received no bids furnishing and delivering 15,000 gal. liquid fuel oil Noted Feb 19.

★Road Materials—St. George, S. I., N. Y.—C. D. Van Name, pres. Richmond Boro., let contract furnishing and delivering 100,000 gal. bituminous road surfacing material, to Barrett Co., 17 Battery Pl., New York City, $11,000; 900 cu.yd. 1½ in. broken stone, screening trap rock, Dist. 1, 2 and 3, to J. Johnson, 155 Bway., West New Brighton, $5,270, $5,655 and $12,035 respectively; grits for Dists., 1, 2, and 3, to J. E. Donovan, 2205 Richmond Terrace, Port Richmond, $3,870, $3,080 and $2,035 respectively. Noted March 4.

★Percolator and Treating Tank—Cleveland, O.—E. Shattuck, city purch. agt., let contract furnishing garbage percolator, to Ohio Machine & Boiler Co., University Rd., $8,885; one 4 x 24 in. treating tank, to Farasey Mfg. Co., East 37th St. and Erie R.R., $1,350. Noted Feb. 26.

★Trucks — Cleveland, O. — E. Shattuck, city purch. agt., let contract furnishing 5 trucks with dump bodies, to White Co., East 79th St. and St. Clair Ave., $16,516. Noted March 18.

Portland Cement—St Paul, Minn.—H. W. Austin, city purch. agt., received bids March 1, furnishing 37,493 bbl. Portland cement, from Gopher Lime & Cement Co., Griggs and Fuller Sts., and St. Paul Builders Material Co., 606 Ryan Bldg., at $2.75 per bbl. each.

Sewer Pipe—St. Paul, Minn.—H. W. Austin, city purch. agt., received bids March 1, furnishing 4,050 lin.ft. 12 in. sewer pipe, from Gopher Lime and Cement Co., Griggs and Fulton Sts., and St. Paul Builders Material Co., 605 Ryan Annex, at $1.47 per lin.ft. each. Noted Feb. 26.

★Fill—Seattle, Wash.—City let contract building Duwamish Sanitary Fill, 1, involving 593,000 cu.yd. excav., to Commercial Waterway Dist. 1, Hoge Bldg., $90,765.

★Pier—Tacoma, Wash.—Port of Tacoma, 308 Natl. Bank of Tacoma Bldg., let contract for dredging, bulkheading and riprap work in connection with construction of Pier 1, 800 ft. long, 166 ft. wide, involving 28,950 cu.yd. earth fill, to Tacoma Dredging Co., Natl. Bank of Tacoma Bldg., $404,980; pile driving and building pier, involving 60,000 lin.ft. creosoted wood piling, 133,000 ft. bark piling, 62,500 lb. iron and 1,710 M ft. lumber, to D. W. Rutherford, Municipal Dock, $169,600.

★Foundation, etc.—Los Angeles, Cal.—Grauman Theatre Co., 301 South Bway., let contract for foundation and excavation work for theatre on 6th and Hill Sts., to J. A. Hill, 695 Westmoreland Ave. About $75,000.

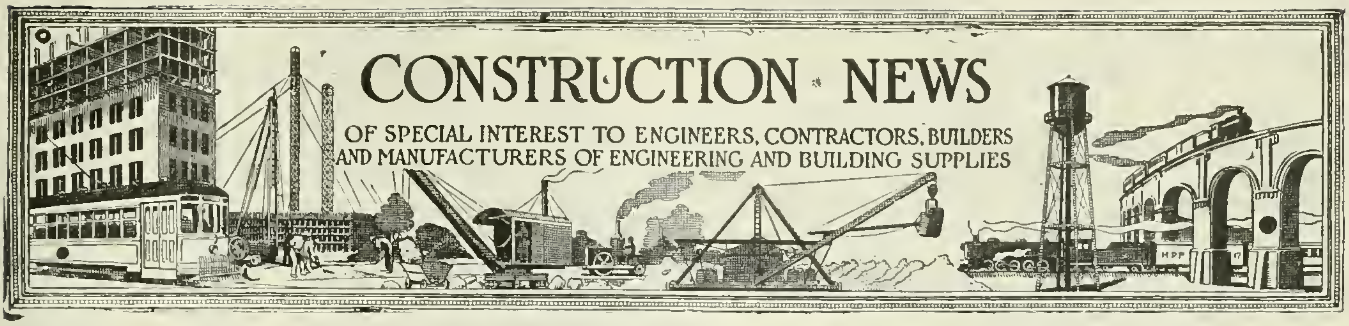
★Slide Gates—San Francisco, Cal.—Bd. Pub. Wks. let contract furnishing and delivering 47 x 90 in. slide gates for outlet system of Hetch Hetchy Dam, to Coffin Valve Co., Neponset St., Boston, $121,000 plus $8.50 per day for foreman's service. Noted March 18.

Valves—San Francisco, Cal.—Bd. Pub. Wks. received bids furnishing and delivering six 3 ft. balanced valves for outlet system of Hetch Hetchy Dam, (a) conforming to drawings furnished by board (b) conforming to drawings submitted by bidder, from J. Hendy Iron Wks., 75 Fremont St., (a) $187,166 plus $12 per day for foreman's service, (b) $189,200 plus $12 per day for foreman's service; Pacific Rolling Mills Co., 17th and Mississippi Sts., (a) $199,000 plus $15 per day for foreman's service; W. Cramp & Son, (b) $173,100 plus $15 per day for foreman's service. Noted Feb. 5.

Cement — San Luis Obispo, Cal. — Bd. Supervs. San Luis Obispo Co. received bids furnishing 50,000 bbl. cement from California Portland Cement Co., Douglas Bldg., Los Angeles, $200,897; H. Cowell Lime & Cement Co., Santa Cruz Portland Cement Co., Pacific Coast Coal Co., 112 West Jefferson St., Los Angeles, Pacific Portland Cement Co., Citizens Natl. Bank Bldg., Los Angeles, all $212,390. An allowance of $50,000 will be made for returned sacks.

★Pier—Santa Monica, Cal.—City Comn. rejected bids received Feb. 27 repairing rein.-con. pleasure pier. Work will be done by day labor under supervision of W. G Murdock, Santa Monica. Noted March 11.

Railway Tanks—Ontario—Canadian Pacific Ry., Windsor St., Montreal, Que., let contract building four 100,000 Imperial gal. steel railway tanks, 1 at Raith, 1 at Upsala, 1 at Eagle River and 1 at Dyment, Ont.; also two 60,000 Imperial gal. steel railway tanks, 1 at Ft. William, Ont., and 1 at Brandon, Man., to Canadian Des Moines Steel Co., Inches Ave., Chatham, Ont. About $70,000.



CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

UPS AND DOWNS OF THE MARKET

PIG IRON—Prices are about the same as last month. Car shortage still acute. It is believed that the crest in prices has been reached.

RAILWAY MATERIALS—Standard rails have advanced $10 in Pittsburgh and are given a range of $45@$55 for bessemer and $47@$57 for openhearth in Chicago. Light rails sell for as high as $3.75 per 100 lb., although the U. S. Steel Corp. quotes $2.45 for 25@45 lb., with few sales.

PIPE—Steel pipe quotations unchanged. Cast iron pipe advanced from $70.30 to $75.30, on 4-in., which in San Francisco sells at $95.55.

ROAD OILS—Prices rising, owing to scarcity. There is an acute shortage of crude oil. The U. S. Government called for 5,000,000 lb. of crude oil, and was able to obtain only 660,000.

CONCRETING MATERIALS—Sand, gravel, stone, lime and cement have changed little in the last month. Gravel advanced in both Boston and New Orleans. Crushed stone is up 25c. in Boston. Hydrated lime advanced $1 for finished and $3, common, in Cincinnati. It will be noticed that quotations on crushed slag are published this month for the first time in the Price Section. Portland cement up 15c. in Dallas. In Boston the dealers' price has advanced 30c., but the wholesale price is still $3.02 gross. In Baltimore sand for concrete work sells at 70c., sand for plaster work at 80c.

REINFORCING MATERIALS—No price change on triangle mesh. Certain handlers of expanded metal lath in New York advanced the price, but lath is still obtainable at last month's price. Lath up in Chicago. Quotations on bars range as high as $4 at the mill, $5 at warehouse.

COMMON BRICK—Up in Dallas and Cincinnati, otherwise the price is steady.

HOLLOW TILE—Up in New York and at Perth Amboy factory. All but 4-in. up in Chicago. Advance in New Orleans. In Baltimore, prices are given only on specifications.

STRUCTURAL MATERIAL—Pittsburgh fabricators report active inquiry, but that mills are filled for three months at least. Carnegie Steel Co. states $2.45 as its price for beams and channels, but the range elsewhere is up to $4, mill, and $5, warehouse. Premiums are the rule.

STEEL SHEETS—Prices still rising. Lack of cars holds up shipments from mill. Prices range from $4.35 to $10 for ordinary black sheets. We quote a range in Pittsburgh, the lower prices being the Mar. 21 schedule of the leading interest, while the higher figures give the independent mill levels.

ROOFING MATERIALS—Tar felt up $10, to $99 per square. Advances in tar pitch, asphalt pitch and asphalt felt.

LUMBER—Adjustment of prices in New York, but price changes are not more than $1 either way. Pine and spruce up in Boston. Ten-dollar increases in pine and fir in Montreal. Pine up in Baltimore. Fir up $2@$4 in Seattle.

LABOR—Wage increases granted in Dallas, New Orleans and San Francisco. Our correspondents report no strikes.

Price advances are indicated by **heavy type**; declines by *italics*

PIG IRON—Quotations compiled by The Matthew Addy Co.:

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	$44 60	$44 60
Northern Basic	42.80	42.80
Southern Ohio No. 2	43.80	43.80
NEW YORK, tidewater delivery		
2X Virginia (silicon 2.25 to 2.75)	47.65	47.65
Southern No. 2 (silicon 2.25 to 2.75)	47.70	47.70
BIRMINGHAM		
No. 2 Foundry	41.00	41.00
PHILADELPHIA		
Eastern Pa	45.35–45.65*	45.35–45.65*
Virginia No. 2	43.25*	43.25*
Basic	43 00†	43.00†
Grey Forge	42.50*	42.50*
CHICAGO		
No. 2 Foundry Local	43.00	43.00
No. 2 Foundry Southern	46.60	46.60
PITTSBURGH, including freight charge from the Valley		
No. 2 Foundry Valley	43.65	43.65
Basic	42.90	42.90
Bessemer	43.40	43.40
MONTREAL		
Silicon 2.25 to 2.75%	43.25	43.25

* F. o. b. furnace. † Delivered.

RAILWAY SUPPLIES

STEEL RAILS—The following quotations are per ton f. o. b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Current	One Year Ago	Current	One Year Ago
Standard bessemer rails	**$55.00**	$45.00	$45.00@**$55.00**	$45.00
Standard openhearth rails	**57.00**	47.00	47.00@**57.00**	47.00
Light rails, 8 to 10 lb.	2.58½*@3.75	2.58*	2.585*@3.75	2.835*
Light rails, 12 to 14 lb.	2.54*@3.75	2.54*	2.54*@3.75	2.79*
Light rails, 25 to 45 lb.	2.45*@3.75	2.45*	2.45*@3.75	2 70*

* Per 100 lb.

Note.—The lower price is that of the U. S. Steel Corp. but the market is mostly speculative and higher prices prevail.

RAILWAY TIES—For fair-sized orders, the following prices per tie hold:

		7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago	Plain	$1 48	$1.33
San Francisco	Douglas Fir—Green	1.74	1.24
San Francisco	Douglas Fir—Creosoted	3.36	2.38

Prices per tie at Missouri mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0.70	No. 1	$0.55
No. 2	.80	No. 2	.65
No. 3	.90	No. 3	.75
No. 4	.98		
7x9x8 white oak			1.05
7x9x8 red oak (No. 4)	$0.80	No. 5	.87

Note.—Add 36c. each for treatment.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Curreat	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard spikes, 9/16-in. and larger	$3.35	$3 25	$3 62	$4.44	$5.65
Track bolts	4 90@5 00	4.90	4.62	Premium	6.65
Standard section angle bars	2 75	3 25	3 02	Premium	4 90

PIPE

STEEL AND IRON—The following discounts are to jobbers for carload lots on the Pittsburgh basing card, discounts on steel pipe, applying as from January 14, 1920, and on iron pipe from January 7, 1920:

BUTT WELD

Inches	Black	Galv.	Inches	Black	Galv.
⅛, ¼ and ⅜	47	20½	⅛ and ¼	1	+25
½	51	36½	⅜	25½	+ 1½
¾ to 3	54	41½	½	29½	11½
			¾ to 1½	34½	18½
			2 and 2½	33½	17½

LAP WELD

Inches	Black	Galv.	Inches	Black	Galv.
2	47	34½	1¼	24½	9½
2½ to 6	50	37½	1½	31½	17½
7 to 12	47	33½	2	28½	14½
13 and 14	37½	.	2½ to 6	30½	17½
15	35	...	7 to 12	27½	14½

BUTT WELD, EXTRA STRONG, PLAIN ENDS

Inches	Black	Galv.	Inches	Black	Galv.
⅛, ¼ and ⅜	43	25½	¼	+7	+40
½	48	35½	⅜	23½	6½
¾ to 1½	52	39½	½	28½	15½
2 to 3	53	40½	¾ to 1½	34½	19½
			2 and 2½	34½	19½

LAP WELD, EXTRA STRONG, PLAIN ENDS

Inches	Black	Galv.	Inches	Black	Galv.
2	45	33½	1¼	21½	6½
2½ to 4	48	36½	1½	27½	13½
4½ to 6	47	35½	2	20½	16½
7 to 8	43	29½	2½ to 4	31½	19½
9 to 12	38	24½	4½ to 6	30½	18½
			7 to 8	22½	10½
			9 to 12	17½	5½

STEEL—From warehouses at the places named the following discounts hold for steel pipe:

	Black New York	Black Chicago	Black St. Louis
¾ to 3 in. butt welded	47%	54%	45%
2½ to 6 in. lap welded	42%	50%	41½%

	Galvanized New York	Galvanized Chicago	Galvanized St. Louis
¾ to 3 in. butt welded	31%	40½%	30½%
2½ to 6 in. lap welded	27%	37½%	27½%

Malleable fittings, Class B and C, from New York stock sell at + 23% list prices. Cast iron, standard sizes, net.

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York Current	New York One Month Ago	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
4 in.	$75 30	$70.30	$60 70	$75 80	$71.00	$93 55	$70.30
6 in. and over	72.30	67.30	57.70	72.80	68.00	90.55	67.30

Gas pipe and 16-ft. lengths are $2 per ton extra.

CLAY DRAIN TILE—The following prices are per 1000 lin.ft.:

Size, In.	New York Current	New York One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$35.00	$35 00	$22 50	$60 00	..	$33.44
4	51 00	51.00	27.00	80.00	$45.00	50 16
5	65 00	65 00	45 00	100 00	65.00	62.70
6	90.00	90.00	55.00	120 00	90.00	83.60
8	130.00	130.00	100.00	180.00	150.00	133.76

SEWER PIPE—The following prices are in cents per foot for carload lots:

Size, In.	New York Current Delivered	New York Year Ago Not Del.	St. Louis	Chicago	San Francisco	Dallas
3	$0 19	$0.09	....	$0.15	..	$0 175
4	19	.09	....	.15	$0.16	175
5	.29	.135	....	.225	.20	245
6	.29	135	$0.16	.225	.24	245
8	.45	.21	.21	.35	34	.35
10	.67	.315	.29	525	.47	....
12	86	405	.37	625	64	63
15	1 30	54	.56	.90	1 00	...
18	1 88	.75	.91	1 25	1 35	......
20	2 25	.90	1 14	1 50	1 80	......
22	3 00	1 20	1.46	2.00	..	....
24	8 38	1 485	1 56	2 25	2.24	3.10
27	...	2 145	1 90	3 50	......	
30	....	2.376	2.57	4 00	......	
33	....	3.15	3.09	4 75	......	..
36	....	3 5870	3 37	5.50	......	5 60

	3	5	8	12	24	36
Boston	$0 135	$0 203	$0 315	$0 6075	$2.025	$6 31
St. Paul	125	.167	.295	495	1 87	4.37
Denver	.. .	...	.29	50	1 75	....
Seattle	....	...	3825	68	.. ..	2.375
Kansas City			No prices obtainable			
Los Angeles	.0975*	.1525*	27	48	60*	......
New Orleans			45 per cent off			
Cincinnati			56 per cent off			
Atlanta	....	....	.34	.55	2.00	....
Montreal			55 per cent. off			
Detroit			58 per cent. off			
Baltimore	.168	.232	.392	.756	2.52	.....

* 4-in., 6-in., 30-in. respectively

ROAD AND PAVING MATERIALS

ROAD OILS—Following are prices per gallon in tank cars 8000 gal. minimum f.o.b. place named:

	Current	One Month Ago
New York, 45–65% asphalt (at terminal)	$0 11½	$0.09
New York, liquid asphalt (" ")	.11½	.09
New York, binder (" ")	.11½	.10
New York, flux (" ")	.12	....
St. Louis, 40% asphalt	.065	.065
Chicago, 40-50% asphalt	.08	.07
Chicago, 60-70% asphalt	.08½	.0725
Dallas, 40–50% asphalt	.07	.07
Dallas, 60–70% asphalt	.03	.08
Dallas, 75–90% asphalt	.10	.10
San Francisco, asphalt base, 42 gal. per bbl	2.25	2.25

ASPHALTUM—Price per ton in packages (350-lb. bbls. or 425-lb. drums), and in bulk in carload lots:

	Package	Bulk*
New York	$32.00	$26 00
Chicago	30.90	23.40
San Francisco	17.00	13.75
Dallas	35.00	31.00
Seattle	25.00	.....
Denver	40.00	36.00
St. Paul	24.00	21.00
Kansas City	34.00	26.00
Atlanta	25.00	20.80
New Orleans	16.50	..
St. Louis	23.25*	17.75
Baltimore	43.00	....
Los Angeles	.....	15.00
Montreal	.....	19.60
Detroit	49.00	42.25

PAVING STONE—

New York	5-in. granite	$130.00	per M
Chicago	About 4x8x4 dressed	3.10	sq yd.
	About 4x8x4 common	2.80	sq.yd.
San Francisco	Basalt block 4x7x8	65.00	per M
Kansas City	Granite	3.00	sq.yd.
Boston	5-in. granite	110.00	per M
St. Paul	Sandstone	2.47	sq.yd.
Atlanta	Granite	2.00	sq.yd.
Detroit	Granite, 26½ blocks per sq. yd.	2.85	sq.yd.
Baltimore	Common	2.30	sq.yd.
Montreal	Granite	5.90	sq.yd.

FLAGGING—

New York	Bronx	$0.24	sq.ft.
	Manhattan	.25	sq.ft.
	Queens, 5 ft.	.25	sq.ft.
	6x20-in. cross-walk	.80	lin.ft.
Chicago	18 in. wide	.70	lin.ft.

WOOD BLOCK PAVING—	Size of Block	Treatme	Per Sq.Yd.
New York	3½	16	$3.75
New York	4	16	4.10
Chicago	4	16	4.50
Chicago	3½	16	3.50
Chicago	City specifications		5.00
St. Louis	3½	16	2.90
St. Louis	4	16	3.32
Seattle	4	16	2.55
Kansas City	4	16	3.00
St. Paul	3½	..	2.75
Atlanta	3½	16	2.30
New Orleans	3½	16	2.63
New Orleans	4	16	3.00
Dallas	4	18	3.57
Baltimore	3½	16	3.60
Montreal	4	16	4.60

CONSTRUCTION MATERIALS

SAND AND GRAVEL—Price for cargo or carload lots is as follows, per cu.yd:

	Gravel 1½ In. Current	Gravel 1½ In. One Yr. Ago	Gravel ¾ In. Current	Gravel ¾ In. One Yr. Ago	Sand Current	Sand One Yr Ago
New York	$2.25	$2.00	$2.25	$2.00	$1 25	$1 25
Denver	1.80	1 60	1.80	1.60	1.40	1.10
Chicago	2.00	2 00	2.00	1 40	2.00	1.10
Kansas City	3.25	2 50	3.75	3.00	1.25	1.00
St. Louis	1.78	1 76	1.82	1.82	1.68	1.68‡
Seattle, per ton	1.25	1 25	1.25	1.25	1.25	1.25
Dallas	*2.50*	2.25	*2.50*	2.25	*2.00*	1.35
St. Paul	1.50	1.25	1.35	1.35	.75	.60
Cincinnati	....	1 35‡	...	....	1.30	1.35‡
San Francisco	1.50	1.15	1 50	1.15	1.50	1.15
Boston	2 85	1.70‡	2 85	1.70‡	2.00	.95‡
New Orleans	3 00	2 75		2.75	1.40	1.50
Los Angeles	1 50	1.02	....	1.02	1.00	70
Atlanta, per ton	2 25	2.40	2.25	2 40	1.15	....
Detroit	2.50	....	2.00	...	1.85	....
Baltimore	1.40‡	....	1.60‡	....	.70	....
Montreal, per ton	1.15	....	....	....	1 40	.. ..

* Fine white sand, Pacific and Ottawa, per ton $6.

† Kaw River sand is $1 75 per yd ‡ per ton.

CRUSHED STONE—Price for cargo or carload lots is as follows, per cu.yd.:

	1½ In.		¾ In.	
	Current	One Year Ago	Current	One Year Ago
New York	$1.85@1.95	$1.65@1.75	$2@2.10	$1.75@1.85
Chicago	2.00	1.60	**2.15**	1.70
St. Louis	1.65	1.35	1 65	*1.35*
Dallas	**3.50**	2.25	**3.50**	2.25
San Francisco	1.50	1.15	1.50	1.15
Boston	**3 25** (del)	3.00	**3.25** (del)	3.00
St. Paul	1.50†	1.15	1.60	1.25
Denver	3.75	1.60	3.75	1.60
Kansas City	2.25	1.70	2.35	1.80
Seattle (Del.)	3.50	1.50	3.50	1.50
Atlanta	3.10*	2.60	....	**2.85**
New Orleans	4.00	....	4.35	1.28
Los Angeles	1.50	*1.12*	1.50	*1.12*
Detroit	1.75	....	1.75	....
Baltimore	1.50*	....	1.50*	....
Montreal	1.75*	....	2.00*	....

* Per ton. † Limestone; traprock, $1.60 and $1.80 per ton for 1½ and ¾-in.

CRUSHED SLAG—Price of crushed slag per net ton in carload lots:

	1½-In.	¾-In.	Roofing	Sand
Lebanon or Bethlehem, Pa	$1.00	$1.00	$2.50	$0.90
Allentown, Pa	1.00	1.00	2.50	1.00
Buffalo, N. Y	1.25	1.00	2.00	1.00
East Canaan, Conn	1.25	1.35	3.50	1.10
Birmingham, Ala	1.25	1.25	.....	1.00

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 200-Lb. Barrel	
	Finished	Common	Finished	Common
New York	**$18.50**	**$17.50**	**$3.00***-atplant-	**$2.80***
Kansas City	26.00	25.00	2.50	2.40
Chicago	20.50	14.50	2.25	1.50
St. Louis	22.00	18.00	....	2.00
Boston	24.00	**21.00**	**4.30***	**4.05***
Dallas	...	*25.00*	......	*2.50†*
Cincinnati	**17.20**	**16.20**	......	**13.20‡**
San Francisco	20.00	16.00	.....	*2.25*
St. Paul	24.00	19.00	1.60†	1.50
Detroit	27.20	.....	2.85†	1.80*
Seattle	30.00	.....	2.80†	2.80†
Los Angeles	2.75†	2.20†	2.75†	2.00†
Baltimore	21.35	16.50	....	10.65‡
Montreal	25.00	25.00	15.00‡	15.00‡
Atlanta	22.50	.....	.....	.....
New Orleans	.....	22.00	.....	2.40

* 300-lb. barrels. †Per 180-lb. barrel. ‡ Per ton.

NOTE—Refund of 10c. per barrel with 25c per ton off on hydrated.

NATURAL CEMENT—Price to dealers for 500 bbl. or over, f. o. b., exclusive of bags:

	Current	One Year Ago
St. Paul (Austin)	$1.50	$1.63
Kansas City (Ft. Scott)	1.75	1.30
New Orleans	**3.36**	2.52
Atlanta (Magnolia)	1.90	....
Cincinnati (Louisville)	2.25	1.50

PORTLAND CEMENT—Current prices are for barrels in carload lots, *without* bags, to contractors:

	Current	One Month Ago	One Year Ago
	Without Bags		Without Bags
New York (del.)	$2.80*	$2.80	$2.45
Jersey City (del.)	2.47	2.47	2.62
Boston	2.42	2.42	2.57
Chicago	2.00	2.00	2.05
Pittsburgh	2.05	2.05	2.15
Cleveland	2.32	2.32	2.32
Detroit	2.08	2.08	2.28
Indianapolis	2.27	2.27	2.22
Toledo	2.12	2.12	2.22
Milwaukee	2.11	2.11	2.16
Duluth	2.10	2.10	2.20
Peoria	2.12	2.12	2.16
Cedar Rapids	2.18	2.18	2.28
Davenport	2.14	2.14	2.24
St. Louis	2.20	2.20	2.30
San Francisco	2.63	2.63	3.00
New Orleans	2.36	2.36	2.70
St. Paul	2.22	2.22	2.40
Denver	2.82	*2.82*	2.67
Kansas City	2.36	2.36	2.30
Seattle	2.78	**2.78**	2.13
Dallas	**2.15**	2.03	2.03
Atlanta	2.70	2.70	*2.60*
Cincinnati	3.00	**3.00**	....
Los Angeles	2.78	2.78	*2.68*
Baltimore (del)	2.90	**2.90**	.....
Montreal (including bags)	3.48†	*2.48†*	.....

NOTE—Bag charge is generally 15c. each. ***Delivered Manhattan, The Bronx or Brooklyn.** †Including bags.

TRIANGLE MESH—Price per 100 sq.ft. in carload lots:

PLAIN 4-INCH by 4-INCH MESH

Style Number	Sectional Area Square Inches per Ft. Width	Pittsburgh	New York	Chicago	St. Louis	Dallas	San-Francisco
032	0.032	$0.92	$1.16	$0.98	$0.99	$1.13	$1.32
049	0.049	1.18	1.48	1.26	1.26	1.43	1.67
068	0.068	1.44	1.86	1.53	1.56	1.79	2.06
093	0.093	1.85	2.39	1.97	2 00	2.41	2.65
126	0.126	2.28	3.02	2.43	2.47	2.92	3.28
153	0.153	2.72	3.59	2.90	2.95	3.48	3.93
180	0.180	3.12	4.13	3.33	3.39	3.99	.....
245	0.245	4 12	5.44	4.40	4.47	5.27	.....
287	0.287	4 76	6.29	5.08	5.16	6.10	6.86
336	0.336	5.52	7.30	5.89	5.99	7.06	.....
395	0.395	6.40	8.45	6.83	6.94	8.19	.....
PAVING							
036P	0.036	$0.71	$0.92	$0.76	$1.77	$0.80	.....
053P	0.053	1.00	1.28	1.06	1.08	1.12	.....
072P	0.072	1.26	1.66	1.34	1.37	1.46	.....
097P	0.097	1.62	2.12	1.73	1.76	1.88	.....
049R	0.049	1.00	1.28	1.06	1.08	1.12	.....
067R	0.067	1.26	1.65	1.34	1.37	1.46	.....
089R	0.089	1.62	3.11	1.73	1.76	1.88	.....

Made in 16-, 20-, 24-, 28-, 32-, 36-, 40-, 44-, 48-, 52- and 56-in. width in rolls 150-, 200- and 300-ft. lengths. Galvanized is about 10% higher.

EXPANDED METAL LATH—Prices in carload lots per 100 yd. for painted are as follows:

		New York					
		Current					
Gage	Weight	Carloads	Less Carloads	Chicago	St. Louis	San Francisco	Dallas
27	233	$32.10	$32.20*	**$33.60†**	$33.00	$36.00	$32.75
26	250	33.45	33.65*	**35 20†**	34.00	......	34.50
25	300	34.90	35.00*	**36.90†**	......	39.00	36.75
24	340	36.50	36.65*	**40.00†**	37.00	44.00	39.25
22	450	39.60	39.80*	**45 10†**	......	......	43.30

* Delivered on job.
†Galvanized is $8 per 100 yd , additional.

BARS, CONCRETE REINFORCING—Following quotations are per 100 lb.:

ROLLED FROM BILLETS

		Warehouse, Uncut				
		New York				
In.	Mill Pittsburgh	Current	One Year Ago	Chicago	Dallas	San Francisco
¾ and larger.	$2.35@$4 00	$3.52@$5.00	$3.37	$3.37	$4.75	$5.30
⅝	2.40@ 4.00	3.57@ 5.00	3.42	3.42	4.80	5.35
½	2.45@ 4.00	3.62@ 5.00	3.47	3.47	4.95	5.40
⅜	2.60@ 4.00	3.77@ 5.00	3.62	3.62	5.00	5.55
¼	2.85@ 4 00	4.02@ 5 00	3.87	4.87	5.05	5.80

Twisted bars cut to length take extra of 29½c. per 100 lb.

ROLLED FROM RAILS

	Chicago	St. Louis	Dallas		Chicago	St. Louis	Dallas
¾ in. and larger	**$3.75**	$3.50	$4.25	⅜	**$4.00**	$3.75	......
⅝	**3.80**	3.55	4.30	¼	**4.25**		
½	**3.85**	3.60	.....				

BRICK—To contractors price per 1000 in cargo or carload lots is as follows:

	Common			Paving	
	Current	One Month Ago	One Year Ago	Brick	Block
New York	$25 00	$25.00	$15.00	No Quotations	
New Orleans	22.50	22 50	......	23 50	.....
Chicago	14.00	14.00	12.00	.35@.40	None
St. Louis, salmon	16.00	**16.00**	10.00	31 00	.....
Denver	17.00	**17.00**	12.00	......	.....
Dallas	**24.00**	18.57	16.07	**34.00**	**45 00**
San Francisco	15.00	**15.00**	12.50	.....	.....
Boston	*30.00*	35.00	18.00	50 00	55.50
St. Paul	20.00	20.00	10.25	.....	40.00
Kansas City	20.00	20.00	14.00	44.50	.....
Seattle	15.00	15.00	15.00	.....	44.00
Cincinnati	**22 00**	19.00	16.50–14.00	36.00	.....
Montreal (del.)	17.50	17.50	.....	55.00‡	.....
Detroit	21.00	21.00	.....	40.00	.....
Baltimore (del)	18.00–22.00	18.00–22.00	.....	*25.00*	45.00

*Hard brick $18 50 in St. Louis. ‡Not delivered.

HOLLOW TILE—Price per block in carload lots for hollow building tile:

	New York						
	Current on Trucks	One Year Ago	Chicago	St. Louis	San Francisco	Dallas	Factory Perth Amboy, N. J.
4x12x12	**$0.1895†**	$0.11925	**$0.1326**	$0.08	$0.1125	**$0.148**	**$0 1705†**
6x12x12	**.2526†**	.159	**.199**	.105	.15	....	**.2274†**
8x12x12	....	....	**.2387**	.15	....	....	**.3411***
10x12x12	....	....	**.2984**	.173	....	....	**.4263***
12x12x12	....	....	**.3581**	.208	....	....	**.5116***

*Natco XXX. These prices subject to 5% cash discount in 15 days from date of shipment. † Partition tile.

	4x12x12	8x12x12	12x12x12
Boston	$0.20	$0.40	$0.55
St. Paul	.087	.158	.248
Cincinnati		All prices withdrawn	
Kansas City		No prices obtainable	
Denver	.12	.185	.....
Seattle	.09	.175	.30
Atlanta	.115	.19	.28
Los Angeles	.082	.154	
New Orleans	**.198**	**.264**	**.38**
Detroit	.12	.235	.335
Montreal	.19	.28	.35
Baltimore		On specifications	

STRUCTURAL MATERIAL—Following are base prices f.o.b. mill, Pittsburgh, together with quotations per 100 lb. from warehouses at places named:

	Mill Pittsburgh	New York Current	New York 1 Yr. Ago	Chicago	San Francisco	Dallas
Beams, 3 to 15 in.	$2.45@$4	$3.97@$5	$3.47	$3.97	$5.40	$5.50
Channels, 3 to 15 in.	2.45@ 4	3.97@ 5	3.47	3.97	5.40	5.50
Angles, 3 to 6 in., ¼ in. thick.	2.45@ 4	3.97@ 5	3.47	3.97	5.40	5.50
Tees, 3 in. and larger	2.45@ 4	4.02@ 5	3.52	4.02	5.40	5.50
Plates	2.65@ 4	4.17@ 5	3.67	4.17	6.30	5.75

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill Pittsburgh	Warehouse New York Current	Warehouse New York One Yr. Ago	Warehouse Chicago	Warehouse St. Louis	Warehouse San Francisco	Warehouse Dallas
¾ in. and larger	$4.50	$6.00	$5.05	$5.37	$5.44	$6.65	$7.50

CONE HEAD BOILER

	Mill Pittsburgh	Warehouse New York Current	Warehouse New York One Yr. Ago	Warehouse Chicago	Warehouse St. Louis	Warehouse San Francisco	Warehouse Dallas
¾ in. and larger	4.60	6.10	5.15	**5.47**	5.54	6.75	7.50
⅝ and 11/16	4.75	6.25	5.30	**5.62**	5.54	7.00	7.50
½ and 9/16	5.00	6.00	5.55	**5.97**	5.54	7.25	7.75

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	New York	Chicago	San Francisco	Dallas	Montreal
Wire	$4.50	$7.50	$4.15	$5.50	$6.90	$4.95
Cut	....	8.00	7.00	6.90	6.40	5.00

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

	1-Ply c.l.	1-Ply l.c.l.	2-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.	3-Ply l.c.l.
No. 1 grade	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25
No. 2 grade	1.70	1.95	2.15	2.40	2.50	2.75

Asbestos asphalt-saturated Felt (14 lb. per square) costs $170 per ton f.o.b. Erie.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $3.00 per roll in carload lots and $3.25 for smaller quantities.

Shingles, red and green slate finish, cost $7.25 per square in carloads; $7.50 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

	Carload Lots N. Y.	Carload Lots Chicago	Less Than Carload Lots N. Y.	Less Than Carload Lots Chicago
Tar felt (14 lb. per square of 100 sq.ft.)	$99.00	$97.00	$101.00	$99.00
Tar pitch (in 400-lb. bbl.)	25.00	22.00	26.00	23.00
Asphalt pitch (in barrels)	40.00	40.00	43.50	43 50
Asphalt felt	98 00	98.00	100.00	100.00

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Yr. Ago
No. 10	$3.55@$5.95	$6.02	$6.02	$7.50	$6.62@$6.80	$4.57
No. 12	3.60@ 6.05	6.07	6.07	7.55	6.67@ 6.85	4.62
No. 14	3.65@ 6.10	6.12	6.12	7.60	6 22@ 6.90	4.67
No. 16	3 75@ 6.20	6.17	6.17	7.70	6 82@ 7.00	4.77
Black						
*Nos. 18 and 20	4.15@ 6 30	6.80	6.80	7.85	7 80@ ..	5.42
*Nos. 22 and 24	4.20@ 6.35	6.85	6.85	7.90	7.85@	5.47
*No. 26	4.25@ 6.40	6.90	6.90	7.95	7.90@	5.52
*No. 28	4.35@ 6.50	7.00	7.00	8.05	8.00@	5.62
Galvanized						
No. 10	4.70@ 7.50	7.50	7.50	8.60	8.25@ 9.00	5.97
No. 12	4.80@ 7.60	7.60	7.60	8.60	8.35@ 9.10	6.02
No. 14	4 80@ 7.60	7.60	7.60	8.60	8.35@ 9 10	6.07
Nos. 18 and 20	5 10@ 7 90	7 90	7 90	8.90	8 65@ 9 40	6.37
Nos. 22 and 24	5 25@ 8 05	8.05	8 05	9.05	8 80@ 9.55	6.52
*No. 26	5 40@ 8.20	8 20	8.20	9.20	8 95@ 9.70	6.67
*No. 28	5.70@ 8 50	8.50	8 50	9.50	9 25@ 10.00	6.97

*For painted corrugated sheets add 30c. per 1000 lb. for 5 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 15c., all gages.

LINSEED OIL—These prices are per gallon:

	New York Current	New York One Year Ago	Chicago Current	Chicago One Year Ago
Raw in barrel (5 bbl.)	$1 87	$1.55	$2 05	$1.66
5-gal. cans	1 87*	1 70	2 30	1.86

*To this price must be added the cost of the cans (returnable). $2 25 for case of six

---

WHITE AND RED LEAD—Base price per pound:

	Red Current Dry	Red Current In Oil	Red 1 Year Ago Dry	Red 1 Year Ago In Oil	White Current Dry and In Oil	White 1 Yr. Ago Dry and In Oil
100-lb. keg	15.50	17.00	13.00	14.50	15.50	13.00
25 and 50-lb. kegs	15.75	17.25	13.25	14.75	15.75	13.25
12½-lb. keg	16.00	17.50	13.50	15.00	16.00	13.50
5-lb. cans	18.50	20.00	15.00	16.50	18.50	15.00
1-lb. cans	20.50	22.00	16.00	17.50	20.50	16.00

500 lb. lots less 10% discount; 2000 lb. lots less 10-2½% discount.

LUMBER

San Francisco—Prices of rough Douglas fir No. 1 common, in more than carload lots:

Lumber Prices in Yards at San Francisco

	6-8-12 and 14 Ft.	10-16-18 and 20 Ft.	22 and 24	25 to 32 Ft.
3x3 and 4	$42.00	$42.50	$43.50	$45.50
3x6 and 8	43.00	43.50	44.50	46.50
4x4-6 and 8	43.50	44.50	45.50	47.50
3x10 and 12	43.50	44.50	45.50	47.50
3x14	44.00	45.00	46.00	48.00
4x10 and 12	43.50	44.50	45.50	47.50
4x14	44.50	45.50	46.50	48.50

	24 Ft. and Under	25 to 32 Ft.	33 to 40 Ft.
6x10	$43.00	$45.00	$46.00
6x14	44.50	46.50	47.00
8x10	43.00	45.00	46.00
8x14	44.50	46.50	47.00

New York, Chicago and St. Louis

	Southern Pine New York* 20 Ft. and Under	Southern Pine New York* 22-24 Ft.	Southern Pine Chicago 20 Ft. and Under	Southern Pine Chicago 22-24 Ft.	Yellow Pine St. Louis 20 Ft. and Under	Yellow Pine St. Louis 22-24 Ft.
3x 4 to 8x 8	*$62.00*	*$63.00*	$70.00	$71.00	$52.50	$53.50
3x10 to 10x10	67.00	68.00	71.00	73.00	57.50	58.50
3x12 to 12x12	**72.00**	**73.00**	75.00	76.00	60.00	61.00
3x14 to 14x14	*77.00*	*78.00*	80.00	81.00	65.00	66.00
3x16 to 16x16	85.00	86.00	85.00	86.00	67.50	68.50
3x18 to 18x18	*90.00*	*91.00*	90.00	91.00	72.50	73.50
4x20 to 20x20	*100.00*	*101.00*	.....	.....	......	......

* Prices from Lumbermen's Bureau.

Over 24 ft.—Add $1 for each additional 2 ft. in length up to 40 ft. for sizes 12 x 12 and under; for sizes over 12 x 12 add $2. For merchantable add $2 to sizes 10 x 10 and under. For prime add $2 to the price of merchantable for all sizes.

Other Cities

	8 x 8-In. x 20-Ft. and Under P.	8 x 8-In. x 20-Ft. and Under Fir	8 x 8-In. x 20-Ft. and Under Hemlock	8 x 8-In. x 20-Ft. and Under Spruce	12 x 12-In. 20 Ft. and Under P.	12 x 12-In. 20 Ft. and Under Fir
Boston	$86.50	$65.00	$65.00	$65.00	$110.00	$100.00
Kansas City	53.00	52.25	52.25	52.25	64.00	52.25
Seattle	.....	34.00	.....	.....	.....	35.00
New Orleans	55.00	......	......	......	65.00	......
St. Paul	62.00	61.00	61.00	47.50	43.00	58.00
Atlanta	62.50	64.50	66.00	76.00	79.50	82.00
Baltimore	75.00	......	......	......	87.50	......
Cincinnati	55.00	55.00	55.00	......	62.50	60.00
Montreal	89.00	80.00	65.00	60.00	73.00*	73.00
Los Angeles	.....	59.00	58.00	.....	.....	51.00
Denver	.....	65.00	65 00	65.00	.....	66.00

	1-In. Rough, 10 In. x 16 Ft. and Under P.	1-In. Rough, 10 In. x 16 Ft. and Under Fir	1-In. Rough, 10 In. x 16 Ft. and Under Hemlock	2-In. T. and Gr. 10 In. x 16 Ft. P.	2-In. T. and Gr. 10 In. x 16 Ft. Fir
Boston	$75.00	$65.00	$65.00	$85.00	$65.00
Kansas City	115.25	89.75	89.75	117.25	92.75
Seattle	.....	37.50	.....	.....	38.50
New Orleans	60.00	.....	.....	65.00	.....
St. Paul	54.00	54.00	53.00	64.50	58.50
Atlanta	85.00	90.00	......	77.50	87.50
Baltimore (box)	65@67.50	.....	.....	60–50.00	......
Cincinnati	60.00	58.00	60.00	55.00	55.00
Montreal	75.00	75 00	65.00	66.00	66.00
Los Angeles	.....	57.00	56.00	.....	.....
Detroit	54.00	.. .	.....	56.00	.....
Denver	.....	62.00	62.00	140.00	127.50

* Montreal—Up to 32 ft.; over which, $3.00 per M. increase up to 30 ft.

Dallas—Yellow pine. Price per M:

1 in. rough, 10 in. and under, 16 ft. and under	$62.50
2 in., t and g., dressed and matched, 10 in. x 16 ft. and under	62.50
8 x 8 and under, 20 ft. and under	72 50
12 x 12, 20 ft. and under.	75 00

FREIGHT RATES

On finished steel products in the Pittsburgh district, including plates, structural shapes, merchant steel, bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc., the following freight rates are effective in cents per 100 lb.:

Boston	$0.30	New Orleans	$0.38½
Buffalo	.17	New York	.27
Chicago	.27	Pacific Coast (all rail)	1.25*
Cincinnati	.23	Philadelphia	.24½
Cleveland	.17	St. Louis	.24
Denver	.99	St. Paul	.49½
Kansas City	.59	Detroit	.33
		Baltimore	.33

Note—Add 3% transportation tax. * Minimum carload, 80,000 lb.

CONTRACTORS' SUPPLIES

STEEL SHEET PILING—The following price is base per 100 lb. f. o. b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$2.55@$3 65	$2.55@3.65	$2.55

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Hercules red strand, all constructions	20%
Patent flattened strand, special and cast steel	20%
Patent flattened strand, iron rope	5%
Plow steel round strand rope	35%
Special steel round strand rope	30%-10% and 5%
Cast steel round strand rope	22½%
Iron strand and iron tiller	5%
Galvanized iron rigging and guy rope	+12%

Another manufacturer advises following discounts in New York and Chicago: Plow Steel, 30%; Mild Plow Steel, 30%; Crucible Cast Steel, 22½%.

San Francisco: Galvanized Iron Rigging and Guy Ropes, +17½%; Bright Plow, 25% off.

Chicago, +12½ on galvanized, *30* off on bright.

MANILA ROPE—For rope smaller than ¾-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅝-in., 8 ft., ¾-in., 6; ⅞-in., 4½; 1-in., 3½; 1⅛-in., 2 ft. 10 in.; 1¼-in., 2 ft. 4 in. Following is price per pound for ¾-in. and larger, in 1200-ft. coils:

Boston	$0.33	Kansas City	$0.26½
New York	.29	New Orleans	.28½
Chicago	.27½	Los Angeles	.28½
St. Paul	.27½	Seattle	*.25*
San Francisco	.27	St. Louis	.26½
Atlanta	.29½	Montreal	.32
Denver	.27½	Detroit	.26
Cincinnati	.27½	Baltimore	.25½
Birmingham	.32	Dallas	.34½

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb keg for black powder.

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	80%	Black Powder
New York	.....	$0.34½	$0.34½	.....	$2.30
Boston	$.225-24	.245-28	.25-31	$.3525	2.40
Kansas City	.235	.26	.385	.3275	2.35
Seattle	.18	.21½	.24½	.29	2.45
Chicago	.2175	.2525	.2975	.34	2.45
St. Paul	.185	.2275	.2525	.2950	2.25
St. Louis	.2175	.26	.285	.295	1.90
Denver	.205	.2475	.2725	.315	2.50
Dallas	.265*	.275	.3025	....	*2.60*
Los Angeles	.25	.30	.35	.275	2.95
Atlanta	.22	.245	.265	.....	2.55
Baltimore	.225	.2675	.3075	.325	2.40
Cincinnati	.2275	*.2525*	.2725	.....	2 30
Montreal	.28	.31	.34	.38	3.90

* 30 Per Cent.

POLES—For plain pine poles, delivered New York, the price is as follows:

10-in. butts, 5-in. tops, length 20-30 ft.	$9.00
12-in. butts, 6-in. tops, length 30-40 ft.	11.50
12-in. butts, 6-in. tops, length 41-50 ft.	12.50
14-in. butts, 6-in. tops, length 51-60 ft.	21.00
14-in. butts, 6-in. tops, length 61-71 ft.	23.50

[illegible]	Dallas
6-in. x 20-ft.	$4.60
6-in. x 30-ft.	7.10
8-in. x 30-ft.	8.45
8-in. x 35-ft.	10 38

OLD MATERIAL—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and St. Louis the quotations are per net ton and cover delivery at the buyer's works, including freight transfer charges.

	New York	Chicago	St. Louis
No. 1 railroad wrought	$33.00	$27.00	*$25.50*
Stove plate	31.00	*31.00*	*30.50*
No. 1 machinery cast	41.80	*38.00*	.
Machine shop turnings	16.50	*13.75*	*15.00*
Cast borings	19.00	*14.00*	*15.00*
Railroad malleable cast	29.00	*28.00*	*26.00*
Re-rolling rails	33.00	32.50	32.50
Relaying rails	50.00	40@50	50@55

SHIP SPIKES—Current prices per 100 lb.

	San Francisco		Seattle
In.	Galv.	Black	Black
¼	$9.20	$8.50	$8.55
⅝	8.25	6.25	8.25
½	8.60	6.60	8.30

Pittsburgh base, $4.50 per 100 lb.

LABOR RATES AND CONDITIONS THROUGHOUT THE COUNTRY

S means scarce; E, enough; P, plentiful

Cities	Bricklayers	Carpenters	Hoisting Engineers	Hod Carriers	Pile Drivers	Structural Iron Workers	Common Labor	Remarks
Atlanta	$0.90S	$0.60-75P	$0.50-65P	$.40-.45P	$0.60-.65	$0.75	$0.35S	Atlanta—Great activity in construction. Common labor scarce.
Baltimore	1.00E	.80-90E	.87½E	.46-.54E	.74P	1 00E	.35-.45E	Baltimore—Changes expected May 1
Boston	1.25P	1 00P	1.00P	.85P	1.25P	1.00P	.62½P	Boston—Labor of all kinds plentiful.
Cincinnati	1.25S	.25	.75	.65	.50	.875P	.60S	Cincinnati—Common labor scarce.
Cleveland	1.00S	.90S	1.00E	.57½E	.80E	1.00E	.57½E	
Dallas	1.25S	1@1.25S	1.00E	.60E	.100E	1 25S	.44@.60S	Dallas—Common labor very scarce. Bricklayers, ironworkers and carpenters scarce.
Denver	1.12½E	1.12½E	1.00E	.68¾-.75	......	1.00E	.50E	Denver—General increase. Double pay for overtime.
Detroit	1 10S	.85E	.90-1.00P	.65-70S	.90E	.85-.90E	.60-.65S	Detroit—All trades busy. Common labor scarce. Considerable work under contract, but tendency is to slow down on proposed construction.
Kansas City	1.00	.85-.87½	.90	.68¾	.77	.90	.57½	Kansas City—Usual demand for increase on May 1, 1920
Los Angeles	1.15	.75E	.75P	.56-.75S	.75P	.75P	.50-.62½E	Los Angeles—Resident construction active.
Montreal	80¼	.75	.65S	.50-55P	.55P	.45-.55S	45@ 50S	Montreal—Good labor scarce account of exodus of foreigners, who comprise 75 per cent of Canadian labor.
New Orleans	.75E	.75	1.00E	.40-.60E	.85E	1.00	.40E	New Orleans—Bricklayers demand $1 06; carpenters, $1; piledrivers, $1 25.
New York	1.08	1.00	1.12½	.57½	1.00	1.08	.68¾	New York—Agreement effective Jan. 1, expected to hold until Dec. 31, 1921.
St. Louis	1.00	.87½	1.00-1.12½	.70	.80-.92½	.90	.45-.60	
St. Paul	1.25	.87½	.112½	.65	.80	.85	.70	St. Paul—All trades busy. Common labor scarce.
San Francisco	1.25E	1.06¼E	1.12½E	.93¾E	1.06¼E	1.12½E	.45-.50E	San Francisco—All lines busy.
Seattle	1.12	.93¾	.94	75- 80	.90	1.00	.75S	

PROPOSALS

"For proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Apr. 5	New York, N. Y.	Apr. 1
Apr. 7	Perth Amboy, N. J.	Apr. 1
Apr. 8	Tonkawa, Okla.	Apr. 1
Apr. 12	Defiance, O. Adv. Mar. 11.	Mar. 11
Apr. 15	Catawissa, Pa.	Apr. 1
Apr. 19	Altus, Okla.	Apr. 1
Apr. 26	Elyria, O. Adv. Apr. 1.	Apr. 1
Apr. 27	Newark, N. J.	Apr. 1
May 1	Montreal, North Que.	Mar. 18

SEWERS

Bids Close		See Eng. News-Record
Apr. 5	Huntingburg, Ind.	Mar. 18
Apr. 6	Saginaw, Mich.	Apr. 1
Apr. 7	Portland, Ore. Adv. Mar. 25.	Mar. 25
Apr. 8	Jackson, Mich.	Mar. 25
Apr. 8	Milwaukee, Wis. Adv. Feb. 26.	Feb. 26
Apr. 8	Cherryville, N. C.	Apr. 1
Apr. 12	Elmhurst, Ill.	Mar. 18
Apr. 13	Woodbury, N. J	Mar. 18
Apr. 14	Portland, Ore. Adv. Mar. 25.	Mar. 25
Apr. 14	Wauseon, O.	Apr. 1
Apr. 15	Clarksburg, W. Va.	Apr. 1
Apr. 16	Plainview, Minn.	Apr. 1
Apr. 19	Pleasantville, N. J.	Apr. 1
Apr. 19	La Junta, Col. Adv. Apr. 1.	Apr. 1
Apr. 21	Portland, Ore. Adv. Mar. 25.	Mar. 25
Apr. 26	Cape Girardeau, Mo.	Mar. 25
Apr. 28	Portland, Ore. Adv. Mar. 25.	Mar. 25
May 5	Portland, Ore. Adv. Mar. 25.	Mar. 25

BRIDGES

Bids Close		See Eng. News-Record
Apr. 3	Fairfield, Kan.	Mar. 11
Apr. 5	North Carolina	Apr. 1
Apr. 5	Reno, Nev.	Apr. 1
Apr. 6	Duluth, Minn.	Mar. 18
Apr. 6	Billerica, Mass.	Apr. 1
Apr. 7	Cherokee, Kan.	Mar. 11
Apr. 7	Hartland, Mich.	Mar. 25
Apr. 7	Paterson, N. J.	Mar. 18
Apr. 7	Pleasure Bay (Long Branch P. O.), N. J.	Mar. 25
Apr. 7	Morley, Mich.	Apr. 1
Apr. 7	Fairgrove, Mich.	Apr. 1
Apr. 7	Sigourney, Ia.	Apr. 1
Apr. 8	Girard, Kan.	Mar. 11
Apr. 8	Ontario	Apr. 1
Apr. 8	Crookston, Minn.	Apr. 1
Apr. 9	Guelph, Ont.	Apr. 1
Apr. 9	Elora, Ont.	Apr. 1
Apr. 9	Ft. Dodge, Ia.	Mar 25
Apr. 9	Kirkland Ill. Adv. Mar. 25.	Mar. 25
Apr. 13	Georgetown, Tex.	Mar. 25
Apr. 13	Romeo, Mich.	Apr. 1
Apr. 14	Flint, Mich.	Apr. 1
Apr. 14	Milton, Fla.	Mar. 18
Apr. 14	Careyville, Fla.	Mar. 18
Apr. 15	Louisville, Ill.	Mar. 25
Apr. 19	Bunkerville, Nev. Adv. Apr. 1.	Apr. 1
Apr. 20	Newton, Ga.	Mar. 18
Apr. 22	Hawkinsville, Ga.	Apr. 1
Apr. 26	Tucson, Ariz. Adv. Apr. 1.	Apr. 1

STREETS AND ROADS

Bids Close		See Eng. News-Record
Apr. 5	Washington	Mar. 4
Apr. 5	Cleveland Heights (Warrensville P. O.), O.	Mar. 11
Apr 5	Colorado	Mar. 18
Apr 5	Long Prairie, Minn.	Mar. 18
Apr. 5	Montana	Mar. 25
Apr 5	Livingston, Tex.	Mar 25
Apr. 5	Albany, N. Y.	Mar. 25
Apr 5	Fresno, Cal.	Mar. 25
Apr. 5	Grand Forks, N. D.	Mar 18
Apr. 5	California	Mar. 18
Apr. 5	Mayo, Fla.	Mar. 18
Apr. 5	Pt. Pleasant, W. Va.	Mar 18
Apr. 5	Indiana	Mar 18
Apr 5	Seattle, Wash.	Mar. 18
Apr. 5	Idaho	Mar. 25
Apr. 5	Salinas, Cal.	Mar 25
Apr 5	Martinez, Cal.	Mar 25
Apr 5	Hemet, Cal.	Mar. 25
Apr. 5	Ellensburg, Wash.	Mar 25
Apr. 5	Washington	Mar 25
Apr. 5	Nebraska	Apr 1
Apr. 5	Fresno, Cal.	Apr. 1
Apr. 5	Missouri	Apr. 1
Apr. 5	Cleveland, O.	Apr. 1
Apr. 5	St. Paul, Minn.	Apr. 1
Apr. 5	North Carolina	Apr. 1
Apr. 6	Junction, Tex.	Apr. 1
Apr. 6	Massachusetts	Apr. 1
Apr. 6	Davenport, Ia.	Apr. 1
Apr. 6	Corning, N. Y. Adv. Apr. 1.	Apr. 1
Apr. 6	New York, N. Y.	Apr. 1
Apr. 6	Duluth, Minn.	Apr. 1
Apr. 6	Rockwell City, Ia.	Apr. 1
Apr. 6	Brunswick, Ga. Adv. Mar. 25.	Mar. 25
Apr. 6	South Dakota	Mar. 25
Apr. 6	Michigan	Mar. 25
Apr. 6	Walker, Minn.	Mar. 25
Apr. 6	Morris, Minn.	Mar. 25
Apr. 6	Edwardsburg, Ont.	Mar. 25
Apr. 6	Duluth, Minn.	Mar. 18
Apr. 6	Indiana	Mar. 18
Apr. 6	Greenfield, Ind.	Mar. 18
Apr. 6	New York, N. Y. Adv. Mar. 11.	Mar. 11
Apr. 6	Geneva, N. Y.	Mar. 4
Apr. 6	Arkansas	Mar. 11
Apr. 6	Ft. Scott, Kan.	Mar. 11
Apr. 6	Grosse Pointe Farms (Detroit P. O.), Mich.	Apr. 1
Apr. 6	Junction, Tex.	Apr. 1
Apr. 7	Nevada, N. J.	Apr. 1
Apr. 7	North Carolina	Apr. 1
Apr. 7	Cherokee, Kan	Mar. 11
Apr. 7	La Grange, Ga.	Mar. 18
Apr. 7	Elbow Lake, Minn.	Mar. 25
Apr. 7	Fredericksburg, Tex.	Mar. 25
Apr. 7	South Dakota	Mar. 25
Apr. 7	Halifax, N. S.	Apr. 1
Apr. 7	North Carolina	Apr. 1
Apr. 7	Ontario	Mar. 25
Apr. 7	Tucson, Ariz.	Mar 25
Apr. 7	Nebraska	Apr 1
Apr. 7	North Carolina	Apr. 1
Apr. 7	Wisconsin	Apr. 1
Apr. 8	Tarentum, Pa.	Apr. 1
Apr. 8	Warren, Minn.	Apr. 1
Apr. 8	Wisconsin	Apr 1
Apr. 8	Grand Rapids, Wis.	Apr. 1
Apr. 8	Wayne, W. Va.	Apr. 1
Apr. 8	South Dakota	Apr. 1
Apr. 8	South Dakota	Mar. 25
Apr. 8	Somerville, N. J.	Mar. 18
Apr. 8	Girard, Kan.	Mar. 11
Apr. 8	Elkins, W. Va.	Mar. 18
Apr. 8	Savannah, Ga. Adv. Feb. 19 and 26.	Feb. 19
Apr. 8	Ft. Wayne, Ind	Mar. 25
Apr. 8	Buchanan, Ga.	Apr. 1
Apr. 8	New York, N. Y.	Apr. 1
Apr. 9	Linden, Tex.	Apr. 1
Apr. 9	Crookston, Minn.	Mar. 25
Apr. 9	South Dakota	Mar. 25
Apr. 9	Ft. Scott, Kan.	Mar. 11
Apr. 9	Independence, Kan.	Mar. 25
Apr. 9	Auburn, Neb.	Mar. 25
Apr. 9	Michigan	Mar. 25
Apr. 9	Wisconsin	Apr. 1
Apr. 9	North Carolina	Apr. 1
Apr. 9	Rhode Island Adv. Apr. 1.	Apr. 1
Apr. 10	Duluth, Minn.	Apr. 1
Apr. 10	Grafton, N. D.	Mar. 18
Apr. 10	Hot Springs, Ark.	Mar. 18
Apr. 10	Hazard, Ky.	Mar. 25
Apr. 10	Roanoke, Va.	Mar. 25
Apr. 12	Winder, Ga. Adv. Apr. 1.	Apr. 1
Apr. 12	Van Horn, Tex.	Mar. 18
Apr. 12	Waco, Tex.	Apr. 1
Apr. 12	Salem, N. J.	Mar. 25
Apr. 12	Seattle, Wash.	Mar. 25
Apr. 12	California	Mar. 25
Apr. 12	Mt. Clemens, Mich.	Mar. 25
Apr. 12	Jefferson, O.	Apr. 1
Apr. 12	Camden, N. J.	Apr. 1
Apr. 12	Aitkin, Minn.	Apr. 1
Apr. 12	Seattle, Wash.	Apr 1
Apr. 12	Palmerton, Pa.	Apr. 1
Apr. 12	New Jersey	Apr. 1
Apr. 13	Pennsylvania	Mar. 25
Apr. 13	Hutchinson, Minn.	Apr 1
Apr. 13	Paterson, N. J.	Apr 1
Apr. 13	Hutchinson, Kan.	Mar. 25
Apr. 14	Mays Landing, N. J.	Mar. 18
Apr. 14	Cottonwood Falls, Kan.	Mar 25
Apr. 14	Michigan	Apr. 1
Apr. 14	Tyler, Tex.	Apr. 1
Apr. 14	Michigan	Apr. 1
Apr. 14	Wauseon, O.	Apr 1
Apr 15	North Bergen, N. J.	Apr. 1
Apr. 15	Ontario	Apr. 1
Apr. 15	Michigan	Apr. 1
Apr 15	Clarksburg, W. Va.	Apr. 1
Apr. 15	Bradford, Pa.	Mar. 25
Apr. 15	South Dakota	Apr. 1
Apr. 16	New York Adv. Apr. 1.	Apr. 1
Apr. 16	South Dakota	Apr. 1
Apr. 16	Fresno, Cal.	Apr 1
Apr. 16	Ferndale, Pa	Apr. 1
Apr. 16	Ortonville, Minn.	Apr 1
Apr. 16	Plainview, Minn.	Apr 1
Apr. 16	Michigan	Apr 1
Apr. 17	Michigan	Apr 1
Apr. 17	Brainerd, Minn.	Mar. 25
Apr. 19	Akron, O.	Apr. 1
Apr. 19	Goldendale, Wash.	Apr. 1
Apr. 19	Logan, W. Va.	Apr. 1
Apr. 19	Easton, Md.	Mar. 25
Apr. 19	Grafton, W. Va.	Mar. 25
Apr. 20	Meade, Kan.	Mar. 18
Apr. 20	Colfax, Wash.	Mar. 11
Apr. 21	Rockwood, Man.	Mar. 25
Apr. 21	Freehold, N. J.	Apr. 1
Apr. 21	Preston, Minn.	Apr. 1
Apr. 22	Owatomna, Minn.	Apr. 1
Apr. 22	Rock Hills, S. C.	Apr. 1
Apr. 26	Junction City, Tex.	Apr. 1
Apr. 26	Chaska, Minn.	Apr. 1
Apr. 26	Albion, Idaho	Apr. 1
Apr. 27	Ivanhoe, Minn.	Apr. 1
Apr. 27	Hastings, Minn.	Apr. 1
May 1	Lancaster, O.	Apr. 1
May 3	Grand Rapids, Mich.	Apr. 1
May 4	Mantorville, Minn.	Apr. 1
May 5	Grand Rapids, Mich.	Apr. 1

RAILWAYS

Bids Close		See Eng. News-Record
Apr. 8	Texas Adv. Mar. 25.	Mar. 25

EXCAVATION AND DREDGING

Bids Close		See Eng. News-Record
Apr 6	Carroll, Ia.	Mar. 25
Apr. 8	Jonesboro, Ark.	Apr. 1
Apr. 10	Ontario	Mar. 25
Apr. 10	Morrison, Ill. Adv. Apr. 1.	Apr. 1
Apr. 16	Hull, Ill.	Apr. 1
Apr. 22	Fort Madison, Ia. Adv. Apr. 1.	Apr. 1
Apr. 25	Ontario	Mar. 25
May 20	Basin, Wyo.	Apr. 1

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
Apr. 3	Middletown, Conn.	Apr. 1
Apr. 5	Grand Forks, N. D.	Apr. 1
Apr. 7	Ft. William, Ont.	Mar. 25
Apr. 7	Baltimore, Md.	Apr. 1
Apr. 8	Baltimore, Md.	Apr. 1
Apr. 8	Brooklyn, N. Y.	Apr. 1
Apr. 8	Halifax, N. S.	Mar. 25
Apr. 9	Grand Rapids, Mich.	Apr. 1
Apr. 10	Detroit, Mich.	Apr. 1
Apr. 12	South River, N. J.	Mar. 18
Apr. 15	Detroit, Mich.	Apr. 1
Apr. 20	Comstock, N. Y. Adv. Apr. 1.	Apr. 1
Apr. 27	Lebanon, O.	Apr. 1
Sept. 1	Hutchinson, Kan.	Feb. 19

BUILDINGS

Bids Close		See Eng. News-Record
Apr. 5	Bertha, Minn.	Mar. 18
Apr. 5	Etna (Pittsburgh P. O.) Pa.	Mar. 25
Apr. 5	New Brunswick, N. J.	Mar. 25
Apr. 5	Kearney (Arlington P. O.), N. J.	Apr. 1
Apr. 5	Kemmerer, Wyo.	Apr. 1
Apr. 6	Newark, N. J.	Apr. 1
Apr. 6	Baltimore, Md.	Apr. 1
Apr. 6	Holyrood, Kan.	Apr. 1
Apr. 6	Taylor, Pa.	Apr. 1
Apr. 6	Minneapolis, Minn.	Apr. 1
Apr. 6	Coquitlam, B. C.	Mar. 25
Apr. 6	Olds, Ia.	Mar. 18
Apr. 7	Phila., Pa.	Apr. 1
Apr. 7	Huntington, Ind	Mar. 18
Apr. 7	Detroit, Mich.	Mar. 11
Apr. 7	Hayesville, Ia.	Apr. 1
Apr. 7	Zion (Spaulding P. O.), Ia.	Mar. 18
Apr. 7	Sacred Heart, Minn.	Apr. 1
Apr. 7	Defiance, O.	Mar. 25
Apr. 8	Willow Creek, Mont.	Mar. 25
Apr. 8	Fresno, Cal.	Mar. 4
Apr. 8	Havensville, Kan.	Apr. 1
Apr 9	Southhold, N. Y.	Mar. 18
Apr. 9	Cleveland, O.	Apr. 1
Apr. 9	Independence, Cal.	Apr. 1
Apr. 10	Duluth, Minn.	Apr. 1
Apr. 10	Merrill, Wis.	Apr. 1
Apr. 10	Nepeming, Minn.	Apr. 1
Apr. 10	Goose Lake, Ia.	Mar. 25
Apr. 11	Kearney, Neb.	Mar. 11
Apr 12	Cedar Rapids, Ia.	Mar. 25
Apr. 12	Hiawatha, Kan.	Apr. 1
Apr. 13	Berkeley, Cal.	Apr. 1
Apr. 14	Hawarden, Ia	Apr. 1
Apr. 14	Waterloo, Ia.	Apr. 1
Apr. 15	Hastings, Neb.	Apr. 1
Apr. 15	Worthington, Minn.	Apr. 1
Apr. 15	Deer River, Minn.	Mar. 25
Apr. 15	Reading, Pa.	Apr. 1
Apr. 15	Detroit, Mich.	Apr. 1
Apr. 15	Fergus Falls, Minn.	Mar. 25
Apr. 15	Mt. Morris, Mich.	Mar 25
Apr 15	Riverton, Wyo	Mar 4
Apr 15	Croton, O	Apr. 1
Apr 15	Coleraine, Minn.	Mar 18
Apr 15	Wheatland, Wyo.	Mar 4
Apr. 15	Delmont, S. D	Feb. 26

Bids Close		See Eng. News-Record
Apr. 16	Waterloo, Ia.	Apr. 1
Apr. 17	Morley, Ia.	Apr. 1
Apr. 19	Gering, Neb.	Mar. 25
Apr. 19	Sioux City, Ia.	Apr. 1
Apr. 20	Hibbing, Minn.	Apr. 1
Apr. 20	Newton (Boston P. O.), Mass.	Apr. 1
Apr. 20	Glidden, Ia.	Apr. 1
Apr. 20	Buhl, Idaho	Apr. 1
Apr. 20	Wende (Millgrove P. O.), N. Y.	Apr. 1
Apr. 23	Alden, N. Y.	Mar. 25
Apr. 25	Indiana Pa.	Apr. 1
Apr. 27	Hibbing, Minn.	Apr. 1
May 1	Racine, Wis.	Apr. 1

FEDERAL GOVERNMENT WORK

Bids Close		See Eng. News-Record
Apr. 6	Portland Cement — Louisville, Ky. Adv. Mar. 18.	Mar. 18
Apr. 7	Kitchen Equipment—Spec. 4097—San Diego, Cal.	Mar. 18
Apr. 7	Seaplane Hangars—Phila., Pa.	Apr. 1
Apr. 7	Quarter, Power, Pump and Blower Houses—Spec. 4141 —Guam, P. I.	Apr. 1
Apr. 8	Rock—New Orleans, La. Adv. Mar. 4.	Mar. 4
Apr. 9	Steel, Sheet Piling—Louisville, Ky. Adv. Mar. 18.	Mar. 18
Apr. 10	Barges—Vicksburg, Miss.	Mar. 18
Apr. 13	Building—Chelsea, Mass.	Apr. 1
Apr. 13	Officers Double Quarters—Phila., Pa. Adv. Apr. 1.	Apr. 1
Apr. 14	Sidewalk—Alexandria, Va.	Apr. 1
Apr. 15	Dredging—Detroit, Mich.	Mar. 18
Apr. 15	Electric Freight Elevator, Birmingham, Ala.	Mar. 25
Apr. 15	Lighting Plant and Water Supply System, Charleston, S. C.	Mar. 25
Apr. 15	Steel Hangar, Brooks Field, Tex. Adv. March 25.	Mar. 25
Apr. 15	Boiler Repairs, Cincinnati, O.	Mar. 25
Apr. 16	Lock—Pittsburgh, Pa. Adv. Mar. 18.	Mar. 18
Apr. 16	Rock Excavation, Chicago, Ill. Adv. March 25.	Mar. 25
Apr. 19	Dredging—Phila, Pa.	Apr. 1
Apr. 20	Dredging, Tonawanda, N. Y. Adv. March 25.	Mar. 25
Apr. 20	Bombproof Switchboard Building and Bombproof Cover for Casemate, Ft. Monroe, Va. Adv March 25.	Mar. 25
Apr. 21	Barracks — Spec. 4086 — Kaukau, H. T.	Mar. 18
Apr. 23	Dredging, Cleveland, O. Adv March 25.	Mar. 25
Apr. 28	Storehouses, Garage and Quarters — Spec. 4048 — Keyport, Wash.	Apr. 1
Apr. 29	Removing and Rebuilding Breakwaters — Milwaukee, Wis.	Apr. 1
May 3	Bridge—Alaska Adv. Jan. 22.	Jan. 22

MISCELLANEOUS

Bids Close		See Eng. News-Record
Apr. 3	Earth Fill—Detroit, Mich.	Apr. 1
Apr. 5	Gravel Screening and Loading Plant — Minneapolis, Minn.	Mar. 18
Apr. 5	Portland Cement, Idaho	Mar. 25
Apr. 5	Pipe—Trenton, N. J.	Apr. 1
Apr. 5	Transformer Station—New York, N. Y.	Apr. 1
Apr. 5	Limestone Dust and Stone —Jersey City, N. J.	Apr. 1
Apr. 6	Telegraph Poles — Nova Scotia	Apr. 1
Apr. 6	Unloading and Hauling Stone Chips, Baltimore, Md.	Mar. 25
Apr. 6	Piers, Stapleton, S. I., N. Y.	Mar. 25
Apr. 7	Bituminous Materials—Baltimore, Md. Adv. Apr. 1.	Apr. 1
Apr. 7	Fire Alarm System—Central Islip, N. Y. Adv. Mar. 18.	Mar. 18
Apr. 7	Bulkhead and Stone Cribbing, Freehold, N. J.	Mar. 25
Apr. 8	Road Supplies—Montreal, Que.	Apr. 1
Apr. 8	Pontoons—Portland, Ore.	Apr. 1
Apr. 9	Road Material, Hollidaysburg, Pa.	Mar. 25
Apr. 9	Bridge Lumber and Culvert Pipe, Ft. Dodge, Ia.	Mar. 25
Apr. 10	Sewer Cleaning Machines —Niagara Falls, Ont. Adv. Apr. 1.	Apr. 1
Apr. 12	Lock—Freeport, Pa.	Apr. 1
Apr. 12	Bituminous Material—Albany, N. Y. Adv. Apr. 1.	Apr. 1
Apr. 12	Breakwater, Toronto Island, Ont.	Mar. 25
Apr. 13	Portland Cement — San Diego, Cal.	Apr. 1
Apr. 13	Piers — Stapleton, S. I., N. Y.	Apr. 1
Apr. 13	Gate Valves, etc.—Grand Gorge, N. Y. Adv. Apr. 1.	Apr. 1
Apr. 14	Tractors—Pipestone, Minn.	Apr. 1
Apr. 15	Asphalt Plant — Atlantic City, N. J.	Apr. 1
Apr. 16	Refined Asphalt — New York, N. Y.	Apr. 1
Apr. 17	Cast Iron Pipe—Buffalo, N. Y.	Apr. 1
Apr. 20	Pier Shed, Brooklyn, N. Y. Adv March 25.	Mar. 25
Apr. 20	Centrifugal Sewage Pump —Toronto, Ont.	Mar. 11
Apr. 21	Aqueduct Tunnels, San Francisco, Cal.	Mar. 25
Apr. 25	Swimming Pool—Aurora, Ill.	Apr. 1

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

Mass., Boston—Comr. Pub. Wks. soon lets contract building 3,450 ft. 4-30 in. water mains. T. F. Sullivan, city engr.

N. Y., Dansville—City voted $25,350 bonds to build reservoir and auxiliary pipe line. Hopkins & Field, 349 Cutler Bldg., Rochester, consult. engrs.

N. Y., Horseheads—Village plans to improve waterworks system and build concrete reservoir. Hopkins & Field, 349 Cutler Bldg., Rochester, consult. engrs.

N. Y., Watertown—Bd. Light, Water & Power plans to purchase and install between 4,000 and 5,000 water supply meters for blocks and private users.

Pa., Williamsport—Williamsport Water Co., 330 Pine St., plans to extend watermains and lay new pipe in Erie Ave., 4th, Scott, Rose, Hepburn, West and Church Sts., involving 14,000 ft. 16-24 in. pipe. About $150,000.

O., Springfield—See "Miscellaneous."

O., Springfield—City plans to complete 42 in. c.i. supply main to McKaig Park. About $50,000. O. E. Carr, city mgr.

O., Willoughby — Village retained M. Knowles, engr., 716 Hippodrome Bldg., Cleveland, to make survey for waterworks system and reservoir, here. About $200,000.

Mich., Lansing—City soon receives bids installing air lift pumping equipment in Pennsylvania Ave. Pumping Sta., 3,500,000 gal. daily capacity. About $55,000. Alvord & Burdick, Hartford Bldg., Chicago, engrs.

Mich., Saginaw—City having plans and specifications prepared trenching and laying 90,000 ft. 12-16 in. c.i. pipe watermains, in Brewster, Delaware, Marquette and Main Sts. H. H. Eymer, city engr.

Kan., Cimarron—City having plans prepared improving waterworks system, to include pumping equipment and building tower, tank, and new well. About $30,000. W. B. Rollins & Co., 209 Ry. Exch. Bldg., Kansas City, Mo., engrs.

N. D., Grafton—City plans to build water mains in various streets. About $17,000. C Pillsbury & Co., 805 Metropolitan Life Bldg., Minneapolis, Minn., engrs.

N. D., Fessenden—City Council rejected bids building waterworks system. About $50,000. T. R. Atkinson, Bismarck, engr. Noted Feb. 26.

Tex., Tulia—City plans to build waterworks and electric light plans.

Okla., Collinsville—City election April 7, to vote on $120,000 bonds to improve waterworks and electric light systems, to include building new intake works, pumping station,, new supply line and new electric and power plant equipment. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs.

N. M., Clovis—City election April 6, to vote on $218,000 bonds to build waterworks and sewerage system and pave various streets.

Ida., Harrison—Kootenai Co. voted $36,000 bonds to improve waterworks system.

Ariz., Tuscon—City plans election to vote on $140,000 bonds to extend and improve waterworks system. W. C. Lefebure, city engr.

Que., Iberville—Provincial Bd. Health has ordered city to improve waterworks system and filtration plant. About $25,000.

Que., Lachine—Provincial Bd. of Health has ordered city to extend waterworks system and filtration plant. About $50,000.

Que., Levis—Provincial Bd. Health has ordered city to improve waterworks system and filtration plant. About $25,000.

Que., Sorel—Provincial Bd. Health has ordered city to improve waterworks system and filtration plant. About $25,000.

Ont., Leamington—Town plans to construct 2,500 ft. 4-8 in. c.i. water mains. About $8,000. J. J. Newman, Davis Blk., Windsor, engr.

Ont., London—City plans to build 4,000 ft. 8 or 10 in. c.i. pipe. About $20,000. E. V. Buchanan, Hydro Offices, engr.

Ont., Renfrew—Town plans to extend waterworks system. About $13,042. I. A. Devenny, town clk.

Ont., York—Town plans election to vote on $22,000 bonds to lay 4,050 ft. 12 in. c.i. pipe in Silverthorn Ave., Kane and Cameron Sts. F. Barber, 40 Jarvis St., Toronto, engr.

BIDS DESIRED

N. Y., New York—Until April 5, by Dept. Pub. Welfare, Municipal Bldg., furnishing labor and material building and completing water supply system for fire and domestic use, for group building, dining hall and present nurses home at Sea View Hospital; also sections of new mains at Farm Colony, Richmond Boro. B. S. Coler, comr.

N. J., Newark—Until April 27, by North Jersey Dist. Water Supply Comn., 20 Clinton St., furnishing material, machinery, plant and and all necessary work required for construction of Wanaque Dam and appurtenances. L. J. Tonnele, chn.; advertised in this issue.

Pa., Catawissa—Until April 15, by L. C. Mensch, secy. Catawissa Water Co., furnishing and setting 1 deep well pump of 70 gal. per minute capacity with gasoline or oil engine; advertised in this issue.

O., Elyria—Until April 26, by H. A. Beck, dir. pub. serv., building filtration plant substructures, to include rein.-con. rapid sand filter tanks with pipe gallery and substructure of control house, rein.-con. mixing chamber, concrete coagulation basin and concrete filtered water reservoir; also furnishing and erecting controllers, gages, piping and equipment for a rapid sand filtration plant. M. Knowles, Inc., 1200 B. F. Jones Bldg., Cleveland, engrs.; advertised in this issue.

Okla., Altus—Until April 19, by Mayor and City Council, building extensions to water supply system. Johnson & Benham Firestone Bldg., Kansas City, Mo., engrs. Noted Jan. 15.

Okla., Tonkawa—Until April 8, by City Council, improving waterworks and electric light systems, to include building extensions to present water mains, taking up and relaying force main and extending same to water supply, infiltration well and system of underground galleries, together with all necessary pumping machinery, also constructing white way in business district. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs. Noted Feb. 5.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★O., Ashland—City will build superstructure of 1 story, 32 x 54 ft., concrete, steel and brick filtration plant; work will be done by day labor. Contract for filter equipment let to Amer. Water Softener Co., 1011 Chestnut St., Phila., cost $34,000; 2 pumps, to Dravo-Doyle Co., Diamond Bank Bldg., Pittsburgh, $5,056. Noted March 18.

★O., Cleveland Heights (Warrensville P. O.)—See "Sewers."

O., Cleveland—See "Sewers."

★Mich., Detroit—Water Bd. will trench and lay 10,385 ft. 6-10 in. c. i. watermains in Six Mile Rd., Martin, Waltham, Traverse, Canterberry, Clairmount, Otsego, Lumpkin, Hawthorne, Fairport, Cambridge, Lawndale and Richton Aves. Pipe will be purchased and work will be done by day labor.

Waterworks (Continued)

★**Ia., Stanton**—City let contracts building main and lateral sewers to H. Rees & Sons, Quincy, Ill., involving 360 ft. 8 in. pipe, 0-4 ft. cut, $1.40 per ft., 1,585 ft. 4-6 ft. cut, $1.70, 4,045 ft. 6-8 ft. cut, $1.80, 4,057 ft. 8-10 ft. cut, $2.10, 1,000 ft. 10-12 ft. cut, $2.30; 740 ft. 10 in. pipe, 0-4 ft. cut, $1.62, 335 ft. 4-6 ft. cut, $1.85, 350 ft. 6-8 ft. cut, $2.00; 265 ft. 12 in. pipe, 4-6 ft. cut, $1.95, 1,127 ft. 6-8 ft. cut, $2.00, 280 ft. 8-10 ft. cut, $2.30, 360 ft. 10-12 ft. cut, $2.50, etc., total cost, $32,609; sewage disposal plant, to Harness Bros., Ottumwa, $12,640. Noted Feb. 19.

★**Ia., Tabor**—City let contracts building main and lateral sewers, to Dunnegan & Briggs, Shsnandoah, involving 480 ft. 6 in. pipe, 4-6 ft. cut, $1.30 per ft., 1,020 ft. 6-8 ft. cut, $1.60, 640 ft. 8-10 ft. cut, $1.75; 1,710 ft. 8 in. pipe, 4-6 ft cut, $1.40, 5,885 ft. 6-8 ft. cut, $1.75, 4,130 ft. 8-10 ft. cut, $1.85, 2,405 ft 10-12 ft. cut, $2.00; 708 ft. 10 in. pipe, 12-14 ft. cut, $2.55; 1,789 ft. 12 in. pipe, 4-6 ft. cut, $1.80, 756 ft. 6-8 ft. cut, $2.10, 440 ft. 8-10 ft. cut, $2.55, etc., total cost, $39,747; sewage disposal plant, to Ward & Weighton, Davidson Bldg., Sioux City, $17,610.

★**Kan., Courtland**—City let general contract improving waterworks system, to McCoy & Taylor, Emporia, $14,431; valves, to Ludlow Valve Co., R. A. Long Bldg., Kansas City, Mo., $1,857; pumps, to Midwest Engine Co., Reliance Bldg., Kansas City, Mo., $1,000; pipe, to U. S. Cast Iron Pipe & Fdry. Co., Security Bldg., St. Louis, Mo., $17,326.

Cal., San Fernando—City Trustees received bids building 3,000,000 gal. concrete lined reservoir, 200 ft. square, from E. E. East, 121 Lexington Drive, Glendale, $20,050; Mercereau Bridge & Constr. Co., Pacific Electric Bldg., Los Angeles, $24,550; G. Napier, San Fernando, $24,696. Noted March 4.

Sewers

PROPOSED WORK

Conn., New Haven—City had plans prepared laying 3,000 ft. 72 in. sewer pipe in Crescent St. from Munson St. to Wilmot Creek. About $70,000. F. L. Ford, city engr.

N. Y., Hamburg—Village voted $250,000 bonds to build sewerage disposal plant and 10 mi. sewerage system, to include Imhoff tank and sprinkling filter. Hill & Hill, Erie, Pa., engrs.

N. Y., Niagara Falls—City plans to lay 920 lin. ft. 10-15 in. tile block sewer pipe in McKinley Ave. from Lewiston Rd. to Niagara Rapids Blvd., cost $5,300; 970 lin. ft. 10-12 in. in Harrison Ave. from Lewiston Rd. to Niagara Rapids Blvd., $5,400. W. B. Bennett, Walnut Ave. and 6th St., engr.

O., Cleveland—City plans to sell $650,000 bonds in June, to build sewers in various streets. R. Hoffman, city engr.

O., Columbus—City having preliminary plans prepared building sewer in Marcossen, Wilson and Shrunk Sts. H. A. Maetzel, city engr.

Mich., Port Huron—City having plans prepared trenching and laying vitr. crock lateral sewers in Water St. from 14th to 13th Sts., with arm in 13th St., McPherson St. from 12th to River Sts., Rural St. from Lapeer Ave. to Rosdale plat and Thomas St. from 10th Ave. to 12th St., involving 8,000 ft. 6-10 in. vitr. pipe. About $19,000. E. R. Whitmore, City Hall, engr.

Wis., Kilbourn—Village rejected bids received March 10, building 3,600 ft. sanitary sewers in various streets. Parsons & Orbert, 627 M. & M. Bank Bldg., Milwaukee, engrs. Noted Feb. 26.

Ia., Davenport—City plans to build sanitary sewers in 2nd. 3rd, 4th and Westholme additions, involving 15,455 lin.ft. 8-18 in. sewer pipe, 48 manholes and 100 cu. yd. concrete crossing. About $31,125. H. K. Earle, city engr.

S. D., Philip—City voted $40,000 bonds and soon receives bids installing sewerage system.

N. D., Fessenden—City Council rejected bids building sewerage system. About $50,000. T. R. Atkinson, Bismarck, engr. Noted Feb. 26.

N. D., Grafton—City plans to build sewers in 45 blocks. About $18,000 C. Pillsbury & Co., 805 Metropolitan Life Bldg., Minneapolis, engrs.

Mont., Billings—City plans to build storm sewers in Montana Ave. from 15th to 29th Sts. About $76,000. E. M. Sneckenberger, city engr.

N. M., Lordsburg—City election April 6, to vote on $50,000 bonds to build sewerage system. W. E. Holt, clk.

Ont., Englehart—City plans to construct sanitary sewerage system, involving 10,000 ft. 8-12 in. vitr. tile pipe also 4-6 in. c.i. fillings for wood pipe. About $20,000. Sutcliffe & Neelands, New Liskeard, engrs.

Ont., London—City had estimates prepared for sanitary sewer in Dundas St. from Oak St. easterly. Abot $57,000. H. A. Brazier, city engr.

Ont., Niagara Falls—City plans to construct 5-8 mi. trunk sewerage system. About $250,000. D. T. Black, Erie St., engr.

Ont., Ottawa—City having estimates and plans prepared for laying 17,000 ft. sanitary sewers in western section of city. About $48,000. A. F. Macullum, city engr.

BIDS DESIRED

N. J., Pleasantville — Until April 19, by Common Council, City Hall, building sewage screening plant and pumping station (Contr. 2), mechanical equipment consisting of sewage screens, pumps and motors (Contr. 3) and force mains (Contr. 4). N. Andrews, city clk.; advertised in this issue.

Pa., Tarentum—See "Streets and Roads."

W. Va., Clarksburg — Until April 15. (change of date) by city, building sewers in various streets, involving 5 mi. 6-42 in. vitr. and concrete pipe. 70 manholes and 100 storm water inlets. C F. Mebus, City Hall, consult. engr.; advertised in this issue. Noted March 11.

N. C., Cherryville—Until April 8, by J. B. Houser, mayor, and Town Comrs., furnishing material and labor building 36,750 lin.ft. 6-8 in. vitr. pipe sewerage system and three 19,000 gal. concrete disposal plants. Carolina Eng. Co., 412 Southern Bldg., Wilmington, engrs.; advertised in this issue.

S. C., Rock Hill—See "Streets & Roads."

O., Wauseon—Until April 14, by J. C. King, city clk., building sanitary sewer in East Elm St., involving 1,500 lin.ft 8 in. pipe sewer, 5 manholes and forty-two 6 in. on 8 in. Ys. G. Champe, Toledo, civil engr.

Mich., Saginaw—Until April 6, by R. F. Johnson, comr., relaying sewers, bends, sewer curves, etc., in Cedar, Brown, 11th, Weber, Stark, Bond, Fayette and Monroe Sts., involving 12-18 in. vitr. pipe, also 770 ft. 6 in. water mains. About $10,000. H. H. Eymer, city engr.

Minn., Plainview—Until April 16, by M. T. Duerre, village clk., extending sewerage system, involving 25,000 ft. sewers. About $65,000. Druar & Smith, Globe Bldg., St. Paul, engrs. Noted March 4.

Kan., Protection—City receiving bids installing 4 mi. sanitary sewers having 8 in. and 12 in. mains, sand filters and building pumping plant and sewage disposal plant. About $50,000. W. B. Rollins & Co., 209 Ry. Exch. Bldg., Kansas City, Mo., engrs.

S. D., Brookings—Until April 5, by Town clerk, building 101 lin.ft. 8 in. storm sewer less than 6 in. deep, 6,542 lin.ft. 10 in. storm sewer 6-8 in deep, 1,954 lin.ft. 8-10 in. inlet connections, and 15 storm sewer manholes, furnishing and placing 53 No. 1 and 75 No. 2 inlets, etc. Separate bids on 1,930 lin.ft 8 in. sanitary sewer 6-12 in. deep and 4 manholes also on 390 lin.ft. 4 in. c.i. water main.

Col., La Junta—Until April 19, by S. W. Brown, city clk. and recdr., furnishing materials, supplies and labor, etc., for construction of sewerage system, Dist. 1.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**R. I., Newport**—Dept. Pub. Wks. will build new sewers in various streets. Cost $10,900. Work will be done by day labor. Noted March 18.

Conn., Stratford (Bridgeport P. O.)—Bd. Sewer Comrs. received lowest bid furnishing labor and material building 15.6 mi. pipe sewer, 8-24 in. diam., from Pierce Mfg. Co., 785 Housatonic Ave., Bridgeport. About $275,000 Noted Feb. 26.

N. Y., New York — H. Bruckner, pres. Bronx Boro., received bids March 25, building sewers and appurtenances in (a) West 260th St., (b) Review Pl., (c) West 174th St., from S. McBride, 2904 Valentine Ave., (a) $15,478, (b) $16,114; M. DelBalso, 1434 Bryant Ave., (a) $17,469; Tusiano & Lauri, (a) $18,174, (c) $6,774; C. E. Farrell, (b) $13,803; Walter Constr. Co., (b) $16,622; F. DeMicco, 2385 Hoffman St., (c) $5,819. Noted March 18.

★**Pa., Phila.**—City let contract building brick and concrete sewer in Bigler St. from Delaware River to Severn St., to A. Jafolla, 139 South 50th St. About $245,000.

★**O., Cleveland**—City let contract building 230 ft. 6 ft. rein.-con. sewer in Burk Brook across East 55th St., to W. O. Gibbons, 340 Leader-News Bldg., $11,852. Noted March 11.

O., Cleveland—Broadview Co., care of C. W Courtney, engr., 509 Leader-News Bldg., received building sewer and water mains in Broadale Ave., involving 1,300 ft. 10-20 in. vitr. pipe, 1,500 ft. 4 and 6 in. c. i water pipe, 9 manholes, etc., from W. B. Smith, 5310 Franklin Ave., $14,320; A. J. Galvin, Lennox Bldg., $15,848.

★**O., Cleveland Heights** (Warrensville P. O.)—Davidson & Gallimore, 804 Marshall Bldg., Cleveland, let contract building sewer and water main in South Park Blvd. from Warwick Rd. to Larchmere Blvd., here, involving 3,300 ft. 8-15 in. vitr. and 1,000 ft. 6 in. c.i. pipe, to B. W. Ernest, 14011 Woodworth Rd., Cleveland, $13,754.

Mich., Detroit—City received bids March 23 furnishing labor and material for building and backfilling sewers in (a) Burlingame Ave., (b) Shoemaker Ave., (c) Henry St., (d) Lateral Sewer 3,238, (e) Lateral Sewer 3,263, from Jaynes A. Affeld, 1208 Ford Bldg., (a) $44,760, (c) $16,737; W. Blanck & Co., 330 Longfellow Ave., (a) $53,265, (b) $99,600, (c) $17,700; J. A. Mercier, 216 Hammond Bldg., (a) $53,130, (b) $109,350; Lennane Bros., Union Trust Bldg., (b) $112,578; R. D. Baker, 1454 Penobscot Bldg., (c) $19,997; R. R. Barton, 400 Penobscot Bldg., (d) $7,688, (e) $3,038; W. W. Carpenter & Son, 53 Harrison St., (e) $4,497. Noted March 18.

★**Mich., Pontiac**—Citizens Development Co. let contract furnishing labor and material building 14,000 ft. 8 and 10 in. vitr. crock sanitary sewers and 8,000 ft. 18-30 in. storm sewers, to C. Johnson, Birmingham, $79,046. Noted March 18.

★**Minn., Redwood Falls**—L. P. Wolff, engr., Guardian Life Bldg., St. Paul, let contract to L O. Greene, Albert Lea, building storm sewers here, involving 4,475 lin ft. 8-27 in. pipe, 12 manholes, 45 No. 1 and 27 No. 2 inlets, 1,744 lin.ft. 8 and 10 in. inlet connections and 2 outlet retaining walls, $14,700. Noted Jan. 29.

Kan., Pittsburg—City let contract building storm sewers in various streets, to Independent Constr. Co., Pittsburg, $11,230.

★**Mont., Billings**—City let contract building 7½ mi. 18-72 in. storm sewers in various streets, to Security Bridge Co., 502 North 32nd St., $397,035. Noted Feb. 26.

Cal., El Monte—City received lowest bid building sewerage system and Imhoff septic tank, from McNeil & Barnett, 234 South Center St., Orange, $41,813. Work involves 14,700 ft. 8 in. cement pipe at $0.67 per ft., 3,200 ft. 10 in., $0.95, 2,075 ft. 12 in., $1.07, 5,980 ft. 18 in., $1.55, 52 manholes, $65 each, 17 flushtanks, $75 each and septic tank, $12,240. Noted March 4.

Bridges

PROPOSED WORK

Mass., Oak Bluffs—State Highway Comn., Boston, plans to build 1,000 ft. rein-con. bridge over outlet of Lagoon Pond, 16 ft. wide, here.

N. Y., Jamestown—City appointed special committee to investigate possibility of building bridge on West 3rd St. over Erie R.R. Cost between $150,000 and $175,000. C. E. Jones, chn.

N. Y., Lyons—Town election April 8, to vote on $28,000 bonds to build 100 ft. span bridge on West Water St. and 15 ft. span culvert on Montezuma St. Noted March 18.

N. J., South Amboy—State Highway Dept., Trenton, having plans prepared by W. G. Thompson, engr., Broad St. Bank Bldg., Trenton, for bridge across Raritan River between here and Perth Amboy, ⅝ mi. long, 30 ft. wide, to have concrete piers and steel plate girders. About $2,000,000.

N. J., Trenton—Bd. Freeholders Mercer Co. soon receives bids building rein.-con. girder memorial bridge across Sanbican Creek, 77 ft. long, 29 ft wide, slab construction, to have 3 spans, center 54 ft. and approaches 16 ft. wide, arch effect with bronze balustrade. About $45,000. Waddell & Son, Inc., 35 Nassau St., New York City, engrs.

Ky., Louisville—City plans to build rein.-con. and steel bridge. About $2,000,000. J. W. Wilson, city engr.

Sewers (Continued)

O., Middletown—City plans to build 250 ft. steel truss bridge, 24 ft. wide, 6 ft. sidewalks, probably 3 spans, over new channel of Miami River. About $200,000. W. Morrison, city engr.

Wis., Beloit—City having revised plans prepared building Central Bridge, over Rock River, 240 ft. long, rein.-con. girder type. Klug & Smith, 40 Mack Blk., Milwaukee, engrs.

Ia., Boone—Boone Co. soon lets contract building 80 ft. span rein.-con. arch bridge, 18 ft. roadway suspended from arch ribs, Beaver Twp., involving 283 cu.yd. rein.-con., 12,000 lb. structural steel, 18,900 lb. steel bars, 1,404 lin.ft. wooden piling, etc., cost $15,000; 90 ft. span rein.-con. arch bridge, 18 ft. roadway, between Jackson and Harrison Twps., 373 cu.yd. rein.-con., 12,200 lb. structural steel, 20,700 lb. steel bars, 1,404 lin.ft. wooden piling, etc., $19,000. J. A. Ileman, co. engr. Noted March 25

Missouri—State Highway Dept., Jefferson City, plans to construct 48 ft. through girder span on Le May Ferry Rd. over Mattis Creek, Sta. 265; 33 ft. span on Manchester Rd. over East Branch Grand Glaze Creek, Sta. 351; 28 ft. span on Manchester Rd. over West Branch Grand Blaze Creek, Sta. 480; 33 ft. span on Manchester Rd. over Fishpot Creek, Sta. 581; 39 ft. span on St. Charles Rd over Cold Water Creek, Sta. 276 and 20; above spans to be built on old abutments faced with concrete, all 18 ft roadway; three 23 ft. slab spans and 2 piers on Gravois Rd. over Gravois Creek, Sta. 158 and 30, 20 ft. roadway, also constructing 40 ft. through girder span on new concrete abutments, 18 ft roadway, over Center Branch Grand Glaze Creek, Sta. 283 and 75, involving 19,327 lb. steel, 209 cu.yd. 1:2:4 and 20 cu.yd. 1:2:3 concrete.

Ont., Burlington—Dept. Pub. Wks., Ottawa, soon receives bids building bridge over Burlington Channel. About $100,000. E Lafleur, c/o Dept. Pub. Wks., Ottawa, engr. Noted July 17.

Ont., Merrickville — Carleton Co. (Ottawa), soon receives bids constructing bridge over Rideau River, here. About $20,000. Patterson & Byrne, 71½ Sparks St., Ottawa, engrs.

Ont., Sandwich—See "Streets and Roads."

BIDS DESIRED

Mass., Billerica—Until April 6, by State Highway Comn., Boston, building rein.-con. arch bridge over Concord River, 90 ft. span, 26 ft. wide. A. W. Dean, Boston, engr

North Carolina—See "Streets and Roads."

North Carolina—Until April 5, by Div. Office State Highway Comn., Greensboro, building 6 concrete bridges on state highway, Federal Aid Project 92, involving 915 cu.yd. concrete and 111,950 lb. reinforcing steel. W. S. Fallis, Raleigh, state highway engr.

Ga., Hawkinsville—Until April 22, by M. Thompson, comr. Pulaski Co., constructing bridge over Ocmulgee River, rein.-con. approaches and steel draw span. Contr. (1) (concrete approaches) 1,935 cu.yd. Class "A" and 1,207 cu.yd. Class "B" concrete, 414,000 lb. reinforcing steel, 3,150 lin. ft. concrete railing, 4,908 sq.yd. 2 in. rock asphalt paving, 1,754 sq.yd. 5 in. concrete base, 1,754 lin.ft. concrete curb, and taking down old approaches; Contr. (2) removing present draw span and furnishing and erecting new 210 ft. draw span complete, Garrett & Slack, Bell Bldg., Montgomery, Ala., engrs.; advertised in this issue.

Mich., Fairgrove—Until April 7, by F. F. Rogers, state highway comr., Lansing, building State Trunk Line Bridge 384, over Quanicassee River, 8 mi. west of here, to have 45 ft. span concrete girder, 20 ft. wide, on 10 ft. abutments, involving 258 cu.yd. rein.-con.

Mich., Flint—Until April 14, by F F. Rogers, state highway comr. and Bd. Rd. Comrs. Genessee Co., (Flint,) building State Reward Bridge R-28 Kersley Creek, 2 mi. east of here, to have two 45 ft. concrete girders with 20 ft. roadway on 15 ft. plain abutments, involving 581 cu.yd. concrete.

Mich., Morley—Until April 7, by F. F. Rogers, state highway comr., Lansing, building State Trunk Line Bridge 336, 35 ft. concrete girder, 20 ft. wide, with 19 ft. rein.-con. abutments, involving 259 cu.yd. rein.-con.

Mich., Romeo—Until April 13, by F. F. Rogers, state highway comr. and Bd. Rd. Comrs. Macomb Co, (Mt. Clemens,) building State Reward Bridge R-68, over Clinton River, 3 mi. east of here, to have three 28 ft. I-beam spans, two 11 ft. abutments, two 11 ft. piers and 18 ft. roadway, involving 363 cu.yd. concrete.

Ia., Sigourney—Until April 7, by Keokuk Co., building 20 x 20 ft. rein.-con. slab bridge, also rein.-con. box and circular culverts, varying in size from 2 x 2 ft. to 6 x 6 ft. About $55,000. A. O. Bosshard, co. engr.

Minn., Crookston—Until April 8, by H. J Welts, aud. Polk Co., building Bridge 3135, 30 ft. span, Bridges 3266, 3267, 3268 and 3270, 20 ft. spans, Bridges 3269, 3271 and 3272, 16 ft. spans; all rein.-con. About $25,000. E. H. Harding, Crookston, engr.

Nev., Bunkerville—Until April 19, by C. C. Cottrell, State Highway Engr., Carson City, building two Pratt truss highway spans with timber trestle approach and control wire complete, over Virgin River, near here; advertised in this issue.

Nev., Reno—Until Apr. 5, by E. H. Beemer, clk., Washoe County Court House, Reno. Building 170 ft. rein.-con. arch bridge, 31 ft wide, over Truckee River, consisting of one arch span 120 ft. long, and approaches. C. R. Hill, Reno, engr. Noted Feb. 26.

Ariz., Irene—Until April 26, by T. Maddock, state engr., at office of Bd. Superv. Pima Co. (Tucson), building 278 ft., rein.-con. bridge over Cienega Creek and Southern Pacific R.R., on the Benson-Vail Highway, near here.

Ontario—Until April 8, by W. A. McLean, deputy minister or highways, Toronto, for excav., constructing concrete culverts and other necessary work in Clinton, Saltfleet and North Grimsby Twps. Work involves 2,300 cu.yd. stone and 6,000 cu.yd. excav. Provincial Government will supply steel and 2,400 cu.yd. concrete. About $45,000. G. Hogarth, Parliment Bldg., Toronto, engr.

Ont., Elora—Until April 9, by A. W. Connor, 34 Victoria St., Toronto, engr., constructing 125 ft. rein.-con. or steel bridge over Irvine River, to have two 61 ft. spans. About $45,000.

Ont., Guelph—Until April 9, by F. McArthur, city engr., for rein.-con. bridge, to have one 96 ft. arch with five 34 ft. approach spans. 20 ft. roadway. Work involves 1,200 cu.yd. rein.-con. and 1,100 cu. yd. stone. About $40 000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Boston—City let contract building new superstructure, paving, etc., bridge on Warren Ave. over Boston Harbor, 1,200 ft. long, 80 ft. wide, to V. Grande, Boston, $210,000. Noted Feb. 26.

★Mass., Springfield—Comrs. Hampden Co. let contract building highway bridge between here and West Springfield over Connecticut River and over New York, New Haven & Hartford R.R. yard, also viaduct over railroad yard, to H. P. Converse & Co., 88 Broad St., Boston. $3,254,883. Noted March 25.

N. Y., Fayetteville—E. S. Walsh, Pub. Wks. Supt., Capitol, Albany, received bids building through plate girder bridge over Limestone Creek, here, from Lupfer & Remick, 594 Ellicott Sq., Buffalo, $49,415; S. Beskin, Beacon, $50,785. Noted Feb. 5.

N. Y., Kingston—F. S. Greene, state highway comr., 55 Lancaster St., Albany, received bids March 25, building bridge over Rondout Creek, here, from Terry & Tench Co., Inc., Grand Central Terminal, New York City. $637,124; Bethlehem Steel Bridge Corp., Bethlehem, Pa. (Informal.) Noted March 11.

★W. Va., Adamson — Comrs Harrison Co. (Clarksburg) let contract building bridge here, to Concrete Steel Bridge Co., Clarksburg, $78,986. Noted March 11.

★W. Va., Clarksburg—Comrs. Harrison Co let contract building East Main, East Pike, Hartland and Sycamore Bridges, to Luton Bridge Co., $45,338, $39,798, $10,679 and $36,526 respectively. Noted March 11

★O., Cincinnati—Comrs. Hamilton Co. let contract building steel bridge over Whitewater River, in Whitewater Twp., to E. N. Scully Contg. Co., Provident Bank Bldg. About $95,000. Noted Feb. 19.

★Michigan—State Highway Dept., Lansing, let contract building State Trunk Line Bridge 240 over Deer Creek, Polkton Twp., 70 ft. long, 20 ft. wide, to have two 35 ft. concrete girders, two 15 ft. rein.-con. abutments and one 15 ft. pier, involving 378 cu.yd. rein.-con., to A. R. Morrison, Port Huron, $11,832; State Reward Bridge 53 over Kalamazoo River, Marshall and Emmett Twps., 100 ft. long, 20 ft. wide, with two 50 ft. span concrete arches, involving 883 cu.yd. rein.-con., to L. Smith and H. A. McNichols, Hastings, $25,175; State Trunk Line Bridge 151 over Coldwater River, Coldwater Twp., 65 ft. long, 20 ft. wide, one 5 ft. sidewalk, involving 147 cu.yd. concrete and 77,100 ton steel, to Brookville Bridge Co., Brookville, O., $10,780. Noted March 4.

★Ia., Knoxville—F. Crawford, aud. Marion Co., let contract building three 16 x 24 ft. I-beam bridges and 25 box culverts, from 3 x 3 ft. to 6 x 6 ft., 20 ft. roadways, to Gabriel Constr. Co., Knoxville, $35,600. Noted March 25.

Ia., Marshalltown—Marshall Co. received bids March 23, building (a) one 20 x 60 ft. pony steel truss bridge, concrete abutments and flooring, 16 rein.-con. box culverts, from 3 x 3 ft. to 6 x 6 ft., involving 566.3 cu.yd. rein.-con, 30,500 lb. structural steel, 39,586 lb. steel bars, 672 lin.ft. wooden piling, etc., (b) two 20 x 20 ft. rein.-con. slab bridges, 22 rein.-con box culverts, from 3 x 3 ft. to 10 x 10 ft., 1,277 cu.yd. rein.-con., 40.2 ton steel bars, 1,600 lin.ft. wooden piling, etc., (c) one 18 x 32 ft. I-Beam Bridge, one 18 x 20 ft. and one 18 x 24 ft. slab bridges and one 18 x 50 ft. pony steel truss bridge, also 24 rein.-con. box culverts, from 3 x 3 ft. to 10 x 10 ft., 1,264.3 cu.yd. rein.-con, 34,419 lb. structural steel, 82,305 lb. steel bars, 2,720 lin. ft. wooden piling, etc., (d) one 18 x 50 ft. pony truss span bridge, 10 rein.-con. box culverts, from 3 x 3 ft. to 8 x 12 ft, 581.3 cu.yd. rein.-con., 21,000 lb. structural steel, 38,220 lb. steel bars, 608 lin.ft. wooden piling, etc., from Miller-Fifield Constr. Co., U & J. Bank Bldg., Waterloo, (a) $21,500, (b) $37,000; J. T. Fuller & Sons, Grundy Center, (a) $23,500; Pittsburgh-Des Moines Steel Co., 9th and Tuttle Sts., Des Moines, (a) $24,900; Cole Bros., Ames, (b) $44,527; Alexander & Highie, 2733 6th Ave., Des Moines, (b) $45,420; N. M. Stark & Co., 1215 Mulberry St., Des Moines, (c) $55,884, (d) $24,730; Federal Bridge Co., 1002 Equitable Bldg., Des Moines, (c) $60,000, (d) $26,000; Ingersoll-Stauffer Co, Marshalltown, (c) $53,444, (d) $26,140.

★Kan., Cottonwood Falls—Chase Co. let contract building 120 ft. steel truss bridge, to Campbell Bros., 207 New England Bldg., Kansas City, Mo., $22,657.

★Cal., Dinuba—Bd. Supervs. Tulare Co let contract building 320 ft. rein.-con. bridge, over Kings River, near here, to have 512 ft. approach, to E. G. Noble, Visalia, $32,656. Noted Feb 19.

Ont., York — Toronto and York Rds. Comn., 57 Adelaide St. E., Toronto, received bids constructing rein.-con. truss bridge on Don Mills Rd. from Ritchie Constr. Co., Beamsville (no steel), $17,108; R. H. Blackwell, Aurora (with steel), $20,830; Lewis Constr. Co., St. James Chambers, Toronto (with steel), $23,995.

Structural Steel

PROPOSED WORK

Conn., New Haven—Dormitory—See "Buildings."

Conn., Waterbury — Hospital — See "Buildings."

N. Y., Flushing—Theatre and Store—See "Buildings."

N. Y., Middletown—School—See "Buildings."

N. Y., New York—Offices—See "Buildings."

New Jersey—See "Bridges."

N. J., Newark—Theatre—See "Buildings."

Pa., Wheatland—See "Industrial Works."

Ky., Louisville—See "Bridges."

O., Cleveland—See "Industrial Works."

O., Cleveland—High School—See "Buildings."

Mich., Detroit—See "Industrial Works."

Ill., Chicago—Bank and Office—See "Buildings."

Kan., Hutchinson—Bank—See "Buildings."

Mo., St. Louis—See "Buildings."

Ont., Kitchener—See "Miscellaneous."

BIDS DESIRED

N. J., Newark—Store, etc.—See "Buildings."

Md., Baltimore — Administration — See "Buildings."

S. C., Rock Hill—See "Streets and Roads."

Structural Steel (Continued)

Ia., Waterloo—High School—See "Buildings."

Neb., Hastings—See "Buildings."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**R. I., Providence**—See "Industrial Works."

★**N. Y., Brooklyn**—See "Industrial Works."

★**N. Y., Brooklyn**—Temple—See "Buildings."

★**N. Y., New York**—See "Industrial Works."

★**N. Y., New York**—Club—See "Buildings."

★**N. Y., New York**—Office—See "Buildings."

★**N. Y., New York**—School—See "Buildings."

★**N. Y., New York**—Store and Loft—See "Buildings."

★**Md., Locust Point** (Baltimore P. O.)—See "Industrial Works."

★**N. C., Winston-Salem** — Hotel — See "Buildings."

★**O., Cleveland**—See "Industrial Works."

★**O., Cleveland**—Exchange—See "Buildings."

★**Michigan**—See "Bridges."

★**Mich., Detroit**—Church—See "Buildings."

★**Wis., St. Francis** (Milwaukee P. O.)—See "Industrial Works."

★**Ia., Cedar Rapids**—See "Industrial Works."

★**Que., Montreal** — See "Industrial Works."

Reinforced Concrete

PROPOSED WORK

Mass., Boston—See "Industrial Works."

Conn., Waterbury — Hospital — See "Buildings."

N. Y., Amsterdam—School—See "Buildings."

New Jersey—See "Bridges."

N. J., Newark—Clubhouse—See "Buildings."

N. J., Trenton—See "Bridges."

Pa., Phila.—School—See "Buildings."

Ky., Louisville—See "Bridges."

O., Cleveland—See "Industrial Works."

O., Cleveland—High School—See "Buildings."

Mich., Detroit—See "Industrial Works."

Ill., Chicago—Bank and Office—See "Buildings."

Ill., Chicago—Store—See "Buildings."

Minn., Minneapolis—Hotel—See "Buildings."

Kan., Hutchinson—Bank—See "Buildings."

BIDS DESIRED

N. J., Newark—Store, etc.—See "Buildings."

Md., Baltimore — Administration — See "Buildings."

Mich., Fairgrove—See "Bridges."

Mich., Morley—See "Bridges."

Ia., Waterloo—High School—See "Buildings."

Minn., Hibbing — High School — See "Buildings."

Minn., Hibbing—Recreation—See "Buildings."

Neb., Hastings—See "Buildings."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**R. I., Providence**—See "Industrial Works."

★**Conn., Greenwich**—Grade School—See "Buildings."

★**Conn., Hartford**—Office—See "Buildings."

★**N. Y., Brooklyn** — See "Industrial Works."

★**N. Y., New York**—Club—See "Buildings."

★**N. Y., New York**—Office—See "Buildings."

★**N. Y., New York**—See "Industrial Works."

★**N. Y., New York**—Store and Loft—See "Buildings."

★**N. J., Elizabeth**—School—See "Buildings."

★**Del., Wilmington**—Theatre—See "Buildings."

★**Md., Locust Point** (Baltimore P. O.)—See "Industrial Works."

★**O., Cleveland**—Exchange—See "Buildings."

★**O., Cleveland**—See "Industrial Works."

★**Michigan**—See "Bridges."

★**Mich., Detroit**—Church—See "Buildings."

★**Ia., Cedar Rapids**—See "Industrial Works."

★**Cal., Dinuba**—See "Bridges."

Streets and Roads

PROPOSED WORK

Mass., Kingston—City appropriated $100,000 bonds to improve highways. Engineer not selected.

Conn., Bridegport—City plans to macadamize various streets. About $400,000. J. A. McElroy, city engr.

N. Y., Allegany—Village plans election to vote on $40,000 bonds to pave Main St., with rein.-con., Western New York & Pennsylvania Traction Co., 142 North Union St., Olean, will appropriate $15,000 toward cost.

N. Y., Donsville — City voted $40,000 bonds to pave Perine St., brick. Hopkins & Field, 349 Cutler Bldg., Rochester, consult engrs.

N. Y., Forestville—Village plans to pave 480 ft. Main St, concrete and slag. About $16,000.

N. Y., Perry—Village voted $148,000 bonds to pave Main St., brick.

N. Y., Rochester — Bd. Contr. & Supply soon lets contract repairing various streets with asphalt. About $56,000. C. A. Poole, city engr.

N. J., Trenton—City plans to pave ¼ mi. Wayne Ave., 20 ft. wide, asphalt surface. About $20,000. A. Swan, city engr.

N. J., Trenton—City having plans prepared widening and paving 1,300 ft. North Montgomery St., 60 ft. wide, brick. About $20,000. J. R. Fell, City Hall, engr.

Pennsylvania — State Highway Dept., Harrisburg, received no bids March 24 repaving Route 82, Sect. 3, Crawford Co., Route 295, Erie Co., Route 288, Sect. 1, Fayette Co. Noted Feb. 26.

W. Va., Bluefield—City Council plans election to vote on $275,000 bonds to improve various streets.

W. Va., Grafton—Taylor Co. voted $1,000,000 bonds to build 38 mi. road. J. A. Sincel. Grafton, engr.

W. Va., Louisburg—Greenbrier Co. election April 17, to vote on $99,000 bonds to build 18 mi. road, Williamsburg Dist.; $41,500 bonds to build 2.1 mi. road, Frankford Dist. F. K. Rader, co. engr.

W. Va. Morgantown—Comrs. Monongalia Co. plans to improve 2 mi. Fairmont-Morgantown Rd., concrete. About $28,000. L. M. Cox, Morgantown, engr.

W. Va., Webster Springs—Webster Co. voted $500,000 bonds to build roads. J. Hancock, co. engr.

N. C., Asheville—Comrs. Buncombe Co. plan to hard surface 7 mi. Mine Hole Gap-Hickory Mt. Gap. W. S. Fallis, Raleigh, engr.

Ky., Greenup—City having plans and specifications made grading and paving 4,000 ft. Washington, Harrison and Laurel Sts., 18 ft. wide, brick, etc. on 7 in. concrete base, concrete curbing and guttering. About $30,000. W. A. Smith, 9 Retter Bldg., Huntington, engr.

Ohio—State Highway Comn., Columbus, received no bids March 26 building roads in following counties:

Clermont Co., Sect. "I" Cincinnati West Union Rd., 2.542 mi., grading, constructing bridges and culverts and paving with bituminous macadam or waterbound macadam.

Sect. "L" Cincinnati West Union Rd., 4.82 mi., grading, constructing bridges and culverts and paving with bituminous macadam or waterbound macadam.

Erie Co., Sect. "A" Lima-Sandusky Rd., 2.051 mi., grading, constructing drainage structures and paving with concrete.

Hardin Co., Sect. "E" Findlay-Kenton Rd., 2.08 mi., grading, constructing drainage structures and paving with asphaltic concrete on concrete base.

Jackson Co., Sect. "A" Portsmouth-Oak Hill Rd., 2.478 mi., grading, constructing bridges and culverts and paving with bituminous macadam, bituminous macadam with asphaltic base or waterbound macadam.

Lorain Co., Sect. "N" Cleveland-Sandusky Rd., 2.688 mi., grading, constructing drainage structures and paving with monolithic brick, bituminous concrete or rein.-con.

Paulding Co., Sect. "A-2" Paulding-Ft Wayne Rd., 2.997 mi., grading, constructing drainage structures and paving with concrete or monolithic brick.

Portage Co., Sect. "T" Ravenna-Warren Rd., constructing bridges and culverts only over stretch 1.99 miles long.

Wayne Co., Sects. "F" and "G1" Columbus-Wooster Rd., 3 mi., grading, constructing bridges and culverts and paving with monolithic brick, bituminous macadam or plain concrete.

Sect. "F" Cleveland-Wooster Rd., 4.08 mi., grading, constructing bridges and culverts and paving with monolithic brick, plain concrete or bituminous macadam. Noted March 11.

O., Cleveland—City plans to sell $500,000 bonds in June, to grade, drain, curb and pave various streets throughout the city, asphalt and brick. R. Hoffman, city engr

O., Dayton — City plans to grade and gravel 1,100 ft. Baker St. from Edison to Kammer Aves., 30 ft. wide, involving 3,500 sq.yd. macadam, 2,000 ft. cement curbing, 2,000 ft. cement guttering, 15,000 sq.ft. cement sidewalk. About $10,500. F. O. Eichelberger, city engr.

O., Lima—City plans to pave (1) Vine St., (2) Atlantic Ave., (3) Garfield Ave., total length 1,600 ft., 30 ft. wide, involving 45,000 sq.yd. 6 in. concrete or brick on 5 in. concrete base, cost (1) $30,000, (2) $7,500, (3) $6,000.

Michigan — F. F. Rogers, state highway comr. Lansing, rejected bids grading, draining and surfacing 4.538 mi. State Trunk Line Rd. 14-2A, 18 ft. wide, Jackson Co., involving 47,920 sq.yd. vitr. brick, asphalt or concrete, 21,077 cu.yd. earth excav., 1,129 lin.ft. 12-18 in. encased tile, 7,487 lb. steel reinforcement, 131.9 cu.yd. 1 : 2 : 4, 128.2 cu.yd. 1 : 2½ : 5 and 109.9 cu.yd. 1 : 3 : 6 concrete, etc. Alternate bids on 718 lin.ft. 12 in. corrugated culverts. Work will be readvertised. Noted Feb. 12.

Mich., Detroit—Dept. Pub. Wks. soon lets contract improving Blaine Ave. from LaSalle Blvd. to Linwood Ave., cost $17,520, Horatio St. from Hammond to Military Sts., $7,100, Euclid Ave. from 12th to LaSalle Blvd., $32,970, Greenway Ave. from Grand River to Southfield Aves., $47,440, Beniteau Ave. from Canfield Ave. northerly, $16,750, all 26 ft. wide; Dailey Ave. from Northfield Ave. to Beniteau Blvd., $22,910, 14th St. from alley south of Euclid Ave. to Euclid Ave., $4,950, both 40 ft. wide; Highfield Ave. from Dailey to Grand River Aves., $24,900, 40 ft. wide less double track space, all sheet asphalt on 6 in. concrete base and Amherst or Medina curbstone.

Mich., Pontiac—City plans to grade, drain and pave Whittemore, East Wilson, Lafayette, Railroad and Edison Sts., involving 1,014 sq.yd. vitr. brick, 13,319 sq.yd. 1 course concrete, 4,774 cu.yd. earth excav., etc. About $80,000. L. G. Lenhardt, City Hall, engr.

Wis., Racine—Racine Co. State Rd. and Bridge Com. soon lets contract grading and paving Rochester-Burlington Rd., between Village of Rochester and city of Burlington, involving 19,330 cu.yd. grading, 51,731 sq. yd. concrete surfacing, 18 ft. wide, 160 cu. yd. concrete in culverts, etc.; Beaumont-Rochester Rd., west from end of concrete, built in 1919, 6,307 cu.yd. grading, 20,750 sq.yd. concrete surfacing, 18 ft. wide, 71 cu. yd concrete in culverts, etc. W. O. Thomas, comr.

Ia., Des Moines—Comrs. Polk Co. soon let contract grading 6¼ mi. roads, involving 43,000 cu.yd. earth. E. O. Laing, Des Moines, engr.

Minn., Albert Lea—F. Tavis, aud. Freeborn Co., rejected bids received March 2, improving State Rd. 6, Federal Project 61, Div. 2, involving 7,000 cu.yd. gravel surfacing. Noted Feb. 19.

Minn., Faribault—Rice Co. rejected bids received March 2, grading 5.4 mi. State Job 2001, 24 ft. wide, cost $25,000; also 8.5 mi. State Job 2002, 24 ft. wide, $45,000. Work may be readvertised Noted Feb. 5.

Minn., Marshall—Lyon Co. plans to grade and gravel 8 mi. road from State Rd. 2 to State Rd. 3, thence to Murray Co line, 24 ft wide. About $45,000. C. W. Anderson, Marshall, engr.

Streets and Roads—(Continued)

Minn., St. Paul—Ramsey Co. plans to pave 1 mi. Stillwater Cutoff, 24 ft. wide, concrete. About $40,000. R. E. Godfrey, St. Paul, engr.

Minn., Warren—Marshall Co. plans to grade 6 mi. road from Steiner to Holt, 24 ft. wide. About $18,000. H. R. Lindsey, Warren, engr.

Minn., Willmar—Kandiyohi Co. plans to gravel 5 mi. road south of here, 24 ft. wide. About $15,000. H. L. Wadell, Willmar, engr.

Mo., Mount Vernon—Comrs. Lawrence Co. received no bids building 22 mi. Springfield-Joplin Rd., Mount Vernon Special Rd. Dist., 16-24 ft. wide. Cost $86,441. Noted March 11.

Tex., Austin—Travis Co., Kimbro Dist. voted $150,000 bonds to build 10 mi. Kimbro-Elgin Rd. H. W. Nolan, Littlefield Bldg., engr.

Tex., Corsicana — H. E. Traylor, judge Navarro Co., received no bids March 9, grading, graval surfacing and building concrete trestle and rein.-con. drainage structures on 11.66 mi. Highway 14. About $323,824. Noted Feb. 26.

Okla., Ada—City Bd. Comrs. passed resolution to pave 125 blocks in business and residential sections. About $750,000. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs.

Okla., Lindsay—City Bd. Trustees passed resolution to pave 12 blocks in busniess district. About $115,000. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs.

Okla., Tishomingo—City election April 20, to vote on $250,000 bonds to build roads. Engineer not decided.

Col., Colorado Springs—City election May 1 to vote on $1,000,000 bonds to pave various streets.

N. M., Clovis—See "Waterworks"

Idaho, Twin Falls—Twin Falls Highway Dist. rejected bids paving 33 mi. road with bituminous macadam. W. L. Johnson, Twin Falls, engr.

Ariz., Kingman — Mohave Co. election April 6, to vote on $300,000 bonds to build roads. J. S. Withers, clk.

Wash., Colfax—Whitman Co. soon receives bids grading and surfacing with crushed rock 4.7 mi. Sect. A, Improved Rd. 7, from Seltice to Farmington, cost $30,000; 5.5 mi. Sect. B, from Farmington west, $35,000. T. Mead, Colfax, engr.

Wash., Ritzville — Adams Co. plans to build 9 mi. Donohue Rd. 8, cost $80,000; 9 mi. Donohue Rd. 9, $80,000; 10 mi. Donohue Rd. 10, $90,000; all 16 ft. wide, crushed rock and gravel. F. R. Hewett, co. engr.

Wash., Seattle—Bd. Pub. Wks. received no bids March 19, paving Wilson Ave. et al, involving 4,450 sq.yd. 1 course 6 in. and 50,200 sq.yd. 1 course 7 in. concrete, 15,400 lin.ft. armored concrete curb and 145,000 cu.yd. earth excav. About $393,504. Work will be readvertised. A. H. Dimock, city engr.

Cal., El Centro—Bd. Supervs. Imperial Co. rejected bids received March 8, building 25.75 mi. road in 4 sections. About $647,470. Work will probably be readvertised. Noted Feb. 26.

Cal., San Diego—Common Council passed resolution to pave Lytton and Voltaire Sts., Chatsworth and Catalina Blvds., 20 ft. wide, Warrenite bitulithic wearing surface on asphaltic concrete base, involving 242 ft. cement curbing, 754 ft. 12-36 in. cement pipe culvert, etc. F. A. Rhodes, city engr.

Que., Bienville—City soon receives bids paving 3 mi. macadam road, 18-20 ft. wide. Eng. Dept. Rds., Quebec, engrs.

Que., Lauzon—City soon receives bids paving 2 mi. macadam road. Eng. Dept. Rds., Quebec, engrs.

Que., Levis—Town receives bids in April paving 1 mi. road to Quebec Bridge, 18 in. broken stone and 6 in. cement. About $80,000. P. Hamel, town engr.

Que., St. Joseph—City plans to build 2 mi. macadam road, 20 ft. wide. Eng. Dept. Rds., Quebec, engrs.

Ont., Brantford—Dept. Pub. Highways, Toronto, soon lets contract paving 2½ to 3 mi. Provincial Highway, here, involving 30,000 sq.yd. concrete. About $125,000. G. Hogarth, Parliament Bldgs., Toronto, engr.

Ont., Oshawa—Town soon lets contract for 39,000 sq.yd. concrete pavement and 27,000 lin.ft. concrete curbing. About $160,000. W. G. Worden, town engr.

Ont., Sandwich—Essex Co. voted $300,000 to build and maintain roads and bridges. Work includes building concrete or asphalt road from Ojibway to Amherstburg. W. H. Knister, supt.

Ont., Toronto—City plans to pave 2,800 ft. Wellesley St. and Prince Arthur Ave., involving 7,000 sq.yd. asphalt, 8,500 sq.yd. concrete base, 56,000 lin.ft. concrete curbing and 1,500 sq.yd. bitulithic concrete, cost $36,000; 8,000 ft. Avenue Rd. from Bloor to Dupont Sts., 20,000 sq.yd. asphalt, 20,000 sq.yd. concrete base and 16,000 lin.ft. concrete curbing, $91,500; widen Howard St., $41,500; pave Glenrose St. and Harvie Ave. $44,000; widen and grade Bloor St. $185,000. R. C. Harris, city engr.

Ont., Toronto—City plans to curb 3,400 ft. Kelle St., cost, $4,133; pave 6,600 ft. Keele St. from Dundas St. to St. Clair Ave., asphalt and granite block on 8 in. concrete foundation, brick block gutters, $80,971; widen Bay and Queen Sts., $53,250; extend 4,039 ft. Yorkway Ave. from Kenilworth to Lee, $40,000; extend and grade 6,000 ft. Mt. Pleasant Rd. from Blythmoor Ave. south to Mt. Pleasant Rd., $9,500. R. C. Harris, city engr.

Ont., Toronto—R. C. Harris, city engr., submitted report to City Council estimating cost of paving Yonge St. as far north as Caledonia Rd., at $630,000; St. Clair Ave. from Oakwood Ave. to Lansdowne Ave. $172,879. Total length about 6/8 mi., asphalt on concrete base.

BIDS DESIRED

Massachusetts—Until April 6, by State Highway Comn., Boston, building 12,100 ft. bituminous macadam road, 24 ft. wide, Saugus Twp., 7,900 ft., 22 ft. wide, Southwick Twp., also building 16,000 ft. bituminous macadam road, 22 ft. wide with small rein.-con. bridge, Huntington Twp. A. W. Dean, Boston, state engr.

Rhode Island—Until April 9, by State Bd. Pub. Rds., State House, Providence, furnishing and applying 350,000 gal. asphaltic oil or refined tar, on sections of state roads; advertised in this issue.

New York—Until April 16, by State Highway Comn., Capitol, Albany, improving 4.89 mi. highway, Allegany Co., 5.35 mi. Broome Co., 5.85 mi. Chautauqua Co., 2.35 mi. Cortland Co., 4.95 mi. and 2.28 mi. Dutchess Co., 3.53 mi. Franklin Co., 4.14 mi. Genesee Co., 3.66 mi. Lewis Co., 8.34 mi. Livingston Co., 0.22 mi. Onondaga Co., 1.69 mi. Ontario Co., 1.69 mi. Seneca Co., 1.38 mi Tioga Co., 1.63 mi. Wayne Co.; also repairing 4 highways, Broome Co., 1 in Chenango, Cortland, Livingston, Monroe, Onondaga, Orleans, Oswego, Otsego, Saratoga, Schenectady, Sullivan, and Wyoming Counties, 2 in Oneida Co. F. S. Greene, comr.; advertised in this issue.

N. Y., Corning—Until April 6, by Bd. Pub. Wks., building 13,153 sq.yd. brick pavement. W. O. Drake, city engr.; advertised in this issue.

N. Y., New York—Until April 6, by H. H. Curran, pres. Manhattan Boro., regulating and repaving roadway of Battery Pl. from Bway. to West St., with granite block on concrete foundation.

N. Y., New York—Until April 8, by Park Bd., Municipal Bldg., furnishing labor and material paving and repaving walks of Central and City Hall Parks, with asphalt mastic.

New Jersey—Until April 12, by State Highway Comn., Broad St. Bank Bldg., Trenton, building State Highway Route 1, Sect. 5, from Hightstown to Millstone River, Mercer Co., involving 15,471 sq.yd. concrete surface. A. L. Grovet, ch. clk.

N. J., Camden—Until April 12, by Bd. Freeholders Camden Co, rebuilding road at Clementon, King's Highway and north end of Blackwood Pike. C. F. Wise, chn. Rd. Comn.; advertised in this issue.

N. J., Freehold—Until April 21, by Bd. Freeholders Monmouth Co, rebuilding Eatontown-Long Branch Co. Rd., Eatontown Twp. and West Long Branch Boro. W. M. Bergen, dir.; advertised in this issue.

N. J., Newark—Until April 7, by T. L. Raymond, dir. Dept. Streets & Pub. Impvts., City Hall, repaving Plane St. from State to Market Sts., 8th Ave. from Nesbitt St. to Clifton Ave., Nehbitt St. from Sussex to 8th Aves., paving Exch. Alley from Mechanic to Hamilton Sts. and Thomas St. from Dawson to Pacific Sts.

N. J., North Bergen—Until April 15, by town, improving South St. Cost to exceed $20,000. Noted March 11.

N. J., Paterson—Until Aprli 13, by Bd. Pub. Wks., City Hall, repaving Bway. from New York, Susquehanna & Western R.R. to East 33rd St., Main St. from Weiss St. to Newark Branch of Erie R.R. and Union Ave. from Hamburgh to Paterson Aves. A. V. V. Livingston, clk.; advertised in this issue. Noted Feb. 10.

Pennsylvania—Sutton & Carson, 9th St. and Simpson Ave., Ocean City, N. J., desire to sublet 12,000 cu.yd. road grading, and also have 15,000 tons stone and sand to unload and haul (work in Pennsylvania); advertised in this issue.

Pa., Ferndale—Until April 16, by A. E. Snook, boro. clk., furnishing labor and material building 8,000 ft. Henry, Glenwood, Vickroy, Harlan and Summitt Aves., 20-25 ft. wide, involving 20,000 sq.yd. vitr. fireclay or shale paving brick on concrete base or with 1 course rein.-con. About $80,000.

Pa., Palmerton—Until April 12, by A. C. Schaefer, boro. secy., 180 Delaware St., improving various streets; advertised in this issue.

Pa., Tarentum—Until April 8, by Boro. Secretary, grading, curbing, paving, etc., 5th Ave. between Lock and Corbet Sts., Lawton St. between East 9th and East 10th Aves.; repaving East 6th Ave. between Lock and Corbet Sts.; building sewer in East 6th Ave. from present sewer to point 150 ft. east of Corbet St.

W. Va., Clarksburg—Until April 15, (change of date) by city, laying 32,000 sq. yd. vitr. brick and 26,000 sq.yd. sheet asphalt or asphaltic concrete paving, all on cement concrete base, also 35,000 ft. concrete curbing. C. F. Mebus, City Hall, consult. engr.; advertised in this issue. Noted March 11.

W. Va., Logan—Until April 19, by Comrs. Logan Co. building 2.5 mi. Monitor Junction-Monaville Rd., 16 ft. wide, involving 20,000 cu.yd. excav., cost $110,000; 12.4 mi. Logan-Man Rd., involving 110,000 cu.yd. excav., $135,000. J. N. Smith, Logan, engr. Noted Jan. 28.

W., Va. Wayne—Until April 8, by Comrs. Wayne Co. grading and building drainage structures on 3.7 mi. Wayne-Kenova Rd. H. A. Levering, Wayne, engr.

North Carolina—Until April 9, by Div. Office State Highway Comn., Kinston, clearing, grading and hard surfacing 9.63 mi. road, 16 ft. wide, Federal Aid Project 64, Pitt Co., also building necessary bridges and culverts on same. W. S. Fallis, Raleigh, state highway engr.

North Carolina—Until April 7, at Div. Office State Highway Comn., Raleigh, top soiling, excavating, piping and building culverts on 7.03 mi. road, 16 ft. wide, Federal Aid Project 75, Columbus Co., W. S. Fallis, Raleigh, state highway engr

North Carolina—Until April 7, by State Highway Comn., Raleigh, clearing, grading, surfacing top soiling and building bridges 11.32 mi. road, 16 ft. wide, Federal Aid Project 103, Duplin Co., involving 420 cu.yd. Class A concrete, 37,390 lb. reinforcing steel, 410 lb. plates and bolts, etc. W. S. Fallis, state highway engr.

North Carolina—Until April 7, by State Highway Comn., Raleigh, grading and top soiling 6.02 mi. road, 16 ft. wide, Federal Aid Project 58, Johnston Co.; also building concrete and steel bridges on same. W. S. Fallis, state highway engr.

North Carolina—Until April 7, by State Highway Comn., Raleigh, grading, clearing and sand clay surfacing 11.03 mi. Federal aid road, 16 ft. wide. W. S. Fallis, state highway engr.

North Carolina—Until April 5, at Div. Office State Highway Comn., Greensboro, hard surfacing 4.47 mi. Federal Aid Project 26, Davidson Co., 2 mi. Federal Aid Project 50 and 2¼ mi. Federal Aid Project 51, Guilford Co., all 16 ft. wide. W. S. Fallis, Raleigh, state highway engr.

S. C., Rock Hill—Until April 22, by Mayor and City Council, improving various streets, involving 130,000 sq.yd. asphalt pavement, 90,000 lin.ft. curbing and guttering, 25,000 sq.yd. sidewalks, 40,000 cu.yd. grading; 2½ mi. storm water drains, 8 mi. c.i. water mains and 8 mi. sanitary sewers. V. B. Blankenship, mayor. G. C. White, Durham, N. C., engr.; advertised in this issue.

Ga., Buchanan—Until April 8, by Bd. Comrs. Roads and Revenues, Haralson Co., furnishing labor, material, equipment, etc., for (1) Project No. 85, involving 12.58 acres clearing and grubbing, 1,005 lin.ft. 18-24 in. D. S. V. C. pipe, 56.32 cu.yd. Class "A" concrete in headwalls, 53,187 cu.yd. earth excav. and borrow, 488 cu.yd. rock excav., 15,000 cu.yd. top soil surfacing, etc.; (2) Project No. 86, 15.94 acres clearing and grubbing, 2,042 lin.ft. 18-24 in. D. S. V. C. pipe, 1,725 lb. reinforcing steel, 25.2 cu.yd. Class "A" concrete, 109.65 cu.yd. Class "B" concrete, 46,568 cu.yd. earth excav. and borrow, 700 cu.yd. rock excav., etc. J. G. Holcombe, chn.

Streets and Roads—(Continued)

Ga., Winder — Until April 12, by H. G. Hill, Ordinary of Barrow Co., furnishing labor, material, equipment, etc. for constructing 6.842 mi. road between Jackson Co. line and Walton Co. line. Work involves 1.184 acres clearing and grubbing; 28,189 cu.yd. common excav., 1,092 cu.yd. rock excav.; 17,756 cu.yd. top soil surfacing; 1,781 lin.ft. 15-24 in. pipe; 156 cu.yd. concrete in headwalls; 56 cu.yd. Class "A" concrete; 9.59 cu.yd. Class "B" concrete and 4,188 lb. reinforcing steel. T. P. Wright, 406 Walton Bldg., Atlanta, project engr.; advertised in this issue.

O., Akron—Until April 19, by E. A. Zeisloft, dir. pub serv., for 36,000 cu.yd. grading, 21,000 sq.yd. brick, asphalt or bitulithic pavement, 19,000 sq.yd. concrete sidewalks, 10,300 lin.ft. stone curb, etc. E. A. Kemmler, city engr.; advertised in this issue.

O., Cleveland—Until April 5, by Conger-Helper Co., Natl. City Bldg., constructing 15,000 sq.ft. 3 in. cement sidewalk in Lookout Heights About $16,000. Wight-O'Rourke Co., Rose Bldg., engrs.

O., Jefferson—Until April 12, by Ashtabula Co., grading and paving 5.77 mi. Rome-Morgan Rd., involving 23,340 cu.yd. earth and 60 cu.yd. rock excav., 3 bridges, 15 culverts, 8,000 ft 4 in. underdrain. 1,700 ft. 10 and 12 in. tile and 34,050 sq.yd. 9 in. concrete of monolithic brick on 5½ in. concrete base, cost $140,831 and $169,774 respectively; .42 mi. Rome-Morgan Extension, 1,081 cu.yd. earth excav., 1,450 ft. 1 in. underdrain, 280 ft. 10 and 12 in. driveway tile, 3,190 sq.yd. 9 in. concrete or monolithic brick on 5½ in. concrete base, $11,507 and $14,218; 4.85 mi. Richmond Sect., Youngstown-Conneaut Rd., 13,767 cu.yd. earth excav., 7,500 ft. 4 in. underdrain, 170 ft. 12-20 in. tile, 2 bridges, 10 culverts, 28,389 sq.yd. 9 in. concrete or monolithic brick on 5½ in. concrete base, $135,679 and $156,971; 5 mi. I. C. H. Sect. Monroe, Youngstown-Conneaut Rd., 19,500 cu.yd. earth excav., 10,000 ft. 4 in. underdrain. 780 ft 8 and 10 in. driveway tile, 29,245 sq.yd. monolithic brick on 5½ in. concrete base, $182,121; 5.25 mi. Pierpont Sect. Youngstown-Conneaut Rd., 14,426 cu. yd. earth excav., 10,000 ft. 4 in underdrain. 132 ft. 12 and 15 in. tile, 10 culverts, 31,613 sq.yd. 9 in. concrete or monolithic brick on 5½ concrete base, $170,726 and $194,436; all 10 ft. wide. A. G Bixler, Jefferson, engr.

O., Lancaster—Until May 1. by City Clerk, paving 2,800 ft. South Main St., 30 ft. wide, involving 9,600 sq.yd. brick block on 6 in. concrete base and 5,500 ft. concrete curbing. About $50,000. C. J. Justis, dir. pub. serv.

O., Wauseon—Until April 14, by J. C. King, city clk., paving Chestnut St. from Fulton St. to Shoop Ave., involving 2,170 cu.ft. grading, 1,515 lin.ft. 8 and 10 in. pipe sewer, 3,320 lin.ft. straight and 85 lin.ft. circular curb, 3,504 lin.ft. 4 in. drain tile, 4,640 sq.yd. concrete pavement, etc.; Elm St. from Shoop to Elmwood Aves., 420 cu.yd. grading, 675 lin.ft. 8 and 10 in. pipe sewer, 1,255 lin.ft. straight and 113 lin.ft. circular curb, 1,368 lin.ft. 4 in. drain tile and 1,613 sq.yd. concrete pavement. G. Champe, Toledo, civil engr.

Michigan—Until April 14, by F. F. Rogers, state highway comr., at office Bd. Rd. Comrs., Ionia Co., Ionia, grading, draining and surfacing 3.967 mi. Assessment Dist. Rd. 96, 9 ft. wide, involving 12,819 cu.yd. earth excav., 20,912 sq.yd. gravel, 980 lin.ft. 12-18 in. encased tile, 600 lin.ft. 12 in. vitr. tile drain, 5,103 lb. steel, 126.2 cu.yd. 1:2:4, 32 cu.yd. 1:2½:5 and 50.1 cu.yd. 1:3:6 concrete. Noted Jan. 22.

Michigan—Until April 14, by F. F. Rogers, state highway comr. at dist. office of State Highway Dept., Pt. Huron, grading, draining and surfacing 2.840 mi. Sects. A and B, 6.349 mi. Sect. C and 1.406 mi. Sects. D and E, Federal Aid Project 38, 18 ft. wide, St. Clair Co., cement or bituminous concrete. Former bids rejected. Noted March 18.

Michigan—Until April 17, by F. F. Rogers, state highway comr., at dist. office, Cadillac, grading, draining and surfacing 2.968 mi. State Trunk Line Rd. 63-2, 16 ft. wide, Osceola Co., involving 17,976 cu.yd. earth excav., 27,857 sq.yd. gravel, stone or slag gravel, 171 lin.ft. 12-18 in. encased tile, 925 lb. steel, 34.5 cu.yd. 1:2:4 and 38.2 cu.yd. 1:3:6 concrete, etc. Alternate bids on 36 lin.ft. 12 in. corrugated pipe. Noted March 4.

Michigan—Until April 16, by F. F. Rogers, state highway comr., at office of Bd. Rd. Comrs. Roscommon Co., Roscommon, grading, draining and surfacing 0.463 mi. Sect. A, 6.639 mi. Sect. B, 5.309 mi. Sect. C, State Trunk Line Rd. 18-6. Sect. A involves 3,816 sq.yd. concrete, 1,890 lin.ft. earth excav., 68 lin.ft. 12 in. encased tile, 19.8 cu.yd. concrete, etc.; Sect. B, 62,317 sq.yd. gravel, 16,889 sq.yd. special gravel, 21,156 cu.yd. earth excav., 142 lin.ft. 12-15 in. encased tile, 59 cu.yd. concrete, etc.; Sect. C, 32,953 sq.yd. gravel, 13,569 cu.yd. earth excav., 110 lin.ft. 12-15 in. encased tile, 43.2 cu.yd. 1:2:4 and 68.6 cu.yd. 1:3:6 concrete, etc.

Michigan—Until April 16, by F. F. Rogers, state highway comr. at office of Bd Rd. Comrs. Muskegon Co., Muskegon, grading and surfacing 3.958 mi. Sect. A and 2.424 mi. Sect. B, Federal Aid Project 1, 16 ft. wide, Muskegon and Oceana Counties, involving 59,910 sq.yd. concrete, etc.

Michigan—Until April 14, by F. F. Rogers, state highway comr. at office of Bd. Rd. Comrs. Ionia Co., Ionia, grading, draining and surfacing 11.765 mi. Assessment Dist. Rd. 352, 16 ft. wide, Ionia and Kent Counties. Sect. A (Group 1) involves 27,696 cu.yd. earth excav., 11,973 yd. station overhaul, 783 lin.ft. 12-15 in. encased tile culvert, 1,317 lb. steel reinforcement, 88.4 cu.yd. 1:2:4 and 69.2 cu.yd. 1:3:5 concrete, alternate bid 360 lin.ft. 12 in. corrugated metal culvert; (Group 2) 54,012 sq.yd. gravel surfacing, 1,870 lin.ft. guard rail. Sect. B involves 41,050 cu.yd. earth excav., 9,871 yd. station overhaul, 521 lin.ft. 12-15 in. encased tile culvert, 8,258 lb. steel reinforcement, 119.5 cu.yd. 1:2:4, 89.2 cu.yd. 1:2½:5 and 172.6 cu.yd. 1:3:6 concrete, alternate bid 216 lin.ft. 12 in. corrugated metal culvert; (Group 2) 56,351 sq.yd. gravel surfacing, 3,655 lin.ft. guard rail. Noted Feb. 26.

Michigan—Until April 15, by F. F. Rogers, state highway comr., at office of Bd. Rd. Comrs. Mason Co., (Ludington), grading, draining and surfacing 2.731 mi. State Trunk Line Rd. 20-16, 16 ft. wide, involving 25,638 sq.yd. gravel, 10,064 cu.yd. earth excav., 121 lin.ft. 12-18 in. encased tile, 21.7 cu.yd. 1:2:4 and 9.1 cu.yd. 1:3:6 concrete, etc.

Mich., Grosse Pointe Farms (Detroit P. O.)—Until April 6, R. H. Erley, engr., Village Hall, grading, shaping, paving, draining, etc., Moross Rd. to intersection of Grosse Points Blvd., 30 ft. wide, involving 1,885 sq.yd. 9 in. 1 course concrete and 363 cu.yd. earth excav. About $10,000.

Wisconsin—Until April 9, by State Highway Dept., at div. office, Citizens Natl. Bank Bldg., Grand Rapids, grading and paving 0.61 mi. Washington St. Rd., Federal Aid Project 157, City of Berlin, Green Lake Co., involving 2,119 cu.yd. earth excav., 12.6 cu.yd. Class "A" concrete in culverts, 116 cu.yd. Class "A" concrete in structures over 20 ft. span. 6,389 sq.yd. concrete surfacing. 18 ft. wide, etc. Noted March 11.

Wisconsin—Until April 9, by State Highway Dept., at div. office, Spooner, grading and paving, 1.02 mi. Glen Flora-Tony Rd., Federal Aid Project 173, Rusk Co., involving 4.54 acres clearing, 4.47 acres grubbing, 4,642 cu.yd. earth and 2,961 cu.yd. borrow excav. and 22.4 cu.yd. Class "A" concrete; 1.4 mi. Sanborn-Ashland Rd., Federal Aid Project 118, Ashland Co., 2,098 cu.yd. earth and 95 cu.yd. borrow excav., 9.8 cu.yd. Class "A" concrete and 14,800 sq.yd. gravel surfacing, 18 ft. wide.

Wisconsin—Until April 7, by State Highway Com., at div. office, 213 South Barstow St., Eau Claire, grading and paving 1.89 mi. Eau Claire-Osseo Rd., Federal Aid Project 111, Eau Claire Co., involving 5,591 cu.yd. earth and 1,891 cu.yd. borrow excav., 15,164 sq.yd. concrete surfacing, 18 ft. wide, 7,357 sq.yd. rein.-con. surfacing with integral curb and gutter, etc.; 1.49 mi. Mondovi-Durand Rd., Federal Aid Project 78, Pepin Co., 0.31 acres clearing and grubbing, 9,540 cu.yd. earth and 740 cu.yd. borrow excav., 1,814 cu.yd. gravel, 129.28 cu.yd. Class "A" concrete, 13,138 sq.yd. gravel surfacing, 15 ft. wide, etc.; 2.35 mi. Alma-Durand Rd., Federal Aid Project 16, Pepin Co., 3 acres clearing and grubbing, 23,197 cu.yd. earth and 86 cu.yd. borrow excav., 20,598 sq.yd. gravel and shale surfacing, 15 ft. wide, etc. Noted March 11.

Wisconsin—Until April 7, by State Highway Dept., at div. office, 208 Stephenson Bldg., Milwaukee, grading and paving 4.72 mi. Town Line Rd., Federal Aid Project 115, Walworth Co., involving 36,207 cu.yd. earth excav., 900 cu.yd. ditching, 297.9 cu.yd. Class "A" concrete in culverts, 212.7 cu.yd. Class "A" concrete in bridges, 49,842 sq.yd. concrete surfacing, 18 ft. wide, etc.; 3.59 mi. Fond du Lac-Milwaukee Rd., Federal Aid Project 154, Fond du Lac Co. 14,767 cu.yd. earth and 47 cu.yd. borrow excav., 350 cu.yd. ditching, 203.2 cu.yd. Class "A" concrete, 38,082 sq.yd. concrete surfacing, 18 ft. wide, etc.; 2.45 mi Lake Shore Rd., Ozaukee Co., Federal Aid Project 104, 11,325 cu.yd. earth excav., 169.4 cu.yd. Class "A" concrete, 26,000 sq.yd concrete surfacing, 18 ft. wide, etc.; 0.93 mi. Sheridan Rd., Federal Aid Project 39, Racine Co., 2,287 cu.yd. earth and 4,758 cu.yd. borrow excav., 17.8 cu.yd. Class "A" concrete, 9,831 sq.yd. concrete surfacing, 18 ft. wide, etc. Noted Feb. 26 and March 4.

Wisconsin—Until April 8, by State Highway Dept., at div. office, Wilner Bldg., Green Bay, grading and paving 2.97 mi Green Bay-Sturgeon Bay Rd., Federal Aid Project 163, Kewaunee Co., involving 13,646 cu.yd. earth excav., 389.7 cu.yd. Class "A" concrete, 26,167 sq.yd. gravel surfacing, 15 ft. wide, etc.; 4.83 mi. Hilbert-Chilton Rd., Federal Aid Project 143, Calumet Co., 18,141 cu.yd. earth and 46 cu.yd. borrow excav., 176.6 cu.yd. Class "A" concrete, 51,000 sq.yd. concrete surfacing, 18 ft. wide, etc.; 4.14 mi. New Holstein-Elkhart Lake Rd., Calumet Co., State aid construction, 38,862 sq.yd. concrete surfacing, 16 ft. wide; also building Killsnake Bridge, Chilton Twp., located between sections 1 and 6, Town 18 North, Range 19 East, Calumet Co., to have two 30 ft. spans, with 24 ft. roadway, 331.5 cu.yd. Class "A" concrete, etc.

Wisconsin—Until April 8, by State Highway Dept., at div. office, Court House, La Crosse, grading and paving 0.88 mi. La Crosse-Sparta Rd., Federal Aid Project 107, Monroe Co., involving 2,615 cu. yd. earth, 1,237 cu.yd. rock and 35 cu.yd. borrow excav., 23.2 cu.yd. Class "A" concrete and 9,284 sq.yd. concrete surfacing, 18 ft. wide; 2.88 mi. Viroqua-Prairie du Chien Rd., Federal Aid Project 136, Vernon Co., 11,714 cu.yd. earth, 3,855 cu.yd. rock and 149 cu.yd. borrow excav., 140.23 cu.yd. Class "A" concrete, 29,559 sq.yd. bituminous macadam surfacing, 18 ft. wide, etc.; 2.75 mi. La Crosse-Sparta Rd., Federal Aid Project 28, La Crosse Co., 3,750 cu.yd. earth excav., and 29,183 sq.yd. concrete or bituminous macadam surfacing, 18 ft. wide; La Crosse-Sparta Rd., Federal Aid Project 164, La Crosse Co., 12,200 cu.yd. earth and 345 cu. yd. borrow excav., 57.5 cu.yd. Class "A" and 26.7 cu.yd. Class "B" concrete, 22,008 sq.yd. concrete surfacing, 18 ft. wide, etc. Noted Feb. 5.

Wisconsin—Until April 9, by State Highway Dept., State Capitol, Madison, grading and paving 0.76 mi. Ableman-Reedsburg Rd., Federal Aid Project 61, Sauk Co., involving 4,497 cu.yd. earth excav., 34.3 cu. yd. Class "A" concrete in culverts, 11,122 sq.yd. featheredge gravel surfacing, 26 ft. wide, bridge at Sta. 37, 195.7 cu.yd. Class "A" concrete, 54,630 lb. structural steel, etc.; 3.53 mi. County Line Rd., Federal Aid Project 72, Jefferson and Dodge Counties, 18,482 cu.yd. earth and 19 cu.yd. borrow excav., 145.26 cu.yd. Class "A" concrete, 37,334 sq.yd. concrete surfacing, 18 ft. wide, etc.; 6.45 mi. Horicon-Beaver Dam Rd., Federal Aid Project 150, Dodge Co., 18 acres clearing and grubbing, 25,636 cu. yd. earth, 2,147 cu.yd. borrow and 6,756 cu.yd. loose rock excav., 236.27 cu.yd. Class "A" concrete, 68,107 sq.yd. concrete surfacing, 18 ft. wide, etc.; 1.54 mi. Leadmine-Shillsburg (Aetna Hill) Rd., Federal Aid Project 137, Lafayette Co., 13,717 cu.yd. earth, 511 cu.yd. rock and 115 cu.yd. borrow excav., 194.5 cu.yd. Class "A" concrete, 70 ft. span bridge, 274 cu.yd. Class "A" concrete, 44,720 lb. structural steel, 1,062 sq.yd. concrete surfacing, etc. Noted Sept. 18 and March 4.

Wisconsin—Until April 9, by State Highway Dept., State Capitol, Madison, grading and paving 0.11 mi. Cazenovia Bridge Rd., Federal Aid Project 171, Richland Co., involving 821 cu.yd. earth and 143 cu.yd. borrow excav., 1,025 sq.yd. concrete surfacing, 18 ft. wide, 196 sq.yd. concrete surfacing, 24 ft. wide, bridge at Sta. 2 plus 62, 80 ft. span arch, 415.5 cu.yd. Class "A" and 254 cu.yd. Class "B" concrete, 81.3 cu.yd. pavement in arch, etc.; 3.5 mi. Richland Center-Boaz Rd., Federal Aid Project 172, Richland Co., 25,990 cu.yd. earth, 1,518 cu.yd. rock and 107 cu.yd. borrow excav., 383 cu.yd. Class "A" concrete in culverts, 92.9 cu.yd. Class "A" concrete in 20 ft. span bridge, 1,146 cu.yd. excav., creek channel and intercepting ditches, etc.; 3.47 mi. Dunbarton-Darlington Rd., Federal Aid Project 86, Lafayette Co., 1.48 acres clearing and grubbing, 17,745 cu.yd. earth, 610 cu.yd. loose rock and 1,199 cu.yd. solid rock excav., 209.3 cu.yd. Class "A" concrete in culverts, 2,042 sq.yd. concrete surfacing, 16 ft. wide, etc.; 1.65 mi. Watertown-Plank Rd., Federal Aid Project 59, Jefferson Co., 17,400 sq.yd. concrete surfacing, 18 ft. wide; 1.13 mi. Dubuque-Platteville Rd., Federal Aid Project 100, Grant Co., 9,920 cu.yd. earth and 187 cu.yd. borrow excav., 104.87 cu.yd. Class "A" concrete in culverts, 202.6 cu.yd. Class "A" concrete in bridges, 2,580 sq.yd. concrete surfacing, 16 ft wide, etc.

Streets and Roads—(Continued)

Wis., Grand Rapids—Until April 8, by Wood Co. State Rd. and Bridge Com., grading and paving 5,298 ft. Grand Rapids-Milladore Rd., 18 ft. wide, involving 10,596 sq.yd concrete surfacing, 1,573 cu.yd. earth excav. and 57.8 cu.yd. concrete in bridges; 14,363 ft.road, 16 ft. wide, Sigel Twp., 25,534 sq.yd. concrete surfacing, 5,247 cu.yd earth excav. and 25.8 cu.yd. concrete in culverts; 12,884 lin.ft. Auburndale-Marshfield Rd., 16 ft. wide, 22,904 sq. yd. concrete surfacing, 5,600 cu.yd. earth excav. and 20 6 cu.yd. concrete in culverts. E. Morris, comr. Noted Jan. 22.

Ia., Davenport—Until April 6, by city, paving Davenport Ave. from 29th to 32nd Sts., involving 3,329 sq.yd. asphaltic concrete, concrete or brick, 853 cu.yd. earth excav. and 2,634 lin.ft. concrete curbing, cost $15,056, Essex Lane from McClellan Blvd. to Forest Rd., 3,062 sq.yd. vitr. brick, asphalt or concrete, 7,096 cu.yd. earth excav., 902 lin.ft. concrete curbing and 1,806 lin.ft. concrete guttering, $11,965, 1,125 ft. 6th St. from Washington to Division Sts., 3,684 sq.yd. vitr. brick, asphalt or concrete, 1,574 cu.yd. earth excav., 2,322 lin.ft. combined concrete curb and gutter, etc., 980 ft. Sheridan St. from Grant to 29th Sts., 2,405 sq.yd. vitr. brick, asphalt or concrete, 1,991 lin.ft. combined concrete curb and gutter, 688 cu.yd. earth excav., etc., 1,135 ft. Le Claire St. from Pleasant to Rusholme Sts., 3,659 sq.yd. vitr. brick, asphalt or concrete, 2,319 lin.ft. combined concrete curb and gutter, 969 cu. yd. earth excav., etc.; repaving 320 ft. Ripley St. from 1st to 2nd Sts., 1,893 sq.yd. vitr. brick or asphalt, 64 cu.yd. concrete, 656 lin.ft. concrete gutter, 45 cu.yd. earth excav., etc., 380 ft. Harrison St. from 1st to 2nd Sts., 2,451 sq.yd. vitr. brick or asphalt, 805 lin.ft. concrete gutter, 794 cu.yd. earth excav., etc., 879 ft. 1st St. from Main to Perry Sts., 4,210 sq.yd. vitr. brick or asphalt, 24 cu.yd. concrete, 1,323 lin.ft. concrete gutter, 154 cu.yd. earth excav., etc., 2,311 ft. 2nd St. from Fillmore to Warren Sts., 11,567 sq.yd. vitr. brick or wood block, 4,546 lin.ft. combined concrete curb and gutter, 3,495 cu.yd. earth excav., etc.; rebuilding present old concrete base and relaying old brick pavement on Marquette St., from 9th to 15th Sts., 8,412 sq. yd. old vitr. brick, 421 sq.yd. new vitr. brick, 2,110 lin.ft. concrete curb, 1,395 lin. ft. concrete gutter, 2,803 cu.yd. earth excav. R. K. Earle, city engr.

Ia., Rockwell City — Until April 6, by Comrs. Calhoun Co. graveling 45 mi road. W. E. McClure, Rockwell City, engr.

Minn., Aitkin—Until April 20, by H. C. Beecher, aud. Aitkin Co., grading and graveling 8 mi. County Job 2003, 24 ft. wide. About $40,000. F. J. O'Hara, Aitkin, engr. Noted March 1.

Minn., Chaska—Until April 26, by W. C. Schimmelpfenning, aud. Carver Co., grading and graveling 19 mi. Federal Aid Project 118, 24 ft. wide. About $133,000. W. H. Tischer, Waconia, engr.

Minn., Duluth—Until April 6, by city, paving 4,800 ft. Railroad St. from 7th St. to Garfield Ave., 30 ft. wide, involving 15,800 sq.yd. vitr. brick and 8,000 cu.yd. earth excav. About $92,933. E. K. Coe, city engr.

Minn., Duluth—Until April 10, by city, paving 1,100 ft. 1st St. from 30th Ave., W., to Chestnut St. and Chestnut St. from 1st to 3rd Sts., 24 and 30 ft. wide, involving 3,150 sq.yd. concrete, 2,000 lin.ft. curbing and 750 cu.yd. earth excav. About $13,272. E. K. Coe, city engr.

Minn., Grand Rapids—Until May 5, by T. Erskine, aud. Itasca Co., grading and graveling 7.5 mi. Federal Aid Project 176, 24 ft. wide. About $52,000. H. A. La Sueur, Grand Rapids, engr.

Minn., Grand Rapids—Until May 3, by T. Erskine, aud. Itasca Co., grading 7 mi. Federal Aid Project 157, cost $42,000; 8.4 mi. Federal Aid Project 168, $50,000; 19 mi. State Job 2003, $54,000; 15 mi. County Job 2002, $90,000; all 24 ft. wide. H. A. Le Sueur, Grand Rapids, engr.

Minn., Hastings—Until April 27, by R. W. Downs, aud., Dakota Co., grading and graveling 16 mi. Federal Aid Project 22 from here to Farmington, 24 ft. wide. About $96,000. C. L. Methven, Hastings, engr. Noted March 11.

Minn., Hutchinson—Until April 13, by F. D. Stocking, aud. McLeod Co., grading and graveling 3 mil. State Job 2001, 24 ft. wide, cost $21,000; 2 mi. State Job 1903, 24 ft. wide, $14,000. I. C. Christlieb, Hutchinson, engr.

Minn., Ivanhoe—Until April 27, by A. L. Swenson, aud. Lincoln Co., grading and graveling 19 mi. Federal Aid Project 146, 24 ft. wide. About $133,000. J. C. West, Ivanhoe, engr.

Minn., Mantorville—Until May 4, by G. L. Taylor, aud. Dodge Co., grading 3 mi. State Job 2001, 24 ft. wide. About $18,000. R. D. Jorgens, Hayfield, engr.

Minn., Ortonville—Until April 16, by A. V. Randall, aud. Big Stone Co., building 2.68 mi. State Job 2001, Rd. 1, 24 ft. wide, involving 18,834 cu.yd. earth and 374 cu.yd. solid rock excav., 70,035 cu.yd. overhaul, 3,222 cu.yd. gravel surfacing and 572 ft. 12-30 in. concrete culverts, cost $18,000; 9.1 mi. Federal Aid Project 30, 24 ft. wide, 85,048 cu.yd. excav., 5,050 lin.ft. guard rail, 1,506 ft. 12-24 in. concrete portable culverts and 10,926 cu.yd. gravel surfacing, $54,000. L. P. Zimmerman, Ortonville, engr.

Minn., Owatonna—Until April 22, by G. Griffin, aud. Steele Co., grading 8 mi. Federal Aid Project 100, 24 ft. wide. About $48,000. Noted March 25.

Minn., Plainview—Until April 16, by M. T. Duerre, village recdr., paving 3 mi. various streets, 50 ft. wide. Bids will be received on all types of pavement. About $165,000. Druar & Smith, Globe Bldg., St. Paul, engrs. Noted March 4.

Minn., Preston—Until April 21, by J. Dunford, aud. Fillmore Co., building 6 mi. Federal Aid Project 137, State Rds. 1 and 6, involving 7,524 cu.yd. gravel surface material, cost $20,000; 4 mi. Federal Aid Project 138, State Rd. 1, 42,560 cu.yd. earth, 2,400 cu.yd. solid and 3,600 cu.yd. rock excav., 6,200 lin.ft. guard rail, 789 lin.ft. 12-36 in. portable culvert pipe, seven 24 in. and ten 36 in. concrete end walls, also Bridge 3,309, 30 ft. span, involving 125 cu.yd. rein.-con., and 5 culverts, 175 cu.yd. rein.-con., $24,000; 3 mi. State Rds. 6 and 6A, Job 2002, involving 1,203 cu.yd. gravel surfacing, $18,000; 2.5 mi. State Rd. 9, Job 2004, 4 acres clearing, 3 acres grubbing, 11,818 cu.yd. earth, 3,900 cu.yd. loose rock and 1,932 cu.yd. solid rock excav., 1,450 lin.ft. guard rail, 190 lin.ft. 12-36 in. portable culvert pipe, four 24 in. and two 36 in. concrete end walls, $11,000; all 24 ft. wide. W. Dunbar, Preston, engr.

Minn., St. Paul—Until April 5, by G. Ries, aud. Ramsey Co., paving ½ mi. Long Lake Rd. from here to Bulwer Junction, 24 ft. wide, concrete, cost $24,000; grading, claying and graveling 3 mi. Crosby Rd. between Edgerton and McMenemy, Bellaire Ave. between Lake Johanna and White Bear Lake, Bald Eagle Blvd. from end of present improvement to Hugo Rd., Lake Owasso Blvd. between Rice and Dale Sts., 24 ft. wide, $20,000. Former bids rejected. R. E. Godfrey, co. surv.

Minn., Warren—Until April 8, by A. G. Lundgren, aud. Marshall Co., building 7.5 mi. Job 2006, 24 ft. wide, involving 47,258 cu.yd. excav., 1,474 cu.yd. overhaul and 792 lin.ft. 24-48 in. culverts. About $28,000. H. R. Lindsay, Warren, engr.

Nebraska—Until April 7, by State Dept. Pub. Wks., Lincoln, grading and constructing culverts on 7.76 mi of Longpine-Ainsworth Rd., Federal Aid Project 125-A, involving 85,458 cu.yd. excav., 800 cu.yd. hauling, 80,624 cu.yd. overhauling, 720 lin. ft. 18-24 in. pipe culvert, etc.; 2 59 mi. Barnum-Creek, Federal Aid Project 115, 18,107 cu.yd. earth excav., 4,455 cu.yd. hauling, 7,889 cu.yd. overhauling, 27,164.7 sq yd. concrete paving, 99,017 cu yd. plain concrete, 244 lin.ft. 18 in. pipe culvert, etc.; 6.79 mi. Center-Niobrara Rd., Federal Aid Project 113-A, 76,881 cu.yd. earth excav., 11,125 cu.yd. overhauling, 880 lin.ft. 18-48 in. pipe culvert, 86.4 cu.yd. 1:2:4 concrete, etc., 10.96 mi. Chappell-Big Springs Rd., Federal Aid Project 54, 54,664 cu.yd earth excav., 19,765 cu.yd. overhauling, 768 lin.ft. 18-30 in. pipe culvert, 53.39 cu.yd. 1:2:4 concrete, etc.; 13.31 mi. Burwell-Scotia Rd., Federal Aid Project 85-A, 104.555 cu. yd. earth excav., 612 lin.ft 18-48 in. pipe culvert, 6,784 cu.yd. overhauling, etc.; 6.603 mi. Greely Center Wolbach Rd., Federal Aid Project 84-A, 57,661 cu.yd. excav., 2,099 cu yd. hauling, 52,513 cu.yd. overhauling, 318 lin.ft. 18-36 in. pipe culvert, etc.; 8.67 mi Broadwater Oshkosh Rd., Federal Aid Project 82-A, 68,064 cu.yd excav., 22,996 cu.yd. hauling, 280 lin.ft. 18-36 in. pipe culvert, etc.; 13.39 mi. Bayard-Broadwater Rd. Federal Aid Project 79-A, 81,628 cu.yd. earth excav., 907 cu.yd. hauling, 32 lin.ft. 18-24 in. pipe culvert, etc.; 4.46 mi. McCook-Trenton Rd., Federal Aid Project 68-A, 54,935 cu.yd. earth excav., 22,186 cu.yd. overhauling, 1,485 sq.yd. 7 in. concrete pavement, etc.; 24.56 mi. Valentine-Sparks Rd., Federal Aid Project 66, 145,432 cu.yd. earth excav., 58,203 cu yd. hauling, 19,124 cu.yd. overhauling, 62,532 cu.yd. hard clay excav., 1,700 lin.ft. 18-36 in. pipe culvert, etc.; 9.608 mi. Pierce Rd., Federal Aid Project 64-A, 71,977 cu.yd. excav., 1,200 lin.ft. 18-24 in. pipe culvert, etc. G. E. Johnson, state engr.

Nebraska—Until April 5, by State Dept. Pub. Wks., Lincoln, grading and constructing culverts on 11.917 mi. of Crete-Wilber Rd., Federal Aid Project 98-B, involving 65,726 cu.yd. excav., 23,013 cu.yd. overhauling, 51 cu yd. special excav., 236 lin.ft. 24-30 in. pipe culvert, etc.; 13 857 mi. Tecumseh-Crab Orchard Rd., Federal Aid Project 43, 115,688 cu.yd. excav., 20,204 cu.yd. overhauling, 829 cu.yd. special excav., 2,034 lin.ft. 18-48 in. pipe culvert, etc.; 7.58 mi. St. Paul-Grand Island Rd., Federal Aid Project 60-A, 58,159 cu.yd. excav and 12,836 cu.yd. hauling; 3.224 mi. Norfolk-Ewing Rd., Federal Aid Project 139-A, 5,674 cu.yd. gravel, 200 cu.yd. special excav., 264 lin.ft. 18-24 in. pipe culvert, etc. G. E. Johnson, state engr

South Dakota—Until April 8, by State Highway Comn., Pierre, grading and draining 3.73 mi. Madison Flandreau Rd., 36 ft. wide, Federal Aid Project 48, Moody Co., involving 24,757 cu.yd excav., 5,662 yd. overhauling, 150 cu.yd. structure excav., 130 cu.yd. Class "A" and 132 cu.yd. Class "B" concrete, 1,024 lin.ft. concrete or corrugated iron pipe culvert, 12,228 lb. reinforcing and 475 lb. structural steel, $24,800. F. C. Peck, state highway engr.

South Dakota—Until April 15, by State Highway Comn., Pierre, grading and building drainage structures on 6 mi Clear Lake-Milbank Highway, 36 ft. wide, Federal Aid Project 54, Grant Co., involving 56,506 cu.yd. excav., 24,645 yd. overhauling, 661 cu.yd. structure excav., 491 lin.ft. concrete or corrugated iron pipe culverts, 565 cu yd. Class "A" and 48 cu.yd. Class "B" concrete, 45,420 lb. reinforcing and 475 lb. structural steel, $54,500. F. S. Peck, state highway engr. Noted March 4.

South Dakota—Until April 16, by State Highway Comn., Pierre, graveling 24.46 mi. Britton-Sisseton Highway, 16 to 20 ft. wide, Federal Aid Project 41, Marshall and Roberts Counties, involving 4,120 cu yd. excav., 31,554 cu.yd. gravel, 925 cu.yd. clay binder, cost $53,000, grading and building drainage structures on same, 36 ft. wide, involving 217,393 cu.yd. excav., 41,335 yd. overhauling, 395 cu yd. rip-rap, 1,280 lin.ft. 6 in. tile drain, 961 cu.yd. structure excav., 4,330 lin.ft. concrete or corrugated iron pipe culverts, 617 cu.yd. class "A" and 342 cu yd. Class "B" concrete, 49,806 lb. reinforcing and 576 lb. structural steel, 112 lin.ft. wooden piling, $162,300. F. S. Peck, state highway engr. Noted Jan. 22.

Mont., Lewistown—Until April 12, by J. J. Carey, city clk., paving Dist. 31, involving 8,000 cu.yd. grading, 5,600 lin.ft. concrete curbing, 12,251 sq.yd. paving, .44 acres parking strips: Dist. 33, 3,456 cu.yd. grading, 3,000 lin.ft. concrete curbing, 15,585 sq.yd. paving; Dist. 34, 1,320 cu.yd. grading, 5,943 sq.yd. paving; Dist. 35, 1,078 cu.yd. grading, 2,328 lin.ft. concrete curbing, 4,853 sq.yd. paving, .15 acres parking strips; advertised in this issue.

Missouri—Until April 5, by State Highway Dept., Jefferson City, improving 9.44 mi. Joplin-Tipton Ford Rd., 18-24 ft. wide, Joplin Special Rd. Dist., Jasper Co., involving 32,790 cu.yd. earth and 600 cu.yd. rock excav., 1,000 cu.yd. borrow, 2,000 cu. yd. overhauling, 99,800 sq.yd. 1 course plain cement concrete and 42 sq.yd. 1 course reinforced cement concrete pavement, 56.6 cu. yd. Class B and 175 cu.yd. Class C concrete, 7,028 lb reinforcing, etc., cost $222,038; 4.3 mi. Joplin-Springfield Rd., 18-24 ft wide, involving 8,604 cu.yd. earth excav., 2,103 cu.yd. borrow, 42,548 sq.yd. 1 course plain cement concrete pavement, 224.5 cu.yd. Class "B" and 14.2 cu.yd. Class "C" concrete and 13,383 lb. reinforcing steel, $94,142.

Tex., Junction—Until April 6, by C. R. Stevenson, judge Kimble Co., grading, surfacing and draining 6.83 mi. Highway 27 from here to 6 mi. crossing, 9 ft. wide, involving 12 acres clearing and grubbing, 7,917 cu.yd. borrow and 17,657 cu.yd. earth excav., 6,653 cu.yd. gravel, 17,161 lb. reinforcing steel, 134.6 cu.yd. Class "A" and 17 cu.yd. Class "B" concrete. About $24,224. W. E. Simpson, Junction, engr.

Tex., Junction—Until April 6, by C. R. Stevenson, judge Kimble Co., grading, surfacing and draining 24.73 mi. Highway 27, from here to Kerr Co., 9 ft. wide, involving 114.6 acres clearing and grubbing, 170.85 cu.yd. earth borrow, 170.85 cu.yd. gravel, 122,660 cu.yd. earth and 15,172 cu.yd. rock excav., 76,794 lb. reinforcing steel, 525 cu. yd. Class "A," 364 cu.yd. Class "B" and 444 cu.yd Class "C" concrete, etc. About $144,924. W. E. Simpson, Junction, engr.

Streets and Roads—(Continued)

Tex., Junction—Until April 6, by C. R Stevenson, judge Kimble Co., grading, surfacing and draining 3.4 mi. Highway 27, from 6 mi. crossing to 10 mi. crossing, involving 20 acres clearing and grubbing, 7,331 cu.yd. gravel, 25,560 cu.yd. unclassified earth excav., 42,800 lb. reinforcing steel, 241 cu.yd. Class "A," 238.5 cu.yd. Class "B" and 141.4 cu.yd. 1 : 2 : 3 concrete. About $31,047. W. E. Simpson, Junction, engr.

Tex., Junction — Until April 26, by Clerk Kimble Co., gravel surfacing, grading and draining 34.9 mi. road involving 145.3 acres clearing and grubbing, 170,043 cu.yd. earth excav., 22,171 cu.yd. borrow, 19,369.2 cu.yd. rock excav., 139,323 cu.yd. gravel, 1,234.6 cu.yd. 1:2:4, 209.5 1:2½:5 and 684.6 cu.yd. 1:2:3 concrete, 183,784 lb. reinforcing steel, etc. Noted March 25.

Tex., Linden—Until April 9, by H. D. Nelson, judge Cass Co., grading, sufacing and draining 7.689 mi. Highways 1 and 8, Douglasville Rd., 9 ft. wide, involving 8.3 acres clearing and grubbing, 53,899 cu.yd. earth borrow, 9,021 cu.yd. gravel, 19,772 lb. reinforcing steel, 148.9 cu.yd. Class "A," 52.4 cu.yd. Class "B" and 45.8 cu.yd. Class "C" concrete, cost $68,810 ; 4.949 mi. Highway 1, from point 5 mi. west of Powell Creek to Powell Creek, 9 ft. wide, 6.5 acres clearing and grubbing, 11,997 cu.yd. borrow and 40,708 cu.yd. earth excav., 5,806 cu.yd. gravel, 23,608 lb. reinforcing steel, 162.85 cu.yd. Class "A," 92.96 cu.yd. Class "B" and 24.9 cu.yd. Class "C" concrete, $54,539. Hess & Skinner, Southwestern Life Bldg., Dallas, engr.

Tex., Linden—Until April 9, by H. D. Nelson, judge Cass Co., grading, surfacing and draining 9.69 mi. Bryans Mill Rd., Highway 1, 9 ft. wide, involving 11.49 acres clearing and grubbing, 28,023 cu.yd. earth borrow, 11,736 cu.yd. gravel, 41,798 cu.yd. earth excav., 24,266 lb. reinforcing steel, 136.3 cu.yd. Class "A," 127.7 cu.yd. Class "B" and 90.1 cu.yd. Class "C" concrete, etc. About $83,165. Hess & Skinner, Southwestern Life Bldg., Dallas, engrs.

Tex., Tyler—Until April 14, by Smith Co. gravel surfacing and building concrete bridges and culverts on 24.6 mi. Highway 15. I. K. Caldwell, co. engr. Noted Feb. 12.

Idaho, Albion—Until April 26, by F. E. Tremayne, city clk., paving 2 mi. cement sidewalks, 4 to 8 ft. wide.

Wash., Goldendale — Until April 19, by by Comrs. Klickitat Co., improving 25 mi. road in Trout Lake Rd. Improvement Dist. 3, 42 ft. wide, involving 133,000 sq.yd. concrete, 120,000 cu.yd. earth and 25,000 cu.yd. rock excav., and 22,000 cu.yd. gravel surfacing. About $450,000. E. T. Hinshaw, Goldendale, engr. Former bids rejected. Noted Feb. 26.

Wash., Seattle—Until April 12, by Comrs. King Co., paving 1.75 mi. Franklin-Enumclaw Rd., 20 ft. wide, involving 18,777 sq.yd. concrete or brick, cost $53,000 and $72,000 respectively. S. J. Humes, co. engr

Cal., Fresoo—Until April 5, by Bd. Supervs. Fresno Co., paving 2.75 mi. Route 18, Sect. A, through Del Rey Twp, involving 3,200 cu.yd. excav., 3,624 cu.yd. concrete, 234,826 sq.ft. surfacing and asphalt concrete pavement, etc. Bids will be taken under 4 specifications providing for concrete base with asphaltic concrete or Warrenite top and bituminous base with Topeka or Warrenite top. D. M. Barnwell, clk.

Cal., Fresno—Until April 16 by D. M. Barnwell, clk. Bd. Supervs. Fresno Co., grading Routes 22 and 23, Sect. A, involving 636,160 sq.ft. asphalt, 9,818 cu.yd. concrete, 10,448 cu.yd. earth excav., etc. Cost between $154,662 and $201,085. Former bids rejected. Noted March 4.

N. S., Halifax—Until April 7, by Comrs. Halifax Co., constructing 5 mi. waterbound macadam road on Halifax-Windsor Highway. About $55,000. J. W. Roland, engr.

Ontario—Until April 15, by W. A McLean, deputy minister, Dept. Pub. Highways, Toronto, for earthwork and other necessary work on Provincial Highway, Saltfleet Twp. About $30,000. G. Hogarth, Parliament Bldg., Toronto, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Brockton—See "Miscellaneous."

★R. I., Newport—Dept. Pub. Wks. will pave various streets, waterbound macadam. Cost $53,825. Work will be done by day labor. Noted March 18.

★Conn., Manchester—Bd. Selectmen, Hall of Records, South Manchester, let contract building concrete walks, curbing, radius and drive corners, etc., to W. E. Potter, Montowese, New Haven, cost $33,743. Noted March 4.

N. Y., Brooklyn—Park Bd., Municipal Bldg., New York City, received bids March 18, furnishing labor and material resurfacing old walks, Prospect Park, sheet asphalt, from Sicilian Asphalt Paving Co., 41 Park Row, New York City, $10,800 ; Consolidated Asphalt Paving Co., 52 9th St., $11,000 ; Uvalde Paving Co., 1 Bway., New York City, $12,000. Noted March 11.

★N. Y., Lockport—City let contract paving High St., from Pine to South Transit Sts., asphalt, and Park Ave. with concrete, to C. B. Whitmore Co., 30 Market St., $24,800 and $79,318 respectively.

N. Y., Brooklyn—E. Riegelmann, boro pres., received bids March 24, regulating and paving (a) Bay 32nd St., (b) regulating and grading Stilwell Ave. from Neptune to Canal Aves., (c) regulating, grading and curbing Stillwell Ave. from Neptune to Surf Ave., (d) regulating, grading, curbing and laying sidewalks on Stillwell Ave. from Neptune to Canal Aves., from Consolidate Asphalt Paving Co., 52 9th St., (a) $13,167 ; Uvalde Asphalt Paving Co., 1 Bway., New York City, (a) $13,448 ; Sicilian Asphalt Paving Co., 41 Park Row, New York City, (a) $13,795 ; J. J. Guinan, 2314 Gravesend Ave., (b) $4,615, (c) $4,518, (d) $9,622 ; B. Turacamo Contg. Co., 121 Bay 11th St., (b) $5,670, (d) $9,873 ; Grimm Constr. Co., 460 Harold Ave., (c) $4,196 ; J. Jennings, Belle Harbor, (c) $5,351, (d) $10,472. Noted March 18.

★N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., let contract regulating, grading and paving Anable St., to Hastings Paving Co., 20 Broad St., New York City, $7,470 ; 88th St., to C. Kurth, $3,560 ; 46th St., to J. Marcio, $3,321 ; Gunther Ave., to R. A. Hess, Inc., $6,319. Noted March 18.

N. Y., New York—H. H. Curran, pres. Manhattan Boro., received bids March 25, regulating and repaving Catharine St., from O'Rourke Constr. Co., 150 Nassau St., $20,518, W. J Fitzgerald, 547 West 45th St., $20,545 ; retubing, from Consolidated Shipbuilding Corp., Morris Heights, $15,950. Noted March 18.

N. Y., New York—H. Bruckner, pres. Bronx Boro., received bids March 25, paving (a) Willow Ave., (b) East 169th St., (c) Baker Ave., (d) East 141st St., (e) regulating and grading, etc., Hunt Ave., (f) Rheinlander Ave., from J. L Brusstar, Harlem River and 150th St., (a) $28,289 ; Uvalde Asphalt Paving Co., 1 Bway., (a) $29,543, (b) $30,764, (c) $8,650 ; Asphalt Constr. Co., 2197 Madison Ave., (a) $29,745, (b) $32,430, (c) $8,835, (d) $7,801 ; Union Paving Co., Bway. and 112th St., (a) $30,074, (b) $30,931, (c) $8,936 ; T. Callanan, (d) $6,463 ; D. J. McCarthy, (d) $6,582 ; Burnside Contg. Co., 270 Burnside Ave., (d) $7,684, (e) $55,446, (f) $19,694 ; S. Guidera, 457 East 188th St. (e) $42,209 ; M. DelBalso, 1434 Bryant Ave., (f) $16,443. Noted March 18.

Penosylvania — State Highway Dept., Harrisburg, received bids March 24, repaving roads in counties as follows:

Adams Co., Route 43, Sect. 3, 1 course rein.-con., from Mason & Hanger Co., Inc., Paxinos, $485,420 ; Snare & Triest Co., 8 West 40th St., New York City, $495,098 ; Crawford Paving Co., 2620 E. St., N. W., Washington, D. C., $552,964.

Beaver Co., Route 204, Sect. 2, 1 course rein.-con. and Hillside vitr. brick, from J. C. Devine Co., Alliance, O., $424,838 ; S. Gamble Co., Glass St, Carnegie, $445,234.

Butler Co., Route 78, Sect. 1, 1 course rein.-con., from C. E. Walter, Mill and Washington Sts., Butler, $351,355.

Carbon Co., Route 162, Sect. 1, 1 course rein.-con. on Telford base, from Bohn & Gallagher, 402 Bennett Bldg., Wilkes-Barre, $197,169.

Franklin and Adams Counties, Route 43, Sect. 2, 1 course rein.-con., from Souder Constr. Co., Inc., 26 East King St., Lancaster, $417,872 ; Mason & Hanger Co., Inc., Paxinos, $491,664.

Huntingdon Co., Route 33, 1 course rein.-con., from T. J. Strickler, 508 Church St., Huntingdon, $15,755 ; E. H. and L. A. Brua, Jr., Hollidaysburg, $16,998 ; Standard Contg. Co., 28 Altoona Trust Co., Altoona, $17,384

Lycoming Co., Route 20, Sect. 2, 1 course rein.-con., from Busch & Stewart, Inc., 120 West 4th St., Williamsport, $413,418.

McKean Co., Route 210, 1 course rein.-con., from P. B. Colgan, 332 Park Ave., Dunkirk, N. Y., $136,893 ; G. Metzger, Jr., 12 East 4th St, Emporium, $141,380 ; H. E. Bunce, 125 Fulton St., Olean, N. Y., $149,914.

Northampton Co, Route 156, Sect. 1, 1 course rein.-con., from Smith, McCormick Co. and McInerney & McNeal, Inc., Northampton Natl. Bank Bldg., Easton, $450,383. Route 161, Sect. 2, 1 course rein.-con., from Mason & Hanger Co., Inc., Paxinos, $294,459.

Venango Co., Route 208, Sect. 1, 1 course rein.-con., from M. Dolan, Jamestown, N. Y., $198,978 ; C. F. Hamilton, Inc., Trust Co. Bldg., Franklin, $215,840. Noted Feb. 26.

★Pennsylvania — State Highway Dept., Harrisburg, let contract building 14,784 ft. Route 233, Lawrence Co., to Aronberg & MacDonald, Wallace Bldg., New Castle ; 14,850 ft. Route 141, Berks Co., to Bennett & Randall, Lebanon ; 20,927 ft. Route 60, Clearfield Co., to Burnside Constr. Co., P. O. Box 61, Clearfield ; 21,665 ft. Route 102, Potter Co., to J. C. Bradley & Co., Wellsboro ; 13,811 ft. Route 268, Sect. 3, Greene Co., to Con Oil Tank Co., 802 Fulton Bldg., Pittsburgh ; 15,013 ft. Route 131, Delaware Co., to Heyman & Goodman Co., 15 Exch. Pl., Jersey City, N. J. ; 7,291 ft. Route 59, Clearfield Co., to Johnson & Kearns, Du Bois ; 41,753 ft. Route 195, Dauphin and Perry Counties, to MacArthur Bros. Co., 120 Bway., New York City ; 7,543 ft. Route 97, Elk Co., to Miller Constr. Co., Weber Bldg., Punxsutawney ; 2,080 ft. Route 88, Warren Co., to J. P. Morrissey, 332 Park Ave., Dunkirk, N. Y. ; 3,732 ft. Route A-1,022, Fayette Co., to Petriello Bros. Co., P. O. 61 South Brownsville ; 21,109 ft. Route 88, Erie Co., to Summit Constr. Co., Akron, O. ; 29,904 ft. Route 284 and A-1,031, Berks Co., also 31,957 ft. Route 127, York Co., to Weller Constr. Co., 816 14th St. N. W., Washington, D. C., all above rein.-con. ; 5,326 ft. Route 56, Center Co., vitr. brick, to L. E. Kelly, 296 Stuyvesant Ave., Brooklyn, N. Y. Noted Jan. 8, Feb. 5 and 19.

★Pa., Phila.—City let contracts to Eastern Paving Co., Colonial Trust Bldg., repaving Courtland St., $3,560, 4th St., $18,031, paving with asphalt Belfield St., $8,797, Hutchinson and Hollywood Sts., $11,621, Lansdowne Ave., $11,019, Sydeham and Ruscomb Sts., $11,252, 16th and 8th Sts., $14,822, 7th and Tower Sts., $15,767 ; to Barber Asphalt Co., 30th and Race Sts., Broad St., $204,600, Morris St., $8,779, Dover and Cleveland Sts., $10,216, Snyder and Oregon Aves., $14,511 ; to Mack Paving Co., Nicetown Lane and C St., paving with vitr. block Retta St., $10,715, with asphalt Water St., $3,730 ; to Estate of R. P. Bennis, Chew and Price Sts., paving with vitr. brick James St., $11,325 ; to Union Paving Co., 30th and Leicester Sts., asphalt paving Girard Ave., $43,750, square bounded by Broad, 15th and Moyamensing Aves., $50,550 ; to I. K. Davis, 6100 North 20th, grading 15th, Cheltenham, Williams and Michner Sts., $34,749 ; to J. J. McHugh, 1430 South Penn Sq., curbing and building footways in Dists. 2, 5 and 7, $64,751 ; to H. Gramm, Inc., 176 East Tulpehocken St., Dist. 6, $24,163.

★Pa., Phila.—City let contract furnishing and applying asphalt and oil on various streets, to M. J. McCrudden, Franklin Trust Bldg., $26,400.

★Pa., Phila.—City let contract paving Marlyn Rd. from Diamond to Malvern Sts., asphalt, to Eastern Paving Co., Colonial Trust Bldg., $12,350.

★Delaware—State Highway Dept., Dover, let contract to Field, Barker & Underwood, Commercial Trust Bldg., Phila., building 3.43 mi. road from Mt. Pleasant to Boyds Corner, 16 ft. wide, involving 6,550 cu yd. concrete and 14,000 cu.yd. earth excav., cost $150,250 ; Fisher & Carozza Bros., 803 Calvert Bldg., Baltimore, 4.53 mi. road from Hares Corner to "The Causeway," 18 ft. wide, 9,730 cu.yd concrete and 29,200 cu.yd. earth excav., $278,652, also 3.36 mi. Naanans Creek Rd., 16 ft. wide, 6,400 cu.yd. concrete and 33,000 cu.yd. earth excav., $224,336 ; all in New Castle Co. Noted Feb. 26.

★W. Va., Fayetteville—C. E Mahan, clk. Fayette Co. let contract improving 7 mi. road from Hico to Ansted, involving 10,000 cu.yd. excav. and drainage structures, to Fayette Constr. Co., Winona, $56,155 ; 5.6 mi. road from Prince to Hemlock, involving 60,000 cu.yd. excav. and drainage structures, to G. T. Franklin & Co., Pocahontas, Va., $80,149. Noted Feb. 12.

★W. Va., Fayetteville—C. E. Mahn, clk., Fayette Co., let contract grading and building drainage structures on 3.1 mi. road from Deepwater to Robson, involving 49,000 cu. yd. excav., to T. Towles & Co., Princeton, $64,183 ; grading and draining 3.1 mi. road from Top Paint Creek Mt. to Loup Creek, involving 46,000 cu.yd. excav., to Walton Sudduth Co., Bluefield, $44,479. Noted Feb. 12.

★W. Va., Fayetteville—C. E. Mahan, clk., Fayette Co. let contract grading and draining 2.5 mi. road from Lykens Branch to

Streets and Roads—(Continued)

Paint Creek Mt., involving 40,000 cu.yd excav., etc., to Randich Contg. Co., Princeton, $41,290. Noted Feb. 12.

★**W. Va., Grantsville**—Comrs. Calhoun Co. let contract improving 2.89 mi. Arnoldsburg-Spencer Rd., 26 ft. wide, involving 27,460 cu.yd. earth excav. and 3,860 lb. steel, to Tulley Constr. Co., Sutton, $37,695.

★**W. Va., Martinsburg**—City let asphalt macadam contract improving Queen, John, Sts., to P. Flanigan & Sons, Hartford Rd. and Baltimore & Ohio R.R., Baltimore, cost $93,000; brick work, to H. C. Brooks Corp., Martinsburg, $30,000.

★**W. Va., Parsons**—Comrs. Tucker Co. let contract improving 3 mi. Parsons-Elkins Rd., 26 ft. wide, involving 48,000 cu.yd. earth excav. and 1,000 lin.ft. 12 in. rein.-con. pipe, to W. H. Rhodes, Elkins, $58,000.

Ohio—State Highway Comn., Columbus, received bids March 26, building roads in following counties:

Fairfield Co., Sect. "C" Baltimore-Reynoldsburg Rd., 2.39 mi., grading, constructing bridges and culverts and paving with waterbound macadam, Winchell & McDaniels, Columbus, $37,035; H. W. Curry, Eaton, $37,446; C. J. Breckenridge, Columbus, $37,764.

Henry Co., Sect. "C" Bryan-Napoleon Rd., 2.369 mi., grading, draining and paving with waterbound macadam, Stone & Hill, Lima, $66,530; J. A. Westrick, Napoleon, $67,336.

Sect. "D-1" Bryan-Napoleon Rd., 0.903 mi., grading, draining and paving with waterbound macadam, Stone & Hill, $32,351; J. A. Westrick, $32,735. Noted March 11.

★**O., Cleveland**—City let contract building 20,000 sq.ft. 3 in. cement sidewalk in Southerly Dist. and 25,000 sq.ft. in Northerly Dist., to Rieley Bros., The Arcade, $10,271 and $13,190 respectively. Noted March 11.

★**Cleveland**—City let contract building 175,000 sq.ft. 2½ in. sandstone sidewalks in Northerly, Southerly and Westerly Bldg., $65,832; 38,000 sq.ft. cement sidewalk in Westerly Dist., to M. P. Platten, Columbus Rd., $15,054. Noted March 11.

★**O., Jefferson**—Astabula Co. let contract grading and paving 6.48 mi. Astabula-Austinburg Rd., 10 ft. wide, involving 37,812 sq.yd. vitr. brick on 4½ in. concrete base, 23,776 cu.yd. earth excav., 10 concrete culverts, 5,000 ft. 4 in. underdrain and 1,000 ft. 8 and 10 in. driveway tile, to T. P. Fitzgerald, 306 Main St., Astabula, $171,666.

★**O., Middletown**—City let contract paving Michigan Blvd. frrom South Main St. to Yankee Rd., to Bigler Bros., Middletown, $36,455.

★**Michigan**—State Highway Dept., Lansing, let contract grading, draining and surfacing 6.937 mi. State Trunk Line Rd. 38-3, 16 ft. wide, Lapeer and Tuscola Counties, to J. A. Slatterly, North Branch, $118,475. Work involves 23,534 cu.yd. earth excav. at $0.80 per cu.yd., 4,061 yd. station overhaul, $.03, 845 lin.ft. 12-15 in. encased tile, $1.14½, 165.1 cu.yd. 1:2:4 concrete, $32 and 185 cu.yd. 1:3:6 concrete, $32, 7,880 lb. steel reinforcement, $.10 and 65,088 sq.yd. gravel, $1.33. Noted Feb. 19.

★**Michigan**—State Highway Dept., Lansing, let contracts grading, draining and surfacing 6.916 mi. Sect. A and 7.04 mi. Sect. B Federal Aid Rd. 43, 18 ft. wide, to G. P. Scharl, Pontiac, $225,360 and $265,006 respectively. Sect. A involves 365 stations at $50 per station, 838 lin.ft. 12 in. encased tile culvert, $2, 132 lin.ft. 15 in. encased tile culvert, $2.30, 188 cu.yd. 1:2:4: concrete, $28, 258 cu.yd. 1:3:6 concrete, $27, 7,658 lb. steel reinforcement, $0.10, 11,025 lin.ft. guard rail, $0.80 and 73,038 sq.yd. concrete pavement, $2.92. Sect. B involves 371 stations, $50, 570 lin. ft. 12 in encased tile culvert, $2, 192 lin.ft. 15 in. encased tile culvert, $2.30, 141 cu.yd. 1:2:4 concrete, $29, 134 cu.yd. 1:3:6 concrete, $28, 5,451 lb. steel reinforcement, $0.10, 400 lin.ft guard rail, $0.80 and 74,249 sq.yd. concrete pavement, $3.18. Noted March 4.

★**Mich., Detroit**—Lincolnshire Land Co let contract grading, shaping and paving Craigmoor and Fairfield Aves., to W. B. Brady Constr. Co., 1972 Grand River Ave. About $64,000. Noted March 11.

★**Mich., River Rouge** — City let contract grading, paving and curbing Henry and Pine Sts., Burke and Maple Aves., to Rice Constr. Co., Wyandotte, $75,742. Noted Feb. 19.

★**Illinois**—State Highway Comn., Springfield, let contract building 5 mi Sect. 16, Winnebago Co., and 4.49 mi. Sect. 18, Stephenson Co., State Bond Issue Route 5, concrete, to Jansen & Schaefer, 122 North Capitol St., Pekin, $257,500; Sects. A, B, C and D, Edgar Co., Sect. E, Edgar and Clark Counties, and Sect. F, Clark Co., State Bond Issue Route 1, consisting of 5.08 mi. brick and 23.72 mi. concrete paving, to A. J. Parrish, Paris, $1,000,819. Noted Feb. 19 and 5.

Wisconsin—State Highway Dept., at div. office, Stephenson Bldg., Milwaukee, received bids March 23, from Peterson Constr. Co., 225 Main St., Kenosha, grading and paving 3.02 mi. Geneva Rd., Kenosha Co., involving 21,200 cu.yd. earth excav., at $1.20 per cu-yd., 202.6 cu.yd. Class "A" concrete, $25,000, 2,480 lin.ft. guard rail, $0.75, 31,768 sq.yd. concrete surfacing, $1.95, etc., total cost, $120,495. Noted March 18.

Wisconsin—State Highway Dept., at div. office, Stephenson Bldg., Milwaukee, received bids March 23, grading and paving 3.04 mi. Milwaukee-Madison Rd., Waukesha Co., involving (a) 13,005 cu.yd. earth excav., (b) 145 cu.yd. borrow excav., (c) 134.9 cu.yd. Class "A" concrete, (d) 825 lin.ft. guard rail, (e) 31,562 sq.yd. concrete surfacing, (f) 10,800 bbl. cement in place, from Froemming Bros., 1326 Humboldt Ave., Milwaukee, (a) $1.18, (b) $1.18, (c) $24.000, (d) $0.70, (e) $1.49, (f) $2.54, total cost $93,791; McGucken Constr. Co., 425 East Water St., Milwaukee, (a) $1.25, (b) $1.25, (c) $23.000, (d) $0.80, (e) $1.59, (f) $2.80, $100,624; R. R. Birdsall Constr. Co., Racine, (a) $1.40, (b) $1.40, (c) $25.00, (d) $0.90, (e) $1.62, (f) $2.62, $104,951. Noted March 18.

★**Wis., Milwaukee**—G. Hampel, clk. Milwaukee Co., let contract to Schoonmaker Constr. Co., State St., Wauwatosa, grading and paving 0.45 mi. Hawley Rd., involving 6,600 sq.yd. 1 course concrete pavement, at $2.48 per sq.yd., total cost $16,120. Noted March 25.

Wis., Milwaukee—G. Hampel, clk. Milwaukee Co. received bids grading and paving (1) 2 mi. 77th Ave., involving (a) 11,800 cu.yd. excav., (b) 20,500 sq.yd. 1 course concrete pavement, (c) 95 cu yd. concrete in culverts, (d) 85 cu.yd. concrete in bridges, (2) 2 mi. Layton Ave., (a) 21,200 sq.yd. 1 course concrete pavement, (b) 7,200 cu.yd. excav., (c) 90 cu.yd. concrete in culverts, from Wisconsin Constr. Co., 1000 Humboldt Ave., (1a) $1.25, (1b) $2.49, (1c) $22., (1d) $25, total cost for (1) $70,010, (2a) $2.80, (2b) $1.40, (2c) $22.; Blodgett-Clayton Constr. Co., 204 Grand Ave., (1a) $1.18, (1b) $2.60, (1c) $27., (1d) $30., (2a) $2.71, (2b) $1.40, (2c) $27., total for (2) $69,962; Milwaukee Genl. Constr Co., 857 8th Ave., (1a) $1.20, (1b) $2.64, (1c) $25., (1b) $28., (2a) $2.87, (2b) $1.40, (2c) $25.; McGucken Constr. Co., East Water St., (1a) $1.18, (1b) $2.66, (1c) $23., (1d) $30.; Stein Constr. Co., Grand Ave., (1a) $1.20, (1b) $2.68, (1c) $26., (1d) $32.; Froemming Bros., 1326 Humboldt Ave., (1a) $1.33, (1b) $2.68, (1c) $35., (1d) $45, Dean Constr. Co., Wisconsin St., (1a) $1.04, (1b) $2.73, (1c) $27, (1d) $30. Noted March 25.

Wis., Milwaukee—P. Braman, comr. Pub. Wks., received bids March 11, paving (1) Northside Atkinson Ave. from Green Bay Ave. to 11th St., involving (a) 40 cu.yd grading, (b) 4,816 sq.ft. cement walks, (2) Concordia Ave. from 20th to 21st Sts., (a) 598 cu.yd. grading, (b) 916 sq.yd sheet asphalt, (c) 545 lin.ft. combined cement curb and gutter, (d) 2,910 sq.ft. new cement walks, (3) Elm St. from 57th to 58th Sts., (a) 60 cu.yd grading, (b) 630 sq.yd. standard sheet asphalt, (c) 498 lin. ft. combined cement curb and gutter, (d) 33 lin.ft. cement or brick gutter paving. (e) 2,592 sq.ft. cement walks, (4) 40th St. from North Ave. to Center St., (a) 1,842 sq.yd. old asphalt removed, including base, (b) 6,332 sq.yd. asphalt surface removed, (c) 6,332 sq yd. light traffic asphalt resurface. (d) 126 lin.ft. combined cement curb and gutter, (e) 138 lin.ft. old cement curb (reset), (5) Meinecke Ave from 39th St. to Sherman Blvd., (a) 4,156 sq.yd. brick pavement removed, (b) 4,156 sq.yd. light traffic asphalt resurface, (c) 76 lin.ft. combined cement curb and gutter, (d) 50 lin.ft. cement gutter paving, (6) Middemass St. from Dunlap St. north, (a) 15 cu.yd. grading, (b) 2,906 sq.yd. bituminous concrete paving, (c) 1,310 lin.ft. combined cement curb and gutter, (7) 9th Ave. from Dakota St. to 558 ft. north, (a) 39 cu.yd grading, (b) 1,707 sq.yd. standard sheet asphalt paving, (c) 1,116 lin.ft. combined cement curb and gutter, (8) 39th St. from North Ave. to Clarke St., (a) 6,165 sq yd. old asphalt removed, (b) 6 165 sq.yd. light traffic asphalt resurface, (c) 48 lin.ft. combined cement curb and gutter, (d) 24 lin.ft. old combined cement curb and gutter reset, (9) Wells St. from 24th to 26th Sts., (a) 241 cu.yd. grading, (b) 2,637 sq.yd. old pavement removed, (b) 2,249 sq.yd. standard sheet asphalt paving, (c) 388 sq.yd. brick and gutter paving, (d) 140 lin.ft. new limestone curb, (e) 1,280 lin.ft. old limestone curb reset, (10) Wright St. from 39th St. to Sherman Blvd, (a) 4,473 sq.yd. old pavement removed, (b) 4,473 sq.yd. light traffic asphalt resurface, (c) 48 lin.ft. combined cement curb and gutter, (11) alley between East Water and Market Sts., Knapp and Juneau Aves., (a) 65 cu.yd. grading, (b) 559 sq.yd cement concrete paving, (12) alley between 16th and 17th Sts., Clybourn and Grand Aves., (a) 4 cu.yd. grading, (b) 660 sq.yd. cobble-stone pavement removed, (c) 660 sq.yd. cement concrete paving, (13) alley between 10th, 11th, Sherman and Walnut Sts., (a) 199 cu.yd. grading, (b) 430 sq.yd. cement concrete paving, (14) alley between Ellen, Kinnick and Rusk Aves., (a) 504 cu.yd. grading, (b) 2,248 sq.yd. cement concrete paving, (15) alley between 52nd, 53rd, Vine and Pabst Sts., (a) 67 cu.yd. grading, (b) 965 sq.yd. cement concrete paving, (16) alley between 25th, 26th, Chambers and Burleigh Sts., (a) 237 cu.yd. grading, (b) 1,066 sq.yd. cement concrete paving, (17) alley between 24th, West 24th, Locust and Chambers Sts., (a) 207 cu.yd. grading, 1,083 sq.yd. cement concrete paving, (18) alley between 26th, 27th, Locust and Chambers Sts., (a) 403 cu.yd. grading, (b) 10 sq.yd. old pavement removed, (c) 15 lin.ft. stone curb removed, (d) 90 sq.ft. cement walks removed, (e) 14 lin.ft. new stone curb, (f) 1,069 sq.yd. cement concrete paving, (19) all alleys between 55th and 56th Sts., Elm and North Aves., (a) 361 cu.yd. grading, (b) 985 sq.yd. cement concrete paving, (20) alleys between 47th and 48th Sts., Elm and North Aves., (a) 387 cu.yd. grading, (b) 100 sq.ft. old cement walks removed, (c) 20 sq.yd. new cement walks, (d) 736 sq.yd. cement concrete paving, (21) all alleys between 56th and 57th Sts., Elm and North Aves., (a) 242 cu.yd. grading, (b) 903 sq.yd. cement concrete paving, (22) alley between 57th, 58th, Elm and Pabst Sts., (a) 136 cu.yd. grading, (b) 1,297 sq.yd. cement concrete paving, (23) alley east and west and north 165 ft., alley north and south between 38th, 39th, Clarke and Center Sts., (a) 158 cu.yd. grading, (b) 120 sq.ft. old cement walks removed, (c) 15 lin.ft. old curb and gutter removed, (d) 30 sq.ft. new cement walks, (e) 35 lin.ft new curb and gutter, (f) 784 sq.yd. cement concrete paving, (24) alley between 26th and 27th Sts., Becher and Grant Aves., (a) 21 cu.yd. grading, (b) 1,336 sq.yd. cement concrete paving, (25) alley between 14th and 15th Sts., Ring and Concordia Aves., (a) 224 cu.yd. grading, (b) 562 sq.yd. cement concrete paving, (26) alley between 12th St., Louis, Ring and Concordia Aves., (a) 155 cu.yd. grading, (b) 955 sq.yd. cement concrete paving, from Retzlaff, Froemming & Bluhm, 948 4th St., (1a) $1.75, (1b) $0.25, (18a) $1.75, (18b) $0.65, (18c) $0.15, (18d) $0.10, (18e) $1.50, (18f) $2.30, (25a) $1.75, (25b) $2.33, (26a) $1.79, (26b) $2.32; Badger Constr. Co., 97 Wisconsin St., (2a) $1.50, (2b) $3.59, (2c) $1.00, (2d) $0 25, (3a) $1.50, (3b) $3.59, (3c) $1.00, (3d) $0.90, (3e) $0.25, (4a) $1.10, (4b) $0.40, (4c) $2.16, (4d) $1.25, (4e) $0.30, (5a) $0.40, (5b) $2.16, (5c) $1 25, (5d) $1.00, (8a) $0.40, (8b) $2.12, (8c) $1.25, (8d) $0.30, (10a) $0.40, (10b) $2.16, (10c) $1.25; R. H. Gumz, 831 13th Ave., (6a) $1.50, (6b) $2 85, (6c) $1.00; White Constr. Co., 425 East Water St., (7a) $1.20, (7b) $3.48, (7c) $0.98; F. P. Caughlin Co., Humboldt Ave., (9a) $1.30, (9b) $1.20, (9c) $3.49, (9d) $4 00, (9e) $1.30, (9f) $0.25; Dean Constr. Co., 82 Wisconsin St., (11a) $2.00, (11b) $2.31. (12a) $1 45, (12b) $0.38, (12c) $2.33, (13a) $2.00, (13b) $2.35, (23a) $2.00, (23b) $0.10, (23c) $0.10, (23d) 0.25, (23e) $0.90, (23f) $2.41; F. Banaszak, 1335 4th Ave., (14a) $1.98, (14b) $2.00, (24a) $1.98, (24b) $2.00; O. Bodemann, 801 Winnebago St. (15a) $1.75, (15b) $2 00, (19a) $1.75, (19b) $2.00. (21a) $1.75, (21b) $2.00, (22a) $1.75, (22b) $2.00; Blodgett-Clayton Constr. Co., 204 Grand Ave., (16a) $1.85, (16b) $2 33, (17a) $1.85, (17b) $2.33; F. Schomann, 770 28th St., (20a) $1.50, (20b) $0.08, (20c) $0.25, (20d) $2 20.

★**Minn., Albert Lea**—F. Tavis, aud. Freeborn Co., let contract improving 12 mi. State Aid Rd. 3, Job 2003, 24 ft. wide, involving 135,000 cu.yd. excav., 1,600 ft. concrete culvert pipe and 17,000 cu.yd. gravel surfacing, to Morris & Doherty, Globe Bldg., St. Paul. About $46,000. Noted Feb. 19.

★**Mion., Albert Lea**—F. Tavis, aud. Freeborn Co., let contract building 10 mi. State Rd. 4, Federal Aid Project 121, 24 ft.

Streets and Roads—(Continued)

wide, involving 86,000 cu.yd. excav., 1,300 ft. concrete pipe culverts, 13,300 cu.yd. gravel surfacing, 5,000 ft. guard rail and 1 single span concrete bridge, to Cameron & Joyce, Keokuk, Ia. About $76,000. Noted Feb. 19.

★**Minn., Austin**—Mower Co. let contract building 2 mi. County Job 2003, 24 ft. wide, involving 8,000 sq.ft. clearing, 12,305 cu.yd. earth excav., 5,920 cu.yd. overhaul, 100 cu. yd. hand ditch and 1,020 lin.ft. guard rail, to Siems, Helmers & Schaffner, 514 Guardian Bldg., St. Paul. About $14,600. Noted March 4.

★**Minn., Blue Earth**—Faribault Co let contract building Federal Aid Project 36, 24 ft. wide, involving 63,408 cu.yd. excav., 1,248 lin.ft. guard rail and 29,439 cu.yd. gravel surface material, to Adam & Eret, 604 Ashton Ave., St. Paul. About $63,000.

★**Minn., St. James**—A. G. Countryman, aud. Watonwan Co., let contract building 22 mi. Federal Aid Project 107 and State Rd. 2001, 24 and 18 ft. wide, to Johnson & Drake, 912 Plymouth Bldg., Minneapolis, $600,000. Noted March 11.

★**Kan., Iola**—Allen Co. let contract paving 0.92 mi. Federal Aid Project 18, Sect. A, 1 course concrete, to A. L. Cook, Ottawa, $48,430.

Kan., Iola—Allen Co. received bid paving 12.87 mi. Humbolt-Elsmore Rd., waterbound macadam, from A. L. Cook, Ottawa, $318,541.

★**Kan., Newton**—City let contract paving Main St., involving 11,000 sq.yd. concrete, to Kaw Paving Co., 609 N. E. Bldg., Topeka, $35,389.

★**S. D., Pierre**—Comrs. Hughes Co. let contract grading 17 83 mi. and graveling 5½ mi. Pierre-Blunt Rd., to C. J. Wheelock, Huron, $59,273; building drainage structures on same, to J. Stainer, Pierre, $13,740.

★**Montana**—State Highway Comn., Helena, let contract building 1.89 mi. Hinsdale-Thoeny Rd', Federal Aid Project 83, 16 ft. wide, involving 3,448 cu.yd. gravel and 6,650 cu.yd. common Excav., to J. O'Connor, Malta, $14,599. Noted Feb. 26.

★**Montana**—State Highway Dept., Helena, let contract gravel surfacing 0.86 mi. Great Falls-Sun River Rd., 16 ft. wide, Cascade Co., to White, Brown & Leahey, Great Falls, $7,565; 21.52 mi. Billings-Ballantine Rd., Federal Aid Project 53, Sect. A. Yellowstone Co., to State Highway Constr. Co., Helena, $149,137; 2.52 mi. Cemetery Rd., Yellowstone Co., will be surfaced by day labor, cost $6,900. Noted Sept. 25. and Feb. 26.

★**Mont., Billings**—City let contract paving 6,676 sq.yd. Broadwater Ave., et al., 16 ft. wide, to McElroy-Clark Constr. Co., Billings, $28,106. Noted Feb. 26.

★**Tex., Cooper**—Delta Co. let contract clearing, grading, gravel surfacing and installing concrete and corrugated iron drainage structures on 11.31 mi. State Highway 19, north from here, to Smith & Healey Constr. Co., Cooper, $301,458. Noted March 11.

★**Tex., Groesbeck**—J. E. Bradley, judge Limestone Co., let contract grading, subgrading and surfacing 7.064 mi. Highway 7, from Freestone Co. to Tehuacana, 12 ft. wide, involving 5 acres clearing and grubbing and 30,893 cu.yd. borrow excav., to Cook & Arrington, Crockett, $70,030, plus 10% per engineering and contingencies. County will furnish 11,025 cu.yd. crushed rock, cost $29,062. Noted Feb. 12.

★**Tex., Waco**—J. P. Alexander, judge McLennan Co., let contracts surfacing and draining 0.38 mi. Highway 7, Waco-Springfield Rd., 15 ft. wide, involving 3,283 sq.yd. 1 course rein.-con., 752 cu.yd. earth excav., 3,506 lb. reinforcing steel, 8.5 cu.yd. 1:2:4, 42.07 cu.yd. 1:2:3 and 43.9 cu yd. 1:2½:5 cu.yd. concrete also 0.63 mi. Highway 31, Waco-Axtell Rd., 15 ft. wide, 5,483 sq.yd. 1 course concrete, 1,136 cu.yd. earth excav., 38 cu.yd. 1:2:4, 100.3 cu.yd. 1:2½:5 and 1:2:3 concrete, to Byars & Byars, Waco, $19,068 and $29,701, respectively, both including 10% for engineering and contingencies. Noted Feb. 19.

★**Idaho** — Comr. Pub. Wks., Boise, let contract grading 8.4 mi Greer-Fraser Highway Section of Clearwater State Highway, to Siems & Carlson, Spokane, $184,008. Noted March 4.

★**Idaho, Boise**—Ada Co. let contract paving 12.9 mi. Boise-Star Rd., 18 ft. wide, 5 in. bitulithic concrete, to C. H. Helmer, Twin Falls, $385,788 Noted Feb. 26.

★**Ariz., Tuscon**—City let contract paving Drachman St., Stone and 8th Aves., to West Constr Co, Tuscon, $119,458.

Wash., Bellingham—Whatcom Co. received only bid March 15, grading 4 mi. Laurel—Linden Rd., from Riddell & Hawkins, Bellingham, $11,083.

★**Wash., Colfax** — Whitman Co. let contract surfacing 15.2 mi. Colfax-Diamond Rd., involving 35,778 cu.yd. crushed rock, to Highway Constr. Co., Colfax, $186,593. Noted March 18.

★**Wash., Seattle**—Bd. Pub. Wks. let contract building 12,000 sq.yd. concrete sidewalk on 21st Ave., S., et al, to Di Julio & Alfonso, Seattle, $22,605. Noted March 25.

Wash., Tacoma—City received bids March 20, paving Pacific Ave. from South 34th to South 96th Sts., (1) 16 ft., (2) 20 ft. wide, from J. Warter, Tacoma, (1) $125,475, (2) $159,875; D A. Williams, Tacoma, (1) $126,000, (2) $135,000; T. M. Morgan, Everett, (1) $137,998, (2) $177,000.

★**Wash., Waterville**—Douglas Co. let contract paving 2 mi. L. I. D. Rd. 9 from Douglas & Columbia Co. bridge toward Rock Island, to Armstrong & Doust, Spokane, $61,884; grading and gravel surfacing 4.25 mi. road from Waterville north, to Mohr Constr. Co., Waterville, $31,268. Noted March 25.

Cal., Santa Rosa—Bd. Supervs. received bids improving 5.035 mi. Sect. A, Petaluma Rd., involving 13,637 cu.yd. grading, (a) 6,565 cu.yd. plain concrete paving, (b) 7,878 cu.yd. macadam, from W. A. Dontanville, Arroyo Grande, (a) $117,000; G. W. Conners and H. Hansen, Santa Rosa, (b) $78,000.

Cal., Santa Rosa—Bd. Supervs. Sonona Co. received bids from A. J. Fairbanks, Willits, improving 8.921 mi. Sect. A, Petaluma-Valley Ford Rd., involving 48,740 cu.yd. grading, (a) 11,631 cu.yd. concrete paving, (b) 13,957 cu.yd. macadam, (a) $269,000, (b) $177,500; 6.311 mi. Sect. B, Valley Ford Rd., involving 44,960 cu.yd. grading, (a) 9,875 cu.yd. gravel paving, (b) 9,875 cu.yd. macadam and (c) 8,230 cu.yd. plain concrete paving, (a) $116,500, (b) $147,500, (c) $202,000; 1.728 mi. Sect. B, Healdsburg to Napa Co. line, involving 64,728 cu.yd. grading, guard fences, etc., $50,000. Noted March 11.

Railways

PROPOSED WORK

Ohio—Cleveland Ry. Co., Leader-News Bldg., Cleveland, secured permit from city to renew, re-lay and fill in with concrete ballast 80,624 ft. car tracks. About $1,011,513. J. Stanley, pres.

Ohio—Cleveland & Sharon Rapid Transit Co., Superior Bldg., Cleveland, filed application with city of Warren for franchise to build 11 mi. railway from Warren to Niles, thence to Youngstown, involving crushed stone ballast, steel rails, poles, etc. C. H. Felton, secy.

Canada—Dominion Government, Ottawa, plans to expend $6,321,000 on construction and betterment of railroads. W. A. Bowden, Western Blk., Ottawa, ch. engr.

Excavation and Dredging

PROPOSED WORK

Mass., Boston—Dredging—Dept. Pub. Wks. soon lets contract dredging 110 cu.yd. rock ledge from entrance to drydock, 37 ft. minimum working depth. About $25,000. F. W. Hodgkins, 120 State House, engr.

Tenn., Trenton — Drainage — D. D. 9, Gibson Co., soon lets contract building drainage canal, 6.36 mi. long, involving 94,628 cu.yd earth excav. and 26 acres of clearing; work suitable for either drag line or floating dredge. S. W. McCleskey, 11 South 2nd St., Memphis, engr.

Ill., Clinton—Drainage—Comrs. Friends Creek Special D. D. soon let contract building drainage system, involving 13,100 ft. 12-30 in vitr., salt glazed, farm drain tile, also steel rein.-con. headwall and apron, 3 mi. northeast of Weldon and 4 mi. southeast of DeWitt.

Ia., Ft. Dodge—Drainage—City soon receives bids draining D. D. 16, involving 3,900 ft. 15-32 in. Double Section and 18,867 ft. 8-32 in. Standard tile, cost $33,833, D. D. 43, 9,000 ft. 26-34 in. Double Section and 13,800 ft. 18-32 in. Standard tile, $68,840; D. D. 51, 4,600 ft 34 in. Double Section and 10,700 ft. 16-26 in. Standard tile, $36,440; D. D. 287, 50 ft. 34 in. sewer pipe and 6,460 ft. 32-34 in. tile, $19,600; D. D. 306, 24,158 ft 6-36 in. tile, $54,747, and 22,974 cu.yd. open ditch, $7,500; D. D. 312, 17,150 ft. 12-34 in. tile, $30,080; D. D. 313, 4,900 ft. 20-24 in. Double Section and 10,275 ft. 8-20 in. Standard tile, $18,785, 7,800 cu.yd. open ditch, 8 ft. base and 15,000 cu.yd. open ditch, 6 ft. base, $8,000; D. D. 314, 6,000 ft. 14-20 in. tile; reconstructing D. D. 2, 70,000 cu.yd. clean out, 6 ft. base, $15,000; D. D. 4, 58,000 cu.yd. clean out, 6 ft. base, $12,760, 14,000 cu.yd. clean out, 8 ft. base, $3,080, 12,420 cu.yd. clean out, 6 ft. base, $2,732, 3,000 ft. 12-18 in. tile, $3,720, 5,400 ft. 18-36 in. tile and 8,000 cu.yd. old ditch filling, $21,632.

Minn., Benson—Ditch—Swift Co. plans to build Judicial Ditch 8, 32 mi. long, involving 1,700,000 cu.yd. excav. and 111 mi. 5-30 in. tile drain. About $541,000 S. B. Gardner, Benson, engr.

Utah, Avon—Irrigation—Hyrum Irrigation Co., Hyrum, plans to build irrigation system, dam and reservoir in East Canyon, near here. About $250,000. T. H. Humpheries, Logan, engr.

Ont., Ottawa — Canal — Dept. Rys. & Canals, Western Blk., plans to expend $400,000 on Trent Canal this year. W. A Bowden, ch. engr.

Ont., Welland—Canal—Dominion Government, Ottawa, will expend about $5,500,000 on Welland Ship Canal this year. W. A. Bowden, Western Bl., Ottawa, ch. engr.

BIDS DESIRED

Ill., Hull—Excavation—Until April 16, at office of E. J. Chamberlain, engr. for McCraney Sub-district of Sny Island Levee D. D., Pittsfield, for 319,806 cu yd. excav. and levee embankment, near here. H. Koeller, New Canton, pres.

Ill., Morrison—Excavation—Until April 10, by Comrs. Johnson Creek Levee and D. D. and Ex-Officio Comrs. of Sub-Dist. No. 1, at office of J. A. Riordon, Morrison, building lateral ditch in sub-district, involving 21,105 yd. excav. J. R. Russell and W. A. Field, comrs.; advertised in this issue.

Ia., Ft. Madison—Ditch—Until April 22, by R. A. Gardner, aud. Lee Co., completing ditches, Sects. 2 and 3, in Green Bay Levee and D. D.; advertised in this issue.

Wyo., Basin—Drainage—Until May 5, by Alamo D. D., constructing 51,182 ft. closed tile drain, 9 ft. deep C. W. Atherly, Basin, engr.

Ark., Jonesboro—Ditches—Until April 8, by Bd. Comrs., D. D. 23, constructing ditches, involving, 1,100,000 cu yd. earth excav. and nine 18-70 ft. steel span bridges. E. E. Randolph, secy. Klyce & Kackley, 721 4th and 1st Natl. Bank Bldg., engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New York—Dredging—M. Hurlburt, comr. docks, Prier "A", foot of Battery Pl., North River, received bids March 25, furnishing labor and material dredging in North and East Rivers, from F. E. Jones, 17 Battery Pl, $32,780 and $41,275 respectively; P. S. Ross, $38,952 and $40,640 respectively; Columbia Dredging Co., $35,164 and $44,450 respectively. Noted March 18.

★**O., Cleveland** — Excavation — Fisher Body Co., Piquette Ave., Detroit, let contract for 70,000 cu.yd. excavation, at East 140th St and Coit Rd., here, to Udelson Contg. Co., 1836 Euclid Ave. About $70,000.

Ont., Tupperville—Dredging—Kent Co. let contract dredging 19 mi. of Little Bear Creek Drain and erecting several concrete or steel bridges over same, to Chatham Dredging & Contg. Co., Chatham. About $150,000.

Industrial Works

PROPOSED WORK

Me., Clark Mills (Hollis Center P. O.)—Clark Power House Co, having plans prepared by Sawyer & Bean, archts. and engrs., 11 Lisbon St., Lewiston, for 1 story, brick, rein.-con. and steel power house.

N. H., Peterboro—J. Noones Sons Co, plans to build two 1 story, brick and steel additions to manufacturing plant, rein.-con. flooring, concrete foundation. About $76,000. Private plans.

Mass., Athol — Union Twist Drill Co. having plans prepared by Frost & Chamberlain, archts., Slater Trust Bldg., Worcester, for 4 story, 60 x 200 ft., brick and concrete manufacturing plant. About $150,000.

Mass., Boston — Bethlehem Shipbuilding Corp., Fore River, soon lets contract building 2 story, 50 x 220 ft., brick and steel shop, at Fore River Private plans.

Industrial Works (Continued)

Mass., Boston—W C. Gaunt Co., 212 Summer St., had plans prepared by G. F. Shepard, archt., 78 Devonshire St., for 5 story, 60 x 160 ft., rein.-con., warehouse, on Fargo St. About $300,000.

Mass., Boston — Salada Tea Co., 155 Berkley St., having plans prepared by Densmore & LeClear, archts., 88 Broad St., for limestone, terra cotta and granite addition to plant, on Berkeley and Stuart Sts. About $250,000.

Mass., Brookline—Metropolitan Coal Co., 20 Exchange St., Boston, having plans prepared by W. M. Bacon, archt., 27 Kilby St., Boston, for 1 story, 80 x 90 ft., rein.-con garage, on Reservoir St. About $25,000.

Mass., Cambridge (Boston P. O.)—W. Filene Sons Co., 416 Washington St., Boston, plans to build rein.-con. factory and storehouse, here. Architect not slected.

Mass., Chelsea (Boston P. O.)—S. S. Eisenberg, archt., Exch. Bldg., soon receives bids building 3 story, 40 x 60 ft., brick and mill construction addition to manufacturing plant, concrete foundation, for L. Cohen, Pearl St. About $25,000.

Mass., Jamaica Plain (Boston P. O.)—S. J. Rantiu, archt., 1117 Columbus Ave., Roxbury, soon receives bids building 2 story, 40 x 60 ft., brick and steel plant, concrete foundation, on Washington St., for E. Weiber, c/o architect. About $25,000.

Mass., Rockland—J. W. Beal, archt., 62 Sumner St., Boston, soon lets contract building 1 story, 50 x 120 ft., garage with 30 x 40 ft. wing, rein.-con. flooring, on West Water St., for H. B. Vesper, c/o architect. About $60,000. Noted March 4.

Mass., Salem — J. Friend, Endicott St., plans to build large factory and storehouse, on Derby and Congress Sts. Private plans.

Mass., Springfield—Cordner Garage, 425 St. James Ave., plans to build 1 story, brick and steel garage and showroom, on State St. About $100,000. Architect not selected.

Mass., Wakefield—F. P. Sheldon & Sons, engrs., 1008 Hospital Trust Bldg., Providence, R. I., soon let contract building 3 story, 50 x 175 ft., brick and concrete storehouse, concrete foundation, for Winship-Boit & Co., Harvard St. About $75,000.

Mass., Westfield—M. E. Harding, archt., 33 Elm St., soon receives bids building 2 story, 65 x 102 ft., brick and mill construction addition to factory, concrete foundation, for Westfield Mfg. Co., Cycle Ave. About $35,000.

R. I., Woonsocket — W. F. Fontaine, archt., Federal Bldg., soon lets contract building 2 story, 60 x 200 ft., brick and mill construction dyehouse, rock foundation, for Rosemont Dyeing Co., 292 East School St. About $100,000.

Conn., Bridgeport — Summerill Tubing Co. having revised plans prepared by H. G. McMurtrie, archt., 1012 Walnut St, Phila., for 2 story, 60 x 120 ft., brick and rein.-con. factory.

Conn., Hartford—B. S. Clark, archt., 98 Sargeant St., soon receives bids building 3 story, 58 x 102 ft., brick and steel garage, rein.-con. flooring and foundation, on Albany Ave. and Bedford St., for F. D'Esopo, 647 Main St. About $70,000. Noted Jan. 15.

Conn., Meriden — Orr & Del Grella, archts., 956 Chapel St., New Haven, soon let contract constructing 1 and 2 story, 41 x 120 ft., brick and mill construction factory and office building, concrete foundation, on Griswold St., for C. N. Flagg & Co., Inc., 27 State St. About $35,000.

Conn., Meriden—E. Miller & Co., 99 Center St., having plans prepared by Orr & DelGrella, archts., 956 Chapel St., New Haven, for 5 story, brick and mill construction storage plant, concrete foundation, on Center St. About $100,000.

Conn., Middletown—Standard Oil Co. of New York, 26 Bway., New York City, plans to build brick and concrete oil plant, along Connecticut River, here. About $100,000. Private plans.

Conn., New Britain — Russell & Erwin Mfg. Co., Washington St., plans to build brick, steel and concrete addition to manufacturing plant. P. Sellers, 207 Orange St., New Haven, engr.

Conn., South Norwalk—J. Riccio & Bro., 13 Woodward Ave., plan to build 1 story, 100 x 100 ft., concrete garage and service station, rein.-con. flooring, concrete foundation, on Woodward Ave. and Cross St. About $40,000. Private plans.

Conn., Willimantic—S. Porcaro, 22 Union St., soon lets contract building 2 story, 90 x 90 ft., brick and concrete garage and showroom, concrete flooring and foundation, on Temple St About $45,000. Private plans.

N. Y., Batavia—W. J. Goade plans to build brick, concrete and steel addition to factory, on Ellicott St. About $25,000.

N. Y., Buffoto—Hewitt Rubber Co., Kensington Ave., plans to build 2 story, brick addition to plant. About $25,000.

N. Y., Buffalo — Sowers Mfg. Co., 1300 Niagara St., plans to alter and build brick addition to machine shop and foundry. About $100,000.

N. Y., Johnson City—Sweet Bros. Fdry. plans to build 1 story, 160 x 200 ft., concrete and steel foundry, on Grand Ave. Cost between $60,000 and $70,000. Address A. J. Sweet, Johnsion City

N. Y., New York—J. Massininni, c/o E Wilbur, archt. and engr., 507 5th Ave., having plans prepared for 1 story, 50 x 150 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 162nd St. About $35,000.

N. Y., S. I., Rossville—Gotham Shoe Mfg. Co. plans to enlarge present factory and build addition. Cost between $70,000 and $80,000. Architect not selected.

N. Y., Union—Union Milling Co. plans to alter and build addition to plant recently damaged by fire. Cost between $75,000 and $85,000.

N. Y., Watertown—North Counties Coal & Supply Co., 204 Franklin St. purchased C. W. Gray Bldg. on State St., and plans to build 3 story, 55 x 60 ft., brick, concrete and steel addition. Cost between $60,000 and $75,000. H. J. Cadwell, mgr.

N. J., Trenton—Pocono Rubber Cloth Co., East State St., plans to build 43 x 45 ft. boiler and power house and 1 story, 25 x 70 ft. engine house, brick and steel, also 1 story, 26 x 170 ft. drying and unloading building, cement and brick, rein.-con. flooring, concrete foundation. About $30,000. Karmo-Smith Co., Broad St. Bank Bldg., archts.

Pa., Bellefonte—J. H. and C. K. Eagle Co., Inc., Franklin and Independence Sts., receives bids about May 1, building 2 story, 100 x 120 ft., silk mill, rein.-con. and brick, rock foundation. About $125,000. Architect not selected.

Pa., Titusville — Odin Constr. Co., Inc., Monroe St., plans to build extension to plant. About $60,000. H. A. Curtis, secy.

Pa., Wheatland—Slick-Knok Steel Co., Hippodrome Bldg., Cleveland, O., plans to build 1 story, 500 ft., brick and steel mill, brick foundation. About $300,000. W. L. Ulmer, dir. Private plans.

Md., Baltimore—L. Blaustein, 612 Water St., having plans prepared and soon receives bids building 2 story, 57 x 130 ft., brick garage, cement flooring, concrete foundation, at 609-13 North Fremont Ave. About $40,000. G. R. Callis, 611 Amer. Bldg., archt.

Md., Baltimore—Federal Motor & Sales Co., 803 Low St., receives bids about April 15, constructing 3 story, 106 x 117 ft., concrete and brick garage, service and sales station, concrete foundation, on Grasshopper Hill, North Ave. and Lord St. H. A. Loane, Builders Exch. Bldg., archt. Noted March 11.

W. Va., Huntington — Huntington-Nash Co, 1040 4th Ave., plans to build 2 story, 75 x 125 ft., rein.-con. and steel warehouse, rein.-con. flooring, concrete foundation, on Adams Ave. and 15th St. Architect not selected.

N. C., Franklinton—Franklinton Hosiery Mill plans to build 1 story, 100 x 120 ft. mill, steel frame. J. E. Sirrine, Greenville, S. C., engr.

N. C., Spindale—Stonecutter Mills plan to build 2 story, 106 x 292 ft. cotton mill and 1 story, 157 x 420 ft. weave shed, mill construction J. E. Sirrine, Greenville, S. C., engr.

S. C., Greenville—C. M. Goodyear Co. plans to build 3 story, 100 x 250 ft. mill construction plant. J. E. Sirrine, Greenville, engr.

S. C., Warrenville—Warren Mfg. Co. plans to build 150 x 250 ft. mill construction weave shed. J. E. Sirrine, Greenville, engr.

Ga., Augusta—Sibley Mfg. Co., Goodrich St., having plans prepared by J. E. Sirrine, engr., Greenville, S. C., for rebuilding water power plant and dye house.

Ky., Louisville—Belknap Hardware & Mfg. Co., 2nd and Washington Sts., having sketches made for warehouse on 2nd and Washington Sts. About $1,000,000. W. H. Heyburn, pres.

O., Cincinnati — Amer. Can Co., 120 Bway., New York City, preparing plans building plant, on Fergus St., here, including several 1 and 3 story buildings. About $1,000,000.

O., Cleveland—Cleveland Ry., Leader-News Bldg., having plans prepared by L. P. Crocelius, archt. and engr., 700 Leader-News Bldg., for 1 story, 60 x 110 ft., concrete, steel and brick converter station, rein.-con. flooring, concrete foundation, on East 105th St. near Wade Park. About $75,000.

O., Cleveland — Cleveland Steel Co., Rockefeller Bldg, plans to build 1 story, steel and brick plant, on West 117th St. and Cleveland, Cincinnati, Chicago & St. Louis R.R. About $350,000. A. S. McKee Co., Rockefeller Bldg., engrs.

O., Cleveland—Harold Bros., 714 Euclid Ave., plans to build 2 story, 125 x 195 ft., steel and brick factory, brick foundation, on East 40th St. About $50,000. Private plans.

O., Cleveland—J. S. Kohn, Engineers Bldg., soon lets contract building 1 story, 58 x 168 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, at 936 East 72nd St. About $25,000. P. Matzinger, Caxton Bldg., archt.

O., Cleveland—A. Osborn Co., archts. and engrs., Rose Bldg., soon lets contract building 1 story, 100 x 200 ft., concrete, steel and brick foundry, rein.-con. flooring, concrete foundation, on Dunham Rd., for Minerva Engine Co., East 66th St. and Euclid Ave. About $60,000.

O., Cleveland—Simmons Motor Car Co., 4100 Euclid Ave., having plans prepared by G. W. Drach, archt. and engr., Union Trust Bldg., Cincinnati, for 3 story, 95 x 195 ft., concrete, steel and brick garage and sales building, rein.-con. flooring, concrete foundation, on East 30th St. and Euclid Ave. About $300,000.

O., Dover—Dover Mfg. Co., c/o Poe Eng. Co., archts. and engrs., Rockefeller Bldg., Cleveland, having plans prepared for 3 story, 80 x 200 ft., concrete, steel and brick fcatory, rein.-con. flooring, concrete foundation, here. About $100,000.

O., Lakewood (Cleveland P. O.)—Lakewood Fireproof Storage Co., c/o W. S. Ferguson Co., archts., 1900 Euclid Ave., Cleveland, having plans prepared constructing 6 story, rein.-con., steel and brick storage building, rein.-con. flooring, concrete foundation, on Lincoln and Detroit Aves. About $125,000.

Ind., Ft. Wayne—J. H. and W. C. Ely, archts., Firemans Bldg., Newark, N. J., soon lets contract building 2 story, 100 x 400 ft., concrete, brick and steel plant, for Genl. Electric Co., Bway. and Pennsylvania Ry.

Mich., Detroit—Congress Tool & Die Co., 7 Fort St. E., having plans prepared by A. Clubb, archt., Goebel Bldg., for 2 story, brick and steel factory, brick foundation, on East Fort St.

Mich., Detroit—Ewing Bolt & Screw Co., 403 Farwell Bldg., plans to build 1 story, rein.-con. and steel factory, rein.-con. flooring, concrete foundation. About $350,000. Private plans.

Mich., Detroit—Wolverine Bedding Co., 55 Iroquois Ave., having plans prepared by I. M. Lewis, archt., Congress Bldg., for 2 story, 40 x 100 ft., brick and steel factory, brick foundation, on Iroquois Ave. About $25,000.

Mich., Flint—Dort Motor Car Co. plans to build 3 story, rein.-con., brick and steel machine shop, rein.-con. flooring, concrete foundation, on Western Rd. About $100,000. Smith, Hinchman & Grylls, 710 Washington Arcade, Detroit, archts.

Ill., Chicago—D. O. James Mfg. Co., 1120 West Monroe St., having plans prepared by Ronneberg & Pierce, archts., 10 South La Salle St., for 3 story, 48 x 120 ft., brick and timber factory, concrete foundation. About $50,000.

Wis., Kenosha—United Motor Transport Lines, 211 Wisconsin St., having plans prepared by White, White & White, archts., Pub. Serv. Bldg., for 1 and 2 story, 100 x 120 ft. ice manufacturing and storage plant, rein.-con. and brick, rein.-con flooring, concrete foundation, on Sheridan Rd.

Wis., Merton—J. Menge, Jr., archt., 138 Dwight St., Milwaukee, soon lets contract building 2 story, 130 x 247 ft., brick and mill construction cannery, concrete foundation, for Bark River Canning Co About $100,000. Noted March 18.

Wis., Oconomowoc—H. V. Miller, archt., 646 24th St., Milwaukee, receives bids about April 3, constructing cannery, to include several 1 and 2 story buildings, brick and mill construction, concrete foundation for Oconomowoc Canning & Products Co. About $60,000.

Industrial Works (Continued)

Wis., Racine—Fox Ice Co., Liberty St., plans to build ice manufacturing plant, brick and concrete. Architect and engineer not selected.

Minn., St. Paul—Snelling Garage Co. having plans prepared by S. Jacobson and W. F. Stevens, archts., 403 Endicott Bldg., for 2 story, 50 x 125 ft., brick garage, on Marshall and Snelling Sts. About $52,000.

Neb., Grand Island—Teeter & Homair, having plans prepared by G. W. Graves, archt., 43 John R. St., Detroit, for 4 story, 66 x 132 ft., rein.-con. brick and steel garage and service building, rein.-con. flooring, concrete foundation, on Main St. About $86,000.

Mo., St. Joseph—St. Joseph Oil Co., 4th and Duncan Sts., having plans prepared for 2 story, 50 x 160 ft. power house, 1 story, 50 x 100 ft. garage and 1 story, 30 x 50 ft. office, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $200,000. Private plans.

Tex., Houston — F. S. Glover & Son, archts., Binz Bldg., receive bids about April 1, constructing 4 story, 100 x 153 ft., rein.-con. and brick warehouse and office building for Houston Drug Co., Caroline and Preston Sts. About $225,000.

Cal., San Bernardino — W. J. Hanford Iron Wks. having plans prepared by H. E. Jones, archt., Katz Bldg., for 1 story, 70 x75 ft. factory, steel and corrugated iron, concrete foundation. About $75,000.

Cal., San Bernardino—Southern California Ice Co. having plans prepared by H. E. Jones, archt., Katz Bldg., for 2 story, 40 x 80 ft. timber plant, concrete foundation.

Que., Montreal—A. G. Noseworthy, archt., 304 University St., receives bids about May 1, building 2 story, 75 x 140 ft. plant, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on St. Catherine St. E., for Canadian Film Co., Ltd., 284 Catherine St. W. About $75,000.

Ont., Oakville—Oakville Basket & Veneer Wks. plan to build 2 story, box factory, brick and steel, wood flooring, concrete foundation. About $80,000. Private plans.

Ont., Ottawa—Standard Bread Co., Hillson Ave., soon receives bids building bread factory on Oliver St. About $150,000. Architect not selected.

BIDS DESIRED

Conn., Middletown—Until April 3, by Ford, Buck & Sheldon, Inc., engrs., 60 Prospect St., Hartford, building 3 story, 50 x 220 ft. addition to manufacturing plant, with 30 x 50 ft. ell, brick and mill construction, concrete foundation, on Church St., for Goodyear Rubber Co., 114 Church St. About $90,000.

N. Y., Brooklyn—Until April 8, by Dept. Pub. Welfare, Municipal Bldg., New York City, furnishing labor and material building addition to refrigerating plant at Kings County Hospital, here. B. S. Coler, comr.

N. Y., Comstock—Until April 20, by C. F. Rattigan, supt. state prisons, Capitol, Albany, building 1 story, 60 x 170 ft., brick shop, concrete foundation, at Great Meadows Prison, here. L. F. Pilcher, Albany, state archt., advertised in this issue. Noted March 25

N. J., Newark—F. Grad, archt., Amer. Natl. Bank Bldg, receiving bids building 1 story, 100 x 112 ft., brick and limestone garage and sales, on Frelinghuysen and Clifton Sts., for Koplin Motor Sales Co., 486 Central Ave. About $30,000.

Pa., Marcus Hook—Ballinger & Perrot, archts. and engrs., 329 South Broad St., Phila., receiving bids bulidings 3 story, 60 x 110 ft., brick boiler house, for Viscose Co. About $100,000.

Pa., Phila.—Until April 8, by Ballinger & Perrot, archts. and engrs., 329 South Broad St., building 1 story, 60 x 90 ft., rein.-con. addition to leather factory, for E. Hubschman, Orianna and Willow Sts.

Md., Baltimore—Until April 8, by O. G. Simonson, archt., Baltimore St. and Guilford Ave., oonstructing plant, on 37th and 40th Sts. and Cedar and Elm Aves., including garage, powor house and printing shop, 1 story, 60 x 122 ft. each, also 3 story, 300 x 300 ft. administration building, all concrete, steel and brick, concrete foundations, for Maryland Casualty Co., Baltimore and Guilford Sts. About $3,000,000. H. Adams, 1261 Calvert Bldg., engr. Noted Sept. 4.

Md., Ridgely—Until April 7, by Erlanger Underwear Mfg. Co., 527 West Pratt St., Baltimore, building 1 story, 35 x 111 ft., cement block and concrete factory, concrete foundation, here. About $30,000. W. M. Gieske, 65 Gunther Bldg., Baltimore, archt.

O., Lebanon—Until April 27, by Bd. Trustees of Pub. Affairs, building municipal light plant. About $135,000. E. M Chace, Union Central Bldg., Cincinnati, engr.

Mich., Detroit—Until April 10, by Pollmar & Ropes, archts. and engrs., 45 State St., building 2 story, 90 x 150 ft., rein.-con., brick and steel garage, rein.-con. flooring, concrete foundation, on Vermont and Ferry Park Aves., for Cable Draper Baking Co., Vermont and Marquette Ave., About $40,000. Noted March 25.

Mich., Detroit—Until April 15, by A. Clubb, archt., Goebel Bldg., constructing 2 story, 62 x 150 ft., brick and steel garage, brick foundation, on Canfield Ave., for Waisman Bros., 140 East Canfield Ave. About $40,000.

Mich., Grand Rapids—Until April 9, by Robinson & Campau, archts., 715 Michigan Trust Bldg., constructing 2 story, 80 x 400 ft., rein.-con. and brick warehouse, rein.-con. flooring, concrete foundation, on Fulton St., for Grand Rapids Furniture Mfg. Assn., 216 Lyons St., N. W. About $125,000.

Wis., Jackson—H. V. Miller, archt., 646 24th St., Milwaukee, receiving bids constructing pea cannery, to include several 1 and 2 story, brick and mill construction buildings, concrete foundation, for Jackson Canning Co. About $50,000.

Minn., Duluth—Until April 10, by J. J. Waugenstein, archt. and engr., Providence Bldg., constructing 2 story, 75 x 116 ft., concrete and brick warehouse and office building, rein.-con. flooring, concrete foundation, on 46th and Grand Aves., for Diamond Calb Horseshoe Co., Grand Ave. About $50,000.

Kan., Wichita — Johnson Larimer Dry Goods Co., 619 East Douglas Ave., receiving bids building 5 story, 75 x 140 ft., brick, concrete and steel factory and warehouse, rein.-con. flooring, concrete foundation. About $150,000. L. Schmidt & Co., 121 North Market St., archts. Noted March 18.

N. D., Grand Forks—Until April 5, by Industrial Comn. of North Dakota, Bismarck, constructing 2,000 to 3,000 bbl. capacity flour mill, 1,500,000 bu. capacity elevator, 8 story, 42 x 160 ft. office building and thirty-two 30 x 90 ft. concrete grain bins. About $1,500,000. Former bids rejected. C. L. Pillsbury Co., 805 Metropolitan Life Bldg, Minneapolis, engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., East Springfield—Storms Drop Forging Co., 168 Bridge St., let contract building 1 story, 70 x 160 ft., brick and concrete forge shop, concrete flooring and foundation, on Cottage St., to E. F. Carlson Co., 244 Main St. About $36,000.

★Mass., Everett (Boston P. O.)—Sexton Can Co., 228 Franklin St., Boston, let contract building 3 story, 80 x 121 ft., brick and mill construction addition to factory, concrete foundation on Cross and Alfred Sts., to F. C. Alexander, 745 Old South Bldg., Boston. About $120,000. Noted March 25.

★Mass., Middleboro—C. T. Main, engr., 201 Devonshire St., Boston, let contract to Casper Ranger Constr. Co., 20 Bond St., Holyoke, building 1 story, 70 x 140 ft., brick and steel mill, 1 story, 36 x 50 ft. weave shed and 1 story, 25 x 50 ft. brick office, concrete flooring and foundation, for Nemasket Worsted Mills Co. About $50,000. Noted March 4.

★Mass., South Braintree (Boston P. O.) —G. F. Shepard, archt., 78 Devonshire St., Boston, let contract to Mitchell & Sutherland, Inc., 166 Denvonshire St., Boston, building 1 story, 70 x 110 ft. brick and steel factory, concrete flooring and foundation, here, for Rice & Hutchins, Inc., 10 High St., Boston. About $35,000. Noted March 11.

★Mass., Taunton—Nobska Mills, Chandler Ave., let contract building 1 story, 60 x 125 ft., brick and mill construction addition to manufacturing plant, concrete flooring and foundation, to D. J. Sullivan, 83 Bway. About $30,000.

★Mass., Waverly (Boston P. O.)—Housing Co., 248 Boylston St., Boston, will build 1 story, 90 x 160 ft., concrete manufacturing plant, concrete flooring and foundation, on Sycamore St. About $45,000. Work will be done by day labor.

★R. I., Pawtucket—J. and P. Coats, Inc., 366 Pine St., let contract building 1 story, 40 x 76 ft., brick and rein.-con. extension to dyehouse, rein.-con. flooring, concrete foundation, to J. W. Bishop Co., 109 Foster St., Worcester, Mass. About $50,000.

★R. I., Providence—Narragansett Electric Lighting Co., Turks Head Bldg., will build 5 story, 75 x 95 ft., brick, concrete and steel extension to power house, rein.-con. flooring, concrete foundation, on South St. About $700,000. Work will be done by labor. Noted March 11.

★Conn., Hartford—S. K. F. Ball Bearing Co., 330 New Park Ave., let contract building 1 story, 50 x 153 ft., brick and concrete storehouse, concrete flooring and foundation, to J. H. Crozier Co., 721 Main St. About $25,000.

★Conn., Meriden — International Silver Co., 48 State St., let contract building two 1 story, brick, concrete and steel additions to factory, on George St., to Immick Co., State St. About $40,000.

★Conn., New Britain—A. G. Hawker, 8 Elm St., let contract building 1 story, 55 x 100 ft., brick and concrete garage and service station, rein.-con. flooring, concrete foundation, to W. H. Allen Co., Inc., 6 Hungerford Court. About $30,000. Noted Feb. 26.

★Conn., New Haven—New Haven Silk Mills, c/o R. G. Corey, archt. and engr., 50 Church St., New York City, let contract building 4 story, brick and steel factory, weave shed and power house, rein.-con. flooring, concrete foundation, to Sperry Eng. Co., 82 Church St.

★Conn., New Haven—L. C. Realty Co., 166 Brewery St., let contract building 1 story, 50 x 175 ft. garage and showroom, with 19 x 40 ft. ell, brick and concrete, concrete flooring and foundation, on Whalley Ave., to Larkin-Carey Co., 166 Brewery St. About $30,000.

★Conn., New Haven—Smedley Bros., 266 State St., let contract building 3 story, 40 x 90 ft., brick and mill construction factory, concrete foundation, on Brewery St., to Larkin-Carey Co., 166 Brewery St. About $25,000.

★Conn., Putnam—Manhasset Mfg. Co., 83 Canal St., let contract building 3 story, brick and concrete addition to factory, concrete flooring and foundation, to Torrington Bldg. Co., 197 Water St., Torrington. Cost to exceed $50,000.

★Conn., South Manchester — Stephens-Williams Co., 361 Center St., will build 1 story, 80 x 195 ft., brick and steel garage and showroom, concrete flooring and foundation, on East Center St. About $60,000. Work will be done by day labor. Noted Feb. 26.

★Conn., Springdale—British-Amer. Mfg. Co. let contract building 2 story, 50 x 101 ft., brick and concrete addition to factory, rein.-con. flooring, concrete foundation, to H. A. Parsons, 49 Bank St., Stamford. About $30,000.

★N. Y., Binghamton — Brewer - Tichener Corp., Court St., let contract building 1 and 2 story, 144 x 200 ft., brick, concrete and steel factory, to J. L. Lewis, 38 Wall St. About $100,000.

★N. Y., Brooklyn—Amer. Numbering Machine Co., 226 Shepherd Ave., let contract building 2 story, 50 x 100 ft., brick and steel factory and garage, rein.-con. flooring, concrete foundation, on Atlantic Ave., to O. B. La Freniere, 215 Montague St. About $40,000. Noted March 18.

★N. Y., Brooklyn—Mordy Constr. Co., 690 Bway, will build 1 story, 100 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 39th St. About $30,000. Work will be done by day labor.

★N. Y., Brooklyn—T. Rockford, c/o A. J. Halprin, 41 Park Row, New York City, will build 1 story, brick, steel and stone garage and showroom, rein.-con. flooring, concrete foundation, on Crown St. and Bedford Ave., here. About $60,000. Work will be done by day labor.

★N. Y., Brooklyn—A. Rockmore, 50 Court St., will build 1 story, 50 x 180 ft., brick and steel addition to garage, rein.-con. flooring, concrete foundation, on Bergen St. About $25,000. Work will be done by day labor.

★N. Y., Brooklyn—Rothfeld & Bernstein, c/o Brook & Sackheim, archts., 215 Montague St., will build 1 story, 100 x 100 ft., brick and steel garage, rein.-con. flooring, brick foundation, on Hope and Rodney Sts. About $40,000. Work will be done by day labor.

★N. Y., Brooklyn—J Rubin & Son, Inc., 112 Greene St., New York City, will build 1 story, 135 x 245 ft., brick, concrete and steel warehouse, rein.-con flooring, concrete foundation, on Metropolitan Ave. About $80,000. Work will be done by day labor.

★N. Y., Brooklyn—A. Schwartz, c/o M Hirsch, archt., 215 Montague St., will build 1 story, 100 x 250 ft., brick and steel garage, rein.-con. flooring, concrete foundation. About $100,000. Work will be done by day labor.

Industrial Works (Continued)

★N. Y., Brooklyn—Tillary Constr. Co., 41 Court St., will build 6 story, 50 x 200 ft. brick and steel factory, rein.-con flooring concrete foundation, on Pearl and Tillary Sts. About $300,000. Work will be done by day labor.

★N. Y., New York—G. Backer Constr. Co., 33 East 33rd St., will build 6 story, brick, concrete and steel garage, rein.-con flooring, concrete foundation, on West 49th St. About $250,000. Work will be done by day labor.

★N. Y., New York—Battle Iron Truck Co., 44 Court St., Brooklyn, let contract building 5 story, 100 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 57th St. and 11th Ave., to L. Gold, 44 Court St., Brooklyn. About $250,000. Work will be done by day labor.

★N. Y., New York—Chelsea Fireproof Storage Warehouse, 426 West 26th St., will build 9 story, 50 x 100 ft., brick, concrete and steel warehouse, rein.-con. flooring, concrete foundation, at 108-110 West 107th St. About $125,000. Work will be done by day labor under the supervision of D. Wortman, archt. and engr., 116 Lexington Ave. Noted Jan. 29.

★N. Y., Watertown—New York Central R.R., Terminal Pl., let contract building 30 x 100 ft. frame sand house, concrete foundation, near round house, to Walsh Constr. Co., Smith St. About $25,000.

★N. J., Camden—Ruby Kid Co., 1051 North 2nd St., let contract building 2 story, 121 x 210 x 300 ft., slowburning construction storage, to A. R. Raff, 1635 Thompson St., Phila.

★N. J., Newark—Arrow Motor & Machine Co., 307 Market St., let contract building 1 and 2 story, 20 x 70 ft. and 70 x 100 ft. brick and cement plant, at 727 Frelinghuysen St., to H. Robertson, 230 Highland St. About $60,000.

★N. J., Newark—Baker & Co., 54 Austin St., let contract building 1 and 2 story, 33 x 38 ft., 14 x 18 ft. and 38 x 50 ft., concrete and brick garage and carpenter shop, on Austin St., to F. Kilgus, Inc., 13 South 6th St. About $43,000.

★N. J., Trenton—Cook Linoleum Co., East State St., let contract building 1 story, 79 x 165 ft., brick and steel addition to plant, to J. H. Morris, Broad St. Bank Bldg. About $50,000.

★N. J., Trenton—Lenox, Inc., Mead St., let contract constructing pottery plant, to include 3 story, 41 x 75 ft., 2 story, 20 x 400 ft., and 1 story, 100 x 394 ft. buildings, concrete, brick and hollow tile, to Karno-Smith Co., Broad St. Bank Bldg. About $200,000.

★Pa., Altoona — Altoona Overland Co., 900 Green Ave., let contract building 3 story, 50 x 150 ft., rein.-con., brick and steel garage and service station, rock foundation, on Green Ave. and 9th St., to C. M. Singise, 907 28th St. About $80,000.

★Pa., Altoona—Hoffman Ice Cream Co., 1211 9th St., let contract building 3 story, 48 x 75 ft. and 2 story, 53 x 78 ft., rein.-con. and brick plant, rein.-con. flooring, at 901 Green St. and 900 11th Ave., to F. D. Beyer & Co., Line Ave. and 15th St., Tyrone, $77,100.

★Pa., Cementon—W. L. Rich, Jr., let contract building 1 and 2 story, 100 x 340 ft., steel and frame factory, to Austin Co., Bulletin Bldg., Phila.

★Pa., Lancaster — Merchant & Evans, 2035 Washington St., Phila., let contract building 1 story, 100 x 300 ft., brick and steel factory, here, to Austin Co., Bulletin Bldg., Phila.

★Pa., Phila.—Franklin Worsted Co., York and Mascher Sts., will build 2 story, 60 x 150 ft., brick mill, on Venango and G Sts. Work will be done by day labor.

★Pa., Phila.—International Tire Co., Broad and Cumberland Sts., let contract building 2 story, 70 x 80 ft., concrete and brick factory, on 29th and Dauphin Sts., to P. Haibach Contg. Co., 1261 North 26th St.

★Pa., Phila.—Simmons Co., 24th and Vine Sts., let contract building 2 story, 120 x 250 ft., concrete storage plant, on Huntington Park Ave. and 25th St., to Wark Co., 1737 Filbert St. About $100,000.

★Pa., Phila.—F. J. Stokes, 17th and Cambria Sts., let contract building 1 story, 90 x 160 ft., concrete and steel machine shop, on Tabor Ave. and Perry St., to J. N. Gill, Otis Bldg. About $50,000.

★Pa., Phila.—Sun Co., Finance Bldg., let contract building 2 story, 30 x 80 ft., concrete and brick storage plant, on Lombard and 27th Sts., to J. Homan, 34 South 17th St. About $55,000.

★Pa., Williamsport—Williamsport Wire Rope Co. let contract building 1 story, 100 x 340 ft., concrete and steel factory, to Austin Co., Bulletin Bldg., Phila.

★Del., Newark—Continental Fibre Co. let contract building 2 story, 75 x 140 ft., rein.-con. factory, to Austin Co., Bulletin Bldg., Phila.

★Md., Locust Point (Baltimore P. O.)—Amer. Sugar Refining Co., 117 Wall St., New York City, let contract building plant covering 15 acres, on the waterfront, here, including several 5 to 8 story, rein.-con., steel and brick buildings, rein.-con. flooring, concrete foundations, to Stone & Webster, 120 Bway., New York City. About $8,000,000. Noted Jan. 1.

★Md., Towson—Baltimore City Printing & Binding Co., 352 Equitable Bldg., Baltimore, will build 2 story, 70 x 120 ft., concrete and brick printing and binding plant, rein.-con. flooring, concrete foundation, here. About $35,000. Work will be done by day labor.

★N. C., Raleigh—J. R. Rogers let contract building 3 story, 50 x 100 ft., rein.-con. and brick garage, to Liberty Eng. & Constr. Co., Inc., 604 Murchison Bank Bldg., Wilmington, Del. About $100,000.

★La., New Orleans—McCardell Cotton Co., 822 Union St., let contract building 1 story, 90 x 300 ft., rein.-con. and timber reginning plant, to R. W. Markel, Marine Bank Bldg. About $30,000.

★O., Cincinnati—E. H. Bardes Range Co., 2619 Colerain Ave., let contract building 2 story, 85 x 102 ft., rein.-con. shop, to J. and F. Harig, 1240 Queen City Ave.

★O., Cleveland—Grieble & Eberling, archts. and engrs., 600 Racine Bldg., let contract to Richley Constr. Co., 300 Racine Bldg., constructing 2 story, 120 x 134 ft., steel and brick garage, work shop and office, rein.-con. flooring, brick foundation, on East 21st and Chester Ave., for Bessinger Magneto Co., 2352 Euclid Ave. About $60,000. Noted Jan. 8.

★O., Cleveland—Collinwood Fdry. Co., 17004 Waterloo Rd., let contract rebuilding 1 story, 60 x 200 ft., steel and brick foundry, brick foundation, to A. A. Lane Constr. Co., Union Bldg. About $50,000.

★O., Cleveland—A. Kahn, archt., Marquette Bldg., Detroit, let contract to Thompson-Starrett Co., Lincoln Bldg., Detroit, constructing 7 story, 120 x 1,300 ft., rein.-con., steel and brick factory, rein.-con. flooring, concrete foundation, on Coit Rd., here, for Fisher Body Co., Piquette Ave., Detroit. About $6,000,000. Noted Feb. 26.

★O., Cleveland—Green Rohn Realty Co., Sloan Bldg., let contract building 2 story, 80 x 200 ft., rein.-con. brick and steel garage, rein.-con. flooring, concrete foundation, on East 19th and Prospect Ave., to R. E. Beck, 64 Public Sq. About $50,000.

★O., Springfield—Thompson Grinder Co., Main and Murray Sts., let contract building 1 story, 50 x 200 ft., rein.-con. and brick factory and shop, also 1 story, 30 x 60 ft., stuccoed office, rein.-con. flooring, concrete foundation, on Main and Zwischler Sts., to Concrete Steel Constr. Co., 415-16 Mitchell Bldg. About $75,000. Noted Aug. 7.

★Mich., Detroit—J. L. Hudson Co., Woodward Ave., let contract building 3 story, 58 x 200 ft., rein.-con. and brick warehouse, rein.-con. flooring, concrete foundation, on Beaubien and Beacon Sts., to Bryant & Detwiler Co., 2335 Dime Bank Bldg.

★Mich., Detroit—F. J. Whitney, 1443 Grand River Ave., let steel contract building 1 story, 200 x 250 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Franklin St., to Lewis-Hall Iron Wks., Ferry Ave.

★Mich., Kalamazoo—Handley-Knight Co., c/o J. I. Handley, let contract building 3 story, 80 x 800 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, along tracks of Lake Shore & Grand Trunk Rys., to H. L. Van der Horst, Kalamazoo.

★Ill., Chicago—H. C. Miller, archt., 112 West Adams St., let general contract to C. E. Anderson, 19 South La Salle St., building 3 story, 120 x 140 ft., brick and timber factory, concrete foundation, at 1701 West Superior St., for Kroeck Paper Box Co., 220 Institute Pl. About $200,000. Noted Feb. 12.

★Wis., Cudahy — Federal Rubber Co., Packard Ave., will build 6 story, 160 x 220 ft., concrete, brick and steel factory, rein.-con. flooring, concrete foundation, Work will be done by day labor. Noted Feb. 12.

★Wis., Milwaukee — Federal Cone & Candy Co., 100 George St., let contract building 3 story, 50 x 60 ft. candy factory, rein.-con. and brick, rein.-con. flooring, concrete foundation, on Holton St., to W. Tuckwell, 86 Michigan St.

★Wis., Milwaukee — Trapp Bros. Dairy Co., Burleigh St., let contract building 2 story, 70 x 110 ft., rein.-con. and brick dairy, rein.-con. flooring, concrete foundation, on Burleigh St., to R. Reisinger Co., 425 East Water St. About $75,000.

★Wis., St. Francis (Milwaukee P. O.)—Milwaukee Electric Ry. & Lighting Co., Pub. Serv. Bldg., Milwaukee, let general contract constructing power plant, to include five 1 story, brick and steel buildings, rein.-con. flooring, concrete foundation, to Dahlman Constr. Co., Majestic Bldg., Milwaukee, cost plus percentage basis; structural steel, to Northwestern Bridge & Iron Co., 32nd and Hopkin Sts., Milwaukee. Total cost $500,000. Noted Feb. 26.

★Ia., Cedar Rapids—Nash Motor Car Co., Kenosha, Wis., let contract constructing 4 story, 80 x 140 ft., brick, rein.-con. and steel garage and office building, rein.-con. flooring, concrete foundation, to T. Stark & Co., 1103 1st Ave. W. About $350,000; cost plus percentage basis.

★Ia., Iowa Falls—Swift & Co., 76 West Monroe St., Chicago, let contract building 4 story, 74 x 128 ft., brick, rein.-con. and steel produce house, rein.-con. flooring, concrete foundation, to T. Stark & Co., 1103 1st Ave. W., Cedar Rapids. About $175,000; cost plus percentage basis.

★Ia., Sioux City—Chesterman Co., 405 Pearl St., let contract building pop factory, concrete, to Coomer & Small, Sioux City. About $100,000.

★Wash., Seattle—Hardeman Hat Co., 7th St. N. and Republican St., let contract building 4 story, 32 x 120 ft., brick factory, concrete foundation, at 1231 Westlake Ave., N., to Mortensen & Kelton, Seattle. About $55,000.

★Wash., Spokane—J. G. F. Hieber, 2011 1st Ave., let contract building 3 story, 73 x 110 ft., fruit juice plant, rein.-con. and brick, concrete foundation, to H. E. Smith, 1211 Old Natl. Bank Bldg. About $100,000.

★Cal., Chino—Chino Walnut Growers Assn. let contract building 1 story, concrete and frame packing house, to F. S. Bishop, Santa Ana. About $25,000.

★Cal., Los Angeles—Sun Drug Co., 927 South Los Angeles St., let contract building 4 story, 80 x 139 ft., rein.-con. warehouse, rein.-con. flooring, concrete foundation, at 1108 South Los Angeles St., to F. Meline Co., 6779 Hollywood Blvd., $132,500.

★Cal., Puente—LaPuente Walnut Growers Assn. let contract building 1 story, 175 x 200 ft., concrete and hollow tile packing house, concrete foundation, to F. S. Bishop, Santa Ana. About $125,000.

★Que., Montreal—Canadian Pacific Ry., Windsor St., let contract building 9 brick and steel railway shops, to Foundation Co., Ltd., 224 St. James St. About $500,000.

★B. C., New Westminster—Imperial Oil Co., Cambie and Smithe Sts., Vancouver, let contract installing distributing system, including storage house, garage, pump house and wharf, to Dominion Constr. Co., 509 Richards St., Vancouver. About $25,000.

Buildings

PROPOSED WORK

Mass., Boston — Market — Handschumacher & Co., 25 John St., plans to build brick and steel, on North St. Cost to exceed $50,000. Architect not selected.

Mass., Boston—Office—Desmond & Lord, archts., 15 Beacon St., soon let contract building 8 story, 90 x 120 ft., on Arlington St., for Massachusetts Bonding & Insurance Co., 77 State St. Noted Jan. 29.

Mass., Boston—Store and Office—A. J. Carpenter, Jr., archt., 39 Dunreath St., Roxbury, soon lets contract building 6 story, 30 x 75 ft., brick and steel, concete foundation, on Beach St. About $100,000. Owner's name withheld.

Mass., Brookline (Boston P. O.)—Bank—Brookline Savings Bank, Washington St., having plans prepared by F. J. Untersee, archt., 585 Boylston St., Boston, for 1 story, stone and concrete, rein.-con. flooring, concrete foundation, on Washington and Boylston Sts. About $50,000.

Mass., Dorchester (Boston P. O.)—Theatre and Business—Funk & Wilcox, archts. and engrs., 1148 Old South Bldg., Boston, soon receives bids building 1 and 2 story, 60 x 210 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation, on Bluehill Ave., for H. Norman, c/o architects. About $200,000. Noted March 4.

Buildings—(Continued)

Mass., Fall River—Parish—C. C. Coveney, archt., 184 Boylston St., Boston, soon lets contract altering and building 2 story, terra cotta and stucco addition, for St. Marks Episcopal Society, c/o architect. About $50,000. Noted Jan 29.

Mass., Fall River—Store and Business—M. J. Doran Co., Newport, R. I., plans to build 2 story, 51 x 160 ft., brick, steel and stone, on South Main and Spring Sts., here. About $80,000. Architect not selected.

Mass., Falmouth—Club Woods Hole Golf Club, Woods Hole, having plans prepared by G. F Shepard, archt., 78 Devonshire St., Boston, for clubhouse. About $50,000.

Mass., Ipswich—Memorial—Town Memorial Comn. plans to construct brick and steel memorial building. About $100,000. Architect not selected.

Mass., Needham (Boston P. O.)—Hospital—Coolidge & Shattuck, archts., 122 Ames Bldg., Boston, soon let contract building 1 story, 36 x 150 ft. hospital ward and 2 story service building and power house, brick, steel and concrete, rein.-con flooring, concrete foundation, on Chestnut St., for Glover Home and Hospital. About $75,000.

Mass., Springfield—Showroom—See "Industrial Works."

Mass., Wakefield — High School — Bd. Educ. soon receives bids building school. About $450,000. F. I. Cooper Corp., 33 Cornhill St., Boston, archts. Noted Jan. 29.

Mass., Wakefield—Office—Lee & Hewitt, archts. and engrs., 1123 Bway., New York City, soon let contract building 2 story, 60 x 80 ft., brick, limestone and steel, rein.-con. flooring, concrete foundation, here, for Heywood Bros. and Wakefield Co., Gardner. Noted Jan. 29.

Mass., Winthrop (Boston P. O.)—School—Town had plans prepared by W. Bacon, archt., 14 Kilby St., Boston, for 3 story, 100 x 150 ft., brick, concrete foundation, on Highland St. About $250,000.

Mass., Winthrop (Boston P. O.)—School—Bd. Educ. soon receives bids building 2 story, brick and steel addition, on Shirley St. About $80,000. A. S. Smith, Field Rd., chn. Brainerd & Leeds, 89 Franklin St., Boston, archts. Noted March 4.

R. I., Providence—Hospital—Rhode Island Hospital, 593 Eddy St., having plans prepared by Kendall, Taylor & Co., arcths., 93 Federal St., Boston, for 5 story 80 x 150 ft., building for private patients, brick and terra cotta. About $350,000.

R. I., Providence — School — Pub. Bldg. Dept. plans to build 3 story, 30 room, brick and concrete, on Arthur Ave. About $350,000. Private plans.

Conn., Bridgeport — Theatre — L. Capozzeillo, 391 Lexington Ave., having plans prepared by F. A Cooper, archt., 1024 Main St., for 1½ story, 50 x 110 ft., brick and concrete, concrete flooring and foundation, on Grand St. About $50,000.

Conn., Bridgeport — Theatre — P. Dowe, 275 Fairfield Ave., plans to build brick and concrete, on State St. About $200,000. Architect not selected.

Conn., Bridgeport — Theatre, Business, etc.—G. E. Bromley, c/o Berkshire Steel Products Co., plans to construct 1½ story, 100 x 100 ft., theatre and 3 story, 40 x 120 ft., business building to include stores, pool and bowling alleys, brick and steel, concrete foundation, on East Main and Putnam Sts. About $100,000. Private plans.

Conn., Bristol—Hotel—A. J. Mussy, 170 Main St., having plans prepared by A. R. Ellis, archt., 36 Pearl St., Hartford, for 5 story, brick, concrete and steel, on Prospect St. About $200,000.

Conn., Hartford—Business—Pallotti, Andretta Co., 96 Windsor St., having plans prepared by D. A. Guerriero, archt., 841 Main St., for brick business building, on Main St.

Conn., Naugatuck — Jallade & Lindsey, archts. and engrs., 37 Liberty St., New York City, revising plans and receive bids about April 26, constructing 3 story brick, steel and stone building, brick foundation, on Church St., here, for Y. M. C. A., 2 West 45th St., New York City. About $220,000.

Conn., New Britain—Business—Brown & Von Beren, archts., 185 Church St., New Haven, soon receive bids building 3 story, 50 x 140 ft., brick and rein.-con., rein.-con flooring, concrete foundation, on Main St., for Besse-Leland Co., 215 Main St. About $60,000. Noted Jan. 8

Conn., New Britain—Theatre and Business—S. Shurburg, 55 Franklin St., having plans prepared by F. C. Walz, archt., 348 Trumbull St., Hartford, for 4 or 5 story, 100 x 100 ft., brick and concrete, concrete flooring and foundation, on Main St. About $200,000. Noted Jan. 8.

Conn., New Haven — Dormitory — Yale University plans to build brick and steel, on campus. About $450,000.

Conn., New Haven—School—Hopkins Grammar School, 1209 Chapel St., having plans prepared by Norton & Townsend, archts., 839 Chapel St., for brick and steel. About $100,000. H. W. Farnum, chn. bldg. com.

Conn., New Haven—Store—Brown & Von Beren, archts., 185 Church St., soon lets contract converting old Y. M. C. A. building on Colony St. into store building, for Besse-Boynton & Co., 19 Colony St. About $50,000.

Conn., Norwich—Business—J. M. Thayer, 32 Church St., soon lets contract building 4 story, 61 x 70 ft., rein.-con. addition, concrete foundation, on Bath and Franklin Sts. About $50,000. Private plans. Noted March 11.

Conn., South Manchester—Bank—Hutchins & French, archts., 6 Beacon St., Boston, soon let contract building 1 story, 60 x 100 ft., brick, limestone and steel, concrete flooring and foundation, for Manchester Trust Co., 1007 Main St. About $60,000.

Conn., Stratford (Bridgeport P. O.)—High School—School Comn. having plans prepared by F. I. Cooper Corp., archts., 33 Cornhill St., Boston, for 3 story, 50 x 200 ft., brick, concrete and steel, rein.-con. flooring, concrete and brick foundation, on North Parade St. About $200,000.

Conn., Thompsonville—Society—Knights of Columbus, Pearl St., plans to construct brick and steel society building. About $50,000. Address T. Savage. Architect not selected.

Conn., Waterbury — Hospital — L. A. Walsh, archt., 51 Leavenworth St., revising plans and soon receives bids building 5 story, 60 x 132 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation, on Franklin St., for St. Mary's Hospital. About $500,000.

Conn., Windsor—High School—Bd. Educ. plans to build 3 story, brick and steel. About $200,000 Architect not selected.

N. Y., Amsterdam—School—Bd. Educ. having plans prepared by A. Daley, archt., Amsterdam, for 3 story, 100 x 150 ft., brick and concrete, concrete foundation. About $300,000.

N. Y., Batavia—Theatre—H. D. Crosby and others had plans prepared by L. H. Lempert, archt., Cutler Bldg., Rochester, converting Odd Fellows Temple on Elliot St. into a theatre. About $60,000.

N. Y., Brooklyn—Asylum—E. W. Adelsohn, archt. and engr., 1778 Pitkin Ave., receives bids about May 1, constructing groups of 1 and 2 story buildings, brick, steel and stone, brick foundation, on Dumont Ave., New Lots Rd., Elton and Linwood Aves., for Judea Orphan Aslym Assn., 505 Lafayette Ave. About $280,000. Noted March 4.

N. Y., Brooklyn—Store—Starrett & Van Vleck, archts. and engrs., 8 West 40th St., New York City, soon let contract altering and building 1 story, addition, on Fulton St., for Abraham & Strauss, 422 Fulton St. About $200,000. Noted March 18.

N. Y., Brooklyn—Theatre—M. J. Harrison, archt. and engr., 63 Park Row, New York City, receives bids about April 5, building 2 story, 65 x 75 ft., brick, steel and stone, brick foundation, at 158 Myrtle Ave., for H. Barr, 348 West 47th St., New York City. About $50,000.

N. Y., Brooklyn — Theatre — H. H. W. Constr. Co., 971 Manhattan Ave., having plans prepared by DeRosa & Pereira, archts. and engrs., 110 West 40th St., New York City, for 2 story, 141 x 200 ft., brick, steel and stone, brick foundation, on Lorimer St. About $150,000. I. Birnbaum, pres.

N. Y., Flushing—Theatre and Store—Wilmer & Vincent, 1451 Bway, New York City, having plans prepared by E. C. Horn & Son, archts. and engrs., 1476 Bway., New York City, 1 story, brick, steel and stone, brick foundation, here. About $300,000.

N. Y., Lackawanna—Library—City election April 15, to vote on $100,000 bonds to build memorial library.

N. Y., Middletown—School—Bd. Educ. having plans prepared by D. H. Canfield, archt., Middletown, for 3 story, brick and steel, on Linden Ave. About $356,000.

N. Y., New York—Loft—L. S. Beardsley, archt. and engr., 40 West 32nd St., preparing sketches for altering brick and steel. About $50,000. Owner's name withheld.

N. Y., New York—Nurses Home—Dept. Pub. Charities, Municipal Bldg., rejected bids furnishing labor and material altering and building addition to nurses home at Metropolitan Hospital, Blackwells Island. About $125,000. Noted March 11.

N. Y., New York—Offices—Standard Oil Co. of New York, 26 Bway., having plans prepared by Carrere & Hastings, archts., 52 Vanderbilt Ave., for 5 story extension at 26 Bway. and 12 story, at 18 Bway., brick, steel and stone.

N. Y., New York—Sales and Showroom—J. H. Scheier, archt. and engr., 25 West 42nd St., preparing sketches altering brick, steel and stone, on 55th St. and Bway. About $100,000. Owner's name withheld.

N. Y., New York—School—C. B. J. Snyder, archt. and engr., Municipal Bldg., rejected only bid building P. S. 61, corner Crotona Park E. and Charlotta St., Bronx Boro., for Bd. Educ., 500 Park Ave. About $900,000. Noted March 18.

N. Y., New York—Store and Showroom—Avedon & Co., c/o H. A. Jacobs, archt. and engr., 320 5th Ave., having plans prepared for 6 story, 35 x 100 ft., brick and steel, brick foundation, at 448 5th Ave. About $150,000.

N. Y., New York—Theatre—M. Spiegel, 1579 Bway., having sketches made by De Rosa & Pereira, archts. and engrs., 110 West 40th St., for brick, steel and stone, at 246-256 West 44th St. About $300,000.

N. Y., New York—Theatre—Sonn Bros., 49 Church St., having plans prepared by De Rosa & Pereira, archts. and engrs., 110 West 40th St., for brick, steel and stone, brick foundation, on Belmont and Tremont Aves. About $300,000.

N. Y., Norfolk—High School—Williams & Johnson, archts., Ogdensburg, soon receive bids building high school, for Bd. Educ. Bonds for $100,000 voted for project.

N. Y., Ogdensburg—Hotel—Gore Bros. plan to purchase Whites Hotel and build 40 room brick addition. About $50,000. Address R. W. Gore, Ogdensburg.

N. Y., Oswego — Hotel — Oswego Hotel corp. plans to build 2 story addition to Pontiac Hotel. About $100,000.

N. Y., Sshenectady—Theatre—A. B. Van Voast, 152 Barrett St., plans to build 1 story, 56 x 118 ft., brick, concrete tile and steel, concrete foundation. About $80,000. Contract for steel has been awarded to Binghamton Bridge Co., Press Bldg., Binghamton, $16,000.

N. Y., Tonawanda—School—Bley & Lyman, archts., 250 Delaware Ave., soon let contract building 2 story, 8 room, brick, rein.-con. flooring, for Bd. Educ. About $70,000.

N. Y., Williamstown—School and Library—Town Bd. plans to construct brick, concrete, steel and stone memorial school and library. Cost between $75,000 and $80,000.

N. J., Camden—Nurses Home—Cooper Hospital, Stevens and 6th Sts., having plans prepared by Morris & Erskine, archts., Crozer Bldg., Phila., for 1 and 3 story, 25 x 45 ft. and 40 x 50 ft., concrete and brick. Cost to exceed $50,000.

N. J., Clinton—Theatre—B. F. Keith Interests, 1564 Bway., New York City, having plans prepared by E. C. Horn & Sons, archts. and engrs., 1476 Bway., New York city, for brick, steel and stone, brick foundation, on West State St. About $80,000.

N. J., Kearney (Arlington P. O.)—High School—Bd. Educ. plans to build new high school with 950 stating capacity About $687,000.

N. J., Newark—Clubhouse—Newark Athletic Club, 207 Market St., having plans prepared by J. Green, archt., 27 Clinton Ave., for concrete and brick, at 16-18 Park Pl. Cost to exceed $500,000.

N. J., Newark—Temple—Salaam Temple, 165 Market St., plans to build new concrete and brick. Cost to exceed $50,000.

N. J., Newark—Theatre—J. Stern, 207 Market St., having plans prepared by H. Baechlin, archt., 665 Broad St., for 1 story, 105 x 165 ft., brick and steel, on Perry, Polk and Merchant Sts. About $300,000.

N. J. Trenton—Convent—Sisters of St. Marys, 151 North Warren St., plan to build convent on North Warren St. About $60,000. Architect not selected.

N. J., Trenton — School — St. Mary's Church, Adeline St., plans to build 3 story, 60 x 88 ft., concrete and brick. About $100,000. R. A. Schuman, 932 Lamberton St., archt.

Pa., Altoona—Business Block and Lodge—S. F. Daugherty, 701 Green Ave., J.

Buildings—(Continued)

Mills, 3306 6th Ave., C. Y. Stern, 2404 5th Ave., members of building committee, will receive bids in summer for 5 story, 60 x 80 ft., brick and concrete, on 13th Ave. and 11th St., for Red Men Lodges, 1321 11th St. About $100,000.

Pa., Ashland—High School—W. C. Lentz, secy. School Dist. receives bids about April 15, building 3 story, 110 x 120 ft., rein.-con. and brick, rein.-con flooring, rock foundation. About $150,000. F. A. Hersh and F. J. Shollar, Commerce Bldg., Altoona, archts.

Pa., Phila. — Convent — St. Boniface's Roman Catholic Church, c/o P. F. Getz, archt., 1634 North 6th St., having plans prepared for 2 story, 55 x 90 ft., concrete and brick, on Masher and Norris Sts. Cost to exceed $50,000.

Pa., Phila.—School—Bd. Educ., Keystone Bldg., preparing plans for 3 story concrete and brick, on 6th and Fairmont Sts. About $400,000.

Pa., Phila—School—Bd. Educ., Keystone Bldg., will tear down old school and build new 3 story concrete and brick, on 7th and Norris Sts. About $400,000.

Md., Baltimore—Sales—See "Industrial Works."

Md., Baltimore—Store and Laboratory—Wiley & Co., Inc., 7 South Gay St., having plans prepared by W. G. Beecher, archt., Frederick Rd., Catonsville, for 3 story, 50 x 122 ft., concrete, brick and stone, concrete foundation, at 900-904 North Calvert St. About $150,000.

Md., Cumberland—Store—L. Bernstein Furniture Co., 9 North Centre St., having plans prepared by G. F. Sansbury, archt., Citizens Natl. Bank Bldg., for rein.-con. and brick, concrete foundation, on Center St. About $100,000.

Va., Richmond—Office, etc.—Miller & Rhoads, c/o Starrett & Van Vleck, archts. and engrs., 8 West 40th St., New York City, having plans prepared for 5 and 6 story, 260 x 300 ft., brick, steel and stone, concrete foundation, to include hospital, roof garden, cafe, etc. About $750,000.

W. Va., Bluefield—City Hall, Library and Market—City Council plans election to vote on $200,000 bonds to build city hall, $40,000 for library and $25,000 for city market.

W. Va., Huntington—Stores and Office—W. O. Walton having plans prepared by Mianor & Handloser, archts., R & P Bldg., for 3 story, brick and steel, on 9th St. near 4th Ave. About $50,000.

S. C., Greenville—Bank and Office—Mowbray & Uffinger, archts. and engrs., 56 Liberty St., New York City, receive bids about April 15, building 16 story, brick, steel and stone, concrete foundation, here, for Farmers & Merchants Bank. About $1,000,000. Noted Jan 22.

Ky., Louisville—Bank—Liberty Insurance Bank, 207 West Market St., having plans prepared by Joseph & Joseph, archts. and engrs., Atherton Bldg., for 3 story, 90 x 100 ft., brick and stone addition, at 2nd and Market Sts. About $200,000.

Ky., Louisville—Hotel—Market St. Merchants Assn. plans to build hotel at 4 Market St. About $3,000,000.

O., Cleveland—Bank—Natl. City Bank, Leader-News Bldg., soon lets contract remodeling 1 story, 46 x 121 ft., on East 6th St. and Euclid Ave. About $75,000. Graham, Anderson, Probst & White, Ry. Exch. Bldg., Chicago, archts.

O., Cleveland — Sales See "Industrial Works."

O., Cleveland—School—Bd. Educ. having plans prepared by W. R. McCormack, archt., East 6th St. and Rockwell Ave., for 3 story, 12 room, concrete, steel and brick addition, rein.-con. flooring, concrete foundation, on East 55th St. and Scovill Ave. About $200,000.

O., Cleveland—Theatre and Commercial—East 128th and St. Clair Ave. Co., c/o Grieble & Eberling, archts., 600 Racine Bldg., having plans prepared for 1 and 3 story, concrete, steel and brick, concrete foundation, on East 128th St and St. Clair Ave. About $200,000.

Mich., Highland Park (Detroit P. O.)—Hotel—P. Christie, c/o S. E. Remey, archt., Whitney Bldg., Detroit, having plans prepared for 4 story, brick and steel, brick foundation, on Labelle Ave. About $100,000.

Mich., South Grand Rapids — Bank — South Grand Rapids State Bank having plans prepared by Williamson, Crow & Proctor, archts., 611 Gilbert St., Grand Rapids, for 2 story, 40 x 100 ft., rein.-con., brick and terra cotta, concrete foundation, here. About $50,000.

Ill., Chicago—Bank and Office—Federal Reserve Bank having plans prepared by Graham, Anderson, Probst & White, archts., Railway Exch. Bldg., for 14 story, 160 x 165 ft., steel and concrete, on Jackson Blvd. and LaSalle St. About $3,000,000.

Ill., Chicago—Church—Catholic congregation, c/o J. W. McCarthy, archt., 139 North Clark St., having plans prepared building 2 story, 25 x 150 ft., brick and stone, brick foundation, at 7320 Yale Ave. About $100,000.

Ill., Chicago—Church—North Shore Baptist Church, c/o S. M. Seator, archt., 35 North Dearborn St., having plans prepared for 2 story, 110 x 125 ft., brick and stone, concrete foundation, on Lakewood and Berwyn Aves. About $300,000.

Ill., Chicago—Store—Sears, Roebuck Co., Arthington St. and Homan Ave., having plans prepared by G. C. Nimmons & Co., archts., 120 South Michigan Ave., for 9 story, 160 x 300 ft., flat slab rein.-con., rein.-con. flooring, concrete foundation. About $2,000,000.

Wis., Delafield—Chapel—St. John's Military Academy having plans prepared by Magner & Tusler, archts., 450 Builders Exch. Bldg., Minneapolis, for 1 story, 50 x 100 ft., stone. About $200,000.

Wis., Milwaukee — Bank, etc. — Rosman & Wierdsma, archts., 424 Jefferson St., receive bids about April 6, building 7 story, 60 x 100 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Lisbon Ave., for Park Bank Bldg. Co., 3323 Lisbon Ave. About $200,00.

Wis., Milwaukee — Sales — Achen Motor Co., 155 Oneida St., having plans prepared by Van Ryn & De Gelleke, archts., Caswell Blk., for 2 story, 120 x 150 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Jackson St. About $100,000.

Wis., Roberts—High School—Bd. Educ. having plans prepared by A. H. Wheeler, archt., Globe Bldg., St. Paul, for 2 story, 62 x 69 ft., rein.-con. and brick addition. About $55,000.

Ia., Ames—School—Bd. Educ. plans to build school. About $60,000. Architect and engineer not selected.

Ia., Ames—Theatre—Rialto Theatre, 721 Locust St., having plans prepared by Vorse, Kraetsch & Kraetsch, archts., 901 S. & L. Bldg., Des Moines, for 2 story, 48 x 120 ft., brick, rein.-con. and steel, rein.-con flooring, concrete foundation, here. About $60,000. A. H. Blank, pres.

Ia., Barnum—School—Bd. Educ. having plans prepared by Damon & O'Meara, archts., Ft. Dodge, for 2 story, 60 x 115 ft., brick, concrete and steel, concrete foundation. About $65,000. Noted Feb. 26.

Ia., Cromwell—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 2 story, 54 x 70 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $85,000. C. H. Molby, secy.

Ia., Greene — High School — Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 2 story, 66 x 127 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $150,000. F. L. Stober, secy.

Ia., Killduff — School — Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Monies, for 2 story, stone and brick, rein.-con. flooring, concrete foundation. About $75,000. H. D. Sharp, pres. school bd.

Ia., Mason City—Orphans' Home—State I. O. O. F. plans to build 3 story, 56 x 140 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. J. H. Felt & Co., Grand Ave Temple Bldg., Kansas City, Mo., archts.

Ia., Moorland—School—Bd. Educ. plans to build 2 story, 57 x 104 ft., brick, concrete and steel, concrete foundation. About $65,000. Damon & O'Meara, Ft. Dodge, archts.

Ia., Pocahontas—Court House—Pocahontas Co. plans to build court house. About $400,000. Architect and engineer will be selected at once.

Ia., West Liberty—Hotel—Hotel Co., c/o G. H. Fairall, plans to build brick, concrete and steel, concrete foundation. About $60,000. Architect not selected.

Ia., Whitten—School—Bd. Educ. having plans prepared by H. E. Reimer, archt., Marshalltown, for 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000.

Minn., Browns Valley—School—Catholic Congregation having plans prepared by W. L. Albans, archt., 347 Endicott Bldg., St. Paul, for 2 story, 60 x 100 ft., brick, here. About $55,000.

Minn., Minneapolis—Hotel—H. Tremain, 931 Andrus Bldg., and others plan to build 12 story, rein.-con., on 7th and Marquette Aves. About $5,000,000.

Minn., Minneapolis — Synagogue — Romanian Hebrew congregation, 1107 5th St., S., having plans prepared by S. J. Bowler, archt., 423 Andrews Exch. Bldg, for 46 x 100 ft., brick and stone, at 929 15th Ave., S. About $50,000.

Kan., Hutchinson — Bank — State Exch. Bank plans to build brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $400,000. Mann & Gerow, Hutchinson, archts.

Kan., Lindsborg — Church — Swedish Angelico Mission Church having plans prepared by Brostrom & Brotts, archts., Reliance Bldg., Kansas City, Mo., for 1 story, 58 x 90 ft., brick, concrete and steel, concrete foundation. About $60,000.

Kan., Valley Falls — School — Bd. Educ. soon lets contract building 2 story, 50 x 115 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $62,000. W. E. Glover, 609 Kansas Ave., Topeka, archt. Noted Jan. 8.

S. D., De Smet—School—Bd. Educ. having plans prepared by Slifer & Abrahamson, archts., 595 Endicott Bldg., St. Paul, for 2 story, 80 x 120 ft., rein.-con. and brick. About $160,000.

S. D., Huron—Church—Lutheran congregation having plans prepared by Slifer & Abrahamson, archts., 595 Endicott Bldg., St. Paul, for 1 story, 38 x 110 ft., brick and stone. About $52,000.

S. D., Ipswich—School—J. Owens, clk. Bd. Educ. rejected bids received March 15, building 2 story, 75 x 120 ft., brick. About $100,000. Edwins & Edwins, 911 Northwestern Bank Bldg., Minneapolis, archts. Noted Feb. 26.

N. D., Fairmont—Church—Catholic congregation having plans prepared by Slifer & Abrahamson, archts., 595 Endicott Bldg., St. Paul, for 1 story, 45 x 120 ft., rein.-con. and tile. About $100,000.

N. D., Gregory—Bank and Temple—Commercial State Bank soon receives bids building 2 story, 50 x 105 ft., rein.-con., brick, steel and stucco, tile flooring. About $75,000. P. P. Lewis, 5846 Florence Blvd, Omaha, archt.

N. D., Oakes—School—Bd. Educ. having plans prepared by Bell & Kinports, archts., 909 Andrus Bldg., Minneapolis, for 3 story, brick. About $250,000. J. C. Gould, clk.

Mont., Billings — Hotel — McIver & Cohagen, archts., 407 Electric Bldg., receive bids in April, building Carruthers Hotel, 6 story, 140 x 150 ft., on 29th St. and 2nd Ave., for A. H. Barth, 43 Yellowstone Ave. About $700,000. Noted Jan. 1.

Mont., Forsyth—Church—Forsyth Presbyterian Church plans to build church. About $50,000 McIver & Cohagen, 407 Electric Bldg., Billings, archts.

Mo., Marshall — Custodian — Missouri Colony of Feeble Minded having plans prepared by J. H. Felt & Co., archts., 802 Grand Ave., Kansas City, for rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $75,000.

Mo., St. Joseph—Office—See "Industrial Works."

Mo., St. Louis—Theatre and Office—Cornwell, Higgs & Gray, La Salle Bldg., having plans prepared by DeRosa & Pereira, archts. and engrs., 110 West 40th St., New York City, for brick, stone and steel, concrete foundation, on Locust Ave. About $500,000.

Mo., Webster Groves — Schools — Bd. Educ. plans to build 2 story addition to Bristol School, cost $160,000; 2 story addition to Avery School, $70,000; also addition to High School, $20,000. W. B. Ittner, Bd. Educ. Bldg., St Louis, archt.

Tex., Georgetown—Schools—Williamson Co. voted $234,000 bonds to build and equip schools

Tex., Mercedes—High School—Independent School Dist. had plans prepared by H. F. Kuehne, archt., 824 Littlefield Bldg., Austin, and soon receives bids building 1 story, 157 x 217 ft., rein.-con., brick and stone, rein.-con. flooring, brick foundation.

Okla., Enid—Auditorium—City plans to build brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $200,000. Layton, Smith & Forsythe, 701 Majestic Bldg., Oklahoma, archts.

Okla., Kelleyville — High School — City election April 20, to vote on $64,900 bonds to build new high school. Architect and engineer not selected.

Buildings—(Continued)

Okla., Miami—School—State Bd. Pub. Affairs, Oklahoma, having plans prepared by Hawk & Parr, archts., 501 Security Bldg., Oklahoma, for 2 story, 59 x 99 ft. school of mines and 23 x 57 ft. boiler room, brick, rein.-con. and steel, rein.-con. flooring brick foundation, here. About $100,000.

Okla., Muskogee—Hospital—City election April 6, to vote on $150,000 bonds to build hospital. Architect and engineer not decided.

Okla., Oklahoma—Mausoleum—Fairlawn Cemetery Assn., 2700 North Shartel St., having plans prepared by Bailey & Alden, archts. and engrs., Oklahoma, for 1 story, 70 x 122 ft., stone, marble and granite, in Fairlawn Cemetery. About $170,000.

Okla., Okmulgee—Library—City election April 20, to vote on $50,000 bonds to build library. Architect and engineer not selected.

Okla., Ponca City—Grade School—Bd. Educ. having plans prepared by Layton, Smith & Forsythe, archts., 701 Majestic Bldg., Oklahoma, for 2 story, 64 x 134 ft., brick, concrete and steel, concrete foundation. About $60,000.

Okla., Ponca City—High School—Bd. Educ. having plans prepared by Layton, Smith & Forsyth, archts., 701 Majestic Bldg., Oklahoma, for junior high school, 2 story, 64 x 134 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000.

Col., Florence—High School—School Dist. 2 soon lets contract building 2 story, 120 x 140 ft., brick and stone. About $100,000. French & Frewen, 313 Chamber of Commerce Bldg., Denver, archts. Noted Dec. 11.

N. M., Dexter—School—Bd Educ. will sell $82,000 bonds April 10, to build 2 story, 100 x 100 ft., tile or concrete. F. Mielenz, clk.

Idaho, Blackfoot—Courthouse—Bingham Co. election April 2 to vote on $300,000 bonds to build new courthouse.

Utah, Fountain Green—School—San Pete School Bd. soon lets contract building 1 story, 40 x 90 ft. brick, here About $50,000. R. C. Watkins, Herbert Ave., Salt Lake City, archt.

Utah, Moroni—High School—San Pete School Bd. soon lets contract building 1 story, 12 room, 150 x 150 ft., brick, including auditorium and gymnasium, here. About $65,000. R. C. Watkins, Herbert Ave, Salt Lake City, archt.

Utah, Mt. Pleasant—School—San Pete School Bd. soon lets contract building 2 story, 40 x 100 ft., brick, here. About $50,000. R. C. Watkins, Herbert Ave., Salt Lake City, archt.

Ariz., Kingman—Hospital—Mohave Co. election April 6, to vote on $80,000 bonds to build hospital. J. S. Withers, clk.

Cal., Compton—School—School Trustees retained A. W. Angel, archt., 3339 Princeton Ave., Los Angeles, to prepare plans for 100 x 228 ft. school, concrete foundation. About $60,000.

Cal., Fresno—Depot—J. M. Rustigan, c/o Swartz & Ryland, archts., Powell Bldg., having plans prepared for 2 story, 150 x 150 ft., brick and hollow tile, concrete foundation, on J and Mono Sts. About $65,000

Cal., Kingsburg—School—School Trustees voted $75,000 bonds to build grade school. Noted March 18.

Cal., Lone Pine—High School—School Trustees having plans prepared by W. S. Weeks, archt., 75 Post St., San Francisco, for rein.-con. About $80,000.

Cal., Long Beach—Club House—Virginia Country Club, Anaheim Rd., purchased tract and plans to build frame clubhouse. Cost between $50,000 and $75,000. L. Bixby, 1465 East Ocean Ave., and A. C. Sellery, Long Beach Bank Bldg., members of bldg. com.

Cal., Los Alamitos—School—Trustees Laurel School Dist. voted $55,000 bonds to build school.

Cal., Los Angeles—Church—St. Paul's Protestant Cathedral had preliminary plans prepared by R. D Johnson, archt, 100 East Colorado St., Pasadena, for brick and concrete, on Olive St., near 6th St. About $300,000. A. MacCormack, 523 South Olive St., rector.

Cal., Los Angeles—Office—Los Angeles Ry., Pacific Electric Bldg., having plans prepared by C. H Noerenberg, archt., c/o owner, for 10 story, 65 x 176 ft., rein.-con., concrete foundation, on 11th St. and Bway. Noted Aug. 21.

Cal., Pasadena—Hotel—California Hotel Co., Euclid Ave. and Colorado St., having plans prepared by W. Hunt, archt., Hibernian Bldg., Los Angeles, for three 5 room frame bungalows, 60 room addition to hotel and 50 room addition to help's quarters, both hollow tile and concrete, concrete foundation, on Oak Knoll Ave.

Que., Grosse Isle—Quarantine Station—Dominion Government, Ottawa, having plans prepared by R. C Wright, archt., c o Dept. Pub. Wks., Ottawa, for quarantine station, here. About $200,000.

Que., Montreal—Office—Montreal Foncier Lt., having plans prepared by J. Asselin, archt., for 10 story, rein.-con., on St. Lawrence Bldv. and Notre Dame St. Cost to exceed $500,000.

Que., Quebec—Bank and Office—Price Bros. Co., Ltd., 56 St. Peter St., having plans prepared by Ross & Macdonald, archts., 1 Belmont St., Montreal, for 6 story, 60 x 105 ft., concrete, brick and steel, on St. Louis St.

Ont., Brockville—Church and Seminary—Church of Amer., Prescott, plans to build 3 story, rein.-con., brick and steel, concrete foundation, here. About $100,000. A. C. Horner, bishop.

Ont., Iroquois Falls—School—Pub. School Bd. plans to build 2 story, 6 room, brick and steel, rock foundation. About $75,000. Architect and engineer not selected.

Ont., London—Parish Hall—Cronyn Memorial Church, 440 William St., plans to build 2 story, rein-con., brick and steel, concrete foundation. About $100,000. Architect and engineer not selected.

Ont., Ottawa—Temple—Allied Trades and Labor Assn., Hope Chambers, plans to build temple. About $75,000. P. M. Draper, c/o Government Printing Bureau, secy.

B. C., Vancouver—Office—Dominion Government, Ottawa, Ont., plans to build 10 story office building here. About $1,000,000.

B. C., Vancouver—Office and Store—E. Sprodt, archt., 403 Dominion Bldg., receives bids about April 15, building 5 story, 50 x 70 ft., rein.-con., tile and brick, concrete foundation, on Gore Ave. and Pender St., for Local Chinese Society. About $60,000.

BIDS DESIRED

Mass., Newton (Boston P. O.)—School—Until April 20, by City Clerk, building 4 story, on Beacon St. About $500,000. W. G. Percy and J. H. McNaughton, 19 Congress St, Boston, archts.

N. Y., Wende (Millgrove P. O.)—Home—Until April 20, by E. F. Jaeckle, clk. Bd. Supervs., Erie Co. (Buffalo), building Erie Co. Home, here.

N. J., Kearney (Arlington P. O.)—Office—Until April 5, by D. Wortman, archt. and engr., 116 Lexington Ave., New York City, for 2 story, 40 x 90 ft., brick and steel, brick foundation, here, for Genl. Ceramics Co. About $50,000.

N. J., Newark—Sales—See "Industrial Works."

N. J., Newark—School—Bd. Educ., Essex Co. Bldg., receiving bids altering and building 3 story, 70 x 80 ft., concrete and brick addition, on Alexander St., also altering 12 other school buildings.

N. J., Newark—Store, etc.—Until April 6, by J. Hunt, archt. and engr., 30 North Michigan Ave., Chicago, building 25 story, concrete, brick and steel addition, on Market St., for L. Bamberger & Co. About $2,000,000.

N. J., Perth Amboy—Until April 7, by Bd. Water Comrs., City Hall, building reservoir, pipe line and appurtenances. S. J. Mason, supt. and engr.; advertised in this issue.

Pa., Indiana—School—Until April 25, by School Dist. building 3 story, 85 x 123 ft., rein.-con. and brick, rock foundation, in 4th Ward. About $100,000 O. Fry, secy. F. A. Hersh and F. J. Shollar, Commerce Bldg., Altoona, archt.

Pa., Phila.—Home—Until April 7, by Magazine & Eberhard, archts., 603 Chestnut St., building 2 story, brick, on Tabor Rd. and York St., for Jewish Sheltering Home for Infants. Noted March 13.

Pa., Reading—Mercantile—Until April 15, by J. E Mills & Son, archts., 1305 Kresge Bldg., Detroit, Mich., building 4 story, 50 x 270 ft., concrete, brick and steel addition, concrete foundation, here, for S. S. Kresge Co., Kresge Bldg., Detroit, Mich. About $100,000. Noted Feb. 12.

Pa., Taylor—High School—Until April 6, by F. F. Kehr, secy. Boro. School Dist., building high school on South Main and Williams Sts.

D. C., Washington—Church—Columbia Heights Christian Church, 1658 Park Rd., N. W, receiving bids building 1 story, 30 x 90 ft., brick, rein.-con. flooring, at 1628 Columbia Rd. About $150,000. M. R. Rhoades, Chambersburg, Pa, archt.

Md., Baltimore—Administration—See "Industrial Works."

Md., Baltimore—Theatre—Until April 6, by E. G Blanke, archt., 213 North Calvert St., altering and building 3 story, 140 x 200 ft., brick and hollow tile addition, on Gay and Fayette Sts., for Wilson Theatre Co., 418 East Baltimore St. Noted Feb. 12.

O., Cleveland—Bathhouse—Until April 9, by city, building 2 story, 66 x 70 ft., rein.-con., steel, brick and tile, rein.-con. flooring, concrete foundation, on Starkweather Ave. About $100,000. F. H. Betz, 604 City Hall, archt. Noted Feb. 19.

O., Croton—School—Until April 15, by Bd. Educ. Hartford Centralized School Dist., building 2 story, 60 x 110 ft., concrete and brick. About $90,000. F. S. Rusk, 16 South 3rd St., Columbus, archt.

Mich., Detroit—Clubhouse—Until April 15, by G. W. Graves, archt., 43 John R St., building 3 story, 50 x 120 ft., rein.-con., brick and steel, concrete and piling foundation, on Lake Shore Rd., at Lake St. Clair, for Masonic Athletic Assn., Masonic Temple. About $125,000. W. F. Jordan, secy. Noted Aug. 7.

Wis., Janesville—Church—F. E. Sadler, archt., Hayes Blk., receiving bids building 60 x 90 ft., brick, concrete foundation, for 1st Christian Church, 313 High St. About $60,000.

Wis., Merrill—Church—Until April 10, by St. Stephans Church, building 70 x 100 ft., brick and tile, concrete foundation. About $70,000. H. C. Haeuser, Colby-Abbott Bldg., Milwaukee, archt.

Wis., Racine—Business—Until May 1, by L. Bassindale archts., 321 Capital Bank Bldg., St. Paul, building 2 story, 60 x 120 ft. brick and stone, for Journal-News Publishing Co, 328 Main St. About $100,000.

Ia., Glidden—School—Until April 20, (change of date), by Bd. Educ. building 3 story, 90 x 162 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $150,000. H. W. Porter, secy. W. Gordon, 319 Hubbell Bldg., Des Moines, archt.

Ia., Howardon—School—Until April 14, by Bd. Educ., building 2 story, 60 x 150 ft. rein.-con. and brick. About $125,000. O. A. Bader, secy. G. L Lockhart, 391 Endicott Bldg., St. Paul, archts. Noted March 18.

Ia., Hayesville—School—Until April 7, by Bd. Educ., building 1 story, 56 x 86 ft., brick, rein.-con. and stone, rein.-con. flooring, concrete foundation. About $60,000. R. G. H. Richardson, secy. W. E. Huise & Co., 210 Masonic Temple, Des Moines, archts. Noted March 11.

Ia., Morley—School—Until April 17 (change of date), by Bd. Educ., building 2 story, 43 x 135 ft., brick, rein-con. and steel, rein.-con. flooring, concrete foundation.. About $60,000. W. J. Brown, 201 Amer. Trust Bldg, Cedar Rapids, archt. Noted Jan. 29.

Ia., Sioux City—School—Until April 19, by Bd. Educ., building Jay School, 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $60,000. Beuttler & Arnold, 235 Grain Exch. Bldg., archts.

Ia., Sioux City—School—Until April 19, by Bd. Educ., building West Ward School, 2 story, brick, concrete and steel, concrete foundation, on Martha and Bushnell Sts. About $50,000. Beuttler & Arnold, 235 Grain Exch. Bldg., archts.

Ia., Sioux City—School—Until April 19, by Bd. Educ., building East Ward School, 2 story brick, concrete and steel, concrete foundation, on 2nd and Paxton Sts. About $55,000. Beuttler & Arnold, 235 Grain Exch. Bldg., archts.

Ia., Sioux City—High School—Until April 19, by Bd. Educ., building West Junior High School, 2 story, brick, rein-con. and steel rein.-con. flooring, concrete foundation About $200,000. Beuttler & Arnold, 235 Grain Exch. Bldg., archts.

Ia., Waterloo—Church—Until April 16, by 1st Baptist Church, 500 Jefferson St., building 2 story, 95 x 114 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. C. P. Shockley, 719 Blacks Bldg., archt.

Ia., Waterloo—High School—Until April 14, by Bd. Educ., building 4 story, 177 x 467 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $600,000. W. B. Ittner, Bd. Educ. Bldg., St. Louis, Mo., archt. Noted Feb. 5.

Ia., Zearing—School—Bd. Educ. receiving bids building 2 story, 70 x 90 ft., brick,

Buildings—(Continued)

concrete and steel. concrete foundation. About $130,000. W. L. Pericord, Iowa Falls. archt. Noted Feb. 12.

Minn., Duluth — Office — See "Industrial Works."

Minn., Hibbing—High School—Until April 27, by T. J. Godfrey, clk. Bd. Educ., building 2 story, 62 x 400 ft., rein.-con., brick and stone, rein.-con. flooring, concrete foundation, on Mesaba St. About $500,000. W. T Bray, Torrey Bldg., Duluth, archt. and engr.

Minn., Hibbing—Recreation—Until April 20, by J. Murphy, city recdr., building 2 and 3 story, 149 x 283 ft., rein.-con., brick and stone, rein.-con. flooring, concrete foundation, on 1st Ave. and Jackson St. About $500,000. Halstead & Sullivan, Palladio Bldg., Duluth, archts. and engrs.

Minn., Minneapolis—Hall—Until April 6, by State Bd. Control, St. Paul, building addition to Sanford Hall, consisting of two 3 story, 44 x 68 ft., rein.-con. and brick wings, at State University, here. About $180,000. C. H. Johnston, 715 Capitol Bank Bldg., St. Paul, archt. and engr.

Minn., Minneapolis—School—Until April 6, by State Bd. Control, St. Paul, building 1 story, brick addition to School of Pathology, at Farm School, here. About $55,000. C. H. Johnston, 715 Capital Bank Bldg., St. Paul, archt. and engr.

Minn., Nopeming — Nurses' Home—Until April 10, by A. T. Laird, supt. Nopeming Sanatorium Assn., building 2 story, 30 x 130 ft., frame and stucco, rein.-con. foundation. About $50,000. Halstead & Sullivan, Palladio Bldg., Duluth, archts. and engrs.

Minn., Sacred Heart—School—Until April 9, by H. Evenson, clk. Independent Consolidated School Dist. 40, building fireproof school. W. L. Alban, 347 Endicott Bldg., St. Paul, engr.

Minn., Worthington—Nurses' Home—Until April 15, by Supt. Tuberculosis Sanatorium, building 2 story, 34 x 90 ft., stucco, here, for State Bd. Control, St. Paul. About $55,000. Sund & Dunham, 512 Essex Bldg., Minneapolis, archts.

Kan., Havensville—School—Until April 8, by Bd. Educ., building 2 story, 64 x 76 ft. brick, rein.-con. and steel. concrete foundation. About $60,000. T. W. Williamson & Co., 418 Central Natl. Bank Bldg., Topeka, archts. Noted March 18.

Kan., Hiawatha — Auditorium — Until April 12, by city, building 2 story, 80 x 130 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $75,000. T. W. Williamson & Co., 418 Central Natl. Bank Bldg., Topeka, archts.

Kan., Holyrood—School—Until April 6, by Bd. Educ., building 3 story, 75 x 110 ft., brick, concrete and steel, concrete foundation. About $75,000. F. G. McCune, Wichita, archt. Noted March 11.

Neb., Hastings—Temple—Until April 15, by Masonic Temple Assn., building 3 story, 96 x 139 ft., rein.-con. brick and steel, rein.-con. flooring, concrete foundation. About $500,000. Keffer & Jones, 201 Hubbell Bldg., Des Moines, Ia., archts.

N. D., Grand Forks—Office—See "Industrial Works."

S. D., De Smet — Church — St. Thomas Catholic Church having plans prepared by Slifer & Abrahamson, archts., 595 Endicott Bldg., St. Paul, for 1 story, 40 x 115 ft., rein.-con. and brick. About $70,000.

Idaho, Buhl—High School—Until April 20, by B. M. Nesbit, archt., Buhl. building 2 story, 130 x 202 ft., for Independent School Dist. 3. About $150,000.

Cal., Berkeley—School—April 13, by Bd. Educ. building 2 story, 200 x 200 ft., concrete and brick, rein.-con. flooring, concrete foundation, on Prince, Ellis and King Sts. About $185,000. Noted March 11.

Cal., Independence—Court House—Until April 9, by Bd. Supervs. Inyo Co., building 2 story, rein.-con. and terra cotta, concrete foundation. Bonds for $150,000 voted for project. Noted Feb. 19.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Augusta** — Home — State Hospital Comn. let contract building 3 story, 43 x 130 ft. home for nurses, brick, steel, concrete and stone, concrete foundation, to O. Neson Co., 194 Exchange St., Bangor. About $100,000. Noted Feb. 26.

★**N. H., Suncook** — Housing — Suncook Mills, Pembroke, let contract building thirty-four 2 story timber houses for workmen, concrete foundation, here, to Hutchinson Bldg. Co., 159 South Main St., Concord. About $125,000.

★**Mass., Dorchester** (Boston P. O.)—Lion House—Park & Recreation Bd., 33 Beacon St., Boston, let contract building 1 story, 35 x 100 ft., brick, concrete and stone, rein.-con. flooring, concrete foundation, at Franklin Park, here, to A. Piotti, 98 Melville Ave., $61,095. Noted March 25.

★**Mass., Fall River**—Store and Business—S. M. Hyde, 44 2nd St., will build 3 story, 62 x 80 ft., brick and steel, concrete foundation, on North Main St. About $50,000. Work will be done by day labor under supervision of J. M. Darlin, archt., 56 North Main St.

Mass., Holyoke — Church — Second Congregational Church, Appleton St., let contract building 1 story, brick and stone, to Casper Ranger Constr. Co., 201 Devonshire St., Boston. About $500,000.

★**Mass., Shelburne Falls**—School—Shelburne Twp. will build 2 story, brick, steel and mill construction, on Ashley St., here, to replace one recently destroyed by fire. About $50,000. Work will be done by day labor. Noted Jan. 29.

★**Mass., Springfield**—Hotel—D. H. Sievers & Co., Hillman St., let contract building 3 story, 98 x 200 ft., brick and steel addition to Highland Hotel, concrete foundation, to E. J. Pinney, Inc., 264 Main St. About $200,000.

★**Mass., Springfield**—Office and Business—D. Gilmore and others, c/o E. C. and G. C. Gardner, archts., 33 Lyman St., let contract converting Court Sq. Hotel, on Elm St., into store and office building, concrete and steel, to F. T. Ley & Co., Inc., 499 Main St. About $50,000.

★**Mass., Springfield** — Sales — Western Massachusetts Cadillac Co., Inc., 521 Worthington St., let contract building 1 and 2 story, brick, concrete and steel, rein.-con. flooring, concrete foundation, to Chaplin & Chaplin, 374 Main St. About $50,000.

★**Mass., Springfield**—Stores and Amusement—Goldstein Bros. Amusement Co., Bridge St., let contract building 2 story, 64 x 130 ft., brick and concrete, rein.-con. flooring, concrete foundation, on Bway. and Bridge St., to J. Boucher, 163 Trafton Rd About $50,000.

★**Mass., Three Rivers**—Amusement and Assembly Hall—St. Stanislaus Roman Catholic Society let contract building 2 story, brick, steel and stone, concrete foundation, to J. Topor, 38 Knipfer Ave., Easthampton. About $50,000.

★**Mass., Worcester**—Store and Business—Budish & Kaplan Co., 20 Bridge St., let contract building 1 story, 55 x 100 ft., brick, concrete and steel, concrete foundation, on Main St., to Budish & Levy, 147 Dorchester St. About $50,000.

★**Conn., Greenwich**—Grade School—Bd. Educ. let contract building 2 story, 62 x 148 ft. and 52 x 104 ft., brick and concrete, to Rangeley Constr. Co., 56 West 39th St., New York City. About $250,000.

★**Conn., Hartford** — Hotel — Hotel Bond Co., Inc., 320 Asylum St., let contract building 6 and 12 story, brick, concrete and steel addition to Bondmore Hotel, rein.-con. flooring, concrete foundation, to G. A. Fuller Co., 175 5th Ave., New York City.

★**Conn., Hartford**—Office—Travelers Insurance Co., 700 Main St., let contract building 12 story, rein.-con., rein.-con. flooring, concrete foundation, on Prospect St., to M. Eidlitz & Son, Inc., 30 East 42nd St., New York City. Noted Feb. 12.

★**Conn., Madison**—Bathhouse—State Park Comn., Capitol, Hartford, let contract building 1 story, 300 x 300 ft., timber, at Hammonsette Beach, here, to F. S. Sellew, Inc., 647 Main St., Hartford. About $50,000.

★**Conn., South Manchester**—Business—M. Gorman, 732 Main St., let contract building 2½ story, 33 x 100 ft., brick and steel, concrete foundation, to T. J. Gorman, 75 Linden Ave. About $50,000. Noted Jan. 29.

★**N. Y., Brooklyn** — School — C. B. J. Snyder, archt. and engr., Municipal Bldg., New York City. let contract to T. Dwyer, Bway. and 216th St., New York City, building P. S. 181, 5 story, brick and steel, concrete foundation. on New York Ave. and East 34th St. between Tilden and Snyder Aves., for Bd. Educ., 500 Park Ave., New York City. About $822,000. Noted March 18.

★**N. Y., Brooklyn**—Showroom—See "Industrial Works."

★**N. Y., Brooklyn**—Temple—Masons of New York (Ridgewood Lodge), will build 3 story, 100 x 100 ft., brick, steel and stone, concrete foundation, on Bway. and Gates Ave. About $1,000,000. Work will be done by day labor.

★**N. Y., New York**—Office—Farquharson & Wheelock, 724 5th Ave., will build 12 story, brick, steel and stone, brick and concrete foundation. About $500,000. Work will be done by day labor under supervision of Severence & Van Allen, archts. and engrs., 372 Lexington Ave.

★**N. Y., New York**—Club—W. H. Gompert, archt. and engrs., 171 Madison Ave., New York City, let contract to E. Corning Co., Vanderbilt Ave. and 45th St., building 9 story, brick, steel and stone, concrete foundation, on 49th St. and Lexington Ave., for International Sporting Club, c/o architect. About $600,000. Noted Feb. 5.

★**N. Y., New York**—Loft—J. Fallwood, c/o E. Roth, archt. and engr., 119 West 40th St., let contract altering 6 story, brick, steel and stone, at 165 Madison Ave., to J. J. Hearn Constr. Co., 1036 6th Ave. About $50,000.

★**N. Y., New York** — Office — Hide & Leather Realty Co. let contract building 18 story, 75 x 80 ft., brick, steel and stone, concrete foundation, on Franklin and Gold Sts., to Thompson-Binger, 280 Madison Ave. About $400,000. Noted March 18.

★**N. Y., New York**—Office—M. Holmes, 43 West 57th St., let contract building 8 story, brick, steel and stone, concrete foundation, to R. H. MacDonald, 29 West 34th St. About $500,000.

★**N. Y., New York**—Office—Robertson-Cole Co., 149 Bway., let contract building 10 story, brick, steel and stone, concrete foundation, on 48th St. and 7th Ave., to Wharton-Green & Co., 37 West 39th St. About $500,000.

★**N. Y., New York**—School—C. B. J. Snyder, archt. and engr., Municipal Bldg., let contract to Frymier & Hanna, 25 West 45th St., building P. S. 38, brick and steel, brick and concrete foundation, on St. Anns Ave., for Bd. Educ., 500 Park Ave. Cost $834,000. Noted March 11.

★**N. Y., New York**—Store and Loft—Sloane Estate, Inc., 316 East 65th St., let contract building 10 story, 85 x 100 ft., brick and steel, concrete foundation, on West 39th St., to F. T. Ley, 19 West 44th St. About $300,000.

★**N. J., Elizabeth**—School—Bd. Educ. let contract building concrete and brick, on Bayway and South Broad Sts., to Dose Eng. Co., 299 5th Ave., New York City, $376,900.

★**N. J., Newark**—School—Bd. Educ., Essex Co. Bldg., let contract building 3 story, 38 x 144 ft., concrete and brick, on Hunterdon and Peshine Sts., to D. W. McGee Constr. Co., 142 1st St., $261,537.

N. J., Newark—School—Bd. Educ., Essex Co. Bldg., received bids March 25, building Franklin School. 3 story, 70 x 86 ft., concrete and brick, from C. Flochen, Liberty Ave., Hillside, $296,526; D. W. McGee Constr. Co., 142 1st St., $357,793; Essex Constr. Co., 85 Academy St, $380,000. Noted March 11.

★**Pa., Chester**—**Bank**—First Natl. Bank, 5th and Market Sts., let contract building 1 story, 13 x 26 ft., concrete, brick, stone and marble addition, to H. E. Eaton, 1713 Sansom St., Phila. About $50,000. Noted Jan. 15.

★**Pa., Phila.**—Office—Potts & Thomson, 2521 Frankford St., let contract building 1 story, 32 x 50 ft., brick and limestone, at 1809 East Allegheny St., to F. G. Stewart, 1619 Sansom St. Noted March 11.

★**Pa., Phila.** — School — Corpus Christi Roman Catholic Church, Allegheny and 28th Sts., let contract building 3 story, 70 x 125 ft., concrete and stone, to W. J. McShane, 417 South 13th St. About $100,000. Noted Feb. 26.

★**Del., Wilmington**—Theatre—Wilmington Theatre Corp. let contract building 2 story, 57 x 210 ft., rein.-con., on Market St., to M. Shapiro & Sons, 52 Vanderbilt Ave., New York City. About $250,000.

★**N. C., Winston-Salem**—Hotel—D. Omstead, Cleveland, O., let contract building 9 story, brick, steel and stone, concrete foundation, on 5th and Cherry Sts., to H. L. Stevens Co., 30 North Michigan Ave., Chicago. About $1,000,000. Noted Jan. 8.

Buildings—(Continued)

★**O., Cleveland**—Exchange—Film Exch. Bldg. Co., c/o G. T. Bander, Williamson Bldg., let contract constructing 8 story, 135 x 143 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on East 21st St. and Payne Ave., to W. Dunbar Co., 8201 Cedar Ave. About $1,000,000.

O., Cleveland—Hall—City received bids March 16, furnishing and setting exterior work on 4 story, 180 x 420 ft., fireproof, on East 6th St. and St. Clair Ave., from Maine & New Hampshire Granite Co., 760 Hippodrome Bldg., $90,000; Rockport Granite Co., 31 State St., Boston, $98,000. Total cost, $2,500,000. Noted March 11.

★**O., Columbus**—Store—J. M. Caren Co., 169 North High St., let contract remodeling 4 story, 30 x 60 ft. and building 4 story, 30 x 90 ft., brick addition, to D. Livingston, Columbus. About $65,000; cost plus percentage basis.

★**O., Dayton**—Market—Jefferson-Main St. Market Co., let contract building 4 story, 50 x 400 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Main and Jefferson Sts., to J. Lowes, Schwind Bldg. About $500,000.

★**O., Warren**—Lodge and Commercial—Fraternal Order of Eagles let contract building 2 story, 50 x 76 ft., steel, brick and tile, rein.-con. flooring, brick foundation, to Heller Bros., Furnace St., Youngstown. About $50,000.

★**Mich., Alpena**—Hall—Amer. Legion will build 2 story, 107 x 172 ft., rein.-con., brick and steel memorial hall, rein.-con. flooring, concrete foundation, at City Hall Sq. About $75,000. Work will be done by day labor under supervision of C. P. Harris, chn. Noted Jan. 15.

★**Mich., Detroit**—Church—North Woodward Methodist Church, c/o W. E. N. Hunter, archt., Chamber Commerce, let contract building 2 story, 180 x 250 ft., rein.con., brick, steel and stone, rein.-con. flooring, concrete foundation, on Woodward and Chandler Aves., to Bryant & Detwiler, 2335 Dime Bank Bldg. About $700,000.

★**Mich., Grand Rapids**—Church—Sacred Heart Church, 156 Valley Ave., let contract building brick, concrete foundation, to J. McNabb & Son, Grand Rapids. About $150,000; cost plus percentage basis.

Mich., Northville—Hospital—Bd. Health received bids March 1 constructing hospital group, including (a) administration building, (b) infirmary, (c) Ward A, (d) Ward B, (e) Ward C, (f) Ward D, (g) service building, (h) power house, (i) nurses home, (j) employees building, (k) laboratory, (l) tunnels, (m) special allowances, from J. Finn Co., 234 East Fort St., Detroit, (a) $88,000, (b) $540,000, (c) $167,840, (d) $208,206, (e) $211,000, (f) $214,000, (g) $106,735, (h) $66,570, (i) $73,762, (j) $95,932, (k) $29,375, (l) $45,000, (m) $137,000, total $1,991,725; G. A. Fuller Co., 540 Penobscot Bldg., Detroit, (a and b) $602,110, (c) $181,695, (d) $214,391, (e) $221,500, (f) $216,940, (g) $143,078, (h) $95,500, (i) $77,705, (j) $106,870, (k) $30,700, (l) $30,000, (m) $137,000, total $2,057,500. Noted Feb. 19.

★**Wis., Elm Grove**—Convent—Sisters of Notre Dame let contract building 5 story, 50 x 135 ft., rein.-con. and brick addition, rein.-con. flooring, concrete foundation, to Dallman Constr. Co., Majestic Bldg., Milwaukee. About $200,000; cost plus percentage basis.

Wis., Menasha—High School—Bd. Educ. received bid March 18, building 2 story, 65 x 90 ft. and 60 x 100 ft. additions, brick and concrete, rein.-con. flooring, concrete foundation, from Appleton Constr. Co., College Ave., Appleton, $199,000. Noted March 4.

★**Wis., Racine** — School — Bd. Educ. let contract building McKinley School, 2 story, brick and concrete, rein.-con. flooring, concrete foundation, to Bondgard & Christensen, 1765 Northwestern Ave., $198,373. Noted March 11.

★**Ia., Cedar Rapids**—Office—See "Industrial Works."

★**Ia., Ottumwa** — Club House—Wapello Club let contract building 2 story, 50 x 90 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to Ottumwa Mill & Constr. Co., Ottumwa. About $75,000; cost plus percentage basis. Noted Feb. 26.

★**Ia., Sewal** — School — A. A. Andrews, secy. Bd. Educ., let general contract building school, to B. F. Staley, Centerville, $65,819; heating and plumbing, to Bailey Plumbing Co., 404 Grand Ave., Des Moines, $14,852. Noted Feb. 19.

★**Minn., Minneapolis**—Stock Pavilion—C. H. Johnston, archt. and engr., Capital Bank Bldg., St. Paul, let general contract building 1 story, 140 x 240 ft., rein.-con. and steel, at fair grounds, here, to F. Nordlander, 408 Metropolitan Bank Bldg., $334,500; plumbing, Hineline Plumbing & Heating Co., 625 3rd Ave., S., $16,377; electrical, Lamgford Electric Co., 601 Wilmac Bldg., $18,850. Noted March 18.

Minn., Robbinsdale—School—Bd. Educ. received bids March 26, building 2 story, 90 x 118 ft., fireproof, from J. Peterson, 3152 10th Ave., S., $134,500; Bracker Constr Co., 638 Builders Exch. Bldg., $138,790; Madsen Constr. Co., 848 Builders Exch. Bldg., $143,600; contractors all of Minneapolis. Noted March 18.

★**Minn., Virginia** — Courthouse — W. H. Borgen, treas. St. Louis Co., let contract building 2 story, 75 x 120 ft., brick and stone addition, rein.-con. flooring and foundation, on Central Ave., to Natl. Constr. Co., Central Ave., $276,961. Noted Feb. 26.

★**Mont., Culbertson** — High School — Roosevelt Co. School Dist. 17 let contract building 2 story, 80 x 108 ft., to Leigland & Kleppe, Great Falls, $74,640. Noted March 4.

★**Mont., Forsyth**—Hospital—Rosebud Co. let contract building 2 story, 40 x 100 ft., to A. E. Lyle, 312 Electric Bldg., Billings, $77,000.

★**Mo., Desloge** — School — Bd. Educ. let contract building 3 story, 83 x 114 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to G. Gassman, Charleston, $101,565. Noted March 11.

★**Tex., Denton**—Gymnasium—College of Industrial Arts let contract building 2 story, brick and concrete, to Cooper & Lund, Denton. About $150,000; cost plus percentage basis.

★**Tex., Waxahachie**—Sanitarium—C. H. Page & Bro., archts., Austin Natl. Bank Bldg., Austin, let contract to Wattinger & Son, Calvert, building 2 story, brick and concrete, concrete flooring, for Waxahachie Sanitarium. Cost $83,089. Noted March 18.

★**Okla., Duncan**—School—Bd. Educ. let contract building 1 story, 54 x 75 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to Manhattan Constr. Co., Muskogee. About $75,000.

★**Okla., Holdenville** — Court House — Hughes Co. let contract building 3 story, 65 x 150 ft., brick, concrete and steel, concrete foundation, on Main St., to Manhattan Constr. Co., Muskogee. About $75,000. Noted Jan. 15.

★**Idaho, Buhl**—Business—C. M. Merrick let contract building 2 story, 50 x 120 ft. to I. T. Brown, Buhl. About $50,000.

★**Cal., Glendale**—Theatre and Stores—W. C. Goodno, 397 South El Molino Ave., Pasadena, let contract building 2 story, 75 x 180 ft., brick, concrete foundation, at 124 South Brand Blvd., here, to C. W. Kent & Son, 131 South Brand Blvd. About $75,000. Noted Feb. 26.

★**Cal., Long Beach**—High School—Bd. Educ. let contract building 138 x 148 ft., brick, concrete foundation, to J. W. Davison, 361 Walnut St., $161,286. Noted March 25.

★**Cal., Los Angeles**—Studio—K. W. Vidor let contract constructing seven 1 and 2 story, glass and steel buildings, concrete foundation, on Santa Monica Blvd., to Milwaukee Bldg. Co., 316 Wright & Callender Bldg. About $100,000.

★**Cal., Tropico** (Los Angeles P. O.)—Mausoleum—Amer. Security & Fidelity Co., San Francisco, let contract for rein.-con. work and grading for rein.-con., granite, marble and bronze mausoleum, to C. P. Day, Boston Bldg., Pasadena, $42,000.

Federal Government Work

PROPOSED WORK

N. H., Portsmouth—Monitor Roof—Spec. 4162—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build on power plant engine room, Bldg. 72, here. About $4,500.

R. I., Newport—Painting Water Tank—Spec. 4164—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to paint inside of water tank, here. About $1,900.

Pa., Phila.—Factory—Spec. 4163—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build mattress factory, here. About $95,000.

Pa., Phila.—Power Plant Piping—Spec. 4161—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to furnish and install steam piping in power plant extension "C" at Marine Corps, Quartermaster Depot, on Washington Ave., Broad and Alter Sts., here; $10 deposit required for plans and spec.

Md., Indian Head—Cranes—Spec. 4158—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build cranes for nitrate of soda storehouse, here. About $12,000.

D. C., Anacostia — Hangar and Cinder Road—Spec. 4156—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build 1 hangar and cinder road, here. About $17,000.

D. C., Wash.—Storehouse—Spec. 4155—Bureau Yards & Docks, Navy Dept., plans to build 1 story, 60 x 140 ft., rein.-con. and steel frame storehouse for combustibles. About $30,000.

D. C., Wash.—Track Scale—Spec. 4160—Bureau Yards & Docks, Navy Dept., plans to install 300,000 lb. railroad track scale. About $8,000.

S. C., Charleston—Stowage—Spec. 4159—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build additional stowage for torpedoes, here. About $13,000.

S. C., Paris Island—Tile Floors, Etc.—Spec. 4154—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to lay tile floors and improve hospital, here. Bids to be opened at local yard.

Fla., Pensacola—Stowage—Spec. 4159—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build additional stowage for torpedoes, here. About $13,000.

O., Cincinnati—Changes and Repairs—Treas. Dept., Wash., D. C., rejected bids received March 5, for changes and repairs to main building at Marine Hospital, here. J. A. Wetmore, superv. archt. Noted March 18.

Ia., Des Moines—Remodeling Post Office—Treas. Dept., Wash., D. C., rejected bids received Feb. 25, remodeling, here. J. A. Wetmore, superv. archt. Noted March 4.

Idaho — Road Work — B. J. Finch, dist. engr. Bur. Pub. Rds., Ogden, Utah, soon lets contract grading 6.61 mi. Montpelier-Afton Project, Sect. 2, Bear Lake Co.

Cal., San Diego—Quartermaster Storehouse, Etc.—Spec. 4157—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build 2 story, 40 x 200 ft., quartermaster storehouse, with two 40 x 100 ft. wings, rein.-con., also install heating, plumbing electric wiring and 2 freight elevators, at Marine Base, here. About $150,000.

W. I., Guantanamo—Pier—Spec. 4165—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build rein.-con. pile pier, here. About $130,000.

BIDS DESIRED

Mass., Chelsea—Building—Until April 13, by Supt. Lighthouse, Boston, constructing brick and rein.-con. building at Lighthouse Depot, 37 Marginal St., here.

Pa., Phila.—Dredging—Until April 19, by U. S. Engr. Office, 815 Witherspoon Bldg., dredging in Delaware River, in front of Camden, N. J.

Phila., Pa.—Officers' Double Quarters—Until April 13, by H. J. Lumsden, constr. officer, Frankford Arsenal, constructing 2 sets of double quarters for officers; advertised in this issue.

Pa., Phila. — Seaplane Hangers — Spec. 4121—Until April 7, by Bureau Yards & Docks, Navy Dept., Wash., D. C., dismantling 3 seaplane hangars at Brunswick, Ga., and re-erecting same as 1 building, at Navy Yard, here. About $47,000; $10 deposit required for plans and spec. Noted Jan. 15.

Va., Alexandria—Sidewalk—Spec. 4140—Until April 14, by Bureau Yards & Docks, Navy Dept., Wash., D. C., paving and curbing, here. About $2,600; $10 deposit required for plans and spec. Noted March 25.

Federal Government Work (Continued)

Wis., Milwaukee—Removing and Rebuilding Superstructure. Until April 29, by U S. Engr. Office, Federal Bldg., removing stone filled timber superstructure and building concrete on south breakwater, Ludington Harbor, Mich.; advertised in this issue.

Wash., Keyport—Storehouses, Garage and Quarters—Spec. 4048—Until April 28, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building 24 x 66 ft. war head and 64 x 117 ft. torpedo storehouses, 28 x 83 ft. garage and three 2 story, 23 x 34 ft. quarters for officers, here. Bids will also be opened at local yard. About $60,000; $10 deposit required for plans and spec. Noted March 25.

P. I., Guam—Quarters, Power, Pump and Blower Houses—Spec. 4141—Until April 7, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building 30 x 38 ft. extension to power house at Agana and 26 x 35 ft. extension to Naval Radio Sta., 12 x 14 ft. extension to pump house. 8 x 16 ft. extension to blower house, 22 x 47 ft. quarters with 18 x 24 ft. wings; $10 deposit required for plans and spec. Noted March 25.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New York—Lighting Fixtures—Treas. Dept., Wash., D. C., received bids March 18, furnishing and installing standard lighting fixtures in U. S. Assay Office, here, from Simes Co., 22 West 15th St., $1,412; F. Storsberg & Co., 22 Atlantic St., Newark, N. J., $1,500; E. J. Schroeder Lamp Wks., 716 Jersey Ave., Jersey City, N. J., $1,828 Noted Feb. 26.

★N. Y., Rome—Remodeling Post Office—Treas. Dept., Wash., D. C., let contract remodeling Post Office (except lift), here, to L. Carey, 112 John St., New York City About $4,000. Noted March 18.

Pa., Phila.—Roof Covering—Spec. 4153—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids recovering roof of temporary storage Bldg. 350, at Navy Yard, here, from Ehret Roofing Co., 1096 Drexel Bldg., $5,099 (40 days) alternate $4,333; E. S. Eortel Co., 1913 Washington Ave., $6,295 (40 days) alternate $6,490 (40 days); W. Ehret Co., 36th St. and Grays Ferry Rd., $6,984 (30 days). Noted March 11.

D. C., Wash.—Dining Hall and Dormitory—Soldiers Home, received lowest a bids March 29, building dining hall and north wing of dormitory at soldiers home, from Boyle-Robertson Constr. Co., Evans Bldg., $733,649; W. P. Lipscomb Co., District Natl. Bank Bldg., $783,682; P. F. Gormley Constr. Co., Union Trust Bldg., $824,542.

★D. C., Wash.—Lighting Fixtures—U. S. Engr. Office, War Dept., let contract installing watertight lighting fixtures, to F. H. Lovell & Co., Arlington, N. J., $7,416.

Va., Norfolk — Drainage System—Spec. 4131—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids March 24, installing storm water drainage system, at Navy Yard, here, (1) work complete, from N. Connelly, 1905 Ridge Ave., Phila., (1) $32,845 (90 days), (2) $150, (3) $4, (4) $0.50, (5) $15; G. E. Eng. Co., 22 Laight St., New York City, (1) $52,750, (150 days), (2) $100, (3) $500, (4) $8, (5) $15; E. F. Monahan, 195 Hasting St., Manhattan Beach, N. Y., (1) $66,648 (120 days), (2) $200, (3) $7.50, (4) $5, (5) $15. Noted March 11.

★N. C., Morehead City—Completing Fire Protection System — Spec. 4073 — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract completing fire protection system, cleaning, riveting and painting 2 hangars and building wood stave tank, here, to F. Colenda, Jr., Morehead City, $10,500 (60 days). Noted March 18.

★S. C., Paris Island—Seawall, Roads, Curbs, Gutters, etc.—Spec. 4104—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building 2,062 lin.ft concrete seawall, 2,000 lin.ft. concrete roads, 15 and 18 ft. wide, 13,000 lin.ft. concrete curbs, gutters, sewers and drains, at Marine Barracks, here, to Waterfront & Foundations Co., 51 Broad St., Charleston, $116,886 (135 days). Noted March 4.

Fla., Apalachicola—Post Office and Customhouse—Treas. Dept., Wash., D. C., received bids March 29, building, here, (a) limestone, (b) sandstone, from R. P. Farnsworth & Co., New Orleans, (a) $96,923, (b) $100,000; King Lumber Co., Charlottesville, Va., (a) $99,700, (b) $102,000. Noted Feb. 12.

★Mich., Detroit—Radio Building—Spec. 4120—Pub. Wks. Office, let contract building, at Windmill Point, to W. M. Bateson, 609½ South Main St., Lima, O., $8,928 (120 days). Noted March 25.

★Mo., St. Louis—Remodeling Plumbing and Electric Lines—Treas. Dept., Wash., D. C., let contract remodeling in U. S. Appraisers Stores, here, to W. Wilby, Selma, Ala., $36,675. Noted March 25

Okla., Ardmore—Dormitory and Dairy Barn—Dept. of Interior, Office of Indian Affairs, Wash., D. C., received bids March 25, furnishing labor and material building brick dormitory and dairy barn, at Bloomfield Seminary, here, from G. W. Stiles Constr. Co., 11 South La Salle St., Chicago, $84,880 and $13,686 respectively (300 days); A. Motschman Co., Chicago, $107,800 and $15,100 respectively (400 days); Regan Constr. Co., Baltimore, Md., $112,349 and $24,136 respectively (200 days). Noted March 4.

Okla., Tulsa — Screen — Treas. Dep., Wash., D. C., received bids building screen at Post Office and Court House, here, from King Lumber Co., Charlottesville, Va., $16,900; G. E. Wright, Inc., 1461 Monadnock Blk., Chicago, $17,500; J. C. Glenn, Tulsa, $18,130.

★Cal., San Diego — Lighting Fixtures — Spec. 4129—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract furnishing and installing, in 6 buildings at Marine Barracks, here, to Croker Electric Co., 1270 Bway., New York City, $11,800 (120 days). Noted March 11

★Cal., San Diego—Storehouse and Hangars—Spec. 4087—Pub. Wks. Office, let contract building storehouse and 3 hangars "A," "B" and "C," at Naval Air Sta., to Lange & Bergstrom, Sharon Bldg., San Fransico, $115,327 (180 days). Noted March 18.

Miscellaneous

PROPOSED WORK

Greenhouse—Dorchester, Mass. (Boston P. O.)—Park & Recreation Dept., 33 Beacon St., Boston, soon let contract building 1 story, concrete and glass, in Franklin Park, here. About $60,000. Haven & Hoyt, 220 Devonshire St., Boston, archts. Noted Feb. 26.

Tower Piping—Pawtucket, R. I.—Jenks & Ballou, engrs., 1035 Grosvenor Bldg., Providence, soon let contract installing cooling tower piping in cooling tower, for Tamarack Co., Fountain St. About $15,000.

Steam Engine — Brooklyn, N. Y. — E. Riegelmann, boro. pres., rejected bids furnishing and delivering 1 steam engine. About $12,000. Will be readvertised.

Transformer Station—New York, N. Y.—New York Edison Co., Irving Pl. and 15th St., having plans prepared by W. Whitehill, archt. and engr., 32 Union Sq., for 113 x 177 ft., rein.-con. and steel transformer station, rein.-con. flooring, concrete foundation, on Inwood Ave. About $100,000.

Park Improvements — Camden, N. J. — City having plans prepared by Karcher & Smith, engrs., 34 South 17th St., Phila., for improvements to Cooper Sp. Park, to include building fountain, pool, etc. About $50,000.

Tar and Asphaltic Oil—Trenton, N. J.—Bd. Freeholders Mercer Co. receives bids about April 12, furnishing 150,000 gal. tar and 110,000 gal. asphaltic oil. About $90,000.

Switch Track, Coal Handling Machinery and Boilers—Springfield, O.—City plans to elevate switch track and install coal handling machinery and boilers, at waterworks. About $50,000. O. E. Carr, city mgr.

Scenic Railway—Detroit, Mich.—Ingersoll & McKee, Jefferson Ave., plan to build 4,200 ft., structural steel, concrete and timber scenic railway, at Riverside Park. W. H. Adams, Vinton Bldg., engr.

Asphalt Paving Plant—St. Paul, Minn.—H. W Austin, city purch. agt., rejected bids received March 1, furnishing asphalt paving plant, 400,000 lb. daily capacity. About $25,000. Noted March 18.

Portland Cement—St. Paul, Minn.—H. W. Austin, city purch. agt., rejected bids received March 1, furnishing 37,493 bbl. portland cement. Noted March 25.

Park—Muskogee, Okla.—City election April 6, to vote on $50,000 bonds to build athletic park. Engineer not selected.

Arch—Oklahoma City, Okla.—State plans to build 3 span granite memorial arch, 60 ft. high, 30 ft. wide, base to be 35 x 150 ft., on 16th St. and Lincoln Blvd. About $700,000. Engineer not selected.

Grain Elevator—Oklahoma, Okla.—Grain dealers, c/o P. J. Jacobson, plan to build concrete and steel grain elevator, concrete foundation, 2,000,000 bu. capacity. About $750,000. Engineer not selected.

Dam, etc.—St. Johns, Ariz.—State Loan Bd., Phoenix soon receives bids completing Lyman dam and extending main canal about 15 mi., involving 20,000 cu.yd rock and 50,000 cu.yd. earth at toe of dam, 26,000 cu.yd. earth riprapped with stone on upstream face, etc. About $315,000. A P Fleishman, c/o State Highway Dept., Phoenix, engr.

Subways, Culverts and Ornamental Lights—Tuscon, Ariz.—City plans election to vote on $80,000 bonds to build 2 rein.-con. subways, $75,000 for concrete culverts and $35,000 for ornamental lights. W. C. Lafebure, city engr.

Railway Equipment—Canada—Dominion Government, Ottawa, plans to expend about $16,925,000 on miscellaneous railway equipment. W. A. Bowden, Western Blk., Ottawa, ch. engr.

Harbor Improvements—St. John, N. B.—Dept. Pub. Wks., Ottawa, soon receives bids for harbor improvements, here. About $1,250,000. H. Dufresne, St. John, engr.

Hockey and Skating Arena—Kitchener, Ont.—Young Men's Business Assn. plans to build hockey and skating arena, brick and steel, concrete foundation. About $250,000. Architect and engineer not selected.

Boilers and Pumps—Ottawa, Ont.—City soon let contract for one 100 h.p. boiler and two asphalt pumps. A. F. Macallum, city engr.

Harbor Improvements—Port Arthur, Ont.—Dept. Pub. Wks., Ottawa, soon receives bids for river and harbor improvements here and at Ft. William. About $600,000. E. Lafleur, c/o Dept. Pub. Wks., engr.

Harbor Improvements — Toronto, Ont. — Dept. Pub. Wks., Ottawa, soon receives bids for harbor improvements, here. About $1,700,000. E. Lafleur, c/o Dept. Pub. Wks., engr.

BIDS DESIRED

Bituminous Material — Albany, N. Y. — Until April 12, by State Highway Comm., Capitol, furnishing and delivering bituminous material, f.o.b cars. F. S. Greene, comr.; advertised in this issue.

Cast Iron Pipe — Buffalo, N. Y. — Until April 17, by Dept. Pub. Wks., furnishing 1,000 ton 4-16 in. c.i. pipe, to be delivered on or before Aug. 1.

Shell Bucket—Buffalo, N. Y.—Buffalo Steel Car Co., Fidelity Bldg., receiving bids for 1½ cu.yd. clam shell bucket.

Gates, Valves, Etc.—Grand Gorge, N. Y.—Until April 13, by Bd. Water Supply, Municipal Bldg., New York City, furnishing and delivering gate valves, hydraulic cylinders, bronze castings and appurtenances for Gilboa Dam and Shandaken Tunnel. J. F. Galvin, pres.; advertised in this issue.

Refined Asphalt—New York, N. Y.—Until April 6, by H. H. Curran, pres. Manhattan Boro., furnishing and delivering 450,000 gal. refined asphalt.

Transformer Station—New York, N. Y.—Until April 5, (change of date), by W. Whitehill archt. and engr., 32 Union Sq., building 3 story, 45 x 75 ft., rein.-con. and steel, concrete foundation, on East 6th St., for New York Edison Co., Irving Pl. and 15th St. About $60,000 Noted Jan. 29.

Piers—Stapleton, S. I., N. Y.—Until April 13, by M. Hurlburt, comr. docks, Pier "A." North River, foot of Battery Pl., New York City, furnishing labor and material building at individual prices one of Piers 15 and 16, here.

Asphalt Plant—Atlantic City, N. J.—Until April 15, by Bd. Comrs., City Hall, furnishing and erecting asphalt plant. L. A. Steinbricker, dir.; advertised in this issue.

Miscellaneous (Continued)

Limestone Dust and Stone—Jersey City, N. J.—Until April 5, by Hudson Co. Park Comrs., 1 Exch. Pl., furnishing 400 cu.yd. limestone dust, containing no particle which will not pass through ¼ in. mesh, also 50 cu.yd. ⅜ in. stone.

Pipe—Trenton, N. J.—Until April 5, by City Comn., furnishing 50 ton 4 in. and 100 ton 6 in. Class "B" c.i. water pipe. About $11,000. A. Bugbee, city engr.

Tanks—Bradford, Pa.—Kendall Refining Co., Kendall Ave., receiving bids for two 10,000 gal. storage tanks. P. C. Hubbard, purch. agt.

Lock—Freeport, Pa.—Until April 12, by Bd. Harbor Comn., Pittsburgh, building Lock 5, on Allegheny River, above here.

Bituminous Materials—Baltimore, Md.—Until April 7, by Bd. Awards, furnishing and delivering bituminous materials to Highways Engineer's Dept. G. F Wieghardt, highways engr.; advertised in this issue.

Earth Fill—Detroit, Mich.—Until April 3, by T. Campau, engr., 502 Whitney Office Bldg., leveling off earth fill back of seawall, sand and clay mixed, over area 4,000 ft. long and 600 ft. wide, involving 267,000 sq.yd. grading, for Windmill Point Land Co. About $25,000.

Swimming Pool — Aurora, Ill. — Until April 25, by W. G. Bohnstengel, chn. Bd. Park Comrs, building concrete swimming pool, in Phillips Park; advertised in this issue.

Tractors—Pipestone, Minn.—Until April 14, by T. A. Bailey, aud. Pipestone Co., furnishing 3 light tractors suitable for road dragging.

White Way — Tonkawa, Okla. — See "Waterworks."

Pontoons—Portland, Ore.—Until April 8, by Comn. Pub. Wks., building 5 pontoons of floating drydock. About $1,000,000. G. G. Hegardt, foot Stark St., engr.

Portland Cement—San Diego, Cal.—Until April 13, by E. D. Williams, purch. agt., furnishing 25,000 bbl. Portland cement.

Telegraph Poles — Nova Scotia — Until April 6, by Dept. Pub. Wks., Ottawa, for supply and delivery of 928 poles more or less, of spruce or cedar (cedar preferred) 25 ft. long, not less than 5 in at top, distributed between Englishtown and Ingonish Ferry, also 1,020 poles distributed between Port Hawkesbury and Port Hood. About $14,000. D. H. Keeley, supt.

Road Materials — Montreal, Que. — Until April 8, by M. P. Fennell, Jr., secy., for concrete and macadamizing stone, sand, portland cement, oils, shoveling grain, castings, steel bars, and testing materials. F. W. Cowle, ch. engr.

Road Machinery—Brantford, Ont.—A. M. Jackson, supt. Brant Co., receiving bids for road rollers, crushers, graders, etc. About $26,000.

Sewer Cleaning Machines—Niagara Falls, Ont.—Until April 10, by D. T. Black, city engr., supplying sewer cleaning machines and appliances; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Field House and Swing Shelter—Boston, Mass.—Park & Recreation Dept., 33 Beacon St., received bids March 25, building 1 story, 20 x 50 ft., brick field house and swing shelter, on Mozart St., from W. Crane, 1 Hayward St., Cambridge, $16,445; R. A. Bossi, Dorchester, $17,895; J. J. Flyan, 101 Tremont St., $19,223.

★Gate Boxes, etc—Boston, Mass.—Comr. Pub. Wks. let contract furnishing 150 ton 3 part gate boxes and covers, to Central Iron Fdry. Co., Boston, $20,160; 1,420 ton 8-24 in. c.i. water pipe and 15 ton special castings, to R. D Wood Co., Boston, $107,250.

★Pier—Boston, Mass.—Comr. Pub. Wks. let contract driving piles, setting timber guards for rebuilding south pier, involving 700 lin.ft. oak timber girders, 325 wood piles 40 ft. and over, to W. S. Rendle Co., East Boston, $14,049.

★Memorial Field—Brockton, Mass.—G. E. Keith, Station Ave., let contract building memorial field, including grading and concrete culvert, to C. A. Batson, 26 Arlington St. About $70,000.

★Dam—Burnside, Conn.—Burnside Tissue Mills, Inc., Church St., let contract building rein.-con. dam at plant, to Casper Ranger Constr. Co., 20 Bond St., Holyoke, Mass. About $22,000.

★Swimming Pool—Hartford, Conn.—Capitol Park Realty Co., 67 California St., West Haven, let contract building rein.-con. swimming pool at Capitol Park, on Wethersfield Ave., here, to Lathrop & Shea Co., 185 Church St., New Haven. About $150,000.

Road Materials—Brooklyn, N. Y.—E. Riegelmann, boro. pres., received bids March 24, furnishing and delivering (a) 2,000 cu.yd. broken stone, (b) 60,000 wood paving blocks, (c) 2,000 cu.yd. sand grit, from J. J. Guinan, 2314 Gravesend Ave., (a) $6,600, (c) $6,800; F. J. Gallagher, 490 Park Pl., (a) $6,760; J. Grillo, (a) $6,800; Amer. Creosoting Co., 17 Battery Pl., New York City, (b) $4,411; E. E. Buhler Co, Greenpoint Ave., (b) $5,400; G. Eaton, 331 Pearl St., (c) $6,660. Noted March 18.

★Tractors—Brooklyn, N. Y.—E. Riegelmann, boro. pres, let contract furnishing and delivering 4 tractors, to White Co., 360 Madison Ave., New York City, $18,219. Noted Feb. 19.

★Road Materials—Long Island City, N. Y.—M. E. Connolly, pres. Queens Boro, let contract furnishing and delivering 2,900 cu.yd. broken stone, to Annarock Eng. & Constr. Co., $9,253; 5,000 cu.yd. sand, to Kennedy-Smith, Inc., $14,350; 100,000 hard wood and 100,000 oak key paving blocks, to C. H. and R. C. Peckworth, 1170 Bway., New York City, $7,457 and $6,500 respectively; 500 net ton lime, to E. E. Buhler Co, 103 Park Ave., New York City, $12,225. Noted March 18.

★Tractors — Long Island City — M. E. Connolly, pres Queens Boro., let contract furnishing and delivering 3 tractors, to J. H. Conell, $2,391. Noted March 4.

Cast Iron Pipe, etc.—New York, N. Y.—Bd. Purchase, Municipal Bldg., received bids March 23, furnishing c.i. pipe and castings, from J. Fox & Co., East Orange, N. J., $146,796, United States Cast Iron Pipe & Fdry. Co., 71 Bway., $148,510; lumber, from G. Elias & Bro., $5,226, J. A. Maloney Co, 1182 Bway., $5,374.

Dust and Coal—New York, N. Y.—H. H. Curran, pres. Manhattan Boro., received bids furnishing and delivering 3,000 ton limestone dust, from New York Trap Rock Corp., 17 Battery Pl., $29,160; coal, from W. Farrell & Son, 6 Church St., $349,995. Noted March 18

Road Materials—New York, N. Y.—H. Bruckner, pres. Bronx Boro., received bids furnishing and delivering motor gasoline, from Standard Oil Co., 26 Bway., $2,130; 5,500 cu.yd. asphalt wearing surface sand, from C. W. Crane, $8,250. Noted March 18.

Pipe Tunnel, etc.—Ossining, N. Y.—C. F. Rattigan, supt. state prisons, Capitol, Albany, received bids March 23, building pipe tunnel, here, from Fox, Reynolds Co., Inc., 81 East 125th St., New York City, $130,109; labor and material for heating, from A. B. Barr & Co, 6 River St., Yonkers, $92,936, J. W. Danforth Co., 70 Ellicott Sq., Buffalo, $96,900, W. B. Armstrong Co., 3 Fulton St., Albany, $98,000; electric work, from Jandous Electric Equipment Co, 109 West 31st St., New York City, $16,990, I Fagens, Inc, New York City, $17,000, T. F. Jackson Co., Inc., 99 John St., New York City, $17,841. Noted March 4.

★Generators and Turbine Equipment — Watertown, N. Y.—Beebes Island Corp. let contract furnishing 3 electric generators, 2,500 kw. each, to General Electric Co., River Rd., Schenectady; turbine equipment, to Wellman Seaver Morgan Co, 7000 Central Ave., S. E., Cleveland, O. Total cost, $250,000.

Slag—Dover, Del.—State Highway Comn. received bids March 17, furnishing 10,000 tons slag, from Natl. Slag Co., Bethlehem, Pa., at $1 per ton; Duquesne Slag Co., Pottstown, Pa., $1 per ton; E. R. Pussey, Swedeland, Pa., $1.10 per ton. Noted Feb. 26.

★Centrifugal Feed Pumps—Cleveland, O.—E. Shattuck, city purch. agt., let contract furnishing 2 steam turbine driven centrifugal feed pumps, to J. L. Skeldon Co., Rockefeller Bldg., $13,320. Noted March 4.

★Conveyers—Cleveland, O.—City let contract furnishing conveyers for Willow disposal plant, to Union Eng. Co., West 4th St. and Cuyahoga Ave., $9,400.

★Culvert—Cleveland, O.—Fisher Body Co., Oakland and Piquette Aves., Detroit, let contract building 1,755 ft., concrete culvert, on East 140th St., here, to F. R. Jones Co., Wayside Rd. About $100,000.

★Fill—Cleveland, O.—City let contract filling in trestle on East 55th St., involving 75,000 cu.yd. earth, to Ohio Iron & Supply Co., East 34th St. and Bway. About $27,000. Noted March 11.

Heating and Ventilating System—Cleveland, O.—Bd. Educ. received bids for heating and ventilating system, for Warner Rd. School, from W. B. Van Sickle, 701 Frankfort Ave., $119,590; Chappell-Warren Co., 1838 St. Clair Avo., $125,808.

★Locomotive Crane—Cleveland, O.—E Shattuck, city purch. agt., let contract furnishing one ¾ yd. grab bucket type locomotive crane, to Browning Co., East 162nd St. and Waterloo Rd., $8,670. Noted Feb 26.

★Motor Trucks—Cleveland, O.—City let contract furnishing 5 motor trucks with dump bodies, to White Co, East 79th St. and St. Clair Ave., $16,516.

★Ornamental Light Standards — Cleveland, O.—City let contract furnishing 200 ornamental light standards, to Union Metal Mfg. Co, Canton, $24,252 Noted Feb. 12.

★Ornamental Park Lanterns—Cleveland, O.—City let contract furnishing 200 ornamental park lanterns, to General Electric Co., Nela Park, $11,180.

★Pier, etc.—Detroit, Mich.—Klings Products Co., 1424 East Jefferson St., let contract building rein.-con. and timber pier and concrete foundation for 1 story, 110 x 120 ft., rein.-con. and steel pavilion, rein.-con. flooring, on East Jefferson Ave., to include rein.-con., steel and wood sheet pilin, to Candler Ditch & Dredge Co., 305 Moffat Bldg. About $20,000.

Valves and Hydrants—Saginaw, Mich.—City let contract furnishing valves and hydrants for year, to Flower Valve Co., Clayton and Parkinson Sts., Detroit, 4 in. valves, $13.75; 6 in., $25; 8 in., $40; 10 in., $60; 12 in., $76; 14 in., $114; 16 in., $143 and 5 in. compressed hydrants, $74.80 each.

★Road Oil, Asphalt, Pitch and Tar—Minneapoils, Minn.—K. E. Alexander, city purch. agt., let contract to Carson Petroleum Co., 208 South La Salle St., Chicago, furnishing 1,000,000 gal. road oil, No. 1 at $0.0823 per gal., No. 2, $0.0748 per gal., No. 3, $0.0780 per gal.; Minnesota Road Equipment Co., 922 Laurel Ave., 400 tons asphalt, in tanks, $23.48, in wooden bbl., $27.95; Barrett Co., 1 19th Ave., S., 1,500 tons pitch, $24, also 1,000 tons tar, $22.87. Noted Feb. 5.

★Sewer Pipe, Hydrants and Gate Valves—Minneapolis, Minn.—K. E. Alexander, city purch. agt., let contract to Red Wing Sewer Pipe Co., Red Wing, furnishing segmental block sewer pipe, various sizes, at various prices; Columbian Iron Wks., 811 Boyce St., Chattanooga, Tenn., 50 fire hydrants, at $80.55, also fifty 6 in. gate valves, at $23.95, twelve 8 in., at $37.85, and six 12 in., at $72.35. Noted Jan. 8.

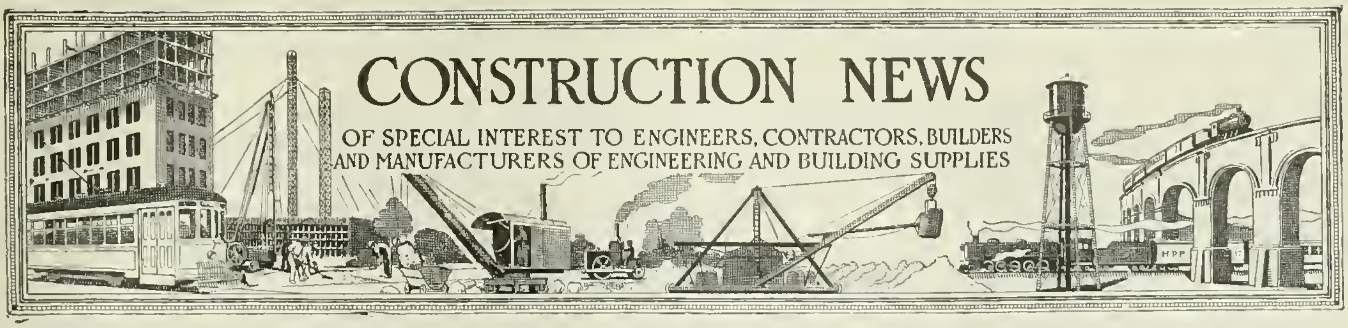
★Asphalt Road Oil—St. Paul, Minn.—G. Rice, aud. Ramsey Co., let contract furnishing 150,000 gal. 40-50 per cent asphalt road oil, to Alden, Spears Sons Co., 63 East South Water St., Chicago, cost $.05½ f.o.b. Natchez, Tex. Noted Jan. 8.

★Electric Improvements — Iola, Kan. — City let contracts improving electric system (turbo-generator unit), to Allis-Chambers Co., West Allis, Wis., $26,710; condenser, to H. R. Worthington Co., 824 Scarritt Bldg., Kansas City., Mo., $10,528.

★Wharf — Orange, Tex. — Lutcher & Moore Lumber Co. let contract building 90 x 500 ft. wharf, to include 1,200 ft. piling and 700 M. ft. lumber, to J. Jacobson, 315 22nd St., Galveston. About $90,000.

★Cement — Tucson, Ariz. — Pima Co. Highway Comn. let contract furnishing 320 bbl. cement, to A. Steinfeld & Co., Tucson, $3.25 per bbl.

Cast Iron Pipe—Windsor, Ont.—City let contract for 320 tons 4-8 in. c.i. pipe, to Natl. Iron Corp., Cherry St., Toronto. About $30,000.



CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

PROPOSALS

"For proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Apr. 12	Defiance, O. Adv. Mar. 11.	Mar. 11
Apr. 15	Catawissa, Pa.	Apr. 1
Apr. 19	Altus, Okla.	Apr. 1
Apr. 19	Steger, Ill. Adv. Apr. 8.	Apr. 8
Apr. 23	Akron, O.	Apr. 8
Apr. 26	Elyria, O. Adv. Apr. 1.	Apr. 1
Apr. 27	Newark, N. J.	Apr. 1
Apr. 27	Billings, Mont.	Apr. 8
May 1	Montreal, North Que.	Mar. 18
May 7	Preston Idaho Adv. Apr. 8.	Apr. 8
May 17	Pontiac, Mich. Adv. Apr. 8.	Apr. 8

SEWERS

Bids Close		See Eng. News-Record
Apr. 12	Newton, Ia.	Apr. 8
Apr. 12	Elmhurst, Ill.	Mar. 18
Apr. 13	Woodbury, N. J	Mar. 18
Apr. 14	Portland, Ore. Adv. Mar. 25.	Mar. 25
Apr. 14	Wauseon, O.	Apr. 1
Apr. 14	Long Island City, N. Y.	Apr. 8
Apr. 15	Clarksburg, W. Va.	Apr. 1
Apr. 16	Plainview, Minn.	Apr. 1
Apr. 19	Pleasantville, N. J.	Apr. 1
Apr. 19	Vandergrift, Pa. Adv. Apr. 8.	Apr. 8
Apr. 19	La Junta, Col. Adv. Apr. 1.	Apr. 1
Apr. 20	Avon-by-the-Sea, N. J.	Apr. 8
Apr. 21	Portland, Ore. Adv. Mar. 25.	Mar. 25
Apr. 21	Aberdeen, Wash.	Apr. 8
Apr. 26	Cape Girardeau, Mo.	Mar. 25
Apr. 27	Potomac, Va. Adv. Apr. 1 and 8.	Apr. 8
Apr. 28	Portland, Ore. Adv. Mar. 25.	Mar. 25
Apr. 29	Viroqua, Wis. Adv. Apr. 8.	Apr. 8
May 5	Portland, Ore. Adv. Mar. 25.	Mar. 25

BRIDGES

Bids Close		See Eng. News-Record
Apr. 13	Georgetown, Tex.	Mar. 25
Apr. 13	Romeo, Mich.	Apr. 1
Apr. 13	Tisbury (Vineyard Haven P. O.), Mass.	Apr 8
Apr. 14	Flint, Mich.	Apr. 1
Apr. 14	Milton, Fla.	Mar. 18
Apr. 14	Careyville, Fla.	Mar. 18
Apr. 15	Oklahoma	Apr. 8
Apr. 15	Louisville, Ill.	Mar. 25
Apr. 19	Bunkerville, Nev. Adv. Apr. 1 and 8.	Apr. 1
Apr. 20	Newton, Ga.	Mar. 18
Apr. 22	Hawkinsville, Ga.	Apr. 1
Apr. 26	Irene, Ariz. Adv. Apr. 1 and 8.	Apr. 1
Apr. 27	Gilboa, N. Y. Adv. Apr. 8.	Apr. 8
May 3	Columbus, O.	Apr. 8
May 3	Grand Rapids, Minn.	Apr. 8

STREETS AND ROADS

Bids Close		See Eng. News-Record
Apr. 12	Winder, Ga. Adv. Apr. 1.	Apr. 1
Apr. 12	Van Horn, Tex.	Mar. 18
Apr. 12	Waco, Tex.	Apr. 1
Apr. 12	Salem, N. J. Adv. Mar. 25, Apr. 1 and 8.	Mar. 25
Apr. 12	Seattle, Wash.	Mar. 25
Apr. 12	California	Mar. 25
Apr. 12	Mt. Clemens, Mich.	Mar. 25
Apr. 12	Jefferson, O.	Apr. 1
Apr. 12	Camden, N. J. Adv. Apr. 1 and 8.	Apr. 1
Apr. 12	Aitkin, Minn.	Apr. 1
Apr. 12	Seattle, Wash.	Apr. 1
Apr. 12	Palmerton, Pa.	Apr. 1
Apr. 12	New Jersey	Apr. 1
Apr. 12	Indiana	Apr. 8
Apr. 12	Van Horn, Tex.	Apr. 8
Apr. 12	Nevada Adv. Apr. 8.	Apr. 8
Apr. 12	Chicago Heights, Ill.	Apr. 8
Apr. 13	Michigan	Apr. 8
Apr. 13	Trenton, N. J.	Apr. 8
Apr. 13	Red Lodge, Mont.	Apr. 8
Apr. 13	Hartford, Conn.	Apr. 8
Apr. 13	Pennsylvania	Mar. 25
Apr. 13	Hutchinson, Minn.	Apr. 1
Apr. 13	Paterson, N. J.	Apr. 1
Apr. 13	Hutchinson, Kan.	Mar. 25
Apr. 13	Florence, Ala.	Apr. 8
Apr. 14	Seymour, Tex.	Apr. 8
Apr. 14	Winchester, Ky.	Apr. 8
Apr. 14	Geneva, Ill.	Apr. 8
Apr. 14	Parkersburg, W. Va.	Apr. 8
Apr. 14	Coleman, Tex.	Apr. 8
Apr. 14	Tyler, Tex.	Apr. 8
Apr. 14	Mays Landing, N. J.	Mar. 18
Apr. 14	Cottonwood Falls, Kan.	Mar. 25
Apr. 14	Michigan	Apr. 1
Apr. 14	Tyler, Tex.	Apr. 1
Apr. 14	Wauseon, O	Apr. 1
Apr. 15	North Bergen, N. J.	Apr. 1
Apr. 15	Ontario	Apr. 1
Apr. 15	Michigan	Apr. 1
Apr. 15	Clarksburg, W. Va.	Apr. 1
Apr. 15	Bradford, Pa.	Mar. 25
Apr. 15	South Dakota	Apr. 1
Apr. 15	Buffalo, Wyo.	Apr. 8
Apr. 15	Easton, Md. Adv. Mar. 25, Apr. 1 and 8.	Mar. 25
Apr. 15	Enterprise, Ore.	Apr. 8
Apr. 15	Michigan	Apr. 8
Apr. 15	Tulsa, Okla.	Apr. 8
Apr. 16	San Antonio, Tex.	Apr. 8
Apr. 16	Lawrenceville, Ga.	Apr. 8
Apr. 16	Jasper, Ala.	Apr. 8
Apr. 16	New York Adv. Apr. 1 and 8.	Apr. 1
Apr. 16	South Dakota	Apr. 1
Apr. 16	Fresno, Cal.	Apr. 1
Apr. 16	Ferndale, Pa.	Apr. 1
Apr. 16	Ortonville, Minn.	Apr. 1
Apr. 16	Plainview, Minn.	Apr. 1
Apr. 16	Michigan	Apr. 1
Apr. 17	Michigan	Apr. 1
Apr. 17	Indiana	Apr. 8
Apr. 17	Brainerd, Minn.	Mar. 25
Apr. 19	Akron, O. Adv. Apr. 1 and 8.	Apr. 1
Apr. 19	Goldendale, Wash.	Apr. 1
Apr. 19	Logan, W. Va.	Apr. 1
Apr. 19	Easton, Md.	Mar. 25
Apr. 19	Grafton, W. Va.	Mar. 25
Apr. 19	Montana Adv. Apr. 8.	Apr. 8
Apr. 19	Chester, Pa. Adv. Apr. 8.	Apr. 8
Apr. 20	Phila., Pa.	Apr. 8
Apr. 20	Indiana	Apr. 8
Apr. 20	New Jersey	Apr. 8
Apr. 20	Meade, Kan.	Mar. 18
Apr. 20	Colfax, Wash.	Mar. 11
Apr. 21	Rockwood, Man.	Mar. 25
Apr. 21	Freehold, N. J.	Apr. 1
Apr. 21	Preston, Minn.	Apr. 1
Apr. 21	Michigan	Apr. 8
Apr. 22	Owatonna, Minn.	Apr. 1
Apr. 22	Rock Hills, S. C.	Apr. 1
Apr. 22	Great Falls, Mont.	Apr. 8
Apr. 22	Phoenix, Ariz.	Apr. 8
Apr. 23	Barbourville, Ky.	Apr. 8
Apr. 23	Beeville, Tex.	Apr. 8
Apr. 24	Montana Adv. Apr. 8.	Apr. 8
Apr. 26	Montana Adv. Apr. 8.	Apr. 8
Apr. 26	Junction City, Tex.	Apr. 1
Apr. 26	Chaska, Minn.	Apr. 1
Apr. 26	Little Rock, Ark.	Apr. 8
Apr. 26	Albion, Idaho	Apr. 1
Apr. 27	Ivanhoe, Minn.	Apr. 1
Apr. 27	Hastings, Minn.	Apr. 1
Apr. 27	Pennsylvania	Apr. 8
Apr. 27	Meadville, Pa. Adv. Apr. 8.	Apr. 8
Apr. 28	Birmingham, Ala.	Apr. 8
Apr. 30	Ft. Wayne, Ind.	Apr. 8
Apr. 30	El Dorado, Ark.	Apr. 8
May 1	Lancaster, O.	Apr. 1
May 3	Grand Rapids, Mich.	Apr. 1
May 4	Mantorville, Minn.	Apr. 1
May 4	Lorain, O.	Apr. 8
May 5	El Dorado, Ark.	Apr. 8
May 5	Grand Rapids, Mich.	Apr. 1

EXCAVATION AND DREDGING

Bids Close		See Eng. News-Record
Apr. 10	Harlowton, Mont.	Apr. 8
Apr. 12	Jefferson, Ia.	Apr. 8
Apr. 16	Hull, Ill.	Apr. 1
Apr. 22	Ft. Madison, Ia. Adv. Apr. 1 and 8.	Apr. 1
Apr. 25	Ontario	Mar. 25
May 20	Basin, Wyo.	Apr. 1

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
Apr. 12	South River, N. J. Adv. Mar. 18 and 25, Apr. 1 and 8.	Mar. 18
Apr. 12	Sidney, O	Apr. 8
Apr. 12	Sioux City, Ia.	Apr. 8
Apr. 13	Olympia, Wash.	Apr. 8
Apr. 14	Brooklyn, N. Y.	Apr. 8
Apr. 15	Detroit, Mich.	Apr. 1
Apr. 15	Edwardsville, Pa.	Apr. 8
Apr. 15	Montreal, Que.	Apr. 8
Apr. 20	Comstock, N. Y. Adv. Apr. 1.	Apr. 1
Apr. 20	Williamsport, Pa.	Apr. 8
Apr. 24	Brooklyn, N. Y.	Apr. 8
Apr. 25	Cincinnati, O.	Apr. 8
Apr. 27	Lebanon, O.	Apr. 1
Sept. 1	Hutchinson, Kan.	Feb. 19

BUILDINGS

Bids Close		See Eng. News-Record
Apr. 10	Electra, Tex.	Apr. 8
Apr. 12	Cedar Rapids, Ia.	Mar. 25
Apr. 12	Hiawatha, Kan.	Apr. 1
Apr. 12	Ford City (Wyandotte P. O.), Mich.	Apr. 8
Apr. 12	Minneapolis, Minn.	Apr. 8
Apr. 12	Dalhart, Tex.	Apr. 8
Apr. 13	New York, N. Y.	Apr. 8
Apr. 13	Berkeley, Cal.	Apr. 1
Apr. 14	Hawarden, Ia.	Apr. 1
Apr. 14	Waterloo, Ia.	Apr. 1
Apr. 15	Lake Wawasee, Ind.	Apr. 8
Apr. 15	Morrilton, Ark.	Apr. 8
Apr. 15	Lincolnton, N. C.	Apr 8
Apr. 15	Hastings, Neb.	Apr. 1
Apr. 15	Worthington, Minn.	Apr. 1
Apr. 15	Deer River, Minn.	Mar. 25
Apr. 15	Reading, Pa.	Apr. 1
Apr. 15	Detroit, Mich.	Apr. 1
Apr. 15	Fergus Falls, Minn.	Mar. 25
Apr. 15	Mt. Morris, Mich.	Mar. 25
Apr. 15	Riverton, Wyo.	Mar. 4
Apr. 15	Croton, O.	Apr. 1
Apr. 15	Coleraine, Minn.	Mar. 18
Apr. 15	Wheatland, Wyo.	Mar. 4
Apr. 15	Delmont, S. D.	Feb. 26
Apr. 15	Detroit, Mich.	Apr. 8
Apr. 16	Waterloo, Ia.	Apr. 1
Apr. 16	Shelton, Conn.	Apr. 8
Apr. 17	Morley, Ia.	Apr. 1
Apr. 17	Greensburg, Ind.	Apr. 8
Apr. 17	Parma, O.	Apr. 8
Apr. 19	Gering, Neb.	Mar. 25
Apr. 19	Sioux City, Ia.	Apr. 1
Apr. 20	Hibbing, Minn.	Apr. 1
Apr. 20	Newton (Boston P. O.), Mass.	Apr. 1
Apr. 20	Glidden, Ia.	Apr. 1
Apr. 20	Huntington, W. Va.	Apr. 8
Apr. 20	Buhl, Idaho	Apr. 1
Apr. 20	Wende (Millgrove P. O.), N. Y.	Apr. 1
Apr. 23	Alden, N. Y	Mar. 25
Apr. 25	Indiana, Pa.	Apr. 1
Apr. 27	Hibbing, Minn.	Apr. 1
Apr. 30	Northfield, Minn.	Apr. 8
May 1	Racine, Wis.	Apr. 1
May 11	Sonyca, N. Y.	Apr. 8

FEDERAL GOVERNMENT WORK

Bids Close		See Eng. News-Record
Apr. 13	Building—Chelsea, Mass.	Apr. 1
Apr. 13	Officers Double Quarters—Phila., Pa. Adv. Apr. 1.	Apr. 1
Apr. 14	Sidewalk—Alexandria, Va.	Apr. 1
Apr. 14	Reinforcing Trusses—Spec. 4150—Hampton Roads, Va.	Apr. 8
Apr. 14	Quarters, Power, Pump and Blower Houses—Spec. 4141—Guam, P. I.	Apr. 8
Apr. 15	Dredging—Detroit, Mich.	Mar. 18

Bids Close		See Eng. News-Record
Apr. 15	Electric Freight Elevator, Birmingham, Ala.	Mar. 25
Apr. 15	Lighting Plant and Water Supply System, Charleston, S. C.	Mar. 25
Apr. 15	Steel Hangar, Brooks Field, Tex. Adv. Mar. 25.	Mar. 25
Apr. 15	Boiler Repairs, Cincinnati, O.	Mar. 25
Apr. 15	Removing and Rebuilding—Baltimore, Md. Adv. Apr. 8.	Apr. 8
Apr. 16	Lock and Abutments—Addison, Ky. Adv. Apr. 8.	Apr. 8
Apr. 16	Lock—Pittsburgh, Pa. Adv. Mar. 18.	Mar. 18
Apr. 16	Rock Excavation, Chicago, Ill. Adv. Mar. 25.	Mar. 25
Apr. 19	Dredging—Phila. Pa.	Apr. 1
Apr. 20	Dredging, Tonawanda, N. Y. Adv. Mar. 25.	Mar. 25
Apr. 20	Bombproof Switchboard Building and Bombproof Cover for Casemate, Ft. Monroe, Va. Adv. Mar. 25.	Mar. 25
Apr. 20	Dredge Pontoon Catamarans—Savannah, Ga. Adv. Apr. 8.	Apr. 8
Apr. 21	Barracks — Spec. 4086 — Kaukau, H. T.	Mar. 18
Apr. 21	Power Plant Piping—Spec. 4161—Phila., Pa.	Apr. 8
Apr. 21	Aviation Facilities—Spec. 4132—Yorktown, Va.	Apr. 8
Apr. 23	Dredging, Cleveland, O. Adv. Mar. 25.	Mar. 25
Apr. 26	Coal—Memphis, Tenn. Adv. Apr. 8.	Apr. 8
Apr. 27	Steel Bars—Wash., D. C.	Apr. 8
Apr. 28	Buoys—Spec. 4068—Yorktown, Va.	Apr. 8
Apr. 28	Track Scale—Wash., D. C.	Apr. 8
Apr. 28	Storehouses, Garage and Quarters — Spec. 4048 — Keyport, Wash.	Apr. 1
Apr. 29	Removing and Rebuilding Breakwaters — Milwaukee, Wis.	Apr. 1
May 1	Power House — Cypress, Ind. Adv. Apr. 8.	Apr. 8
May 3	Bridge—Alaska Adv. Jan. 22.	Jan. 22
May 5	Dredging — Port Huron, Mich. Adv. Apr. 8.	Apr. 8

MISCELLANEOUS

Apr. 12	Lock—Freeport, Pa.	Apr. 1
Apr. 12	Bituminous Material—Albany, N. Y. Adv. Apr. 1 and 8.	Apr. 1
Apr. 12	Breakwater, Toronto Island, Ont.	Mar. 25
Apr. 13	Portland Cement — San Diego, Cal.	Apr. 1
Apr. 13	Piers — Stapleton, S. I., N. Y.	Apr. 1
Apr. 13	Gate Valves, etc.—Grand Gorge, N. Y. Adv. Apr. 1.	Apr. 1
Apr. 14	Tractors—Pipestone, Minn.	Apr. 1
Apr. 15	Asphalt Plant — Atlantic City, N. J.	Apr. 1
Apr. 16	Refined Asphalt — New York, N. Y.	Apr. 1
Apr. 17	Cast Iron Pipe—Buffalo, N. Y.	Apr. 1
Apr. 20	Pier Shed, Brooklyn, N. Y. Adv. Mar. 25, Apr. 1 and 8.	Mar. 25
Apr. 20	Centrifugal Sewage Pump—Toronto, Ont.	Mar. 11
Apr. 20	Sea Outfall—Avon-by-the-Sea, N. J. Adv. Apr. 8.	Apr. 8
Apr. 20	Seawall—Boston, Mass.	Apr. 8
Apr. 21	Bituminous Concrete, Asphalt, Tar, Limestone, Trap Rock, Slag and Gravel—Trenton, N. J. Adv. Apr. 8.	Apr. 8
Apr. 21	Aqueduct Tunnels, San Francisco, Cal.	Mar. 25
Apr. 22	Stations—Brooklyn, N. Y.	Apr. 8
Apr. 25	Swimming Pool—Aurora, Ill.	Apr. 1
Apr. 27	Guide Walls—Marbletown, N. Y. Adv. Apr. 8.	Apr. 8
Apr. 27	Steel—New Orleans, La. Adv. Apr. 8.	Apr. 8
Apr. 29	Heating and Ventilating System—Lorain, O. Adv. Apr. 8.	Apr. 8

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. Y., Tonawanda—City plans to install 90 x 190 ft., brick and rein.-con. filtration plant, concrete flooring. About $200,000. Election soon to vote on bonds for project. T. W. Barrally, Tonawanda, engr.

O., Cleveland—City plans to build Baldwin reservoir, concrete, also pumping station, filter house, gate houses and pipe line in immediate vicinity, cost $2,000,000; East Side filter-plant with necessary pumping units and equipment, also reservoir, pumping station, filter basin and gate houses, $5,000,000. A. V. Ruggles, City Hall, engr.

O., Norwood—City having plans prepared by W. Franklin, archt., Gerke Bldg., East 6th St., Cincinnati, rebuilding waterworks system, destroyed by fire last year. S. Crew, city engr. and serv. dir.

S. D., Mobridge—City had plans prepared improving waterworks system. About $175,000. Burns & McDonnell, Interstate Bldg., Kansas City, Mo., consult. engrs.

N. D., Leeds—City Council rejected bids building 50,000 gal. steel tank on tower, 7,180 ft. 4-8 in. c.i. mains, 23,000 gal. rein.-con. reservoir, etc. T. R. Atkinson, Bismarck, engr. Noted March 11.

N. D., Pembina—City plans to build complete waterworks system. About $28,000. C. L. Pillsbury Co., Metropolitan Life Bldg., Minneapolis, Minn., engrs.

Mont., Choteau—City plans to build gravity pipe line for waterworks system, involving 30,000 lin.ft. 10 in. wood pipe. About $60,000. J. W. Hall, Choteau, engr.

Mont., Shelby—City voted $37,400 bonds to improve waterworks system.

Okla., El Reno—City having plans prepared improving waterworks system, to include 2,000,000 gal. well supply, etc. Bonds for $400,000 voted for project. Burns & McDonnell, Interstate Bldg., Kansas City,

Idaho, Rigby—City voted $50,000 bonds to improve waterworks system.

Wash., Pomeroy—City plans to build watermains from here to Bihlmaier Springs, involving 5,500 lin.ft. 8 in. vitr. and 3,250 lin.ft. 8 and 10 in. steel pipe. Cost to exceed $5,000. J. E. Tupper, Pomeroy, engr.

Ore., Roseburg—See "Industrial Works."

Cal., Ontario—City voted $40,000 bonds to sink well and install pump.

BIDS DESIRED

O., Akron—Until April 23, by E. A. Zeisloft, dir. Bd. Pub. Serv., laying 43,000 ft. 6-16 in. c.i. water pipe, with appurtenant work, involving 27,000 cu.yd. trench excav., etc., Contr. 171. G. G. Dixon, engr.; advertised in this issue.

Mich., Pontiac—Until May 17, by C. W. Ham, city clk., building 10,000,000 gal. filter plant 48 in. intake line, filtered water reservoir, wash water tank, coagulation basin, and other necessary appurtenances; advertised in this issue.

Ill., Steger—Until April 19, by Village Bd., drilling and casting 1 well, 16 in. diameter, 400 ft. deep, to supply 500 gal. of water per minute, also equipment consisting of motor driven deep well pump. J. A. Newquist, clk.; advertised in this issue.

Ia., Newton—See "Sewers."

Mont., Billings—Until April 27, by Yellowstone Co. building 5,900 ft. water main in Special Impvt. Dist. 11. F. E. Williams, co. aud.

Idaho, Preston—Until May 7, by City Council, at office of W. Chatterton, city clk., furnishing material and constructing waterworks system advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Phila**—City let contract building headworks and aqueducts, also altering and extending present beds at Queen Lane filters, to E. Fay & Son, 2 South Mole St. About $375,000. Noted March 25.

★**Mich., Ferndale** (Royal Oak P. O.)—City let contract furnishing labor and material laying 25,000 ft. 6 in. c.i. watermains and setting 35 fire hydrants, etc., to J. A. McDace Co., 920 Fairview Ave. About $70,000. Noted March 11.

★**Cal., Alpaugh**—Bd. Supervs. Tulare Co. let contract building waterworks system in Dist 1, to T. Haverty Co., 801 Maple Ave., Los Angeles, $17,939. Noted Jan. 22.

★**Cal., San Fernando**—City Trustees let contract building 3,000,000 gal. concrete lined reservoir, 200 ft. square, with timber roof, to Mercereau Bridge & Constr. Co., 313 Pacific Electric Bldg., Los Angeles, $21,550. Noted April 1.

Sewers

PROPOSED WORK

Conn., New Haven—City plans to build sewer in Chapel St. from West River to Blvd. About $40,000. F. L. Ford, city engr.

N. Y., Niagara Falls—City plans to lay 490 lin.ft. 15 in. tile sewer in Niagara Rapids Blvd. from Jane to Harrison Aves., cost $3,550; 1,535 lin.ft. 20-36 in. tile sewer in Niagara Rapids Blvd. from Garfield to McKinley Aves., $21,200.

N. Y., Rochester — Common Council adopted resolution to build sewer in Plymouth and Brooks Aves. About $26,000. C. A. Poole, city engr.

O., Cleveland—City soon lets contract building sewers in Hamilton Ave. between East 9th and East 12th Sts., St. Clair Ave. between East 140th and East 152nd Sts., and Glenside Ave. between St. Clair Ave. and East 133rd St., involving 1,275 ft. 20 in. vitr. and 1,970 ft. 3-6 in. segmental block pipe, 8 manholes, etc. R. Hoffman, city engr.

O., Shadyside—City Council soon receives bids building 13 mi. 20 in. vitr. pipe sewers. About $150,000. H. Althar, Bellaire, engr.

Mich., Dearborn—Hannans Real Estate Exch., 1 McGraw Bldg., Detroit, having plans prepared by M. L. Brown & Son, archts., 823 Chamber of Commerce Bldg., Detroit, trenching and laying sanitary sewers in Dearborn Hills Subdivision, near here, involving 40,000 ft. 8-12 in. vitri. crock pipe. About $125,000.

Wis., Racine—Bd. Pub. Wks. soon lets contract laying 9,672 ft. 9-18 vitr. pipe sewer in Lincoln Heights, West Blvd., Maiden Lane, Albert, Clark and Center Sts. P. H. Connolly, city engr.

Ia., Ft. Madison—City had revised plans prepared and soon receives bids building complete sanitary sewerage system. About $375,000. Burns & McDonnell, Interstate Bldg., Kansas City, Mo., engrs.

Kan., Scott City—City receives bids about May 1, building sanitary sewerage system and sewage disposal plant. About $75,000. Rickel Eng. Co., Hutchinson, engrs.

N. D., Mayville—City Council rejected bids building extensions in Sewer Dist. 1. About $20,000. A. T. Atkinson, Bismarck, engr. Noted March 11.

N. D., Pembina—City plans to build complete sewerage system. About $28,000. C. L. Pillsbury Co., Metropolitan Life Bldg., Minneapolis, Minn., engrs.

Mont., Dodson—City election soon to vote on $50,000 bonds to improve sewerage and lighting systems.

Col., Greeley—City having plans prepared for storm and sanitary sewerage system. About $300,000. Burns & McDonnell, Interstate Bldg., Kansas City, Mo., consult. engrs.

Idaho, Rigby—City voted $50,000 bonds to improve sewerage system.

Ore., Joseph—City having plans prepared building sewerage system. J. H. Lewis, Chamber of Commerce, Portland, engr.

Ore., Portland—City Comn. soon receives bids building Terwilliger Ave. and 1st St. Sewerage System, cost $3,879; laying sewer pipes in 71st St. S. E. from 45th Ave. to Foster Rd., $4,800, Wygant St. from Delaware Ave. to Gay St., $2,228, 47th St. S. E., 48th St. S. E., 49th St. S. E., 39th Ave., S. E., $6,209. O. Laurgaard, city engr.

BIDS DESIRED

N. Y., Long Island City—Until April 14, by M. E. Connolly, pres. Queens Boro. building sewer and appurtenances in Sanford Ave. from Forbes to Gerold Sts., in Gerold St. from Sanford Ave. to Lucerne Pl., 3rd Ward, in Herald Ave. from Beaufort Ave. to point 315 ft. south of Beaufort Ave., 4th Ward.

N. J., Avon-by-the-Sea—Until April 20, by Bd. Comrs., furnishing material and labor for building 4,700 ft. 8 in. pipe sewers, manholes and flushing manholes, also settling tank with appurtenances. G. C. Stanton, boro. clk.; advertised in this issue.

Pa., Vandergrift—Until April 19, by W T. Smith, boro. secy., building storm and sanitary sewers in Jackson and Custer Aves.; advertised in this issue.

Sewers (Continued)

Va., Potomac—Until April 27, by town at office of D. J. Howell & Son, engrs., Union Trust Bldg., Washington, D. C., building sanitary sewers, here, involving 30,000 cu. yd. excav., 41,100 lin.ft. 8-12 in. sewers, seven hundred 8 x 6 in. Y branch house connections and 85 manholes. J. W. Varney, mayor; advertised in this issue.

Ind., Indianapolis—See "Streets and Roads."

Wis., Viroqua—Until April 29, by E. J. Older, city clk., furnishing and laying 52,917 ft. 6-12 in. sewer pipe, building sewage disposal plant, manholes, lampholes. also laying 8,200 ft. 4-8 in. c.i. water mains. W. G. Kirchoffer, Madison, engr., advertised in this issue.

Ia., Newton—Until April 12, by city, laying 20,950 ft. 8-10 in. sanitary sewers and building 59 manholes, 2 lampholes and 6 manholes and flush tanks.

Wash., Aberdeen—Until April 21, by N. Thrift, city clk., building complete trunk and lateral sewerage systems, involving 7,010 lin.ft. 36 and 42 in. concrete pipe, 120,855 lin. ft. 6-30 in. concrete or vitr pipe, 215 brick or concrete manholes, 250 lin.ft. 10 in. iron pipe, 700 lin.ft. sewer pipe trestles, also outlets, involving 1,200 lin ft. piling, 360 lin.ft. floating booms, 300 ft. b.m. lumber and 2 tide gates. A. H. Blood, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Vt., Rutland—D. D. Snyder, comr. Dept. Pub. Wks. received bids March 22, building sewers and paving West and Wales Sts., involving 2,700 cu.yd. sewer excav., 880 ft. 42 in. and 270 ft. 54 in. rein.-con. or monolithic pipe, 490 ft. 27-30 in. rein.-con. or vitr. pipe, 200 ft. 12 in. vitr. pipe, 4.770 ft. granite or concrete curbing, 2,925 sq.yd. brick pavement, 8,500 sq.yd. sheet asphalt pavement, from Linberg & Street, Old South Bldg., Boston, $77,544; Portland Constr. Co., Inc., Portland, Me., $78,522. Noted March 11.

N. Y., Buffalo—City received only bid March 29, laying 1,280 ft. 18 in., 450 ft. 15 in. and 443 ft. 12 in. vitr. tile pipe sewer in Lower Terrace, from G. W. Moore, 82 Richfield Ave. About $28,900. Noted March 18.

★**N. Y., New York**—H. H. Curran, pres. Manhattan Boro., let contract building East 26th St. and rebuilding sewer in Madison Ave., to Booth & Flynn, Ltd., 17 Battery Pl., $843,297. Noted March 18.

★**W. Va., Charleston**—City let contract building Upper Glen Elk, 6th Ave and Kentucky St. Sewerage Systems, to W. J. Weakland & Co., 57 Citizens Natl. Bank Bldg., $135,817, $70.501 and $15,011 respectively. Noted March 11.

O., Dayton—Comrs. Montgomery Co. received bids March 27, building sanitary sewers in Mt. Auburn Sewer Dist. 1, from C. Wetzel. 803 Haynes St., $154,410; A. W. Smith, Vernon Ave., $155,253. Noted March 4.

★**Mich., Detroit**—City let contract furnishing labor and material building sewers in Burlingame Ave. and Henry St., to Jaynes & Affeld, 1208 Ford Bldg., $44,760 and $16.737 respectively; Shoemaker Ave., to W. Blanck & Co., 330 Longfellow Ave., $99,600; Lateral Sewers 3,238 and 3,263, to R. R. Barton, 400 Penobscot Bldg., $7,688 and $3,038 respectively. Noted April 1.

Ia., Dayton—City received bids laying 27,369 ft. 8-15 in. vitr. sewer pipe in various streets, from Natl. Constr. Co., Davenport. $60 711; H. McElligott, Chicago, $63,157; R. L. Cox, Sioux City, $65,363.

★**Cal., Pittsburgh**—City let contract building storm and sanitary sewers, to Hutchinson & Co., 444-17th St., Oakland, $30,904.

Bridges

PROPOSED WORK

N. Y., Cortland—Delaware. Lackawanna & Western R.R., 90 West St., New York City, plans to build 80 ft. steel span overhead crossing bridge on North Homer Ave., here, concrete flooring. About $111,000. G. J. Ray, Hoboken, ch. engr.

N. D., Bismarck—State Highway Comn. and Bd. Co. Comrs., Burleigh and Morton Counties, at office State Highway Comn. rejected only bid received March 17, building 4 main piers of Missouri River Bridge between here and Mandan. Project 100. C. P. Turner, Minneapolis, Minn., engr. Noted March 4.

Mo., Independence—Comrs. Jackson Co. received no bids March 20, widening Kansas City Ry. bridge over Rock Creek, 28 ft. on each side for full length of 110 ft. Cost $20,524. Noted March 18.

Tex., Bonham—Bonham Red River Bridge Co. having surveys made building ½ mi. steel span bridge, 18 ft. wide, over Red River, north of here, to have about 8 spans and concrete pillars and abutments. About $500,000. F. M. Cortellyou, Kansas City, Mo., engr.

Wash., O'Brien — Comrs. King Co. (Seattle) receive bids in summer, building 122 ft. steel span bridge, 20 ft. wide, near here. About $12,000. Bids set for March 23 have been cancelled. Noted Feb. 12.

N. B., Edmundston—Dominion Government, Ottawa and State of Maine. plan to construct International Bridge over St. John's River, here. About $100,000. E. Lafleur, c/o Dept. Pub. Wks., Ottawa, engr.

Que., Gracefield—Dept. Pub. Wks. & Labor, Quebec, soon receives bids constructing bridge over Gatineau River. About $525,000.

Ont., London—See "Streets and Roads."

BIDS DESIRED

Mass., Tisbury (Vineyard Haven P. O.)—Until April 13, by State Highway Comn., Boston, building 434 ft. bridge and approach over Lagoon Pond, 18 ft. wide, involving 1,000 sq yd. asphalt, 520 sq.yd. concrete, 1,200 lin.ft. wooden piles, 1,000 cu. yd. earth and 50 cu.yd. rock excav. A. W. Dean, Boston, state highway engr.

N. Y., Gilboa—Until April 27, by Bd. Water Supply, Municipal Bldg., New York City, building Schoharie Bridge, to have 2 spans, total length 222 ft., and Manorkill Bridge, single span, 150 ft. long, both bridges to have 17½ ft. roadways, involving 735,000 lb. structural steel, Gilboa and Conesville Twps.; Contr. 204; advertised in this issue.

Pa., Phila.—See "Streets and Roads."

O., Columbus—Until May 3, by Comrs. Franklin Co., building 833 ft. bridge, 30 ft. driveway, two 6 ft. sidewalks, over Scioto River on Greenlawn Ave., here, involving 10,000 cu.yd. rein.-con., 300 tons steel, 5,700 cu.yd. dry excav., 7 cofferdams, foot bridge, etc. About $400,000. Braun, Fleming, Knollman & Prior, 233 South High St., engrs. Noted March 11.

Minn., Grand Rapids—Until May 3, by T. Erskine, aud. Itasca Co., building Bridge 3303 over Prairie River, consisting of three 75 ft. low truss spans, 20 ft. roadway and standard rein.-con. abutments. Noted March 4.

Oklahoma—Until April 15, by State Highway Dept., Oklahoma, building bridge to have eight 80 ft. steel spans, Grant Co., Federal Aid Project 26; rein.-con. bridge to have forty-eight 32 ft. spans, Woodward Co., Federal Aid Project 28. W. C. Burnham, asst. state highway engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Ia., Marshalltown**—Marshall Co. let contracts building one 20 x 60 ft. pony steel truss bridge, concrete abutments and flooring, 16 rein.-con. box culverts, from 3 x 3 ft. to 6 x 6 ft., also two 20 x 20 ft. rein.-con. slab bridges, 22 rein.-con. box culverts, from 3 x 3 ft. to 10 x 10 ft., to Miller-Fifield Constr. Co., L. & J. Bank Bldg., Waterloo, $21,500 and $37,000 respectively; one 18 x 50 ft. pony steel truss span bridge, 10 rein.-con. culverts, from 3 x 3 ft. to 8 x 12 ft., to N. M. Stark & Co., 1215 Mulberry St., Des Moines, $24,730; one 18 x 32 ft. I-beam bridge, one 18 x 20 ft. and one 18 x 24 ft. slab bridges, one 18 x 50 ft. steel pony truss bridge, 24 ft. rein.-con. box culverts, from 3 x 3 ft. to 10 x 10 ft., to Ingersoll-Stouffer Co., Marshalltown, $53,444. Noted April 1.

★**Ia., Sac City**—Sac Co. let contracts building one 85 ft. structural steel pony truss bridge, with 18 ft. roadway, 5½ mi. from here, and one 200 ft. span steel high truss bridge, with 18 ft. roadway, 1½ mi. from Auburn, both to have concrete flooring and abutments, to Iowa Bridge Co., 812 Hubbell Bldg., Des Moines, $15,896 and $32,000 respectively. Noted March 25.

★**Tex., Liberty**—Liberty Co. let contract building 560 ft. pile trestle, 15 ft. wide, over East San Jacinto River, on Highway 35, to Austin Bros. Bridge Co., 1815 Coombs St., Dallas, $50,001, plus 10 per cent for engineering and contingencies. Noted March 25.

★**Idaho, Knull**—Twin Falls Highway Dist., Twin Falls, let contract building two 75 ft. steel span bridges over irrigation canal, 1 mi north of here, to C. H. Mull, Twin Falls, $15,713.

Oregon—State Highway Comn., Portland, received bids March 23, building (a) bridge over Pole Creek and one over Canyon Creek, Malheur Co., (b) one steel span bridge over Santiam River between Mehama and Lyons, Marion and Linn Counties, (Proposition 1 and 2) (c) steel bridge with concrete approaches over Nestucca River, near Hebo. (1) for construction of entire work in one contract, involving 265 cu yd. Class "A" and 245 cu.yd. Class "B" concrete, 46,000 lb. metal reinforcement, 150,000 lb. structural steel, 750 lin.ft. piling, etc., (2) furnishing and erecting structural steel portion on concrete piers, which will be built under another contract, 150,000 lb. structural steel, from C. Gardner, (a) $16,295; Morrison Knutson Co., Railroad and Reclamation Ave., Boise, Idaho, (a) $17,032; Northwest Bridge & Iron Co., foot of Sheridan St., Portland, (b) Proposition 1, $22,425; Minneapolis Steel & Mfg. Co., 3605 East 27th St., Minneapolis, (b) Proposition 1, $23,985; Pacific Iron Wks., 29th and Clackamas Sts., Portland, (b) $24,950 and $50,017 respectively; Parker & Banfield, Columbia Bldg., Portland, (b) Proposition 2, $49,211, (c1) $45,893; Ford & Brooks, (b) Proposition 2, $54,074; D. M. Stevenson, 264 East 31st St., Portland, (c1) $43,455; Union Bridge Co., Fenwick St., Portland, (c1) $44,874; Pacific Foundation Co., Ry. Exch. Bldg., Portland, (c2) $17,460. Noted March 11.

★**Oregon**—State Highway Comn., Portland, let contract to Colonial Bldg. Co., Hutton Bldg., Spokane, building crossing over Oregon, Washington R.R. and Navigation Co. tracks, near Eddy, cost $16,928, near Dillon, $20,505, rein.-con. viaduct near Seufert, $32,405; to O. Huber, Sherlock Bldg., Portland, bridge in Prineville, cost, $3,970. Noted March 11.

★**Cal., San Diego**—Bd. Supervs. San Diego Co. let contracts building La Costa Bridge (5 spans) and Agua Hediona Bridge (4 spans), rein.-con. girder type, on county highway, to G. Brelin, San Diego, $25,925 and $19,496, respectively.

Streets and Roads

PROPOSED WORK

Mass., Boston—See "Miscellaneous."

Mass., Waltham (Boston P. O.)—City voted $100,000 bonds to improve various streets, 24-60 ft. wide. G. C. Breahm, city engr.

New York—State Highway Comn., Capitol, Albany, received no bids March 18, paving Warsaw-Varyburg Rd., Wyoming Co. Cost, $161,484. F. S. Greene, state highway comr. Noted March 4.

N. Y., Mayville—Bd. Supervs., Chautauqua Co., instructed Highway Com. to prepare plans for highway from Kennedy to Ellington, 9 ft. wide, 2 course concrete or gravel.

N. Y., Medina—City voted $21,000 bonds to pave Main St. from Park Ave. to Eagle St. Total cost, $41,000. B. L. & R. Ry. will pay $8,000 toward cost and balance transferred from water fund.

N. Y., Niagara Falls—Chamber of Commerce plans to pave and widen Main St. About $200,000.

N. Y., Utica—City plans to spend $228,000 for paving various streets. J. Kemper, city engr.

N. Y., Watertown—City plans to pave River St. Cost between $35,000 and $40,000. P. B. Sutton, city engr.

New Jersey—State Highway Dept., Broad St. Bank Bldg., Trenton, rejected bid received March 29, building State Highway Route 8, Sect. 4, Charlottesburg to South Mills, concrete. Work will be readvertised. Noted March 11.

N. J., Burlington—City plans to improve sidewalks, curbs and gutters in various streets. About $50,000. W. W. Marrs, clk.

N. J., Jersey City—Hudson Co. Blvd. Comn. plans to improve 2 sections of Hudson Blvd., bituminous. Cost to exceed $100,000.

Pennsylvania — State Highway Dept., Harrisburg, rejected bids building 21,658 ft. Route 219, Boggs Twp., Centre Co.; 26,300 ft. Route 161, Shamokin, Upper Augusta and Rockfeller Twps., Northumberland Co.; 19,061 ft. Route 208, Sandy Creek and French Creek Twps., Venango Co. Noted April 1.

W. Va., Charleston—Kanawha Co. voted $60,000 bonds to improve roads in Washington Dist. and $25,000 for Poca Dist. F. G. Burdette, Charleston, engr.

W. Va., Gassaway—City election May 1, to vote on $50,000 bonds to grade, pave, curb and build sewers, in Elk and 4th Sts.

Streets and Roads (Continued)

W. Va., Huntington—City having plans prepared improving 4th Ave from 28th to 29th Sts., 28th St. from 3rd to 4th Aves., 21st St. from 8th to 10th Aves., 11th Ave. from 20th to 22nd Sts., 5 blocks on Jefferson Ave., 40 ft. wide, involving 9,000 lin.ft. concrete curbing and guttering and 18,000 sq.yd. concrete or brick on 8 in. concrete base. A. B. Maupin, city engr.

W. Va., Madison—Comrs. Boone Co. rejected only bid received March 31, grading and draining 8 mi. Coal River Rd. Work will be readvertised.

W. Va., Middlebourne—Comrs. Tyler Co. rejected bids received March 26, grading and paving 1.2 mi. Middlebourne Salem Rd., 16 ft. wide. About $36,000. Grading will be done by day labor and new bids will be received later on paving work. Noted March 6.

W. Va., Union—Monroe Co. voted $120,000 bonds to improve roads in Union Dist. J. L. Wehmeyer, co. engr.

W. Va., Wellsburg—Comrs. Brooke Co. plan to improve 1 mi. Wellsburg-Wheeling Rd. About $27,000. G. Steenrod, co. engr.

Ky., Jackson—Comrs. Breathitt Co. plan to grade and drain 6.535 mi. Jackson-Wolf Co. Rd., 20 ft. wide, involving 28 acres clearing and grubbing, 23,065 cu.yd. earth and 75,139 cu.yd. rock excav., 97.58 cu.yd. Class A, 225.55 cu.yd. Class B and 4.89 cu.yd. Class D concrete. W. N. Bosler, Frankfort, road engr.

Ohio—State Highway Comn., Columbus, has asked for Federal aid for construction of roads in following counties:

Clermont Co., 2.242 mi. Ohio Pike between Bethel and Hawesville, Federal aid, $35,000, also 4.82 mi. between Amelia and Bethel, $70,000; both waterbound or bituminous macadam.

Williams Co., 1.187 mi. Stryker-Evansport Rd., $20,000, also 2.58 mi. $14,000; both bituminous macadam.

O., Cleveland Heights (Warrensville P. O.)—Village receives bids in summer, grading, draining, building stone curbing and paving Cedar Rd. from Euclid Blvd. to Coventry Rd., brick, Medina, granite block or asphalt. About $40,000. F. A. Pease Eng. Co., Marshall Bldg., Cleveland, engrs.

Ind., Indianapolis—F. C. Lingerfelter, city engr., soon lets contract grading and paving 2,385 lin.ft. Dexter St. from 18th to 22nd Sts., 24 ft. wide, cost $28,504; 2,247 lin.ft. 18th St. from Gent Ave. to Parkway Blvd., 36 ft. wide, $33,067, wood block, asphalt, bituminous concrete or brick; 7,272 lin.ft. Blvd. Pl. from Crown Hill Ave. to 40th St., 22 ft. wide, $52,972; 2,515 lin.ft. Blvd. Pl. from 40th to 42nd Sts., 22 ft. wide, $17,438; also extending water, gas, sewer and other connections.

Ind., Indianapolis—City plans to pave 2,609 ft. Guilford Ave. from 42nd to 46th Sts., 24 ft. wide, cost, $31,923; 1,734 ft. Capitol Ave. from McCarty to Morris Sts., 30 ft. wide, $27,716; 1,280 ft. Buckingham Drive from Illinois St. to Blvd. Pl. 36 ft. wide, $28,646; 1,059 ft. Spencer Ave. from Washington to Pittsburgh, Cincinnati, Chicago & St. Louis Ry., 24 ft. wide, $16,066; grading and paving 3,349 ft. Blue Ridge Rd. from Illinois St. to Blvd. Pl., 40 ft. wide, $30,324; resurfacing 840 ft. Market St. from Alabama to East Sts., 50 ft. wide, $16,042; 983 ft. Market St. from Pennsylvania to Alabama Sts., 41 ft. wide, $15,136; 559 ft. Market St. from Illinois to Pennsylvania Sts., 50 ft. wide, $10,691; 1,085 ft. Meridian St. from Washington to Tippecanoe Sts., 48 ft. wide, $19,529, brick, asphalt, bituminous concrete or wood block. F. C. Lingenfelter, city engr.

Mich., Grosse Pointe (Detroit P. O.)—City having plans prepared grading, shaping and paving 1 mi. St. Clair Ave., 30 ft. wide, involving 17,600 sq.yd. asphaltic concrete on 6 in. concrete base. About $85,000. M. L. Brown & Son, 823 Chamber of Commerce, Detroit, engrs.

Wisconsin—State Highway Dept., Court House, Rhinelander, received no bids March 25, grading and paving Crandon-Laona Rd., Federal Aid Project 155, Forest Co. Noted March 18.

Wisconsin—State Highway Dept., Court House, Rhinelander, rejected bids received March 25, grading and paving Woodruff-Fifield Rd., Federal Aid Project 165, Vilas Co., involving 53,722 cu.yd. excav., 204.5 cu.yd. concrete in culverts, 57.65 acres clearing and grubbing, etc. Work will be readvertised. Noted March 18.

Wis., Chilton—W. Hoenig, comr. Calumet Co., soon lets contract surfacing 4.11 mi. New Holstein Rd., 16 ft. wide, involving 38,862 sq.yd concrete. State Highway Comn., Madison, engrs.

Wis., Menomonie—City clerk soon lets contract paving 4 streets, involving 19,100 sq.yd. rein.-con. P. F. Huntington, Menomonie, engr.

Wis., Milwaukee—Com. Pub. Wks. soon lets contract paving portion of American Ave., involving 1,584 cu.yd. grading, 2,128 sq.yd. standard sheet asphalt pavement, 1,299 lin.ft. combined curb and gutter, etc.; Cape St., 609 cu.yd. grading, 2,373 sq.yd. granite block pavement on 8 in. concrete base, 2,027 sq.yd. old pavement removed and 60 lin.ft. new straight limestone curb; Cherry St., 1,012 sq.yd. standard sheet asphalt, 850 lin.ft. combined cement curb and gutter and 5,090 sq.ft. cement walks; 58th st., 3,394 cu.yd. grading 1,039 sq.yd. light traffic asphalt, 878 lin.ft. combined cement curb and gutter and 5,238 sq.ft. cement walks; 58th St., 917 cu.yd. grading, 1,321 sq.yd. light traffic asphalt, 1,116 lin.ft. combined cement curb and gutter and 6,696 sq.ft. cement walks; 59th St., 239 cu.yd. grading, 869 sq.yd. light traffic asphalt, 780 lin.ft. combined cement curb and gutter and 4,680 sq.ft. cement walks; 59th St., 234 cu.yd. grading, 1,217 sq.yd. light traffic asphalt, 1,017 lin.ft. combined cement curb and gutter and 6,102 sq.ft. cement walks; Florida St., 412 cu.yd. grading, 1,792 sq.yd. old brick pavement removed, 1,631 sq.yd. standard sheet asphalt and 161 sq.yd. brick gutter pavement; Herbert St., 2,471 cu.yd. grading, 2,355 sq.yd. light traffic asphalt, 2,007 lin.ft. combined cement curb and gutter, 8,803 sq.ft. new cement walks and 230 sq.ft. old walks removed; Jefferson St., 471 cu.yd. grading, 658 sq.yd. old pavement removed, 2,087 sq.yd. standard sheet asphalt, 491 sq.yd. brick gutter pavement, 947 lin.ft. new straight limestone curb, 1,178 lin.ft. old curb reset, 3,045 sq.ft. cement walks removed, etc.; 7th Ave., 330 cu.yd. grading, 1,741 sq.yd. standard sheet asphalt and 1,140 lin.ft. combined cement curb and gutter; Windsor Pl., 640 sq.yd. light traffic asphalt, 436 lin.ft. combined cement curb and gutter and 2,616 sq.ft. cement walks; Wright St., 952 sq.yd. cement concrete pavement.

Ia., Des Moines—Polk Co. soon lets contract paving and grading 4.45 mi. White Pole Rd. from west city limits to county line, 20 ft. wide, involving 52,242 sq.yd. vitr. brick or concrete and 7,140 cu.yd. dry earth excav. About $200,000. F. O. Laing, co. engr.

Minn., East Grand Forks—A. N. Briggs, city clk., rejected bids received March 23, paving various streets. About $150,000. Noted March 18.

Minn., St. Paul—Ramsey Co. plans to pave 1.25 mi. Long Lake Rd., cost $45,000; 1 mi. Hudson Rd. from here to Washington, $40,000; 1.25 mi. Snelling Ave., $45,000; 5.25 mi. White Bear Rd. to Washington Co. line, $210,000; all 24 ft. wide, concrete. R. E. Godfrey, co. engr.

Kan., Lawrence—Douglas Co. plans to issue $300,000 bonds to build Fort to Fort Highway.

N. D., Grand Forks—City Council soon lets contract building ¾ mi. road from Skidmore Ave. to packing plant, Federal Aid Project 51. About $18,000. C. S. Giles, city engr.

N. D., Grand Forks—City rejected bids paving 48 blocks, 24-30 ft. wide, Dists. 10, 16 and 20. Work will probably be done by day labor. C. S. Giles, city engr. Noted March 18.

N. D., Valley City—Comrs. Barnes Co. soon let contract building 37.5 mi. Federal aid road. Cost to exceed $50,000. W. H. Robinson, Bismarck, engr.

Mont., Bozeman—Gallatin Co. rejected bid graveling Belgrade-Maudlow Rd., Federal Aid Project 40. Contract for building 50 ft. steel span bridge on concrete abutments (part of above project), let to D. M. Anderson, 523 West Curtis St., $7,628. Noted March 4 under "Montana."

Mont., Great Falls—Cascade Co. will sell $200,000 bonds April 22, to build various roads. J. E. Moran, co. aud.

Mo., Bethany—Comrs. Harrison Co. rejected bids received March 26, building 9.5 mi. Jefferson Highway, 24 ft. wide, cost $149,872. Noted March 11.

Mo., Danville—Comrs. Montgomery Co. received no bids March 22, building 8.24 mi. Natl. Old Trails Rd., New Florence Special Rd. Dist., 24 ft. wide. Cost $56,357. Noted March 11.

Mo., Independence—Comrs. Jackson Co. received no bids March 20, building 2.1 mi. Washington Park Blvd. Cost $103,570. Noted March 18.

Tex., Athens—Henderson Co. sold $75,000 bonds to build sand clay roads in Rd. Dist. 13. J. A. McDonald, judge.

Tex., Childress—City soon lets contract paving and building sidewalks and gutters on Main St. and Ave. B., involving 30,000 sq.yd. vitr. brick, 15,000 lin.ft. concrete curb and gutter and 10,000 sq.ft. concrete sidewalk. About $40,000. R. G. Canaway, Gainesville, engr. Noted March 25.

Tex., Coleman—Coleman Co. having plans prepared and soon receives bids paving various roads. Bonds for $1,000,000 voted for project. State and Federal Government will each appropriate $500,000 toward cost. W. E. Dickerson, co. engr.

Tex., Mt. Pleasant—Titus Co. having plans prepared scarifying, ditching, gravel surfacing and building rein.-con. drainage structures on 5.11 mi. Highway 11, from here to Camp Co. line, 12 ft. wide, Federal Aid Project 156, involving 6,936 cu.yd. gravel, 4,589 lb. reinforcing steel, 37.8 cu.yd. Class "A" and 134.6 cu.yd. Class "B" concrete. About $39,400. Wilder & O'Neal, Mt. Pleasant, engrs.

Tex., Palestine—City plans to pave various streets. City will appropriate $250,000 toward cost and property owners, $500,000.

Tex., Pittsburg—Camp Co. having plans prepared improving various highways. Bonds for $500,000 voted for project.

Tex., Waco—McLennan Co. election May 4, to vote on $550,000 bonds to build highways. If bonds are voted, $55,000 of state and Federal Aid and will be allotted.

Okla., Oklahoma—Oklahoma Co. voted $750,000 bonds to build roads. Federal Government will appropriate like amount. Engineer not selected. Noted March 18.

Ore., Astoria—City plans to spend about $600,000 to pave and grade 30 streets and build sewers in 12 streets. A. S. Tee, city engr.

Ore., Bend—City plans to spend $154,518 to improve Division, Hill and Harriman Sts., Greeley, Hawthorne, Irving, Kearney and Oregon Aves. D. H. Peoples, city recdr.

Ore., Seaside—City soon lets contract improving Roosevelt Dr. from O'Hanna Creek Bridge to north line of Bway., involving 19,860 sq.yd. pavement, 12,575 lin.ft. straight and 912 lin.ft. circular curbing, 6.8 acre clearing and grubbing, 4,767 cu.yd. common excav., 18,676 cu.yd. embankment, etc.; building timber pier from end of Bway. St. W., into Pacific Ocean; also building walk, bulkhead and shore end of pier on ocean front, involving 22,734 cu.yd embankment, 1,500 cu.yd. excav., 2,650 cu.yd. concrete, 13,150 sq.yd. pavement, 128,000 lb. reinforcing steel, 380 lin.ft. curbing, etc. E. S. Abbott, aud.

Cal., Eagle Rock (Los Angeles P. O.)—City Clerk receives bids about May 1, improving Central Ave., involving 198,000 sq.ft. 5 in. concrete paving, 725 sq.ft. cement walk and 150 ft. cement curbing.

Cal., El Centro—Bd. Supervs. Imperial Co. soon receives bids paving 45 mi. of county highway under $1,500,000 bond issue, bitulithic and concrete. Former bids rejected. Noted April 1.

Cal., Los Angeles—A. M. McPherson, clk. Bd. Supervs. Los Angeles Co., receives bids in May, improving 4.05 mi. Center St., 20 ft. wide, near Norwalk, involving 17,000 lin.ft. 5 in. oil macadam paving, 4,400 lin.ft. 5 in. rein.-con. paving on decomposed granite base, grading, rein.-con. culverts, headwalls, etc.

Cal., San Bernardino—J. H. Osborn, city clk., soon receives bids improving various streets, involving 110,000 sq.ft. 2 in. Warrenite paving on 3rd St., 20,000 sq.ft. 2½ in. concrete paving with 1½ in. Warrenite surface on 2nd St., 220,000 sq.ft. 4 in. concrete paving with ⅜ in. oil and screenings surface on Arrowhead Ave., also 114,000 sq.ft. on 6th St., 100,000 sq.ft. 6 in. rock and oil paving, 72,000 sq.ft. 4 in. concrete paving and 8,000 cu.yd. grading on Highland Ave., and 1 mi. 8 in. vitr. clay pipe sewer in A and 7th Sts. W. L. Brown, city engr. Noted Jan. 22.

Ont., London—City plans to construct 6 mi. asphalt, concrete or bitulithic pavement, 2 mi. macadam and 5 mi. sidewalks. About $600,000. H. A. Brazier, city engr.

Ont., London—Middlesex Co. plans to pave 14 mi. road with waterbound macadam also build concrete bridges. About $200,000. C. Talbot, Court House, engr.

Ont., Port Dover—Town having plans prepared by G. R. Marston, engr., Simcoe, paving 1¼ mi. Main St., macadam. Work also involves 8,000 lin.ft. concrete curbing. W. C. McCall, town clk.

Streets and Roads (Continued)

Ont., Sarnia—Lambton Co. plans to construct 4 mi. waterbound macadam and gravel roads with concrete culverts. About $125,000. J. McAllum, Alvinston, supt.

Ont., Toronto—City plans to construct concrete sidewalks on Kingswood Rd., cost $2,918; asphalt pavement on York St., $17,899; bitulithic pavement on Cornish Rd., $9,318; bitulithic pavement on Davenport Rd., $262,761. Work invloves 4,200 sq.yd. asphalt, 70,000 sq.yd. bitulithic pavement on concrete base and 2,100 lin.ft. concrete sidewalk. R. C. Harris, city engr.

Ont., Windsor—City passed bylaw authorizing expenditure of $30,000 for building 5 mi. concrete sidewalks. M. E. Brian, city engr.

BIDS DESIRED

Conn., Hartford—Until April 13, by Bd. Contr. & Supply, improving Charles, North Winthrop, Arch, Prospect and Talcott Sts., involving 16,270 sq.yd. asphalt, 5,000 sy.yd. sheet asphalt and 900 sq.yd. granite block on concrete base.

New Jersey—Until April 20, by State Highway Comn., Broad St. Bank Bldg., Trenton, building State Highway Route 10, Sect. 2, in boroughs of Ridgefield, Palisade Park and Fort Lee, Bergen Co., involving 18,125 sq.yd. concrete. R. Mullins, 790 Broad St., Newark, div. engr.; advertised in this issue.

N. J., Trenton—Until April 13, Bd. Freeholders Mercer Co., furnishing labor and equipment for application of surface dressing tar to 23 mi. road, 50,000 gal. with covering material, and application of tar for 43 mi., 12,365 gal.; asphalt oil dressing for 37 mi., 106,177 gal. Separate bids for 3 articles. G. H. Hutchinson, dir. rds.

Pennsylvania—Until April 27, by State Highway Dept., Harrisburg, repaving roads in following counties:

Crawford Co., 29,525 ft. and 18,161 ft. bituminous surface course on concrete foundation or rein.-con.

Erie Co., 35,492 ft. bituminous surface course on concrete foundation or rein.-con., also 21,268 ft. rein.-con.

Fayette Co., 15,323 ft. rein.-con. and Hillside vitr. brick.

Huntington Co., 3,007 ft. rein.-con.

Jefferson Co., 1,684 ft. vitr. brick.

Lycoming and Tioga Counties, 72,096 ft. rein.-con.

Schuylkill Co., 53,613 ft. bituminous surface course on concrete foundation, bituminous macadam (penetration method) on Telford or broken stone foundation, rein.-con. and vitr. brick.

Venango Co., 50,025 ft. rein.-con. and Hillside vitr. brick.

Washington Co., 16,137 ft. rein.-con.

York Co., 4,136 ft. bituminous surface course on concrete foundation. L. S. Sadler, state highway comr.; advertised in this issue.

Pa., Chester—Until April 19, by B. Newsome, city clerk, repaving and repairing roadway of various streets, granite block, vitr. block, asphalt or bituminous paving; advertised in this issue.

Pa., Meadville—Until April 27, by A. D. Andrews, city clk., paving and curbing various streets; advertised in this issue.

Pa., Phila.—Until April 20, by J. C. Winston, dir. pub. wks., for (Schedule A) grading Bristol, Brown, Houghton, Howard, Louden, Mentor, Keystone, Vandike, Hegerman, Hellerman, Marshall, Umbria, 27th and 29th Sts.; (Schedule B) vitr. block paving Mayland St.; (Schedule C) curb and footway work; (Schedule D) furnishing and delivering distributing tank wagons; (Schedule E) furnishing and delivering fire wagons; (Schedule F) building portion of parkway from Arch to Filbert Sts.; (Schedule G) removing and laying water pipe in parkway from 23rd to 25th Sts.; (Schedule H) rebuilding southeastern end of Broad St. and Lehigh Ave. Bridge over Norristown Branch of Phila. & Reading Ry.; (Schedule I) building municipal asphalt plant; (Schedule J) asphalt paving Bustleton, Carey, L, M, Sedgley, Steinber, Frazier, Park, Poplar, 3rd and 68th Sts. About $275,000.

W. Va., Parkersburg—Until April 14, by city, grading, curbing and paving various streets, involving 14,230 sq.yd. sheet asphalt, 11,050 sq.yd. brick, 8,800 sq.yd. concrete, 2,800 cu.yd. excav. and 4,000 lin.ft. concrete curbing. About $150,000. Former bids rejected. Noted Feb. 26.

Ga., Lawrenceville—Until April 16, by Bd. Comrs. Gwinnett Co., furnishing labor, material, equipment, etc., constructing 1 mi. Lawrenceville-Buford Rd., known as Georgia State Aid Project S-9-1 on Route 13. Work involves 10,560 sq.yd. pavement. Proposals will be received on bituminous macadam, on clay bound crushed stone, slag or gravel base, (Sect. F); plain concrete, (Sect. J); rock asphalt on crushed stone, slag or gravel base with clay binder, (Sect. M). J. W. Hawkins, 703 Walton Bldg., Atlanta, div. engr.

Ala., Birmingham—Until April 28, by Bd. Revenue Jefferson Co., grading and paving 12 mi. North Bessemer Rd. from Dartmouth Ave. and 32nd St. to Fairfield, via Huey Lane, Project 1, cost $480,000; paving 2 mi. South Bessemer Rd. from city limits to Tuscaloosa Ave. and Poplar St., Project 2, $80,000; 2½ mi. Mt. Pinson Rd. from Inglenook to Norwood Blvd., Project 3, $100,000; 5 mi. Jasper Highway from Pratt City to Birmingham via Thomas, Project 4, $200,000; 4 mi. 8th Ave. Rd. from Ensley to Birmingham, via Owenton, Project 5, $160,000; 4 mi. Ave. E and 34th St. to Edgewater, via Wylan, Project 6, $160,000; 2½ mi. 19th St. Rd. from Ensley to junction of Mulga and Docena Rds., Project 7, $100,000; 3 mi. road from Woodlawn to Irondale, via Gate City, Project 8, $120,000; 7 mi. 24th St. Rd. from Milner Heights to pumping station, Project 20, $140,000; grading 11 mi. road from Warrior to Robbins Cross Rds., via Partridge Cross Rds., Project 9, $75,000; 5 mi. road from Warrior to Trafford, via Coaldale, Project 10, $50,000; 10 mi. road from Blue Creek to Oak Grove, via Mud Creek, Project 11, $55,000; 9 mi. road from Mulga to Port of Birmingham, Project 12, $50,000; 10 mi. Rocky Ridge Rd from reservoir to state highway, Project 13, $75,000; 5 mi. road from Trussville to Acmar, via Roper, Project 14, $30,000; 5 mi. road from Trussville to Clay, Project 15, $30,000; 2 mi. Saddler's Gap Rd, Project 16, $15,000; 2 mi. road from Mt. Pinson to Center Point, Project 17, $10,000; 3 mi. road from Pleasant Hill to Morgan, Project 18, $15,000; 3 mi. road from Palos to Praco, Project 19, $20,000; 2 mi. road from Irondale to Pole Cat Gap, Project 21, $20,000, all 18 ft. wide. S. R. Batson, Jefferson Co. Bank Bldg., engr.

Ala., Florence—Until April 13, by City Clerk, paving 26,000 sq.yd. various streets, sheet asphalt, vitr. brick, bitoslag, concrete, asphaltic concrete or bitulithic, on macadam or concrete base; together with necessary curbing, guttering and draining, on Morrison and Wood Aves. W. M. Paxton, city engr.; advertised in this issue.

Ala., Jasper—Until April 16, by S. Granford, city clk., for 9,500 cu.yd. grading, 78,000 sq.yd. paving, 60,000 lin.ft. curbing and guttering, 2,400 lin.ft. stone headers, 7,500 sq.yd. alley paving, 250 cu.yd. rein.-con., etc. R. L. Totten, Birmingham, consult. engr.; advertised in this issue.

Ky., Barbourville—Until April 23, by City Council furnishing labor and material laying 30,000 sq.yd. Kentucky rock asphalt on stone base, 9,500 lin.ft. concrete curbing and 5,770 lin.ft. curbing and guttering. J. R. Murphy, Barbourville, engr.; advertised in this issue.

Ky., Winchester—Until April 14, by Comrs. Clark Co. improving 6.027 mi. Winchester-Lexington Rd., 18 ft. wide, involving 6,251 cu.yd. earth and 358 cu.yd. rock excav., 23,427 lb. reinforcing steel, 48,178 sq.yd. scarifying, 1,319 cu.yd. borrow, 369 cu.yd. Class A, 608 cu.yd. Class B and 3 cu.yd. Clas D concrete. Alternate bids will be received on Kentucky rock asphalt on macadam base involving 16,431 ton crushed stone and 63,582 sq.yd. asphalt; bituminous concrete on macadam base, 16,431 ton crushed stone and 63,582 sq.yd. bituminous concrete surfacing; 63,582 sq.yd. cement concrete paving; 60,046 sq.yd. bituminous concrete surfacing on concrete base; 60,046 sq.yd. Kentucky rock asphalt on concrete base. W. N. Bosler, Frankfort, engr.

O., Lorain—Until May 4, by city, paving various streets, involving 45,000 sq.yd. concrete, asphalt and brick on concrete base and brick on waterbound macadam base. C. C. Miller, city engr.

Indiana—By Bd. Co. Comrs. building roads in following counties:

April 12, Lake Co., Crown Point, L. E. Barnes No. 2 et al Rd., gravel, Hobart Twp., H. F. MacCracken et al Rd., Calumet Twp., C. T. Lassen et al Rd., Hanover Twp., J. A. Beattie et al Rd., Canton Twp., H. M. Walls et al Rd., Center Twp., H. M. Walls et al Rd., Cedar Creek Twp., W. C. Wood et al Rd., Ross Twp., G. M. Foland, aud.

St. Joseph Co., South Bend, Longley Rd., gravel, Harris Twp., C. Sedgwick, aud.

April 17, Bartholomew Co., Columbus, Herring Rd., macadam, Rockcreek and Jackson Twps., Herring Rd., Jackson Twp., Decatur Co. and Rockcreek Twp., Bartholomew Co., Morrison Rd., crushed stone, Hawcreek and Clifty Twps. R. Henderson, aud.

Delaware Co., Muncie, T. E. Boober Rd., cement concrete, Delaware Twp., C. F. Lloyd Rd., water bound macadam, Niles Twp. J. P. Dragoo, aud.

April 20, Shelby and Rush Counties, Shelbyville, J. Redenbough Rd., stone, on county line. W. W. Leslie, aud.

Ind., Ft. Wayne—Until April 30, by Comrs. Allen Co. draining, grading and surfacing 6.3 mi. Hoagland Rd., 2.9 mi. Hillegass Rd., 1.9 mi. Springfield Rd., all 12 ft. wide, 4 mi Center Rd., 9 ft. wide, stone, 2 mi. McDuffee Rd., 12 ft. wide, gravel, cost $98,170, $44,410, $33,820, $51,840 and $23,380 respectively. A. W. Grosvenor, 408 Brass Bldg., engr.

Michigan—Until April 13, by F. F. Rogers, state highway comr., at office of Bd. Rd. Comrs. Dickinson Co. (Iron Mountain), grading, draining and surfacing 1.543 mi. State Trunk Line Rd. 12-11 B, 16 ft. wide, involving 14,488 sq.yd. waterbound macadam, 12,777 cu.yd. earth excav., 24.5 cu.yd. 1:2:4 concrete, etc.

Michigan—Until April 15, by F. F. Rogers, state highway comrs., at office of Bd. Rd. Comrs. Eaton Co., Charlotte, grading, draining and surfacing 1.049 mi. Sect. A and 6.022 mi. Sect. B, State Trunk Line Rd. 39-1, 16 ft. wide. Sect. A involves, 9,842 sq.yd. gravel, 2,562 cu.yd. earth excav., 176 lin.ft. 12-18 in. encased tile, 1,145 lb. steel, 30.1 cu.yd. 1:2:4 and 38.9 cu.yd. 1:3:6 concrete; Sect. B, 56,840 sq.yd. gravel, 37,033 cu.yd. earth excav., 1,188 lin.ft. 12-18 in. encased tile, 12,463 lb. steel, 202.9 cu.yd. 1:2½:5 and 168.2 cu.yd. 1:3:6 concrete, etc.

Michigan—Until April 20, by F. F. Rogers, state highway comr., at office of Bd. Rd. Comrs. Lenawee Co. (Adrian), grading, draining and surfacing 8.531 mi. State Trunk Line Rd. 34-1, 18 ft. wide, involving 18,298 cu.yd. earth excav., 3,560 lb. steel, 1,110 lin.ft. 12-18 in. encased tile, 151 cu.yd. 1:2:4 and 92.7 cu.yd. 1:3:6 concrete, etc.

Michigan—Until April 20, by F. F. Rogers, state highway comr., at office of Clerk, Newaygo Co. (White Cloud), grading, draining and surfacing 1.043 mi. State Trunk Line Rd. 24-5, 16 ft. wide, involving 9,793 sq.yd. gravel, 2,976 cu.yd. earth excav., 849 lb. steel, 11.3 cu.yd. 1:2:4 and 35.3 cu.yd. 1:3:6 concrete, etc.

Michigan—Until April 21, by F. F. Rogers, state highway comr., at office of Bd. Rd. Comrs. Hillsdale Co., Hillsdale, grading and surfacing 6.032 mi. State Trunk Line Rd. 23-3 C, 16 ft. wide involving 318 stations fine grading, 56,635 sq.yd. concrete or bituminous concrete, etc. Noted Feb. 19.

Ill., Chicago Heights—Until April 12, by W. J. Sadler, secy. Bd. Local Impvts., grading, paving and curbing 15th Pl. from Campbell to Ashland Aves., Sunnyside Ave. from 16th St. to 15th Pl., including all street and alley returns to property lines within said limits, 15th St. from Ashland Ave. to bridge over Thorn Creek east of Edgewood Ave., except 8 ft. strip lying 4 ft. on each side of track of Joliet and Eastern Traction Co., Ashland Ave. from 16th to 15th St., also Sunnyside Ave. from 15th Pl. to 14th Pl., Campbell Ave., from 15th Pl. to 15th St. and Schilling Ave. from 16th St. to 14th St. or Lincoln Highway, 14th Pl. from Ashland Ave. to Schilling Ave. and Campbell Ave. from 15th to 14th Sts., and Sunnyside Ave. from 14th Pl. to 14th St.

Ill., Geneva—Until April 14, by Bd. Local Impvts., grading, draining and paving various streets, involving 7,100 yd. rein.-con. Wells Eng. Co., Aurora, engrs.

Wyo., Buffalo—Until April 15, by H. Fisher, city clk., paving, grading and building sewers, etc., 1st St. from Main St. to Wyoming Ave., Lobban Ave. from 1st to Bennett Sts., Bennett St. from Lobban Ave. to Main St.; grading, paving, etc., Fort St. from Main St. to intersections of North A, B, C and D Sts. Noted March 4.

Montana—Until April 19, by Executive Com. of State Highway Comn., Helena, grading and graveling, 10.8 mi. Chinook-Malta Rd., Federal Aid Project 101, Blaine Co., involving 32,045 cu.yd. common excav., 11,085 cu.yd. gravel surfacing, 2,626 lb. reinforcing steel, 596 sta.yd. overhaul, 524 lin.ft. culvert pipe and 36.48 cu.yd. concrete structures; 21.72 mi. highway from Choteau to Sun River Rd., Teton Co., 0.947 mi. joint road and 13.183 mi. in Cascade Co., Federal Aid Project 65, 150,000 cu.yd. excav., 64,000 cu.yd. gravel surfacing, 355.6 cu.yd. concrete in culverts and bridges, 770 ft. piling, 2,422 lin.ft. rein.-con. culvert, 14,000 lb. reinforcing steel, and 25M ft. lumber;

Streets and Roads (Continued)

19.61 mi. Ignatius-Pablo Rd., Federal Aid Project 63, Missoula Co., Proposal (a) involves 23,000 cu.yd. gravel surface, (b) bridges, 16M ft. lumber, 387 cu.ft. concrete, 1,300 ft. piling and 31,000 lb. reinforcing steel, (c) 63,200 cu.yd. common excav., 1,305 lin.ft. culvert and 145 cu.yd. concrete in culverts. Bids will be received on one or all proposals. J. N. Edy, ch. engr.; advertised in this issue.

Montana—Until April 26, by Executive Com. State Highway Comn., Helena, grading and graveling 18.26 mi. Great Falls-Belt Rd., Federal Aid Project 64, Cascade Co., involving 80,000 cu.yd. common excav., 11,582 cu.yd. rock excav., 1,352 lin.ft. culvert pipe, 3,200 lb. reinforcing steel, 2,500 cu.yd. intermediate excav., 37,500 sta.yd. overhaul excav., 172 cu.yd. concrete in culverts, and 35M ft. lumber. J. N. Edy, ch. engr.; advertised in this issue.

Mont., Billings—Until April 24, by Comrs. Yellowstone Co., paving 2 mi. Polytechnic Rd., Federal Aid Project 52, involving 5,213 cu.yd. common excav., 21,435 sq.yd. paved surface, 7,733 lb. reinforcing steel, 8,436 lb. structural steel, 28,000 sta.yd. overhaul, 136.7 cu.yd. concrete in culverts and structures; advertised in this issue.

Mont., Red Lodge—Until April 13, by C. A. Dool, city clk., paving Bway., in Impvt. Dist. 27, with concrete or bitulithic. About $118,000. G. C. Pruett, Miles City, engr. Noted March 18.

Ark., El Dorado—Until April 30, by Bd. Comrs. Rd. Impvt. Dist. 1, 2, 3 and 4, Union Co., for stripping gravel pits, loading road gravel from pits at a point near Harrell, unloading same for storage for the respective dists., at various points designated; advertised in this issue.

Ark., Eldorado—Until May 5, by Comrs. Rd. Impvt. Dist. 1-4, Union Co., at office State Highway Comn., Little Rock, building 184.96 mi. gravel macadam road; advertised in this issue.

Ark., Little Rock—Until April 26, by Comrs. Little Rock-Pulaski Rd. Impvt. Dist. 10, at office of State Highway Comn., grading, draining and paving 55 mi. Crystal Hill, Conway and Alexander Rds., included in Sect. 1 and 2 of said dist. Lund & Hill, 527 Southern Trust Bldg., engrs.; advertised in this issue.

Tex., Beeville—Until April 23, by Comrs. Bee Co., grading, graveling, surfacing with bituminous topping and building bridges and culverts on 22 mi. State Highway 9. T. M. Cox, judge.

Tex., Coleman—Until April 14, by L. G. Matthews, judge Coleman Co., building 42.17 mi. crushed rock or gravel road in precinct 2, involving 31.88 mi. machine grader work, 57,125 cu.yd. earth and 1,477 cu.yd. rock excav., 110,000 cu.yd. rock or gravel to be hauled and placed, 1,887 cu.yd. concrete and 116,775 lb. reinforcing steel. W. E. Dickerson, co. engr.

Tex., San Antonio—Until April 16, by J. R. Davis, judge Bexar Co., grading, surfacing and draining 15.767 mi. Highway 9, Goliad Rd., 16 ft. wide, Federal Aid Project 131, involving 10.05 mi. road machine work, 24,811 cu.yd. gravel, 3.94 mi. scarifying, 7,080 cu.yd. unclassified earth excav., 42,136 sq.yd. bituminous macadam, ½ in. treatment, 105,926 sq.yd. bituminous macadam, 1 in. treatment, 20,452 lb. reinforcing steel, 3,800 sq.yd. concrete pavement, 426 cu.yd. Class "A," 26 cu.yd. Class "B" and 27 cu.yd. Class "C" concrete, etc. About $205,148. C. E. Hoff, co. engr.

Tex., Seymour—Until April 14, by Clerk Baylor Co., clay surfacing 1.8 mi. road and building 19.9 mi. graded road, same being 1 section of Highway 30, Federal Aid Project 78, Job 12A, involving 85,580 cu.yd. earth excav., 1.34 mi. road grader work, 4,036 cu.yd. placing surfacing, 556 cu.yd. Class "A", 222.98 cu.yd. Class "B" and 77.19 cu.yd. Class "C" concrete, 51,800 lb. reinforcing steel, superstructures for one 30 ft. and one 36 ft. clear span I-beam bridges etc. N. G. Mitchell, co. judge.

Tex., Tyler—Until April 14, by Chairman Smith Co. Comn., grading, surfacing and draining 13 mi. Highway 15 (length of project has been shortened), Federal Aid Project 147, 16 ft. wide, involving 11.96 acres clearing and grubbing, 64,708 cu.yd. unclassified earth and 100 cu.yd. rock excav., 57,926 sq.yd. bituminous macadam, 1,407 sq.yd. Class "A" concrete and 11,385 cu.yd. gravel clay and clay. About $248,000. D. K. Caldwell, Tyler, engr. Noted April 1.

Tex., Van Horn—Until April 12, by Comrs. Culberson Co., building roads, involving 58 acres clearing and grubbing, 27,550 cu.yd. earth and 500 cu.yd. rock excav., 12,750 ft. road grader work, 6,674 yd. gravel surfacing.

Tex., Waco—Until April 12, by J. P. Alexander, judge McLennan Co., surfacing 1.91 mi. Sect. A, Highway 6, Dallas Rd., involving 9,600 gal. asphaltic oil and 19,200 cu.yd. cover material and 10.97 mi. Sect. B, 44,250 gal. asphaltic oil, etc. About $33,926. M. Hannah, co. engr.

Okla., Tulsa—Until April 15, by C. F. Burke, city aud., furnishing labor and material, improving sections of Norfolk Terrace, Sunset Dr., Woodward Blvd., Cincinnati, Detroit, Norfolk, Sylvaa Dale, Lewis and Victory Aves. and 21st, 22nd, and 4th Sts.

Nevada—Until April 12, by C. C. Cottrell, state highway engr., Carson City, subgrading and laying concrete base on 4.14 mi. highway from point 0.65 mi. south of Steamboat to 1 mi. south of Huffmakers, Washoe Co.; grading and graveling 27.81 mi. highway from Zola to Mill City, Pershing Co.; advertised in this issue.

Ariz., Phoenix—Until April 12, by Comrs. Maricopa Co. paving 278 mi. highway, Warrenite concrete and asphaltic concrete on broken stone base. Bonds for $4,000,000 voted for project. Bids will be taken for all, for any section, or for such part as money available will permit. R. C. Perkins, 5 North 17th Ave., engr.

Wash., Seattle—Until April 19, by King Co., paving 1.437 mi. Kent-Black Diamond Highway, 18 to 20 ft. wide, involving 5,900 cu.yd. excav., 15,627 sq.yd. 6 in. concrete or brick on 5 in. concrete base, cost $49,000 and $65,000 respectively. S. J. Humes, co. engr.

Ore., Enterprise—Until April 15, by city, building 65,400 sq.yd. hard surface pavement. O. J. Roe, city recdr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Massachusetts—State Highway Comn., State House, Boston, received bids March 31, building 5,700 ft. road between Danvers and Peabody Twps., from Hamlin & Nelson, Salem, $43,923, F. E. Ellis & Son, Melrose, $45,242, Linberg & Street, 294 Washington St., Boston, $48,847; 6,100 ft., Leicester Twp., from McGuire & McGurty, Inc., 30 Orme St., Worcester, $44,602, Cenedella & Co., Milford, $57,603, Lane Constr. Co., 37 Colony St., Meriden, Conn., $62,363; 1,800 ft., Wayland Twp., from J. H. McCusker, Waltham, $13,370, Framingham Constr. & Supply Co., Framingham, $14,449, Hanscom Constr. Co., 70 Kilby St., Boston, $14,521; 7,392 ft., Attleboro Twp., from Lane Constr. Co., 37 Colony St., Meriden, Conn., $28,178, Marshfield Constr. Co., Marshfield, $29,425, C. T. Alger, 114 East Bittania St., Taunton, $31,380. Noted March 25.

Mass., Boston—City received only bid March 17, repairing bituminous pavement on various streets, from Bermudez Co., 246 1st St., Cambridge, $85,270.

N. Y., Brooklyn—E. Riegelmann, boro. pres., received bids March 31, regulating and paving, Saratoga Ave., from Consolidated Asphalt Paving Co., 52 9th St., $29,752, Uvalde Asphalt Paving Co., 1 Bway., New York City, $30,405, Sicilian Asphalt Paving Co., 41 Park Row, New York City, $32,116; also furnishing and delivering 12,000 cu.yd. asphalt paving sand, from G. Eaton, 231 Pearl St., $23,880, C. A. Myers, Stagg St., $24,000, J. J. Guinan, 2316 Gravesend Ave., $25,080. Noted March 25.

★N. Y., Buffalo—City let contract paving Vanderbilt St. from Greene to North Main Sts., asphalt surface on concrete base, to Rock Asphalt & Constr. Co., Morgan Bldg., $29,462.

N. Y., Buffalo—City received bids March 29, paving (a) 1,300 ft. Grove St., (b) paving and laying curb, 667 ft. Trenton Ave., (c) 956 ft. Blake St., (d) 563 ft. Manitoba St. (e) 1,511 ft. Eller Ave., all 26 ft. wide, (1) brick, (2) asphalt, (3) sheet asphalt, from Erie Contg. Co., Morgan Bldg., (a1) $22,300, (b1) $11,850, (c1) $27,500; Rock Asphalt Constr. Co., Morgan Bldg., (a2) $22,220, (b2) $11,073, (c2) $16,130, (d2) $10,120; H. P. Burgard Co., 1968 Fillmore Ave., (a2) $23,120, (b2) $10,000, (e2) $24,000; B. F. Spire, 24 Colonial Circle, (e1) $16,915, (d1) $10,875; Peckham Constr. Co., Niagara Life Bldg., (c3) $16,290, (d3) $9,687, (e3) $26,100. Noted March 18.

★N. Y., Jamestown—City will improve 555 ft. Whitney Ave., 250 ft. Stillers Alley, 2,910 ft. South Main St., 807 ft. Charles St., 250 ft. Potters Alley, 725 ft. Prospect St., 451 ft. Cowden Pl., 1,381 ft. Pershing Ave., 646 ft. Fairfield Ave., 391 ft. Monroe St., 1,509 ft. Broadhead Ave., 1,078 ft. Blanchard St., 535 ft. Wilson Pl., 1,446 ft. Sturgis St., 2,543 ft. Newton Ave., 412 ft. Beverly Pl., 556 ft. Highland Ave., 2,047 ft. West 6th St., all vitr. brick, 450 ft. Mt. Vernon Pl., asphalt, all paving on 5 in. concrete base with 1½ in. sand cushion, combined 5 in. curb with 15 in. gutters, 26 ft. wide between curbs on streets except 6th St., 32 ft. Work will be done by day labor.

N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., received bids April 1, paving (a) Fairview Ave., (b) 25th St., from Uvalde Asphalt Paving Co., 1 Bway, New York City, (a) $8,875, (b) $38,002; Consolidated Asphalt Paving Co., 52 9th St., Brooklyn, (a) $9,035, (b) $37,735; Sicilian Asphalt Paving Co., 41 Park Row, New York City, (a) $9,090; Cleveland Trinidad Paving Co., Flushing Ave., Brooklyn, (a) $9,295, (b) $37,499. Noted March 25.

N. Y., New York—H. Bruckner, pres. Bronx Boro., received bids April 1, paving (a) Southern Blvd. from East 182nd St. to Fordham Rd., (b) Westchester Ave. from Ward to East Tremont Ave., (c) Westchester Ave. from East Tremont Ave to Eastern Blvd., (d) extending sewer in White Plains Ave. and East River, from Union Paving Co., Bway. and 112th St., (a) $122,384; Asphalt Constr. Co., 1 Madison Ave., (a) $125,511; Uvalde Asphalt Paving Co., 1 Bway., (a) $127,025; O'Rourke Contg. Co., 154 Nassau St., (b) $502,266; Leonard Paving Co., 233 Bway., (b) $585,460, (c) $306,828; Burnside Contg. Co., 270 Burnside Ave., (b) $624,722, (c) $331,137; Astoria Contg. Co., 169 Hunter Ave., (c) $280,314; Hitchfield Constr. Co., 280 Madison Ave., (d) $106,642; Phoenix Constr. Co., 41 Park Row, (d) $124,897. Noted March 25.

N. Y., Olean—S. M. Gaylor, comr. Dept. Pub. Wks., received bids March 18, paving (a) Center St., 1st, 2nd, 3rd and 4th Aves., involving 11,900 sq.yd. brick on concrete foundation, (b) Coleman St., 3,290 sq.yd. brick on concrete foundation, (c) 13th, 14th, 15th, Irving, South 7th and South 8th Sts., 27,579 sq.yd. brick on concrete foundation, from J. H. Havens & Son, (a) $60,601, (b) $16,076, (c) $129,721; Fury-Foote Constr. Co., (a) $63,313, (c) $128,816; Bunce & Carrill, (a) $65,048, (b) $17,490, (c) $138,511; M. Barber, Binghamton, (b) $19,180. Noted March 11.

★N. Y., Rochester—Bd. Contr. & Supply let contract repairing asphalt pavement to Whitmore, Rauber & Vicinus, 279 South Ave., at $15.27 per ton, based on quantity of 3,500 tons.

★N. Y., Syracuse—Bd. Contr. & Supply let contract paving 1.25 mi. Manlius St., to G. B. Dickison, Union Bldg., $176,961. Noted March 11.

★New Jersey—State Highway Dept., Broad St. Bank Bldg., Trenton, let contract building 12,800 sq.yd. State Highway Route 8, Sect. 3, White's Bridge to Bloomingdale, Passaic and Morris Counties, concrete, to P. Jannorone, 20 Harrison St., Nutley, $86,867. Noted March 11.

★New Jersey—State Highway Dept., Broad St. Bank Bldg., Trenton, let contract building 76.302 mi. State Highway Route 6, 20 ft. wide, Mullica Hill Section, Salem and Gloucester Counties, to M. Staub, Hammonton, $438,562.

★Pennsylvania—State Highway Dept., Harrisburg, let contract building portion Route 43, Adams and McKean Counties, to Mason & Hanger Co., Inc., Paxinos, $485,420; Route 210, McKean Co., to P. B. Colgan, Dunkirk, N. Y., $136,893. Noted Apr. 1.

★S. C., Greenville—City let contract topsoiling and draining 2½ mi. Overbrook Ave. and Hinit St., 40 ft. wide, to Fisk Carter Constr. Co., Main St., $11,500.

★S. C., Greenville—Comrs. Greenville Co. let contract grading and topsoiling 12 mi. Paris Mt. Rd., 25 ft. wide, to Cooley & Gillespie, Washington St. About $15,000; cost plus percentage basis.

★La., New Orleans—City let contract paving 87,150 sq.yd. Lee Circle to Louisiana and Carrollton Aves., to Craven & Lang, Hibernia Bank Bldg.

★O., Cincinnati—Hamilton Co. let contract building Pippin Rd., to H. Westermann, Cincinnati, $17,300

Streets and Roads (Continued)

Wisconsin—State Highway Dept., at div. office, Grand Rapids, received bids March 26, grading and paving Appleton-Waupaca Rd., Federal Aid Project 70, Waupaca Co., involving (a) 16,006 cu.yd. earth excav., (b) 308.7 cu.yd. concrete in culverts, (c) 57,448.5 sq.yd. concrete surfacing exclusive of cement, (d) 20,000 bbl. cement in place, (e) 360 cu.yd. borrow excav., etc., from A. J. Kramp, Berlin, (a) $0.92, (b) $26, (c) $2.03, (d) $1.20, etc., total cost, $195,082; Universal Eng. Co., Eau Claire, (a) $1.16, (b) $28, (c) $1.96, (d) $2.72, (e) $1.10, etc., $195,243; M. Martin, Berlin, (a) $0.96, (b) $26, (c) $2.05, (d) $2.75, (e) $1.25, etc., $197,185. Noted March 18.

Wisconsin—State Highway Dept., at div. office, Wilner Bldg., Green Bay, received bids March 24, grading and paving (1) Pembine-Niagara Rd., Federal Aid Project 129, Marinette Co., involving (a) 48,869 cu.yd. earth excav., (b) 3,940 cu.yd. rock excav., (c) 1,384 cu.yd. concrete in culverts, (d) 26 acres clearing and grubbing, (e) 2,445 cu.yd. borrow excav., etc., (2) Appleton-Shawano Rd., Federal Aid Project 117, Shawano Co., (a) 32,430 cu.yd. earth excav., (b) 235.6 cu.yd. concrete in culverts, (c) 215 cu.yd. concrete in bridges, (d) 44,167 sq.yd. gravel surfacing, (e) 2.23 acres clearing and grubbing, (f) 563 cu.yd. borrow excav., etc., from G. Gross, Appleton, (1a) $1.23, (1b) $4.50, (1c) $29, (1d) $225, (1e) $1.23, total cost, $95,268, (2a) $0.87, (2b) $26, (2c) $28, (2d) $0.69, (2e) $150, (2f) $0.97, $72,178; Conway & Toughey, Green Bay, (1a) $0.86, (1b) $4.50, (1c) $24.50, (1d) $110, (1e) $0.99, $71,402; J. Brogan, 700 Dousman St., Green Bay, (1a) $0.88, (1b) $5.25, (1c) $25, (1d) $150, (1e) $1.10, $77,109; J. Young & Bro., Oconto, (2a) $0.90, (2b) $27.10, (2c) $30, (2d) $0.40, (2e) $165, (2f) $1.20, $63,359; S. Knechtl, Manitowoc, (2a) $0.68, (2b) $25, (2c) $24, (2d) $0.63, (2e) $350, (2f) $0.75, $62,761; Jorgenson Constr. Co., Denmark, (2a) $0.74, (2b) $24, (2c) $23, (2d) $0.75, (2e) $150, (2f) $0.76, $68,953. Noted March 18.

Wisconsin—State Highway Dept., Court House, Rhinelander, received bids March 25, from W. H. Bent, Eagle River, grading and paving Eagle River-Woodruff Rd., Federal Aid Project 146, Vilas Co., involving 17,236 cu.yd. earth excav., $0.40, 54.83 cu.yd. concrete in culverts, $28, 12,476 cu.yd. gravel surfacing, $2, 903 cu.yd. borrow excav., $0.40, etc., total cost, $34,933; Worden-Allen Co., Port Washington Rd., Milwaukee, 315 sq.yd. Class "E" concrete and 85,000 lb. steel, $5,890; Wausau Iron Wks., Wausau, 315 sq.yd. Class "E" concrete and 85,000 lb. steel, $8,344. Noted March 18.

Wisconsin—State Highway Dept., Court House, Rhinelander, received only bid March 25, from W. H. Bent, Eagle River, grading and paving Rhinelander-Eagle River Rd., Federal Aid Project 170, Oneida Co., involving 10,919 cu.yd. earth excav., at $0.45 per cu.yd., 170.5 cu.yd. concrete in culverts, $28, 51,276 sq.yd. gravel surfacing, $2.75, 606 cu.yd. borrow excav., $0.45, etc., total cost, $39,167; J. B. Jeffrey, Phillips, grading and paving Fifield-Radisson Rd., Federal Aid Project 130, Price Co., 407.22 cu.yd. concrete in culverts, $28, 952 lin.ft. piling, $0.80, $12,164; B. McGinley, Crandon, Pelican-Crandon Rd., Federal Aid Project 73, Forest Co., 13,167 cu.yd. earth excav., $0.90, 80.5 cu.yd. concrete in culverts, $30, 62,823 cu.yd. gravel surfacing, $0.45, 4.82 acres clearing and grubbing, $200, $44,134. Noted March 18.

★**Ia., Davenport**—Scott Co. let contracts paving 4.46 mi. road from River to River and 5.38 mi. Gambril Rd., to McCarthy Impvt. Co., 220½ Main St.; 6.44 mi. Harrison St. and 5.43 mi. Princeton Rd., to Central Eng. Co., 711 Putnam Bldg. All to be paved with bituminous filled brick.

★**Minn., Marshall**—A. G. Bumford, city recdr., let contract paving various streets, to Coolsaet Bros., Marshall, $31,471. Noted Feb. 12.

★**Minn., Slayton**—B. Teitema, city clk., let contract paving 15 blocks, 18 ft. wide, 7½ concrete, to Hanlon & Okes, 338 Lumber Exch., Minneapolis, $3.50 per sq.yd. Noted March 4.

★**Minn., Wabasha**—G. L. Ginthner, aud. Wabasha Co., let contract building 1.5 mi. Federal Aid Project 125, State Rd. 1, 24 ft. wide, to L. H. Baumgardner Co., 301 Central Bank Bldg., St. Paul, $64,600. Noted March 4.

★**Kan., Great Bend**—Barton Co. will pave 26.4 mi. roads, 18 ft. wide, 1 course concrete. Work will be done by day labor.

★**Mont., Wibaux**—Wihaux Co. received no bids graveling 6.85 mi. Federal Aid Project 61. Work will be done by day labor. Estimated cost, $32,000. Noted March 4 under "Montana."

Mo., Sedalia—Comrs. Pettis Co. received only bid March 23, building 5.3 mi. Southern Highway, 24 ft. wide, Sedalia Special 12 mi. Rd. Dist., from J. W. Menefie, Sedalia, $61,792. Noted March 11.

★**Tex., El Paso**—El Paso Co. let contract grading and surfacing 11 mi. road below Fabens, 18 ft. wide, involving 115,000 sq.yd. bituminous macadam, to El Paso Bitulithic Co., Piedras St., along tracks of Galveston-Houston R.R. tracks. About $100,000.

★**Tex., Freeport**—Brazoria Co. let contract grading and draining 9.44 mi. Quintana Rd., Highway 36, from here to Jones Creek, 16 ft. wide, involving 1½ acres clearing and grubbing, 175 ft. pile trestle, 150 lin.ft. pile bridges, 260 cu.yd. concrete and 102,000 cu.yd. unclassified earth excav., to Rd. Dist. 23, Freeport, c/o L. Mims, chn., $64,598, including engineering and contingencies.

★**Tex., Freeport**—City let contract building sidewalks on all principal streets, to M. C. Dougherty, Freeport. About $25,000.

★**Tex., Liberty**—C. N. Smith, judge Liberty Co., let contract grading, surfacing and draining 8.518 mi. Highway 35, from Cleveland to Montgomery Co. line, 16 ft. wide, to J. O. Moore & Sons and H. F. Bland, Jasper, $97,523, plus 10% for engineering and contingencies. Gravel will be furnished by county, $1,715. Noted March 25.

★**Tex., Marshall**—Harrison Co. let contract clearing, grading, surfacing with gravel and bituminous macadam and building concrete drainage structures on 32 mi. Jefferson Highway, 18 ft. wide, to Smith Bros. & Healey, Marshall, $718,732.

★**Col., Pueblo**—City let contract paving North Side Dist., to Strange-MacGuire Constr. Co., $286,660.

Utah, Ogden—City received bids paving Dist. 130 including Grant, Jefferson and 30th Aves., (a) asphalt, (b) bitulithic, (c) rein.-con., from Moran Paving Co., Salt Lake City, (a) $326,841, (b) $322,020, (c) $358,526, Wheelwright Constr. Co., Ogden, (a) $334,465, (b) $337,220, (c) $355,129, Gibbons & Reed, Kearns Bldg., Salt Lake City, (a) $347,502, (b) $346,814, (c) $378,499

★**Arizona**—State Highway Dept., Phoenix, let contract building 3.718 mi. Holbrook-St. John's Highway, Federal Aid Project 3, 20 ft. wide, involving 16,180 cu. yd. unclassified earth excav., 330 cu.ft. Class "A" concrete, 79.3 cu.yd. Class "C" concrete, 93.7 cu.yd. Class "B" concrete, etc., to J. Turley, $10,946. Noted Feb. 12.

★**Wash., Bellingham** City let contract grading and paving 2 mi. Lake Padden Rd., 8 ft. wide, concrete, to C. W. Sauset, Bellingham, $58,600.

★**Wash., Chehalis**—Lewis Co. let contract clearing, grading and paving 5 mi. Winlock-Cowlitz Rd., 16 ft. wide, concrete, to Allred, James & Hendricks, Centralia, $182,288. Noted March 11.

Oregon—State Highway Comn., Portland, received bids March 23, improving roads in following counties: (a) Jefferson Co., 17.44 mi. Deschutes Co. Line-Madras Highway, involving 26,250 cu.yd. broken stone surfacing, 15,200 cu.yd. excav., (b) Umatilla Co., 22 mi. Echo-Pendleton Highway, 37,500 cu.yd. crushed gravel surfacing, 5,500 cu.yd. broken stone surfacing, 15,000 yd. mile payhaul, (1) with concrete pipe, (2) corrugated iron pipe, from O. Huber, Sherlock Bldg., (a1) $153,624; J. F. Clarkson, Yeon Bldg., (a2) $168,866; A. D. Kern, 178 East 15th St., (a1) $169,819, (b1) $128,000; Porter & Connelly, Ry. Exch. Bldg., (b1) $113,500; Washburn & Hall, Bway. Bldg., (1b) $127,650. Contractors all of Portland. Noted March 25.

★**Oregon**—State Highway Comn., Portland, let contract improving 12.5 mi. Seufert-Deschutes River Sect. Columbia Highway, Wasco Co., involving 146,000 cu.yd. excav., one 75 ft. and one 107 ft. tunnels, etc., to J. F. Clarkson Co., Yeon Bldg., Portland (corrugated iron pipe), $189,871; 8.9 mi. Blalock-Arlington Sect., Gilliam Co., 8,000 cu.yd. broken stone surfacing, 6,000 cu.yd. payhaul, 10,800 cu.yd. crushed gravel surfacing, to Porter & Connelly, Ry. Exch. Bldg., Portland (concrete pipe), $44,825; 8.4 mi. Wallowa Canyon Sect., 75,000 cu.yd. excav., 4,500 lin.ft. guard fence, 238 cu.yd. concrete, to A. D. Kern, 178 East 15th St., Portland (corrugated iron pipe), $112,336. Noted March 25.

Ore., Portland—City received bids March 24, improving portions of (a) Jersey, Buchanan and Richmond Sts., (b) East 35th St. from Schuyler to Tillamook Sts., (c) Westover Rd. from Summit Ave. to 25th St., (d) Tenino Ave. from East 11th to East 13th Sts., (e) Wygant St. from Delaware to Denver Aves., (1) asphaltic concrete No. 1, 2 in. top on 4 in. crushed rock base in roadway, (2) concrete No. 3 in roadway, (3) concrete No. 1 in roadway, from United Contg. Co., Northwestern Bank Bldg., (a1) $2.29 per sq.yd., total $38,918, (c3) $2.65 per sq.yd., $13,526, (d1) $2.29 per sq.yd., $3,127, (e1) $2.26 per sq.yd., $15,867; Cochran Bros., 415 South Syracuse St., (a2) $2.30 per sq.yd., $40,963; Municipal Paving Plant, Portland, (b1) $1.65 per sq.yd., $2,191; Warren Constr. Co., Journal Bldg., (b1) $2.32 per sq.yd., $2,832; Hahn & Rebman, Portland, (b2) $2.40 per sq.yd., $2,928, (e2) $2.30 per sq.yd. $15,723.

★**Cal., El Centro**—Bd. Suprvs. Imperial Co. will grade 45 mi. of highway system under $1,500,000 bond issue. Work will be done by day labor, leasing equipment. Noted April 1.

★**Cal., Modesto**—City let contract improving various streets and intersections, to Standard Paving Co., 9th and N Sts. About $35,000. Noted Jan. 8.

★**Cal., Oakland**—Bd. Supervs. Alameda Co., let contract improving Mt. Eden Rd. from East 14th St. to Washington Twp. line, in Eden Twp., to Bates & Borland, Bway. and 12th St., $206,380. Noted March 11.

★**Cal., Redwood City** — Redwood Highlands Co. let contract improving Redwood Highlands Dist., including oiled macadam paving, cement curbing, concrete guttering and grading, to Hutchinson Co., 44 17th St., Oakland. About $54,000.

★**Cal., San Francisco**—City let contract improving Quesada Ave. between Railroad Ave. and Newhall St., to Eaton & Smith, 407 11th St., $23,076. Noted March 25.

★**Cal., Santa Barbara**—City let contract improving Victoria St., et al, bituminous and bitulithic paving, cement-concrete curbs and gutters, etc., to Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, $38,653.

★**Cal., Santa Cruz**—Bd. Supervs. Santa Cruz Co. let contract grading and concrete paving 7.09 mi. road between Soquel and Aptos, to Marshall & Baker, 2967 Avalon Ave., Berkeley, $197,851.

Cal., Santa Rosa — Bd. Supervs. Sonoma Co. rejected bids received March 10, improving Sects. A and B, Petaluma-Valley Ford Rd. Work will be done by day labor. Noted April 1.

★**Cal., Santa Rosa**—Bd. Supervs. Sonoma Co. let contract paving and grading 5 mi. Sect. A, Petaluma-Sonoma Rd., involving 6,565 cu.yd. concrete paving and 13,637 cu. yd. grading, to W. A. Dontonville, Acampo, $117,000. Noted April 1.

Cal., Taft—City Trustees received only bid grading, paving with 5 in. concrete, building concrete curbs, cement sidewalks, etc., on 4th St., from Rogers Bros. Co., 350 Merrick St., Los Angeles, $29,700.

★**Cal., Taft**—City let contract grading and paving 4th St., to Rogers Bros. Co., 350 Merrick St., Los Angeles, $29,700. Noted April 8.

★**Cal., Ventura** — Bd. Supervs. Ventura Co. let contract improving 1½ mi. Foothill Rd., involving 3,400 cu.yd. excav., 7,800 lin.ft. shaping roadbed, 125,600 sq.ft. 4 in. asphaltic concrete paving, 3,100 lb. reinforcing steel, 48½ cu.yd. concrete in culverts, 2M ft. lumber in bulkhead, to Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, $25,850.

★**Cal., Ventura** — Bd. Supervs. Ventura Co. rejected bid improving ¾ mi. Wheeler Springs Rd., involving 16,000 cu.yd. rock excav. and 200 cu.yd. rubble masonry. Work will be done by day labor. C. Petit, co. surv.

★**Ont., Exeter**—City let contract paving 1¼ mi. Main St., involving 10,000 sq.yd. concrete, to W. Hollingworth, Hamilton. About $41,566

★**Ont., Owen Sound**—City let contract for 20,000 sq.yd. bitulithic pavement on concrete base, to Warren Bituminous Paving Co., McKinnon Bldg., Toronto. About $90,000.

Railways

PROPOSED WORK

Quebec—Levis Co. Ry., 127 Commercial St., Levis, soon receives bids building 1½ mi. line from Terminus to St. Joseph. About $60,000. N. Bateman, ch. engr.

Ont., St. Catherioes — See "Industrial Works."

Excavation and Dredging

PROPOSED WORK

Ia., Emmetsburg—Drainage—W. F Egan, aud. Palo Alto Co., soon lets contract building D. D. 114, involving 456,666 cu yd. excav.

Ia., Ft. Madison—Ditches—R. A. Gardner, aud. Lee Co., received no bids March 16, completing ditches in Green Bay Levee and D. D., involving 108,000 cu.yd. excav. E. T. Perkins, 1211 1st Natl Bank Bldg., Chicago, engr. Noted Feb. 19.

Ia., Hastings—Ditches—W. M. Moore, aud. Mills Co., (Glenwood) soon lets contract building Hastings Ditch, here, to include 1.72 mi. main ditch, with 6 to 10 ft. bottom, width, 8 ft. deep, involving 60,000 cu.yd. excav., also 2 lateral ditches, one 800 ft. long, 6 ft. bottom, involving 8,000 cu.yd. excav. and other 2,500 ft. long, 3 ft. bottom, involving 3,700 cu.yd. excav. S. Dean, co. drainage engr.

Ore., Medford—Irrigation—Medford Irrigation Dist. plans to develop Fish Lake Project to irrigate 10,000 acres in center of Rogue River Valley fruit and alfalfa district. To obtain storage to supplement the flow of Little Butte and Bear Creeks, rock fill type dams, faced with rein.-con. will be constructed at outlets of Fish and Fourmile Lakes. Other features of above project are the enlarging of 20 mi. of existing main canal, constructing 45 mi. new main and feeder canals and abouts 75 mi. near laterals. District will ask for state certification of $1,250,000 worth of 6 per cent bonds, which have already been voted. D. C. Henry, Spalding Bldg., Portland, consult. dist. engr. J. B. Piatt, Medford, dist. engr.

Cal., Anderson—Canals, etc.—Anderson-Cottonwood Irrigation Dist. election May 8 to vote on $200,000 bonds to build earth irrigation canals and drainage ditches.

Cal., Paradise—Canal, etc.—Paradise Irrigation Dist. plans to replace 13,000 ft. open canal with 36 in. pipe line, completing auxiliary reservoir system for high lands of district and completing distributing system. About $140,000. L. M. Edwards, Paradise, engr. Noted March 11.

Canada—Dominion Government, Ottawa, plans to dredge in Maritime Provinces, $500,000; Ontario and Quebec, $450,000; Manitoba $75,000 and British Columbia $400,000; also Fraser River, B. C., $32,000 and Naas River, B. C., $10,000. K. M. Carmeron, c/o Dept. Pub. Wks., Ottawa, engr.

BIDS DESIRED

Ia., Jefferson—Drain—Until April 12, by Bd. Supervs. Greene Co., furnishing labor and material building D. D. 141, involving 17,500 ft. 6-28 in. tile etc. S. J. Melson, Jefferson, engr. in charge.

Mont., Harlowton — Irrigation — Until April 10, by J. L. Farnum, secy. of Diamond "F" Ranch Co., constructing ditches and structures for irrigating certain lands of above named company, 12 mi. south of here, involving 36,000 cu.yd. common excav., 3,000 cu.yd. loose rock excav., 1,000 cu.yd. solid rock excav., 450 lin.ft. 7 in. metal flume, 12 concrete headgates and 1 earth fill dam.

Ontario—Drain—Until April 10, by M. Murdie, twp. clk., Seaforth, constructing Dolmage Drain in McKillop Twp., and Dickson Drain McKillop and Hullett Twps. Work involves 90,000 cu.yd. earth excav. About $36,000. J. Roger, Mitchell, engr.

Ontario—Drain—Until April 25, by H. Strong, twp. clk, R.R. No. 1, Hensall, constructing Winchesa Creek Drain, Usborne Twp. Work involves 150,000 cu.yd. earth excav. About $60,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Buffalo—Dredging—G. H. Norton, city engr., received bids March 30, dredging 125,000 cu.ft., Buffalo Inner Harbor, from Great Lakes Dredge & Dock Co., Morgan Bldg., $0.335 per cu.yd., Empire Eng. Co., North Tonawanda, $0.36 per cu.yd. Noted March 18.

★**Ia., Northwood**—Drain—C. N. Urfahl, and Worth Co., let contracts furnishing labor and material building Drain 46, to E. Iverson, Northwood, Humboldt Gravel & Tile Co., Humboldt and J. Rafdah, Northwood; D. D. 48, to Natl. Sewer Pipe Co., Webster City and N. Paulsen, Thornton. Noted March 18.

★**Tex., Orange** — Channel — Orange Co. Navigation Dist. let contract cleaning out [illegible] present Sabine-Neches Channel to bottom depth of 26 ft. from mouth of Sabine River to mouth of Neches River, involving 150,000 yd. hydraulic dredgework, to Bowlers Southern Dredging Co., 914 Amer. Natl. Insurance Bldg., Galveston. About $10,000.

Man., Winnipeg—Drainage—City received bids constructing 4.2 mi. 96 in. rein.-con. conduit pipe from Carter Halls Aldinger Co., 1010 Union Bk. Bldg., $110,963 per mi.; Fowler & Young, 24 Aikens Bldg., $148,409 per mi.; Northern Constr. Co., 606 Union Bk. Bldg. $158,004 per mi. Above work of protection made necessary by action of soil alkalies on reinforced concrete.

Industrial Works

PROPOSED WORK

Mass., Brockton—Tuck & Gilman, archts. and engrs., 34 School St., Boston, soon let contract building 5 story, 70 x 200 ft., brick and concrete manufacturing plant, concrete foundation, on North Main St., for Puritan Shoe Mfg. Co., Inc., 263 North Main St. About $175,000. Noted March 11.

Mass., Cambridge—E. E. Gray Co. having plans prepared by F. F. Jonsberg Co., archts. and engrs., 16 Central St., Boston, for 2 story, 140 x 230 ft., refrigerating plant and storehouse, rein.-con., rein.-con. booring, on Albany St. About $250,000.

Mass., Cambridge—Presto-Lite Co., Inc., 30 East 42nd St., New York City, having plans prepared for 1 story, 25 x 100 ft., brick and steel acetylene plants, rein.-con. flooring, concrete foundation. About $80,000.

Mass., Chelsea (Boston P. O.)—H. Cutler & Co., 96 2nd St., plans to build manufacturing plant on 2nd St., to replace one recently destroyed by fire. Loss $50,000. Architect not selected.

Mass., Springfield—McClintock & Craig, archts. and engrs., 33 Lyman St., soon let contract building 3 story, brick and steel manufacturing plant, concrete foundation, for Victor Sporting Goods Co., 88 Birnie Ave.

Mass., West Springfield (Springfield P. O.)—F. M. West Box Co., 225 Liberty St., Springfield and New England Box Co., Greenfield, purchased 5.25 acre site, here, on Cold Spring Ave., west side of Boston & Albany R.R., and plan to build large factory. About $150,000.

R. I., Providence—L. E. Danforth, 76 Dorrance St., soon receives bids building 1 story, 100 x 200 ft., brick, concrete and steel garage and service station, concrete flooring and foundation. About $80,000. Tuck & Gilman, 34 School St., Boston, archts.

Conn., Plainville—Peck Spring Co., 68 Broad St., plans to build brick and mill construction addition to manufacturing plant, on Broad St. About $25,000. Architect not selected.

Conn., Wallingford—Dowd-Rodgers Co., Carleton St., plans to build 3 story, 50 x 100 ft., brick and steel factory, on South Cherry St. Private plans.

N. Y., Buffalo—Maritime Trading Corp., 15 Pratt St., plans to build 5 story feed mill, rein.-con., at 246 Hopkins St. Cost between $100,000 and $110,000.

N. Y., Buffalo—C. F. Monroe, 88 Highland Ave., plans to build 3 story, brick, concrete and steel garage and salesroom, at 1970 Main St. About $100,000.

N. Y., Evans Mills—F. X. Baumert Co., Antwerp, plans to build 2 story, hollow tile addition to milk plant, here. About $30,000.

N. Y., Fulton—C. M. Allen, Inc., North 1st St., plans to build 2 story excelsior plant to replace one recently damaged by fire. brick. Cost between $60,000 and $70,000.

N. Y., Gowanda—Iroquois Utilities Corp., 39 West Main St., had plans prepared by C. E. Eaton, consult. engr., Sherman Bldg., Watertown, for concrete and steel power house on Cattaragus Creek. About $150,000.

N. Y., Medina—Western New York Utilities Co. has asked authority of Pub. Serv. Comm., Albany, to issue bonds to build plant, here. About $260,000.

N. Y., Olean—City voted $200,000 bonds to build heating plant for high school and improve heating system in other schools.

Pa., Phila.—Presto-Lite Co., Inc., 30 East 42nd St., New York City, having plans prepared for 1 story, 25 x 100 ft., brick and steel acetylene plant, rein.-con. flooring, here. About $80,000. Private plans.

Md., Lansdowne—Natl. Steel Rolling Co., 203 Keyser Bldg., Baltimore, recently incorporated under laws of Maryland, acquired site near here, and plans to build reclaiming steel bar rolling mill, oil and electrically operated, annual capacity of 9,000 tons. About $100,000.

N. C., Greensboro—Master Auto Serv. Co. having plans prepared by A. Worth, archt., Greenboro, for 2 story, 55 x 150 ft., rein.-con. and steel garage. About $50,000.

Ala., Birmingham Tennessee Coal Iron & R.R. Co., B-M Bldg., having plans prepared by H. H Lane, engr., 2320 Dime Bank Bldg., Detroit, for 1 and 2 story, freight car shop, rein.-con. brick and steel, rein.-con flooring, concrete foundation. About $2,500,000.

Ky., Louisville—W. E. Ross is pres. of stock recently organized to build 5 story, 90 x 210 ft., steel and concrete garage at 2 and 3 Market St. About $100,000.

O., Cincinnati—Presto-Lite Co., Inc., 30 East 42nd St., New York City, having plans prepared for acetylene plant, here, to include several 1 story, brick and steel buildings, rein.-con. flooring, concrete foundations, averaging 25 x 100 ft. each. About $75,000. Private plans.

O., Cleveland—Bloomfield Co., West 9th St. and Lakeside Ave., plans to build 3 story, concrete, steel and brick factory, rein.-con. flooring, concrete foundation, on East 24th St. and Superior Ave. About $200,000. S. Bloomfield, treas. Architect and engineer not selected.

O., Cleveland—Cuyahoga Fdry. Co., c/o F. Hronek, archt., 3608 East 131st St., soon lets contract building 1 story, 110 x 213 ft., steel and brick foundry, rein.-con. flooring, brick foundation. About $100,000.

O., Cleveland—Kaynee Co., Bway. and Aetna Rd., plans to build 5 story, concrete, steel and brick addition to factory, rein.-con. flooring, concrete foundation. About $250,000. Christian, Schwarzenberg & Gaede Co., 1900 Euclid Ave., archts. and engrs.

O., Cleveland—A. B. Lea, Swetland Bldg., having plans prepared by Best & Hoefler, archts. and engrs., 6532 Euclid Ave., for 1 story, 124 x 138 ft., concrete, steel and brick garage, rein.-con. flooring, concrete foundation, on Summer Ave. About $60,000.

Ind., Indianapolis—Craig Hunt Motors Co., 9 North Illinois St., having plans prepared by S. A. Craig, archt., Huntington, for rein.-con. factory, on 38th and Meridian Sts. About $300,000.

Ind., Rushville—Mullins & Taylor plan to build 1 story, 83 x 165 ft., rein.-con. and brick garage and service station. About $70,000. McGuire & Shook, 320 Pythian Bldg., Indianapolis, archts.

Ind., West Terre Haute—Valentine Packing Co. plans to build 1 and 2 story meat packing house, brick and concrete. About $100,000. H. Valentine, mgr. Private plans.

Wis., Milwaukee—Evinrude Motor Co., 279 Walker St., plans to build 1 story, 100 x 300 ft., brick, concrete and steel factory, rein.-con. flooring, concrete foundation, on Lake St. Federal Eng. Co., Stephenson Bldg., archts. and engrs.

Tex., Dallas—Avery Co. of Texas, 401 Main St., preparing plans building 2 story, 100 x 122 ft., concrete and brick warehouse and store, rein.-con. flooring, brick and concrete foundation, on Main and Houston Sts. About $200,000.

Tex., Dallas—Dallas Art & Novelty Co. preparing plans for 2 story, 60 x 300 ft., brick and concrete factory, rein.-con. flooring, brick and concrete foundation. About $200,000.

Tex., Dallas — Silvers Box Corp., 317 Bourbon St., having plans prepared by J. C. Silvers, engr., Clarence and Latimore Sts., for box factory, to include 6 units, each 1 story, 60 x 200 ft., brick, brick foundation, on 10 acre tract near here. About $250,000.

Tex., Dallas—Simple Auto Rim Co. having plans prepared by W. H. McCullough, engr., 1711 West Ave., Waco, for brick and concrete factory, rein.-con. flooring, brick and concrete foundation. About $250,000.

Ore., Roseburg—City plans election in May to vote on $500,000 bonds to build power plant and waterworks system

Cal., Modesto—Stanislaus Co. Growers' Assn. plans to build canning plant About $150,000. G N. Pfarr, secy. Architect not selected.

Cal., Oakland—Palmolive Co., 12 4th St., Milwaukee, having plans prepared by Lockwood, Greene & Co., engrs., 38 South Dearborn St., Chicago, for oil mill, rein.-con. and brick, concrete foundation, here. About $500,000. Noted March 4.

Industrial Works (Continued)

Ont., Guelph—Commerce Trucks Ltd. plans to build motor truck factory, rein.-con., brick and steel, concrete foundation. About $500,000. Architect not selected.

Ont., Guelph—Ontario Agricultural College having plans prepared by F. R. Heakes, archt., Parliament Bldgs., Toronto, for 1 story dairy, concrete and brick, concrete foundation on college grounds. About $150,000.

Ont., Guelph—Simpson Co. Ltd., plans to build 3 or 4 story grocery warehouse, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $300,000. Architect not selected.

Ont. Peterboro—Canadian General Electric Co., 107 Park St., soon receives bids extending plant. About $1,000,000.

Ont., St. Catharines—Niagara, St. Catharines & Toronto Ry. plans to expend $500,000 for road improvements. Work includes car shop on Welland Ave., cost $50,000, increasing power sub-station facilities and centralization on control, also additions to rolling stock and repairs to tracks. E. W. Oliver, genl. supt.

Ont., Timmins—Ontario Tie Timber & Constr. Co., plans to construct 1 story, saw mill, wood construction throughout, stone foundations, on Mattagami River. About $50,000. Architect and engineer not selected.

Ont., Toronto—Langley Ltd., 289 Sumach St., plans to construct 4 story building for cleaning, dyeing and pressing clothes, concrete, brick and steel, concrete foundation, on Gerrard and Carlaw Ave. About $100,000. Architect not selected.

BIDS DESIRED

N. Y., Brooklyn—Until April 24, by F. A. Phelps, archt., Union Bldg., Newark, N. J., building 4 story, 55 x 175 ft., brick and rein.-con. factory, on Hamilton and Smith Sts., for Devoe-Reynolds, 460 Smith St.

N. Y., Brooklyn—Until April 14, by W. B. Wills, Inc., archts. and engrs., 1101 Myrtle Ave., building 2½ story, 100 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Grand Ave., for F. Huber, 314 Park Ave. About $50,000.

Pa., Edwardsville—Until April 15, by H. A. Maier, archt., Coal Exch. Bldg., Wilkes-Barre, building 2 story, 58 x 148 ft. silk mill, brick and steel, rein.-con. flooring, rock foundation, on Short St., for Energetic Throwing Co., c/o architect. About $150,000.

Pa., Phila.—L. B. Rothchild, archt., 1225 Sansom St., receiving bids building 4 story, 80 x 140 ft., brick and concrete, auto top factory, on 17th and Fairmount Sts., for Keystone Auto Top Co., Co., 1412 Fairmount St. Noted March 4.

Pa., Williamsport—Until April 20, by J. N. Stearns Silk Co., 1627 Erie Ave., building 4 story, 52 x 65 ft., storage and supply room, brick, rein.-con. flooring. About $80,000.

O., Cincinnati—Until April 25, by Williamson Heating Co., Marburg Ave., building 2 story, 64 x 180 ft., concrete and brick addition to foundry. About $50,000. Zettel & Rapp, Mercantile Library Bldg., archts.

O., Loveland—Until April 27, by F. Chase, engr., Loveland, building electric light plant, for city. About $125,000.

O., Sidney—Until April 12, by Bennett-Bull Packing Co., building 3 story, 40 x 81 ft., steel and brick packing plant. About $75,000. Anders & Reimers, 430 Erie Bldg., Cleveland, archts. and engrs.

Mich., Detroit—Until April 15, by A. Kahn, archt., Marquette Bldg., constructing 1 story, 175 x 282 ft., concrete, brick and steel factory, rein.-con. and wood flooring, concrete foundation, on Mt. Elliott and Strong Aves., for Detroit Pressed Steel Co., 1800 Mt. Elliott Ave.

Ill., Chicago—Ronneberg & Pierce, archts., 10 South La Salle St., receiving bids building 3 story, 48 x 120 ft., brick and timber factory, concrete foundation, for D. O. James Mfg. Co., 1120 West Monroe St. About $70,000. Noted April 1.

Wis., Kohler—Brust & Philipp, archts. and engrs., Free Press Bldg., Milwaukee, receiving bids building 3 story, 62 x 148 ft., rein.-con. mill, rein.-con. flooring, concrete foundation, for Kohler Co.

Ia., Sioux City—Until April 12, by Sioux City Casket Co., 900 5th St., building 3 story, 135 x 135 ft., rein.-con. factory and office, on 4th and Prospect Sts. About $200,000. Beuttler & Arnold, 235 Grain Exch. Bldg., archts.

Wash., Olympia—Until April 13, by State Capitol Comn., building rein.-con and brick power house, rein.-con. flooring, concrete foundation. About $100,000. Wilder & White, 50 Church St., New York City, archts. and engrs. Noted March 18.

Que., Montreal—Until April 15, by M. P. Frennell, Jr., city secy., for 10 story rein.-con. cold storage warehouse. About $1,000,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Lewiston**—Bates Mfg. Co. let contract building 5 story, brick and mill construction addition to manufacturing plant, stone foundation, to Cummings Constr. Co., Fidelity Bldg., Portland. About $150,000.

★**Vt., Rutland**—G. H. Grimm Co. let contract building brick and mill construction manufacturing plant, to F. H. Remington, Mead Bldg. About $50,000.

★**Mass., Boston**—W. C. Gaunt Co., 212 Summer St., let contract building 5 story, 60 x 160 ft., rein.-con. warehouse, rein.-con. flooring, concrete foundation, on Fargo St., to W. F. Kearns Constr. Co., 153 Milk St. About $300,000. Noted April 1.

★**Mass., Fitchburg**—Crocker, Burbank & Co., 549 Westminster St., let contract building 2 story, 46 x 300 ft. machine shop, 1 story, 54 x 100 ft. spinning shop, 2 story, 130 x 130 ft. beader shop and altering boiler house, all rein.-con., rein.-con. flooring, concrete foundation, to E. J. Cross Co., 82 Foster St., Worcester. About $400,000.

★**Mass., Greendale** (Worcester P. O.)—Norton Co., Barbers Crossing, Worcester, let contract building 6 story, 42 x 175 ft., rein.-con. and steel addition to manufacturing plant, rein.-con. flooring, concrete foundation, on New Bond St., here, to E. J. Cross Co., 82 Foster St. About $250,000. Noted March 11.

★**Mass., Holyoke**—Lachapelle Bourger & Co. let contract building 3 story, 55 x 100 ft., concrete garage and shop, on Main St., to Laliberte Constr. Co., 263 Oak St. About $120,000.

★**Mass., Indian Orchard**—Chapman Valve Co. let contract building 1 story, 160 x 200 ft., brick and steel addition to manufacturing plant, rein.-con. flooring, concrete foundation, on Pine St., to E. J. Pinney, Inc., 264 Main St., Springfield. About $75,000.

★**Mass., North Adams**—H. W. Clark Biscuit Co., 185 Ashland St., let contract building 4 story, 90 x 140 ft., concrete and steel addition to factory, rein.-con. flooring, concrete foundation, to Turner Constr. Co., 244 Madison Ave., New York City. About $150,000. Noted March 11.

★**Mass., Springfield**—Cordner Garage, 425 St. James Ave., let contract building 1 story, 111 x 257 ft., brick, concrete and steel garage and showroom, concrete flooring and foundation, on State St., to Chaplin & Chaplin, 374 Main St. About $85,000. Noted April 1.

★**Mass., Westfield**—M. B. Harding, archt., 33 Elm St., let contract to E. F. Carlson Co., 244 Main St., Springfield, building 1 and 3 story, 65 x 102 ft., addition to manufacturing plant and 1 story, storehouse, brick, concrete foundation, on Cycle Ave., for Westfield Candy Co. About $50,000. Noted April 1.

★**Mass., West Springfield** (Springfield P. O.)—Gilbert & Barker Mfg. Co., Cold Springs Ave., let contract constructing 2 story 80 x 400 ft. brass foundry, 1 story, 40 x 80 ft. zinc building, 2 story, 164 x 200 ft. sheet metal building, 1 story, 50 x 92 ft. power house addition, 1 story, 40 x 50 ft. garage, 1 story, 35 x 50 ft. sand blast building, 1 story, 14 x 75 ft. oxygenating building, 40 x 72 ft. engine house, 1 story, 63 x 141 ft. testing building, 1 story, 160 x 180 ft. storehouse, 3 story, 63 x 222 ft. recreation building and 3 story, 50 x 145 ft. administration building, to Tucker & Lewis, Inc., 101 Park Ave., New York City. About $1,000,000. Noted March 4.

★**Mass., Worcester**—O. Bradley Car Co., West Boylston St., will build 3 story, brick and concrete addition to manufacturing plant, concrete flooring and foundation. About $325,000. Work will be done by day labor.

★**R. I., Woonsocket**—Nyanza Mills, 159 Singleton St., let contract building 3 story, 155 x 300 ft., brick and concrete addition to manufacturing plant, rein.-con. flooring, concrete foundation, on Harding St., to Eastern Constr. Co., 660 Winter St. About $300,000.

★**Conn., Bridgeport**—Bullard Machine Tool Co., Broad St., let contract building 1 story, 50 x 240 ft., brick and steel factory, concrete flooring and foundation, on Brewster St., to J. R. Sheehan, 211 State St. About $50,000.

★**Conn., Hartford**—Nielsens Garage, 40 Temple St., let contract building 2 story, 50 x 140 ft., brick and concrete garage, rein.-con. flooring, concrete foundation, on Maple St., to H. M. Nielsen, 246 Laurel St. About $50,000. Noted Feb. 26.

★**Conn., Hartford**—C. F. Pond, 327 Trumbull St., let contract building 2 story, 40 x 65 ft., brick and mill construction warehouse, concrete foundation, to W. A. Wilcox, 327 Trumbull St., cost plus percentage basis.

★**Conn., Meriden**—Miller Bros. Cutlery Co., 464 Pratt St., let contract building 4 story, 50 x 90 ft., brick and mill construction addition to manufacturing plant, concrete foundation, to J. H Grozier Co., 721 Main St., Hartford. About $50,000. Noted March 11.

★**Conn., Windsor Locks**—J. R. Montgomery & Co. let contract building 6 story, 62 x 65 ft., brick and concrete addition to factory, rein.-con. flooring, concrete foundation, to Bent-Bartlett Co., 43 Ann St., Hartford. Noted March 4.

★**N. Y., Amsterdam**—McCleary, Wallie & Crouse let contract building 3 story, 80 x 165 ft., brick and steel manufacturing plant, concrete foundation, to J. H. Grozier Co., 721 Main St., Hartford, Conn. About $125,000.

★**N. Y., Brooklyn**—H. Figge, 285 Atlantic Ave., will build 4 story, brick, steel and concrete garage, rein.-con. flooring, concrete foundation, on Pacific St. About $60,000. Work will be done by day labor. Noted Feb. 19.

★**N. Y., Brooklyn**—Self-Winding Clock Co., Grand and Willoughby Aves., will alter brick, steel and concrete factory, rein.-con. flooring. About $100,000. Work will be done by day labor under supervision of Shampan & Shampan, archts., 50 Court St.

N. Y., Brooklyn — S. Wisglass & Co., Milford St. and Atlantic Ave., will build 1 story, 18 x 67 ft. garage, 1 story, 25 x 45 ft. boiler house, 1 story, 25 x 50 ft. power house and 2 story, 44 x 100 ft. addition to factory, brick, steel and rein.-con., rein.-con. flooring, concrete foundation. Work will be done by day labor under supervision of Shampan & Shampan, archts., 50 Court St.

★**N. Y., Long Island City**—Fahnestock Electric Co., Skillman Ave., let contract building 2 story, 50 x 100 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on East Ave. and 8th St., to C. C. Woodruff, 213 10th Ave. About $52,000.

★**N. Y., Long Island City**—J. Welden, 1 Bridge Plaza, let contract building 2 story, 90 x 100 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on 1st and Freeman Aves., to C. C. Woodruff, 213 10th Ave. About $65,000.

★**N. Y., Salamanca**—Salamanca Panel Co., 50 Elm St., let contract building 1 story, 130 x 150 ft., brick and concrete factory, to Tuna Mfg. Co., 72 Mechanic St., Bradford, Pa. About $60,000.

★**N. Y., Syracuse**—R. E. Deitz Co. let contract building 4 story, 108 x 124 ft., brick and concrete factory, on Wilkinson St., to Dawson Bros., Union Bldg. About $145,000.

★**N. J., East Orange** — Simms-Magneto Co, North Arlington Ave., let contract building 2 story, 177 x 231 ft., concrete addition to plant, to Amer. Concrete Steel Co., 27 Clinton St., Newark. About $385,000.

★**N. J., Newark**—Essex Leather Bag Co., 11 Campbell St., let contract building 3 story, 48 x 100 ft., concrete and brick factory, on Clifton and Sherman Sts., to Salmond Bros., 526 Elm St., Arlington.

★**N. J., Newark**—Genl. Lead Batteries, 123 West 56th St., New York City, will build 5 story, brick and steel factory, rein.-con. flooring, concrete foundation, on Lester Ave. and Chapel St. About $150,000. Work will be done by day labor under supervision of Timmis & Chapman, archts. and engrs., 315-5th Ave., New York City. Noted Feb. 5.

★**N. J., Newark**—Hanovia Chemical & Mfg. Co., New Jersey R.R. Ave. and Chestnut St., let contract building 3 story, 40 x 75 ft. chemical plant, brick and concrete, to Becker Constr. Co., 361 Grove St.

★**N. J., Newark**—Mono Serv. Co., Verona and Oraton Sts., let contract building 2 story, 103 x 175 ft. paper container factory, brick and concrete, to Wark Co., 1737 Filbert St., Phila.

Industrial Works (Continued)

★**N. J., Trenton**—Nearpara Rubber Co., 79 Prince St., let contract building 1 story, 100 x 125 ft. plant, also 1 story, 30 x 30 ft. power house, steel, to Bethlehem Constr. Co., Bethlehem Trust Bldg., Bethlehem, Pa. About $150,000.

★**Pa., Phila.**—J. Blood & Bros., Trenton and Allegheny Sts., let contract building 3 story, concrete and brick dye house, on Janney and Clearfield Sts., to G. Byers, 1747 Foulkrod St. About $60,000. Noted Feb. 12.

★**Pa., Phila.**—Penn Warehousing & Safe Deposit Co., 113 South 3rd St., let contract building 9 story, 12 x 68 ft., brick garage, on Swanson and Fitzwater Sts., to R. E. Lamb Co., 841 North 19th St. About $70,000.

★**Pa., Phila.**—P. S. Tyre, archt. and engr., 1509 Arch St., let contract to Standard Constr. Co., 1713 Sansom St., constructing 2 story, 75 x 214 ft., brick and stone service building, on 34th and Chestnut Sts., for Universal Motor Agency, 3428 Ludlow St. Cost to exceed $50,000. Noted Jan. 22.

★**Pa., Pittsburgh**—T. H. Nevin Co., Preble and Island Sts., let contract building 3 concrete, brick and steel additions to paint plant, to J. W. Cowper Co., Fidelity Bldg., Buffalo, N. Y. About $200,000.

★**O., Cleveland**—Allen-Osborne Co., archts. and engrs., Rose Bldg., let contract to C. Peterson Co., 4500 Euclid Ave., building 1 story, 100 x 150 ft., steel and brick foundry, brick foundation, on Dunham Rd., for Minerva Engine Co., East 66th St. and Euclid Ave. About $60,000. Noted April 1.

★**O., Cleveland**—Guarantee Bldg. Co., Union Bldg., let contract constructing 4 story, 60 x 150 ft., concrete, steel and brick garage and salesroom, rein.-con. flooring, concrete foundation, on East 55th St. and Prospect Ave., to A. A. Lane Constr. Co., Union Bldg. About $250,000.

★**O., Cleveland**—G. E. Hayman, mgr. Variety Cabinet Co., 1421 East 40th St., let contract building 2 story, 50 x 100 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, on East 66th St. near Euclid Ave., to G. F. Feaga Co., 5927 Euclid Ave. About $50,000.

★**O., Cleveland**—Langanean Mfg. Co., 8403 Franklin Ave., let contract building 2 story, 40 x 50 ft., concrete, steel and brick boiler house, rein.-con. flooring, concrete foundation, to H. G. Slatmeyer & Son Co., 203 Lakeside Ave. About $50,000.

★**O., Cleveland**—Lincoln Motor Sales Co., c/o E. McGeorge, archt., 1900 Euclid Ave., let contract building 1 story, 75 x 160 ft., concrete and brick garage, rein.-con. flooring, concrete and brick foundation, on East 37th St. and Prospect Ave., to S. W. Emerson Co., 1900 Euclid Ave. About $75,000.

★**O., Cleveland**—Loomis-Sielaff Co., 6616 Morgan Ave., let contract building 1 story, 60 x 240 ft., brick and steel factory, at 6600 Morgan Ave., to A. A. Lane Constr. Co., Union Bldg. About $75,000.

★**O, Cleveland**—Phoenix Ice Machine Co., 2711 Church Ave., let contract constructing 1 story, 50 x 70 ft., steel and brick storage building, to J. Hruby, 4122 East 131st St. About $50,000. Noted March 18.

★**O., Dayton**—See "Buildings."

★**O., Lorain**—Natl. Stove Co. let contract building 1 story, 60 x 180 ft., steel and brick addition to factory, brick foundation, to L. A. Burgett, 6th St. About $60,000.

★**O., Shelby**—Shelby Metal Products Co. let contract building 1 story, 90 x 150 ft., steel and brick factory, to H. K. Ferguson Co., 6532 Euclid Ave., Cleveland. About $50,000.

★**O., Warren**—H. M. Lane Co., engrs., 701 Owen Bldg., Detroit, let contract to Foundation Co., 233 Bway., New York City, constructing 2 story, 100 x 200 ft., rein.-con. and steel foundry, rein.-con. flooring, concrete foundation, here, for Genl. Fire Extinguisher Co. About $350,000. Noted Jan. 22.

★**Mich., Detroit**—Mercantile—See "Buildings."

★**Mich., Detroit**—Book Estate, Book Bldg., let contract altering and building 5 story, 65 x 95 ft. addition to factory, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Grand River Ave. and Washington Blvd., to F. W. Russum, Penobscot Bldg. About $70,000.

★**Mich., Milan**—Amer. Furnace & Fdry. Co. let contract building 1 story, 75 x 200 ft., brick, concrete and steel foundry, concrete foundation, along tracks of Michigan Central Ry., to T. Gotts, Milan. About $50,000.

★**Wis., Kohler**—Kohler Co. will build 1 story, 100 x 290 ft., brick and steel foundry, concrete foundation. Work will be done by day labor.

★**Tex., Houston**—Armour Auto Agency, Preston and Washington Sts., let contract building 3 story, 100 x 151 ft., rein.-con. and brick warehouse and salesroom, rein.-con. flooring, on Louisiana and Preston Sts., to Southwestern Constr. Co., El Paso. About $150,000. Noted March 11.

★**Tex., Houston**—Magnolia Petroleum Co., Mason Bldg., let contract building 2 story, 60 x 100 ft., rein.-con. and brick filling station, on McKinney and Fannin Sts., to A. Baring, 3602 Milam St. About $150,000. Noted March 11.

★**Wash., Seattle**—W. Bebb, Denny Bldg., let contract constructing 2 story, 60 x 100 ft., concrete warehouse or loft, on Hubbel Way and 9th Ave., to Sylliaasen & Sando, Downs Blk. About $56,000.

★**Cal., San Francisco**—Natl. Carbon Co., 8th and Brannan Sts., let contract building 4 story, 175 x 275 ft., rein.-con. warehouse, rein.-con flooring, to Hannah Bros., 142 Sansome St., $362,500.

Buildings

PROPOSED WORK

N. H., Manchester—High School—Bd. Educ. having plans prepared by W. E. Provost, archt., 581 Union St., for 3 story, 30 room, brick, steel and stone, on West Side. About $300,000. L. A. Thorp, Amoskeag Savings Bank Bldg., chn.

N. H., Manchester—High School—Bd. Educ. having plans prepared by C. R. Whitcher, archt., 814 Elm St., for 3 story, 40 room, brick, steel and concrete, rein.-con. flooring, concrete foundation. L. A. Thorp, Amoskeag Savings Bank Bldg., chn.

Mass., Boston—Bank and Office—Federal Trust Co., 85 Devonshire St., having plans prepared by J. E. McLaughlin, archt., 88 Tremont St., for brick, steel and concrete, on Washington St.

Mass., Boston—Theatre—Washington Essex Bldg. Trustees, c/o Mowll & Rand, archts., 59 Bromfield St., having plans prepared converting present store and office building on Washington St. corner Essex St., into theatre (3,500-4,000 seating capacity). About $2,000,000.

Mass., Cambridge (Boston P. O.)—Theatre—Harvard Amusement Co., c/o H. J. Krapp, archt, 116 East 16th St., New York City, having plans prepared for 4 story, brick and rein.-con., on Harvard Sq., here. About $1,000,000.

Mass., Hinsdale—School—School Bd. plans to build 2 story, brick. About 50,000. Architect not selected.

Mass., Lynn—Home—Lynn Home for Aged Women, North Common St., plans to build home to replace one recently destroyed by fire. Loss between $65,000 and $75,000. Architect not selected.

Mass., Medford (Boston P. O.)—Club—B. P. O. Elks, Terrace Rd., plans to build brick and steel clubhouse and home, on Forest St. About $75,000. M. J. Daly, ch. bldg. com. Architect not selected.

Mass., New Bedford—Office—Blackall, Clapp & Whittemore, archts., 20 Beacon St., Boston, preparing revised plans for 8 story, steel and stone. Owner's name withheld.

Mass., Palmer—School—Town plans to build elementary school in Depot Village Dist. About $50,000. D. F. Dillon, 431 Main St., chn. Architect not selected.

Mass., Pittsfield—Church—First Baptist Church, 64 North St., plans to build brick and steel, on North St. About $50,000. Architect not selected.

Mass., South Boston (Boston P. O.)—Church—Wesley Methodist Episcopal Society, c/o W. H. Taylor, archt, 50 Bromfield St., Boston, having plans prepared for altering and building 1 story, brick and stucco addition, concrete foundation, on L St. About $50,000.

Mass., Springfield—Business and Office—Republic Co., Main St., soon lets contract remodeling present building. About $50,000. Private plans.

Mass., Springfield—High School—Bd. Educ. plans to build 3 story, brick, concrete and steel, on State St. About $250,000. Architect not selected.

Mass., Warren—School—Bd. Selectmen plans to build 2 story, brick, on East Main St. About $50,000. Architect not selected.

Mass., Winchester—School—School Bldg. Com. plans to build 2 story, brick and steel. About $60,000. Architect not selected.

R. I., Arctic (Barbourville P. O.)—Theatre—T. C. Herrmann, archt., 17 Exchange St., Providence, preparing plans for 1 story, 80 x 125 ft., brick terra cotta and steel. About $50,000. Owner's name withheld.

R. I., Pawtucket—Theatre—B. F. Keith Co., Keith Bldg., Phila., plans to build brick and steel, on Exchange and North Union Sts., here. About $150,000.

R. I., Providence—School—Pub. Bldg. Dept. plans to build 2 story, 6 room, brick, concrete and steel. About $75,000. Private plans.

Conn., Middletown—Hospital—D. K. Perry, archt., 79 Golf Maple Hill, New Britain, soon lets contract building 2 story, 105 x 203 ft., brick, concrete and steel addition, rein.-con. flooring, concrete foundation, on South Farms, for Connecticut Hospital for Insane, c/o architect. About $175,000.

Conn., Middletown—Housing—Noiseless Typewriter Co., High St., soon lets contract building several 2 story, frame houses for workmen, rock foundation. About $50,000. Private plans.

Conn., Middletown—Housing—Russell Mfg. Co., South Farms, soon lets contract building twenty-four 2 story, frame houses for workmen, concrete foundation. About $125,000. Private plans.

Conn., Torrington—Administration—Torrington Co., 52 Field St., plans to construct brick, steel and concrete administration building. About $100,000. Private plans.

Conn., Wallingford—School—Choate School for Boys having sketches made by J. T Simpson, archt., Essex Bldg., Newark, N. J., for brick and concrete, here. Cost to exceed, $100,000.

Conn., Waterbury—Bank—Waterbury Trust Co., 132 Grand St., having plans prepared by W. P Crabtree, archt., 272 Main St., New Britain, for remodeling interior of present building. About $60,000.

Conn., Waterbury—High School—Bd plans to build 3 story, brick, concrete and steel. About $250,000. Architect will soon be selected.

Conn., Waterbury—School—Bd. Educ. having plans prepared by T. F. Freney, archt., 51 Leavenworth St., for 2 story, 4 room brick, steel and concrete addition, concrete foundation, on Highland Ave. About $50,000.

Conn., West Hartford (Hartford P. O.)—High School—Bd. Educ. having plans prepared by W. T. Marchant, archt., 36 Pearl St., Hartford, for 3 story, brick, concrete and steel, on South Main St. About $500,000.

N. Y., Batavia—Community Hall—Local Council, Knights of Columbus, purchased site at 215 East Main St. and plans to build 2 story, brick and concrete. About $60,000.

N. Y., Binghamton—Temple—Masonic Bldg. Corp. plans to build temple. Cost between $200,000 and $250,000. G. L. Nelson, 1 Carroll St., pres.

N. Y., Brooklyn (Bay Ridge)—Hospital—W. B. Wills, Inc., archts. and engrs., 1101 Myrtle Ave., receives bids about May 1, building 5 story, brick, steel and stone, concrete foundation, on 4th Ave. and 17th St. About $125,000. Owner's name withheld.

N. Y., Buffalo—Sales—See "Industrial Works."

N. Y., Ithaca—Dormitory—W. G. Mennen and E. M. Williams, Detroit, Mich., donated $100,000 to build dormitory, at Cornell University, here.

N. Y., Jamestown—High School—Bd. Educ. had plans prepared for high school. Election soon to vote on $1,500,000 bonds for project.

N. Y., Long Island City—Church—Community Methodist Church, 185-25th St., Jackson Heights, having plans prepared by E. P. Platt, archt. and engr., 680 5th Ave., New York City, for 2 story, 100 x 125 ft., brick, steel and stone, brick foundation, on Fillmore Ave. About $100,000. F. P. Carson, pastor.

N. Y., Niagara Falls—Y. M. C. A. and Y. W. C. A. plan campaign to raise $650,000, part of which will be used to construct building.

N. Y., New York—Club—Natl. Sporting Assn., c/o Dewey & Greenley, archts. and engrs., Flatiron Bldg., having sketches made for 5 story, 50 x 100 ft., brick, steel and stone, brick foundation. About $200,000.

N. Y., New York—Exchange—New York Telephone Co., 15 Dey St., having sketches made by McKenzie, Voorhies & Gmelin,

Buildings (Continued)

archts. and engrs., 1123 Bway., for brick, steel and stone, concrete foundation, on Vesey, Barclay, West and Washington Sts. About $750,000.

N. Y., New York—Office—J. Herrick, 99 Nassau St., having plans prepared by J. Levingson, archt. and engr., 405 Lexington Ave., for altering brick and steel office building, on Fulton and Ann Sts. About $75,000.

N. Y., New York—Office—R. C. Boehler, archt. and engr., 38 West 32nd St., soon lets contract building 12 story, brick, steel and stone, concrete foundation, at 146 West 26th St., for Leopold Realty Co., c/o architect.

N. Y., New York—Theatre—W. C. Jordan, c/o W. N. Smith, archt. and engr., 101 Park ave., having plans prepared altering 2 story, 100 x 100 ft., brick, steel and stone. About $50,000.

N. Y., Rochester—Association—Rochester Joint Bd., Sect. of Amalgamated Clothing Workers of Amer., plans to construct 4 or 5 story, brick, concrete and steel. Cost between $150,000 and $200,000. Address A. I. Pearlman, mgr.

N. J. Asbury Park—Hotel—Froling & Holler, archts. and engrs., 150 Nassau St., New York City, preparing plans for 12 story, brick, steel and stone, concrete foundation, on Ocean Ave. between 2nd and 3rd St. About $1,000,000. Owners name withheld.

N. J., Atlantic City — Hotel — Nemours Hotel Co., Wilmington, Del., soon lets contract building 12 story, 200 x 200 ft., concrete and brick. H. Trumbauer, Land Title Bldg., and Druckenmiller & Williams, 1537 Chestnut Sts., Phila., archts.

N. J., Boonton—School — Bd. Educ. rejected bids received March 25, building 11 room school. Work will be readvertised. Noted March 18.

N. J., Collingswood (Campbellsport P. O.) —School—Bd. Educ. plans to build brick and concrete junior high school. About $200,000. P. A. Davis, 1713 Sansom St., Phila., archt.

N. J., East Orange—Community—City plans to construct community building as memorial to war veterans. About $500,000.

N. J., Freehold—High School—Bd. Educ. plans to build 4 story, brick, steel and stone, brick foundation. W. Conover, 114 Liberty St., New York City, archt. and engr.

N. J., Hoboken—School—Bd. Educ. plans to build new school on 9th St. About $200,000. O. Dieffenbach, 84 Washington St., archt.

N. J., Jersey City—Office and Restaurant —D. Sinisi, 2893 Hudson Blvd., plans to build office and restaurant, on Hudson Blvd. and Bergen Ave. About $50,000.

N. J., Jersey City—Theatre—Haring & Blumenthal, c/o De Rosa & Pereira, engrs. and archts., 110 West 40th St., New York City, having plans prepared for brick, steel and stone, brick foundation, on Central Ave. and Sherman Pl. About $200,000.

N. J., Trenton—Home—Trenton Masonic Temple Assn., 940 West State St., plans to build home on West Front St. About $500,000. E. D. Coleman, secy. Architect not selected.

N. J., Trenton—School—Bd. Educ. plans to build new school on West State St. About $750,000. W. A. Poland, 9 South Stockton St., archt.

Pa., Barnesboro—Parish House and Sunday School—R. Barnes (donor) soon receives bids building 2 story, 58 x 120 ft., stone and timber, rock foundation, for Episcopal Church About $55,000. F. A. Hersh and F. J. Shollar, Commerce Bldg., Altoona, archts.

Pa., Phila. — Office — Hoffman - Henon, archts. and engrs., Finance Bldg., soon let contract building 6 story, 20 x 60 ft., concrete and brick, on 16th and Sansom Sts. Owner's name withheld.

Del., Seaford—High School—Bd. Educ. having sketches made by Guilbert & Betelle, archts., 2 Lombardy St., Newark, N. J., for high school. About $200,000.

Md., Salisbury—Schools—Wicomico Co. election May 3, to vote on $200,000 bonds to build new schools, also repair, alter and build additions to old schools, in various towns. J. M. Bennett, secy Bd. Educ.

W. Va., Fairmont—Schools—City election April 20, to vote on $98,000 bonds to build 2 schools. D. F. Ice, secy, Bd. Educ.

W. Va., Huntington—School—Bd. Educ. having plans prepared by W. F. Diehl, archt., Robson-Prichard Bldg., for 3 story, 130 x 130 ft., brick and steel, rein.-con. flooring, concrete foundation, on 12th Ave. and 7th St. About $100,000.

W. Va., Huntington—Theatre—B. N. Johnson having plans prepared by R. M. Bates, archt., 1st Natl. Bank Bldg., for 1 story, 65 x 210 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Adams Ave. About $75,000.

N. C., Charlotte—Hotel—R. Lassiter, Columbia Bank Bldg., plans to build 10 or 12 story. About $100,000. Architect not selected.

N. C., Franklinton—School—Bd. Educ. plans to build school. About $100,000. A. H. Vonn, chn. Architect not selected.

N. C., Hickory—City Hall—City plans to build 2 story. About $100,000. Work will be done by day labor under supervision of R. G. Henry, city mgr.

Ga., Lagrange—Hotel and Theatre—Lagrange Hotel Co., c/o W. L. Stoddart, archt., 9 East 40th St., New York City, having plans prepared for 100 x 100 ft., brick, steel and stone, concrete foundation. About $500,000.

Fla., Miami — Bank — First Natl. Bank, 239 12th St., having plans prepared by H. H. Hundy, archt., 135 11th St., for 4 story, 50 x 110 ft., rein.-con., on Ave. C. About $150,000.

Fla., Miami—Hotel—L. T. Highleman and W. B. Moore, Miami City Hall, plan to build rein.-con., on 12th St. About $2,000,000. Architect and engineer not selected.

Ky., Ashland—Office and Bank—Ashland Natl. Bank plans to build 10 story, on Winchester Ave. Architect not selected.

Ky., Louisville—State Fair—State Bldg. Com., Frankfort, had plans prepared by Joseph & Joseph, archts. and engrs., Atherton Bldg., for fair building on State Fair grounds, here. About $300,000.

O., Amsden—School—Bd. Educ. Jackson Twp. having plans prepared by Glass & Austin, archts., Grand Theatre Bldg., Columbus, for 2 story, 74 x 108 ft., concrete and brick. About $120,000.

O., Bascom—School—Bd. Educ. Hopewell Twp. soon lets contract building 2 story, 60 x 80 ft., concrete and brick, rein.-con. flooring, here. About $80,000. O. D. Howard, 8 East Broad St., Columbus, archt. Noted Jan. 22.

O., Centerburg—School—Bd. Educ. having plans prepared by O. D. Howard, archt., 8 East Broad St., Columbus, for 2 story, concrete and brick. About $125,000. D. E. Rinehart, clk.

O., Cleveland—Bank—Cleveland Trust Co., East 9th St. and Euclid Ave., having plans prepared by G. B. Post & Sons, archts., Schofield Bldg., altering and building 1 story, concrete, steel and brick addition. About $125,000.

O., Cleveland — Commercial — W. D. Hirsch, Natl. City Bldg., plans to build 6 story, 100 x 120 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, at 711 St. Clair Ave. About $200,000. Architect not selected.

O., Cleveland — Commercial—Syndicate, c/o W. L. Ullmer, 1001 Hippedrome Bldg., plans to build 4 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on Oregon Ave., between East 9th and 12th Sts. About $250,000. Architect and engineer not selected.

O., Cleveland—Office—J. De Kaiser, East Ohio Gas Bldg., plans to remodel 8 story, marble, tile, cement and iron, at 803 West Superior Ave. About $100,000. Architect not selected.

O., Cleveland—High School—Bd. Educ. plans to build 3 story concrete, steel and brick, rein.-con. flooring, concrete foundation, on University Circle. About $5,000,000. W. R. McCormack, East 6th St. and Rockwell Ave., archt.

O., Cleveland—Theatre and Commercial—J. Makoff, 3525 Woodland Ave., plans to build 2 story, 50 x 150 ft., steel and brick, on East 25th St. and Seville Ave. About $60,000. Architect not selected.

O., Cleveland Heights (Warrensville P. O.)—Church—Cleveland Heights Methodist Episcopal Church, c/o W. H. Nicklas, archt., 1900 Euclid Bldg., Cleveland, having plans prepared for 1 story, 140 x 180 ft., steel, brick and stone, rein.-con. flooring, concrete and brick foundation, on Euclid Blvd., here. About $250,000.

O., Cleveland Heights (Warrensville P. O.)—Library—Pub. Library Bd., c/o A. Clum, Leader-News Bldg., Cleveland, plans to build 1 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, here. About $100,000. Architect not selected.

O., Columbia—Church—Christ Lutheran Church plans to build 75 x 100 ft., brick and stone. About $75,000. C. V. Sheatsley, pastor. Architect not selected.

O., Fairview—School—Bd. Educ. plans to build 2 story, concrete, steel and brick. About $100,000. L. E. Garnett, pres. Architect not selected.

O., Lakewood (Cleveland P. O.)—Market —Bd. Comrs. Cuyahoga Co., c/o J. Menning, Cleveland, plans to build 1 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, here. About $300,000. Architect not selected.

O., Oak Hill—High School—Bd. Educ. having preliminary plans prepared by Glass & Austin, archts., Grand Theatre Bldg., Columbus, for 2 story, 70 x 85 ft., brick and concrete. About $60,000.

O., Shaker Heights (Cleveland P. O.)—Hospital—Shaker Heights Hospital c/o W. C. Keough, Engineers Bldg., Cleveland, plans to build 3 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, here. About $100,000. Architect not selected.

O., Springfield—Parish House—St. Bernard's Church having plans prepared by R. F. Gable, archt., Gotwald Bldg., for 2 story, 60 x 110 ft., brick and stone, concrete foundation, on west side. About $50,000.

O., Springfield—School—Bd. Educ. plans to build 2 story, 80 x 110 ft., steel and brick, rein.-con. flooring, concrete foundation, on Blee Estate, Greene Twp. About $50,000. R. C. Gotwald, Gotwald Bldg., archt.

Ind., Cloverdale — High School — G. Walker, twp. trustee, having plans prepared by Johnsen & Miller, archts., 105 South 7th St., Terre Haute, for 2 story. About $110,000.

Ind., Indianapolis — Clubhouse—Indianapolis Lodge No. 13, P. P. O. E. had plans prepared by A. Scherrer, archt., 417 Indianapolis Trust Bldg., for 7 story, brick and stone, on East 30th and Vermont Sts. Cost between $600,000 and $700,000.

Ind., Russiaville—School—O. S. Flora, twp. trustee, having revised plans prepared by E. E. Dunlap Co., archts., 909 State Life Bldg., Indianapolis, for 2 story, high and grade school, brick. About $50,000.

Ind., Terre Haute—Hospital—Union Hospital Executive Com. having preliminary plans prepared by Stratton & Snyder, archts., 1110 Union Trust Bldg., Detroit, for 3 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on 7th Ave. F. P. Fairbanks, chn. About $350,000.

Mich., Detroit—Bank—Amer. State Bank, 115 Griswold St., plans to alter and build 10 story, 58 x 62 ft., concrete brick and steel addition, rein.-con. flooring, on State and Griswold Sts. About $100,000. Architect's name withheld.

Mich., Detroit—Bank—Bank of Detroit, 43 West Fort St., having plans prepared by L. Kamper, archt., Book Bldg., for 2 story, 60 x 85 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on West Jefferson and Cary Aves. About $75,000.

Mich., Detroit — Bank — Central Savings Bank, Majestic Bldg., having plans prepared by L. Kamper, archt., Book Bldg., for 2 story, 55 x 75 ft., brick, concrete, steel and stone, rein.-con. flooring, concrete foundation, on Mack and Holcomb Sts. About $75,000.

Mich., Detroit — Church and School—Church of Visitation, c/o Donaldson & Meier, archts., 1314 Penobscot Bldg., had plans prepared building 2 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on 12th St. and Lawrence Ave. About $300,000. Noted Jan. 22.

Mich., Detroit—Lodge House—Independent Order Odd Fellows Assn., c/o G. D. Mason, archt., 80 Griswold St., having plans prepared for 2 story, concrete, brick and stone, rein.-con. and wood flooring, concrete foundation, on Pulford and Concord Aves. About $150,000.

Mich., Detroit — Mercantile — R. Finn, archt., 435 Woodward Ave., preparing plans for 2 story, 40 x 90 ft., rein.-con., brick and steel, concrete foundation, on 31st St. and Michigan Ave. About $50,000. Owner's name withheld.

Mich., Detroit—Mercantile—A. E. Harley, archt., 435 Woodward Ave., preparing plans for altering and building 3 story, 40 x 100 ft addition, rein.-con., brick and steel, rein.-con. flooring, on Grand River Ave. and Park St. About $55,000. Owner's name withheld.

Wis., Madison — Hospital — Wisconsin Methodist Hospital Assn., Pioneer Blk., having plans prepared by F. H. Ellerbe, archt., Endicott Bldg., St. Paul, for 9 story,

Buildings (Continued)

brick and concrete, rein.-con. flooring, concrete foundation, on Wisconsin Ave. About $500,000.

Wis., Manitowoc—Theatre—George Bros. Co., 913 South 8th St., soon receives bids building 1 story, 100 x 130 ft., concrete and brick. About $135,000.

Wis., Milwaukee—Church—R. E. Oberst, archt., 353 Natl. Ave., receives bids about April 10, building 1 story, 40 x 73 ft., brick and steel, concrete foundation, on 10th and Hadley Sts., for Gloria Lutheran Church, 1183 30th St. About $50,000.

Wis., Rice Lake—Hospital—Wisconsin Methodist Hospital Assn. having plans prepared by F. H. Ellerbe, archt., Endicott Bldg., St. Paul, for brick and concrete, rein.-con. flooring, concrete foundation. About $150,000. Noted Feb. 12.

Wis., Sturgeon Bay—High School—Bd. Educ. having plans prepared by Foeller & Schober, archts., Fox Blk., Green Bay, for brick and concrete, rein.-con. flooring, concrete foundation. About $75,000.

Ia., Redfield—School—Bd. Educ. having preliminary plans prepared by W. Gordon, archt., 319 Hubbell Bldg., Des Moines, for 3 story, rein.-con. and brick, rein.-con. flooring, concrete foundation. About $150,000. W. Taylor, secy.

Minn., Birchdale—School—Bd. Educ. rejected bids building 1 story, 32 x 91 ft., rein.-con. and brick. About $80,000. Project postponed until fall. A. P. Allred, 204 Ferguson Bldg., Duluth, archt. Noted March 4.

Minn., Lewiston—High School—Bd. Educ. having plans prepared by Croft & Boerner, archts., 833 Palace Bldg., Minneapolis, for 2 story, 68 x 140 ft., rein.-con., brick and tile. About $135,000. W. F. Gensmer, clk.

Minn., Morris—School—State Bd. Educ., St. Paul, having plans prepared by C. H. Johnston, archt., 715 Capital Bank Bldg., St. Paul, for 2 story, 44 x 120 ft., rein.-con. and brick, at State farm, here. About $75,000.

Minn., Northfield—Dormitory—Carleton College having plans prepared by Holmes & Flinn, archts., 8 South Dearborn St., Chicago, for 4 story, 32 x 80 ft., brick addition, here. About $75,000. D. J. Cowling, pres.

Minn., St. Paul—Hospital—City and Ramsey County having plans prepared by C. H. Johnson, archt., 715 Capital Bank Bldg., for 3 story, 44 x 84 ft., rein.-con. and brick, on Jefferson Ave. and Colborne St. About $100,000.

Minn., Thief River—School—Bd. Educ. having plans prepared by Sund & Dunham, archts., 512 Essex Bldg., Minneapolis, for 2 story, 61 x 163 ft., brick and tile here. About $125,000. P. O. Myhrum, clk.

Tex., Amarillo—Store—Aveary Co. of Texas, 401 Main St., Dallas, preparing plans for 2 story, 100 x 100 ft., brick and rein.-con., rein.-con. flooring, here. About $100,000.

Tex., Dallas—Store, etc.—See "Industrial Works."

Tex., Port Arthur—Schools—Bd. Educ. rejected bids received March 16, building three 2 story brick schools. About $200,000. W. B. Ittner, Bd. Educ. Bldg., St. Louis, Mo., archt. Noted Feb. 19.

Tex., Wichita Falls—Schools—City election April 24, to vote on $300,000 bonds to build schools.

N. M., Gallup—Schools—Bd. Educ. rejected bids received March 23, building rein.-con. high school and brick grammar school. New plans will probably be prepared. W. R. Cregar, clk. C. L. Wilson, Alhambra, Cal., archt. Noted March 4.

N. M., Las Cruces—School—School Dist. 2, Dona Ana Co., plans election April 13, to vote on $120,000 bonds to build school, here. E. R. Korf, clk.

Nev., Reno—Hospital—State Bldg. Com., Carrson City, soon receives bids building 2 story, rein.-con., here. About $200,000. J. F. DeLongchamps, Nixon Bldg., archt.

Ariz., Phoenix—Lodge—B. P. O. E. Lodge plans to build 4 story, 100 x 137 ft. rein.-con., here. About $400,000. Architect not selected

Ariz., Safford—School—School Dist. 1, Graham Co., plans election April 16, to vote on $50,000 bonds to build new school, on Hampton site. M. Layton, clk.

Wash., Seattle—Studio—Cornish School of Music, 905 East Pine St., having plans prepared by A. H. Albertson, archt., Henry Bldg., for 3 story, 100 x 100 ft., rein.-con. and brick, on North Bway. and Aloha St. About $200,000.

Wash., Tacoma—Bank—Natl. Bank of Tacoma, Pacific and 13th Sts., plans to build 3 story, rein.-con. and brick, on Pacific and 12th Sts. Architect not selected.

Ore., McMinnville—Church—First Baptist Church plans to build church. About $100,000.

Cal., Fellows — School — Trust Midway School Dist. having plans prepared by T. B. Wiseman, archt., Brower Bldg., Bakersfield, for school, to include manual training and domestic science buildings, additional class rooms, etc. About $100,000.

Cal., Los Angeles — Church — Mt. Olive Methodist Episcopal Church, 1716 North Mariposa Ave., having plans prepared by R. H. Orr, archt., 1301 Van Nuys Bldg., for brick and stucco, concrete foundation, on Harold Way. About $100,000. G. L. Graff, pastor.

Cal., Sacramento — High School — Bd. Educ. retained E. A. Mathews, archt., Call Bldg., San Francisco, to prepare plans for new high school. About $600,000.

Cal., Santa Ana—Office—First Natl. Bank plans to build 6 story, 75 x 100 ft., rein.-con. and steel, rein.-con. flooring, concrete foundation. J. Parkinson, 420 Title Insurance Bldg., Los Angeles, archt. Engineers not selected.

Que., Nicolet—School—Sisters of the Assumption soon receive bids constructing 3 story, 50 x 100 ft. normal school, brick, steel and concrete, concrete foundation. About $200,000. Architect's name withheld.

Ont., Brantford — Hospital—Brantford General Hospital Bd. having plans prepared by W. C. Tilley, archt., Temple Bldg., for altering buildings for nurses' home and isolation hospital, cost, $87,000; extending general hospital, $78,000, rein.-con., brick and steel, concrete foundation.

Ont., Bridgeburg—Town Hall—Town Building Com. plans to erect new town hall. About $100,000.

Ont., Leamington—School — Pub. School Bd., Windsor, having plans prepared by J. C. Pennington, archt., La Belle Bldg., Windsor, for 2 story, 10 room, concrete, brick and steel, rein.-con. flooring, concrete foundation. About $100,000.

Ont., Ottawa—Schools—Pub. School Bd., Elgin and Gilmore Sts., plans to build two 2 story, rein.-con., brick and steel, concrete foundations. About $250,000. Architect not selected.

Ont., Sarnia—Hotel and Mercantile—Martin & Sperry, c/o J. B. Sperry, Huron Ave., Port Huron, Mich., plans to construct 4 story hotel and mercantile building, rein.-con., brick and steel, concrete foundation. About $200,000. Architect not selected.

Ont., Toronto — Hospital—City having plans prepared by W. D. Price, city archt., for 3 story, concrete, steel and brick, rein.-con. flooring, concrete foundation. About $300,000.

BIDS DESIRED

Conn., Shelton—High School — Until April 16, by Bd. Educ., building 2 story, brick and steel, concrete flooring and foundation, on Coram Ave. About $125,000. Brown & Von Beren, 185 Church St., New Haven, archts.

N. Y., New York—School—Until April 13, by Bd. Educ., building P. S. 61, corner Crotona Park E., and Charlotte St. About $900,000. C. B. J. Snyder, Municipal Bldg., archt. and engr. Noted April 1.

N. Y., Sonyea—Dining, etc.—Until May 11, by P. L. Lang, pres. Bd. Mgrs., Craig Colony for Epileptics, for insulating refrigerating rooms, dining room and kitchen buildings. L. F. Pilcher, Capitol, Albany, state archt.; advertised in this issue.

W. Va., Huntington — School — Until April 28, by Bd. Educ., independent Dist., building 2 story, 96 x 132 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on 11th Ave. and 17th St. About $100,000. R. M. Bates, 1st Natl. Bank Bldg., archt.

N. C., Lincolnton—Court House—Until April 15, by D. A. Troutman, chn. Lincoln Co., building court house. About $100,000. Salter & Nelson, Raleigh, archts.

O., Parma—Schools—Until April 17, by Bd. Educ., building two 1 story, 89 x 139 ft. grade schools, cost $200,000; also 1 story, 89 x 139 ft. high school, $150,000; concrete, steel and brick, rein.-con. flooring, concrete foundations. C. W. Bates, Natl. Bank Bldg., Wheeling, W. Va., archt. Noted Feb. 12.

O., West Park—Church—Until April 10, by Christian Church, c/o C. E. Towsley, archt., 1500 Euclid Ave., Cleveland, building 1 story, 46 x 74 ft., brick and stone, on West 119th St. and Lorain Ave., here. About $75,000. Noted March 4.

Ind., Greensburg—Hospital—Until April 17, by Bd. Comrs. Decatur Co., building 3 story, 40 x 100 ft., brick. About $100,000. D. A. Bohlen & Son, 1001 Majestic Bldg., Indianapolis, archts.

Ind., Lake Wawasee—Hotel—Until April 15, by A. M. Strauss, archt., 705 Shoaff Bldg., Ft. Wayne, building 2 story, 80 x 220 ft., stucco, for Wawasee Inn Hotel Co. About $150,000. Noted March 4.

Mich., Ford City (Wyandotte P. O.)—Until April 12, by Bd. Educ., building 2 story, 129 x 148 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Main St. About $150,000. Former bids rejected and plans revised. Noted March 4.

Wis., Fond du Lac—Bank and Office—S. Lovell, archt., 30 North Michigan Ave., Chicago, receiving bids building 6 story, 66 x 105 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, for Commercial Natl. Bank. About $250,000. Noted Feb. 26.

Wis., Waupun—Temple—Lodge 46, F. & A. M., receiving bids building 2 story, 20 x 30 ft. and 33 x 68 ft., brick, concrete foundation. About $50,000. L. Hunt, Security Bldg., Milwaukee, archt.

Ia., Sioux City—Office—See "Industrial Works."

Minn., Minneapolis—School—Until April 12 (change of date), by Bd. Educ., building Miles Standish School, 2 story, 75 x 200 ft., rein.-con. and brick, on 22nd Ave. S. E., and 40th St. About $250,000. E. H. Enger, c/o Bd. Educ., archt. Noted March 18.

Minn., Minneapolis—School—Until April 12 (change of date), by Bd. Educ., building Louis Agassiz School, 2 story, 75 x 200 ft., rein.-con. and brick, on Harriet Ave. and 38th St. About $150,000. E. H. Enger, c/o Bd. Educ., archt. Noted March 18.

Minn., Minneapolis—School—Until April 12 (change of date), by Bd. Educ., building Minnehaha School, 2 story, 75 x 21[illegible] ft., rein.-con. and brick, on 51st St. and 29th Ave. S. About $150,000. E. H. Enger, c/o Bd. Educ., archt. Noted March 18.

Minn., Northfield—Science Hall—Until April 30 (change of date), by St. Olaf's College, building 3 story, 73 x 186 ft., rein.-con., brick and stone. About $200,000. N. E. Mohn, 596 Endicott Bldg., St. Paul, archt. Noted Jan. 29.

Ark., Morrilton — High School — Until April 15, by Bd. Educ., building 3 story, concrete and brick. About $140,000. J. P. Alman, Boyle Bldg., Little Rock, archt.

Tex., Dalhart—Court House—Until April 12, by Comrs. Dallam Co., building 3 story, 76 x 90 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $175,000. Mann & Gerow, 722 Rorabaugh Wiley Bldg., Hutchinson, Kan., archts. Noted Feb. 26.

Tex., Electra—Church—Until April 10, by Bldg. Com. 1st Methodist Church, 1 story, rein.-con. and brick, brick and concrete foundation. About $100,000. Sparger & Peters, Bonham, engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Boston—Store and Office—A. J. Carpenter, archt., 39 Dunreath St., Roxbury, let contract to N. Hurwitz, 20 East St., building 6 story, 60 x 75 ft., brick, steel and limestone, concrete foundation, on Beach and Edinborough Sts. About $100,000. Owner's name withheld. Noted April 1.

★Mass., Boston—Store—Ginter Co., 369 Congress St., will remodel brick and concrete building, on Boylston St. About $150,000. Work will be done by day labor.

★Mass., Cambridge — Hotel—Barnard Constr. Co., 1783 Massachusetts Ave., will convert 5 story, 50 x 250 ft., brick and granite, dormitory, on Harvard St., into 70 room hotel. Work will be done by day labor.

★R. I., Lonsdale (Pawtucket P. O.)—School — Lincoln Twp. Memorial School Comn., let contract building 2 story, 56 x 110 ft., school with 45 x 70 ft. ell, brick and steel, concret foundation, here, to A. F. Smiley, Oak Hall Bldg., Pawtucket, $82,000. Noted Feb. 19.

★R. I., Pawtucket — Housing — Lorrain Mfg. Co., 517 Mineral Springs Ave., let contract building several brick and frame houses for workmen, near plant, to Central Constr. Co., Slater Trust Bldg. About $125,000.

★Conn., Beacon Falls—Housing—Beacon Falls Rubber Shoe Co. will build fifty 1 story, frame houses for workmen, rock foundation. About $175,000. Work will be done by day labor.

★N. Y., Lackawanna—Church and School—St. Patrick's Parish let contract building church and school, to E. Jordan, Lackawanna. About $160,000. Noted March 18.

Buildings (Continued)

★N. Y., New Rochelle—Theatre—Loews Enterprises, 1493 Bway., New York City. let contract altering and building addition to brick, steel and stone, brick foundation, here, to Fleischmann Constr. Co.. 531 7th Ave., New York City. About $100,000.

★N. Y., New York—Hotel—Allerton House Corp., 143 East 39th St., will build 14 story, brick, steel and stone, concrete foundation, on Lexington Ave. and 57th St. About $1,500,000. Work will be done by day labor. Noted Jan. 15.

★N. Y., New York—Library—Hispanic Society of Amer., 155th St., let contract building 3 story. 50 x 62 ft., brick, steel and stone, brick foundation, at 607 West 155th St., to E. Strinberg, 8 West 40th St. About $120,000.

★N. Y., New York—Office—Produce Exchange Bldg., Beaver St., let contract building 1 story, brick, steel and stone addition to J. Lowry, Jr., 8 West 40th St. About $100,000.

N. Y., New York—School—C. B. Snyder, archt. and engr., Municipal Bldg., received bids March 31, building P. S. 62, 5 story. 230 x 280 ft., Leggett Ave., from P. J. Brennan & Son, 624 Madison Ave., $869,000, T. Dwyer, 216th St. and Bway., $878,735, Putnam Constr. Co., 271 Ft. Washington Ade., $879,423. Noted March 25.

★N. Y., New York — Theatre — M. R. Huntington, 10 East 58th St., will build 2 story, 85 x 100 ft., brick and steel, brick foundation, on Washington Pl. About $250,000. Work will be done by day labor. Noted March 18.

★N. J., Jersey City—Theatre—Haring & Blumenthal, c/o De Rosa & Periara, archts. and engrs., 110 West 40th St., New York City, let contract building brick, steel and stone, brick foundation, on Central Ave. and Sherman Pl., here, to J. Jardin, 507 5th Ave.. New York City. About $200,000.

Pa., Phila. — Sales, etc. — A. Hartman, c/o L. R. Rothchild, archt., 1225 Sansom St., will construct 6 story, 56 x 125 tt. concrete and brick sales and service building, on 16th and Vine Sts. About $100,000; cost plus percentage basis. Work will be done by day labor.

★Pa., Pittsburgh—Mercantile—M. Lando, Century Bldg., let contract building 7 story, 40 x 160 ft., rein.-con., to H. Miller & Sons Co., May Bldg. About $140.000.

★Pa., Pittston—High School—St. Johns Catholic Assn. let contract building 3 story. 90 x 180 ft., brick and steel, rein.-con. flooring, rock foundation, on Dock St., to J. Curtis & Co., Hickory St., Wilkes-Barre. About $250,000.

★S. C., Greenville—Business—C. C. Hindman and G. H. Bailes let contract building 3 story, 52 x 130 ft., brick and steel, on Main St., to M. T. Gossett, Marshall Ave. About $52,000; cost plus percentage basis.

★S. C., Greenville—Business—S. Zunnerman, F. Williams et al let contract building 2 story, 89 x 154 ft., brick and steel, on College St., to W. M. Jordon, Main St., $114,900.

★O., Cleveland—Commercial—E. Zweig, 1384 West 6th St., let contract rebuilding 4 story, steel and brick, on West 6th St. and St. Clair Ave., to G. A. Rutherford Co., 2729 Prospect Ave. About $50,000. Noted Jan. 1.

★O., Cleveland—Hall—City let contract furnishing and setting exterior granite on 4 story, 180 x 420 ft., fireproof, now under construction on East 6th St. and St. Clair Ave., to Maine & New Hampshire Granite Corp., 760 Hippodrome Bldg. About $90,000. Noted April 1.

★O., Cleveland—Salesroom—See "Industrial Works."

★O., Cleveland — Theatre—Five Points Theatre Co., c/o M. Froelich, 1807 East 82nd St., let contract building 1 story, 32 x 144 ft., steel and brick addition, on East 152nd St. and St. Clair Ave., to F. F. Feaga Co., 5927 Euclid Ave. About $60,000.

★O., Dayton — School — Bonebrake Seminary, c/o J. E. Fout, 1521 West 1st St., let contract building 4 story, 90 x 225 ft., rein.-con., brick and stone, rein.-con. flooring, concrete foundation, also power house, on Calalpa and Cornell Sts., to H. J. Osbun, Salem Ave. About $750,000.

★Ind., Indianapolis—High School—G. C. Hill, business dir. Bd. Educ., Meridian and Ohio Sts., let general contract building 3 story, 90 x 194 ft., brick, on Merrill St., to W. P. Jungclaus, 825 Massachusetts Ave., $408,100.

★Mich., Detroit — Mercantile, etc.—D L. Colwell, 701 Whitney Office Bldg., let contract constructing 3 story, 150 x 160 ft., mercantile building and garage, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Grand River Ave., to Culbertson & Kelly, 814 Ford Bldg. About $100,000. Noted Aug. 21.

★Wis., Bloomer—High School—School Dist. 4 let contract building 2 story, 110 x 125 ft., brick, rein.-con. and stone, to Hoeppner-Bartlett Co., 414 Grand Ave. E., Eau Claire. About $190,000.

★Wis., Milwaukee — Terminal — A. S. Hecht, archt., 64 West Randolph St., Chicago, let contract to Thompson-Starrett Co., 49 Wall St., New York City, building 4 story, 125 x 440 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Bway. and Erie St., for Chicago, Racine & Milwaukee Line, 148 Bway. About $750,000. Noted March 25.

★Wis., Watertown — Home—Lutheran Home for Feeble Minded, 800 Main St., let contract building 3 story, brick and concrete, rein.-con. flooring, concrete foundation, to Block, Mallow & Kaddotz, Watertown. About $170,000. Noted March 11.

Wis., West Allis (Milwaukee P. O.)—Schools—Bd. Educ. received bids March 27, building two 2 story ward schools, brick, rein.-con. flooring, concrete foundation, from Kroening Constr. Co., 69th and National Aves., $109,800 each, or ($100,000 plus 10%); Riesen Bros., 86 Michigan St., Milwaukee, $124,390, or ($112,900 plus 8%). Noted Feb. 19.

★Minn., Forest Lake—High School—Bd. Educ. let general contract building 3 story, 80 x 120 ft., brick, to Bracker Constr. Co., 638 Builders Exch., $82,240. Noted March 4.

★Minn., Minneapolis—Business—J. Resler, 24 4th St., N., let contract building 3 story, 97 x 110 ft., fireproof addition, on 1st Ave., N., to Fleisher Constr. Co., 608 Builders Exch. About $160,000; cost plus percentage basis. Noted March 18.

★Kan., Atchinson—Memorial Hall—Atchinson Co. let contract building 2 story, 100 x 160 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to G. H. T. Shaffer, Atchison, $122,967. Noted March 4.

★N. D., Williston—Theatre—W. Snyder let contract building 2 story, 75 x 140 ft., to Thorvaldsen & Johnson, Wolf Point, Mont. About $100,000.

★Nev., Lovelock—School—School Trustees let contract building 1 story, brick school, to H. S. Williams, Hearst Bldg., San Francisco, Cal. About $65,000. Noted 1.

★Wash., Seattle—Loft—See "Industrial Works."

★Wash., Spokane—Synagogue—Jewish congregation let contract building 3 story, 125 x 175 ft., brick, stone and terra cotta, on 2nd and Main Sts., N., to Alloway & George, Hutton Bldg. About $175,000.

★Cal., Los Angeles—Studio—J. B. Holtzclaw, Title Guarantee Bldg., let contract building 3 story, 100 x 140 ft., stucco and timber, concrete foundation, on Normandie Ave., to Milwaukee Bldg. Co., 316 Wright & Callender Bldg. About $100,000.

★Cal., Salinas — High School — Trustees Salinas Union High School Dist. let contract building 2 story, rein.-con., rein.-con. flooring, concrete foundation, to McLeran & Peterson, Hearst Bldg., San Francisco, $235,400. Noted Feb. 19.

★Cal., San Francisco — Office — Standard Oil Co., Standard Oil Bldg., let contract building 20 story, 137 x 206 ft., concrete and steel, rein.-con. flooring, on Bush and Sansome Sts., to P. J. Walker Co., Monadnock Bldg. About $5,000,000. Noted Jan. 1.

★Ont., Ingersoll — School — Pub. School Bd. let contract building 2 story, 16 room, concrete, brick and steel, rein.-con. flooring, concrete foundation, to Contractors & Builders Ltd., Brockville. About $125,000.

Federal Government Work

PROPOSED WORK

N. Y., Buffalo—Dredging and Excavating—U. S. Engr. Office, 540 Federal Bldg., rejected only bid received March 17, dredging and rock excavating in Black Rock Channel. Noted Feb. 19.

Ala., Florence—Lock and Esplanade—U. S. Engr. Office, Florence, rejected only bid received Jan. 2, building lock and esplanade at Widows Bar, Tennessee River, near Bridgeport.

Col., Ft. Lyon—Steel Water Tanks—Spec. 4171—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install one 200,000 gal. or two 100,000 gal. steel water tanks, with 60 ft. steel towers and appurtenances at Naval Hospital, here. $10 deposit required for plans and spec.

BIDS DESIRED

Pa., Phila.—Power Plant Piping—Spec. 4161—Until April 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., changing, at Quartermaster Depot, Bldg. "C," here. About $2,000. Noted April 1.

Md., Baltimore—Removing and Rebuilding—Until April 15, by Supt. Lighthouses, removing Cherrystone Light Sta. from Virginia and rebuilding same at Choptank River Light Sta., Maryland; advertised in this issue.

D. C., Wash.—Steel Bars—Until April 27, by Dist. Comrs., Dist. Bldg., furnishing Sewer Div., Eng. Dept., with 110,000 lb. cold twisted steel bars, delivered f.o.b. cars, property yard siding, 2nd and I Sts., S. E. C. W. Kutz, comr.

D. C., Wash.—Track Scale—Spec. 4160—Until April 28, by Bureau Yards & Docks, Navy Dept., installing 300,000 lb. railroad track scale. About $8,000; $10 deposit required for plans and spec. Noted April 1.

Va., Hampton Roads — Reinforcing Trusses—Spec. 4150—Until April 14, by Bureau Yards & Docks, Navy Dept., Wash., D. C., reinforcing present end trusses of Seaplane Hangar 1, here. About $5,000. Noted March 25.

Va., Yorktown—Aviation Facilities—Spec. 4132—Until April 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building, here. About $47,000. Noted Feb. 5.

Va., Yorktown—Buoys—Spec. 4068—Until April 28, by Bureau Yards & Docks, Navy Dept., Wash., D. C., furnishing 4 mooring buoys, for Fuel Oil Sta., here. Former bids rejected. About $7,000. Noted March 11.

Ga., Savannah—Dredge Pontoon Catamarans—Until April 20, by U. S. Engr. Office, building dredge pontoon catamarans with discharge pipe; advertised in this issue.

Ky., Addison—Lock and Abutment—Until April 16, by U. S. Engr. Office, 425 Customhouse, Louisville, building lock and abutment for Dam 45, Ohio River, here; advertised in this issue.

Tenn., Memphis—Coal—Until April 26, at Office of Engr., Mississippi River Dredging Dist., Box 1017, furnishing 8,000 ton coal in barges; advertised in this issue.

Ind., Cypress—Power House—Until May 1, by U. S. Engr. Office, 425 Custom House, Louisville, Ky., building fireproof power house, at Dam 48, Ohio River, here; advertised in this issue. Noted March 11 under "Louisville, Ky."

Mich., Port Huron—Dredging—Until May 5, by U. S. Engr. Office, Federal Bldg., Detroit, dredging in St. Clair River, here; advertised in this issue.

P. I., Guam—Quarters, Power, Pump and Blower Houses—Spec. 4141—Until April 14 (change of date), by Bureau Yards & Docks, Navy Dept., Wash., D. C., building 30 x 38 ft. extension to power house at Agana and 26 x 35 ft. extension to power house at Naval Radio Sta., 12 x 24 ft. extension to pump house and 8 x 16 ft., to blower house, 22 x 47 ft. quarters with 18 x 24 ft. wings; $20 deposit required for plans and spec. Noted April 1.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. Y., New York—Dredging and Rock Removal—U. S. Engr. Office, 39 Whitehall St., let contract for dredging and rock removal in Hudson River, to Great Lakes Dredging & Dock Co., 17 Battery Pl., $656,978. Noted Feb. 12.

★N. Y., Rome—Electric Dumbwaiter—Treas. Dept., Wash., D. C., let contract installing, in Post Office, here, to Electric Supplies Co., 1515 Willow Ave., Hoboken, N. J., $2,205. Noted March 18.

Pa., Harrisburg—Changes in Approaches and Lobby Vestibule Doors—Treas. Dept., Wash., D. C., received bids March 26, making changes at U. S. Post Office and Courthouse, here, from D. Stewart, Janesville, Wis., $3,139; H. A. Hipple, Harrisburg Natl. Bank Bldg., $3,305; E. Terry Co., Phila., $3,688. Noted March 4.

Federal Government Work (Continued)

★Pa., Phila.—Roof Covering—Spec. 4153—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract recovering roof of temporary storage Bldg. 350, at Navy Yard, here, to Ehret Roof & Mfg. Co., 1096 Drexel Bldg., $4,333 (25 days). Noted April 1.

D. C., Wash.—Mechanical Equipment and Piping—Spec. 3708—Bureau Yards & Docks, Navy Dept., received bids March 31, installing at boiler and power plant, (1) work complete, from J. W. Danforth, 2 Ellicott St., Buffalo, N. Y., (1) $218,300 (200 days), (2) add $8,500 (30 days), (3) add $10,100 (30 days), (4) add $13,000, (5) add $12,300 (30 days), (6) $8,950 (30 days); S. W. Rittenhouse, 1316 Harvard St., (1) $227,853 (190 days), (2) $9,946, (3) $12,762, (4) $3,900, (5) $5,266 (30 days); W. G. Cornell Co., 923 12th St., N. W., (1) $232,800 (200 days), (2) $8,360 (200 days), (3) add $8,512 (30 days), (5) $7,350 (30 days). Noted March 11.

★Va., Norfolk—Drainage System—Spec. 4131—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing storm water drainage system, at Navy Yard, here, to N. Connolly, 1905 Ridge Ave., Phila., Pa., $32,845 (90 days). Noted April 1.

W. Va., South Charleston—Electric Substation—Spec. 4148 — Bureau Yards & Docks, Navy Dept., Wash., D. C., received only bid March 31, building outdoor electric substation, from Eng. Serv. Co., 411 Odd Fellows' Bldg., Charleston, $41,250 (150 days). Noted March 25.

La., New Orleans—Storehouses—Spec. 4084—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids March 31, building mine storage plant and shell house at Naval Sta., here, (1) work complete, from R. P. Farnsworth, 4125 St. Charles Ave., (1) $73,109 (150 days), (2) $48,932 (150 days), (3) $26,428 (150 days), (4) $2,500 (10 days), (5) $3,200 (10 days), (6) deduct $100 (1 day); Hyde & Baxter, 711 13th St., Wash., D. C., (1) $84,350 (150 days), (2) $59,350 (140 days), (3) $25,850 (140 days), (4) $6,500, (5) $4,500. Noted March 18.

★Wis., Milwaukee—Radio Building—Spec. 4107—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract constructing, at Navy Grounds, McKinley Park, to Buestrin Constr. Co., 567 East Water St., $4,382 (120 days). Noted March 25.

Tex., Galveston—Dredging—U. S. Engr. Office, Trust Co. Bldg., received lowest 3 bids March 11, dredging Houston Ship Channel, (a) Sect. 1, lower end of channel in Bolivia Rds. to Sta. 86, involving 6,400,000 cu.yd. excav. including overdepth, (b) Sect. 2, from Sta. 86 to 37, 6,400,000 cu.yd. (c) Sect. 3, from Sta. 37 to 3, 7,150,000 cu.yd., (d) Sect. 1 and 2 combined, 12,800,000 cu.yd., (e) Sect. 1 and 3 combined, 13,550,000 cu.yd., (f) Sects. 1, 2 and 3 combined, 19,950,000 cu.yd. (g) Sect. 2 and 3 combined, from Atlantic Gulf & Pacific Co., 13 Park Row, (a) $.0844, (b) $.0897, (c) $.0824, (d) $.087, (e) $.083, (g) $.0857; J. Stewart & Co., 30 Church St., (a) $.115, (c) $.115; United Dredging Co., 3910 Woolworth Bldg., (a) $.085, (b) $.085, (c) $.085. Contractors all of New York City. Noted Feb. 12.

★Cal., San Diego—Distributing System and Power Plant Equipment—Spec. 4118—Pub. Wks. Office let contract furnishing and installing, here, to T. Haverty Co., 801 Maple St., Los Angeles, $189,650. Noted March 18.

Cal., San Francisco — Dredging—U. S. Engr. Office, Fair Bldg., received bids March 22, dredging off part of point from Dos Rios Island and vicinity near mouth of Sacramento River, involving (a) 6,000,000 cu.yd. excav. with U. S. oil transportation, (b) without U. S., from San Francisco Bridge Co., 1005 Nevada Bank Bldg., (a) $0.0645 per cu.yd., total $387,000, (b) $0.0617 per cu.yd., $388,200; United Dredging Co., 414 13th St., Oakland, (b) $0.0688 per cu.yd., $400,800; F. C. Franks Contg. Co., Amer. Natl. Bank Bldg., (a) $0.0989 per cu.yd., $593,400 alternate $0.0819 per cu.yd., $491,400. Noted March 18.

PROPOSED WORK

Playground—Boston, Mass.—Park Comn. having plans prepared by J. J. Murphy, engr., 33 Beacon St., for playground, laying out walks, drains, drives and play areas involving 25,000 yd. earthwork. About $80,000.

Memorial Monument—Newtonville, Mass., (Boston P. O.)—Bldg. Com., Newton, having plans prepared by H. Bacon, archt., 101 Park Ave., New York City, for memorial monument, here. About $50,000. H. I. Harriman, 50 Congress St., Boston, chn.

Galvanized Piping—Buffalo, N. Y.—City had plans prepared by G. H. Norton, city engr., for installing galvanized piping for extension to refrigerating system in Washington Market. About $30,000.

Flood Control—Hornell, N. Y.—J. A O'Connor, consult. engr., 100 State St., Albany, submitted report to Chamber of Commerce for abatement of floods within corporate limits of this city, Canisteo River, Canacadea Creek and Chauncey Run, combined drainage area of 170 sq.mi., Crosby Creek, 10 sq.mi. Work includes new channel, straightening and enlarging carrying capacity of river together with dykes on both sides, north of Seneca St., a distance of about ½ mi., a new concrete wall, 700 ft. long on east side of river, several concrete walls and troughs. About $400,000.

Road Equipment—Mayville, N. Y.—Bd Supervs., Chatauqua Co., instructed Highway Com. to rent or purchase equipment necessary to complete Stowe-Ashville Rd. If purchase, price not to exceed $20,000.

Concrete Mixing Equipment—Medina, N. Y.—City voted $5,000 bonds to purchase mixing equipment.

Heating System—Olean, N. Y.—Citizens Com. has been formed to petition City Council to issue $200,000 bonds to build isolated heating plant to provide proper heating system for schools.

Street Cleaning Equipment, Etc.—Rochester, N. Y.—Common Council approved $100,000 note issue to purchase street cleaning and refuse collecting equipment. C. A. Poole, city engr.

Conduits, etc.—Detroit, Mich.—Pub. Lighting Comn., 40 Atwater St., E, plans to build conduits on Junction Ave, cost $48,810; 14th Ave. from Fort St. to Michigan Ave., $33,500; 14th Ave. from Michigan to Grand River Aves., $43,716; 14th Ave. from Michigan Ave. to Perry St., Magnolia to Butternut Sts. and Poplar St. to Grand River Ave., $25,000;; Kercheval Ave., to include cable and fitting up lamp posts and 82 arc lamps, 150 ft. apart, also fitting circuit regulators in substation to serve proposed lighting, $107,930.

Piers—Seattle, Wash.—Union Oil Co. of California, 3000 Railroad Ave., plans to extend Pier 18 a distance of 250 ft., also tear down temporary dock and build pier, 450 ft. long and 50 ft. wide. Cost between $175,000 and $200,000.

Breakwater—Corpus Christi, Tex.—City soon receives bids building rubble mound breakwater in Corpus Christi Bay, involving 100,000 ton stone rip rap. C. J. Howard, city engr. R. J. Cummins, 203 Stewart Bldg., Houston, consult. engr.

Dam — Tobique Narrows, N. B. — A. Fraser, Edmundston, and D. Fraser, Plaster Rock, soon receive bids constructing dam, near here. About $100,000.

Asphalt Plant—Hamilton, Ont.—City plans to install asphalt plant. About $40,000. E. R Gray, city engr.

Fire Alarm System—Hamilton, Ont.—City plans to construct fire alarm system. About $100,000. A. B. Ten Eyck care of Central Fire Station, fire chief. E. R. Gray, city engr.

Railway Dispatching Service—Hamilton, Ont.—Grand Trunk Ry., McGill St., Montreal, Que., plans to install 150 mi. telephone dispatching service between here and Sarnia. About $200,000. C. Forrester, London, supt.

Road Sweeper, Street Flusher, etc. — Hamilton, Ont—City soon receives bids for motor driven road sweeper, street flusher and trenching machine About $25,000. E. R. Gray, city engr.

Drydock—Kingston, Ont.—Collingwood Shipbuilding Co., Collingwood, soon receives bids constructing 750 ft drydock, here. J. L. Leitch, mgr.

Dam—Lake Megantic, Que.—Municipality soon receives bids constructing dam on Chaudiere River, capable of furnishing 500 hp. About $225,000. N. A. Girard, engr

Truck — London, Ont. — Middlesex Co. plans to purchase truck for road work A. Talbot, Court House, engr.

Breakwater—Toronto, Ont.—Dept. Pub. Wks., Ottawa, soon receives bids constructing breakwater, here. About $200,000. E. Lafleur, c/o Dept. Pub. Wks., engr.

BIDS DESIRED

Seawall—Boston, Mass—Until April 20, by city, repairing old seawall and building 1,350 ft. new one on Albany St., concrete stone, boulder back fill, 10-20 ft. wide. Bonds for $60,000 voted to cover cost of project T. F. Sullivan, city engr.

Station—Brooklyn, N. Y.—Until April 22, by J. H. Delaney, comr. Transit Constr., 49 Lafayette St., New York City, finishing 7 stations on Eastern Parkway Rapid Transit R.R., here.

Guide Walls—Marbletown, N. Y.—Until April 27, by Bd. Water Supply, Municipal Bldg., New York City, building masonry guide walls and doing miscellaneous work at Ashokan Spillway, here; advertised in this issue.

Sea Outfall—Avon-by-the-Sea, N. J.—Until April 20, by Bd. Comrs., building sea outfall. G. C. Stanton, boro. clk.; advertised in this issue.

Bituminous Concrete, Asphalt, Tar, Limestone, Trap Rock, Slag and Gravel—Trenton, N. J.—Until April 21, by State Highway Comn., Broad St. Bank Bldg., furnishing 190 tons bituminous concrete, hot mix, delivered in place on road; 1,665 tons bituminous concrete, cold mix, at manufacturer's plant or delivered on ground; 107,600 gal. Grade K, cut back asphalt; 302,000 gal. light tar, Grade N or U2, delivered by pressure distributor on road; 8,500 gal. asphalt, Grade K, and 11,100 gal. heavy tar, Grade M-n-U2 or U3, in barrels for patching; also 3,150 tons crushed limestone or approved trap rock; 15,600 tons crushed trap rock; 3,650 tons slag for cover and 3,000 tons approved gravel for cover. E. M. Vail, 611 Broad St. Bank Bldg., maintenance engr.; advertised in this issue.

Municipal Asphalt Plant—Phila., Pa.—See "Streets and Roads."

Tank and Fire Wagons—Phila., Pa.—See "Streets and Roads."

Structural Steel—New Orleans, La.—Until April 27, by Bd. Comrs., Port of New Orleans, furnishing structural steel for Desire St. banana wharf, shed, and outbound shed, etc. A. Perrilliat, 1 Canal St., ch. engr.; advertised in this issue.

Heating and Ventilating System—Lorain, O.—Until April 29, Bd. Educ., installing heating and ventilating system, in East Side School. Perkins, Fellows & Hamilton, 814 Tower Court, Chicago, archts.; advertised in this issue.

Paving and Grading Equipment—Fresno, Cal.—Bd. Supervs. Fresno Co. receiving bids for paving and grading equipment. About $30,000. C. Jensen, Cory Bldg., engr.

Drilling Machines, etc.—San Diego, Cal.—E. D. Williams, purch. agt., receiving bids for drilling machines, concrete spouting equipment, skips, conveyor parts, rock screens cableway parts, wire rope, etc., for use on Barrett Dam. About $15,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Electrical Equipment—Buffalo, N. Y.—J. F. Malone, comr. bldgs., received bids March 29, furnishing sundry electrical equipment including wire, conduits, etc., to be used in wiring 39 fire houses, from Bison Electric Co., 250 Pearl St., $17,269; McCarthy Bros. & Ford, 75 West Mohawk St., $17,125; Robertson Cataract Electric Co., 151 West Mohawk St., $17,086.

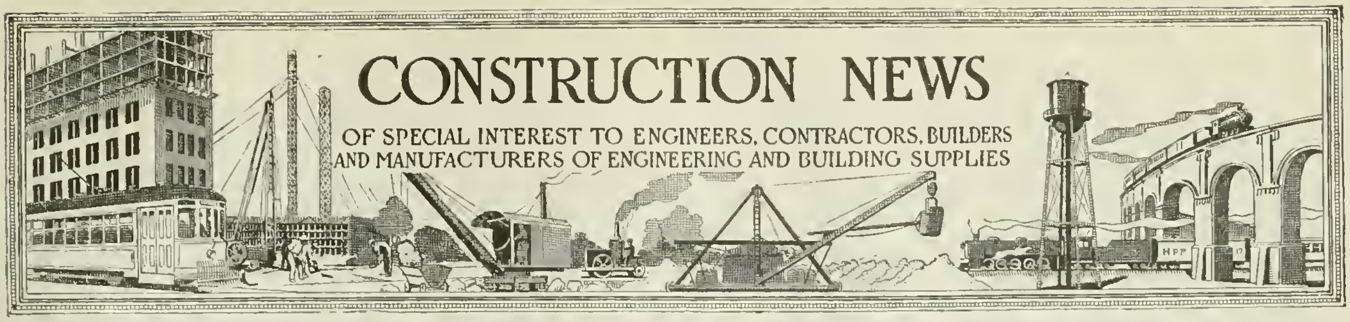
★Overhead Lighting System—Churchville, N. Y.—Village Bd. let contract installing overhead lighting system, including two 50 kw. transformers, 60 street lamps and special business section lamps, to O'Connell Contg. Co., 859 Hudson Ave., Rochester. About $25,000.

Signal Tower—Long Island City, N. Y.—Pub. Serv. Comn., 49 Lafayette St., New York City, received bids April 1, building signal tower, at Queens Plaza Sta., here, from D. C. Serber, 1123 Bway., New York City, $24,800; J. D. Roberts, 3 West 29th St., New York City, $31,200.

Pier—New York, N. Y.—M. Hurlburt, comr. docks, Pier "A," foot of Battery Pl., received bids March 29, altering pier at foot of 5th St., East River, etc., from Snare & Triest, 233 Bway., $120,500, Lustig & Weil, 103 Park Ave., $124,000, Associated Contractors, 17 West 42nd St., $131,490; water supply and plumbing, from Egan Co., Inc., 217 West 13th St., $5,888; W. Young Plumbing Co., 32 Old Bway., $6,278; Altman Plumbing Co., 802 2nd Ave., $7,350. Noted March 25.

★Cast Iron Pipe—Cleveland, O.—E. Shattuck, city purch. agt., let contract furnishing 1,500 tons c.i. pipe, to United States Pipe & Fdry Co., $12,000. Noted March 18.

★Pipe—San Fernando, Cal.—City let contract furnishing 200 ton 6 and 8 in. Class "B" c.i. pipe, f.o.b. San Fernando, to R. B. Wood & Co., 400 Chestnut St., Phila., $92.50 per ton, 8,000 ft. dipped screw casing, to Crane Co., 321 East 3rd St., Los Angeles, $55.25 per 100 ft. for 4 in. and $157.20 for 8 in.



CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

PROPOSALS

"For proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Apr. 19	Steger, Ill. Adv. Apr. 8.	Apr. 8
Apr. 23	Akron, O.	Apr. 8
Apr. 26	Elyria, O. Adv. Apr. 1.	Apr. 1
Apr. 26	Lake Benton, Minn.	Apr. 15
Apr. 27	Newark, N. J.	Apr. 1
Apr. 27	Billings, Mont.	Apr. 8
Apr. 28	Scarboro, Ont.	Apr. 15
Apr. 30	Wilder, Idaho	Apr. 15
May 1	Montreal North, Que.	Mar. 18
May 4	Charleston, S. C.	Apr. 15
May 5	Tonawanda, N. Y.	Apr. 15
May 7	Preston, Idaho Adv. Apr. 8 and 15.	Apr. 8
May 15	Seattle, Wash.	Apr. 15
May 17	Pontiac, Mich. Adv. Apr. 8 and 15.	Apr. 8

SEWERS

Apr. 19	Tillamook, Ore.	Apr. 15
Apr. 19	Pleasantville, N. J.	Apr. 1
Apr. 19	Vandergrift, Pa. Adv. Apr. 8.	Apr. 8
Apr. 19	La Junta, Col. Adv. Apr. 1.	Apr. 1
Apr. 19	Fertile, Minn.	Apr. 15
Apr. 20	Avon-by-the-Sea, N. J.	Apr. 8
Apr. 21	Portland, Ore. Adv. Mar. 25.	Mar. 25
Apr. 21	Aberdeen, Wash.	pr. 8
Apr. 21	Brooklyn, N. Y.	Apr. 15
Apr. 22	Ellsworth, Minn.	Apr. 15
Apr. 26	Cape Girardeau, Mo.	Mar. 25
Apr. 26	Lake Benton, Minn.	Apr. 15
Apr. 27	Potomac, Va. Adv. Apr. 1 and 8.	Apr. 8
Apr. 27	Columbus, O.	Apr. 15
Apr. 28	Portland, Ore. Adv. Mar. 25.	Mar. 25
Apr. 29	Viroqua, Wis. Adv. Apr. 8.	Apr. 8
Apr. 29	Poughkeepsie, N. Y. Adv. Apr. 15.	Apr. 15
Apr. 30	Detroit, Mich.	Apr. 15
May 3	Decatur, Ill. Adv. Apr. 15.	Apr. 15
May 4	Thief River Falls, Minn.	Apr. 15
May 6	Portland, Ore. Adv. Mar. 25.	Mar. 25
June 8	Milwaukee, Wis. Adv. Apr. 15.	Apr. 15

BRIDGES

Apr. 19	Bunkerville, Nev. Adv. Apr. 1 and 8.	Apr. 1
Apr. 19	Topeka, Kan.	Apr. 15
Apr. 20	Newton, Ga.	Mar. 18
Apr. 20	Center City, Minn.	Apr. 15
Apr. 22	Hawkinsville, Ga.	Apr. 1
Apr. 22	Massena, N. Y. Adv. Apr. 15.	Apr. 15
Apr. 26	Irene, Ariz. Adv. Apr. 1 and 8.	Apr. 1
Apr. 27	Gilboa, N. Y. Adv. Mar. 25 to Apr. 15.	Apr. 8
Apr. 27	Trenton, N. J. Adv. Apr. 15.	Apr. 15
Apr. 28	Neponsett (Boston P. O.), Mass.	Apr. 15
May 3	Columbus, O.	Apr. 8
May 3	Grand Rapids, Minn.	Apr. 8
May 5	Paterson, N. J. Adv. Apr. 15.	Apr. 15
May 11	Detroit, Mich.	Apr. 15

STREETS AND ROADS

Bid. Close		See Eng News-Record
Apr. 19	Akron, O. Adv. Apr. 1 and 8.	Apr. 1
Apr. 19	Goldendale, Wash.	Apr. 1
Apr. 19	Logan, W. Va.	Apr. 1
Apr. 19	Easton, Md.	Mar. 25
Apr. 19	Grafton, W. Va.	Mar. 25
Apr. 19	Montana Adv. Apr. 8.	Apr. 8
Apr. 19	Chester, Pa. Adv. Apr. 8.	Apr. 8
Apr. 19	Brainerd, Minn.	Apr. 15
Apr. 19	Casselman, Ont.	Apr. 15
Apr. 19	Detroit, Mich.	Apr. 15
Apr. 19	Altus, Okla.	Apr. 15
Apr. 20	Wyoming	Apr. 15
Apr. 20	Center City, Minn.	Apr. 15
Apr. 20	Philadelphia, Pa.	Apr. 8
Apr. 20	Indiana	Apr. 8
Apr. 20	New Jersey Adv. Apr. 8 and 15.	Apr. 8
Apr. 20	Meade, Kan.	Mar. 18
Apr. 20	Colfax, Wash.	Mar. 11
Apr. 20	Emory, Tex.	Apr. 15
Apr. 20	Spokane, Wash.	Apr. 15
Apr. 20	Michigan	Apr. 15
Apr. 21	Michigan	Apr. 15
Apr. 21	Rockwood, Man.	Mar. 25
Apr. 21	Freehold, N. J. Adv. Apr. 8 and 15.	Apr. 1
Apr. 21	Preston, Minn.	Apr. 1
Apr. 21	Michigan	Apr. 8
Apr. 22	Kingsville, Tex.	Apr. 15
Apr. 22	Owatonna, Minn.	Apr. 1
Apr. 22	Rock Hills, S. C. Adv. Apr. 8 and 15.	Apr. 1
Apr. 22	Great Falls, Mont.	Apr. 8
Apr. 22	Phoenix, Ariz.	Apr. 8
Apr. 22	Poughkeepsie, N. Y. Adv. Apr. 15.	Apr. 15
Apr. 22	Rock Hill, S. C.	Apr. 15
Apr. 22	Wheaton, Minn.	Apr. 15
Apr. 22	Detroit, Mich.	Apr. 15
Apr. 23	Barhourville, Ky. Adv. Apr. 8 and 15.	Apr. 8
Apr. 23	Beeville, Tex.	Apr. 8
Apr. 23	Winona, Minn.	Apr. 15
Apr. 23	Spokane, Wash.	Apr. 15
Apr. 24	Montana Adv. Apr. 8 and 15.	Apr. 8
Apr. 24	Swan River, Man.	Apr. 15
Apr. 26	Montana Adv. Apr. 8 and 15.	Apr. 8
Apr. 26	Junction City, Tex.	Apr. 1
Apr. 26	Chaska, Minn.	Apr. 1
Apr. 26	Little Rock, Ark. Adv. Apr. 8 and 15.	Apr. 8
Apr. 26	Albion, Idaho	Apr. 1
Apr. 26	Seattle, Wash.	Apr. 15
Apr. 26	Washington	Apr. 15
Apr. 27	Trenton Jct., N. J.	Apr. 15
Apr. 27	Mora, Minn.	Apr. 15
Apr. 27	Michigan	Apr. 15
Apr. 27	Ivanhoe, Minn.	Apr. 1
Apr. 27	Randolph, Wis.	Apr. 15
Apr. 27	Hastings, Minn.	Apr. 1
Apr. 27	Pennsylvania Adv. Apr. 8 and 15.	Apr. 8
Apr. 27	Meadville, Pa. Adv. Apr. 8.	Apr. 8
Apr. 28	Birmingham, Ala.	Apr. 8
Apr. 28	Orange, Tex.	Apr. 15
Apr. 30	Ft. Wayne, Ind.	Apr. 8
Apr. 30	El Dorado, Ark.	Apr 8
Apr. 30	Leamington, Ont.	Apr. 15
May 1	Lancaster, O.	Apr. 1
May 1	Ritzville, Wash.	Apr. 15
May 3	Grand Rapids, Mich.	Apr. 1
May 3	Fayetteville, W. Va.	Apr. 15
May 3	Kingsville, Tex Adv. Apr. 15.	Apr. 15
May 3	California	Apr. 15
May 4	Fergus, Falls, Minn.	Apr. 15
May 4	Thief River Falls, Minn.	Apr. 15
May 4	Mantorville, Minn.	Apr. 1
May 4	Lorain, O.	Apr. 8
May 5	El Dorado, Ark. Adv. Apr. 8 and 15.	Apr. 8
May 5	Grand Rapids, Mich.	Apr. 1
May 5	New York Adv. Apr. 15.	Apr. 15
May 6	Glenwood, Minn.	Apr. 15
May 10	Douglas, Ariz.	Apr. 15

EXCAVATION AND DREDGING

Apr. 20	Bryan, Tex.	Apr. 15
Apr. 22	Ft. Madison, Ia. Adv. Apr. 1 and 8.	Apr. 1
Apr. 25	Ontario	Mar. 25
Apr. 27	Oxnard, Cal.	Apr 15
May 8	Ottawa, Ont.	Apr 15
May 20	Basin, Wyo.	Apr. 1

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
Apr. 17	Baltimore, Md.	Apr. 15
Apr. 19	Detroit, Mich.	Apr. 15
Apr. 20	Comstock, N. V. Adv. Apr. 1.	Apr. 1
Apr. 20	Williamsport, Pa.	Apr. 8
Apr. 20	Ashland, Mass.	Apr. 15
Apr. 24	Brooklyn, N. Y.	Apr. 8
Apr. 25	Cincinnati, O.	Apr. 8
Apr. 26	Toronto, Ont.	Apr. 15
Apr. 27	Lebanon, O.	Apr. 1
Apr. 30	South Boston (Boston P. O.), Mass.	Apr. 1
Sept. 1	Hutchinson, Kan.	Feb. 19

BUILDINGS

Apr. 19	Gering, Neb.	Mar. 25
Apr. 19	Sioux City, Ia.	Apr. 15
Apr. 19	Sioux City, Ia.	Apr. 1
Apr. 19	Hoboken, N. J.	Apr. 15
Apr. 20	Hibbing, Minn.	Apr. 1
Apr. 20	Newton (Boston P. O.), Mass.	Apr. 1
Apr. 20	Glidden, Ia.	Apr. 1
Apr. 20	Huntington, W. Va.	Apr. 8
Apr. 20	Buhl, Idaho	Apr. 1
Apr. 20	Wende (Millgrove P. O.), N. Y.	Apr. 1
Apr. 20	Cedar Banks (Lansing P. O.), Mich.	Apr. 15
Apr. 20	Philadelphia, Pa.	Apr. 15
Apr. 21	Shelby, Ia.	Apr. 15
Apr. 21	McCallshurg, Ia.	Apr. 15
Apr. 22	Baltimore, Md.	Apr. 15
Apr. 23	Alden, N. Y.	Mar. 25
Apr. 23	Okmulgee, Okla.	Apr. 15
Apr. 25	Indiana, Pa.	Apr. 1
Apr. 26	Detroit, Mich.	Apr. 15
Apr. 26	White Plains, N. Y.	Apr. 15
Apr. 27	Hibbing, Minn.	Apr. 1
Apr. 27	Maynard, Ia.	Apr. 15
Apr. 28	Lancaster, Wis.	Apr. 15
Apr. 28	Brooklyn, N. Y.	Apr. 15
Apr. 29	Greene, Ia.	Apr. 15
Apr. 30	Northfield, Minn.	Apr. 8
Apr. 31	Winthrop (Boston P. O.), Mass.	Apr. 15
May 1	Racine, Wis.	Apr. 1
May 1	Cleveland, O.	Apr. 15
May 3	Cleveland, O.	Apr. 15
May 11	Sonyea, N. Y. Adv. Apr. 1 to 15.	Apr. 8

FEDERAL GOVERNMENT WORK

Apr. 20	Dredging, Tonawanda, N. V. Adv. Mar. 25.	Mar. 25
Apr. 20	Bombproof Switchboard Building and Bombproof Cover for Casemate, Ft. Monroe, Va. Adv. Mar. 25.	Mar. 25
Apr. 20	Dredge Pontoon Catamarans—Savannah, Ga. Adv. Apr. 8.	Apr. 8
Apr. 21	Transmitting Station and Quarters—Spec. 4135—Mt. Desert Island, Me.	Apr. 15
Apr. 21	Barracks — Spec. 4086 — Kaukau, H. T.	Mar. 18
Apr. 21	Power Plant Piping—Spec. 4161—Phila., Pa.	Apr. 8
Apr. 21	Aviation Facilities—Spec. 4132—Yorktown, Va.	Apr. 8
Apr. 23	Dredging, Cleveland, O. Adv. Mar. 25.	Mar. 25
Apr. 26	Coal—Memphis, Tenn. Adv. Apr. 8.	Apr. 8
Apr. 26	Cast Iron Railing Posts, etc.—Buffalo, N. Y. Adv. Apr. 15.	Apr. 15
Apr. 27	Steel Bars—Wash., D. C.	Apr. 8
Apr. 28	Buoys—Spec. 4068—Yorktown, Va.	Apr. 8
Apr. 28	Track Scale—Wash., D. C.	Apr. 8
Apr. 28	Laundry, Bakery, Refrigerating Equipment — Spec. 4114—San Diego, Cal.	Apr. 15
Apr. 28	Storehouses, Garage and Quarters — Spec. 4048 — Keyport, Wash.	Apr. 1
Apr. 29	Removing and Rebuilding Breakwaters — Milwaukee, Wis	Apr 1

Bids Close		See Eng News-Record
May 1	Power House — Cypress, Ind. Adv. Apr. 8.	Apr. 8
May 3	Bridge—Alaska Adv. Jan. 22.	Jan. 22
May 5	Dredging — Port Huron, Mich. Adv. Apr. 8.	Apr. 8
May 8	American Portland Cement —Wheeling, W. Va.	Apr. 15
May 20	Repairing Breakwater and Placing Riprap—Cleveland, O. Adv. Apr. 15.	Apr. 15
May 27	Emergency Dam—Detroit, Mich. Adv. Apr. 15.	Apr. 15

MISCELLANEOUS

Apr. 19	Tractor, etc.—St. George, S. I., N. Y.	Apr. 15
Apr. 19	Motor Truck and Combined Sprinkler and Road Flusher —Buhl, Minn.	Apr. 15
Apr. 20	Pier Shed, Brooklyn, N. Y. Adv. Mar. 25, Apr. 1 and 8.	Mar. 25
Apr. 20	Centrifugal Sewage Pump —Toronto, Ont.	Mar. 11
Apr. 20	Sea Outfall—Avon-by-the-Sea, N. J. Adv. Apr. 8.	Apr. 8
Apr. 20	Seawall—Boston, Mass.	Apr. 8
Apr. 21	Bituminous Concrete, Asphalt, Tar, Limestone, Trap Rock, Slag and Gravel—Trenton, N. J. Adv. Apr. 8.	Apr. 8
Apr. 21	Aqueduct Tunnels, San Francisco, Cal.	Mar. 25
Apr. 21	Crushers — Breckenridge, Tex.	Apr. 15
Apr. 22	Asphalt Road Oil—New York, N. Y.	Apr. 15
Apr. 22	Piers—Stapleton, N. Y.	Apr 15
Apr. 22	Stations—Brooklyn, N. Y.	Apr. 8
Apr. 25	Swimming Pool—Aurora, Ill.	Apr. 1
Apr. 26	Triplex Plunger Pump — Red Lake Falls, Minn.	Apr. 15
Apr. 27	Guide Walls—Marbletown, N. Y. Adv. Apr. 8.	Apr. 8
Apr. 27	Steel—New Orleans, La. Adv. Apr. 8.	Apr. 8
Apr. 29	Heating and Ventilating System—Lorain, O. Adv. Apr. 8.	Apr. 8
Apr 29	Wharf — Little Current, Ont.	Apr. 15
May 1	Mechanical Equipment—Owatonna, Minn.	Apr. 15
May 3	Bituminous Material—Albany, N. Y. Adv. Apr. 15.	Apr 15
May 5	Combustion Engines, Generators, etc.—Moosomin. Sask.	Apr. 15
May 11	Power Plant Equipment—Kinston, N. C. Adv. Apr. 15.	Apr. 15
May 15	Equipment—Cedar Rapids. Ia.	Apr 15

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. Y., Gowanda—State Hospital Comn., Capitol, Albany, plans to install water supply system, at State Hospital, here. About $20,000. L. F. Pilcher, state archt.

N. Y., Sonyea—(Mt. Morris P. O.)—Bd. Mgrs., Craig Colony, plans to build addition to water supply system and concrete retaining wall. About $15,000 each. L. F Pilcher, Capitol, Albany, state archt.

O., Cleveland—City soon lets contract building water mains in sections of East 140th, East 91st, East 103rd, East 144th, East 85th, East 117th, East 118th and East 143rd Sts., Corlett, Grithog, Melzer, Reno, Sandusky, Benwood, Ella, Farringdon, Gay, Putnam, Maryland and Holborn Aves., S. C., Beyerle Pl., Ellie and Beyerle Rds., S. E., involving 26,284 ft. 6-16 in. c.i. pipe. About $30,000. R. Hoffman city engr

O., Cleveland—W. H. Evers Eng Co., engrs., 332 The Arcade, soon lets contract building 2,550 ft 4-8 in. c.i water mains and 2,320 ft. 12-34 in. vitr. pipe sewers, for Miles-Harvard Park Co. About $40,000

O., Cleveland — W. H. Evers Eng. Co., engrs., 332 The Arcade, soon lets contract building 3,420 ft. 4-12 in. c.i. water mains. for Koblitz Bros., The Arcade About $38,000.

O., St. Clairsville—Village having plans prepared building complete water works system, including deep wells, steel tank, etc. About $65,000. H. L. Maddocks, Newark, engr

Mich., Farmington—City plans to extend watermains and build rein.-con. reservoir, or elevated tank, 150,000 gal. capacity. About $25,000. R. A. Murdock, 603 Free Press Bldg., Detroit, engrs.

Kan., El Dorado—City election April 21, to vote on $375,000 bonds for waterworks system. Engineer not decided.

N. D., Hatton—City having plans prepared installing complete waterworks system. Cost to exceed $20,000. Atkinson & Hall, Devils Lake, engrs.

N. D., McVille—City soon lets contract building 125,000 gal. concrete reservoir, 40,000 steel stand pipe and tank, 9,519 ft. 4/8 in. c.i. water mains, 17 hydrants, 3 pumps. About $36,000. Atkinson & Hall, Devils Lake, engrs.

N. D., Michigan—City having plans prepared installing complete waterworks system. Cost to exceed $35,000. Atkinson & Hall, Devils Lake, engrs.

Tex., Farmersville—Farmersville Water & Sewerage Co. preparing plans improving waterworks and sewerage systems, to include building reservoir, 65,000,000 gal. capacity, 1 mi. from city limits. About $100,000.

Tex., Marlin—City had plans prepared and soon receives bids building reservoir, 160,000 gal. capacity. L. Goodrich, city engr.

Tex., Ranger—City retained J. B. Hawley, engr., Dallas, to prepare surveys and recommendations for waterworks system to supply population of 50,000 to 75,000. About $200,000.

Okla., Miami—City voted $420,000 bonds to improve waterworks and sewerage systems. Hughes Eng. Co., Oklahoma, engrs.

Utah, St. George—City plans to build 14 mi. water mains. About $50,000. Caldwell & Richards, Vermont Bldg., Salt Lake City, engrs. Noted Jan. 1.

Utah, Salt Lake City—City plans to improve water-works system, to include building dykes and levee on one side of Utah Lake, also pumping plant to deliver 52,500,000 gal. daily, using Utah Lake as source of supply. About $2,500,000. C. F. Brown, Walker Bank Bldg., engr. Noted Feb. 19.

Cal., Sierra Madre—City voted $60,000 bonds to build pumping plant, new mains, etc. J. E. Mackerran, Sierra Madre, engr.

Cal., South Pasadena—City voted $325,000 bonds to purchase present distributing systems, lay steel and c.i. mains, install 35 fire hydrants and line Marengo Reservoir with concrete. C. L. Hill, city engr.

N. S., Bridgewater—Town soon receives bids improving present waterworks system by installing new pump and wheel, building additional reservoir and connecting latter with source supply by 10 in. wood stave pipe, about 1½ mi. long. About $50,000. C. H. and P. H. Mitchell, Traders Bank Bldg., Toronto, engrs.

Ont., Oshawa—Town having plans and specifications prepared by R. W. Angus, engr., University of Toronto, for waterworks system. About $80,000.

N. Y., Tonawanda—Until May 5, by T. J. Ballary, engr., Tonawanda, building 90 x 190 ft., brick and rein.-con. filtration plant, concrete flooring. About $200,000. Noted April 8.

Pa., Pittsburgh—Until April 20, by Dept. Pub. Wks., furnishing material and building Gunite concrete lining for Herron Hill Reservoir, also Gunite concrete fence, watchman's office, etc. J Swan, dir.

S. C., Rock Hill—See "Streets and Roads."

Minn., Fertile—See "Sewers."

Minn., Lake Benton—Until April 26, by E. W. Kimball, village recdr., extending water mains, involving 7,087 ft 4-6 in. c.i. pipe, 8 gate valves, 14 hydrants, etc. About $27,000. Bradley Eng. Serv., Weber Bldg., St Cloud, engrs

Idaho, Wilder—Until April 30, by City Comn building 6-10 in c.i. and wood pipe in various streets. About $20,000 Baird & McGee Caldwell, engr

Wash., Seattle—Until May 11, by Bd. Pub. Wks., building pipe line from Cedar River to Volunteer Park reservoir, involving 16 mi. 66 in. steel pipe. About $3,000,000. A. H. Dimock, city engr.

Ont., Scarboro—Until April 28, by E. A. James Co. Ltd., engrs., 36 Toronto St., Toronto, trenching, laying, caulking and backfilling 22,000 ft. 6/12 in. c.i. pipe. Pipe will be delivered at job. Contractor to supply lead for joints. About $25,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Jamaica Plain** (Boston P. O.)—T. G. Plant Co., Bickford St., Boston, let contract building 300,000 gal. concrete reservoir and granolithic walks, here, to W. H. Whitcomb, 6 Beacon St., Boston. About $20,000.

N. Y., New York—Dept. Pub. Welfare, Municipal Bldg., received bids April 5, furnishing labor and material building and completing water supply system for 21 buildings at Sea View Hospital, Farm Colony, Richmond Boro., from Materson Constr. Co., 15 East 40th St., $78,977; G E. Eng. Co., 22 Laight St., $100,000; Wells & Newton, Ave. B and 17th St., $123,421 Noted April 1.

★**N. J., Perth Amboy**—Water Comrs. let contract building reservoir, pipe line and appurtenances, to Snare & Triest, 8 West 40th St., New York City, $1,095,566. Noted April 1.

★**Pa., Phila.**—Dept. Pub. Wks. let contract building brick superstructure for pumping station at Lardners Point Sta., to C. H. Dadney, Bellevue Court Bldg About $17,000. Noted March 25.

★**Md., Baltimore**—City will extend water main in Eutaw Ave. from Harford to Belair Rds., thence out Belair Rd., total distance of 1.5 mi. About $62,000. Work will be done by day labor.

★**W. Va., Clarksburg**—City let contract building intake chamber and coagulating basins and installing equipment for pumping stations, to Richards Constr. Co., Clarksburg, $37,109.

★**S. C., Greenville**—Woodville Investment Co. let contract laying 6,000 ft. 4 in. c.i. and 5,000 ft. 2 in. galvanized iron pipe, to Fisk Carter Constr. Co., Main St., $12,500; cost plus percentage basis.

★**O., East Columbus**—M. Devore, village clk., let contract building water mains in various streets, involving 28,000 ft. 6-12 in. c.i. pipe, to T. C. Brooks & Son, Jackson. Mich., $95,500. Noted March 18.

O., Maple Heights (Bedford P. O.)—Village received bids building 1,400 ft. 10 in. c.i water mains, from W. MacDowell & Son, 10,319 Miles Ave., Cleveland, $17,537; W. B. Smith, 5310 Franklin Ave., Cleveland, $25,555.

★**Okla., El Reno**—City let contract improving waterworks system, to Layne & Bowler, Rand Bldg., Memphis, Tenn., $37,500. Noted April 8.

★**Idaho, Ashton**—City let contract building 17,000 lin.ft. water mains, to R. M. Bardsen Co., Rupert, $20,970. Noted March 4.

Sewers

PROPOSED WORK

N. Y., Rome—Bd. Mgrs., State School for Mental Defectives, plans to alter sewage disposal plant. About $25,000. L. F Pilcher, Capitol, Albany, state archt.

N. J., Jersey City—City plans to lay 18 in. vitr. pipe sewers in portions of Summit, Pavonia and Sip Aves. Cost to exceed $25,000. C. A. Van Keuren, city engr.

Pa., Titusville — Common Council had plans prepared for 5,918 ft. sewer in various streets. About $56,000-$60,000. A. Fay, city engr.

O., Cleveland—See "Waterworks."

O., Massillon—City plans election April 27, to vote on $69,000 bonds to build 5,000 ft. 36-60 in. storm sewers. H. Howald, engr

Mich., Ford (Wyandotte P. O.) — City having plans prepared for complete storm water sewerage system, rein.-con. and vitr pipe Bonds for $70,000 voted for project M. L. Brown & Son, 823 Chamber of Commerce, Detroit, engrs.

Mich., Royal Oak—Brookwood Land Co having plans prepared by R. A. Murdoch, engr., 603 Free Press Bldg., Detroit, for trenching, laying vitr crock lateral and storm sewers and backfilling in Fern St

Sewers (Continued)

Clifton, Westgate, Ardmore and Brookwood Aves., involving 3,320 ft. 8-16 in. vitr. pipe and 3,000 ft. 6 in. iron pipe. About $25,000.

N. D., Hatton—City having plans prepared installing complete sewerage system. Cost to exceed $20,000. Atkinson & Hall, Devils Lake, engrs.

N. D., McVille—City Council soon lets contract building sewerage system, involving 6,689 ft. 8-12 in. vitr. pipe, 24 manholes and concrete septic tank. About $28,000.

N. D., Michigan—City having plans prepared installing complete sewerage system. Cost to exceed $25,000. Atkinson & Hall, Devils Lake, engrs.

Mont., Forsyth—City rejected bids building sewerage system and plans election to vote on additional $15,000 bonds. Work may be readvertised. W. C. Record, Forsyth, engr. Noted March 4.

Tex., Brownwood—See "Streets and Roads."

Ore., Bend—City plans to build sewerage system. About $141,000. R. B. Gould, city engr.

Ore., Portland—City soon receives bids building Killingsworth Ave. and East 18th St. Sewerage System, cost $111,932, Killingsworth Ave. and East 29th St. Sewerage System, $20,327, sewer in East 58th and East 59th Sts. from Sandy Blvd. to Klickitat St., $6.606 and $5,625 respectively, East 55th St. from Tillamook to Halsey Sts., $6,476, East 65th and Stanton Sts. Sewerage System, $48,436. O. Laurgaard, city engr.

Cal., Glendale—City had surveys made for sewerage system, disposal plant, etc. and plans election to vote on $500,000 bonds for project. Olmsted & Gilleleu, 1112 Hollingsworth Bldg., Los Angeles, engrs.

Ont., Port Dalhousie—Town having estimates prepared by R. W. Angus, engr., Eng. Bldg., University of Toronto, for storm and sanitary sewerage involving 4-5 mi. 8 in. vitr. pipe. About $30,000.

BIDS DESIRED

N. Y., Brooklyn—Until April 21, by E. Riegelmann, boro. pres., furnishing labor and material building sewer in Stillwell Ave. from Neptune to Canal Aves., 65th St. between 17th and 18th Aves., President St. between Schenectady and Utica Aves., 12th Ave. between 54th and 55th Sts.

N. Y., Poughkeepsie—Until April 29, by Bd. Pub. Wks., Eastman Park Mansion, building sewerage receiving wall and pumping station. About $17,800. E. W. Sylvester, supt.; advertised in this issue.

S. C., Charleston—Until May 4, by city, building 5,600 ft. rein.-con. drains, 16,000 ft. terra cotta pipe drain and 17,000 ft. terra cotta pipe sewer. J. H. Dingle, city engr.; advertised in this isssue.

S. C., Rock Hill—See "Streets and Roads."

O., Columbus—Until April 27, by director of Public Service, building brick pumping station for Shephard main trunk sewer, cost $25,000; equipment, $5,000. H. Maetzel, city engr.

Mich., Detroit—Until April 30, by Dept. Pub Wks., furnishing labor and material (except iron manholes, rings and covers) building Sects. 2 and 3 of Bates St. Sewer and Sects. 1 and 2 of Gratiot Ave. Sewer. G. Engel, comr.; advertised in this issue.

Ill., Decatur—Until May 3, by Bd. Trustees of Sanitary Dist., Powers Bldg., constructing 7,000 ft. 5-6 ft. intercepting sewer, together with special connections, manholes and other appurtenances. Pearse & Greeley, 39 West Adams St., Chicago, consult. engrs.; advertised in this issue.

Wis., Milwaukee—Until June 3, by city, furnishing and erecting machinery in sewage disposal plant, to be built on Jones Island. J. H. Fowler, secy.; advertised in this issue.

Minn., Ellsworth—Until April 22, by E. A Meester, village recdr., building sanitary sewerage system and sewage disposal plant, involving 15,000 ft. 8-15 in. pipe, 36 manholes, 2 flush tanks, etc. About $40,000. Former bids rejected. Druar & Smith, Globe Bldg., St. Paul, engrs. Noted March 18.

Minn., Fertile—Until April 19, by Village Council, building sewerage system and extending water works, involving 12,213 lin. ft. 8-18 in. sewer, 33 manholes and 3,085 lin.ft. 4 in. c.i. water main. C. L. Pillsbury Co., 813 Metropolitan Life Bldg., Minneapolis, engrs.

Minn., Lake Benton—Until April 26, by E. W. Kimball, villiage recdr., building sanitary sewerage system, involving 19,121 lin.ft. vitr. pipe, 11,310 lb c.i. pipe 506 wyes, 48 manholes, 1 ejector pit, 1 treatment tank, 1 sludge bed, 2 ejectors, 2 motors, 2 compressors and 1 air storage tank. About $30,000. Bradley Eng. Serv., Weber Bldg., St. Cloud, engrs.

Minn., Thief River Falls—Until May 4, by A. H. Akre, city clk., building sewers in various streets, involving 5,684 lin.ft. 8-20 in. pipe, 5,684 lin.ft. trench, 5-7 ft. deep, 21 manholes and 24 extra depth manholes, catch basins, etc. About $40,000. Bradley Eng. Serv., St. Cloud, engrs.

Ore., Tillamook—Until April 19, by F. B. Stranahan, city recdr., building sanitary sewer in portion of 5th St. and in south portion of city; also paving 7,646 sq.yd. 3rd St., 5,706 sq.yd. Stillwell Ave. and 5,318 sq.yd. 7th St.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Conn., Stratford (Bridgeport P. O.)—Bd. Sewer Comrs. let contract furnishing labor and material building 15.6 mi. pipe sewer, 8-24 in. diam., to Pierce Mfg. Co., 785 Housatonic Ave., Bridgeport. About $260,000. Noted April 1.

★N. Y., New York—H. Bruckner, pres. Bronx Boro., let contract building sewer in Montgomery and Maclay Ave., to Russiano & Lauri, $10,820 and $2,683 respectively. Noted March 11.

★Ind., Anderson—City let contract building trunk sewerage system, to Green & Sons, Chicago, $919,692.

Mich., Detroit—Dept. Pub. Wks. received bids March 26, furnishing labor and material (except manhole rings and covers) trenching and laying sewers in (a) Laterals 3,087, (b) 3,091, (c) 3,143, (d) 3,114, (e) 3,194, (f) 3,197, (g) 3,199, (h) 3,234, (i) 3,247, (j) 3,249, (k) 3,273, (l) 3,274 from W. Blanck & Co., 250 Longfellow St., (a) $29,375, (b) $4,810, (e) $9,973, (f) $10,197, (g) $11,026; Oakwood Constr. Co., 165 Fort Blvd., (a) $26,064, (c) $20,538, (d) $4,793, (i) $24,835, (j) $7,847, (k) $25,199; Lennane Bros., Union Trust Bldg., (c) $11,761, (e) $6,662, (f) $6,745, (g) $7,121; Lennane & McIlvenna, Book Bldg., (c) $14,975, (i) $29,990; A. H. Haynes, 70 Davenport St., (d) $4,050, (j) $7,000, (l) $2,950; C. A. Handyside Constr. Co., 15 Northwestern St., (h) $1,338; Western Constr. Co., 1208 Ford Bldg., (i) $21,990, (l) $2,787; N. Mancini, 580 Concord St., (j) $9,339; R. Baker, 1314 Penobscot Bldg., (k) $65,000; Langley & Barton, 400 Penobscot Bldg., (l) $2.851. Noted March 18.

★Wis., Chilton—City let contract evacuating and laying 6,145 ft. 10 in vitr. sewer pipe, in Main St., to Cornelissen & Co., 73 Lincoln Ave., Sheboygan, $13,014 Noted March 18.

★Wis., Racine—Bd. Pub. Wks. let contracts laying sewers in Lincoln Heights, Center and Clarks Sts., to Jensen & Thompson, Lockwood Ave.; Harvey Rd., Lockwood Ave. and Maiden Lane, to E. R. Harding Co., 400 Robinson Bldg.; Albert St., to P. Gavin, Racine; West Blvd., to P. Frandsen, 1126 Sellick Ave., Kenosha. Work involves 9,672 ft. 9-18 in. sewer pipe, 29 manholes, 26 catchbasins, 1 lamphole and 4 underground manholes. Noted April 8.

★Minn., Duluth—See "Buildings."

★Idaho, Ashton—City let contract laying 16,000 ft. of 8-15 in. vitr. pipe for trunk line sewer and laterals, to R. M. Bardsen Co., Rupert, $87,569. Noted Mar. 4

Bridges

PROPOSED WORK

N. Y., Bonnville—E. S. Walsh, supt. Dept. Pub. Wks., Capitol, Albany, plans to build bridge over Black River Canal, here. About $35,000. F. M. Williams, state engr.

N. Y., Ft. Edward — E. S. Walsh, supt. Dept. Pub. Wks., Capitol, Albany, plans to build bridges over Champlain Canal on East St. and Notre Dame St. About $35,000 and $37,000 respectively. F. M. Williams, state engr.

N. Y., Glen Falls—E. S. Walsh, supt. Dept. Pub. Wks., Capitol, Albany, plans to build bridge over Glens Falls Feeder, on highway between here and Hudson Falls. About $50,000. F. M. Williams, state engr.

N. Y., Hudson Falls—E S. Walsh, supt. Dept. Pub. Wks., Capitol, Albany, plans to build bridge over Glens Falls Feeder, on Pearl St., here. About $37,000. F. M. Williams, state engr.

N. Y., New Hamborg—E. S. Walsh, supt. Dept. Pub. Wks., Capitol, Albany, plans to build bridge over Wappinger Creek, here. About $35,000. F. M. Williams, state engr.

N. Y., Port Leyden—E. S. Walsh, supt Dept. Pub. Wks., Capitol, Albany, plans to build bridge over Black River Canal, on Main St., here. About $33,000. F. M Williams, state engr.

N. Y., Rome—F. S. Walsh, supt. Dept. Pub. Wks., Capitol, Albany, plans to build bridge over Black River Canal on Stanwix St., here. About $25,000. F. M. Williams, state engr

N. Y., Waterford—E. S. Walsh, supt. Dept. Pub. Wks., Capitol, Albany, plans to build bridge over Champlain Canal, on Broad St., here. About $25,000. F. M. Williams, state engr.

N. Y., Waterloo—F. S. Walsh, supt. Dept. Pub. Wks., Capitol, Albany, plans to build bridge over Cayuga and Seneca Canal, on Virginia St., here. About $28,000. F. M. Williams, state engr.

N. Y., Westernville—E. S. Walsh, supt. Dept. Pub. Wks., Capitol, Albany, plans to build bridge over Black River Canal, here. About $40,000. F. M. Williams, state engr.

W. Va., Charleston — See "Streets and Roads."

Mich., Detroit—Wayne Co plans to build double leaf bascule bridge for street and electric car traffic over River Rouge, on West Jefferson Ave., 60 ft. wide, to have 175 ft. span, concrete foundation to be sunk in caissons to bed rock at depth of 86 ft. Bonds for $800,000 voted for project. E. N. Hines, 220 County Bldg., chn. rd. comn.

Mich., St. Clair—City, St. Clair and China Twp. soon let contract building 200 ft. bridge over Pine River, near here, 20 ft. wide, rein.-con. arch type with 3 spans. Cost to exceed $25,000. W. H. Adams, Vinton Bldg., Detroit, engr. Noted Jan. 28.

Kan., Kansas City—Wyandotte Co. having preliminary plans prepared building 2,600 ft. rein.-con. bridge, to have 7 spans, over Kaw River, on 12th St. Cost to exceed $1,000,000. Hedrick & Huff, Interstate Bldg., Kansas City, Mo., engrs.

Missouri—See "Streets and Roads."

Mo., St. Joseph—See "Streets and Roads."

Okla., Enid—Garfield Co. soon lets contract building 11 culverts, ranging from 6 x 6 ft. to 6 x 12 ft., cost $8,500, also 22 rein.-con. bridges, from 20 to 70 ft spans, $91,100. F. W. Denner, co. engr.

Ont., Brantford—City having plans prepared by E. A. James Co., Ltd., consult. engrs., 36 Toronto St., Toronto, for 390 ft. rein.-con. bridge, 42 ft. roadway and 11 ft. sidewalks, over Thames River on Lorne St. About $200,000.

Ont., Grand Bend—Lambton and Huron Counties having plans prepared by J. A Bell & Son, engrs., Court House, London. for 120 ft. steel truss bridge, on concrete abutments, concrete flooring, 20 ft. roadway, on boundry line. About $25,000.

Ont., Ottawa—Carleton Co. plans to construct bridge on boundry line. Leeds and Grenville Counties have been asked to appropriate toward cost. About $40,000. Engineer not selected.

BIDS DESIRED

Mass., Neponsett (Boston P. O.)—Until April 28, by Dist. Comrs., 18 Tremont St., Boston, removing temporary structures and building 260 ft. Scherzer type lift bridge. 40 ft. wide, over Neponsett River, involving 1,463 sq.yd. granite block, 9,660 sq.yd. concrete, 11,500 cu.yd. earth excav., 1,100 ton rock ballast, 110,000 lin.ft. piles, 3,000 cu.yd. gravel ballast, 1,600 cu.yd. stone masonry, 8,000 cu.yd. back fill, etc. Cost to exceed $25,000. J. R. Rablin, 18 Tremont St., Boston, engr.

N. Y., Massena—Until April 22, by F. A. Howe, town clk., furnishing material and labor building 765 ft. riveted steel cantilever bridge over Grasse River, to have 2 anchor arms, each 175.5 ft. long, 2 cantilever arms, each 112.5 ft long and a suspended span, 225 ft. long; substructure to have 2 concrete piers, each 50 ft. high over all and 2 concrete abutments, 22 ft. high over all. Jarrett-Chambers Co., 30 East 42d St., New York City, engrs.; advertised in this issue. Noted Jan. 29.

N. J., Paterson — Until May 5, by Bd. Freeholders Passaic Co., building new rein.-con. arch bridge over Passaic River, between Pennington and West Side Parks. J. M. Morrison, clk.; advertised in this issue Noted March 18.

Bridges (Continued)

N. J., Trenton—Until April 27, by Bd Freeholders Mercer Co., furnishing labor and material for building Sadler Memorial Bridge, rein.-con. arch girder type, over Sanhican Creek, at foot of Willow St.; advertised in this issue. Noted April 1.

Mich., Detroit—Until May 11, by Rd. Comrs. Wayne Co., 220 County Bldg., constructing sub structures for 2 bridges over River Rouge, at southwestern limits of city, where intersected by Jefferson Ave., W. and Fort St., W E. N. Hines, chn.; advertised in this issue.

Minn., Center City—Until April 20, by A. F. L. Stromgren, aud. Chicago Co., building rein.-con. bridges and culverts on State Rds. 5, 2 and 1, as follows: Bridge 2064—10 ft. extension on present bridge. Bridge 3238—20 ft. span on concrete abutments, W66 culvert—35 ft. long, involving 36.22 cu.yd. rein.-con., W66 culvert—45 ft. long, 43.74 cu.yd. rein.-con., W66 culvert—500 ft. long, 385.90 cu.yd. rein.-con., W44 culvert—70 ft. long, 40.98 cu.yd. rein.-con., also separate bids furnishing 2,402 lin.ft. sectional concrete or corrugated metal culverts, 12-30 in. diameter. About $30,000. H. L. Colwell, Sunrise, engr.

Kan., Topeka—Until April 19, by Comrs. Shawnee Co., building 2 steel bridges, one 68 ft. and other 110 ft. long, also 3 concrete bridges, two 40 ft. and one 50 ft. long. About $100,000. J. E. Williams, 1311 Clay St., engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Billerica—State Highway Comn., Boston, received bids April 6, building 1,200 ft. arch bridge and approaches, 90 ft. span, 22 ft. wide, over Concord River, here, involving 630 cu.yd. concrete, 600 cu.yd. excav., 3,150 cu.yd. borrow fill, 890 cu.yd. stone masonry, 140 sq.yd. sidewalks and 5,200 cu.yd. earth excav., from J. H. Fannon, Somerville, $131,062; Bruno & Pettiti, 18 Tremont St., Boston, $163,180. Noted April 1.

North Carolina—See "Streets & Roads."

★Ind., Anderson—Comrs. Madison Co. let contract building 424 ft. bridge, 42 ft. wide, to have five 80 ft. spans, 30 ft. roadway and two 6 ft. sidewalks, involving 4,000 cu.yd. rein.-con. and 50 tons steel, to Koss Constr. Co., 2818 5th St., Des Moines, Ia. About $120,000.

★Ind., Anderson — Comrs. Madison Co. let contract building rein.-con. arch bridge over White River on 9th St., to Koss Constr. Co., 2818 5th St., Des Moines Ia., $119,999. Noted Feb. 26.

★Mich., Detroit—Wayne Co. let contract sinking 4 pneumatic caissons for foundation and building steel supporting girders for bridge over River Rouge, Dix Ave., 90 ft. deep, to Missouri Valley Bridge & Iron Co., Pennsylvania Ave., Leavenworth, Kan. About $120,000. Noted Feb 26.

★Minn., Duluth—W. H. Borgen, treas. St. Louis Co., let contracts building bridges on Miller Trunk Rd. as follows: 4 bridges, involving 163 cu.yd. concrete, 8,335 lb. reinforcing and 16,944 lb. structural steel, to W. O'Shea, 600 Ridgewood Ave., Minneapolis, total cost, $11,317; 3 bridges, 299 cu.yd. concrete, 20,448 lb. reinforcing and 50,760 lb. structural steel, to W. S. Hewett, 4602 Dupont Ave., S., Minneapolis, $19,448; 1 bridge, 88.4 cu.yd. concrete, 7,480 lb. reinforcing and 42,645 lb. structural steel, to Minneapolis Bridge Co., 728 Metropolitan Bldg., Minneapolis, $11,421; 5 bridges, 451 cu.yd. concrete, 28,450 lb. reinforcing and 29,009 lb. structural steel to Hennepin Bridge Co., 900 East N. E. 3rd St., Minneapolis, $27,379; 1 bridge, 105 cu.yd. concrete, 6,580 lb. reinforcing and 23,060 lb. structural steel, to Twin City Bridge Co., Minneapolis, $7,275; 2 bridges, 197 cu.yd. concrete, 11,424 lb. reinforcing and 12,620 lb. structural steel, to H. A. Roush, Webster, Wis., $10,700; 2 bridges, 169 cu.yd. concrete, 11,282 lb. reinforcing steel, to L. E. Baum, 2305 Ogden Ave., Superior, Wis., $7,900; 8 bridges, 1,150 cu.yd. concrete, 80,955 lb. reinforcing and 295,718 lb. structural steel, to Great Northern Bridge Co., Minneapolis, $82,450. Total cost, $177,910. Noted March 4.

Tex., Ballinger—O L. Parrish, judge Runnels Co., received bids March 30, removing structure, building addition to substructure and building new 518 ft. superstructure, 19 ft. wide, to have seven 28½ ft. and four 28 ft. 5 in. girder spans and two 99 ft. 2 in. steel spans, from McCall-Moore Eng. Co., 308-9 Amicable Bldg., Waco, $66,331; Midland Bridge Co., Ship Channel, Fidelity St, Houston, $75,422

Streets and Roads

PROPOSED WORK

N. Y., New York—H. Bruckner, pres. Bronx Boro., rejected bids received April 1, paving Westchester Ave. from Ward to East Tremont Aves. About $500,000. Noted April 8.

N. J., Hoboken—City Comn. soon lets contract repairing Park Ave., 9th, Garden, Hudson, 4th and 5th Sts., also grading, paving, etc., Paterson Ave., Jackson, 4th, 5th, Hudson and Newark Sts. Cost to exceed $150,000. F. Haggerty, city clk.

N. J., Trenton—Mercer Co. will issue $1,500,000 bonds to cover cost of building 25 mi. permanent roads, cement, concrete or vitr. brick, to include all heavy truck lines in county. Above program to cover period of 5 years, ⅕ of work to be completed each year. H. F. Harris, co. engr.

Pa., Monessen—City soon lets contract improving East Donner, McMahon, Maple, Summit and Lillian Aves., Ontario, South 4th, Chestnut, 10th, South 14th, Beatrice, Elsie and Dunlap Sts., involving 17,876 cu.yd. excav., 11,308 lin.ft. straight curb, 2,120 lin.ft. straight curb reset, 1,204 lin.ft. radius curb, 23,300 sq.yd. brick block paving, etc. A. W. Johns, Donner Ave. and 4th St., engr.

W. Va., Union—Comrs. Monroe Co. plans election to vote on $71,000 bonds to improve roads in Sweet Springs Dist. and $66,000 bonds for Red Sulphur Dist. J. L. Wehmeyer, co. engr.

North Carolina—Div. Office State Highway Comn., Greensboro, received no bids March 29, hard surfacing 6.7 mi. road, 16 ft. wide, Federal Aid Project 71, Durham Co. About $190,000. Work will be readvertised. W. S. Fallis, Raleigh, engr. Noted March 11.

South Carolina—State Highway Comn., Columbia, plans to sand clay or top soil road from Pickens to North Carolina line. About $140,000. W. S. Fallis, Raleigh, state highway engr.

S. C. Abbeville—Comrs. Abbeville Co. authorized $450,000 bonds to build roads. Engineer not selected.

S. C., Allendale—Comrs. Barnwell Co. authorized $200,000 bonds to pave roads and various streets. Engineer not selected.

S. C., Barnwell — Comrs. Barnwell Co. authorized $50,000 bonds to pave roads. Engineer not selected.

S. C., Beaufort—Comrs. Beaufort Co. authorized $300,000 bonds to pave highways. Engineer not selected.

S. C., Bennettsville—Comrs. Marlboro Co. authorized $150,000 bonds to build roads. Engineer not selected.

S. C., Bishopville—Comrs. Lee Co. authorized $100,000 bonds to improve roads. Engineer not selected.

S. C., Camden — Comrs. Kershaw Co. authorized $400,000 bonds to build roads. Engineer not selected.

S. C., Charleston — Comrs. Charleston Co. authorized $400,000 bonds to pave roads and build bridges. J. W. Martin, Charleston, engr.

S. C., Charleston — Sanitary & Drainage Comn. Charleston Co. soon lets contract building 7.384 mi. Charleston-Savannah Highway, Federal Aid Project 81, involving 10.25 acres clearing and grubbing, 46,733 cu.yd. earth excav., 77,883 sq.yd. asphaltic concrete paving, 126.6 cu.yd. Class "A," 97.6 cu.yd. Class "B" and 76.6 cu.yd. Class "C" concrete in bridges and culverts, also 45.8 cu.yd. Class "B" concrete for headwalls, etc.

S. C., Darlington—Comrs. Darlington Co. authorized $800,000 bonds to pave highway. Engineer not selected.

S. C., Florence—Comrs. Florence Co. authorized $800,000 bonds to improve and pave roads. Engineer not selected.

S. C., Gaffney — Comrs. Cherokee Co. authorized $100,000 bonds to pave roads. W. S. Stanley, co. engr.

S. C., Kingstree — Comrs. Williamsburg Co. authorized $80,000 bonds to build roads. J. M. Martin, Kingstree, engr.

S. C., Laurens — Comrs. Laurens Co. authorized $100,000 bonds to build roads. N. C. Hughes, Laurens, engr.

S. C., Lexington—Comrs. Lexington Co. authorized $100,000 bonds to improve roads. Engineer not selected.

S. C., McCormick—Comrs. McCormick Co. authorized $60,000 bonds to build roads.

S. C., Manning — Comrs. Clarendon Co. authorized $400,000 bonds to pave roads. Engineer not selected.

S. C., Moncks Corner—Comrs. Berkely Co. authorized $100,000 bonds to pave highway Engineer not selected.

S. C., Newberry—Comrs. Newberry Co. authorized $400,000 bonds to build roads. Engineer not selected.

S. C., Orangeburg—Comrs. Orangeburg Co. authorized $300,000 bonds to build roads. Engineer not selected.

S. C., Ridgeland—Comrs. Jasper Co. authorized $200,000 bonds to improve and build highways. Engineer not selected.

S. C., St. George—Comrs. Dorchester Co authorized $320,000 bonds to pave and grade various roads. Engineer not selected.

S. C., Saluda—Comrs. Saluda Co. authorized $40,000 bonds to improve roads.

S. C., Walhalla—Comrs. Oconee Co. authorized $400,000 bonds to build roads. Engineer not selected.

S. C., Walterboro—Comrs. Colleton Co. authorized $83,500 bonds to pave roads.

Kentucky—State Dept. Pub. Rds., Frankfort, plans to grade and drain 15.051 mi. road from Grayson to Olive Hill, 20 ft. wide, Carter Co., involving 107,398 cu.yd. earth and 14,589 cu.yd. rock excav.; drain and surface 9 mi. Springfield-Harrodsburg Rd., 16 ft. wide, Washington Co., involving 41,337 cu.yd. earth excav., 21,619 tons crushed stone waterbound macadam, 3.73 acres clearing and grubbing, etc. W. N. Bosler, road engr.

Kentucky—State Dept. Pub. Rds., Frankfort, plans to build 5.708 mi. Greenville-Central City Rd., 18 ft. wide, Muhlenberg Co., involving 34,654 cu.yd. earth and 562 cu.yd. rock excav., 7.45 acres clearing and grubbing, Kentucky rock asphalt or penetration paving, drains, etc. W. N. Bosler, road engr.

Ky., Paris—Comrs. Bourbon Co. plan to resurface 9 mi. Paris-Owingsville Rd., 20 ft. wide, involving 14,771 cu.yd. earth and 516 cu.yd. rock excav. and 78,603 sq.yd. Kentucky rock asphalt or Topeka paving. W. N. Bosler, Frankfort, state highway engr.

O., Canal Winchester—G. M. Herbst, village clk., rejected bid received March 22, grading, draining and paving 1,300 ft. High St., 40 ft. wide. Work will be readvertised. Jennings Lawrence Co., Hartmann Bldg., Columbus, engrs. Noted March 18.

O., Columbus — City Council plans to grade, drain, curb, lay water mains and pave 1,374 ft. Chase Ave. from St. Clair Ave. to Cleveland, Akron & Cincinnati R. R., 26 ft. wide, asphalt, cost $27,837; 622 ft. 10th Ave. from Michigan to Perry Aves., 20 ft. wide, asphalt, brick or concrete, $8,617; 2,129 ft. Miller Ave. from Fair Ave to Main St., 28 ft. wide, asphalt, $25,910; 2,050 ft. Lakeview Ave. from High St. to alley west of Milton St., 24 ft. wide, brick, asphalt or macadam, $41,300; also alley north Fair Ave. from Latta Ave. to alley west of Franklin Park West, 800 ft. long, 20 ft. wide, brick or concrete, $7,885. H. Maetzel, city engr.

O., Massillon—City plans to pave, repave, build curbs, gutters and necessary storm sewers in various streets. About $500,000. H. Howald, engr.

Michigan—F. F. Rogers, state highway comr., rejected bids received March 12, grading and surfacing 5.049 mi. Federal Aid Project 24 A-1. Work will be readvertised. Noted Feb. 26.

Mich., Detroit—City soon lets contract grading, shaping and paving Field Ave., involving 7,462 cu.yd. excav. and 12,407 sq. yd. paving, cost $72,000; Warren Ave., 3,771 cu. yd. excav., 5,294 sq.yd. paving, $47,000; Bushey St., 1,242 cu. yd. excav., 1,853 sq.yd. paving, $11,000; Chalmers Ave., 1,998 cu.yd. excav., 2,873 sq.yd. paving, $16,000; Elmhurst Ave., 1,321 cu.yd. excav., 1,731 sq.yd. paving, $11,000; Spring St., 594 cu.yd. excav., 1,108 sq.yd. paving, $6,000; Wilde St., 738 cu.yd. excav., 1,767 sq yd. paving, $10,000, all above sheet asphalt on 6 in. concrete base; Ellsworth Dr., 436 cu. yd. excav. and 667 sq. yd. sheet asphalt on 8 in. concrete base, $5,000. C. W. Hubbell, city engr.

Mich., Grosse Pointe (Detroit P. O.)—City soon lets contract grading, shaping and paving 1 mi. St. Clair Ave., 30 ft. wide, involving 17,600 sq.yd asphaltic concrete on 6 in. concrete base. About $85,000. M L. Brown & Son, 823 Chamber of Commerce, Detroit, engrs. Noted April 8.

Wisconsin—State Highway Dept., State Capitol, Madison, rejected bids received April 9, grading and paving 1.13 mi. Dubuque-Platteville Rd., Federal Aid Project 100, Grant Co. Work will be readvertised Noted April 1

Streets and Roads (Continued)

Wisconsin—State Highway Dept., at div. office, Court House, La Crosse, received no bids April 8, grading and paving 2.88 mi. Viroqua-Prairie du Chien Rd., Federal Aid Project 136, La Crosse Co. Work will be readvertised. Noted April 1.

Wisconsin—State Highway Dept., at div. office, Court House, La Crosse, rejected bids received April 8, grading and paving 2.75 mi. La Crosse-Sparta Rd., Federal Aid Project 28, La Crosse Co., involving 3,750 cu.yd. earth excav., 25,020 sq.yd. 18 ft. concrete surfacing or bituminous macadam and 12,537 bbl. cement. Noted April 1.

Wis., Stoughton—City council plans to pave Market Pl., alleys in business blocks from Water to 4th Sts., Washington St. from Water to 5th Sts., 5th St. from Washington to Jefferson Sts., 6th St. from Main to South Sts., 7th St. from South to Jefferson Sts., Jefferson St. from Water to 7th Sts., South Academy St. from Main St. to Garden Ave., Garden Ave. from Academy St. to end of concrete, also build bridge on Jefferson St.

Ia., Des Moines—Polk Co. soon lets contract paving 4½ mi. highway, involving 6,641 cu.yd. excav. and 48,695 sq.yd. paving. F. O. Laing, Des Moines, engr.

Ia., Orange City—Sioux Co. soon lets contract paving 5 mi. highway, involving 14,206 cu.yd. excav., 54,371 cu.yd. concrete or brick, 6,030 lin.ft. 6 in. tile, etc. W Aardapple, Orange City, engr.

Minn., Little Falls—B. Y. McNairy, aud. Morrison Co., rejected bids received March 31, building 8 mi. Federal Aid Project 24, Job 4, 24 ft. wide. About $26,000. Noted March 18.

Minn., Ortonville—A. V. Randall, aud. Big Stone Co., soon lets contract building 6.14 mi. State Aid Job 2002, 24 ft. wide, cost $45,000; grading 14.9 mi. State Job 2002, 24 ft. wide, $47,000; 5 mi. State Job 2004, 24 ft. wide, $25,000. L. P. Zimmerman, Ortonville, engr.

Minn., Willmar—S. Nelson, aud. Kandiyohi Co., rejected bids received Feb. 9, paving 11 mi. Federal Aid Project 31, State Rd. 6, 18 and 24 ft. wide. About $300,000. Noted Jan. 29.

South Dakota—State Highway Comn., Pierre, soon lets contract gravel surfacing 9.05 mi. Mobridge McIntosh Highway, 20 ft. wide, Federal Aid Project 29, Corson Co., involving 2,000 cu.yd. excav., 6,110 cu.yd. gravel; grading and building drainage structures on same 36 ft. wide, involving 57,245 cu.yd. excav., 20,247 yd. overhauling, 237 cu.yd. Class "A" and 25 cu.yd. Class "B" concrete, 17,000 lb. reinforcing steel, 426 lin.ft. concrete or corrugated iron pipe culverts. F. S. Peck, state highway engr.

South Dakota—State Highway Comn., Pierre, soon receives bids grading and building drainage structures on 7.58 mi. White River-Murdo Rd., 24-36 ft. wide, Federal Aid Project 58, Jones Co., involving 48,500 cu.yd. earth excav., 2,967 cu.yd. gravel surfacing, 900 lin.ft. concrete or corrugated pipe, 200 cu.yd. concrete for culverts, 11,000 lb. reinforcing steel, one 45 ft. span steel truss, cost $48,000; grading, graveling and draining 18.2 mi. Watertown-Clark Rd., 24 ft. wide, Federal Aid Project 57, Codington Co., 72,800 cu.yd. earth excav., 27,300 cu.yd. gravel surfacing, 1,400 lin.ft. concrete or corrugated culverts, 760 cu.yd. concrete for culverts, 42,000 lb. reinforcing steel, $122,000. F. S. Peck, state highway engr.

N. D., Fargo—City Council rejected bids received March 8, paving 13th St. from 5th to 13th Aves., 8th, 9th, 10th, 11th and 12th Aves. from 9th to 13th Sts., 6th Ave. several blocks north, 28-30 ft. wide. About $400,000. J. Jacobson, city engr. Noted March 4.

Missouri—State Highway Dept., Jefferson City, plans to build 12.63 mi. St. Charles Rd., involving 6,800 cu.yd. excav. of old macadam, 57,000 cu.yd. excav., 65,930 lin. ft. ditching, 2,288 sq.yd. bituminous macadam surface course Spec. "B" or "C," 13,980 sq.yd. 4 in. monolithic brick on 4 in. concrete base, 20-22 ft. wide, 4,400 sq.yd. 4 in. monolithic hillside brick on 4 in. concrete base, 18 ft. wide, 23,560 sq.yd. 2 course concrete, 9 in. at center, 7½ in. at sides, 20 ft. wide, 94,096 sq.yd. 1 course concrete, 8½ in. at center, 7 in. at sides, 18 ft. wide, 3,000 lin. ft. 6 in. underdrain, 14 culverts, 1 rein.-con. bridge, cost $573,585; 6.08 mi. Gravois Rd., 30,000 cu.yd. earth excav., 32,106 lin.ft. ditching, 50,013 sq.yd. 2 course cement concrete, 9 in. at center, 7½ in. at sides, 20 ft. wide, 20,089 sq.yd. monolithic hillside brick on 4 in. concrete base, 4,000 ft. concrete 20 ft. wide and 5,600 ft. 18 ft. wide, 7 culverts, 1 rein.-con. bridge, $308,123; 15.75 mi. Manchester Rd., 78,000 cu.yd. earth excav., 83,152 lin.ft. ditching, 30,858 sq.yd. 2 course plain cement concrete surfacing, 9 in. at center, 7½ in. at sides, 2 in. granite surface, 133,252 sq.yd. 1 course plain cement concrete surfacing 8½ in. at center 7 in. at sides, 5,280 sq.yd. 4 in. monolithic hillside brick on 4 in. concrete base, 38 culverts, 4 rein.-con. bridges, $685,321; 7.06 mi. De May Ferry Rd., 35,000 cu.yd. excav., 37,277 lin.ft. ditching, 74,554 sq.yd. 1 course cement concrete, 8½ in. at center, 7 in. at sides, 18 ft. wide, 15 culverts, 2 rein.-con. bridges, $305,402; 12.57 mi. Old Wire Rd., 27,962 cu.yd. earth and 700 cu.yd. rock excav., 117,338 sq.yd. gravel surfacing 5 in. deep, 3,160 sq.yd. gravel sub-base, 5 in. deep, $63,577

Missouri—State Highway Dept., Jefferson City, Ralls Co., plans to build 7 mi. London Perry Rd., 24 ft. wide involving 9,696 cu. yd. earth excav. and 36,960 sq.yd. gravel surfacing. About $27,720.

Mo., Independence—Jackson Co., Kansas City, rejected bids received March 19, building 2.5 mi. Raytown Rd., 26 ft. wide. Noted March 11.

Mo., Mexico—Comrs. Audrain Co. soon let contract building 6.2 mi. Mexico-Fulton Rd., 24 ft. wide, involving 38,038 lin.ft. grading, 12,690 sq.yd. reconstructed base course gravel, 37,900 sq.yd. 2 course gravel, 12,690 sq.yd. gravel surface course. About $55,601.

Mo., St. Joseph — Comrs. Buchanan Co. soon let contract building 11.2 mi. Jefferson Highway, 30 ft. wide, involving 45,242 cu.yd. earth excav., 53 cu.yd. Class "B" and 74 cu.yd. Class "C" concrete, 2,800 lb. reinforcing, 254 lin.ft. 18-36 in. rein.-con. pipe culverts, (1) 113,363 sq.yd. combination cement concrete header and base course, 100,799 sq.yd. bituminous surface course specification B, (2) 113,363 sq.yd. 1 course concrete pavement. Cost (1) $487,318 and $466,473 respectively.

Mo., St. Joseph—Comrs. Buchanan Co. rejected bids received March 19, building 11.2 mi. Jefferson Highway, 30 ft. wide, involving 45,242 cu.yd. earth excav., 53 cu.yd. Class "B" and 74 cu.yd. Class "C" concrete masonry, 2,800 lb. reinforcement, 254 lin. ft. 18-36 in. rein.-con. pipe culvert, 161 lin.ft. relaid pipe culvert, (1 and 2) 100,799 sq.yd. bituminous surface, spec. "B," 18 ft. wide, 2 in. surface course, 5 in. base course, (3) 113,363 sq.yd. 1 course concrete pavement, 18 ft. wide, 8 in. at center, 6 in. at sides, (4) 94,513 sq.yd. vitr. brick surface on 5 in. base, 16 ft. wide, and 100,799 sq.yd. combination cement concrete header curbing and base course cost (1 and 2) $387,162, (3) $349,326, (4) $496,887 respectively. Noted March 11.

Tex., Brownwood — City voted $150,000 bonds to improve various streets, build extensions to sewerage system and construct electric lighting plant.

Tex., Groesbeck — J. E. Bradley, judge Limestone Co., soon lets contract grading and draining 45.6 mi. roads, involving 13 acres clearing and grubbing, 222,000 cu.yd. earth and 560 cu.yd. solid rock excav., 1,200 cu.yd. Class "A" and 1,300 cu.yd. Class "B" concrete, 216,000 lb. reinforcing and 375,000 lb. structural steel, etc.

Tex., Seguin — Guadalupe Co. plans to grade, gravel surface and drain 18.5 mi. Highway 3 from here to Bexar Co., 16 ft. wide, involving 10 acres clearing and grubbing, 85,000 cu.yd. earth excav., 163,000 lb. reinforcing steel, 2,019 sq.yd. concrete dips, 1,582 cu.yd. Class "A" and 69 cu.yd. Class "B" concrete. About $149,814. Hess & Skinner, Southwestern Life Bldg., Austin, engrs.

Tex., Sherman—Comrs. Grayson Co. soon let contract building 9 mi. gravel road in Rd. Dist. 7, extending north and south of Tom Bean. J. C. Field, co. engr.

Okla., Guthrie—Logan Co. plans election soon to vote on $500,000 bonds to build 32 mi. hard surfaced highway. Federal Government will appropriate like amount.

Okla., Idabel—McCurtain Co. voted $350,000 bonds to complete Bankhead Highway.

Okla., Mangum — City plans to pave streets in business and residential districts. About $600,000. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs.

Idaho—State Highway Dept., plans to pave 2.71 mi. Yellowstone Park Highway between Idaho Falls and Ucon, Federal Aid Project 46, Bonneville Co. cost $85,521; gravel surface 12.1 mi. Idaho-Pacific Highway, near Buhl, Federal Aid Project 44, Twin Falls Co., $136,080; 6.3 mi. Gooding-Rupert Highway from Rupert to Downard Bridge, Federal Aid Project 45, Minidoka Co., $55,000. W. J. Hall, Boise, comr pub. wks.

Utah—State Highway Comn., Salt Lake City, plans to build portion Federal Aid Project 9, 5.14 mi. Sect. "G" from Holden toward Kanosh and 4.98 mi. Sect. "K" toward Holden, hard surface pavement. B. J. Finch, dist. engr.

Wash., Palouse—City plans to improve 2.5 mi. various streets. 26 ft. wide, involving 32,000 cu.yd. grading, 104,000 sq.ft. 4 in. sidewalk and 13,000 lin.ft. curb and gutter. About $90,000. H. Smith, Moscow, Idaho, engr.

Wash., Seattle—King Co. having plans prepared grading and hard surfacing 5.5 mi. Vashon Highway from Vashon Heights to Center, 16 ft. wide. About $191,000. S. J. Humes, co. engr.

Wash., Seattle—Bd. Pub. Wks. having plans prepared paving west half of Elliott Ave., et al, brick, cost $150,000; filling, grading and paving, also building sewers, water mains and sidewalks on 4th Ave., S., from Holgate to Spokane Sts., $465,000. A. H. Dimock, city engr.

Wash., Seattle—Comrs King Co. rejected only bid received April 6, grading 6 mi. Renton-Maple Valley Rd., 20 ft. wide. About $73,700 Work will be readvertised. S. J. Humes, co. engr. Noted March 18.

Cal., Los Angeles—H. B. Ferris, secy. Bd. Pub. Wks., receives bids about May 15, grading and paving 12 blocks San Marino St., asphalt surface on bituminous base, concrete paving, cement curbs and walks, etc.

Cal., Orland—City having plans prepared improving various streets, involving 500,000 sq.ft. 3½ in. asphaltic concrete paving with 1½ in. bitulithic surface, 45,000 sq.ft. concrete gutters, 5,000 lin. ft. cement curbs, also conduits for lighting standards. Election soon to vote on $60,000 bonds for project. C. W. Davis, Orland, engr.

Cal., San Diego — City had plans prepared paving Pine, Witherby and Hortensia Sts., involving 62,474 sq.ft. 1 course portland cement on 4 in. concrete base, with ¼ in. asphaltic wearing surface, 506 lin.ft. cement curbing, 1,607 ft. 2-4 in. Class "B" c.i. water pipe, etc., portions Bancroft and Grape Sts., involving 27,383 sq.ft. 1 course portland cement on 4 in. concrete base, 1,082 cu.yd. embankment, 378 sq.ft. cement sidewalks, 1,619 lin.ft. cement curbing, 723 lin.ft. 2-4 in. c.i. pipe, 775 lin.ft. 2 in. w.i. pipe, etc. F. A Rhodes, city engr.

BIDS DESIRED

New York—Until May 5, by F. S. Greene, state highway comr., Capitol, Albany, improving 3.29 mi. highway, Cayuga Co., 4.52 mi., Chemung Co., 1.72 mi. Columbia Co., 1.37 mi. Otsego Co., 3.94 mi. St. Lawrence Co., 3.71 mi. Saratoga Co., 3.46 mi. Schenectady Co., 5.24 mi. Schoharie Co., 4.85 mi. Warren Co., 4.13 mi. Westchester Co., 3.55 mi. Wyoming Co., also repairing 1 highway in Albany, Cattaraugus, Chemung, Jefferson, Madison, Montgomery, Oneida, Rensselaer, Steuben and Tioga Counties, 2 highways in Erie and Ontario Counties; advertised in this issue.

N. Y., Poughkeepsie—Until April 22, by Bd. Pub. Wks., Eastman Park Mansion, for 4,700 sq.yd. vitr. brick pavement, 3,000 lin.ft. new blue stone curbing, 4,700 sq.yd. grading and excavating. E. W. Sylvester, supt.; advertised in this issue.

N. J., Trenton Jct.—Until April 27, by Bd. Freeholders Mercer Co., Trenton, paving ½ mi. Grand Ave., concrete, 30 ft. wide. About $45,000. H. F. Harris, Court House, engr.

Delaware—Until May 12, by State Highway Dept., Dover, building following roads in New Castle and Sussex Counties: 5.57 mi. road from Armstrong's Corner to Pine Tree, Contr. 27; 4.14 mi. road from Townsend to Pine Tree thence to Odessa, Contrs. 28 and CN3; 3.82 mi. road from Felton to Woodside, Contr. 29; 3.4 mi. road from Coverdale Cross Rds. to Jacob's School; 1.09 mi. road in town of Selbyville and 1.04 mi. Christiana Ave., Wilmington. C. M. Upham, ch. engr.; advertised in this issue.

W. Va., Fayetteville—Until May 3, by C. E. Mahan, co. clk. Fayette Co., grading and draining 5.7 mi. road from Ansted to Falls Dist. Line, in Mountain Cove Dist. and 7 mi. road from Hemlock to Rock of Ages, in Quinnimont Dist. J. K. McGrath, road engr.; advertised in this issue.

Streets and Roads (Continued)

S. C., Rock Hill—Until April 22, by V. B. Blankenship, mayor, and City Council, improving various streets, also building waterworks and sewerage system, to consist of 130,000 sq.yd. asphalt or other pavement, 90,000 lin.ft. curbing and guttering, 25,000 sq.yd. sidewalks, 40,000 cu.yd. grading, 2½ mi. storm water drains, 8 mi. c.i. water mains and 8 mi. sanitary sewers. G. C. White, Durham, N. C., engr.

Ga., Decatur—Until April 22, by L. T. Y. Nash, comr. Rds. and Revenues, DeKalb Co., furnishing material, equipment and labor constructing Williams Mill Rd. and Emory University Rd., involving 17.493 cu.yd. grading and 38,380 sq.yd. permanent paving, also necessary clearing, gutters, curbs and pipe drains and appurtenances.

O., Cleveland—Until May 1, by McNutt & McCall Realty Co., Hickox Bldg., improving Turney Rd. Allotment, involving 25,000 cu.yd. grading and 2½ in. stone sidewalks. Wight-O'Rourke Co., Rose Bldg., engrs.

Michigan—Until April 20, by F. F. Rogdrs, state highway comr., at office Clerk Newago Co., White Cloud, grading, draining and surfacing 1.49 mi. State Trunk Line Rd. 24-7, 16 ft. wide, involving 13,950 sq.yd. gravel, 4,360 cu.yd. earth excav., 5,488 lb. steel, 68.8 cu.yd. 1:2:4 and 24.3 cu.yd. 1:3:6 concrete, etc.

Michigan—Until April 27, by F. F. Rogers, state highway comr., at office of Bd. Rd. Comn. Lapeer Co., Lapeer, grading, draining and surfacing State Trunk Line Rd. 21-4, 20 ft. wide, involving 25,380 sq.yd. concrete. Noted March 25.

Michigan—Until April 21, by F. F. Rogers, state highway comr., at office Bd. Rd. Comr. Keweenaw Co., Eagle River, grading, draining and surfacing 4.223 mi. State Trunk Line 15-3, Sects. A and B, 16 ft. wide, involving 39,632 sq.yd. waterbound macadam, 26,494 cu.yd. earth excav., 625 sq.yd. grubbing, 4,963 lb. steel, 116.7 cu.yd. 1:2:4 and 124.6 cu.yd. 1:3:6 concrete, etc.

Mich., Detroit—Until April 22, by Dept. Pub. Wks., grading, shaping and paving portions Gladstone Ave., cost $21,975; Cahalan Ave., $39,105; Merrill St., $5,930; Taylor Ave., $16,490; Blaine Ave., $51,850; Hampton Ave., $4,750; Morton Ave., $7,560, all 26 ft. wide, sheet asphalt on 6 in. concrete base, Berea or Medina curbstone. C. W. Hubbell, city engr.

Mich., Detroit—Until April 19, by city, grading, shaping and paving Beniteau Ave., from Canfield to Scheppe Aves., involving 1,555 cu.yd. excav., 1,810 lin.ft. curbstone, 2,618 sq.yd. sheet asphalt on 6 in. concrete base, cost $16,000; Beniteau Ave. from Hearn St. to alley south of Harper Ave., 1,065 cu.yd. excav., 1,530 lin.ft. curbstone, 2,158 sq.yd. paving, $13,000; Gladstone Ave., 2,319 cu.yd. excav., 2,132 lin.ft. curbstone, 3,283 sq.yd. paving, $21,000; Greenway Ave., 4,367 cu.yd. excav., 4,596 lin.ft. curbstone, 7,080 sq.yd. paving, $47,000; Hampton Ave., 369 cu.yd. excav., 426 lin.ft. curbstone, 659 sq.yd. paving, $4,000; Merrill Ave., 526 cu.yd. excav., 543 lin. ft. curbstone, 775 sq.yd. paving, $5,000; Martindale Ave., 2,039 cu.yd. excav., 2,278 lin.ft. curbstone, 3,448 sq.yd. paving, $21,000; Morton Ave., 532 cu.yd. excav., 667 lin.ft. curbstone, 1,053 sq.yd. paving, $7,000; Otis Ave., 2,695 cu.yd. excav., 3,043 lin.ft. curbstone, 4,816 sq.yd. paving, $29,000; 29th St., 850 cu.yd. excav., 1,109 lin.ft. curbstone, 1,610 sq.yd. paving, $10,000. Noted April 1.

Wis., Randolph—Until April 27, by J. O. Jones, village clk., paving various streets, involving 34,093 sq.yd. concrete, sheet asphalt, asphaltic concrete or brick pavement, 19,395 lin.ft. straight curb, 839 lin.ft. radius curb, etc.

Minn., Aitkin—Until April 21, by H. C. Beecher, aud. Aitkin Co., building 10 mi. Federal Aid Project 86, State Rd. 3, 24 ft. wide, cost $50,000; also Federal Aid Project 149, State Rd. 3, $140,000. F. J. O'Hara, Aitkin, engr.

Minn., Brainerd—Until April 19, by A. Mahlum, city clk., grading and paving Kingwood St. from North 8th St. to East Bluff Ave., Kindred St. from Gillis to 3rd Aves., South 7th St. from Front to Laurel Sts., involving 3,389 cu.yd. excav. and 16,437 sq.yd. rein.-con., bituminous concrete or asphaltic concrete. R. T. Campbell, city engr.

Minn., Caledonia—Until May 11, by E. N. Newhouse, aud. Houston Co., grading and graveling 2 mi. Federal Aid Project 147, 24 ft. wide. About $27,000. C. D. Conzett, Caledonia, engr.

Minn., Center City—Until April 20, by A. F. L. Stromgren, aud. Chisago Co., building 6 mi. State Rds. 5 and 2 and part of State Rd. 1, 24 ft. wide, cost $68,000. H. L. Colwell, Sunrise, engr.

Minn., Fergus Falls—Until May 4, by W. Lincoln, aud. Ottertail Co., building 20 mi. Federal Aid Project 159, Job 2001, Federal Aid Project 160, Job 2002, and State Aid Job 1908, 24 ft. wide, cost $100,000. A. L. Flygare, Fergus Falls, engr.

Minn., Glenwood—Until May 6, by O. Ingens, aud. Pope Co., building Federal Aid Project 145, State Rd. 9, involving 95,153 cu.yd. earth and 1,984 cu.yd. loose rock excav., 266,743 cu.yd. overhaul, 3,460 lin.ft. guard rail, 1,364 lin.ft. portable culverts and 9,000 cu.yd. gravel surfacing.

Minn., Mora—Until April 27, by A. V. Sander, aud. Kanabec Co., building 16 mi. Federal Aid Project 91, State Rd. 2, involving 98,131 cu.yd. excav., 5,323 cu.yd. hand ditching, 6,650 lin.ft. guard rail, 2,623 lin.ft. 12-36 in. portable culvert pipe, 26,857 cu.yd. gravel surfacing material, 1,950 lin.ft. 8 in. tile, etc. R. G. Streetly, Mora, engr.

Minn., Thief River Falls—Until May 4, by A. H. Akre, city clk., paving 8.15 mi. various streets and alleys, 18 ft. wide, involving 53,657 sq.yd. paving, 16,870 cu.yd. excav, 13,760 lin.ft. straight curb, 3,666 sq.yd. brick gutter, etc. About $250,000. Bradley Eng. Serv., Weber Bldg., St. Cloud engrs.

Minn., Wheaton—Until April 22, by O. M. Anderson, aud. Traverse Co., building Job 2002, State Rd. 3, involving 82,308 cu.yd. excav. and 1,795 ft. 12-30 in. portable culverts; 15.4 mi. Federal Aid Job 164, State Rd. 2, involving 61,414 cu.yd. excav., 19,098 cu.yd. ditch excav., 18,479 cu.yd. gravel surfacing material, 1,114 ft. 12-30 in. portable culvert material, 1,500 lin.ft. 24 in. drain tile, also 3 concrete bridges, etc.

Minn., Winona—Until April 23, by A. Baeurerlen, aud. Winona Co., building 4 mi. Federal Aid Project 96, State Rd. 1, 24 ft. wide, involving 3 acres clearing, 4 acres grubbing, 32,819 cu.yd. earth, 12,509 cu.yd. loose rock and 4,835 cu.yd. solid rock excav., 35,470 cu.yd. overhaul, 585 cu.yd. riprap, 100 cu.yd. retaining wall, also installing 1,226 lin.ft. 24-48 in. portable culverts. About $32,000. H. B. Childs, Winona, engr. Noted Jan. 1.

Neb., Fremont—City receiving bids improving various streets, 25 ft. wide, in Dist. 47, involving 7,291 cu.yd. concrete paving 3,196 ft. curbing, 1,233 cu.yd. excav.; Dist. 48, 8,750 cu.yd. concrete, 3,795 ft. curbing, 2,768 cu.yd. excav.; Dist. 49, 1,355 cu.yd. concrete, and 340 cu.yd. excav. L. M. Roessler, Fremont, engr.

Wyoming—Until April 20, by D. S. Calman, supt. State Highway Dept., Capitol Bldg., Cheyenne, grading and installing culverts on 7.169 mi. Yellowstone Highway, Federal Aid Project 56, Converse Co., involving 23,000 cu.yd. earth excav., 43 cu.yd Class B concrete in culvert endwalls; 16.189 mi. Eden Valley Rd., Federal Aid Project 62, Sweetwater Co. 45,000 cu.yd. earth excav., 28 cu.yd. Class A concrete in culverts, 95 cu.yd. Class B concrete in culverts, 3,850 lb. deformed steel bars and 48 cu.yd. Class B concrete in pipe endwalls; 13.5 mi. Gillette-Arvada Rd., Federal Aid Project 66, Campbell Co., 51,400 cu.yd. earth excav., 400 cu.yd. loose rock excav. and embankment, 68 cu.yd. Class B concrete in culvert endwalls; 7.36 mi. Sheridan-Casper Rd. from Kaycee north, Federal Aid Project 67, Johnson Co., 11,000 cu.yd. earth excav., 52 cu.yd. Class B concrete in culvert endwalls; 10.75 mi. Sheridan-Casper Rd. south of Buffalo, Federal Aid Project 69, Johnson Co., 65,100 cu.yd. earth excav. and 80 cu.yd. Class B concrete in culvert endwalls; 6.395 mi. road from Urie to Ft Bridger, Federal Aid Projects 75 and 17, Uinta Co., 12,500 cu.yd. earth excav. 19 cu.yd. Class B concrete in culvert endwalls; 1.961 mi. Garland-Deaver Rd., Federal Aid Project 76, Park Co., 24,000 cu.yd. earth excav., 42 cu.yd. Class A concrete in culverts, 52 cu.yd. Class B concrete in culverts, 1,800 lb. deformed steel bars, 48 cu.yd. Class B concrete in culvert endwalls; 25.301 mi. Lincoln Highway west of county line, Federal Aid Project 46, Laramie Co., 182,700 cu.yd. earth excav., 140 cu.yd. loose rock excav., 550 cu.yd. solid rock excav., 65 cu.yd. Class A concrete, 65 cu.yd. Class B concrete 5,000 lb. deformed steel bars, and 141 cu.yd. Class B concrete in endwalls; 6.951 mi. Cody-Meeteetse Rd., Federal Aid Project 84, Park Co., 35,000 cu.yd. earth excav., 2,000 cu.yd. loose rock excav., 3,000 cu.yd. solid rock excav., 15 cu.yd. Class A concrete, 200 cu.yd. Class B concrete, 5,600 lb. deformed steel bars, and 58 cu.yd. Class B concrete in pipe endwalls; 10 mi. Yellowstone Highway, Casper west, Federal Aid Project 85, Natrone Co., 47,000 cu.yd. earth excav., 59 cu.yd. Class A concrete in culverts, 41 cu.yd. Class B concrete in culverts, 5,800 lb. deformed steel bars, 65 cu.yd. Class B concrete in culvert endwalls; 3.472 mi. road from Lovel to Cowley, and constructing 30 ft. rein.-con. bridge, Federal Aid Project 65, Big Horn Co., 17,600 cu.yd. earth excav., 3,000 loose rock excav., 2,500 cu.yd. solid rock excav., 118 cu.yd. Class A concrete, 39 cu.yd. Class B concrete in culvert endwalls and 13,200 lb. deformed steel bars; 10.089 mi. Custer Battlefield Highway from Moorcroft to Carlisle, also constructing concrete culverts and 90 ft. concrete bridge, Federal Project 41, Crook Co., 54,000 cu.yd. earth excav. 204 cu.yd. Class A concrete, 145 cu.yd. Class B concrete, 10 cu.yd. Class C concrete, 31,700 lb. deformed steel bars, and 28 cu.yd. Class B concrete in culvert endwalls; 2.902 mi. Yellowstone Highway, from Worland and constructing 30 ft. rein.-con. bridge, Federal Aid Project 70, Washakie Co., 22,000 cu.yd. earth excav., 34 cu.yd. Class A concrete, 58 cu.yd. Class B concrete, 18 cu.yd. Class C concrete, 8,000 lb. deformed bars, and 22 cu.yd. Class B concrete in endwalls; 3.131 mi. Yellowstone Highway from Neiber south, Federal Aid Project 71, Washakie Co., 20,000 cu.yd. earth excav., 127 cu.yd. Class B concrete, 2,400 lb. deformed steel bars, and 27 cu.yd. Class B concrete in endwalls; 22.861 mi. Cheyenne-Torrington Rd., including 2 rein.-con. bridges, Federal Aid Project 82, Goshen and Laramie Counties, involving 92,000 cu.yd. earth excav., 233 cu.yd. Class A concrete, 36 cu.yd. Class B concrete, 13 cu.yd. Class C concrete, 33,400 lb. deformed steel bars, and 106 cu.yd. Class B concrete in pipe endwalls; 2.649 mi. roads at Daniel, Federal Aid Project 50, Lincoln Co., 18,500 cu.yd. earth excav., 39 cu.yd. Class B concrete in culvert endwalls, 2,100 lin.ft. timber piling, including 1-10 ft., 412 ft., 1-30 ft., 3-50 ft., and 1-64 ft. timber span bridge, involving 10 M. ft. timber in bulkheads, bridge seats, bracing, etc. and 1,000 lb. bridge iron in substructure; grading and paving 37.7 mi. various sections of Casper-Salt Creek Rd. with concrete 9 ft. wide, from end of present grade pavement to Salt Creek, 60,000 cu.yd. earth excav., 127,000 sq.yd. 6½ concrete pavement.

Tex., Emory — Until April 20, by H. D. Garrett, judge Rains Co., grading, gravel surfacing and draining 22.34 mi. Culberson Highway 42, involving 24.4 acres clearing and grubbing, 138,217 cu.yd. borrow excav., 33,040 cu.yd. gravel hauled ¼ mi., 171,415 cu.yd. gravel hauled additional ¼ mi., additional 444.14 cu.yd. Class "A" and 324.26 cu.yd. Class "C" concrete and 641 lb. reinforcing steel. Gravel to be furnished by county.

Tex., Kingsville—Until May 3, by Clerk Kleberg Co., improving certain highways. B. J. Wilson, judge; advertised in this issue.

Tex., Kingsville—Until April 22 (change of date) by B. F. Wilson, judge Kleberg Co., building 19.6 mi. Highway 12, Federal Aid Project 148. About $430,000. H. C. Porter, co. engr. Noted March 25.

Tex., Orange—Until April 28, by D. C. Bland, judge Orange Co., grading, paving and draining 10.26 mi. Highway 3, from here to Beaumont, 16 ft. wide, involving 8.15 acres clearing and grubbing, 88,478 sq.yd. concrete pavement, 7,734 sq.yd. rein.-con., 40,356 cu.yd. borrow and 15,099 cu.yd. earth excav. About $423,706. J. E. Johnson, Orange, engr.

Okla., Altus—Until April 19, by R. Welch, city clk., furnishing labor and material paving in Dists. 5, 6, 8 and 10, involving 10,350 cu.yd. excav., 18,272 lin.ft. integral curb, 24,776 sq.yd. 1 course concrete paving and 1,302 lin.ft. 24 in. vitr. sewer pipe. S. E. Hickman, mayor. Noted March 4.

Ariz., Douglas—Until May 10, by City Council, paving 4 streets with concrete or concrete base and asphalt wearing surface, involving 100,000 sq.yd. paving, 50,000 lin.ft. curbing and guttering, 225,000 sq.ft. sidewalks and 10 concrete culverts. M. F. Bane, city engr.; advertised in this issue.

Washington—Until April 26, by State Highway Comn., Olympia, clearing, grading draining and surfacing with crushed rock or gravel 4 mi. State Rd. 22, Stevens Co., grading, draining and surfacing with gravel 1.7 mi. North Central Highway, Grant Co.,

Streets and Roads (Continued)

and 0.8 mi. North Bank Highway, Skamania Co., clearing, grading, draining and surfacing with crushed rock 7 mi. Inland Empire Highway, Garfield Co., and 2 mi. State Rd. 2, Okanogan Co., grading, draining and paving with concrete 1.7 mi. Sunset Highway, Chelan Co., and 1 mi. Pacific Highway, Snohomish Co. J. Allen, state highway engr.

Wash., Ritzville—Until May 1, by Adams Co., surfacing 9 mi. Donohue Rd. 7, 16 ft. wide, crushed rock and gravel. About $45,000. F. R. Hewett, Ritzville, engr.

Wash., Seattle—Until April 26, by King Co., grading and graveling 2½ mi. R. A. Ballinger Rd., 20 ft. wide, involving 23,188 cu.yd. excav. About $45,000.

Wash., Spokane—City receiving bids paving 0.8 mi. Inland Empire Highway, 40 ft. wide, various kinds of paving. About $33,200. A. D. Butler, city engr.

Wash., Spokane — Until April 20, by Comrs. Spokane Co., grading, 24 ft. wide, and macadamizing, 16 ft. wide, 13 mi. Fairfield, Waverly and Latah Rds. Former bids rejected. H. J. Doolittle, co. engr.

Wash., Spokane — Until April 23, by Spokane Co., grading and macadamizing 4.5 mi. road from Rockford to Mt. Hope, cost $70,000; 3 mi. Day-Mt. Spokane Rd., $45,000; o4.5 mi. road south of Cheney, $70,000. Former bids rejected. H. J. Doolittle, co. engr. Noted March 18 and Jan. 29.

California—Until May 3, by State Highway Comn., Forum Bldg., Sacramento, grading 10.7 mi. road between Ione and Jackson, Amador Co., involving 44,000 cu.yd. excav. without classification, 260 cu.yd. Class "A" Portland cement concrete, 928 lin.ft. 12-24 in. corrugated metal pipe, etc. paving 6.6 mi. road between Auburn and northerly boundary of Placer Co., involving 26,000 cu.yd. excav. without classification, 6,500 cu.yd Class "A" Portland cement concrete (pavement), 180 cu.yd. Class "A" Portland cement concrete (culverts and monuments), 900 lin.ft. 12-24 in. corrugated metal pipe, etc.; 13.6 mi. road between Red Bluff and northerly boundary of Tehama Co., 15 ft. wide, involving 13,300 cu.yd. Class "A" cement concrete. Commission will furnish reinforcing steel, Portland cement, corrugated metal pipe, sand and coarse aggregate for concrete.

Ont., Casselman — Until April 19, by Comrs. Russell Co. (L'Original) building 3½ mi. macadam road, here. About $26,000. Y. E. Belanger, Hawkesbury, engr.

Ont., Leamington—Until April 30, by city, constructing ½ mi. concrete pavement on Main St. About $30,000. J. J. Newman, Davis Blk., Windsor, engr.

Man., Swan River—Until April 24, by J. Armstrong, secy.-treas., Box No. 153, grading 135,750 cu.yd. various roads.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Massachusetts**—State Highway Comn., State House, Boston, let contract building 5,700 ft. bituminous macadam road, Danvers Twp., to Hamlin & Nelson, Salem, $43,923; 7,392 ft., Attleboro Twp., to Lane Constr. Co., 37 Colony St., Meriden, Conn., $28,178. Noted April 8.

★**Massachusetts** — State Highway Comn., State House, Boston, let contract building 16,000 ft. bituminous macadam road and concrete bridge, Huntington Twp., involving 11,859 cu.yd. earth and 1,200 cu.yd. rock excav., 34,200 sq.yd. bituminous macadam, 630 cu. yd. concrete, 7,000 lin.ft. piling, 8,000 cu.yd. stone fill, 610 cu.yd. rock embankment, 2,000 cu.yd. bridge excav., to Cordner & Montague, 373 Bay St., Springfield, $182,232. Noted April 1.

Massachusetts — State Highway Comn., Boston, received bids April 6, building 7,900 ft. bituminous macadam road, 22 ft. wide, Southwick Twp., involving 1,600 ton broken stone, 1,900 cu.yd. gravel, 3,500 cu.yd. earth excav., 16,000 gal. bituminous macadam, from J. Barletta, Roslindale, $31,960, Marshfield Constr. Co., Marshfield, $43,305; 5,700 ft. road between Lynnfield and Peabody, Saugus Twp., involving 10,000 ton broken stone, 6,200 cu.yd. gravel, 5,850 cu. yd. earth and 2,100 cu.yd. rock excav., 56,000 gal. bituminous macadam, from F. E. Ellis, Melrose, $98,938. Noted April 1.

★**Conn., New Haven**—City let contract paving 22,300 sq.yd. Chapel St., asphalt, to D. V. H Webb Co., East Haven. Noted March 4

★**N. Y., Brooklyn**—E. Riegelmann, boro. pres., let contract regulating and paving Bay 32nd St. and Saratoga Ave., to Consolidated Asphalt Paving Co., 52 9th St., $13,167 and $29,752 respectively; regulating, grading and curbing Stillwell Ave. from Neptune to Surf Aves., to Grimm Constr. Co., 460 Harold Ave., $4,195; regulating and grading, also curbing and laying sidewalks, Stillwell Ave. from Neptune to Canal Aves., to J. J. Guinan, 2314 Gravesend Ave., $4,615 and $9,622 respectively; furnishing and delivering 12,000 cu.yd. asphalt sand, to G. Eaton, 231 Pearl St., $23,880. Noted April 1 and 8.

★**N. Y., Long Island City**—G. A. Whalen, comr. Plants & Structures, Municipal Bldg., New York City, let contract reconstructing portions of pavement on Queens approach and plaza of Queensboro Bridge, here, to Astoria Contg. Co., 699 Crescent St., Astoria, $49,100. Noted March 18 under "New York."

★**N. Y., Long Island City**—M. E. Connolly, pres. Queens Boro., let contract regulating and paving Fairview Ave., to Uvalde Asphalt Paving Co., 1 Bway., New York City, $8,875; 25th St., to Cleveland Trinidad Paving Co., Flushing Ave., Brooklyn, $37,499. Noted April 8.

★**N. Y., New York**—H. Bruckner, pres. Bronx Boro., let contract paving Westchester Ave. from East Tremont Ave. to Eastern Blvd., to Leonard Paving Co., 233 Bway., $306,828; extending sewer in White Plains Ave., to Hitchfield Constr. Co., 280 Madison Ave., $106,642. Noted April 8.

★**N. Y., New York**—H. Bruckner, pres Bronx Boro., let contract regulating and grading Willow Ave., to J. L. Brusstar, Harlem River and 150th St., $28,289; East 169th St. and Baker Ave., to Uvalde Asphalt Paving Co., 1 Bway., $30,764 and $8,650 respectively; East 141st St., to T. Callanan, $6,463; Hunt Ave., to M. Del Balso, 1434 Bryant Ave., $16,443. Noted April 1.

★**N. Y., New York**—H. H. Curran, pres. Manhattan Boro., let contract regulating and repaving Catharine St., to O'Rourke Constr. Co., 150 Nassau St., $20,518; retubing, to Consolidated Shipbuilding Corp., Morris Heights, $15,950. Noted April 1.

N. Y., New York—E. S. Walsh, supt. Pub. Wks., Capitol, Albany, received bids April 6, paving Barge Canal Terminal Piers, at West 53rd St. and Greenpoint, here, Constr. 19-P, from Hastings Pavement Co., 25 Broad St., $24,128, C. A. Myers Contg. Co., foot of Stagg St., Brooklyn, $24,875, C. Hyatt, Scarsdale, $25,555. Noted March 11.

★**New Jersey**—State Highway Dept., Trenton, let contract building 5.2 mi. Route 14, from Cape May Court House to Swainton, 20 ft. wide, concrete, to E. R. Mixler, Goshen, $298,515.

★**New Jersey** — State Highway Dept., Trenton, let contract building 1 mi. Ancora-Atco Route of State Highway, 40 ft. wide, Camden Co., to J. H. Hurley, 153 East Front St., Trenton, $43,014.

★**Pennsylvania** — State Highway Dept., Harrisburg, let contracts rebuilding 31,269 ft. road in McKeon Co., 20,545 ft. and 26,200 ft. in Northumberland Co., to Mason & Hanger Co., Paxinos. Noted Feb. 26 and April 1.

★**Pa., Pittsburgh**—City let contracts to M. O'Herron Contg. Co., South 1st and McKean Sts., improving Bigelow Blvd., $295,000, repaving River Ave., $40,000, Main St., $20,500; to T. Cronin Co., South 17th and Muriel Sts., repaving Liberty Ave., from Stanwix to 11th Sts., $100,000, Liberty Ave. from point 60 ft. east of Winebiddle to Center Aves., $44,000; to Dallas & Nardulli, 608 Larimer Ave., repaving, recurbing, etc. Wheatland St., $2,600.

★**W. Va., Elizabeth**—Comrs. Wirt Co. let contract improving 2.58 mi. Parkersburg-Elizabeth Rd., 26 ft. wide, involving 18,000 cu.yd. excav. and drainage structures, to Smith & Quinn, Parkersburg, $29,333. Noted March 18.

★**W. Va., Wheeling**—City let contract to Coss & Otto, paving portion of 23rd, Virginia, Florida, South Huron and North Main Sts., brick on concrete, $23,297, $36,723, $6,336, $18,391 and $53,422 respectively; to H. L. Seabright, paving 45th and Woods Sts., brick on concrete, $20,736 and $11,445 respectively; 39th, Jacob Wetzel and Water Sts., concrete, $2,386, $35,286, $17,946 and $2,569 respectively; to P. J. Gilligan, Baltimore and Eoff Sts., brick on concrete, $11,536 and $11,103 respectively; to Stringer & Springer, 17th St., brick on concrete, $29,188; to Jacovetti & Savage, Chapline and 23rd Sts., brick on concrete, $37,079 and $4,000 respectively; above contractors from Wheeling; to Federal Asphalt Paving Co., Pittsburgh, 22nd, Market, Ohio, South Huron, 18th, Chapline, 33rd, 29th, McColloch, North Market, 17th and 23rd Sts., asphaltic concrete, $19,927, $23,367, $18,821, $24,420, $20,502, $73,852, $3,501, $17,643, $20,417, $15,412 and $4,171 respectively, resurfacing 15th, 12th and 24th Sts., asphalt, $23,053 and $10,223 respectively, paving 27th St., sheet asphalt, $13,000. Noted March 11.

W. Va., Winfield—Comrs. Putnam Co. received only bid improving 2 mi. Teays Valley Rd., 16 ft. wide, near Kanawha Co. line, involving 9,400 cu.yd. excav., and 18,873 sq.yd. bituminous macadam, 2 mi. Teays Valley Rd., 16 ft. wide, near Mt. Vernon School, involving 15,400 cu.yd. excav. and 18,773 sq.yd. bituminous macadam, from Huntington Eng. Co., Huntington, $54,982 and $63,577 respectively. Noted March 18.

★**North Carolina**—Div. Office State Highway Comn., Greensboro, let contract top soiling 3.8 mi. Federal Aid Project 72, 16 ft. wide, to Gibson Constr. Co., Knoxville, Tenn., $43,397; building 3 concrete bridges on same, to J. Kreis & Co., Knoxville, Tenn., $17,773. Noted March 25.

★**N. C., Pittsboro**—Comrs. Chatham Co. let contract top soiling 12.6 mi. road, Federal Aid Project 99, to T. W. Chandler, Virgilina, Va., $84,547. Noted March 11.

★**S. C., Charleston**—Comrs. Charleston Co. let contract building 7 mi. St. Andrews Rd., cement, to Charleston Eng. & Contg. Co., 58 Broad St., $406,264.

★**Fla., Jacksonville**—Comrs. Duval, Baker and Columbia Counties let contract building 54 mi. road, involving 507,000 sq.yd. vitr. brick and 570,240 lin.ft. concrete curbing, to H. Y. Wilson, Clark Bldg. About $2,000,000.

★**Kentucky** — State Dept. Pub. Rds., Frankfort, let contract surfacing with Kentucky rock asphalt 5.214 mi. Bell-Harlan Rd., Bell Co., to Bailey Constr. Co., Pineville, $104,066; 7.757 mi. Moorehead-Farmer Rd., Rowan Co., involving 2,217 cu.yd. crushed sandstone, 9,554 ton limestone and 4,347 sq.yd. Kentucky rock asphalt, to Larue Constr. Co., Frankfort, $207,707

★**Ohio**—State Highway Comn., Columbus, let contracts building roads in following counties:

Fairfield Co., 2.39 mi. Sect. "C" Baltimore-Reynolds Rd., waterbound macadam, to Winchell & McDaniels, Columbus, $37,035.

Henry Co., 2.369 mi. Sect. "C" and 0.903 mi. Sect. "D-1" Bryan-Napoleon Rd., waterbound macadam, to Stone & Hill, Lima, $66,530 and $32,351 respectively. Noted April 1.

★**O., De Graff**—W. J. Geissener, village clk., let contract grading, curbing and paving 1,061 ft. Main St., 38 ft. wide, 660 ft. Hay St., 38 ft. wide, and 3,700 ft. Miami St., 18 and 24 ft. wide, rein.-con., to W. K. Drake, Marion, $70,708. Noted March 18.

★**Michigan**—F. F. Rogers, state highway comr., let contract grading, draining and surfacing 3.352 mi. State Trunk Line Rd. 16-4, 16 ft. wide, to M. H. Webber, Ionia, $58,340. Work involves 15,743 cu.yd. excav. at $0.70 per cu.yd., 4,132 yd. station overhaul, $0.03, 324 lin.ft. 12 in. encased tile, $1.55, 165 lin.ft. 15 in. encased tile, $1.85, 3,080 lb. steel reinforcement, $0.12, 81.7 cu.yd. 1:2:4 concrete, $25, and 226 cu.yd. 1:3:6 concrete, $21, etc. Noted March 25.

★**Michigan**—F. F. Rogers, state highway comr., let contract grading, draining and surfacing 0.962 mi. State Trunk Line Rd. 38-2, 20 ft. wide, to Sager Bros., Midland, $34,672. Noted Feb. 19.

Mich., Detroit—City received bids grading, shaping and paving (a) Bewick Ave., (b) Clairmont Ave., (c) Colfax Ave., (d) Concord Ave., (e) Duncan St., (f) Edward St., (g) Galster St., (h) Leland St., (i) Rienen Ave., (j) Wilson Ave., sheet asphalt on 6 in. concrete base, Berea or Amherst curbstone, from W. B. Brady Constr. Co., 1972 Grand River Ave., (a) $33,757, (b) $21,667, (c) $28,817, (d) $24,122, (e) $12,422, (f) $31,891, (g) $8,293 (h) $11,905, (i) $13,783, (j) $7,928; Detroit Asphalt Paving Co., 200 McGraw Bldg., (a) $32,707, (b)

Streets and Roads (Continued)

$21,917, (c) $28,587, (d) $23,087, (e) $12,058, (f) $31,060, (g) $8,084, (h) $11,610, (i) $13,380, (j) $7,967; Cleveland Trinidad Paving Co., 2940 Woodward Ave., (a) $34,195, (b) $22,389, (c) $29,419, (d) $23,600, (e) $12,299, (f) $32,119, (g) $8,248, (h) $11,852, (i) $13,758, (j) $7,779

★**Mich., Munising**—Alger Co. let contract grading, shaping, draining and surfacing 6.51 mi. State Trunk Line Rd. 25-9, 16 ft. wide, to Bd. Rd. Comrs., Alger Co., Munising About $94,337. Noted Jan. 22.

★**Mich., Port Huron**—St. Clair Co. let contract grading, shaping and surfacing 4 mi. Mill Creek Highway, 16 ft. wide, south from Yale, involving 37,500 sq.yd. gravel, to W. and E. Burns, Emmett, $40,753.

★**Mich., Saginaw**—Comrs. Saginaw Co. let contracts grading, shaping and surfacing 3.97 mi. Rd. 37, Spalding Twp., 1.2 mi. Rd. 38, Buena Vista Twp., 1.947 mi. Rd. 41, Bloomfield Twp., to J. W. Ederer & Co., c/o R. W. Roberts Co., engrs., 201 Schirmer Bldg., $71,060, $31,673 and $21,582 respectively. Noted March 18.

Wisconsin — State Highway Dept., State Capitol, Madison, received bids April 9, grading and paving (1) Dunbarton-Lancaster Rd., Federal Aid Project 86, Lafayette Co., involving (a) 17,745 cu.yd. earth excav, (b) 1,499 cu.yd. rock excav., (c) 209.3 cu.yd. concrete in culverts, (d) 2,042 sq.yd. concrete surfacing, (e) 1.48 acres clearing and grubbing, (f) 642 cu.yd. loose rock excav., etc., (2) Leadmine-Shullsburg Rd., Federal Aid Project 137, Lafayette Co., (a) 70 ft. span bridge, (b) 13,717 cu.yd. earth excav., (c) 511 cu.yd. rock excav., (d) 194.5 cu.yd. concrete in culverts, (e) 274 cu.yd. concrete in bridges, (f) 1,052 sq.yd. concrete surfacing, (g) 115 cu.yd. borrow excav., etc., from J. L. Burch, Cuba City, (1a) $1.35, (1b) $2.80, (1c) $29, (1e) $250, (1f) $2.25, etc., total cost, $36,999, (2b) $1.20, (2c) $2.80, (2d) $28, (2g) $120, etc., $26,276; Wausau Iron Works, Wausau, (2a) $12,384; W. H. Shons, Freeport, Ill., (2a) $11,167, (2e) $27, $18,565; Elkhart Bridge & Iron Co., Madison, (2a) $12,505. Noted April 1.

★**Wisconsin**—State Highway Dept., State Capitol, Madison, let contract to M. O. Carter, Richland Center, grading and paving 3.5 mi. Richland Center-Boaz Rd., Federal Aid Project 172, Richland Co., involving 25,990 cu.yd. earth excav., $0.87½, 1,518 cu.yd rock excav., $1,75, 383 cu.yd. concrete in culverts, $28, 92.9 cu.yd. concrete in bridges, $30, 1,146 cu.yd. creek channel excav., $1, 107 cu.yd. borrow excav., $0.90, etc., total cost, $41,304; to E. Kelley, Cazenovia, grading, paving and building rein.-con. arch bridge on 0.11 mi. Cazenovia Bridge Rd., Federal Aid Project 171, Richland Co., involving 821 cu.yd. earth excav., $0.80, 143 cu.yd. borrow excav., $1.50, 1,025 sq.yd. 17 ft. concrete surfacing, $3, 196 sq.yd. 24 ft. concrete surfacing, $3, bridge complete, $20,430, etc., total cost, $25,915. Noted April 1.

★**Wisconsin** — State Highway Dept., at div. office, Stephenson Bldg., Milwaukee, let contract grading and paving 3.04 mi. Milwaukee-Madison Rd., Waukesha Co., to Froemming Bros., 1326 Humboldt Ave., Milwaukee, $93,791; 3.02 mi. Geneva Rd., Kenosha Co., to C. Peterson, 225 Main St., Kenosha, $120,495. Noted April 1.

Wisconsin—State Highway Dept., at div. office, 213 South Barstow St., Eau Claire, received bids April 7, grading and paving (1) 1.89 mi. Eau Claire-Osseo Rd., Federal Aid Project 111, Eau Claire Co., involving (a) 5,591 cu.yd. earth and (b) 1,891 cu.yd. borrow excav., (c) 15,164 sq.yd. 18 ft. concrete surfacing, (d) 7,230 sq.yd 24 ft. concrete surfacing with integral curb and gutter, (e) 7,800 bbl. cement in place, (f) 127.9 cu.yd curb and gutter, etc., (2) 1.49 mi. Mondovi-Durand Rd., Federal Aid Project 78, Pepin Co., (a) 9,540 cu.yd earth, (b) 740 cu.yd. borrow and (c) 1,814 cu.yd. gravel exacv, (d) 129.27 cu.yd. Class "A" concrete, (e) 13,138 sq.yd. 15 ft gravel, (f) 0.31 acres clearing and grubbing, etc., (3) 2.35 mi. Alam-Durand Rd., Federal Aid Project 16, Pepin Co., (a) 24,817 cu.yd. earth excav. (b) 385 cu.yd. borrow excav., (c) 20,160 sq.yd. 15 ft. gravel surfacing, (d) 20,598 sq.yd. 15 ft. shale, etc., from Cast Stone Constr. Co., 419½ South Barstow St., Eau Claire, (1a) $1.10, (1b) $0.80, (1c) $1.86, (1d) $2.10, (1e) $2.95, (1f) $27.50, etc., total cost (without cement), $81,109; A. Larson & Co., Eau Claire, (1a) $1.05, (1b) $0.70, (1c) $1.92, (1d) $2.04, (1e) $2.85, (1f) $24., etc., $79,922; Universal Eng. Co., Eau Claire, (1a) $1.15, (1b) $0.80, (1c) $1.89, (1d) $2.04, (1e) $2.94, (1f) $26, etc., $81,234; W. J. Wolf, Eau Claire, (2a) $0.58, (2b) $0.45, (2d) $27, (2e) $0.18, (2f) $32, etc., $16,723; Ofstie & Mulheron, Spring Valley, (2a) $0.60, (2b) $0.55, (2d) $28.50, (2e) $0.20, (2f) $200, etc., $18,440; Lowe Bros., Allen, (2a) $0.60, (2b) $0.60, (2d) $25.90, (2e) $0.30, (2f) $200, etc., $18,110, (3a) $0.60, (3b) $0.60, (3c) $0.20, (3d) $0.30, etc., $27,983; Isaacson Bros. & Mulheron, Spring Valley, (3a) $0.60, (3b) $0.60, (3c) $0.34, etc., $24,577. Noted April 1.

★**Wisconsin**—State Highway Dept., at div. office, Wilner Bldg., Green Bay, let contract to J. Young & Bro., Oconto, grading and paving 4.14 mi. Elkhart-New Holstein Rd., Calumet Co., state aid construction, involving 38,862 sq.yd. concrete surfacing, $2.69, total cost, $104,539; also building Killsnake Bridge, to have two 30 ft. concrete girders, $10,553. Noted April 1.

Wisconsin—State Highway Dept., at div. office, Wilner Bldg., Green Bay, received bids April 8, grading and paving (1) 4.83 mi. Hilbert-Chilton Rd., Federal Aid Project 143, Calumet Co., involving (a) 18,141 cu.yd. earth excav., (b) 176.6 cu.yd. concrete in culverts, (c) 17,000 bbl cement in place, (d) 51,000 sq.yd. concrete surfacing, (e) 46 cu.yd. borrow excav., (2) 2.97 mi. Green Bay-Sturgeon Bay Rd., Federal Aid Project 163, Kewaunee Co., (a) 13,646 cu.yd. earth excav., (b) 369.7 cu.yd. concrete in culverts, (c) 232.3 cu.yd. concrete in bridges, (d) 26,167 sq.yd. gravel surfacing, etc., from Appleton Constr. Co., Odd Fellows Bldg., Appleton, (1a) $0.98, (1b) $25, (1c) $2.58, (1d) $1.80, (1e) $1, total cost, $157,899; G. M. Gross, Appleton, (1a) $1.09, (1b) $27, (1c) $2.56, (1d) $1.79, (1e) $1.09, $159,402; J. Young Bros., Oconto, (1a) $0.98, (1b) $24, (1c) $2.69, (1d) $1.93, (1e) $1.15, $166,229; V. Everard, Luxembourg, (2c) $28.86, etc., $6,919; H. Boulanger, Casco, (2a) $0.68, (2b) $22, $17,853; Garvey & Weyenberg, 812 College St., Appleton, (2a) $0.85, (2b) $28, (2c) $34.50, etc., $31,232; Brogan & Burns, Green Bay, (2a) $0.85, (2b) $26, (2c) $43.50, etc., $32,601; Jorgenson Constr. Co., Denmark, (2a) $0.69, (2b) $28, (2c) $30, (2d) $0.69, etc., $46,279. Noted April 1.

Wisconsin—State Highway Dept., at div. office, 208 Stephenson Bldg., Milwaukee, received bids April 7, grading and paving (1) $3.59 mi. Fond du Lac-Milwaukee Rd., Federal Aid Project 154, Fond du Lac Co., involving (a) 350 cu.yd. ditching, (b) 14,767 cu.yd. earth excav., (c) 47 cu.yd. borrow excav., (d) 38,082 sq.yd. concrete surfacing, (e) 203.2 cu.yd. Class "A" concrete, etc., (2) 2.45 mi. Lake Shore Rd, Federal Aid Project 104, Ozaukee Co., (a) 11,325 cu.yd. earth excav., (b) 26,000 sq.yd. concrete surfacing, (c) $169.4 cu.yd. Class "A" concrete, etc., (3) 0.93 mi. Sheridan Rd., Federal Aid Project 39, Racine Co., (a) 2,287 cu.yd. earth excav., (b) 4,758 cu.yd. borrow excav., (c) 9,831 sq.yd. concrete surfacing, (d) 17.8 cu.yd. Class "A" concrete, etc., (4) 4.72 mi. Town Line Rd., Federal Aid Project 115, Walworth Co., (a) 900 cu.yd. ditching, (b) 36,207 cu.yd. earth excav., (c) 297.9 cu.yd. Class "A" concrete in culverts, (d) 212.7 cu.yd. Class "A" concrete in bridges, (e) 49,842 sq.yd. concrete surfacing, etc., from C. Johnson, 75 Main St., Oshkosh, (1a) $1.50, (1b) $1.30, (1c) $1.50, (1d) $1.99, (1e) $27.50, etc., total cost, $138,617; J. McCarthy, Kaukauna, (1a) $1.35, (1b) $1.20, (1c) $1.35, (1d) $2.08, (1e) $26, $141,539; L. A. Larson & Co., 104 Main St., Oshkosh, (1a) $1.32, (1b) $1.32, (1c) $1.32, (1d) $2.06, (1e) $27, $146,887; McGucken Constr. Co., 425 East Water St., Milwaukee, (2a) $1,25, (2b) $1.90, (2c) $27, $90,900; Froemming Bros., Humboldt Ave., Milwaukee, (2a) $1.25, (2b) $1.89, (2c) $25, $91,000; R. R. Birdsall, 1108 Park Ave., Racine, (3a) $1.40, (3b) $1.90, (3c) $1.80, (3d) $28, $42,344, (4b) $1.15, (4c) $28, (4d) $39, $62,770; Michie Constr. Co., Camp Bldg., Milwaukee, (4a) $1.75, (4b) $1.24, (4c) $27, (4d) $35, $65,556. Noted April 1.

Wisconsin—State Highway Dept., State Capitol, Madison, received bids April 9, grading and paving (1) 6.45 mi. Horicon-Beaver Dam Rd., Federal Aid Project 150, Dodge Co., involving (a) 25,636 cu.yd. earth excav., (b) 6,756 cu.yd. loose rock excav., (c) 236.27 cu.yd. concrete in culverts, (d) 68,107 sq.yd. concrete surfacing, (e) 18 acres clearing and grubbing, (f) 22,600 bbl. cement, (g) 2,147 cu.yd. borrow excav., etc., (2) Watertown Plank Rd., Federal Aid Project 59, Jefferson Co., (a) 17,400 sq.yd. 18 ft. concrete surfacing, (b) 5,800 bbl. cement, (3) 3.53 mi. County Line Rd., Federal Aid Project 72, Dodge and Jefferson Counties, (a) 18,482 cu.yd earth excav., (b) 145.26 cu.yd. concrete in culverts, (c) 37,334 sq.yd. concrete surfacing, (d) 12,400 bbl. cement, etc., from McGucken Constr. Co., 425 East Water St., Milwaukee, (1a) $1.10, (1b) $2, (1c) $26, (1d) $2.16, (1e) $10, (1f) $2.85, (1g) $1.10 total cost, $263,286; Froemming Bros., Humboldt Ave., Milwaukee, (1a) $1.30, (1b) $2.15, (1c) $25, (1d) $2.11, (1e) $9, (1f) $2.70, (1g) $1.30, $262,807; E. L. Bartlett, Watertown, (2a) $2.20, (2b) $2.88, $54,984, (3a) $1.25, (3b) $25, (3c) $2.50, (3d) $2.88, etc., $161,516. Noted April 1.

Wisconsin—State Highway Dept., at div. office, Court House, La Crosse, received bids April 8, grading and paving (1) La Crosse-Sparta Rd., Federal Aid Project 164, La Crosse Co., involving (a) 12,200 sq.yd. earth excav., (b) 57.5 cu.yd. concrete in culverts, (c) 22,009 sq.yd. 18 ft. concrete surfacing, (d) 345 cu.yd. borrow excav., (e) 7,400 bbl. cement, etc., (2) La Crosse-Sparta Rd., Federal Aid Project 107, Monroe Co., (a) 2,615 cu.yd. earth excav., (b) 1,237 cu.yd. rock excav., (c) 23.2 cu.yd. concrete in culverts, (d) 9,284 sq.yd. 18 ft. concrete surfacing, (e) 3,100 bbl. cement, etc., from Western Constr. Co., 310 South 4th St., La Crosse, (1a) $1.15, (1b) $32, (1c) $2.40, (1d) $1.15, (1e) $3.32, etc., (2a) $1, (2b) $3, (2c) 28, (2d) $2.61, (2e) $3.16, etc., total cost, $41,028; Campbell Constr Co., 3050 Hennepin Ave., Minneapolis, Minn., (2a) $0.85, (2b) $2.75, (2c) $35 (2d) $3.10, (county to furnish rock, etc.), $35,247. Noted April 1.

★**Wis., Grand Rapids**—Wood Co State Rd. and Bridge Com. let contracts to Mathis Constr. Co., Grand Rapids, grading and paving Grand Rapids-Sherry-Marshfield Rd., City of Grand Rapids, involving 1,573 cu.yd. earth excav., $0.90, 113.9 cu. yd concrete in bridges, $30, 10,588 sq.yd concrete surfacing, $1.73, 3,529 bbl. cement in place, $2.57, etc., total cost, $34,564. Grand Rapids-Sherry-Marshfield Rd., Town of Siegel, 5,847 cu.yd. earth excav., $0.98, 25.8 cu.yd. concrete in culverts, $30, 25,532 sq yd. concrete surfacing, $1.86, 8,510 bbl cement, $2.62, etc., $76,633; Auburndale-Marshfield Rd., Town of Marshfield, 7,665 cu.yd earth excav., $0.98, 32.9 cu.yd. concrete in culverts, $30, 23,238 sq.yd. concrete surfacing, $1.88, 7,746 bbl. cement, $2.62, etc., $72,483. Noted April 1.

Wis., Milwaukee — Commissioner Pub. Wks. received bids April 5, paving portion of (1) American Ave., involving (a) 1,584 cu.yd. grading, (b) 2,128 sq.yd. standard sheet asphalt, (c) 1,299 lin.ft. combined curb and gutter, etc., (2) Cape St., (a) 609 cu.yd. grading, (b) 2,027 sq.yd. old pavement removed, (c) 2,373 sq.yd. granite block pavement on 8 in. concrete base, (d) 60 lin.ft. new straight limestone curb, etc., (3) Cherry St., (a) 1,012 sq.yd. standard sheet asphalt, (b) 850 lin.ft. combined curb and gutter, (c) 5,090 sq.ft. cement walks, etc., (4) 58th St., (a) 3,394 cu.yd. grading, (b) 1,039 sq.yd. light traffic asphalt, (c) 878 lin.ft. combined cement curb and gutter, (d) 5,238 sq.ft. cement walks, etc., (5) 58th St., (a) 917 cu.yd. grading, (b) 1,321 sq.yd. light traffic asphalt, (c) 1,116 lin.ft. combined cement curb and gutter, (d) 6,696 sq.ft. cement walks, etc., (6) 59th St., (a) 239 cu.yd. grading, (b) 869 sq.yd light traffic asphalt, (c) 780 lin.ft. combined cement curb and gutter, (d) 4,680 sq.ft cement walks, etc., (7) 59th St., (a) 234 cu.yd. grading, (b) 1,217 sq.yd. light traffic asphalt, (c) 1,017 lin.ft. combined cement curb and gutter, (d) 6,102 sq.ft. cement walks, etc., (8) Florida St., (a) 412 cu.yd. grading, (b) 1,792 sq.yd. old brick pavement removed, (c) 1,631 sq.yd. standard sheet asphalt, (d) 161 sq.yd. brick gutter pavement, etc., (9) Herbert St., (a) 2,471 cu.yd. grading, (b) 2,355 sq.yd. light traffic asphalt, (c) 2,007 lin.ft. combined cement curb and gutter, (d) 8,803 sq.ft. new cement walks, (e) 230 sq.ft. old walks removed, etc., (10) Jefferson St., (a) 471 cu.yd. grading, (b) 658 sq.yd. old pavement removed, (c) 2,087 sq.yd. standard sheet asphalt, (d) 491 sq.yd. brick gutter pavement, (e) 1,178 lin.ft. old curb reset, (f) 3,045 sq.ft. cement walks removed, (g) 947 lin.ft. new straight limestone curb, etc., (11) 7th Ave., (a) 330 cu.yd grading, (b) 1,741 sq.yd. standard sheet asphalt, (c) 1,140 lin.ft. combined cement curb and gutter, etc., (12) Windsor Pl., (a) 640 sq.yd light traffic asphalt, (b) 436 lin.ft. combined cement curb and gutter, (c) 2,616 sq.ft. cement walks, etc., (13) Wright St., (a) 952 sq.yd. cement concrete pavement, etc., from White Constr. Co., East Water St., (1a) $1.20, (1b) $3.48, (1c) $0.98, etc., (3a) $3.70, (3b) $1, (3c) $0.25, (4a) $1.25, (4b) $3.44, (4c) $1, (4d) $0.25, (5a) $1.25, (5b) $3.44, (5c) $1, (5d) $0.25, (6a) $1.25, (6b) $3.44, (6c) $1, (6d) $0.25, (7a) $1.25 (7b) $3.44, (7c) $1, (7d) $0.25, (8a) $1.50, (8b) $1.40, (8c) $3.54, (8d) $4., (9a) $1.50 (9b) $3.44, (9c) $1, (9d) $0.50, (9e) $0.25, (10a) $1.50, (10b) $0.40, (10c) $3.59, (10d) $4, (10e) $0.25, (10f) $0.15, (10g) $1.30 (11a) $1.20, (11b) $3.48, (11c) $0.98, (12a) $3.44,

Streets and Roads (Continued)

(12b) $1, (12c) $0.25; Badger Constr. Co., Ry. Exch. Bldg., (1a) $1.50, (1b) $3.65, (1c) $1, (3a) $3.67, (3b) $1, (3c) $0.25, (4a) $1.30, (4b) $3.47, (4c) $1, (4d) $0.25, (5a) $1.30, (5b) $3.47, (5c) $1, (5d) $0.25, (6a) $1.30, (6b) $3.47, (6c) $1, (6d) $0.25, (7a) $1.30, (7b) $3.47, (7c) $1, (7d) $0.25, (8a) $1.25, (8b) $1.50, (8c) $3.62, (8d) $4.50, (9a) $1.40, (9b) $1.40, (9c) $1, (9d) $0.25, (9e) $0.12, (10a) $2, (10b) $0.50, (10c) $3.75, (10d) $4.50, (10e) $0.25, (10f) $0.25, (10g) $1.40, (11a) $1.35, (11b) $3.65, (11c) $1, (12a) $1.50, (12b) $3.47, (12c) $1, (12d) $0.25; A. H. Prange, Fowler St., (2a) $1.66, (2b) $0.56, (2c) $5.35, (2d) $1.16; Dean Constr. Co., Camp Bldg., (2a) $2, (2b) $0.55, (2c) $6, (2d) $1.25, (13a) $3.10; Retzlaff, Froemming & Bluhm, 948 4th St., (13a) $2.62. Noted April 8.

★**Ia., Davenport**—Scott Co. let contracts grading and paving with vitr. brick 4.47 mi. Davenport-Durant Rd. and 5.38 mi. Davenport-Gambril Rd. to McCarthy Impvt. Co. 220½ Main St., $267,952 and $357,034 respectively; 6.44 mi. Harrison St. Rd. and 5.42 mi. Davenport-Princeton Rd., to Central Eng. Co., 711 Putnam Bldg., $435,292 and $330,793 respectively.

★**Minn., Duluth**—See "Buildings."

★**Minn., Winona**—A. Baeurlen, aud. Winona Co. let contract building Federal Aid Project 8, State Rd. 1, 24 ft. wide, to J. J. Litcher, Lewiston, $107,310; less 27,735 lin. ft. guard rail, $90,669. Noted March 18.

★**Missouri**—State Highway Dept., Jefferson City, let contract building 5.3 mi. Southern Highway from Emmett Ave. and Bway., Sedalia, to Sedalia Special 12 mi. Rd. Dist., Pettis Co., involving 28,042 lin.ft. grading, 49,852 sq.yd. reconstructed base course, 4,629 sq.yd. broken stone, 49,852 sq.yd. stone and 112,167 gal. asphalt for bituminous surface course, 35.1 cu.yd. Class B and C concrete masonry and 1,000 lb. reinforcement for concrete masonry, to J. W. Menfee, Sedalia, $61,792.

★**Mo., Liberty**—Clay Co. will improve 13.07 mi. Liberty-Excelsior Springs Rd., involving 69,760 cu.yd. earth and 11,626 cu.yd. rock excav., 18.574 cu.yd. borrow, 10,000 cu.yd. overhauling, 122,508 sq.yd. broken stone base course, 122,508 sq.yd. bituminous macadam surface course, specification A, 11.8 cu.yd. Class A, 267 cu.yd. Class B and 164 cu.yd. Class C concrete masonry, 20,400 lb. reinforcement for concrete masonry, 1,288 lin.ft. 15-24 in. rein.-con. pipe culvert, 5,000 lin.ft. 4 in. vitr. tile underdrain, 7,960 lb. fabricated structural steel, cost $459,699; 10.52 mi. Jefferson Highway, 74,423 cu.yd. earth and 5,624 cu.yd. rock excav., 2,521 cu.yd. borrow, 10,000 cu.yd. overhauling, 98,889 sq.yd. broken stone base course, 98,889 sq.yd. stone and 222,500 gal. bitumen for bituminous macadam surface course, 5.3 cu.yd. Class A and 627.5 cu.yd. Class B concrete masonry, 49,340 lb. reinforcement for concrete masonry, 2,020 lin.ft. 12-24 in. rein.-con. pipe culvert, both 16-24 ft. wide, $249,494. Work will be done by day labor. Noted Jan. 15.

★**Idaho** — State Highway Dept., Boise, plans to rock or gravel surface 40 mi. roads, 12 to 20 ft. wide. Most of this mileage will be built by day labor. About $300,000.

★**Wash., Hoquiam**—City let contract grading and paving 12 blocks Simpson Ave., to Grays Harbor Constr. Co., Hoquiam, $121,164.

★**Wash., Ritzville**—Adams Co. let contract grading and building culverts on 9 mi. Donohue Rd. 2, 30 ft. wide, involving 100 sq.yd. concrete and 39,000 cu. yd. excav., to Mitchell Bros., East 127 Mission St., Spokane, cost $25,400; grading, building culverts and surfacing with crushed rock, 16 ft. wide, 4.3 mi. Donohue Rd. 2, 30 ft. wide, 100 cu.yd. concrete, 22,000 cu. yd earth and 7,900 cu.yd. rock excav., to R A. Sloane, Seattle, $40,092.

★**Wash., Seattle**—City let contract paving Dexter Ave., et al, involving 26,100 sq.yd. concrete and asphaltic concrete, 11,800 lin. ft. armored concrete curbing and 8,500 cu. yd. earth excav., to Jahn & Bressi, Seattle, $128,418.

★**Wash., Seattle**—Comrs. King Co. let contract grading, paving and building 1 bridge on 4.47 mi. Redmond-Hollywood Rd., 18 ft. wide, concrete, to Ferguson Constr. Co., Henry Bldg., $127,425. Noted March 18

★**Wash., Tacoma**—Pierce Co. let contract to D. A. Williams, Tacoma, paving 3.66 mi. Sumner Dieringer Rd. Bond 4, 16 ft. wide, concrete, cost $90,200, also 2 mi. Kapawsin Highway Bond Rd. 23, 16 ft. wide, bitulithic, $44,000; D. W. Rutherford, Municipal Dock, clearing, grubbing, draining and building bridge on 1 mi. Permanent Highway 14, 24 ft. wide, $96.100.

★**Wash., Tacoma**—Pierce Co. will clear, grub, drain and grade 2.26 mi. Pioneer Way Bond Rd. 10, 24 ft. wide. About $40,000. Work will be done by day labor.

Ore., Portland—City received bids March 31, grading sidewalks and curbs, on 86th Ave. S. E., from 65th Ave. S. E., to Woodstock Ave., S. E., from G. K. Howitt, 41 East 78th St., $6,873; paving 88th St. S. E., from 65th Ave. to Foster Rd., macadam, from Hetrick & Cline, Portland, $19,662 or $5.50 per cu.yd. for 8 in. crushed gravel.

★**Cal., Long Beach**—City let contract improving 5th St., involving 108,964 sq.ft. concrete paving with asphaltic surface, 1,010 sq.ft. cement walks, etc., to Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, $25,899.

★**Cal., Oakland**—City let contract grading, paving and curbing Prentiss St., Prentiss Pl., and portions Davis St. and Fruitvale Ave., to Hutchinson Co., 444 17th St., $9,174. Noted March 25.

★**Cal., San Francisco**—City let contract grading, paving and curbing Townsend St. from 4th to 8th Sts., involving 31,923 sq.yd. asphaltic concrete, 6,846 lin. ft. concrete curbing, 3,550 lin. ft. 12-15 in. sewers, 1,220 lin. ft. 10 in. culverts, etc., to Eaton & Smith, 407 11th St., $100,045

★**Cal., San Francisco**—City let contract grading, curbing and paving 41st Ave., to F. McHugh, 2613 Bush St., $8,737; 20th, 21st, 22d, 23d, 24th, 25th and 26th Sts., involving 17,333 asphaltic concrete, 8,400 lin.ft. concrete curbing and 4,225 cu.yd. earth excav., to Fay Impvt. Co., 758 Phelan Bldg., $49.905. Noted March 25.

Cal., San Francisco—City received bids grading, paving and curbing (a) 43d and 44th Sts., (b) Beach St., from State Impvt. Co., 112 Lyon St., (a) $20,773; Raisch Impvt. Co., 46 Kearny St., (a) $21,005, (b) $13,967; Fay Impvt. Co., 758 Phelan Bldg., (a) $21,741, (b) $14,344; Pacific States Constr. Co., Call Bldg., (h) $11,859 Noted March 25.

Railways

PROPOSED WORK

Michigan—City of Detroit voted $15,000,000 bonds to build and equip 100.75 mi. electric railways with car shops and power houses. C. W. Hubbell, city engr.

Utah—Old Capitol Petroleum Fuel & Iron Co., McIntyre Bldg., Salt Lake City, plans to build 46 mi. road from Lund to coal and iron deposits near Cedar City. About $500,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Washington**—Bd. Pub. Wks. of Seattle let contract building 22 mi. railroad spur from Rockport into the Skagit River power site, to Grant Smith Co., Hoge Bldg. About $466,000.

★**Ontario**—City of Toronto will construct 1½ mi. electric car line on Mt. Pleasant Rd. About $1,060,000. Work will be done by day labor.

Excavation and Dredging

PROPOSED WORK

N. Y., Canisteo—Dredging, etc.—Village petitioned State Legislature to appropriate $50,000 bonds to deepen, dredge and improve Purdy Creek, Bennetts Creek and Canisteo River for flood prevention. Election will be held to vote on $50,000 additional bonds to cover cost. J. A. O'Connor, consult. engr.

N. Y., New York—Dredging—M. Hurlburt, comr. docks, Pier "A," foot of Battery Pl., rejected bids received March 30, furnishing labor and material dredging in Manhattan, Queens and Richmond Boroughs. About $100.000. Noted March 25.

Wis., Sheboygan—Drain—Sheboygan Co. having plans prepared building Drainage Project 1, Sheboygan Twp., Drainage Project 2, Lima Twp., involving 17,000 ft. 6-12 in. drain tile. About $25,000. M. Hoppert, secy. J. Donahue, North 8th St., engr.

Tex., Waco—Drain—East Waco D. D., McLennan Co., plans election May 15, to vote on $139,000 bonds to build drainage system.

BIDS DESIRED

Ill., Shiloh—Drainage—Until April 20, by Comrs. Shiloh D. D. 3, Edgar Co., cleaning out and extending ditch, involving 60.776 cu.yd. excav. J. E. Bonnell, engr.

Tex., Bryan—Levee—Until April 20, by Bd. Supervs. Burleson Co. Levee Impvt. Dist. 1, building levee, 5,600 ft. long and 10 ft. high W. R. Ettle, secy.

Cal., Oxnard—Dredging—Until April 27, (change of date), by Oxnard D. D., building 4½ mi. drainage ditch, gate house, tide gates, etc. About $200,000. C. C. Rupert. secy. Noted March 18.

Ont., Ottawa—Drains—Until May 8, by Carlton Co. building Logan Drain, 19,153 ft. long, involving 7,985 cu.yd. excav.; Gillissie Drain, 6,540 cu.yd. excav., 39 cu.yd. rein.-con., 20 cu.yd. gravel grading; Daglish Drain, 3,315 cu.yd. earth excav., 81 cu.yd. hardpan; Blanchfield Drain, 13,000 ft. long, 9,509 cu.yd. earth excav., 8 cu.yd. rein.-con., grubbing and clearing; Buckles Drain, 2,294 cu.yd. earth excav. About $35,000. Magwood & Stidwell, Pitt St., Cornwall, engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Boston—Dredging—Comr. Dept. of Pub. Wks. received bids April 2, dredging 110 cu.yd. rock ledge from entrance to drydock basin, from W. E. Barber, Boston, $11,900; G. T. Rendle Co., Boston & Albany R.R. Bridge, $12,600; Bay State Dredging Co., 62 Condor So., $29,900. Noted April 1.

★**N. Y., Buffalo**—Dredging—G. H. Norton, city engr., let contract dredging in Buffalo Inner Harbor, to Great Lakes Dredge & Dock Co., Morgan Bldg., $0.335 per cu.yd. Noted April 8.

★**N. Y., New York**—Dredging—M. Hurlburt, comr. docks, Pier "A," foot of Battery Pl., let contract furnishing labor and material dredging in North River, to F. E Jones, 17 Battery Pl., $32,780, East River, to F. S. Ross, $40,640. Noted April 1.

★**Mo., St. Joseph** — Drainage — Platte River D. D. 1, let contract building 17.11 mi. drainage system, involving 1,495,000 cu.yd. earth excav., to Land & Sampson, Balanges Bldg., $214,872

Industrial Works

PROPOSED WORK

Mass., Boston—G. N. Jacobs, archt., 9 Hamilton Pl., soon receives bids building 5 story, 70 x 90 ft., brick and mill construction, factory, concrete foundation, on Albany St., for A. Lourie, 128 Pearl St About $85,000.

Mass., Brockton—G L. Falk, archt., 63 Main St., soon lets contract building 3 story, 55 x 160 ft., brick and tile, dry kiln plant, concrete foundation, on Cherry St., for Miller Tree Co., c/o architect. About $50,000.

Mass., Whitinsville — Whitins Machine Wks. having plans prepared by J. D. Leland, archt., 185 Devonshire St., Boston, for 2 story, 60x240 ft., brick and rein.-con. carpentry shop, rein.-con. flooring, concrete foundation. About $80,000.

R. I., East Warren (Warren P. O.)—Greyhound Motor Car Corp., 5 Columbus Circle, New York City, plans to build 1st unit of factory, 1 story, 60 x 200 ft., stone and concrete, concrete flooring and foundation, here. About $50,000. Private plans.

Conn., Ansonia—Lockwood, Greene & Co., archts. and engrs., 101 Park Ave., New York City, soon lets contract building 2 story, 80 x 125 ft., brick and concrete addition to factory, concrete flooring and foundation, for Ansonia O & C Co. About $100,000. Noted March 25.

Conn., Bridgeport—Harvey Hubbell, Inc., Bostwick Ave., plans to build 4 story, rein.-con. factory, rein.-con. factory, rein.-con. flooring, concrete foundation, on State St. About $175,000 Private plans.

Industrial Works (Continued)

Conn., Danielson—Powdrell & Alexander, 161 Devonshire St., Boston, plans to build brick and rein.-con. manufacturing plant, here. Private plans.

Conn., New London—U. S. Electric Co., 108 State St., plans to build brick and steel electric power plant. Private plans.

N. Y., Auburn—C. F. Rattigan, supt. prisons, Capitol, Albany, plans to build central heating and lighting plant at prison, here. About $75,000. L. F. Pilcher, state archt.

N. Y., Brooklyn—Keystone Varnish Co., 91 Otsego St., having plans prepared by J. E. Nitchie, archt. and engr., 63 Park Row, New York City, for 4 story, 50 x 100 ft., brick, concrete and steel addition to factory, rein.-con. flooring, concrete foundation, at 73 Otsego St. About $85,000.

N. Y., Buffalo—Amer. Car & Fdry. Co., 370 Babcock St., plans to build brick and steel car shop. About $200,000.

N. Y., Buffalo—Loew Theatre Co., Inc., 1493 Bway., New York City, plans to build 7 story, brick, concrete and steel warehouse, at 512 Washington St., here. About $65,000.

N. Y., Buffalo—Spark Dairy, Hudson and Niagara Sts., having plans prepared by McCormick Co., archts. and engrs., 41 Park Row, New York City, for 2 story, 65 x 105 ft., brick, concrete and steel plant, rein.-con. flooring, concrete foundation, on Prospect Ave. About $75,000.

N. Y., Buffalo—State Hospital Comn., Capitol, Albany, plans to alter and build addition to central heating plant, at State Hospital, here. About $125,000. L. F. Pilcher, state archt.

N. Y., Central Islip—State Hospital Comn., Capitol, Albany, plans to build and equip cold storage plant, at State Hospital, here. About $100,000. L. F. Pilcher, state archt.

N. Y., Dunkirk—Atlas Crucible Steel Co., Howard St., plans to construct warehouse, inspecting and annealing buildings, covering 44,000 sq.ft. floor space, 70 x 200 ft. electric melting building, 68 x 119 ft. extension to 10 in. mill, 88 x 237 ft. extension to 16 and 28 in. mill building, 80 x 237 ft. billet storage building, 158 x 172 ft. extension to wire mill and 40 x 140 ft. transformer building. Total cost, $1,800,000.

N. Y., East Syracuse—East Syracuse Live Stock Rendering & Fertilizing Co., recently incorporated with $500,000 capital stock, plans to build packing plant. H. F. Riley, c/o Clapp, Nostrom & Riley, 14 South Canal St., Chicago, pres.

N. Y., Frankfort—United Tractors Corp. had plans prepared by Lockwood, Greene & Co., engrs., 101 Park Ave., New York City, for brick, concrete and steel factory, in 10 sections, each 1 story, 50 x 300 ft.

N. Y., Jamaica—J. Hessler & Son, 18 Cedar St., New York City, having plans prepared by W. B. Wills, Inc., archts. and engrs., 1101 Myrtle Ave., Brooklyn, for 3 story, brick and steel factory, rein.-con flooring, concrete foundation, here. About $50,000.

N. Y., Malone—Hogle Motor Sales Co. plans to build 2 story, brick, concrete and steel garage and machine shop, on East Main St. About $50,000. Address J. H. Stevens.

N. Y., Norwich—Abbott & Kohn Ribbon Co., 235 Ellison St., Paterson, N. J., plans to build 1 story, 60 x 200 ft., brick factory, here About $50,000.

N. Y., Painted Post—Ingersoll-Rand Co. plans to build 3 story, brick foundry, cost $500,000; also 100 modern houses for workmen.

N. Y., Pyrites—DeGrasse Paper Co. had plans prepared for 1 story, 60 x 208 ft., concrete and steel machine shop. About $150,000

N. Y., Rome—Bd., Mgrs., State School for Mental Defectives, plans to build central heating and lighting plant. About $120,000. L. F Pilcher, Capitol, Albany, state archt

N. Y., Rome—Water & Sewer Bd. had plans prepared by C. W. Knight, engr., 101 West Liberty St., for 350 hp. hydro-electric plant, at Ridge Mills, on Mohawk River. About $65,000

N. Y., Rossie—G. N. Wilson filed application with Pub. Serv. Comn. for permission to build and operate electric lighting plant, 500 hp. hydro electric development, on Indian River, here.

N. Y., Sardinia—Holland-Sardinia Light & Power Corp. plans to build hydro power plant also storage dam, 1,160 ft. long, 216 ft. wide, with 10 ft. maximum depth, impounding 1,252,800 cu.ft. water, working head of dam, 10 ft. M. L. Harrington, pres.

N. Y., Wards Island—State Hospital Comn., Capitol, Albany, plans to build and equip bakery, at Manhattan State Hospital, here. About $75,000. L. F. Pilcher, state archt.

N. J., Verona—See "Buildings."

Pa., Phila.—Freihofer Baking Co., 20th and Indiana Sts., having plans prepared by C. B. Comstock, archt. and engr., 110 West 40th St., New York City, for brick, steel and concrete plant, rein.-con. flooring, concrete foundation, on 49th St. and Florence Ave. About $100,000.

Md., Baltimore—Crystal Laundry Co., Baltimore St., having plans prepared by T. W. Biddle, archt., c/o Kelly Springfield Tire Co., River Rd., for 1 and 2 story, 130 x 284 ft., concrete, steel and brick laundry, garage and power house, rein.-con. flooring, concrete foundation. About $200,000.

Md., Baltimore—Presto-Lite Co., Inc., 30 East 42d St., New York City, having plans prepared for acetylene plant, here, to include eight 1 story, brick and steel buildings, rein.-con. flooring, concrete foundations, averaging 25 x 50 ft. each. About $75,000. Private plans.

Ky., Louisville—R. Mansfeld & Co., 625 East Market St., plans to build 2 and 4 story, 140 x 246 ft. factory, on Barrett St. and Bway. About $100,000.

Ky., Louisville—Prince Wells plan to build 74 x 200 ft. garage on 3rd St. and Bway. About $100,000.

Ky., Louisville—W. E. Ross having plans prepared by Gaffney & Epping, archts. and engrs., Louisville, for 5 story, 90 x 210 ft., rein.-con. and steel garage, at 2-3 Market St. About $100,000. Noted April 8.

O., Cleveland—Allweather Top & Body Co., 6545 Carnegie Ave., plans to build 2 story, concrete, steel and brick factory, rein.-con. flooring, concrete and brick foundation. About $100,000. J. W. Hayes, mgr. Architect and engineer not selected.

O., Cleveland—Cleveland Ry., Leader News Bldg., having plans prepared by L. P. Crecelius, archt. and engr., Leader-News Bldg., for 46 x 60 ft. substation, on West 73rd St. and St. Clair Ave., cost $100,000; also 46 x 60 ft. substation, on East 80th St. and St. Clair Ave., $100,000; both 1 story, concrete, steel and brick, rein.-con. flooring, concrete foundations.

O., Cleveland—Cleveland Ry., Leader-News Bldg., having plans prepared by L. P. Crecelius, archt. and engr., 650 Leader-News Bldg., for 1 story, 46 x 60 ft., concrete, steel and brick substation, rein.-con. flooring, concrete foundation, on East 152nd St. and St. Clair Ave. About $100,000.

O., Cleveland—W. S. Ferguson Co., archts. and engrs., 1900 Euclid Ave., soon lets contract constructing 6 story, 100 x 200 ft. rein.-con., steel and brick storage building, rein.-con. flooring, concrete foundation, on Lincoln and Detroit Aves., for Lakewood Storage Co., c/o architects. About $125,000.

O., Cleveland—Freeman Motor Co., Whitney-Power Blk., having plans prepared by J. H. Albrecht, engr., c/o owner, for 1 story, 80 x 300 ft., brick and steel factory, brick foundation, along tracks of Belt Line R. R About $200,000. F. L. Freeman, mgr.

O., Cleveland—G. S. Rider & Co., archts. and engrs., Century Bldg., soon lets contract constructing 1 story, concrete, steel and brick addition to factory, rein.-con. flooring, concrete foundation, for Natl. Acme Co., East 131st St. and Coit Rd. About $300,000. Noted March 18.

O., Cleveland—Wheatcrip Products Co., c/o C. Blatz, 1030 Guardian Bldg., plans to build 2 story, concrete, steel and brick factory, rein.-con. flooring, concrete foundation, on Mayfield and Random Rds. About $200,000 Architect and engineer not selected.

O., Cleveland—White Co., East 79th St and St. Clair Ave., having plans prepared by Watson Eng. Co., archts. and engrs., Hippodrome Bldg., for 6 story, 125 x 200 ft. factory, on East 75th St. and Detroit Ave., cost $200,000; also 1 story, 220 x 240 ft. shipping room, on Stone's Levee, $100,000; both concrete, steel and brick, rein.-con. flooring, brick foundations. W. White, pres.

O., Columbus—Climax Rubber Co., 21 West Gay St., having plans prepared by N. F. Blair, archt., Cleveland, for 3 story, 200 x 200 ft., tire and tube factory, rein.-con., on West Goodale St. About $200,000.

O., Dayton—Electric Automotive Co., 12 Broadwell Pl., plans to build 2 story, 75 x 120 ft., rein.-con. and brick garage, rein.-con. flooring, concrete foundation, on West 2nd St. About $75,000. R. B. Karl, secy F. Packard, New Hayden Bldg., Columbus, archt.

Ind., Lebanon—See "Buildings."

Mich., Bay City—Amer. Worsted Yarn Co., c/o D. L. Galbraith, plans to build 4 story, 120 x 400 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, on Water St. About $300,000. Private plans.

Mich., Detroit—See "Buildings."

Mich., Detroit—Hannan Real Estate Exch., 1 McGraw Bldg., plans to construct 3 story, 100 x 190 ft., rein.-con., brick and steel garage and sales room, rein.-con. flooring, concrete foundation, on 2nd Ave. and Canfield St. About $175,000. Architect's name withheld.

Mich., Grand Rapids—Grand Rapids Tire & Rubber Co., 315 Kelsey Bldg., having plans prepared for 2 and 3 story, rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, on Fuller Ave. along tracks of Grand Trunk Ry. About $400,000. H. H. Swan, mgr. Private plans.

Mich., Jackson—Walcott Lathe Co., Calhoun and Jackson Sts., plans to build 1 and 2 story, 60 x 150 ft. drop forge plant, brick, steel and concrete, rein.-con. flooring, concrete foundation, along track of Grand Trunk Ry. About $150,000. D. G. Kimball, mgr. Private plans.

Mich., Marshall—Flint Fdry. Co. plans to build 1 story, 70 x 200 ft. and 80 x 118 ft., brick, steel and concrete foundry, rein.-con. flooring, concrete foundation. About $75,000.

Mich., Milwaukee (Saginaw P. O.)—Michigan Light & Consumers Power Co., 226 West Main St., Jackson, plans to build 2 story, rein.-con., brick and steel power house, to include 30,000 kw. steam generating station, on Saginaw River, here. About $4,893,000. Private plans.

Mich., Pontiac—Oakland Motor Car Co. plans to build 2 story, 60 x 200 ft., rein.-con., brick and steel service station, rein.-con. flooring, concrete foundation, on Baldwin Ave. About $250,000. Private plans.

Wis., Milwaukee—City having preliminary plans prepared by H. M. L. Harding, engr., 52 Vanderbilt Ave., New York City, for freight terminal, consisting of piers, sheds, warehouses, railways, etc. About $10,000,000.

Wis., Sheboygan Falls—C. S. Weiser Co having preliminary plans prepared building 4-6 story, 60 x 250 ft., tannery, brick, rein.-con. and steel, rein.-con. flooring, brick foundation, on Buffalo St. Cost between $100,000 and $150,000. Architect not selected.

Tex., Brownwood—See "Streets & Roads."

Tex., Dallas—Dallas Auto Laundry & Storage Co., c/o D. Spillers, secy.-mgr. Dallas Auto Club, having plans prepared by C. W. Almstead, engr., Cleveland, O., for 6 story, 100 x 150 ft., rein.-con. garage and auto storage building, rein.-con. flooring, concrete foundation. About $250,000.

Tex., Dallas—Genl. Motors Co. of Texas having plans prepared by Lang & Witchell, archts., Amer. Exch. Bank Bldg., for 6 story, 100 x 100 ft., storage building and auto salesroom, rein.-con., brick and steel, rein.-con. flooring, brick and concrete foundation, on Jackson and Jefferson Sts. About $150,000. R. Briggs, mgr.

Tex., Dallas—G. A. Sprague, 1014 Powhattan St., having plans prepared for 1 story, 100 x 150 ft., storage warehouse, rein.-con. and brick, rein.-con. flooring, brick and concrete foundation, on Cadiz and Marion Sts. About $200,000

Industrial Works (Continued)

Tex., McKinney—Sunlite Co. plans to build 1 story, auto factory, brick and concrete, rein.-con. flooring, near city limits. About $150,000. E. R. Brackett, McKinney, engr.

Tex., Port Neches—Magnolia Petroleum Co., 723 23rd St., Galveston, having plans prepared by G. D. Anderson, engr., 315 Keith Bldg., Beaumont, for 1st unit of oil refinery here, to have 50,000 bbl. daily capacity. About $200,000. J. Sealey, pres.

Okla., Oklahoma—New State Shirt & Overall Co. soon lets contract building 3 story, 80 x 190 ft., shirt factory, rein.-con. About $140,000. C. P. Nieder, Oklahoma, archt. Noted Feb. 26.

Okla., Sapulpa—Sapulpa Motor Co., Main and Hobson Sts., having plans prepared by Monnot & Reid, archts., 409 Empire Bldg., Oklahoma, for 2 story, 120 x 150 ft., brick, rein.-con. and steel garage, rein.-con. flooring, concrete foundation. About $140,000.

Wash., Seattle—Seattle Baking Co., 302 19th St., S., having plans prepared by A. C. P. Willatzen, archt., Boston Blk., for 2 story, 104 x 117 ft., concrete and steel bakery, rein.-con. flooring, concrete foundation, on 19th and Main Sts. About $110,000.

Cal., Sacramento—Southern Pacific Ry., 65 Market St., San Francisco, having plans prepared for brass foundry, spring factory, sawmill, etc., galvanized iron and frame, at shops, here. About $100,000.

Cal., Wilmington—Vegetable Oil Products Co., Wilmington, Del., plans to secure lease on city lands, in inner harbor, here, and build refinery. 1st unit to cost $300,000. E. G. Mueller and E. DuPont, Wilmington, Del., dirs.

Que., Chelsea—Royal Securities Corp., Ltd., 164 St. James St., Montreal, plans to construct pulp and paper mill along bank of Gatineau River, here. About $1,000,000. Engineer not selected.

Ont., Hamilton—T. B. McQuestin, chn. Civic Gas Com., recommended that city build gas manufacturing plant. About $3,000,000. E. R. Gray, city engr.

Ont., Toronto—Canada Bread Co., 160 Avenue Rd., having plans prepared by C. J. Gibson, archt., Elcelsior Life Bldg., for 2 and 3 story, rein.-con., brick and steel bakery, rein.-con., flooring, concrete foundation. About $200,000.

BIDS DESIRED

Mass., Ashland—Until April 20, by Swett Root Beer Inc., 10 Post Office Sq., Boston, building 3 story, 65 x 65 ft., brick and concrete manufacturing plant and power house, here. About $50,000. McNaughton & Robinson, 101 Tremont St., Boston, archts.

N. J., Irvington—(Newark P. O.)—J. T. Simpson, archt., Essex Bldg., Newark, receiving bids constructing 1 and 2 story, 50 x 180 ft., 200 x 250 ft. and 282 x 600 ft., concrete and brick factory, office and community building, on Coit St., for Vreeland Motor Co., 407 Elizabeth Ave., Newark. Cost to exceed $300,000. Noted March 25.

Pa., Phila.—See "Buildings."

Md., Baltimore—Until April 17, by F. E. Tormey, archt., 813 Newington Ave., building 5 story, 69 x 100 ft., rein.-con. and brick warehouse, concrete foundation, on Calvert and Pleasant Sts., for Baltimore Electrical Supply Co., 309 North Calvert St. About $150,000.

Mich., Detroit—Until April 19, by Smith, Hinchman & Grylls, archts., 710 Washington Arcade, building 3 story, 100 x 112 ft., rein.-con., brick and steel addition to factory, rein.-con. flooring, concrete foundation, for Detroit Twist Drill Co., Fort St. and 14th Ave. About $60,000.

Minn., Minneapolis—P. Crosier, archt., 240 La Salle Bldg., receiving bids building 2 story, 65 x 110 ft., rein.-con. and brick garage, on 17th St. and Nicollet Ave., for Robinson Motor Truck Co., 909 Hennepin Ave. About $100,000.

Ont., Toronto—Until April 26, by E. G. Bird, archt., 6 King St. W., constructing two factory buildings, one 4 story, 70 x 400 ft., and other 2 story, 52 x 175 ft., brick and steel, concrete foundations, on Wallace and Ward Aves., for Canadian General Electric Co., King and Simcoe Sts. About $300,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Vt., St. Johnsbury—Cary Maple Sugar Co. let contract building 2 and 4 story, 54 x 200 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, to H. P. Cummings Constr. Co., Fidelity Bldg., Portland, Me. About $125,000. Noted Jan. 15.

★Mass., Cambridge—(Boston P. O.)—W. Filene Sons Co., 416 Washington St., Boston, let contract building rein.-con. utility plant, rein.-con. flooring, concrete foundation, on Esplanade, here, to Stone & Webster Eng. Co., 147 Milk St., Boston. About $300,000; cost plus percentage basis. Noted April 1.

★Mass., Chicopee—Fiske Rubber Co. let contract building 2, 3 and 5 story, brick and cement addition to factory, concrete foundation, to F. T. Ley, 19 West 44th St., New York City. About $150,000.

★Mass., Quincy (Boston P. O.)—Bethlehem Shipbuilding Corp. let contract building 3 story, 50 x 220 ft., brick, concrete and steel shop, rein.-con. flooring, concrete foundation, at Fore River, to Snare & Triest Co., 8 West 40th St., New York City. About $75,000. Noted Feb. 26.

★Mass., Quincy (Boston P. O.)—J. Klein, c/o S. S. Eisenberg, archt., Exchange Bldg., Chelsea, will build 2 story, 50 x 140 ft., brick and mill construction warehouse, concrete foundation, on Norfolk St. About $50,000. Work will be done by day labor under supervision of architect.

★Mass., Roxbury (Boston P. O.)—Tuck & Gilman, archts., 34 School St., Boston, will build 2 story, 85 x 150 ft., rein.-con. garage, concrete flooring and foundation, on Warren St. Cost between $60,000 and $75,000. Work will be done by day labor. Owner's name withheld. Noted March 4.

★Mass., South Attleboro—Home Bleach & Dye Wks., Branch St., Pawtucket, let contract building 3 story, 75 x 90 ft., brick and mill construction addition to dye house, concrete foundation, here, to J. J. Prindeville Co., 59 Concord St., Framingham. About $60,000.

★Mass., Wakefield — Lee & Hewett, archts. and engrs., 1123 Bway., New York City, let contract to S. Willey Co., 1123 Bway., New York City, building 3 story, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, here, for Heywood Bros. and Wakefield Co., Gardner. About $150,000. Noted Jan. 29.

★Mass., Worcester—Norton Co., Barbers Crossing, let contract building 6 story, 42 x 176 ft. mill, on Bond St., to E. J. Cross, 82 Foster St. About $100,000.

★R. I., Apponaugh—Apponaugh Co. let contract constructing 4 story rein.-con. storehouse, 2 story, mercerizing building and 2 story, brick and mill construction dye house, rein.-con. flooring, concrete and rock foundation, to W. H. Hamlyn & Son, Inc., 35 Greenwich St., Providence. About $500,000.

★R. I. Woonsocket — W. F. Fontaine, archt., Federal Bldg., let contract to L. F. Flerant & Son, 158 Rathbun St., building 2 story, 60 x 200 ft., brick and mill construction dyehouse, rock foundation, for Rosemont Dyeing Co., 292 East School St. About $60,000. Noted April 1.

★Conn., Watertown — Watertown Mfg. Co. let contract building 1½ story, 100 x 140 ft., brick and concrete addition to factory, concrete flooring and foundation, to H. Wales Lines Co., 134 State St., Meriden. About $65,000.

★N. Y., Brooklyn—Hygrade Homes, Inc., c/o Slee & Bryson, archts., 154 Montague St., will build 1 story, 55 x 120 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on President St. About $50,000. Work will be done by day labor.

★N. Y., Brooklyn—Kelly Realty Co., 39 West 113th St., New York City, will build 1 story, 100 x 320 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Columbia and Baltic Sts., here. About $150,000. Work will be done by day labor.

★N. Y., Buffalo—Maritime Trading Corp., 15 Pratt St., let contract building 5 story, brick, rein.-con. and steel mill, on Hopkins St., to Huntley & Derdenger, Electric Bldg. About $325,000. Noted April 8.

★N. Y., Buffalo—J. T. Ryerson & Son, Stanley St., let contract building 1 story, 126 x 270 ft., brick and steel addition to warehouse, to J. W. Cowper Co., Fidelity Bldg. About $250,000.

★N. Y., Long Island City—Partley Realty Co., 95 Webster Ave., let contract building 1 story, 100 x 175 ft., brick,, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Webster Ave., to G. A. Violante, 241 Camelia St. About $55,000.

★N. Y., New York—L. Gold, 44 Court St., Brooklyn, will build 5 story, 100 x 110 ft. brick and steel garage, rein.-con. flooring, concrete foundation, at 239 West 64th St. here. About $200,000. Work will be done by day labor.

★N. Y., New York—H. Underhill, 438 West 37th St., will build 2 story, 75 x 99 ft., brick and steel garage, rein.-con flooring, concrete foundation, at 439 West 36th St. About $60,000. Work will be done by day labor.

★N. Y., Watertown—Beebe's Island Corp. let contract building rein.-con., brick and steel hydro-electric plant, rein.-con. flooring, concrete foundation, on Beebe's Island, near here, to J. G. White Eng. Corp., 43 Exch. Pl., New York City. About $1,000,000. Noted March 25.

★N. J., Newark—Economy Machine Co. c/o W. E. Lehman, archt., 738 Broad St., let contract building 2 story, 86 x 111 ft., concrete and brick factory, on Badger and Runyon Sts., to Irvington Lumber & Door Co., 738 Broad St. About $50,000.

★N. J., Newark—Morse Bros., 12 John St., New York City, let contract building jewelry factory, concrete and brick, on Central Ave. and Golden St., to W. L. Blanchard, 160 Sherman St. About $50,000.

★N. J., Trenton—Amer. Bridge Co., Warren St., will construct 1st unit of plant to consist of 2 story, 60 x 250 ft., steel building, on South Warren St. About $55,700. Work will be done by day labor. Noted Jan. 8.

★Pa., Easton—J. Schardly let contract building brick, steel and concrete bakery, rein.-con. flooring, concrete foundation, to Stewart Contg. Co., Jones Bldg. About $100,000. Noted Jan. 8.

★Md., Dukes (Adelina P. O.)—West Virginia Pulp & Paper Co., 200 5th Ave., New York City, will build 50 x 90 ft. and 100 x 120 ft., rein.-con. and steel additions to factory, rein.-con. flooring, concrete foundations here. Work will be done by day labor. Noted March 25.

★O., Cincinnati — Standard Silicate Co. let contract constructing plant, on Paddock Rd., including two factory buildings, 2 story, 98 x 160 ft. and 1 story, 49 x 80 ft., to Fisher-De Vore Co., 36 Blymyer Bldg. Noted March 18.

★O., Cleveland—Euclid Fdry. Co., c/o Hulett & Stanton, archts., 226 West Superior Ave., let contract building 1 story, 125 x 140 ft., concrete, steel and brick foundry, rein.-con. flooring, concrete foundation, on St. Clair Ave. along tracks of New York Central R. R., to Complete Constr. Co., 226 West Superior Ave. About $100,000. Noted March 11.

★O., Cleveland — Independent Tile Co., 340 The Arcade, will build 1 story, brick and steel plant, along tracks of Wheeling & Lake Erie R.R. between West 14th and West 25th Sts., also install railroad switch. About $200,000. Work will be done by day labor.

★O., Cleveland—Kelly Reamer Co., 1555 Columbus Rd., let contract building 1 story, 60 x 200 ft., steel and brick factory, brick foundation, on West 73rd St., to Reconstruction Co., East 55th St. and New York Central R.R. About $100,000.

★O., Fremont—Fremont Fdry. Co. let steel contract for 1 story, 60 x 220 ft., steel and brick foundry, to Fort-Pitt Bridge Wks., House Bldg., Pittsburgh, Pa. About $100,000.

★O., Marion—Marion Packing Co. let contract building 3 additions to cold storage plant, including 4 story, 42 x 84 ft. pickle cellar, concrete and brick, to E. Elford, 104 North 3rd St., Columbus. About $120,000.

★O., Piqua—Piqua Motor Sales Co., Main St., let contract constructing 2 story, 50 x 112 ft., rein.-con. and brick garage and sales building, rein.-con. flooring, concrete foundation, to Concrete Steel Constr. Co., 415-16 Mitchell Bldg. About $75,000.

★O., Springfield—Elwood Myers Co., 2-20 North Lowry Ave., let contract building 3 story, 80 x 80 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, to Frank Hill-Smith Co., Reibold Bldg., Dayton. About $75,000.

★O., Springfield—Steel Products Eng. Co., East St., let contract building 1 story, 60 x 152 ft., rein.-con. machine shop, rein.-con. flooring, concrete foundation, to Concrete Steel Constr. Co., 415-16 Mitchell Bldg. About $50,000.

Industrial Works (Continued)

★**Ind., Terra Haute**—Columbian Enameling & Stamping Co., 15½ and Beech Sts., let general contract building 1 story, 155 x 240 ft., brick and steel factory, to Roehm Bros., Deming Bldg. About $100,000.

★**Mich., Grand Rapids**—Grand Rapids Furniture Mfgrs. Assn., 216 Lyons St., N. W., let contract building 2 story, 80 x 400 ft., rein.-con., brick and steel warehouse, also rein.-con. loading platform, rein.-con. flooring, concrete foundation, on Fulton St., to Owen, Ames, Kimball Co., 12 Pearl St. Noted April 1.

★**Mich., Manistee**—Manistee Canning Co. let contract building 2 story, 86 x 250 ft., rein.-con. and tile factory, rein.-con. flooring, concrete foundation, to M. Peterson, Manistee. About $100,000.

★**Mich., Muskegon**—Shaw-Walker Co., West Western Ave., let contract building 4 story, 80 x 340 ft., rein.-con., brick and steel addition to factory, rein.-con. flooring, concrete foundation, to O. W Rosenthal & Co., 80 East Jackson Blvd., Chicago.

★**Wis., Belgium** — Witmeyer - Hubing Shoe Co. let contract building 3 story, 55 x 120 ft., rein.-con., brick and mill construction shoe factory, rein.-con. flooring, brick foundation, on Main St., to J. Ubbink, Port Washington. About $50,000. Noted March 11.

★**Wis., Carrollville**—H. J. Esser, archt., Camp Bldg., Milwaukee, let contract to P. Riesen's Sons, 1018 Humboldt Ave., Milwaukee, building superstructure for 3 story, 377 x 500 ft., manufacturing plant, rein.-con. and brick, rein.-con. flooring for United States Glue Co. About $2,000,000. Noted March 11.

★**Wis., Jackson**—H. V. Miller, archt., 646 24th St., Milwaukee, let contract to P. Berres, West Bend, constructing canning factory, to include several 1 and 2 story, brick and mill construction buildings, concrete foundation, for Jackson Canning Co. About $100,000. Noted April 1.

★**Wis., Lomira**—Star Bros., c/o Star Brewery, let contract building 3 story, 75 x 95 ft., pea canning factory, rein.-con. and brick, rein.-con. flooring, brick foundation, to Hutter Constr. Co., 128-136 Western St., Fond du Lac, $48,500.

★**Wis., Sheboygan**—Loeffler Machine Co., let contract building 2 story, 177 x 295 ft., brick, rein.-con. and steel foundry and machine shop, rein.-con. flooring, brick foundation, on 15th St, to M. Schuchardt, Erie St. About $100,000.

★**Wis., West Allis**—Allis-Chalmers Mfg. Co. let contract building 1 story, 130 x 500 ft., brick and steel foundry, concrete foundation, to Klug & Smith, 40 Mack Blk., Milwaukee. About $200,000.

★**Ia., Sioux City**—Springdale, Albertson & Co. let contract building 2 story, 65 x 150 ft., brick, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, to Federation Constr. Co., Sioux City. About $75,000; cost plus percentage basis.

★**Ont., Kitchener**—Lang Tanning Co., Francis St., let contract constructing 3 story, rein.-con., brick and steel tannery, rein.-con. flooring, concrete foundation, on Francis St. to Casper Braum, King and Water Sts. About $150,000.

Buildings

PROPOSED WORK

N. H., Durham—Dormitory—New Hampshire College of Agriculture soon receives bids building 3 story, 50 x 125 ft., brick, concrete and steel, concrete foundation, on campus. About $100,000. Private plans. Noted March 11.

N. H., Laconia—High School—Bd. Educ. soon lets contract building 2 story, 70 x 180 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation. About $225,000. P. S. Avery, 95 Milk St., Boston, archt. Noted Feb. 26.

N. H., Nashua—Church—W. F. Fontaine, archt., Federal Bldg., Woonsocket, R. I., soon lets contract altering and building brick and steel addition, on Hollis St., for St. Louis French Catholic Society, c/o architect. About $100,000.

Vt., Burlington—Memorial—University of Vermont plans campaign to raise $300,000 to construct memorial building.

Mass., Arlington (Boston P. O.)—High School—School Bd. plans to build Junior High School. About $150,000. Architect not selected.

Mass., Back Bay (Boston P. O.)—School—Bd. Educ. receives bids about July 1, build 30 room. About $1,200,000. J. E. McLaughlin, 88 Tremont St. Boston, archt.

Mass., Boston — Club — Boston & Maine R. R., North Sta., having plans prepared for 6 story, 125 x 134 ft., brick and concrete. About $500,000. Private plans.

Mass., Boston — Memorial — Memorial Comn. plans to construct memorial building on Charles River Island About $2,000,000. Architect not selected.

Mass., Boston—School—Michael Angelo School receives bids about May 15, building 2 story addition, on Charter St. C. H. Walker & Co., 71 Kilby St., archts.

Mass., Dorchester—High School—Bd. Educ. receives bids about July 1, building 20 room. About $320,000. H. H. Atwood, Ashmount St., archt.

Mass., East Boston (Boston P .O.)—School—Bd. Educ. receives bids about June 1, building 3 story, 16 room, brick, on Frankfort St. About $220,000. C. G. Loring, 7 Water St, Boston, archt. Noted Jan. 22.

Mass., Gardner—Hospital—Henry Heywood Memorial Hospital, Woodland St., having plans prepared by E. F. Stevens, archt., 9 Park St., Boston, for 3 story, 40 x 110 ft., brick and rein.-con., rein.-con. flooring, concrete foundation, on Woodland St. About $100,000.

Mass., Hingham—Church—St. Johns Evangelist Church having plans prepared by Coolidge & Shattuck, archts., 122 Ames Bldg., Boston, for 1 story, brick. About $100,000.

Mass., Marlboro — Bank — First Natl. Bank, Main St., having plans prepared by Allen & Collens, archts., 40 Central St., Boston, for bank. About $100,000.

Mass., Medford (Boston P. O.)—Lodge, Etc.—Mt. Hermon Lodge of Masons, plans to build brick, on Forest St. About $100,000. W. Reed, chn. Architect not selected.

Mass., New Bedford—Theatre and Office—Mowll & Rand, archts., 50 Bromfield St., Boston, soon let contract building 2 story, 143 x 160 ft., brick, concrete, steel and stone, rein.-con. flooring, concrete foundation, on Purchase St., here, for Gordon & Schoolman, 18 Tremont St., Boston. About $500,000. Noted March 25.

Mass. West Roxbury (Boston P. O.)—High School—Bd. Educ. receives bids about May 1, building 3 story, brick and steel, here. About $150,000. Andrews, Rantoul & Jones, 50 Congress St., Boston, archts.

Mass., West Springfield (Springfield P. O.)—Temple—League of Junior Achievement plans campaign to raise $1,000,000 to construct temple at Eastern States Exposition Fair Grounds. Address H. A. Moses, 55 Riverview Terrace. Architect not selected.

Mass., Winchester—High School—School Com. plans to build brick and steel. Architect not selected.

Mass., Winthrop (Boston P. O.)—High School—Town having plans prepared by W. M. Bacon, archt., 27 Kilby St., Boston, for brick and steel addition. About $150,000. A. S. Smith, Field Rd., chn.

Mass., Worcester—Administration—Reed & Prince Mfg. Co., Duncan Ave., having plans prepared by J. D. Leland, archt., 185 Devonshire St., Boston, for 3 story, brick, concrete and steel.

R. I., Providence—Hotel—H. A. Lewis, archt., 75 Westminster St., preparing plans for 3 story, 140 x 200 ft., tile and stucco, concrete foundation. About $100,000. Owner's name withheld.

N. Y., Binghamton—School—Bd. Educ. plans to build 40 room, brick, concrete, steel and stone, on Clinton St., 1st Ward, to replace one recently destroyed by fire. About $350,000. D. J. Kelly, supt.

N. Y., Brooklyn—Office—Curb Holding Co., c/o F. S. Parker, archt. and engr., 44 Court St., having plans prepared for 12 story, 134 x 135 ft., brick, steel and stone, concrete foundation, on Washington St. About $1,000,000.

N. Y., Buffalo—Hospital—State Hospital Comn., Capitol, Albany, plans to construct building for 300 patients, at State Hospital, here. About $325,000. L. F. Pilcher, state archt.

N. Y., Buffalo—Office and Theatre—M. Slotkin, c/o Olympic Amusement Co., 10 Bway., plans to build 9 story, brick, concrete and steel. About $750,000.

N. Y., Dunkirk — Club and Lodge — Knights of Columbus purchased 98 x 150 ft. site on Washington and 5th Sts and plans to build 3 story, brick, concrete and steel.

N. Y., Central Islip—Hospital—State Hospital Comn., Capitol, Albany, plans to build addition, to State Hospital, here. About $578,000. L. F. Pilcher, state archt.

N. Y., Ithaca—College—Bd. Trustees Cornell University, plans to build extension to State College of Agriculture. About $3,000,000. L. F. Pilcher, Capitol, Albany, archt.

N. Y., Jamestown—Theatre—M. W Peterson and M. L. Woods, c/o Winter Garden Theatre, 313 North Main St., plan to build vaudeville theatre, (2,400 seating capacity), on 3rd St.

N. Y., Kings Park—Hospital, etc.—State Hospital Comn., Capitol, Albany, plans to build addition to hospital, also dining room and kitchen, at State Hospital, here. About $510,000 and $85,000 respectively. L. F Pilcher, state archt.

N. Y., Lockport—High School—Bd. Educ. plans to build 3 story, brick, concrete and steel, on High St. About $500,000. H. W. Lowell, chn.

N. Y., Marcy—Hospital—State Hospital Comn., Capitol, Albany, plans to construct new buildings, at Utica State Hospital, here. About $1,690,000. L. F. Pilcher, state archt.

N. Y., Middletown — Hospital — State Hospital Comn., Capitol, Albany, plans to construct building, at State Hospital, here. About $400,000. L. F. Pilcher, state archt.

N. Y., New York—Office—Lawyers Mortgage Co., 59 Liberty St., having plans prepared by Renwick, Aspinwall & Tucker, archts. and engrs., 8 West 40th St., for brick, steel and stone, concrete foundation, on Maiden Lane and Nassau St. About $1,500,000.

N. Y., New York — Office — Deutsch & Polis, archts. and engrs., 50 Church St., receive bids about April 23, building 16 story, brick and steel, concrete foundation, at 7-11 Water St., for Natl. Park Real Estate Corp., 32 Union Sq. Noted March 25.

N. Y., New York—Stores and Salesrooms—J. Samuels, c/o B. W. Levitan, archt. and engr., 7 West 45th St., having plans prepared for 13 story, 50 x 100 ft., brick, steel and stone, concrete foundation, at 6-8 East 30th St. About $400,000.

N. Y., New York—Theatre—W. Roach, 214 West 141st St., having plans prepared by H. C. Ingalls, archt. and engr., 347 Madison Ave., for 2 story, 100 x 110 ft., brick, steel and stone, brick foundation, on 7th Ave. and 137th St. About $200,000.

N. Y., Painted Post—Housing—See "Industrial Works."

N. Y., Potsdam—School—Comr. Educ., Capitol, Albany, plans to repair and alter Cook and Stowell Annexes at Normal School, here. About $100,000. L. F. Pilcher, state archt.

N. Y., Poughkeepsie—Home—State Hospital Comn., Capitol, Albany, plans to build home for employees, at Hudson River State Hospital, here. About $165,000. L. F. Pilcher, state archt.

N. Y., Ray Brook—Hospital—State Hospital Comn., Capitol, Albany, plans to construct building, for care of tubercular children, at State Hospital, here. About $500,000. L. F. Pilcher, state archt.

N. Y., Rochester — Office — City having plans prepared by Gordon & Kaelber, archts., 300 Sibley Blk., for addition to Chamber Commerce Bldg. About $250,000.

N. Y., Tonawanda—School—Bley & Lyman, archts., 250 Delaware Ave., Buffalo, rejected bids received March 29, building 2 story, 8 room, brick, rein.-con flooring, for Bd. Educ. About $70,000. Noted April 1

N. Y., Union—School—Bd. Educ. had plans prepared by S. O. Lacey, archt., Phelps Bldg., Binghamton, for 2 story, brick addition to Loder St. School. Election will be held in May to vote on $150,000 bonds for project.

N. Y., Wards Island—Hospital—State Hospital Comn., Capitol, Albany, plans to alter East Bldg. and reconstruct U. S Naval Hospital group, for Manhattan State Hospital, here. About $75,000 and $90,000 respectively. L. F. Pilcher, state archt

N. Y., Westfield—Hotel—Rumsey Hotel and Black Water Baths Corp., recently incorporated with $500,000 capital stock, plans to build large hotel. M. C. Miller, 52 Niagara St., Buffalo, archt.

N. J., Verona—Hospital—Essex Co. Hospital for Tubercular Diseases soon receives bids constructing nurse and doctors home, storage and employees buildings, laundry, garage, morgue, tunnels and connecting passages, concrete, brick and steel. Cost to exceed $350,000. J Green, Essex Bldg., Newark, archt.

Buildings (Continued)

Pa., Cynwyd—School—Savery & Scheetz, archts., 21 South 12th St., Phila., soon lets contract building 2 story, 75 x 130 ft., rein.-con., brick and stone addition, for Bd. Educ. About $100,000.

Pa., Danville—High School—Bd. Educ. having plans prepared by Richter & Lee, archts., 32 South 17th St., Reading, for 2 story, brick and stone. Cost to exceed $100,000.

Pa., Phila.—Theatre—J. P. Beury, Walnut and 9th Sts., having plans prepared by Richter & Lee, 32 South 17th St., for 4 story, 78 x 80 ft., brick and concrete. Cost to exceed $100,000.

Pa., Sunbury — Church — Zion Lutheran Church having plans prepared by Richter & Lee, archts., 32 South 17th St., Reading, for 1 story, stone. Cost to exceed $200,000.

Md., Baltimore—Church—SS. Philip and James' Catholic Church acquired site on Charles St. between 28th and 29th Sts. and plans to build church. About $1,000,000. J. E. Wade, pastor.

Md., Baltimore — Office — Company, of which C. S. Bailey, 3003 St. Paul St., will be president, is having plans prepared by E. H. Glidden, archt., 1210 Amer. Bldg., for 20 story, 100 x 110 ft., concrete, steel, brick and stone, concrete foundation, on Calvert and Lexington Sts. About $2,250,000. Preston & Fields, Munsey Bldg., attys.

Md., Laurel—Hospital—Brightwood Sanitarium Co. having plans prepared by Stern & Tomlinson, archts., Washington, D. C., for additions to main building, here, consisting of six 1 and 2 story, 42 x 160 ft., concrete, steel and brick wings, to he connected by 1 story, 50 x 100 ft. corridors. About $250,000. C. Holstrom, supt.

Ky., Louisville — Club — Pendennis Club, 324 West Walnut St., plans to build addition, to include sleeping rooms and ball room. About $300,000. C. F. Grainger, pres.

Ky., Louisville—Market—A. J. Barber, Coal Exch. Bldg., Wilkes-Barre, Pa., plans to build on 3rd and Chestnut Sts., here. About $225,000.

O., Akron—Commercial and Theatre—M. Loew, 1111 Euclid Ave., Cleveland, having plans prepared by C. H. Crane, archt., 2325 Dime Bank Bldg., Detroit, for 1 and 3 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on Main and Bowery Sts., here. About $1,250,000.

O., Alger—School—Bd. Educ. having plans prepared by F. L. Packard, archt., New Hayden Bldg., Columbus, for 2 story, concrete and brick, here. About $100,000. H. Miller, clk.

O., Bourneville—School—Bd. Educ. having plans prepared by Glass & Austin, archts., Grand Theatre Bldg., Columbus, for 2 story, 65 x 100 ft., brick and concrete. About $100,000.

O., Cleveland—Commercial—Greible & Ebeling, archts. and engrs., East 11th and Chestnut Sts., preparing plans for 4 story, 100 x 200 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 12th St. and Oregon Ave. About $300,000. Owners name withheld.

O., Cleveland—Commercial—W. H. Harshaw, Electric Bldg., having plans prepared by Hubbell & Benes, archts., 4500 Euclid Ave., for 4 story, 60 x 124 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 97th St. and Euclid Ave. About $200,000.

O., Cleveland — Commercial — S. Kresge Co., c/o H. H. Service, Real Estate Dept., Kresge Bldg., Detroit, plans to build, on East 4th St. and Euclid Ave., here. About $500,000.

O., Cleveland—Commercial and Office—Greible & Ebeling, archts. and engrs., East 11th and Chestnut Sts., preparing plans for 8 story, 150 x 150 ft., rein.-con., brick and terra cotta, rein.-con. flooring, concrete foundation, on East 6th St. and Hamilton Ave. About $500,000. Owners name withheld.

O., Cleveland—Hotel—M. Morris, 12810 St. Clair Ave., soon lets contract building 3 story, 42 x 144 ft., steel and brick, brick foundation, on St. Clair Ave. near East 123rd St. About $125,000. M. Weiss, 618 Union Bldg., archt.

O., Cleveland—Hotel—Wade Park Co. plans to build 8 or 10 story, 200 x 225 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 107th St. and Wade Park Ave About $3,000,000. Address M. B. Daly, c/o East Ohio Gas Co., East 6th St. and Rockwell Ave. Architect not selected

O., Cleveland—Market—Comrs. Cuyahoga Co., c/o J. Menning, plans to build 1 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, here. About $300,000. Architect not selected.

O., Cleveland—Theatre and Commercial—M. Solomon, 2189 East 82nd St., having plans prepared by A. F. Janowitz, archt., Permanent Bldg., for 1 and 2 story, 40 x 200 ft., concrete, steel and brick, rein.-con. flooring, on West 25th St. About $125,000.

O., East Cleveland (Cleveland P. O.)—Hospital—East Cleveland Hospital Comn. having plans prepared by A. M. Allen Co., archts., 1900 Euclid Ave., Cleveland, for 3 story, 90 x 250 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Euclid and Strathmore Aves. About $250,000. C. M. Osborn, city mgr. Noted Jan. 22.

O., East Cleveland (Cleveland P. O.)—Market—Comrs. Cuyahoga Co., c/o J. Menning, Cleveland, plans to build 1 story, concrete, steel and brick, rein.-con. flooring, concrete foundation. About $300,000. Architect not selected

O., Elyria—Bank and Office—Elyria Natl. Bank having plans prepared by Walker & Weeks, archts., 1900 Euclid Ave., Cleveland, for 3 story, 30 x 120 ft., concrete, steel, brick and marble, rein.-con flooring, concrete foundation, on Public Sq. here. About $200,000.

O., Ironton—High School—Bd. Educ. having preliminary sketches made by F. L. Packard, archt., New Hayden Bldg., Columbus, for 2 story, in Beechwood Park, here. About $500,000.

O., Lakewood (Cleveland P. O.)—Bank—Cleveland Trust Co., East 9th St. and Euclid Ave., Cleveland, plans to build 1 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on Detroit Ave., here. About $100,000. Architect's and engineer's name withheld.

O., Lakewood (Cleveland P. O.)—Commercial and Theatre—C. A. Catabish, c/o S. H. Weis, archt., 1032 Schofield Bldg., Cleveland, receives bids about April 19, constructing 3 story, 100 x 220 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, at 13606 Detroit Ave. About $300,000. Noted Jan. 8.

O., Struthers—High School—Bd. Educ. having plans prepared by Miller & Son, archts., 408 Dollar Bank Bldg., Youngstown, for 3 story, 113 x 245 ft., fireproof, on Main St. About $275,000. S. J. McNab, clk.

O., Trumbull—School—Bd. Educ. having plans prepared by Miller & Son, archts., 408 Dollar Bank Bldg., Youngstown, for 2 story, 91 x 150 ft., fireproof, on Churchill Rd., here. About $150,000. C. Cliffe, R. F. D. 3, Youngstown, clk.

O., Youngstown—Bank and Office—First Natl. Bank having plans prepared by Walker & Weeks, archts., 1900 Euclid Ave., Cleveland, for 15 story, 60 x 120 ft., concrete, steel and hrick, rein.-con. flooring, concrete foundation, here. About $2,000,000.

Ind., Indianapolis—Sales and Service—Olin Sales Co., 511 North Meridian St., soon lets contract building 3 story, 61 x 200 ft., rein.-con. and brick, tile flooring, at 30-32 West Vermont St. About $100,000. Rubush & Hunter, 428 Amer. Central Life Bldg., archts.

Ind., Lebanon—Jail, etc.—Comrs. Boone Co. plan to build 2 story, 70 x 120 ft. jail and lighting plant. About $100,000. J. Frost, Lebanon, and L. Allen, 406 Lombard Bldg., Indianapolis, archts. Ammerman & McColl, 425 Accidental Bldg., Indianapolis, engrs.

Mich., Birmingham—Bank and Commercial—First Natl. Bank of Birmingham plans to build 2 story, 75 x 100 ft., rein.-con. and stone, rein.-con. flooring, concrete foundation. About $100,000. Donaldson & Meier, 1314 Penobscot Bldg., Detroit, archts.

Mich., Detroit—Clubhouse—Veterans of Foreign Wars plan to build 7 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $500,000. H. M. Leland, 2984 West Grand Blvd., chn. Bd Trustees. G. D. Mason, 80 Griswold St., archt.

Mich., Detroit—Fire Alarm Station—Bd. Fire Comrs., Larned St., having plans prepared by Donaldson & Meier, achts., 1344 Penobscot Bldg., for 3 story, 90 x 120 ft., rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation, on Macomb and Hastings Sts. About $250,000 Address G. J. Finn, secy.

Mich., Detroit—Hospital—Woman's Hospital & Infants' Home, Forest Ave., plans to build 3 or 4 story, rein -con., brick and steel addition, rein.-con. flooring, concrete foundation, on Forest Ave. and Beaubien St. About $300,000. Architect not selected.

Mich., Detroit—Hotel—Vassos Bros., 2555 East Jefferson St., plans to build 4 story, 60 x 120 ft., brick, steel and concrete, concrete foundation. About $100,000. H. Kohner and A. J. Seeler, 1402 Kresge Bldg., archts.

Mich., Detroit — Office and Loft — H. Scherer, c/o L. Kamper, archt., Book Bldg., having plans prepared for 10 story, 53 x 141 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, Woodward and Sibley Aves. About $1,000,000.

Mich., Eloise — Hospital and Home — Wayne Co. Poor Bd., c/o O. P. Gulley, 27 Churchill St., Detroit, plans to build 4 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $400,000. Architect not selected.

Mich., Ferndale (Royal Oak P. O.)—School—St. James Parish having plans prepared by Donaldson & Meier, archts., 1314 Penobscot Bldg., Detroit, for 2 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Woodward Ave. About $200,000.

Mich., Grand Rapids—Y. W. C. A., c/o Robinson & Campau, archts., 715 Michigan Trust Bldg., having plans prepared for 3 story, rein.-con. and brick building for administration offices, rein.-con. flooring, concrete foundation, on Sheldon and Island Sts. About $200,000.

Ill., Niles (Chicago P. O.)—Infirmary, Superintendent's House, etc.—E. Brielmaier & Sons Co., archts., University Bldg., Milwaukee, Wis., soon lets contract building 3 story, 46 x 100 ft. infirmary, 2 story, 34 x 50 ft. superintendent's house and 1 story, 50 x 125 ft. printery, all brick and concrete, concrete foundations, here, for St. Hedwig's Infirmary. About $150,000. Noted Jan. 15.

Ill., Springfield — Theatre and Stores — Stock Co., c/o H. J. Reiger, archt., Booth Bldg., preparing plans for 70 x 160 ft., brick and terra cotta. About $175,000.

Wis., Baraboo—School—Bd. Educ. authorized $200,000 bond issue to build school on Ash St.

Wis., Milwaukee—Home—Y. W. C. A., 384 Jackson St., plans to build 4 story, brick and concrete home for girls, rein.-con. flooring, concrete foundation. About $125,000. M. E. Betts, secy. Architect not selected.

Ia., Ivester (Grundy Center, P. O.)—School—Bd. Educ. having plans prepared by W. L. Pedicord, archt., Iowa Falls, for 2 story, 63 x 97 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $110,000.

Ia., Mason City—Hotel—Mason City Hotel Co. having plans prepared by Proudfoot, Bird & Rawson, archts., Hubbell Bldg., Des Moines, for 7 story, 132 x 165 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $800,000.

Ia., Mt. Pleasant—Hospital—Henry Co. Hospital Assn. having revised plans prepared by G. L. Lockhart, archt., Endicott Bldg., St. Paul, and soon receives bids building 2 story, 50 x 100 ft., rein.-con. About $100,000. Former bids rejected. F. B. Crane, secy. Noted March 18.

Ia., Nodaway—School—Bd. Educ. having plans prepared by Keffer & Jones, archts., Masonic Bldg., Des Moines, for 2 story, 69 x 103 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000.

Ia., Sioux City—School—Bd. Educ. receives bids about July 1, building North Side Junior High School, 3 story, 140 x 300 ft., on 25th and Nebraska Sts. About $350,000. Beuttler & Arnold, 235 Grain Exch. Bldg., archts.

Minn., Minneapolis — Home — Bethany Home, 3719 Bryant Ave. S., having plans prepared by A. R. Van Dyck, archt., 403 Soo Line Bldg., for 3 story, 110 x 125 ft. About $175,000. M. L. Lacy, supt.

Minn., St. Paul—Hospital—Cobb Memorial Assn. having preliminary sketches prepared by L. Bassindale, archt., 321 Capital Bank Bldg., for 3 story, 100 x 200 ft., rein.-con. and brick, in Merriam Park Dist. About $100,000. H. A. Humanson, secy.

Minn., St. Paul—Merchandise, Administration, Etc.—Montgomery Ward & Co., Chicago and Larrabee Sts., Chicago, will let contract about May 1, constructing 10 story, 220 x 340 ft. merchandise building and 3 story, 80 x 580 ft. administration biuilding, flat slab concrete construction, here; separate contract later for 12,000 kw power plant. Total cost, $4,000,000. Incorrectly noted in our issue of March 25.

Buildings (Continued)

Neb., Lincoln—School—Bd. Educ. having plans prepared by Fiske & Meginnis, archts., 533 Bankers Life Bldg., for 2 story, 140 x 225 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $450,000.

Neb., Nelson—School—Bd. Educ. plans to build 2 story, rein.-con. brick and steel, rein.-con. flooring, concrete foundation. About $100,000. H. P. Pampel. Finance Bldg., Kansas City, Mo., archt.

S. D., Sioux Falls—Theatre—McCarthy Bros., Fargo, N. D., soon receive bids building 3 story, 66 x 150 ft., on South Main Ave., between 10th and 11th Sts. About $175,000.

Mo., St. Joseph—Hotel—C. Geiger, 210 North 7th St., plans to build 8 story, 130 x 160 ft., concrete, brick and steel, concrete foundation. About $100,000. Will select architect at once.

Tex., Dallas—Office—T. Dees, c/o Guaranty Bank & Trust Co., Commonwealth Bldg., having plans prepared for 12 story, 60 x 100 x 150 ft., brick, tile and steel, rein.-con. flooring, brick foundation, on St. Paul, Elm and Pacific Sts. About $1,700,000.

Tex., Dallas — Orphanage — Methodist Church, South, Herring Ave., Waco, had plans prepared by M. W. Scott, archt., 412½ Franklin St., Waco, for 3 story, rein.-con. and brick, rein.-con. flooring, brick foundation, here. About $200,000.

Tex., Dallas—Salesroom—See "Industrial Works."

Tex., Dallas — Store — Sears, Roebuck & Co., Arthington St. and Homan Ave., Chicago, Ill., having plans prepared by G. C. Nimmons & Co., archts., 120 South Michigan Ave., Chicago, Ill., for 9 story, 160 x 300 ft., flat slab rein.-con., rein.-con. flooring, concrete foundation, here. About $2,000,000. Incorrectly noted in our issue of April 1.

Okla., Ardmore — High School — J. B. White, archt., Ardmore, soon lets contract building Junior High School, 3 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, for Bd. Educ. About $240,000. Noted Jan. 15.

Okla., Durant—School—State Bd. Pub. Affairs, State Capitol Bldg., Oklahoma, soon lets contract building 2 story, rein.-con. and brick, wood and cement flooring. About $100,000. J. Hicks, 19½ West Main St., Oklahoma, archt. Noted March 11.

Okla., Madill—School—City voted $100,000 bonds to build schools. Architect and engineer not decided.

Okla., Mangum—High School—Bd. Educ. soon lets contract building 2 story, 128 x 130 ft., brick, concrete and stone. About $130,000. D. F. Covington, clk. Hawk & Parr, 591 Security Bldg., Oklahoma, archts.

Okla., Muskogee—Hospital—City voted $150,000 bonds to build hospital. Architect and engineer not selected. Noted April 1.

Okla., Okmulgee — Lodge — Knights of Columbus plan to build 3 story lodge. About $100,000. Architect and engineer not decided.

Okla., Tecumseh—Industrial Home—State Bd. Pub. Affairs, Oklahoma, having plans prepared by J. Hicks, archt., 19½ West Main St., Oklahoma, for 2 story, brick, rein.-con. and steel, industrial home for girls, rein.-con. flooring, concrete foundation, here. About $176,000. Noted Sept. 18.

Utah, Nephi—Schools—East Juah School Dist. voted $175,000 bonds to build new schools, here.

Wash., Everett—Y. M. C. A. having plans prepared by Baker & Vogel, archts., Pacific Blk., Seattle, for 3 story, 114 x 115 ft., brick and stone, on Colby Ave. About $200,000.

Wash., Seattle—Mortuary—Butterworth & Sons, 1st and Virginia Sts., having plans prepared by C. Haynes, archt., Melhorn Bldg., for 3 story, 110 x 110 ft., stone and terra cotta, rock foundation, on Pine and Melrose Aves. About $250,000.

Cal., Alhambra (Los Angeles P. O.)—Schools—Bd. Educ. plans to build additions to 2 schools, also construct 8 room hollow tile school and 12 room brick commercial building at high school, concrete foundations. About $200,000. Allison & Allison, 1405 Hibernian Bldg., Los Angeles, archts.

Cal., Anaheim—Auditorium, Gymnasium, etc.—City voted $175,000 bonds to build addition to high school, to include 90 x 126 ft. auditorium and 50 x 80 ft. gymnasium, steel and hollow tile, concrete foundations. Jeffery & Schaefer, 1106 Kerckhoff Bldg., Los Angeles, archt. Noted Feb. 12.

Cal., Bakersfield—Schools—School Bd. voted $300,000 bonds to build additions to 4 schools, also construct new building on Lincoln site and install steam heating system at Franklin School. C. H. Biggar and T. B. Wiseman, Morgan Bldg., archts. Noted Jan. 15.

Cal., Los Angeles — Theatre — Orpheum Theatre Co., 1564 B'way., New York City, purchased site and having plans prepared by G. A. Landsburgh, archt., Gunst Bldg., San Francisco, for 120 x 235 ft. theatre, on 8th and Hills Sts. About $2,500,000.

Cal., Montebello—School—School Bd. soon receives bids building 1 story, 175 x 300 ft., hollow tile. About $200,000. Jeffery & Schaeffer, 1106 Kerckhoff Bldg., Los Angeels, archts.

Cal., Oxnard—High School—Trustees High School Dist. retained Allison & Allison, archts., Hibernian Bldg., Los Angeles, to prepare plans for high school. About $150,000.

Cal., Piedmont (Oakland P. O.)—High School—City voted $250,000 bonds to build high school.

Cal., Redlands—High School—School Bd. having plans prepared by E. Bergstrom, archt., 1129 Citizens Natl. Bank Bldg., Los Angeles, for 2 story, 22 room, rein.-con., rein.-con. flooring, concrete foundation. Bonds for $185,000 voted for project.

Cal., San Francisco—School—Bd. Pub. Wks. soon lets contract building 3 story, 82 x 98 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Harrison St. between 11th and 12th Sts. About $108,000. J. Reid, Jr., 1st Natl. Bank Bldg., archt. Noted March 25.

Cal., San Francisco—Store and Lofts—C. C. Moore & Co., Sheldon Bldg., having preliminary plans prepared by F. H. Meyer, archt., Bankers Investment Bldg., for 5 story, rein.-con., rein.-con. flooring, on 1st and Mission Sts. About $300,000.

Que., Beaconsfield—Club House—Beaconsfield Golf Club soon lets contract building club house. About $200,000. C. J. Saxe, 364 Dorchester W., Montreal, archt.

Que., Buckingham — Church — Catholic Congregation plans to build church. About $300,000. F. Chatelaine, in charge of work, Architect not selected

Que., Montreal—Bank—Merchants Bank, St. James St., soon receives bids constructing 10 story, 50 x 95 ft. rein.-con. and stone, concrete foundation, on St. James, St. Peter and Fortification Sts.

Que., Montreal—Church—Church of Holy Redeemer soon lets contract building stone church, concrete foundation. About $250,000. J. Gascon, 502 St. Catharine St., E., archt.

Que., Montreal—Hospital—Women's Hospital, 1002 St. Catherine St. W., plans campaign to raise $150,000 to construct new building.

Que., Montreal—School—Catholic School Bd. Comn., 87 Catherine St. E., soon lets contract building 100 x 110 ft., brick and steel, on Cherrier and St. Hubert Sts. About $190,000. Vautrain & Bernier, 92 Notre Dame St. E., archts.

Que., Montreal—Teachers' Home—Catholic School Bd. Comn., 87 Catherine St., E., soon lets contract building brick and steel, stone tower, concrete foundation, on Demontigny St. About $155,000. Vautrin & Bernier, 92 Notre Dame St., E., archts.

Que., Outremont — School — Outremont Protestant Bd. soon receives bids building 3 story, 75 x 100 ft., brick and concrete, on D 'L Epee Ave. About $275,000. E. W. Sayer, secy.

Ont., London—Schools—Bd. Educ., Dundas St., having plans prepared by L. V. Carrothers, archt., Hydro Bldg., for 2 public schools and 1 collegiate institute, all rein.-con., brick and steel, concrete foundation. About $100,000.

Ont., Ottawa—Hospital—Salvation Army, 63 William St., having plans prepared by G. Miller, archt., 20 Albert St., Toronto, for 2 or 3 story, rein.-con., brick and steel, concrete flooring and foundation. About $150,000.

Ont., Ottawa—School—Pub. School Bd. soon lets contract building concrete and brick on York St. About $300,000. W. C. Beattie, Elgin St., archt. Noted Feb. 12.

Ont., St. Catherines—School—Bd. Educ. and City Council plan election soon to vote on $200,000 bonds to build 3 story Industrial Collegiate Institute School, brick, stone, concrete and steel.

Ont., Toronto—Hotel—United Hotels Ltd., King Edward Hotel, soon receives bids constructing 16 story, 500 room addition to King Edward Hotel on King St. E., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $2,000,000. Structural steel contract let to Dominion Bridge Co., Imperial Life Bldg. Watt & Blackwell, 79 Adelaide St. E., and Esenwein & Johnson, Ellicott Sq., Buffalo, N. Y., archts.

Ont., Toronto—Y. M. C. A., 21 McGill St., and Dominion Council, 604 Jarvis St., plan to construct 4 story, rein.-con., brick and steel building, concrete foundation. About $650,000. Architect not selected.

Ont., Welland—Office, Theatre, Store and Bank—S. L. Lambert has purchased site on East Main St. and plans to build 3 story, 60 x 100 ft. About $125,000.

BIDS DESIRED

Mass., Winthrop (Boston P. O.)—School—Until April 31, by W. M. Bacon, archt. and engr., 27 Kilby St., Boston, building 4 story, brick and limestone, on Highland St., for Bd. Educ. About $200,000. Noted April 1.

N. Y., Brooklyn—Office and Salesroom—Until April 28, by Tooker & Marsh, archts. and engrs., 101 Park Ave., New York City, building 4 story, brick, steel and stone, concrete foundation, on Bedford Ave. and Sterling Pl., here, for Studebaker Corp., Main and Bronson Sts., South Bend, Ind. About $150,000. Noted Feb. 12.

N. Y., White Plains—High School—Until April 26, by Tooker & Marsh, archts. and engrs., 101 Park Ave., New York City, building brick and steel, brick foundation, for Bd. Educ. About $125,000. Noted Feb. 12.

N. J., Hoboken—School—Until April 19, by Bd. Educ., Park Ave., building 4 story, on 9th St., between Garden St. and Park Ave. About $200,000.

Pa., Phila.—Office, etc.—Until April 20, by Ballinger & Perrot, archts. and engrs., 329 South Broad St., building 1 story, 124 x 193 ft., office and service building, rein.-con. and brick, on Broad and Lehigh Sts.

Md., Baltimore—Office—Until April 22, by C. N. Friz, archt., 814 Lexington Bldg., constructing 6 story, 90 x 140 ft., steel, brick and stone, concrete foundation, on Courtland and Franklin Sts., for Standard Oil Co., Pratt and South Sts. About $500,000. H. F. Doeleman, 507 North Charles St., structural engr. C. L. Reeder, Park Ave. and Saratoga St., consult. engr. Noted Feb. 5.

S. C., Greenville—Bank and Office—Until May 1, by Mowbray & Uffinger, archts. and engrs., 56 Liberty St., New York City, building 16 story, brick, steel, marble and stone, concrete foundation, for Farmers & Merchants Bank. About $1,000,000. Noted April 1

O., Cleveland—School—Until May 3, by Bd. Educ., building 3 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 92nd St. and Parkgate Ave. About $600,000. W. R. McCormack, East 6th St. and Rockwell Ave., archt.

O., Lakewood (Cleveland P. O.)—Church—Until May 1, by First Church of Christ Scientist, c/o W. F. Kees, 931 Society for Savings Bldg., Cleveland, constructing 1 story, 100 x 100 ft., brick, steel and stone, rein.-con. flooring, concrete and brick foundation, at 15422 Detroit Ave. About $100,000. C. B. Falkner, South Dearborn St., Chicago, archt.

Mich., Cedar Banks (Lansing)—Training School—Until April 20, by G. P. Wanty, secy. Michigan State Training School, building 2 and 3 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on State Grounds, to include 3 dormitories, administraton building, power house and laundry. About $500,000. E. A. Boud, Lansing, archt.

Mich., Detroit—Fire Alarm Station—Until April 26, by G. J. Finn, secy. Bd. Fire Comrs., building 2 story, 55 x 109 ft., rein.-con., brick, stone, terra cotta and steel, rein.-con. flooring, concrete foundation, on Macomb and Antoine Sts.

Ia., Greene—School—Until April 29, by Bd. Educ., building 2 story, 66 x 127 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $150,000. W. E. Hulse & Co., Masonic Bldg., Des Moines, archts. Noted April 1.

Buildings (Continued)

Ia., Maynard—School—Until April 27, by Bd. Educ., building 2 story, 80 x 140 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $150.000. Netcott & Netcott, Black Bldg., Waterloo, archts. Noted Feb. 26.

Ia., McCallsburg—School—Until April 21, by Bd. Educ., building 2 story, 79 x 103 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $120,000. W. L. Pedicord, Iowa Falls, archt.

Ia., Packwood — School — Bd. Educ. receiving bids building 3 story, 56 x 99 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $125,000. Noted March 11.

Ia., Shelby—School—Until April 21, by Bd. Educ., building 2 story, 120 x 190 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $150,000. J. Latenser & Sons, Peters Trust Bldg., Omaha, Neb., archts. Noted Feb. 26.

Ia., Sioux City—School—Until April 19, by Bd. Educ., building West Side Junior High School, on 5th and Isabelle Sts. About $200,000. Beuttler & Arnold, 235 Grain Exch. Bldg., archts.

Okla., Oklahoma City—Temple—Masonic Lodge receiving bids building 4 story, stone, rein.-con. and steel, on 5th and Robinson Sts. L. H. Bailey, 1214 North Oklahoma St., and Layton-Smith & Forsythe, 401 Southwestern Bank Bldg. and J. Hicks, 19½ West Main St., archts.

Okla., Okmulgee—Hotel—Creek Hotel Co. receiving bids building 9 story, 100 x 140 ft., brick, rein.-con. and steel, rein-con. flooring, concrete foundation. About $750,000. Smith, Rea, Lovet & Seuter, Finance Bldg., Kansas City, Mo., archts. Noted Feb. 19.

Okla., Okmulgee—School—Until April 23, by Bd. Educ., building 1 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on west side. About $110,000. Noted Jan. 29.

Col., Florence—High School—School Dist. 2 received low bid building 2 story, 120 x 140 ft., brick and stone, from A. S. Hall & Son, Fowler, $112,800. Noted April 1.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Boston — Bank — Metropolitan Trust Co., 40 State St., let contract altering bank building on Milk St., to E. A. Abbott Co., 3 Park St. About $150,000.

★Mass., Bourne—Theatre, etc.—W. D. Borrow and R. E. Morris, c/o H. A. Lewis, archt., 75 Westminster St., Providence, let contract building [illegible] story, 135 x 157 ft., stucco moving picture theatre and dance pavilion, concrete foundation, to C. S. McCallum, 297 Dyer St., Providence. About $100,000.

★Mass., Brighton (Boston P. O.)—Hotel—S. Rudnick, 37 Fayston St., Roxbury, will build 4 story, 90 x 600 ft., brick, steel, concrete and stone, rein.-con. flooring, concrete foundation, on Buckminster St., here. About $1,000,000. Work will be done by day labor.

★Mass., Lowell — Hotel — O'Connell & Shaw, archts., 18 Boylston St., Boston, let contract to E. A. Abbott Co., 3 Park St., Boston, building 7 story, 80 x 100 ft., brick and mill construction, concrete foundation, on Middle St., for F. E. Harris, 21 Central St. About $175,000. Noted Feb. 26.

★Mass., Roxbury (Boston P. O.)—Business and Post Office—J. F. Coleman, 1 Marginal St., Chelsea, let contract constructing brick and steel business building and Post Office, on Dudley St., here, to Coleman Bros., 1 Marginal St., Chelsea. About $100,000.

★Mass., Wakefield—Office—Lee & Hewett, archts. and engrs., 1123 Bway., New York City, let contract to S. Willey Co., 1123 Bway., New York City, building 2 story, 60 x 80 ft., limestone and steel, brick foundation, here, for Heywood Bros. and Wakefield Co., Gardner. Noted April 1.

★Mass., Wellesley (Boston P. O.)—College and Tower—F. J. Untersee, archt., 585 Boylston St., Boston, let contract to J. Driscoll & Son Co., 94 Washington St., Brookline, building 4 story, 110 x 190 ft., brick and stone, concrete flooring and foundation, on Worcester St., for Academy of the Assumption, Wellesley Hills. About $350,000. Noted Jan. 15.

★R. I., Providence—Store—Outlet Co., Pine St., let contract building 5 story, brick and steel addition, rein.-con. flooring, concrete foundation, on Eddy and Pine Sts., to Williams & Merchant, Inc., 86 Weybossett St. About $200,000.

★Conn., Middletown — Armory — State Military Emergency Bd., Hartford, let contract building 2 story, 75 x 200 ft., brick, concrete and steel, concrete flooring and foundation, on Main St., here, to Connor & Haggerty, Inc., 54 Church St., Hartford. About $150,000. Noted March 18.

★Conn., New Britain—Home and School—New Britain Childrens Home, 81 Garden St., let contract building 3 story, brick, terra cotta and steel, rein.-con. flooring, concrete foundation, at Rackliffe Heights, to J. A. Carlson, 157 Dwight St. About $350,000. Noted March 4.

★Conn., Seymour—High School—Johnson & Burns, archts., 174 Bond St., Hartford, let contract to E. K. Tomlinson, 2 Washington St., building 2 story, 62 x 124 ft. with 42 x 57 ft. ell, brick and steel, concrete foundation, on Main St., here, for East Hartford Dist About $150,000. Noted Feb. 26.

Conn., South Manchester—School—St. James Roman Catholic Society, 896 Main St., soon lets contract building 2 story, 76 x 126 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation. About $100,000. Whiton & McMabon, 36 Pearl St., Hartford, archts.

★N. Y., New York — Bank, Offices and Stores—Corn Exchange Bank, 13 Williams St., let contract building 3 story, 50 x 100 ft., brick and steel, brick foundation, at 527 Bway., to W. H. Kiehnle Co., 1035 Stebens Ave. About $175,000. Noted Jan. 15.

★N. Y., New York—Loft—I. Miller & Sons, c/o Schwartz & Gross, archts. and engrs., 347 5th Ave., having plans prepared for 12 story, brick and steel, concrete foundation, on 46th St. and 5th Ave.

★N. Y., New York—Loft, Showroom and Stores—U. S. Realty Co., c/o J. H. Scheler, archt. and engr., 25 West 42nd St., will alter brick, steel and stone, on 6th Ave. between 20th and 21st Sts. About $300,000. Work will be done by day labor. Noted March 4.

★N. Y., New York—Office—J. H. Scheier, 25 West 42nd St., will build 8 story, 55 x 60 x 118 ft., brick, steel and stone, concrete foundation, on 52nd St. near Bway. About $400,000. Work will be done by day labor.

★N. Y., Olean—Bank—Mowbray & Uffinger, archts. and engrs., 56 Liberty St., New York City, let contract to E. Diebitsch, 383 Madison Ave., New York City, building 5 story, brick, steel, stone and marble addition, concrete foundation, for Exch. Natl. Bank, Noted March 4.

★N. J., Newark—School—Bd. Educ. let contract building Franklin School, 3 story, 70 x 86 ft., concrete and brick, to C. Flochen, Liberty Ave., Hillside, $296,526. Noted April 1.

★N. J., Newark—Theatres—Loews Enterprises', 1493 Bway., New York City, let contracts building theatre on Main St., also one on Broad St., brick, steel and stone, brick foundations, to Fleischman Constr. Co., 531 7th Ave., New York City. About $300,000 and $400,000 respectively.

★Pa., Farrell — High School — Bd. Educ. let contract building high school, to H. J. Conrath, Erie. About $186,000.

★Md., Cumberland—Hotel and Cafeteria—Central Investment Co., c/o J. L. Punderson, Queen City Hotel, let contract building 5 story, 69 x 100 ft., concrete, steel and brick, concrete foundation, on Baltimore St., to W. J. Morley, 98 Bedford St. About $160,000.

★D. C., Wash.—Church and Library—Columbia Heights Christian Church, 1658 Park Rd. let contract building 1 story, 30 x 90 ft., brick, rein.-con. flooring, to W. P. Linscomb Co., Dist. Natl. Bank Bldg. About $150,000. Noted April 1.

★N. C., Greensboro—School—North Carolina College for Women let contract building school, to J. A. Jones Constr. Co., Realty Bldg., Charlotte. About $275,000.

★N. C., Raleigh — School — State College let contract remodeling hall and building 2 dormitories and greenhouse, to W. B. Barrow, Raleigh. About $215,000.

★La., Shreveport—Hospital—Consolidated Sanitorium Co. let contract constructing 5 story, 40 x 300 ft. rein.-con., rein.-con. flooring, brick foundation, on Louisiana Ave., to Garson Bros., Shreveport. About $500,000.

★O., Cleveland—Bank—Cleveland Trust Co., East 9th and Euclid Ave., let contract altering and building 1 story, 68 x 75 ft., concrete, steel and brick addition, rein.-con. flooring, concrete foundation, to Crowell-Lundoff-Little Co., 5716 Euclid Ave. About $100,000. Noted April 8.

★O., Cleveland—Clubhouse—Cleveland-Columbia Bldg. Co., 3422 Euclid Ave., let contract constructing 3 story, 63 x 75 ft., brick and steel addition, brick foundation, to Drummond & Miller Co., 4500 Euclid Ave. About $100,000. Noted Jan. 22.

O., Cleveland—Hall—City received bids for stone work on 4 story, 180 x 420 ft., fireproof (now under construction), on East 6th St. and St Clair Ave., from Ohio Cut Stone Co., Amherst, $353,129; H. Stouble, Cleveland. $356,238; Consolidated Stone Co., Bedford, $369,875.

★O., Cleveland—Office—Brooks-Wilbor-Parsons Co., Plain Dealer Bldg., let contract constructing 2 story, 66 x 105 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on East 12th St. and Chester Ave., to S. W. Emerson Co., 1900 Euclid Ave. About $150,000.

O., Marion—School—Bd. Educ. received bid March 29, building 2 story, 70 x 90 ft., concrete and brick, on Grand Ave., from E. E. Beckett, 674 South Ohio Ave., $115,000. Noted March 4.

★Mich., Detroit—School—Bd. Educ., 50 Bway., let masonry contract building 2 story, 100 x 250 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on St. Antoine St. and Palmer Ave., to F. H. Goddard, 516 Franklin St., $286,000; carpentry, to H. M. Martens Co., 221 Moffat Bldg., $102,378; heating and ventilating, to J. W. Partlan, 51 Park Pl., $139,000; electrical work, to J. H. Busby Co., 36 Cherry St., $16,287. Contracts let on revised plans.

★Mich., Muskegon—School—Bd. Educ. let contract building 2 story, 70 x 175 ft. brick, steel and concrete, rein.-con. flooring, concrete foundation, to Drummond-Miller Co., 4500 Euclid Ave., Cleveland. About $225,000. Noted Jan. 29.

★Mich., Muskegon—Theatre—Schlossman Amusement Co. let contract building 2 story, 100 x 125 ft., rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation, on McKinney Ave., to G. Lathers, Traverse City. About $200,000.

★Mich., Northville — Sanitorium — Bd. Health, Antoine St., let contract building hospital group, to J. Finn & Son, 2328 Woodward Ave., Detroit. About $1,460.800, including contractor's fee and excluding fixed charges. If complete work exceeds estimate, 15% of excess to be deducted from fee, contractor to receive 7% of cost if guaranteed limit is not exceeded. Noted April 1.

Ill., Chicago—School—Bd. Educ., 7 South Dearborn St., received bids for masonry work on 3 story, 132 x 175 ft., rein.-con., steel, brick and stone, on Augusta St. and Laramie Ave., from S. N. Nielson & Co., 3059 Augusta St., $119,198, F. A. Siebold & Son, 64 West Randolph St., $143,100, J. Nuenkirchen, $148,716; cut stone, from J. A. Hagan, 1620 South Laramie Ave., $37,835, A. J. Ward & Co., Fullerton Ave. Bridge, $39,900, Olsen & Nelson Stone Co., 3401 South La Salle St., $39.985; structural steel, Vanderkloot Steel Co., 2611 South Halsted St., $67,434, Hansell Elcock Co., Archer and Normal Aves., $67,730, Holmes Pyott & Co., 159 North Jefferson St., $68,350; fireproofing, Egan Co., 133 West Washington St., $53,690, Natl. Fireproofing Co., 2600 Shields Ave., $67,683, E. V. Johnson & Co., 20 East Jackson Blvd., $68,974; steam heating, Natl. Steam Heating Co., 1331 North Clark St., $39,423, W. A. Pope, 26 North Jefferson St., $41,790, Kohlbry-Howlett Co., 111 West Washington St., $43,043. Noted Jan. 15.

★Minn., Duluth — Housing — Minnesota Steel Co., Wolvin Bldg., let contract building 150 concrete block houses at Morgan Park, to G. H. Lounsberry, 332 East Superior St., also grading, building sewers and water mains, in 8 streets, to D. H. Clough Co., 814 East 1st St. About $2,000,000; cost plus percentage basis.

★Minn., Keewatin—High School—R. M. Blockburn, clk. School Dist. 9, Itasca Co., Nashwauk, let contract building 2 story, 160 x 174 ft., rein.-con., brick and tile, rein.-con. flooring, concrete foundation, here. to J. M. and W. A. Elliott, Exch. Bldg., Minneapolis, $354.715. Noted March 4.

Buildings—(Continued)

★**Minn., Nashwauk**—High School—R. M. Blockburn, clk. School Dist. 9 Itasca Co., let contract building 2 story, 160 x 174 ft., rein.-con., brick and tile, rein.-con. flooring, concrete foundation, to A. C. Thomas-Guthrie Constr. Co., Guardian Life Bldg., St. Paul, $365,360. Noted March 4.

★**Mont., Deer Lodge**—Court House—Comrs. Powell Co. let contract building 3 story, 80 x 110 ft., to Nelson & Pederson, Park and Washington Sts., Butte. About $100,000. Noted Feb. 26.

★**Mont., Helena** — College — Mount St. Charles College, Capitol Hill, let contract building 5 story addition to south end of school, to F. Jacoby & Son, Helena. About $150,000. Noted Jan. 8.

★**Mo., Kansas City**—Sales and Office—Frederick Realty Investment Co., 1019 Walnut St., let general contract building 5 story, 50 x 117 ft., rein.-con., brick and terra cotta, concrete foundation, on 23rd and Grand Sts., to A. S. Hecker Co., Turkey Creek and Liberty Sts. About $150,000. Noted March 11.

★**Mo., St. Joseph** — Hospital — Missouri Methodist Hospital Assn. let contract building 5 story, rein.-con. brick and steel, steel and wood flooring, concrete foundation, to Lehr Constr. Co., 1712 Fred Ave. About $600,000; cost plus percentage basis.

★**Okla., Enid** — Mausoleum — Cemetery Assn. let contract building 2 story, 40 x 100 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to Economy Mausoleum Constr. Co., Enid. About $200,000; cost plus percentage basis.

★**Okla., Stillwater** — Library—Oklahoma A. & M. College let contract building 2 story, 50 x 145 ft., brick and concrete, rein.-con. flooring, on Main St., to Schafer & Kreipke Constr. Co., El Reno. About $150,000.

Cal., Modesto—School—Bd. Educ. received bid building school on 12th and L Sts., (general contract), from McLeran & Peterson, Hearst Bldg., San Francisco, $112,995; electrical work, from Turner Hardware Co., 902 H St., $10,250; heating, from Hoffman & Rhien, Modesto, $12,970.

Federal Government Work

PROPOSED WORK

D. C., Wash.—Gun Park Crane Runway—Spec. 4174—Bureau Yards & Docks, Navy Dept., plans to build, over Slip 5. About $4,400.

W. Va., South Charleston — Electrical Equipment—Spec. 4146—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids furnishing and installing switchboards, oil switches and barriers, busses and connections, storage battery motor generator set, transformers, disconnecting motor starters and other electrical equipment furnished by Government; also making necessary connections for complete indoor substation ready for operation at Naval Ordnance Plant, here. About $195,000; $10 deposit required for plans and spec.

S. C., Paris Island—Remodeling Quarters—Spec. 4167—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to remodel quarters for medical corps, here. About $7,600. Bids to be opened at local yard.

Ga., Savannah — Radio Buildings and Towers — Spec. 4139 — Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids, constructing at Radio Quarters, here. About $6,000; $10 deposit required for plans and spec.

Fla., Key West — Dismantle Dirigible Hangars — Spec. 4172 — Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to dismantle, here. About $25,000.

Fla., Pensacola — Additional Stowage — Spec. 4170—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install addition stowage for torpedoes, here. About $22,000.

Fla., Pensacola—Kite Balloon Hangars—Spec. 4173—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $8,000.

Tex. Ft. Worth — Deep Well Pumping Equipment—Spec. 4166—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to furnish and install, here. About $30,000.

Col., Ft. Lyon—Steel Water Tanks—Spec. 4171—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids installing elevated steel water tanks, here. About $22,000; $10 deposit required for plans and spec. Noted April 8.

P. I., Guam—Refrigerator Plant—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $40,000.

P. I., Guam—Turbo Generators, Exciters and Switchboards — Spec. 4169 — Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to furnish and deliver 200 kw. f.o.b., Mare Island, shipped by Government to Naval Sta., here, 10 kw. exciters, 775 kva. transforms, large and several small ones. About $32,000.

H. I., Kuahua — Ordnance Buildings — Spec. 4168—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to construct 5 ordnance buildings, here. About $25,200.

BIDS DESIRED

Me., Mt. Desert Island—Seawall Spec. 4132—Until April 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C. building at transmitting station, here. About $20,000; $10 deposit required for plans and spec.

N. Y., Buffalo—Cast Iron Railing Posts, etc.—Until April 26, by Supt. Lighthouses, furnishing 12 ton c.i. railing posts, stairs, cornices, window sill, etc.; advertised in this issue.

W. Va., Wheeling—American Portland Cement—Until May 8, by U. S. Engr. Office, furnishing and delivering 15,000 bbl., for Dam 27, Ohio River.

O., Cleveland—Repairing Breakwater and Placing Riprap—Until May 20, by U. S. Engr. Office, Federal Bldg., repairing rubble mound east breakwater and placing riprap in front of west breakwater, at Cleveland Harbor; advertised in this issue.

Mich., Detroit—Emergency Dam—Until May 27, by U. S. Engr. Office, 337 Federal Bldg., furnishing and building emergency dam above 3rd and 4th Locks, St. Marys Falls Canal; advertised in this issue.

Cal., San Diego—Laundry, Bakery, Refrigerating Equipment—Spec. 4114—Until April 28, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building, here. About $55,000; $10 deposit required for plans and spec.

PRICES AND CONTRACS AWARDED

(★Indicates award of contract)

★**Pa., Phila.**—Dredging—U. S. Engr. Office, 815 Witherspoon Bldg., let contract dredging Delaware River, Phila. Harbor, to Amer. Dredging Co., Mariner & Merchant Bldg., $519,639. Noted March 4.

Pa., Phila. — Seaplane Hangars — Spec. 4121—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids April 7, dismantling 3 seaplane hangars at Brunswick, Ga., and re-erecting same as 1 building, at Navy Yard, here, (1) work complete, from Hyde & Baxter, 711 14th St. N. W., Wash., D. C., (1) $58,785 (75 days), (2) $9,470 (10 days), (3) $3,250 (10 days), (4) $15,725 (20 days); Hughes Foulkrod, 1406 Commonwealth Bldg., (1) $66,360 (75 days), (2) $3,920, (3) $2,400, (4) $16,710, (5) $7.62; Stang & Mitchell, 733 Real Estate Trust Bldg., (1) $78,500, (2) $4,500 (15 days), (3) $2,500, (4) $12,500 (15 days), (5) add $12.50 deduct $5. Noted April 1.

D. C., Wash.—Grading—Dist. Comrs., 509 Dist. Bldg., received bids March 31, grading various streets, from G. B. Mullin, 3303-11th St., N. W., $1.47 per cu.yd.; E. Costigan, Colorado Bldg., $2.70 per cu.yd. Noted March 18.

★**D. C., Wash.** — Hospital, Mess Hall, Ward Building, etc.—Soldiers Home, let contract constructing hospital, mess hall, and converting ward into administration building, to Boyle-Robertson Constr. Co., Evans Bldg., $733,649. Noted April 1.

★**D. C., Wash.**—Repairing Locomotive—Bureau Yards & Docks, Navy Dept., let contract repairing, at Edgewood Arsenal, to Baldwin Locomotive Wks., Broad and Spring Garden Sts., Phila., $26,806.

★**D. C., Wash.**—Rubber Insulated Lead Covered and Armored Cable—U. S. Engr. Office, War Dept., let contract furnishing rubber insulated lead covered and armored cable, to Hazard Mfg Co., 533 Canal St., New York City, $27,303.

D. C., Wash.—Sewer Work—Dist. Comrs. received bids April 7, laying sewer, (1) excav., (2) concrete masonry in place, (3) vitr. brick masonry, (4) sewer brick masonry, from W. F. Brenizer Co., 101 New York Ave. N. E., (1) $3.60 per cu.yd., (2) $18, (3) $37, (4) $28; A. McCandlish, Wash., (1) $4, (2) $20, (3) $45, (4) $40; W. F. Cush, 3rd and R Sts. N. E., (1) $3, (2) $19.50, (3) $50, (4) $39.

Fla., Ft. Meyers—Cottage—Interior Dept., Office of Indian Affairs, Wash., D. C., received only bid April 5, furnishing material and labor building, here, from A. Motschman, 1408 Security Bldg., Chicago, $23,100 (300 days). Noted March 25.

★**Tenn., Memphis** — Watertube Boilers — U. S. Engr. Office, War Dept., Wash., D. C., let contract furnishing watertube boilers for dredging "Iota" and "B. M. Harrod," to C. Ward Eng. Wks., South Side, Charleston, W. Va., (Lot 1), $22,630, Heine Safety Boiler Co., 5319 Marcus St., St. Louis, Mo., (Lot 2), $38,000.

★**Tenn., Nashville**—Steel Lock Gates—U. S. Engr. Office, 4th and 1st Natl. Bank Bldg., let contract for steel lock gates for Lock "E" Cumberland River, to Nashville Bridge Co., foot of Shelby Ave., $28,710. Noted Feb. 26.

★**Cal., Los Angeles**—Manholes and Sewer Pipe—U. S. Engr. Office, War Dept., Wash., D. C., let contract building manholes and laying sewer, to United Dredging Co., Central Bldg., $5,999.

Cal., Mare Island—Remodeling Barracks Building—Spec. 4147—Pub. Wks. Office, received lowest 3 bids, March 31, remodeling, Bldg. 53, at Marine Reservation, Navy Yard, here, (1) work complete, from Schultz Constr. Co., 46 Kearny St., San Francisco, (1) $62,240, (2) deduct $1,110, (3) deduct $100; A. H. Vogt, 185 Stevenson St., San Francisco, (1) $72,837, (2) deduct $2,800, (3) deduct $2,000; Lange-Bergstrom, 207 Sharon Bldg., San Francisco, (1) $78,000, (2) $2,300, (3) $1,768. Noted March 25.

Cal., San Diego—Kitchen Equipment—Spec. 4097—Bureau Yards & Docks, Navy Dept., Wash., D.C., received bids April 7, installing, in 6 barracks, at Marine Corps, here, (1) work complete, from L. Barth & Sons, 32 Cooper Sq., New York City, (1) $51,407 (time as specified), (2) $42,797, (3) deduct $1,800, (4) deduct $3,610, (5) deduct $1,800; Wrought Iron Range Co., 5661 Natural Bridge Ave., St. Louis, (1) $56,276 (145 days), (2) $46,196, (3) $2,658, (4) $3,910, (5) $4,875; Hobart Mfg. Co., Troy, O., 1 machine only, $4,400. Noted March 18.

★**Cal., San Francisco**—Dredging—U. S. Engr. Office, Fair Bldg., let contract dredging off part of point from Des Rios Island and vicinity near mouth of Sacramento River, 3rd Dist., to San Francisco Bridge Co., 1005 Nevada Bank Bldg., $388,200. Noted April 8.

Miscellaneous

PROPOSED WORK

Bathing Pavilion — Rock Point, R. I. (Warwick P. O.)—Rocky Point Amusement Co. soon receives bids building 1 and 2 story, 45 x 200 ft. frame. About $50,000. H. A. Lewis, 75 Westminster St., Providence, archt.

Underground Service Connections—Central Islip, N. Y.—State Hospital Comn., Capitol, Albany, plans to install underground service connections for laundry, at State Hospital, here. About $27,000. L. F. Pilcher, state archt.

Power Line—Fillmore, N. Y.—W. L. Young, pres. Fillmore Electric Co., has taken over business of Genesee Valley Power Co. and plans to extend line to Belmont, Angelicam, Belfast, Rushford and other adjoining villages.

Dam—Inlet, N. Y.—Conservation Com., Albany, plans to build dam at foot of Sixth Lake of Fulton Chain, here. About $35,000.

Pier—New York, N. Y.—M. Hurlburt, comr. docks, Pier "A," foot of Battery Pl., rejected bids received March 29, altering pier at foot of 5th St., East River, and building new freight shed. About $120,000. Noted April 8.

Coal Pocket and Elevator—Rome, N. Y.—Kelley & Schneible, 105 Jasper St., plan to build rein.-con. coal pocket and elevator, on Canal St., to replace one recently destroyed by fire. Cost between $25,000 and $30,000.

Retaining Wall — Sonyea, N. Y. (Mt. Morris P. O.)—See "Waterworks."

Horse Stalls—Syracuse, N. Y.—Bd. Trustees State Fair, Albany, plans to build stalls for horses, on State Fair Grounds, here. About $50,000. L. F. Pilcher, state archt.

Park Improvements—Jersey City, N. J.—Park Comn. Hudson Co. plans to spend $250,000 to improve parks.

Miscellaneous (Continued)

Vault—Columbus, O.—R. W. Archer, state treas., soon lets contract building steel vault, concrete retaining walls and foundation, in State House, here. About $80,000. F. L. Packard, New Hayden Bldg., archt.

Crane—Milwaukee, Wis.—United Coal & Dock Co., 437 Bway., plans to build new coal loading crane, steel. About $200,000. Private plans.

Street Lighting Materials — Milwaukee, Wis.—Com. Pub. Wks. soon lets contract furnishing and installing streets lighting materials, including, concrete poles, cables, etc. About $200,000.

Graders—Buffalo, Minn.—E. R. Anderson, aud. Wright Co., soon lets contract furnishing 4 graders with 6 ft. blades. About $1,000.

Ornamental Lighting System—St. Paul, Minn.—H. W. Austin, city purch. agt., soon receives bids constructing ornamental lighting system, on Summit Ave. between Rice St. and Mississippi River. About $104,000.

Graders, etc.—Dallas, Tex.—C. E. Gross, aud. Dallas Co., soon lets contract for three 8 ft. graders for road work and 1 gasoline tractor with caterpillar drive, etc.

Park — Muskogee, Okla. — City voted $100,000 bonds to build athletic park. Engineer not selected. Noted April 1.

Bulkhead, etc. — Hammond, Ore. — Town voted $50,000 bonds to build bulkhead and reclamation work along Columbia River.

Breakwaters, Wharfs, Etc. — Ontario — Dominion Government, Ottawa plans to make following improvements, in Province of Nova Scotia, repairs to breakwater, Devils Island, cost $13,000, West Chezzetcooke, $15,100, reconstruct breakwater, North Ingonish, $11,000, harbor improvements, Inverness, $12,000, wharf, Sydney, $100,000; Province of Quebec, wharf—Anse aux Gascons, $36,000, North Temiskaming, $13,000, Grosse Isle, Quarantine Sta., $50,000, Pointe Pizeau, Sillery, $13,000, St. Ann de Beaupre, $30,000, St. Famille, $17,000, St. Francis Sud, $33,000, St. Jean d'Orleans, $31,000, St. Laurent, Island of Orleans, $21,000, St. Michel de Bellechasse, $36,000 Sorel, $10,400; piers—Grande Riviere, $12,900, Pointe Shea. Amherst, $10,000; harbor improvements—Rimouski, $13,000; Province of Ontario—breakwaters, Collingwood $50,000, Port Colborne, $66,500, wharfs—Kagawong, $12,000, Oshawa, $15,000, pier—Rondeau, $17,000, harbor improvements, Port Stanley, $19,000; Province of British Columbia—improving lower Fraser River, $25,000, wharfs—Kincolith, $11,000, Powell River, $11,000; Province of Prince Edward Island, boat harbor—North Lake, $27,000, breakwater—Souris, $40,000; Province of New Brunswick, repairing breakwaters and pier —Cape Bald, $10,000, repairing breakwaters, Petit Rocher, $15,000, Shippigan Gully, $12,000, reconstructing breakwaters and repairing pier, Quaco (St. Martin's), $22,000. E. Lafleur, c/o Dept. Pub. Wks., Ottawa, engr.

Dash Wheel and Pit, etc.—Chatham, Ont.—J. St. Pierre, R.R. 1, Bear Line, soon lets contract building dash wheel, concrete wheel pit and brick pumphouse in connection with land reclamation work, here, for Dover Twp. Cost between $15,000 and $25,000. W. C. McGeorge, ch. engr.

BIDS DESIRED

Bituminous Material—Albany, N. Y.—Until May 3. by F. S. Greene, state highway comr., Capitol, Albany, furnishing and delivering bituminous materials, f.o.b. cars, at destination; advertised in this issue.

Asphalt Road Oil—New York, N. Y.—Until April 22, by H. Bruckner, pres. Bronx Boro., furnishing and delivering 200,000 gal. asphalt road oil.

Tractor, etc.—St. George, S. I. N. Y.—Until April 19, by C. D. Van Name, pres. Richmond Boro., furnishing and delivering 1 automobile tractor, capacity ¾ ton with semi rail, one 5 ton and one 2½ ton automobile trucks, one 4 door, 5 passenger Sedan automobile.

Piers—Stapleton, S. I. N. Y.—Until April 22, by M. Hurlburt, comr. docks, Pier "A," foot of Battery Pl., New York City, furnishing labor and material building at individual prices one of Piers 17 and 18, Richmond Boro., here.

Road Roller, Wilmington, Del.—Elder & Co., Ford Bldg., receiving bids furnishing 10-ton road roller.

Power Plant Equipment—Kinston, N. C.—Until May 11. by J. Dawson, mayor, and City Council, for power plant equipment. W. B. Coleman, clk. W. C. Olsen, Sumter, S. C., consult. engr.; advertised in this issue

Equipment — Cedar Rapids, Ia. — Until May 15, by Bd. Educ., furnishing mechanical equipment for domestic science laboratories for each of 4 high schools. About $100,000 each.

Motor Truck and Combined Sprinkler and Road Flusher—Buhl, Minn.—Until April 19, by F. J. Demel, village clk., furnishing one 5 ton motor truck and power driven combined sprinkler and road flusher.

Mechanical Equipment—Owatonna, Minn.—Until May 1, by J. H. Dinsmore, clk. Bd. Educ., furnishing mechanical equipment for high school. About $150,000. F. Tustison, 355 Auditorium Bldg., Minneapolis, engr.

Tripley Plunger Pump — Red Lake Falls, Minn.—Until April 26, by City Council, furnishing 6 x 8 single acting triplex plunger pump of capacity to pump 175 gal. per min. against 150 lb. pressure or 350 ft. elevation. J. Perrault, city clk.

Crushers—Breckenridge, Tex.—Until April 21, by E. E. Coulee, aud. Stephens Co., furnishing 2 portable and 1 semi-portable rock crushers, including power, screens, conveyors, elevators, compressors and drills to operate each crusher (as separate unit).

Wharf—Little Current, Ont.—Until April 29, by Dept. Pub. Wks., Ottawa, rebuilding wharf, 300 ft. long, 16 ft. wide, rein.-con., pilework foundation, filling rear with earth and stone. About $44,000. E. Lafleur, c/o Dept. Pub. Wks., Ottawa, engr.

Combustion Engines, Generators, etc.—Moosomin, Sask.—Until May 5, by G. S. Page, town clk., for supply delivery and erection of combustion engines, (b) generators, exciters, switch-board, street lighting apparatus, transformers, meters etc. (c) supply and delivery of one oil storage tank, (d) pole, wire and line material, (e) erection of electric line pole, (f) erection of power station and cooling chamber. Murphy & Underwood, Saskatoon, consult. engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Water Meters—Boston, Mass.—City received bids furnishing six thousand ¾ in., twenty-five 1 in., twenty-five 1½ in., twenty 2 in. and ten ¾ in. water meter, from Worthington Pump Co., Tremont Bldg., $54,300; Gamon Meter Co., $54,700; Pittsburgh Meter Co., East Pittsburgh, $60,618.

Heating and Ventilating—Brooklyn, N. Y.—Bd. Educ., 500 Park Ave., New York City, received lowest 3 bids April 9, installing heating and ventilating apparatus, in P.S. 20, here, from Gillis & Goeghagan, 537 Bway., $155,994; W. J. Olvany, 177 Christopher St., $157,261; D. J. Rice, 42nd St. and Lexington Ave., $157,285. Contractors all of New York City.

Heating and Ventilating Apparatus—Brooklyn, N. Y.—Bd. Educ., 500 Park Ave., New York City, received lowest 3 bids April 5, installing heating and ventilating apparatus in P. S. 91, from Gillis & Goeghagan, 537 West Bway., $58,700; W. J. Olvany, 177 Christopher St., $59,962; D. J. Rice, 42nd St. and Lexington Ave., $62,690. Contractors all of New York City.

★Manhole Heads and Covers—Brooklyn, N. Y.—E. Riegelmann, boro. pres., let contract furnishing and delivering manhole heads and covers for 1920, to Flockhart Fdry. Co., 60 Polk St., Newark, N. J., $9,378. Noted March 11.

★Road Materials—Brooklyn, N. Y.—E. Riegelmann, boro. pres., let contract furnishing and delivering 2,000 cu.yd. broken stone, to J. J. Guinan, 2314 Gravesend Ave., $6,600; 60,000 wood paving blocks, to Amer. Creosoting Co., 17 Battery Pl., New York City, $4,411; 2,000 cu.yd. sand grit, to G. Eaton, 231 Pearl St., $6,660. Noted April 1.

★Limestone Dust—New York, N. Y.—H. H. Curran, pres. Manhattan Boro., let contract furnishing and delivering 3,000 tons limestone dust, to New York Trap Rock Corp., 17 Battery Pl., $29,160. Noted April 1.

Refined Asphalt—New York, N. Y.—H. H. Curran, pres. Manhattan Boro., received bids April 6, furnishing and delivering 450,000 gal. refined asphalt, from Standard Oil Co., 26 Bway., $47,025, Warner-Quinlan Co., 79 Wall St., $56,250. Noted April 1.

★Road Materials—New York, N. Y.—H. Bruckner, pres. Bronx Boro., let contract furnishing and delivering motor gasoline, to Standard Oil Co., 26 Bway., $2,130; 5,500 cu.yd. asphalt wearing surface sand, to C. W. Crane, $8,250. Noted April 1.

Piers—Stapleton, S. I., N. Y.—M. Hurlburt, comr. docks, Pier "A," foot of Battery Pl., New York City, received bids April 6. building (a) Pier 12, (b) Pier 13, from Smith, Hauser & MacIsaacs, 18 East 41st St., (a and b) $2,288,089; Snare & Triest. 8 West 40th St., (b) $1,272,596; G. B. Stearin, 90 West, St., (b) $1,328,315. Contractors all of New York City. Noted March 25.

★Water Meters—Watertown, N. Y.—Bd. Water, Light & Power let contract for nine hundred ⅝-in. water meters, ¾-in. connections, forty 1-in. and sixty ¾-in. meters, to Neptune Meter Co., 50 East 42nd St., New York City, and Pittsburgh Meter Co., East Pittsburgh. Total cost, $11,540.

★Sand and Gravel—Baltimore, Md.—State Bd. Awards let contract furnishing sand and gravel, to Arundel Corp., 1515 Fidelity Bldg. About $50,000. Noted March 18.

★Motor Trucks—Cleveland, O.—E. Shattuck, city purch. agt., let contract furnishing five 5 ton motor trucks with dump bodies, to White Co., East 79th St. and St. Clair Ave., $25,520. Noted March 18.

★Street Sweepers—Cleveland, O.—City let contract furnishing 5 street sweepers. to Elgin Sales Corp., 37 West Van Buren St., Chicago. About $27,800. Noted Feb. 26.

Ornamental Lighting System—St. Paul, Minn.—H. W. Austin, city purch, agt., received bids constructing ornamental lighting system on University Ave. between Rice and Emerald Sts., from Electric Constr. Co., 174 East 6th St., Minneapolis, $109,500; Kelley Constr. Co., 314 South Barstow St., Chippewa Falls, Wis., $118,939; J. G. Robertson. University Ave. and Eustis St., $123,509.

★River Protection — Fulton, Ark. — Missouri Pacific R.R., Ry. Exch. Bldg., St. Louis, let contract furnishing material and equipment building 3,000 ft. river protection on south side Red River, here, to Mastson Constr. Co., Kansas City; cost plus percentage basis. Balance of work will be done by day labor. Total cost $60,000.

★Spray Pond and Cooling System—Dallas, Tex.—Dallas Power & Light Co., Interurban Bldg., will excavate and build concrete spray pond and cooling system, involving about 25,000 cu.yd. mass concrete, also install necessary pipes. About $107,000. Work will be done by day labor.

★Pier—Portland, Ore.—City let contract building Pier 5, involving 84,000 lin.ft. wood pile driving, 70,000 lin.ft. sheet timber piling in place, 25,000 lb. dock iron in place, 12,000 cu.yd. riprap in place, etc., to A. Guthrie & Co., Sherlock Bldg., $37,865.

Slide Gates and Valves—San Francisco, Cal.—Bd. Pub. Wks. received bids furnishing and delivering 33 x 42 in. slide gates for Hetch Hetchy Dam, from Coffin Valve Co., Neponset St., Boston, $175,000 plus $8,50 per day for foreman's services, J. Hendy Co., 75 Fremont St., $197,398 plus $12 per day for foreman's services. Moore Shipbuilding Co., foot Adeline St., Oakland, $210,000 plus $25 per day for foreman's services; six 3 ft. balanced valves, according to designs by (a) board, (b) bidder, from J. Hendy Iron Wks., (a) $104,693 plus $15 per day for foreman's services, W. Cramp & Sons, Richmond and Norris Sts., Phila., (b) $98,500 plus $15 per day for foreman's services. Noted Feb. 5.

★Valves—San Francisco, Cal.—Bd. Pub. Wks. let contract furnishing and delivering 5 ft. balanced valves for outlet system of Hetch Hetchy Dam (Contr. 68), to W. Cramp & Sons, Richmond and Norris Sts., Phila., $173,100 and $15 per day for foreman's services. Noted March 25.

Tunnel—Montreal, Que. — Administrative Comn. received bids widening St. Denis St. tunnel from Atlas Constr. Co., 37 Belmont St., $49,982; Filion Bros., 2419 Denis St., $59,500; J. Lessard, Montreal. $63,598.

OFFICIAL PROPOSALS

Bids: April 27.

Reconstruction of Pavements

PENNSYLVANIA STATE HIGHWAY DEPARTMENT

Harrisburg, Pa.

Sealed proposals will be received at the State Capitol until 10 a.m., April 27, 1920, when bids will be publicly opened and scheduled, and contracts awarded as soon thereafter as possible, for the reconstruction of the following pavements: 29,525 feet of either Bituminous Surface Course on a Concrete Foundation or Reinforced Concrete; also 18.161 feet of either bituminous Surface Course on a Concrete Foundation or Reinforced Concrete in Crawford County; 35,492 feet of either Bituminous Surface Course on a Concrete Foundation or Reinforced Concrete; also 21,268 feet of Reinforced Concrete in Erie County; 15,323 feet of Reinforced Concrete and Hillside Vitrified Brick in Fayette County; 3,007 feet of Reinforced Concrete in Huntingdon County; 1.684 feet of Vitrified Brick in Jefferson County; 72.096 feet of Reinforced Concrete in Lycoming and Tioga Counties; 53,613 feet of Bituminous Surface Course on a Concrete Foundation-Bituminous Macadam (Penetration Method) on a Telford or Broken Stone Foundation-Reinforced Concrete-Vitrified Brick in Schuylkill County; 50,025 feet of Reinforced Concrete and Hillside Vitrified Brick in Venango County; 16,137 feet of Reinforced Concrete in Washington County, and 4,136 feet of Bituminous Surface Course on a Concrete Foundation in York County.

Bidding blanks and specifications may be obtained free and plans upon payment of $2.50 per set, upon application to the State Highway Department, Harrisburg. No refund for plans returned. They can also be seen at office of State Highway Department, Harrisburg; 1001 Chestnut Street, Philadelphia, and 904 Hartje Building, Pittsburgh, Pa.

LEWIS S. SADLER.
State Highway Commissioner.

Bids: Apr. 27.

Construction of Guide Walls, Etc.

CONTRACT 193

Marbletown, N. Y.

Sealed bids will be received by the Board of Water Supply, at its offices, twenty-second floor, Municipal Building, Park Row, Centre and Chambers streets, New York City, until 11 a.m., on Tuesday, April 27, 1920, for Contract 193, for the construction of masonry guide walls and doing miscellaneous work at the Ashokan spillway, in the Town of Marbletown, Ulster county, New York, all as set forth in the specifications.

At the above place and time the bids will be publicly opened and read. Pamphlets containing information for bidders and contract drawing can be obtained at the above address, at the office of the Secretary, by depositing the sum of ten dollars ($10) in cash or its equivalent for each pamphlet. For further particulars apply to the office of the Chief Engineer at the above address.

JOHN. F. GALVIN,
President.
CHARLES N. CHADWICK,
L. J. O'REILLY,
Commissioners, Board of Water Supply.
BENJ. F. EINBIGLER, Secretary

The publication of an advertisement on this page is an official notice that bids are wanted from other than local bidders.

It is also a guarantee that maximum competition is invited because Engineering News-Record is the *one* nationally recognized medium for Proposal advertising. Its Searchlight Section is read each week by nearly every worth-while contractor in this country who bids on public work outside his own city.

Official Proposals reaching our office in first mail Wednesday morning (9 o'clock) can usually be published in the issue out the next day. Special price for Official Proposals, $3.60 an inch.

Bids: Apr. 26.

Grading, Draining and Paving

LITTLE ROCK-PULASKI ROAD IMPROVEMENT DISTRICT
NO. 10

Little Rock, Ark.

Notice is hereby given that sealed bids will be received by the Commissioners of Little Rock-Pulaski Road Improvement District No. 10, until 10 A.M., Monday, April 26, 1920, at the office of the State Highway Commission, Little Rock, Arkansas, at which time they will be publicly opened and read, for the construction of approximately 55 miles of streets and roads included in Sections 1 and 2 of the District. The work to be done under this contract is the grading, draining and paving of the Crystal Hill Road, the Conway Road, and the Alexander Road, each of which radiates from the city of North Little Rock.

Bids will be received on the following types of paving: asphaltic concrete or Warrenite on a rolled stone base or a concrete base and plain concrete pavement. Bids will also be for grading, concrete culverts and bridges, bridge piers, vitrified tile or concrete pipe culverts, or concrete curb and gutter, and for concrete binder curbs; furnishing, hauling and placing stone for construction of rolled stone base and all other items that would enter into the construction of the above described roads and streets.

Estimats, plans and specifications may be secured from the Engineers for the District for a deposit of $30, half of which will be returned when the plans are returned in good condition. Plans may be examined at the office of the Board or at the office of the State Highway Commission, or at the office of the Engineers, 527 Southern Trust Bldg., Little Rock, Arkansas.

Detailed estimates and forms for bidding may be obtained from the Engineers upon request and without cost. All persons desiring to bid on this work must deliver to B. Bodemann, Secretary of the District, a certified check or Little Rock exchange issued by some bank of Pulaski County, Arkansas, payable to B Bodemann, Secy., for the sum of $25,000. This check must be filed with the Secretary at the Peoples Savings Bank, 124 Main Street, Little Rock, Arkansas, forty-eight hours in advance of the time of opening bids, as a guarantee that the bidder will execute a bond satisfactory to the Commissioners for 25% of the amount of contract awarded him within 10 days after receiving notice of said award. This bidder's check will authorize the bidder to bid on all or any part of the work offered for contract by the District at this time The Commissioners reserve the right to accept or reject any part of any bid or to accept or reject any and all bids and to waive all informalities.

LITTLE ROCK-PULASKI ROAD
IMPROVEMENT DISTRICT NO. 10.
J. R. ALEXANDER, Chairman.
B. BODEMAN, Secretary.
LUND & HILL, Engineers,
527 Southern Trust Bldg.,
Little Rock.

Bids: April 22.

Construction of Highway Bridge

Massena, New York.

Sealed proposals will be received at the office of the Town Clerk of the Town of Massena, New York, until 2:00 p.m., on April 22nd, 1920, and at that time publicly opened and read, for furnishing of all materials, equipment and labor necessary to construct a highway bridge over the Grasse River in the Town of Massena, New York.

The bridge will consist of a riveted steel cantilever superstructure with concrete substructure. The superstructure will be seven hundred and sixty-five (765) feet long, consisting of two anchor arms, each one hundred and fifty-seven and one-half (1157.5) feet long; two cantilever arms, each one hundred and twelve and one-half (112.5) feet long and a suspended span, two hundred and twenty-five (225) feet long.

The bridge wil have one roadway, eighteen feet wide, paved with wood blocks, and two sidewalks, each six feet wide, with concrete floors.

The substructure will consist of two concrete piers each about fifty feet high over all, and two concrete abutments about twenty-two feet high over all.

The work will also require the grading of the approaches.

Proposals will be received for the substructure and superstructure separately.

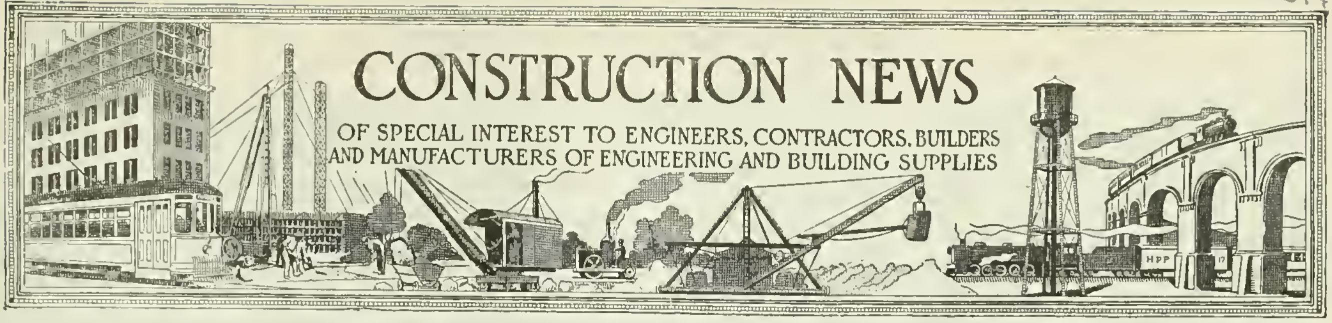
Plans and specifications may be had at the office of the Town Board or of the Consulting Engineers, the Jarrett-Chambers Company, No. 30 East 42nd Street, New York City, upon deposit of ten dollars for superstructure plans or five dollars for substructure plans, which will be refunded when the plans are returned.

A certified check, payable to the Town Board of Massena, New York, shall be enclosed with each proposal. Checks accompanying proposals for the superstructure shall be for the sum of ten thousand dollars. substructure shall be for three thousand dollars.

The right is reserved to reject any or all proposals or to waive any informality in the proposals received.

ANDREW J. HANMER, Supervisor
FRANK A. HOUGH, Town Clerk.
Massena, N Y.

JARRETT-CHAMBERS CO.,
Engineers, New York.



CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

PROPOSALS

"For proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Apr. 27	Newark, N. J.	Apr. 1
Apr. 27	Billings, Mont.	Apr. 8
Apr. 28	Scarboro, Ont.	Apr. 15
Apr. 28	Akron, O.	Apr. 22
Apr. 30	Wilder, Idaho	Apr. 15
May 1	Montreal North, Que.	Mar. 18
May 4	Charleston, S. C.	Apr. 15
May 5	Tonawanda, N. Y.	Apr. 15
May 7	Preston, Idaho Adv. Apr. 8 and 15.	Apr. 8
May 15	Seattle, Wash.	Apr. 15
May 15	Drummondsville, Que.	Apr. 22
May 17	Pontiac, Mich. Adv. Apr. 8 and 15.	Apr. 8

SEWERS

Bids Close		See Eng. News-Record
Apr. 26	Allentown, Pa.	Apr. 22
Apr. 27	Potomac, Va. Adv. Apr. 1 and 8.	Apr. 8
Apr. 27	Columbus, O.	Apr. 15
Apr. 27	Hoboken, N. J.	Apr. 22
Apr. 28	Milwaukee, Wis.	Apr. 22
Apr. 28	Portland, Ore. Adv. Mar. 25.	Mar. 25
Apr. 28	Des Moines, Ia.	Apr. 22
Apr. 29	Viroqua, Wis. Adv. Apr. 8.	Apr. 8
Apr. 29	Poughkeepsie, N. Y. Adv. Apr. 15.	Apr. 15
Apr. 30	Detroit, Mich.	Apr. 15
May 3	Decatur, Ill. Adv. Apr. 15 and 22.	Apr. 15
May 3	Mt. Union, Pa.	Apr. 22
May 4	Thief River Falls, Minn. Adv. Apr. 15 and 22.	Apr. 15
May 5	Portland, Ore. Adv. Mar. 25.	Mar. 25
May 10	Haddonfield, N. J.	Apr. 22
May 12	Hagerstown, Md.	Apr. 22
June 3	Milwaukee, Wis. Adv. Apr. 15 and 22.	Apr. 15

BRIDGES

Bids Close		See Eng. News-Record
Apr. 26	Scranton, Pa.	Apr. 22
Apr. 27	Oregon	Apr. 22
Apr. 27	Gilboa, N. Y. Adv. Mar. 25 to Apr. 15.	Apr. 8
Apr. 27	Trenton, N. J. Adv. Apr. 15 and 22.	Apr. 15
Apr. 27	Whitby, Ont.	Apr. 22
Apr. 28	Neponset (Boston P. O.), Mass.	Apr. 15
Apr. 28	Illinois	Apr. 22
Apr. 29	Philadelphia, Pa.	Apr. 22
Apr. 30	Farnham, Que.	Apr. 22
May 3	Columbus, O.	Apr. 8
May 3	Grand Rapids, Minn.	Apr. 8
May 4	Ft. Wayne, Ind.	Apr. 22
May 4	Clarksdale, Miss. Adv. Apr. 22.	Apr. 22
May 5	Belleville, Kan.	Apr. 22
May 5	Paterson, N. J. Adv. Apr. 15 and 22.	Apr. 15
May 5	Ontario	Apr. 22
May 6	Boston, Mass.	Apr. 22
May 11	Detroit, Mich.	Apr. 15
May 11	Blue Ridge, Ga.	Apr. 22
May 24	Danville, Ill.	Apr. 22

STREETS AND ROADS

Bids Close		See Eng. News-Record
Apr. 26	Beckley, W. Va.	Apr. 22
Apr. 26	Johnstown, Pa.	Apr. 22
Apr. 26	Montana	Apr. 22
Apr. 26	Halifax, N. C.	Apr. 22
Apr. 26	Oshawa, Ont.	Apr. 22
Apr. 26	Chaska, Minn.	Apr. 22
Apr. 26	New York, N. Y.	Apr. 22
Apr. 26	St. George, S. I., N. Y.	Apr. 22
Apr. 27	Algona, Ia. Adv. Apr. 22.	Apr. 22
Apr. 27	Corning, N. Y. Adv. Apr. 22.	Apr. 22
Apr. 27	Trenton Jct., N. J.	Apr. 15
Apr. 27	Mora, Minn.	Apr. 15
Apr, 27	Michigan	Apr. 15
Apr. 27	Ivanhoe, Minn.	Apr. 1
Apr. 27	Randolph, Wis.	Apr. 15
Apr. 27	Detroit, Mich.	Apr. 22
Apr. 27	L'Epiphany, Que.	Apr. 22
Apr. 27	Jersey City, N. J.	Apr. 22
Apr. 27	Wisconsin	Apr. 22
Apr. 27	Hastings, Minn.	Apr. 1
Apr. 27	Pennsylvania Adv. Apr. 8 and 15.	Apr. 8
Apr. 27	Meadville, Pa. Adv. Apr. 8-22.	Apr. 8
Apr. 27	St. Louis, Mo.	Apr. 22
Apr. 28	Birmingham, Ala.	Apr. 8
Apr. 28	Orange, Tex.	Apr. 15
Apr. 28	Brooklyn, N. Y.	Apr. 22
Apr. 28	Des Moines, Ia.	Apr. 22
Apr. 28	Illinois	Apr. 22
Apr. 29	Kitchener, Ont.	Apr. 22
Apr. 29	Wisconsin	Apr. 22
Apr. 29	Atlantic City, N. J. Adv. Apr. 22.	Apr. 22
Apr. 30	Anoka, Minn.	Apr. 22
Apr. 30	Indiana	Apr. 22
Apr. 30	Ft. Wayne, Ind.	Apr. 8
Apr. 30	Hillsboro, Tex.	Apr. 22
Apr. 30	Wisconsin	Apr. 22
Apr. 30	El Dorado, Ark. Adv. Apr. 8-22.	Apr. 8
Apr. 30	Leamington, Ont.	Apr. 15
Apr. 30	Ilion, N. Y. Adv. Apr. 22.	Apr. 22
Apr. 30	Ashley, N. D.	Apr. 22
May 1	Lancaster, O.	Apr. 1
May 1	Ritzville, Wash.	Apr. 15
May 1	Montreal West, Que.	Apr. 22
May 3	Grand Rapids, Mich.	Apr. 1
May 3	Fayetteville, W. Va. Adv. Apr. 15 and 22.	Apr. 15
May 3	Kingsville, Tex. Adv. Apr. 15.	Apr. 15
May 3	California	Apr. 15
May 3	California	Apr. 22
May 3	Indiana	Apr. 22
May 3	Point Pleasant, W. Va.	Apr. 22
May 3	Red Wing, Minn.	Apr. 22
May 3	Nevada	Apr. 22
May 3	Kingsville, Tex.	Apr. 22
May 4	Ft. Scott, Kan.	Apr. 22
May 4	Cando, N. D.	Apr. 22
May 4	Indiana	Apr. 22
May 4	Fergus, Falls, Minn.	Apr. 15
May 4	Thief River Falls, Minn.	Apr. 15
May 4	Mantorville, Minn.	Apr. 1
May 4	Lorain, O.	Apr. 8
May 4	Michigan	Apr. 22
May 4	Little Rock, Ark. Adv. Apr. 22.	Apr. 22
May 4	Cumberland, W. Va.	Apr. 22
May 4	Walker, Minn.	Apr. 22
May 5	El Dorado, Ark. Adv. Apr. 8-22.	Apr. 8
May 5	Grand Rapids, Mich.	Apr. 1
May 5	New York Adv. Apr. 15 and 22.	Apr. 15
May 5	Ft. Wayne, Ind.	Apr. 22
May 5	Tennessee	Apr. 22
May 5	Clinton, Ont.	Apr. 22
May 5	Maine Adv. Apr. 22.	Apr. 22
May 5	Indiana	Apr. 22
May 5	Clayton, Mo.	Apr. 22
May 6	Ithaca, N. Y. Adv. Apr. 22.	Apr. 22
May 6	Glenwood, Minn.	Apr. 15
May 6	North Bergen (Weehawken P. O.), N. J.	Apr. 22
May 10	Oakland, Md.	Apr. 22
May 10	Douglas, Ariz. Adv. Apr. 15 and 22.	Apr. 15
May 10	Lebanon, Pa. Adv. Apr. 22.	Apr. 22
May 10	Oil City, Pa.	Apr. 22
May 10	Sea Bright, N. J.	Apr. 22
May 10	Montgomery, Ala.	Apr. 22
May 10	Freehold, N. J. Adv. Apr. 22.	Apr. 22
May 11	Maine Adv. Apr. 22.	Apr. 22
May 11	Pennsylvania Adv. Apr. 22.	Apr. 22
May 11	Indiana	Apr. 22
May 11	St. Catharines, Ont.	Apr. 22
May 11	Blue Ridge, Ga.	Apr. 22
May 12	Scituate (North Scituate P. O.), R. I. Adv. Apr. 2.	Apr. 22
May 14	Mt. Holly, N. J.	Apr. 22
May 18	Union, W. Va.	Apr. 22

EXCAVATION AND DREDGING

Bids Close		See Eng. News-Record
Apr. 26	Somerville, Tenn.	Apr. 22
May 18	Rochester, N. Y. Adv. Apr. 22.	Apr. 22

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
Apr. 26	Mattapan (Boston P. O.) Mass.	Apr. 22
Apr. 26	Merion, Pa.	Apr. 22
Apr. 27	Emmetsburg, Ia.	Apr. 22
Apr. 30	South Boston (Boston P. O.), Mass.	Apr. 1
Apr. 30	Chelsea (Boston P. O), Mass.	Apr. 22
May 2	Albany, N. Y.	Apr. 22
May 3	Sioux City, Ia.	Apr. 22
May 18	Morris Plains, N. J.	Apr. 22
May 18	Phila., Pa.	Apr. 22
Sept. 1	Hutchinson, Kan.	Feb. 19

BUILDINGS

Bids Close		See Eng. News-Record
Apr. 26	Brooklyn, N. Y.	Apr. 22
Apr. 26	New York, N. Y.	Apr. 22
Apr. 26	Wilkes-Barre, Pa.	Apr. 22
Apr. 27	Hibbing, Minn.	Apr. 1
Apr. 27	Maynard, Ia.	Apr. 15
Apr. 28	Lancaster, Wis.	Apr. 15
Apr. 28	Brooklyn, N. Y.	Apr. 15
Apr. 28	Mt. Carmel, Ill.	Apr. 22
Apr. 28	Hancock, Minn.	Apr. 22
Apr. 28	Lancaster, Wis.	Apr. 22
Apr. 29	Forest Grove, Ore.	Apr. 22
Apr. 29	Greene, Ia.	Apr. 15
Apr. 29	Cleveland, O.	Apr. 22
Apr. 30	Olivia, Minn.	Apr. 22
Apr. 30	Northfield, Minn.	Apr. 8
Apr. 30	Jamaica, N. Y.	Apr. 22
Apr. 30	Ridgway, Ont.	Apr. 22
Apr. 30	Cleveland, O.	Apr. 22
Apr. 31	Winthrop (Boston P. O.), Mass.	Apr. 15
May 1	Birmingham, Mich	Apr. 22
May 1	Racine, Wis.	Apr. 1
May 1	Cleveland, O.	Apr. 15
May 1	Lakewood, (Cleveland P. O.) Ohio	Apr. 22
May 1	Morgantown, W. Va.	Apr. 22
May 1	Redford, Mich.	Apr. 22
May 1	Detroit, Mich.	Apr. 22
May 3	Cleveland, O.	Apr. 15
May 3	Flint ,Mich.	Apr. 22
May 3	Altoona, Pa.	Apr. 22
May 3	Elkins Park, Pa.	Apr. 22
May 3	Minneapolis, Minn.	Apr. 22
May 3	Wichita, Kan.	Apr. 22
May 4	Mountain Lakes, N. J.	Apr. 22
May 5	Sarnia, Ont.	Apr. 22
May 10	Columbus, O.	Apr. 22
May 11	Sonyea, N. Y. Adv. Apr. 8-22.	Apr. 8
May 12	La Crosse, Wis.	Apr. 22
May 14	Youngstown, O.	Apr. 22
May 15	Bemidji, Minn.	Apr. 22
May 15	Montreal, Que.	Apr. 22
May 15	Wauwatosa, Wis.	Apr. 22

FEDERAL GOVERNMENT WORK

Bids Close		See Eng. News-Record
Apr. 27	Steel Bars—Wash., D. C.	Apr. 8
Apr. 28	Buoys—Spec. 4068—Yorktown, Va.	Apr. 8
Apr. 28	Track Scale—Wash., D. C.	Apr. 8
Apr. 28	Steel Water Tanks, Spec. 4171, Ft. Lyon, Col.	Apr. 22
Apr. 28	Radio Buildings and Towers, Spec. 4139, Savannah, Ga.	Apr. 22
Apr. 28	Laundry, Bakery, Refrigerating Equipment — Spec. 4114—San Diego, Cal.	Apr. 15
Apr. 28	Storehouses, Garage and Quarters — Spec. 4048 — Keyport, Wash.	Apr. 1
Apr. 29	Removing and Rebuilding Breakwaters — Milwaukee, Wis. Adv. Apr. 8-22.	Apr. 1

Bids Close		See Eng. News-Record
May 1	Power House — Cypress, Ind. Adv. Apr. 8-22.	Apr. 8
May 3	Bridge—Alaska Adv. Jan. 22.	Jan. 22
May 5	Dredging — Port Huron, Mich. Adv. Apr. 8-22.	Apr. 8
May 7	Changes and Repairs, Cincinnati, O.	Apr. 22
May 8	American Portland Cement —Wheeling, W. Va.	Apr. 15
May 10	Officers' Quarters, Savannah, Ga. Adv. Apr. 22.	Apr. 22
May 12	Dwelling—Pocasset, Mass.	Apr. 22
May 19	River Wall Power Plant, Machinery, etc., Cincinnati, Ohio Adv. Apr. 22.	Apr. 22
May 20	Stone Riprap, Detroit, Mich. Adv. Apr. 22.	Apr. 22
May 20	Repairing Breakwater and Placing Riprap—Cleveland, O. Adv. Apr. 15.	Apr. 15
May 25	Rubble Mound Jetty and Pierhead, Cleveland, O.	Apr. 22
May 27	Emergency Dam—Detroit, Mich. Adv. Apr. 15.	Apr. 15
June 1	Hydraulic Turbines, Florence, Ala. Adv. Apr. 22.	Apr. 22

MISCELLANEOUS

Apr. 27	Guide Walls—Marbletown, N. Y. Adv. Apr. 8.	Apr. 8
Apr. 27	Steel—New Orleans, La. Adv. Apr. 8.	Apr. 8
Apr. 28	Cast Iron Pipe, Binghamton, N. Y.	Apr. 22
Apr. 29	Heating and Ventilating System—Lorain, O. Adv. Apr. 8.	Apr. 8
Apr. 29	Wharf — Little Current, Ont.	Apr. 15
May 1	Mechanical Equipment—Owatonna, Minn.	Apr. 15
May 1	Lighting System, Montreal West, Que.	Apr. 22
May 3	Bituminous Material—Albany, N. Y. Adv. Apr. 15 and 22.	Apr. 15
May 3	Dressel Oil Engines, Generators and Exciters — Chicago, Ill. Adv. Apr. 22.	Apr. 22
May 4	Iron Fence — Fulton, N. Y. Adv. Apr. 22.	Apr. 22
May 5	Combustion Engines, Generators, etc.—Moosomin, Sask.	Apr. 15
May 11	Power Plant Equipment—Kinston, N. C. Adv. Apr. 15.	Apr. 15
May 12	Turbine Pump and Gasoline Engine, Pembroke, Ont.	Apr. 22
May 15	Equipment—Cedar Rapids, Ia.	Apr. 15
May 18	Electrical Work, etc., Brooklyn, N. Y. Adv. Apr. 22.	Apr. 22
May 25	Plumbing and Electrical Work—Phila, Pa.	Apr. 22

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. Y., Huntington—Village plans to improve waterworks system. About $450,000. Johnson & Benham, 150 Nassau St., New York City, consult. engrs.

N. Y., New York—Dept. Pub. Welfare, Municipal Bldg., rejected bids received April 5, furnishing labor and material building and completing water supply system, for 21 buildings at Sea View Hospital, Farm Colony, Richmond Boro. B. S. Coler, comr. Noted April 15.

N. Y., Scarsdale—Village plans to improve waterworks system. About $200,000. Johnson & Benham, 150 Nassau St., New York City, consult. engrs.

Va., Culpepper—City having surveys and estimates made for water works system, to include small filtration plant, coagulating basin with immediate c.i. piping, and probably 1½ mi. c.i. raw water line. Diehl & Vance, Virginia-Carolina Bldg., Norfolk, engrs.

S. C., Anderson—Equinox Mills plan to install waterworks and sewerage system. Cost to exceed $25,000. J. E. Sirrine, Greenville, engr.

S. C., Anderson—Gluck Mills plan to install waterworks and sewerage system Cost to exceed $25,000. J. E. Sirrine, Greenville, engr.

Mich., Springwells—Village having surveys made by G. Jerome, engr., 1331 Majestic Bldg., Detroit, for waterworks system, to include 4 mi. 6-8 in. c.i. water mains. About $100,000.

S. D., Belle Fourche—City having plans prepared constructing 10 mi. 8-12 in. wood stave water pipe line. Gupe & Walters, 312 Karbach Blk., Omaha, engrs. About $175,000.

N. D., Bismarck—City having plans prepared building waterworks system. About $225,000. T. R. Atkinson, city engr.

N. D., Dickinson—City plans to build brick addition to pump house, concrete reservoir, 1,000,000 gal. capacity, air compressors and boiler plant. About $40,000.

N. D., Grafton—See "Sewers."

Tex., Big Springs—City retained H. Elrod Eng. Co., engrs., Interurban Bldg., Dallas, to prepare plans rebuilding waterworks system, to include building pumping plant and reservoir. About $40,000.

Tex., Dallas—City voted $400,000 bonds to extend waterworks system. G. D. Fairtrace, city engr.

Idaho, Buhl—City plans to lay 21,500 ft. c.i. mains and repair concrete lined reservoir. About $125,000. E. J. Baird, Buhl, engr.

Ore., Enterprise—City soon lets contract building waterworks system to include supply main, reservoir and distributing system. O. J. Roe, recdr.

Cal., Long Beach—City plans to build 100 ft. well and concrete pipe line between reservoir and wells, first 150 ft. to have 26 in. concrete casing. About $100,000. Work will probably be done by day labor. H. C. Waughop, city clk. Noted Feb. 12.

Que., Sherbrooke—City soon receives bids extending waterworks. About $277,000.

Ont., London — E. V. Buchanan, engr., Hydro Bldg., receives bids about May 6, for 30,000 cu.yd. earth excav (steam shovel work), in connection with 10,000,000 imp. gal. reservoir to be built at Sprinbank Park. About $22,000.

BIDS DESIRED

O., Akron—Until April 28, by city, building 1 story, 25 x 25 ft., concrete and brick Booster pumping station, also furnishing 2 centrifugal pumps, 500,000 gal. capacity, at Fairlawn Heights. About $75,000. M. Knowles, 716 Hippodrome Bldg., Cleveland, engr.

Que., Drummondville—Until May 15, by town engr., building waterworks system. About $80,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

O., Cleveland—W. H. Evers Eng. Co., 332 The Arcade, received bids building water mains and sewers in Benwood Ave., East 147th and East 148th Sts., for Miles-Howard Park Co., from Joseph & Kalill, 1200 Bolivar Rd., $22,288; Lanese Co., Columbia Bldg., $24,075; Jackson & Elias, 10714 Amor Ave., $26,018. Noted April 15.

★O., Cleveland—See "Sewers."

★O., Maple Heights (Bedford P. O)—Village let contract building 1,400 ft. 10 in. c.i. water mains, to W. MacDowell & Son, 10319 Niles Ave., Cleveland, $17,537. Noted April 15.

★Idaho, Moscow—City let contract building 80 ft. steel water tower, 300,000 gal. capacity, to Pittsburgh-Des Moines Steel Co., Curry Bldg., Pittsburgh, Pa., $31,556. Noted March 25.

Sewers

PROPOSED WORK

N. J., Egg Harbor City—City having plans prepared by Remington & Vosbury, engrs., 6th and Market Sts., Camden, for sewerage system and sewage disposal plant. Cost between $40,000 and $50,000.

N. J., Woodbury Heights—City having plans prepared by Remington & Vosbury, engrs., 6th and Market Sts., Camden, for sewerage system and sewage disposal plant Cost between $10,000 and $50,000.

Pa., Williamsport—City election May 18, to vote on $300,000 bonds to build sanitary and storm sewers. J. B Otto, city engr.

S. C., Anderson—See "Waterworks."

O., Kenmore—Village having plans prepared building storm and sanitary sewers. About $350,000. D. P. Dowling, Kenmore, engr.

Ill., Chicago—Bd. Local Impvts., 207 City Hall, soon lets contracts building brick and tile sewers in 11 avenues, cost $63,571.

Wis., Milwaukee—Sewerage Comn. soon lets contract laying 5,632 lin.ft. sewers in 2nd Ave. and Scott St., and building 60 in. concrete sewer in tunnel. T. C. Hatton, city engr.

S. D., Kimball—City soon lets contract building complete sewerage system, involving 22,639 lin.ft. 8-18 in. vitr. pipe, etc. C. H. Coxe, aud. Smith & Reeves, Mitchell, civil engrs.

N. D., Grafton—City having plans prepared building sewerage system and extending water mains in 25 blocks. About $40,000. C. L. Pillsbury Co., Metropolitan Life Bldg., Minneapolis, engrs.

Wyo., Cheyenne—City soon receives bids building sanitary and storm sewerage system. About $300,000. J. J. Showalter, clk. J. A. Whiting, 214 1st Natl. Bank Bldg., engr.

Tex., Abilene—See "Buildings."

Tex., Dallas—City voted $400,000 bonds to extend sanitary sewerage system. G. D. Fairtrace, city engr.

Tex., Wichita Falls—City election May 20, to vote on $400,000 bonds to extend sewerage system.

Idaho, Nampa—City plans to build sewers in Dist. 26. About $194,000. L. C. Kelsey, Nampa, engr.

BIDS DESIRED

N. Y., Ossining—Until May 18, by C. F. Rattigan, supt. prisons, Capitol, Albany, installing underground sanitary and storm water sewerage and water distribution systems, also pumping and chlorinating apparatus, pipe connections in pump house and reservoir, for water supply system, at Sing Sing Prison, here. About $120,000 and $7,000 respectively.

N. J., Haddonfield—Until May 10, by boro., building sewage disposal plant with clarification tank and sprinkler filters. Cost between $45,000 and $50,000. Remington & Vosbury, 6th and Market Sts., Camden, engrs.

N. J., Hoboken—Until April 27, by city, building sewers in 7th and 15th Sts. Cost to exceed $200,000. D. Haggerty, clk.

Pa., Allentown—Until April 26, by M. W. Gross, mayor, building sanitary sewer in Gordon St. from Jordan to 6th Sts., vitr. pipe.

Pa., Mt. Union—Until May 3, by G. W. Morgan, boro. secy., 206 South Division St., building storm and sanitary sewers in North Jefferson, North and South Division Sts. Boro. to furnish material. About $40,000.

Md., Hagerstown—Until May 12, by Hagerstown Sewerage Comn., building mains and lateral sewers in various streets and alleys. J. Carmichael, chn.; advertised in this issue.

Wis., Milwaukee — Until April 28, by Dept. Pub. Wks., furnishing labor and material laying drains and improving waterworks systems in Herbert St. and 32nd Ave. P. Braman, comr.

Ia., Des Moines—Until April 28, by J. P. Maher, city clk., laying 112,789 ft. 10-22 in. sewer pipe. H. H. Barton, mayor.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Vt., Rutland—D. D. Snyder, comr. Dept. Pub. Wks. let contract building sewers and paving West and Wales Sts., to Linberg & Street, Old South Bldg., Boston, $77,544 Noted April 8.

★N. Y., New York—H. Bruckner, pres. Bronx Boro., let contract building sewers and appurtenances in West 260th St., to S. McBride, 2904 Valentine Ave., $15,478; in Review Pl., to C. E. Farrell Contg. Co., 875 East 180th St., $13,803. Noted April 1.

★N. C., Cherryville—J. B. Houser, mayor and Town Comrs., let contract building complete sewerage system, to Dysard Constr. Co., Austell Bldg., Atlanta, Ga., $52,239; 3 disposal plants, to Tucker & Laxton, Inc., Realty Bldg., Charlotte, $13,693. Noted April 1.

★O., Cleveland—Broadview Co., c/o C. W. Courtney, engr., 509 Lender-News Bldg., let contract building 1,300 ft. 10-20 in. vitr. pipe sewers and 1,500 ft. 4 and 6 in. c.i. water mains in Broadale Ave., to W. B. Smith, 5310 Franklin Ave., $14,320

Sewers (Continued)

★**O., Cleveland**—Woodside Land Co., Bangor Bldg., let contract building 1,600 ft. 10-18 in. tile sewer and 1,500 ft. 4 and 6 in. c.i. water mains, to Jackson & Elias, 10714 Amor Ave., $18,892.

O., Cleveland—City received bids building sewers in sections of (1) Hamilton, (2) Glenside and (3) St. Clair Aves., from Amato Constr. Co., 345 The Arcade, (1) $6,768, (2) $3,055; W. MacDowell, 10319 Miles Ave., (1) $9,202; N. Iafornaro, 3218 Murray Hill Rd., (2) $3,908, (3) $51,500; Gallagher-Burke Constr. Co., 1339 Irene Ave., (3) $45,000. Noted April 8.

O., Cleveland Heights (Warrensville P. O.)—Village received bids March 15, building sewers and water mains in Cumberland Ave. from Lee to Mayfield Rds., from N. Iafornaro, 3218 Murray Rd., $35,412; Curro Bros., 12206 Mayfield Rd., $36,687. Noted Feb. 26.

★**Ia., Burlington**—City Council let contract laying 300,000 ft. 10 in. vitr. or concrete sewer pipe, to M. W. Daly, 1017 North Central St., $1.66⅓ per ft.

★**Cal., El Monte**—City let contract building sewerage system, to C. McNeil and P. Barnett, 234 South Center St., Orange, $30,475. Noted April 1.

★**Cal., San Bernardino**—City let contract building 4 mi. vitr. pipe sewer in South Mt. Vernon Ave. Dist., to R. N. Niksevich, P. O. Box 204, Long Beach, $23,449.

★**Ont., Woodstock**—City let contracts for concrete and construction work on activated sludge plant, to W. H. Brennan Contg. Co., Hamilton, $42,837; piping and machinery, to Flanagan & Anderson, Ft. William, $37,309.

Ore., Portland—City received bids April 7, building (a) sewer in 42nd Ave. S. E., from 46th St. S. E., to 50th St. S. E., (b) East 33rd and Staffords Sts. Sewerage System, (c) East 13th St. Trunk Sewer, (d) East 72nd St. et al Sewerage System, (1) concrete pipe, (2) vitr. (3) cement, from Braley & Cusick, 920 Hancock Ave., (a1) $2,516, (d3) $12,529; Lundstrom & Carlson, (a2) $2,523, (d2) $11,372; J. Bakal, (a3) $2,669; J. F. Shea, 6 North 2nd St., (b2) $246,995; Jacobson-Jensen Co., 407 Stanton Bldg., (b3) $247,806, (c3) $113,033. Noted March 25.

Bridges

PROPOSED WORK

R. I., Narragansett—Bd. Pub. Wks., Providence, having plans prepared by I. W. Patterson, state engr., for 243 ft. rein.-con. bridge over Narrow River, here.

North Carolina—See "Streets & Roads."

Ind., Ft. Wayne—Bd. Comrs. Allen Co. having plans prepared by A. W. Grosvenor, engr., 408 Bass Bldg., for 290 ft. bridge, 50 ft. wide, on Main St., to have 3 concrete arches. About $150,000.

Ia., Chariton—G. E. Parkin, aud. Lucas Co., soon lets contract building 120 ft. skew high truss bridge, 18 ft. wide, concrete and steel. C. W. Eby, co. engr.

Tex., Vernon—See "Streets and Roads."

Utah, Manti—See "Streets and Roads."

Ont., Walkertown—Bruce Co. plans to expend between $60,000 and $70,000 for concrete and steel bridges. D. J. Izzard, Port Elgin, co. supt.

BIDS DESIRED

Mass., Boston—Until May 6, by city, building 120 ft. steel and concrete bridge, 60 ft. wide, over tracks at Clarendon Extension, also 128 ft. rein.-con. retaining wall. About $340,000. T. F. Sullivan, city engr.

Pa., Phila.—Until April 29, by Dept. Pub. Wks. building foot bridge on line of Harvey St., cost to exceed $25,000; steel and concrete bridge over Phila., Baltimore & Washington R. R., 49th St., to exceed $80,000; 2 concrete arch bridges over Cobbs Creek, near Cobbs Creek Parkway, to exceed $25,000.

Pa., Scranton—Until April 26, by Mayor, drilling borings for foundation and building 500 ft. rein.-con. ornamental bridge, 32 ft. roadway and two 8 ft. walks. About $200,000. A. B. Cohen, Newark, N. J.

Ga., Blue Ridge—Until May 11, by G. A. Curtis, ordinary of Fannin Co., building 200 ft. steel bridge over Toccoa River. H. W. Morgan, 404 Jackson Bldg., Gainesville, div. engr.

Ala., Ariton—Until May 10, by W. S. Keller, state highway engr., Bell Bldg., Montgomery, building 450 ft bridge and approaches over Pea River, between here and Brundidge.

Miss., Clarksdale—Until May 4, by City Comrs., building steel trestle and repairing and painting steel highway bridge across Sunflower River, 2nd St. W. S. Bobo, city engr.; advertised in this issue.

Ind., Ft. Wayne—Until May 4, by Allen Co., removing present bridge and constructing 3 span concrete arch bridge over St. Mary's River, on West Main St. About $155,000. A. W. Grosvenor, 408 Bass Bldg., engr.; advertised in this issue.

Illinois—Until April 28, by State Highway Dept., Springfield, building North Fork Bridge on Danville-Hoopeston Highway, Project 11, Sect. S, Vermillion Co., 1 bridge on Morris-Henry Highway, Project 7, Sect. V, La Salle Co., 1 concrete bridge on Route 4, Sect. 1, Scott Co., cost $8,145, also one on Route 11, Sect. G, Japser Co., $1,055. C. Older, ch. highway engr.

Ill., Danville—Until May 24, by L. G. Frankeberger, city clk., building 1,038 ft. rein.-con. bridge over Vermillion River, consisting of 6 arch spans and 7 approach girder spans, 30 ft. roadway and two 7 ft. sidewalks. H. H. Edwards, city engr. Harrington, Howard & Ash, Orear-Leslie Bldg., Kansas City, Mo., consult. engrs. Noted March 18.

Kan., Belleville—Until May 5, by Comrs. Republic Co. building 300 ft. steel bridge, also 20 ft., 25 ft. and 30 ft. rein.-con. bridges. E. A. D. Parker, co. engr. E. C. L. Wagner, Kansas City, Mo, consult. engr.

Oregon—Until April 27, by State Highway Comn., Portland, furnishing labor and material building bridge over Millers Gulch and 1 over Birdsey Creek, Jackson Co., 105 ft. wood truss span over Grave Creek, near Leland, Josephine Co., and 1 overhead crossing over Southern Pacific R.R., near Ashland, Jackson Co. H. Nunn, Salem, state highway engr.

Que., Farnham—Until April 30, by D. H. Noiseux, secy.-treas., building concrete bridges and roads. About $100,000.

Ontario—Until May 5, by W. A. McLean, minister pub. highways, Toronto, for excavating and building concrete structures, etc., on Provincial Highway, in Pittsburg, Leeds, Lansdowne, Yonge, Escott, Elizabethtown and Matilda Twps. About $100,000. G. Hogarth, Parliament Bldgs., Toronto, engr.

Ontario—Until May 5, by W. A. McLean, minister pub. highways, Toronto, excavating and constructing concrete culverts on Provincial Highway in Ancaster and Brantford Twps. About $30,000. Steel and cement supplied by owners. G. Hogarth, Parliament Bldgs., engr.

Ont., Whitby—Until April 27, by D. F. Kean, engr., Whitby, building concrete culverts and bridges on county road system in Ontario Co. About $25,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Harrisburg**—Pennsylvania & Reading R.R., Reading Terminal, Phila., let contract building 3,500 ft. rein.-con. bridge, to J. McGraw Co., Commercial Trust Bldg., Phila. Former contract rescinded. Noted March 25.

Ia., Boone—Boone Co. received bids building (1) 1 box culvert, 2 slab and 2 rainbow arch bridges, (2) 3 box culverts, 6 slab, 1 I-beam and 4 deck girder span bridges, all rein.-con., from Koss Constr. Co., 2818 5th St., Des Moines, (1) $32,887, (2) $53,145; A. Fick, Boone, (1) $41,031, (2) $45,548; N. M. Stark & Co., 1215 Mulberry St., Des Moines, (1) $40,796, (2) $53,191. Noted April 1.

Ia., Marshalltown—O. G. Herm, city engr. received bids April 5, building rein.-con. rainbow arch span bridge, on South 3rd Ave., from N. M. Stark & Co., 1215 Mulberry St., Des Moines, $38,000; Ingersoll & Stauffer, Marshalltown, $40,000; Coburn & Bates, Marshalltown, (alternate design for steel truss bridge jacketed in concrete), $36,822. Noted March 4.

★**Kan., Independence**—Montgomery Co. let contract building 200 ft. concrete bridge across Drum Creek, to F. Luttjohann, 1122 West 2nd St., Topeka, $32,543.

★**Kan., Independence**—Montgomery Co. let contract building 2 bridges, to E. W. Appleby, 3634 Garfield Ave., Kansas City, Mo., $38,885.

★**N. D., Carrington**—Foster Co. let contract building concrete girder bridge over James River, to Fargo Bridge & Iron Co., 1 Bway., Fargo, $35,102. Noted March 25.

★**Tex., Ballinger**—O. L. Parrish, judge Runnels Co., let contract building 518 ft. girder bridge, 19 ft. wide, over Colorado River, to McCall-Moore Eng. Co., 308-9 Amicable Bldg., Waco, $72,964, (includes 10% for engineering and contingencies). Noted April 15.

Tex., Georgetown—Williamson Co. received bids April 13, building 70 ft. steel truss span bridge, to have three 22 ft. concrete slab spans, from Kansas City Bridge Co., 510 Orear-Leslie Bldg., Kansas City, Mo., $22,593; Midland Bridge Co., Ship Channel, Fidelity St., Houston, $23,749; McCall-Moore Eng. Co., 308-9 Amicable Bldg., Waco, $23,907. Noted March 25.

★**Tex., Wexahachie**—Ellis Co. let contract building concrete bridge, to have one 100 ft., one 80 ft. and two 60 ft. steel spans and five 20 ft. steel beam spans, 18 ft. clear roadway, to Austin Bros. Bridge Co., 1815 Coombs St., Dallas, $79,800.

★**Nev., Reno**—Comrs. Washoe Co. let contract building 170 ft. rein.-con. arch bridge, 34 ft. wide, over Truckee River, to J. S. Hoffman, Minden, $32,097. Noted April 1.

Ariz., Marinette—Maricopa Co. rejected bids received Feb. 20, building 450 ft. rein.-con. bridge, Federal Aid Project 10, over Fria River, near here. About $50,000. Work will be done by State Highway Dept., Phoenix. Noted March 18.

★**Washington**—State Highway Comn., Olympia, let contract building 80 ft. rein.-con. arch bridge, over South Slough on Pacific Highway, Snohomish Co., to Everett Constr. Co., Everett, $16,678. Noted March 11.

Streets and Roads

PROPOSED WORK

Vermont—State Highway Comn., Montpelier, receives bids about May 1, building gravel road and bridges. Cost $782,798. H. M. McIntosh, state highway engr.

Massachusetts—State Highway Comn., Boston, receives bids about May 1, building 25 mi. Cape Cod Highway, bituminous macadam, 18-24 ft. wide, Truro and Wellfleet Twps. About $200,000. A. W. Dean, state highway engr.

New York—State Highway Comn., Capitol, Albany, received no bids April 16, improving 2.28 mi. Rhinebeck-Rhinecliff Rd. 1530, Dutchess Co., 3.53 mi. Tupper Lake-Saranac Lake, Part 1, Rd. 1385, Franklin Co.; 3.66 mi. Barnes Corners-Copenhagen, Part 2, Rd. 1442, Lewis Co., 5.35 mi. Maine-Glen Aubrey, Rd. 1449, Broome Co., .22 mi. East Onondaga-Seneca St., Rd. 1359, Onondaga Co., 1.69 mi. MacDougall-Fayette, Part 1, Rd. 1556, Seneca Co., 4.14 mi. Darien Center-Alexander, Part 1, Rd. 1557, Genessee Co., 4.89 mi. Belmont-Phillips Creek, Part 1, Rd. 1559, Allegheny Co., 5.85 mi. Pratt Corner-Sinclairville, Rd. 1471, Chautauqua Co., repairing 1.39 mi. Rds. 266 and 5242, Contr. 1241, Broome Co. F. F. Greene, comr. Noted April 1.

N. Y., Binghamton—Common Council plans to spend $260,000 to pave various streets. W. E. Weller, city engr.

N. Y., Depew—Village Bd. Trustees plans to pave Depew Blvd., Crane Ave., Harlem, Sanilac and Muskingon Sts. Cost between $35,000 and $40,000.

N. Y., Utica—R. S. Cookingham, city engr., soon receives bids paving, curbing and building sidewalks on 10 streets. Cost between $275,000 and $300,000.

N. Y., Watertown—Jefferson Co. plans to build 50 mi. highway. About $250,000. H. S. Ball, co. supt

N. J., Jersey City—Town Council soon receives bids improving 28th, 30th, 32nd, 33rd, 34th and 35th Sts., Hudson, Palisade and Bergenline Aves, sanitary and storm sewer in latter. Cost to exceed $200,000. F. A. Dolan, clk.

Pennsylvania—State Highway Dept., Harrisburg, received no bids April 13, paving Route 82, Sect. 1, and Route 89, Sect. 1, Crawford Co., Route 117, Sect. 3 and Route 247, Sect. 3, Fayette Co, Routes 223 and 314, Indiana Co., Route 4, Sect. 4, Luzerne Co., Route 196, Sect. 2, Tioga Co. Noted March 25.

Pennsylvania—State Highway Dept., Harrisburg, received no bids April 14, paving portion Route 207, Sect. 1, Crawford Co., Route 117, Sect. 1, Fayette Co., Route 64, Sects. 2 and 4, Jefferson Co., Route 196, Sect. 1, Tioga Co., Application 154, Warren Co. and Route 187, Sect. 2, Westmoreland Co. Noted March 25.

Pa., Williamsport—City election May 18 to vote on $450,000 bonds to pave various streets, brick and asphalt, and $75,000 bonds to resurface and repair highways. J. B. Otto, city engr.

North Carolina—State Highway Comn., Greensboro, rejected bids received April 5, hard surfacing 4.47 mi. road, Federal Aid Project 26, Davidson Co.; 2 mi. Federal Aid Project 50, and 2¼ mi. Federal Aid Project 51, Guilford Co., all 16 ft. wide; also building 2 concrete bridges, etc., on state highway, Federal Aid Project 92. W. S. Fallis, Raleigh, state highway engr. Noted April 1.

Streets and Roads (Continued)

N. C., Greensboro—Guilford Co. plans to hard surface 5 mi. High Point-Archdale Rd.

S. C., Columbia—City receives bids about May 10 paving, curbing, grading and draining 3,800 ft. North Main St., 52 ft. wide. F. C. Wyse, Columbia, engr. About $75,000.

Fla., Miami—City soon lets contract grading, paving, curbing and guttering 29,500 lin.ft. various streets, 21-31 ft. wide, oiled macadam and asphalt. About $135,000. C. W. Murray, city engr.

O., Jefferson—Ashtabula Co. having estimates and plans prepared rebuilding 6.6 mi. Windsor-Orwell Intercounty Highway 15, 16 ft. wide, waterbound macadam; also grading and paving 2.5 mi. Austinburg-Jefferson Rd., 10 ft. wide, monolithic brick. A G. Bixler, co. engr.

O., Kenmore—Village having plans prepared paving various streets. About $450,000. L. P. Dowling, Kenmore, engr.

Michigan—State Highway Dept., Lansing, soon receives bids grading, draining and surfacing 2.992 mi. State Trunk Line Rd. 39-5, and 3.44 mi. Federal Aid Project 40, 16 ft. wide, gravel, Barry Co.

Michigan—State Highway Dept., Lansing, rejected bids received April 6, grading, draining and surfacing 1.515 mi. Assessment Dist. Rd. 343, 12 ft. wide. Noted March 25.

Michigan — State Highway Dept., Lansing, plans to grade, drain and gravel surface 5.509 mi. State Trunk Line Rd. 21-1 and 3 mi. State Trunk Line Rd. 16-8, Clinton Co.; 11.480 mi. State Trunk Line Rd. 76-5, Arenac Co.; 5.534 mi. Assessment Dist. Rd. 364, Isabella Co.; 2.028 mi. State Trunk Line Rd. 22-7 and 3.329 mi. State Trunk Line Rd. 22-1, Leelanau Co.; 8.027 mi. Assessment Dist. Rd. 205, Macomb and St. Clair Counties, all aoove 16 ft. wide; 7.178 mi. Assessment Dist. Rd. 180, 12 ft. wide, Midland Co.; stone gravel 5.509 mi. Assessment Dist. Rd. 204, 9 ft. wide, Hillsdale and Branch Counties; concrete and gravel 3.001 mi. State Trunk Line Rd. 10-21 and 4.318 mi. State Trunk Line Rd. 10-20, 16-20 ft. wide, Iosco Co. Noted Feb. 19.

Ill., Chicago—Bd. Local Impvts., 207 City Hall, soon lets contract paving various streets, alleys and avenues, asphalt on concrete and blast furnace slag or limestone on granite or trap rock, cost $265,500.

Wis., Milwaukee—City voted $1,000,000 bonds to widen Cedar, Biddle and Lake Sts. G. Stahl, city engr.

Minn., Little Falls—City having plans prepared paving various streets, 18 ft. wide, involving 38,324 sq.yd. asphaltic concrete. About $100,000. C. L. Pillsburg Co., Metropolitan Life Bldg., Minneapolis, engrs.

Minn., Minneapolis—A. P. Erickson, and Hennepin Co., soon lets contract building 8.5 mi. Rockford Rd., 30 ft. wide, involving 65,000 cu.yd. grading. About $75,000. E. E. Terrell, co. surv. Noted Feb. 5.

Minn., South St. Paul—City Council soon lets contract grading, curbing and improving 7th, 8th and 9th Aves. and Highland Heights Addition, also grading and paving 2nd St., S., and 20th Ave., concrete. About $65,000. J. R. Stevenson, city recdr.

Minn., Wykoff—City rejected bids received April 8, for 12,000 sq.yd. paving. About $60,000. Work postponed until next year. Noted March 18.

Neb., South Sioux City—City soon lets contract paving various streets. About $300,000. K. C. Gaynor, city engr.

South Dakota—State Highway Comn., Milbank, soon lets contract gravel surfacing, grading and draining 9.61 mi. Clear Lake-Milbank Rd., 24-36 ft. wide, Federal Aid Project 55, Deuel Co., $889,814. F. S. Peck, Pierre, state highway engr.

N. D., Grand Forks—City rejected bids building Federal Air Project 51, from Skidmore Ave. to packing plant, 16-24 ft. wide. Cost to exceed $25,000. C. S. Giles, city engr. Noted April 8.

Wyo., Casper—City plans to pave various streets, bituminous concrete, with necessary concrete curbing and storm sewers. Bids will be received on bitulithic, Topeka mix or other paving material capable of holding up under heavy trucking and traffic conditions.

Idaho, Buhl—City plans to pave 32,000 sq.yd. Maple St., 8th, 11th and 12th Aves., 30 ft. and 40 ft. wide, bitulithic About $120,000. E. J. Baird, Buhl, engr.

Mont., Manhattan—City Council soon lets contract paving ¾ mi. Federal Aid Project 51, portland cement concrete, portland cement concrete base with top of bitulithic or modified topeka J. N. Edy, c/o State Highway Dept., Helena, engr

Mo., Carthage—Jasper Co. received no bids April 5, improving 9.44 mi. Joplin-Tipton Ford Rd., 18-24 ft. wide, cost, $222,038 and 4.3 mi. Joplin-Springfield Rd., 18-24 ft. wide, $94,142. Noted April 1.

Tex., Abilene—See "Buildings."

Tex., Canadian—Hemphill Co. had estimates prepared grading, surfacing and draining 14.44 mi. Highway 4, Federal Aid Project 158, 16 ft. wide. About $79,994. Hess & Skinner, Southwestern Life Bldg., Dallas, engrs.

Tex., Dallas—C. E. Gross, aud. Dallas Co. rejected bids received March 29, grading and paving 8.8 mi. Seyene Rd., 18 ft. wide, cost $250,000; 11.3 mi. Dallas-Benton Rd., State Highway 40, 18 ft. wide, $300,000. Work will be readvertised. Noted March 18 and 25.

Tex., Ft. Worth—Tarrant Co. plans to build 10 mi. Ft. Worth-Dallas Pike Rd. and other roads, 20 ft. wide, concrete. Bonds for $3,450,000 voted for project.

Tex., Fredericksburg—A. H. Kneese, judge Gillespie Co., rejected bids grading and surfacing 17.63 mi. Highway 9, 16 ft. wide. Work will be readvertised. A. F. Moursand, Fredericksburg, engr. Noted Jan. 8.

Tex., Marshall—Harrison Co. rescinded contract let to Smith Bros. & Healey, Marshall, for surfacing and draining 32 mi. Jefferson Highway, 18 ft. wide. Work will be readvertised. G. A. Duren, co. engr. Noted April 8.

Tex., Vernon—Wilbarger and Baylor Counties having plans prepared building 44 mi. highway from here to Seymour, 18 ft. wide., also 200 ft. steel span bridge over Big Wichita River. About $500,000.

Okla., McAlester—Pittsburg Co. election May 25, to vote on $1,000,000 bonds to improve 132 mi. highways. Federal Government will appropriate like amount if election carries.

Okla., Pauls Valley—City election May 12, to vote on $675,000 bonds to improve roads. Engineer not selected.

Idaho, Grangeville—City plans to pave 1,265 ft. Main St., 56 ft. wide, concrete or bitulithic. About $44,431. P. P. Oehler. Lewiston, engr.

Idaho, Nampa—City plans to pave various streets, bitulithic, concrete or asphalt. About $691,000. L. C. Kelsey, Nampa, engr.

Utah, Manti—San Pete Co. election April 27, to vote on $280,000 bonds to build roads and bridges. F. R. Lamb, clk.

Washington—State Highway Comn., Olympia, rejected only bid received March 29, grading, draining and paving 3 mi. Olympic Highway from Thurston Co. line to Kamilche, concrete. About $109,723. Noted March 4.

Washington—State Highway Comn., Olympia, rejected bids received March 29, grading, draining and paving 3.89 mi. Natl. Park Highway from Muck Creek to Ohop Valley, concrete, Pierce Co. About $167,975.

Washington — State Highway Comn., Olympia, rejected bids received April 5, clearing, grading and draining 3.64 mi. Olympic Highway from Montesano to Brady, Grays Harbor Co., cost $41,987; clearing, grading and surfacing with gravel 1.24 mi. State Rd. 5, Lewis Co., $33,769. J. Allen, state highway engr.

Wash., Seattle—Comrs. King Co. rejected only bid received April 12, paving 1.75 mi. Franklin-Enumclaw Rd., cost, concrete $53,000, brick $72,000. Work will be readvertised. S. J. Humes, co. engr.

Ore., Portland—City soon lets contract grading and paving 10 streets. About $180,000. O. Laurgaard, city engr.

Cal., Fresno—Fresno Co. rejected bids paving 1.492 mi. Sect. A, Route 16 and 2.756 mi. Sect. A, Route 18. Noted April 1.

Cal., Los Angeles—Bd. Pub. Wks. receives bids about May 30, paving 7 blocks Norton Ave., 5 in. concrete with 1½ in. Warrenite surface, cement curbs, gutters, etc. Cost to exceed $50,000. J. A. Griffin, city engr.

Cal., Los Angeles—Los Angeles Co. having plans prepared grading, graveling, oiling, etc., 12 mi. road between Palmdale and Llano, Rd. Dist. 137. Rd. Dept., Hall of Records, engrs.

Nova Scotia — Provincial Government Halifax, plans to expend $1,500,000 annually on road construction and $1,000,000 for maintenance, to include gravel surfacing and ditching. Above is 5 year program to which Dominion Government will contribute $400,000 annually. A. Roland, ch. engr.

Ontario—Provincial Government, Toronto, plans to build 35 mi. earth and gravel road. About $210,000. C. H. Fullerton, Parliament Bldgs., engr.

Ont., Ottawa—Bd. Control soon receives bids paving 5 streets asphalt, stone black and tarvia macadam. About $67,228. A. F. Macallum, city engr.

Ont., Walkerton—Bruce Co. plans to build about 30 mi. waterbound or tar macadam roads. About $400,000. P. A. Malcomson, clk.

Man., La Salle—Town soon receives bids building 4.9 La Salle Rd., bituminous macadam, 0.94 mil. Lafleur Ave., waterbound macadam, and 1.6 mi. St. Patricks St., cement concrete. P. A. Beique, 120 St. James St., Montreal, engr

BIDS DESIRED

Maine—Until May 5, by State Highway Comn., Augusta, building 3.92 mi. highway, in Westbrook; 2.54 mi., Belfast; 4.71 mi., Newport Twp.; 5.118 mi. Perry and Pembroke Twps. P. D. Sargent, ch. engr.; advertised in this issue

Maine—Until May 5, by State Highway Comn., Augusta, building 7.24 mi. highway in Falmouth and Cumberland; 7.08 mi., Gray; 6.63 mi. Wilton and Farmington; 5.87 mi. Sherman and Crystal; 3.69 mi. Island Falls and Dyer Brook. P. D. Sargent, ch engr.; advertised in this issue.

R. I., Scituate (North Scituate P. O.)—Until May 12, at office of Water Supply Bd., Providence, building 3.1 mi. and 1.75 mi. earth roads, Contr. 5 and 6, here. F. E. Winsor, ch. engr.; advertised in this issue.

N. Y., Binghamton—Dept. Pub. Wks. receiving bids paving 10 streets. Cost between $250,000 and $275,000. A. L. La-Roche, comr.

N. Y., Brooklyn—Until April 28, by E. Riegelmann, boro. pres., regulating and paving with permanent asphalt on 6 in. concrete foundation, roadway of Ocean Ave. from Parkside to Flatbush Aves., Canarsie Lane from Flatbush to Nostrand Aves., Robinson St. from Rogers to Nostrand Aves., with preliminary asphalt on 5 in concrete foundation, roadway of President St. from Nostrand to Rogers Aves., regulating and paving with permanent ashpalt on 6 in. concrete foundation, roadway of Bay 29th St. from Bath to Cropsey Aves., Bay 31st St. from Bath to Benson Aves.

N. Y., Corning—Until April 27, by Bd. Pub. Wks., building 6,737 sq.yd. Hillside block paving, 13,153 sq.yd. plain block, 1,930 lin.ft. concrete curbing and guttering and 8,299 lin.ft. concrete curbing. W. O. Drake, city engr.; advertised in this issue. Noted April 1.

N. Y., Ilion—Until April 30, by Bd. Trustees and Bd. Street Comrs. building 14,000 sq.yd. pavement and 9,000 lin.ft. curbing and necessary catchbasins, tile, etc. S. Squire, village engr.; advertised in this issue.

N. Y., Ithaca—Until May 6, by C. D. Bostwick, compt., Cornell University, building ½ mi. 16 ft. rein.-con. pavement, with necessapy grading, drains, outlets, etc., on Tower Rd., college campus; advertised in this issue.

N. Y., New York—Until April 26, by H. Bruckner, pres. Bronx Boro., repaving with asphalt blocks on concrete foundation, Trinity Ave., repaving with granite blocks, East 158th St., Wales Ave., repaving with granite blocks and sheet asphalt, East 168th St., regulating, grading, setting curb, laying sidewalks, crosswalks, building receiving basins, drains, culverts, approaches and guard rails, on Watson Ave., Sagamore St. and Hering Ave., also on Haviland Ave. from Pugsley Ave. to East 177th St. and from Castlehill to Zerega Aves., omitting flagging and curbing between Havemeyer and Zerega Aves.; paving with granite blocks on sand foundation, Waterloo Pl., paving with sheet asphalt and granite blocks, East 181st St., also building sewer and appurtenances in Fieldston Rd.

N. Y., S. I., St. George—Until April 26, by C. D. Van Name, pres. Richmond Boro. building concrete sidewalks on both sides of Elliott Ave. from Johnson Ave. to Amboy Rd., on westerly side of Tench St. between Rose Ave. and New Dorp Lane, reconstructing or repairing sidewalks and setting bluestone curbing, on Lenden Ave. from Van Pelt Ave. to Maple Parkway, Union Ave. from Staten Island Rapid Transit R.R. tracks to Continental Pl., on Walloon St. from Union Ave. to Maple Parkway, Richmond Terrace from Holland to Grand View Aves., Richmond Terrace from Jewett Ave. to Empire Theatre, Richmond Ave. from Staten Island Rapid Transit tracks to Charles Ave., Washington Ave. from Rich-

Streets and Roads (Continued)

mond to Columbus Aves., for constructing or repairing sidewalks on Castleton Ave. from Clove Rd. to Jewett Ave., from North Burgher Ave. to Taylor St., Richmond Terrace from York to Westervelt Aves., constructing bluestone curb, vitr. brick gutter and concrete sidewalk on Maple Ave. from Bay to Edgewater Sts.

N. J., Atlantic City—Until April 29, by Bd. Comrs., improving portions of Mediterranean and other avenues; advertised in this issue.

N. J., Freehold—Until May 10, by Bd. Freeholders Monmouth Co., rebuilding Rumson Rd. and Ocean Ave., Seabright and Monmouth Beach Boros; advertised in this issue.

N. J., Jersey City—Until April 27, by city, improving Hopkins Ave. About $50,000. F. A. Dolan, clk. Noted March 25.

N. J., Mt. Holly—Until May 14, by Bd. Freeholders Burlington Co., rebuilding South Pemberton and Chambers Corner, Bordentown Rds. and Camden Co. line-Marlton-Medford Rd., Sect. 2, Evesham and Medford Twps., sheet asphalt surface on widened and resurfaced macadam foundation; advertised in this issue.

N. J., North Bergen (Weehawken P. O.)—Until May 6, by Town Council, improving 34th and 35th Sts., granite and bituminous. Cost to exceed $100,000. P. Brady, clk. Noted Aug. 21.

N. J., Sea Bright—Until May 10, by boro., paving wings of Ocean Ave. from bridge crossing Shrewsbury River, on Rumson Rd., to north line of Monmouth Beach; advertised in this issue.

Pennsylvania—Until May 11, by State Highway Dept., Harrisburg, improving 70,330 ft. Chester Co., 13,407 ft. Cumberland Co., 27,642 ft. Delaware Co., 8,935 ft. Erie Co., 6,577 ft. McKean Co., 34,904 ft. Northampton Co., 38,315 ft. Schuylkill Co., 27,917 ft. Somerset Co., 18,564 ft. Susquehanna Co., 27,596 ft. Mercer and Venango Counties, 36,283 ft. Venango Co., 12,012 ft. Warren Co., 17,630 ft. York Co., rein.-con., Hillside vitr. brick, bituminous surafce course or bituminous macadam; advertised in this issue.

Pennsylvania—Until May 11, by Pub. Serv. Comn., Harrisburg, building 2,300 lin.ft. Route 39, 18 ft. wide, 1 course rein.-con.; advertised in this issue.

Pa., Johnstown—Until April 26, by M. L. Masterson, supt. streets and roads, curbing, grading, paving and building sanitary and storm sewers in (Contr. 1) Grove and Linden Aves. and 6th Alley, (Contr. 2) Worth St., Hammer and McKinley Aves., (Contr. 3) Peter St., Seibert and Hill Alleys, 1 course concrete, brick, terra cotta, etc. About $100,000.

Pa., Lebanon—Until May 10, by D. M. Sharp, city clk., paving 5 streets; advertised in this issue.

Pa., Oil City—Until May 10, by E. W. Egan, city compt., paving and repaving 43,000 sq.yd. various streets; advertised in this issue.

Maryland—Until April 27, by State Rds. Comn., 601 Garrett Bldg., Baltimore, building 1 mi. road from Laurel toward Ashton, concrete, Contr. P-19, Prince George's Co. F. H. Zouck, chn.; advertised in this issue.

Md., Oakland—Until May 10, by Comrs. Garrett Co., paving 2 mi. state aid highway along Bear Creek Route from Friendsville toward Cove, 15 ft. wide, macadam or concrete. J. N. Mackall, c/o State Highway Dept., 601 Garrett Bldg., Baltimore, engr.

W. Va., Beckley—Until April 26, by Raleigh Co., grading and draining 4½ mi. Logan Turnpike, between Beckley and Trap Hill Dist. Line. C. B. Scott, highway engr.

W. Va., New Cumberland—Until May 4, by R. R. Hobbs, clk. Hancock Co., building 2 mi. road, Federal Aid Project 52, bituminous macadam.

W. Va., Pt. Pleasant—Until May 3, by W. B. Barnett, clk. Mason Co., gravel surfacing 7½ mi. 16 ft. wide road, Wagoner Dist. B. E. McCown, dist. engr.

W. Va., Union—Until May 18, by E. S. McNeer, clk. Monroe Co., grading, draining and surfacing 3.3 mi. road from here to Pickaway, water bound macadam.

N. C., Halifax—Until April 26, by Halifax Co., Highway Comn., Weldon, surfacing 7.3 mi. Scotland Neck-Edgecombe Rd., sand clay or gravel clay. C. F. Gore, Weldon, engr.

Ga., Blue Ridge—Until May 11, by G. A. Curtis, ordinary of Fannin Co., building 5.453 mi. road. H. W. Morgan, 404 Jackson Bldg., Gainesville, div. engr.

Tennessee—Until May 5, by Dept. of Highways, Nashville, paving 11.872 mi. State Highway 10, with bituminous macadam or rock asphalt surface course, also building 20 ft. bridge. W P. Moore, ch. engr.

Indiana—By Bd. Co. Comrs. building roads in following counties:

April 30, Allen Co., Ft. Wayne, 33,245 ft. Hoagland Rd., stone, Marion Twp., 9,858 ft. Springfield No. 4 Rd., Springfield Twp., 21,290 ft. Center Rd., Lafayette Twp. and 15,050 ft. Hillegoss No. 4 Rd., Perry Twp. A. C. McCoy, aud.

May 3, Jennings Co., Vernon, 14,020 ft. D. Woltermire Rd., crushed stone, Geneva Twp. E. Bimish, aud.

St. Joseph Co., South Bend, 33,965 ft. Edwardsburg Rd., concrete, Clay and Harris Twps. C. Sedgwick, aud.

May 4, Morgan Co., Martinsville, 8,009 ft. E. Crone Rd., crushed stone, Adams Twp. H. H. Nutter, aud.

Dearborn Co., Lawrenceburg, 17,768 ft. J. Schaick Rd., broken stone, Harrison Twp. A. P. Jackson, aud.

May 5, Allen Co., Ft. Wayne, 28,215 ft. Townley Rd., stone, Jackson Twp., 5,677 ft. Bartell Jct. Rd., Maumee, Scipio and Springfield Twps. and 14,300 ft. Hosler Rd., Cedar Creek Twp. A. C. McCoy, aud.

May 11, Rush Co., Rushville, 51,238 ft. S. S. Offutt et al Rd., concrete. W. H. McMillin, aud.

Ind., Ft. Wayne—Until May 5, by Comrs. Allen Co. draining, grading and surfacing 5.3 mi. Townley Rd., cost, $88,465; 2.7 mi. Hosier Rd., $45,325; 1.1 mi. Bartell Jct. Rd., $20,000; 1 mi. Battenberg Rd., $17,864; 1.4 mi. Kneubuhler Rd., stone, $25,470; all stone, 12 ft. wide. A. W. Grosvenor, 408 Bass Bldg., engr.

Michigan—Until May 4, by F. F. Rogers, state highway comr., at office Bd. Rd. Comrs. Clinton Co., St. Johns, grading, draining and gravel surfacing 3.144 mi. Sect. 1 and 4.264 mi. Sect. 2, Assessment Dist. Rd. 273, 16 ft. wide, Clinton and Shiawassee Counties. Noted March 4.

Mich., Detroit—Until April 27, by Dept. Pub. Wks., grading, shaping and paving with 1 course concrete, Alleys 1126 to 1137, 18 and 20 ft. wide. About $41,000. C. W. Hubbell, city engr.

Illinois—Until April 28, by State Highway Dept., Springfield, constructing 1.94 mi. Sect. K, Dixie Highway, Iroquois Co., 0.58 mi. Sect. Z, Springfield-East St. Louis Highway, Madison Co., 0.06 mi. Sect. V, Henry Morris Highway, La Salle Co., and 3.35 mi. Sect. 13, Lincoln Highway, Lee Co.; also 2,500 ft. Sect. E, Route 5, Adams Co., and 1,600 ft. Sect. D, Jefferson Co., cost $11,406 and $9,397 respectively. C. Older, ch. highway engr.

Wisconsin—Until April 30, by State Highway Dept., at div. office, 213 South Barstow St., Eau Claire, grading and paving 3.7 mi. Neillsville-Humbird Rd., 15 ft. wide, gravel, Federal Aid Project 145, Clark Co.; 5.59 mi. Abbotsford-Medford Rd., 15 ft. wide, granite and gravel top, Federal Aid Project 147, Clark Co.; 3.75 mi. Cornell-Bloomer Rd., Federal Aid Project 144, Chippewa Co.

Wisconsin—Until April 27, by State Highway Dept., at div. office, Citizens Natl. Bank Bldg., Grand Rapids, grading and paving 2.319 mi. Portage-Stevens Point Rd., Federal Aid Project 133, Waushara Co.; 4.38 mi. Berlin-Weyauwega Rd., Federal Aid Project 148, Waushara Co.; 4.618 mi. Packwaukee-Montello Rd., Federal Aid Project 132, Marquette Co., both top soil surfacing.

Wisconsin—Until April 29, by State Highway Dept., at div. office, Spooner, grading and paving 5.8 mi. Superior-Solon Springs Rd., 18 ft. wide, concrete, Federal Aid Project 113, Dougles Co.; 5.1 mi. Spooner-Hayward Rd., Federal Aid Project 156, Washburn Co.

Ia., Algona—Until April 27, by Auditor Kossuth Co., grading, draining and paving 21.31 mi. Daniel Boone Trail; advertised in this issue.

Ia., Des Moines—Until April 28, by J. P. Maher, city clk., paving 1,926 sq.yd. Forest Ave., No. 1 vitr. brick, also 1,056 sq.yd. alley between 9th and 10th Sts., No. 1 vitr. brick or Portland cement concrete. H. H. Barton, mayor.

Minn, Anoka—Until April 30, by A. A. Caswell, aud. Anoka Co., building 26 mi. State Rd. 4, Federal Aid Project 92; grading 2 mi. State Rd. 3, Bethel and St. Francis Rd., Job. 2003, and 0.6 mi. State Rd. 3, St. Francis at Mattutat, Job 2007.

Minn., Chaska—Until April 26, by W. Schmelpfenig, aud. Carver Co., building 21 mi. Federal Aid Project 116, State Rd. 1, 24 ft. wide. About $126,000. W. H. Tischer, Waconia, engr.

Minn., Red Wing—Until May 3, by C. H. Meyer, aud. Goodhue Co., grading and installing culverts and 1 bridge, No. 2939, on 3.08 mi. Job 2001, State Rd. 1; also grading, graveling and installing culverts and Bridges 3350 and 3351, on Job 2002, State Rd. 6.

Minn., Walker—Until May 4, by C. D. Bacon, aud. Cass Co., building State Rd. 6, Federal Aid Project 142; 8.066 mi. Pine River-Jenkins Rd., Job 2005; Pine River-Remer Rd., Federal Aid Project 140; Walker-Remer Rd., Job 2002; Hackensack-Longville Rd., Federal Aid Project 141. Separate bids will be received on each or any one of the above jobs or part thereof. Noted March 25.

N. D., Ashley—Until April 30, by McIntosh Co. building 18 mi. road from here east to Coldwater, Federal Aid Project 33. Cost to exceed $25,000. W. H. Robinson, c/o State Highway Dept., Bismarck, engr.

N. D., Cando—Until May 4, by Comrs. Towner Co., building 18 mi. road from Arndt north through Rock Lake, Federal Aid Project 22. Cost to exceed $25,000. W. H. Robinson, Bismarck, engr.

Montana—Until April 26, by State Highway Comn., Helena, gravel surfacing and naving 8.5 mi. Helena-Bozeman Rd., Federal Aid Project 77, Lewis and Clark Counties. About $92,871. Former bids rejected. J. N. Edy, c/o State Highway Dept., Helena, engr. Noted March 25.

Montana—Until April 26, by State Highway Comn., Helena, gravel surfacing 6.8 mi. road, Federal Aid Project 105, Park Co., cost $55,309; grading 4.58 mi. highway from Virginia City to Ennis Rd., Federal Aid Project 9A, Madison Co., $20,920. J. N. Edy, c/o State Highway Dept., Helena, engr.

Mo., Clayton—Until May 5, by Clerk St. Louis Co., grading and paving 4,229 ft. Big Bend Rd., 2 course reinforced cement concrete, 21 ft. wide; building rein-con. arch bridge over River des Peres, on Big Bend Rd.; advertised in this issue.

Mo., St. Louis—Until April 27, by Bd. Pub. Serv., Room 208, New City Hall, improving Northeast Kings Highway from Euclid to West Florrissant Aves., cost $125,750; reconstructing Biddle St. from 7th to 14th Sts. running south of Biddle St. C. E. Smith, city engr.

Ark., Little Rock—Until May 4, (change of date) by Comrs. Little Rock-Pulaski Rd. Impvt. Dist. 10, at office State Highway Comn., grading, draining and paving 55 mi. Crystal Hill, Conway and Alexander Rds. Lund & Hill, 527 Southern Trust Bldg., engrs.; advertised in this issue. Noted April 8.

Tex., Hillsboro—Until April 30, by J. T. Burns, judge Hill Co., grading and surfacing 7.15 mi. Highway 6, Sect. 2A, 16 ft. wide, Federal Aid Project 113. Former bids rejected. Bryant & Huffman, Littlefield Bldg., Austin, engrs.

Tex., Kingsville—Until May 3 (Change of date) by Clerk Kleberg Co., spreading, shaping and surfacing various roads involving 37,943 cu.yd. gravel surfacing, 46,450 cu.yd. placing surfacing, 1,914.74 cu.yd. 1:2:4, 440.4 cu.yd. 1:2½:5 and 4.56 cu.yd. 1:3:6 concrete, 268,995 lb. reinforcing steel, etc. B. F. Wilson, judge. Noted April 15.

Nevada—Until May 3, by C. C. Cottrell, state highway, engr., Carson City, paving 8.25 mi. highway from Washoe Summit to 1 mi. south of Huffakers, Washoe Co., 6 in. cement concrete; advertised in this issue.

California—Until May 3, by State Highway Dept., 515 Forum Bldg., Sacramento, paving 6.5 mi. State Highway between Tule and Gravel Wash, 15 ft. wide, Portland cement concrete. A. B. Fletcher, state highway engr.

Ont., Clinton—Until May 5, by W. A. McLean, deputy minister highways, Toronto, building 3¼ mi. bituminous macadam road, here. About $80,000. G. Hogarth, Parliament Bldgs., Toronto, engr.

Ont., Kitchener—Until April 29, by A. H. Millar, city clk., building 19,000 sq.yd. asphalt, bitulithic and concrete pavement. About $90,000. B. G. Michel, city engr.

Ont., Oshawa—Until April 26, by town, building 112,000 sq.ft. granolithic concrete sidewalks. About $40,000. W. G. Worden, town engr.

Ont., St. Catharines—Until May 11, by W. A. McLean, deputy minister highways, Toronto, building 11¼ mi. Provincial Highway from here to Stoney Creek, 20 ft. wide, waterbound and bituminous macadam. About $350,000. G. Hogarth, Parliament Bldgs, Toronto, engr.

Que., Farnham—See "Bridges."

Que., L'Epiphany—Until April 27, by J. B. Richard, secy.-treas., graveling 27,763 ft. road. About $70,000.

Streets and Roads (Continued)

Que., Montreal West—Until May 1, by town, grading and macadamizing 1½ mi., streets, 66 ft. wide. About $100,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Massachusetts**—State Highway Comn. Boston, let contract building 6,100 ft. road, 18 ft. wide, Leicester Twp., to McGuire & McGurty, Inc., 30 Orme St., Worcester, $44,602. Noted April 8.

★**Massachusetts**—State Highway Comn., Boston. let contract building 1,200 ft. bituminous macadam road and concrete bridges, 22 ft. wide, Ware Twp., to L. Carchia, 16 Foster St., Boston, 102,487.

New York—State Highway Comn., Capitol, Albany, received bids April 16, improving roads in following counties: (a) Dutchess Co., 4.95 mi. Fishkill Plains-Poughkeepsie, Part 2, Rd. 1529, (b) Cortland Co., 2.35 mi. Virgil-Messengerville, Part 1, Rd. 1558, (c) Wayne Co., 1.63 mi. Lyons Village, Broad, Church, Montezuma and Geneva Sts., Rd. 5653, (d) Livingston Co., 8.34 mi. Conesus-Wayland, Rd. 1321, (e) Ontario Co., 1.99 mi. Phelps-Newark, Part 2, Rd. 1550 (f) Tioga Co., 1.38 mi. Erin-Van Etten-Spencer, Part 3, Rd. 5657; also repairing roads in following counties: (g) Saratoga Co., 1.5 mi. Rd. 243, Contr. 1245, (h) Schenectady Co., 1.79 mi. Rd. 577, Contr. 1247, (i) Oneida Co., 4.34 mi. Rd. 933, Contr. 1249, (j1) Broome Co., 2.78 mi. Rd. 265, Contr. 1232, (2) 1.63 mi. Rd. 134, Contr. 1234, (k) Chenango Co., 1.5 mi. Rd. 5261, Contr. 1242, (l) Otsego Co., 1.16 mi. Rd. 678, Contr. 1240, (m) Sullivan Co., 4.33 mi. Rd. 5223, Contr. 1244, (n) Cortland Co., 4.17 mi. Rds. 510 and 132, Contr. 1250, (o) Oswego Co., 3 mi. Rd. 5251, Contr. 1233, (p) Livingston Co., 5.3 mi. Rd. 623, Contr. 1239, (q) Monroe Co., 1.06 mi. Rd. 269, Contr. 1237, (r) Orleans Co., 2.46 mi. Rd. 5025, Contr. 1238, (s) Wyoming Co., 2.5 mi. Rds. 5024 and 5134, Contr. 1243, from Leonard Paving Co., 233 Bway., New York City, (a) $206,070; Rossney Contg. Corp., Buffalo, (b) $76,874; A. Barbarri, Syracuse, (c) $85,807; Sweeney & Boland, Wolcott Rd., Rochester, (d) $237,534; F. H. Murray, Cutler Bldg., Rochester, (d) $239,851; T. Sullivan and DiPillo Co., Geneva, (e) $68,499; W. J. Semper, Watertown, (e) $75,011; N. E. Young, Union, (f) $51,855; J. W. Gurnett, Watkins, (f) $52,965; W. L. Sherrill, Hudson Falls, (g) $39,991; Collins Bros., Mechanicsville, (g) $40,971; J. J. Malloy, 434 State St., Schenectady, (h) $47,642; Veeder Contg. Co., Inc., Schenectady, (h) $48,829; H. W. Roberts & Co., 610 Lansing St., Utica, (i) $149,865, (m) $122,736, (o) $62,937; N. E. Young, Union, (j1) $15,976, (j2) $9,956; Lane Contr. Corp., 37 Colony St., Meriden, Conn., (j1) $16,513, (j2) $10,513, (m) $81,676, (o) $42,789; Norwich Constr. Co., Norwich, (k) $44,843, (l) $39,989; Atlanta Constr. Co., Atlanta, (p) $162,075; I. M. Ludington Sons, Powers Bldg, Rochester, (p) $165,527, (r) $76,449; Hendrickson-McCabe Constr. Co., Syracuse, (q) $49,610; J. J. Crouch, Rochester, (q) $49,985, (r) $74,987; Greece Constr. Co., Rochester, (r) $71,589; Wing & Munger, Holley, (r) $72,410; Oatka Eng. & Constr. Co., Inc., Warsaw, (s) $69,975; T. F. Murray, Leroy, (s) $76,695; A. A. Howard, Fairport, (s) $77,155. Noted April 1.

★**N. Y., New York**—H. Bruckner, pres. Bronx Boro., let contract paving Southern Blvd., to Union Paving Co., Bway. and 112th St., $122,384. Noted April 8.

N. Y., S. I, West New Brighton—C. D. Van Name, pres. Richmond Boro., St. George, received bids April 13, completing approach work of addition to Richmond Co Court House, from J. M. Knopp, 544 West 43rd St., $54,972; P. T. Cox, 154 Nassau St., $56,900; North Eastern Constr. Co., 101 Park Ave., $72,482. Contractors all of New York City.

★**New Jersey**—State Highway Comn., Trenton, let contract surfacing 15,471 sq. yd. Route 1, Sect. 5, Highstown to Milstone River, 18 ft. wide, Mercer Co., to Thompson & Glickman, Freehold, $124,821. Noted April 1.

★**Pennsylvania**—State Highway Dept., Harrisburg, let contract rebuilding Route R-117, Fayette Co., to J. I. Dick, Scottdale; Route R-168, Monroe Co., to J. J. Guinan Constr. Co., 2314 Gravesend Ave., Brooklyn, N. Y.; Route R-151, Montgomery Co., to Union Paving Co., 30th and Leicester Sts. Noted Feb. 26.

Pennsylvania—State Highway Dept., Harrisburg, received bids April 14, paving roads in counties as follows.

Armstrong Co., Route 188, Sect. 1, from Record Constr. Co., 308 William St., Elmira, N. Y., $124,918.

Cambria Co., Route 222, Sect. 1, from Torquato Bros. Co., 1317 Midway, St., Windber, $361,514 and Route 53, Sect. 3, from P. C. Azzaoo, Cresson, $364,172.

Delaware Co., Route 225, from W. C. Evans, Maple St., Ambler, $83,201; J. F. Burke Co., 309 Park Ave., Plainfield, N. J., $83,511; D. E. O'Connell & Son, 204 Winona St., Ridley Park, $86,071.

Erie Co., Route 84, Sect. 2, from Carey, Campbell & Co., 120 Bway., New York City, $520,756; Warren Bros. Co., 142 Berkeley St., Boston, $600,338; F. L. Cohen, Inc., 1002 Prudential Bldg., Buffalo, N. Y., $624,885.

Fayette Co., Route 366, Sect. 2, from Cunningham & Murray, 1345 Arch St., Phila., $370,018; W. C. Evans, Maple St., Ambler, $415,998.

Greene Co., Route 111, Sect. 1, from Newman & Woy, Boswell, $157,954; Reed & Moore, Waynesburg, $177,606.

Lawrence Co., Route 81, Sect. 2, from Woods & Golden Constr. Co., 212 Mechanic St., New Castle, $320,331; W. Keesecker and E. J. Kane, 1818 Wilson Ave., Youngstown, O., $389,921.

Montgomery Co., Route 151, Sect. 2, from Ambler, Davis Co., Harrison Bldg., Phila., $281,406; W. C. Evans, Maple St., Ambler, $287,147; Union Paving Co., 30th and Locust Sts., Phila., $287,513.

Potter Co., Route 236, from G. Metzger, Jr., 11 4th St., Emporium, $77,581.

Susquehanna Co., Route 10, Sect. 2, from H. B. Sproul Constr. Co., Inc., 218 Adams Ave., Scranton, $294,164; Porter Bros., Wilkes-Barre, $353,031; Atlantic Bitulithic Co., Virginia Ry. & Power Bldg., Richmond, Va., $381,599.

Warren Co., Route 95, Sect. I, from M. Dolan, Jamestown, N. Y., $264,221.

Washington Co., Route 181, Sect. 1, from S. Gamble Co., Glass St., Carnegie, $342,535. Noted March 25.

Pennsylvania—State Highway Dept., Harrisburgh, received bids April 13, paving roads in counties as follows:

Beaver Co., Route 204, Sect. 3, and Application 254 from J. C. Devine Co., Alliance, O., $433,429 and $49,622 respectively.

Crawford Co., Route 84, Sect. 6, from H. E. Bunce, 125 Fulton St., Olean, N. Y., $209,473.

Delaware Co., Route 130, Sect. 1, from Eastern Paving Co., 401 Colonial Trust Bldg., Phila., $47,643; F. Gillespie, 907 Crozer Bldg., Phila., $49,854; W. C. Evans, Maple St, Ambler, $53,311.

Huntingdon Co., Route 33, from Standard Contr. Co., 28 Altoona Trust Co., Bldg., Altoona, $46,207; E. H. and L. A. Brua, Jr., Hollidaysburgh, $46,562; Finn & Son, Inc., Mapleton Depot, $47,554.

Lycoming Co., Route 21, Sect. 4, from H. S. Kerbaugh and R. G. Collins, Jr., 165 Bway., New York City, $1,083,058; Porter Bros., Wilkes Barre, $1,142,148

Mercer and Lawrence Counties, Route 238, Sect. 1, from D. McNeil Co., 6120 Jenkins Arcade Bldg., Pittsburgh, $772,186.

Schuylkill Co., Route 162, Sect. 1, from Pottsville Constr. Co., Mortimer Bldg., Pottsville, $526,141 and $5,257 for materials for Tamaqua Boro.; Porter Bros., Wilkes Barre, $548,944 and $5,068; Mangan & Risser, Lebanon, $582,126 and $5,927.

Warren Co., Route 279, from Carey, Campbell & Co., 120 Bway., New York City, $520,660; F. L. Cohen, Inc., 1002 Prudential Bldg., Buffalo, N. Y., $547,641.

Westmoreland Co., Route 68, Sect. 1, McCrady Bros., Braddock, $495,204; R. H. Cunningham & Sons, 617 Penn Ave., Turtle Creek, $508,044. Noted March 25.

★**Pa., Phila.**—City let contracts to Union Paving Co., 30th and Leicester Sts., paving with asphalt portion 5th St., $58,750, 13th St., $15,775; repaving with granite, Kensington Ave., $100,870, with granite block Vine St., $68,050; Frankford St., $85,770.

★**Maryland**—State Rds. Comn., 601 Garrett Bldg., Baltimore, let contract grading and paving 1 mi. Monroe St. and Elgin Ave., sheet asphalt on concrete base, Baltimore City Contr. BC-29-B, to Baltimore Asphalt Block & Tile Co., 1320 North Monroe St., Baltimore, $75,000. Noted March 18.

★**W. Va., Morgantown**—Comrs. Monongalia Co. let contract building 6.67 mi. Fairmont Pike, 16 ft. wide, to Cole Bros. Constr. Co., Morgantown, $305,402. Noted March 18.

★**W. Va., Fayetteville**—Comrs. Fayette Co. let contract grading 6 mi. road from Deep Water to Montgomery, to J. M. Randish Constr. Co., Fayetteville, $75,227.

★**W. Va., Wayne**—Comrs. Wayne Co. let contract building Buffalo-Kenova Rd., vitr. brick, to C. S. Waugh & Co., Williamson, $67,190.

★**North Carolina**—State Highway Comn. Raleigh, let contract gravelling, grading and building bridges on 18 mi. Federal Aid Project 75 and 59-A, to Columbus Co. Comn., Whiteville, $163,000; 11.32 mi. Federal Aid Project 103, to Duplin Co. Comn., Kenansville, $78,000; 6 mi. Federal Aid Project 58, to R. P. Asheley, Smithfield, $50,000. Noted April 1.

N. C., Gastonia—Gaston Co. will hard surface 9 mi. road from Belmont to Mt. Holly, 12 mi. from Gastonia to Belmont and 4 mi. from Gastonia to Dallas. Work will be done by day labor.

★**N. C., Gastonia**—Gaston Co. will hard surface 6 mi. road from here to Bolling Green and 14 mi. road from here to Cherryville. Work will be done by day labor.

★**Michigan**—State Highway Dept., Lansing, let contract grading and draining 16.595 mi. Federal Aid Project 38, to M. E. Hull and R. Garner, $140,744. Noted April 1.

★**Michigan**—State Highway Dept., Lansing, let contract grading, draining and surfacing 3,251 mi. Assessment Dist. Rd. 300, 16-55 ft. wide, to W. Cosgriff, Alto, $56,963; .898 mi. State Trunk Line Rd. 11-6, 20 ft. wide, Muskegon Co., to O. P. Carpenter, Muskegon Heights, $36,890; 1.08 mi. State Trunk Line Rd. 11-30, 20 ft. wide, Muskegon Co., to J. R. Edelman, Muskegon, $14,133; 3.052 mi. State Trunk Line Rd. 76-1 and 5.47 mi. State Trunk Line Rd. 76-2, 12 ft. wide, Ogemaw Co., to J. Orr, Standish, $40,126 and $84,007 respectively; Federal Aid Project 35, 18 ft. wide, 15.618 mi. Sects. A and B, Washtenaw Co., to Bd. Rd. Comrs. Washtenaw Co., Ann Arbor, $523,181, 9.546 mi. Sects. C, D, E and G, Jackson Co., to Bd. Rd. Comrs., Jackson Co., Jackson, $352,337. Noted Feb. 12, March 11 and 25.

★**Michigan**—State Highway Dept., Lansing, let contract grading, draining and surfacing 4.39 mi. State Trunk Line Rd. 11-4C, 18 ft. wide, Ottawa Co., to Oosting & Hofsteen, Holland, $160,579; 5.8599 mi. State Trunk Line Rd. 11-10, 18 ft. wide, Berrien Co, to Reith-Riley Constr. Co., Goshen, Ind., $237,851; 3.971 mi. Assessment Dist. 96, 9 ft. wide, Ionia Co., to J. Mishler, Freeport, $41,474. Noted March 4 and April 1.

Mich., Detroit—City received bids grading, shaping and surfacing (a) Field Ave., (b) Bushey St., (c) Chalmers Ave., (d) Euclid Ave., (e) Elmhurst Ave., (f) Ellsworth Drive, (g) Horatio St., (h) Spring St., (i) Warren Ave., (j) Wilde St., asphaltic concrete on 6 in. concrete foundation, (1) concrete, (2) Amherst or Berea curbstone, from W. B. Brady Constr. Co., 1972 Grand River Ave., (a1) $78,437, (a2) $82,985, (b1) $12,440, (b2) $13,154, (c1) $18,110, (c2) $19,234, (d1) $31,642, (d2) $33,472, (e1) $11,458, (e2) $12,088, (f1) $4,700, (f2) $5,060, (g1) $7,064, (g2) $7,442, (h1) $7,215, (h2) $7,624, (i1) $45,634, (i2) $47,837, (j1) $10,850, (j2) $11,442; Detroit Asphalt Paving Co., 20 McGraw Bldg., (a1) $78,219, (a2) $83,121, (b1) $11,922, (b2) $12,625, (c1) $17,392, (c2) $18,498, (d1) $32,290, (d2) $34,262, (e1) $11,230, (e2) $11,909, (f1) $4,682, (f2) $5,071, (g1) $6,827, (g2) $7,234, (h1) $7,060, (h2) $7,502, (i1) $43,963, (i2) $46,351, (j1) $10,672, (j2) $11,301; Cleveland Trinidad Paving Co., 2940 Woodward Ave., (a1) $76,682, (a2) $81,155, (b1) $12,212, (b2) $12,982, (c1) $18,044, (c2) $19,256, (d1) $32,170, (d2) $33,970, (e1) $11,430, (e2) $12,050, (f1) $4,537, (f2) $4,891, (g1) $6,710, (g2) $7,082, (h1) $6,890, (h2) $7,293, (i1) $43,436, (i2) $45,614, (j1) $10,338, (j2) $10,920. Noted April 15.

★**Mich., Mt. Clemens**—Macomb Co. let contract grading, draining and surfacing 4.331 mi State Trunk Line Rd. 19-11, 18 ft. wide, to T. E. Currie, 20 McGraw Bldg., Detroit, $173,192. Noted March 25.

Ia., Des Moines—Polk Co. received bids April 9, grading and paving 4.45 mi. White Pole Rd., 20 ft. wide, from O'Rourke Eng. Co., 1215 Mulberry St., $202,737; Koss Constr. Co., 2818 5th St., $206,343; Stein Constr. Co., 204 Grand Ave., Milwaukee, Wis., $210,390. Noted April 8.

★**Ia., Emmetsburg**—Palo Alto Co. let contract building Federal Aid Project 109, 18 ft. wide, involving 68,437 sq.yd. pavement, to Brereton & Bauck, Emmetsburg, $3.25 per sq.yd. Noted March 4.

★**Minn., Crookston**—Comrs. Polk Co. let contract paving 1.4 mi. road from here to Northwestern School of Agriculture, concrete, to Hussey Constr. Co., Crookston, $58,697. Noted March 25.

Streets and Roads (Continued)

★**Minn., Duluth**—City let contract paving 3,300 ft. Raleigh St. from Central to 63rd Aves. W., concrete, to Olsen & Johnson, c/o City Engineer's Office, $56,630. Noted Feb. 5.

Kan., Neodesha—City received bids for 15,000 sq.yd. brick and concrete pavement, from J. K. Shenn Constr. Co., Independence, $105,738; Cook & Slucker, Ottawa, $109,700; E. W. Geiger Constr. Co., Leavenworth, $111,274.

★**Kan., Oskaloosa**—Jefferson Co. let contract paving various roads, 18 ft. wide, bituminous macadam, to List & Hallett, 415 Ry. Exch. Bldg., Kansas City, Mo., $347,341.

★**S. D., Brookings**—City let contract paving various streets, rein.-con., to C. H. Atkinson, Watertown, $265,036. Noted Feb. 26.

N. D., Fargo—City received only bid paving 2 alleys and 8 blocks 8th St., 30 ft. wide, bitulithic, from W. E. Kennedy, Fargo, $5,000 and $70,000 respectively.

★**N. D., Fargo**—City let contract paving portion 6th Ave., bitulithic, to W. E. Kennedy, Fargo. About $130,000.

★**Mont., Billings**—Yellowstone Co. let contract paving 4,700 sq.yd. Miles Ave., Special Impvt. Dist. 12, 16 ft. wide, concrete, to McElroy-Clark Constr. Co., Billings, $16,000.

★**Mont., Livingston**—City let contract for 6 in. plain concrete pavement, to C. T. Heaton Constr. Co., Livingston. About $414,000. Noted March 25.

Mo., Mexico—Audrain Co. received only bid building 7.2 mi. Mexico-Fulton Rd. 24 ft. wide, from C. P. O'Reilly, St. Louis, $55,604. Noted April 15.

★**Mo., St. Joseph**—Buchanan Co. let contract paving 10.7 mi. Faucett Rd. 18 ft. wide, concrete, to Metropolitan Paving Co., Corby Forsyth Bldg., $464,206. Noted March 4.

Tex., Brownsville—Cameron Co. received bids March 25, paving with (a) 7 in. plain concrete, (b) 5 in. concrete with 1½ in. bituminous top, (c) 7 in. gravel and 1½ in. bituminous top with concrete curb, (1) 3.106 mi. Highway 12, Brownsville-San Benito Rd., 15 ft. wide, (2) 3.27 mi. Highway 12, Brownsville-Harlengen Rd., 15 ft. wide, from H. L. Fitch Constr. Co., Box 562, Brownsville, (1a) $87,269, (1c) $145,527, (2a) $81,533, (2c) $128,062; W. T. Montgomery, 802 Alamo Bank Bldg., San Antonia, (1a) $88,386, (1b) $107,267, (1c) (gravel only) $70,053, (2a) $84,726, (2b) $103,521, (2c) (gravel only) $68,716; Haden & Austin, 727 Kress Bldg., Houston, (1c) (bituminous only) $24,420, (2c) (bituminous only) $25,965. Noted March 25.

★**Tex., Childress**—City let contract paving, curbing and guttering 8 blocks Main St. and Ave. B, to Jordan Constr. Co., Plainview, $110,000. Noted April 8.

★**Tex., Corpus Christi**—City let contract building temporary causeway, to Corpus Christi Commercial Assn., Corpus Christi, $35,000.

★**Tex., Denton**—Denton Co. let contract gravel and macadam surfacing and building concrete bridges and culverts, 43.4 mi. Denton-Roanoke, Denton-Pilot and Denton-Sauge Rds., 18 ft. wide, to McElwrath & Rogers, Corsicana, $654,531.

Tex., Georgetown—H. A. Hodges, aud. Williamson Co. received bids March 30, surfacing 10 mi. Meridian Highway 2, 16 ft. wide, with (a) Class "A" asphalt and trap rock, 1 in. treatment, (b) asphalt, trap rock and limestone, 1 in. treatment, (c) ¾ in. treatment Class "A" asphalt and trap rock, (d) ½ in. treatment asphalt and trap rock, from Haden & Austin, 727 Kress Bldg., Houston, (a) $61,072, (b) $58,941, (c) $50,384; W. E. Dozier, Dam Blvd., Austin, (a) $69,930, (b) $63,936, (c) $54,945; Finley Method Co., 703-4 Stewart Bldg., Houston, (a) $64,930, (b) $47,952, (c) $41,959. Noted March 25.

★**Tex., Greenville**—Hunt Co. will pave 23.6 mi. roads, broken stone with asphalt. About $433,000. Work will be done by day labor.

Tex., Junction—C. R. Stevenson, judge Kimble Co., received bids April 6, grading, surfacing and draining 24.7 mi. Highway 27, from here to Kerr Co., 9 ft. wide, (a) 114.6 acres clearing and grubbing, (b) concrete drainage structures, from Coleman & Jenkins, Gunter Bldg., San Antonio, (a and b) $187,735; W. T. Montgomery, Alamo Bank Bldg., and Walsh & Burney, Hicks Bldg., both San Antonio, (a) $133,023, (b) $67,793; M. M. Craven, Bellaire, (a and b) $216,923. Noted April 1.

Tex., Junction—C. R. Stevenson, judge Kimble Co., received bids April 6, grading, surfacing and draining (1) 6.83 mi. Highway 27, from here to 6 mi. crossing, 9 ft. wide, (2) 3.37 mi. Highway 27, from 6 mi. crossing to 10 mi. Bridge, 9 ft. wide, from Walsh & Burney, Hicks Bldg., San Antonio, (1) $25,389, (2) $39,367; M. M. Craven, Bellaire, (1) $28,919, (2) $42,695; Coleman & Jenkins, Gunter Bldg., San Antonio, (1) $24,529, (2) $43,532. Noted April 1.

Tex., Montague—Montague Co. received bids April 8, grading, surfacing and draining (1) 7.47 mi. Highway 2D, Federal Aid Project 128-A, 16 ft. wide, (2) 8.08 mi. Highway 2, Meridian Rd., Federal Aid Project 86B, 16 ft. wide, from Montague Co., c/o W. T. Russell, judge, (1) $51,409, (2) $84,467; Womack Constr. Co., Sherman, (1) $54,950; Bibb & Hughes, Waco, (1) $57,476, (2) $88,951; P. O'Connor, Dallas, (2) $87,674. Noted March 18.

★**Okla., Waurika**—City let contract paving 60 blocks, 24 ft. wide, concrete, to Municipal Excavator Co., 200 East Main St., Oklahoma, $202,000. Noted Jan. 15.

Over 10,000 construction items have been printed in these pages since January 1. The approach of good weather is indicated by the increasing number of news items published each month.

January	2450 items
February	2550 items
March	4100 items

The April 1 issue of Engineering News-Record carried 876 items of construction news—the largest number in a single week.

Colorado—State Highway Comn., Denver, received bids grading and draining 2 mi. Turkey Creek Rd., Federal Aid Project 29, Jefferson Co. from W. Flick, 1556 Williams St., Denver, $58,603, Allen & Lafferty, Morrison, $63,108, Monarch Eng. Co., $63,481; paving 2½ mi. Denver Morrison Rd., Federal Aid Project 82, Jefferson Co., from Colorado Bridge & Constr. Co., Gas & Electric Bldg., Denver, $50,143, Interstate Co., $55,768, Dreher Constr. Co., Logan and Speer Blvd., Denver, $56,613.

★**Utah, Ogden**—City let contract paving Dist. 130, to Moran Paving Co., Salt Lake City, $322,019. Noted April 8.

★**Ariz., Mesa**—City let contract grading, curbing, guttering and paving McDonald St., bituminous concrete, to Southwestern Contg. Co., 13th Ave. and Lincoln St., Phoenix, $50,939.

★**Washington**—State Highway Comn., Olympia, let contract grading and paving 3.09 mi. Pacific Highway from Marysville north, Snohomish Co., to Independent Asphalt Paving Co., Seaboard Bldg., Seattle, cost $97,583; 1.99 mi. Pacific Highway from Thurston Co. line to Grand Mound, Thurston Co., to T. M. Morgan, 412 Commercial Bldg., Everett, $65,558; 5.76 mi. Inland Empire Highway from Donald to Burns, Yakima Co., to R. M. Hardy, 402 Masonic Temple, Yakima, $223,271. Noted March 25 and 4.

★**Washington**—State Highway Comn., Olympia, let contracts building 7.72 mi. Inland Empire Highway from Chewelah to Valley and 5.99 mi. from Olson to Springdale, Stevens Co., to Triangle Constr. Co., Ritzville, cost $95,442 and $81,366 respectively; 3.41 mi. Inland Empire Highway from Buroker to Dixie, Walla Walla Co., to A. Guthrie & Co., Sherlock Bldg., Portland, $135,698; 1.97 mi. Navy Yard Highway from Holyoke Creek to Belfair, Mason Co., to J. S. Galbraith, 513 Marion Bldg., Seattle, $24,688. Noted March 11.

★**Wash., Seattle**—Bd. Pub. Wks. let contract filling, paving and building trestle on 4th Ave., S., et al, to Jahn & Bressi, cost $108,879; building concrete sidewalks, on 28th Ave., N. W., to G. L. Smith, $39,862; clearing and grading East 60th St., to A. C. Goerig, $17,076; grading and paving Water Ave., et al, to S. A. Moceri, $25,196; contractors all of Seattle.

★**Wash., Seattle**—King Co. will grade and gravel 1.75 mi. C. T. Conover Rd. 2. About $25,000. Former bids rejected. Work will be done by day labor. Noted March 25.

★**Wash., Tacoma**—Pierce Co. let contract grading and paving 1.08 mi. Burnham Hunt Co. Rd., 16 ft. wide, concrete, to Independent Asphalt Paving Co., 18th St. and Dock, $43,950.

Ore., Portland—City received bids April 7, improving (a) Russett St. from Vancouver to Union Aves., (b) Woolsey St. from Willis Blvd. to Houghton St., (c) 48th St. S. E. from 52nd St. S. E. to 58th St. S. E., (d) Oregonian Ave. from Columbia Blvd. to Bank St., (1) grading and sidewalks, (2) asphaltic concrete No. 1, 2 in. top on crushed rock 4 in. base, in roadway, (3) concrete No. 3, in roadway, from United Contg. Co., Northwest Benk Bldg., (a2) $2.30 per sq.yd., total, $26,493, (c3) $2.30 per sq.yd., $7,420; Hetrick & Cline, foot of East Salmon St., (b1) $5,813; Hahn & Rebman, (b1) $5,825, (d1) $9,766; N. Costanzo, (b1) $5,828; Archer Contg. Co., (b1) $5,936, (c3) $7,355; M. Hansen & Co., 523 East Grant St., (d1) $9,294.

California—State Highway Dept., 515 Forum Bldg., Sacramento, received bids April 12, paving 10.7 mi. road between Woodland and Zamora, Yolo Co., from G. S. Benson & Sons, 521 Stinson Bldg., Los Angeles, $140,889, M. Blumenkranz, Farmers & Merchants Bank Bldg., Stockton, $161,396. P. L. Burr, 512 Mission St., San Francisco, $168,074; 15.7 mi. road between Redding and southerly boundary of Shasta Co., from G. T. Atkinson, 705 Spaulding Bldg., Portland, Ore., $296,726, F. Rolandi, 550 Montgomery St., San Francisco, $350,951; 13.6 mi. road between Glenwood and Los Gatos, Santa Cruz and Santa Clara Counties, from J. L. Conner, 709 Higgins Bldg., Los Angeles, $196,842; 25.2 mi. road between Dyerville and Fortuna, Humboldt Co., from P. L. Burr, 512 Mission St., San Francisco, $442,948, Mercer Fraser Co., 1st and G Sts., Eureka, $563,321; 11.3 mi. road between Flinn Springs and Ogden Ranch, San Diego Co., from Riley & Peterson, Calexico, $177,530, W. E. Kier Constr. Co., 813 1st Natl. Bank Bldg., San Diego, $318,837; 12 mi. road between Oil King School and Huron Rd., Fresno Co., from J. G. Donovan, 780 Lyon St., Los Angeles, $220,696, Noted March 25.

Cal., El Centro—Imperial Co. received bids paving 45 mi. highways, 16 ft. wide, from Peterson Bros., Calexico, $27,456 per mi.; Warren Bros. Co., 142 Berkeley St., Boston, $27,931 per mi. Noted April 8.

★**Cal., Elsinore**—City let contract paving 11,715 ft. Main and Spring Sts., et al, 18 and 25 ft. wide, to R. T. Shea & Co., Riverside, $67,400.

★**Cal., Fresno**—City let contract improving Sarah, Elm, Vassar and White Bridge Aves., et al, to Thompson Bros., 1514 H St. Cost to exceed $40,000. Noted March 11.

★**Cal., Hemet**—City let contract improving 2 mi. streets, 20-42 ft. wide, to Orange Co. Eng. & Constr. Co., Santa Ana. About $64,000. Noted March 25.

Cal., San Pedro—City received bids improving Seaside Ave., et al, from Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., $100,000; Bryant & Austin, Inc., 1650 Compton Ave., $112,200, both of Los Angeles.

★**N. S., Halifax**—City let contract building 17½ mi. macadam road, from here to St. Margarets Bay, to Bedford Constr. Co., Royal Bank Chambers. Noted Feb. 26.

★**Ontario**—Dept. Pub. Wks. Toronto, let contract clearing, grubbing and doing necessary earth and rockwork, etc., in Richmond Twp. also 6 mi. in Tyendinaga Twp., to Chisholm Wellage Co, South Lancaster. Noted Feb. 26.

Railways

PROPOSED WORK

South Carolina—Columbia Ry. Gas & Electric Co., Arcade Bldg., Columbia, plans to lay double tracks from Scott St to city limits, also pave and grade portion North Main St. About $50,000. Tomlinson Eng. Co., Loan & Exch. Bldg., Columbia, engrs.

Wisconsin—See "Industrial Works."

Texas—P. A. McCarthy, ch. engr., of Central Texas Electric Ry., 2003-9 Amicable Bldg., Waco, soon lets contract laying tracks, clearing, grading, surfacing and building trestle on 1st unit (6½ mi.) Waco-Temple Division.

Texas—Dallas Ry., Interurban Bldg., Dallas, plans to build 130 mi. electrical interurban line. About $$7,500,000. F. A. Jones Co., Interurban Bldg., Dallas, engrs.

Texas—C. Endsley, Kansas City, Mo., having preliminary surveys made building 100 mi. line from Uvalde to Sonora. About $5,000,000. Owner will be chief engineer.

Texas—Kansas City, Orient & Mexico R.R., Kansas City, Mo., soon receives bids building 200 mi. line from San Angelo to Del Rio. A. De Bernhardi, Wichita, Kan., ch. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**North Carolina**—Carolina Beach Ry., Wilmington, let grading contract for electric line from Wilmington to Carolina Beach, to E. R. Austin, Norfolk, Va. About $100,000.

Excavation and Dredging

PROPOSED WORK

Ia., Onawa—Ditches—Monona Co. soon lets contract building drainage ditches, involving 3,350 ft. 24-36-in. drain tile and 4,195 ft. 15-36-in. sewer or lock-joint pipe.

Ia., Waterloo—Ditches—Blackhawk Co. had surveys made for 135,000 ft. tile ditches, Barclay Twp. J. A. Francis, aud. A. E. Michel, Algona, engr.

Ore., Nyssa — Ditch — Kingman Colony D. D. soon lets contract for 4 mi. open ditch and 8 mi. closed tile drain. F. Hall, secy.

Cal., San Dimas—Canal, etc.—San Gabriel Reservoir Co. plans to build 8½ mi. canal and reservoir to store 35,000 acre ft., 9,000 ft. tunnel and 150 ft. dam in San Gabriel River, to impound flood waters for irrigating 30,000 acres. About $3,970,000. Address J. H. Christian, 1321 Laurel St., Los Angeles. Bedkman & Linden Eng. Corp., 593 Market St., San Francisco, engrs.

BIDS DESIRED

N. Y. Rochester — Excavation — Until May 18, by E. S. Walsh, supt. Dept. Pub. Wks., Capitol, Albany, completing excavation of canal channel in Genesee River and placing rock spoil protection between Elmwood Ave. and Clarissa St. Bridges, here. Contr. 202 (Revised): advertised in this issue.

Ia., Emmetsburg—Drain—Until April 27, by W. F. Egan, aud. Palo Alto Co, building D. D. 114, involving 456,666 cu.yd. excav. Noted April 8.

Tenn., Somerville—Drainage—Until April 26, by J. A. Phillips, comr. Beaver Dam Creek D. D. 1 of Fayette, Shelby and Tipton Counties, building drainage system, involving 630,000 cu.yd. excav.

Idaho, Picabo—Until April 26, by D. D. 1, Blaine Co. for 158,000 yd. excav., 12 bridges, flumes, etc. H. H. Neal, comr.

Industrial Works

PROPOSED WORK

N. H., Dover T. G. Plant Co., Jamaica Plain, Mass., plans to build 4-story, 50 x 200 ft., brick and mill construction addition to factory, here. About $100,000. Private plans.

Mass., Boston Lawrence & Wambolt, archts., 6 Beacon St., preparing plans for 5 story, 100 x 100 ft., cooling plant, brick, on South Market St About $55,000. Owners name withheld.

Mass., Boston—J. C Spofford archt., 15 Beacon St., receives bids about May 1, building 9 story, 130 x 193 ft., rein.-con garage and storage plant, on Kneeland St. About $750,000. Owners name withheld

Mass., Holyoke—Hampden Glazed Paper & Card Co having plans prepared by Casper Ranger Constr. Co., engrs., 201 Devonshire St, Boston, for additions to plant Cost between $100,000 and $125,000

Mass., Pittsfield—General Electric Co. plans to build two 1-story, 100 x 400 ft., brick and steel manufacturing plants, on Morningside St. About $250,000. Private plans.

Mass., Pittsfield—Pittsfield Industrial Development Co., North St., plans to build 3-story, brick and steel plant. About $60,000. Architect not selected.

Mass., West Springfield (Springfield P. O.)—Wisco Mfg. Co., Chestnut and Liberty Sts., Springfield, having plans prepared by McClintock & Craig, archts., 33 Lyman St., Springfield, for factory, here. About $150,000.

Mass., Wollaston (Boston P. O.)—E. R. Simpson, engr., 176 Federal St., Boston, soon lets contract building 3 story, 55 x 120 ft., brick and mill construction factory, on Colony Ave., for Howard Chemical Co., c/o engineer. About $50,000.

Mass, Wrentham — Commonwealth of Massachusetts, c/o Kendall, Taylor & Co., archts., 93 Federal St., Boston, having plans prepared for 1-story, 50 x 70 ft., cold storage plant and 1-story, 40 x 90 ft., industrial building, brick, concrete and steel, here. About $88,000.

Conn., Bridgeport—Bryant Electric Co., 1421 State St., plans to build 4-story, 120 x 150 ft., brick and steel warehouse, on Organ St. About $150,000. Private plans.

Conn., Hartford—Comrs. Fire Dept. plan to build machine shop, on John St. About $125,000. Architect not selected.

Conn., New London—Chamber of Commerce, c/o Bilderbeck & Langdon, Inc., archts. and engrs., Barrows Bldg., having plans prepared for 4-story, 50 x 100 ft., brick and concrete factory. About $60,000.

Conn., Stamford—F. Urso, archt., 453 West Main St., soon lets contract building 3-story, 50 x 100 ft., brick and steel plant, for A. Caverly, c/o architect. About $60,000.

N. Y., Albany—J. L. Kinney, 234 Clinton Ave., having plans prepared by McCormick Co., Inc., archts. and engrs, 41 Park Row, New York City, for 2-story, 80 x 85 ft., brick, concrete and steel bakery, at 255-261 Dove St. About $60,000.

N. Y., Brooklyn—J. Kroder and H. Reubel, 108 Meeker Ave., having plans prepared by R. Berger, archt. and engr., 309 Bway., New York City, for 129 x 150 ft., brick and steel factory, on North Henry St. About $150,000.

N. Y., Gates—(Lincoln Park P. O.)—Yawman & Erbe Co., Inc., 424 St. Paul St., Rochester, plans to build plant, here. About $400,000.

N. Y., Glenfield—Dexter Sulphite Pulp & Paper Co., Dexter, plans to build sawmill, here. Cost between $75,000 and $100,000. Address H. A. Long, Dexter.

N. Y., Jamaica—W. B. Wills, Inc., engrs. and archts., 1101 Myrtle Ave., Brooklyn, receives bids about April 28, building 3 story, brick and steel factory, here, for J. Hessler & Son, 18 Cedar St., New York City. About $50,000. Noted April 15.

N. Y., Jamaica—W. B. Wills, Inc., archt. and engr., 1101 Myrtle Ave., Brooklyn, preparing plans for 4 story, 50 x 100 ft., brick and steel factory. About $60,000. Owner's name withheld.

N. Y., Lockport—Niagara Co. Dairymen's League plan to build brick, concrete and steel condensery and ice cream plant. About $250,000. E. N. Olds, pres. Architect not selected.

N. Y., New York—G. H. Budke, 561 West 175th St., having plans prepared by S. J. Kessler, archt. and engr., 529 Courtlandt Ave., for 2 story, 100 x 124 ft., brick and steel garage, at 315 West 69th St. About $100,000.

N. Y., New York—New York Edison Co., 103 East 15th St., plans to build 1 story, rein.-con. and steel subsation, on Cedar St. About $75,000. W. Whitehill, 12 Elm St., archt. and engr.

N. Y., North Tonawanda—New York Central R.R., Grand Central Terminal, New York City, plans to build new depot freight house, here; also depot and track rearrangement and elevation, at Tonawanda About $1,000,000. G. W. Kittredge, New York City, ch. engr.

Pa., Phila.—Luithlen Dye Wks., J and Estaugh Sts., plans to build addition to plant, also new power house and garage. W. Steele & Sons Co., 16th and Arch Sts., archts. and engrs.

Pa., Phila.—H. A. May Fdry. Co., East-Wick and 61st Sts., having plans prepared by Peuckert & Wunder, archts and engrs., 310 Chestnut Sts., for brick and concrete foundry, on Walnut and 30th Sts. About $100,000

O., Cleveland—Efficient Vise & Wrench Co., 4207 Clark Ave., plans to build 1 story, brick and steel drop-forge plant, along tracks of Belt Line R.R. About $100,000. W. S. Du Charme, pres. Architect and engineer not selected.

O, Cleveland — Superior Tractor Co., Hickox Bldg., having plans prepared by G. S. Rider & Co., archts. and engrs., Century Bldg., for 1-story, 100 x 300 ft., concrete, steel and brick factory, on St. Clair Ave. and East 200th St. About $150,000.

O., Cleveland—Virden Mfg. Co., Ashland Rd. having plans prepared by E. McGeorge, archt. and engr., 1900 Euclid Ave., for 1 story, 40 x 92 ft., steel and brick addition to factory, on Longfellow Ave. and Ashland Rd. About $60,000.

O., Cleveland—D. D. Wessels, 1385 East 17th St., plans to build 2 story, 32 x 130 ft. and 100 x 116 ft., concrete, steel and brick factory, on East 21st St. and Oregon Ave. About $125,000. Architect and engineer not selected.

O., Cuyahoga Falls—Falls Rubber Co. having plans prepared by E. McGeorge, archt., 1900 Euclid Ave., Cleveland, for 3 story, 61 x 84 ft., concrete, steel and brick addition to factory. About $100,000.

O., Dayton—A-C Electrical Mfg. Co., U. B. Bldg., plans to build 2 story, 100 x 250 ft., rein-con. and steel factory, on East 4th St. About $150,000. Architect not selected.

O., Elyria—Lakeshore Rubber Co., 734 Natl. City Bldg., Cleveland, having plans prepared by Akron Eng. Co., archts. and engrs., Akron, for 3 story, 80 x 240 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, along tracks of New York Central R.R., here. About $125,000.

O., Ravenna—McElrath Tire & Rubber Co., 1836 Euclid Ave., Cleveland, having plans prepared by D. C. Smith, archt., Lennox Bldg., Cleveland, and H. M. Bixler, engr., Akron, for 1-story, 100 x 300 ft. factory, and 2-story, 30 x 50 ft. boiler house, concrete, steel and brick, here. About $150,000.

O., Toledo—Grasselli Chemical Co., c/o S. Gronemeyer, Guardian Bldg., Cleveland, having preliminary plans prepared for 1 story, concrete, steel and brick chemical plant, here. About $300,000. Private plans.

Mich., Detroit—Jansen Mfg. Co., 76 14th Ave., plans to build 2 story, 75 x 100 ft., brick and steel mill, on Howard St. and 14th Ave. About $50,000. D. R. Wells, 435 Woodward Ave., archt and engr.

Mich., Hamtramck (Detroit P. O.)—Swedish Crucible Steel Co., Butler St., having revised plans prepared by Raseman & Freier, archts., 1302 Penobscot Bldg., Detroit, for 4 story, 100 x 200 ft., rein.-con., brick and steel factory, on Butler St. along tracks of Grand Trunk Ry. About $200,000.

Wis., Milwaukee—City having sketches prepared by G. McL. Harding, ch. engr., 52 Vanderbilt Ave., New York City, for freight terminal, to include tracks, piers, sheds, warehouses, etc. About $10,000,000.

Wis., Milwaukee—Natl. Brake & Electric Co., Belleview Pl., having plans prepared by H. J. Esser, archt. and engr., Camp Bldg., for 1 story, 160 x 180 ft., brick, concrete and steel addition to foundry. About $150,000.

Wis., Milwaukee—School Bd., 10th and Prairie Sts., having plans prepared by Van Ryn & De Gelleke, engrs. and archts., Caswell Blk., for 1 story, 22 x 40 ft., brick and concrete boiler house, at Garfield School. About $50,000.

Mo., Kansas City—Lysle Milling Co., 512 Choctaw St., Leavenworth, Kan., plans to build 3,000 bbl. flour mill, here. E. D. Lysle, pres. Architect not selected.

Tex., Big Springs—Texas & Pacific Ry. Co., 165 Bway., New York City, plans to build machine and car shops, here, to replace those destroyed by fire. About $250,000. E. F. Mitchell, Dallas, ch. engr.

Tex., Dallas—City voted $175,000 bonds to build abattoir. Address C. D. Fairtrace, city engr.

Tex., Dallas — Dallas Ry., Interurban Bldg., plans to build power stations, substations transmission lines, etc. About $2,000,000. F. A. Jones Co., Interurban Bldg., engrs.

Tex., Houston—Ford Motor Co., Highland Park, Mich., having plans prepared by A. Kahn, archt., Marquette Bldg., Detroit, for 2 story, 100 x 259 ft., rein.-con., brick and steel storage building, on Harrisburg Blvd., here. About $160,000

Col., Pueblo—Colorado Warehouse Co., 121 West 1st St., receives bids about May

Industrial Works (Continued)

15, building 5 story, 80 x 180 ft. concrete warehouse, on 2nd and Grand Sts. About $150,000.

Ore., Salem—Oregon Pulp & Paper Co. plans to build power plant, on Oregon Flouring Mill site, at foot of North Mill Creek. About $50,000.

Ont., Beamsville—Premier Tire & Rubber Co. plans to build plant. About $250,000. Address T. W. Woodland, Beamsville.

Ont., Essex—Essex Tractor Co. plans to build 1 and 2 story brick addition to factory. About $50,000. Engineer not selected.

Ont., Ottawa—Independent Coal Co. Ltd., 83 Bank St., soon receives bids building planing mill and coal chute, 10,000 tons capacity. About $100,000. Architect not selected.

Ont., Ottawa—Nukol Fuel Co., Ltd., 198 Sparks St., soon receives bids building factory. About $250,000. Architect not selected.

Ont., Toronto—Cutten & Fotser, Ltd., 302 Church St., plans to build 6 or 7-story, rein.-con., brick and steel addition to factory. About $150,000. Architect not selected.

Ont., Toronto—M. Rawlinson, Ltd., Yonge St., having plans prepared by Wickson & Gregg, archts., Temple Bldg., for 6-story, 880 x 160 ft., storage warehouse, rein-con., brick and steel, on Phipps St. About $125,000.

Ont., Waterloo — International Eng. Corp. plans to construct three 1 story, 50 x 100 ft. gas engine factory buildings, rein.-con., brick and steel. About $100,000. Architect not selected.

Man., Portage La Prairie—Saskatchewan Co-operative Elevator Co. plans to build flour mill and elevator which will have 36 grain tanks. About $1,000,000.

BIDS DESIRED

Mass., Chelsea (Boston P. O.)—Until April 30, by L. Cohen, Pearl St., building 3-story, 50 x 100 ft., brick, plant. About $50,000. S. S. Eisenberg, 203 Bway, archt. Noted April 1.

N. Y., Albany—Until May 2, by Embossing Co., 20 Church St., building 8-story, 80 x 100 ft., brick and rein.-con. factory, on Bway. and Pruyn St. About $100,000. C. H. Wood, c/o owners, archt

N. C., Charlotte—Until April 28, by A. Kahn, archt., Marquette Bldg., Detroit, building 6 story, 90 x 198 ft., rein.-con. brick and steel service station, on West Trade and Poplar Sts., for C. C. Coddington. About $300,000.

Mich., Flint—See "Buildings."

Ill., Chicago—E. A. Mayo, archt., 53 West Jackson Blvd., receiving bids building 1 and 2-story, 300 x 300 ft., rein-con. and brick factory, on North Central and Grand Aves., for Casey-Hudson Co., 361 East Ohio St. About $300,000.

Ill., Chicago—P. F. Olsen, archt., 127 North Dearborn St., receiving bids building concrete and steel foundrq, on 18th Pl. and Washtenaw Ave., for Home Stove Wks., 2606 West 18th St.

Wash., Olympia—Until April 30 (change of date), by State Capitol Comn., building rein.-con., brick and steel power house. About $100,000. Wilder & White, 50 Church St., New York City, archts. and engrs. Noted April 8.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Cambridge**—Austin & Doten, 102 North St., Boston, let contract building 1 story, 90 x 200 ft., brick and mill construction warehouse, on Binney St., here, to Austin Co., 217 Bway., New York City. About $50,000.

★**Mass., Lawrence**—Patchogue Plymouth Mills Corp., Maston St., let contract building 2-story, rein.-con. addition to textile plant, to L. E. Locke & Sons, 80 Bay State Bldg. About $250,000.

★**Mass., Springfield**—Packard Motor Car Co., Bway. and 61st St., New York City, let contract building 2 story, 100 x 200 ft., brick, concrete and steel garage and service station, on State St., here, to S. M. Green Co., 293 Bridge St. About $150,000. Noted March 4.

★**Mass., Wakefield**—F. P. Sheldon & Sons, engrs., 1008 Hospital Trust Bldg., Providence, R. I., let contract to S. L. Milton, 80 Boylston St., Boston, building 4 story, 50 x 185 ft., brick and concrete storehouse, for Winship-Boit & Co., Harvard St. About $135,000. Noted April 1.

Conn., Bristol — A. Monico, 329 Park St., will build 2-story, 65 x 120 ft., brick and concrete garage. About $60,000. Work will be done by day labor.

★**Conn., Broad Brook**—Broad Brook Co. let contract building 5-story, 50 x 80 ft., wool manufacturing plant, brick and mill construction to J. H. Grozier Co., 721 Main St., Hartford. About $50,000.

★**Conn., Middletown** — Ford, Buck & Sheldon, Inc., engrs., 60 Prospect St., Hartford, let contract to D. O'Brien & Sons Co., 118 Asylum St., Hartford, building 3 story, 50 x 220 ft. and 30 x 50 ft., brick and mill construction factory, for Goodyear Rubber Co., 114 Church St. About $100,000. Noted April 1.

★**Conn., New Britain**—Landers, Frary & Clark, Commercial Ct., let contract building 6-story, rein.-con. factory, to Torrington Bldg. Co., 197 Water St., Torrington.

★**N. Y., Albany** — Albany Perforated Wrapping Paper Co., 1170 Bway., let contract building 1 story, 120 x 300 ft., brick and steel, factory, to H. K. Ferguson Co., 21 West 43rd St., New York City. About $210,000.

N. Y., Black River — St. Regis Paper Co. will build concrete and steel power house to generate 7,500 hp. About $500,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Amer. Safety Razor Co., 303 Jay St., let contract building 5 story, 75 x 140 ft. and 1 story, 25 x 125 ft. factories, 2 story 45 x 50 ft. garage and 1 story, 25 x 50 ft. boiler house, rein.-con., on Lawrence, Johnson and Jay Sts., to Turner Constr. Co., 244 Madison Ave., New York City. Noted Jan. 29.

N. Y., Brooklyn—E. F. Corll, c/o O. M A. Cantor, archt. and engr., 373 Fulton St., will build 1 story, 100 x 100 ft., brick and steel garage, on Pitkin Ave. About $55,000. Work will be done by day labor.

N. Y., Brooklyn—G. Dascher, care of P. Steigman, archt., 690 Bway., will build 2 story, 100 x 100 ft., brick and steel garage, on Bedford Ave. About $60,000. Work will be done by day labor.

★**N. Y., Endicott**—See "Buildings."

★**N. Y., Frankfort**—United Tractors Corp. let contract building 1 story, 50 x 300 ft., brick, concrete and steel factory, to H. Daley, Frankfort. About $150,000. Noted April 15.

★**N. Y., Long Island City**—E. Ronzoni, Jackson Ave., let contract building 5 story, rein.-con. and steel addition to factory, to L. Chevalier & Co., Inc., 383 Madison Ave., New York City.

N. Y., New York—H. Kaufman, 110 West 23rd St., will build 2 story, 55 x 270 ft., brick, concrete and steel factory, on Westchecter Ave. About $70,000. Work will be done by day labor.

N. Y., New York—Marcus & Goldstein, Inc., 175 East 96th St., will build 2 story, 98 x 100 ft., brick and steel garage, at 330 West 41st St. About $50,000. Work will be done by day labor.

N. Y., New York — M. Rothbart, 1411 Grand Concourse, will build 1-story, 75 x 131 ft., brick and steel garage, on 3rd Ave. and 140th St. About $85,000. Work will be done by day labor.

★**N. Y., Syracuse** — H. H. Franklin Mfg. Co., 302 South Geddes St., let contract building 7-story, 200 x 320 ft., plant, on Gifford and Magnolia Sts., to Reidpath & Son, Builders Exch., Buffalo. About $900,000.

★**N. J., Camden**—Eavenson & Levering, 217 Atlantic Ave., let contract building plant, to include machine shop, power house, scouring mill and warehouses, rein.-con., brick and steel, to G. Kessler, Drexel Bldg., Phila. Cost between $500,000 and $600,000.

★**Pa., Lock Haven**—New York & Pennsylvania Co., 200 5th Ave., New York City, let contract building 1 story, 60 x 150 ft. storage house and 2 story, 425 x 515 ft. mill, rein.-con. and steel, to Turner Constr. Co., 244 Madison Ave., New York City. About $1,500,000.

★**Pa., Moore**—Dupont Motor, Inc., Commerce St., Wilmington, Del., let contract building 1, 2 and 3 story, 50 x 800 ft., rein.-con. and brick factory, here, to E. R. Hall, 34 South 17th St., Phila.

★**Pa., Phila.**—See "Buildings."

★**Pa., Phila.**—H. C. Aberle, A and Clearfield Sts., let contract building 5 story, 80 x 200 ft. and 60 x 60 ft. hosiery factory and power house, concrete, to W. Steele & Sons Co., 16th and Arch Sts.

★**Pa., Phila.**—Cambridge Worsted Mills, Allegheny and C Sts., let contract building 2 story, 60 x 200 ft., slow burning construction factory, on Atlantic and Ruth Sts., to W. Steele & Sons Co., 16th and Arch Sts.

★**Pa., Phila.**—Moss-Rose Mfg. Co., Allegheny and Hancock Sts., let contract building 4 story, 100 x 200 ft. upholstery factory, concrete, to W. Steele & Sons Co., 16th and Arch Sts.

★**Pa., Phila.**—Orlando Dying Co. let contract building 2 story, 95 x 104 ft., brick and concrete factory, on Rorer and Schiller Sts., to A. Crompton & Bro., 4614 Oakland St. About $62,000.

★**Pa., Pittsburgh**—Peoples Ice Co. let contract building 55 x 237 ft. plant, brick and steel, to W. T. Grange Constr. Co., Pittsburgh.

★**Pa., Wilkes-Barre** — Sheldon & Leach Silk Co., Gilligan St, let contract building 1 story, 100 x 100 ft., stucco fireproof construction mill, to A. Hildebrand, Wood St. About $125,000.

★**Md., Baltimore**—Locke Insulator Co., Victor, N. Y., let contract constructing plant, consisting of two 1 and 2 story, concrete and brick buildings, also 24 kilns, on Light St. and Ferry Bar, here, to J. H. Miller, Inc., Eutaw and Franklin Sts About $1,000,000. Noted Jan. 29.

★**Md., Baltimore**—O. G. Simonson, archt., Baltimore St. and Guilford Ave., let contract to Arundel Corp., 1515 Fidelity Bldg., constructing plant, on 37th and 40th Sts. and Cedar and Elm Aves., including garage, power house and printing shop, 1 story, 60 x 122 ft. each, also 3 story, 300 x 300 ft. administration building, all concrete and brick, for Maryland Casualty Co., Baltimore and Guilford Sts. About 3,000,000. Noted April 1.

★**Va., Richmond**—Liggett & Meyers Co., 212 5th Ave., New York City, let contract building 2 story, concrete, steel and brick warehouse, here, to H. K. Ferguson Co., 6532 Euclid Ave., Cleveland. About $300,000.

★**O., Cleveland**—City Ice Delivery Co., Cadillac Bldg., let contract constructing ice storage plant, including 32 x 66 ft., 72 x 100 ft. and 30 x 30 ft. buildings, all 1 story, steel and brick, on Cedar and Lee Rds., to Hunkin-Conkey Constr. Co., Century Bldg. About $100,000.

★**O., Cleveland**—Cuyahoga Fdry Co., care of F. Hroneck, archt., 3608 East 131st St., let contract building 1 story, 100 x 210 ft., steel and brick foundry, on East 71st St. and Belt Line, to F. Vejsicki, 3492 Washington Park Blvd About $100,000. Noted April 8.

★**O., Cleveland**—Jordon Motor Co., 1070 East 152nd St., let contract building 1 story, 70 x 620 factory and 3 story, 34 x 48 ft. power house, rein.-con., steel and brick, on East 152nd St. near St. Clair Ave., to Hunkin-Conkey Constr. Co., Century Bldg. About $300,000.

★**O., Columbus** — Amer. Educational Press, 227 West 36th St., New York City, let contract building 4 story, 46 x 187 ft., printing plant, brick and terra cotta, on 3rd St., here, to D. D. Livingston, 1370 East Main St. About $100,000; cost plus percentage basis.

★**O., Ravenna**—Oak Rubber Co. let contract rebuilding 2 story, 60 x 180 ft., rein.-con. factory, to P. L. Frank Co., Ravenna. About $60,000.

★**O., Sidney**—Bennett-Bull Packing Co. will build 2 story, 40 x 81 ft. steel and brick addition to packing plant. About $100,000. Work will be done by day labor. Noted April 8.

★**Mich., Bay City**—Bigelow-Cooper Co., Marquette Ave., let contract building 40 x 40 ft. power house and 1 story, 55 x 150 ft. addition to dry kilns, rein.-con., brick and steel, to Bay City Stone Co., 1704 Woodside Ave. About $50,000.

★**Mich., Detroit**—Clayton-Lambert Co., 1380 Beaubien St., let contract building 1 story, 210 x 300 ft., brick and steel factory, on Knodell Ave., near Detroit Terminal Ry., to Wisconsin Bridge & Iron Co., 1362 Penobscot Bldg. About $322,000.

★**Mich., Detroit**—Dodge Bros., Jos. Campau Ave., let steel contract building 8 story, 77 x 266 ft., rein.-con., brick and steel auto factory, on Conant Ave., to Russell Wheel & Fdry. Co., Chene St. and Belt Line. Remainder of work will be done by day labor. Noted March 11.

★**Mich., Pontiac**—Grand Trunk Ry., Brust St. Sta., Detroit, let contract building 1 story, 80 x 200 ft., concrete and steel freight sheds and loading platform, on Jackson St., here, to Lennane Bros., Union Trust Bldg., Detroit.

★**Ill., Chicago**—McDonald Machine Co., 3204 Shields Ave., let contract building 1-story, 150 x 400 ft., steel and brick ma-

Industrial Works (Continued)

chine shop, at 7600 South Racine Ave., to J. J. Schworm, 1374 South La Salle St. About $250,000.

★**Wis., Burlington**—Burlington Brass Wks. will build 1 story, 100 x 140 ft., brick and steel foundry. Work will be done by day labor. Noted March 25.

★**Wis., Milwaukee**—Milwaukee Reliance Boiler Wks., 1102-32nd St., let general contract building 1 story, 60 x 300 ft., brick and steel boiler shop, to V. Pacholski, 313 Farwell Ave.; structural steel, to Wisconsin Bridge & Iron Co., North Milwaukee. Total cost, $60,000.

★**Wis., Oshkosh**—Diamond Match Co., 111 Bway., New York City, let contract constructing 86 x 360 ft., block storage building, rein.-con. and steel, here, to Hutter Constr. Co., 128-136 Western Ave., Fond du Lac. About $250,000.

★**Ia., Waterloo**—Waterloo Gas Engine Co., Miles St., let contract building 3 story, 100 x 120 ft., rein.-con., brick and steel factory, to G. F. Scales, Lafayette Bldg. About $50,000; cost plus percentage basis.

★**Minn., Fairmont**—City let contract building central heating plant, to Robb-Bain Eng. Co., 1414 16th Ave., N., Minneapolis. About $150,000.

★**N. D., Grand Forks**—State Industrial Comn., Bismarck, let contract building 8 story, 40 x 160 ft. mill and 60 x 120 x 140 ft. elevator, near Fair Grounds, here, to Northern Constr. Co., 9 North 8th St., and Fegles Constr. Co., Minneapolis, Minn., $922,850. Noted April 1.

★**Mo., St. Joseph**—St. Joseph Structural Steel Co., 4th and Franklin Sts., let contract building 1 story, 40 x 100 ft. and 100 x 180 ft., plant, rein.-con. and steel, to Lawton Constr. Co., St. Joseph. About $125,000, cost plus percentage basis.

★**Tex., Houston**—F. S. Glover & Son, archts., Binz Bldg., let contract to W. C. Hedrick Constr. Co., Carter Bldg., constructing 4 story, 100 x 153 ft., rein.-con. and brick warehouse and office, for Houston Drug Co., Caroline and Preston Sts. About $170,000. Noted April 1.

★**Tex., Houston**—Macks Mfg. Co., 821 Kress Bldg., let contract building 1 story, 74 x 200 ft., steel plant to T. Tellepson, 604 Prince Theatre Bldg. About $50,000.

★**Tex., Whitesboro**—Whitesboro Oil and Refining Co. let contract building oil refinery, with 2,000 bbl. daily capacity, with facilities to tap Hewitt oil pipe line, to Earl & Beck, St. Louis, Mo. About $150,000.

★**Okla., Newkirk**—Newkirk Ice & Creamery Co. let contract building 1 story, 50 x 100 ft. creamery, rein.-con., brick and steel, to A. Frank, Tulsa. About $125,000. Noted March 18.

★**Que., Montreal**—Bovril Ltd., 25-27 St. Peter St., let contract building 5 story, 50 x 110 ft. steel factory at Park and Van Horne Aves., to Anglin Norcross Ltd., 65 Victoria St. About $279,555.

★**Ont., Toronto**—Dominion Oxygen Co., 120 Elm St., let general contract building 3 story, 60 x 80 ft. plant, rein-con., brick and steel, to Wells & Gray, Confederation Life Bldg., plumbing, to Sheppard & Abbott, 119 Harbord St. About $75,000.

★**Ont., Toronto**—Photo Engravers, Ltd., 70 Bond St., let general contract building 3 story, 60 x 80 ft., rein-con. and brick photo engraving plant, to T. E. Essery, Confederation Life Bldg. About $80,000.

Buildings

PROPOSED WORK

Mass., Boston—Theatre and Office—H. Norman had plans prepared by Funk & Wilcox, archts., Dorchester, for 2 story, 60 x 120 ft., brick, concrete and steel, on Blue Hill Ave. About $175,000.

Mass., Cambridge — College — Stone & Webster Eng. Corp., engrs., 147 Milk St., Boston, receives bids about May 1, building 3story, 60 x 180 ft., brick and rein.-con., on Massachusetts Ave., here, for Massachusetts Institute of Technology, Boylston St., Boston. W. W. Bosworth, 527 5th Ave., New York City, archt.

Mass., Chicopee — Theatre and Club House—Polish Natl. Home Assn., c/o G. P. Dion, archt., 30 Center St., had plans prepared for 3 story, 50 x 102 ft., brick, concrete and steel, on Center St. About $100,000.

Mass., Hingham—Church—Coolidge & Shattuck, archts., 122 Ames Bldg., Boston, soon lets contract building 1 story, 36 x 60 ft. and 30 x 30 ft., brick and stone, for St. Johns Evangelist Church. About $100,000. Noted April 15.

Mass., Mattapan (Boston P. O.)—Dormitory, etc.—Mental Disease Comn., 36 State House, Boston, had plans prepared by Kendall, Taylor & Co., archts., 93 Federal St., Boston, for 2 story, 90 x 120 ft., brick and rein.-con. dormitory and custodial building, at Boston State Hospital, here. About $250,000.

Mass., New Bedford — Theatre — Empire Theatres, Inc., c/o J. S. McIntyre, archt., 22 Clifford Bldg., having plans prepared for 1 story, brick and steel. About $125,000.

Mass., Ware—School and Hall—St. Mary Polish Roman Catholic Society plans to build 2 story, brick and steel. About $100,000. Architect not selected.

Conn., Danielson — Housing — Goodyear Cotton Mills, Inc., plans to build one hundred and twenty 2 story, timber houses for workmen. About $500,000. Private plans.

Conn., Hartford—Hospital and Almshouse—Bd. Health plans to alter and build additions, on Holcomb St. About $165,000. Architect not selected.

Conn., Manchester—Theatre—A. E. Fiske, archt., 709 Main St., preparing plans for 2 story, brick and rein.-con., on Main St. About $125,000. Owner's name withheld.

Conn., New London—Hospital—Lawrence Memorial Hospital, Ocean Ave., had plans prepared by D. S. C. Donnelly, archt., Plant Bldg., for 3 story, 46 x 98 ft., brick and steel also 4 story, 48 x 86 ft., brick and concrete additions to main building. About $100,000.

Conn., Stamford — Exchange — Southern New England Telephone Co., 114 Court St., New Haven, having plans prepared by L. N. Robinson, archt., 42 Church St., New Haven, for 3 story, brick, concrete and steel, on Main St., here. About $100,000.

Conn., Waterbury — Bank — Waterbury Trust Co., 132 Grand St., receives bids about April 27, remodeling interior of present building. About $100,000. W. P. Crabtree, 272 Main St., New Britain, archt. Noted April 8.

N. Y., Brooklyn—Theatre—H. Becker, 1482 Bway., New York City, having plans prepared by G. Keister, archt. and engr., 56 West 45th St., New York City, for 1 story, 75 x 75 ft., brick and terra cotta, on 86th St., here. About $100,000.

N. Y., Carthage—School—Bd. Educ. plans to build 3 story, brick, steel, concrete and stone. Cost between $150,000 and $200,000.

N. Y., Corning — School — City election May 4, to vote on $500,000 bonds to build school.

N. Y., Dunkirk—School—Bd. Educ. plans to build 3 story, brick, concrete and steel. About $250,000.

N. Y., New York—Church—Church of Christ Scientist, c/o B. E. Muller, archt. and engr., 477 5th Ave., having plans prepared for 79 x 95 ft., brick, steel and stone, on Anthony Ave. About $300,000.

N. Y., New York—Hospital—Post Graduate Hospital, 2nd Ave. and 20th St., having sketches made by Howells & Rogers, archts. and engrs., 367 Lexington Ave., for 11 story, brick, steel and stone addition.

N. Y., New York—Institutional Center—Hebrew Emigrant Sheltering & Aid Society of Amer., c/o B. W. Levitan, archt. and engr., 7 West 45th St., having plans prepared altering institutional center consisting of dormitories laundry, restaurants, etc., brick and steel, at 425-437 Lafayette St. About $125,000. H. Fischel, pres.

N. Y., New York—Office—B. W. Dorfman, archt. and engr., 26 Court St., Brooklyn, preparing plans for 12 story, brick, steel and stone, on Joralemon St. About $500,000. Owner's name withheld.

N. Y., New York — Office — Scandinavian-Amer. Line, 1 Bway., having plans prepared by A. S. Hedman, archt and engr., 112 East 19th St., for 7 story, 32 x 59 ft., brick, steel and stone, on Washington and Bridge Sts. About $150,000.

N. Y. New York—Salesrooms and Offices—Haynes Automobile Co., 1715 Bway., had preliminary plans prepared by W Hoefeli, archt. and engr., 229 West 42nd St., for 7 story, brick and steel. About $175,000.

N. Y., New York—School—Bd. Educ., 500 Park Ave., having sketches made by G. and E. Blum, archt., 505 5th Ave., for 6 story, brick and steel at Ft. George. About $900,000. C. B. J Snyder, Municipal Bldg., engr.

N. Y., New York—Store and Loft—Buchman & Kahn, archts. and engr., 56 West 45th St., soon let contract building 12 story, 65 x 100 ft., brick, steel and stone, at 36 West 29th St., for C. Kaye, 131 East 23rd St. About $150,000.

N. Y., New York—Synagogue and School—Beth Hamedrash Shaapey Zion, Inc., 46 West 46th St., having sketches made by L. A. Abramson, archt. and engr., 46 West 46th St., for 2 story, 48 x 150 ft., brick, steel and stone, on 178th St. About $250,000.

N. Y., New York—Theatre—Reilly & Hall archts. and engrs., 749-5th Ave., receive bids about May 6, building 152 x 202 ft., brick, steel and stone, on Sheridan Sq., for Sheridan Realty Co., c/o architects. About $500,000. Noted March 11.

N. Y., Penn Yan—Theatre—H. C. Morse plans to build 3 story, brick and concrete. About $100,000.

N. Y., Utica—School—Bd. Educ. soon lets contract building 2 story, 185 x 233 ft., brick, concrete and steel, on North Genesee St. and Herkimer Rd. About $500,000. Kiehm & Jennison, Utica, archts.

N. J., Atlantic City — Sanitarium — C. F. Pabst, 396 Franklin Ave., Brooklyn, having sketches made for 4 story, 75 x 200 ft., brick, steel and concrete, here. About $500,000. Architect's name withheld.

N. J., Kearney (Arlington P. O.)—High School—Bd. Educ. having sketches prepared by Guilbert & Betelle, archts., 665 Broad St., Newark, for 3 story, brick and terra cotta. Cost to exceed $400,000. Noted April 1.

N. J., Morris Plains—School—Bd. Educ. having plans prepared by Rasmussen & Wayland, archts. and engrs., 1133 Bway., New York City, for brick, steel and stone. About $130,000.

N. J., Newark—Office—Bd. Trade, 800 Broad St., having sketches prepared by Guilbert & Betelle, archts. and engrs., 2 Lombardi St., for 10 story, concrete and brick, on Branford and Treat Sts. Cost to exceed $500,000.

Pa., Ashbourne—School—Bd. Educ. having plans prepared by H. C. Wise, archt., 925 Chestnut St., Phila., for 3 story, 50 x 75 ft., stone. About $100,000.

Pa., Milton—High School—Bd. Educ. receives bids about June 1, building 3 story, 60 x 80 ft. addition, brick, concrete and stone, on Turbot St. About $100,000. C. L. Millward, supt. Architect not selected.

Pa., Phila. — Bank — Industrial Trust, Title & Savings Co., Front and Norris Sts., having plans prepared by W. Steele & Sons Co., archts., 16th and Arch Sts., for concrete and steel.

Md., Lansdowne—School—Baltimore Co. School Comrs., Towson, having plans prepared by Smith & May, archts., 1133 Calvert Bldg., Baltimore, for 3 story, concrete, steel and brick, here. About $100,000. A. S. Cook, supt.

Md., Sparrows Point—School—Baltimore Co. School Comrs., Towson, having plans prepared by Smith & May, archts., 1133 Calvert Bldg., Baltimore, for 3 story, concrete, steel and brick, here. About $125,000. A. S. Cook, supt.

Va., Petersburg — Church — Market St. Methodist Episcopal Church having plans prepared by R. E. Mitchell & Co., Ltd., archts., Paul-Gale-Greenwood Bldg., Norfolk, for 2 story, 125 x 177 ft., Indiana limestone, here. About $200,000. Noted Jan. 29.

O., Akron—Hotel—Company, c/o Henry & Murphy, archts., 523-2nd Natl. Bldg., having plans prepared for 8 story, 135 x 186 ft., concrete steel and brick, on East Market and Cambridge Sts. About $3,000,000. Mayer & Valentine, Bangor Bldg., Cleveland, engrs.

O., Alliance—Bank and Office—Alliance Bank plans to build 6 story, concrete, steel and brick. About $500,000. Walker & Weeks, 1900 Euclid Ave., Cleveland, archts.

O., Cleveland—Club—Knights of St. John Holdings Co., 10509 Olivett Ave., plan to build 4 story, 80 x 95 ft., concrete, steel and brick, on West 25th St. and Franklin Ave. About $125,000. D. A. Crotty, chn. Architect not selected.

O., Cleveland—Commercial—C. G. Hale, 400 Erie Bldg., having plans prepared by H. T Jeffrey, archt., Claasen Ave., for 5 story, 100 x 150 ft., concrete, steel and brick, on Superior Ave. and East 12th St. About $150,000. Noted March 4.

O., Cleveland—Commercial—A Leibowitz, 5709 Hawthorne Ave., plans to build 6 story, 80 x 200 ft., concrete, steel and brick, at 3126 Prospect Ave. About $150,000. Architect not selected.

O., Cleveland — Commercial — G. A Rutherford, 2797 Prospect Ave., plans to build 2 story, concrete, steel and brick, at 2721 Prospect Ave. About $100,000. Private plans.

O., Cleveland—High School—Bd. Educ. plans to build 1 story, concrete, steel and brick addition, on West 93rd St and Willard Ave. About $350,000. W R McCornack, East 6th St. and Rockwell Ave., archt.

Buildings (Continued)

O., Cleveland — Memorial — World War Veterans plan to build 1 story, concrete, steel, brick, stone and marble, along lake front. About $2,000,000. Address A. La Tour, c/o Bd. County Comrs. Architect's and engineer's name withheld.

O., Independence—School—Bd. Educ. having plans prepared by Fulton, Taylor & Cahill, archts., Hippodrome Bldg., Cleveland, for 2 story, concrete, steel and brick. About $100,000.

Ind., Cloversdale — School — G. Walker, twp. trustee, soon lets contract building 2 story. About $110,000. Miller, Johnson & Miller, 105 South 7th St., Terre Haute, archts. Noted April 8.

Ind., Ft. Wayne—Coliseum—Allen Co. plans to build coliseum. About $1,000,000. C. R. Weatherhoagg, 401-7 Citizens Trust Bldg., archt.

Ind., Ft. Wayne—Infirmary—Bd. Comrs. Allen Co. plan to build infirmary, near here. About $500,000. C. R. Weatherhoagg, 401-407 Citizens Trust Bldg., archt.

Ind., Gary—Church—First Hungarian Reform Church having plans prepared by C. W. Bolton & Son, archts., Witherspoon Bldg., Phila., for 1 story, 46 x 85 ft., brick and stone. About $100,000.

Mich., Detroit — Clubhouse — Detroit Musicians Club, 84 Macomb St., plans to build 10 story, rein.-con., brick and steel. About $300,000. W. Bailey, chn. bldg. com. Architect not selected.

Mich., Detroit—School and Gymnasium —Bd. Educ., 50 Bway., plans to build 2 story, 47 x 70 ft., rein.-con., brick, steel and stone, on Hamilton Blvd. About $200,000. Malcolmson, Higginbotham & Palmer, 405 Moffat Bldg., archts.

Mich., Muskegon Heights—School—Bd. Educ. soon reecives bids building 3 story, 190 x 240 ft., rein.-con., brick and steel. Ammerman & McColl, 2348 Penobscot Bldg., Detroit, engr. S. D. Butterworth, 432 Tussing Blk., Lansing, archt.

Mich., Saginaw—Office and Auditorium —Bd. Commerce plans to build 2 story, rein.-con., brick and steel. About $100,000. J. B. Kirby, secy. Architect not selected.

Ill., Chicago — Bank — South Side State Bank, 4301 Cottage Grove Ave., plans to build 1 or 2 story, 100 x 160 ft., on 47th St. and Cottage Grove Ave. About $250,000. Architect not announced.

Ill., Chicago — Mail Order — Straus & Schram, 1105 West 35th St., having preliminary plans prepared by S. S. Joy, archt. and E. W. Eppstein, engr., 2001 West 39th St., for first unit of mail order plant, to include 11 or 12 story, 250 x 300 ft., rein.-con. and brick, on Western Ave. and 36th St. About $5,000,000; one-third of ultimate cost.

Wis., Milwaukee—Convent—E. Brielmaier & Sons Co., archts., University Bldg., soon lets contract building 3 story, 50 x 50 ft. and 66 x 85 ft., rein.-con. and brick addition to St. Mary's Convent, 35th and Center Sts. About $100,000. Noted March 11.

Wis., Milwaukee—Office—E. Uihlein et al, 410 Berlin Arcade, having preliminary plans prepared by Kirchhoff & Rose, archts., Majestic Bldg., for 2 story, 80 x 200 ft., brick and concrete, on Port Washington Rd. About $150,000.

Wis., Milwaukee — Sales — Frint Motor Car Co., 209 Wisconsin St., having plans prepared by A. D. Koch, archts., Wells Bldg., for 4 story, 120 x 175 ft., rein.-con. and brick, on Van Buren St. About $250,000.

Wis., Rice Lake—High School—School Bd. having plans prepared by E. J. Hancock, archt., Eau Claire, for 2 story, brick and concrete. About $200,000.

Ia., Davenport—Fair, etc.—Fair Assn. plans to construct concrete, brick and steel fair and exposition buildings. About $250,000. Pearce, Robinson & Sprague, Des Moines, archts.

Ia., Webster City—Hotel—Webster Hotel Co. plans to build 7 story, rein.-con., brick and steel. About $350,000. Architect not selected.

Minn., Minneapolis — Business — Pence Auto Co., 800 Hennepin Ave., soon receives bids building 6 story, 56 x 150 ft., rein.-con. and brick addition. About $200,000. Long, Lamoreaux & Thorsov, Andrus Bldg., archts.

Minn., Minneapolis — Church — Emanuel Lutheran Church having plans prepared by Long, Lamoreaux & Thorsov, archts., Andrus Bldg., for 1 story, 50 x 104 ft., rein.-con. and brick, on Girard Ave. N., and 22nd St. About $100,000.

Minn., Minneapolis—Sales—Lincoln Motor Sales Co., 219 Metropolitan Bank Bldg., Minneapolis, having plans prepared by Long, Lamoreaux & Thorsov, archts., Andrus Bldg., for 2 story, 66 x 145 ft., brick and timber, on 12th St. and Harmon Pl. About $125,000.

Kan., Augusta—Memorial—City having plans prepared by J. R. Switzer, archt., Augusta, for 1 story, 60 x 125 ft brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000.

Kan., Humboldt—School—Bd. Educ. plans to build brick, rein.-con. and steel. About $150,000. T. W. Williamson & Co., 418 Central Natl. Bank Bldg., Topeka, archts.

Kan., Lincoln—High School—City voted $125,000 bonds to build high school. Architect not selected.

Kan., Manhattan — Temple — Masonic Lodge plans to build 2 story temple. About $150,000. W. E. Glover, Topeka, archt.

Kan., Winfield—Memorial—City plans to construct memorial building. About $132,000. Architect and engineer not selected.

Neb., Alliance—High School—Bd. Educ. having plans prepared by Fiske & Meginnis, archts., 533 Bankers Life Bldg., Lincoln, for 2 story, 72 x 168 ft., rein.-con., brick and steel. About $200,000.

Neb., Omaha—Church—Third Presbyterian congregation, c/o R. J. Rott, pastor, 930 South 26th St., having plans prepared by J. P. Guth, archt., 516 Paxton Blk., for 4 story, 66 x 132 ft. rein.-con., brick and steel, on 20th and Leavenworth Sts. About $150,000.

Neb., Omaha—School—Bd. Educ. c/o W. E. Bourke, secy., City Hall, having plans prepared by J. Latenser & Sons, archts., 632 Peters Trust Bldg., remodeling 3 story, concrete, on 20th and Dodge Sts. About $350,000.

S. D., Belle Fourche—High School—Bd. Educ. receives bids in June building 2 story, brick. About $200,000.

Wyo., Casper—Church and Parish House —Episcopal Church plans to build concrete, steel and brick (Cathedral type), 400 seating capacity, on East Sussex and Wolcott Sts. About $125,000. Architect not selected.

Tex., Abilene—Schools—City having plans prepared building schools, paving streets and extending sewerage system. Bonds for $550,000 voted for project.

Tex., Amarillo — Hospital — City having plans prepared and soon receives bids building hospital. Bonds for $250,000 voted for project.

Tex., Dallas—Fair, etc.—Texas State Fair Assn. having plans prepared by Lang & Witchell, archts., Amer. Exch. Bank Bldg., for 1 story, rein..con. barns and other buildings, on Fair Park grounds, here. About $100,000.

Tex., Dallas—Hospital—City voted $275,000 bonds to build hospital. G. D. Fairtrace, city engr.

Tex., Dallas—Office—G. M. Easley, Insurance Bldg., having plans prepared by Lang & Witchell, archts., Amer. Exch. Bank Bldg., for 10 story, rein.-con. and brick, on Bullington and Bryan Sts. About $500,000.

Tex., Dallas—Office—J. T. Jones, 4935 Junius St., having plans prepared by Lang & Witchell, archts., Amer. Exch. Bank Bldg., for 10 story, 100 x 100 ft., rein.-con. and brick, on Commerce and Prather Sts. About $750,000.

Tex., Dallas—Schools—City voted $1,500,000 bonds to build schools. J. F. Kimball, supt. Bd. Educ.

Tex., Dallas — School — Highland Park School Bd. receives bids about May 1, building 2 story addition to Armstrong School, brick, in Highland Park. About $100,000. Lang & Witchell, Amer. Exch. Bank Bldg., archts.

Tex., Lockhart — Schools — City voted $200,000 bonds to build schools. Noted March 25.

Tex., McKinney—Hospital—City having plans prepared by C. H. Page & Bro., archts., Austin Natl. Bank Bldg., Austin, for 2 story. About $100,000.

Tex., Orange—Store and Office—Orange Natl. Bank plans to build 6 story, 50 x 100 ft., rein.-con., brick and steel, on Main and 5th Sts. About $230,000.

Tex., San Angelo—Coliseum—City having plans prepared by J. Y. Rust, engr., San Angelo, for 1 story, 100 x 100 ft., rein.-con. and brick. About $150,000;

Okla., Hartshorne — High School — City voted $110,000 bonds to build high school. Architect and engineer not selected.

Okla., McAlester—Court House—Pittsburg Co. voted $300,000 bonds to build rein.-con. court house. Architect and engineer not selected. Noted March 25.

Okla., Pawhuska — High School — City voted $200,000 bonds to build high school. Architect and engineer not selected.

Okla., Shawnee—Temple—Masonic Lodges plan to build 4 story temple. About $100,000. Address C. W. Hodge, c/o Norwood Hotel. Architect not selected.

Okla., Skiatook—Temple—A. F. & A. O. Masons plan to build 3 story, 75 x 140 ft., on Main St. and Bway. About $100,000. Engineer and architect not selected.

Okla., Tishomingo — School, etc. — Bd. Educ. plans to build school, to include gymnasium, auditorium, etc. About $100,000. Architect and engineer not selected.

Okla., Tulsa—Office—W. A. Marquis, 1515 South Cincinnati St., plans to build 10 story, 80 x 190 ft., rein.-con. and brick, on 8th and Main Sts. About $750,000. Architect and engineer not selected.

Ariz., Peoria—High School—City voted $175,000 bonds to build high school.

Wash., Tacoma — Bank — Tacoma Natl. Bank, Pacific and 13th Sts., having plans prepared by Sutton & Whitney, archts., Natl. Realty Bldg., for 4 story, 50 x 120 ft., rein.-con. and stone, on G and Main Sts. About $400,000. Noted April 8.

Cal., Sacramento—Store—S. Dunn and C. W. Frazier had preliminary plans prepared by E. C. Hemmings, archt., Ochsner Bldg., for 5 story, steel and concrete, on J St. About $100,000.

Cal., Santa Barbara—Hotel—S. W. Straus & Co., 150 Bway., New York City, plans to remodel Ambassador Hotel, build service quarters, 2 bungalows and garage, also alter mechanical plant and improve grounds. About $150,000. M. Hunt, Hibernian Bldg., Los Angeles, archt.

Ont., London—Theatre—United Theatres Ltd. plan to build concrete, brick and steel. About $100,000. J. Meyers, Sarnia, mgr. Architect not selected.

Ont., Saulte Ste. Marie—Temple—Trades and Labor Council plans to build 3 story, 109 x 114 ft. rein.-con., brick and steel. About $150,000. Architect not selected.

Ont., Toronto—Dormitory—Toronto University, Queens Park, having plans prepared by J. M. Lyle, archt., Bloor St. W., for 3 story, 200 x 400 ft. rein.-con., brick and steel. About $1,500,000.

Ont., Toronto—Office and Restaurant-- Childs Restaurant Co., 158 Yonge St., plans to build 12 or 14 story, rein.-con., brick and steel on King St. About $1,000,000. Achitect not selected.

Ont., Toronto — School — St. Augustine Seminary, Kingston Rd., plans to build 3 story, rein.-con., brick and steel, on Wellesley St. About $125,000. Architect not selected.

B. C., Kerrisdale—School—Point Grey School Trustees, Municipal Hall, soon receive bids building 3 story, 8 room, rein.-con., brick and tile, on 4th Ave., here. About $130,000. Twizel, Birds & Twizel, 837 Hastings St., W., Vancouver, archts.

B. C., Marpole—School—Point Grey School Trustees, Municipal Hall, Kerrisdale, soon receive bids building 3 story, 8 room, rein.-con., brick and tile, here. About $130,000. Twizel, Birds & Twizel, 837 Hastings St. W., Vancouver, archts.

BIDS DESIRED

Mass., Gardner—Hospital—E. F. Stevens, archt., 9 Park St., Boston, receiving bids building 3 story, 40 x 110 ft., brick and rein.-con., for Henry Heywood Memorial Hospital, Woodland St. About $100,000. Noted April 15.

Mass., Mattapan (Boston P. O.)—Nurses Home and Dining Room—Until April 26, by Kendall, Taylor & Co., archts., 93 Federal St., Boston, building 2 story, brick, concrete and steel, on Boston State Hospital Grounds, here, for Commonwealth of Massachusetts, 36 State House, Boston. About $265,000.

Conn., Goodyear—School—H. L. Reinbold, Jr., archt., 1513 Walnut St., Phila., Pa., receiving bids building 2 story, 90 x 150 ft., brick and concrete, for Killingly Twp. Schol Com., here. About $100,000.

N. Y., Brooklyn — Nurses Home — Until April 26, by Dept. Pub. Welfare, Municipal Bldg., New York City, furnishing labor and material building additions to nurses home on grounds of Kings County Hospital, Clarkson St. B. S. Coler, comr.

N. Y., Jamaica—School—Until April 30, by C. B. J. Snyder, archt. and engr., Municipal Bldg., New York City, building P. S. 50, on 101st and Liberty Aves. and Liverpool and Allendale Sts., here, for Bd. Educ., 500 Park Ave., New York City.

Buildings (Continued)

N. Y., New York—Bank—Until April 26, by Trowbridge & Livingston, archts. and engrs., 527 5th Ave., building 1 story, 50 x 100 ft., brick, steel, stone and marble addition, for Empire City Savings Bank, 232 West 125th St. Noted March 18.

N. J., Morris Plains—Hospital—Until May 18, by Dept. Architecture, 142 West State St., Trenton, constructing 2 treatment buildings at State Hospital, here. F. H. Bent, state archt.; advertised in this issue. Noted Feb. 19.

N. J., Mountain Lakes—School—Until May 4, by W. T. Leighton, dist. clk., Bd. Educ., Tabor, building brick, steel and stone. About $100,000. Rasmusseo & Wayland, 1133 Bway., New York City, archts. and engrs.

Pa., Altoona—Bank—Until May 3, by Union Bank, 1103 8th Ave., building 4 and 5 story, 50 x 120 ft., brick, steel and stone, on 8th Ave. and 12th St. About $190,000. W. J. Heinsling, pres. Dennison & Hirons, 475 5th Ave., New York City, archts. Noted Aug. 14.

Pa., Chester—Church—C. W. Bolton & Son, archts., Witherspoon Bldg., Phila., receiving bids building 2 story, 75 x 125 ft., stone and granite, for Trinity Methodist Episcopal Church. About $100,000. Noted Jan. 29.

Pa., Elkins Park—High School—Until May 3, by School Director Cheltenham Twp. at High School, here, building 4 story, 75 x 225 ft., stone. About $400,000. H. C. Wise, 925 Chestnut St., Phila., archt. Noted Jan. 1.

Pa., Merion Station—Community—Until April 26, by Karcher & Smith, archts. and engrs., 34 South 17th St., Phila., building 2 story, 40 x 80 ft. and 40 x 140 ft., rein.-con. and brick, for Merion War Tribute Assn. About $100,000. Noted Feb. 19.

Pa., Phila.—Stations—Until May 11, by W. S. Twining, dir. city transit dept., constructing station buildings (Contr. 556, 558 and 559) for Frankford Elevated Ry.; advertised in this issue.

Pa., Phila.—Stations—Until May 18, by W. S. Twining, dir. city transit dept. constructing station buildings (Contr. 557 and 576) and platforms (Contr. 571) for Frankford Elevated Ry.; advertised in this issue.

Pa., Wilkes Barre—School—Until April 26, by Bd. Educ., building 3 story, 80 x 150 ft., brick and steel addition, on Chestnut St. About 100,000. Private plans.

W. Va., Morgantown,—Law—Until May 1, by State Bd. Control, Charleston, building 2 story, 55 x 137 ft., brick, stone and terra cotta, at University, here. C. W. Bates, Natl. Bank Bldg., Wheeling, archt.

O., Clevelaod—Hall—Until April 30, by city, for brick work on 4 story, 180 x 420 ft., fire proof (now under construction), on East 6th St. and St. Clair Ave. About $300,000. Total cost, $2,500,000. F. H. Betz, 604 City Hall, archt.

O., Cleveland—Theatre and Commercial—Until April 29, by A. Silverberg, 1276 West 3rd St., receiving bids building 2 story, 80 x 112 ft., steel and brick, on East 152nd St. and St. Clair Ave. About $100,000. F. J. Prochaska, 11111 Buckeye Rd., archt. Noted March 1.

O., Columbus—Church—Until May 10, by Stribling & Lum, archts., 85 North High St., furnishing labor and material for enclosing 130 x 140 ft., fireproof, for King Ave. Methodist Episcopal Church. J. F. Fergus, chn. Bldg. Com.; advertised in this issue.

O., Lakewood (Cleveland P. O.)—Market—Until May 1, by Lakewood Market House Co., 705 Rose Bldg., constructing 2 story, 78 x 300 ft., concrete, steel and brick, at 11826 Detroit Ave. About $250,000. W. R. Powell, Rose Bldg., archt.

O., Youngstown—Hospital—City receives bids about June, building 2 story, 60 x 150 ft., steel and brick. About $250,000. C. F. Owsley, Mahoning Bank Bldg., archt. Noted Jan. 15.

O., Youngstown—School—Until May 14, by Bd Educ. Liberty Twp., building 2 story, fireproof, on Churchill St., here. C. L. Cliff, R. F. D. 3, clk. Miller & Son, 108 Dollar Bank Bldg., archts.

Mich., Birmingham—Bank and Commercial—Until May 1, by Donaldson & Meier, archts., 1314 Penobscot Bldg., Detroit, building 2 story, 75 x 100 ft., rein.-con., brick and stone, for 1st Natl. Bank of Birmingham. About $100,000. Noted April 15.

Mich., Detroit—Theatre—Untl May 1, by L. Scisorek, archt., 225 Farwell Bldg., for 1 story, 60 x 130 ft., rein.-con., brick and steel, on Michigan Ave. and 12th St., for Loyal Theatre Co., c/o architect. About $100,000.

Mich., Flint—Sales—Until May 3, by Smith, Hinchman & Grylls, archts. and engrs., 710 Washington Arcade, Detroit, building 3 story, 73 x 152 ft. sales and service station, rein.-con., brick and steel on East 5th St., for Dort Sales Co. About $100,000.

Mich., Redford—School—Until May 1, by J. E. Smith, R. F. D. 2, building 2 story, brick, concrete and steel, on Beach Rd., for School Dist. 5. About $150,000.

Ill., Mount Carmel—Bank—Until April 28, by C. Shopbell, archt., Furniture Bldg., Evansville, Ind., constructing 1 story, 45 x 80 ft., rein.-con., steel and brick, for 1st Natl. Bank, here. About $100,000.

Wis., La Crosse—Schools—Until May 12, by Bd. Pub. Wks., building 90 x 145 ft. grade school, on 8th St., also 50 x 70 ft. and 60 x 150 ft. junior high school, on Avon St., both 2 story, rein.-con. and brick. About $170,000 and $140,000 respectively. J. C. Llewellyn, 38 South Dearborn St., Chicago, and Parkinson & Dockendorff, Linker Bldg., archts.

Wis., Lancaster—City Hall and Theatre—Until April 28, by city, building 2 story, 60 x 100 ft. and 40 x 60 ft., brick and concrete. About $100,000. Claude & Starck, Badger Bldg., Madison, archts.

Wis. Wauwatosa—Asylum—Until May 15, by Bd. Administration Milwaukee Co. (Milwaukee), building 1, 2 or 3 story brick and concrete addition to insane asylum, 300 ft. long, here. About $300,000. R. A. Messmer & Bro., Majestic Bldg., Milwaukee, archts.

Ia., Sioux City—High School—Until May 3, by Bd. Educ., building West Junior High School, 2 story, rein.-con., brick and steel. About $200,000. Beuttler & Arnold, Grain Exch. Bldg., archts. Noted April 1.

Minn., Bemidji—School—Until May 15, by Bd. Educ., constructing 3 story, 40 x 100 ft. addition to present building, also 1 story, 50 x 80 ft. building to be used as manual training school, both rein.-con., brick and tile. About $150,000. E. F. Broomhall, Alworth Bldg., Duluth, archt. and engr.

Mion., Hancock—High School—Until April 28, by Bd. Educ., building 2 story, 60 x 110 ft., concrete, brick and tile. About $100,000. A. A. Roberts, clk. S. Jacobson, 403 Endicott Bldg., St. Paul, archt. Noted March 11.

Mion., Olivia—High School—Until April 30, by Bd. Educ., building 3 story, 63 x 150 ft., rein.-con. and brick. About $200,000. W. L. Alban, 347 Endicott Bldg., St. Paul, archt Noted March 4.

Minn., Minneapolis—School—Until May 3 (change of date), by Bd. Educ., building Miles Standish School, 2 story, 75 x 220 ft. rein.-con. and brick ,on 22nd Ave., S. E. and 40th St. About $250,000. E. H. Eager c/o Bd. Educ., archt. Noted April 8.

Mino., Minneapolis—Schools—Until May 3 (change of date), by Bd. Educ., building Minnehaha School, 2 story, 75 x 210 ft., rein.-con. and brick, on 51st St. and 29th Ave., cost $150,000; Louis Agassiz School, 2 story, 75 x 200 ft., rein.-con. and brick, on Harriet Ave. and 38th St., $150,000. E. H. Enger, c/o Bd. Educ., archt. Noted April 8.

Kan., Wichita—Business and Office—Until May 3, by Western Lithographic Co., 125 North Emporia Ave., building 7 story, 60 x 140 ft., brick, rein.-con. and steel. About $200,000. L. Schmidt & Co., 121 North Market St., archts.

Tex., Austin—Church—Universal Baptist Church receiving bids building 1½ story, 115 x 120 ft., brick, steel and concrete, on 22nd and Guadalupe Sts. About $110,000 C. E. Maddry, 702 West 28th St., pastor. R. L. Thomas, Littlefield Bldg., supervising engr. and archt.

Ore., Forest Grove—Home—Until April 29, by W. C. Knighton, archt., U. S. Bank Bldg., Portland, building rein.-con., for Oregon Masonic & Eastern Star Lodge. About $160,000. Noted Feb. 12.

Que., Montreal—School—Until May 15, by Catholic School Comn. 37 St Catherine St. E, building 3 story, 55 x 145 ft brick. I. Sawyer, c/o Catholic School Comn., archt.

Ont., Ridgeway—School—Until April 30, by N. S. Pound, secy.-treas. Bd. Educ., building 2 story, 8 room, brick and steel. About 100,000. W. W. Lachance, 43-44 Temple Bldg., Welland, archt.

Ont., Sarnia—High School—Until May 5, by S. B. Coon & Son, archts., 36 Toronto St., Toronto, for 3 story, 20 room, rein.-con and brick, here, for Bd. Educ. About $325,000. M. F. Thomas, 229 College St., Toronto, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. H., Nashua—College—G. Desharis, c/o W. E. Provost, archt., 1061 Elm St., Manchester, let contract building 2 story, 75 x 125 ft., brick, concrete and stone, on Chandler St., to T. Dube, Nashua. About $100,000.

★Mass., Boston—Bank and Office—State St. Trust Co., 33 State St., let contract building 9 story, 50 x 70 ft., concrete, stone and steel, on Washington St., to L. D. Willcutt & Sons Co., 146 Summer St. About $2,500,000.

★Mass., Boston—Bank and Office—Beacon Trust Co., 20 Milk St., let contract constructing bank and office building, to I. G. Hersey, 53 Warham St. About $100,000.

★Conn., New London—Bank—T. M. James, archt., 3 Park St., Boston, let contract to E. F. Miner Bldg. Co., 25 Foster St., Worcester, building 2 story, 45 x 100 ft., brick, stone and steel, on State St., for Natl. Bank of Commerce, 166 State St. About $100,000. Noted March 25.

★Cono., Taftville—Housing—Ponemah Mills let contract building sixteen 2 story, timber houses for workmen, to Peck-McWilliams Co., 47 West Main St., Norwich. About $100,000.

★N. Y., Albany—Bank—Commercial Trust Co., c/o York & Sawyer, archts. and engrs., 50 East 41st St., New York City, let contract building brick, steel, stone and marble, to W. L. Crow Constr. Co., 103 Park Ave., New York City. About $100,000.

★N. Y., Endicott—Sales, etc.—Endicott Johnson Corp., 108 East Main St., Union, will build 4 story, 100 x 200 ft., sales and storage plant, here, brick, concrete and steel. About $250,000. Work will be done by day labor.

★N. Y., Lake Placid—School—Bd. Educ. let contract building 5 story, 100 x 128 ft., brick, on Main St., to Branch & Callahan, Saranac Lake. About $285,000.

★N. Y., New York—Hotel—New York State Realty & Terminal Co., c/o Warren & Wetmore, archts., 10 East 47th St., let contract building 17 story, brick, steel and stone, on Park Ave. and 49th St., to F. T. Ley Co., 19 West 44th St. About $2,500,000.

★N. Y., New York—Loft—I. Miller & Sons, c/o Schwartz & Gross, archts. and engrs., 347 5th Ave., will build 12 story, brick and steel, on 46th St. and 5th Ave. Work will be done by day labor under supervision of architects. Noted April 15.

★N. Y., New York—Office—Borden Milk Co. 63 Vesey St., let contract building 23 story, 80 x 100 ft., brick, steel, concrete and stone, on 45th St. and Madison Ave., to Cauldwell-Wingate Co., 381 4th Ave.

★N. Y., New York—Office—Combustion Eng. Corp., 11 Bway., will build 8 story, brick, steel and stone, at 43-47 Broad St. About $500,000. Work will be done by day labor.

★N. Y., New York—Office and Salesroom—Bosch Magneto Corp., 223 West 46th St., let contract building 12 story, 75 x 100 ft., brick and steel, at 600 Bway., to J. O'Brien Co., Inc., 624 Madison Ave. About $700,000.

N. Y., New York—Office and Store—E. E. Smathers, 304 West 75th St., will build 11 story, 27 x 100 ft., brick, steel and stone, at 1 West 46th St. About $400.000. Work will be done by day labor under supervision of Schwartz & Gross, archts., 347 5th Ave.

★N. Y., New York—Schools—Bd. Educ. let contract building P. S. 61, brick, steel and stone, on Crotona Park E., and Charlotte St., to T. Dwyer, Bway. and 216th St., $869,449; P. S. 62, 5 story, 230 x 280 ft., brick and steel on Leggett Ave., to P. J. Brennen & Son, 624 Madison Ave., $869,000. Noted April 8.

★N. Y., Watertown—Office—Jardin, Hill & Murdock, archts., 50 East 42nd St., New York City, let general contract to C. T. Wills, Inc., 286 5th Ave., New York City, building 6 story, 105 x 145 ft., brick, concrete and steel, here, for F. W. Woolworth, 233 Bway., New York City. Steel contract, let to Bethlehem Steel Co., 111 Bway., New York City. Total cost, $400,000.

★Pa., Phila.—Office, etc.—Commercial Truck Co., 27th and Brown Sts., let contract building 1 and 2 story, 40 x 100 ft. and 150 x 400 ft., steel and concrete office and factory, Hunting Park and Rising Sun Lane, to W. Steele & Sons Co., 16th and Arch Sts.

Buildings (Continued)

★**Pa., Reading**—Store—Dwes, Pomeroy & Stewart let contract building 7 story, 60 x 207 ft., addition, rein.-con. and brick, on 6th and Penn Sts., to L. S. Focht & Son, Baer Bldg. About $400,000.

★**Md., Baltimore** — Administration — See "Industrial Works."

★**Md., Baltimore** — Theatre — E. G. Blanke, archt., 213 North Calvert St., let contract to W. E. Haru Co., 2314 Oak St., altering and building 3 story, 140 x 200 ft., rein.-con., brick and hollow tile, on Gay and Fayette Sts., for Wilson Theatre Co., 418 East Baltimore St. About $150,000. Noted April 1.

★**N. C., Gastonia** — Hotel — Armstrong Land & Investment Co. let contract building 3 story, 96 x 230 ft., to J. L. Glenn, Gastonia. About $225,000.

★**N. C., Gastonia**—Hotel—C. C. Armstrong let contract building 4 story addition to Armington Hotel, to J. A. Gardner, 204 North Tryon St., Charlotte. About $150,000.

★**Tenn., Memphis** — Theatre — Loew's Enterprises, 1493 Bway., New York City, let contract building brick, steel and stone, on Union Ave., here, to Fleischmann Constr. Co., 531 7th Ave., New York City. About $300,000.

O., Cleveland—Bathhouse—City received bids April 9, building 2 story, 66 x 70 ft., concrete, steel and brick, on Starkweather Ave. and West 14th St., from Drummond-Miller Co., 4500 Euclid Ave., $110,500; Kelly-Demarest Co., Amer. Trust Bldg., $114,900; Bolton-Pratt Constr. Co., Columbia Bldg., $122,600. Noted April 1.

★**O., Cleveland** — Commercial — Globe Wernicke Co., 128 East 4th St., Cincinnati, let contract building 6 story, 50 x 189 ft., concrete, steel and brick, at 2044 Euclid Ave., here, to H. K. Ferguson Co., 6532 Euclid Ave. About $250,000.

★**O. Cleveland**—Hall—City let contract for cut stone work on 4 story, 180 x 420 ft., fireproof (now under construction), on East 6th St. and St. Clair Ave., to Ohio Cut Stone Co., 1306 Citizens Bldg., $353,129. Noted April 15.

★**O., Massillon**—Commercial—C. P. L. McLane let contract building 2 story, 54 x 180 ft., concrete, steel and brick, to J. Meinhart, Massillon. About $100,000. Noted March 4.

★**O., New Carlisle**—School—Bd. Educ. let contract building 3 story, 85 x 110 ft., rein.-con., steel and brick, to G. Hicks, South Main St., Springfield. About $110,000.

★**Mich., Detroit**—Office and Loft—S. J. Murphy Estate, Penobscot Bldg., let contract altering and building 5 story, 100 x 120 ft., rein.-con., brick and steel addition, on Congress St., to Walbridge-Aldinger Co., 2356 Penobscot Bldg. About $120,000.

★**Wis., Milwaukee**—Bank, etc.—Rosman & Wierdsma, archts., 424 Jefferson St., let contract to Riesen Bros., 86 Michigan St., building 6 story, 60 x 105 ft., rein.-con. and brick, for Park Savings Bank, 3323 Lisbon Ave. About $200,000. Noted April 1.

★**Ia., Binney**—School—Bd. Educ. let contract building 2 story, 60 x 98 ft., rein.-con., brick and steel, to Garmer & Stiles, Des Moines, $116,000.

★**Ia., West Branch**—School—Bd. Educ. let contract building 2 story, 75 x 113 ft., rein.-con., brick and steel, to C. W. Ennis, Grinnell, $105,000. Noted March 18.

Minn., Minneapolis—Hall—State University received bids April 12, building addition to Sanford Hall, consisting of two 3 story, 44 x 68 ft., rein.-con. and brick wings, from S. M. Klarquist & Son, 769 Security Bldg., $151,136; plumbing, A. W. Scott Co. 214 6th St., $17,213. Noted April 1.

★**Minn., Robbinsdale**—School—Bd. Educ let contract building 2 story, 90 x 118 ft., fireproof, to J. Peterson, 3152 10th Ave., Minneapolis. About $134,000. Noted April 1.

★**S. D., Groton**—Junior and Senior High School—Bd. Educ. let contract building 2 story, 118 x 150 ft., rein.-con., brick and steel, on Main St., to Peppard & Fulton, 217 Bd. Trade Bldg., Superior, Wis. About $157,000. Noted March 18.

★**Tex., Houston**—Office, etc.—See "Industrial Works."

★**Ore., Roseburg** — Hospital, etc. — Riter Sanitarium Co. let contract constructing administration building, natatorium and heating plant, also 3 story, 80 x 145 ft., addition to main hospital, to C. W. Frazier, Wilbur. About $10,000, $15,000, $20,000 and $175,000 respectively. Noted Feb. 12.

★**N. S., Halifax**—Hospital—Provincial Government let contract building brick and concrete additions to hospital on Tower Rd. Block, South and Morris Sts., to Nova Scotia Constr. Co., Water St. About $460,000.

★**Que., Quebec**—Commercial—C. J. Lockwell, 35 St. Peter St., let contract building 4 story, 64 x 86 ft., on Crown St., to C. A. Vezina, 61 Des Prairies St., $75,209; 3 story, 58 x 80 ft., on St. John St., to C. E. Morrissette, 236 Latourelle St., $58,960, both brick and steel. Noted March 4.

★**Ont., Toronto**—Hospital and Nurses Home—St. Michael Hospital, Church St., let general contract building 6 story, 100 x 180 ft. rein.-con., brick and steel, on Shuter and Victoria Sts., to Archibald & Holmes, Excelsior Life Bldg.; heating, to W. J. McGuire, 91 Jarvis St.; plumbing, to P. J. Hayes, 1245 Queen St. W. Total cost, $600,000.

★**B. C., Armstrong** — School — Provincial Government, Victoria, let contract building 3 story, 12 room, brick and timber, here, to H. J. Davies, Kamloops. About $120,000.

Federal Government Work

PROPOSED WORK

Fla., Appalachicola—Post Office—Treas. Dept., Wash., D. C., rejected bids received April 2, building, here.

Fla., Ft. Meyers—Cottage—Interior Dept., Office of Indian Affairs, Wash., D. C., rejected only bid received April 5, furnishing labor and material building, here. Noted April 15.

Tex., Camp Travis—Ice-Cooled Refrigeration Building—Office of Constructing Quartermaster Mexican Border Project, Box 83, soon lets contract building, at Mercedes, San Benito, McAllen, Sam Fordyce, Ft. Brown, Ft. Ringgold and Ft. Clark.

Tex., Ft. Worth—Deep Well Pumping Equipment—Spec. 4166—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids furnishing and installing, at Helium Production Plant, here. About $30,000; $10 deposit required for plans and spec. Noted April 15.

Cal., Mare Island—Additions and Alterations to Quarters — Spec. 4134 — Bureau Yards and Docks, Navy Dept., Wash., D. C., soon lets contract altering and building addition to officers' quarters at Marine Barracks, Nos. 1, here. Noted Feb. 5.

BIDS DESIRED

Mass., Pocasset — **Dwelling** — Until May 12, by Supt. Lighthouses, Boston, building wooden frame, concrete plastered dwelling at Wings Neck Light Sta., here.

Ga., Savannah—Officers' Quarters—Until May 10, by Treas. Dept., Wash., D. C., building quarters for medical officers, at Marine Hospital, here. J. A. Wetmore, superv. archt.; advertised in this issue.

Ga., Savannah—Radio Buildings and Towers—Spec. 4139—Until April 28, by Bureau Yards & Docks, Navy Dept., Wash., D. C., constructing at Radio Quarters, here. About $6,000; $10 deposit required for plans and spec. Noted April 15.

Ala., Florence—Hydraulic Turbines—Until June 1, by U. S. Engr. Office, furnishing and delivering 4 hydraulic turbines, each 30,000 hp. with governors; advertised in this issue.

O., Cincinnati — Changes and Repairs—Until May 7, by Treas. Dept., Wash., D. C., for changes and repairs to main building at Marine Hospital, here. J. A Wetmore, superv. archt. Noted April 1.

O., Cincinnati—River Wall Power Plant Machinery, etc.—Until May 19 by U. S. Engr. Office, 415 Custom House, furnishing and installing river wall power plant machinery, river wall valve jacks and machinery, lock piping, pipe fittings, valves, cocks and accessories, for Dams 33 and 39; advertised in this issue.

O., Cleveland—Rubble Mound Jetty and Pierhead—Until May 25, by U. S. Engr. Office, Federal Bldg., building at Sandusky Harbor; advertised in this issue.

Mich., Detroit—Stone and Riprap—Until May 20, by U. S. Engr. Office, 337 Federal Bldg., furnishing and placing stone for rubble mound across north entrance and riprap along south breakwater, Harbor Beach; advertised in this issue.

Col., Ft. Lyon—Steel Water Tanks—Spec. 4171—Until April 28, by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing elevated steel water tanks, here. About $22,000; $10 deposit required for plans and spec. Noted April 15.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., New York**—Removing Shoal—U. S. Engr. Office, 39 Whitehall St., let contract removing from Arthur Kill, N. Y. and N. J., 2nd Dist., to Great Lakes Dredge & Dock Co., 17 Battery Pl., $4,500.

★**D. C., Wash.**—Broken Stone—U. S. Engr. Office, let contract furnishing broken stone for park roadways, public buildings and grounds, to Standard Lime & Stone Co., Equitable Bldg., Baltimore, Md., $6,831.

★**D. C., Wash.**—Grading—Dist. Comrs., 509 Dist. Bldg., let contract grading various streets, to G. B. Mullin Co., Inc., 3303 11th St., N. W., $7,600. Noted April 15.

★**D. C., Wash.** — Mechanical Equipment and Piping—Spec. 3708—Bureau Yards & Docks, Navy Dept., let contract installing at boiler and power plant, to J. W. Danforth Co., 72 Ellicott Sq., Buffalo, N. Y., $219,600 (200 days). Noted April 8.

D. C., Wash.—Refrigerating System—U. S. Capitol Bldgs. and Grounds Office, received bids installing in Senate wing of U. S. Capitol, (1a) work complete, (1b) complete except refrigerating system, (1c) refrigerating system, (2) work complete according to bidder's spec., (2b) same as 1b, according to bidder's spec., (2c) same as 1c, according to bidder's spec., from W. G. Cornell Co., 923 12th St. N. W., (1a) $236,730, (1b) $62,630, (1c) $174,900; York Mfg. Co., York, Pa., (1c) $273,725, (2c) $215,645; Carrier Eng. Corp., 39 Cortlandt St., New York City, (2a) $340,900 alternate $317,300 and $272,500, (2b) deduct $235,100.

★**D. C., Wash.** — Sewer Work — Dist. Comrs. let contract building sewer involving 1,250 cu.yd. excav., 140 cu.yd. concrete and 43 cu.yd. brick masonry, 23 cu.yd. sewer brick masonry, to W. F. Brenizer, 101 New York Ave. N. E., $10,000.

Va., Alexandria—Sidewalk—Spec. 4140—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids April 14, building sidewalks and curbs, at Naval Torpedo Sta., here, (1) work complete, from J Trout Constr. Corp., 729—15th St., N. Y., Wash., D. C., (1) $3.90, (2) $4.40, (3) $3., (45 days); M. E. Ryder, 606 A St., N. W., Wash., D. C., (1) $4., (2) $6., (3) $1.25; Hyde & Baxter, 711-13th St., Wash., D. C., (1) $5.24, (3) $3. (45 days). Noted April 1.

Va., Hampton Roads — Reinforcing Trusses—Spec. 4150—Bureau Yards & Docks, Navy Dept., Wash., D. C., received only bid April 14, rein-forcing present end trusses of Seaplane Hangar 1, at Naval Air Sta., here, from Post & McCord, 101 Park Ave., New York City, $9,900 (45 days). Noted April 8.

S. C., Charleston—Lighting Plant and Water Supply System—Treas. Dept., Wash., D. C., received bids installing, at U. S. Quarantine Sta., here, from J. R. Proctor, Inc., 74 Cortlandt St., New York City, $23,988 (160 days); Carleton Mace Eng. Co., 18 Tremont St., Boston, $35,056 (90 days); G. E. Eng. Co., 22 Laight St., New York City, $46,340 (120 days). Noted March 25.

★**Ky., Louisville** — Portland Cement—U. S. Engr. Office, 425 Custom House, let contract furnishing and delivering American portland cement, for Dam 44, Ohio River, to Kosmos Portland Cement Co., Paul Jones Bldg., $56,250. Noted March 18.

O., Cincinnati — Boiler Repairs—Treas. Dept., Wash., D. C., received bids April 15, repairing in U. S. Pub. Bldg., here, from McCabe Constr. Co., 1758 Central Ave., $3,982 (30 days); Gordon Bldg. & Constr. Co., Burnet and Northern Aves., Avon, cost plus 15%. Noted March 25.

★**Tex., Galveston**—Dredging—U. S. Engr. Office, Trust Co. Bldg., Post Office and Tremont St., let contract dredging Houston Ship Channel, (a) Sect. 1, lower end of channel in Bolivia Rds. to Sta. 86, (b) Sect. 2, from Sta 86 to 37, (c) Sect 3, from Sta. 37 to 3, to Atlantic Gulf & Pacific Co., 13 Park Row, New York City, (a and c) $1,124,650; United Dredging Co., 233 Bway., New York City, (b) $544,000. Noted April 8.

★**Okla, Tulsa**—Screen, etc.—Treas. Dept., Wash., D. C., let contract building at Post Office and Court House, here, to King Lumber Co., Charlottsville, Va. About $16,900 Noted April 1.

Federal Government Work (Continued)

★Ore., Portland—Repairing Dredge— U. S. Engr. Office, let contract repairing U. S. Dredge "Col. P S. Michie," 1st Dist., to Pacific Iron Wks., foot of East Yamhill St, $12,500.

Cal., Los Angeles—Road Work—C. H. Sweetser, dist. engr., U. S. Bur. Pub. Rds., 886 Mills Bldg., San Francisco, received bids improving 1.4 mi. San Gabriel Forest Rd., in Angeles Natl. Forest, near Azusa, from Betchel & Hoey, 625 Market St., San Francisco, $95,630; Marsh Bros. & Gardenier, Monadnock Bldg., San Francisco, $103,763.

★Cal., San Diego—Kitchen Equipment—Spec. 1097—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing, in 6 barracks, here, to S. B. Sexton Stove Mfg. Co., 500 Blk. West Conway., Baltimore, Md., $33,949. Noted April 15.

P. I., Guam—Quarters, Power, Pump and Blower Houses—Spec. 4141—Bureau Yards & Docks, Navy Dept., Wash., D. C., and Pub. Wks. Office, San Francisco, Cal., received bids April 14, building, here, (1) work complete, from A. H. Vogt, Builders Exch., San Francisco, (1) $87,566; Pittsburgh-Des Moines Steel Co., Munsey Bldg., Wash., (1) $83,700 (270 days), (2) $25, (2a) $7.50. Noted April 8.

Miscellaneous

PROPOSED WORK

Heating, etc.—Binghamton, N. Y.—Bd. Educ. plans to repair and build addition to heating, lighting and plumbing systems in public schools. About $94,950. D. J. Kelley, supt.

Transformer Station—New York, N. Y.—United Electric Light & Power Co., 130 East 15th St., receives bids about April 28, building 1 story, 30 x 100 ft., brick, rein.-con. and steel, on Elizabeth St. About $100,000. W. Whitehill, 12 Elm St., archt. and engr.

Park—Camden, N. J.—City soon lets contract improving park, building fountain and pool and laying concrete sidewalks, etc. About $60,000. Karcher & Smith, 34 South 17th St., Phila., engrs. Noted April 1.

Asphalt Plant—Phila., Pa.—Dept. Pub. Wks. plans to build asphalt plant, 2,500 sq.yd. daily capacity. About $175,000.

Park—Williamsport, Pa.—City election May 18 to vote on $60,000 bonds to purchase and improve park. J. B. Otto, city engr.

Heating and Electric Plant—Columbia, S. C.—State plans to build heating and electric plant in Capitol. About $50,000. S. W. Cannon, State Capitol, engr.

Road Equipment—Columbia, S. C.—F. C. Wyse, city engr., receives bids about May 9, furnishing machinery for building streets. About $10,000.

Trailers—Kenosha, Wis.—B. C. Brennan, city engr., soon lets contract furnishing 4 reversible trailers with steel bodies (3½ cu.yd. capacity), steel covers.

Piers, Sheds, etc.—Milwaukee, Wis.—See "Industrial Works."

Concrete Outfit—St. Joseph, Mo.—Lehi Constr. Co., 1712 Fred Ave., plans to purchase complete new concrete outfit.

Levee — Caldwell, Tex. — Bd. Supervs. Burleson Co. Levee Impvt. Dist. 1, soon lets contract building 5,600 ft. levee, 10 ft. high. Address W. S. Mial, chn. J. C. Nagle, College Sta., engr.

Transmission Lines—Dallas, Tex.—See "Industrial Works."

Pumping Equipment Lighting System, etc.,—Denison, Tex.—City voted $244,000 bonds to install electric pumping equipment in 2 pumping stations and ornamental lighting system in business district, also pave various streets.

Dam—Pacoima, Cal.—Bd. Supervs. Los Angeles Co., (Los Angeles), soon receives bids building 180 ft. concrete and masonry arch dam in Pacoima canyon. About $500,000. J. W. Reagan, Court House, engr.

Seawall—Toronto, Ont.—City plans to build concrete seawall at exhibition grounds. About $34,000. R. C. Harris, city engr.

BIDS DESIRED

Retaining Wall — Boston, Mass. — See "Bridges."

Cast Iron Pipe—Binghamton, N. Y.—Until April 28, by Bd. Contr. & Supply, furnishing 1,200 lin.ft. 4 in. and 2,800 lin. ft. 6 in. c.i. water pipe.

Electrical Work, etc.—Brooklyn, N. Y.—Until May 18, by E. S. Walsh, supt. Dept. Pub. Wks., Capitol, Albany, for electrical and masonry work at Barge Canal Terminal, Greenpoint, Contr 104; advertised in this issue.

Iron Fence—Fulton, N. Y.—Until May 4, by Common Council, furnishing 226 lin.ft. non-climable fence, two 12 ft. swing drive gates and one 4 ft. swing walk gate. M. C. Woodbury, clk.; advertised in this issue.

Pier—New York, N. Y.—Until April 26, by M. Hurlburt, comr. docks, Pier "A," foot of Battery Pl., altering pier at foot of 5th St, East River. About $120,000. Noted April 15.

Column Foundation and Steel Superstructure—Phila. Pa.—Until May 11, by W. S. Twining, dir. city transit dept., for column foundations (Contr. 505) and steel superstructure (Contr. 508) for Frankford Elevated Ry.; advertised in this issue.

Plumbing and Electrical Work—Phila., Pa.—Until May 25, by W. S. Twining, dir. city transit dept., for plumbing and electrical work on Frankford Elevated Ry. (Contr. 578 and 579); advertised in this issue.

Steam Shovel—Copperhill, Tenn.—Tennessee Copper Co. receiving bids furnishing steam shovel, caterpillar type, ¾ to 1½ yd., (used).

Diesel Oil Engines, Generators and Exciters—Chicago, Ill.—Until May 13, by Clerk of Sanitary Dist. of Chicago, 910 South Michigan Ave., furnishing and delivering 2 Diesel oil engines each direct connected to its engine type alternating current generator of 500 kw. capacity, 3 phase, 60 cycle, 2,300 volts, with direct connected exciter and appurtenances. J. L. Lawley, chn., advertised in this issue.

New Building

To April 15
Engineering News-Record
Announced

1764

Contracts Let

for industrial works
and non-residential
buildings, amounting
to

$445,000,000

Lighting System—Montreal West, Que.—Until May 1, by town, installing new lighting system. About $100,000.

Road Machinery—Ottawa, Ont.—A. Hay, secy. Suburban Rd. Comn., Gloucester St., receiving bids for one 12 ton steam roller, one 450 gal. water wagon, stone crushers, oil distributor, two graders, steam drills and steam tractors to operate crushers.

Turbine Pump and Gasoline Engine — Pembroke, Ont.—Until May 12, by S. L. Briggs, town clk., furnishing and installing 1 turbine pump and 1 gasoline engine with capacities of 1,200 and 800 gal. per min. About $25,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★ Foundation — Whitinsville, Mass. — Whitin Machine Wks. let contract for concrete foundation and roadwork for seventy-five 2 story, houses for workmen, to Foundation Co., 233 Bway., New York City. Total cost, $350,000. Noted Jan. 15 under "Buildings."

★Asphalt Emulsion—Albany, N. Y.—Bd. Contr. & Supply let contract furnishing cold patch asphalt emulsion, to Headley Good Roads Constr. Co., $.266 per gal.

Bituminous Material—Albany, N. Y.—State Highway Comn., Capitol, received bids April 12, furnishing and delivering bituminous material, (a) Contr. 1, Div. 1, 2, 3, 4 and 5, (b) Contr. 2, Div. 6, 7, 8 and 9, (c) Contr. 3, Div. 1, 2, 3 and 5, (d) Contr. 1, Div. 4, 6, 7, 8 and 9, (e) Contr. 5, all divisions and counties, (f) Contr. 7, all divisions and counties, from Headley Good Rds. Co. (a) $138,302, (b) $106,272, (c) $97,757, (d) $83,081; Atlantic Refining Co., 291 Bway., New York City, (a) $145,101, (b) $112,016, (c) $106,064, (d) $90,875, (e) $119,893; Capitol City Supply & Contg. Corp., (c) $97,414, (d) $83,652, (e) $120,635; Warner-Quinlan Co., 79 Wall St., New York City, (e) $90,519; Barrett Mfg. Co., 17 Battery Pl., New York City, (f) $129,639. Noted April 1.

★Heating and Ventilating Apparatus—Brooklyn, N. Y.—Bd. Educ., 500 Park Ave., New York City, let contract installing in P. S. 20, here, to Gillis & Geoghagan, 537 West Bway., New York City, $155,994. Noted April 15.

Gate Valves, etc.—Grand Gorge, N. Y.—Bd. Water Supply, Municipal Bldg., New York City, received only bid April 13, furnishing and delivering gate valves, hydraulic cylinders, bronze castings and appurtenances for Gilboa Dam and Shandaken Tunnel, here, from Coffin Valve Mfg. Co., Neponset, Mass., $90,480. Noted April 1.

★Heating and Ventilating Apparatus—New Dorp, S. I., N. Y. — Bd. Educ., 500 Park Ave., New York City, let contract installing heating and ventilating apparatus in P. S. 11, on Jefferson, Garretson and Cromwell Aves., here, to Gillis & Geoghagan, 537 West Bway., New York City, $58,700.

★Cast Iron Pipe, etc.—New York, N. Y. —Bd. Purchase, Municipal Bldg., let contract furnishing and delivering c.i. pipe and castings, to J. Fox, 253 Bway., $146,796. Noted April 1.

★Refined Asphalt—New York, N. Y.—H. H. Curran, pres. Manhattan Boro, let contract furnishing and delivering 450,000 gal. refined asphalt, to Standard Oil Co., 26 Bway., $47,025. Noted April 15.

★Road Materials—New York, N. Y.—Bd Purchase, Municipal Bldg., let contract furnishing and delivering highway materials, to J. J. Guinan, 2810 Gravesend Ave., Brooklyn, $5,000 and G. Eaton, 331 Pearl St., Brooklyn, $9,000; tar road oil, to Barrett Co., 17 Battery Pl., $.235 per gal.; wood paving blocks, to Amer. Creosoting Co., 17 Battery Pl., $23,000. Noted March 25.

★Piers—Stapleton, S. I., N. Y.—M. Hurlburt, comr. docks Pier "A," foot of Battery Pl., New York City, let contract furnishing labor and material building Pier 15, to G. B. Stearin, 90 West St., New York City, cost, $849,466; Pier 16, to Snare & Triest, 8 West 40th St., New York City, $896,736. Noted April 1.

★Piers—Stapleton, S. I., N. Y.—M. Hurlburt, comr. docks, Pier "A," foot of Battery Pl., New York City, let contract building Piers 12 and 13, here, to Smith, Hauser & MacIsaacs, 18 East 41st St., New York City, $2,288,089. Noted April 15.

★Dam—Sand Springs, Okla.—City let contract building 900 ft. rein.-con. dam, 72 ft. high, to Ambursen Const. Co., 61 Bway., New York City, $375,000.

★Pontoons—Portland, Ore.—Com. Pub. Wks., let contract furnishing labor and material building 5 pontoons for floating drydock, to Cornfoot & McIntosh, 245 Ash St., $761,345. Noted April 1.

★Lighting System—San Bernardino, Cal. —City let contract building ornamental lighting system on 3rd St., involving 118 Marbelite posts, 2½ mi. wiring, to C. W. Sparks, 1137 Orange St., $39,867.

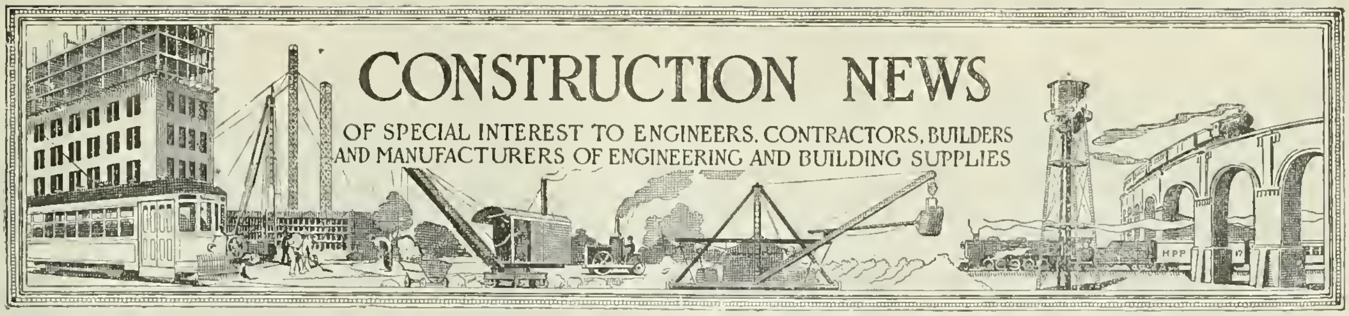
★Pipe — San Fernando, Cal. — City let contract furnishing 8 mi. 6-16 in. riveted steel pipe, to Llewellyn Iron Wks., Main and Ord Sts., Los Angeles. About $52,000.

★Wasteweir — Merriton, Ont. — Riordan Paper Co. will repair wasteweir on old Welland Canal. About $40,000. Work will be done by day labor.

★Pipe—Scarboro, Ont.—Town let contract for 28,000 ft., 6-12 in. c.i. pipe, involving about 600 tons, to Natl. Iron Corp., Cherry St., Toronto, $83 per ton.

★Centrifugal Pumps—Toronto, Ont.—City let contract for four 20,000,000 Imp. gal. per day centrifugal pumps for St John Pumping Sta., to Turbine Equipment Co., Ltd., Canadian Pacific Ry. Bldg. About $75,000.

★Portland Cement and Crushed Stone—Toronto, Ont.—Dept Pub. Wks let contract furnishing portland cement, to Canada Cement Co., Hamilton Bank Bldg., and A. Rogers, Ltd., 28 King St, W.; 150,000 ton crushed stone, to McLean & Stidwell, Cornwall, and E Brule, Box 107, Billings Bridge Noted Feb. 12 and March 11.



CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

PROPOSALS

"For proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
May 4	Charleston, S. C.	Apr. 15
May 5	Tonawanda, N. Y.	Apr. 15
May 7	Preston, Idaho Adv. Apr. 8 and 15.	Apr. 8
May 10	Coxsackie, N. Y. Adv. Apr. 29.	Apr. 29
May 10	Fergus, Ont.	Apr. 29
May 15	Seattle, Wash.	Apr. 15
May 15	Drummondsville, Que.	Apr. 22
May 17	Pontiac, Mich. Adv. Apr. 8 and 15.	Apr. 8
May 20	Decatur, Ill. Adv. Apr. 29.	Apr. 29
June 1	Houston, Tex	Apr. 29

SEWERS

Bids Close		See Eng. News-Record
May 3	Decatur, Ill. Adv. Apr. 15 and 22.	Apr. 15
May 3	Mt. Union, Pa.	Apr. 22
May 3	Xenia, O.	Apr. 29
May 4	Thief River Falls, Minn. Adv. Apr. 15 and 22.	Apr. 15
May 4	Gloversville, N. Y. Adv. Apr. 29.	Apr. 29
May 4	Grafton, N. D.	Apr. 29
May 5	Portland, Ore. Adv. Mar. 25.	Mar. 25
May 5	Ft. Madison, Ia.	Apr. 29
May 6	Bishop, Cal.	Apr. 29
May 7	Janesville, Minn.	Apr. 29
May 8	Alton Park, Tenn.	Apr. 29
May 8	Stratford, Ont.	Apr. 29
May 10	Haddonfield, N. J.	Apr. 22
May 11	South Bend, Ind.	Apr. 29
May 12	Philadelphia, Pa.	Apr. 29
May 12	Hagerstown, Md. Adv. Apr. 22 and 29.	Apr. 22
May 20	Graham, N. C.	Apr. 29
June 3	Milwaukee, Wis. Adv. Apr. 15 and 22.	Apr. 15

BRIDGES

Bids Close		See Eng. News-Record
May 3	Columbus, O.	Apr. 8
May 3	Grand Rapids, Minn.	Apr. 8
May 3	Poland, O.	Apr. 29
May 3	Grand Bend, Ont.	Apr. 29
May 4	Ontario	Apr. 29
May 4	Livingston, Tex.	Apr. 29
May 4	Ft Wayne, Ind.	Apr. 22
May 4	Clarksdale, Miss. Adv. Apr. 22 and 29.	Apr. 22
May 4	Brookings S. D.	Apr. 29
May 5	Belleville, Kan.	Apr. 22
May 5	Paterson, N. J. Adv. Apr. 15 and 22.	Apr. 15
May 5	Ontario	Apr. 22
May 6	Boston, Mass.	Apr. 22
May 6	Massena, N. Y. Adv. Apr. 29.	Apr. 29
May 8	Hoxie, Kan.	Apr. 29
May 11	Detroit, Mich. Adv. Apr. 15-29.	Apr. 15
May 11	St. Augustine, Fla.	Apr. 29
May 11	Blue Ridge, Ga.	Apr. 22
May 12	Elba, Minn.	Apr. 29
May 14	Minneapolis, Kan.	Apr. 29
May 15	Brattleboro, Vt. Adv. Apr. 29.	Apr. 29
May 17	Elmira, N. Y. Adv. Apr. 29.	Apr. 29
May 17	Bronxville, N. Y. Adv. Apr. 29.	Apr. 29
May 20	Biddeford, Me.	Apr. 29
May 24	Danville, Ill. Adv. 22 and 29.	Apr. 22
June 4	Philadelphia, Pa.	Apr. 29

STREETS AND ROADS

Bids Close		See Eng. News-Record
May 3	Grand Rapids, Mich.	Apr. 1
May 3	Fayetteville, W. Va. Adv. Apr. 15 and 22.	Apr. 15
May 3	Kingsville, Tex. Adv. Apr. 15.	Apr. 15
May 3	California	Apr. 15
May 3	California	Apr. 22
May 3	Indiana	Apr. 22
May 3	Point Pleasant, W. Va.	Apr. 22
May 3	Charleston, W. Va.	Apr. 29
May 3	Milwaukee, Wis.	Apr. 29
May 3	Savannah, Ga.	Apr. 29
May 3	Red Wing, Minn.	Apr. 22
May 3	Nevada	Apr. 22
May 3	Mason, Ind.	Apr. 29
May 3	Salem, Ind.	Apr. 29
May 3	Richmond, Va. Adv. Apr. 22 and 29.	Apr. 29
May 3	North Carolina	Apr. 29
May 3	Pataskala, O.	Apr. 29
May 3	Long Island City, N. Y.	Apr. 29
May 4	Alabama City, Ala.	Apr. 29
May 4	Allenhurst, N. J. Adv. Apr. 29.	Apr. 29
May 4	Ft. Scott, Kan.	Apr. 22
May 4	Cando, N. D.	Apr. 22
May 4	Indiana	Apr. 22
May 4	Fergus. Falls, Minn.	Apr. 15
May 4	Thief River Falls, Minn.	Apr. 15
May 4	Mantorville, Minn.	Apr. 1
May 4	Lorain, O.	Apr. 8
May 4	Michigan	Apr. 22
May 4	Little Rock, Ark. Adv. Apr. 22.	Apr. 22
May 4	Cumberland, W. Va.	Apr. 22
May 4	Walker, Minn.	Apr. 22
May 5	El Dorado, Ark. Adv. Apr. 8-22.	Apr. 8
May 5	San Francisco, Cal.	Apr. 29
May 5	Baltimore,. Md.	Apr. 29
May 5	Grand Rapids, Mich.	Apr. 1
May 5	New York Adv. Apr. 15-29.	Apr. 15
May 5	Ft. Wayne, Ind.	Apr. 22
May 5	Tennessee	Apr. 22
May 5	Clinton, Ont.	Apr. 22
May 5	Maine Adv. 22 and 29.	Apr. 22
May 5	Indiana	Apr. 22
May 5	Clayton, Mo. Adv. 22 and 29.	Apr. 22
May 5	Swedesboro, N. J.	Apr. 29
May 5	Rye, N. Y.	Apr. 29
May 5	Michigan	Apr. 29
May 5	Weatherford, Tex.	Apr. 29
May 5	Deschaillons, Que.	Apr. 29
May 5	Brooklyn, N. Y.	Apr. 29
May 6	New York, N. Y.	Apr. 29
May 6	Michigan	Apr. 29
May 6	Marietta, Ga. Adv. Apr. 29.	Apr. 29
May 6	Ithaca, N. Y. Adv. 22 and 29.	Apr. 22
May 6	Glenwood, Minn.	Apr. 15
May 6	North Bergen (Weehawken P. O.), N. J.	Apr. 22
May 6	Oakhurst, N. J. Adv. Apr. 29.	Apr. 29
May 7	Colorado	Apr. 29
May 7	Wisconsin	Apr. 29
May 8	Fort Plain, N. Y.	Apr. 29
May 10	Oakland, Md.	Apr. 22
May 10	Douglas, Ariz. Adv. Apr. 15-29.	Apr. 15
May 10	Lebanon, Pa. Adv. 22 and 29.	Apr. 22
May 10	Oil City, Pa.	Apr. 22
May 10	Sea Bright, N. J. Adv. Apr. 22 and 29.	Apr. 22
May 10	Montgomery, Ala.	Apr. 22
May 10	El Paso, Tex.	Apr. 29
May 10	Freehold, N. J. Adv. 22 and 29.	Apr. 22
May 10	South Pasadena, Cal.	Apr. 29
May 10	Seattle, Wash.	Apr. 29
May 11	Maine Adv. 22 and 29.	Apr. 22
May 11	Pennsylvania Adv. 32 and 29.	Apr. 22
May 11	Indiana	Apr. 22
May 11	St. Catharines, Ont.	Apr. 22
May 11	Blue Ridge, Ga.	Apr. 22
May 11	Michigan	Apr. 29
May 11	St. Augustine, Fla.	Apr. 29
May 12	Scituate (North Scituate P. O.), R. I. Adv. 22 and 29.	Apr. 22
May 12	Missouri Adv. Apr. 29.	Apr. 29
May 12	Duluth, Minn.	Apr. 29
May 12	Caledonia, Minn.	Apr. 29
May 12	Long Prairie, Minn.	Apr. 29
May 12	Carlton, Minn.	Apr. 29
May 14	Michigan	Apr. 29
May 14	Mt. Holly, N. J.	Apr. 22
May 17	Bronxville, N. Y. Adv. Apr. 29.	Apr. 29
May 17	Jennings, La.	Apr. 29
May 18	Princeton, Minn.	Apr. 29
May 18	Union, W. Va.	Apr. 22
May 19	Ft. Wayne, Ind.	Apr. 29
May 19	Wayne, W. Va.	Apr. 29
May 28	Chambly, Que.	Apr. 29
May 31	Arcadia, La.	Apr. 29

EXCAVATION AND DREDGING

Bids Close		See Eng. News-Record
May 4	Storm Lake, Ia.	Apr. 29
May 15	Vancouver, B. C.	Apr. 29
May 18	Rochester, N. Y. Adv. 22 and 29.	Apr. 22

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
May 1	Baltimore, Md.	Apr. 29
May 1	Mt. Vernon, N. Y.	Apr. 29
May 2	Albany, N. Y.	Apr. 22
May 3	Rockport, Mo.	Apr. 29
May 3	Sioux City, Ia.	Apr. 22
May 5	River Rouge, Mich.	Apr. 29
May 10	South River, N. J.	Apr. 29
May 13	New Ulm, Minn.	Apr. 29
May 18	Morris Plains, N. J.	Apr. 22
May 18	Phila., Pa.	Apr. 22
Sept. 1	Hutchinson, Kan.	Feb 19

BUILDINGS

Bids Close		See Eng. News-Record
May 1	Baltimore, Md.	Apr. 29
May 3	Cleveland, O.	Apr. 15
May 3	Flint, Mich.	Apr. 22
May 3	Altoona, Pa.	Apr. 22
May 3	Elkins Park, Pa.	Apr. 22
May 3	Minneapolis, Minn.	Apr. 22
May 3	Wichita, Kan.	Apr. 22
May 3	Jerome, Idaho	Apr. 29
May 4	Mountain Lakes, N. J.	Apr. 22
May 5	Sarnia, Ont.	Apr. 22
May 8	Morning Sun, Ia.	Apr. 29
May 10	Columbus, O. Adv. 22 and 29.	Apr. 22
May 11	Sonyea, N. Y. Adv. Apr. 8-22.	Apr. 8
May 11	Atchison, Kan.	Apr. 29
May 11	Santa Ana, Cal.	Apr. 29
May 12	La Crosse, Wis.	Apr. 22
May 12	Little Falls, N. Y.	Apr. 29
May 12	New London, Conn.	Apr. 29
May 14	Youngstown, O.	Apr. 22
May 14	Searsboro, Ia.	Apr. 29
May 15	Orient, Ia.	Apr. 29
May 15	Bemidji, Minn.	Apr. 22
May 15	Montreal, Que.	Apr. 22
May 15	Wauwatosa, Wis.	Apr. 22
May 17	Dana, Ia.	Apr. 29
May 18	Green Mountain, Ia.	Apr. 29
May 18	Morris Plains, N. J.	Apr. 22
May 21	Verona (Montclair P. O.), N. J.	Apr. 29
May 21	Orrville, O.	Apr. 29
May 22	Whitten, Ia.	Apr. 29
May 23	Middletown, N. Y.	Apr. 29

FEDERAL GOVERNMENT WORK

Bids Close		See Eng. News-Record
May 3	Shops—Dover, N. Y.	Apr. 29
May 5	Nitrate Plant — Muscle Shoals, Ala. Adv. Apr. 29.	Apr. 29
May 5	Dredging — Port Huron, Mich. Adv. Apr. 8-29.	Apr. 8
May 7	Changes and Repairs, Cincinnati, O.	Apr. 22
May 8	American Portland Cement —Wheeling, W. Va.	Apr. 15
May 10	Officers' Quarters, Savannah, Ga. Adv. Apr. 22 and 29.	Apr. 22
May 12	Dwelling—Pocasset, Mass.	Apr. 22
May 12	Round Piling—Cincinnati, O. Adv. Apr. 29.	Apr. 29
May 12	Earth and Levee Work—St. Louis, Mo. Adv. Apr. 29.	Apr. 29

Bids Close		See Eng News-Record
May 14	Road Work—Tennessee Adv. Apr. 29.	Apr. 29
May 19	River Wall Power Plant, Machinery, etc., Cincinnati, O. Adv. Apr. 22 and 29.	Apr. 22
May 20	Stone Riprap, Detroit, Mich. Adv. Apr. 22 and 29.	Apr. 22
May 20	Mild Open Hearth Steel—Memphis, Tenn. Adv. Apr. 29.	Apr. 29
May 20	Repairing Breakwater and Placing Riprap—Cleveland, O. Adv. Apr. 15-29.	Apr. 15
May 24	Frame Cottage — Tulalip, Wash.	Apr. 29
May 24	Gates and Emergency Dams —Pittsburgh, Pa. Adv. Apr. 29.	Apr. 29
May 25	Rubble Mound Jetty and Pierhead, Cleveland, O. Adv. Apr. 22 and 29.	Apr. 22
May 26	Dredging — New York, N. Y. Adv. Apr. 29.	Apr. 29
May 27	Emergency Dam—Detroit, Mich. Adv. Apr. 15-29.	Apr. 15
June 1	Hydraulic Turbines, Florence, Ala. Adv. Apr. 22 and 29.	Apr. 22

MISCELLANEOUS

May 3	Bituminous Material—Albany, N. Y. Adv. Apr. 15-29.	Apr. 15
May 3	Diesel Oil Engines, Generators and Exciters — Chicago, Ill. Adv. Apr. 22.	Apr. 22
May 3	Fire Alarm System—Brockport, N. Y. Adv. Apr. 29.	Apr. 29
May 3	Bulkhead — New York N. Y.	Apr. 29
May 3	Road Materials—St. George, S. I., N. Y.	Apr. 29
May 3	Elevated Steel Water Tank —Portland, Ore.	Apr. 29
May 4	Iron Fence — Fulton, N. Y. Adv. Apr. 22.	Apr. 22
May 5	Refined Tar or Asphalt—Clayton, Mo.	Apr. 29
May 5	Combustion Engines, Generators, etc.—Moosomin, Sask.	Apr. 15
May 5	Portable Air Compressors and Concrete Mixers — Baltimore, Md.	Apr. 29
May 6	Portland Cement—Detroit, Mich.	Apr. 29
May 7	Wheel Shaft — Portland, Ore.	Apr. 29
May 8	Boilers and Chimney—Port Huron, Mich. Adv. Apr. 29.	Apr. 29
May 10	Road Materials — Portland, Ore.	Apr. 29
May 11	Power Plant Equipment—Kinston, N. C. Adv. Apr. 15.	Apr. 15
May 12	Turbine Pump and Gasoline Engine, Pembroke, Ont.	Apr. 22
May 15	Equipment—Cedar Rapids, Ia.	Apr. 15
May 15	Fog Alarm—Ottawa, Ont.	Apr. 29
May 18	Electrical Work, etc., Brooklyn, N. Y. Adv. Apr. 22.	Apr. 22
May 25	Plumbing and Electrical Work—Phila, Pa	Apr. 22

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. Y., Carthage—Bd. Water Comrs. plans to build 1,000,000 gal. steel water supply tank. About $50,000. I W. DeCant, pres.

N. C., Mocksville—Town having plans and specifications prepared building waterworks and sewerage system. About $60,000 N. S. Mullican, Lexington, engr.

S. C., Barnwell—City voted $100,000 bonds to build waterworks and sewerage system; also pave various streets.

O., Akron—F. A Seiberling, c/o Goodyear Tire & Rubber Co., East Market St., had plans prepared for 1 story, 25 x 25 ft., concrete and brick booster pumping station. About $60,000. M. Knowles, Hippodrome Bldg., Cleveland, engr.

O., Canton—H. A. Smith, dir. pub. serv., soon lets contract excavating for 15,000,000 gal. equalizing basin, at D. Smith's farm, north of here. About $300,000. Morris-Knowles co., Inc., Jones Law Bldg., Pittsburgh, engrs.

O., Cleveland—City soon lets contract for 228,000 cu.yd. excav. for filtration plant at Baldwin Reservoir, also for purchase and removal of 18,000 cu.yd. crushed stone. About $200,000. A. V. Ruggles, City Hall, engr. Noted April 8.

O., Cleveland—J. Laronge Co., Williamson Bldg., soon lets contract building 3,990 ft. 8 in. c.i water main, in Westland Heights Allotment. About $20,000. F. J. Landor, Blackstone Bldg., engr.

Ind., Kendallville—City Council having plans and specifications prepared for improving waterworks system and lighting plant. About $100,000.

Mich., Marysville—Village having tentative plans and estimates prepared building semi-permanent water supply system consisting of pumping station with 1 000 ft. submerged intake pipe into St. Clair River, filtration plant, and distributing main from river to Michigan Ave., involving 4,000 ft. 16 in. c.i. pipe. About $200,000. R. Gordon, Marysville, engr.

Kan., Oswatomie—Missouri Pacific R.R., Ry. Exch. Bldg., St. Louis, Mo., plans to build modern water treatment plant, here. About $61,700. E. A. Hadley, 6061 Pershing Ave., St. Louis, ch. engr.

Kan., Peabody—City having plans prepared improving waterworks system. About $180,000. Black & Veatch, Mutual Bldg., Kansas City, Mo., engrs.

N. D., Bowbells—City having plans prepared building waterworks system. Cost to exceed $45,000. Atkinson & Hall, Devils Lake, engrs.

Mont., Billings—City voted $50,000 bonds to repair and extend waterworks system. E. M. Sneckenberger, city engr. Noted Feb. 26.

Mont., Havre—City plans to lay 6 in. water mains in 4th St., 5th, 6th, and 7th Aves. About $18,000. H. R. J. Meyer, Havre, engr.

Mont., Helena—City voted $200,000 bonds to extend waterworks system.

Mont., Wolf Point—City voted $50,000 bonds to extend and improve waterworks system. Noted March 25.

Tex., Paris—City having plans prepared improving waterworks system, to include building dams and pipe lines. About $300,000. J. B. Hawley, Dallas, engr.

Okla., Duncan—City having plans prepared improving waterworks system. About $38,000. V. V. Long & Co., 1300 Colcord Bldg., Oklahoma, engrs.

Okla., Erick—City having plans prepared improving waterworks system. About $35,000. H. G. Olmstead & Co., Oil Exch. Bldg., Oklahoma, engrs.

Okla., Paden—City having plans prepared improving waterworks system, including 4 mi. pipe lines, pumping station, tower and tank, with 65,000 gal. capacity, etc. About $65,000. H. G. Olmsted & Co., Oil Exch. Bldg, Oklahoma, engrs.

Okla., Pryor—City voted $35,000 bonds to improve waterworks system, to include purification plant, pumping station and high line. V. V. Long & Co., Colcord Bldg., Oklahoma, engrs.

Okla., Red Fork—City having plans prepared improving waterworks system. About $30,000. H. G. Olmstead & Co., Oil Exch. Bldg., Oklahoma, engrs.

Col., Kersey—City voted $40,000 bonds to build waterworks system.

Col., Nunn—City voted $30,000 bonds to build waterworks system.

N. M., Clovis—City voted $218,000 bonds to build waterworks and sewerage system and pave various streets. Noted April 1.

N. M., Deming—City voted $100,000 bonds to purchase and improve waterworks system, here.

N. M., Des Moines—City voted $75,000 bonds to build waterworks system.

N. M., Estancia—City voted $50,000 bonds to build waterworks system, including tank, tower, pump, engine and main. Noted March 18.

Ont., Buckingham—Town plans to alter and extend waterworks system and install new c.i. distribution mains, hydrants, etc. About $75,000 Engineer not selected

Ont., Eastview—Bd. Control, Ottawa, having plans prepared by Patterson & Byrnes, engrs., 71½ Sparks St., Ottawa, for installing watermains and building sewerage system. About $150,000.

Ont., Islington—Etobicoke Twp. plans to sink wells, extend watermains, build pumping outfit, stand pipe, etc. Cost between $75,000 and $100,000 E. A. James, 57 Adelaide St., E., Toronto, engr.

BIDS DESIRED

N. Y., Coxsackie—Until May 10, at office of Village Clerk, building storage reservoir. B. Dean, pres. bd. water comrs.; advertised in this issue.

Ill., Decatur—Until May 20, by city, building earth and concrete dam, 1,900 ft. long, 28.5 ft. high, concrete screen chamber, gates, conduits and concrete overflow spillway, including wet and dry excav., backfilling, etc. Pearse & Greeley, 39 West Adams St., Chicago, engrs.; advertised in this issue.

Minn., New Ulm — See "Industrial Works."

Tex., Houston—Until June 1, by D. Fitzgerald, city comr., laying 11,000 ft. 8 and 12 in. water pipes and connecting water works of Houston Heights with system here.

Ont., Fergus—Until May 10, by E. H. Darling, engr., Spectator Bldg., Hamilton, building 250,000 Imp. gal. rein.-con. reservoir. Work involves 400 cu.yd. concrete. About $22,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Pa., Phila.—City let contract laying new ing new pipe and removing old on line of Parkway between 23rd and 25th Sts., to McNichol Paving & Constr. Co., 1923 Cherry St., $21,574. Noted April 8.

★Mich., Grosse Pointe (Detroit P. O.)—City let contract trenching anl laying c.i. pipe line extensions to watermains in Washington Rd. and University Pl., involving 6,600 ft. 6 in. c.i. pipe, to C. Cronin & Son, Grosse Pointe. About $24,000.

★Mich., Redford—City let contract extending watermains, involving 20,000 ft. 4-6 in. c.i. pipe, to L. C. Brooks & Son, Jackson. About $25,000.

★Ia., Washta—See "Sewers."

★N. D., McVille—City let contract building concrete reservoir, 125,000 gal. capacity, 40,000 gal. steel stand pipe and tank, 9,549 ft. 4-8 in. c.i. water mains, etc., to Gedney & Murphy, Fargo, $60,356. Noted April 15.

Sewers

PROPOSED WORK

Vt., Bennington—See "Streets and Roads."

N. J., Jersey City—City plans to build sewerage system between Grant and Fulton Aves. Cost to exceed $100,000. F. A Dolan, clk.

Pa., Erie—City election May 18 to vote on $747,000 bonds to build sewerage system and sewage disposal plants. F. Hanlon, clk.

N. C., Mocksville—See "Waterworks."

S. C., Barnwell—See "Waterworks."

Fla., Miami—City Council soon lets contract laying 43,500 ft. 8-24 in. sanitary tile sewers, involving 19,000 cu.yd. excav., cost $124,000; 6,500 ft. storm sewers, involving 2,800 yd. excav., 27-39 in concrete, and 12-24 in tile pipe, $46,000. C. W Murray, city engr.

O., Cleveland—City plans to build vitr pipe sewers in East 124th St. from Mount Overlook Ave. to Fairmount Rd., East 126th St. from Mount Overlook Ave. to Britton Dr., East 127th St. from Woodland Ave to Fairmount Rd., Britton Dr and Mount Overlook Ave. from East 124th to East 127th Sts., cost $96,281 R. Hoffman city engr.

Mich., Ford (Wyandotte P. O.)—E LeBlanc, village clk., soon lets contract furnishing labor and material for building sewerage system in 2nd and Barry Aves., involving 4,023 ft. 36 in. concrete of vitri pipe. About $70,000. M. L. Brown & Son, 819 Chamber of Commerce, Detroit, engr.

Mich., Jackson—City rejected bids building Whitney Trunk Sewer, involving 750 ft 6 x 9 ft rectangular and 4,050 ft 18-96 in circular pipe; Eggleston Trunk Sewer, 7,830 ft 24-48 in. pipe; Ganson St Relief Sewer, 2,550 ft. 18-24 in. pipe, South

Sewers (Continued)

Park Ave. Sewer, 1,600 ft. 24 in. pipe; New York Alley Sewer, 700 ft. 30 in. pipe; Chapin St. Sewer, 2,700 ft. 30-36 in. pipe (city to furnish pipe for latter), all rein.-con., concrete, segmental block or vitr. Work will be readvertised. W. B. Hodges, city engr.

Wis., Waterloo—City having plans prepared laying 5 mi. vitr. sewer pipe in various streets. About $50,000. Parsons & Orbert, 627 M & M Bldg., Milwaukee, engrs.

N. M., Clovis—See "Waterworks."

Idaho, Rexburg—City soon lets contract laying 13,000 ft. 8 in. vitr. pipe in Sewer Dist. 8. About $55,000. Muddleston & Fiero, Kearns Bldg., Salt Lake City, Utah, engrs.

Ore., Portland—City Council received no bids building Vancouver Ave. trunk sewerage system, vitr. or concrete. About $106,930. O. Laurgaard, city engr.

Ont., Eastview—See "Waterworks."

BIDS DESIRED

N. Y., Gloversville—Until May 4. by city, furnishing labor and material building 2,200 ft. intercepting sewer. H. J. Hanmer, city engr.; advertised in this issue.

Pa., Phila.—Until May 12, by Dept. Pub. Wks., building branch sewers in Torresdale Ave., Broad, Daggett and Poplar Sts., brick cost, $245,000; Everett, Pollock, 24th and Packer Sts., concrete, $225,000.

N. C., Graham—Until May 20, by R. L. Holmes, mayor, and Comrs. building sanitary sewerage system, involving 13.8 mi. 8-18 in. vitr. pipe, manholes, flush tanks and appurtenances, to include two sewage pumping stations with 0.6 mi. 4-6 in. c.i. pipe. Norcross & Keis, 1625 Candler Bldg., Atlanta, Ga., engrs.; advertised in this issue.

Ga., Marietta—See "Streets and Roads."

Tenn., Alton Park—Until May 8, by Mayor and City Council, building sanitary sewerage system, involving 7½ mi. vitr. pipe sewers, 125 brick manholes, septic tank, flushing tanks, etc. W. L. Brandon, Alton Park, engr.

O., Xenia—Until May 3, by City Comn., building sanitary sewers in Dists. 1, 2, 3, 5 and 6, involving 15,000 ft. 6 and 8 in. vitr. pipe and 3,000 cu.yd. earth trenching. About $25,000. Smith & Foster, 701 Commercial Bldg., Dayton, engrs.

Ind., South Bend—Until May 11, by Dept. Pub. Wks., building 1,285 lin.ft 30-36 in. sewer in Division St., from Meade to Chicago Sts., 1,285 lin. ft. 30-36 in. sewer in Fellows St. and Ewing Ave. from Donald St. to Erskine Blvd. and 3,861 lin.ft. 12-33 in. sewer in Michigan St. from Fairview Ave. to Donmoyer St. V. C. Sweeney, clk.; advertised in this issue.

Ia., Ft. Madison—Until May 5, by L. F. Albers, city clk., laying 26 mi. 8—24 in. vitr. sewer pipe, building 2 pumping stations, sewage ejectors, motor driven compressors, etc. Burns & McDonnell, Interstate Bldg., Kansas City, Mo., engrs. Noted April 8.

Minn., Janesville—Until May 7. by R. R. Brown, village recdr., building sewerage system and sewage disposal plant, involving 28,330 ft. 8-12 in. pipe, 80 manholes and rein.-con. Imhoff tank, 26 ft. deep, 22 ft. in diameter, with 30 x 30 ft. sludge bed. About $104,000. F. Boss, city engr.

N. D., Grafton—Until May 4, by city, building sewerage system and extending water main in 25 blocks. About $40,000. C. L. Pillsbury Co., Metropolitan Life Bldg., Minneapolis, engrs. Noted April 22.

Cal., Bishop—Until May 6, by A. D. Schieveley, city clk., building sewers in all streets, involving 19,580 ft. 6-14 in. cement or vitr. clay pipe, etc. Olmsted & Gillelen, Hollingsworth Bldg., Los Angeles, engrs.

Ont., Stratford—Until May 8, by A. B. Manson, city engr., laying 10,425 ft. 24-48 in. sewers. Sewer pipe and castings will be supplied by town. About $50,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Conn., Bridgeport**—City let contract laying 15 mi. pipe sewer, to Pierce Mfg. Co., 785 Housatonic Ave. About $259,000.

N. Y., Brooklyn—E. Riegelmann, boro. pres., received bids April 21, furnishing labor and material building sewer in (a) Stillwell Ave., (b) 65th St., (c) President St., (d) 12th St., from Murphy Bros., 8856 26th St., (a) $13,683, (b) $10,829, (c) $6,636, (d) $2,343; Ward & Tully, Inc., 10th Ave., (a) $13,837; J. Jennings, 15 Van Siclen Ave., (a) $14,523, (b) $11,668, (c) $6,308, (d) $1,973; P. Tomasetti Co., Inc., 1133 60th St., (b) $10,493, (d) $1,545; P. J. McCauley, 394 Halsey St., (b) $10,661, (c) $5,489; J. O'Leary, 929 Peace St., Pelham Manor, (c) $5,202; C. Petracca, 3506 Neptune Ave., (b) $13,462, (c) $5,899, (d) $2,140. Noted April 15.

★**W. Va., Clarksburg**—See "Streets and Roads."

★**O., Cleveland Heights** (Warrensville P. O.)—Village let contract building sewers and water mains in Cumberland Ave. from Lee to Mayfield Rds., involving 5,140 ft. 8-24 in. vitr. pipe, 3,270 ft. 4-6 in. c.i. pipe, 10 manholes, to N. Iafornaro, 3218 Murray Hill Rd., $35,412. Noted April 22.

★**O., Dayton**—Comrs. Montgomery Co. let contract building 30,000 ft. 6-24 in. vitr. pipe sanitary and storm sewers in Mt. Auburn Sewer Dist. 2, to Gessner Co., Toledo, $137,608.

Wis., Milwaukee — Sewerage Comn. received bids April 22, building fine screen plant, from Chain Belt Co., 736 Park St., $258,600.

★**Wis., Milwaukee**—Sewerage Comn. let contract building sewers in 2nd Ave. and Scott St., involving 5,635 ft. 60 in. concrete sewer in tunnel, standard and drop manholes, etc., to G. E. Zimmerman, 3102 McKinley Blvd., $263,934. Noted April 22.

Ia., Cushing—City let contract building main and lateral sewers, in various streets, to Sieg Constr. Co., Waterloo, $18,098; sewage disposal plant, to Ward & Weighton, 516-17 Davidson Bldg., Sioux City, $10,995.

★**Ia., Washta**—City let contract laying 10,000 ft. sewer pipe, in various streets, to W. D. Lovell, 1415 Southeast 8th St., Minneapolis, Minn., $19,785, building sewage disposal plant, to F. Humphrey, Cherokee, $13,400; improving waterworks system, to Lieg Constr. Co., Waterloo, $22,340.

★**Kan., Protection**—City let contract laying sewers in various streets and building sewage disposal plant, to Amerman & Snyder, Wichita, $48,500. Noted April 1.

★**Kan., Sedgwick**—City let contract improving sewers in various streets, to Foster & Skaer, 600 East Douglass Ave., Wichita, $40,048.

★**N. D., McVille**—City let contract building sewerage system, to Gedney & Murphy, Fargo, $25,877. Noted April 15.

Ore., Portland—City received bids April 14, building sewer in (a) Division St. from East 7th to East 9th Sts., (b) 40th Ave. S. E. from 42nd St. S. E. to 47th St. S. E., (c) Interstate Ave. and Lombard St. Sewerage System, (1) concrete, (2) cement, (3) vitr., from Braley & Cusick, Vancouver, Wash., (a1) $4,330, (b) $2,942; J. Albert, 289 Brunside St., (b1) $2,785; J. Bekal, General Delivery, (b1) $2,855; Jacobsen-Jensen Co., 407 Stanton St., (c2) $101,233; J. Keating, Lumbermens Trust Co., (c3) $101,574. Noted March 25.

Bridges

PROPOSED WORK

Me., Lewiston—City voted $150,000 bonds to build 1,000 ft. ornamental concrete bridge, 100 ft wide, over Canal, on Main St.

Conn., Hamden (New Haven P. O.)—Town rejected only bid building 60 ft. rein.-con. bridge, 35 ft. wide, over Mill River on Dixwell Ave. About $30,000. J. F. Jackson, 185 Church St., New Haven, engr.

Conn., Hartford—City plans to build concrete bridge over Park River, on Hamilton St. About $25,000.

O., Cleveland—City and Pennsylvania R. R., Pennsylvania Sta., Pittsburgh, preparing plans for concrete and wood overhead bridges across railroad tracks at Central, Quincy, Platt, Woodland, Grand and Holton Aves., East 71st, East 75th and East 79th Sts., here. About $3,000,000. R. Hoffman, city engr.

O., Elyria — Lorain Co. plans to build Crozier Bridge, 79 ft. span, 1 concrete abutment. About $40,000. C. T. Biggs, Elyria, engr.

Mich., Grosse Pointe (Detroit P. O.)—M. L. Brown & Son, engrs., 819 Chamber of Commerce, Detroit, soon let contract building 2 rein.-con. arch bridges, 30 ft. long, 26 ft. wide, on University Pl. and Lincoln Ave., involving 1,000 cu.yd. rein.-con., for Village Homes Co. About $25,000.

Wisconsin—State Highway Dept., Madison, made surveys and is preparing plans building Ekblom Bridge, Swiss Twp., Burnett Co., to have two 60 ft. through plate girder spans, with concrete abutments. G E. Miller, Webster, comr.

Kan., Girard—Comrs. Crawford Co. rejected bids received April 8, building bridges on Sect. G., Federal Aid Project 40. About $30,000. W. J. Arnold, Girard, engr. Noted March 11.

Wash., Seattle—Bd. Pub. Wks. had preliminary plans prepared for 400 ft., concrete and steel viaduct on West Dravus St., consisting of 5 spans, 69, 71, 81, 85 and 92 ft. long, 52 ft. wide. About $200,000. A. H Dimock, city engr.

Saskatchewan — Provincial Government, Regina, soon lets contract building 80 ft. rein.-con. arch bridge, near Sidmore, involving 246 cu.yd. rein.-con., 176 cu.yd. concrete and 25 tons reinforcing steel; 40 ft. rein.-con. bridge near Esterhazy, 127 cu. yd. rein.-con. and 9 tons reinforcing steel: 30 ft. rein.-con. bridge near Markinch, 87 cu.yd. rein.-con. and 6 tons reinforcing steel. H. S. Carpenter, c/o Dept. Highways, Regina, engr.

B. C., Victoria City—Provincial Government and Canadian Pacific Ry., Union Sta., Toronto, Ont., having plans prepared by Strauss Bascule Bridge Co., engrs., 14 Windson Hotel, Montreal, Que., for railway and highway bridge over Inner Harbor, on Johnson St., here.

BIDS DESIRED

Me., Biddeford—Until May 20, by Comrs. York Co., City Bldg., constructing concrete bridge on Elm St. About $150,000.

Vt., Brattleboro—Until May 15, by Town Clerk, building 330 ft. single span steel highway bridge, 21 ft. roadway and 6 ft. sidewalks, over Connecticut River between here and Hinsdale, N. H.

N. Y., Bronxville—Until May 17, by Bronx Parkway Comn., West Pondfield Rd., building stone faced, rein.-con. arched bridge over Bronx River, on Parkway Dr., south of Woodland Pl., White Plains. J. Downer, secy. and engr.; advertised in this issue.

N. Y., Elmira—Until May 17, by Bd. Pub. Wks., at office of H. Moseson, clk., building 830 ft. rein.-con. bridge, 56 ft. wide over all, over Chemung River on Main St.; advertised in this issue.

N. Y., Massena—Until May 6 (change of date), by F. A. Hough, town clk., furnishing labor and material building highway bridge over Grasse River. Jarrett-Chambers Co., 30 East 42d St., New York City, engrs.; advertised in this issue. Noted April 15.

Pa., Phila.—Until June 1, by Dept. Pub. Wks., rebuilding bridge on South St. Work involves removing old superstructure and piers, dredging, building new piers above high water, furnishing and erecting steel machinery and light iron, paving, etc. About $590,000.

Fla., St. Augustine—See "Streets and Roads."

Fla., St. Augustine—Until May 11, by Comrs. St. John Co., at office of O. P. Goode, clk., building 16 rein.-con. roadway bridges also rein.-con bridge over Matanzas River and 1 over North River; advertised in this issue.

O., Poland—Until May 3, by Comrs. Mahoning Co. (Youngstown), extending through-girder steel highway bridge, also widening floor from 20 to 40 ft., here. About $40,000. G. M. Montgomery, Youngstown, engr.

Minn., Elba—Until May 12, by W. H. Borgen, aud. St. Louis Co., (Duluth), building 30 ft. rein.-con. bridge 20 ft. wide over Duluth & Iron Range R.R. tracks on Miller Trunk Rd., near here, involving 550 cu.yd. concrete and 50,000 lb. steel. About $42,000. R. W. Acton, Duluth, co. engr.

Kan., Hoxie—Until May 8, by Sheridan Co., building two 30 ft. and one 14 ft. span bridges. A. J. Mowry, clk.

Kan., Minneapolis—Until May 14, by Comrs. Ottawa Co., building concrete and steel truss bridge, to have 60 ft. span and 18 ft. roadway. P. L. Evans, co. engr.

Bridges (Continued)

S. D., Brookings—Until May 1, by Bd. Comrs. Brookings Co. building one 60 ft. two 50 ft. and four 40 ft. span steel truss highway bridges, one 30 ft., two 24 ft., and three 16 ft. span, concrete bridges, each to have concrete abutments and wings; advertised in this issue.

Tex., Livingston—Until May 4, by E. T. Murphy, judge Polk Co., building concrete and steel bridges on State Highway 35, from here to Corrigan, involving 2,127 cu. yd. dry and 1,634 cu.yd. wet excav., 229,700 lb. structural and 74,469 reinforcing steel, 801 cu.yd. 1:2:4 and 1,377 cu.yd 1:2½:5 concrete. About $112,110.

Ont., Grand Bend—Until May 3, by J. A. Bell & Son, engrs., Court House, St. Thomas, building 138 ft. steel truss bridge on rein.-con. abutments, over Ausaubles River, on Huron and Lambton Co. line, including wrecking of old bridge and grading road. Work involves 586 cu.yd. rein.-con. and 1,300 cu.yd. excav. About $30,000. Noted April 15.

Ont., Guelph—Until May 4, by A. W. Connors, engr., 34 Victoria St., Toronto, constructing Burk Bridge, Arthur Twp., 40 ft. rein.-con. arch. truss, Elkerton Bridge, Pilkington Twp., 30 ft. rein.-con. beam, Loree Bridge, West Garafaxa Twp., 18 ft. concrete slab, Croft Bridge, Eramosa Twp., 14 ft. rein.-con. slab, involving 800 cu.yd. rein.-con., cost, $25,000; Irvine River Bridge, at Elora, to have two 61 ft. rein.-con. or steel arch spans, $35,000. J. Beattie, co. clk. Noted April 1

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Phila.**—City let contract rebuilding southeast end of bridge on Broad St. and Lehigh Ave., to Mundy Paving & Constr. Co., 228 South Alder St., $63,345 Noted April 8.

★**O., Youngstown**—Mahoning Co. let contract building 230 ft. concrete arch span bridge, 50 ft. wide, at Lanterman Falls, involving 1,330 cu.yd mass and 2,000 cu.yd. rein.-con., 90 tons steel, 4,450 sq.yd. brick paving, 1,000 ft. 12-18 in. tile and c.i. sewer pipe, 4,500 cu yd. earth approach and fill, to N. R. Porterfield, Inc., Youngstown, $175,098.

★**Ind., Boonville**—Comrs. Warrick Co let contract building 37 bridges and culverts, to Montgomery & Parker, Eureka, $57,289.

★**Utah, Salt Lake City**—Comrs. Salt Lake Co. let contract building three rein.-con arch bridges over Jordan River, to Schuyler & Sorenson, North 1st West St., $25 157. Noted March 25.

Streets and Roads

PROPOSED WORK

Vt., Bennington—Village having plans prepared and soon receives bids for 20,000 sq.yd. concrete pavement and storm sewers. H. E. Breed, village engr.

N. Y., Geneva—H. K. Seybolt, supt. Bd. Pub. Wks., rejected bids received April 6, paving Poultney, West North and South Exchange Sts. Work will be readvertised. Noted March 4.

N. J., East Orange—City plans to pave North Arlington Ave. and various other streets. Cost to exceed $25,000. W. D. Willigerod, city engr.

N. J., Newark—City receives bids about May 23, paving and flagging 1,000 ft. Ridgewood Ave. from Hawthorne to Runyon Sts., 20 ft. wide. Cost to exceed $25,000. M. R. Sherrerd, city engr.

N. J., Newark—City soon lets contract grading Harris St., involving 400,000 cu.yd embankment. M. R. Sherrerd, city engr.

N. J., Union—Town Council plans to improve Liberty, Humboldt and Jefferson Sts. Cost to exceed $100,000. E. Bautz, clk.

Pa., Erie—City election May 18 to vote on $226,000 bonds to improve streets. F. Hanlon, clk.

Pa., Somerset—Somerset Co election May 18 to vote on $1,000,000 bonds to improve roads.

Del., Dover—Kent Co. plans election soon to vote on $1,000,000 bond issue to improve roads. M Gooden, Dover, engr

W. Va., Harrisville—Comrs. Ritchie Co. plan to grade 2.81 mi road from here to Smithville. About $35,190. R. O Renshaw, Huntington, engr.

N. C., Spencer—City plans to pave 14,095 ft. principal streets, 23 ft. wide, asphalt About $170,000. R. J Goode, mayor.

N. C., Barnwell—See "Waterworks."

O., Cleveland—City plans to grade, drain, curb and pave London Rd from Euclid Ave. to New York Central R.R., Clyde Ave. from West 7th St. to westerly end, St Olga Ave. from Starkweather to Clyde Aves., brick on concrete base, cost $82,320. R. Hoffman, city engr.

O., Cleveland—City plans to grade, drain, curb and pave St. Tichon St. from Starkweather to Clyde Aves., West 20th St. from Potter Court to New York Central R.R and Wichita Ave. from West 49th St. to Lowrie Allotment, brick, cost $31,259. R. Hoffman, city engr.

O., Cleveland—City soon lets contract paving portions of Arlington, Everett, Helena, Joan, Market, Stewart and Superior Aves., East 87th, East 117th, East 124th and East 143rd Sts., involving 7,499 sq.yd. asphalt, 249,015 sq.ft. brick block, 411,115 sq.yd. 6 in. concrete base, 24,052 cu.yd. grading, 20,552 ft. stone or concrete curbing and 24,281 ft. 4 in. French tile gutter. R. Hoffman, city engr.

O., Dayton—City plans to pave 1,500 ft. Cambridge Ave. from Salem to Bway., 30 ft. wide, involving 5,000 sq.yd wood block on concrete base and 1,000 lin.ft. cement curbing and gutter. About $25,000. R. M. Baker, city engr.

O., Jefferson—Ashtabula Co rejected bids received April 12, grading and paving 5 mi. Monroe Sect. No. 13, Conneaut-Youngstown Rd., 10 ft. wide, monolithic brick on 5 in. concrete base, cost $182,121. Noted April 1.

O., Youngstown—Mahoning Co. having plans prepared paving 2.5 mi. Youngstown-Lisbon Highway, I. C. H. 82, cost $90,000; 2 mi. Youngstown-Pittsburgh Highway, I. C. H. 83, $40,000; 2.5 mi. Salem-Unity Highway, I. C. H. 86, $100,000; 1 mi. North Lima and East Palestine Highway, I. C. H. 89, $25,000; all 16 ft. wide, brick on slag base. G. M. Montgomery, Youngstown, engr.

Michigan—State Highway Dept., Lansing, rejected bids received March 26, grading, draining and surfacing 1.23 mi. State Trunk Line Rd. 11-11 and .816 mi. State Trunk Line Rd. 58-2, 20 ft. wide, Berrien Co. Noted March 18.

Michigan—State Highway Dept., Lansing, soon receives bids grading, draining and surfacing 6 mi. and 4 mi. State Trunk Line Rd. 53-2, 18 and 20 ft. wide, Macomb Co., 1 mi. State Trunk Line Rd. 19-2. 18 and 20 ft. wide, Sanilac Co., concrete or bituminous concrete; 3.705 mi. Assessment Dist. Rd. 345 Lenawee and Hillsdale Counties, 12 ft. wide, gravel; 5 mi. State Trunk Line Rd. 19-10. 16 ft. wide, Sanilac Co., gravel or stone gravel.

Michigan — State Highway Dept., Lansing, soon lets contract grading, draining and surfacing 2.032 mi. State Trunk Line Rd. 13-14, 16 ft. wide, involving 19,060 sq.yd. waterbound or bituminous macadam, 7,903 cu.yd. earth excav., 327 lin.ft. 12-18 in. encased tile, 1,621 lb. steel, 58.6 cu.yd. 1:2:4 and 68.2 cu.yd. 1:3:6 concrete, etc.

Mich., Detroit—City soon receives bids shaping grading and paving 2,200 ft. Thaddeus St., cost $36,850; Evans Ave. from Pershing to Gartner Aves., $20,330; Richardson St. from Mt. Elliott to Foster Aves., $17,430; Wilson Ave. from Pallister to Seward Aves., $15,400, all 26 ft. wide, sheet asphalt on 6 in. concrete base, Berea or Medina curbstone. C. W. Hubbell, city engr.

Mich., Houghton—Bd. Rd. Comrs. Houghton Co. receive bids about May 15, rough grading and draining 20 mi State Trunk Line Rd. 26, Painesdale to Winona, involving 160,000 cu.yd. sandy clay, 12-24 in. pipe culverts, etc. W. C. West, co engr.

Mich., Port Huron—City soon receives bids grading, shaping and paving with concrete, concrete curbing, Gratiot Ave., cost $54,868; Court St., $36,266; Pine Grove Ave., $27,275; Stone St., $6,158; 22nd and Railroad Sts., $2,769; Griswold St., $2,117; Park St., $4,202; Alley Blk. 58, $184; Glenwood Ave., $12,100; Michigan St., $4,716; Minnie St., $9,968; Jenkinson St., $2,703; Moak St., $3,620; Court St., $9,861; 11th St., from Union St. to south line Griswold St., $5,906; 4th St. from Wall to Water Sts. $3,449; Crescent Pl., $3,942; Connor St., $918; Tunnel St., $3,761; Willow St., $13,511; 15th St., $11,958; Stone St., $18,395; 6th St., $9,125; repair South Military St and other pavements, $29,096. E. R. Whitmore, City Hall, engr.

Ill., Highland Park—City Council soon lets contract improving 1st St. from Elm Pl. to Laurel Ave., involving 1,150 cu.yd grading, 2,650 lin.ft. drain tile, 2,600 lin ft. concrete curb and 5,260 sq.yd. brick pavement, bituminous joint filler laid on a 6 in. concrete foundation; St. Johns Ave. from Kincaid St. to Lambert Tree Ave., 2,050 cu.yd. earth excav., 2,200 lin.ft. sewers and 3,100 sq.yd. 2 course rein.-con. pavement, including integral curb edges and expansion joints; also paving and improving connected system of streets in Ravinia Woods Subdivision, 3,900 cu.yd earth excav., 8,360 lin.ft. sewers, 74 cu.yd. retaining walls and 8,550 sq.yd. 2 course reinforced cement pavement, including integral curb edges and expansion joints. E. A. Warren, clk.

Wisconsin—State Highway Dept., at div. office, 213 South Barstow St., Eau Claire, rejected bids received April 7, grading and paving 1.89 mi. Eau Claire-Osseo Rd., Federal Aid Project 111, Eau Claire Co. Noted April 15.

Wisconsin—State Highway Dept., Madison, rejected bids received April 9, grading and paving 6.45 mi. Horicon-Beaver Dam Rd., Federal Aid Project 150, Dodge Co., and Watertown Plank Rd., Federal Aid Project 59, Jefferson Co. Noted April 15.

Wisconsin—State Highway Dept., at div. office, 208 Stephenson Bldg., Milwaukee, rejected bids received April 7, grading and paving 4.72 mi. Town Line Rd., Federal Aid Project 115, Walworth Co. and 3.59 mi Fond du Lac-Milwaukee Rd., Federal Aid Project 154, Fond du Lac Co. Noted April 15.

Wis., Elkhorn—Walworth Co. State Rd. & Bridge Com. soon lets contract grading and paving 1½ mi. Delavan-Darien Rd., State Trunk Highway 61, involving 4,915 cu.yd. earth excav., 60 cu.yd. concrete in culverts and 17,328 sq.yd. concrete surfacing, 18 ft. wide; 3 mi. Lake Geneva-Elkhorn Rd., State Trunk Highway 12, 8,366 cu.yd. earth and 2,000 cu.yd. borrow excav., 887 cu.yd. concrete in culverts, 90.1 cu.yd. concrete in bridges, 31.360 sq.yd. concrete surfacing, 18 ft. wide, etc. H. J. Peters, highway comr.

Wis., North Milwaukee—W. E. Chase, city clk., soon lets contract excavating, grading and paving Western Ave. from Wallace Ave. to Green St., involving 14,211 sq.yd. paving and 4,140 cu.yd. grading; Green St. from Western Ave. to Chicago, Milwaukee & St. Paul R.R., 1,722 sq.yd. paving and 466 cu.yd. grading; Commerce Ave. from Chicago, Milwaukee & St. Paul R.R. to Cedarburg Ave., 7,134 sq.yd. paving and 5,040 cu.yd. grading; Hampton Ave. from Hopkins to Cedarburg Aves (except portion lying between east line 34th St. and west line 32nd St.), 11,492 sq.yd. paving and 2,696 cu.yd. grading; Webster Blvd. from Hampton to Atkinson Aves., 6,644 sq.yd. paving and 3,879 cu.yd. grading. Bids will be received on sheet asphalt, bituminous concrete or 1 course concrete.

Minn., Brainerd—C. W. Mahlum, aud. Crow Wing Co., soon lets contract building Div. "A," Job 1908, State Rd. 1, involving 3.75 acres clearing and grubbing, 19,866 cu. yd. excav., 10,628 cu.yd. overhaul, 567 lin. ft. portable culverts, 7,800 cu.yd. gravel surfacing, etc.; Div. "B," 10.5 acres clearing and grubbing, 30,580 cu yd. excav. 35,985 cu.yd. overhaul, 2,800 lin ft. 12 in. tile drain, 878.5 lin.ft. portable culverts, 7,000 cu.yd. gravel surfacing and spillway.

Minn., Hastings—City having plans prepared paving 6 blocks, 30 ft. wide, rein.-con. About $45,000. L. Clarke, Stillwater, engr.

Minn., Red Wing—City having plans prepared paving 1 mi. 4th St. from Plum to Buchanan Aves, 2 blocks Buchanan Ave. from 4th to 6th Sts., Plum St. from 4th to 5th Sts., Tannery Rd. from south end of concrete paving to city limits and Main St. from Plum to Buff Sts., 30 ft. wide, bituminous macadam. About $75,000. W. Geisheker, city engr.

Kan., Girard—Comrs. Crawford Co. rejected bids received April 8, grading and paving 2.98 mi. Commercial Highway, Federal Aid Project 40, Sects. 11 and 1, 18 ft. wide. About $195,000. Noted March 11.

Mont., Laurel—City plans to lay sidewalks and curb 2 mi. various streets. About $26,800. T A. Rigney, Laurel, engr.

Mont., Lewistown—City rejected only bid paving Dists. 31, 33, 34 and 35. Noted April 1.

Mont., Libby—City plans to gravel surface various streets. About $30,000. B. F. Maiden, clk

Mont., Winnett—City plans to lay sidewalks on various streets. About $105,000. A. Refers, Winnett, engr.

Missouri—State Highway Dept., Jefferson City, plans to build 12.06 mi. Jefferson Highway from Buchanan Co. line to east end of Platte River Bridge in Platte City, 24 ft. wide, involving 182,034 cu yd. excav., 34 culverts, one 48 ft., one 18 ft. and one 100 ft. concrete span bridge, etc., one 450 ft. concrete pile trestle, one 400 ft. steel

Streets and Roads (Continued)

span bridge, etc., cost $231,950; 13.7 mi. Jefferson Highway from Main St. in Platte City to north line of Parkeville Special Rd. Dist., Platte Co., 140,867 cu.yd. excav., 40 culverts, etc., $120,385; 0.376 mi. Frederick Ave. Rd., 33 ft. wide, Buchanan Co., 239 cu.yd. excav. 2,666 cu.yd. borrow, 6,434 sq.yd. bituminous concrete surfacing on 5 in. concrete base, 3,785 lin.ft. combination curb and gutter, 694 lin.ft. concrete gutter, etc., $29,900; 1 mi. Natl. Old Trails Rd., Fayette Special Rd. Dist., 24 ft. wide, Howard Co., 3,500 cu.yd. earth excav., 9,400 sq.yd. chat surfacing, etc., $11,803.

Mo., Jefferson City—City plans to resurface 160 blocks, involving 300,000 sq.yd. surfacing.

Mo., Versailles—Morgan Co. received no bids April 21, building 11.08 mi. Tipton-Versailles Rd., 24 ft. wide, involving 44,040 cu.yd. earth excav., 34,012 sq.yd. gravel pavement Spec. "b", 29,562 gravel surface course and 29,562 reconstructed base course, etc. About $61,502. Noted Dec. 4.

Tex., Center—Shelby Co. having plans prepared grading, surfacing and draining 10.9 mi. Highway 9 from Shelbyville to San Augustine Co., 16 ft. wide, involving 72 acres clearing and grubbing, 59,400 cu. yd. earth excav., 26 cu.yd. concrete, etc. About $110,833. T. H. Dillon, Center, engr.

Tex., Gilmer—Upshur Co. having plans prepared grading, surfacing and draining 8.988 mi. Culberson Highway, east and west through here, 12 ft. wide, involving 37 acres clearing and grubbing, 15.852 cu.yd. gravel, 42,513 cu.yd. earth, 548 lin.ft. 24-48 in. c.i. pipe, etc. About $79,100. Wilder & O'Neal, Mt. Pleasant, engrs.

Tex., Gonzales—Comrs. Gonzales Co. had plans prepared loading, hauling, spreading and gravel surfacing 10.03 mi. Highway 3, 16 ft. wide (local gravel to be used). About $46,000. Wilder & O'Neal, Mt. Pleasant, engr.

Okla., Madill—City having plans prepared and soon receives bids for 70,000 sq.yd. rein.-con. paving. About $340,000. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs.

N. M., Clovis—See "Waterworks."

Idaho, Rexburg—City soon lets contract paving various streets, involving 19,000 lin. ft. concrete curbing, 19,000 lin.ft. concrete guttering, 46,000 sq.ft. concrete sidewalks, and 40,000 sq.yd. concrete or bituminous concrete pavements. About $170,000. Huddleston & Fiero, Kearns Bldg., Salt Lake City, Utah, engrs.

Utah—State Highway Comn., Salt Lake City, soon lets contract paving 4 mi. Arrowhead Trail from Holden to Kanosh, 9 ft. wide, involving 7,000 sq.yd. concrete, cost $60,000; 5 mi. State Rd. south from Holden, 9 ft. wide, Millard Co., 9,000 sq.yd. concrete, $95,000; graveling 33.3 mi. road between Lund and Cedar City, 18 ft. wide, Iron Co., $150,000. I. R. Browning, state highway engr.

Oregon—State Highway Comn., Portland, soon lets contract grading and building guard fence on 5.3 mi. Toledo-Newport Sect. State Highway, Lincoln Co., involving 63,400 cu.yd. earth excav. and 3,550 lin. ft. guard fence; surfacing with run of bank gravel, 1.82 mi. Barlow-Aurora Sect. State Highway, Clackamas Co., 4,700 cu.yd. gravel excav. H. Nunn, Salem, state highway engr.

Ore., Marshfield—City Council plans to improve streets in 1st Dist., beginning on 10th St. extending through Hemlock St., Bay and Boulevard Parks additions. About $40,000.

Cal., Carpinteria—Bd. Supervs., Santa Barbara Co., (Santa Barbara), soon receives bids grading with 4 in. crushed rock and paving with 2 in. bituminous surface, etc., 1½ mi. various streets, here. Cost to exceed $25,000. O. O'Neill, Santa Barbara, co. surveyor.

Ont., Toronto—City plans to build 800 lin.ft. concrete curbing on Ashdale Ave. and Boler St., 1,100 ft. concrete sidewalks on Wrenson Rd., and 29,200 sq.yd. asphalt pavements on Glenrose, Harvie and Royce Aves., concrete base, brick block gutters. About $142,364. R. C. Harris, city engr.

BIDS DESIRED

N. Y., Bronxville—Until May 17, by Bronx Parkway Comn., West Pondfield Rd., paving Bronx River Parkway Dr. between Crane Rd., Scarsdale and Woodland Pl., White Plains. Bids will be received on (a) asphalt block on concrete base, (b) bituminous concrete on concrete base, (c) bituminous macadam on concrete base. J. Downer, engr. and secy.; advertised in this issue.

N. Y., Brooklyn—Until May 5, by E. Riegelmann, boro. pres., building cement curb and laying cement sidewalks on 7th St. from Ave. P. to Ave. Q, regulating and paving with permanent asphalt on 6 in. concrete foundation, roadway of Lott Ave. from Christopher Ave. to Sackman St., Newport St. from Sackman to Powell Sts., West 35th St. from Surf to Mermaid Aves., 65th St. from 13th to 14th Aves., 76th St. from 13th to 14th Aves., building cement sidewalks on south side of 66th St. from 19th to 20th Aves., grading sidewalk space and laying cement sidewalks on both sides of East 4th St. from Ave. F to point 221 ft. north, repairing sidewalks on south side of 54th St. from 4th Ave. to point 95 ft. west.

N. Y., Ft. Plain—Until May 8, by village, building 6,600 sq.yd. concrete pavement. M. Vrooman, Gloversville, engr.

N. Y., Long Island City—Until May 3, by M. E. Connolly, pres. Queens Boro., repairing sheet asphalt pavement in 1st and 2nd Wards, regulating and grading sidewalk space and laying sidewalks on south side of Beddard St. from Boerum Ave. to line 145 ft. east, 3rd Ward, regulating and grading sidewalk and gutter space and laying sidewalks within lines which belong to city, on Maspeth Ave., 2nd Ward, on northerly side from Maurice to Willow Aves., on southerly side from Betts to Vancott Aves. and from Broad St. to Clermont Ave.

N. Y., New York—Until May 6, by H. Bruckner, pres. Bronx Boro., repaving with sheet asphalt on concrete foundation, roadway of East 166th St. from Boston Rd. to Prospect Ave., Tinton Ave. from East 150th to East 151s Sts., Creston Ave. from East 184th to East 188th Sts., Wales Ave. from East 152nd St. to Westchester Ave., East 152nd St. from Wales to Tinton Aves., with sheet asphalt and granite blocks on concrete foundation, Clinton Ave. from Crotona Park N. to East 182nd St., with granite blocks on concrete foundation, East 183rd St. from Park to 3rd Aves., Boston Rd. from East Tremont Ave. to East 180th St., East 134th St. from Alexander to Willis Aves.

N. Y., Rye—Until May 5, by W. H. Selzer, village clk., improving Ridge St. from High to Purchase Sts., involving 2,450 sq.yd. concrete pavement, 200 lin.ft. 8 in. vitr. tile pipe. J. A. Ehler, village engr.; advertised in this issue.

N. J., Allenhurst—Until May 4, by Bd. Comrs. furnishing and laying 8,366 yd. pavement. C. E. King, clk; advertised in this issue.

N. J., Oakhurst—Until May 6, by Ocean Twp., paving 6,470 sq.yd. Lake Ave., concrete or bituminous concrete. W. B. Jeffrey, clk.; advertised in this issue.

N. J., Swedesboro—Until May 5, by H. W. Souder, boro. clk., furnishing labor and material improving Allen St., involving 275 cu.yd. excav. and 1,005 sq.yd. rein.-con. paving; advertised in this issue.

Md., Baltimore—Until May 5, by Bd. Awards, grading, curbing and paving streets listed in Paving Comn. Contr. 175, old granite block on concrete base. R. K. Compton, chn. and engr.

Va., Richmond—Until May 3, by C. E. Bolling, dir. Pub. Wks., grading and paving various streets, involving 80,000 sq.yd. concrete, asphaltic concrete bitulithic, natural rock asphalt, etc.; advertised in this issue.

W. Va., Charleston — Until May 3, by Comrs. Kanawha Co., grading and draining 12.7 mi. road in Mt. Cove and Quinnimont Dists. About $125,000. F. G. Burdette, co. engr.

W. Va., Wayne—Until May 19, by F. H. Fry, clk. Wayne Co., grading and draining 7½ mi. Wayne-Kenova Rd. H. A. Levering, co. engr.

North Carolina—Until May 3, by Div. Office State Highway Comn., Greensboro, hard surfacing 2.54 mi. Federal Aid Project 114, Rowan Co. W. S. Fallis, Raleigh, engr.

Ga., Marietta — Until May 6, by City Council, paving and building storm and sanitary sewers in various streets. Work involves 62,500 sq.yd. vitr. brick, one course concrete, asphalts, bituminous macadam, vitrolithic, and special or patented paving, 49,000 lin.ft. curbing, etc. K. T. Thomas, 300-2 Forsyth Bldg., Atlanta, engr.; Advertised in this issue.

Ga., Savannah—Until May 3, by Mayor, resurfacing 13,000 sq.yd. West Broad St. from Gwinnett to 31st Sts. and repaving 42,600 sq.yd. West Broad St., from Indian to Gwinnett Sts. W. Rockwell, city engr.

Fla., St. Augustine—Until May 11, by Comrs. St. Johns Co. at office of O. P. Goode, clk., hard surfacing 111.1 mi. road and building 40 rein.-con. roadway bridges; advertised in this issue.

Ala., Alabama City—Until May 4, by City Council, paving Forest Ave. from Black Creek to 7th St. About $76,000.

La., Arcadia—Until May 31, by J. S. Williams, secy. Police Jury of Bienville Parish, building hard surfaced roads.

La., Jennings—Until May 17, by Mayor and City council, improving North Market St., Sect. 5, involving 3,300 sq.yd. pavement 1,550 lin.ft. gutters, 250 lin.ft. gutters with rein.-con. top; Cutting Sect. 6, 26,000 sq.yd. gravel pavement, 10,000 lin.ft. concrete gutters, 2,500 lin.ft. concrete gutters and curbs, 1,500 lin. ft. gutters with rein.-top, etc., Cary Ave., Sect. 7, 10,000 sq.yd. pavement, 540 lin.ft. concrete gutters, 6,400 lin.ft. concrete gutters and curbs, 600 lin.-ft. gutters with rein.-con. top, etc. I. C. Carter, Lake Charles, engr.

O., Bellaire—Until May 24, by City Council, paving Belmont, Noble, Jefferson, Guernsey, Union, 32nd, 34th, 37th and 44th Sts., vitr. brick, sheet asphalt or asphaltic concrete. About $300,000. H. C. Althar, Bellaire, engr. Noted Feb. 26.

O., Pataskala—Until May 3, by village, grading, draining, curbing and paving 2,470 ft. Main St., 30 and 40 ft. wide, involving 10,500 sq yd. asphalt, cost $40,000; 861 ft. Town St., 24 ft. wide, 2,380 sq.yd. asphalt, $18,000; 198 ft. Depot St., 34 ft. wide, 740 sq.yd. asphalt, $6,000. Jennings-Lawrence Bldg., Hartmann Bldg., Columbus, engrs. Noted March 18.

Ind., Ft. Wayne—Until May 19, by Comrs. Allen Co., draining, grading and paving 2.83 mi Schlaudroff Rd., 16 ft. wide, concrete, cost $92,000; 2.52 mi. Moore Rd., 12 ft. wide, waterbound macadam, $37,239. A. W. Grosvenor, co. engr.

Ind., Salem — Until May 4, by Comrs. Washington Co., building 15,714 ft. Mt. Tabor and Salem Rd., Vernon Twp., cost $28,632; 4,978 ft. Canton and Seba Rd., between Washington and Franklin Twps., $9,540; 4,732 ft. Clyde Brown et al Rd., Jefferson Twp., $9,678; 5,410 ft. Campbellsburg and Clifty Rd., Brown Twp., $10,862; 9,425 ft. Pekin and Halo Rd., Pierce Twp., $16,422. E. E. Batt, aud.

Michigan—Until May 6, by F. F. Rogers, state highway comr., at office of Bd. Rd. Comrs. Grand Traverse Co., Traverse City, grading, draining and surfacing 2.058 mi. Sect. A and 0.952 mi. Sect. B, State Trunk Line Rd. 42-5, 16 ft. wide, involving (Sect. A) 19,320 sq.yd. gravel, 6,033 cu.yd. excav., 230 lin.ft. 12-18 in. encased tile, 1,142 lb. steel, 37.8 cu.yd. 1:2:4 and 45 cu.yd. 1:3:6 concrete, etc., (Sect. B) 8,941 sq.yd. gravel and 50.3 stations fine grading.

Michigan—Until May 5, by F. F. Rogers, state highway comr., at office of Bd. Rd. Comrs. Eaton Co., Charlotte, grading, draining and gravel surfacing 1.049 mi. Sect. A and 6.022 mi. Sect. B, State Trunk Line Rd. 39-1, 16 ft. wide. Noted April 8.

Michigan — Until May 11, by F. F. Rogers, state highway comr., at office Bd. Rd. Comrs. Livingston Co., Howell, grading, draining and surfacing 11,006 mi. Assessment Dist. Rd. 232, 12 ft. wide, Shiawassee and Livingston Counties, Sect. 1, involves 25,703 cu.yd. earth excav., 715 lin.ft. 12-18 in encased tile culvert, 35,528 sq.yd. gravel surface, 3,048 lb. steel, 116.5 cu.yd. 1:2:4 and 103.7 cu.yd. 1:3:6 concrete, etc., (alternate bid, 180 lin.ft. 12 in corrugated metal culvert); Sect. 2, involves 22,889 cu.yd. earth excav., 992 lin.ft. 12-18 in. encased tile culvert, 41,673 sq.yd. gravel surface, 1,237 lb. steel, 103.9 cu.yd. 1:2:4 and 21.7 cu.yd. 1:3:6 concrete, etc., alternate, 630 lin.ft. 12 in. corrugated metal culvert. Noted March 4.

Michigan — Until May 14, by F. F. Rogers, state highway comr., at dist. office, Press Bldg., Ann Arbor, grading, draining and surfacing 4.773 mi. Assessment Dist. Rd. 321, 16 ft. wide, Washtenaw and Monroe Counties, involving 44,800 sq.yd. gravel, stone gravel, macadam or bituminous macadam, 12,636 cu.yd. earth excav., 4,386 yd. station overhaul, 710 lin.ft. 12-18 in. encased tile, 150.9 cu.yd. 1:2:4 and 150 cu.yd. 1:3:6 concrete, 4,607 lb. steel, etc. Alternate bid 270 lin.ft. 12-18 in. corrugated pipe. Noted March 4.

Mich, Mason—Until May 3, by Bd. Rd. Comrs. Ingham Co., grading, draining and surfacing with gravel 4.01 mi. Assessment Dist. Rd. 2 and 3.516 mi. Rd. 3, 9 ft. wide. S. L. Hall, Mason, engr.

Wisconsin—Until May 7, by State Highway Dept., at div. office 7, Court House, Rhinelander, grading and paving 3.18 mi. Crandon-Laona Rd., Federal Aid Project 155, Forest Co., involving 13.3 acres clearing and grubbing, 14,345 cu.yd. earth excav., 95.3 cu yd. Class "A" concrete, 44,868 sq.yd. feather edge gravel, 24 ft. wide,

Streets and Roads (Continued)

etc., 5.35 mi. Hurley-Mercer Rd., Federal Aid Project 158, Iron Co., 13.3 acres clearing and grubbing, 24,825 cu.yd. earth and 13,250 cu.yd. borrow excav., 133.47 cu. yd. Class "A" concrete, etc., 5.51 mi. Fifield-Radisson Rd., Federal Aid Project 130, Price Co., 33.37 acres clearing and grubbing, 45,741 cu.yd. earth excav., 362.3 cu. yd. Class "A" concrete, etc., 4.6 mi. Rhinelander-Eagle River Rd., Federal Aid Project 170, Oneida Co., 10,919 cu.yd. earth and 606 cu.yd. borrow excav., 170.5 cu.yd. Class "A" concrete, 41,020 sq.yd. gravel surfacing, etc., 9.51 mi. Woodruff-Fifield Rd., Federal Aid Project 165, Vilas Co., 57.65 acres clearing and grubbing, 50,803 cu.yd. earth and 377 cu.yd. borrow excav., 294.5 cu.yd. Class "A" concrete, etc., 5.52 mi. Merrill-Tomahawk Rd., Federal Aid Project 167, Lincoln Co., 6.45 acres clearing and grubbing, 23,136 cu.yd. earth excav., 144.03 cu.yd. Class "A" concrete, 77,707 sq.yd. feather edge gravel, 24 ft. wide, etc., 4.47 mi. Pelican-Crandon Rd., Federal Aid Project 73, Forest Co., 4.32 acres clearing and grubbing, 13,167 cu..yd. earth excav., 3,685 cu.yd. gravel surfacing, 80.5 cu.yd. Class "A" concrete, 62,823 sq.yd. feather edge gravel, 24 ft. wide, etc. Noted April 8.

Wis, Milwaukee—Until May 3, by Comr. Pub. Wks., improving item (1) portions of Canal St., involving 10,662 sq.yd. new granite block pavement, etc., (2) Mitchell St., 13,889 sq.yd. standard sheet asphalt, (3) South Pierce St., 17,548 sq.yd. standard sheet asphalt, (4) alley between 12th, 13th, Cedar and Wells Sts., 478 sq.yd. new cement concrete, (5) alley between Washington, Scott, Hanover and Reed Sts., 711 sq.yd. cement concrete, (6) alley between Sheridan Lane, 12th, Vliet and Cherry Sts., 260 sq.yd. cement concrete, (7) alley between 23rd, 24th, Walnut and Vine Sts., 533 sq.yd. cement concrete, (8) alley between 20th, 21st, Vliet and Cherry Sts., 854 sq.yd. cement concrete, (9) alley between 12th, 13th, Walnut and Fond du Lac Sts., 675 sq.yd. cement concrete, (10) alley between 24th, West 24th, Lloyd and Elm Sts., 746 sq.yd. cement concrete, (11) alley between 20th, 21st, Elm and Fond du Lac Sts., 526 sq.yd. cement concrete, (12) alley between 20th and 21st Aves., Lapham and Mitchell Sts., 1,599 sq.yd. cement concrete. (13) alley between 25th, 26th, Orchard and Lapham Sts., 995 sq.yd. cement concrete, (14) alley between 26th, 27th, Lapham and Mitchell Sts., 1,336 sq.yd. cement concrete, (15) alley between Fratney, North Pierce, Wright and Clarke Sts., 1,305 sq.yd. cement concrete. (16) alley between North Ave., Booth, Holton and Lee Sts., 1,329 sq.yd. cement concrete, (17) alley between 32nd, 33rd, Park Hill and Mt. Vernon Sts., 963 sq.yd. cement concrete, (18) alley between 33rd, 34th, Lisbon and Vine Sts., 309 sq.yd. cement concrete, (19) alley between Lisbon Ave., Vine, 25th and 26th Sts., 529 sq.yd. cement concrete, (20) alley between 41st St., Lisbon and Pabst Aves., 674 sq.yd. cement concrete. (21) alley between 38th, 40th, Roberts and Walnut Sts., 785 sq.yd. cement concrete, (22) alley between 37th, 38th, Brown and Pabst Aves., 686 sq.yd. cement concrete, (23) alley between 33rd, 34th, Center and Hadley Sts., 1,162 sq.yd. cement concrete, (24) alley between 27th, 28th, Auer and Concordia Sts., 1,959 sq.yd. cement concrete, (25) alley between 27th, 28th, Chambers and Locusts Sts, 1,413 sq. yd. cement concrete, (26) alley between 26th, 27th, Auer and Concordia Sts., 1,792 sq.yd. cement concrete, (27) alley between Walker, National, 10th and 11th Aves., 672 sq.yd. cement concrete, (28) alley between 21st Ave., Grant and Becher Sts. and Layton Blvd., 1,684 sq.yd. cement concrete, (29) alley between 11th, 12th, Ring and Burleigh Sts., 2,293 sq.yd. cement concrete, (30) alley between Louis Ave., 14th, Burleigh and Ring Sts., 2,459 sq.yd. cement concrete, (31) alley between 8th, 9th, Ring and Concordia Sts., 715 sq.yd. cement concrete, (32) alley between 11th, 12th, Concordia and Davis Sts., 2,164 sq.yd. cement concrete, (33) alley between 8th, 9th, Concordia and Davis Sts., 1,620 sq.yd. cement concrete.

Minn., Caledonia—Until May 12, by E. N. Newhouse, aud. Houston Co., building 18 mi. Federal Aid Project 147, State Rd. 1, 24 ft. wide, involving 21 acres clearing, 11 acres grubbing, 259,770 cu.yd earth, 20,450 cu.yd. loose rock and 13,825 cu.yd. solid rock excav., 263,865 cu.yd. overhaul, 4,708 lin.ft. 15-36 in. portable culverts, 15,667 cu.yd. gravel and 8,568 cu.yd. clay surfacing, also one 30 ft. and two 40 ft. span bridges and 18 W rein.-con. culverts, etc. About $90,000. C. D. Conzett, co. engr.

Minn., Carlton—Until May 12, by A. R. Norman, aud. Carlton Co., building Federal Aid Project 123, State Rd 2, 24 ft wide, involving 15,651 cu.yd. earth and 710 cu.yd. loose rock excav., 39,600 cu.yd. overhaul, also Bridge 3314, consisting of two 26 ft. clear spans, involving 13,557 lb. reinforcing steel. About $30,000. P. D. Mold, Carlton, engr.

Minn., Duluth—Until May 12, by W. H. Borgen, aud. St. Louis Co., for subgrade construction of following designated state jobs on State Rd. 35: 6.95 mi. Job 2002, involving 93,000 cu.yd. excav., 180,000 cu. yd. overhaul, 3,400 cu.yd. hand ditching and 30 ft. concrete arch; 2.5 mi. Job 2003, 25,500 cu. yd. excav., 21,300 cu.yd. overhaul, 2,300 cu.yd. hand ditching; 1.2 mi. Federal Aid Project 180, 15,000 cu.yd. excav., 5,000 cu.yd. overhaul, 700 cu.yd. hand ditching; 1.6 mi. Job 2004, 8,300 cu.yd. excav., 28,700 cu. yd. overhaul, 3,800 cu.yd. hand ditching; 1 mi. Federal Aid Project 182, 9,000 cu.yd. excav., 850 cu.yd. overhaul, 500 cu. yd. hand ditching; 4.3 mi Job 2005, 48,400 cu.yd. excav., 20,500 cu.yd overhaul, 2,800 cu.yd. hand ditching; 1.8 mi. Federal Aid Project 183, 13,500 cu.yd. excav., 8,000 cu.yd. overhaul, 700 cu.yd. hand ditching; 5 mi. Job 2006, 116,000 cu. yd. excav., 454,300 cu.yd. overhaul, 760 cu.yd. hand ditching. About $550,000. R. W. Acton, co. engr.

Minn., Hastings—Until May 7, by R. W. Downs, aud. Dakota Co., grading 17 mi. State Rd. 2, 24 ft. wide. About $50,000. C. L. Methven, Hastings, engr.

Minn., Long Prairie—Until May 12, by L. J. Ramstad, aud. Todd Co., building 17 mi. Federal Aid Project 99, 24 ft. wide, involving 73,405 cu.yd. overhaul, 1,600 lin.ft. guard rail, 1,383 lin.ft. 12-30 in. portable culverts, etc. About $85,000. A. H. Graves, Long Prairie, engr.

Minn., Park Rapids—Until May 6, by F. Heisel, aud. Hubbard Co., building 2.01 mi. Job 1901, State Rd. 10, involving 17,544 cu.yd. excav., 1,640 cu.yd. overhaul, 2,408 cu.yd. gravel, 10,655 lin.ft. shaping, culverts, etc.; 2.84 mi. Job 2001, State Rd. 10, 23.2 acres clearing, 11.8 acres grubbing, 26,881 cu.yd. excav., 3,408 cu.yd. gravel, 15,200 lin.ft. shaping, culverts, etc.; 2.75 mi. Job 1902, State Rd. 3, 23,023 cu.yd. excav., 15,067 cu.yd. overhaul, 2,117 cu.yd. hand ditching, 3,300 cu.yd. gravel, 14,550 lin.ft. shaping, culverts, etc.; 8.82 mi. Job 2003, Federal Aid Project 79, State Rd. 2, 35.1 acres clearing, 3 acres grubbing, 60,295 cu.yd. excav., 46,537 cu.yd. overhaul, 14,055 cu.yd. gravel, 46,567 lin.ft. shaping, culverts, etc; 9.02 mi. Job 2005, Federal Aid Project 167, State Rd. 9, 47 acres clearing, 23 acres grubbing, 75,610 cu.yd. oxcav., 235,034 cu.yd. overhaul, 7,007 cu.yd. hand ditching, 10,800 cu.yd. gravel, 47,600 lin.ft. shaping, one 16 ft. concrete slab span bridge, culverts, etc.

Minn., Princeton—Until May 18, by W. Peltier, aud. Millelacs Co., building 17 mi. Federal Aid Project 170 from Onamia to Crow Wing Co., line, 24 ft. wide, involving 60 acres clearing, 50 acres grubbing, 144,281 cu.yd. earth excav., 104, 630 cu.yd. overhaul, 1,996 lin.ft. 12-36 in. corrugated metal culverts, 23,100 cu.yd. surfacing, removing old culverts, etc. About $85,000. A. W. Leonard, Milaca, engr.

Minn., South Saint Paul—Until May 3, by J. R. Stevenson, city clk., paving Grand Ave. from Concord to 3rd Sts., N., 3rd Ave. from Grand to Marie Aves., also grading, curbing and improving 2nd St. from 1st to 11th Aves., involving 297 cu.yd. embankment, 2,979 cu.yd. surfacing, 5,240 lin.ft. straight and 120 lin.ft. radius curbing, 1,350 lin.ft. cement block gutters. About $26,700.

Kan., Ft. Scott—Until May 4, by N. Ausman, clk. Bourbon Co., improving 5,366 ft. Hammond Branch Rd., Osage Twp., 10 ft. wide, bituminous macadam; 24,260 ft. Sect. B, Ft. Scott-Wichita Rd., Federal Aid Project 33, 34,494 ft. Sect. A, Ft. Scott-Pittsburg Rd., Federal Aid Project 6, 9,113 ft. Garland Branch Rd., Drywood Twp., 19,221 ft. Sect. B, Kansas City Rd., Federal Aid Project 5, all four 16 ft. wide, bituminous macadam. Former bids rejected. B. Boyle, co. engr. Noted March 11.

Missouri—Until May 12, by State Highway Bd. at office of Clerk St Louis Co., (Clayton), building or improving 12.86 mi. State Road Project 79, from city limits of St Louis, northwestwardly. About $590,227. A. W. Graham, Jefferson City, state highway engr., advertised in this issue.

Ark, Jonesboro—Until May 10, by Bd. Comrs. Impvt. Dists. 20 and 21, at office Cobb & Lee, dist. engrs., grading, draining, curbing, guttering ad paving various streets, asphaltic concrete; advertised in this issue.

Tex., El Paso—Until May 10, by E. B. McClintock, judge El Paso Co., grading, paving and draining 12.61 mi. Highway 1, from Fabens east to county line, 18 ft. wide, involving 89,869 cu.yd. earth overhaul, 486 cu.yd. Class "A" concrete, 32,418 lb. reinforcing steel, etc. About $384,549. L. A. White, El Paso, engr.

Tex., Weatherford—Until May 5, by E. A. Swofford, judge Parker Co., grading, gravel surfacing and draining 16.59 mi. Highway 1, from here west to county line, 18 ft. wide, involving 30 acres clearing and grubbing, 53,274 cu.yd. earth, 689 cu.yd. loose rock and 6,694 cu.yd. solid rock excav., 124,600 gal. 2 course treatment, 48,663 cu.yd. gravel, 158,602 lb. reinforcing and 98,900 lb. structural steel, 1,470.6 cu. yd. Class "A," 1,005.8 cu.yd. Class "B" and 76 cu.yd. Class "C" concrete. About $427,441. O. Leonard, Weatherford, engr.

Colorado—Until May 7, by State Highway Comn., Denver, paving 2 mi. Platteville Rd., Federal Aid Project 35, concrete, cost $50,000; 2 mi. Loveland Rd., Federal Aid Project 86, concrete, $58,000; 3 mi. road south of Littleton, Federal Aid Project 83; $110,000; grading Battle Mt. Rd., Federal Aid Project 78, Eagle Co., $118,000.

Wash., Seattle—Until May 10, by Comrs. King Co., grading and paving 1.75 mi. Franklin-Enumclaw Highway, 20 ft. wide, involving 18,777 sq.yd. concrete, cost $53,542. Noted April 22.

Cal., San Francisco—Until May 5, by Bd. Pub. Wks., improving portions of Balhoa and Cabrillo Sts. W. J. Fitzgerald, acting secy.

Cal., South Pasadena—Until May 10, by B. V. Gardwood, city clk., improving Orange Grove Ave., involving 5,244 cu.yd. grading, 165,000 sq.ft. 5 in. concrete paving 6,031 lin.ft. cement curbing. Former contracts rescinded because of technical errors. Noted March 11.

Que., Deschaillons—Until May 5, by city building 4½ mi. concrete pavement on Chemin Bor dde L'Eau. J. A. Lafevre, Parliament Bldg., Quebec, engr.

Que., Longueuil—Until May 28, by Dept Rds., Quebec, building 13.7 mi. macadam road from here to Chambly Canton, Chambly Co. About $25,000 per mi., 40 per cent of cost will be borne by Provincial Government, 30 per cent by Dominion Government and 30 per cent by Chambly Co.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Conn., Hartford—Bd. Contr. & Supply, let contract improving Charles, North Winthrop, Arch., Prospect, and Talcott Sts., involving 16,270 sq.yd. asphalt and 5,000 sq.yd. sheet asphalt, to E. Balf Co., 26 State St., $89,611, furnishing and laying concrete base and granite block wearing surface on 900 sq.yd. Talcott St., to O'Neill Bros., Hartford, $7,508. Noted April 8.

★N. Y., Brooklyn—Park Bd., Municipal Bldg., New York City, let contract furnishing labor and material resurfacing old walks, Prospect Park, sheet asphalt to Sicilian Asphalt Paving Co., 41 Park Row, New York City. About $10,800. Noted April 1.

★New Jersey—State Highway Dept., Trenton, let contract building 18,125 sq.yd. Route 10, Sect. 2, 18 ft. wide, Ridgefield, Palisade Park and Fort Lee Boros, involving 29,732 cu.yd. earth excav., etc., to Fleming & O'Brien, 401 West 59th St., New York City, $248,740. Noted April 8.

★N. J., Freehold—Bd. Freeholders Monmouth Co. let contract building 1.8 mi. Eatontown Blvd. from Eatontown to Long Branch, 22 ft. wide, to C. G. Julian Eng. & Contg. Co., 20 Nassau St., New York City, $105,301. Noted April 1.

N. J., Newark—City received bids April 13, paving (a) Exchange Alley, granite block, (b) Nesbit and (c) 8th Sts., re-clipped trap rock, (d) Plane St., clipped granite block, (e) Thomas St., concrete, from Newark Paving Co., 133 1st St., (a) $5,157, (b) $36,094, (c) $4,487 (d) $126,149, (e) $19,218; O'Gara Constr. Co., 242 Market St., (b) $37,541, (d) $134,396, (e) $19,142. Noted April 1.

★Pennsylvania — State Highway Dept., Harrisburg, let contract rebuilding Route 72, Butler Co., to Booth & Flinn, Ltd., 1942 Forbes St., Pittsburgh; Route 168, Monroe Co., to Porter Bros., Wilkes-Barre; Route 204, Beaver Co., to J. C. Devine Co., Alliance, O.; Route 43, Franklin and Adams Counties, to Souder Constr. Co., Inc., 214 East Orange St., Lancaster; Route 33, Huntingdon Co., to T. J. Strickler, Huntingdon; Route 20, Lycoming Co., to Busch & Stewart, Inc., Trust Bldg., Williamsport. Noted April 1.

Streets and Roads (Continued)

★**Pa., Phila.**—City let contract grading Crosheim Valley Drive, to Estate of D. McMahon, Germantown and Chelton Sts., $4,983, Keystone, Hellerman and VanDyke Sts., to I. K. Davis Co., 6100 North 20th St., $6,616, Howard, Louden and Mentor Sts., to T. Connor, 3329 North 5th St., $1,121, Umbria St., to E. E. Davis, Phila., $13,292, Marshall and Bristol Sts., to T. Connor, 3329 North 5th St., $2,260 and $1,502 respectively, Houghton St., to E. McGee, Phila., $678, east sidewalk of 29th St., to M. L. Miller, Phila., $484, 27th St., to F. Mark Constr. Co., Art Museum, $2,093; paving with asphalt Park Ave., 68th, Poplar and Frazier Sts., to Barber Asphalt Paving Co., 239 North 30th St., $10,921, $13,598, $4,690 and $5,341 respectively, Bustleton Ave., to Mack Paving Co., Nicetown Lane and C St., $39,337, Carey, L. M. and Steiner Sts. and Sedgley Ave., also 3rd St., to Eastern Paving Co., Colonial Trust Bldg., $36,265 and $7,020 respectively; vitr. block, Mayland St., to Cunningham & Murray, 1345 Arch St., $9,755; curbing new streets, to J. J. McHugh, 1430 South Penn Sq., $19,029. Noted April 8.

★**W. Va., Clarksburg**—City let contract paving and building sewers in Pike, Elk, Main and 6th Sts., to F. L. Grant, Inc., Clarksburg, $100,000; Ferry and Chestnut Sts., to T. Pietro Co., Morgantown, $60,000.

★**W. Va., Madison**—Comrs. Boone Co. let contract building 5 mi. road from Seth to Racine, to G. E. McComes & Son, Madison, $61,000.

★**W. Va., Parkersburg**—City let contract improving Market, Juliana and East 7th Sts., as follows; brick paving and concrete work, to Kennedy Constr. Co., Parkersburg, $88,337; asphalt paving, to Federal Asphalt Co., Hamilton, O., $37,739.

★**N. C., Salisbury**—City let contract paving 2.2 mi. streets, 25-27 ft. wide, bitulithic on 5 in. bituminous concrete base, to R. M. Hudson Co. About $150,000.

★**S. C., Hampton**—Comrs. Hampton Co. will sand clay 16 mi. road from here to Yemassee. About $91,000. Work will be done by day labor.

O., Cleveland Heights (Warrensville P. O.)—J. A. Wigmore, Williamson Bldg., received bids paving Meadowbrook Blvd., involving 5,200 sq.yd. 2 in. asphalt and 45,600 sq.yd. 6 in. concrete, from Cleveland-Trinidad Paving Co., The Arcade, Cleveland, $32,613; Rieley Bros., The Arcade, Cleveland, $32,838.

★**O., Jefferson**—Ashtabula Co. let contract grading and paving 5.8 mi. Rime-Morgan Rd., 10 ft. wide, involving 22,539 cu.yd. earth and 60 cu.yd. rock excav., 8,000 ft. 4 in. drain and 1,800 ft. 10-24 in. sewer tile, 34,050 sq.yd. vitr. brick on 5 in. concrete base and 407 concrete culverts, to C. G. Fuller, 139 Mill St., Conneaut, $169,774.

O., Jefferson — Ashtabula Co. received only bid April 12, grading and paving 5.25 mi. Pierpont Sect. and 4.85 mi. Richmond Sect. of Conneaut-Youngstown Rd., 10 ft. wide, monolithic brick, from T. P. Fitzgerald, Ashtabula, cost $216,992 and $185,086 respectively. Noted April 1.

★**Ind., Ft. Wayne**—City let contract grading and draining 6¾ mi. road, involving 70,000 sq.yd. sheet asphalt, 38,000 sq.yd. asphaltic concrete, 36,000 cu.yd. excav., 37,400 lin.ft. stone and 27,500 lin.ft. cement curbing, to Grace Constr. & Supply Co., Utility Bldg., $514,590.

★**Ind., Sullivan**—Bd. Comrs. Sullivan Co. let contract building E. A. Borders Rd., Turman Twp., to E. E. Carrithers & Son $26,800; S. Riggs Rd., Fairbanks and Turman Twps., and T. M. Douthitt Rd., Jefferson Twp., to F. M. Lloyd, $49,500 and $33,800 respectively; S. Edwards Rd., Gill Twp., to J. L. Gettinger, $22,300.

★**Michigan**—State Highway Depot., at office of Rd. Comrs Menominee Co., Menominee, let contract grading, draining and surfacing with stone gravel 7,451 mi. State Trunk Line Rd. 15-1, Sects. A and B, 16 ft. wide, to Bd. Rd. Comrs. Menominee Co., Menominee, $78,799. Noted March 4.

★**Michigan**—State Highway Dept., Lansing, let contract grading and draining 5.758 mi. Assessment Dist. Rd., 352, Sect. 1, Iona Co., 24 ft. grade, involving 27,696 cu.yd. earth excav., 11,973 yd. station overhaul, 783 lin.ft. 12-15 in. encased tile 1,317 lb. steel, etc., to Schneider & O'Harrow, Laurel, $26,230. Noted Feb. 26.

★**Michigan**—State Highway Dept., Lansing, let contract grading and surfacing 1.53 mi. State Trunk' Line Rd. 11-8, 20 ft. wide, involving 2,074 cu.yd. excav. at $1.50 per cu.yd. and 17,058 sq.yd. pavement, $3.09, to J. R. Edelman, Muskegon, $55,821. Noted March 25.

★**Mich., Detroit**—City let contracts to Detroit Asphalt Paving Co., 20 McGraw Bldg., grading, shaping and paving with sheet asphalt on 6 or 8 in. concrete foundation, Berea or Amherst curbstone, Bewick Ave., $32,707, Colfax Ave., $28,587, Concord Ave., $23,087, Duncan St., $12,058, Edward St., $31,060, Galster St., $8,084, Leland St., $11,070, Reiden Ave., $13,380; to Cleveland Trinidad Paving Co., 2940 Woodward Ave., Wilson Ave., $7,779; to W. B. Brady Const. Co., 1972 Grand River Ave., Clairmount Ave., $21,667. Noted April 15.

Mich., Detroit—City received bids grading, shaping and paving with sheet asphalt on 6 in. concrete foundation, Amherst or Berea curbstone (a) portion Greenway Ave., (b) Beniteau Ave. from Canfield Ave. to Schepke Sub., (c) Beniteau Ave. from Kearn to Harper Aves., (d) Gladstone Ave., (e) Hampton Ave., (f) Merrill St., (g) Martindale Ave., (h) Morton Ave., (i) Otis St., (j) 29th St., from Detroit Asphalt Paving Co., 20 McGraw Bldg., (a) $46,246, (b) $17,059 (c) $13,219, (d) $22,443, (e) $4,198, (f) $5,682, (g) $22,675, (h) $6,718, (i) $30,693, (j) $10,698; Cleveland Trinidad Paving Co., 2940 Woodward Ave., (a) $46,672, (b) $17,713, (c) $13,746, (d) $22,542, (e) $4,353, (f) $5,575, (g) $22,951, (h) $6,919, (i) $31,664, (j) $11,133; W. B. Brady Constr. Co., 1972 Grand River Ave., (a) $45,926, (b) $18,029, (c) $13,904, (d) $22,270, (e) $4,422, (f) $5,675, (g) $22,540, (h) $6,974, (i) $32,384, (j) $11,381.

★**Mich., Grosse Pointe** (Detroit P. O.)—City let contract grading, shaping and paving 1 mi. St. Clair Ave., involving 18,000 sq.yd. asphaltic concrete on 6 in. concrete foundation, to G. R. Cooke, Penobscot Bldg., Detroit. About $119,000. Noted April 15.

★**Wisconsin**—State Highway Dept., Court House, Rhinelander, let contract grading and paving Eagle River-Woodruff Rd., Federal Aid Project 146, Vilas Co., to W. H. Bent, Eagle River, $34,933; bridge work on same, to Wausau Iron Wks., Wausau, $8,344. Noted April 8.

★**Wisconsin**—State Highway Dept., at div. office, Wilner Bldg., Green Bay, let contract grading and building culverts on 2.97 mi. Green Bay-Sturgeon Bay Rd., Federal Aid Project 163, Kewaunee Co., to H. Boulanger, Casco, $18,853; bridges and guard rail, to V. Everard, Luxemburg, $6,919. Noted April 15.

★**Wisconsin** — State Highway Dept., at div. office, 213 South Barstow St., Eau Claire, let contract grading and paving 1.49 mi. Mondovi-Durand Rd., Federal Aid Project 78, Pepin Co., to W. J. Wolf, Eau Claire, $16,723; 2.35 mi. Alma-Durand Rd. Federal Aid Project 16, Pepin Co., to Isaacson & Mulheron, Spring Valley, $24,577. Noted April 15.

Wisconsin — State Highway Dept., at div. office, Spooner, will grade and pave 1.4 mi. Sanborn-Ashland Rd., Federal Aid Project 118, Ashland Co. Work will be done by day labor. Noted Apri 1.

★**Wisconsin** — State Highway Dept., at div. office, 208 Stephenson Bldg., Milwaukee, let contract grading and paving 2.45 mi. Lake Shore Rd., Federal Aid Project 104, Ozaukee Co., to McGucken Constr. Co., 425 East Water St., Milwaukee, $91,000. Noted April 15.

★**Wisconsin**—State Highway Dept., Grand Rapids, let contract paving Washington St. Rd., Federal Aid Project 157, City of Berlin, Green Lake Co., to M. Martin, Berlin, $22,022. Noted March 11.

★**Wis., Elkhorn**—Walworth Co. let contract paving Mukwonago Rd., involving 38,968 sq.yd. concrete paving, 22,951 cu.yd. excav., 115.9 cu.yd concrete in culverts, etc., to Universal Eng. Co., Eau Claire, $135,642.

★**Minn., Duluth**—City let contract paving 9,500 ft. Grand Ave. from 59th to 84th Aves., W., 18 and 42 ft. wide, to Olson & Johnson, c/o city engineer's office, $141,956. Noted Feb. 26.

★**Minn., Elbow Lake**—Grant Co. let contract grading and graveling 6 mi Federal Aid Project 28, through Ashby, 24 ft. wide, to G. H. Clear, Grant, $38,760. Noted March 25.

★**Minn., Long Prairie**—E. M. Berg, aud. Todd Co., let contract building 13.5 mi. Federal Aid Project 98, 24 ft. wide, to H. Thursdale & Co., Bemidji, $46,580. Noted March 18.

★**Minn., Morris**—C. R. Wolthan, aud. Stevens Co., let contract building 17 mi. Federal Aid Project 127, State Rd. 1, 24 ft. wide, to S. Looner, Chokio, $76,797. Noted March 25.

★**Kan, St. Johns**—City let contract paving 9 blocks, to A. L. Cook, Ottawa, $96,443.

Mont., Red Lodge — City received bids paving Bway., Impvt. Dist. 27, from McLaughlin & O'Neill, Livingston, (7 in. rein.-con.), $103,018, G. N. Nash, Missoula, (7 in. rein.-con.), $118,146, G. N Nash, Missoula, (2 in. bitulithic) $113,483. Noted April 8.

★**Mo., Carthage**—Jasper Co. let contracts improving 9.44 mi. Joplin-Tipton Ford Rd., 18-24 ft. wide, and 4.03 mi. Joplin-Springfield Rd., 18-24 ft. wide, to Joplin Special Rd. Dist., care of H. C. Murphy, Cunningham Bldg., Joplin, $222,038 and $94,142, respectively. Noted April 22.

★**Mo., Danville**—Montgomery Co. let contract building 8.24 mi. Natl. Old Trails Rd., New Florence Special Rd. Dist., 24 ft. wide, to New Florence Special Rd. Dist., c/o A. E. Hendershott, New Florence, $56,357. Noted April 8.

Mo., Independence—Jackson Co. received bids April 19, grading and surfacing 3.07 mi. Lone Jack East Rd., from Lone Jack to Jackson-Johnson Co. line, 16 ft. wide, from W. A. Ross, Kansas City, $74,997 and A. C. Baird, Kansas City, $86,566. Noted Nov. 20.

★**Mo., Mexico**—Audrain Co. let contract building 7.2 mi. Mexico-Fulton Rd., 24 ft. wide, to C. P. O'Reilly, St. Louis, $55,604. Noted April 22.

★**Mo., Sedalia**—Pettis Co. let contract improving 5.31 mi. road between here and Smithton, State Rd. Project 23, to J. W. Menefees, Sedalia, $61,792. Noted Jan. 15.

★**Ark., Hope**—Comrs. Impvt. Dist. 1, let contract paving various streets, brick on concrete base, to Smith Constr. Co., Spokane, Wash., $148,792. Noted March 11.

★**Tex., Brownsville**—Cameron Co. let contracts grading paving and draining 3.106 mi. Highway 12, Brownsville-San Benito Rd., 15 ft. wide, and 3.27 mi. Highway 12, Brownsville-Harlengen Rd., 15 ft. wide, to W. T. Montgomery, 802 Alamo Bank Bldg., San Antonio, $93,199 (plus 10% for engineering and contingencies) and $97,225 respectively. Noted April 22.

★**Tex., Georgetown**—H. A. Hodges, aud. Williamson Co., let contract surfacing 10 mi. Highway 2, Meridian Rd., 16 ft. wide, ¾ in. treatment with limestone rock asphalt, to W. E. Dozier, Dam Blvd., Austin, $63,936, plus 10% for engineering and contingencies. Noted April 22.

★**Tex., Junction**—C. R. Stevenson, judge Kimble Co., let contract grading, surfacing and draining 24.7 mi. Highway 27, from here to Kerrville, 9 ft. wide, to Coleman & Jenkins, Gunter Bldg., San Antonio. About $205,000. Noted April 22.

Tex., Livingston — E. T. Murphy, judge Polk Co, received bids April 5, grading, draining and surfacing with crushed rock and bituminous topping, 22 mi. Highway 35, from here to Corrigan, 14 ft. wide, from Smith Bros., Crockett (crushed rock only), $231,324; Polk Co., 470,039; Houston Constr. Co., 3102 McKinney St., Houston, $501,198. Work involves 115 acres clearing and grubbing, 58,655 cu.yd. earth excav., 194,216 sq.yd. bituminous macadam, 131,108 lb. reinforcing steel, 1,489.7 cu.yd. 1 : 2 : 4 and 1,376.9 cu.yd. 1 : 2½ : 5 concrete, etc. Noted March 25.

★**Okla., Comanche**—City let contract paving 15 blocks, to Municipal Excavator Co., 200 East Main St., Oklahoma, $136,450.

★**Colorado**—State Highway Comn., Denver, let contract graveling 5.86 mi. highway between Delta and Montrose, to J. Girardet and F. S. Hotchkiss, Delta. Cost between $50,000 to $60,000. Noted March 18.

★**Colorado**—State Highway Comn. Denver, let contract paving 5¾ mi. Denver-Brighton Rd., concrete, to Colorado Bridge & Constr. Co., Gas & Electricity Bldg., Denver, $113,286; grading and draining 8 mi. road from Ft. Farland to San Luis, Federal Aid Project 64, to Martin & Barela and R. Hess, San Luis, $25,541.

★**Utah**—State Highway Comn., Salt Lake City, let contract grading 13 mi. state road from Castle Rock to Wyoming line, Summit Co., 16 ft. wide, to J. J. Griffith, 231 South 10th St., E., Salt Lake City, $31,214. Noted Feb. 19.

Utah, Provo—City received only bid paving 3,560 ft. 5th West St. from Center to 5th North Sts., 20 ft. wide, 7 in. concrete, from Wasatch Grading Co., Provo, $81,668. Noted Sept. 11.

Streets and Roads (Continued)

★**Utah, Salt Lake City**—Salt Lake Co. let contract paving Redwood Rd. south from Draper, concrete, to Wattis & Samuels, Salt Lake City, $66,710.

★**Nevada**—State Highway Comn., Carson City, let contract grading and graveling 27.81 mi. highway from Zola to Mill City, Pershing Co., to J. H. Causton, $94,289. Noted April 8.

★**Ariz., Tucson**—Pima Co. let contract grading and graveling 11 mi. road from Gunsight toward Tucson, to R. McKay, Tucson, $66,000.

★**Wash., Olympia**—City let contract paving, curbing, building sidewalks and sewers in 1.25 mi. East Bay St., 30 ft. wide, to Albers & Son, Olympia, $88,934.

Ore., Portland—City received bids April 14, improving Maryland Ave. from Alberta to Killingsworth Sts., (b) East Mill St. from Union to Grand Aves., (c) 45th St. S. E., et al and 53rd Ave. S. E., (d) East 23rd St. from Alberta to Sumner Sts., (e) Brazee St. from East 27th to East 28th Sts., (1) asphaltic concrete No. 1, 2 in. top on 4 in. base, (2) concrete No. 3, (3) asphaltic concrete No. 1, from United Contg. Co., Northwest Bank Bldg., (a1) $2.26 per sq.yd., total $13,076; V. R. Dennis Constr. Co., Lewis Bldg., (a2) $2.30 per sq.yd., $13,300; M. Hansen & Co., 523 East Grant St., (a2) $2.35 per sq.yd., $13,354, (b2) $2.35 per sq.yd., $2,373; Warren Constr. Co., Journal Bldg., (b3) $2.28 per sq.yd. $2,410, (c3) $2.62 per sq.yd., $5,918, (d3) $2.52 per sq.yd., $4,067, (e3) $2.35 per sq.yd., $2,871; Hahn & Rebman, Portland, (d2) $2.40 per sq.yd., $3,847.

★**Cal., Los Angeles**—City let contract paving Seaside Ave., involving (a) 136,069 sq.ft. protected concrete paving, (b) 90,725 sq.ft. finish grading, oiling and rolling, (c) 50,000 cu.yd. fill, to Fairchild-Gilmore Wilton Co., Pacific Electric Bldg., (a) $.37 per sq.ft., (b) $.07 per sq.ft., (c) $43,300, total, $99,996.

★**Cal., Monterey**—City let contract grading and paving Relside Ave., Spence St. et al oil macadam, cement curbs and gutters, gravel walks, etc., to Granite Rock Co., Wasonville, $69,500.

Railways

PROPOSED WORK

Texas—Amer. Pub. Serv. Co. and City of Abilene have reached agreement under which Amer. Pub. Serv. Co. will take over, operate and improve Abilene street railway lines. Work consists of repairs to tracks, transmission lines and power plant and new equipment. Cost to exceed $60,000. Address A. Hardgrave, Southwestern Life Bldg., Dallas, state mgr. for Amer. Pub. Serv. Co.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Texas**—P. A. McCarthy, ch. engr. of Central Texas Electric Ry. Co., 2008 Amicable Life Bldg., Waco, let contract laying tracks, including grading and trestle work on 1st unit (6½ mi.) Waco-Temple Interurban, to Central Texas Eng. & Constr. Co., Amicable Life Bldg., Waco; cost plus percentage basis. Noted April 22.

Excavation and Dredging

PROPOSED WORK

N. Y., Batavia—Channel—City plans to improve, widen and deepen Tonawanda Creek Channel, to prevent flood damage. Total cost, $32,000. New York State Legislature will appropriate $16,000 toward cost.

Ia., Humboldt—Ditch—D. D. 3, Beaver, Lake and Norway Twps., Humboldt Co., receives bids about Aug. 1, building 8 mi. open ditch, 10 ft. bottom, 12 ft. deep, involving 270,000 cu.yd. excav. and 50,000 ft. 12-45 in. tile. F. Goodrich, engr.

S. D., Woonsocket—Ditch—Sanborn Co. rejected bids received April 6, building County Ditch 20. E. B. Wilds, Woonsocket, aud. Noted March 25.

Wyo., Basin—Drainage—Basin D. D. plans to build system to drain 5,500 acres of land, involving 145,000 ft. drain tile. About $100,000. R. A. Hart, 1257 Stratford Ave., Salt Lake City, engr.

Wyo., Byron—Drainage—Byron D. D. plans to build system to reclaim 4,500 acres of land near here, involving 160,000 yd. drain tile. About $62,000. R. A. Hart, 1257 Stratford Ave., Salt Lake City, engr

Wyo., Cowley—Drainage—Cowley D. D. plans to build system to drain 15,000 acres of land, involving 300,000 yd. drain tile. About $250,000. R. A. Hart, 1257 Stratford Ave., Salt Lake City, engr.

Ark., Little Rock—Ditch—Pulaski and Lonoke D. D. plans to build ditch (floating dredge work). About $110,968. Lund & Hill, 527 Southern Trust Bldg., engrs.

Tex., Dallas—See "Miscellaneous."

Canada—Dredging—Dept. Rys. & Canals, Western Blk., Ottawa, Ont., soon receives bids dredging Lachine Canal, cost $26,000, improving Chambly, Carillon, Grenville, and Soulanges Canals $50,100; St. Annes Lock, $10,300; St. Lawrence River, $39,500. W. A. Bowden, c/o Dept. Rys. & Canals, ch. engr.

BIDS DESIRED

Ia., Storm Lake—Drainage—Until May 4, by Bd. Supervs. Buena Vista Co., improving D. D. 128, involving 20,240 ft. 8-26 in. tile. W. W. Bennett, aud.

Mo., Rockport—Drainage—Until May 3, by B. B. Hurst, Engr., D. D. 2, Atchison Co., straightening 9½ mi. Middle Tarkio Creek, bottom width, 6 ft., average depth 10½ ft.

B. C., Vancouver—Dredging—Until May 15, by W. D. Harvie, secy. Harbor Comrs., dredging and filling for new Ballantyne Pier, at Burrard Inlet.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Ia., Estherville**—Drain—City let contract building laterals in D.D. 70, involving 41,460 ft. 6-30 in. tile, to Ceylon Cement Tile Co., Ceylon, Minn., $31,275.

Industrial Works

PROPOSED WORK

Me., Portland—Henley & Kimball, 380 Forest Ave., plans to build 4 story, 100 x 100 ft., brick auto factory. About $105,000. F. A. Rumery & Co., 21 Portland St., archts. and engrs.

N. H., Keene—W. H. McElwain Co., Byron St., Manchester, soon lets contract building 2 story, 55 x 290 ft., brick and mill construction factory, stone foundation, on Marlboro St., here. About $75,000. Private plans.

Mass., East Boston (Boston P. O.)—M. J. Mastrangelo, archt. and engr., 2 North Sq., soon lets contract building 2 story, 70 x 175 ft., brick and concrete garage, concrete flooring and foundation, on Curtis St., for A. Pellucci, Chelsea St. About $50,000. Noted March 4.

Mass., Natick—Natick Bldg. Assn. plans to build 4 story, 75 x 300 ft., rein.-con. factory. About $300,000. Architect not selected.

Mass., Revere (Boston P. O.)—Bd. Pub. Wks. soon lets contract building 1 story, brick and concrete garage and stable, rein.-con. flooring, concrete foundation. About $60,000. Private plans.

Mass., Springfield—Wico Electric Co., 44 Avon Pl., having plans prepared by McClintock & Craig, archt. and engrs., 33 Lyman St., for brick and concrete plant, on Chestnut St. P. Brown, pres.

Mass., West Springfield (Springfield P.O.)—McClintock & Craig, archts. and engrs., 33 Lyman St., Springfield, soon let contract building (1st unit of factory), 1 story, 90 x 200 ft., brick and concrete, concrete flooring and foundation, for Wico Electric Co., 44 Avon Pl. About $75,000.

R. I., Providence—Autocar Sales & Service Co., 302 Pearl St., soon lets contract building 1 story, 150 x 200 ft., concrete and steel garage and service station, concrete flooring and foundation, on Elmwood Ave. About $100,000. Private plans.

N. Y., Long Island City — S. L. Reily, archt. and engr., 112 West Adams St., Chicago, soon lets contract building 4 story, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, for P. Van Iderstine Corp., Greenpoint Ave.

N. Y., Middletown—Middletown Rubber Co., 5 Columbus Circle, New York City, plans to build 3 story, brick and rein.-con. factory, here. About $500,000. Waldron & Van Winkle, 37 Wall St., New York City, engrs.

N. Y., Penn Yan.—Michaels, Stern & Co., 220 5th Ave., New York City, purchased site on Liberty St., here, and plans to build 3 story, brick factory. Cost between $200,000 and $250,000.

N. Y., Queens (Jamacia P. O.)—L. A. Hornum, archt. and engr., 405 Lexington Ave, New York City, soon lets contract building 5 story, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Hill and Gale Sts., here, for P. Trainer & Co., 110 Green St., Brooklyn.

N. Y., Redwood — Northern New York Utilities Inc., Light and Power Bldg., Watertown, plans to build substation and 3 phase high tension transmission line from here to Alexandria Bay, distance about 8 mi.

N. J., Hoboken—White Metal Mfg. Co., 1006 Clinton St., plans to build brick, steel and concrete power house, rein.-con. flooring, concrete foundation. About $60,000. J. C. Schaeffler, 40 West 32nd St., New York City, archts. and engrs.

N. J., New Brunswick—State plans to build ceramics plant, here. About $100,000. F. H. Bent, 142 West State St., Trenton, archt.

N. J., Trenton—Mutual Potteries Co., recently incorporated with $1,000,000 capital stock plans to build large pottery, here. J. A. Campbell, 379 West State St., pres.

Pa., Dickson City—Early Fdry. Co plans to build foundry 90 x 200 ft., 38 ft. high, rein.-con., brick and steel, rock foundation, on Main Rd. About $200,000. Architect not selected.

Pa., Pittsburgh—McKenna Brass & Mfg. Co., 1st and Ross Sts., plans to build 4 story, 53 x 80 ft., brick and steel addition to plant, concrete foundation. About $175,000. J. T. Steen & Sons, Fulton Bldg., archts.

Pa., Scranton—Borgenicht Dress Co. plans to build 3 story, 80 x 166 ft., brick and steel factory, rein.-con. flooring, rock foundation, on South Webster Ave. About $150,000. Architect not selected.

Pa., Wilkes-Barre—Sheldon. Axle & Spring Co., 221 Conyngham Ave., plans to build 2 story, 50 x 80 ft., concrete factory, rein.-con. flooring, rock foundation. About $125,000. Architect not selected.

Pa., Wilkes-Barre — Woodlawn Dairy Corp., 181 North Pennsylvania Ave., plans to build 2 story, 50 x 125 ft., brick and steel dairy, rein.-con. flooring, rock foundation, on North Washington St. About $100,000. , Architect not selected.

Md., Baltimore—Simmons Co., 612-18 West Pratt St., plans to build 8 story, 175 x 750 ft., concrete, steel and brick factory, on Fort Ave. near Key Highway. About $1,500,000. J. L. Joyce, mgr.

Md., College Park—Maryland State College having plans prepared by C. L. Reeder, engr., Park Ave. and Saratoga St., Baltimore, remodeling boiler plant, here. About $50,000.

Md., Cumberland—Crystal Laundry Co., Baltimore St., having plans prepared by T. W. Biddle, archt., c/o Kelly Springfield Tire Co., River Rd., for 1 and 2 story, 130 x 284 ft., concrete, steel and brick laundry, garage and power house, rein.-con. flooring, concrete foundation. About $200,000. Incorrectly noted in our issue of April 15 under "Baltimore."

Md., Cumberland—Kelly-Springfield Tire Co., River Rd., had plans prepared by S. Diescher & Sons, archts. and engrs., Farmers Bank Bldg., Pittsburgh, for 3 and 4 story, 575 x 620 ft., concrete, steel and brick factory, here. Cost between $2,000,000 and $3,000,000.

Ala., Birmingham—Dixie Brass & Fdry. Co., 6th Ave., N., plans to build hollow tile addition to plant. About $50,000. Architect not selected.

La., New Orleans—H. O. Van Horn Co., 518 Camp St., having preliminary plans prepared by J. Fromherz, archt., Title Guarantee Bldg., for 3 story, rein.-con. and brick factory, on Lafayette Sq. About $100,000.

O., Canton—Superior Sheet Steel Co. plans build 1 story, 120 x 500 ft. mill, steel construction, on Louisville Rd. About $200,000. H. A. Roemer, pres. Architect and engineer not selected.

O., Cleveland—Amer. Can Co., 1677 East 40th St., preparing plans for 3 story, concrete, steel and brick addition to factory, rein.-con. flooring, concrete foundation. About $200,000. Private plans.

O., Cleveland—Loew Mfg. Co., West 90th St. and Madison Ave., plans to build concrete, steel and brick addition to factory, rein.-con flooring, concrete foundation. About $200,000. Architect not selected.

O., Cleveland—Virden Mfg. Co., Ashland Rd., soon lets contract building 2 story, 40 x 92 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, on Longfellow Ave. and Ashland

Industrial Works (Continued)

Rd. About $50,000. E. McGeorge, 1900 Euclid Ave., archt. and engr. Noted April 22.

O., Cleveland—Waite Taxicab & Livery Co., 1457 East 6th St., plans to build 2 story, 66 x 280 ft., concrete, steel and brick garage, rein.-con. flooring, concrete foundation, on Superior Ave. near East 12th St. About $150,000. Architect and engineer not selected.

O., Cleveland—Western Electric Co., East 4th St. and Huron Rd., soon lets contract building 4 story, 90 x 120 ft., steel and brick warehouse and office, brick foundation, on Oregon Ave. About $125,000. M. Lane, Dime Savings Bank, Detroit, Mich., archt. and engr.

O., Coshocton—Pope Coshocton Pottery Co., c/o C. M. Metsch, archt, 1st Natl. Bank Bldg., East Liverpool, having plans prepared for 1 and 2 story, 290 x 600 ft., brick pottery, here. About $300,000.

O., Norwood—G. A. Gray Co., Gest and Depot Sts., plans to build plant, including factory and workmen's homes, on Edwards St. and Edmondson Ave. About $1,500,000. Architect and engineer not selected.

O., Ravenna—McElrath Tire & Rubber Co., 1836 Euclid Ave., Cleveland, soon lets contract building 1 story, 100 x 300 ft. factory and 2 story, 30 x 50 ft. boiler house, concrete, steel and brick, rein.-con. flooring, concrete foundations, here. About $125,000. D. C. Smith, Lennox Bldg., Cleveland, archt. and engr. Noted April 22.

Ind., Kendallville—See "Waterworks."

Ind., Terre Haute—Terre Haute Atomized Fuel Co. having plans prepared for plant. About $500,000.

Mich., Marysville—Detroit Edison Co., David Whitney Bldg., Detroit, plans to build rein.-con., brick and steel plant, concrete foundation, on Bunce Creek Rd., here. About $200,000. Private plans.

Wis., Fond du Lac—J. Gerhard Baking Co., 22 Main St., soon lets contract building 2 story, 66 x 104 ft. bakery. About $50,000. B. E. Mehner, 6 East Division St., archt.

Wis., Milwaukee—School Bd. soon lets contract building 1 story, 22 x 40 ft., rein.-con. and brick boiler house, rein.-con. flooring, concrete foundation, at Garfield School. About $50,000. Van Ryn & De Gelleke, Caswell Blk., archts. and engrs. Noted April 22.

Wis., North Milwaukee—Bernert Mfg. Co., 489 12th St., Milwaukee, having plans prepared by J. Glaser, archt., 731 Caswell Blk., Milwaukee, for 1 story, 120 x 260 ft., brick and mill construction factory, concrete flooring and foundation. About $50,000.

N. D., Dickinson—Northern Pacific R.R., 606 Metropolitan Life Bldg., St. Paul, Minn., plans to build 50 x 250 ft. car shop, brick, also 4 spur tracks, here. Cost to exceed $50,000. B. Blum, St. Paul, Minn., engr.

Tex., Dallas—Eastland Oil & Refining Co., Security Natl. Bank Bldg., having plans prepared by H. L. Williford, engr., 3501 Harvard Ave., for lubricating unit for oil refinery. About $350,000.

Tex., Waco—Sanger Mfg. Co., Austin, 4th, Washington and 3rd Sts., having plans prepared building overall factory, brick. About $75,000.

Utah, Brigham—City plans to rebuild hydro-electric plant and increase capacity to 1,500 hp., also build diversion dam and pipe line. About $125,000. C. O. Raskelly, Brigham, engr.

Que., Murray Bay—Murray Bay Power & Pulp Co. plans to build plant, here. About $500,000.

Ont., Guelph—Commerce Motor Trucks, Ltd., having plans prepared by E. A. James Co., Ltd., archts. and engrs., 36 Toronto St., Toronto, for 1 story, 90 x 300 ft., concrete, brick and steel factory, on York Rd. About $100,000.

Ont., London—Rawleigh Products Co. plans to build factory on Adelaide St. Architect not selected.

BIDS DESIRED

N. Y., Mt. Vernon—Until May 1, by Armour & Co., Union Stock Yards, Chicago, building 5 story, rein.-con and steel packing plant, rein.-con. flooring, concrete foundation, here. R. C. Clark, c/o owners, archt. and engr.

N. J., South River—Until May 10, by Bd. Pub. Wks. and Boro. Council, for design, construction, delivery and erection of building, machinery and equipment for addition to electric generating station; advertised in this issue. Noted March 18.

Md., Baltimore—Until May 1, by C. M. Anderson, archt., 324 North Charles St., building 3 story, 61 x 76 ft., rein.-con. and brick addition to plant, concrete foundation, for Natl. Enameling & Stamping Co., Race and Ostend Sts. About $100,000.

Md., Baltimore—Until May 1, by R. McLaughlin, engr., Ethington, Pa., building 2 story, 262 x 274 ft., rein.-con. factory, power house and garage, cement flooring, concrete foundation, on Wilkens Ave., for Reliable Furniture Co., 303 President St. About $200,000.

Md., Baltimore—Until May 1, by Standard Oil Co., Pier 2, Pratt St., building 1 story, 66 x 99 ft., brick service station and garage, concrete foundation, on Central and Eastern Aves. About $75,000. Private plans.

Mich., River Rouge—Until May 5, by L. Kamper, archt., Book Bldg., Detroit, constructing 1 and 2 story, 40 x 145 ft. rein.-con. and steel, storage and handling plant, rein.-con. flooring, concrete foundation, on West Jefferson Ave., here, to include rein.-con. pockets and 145 ft. tunnel, 7 x 6½ ft. in section, 14 in. walls, for Amer. Gypsum Co., Port Clinton, O. About $75,000. Noted March 25.

Wis., Sheboygan—Helming Bros. Co., c/o G. Helming, 1714 North 9th St., receiving bids building 3 story, 60 x 150 ft., brick, rein.-con. and tile garage, rein.-con. flooring, brick foundation, on Erie Ave. About $100,000. Private plans.

Minn., New Ulm—Until May 13, by city, building 1 story, 40 x 90 x 90 ft., brick power plant. About $200,000. S. Jacobson, 403 Endicott Bldg., St. Paul, archt. A. J. Mueller, New Ulm, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Vt., Derby Line—Butterfield & Co., let contract building 3 story, 65 x 200 ft., brick and steel addition to factory, stone foundation, to J. J. Power, 15 Ashland St., Worcester, Mass. About $100,000. Noted March 18.

★Mass., Athol—Union Twist Drill Co. let contract building 4 story, 60 x 200 ft., brick and concrete addition to factory, concrete flooring and foundation, to E. J. Cross Co., 82 Foster St. Worcester. About $150,000. Noted April 1.

★Mass., Boston—L. C. Greenleaf, archt., 101 Tremont St., let contract to J. H. Brown, Jr., 15 Middlesex Ave., Worcester, building 1 story, 197 x 295 ft., brick and concrete garage and machine shop, rein.-con. flooring, concrete foundation, on Tremont, Whittier and Hampshire Sts., for W. B. Rice Estate, c/o architect. About $150,000. Noted Feb. 26.

★Mass., Cambridge—Lever Bros. Co., Portland St., let contract building 6 story, 90 x 190 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, to Stone & Webster Eng Corp., 147 Milk St., Boston. About $350,000. Noted March 11.

★Mass., Chelsea (Boston P. O.)—L. E. Gingras, 156 Marginal St., will alter 2 story, brick and steel tannery. About $65,000. Work will be done by day labor under supervision of Tuck & Gilman, archts. and engrs., 34 School St., Boston.

★Mass., East Walpole—Bird & Son, Inc. let contract building rein.-con. storehouse, rein.-con. flooring, concrete foundation, to Guarantee Constr. Co., 140 West Cedar St., New York City. About $65,000.

★Mass., Holyoke—Hampden Glazed Paper & Card Co., Riverside, let contract building 2 story brick and concrete addition to factory, rein.-con. flooring, concrete foundation, here, to Casper Ranger Constr. Co., 20 Bond St. About $125,000. Noted April 22.

★Mass., Roxbury (Boston P.O.)—Trimont Mfg. Co., 55 Armory St., let contract building 3 story, 43 x 240 ft., brick and mill construction factory, concrete flooring and foundation, to Holt-Fairchild Co., 248 Boylston St., Boston. About $100,000. Noted March 11.

★Mass., Worcester—Thomas & Co., 110 Exchange St., let contract building 1 story, 50 x 160 ft., brick and steel factory, concrete flooring and foundation, on Dewey and Parker Sts., to G. W. Carr Co., 518 Main St. About $50,000.

★Mass., Worcester—Worcester Tire Fabric Co., 98 Union St., let contract building 4 story, 75 x 145 ft., rein.-con. and steel addition to factory, rein.-con. flooring, concrete foundation, on Union and Market Sts., to E. D. Ward Co., 82 Foster St. About $150,000.

★R. I., East Providence (Providence P. O.)—Fox Point Warehouse Co., let contract building 1 story, 105 x 270 ft., frame warehouse, concrete flooring and foundation, on Valley St., to T. E. Logan, 77 6th St., Fall River, Mass. About $75,000.

★R. I., Pawtucket—Fales & Jenks Machine Co., 320 Dexter St., let contract building 3 story, 45 x 80 ft., brick and mill construction addition to factory, concrete foundation, on Pine St., to Willmarth-Mackillop, Inc., Freeman St. About $50,000.

★R. I., Pawtucket—Times Publishing Co., Exchange St., let contract building 2 story, 60 x 125 ft., brick and concrete plant, rein.-con. flooring, concrete foundation, on North Union St., to F. G. Rowley Co., 260 Central St. About $60,000.

★R. I., Pawtucket—Union Wadding Co., Dexter St., let contract building 1 story, 40 x 190 ft., brick, concrete and steel addition to factory, concrete flooring and foundation, on Weeden St., to A. F. Smiley, Oak Hall Bldg. About $[illegible]0,000.

★R. I., Providence—L. E. Danforth, 76 Dorrance St., will build 1 story, 100 x 200 ft., brick, concrete and steel garage and service station, concrete flooring and foundation, on Broad St. About $85,000. Work will be done by day labor. Noted April 8.

★Conn., Danielson—Goodyear Tire & Rubber Co., East Market St., Akron, O., let contract building 1, 2 and 4 story, brick, concrete and steel factories, including shipping plant, offices and power plant, here, to Hunkin-Conkey Constr. Co., Century Bldg., Cleveland. About $3,500,000.

★N. Y., Buffalo—See "Buildings."

★N. Y., Buffalo—Amer. Brass Co., Grand and Meadow Sts, Waterbury, Conn., will build 165 x 650 ft. rolling mill, brick, concrete and steel, at 446 Military Rd., here. About $600,000. Work will be done by day labor.

★N. Y., Jamacia—A. L. Read Co., Jamacia Ave. and 121st St., Richmond Hill, let contract building 2 story, 70 x 125 ft., rein.-con and steel factory, rein.-con. flooring, concrete foundation, here, to Barney-Ahlers, 110 West 40th St., New York City. About $75,000.

N. Y., New York—Pub. Serv. Comn., 49 Lafayette St., received lowest 3 bids, April 23, furnishing and erecting structural steel for inspection shed for White Plains Rd. Rapid Transit R.R., from Bethlehem Steel Bldg. Co., 111 Bway., $129,470; Bigelow & Nichols, 45 East 42nd St., $134,600; Terry & Tench, Grand Central Terminal, $135,960.

★N. Y., Syracuse—M. L. Oberdorter Brass Co., Water St., let contract building factory, on Messina Springs Rd., to A. and T. Constr. & Eng. Co., 115 South Salina St. About $500,000; cost plus percentage basis. Noted Feb. 19.

★N. J., Newark—Accounting Machine Co., 156 Bway., New York City, let contract building 1 story, 84 x 111 ft., concrete and brick factory, at 248 Badger Ave., to Irvington Lumber & Door Co., 738 Broad St. About $75,000.

★N. J., Trenton—W. Hankin, archt., 241 South Warren St., let contract to J. S. Rogers Co., Drexel Bldg., Phila., constructing 6 story, 89 x 157 ft., rein.-con. plant, rein.-con. flooring, to have 140 ft. tower, on East State St., for Lee Mercantile Co., 13 East State St. About $230,000. Noted March 11.

★Pa., Phila.—Carver File Co., 3231 Frankford St., let contract building 1 story, 140 x 196 ft., brick and steel factory, on Tanney and Buckius Sts., to W. Steele & Sons Co., 16th and Arch Sts. About $70,000.

★Pa., Scranton—Scranton Button Co., 409 Cherry St., let contract building rein.-con. and steel warehouse, rein.-con. flooring, concrete foundation, to Westinghouse, Church & Kerr, 37 Wall St., New York City. About $150,000.

★Md., Baltimore—F. E. Tormey, archt., 813 Newington Ave., let contract to J. J. O'Connor, Knickerbocker Bldg., constructing 5 story, 69 x 100 ft., rein.-con. and brick warehouse, concrete foundation, on Calvert and Pleasant Sts., for Baltimore Electrical Supply Co., 309 North Calvert St. About $150,000. Noted April 15.

★Md., Curtis Bay (Baltimore P. O.)—Union Acid Wks. let contract building 2 story, 200 x 500 ft., steel and concrete plant, concrete foundation, on Aspin St. and Railroad Ave., to Whiting-Turner Constr. Co., Stewart Bldg., Baltimore. About $200,000.

Industrial Works (Continued)

★Va., Danville—Westbrook Elevator Mfg. Co., 410 Spring St., let contract building 2 story, 60 x 180 ft., brick and timber factory, to J. A. Jones Constr. Co., Realty Bldg., Charlotte, N. C. About $50,000.

★Ga., Atlanta—White Auto Co., East 79th St. and St. Clair Ave., Cleveland, O., let general contract building 2 story, 180 x 240 ft. rein.-con., brick and steel garage and display room, rein.-con. flooring, concrete foundation, to A B. Gade, Atlanta. About $200,000.

★O., Cleveland—Amer. Steel & Wire Co., Western Reserve Bldg., let steel contract for 1 story, 50 x 138 ft., brick and steel boiler house, brick foundation, on Lakeside Ave., to Amer. Bridge Co., Frick Bldg., Pittsburgh. About $150,000.

★O., Cleveland—Laundryette Mfg. Co., 1190 East 152nd St., let contract building 3 story, 200 x 200 ft., rein.-con., steel and brick factory, rein.-con. flooring, concrete foundation, on East 152nd St., to A. A. Lane, Union Bldg. About $200,000.

★O., Cleveland—G. S. Rider & Co., archts. and engrs., Century Bldg., let contract to W. I. Thompson & Son, 5103 Euclid Ave., building 1 story, concrete, steel and brick addition to factory, rein.-con. flooring, concrete foundation, on East 131st St. and Coit Rd., for Natl. Acme Co., Coit Rd. About $250,000. Noted April 15.

★O., Cleveland—Superior Fdry. Co., East 71st St. and Wheeling & Lake Erie R. R., let contract building 2 story, 60 x 200 ft., concrete, steel and brick foundry, rein-con. flooring, concrete foundation, to S. W. Emerson Co., 1900 Euclid Ave. About $100,000.

★Mich., Battle Creek—Clark Equipment Co., Buchanan, let contract constructing 1 story, 100 x 450 ft., plant and 2 story, 50 x 450 ft. office building and power house, brick and steel, concrete foundations, on Springfield Pl., here, to Bates & Rogers, Chicago, Ill. Noted March 11.

★Mich., Detroit—Jansen Mfg. Co., 76 14th Ave., let contract building 2 story, 75 x 100 ft., brick and steel factory, rein.-con. and work flooring, concrete foundation, on Howard St., to J. Finn & Sons, 2375 Woodward Ave. Noted April 22.

★Mich., Pontiac—Oakland Motor Car Co. let contract building 2 story, 70 x 200 ft. service station, rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation, on Baldwin Ave., to DuPont Eng. Co., 435 Woodward Ave., Detroit. About $250,000. Noted April 15.

★Mich., Muskegon — Brunswick-Balke-Collender Co., Laketon Ave., let contract building 4 story, 230 x 360 ft. tire factory, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to Natl. Constr. Co., Dime Bank Bldg., Detroit. About $400,000.

★Wis., Cudahy—Federal Rubber Co., Packard Ave., let contract building 6 story, 100 x 120 ft. brick and steel rubber mill, concrete foundation, to Leonard Constr. Co., 332 South Michigan Ave., Chicago.

★Wis., Merton—Bark River Canning Co. let contract constructing cannery, including several 1 and 2 story buildings, brick and steel, concrete foundations. About $100,000. J. Menge, Jr., 138 Wright St., Milwaukee, archt. Noted April 1.

★Wis., Sheboygan—See "Buildings."

★Ia., Davenport—White Lily Mfg. Co., 1535 Rockingham Rd., let contract constructing 1 story, 210 x 225 ft., plant, rein.-con., brick and steel, rein.-con. flooring, to J. F Nebergall & Son, Masonic Temple. About $200,000.

★Ia., Sioux City—Zoola Tire & Rubber Co., 404 Iowa Bldg., let contract building 1 story, 150 x 170 ft., tire factory; brick, concrete and steel, to Federation Constr. Co., Sioux City. About $125,000; cost plus percentage basis.

★Mo., St. Louis—Alpha Realty & Investment Co., 3616 Windsor Pl., let contract building 1 story, 117 x 190 ft concrete and brick, box factory, concrete flooring and foundation, to McCormick-Combs Constr. Co., Columbia Bldg., $71,300.

★Mo., St. Louis—Conzelman-Crundeo Realty Co., 2nd and Cratiot Sts., let contract building 6 story, 110 x 115 ft., woodenware factory, concrete and steel, at 750 South 2nd St., to Gamble Constr. Co., 620 Chestnut St. About $215,000.

★Mo., St. Louis—McElroy-Sloan Shoe Co. 1511 Washington Ave., let contract building 5 story, 120 x 171 ft., brick factory, rein.-con. flooring, at 2101-11 Lucas St., to Murch Bros. Constr. Co., Ry. Exch. Bldg. About $250,000.

★Okla., Tecumseh—See "Buildings."

★Ont., Toronto—Barrett & Co., 17 Battery Pl., New York City, let contract building roofing factory, concrete and brick, concrete foundation, here, to J Stewart, 30 Church St., New York City. About $400,000.

★Sask., Bienfait—Lignite Utilization Bd. let contract building briquette plant here, to Smith Bros. & Wilson, Regina. About $200,000.

Buildings

PROPOSED WORK

Me., Auburn—Jallade, Lindsey & Warren, archts., 37 Liberty St., New York City, soon let contract constructing 4 story, 105 x 117 ft., brick, steel and stone building, brick and concrete foundation, here, for Y. M. C. A., 2 West 45th St., New York City.

N. H., Laconia—High School—Bd. Educ. rejected bids building 2 story, 70 x 180 ft., brick, concrete and steel. About $225,000 Project postponed indefinitely. P. S. Avery, 95 Milk St., Boston, archt. Noted April 15.

Vt., Barre—Hospital—Washington Co. Tuberculosis Hospital having plans prepared by Pember & Campaigne, archts., 24 James St., Albany, N. Y., for brick and steel. About $125,000.

Vt., Rutland—Armory—City and State Armory Comn., Montpelier, soon let contract building 2 story, brick, concrete and steel, here. About $200,000. Chapman & Frazier, 112 Water St., Boston, archts.

Mass., Agawam—High School—School Comn. plans to build 2 story, brick. About $150,000. Architect not selected.

Mass., Arlington (Boston P. O.)—School—Town School Comn. plans to build 2 story, brick and steel. About $100,000. Architect not selected.

Mass., Boston—Bank—Mowll & Rand, archts., 50 Bromfield St., soon let contract altering bank building, for Cosmopolitan Trust Co., 60 Devonshire St. About $200,-00. Noted March 25.

Mass., Boston — Hospital — Beth Isreal Hospital, 45 Townsend St., plans to build brick, concrete and steel, addition. About $150,000. Architect not selected.

Mass., Boston—Mercantile—W. H. Morton, archt., 308 Boylston St., soon lets contract building 5 story, 60 x 150 ft., brick and steel, concrete foundation, on Washington and Bennett Sts., for Holland System, Inc., 27 Haymarket Sq. About $125,000. Noted March 25.

Mass., Boston — Office—Graphite Arts Printing Corp., 516 Atlantic Ave., soon lets contract building 10 story, 150 x 268 ft., rein.-con., rein.-con. flooring, concrete foundation, on Stuart St. About $3,000,000. Lockwood-Greene Co., State St., engrs.; Derby & Robinson, 20 Beacon St., archts.

Mass., Boston—Studio—C. G. Loring, archt., 7 Water St., soon lets contract constructing 5 story, brick and steel, on Charles and Chestnut Sts. About $100,000. Owners name withheld.

Mass., Boston—Theatre and Office—Mowll & Rand, archts., 50 Bromfield St., soon let contract building 12 story, brick, concrete and stone, rein.-con. flooring, brick and concrete foundation, on Washington and Province Sts., for Gordon & Shuman, 18 Tremont St. About $1,000,000.

Mass., Boston — Theatre and Stores — Mowll & Rand, archts., 50 Bromfield St., soon let contract building 2 story, 150 x 260 ft., brick, concrete and steel, concrete flooring and foundation, on Commonwealth Ave., to J. C. Kiley & Co., 18 Tremont St. About $500,000. Noted March 25.

Mass., New Bedford—Theatre—J. S. McIntyre, archt., 22 Clifford Bldg., soon lets contract building 2 story, 70 x 140 ft., brick and concrete, rein.-con flooring, concrete foundation, on Elm St., for Empire Theatres, Inc., 2 Masonic Bldg. About $150,000 Noted April 22.

R. I., Providence—Church—Bd Trustees, Church of the Mediator, plans to build 1 story, steel and stone, stone foundation, on Elmwood Ave. About $200 000 Architect not selected.

Conn., Bristol—Hospital—Bristol Hospital Inc., 110 South St., plans to build hospital, on Queen St. About $200,000. Address F. B Jennings. Architect not selected.

Conn., Hartford—Church—St. Anthony Roman Catholic Church, 72 Talcott St., having plans prepared by D. Guerriero, archt., 647 Main St., for 1 story, 70 x 130 ft., brick and stone, concrete and stone foundation. About $125,000. A. Kelly, pastor.

Conn., New Britain—School—Bd. Educ. having plans prepared by D. K. Perry, archt., 27 West Main St., for 3 story, 24 room, brick, concrete and steel, on Tremont St. About $350,000. Noted Jan. 15.

Conn., New Milford—School—Canterbury School, Main St., having plans prepared by R. Hume, archt., 2 West 47th St., New York City, for 4 buildings, to include 2 dormitories, gymnasium and chapel, brick. About $175,000.

Conn., New London—Church—Methodist Episcopal Congregation, 193 Hempstead St., soon receives bids building 1 story, 75 x 104 ft., brick and steel, concrete foundation, on Broad St. About $100,000. M. E. Genter, pastor. A. E. Hill, 75 Westminster St., Providence, R. I., archt.

N. Y., Brooklyn—Bank and Office—State Bank, 363 Stone Ave., having plans prepared by H. R. Mainzer, archt. and engr., 105 West 10th St., New York City, for 4 story, 50 x 100 ft., brick, steel and stone, concrete foundation, on Pitkin and Stone Aves.

N. Y., Brooklyn—School—Holy Name Roman Catholic Church, 245 Prospect Park West, having plans prepared by F. J. Berlenbach, archt. and engr., 260 Graham Ave., for 2 story, 70 x 245 ft., brick, steel and stone, brick foundation, on Howard Pl. About $160,000.

N. Y., Brooklyn—Theatre—Syndicate represented by W. Small, 215 Montague St., plans to build 150 x 154 ft., brick, steel and stone, brick foundation, on Grand and Keap Sts. About $500,000. Architect or engineer not selected.

N. Y., Buffalo—Church, etc.—City Park Methodist Episcopal congregation having plans prepared by C. W. Bolton & Son, archts., Witherspoon Bldg., Phila., for 1 story, 156 x 176 ft., church and 2 story community hall and parsonage, granite and artificial stone, on Morris, Westley and Beard Sts. About $200,000.

N. Y., Buffalo—Hotel and Theatre—Hotel Statler Co., Washington St., having plans prepared by G. B. Post, archt., 101 Park Ave., New York City, for 17 story, 84 x 130 x 279 x 292 x 348 ft., brick, steel and limestone, concrete foundation, on Delaware Ave., Niagara Sq., Franklin and Mohawk Sts. About $5,500,000.

N. Y., Maybrook—Club—New York, New Haven & Hartford R.R., New Haven, plans to construct 2 buildings, as extension to present Y. M. C. A. Bldg., here. About $100,000. Private plans.

N. Y., New York—Bank and Office—Royal Bank of Canada, 68 William St., having plans prepared by A. F. Gilbert, archt. and engr., 80 Maiden Lane, altering 16 story, brick, steel and stone. About $200,000.

N. Y., New York—Bank and Office—State Bank, 363 Stone Ave., Brooklyn, having plans prepared by H. R. Mainzer, archt. and engr., 105 West 40th St., for 8 story, 25 x 100 ft., brick, steel and stone, concrete foundation, at 349 West 34th St.

N. Y., New York—Club—Amer. Legion of Bronx Co., c/o Starrett & Van Vleck, archts. and engrs., 8 West 40th St., having plans prepared for 4 story, 100 x 200 ft., brick, steel and stone, concrete foundation. About $400,000. W. F. Deegan, chn.

N. Y., New York—Hospital—Knickerbocker Hospital, 131st St. and Amsterdam Ave., having plans prepared by J. Oakman, archt. and engr., 315 5th Ave., for 8 story, 141 x 201 ft., brick, steel and stone, rein.-con. flooring, concrete foundation, on Convent Ave. and 130th St. About $1,250,000.

N. Y., New York—Loft—L. Goldstein, 197 William St., having plans prepared by G and E. Blum, archts. and engrs., 505 5th Ave., for 6 story, 72 x 96 ft., brick, steel and stone, concrete foundation, at 92-96 Gold St About $150,000

N. Y., New York—Office—A F. Gilbert, archt and engr., 80 Maiden Lane, receives bids about May 8, building 7 story, 40 x 50 ft., brick, steel, concrete and stone, concrete foundation, at 131 Cedar St., for R. Dunther and R. Law, Inc., 25 Broad St. About $160,000 Noted Feb 12

Buildings (Continued)

N. Y., New York—Office—London Guarantee & Accident Co., 55 John St., having plans prepared by A. F. Gilbert, archt. and engr., 80 Maiden Lane, for altering brick, steel and stone, at 90-94 Maiden Lane. About $500,000.

N. Y., Niagara Falls—Bank—Bank of Niagara, 201 Falls St., having plans prepared by Carrere & Hastings, archts. and engrs., 52 Vanderbilt Ave., New York City, for brick, stone and steel, brick foundation, on 3rd St. About $100,000.

N. Y., Seneca Falls—Office—G. B. Post, archt., 101 Park Ave., New York City, soon lets contract building 2 story, brick and stone, concrete foundation, for Goulds Mfg. Co., 240 Fall St. About $200,000.

N. Y., Utica—School—Bd. Educ. rejected bids building school, in 16th Ward. About $500,000. Project abandoned.

N. Y., Watertown—Bank and Office—Watertown Natl. Bank, 100 Court St., had plans prepared by W. L. Stoddart, archt., 9 East 40th St., New York City, for 8 story, granite, steel, terra cotta and concrete, on American corner. Cost between $800,000 and $900,000.

N. Y., Watertown—School—Bd. Educ. and C. A. Bingham, city mgr., had plans prepared by C. E. Dewey, archt., Light and Power Bldg., for school on Cooper St. About $400,000.

N. J., Clinton—Home—State Reformatory plans to build maternity home, 2 story, 68 x 131 ft., brick and concrete, here. About $100,000. F. H. Bent, 142 West State St., Trenton, engr.

N. J., Hackensack—Hospital—Hackensack Hospital, 3rd St., having sketches made by Crow, Lewis & Wick, archts., 200 5th Ave., New York City, for brick and stone. About $750,000.

N. J., Leonardo—School—Bd. Educ. soon lets contract building 2 story, brick and stone, brick foundation, in Middletown Twp. About $100,000. A. F. Arend, 105 West 40th St., New York City, archt. and engr.

N. J., Middletown—School—Bd. Educ soon lets contract building 2 story, brick and stone, brick foundation, in Middletown Twp. About $100,000. A. F. Arend, 105 West 40th St., New York City, archt. and engr.

N. J., Montclair — Clubhouse — H. P. Knowles, archt. and engr., 21 West 49th St., New York City, receives bids about May 4, building 3 story, 50 x 220 ft., brick and stone, brick foundation, for Montclair Golf Club. About $200,000. Noted March 11.

N. J., Port Monmouth—School—Bd. Educ. soon lets contract building 3 story, 40 x 60 x 90 ft., brick and stone, brick foundation, in Middletown Twp. About $150,000. A. F. Arend, 105 West 40th St., New York City, archt. and engr.

N. J., Trenton—Office—I. Goldberg, 142 North Clinton Ave., represents corporation which plans to build 12 story, on South Broad and Front Sts. About $3,000,000.

Pa., Cynwyd—Church—St. John's Protestant Episcopal Church plans to build 1 story, stone. About $100,000. Zantinger, Borie & Medary, Otis Bldg., Phila., archts.

Pa., Dorranceton (Kingston P. O.)—Church—Church of Christ congregation plans to build 2 story, 40 x 90 ft., brick, steel and marble, rock foundation, on Wyoming Ave. About $115,000. Architect not selected.

Pa., Erie—Engine House—City election May 18 to vote on $107,000 bonds to build engine house. F. Hanlon, clk.

Pa., Forty Fort (Kingston P. O.)—Church—Methodist Episcopal Church plans to build 1½ story, 50 x 100 ft., brick and stone, rock foundation, on Wyoming Ave. About $150,000. Architect not selected.

Pa., Montoursville—Bank—Peoples Bank of Montoursville plans to build 3 story, 60 x 110 ft. on Washington and Broad Sts About $100,000. D. B. Nevins, dir. Architect not selected.

Pa., Pittsburgh—Store—J. Horne Co., Penn and 5th Sts., having preliminary estimates prepared by B. Janssen, archt., Century Bldg., for 7 story, 120 x 240 ft., concrete, brick, steel, terra cotta and limestone, rein.-con. flooring, on Duquesne Way and Stanwix St. About $800,000.

Pa., Scranton—Church—St. Peter's Cathedral, 315 Wyoming Ave., plans to build 1½ story, 50 x 90 ft., brick and steel addition, rock foundation. About $100,000. Architect not selected.

Pa., Scranton—College—Venard Apostolic College Assn. plans to build 3 story, 100 x 300 ft., rein.-con., brick, steel and marble, rein.-con. flooring, rock foundation, on Clarks Green. About $200,000. Architect not selected.

Pa., Scranton—Hall—Knights of Columbus, 541 North Washington Ave., plan to build 3 story, 50 x 100 ft., brick and steel, rock foundation. About $130,000. Architect not selected.

Pa., Scranton — Hospital—St. Mary's Catholic Church plans to build 3 story, 60 x 100 ft., brick and steel, rock foundation, on Hickory St. About $230,000. Architect not selected.

Pa., Wilkes-Barre—Convent—St. Mary's Catholic Church plans to build 3 story, 80 x 250 ft., brick and steel, rein.-con. flooring, rock foundation, on South Washington St. About $500,000. Architect not selected.

Md., Baltimore—College—Johns Hopkins University, Homewood, having plans prepared by Carrerre & Hastings, archts. and engrs., 52 Vanderbilt Ave., New York City, for 3 story, brick, steel and stone addition, concrete and brick foundation, here. About $300,000.

Md., Baltimore—Community—L. Levi, archt., Real Estate Trust Bldg., Phila., soon receives bids building 4 story, 40 x 150 ft., concrete and brick, at 1914 Madison Ave., here, for Madison Ave. Temple. About $100,000.

Md., Baltimore — Synagogue — Chizuk Ammo Congregation having plans prepared by J. E. Sperry, archt., 409 Calvert Bldg., for 1 and 2 story, 100 x 150 ft., granite, marble and brick, stone and concrete foundation, on Eutaw and Chauncey Sts. Cost between $125,000 and $150,000. W. Levy, 2352 Eutaw Pl., chn. Bldg. Com.

Md., Cumberland — Office — G. F. Sansbury, archt., Citizens Natl. Bank Bldg., receives bids about May 10, constructing 5 story, 100 x 116 ft., rein.-con. and steel, rein.-con. flooring, concrete foundation, on Baltimore St., for West Side Realty Co., Liberty and Pershing Sts. About $200,000.

Md., Hamilton (Baltimore P. O.) — Church and Sunday School—Grace Lutheran Church, having plans prepared by Richter & Lee, archts., 6th and Court Sts., Reading, Pa., for 1 story, 75 x 200 ft., stone and brick, stone and concrete foundation. About $100,000. C. S. Wolf, 5602 Hartford Ave., pastor.

D. C., Washington—Bank—A. H. Wilson, archt., Washington Loan & Trust Bldg., soon lets contract constructing 4 story, brick and stone, for Standard Savings Bank, 717 14th St. About $100,000.

W. Va., Charleston — Law — State Bd Control soon lets contract building 2 story, 55 x 137 ft., brick, stone and terra cotta. About $150,000. C. W. Bates, Natl. Bank Bldg., Wheeling, archt.

W. Va., Charleston—Schools—Charleston Independent School Dist. plans to issue $480,000 bonds to build schools.

W. Va., Fairmont—Theatre—S. Spicer plans to build theatre on Main St. About $150,000. Dreher, Churchman, Paul & Ford, Fairmont, archts.

W. Va., Mannington—Schools—City election July 8, to vote on $300,000 bonds to build high school and $150,000 bonds for 3 grade schools. J. H Patterson, supt. schools.

N. C., Selma—School—Bd. Educ. plans to build 2 story, 100 x 150 ft. rein.-con. and brick, rein.-con. flooring. About $125,000. Architect not selected

N. C., Winston-Salem—Dormitories, etc.—Salem College receives bids about June 18, building two 40 x 200 ft. dormitories and one 60 x 120 ft. dining hall rein.-con., brick and steel, rein.-con. flooring, on Main St. About $250,000. W. C. Northup, Winston-Salem, archt.

S. C., Florence—Hotel—J. W. Ivey, et al, plan to build 150 room hotel About $500,000. Architect not selected.

Ky., Louisville — Theatre — Majestic Theatre Co., 544 South 4th St., plans to build theatre on 4th and Chestnut Sts. About $200,000.

O., Akron—Hotel and Theatre—Hotel Franklin Co. soon receives bids constructing brick and limestone, concrete foundation. About $5,000,000. G. B Post, 101 Park Ave., New York City, archt. Incorrectly noted in our issue of March 4.

O., Ansonia—Bank and Theatre—First Natl. Bank having plans prepared by Walker & Weeks, archts., 1900 Euclid Ave., Cleveland, for 1 story 30 x 80 ft. and 40 x 110 ft. brick, steel and stone, brick foundation. About $100,000.

O., Cincinnati—Club, etc.—Cincinnati Auto Club, Hotel Metropole, negotiating for site and plans to build club and garage. About $1,500,000. Architect and engineer not selected.

O., Cleveland—High School—Bd. Educ. having plans prepared by A. M. Allen & Co., archts., 1900 Euclid Ave. for 2 story, 100 x 100 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 55th St. and Scovill Ave. About $175,000.

O., Cleveland—Hotel—I. Margolin, 10527 Churchill Ave., soon lets contract building 8 story, 45 x 220 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on East Blvd. About $1,500,000. M. Weiss, 618 Union Bldg., archt.

O., Cleveland — Office—See "Industrial Works."

O., Cleveland—School—Bd. Educ. having plans prepared by Allen-Osborn Co., Rose Bldg., for 2 story, 40 x 180 ft., concrete, steel and brick addition to South High School, on Bway. and Fuller Ave. About $150,000.

O., Cleveland—Theatre and Commercial—East 128th St. and St. Clair Co., c/o Grieble & Eberling, archts., Racine Bldg., soon lets contract building 3 story, rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on East 128th St. and St. Clair Ave. About $300,000. Noted April 1.

O., Columbus — Store—F. B. Chapman, 1117 East Broad St., having plans prepared by H. Holbrook, archt., Outlook Bldg., for superstructure of 4 story, 31 x 187 ft., steel and brick, on South High St. About $175,000.

O., Conneaut—Exchange—Conneaut Telephone Co. plans to build 2 story, 40 x 80 ft. and 1 story, 40 x 40 ft. concrete. About $65,000. G. Hirsch, Columbus, consult. engr.

O., East Cleveland (Cleveland P. O.)—School—Bd. Educ. having plans prepared by Kavanaugh & Baer, archts., 1900 Euclid Ave., Cleveland, for 2 story, 64 x 122 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, here. About $15,000. C. Ammerman, Williamson Bldg., Cleveland, clk. Noted Jan. 29.

O., Lakewood (Cleveland P. O.)—High Schools— Bd. Educ., Warren Rd., having preliminary plans prepared by C. W. Hopkinson, archt., Rose Bldg., Cleveland, for 3 story, on West Clifton Blvd. and 3 story, on Jackson Ave.; both concrete, steel and brick, rein.-con. flooring, concrete foundations, cost $400,000 each.

Ind., Terre Haute—Church—First Church of Christ Scientist, 6th and Cherry Sts., having plans prepared by Johnson, Miller & Miller, archts., 105 South 7th St., for 2 story, 70 x 80 ft., brick and terra cotta. About $100,000.

Mich., Detroit—Church—Third Church of Christ Scientist, 2nd and Ledyard Aves., having plans prepared by G. D. Mason & Co., archts., 80 Griswold St., for 2 story, brick, steel and stone, rein.-con. flooring, concrete foundation, on 2nd and Seward Aves. About $200,000.

Mich., Detroit—Commercial—J. Seros, 709 Brush St., plans to build 4 story, rein.-con., brick and steel, concrete foundation, at 499 Woodward Ave. About $150,000. Architect not selected.

Mich., Detroit—Hotel—R. H. Marr, archt., 435 Woodward Ave., receives bids about May 20, building 5 story, 33 x 136 ft., brick and steel, on Cass Ave. About $125,000. Owner's name withheld. Noted March 18.

Mich., Highland Park (Detroit P. O.)—Church—Highland Park Congregational Church, Grand Ave., soon receives bids building 2 story, 40 x 100 ft., brick, steel and stone, rein.-con. flooring, brick foundation, on Grand and 2nd Aves. About $100,000. Muehlman & Farrar, Dime Bank Bldg., Detroit, archts.

Wis., Milwaukee — Bath House—City plans to issue $100,000 bonds to build brick and concrete, rein.-con. flooring, concrete foundation, in 9th, 19th or 22nd Ward. C. E. Malig, city engr.

Wis., Milwaukee — Lodge—Loyal Order of Moose, 403 Grand Ave., plans to build brick and concrete, rein.-con. flooring, concrete foundation. About $150,000. Architect and engineer not selected.

Wis., Milwaukee—Store and Office—English Woolen Mills Co., 204 3rd St., plans to build 12 story, 120 x 150 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation, on 3rd and Wells Sts. Architect and engineer not selected.

Buildings (Continued)

Ia., Burnside—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 2 story, 56 x 86 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $100,000. A. Johnson, pres. Noted Feb. 26.

Ia., Carl—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., Masonic Temple, Des Moines, for 2 story, 56 x 86 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $110,000.

Ia., Cedar Rapids—Gymnasium and Auditorium—St. Wenceslaus Church, 1256 So. 5th St. and St. Ludmia Church, plan to build 2 story, 60 x 110 ft. gymnasium and auditorium. About $100,000. Architect not selected.

Ia., Haskins—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 2 story, 60 x 90 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $100,000. B. M. Cole, secy. Noted Feb. 26.

Ia., Mason City—Dormitory—Orphans Home State I. O. O. F. having plans prepared by J. H. Felt & Co., archts., Grand Ave. Temple, Kansas City, Mo., for 3 story, 60 x 140 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $110,000.

Ia., Mason City—Hotel—Miller Hotel Co., having plans prepared by Proudfoot, Bird & Rawson, archts., 810 Hubbell Bldg., Des Moines, for 7 story, 122 x 165 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $800,000.

Ia., Pocahontas—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 2 story, 56 x 110 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $150,000. W. J. Gilchrist, pres.

Ia., Spirit Lake—School—Bd. Educ. Excelsior Twp., voted $100,000 bonds to build 2 story school. Architect and engineer not selected.

Minn., Duluth—Temple—J. Jensen, chn. Duluth Labor Temple Assn., 105 East 8th St., receives bids about May 20, building 3 story, 100 x 140 ft., rein.-con. and brick, rein.-con. flooring and foundation, on West 1st St. About $200,000. A. Hanford, 413 Sellwood Bldg., archt. and engr.

Minn., Sacred Heart—High School—Bd. Educ. rejected bids received April 9, building 3 story, 60 x 164 ft., fireproof. About $160,000. W. L. Alban, 347 Endicott Bldg., St. Paul, archt. Plans may be modified Noted April 1.

Kan., Peabody—Hotel—Forrester Hotel Co. having plans prepared by L. Schmidt & Co., engrs. and archts., 121 North Market St., Wichita, for 3 story, 50 x 140 ft., rein.-con. and brick, on Main St. About $100,000.

Kan., Winfield—Bank and Office—Cowley Co. Natl. Bank having plans prepared by Ivar, Vishe & Maess, archts., 54 East Van Buren St., Chicago, Ill., for 6 story, 50 x 140 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $250,000.

Wyo., Casper—Bank—A. J. Cunningham, 1010 South Center St., having plans prepared by Hoggson Bros., archts., 485 5th Ave., New York City, for 2 story, 30 x 60 ft., granite, brick, terra cotta tile and marble, on 2nd and Center Sts. About $150,000.

Mont., Billings—High School—City defeated $600,000 bonds for 2 story, brick, stone or concrete. Noted Feb. 5.

Mont., Butte—Schools—City defeated $1,250,000 bond issue to build schools. Noted Feb. 12.

Mont., Missoula — Grade Schools—City voted $205,000 bonds to build 2 grade schools to replace Willard and Whittier Schools and new one in southeastern part of city. About $60,000 each and $25,000 for new site. Noted March 4.

Mo., Independence—Lodge—Masonic Order plans to build 3 story, rein.-con., concrete and steel, rein.-con. flooring. About $150,000. Architect not selected.

Mo., St. Joseph—Clubhouse—St. Joseph Elks' Lodge plans to build 5 story, fireproof clubhouse, on 5th St. between Francis and Jule Sts. About $400,000. Architect will be selected at once.

Mo., St. Louis — Church — Winnebago Presbyterian Church, c/o J. Johnson, Winnebago and Tennessee Sts., plans to build brick church, here About $125,000. Architect not selected

Mo., Springfield—Church—Grace Methodist Episcopal Church plans to build rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $125,000. Architect not selected.

Tex., Brownsville—Hotel—C. H. Moore having plans prepared by A. B. Ayres, archt., Bedell Bldg., San Antonio, for modern hotel. About $300,000.

Tex., Dallas—High School—School Bd. had plans prepared by W. B. Ittner, archt., Bd. of Educ. Bldg., St. Louis, Mo., for 3 story, concrete and brick, rein.-con. flooring, concrete and brick foundation, on Haskell and McKinney Sts. About $250,000.

Tex., Dallas — Office — Security Natl. Bank, Commonwealth Bldg. had plans prepared by H. M. Greene Co., archts. and engrs., N. Texas Bldg., remodeling Southland Hotel and adding 4 stories to same, also constructing 12 story, 25 x 200 ft. addition making whole building, 12 story, 100 x 200 ft., rein.-con. and brick, rein.-con. flooring, brick and concrete foundation, on Main and Murphy Sts. About $1,000,000.

Tex., Dallas—Schools—Bd. Educ. soon receives bids building North Dallas High School, on Cole, Haskell, McKinney and Carroll Aves., also grade school in Mt. Auburn Dist. Bonds for $1,500,000 voted to build and equip schools; part of this amount will be used to finance above project. W. B. Ittner, Bd. of Educ. Bldg., St. Louis, Mo., archt.

Tex., Paris—Auditorium and Exhibit—Lamar Co. Fair Assn. having plans prepared constructing 1 story, concrete and brick auditorium, also several concrete buildings for exhibits, rein.-con. flooring, concrete foundations, on Fair Grounds. About $100,000.

Col., Colorado Springs—School—Cheyenne School Dist. voted $100,000 bonds to build school, here.

Col., Glenwood Springs—School—City election May 3, to vote on $190,000 bonds to build new school, in Dist. 1. E. J. Horan, secy.

Idaho, Boise—Mechanic Arts School—Bd. Educ. receives bids about June building 3 story, 100 x 120 ft. mechanic art school. About $100,000. Tourtellotte & Hummel, Overland Bldg., archts.

Utah, Brigham—Schools—Boxelder Co. voted $180,000 bonds to build schools, here.

Cal., Los Angeles—Auditorium—Trustees Al Malikah Temple, c/o M. H. Flint, Trust & Savings Bldg., having plans prepared by J. C. Austin, 1121 Baker-Detwiler Bldg., and A. M. Edelman, H. W. Hellman Bldg., archts., for auditorium on Jefferson St., to replace one recently destroyed by fire. Cost to exceed $100,000. Noted Jan. 29.

Cal., Sacramento—Bank—Sacramento-Ft. Sutter Bank having plans prepared by W. P. Day, engr. and C. P. Weeks, archt., Phelan Bldg., San Francisco, for 18 story, 80 x 120 ft., on 7th and K Sts. About $1,000,000.

Cal., San Francisco—School—Bd. Educ. soon lets contract building 3 story, rein.-con., rein.-con. flooring, concrete foundation, on Pacific Ave. About $204,000. J. Reid, Jr., 1st Natl. Bank Bldg., archt.

Que., Montreal—Barracks—Dept. Militia Defence, Ottawa, plans to build barracks and houses for married officers. About $1,000,000.

Que., Montreal—Office—Sun Life Insurance Co., Metcalfe St., soon lets contract building 4 story, 50 x 100 ft. stone, on Dorchester and Mansfield Sts. About $750,000. Darling & Pearson, Ltd., 2 Leader Lane, archts.

Que., Quebec—School—School Comn. having plans prepared by E. Tanguay, archt., 20 D'Aifuillon St., for 3 story, 64 x 224 ft., on 13th St. About $155,000.

Ont., Ottawa—Hospital—City plans campaign to raise $2,750,000 to build hospital.

Ont., Ottawa — Research Institute — Dominion Government soon receives bids building 4 story research institute, here. About $500,000. R. C. Wright, c/o Dept Pub. Wks., archt.

Ont., Ottawa — Store — A. A. Fournier, Bank St., soon receives bids building 3 story, 100 x 130 ft. rein.-con. and brick, rein.-con. flooring. About $140,000 W. C. Noffke, Central Chambers, archt.

B. C., Point Grey—College—University of British Columbia, Vancouver, plans to build group of college buildings here. About $750,000 Sharpe & Thompson, London Bldg., Vancouver, archts.

BIDS DESIRED

Conn., Middletown—Laboratory—Until May 23, by H. Bacon, archt. and engr., 101 Park Ave., New York City, building 2 story, brick, steel and stone, rein.-con. flooring, brick foundation, for Wesleyan University, 374 High St. About $500,000. Noted March 11.

Conn., New London—High School—Until May 12, by Bd. School Comrs., building 3 story, brick, concrete and steel, rein.-con. flooring, brick and concrete foundation, on William and Mercer Sts. About $500,000. D. S. Donnelly, Plant Bldg., archt.

N. Y., Little Falls—School—Until May 12, by Bd. Educ., building brick, steel and stone, brick foundation. About $125,000. Tooker & Marsh, 101 Park Ave., New York City, archts. and engrs. Noted March 11.

N. J., Verona (Montclair P. O.)— Hospital—Until May 21, by G. C. Bergen, Freeholders Room, Court House, Newark, constructing administration building, nurses and doctors home, garage, laundry, store house and employees building, at Essex Co. Hospital, here, concrete, brick and steel. Cost to exceed $500,000. J. Green, 21 Clinton St., archt., Runyon & Carey, 845 Broad St., engrs., both of Newark. Noted April 15.

Md., Baltimore — Church and Sunday School—Until May 1, by J. R. Pope, archt., 527 5th Ave., New York City, building 46 x 35 ft., brick and steel, concrete foundation, on Greenway and Charles St., here, for University Baptist Church, 1308 Eutaw Pl. About $250,000.

O., Gettysburg—School—Until May 4, by Bd. Educ., building 2 story, 72 x 100 ft., concrete and brick. About $100,000. Walker & Norwick, 300 Commercial Bldg., Dayton, archts.

O., Orrville—School—Until May 21, by Bd. Educ., building 2 story, 75 x 125 ft., concrete and brick. About $200,000. O D. Howard, 8 East Broad St., Columbus, archt. Noted March 4.

Ind., Linton—School—Until May 6, by Bd. Educ., building 2 story, 96 x 168 ft., brick and stone. About $150,000. J. Roach, trustee. J. W. Gaddis, Amer. Natl. Bank Bldg., Vincennes, archt.

Wis., Milwaukee — Bank and Office — Kirchoff & Rose, archts., Majestic Bldg., receiving bids building 2 story, 40 x 90 ft., brick and concrete, rein.-con. flooring, concrete foundation, on Mitchell St., for Amer. Exch. Bank, Plankinton Arcade. About $100,000. Noted March 4.

Ia., Dana—School—Until May 17, by Bd. Educ., building 2 story, 56 x 86 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $110,000. W. E. Hulse & Co., Masonic Temple, Des Moines, archts. Noted March 25.

Ia., Green Mountain—School—Until May 18, by Bd. Educ. building 2 story, 60 x 85 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $110,000. H. E. Reimer, Marshalltown, archt.

Ia., Morning Sun—School—Until May 8, by Bd. Educ., building 2 story, brick, rein.-con. and steel, rein.-con. flooring, brick foundation. About $200,000. W. E. Hulse & Co., Masonic Bldg., Des Moines, archts. Noted March 11.

Ia., Orient—School—Until May 15, by Bd. Educ., building 2 story, 56 x 96 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $115,000. W. Gordon, Hubbell Bldg., Des Moines, archts. Noted March 25.

Ia., Searsboro—School—Until May 14, by Bd. Educ., building 2 story, 70 x 96 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $110,000. Keffer & Jones, Masonic Bldg., Des Moines, archts. Noted Feb. 26.

Ia., Whitten—School—Until May 22, by Bd. Educ. building 2 story, 54 x 80 ft., rein.-con. brick and steel, rein.-con. flooring, concrete foundation. About $100,000. H. E Reimer, Marshalltown, archt. Noted April 1.

Kan., Atchison—Schools—Until May 11, by Bd. Educ., building Lincoln School, 2 story, 88 x 90 ft., Roosevelt School, 3 story, 78 x 121 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundations. Cost of each $125,000. R. J. Kaaz, 719 Kansas Ave., and W. H. Saylor & Co., Mutual Bldg., Kansas City, Mo., archts. Noted Jan. 15.

Mo., Slater—High School—Bd. Educ receiving bids building 2 story, 45 x 120 ft. rein.-con., concrete, steel and brick, rein.-con. flooring, concrete foundation. About $110,000. J. H. Felt & Co., Grand Ave. Temple, Kansas City, archts. Noted Jan 1.

Idaho, Jerome—High School—Until May 3, by O Hill, clk., Bd. Educ., building 1 story, brick, in Dist 33. About $130,000 Wayland & Fennell, Idaho Bldg., Boise archts. Noted Mar 25

Buildings (Continued)

Cal., Santa Ana—High School—Until May 11, by Bd. Educ. constructing rein.-con. administration building, hollow tile gymnasium, also frame and stucco shop, at high school. About $110,000. N. F. Marsh, Bway. Central Bldg., Los Angeles, archt. Noted Feb. 12.

Ont., London—Office—Until May 7, by London & Western Trusts Co., 382 Richmond St. building 3 story, on Richmond St. About $150,000. Architect not selected.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. H., Durham—Dormitory—New Hampshire College of Agriculture let contract building 3 story, 50 x 125 ft., brick and steel rein.-con. flooring, rock foundation, on campus, to F. W. Cunningham & Sons, 430 Congress St., Portland, Me. About $100,000. Noted April 15.

★Mass., Hingham—Church—Coolidge & Shattuck, archt., 122 Ames Bldg., Boston, let contract to I. G. Hersey, 75 Wareham St., Boston, building 1 story, 36 x 60 ft., with 30 x 30 ft. tower, fieldstone and brick, stone foundation, for St. Johns Evangelist Church. About $100,000. Noted April 22.

★Mass., Holyoke—Temple—Masonic Temple Society, 280 High St., let contract building 4 story, brick and steel, concrete flooring and foundation, on Chestnut St., to S. O. Hoyt, North Pleasant St. About $150,000. Noted Feb. 26.

★Mass., New Bedford—Theatre and Office—Mowll & Rand, archts., 50 Bromfield St., Boston, let contract to W. J. Sinnott, 68 Devonshire St., Boston, building 2 story, 143 x 160 ft., brick, concrete, stone and steel, rein.-con. flooring, concrete foundation, on Purchase St., here for Gordon & Schuman, 18 Tremont St., Boston. About $500,000. Noted April 15.

★Mass., Pittsfield—Hotel—Wendell Co., South St., let contract remodeling and building additions to Hotel Wendell, to J. R. Hampson & Co., Inc., Pittsfield. About $150,000; cost plus percentage basis.

★Conn., Bristol—School—Bd. Educ. let contract building 2 story, brick, concrete and steel, rein.-con. flooring, concrete foundation, on Burlington Ave., to Triangle Constr. Co., 57 South Bway., Yonkers, N. Y. About $250,000. Noted March 18.

★Conn., Danielson—Housing—Goodyear Cotton Mills, Inc., will build one hundred twenty 2 story, timber houses for workmen, concrete foundations. About $500,000. Work will be done by day labor. Noted April 22.

★N. Y., Brooklyn—Store—Abraham & Strauss, 422 Fulton St., let contract altering and building 1 story, brick, steel and stone addition, brick foundation, to Rheinstein & Hass, 21 East 40th St., New York City. About $200,000. Noted April 1.

★N. Y., Brooklyn—Synagogue—McCarthy & Kelly, archts., 16 Court St., let contract to E. Lieberman, 758 Ocean Ave., building 1 story, brick, steel and stone, brick foundation, at 1607 Ave. L, for Temple Shaari Torah, c/o architects. About $175,000. Noted Feb. 5.

★N. Y., Buffalo—Sales, etc.—Kam Kaderbaeck Co., 967 Main St., let contract constructing 2 story, 60 x 120 ft., salesroom and service station, at 1120 Main St., to J. Geigand, 346 Herman St. About $150,000.

★N. Y., New York—Bank and Office—McKim, Mead & White, archts. and engrs., 101 Park Ave., let contract to Clough-Bourne Corp., 101 Park Ave., altering 4 story, brick, steel and stone, on 34th St. and 5th Ave., for 330 West 95th St. Corp., 170 Bway. About $250,000. Noted Jan. 22.

★N. Y., New York—Hospital—Beth Israel Hospital Assn., Inc., 70 Jefferson St., let contract building 12 story, 107 x 184 ft., brick, steel and stone, concrete foundation, on Livingston Pl. between 16th and 17th St., to G. R. Davis, 30 East 42nd St. About $1,750,000.

★N. Y., New York—Hotel—M. Kaufman, 30th St. and Madison Ave., will alter brick, steel and stone. About $100,000. Work will be done by day labor under supervision of G. and E. Blum, archts. and engrs., 505 5th Ave.

★N. Y., New York—Loft—L. and G. Realty Co., c/o G. and E. Blum, archts. and engrs., 505 5th Ave., will build 13 story, brick, steel and stone, concrete foundation, at 213-223 West 35th St. About $750,000. Work will be done by day labor under supervision of architects.

★N. Y., New York—Loft—Silk Traders, Inc., c/o G. and E. Blum, archts. and engrs., 505 5th Ave., will build 12 story, brick, steel and stone, concrete foundation, on 4th Ave. About $600,000. Work will be done by day labor under supervision of architects. Noted March 18.

★N. Y., New York—Office—Curb Holding Co., 44 Court St., Brooklyn, will build 12 story, 134 x 135 ft., brick, steel and stone, concrete foundation, on Washington St., here. About $1,750,000. Work will be done by day labor. Noted April 15, under "Brooklyn."

★N. Y., New York—Office—Heckscher Bldg. Corp., 50 East 42nd St., will build 24 story, 100 x 162 ft., brick, steel and stone, concrete foundation, on 57th St. and 5th Ave. About $3,000,000. Work will be done by day labor.

★N. Y., New York—Office—Standard Oil Co. of New York, 26 Bway., let contract altering brick, steel and stone, to H. D. Best & Co., 175 5th Ave. About $200,000.

★N. Y., New York—Office and Loft—Romax Realty Corp., c/o J. H. Scheier, archt. and engr., 25 West 42nd St., will alter brick, steel and stone, on 47th St. About $100,000. Work will be done by day labor. Noted March 11.

★N. Y., New York—Office and Stores—Liggett, Winchester & Ley, 19 West 44th St., let contract building 25 story, 11 x 54 x 100 x 240 ft., brick, steel and stone, concrete foundation, on 57th St. and 8th Ave., to F. T. Ley, 19 West 44th St. About $2,500,000.

★N. Y., New York—Theatre—Sonn Bros., 49 Church St., will build brick, steel and stone, brick foundation, on Belmont and Tremont Aves. About $300,000. Work will be done by day labor. Noted April 1.

★N. Y., Olean—Office—Mowbray & Uffinger, archts. and engrs., 56 Liberty St., New York City, let contract to E. Diebitsch, 383 Madison Ave., New York City, altering brick, steel and stone, for F. L. Bartlett. About $100,000. Noted March 18.

★N. Y., Watertown—Hotel—Woodruff Holding Corp., Public Sq., let contract remodeling New Woodruff Hotel, to F. O'Farrall, 53 West 39th St., New York City. About $200,000. Noted Feb. 5.

N. Y., Wende (Millgrove P. O.)—Home—E. F. Jaeckle, clk. Bd. Supervs. Erie Co., Buffalo, received bids April 20, building home, here, (general contract), from Tifft Constr. Co., Iroquois Bldg., Buffalo, $1,145,000, J. W. Cowper & Co., Fidelity Bldg., Buffalo, $1,211,795, Eastern Concrete Steel Co., Morgan Bldg., Buffalo, $1,382,655; electrical equipment, from Wheeler Green Electric Co., 31 St. Paul St., Rochester, $44,900, Buffalo Electric Contg. Co., 18 Bway., Buffalo, $44,400, McCarthy Bros. & Ford, 75 West Mohawk St., Buffalo, $54,640; heating, from Power Efficiency Co., New York City, $173,200, Northwestern Heating & Plumbing Co., Erie, Pa., $177,717, J. W. Danforth Co., 70 Ellicott St., Buffalo, $182,848. Noted April 1.

★N. Y., White Plains—High School—Tooker & Marsh, archts. and engrs., 101 Park Ave., New York City, let contract to Oscawana Bldg. Co., 101 Park Ave., New York City, building brick and steel, brick foundation, for Bd. Educ. About $133,460. Noted April 15.

★N. J., Hoboken—School—Bd. Educ. let general contract building P. S. 2, to W. H. and F. W. Kane, New York City, $1,599,900; plumbing, to J. Marnell, Hoboken, $51,126; heating, to J. Cooney, 210 North 4th St., Harrison, $112,494; electrical work, to W. J. Coleman, Willow Court, Jersey City, $20,000.

★N. J., Newark—Amer. Brake Shoe Co., 30 Church St., New York City, let contract constructing foundry and 2 buildings, 1 story, 40 x 400 ft., 116 x 118 ft. and 116 x 220 ft., concrete and brick, on Ave. L between Mary and Paris Sts., to J. Stewart, 30 Church St., New York City. About $400,000.

★N. J., Trenton—Stores—C. F. Hildebrecht, 19 West State St., let contract building 4 story, 50 x 240 ft., concrete and steel, to J. S. Rogers & Co., Drexel Bldg., Phila. About $250,000.

★Pa., Farrell—Bank—Colonial Trust Co., Bway., let contract building brick, steel and stone, brick foundation, to R. H. Howes Constr. Co., 105 West 40th St., New York City. About $300,000.

★Pa., Johnstown—Hospital—Midvale Steel & Ordnance Co., Widener Bldg., Phila., let contract to Mellon-Stewart Co., Oliver Bldg., Pittsburgh, building 3 story, 120 x 150 ft., brick, for Cambria Steel Co., Prospect St. About $600,000. Noted March 18.

★Pa., Phila.—Hospital—Children's Hospital, 18th and Fitzwater Sts., let contract building 3 story, 57 x 82 ft., brick and concrete addition, to Roydhouse-Arey, 112 North Broad St. About $100,000.

★Del., Wilmington—Chapel—A. I. Du Pont, 811 Market St., let contract building brick and stone, brick foundation, to Smythe Constr. Co., 826 Orange St. About $200,000.

★Md., Baltimore—Theatre—Regent Theatre Co., 1627 Pennsylvania Ave., let contract building 1 story, 85 x 170 ft., brick addition, brick and concrete foundation, to H. Rosen, 2337 Madison Ave. About $100,000.

★Md., Baltimore—Theatre—Norton, Bird & Whitman, 501 5th Ave., New York City, will build brick, steel and stone, brick foundation, here. About $300,000. Work will be done by day labor.

★O., Akron—Theatre—H. Thomas, c/o W. A. Swasey, archt., 101 Park Ave., New York City, will build brick, steel and stone, brick foundation, here. About $250,000. Work will be done by day labor under supervision of Withington, Roberts & Wright Co., engrs., Swetland Bldg., Cleveland.

O., Parma—Schools—Bd. Educ. received lowest bid April 17, building 1 high and 2 grade schools, all 1 story, 89 x 139 ft., concrete, steel and brick, rein.-con. flooring, concrete foundations, from C. D. Keyser, Bellaire, $225,000. Noted April 8.

★Mich., Battle Creek—Office—See "Industrial Works."

★Mich., Ford City (Wyandotte P. O.)—School—Bd. Educ. let contract building 2 story, 129 x 148 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Main St., to C. R. Schewe Co., 522 Chamber of Commerce, Detroit. About $150,000. Noted April 8.

★Mich., Hamtramck (Detroit P. O.)—School—Dist. 8, c/o W. V. Tyler, let contract building 2 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Playfair Ave., to W. H. Mueller, Ford Bldg., Detroit. About $150,000. Noted March 25.

★Mich., Saginaw—School—St. Marys Church let contract building 2 story, 120 x 120 ft., rein.-con. and brick, to Burnett-Henige Constr. Co., Saginaw.

★Ill., Oakland—High School—Bd. Educ. let contract building 2 story, rein.-con., brick and hollow tile, to J. W. Montgomery, Sidell. About $110,000.

★Wis., Milwaukee—Sales—Wisconsin-Oakland Co., 525 Jefferson St., let contract building 4 story, 98 x 120 ft., concrete and brick, rein.-con. flooring, concrete foundation, on Jackson and Oneida Sts., to J. L. Stanage, 144 Oneida St. About $150,000. Noted March 25.

★Wis., Sheboygan—Office, etc.—Badger State Tanning Co., South Water St. and Maryland Ave., let contract building 4 story, 110 x 225 ft. office and 87 x 123 ft. beam house, brick, rein.-con. and steel, rein.-con. flooring, brick foundations, to Westinghouse, Church, Kerr & Co., 37 Wall St, New York City. About $200,000.

★Ia., Bayard—School—Bd. Educ. let contract building 2 story, 90 x 140 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to H. Evers, Minneapolis, Minn. About $100,000. Noted Feb. 26.

★Ia., Rippey—School—Bd. Educ. let contract building 2 story, 63 x 105 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, to Garmer & Stiles, 422 Flynn Bldg., Des Moines, $118,000. Noted March 25.

★Ia., Waterloo—School—Bd. Educ. let contract building 2 story, 171 x 267 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to H. A. Maine Co., 305-7 March Pl. Bldg. About $700,000.

★Minn., Minneapolis—Hall—State Bd. Control, St. Paul, let contract building addition to Sanford Hall, consisting of two 3 story, 44 x 68 ft., rein.-con. and brick wings, at State University, here, to S. M. Klarquist & Son, 760 Security Bldg., $151,136. Noted April 22.

★Mo., Kansas City—Bank and Office—Kansas City Federal Reserve Bank let contract building 16 story, 115 x 145½ ft., brick, steel, and stone, concrete foundation, on Grand Ave. and 10th St., G. A. Fuller Constr. Co., 175 5th Ave., New York City, $3,604,800.

★Mo., St. Louis—Hospital—Sisters of Mercy, Euclid and Parkview Sts., let contract building 5 story, 111 x 112 ft., brick and concrete addition, rein.-con. flooring, at 4939 Audubon St., to Raterman Building & Contg. Co., 1943 St. Louis Ave. About $175,000.

Buildings (Continued)

★Ark., Little Rock — Station — Missouri Pacific R.R., Ry. Exch. Bldg., St. Louis, Mo., let contract building rein.-con. and steel station, here, to J. Stewart, 30 Church St., New York City. About $700,000.

★Tex., Dalhart — Court House — Comrs. Dallam Co., let contract building 4 story, 81 x 96 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to Eberhardt Constr. Co., Salina, Kan. About $181,000; cost plus percentage basis. Noted April 8.

★Tex., Kerrville—Hospital—State Bd. Health, Austin, let contract building hospital for tuburcular soldiers, here, to Mc Kenzie Constr. Co., Bedell Bldg., San Antonio. About $500,000.

★Okla., Clinton—Administration—State Bd. Pub. Affairs, Oklahoma, let contract building brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, at tuberculosis sanitarium, here, to C. H. Crissman & Santee, Oklahoma, $75,000. Noted Jan. 29.

★Okla., Guthrie — Consistory — Scottish Rite Consistory let contract building 3 story, 208 x 253 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to J. Stewart, 30 Church St., New York City. About $3,000,000. Noted Feb. 12.

★Okla., Pawhuska—Bank—Citizens Natl. Bank let contract building 7 story, 50 x 140 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to G. M. Bliss Constr. Co., Lathrop Bldg., Kansas City, Mo. About $400,000; cost plus percentage basis. Noted Feb. 12.

★Okla., Tecumseh—School, etc.—State Bd. Affairs, Oklahoma, let contract constructing school, administration buildings, power plant and two cottages, to Manhattan Constr. Co., Oklahoma, $152,700. Noted April 15.

★Wash., Seattle—Store—J. T. Hefferman, 108 Railroad Ave., S., let contract building 2 story, 120 x 120 ft., rein.-con. and terra cotta, on 6th and Pine Sts., to C. C. Cawsey, Boston Blk. About $225,000.

★Wash., Seattle—Store and Office—Pine St. Bldg. Co., Peoples' Bank Bldg., let contract constructing 2 story, 108 x 173 ft., concrete, steel and terra cotta, on 4th and Pine Sts., to H. Pederson, Alaska Bldg. About $250,000.

★Cal., Independence—Court House—Bd. Supervs. Inyo Co. let contract building 2 story, rein-con. and terra cotta, rein-con. flooring, concrete foundation, to McCombs & Sons, Bishop. About $160,000. Noted April 1.

Cal., San Francisco—School—Bd. Educ. received bids building 3 story, 82 x 98 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Harrison St. between 11th and 12th Sts., from O. Monson, 1734 10th Ave., $128,247; P. F. Reilly, 2857 Howard St., $129,875; Anderson & Ringrose, 320 Market St., $131,190. Noted April 15.

Federal Government Work

PROPOSED WORK

N. Y., Brooklyn — Kitchen and Commissiary Equipment—Spec. 4177—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install, at Naval Hospitals, here.

N. Y., Rockaway — Altering Marine Railway — Spec 4184 — Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to alter marine railway, here.

Pa., Pittsburgh—Gate and Valve Operating Machinery—U. S. Engrs. Office, 2111 Farmers Bank Bldg., soon receives bids for gate and valve operating machinery, 56 ft. and 110 ft. locks at Emsworth Locks, Ohio River, near here.

D. C., Wash. — Aeronautical Engine-Testing Laboratory — Spec. 4182 — Bureau Yards & Docks, Navy Dept., plans to build, aeroneutical engine-testing laboratory.

Va., Hampton Roads—Seaplane Runway—Spec. 4181—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build concrete, here. About $42,500.

Va., Hampton Roads—Sewers and Water Piping—Spec. 4178—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to lay sewers and water piping around storehouse, here. About $50,000.

Fla., St. Petersburg—Operating Building and Quarters—Spec. 4183—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to construct, here.

Wash, Puget Sound—Auxiliary Equipment and Piping — Spec. 4179 — Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to purchase and install, for air compressor, here. About $60,000.

BIDS DESIRED

N. Y., New York—Dredging—Until May 26, by U. S. Engr. Office, 39 Whitehall St., dredging in Shrewsbury River, Shoal Harbor, Compton Creek and Keyport Harbor, N. J.; advertised in this issue.

N. J., Dover—Shops—Until May 3, by A. Niles, commanding officer, building 4 concrete and hollow tile shops, at Picatinny Arsenal. Material will be furnished by Government.

Pa., Pittsburgh—Gates and Emergency Dams—Until May 24, by U. S. Engr. Office, 2111 Farmers Bank Bldg., furnishing, delivering and building for Emsworth Locks, Ohio River; advertised in this issue.

Ala., Muscle Shoals—Nitrate Plant—Until May 5, at office of Constr. Quartermaster, altering and building additions at U. S. Nitrate Plant 2, to include track work, rein.-con. trestle and storage bins, grading, etc.; advertised in this issue.

Tennessee—Road Work—Until May 14, by C. H. Moorefield, dist. engr., Bur. Pub. Rds., U. S. Dept. Agriculture, Bristol, building or improving 12.23 mi. Natl. Forest Rd., Sullivan and Johnson Counties; advertised in this issue.

Tenn., Memphis—Mild Open Hearth Steel—Until May 20, by Mississippi River Comn., 1st and 2nd Dists., Custom House, furnishing and delivering; advertised in this issue.

O., Cincinnati—Round Piling—Until May 12, by U. S. Engr. Office, 405 Custom House, furnishing and delivering for lock and dam; advertised in this issue.

Mo., St. Louis—Levee Work—Until May 12, at office of Secy. Mississippi River Comn., 1311 International Life Bldg., constructing 260,000 cu.yd. earthwork, (172,000 cu.yd. hydraulic fill in old borrow pits and 88,000 cu.yd. levee enlargement) in Hunt D.D., Ill.; advertised in this issue.

Wash., Tulalip—Frame Cottage—Until May 24, Dept. of Interior, at office of Indian Affairs, Wash., D. C., building frame cottage 86, at Tulalip Indian School, here. C. Sells, comr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contracts)

Me., Mt. Desert Island—Seawell—Spec. 4135—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids April 21, building at transmitting station and quarters, here, from A. B. and J. R. Hodgkins, 42 Greenly Ave., Bar Harbor, $28,800 (120 days), G. E. Eng. Co., 22 Laight St., New York City, $29,000 (120 days). Noted April 15.

N. Y., Buffalo—Dredging—U. S. Engr. Office, 540 Federal Bldg., received bids dredging, Niagara River, from Dunbar & Sullivan Dredging Co., 2211 Dime Bank Bldg., Detroit, Mich., $241,025; Duluth-Superior Dredge Co., foot of 45th Ave., W., Duluth, Minn., $245,245; Great Lakes Dredge & Dock Co., D. S. Morgan Bldg., $257,687.

★N. Y., New York—Removing Wreck—U. S. Engr. Office, 39 Whitehall St., let contract removing wreck of concrete barge "Jacky," to Merritt & Chapman Derrick & Wrecking Co., 17 Battery Pl., $8,940.

★Pa., Phila.—Seaplane Hangars—Spec. 4121—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract dismantling 3 hangars at Brunswick, Ga., and re-erecting same as 1 building, at Navy Yard, here, to Hyde & Baxter, 711 13th St., N. W., Wash., D. C., $68,255 (85 days). Noted April 15.

★Va., Alexandria—Sidewalks—Spec. 4140—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building sidewalks and curbs at Naval Torpedo Sta., here, to J. Trout Constr. Corp., 729 15th St., Wash., D. C., $3,357 (45 days). Noted April 22.

★Va., Hampton Roads — Reinforcing Trusses—Spec. 4150—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract reinforcing present end trusses and Seaplane Hangar 1, at Naval Air Sta., here, to Donnell Zane Co., Inc., 298 Bway., New York City, $6,938 (45 days).

Va., Yorktown—Hangars—Spec. 4132—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids April 21, building at Naval Mine Dept., here, from Newport Contg. & Eng. Co, Law Bldg., Newport News, $45,844 (75 days), S. R. Curtis, Lee Hall, $47,480 (75 days), F. G. Fearon, 280 Madison Ave., New York City, $57,860 (75 days). Noted April 8.

★Ky., Louisville—Steel Sheet Piling—U. S. Engr. Office, 425 Custom House, let contract furnishing and delivering for Dam 44, Ohio River, to Lackawanna Steel Co., Lackawanna, N. Y., $74,008. Noted March 18.

Mich., Detroit—Dredging—U. S. Engr. Office, 337 Federal Bldg., received bids widening and straightening River Rouge Channel from Detroit River to Dix Ave., involving 2,445,000 cu.yd. hydraulic dredgework, from Duluth-Superior Dredging Co., foot of 45th Ave., W., Duluth, Minn., $.169 per cu.yd., total $413,205; Central Dredging Co., 1215 Swetland Bldg., Cleveland, O., $.224 per cu.yd., $547,680; Great Lakes Dredge & Dock Co., 104 South Michigan Ave., Chicago, $.27 per cu.yd., $660,150. Noted March 18.

★Wis., Milwaukee—Portland Cement—U. S. Engr. Office, Federal Bldg., let contract furnishing Portland cement for improving Indian Harbor, to Western Lime & Cement Co., 130 1st Ave., $17,570.

Miscellaneous

PROPOSED WORK

Refrigeration Machine, etc.—Buffalo, N. Y.—J. F. Malone, comr. Pub. Bldgs., soon lets contract furnishing material and installing 60 ton refrigeration machine in Washington Market. Separate bids will be received on (a) refrigerating machine, condenser, tank, pumps, pipe-lines, electrical work, etc., (b) plumbing, draining, gas fitting, etc.

Transmission Line—Redwood, N. Y.—See "Industrial Works."

Bulkhead—Jersey City, N. J.—Lehigh Valley R.R., 143 Liberty St., New York City, plans to build concrete bulkhead at Claremont Ave. terminal, here. About $975,000. G. T. Hand, ch. engr.

Elimination of Grade Crossing—Erie, Pa.—City election May 18 to vote on $175,000 bonds to eliminate grade crossing. F. Hanlon, clk.

Memorial—Scranton, Pa.—Kiwanis Club plans to build soldiers memorial, 20 x 20 ft., 38 ft. high, granite and bronze, rock foundation, on Ridge Ave. About $200,000. Architect not selected.

Park and Playground—Wilkes-Barre, Pa.—City plans to build park and playground on Jackson St. About $45,000. B. K. Finch, city engr. Noted Jan. 1.

Fill—Miami, Fla.—City plans to make fill in Biscayne Bay from 8th to 14th Sts., 800 ft wide (to be used as park). Work involves 600,000 cu.yd. hydraulic dredgework and 4,000 cu.yd. rein.-con. for bulkhead, etc. About $2,000,000. Engineer not selected.

Coal and Ash Handling Equipment—Milwaukee, Wis.—Bd. Industrial Educ., Manufacturers' Home Bldg., having specifications made for coal and ash handling equipment. Cahill & Douglas, 217 West Water St., engrs.

Levees—Dallas, Tex.—Dallas Co. Impvt. Dist. 10 plans to build 2 levees, 30 ft. high, each 4 mi. long, also change and straighten Trinity River Channel. About $5,000,000. A. A. Stiles, Austin, state engr.

Dam — Brigham, Utah — See "Industrial Works."

Marine Railway Drydocking and Cargo Handling Equipment—Astoria, Ore.—Port of Astoria soon receives bids furnishing material and constructing marine railway drydocking equipment with lifting capacity of 6,500 tons, to be installed in center of slip 2, with cradle length sufficient to dock 450 ft. vessel of 12,000 ton net register, electrical equipment with 8 chain haul; furnishing 4 electrically operated straight line operating cargo cranes, 3 ton capacity at extreme end of boom, to operate on roof of freight shed and have hoisting spee of about 250 ft. per minute, with trolley travel not less than 500 ft., adjustable booms, laterally and vertically; furnishing 6 electric tractors and about 30 trailers to be used for distribution of freight. R. R. Bartlett, engr.

Slide Gates—San Francisco, Cal.—Bd. Pub. Wks. rejected bids received March 24 furnishing and delivering 33 x 42 in. slide gates for outlet system of Hetch Hetchy Dam Noted April 1.

Dam—Victorville, Cal.—Mohave River Irrigation Dist. voted $5,000,000 bonds to purchase and complete Little Bear Dam of Arrowhead Reservoir & Power Co.; power development and distributing system to serve 27,000 acres. F. E. Trask, Central Bldg., Los Angeles, engr.

BIDS DESIRED

Road Machinery—Boonville, N. Y.—Gallup Sand & Gravel Co., Inc., receiving bids for gravel, excavating, cleaning, conveying and grading machinery.

Miscellaneous (Continued)

Fire Alarm System—Brockport, N. Y.—Until May 3, by Bd. Trustees, furnishing and installing automatic telegraph fire alarm system. C. H. Ross, village clk.; advertised in this issue.

Bulkhead—New York, N. Y.—Until May 3, by M. Hurlburt, comr. docks, Pier "A," foot of Battery Pl., furnishing labor and materials rebulidng sheet pile bulkhead along Beach Channel Dr. between 130th and Beach 141st Sts., Belle Harbor, Queens Boro.

Steel Piling—Niagara Falls, N. Y.—Universal Equipment Co., 504 Gluck Bldg., receiving bids for steel piling.

Road Materials—St. George, S. I., N. Y—Until May 3, by C. D. Van Name, pres. Richmond Boro, furnishing and delivering twenty thousand 3 x 3 x 8 in. and fifteen thousand 3 x 4 x 8 in. wood blocks, 5,000 paving brick, 2,500 asphalt blocks, to Du Bois Ave. Store Yard of Bureau of Highways, 5,000 paving brick and 2,500 asphalt blocks, to Hannah St.

Road Oil—Newark, N. J.—Until May 4, by Dept, Streets & Pub. Impvts., furnishing 60,000 gal. non-asphaltic road oil. About $10,000. T. L. Raymond, city engr.

Dump Cars—Bethlehem, Pa.—P. J. Malloy, 551 East Goepp St., receiving bids for 2 way shaped dump cars, steel.

Steam Shovel, Saw Rig and Traction Wheels—Phila., Pa.—B. M. Weiss, 1324 Widener Bldg., receiving bids for 1 Marion 76 steam shovel, 1 saw rig and 1 set traction wheels for model 41 Marion steam shovel.

Portable Air-Compressor and Concrete Mixers—Baltimore, Md.—Until May 5, by Bd. Awards, furnishing and delivering 1 portable air-compressor and 2 concrete mixers, to Water Dept., City Hall. W. A. Megraw, engr.

Portland Cement—Detroit, Mich.—Until May 6, by J. A. Martin, comr. purchases and supplies, furnishing 30,000 bbl. Portland cement, f.o.b. here.

Boilers and Chimney—Port Huron, Mich.—Until May 8, at office of City Clerk, furnishing and setting two 350 hp. boilers at pumping station, also building concrete or brick chimney; advertised in this issue.

Bar Shear and Bender—Milwaukee, Wis.—S. M. Siesel, Brumder Bldg., receiving bids for bar shear and bender.

Refined Tar or Asphalt—Clayton, Mo.—Until May 5, by W. Elbing, engr., St. Louis Co., furnishing refined tar or aspshalt on such roads as may be designated within radius of 10 mi. from western limits of St. Louis.

Relaying Rails and Locomotive Crane—St. Louis, Mo.—Harry Benjamin Equipment Co., 723-727 Central Natl. Bank Bldg., receiving bids for 50 ton 45 lb. relaying rails (Missouri delivery), 100 ton 25 lb. relaying rails (Arkansas delivery), and 10 ton locomotive crane with 40 ft. boom (Texas delivery).

Stone Crushing Machinery—Chico, Tex.—Federal Crushed Stone Co., Dallas, receiving bids for stone crushing machinery, 2,000 ton daily capacity, to be installed at plant, here. About $250,000. C. J. Hutchinson, engr., Dallas.

Elevated Steel Water Tank — Portland, Ore.—Until May 3, at office of S. C. Pier, purch. agt., City Hall, furnishing 1,000,000 gal. tank.

Track Scale, etc.—Portland, Ore.—Until May 10, by Pub. Dock Comn., Terminal 4, for 75 ton railroad track scales and modern phosphate rock handling machinery, to include automatic car dumper. G. B. Hegardt, engr.

Wheel Shaft—Portlaod, Ore—Until May 7, by Port of Portland Comn., for nickel steel hollow wheel shaft for Steamer Portland. J. H. Polhemus, engr.

Fog Alarm Building—Ottawa, Ont.—Until May 15, by Dept. Marine, constructing wooden fog alarm building on Otter Island, Lake Superior, for Dominion Government. About $26,000. B H. Fraser, Rea Bldg., engr.

Road and Fuel Oil—Ottawa, Ont.—Bd. Control receiving bids on 120,000 Imp. gal. roads oil and 20,000 Imp. gal. fuel oil. About $40,000. A. F. Macallum, city engr.

Roofing—Toronto, Ont.—City receiving bids building 40,000 sq.ft. copper or tile roof on city hall. About $35,000. A. Price, city archt.

RESERVOIR, PUMPING STATION, ETC.—PERTH AMBOY, N. J.

Bids were received by city, April 7th, for the construction of a reservoir, pumping station, pipe lines, etc., from (A) Snare & Triest Co., 8 West 40th St., New York City (awarded contract); (B) Ira R. Crouse, 495 State St., Perth Amboy; (C) John L. Lee, 4260 Broadway, New York City; (D) J. L. Sigretto & Co., 1455 Woodhaven, N. Y., $1,205,746. The unit bids of the lowest 3 bidders were as follows:

	A	B	C
90,000 cu.yd. earthwork	$1.90	$25.00	$1.89
20,400 cu.yd. concrete	19.80	25.00	16.10
117,000 bags Portland cement	80	65	.95
1,200 tons reinforcing steel	07½	07	.07½
2,240 lin.ft. 4-in. B. & S. pipe	2.40	1.60	2.80
300 lin.ft. 6-in. B. & S. pipe	3.30	2.18	3.50
1,900 lin.ft. 8-in. B. & S. pipe	4.20	2.82	4.40
700 lin.ft. 10-in. B. & S. pipe	5.00	3.69	5.95
2,500 lin.ft. 16-in. B. & S. pipe	9.00	6.52	10.10
6,100 lin.ft. 24-in. B. & S., class A	13.00	9.94	16.90
60 lin.ft. 24-in. B. & S., class D	18.00	14.55	22.65
1,850 lin.ft. 30-in. B. & S., class A	18.00	14.87	23.60
72 lin.ft. 30-in. B. & S., class D	25.00	21.90	31.50
2 tons flanged pipe	300.00	298.00	300.00
1 4-in. valve, hub end	50.00	17.30	28.00
2 6-in. valves	60.00	33.00	56.00
2 8-in. valves	85.00	55.00	75.00
1 10-in. valve	110.00	82.50	110.00
1 16-in. valve	220.00	187.00	250.00
5 24-in. valves	550.00	455.00	625.00
2 24-in. valves, flanged ends	650.00	565.00	850.00
1 30-in. valve	1,250.00	1,040.00	1,500.00
1 shear gate	75.00	49.00	55.00
2 hydrants	85.00	72.00	90.00
3,500 lb. manhole heads, etc	.15	.10	.30
5 air vents	50.00	9.50	40.00
980 lin.ft. 8-in. underdrains	1.00	.50	1.00
11,200 lin.ft. 4-in. underdrains	.50	.25	.60
1,400 lin.ft. 36-in. concrete drain	9.50	6.50	30.00
540 lin.ft. 27-in. concrete drain	7.50	5.45	30.00
1 bar screen	220.00	38.00	25.00
2,500 sq.ft. waterproofing fabric	.22	13½	.30
3,000 lb. asphalt cement	20	11½	30
630 sq.yd. gravel roadbed	2.00	3.50	3.50
95 sq.yd. brick gutter paving	6.00	4.70	5.00
Boat house (lump sum)	4,200.00	3,133.00	8,000.00
Pumping station (lump sum)	4,000.00	3,523.00	12,500.00
1 depth gage (lump sum)	350.00	300.00	376.00
4,900 lin.ft. fence	3.50	3.35	3.00
40M. ft.b.m. lumber	90.00	80.00	250.00
8 acres seeding	150.00	100.00	360.00
Extended totals	$1,095,566	$1,125,173	$1,152,735

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Seawall, etc.—Boston, Mass.—City received only bid building concrete seawall, platform and necessary dredging in Roxbury Canal, on Albany St., from W. S. Rendle, 364 Border St., East Boston, $200,743.

Station Finish—Brooklyn, N. Y.—J. H. Delaney, comr. Transit Constr., 49 Lafayette St., New York City, received lowest 3 bids April 22, for station finish for part of Eastern Parkway Rapid Transit R. R., here, from H. H. Ures, 525 East 26th St., $535,000; P. J. Carlin, 1125 Bway., $600,000; A. W. King, 1511 Bryant Ave., $601,979. Contractors all of New York City. Noted April 8.

★Heating and Ventilating Apparatus—Brooklyn, N. Y.—Bd. Educ., 500 Park Ave., New York City, let contract installing in P. S. 182, here, to D. J. Rice, 405 Lexington Ave., New York City, $153,380.

Lumber—New York, N. Y.—Bd. Purchase, Municipal Bldg., received lowest 3 bids, April 20, furnishing in various departments, from East River Mill & Lumber Co., 92nu St. and East River, $38,412, G. Elias & Bro., $40,675, J. A. Maloney & Co, 1182 Bway., $72,689.

★Transformer Station—New York, N. Y.—New York Edison Co., Irving Pl. and 15th St., let contract building 113 x 177 ft., rein.-con. and steel transformer station, rein.-con. flooring, concrete foundation, on Inwood Ave., to Northeastern Constr. Co., 101 Park Ave. About $100,000.

Tractor, etc.—St. George, S. I. N. Y.—C. D. Van Name, pres. Richmond Boro., received bids April 19, furnishing and delivering, (a) tractor, (b) 5 ton motor truck, (c) 2½ ton motor truck, (d) Sedan automobile, from G. B. Hall, 320 Clove Rd., West Brighton, (a) $3,400, (b) $5,350, (c) $3,175; Richmond Garage, 163 Richmond Ave., West Brighton, (b) $5,193; (c) $3,916, (d) $1,685; White Co., Madison Ave. and 45th St., New York City, (a) $4,075, (b) $5,177, (c) $4,765. Noted April 15.

★Piers—Stapleton, S. I., N. Y.—M. Hurlburt, comr. docks, Pier "A," foot of Battery Pl., New York City, received bids April 22, furnishing labor and material building (a) Pier 17, (b) Pier 18, here, from B. S. Cronin, 573 Clinton St., Brooklyn, (a) $680,071, (b) $755,000; Phoenix Constr. Co., 41 Park Row, New York City, (a) $699,490, (b) $741,897; Smith, Hauser & MacIsaac, 18 East 41st St., New York City, (a and b) $1,479,046. Noted April 15.

★Sea Wall—Monmouth Beach, N. J. (Long Branch P. O.)—Bd. Freeholders Monmouth Co. let contract building sea wall, here, to T. Proctor, Long Branch, $75,996.

★Bulkhead—Baltimore, Md.—Consolidated Gas, Electric Light & Power Co., Lexington Bldg., will build timber and stone bulkhead, 1,330 ft. long, 400 ft. deep, extending in Patapsco River from foot of Fort Ave. to point near Warner St. Work will be done by day labor.

★Street Flushers, Road Scrapers and Motor Tractors—Cleveland, O.—City let contract furnishing 2 motor street flushers, to A. L. Englander Motor Co., Euclid Ave., $18,663; 3 Galion road scrapers, to Day & Maddock Co., Cleveland, $1,500; 5 caterpillar motor tractors, to J. T. Tractor Co., Bangor Bldg., $14,000. Noted March 11.

★Trucks—Cleveland, O.—City let contract furnishing two 3½ ton trucks with hydraulic hoist, to Tiffin Wagon Co., Tiffin, $9,157; seven 2 ton trucks with hydraulic hoist and steel dump bodies, to Reynold Motor & Tractor Co., Cleveland, $24,470.

★Street Lighting Equipment—Milwaukee, Wis.—Dept. Pub. Wks. let contract furnishing and installing street lighting equipment, to W. F. Cummings Co., 330 South Paulina St., Chicago, $320,000. Noted April 15.

Portland Cement—San Diego, Cal.—E. D. Williams, purch. agt., received bids furnishing 25,000 bbl. portland cement for use in building Barrett Dam, from Spreckles Bros. Commercial Co., San Diego, $2.65 per bbl. f.o.b. factory. Crestmore; California Portland Cement Co., Douglas Bldg., Los Angeles, $2.65 f.o.b. Colton; J. S. Schirm Commercial Co., 268 4th St., San Diego, $2.593, f.o.b. Victorville. Each bid is subject to $0.05 per. bbl. discount if invoice is paid within 10 days. Noted April 1.

Aqueduct Tunnels—San Francisco, Cal.—Bd. Pub. Wks. received bids April 21 building 18 mi. aqueduct tunnels for Hetch Hetchy Dam, from Constr. Co. of North Amer., $7,292,900, also $82 per ft.; R. C. Storrie Co., Crocker Bldg., $8,798,000, also $90 per ft.; Utah Constr. Co., McIntyre Bldg., Salt Lake City, $150 per ft.; Healy Tibbits Co., 9 Main St., $178 per ft. Noted March 25.

★Valves—San Francisco, Cal.—Bd. Pub. Wks. let contract furnishing six 3 ft. balanced valves for outlet system of Hetch Hetchy Dam, to W. Cramp & Sons, Richmond and Norris Sts., Phila., $98,500 plus $15 per day for foreman's services.

OFFICIAL PROPOSALS

The publication of an advertisement on this page is an official notice that bids are wanted from other than local bidders.

It is also a guarantee that maximum competition is invited because Engineering News-Record is the *one* nationally recognized medium for Proposal advertising. Its Searchlight Section is read each week by nearly every worth-while contractor in this country who bids on public work outside his own city.

Official Proposals reaching our office in first mail Wednesday morning (9 o'clock) can usually be published in the issue out the next day. Special price for Official Proposals, $3.60 an inch.

Bids: May 11, 18, 25.

Column Foundations, Steel Superstructure, Station Platforms and Buildings, Plumbing and Electrical Work for the Frankford Elevated Railway.

DEPARTMENT OF CITY TRANSIT,
CITY OF PHILADELPHIA
11th Floor, 1211 Chestnut Street
Philadelphia, Pa.

Sealed proposals, addressed to the undersigned at the office above mentioned, will be received until 12 o'clock noon on Tuesday, May 11, 1920, for Column Foundations, Contract 505; Steel Superstructure, Contract 508; and Station Buildings, Contracts 556, 558 and 559; and on Tuesday, May 18, 1920, for Station Platforms, Contract 571; and Station Buildings, Contracts 557 and 576; and on Tuesday, May 25, 1920, for Plumbing Work, Contract 578, and Electrical Work, Contract 579; and opened immediately thereafter. Authorized by Ordinances of Councils Approved July 20, 1916, and March 6, 1917.

Contract 505.—Construction of 47 Column Foundations of concrete in Front Street near Arch Street, and in Frankfort Avenue between Dyre and Bridge Streets, and the demolition of certain buildings at Front and Arch Streets.

Contract 508.—Steel Superstructure in Front Street near Arch Street and in Frankfort enue between Dyre and Bridge Streets, comprising about 1,112 linear feet of structure.

Contract 571.—Station Platforms and shelters on Kensington Avenue at Huntingdon Street, Tioga Street, and Torresdale Avenue, including steel framework and railing, reinforced concrete platform floors, glazed steel sash side enclosures, shelter roofs of wood and slag or of asbestos lumber, copper flashings, gutters and cornices, galvanized pipe down spouts and appurtenant work.

Contract 556.—Station Buildings of stone, terra-cotta, brick, steel and reinforced concrete at the southeast corner of Kensington Avenue and Tioga Street, and at the northwest corner of Tioga and "K" Streets, including the removal of the existing building at Tioga and "K" Streets.

Contract 558.—Station Buildings of brick, steel, and reinforced concrete at the southeast corner of Kensington Avenue and Huntingdon Street and at the corner of Kensington Avenue and "B" Street, including the removal of the existing buildings.

Contract 559.—Covers both contracts 556 and 558—all four (4) buildings grouped into one contract.

Contract 557.—Station Buildings of brick, steel, and reinforced concrete at the southeast and northwest corners of Kensington Avenue and Torresdale Avenue.

Contract 576.—Station Building of stone, terra-cotta, brick, steel and reinforced concrete at the northeast corner of Frankford Avenue and Pratt Street.

Contract 578.—Plumbing Work for the Station Buildings at the southeast corner of Kensington Avenue and Huntingdon Street, the corner of Kensington Avenue and "B" Street, the southeast corner of Kensington Avenue and Tioga Street, the northwest corner of Tioga and "K" Streets, the southeast and northwest corners of Kensington and Torresdale Avenues and at the northeast corner of Frankford Avenue and Pratt Street.

Contract 579.—Electrical Work for the Station Buildings at the southeast corner of Kensington Avenue and Huntingdon Street, the corner of Kensington Avenue and "B" Street, the southeast corner of Kensington Avenue and Tioga Street, the northwest corner of Tioga and "K" Streets, the southeast and northwest corners of Kensington and Torresdale Avenues and at the northeast corner of Frankford Avenue and Pratt Street.

For the buildings at Tioga Street and at Huntingdon Street, Contracts 556, 558 and 559, a guaranteed survey of quantities is furnished to bidders.

Plans and specifications can be seen at 1211 Chestnut Street, twelfth floor, and copies of same, with blank forms for proposal will be supplied to intending bidders. A deposit of ten (10) dollars will be required for the plans for each contract, and on their return it will be refunded.

Bidders must be skilled and regularly engaged in the class of work bid for.

Contractors will be required to comply with the Act of Assembly of July 18, 1917, relative to Workmen's Compensation Insurance, and proof must be furnished the Department by each Contractor that he has accepted the provisions of said Act and insured his liability thereunder, or secured exemption therefrom.

For each bid a proposal bond in the sum of five hundred (500) dollars must be filed in the Law Department, Room 464, City Hall, in accordance with the Ordinance of May 25, 1860, the certificate of such filing to be enclosed with the bid.

The Director reserves the right to reject any or all bids as he may deem best for the interest of the City of Philadelphia.

WILLIAM S. TWINING,
April 19, 1920. Director.

Bids: May 10.

Furnishing Labor and Material

Columbus, Ohio.

Sealed proposals will be received by Stribling & Lum, Architects, 85 N. High Street, Columbus, Ohio, until noon, May 10, 1920, for furnishing labor and material necessary to enclose the King Avenue M. E. Church, 130 x 140 ft. fireproof.

Plans may be obtained from architects upon deposit of $10.

JOHN F. FERGUS,
Chairman Building Committee.

Bids: May 5 and 11.

Road Construction

STATE HIGHWAY COMMISSION
Augusta, Me.

Sealed proposals addressed to the State Highway Commission, Augusta, Maine, for building four (4) sections of state highway in the cities of Westbrook, 3.92 miles, Belfast, 2.54 miles, and the towns of Newport, 4.71 miles, Perry and Pembroke, 5.18 miles, will be received until Wednesday, May 5th, at eleven o'clock, a.m.; and for building five (5) sections of road in Falmouth and Cumberland, 7.24 miles, Gray, 7.08 miles, Wilton and Farmington, 6.63 miles, Sherman and Crystal, 5.87 miles, Island Falls and Dyer Brook, 3.69 miles, until Tuesday, May 11th, at eleven o'clock a.m., each endorsed with the name of the town, and at that time and place publicly opened and read.

The sections in Westbrook, Belfast and Newport will be built of bituminous macadam; Falmouth, Cumberland and Gray of cement concrete or bituminous macadam; Perry, Pembroke, Wilton, Farmington, Sherman, Crystal, Island Falls and Dyer Brook of gravel.

Each proposal must be made upon a blank form provided by the Commission, for copy of which one dollar will be required, and must be accompanied by a certified check for 10% of the amount bid, payable to the Treasurer of State of Maine. The certified check will be returned to the unsuccessful bidder unless forfeited under the conditions stipulated.

A surety company bond satisfactory to the Commission, of not less than one-fourth nor more than one-half of the amount of the contract, will be required. Plans may be examined and copy of specifications and contract may be obtained at the office of the Commission, Augusta, Maine.

The right is reserved to reject any or all proposals.

WILLIAM M. AYER, Chairman.
PHILIP J. DEERING,
FRANK A. PEABODY,
State Highway Commission.
PAUL D. SARGENT Chief Engineer.
Dated at Augusta, Maine, April 13, 1920.

Bids: May 17.

Concrete Bridge Construction

Elmira, N. Y.

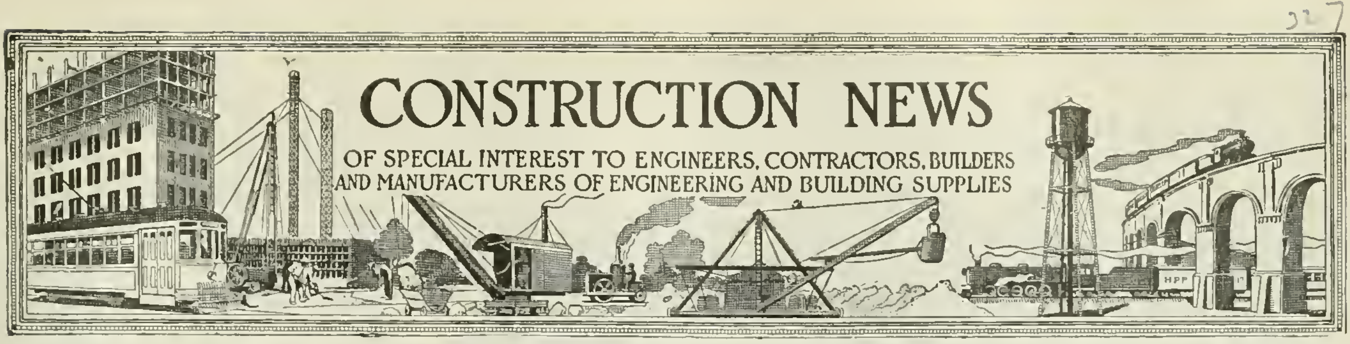
Sealed proposals for the construction of a reinforced concrete bridge about 830 feet long and 56 feet wide over all, over the Chemung River at Main Street in the City of Elmira, N. Y., will be received by the Board of Public Works of Elmira, N. Y., at the office of the City Clerk in the City Hall, until 11 o'clock a.m., Monday, May 17, 1920, and opened at that time.

Bids must be made upon proposal blanks attached to the specifications and must be accompanied by a certified check for $20,000 made payable without reservations to the order of the Mayor of the City of Elmira, N. Y.

Plans and specifications may be seen at the office of the City Engineer in the City Hall and at the office of the *Engineering News-Record*, in New oYrk City.

The right to reject any or all bids is reserved by the Board.

HARRY MOSESON,
Clerk of the Board of Public Works.
April 19, 1920.



CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

UPS AND DOWNS OF THE MARKET

PIG IRON—Lowered production and expensive coke have raised the price of pig iron from one to two dollars per ton.

RAILWAY MATERIALS—The prices quoted for ties are the ones that prevailed during Government operation, and are practically in effect now, except that some Eastern lines have paid as high as 80 per cent premium, thus unsettling the market.

PIPE—It is reported that the mills are sold up on iron and steel pipe; also, that two large mills in the Youngstown district are shut down, owing to the railway strike. Cast iron pipe has advanced, this time $4 per ton, making the increase over May, 1914, just 372 per cent for New York. Sewer pipe up in Boston, Cincinnati, Baltimore and Detroit.

CONCRETING MATERIALS—Cement appears to be commencing a general rise. While a number of cities in the West and Middle West have not reported increases, prices in Eastern cities have advanced from 20c. to 60c. per bbl. Sand and gravel remain stationary, but crushed stone advanced in six cities. New York producers state that they are sold up on gravel for the remainder of the year. The production of sand in New York is six against one of gravel; sand is $1.50 per cu yd.; gravel is quoted nominally at $2.50 per cu.yd., which is a 25c. advance over last month's quotation. Gravel advanced 15c. in Chicago, and 20c. in Cincinnati. Crushed slag is up 20c. at Easton, Pa. Slag is quoted at Toledo this month. Hydrated lime advanced $3 per ton in St. Louis, and about $1.50 in Baltimore. In not more than a week, both hydrated and lump lime will advance in New York; the new prices are given in the tabulation.

REINFORCING MATERIALS—The situation is practically unchanged, and the same flexible quotations are given. Expanded metal lath advanced $2 per ton in St. Louis. Stocks generally scarce.

COMMON BRICK—Up in New Orleans, Kansas City, Cincinnati, Baltimore and Detroit.

HOLLOW TILE—Up in Los Angeles and Detroit. Cincinnati is again quoting.

STRUCTURAL MATERIAL—The Carnegie Steel Co. price on plain material, up to 15-in., is still $2.45, but another concern in the district quotes $3.10 to $3.25 to regular customers and for indefinite delivery another producer quotes $4, Pittsburgh. Hence our quotations are given as these limits, $2.45@$4, mill. Plate mills are on 50 per cent operation owing to the railway strike. Prices of ¼-in. and heavier range from $3.50@$4 for 3@4 months delivery.

STEEL SHEETS—Advances in New York, St. Louis and Chicago. Shortage on practically all gages. The American Sheet & Tin Plate Co. plants were running on 15 per cent capacity last week. There are heavy stocks at all the mills, but railway movements are few.

LUMBER—The yellow pine market was quiet during April, with demand falling off and prices adjusting downward. Production was close to normal, but rail shipments were next to impossible. In the fir industry many cancellations of orders are reported, with unsteadying results. Very high prices prevail in Kansas City, where pine is $123.50 against $115.25 last month. Quotations have been withdrawn in Detroit, although the tendency is downward. There are no changes in Chicago or St. Louis, but New York shows decreases of from $2 to $10.

LABOR—Advances in Detroit, Kansas City, Los Angeles, Montreal, New Orleans, New York and St. Louis.

Price advances are indicated by **heavy type**; declines by *italics*

PIG IRON—Quotations compiled by The Matthew Addy Co.:

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	**$45 60**	$44 60
Northern Basic	42.80	42.80
Southern Ohio No. 2	**46 80**	43.80
NEW YORK, tidewater delivery		
2X Virginia (silicon 2.25 to 2.75)	**49 65**	47.65
Southern No. 2 (silicon 2.25 to 2.75)	**49.70**	47.70
BIRMINGHAM		
No. 2 Foundry	**42.00**	41 00
PHILADELPHIA		
Eastern Pa	45.35-45.65*	45.35-45 65*
Virginia No. 2	43 25*	43.25*
Basic	**44 50†**	43.00†
Grey Forge	**43 50***	42.50*
CHICAGO		
No. 2 Foundry Local	**44 25**	43.00
No. 2 Foundry Southern	**47.00**	46.60
PITTSBURGH, including freight charge from the Valley		
No. 2 Foundry Valley	**45 65**	43.65
Basic	**44 40**	42.90
Bessemer	**44.90**	43.40
MONTREAL		
Silicon 2.25 to 2.75%	43 25	43 25

* F. o. b. furnace. † Delivered.

RAILWAY SUPPLIES

STEEL RAILS—The following quotations are per ton f. o. b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Current	One Year Ago	Current	One Year Ago
Standard bessemer rails	$45 00 @$60 00	$45.00	$45.00@$55 00	$45 00
Standard openhearth rails	47.00 @ 60.00	47.00	47.00@ 57.00	47.00
Light rails, 8 to 10 lb.	2.58½*@ 3.75	2.585*	2.585*@3.75	2 835*
Light rails, 12 to 14 lb.	2.54* @ 3.75	2 54*	2.54* @3.75	2 79*
Light rails, 25 to 45 lb.	2.45* @ 3.75	2 45*	2.45* @3.75	2 70*

* Per 100 lb.

Note.—The lower price is that of the U. S. Steel Corp. but the market is mostly speculative and higher prices prevail.

RAILWAY TIES—For fair-sized orders, the following prices per tie hold:

		7 In. x 9 In. by 8 Ft. 6 In.	6 In- x 8 In. by 8 Ft.
Chicago	Plain	$1.48	$1.33
San Francisco	Douglas Fir—Green	1.74	1 24
San Francisco	Douglas Fir—Creosoted	3.36	2.38

Prices per tie at Missouri mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0 70	No. 1	$0.55
No. 2	.80	No. 2	65
No. 3	.90	No. 3	.75
No. 4	.98		
7x9x8 white oak			1.05
7x9x8 red oak (No. 4)	$0.80	No. 5	.87

Note.—Add 36c. each for treatment.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard spikes, $\frac{9}{16}$-in. and larger	**$4 00**	$3 25	$3.62	**$5 34**	$5 65
Track bolts	**6 00@6 50**	4.90	4.62	Premium	6 65
Standard section angle bars	**3.00@4 00**	3 00	3 02	Premium	**4 90**

PIPE

STEEL AND IRON—The following discounts are to jobbers for carload lots on the Pittsburgh basing card, discounts on steel pipe, applying as from January 14, 1920, and on iron pipe from January 7, 1920:

Inches	Black	Galv.	Inches	Black	Galv.
BUTT WELD					
⅛, ¼ and ⅜	47	20½	¼ and ⅜	1	+25
½	51	36½	⅜	25½	+ 1½
¾ to 3	54	41½	½	29½	11½
			¾ to 1½	34½	18½
			2 and 2½	33½	17½
LAP WELD					
2	47	34½	1¼	24½	9½
2½ to 6	50	37½	1½	31½	17½
7 to 12	47	33½	2	28½	14½
13 and 14	37½	...	2½ to 6	30½	17½
1.	35		7 to 12	27½	14½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
⅛, ¼ and ⅜	43	25½	¼	+7	+40
½	48	35½	⅜	23½	6½
¾ to 1½	52	39½	½	28½	15½
2 to 3	53	40½	¾ to 1½	34½	19½
			2 and 2½	34½	19½
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	45	33½	1¼	21½	6½
2½ to 4	48	36½	1½	27½	13½
4½ to 6	47	35½	2	20½	16½
7 to 8	43	29½	2½ to 4	31½	19½
9 to 12	38	24½	4½ to 6	30½	18½
			7 to 8	22½	10½
			9 to 12	17½	5½

STEEL—From warehouses at the places named the following discounts hold for steel pipe:

	Black New York	Black Chicago	Black St. Louis
¾ to 3 in. butt welded	47%	54%	45%
2½ to 6 in. lap welded	42%	50%	41½%

	Galvanized New York	Galvanized Chicago	Galvanized St. Louis
¾ to 3 in. butt welded	31%	40½%	30½%
2½ to 6 in. lap welded	27%	37½%	27½%

Malleable fittings, Class B and C, from New York stock sell at + 23% list prices. Cast iron, standard sizes, net.

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York Current	New York One Month Ago	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
4 in.	**$79 30**	$75 30	$60.70	**$78 80**	**$78 00**	$93 55	**$74.30**
6 in. and over	**76.30**	72.30	57.70	**75 80**	**75 00**	90.55	**71 30**

Gas pipe and 16-ft. lengths are $2 per ton extra.

CLAY DRAIN TILE—The following prices are per 1000 lin.ft.:

Size, In.	New York Current	New York One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$35.00	$35.00	$22 50	$60 00	..	$33.44
4	51.00	51.00	27.00	80 00	$45.00	50.16
5	65.00	65.00	45.00	100 00	65.00	62.70
6	90 00	90 00	55 00	120 00	90 00	83.60
8	130.00	130.00	100.00	180 00	150.00	133.76

SEWER PIPE—The following prices are in cents per foot for carload lots:

Size, In.	New York Current Delivered	New York Year Ago Not Del.	St. Louis	Chicago	San Francisco	Dallas
3	$0 19	$0.09	..	$0 15		$0.175
4	19	09	.	15	$0 16	175
5	29	.135		225	20	245
6	29	135	$0 16	225	24	245
8	45	21	.21	35	34	35
10	67	315	.29	525	47	
12	86	405	37	625	64	63
15	1 30	54	56	90	1 00	
18	1 88	75	91	1 25	1 35	
20	2.25	90	1.14	1 50	1 80	
22	3 00	1 20	1.46	2 00		
24	8 38	1 485	1.56	2.25	2.24	3 10
27	..	2.145	1.90	3.50	.....	
30	....	2.376	2.57	4 00	......	
33	....	3.15	3.09	4 75	......	..
36	...	3.5875	3.37	5 50	....	5 60

	3	5	8	12	24	36
Boston	**$0 144**	**$0 216**	**$0.336**	**$0.648**	**$2 70**	**$5 31**
Minneapolis	125	167	.295	495	1 87	4 37
Denver	.....	.. ..	29	50	1 75	
Seattle	. .		**3850**	68	.	2 375
Kansas City	No prices obtainable					
Los Angeles	.0975*	.1525*	27	48	60*	..
New Orleans	45 per cent off				List	
Cincinnati	53 per cent off					38%
Atlanta	.....		34	55	2 00	
Montreal			..55 per cent. off			
Detroit			52 per cent. off		46%	42%
Baltimore	**177**	**2655**	**413**	**7965**	**2 655**	

* 4-in., 6-in., 30-in respectively.

ROAD AND PAVING MATERIALS

ROAD OILS—Following are prices per gallon in tank cars 8000 gal. minimum f.o.b. place named:

	Current	One Month Ago
New York, 45–65% asphalt (at terminal)	**$0.13**	$0.115
New York, liquid asphalt... (" ")	**13**	.115
New York, binder (" ")	**.13½**	.115
New York, flux (" ")	**.14**	.12
St. Louis, 40% asphalt	**.10**	.065
Chicago, 40-50% asphalt	.08	.08
Chicago, 60-70% asphalt	.08½	.085
Dallas, 40–50% asphalt	.07	.07
Dallas, 60–70% asphalt	.08	.08
Dallas, 75–90% asphalt	.10	.10
San Francisco, asphalt base, 42 gal. per bbl.	2.25	2.25

ASPHALTUM—Price per ton in packages (350-lb. bbls. or 425-lb. drums), and in bulk in carload lots:

	Package	Bulk
New York	**$40.00**	**$35.00**
Chicago	30.90	23.40
San Francisco	17.00	13.75
Dallas	35.00	31 00
Seattle	25.00	
Denver	40.00	36 00
St. Paul	24.00	21.00
Kansas City	**38 00**	**27.00**
Atlanta	25.00	20.80
New Orleans	16 50	...
St. Louis	**29 40**	**23.90**
Baltimore	43.00	.....
Los Angeles	21.15	.....
Montreal	..	19.60
Detroit	49.00	42.25

PAVING STONE—

New York	5-in. granite	$130.00	per M
Chicago	About 4x8x4 dressed	3.10	sq.yd.
	About 4x8x4 common	2.80	sq yd.
San Francisco	Basalt block 4x7x8	65.00	per M
Kansas City	Granite	**3 50**	sq.yd.
Boston	5-in. granite	110.00	per M
St. Paul	Sandstone	2.47	sq.yd.
Atlanta	Granite	2.00	sq.yd.
Detroit	Granite, 26½ blocks per sq. yd.	2.85	sq.yd.
Baltimore	Common	**2.40**	sq yd.
Montreal	Granite	5.90	sq yd.

FLAGGING—

New York	Bronx	$0.24	sq.ft.
	Manhattan	.25	sq.ft.
	Queens, 5 ft.	.25	sq.ft.
	6x20-in. cross-walk	.80	lin.ft.
Chicago	18 in. wide	.70	lin.ft.

WOOD BLOCK PAVING—	Size of Block	Treatment	Per Sq.Yd.
New York	3½	16	$3 75
New York	4	16	4.10
Chicago	4	16	4.50
Chicago	3½	16	3.50
Chicago	City specifications		5.00
St. Louis	3½	16	2.90
St. Louis	4	16	3.32
Seattle	4	16	Off market
Kansas City	4	16	3 00
Minneapolis	3½		2 75
Atlanta	3½	16	2 30
New Orleans	3½	16	2 63
New Orleans	4	16	3 00
Dallas	4	18	3.57
Baltimore	3½	16	3.60
Montreal	4	16	4.60

CONSTRUCTION MATERIALS

SAND AND GRAVEL—Price for cargo or carload lots is as follows, per cu yd.:

	Gravel 1½ In. Current	Gravel 1½ In. One Yr. Ago	Gravel ¾ In. Current	Gravel ¾ In. One Yr. Ago	Sand Current	Sand One Yr. Ago
New York	**$2 50**	$2.00	**$2 50**	$2 00	**$1 50**	$1.25
Denver	1 80	1 60	1 80	1 60	1 40	1.10
Chicago	**2 15**	2 00	**2 15**	1 40	**2 15**	1.10
Kansas City	3 25	2 50	3.75	3 00	1 25	1.00
St Louis	1 78	1 76	1 82	1 82	1.68	1.68‡
Seattle, per ton	1 25	1 25	1 25	1 25	1.25	1.25
Dallas	2 50	2 25	2 50	2.25	2.00	1.35
Minneapolis	1 50	1 25	1 35	1.35	75	.60
Cincinnati		1 35‡	1 55		**1.50**	1.35‡
San Francisco	1 50	1 15	1 50	1 15	1 50	1 15
Boston	2 85	1 65‡	2 85	1 75‡	2 00	1 00
New Orleans	3 00	2 75		2 75	1.40	1 50
Los Angeles	1 25	1.02	1.25	1 02	**1.15**	70
Atlanta, per ton	2 25	2 40	2.25	2 40	1 15	75
Detroit	2 50		2 00		1 85	
Baltimore	1 40‡		1 60‡		**80**	
Montreal, per ton	1 15				1 40	

* Fine white sand, Pacific and Ottawa, per ton $6.

† Kaw River sand is $1 75 per yd ‡ per ton

CRUSHED STONE—Price for cargo or carload lots is as follows, per cu.yd.:

	1½ In.		¾ In.	
	Current	One Year Ago	Current	One Year Ago
New York	**$1.90@2 00**	$1.65@1 75	**$2 15**	$1.75@1 85
Chicago	**2.15**	1.60	2 15	1 70
St. Louis	**1.90**	1.35	**1.90**	1 35
Dallas	3.50	2.25	3.50	2.25
San Francisco	1.50	1.15	1.50	1 15
Boston	3.00*(del)	3.00	3.00 (del)	3.00
Minneapolis	1.50†	1.15	1.60	1 25
Denver	3.75	1.60	3.75	1 60
Kansas City	**2.35**	1.70	**2 50**	1 80
Seattle (Del.)	3.50	1 50	3.50	1 50
Cincinnati			1 65	
Atlanta	3.10*	2.35	....	2 60
New Orleans	4.00		4.35	1 28
Los Angeles	1.60*	1 12	1 70*	1 12
Detroit	1.75	....	1.75	....
Baltimore	1.50*	....	1.50*	....
Montreal	2.00*	....	2.00*	....

* Per ton. † Limestone; traprock, $1.60 and $1.80 per ton for 1½ and ¾-in.

CRUSHED SLAG—Price of crushed slag per net ton in carload lots:

	1½-In.	¾-In.	Roofing	Sand
Lebanon or Bethlehem, Pa	$1 00	$1 00	$2 50	$0 90
Easton, Pa	**1 20**	**1.20**	**3 00**	**1 10**
Buffalo, N. Y	1 25	1.00	2.00	1.00
East Canaan, Conn	1 25	1.35	3.50	1 10
Birmingham, Ala	1 25	1 25	. .	1 00
Toledo, Ohio	1 50	1.50	.....	....

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 200-Lb. Barrel	
	Finished	Common	Finished	Common
New York	**$19.50**	**$18.50**	$3 50*-at plant-	$3.30*
Kansas City	26.00	25.00	2.50	2 40
Chicago	. .	..	**2.40**	**1.75**
St. Louis	**25.00**	**21 00**	.	**2 25**
Boston	24.00	21.00	4.30*	4 05*
Dallas	.	25 00	......	2 50†
Cincinnati	17.20	16.20	......	13 20‡
San Francisco	20.00	16.00	.....	2.25
St. Paul	24.00	19 00	1.60†	1.50†
Detroit	27.20	.....	2.85†	1.80*
Seattle	30.00	.....	.. .	*1.85*†
Los Angeles	2 75†	2 20†	2.75†	2.00†
Baltimore	**22 35**	**18 00**	....	**12 00**‡
Montreal	25 00	25.00	15.00‡	15.00‡
Atlanta	22.50	.....	.....	.....
New Orleans	.....	.....	.....	**2.50**

* 300-lb. barrels. †Per 180-lb. barrel. ‡ Per ton.

NOTE—Refund of 10c. per barrel with 25c per ton off on hydrated

NATURAL CEMENT—Price to dealers for 500 bbl. or over, f. o. b., exclusive of bags:

	Current	One Year Ago
Minneapolis (Austin)	$1.50	$1.55
Kansas City (Ft. Scott)	*1.60*	1.[illegible]
New Orleans	3.36	2.52
Atlanta (Magnolia)	1.90	....
Cincinnati (Louisville)	**2.85**	1.50

PORTLAND CEMENT—Current prices are for barrels in carload lots, *without* bags, to contractors:

	Current Without Bags	One Month Ago	One Year Ago With Bags
New York (del.)	**$3.[illegible]0**	$2.80	$2.59
Jersey City (del.)	**2.[illegible]7**	2.47	2.50
Boston	**2.62**	2.42	2.81
Chicago	2.00	2.00	2.36
Pittsburgh	2.05	2.05	2.46
Cleveland	2.32	2.32	2.59
Detroit	**2.35**	2.08	2.55
Indianapolis	2.27	2.27	2.59
Toledo	2.12	2.12	2.59
Milwaukee	2.11	2.11	2.48
Duluth	2.10	2.10	2 51
Peoria	2.12	2.12	2.48
Cedar Rapids	2.18	2.18	2.60
Davenport	2.14	2.14	2.55
St. Louis	**2.80**	2.20	2.60
San Francisco	2.63	2.63	2.80
New Orleans	**2 96**	2.36	3.10
Minneapolis	2.22	2.22	2.68
Denver	2.82	2.82	3.40
Kansas City	**2.56**	2.36	2.59
Seattle	**3.03**	2.78	3.75
Dallas	2.15	2.15	2.60
Atlanta	2.70	2.70	3.00
Cincinnati	*2.90*	3.00	
Los Angeles	**3.10**	2.78	2.30
Baltimore (del)	**3 85**	2 90	.....
Montreal (including bags)	3 48†	**3 48**†	....

NOTE—Bag charge is generally 15c. each. *Delivered Manhattan, The Bronx or Brooklyn. †Including bags.

TRIANGLE MESH—Price per 100 sq.ft. in carload lots:

PLAIN 4-INCH by 4-INCH MESH

Style Number	Sectional Area Square Inches per Ft. Width	Pittsburgh	New York	Chicago	St. Louis	Dallas	San Francisco
032	0.032	$0.92	$1 16	$0.98	$0.99	$1.13	$1.32
049	0.049	1.18	1.48	1.26	1.26	1.43	1.67
068	0.068	1.44	1.86	1.53	1.56	1.79	2.06
093	0.093	1.85	2.39	1.97	2 00	2.41	2.65
126	0.126	2.28	3.02	2.43	2.47	2.92	3.28
153	0.153	2.72	3.59	2.90	2.95	3.48	3.93
180	0.180	3.12	4.13	3.33	3.39	3.99	.....
245	0.245	4.12	5.44	4.40	4.47	5.27	....
287	0.287	4.76	6.29	5.08	5.16	6.10	6.86
336	0.336	5.52	7.30	5 89	5.99	7.06	.....
395	0.395	6.40	8.45	6.83	6.94	8.19	.....

PAVING

Style Number	Sectional Area Square Inches per Ft. Width	Pittsburgh	New York	Chicago	St. Louis	Dallas	San Francisco
036P	0.036	$0.71	$0.92	$0.76	$1.77	$0.80	.....
053P	0.053	1.00	1.28	1.06	1.08	1.12	...
072P	0.072	1.26	1.66	1.34	1.37	1.46	..
097P	0.097	1.62	2.12	1.73	1.76	1.88	.....
049R	0.049	1.00	1.28	1.06	1.08	1.12	.....
067R	0.067	1.26	1.65	1.34	1.37	1.46	.....
089R	0.089	1.62	3.11	1.73	1.76	1.88	.....

Made in 16-, 20-, 24-, 28-, 32-, 36-, 40-, 44-, 48-, 52- and 56-in. width in rolls 150-, 200- and 300-ft. lengths. Galvanized is about 10% higher.

EXPANDED METAL LATH—Prices in carload lots per 100 yd. for painted are as follows:

		New York Current					
Gage	Weight	Carloads	Less Carloads	Chicago	St. Louis	San Francisco	Dallas
27	233	$32.10	$32.20*	$33.60†	**$35.00**	$36.00	$32 75
26	250	33.45	33.65*	35 20†	**36.00**	.	34.50
25	300	34.90	35.00*	36.90†	......	39.00	36.75
24	340	36.50	36.65*	40.00†	**39.00**	44.00	39.25
22	450	39.60	39.80*	45 10†	.....	......	43 30

* Delivered on job.

†Galvanized is $8 per 100 yd., additional

BARS, CONCRETE REINFORCING—Following quotations are per 100 lb.:

ROLLED FROM BILLETS

		Warehouse, Uncut				
		New York				
In.	Mill Pittsburgh	Current	One Year Ago	Chicago	Dallas	San Francisco
¾ and larger	$2.35@$4 00	$3.52@$5.00	$3.37	$3.37@$3.87	$4.75	$5.30
⅝	2.40@ 4.00	3.57@ 5.00	3.42	3.42@3 92	4 80	5.35
½	2.45@ 4.00	3.62@ 5 00	3.47	3.47@3 97	4.95	5.40
⅜	2.60@ 4.00	3.77@ 5 00	3.62	3.62@4 12	5.00	5.55
¼	2.85@ 4.00	4.02@ 5 00	3.87	4.07@4 57	5.05	5.80

Twisted bars cut to length take extra of 29½c. per 100 lb.

ROLLED FROM RAILS

	Chicago	St. Louis	Dallas
¾ in. and larger	$4 [illegible]	$3.50	$4.25
⅝	3.80	3.55	4.30
½	2 85	3.60	.....
⅜	$4.00	$3.75	..
¼	4.25		

BRICK—To contractors price per 1000 in cargo or carload lots is as follows:

	Common			Paving	
	Current	One Month Ago	One Year Ago	Brick	Block
New York	$25 00	$25.00	$15.00	No Quotations	
New Orleans	**23.00**	22 50	.	23 50	.
Chicago	14.00	14.00	12.00	.35@.50	None
St Louis, salmon	16.00	16.00	10.00	31 00	..
Denver	17.00	17.00	12.00	......	
Dallas	24.00	24 00	16.07	34.00	45.00
San Francisco	15.00	15.00	12.50	......	...
Los Angeles	13 50		.		
Boston	30.00	35.00	18.00	50.00	55.00
Minneapolis	20 00	20 00	10.25	.....	40.00
Kansas City	**22 00**	20.00	14.00	44.50	....
Seattle	15.00	15.00	15.00	.....	44.00
Cincinnati	**24 00**	22.00	16.50-14.00	36.00	.....
Montreal (del.)	17.50	17.50	.....	55.00‡	.....
Detroit	**23.00**	21.00	.....	40.00	.....
Baltimore (del.)	18 00–**24 00**	18 00 22.00	.....	**27.00**	45.00

*Hard brick $18.50 in St. Louis. ‡Not delivered.

HOLLOW TILE—Price per block in carload lots for hollow building tile:

	New York						
	Current on Trucks	One Year Ago	Chicago	St. Louis	San Francisco	Dallas	Factory Perth Amboy, N. J.
4x12x12	$8.1895†	$0.11455	$0.1326	None	$0.1125	$0.148	$0.1705†
6x12x12	2526†	.153	.199	"	.15	.....	.2274†
8x12x12	.. ....	.204	.2387	"	....	.	.3411*
10x12x12	..	......	.2984	"	....		4263*
12x12x12	......	....	.3581	"	....	.	5116*

*Natco XXX. These prices subject to 5% cash discount in 15 days from date of shipment. † Partition tile

	4x12x12	8x12x12	12x12x12
Boston	$0.20	$0.40	$0.55
Minneapolis	.087	.158	.248
Cincinnati	**125**	**2186**	**3286**
Kansas City	No prices obtainable		
Denver	.12	.185	.....
Seattle	.09	.175	.30
Atlanta	.115	.19	.28
Los Angeles	**.10**	**.75**	..
New Orleans	.198	.264	**.39**
Detroit	**.13**	**.26**	**.37**
Montreal	.19	28	.35
Baltimore	On specifications		

STRUCTURAL MATERIAL—Following are base prices f.o.b. mill, Pittsburgh, together with quotations per 100 lb. from warehouses at places named:

	Mill Pittsburgh	New York Current	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in.	$2.45@$4	$3.97@$5	$3.47	$4.04	$3.97	$5.40	$5.50
Channels, 3 to 15 in.	2.45@4	3.97@5	3.47	4.04	3.97	5.40	5.50
Angles, 3 to 6 in., ¼ in. thick	2.45@4	3.97@5	3.47	4.04	3.97	5.40	5.50
Tees, 3 in. and larger	2.45@4	4.02@5	3.52	4.09	4.02	5.40	5.50
Plates	2.65@4	4.17@5	3.67	4.24	4.17	6.30	5.75

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill Pittsburgh	Warehouse New York Current	Warehouse New York One Yr. Ago	Warehouse Chicago	Warehouse St. Louis	Warehouse San Francisco	Warehouse Dallas
¾ in. and larger	$4.50	$6.00	$5.05	$5.37	$5.44	$6.65	$7.50

CONE HEAD BOILER

	Mill Pittsburgh	Warehouse New York Current	Warehouse New York One Yr. Ago	Warehouse Chicago	Warehouse St. Louis	Warehouse San Francisco	Warehouse Dallas
¾ in. and larger	4.60	6.10	5.15	5.47	5.54	6.75	7.50
⅝ and 11/16	4.75	6.25	5.30	6.62	5.54	7.00	7.50
½ and 9/16	5.00	6.00	5.55	5.97	5.54	7.25	7.75

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	New York	Chicago	San Francisco	Dallas	Montreal
Wire	*$4.00*	$8 50	$4 15	$5 50	$6.90	$4 95
Cut	....	9.00	7 00	6.90	6.40	5 00

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows at manufacturing points:

	1-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.
No. 1 grade	$2 40	$2.90	$3.45
No. 2 grade	2 15	2.00	3.10

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $3 50 per roll in carload lots and $3.75 for smaller quantities.

Shingles, red and green slate finish, cost $7.75 per square in carloads; $8.00 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

Tar felt (14 lb. per square of 100 sq.ft.) per roll	$3.50
Tar pitch (in 400-lb. bbl.) per 100 lb	1.85
Asphalt pitch (in barrels) per ton	46.50
Asphalt felt (light) per ton	118.00
Asphalt felt (heavy) per ton	119.50

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Yr. Ago
No. 10	$3.55@$6.00	$7.09	$7.02	$7.50	$6.62@$8 00	$4.57
No. 12	3.60@ 6.05	7.09	7.07	7.55	6 67@ 8.05	4.62
No. 14	3.65@ 6 10	7.09	7.12	7.60	6 22@ 8 10	4.67
No. 16	3.75@ 6.20	7.09	7 17	7.70	6.82@ 8.20	4 77
Black						
*Nos. 18 and 20	4.15@ 6.30	8.10	7.80	7.85	7 80@ 8 80	5.42
*Nos. 22 and 24	4.20@ 6.35	8.10	7.85	7.90	7.85@ 8 85	5.47
*No. 26	4.25@ 6.40	8.10	7.90	7.95	7.90@ 8.90	5.52
*No. 28	4.35@ 6.50	8.10	8.00	8.05	8.00@ 9 00	5.62
Galvanized						
No. 10	5 80@ 7 50	9 60	8.50	8 60	8 25@ 10 00	5.97
No. 12	4.80@ 7 60	9.60	8 60	8.60	8.35@ 10.10	6.02
No. 14	4 80@ 7 60	9 60	8.60	8.60	8 35@ 10 10	6.07
Nos. 18 and 20	5.10@ 7 90	9 60	8 90	8 90	8.65@ 10 40	6 37
Nos. 22 and 24	5 25@ 8 05	9 60	9 05	9 05	8 80@ 10 55	6.52
*No. 26	5.40@ 8 20	9 60	9 20	9 20	8 95@ 10 70	6.67
*No. 28	5 70@ 8 50	9 60	9 50	9 50	9 25@ 11 00	6.97

*For painted corrugated sheets add 30c. per 1000 lb. for 5 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 15c., all gages.

LINSEED OIL—These prices are per gallon:

	New York Current	New York One Year Ago	Chicago Current	Chicago One Year Ago
Raw in barrel (5 bbl.)	$1.87	$1.63	$2 05	$1.66
5-gal. cans	1.87*	1 76	2.30	1.86

*To this price must be added the cost of the cans (returnable), $2.25 for case of six

WHITE AND RED LEAD—Base price per pound:

	Red Current Dry	Red Current In Oil	Red 1 Year Ago Dry	Red 1 Year Ago In Oil	White Current Dry and In Oil	White 1 Yr. Ago Dry and In Oil
100-lb. keg	15.50	17.00	13.00	14.50	15.50	13.00
25 and 50-lb. kegs	15 75	17.25	13.25	14.75	15.75	13.25
12½-lb. keg	16.00	17.50	13.50	15.00	16.00	13.50
5-lb. cans	18.50	20.00	15.00	16.50	18.50	15.00
1-lb. cans	20.50	22.00	16.00	17.50	20.50	16.00

500 lb. lots less 10% discount; 2000 lb. lots less 10-2½% discount.

LUMBER

San Francisco—Prices of rough Douglas fir No. 1 common, in more than carload lots:

Lumber Prices in Yards at San Francisco

	6-8-12 and 14 Ft.	10-16-18 and 20 Ft.	22 and 24	25 to 32 Ft.
3x3 and 4	$42.00	$42.50	$43.50	$45.50
3x6 and 8	43.00	43.50	44.50	46.50
4x4-6 and 8	43.50	44.50	45.50	47.50
3x10 and 12	43.50	44.50	45.50	47.50
3x14	44.00	45.00	46.00	48.00
4x10 and 12	43.50	44.50	45.50	47.50
4x14	44.50	45.50	46.50	48.50

	24 Ft. and Under	25 to 32 Ft.	33 to 40 Ft.
6x10	$43.00	$45.00	$46.00
6x14	44.50	46.50	47.00
8x10	43.00	45.00	46.00
8x14	44.50	46.50	47.00

New York, Chicago and St. Louis

	Southern Pine New York* 20 Ft. and Under	Southern Pine New York* 22-24 Ft.	Southern Pine Chicago 20 Ft. and Under	Southern Pine Chicago 22-24 Ft.	Yellow Pine St. Louis 20 Ft. and Under	Yellow Pine St. Louis 22-24 Ft.
3x 4 to 8x 8	*$60.00*	*$61.00*	$70.00	$71.00	$52.50	$53.50
3x10 to 10x10	*65.00*	*66.00*	71.00	73.00	57.50	58.50
3x12 to 12x12	*70.00*	*71.00*	75.00	76.00	60.00	61.00
3x14 to 14x14	*75.00*	*76.00*	80.00	81.00	65.00	66.00
3x16 to 16x16	*80.00*	*81.00*	85.00	86.00	67.50	68.50
3x18 to 18x18	*85.00*	*86.00*	90.00	91.00	72.50	73.50
4x20 to 20x20	*90.00*	*91.00*	.....	.....	......	......

* Prices from Lumbermen's Bureau

Over 24 ft.—Add $1 for each additional 2 ft. in length up to 40 ft. for sizes 12 x 12 and under; for sizes over 12 x 12 add $2. For merchantable add $2 to sizes 10 x 10 and under. For prime add $2 to the price of merchantable for all sizes.

Other Cities

	8 x 8-In. x 20-Ft. and Under P.	8 x 8-In. x 20-Ft. and Under Fir	8 x 8-In. x 20-Ft. and Under Hemlock	8 x 8-In. x 20-Ft. and Under Spruce	12 x 12-In. 20 Ft. and Under P.	12 x 12-In. 20 Ft. and Under Fir
Boston	$86.50	$65.00	$65.00	$65.00	$110.00	$100 00
Kansas City	61.00	*51.25*	*51.25*	*51.25*	72.00	*51.25*
Seattle	..	34.00	.....	......	.....	35.00
New Orleans	. .	....	......	......	.....	60.00
St. Paul	62.00	61.00	61.00	47.50	43.00	58.00
Atlanta	62.50	64 50	66.00	76.00	79.50	82.00
Baltimore	75.00	......	......	......	87.50	.. ...
Cincinnati	*50.00*	55.00	55.00	......	*60.00*	60.00
Montreal	89.00	80.00	65.00	60.00	73.00*	73.00
Los Angeles †	....	62.00	. ...	.....	.....	62.00
Denver	.....	65.00	65.00	65.00	.....	66.00

	1-In. Rough, 10 In. x 16 Ft. and Under P.	1-In. Rough, 10 In. x 16 Ft. and Under Fir	1-In. Rough, 10 In. x 16 Ft. and Under Hemlock	2-In. T. and Gr. 10 In. x 16 Ft. P.	2-In. T. and Gr. 10 In. x 16 Ft. Fir
Boston	$75.00	$65.00	$65.00	$85.00	$65.00
Kansas City	123.50	106.50	106.50	134 00	112 75
Seattle	. .	37.50	.....	. ..	38.50
New Orleans	61 00	.....	.....	*54.00*	.....
St. Paul	54.00	54.00	53.00	64.50	58 50
Atlanta	85.00	90.00	......	77.50	87.50
Baltimore (box)	65@67.50	.... .	.....	60–65.00	......
Cincinnati	*55.00*	58.00	*55.00*	*50.00*	*52.50*
Montreal	75.00	75 00	65.00	66.00	66.00
Los Angeles	....	61 00	.	.....	....
Detroit		(no quotations)			
Denver		62 00	62.00	140.00	127.50

* Montreal—Up to 32 ft., over which, $3.00 per M. increase up to 30 ft.

† Base price, 2 x 3's and 2 x 4's, 8 to 14 ft., is $54.00

Dallas—Yellow pine. Price per M:

1 in. rough, 10 in. and under, 16 ft. and under	$62 50
2 in., t and g., dressed and matched, 10 in. x 16 ft. and under	62 50
8 x 8 and under, 20 ft. and under	72 50
12 x 12, 20 ft. and under	75 00

FREIGHT RATES

On finished steel products in the Pittsburgh district, including plates, structural shapes, merchant steel, bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc., the following freight rates are effective in cents per 100 lb.:

Boston	$0.30	New Orleans	$0.38½
Buffalo	.17	New York	.27
Chicago	.27	Pacific Coast (all rail)	1.25*
Cincinnati	.23	Philadelphia	.24½
Cleveland	.17	St. Louis	.24
Denver	.99	St. Paul	.49½
Kansas City	.59	Detroit	.33
		Baltimore	.33

Note—Add 3% transportation tax. * Minimum carload, 80,000 lb.

CONTRACTORS' SUPPLIES

STEEL SHEET PILING—The following price is base per 100 lb. f. o. b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$2.55@$3.65	$2.55@3.65	$2.25

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Hercules red strand, all constructions	20%
Patent flattened strand, special and cast steel	20%
Patent flattened strand, iron rope	5%
Plow steel round strand rope	30%
Special steel round strand rope	30%
Cast steel round strand rope	22½%
Iron strand and iron tiller	5%
Galvanized iron rigging and guy rope	+12%

San Francisco: Galvanized Iron Rigging and Guy Ropes, +17½%; Bright Plow, 25% off

Chicago, +12½ on galvanized, 30 off on bright.

MANILA ROPE—For rope smaller than ¾-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ½-in., 8 ft., ⅝-in., 6; ¾-in., 4½; 1-in., 3½; 1⅛-in., 2 ft. 10 in.; 1¼-in., 2 ft. 4 in. Following is price per pound for ¾-in. and larger, in 1200-ft. coils:

Boston	$0.35	Kansas City	$0.30½
New York	29	New Orleans	.28½
Chicago	.27½	Los Angeles	.31
St. Paul	.27½	Seattle	.28
San Francisco	.27	St. Louis	.26½
Atlanta	.29½	Montreal	.32
Denver	.27½	Detroit	.26
Cincinnati	.30	Baltimore	.27
Birmingham	32	Dallas	34

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb keg for black powder.

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	80%	Black Powder
New York	......	$0.34¼	$0.34½	.....	$2.30
Boston	$.225-24	.245-28	.25-31	$.3525	2.40
Kansas City	.2475	.27	.30	.3425	2.45
Seattle	.18	.21¾	.24¾	.29	2.45
Chicago	.2175	.2525	.2975	.34	2.45
St. Paul	.185	.2275	.2525	.2950	2.25
St. Louis	.2175	.26	.285	.295	1.90
Denver	.205	.2475	.2725	.315	2.50
Dallas	.265*	.275	.3025	....	2.60
Los Angeles	.22	.27	.31	.....	2.95
Atlanta	.22	.245	.265	.....	2.55
Baltimore	.225	.2675	.3075	.325	2.40
Cincinnati	.2275	.2525	.2725	.....	2 30
Montreal	.28	.31	.34	.38	3.90
New Orleans	.2425	28 25	31 25	.38	2.60

* 30 Per Cent

POLES—For plain pine poles, delivered New York, the price is as follows:

10-in. butts, 5-in. tops, length 20-30 ft.	$9.00
12-in. butts, 6-in. tops, length 30-40 ft.	11.50
12-in. butts, 6-in tops, length 41-50 ft.	12.50
14-in. butts, 6-in. tops, length 51-60 ft.	21 00
14-in. butts, 6-in. tops, length 61-71 ft.	23 50

	Dallas
6-in. x 20-ft.	$4.60
6-in. x 30-ft.	7.10
8-in. x 30-ft.	8.45
8-in. x 35-ft.	10.38

OLD MATERIAL—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and St. Louis the quotations are per net ton and cover delivery at the buyer's works, including freight transfer charges.

	New York	Chicago	St. Louis
No. 1 railroad wrought	$29.00	$27.00	$29.00
Stove plate	29.00	30.50	32.50
No. 1 machinery cast	39.00	37.50	39.50
Machine shop turnings	15 50	12.50	15.50
Cast borings	16.00	14.25	16.50
Railroad malleable cast	27.50	28.00	28.50
Re-rolling rails	29.00	32 00@33 00	31.50@32.00
Relaying rails	.	40@50	50@55

SHIP SPIKES—Current prices per 100 lb.

	San Francisco		Seattle
In.	Galv.	Black	Black
¼	$9.20	$8.50	$8.55
⅜	8.75	6.75	8.25
½	8.60	6.60	8.30

Pittsburgh base, $4.50 per 100 lb.

LABOR RATES AND CONDITIONS THROUGHOUT THE COUNTRY

S means scarce; E, enough; P, plentiful

Cities	Bricklayers	Carpenters	Hoisting Engineers	Hod Carriers	Pile Drivers	Structural Iron Workers	Common Labor	Remarks
Atlanta	$0.90S	$0.60-75P	$0.50-65P	$.40-.45P	$0.60-.65	$0.75	$0 35S	Atlanta—Great activity in construction. Common labor scarce.
Baltimore	1 00S	.80-90 S	.87½S	.46-.54S	.74P	1 00E	35-.45S	Baltimore—Contractors are offering more than the union scale.
Boston	1.00E	1.00E	1.00E	.85E	1.25E	1.00E	.62½S	Boston—Labor not so plentiful as last month.
Cincinnati	1.25S	.75	.75	.65	.50	.875P	.60S	Cincinnati—Common labor scarce.
Cleveland	1 00S	.90S	1.00E	.57½E	.80E	1 00E	57½E	
Dallas	1 25S	1@1.25S	1.00E	.60E	.100E	1 25S	44@.60S	Dallas—Common labor very scarce. Bricklayers, ironworkers and carpenters scarce.
Denver	1.12½E	1 12½E	1 00E	.68¾ .75	.....	1 00E	.50E	Denver—General increase. Double pay for overtime.
Detroit	1 25S	1 00E	.90-1.00P	.65-70S	.90P	85-.90E	.60-.75S	Detroit—Common labor scarce. Considerable work under contract, but tendency is to slow down on proposed construction. Increase asked by practically every trade.
Kansas City	1.12½	1 00	1 00	82	1.00	1.00	.57½	Kansas City—Schedule in effect May 1. Common labor demanding 90c.
Los Angeles	1.25P	.87½P	.87½P	1 00P	.87½P	87½P	.56¼ 62½E	Los Angeles—Resident construction has declined sharply. Rates shown are union; non-union a little less; but union scale prevails generally.
Montreal	85	80	.65S	50-55P	.55P	.45-.55S	45@.50P	Montreal—Strikes expected.
New Orleans	1 00E	1 12½	.87½E	.35@.40E	.80E	1.00	35@.50E	
New York	1.25	1 12½	1.25	87½	1.12½	1.12½	.75@.80	New York—Agreement of Nov. 20, 1919, was modified as shown, effective May 1, 1920. Excavators, 75c.; Concrete workers, 81¼c.
St. Louis	1 25	1.00	1.12½-1.25	.70	1.00-1.25	1.25	.52@.80	St. Louis—Bricklayers' helpers receive 80c.; Carpenters' helpers, 67½c.; as to hoisting engineers, the rates are $1.12½ for one drum, $1.25 for two drums, and $1.21½ for road roller. Pile drivers receive $1.00 on wood and concrete, $1.25 on steel. Unskilled labor is classified as follows: Common, 52c.; construction, 67½c.; pipe laying, 75c.; track, 53c.; concrete, 80c.
Minneapolis	1.25	1.00P	1.00	.65	.80	.85	.58@.70	Minneapolis—Rates given by Minneapolis Builders' Exchange.
San Francisco	1.25E	1 06¼E	1 12½E	.93¾E	1.06¼E	1 12½E	.45-.50E	San Francisco—All lines busy.
Seattle	1.12	.93¾	.94	.75-.80	.90	1.00	.75S	

PROPOSALS

"For proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
May 10	Coxsackie, N. Y. Adv. Apr. 29.	Apr. 29
May 10	Fergus, Ont.	Apr. 29
May 15	Seattle, Wash.	Apr. 15
May 15	Drummondsville, Que.	Apr. 22
May 15	Metter, Ga.	May 6
May 17	Pontiac, Mich. Adv. Apr. 8 and 15.	Apr. 8
May 20	Decatur, Ill. Adv. Apr. 29.	Apr. 29
May 20	Cisco, Tex.	May 6
May 28	Gibbstown, N. J. Adv. May 6.	May 6
June 1	Houston, Tex	Apr. 29

SEWERS

Bids Close		See Eng. News-Record
May 10	Haddonfield, N. J.	Apr. 22
May 10	Copper Cliff, Ont.	May 6
May 10	New Haven, Conn.	May 6
May 11	South Bend, Ind. Adv. Apr. 29 and May 6.	Apr. 29
May 12	Philadelphia, Pa.	Apr. 29
May 12	Hagerstown, Md. Adv. Apr. 22 and 29.	Apr. 22
May 14	Bedford Hills, N. Y. Adv. May 6.	May 6
May 18	Wells, Minn.	May 6
May 18	Humeston, Ia.	May 6
May 20	Graham, N. C. Adv. Apr. 29 and May 6.	Apr. 29
May 20	St. Paul, N. C. Adv. May 6.	May 6
May 21	Cheyenne, Wyo. Adv. May 6.	May 6
June 3	**Milwaukee, Wis. Adv. Apr. 15 and 22.**	**Apr. 15**

BRIDGES

Bids Close		See Eng. News-Record
May 11	**Detroit, Mich. Adv. Apr. 15-29.**	**Apr. 15**
May 11	**St. Augustine, Fla. Adv. Apr. 29 and May 6.**	**Apr. 29**
May 11	**Blue Ridge, Ga**	**Apr. 22**
May 11	**Newark, N. J.**	**May 6**
May 12	Elba, Minn.	Apr. 29
May 12	Woodville, Tex.	May 6
May 14	Minneapolis, Kan.	Apr. 29
May 15	Brattleboro, Vt. Adv. Apr. 29.	Apr. 29
May 17	Elmira, N. Y. Adv. Apr. 29 and May 6.	Apr. 29
May 17	Bronxville, N. Y. Adv. Apr. 29 and May 6.	Apr. 29
May 17	Bunkerville Nev. Adv. May 6.	May 6
May 18	Ottawa, Ont.	May [illegible]
May 20	Biddeford, Me.	Apr. 29
May 20	Poughkeepsie, N. Y. Adv. Apr. 29 and May 6.	May 6
May 21	Duluth, Minn.	May 6
May 24	Danville, Ill. Adv. Apr. 29 and May 6.	Apr. 22
May 28	Philadelphia, Pa.	May 6
June 4	Philadelphia, Pa.	Apr. 29

STREETS AND ROADS

Bids Close		See Eng. News-Record
May 8	Fort Plain, N. Y.	Apr. 29
May 10	Oakland, Md.	Apr. 22
May 10	Douglas, Ariz. Adv. Apr. 15-29.	Apr. 15
May 10	Lebanon, Pa. Adv. 22 and 29.	Apr. 22
May 10	Oil City, Pa.	Apr. 22
May 10	Sea Bright, N. J. Adv. Apr. 22 to May 6.	Apr. 22
May 10	Montgomery, Ala.	Apr. 22
May 10	El Paso, Tex	Apr. 29
May 10	Freehold, N. J. Adv. 22 and 29.	Apr. 22
May 10	South Pasadena, Cal.	Apr. 29
May 10	Seattle, Wash. Adv. Apr. 22 to May 6.	Apr 29
May 10	Jonesboro, Ark. Adv. Apr. 22 to May 6	Apr. 29
May 10	Gallitzin, Pa.	May 6
May 10	L'Original, Ont.	May 6
May 10	North Bay, Ont.	May 6
May 11	Maine Adv. Apr. 22 and 29.	Apr. 22
May 11	Pennsylvania	Apr 22
May 11	Indiana	Apr 22
May 11	St. Catharines, Ont.	Apr. 22
May 11	Blue Ridge, Ga.	Apr. 22
May 11	Michigan	Apr. 29
May 11	St. Augustine, Fla. Adv. Apr. 29 and May 6.	Apr. 29
May 11	Hartford, Wis.	May 6
May 11	Newark, N. J.	May 6
May 11	New Hampshire	May 6
May 11	Mt. Sterling, Ky.	May 6
May 11	Corbin, Ky.	May 6
May 11	St George, S I, N Y	May 6
May 11	Tyler, Tex.	May 6
May 12	Scituate (North Scituate P. O.), R. I. Adv. 22 and 29.	Apr. 22
May 12	Missouri Adv. Apr. 29.	Apr. 29
May 12	Caledonia, Minn.	Apr 29
May 12	Long Prairie, Minn.	Apr. 29
May 12	Carlton, Minn.	Apr. 29
May 12	Duluth, Minn.	May 6
May 12	Hastings, Minn.	May 6
May 12	Columbus, O	May 6
May 12	Delaware Adv. May 6.	May 6
May 12	North Carolina	May 6
May 12	Stanbridge, Ont.	May 6
May 12	Wessington Springs, S. D.	May 6
May 12	Fredericksburg, Tex.	May 6
May 12	Brooklyn, N. Y.	May 6
May 13	Niagara Falls, N. Y.	May 6
May 14	Michiga	Apr. 29
May 14	It. Holly, N. J.	Apr. 22
May 14	Wharton, Tex.	May 6
May 14	North Carolina	May 6
May 14	Beloit, Kan.	May 6
May 14	St. George, S. I., N. Y.	May 6
May 17	Bronxville, N. Y. Adv. Apr. 29 and May 6.	Apr. 29
May 17	Jennings, La.	Apr. 29
May 17	New Jersey	May 6
May 17	Beggs, Okla. Adv. May 6.	May 6
May 17	Seattle, Wash.	May 6
May 17	Los Angeles, Cal.	May 6
May 17	San Diego, Cal.	May 6
May 18	Princeton, Minn.	Apr. 29
May 18	Union, W. Va.	Apr. 22
May 18	Moorhead, Minn.	May 6
May 18	Clinton, Ind.	May 6
May 19	Ft. Wayne, Ind.	Apr 29
May 19	Wayne, W. Va.	Apr. 29
May 19	Quebec	May 6
May 19	Ontario	May 6
May 19	Preston, Minn.	May 6
May 19	Hallock, Minn.	May 6
May 20	Blytheville, Ark.	May 6
May 21	New Jersey	May 6
May 21	Buffalo, N. Y.	May 6
May 28	Chambly, Que.	Apr. 29
May 28	Ohio	May 6
May 31	Arcadia, La.	Apr. 29
June 1	New Martinsville, W. Va.	May 6
June 15	Westmount, Que.	May 6

EXCAVATION AND DREDGING

Bids Close		See Eng. News-Record
May 10	New York, N. Y	May 6
May 11	Fort Dodge, Ia.	May 6
May 12	Port Arthur, Ont.	May 6
May 15	Vancouver, B. C.	Apr. 29
May 15	Windom, Minn.	May 6
May 17	Atlantic, Ia.	May 6
May 18	Rochester, N. Y. Adv. Apr. 22 and May 6.	Apr. 22

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
May 10	South River, N. J.	Apr. 29
May 12	St. Johns, N. B.	May 6
May 13	New Ulm, Minn. Adv. Apr. 22 to May 6.	Apr. 29
May 15	Irvington, N. J.	May 6
May 18	Philadelphia, Pa.	Apr. 22
May 18	Madison, Wis.	May 6
Sept. 1	Hutchinson, Kan.	Feb. 19

BUILDINGS

Bids Close		See Eng. News-Record
May 10	Columbus, O. Adv. Apr. 22 to May 6.	Apr. 22
May 10	Zion, Ia.	May 6
May 10	Ellston, Ia.	May 6
May 10	Cleveland, O.	May 6
May 10	Council Bluffs, Ia.	May 6
May 10	Salt Lake City, Utah	May 6
May 10	Redfield, Ia.	May 6
May 11	Sonyea, N. Y. Adv. Apr. 8-22.	Apr. 8
May 11	Atchison, Kan.	Apr. 29
May 11	Santa Ana, Cal.	Apr 29
May 11	Norwalk, O.	May 6
May 11	Herman, Minn.	May 6
May 12	La Crosse, Wis.	Apr. 22
May 12	Little Falls, N. Y.	Apr. 29
May 12	New London, Conn.	Apr. 29
May 12	Danielson, Conn.	May 6
May 12	Plymouth, Mass.	May 6
May 12	Newton (Flushing P. O.), N. Y.	May 6
May 14	Youngstown, O.	Apr. 22
May 14	Searsboro, Ia.	Apr. 29
May 15	Orient, Ia.	Apr. 29
May 15	Bemidji, Minn.	Apr 22
May 15	Montreal, Que.	Apr. 22
May 15	Wauwatosa, Wis.	Apr. 22
May 15	Detroit, Mich.	May 6
May 15	Cedar Grove, Wis.	May 6
May 15	Waterbury, Conn.	May 6
May 17	Dana, Ia.	Apr. 29
May 17	Dana, Ia.	May 6
May 17	Chippewa Falls, Wis.	May 6
May 18	Green Mountain, Ia.	Apr. 29
May 18	Morris Plains, N J. Adv Apr. 29 and May 6	Apr. 22
May 18	West Roxbury (Boston P. O.), Mass.	May 6
May 18	Lakewood (Cleveland P. O.), O.	May 6
May 19	Los Angeles, Cal.	May 6
May 20	Corydon, Ia.	May 6
May 21	Verona (Montclair P. O.), N. J.	Apr. 29
May 21	Orrville, O.	Apr. 29
May 22	Whitten, Ia.	Apr. 29
May 23	Middletown, N. Y.	Apr. 29
May 25	Lake Providence, La.	May 6
May 26	Willard, N. Y. Adv. May 6.	May 6
May 29	Dallas, Tex.	May 6
June 1	New Orleans, La.	May 6
June 1	Conway, Ark.	May 6
June 25	Newport News, Va.	May 6

FEDERAL GOVERNMENT WORK

Bids Close		See Eng. News-Record
May 10	Officers' Quarters, Savannah, Ga. Adv. Apr. 22 and 29.	Apr. 22
May 12	Dwelling—Pocasset, Mass.	Apr. 22
May 12	Round Piling—Cincinnati, O. Adv. Apr. 29 and May 6.	Apr. 29
May 12	Earth and Levee Work—St. Louis, Mo. Adv. Apr. 29 and May 6.	Apr. 29
May 12	Alterations and Additions to Quarters—Spec. 4143—Mare Island, Cal.	May 6
May 14	Road Work—Tennessee Adv. Apr. 22 to May 6.	Apr. 29
May 15	Road Work — South Dakota	May 6
May 15	Repairing Dock—New London, Conn.	May 6
May 19	River Wall Power Plant, Machinery, etc., Cincinnati, O Adv. Apr. 22 to May 6.	Apr. 22
May 19	Deep Well Pumping Equipment — Spec. 4166—Ft. Worth, Tex.	May 6
May 19	Electrical Equipment — Spec. 4146—South Charleston, W. Va.	May 6
May 20	Stone Riprap, Detroit, Mich. Adv. Apr. 29 and May 6.	Apr. 22
May 20	Mild Open Hearth Steel—Memphis, Tenn. Adv. Apr. 15 to May 6.	Apr. 29
May 20	Repairing Breakwater and Placing Riprap—Cleveland, O. Adv. Apr. 29 and May 6.	Apr. 15
May 20	Completing Headquarters—Ft. H. G. Wright, N. Y.	May 6
May 20	Incinerator—Boston, Mass.	May 6
May 21	Concrete Roadway and Sidewalk — Cape Henry, Va.	May 6
May 24	Frame Cottage — Tulalip, Wash.	Apr 29
May 24	Gates and Emergency Dams—Pittsburgh, Pa. Adv. Apr. 22 to May 6.	Apr. 29
May 24	Officers Quarters and Infirmary—New Dorp, N. Y. Adv. May 6.	May 6
May 25	Rubble Mound Jetty and Pierhead, Cleveland, O. Adv. Apr. 29 and May 6.	Apr. 22
May 26	Dredging — New York, N. Y. Adv. Apr. 15 to May 6.	Apr. 29
May 27	Emergency Dam—Detroit, Mich. Adv. Apr. 15-29.	Apr. 15
May 27	Repairing and Building Superstructure — Buffalo, N. Y. Adv. Apr. 29 and May 6.	May 6
May 27	Paving Blocks, etc. — Wash., D. C.	May 6
June 1	Hydraulic Turbines, Florence, Ala. Adv. Apr. 22 to May 6.	Apr. 22
June 1	American Portland Cement—Cincinnati, O. Adv. May 6.	May 6
June 7	Dormitory — Tahlequah, Okla.	May 6
June 15	Electric Generators, Exciters and Accessories — Florence, Ala. Adv. May 6.	May 6

MISCELLANEOUS

Bids Close		See Eng. News-Record
May 8	Road Roller—Metcalfe, Ont.	May 6
May 10	Road Materials — Portland, Ore.	Apr. 29
May 10	Asphalt and Stone—Mon-	
May 10	Sprinklers and Flushers—Montreal, Que.	May 6
May 10	Street Flusher—Milwaukee, Wis.	May 6
May 10	Freight Shed and Pier—New York, N Y	May 6

Bids Close		See Eng. News-Record
May 11	Power Plant Equipment—Kinston, N. C. .... Adv. Apr. 15.	Apr. 15
May 12	Turbine Pump and Gasoline Engine, Pembroke, Ont.	Apr. 22
May 12	Extending Landing Platform—New York, N. Y...	May 6
May 13	Belting—Portland, Ore....	May 6
May 14	Asphalt—Montreal, Que...	May 6
May 15	Equipment—Cedar Rapids, Ia.	Apr. 15
May 15	Fog Alarm—Ottawa, Ont..	Apr. 29
May 18	Electrical Work, etc., Brooklyn, N. Y........... Adv. Apr. 22.	Apr. 22
May 20	Concrete Culverts—Ontario,	May 6
May 25	Plumbing and Electrical Work—Philadelphia, Pa. ..	Apr. 22
May 25	Banana Conveyors—New Orleans, La. .... Adv. May 6.	May 6
June 1	Water Tube Boilers and Chain Grate Stakers — Lockport, Ill.	May 6

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. J., Newark—North Jersey Dist. Water Supply Comn. of State. 20 Clinton St., rejected bids received April 27, furnishing labor and material building Wanaque Dam. Work will be readvertised. Noted April 1.

Ky., Newport—St. Josephs Orphanage plans to build reservoir, 1,000,000 gal. capacity, electrical centrifugal pumps, steel tank of 60,000 gal. capacity, on 100 ft. columns, with distributing pipe system. About $20,000. G. Hornung, 512 Fairfield Ave., Bellevue, engr.

O., Cleveland—Amer. Steel & Wire Co., Western Reserve Bldg., soon lets contract building water tunnel, 1,400 ft. long, 10 ft. diameter, brick. About $150,000. J. Fleming, purch. agt. Private plans.

O., Lakeview—Village having plans prepared building and equipping pumping station, drilling deep well and laying service mains. Cost between $90,000 and $100,000. Jennings & Lawrence, Hartman Bldg., Columbus, engrs.

Mich., Ironwood — Alvord & Burdick, engrs., 8 South Dearborn St., Chicago, receive bids about May 15, building additions to ground water supply, electrical pumping equipment and 5 mi. 16 in. c.i. pipe. About $300,000. Noted March 25.

Wis., Cedarburg — City voted $85,000 bonds to improve waterworks and sewerage systems. W. G. Kirchoffer, Madison, engr.

Wyo., Lusk—City election May 11, to vote on $75,000 bonds to build waterworks system. D. E. Goddard, clk.

Tex., Garland—City plans election soon to vote on $100,000 bonds to improve waterworks system. D. Murphy, mayor.

Okla., Duncan—City voted $38,000 bonds to build waterworks system. Engineer not selected. Noted April 29.

Okla., Oklahoma City—City election May 25, to vote on $300,000 bonds to improve waterworks system. Engineer not selected.

Okla., Walters—City voted $65,000 bonds to improve and extend waterworks system. W. B. Anthony, clk.

Ont., New Toronto—Town plans to enlarge waterworks system by addition of new electric pumps and 4100 ft. 16 in. feeder main. About $35,000. E. A. James Co., Ltd., 36 Toronto St., Toronto, engrs.

Cuba, Cienfuegos — City receives bids about June 1, installing mechanical filtration plant, with 7,000,000 gal. capacity. About $150,000. A. Potter, 50 Church St., New York City, engr.

BIDS DESIRED

N. J., Gibbstown—Until May 28, by Greenwich Twp. Comn., furnishing, laying or placing 1,200 ft. 8 in. c.i. watermains, 3 fire hydrants, etc., in Paulsboro Rd. E. A. Allen, twp. clk.; advertised in this issue.

N. C., St. Paul—See "Sewers."

Ga., Metter—Until May 15, by L. C. Anderson, mayor, building waterworks system and pumping plant, including well, tank, tower, and pipe lines. About $35,000.

Tex., Cisco—Until May 20, by city, building concrete or earth dam. H. E. Elrod Co., 220 Interurban Bldg., Dallas, engrs.; advertised in this issue.

Ont., Copper Cliff—See "Sewers."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Wharton**—City let contract laying watermains in various streets to W. G. Fritz, Essex Bldg., Newark, N. J. About $400,000.

★**N. C., Sylva**—City let contract building waterworks and sewerage system, to J. B. McCrary, 3rd Natl. Bank Bldg., Atlanta, Ga. About $90,000.

★**Mich., Lansing**—City let contract building concrete reservoir, 250,000 gal. capacity, also installing air lift on 19 wells, and electric drive air compressor, to Ellington-Miller Co., 417 South Dearborn St., Chicago. About $75,000. Noted April 1.

★**O., Cleveland**—City let contract building 6-16 in. c.i. water mains in sections of Corlett, Reno, Putnam Aves., East 91st and East 143rd Sts., to Gantose Constr. Co., Columbia Bldg., $9,560; Griffing, Sandusky, Ella, Maryland Aves., East 103rd and East 85th Sts., Beyerle Pl., Effie and Beyerle Rds., to Curro Bros., 12206 Mayfield Rd., $6,632; East 117th, East 118th, East 140th and East 144th Sts., Melzer, Benwood, Farrington, Gay and Holburn Aves., to D. Pfahl, Guardian Bldg., $18,814. Noted April 15.

O., West Park—J. Laronge Co., 214 Williamson Bldg., received bids building 3,990 ft. c.i. water main in Wagner Rd., West 157th and West 158th Sts., here, from Phillips & Bixel, Blackstone Bldg., $15,948; T. P. Egan, Caxton Bldg., $19,891; Sprague & Burkhart, 12011 Woodland Ave., $20,499; contractors all of Cleveland.

★**O., West Park**—Village let contract building 4,140 ft. 8 in. c.i. water main, in Hirst Ave. from West 139th St. to Brunner Ave., to D. Pfahl, Guardian Bldg., Cleveland, $31,446.

Ont., Acton—Town let contract for 28,500 ft. 4-8 in. c.i. water pipe, to Gartshore Thompson Pipe & Fdry. Co., Ltd., Stuart St., W., Hamilton, $30,000.

Sewers

PROPOSED WORK

Pa., Easton—City plans to issue $100,000 bonds to improve and extend sewerage system, build sewage disposal plant and pumping station. J. H. Warner, clk.

S. C., Spartanburg—City plans election to vote on $50,000 bonds to extend sewers.

O., Lakeview—Village having plans prepared building sanitary sewerage system. About $50,000. Jennings & Lawrence, Hartmann Bldg., Columbus, engrs.

O., Springfield—City plans to build sewers in Oak, Laurel, Pine, Kenton, West Jefferson, West Mulberry and Bell Sts., involving 3,500 ft. 6-30 in. vitr. pipe, 5,000 cu.yd. earth and 900 cu.yd. rock trenching. About $75,000. W. Lucas, city engr.

Ind., Evansville — City sold $30,000 bonds to build sewers.

Ind., Ft. Wayne—Bd. Pub. Wks. plans to build Main Storm Sewer 43, involving 8,015 ft. 12-48 in. pipe, cost $31,089; Local Sanitary Sewer 316, 12,840 ft. 8-10 in. pipe, $30,470. F. M. Randall, city engr.

Ill., Carbondale—City Council plans to build Mill St. sewer, involving 20,462 lin. ft. 8 and 15 in. hard burned, salt glazed, vitr. clay pipe, 60 lin.ft. 12 in. c.i. water pipe, 14,030 cu.yd. excav., backfilling, etc., 28 cu.yd. Tarvia pavement removed and restored, 37 manholes, etc., cost $42,544. W. J. Brown, clk.

Wis., Cedarburg—City having plans prepared installing sewers and water mains in various streets. Bonds for $150,000 voted for project. W. R. Kirchoffer, 31 Vroman Blk., Madison, engr.

Wis., Kenosha—Allen Sons Co., North Main St., having plans prepared building rein.-con. sewage disposal plant. About $50,000. Vaughn & Meyer, Security Bldg., Milwaukee, engrs.

Wyo., Rawlins—City voted $45,000 bonds to build sewerage system.

Tex., Lufkin—City voted $50,000 bonds to build sewerage system.

Ont., Elmira—City plans to build sewerage system involving 2 mi. vitr. pipe and probably septic tanks. About $30,000. H. Johnston, Kitchener, engr.

Cuba, Cienfuegos—City plans to build 25 mi. 30 in. sewers. About $2,000,000 A. Potter, 50 Church St., New York City, engrs.

Cuba, Guantanamo—City receives bids about June 1, building sewerage and drainage systems in various streets. About $1,000,000. A. Potter, 50 Church St., New York City, engrs.

Cuba, Santiago—City having plans prepared by A. Potter, engr., 50 Church St., New York City, and receives bids about June 1, building sewerage system. About $2,000,000.

BIDS DESIRED

Conn., New Haven—Until May 10, by city, building sewers and appurtenances in Chatham St. from Maltby to Downing Sts., Barclay St. from Frank to Truman Sts., Goffe Terrace from Ellsworth Ave. to Boulevard. F. L. Ford, city engr.

N. Y., Bedford Hills—Until May 14, by W. G. Barrett, pres. bd. mgrs., State Reformatory for Women, repairing sewage disposal plant. L. F. Pilcher, Albany, state archt.; advertised in this issue.

N. C., St. Paul—Until May 20, by town, laying 33,000 ft. 6-12 in. vitr. sewer pipe, disposal plant and 24,000 ft. 8 in. c.i. water mains, etc. Carolina Eng. Co., 412 Southern Bldg., Wilmington, engrs. J. C. Lenthe, mayor; advertised in this issue.

Ind., Clinton—See "Streets & Roads."

Ia., Humeston—Until May 18, by city, laying 30,774 ft. 8-12 in. sanitary sewers and building sewage disposal plant. M. G. Hall, city engr.

Minn., Wells—Until May 18, by Village Council, building general sewer and district sewers in Dists. 1 to 9 inclusive, involving sewage treatment plant, sewage lift, 37,295 ft. 8-18 in. sewer, manholes, flush tank, etc.; also building trunk sewers, involving 12,283 ft. 10-24 in. sewer, 132 ft. 10 in. inlet connections, 17 manholes, 34 No. 1 and 40 No. 2 inlets. L. P. Wolff, Guardian Life Bldg., St. Paul, consult. engr.

Wyo., Cheyenne—Until May 31, by city, at office of clerk, furnishing materials and constructing sanitary and storm sewerage systems. J. A. Whiting, 214 1st Natl. Bank Bldg., engr.; advertised in this issue.

Ont., Copper Cliff—Until May 10, by International Nickel Co. of Canada laying 12,000 ft. 6-12 in. sewers and 5,000 ft. ¾-2 in water mains. About $30,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Scranton**—City let contract building sanitary sewers in Sect. A, 21st Ward, also rebuilding sewer in South Bromley Ave., to R. P. Jones, 311 North Fillmore Ave., $5.76 per lin.ft.

★**Va., Potomac**—Town let contract building sanitary sewers, to Wingo & Deaner, P. O. Box 816, Richmond. Unit prices as follows: (1) $198, (2) $0.49, (2a) $0.50, (3) $0.72, (3a) $0.73, (4) $0.91, (4a) $0.93, (5) $1.79, (6) $45, (7) $50, (8) $60, (9) $67, (10) $74, (11) $80, (12) $85, (13) $100, (14) $110, (15) $126, (16) $140, (17) $155. (18) $170, (19) $18, (20) $13, (21) $12. Noted April 8.

★**N. C., Sylva**—See "Waterworks."

O., Columbus — City received only bid April 27, building brick pumping station for Shepard main trunk sewerage system, from C. E. Cannell, 562 Hale Ave., Cincinnati, $33,495. Noted April 15.

★**Wis., Edgerton**—G. W. Blanchard, city clk., let contract excavating and laying 1.7 mi. 8 in. sanitary sewers in Albion Rd., East Fulton, Chamberlin and Roosevelt Sts., to Gray Robinson Constr. Co., Manitowoc. About $25,000. Noted March 11.

Ore., Portland — City received bids April 21, building (a) Portland Blvd. and Orient St. Sewerage System, (b) sewer in 42nd Ave., S. E., from 42nd St., S. E., to 46th St., S. E., (1) cement pipe, (2) vitr. pipe, from E. Sandeberg, 74 East 24th St., (a2) $121,446; Jacobsen-Jensen Co., 407 Stanton St., (a1) $132,943; J. Keathing, Lumbermans Trust Co., (a1) $139,000; J. Bekal, General Delivery, (b1) $1,807; Joseph & Son, 269 East 16th St., (b1) $1,991.

Bridges

PROPOSED WORK

N. J., Trenton—Bd. Freeholders Mercer Co. rejected bids received April 27 building Sadler Memorial Bridge, over Samhican Creek. Work will be readvertised. Noted April 15.

Md., Annapolis—State Rds. Comn., 601 Garrett Bldg., Baltimore, soon receives bids constructing 1,903 ft. concrete bridge, 24 ft. roadway with 6 ft. walk on each side, concrete piling, over Seven River, here. J N. Mackall, state highway engr.

O., Cincinnati—Southern R.R., Ingalls Bldg., preparing plans for bridge to replace one spanning Ohio River from here to Ludlow, Ky. About $3,250,000. Private plans. W. H. Wells, Washington, D. C., ch. engr.

Wis., Fond du Lac—City having plans prepared building 107 ft. rein.-con. or steel

Buildings (Continued)

bridge, 36 ft. wide, on Scott St. J. C. Pinney, 1200 Sycamore St., Milwaukee, engr.

Ia., Nevada—Bd. Supervs. Story Co. having plans prepared building 200 ft. bridge, 24 ft. roadway, one 5 ft. sidewalk, over Squaw Creek, on Lincoln Way. Three designs are on file: 2 span rein.-con. arch. 3 span through steel plate girder and 5 span rein.-con. deck girder. About $45,000. S. Stiegerwalt, co. engr.

Ont., Ottawa—See "Streets and Roads."

Ont., Toronto—City petitioned Dominion Government to build bridge across Western Gap to Toronto Island. Cost between $750,000 and $1,000,000.

BIDS DESIRED

N. Y., Poughkeepsie—Until May 20, by Bd. Pub. Wks., building 28 ft. span I-beam concrete floor bridge, 140 ft. long complete, including foundations. E. W. Sylvester, supt.; advertised in this issue.

N. J., Newark—Until May 11, by Dept. Pub. Impvts., building 28 ft. steel I beam bridge over Morris Canal, on Washington St., 41 ft. 7 in. wide, including rein.-con. roadway and 2 sidewalks, 12 ft. and 11 ft. wide, involving 100 cu.yd. 1:2½:5 concrete.

Pa., Phila.—Until May 28 (change of date), by city, removing 3 old superstructure spans, piers, fenders, dredging channel, building 4 new piers, furnishing and erecting steel, light iron and machinery, etc., on South St. J. C. Winston, dir. Pub. Wks.; advertised in this issue. Noted April 29.

Minn., Duluth—Until May 21, by W. H. Borgen, aud. St. Louis Co., building Bridge J-O-26, 50 ft. steel truss span, 20 ft. wide, involving 200 cu.yd. rein.-con. and 80,000 lb. steel, cost $29,000, and Bridge J-O-28, 120 ft. steel truss bridge consisting of one 45 ft. and one 75 ft. spans, 20 ft. wide, 250 cu.yd. concrete and 78,000 lb. steel, $26,000, both near Chisholm; also Bridge J-O-26-1, 60 ft. steel span, overhead crossing Great Northern Ry. in Sect. 26, Twp. 58, Range 20, and Bridge J-O-22-1, 120 ft. steel span, overhead crossing Duluth, Missabe & Northern Ry. in Sect. 22, Twp. 58, Range 20, both on State Rd. 35, Job 2006. R. W. Acton, co. engr.

Ark., Blytheville — See "Streets and Roads."

Tex., Woodville—Until May 12, by W. A. Johnson, judge Tyler Co., building bridges and culverts on county highways. Hess & Skinner, South Western Life Bldg., Dallas, engrs.

Nev., Bunkerville—Until May 17, by C. C. Cottrell, state highway engr., Carson City, building bridge and appurtenances over Virgin River, near here, Clark Co., involving 5,600 cu.yd. excav., 108 cu.yd. class "B" concrete and 195,000 lb. steel, etc.; advertised in this issue.

Ontario—Until May 19, by Dept. Pub. Highways, Toronto, excavating and building concrete structures and other necessary werk on Provincial Highway in Sect. C. Edwardsburg Twp., Sect. A, Oxford Twp. Marlborough, Nepean and North Gower Twps. About $30,000. G. Hogarth, Parliament Bldg., Toronto, engr.

Ont., L'Orignal — See "Streets and Roads."

Ont., Ottawa—Until May 18, by city, building bridge over Rideau River, to replace Cummings Bridge. About $300,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Gilboa—Bd. Water Supply, Municipal Bldg., New York City, received only bid April 27, building Schoharie and Manorkill Bridges, Gilboa and Conesville Twps., from Lupfer & Remick, Inc., Ellicott Sq., Buffalo, $186,330. Noted April 8.

★**New Jersey** — State Highway Dept., Trenton, let contract building Bridge 8, 66 ft. steel girder span, 30 ft. wide, on Route 1, over Millstone River, Mercer and Middlesex Counties, to Selbach-Meyer Co., 601 22nd St., West New York, $27,470.

★**Mich., Grosse Pointe** (Detroit P. O.)—Village let contract furnishing labor and material building 2 rein.-con. arch bridges, each 30 ft. long, 26 ft. wide, University Pl. and Lincoln Ave., to G. R. Cooke, Penobscot Bldg., Detroit. About $25,000. Noted April 29.

★**Ia., Boone** — Boone Co. let contracts building one 8 x 12 x 22 ft. box culvert, one 18 x 18 ft. and 14 x 18 ft. slab bridge, one 18 x 80 ft. and one 18 x 90 ft. Marsh rainbow arch bridge, involving 931 cu.yd. rein.-con., 40 ton steel, 3,704 lin.ft. wooden piling, etc., to Koss Constr. Co., 2818 5th St., Des Moines, $32,887; three 8 x 8 ft. to 10 x 10 ft. box culverts, six 14 ft. to 22 ft. span slab bridges, one 18 x 32 ft. I-beam bridge, four 28 ft. to 36 ft. span deck girder bridges, 1,397 cu.yd. rein.-con., 52 ton steel, 5,600 lin.ft.. wooden piling, etc, to A. Fick, Boone, $45,548. Noted April 22.

★**Ia., Marshalltown** — O. G. Herm, city engr., let contract building 106 ft. rein.-con. bridge, 25 ft. roadway, two 6 ft. sidewalks, on South 3rd Ave., to N. M. Stark & Co., 1215 Mulberry St., Des Moines, $35,000. Work involves 720 cu.yd. rein.-con. 43 ton steel, 3,500 lin.ft. wooden piling, etc. Noted April 22.

★**Ont., Guelph**—Wellington Co. let contract building 266 ft. rein.-con. highway bridge over Speed River, to have one 96 ft. arch. five 34 ft. approach spans and 20 ft. roadway, to G. G. Reid, 34 Victoria St., Toronto, $32,450.

Streets and Roads

PROPOSED WORK

Mass., Newton (Boston P. O.)—City plans to build concrete sidewalks on various streets. About $30,000.

N. J., Jersey City—City plans to widen, pave and improve Mallory Ave., asphalt on concrete base. About $50,000. C. Van Keuren, city engr.

N. J., Jersey City—Hudson Co. Blvd. Comn. approved plans and specifications for repaving Hudson Blvd. from Terhune to Communipaw Aves., bituminous surface. About $200,000. T. J. Wasser, Court House, engr. Noted April 8.

Pennsylvania — State Highway Dept., Harrisburg, received no bids April 27, repaving 15,323 ft., Route 288, Sect. 1, Fayette Co.; 50,025 ft., Route 233, Sect. 1, Venango Co. Noted April 8.

Pa., Stroudsburg — Monroe Co. election May 18 to vote on $500,000 bonds to improve roads. J. B. Hamblin, clk.

W. Va., Charleston—Kanawha Co.,—Washington Dist., voted $60,000 bonds to build dirt and brick roads. F. G. Burdette, co. engr.

W. Va., Fairmont — Marion Co. voted $40,000 bonds to grade, drain, hard surface and build bridges on Morgantown and Fairmont Turnpike, $52,000 for Pricketts Creek Rd., and $26,000 for Montana Rd. Noted March 25.

W. Va., Madison—Boone Co. soon lets contract grading and draining roads, Sect. A involves 5.4 mi., Sect. B 4.3 mi., Sect. C 4.3 mi., Sect. D 5.2 mi. and Sect. E 3 mi. J. P. Blundon, road engr.

S. C., Spartanburg—City plans election to vote on $100,000 bonds to pave various streets.

S. C., Sumter—Sumter Co. election May 11, to vote on $2,500,000 bonds to build roads

Ky., Madisonville — City soon receives bids building sidewalks and paving various streets. About $100,000. G. M. Flanagan, city engr.

O., Dayton—City plans to pave 1,500 ft. Webster St. from Amelia St. to Mad River, 30 ft. wide, involving 5,000 sq.yd. granite durax block on concrete foundation. About $30,000. G. Baker, city engr.

O., Dayton—Montgomery Co. plans to build 8,250 ft. Germantown Pike, 24 ft. wide, involving 22,000 sq.yd. vitr. brick on concrete base, concrete header on each side. About $135,000. P. S. Brookwater, co. engr.

O., Youngstown—City Council had preliminary plans prepared paving and remodeling Public Sq., including rearranging street car tracks and building comfort station, cost $212,060. C. F. Owsley, Mahoning Bldg., archt. F. M. Lillie, 274 Lora Ave., engr.

Mich., Coldwater—Branch Co. receives bids about May 15, grading, draining and surfacing 4¾ mi. road in Quincy and Coldwater Twps., 9 ft. wide, gravel surface on crushed stone base; 3¾ mi. road, Sherwood and Mattison Twps., 60 per cent gravel top course on crushed stone base course. About $43,000 and $34,900 respectively. C. T. Smith, Coldwater, engr.

Ill., Carbondale—City Council plans to build sidewalks in Central Sidewalk Dist., involving 4,108 cu.yd. excav., grading and filling under sidewalks and cross-walks., 213,431 sq.ft. 4 in. and 8,379 sq.ft. 5½ in. portland cement sidewalk and cross-walks, 221,810 sq.ft. trimming, tamping and preparing foundation or subgrade for sidewalk and cross-walks, 1,067 lin.ft. 8-30 in. hard burned, salt glazed, vitr. clay sewer pipe, etc., cost $65,354. W. J. Brown, clk.

Wisconsin—State Highway Dept., at div. office, Citizens Natl. Bank Bldg., Grand Rapids, received no bids April 27, grading and paving 2.319 mi. Portage-Stevens Point Rd., Federal Aid Project 133, Waushara Co.; 4.38 mi. Berlin-Weyauwega Rd., Federal Aid Project 148, Waushara Co. Work will be readvertised. Noted April 22.

Wisconsin—State Highway Dept., at div. office, 213 South Barstow St., Eau Claire, received no bids April 30, grading and paving 5.59 mi. Abbotsford-Medford Rd., Federal Aid Project 147, Clark Co.; 3.75 mi. Cornell-Bloomer Rd., Federal Aid Project 144, Chippewa Co. Work will be readvertised. Noted April 22.

South Dakota — State Highway Comn., Pierre, received no bids April 7, grading, graveling, etc., 7.76 mi. Mitchell-Plantinton Highway, 24 ft. wide, Federal Aid Project 21, Aurora Co. F. S. Peck, state highway engr. Noted March 25.

South Dakota — State Highway Comn., Pierre, received no bids April 6, grading, graveling, etc. 6.58 mi. Presho-Winner Rd., 10 ft. wide, Federal Aid Project 27, Layman and Tripp Counties. F. S. Peck, state highway engr. Noted March 25.

Tex., Amarillo—Potter Co. having plans prepared graveling, gravel surfacing and draining 22.97 mi. Highway 5, Colorado-Gulf Rd., 18 ft. wide, involving 22,973 mi. grading, 1,200 lin.ft. machine work, 45,200 cu.yd. embankment borrow, 575 sq.yd. rein.-con., 12,600 cu.yd. earth excav., 30,000 lb. reinforcing and 40,000 lb. structural steel, 49,170 cu.yd. gravel, etc. About $575,000. Nagle, Witt & Rollins, Amer. Exch. Natl. Bank Bldg., Dallas, engrs.

Tex., Baird—Callahan Co. voted $100,000 bonds to build roads.

Tex., Conroe—Montgomery Co. voted $1,500,000 bonds to improve highways.

Tex., Groesbeck—Limestone Co. having plans prepared grading and draining 23.37 mi. Highway 14, Federal Aid Project 161, 15 ft. wide, involving 17 acres clearing and grubing, 14,600 cu.yd. grading, 12,000 lin.ft. machine work, 1,700 sq.yd. concrete, 160,000 lb. reinforcing steel, etc. About $287,155. Hess & Skinner, Southwestern Life Bldg., Dallas, engrs.

Tex., Junction—C. R. Stevenson, judge Kimble Co., rejected bids received April 6, grading, surfacing and draining 3.37 mi. Highway 27. Noted April 1.

Tex., Lufkin—City voted $100,000 bonds to pave various streets.

Tex., Texarkana—City Council having plans prepared paving business district with bituminous macadam, and residential district, gravel. About $600,000. O. Genglin, Texarkana, engr

Okla., Altus—Jackson Co. election May 25, to vote on $650,000 bonds to build roads. Engineer not selected.

Idaho, Montpelier—City voted $45,000 bonds to pave various streets.

Ariz., Prescott — Yavapai Co. election May 8 to vote on $1,500,000 bonds to build highways.

Ore., Pendleton—State Highway Comn., Salem, plans to grade and gravel 30 mi. road, Umatilla Co. About $185,000.

Cal. Los Angeles—Bd. Supervs. Los Angeles Co. rejected bids improving 22,008 ft. Lancaster-Sierra Bonita Rd., Rd. Dist. 155, 18 ft. wide. Noted March 25.

Ont., Essex—Town plans to build 7,000 sq.yd. concrete pavement. About $28,000. R. R. Brett, clk.

Ont., Ottawa—Suburban Rd. Comn., Thistle Bldg., Wellington St., soon receives bids resurfacing 2 roadways with broken stone and constructing waterbound macadam pavements, also building concrete bridge and culverts. About $150,000. A. Hay, Thistle Bldg., and R. C. Muir, Parliament Bldg., Toronto, engrs.

Ont., St. Catharines—Lincoln Co. plans to build 12 mi. tarvia roads, cost $97,500; 22 mi. earth road, $9,500, and concrete culverts and bridges, $6,500. Large portion of work will be done by day labor. P. Robertson, Beamsville, supt.

Ont., St. Marys—City having estimates prepared by E. A. James Co., Ltd., engrs., 36 Toronto St., Toronto, for 3 mi. asphalt or bitulithic pavement. Cost between $60,000 and $100,000.

BIDS DESIRED

New Hampshire—Until May 11, by F. E. Everett, state highway comr., Concord, building 6 mi. crushed gravel highway, Concord Twp. and 1 mi., Rochester Twp. About $25,000.

N. Y., Brooklyn—Until May 12, by E. Riegelmann, boro. pres., regulating and paving roadway of Stillwell Ave. from Neptune to Surf Aves., permanent asphalt on 6 in. concrete foundation, regulating, grading, curbing and laying sidewalks on southerly side of 81st St. from 17th Ave. to line about 475 ft. west.

Streets and Roads (Continued)

N. Y., Buffalo—Until May 21, by city, repaving Delaware Ave., 40 ft. wide, involving 18,067 sq.yd. asphalt on 6 in. concrete base, cost $100,000, Bailey Ave., 40 ft. wide, 33,905 sq.yd. asphalt on 6 in. concrete base, $187,000, Stanley St., 26 ft. wide, 3,316 sq.yd. asphalt or brick on 6 in. concrete base, 2,122 cu.yd. earth excav., $19,000, Townsend St., 28 ft. wide, 8,308 sq.yd. asphalt on 6 in. concrete base, $46,000, Mandau St., 26 ft. wide, 1,435 sq.yd. asphalt or brick on 6 in. concrete base, 600 cu.yd. earth excav., $8,000, all to have 4 in. Medina sandstone curbing. G. H. Norton, city engr.

N. Y., Niagara Falls—Until May 13, by city, paving 908 ft. Macklem Ave., involving 2,622 sq.yd. vitr. brick or asphalt, 1,990 lin. ft. Medina curbing and drain tile, etc., 2,166 ft. 1st Sect. La Salle Ave., 7,440 sq.yd. vitr brick or asphalt, 4,350 lin.ft. Medina sandstone, etc, 2,000 ft. 2nd Sect., 5,478 sq.yd. vitr. brick or asphalt, 3,990 lin.ft. Medina curbing, etc., 1,368 ft. Haeberle Ave., 3,885 sq.yd. vitr. brick, 2,800 lin.ft. 5 in. Medina curbing, etc., 265 ft. Ivy Court, 782 sq.yd. vitr. brick or asphalt, 590 lin.ft. Medina curbing and drain tile, etc., 1,086 ft. 1st Sect. Vanderbilt Ave., 2,980 sq.yd. vitr. brick or asphalt, 2,220 lin.ft. Medina curbing and drain tile etc., 626 ft. 2nd Sect., 2,015 sq.yd. vitr. brick or asphalt, 1,375 lin.ft. Medina curbing and drain tile, etc W. B. Bennett, city engr.

N. Y., S. I., St. George—Until May 11, by C. D. Van Name, pres. Richmond Boro., repaving roadway of Willow Ave. from Bay to Edgewater Sts., Maple Ave. from Bay to Edgewater Sts., east wing Bay St. from Baltic to Hannah Sts., granite blocks.

N. Y., S. I., St. George—Until May 14, by C. D. Van Name, pres. Richmond Boro., repaving roadway of Richmond Terrace from Davis to Campbell Aves., napped granite block.

New Jersey — Until May 21, by State Highway Comn., Broad St. Bank Bldg., Trenton, building Route 14, Cape May Court House Sect., Cap May Co., involving 14,951 sq.yd. concrete surface; advertised in this issue.

New Jersey—Until May 17, by State Highway Dept., Trenton, rebuilding foundation on Route 1 from New Brunswick to Hightstown, involving 6,000 cu.yd. excav., 3,000 sq.yd. scarifying and reshaping, 1,000 cu.yd. cinders, 2,000 cu.yd. rock bottom and 3,500 ton crushed stone. E. M. Vail, Hotel Windsor, Trenton, engr.

N. J., Newark—Until May 11, by Bd. Freeholders Essex Co., furnishing labor and material for laying 6 mi. bituminous concrete pavement. About $25,000. F. A. Reimer, co. engr.

N. J., Newark—Until May 11, by city, repaving Academy St. from Broad St. to point 175 ft. west and paving Verona Ave. from DeGraw St. to Beaumont Pl., involving 350 sq.yd. asphalt, 1,100 sq.yd. concrete, 550 lin.ft. 5 in. blue stone curbing, etc. M. R Sherrerd, city engr. Noted March 11.

Pa., Gallitzin—Until May 10, by P. Conrad, secy. Boro. Council, 706 Hemlock St., paving Dawson Rd., 20 ft., wide, involving 3,000 sq.yd. 1 course rein.-con. or vitr. clay block on concrete base. About $25,000. Noted Aug. 21.

Delaware—Until May 12, by State Highway Dept., Dover, building 1.19 mi. highway through Frederica, Contr. 24, and 2.93 mi. highway from Tybout's to Hare's Corners, Constr. 34, Kent and New Castle Counties. C. M. Upham, ch. engr.; advertised in this issue.

W. Va., New Martinsville—Until June 1, by S. Myers, clk., Wetzel Co., building 1.25 mi. New Martinsville-Wileyville Rd., 16 ft. wide, cement concrete. G. W. Comstock, co. road engr.

North Carolina—Until May 12, by Div. Office State Highway Comn., Asheville, building 5.04 mi. Federal Aid Project 94-A, Mitchell Co., involving 26,360 sq.yd. bituminous macadam and 11,800 cu.yd. earth excav. W. S. Fallis, Raleigh, engr.

North Carolina—Until May 14, by Div. Office State Highway Comn., Ashville, top soiling 4.83 mi. road, Federal Aid Project 70-A, Jackson Co., involving 43,060 cu.yd. earth and 16,620 cu.yd. rock excav.; 6.76 mi. road, Federal Aid Project 84-B, Mitchell Co., 77,580 cu.yd. earth excav.; grading and top soiling 8.33 mi. road, also building 2 concrete and steel bridges on Federal Aid Project 84-A, Burke and McDowell Counties, 53,925 cu.yd. earth and 8,510 cu.yd. rock excav. W. S. Fallis, Raleigh, engr.

Ky., Corbin—Until May 11, by Common Council grading and paving Barbourville, Ford, 2nd, 3rd, 6th, 7th, Poplar and Gordon Sts. and Kentucky Ave., rein.-con., Kentucky rock asphalt, bituminous or waterbound macadam. G. M. Smith, mayor.

Ky., Mt. Sterling—Until May 11, by City Council, paving various streets, involving 9,200 yd. vitr. brick, asphalt, tarvia or bitulithic on concrete foundation, or Kentucky rock asphalt with or without concrete foundation, 7,100 ft. curbing and guttering. H. B. Ringo, clk.

Ohio—Until May 28, by State Highway Comn., Columbus, building roads in the following counties:

Belmont Co., Sect. "E" New Athens-Morristown Rd., 4.454 mi. grading, constructing bridges and culverts and paving with bituminous macadam, cost $159,810.

Sect. "I" Barnesville-Woodsfield Rd., 2.061 mi., grading constructing bridges and culverts and paving with bituminous macadam, $70,208.

Sect. "H-1" Barnesville-Woodsfield Rd., 1.788 mi. grading, constructing bridges and culverts and paving with bituminous macadam, $65,529.

Champaign Co., Sect. "A" Springfield-Urbans Rd., 5.068 mi., grading, constructing bridges and culverts and paving with brick or rein.-con. $217,706.

Clermont Co., Sect. "1" Cincinnati-West Union Rd., 2.542 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $70,606.

Sect. "L" Cincinnati-West Union Rd., 4.821 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $149,679.

Franklin Co., Sect. "Z" Natl. Rd., west of Columbus, .84 mi., grading, constructing drainage structures and paving with brick, $131,160.

Fulton Co., Sect. "P" and "Q" Bryan-Wauseon Rd., 6.191 mi., grading, constructing bridges and culverts and paving with concrete, $200,235.

Sect. "K-2" Archbold-Fayette Rd., .999 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $19,367.

Hamilton Co., Sect. "A" Glendale-Milford Rd., 2.59 mi., grading constructing bridges and culverts and paving with concrete, semimonolithic brick, warrenite or bitoslag, $129,898.

Hardin Co., Sect. "E" Findlay-Kenton Rd., 2.08 mi., grading, constructing bridges and culverts and paving with asphaltic concrete, $79,664.

Huron Co., Sect. "L" Norwalk-Plymouth Rd., 2.58 mi., grading, constructing bridges and culverts and paving with concrete, $57,142.

Jefferson Co., Sect. "M," Ohio River Rd., 1.21 mi., grading, constructing bridges and Culverts and paving with brick, $69,561.

Marion Co., Sect. "G" Marion-Kenton Rd., 6.106 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $194,971.

Sect. "L-2" Marion-Marysville Rd., 1.98 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $62,117.

Medina Co., Sect. "H-1" Cleveland-Hinckley-Medina Rd., 1.49 mi., grading, constructing bridges and culverts and paving with rein.-con., $70,926.

Portage Co., Sect. "T,U,V and W" Ravenna-Warren Rd., 10.47 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $245,340.

Wood Co., Sect. "B-2" Toledo-Elmore Rd., 3.378 mi., grading, constructing bridges and culverts and paving with bituminous macadam or concrete, $171,390.

O., Columbus—Until May 12, by Comrs. Franklin Co., building approaches to bridges in Mifflin Twp., involving 10 cu.yd. rein.-con., 266 sq.yd. fill, 376 ft. curbing, 320 sq.yd. bituminous macadam and 496 sq.yd. brick paving, concrete abutment, sewers, etc. About $25,000. C. C. Lattimer, co. engr.

Ind., Clinton—Until May 18, by city paving Elm St. from Water to 9th Sts., involving 11,000 sq.yd. brick, asphaltic concrete or concrete; also laying ½ mi. 8-22 in. sewer pipe in North Main St. W. R. Paige, Rose Dispensary Bldg., Terre Haute, engr.

Wis., Hartford—Until May 11, by city, building 5,530 lin.ft. pavement, 20, 30 and 47 ft. wide, rein.-con. brick or bitulithic.

Minn., Bemidji—Until May 10, by A. D. Johnson, aud. Beltrami Co., building 6.55 mi. Federal Aid Project 57, Job 1901, Div. C, State Rd. 4, involving 52.05 acres clearing and grubbing, 90,298 cu.yd. excav., 92,530 cu.yd. overhaul, 3,666 cu.yd. hand ditching, 823 lin.ft. 15-24 in. portable culverts, 10,602 cu.yd. surfacing, also Bridge 3112, consisting of three 75 ft. spans; 2.97 mi. Federal Aid Project 136, Job 1903, State Rd. 11, 5,740 cu.yd. excav., 6,985 cu.yd. overhaul, 3,564 cu.yd. surfacing; 3.19 mi. Federal Aid Project 135, Job 1907, State Rd. 12, 12.04 acres clearing and grubbing, 14,697 cu.yd. excav., 16,260 cu.yd. overhaul, 248 lin.ft. 15-36 in portable culverts, 3,595 cu.yd. surfacing; 6.27 mi. Federal Aid Project 143, Job 1912, State Rd. 6, 15.27 acres clearing and grubbing, 45,380 cu.yd. excav., 92,219 cu.yd. overhaul, 278 lin.ft. 12-18 in. portable culverts, 7,493 cu.yd. surfacing; 9.15 mi. Job 1901, Div. A, State Rd. 4, 74.3 acres clearing and grubbing, 49,917 cu.yd. excav., 101,978 cu. yd. overhaul, 384 lin.ft. 15-36 in. portable culverts, 14,744 cu.yd. surfacing; 7.6 mi. Job 1901, Div. B, State Rd. 4, 57.93 acres clearing and grubbing, 51,808 cu.yd. excav., 315,364 cu.yd. overhaul, 3,191 cu.yd. hand ditching, 353 lin.ft. 15-24 in. portable culverts, 12,030 cu.yd. surfacing; 6.3 mi. Job 1901, Div. C, State Rd. 4, 50.3 acres clearing and grubbing, 38,290 cu.yd. excav., 27,835 cu.yd. overhaul, 1,175 lin.ft. 15 and 18 in. portable culverts, 10,059 cu.yd. surfacing; 1.81 mi. Job 1903-A, State Rd. 11. 3,249 cu.yd. excav., 20,920 overhaul, 35 lin.ft. 24 in. portable culverts, 2,179 cu.yd. surfacing; 7.1 mi. Job 1903-B, State Rd. 11, 12,204 cu.yd. excav., 21,475 cu.yd. overhaul, 143 lin.ft. 18-36 in. portable culverts. 7,466 cu.yd. surfacing; 4.5 mi. Federal Aid Project 156, Job 1909, Div. A, State Rd. 8, 35.72 acres grubbing, 19,602 cu.yd. excav., 22,030 cu.yd. overhaul, 376 lin.ft. 15-24 in. portable culverts. 5,446 cu.yd. surfacing; 4.63 mi. Federal Aid Project 156, Job 1909, Div. B, State Rd. 8, 20.38 acres clearing, 24.04 acres grubbing, 37,100 cu.yd. earth, 270 cu.yd. solid rock and 2,000 cu.yd. loose rock excav., 23,710 cu.yd. overhaul, 770 lin. ft. 18 and 24 in. portable culverts, 5,505 cu.yd. surfacing; 5.53 mi. Job 1907, State Rd. 12, 44.22 acres clearing and grubbing, 14,635 cu.yd. excav., 223,175 cu.yd. overhaul, 68 lin.ft. 15 in. portable culverts, two 18 x 16 ft., five 16 x 10 ft. and three 20 x 10 ft. mud sill bridges, 6,635 cu.yd. surfacing; 2 mi. Job 1908, County Rd. 24, 10 acres clearing and grubbing, 12,365 cu.yd. excav., 12,000 cu.yd. overhaul, 90 lin.ft. 18-24 in. portable culverts, 3,200 cu. yd. surfacing. S. D. Snyder, Bemidji, engr.

Minn., Duluth — Until May 12, by St. Louis Co., grading 6.8 mi. Federal Aid Project 183, Job 2006, 24 ft. wide, cost $35,000; 8.6 mi. Federal Aid Project 180 and 182; Jobs 2004 and 2005, 24 ft. wide, $27,000; 9.5 mi. Jobs 2002 and 2003, 24 ft. wide, $26,000. R. A. Acton, Duluth, engr.

Minn., Hallock—Until May 19th, by Kittson Co., grading and graveling 3 mi. F. A. P. No. 151, 24 ft. wide. About $78,000. J. E. Dishington, Hallock, engr.

Minn., Hastings — Until May 12, by Dakota Co., grading and graveling 16 mi. F.A.P. 22, 24 ft. wide. About $96,000. C. L. Methven, Hastings, engr. Noted April 1.

Minn., Moorhead—Until May 18, by Clay Co. grading 15 mi. Federal Aid Project No. 129, 24 ft. wide. About $75,000. E. Martinson, Moorhead, engr.

Minn., Preston—Until May 19, by J. Dunford, aud. Fillmore Co., building 4.7 mi. Federal Aid Project 138, State Rd. 1, involving 10.7 acres clearing, 4.8 acres grubbing. 42,560 cu.yd. earth, 3,600 cu.yd. loose rock and 2,400 cu.yd. solid rock excav., 6,200 lin.ft. guard rail, 798 lin.ft. portable culvert pipe, also Bridge 3,309, 30 ft. span, involving 125.5 cu.yd. rein.-con., and 5 culverts, 175 cu.yd. rein-con.; 1.6 mi. Job 2004. State Rd. 9, 4.5 acres clearing, 3.5 acres grubbing, 11,818 cu.yd. earth, 3,900 cu.yd. loose rock and 1,932 cu.yd. solid rock excav., 190 lin.ft. 12-36 in. portable culvert pipe.

Kan., Beloit—Until May 14, by Comrs. Mitchell Co., building 6.86 mi. highway, 16 ft. wide, 2 course concrete, also 35 ft. rein.-con. T-girder span, 20 ft. roadway and 20 ft. concrete slab, on plain abutments, on Federal Aid Project 1, Sect. D and E. I. E. Taylor, resident engr.

S. D., Wessington Springs—Until May 12, by city, paving 8,500 ft. various streets, involving 17,000 lin.ft. concrete curbing and guttering, 36,000 sq.yd. concrete, asphaltic concrete, asphalt, brick or bitulithic. About $100,000. K. C. Gaynor, Trimble Bldg., Sioux City, Ia., engr.

Ark., Blytheville—Until May 20, by Bd. Dir. Blytheville-Barfield Rd. Impvt. Dist., Mississippi Co., furnishing labor and material building various streets, involving 14.6 acres clearing, 4.9 acres grubbing, 81,832 cu.yd. excav., 105,604 sq.yd. gravel and 85,430 sq.yd. concrete pavement, 1,735 lin.ft. 12-36 in. corrugated metal pipe culverts, 11,083 cu.yd. Class "B" concrete in headwalls, 10 steel bridges, etc. Pride & Fairley, Blytheville, engrs.

Streets and Roads (Continued)

Tex., Fredericksburg—Until May 12, by A. H. Kneese, judge Gillespie Co., gravel surfacing 4.395 mi. Highway 9, from here to Mason Co., 16 ft. wide, involving 10 acres clearing and grubbing, 8,847 cu.yd. earth borrow, 10,502 cu.yd. earth, 470 cu.yd. solid and 540 cu.yd. loose rock excav., 9,035 cu.yd. gravel surfacing in place, etc., cost $34,000; 13.2 mi. Highway 9 from here to Mason Co. line 16 ft. wide, 35 acres clearing and grubbing, 25,483 cu.yd. earth borrow and 1,950 cu.yd. solid rock excav., and 27,298 cu.yd. crushed stone hauled and placed, $98,000. A. F. Moursand, Fredericksburg, engr. Noted April 22.

Tex., Tyler—Until May 11, by Chairman Smith Co. Comn., grading, gravel surfacing and draining 14.04 mi. Highway 15, 15 ft. wide, involving 11.96 acres clearing and grubbing, 1,407.2 cu.yd. Class "A" concrete, 57,926 sq.yd. bituminous macadam, 64,708 cu.yd. unclassified earth and 100 cu.yd. rock excav., etc. About $240,000. D. K. Caldwell, Tyler, engr Noted April 8.

Tex, Wharton—Until May 14, by W. G. Davis, judge Wharton Co., improving 5.9 mi. State Highway 3, involving 13,210 cu. yd. unclassified excav., 10,673 cu.yd. outfall ditches, 4,395 mi. road grader work, 281 cu.yd. Class "A" concrete and 22,925 lb. reinforcing steel; 6.4 mi. State Highway 3, 18,869 cu.yd. unclassified excav., 1,680 cu.yd. outfall ditches, 4,715 mi. road grader work, 159.33 cu.yd. Class "A" concrete and 12,770 lb. reinforcing steel. B. D. King, co. engr. Noted Jan. 15.

Okla., Beggs—Until May 17, by W. K. Enochs, town clk., grading, paving and curbing streets in Dist. 1, involving 24,000 sq.yd. brick on 5 in. concrete base; advertised in this issue.

Wash., Seattle—Until May 17, by King Co., improving 1.4 mi. Kent-Black Diamond Rd., 18 to 20 ft. wide, involving (1) 15,627 sq.yd. 6 in. concrete and (2) 5,900 cu.yd. grading and graveling. About $46,769. Former bids rejected. S. J. Humes, co. engr. Noted April 8.

Cal., Los Angeles—Until May 17, by Bd. Supervs. Los Angeles Co., paving 4 mi., near Downey, oil macadam and concrete. About $60,000.

Cal., San Diego—Until May 17, by Bd. Supervs. San Diego Co., grading, draining and paving 6 mi. road near Lamesa, concrete.

Quebec—Until May 19, by B. Michaud, deputy minister, Parliament Bldgs., Quebec, constructing concrete pavement, bituminous and waterbound macadam in St. Romuald, Levis Co.

Que., Stanbridge—Until May 12, by C. H. Hibbard, secy.-treas., Stanbridge East, building 21,134 ft. Knowlton-Lacolle Highway, 20 ft. wide, gravel. About $25,000.

Que., Westmount—Until June 15, by A. Jarman, city engr., building concrete sidewalks, cost $250,000, and macadam tar roads, $300,000.

Ont., L'Orignal—Until May 10, by Presscott Co. Council, building 3½ mi. Rd. No. 3, macadam in Lefaivre, also one bridge and culvert on Rd. No. 15 A, Caledonia Twp. About $30,000 V. Belanger, Hawkesbury, engr.

Ont., North Bay—Until May 10, by W. N. Snyder, town clk., building 15,000 sq.yd. asphalt, bitulithic, concrete, bituminous concrete, bituminous concrete or bituminous macadam pavement, on Main St. About $65,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Billerica—State Highway Comn., Boston, let contract building 3,168 ft. road, 22 ft. wide, here, involving 1,430 cu.yd. concrete, 9,300 cu.yd. earth excav., 310 cu. yd. rein.-con. and 890 cu.yd. boulder concrete for bridge, to J. Fannon, Somerville, $123,242.

N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., received bids May 3, (a) repaving with sheet asphalt in 1st and 2nd Wards, (b) regulating and grading sidewalk space and laying sidewalks on south side of Beddard St., (c) Maspeth Ave., from Sicilian Asphalt Paving Co., 41 Park Row, New York City, (a) $16,380; Uvalde Asphalt Paving Co., 1 Bway., New York City, (a) $18,450; Consolidated Asphalt Paving Co., 52-9th St., Brooklyn, (a) $19,730; Peace Bros., Inc., 20 Main St., Flushing, (b) $350, (c) $15,529; Kennedy & Smith, (b) $420, (c) $14,145; Scott Bros., Inc., (c) $12,105. Noted April 29.

N. Y., New York—H. Bruckner, pres. Bronx Boro., received bids April 26, improving (a) Trinity Ave., (b) East 158th St., (c) Wales Ave., (e) Haviland Ave., (f) Watson Ave., (g) Sagamore St., (h) Hering Ave., (i) Waterloo Pl., (j) East 181st St., (k) building sewer in Fieldston Rd., (1) modern granite blocks, different sizes, (2) Durax granite blocks, from Hastings Paving Co., 25 Broad St., (a) $60,799; Leonard Paving Co., 233 Bway., (b) $21,002, (c1) $44,410, (c2) $38,641; Asphalt Constr. Co., 1 Madison Ave., (b) $21,541, (c1) $46,844, (d) $29,279, (j) $24,514; Astoria Contg. Co., Astoria, (b) $21,642, (c1) $49,429, (i) $6,955; Burnside Contg. Co., 270 Burnside Ave., (b) $21,801, (c1) $47,298, (c2) $42,214, (i) $7,288; Uvaldo Asphalt Paving Co., 1 Bway., (d) $31,641, (j) $28,072; J. L. Brustarr, Harlem River and 150th St., (d) $33,583, (j) $26,460; Cornett Constr. Co., (e) $45,567, (f) $47,922; Gasperini & DelBiaslo, 1964 Honeywell Ave., (e) $47,655, (f) $39,630, (g) $29,596, (k) $5,608; Spadero Contg. Co., 837 East 217th St., (e) $50,350, (h) $65,174; Lamura Contg. Co., Seaman Ave. and 218th St., (h) $55,975; McLoughlin & Buckley, 28 West 144th St., (k) $5,045; Anita Constr. Co., (k) $6,006. Noted April 22.

★N. Y., Warsaw—City let contract resurfacing 2½ mi. concrete road, near here, to Oatka Eng. & Constr. Co., $69,975.

★New Jersey—State Highway Dept., Trenton, let contract building 2½ mi. Route 4, Mullica River Sect., Chestnut Neck to New Gretna, 18 ft. wide, involving 62,495 cu.yd. embankment and 9,233 cu.yd. gravel surface, to Ross & Whelan, Broad St. Bank, Trenton, $173,234.

★N. J., Elizabeth—Bd. Freeholders Union Co. let contract improving Westfield Ave., to Walden Constr. Co., Rahway, $58,097; repairing macadam and bituminous roads, to C. H. Winans Co., 207 Broad St., $13,345 and $22,521 respectively. Noted March 4.

N. J., Trenton Jct.—Bd. Freeholders Mercer Co. received bids April 27 paving Grand Ave., from Hill Constr. Co., Trenton, $68,380; A. De Lucia, 52 Bayard St., Trenton, $54,325. Noted April 15.

★Pennsylvania — State Highway Dept., Harrisburg, let contract improving 52,042 ft. Route 123, Sects. 2 and 3, Adams Co., to G. Merdinger, Forker and Northampton Sts., Bethlehem, $511,606; 19,417 ft. Route 133, Chester and Delaware Counties, to Dunleavey Bros., Coatesville, $212,850; 43,573 ft. Route 20, Sect. 1, Bradford Co., to Trinidad Asphalt Co., Larksville, $439,865; 15,686 ft., Route 22, Sect. 3, Tioga Co., to Adams-Evans Co., 709 6th Ave., New York City, $172,779. Noted Jan. 29, Feb. 19 and 26.

Pennsylvania — State Highway Dept., Harrisburg, received bids April 27, repaving roads in counties as follows:

Crawford Co., 29,525 ft. Sect. 3A and 18,161 ft. Sect. 3B, Route 82, from Atlantic Bitulithic Co., Virginia Ry. & Power Bldg., Richmond, Va., (Warrenite "D") $435,849 and $232,655 respectively. Erie Co., 35,492 ft. Sect. 4, Route 84, from Warren Bros. Co., 142 Berkeley St., Boston, (Warrenite "D") $509,972, Adams, Evans Co., 709 6th Ave., New York City, (1 course) $512,389; 21,268 ft. Route 295, from Rosoff Eng. Co., Park Row Bldg., New York City, $252,515. Huntington Co., 3,007 ft. Route 352, from Finn & Son, Inc., Mapleton Depot, $29,562; E. H. and L. A. Brua, Jr., Hollidaysburg, $31,501. Jefferson Co., 1,684 ft. Route 64, from S. Van Shields, Brookville, $37,430; Humphrey, Sayer & Thompson, Brookville, $44,931. Lycoming and Tioga Counties, 72,096 ft. Sect. 3, Route 21, from Porter Bros., Mt. Pocono, $1,188,025; H. S. Kerbaugh and R. G. Collins, Jr., 165 Bway., New York City, $1,247,106; F. L. Cohen, 1002 Prudential Bldg., Buffalo, N. Y., $1,442,723. Schuylkill Co., 53,613 ft. Sect. 2, Route 290, from F. Gillespie and B. Franklin, Jr., 1420 Chestnut St., Phila., (Spec. "A" sheet asphalt), $770,153. Washington Co., 16,137 ft Sect. 2, Route 181, from T. Arrigo, Charleroi, $212,714. York Co., 4,136 ft. Route 126, from W. S. Souder and J. A. Raeyling, York, (Spec. "A" sheet asphalt) $106,318; A. B. Kraft, 511 South Water St., York, $108,423. Noted April 8.

★Pennsylvania — State Highway Dept., Harrisburg, let contract building 7,471 ft. Route 225, Delaware Co., to W. C. Evans, Maple St., Ambler, $83,301; 4,243 ft. Route 33, Huntington Co., to Standard Contg. Co., 339 Altoona Trust Bldg., Altoona, $46,206; 25,911 ft., Route 151, Sect. 2, Montgomery Co., to Ambler-Davis Co., Harrison Bldg., Phila., $281,406; 28,644 ft., Route 81, Sect. 2, Lawrence Co., to Woods & Golder, Mechanic St., New Castle, $320,331; 41,441 ft., Route 168, Sect. 2A, Monroe Co., to J. J. Guinan, 2314 Gravesend Ave., Brooklyn, N. Y., $516,122; 48,465 ft., Route 82, Sect. 3, Mercer Co., to D. McNell Co., Jenkins Arcade, Pittsburgh, $585,230; 29,974 ft., Route 10, Susquehanna Co., to H. B. Sproul Constr. Co., Scranton, $294,164; 24,431 ft., Route 63, Sect. 3, Cambria Co., to P. C. Azzara, Cresson, $364,172; 42,900 ft., Route 84, Sect. 2, Erie Co., to Cary-Campbell & Co., New York City, $520,756. Noted Feb. 26, March 25, April 22.

★Maryland—State Rds. Comn., 601 Garrett Bldg., Baltimore, let contract building 1 mi. road from Laurel toward Ashton, 15 ft. wide, concrete, Contr. P-19, Prince George's Co., to Ward & O'Connell, 407 Law Bldg., Baltimore, $32,650. Noted April 22.

★Md., Baltimore—Bd. Awards let contract paving 13 streets, involving 15,800 sq.yd. sheet asphalt and 10,800 lin.ft. concrete curbing, to Amer. Paving and Contg. Co., Montebello Ave. near Harford Ave. About $107,000.

★North Carolina—State Highway Comn., Raleigh, will hard surface 6.3 mi. road from Durham to Chapel Hill, Federal Aid Project 71, Orange and Durham Counties. Work will be done by day labor.

★Tennessee—Dept. of Highways, Nashville, let contract building 7.717 mi. State Highway 12 from Ripley to Tipton Co. line, Lauderdale Co., to Murphy Sparkman Co., Martin, $270,881; 7.43 mi. State Highway 12 from Memphis to Mississippi state line, Shelby Co., to Mid-Continent Constr. Co., 310 Church St., Nashville, $250,521.

★Tenn., Chattanooga—Hamilton Co. will build 11 mi. roadway, involving 40,000 cu.yd. grading, 95,000 sq.ft. concrete, 16 ft. wide, 6 in. on sides, 7½ in. in center, 3 ft. chert shoulders. About $400,000. Work will be done by day labor.

★O., Akron—City let contracts paving Manchester Rd. from Thornton to South Sts. and from South St. to south corporation line, asphalt on 7 in. base, to Columbus Asphalt Paving Co., 288 East 16th Ave., Columbus, $65,294 and $137,036, respectively.

★O., Cleveland—Cleveland Union Terminals Co., c/o O. P. Van Sweringen, Marshall Bldg., let contract grading 100,000 yd. on Bway. from East 34th St. to Pub. Sq., for track approaches to new freight terminals and depot, to Central States Eng. & Constr. Co., Citizens Bldg. About $150,000.

O., Columbus—City received bids April 27, grading, draining, paving with asphalt, laying water main in 1,000 ft. High St. from Poplar St. to Buttles Ave., 52 ft. wide, from Cleveland Trinidad Paving Co., The Arcade, Cleveland, $33,936; Franklin Asphalt Paving Co. Columbus, $34,254.

★O., East Cleveland (Cleveland P. O.)—Village let contract paving 4th Ave. from Hayden to Euclid Ave., involving 8,000 cu. yd. concrete, to Gould & Maybach, East 150th St., Cleveland, $5,209; Lee Rd. from Euclid Ave. to Terrace Rd., involving 2,600 sq.yd. Mexican asphalt, and Elderwood Ave. from Collomer St. to present pavement, 1,800 sq.yd. Mexican asphalt, to Rieley Bros., The Arcade, Cleveland, $33,826. Noted March 11.

★O., Youngstown — The following contracts were let some time ago and held up owing to lack of funds; work to begin within a month. Mercer St., involving 5,055 sq.yd. vitr. brick on concrete base, to E. Diorio, City Hall, $27,470; Overland and Princeton Aves., 5,170 sq.yd. vitr. brick on concrete base, W. Serafino, City Hall, $27,082; Richview St., 5,050 sq.yd. concrete, City Constr. Co., City Hall, $19,845; Willis Ave., 5,442 sq.yd. asphalt and concrete, Hillman Ave., 4,800 sq.yd. concrete, Midland St., 6,955 sq.yd. concrete, Manhattan St., 6,750 sq.yd. concrete, Edwards St., 8,490 sq.yd. concrete, to Turner Constr. Co., 25 Wood St., $22,468, $22,427, $28,154, $26,938 and $33,637 respectively; Homewood and Carr Sts., 8,950 sq.yd. vitr. brick and 4,320 sq.yd. concrete, Gladstone St., 5,053 sq.yd. vitr. brick on bituminous concrete base, to L. Tiberio, City Hall, $22,657 and $24,353 respectively; Philadelphia St., 6,700 sq.yd. asphalt and concrete, Southern Blvd., 7,955 sq.yd. asphalt and concrete, to Kelly & Myers, City Bldg., $35,851 and $35,481 respectively; Boston St., 6,680 sq. yd. asphalt and concrete, Judson St., 6,508 sq.yd. asphalt and concrete, Aberdeen St., 4,990 sq.yd. asphalt and concrete, to Webster Bros., City Bldg., $30,717, $30,141 and $23,440 respectively; Cleveland St., 3,268 sq.yd. vitr. brick on concrete base, to Bullock & Clark, $20,054; Mayfield and Highland Sts., 6,641 sq.yd. concrete, Avondale St., 4,176 sq.yd. asphalt and concrete, to Victor-Olson Constr Co., 507 Mahoning Bank Bldg., $26,923 and $19,254 respectively; Salt Spring St., 10,100 sq.yd. vitr. brick on concrete base, to L. H. De Grodt, City Hall, $50,488; all 27 and 30 ft. wide.

★Ind., Ft. Wayne—Hilgeman & Schaaf, 346-347 Utility Bldg., let contract grading and draining 7,006 ft. various streets 24 ft. wide, in Sect. "B", Southwood Park, involving 14,959 lin.ft. concrete curbing and guttering, 13,932 cu.yd. clay earth excav.,

Streets and Roads (Continued)

15,543 sq.yd. bituminous concrete on concrete base, etc., to Grace Constr. & Supply Co., 220-221 Utility Bldg., $81,707.

★**Mich., Coldwater**—Branch Co. let contract grading, draining and surfacing 5½ mi. road, in Alagansee and California Twps., 9 ft. wide, 8 in. compacted 60 per cent gravel, involving 16,108 cu.yd. earth excav., 296.3 cuyd concrete, etc, to Paradine & McMurry, Coldwater, $29,740; 4 mi. in Alagansee Twp., involving 14,276 cu.yd. earth excav., etc., to Gardner & Owens Constr. Co., Allen, $36,309.

★**Mich., Detroit**—City let contracts to Detroit Asphalt Paving Co., 20 McGraw Bldg., grading, shaping and surfacing with sheet asphalt on 6 in. concrete base, Amherst or Berea curbstone, Bushey St., $12,625; Chalmers Ave., $18,498; Elmhurst Ave., $11,909; Beniteau Ave. from Canfield St. to Lots 2 and 3 Schepkes Sub., $17,059; Beniteau Ave. from Kearn to Harper Sts., $13,219; Hampton Ave., $4,198; Morton Ave., $6,718; Otis St., $30,693; 29th St., $10,698; Cleveland Trinidad Paving Co., 2940 Woodward Ave., Field Ave., $81,155; Elsworth Drive, $4,891; Horatio St., $7,082; Spring St., $7,293; Warren Ave., $45,614; Wilde St., $10,920; Merrill St., $5,575; W. B. Brady Constr. Co., 1972 Grand River Ave., Euclid Ave., $33,472; Greenway Ave., $45,926; Martindale Ave., $22,540; Gladstone Ave., $22,270. Noted April 22 and 29.

Mich., Detroit—City received bids excavating and placing concrete base manhole drains and crushed stone backfilling for double track roadbed on Charlevoix Ave. from Connors Ave. to Alter Rd., involving 7,860 cu.yd. excav., 8,826 sq.yd. 8½ in. concrete base, 11,212 ft. 6 in. tile, 461 cu.yd. 1½ in. crushed stone, backfill, etc., from J. A. Mercier, 216 Hammond Bldg., $51,446; R. Porath, 1131 McKinley Ave., $56,960.

★**Ill., Amboy**—City let contract paving Mason St. from Main to Wasson Sts., rein.-con., to Gund, Graham & Co., 207 Old Colony Bldg., Freeport, $40,829.

★**Wisconsin**—State Highway Dept., at div. office, Wilner Bldg., Green Bay, let contract grading and paving Pembine-Niagara Rd., Federal Aid Project 129, Marinette Co., to Road Comn. Marinette Co. Marinette. Former bids rejected.

Wisconsin—State Highway Dept., at div. office, Sponner, received bids April 29, grading and paving (1) 5.8 mi. Superior-Solon Springs Rd., 18 ft. wide, concrete, Federal Aid Project 113, Douglas Co., involving (a) 29,078 cu.yd. earth excav., (b) 10,907 cu.yd. borrow excav., (c) 61,344 sq.yd. concrete surfacing, (d) 20,675 bbl. cement, (e) .57 acres clearing and grubbing, etc, (2) 5.1 mi. Spooner-Hayward Rd., Federal Aid Project 156, Washburn Co., (a) $59,893 cu.yd. earth excav., (b) 377 cu.yd. borrow excav., (c) 405.6 cu.yd concrete in culverts, (d) 22.68 acres clearing and grubbing, from Cast Stone Constr. Co., 419½ South Barstow St., Eau Claire, (1a) $1.30, (1b) $1.10, (1c) $2.42, (1d) $2.53, (1e) $200, etc., total cost, $264,929; E C. Johnson & Co., Superior, (1a) $1.50, (1b) $1.60, (1c) $2.49, (1d) $2.58, (1e) $89, etc., $281,462; Peterson & Nelson Co., Superior, (1a) $1.25, (1b) $1.40, (1c) $2.33, (1d) $2.48, (1e) $125., etc., $264,900; C. Johnson, 75 Main St., Oshkosh, (2a) $0.89, (2b) $0.89, (2c) $30, (2d) $200., etc., $73,593; Ord Co., Duluth, Minn., (2a) $0.80, (2b) $0.80, (2c) $40, (2d) $175, etc., $71,678; Van Der Boom Constr. Co., 120 Wisconsin St., Milwaukee, (2a) $0.79, (2b) $0.79, (2c) $28, (2d) $145, etc., $65,291; Universal Eng. Co., Eau Claire, (2a) $0.84, (2b) $0.88, (2c) $33., (2d) $225, etc., $72,769. Noted April 22.

★**Wisconsin**—State Highway Dept., at div., office, Citizens Natl. Bank Bldg., Grand Rapids, let contract grading and paving 4.618 mi. Packwaukee-Montelo Rd., Federal Aid Project 132, Marquette Co., to M. Jones, Endeavor, $30,112. Noted April 22.

Wis., Port Washington — Ozaukee Co. received bids grading and paving 2 mi. Lake Shore Rd., 16 and 18 ft. wide, involving 26,000 sq.yd. 2 course rein.-con., from McGueken Constr. Co., 425 East Water St., Milwaukee, $90,990; Froemming Bros., 1288 Humboldt Ave., Milwaukee, $91,000.

★**Ia., Des Moines**—City Council let contract paving Southwest 21st St. from Chicago, Burlington & Quincy R.R. tracks to city limits, 20 ft. wise, involving 15,195 sq.yd. Class "D" brick on 6 in. concrete base, with asphalt filler, to G. F. Lambert, 405 Utica Bldg. $69,593. Noted March 18.

★**Ia., Des Moines**—Polk Co. let contract grading and paving 4.45 mi. White Pole Rd., west from city limits to county line, 20 ft. wide, involving 48,659 sq.yd. Class "A" concrete and 6,641 cu.yd. excav., to O'Rourke Eng. Co., 1215 Mulberry St., $202,737. Noted April 22.

★**Ia., Hawarden**—City let contract paving curbing and guttering 3 mi. various streets, asphaltic concrete, to Western Asphalt Paving Corp., Sioux City. About $280,000.

★**South Dakota**—State Highway Comn., Pierre, let contract gravel surfacing 11.14 mi. Madison-Howard Highway, 24 ft. wide, Federal Aid Project 33, Miner Co., also grading and draining same, 36 ft. wide, to W. R. Shipman Constr. Co., Sioux City, Ia., $47,581 and $59,077 respectively; grading, gravel surfacing and draining 9.5 mi. Mobridge-Selby Highway, Federal Aid Project 20, Walworth Co., also grading and draining 15.37 mi. Aberdeen-Ipswich Highway, Federal Aid Project 32, Edmunds Co., both 36 ft. wide, to Stevens Bros., St. Paul, Minn., $75,158 and $104,865 respectively. Noted March 25.

★**South Dakota**—State Highway Comn., Pierre, let contract grading and building drainage structures on 9.05 mi. Mobridge-McIntosh Highway, Federal Aid Project 29, Corson Co., to H. J. Hawley, Trail City, $49,111; 17.75 mi. Parker-Centerville Highway, Federal Aid Project 36, Turner Co., to W. R. Shipman Constr. Co., Sioux City, $108,243; 17.52 mi. Tyndall-Lake Andes Rd., Federal Aid Project 28, Charles Mix Co., A. A. Loft, Yankton, $65,249; 3.73 mi. Madison-Flandreau Highway, Federal Aid Project 48, Moody Co., to D. D. Didwell, Egan, $32,516; 8.49 mi. Huron DeSmet Rd., Federal Aid Project 31, Beadle Co., to W. J. Cole, Huron, $40,035; 6.58 mi. Kadoka-Martin Rd., Federal Aid Project 23, Jackson Co., to E. C. Pettyjohn, Kadoka, $42,188; all 36 ft. wide. Noted March 25 and April 1-15.

★**South Dakota**—State Highway Comn., Pierre, let contract gravel surfacing 8.49 mi. Huron-De Smet Rd., 24 ft. wide, Federal Aid Project 31, Beadle Co., to Bd. Comrs. Beadle Co., Huron, $47,055; grading, graveling and draining 27.36 mi. Mitchell-Alexandria Rd., Federal Aid Project 24, Hanson Co., to Bd. Comrs. Hanson Co., Alexandria, $140,968. Noted March 25.

★**Mo., Independence**—Jackson Co. let contract surfacing 3.07 mi. Lone Jack East Rd., 16 ft., wide, involving 28,821 sq.yd. broken stone base course, 28,821 sq.yd. bituminous macadam surface, 6,524 lb. reinforcement for concrete masonry, 82 cu.yd. class B and 30 cu.yd. class C concrete, etc., to W. A. Ross, Kansas City, $74,997. Noted April 29.

★**Mo., Jefferson City**—City let contract paving 1 block Bway. from High to Main Sts., 60 ft. wide, 1 block Harrison St. from Main to Water Sts., 48 ft. wide, 1 block Madison St. from High to McCarty Sts., 55 ft. wide, vertical fibre brick on 4 in. cement concrete base, to Pope Constr. Co., Merchants Bank Bldg., $17,214, $9,841 and $13,280 respectively. Noted March 18.

★**Mo., St. Joseph**—Buchanan Co. let contract paving 6.5 mi. Agency Rd., bituminous concrete and waterbound macadam on concrete base, to W. M. Spencer, 211 North Delaware St., Independence, $176,024 Noted March 4.

★**Tex., Comanche** — Comanche Co. will grade and drain 7.9 mi. Highway 22 from near here, north, to Rush Creek, 16 ft. wide. Cost $53,278 including 10 per cent for engineering and contingencies. Work will be done by day labor. Noted March 25.

★**Tex., Dallas**—C. E. Gross, aud. Dallas Co. let contract grading, clearing and paving 8.88 mi. Dallas-Sevene Rd., 18 ft. wide, involving 53,500 cu.yd. earth and 260,063 cu.yd. rock excav., 129,144 cu.yd. grading overhaul, etc., to O'Conner & Gilkinson Co., Dallas, cost plus 10 per cent; building bridges and drainage structures on above, involving 1,841 cu.yd. concrete, 166,563 lb. reinforcing steel, 1,180 ft. 18-36 in. concrete pipe, etc., to Tyler Constr. Co., Dallas, cost plus 10 per cent. Noted April 22.

Tex., Emory—H. D. Garrett, judge Rains Co., received bids March 20, grading, gravel surfacing and draining 22.34 mi. Highway 42, from Hunt to Wood Co. lines, 12 ft. wide, from Allhands & Davis, Dallas, $125,876; Hagler & Oglesby, Tyler, $129,736; Womack Constr. Co. and McElrath & Rogers, c/o latter, Corsicana, $138,422; county to furnish gravel, cost $118,877. Work involves 24.4 acres clearing and grubbing, 126,012 cu.yd. borrow and 5,950 cu.yd. cut excav., 47,510 lb. reinforcing steel, 34,963 cu.yd gravel, 584 cu.yd. Class "A" and 55 cu.yd. Class "B" concrete. Noted April 15.

★**Tex., Junction**—C. R. Stevenson, judge Kimble Co., let contract grading, surfacing and draining 6.83 mi. Highway 27 from here to 6 mi. crossing, 9 ft. wide, to Coleman & Jenkins, Gunter Bldg., San Antonio, $26,403, including 10% for engineering and contingencies. Work involves 9.3 acres clearing and grubbing, 5,265 cu.yd. earth borrow, 127 cu.yd. Class "A," 17 cu.yd. Class "B" and 116 cu.yd. Class "D" concrete. Noted April 22.

★**Tex., Lubbock**—Lubbock Co. let contract paving, curbing and guttering 2 mi. principal streets, bituminous macadam, involving 10,000 lin.ft. combined curb and gutter, to Panhandle Constr. Co., Plainview. About $250,000; cost plus percentage basis.

★**Tex., Montague** — Montague Co. will grade, surface and drain 7.47 mi. Highway 2D, Sect. A, Federal Aid Project 128, 16 ft. wide, involving 35,652 cu.yd. embankment borrowed, 12,040 cu.yd. earth, 343 cu.yd. solid rock and 1,055 cu.yd. loose rock excav., 21,398 lb. reinforcing steel, 271 cu.yd. Class "A," 104 cu.yd. Class "B" and 36 cu.yd. Class "C" concrete, also 8.08 mi. Highway 2, Sect. B, Federal Aid Project 86, 16 ft. wide, 6 acres clearing and grubbing, 57,149 cu.yd. embankment borrowed, 10,848 cu.yd. earth, 550 cu.yd. solid rock and 1,400 cu.yd. loose rock excav., 26,995 lb. reinforcing steel, 310 cu.yd. Class "A", 217 cu.yd. Class "B" and 16 cu.yd. Class "C" concrete, $56,550 and $92,913, respectively, including 10 per cent for engineering and contingencies. Work will be done by day labor. Noted April 22.

Tex., Orange—D. C. Bland, judge Orange Co., received bids April 28, grading, paving and draining 10.26 mi. Highway 3, Orange-Beaumont Rd., 16 ft. wide, from Houston Constr. Co., 3102 McKinney St., Houston, $420,573; A. C. McFarlane, co. judge Orange Co., $455,124. Work involves 8.15 acres clearing and grubbing, 40,365 cu.yd. earth borrow, 47,892 sq.yd. earth shoulders, 15,099 cu.yd. earth excav., 88,478 sq.yd. plain and 7,734 sq.yd. rein.-con. pavement, 106,745 lb. reinforcing steel, 69,608 lb. mesh reinforcement, 914.7 cu.yd. Class "A" and 125.4 cu.yd. Class "B" concrete, etc. Noted April 15.

Tex., Seymour—Baylor Co. received bids April 14, grading, gravel surfacing and draining 12.3 mi. Highway 30, 16 ft. wide, from A. Ferrier and W. Stephens, Seymour, $60,249; Baylor Co., c/o co. judge, $70,272; Womack Constr. Co., Houston, $71,014. Noted April 8.

★**Oklahoma**—State Highway Dept., Oklahoma, let contract improving 10 mi. road from Ponca City to Newkirk, to M. Swatek, 412 Security Bldg., Oklahoma, $68,600. Noted March 25.

★**Okla., Tulsa**—City let contracts paving Victor Ave. from Admiral North to Chambers Sts. and Sunset Park from Pearl St. to east line of Blocks 2 and 7, to F. P. McCormick, Tulsa, $27,933 and $40,050 respectively; Cincinnati Ave. from 21st to 23rd Sts., to Standard Paving Co., 321 North Boston St., $162,166. Noted April 8.

Utah, Salt Lake City—Salt Lake Co. will build 1.7 mi. Murray-Taylorsville Rd., 18 ft., wide, and 1.25 mi. 72nd St. South extension, 18 ft. wide. Former bids rejected Work will be done by day labor. G. B. Bywater, co. engr. Noted March 25.

★**Utah, Salt Lake City**—Salt Lake Co. let contract paving 2.1 mi. roads from Draper to Riverton, 18 ft. wide, to Wattis & Samuels Co., Newhouse Bldg., $64,640; 5.25 mi. Redwood Rd. extension, 18 ft. wide, to W E. Ryberg, Kearns Bldg., $45,925. Noted March 25.

★**Wash., Colfax**—City let contract grading, paving with concrete and building retaining wall, 16 ft. high, on Wall St., to T. Ristvedt, Colfax, $27,348.

★**Wash., Ritzville**—Adams Co. let contract surfacing 9 mi. Donohue Rd. 7, involving 16,125 cu.yd. crushed stone, to Mitchell Bros., East 127 Mission St., Spokane, $45,150. Noted April 15.

Wash., Seattle—Bd. Pub. Wks. received bids April 24, improving Beach Drive et al, involving 11,600 sq.yd. (a) 1 course and (b) 2 course concrete sidewalk, 3,000 lin.ft. 3 in., sewer pipe and 1,500 lin.ft. 3 in. tile drain, from R. H. Travers, Arcade Bldg., (a) $22,885, (b) $26,133; J. M. Keating Co., (a) $24,351, (b) $24,119; D. H. Traphagen, Walker Bldg., (a) and (b) $25,256 each; contractors all of Seattle.

Wash., Seattle — King Co. received bids April 26, grading and graveling 2.5 mi. R. A. Ballinger Rd., 20 ft. wide, involving 23,188 cu.yd. earth excav., from E. M. McQuaid, $35,800; T. Jones, $36,495; P. Yangsmo, $39,677; contractors all of Seattle. Noted April 15.

★**Wash., Tacoma**—Pierce Co. let contract grading and paving 6.47 mi. Midland Summit Highway, 16 ft. involving 22,185 cu.yd. excav. and 60,947 sq.yd. concrete, to D. A. Williams, Tacoma, $219,424.

★**Wash., Tacoma**—Pierce Co. let contract grading and building wooden bridge on 2.13 mi. Permanent Highway 13, 16 ft

Streets and Roads (Continued)

wide, involving 65,063 cu.yd. excav., to D. W. Rutherford, Municipal Dock, $82,200.

★**Wash., Tacoma**—Pierce Co. let contract to F. J. McHugh, 1816 South G St., grading and paving 4.59 mi. Bond Rd. 20, involving 43,633 sq.yd. concrete, 4,590 cu.yd. excav., cost $102.388; 3.66 mi. Bond Rd. 21, 34,847 sq.yd. concrete, 7,200 cu.yd. earth excav., $89,911; 4.73 mi. Bond Rd. 22, 45,466 sq.yd. concrete, 9,500 cu.yd. earth excav., $112,936.

Ore., Enterprise—City received only bid April 15, paving 12 various districts with asphaltic concrete, from Warren Const. Co., Journal Bldg., Portland, $2.25 per sq.yd., total $203,629.

★**Ore., Eugene**—City let contract paving 8 blocks of 12th Ave., E., from East Oak to Kincaid Sts., 34 ft. wide, involving 12,500 sq.yd. concrete, to J. T. Long Constr. Co., Eugene, $2.45 per sq.yd., total, $39,600; River Rd. to connect with state highway, 16 ft. wide with 6 ft. macadam shoulders, involving 600 sq.yd. concrete, to Stein Bros., Eugene, $2.55 per sq.yd., $2,400.

Ore., Portland—City received bids April 21, improving (a) East 20th St. from Prescott to Alberta Sts., (b) 29th St. from Nicolai St. to Industrial Ave., (c) Killingsworth Ave. from Union Ave. to East 9th St., (d) portions of 64th St. S. E. and 45th Ave. S. E., (e) 43rd St. S. E. from Woodstock to 64th Aves., S. E., (f) Klickitat St. from East 30th to East 31st Sts., (g) East 30th St. from Siskiyou to Fremont Sts., (h) Prescott Court from Concord St. to Denver Ave., (i) grading and building sidewalks on portions of 53rd St. S. E., 54th St. S. E., 33rd Ave., S. E., and 31st Ave., S. E., (j) portions of East Morrison, East Alder, East Washington, East Stark, East Oak, East 6th, East 7th, East 8th and East 9th Sts., (1) asphaltic concrete, 2 in. top on 4 in. crushed rock base in roadway, (2) asphaltic concrete No. 1, 2 in. top on 4 in. crushed rock base, (3) 2 in. asphaltic concrete No. 1, redress, from United Contg. Co., Northwest Bank Bldg., (a1) $2.28 per sq.yd., total $12,069, (b1) $2.26 per sq.yd., $4,996 (c1) $2.26 per sq.yd., $15,101, (h2) $2.26 per sq.yd., $4,996; Warren Constr. Co., Journal Bldg., (d2) $2.36 per sq.yd., $27,364, (e2) $2.39 per sq.yd., (e3) $1.73 per sq.yd., $6,758, (f2) $2.26 per sq.yd., $1,725, (g2) $2.26 per sq.yd., $9,003; Municipal Paving Plant, Portland, (f2) $1.90 per sq. yd., $1,500, (g2) $1.90 per sq.yd., $7,701, (h2) $1.85 per sq.yd., $4,338; Cochran Bros., 415 South Syracuse St., (i) $31,000; J. A. Lyons, 725 Weidler St., (i) $34,365; M. Hansen & Co., 523 East Grant St., (j) $19,742.

★**Ore., Tillamook**—F. B. Stranahan, city recdr., let contract paving 3rd and 7th Sts., Sunnymead Dist., also building sewer in 5th St., to Oregon Contract Co., Tillamook, $82,933 and $24,418 respectively. Noted April 15 under "Sewers."

Cal., San Diego—San Diego Co. received bids improving Sect. A, Highway over Poway, involving 45,500 cu.yd. grading, 1,430 ft. corrugated iron culverts, 110 cu. yd. concrete and 6,742 lb. steel from C. H. Hudson, 408 Marsh Strong Bldg., Los Angeles, $53,319; Wells & Bressler, Santa Ana, $80,160; H. G. Fenton, Owl Drug Bldg., $94,343. Noted Jan. 8.

★**Ont., Niagara Falls**—City let contract for 70,000 sq.yd. asphalt on concrete base and 40,000 lin.ft. concrete curbing and guttering, to Nicholson & McNamara, St. Catharines, $148,454.

Railways

PROPOSED WORK

New York—Pub. Serv. Comn., 49 Lafayette St., New York City, receives bids April 27, installing tracks at 180th St., yard, from Slattery Eng. & Constr. Co., 7 East 42nd St., New York City, $127,159; T. Crimmins, 444 East 69th St., New York City, $178,280.

New Jersey—Pennsylvania R.R., Broad St. sta., Phila., plans to improve and enlarge yards in Jersey City Meadows. About $100,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Michigan**—Grand Trunk Ry., Merchants Loan & Trust Bldg., Chicago, let contract grading ½ mi. for 6 team track at freight terminal of Pontiac, Oxford & Northern Ry. division, here, to Lennane Bros., Union Trust Bldg., Detroit, $80,060.

Excavation and Dredging

PROPOSED WORK

Ia., Ft. Madison—Ditches—R. A. Gardner, aud. Lee Co., rejected bids received April 22, completing ditches in Green Bay Levee and D.D., involving 108,000 cu.yd. excav. E. T. Perkins Eng. Co., 1211 1st Natl. Bank Bldg., Chicago, Ill., engrs. Noted April 1.

Que., Montreal — Dredging — Dominion Government, Ottawa, voted $478,000 to dredge St. Lawrence River from here to Quebec City, involving 29,000,000 cu.yd. dredging.

BIDS DESIRED

N. Y., New York—Dredging—Until May 10, by M. Hulbert, comr. docks, Pier "A," foot of Battery Pl., furnishing labor and material dredging in Manhattan, Queens and Richmond Boroughs.

Ia., Atlantic—Drainage—Until May 17, by C. E. Kringel, aud. Cass Co., building 12 mi. drainage ditches for straightening Indian Creek and tributaries in Brighton, Cass and Washington Twps., involving 724,500 cu.yd. excav. in Sect. 1 and 26,280 cu.yd. excav., Sect. 2.

Ia., Ft. Dodge—Drains—Until May 11, by C. A. Snook, aud. Webster Co., building Drain 312, involving 18,590 ft. tile, cost $35,795; Drain 313, 22,800 cu.yd. earth excav. and 15,050 ft. tile, $26,785; Drain 4, 100,000 cu.yd. earth excav. and 3,000 ft. tile, $25,720· Drain 306, 22,974 cu.yd. earth excav. and 25,000 ft. tile, $62,247. J. L. Parsons, Ft. Dodge, engr. Noted April 1.

Minn., Windon—Drainage—Until May 15, by Redding & Smaage, Windon, building drainage ditch, about 5 mi. from here, involving 23,100 yd. open work and 34,690 ft. 26-40 in. tile.

Ont., Port Arthur—Dredging—Until May 12, by Dept. Pub. Wks., Ottawa, dredging Canadian Natl. Ry. elevator slip, 19 ft. channel leading to drydock, shoal spots in main entrance channel and slip at Thunder Bay Elevator to 25 ft., involving 151,000 sq.yd. sand, clay, gravel, hardpan and boulders (floating dredgework). About $30,000. A. Cameron, c/o Dept. Pub. Wks., engr.

Industrial Works

PROPOSED WORK

N. H., Nashna—Nashua Mfg. Co., Mine Falls, having plans prepared by Lockwood, Greene & Co., archts. and engrs., 60 Federal St., Boston, for rein.-con. factory, rein.-con. flooring, concrete foundation. About $2,000,000.

Mass., Boston—L. K. Allentuck, c/o Tuck & Gilman, archts. and engrs., 34 School St., having plans prepared for 2 story, 80 x 200 ft., rein.-con. garage, concrete flooring and foundation, on Fordham Rd. About $150,000.

Mass., Clinton — Lancaster Mills having plans prepared by Lockwood, Greene & Co., archts. and engrs., 60 Federal St., Boston, for 4 story, brick and rein.-con. weave shed. About $150,000.

Mass., Dorchester (Boston P. O.)—Stebbins & Watkins, 164 Federal St., Boston, soon receive bids building 1 story, irregular shaped, concrete garage, rein.-con. flooring, concrete foundation, on East Cottage St., for Thayer-Griffith Co., 148 State St., Boston. About $100,000.

Mass., West Springfield (Springfield P. O.)—C. P. Newton, archt., 318 Main St., Springfield, soon lets contract building 1 story, brick and concrete factory, concrete flooring and foundation on Coid Springs Ave., for New England Box Co., c/o architect. About $150,000.

R. I., Woonsocket—Amer. Wringer Co., 91 Social St., having plans prepared by Cooley & Marvin Co., archts., 711 Tremont Bldg., Boston, for 1 story, 80 x 100 ft., brick, concrete and tile dry kiln building, 2 story, 60 x 186 ft., brick and steel mechanical roll building and 3 story, 40 x 90 ft., brick addition to warehouse, rein.-con. flooring, concrete foundations. About $100,000.

Conn., Hartford — Depts. Health & Charity having plans prepared by Whiton & McMahon, archts., 36 Pearl St., for central heating plant and laundry for isolation hospital and almshouse, on Holcomb St. About $80,000.

Conn., Meriden — Orr & Del Grella, archts., 956 Chapel St., New Haven, soon receive bids building 5 story, brick and mill construction addition to factory, concrete foundation, for E. Miller & Co., 99 Center St. About $100,000. Noted April 1.

Conn., Middletown—Wilcox Crittenden & Co., Inc., 8 South Main St., plans to build 1 story, rein.-con. foundry. About $50,000. Architect not selected.

N. Y., New York—M. Courland, archt. and engr., 47 West 34th St., preparing sketches for 18 story, brick, steel and stone factory, rein.-con. flooring, concrete foundation. About $1,200,000. Owner's name withheld.

N. Y., New York — Johnson Estate, 30 East 42nd St., having plans prepared by G. McCabe, archt. and engr. 96 5th Ave., for 2 story, 175 x 200 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Westchester Ave. About $100,000.

N. Y., Niagara Falls—Shredded Wheat Co., 424 Buffalo Ave., plans to build concrete and tile storage plant, on 10th St. About $92,000.

Pa., Creasy (Mifflinville P. O.)—Creasy Creamery Co. having plans prepared by G. F. Schroeder and C. Schmitt, archts., Wietzenkorn Bldg., Wilkes-Barre, for 2 story, 50 x 100 ft., brick and timber creamery, rock foundation, on Main Rd. About $100,000.

Pa., Nanticoke — Liberty Throwing Co. soon lets contract building 1 story, 52 x 192 ft. addition to plant, brick. About $100,000. C. Epstein, genl. mgr.

Pa., Phila.—W. E. S. Dyer, archt. and engr., Land Title Bldg., soon lets contract constructing 5 story, 145 x 160 ft., brick and concrete mill building, on Lippincott and 21st Sts., for Glen Knitting Co., 2nd and Westmoreland Sts.

Md., Baltimore—McCawley & Co., Lombard and Commerce Sts., having plans prepared by Lockwood, Greene & Co., archts., 101 Park Ave., New York City, for 4 story, 175 x 190 ft., rein.-con and brick factory, concrete foundation, on North Ave. and Wolfe St. About $500,000.

Md., Pocomoke City—Peninsular Storage Co. having plans prepared by J. S. Nussear, archt., 324 North Charles St., for 1 story, 100 x 240 ft., concrete and brick cold storage plant, concrete foundation, here. About $100,000.

N. C., High Point—Harris-Covington Hosiery Mills plan to build 2 story, 50 x 80 ft., and 1 story, 32 x 77 ft. mill, mill construction. J. O. Cannon, High Point, archt. and engr.

N. C., Kinston—City plans to install electric plant, to cost several hundred thousand dollars. W. C. Olsen, Sumter, S. C., archt.

N. C., Wilmington—Wilmington Printing Co., 120 North 2nd St., plans to build plant on 3rd St. About $50,000. H. E. Bonitz, 213 Princess St., archt.

N. C., Winston-Salem—Flint Tobacco Co. plans to build factory. About $300,000. Architect not selected.

Fla., Miami—See "Miscellaneous."

O., Cincinnati — Ford Motor Car Co., Highland Park, Detroit, preparing plans for 2 story, 110 x 130 ft. factory, on Montgomery Rd., here. About $150,000. Private plans.

O., Cincinnati—Hercules Rubber Corp., 908 Union Central Bldg., plans to build 2 or 3 story, 200 x 300 ft. factory. About $500,000. Architect not selected. W. G. Brown, 2801 Union Central Bldg., engr.

O., Cleveland—T. Knight, The Arcade, plans to build 1 story, brick, steel and concrete factory, rein.-con. flooring, concrete foundation, on Fairfield Ave. and Scranton Rd. About $50,000.

O., Cleveland—J. F. Rybak, 5454 Bway., plans to build 4 story brick, steel and concrete warehouse, rein.-con. flooring, concrete foundation, on Woodland Ave. between East 9th and East 14th Sts. About $200,000. Architect and engineer not selected.

O., Cleveland—Waite Taxicab & Livery Co., 1457 East 6th St., having plans prepared by W. S. Ferguson & Co., archts. and engrs., 1900 Euclid Ave., for 2 story, 66 x 280 ft., concrete, steel and brick garage, rein.-con. flooring, concrete foundation, on Superior Ave. and East 12th St. About $150,000. Noted April 29.

O., Warren—Warren Iron & Steel Co. having plans prepared by Watson Eng. Co., archts. and engrs., Hippodrome Bldg., Cleveland, for 1 story, concrete, steel and brick, rolling mill, rein.-con. flooring, concrete foundation. About $150,000.

Ind., Evansville—Schmadel Packing & Ice Co., Fulton Ave., had plans prepared by H. E. Boyle & Co., archts., Furniture Bldg., for 3 story, 65 x 65 ft. addition to plant, brick and rein.-con. About $60,000. J. Schmadel, pres.

Mich., Detroit—Fisher Body Co., Oakland and Piquetts Aves., having plans prepared by A. Kahn, archt., Marquette Bldg., for 6 story, 72 x 990 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, on West End Ave.

Mich., Detroit—J. Shevitz, 195 Ferry Park Ave., having plans prepared by J. I. Weinberg, archt., 401 Congress Bldg., for 4 story, 100 x 180 ft., brick and steel factory, rein.-con. and wood flooring, brick foundation, on Grand Blvd. and Moran St. About $125,000.

Industrial Works (Continued)

Ill., Chicago — W. G. Rosenberger, 214 West Ontario St., having plans prepared by A. S. Alschuler, archt., 28 East Jackson St., for 3 story (ultimate 7 story), 80 x 100 ft. factory, mill construction, on La Salle and Ontario Sts. About $250,000.

Wis., Galesville—Galesville Canning Co. soon lets contract constructing pea cannery, to include four 2 story buildings, brick and concrete. About $100,000. Noted Sept. 11.

Wis., Menasha—Wentink Mfg. Co. having plans prepared building plant. About $100,000. Private plans.

Wis., Sheboygan—Amer. Hide & Leather Co., 1102 Wisconsin Ave., had preliminary plans prepared by Juul & Smith, archts., Imig Bldg., for 2 story, 50 x 130 ft., brick, rein.-con. and steel addition to tannery, rein.-con. flooring, brick foundation, on Wisconsin Ave. About $50,000. F. Schnellen, mgr.

Ia., Sioux City—Sioux City Casket Co., 900 5th St., rejected bids received April 12, and having revised plans prepared by Beuttler & Arnold, archts., Grain Exch. Bldg., for 3 story, 136 x 145 ft., brick, rein.-con. and steel factory, rein.-con. flooring, concrete foundation. About $200,000. Noted April 8.

Kan., Ellsworth—Weber Four Mills Corp., Salina, plans to build 6 story, 1,000 bbl. capacity, concrete and steel mill, here. About $250,000.

Tex., Memphis—Memphis Cotton Oil Co., soon receives bids building cotton seed crushing plant and oil mill. About $200,000.

Tex., Necessity — Alamo Refining Co., Eastland, plans to build oil refinery, here. About $500,000. G. B. Dartoise, ch. engr.

Que., Montreal—Canadian Pacific Ry., Windsor Sta., receives bids about May 15, extending Angus Shops. About $1,000,000. A. Mapes, constr. engr.

Que., Montreal—Food Specialty Co. plans to build plant on Park Ave. About $270,000.

Que., Montreal — Imperial Tobacco Co., Ltd., St. Antoine St., soon receives bids building addition to plant on Laurier Ave. About $60,000.

Ont., Galt—Galt Brass Co., 471 Macadamized Rd., plans to build two 1 story, brick additions to factory, concrete flooring. About $50,000. Architect not selected.

Ont., London—Ford Motor Co. of Canada Ltd., 680-690 Waterloo St., plans to build concrete, brick and steel factory, concrete flooring and foundation. About $100,000. Architect not selected.

Ont., Orillia—Glasscoat Sewer Pipe and Clay Products, Ltd., plans to build frame construction factory. About $150,000. Engineer not selected.

Ont., Toronto—Decalcomania Co. of Canada, Ltd., 364 Richmond St., W., plans to build 3 or 5 story, 60 x 175 ft., clothing factory, brick and steel, on King St., E., near Sackville St. Cost between $80,000 and $100,000. Architect not selected.

Ont., Toronto—Empire Clothing Co., 160 John St., plans to build 7 story, 90 x 107 ft. factory, brick and steel, concrete foundation, on Richmond and Duncan Sts. About $250,000. Architect not selected.

Ont., Toronto—Republican Motor Car Co., 518 Yonge St., plans to build garage, service station and storeroom, brick and mill construction, on St. Albans St. About $170,000. Architect not selected.

Ont., Toronto—Toronto Carpet Co., had plans prepared by W. Steel & Sons., engrs., Ryrie Bldg., for 6 story, 68 x 165 ft. rein.-con. brick and steel factory and dye house, concrete flooring and foundation, on Fraser Ave. About $300,000.

BIDS DESIRED

N. J., Irvington (Newark P. O.)—Until May 15, by J. T. Simpson, archt. and engr., Essex Bldg., Newark, building 1 and 2 story, 50 x 180 ft., 200 x 250 ft. and 282 x 600 ft., concrete and brick factory, here, for Vreeland Motor Co., 407 Elizabeth Ave., Newark. Cost to exceed $300,000. Noted April 15.

Ill., Chicago — G. C. Nimmons & Co., archts., 104 South Michigan Ave., receiving bids building 1 and 2 story, 135 x 400 ft., concrete and brick factory, concrete foundation, on Taylor and Campbell Sts., for Harrington & King Perforating Co., 614 North Union Ave. About $275,000.

Wis., Madison—Until May 18, by University of Wisconsin, University Ave., building 1 story, 100 x 180 ft., engineering shop, brick, concrete and steel, rein.-con. flooring, concrete foundation. About $65,000. A. Peabody, Capitol Bldg., archt.

N. B., St. Johns—Until May 12, by Atlantic Sugar Refining Co., building rein.-con., brick and steel warehouse, rein.-con. flooring, concrete foundation. About $150,000. W. Higginson, 18 East 41st St., New York City, archt. and engr.

Ont., Ft. William—J. C. Holden, engr., Winnipeg, receiving bids for 300 ton coal handling plant, concrete and wood construction here, for Canadian Pacific Ry., Windsor Sta., Montreal, Que.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Portland**—T. Laughlin Co., 133 Fore St., let contract building 5 story, 100 x 100 ft., concrete machine shop, at 23 Hancock St., to J. W. Gulliver, 120 Exchange St. About $75,000.

★**Mass., Boston**—Lawrence & Wambolt, archts., 6 Beacon St., let contract to Gerry & Northrup, 494 Harrison St., altering 5 story, timber cooling plant, on South Market St. About $55,000. Owner's name withheld. Noted April 22.

★**Mass., Boston**—G. N. Jacobs, archt., 9 Hamilton Pl., let contract to Snider & Druker, 18 Tremont St., building 5 story, 70 x 90 ft., brick and mill construction factory, concrete flooring and foundation, on Albany St., for A. Lourie, 128 Pearl St. About $85,000. Noted April 15.

★**Mass., New Bedford** — Kilburn Mills, West French Ave., let contract building 2 story, 70 x 80 ft., brick and rein.-con. garage, concrete flooring and foundation, to J. W. Bishop Co., 109 Foster St., Worcester. About $90,000.

★**Mass., Revere** (Boston P. O.)—O. F. Farley, Jr., 27 State St., Boston, let contract building 1 story, 90 x 110 ft., rein.-con. garage, rein.-con. flooring, concrete foundation, on Boulevard, to W. E. Jackson, 15 Court Sq., Boston. About $50,000.

★**Conn., Goodyear** (Killingly P. O.) — Goodyear Cotton Mills, Inc., Killingly, will build 2 story, 146 x 550 ft., rein.-con. mill, rein.-con. flooring, concrete foundation. About $650,000. Work will be done by day labor.

★**Conn., Talcottville**—Talcott Bros. Co. let contract building 3 story, 40 x 140 ft. and 1 story, 30 x 65 ft., brick and mill construction addition to factory, concrete foundation, to W. A. Wilcox, 327 Trumbull St., Hartford. About $50,000.

★**N. Y., Brooklyn**—F. H. Parsons, 60 Wall St., New York City, will build 1 story, 200 x 225 ft., brick and steel garage, rein.-con. floorng, concrete foundation, on 4th Ave., here. About $100,000. Work will be done by day labor.

★**N. Y., Buffalo** — Amer. Radiator Co., 1803 Elmwood Ave., will build 1 story, 116 x 200 ft., addition to factory, at 89 Rano St. and 1 story, 110 x 140 ft. addition, at 1 Austin St. About $50,000 and $30,000 respectively. Work will be done by day labor.

★**N. Y., Buffalo** — General Drop Forge Co., 1738 Elmwood Ave., let contract building 1 story, 60 x 100 ft. forge shop and 1 story, 100 x 100 ft., heat treating plants, brick, concrete and steel, rein.-con. flooring, concrete foundation, to J. C. Cooper Co., Fidelity Bldg. About $200,000.

★**N. Y., New York**—Pub. Serv. Comn., 49 Lafayette St., let contract furnishing and erecting steel for inspection shed of Interborough Rapid Transit Co. Yard, on 180th St., to Bethlehem Steel Bridge Corp., 111 Bway., $129,470.

★**N. Y., New York**—Ris Constr. Co., 291 Bway., will build 2 story, 100 x 100 ft., brick, steel and concrete garage, rein.-con. flooring, concrete foundation, on 10th Ave. and 56th St. About $70,000. Work will be done by day labor.

★**N. Y., New York**—McKenzie, Voorhies & Gmelin, archts. and engrs., 1123 Bway., let contract to Turner Constr. Co., 244 Madison Ave., building 10 story, 200 x 201 x 323 x 340 ft., rein.-con. and steel factory and warehouse, rein.-con. flooring, concrete foundation, on Greenwich, Clarkson and Hudson Sts., for Western Electric Co., 195 Bway. About $2,700,000. Noted March 25.

★**Pa., Harrisburg**—Jackson Mfg. Co., 4th and Boyd Sts., let contract building 1 story, 90 x 480 ft., wheelbarrow factory, brick and steel, concrete flooring, on South 11th St., to include ½ mi. standard gage railroad, to Central Constr. Co., 222 Market St. About $100,000.

★**Pa., Kingston** (Wilkes-Barre P. O.)—Crane Bros. Silk Co., 416 West Elm St., let contract building 2 story, 48 x 121 ft., brick and steel mill, rein.-con. flooring, rock foundation, on Market St., to Shephard Constr. Co., South Main St., Wilkes-Barre. About $110,000.

★**Pa., Rochester**—H. C. Fry Glass Co. let contract building 1 story, 80 x 200 ft. and 90 x 100 ft. additions to factory, brick, steel and corrugated iron, to Austin Co., Union Arcade, Pittsburgh. About $110,000, cost plus percentage basis.

★**Pa., Wilkes-Barre** — Sperling Tobacco Co., 47 South Pennsylvania Ave., let contract building 3 story, 60 x 120 ft., brick and steel warehouse, rein.-con. flooring, rock foundation, to W. J. Kear, Gildersleeve St. About $100,000.

★**Md., Baltimore**—Federal Motor & Sales Co., 803 Low St., let contract building 3 story, 106 x 117 ft., concrete and brick garage, service and sales station, concrete foundation, on Grasshopper Hill, North Ave. and Lord St., to J. L. Robinson Constr. Co., 1130 West Lafayette Ave. About $100,000. Noted April 1.

★**Md., Canton** (Baltimore P. O.)— Canton Co., Commerce and Water Sts., let contract building 3 story, 80 x 144 ft., rein.-con. warehouse, wood piles and concrete foundation, on 5th Ave. and 16th St., to Sanford & Brooks, 24 Commerce St., Baltimore. About $110,000.

★**Va., Richmond** — Amer. Tobacco Co., 2400 East Cary St., let contract building 2 factories, to Ferro Concrete Constr. Co., Richmond and Harriet Sts., Cincinnati. About $250,000.

★**O., Cleveland**—Colburn Machine Tool Co., 1040 Ivanhoe Rd., let contract building 1 story, 92 x 238 ft., concrete, steel and brick addition to factory, rein.-con. flooring, concrete foundation, to Hunkin-Conkey Constr. Co., Century Bldg. About $125,000.

★**O., Cleveland** — Interstate Fdry. Co., 3161 East 61st St., let contract constructing 1 story, 80 x 160 ft., sand and core building, brick and steel, brick foundation, on East 61st St., to A. A. Land Constr. Co., 1836 Euclid Ave. About $100,000.

★**O., Cleveland** — W. S. Ferguson Co., archts. and engrs., 1900 Euclid Ave., let contract to G. A. Rutherford Co., 2729 Prospect Ave., constructing 6 story, 100 x 200 ft., rein.-con., steel and brick storage building, rein.-con. flooring, concrete foundation, on Lincoln and Detroit Aves., for Lakewood Storage Co. About $125,000. Noted April 15.

★**O., Toledo**—Andes Tire & Rubber Co. let contract building 3 story, 80 x 300 ft., rein.-con., steel and brick factory, rein.-con. flooring, concrete foundation, on Star Ave., to C. C. Kinne, Bangor Bldg., Cleveland. About $200,000.

★**Mich., Detroit** — Morgan & Wright, Bellevue Ave., let contract building 9 story, 326 x 456 ft. tire factory and warehouse, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Jefferson Ave., to Stone & Webster Corp., Book Bldg. About $4,000,000.

★**Mich, Detroit**—F. L. and A. Smith, 1905 Dime Bank Bldg., let contract building 2 story, 93 x 220 ft., rein.-con., brick and steel garage and service station, rein.-con. flooring, concrete foundation, on Woodward Ave. near Parsons St., to O. Misch, Chamber of Commerce Bldg. About $125,000.

★**Ill., Chicago**—A. S. Alschuler, archt., 28 East Jackson St., let contract to R. C. Wieboldt, 1534 West Van Buren St., building 7 story, 120 x 175 ft., rein.-con., brick and terra cotta printing plant, rein.-con. flooring, concrete foundation, on 21st St. and Calumet Ave., for Columbia Colortype Co., 2141 Calumet Ave. About $650,000. Noted March 11.

★**Ill., Chicago**—Flexible Steel Lacing Co., 522 South Clinton St., let contract building 1 and 2 story, 125 x 260 ft., brick factory, concrete foundation, at 4619 Lexington St., to J. L. Carnegie & Son, 189 West Washington St. About $200,000. Noted Feb. 12.

★**Ill., Chicago** — Transo Envelope Co., 3550 Kimball Ave., let contract building 1 story, 210 x 350 ft. factory, on Kimball Ave. and Addison St., to O. W. Rosenthal, 80 East Jackson St. About $275,000.

Wis., Fond du Lac—Northern Casket Co., 16 North Brocke St., received low bid constructing 3 story, 100 x 100 ft., brick plant, from Immel Constr. Co., 200 North Main St. About $150,000.

★**Wis., Milwaukee**—Interstate Drop Forge Co., 1227 27th St., let contract building 1 story, 70 x 80 ft. and 80 x 140 ft. brick and steel drop forge plant, concrete foundation, on 27th and Lake Sts., to Northwestern Bridge & Iron Co., 32nd and Hopkins Sts. About $70,000.

★**Wis., Sheboygan**—Badger State Tanning Co., South Water St. and Maryland Ave., let contract building 4 story, 105 x 342 ft., brick, rein.-con. and steel tannery, rein.-con. flooring, brick foundation, to Westinghouse, Church, Kerr & Co., 37 Wall St., New York City. About $750,000. Noted Jan. 15.

Industrial Works (Continued)

★**Wis., Sheboygan**—Jenkins Machine Co., 318 North 8th St., let contract building 2 story, 150 x 200 ft., brick, rein.-con. and steel machine shop, rein.-con. flooring, brick foundation, on North 8th St., to Verhulst Bros., 1615 Erie St. Cost between $50,000 and $75,000. Noted March 11.

★**Wis., Sheboygan Falls** — C. Weisse Tanning Co. will build 3 story, 84 x 248 ft., brick and steel tannery, concrete foundation. Work will be done by day labor. Contract for structural steel let to Worden-Allen Co., Port Washington Rd., Milwaukee. Total cost $150,000. Noted April 15.

★**Ia., Des Moines**—S. Davidson & Bros., 412 Walnut St., let contract building 6 story, 60 x 130 ft., rein.-con. and brick storage warehouse, rein.-con. flooring, concrete foundation, on 6th and Elm Sts., to A. H. Neumann & Co., Hubbell Bldg. About $130,000.

★**Ia., Des Moines** — Dempster Mfg. & Supply Co., 201 East Court Ave., let contract building 1 story, 120 x 180 ft., brick, rein.-con. and steel foundry and machine shop, concrete foundation, to A. H. Newmann & Co., 519 Hubbell Bldg. About $100,000.

★**Wash., Olympia**—State Capitol Comn. let contract building rein.-con., steel and brick power house, rein.-con. flooring, concrete foundation, to Western Constr. Co., Seaboard Bldg., Seattle. About $100,000 Noted April 22.

★**Cal., Los Angeles**—Coast Bldg. & Investment Co., let contract for excavating and concrete work on 3 story, 123 x 145 ft., rein.-con. warehouse, on 2nd and Hewitt Sts., to Leonardt & Peck, H. W. Hellman Bldg. About $100,000.

★**N. S., St. Margarets Bay**—Nova Scotia Power Comn., Halifax, let general contract building power house, dams, pipe house and intakes, here, to D. G. Loomis & Sons, 1112 St. Patrick St., Montreal. About $250,000.

★**Ont., Sarnia**—Holmes Fdry. Co. let contract building 1 story, brick and steel addition to plant, concrete foundation, to Wells & Gray, Confederation Life Bldg., Toronto. About $100,000.

★**Ont., Saulte Ste. Marie**—Algoma Steel Corp. let structural steel contract for plant, to Hamilton Bridge Co., Bay St., Hamilton: Dominion Bridge Co., Imperial Life Bldg., Toronto, and McGregor & McIntyre Ltd., 1139 Shaw St., Toronto. Total cost including equipment $7,000,000.

★**Ont., Windsor** — Canadian Fairbanks Morse Co., 26 Front St., W., Toronto, let general contract building 2 story, 50 x 100 ft., brick, steel and concrete warehouse, concrete flooring, to Dickie Constr. Co., Ryrie Bldg., Toronto. About $55,000.

Buildings

PROPOSED WORK

Mass., Cambridge—Church—C. R. Greco, archt., 8 Beacon St., Boston, soon lets contract building 1 story, 75 x 190 ft., brick and steel, concrete and stone foundation, on Harvey St., for Notre Dame de Petrie, c/o architect. About $150,000. Noted Jan. 22.

Mass., Chicopee — Housing—Howes & Howes, archts., 243 High St., Holyoke, soon let contract building several 3 story, brick and frame houses for workmen, concrete foundation, for Dwight Mfg. Co., Front St About $350,000.

Mass., Chicopee—Theatre and Club House—G. P. Dion, archt. 30 Center St., soon receives bids building 3 story, 50 x 102 ft., brick, concrete, steel and stone, concrete foundation, on Center St., for Polish Natl. Home Assn., c/o architect. About $100,000. Noted April 22.

R. I., Providence — Hospital—Kendall, Taylor & Co., archts., 93 Federal St., Boston, soon let contract building 5 story, 80 x 150 ft., brick, stone, terra cotta, concrete and steel addition, for Rhode Island Hospital, 593 Eddy St. About $300,000. Noted April 1.

Conn., Hartford—Business—D. A. Guerriero, archt., 647 Main St., soon receives bids building 4 story, 32 x 100 ft., brick and rein.-con., concrete flooring and foundation, on Main St., for Pallotti, Andretta & Co., 96 Windsor St. About $100,000. Noted April 1.

Conn., Hartford—School—I. A. Allen, Jr., Inc., archt., 904 Main St., receives bids about June 1, building 3 story, 108 x 139 ft., brick, concrete and steel addition to Brown School, rein.-con. flooring, brick and concrete foundation, on Talcott St., for Bd. Educ. About $600,000. W. E. Cone, 89 Asylum St., chn. com.

Conn., Stafford Springs—School—Stafford Twp. receives bids about June 1, building 2 story, brick, concrete and steel, concrete foundation, on Prospect St., here. About $125,000. J. H. Valentine, East Main St., chn. E. C. and G. C. Gardner, 83 Lyman St., Springfield, Mass., archts. Noted March 18.

Conn., Waterbury — Church—St. Peter & Paul Roman Catholic Society, 78 Scoville St., plans to build 1 story, brick, steel and stone, on Southmayo Rd. About $100,000. T. P. Mulcahy, pastor. Architect not selected.

Conn., Waterbury — School—Bd. Educ. having plans prepared by T. F. Freney, archt., 51 Leavenworth St., for 3 story, 65 x 75 ft., brick, concrete and steel addition to Russell School, rein.-con. flooring, concrete foundation. About $100,000.

N. Y., Coney Island—Bathhouse—Comr. Pub. Wks., Borough Hall, Brooklyn, having plans prepared by J. S. Kennedy, archt. and engr., 157 Remsen St., Brooklyn, for 4 story, rein.-con. and steel addition, rein.-con. flooring, concrete foundation, here. About $500,000.

N. Y., New York—Exchanges—New York Telephone Co., 15 Dey St., having sketches made by McKenzie, Voorhies & Gmelin, archts., 1123 Bway., for brick, steel and stone additions on Webster Ave., 18th, 58th, 89th, West 175th and East 176th Sts. About $100,000 each.

N. Y., New York—Office—J. S. Kennedy, archt. and engr., 157 Remsen St., preparing plans for 6 story, brick, steel and stone, concrete foundation, on Gold and John Sts. About $500,000. Owner's name withheld.

N. J., Hillside (Elizabeth P. O.)—School—Bd. Educ. soon lets contract building brick and terra cotta addition. About $100,000. C. G. Poggi, 275 Morris Ave., Elizabeth, archt.

Pa., Beaver Falls — School — Bd. Educ. soon receives bids building 2 story, 60 x 132 ft., rein.-con. brick and steel, rein.-con. flooring, brick foundation. About $160,000. Carlisle & Sharer, Jenkins Arcade, Pittsburgh, archts.

Pa., Wilson—School and Natatorium—Bd. Educ. soon receives bids building 2 story, concrete, brick and steel. Cost between $150,000 and $200,000. C. G. Compton, Donera, archt.

Pa., Woodlawn—Theatre and Office—E. Harvey had plans prepared by Carlisle & Sharer, archts., Jenkins Arcade, Pittsburgh, for 2 and 3 story, 75 x 150 ft., rein.-con., brick and steel. About $125,000.

O., Canton—High School—Bd. Educ. receives bids about June 1, building 3 story, 157 x 287 ft., concrete, steel and brick, on East 14th St. About $1,000,000. Thayer & Thayer, Mercantile Bldg., New Castle, Pa., archts.

O., Celina—Courthouse—Mercer Co. voted $500,000 bonds to build new courthouse, here.

O., Cleveland — Hospital — City voted $3,500,000 bonds to build 4 story, concrete, steel and brick addition, rein.-con. flooring, concrete foundation, on Sackett Ave. and Scranton Rd. F. H. Betz, 604 City Hall, engr.

O., Cleveland — Jail — City defeated $3,500,000 bond issue to build 4 story, concrete, brick and stone, on West 3rd St. and Lakeside Ave. Noted Jan. 22.

Mich., Detroit—Commercial—B. C. Wetzel & Co., archts., 2317 Dime Bank Bldg., receive bids about May 15, building 1 story, 91 x 126 ft., brick, steel and terra cotta, rein.-con. flooring, concrete foundation, on Woodward and Davenport Aves., for A. G Sherman, c/o architects. About $100,000.

Mich., Detroit—Lodge House—Palestine Assn., 150 Fort St., W, plans to build 4 story, rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation on Charlotte St. near Cass Ave. About $500,000. Architect not selected.

Ill., Chicago—Theatre—L. J. McCormick Corp., c/o Holabird & Roche, archts., 104 South Michigan Ave., having plans prepared for 1 story, 100 x 120 ft., brick, steel and stone, rein.-con. flooring, concrete foundation, on Dearborn and Randolph Sts. About $1,000,000.

Ill., Kewanee—School—Holmes & Flinn, archts., 8 South Dearborn St., Chicago, receive bids about May 10, building 2 story, 60 x 75 ft., brick and tile addition to Franklin School, concrete foundation, for Bd. Educ. About $100,000.

Ia., Le Mars—Temple—Masonic Bldg. Assn. having plans prepared by G. W. Burkhead, archt., Fidelity Life & Trust Bldg., Sioux City, building 2 story 40 x 100 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $120,000.

Ia., Mason City — Schools — Bd. Educ. plans to build 2 schools. About $175,000. R. L. James, secy. Architect not selected Noted Feb 12.

Ia., Mediapolis—School—Bd. Educ. having preliminary plans prepared by Keffer & Jones, archts., 204 Masonic Temple, Des Moines, for 3 story, rein.-con. and brick, rein.-con. flooring, concrete foundation. About $160,000.

Ia., Pocahontas—Court House—Pocahontas Co. having plans prepared by Proudfoot, Bird & Rawson, archts., 310 Hubbell Bldg., Des Moines, for 3 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $400,000. Noted April 1.

Ia., Waterloo — Hospital — Presbyterian Syndical Hospital Assn. having plans prepared by Schmidt, Garden & Martin, archts., 1907 South Michigan St., Chicago, Ill., for 4 story, 45 x 200 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $400,000.

Ia., Yarmouth—School—Bd. Educ. having preliminary plans prepared by Keffer & Jones, archts., 204 Masonic Temple, Des Moines, for 3 story, rein.-con. and brick, rein.-con. flooring, concrete fohndation. About $100,000. C. C. Featherby, secy. Noted Feb 12

Kan., Independence—School—Bd. Educ. having plans prepared by N. S. Spencer & Son, archts., 37 West Van Buren St., Chicago, Ill., for brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $500,000.

Neb., Kearney — Dormitory — State Bd. Educ., Lincoln, having revised plans prepared by J. H. Craddock & Co., archts., Elks Bldg., Omaha, for 3 story, 64 x 160 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, here. About $100,000. Noted March 11.

S. D., Aberdeen—Auditorium—City voted $500,000 bonds to build memorial auditorium. Architects name withheld. H. C. Behrens, mayor.

S. D., Sioux Falls—Y. M. C. A. soon lets contract constructing 5 story, 131 x 151 ft., rein.-con., brick and steel building, rein.-con. flooring, concrete foundation. About $350,000. Perkins & McWayne, Cedar Rapids, Ia., archts.

Tex., Ft. Worth—Hotel—J. F. Norris, 1201 6th Ave., having plans prepared for 6 story, rein.-con. and brick, rein.-con. flooring, brick and concrete foundation, on 3rd and Throckmorton Sts. About $100,000.

Tex., Paris—Schools—City voted $400,000 bonds to build schools. W. G. George, secy. Noted March 25.

Tex., Waco—Store—Waco Drug Co., 5th and St. Mary Sts., having plans prepared E. McI. Ross, archt., 208 Bankers Trust Bldg, for 4 story, 95 x 130 ft. rein.-con.

Tex., Wichita Falls—Schools—City voted $300,000 bonds to build schools. Noted April 8.

Okla., Frederick—Court House—Tillman Co. having plans prepared by Tonini & Bramblett, archts., 301 Terminal Bldg., Oklahoma, for 4 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $250,000.

Okla., Muskogee — Schools — City voted $250,000 bonds to build schools. Architect and engineer not selected.

Okla., Picher—High School—Bd. Educ. having plans prepared by Tonini & Bramblett, archts. and engrs., 417 Terminal Bldg., Oklahoma, for 3 story, brick, on Main St. About $100,000.

Okla., Poteau—Court House—Comrs. Leflore Co. having plans prepared by Toninl & Bramblett, archts. and engrs., 417 Terminal Bldg., Oklahoma, for 3 story, brick, concrete foundation, on Main St. About $150,000.

Okla., Tulsa—Office—Constantin Refining Co., 1st Natl. Bank Bldg., plans to build 6 story, 60 x 160 ft., on 7th Ave. and Cheyenne St. About $400,000. Architect not selected.

Okla., Tulsa—Office—H. F. Wilcox, New Wright Bldg., plans to build 5 story. About $250,000. Architect not selected.

Col., Denver—Theatre—Loews Enterprises 1493 Bway, New York City, having sketches made by T. W. Lamb, archt., 644 8th Ave., New York City, for brick and stone, brick foundation, here. About $350,000.

Utah, Cedar City — Hotel — Cedar City Hotel Co. soon receives bids building 3 story, 250 room, rein.-con. and brick, on Main St. About $175,000. Randall Jones & Co., Cedar City, archts. and engrs.

Ariz., Tucson—Dormitory—University of Arizona plans to build dormitory on university grounds. About $125,000. Architect not selected.

Cal., Fresno—Church—Fresno Methodist Episcopal Church having plans prepared by N. F. Marsh, archt., Bway. Central Bldg., Los Angeles, for 100 x 125 ft., brick and hollow tile. About $100,000.

Buildings (Continued)

Cat., Long Beach—Hotel and Store—C. C. and F. B. Lewi, 122 Pine Ave., plans to build 3 story, at 119 East 3rd St. About $100,000. Architect not selected.

Cal., Long Beach—Theatre—Lowes Enterprises, 1493 Bway., New York City, having sketches made by T. W. Lamb, archt., 644 8th Ave., New York City, for brick and stone, brick foundation, here. About $500,000.

Que., Montreal—Hotel—Women's Society—Church of England, Synod Hall, Union Ave., receives bids in June building brick and steel, concrete foundation. About $125,000.

Ont., Collingwood — College — Bd. Educ. plans to build 15-20 room rein.-con., brick and steel, concrete flooring and foundation. About $200,000. Architect not selected.

Ont., Ottawa—Hospital—Stevens & Lee, archts., 2 College St., Toronto, receive bids about June 15. building brick, concrete flooring and foundation for city. About $2,500,000.

Ont., Ottawa—Hostel—Anglican Church soon receives bids building womens hostel here. About $100,000. A. Farthing, Union Ave., Montreal, Que., interested.

Ont., Saulte Ste. Marie—Theatre—Paramount Theatres, Ltd., Temple Bldg., Toronto, having plans prepared by J. M. Jeffrey, archt., 348 Confederation Life Bldg., Toronto, for concrete, brick and steel, concrete flooring and foundation. About $200,000.

Ont., Toronto—Church—Bloor St. Baptist Church, Bloor and North Sts., plans to build brick or stone, concrete flooring and foundation. About $600,000. Address W. A. Cameron, Selky Apartments. Architect not selected.

Ont., Toronto—Clubhouse—Royal Canadian Yacht Club, Center Island, plans to build new clubhouse, mill construction. About $150,000. Architect not selected.

Alta., Calgary—Theatre—Loew's Enterprises, 1493 Bway., New York City, having sketches made by T. W. Lamb, archt., 644 8th Ave., New York City, for brick and stone, here. About $500,000.

Alta., Edmonton—Theatre—Loew's Enterprises, 1493 Bway., New York City, having sketches made by T. W. Lamb, archt., 644 8th Ave., New York City, for brick and stone, here. About $400,000.

B. C., Victoria—Theatre—Loew's Enterprises, 1493 Bway., New York City, having plans prepared by T. W. Lamb, archt., 644 8th Ave., New York City, for brick and stone, here. About $400,000.

B. C., Winnipeg—Theatre—Loew's Enterprises, 1493 Bway., New York City, having sketches made by T. W. Lamb, archt., 644 8th Ave., New York City, for brick and stone, here. About $500,000.

BIDS DESIRED

Mass., Plymouth—Memorial Hall—Until May 12, by Town Memorial Comn., building 2 story, brick, concrete and steel, rein.-con. flooring, concrete foundation, on Court St. About $250,000. Little & Russell, 45 Bromfield St., Boston, archts. Noted March 25.

Mass., West Roxbury (Boston P. O.)—High School—Until May 18, by School Com., Boston, building 3 story, brick and steel addition, rein.-con. flooring, concrete foundation, on Elm St. About $150,000. Andrews, Rantoul & Jones, 50 Congress St., Boston, archts. and engrs. Noted April 15.

Conn., Danielson—School—Until May 12, by N. L. Greig, chn., Killingly School Comn., Town Hall, building 2 story, 90 x 150 ft., brick and concrete school and assembly hall, rein.-con. flooring, concrete foundation, on School St. About $100,000. Private plans.

Conn., Waterbury—Armory—Until May 15, by State Military Emergency Bd., State Armory, Hartford, building 4 story, 180 x 200 ft., brick, concrete and steel, concrete flooring and foundation, on Field St., here. About $400,000. L. A. Walsh, 51 Leavenworth St., archt. Noted Jan. 15.

N. Y., Newton (Flushing P. O.)—High School—Until May 12, by Bd. Educ., 500 Park Ave., New York City, building brick and stone addition, brick foundation, on Etna Pl., here. About $800,000. C. B. J. Snyder, Municipal Bldg., New York City, archt. and engr.

N. Y., Willard—Hospital—Until May 26, by State Hospital Comn., Capitol, Albany, constructing Edgemere Bldg., at State Hospital, here. L. F. Pilcher, state archt.; advertised in this issue.

Pa., Harrisburg—Office—Yoffee Bros., 142 South Cameron St., receiving bids building 8 story, 50 x 75 ft., concrete and steel, rein.-con. flooring, concrete foundation, on 2nd and Market Sts. About $150,000. Markley & Starr, 9 North 2nd St., archts.

Va., Newport News—Synagogue—Until June 15, by Adath Yeshurun congregation, building 3 story, 65 x 90 ft., concrete, brick and stone. About $100,000. M. Levinson, 27th St. and Jefferson Ave., chn. Bldg. Com. McKee & Williams, 225 28th St., archts.

La., New Orleans—Sales—Until June 1, by W. A. Keenan, archt. and engr., Strand Bldg., building 3 story, brick addition, rein.-con. flooring, concrete foundation, on St. Charles and St. Andrew Sts., for Abbott Auto Co., 821 Baronne St. About $150,000.

O., Cincinnati—Hotel—Gibson Hotel, Walnut St., receiving bids building 12 story addition, on 5th and Walnut Sts. About $1,000,000. G. W. Drach, 1701 Union Trust Bldg., archt. Noted Aug. 14.

O., Cleveland—Commercial—Until May 10, by H. D. Koblitz, 1310 Huron Rd., building 4 story, 140 x 200 ft., concrete, brick and steel, rein.-con. flooring, concrete foundation, on Euclid Ave. near East 40th St. About $200,000. Lehman & Schmitt, Electric Bldg., archts. and engrs.

O., Columbus—Schools—Bd. Educ. receiving bids building 2 story, 110 x 112 ft., on Fulton St., cost $125,000; 2 story, 110 x 190 ft., on Taylor Ave., $175,000; 2 story, 110 x 190 ft., on Sullivant Ave., $175,000; all brick and concrete. D. Riebel & Sons, New 1st Natl. Bank Bldg., archts. Noted March 18.

O., Lakewood (Cleveland P. O.)—Schools—Until May 18, by Bd. Educ., building additions to schools on West Clifton Blvd., Franklin St. and Elbur Ave. and Clifton Blvd. and Summit Ave.; all 2 story, concrete, steel and brick, rein.-con. flooring, concrete foundations. Cost $100,000 each.

O., Linden (Columbus P. O.)—School—Bd. Educ., Columbus, receiving bids building 2 story, irregular shaped, concrete and brick, here. About $200,000. D. Riebel & Sons, New 1st Natl. Bank Bldg., Columbus, archts. Noted March 25.

O., Norwalk—School and Parish House—Until May 11, by A. Kahn, archt., Marquette Bldg., Detroit, building 2 story, 89 x 152 ft., rein.-con., brick and steel school and parish house, also 33 x 50 ft. garage and boiler house, rein.-con. flooring concrete foundation, on Main and Milan Sts., for St. Paul's Church. About $200,000.

Mich., Detroit—Commercial—Until May 15, by I. M. Lewis, archt., 503 Congress Bldg., constructing 2 story, 100 x 200 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on West Grind Blvd. and Woodward Ave., for Chinese Amer. Realty Co., 1401 Ford Bldg. About $200,000.

Ill., Chicago—Office—Holabird & Roche, archts., 104 South Michigan Ave., receiving bids building 4 story (ultimate 8 story), 66 x 128 ft., brick, steel and stone, rein. con. flooring, concrete foundation, for J. T. Reyerson & Son, 16th and Rockwell Sts. About $350,000.

Wis., Cedar Grove—Church—Until May 15, by Juul & Smith, archts., Imig Bldg., Sheboygan, building 2 story, 76 x 90 ft., brick and tile, concrete foundation, on Main St., for Presbyterian Church. Cost between $75,000 and $100,000. J. Von Stratte, pastor. Noted Jan. 15.

Wis., Chippewa Falls — High School — Until May 17, by Bd. Educ., building 3 story, Junior High School, brick and concrete, rein.-con. flooring, concrete foundation. About $175,000. Beers, Schling & Bailey, Monadnock Blk., Chicago, archts.

Wis., Manitowoc—Theatre—W. J. Raeuber, archt., Teitgen Bldg., receiving bids building 115 x 130 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation, for George Bros., 913 South 8th St. About $100,000. Noted April 8.

Ia., Corydon—School—Until May 20, by Bd. Educ., building 2 story, 64 x 106 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $130,000. W. Gordon, 317 Hubbell Bldg., Des Moines, archts.

Ia., Council Bluffs—School—Until May 10, by School Bd. Independent Dist., building 2 story, 75 x 135 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $300,000. Proudfoot, Bird & Rawson, 810 Hubbell Bldg., Des Moines, archts.

Ia., Ellston—School—Until May 10, by Bd. Educ., building 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $110,000. Kieffer & Jones, Masonic Bldg., Des Moines, archts. Noted March 11.

Ia., Perry—Theatre and Office—J. C. Atkins Lund Co. receiving bids building 4 story, 16 x 90 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $200,000. Boyd & Moore, Securities Bldg., Des Moines, archts.

Ia., Redfield—School—Until May 10, by Bd. Educ., building 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $150,000. W. Gordon, 317 Hubbell Bldg., Des Moines, archts. Noted April 8.

Ia., Zion—School—Until May 10, by Bd. Educ., Union Twp., or W. E. Hulse & Co., archts, 210 Masonic Temple, Des Moines, building 2 story, 56 x 86 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $100,000. C. F. Hayden, secy. Noted March 18.

Minn., Herman—School—Until May 11, by Bd. Educ., building 2 story, 94 x 130 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $125,000. E. F. Broomhall, 710 Alworth Bldg., Duluth, archt. and engr.

Minn., Hibbing—Recreation—Until May 18, by J. Murphy, town recdr., building 2 and 3 story, 149 x 284 ft., rein.-con., brick, stone and tile, concrete flooring and foundation, on 1st Ave. and Jefferson St. About $500,000. Holstead & Sullivan, Palladio Bldg., Duluth, archts. and engrs.

Neb., Kearney—Hospital—Roman Catholic Congregation receiving bids building 4 story, 45 x 150 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $200,000. J. H. Craddock & Co., Elks Bldg., Omaha, archts.

Ark., Conway—Dormitory—Until June 1, by Wittenberg & De Loney, archts., Little Rock, building 3 story, 45 x 200 ft., brick and concrete, for Central Baptist College, here. About $150,000.

Tex., Dallas—High School—Until May 29, by C. M. Moore, secy. Bd. Educ., building 3 story, concrete and brick, rein.-con. flooring, concrete foundation, on Haskell and McKinney Sts. About $300,000. W. B. Ittner, 911 Locust St., St. Louis, Mo., archt. Noted April 29.

Utah, Salt Lake City—High Schools—Until May 10, by School Bd. building East Junior High School, 2 story, 70 x 220 ft., rein.-con. and brick, cost $200,000; 2 story, Junior High School on Ontario St., rein.-con. and brick, brick foundation. Rutherford & Ashton, Vermont Bldg., engr. and archt. for former, and C. A. Bowman, City and County Bldg., engr., for latter.

Cal., Los Angeles—School—Until May 19, by Bd. Educ. building brick school, on 7th St. About $170,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Athol**—Business—L. S. Starrett let contract building 3 story, 50 x 100 ft., brick, concrete and steel, rein.-con. flooring on Main and Marble Sts., to L. B. Taylor, Main St. About $200,000.

★**N. Y., Brooklyn**—Office—P. Glickman, 44 Court St., will build 12 story, brick, steel and stone, on Jerolemon and Court Sts. About $500,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Recreation Center—Brooklyn Jewish Recreation Center, 881 Eastern Parkway, will build 3 story, 125 x 187 ft., brick and steel, concrete foundation, on Eastern Parkway. About $750,000. Work will be done by day labor under supervision of L. A. Abramson, archt. and engr., 46 West 46th St., New York City. Noted Jan. 22.

★**N. Y., Brooklyn**—Theatre—Levy Bros., c/o Bedford Theatre, Bedford Ave., will build brick, steel and stone, brick foundation, on New Utrecht Ave. and 51st St. About $250,000. Work will be done by day labor. Noted March 25.

N. Y., Jamaica—School—C. B. J. Snyder, archt. and engr., Municipal Bldg., New York City, received lowest 3 bids, April 30, building P. S. 50, on 101st and Liberty Aves., here, from Putnam Constr. Co., 271 Ft. Washington Ave., New York City, $603,000; T. A. Clarke Co., 122 Livingston St., Brooklyn, $616,300; J. MacArthur, 22 Ormund Pl., Brooklyn, $623,000. Noted April 22.

★**N. Y., New York**—Bank—Battery Park Natl. Bank, 8 Bway., will alter brick and stone. About $100,000. Work will be done by day labor under supervision of B. Cunnyngham, archt., 25 West Bway.

★**N. Y., New York**—Bank—Chatham & Pheonix Natl. Bank, 149 Bowery, let contract building 60 x 100 ft., brick, stone and marble, brick foundation, at 118-122 Bowery, to Tidewater Bldg. Co., 16 East 33rd St. About $500,000.

★**N. Y., New York**—Bank—Trowbridge & Livingston, archts. and engrs., 527 5th Ave., let contract to Niewenhouse Bros., Inc., 316 East 161st St., building 1 story, 50 x 100 ft., brick, steel, stone and marble, brick foundation, for Empire City Savings Bank, 232 West 125th St. Noted April 22.

Buildings (Continued)

★**N. Y., New York**—Exchange—New York Telephone Co., 15 Dey St., let contract building 5 story, brick, steel and stone, concrete foundation, on 30th St. and 2nd Ave., to J. I Downey, 410 West 34th St. About $1,000,000. Noted Feb. 19.

★**N. Y., New York**—Hospital—Fifth Ave. Hospital, 67th St. and Park Ave., let contract building 9 story, brick, steel and stone, concrete foundation, on 5th Ave., 105th and 106th Sts., to M. Eidlitz, 30 East 42nd St. About $2,500,000.

★**N. Y., New York**—Store and Loft—Buchman & Kahn, archts. and engrs., 56 West 45th St., let contract to C. A. Cowan, 39 East 42nd St., building 12 story, 66 x 100 ft., brick, steel and stone, concrete foundation, at 36 West 29th St., for C. Kaye, 131 West 23rd St. About $500,000.

★**N. Y., New York**—Store and Office—Wendell Estate, 175 Bway., let contract altering 6 story, brick and stone, at 181 Bway., to V. Lynch, 13 Park Row. About $100,000. F. G. Shattuck, 62 West 23rd St., lessee.

★**N. Y., New York**—Synagogue—Temple Israel of Washington Heights, c/o S. B. Eisendrath, archt. and engr., 18 East 41st St., will build brick and stone, brick foundation, on 185th St. and Bway. About $100,000. Work will be done by day labor.

N. J., Vineland—Dormitory—State Comn., Trenton, plans to build 2 story, 53 x 104 ft., concrete and brick, at Feeble Minded Home, here. About $100,000. F. H. Bent, 142 West State St., Trenton, archt.

Pa., Canonsburg—School—Bd. Educ. received bid building 2 story, 33 x 140 ft., rein.-con., brick and steel, rein.-con. flooring, from Taylor & Crawford, Canonsburg, $80,700.

★**Pa., Harrisburg** — Hotel and Store—Belehaus & Hemawel, 327 Market St., let contract building 6 story, 26 x 210 ft., rein.-con. and brick, rein.-con. flooring, to Central Constr. Co., 222 Market St. About $100,000.

★**Pa, Wilkes-Barre**—Store—Flower, Dick & Walker, 15 South Main St., let contract building 3 story, 100 x 100 ft., brick and steel addition, rock foundation, to L. M. Roth, Wilkes-Barre. About $100,000.

★**O., Cleveland**—Bank—Natl. City Bank, Leader-News Bldg., let contract remodeling 2 story, 46 x 121 ft., brick, steel and stone, on East 6th St. and Euclid Ave., to Van Blarcon Constr. Co., East 22nd St. and Prospect Ave. About $150,000. Noted April 1.

★**O., Cleveland**—Commercial—F. J. Whitney, Grand River Ave., Detroit, let contract building 4 story, 90 x 100 ft., brick and steel, brick foundation, at 1000 Oregon Ave., here, to Bolton-Pratt Constr. Co., Columbia Bldg. About $100,000.

★**O., Cleveland** — Theatre — B. F. Keith Theatre Co., 1564 Bway., New York City, let contract building 1 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 105th St. and Euclid Ave., here, to Lundoff-Bicknell Co., 5716 Euclid Ave. About $600,000.

★**O., Kent**—Dormitories—Mason Tire & Rubber Co. let contract building three 2 story, brick, stucco and tile, brick foundations, to Van Blarcom Constr. Co., East 22nd St. and Prospect Ave., Cleveland. About $100,000.

★**O., Parma**—Schools—Bd. Educ. let contract building 1 high and 2 grade schools, all 1 story, 89 x 139 ft., concrete, steel and brick, rein.-con. flooring, concrete foundations, to C. D. Keyser, Bellaire. About $225,000. Noted April 29.

★**O., Shaker Heights** (Cleveland P. O.)—Hospital—Shaker Heights Hospital Co., c/o M. Loeser, 800 Natl. City Bldg., Cleveland, let contract building 3 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, to Crowell & Little Constr. Co., East 57th St. and Euclid Ave., Cleveland. About $250,000. Noted April 18.

Mich., Detroit—Fire Alarm Station—Bd. Fire Comrs., Larned and Shelby Sts., received bids April 26, building 2 story, 55 x 109 ft., rein.-con., brick, stone, steel and terra cotta, rein.-con flooring, concrete foundation, from Bryant & Detwiler Co., 2336 Dime Bank Bldg., $162,937; M. Bartholomaei Son & Co., 166 East Warren Ave., $163,452; J. Bollin Co., 906 Bellevue St., $184,700. Noted April 15.

★**Mich., Detroit**—Office—Detroit Evening News Co., Lafayette Blvd., let contract building 2 story, 60 x 145 ft., brick and steel addition, rein.-con. flooring, concrete foundation, to G. A. Fuller Co., 540 Penobscot Bldg. About $175,000.

★**Mich., Detroit**—Office—Standard Accident Insurance Co., 34 Fort St., W., lot contract building 8 story, 90 x 125 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Bagg St. and Cass Park, to H. G. Christman Co., 315 Stevens Bldg. About $500,000. Noted March 18.

★**Mich., Grand Rapids** — School — Bd. Educ. let contract building 2 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Dickinson St., to G. Koekzema, 420 Grant St., $210,300. Noted March 18.

★**Ill., Chicago**—Store and Office—Spondley & Letsche, 940 Gault St., let masonry contract for 2 story, 130 x 150 ft., brick and stone, concrete foundation, at 2742 North Clark St., to J. Anderson & Sons, 1650 Rosedale Ave., carpentry, to Carlson & Erickson, 19 South La Salle St. About $175,000.

★**Wis., Marshfield**—Bank—First Natl. Bank let contract building 1 story, 52 x110 ft., concrete and steel, to Immel Constr. Co., 200 North Main St., Fond du Lac. $200,000.

★**Ia., Boone**—Theatre—Rialto Theatre Co., c/o A. H. Blank, 326 Iowa Bldg., Des Moines, let contract converting 2 story, brick, rein.-con. and steel hotel into theatre, to Kofab & Brawner, Boone. About $100,000; cost plus percentage basis. Noted Feb. 5.

Ia., Glidden—School—Bd. Educ. received bids April 20, building 3 story, 90 x 162 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, from W. F. Kucharo & Co., 622 Hubbell Bldg., Des Moines, $170,654; Western Constr. Co., Earlham, $173,000; Garmer & Stiles, 422 Flynn Bldg., Des Moines, $173,989. Noted April 1.

★**Ia., Glidden**—School—Bd. Educ. let contract building 2 story, 76 x 162 ft., brick, rein.con. and steel, rein.-con. flooring, concrete foundation, to W. F. Kucharo Co., Hubbell Bldg, Des Moines, $169,000. Noted March 4.

★**Ia., Ottumwa** — Business — Ottumwa Courier Co. let contract building 2 story, 63 x 170 ft., concrete and brick, to A. A. Arnould, 58 Davenport Savings Bank Bldg., Davenport. About $150,000. Noted Jan. 22.

★**Ia., Ottumwa**—Y. M. C. A. let contract constructing 4 story, 99 x 160 ft., brick, rein.-con. and steel building, rein.-con. flooring, concrete foundation, to Wells Bros. Constr. Co., 4111 South Union St., Chicago. About $350,000; cost plus percentage basis. Noted Feb. 26.

★**Ia., Shelby**—School—Bd. Educ. let contract building 2 story, 120 x 190 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to R. Butke, 528 Paxton Blk., and J. E. Wakefield Constr. Co., 750-52 Brandeis Theatre Bldg., both of Omaha, Neb. About $150,000. Noted Apr. 15.

★**Ia., Waterloo**—Church—First Baptist Church, 500 Jefferson St., let contract building 2 story, 95 x 114 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to Currie & Simpson, Waterloo. About $120,000. Noted April 1.

★**Minn., Buhl**—High School—Bd. Educ. let contract building 3 story, 148 x 275 ft. with two 64 x 82 ft. wings, rein.-con., brick, stone and tile, concrete flooring, to Natl. Constr. Co., Virginia, $208,714.

★**Minn., Hibbing**—High School—Bd. Educ. let contract building 3 story, 174 x 417 ft., rein.-con., brick and tile, rein.-con. flooring, concrete foundation, on 3rd St., Central Addition, to Jacobson Bros., Columbia Bldg., Duluth, $579,500.

★**Kan., El Dorado**—Hotel and Theatre—El Dorado Hotel & Theatre Co. let contract building 5 story, 81 x 147 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to F. Borgotte, El Dorado. About $300,000; cost plus percentage basis.

★**Neb., Gering** — Court House — Scotts Bluff Co. let contract building 4 story, 70 x 112 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to C. E. Goodland, Ord, $204,534. Noted March 25.

★**Mo., Columbia** — Hospital — Boone Co. Hospital Bd. let contract building 3 story, 40 x 125 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, to Davis & Phillips, Columbia. About $175,000. Noted March 25.

★**Mo., Fulton**—Academy—William Woods College let contract building 3 story, 65 x 110 ft., brick and timber, concrete foundation, to W. R Odor, Canton. About $125,000. Noted March 4.

★**Mo., Fulton**—Hospital—Callaway Co. Hospital let contract building 2 story, 65 x 131 ft., brick and timber, rein.-con. flooring, to W. R. Odor, Canton. About $200,000.

★**Mo., Joplin**—Business and Garage—Joplin Supply Co., 3rd and Wall Sts., let contract building 5 story, 76 x 120 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, to C. A. Dieter, 410 North Pearl St. About $170,000.

★**Utah, Salt Lake City** — School — Bd. Educ. let general contract building 2 story, rein.-con. and brick addition to Jackson School, to Rudine & Chytraus, Salt Lake City, $106 440; plumbing, to W. Reese Plumbing Co., 125 1st St., S., $10,780.

★**Tex., Eastland**—Hotel—C. U. Connellee will build 8 story, rein.-con. and brick, rein.-con. flooring. About $300,000. Work will be done by day labor under supervision of M. Dunning, archt., 310 South Wabash Ave., Chicago. Foundation already completed.

★**Ariz., Casa Grand**—High School—Bd. Educ. let contract building 2 story, school, to J. J. Garfield, Miami, $117,958. Noted Jan. 1.

★**Wash., Seattle**—School—Bd. Educ. received bids April 20, building 1 story, 202 x 240 ft., on 10th Ave. and West Trenton St., from Jenkins & Jones, Hinckley Blk., $169,756; W. Butler, Central Bldg., $169,900; Western Constr. Co., Seaboard Bldg., $178,442.

Cal., San Francisco—Store—Barrett & Hilp, Sharon Bldg., will construct 2 story, 100 x 125 ft., rein.-con. About $225,000. Work will be done by day labor.

★**Cal., San Francisco** — Sales — D. Lee, 1601 Van Ness St., let contract building 7 story, rein.-con., to Lindgren Co., Monadnock Bldg. About $600,000.

★**Cal., Whittier**—Hospital—S. J. Murphy let contract building 2 story, 40 x 160 ft., brick and hollow tile, rein.-con. flooring, concrete foundation, to Austin-Murphy Co., 45 East Green St., Pasadena. About $100,000.

★**Ont., Oshawa** — Theatre — Paramount Theatres Ltd., Temple Bldg., Toronto, let general contract building concrete, brick, steel and marble, concrete flooring and foundation, to N. McLeod, Kent Bldg., Toronto. About $200,000.

Federal Government Work

PROPOSED WORK

Md., Indian Head — Monorail Hoists — Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids furnishing and installing two 1½ ton 3-motor monorail hoists, new curves and switches, rails on bottom flange of present I-beam and new rigid conductors and supports for the monorail system in soda storehouses at Naval Proving Ground and powder factory, here; $10 deposit required for plans and spec. Noted March 25.

Fla., St. Petersburg—Operating Buildings and Quarters—Spec. 4183—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids constructing 1 story, 25 x 40 ft., with 200 ft. concrete road, here; $10 deposit required for plans and spec. Noted April 29.

Miss., Vicksburg—Barges—Office of 3rd Mississippi River Dist., P. O. Box 404, rejected bids received April 10, building 3 steel barges. Noted March 18.

Ky., Louisville—Lock and Abutment—U. S. Engr. Office rejected bids received April 16, building for Dam 45, Ohio River.

H. T., Kaukau—Barracks—Spec. 4086—Bureau Yards & Docks, Navy Dept., Wash., D. C., rejected bids building at Naval Ammunition Depot, here. Noted March 18.

P. I., Guam—Turbo Generators and Exciters and Switchboards—Spec. 4169—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids for 200 kw. turbo alternators, 1 turbine driven exciter, 1 motor driven exciter and switchboard, f. o.b. cars, Navy Yard, Mare Island, Cal., also for services of an erecting engineer to supervise and be responsible for installing same in power plant, at Naval Sta., here; $10 deposit required for plans and spec. Noted April 15.

BIDS DESIRED

Mass., Boston — Incinerator — Until May 20, at office of R. C. Allen, constructing quartermaster, Coast Defenses of Boston, Room 102 Army Supply Base, furnishing labor and materials for building incinerator plant at Ft. Warren, Boston Harbor.

Conn., New London — Repairing Dock — Until May 15, by R. C. Bower, constr quartermaster, Ft. H. G. Wright, N. Y., repairing dock here. Government will furnish all piles, decking, caps, chocks and wharf logs.

Federal Government Work (Continued)

N. Y., Buffalo—Repairing and Building Superstructure—Until May 27, by U. S. Engr. Office, 540 Federal Bldg., building and repairing concrete superstructure of west pier, at Dunkirk Harbor; advertised in this issue.

N. Y., Ft. H. G. Wright—Completing Headquarters — Until May 20, by R. C. Bower, constr. quartermaster, completing headquarters building.

N. Y., New Dorp—Officers Quarters and Infirmary — Until May 24, at office of Constr. Quartermaster, 39 Whitehall St., New York City, furnishing labor and material building 19 quarters and 1 infirmary, at Air Coast Defense Sta., here; advertised in this issue.

D. C., Wash. — Paving Blocks, etc. — Until May 27, by Dist. Comrs., 509 Dist. Bldg., furnishing and delivering from July 1, 1920, to June 30, 1921, asphalt paving blocks, repressed, vitr. paving blocks, repressed vitr. sewer invert bricks, castings, asphalt paving cement, Portland cement, road oils, tars and bituminous patching materials, fuel oil, paving pitch, terra cotta sewer pipe, sand and gravel. C. W. Kutz, comr.

Va., Cape Henry—Concrete Roadway and Sidewalk—Until May 21, by U. S. Engr. Office, Custom House, Norfolk, building, here; advertised in this issue.

W. Va., South Charleston — Electrical Equipment—Spec. 4146—Until May 19, by Bureau Yards & Docks, Navy Dept., Wash., D. C., furnishing and installing, at Naval Ordnance Plant, here. About $195,000; $20 deposit required for plans and spec. Noted April 15.

Ala., Florence—Electric Generators, Exciters and Accessories—Until June 15, by U. S. Engr. Office, furnishing and delivering 4 electric generators, each of 25,000 kva. capacity, 5 exciters and accessories; advertised in this issue.

O., Cincinnati — American Portland Cement—Until June 1, by U. S. Engr. Office, 415 Custom House, furnishing and delivering 60,000 bbl. for lock and dam; advertised in this issue.

South Dakota—Road Work—Until May 15, by J. S. Bright dist. engr., Bureau Pub. Rds., U. S. Dept. of Agriculture, at Forest Supervs. Office, Custer, building or improving 7.3 mi. Harney Natl. Forest Rd., Custer Co., involving 20 acres clearing, 10,971 cu. yd rock and 18,289 cu.yd. common excav., 1,086 lin.ft. pipe culvert, 2,750 cu.yd. surfacing, 315 cu.yd. dry rubble masonry and 1 timber bridge, 10 ft. span. About $50,000.

Tex., Ft. Worth—Deep Well Pumping Equipment—Spec. 4166—Until May 19, by Bureau Yards & Docks, Navy Dept., Wash., D. C., furnishing and installing, here. About $30,000. Noted April 22.

Okla., Tahlequah — Dormitory — Until June 7, by Dept. of Interior, office of Indian Affairs, Wash., D. C., building brick, at Cherokee Orphan Training School, here.

Cal., Mare Island—Alterations and Additions to Quarters—Spec. 4134—Until May 12, by Bureau Yards & Docks, Navy Dept., Wash., D. C., altering and building 2 story addition to officers quarters at Marine Barracks 1, here. Noted April 22.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Me., Mt. Desert Island—Seawall—Spec. 4135—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building at transmitting station and quarters, here, to E. K. Whitaker, 122 Cottage St., Bar Harbor. $25,673 (110 days). Noted April 29.

★R. I., Providence — Dredging — U. S. Engr. Office let contract dredging in Connecticut River, below Hartford, to Hartford & New York Transportation Co., 285 State St., Hartford, Conn. About $15,000. Noted March 11.

★N. Y., Tonawanda—Dredging—U. S Engr. Office, 540 Federal Bldg., Buffalo, let contract dredging in Niagara River, here, to Dunbar & Sullivan Dredging Co., 2211 Dime Bank Bldg., Detroit, $241,025. Noted April 29 under "Buffalo."

★Pa., Phila.—Steel Pontoon Dredge Pipe —U. S. Engr. Office, 815 Witherspoon Bldg., let contract building, for U. S. Dredge Currituck, to Machold & Riddell, Stephen Gerard Bldg., $9,000.

★Del., Wilmington—Building and Repairing Jetty—U. S. Engr. Office, Old Federal Bldg., let contract, building and repairing jetty in Mispillion River, to Vineyard Shipbuilding Co., Milford, $28,612.

AQUEDUCT TUNNELS—SAN FRANCISCO, CAL.

Bids were received by Bd. Pub. Wks., Apr 21, for constructing aqueduct tunnels in the mountain division of the Hetch Hetchy Water Supply, City and County of San Francisco, Contr. 77, (unit price basis), from (A) R. C. Storrie & Co., 804 Crocker Bldg.; (B) Healy-Tibbitts Constr. Co., 9 Main St.; Contr. 77C, (cost plus fee basis), from (A) Constr. Co. of North America, 121 21st Ave. (awarded contract); (B) R. C. Storrie & Co., 804 Crocker Bldg.; (C) Healy-Tibbitts Constr. Co., 9 Main St. The unit bids were as follows:

Contr. 77.

PROPOSITION "A"

All tunnels fully lined throughout with concrete

	A	B
16,400 lin.ft. lined tunnel between Early Intake and South Fork	$107.00	$178.50
24,744 lin.ft. lined tunnel between South Fork and Adit No. 8-9	105.00	187.30
41,600 lin.ft. lined tunnel between Adit No. 8-9 and Priest Portal	109.00	173.00
10,000 lin.ft. extra price for permanently timbered tunnel	10 00	25 60
24,000 cu.yd. concrete lining in tunnels excavated by the city	20 00	26 15
2,700 cu.yd. concrete lining in shafts excavated by the city	22 00	30 00
425 lin.ft. constructing shaft No. 2, with lining below the part excavated by the city	400.00	540 00
5,000 cu.yd. additional excavation in tunnel and shaft	10.00	34.00
5,000 cu.yd. additional concrete in tunnel and shaft	20.00	26.15
100 lin.ft. extending adits	40 00	27.00
500 cu.yd. excavation in open cut	8.00	2.00
500 cu.yd. concrete in open cut	20.00	15.00
5,000 bbl. extra cement	6.50	8.25
40,000 lb. furnishing and placing reinf. steel	10	12
10,000 lb. placing reinforcing steel furnished by the city	05	.02
Extended totals	$9,901,720	$16,311,051

PROPOSITION "B"

Part of the tunnels to be fully lined with concrete, the remainder to have sides and arch unlined and invert paved with concrete

	A	B
200 lin.ft. lined tunnel between Early Intake and South Fork	$117 50	$178.50
12,000 lin.ft. lined tunnel between South Fork and Adit No 8-9	105.50	187.30
41,600 lin.ft. lined tunnel between Adit No. 8-9 and Priest Portal	110 00	173.00
10,000 lin.ft. extra price for permanently timbered tunnel	10.00	27.00
13,000 cu.yd. concrete lining in tunnels excavated by the city	22 00	25.25
2,700 cu.yd. concrete lining in shafts excavated by the city	22.00	26.15
425 lin.ft. constructing shaft No. 2, with lining, below the part excavated by the city	400.00	540.00
5,000 cu.yd. additional excavation in tunnel and shaft	10.00	34.00
5,000 cu.yd. additional concrete in tunnel and shaft	20 00	26.15
100 lin.ft. extending adits	40.00	27.00
500 cu.yd. excavation in open cut	8.00	2 00
500 cu.yd. concrete in open cut	20.00	15.00
5,000 bbl. extra cement	6.50	8.25
40,000 lb. furnishing and placing reinf steel	10	12
10,000 lb. placing reinforcing steel furnished by the city	05	02
16,200 lin.ft. unlined tunnel with paved invert, between Early Intake and South Fork	97 50	169.00
12,744 lin.ft. unlined tunnel with paved invert, between South Fork and Adit No. 8-9	94 50	182 00
7,000 lin.ft. completing tunnels excavated by the city where full lining is not required	27 50	65 20
Extended totals	$9,674,208	$16,250,263

Contr. 77C

PROPOSITION "A"

All tunnels fully lined throughout

	A	B	C
16,400 lin.ft. lined tunnel between Early intake and South Fork	$78 95	$96.00	$178 50
24,744 lin.ft. lined tunnel between South Fork and Adit No 8-9	84 20	95.00	187 00
41,600 lin.ft. lined tunnel between Adit No 8-9 and Priest Portal	82 08	98.00	173 00
10,000 lin.ft. extra price for permanently timbered tunnel	25 00	9 00	25.60
24,000 cu.yd. concrete lining in tunnels excavated previous to this contract	16 50	18.00	26 15
2,700 cu.yd. concrete lining in shafts excavated previous to this contract	20 00	20 00	30 00
425 lin.ft. constructing shaft No 2, with lining, below the part excavated previous to this contract	330.00	400.00	5[illegible] 00
5,000 cu.yd. additional excavation in tunnel and shaft	10.50	10.00	34.00
5,000 cu.yd. additional concrete in tunnel and shaft	15.00	20.00	26.15
100 lin.ft. extending adits	45.00	35 00	27.00
500 cu.yd. excavation in open cut	2 50	8.00	2.00
500 cu.yd. concrete in open cut	15.00	20.00	15.00
5,000 bbls. extra cement	5 00	6.50	8.25
40,000 lb. furnishing and placing reinf steel	10	10	12
10,000 lb placing reinforcing steel furnished by the city	02	05	.02
Extended totals	$7,802,953	$8,952,380	$16,303,628

PROPOSITION "B"

Part of tunnels to be fully lined with concrete, remainder to have sides and arch unlined and invertpaved with concrete

	A	B	C
200 lin.ft. lined tunnel between Early Intake and South Fork	$82 94	$100.00	$178.50
12,000 lin.ft. lined tunnel between South Fork and Adit No 8-9	84 17	96 00	187 00
41,600 lin.ft. lined tunnel between Adit No 8-9 and Priest Portal	81 58	97 00	173.00
10,000 lin.ft. extra price for permanently timbered tunnel	21 00	9 00	27 00
13,000 cu.yd. concrete lining in tunnels excavated previous to this contract	16 50	20 00	25 25
2,700 cu.yd. concrete lining in shafts excavated previous to this contract	20 00	20 00	26.15
425 lin.ft. constructing shaft No. 2, with lining, below the part excavated previous to this contract	330 00	400 00	540.00
5,000 cu.yd. additional excavation in tunnel and shaft	10 50	10 00	34.00
5,000 cu.yd. additional concrete in tunnel and shafts	14 00	20.00	26.15
100 lin.ft. extending adits	45.00	35.00	27.00
500 cu.yd. excavation in open cut	2.50	8.00	2.00
500 cu.yd. concrete in open cut	15 00	20.00	15.00
5,000 bbl. extra cement	5 00	6 50	8.25
40,000 lb. furnishing and placing reinf steel	10	.10	12
10,000 lb. placing reinforcing steel furnished by the city	02	05	02
16,200 lin.ft. unlined tunnel with paved invert, between Early Intake and South Fork	66 87	92 00	169 00
12,744 lin.ft. unlined tunnel with paved invert, between South Fork and Adit No. 8-9	67 84	90 00	182.00
7,000 lin.ft. completing tunnels excavated previous to this contract, where full lining is not required	20 00	25 00	65.20
Extended totals	*$7,291.903	$8.798.060	*$16,246.663

Federal Government Work (Continued)

D. C., Wash.—Track Scale—Spec. 4160—Bureau Yards & Docks, Navy Dept., received bids April 28, installing 300,000 lb. railroad track scale, at Navy Yard, from Howe Scale Co., 341 Bway., (1) $7,139, (2) $2,402 (90 days); Fairbanks Co., 416 Broome St., (1) $9,932 (120 days). Contractors of New York City. Noted April 8.

★Va., Norfolk—Dredge Pipe—U. S. Engr. Office let contract building for U. S. Dredge "H. S. Taber," to Mochald & Riddell, Stephen Girard Bldg., Phila., $6,894.

Va., Yorktown—Buoys—Spec. 4068—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids April 28, furnishing 4 mooring buoys, for Fuel Oil Sta., here, from Mansfield & Savage, 135 William St., New York City, $9,991 (120 days), Newport Contg. & Eng. Co., Law Bldg., Newport News, $19,825 (150 days), Noland Clifford Co., 322 28th St., Newport News, $23,000 (180 days). Noted April 8.

★Va., Yorktown—Hangers—Spec. 4132—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building at Naval Mine Depot, here, to Newport Contg. & Eng. Co., Law Bldg., Newport News, $45,844 (75 days). Noted April 29.

★W. Va., South Charleston — Outdoor Substation—Spec. 4148—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building, here, to J. R. Proctor, Inc., 74 Cortlandt St., New York City, $26,917.

Ga., Savannah — Radio Buildings and Towers — Spec. 4139—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids April 28, constructing at Radio Station, here, (1) work complete, from J. R. Proctor, 74 Cortlandt St., New York City, (1) $9,295 (120 days), (2) add $500, (3) deduct $50, (4) add $1,643 (30 days), (5) $1,995, (6) deduct $305 (10 days); Mansfield & Savage Co., 135 William St., New York City, (1) $13,553 (120 days), (2) $2,284, (3) $100, (4a) $3,439, (4b) $200, (5) $14,885 (120 days), (6) $10,511 (120 days). Noted April 22.

★Mich., Detroit—Dredging—U. S. Engr. Office, 337 Federal Bldg., let contract dredging in River Rouge, to Duluth-Superior Dredging Co., foot of 45th Ave., W., Duluth, Minn. About $413,205. Noted April 29.

Wis., Milwaukee—Removing and Rebuilding Superstructure—U. S. Engr. Office, Federal Bldg., received bids April 29, removing stone filled timber superstructure and building on south breakwater, Ludington Harbor, Mich., from Greiling Bros .Co., 124 North Adams St., Green Bay.$100,384. Great Lakes Dredge & Dock Co., 216 West Water St., $138,128. Noted April 1.

Col., Ft. Lyon — Steel Water Tanks — Spec. 4171—Bureau Yards & Docks, Navy Dept., Wash., D. C., received lowest 3 bids April 28, installing elevated steel water tanks, here, (1) work complete, from Omaha Steel Wks., 28th and Leavenworth Sts., Omaha, Neb., (1) $19,400 (180 days); Pittsburgh-Des Moines Steel Co., 959 Munsey Bldg., Wash., D. C., (3) $20,370 (180 days) alternate $20,000 (180 days), (4) $24,880 (210 days) alternate $24,280 (220 days); Drabo Contg. Co., Diamond Bank Bldg., Pittsburgh, Pa., (1) $33,550 (150 days), (2) $42,437 (170 days). Noted April 22.

Miscellaneous

PROPOSED WORK

Coal Pocket—Bridgeport, Conn.—Bridgeport Coal Co., c/o Davis & Dane, archts., 1024 Main St., having plans prepared for 16 x 45 x 120 ft., concrete coal pocket, garage and office. About $25,000.

Asphalt Road Oil—New York, N. Y.—H Bruckner, pres. Bronx Boro., received no bids April 22, furnishing and delivering 200,000 gal. asphalt road oil. Work will be readvertised. Noted April 15.

Park Development—Columbia, S. C.—City plans to develop Keenan Park; surveys have been made for grading cross roads and 2 mi. boulevard around park, also buildin damsite, summer houses, etc About $50,000. F. C. Wyse, city engr.

Park Improvements—Spartanburg, S. C.—City plans election to vote on $50,000 bonds to improve parks.

Wharf—Miami, Fla.—City plans election to vote on $400,000 bonds to improve municipal wharf, to include excavating new channel, installing wood and steel piling and retaining wall, paving, building warehouses, etc.

Subway—Cleveland—City defeated $15,000,000 bond issue to build subway.

Levee—Dallas, Tex.—Dallas Co. Impvt. Dist 10 retained E. N. Noyes, engr., Juanita Bldg., to prepare plans for 2 levees, 30 ft. high, each 4 mi. long, also change and straighten Trinity River. Noted April 29.

Fire Apparatus—Oklahoma, Okla.—City election May 25, to vote on $250,000 bonds to purchase apparatus, machines, etc., for fire department.

Harbor Improvement—Aberdeen, Wash.—Grays Harbor Port Comn. plan election June 26, to vote on $800,000 bonds to improve harbor, here, in accordance with recommendations of C. A. Strong, engr., Tacoma. Noted March 25.

Paving Plant — Long Beach, Cal. — City Comrs. plan to establish paving plant and purchase street paving equipment. A. De Ruis, city engr.

Subway—Brantford, Ont.—City soon receives bids building rein.-con. subway under railway tracks on St. Paul Ave. About $40,000. A. McLennan, City Hall, acting engr.

Dam — London, Ont. — Pub. Utilities Comn. plans to build concrete dam on Thames River at Springbank, and develop 1,000 h.p. Cost including turbines, generating equipment, etc., $300,000. E. V. Buchanan, Hydro Bldg., engr.

BIDS DESIRED

Extending Landing Platform—New York, N. Y.—Until May 12, by M. Hulbert, comr. docks, Pier "A," foot of Battery Pl., furnishing labor and materials for building extension to Battery landing platform.

Freight Shed and Pier—New York, N. Y.—Until May 10, by M. Hulbert, comr. docks, Pier "A," foot of Battery Pl., furnishing labor and materials building freight shed piers at foot of 35th St., North River, Manhattan Boro.

Banana Conveyors—New Orleans, La.—Until May 25, by Bd. Comrs. Suite 200, New Court Bldg., furnishing and building 3 banana conveyors, for Desire St. Banana Wharf, advertised in this issue.

Water Tube Boilers and Chain Grate Stokers—Lockport, Ill.—Until June 1, by Penitentiary Comn., at office of J. Lambert, pres., 208 South La Salle St., Chicago, furnishing 4 water tube boilers, 300 hp. each, and chain grate stokers for same, for power house at New Illinois State Penitentiary, near here. Zimmerman, Saxe & Zimmerman, 64 East Van Buren St., Chicago, archts.; advertised in this issue.

Street Flusher and Sprinkler—Milwaukee, Wis.—Until May 10, by Central Bd. Purchases, City Hall, furnishing one 1,500 gal. capacity motor-driven street flusher and sprinkler. Noted March 25.

Belting—Portland, Ore.—Until May 13, by Pub. Dock Comn., for 5,000 ft. 24 and 30 in. belting for phosphate handling machinery. G. B. Hegardt, engr.

Asphalt—Montreal, Que.—Until May 14, by R. Bauset, city clk., for 200,000 gal. 60% and 100,000 gal. 40% liquid asphalt. L. O. Pion, supt. of purchases.

Asphalt, Stone, etc.—Montreal, Que.—Until May 10, by City Comrs., furnishing 2,000 ton asphalt, cost about $63,000; 50,000 ton broken stone, $180,000; 52,000 ton sand, $60,000; 1,000 tons inorganic dust for paving, $7,000. M. Doucet, city engr.

Sprinklers and Flushers—Montreal, Que.—Until May 1, by City Comr., furnishing sprinklers and flushers. About $100,000. M. Doucet, city engr.

Concrete Culverts—Ontario—Until May 20, by W. A. McLean, deputy minister of highways, Toronto, building concrete culverts on Provincial Highway in Brighton, Cramahe, Haldimand and Darlington Twps., involving 2,200 cu.yd. rein.-con., 3,300 cu.yd. stone and 3,800 cu.yd. earth excav. About $40,000. G. Hogarth, Parliament Bldg., Toronto, engr.

Road Roller—Metcalfe, Ont.—Until May 8, by Osgoode Twp. Council, for 10 ton road roller. F. Iveson, twp. clk.

Cement and Asphalt—Ottawa, Ont.—Standard Paving Co., Ltd., Central Chambers, receiving bids for 55,000 bbl. cement and 10,000 ton asphalt.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Retaining Wall—Boston, Mass.—City received bids April 23, building 1,350 ft. retaining wall, concrete, stone faced on piles, on Albany St., from W. S. Rendle, East Boston, $200,823; Rendle-Stoddard Co., 27 Upland Rd., $227,193; Coleman Bros., Chelsea, $259,070.

★Storage Tank—West Warren, Mass.—Warren Cotton Mills let contract building 150,000 gal. concrete storage tank, to Hallett-Grant Constr Co., 136 Federal St., Boston. About $25,000

★Coal Trestle—Mansfield Depot, Conn.—Mansfield State Training School let contract building rein.-con. coal trestle at school, to Ellison Constr. Co., 60 Prospect St., Hartford. About $25,000.

★Station Finish—Brooklyn, N. Y.—J. H. Delaney, comr. Transit Constr., 49 Lafayette St., New York City, let contract for station finish for part of Eastern Parkway Rapid Transit R. R., here, to H. H. Uris Iron Wks., 533 West 26th St., New York City, $520,401.

★Gate Valves, etc.—Grand Gorge, N. Y.—Bd. Water Supply, Municipal Bldg., New York City, let contract furnishing and delivering gate valves, hydraulic cylinders, bronze castings, etc., for Gilboa Dam and Shandaken Tunnel, here, to Cotlin Valve Co., Neponset, Mass., $90,480. Noted April 22.

Guide Walls—Marbletown, N. Y.—Bd. Water Supply, Municipal Bldg., New York City, received lowest 3 bids, April 27, building masonry guide walls and doing miscellaneous work at Ashokan Spillway, here, from H. E. Fox, 81 East 125th St., New York City, $85,755; Ward & Tully, 2047 West 11th St., Brooklyn, $103,650; Winston & Co., Brown Sta., New York City, $116,405. Noted April 8.

Bulkhead—New York, N. Y.—M. Hulbert, comr. docks, Pier "A," foot of Battery Pl., received lowest 3 bids, May 3, furnishing labor and material rebuilding sheet pile bulkhead along Beach Channel Dr., Belle Harbor, Queens Boro., from Lustig & Weil, 103 Park Ave., $18,750, Riverside Contg. Co., 39 Cortland St., $19,310, A. M. Hazell, Inc., 26 Cortland St., $21,325. Noted April 29.

Pier—New York, N. Y.—M. Hulbert, comr. docks, Pier "A," foot of Battery Pl., received bids April 26, altering pier and freight shed at foot of 5th St., East River, from Associated Contractors Corp., 17 West 42nd St., $122,790; Lustig & Weil, 103 Park Ave., $128,000. Noted April 22.

★Piers—Stapleton, S. I., N. Y.—M. Hurlburt, comr. docks, Pier "A", foot of Battery Pl., New York City, let contract furnishing labor and material building Pier 17, to B. S. Cronin, 573 Clinton St., Brooklyn, $680,071; Pier 18, to Phoenix Constr. Co., 41 Park Row, New York City, $741,897. Noted April 29.

★Pipe—Wharton, Pa.—City let contract furnishing pipe for watermains, to R. F. Oram, Wharton. About $600,000.

★Heating Plant—Columbia, S. C.—State Bldg. Comn. let contract installing heating plant in capitol, to W. B. Guimarin, 1220 Washington St., $34,480. Noted April 22.

★Grain Elevator—Lyons, Kan.—Central Kansas Milling Co., let contract building rein.-con. grain elevator, 80,000 bu. capacity, to Burrell Eng. & Constr. Co., 327 South La Salle St., Chicago, Ill. About $50,000.

★Pipe—Murray, Utah—City let contract furnishing 80,000 ft. 4-12 in. machine banded wood pipe for new waterworks system, to Pacific Tank & Pipe Co., 318 Market St., San Francisco.

★Portland Cement—Nevada—State Highway Comn., Carson City, let contract for 70,000 bbl. Portland Cement, f.o.b. Reno, to Pacific Portland Cement Co., $4.09 per bbl. with $1 rebate for returned sacks and 5 per cent discount for cash in 10 days. Noted March 25.

★Dam—St. Johns, Ariz.—State Loan Bd let contract completing Lyman dam on Little Colorado River, involving 104,000 cu.yd. earth fill, to D. K. Udall, St. John About $151,300. Noted April 1.

★Steel Hull, etc.—Portland, Ore.—Port of Portland, 916 Spalding Bldg., let contract building steel hull and overhauling machinery on dredge "Columbia," to Pacific Marine Iron Wks., foot of East Main St., $425,500.

★Pipe—San Diego, Cal.—City let contract furnishing 10 mi. 18 in. machine banded wood pipe for supply line from Lake Hodges Dam, to Pacific Tank & Pipe Co., 318 Market St., San Francisco.

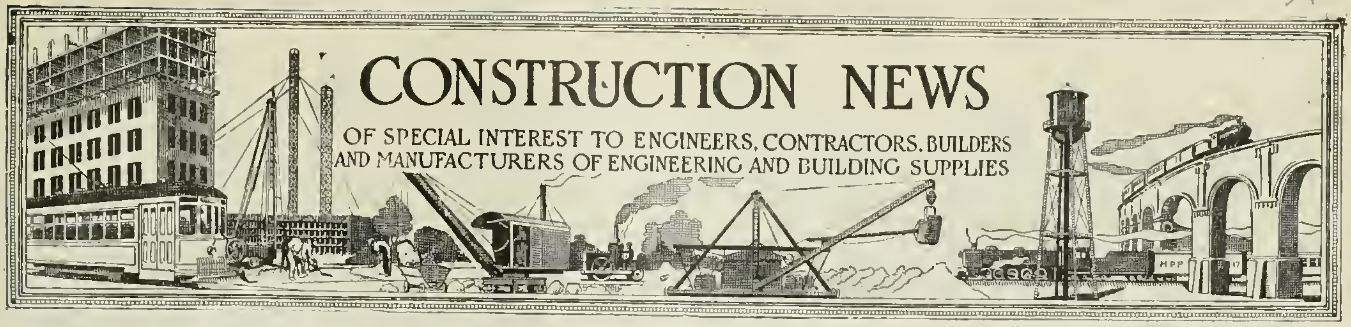
★Aqueduct Tunnels—San Francisco, Cal.—Bd. Pub. Wks. let contract building aqueduct tunnels for Hetch Hetchy Dam, to Constr. Co of North Amer., 121 21st Ave.; cost plus percentage basis. Contractor guarantees cost not to exceed $7,803,000. Noted April 29.

★Boardwalk—San Francisco, Cal.—City let contract building boardwalk on Great Highway, to Hannah Bros., 142 Sansome St. Noted March 4.

★Pipe—Guelph, Ont.—City let contract for 6-12 in. vitr. sewer pipe, to Clay Products Agency, Toronto. 15-36 in. concrete pipe, to Independent Concrete Pipe Co., Harbor Bldg., Toronto. Total cost, $30,000.

CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES



PROPOSALS

"For proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
May 17	Pontiac, Mich. Adv. Apr. 8 and 15.	Apr. 8
May 18	Long Island City, N. Y.	May 13
May 19	Burlington, N. J.	May 13
May 20	Decatur, Ill. Adv. Apr. 29.	Apr. 29
May 20	Cisco, Tex.	May 6
May 20	Grosse Point (Detroit, P. O.), Mich.	May 13
May 21	New York, N. Y.	May 13
May 28	Gibbstown, N. J. Adv. May 6.	May 6
May 29	Grand Forks, N. D.	May 13
June 1	Houston, Tex	Apr. 29

SEWERS

Bids Close		See Eng. News-Record
May 18	Long Island City, N. Y.	May 13
May 18	Wells, Minn.	May 6
May 18	Humeston, Ia.	May 6
May 20	Graham, N. C. Adv. Apr. 29 and May 6.	Apr. 29
May 20	St. Paul, N. C. Adv. May 6.	May 6
May 21	New York, N. Y.	May 13
May 24	Haddonfield, N. J. Adv. May 13.	May 13
May 25	Newmarket, Ont.	May 13
May 27	Mandan, N. D.	May 13
May 31	Cheyenne, Wyo. Adv. May 6.	May 6
June 1	Lock Haven, Pa.	May 13
June 3	Milwaukee, Wis. Adv. Apr. 15 and 22.	Apr. 15
June 7	Ames, Ia. Adv. May 13.	May 13
June 9	Ft. Madison, Ia Adv. May 13.	May 13
June 14	Hammond, Ind. Adv. May 13.	May 13

BRIDGES

Bids Close		See Eng. News-Record
May 15	Brattleboro, Vt. Adv. Apr. 29.	Apr. 29
May 17	Elmira, N. Y. Adv. Apr. 29 and May 6.	Apr. 29
May 17	Bronxville, N. Y. Adv. Apr. 29 to May 13.	Apr. 29
May 17	Bunkerville Nev. Adv. May 6.	May 6
May 17	Minneapolis, Minn.	May 13
May 17	Ontario	May 13
May 17	Orangeville, Ont.	May 13
May 18	Ottawa, Ont.	May 6
May 18	Bismarck, N. D.	May 13
May 20	Biddeford, Me.	Apr. 29
May 20	Poughkeepsie, N. Y. Adv. Apr. 29 and May 6.	May 6
May 21	Duluth, Minn.	May 6
May 21	Stephenville, Tex.	May 13
May 24	Danville, Ill. Adv. Apr. 29 to May 13.	Apr. 22
May 24	Mt. Vernon, N. Y Adv. May 6 and 13.	May 13
May 28	Philadelphia, Pa. Adv. May 6 and 13.	May 6
June 1	Florence, Ariz. Adv. May 13.	May 13
June 4	Philadelphia, Pa.	Apr. 29
June 7	Florence, Ariz. Adv. May 13.	May 13

STREETS AND ROADS

Bids Close		See Eng. News-Record
May 17	Bronxville, N. Y. Adv. Apr. 29 to May 13.	Apr. 29
May 17	Jennings, La.	Apr. 29
May 17	New Jersey	May 6
May 17	Beggs, Okla. Adv. May 6.	May 6
May 17	Seattle, Wash.	May 6
May 17	Los Angeles, Cal.	May 6
May 17	San Diego, Cal.	May 6
May 17	Missouri	May 13
May 17	Ottawa, Ont.	May 13
May 17	Kalamazoo, Mich.	May 13
May 17	Bristol, Conn.	May 13
May 17	Houston, Tex.	May 13
May 17	St. George, S. I., N. Y.	May 13
May 18	New York, N. Y.	May 13
May 18	Princeton, Minn.	Apr. 29
May 18	Union, W. Va.	Apr. 22
May 18	Moorhead, Minn.	May 6
May 18	Clinton, Ind.	May 6
May 18	Richmond, Va. Adv. May 13.	May 13
May 18	Mangum, Okla.	May 13
May 19	Ft. Wayne, Ind.	Apr. 29
May 19	Wayne, W. Va.	Apr. 29
May 19	Quebec	May 6
May 19	Ontario	May 6
May 19	Preston, Minn.	May 6
May 19	Hallock, Minn.	May 6
May 19	Hallock, Minn.	May 13
May 19	Grand Island, Neb.	May 13
May 19	St. George, S. I., N. Y.	May 13
May 20	North Bergen (Weehawken P. O.), N. J.	May 13
May 20	Blytheville, Ark.	May 6
May 20	Columbus, O.	May 13
May 20	Michigan	May 13
May 20	Gonzales, Tex.	May 13
May 20	Niagara Falls, N. Y.	May 13
May 21	New Jersey	May 6
May 21	Buffalo, N. Y. Adv. May 6 and 13.	May 6
May 21	Lasalle, Que.	May 13
May 21	Washington, Pa.	May 13
May 21	Stephenville, Tex.	May 13
May 22	Ontario	May 13
May 22	Idaho	May 13
May 24	Brookline (Boston P. O.), Mass. Adv. May 13.	May 13
May 24	Jersey City, N. J.	May 13
May 25	Wadena, Minn.	May 13
May 27	Mandan, N. D.	May 13
May 28	Chambly, Que.	Apr. 29
May 28	Ohio	May 6
May 31	Arcadia, La.	Apr. 29
May 31	New Cumberland, W. Va.	May 13
June 1	New Martinsville, W. Va.	May 6
June 1	Florence, Ariz. Adv. May 13.	May 13
June 2	Freehold, N. J. Adv. May 13.	May 13
June 7	Fayetteville, W. Va.	May 13
June 10	West Palm Beach, Fla. Adv. May 13.	May 13
June 15	Westmount, Que.	May 6
June 28	Savannah, Ga. Adv. May 13.	May 13

EXCAVATION AND DREDGING

Bids Close		See Eng. News-Record
May 17	Atlantic, Ia.	May 6
May 17	Mason City, Ia.	May 13
May 18	Rochester, N. Y. Adv. Apr. 22 and May 6.	Apr. 22
May 18	Alexandria, Minn.	May 13
May 20	Sheridan, Mo. Adv. May 13.	May 13
May 21	Manning, S. C.	May 13
June 3	Boise, Idaho	May 13

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
May 15	Irvington, N. J.	May 6
May 16	Boston, Mass.	May 13
May 17	Detroit, Mich.	May 13
May 18	Philadelphia, Pa.	Apr. 22
May 18	Madison, Wis.	May 6
May 21	Montreal, Que.	May 13
May 22	New York, N. Y.	May 13
May 24	Wakefield, Mass.	May 13
May 26	Baltimore, Md.	May 13
May 26	Cleveland, O.	May 13
May 27	Cleveland, O.	May 13
May 30	Baltimore, Md.	May 13
June 1	Casper, Wyo.	May 13
June 7	Akron, O.	May 13
Sept. 1	Hutchinson, Kan.	Feb 19

BUILDINGS

Bids Close		See Eng. News-Record
May 15	Waterbury, Conn.	May 6
May 15	Washington, D. C.	May 13
May 17	Chippewa Falls, Wls.	May 6
May 18	Green Mountain, Ia.	Apr. 29
May 18	Morris Plains, N. J. Adv. Apr. 29 and May 6.	Apr. 22
May 18	West Roxhury (Boston P. O.), Mass.	May 6
May 18	Lakewood (Cleveland P. O.), O.	May 6
May 18	Westmount, Que.	May 13
May 19	Los Angeles, Cal.	May 6
May 19	Philadelphia, Pa.	May 13
May 20	Corydon, Ia.	May 6
May 20	Hawarden, Ia.	May 13
May 20	Duluth, Minn.	May 13
May 20	Newhall, Ia.	May 13
May 21	Verona (Montclair P. O.), N. J.	Apr. 29
May 21	Orrville, O.	Apr. 29
May 21	Leamington, Ont.	May 13
May 22	Whitten, Ia.	Apr. 29
May 22	Bishop, Cal.	May 13
May 22	Sudbury, Ont.	May 13
May 23	Middletown, N. Y.	Apr. 29
May 24	Bethlehem, Pa.	May 13
May 24	East Cleveland (Cleveland P. O.), O.	May 13
May 25	Lake Providence, La.	May 6
May 25	Detroit, Mich.	May 13
May 26	Willard, N. Y. Adv. May 6 and 13.	May 6
May 29	Dallas, Tex.	May 6
May 29	Frankford, W. Va.	May 13
June 1	New Orleans, La.	May 6
June 1	Conway, Ark.	May 6
June 2	Cleveland, O.	May 13
June 5	Paton, Ia.	May 13
June 5	Ansonia, O.	May 13
June 5	Naugatuck, Conn.	May 13
June 9	Pittsburgh, Pa.	May 13
June 25	Newport News, Va.	May 6
July 1	Chisholm, Minn.	May 13

FEDERAL GOVERNMENT WORK

Bids Close		See Eng. News-Record
May 15	Repairing Dock—New London, Conn.	May 6
May 18	Riprap Stone—Baltimore, Md.	May 13
May 18	Buoys — Tompkinsville, N. Y.	May 13
May 19	River Wall Power Plant, Machinery, etc., Cincinnati, O. Adv. May 6 and 13.	Apr. 22
May 19	Deep Well Pumping Equipment — Spec. 4166—Ft. Worth, Tex.	May 6
May 19	Electrical Equipment — Spec. 4146—South Charleston, W. Va.	May 6
May 19	Electrify Causeway and Transfer Yard — Mare Island, Cal.	May 13
May 20	Stone Riprap, Detroit, Mich. Adv. Apr. 29 to May 13.	Apr. 22
May 20	Mild Open Hearth Steel—Memphis, Tenn. Adv. Apr. 15 to May 13.	Apr. 29
May 20	Repairing Breakwater and Placing Riprap—Cleveland, O. Adv. Apr. 29 and May 6.	Apr. 15
May 20	Completing Headquarters—Ft. H. G. Wright, N. Y.	May 6
May 20	Incinerator—Boston, Mass.	May 6
May 20	Bridge—Wash., D. C.	May 13
May 21	Concrete Roadway and Sidewalk — Cape Henry, Va. Adv. May 6 and 13.	May 6
May 21	Oil Storage Tanks—Tompkinsville, N. Y.	May 13
May 24	Frame Cottage — Tulalip, Wash.	Apr. 29
May 24	Gates and Emergency Dams—Pittsburgh, Pa. Adv. Apr. 22 to May 13.	Apr. 29
May 24	Officers Quarters and Infirmary—New Dorp, N. Y. Adv. May 6.	May 6
May 25	Ruhble Mound Jetty and Pierhead, Cleveland, O. Adv. Apr. 22 to May 13.	Apr. 22
May 25	Steel Derricks—Memphis, Tenn. Adv. May 13.	May 13
May 26	Dredging — New York, N. Y. Adv. Apr. 15 to May 13.	Apr. 29
May 27	Emergency Dam—Detroit, Mich. Adv. Apr. 15-29.	Apr. 15
May 27	Repairing and Building Superstructure — Buffalo, N. Y. Adv. Apr. 29 to May 13	May 6

Bids Close		See Eng. News-Record
May 27	Paving Blocks, etc. — Wash., D. C.	May 6
May 31	Hospital—Ft. Bliss, Tex.	May 13
June 1	Hydraulic Turbines, Florence, Ala. Adv. Apr. 22 to May 13.	Apr. 22
June 1	American Portland Cement —Cincinnati, O. Adv. May 6 and 13.	May 6
June 1	Steel Hangar—Brooks Field, Tex. Adv. May 6 and 13.	May 13
June 1	Laundry—Stapleton, N. Y. Adv. May 13.	May 13
June 1	Mechanical Equipment — Stapleton, N. Y.	May 13
June 2	Operating Building and Quarters—Spec. 1183 St. Petersburg, Fla.	May 13
June 3	Earthworth—Yuma, Ariz. Adv. May 13.	May 13
June 7	Dormitory — Tahlequah, Okla.	May 6
June 10	Dredging—Boston, Mass. Adv. May 13.	May 13
June 14	Improving Water System—Ft. Yates, N. D.	May 13
June 14	Air Seacoast Defense Station—San Francisco, Cal.	May 13
June 15	Electric Generators, Exciters and Accessories — Florence, Ala. Adv. May 6 and 13.	May 6

MISCELLANEOUS

May 15	Breakwater, Buoys, etc.—St. Pierre, N. F.	May 13
May 17	Fire Alarm System—Brockport, N. Y. Adv. May 6 and 13.	May 13
May 18	Paving Plant, etc.—New York, N. Y.	May 3
May 18	Electrical Work, etc., Brooklyn, N. Y. Adv. Apr. 22.	Apr. 22
May 18	Power Plant Equipment—Kinston, N. C. Adv. May 13.	May 13
May 20	Concrete Culverts—Ontario,	May 6
May 20	Stairs and Wire Enclosures —Dannemora, N. Y. Adv. May 13.	May 13
May 20	Transmission Line—Haven, Kan.	May 13
May 24	Equipment — Allentown, N. J. Adv. May 13.	May 13
May 24	Power Equipment — East Cléveland (Cleveland P. O.), O.	May 13
May 25	Plumbing and Electrical Work—Philadelphia, Pa.	Apr. 22
May 25	Banana Conveyors—New Orleans, La. Adv. May 6.	May 6
May 26	Tractor, Elevating Grader and Dump Wagons — Wadena, Minn.	May 13
May 27	Laying Gas Mains—Duluth, Minn.	May 13
May 27	Sheds — Stapleton, S. I., N. Y. Adv. Apr. 29 to May 13.	May 13
June 1	Water Tube Boilers and Chain Grate Stakers — Lockport, Ill. Adv. May 6 and 13.	May 6
June 15	Scenic Railway—Detroit, Mich.	May 13

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

Conn., Mansfield Depot—Ford, Buck & Sheldon, Inc., engrs., 60 Prospect St., Hartford, soon let contract building 1 story, 40 x 50 ft., rein.-con. filtration plant and concrete dam, for Mansfield State Training School, here. About $25,000.

N. Y., New York—City plans to lay secondary watermain in Adams Ave. from pumping station to Sugar St. and Buffalo Ave., involving 4,840 lin.ft. 24-36 in. c.i. pipe, thirteen 24-36 in. valves, etc., cost $84,316; watermain in Michigan Ave. from 27th to Sugar Sts., 350 lin.ft. 6 in. c.i. pipe, $1,300, Cleveland Ave., 810 lin.ft. 6 in. c.i. pipe, $2,710; Linwood Ave., 1,060 lin.ft. 6 in. c.i. pipe, $3,560; Niagara St., 1,300 lin.ft. 6-8 in. c.i. pipe, $5,900; 27th St., 750 lin.ft. 6 in. c.i. pipe, $2,460; Center Ave., 6,200 lin.ft. 6 in. c.i. pipe and 3 ton specials, $22,500; Bell St., 1,420 lin.ft. 6-8 in. c.i. pipe, $6,552; Harrison Ave., 950 lin.ft. 6 in c.i. pipe, $3,380; McKinley Ave., 930 lin.ft. 6 in. c.i. pipe, $3,370; Niagara Rapids Blvd., 365 lin.ft. 6 in. c.i. pipe, $1,225; Willow Ave., 1,572 lin.ft. 6 in. c.i. pipe, $5,080; Sugar St., 5,376 lin.ft. 6-20 in c.i. pipe, forty-three 6-24 in. valves, 67,392 lb. specials, 20 M. ft. lumber, etc., $164,700; College Ave., 612 lin.ft. 6 in. c.i. pipe, $2,200; Sugar St., 776 lin.ft. 6-20 in. c.i. pipe, $7,591; Maple Ave., 743 lin.ft. 6 in. c.i. pipe, $1,545; Wilson St., 699 lin.ft. 6 in. c.i. pipe, $1,560; Garrett Ave., 1,118 lin.ft. 6 in. c.i. pipe, $2,332; Cliff St., 842 lin.ft. 6 in. c.i. pipe, $1,823; James Ave., 1,025 lin.ft. 6 in. c.i. pipe, $2,116; James Ave., 2nd Sect., 1,410 lin.ft. 6 in. c.i. pipe, $3,451; 14th St., 742 lin.ft. 4-6 in. c.i. pipe, $1,739; Vanderbilt Ave., 150 lin.ft. 6 in. c.i. pipe, $326. W. B. Bennett, city engr.

N. Y., Rensselaer—Common Council plans to install water supply system. (3,000,000 gal. daily capacity). About $500,000.

O., Columbus—City rejected bids received April 27, equipping and building Nelson Rd. pumping station for Shepard Main Trunk Sewerage System; also building Summit St. sewer, involving 2,640 ft. 12-20 in. pipe, 10 man holes, etc. Work will be readvertised H A Maetzel, city engr. Noted May 6.

O., Delaware—Delaware Water Co. plans to build 2 story, concrete filtration plant.

O., Wooster—City plans to complete waterworks system, involving pumping station, extension of water mains, etc. Bonds for $60,000 voted for project. C. O. Williamson, city engr.

Tex., Clyde—City plans to improve waterworks system, to include digging well, installing and furnishing pump and power equipment, laying 1½ mi. 4 and 6 in. pipe, building 50,000 gal. elevated tank, valves, hydrants, etc.

Okla., Madill — City having plans prepared and receives bids in June, extending waterworks system. Bonds for $400,000 voted for project. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs. Noted Feb. 5.

Okla., Pawnee—City voted $100,000 bonds to improve waterworks system and electric light plant. Engineer not selected.

Ariz., Tucson—City election May 15, to vote on $140,000 bonds to extend and improve waterworks system. L. O Cowan, clk. Noted April 1.

Ont., Port Credit—Village having estimates prepared for waterworks system, to include brick pumphouse, pumps, mechanical filters, chlorination, elevated tank, 1,200 ft. steel intake pipe and 20,000 ft. c.i. water mains. About $80,000. E. A. James Co., Ltd., 36 Toronto St., Toronto, engrs.

BIDS DESIRED

N. J., Burlington—Until May 19, by G. A. Allinson, supt. waterworks, installing high service pumping machinery, in one 3,000,000 gal. unit. W. H. Boardman, 426 Walnut St., Phila., engr.

Pa., Lock Haven—Until June 1, by A. Sterner, supt. accounts and finances, laying large water mains, installing electric booster pump, removing tubercules from mains, extending sewers, and paving various streets with concrete. About $80,000.

Mich., Grosse Point (Detroit P. O.)—Until May 20, by T. M. Campau, engr., at Village Hall, Jefferson and Maryland Aves., furnishing labor and material for trenching and laying watermains in Beaconsfield and Queen Aves. from Jefferson Ave. to Essex Blvd., involving 8,000 ft. 6 in. c.i. pipe etc. About $25,000.

N. D., Grand Forks—Until May 29, by Industrial Comn. of North Dakota, Bismarck, building reservoir, filter plant and power house, including boilers, stokers, etc. C L. Pillsbury Co., 805 Metropolitan Life Bldg., Minneapolis, Minn., engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. J., Hamilton Square**—Boro. let contract laying watermains and installing pumps, motor and tank, to C. F. Danser, Hamilton Square. About $20,000.

★**S. C., Rock Hill**—See "Streets & Roads."

★**O., Canton**—H. A. Smith, dir. Bd. Pub. Serv., let contract constructing 15,000,000 gal. equalizing basin, 362 ft. long, 362 ft wide, 22 ft deep, rein.-con. and steel, at D. Smith's farm north of here, to Melbourne Bros., Eagle Blk., $298,980

O., Cleveland — City received only bid April 29, for 228,000 cu.yd. excav., at Baldwin Reservoir, from R. E. Carey Co., West 112th St., $369,600. Noted April 29.

★**Utah, Salt Lake City**—City let contract building waterworks system involving 900,000 gal. rein.-con. reservoir, 17,000 ft. 3-12 in, wood and 5,280 ft. 18 in. vitr. pipe, to Mullins & Palm, Dooly Bldg., $54,515.

Sewers

PROPOSED WORK

Conn., Bridgeport—City plans to issue $550,000 bonds to build sewage disposal plant on east side. Engineer not selected.

N. Y., Niagara Falls—City plans to lay sewer in Niagara Rapids Blvd., involving 1,490 ft. 27-48 in. pipe, etc., cost $26,400; Royal Ave., 2,380 ft. 42-54 in. pipe, $95,000; 13th St., 2,614 ft. 24-48 in. pipe, $100,900; 27th St., 5,847 ft. 15-48 in. pipe, $156,500; Calumet Ave., 3,726 ft. 15-42 in. pipe, $51,700; 26th St., 1,136 ft. 12-15 in. tile pipe, $10,200; College Ave., 1,095 ft. 12-15 in. tile pipe, $10,900; 1st Sect. Sugar St., 2,700 ft. 12 in. tile pipe, $14,200 and 2nd Sect., 3,500 ft. 12 in. tile pipe, $21,800; Royal Ave., 1,560 ft. 12-24 in. pipe, $12,000; Niagara St., 1,050 ft. 12 in. tile pipe, $10,400; Vanderbilt Ave., 655 ft. 12 in. tile pipe, $5,700; La Salle Ave., 500 ft. 12 in. tile pipe, $2,750; Morley Ave., 860 ft. 12 in. tile pipe, $5,700; Washington St., 235 ft. 12 in. tile pipe, $1,450; Cliff St., 360 ft. 10 in. tile pipe, $3,200; Glenn St., 350 ft. 12 in. tile pipe, $3,300, Barton St., 400 ft. 10 in. tile pipe, $3,400; in alley between 10th and 11th Sts., 13th and 14th Sts., Erie and Jefferson Aves., Main and 8th Sts., Jefferson and Buffalo Aves., 9th and 10th Sts., 5th and 6th Sts., 4th and 5th Sts., 3rd and 4th Sts., and 3rd Sts., 6,120 ft. 8-12 in. tile pipe $41,750. W B. Bennett, city engr.

N. Y., Utica—Common Council plans to build storm water and sanitary sewerage system, in 13th Ward About $125,000. J. Kemper, city engr.

N. J., Hoboken—City Comn. plans to build sewerage system and construct sewers in Paterson Ave. from Ferry to Marshall Sts. and Clinton St. from 12th to 15th Sts. About $1,000,000. J. O Whittemore, city engr.

S. C., Newberry—City voted $25,000 bonds to extend sewerage system. Engineer not selected.

Ky., Louisville — City voted $1,000,000 bonds to build sewers on various streets.

Mich., Ford (Wyandotte P. O.)—E. LeBlanc, village clk., rejected bids building storm sewerage system, involving 4,023 ft. 36 in. vitr. crock or concrete pipe. About $70,000. Work will be readvertised. M. L. Brown & Son, Chamber of Commerce, Detroit, engrs. Noted April 22.

Minn., Plainview—Village rejected only bid received April 16, extending sewerage system, involving 25,000 ft. sewers. About $65,000. Druar & Smith, Globe Bldg., St. Paul, engrs. Work will be readvertised. Noted April 1.

Ariz., Yuma—S. F. Stanley, city recdr., soon receives bids building 13 mi. 4-20 in. vitr. sanitary sewer pipe, concrete pumphouse, sewage pumping plant and 6 mi. 20 in. concrete outfall sewer pipe. About $125,000. N. B. Conway, Yuma, engr. Noted March 25.

Ont., Peterboro — City plans to build sewage disposal station and pumping plant, brick. About $50,000. R. H. Parsons, city engr.

BIDS DESIRED

N. Y., Long Island City—Until May 18, by M. E. Connolly, pres. Queens Boro., building sewer and appurtenances in Alstyne Ave. from Junction Ave. to Card Pl., Lurting St. from Junction Ave. to point 600 ft. west, North Railroad Ave. from Junction Ave. to point 600 ft. west, Hunt St. from Luydig Pl. to Van Dine St., Junction Ave. from Hunt St to Roosevelt Ave., 2nd Ward, Corona Ave. from Alstyne to Junction Aves., Gerry Ave. from Junction Ave. to Toledo St., Junction Ave. from Corona to Maurice Aves., Maurice Ave. from Junction Ave. to Bway., Maurice Ave. from Junction Ave. to Toledo St., and from point 480 ft. east of Bway. to Chicago Ave., Bway. from Maurice Ave. to St. James Pl., temporary connection to sewer in Bway. at St. James Pl., 2nd Ward, building receiving basins and appurtenances in 2nd Ave. at south corner of Woolsey Ave., Astoria Ave., east and south corners Wilbur and Van Alst Aves., also building inlet basins on north and south corner Hoyt Ave., and east corner Cushing Pl.

N. Y., New York—Until May 21, by H. H. Curran, pres. Manhattan Boro., repairing barrel sewer at foot of Coenties Slip, Jefferson, 21st, 29th and 33rd Sts., East River.

N. J., Haddonfield—Until May 24, by Boro Comrs., building 12 in. outfall sewer,

Sewers (Continued)

involving 5,450 lin.ft. terra cotta pipe, etc. (Item A); rebuilding present sewage disposal plant, (Item B); building new disposal plant. (Item C). A. Clymer. clk.; advertised in this issue.

Pa., Lock Haven—See "Waterworks."

Ind., Hammond—Until June 14, by Bd. Pub. Wks. building North Side and South Side Sewers, also pumping station. About $1,124,053. W. F. Bridge, city civil engr.; advertised in this issue.

N. D., Mandan—Until May 27, by city, building 13,092 ft. 10-24 in. storm sewer and 40 manholes. Black & Griffin, Mandan, engrs.

Ia., Ames—Until June 7, by A. B. Maxwall, city clk., building sewage treatment plant, to include pumping plant, Imhoff tank, etc. Noted March 4. Advertised in this issue.

Ia., Ft. Madison—Until June 9, by L. F. Albers, city clk., building sanitary sewers. 2 pumping stations, etc.; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Reading—City let contract laying 10,000 ft. vitr. pipe sewers in various streets, to A. Cefalo, 316 Belgrade Ave., Roslindale. About $30,000.

★N. J., Pleasantville—City let contract building sewage screening plant and pumping station, to Seaman, Letzkus & Smith. $42,914; force mains, and mechanical equipment, to Simpson & Brown Co., 90 West St., New York City, $21,890 and $32,261 respectively. Noted April 1.

★N. J., Hoboken—City Comn. let contract building sewers in 7th and 15th Sts., to W. T. S. Crichfield, 54 5th St., $327,752 and $433,622 respectively. Noted April 22.

★S. C., Rock Hill—See "Streets & Roads."

O., Cleveland Heights (Warrensville P. O.)—Cedar Heights Land Co., c/o F. A. Pease Eng. Co., engrs., 804 Marshall Bldg., Cleveland, received bids building sewers and water mains in Bainbridge, Revers and Stanton Rds., Berkeley and Blanche Aves. involving 27,940 ft. 8-36 in. vitr., 1,425 ft. 30 and 36 in. segmental block and 15,485 ft. 4 and 6 in. c.i. pipe, 54 manholes and 84 catch basins, from Hadded-Mall Co., Schofield Bldg., $189.946; A. Marra, Illuminating Bldg., $198,523; Lanase Co., Columbla Bldg., $204,028; contractors all of Cleveland.

★Ind., Lafayette—City let contract building sewerage system, to J. F. Hipskind, 233 Colonial St., Richmond. About $70,000.

Mich., Detroit—City received bids April 30, building Sect. 1, Gratiot Ave. Sewer. involving 3,850 ft. 5 to 11 ft. brick, monolithic concrete or concrete segmental block pipe, from J. A. Mercier, 216 Hammond Bldg., $485,000; J. Porath, 34 McGraw Bldg., $492,583. Noted April 15

★Ia., Wellsburg—City let contract building sewers in various streets, to M. McElligott Co., Evanston, Ill., $52,781; sewage disposal plant, to Ward & Weighton, 516-17 Davidson Bldg., Sioux City, $16,700.

★Col., La Junta—City let contract building new storm sewerage system, Dist. 1, to Reed & Wheelock, Clay Center, Kan., $62,481. Noted April 1.

Cal., National City—City received only bid building 10.7 mi. sewerage system, involving 16,320 ft. 4-12 in. concrete pipe, etc., from J. Engelhretsen, 205 McNeece Bldg., San Diego, $105,600.

Bridges

PROPOSED WORK

Pa., Morrisville—Boro. plans to build concrete bridge over Pennsylvania Canal. About $25,000. L. Hall, Morrisville, engr.

Pa., Phila.—City received no bids April 29, building bridges on Cobbs Creek Parkway, Harvey and 49th Sts. Noted April 22.

N. C., Lexington—Davidson and Rowan Counties and State Highway Comn., Raleigh, plan to build concrete bridge over Yadkin River on Natl. Highway Crossing. About $65,000. W. S. Fallis, Raleigh, state highway engr.

O., Columbus—Comrs. Franklin Co. received no bids May 3, building 833 ft. bridge, 30 ft. driveway, two 6 ft. sidewalks, over Scioto River on Greenlawn Ave., here. About $375,000. Braun, Fleming & Knollman, 233 South High St., engrs. Work will be readvertised. Noted April 8.

Wis., Sheboygan—Sheboygan Co. having plans prepared for 30-ft semi-circular arch type I beam bridge in Holland Twp., rein.-con. abutments, earth approach and fill. Cost between $20,000 and $30,000. G. W. Ubbelohde, co. engr.

Kan., Belleville—Bd. Comrs. Republic Co. rejected bids received May 5, building 300 ft. steel bridge, also several smaller bridges. E. A. D. Parker, co. engr. Noted April 22.

Mo., Marshall—Saline Co. had plans prepared building 3 span concrete arch bridge over Salt Fork Creek and concrete slab and girder bridge over Missouri Pacific R.R. tracks, on Marshall Special Rd. Dist., near here. Work involves 2,200 cu.yd. concrete and rein.-con., 50 ton reinforcing steel, 1,500 lin.ft. concrete piling and 53,000 cu.yd. earth approach and fill, etc. Bonds for $85,000 voted for project. C. D. Mann, Jefferson City, state bridge engr.

New Mexico—State Highway Dept., Santa Fe, rejected bids received May 5, building Logan bridge, 734 ft. long, over Canadian River, Federal Aid Project 39, Quay Co. L. A. Gillett, state highway engr.

Ariz., Kingman — See "Streets and Roads."

BIDS DESIRED

N. Y., Mt. Vernon—Until May 24, by cities of Mt. Vernon and Yonkers and Bronx Parkway Comn., at office of Bronx Parkway Comn., West Pondfield Rd., Bronxville, completing Broad St. viaduct. over New York Central R.R. tracks and Bronx River, between here and Bronxville; advertised in this issue.

Fla., West Palm Beach—Until June 10, by Bd. Comrs. Palm Beach Co., building 1,885 ft. bridge over Lake Worth, from here to Palm Beach. R. F. Goodman, co. engr.; advertised in this issue.

Minn., Minneapolis—Until May 17, by A. P. Erickson, aud. Hennipin Co., building 140 ft., concrete bridge, 60 ft. concrete girder, concrete abutments, over Grays Bay. About $35,000. Noted Feb. 5.

N. D., Bismarck—Until May 18 by T. Flaherty, clk. Burleigh Co., L. Nichols, clk. Morton Co., (Mandan), and State Highway Comn., building 1,200 ft. bridge over Missouri River, 40 ft. wide, to have three 400 ft. steel spans. Work includes 5 mi. filling. About $750,000. C. A. P. Turner. 627 1st Ave. N., Minneapolis, Minn., engr. Noted April 8.

Missouri—See "Streets and Roads."

Tex., Stephenville—Until May 21, by E. E. Solomon, judge Erath Co., building rein.-con. and steel bridges and culverts on Highway 10, involving 1,306 cu.yd. rein.-con., 1,775 cu.yd. Class "B" and 40.6 cu.yd. Class "C" concrete, 135,776 lb. structural and 194,951 lb. reinforcing steel. About $115,000. C. C. Fielder, Waco, engr.

Ariz., Florence—Until June 1, by Pinal Co. Highway Comn., building bridge, culverts, head walls and retaining walls on Ray-Kelvin highway, involving 160 cu.yd. class "A" and 630 cu.yd. class "C" concrete, 1,120 cu.yd. cement rubble and 12,000 lb. reinforcing steel. County will furnish corrugated metal pipe. E. G. Dentzer, secy.; advertised in this issue.

Ariz., Florence—Until June 7, by Pinal Co. Highway Comn., furnishing plans and building two 150 ft. single arch, rein.-con. bridges across Mineral Creek, on Ray-Kelvin Highway. E. G. Dentzer, secy.; advertised in this issue.

Ontario—Until May 17, by H. T. Hazen, engr., 27 Wellington St. E., Toronto, building 16 rein.-con. railway bridges and culverts for Canadian National Ry., Royal Bank Bldg., Toronto. About $200,000.

Ont., Orangeville — Until May 17, by Wheelock & Christie, engrs., Orangeville, building 8 rein.-con. bridges, 6-45 ft. long, 16-20 ft roadways, on Dufferin Co. roads, involving 1,500 cu.yd. rein.-con. and 1,800 cu.yd. gravel. About $30,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Neponset (Boston P. O.)—Dist. Comrs., 18 Tremont St., Boston, received bids building 703 ft. bridge and approaches, 40 ft. wide, over Neponset River, here, from Bay State Dredging Co., 62 Condor St., Boston, $792,760; Holbrook, Cabot & Rollins, Beacon St., Boston, $813,755; Coleman Bros., Chelsea, $833,143. Noted April 15.

★N. Y., Gilboa—Bd. Water Supply, Municipal Bldg., New York City, let contract building Schoharie and Manorkill Bridges, Gilboa and Conesville Twps., to Lupfer & Remick, Inc., Ellicott Sq., Buffalo, $186,330. Noted May 6.

★O., Cincinnati—Southern R.R., Ingalls Bldg., let contract building rein.-con. and steel bridge, to replace one spanning Ohio River from here to Ludlow, Ky., to Amer. Bridge Co., 30 Church St., New York City. $3,250,000. Noted May 6.

★Ind., Ft. Wayne—Comrs. Allen Co. let contract building 290 ft. three span rein. con. arch bridge, 56 ft. wide, on Main St., to Tapp Constr. Co., Spy Run Ave. and State Blvd., $151,600. Noted April 22.

Mich., St. Clair—City, St. Clair and China Twps. received bid building 200 ft. 3 span, rein.-con., arch type highway bridge, 20 ft. wide, over Pine River, near here, from R. F. Hanneman, 454 Ferdinand Ave., $32,000. Noted April 15.

★Illinois—State Highway Dept., Springfield, let contract building bridge on Federal Aid Project 7, Sect. 5, La Salle Co., to Ferguson Constr. Co., Rockford, $22.572, exclusive of cement. Noted April 22.

Wis., La Crosse—State Highway Dept., at div. office, La Crosse, received bids May 4, building bridge over Black River, at Clinton St., here, from Wausau Iron Wks., Wausau, $87,700; Michie Constr. Co., 82 Wisconsin St., Milwaukee, $93,300; Kelly-Atkinson Co., 189 West Madison St., Chicago, $111,101.

★Ark., Little Rock—Little Rock-Spring Lake Highway Dist. let contract building 200 ft. steel bridge over Fourche Bayou, 19 ft. roadway, to Illinois Steel Bridge Co., Jacksonville, Ill., $47,933.

★Tex., Cooper—Delta Co. let contract building bridges on Highway 19, to Austin Bros. Bridge Co., 1815 Coombs St., Dallas, $71,843. Work involves 382 cu.yd. excav., 189,479 lb. structural and 57,259 lb. reinforcing steel, 326 cu.yd. Class "A," 720 cu. yd. Class "B" and 8 cu.yd. Class "C" concrete.

★Arizona — State Highway Dept., Phoenix, let contract building Cienga Creek Bridge, 278 ft. long, with 146 ft. clear span, Federal Aid Project 18, to English & Pierce, $27,480.

Wash., Seattle—Bd. Pub. Wks. received bids April 30, building 12 trestles, 45 to 210 ft. long, on Skagit River R.R. from Rockport to new power plant, from Culliton Bros., Seattle, $43,874; Grant Smith Co., Henry Bldg., $45.593; J. A. McEachern, Bell St. Dock, $50,985.

★Oregon—State Highway Comn., Portland, let contract furnishing labor and material building rein.-con. overhead crossing over Southern Pacific R.R., near Ashland, involving 200 cu.yd. Class "A" and 325 cu. yd. Class "B" concrete, 250 cu.yd. excav., etc., to D. M. Stevenson, 264 East 31st St., Portland, $35,458; two small highway bridges over Birdsey Creek and Millers Gulch, Jackson Co., involving 220 cu.yd. Class "A" rein.-con., 16.5 ton steel, etc., to F. C. Carter, Talent, $12,183. Noted April 22.

Streets and Roads

PROPOSED WORK

Maine—State Highway Comn., Augusta, rejected bids received May 5, building 4.71 mi. bituminous macadam road, Newport Twp., 2.54 mi., Belfast Twp., also culverts in Belfast, Westbrook, Newport, Perry and Pembroke Twps. Work will be readvertised. Noted April 22.

Conn., Bridgeport—City plans to issue $300,000 bonds to pave various streets, macadam and asphalt. J. A. McElroy, city engr.

N. Y., Mohawk—Village Bd. having plans prepared paving Marshall Ave., Orchard, Michigan, Washington and Warren Sts. Cost between $50,000 and $60,000. E. M. Evans, Herkimer, engr.

N. Y., New York—H. Bruckner, pres. Bronx Boro., rejected bids received April 26, repaving Sagamore St. About $25,000. Noted May 6.

N. Y., Niagara Falls—City having plans prepared paving 1084 ft. McKenna Ave., 30.83 ft. wide. About $30,000. W. B Bennett, city engr.

N. Y., Oneida—City voted $44,000 bonds to pave Mott, Elizabeth and East Walnut Sts. J. M. Hutton, city engr.

N. J., Long Branch—City plans to pave various streets, involving 130,000 sq.yd. bituminous E. E. Throckmartors, city engr.

N. J., New Brunswick—City receives bids in May or June paving various streets, involving 43,000 sq.yd. sheet asphalt, asphalt block, brick or concrete. About $200,000. A. Atkinson, city engr.

N. J., Vineland—City plans to pave various streets, involving 40,000 sq.yd. concrete or brick. Remington & Vosbury, 6th and Market Sts., Camden, engrs.

Streets and Roads (Continued)

Pa., Carlisle—City plans to pave various streets, involving 17,000 sq.yd. concrete. D C. Weller, city engr.

Pa., Harrisburg—City plans to pave various streets, involving 100,000 sq.yd. sheet asphalt or concrete. M. B. Cowder, city engr.

W. Va., Buckhannon—City voted $50,000 bonds to pave streets.

W. Va., Union—Monroe Co. election June 2, to vote on $71,000 bonds to grade and drain 14½ mi. roads in Sweet Springs Dist. J. L. Wehmeyer, Union, engr. Noted April 15.

North Carolina—Div. Office State Highway Comn., Greensboro, received no bids May 3, building 2.54 mi. Federal Aid Project 114, concrete, Rowan Co. W. S. Fallis, Raleigh, engr. Noted April 29.

N. C., Newbern—Craven Co. election June 5, to vote on $2,000,000 bonds to build roads.

S. C., Lexington—Lexington Co. soon receives bids building Batesburg to New Brookland Rd., also Piedmont and Columbia-Charleston Highways. About $100,000.

Fla., Delray—City plans election to vote on $100,000 bonds to improve streets and roads.

Ala., Alabama City—City Council received no bids May 4, paving Forest Ave. from Black Creek to 7th St. About $76,000. W. H. Marton, clk. Noted April 29

Ind., Sullivan—City received no bids April 30, paving various streets, involving 6,200 sq.yd. brick, asphaltic concrete, wood block, vitrolithic or bitulithic: work will be readvertised. J. Graveman, clk.

Mich., Allegan—Allegan Co. having plans prepared for grading, draining and surfacing 6 mi. road on town line between Laketown and Filmore Twps., gravel surface on crushed stone or gravel base. About $72,000. L. F. Levin, co. engr.

Ill., East St. Louis—City plans to resurface 5 blocks North 10th St. from Illinois to St. Clair Aves., 36 ft. wide, involving 12,000 sq.yd, asphalt. About $38,000. E. F. Harper, city engr.

Ill., Galesburg—Bd. Local Impvts. plans to pave South Henderson St. from Monmouth Blvd. to West 6th St., involving 4,900 cu.yd. grading, 4,210 lin.ft. combined concrete curb and gutter flag, 3,835 lin.ft. marginal curbing and 8,115 sq.yd. brick on 4 in. concrete base asphalt filler. About $49,425. F. M. Connolly, city engr.

Wisconsin—State Highway Dept., at div. office, Spooner, rejected bids received April 29, grading and paving 5.1 mi. Spooner-Hayward Rd., Federal Aid Project 156, Washburn Co. Work may be readvertised later in season. Noted May 6.

Wis., North Milwaukee—W. E. Chase, city clk., received no bids April 27, paving Green St., Western, Commerce and Hampton Aves. Work will be readvertised. H. C. Webster, city engr. Noted April 29.

Wis., Sheboygan—City plans to pave 7 mi. Pennsylvania Ave. and North 6th St., et. al., 18 ft. wide, involving 15,770 sq.yd. concrete and 8,250 lin.ft. concrete curb and gutter. About $75,000. C. U. Boley, city engr.

Minn., Ivanhoe—A L Swenson, aud., Lincoln Co., rejected bids received April 27, grading and graveling 19 mi. Federal Aid Project 146, 24 ft. wide. About $133,000. Work will be readvertised. Noted April 1.

South Dakota—State Highway Comn., Pierre, received no bids April 9, graveling 14,11 mi. De Smet-Brookings Highway, 24 ft. wide, Kingsbury Co. About 42,000. F. S Peck, state highway engr. Noted March 25.

Wyoming—State Highway Dept., Cheyenne, rejected bids building 3 mi. section of Yellowstone Highway, north of Worland, Federal Aid Project 70, Washakie Co., 3 mi. section on Daniel-Lane Rd., Lane Co. Noted April 15.

Montana—State Highway Comn., Helena rejected bids received April 19, grading and graveling Federal Aid Project 65, Cascade Co. Noted April 8.

Mont., Glasgow—Valley Co. voted $200,000 bonds to build roads. Noted Feb. 26.

Missouri—State Highway Dept., Jefferson City, plans to build 5.55 mi. Nevada-Springfield Rd. 24 ft. wide, Eldorado Special Rd. Dist., Cedar Co., involving 1,020 cu.yd. rock and 19,975 cu.yd. earth excav., 52,140 sq.yd. Joplin chat. surfacing, 15 culverts and one 35 ft. span bridge, cost $19,719; 7 mi. Preston-Collins Rd., 24 ft wide, Wheatland Special Rd. Dist., Hickory Co., 21,000 cu.yd. excav. 1% rock, 36,960 sq.yd. 2 course gravel surfacing, 19 culverts and one 24 ft. concrete span bridge, $39,004; 10.6 mi. Kansas City-Liberty Rd., 24 ft. wide, Clay Co., 59,392 cu.yd. excav. 18% rock, 99,502 sq.yd. bituminous macadam surfacing, 32 culverts, 1,400 lin.ft. guard rail, 2,500 lin.ft. under drain and 5 bridges to be widened, $253,322; 24.68 mi. St. Louis-Fredericktown-Poplar Bluff Rd., 24 ft. wide, 123,500 cu.yd. excav. 5% rock, 79,200 sq.yd. gravel surfacing, 7 culverts, two 40 ft., two 35 ft., one 85 ft., one 36 ft., and three 60 ft. concrete span bridges, etc., $137,600; 7.72 mi. Clinton-Springfield Rd., 24 ft. wide, Osceola Special Rd. Dist., St. Clair Co., 25,000 cu.yd. earth excav. 4% rock, 2,000 sq.yd. 1 course and 38,866 sq.yd. 2 course gravel surfacing, 14 culverts, 1,000 cu.yd. rock excav. and one 16 ft. span superstructure for bridge, $38,600; 13 mi. New Florence Montgomery-Wellsville Rd., 24 ft. wide, Montgomery Special Rd. Dist., Montgomery Co., 45,500 cu.yd. earth excav., 13,320 sq.yd. gravel surfacing, 27 culverts and one 30 ft. rein.-con. span bridge, $46,199.

Mo., Galena—Stone Co. will sell $95,000 bonds May 22, to builds roads. G. W. Short, co. treas.

Mo., Marshall—Saline Co. had plans prepared paving and surfacing 7½ mi. Old Trails Rd., 18 ft. wide. Bonds for $85,000 voted on project. State and Federal Government will appropriate toward cost.

Tex., Center—Shelby Co. voted $350,000 bonds to build roads.

Tex., Childress—Childress Co. had plans prepared grading, sand clay surfacing and draining 10.15 mi. Highway 4 from here to Red River, 18 ft. wide, involving 4 acres clearing and grubbing, 817 cu.yd. Class "A" concrete, 75,182 cu.yd. earth excav. and 69,000 lb. reinforcing steel. About $70,005. Hess & Skinner, Southwestern Life Bldg., Dallas, engrs.

Tex., Galveston—Galveston Co. defeated $350,000 bond issue to improve highways. Noted March 25.

Okla., Wagoner—Comrs. Wagoner Co. plan to build 2½ mi. highway between Muskogee and Tulsa. About $29,260. R. C. Terrell, c/o State Highway Dept., Oklahoma, engr.

Idaho—State Highway Dept., Boise, soon receives bids grading and surfacing 9 mi. Idaho-Utah Highway from Downing to Franklin Co. line, 18 ft. wide, Federal Aid Project 17, Bannock Co., gravel and crushed rock. About $68,000. D. P. Olsen, dir. Bureau Highways. Noted Dec. 18.

Idaho, Preston—City plans to pave 1.4 mi. Main St., 40 ft. wide, 7 in. plain cement concrete. About $79,000. T. H. Humpheries, Co. Court House, Logan, engr.

Utah—State Highway Comn., Salt Lake City, plans to surface 40.3 mi. road from Thompson to Moab, 16 ft. wide, cost $275,000; 7½ mi. road from Moab to La Salle, 16 ft. wide, gravel or shale, $83,800. I. R. Browning, state highway engr.

Ariz., Kingman — Mohave Co. election June 6 to vote on $700,000 bonds to build roads and bridges.

Ariz., Yuma—S. F. Stanley, city recdr., soon receives bids improving various streets, including guttering, cement curbing and warrenite-bitulithic paving. About $100,000. N. B. Conway, Yuma, engr.

Washington — State Highway Comn., Olympia, rejected bid received April 26, grading, graveling and building slab bridge on 1.99 mi. State Rd. 4, Okanogan Co., cost $32,664.

Wash., Pullman—City plans to grade and pave 17 blocks in Impvt. Dist. 1, concrete, cost, $95,800; 6 blocks in College Park Addition, concrete, $32,457. M. K. Snyder, city engr.

Wash., Seattle—King Co. rejected bids received April 26, grading and graveling 2.5 mi. R. A. Ballinger Rd., 20 ft. wide. About $31,000. Work may be readvertised. S. J. Humes, co. engr. Noted May 6

Cal., Oroville — Bd. Suprvs. Butte Co. soon receives bids for 1st section of work under $1,800,000 bond issue, to include 3 mi. road from Cana to State Highway, 3 mi. from Biggs to East Biggs, 6 mi. west from Gridley, 3 mi. Thermalito-Grand Ave. Rd., all macadam. M C. Polk, Oroville, engr. Noted Jan. 8.

Cal., Santa Monica—City Comrs. receive bids about June 15, improving 8,000 ft. San Vincente Blvd., 28 ft. wide, involving 461,000 sq.ft. 2½ in. asphaltic concrete paving with 1½ in. bitulithic surface, 550 ft 30 in. radial interlocking brick storm drain etc. J. A. Morton, city engr

California—State Highway Dept., 515 Forum Bldg., Sacramento, received no bids May 3, paving 6.6 mi. road between Auburn and northerly boundary of Placer Co., also 6.5 mi. road between Tule Wash and Gravel Wash, Imperial Co Noted April 15 and 22.

BIDS DESIRED

Mass., Brookline (Boston P. O.)—Until May 24, by Bd. Selectmen, Town Hall, reconstructing Dudley St. between Warren and Lee Sts., involving 5,000 sq.yd. bituminous macadam. E. A. McEttrick, secy.; advertised in this issue.

Conn., Bristol—Until May 17, by C. W. Buell, city engr., paving Laurel and Center Sts., involving 3,000 sq.yd. standard concrete, 6 in. at sides and 8 in. in center, on concrete base.

N. Y., New York—Until May 18, by H. Bruckner, pres. Bronx Boro., repairing sheet asphalt pavement in railroad area, when and where directed; also regulating, grading, setting curb, laying sidewalks and crosswalks and building inlets, receiving basins, drains, culverts, approaches and guard rails on Sagamore St. from White Plains to Unionport Rds., repaving with granite blocks on concrete foundation roadway of Webster Ave. from East 194th St. to Bedford Park Blvd., paving with granite block and sheet asphalt on cement concrete foundation, roadway of Teller Ave. from East 167th to East 169th Sts., repaving with asphalt blocks on concrete foundation, East 152nd St. from Courtlandt to Morris Aves., paving with sheet asphalt on cement concrete foundation, Trinity Ave. from 147th to 149th Sts., East 137th St. from Locust to Willow Aves., Garden St. from Southern Blvd. to Crotona Ave., with sheet asphalt and asphalt block on cement concrete foundation, East 197th St. from Bainbridge Ave. to Grand Blvd. and Concourse, with bituminous concrete on cement concrete foundation, Mohegan Ave. from East 175th to East 176th Sts.

N. Y., Niagara Falls—Until May 20, by city, paving 950 ft. 21st St., involving 3,560 sq.yd. paving, 2,015 lin.ft. Medina and 245 lin.ft. Margin curbing, etc., 738 ft. McKenna Ave., 2,683 sq.yd. paving, 1,512 lin.ft. Medina and 120 lin.ft. Margin curbing, etc., 286 ft. 15th St., 763 sq.yd. paving, 583 lin.ft. Medina and 50 lin.ft. Margin curbing, etc., 2,303 ft. 18th St., 7,896 sq.yd. paving, 4,622 lin.ft. 5 in. Medina and 120 lin.ft. Margin curbing, etc, 3,523 ft. Falls St., 12,190 sq.yd. paving, 7,140 lin.ft. 5 in. and 210 lin.ft. 4 in. Medina curbing. Bids will be received on vitr. brick, vertical fibre, granite block, wood block, asphalt and concrete. W. B. Bennett, city engr.

N. Y., S. I., St. George—Until May 17, by C. D. Van Name, pres. Richmond Boro., building concrete sidewalks on both sides of Elliott Ave from Johnson Ave. to Amboy Rd., on west side of 10th St. between Rose Ave. and New Dorp Lane, building and repairing sidewalks and setting bluestone curbs, on north side of Linden Ave. from Van Pelt Ave. to Maple Parkway, both sides of Union Ave. from Staten Island Rapid Transit R.R. tracks south to Continental Ave., Walloon St. from Union Ave. to Maple Parkway, on north side of Richmond Terrace from Holland to Grand View Aves., and from Jewett Ave. to Empire Theatre, both sides between fence and curb lines, on both sides of Richmond Ave. from Staten Island Rapid R.R. tracks to Charles Ave. and on both sides of Washington Ave. from Richmond to Columbus Aves., Castleton Ave. from Clove Rd. to Jewett Ave., Castleton Ave. from North Burgher Ave. to Taylor St., Richmond Terrace from York to Westervelt Aves., Maple Ave. from Bay to Edgewater Sts.

N. Y., S. I., St. George—Until May 19, by C. D. Van Name, pres. Richmond Boro., regulating and repaving roadway of Tompkins Ave. from Vanderbilt to St. Marys Aves., bituminous concrete.

N. J., Freehold—Until June 2, by Bd. Freeholders Monmouth Co., rebuilding Freehold-Adelphia Rd., Sect. 3, Freehold and Howell Twps.; advertised in this issue.

N. J., Jersey City — Until May 24, by Hudson Co. Blvd. Comn., improving Hudson Blvd. between Terhune and Communipaw Aves., bituminous surface About $160,000. Noted May 6.

N. J., North Bergen (Weehawken P. O.) —Until May 20, by Town Council, improving 34th and 35th Sts. About $100,000. Former bid rejected. Noted April 22.

Pa., Lock Haven—See "Waterworks."

Pa., Washington — Until May 21, by Washington Co Controller, improving 3½ mi. Finleyville-Library Rd., 16 ft. wide, in-

Streets and Roads (Continued)

volving 30,500 sq.yd. rein.-con., also 5 mi. Washington-West Middleton Rd., 16 ft. wide, 47,000 sq.yd. rein.-con. Separate bids on latter for first 2 mi. or 18,740 sq.yd. Chaney Eng. Co., Washington, engrs.

Delaware—Until May 26, by State Highway Dept., Dover, building 1.19 mi. highway through Frederica, Contr. 24, and 2.93 mi. highway from Tybout's to Hare's Corners, Contr. 34, Kent and New Castle Counties. C. M. Upham, ch. engr.; advertised in this issue. Incorrectly noted in our issue of May 6.

Va., Richmond—Until May 18, by Dept. Pub. Wks., paving North Ave. from Poe St. to Brookland Park Blvd., involving 8,000 sq.yd. concrete, asphaltic concrete, bitulithic, Willite or natural rock; advertised in this issue.

W. Va., Fayetteville—Until June 7, by Comrs. Fayette Co. grading 11 mi. Lower Loup Creek Rd. from Robson to Wriston. J. K. McGrath, co. engr.

W. Va., New Cumberland—Until May 31, by Comrs. Hancock Co. building 3 mi. River Rd., 1½ mi. Weirton-Oakland Rd. and 1½ mi. Mt. Hudson Rd. C. E. Grafton, co. engr.

Ga., Suvannah—Until June 28, by Comrs. Chatham Co., paving and draining road to Tybee; advertised in this issue.

Ala., Birmingham—Until June 7, by Bd. Revenue Jefferson Co., paving 4 mi. road from Ensley to Edgewater, Project 6, $160,000; 2½ mi. road from Ensley to junction of Mulga and Docena Rds., Project 7, $100,000, and 7 mi. road from Milner Heights to pumping station, Project 20, $140,000, all 18 ft. wide. Former bids rejected. Noted April 8.

O., Columbus—Until May 20, by Comrs. Franklin Co., grading, building bridges and culverts and paving 4.277 mi. Harbor Rd., 18 ft. wide, rein.-con., Clinton, Mifflin, Sharon and Blendon Twps. About $386,000. C. C. Lattimer, co. engr.

Michigan—Until May 20, by F. F. Rogers, state highway comr. at office of Bd. Rd. Comrs., Muskegon Co., Muskegon, grading, draining and surfacing 3.956 mi. Federal Aid Project 1, Sect. A, 16 ft. wide, involving 37,137 sq.yd. concrete, etc.

Mich., Kalamuzoo—Until May 17, by Comrs. Kalamazoo Co., grading, draining and surfacing 7.776 mi. road in Brady Twp.., involving 41,200 sq.yd. 3 in. compacted gravel top on stone base, 21,000 cu. yd. earth excav., 500 lb. reinforcing steel, etc. About $99,000. G. Pierson, Kalamazoo, engr.

Minn., Hallock—Until May 19, by J. Dayne, aud. Kittson Co., building 3 mi. State Aid Job 2006, 24 ft. wide, involving 3,268 cu.yd. excav. and 1,304 cu.yd. gravel surfacing. About $30,000. J. E. Dishington, Hallock, engr.

Minn., Wadena—Until May 25, by E. Ross, aud. Wadena Co., building 5 mi. Federal Aid Projcet 152, 24 ft. wide, involving 49,693 cu.yd. excav., 2,670 lin.ft. 10 in. tile drain, 875 lin.ft. 18 and 24 in. culvert pipe, 8,123 cu.yd. gravel surfacing and 53 cu.yd. concrete. About $35,000. E. Ward, Wadena, engr.

Neb., Grand Island—Until May 19, by city, paving streets in Dist. 30, involving 12,400 sq.yd. vitr. brick or asphalt on concrete base, 47,000 lin.ft. combined concrete curbing and guttering, 1,850 cu.yd. earth excav. Cost, $62,360. J. R. Morearty, Grand Island, engr.

N. D., Mandan—Until May 27, by city, for 119,000 sq.yd. paving, 6,000 sq.yd. alley paving, 49,000 ft. straight and 5,200 ft. curved curbing, 123 catch basins. Black & Griffin, Mandan, engr.

Missouri—Until May 17, by State Highway Dept., Jackson, building 3.18 mi. Kings Highway, 24 ft. wide, Cape Girardeau Special Rd. Dist., Federal Aid Project 52, involving 6,083 cu.yd. earth excav., 4,046 cu.yd. borrow, 16,019 cu.yd. per 100 ft. overhaul, 6,427 lin.ft. grading, 33,550 sq.yd. 1 course plain cement concrete and 3,550 lb. reinforcement for concrete masonry, etc., cost $80,271; 40 ft. rein.-con. deck girder span bridge, 18 ft. clear roadway, rein.-con. abutments, over Cape La Cruz Creek, 22,250 lb. reinforcing steel, 3.9 cu.yd. Class "A" and 207.7 cu.yd. Class "B" concrete, $6,945; (Whitelaw Bridge) 20 ft. concrete slab span bridge, 18 ft. clear roadway, rein.-con. abutments, and one temporary wooden trestle, 14,570 lb. reinforcing steel, 2.1 cu.yd. Class "A" and 182.5 cu.yd. Class "B" concrete, $5,987. Noted Jan. 15.

Tex., Gonzales—Until May 20, by J. C. Romberg, judge Gonzales Co., improving 10.03 mi. Highway 3, section of Federal Aid Project 68, 16 ft. wide, involving 22,088 cu.yd. gravel. Former bids rejected. Wilder & O'Neal, Mt. Pleasant, engrs. Noted April 29.

Tex., Houston—Until May 17, by H. L. Washburn, aud. Harris Co., scarifying 4 mi. Highway 35, Humble Rd., 16 ft. wide, involving 6,884 cu.yd. gravel and 2,064 ton shell binder. About $42,063. Howe & Wise, 211 1st Natl. Bank Bldg., engrs.

Tex., Stephenville—Until May 21, by E. E. Solomon, judge Erath Co., improving 31.26 mi. Highway 10, Brownwood-Ft. Worth Rd., 16 ft. wide, involving 14 acres clearing and grubbing, 173,305 cu.yd. embankment, 13,991 cu.yd. rock, 51,098 cu.yd. gravel, 2,070 cu.yd. waste and 1,485 cu.yd. loose rock excav., etc. About $118,000. L. D. Parks, De Leon, engr.

Okta., Mangum—Until May 18, by city, paving 40,000 yd. in Street Impvt. Dist. 1. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs. Noted April 15.

Idaho—Until May 22, by State Highway Dept., Boise, grading and paving road from Bannock Co. line to 2 mi. north of Yellowstone Park Highway, 18 ft. wide, Federal Aid Project 25, Bingham Co., cost $60,900; 5.93 mi. Yellowstone Park Highway from Idaho Falls to Bingham Co. line, 18 ft. wide, Federal Aid Project 14, Bonneville Co., also building culverts and one 20 ft. concrete span bridge on same, $184,650; grading and building culverts on 7.51 mi. Yellowstone Park Highway from Bonneville Co. to Madison Co. line, 20 ft. wide, Federal Aid Project 16, Jefferson Co., $64,500; grading and surfacing 22.43 mi. North and South Highway from Genessee to Moscow, 18 ft. wide, Federal Aid Project 18, Latah Co., crushed rock, $306,800; grading and graveling 10.8 mi. Idaho-Montana Highway from Spencer to South Co. line, 18 ft. wide, Federal Aid Project 32, Clark Co., $60,000; 7 mi. Malad Valley Highway, 18 ft. wide, Federal Aid Project 34, Oneida Co., $62,500. D. P. Olson, dir. Bureau Highway. Noted Dec. 18.

Ariz., Florence—Until June 1, by Pinal Co. Highway Comn., grading 5 mi. highway between Ray and Kelvin, involving 35,000 cu.yd. solid rock, 14,861 cu.yd. loose rock and 13,000 common excav., etc. E. G. Dentzer, secy.; advertised in this issue.

Que., Lasalle—Until May 21, by Lafleur, secy.-treas., paving 1 mi. Lafleur Ave. waterbound macadam, 5 mi. Lasalle Rd., bituminous macadam, and 2 mi. St. Patrick Rd., cement concrete. About $100,000. P. A. Beique, 516 Transportation Bldg., Montreal, engr.

Ontario—Until May 22, by W. A. McLean, deputy minister of highways, grading 5 mi. Provincial Highway, 1 mi. east of Oshawa, East Whitby Twp. About $35,000. G. Hogarth, Parliament Bldg., Toronto, engr.

Ont., Ottawa—Until May 17, by J. Bingham, chn., Suburban Rd. Comn., Thistle Bldg., constructing 2 mi. macadam road. About $28,500. A. Hay, Thistle Bldg., engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Massachusetts—State Highway Comn., Boston, let contract building 56,400 ft. state road, 22 ft. wide, Eastham and Wellflett Twps., involving 12,900 ton bituminous concrete, 56,000 gal. bituminous macadam, 5,200 cu.yd. earth excav., to Thomas & Murphy Co., Keene, N. H., $166,047.

Massachusetts—State Highway Comn., received bids May 4, building 5,200 ft. bituminous macadam state road, 22 ft. wide, Cohasset Twp., involving 3,240 ton stone, 21,000 gal. bituminous macadam, 425 cu.yd. earth and 225 cu.yd. rock excav., from W. A. Jones, Barnestable, $26,352; W. F. Loud & Sons, Quincy, $29,655; E. L. Lane Co., Boston, $30,048.

Mass., Boston—City received bids April 28, paving Havelock St., et al, 40 ft. wide, involving 4,800 sq.yd. asphalt on 4 in. concrete base, from Rowe Constr. Co., Milk St., $29,525; J. Landis, Boston, $33,326; Warren Bros., Berkeley St., $36,314.

New York—F. S. Greene, state highway comr., Capitol, Albany, received bids May 5, repairing roads in following counties: (a) Albany Co., Rd. 193, (b) Oneida and Madison Counties, Rds. 406, 1157, 5406, 5521, 5558, 1160, 1216, 1217, 5447, 5586, (c1) Ontario Co., Rd. 635, (c2) Rd. 5252, (d) Chemung Co., Rd., 5289, (e) Steuben Co., Rd. 5255, (f) Tioga Co., Rds. 5168 and 5429, (g) Cattaraugus Co., Rd. 731, (h) Erie Co., Rd. 644, from J. P. Kelly, Cohoes, (a) $71,354; J. J. Crouch, Rochester, (b) $30,721, (e) $63,460; Harris Eng. & Constr. Co., Buffalo, (c1) $88,625; W. J. Semper, Watertown, (c1) $91,076; Dale Eng. Co., Mann Bldg., Utica, (c2) $43,696, (d) $41,942; T. F. Murray, Leroy, (d) $40,183; Holleran Bros., 901 Linden Pl., Elmira, (d) $41,856; I. M. Ludington Sons, Inc., Powers Bldg., Rochester, (e) $64,527, (h) $22,795; Lane Constr. Co., 37 Colony St., Meriden, Conn., (f) $81,410; Bunce & Carl, Olean, (g) $23,881; Fure & Fote, Olean, (g) $24,036; Felton Constr., Buffalo, (h) $23,175. All construction work in this letting withdrawn. Noted April 15.

N. Y., Brooklyn—E. Riegelmann, boro. pres., received bids May 5, building cement curb and laying sidewalks on (a) East 7th St., (b) regulating and paving, Lott Ave., (c) Newport St., (d) West 38th St., (e) 65th St., (f) 76th St., (g) building cement sidewalks on 66th St., (h) furnishing labor and material repairing sewer in Walcott St., from Grimm Constr. Co., 460 Harold Ave., Richmond Hill, (a) $1,340, (g) $3,259; Consolidated Asphalt Paving Co., 52 9th St., (h) $4,420, (c) $4,533, (d) $9,029, (e) $14,604, (f) $12,569; Uvalde Asphalt Paving Co., 1 Bway., New York City, (b) $4,611, (c) $4,724, (d) $9,486, (e) $15,228, (f) $13,112; Sicilian Asphalt Paving Co., 41 Park Row, New York City, (b) $4,979, (c) $5,091; J. Jennings, Bell Harbor, (h) $6,270; P. J. Donlin Contg. Co., 669 Williams Ave., (h) $6,710. Noted April 29.

★N. Y., Ilion—Bd. Trustees let contract paving various streets involving 4,800 lin.ft. rein.-con., to Koeteritz & Blakeslee, Little Falls, $74,588.

N. Y., New York—H. Bruckner, pres. Bronx Boro., received bids May 6, repaving (a) East 166th St., (b) Tinton Ave., (c) Clinton Ave., (d) Creston Ave., (e) Wales Ave., (f) East 183rd St., (g) Boston Rd., (h)East 134th St., (1) Standard block, (2) Durax block, from Uvalde Asphalt Paving Co., 1 Bway., (a) $24,234, (b) $11,396, (c) $76,960, (d) $16,306, (e) $24,672; J. L. Brustarr, Harlem River and 150th St., (a) $24,568, (b) $8,755 (c) $72,843, (d) $16,353, (e) $23,880; Asphalt Constr. Co., 2197 Madison Ave., (a) $29,261, (b) $11,070, (c) $72,617, (d) $15,821, (e) $22,398, (f1) $31,996, (g) $38,600, (h1) $19,137; Davney Asphalt Co., 438 East 91st St., (b) $10,551, (e) $20,686; Union Paving Co., Bway. and 112th St., (a) $33,930, (b) $11,228, (d) $16,066, (e) $23,873; Astoria Constr. Co., (f1) $29,851, (g) $42,513; Leonard Paving Co., 233 Bway., (f1) $32,641, (f2) $29,498, (g) $42,382, (h1) $20,434; (h2) $17,500; Burnside Constr. Co., 270 Burnside Ave., (f1) $37,288, (f2) $31,348, (g) $43,231, (h1) $21,279, (h2) $19,137; C. Helbrock, (f1) $33,437, (h1) $19,905, (h2) $21,955. Noted April 29.

★N. Y., New York—H. Bruckner, pres. Bronx Boro., let contract improving Trinity Ave., to Hastings Paving Co., 25 Broad St., $60,799; East 158th St. and Wales Ave., to Leonard Paving Co., 233 Bway., $21,002 and $83,051 respectively; 168th St., to Uvalde Asphalt Paving Co., 1 Bway., $31,641; Haviland Ave., to Cornett Constr. Co., $45,567; Waston Ave., to Gasperini & Del Blasio, 1964 Honeywell Ave., $39,630; Hering Ave., to Lamura Contg. Co., Seaman Ave. and 218th St., $55,975; Waterloo Pl., to Burnside Contg. Co., 270 Burnside Ave., $7,288; 181st St., to J. L. Brustarr, Harlem River and 150th St., $26,460; also building sewer in Fieldston Rd., to McLoughlan & Buckley, 28 West 144th St., $5,045. Noted May 6.

★N. Y., S. I. West New Brighton—C. D. Van Name, pres. Richmond Boro., St. George, let contract completing approach work at Court House, here, to J. M. Knopp, 544 West 43rd St., New York City, $54,972. Noted April 22.

★N. J., Newark—City let contract grading and excavating Haines Ave., to H Steers, Inc., 17 Battery Pl., New York City, $392,320.

★Pa., Monessen—City let contract improving 15 streets, Pennsylvania clay brick, to Donora Constr. Co., Donora. Noted April 15.

★W. Va., Huntington—City let contract improving 9th Ave. from 20th to 25th Sts., to L. J. Gillespie, Huntington, $42,674.

★N. C., Halifax—Comrs. Halifax Co. let contract grading and graveling 7.3 mi. road also building bridges, on same, involving 20,000 cu.yd. earth excav. and 9,000 cu.yd. gravel, to Poter & Peck, Greenville. About $60,000. Noted April 22.

Streets and Roads (Continued)

★**S. C., Rock Hill**—City let contract paving various streets also building waterworks and sewerage systems, to Carolina Asphalt Paving Co., Charlotte, N. C., $792,537. Noted April 15.

S. C., Union—Comrs. Union Co. received only bid April 29, grading, draining and top-soiling 3,873 mi. Union-Lockhardt Rd., 22-34 ft. wide, from Elliott & Sons, $25,307.

★**Fla., Tampa**—Comrs. Hillsborough Co. let contract widening 32 mi. road from 9th to 16th Sts., to Davis & Webb, 410½ Franklin St. About $600,000.

★**Ala., Birmingham**—Bd. Revenue Jefferson Co., let contract to Dunn Constr. Co., Chamber of Commerce Bldg., paving 8.2 mi. North Bessemer Rd., Project 1-A, involving 80,563 sq.yd. asphalt, 85,302 sq.yd. concrete base, 37,700 cu.yd. earth and 5,000 cu.yd rock excav., cost $402,452; 5 mi. Jasper Highway from Pratt City to Birmingham, via Thomas, Project 4, 41,147 sq. yd. asphalt, on concrete base, 22,500 cu.yd. earth and 1,500 cu.yd. rock excav., $197,015, 3 mi. Leeds Rd. from Woodlawn to Irondale, Project 8, 30,165 sq.yd. asphalt, 30,685 sq.yd. concrete base, 9,300 cu.yd. earth and 1,700 cu.yd. rock excav., $126,356, 2 mi. North Bessemer Rd., 20 ft. wide, Project, 1-B, 32,320 sq.yd. asphalt on concrete base, 5,900 cu.yd. earth and 500 cu.yd. rock excav., $121,698; to H. N. Bowdry, Empire Bldg., 2 mi. South Bessemer Rd., Project 2, 18,096 sq.yd. asphalt on concrete base, 6,250 cu.yd. earth and 500 cu.yd. rock excav., $65,335, 2.5 mi. Mt. Pinson Rd. from Inglennook to Norwood Blvd., Project 3, 23,755 sq.yd. asphalt, 24,380 sq.yd. concrete base, 6,500 cu.yd. earth excav., $91,730, 4 mi. 8th Ave. Rd. from Ensley to Birmingham, Project 5, 42,525 sq.yd. asphalt on concrete base, 9,100 cu.yd. earth and 1,000 cu.yd. rock excav., $164,5[illegible]5; to P. Wallace, Birmingham, grading [illegible] mi road from Warrior to Robbins Cross Rd., Project 9, 28,000 cu.yd. earth and 7,000 cu.yd. rock excav., $49,235, 5 mi. road from Warrior to Coaldale, Project 10, 22,000 cu.yd. earth and 8,000 cu.yd. rock excav., $41,507, 9 mi. road from Mulga to Port of Birmingham, Project 12, 32,500 cu.yd. earth and 500 cu.yd. rock excav., $40,583; to A. F. Bearden, Birmingham, 2½ mi road from Irondale to Pole Cat Gap, Project 21, 16,000 cu.yd. earth and 5,000 cu.yd. rock excav., $27,858, 10 mi. Rocky Ridge Rd from reservoir to State Highway, Project 13, 40,000 cu.yd. earth and 16,000 cu.yd. rock excav., $80,145; to J. A. Dabbs, Bessemer, 10 mi. road from Oak Grove to Mud Creek, Project 11, 35,600 cu.yd. earth and 1,500 cu.yd. rock excav., $72,175; to Kershaw Constr. Co., Birmingham, 5 mi. road from Trussville to Clay, Project 15, 12,000 cu.yd. earth and 2,000 cu.yd. rock excav., $31,199; to J. M. Acton and E. H. Self, Trussville, 5 mi. road from Trussville to Acmar, 19,000 cu.yd. earth and 3,000 cu.yd. rock excav., $27,905. Noted April 8.

O., Canton—Stark Co. let contract building 1.5 mi. Middlebranch Rd., 60 ft. wide, 9 in. monolithic brick on concrete base, concrete curbing, to H. Corl, Canton, $52,770.

O., Cleveland—City received bids April 28, grading, draining, curbing and paving with brick and asphalt (1) East 117th St., (2) Market Ave., (3) East 87th St., (4) Arlington Ave., (5) Helena Ave., (6) Joan Ave., (7) East 124th St., (8) Stewart Ave., (9) Arlington Ave. from East 125th to East 131st St., (10) Superior Ave., from G. B. Herring, Cleveland, (1) $30,720, (5) $12,695; Rieley Bros., The Arcade, (1) $30,865, (2) $11,725, (3) $53,775, (4) $11,957, (6) $6,305, (8) $10,970, (9) $38,450, (10) $168,630; Baldwin Bros., 4500 Euclid Ave., (1) $30,895, (3) $53,873, (4) $12,003, (5) $12,311, (6) $6,151, (7) $2,006, (8) $11,073, (9) $38,427, (10) $168,325; Roehl Bros., West 125th St., (2) $11,419; Burnett & Hathaway, Cleveland, (2) $11,877, (5) $12,028, (7) $1,980, (8) $10,620, (10) $167,715; Bentley Bros., 1836 Euclid Ave., (3) $52,450, (6) $6,133, (7) $2,209; Gould & Maybach, East 150th St., (4) $11,852, (9) $38,397. Noted April 29.

★**O., Columbus**—City let contract grading, draining, paving with asphalt and laying water main in 1,000 ft. High St. from Poplar St. to Buttles Ave., 52 ft. wide, involving 4,200 sq.yd. asphalt, steel circle curbs, to Cleveland Trinidad Paving Co., The Arcade, Cleveland, $33,936. Noted May 6.

★**Ind., Ft. Wayne**—Comrs. Allen Co. let contract to F. B. Fishbaugh, Bluffton, grading, draining and paving with waterbound macadam 2.7 mi Hosier Rd., $43,150, 1.1 mi. Bartell Rd., $39,700, 1.4 mi. Kneubuhler Rd., $23,400; to Heckler & Lindemuth, North Amer. Bldg., 5.3 mi. Townley Rd., $84,989, 1 mi. Battenburg Rd., $16,787; all 12 ft. wide. Noted April 22.

★**Ind., Salem**—Comrs. Washington Co. let contract building roads to A Meyers, Campbellsburg, $24,885, E. Jean, Campbellsburg, $9,678, J. Brown, Salem, $10,861; J. N. Smith, Pekin, $16,420; R. Simpson, Salem, $42,560.

★**Mich., Detroit**—City let contract excavating and placing concrete base, manholes, drains and crushed stone fill for double track roadbed for section of electric railway on Charlevoix Ave. from Conners Ave. to Alter Rd., to J. A. Mercier, 216 Hammond Bldg., $51,446. Noted May 6.

Mich., Detroit—City received bids grading, shaping and paving with sheet asphalt on 6 in. concrete base, Amherst or Berea curbstone, portions of (a) Ranspach St., (b) Elsmere Ave., (c) Cahalan Ave., (d) Mason Pl., (e) Holmer Ave., (f) Hindle St., (g) Hammond Ave., (h) Highfield Ave., (i) Lane Ave., (j) Dailey Ave., from Detroit Asphalt Paving Co., 20 McGraw Bldg., (a) $13,376, (b) $20,126, (c) $39,094, (d) $11,533, (e) $88,367, (f) $21,556, (g) $12,517, (h) $25,945, (i) $11,361, (j) $22,427; Cleveland Trinidad Paving Co., 2940 Woodward Ave., (a) $13,895, (b) $20,839, (c) $40,320, (d) $11,986, (e) $89,814, (f) $21,464, (g) $12,904, (h) $25,955, (i) $11,698, (j) $22,706; W. B. Brady Constr. Co., 1972 Grand River Ave., (a) $14,171, (b) $21,240, (c) $41,431, (d) $12,309, (e) $89,741, (f) $22,766, (g) $12,992, (h) $25,654, (i) $11,786, (j) $22,228.

★**Illinois**—State Highway Dept., Springfield, let contract building Sect. K. Project 2, Iroquois Co., concrete, to Tegge & Co., Papineau, cost $53,111; Sect. 13, Project 1, Lee Co., bituminous macadam, to W. A. Jaicks, River Forest, $107,324; Sect. Z, Project 8, Madison Co., concrete, to G. R. Hyten, Edwardsville, $17,400; also building bridges on Sect. 1, Route 4, Scott Co., to T. Whitlock, Exeter, $7,000. Noted April 22.

Ill., Chicago—Highway Dept., Cook Co., received bids May 3 paving 1.925 mi. Western Ave., 18 ft. wide, involving (1) 20,328 sq.yd. 8 in. concrete or (2) 2 in. asphalt on 7 in. concrete, (3) 13,552 sq.yd. earth shoulders, (4) 7,767 cu.yd. excav., (5) 254.9 cu.yd. concrete in bridges, (6) 10.25 tons steel reinforcement, from J. Macker, Chicago Heights, (1) $2.89 per sq.yd., (3) $0.15 per sq.yd., (4) $1.50 per cu.yd., (5) $30 per cu.yd., (6) $0.05 per lb.; Orr & Hildeman, Chicago Heights, (2) $3.91 per sq.yd., (3) $0.10 per sq.yd., (4) $1.50 per cu.yd., (5) $35 per cu.yd., (6) $0.10 per lb.

Ill., Chicago—Bd. Local Impvts., 207 City Hall, received bids April 23, paving (1) alley between West 46th, West 47th, South Hermitage and South Wood Sts., involving 200 cu.yd. grading, 1,160 sq.yd asphalt on 7 in. concrete, 160 ft. 10 in. tile sewer, etc., (2) alley between West 47th, West 48th, South Paulina and South Hermitage Sts., 350 cu.yd. grading, 1,480 sq.yd. asphalt on 7 in. concrete, 120 ft. 10 in. tile sewer, etc., (3) alley between West Adams St., Jackson Blvd. Crawford and Karlov Ave., 391 cu.yd. grading, 1,038 sq.yd. asphalt on 7 in. concrete, (4) Roslyn Pl. from Lakeview Ave. to North Clark St., 1,300 ft. concrete curb, 800 cu.yd. grading, 1,720 sq.yd. asphalt on 6 in. concrete, etc., (5) West 13th Pl. from South Talman Ave. to South Washtenaw St., 570 ft. concrete curb, 107 cu.yd grading, 600 sq.yd asphalt on 6 in. concrete, (6) South Troy St. from 57th to 58th Sts., 1,220 ft. concrete curb 750 cu.yd. grading, 2,010 sq.yd. 8 in. blast furnace slag or limestone on 2½ in. granite or traprock etc., (7) Foster and Berwyn Aves. from Bway to Clark St., Balmoral Ave. from Bway, to Ashland Ave., Catalpa Ave. from Bway. to Glenwood Ave., Magnolia Ave. from Bway. to Bryn Mawr Ave., Lakewood and Wayne Sts. from Foster to Bryn Mawr Aves. and Glenwood Ave. from Balmoral to Bryn Mawr Aves., involving 34,100 ft concrete curb, 21,800 cu.yd. grading, 54,600 sq.yd. asphalt on 6 in. concrete, 590 ft. 10 in. tile sewer, 113 catch basins, etc., from Central Paving Co., 179 Washington St., (1) $5,783, (2) $7,389, (3) $5,018 (6) $10,308; P. J. O'Brien & Co., 29 South La Salle St., (1) $5,816, (2) $7,396, (3) $4,995; Contg. & Material Co., 3219 South Michigan Ave., (1) $5,839, (2) $7,141 (6) $10,294; J Dillon & Co., 179 West Washington St., (3) $5,005; R. F Conway Co., 133 West Washington St., (4) $10,553, (7) $322,936; White Paving Co., 17 North La Salle St., (4) $10,585, (7) $321,700; Amer. Asphalt Paving Co., 133 W[illegible]ington St., (1) $10,761, (5) 1,128, (7) $329,749; Standard Paving Co., 29 La Salle St., (5) $3,931. Noted April 22.

★**Wisconsin**—State Highway Dept., at div. office, 213 South Barstow St., Eau Claire, let contract grading and paving 3.7 mi. Neillsville-Humbird Rd., 15 ft. wide, Federal Aid Project 145, Clark Co., to Isaacson Bros. & Mulheron, Spring Valley, $19,524; 1.89 mi. Eau Claire-Osseo Rd., Federal Aid Project 111, Eau Claire Co., to A. Larson & Co., Eau Claire, $72,429. Noted April 22 and 29.

★**Wisconsin**—State Highway Dept., at div. office, Grand Rapids, let contract grading and paving 4.5 mi. Kilbourn-Friendship Rd., Federal Aid Project 131, Adams Co., to G. M. Gross, Appleton, $43,303. Noted March 29

★**Wisconsin**—State Highway Dept., at div. office, Spooner, let contract grading and paving 1.02 mi. Glen Flora-Tony Rd., Federal Aid Project 173, Rusk Co., to G Savord, Ladysmith, $82,077. Noted April 1.

Wis., Elkhorn—Walworth Co. State Rd. and Bridge Com. received bids April 27, building (1) Delavan-Elkhorn Rd., involving (a) 4,915 cu.yd. earth excav., (b) 17,328 sq.yd. concrete surfacing, 18 ft. wide, (c) 60 cu.yd. concrete in culverts, (d) 5,900 bbl. cement in place, (2) Geneva-Elkhorn Rd., (a) 9,497 cu.yd. earth excav., (b) 911 cu.yd. borrow excav., (c) 89.92 cu.yd. concrete in culverts, (d) 90 cu.yd. concrete in bridges, (e) 31,360 sq.yd. concrete surfacing, 18 ft. wide, (f) 660 cu.yd. ditching, (g) 10,700 bbl. cement in place, from Blodgett-Clayton Constr. Co., 204 Grand Ave., Milwaukee, (1a) $1.50, (1b) $2.14, (1c) $28, (1d) $2.62, total cost, $61,595, (2a) $1.40, (2b) $1.40, (2c) $28, (2d) $36, (2e) $2.17, (2f) $2.90, (2g) $2.70, $120,480; Whitewater Bridge Co., Whitewater (1a) $1.20, (1b) $2.02, (1c) $28, (1d) $2.63, $58,100, (2a) $1.26, (2b) $1.26, (2c) $29, (2d) $31, (2e) $2.07, (2g) $2.67, $113,087; Dean Constr. Co., Whitewater, (2a) $1.24, (2b), $1.35, (2c) $28, (2d) $28, (2e) $2.03, (2f) $1.25, (2g) $2.66, $112,082. Noted April 29.

Wis., Juneau—Dodge Co. received bids grading, surfacing, excavating and building culverts on 8 mi. Horicon-Beaver Dam Rd., 18 ft. wide, from Froemming Bros., 1288 Humboldt Ave., Milwaukee, $262,806; McGucken Constr. Co., 425 East Water St., Milwaukee, $263,286. Noted Feb. 12.

Wis., Milwaukee—Comr. Pub. Wks. received bids May 3, improving portions of (1) Canal St., involving (a) 1,646 cu.yd grading, (b) 10,662 sq.yd. granite block pavement, etc., (2) South Pierce St., (a) 4,644 cu.yd. grading, (b) 17,548 sq.yd. sheet asphalt, (3) alley between 12th, 13th, Wells and Cedar Sts., (a) 2 cu.yd. grading, (b) 478 sq.yd. cement concrete pavement (4) alley between Washington, Scott, Hanover and Reed Sts., (a) 54 cu.yd. grading, (b) 711 sq.yd. cement concrete pavement, (5) alley between Sheridan Lane, 12th, Vliet and Cherry Sts., (a) 18 cu.yd. grading, (b) 260 sq.yd. cement concrete pavement, (6) 23rd, 24th, Walnut and Vine Sts., (a) 34 cu.yd. grading (b) 533 sq.yd. cement concrete pavement, (7) alley between 20th, 21st, Vliet and Cherry Sts., (a) 305 cu.yd grading, (b) 854 sq.yd. cement concrete pavement, (8) alley between 12th, 13th, Walnut and Fond du Lac Sts., (a) 67 cu.yd. grading, (b) 675 sq.yd. cement concrete, (9) alley between 24th, West 24th, Lloyd and Elm Sts., (a) 80 cu.yd. grading, (b) 746 sq.yd. cement concrete, (10) alley between 20th, 21st, Elm and Fond du Lac Sts., (a) 92 cu.yd. grading, (b) 526 sq.yd cement concrete, (11) alley between 20th and 21st Aves., Lapham and Mitchell Sts., (a) 1,478 cu.yd. grading, (b) 1,599 sq.yd. cement concrete, (12) alley between 25th and 26th Aves., Orchard and Lapham Sts., (a) 876 cu.yd. grading, (b) 995 sq.yd. cement concrete (13) alley between 26th, 27th, Lapham and Mitchell Sts., (a) 395 cu.yd. grading, (b) 1,336 sq.yd. cement concrete, (14) alley between Fratney, North Pierce, Wright and Clarke Sts., (a) 633 cu.yd. grading, (b) 1,305 sq.yd. cement concrete, (15) alley between North Ave., Booth, Holton and Lee Sts., (a) 48 cu.yd. grading, (b) 1,329 sq.yd. cement concrete, (16) alley between 32nd, 33rd, Park Hill and Mt. Vernon Sts., (a) 226 cu.yd. grading, (b) 963 sq.yd. cement concrete, (17) alley between 33rd, 34th, Lisbon and Vine Sts., (a) 248 cu.yd. grading, (b) 309 sq.yd. cement concrete, (18) alley between Lisbon Ave., 25th, 26th and Vine Sts., (a) 12 cu.yd. grading, (b) 529 sq.yd. cement concrete, (19) alley between 41st St., Lisbon and Pabst Aves., (a) 240 cu.yd. grading, (b) 674 sq.yd. cement concrete, (20) alley between 38th, 40th, Roberts and Walnut Sts., (a) 405 cu.yd grading, (b) 785 sq.yd cement con-

Streets and Roads (Continued)

crete, (21) alley between 37th, 38th, Brown and Pabst Aves., (a) 538 cu.yd. grading, (b) 686 sq.yd. cement concrete, (22) alley between 33rd, 34th, Center and Hadley Sts., (a) 197 cu.yd. grading, (b) 1,162 sq.yd. cement concrete, (23) alley between 37th, 38th, Auer and Concordia Sts., (a) 533 cu.yd. grading, (b) 1,959 sq.yd. cement concrete, (24) alley between 27th, 28th, Locust and Chambers Sts., (a) 194 cu.yd. grading, (b) 1,413 sq.yd. cement concrete, (25) alley between 26th, 27th, Auer and Concordia Sts., (a) 377 cu.yd. grading, (b) 1,792 sq.yd. cement concrete, (26) alley between 10th, 11th, Walker and National Aves., (a) 14 cu.yd. grading, (b) 672 sq.yd. cement concrete, (27) alley between Layton Blvd., 21st Ave., Grant and Becher Sts., (a) 4 cu.yd. grading, (b) 1,684 sq.yd. cement concrete, (28) alley between 11th, 12th, Burleigh and Ring Sts., (a) 943 cu.yd. grading, (b) 293 sq.yd. cement concrete, (29) alley between Louis Ave., 14th, Burleigh and Ring Sts., (a) 1,405 cu.yd. grading, (b) 2,459 sq.yd. cement concrete, (30) alley between 8th, 9th, Ring and Concordia Sts., (a) 6 cu.yd. grading, (b) 715 sq.yd. cement concrete, (31) alley between 11th, 12th, Concordia and Davis Sts., (a) 7 cu.yd. grading, (b) 2,164 sq.yd. cement concrete, (32) alley between 8th, 9th, Concordia and Davis Sts., (a) 2 cu.yd. grading, (b) 1,260 sq.yd. cement concrete, from Milwaukee Genl. Constr. Co. 857 8th Ave., (1a) $1.20, (1b) $5.80, (3a) $2, (3b) $2.48, (4a) $1.35, (4b) $2.35, (6a) $1.60, (6b) $2.45, (8a) $2.20, (8b) $2.45, (11a) $2, (11b) $2.35, (12a) $2, (12b) $2.35, (13a) $2, (13b) $2.35, (21a) $2, (21b) $2.50, (22a) $2, (22b) $2.38, (23a) $1.80, (23b) $2.38, (24a) $1.80, (24b) $2.38, (25a) $1.25, (25b) $2.38, (26a) $1.25, (26b) $2.34, (27a) $1.80, (27b) $2.30, (28a) $2, (28b) $2.38, (29a) $2, (29b) $2.38, (31a) $2, (31b) $2.38, (32a) $2, (32b) $2.38; Dean Constr. Co., Camp Bldg., (1a) $1, (1b) $5.89, (3a) $2.35, (3b) $2.62, (4a) $1, (4b) $2.65, (5a) $1.75, (5b) $2.75, (6a) $1.50, (6b) $2.65, (7a) $2.25, (7b) $2.62, (8a) $2.50, (8b) $2.65, (9a) $2.35, (9b) $2.65, (10a) $2.35, (10b) $2.65, (14a) $2, (14b) $2.60, (15a) $1.25, (15b) $2.60, (16a) $2.15, (16b) $2.60, (17a) $2.35, (17b) $2.65, (18a) $2.15, (18b) $2.65, (19a) $2.20, (19b) $2.65, (20a) $2.20, (20b) $2.65, (21a) $2.25, (21b) $2.65, (22a) $2.20, (22b) $2.62, (23a) $1.90, (23b) $2.52, (24a) $2.10, (24b) $2.52, (25a) $1.10, (25b) $2.52, (26a) $2.50, (26b) $2.68, (28a) $2.15, (28b) $2.65, (29a) $2.15, (29b) $2.65, (30a) $2.25, (30b) $2.65, (31a) $2.15, (31b) $2.65, (32a) $2.20, (32b) $2.65; A. H. Prange, Fowler St., (1a) $0.86, (1b) $6; White Constr. Co., 425 East Water St., (2a) $1.50, (2b) $3.54; Badger Constr. Co., Ry. Exch. Bldg., (2a) $1.65, (2b) $362; F. Schomann, 770 28th St., (3a) $2.75, (3b) $2.75, (5a) $2, (5b) $2.70, (6a) $1.75, (6b) $2.60, (7a) $2.70, (7b) $2.60, (8a) $2.75 (8b) $2.75, (9a) $2.75, (9b) $2.70, (10a) $2.70, (10b) $2.70, (17a) $2.70, (17b) $2.75, (18a) $2.75, (18b) $2.70, (19a) $2.75, (19b) $2.75, (20a) $2.75, (20b) $2.75, (21a) $2.75, (21b) $2.75; F. Banaszak, 1335 4th Ave., (4a) $1.50, (4b) $2.19, (13a) $1.89, (13b) $2.24, (26a) $1.75, (26b) $2.21; M. Switalski, 765 5th Ave., (4a) $2, (4b) $2.20, (12a) $2, (12b) $2.30, (13a) $1.90, (13b) $2.22, (23a) $1.95, (23b) $2.20, (24a) $1.90, (24b) $2.20, (25a) $1.75, (25b) $2.25, (26a) $2, (26b) $2.30, (27a) $2, (27b) $2.20; Rybach & Sadowski, 1092 2nd Ave., (4a) $1.25, (4b) $2.25, (11a) $1.90, (11b) $2.25, (12a) $1.70, (12b) $2.25, (13a) $1.69, (13b) $2.25, (26a) $1.75, (26b) $2.25, (27a) $1.70, (27b) $2.25; Blodgett-Clayton Constr. Co., 204 Grand Ave., (6a) $1.80, (6b) $2.31, (7a) $1.80, (7b) $2.31, (9a) $1.95, (9b) $2.31, (10a) $1.95, (10b) $2.31, (14a) $1.85, (14b) $2.34, (15a) $1.95, (15b) $2.34, (18a) $2, (18b) $2.30, (19a) $1.80, (19b) $2.33, (20a) $1.85, (20b) $2.32, (21a) $1.85, (21b) $2.32, (22a) $1.65, '(22b) $2.37, (23a) $1.55, (23b) $2.36, (24a) $1.70, (24b) $2.36, (25a) $0.95, (25b) $2.36, (28a) $1.75, (28b) $2.40, (29a) $1.75, (29b) $2.39, (30a) $1.90, (30b) $2.39, (31a) $1.90, (31b) $2.39, (32a) $1.85, (32b) $2.39, Retzlaff, Froemming & Bluhm, 948 4th St., (6a) $2, (6b) $2.43, (8a) $2, (8b) $2.42, (14a) $1.75, (14b) $2.39, (15a) $1.80, (15b) $2.39, (22a) $1.90, (22b) $2.46, (23a) $1.75, (23b) $2.39, (24a) $1.80, (24b) $2.38, (25a) $0.80, (25b) $2.39, (28a) $1.95, (28b) $2.41, (29a) $1.70, (29b) $2.39, (30a) $1.80, (30b) $2.42, (31a) $1.80, (31b) $2.41, (32a) $1.95, (32b) $2.40; Kehrein Constr. Co., Milwaukee, (9a) $2.40, (9b) $2.60, (10a) $2.59, (10b) $2.40, (15a) $1.98, (15b) $2.47, (18a) $2.15, (18b) $2.59, (24a) $2.10, (24b) $2.51, (28a) $1.85, (28b) $2.46, (31a) $2, (31b) $2.47, (32a) $1.50, (32b) $2.47. Noted April 29.

Minn., Brainerd—C. W. Mahlum aud. Crow Wing Co. let contract building 2 mi. State Rd. Job 2001, Rd. 2, 18 ft. wide, to E. Johnson & Co., Superior, Wis., $80,563. Noted March 25.

★**Minn., Montevideo**—Chippewa Co. let contract grading and graveling 15 mi. road from here to Swift Co. line, 24 ft. wide, Federal Aid Project 128, to Studer & Manion, Excelsior. About $90,000. Noted Jan. 29.

★**Minn., Ortonville**—A. V. Randall, aud. Big Stone Co., let contract to Larkin Constr. Co., Ortonville, building 9.1 mi. Federal Aid Project 130, involving 85,048 cu.yd. excav., 5,050 lin.ft. guard rail, 1,507 ft. sectional concrete portable culvert material, 10,926 cu.yds. gravel surfacing, cost $64,398, also 14.9 mi. State Aid Job 2002, 60,859 cu.yd. excav., 1,839 ft. 12-24 in. portable culvert material, and 1 W-106 box culvert, 24 ft. long, on State Aid Job 2003, State Rd. 2, cost $47,000; T. A. Barr, Correll, 2.68 mi. State Aid Job 2001, State Rd. 1, 18,834 cu.yd. earth and 374 cu.yd. solid rock excav., 70,035 cu.yd. overhaul, 3,222 cu.yd. gravel surfacing, 572 ft. portable culvert material, $16,151; C. H. Windsor, Montevideo, 5 mi. State Aid Job 2004, State Rd. 1, 6,000 cu.yd. gravel surfacing, $16,242; all 24 ft. wide. Noted April 15 and 1.

★**Neb., Fremont**—City let contract improving streets in Dists. 47, 48 and 49, involving gravel concrete at $3.12 and $3.17 per sq.yd., 3 in. vertical fiber brick on 5 in. concrete base, $4.34, straight curb, $0.75 per lin.ft. and fir headers, $0.38, to Roberts Constr. Co., 510-11 1st Natl. Bank Bldg., Lincoln. Noted April 15.

South Dakota — State Highway Comn., Pierre, received only bid April 13, graveling 15.37 mi. Aberdeen-Ipswich Highway, 20 ft. wide, Federal Aid Project 32, Edmunds Co., from Stevens Bros., St. Paul, Minn., $96,354. Noted March 25.

★**South Dakota**—State Highway Comn., Pierre, let contract grading and draining 14.11 mi. De Smet-Brookings Highway, 36 ft. wide, Federal Aid Project 26, Kingsbury Co., to W. R. Shipman Constr. Co., Sioux City, Ia., $91,302. Noted March 25.

★**Wyoming**—State Highway Dept., Cheyenne, let contract building Lincoln Highway from Cheyenne to Buford and 22 mi. Cheyenne-Torrington Rd., Federal Aid Project 82, Goshen and Laramie Counties and 16.189 mi. Eden Valley Rd. from Zembras Wells to Eden, Federal Aid Project 62, Sweetwater Co., to Utah Constr. Co., McIntyre Bldg., Salt Lake City, cost $85,000 and $79,000 respectively; 10 mi. Yellowstone Highway, from Casper west, Federal Aid Project 85, Natrone Co. and 4 mi. Yellowstone Highway, north of Kirby, Federal Aid Project 68, and 3.131 mi. Yellowstone Highway from Neiber south, Federal Aid Project 71, Washakie Co., to Johnson & Crane, Casper; 7.169 mi. Yellowstone Highway, west of Douglas, Federal Aid Project 36, Converse Co. and 10.089 mi. Custer Battlefield Highway between Arvada and Gillette, Campbell Co., to Gilbert Bros., Casper, $13,000 and $30,000 respectively; 3.472 mi. Cowley-Lovell Rd., Federal Aid Project 65, Big Horn Co., to Taggart Bros., Cowley, $22,000; 18 mi. Sheridan-Casper Rd. between Buffalo and Kaycee, including drainage structures and moving 40 ft. steel bridge north of Kaycee, Federal Aid Projects 67 and 69, to Atlas Constr. Co., La Veta, Col., $74,000; 6.395 mi. Lincoln Highway from Lyman to Ft. Bridger, Federal Aid Project 75 and 17, Uinta Co., to R. Nicholson, Mountain View, $8,000; 4.964 mi. Garland-Deaver Rd., Federal Aid Project 76, Park Co., to H. Downer, Deaver, $16,000; 6.951 mi. Cody-Meeteetse Rd., Federal Aid Project 84, Park Co., to J. E. Hilton, Manderson, $63,000; one 90 ft. rein.-con. bridge over Belle Fourche River, on Custer-Battlefield Highway, Crook Co., to A. C Evans, Sheridan, $21,000; 10.089 mi. Custer-Battlefield Highway from Moorcroft to Carlisle, Federal Aid Project 41, to R. D George, Rozet, $28,000. Noted April 15.

★**Montana**—State Highway Comn., Helena, let contract grading and graveling 10.8 mi. Chinook-Malta Rd., Federal Aid Project 101, Blaine Co., to Chinook Eng. & Constr. Co., $44,980. Noted April 8.

Tex., Beeville—Bee Co. received bids April 23, grading, surfacing and draining 21.617 mi. Highway 9, from 11 mi. north of here to 11 mi. south of here, involving (a) 44 acres clearing and grubbing, 20.4 mi. machine grading, 12,664 cu.yd. earth excav., 203,195 sq.yd. bituminous macadam, 30,761 lb. reinforcing steel, 1,068 cu.yd. Class "A" and 461 cu.yd. Class "B" concrete, (b) building 100 ft. steel span bridge on same, involving 78,378 lb. strucural and 3,802 lb. reinforcing seel, 35.6 cu.yd. Class "A" and 271 cu.yd. Class "B" concrete from Wright & Saunders, Alamo Bank Bldg., San Antonio, $405,371; Chapin & Coglazier Constr. Co., Moore Bldg., San Antonio, $412,235; Kansas City Bridge Co., 510 Orear-Leslie Bldg., Kansas City, Mo., $23,096. Noted April 8.

★**Tex., Cooper**—Delta Co. let contract grading, surfacing and building rein.-con. culverts on 11.3 mi. Highway 19, 14 ft. wide, to Smith Bros. and Healey Constr. Co., Crockett, $195,800, including 10 per cent for engineering and contingencies. Work involves 66,933 cu.yd. embankment borrowed, 8,763 cu.yd. gravel, 6,673 cu.yd. crushed rock, 312 cu.yd. Class "A" and 33 cu.yd. Class "B" and "C" concrete, 1,310 cu.yd. concrete pavement, etc. Former contract rescinded. Noted April 1.

★**Tex., Emory**—H. D. Barrett, judge Rains Co. let contract grading, gravel surfacing and draining 22.3 mi. Highway 22, Culberson Highway, from Wood to Hunt Co. lines, 12 ft. wide, to Allhands & Davis, Dallas, $269,228, including 10 per cent for engineering and contingencies. County to furnish 34,963 cu.yd. gravel, (cost $118,877, same included in above amount.) Noted May 6.

Tex., Hillsboro—J. T. Burns, judge Hill Co., received bids April 30, grading, surfacing and draining (a) 7.15 mi. Highway 6, Sect. B., Federal Aid Project 113, 16 ft. wide, involving 42,089 cu.yd. embankment borrowed, 16,728 cu.yd. earth and 1,000 cu.yd. earth and 1,000 cu.yd. rock excav., 30,937 lb. reinforcing steel, 370 cu.yd. Class "A," 76 cu.yd. Class "B" and 138 cu.yd Class "C" concrete, etc., (b) 6.81 mi. Highway 2, Sect. A, Federal Aid Project 114, 877 sq.yd. 1 course rein.-con. pavement, 77,868 lb. reinforcing steel, (13,152 cu.yd. gravel to be furnished by county), 636.5 cu.yd. Class "A" and 251.5 cu.yd. Class "B" concrete, etc., from Bibb & Hughes, Waco (a) $69,977, (b) $72,294; McElwarth & Rogers and Womack Constr. Co., c/o McElwarth & Rogers, Corsicana, (a) $71,582, (b) $76,410; W. P. McCoy, Arlington, (a) $72,845, (b) $82,445. Noted April 22.

Tex., Kingsville—B. F. Wilson, judge Kleberg Co., received bids April 22, improving 19.6 mi. Highway 12, from Neuces Co. south, 16 ft. wide, from W. T. Montgomery, Alamo Bank Bldg., San Antonio, $363,602; Womack Constr. Co., Sherman, $369,178; M. M. Craven, Bellaire, $390,881. Work involves 41.5 acres clearing and grubbing, 16,279 cu.yd. earth borrow, 215,134 cu.yd. earth and 150 cu.yd. rock excav., 268,995 lb. reinforcing steel, 37,943 cu.yd. gravel, 1,915 cu.yd. Class "A," 440 cu.yd. Class "B" and 5 cu.yd. Class "C" concrete, etc. Noted April 15.

★**Tex., Seymour**—Clerk Maylor Co. let contract grading, surfacing and building concrete and steel bridges and culverts on 12.3 mi. Highway 30, Sect. B, State Aid Project 78, 16 ft. wide, to A. Ferrier and W. F. Stephens, Seymour, $66,274, including 10% for engineering and contingencies. Noted May 6.

★**Tex., Waco**—McLennan Co. will surface 12.88 mi. Highway 6, Waco-Dallas Rd., 16 ft. wide, involving 53,850 gal. asphalt and 107,700 sq.ft. cover material. About $35,541. Work wil be done by day labor. Noted April 8.

Tex., Weatherford—E. A. Swofford, judge Parker Co., received bids May 5, surfacing and applying 2 course asphalt treatment on 16.59 mi. Highway 1 from here to west county line, 18 ft. wide, involving 175,200 sq.yd. gravel (material to be furnished by county), 124,600 gal. asphalt topping, from J. E. Ward, 427 Western Indemnity Bldg., Dallas, $35,306; H. K. McCollum, Texas State Bank Bldg., Ft. Worth, $38,121; grading and building rein.-con. drainage structures on above road, 18 ft. wide, 30 acres clearing and grubbing, 136,175 cu.yd. earth borrow, 53,275 cu.yd. unclassified earth, 6,694 cu.yd. solid rock and 689 cu.yd. loose rock excav., 158,608 lb. reinforcing and 98,900 lb. structural steel, 1,470 cu.yd. Class "A," 1,006 cu.yd. Class "B" and 76 cu.yd. Class "C" concrete, etc., from Womack Constr. Co., Sherman, $262,048; Tibbett & Tibbett, Mineral Wells, $276,490. Noted April 29

★**New Mexico** — State Highway Dept., Santa Fe, let contract building New Mexico Federal Aid Project 14-B, Santa Fe Co., to Mishou, Millard, Clark and Teyssier, Santa Fe, $45,000.

★**Ariz., Tucson** — Pima Co. let contract graveling 11 mi. Tucso-Ajo Rd., extending from Gunsight East, to R. McKay, Tucson. About $66,000.

★**Washington** — State Highway Comn., Olympia let contract to Burke, Sengfelder & Burg, Wenatchee, grading and paving 1.67 mi. Sunset Highway from Cashmere east,

Streets and Roads (Continued)

Chelan Co., involving 1,790 cu.yd. common and 2,830 cu.yd. subgrade excav., at $0.95 and $1.15 per cu.yd. respectively, 18,090 sq.yd. concrete pavement, $2.82 per sq.yd., total cost $60,626; Porter & Conley, 510 Ry. Exch. Bldg., Portland, Ore., grading, draining and surfacing 7.42 mi. Inland Empire Highway from Pomeroy to Alpowa, Garfield Co., 67,260 cu.yd. common, 35,150 cu.yd. loose and 25,230 cu.yd. solid rock excav at $0.60 $0,90 and $1.75 per cu.yd respectively, 12,460 cu.yd. crushed rock surfacing, $2.75, per cu.yd., 249.39 cu.yd. concrete, $30 per cu.yd., 20,310 lb. reinforcing bars, $0.10 per lb., total cost, $168,507; Genl. Constr. Co., 444 Peyton Bldg., Spokane, grading and surfacing 3.34 mi. North Central Highway from Wilson Creek to Marlin, Grant Co., 13,780 cu.yd. common, 10,360 cu.yd. loose and 6,030 cu.yd. cu.yd. solid rock, at $0.60, $0.80 and $2.50 per cu.yd respectively, 4,010 cu.yd 1 course gravel surfacing, $2.00 per cu.yd., 10,650 lb. reinforcing bars, $0.12 per lb., 134.5 cu.yd. 1st class concrete, $25. per cu.yd., 9.2 cu.yd. 2nd concrete, $25. per cu.yd., etc., total cost, $46,058, also 4.05 mi. State Rd. 22 from Harvey to Rickey, Stevens Co., 18,660 cu.yd. common and 390 cu.yd. solid rock excav., $0.60 and $3.50 per cu.yd. respectively, 6,450 cu.yd. gravel surfacing, $2.50 per cu.yd., etc., total cost, $35,157. Noted April 15.

Washington — State Highway Comn., Olympia, received only bid April 26, grading and paving 1 mi. Pacific Highway from Silvana north, concrete, from R. H. Travers, Arcade Bldg., Seattle, $43,815. Noted April 15.

★**Wash., Grandview**—City let contract grading and paving 25 blocks Main St., et al, bitulithic on block base, to G. M. Savage, Yakima, $99,500.

Wash., Seattle—Bd. Pub. Wks. received bids April 30, grading, filling and paving West Spokane St., et al. involving 26,500 cu.yd earthwork, 2,130 lin.ft. armored concrete curbing and 7,900 sq.yd. (1) 7 in. or (2) 8 in. concrete, from Sparger Constr. Co., Colman Bldg., (1) $76,109, (2) $79,664; Olympic Constr. Co., Seattle, (1) $79,860, (2) $81,835; D. H. Traphagen, Walker Bldg., (1) $81,344, (2) $89,714

★**Wash., Walla Walla**—Walla Walla Co. let contract grading and paving 8 mi. Donohue Rd. 5, 18 ft. wide, concrete, to Crown Paving & Constr. Co., Walla Walla, $272,071.

★**Wash., Wenatchee** — City let contract grading, laying water mains and paving 25 blocks North End Street Dist., to Burke, Sengfelder & Burg, Wenatchee, $157,305.

★**Wash., Wenatchee**—Chelan Co. let contract grading, graveling and paving 3.17 mi. Chelan-Monson Highway, involving 10,340 cu.yd. earth and 550 cu.yd. rock excav., 16,727 sq.yd. concrete 9 ft. wide, 2,787 sq.yd. graveling, 9 ft. wide, 1,000 ft. 12-24 in. pipe, to White & Ford, Wenatchee and Seattle, $66,143.

Oregon — State Highway Comn., Portland, received bids clearing and grading 5.3 mi. Toledo-Newport Sect., Lincoln Co., from T. E. Young, $51,598, Hauser Constr. Co., $65,586. Noted April 29.

Ore., Portland—City received bids April 28, improving (a) East 76th St. from Base Line Rd. to East Glisan St., (b) Patton Rd. from Georgian Pl. to Greenway, (c) Atlantic St. from Portland Blvd to Lombard St., (d) Vista Ave. from Patton Rd. to Spring St., (e) Concord St. from Prescott to Humboldt Sts., (f) Cardinal Dr. from 16th St. to alley in Block 13, Cardinell Park, (g) Upper Dr. from Lot 3, Block B, Smiths Addition to Fern Ave., (h) portions of Albina Ave. and River St., (i) portions of East 12th, Dent and Gideon Sts., (j) East 60th St. from Sandy Blvd to Fremont St., (k) Gerald Ave., (l) portions of 13th and College Sts., (m) building sewer in 39th Ave., S. E., from point 30 ft west of 54th St., S. E., to 52nd St., S. E., (n) East 58th St. from East Burnside to East 58th Sts., 120 ft. south of south line of East Davis St., (o) Ainsworth Ave. and East 31st St. Sewerage System, (p) Holladay Ave. from point 275 ft east of East 84th St. to East 82nd St., (1) asphalt concrete No. 1, 2 in. top on 4 in. crushed rock base in roadway, (2) concrete No. 3 in roadway, (3) concrete between ties, (4) 8 in. macadam in roadway, (5) concrete No. 1 in track, (6) concrete No. 1 in roadway, (7) concrete No. 1, 8 in. thick in track, (8) concrete No. 1, 8 in. thick in roadway, (9) asphaltic concrete No. 1, redress, 2 in thick in roadway, (10) concrete No. 1, between ties, (11) concrete No. 1, under ties, (12) ballast, 2 in. thick, (13) cement pipe, (14) concrete pipe, (15) concrete or vitr pipe, (16) asphaltic concrete No. 2, redress in roadway, from Warren Constr. Co., Journal Bldg., (a1) $2.34 per sq.yd., total, $26,009 (i5) $2.35 per sq.yd., (i9) $1.68 per sq.yd. (i10) $1.80 per sq.yd. (i11) $2.35 per sq.yd. (i12) $2.30 per sq.yd., $41,528, (j1) $2.34 per sq.yd., $15,065; United Contg. Co., Northwest Bank Bldg., (b2) $2.50 per sq.yd., (b3) $2.50 per sq.yd., $20,289, (d16) $1.75 per sq.yd., (d3) $2.65 per sq.yd., $21,418, (f2) $2.50 per sq.yd., $6,406, (g2) $2.50 per sq.yd. $2,442, (k2) $2.50 per sq.yd., $4,444, (l2) $2.50 per sq.yd., $3,729; G. K. Howitt, 41 East 78th St., (c) $16,794, (e) $8,083; J. Grieder & Co., 675 East Stark St., (e) $7,990; N. Costanzo, 651 Bway., (e) $8,728, (f4) $5.50 per cu.yd., $5,058; P. Ell, 5704 49th Ave., S. E., (h5) $3 per sq.yd., (h6) $3 per sq.yd., $15,785; V. R. Dennis Constr. Co., Lewis Bldg., (h7) $3.31 per sq.yd., (h8) $3.31 per sq.yd., $17,393; J. Bekel, General Delivery, (m13) $1,090, (n13) $916; Mehemarie & Co., Portland, (m13) $1,264, (n13) $1,023; Braley & Cusick, (m14) $1,276, (n14) $1,326; J. Albert, 794 East 11th St., (m13) $1,358, (n13) $1,051; Elliott & Scoggin, 207 McKay Bldg., (o13) $11,883; Parker-Schram Co., (o15) $12,470, (p15) $7,083.

★**California**—State Highway Dept., 515 Forum Bldg., Sacramento, let contract paving with Portland cement 10.7 mi. highway between Woodland and Zamora, Yolo Co., to G. S. Benson & Son, 521 Stimson Bldg., Los Angeles, $140,889. Noted April 22.

California — State Highway Dept., 515 Forum Bldg., Sacramento, received bids May 3, grading 10.7 mi. highway between Ione and Jackson, Amador Co., from J. E. Johnston, Tracy, $86,307; W. S. Mead, Hobart Bldg., San Francisco, $100,129; M. Blumenkranz, Farmers & Merchants Bank Bldg., Stockton, $109,885; paving with portland cement concrete 13.6 mi. highway between Red Bluff and northerly boundry of Tehama Co., from G. F. Atkinson, 705 Spaulding Bldg., Portland, Ore., $216,125. Noted April 15.

★**Cal., Los Angeles** — City let contract improving 4 blocks of York Blvd., to G. R. Curtis, 2440 sq.ft. asphalt paving at $0.37½ per sq.ft., 38,004 sq.ft. grading, $0.15, 6,266 sq.ft. cement walks, $0.25, 996 lin.ft. cement curbs, $0.75, 1,576 sq.ft. concrete gutters, $0.50, storm drain, $3,000.

★**Cal., Napa**—Comrs. Napa Co. let contract grading and concrete paving 11.6 mi. road from Calistoga to Rutherford, to Ransome-Randall Co., 28th and Poplar Sts., Oakland. About $171,000.

★**Cal., San Diego**—Comrs. San Diego Co. let contract grading 6 mi. Mission Rd. 1, Sect. A, over Poway Hill, including rein.-con. and corrugated iron culverts, to C. H. Hudson, 408 Marsh-Strong Bldg., Los Angeles, $59,319. Noted May 6.

★**Cal., Woodland**—Bd. Supervs. Yolo Co. let contract building 10.77 mi. road from Coils Corner to Knights Landing, 1½ in. Topeka top on 3½ in. asphaltic concrete base, to Clark & Henery Constr. Co., Ochsner Bldg., Sacramento, $226,441.

Ont., Hamilton—City received bids grading 34,000 cu.yd. Scott Park, from A. Cope & Sons, 29 Albert S., $1.00 per cu.yd.; Sheridan & Morrison, $1.56 per cu.yd.; W. C. Brennan & Co., $2.00 per cu.yd.

★**Ont., Oshawa**—Town let contract for 39,000 sq.yd. concrete pavement and 27,000 lin.ft. concrete curbing and guttering, to W. C. Brennan Constr. Co., Hamilton. About $130,000.

★**Ont., Windsor**—City let contract building 240,000 sq.ft. granolithic concrete sidewalks, to Chick Contg. Co., 351 McDougall Ave. About $70,000

Railways

PROPOSED WORK

Oklahoma—St. Louis & San Francisco R.R., Ry. Exch. Bldg., St. Louis, Mo., plans to double track 91 mi. line from Sapulpa to Afton. About $900,000. A. Zonah, ch engr.

Excavation and Dredging

PROPOSED WORK

Idaho, New Sweden — Irrigation — New Sweden Irrigation Dist plans election May 25 to vote on $250,000 bonds to build system. C. E. Anderson, secy.

Utah, Farmington—Irrigation—Davis Co. Irrigation Dist. plans to build system to irrigate 49,000 acres of land. Work includes 105 ft. dam, storing 62,000 acres ft. water, also hydroelectric plant to develop 10,000 h.p. About $2,331,000. A. F. Parker, 585 8th St., Ogden, engr.

Utah, Salt Lake City—Drainage—Granger D.D., Salt Lake Co., plans to build system to drain 7,000 acres. About $175,000. J. Holmberg, secy. R. A. Hart, 1257 Stratford Ave., engr.

BIDS DESIRED

Massachusetts—Dredging—Until May 17, by Dept. Pub. Wks., Boston, dredging basins along coast in Scituate, Falmouth, Barnestable, Yarmouth and Harwich Twps., involving 175,000 cu.yd. About $200,000. W. F. Williams, state highway engr.

S. C., Manning—Ditches—Until May 21, by Clarendon Co. D.D. 5, Clarendon and Williamsburg Counties, building 11 mi. ditches, involving 163,000 cu.yd. earth excav. About $36,000. Address D. W. McKenzie, Manning.

Ia., Mason City—Drainage—Until May 17, by P. Weigand, aud. Cerro Gordo Co., building D.D. 79, involving 12,650 ft. 6-26 in. drain tile in Sect. 1 and 20,550 ft. 6-12 in. tile, 1 headwall with 5 cu.yd. concrete and 5 tile inlets, in Sect. 2.

Minn., Alexander—Ditch—Until May 16, by V. Thomas, aud. Douglas Co., building Ditch 22, involving 35,500 ft. 10-24 in. tile, etc. About $47,000. A Webster, Alexandria, engr.

Mo., Sheridan—Drainage—Until May 20, by W. C. Okey, secy. Bd. Superv. Platte Valley D.D., clearing and excavating main ditch and 6 laterals; advertised in this issue.

Idaho, Boise—Drainage—Until June 3, by Ada Co. D. D. 2, for 24 mi. open drains involving 1,750,000 cu.yd. excav. also 22 mi. tile drains, bridges, culverts and flumes, in Ada and Canyon Counties. About $425,000. G. McGee, Boise, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Ill., Hull—Excavation**—McCraney Subdistrict of Sny Island Levee D.D., Pittsfield, let contract for 319,806 cu.yd. excav. and levee embankment, near here, to A. Y. Wills & Sons, 418 Title Guaranty Bldg., St. Louis, $0.31 per cu.yd. Noted April 1.

★**Idaho, Picabo**—Drain—Blaine Co. D. D. 1 let contract building 6 mi. open drain, involving 158,000 cu.yd. dredging, etc., to Morrison-Knudsen Co., Railroad and Reclamation Aves., Boise. About $49,900. Noted April 22.

★**Cal., Oxnard**—Dredging—Oxnard D. D. let contract excavating main canal 4½ mi. long, 10 ft. deep, 8 ft. wide at bottom, with 1½ to 1 slope, to Ross Constr. Co., P. O. Box 161, Glendale, $127,197. Noted April 15.

Industrial Works

PROPOSED WORK

Me., Dixfield—Elastic Webbing Co., Pawtucket, R. I., plans to build 4 story, 100 x 150 ft., brick factory, along bank of Webb River, here. About $95,000. Private plans.

Mass., Everett (Boston P. O.)—Metropolitan Lithographing & Publishing Co., Dane St., soon lets contract building 1 story, 50 x 162 ft., brick and mill construction plant, concrete flooring and foundation, on Bow St. About $50,000. Private plans.

Mass., Springfield—Chaplin & Chaplin, 374 Main St., having plans prepared by A. W. Cobb, archt., 374 Main St., for brick and steel garage and sales station, on State St. About $50,000

Conn., Bridgeport — Bridgeport Elastic Fabric Co., Inc., 209 Center St., having plans prepared by Fletcher Trompson, Inc., engrs. and archts., 1089 Broad St., for 3 story, brick and steel addition to plant, concrete or stone foundation About $100,000.

Conn., Bridgeport—O Krokstedt, archt., 925 Main St., soon lets contract remodeling and building 2 story, 130 x 147 ft., brick, concrete and steel addition, to garage, rein-con flooring, concrete foundation, on State St About $150,000. Owner's name withheld.

Industrial Works (Continued)

Conn., Bridgeport—G. B. Westfield Co., 190 Whalley Ave., New Haven, soon lets contract building 1 story, 90 x 210 ft., brick and concrete service station and salesroom, concrete flooring and foundation, on Fairfield and Holland Aves., here. About $75,000. C. S. Palmer, 114 Whitney Ave., New Haven, archt.

Conn., Hartford—G. A. Zunner, archt. and engr., 756 Main St., soon receives bids building 3 story, 100 x 100 ft., brick and concrete garage, concrete flooring and foundation, for Dragat & Toubman, 340 Windsor Ave. About $100,000.

N. Y., Bainbridge—Casein Mfg. Co., 15 Park Row, New York City, plans to build plant, bere, to replace one recently destroyed by fire. Loss $250,000.

N. Y., Beaver Falls—J. P. Lewis Co. plans to build 2 mills to replace those recently destroyed by fire. Loss $100,000.

N. Y., Brooklyn—Brooklyn Edison Co., 360 Pearl St., having sketches made by W. Whitehill, archt. and engr., 55 Duane St., New York City, for 1 story, brick and steel, sub station, concrete foundation, on Grand St., here. About $100,000.

N. Y., Buffalo—Hecker-Jones-Jewell Milling Co., 503 Seneca St., having plans prepared by A. E. Baxter, engr., Ellicott Sq. Bldg., for two 9 story 132 x 1150 ft. flour mills and two 3,000,000 bushel grain elevators, rein.-con. and steel.

N. Y., New York—J. A. Hearns Sons, Inc., 20 West 14th St., having plans prepared by Densmore & Le Clear, archts. and engrs., 88 Broad St., Boston, for 2 story, 50 x 135 ft., rein.-con. and steel boiler plant, rein.-con. flooring, concrete foundation, at 26 West 13th St. About $135,000.

N. Y., Rochester—M. B. Schantz, Inc., plans to build 4 story, 60 x 105 ft., brick addition to factory on Monroe Ave. and Rutgers St. About $75,000.

N. J., Camden—Victor Talking Machine Co., Front and Cooper Sts., having sketches prepared by Ballinger & Perrot, archts. and engrs., 329 South Broad St., Phila., for 4 story, brick warehouse, on State, York, Pine and Front Sts. About $1,000,000.

N. J., Newark—Pub. Serv. Corp. Terminal Bldg., plans to build concrete and brick power plant. Cost between $12,000,000 and $15,000,000. Private plans.

Pa., Phila.—Price & McLanahan, archts., Bellevue Court Bldg., soon let contract building 1 story, 60 x 200 ft. pipe bending shop, brick, Master and Germantown Sts., here, for Crane Co., 836 South Michigan Ave., Chicago.

Pa., Phila.—Standard Crown Co., Hope and Palmer Sts., having plans prepared by Mills & Van Kirk, archts. and engrs., Harrison Bldg., for 2 story, 67 x 212 ft., rein.-con. and brick factory, on Clearfield and Masher Sts. Cost to exceed $100,000.

Pa., Washiggton—S. M. Byers, 120 South Main St., plans to build 3 story, 100 x 120 ft. garage and service station, rein.-con. and brick, rein.-con. flooring, brick and concrete foundation, on East Main St. About $110,000. J. R. Lewis, c/o owner, archt.

Pa., Washington—Hazel—Atlas Glass Co. plans to build 1 and 2 story, 100 x 368 ft., concrete, brick and steel factory, concrete foundation. About $500,000.

Md., Baltimore—Knothe Bros., 124 5th Ave., New York City, receive bids about May 20, constructing additional story, 60 x 90 ft., also 2 story, 27 x 35 ft. brick addition to factory, rein.-con. flooring, concrete foundation, here. About $100,000. O. H. Wight, Munsey Bldg., archts. and engrs.

Md., Hagerstown—W. H. Reisner Mfg. Co., 66 West Washington St., having plans prepared by F. J. Mack, archt., Negley Bldg., for additions to mechanics specialties plant, including 35 x 45 ft. and 38 x 104 ft. concrete and brick buildings, 3 stories each, concrete foundations. About $100,000.

D. C., Washington—Dupont Fibre Silk Co., Dupont Bldg., Wilmington, Del., having plans prepared by Dupont Eng. Corp., Dupont Bldg., Wilmington, for 3 story, brick factory, covering 350,000 sq.ft. floor space, here. About $750,000.

W. Va., Morgantown—Seaman Mill & Lumber Co. plans to build 1 story, 125 x 312 ft. mill, brick. About $50,000. Engineer and architect not selected.

S. C., Cayce—Seminole Fertilizer & Oil Co., Duval Bldg., Jacksonville, Fla., had plans prepared for 3 story, 75 x 200 ft. factory. About $300,000.

Tenn., Memphis—B. F. Averys & Sons, 169 South Front St., plans to build 6 or 7 story warehouse and office. About $360,000. Architect not selected.

O., Akron—Summit Auto Co., 697 South Main St., having plans prepared by E. McGeorge, archt. and engr., 1900 Euclid Ave., Cleveland, for 3 story, concrete, steel and brick addition to garage, rein.-con. flooring, concrete and brick foundation. About $100,000.

O., Ashland—Alboy Co. had plans prepared by Dercum & Beer, archts., 4500 Euclid Ave., Cleveland, for 2 story, 200 x 200 ft., rein.-con., steel and brick factory, rein.-con. flooring, concrete foundation. About $150,000.

O., Canton—Hoover Suction Supply Co. had plans prepared by Bernard & Prack, archts. and engrs., Keystone Bldg., Pittsburgh, Pa., for 130 x 130 ft., brick and steel factory, rein.-con. flooring, brick foundation. Cost between $300,000 and $400,000.

O., Cleveland—Grieble & Ebeling, archts. and engrs., Racine Bldg., preparing plans for 1 and 2 story, 150 x 280 ft., brick, steel and rein.-con. garage, rein.-con. flooring, concrete foundation, on East 71st St. and Euclid Ave. About $200,000. Owner's name withheld.

O., Cleveland—W. W. Hodges, archt., Lennox Bldg., preparing plans for 3 story, 80 x 175 ft., brick, steel and rein.-con. factory, rein.-con. flooring, concrete foundation, on Train Ave. About $100,000. Owner's name withheld.

O., Cleveland—Oster Mfg. Co., 2057 East 61st St., plans to build 5 story, concrete, steel and brick factory, rein.-con. flooring, concrete foundation, at 6205 Carnegie Ave. About $250,000. R. B. Tewksbury, pres. Architect not selected.

O., Cleveland—H. A. Stahl Co., Hickox Bldg., plans to build 3 story, steel and brick factory, brick foundation, on East 55th St. and Pennsylvania R.R. About $100,000 Architect not selected.

O., Dayton—Air Friction Carbureter Co., 1st and Madison Sts., plans to build 5 story, 110 x 200 ft., rein.-con. factory and machine shop, rein.-con. flooring and foundation. About $150,000. Architect not selected.

O., Greenville—Franklin Tractor Co., 1026 Lindsey Bldg., Dayton, plans to build 2 story, 100 x 200 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, here. About $130,000. Private plans.

O., Massillon—Massillon China Co., Inc., plans to build 1 and 2 story, 100 x 200 ft. pottery, brick construction, along Baltimore & Ohio R.R. north of West Main St., to include office and kiln department. About $300,000. Architect and engineer not selected.

Mich., Detroit—A. Colton Co., 782 Jefferson Ave., having plans prepared by Mildner & Eisen, archts., 924 Hammond Bldg., for 3 story, 60 x 100 ft. machinery factory, rein.-con. and brick, rein.-con. flooring, concrete foundation, on Jefferson Ave. and Chene St. About $50,000.

Mich., Detroit—A. Kahn, archt., Marquette Bldg., soon lets contract constructing 1 story, 140 x 305 ft. mill building, brick and steel, on Fort St. and West End Ave., for Fisher Body Corp., Oakland and Piquette Aves.

Mich., Detroit—E. F. Lyons Spring & Axle Co., Milwaukee Ave., soon lets contract building 2 story, 60 x 93 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation. About $50,000. Stahl & Kinsey, 435 Woodward Ave., archts.

Mich., Detroit—A. Kahn, archt., Marquette Bldg., soon lets contract building 5 story, 62 x 441 ft. automobile factory, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Jefferson and Clark Aves., for Studebaker Corp., Brush and Piquette Aves.

Mich., Snginaw—Herzog Art Furniture Co., 1900 South Michigan St., soon lets contract building 3 story, 85 x 227 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation. About $95,000. Cooper & Beckbissinger, 114 South Jefferson St., archts.

Wis., Port Washington—Turner Mfg. Co. plans to enlarge present factory or build new 4 story, 100 x 500 ft. unit, brick, rein.-con. and steel, rein.-con. flooring, brick foundation. About $100,000. L. M. Turner, mgr. Architect not selected.

Wts., West Bend—Schmidt-Stork Wagon Co., Mill St., soon lets contract building 1 story, 100 x 280 ft. wagon factory, brick, rein.-con. and steel, rein.-con. flooring, brick foundation. About $55,000. A. Juth, c/o owner, archt. Noted March 4.

Kan., Argentine—Pennsylvania Tank Line Co., Sharon, Pa., soon lets contract constructing 1 story, 75 x 218 ft. and 78 x 320 ft. brick and steel, car and tank repair shops, here.

Kan., Newton—See "Buildings."

Tex., Waco—Goldstein-Migel Co. plans to build 3 story, 76 x 165 ft., brick and concrete addition to factory. About $100,000. I. A. Goldstein, 1225 Washington St., pres.

Okla., Pawnee—See "Waterworks."

Cal., San Francisco—Pacific Gas & Electric Corp., 445 Sutter St., plans to build additions and improve electrical generating and distributing system, to include hydro-electric plants on Pitt River, transmission lines, etc. About $13,062,426. J. A. Britton, vice pres.

Que., Montreal — C. Lafleur, Workman St., soon receives bids building 3 story, 50 x 90 ft. shoe factory, brick, steel and concrete, concrete foundation, on Greene Ave. About $200,000.

Que., Montreal—Montreal Harbor Comn. soon receives bids building 50 x 150 ft., rein.-con. and brick power house. About $150,000. F. W. Cowie, 731 Sherbrooke St., W., engr.

Ont., Hanover — Hanover Cotton & Woolen Co. plans to build clothing factory, brick. About $60,000. Architect not selected.

Ont., London—W. T. Rawleigh Co., 55-65 Liberty St., Freeport, Ill., receives bids about June 1, building pure food products factory on Adelaide St., here. About $300,000. Noted April 29.

Ont., London—Simmons Bed Co., Montreal, plans to build bed factory on East London St. About $100,000. Architect not selected.

BIDS DESIRED

O., Cincinnati—A. S. Taft 316 Pike St., receiving bids building 10 story, 40 x 60 ft., brick addition to power plant, on 8th and Sycamore Sts. H. Hake, Telephone Bldg., archt.

O., Cleveland—Until May 26, by Best & Hoefler, archts., Vickers Bldg., for 1 and 2 story, 70 x 160 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, at 1802 East 47th St., for Blue Valley Creamery Co., c/o architects. About $60,000.

O., Cleveland—Until May 27, by Frankie Light Co., 5016 Woodland Ave., building 3 story, 56 x 110 ft., steel and brick factory, brick foundation, on East 51st St. and Woodland Ave. About $50,000. M Weiss, 618 Union Bldg., archt.

Mich., Detroit—Until May 17, by J. I. Weinberg, archt., 401 Congress Bldg., constructing 4 story, 100 x 180 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Grand Blvd. and Moran St., for J. Shevitz, 195 Perry Park. About $125,000. Noted May 6.

Mich., Detroit—Until May 25, by R. H. Marr, archt., 435 Woodward Ave., building 2 story, 100 x 130 ft. publishing house, rein.-con., brick and steel, rein.-con. and maple flooring, concrete foundation, on Howard and 6th Sts., for Sprague Publishing Co., 150 Lafayette Blvd. About $110,000.

Minn., Duluth—Until May 20, by G. Phillips, comr. Duluth Water & Light Dept., constructing 3 story, 50 x 140 ft., rein.-con., brick and tile storage and office buildings, rein.-con. flooring, concrete foundation, on West 1st St. About $125,000. Halstead & Sullivan, 406 Palladio Bldg., archts. and engrs.

Que., Montreal—Until May 21, by Montreal Harbor Comn., building 8 story, 110 x 400 ft. rein.-con. cold storage warehouse. About $1,000,000. F. W. Cowie, 731 Sherbrooke St., W., engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Dorchester** (Boston P. O.)—N. Douglas, archt., and engr., 307 Howard St., Cambridge, let contract to G. C. Holliday, 52 Waldeck St., building 1 story, 100 x 128 ft., rein.-con. garage, concrete flooring and foundation, on Dorchester Ave., for Mutrie Auto Express Co., 11 Pearl St. About $50,000. Noted March 11.

Industrial Works (Continued)

★**Mass., East Boston** (Boston P. O.)—Mead-Morrison Mfg. Co., 125 Prescott St., let contract building 2 story, 85 x 175 ft., rein.-con. machine shop, rein.-con flooring, concrete foundation, on Orleans St., to F. T. Ley, Inc., 24 Milk St., Boston. About $125,000.

★**Mass., South Boston** (Boston P. O.)—J. Burnett Co., 36 India St., Boston, let contract building 7 story, 80 x 160 ft., rein.-con. plant, rein.-con. flooring, concrete foundation, on Fargo and D Sts., here, to W. M. Bailey Co., 88 Broad St., Boston. About $100,000.

★**Mass., Springfield**—U. S. Envelope Co., Cypress St., let contract building 5 story, 100 x 250 ft., brick and timber addition to factory, brick foundation, to Casper Ranger Constr. Co., 20 Brond St., Holyoke. About $250,000.

★**Mass., Williamansett** (Holyoke P. O.)—Stevens-Duryea Co., Chicopee Falls, let contract building two 1 story, 300 x 320 ft. automobile plants and 1 story, 60 x 270 ft., heat treating plant, brick and steel, rein.-con. flooring, concrete foundations, to P. J. Kennedy Co., Inc., 464 Maple St., Holyoke About $800,000.

★**Mass., Wollaston** (Boston P. O.)—E. R. Simpson, engr., 176 Federal St., Boston, let contract to S. C. Sperry Co., 300 Main St., Cambridge, building 3 story, 55 x 120 ft., brick and mill construction plant, concrete foundation, on Old Colony Ave., for Howard Chemical Co., c/o engineers. About $50,000. Noted April 22.

★**R. I., Pawtucket**—J. K. Bateman, 17 Dexter St., let contract building 2 story, brick, concrete and steel warehouse, rein.-con. flooring, concrete foundation, to A. F. Smiley, 202 Oakhall Bldg. About $50,000.

★**Conn., New Haven**—United Illuminating Co., 81 Temple St., let contract building 1 story, 70 x 175 ft., brick, concrete and steel extension to turbine room, rein.-con. flooring, concrete foundation, on Grand Ave., to C. W. Murdock, Inc., 185 Church St., boiler room, to Westcott & Mapes, Inc., 207 Orange St. About $65,000.

★**Conn., Norwalk**—Foster, Stewart & Co., Inc., 373 Pacific St., Brooklyn, N. Y., let contract building 1 story, rein.-con. and steel awning factory, rein.-con. flooring, concrete foundation, on Main and Broad Sts., here, to D. S. Leonard, 52 Underhill Ave., Brooklyn. About $75,000.

★**N. Y., Brooklyn**—Rechnitz Bros., 44 Court St., will build 1 story, 45 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Malbone St., near Rogers Ave. About $100,000. Work will be done by day labor.

★**N. Y., New York**—R. Berkowitz, 189 Orchard St., will build 2 story, 80 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 518 East 15th St. About $50,000. Work will be done by day labor.

★**N. Y., New York**—F. Nathan, 235 West 101st St., will build 2 story, 75 x 195 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Commerce and Bedford Sts. About $85,000. Work will be done by day labor.

★**N. Y., Pyrites**—DeGrasse Paper Co. let contract building 2 story, 60 x 208 ft., rein.-con. and steel addition to machine room, to Hodge & Foster, Flower Bldg., Watertown. About $100,000. Noted April 15.

★**N. Y., Watertown**—Beebe's Island Corp. let general contract building hydro-electric plant, on Beebe's Island, near here, to Jarrett-Chambers Constr. Co., 30 East 42nd St., New York City; hydraulic turbine equipment, to Wellman, Seaver, Morgan Co., 7000 Central Ave., S. E., Cleveland; electric generators, to General Electric Co., River Rd., Schenectady. Total cost, $750,000. Incorrectly noted in our issue of "April 15."

★**N. J., Jersey City**—Amer. Butterine Co., Henderson St., let contract building 5 story, 50 x 100 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, to Realty Associates, 162 Remsen St., Brooklyn, N. Y. About $100,000.

★**Pa., Phila.**—Amer. Card Clothing Co., American and Dauphin Sts., let contract buiding 3 story, 66 x 98 ft., brick factory, on 5th and Cayuga Sts., to J. N. Gill & Co., Otis Bldg. About $100,000.

★**Pa., Phila.**—Miller North Broad Storage Co., 2715 North Broad St., let contract building 7 story, 71 x 140 ft., rein.-con. warehouse, on 52nd and Whitby Sts., to J. N. Gill & Co., Otis Bldg. About $200,000.

★**Pa., Spring City**—Schuylkill Valley Mills let contract building 3 story, 90 x 200 ft., rein.-con. mill, to Turner Constr. Co., 1713 Sansom St., Phila.

★**Md., Baltimore**—Standard Oil Co., Pier 2, Pratt St., let contract building 1 story, 66 x 99 ft., brick service station and garage, concrete foundation, on Central and Eastern Aves., to Price Constr. Co., 210 Maryland Trust Bldg. About $75,000. Noted April 29.

★**Md., Fairfield** (Baltimore P. O.)—Globe Shipbuilding & Dry Dock Co. let contract building 50 x 100 ft. mold loft, 50 x 150 ft. joiner shop, 30 x 110 ft. power house and 60 x 450 ft. plate and engle shop, to Bancroft-Jones Co., Mutual Life Bldg., Buffalo, N. Y., $850,000; 50 x 140 x 365 ft. machine shop, also boilers, to McClintic-Marshall Co., Oliver Bldg., Pittsburgh, $500,000; all 1 story, concrete and steel, concrete foundations. Noted Feb. 5.

★**O., Cleveland**—Kaynee Co., Bway., and Aetna Rd., let contracts to J. Hruby, East 124th St. near Miles Ave., building 1 story, 32 x 50 ft. factory, at 3266 East 49th St., and 1 story, 32 x 64 ft. factory, at 3055 East 55th St., both concrete, steel and brick, rein.-con. flooring, concrete foundations, cost $30,000 each.

★**O., Cleveland**—W. Nathan, 1383 East Blvd., let contract building 3 story, 46 x 108 ft., brick addition to factory, brick foundation, at 6203 Cedar Ave., to W. Dunbar Co., 8201 Cedar Ave. About $50,000.

O., Cleveland—T. J. Sunkel, 1319 University Rd., let contract building 2 story, 100 x 110 ft., brick and steel garage, brick foundation, at 2138 Columbus Rd., to Complete Constr. Co., 226 North Superior Ave. About $100,000.

★**O., Cleveland**—Virden Mfg. Co., Ashland Rd., let contract building 1 story, 40 x 92 ft., concrete, steel and brick addition to factory, rein.-con. flooring, concrete foundation, to Myers-Kuhn Constr. Co., 210 Metropolitan Bldg. About $60,000. Noted April 29.

★**O., Columbus**—Jeffrey Mfg. Co., North 4th St., let contract building 1 story, 215 x 253 ft., brick and steel machine shop, to R. H. Evans Co., Columbus Savings & Trust Bldg. About $166,000.

★**O., Dover**—Dover Mfg. Co., c/o Poe Eng. Co., archts. and engrs., Rockefeller Bldg., Cleveland, let steel contract for 3 story, 80 x 200 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, here, to Canton Bridge Co., Belden Ave. & Pennsylvania R.R., Canton. Masonry work will be done by day labor. Total cost, $100,000. Noted April 1.

★**Mich., Mt. Clemens**—S. S. Kresge Co., Kresge Bldg., Detroit, let contract building 1 story, 120 x 823 ft. pottery plant, brick and steel, rein.-con. flooring, concrete foundation, to G. A. Fuller Co., 540 Penobscot Bldg., cost plus percentage basis.

★**Ill., Moline**—A. S. Abraham & Co., 20th St. and 2nd Ave., let contract building 4 story, 40 x 144 ft., rein.-con. and steel factory, rein.-con. flooring, to H. P. Lorenz, 413-14 Peoples Bank Bldg. Cost between $100,000 and $120,000.

★**Ill., Rock Island**—W. L. Frank Mfg. Co., 44th St. and Railroad Ave., let contract building 1 story, 90 x 108 ft., brick and steel factory, concrete flooring, to H. W. Horst Co., Horst Bldg. About $50,000.

★**Wis., Manitowoc**—Spindler Co. let contract building 2 story, 60 x 130 ft., artificial ice plant, brick, rein.-con. and steel, rein.-con. flooring, brick foundation, on 8th St., to B. Herman & Son, Manitowoc.

★**Wis., Menasha**—See "Buildings."

Wis., Milwaukee — Evinrude Motor Co., 279 Walker St., will build 1 story, 200 x 300 ft., brick and steel factory, concrete foundation, on 27th and Lake Sts. Work will be done by day labor. Noted April 8.

★**Wis., Milwaukee**—Geuder, Paeschke & Frey, St. Paul Ave. and 15th St., let contract building 1 story, 75 x 100 ft., brick and concrete power plant, rein.-con flooring, concrete foundation, on St. Paul Ave., to Meredith Bros., 1013 Kinnickinnic Ave., About $75,000. Noted Feb. 19.

★**Wis., Milwaukee**—Parry Products Co., 114 Grand Ave., let contract building 1 and 5 story, 50 x 350 ft., rein.-con and brick warehouse and grain elevator, rein.-con. flooring, concrete foundation, on National Ave., to Burrell Eng. & Constr. Co., 323 South La Salle St., Chicago, Ill.

★**Tex., El Paso**—International Warehouse Co. let contract building 3 story, 120 x 160 ft., concrete and steel warehouse, to V. E. Ware, 1614 East Missouri Ave. About $100,000.

★**Tex., McKinney**—Sunlite Co. let contract building 1 story, 90 x 136 ft. auto accessory plant, stucco, to J. E. Cooper, McKinney. About $150,000. Noted April 15.

★**Cal., San Francisco**—Holbrook, Merrill & Stetson, 6th and Bluxome Sts., let contract building 4 story, rein.-con. warehouse, on 6th and Townsend Sts., to P. J. Walker Co., Monadnock Bldg. About $500,000.

★**Cal., Westend** (San Rafael P. O.)—Westend Mining Co. let contract constructing borax plant, to include 80 x 180 ft. mill building, 32 x 48 ft. boiler house, several 180 x 220 ft. spray ponds, 1 to 8 ft. deep, galvanized iron and timber, concrete foundation, to J. Simpson & Co., Grant Bldg., Los Angeles. About $50,000.

★**Ont., Peterboro** — Canadian General Electric Co., 212 King St. W., Toronto, let contract building 6 story, concrete, brick and steel addition to plant, concrete foundation, to J. E. Hayes, 219 Park St. About $500,000.

★**Ont., Toronto**—Evening Telegram, Bay and Melinda Sts., let contract building 5 story, brick and steel printing shop and warehouse, concrete flooring and foundation, to Jackson Lewis Constr. Co., 76 Adelaide St. W. About $85,000.

★**Ont., Toronto**—United Drug Co., Ltd., 78 Broadview Ave., let contract building brick and steel addition to factory, concrete flooring and foundation, to L. E. Dawling, 167 Yonge St. About $130,000.

Buildings

PROPOSED WORK

Me., Portland—Theatre—Maine Theatres, Inc., Central Blk., Rockland, having revised plans prepared by A. W. Pease, archt., Fidelity Bldg., for 2½ story, brick, concrete and steel, rein.-con. flooring, concrete foundation, on Congress St., here. About $150,000. Noted Jan. 29.

N. H., Portsmouth — Hospital — Portsmouth Hospital, Junkins Ave., having plans prepared by Kendall, Taylor & Co., archts., 92 Federal St., Boston, for 3 story, brick and rein.-con. About $200,000.

Mass., Boston—Church—Methodist Diocese had plans prepared by Woodbury & Stuart, archts., Copley Sq., for 2 story, 80 x 150 ft., brick and stone, concrete foundation, on Hanover St. About $150,000.

Mass., Boston—Office—C. W. Whittier & Bro., 55 Congress St., plan to build 10 story, brick, concrete and steel, on Washington St. Architect not selected.

Mass., Boston—Office and Business—McNaughton & Robinson, archts., 101 Tremont St., soon let contract building 8 story, brick and terra cotta, concrete flooring and foundation, for Henderson & Ross, 148 State St. About $300,000. Noted March 18.

Mass., Boston — School — C. M. Parry, archt., 78 Devonshire St., soon lets contract building 2 story, brick and concrete, concrete flooring and foundation, on Huntington Ave., here, for Tufts College, Medord. About $125,000. Noted Jan. 1.

Mass., Brookline (Boston P. O.)—Hospital—Hospital Corp., c/o H. F. Kellogg, archt., 93 Federal St., Boston, plans to build 3 story, 80 x 130 ft., brick and concrete, on Pond Ave., here. About $150,000.

Mass., Chicopee — Business — Chicopee Corp. having plans prepared by G. P. Dion, archt., 30 Center St., altering Clymer Blk., timber and steel, on Miller and Exchange Sts. Cost between $100,000 and $125,000.

Mass., Clinton—Housing—Lancaster Mills having plans prepared by Lockwood, Greene & Co., archts., 60 Federal St., Boston, for houses for workmen. About $125,000.

Mass., Danvers — High School—School Bd. plans to build 3 story, brick and steel. About $350,000. Architect not selected.

Mass., Danvers—Memorial Hall—Town plans to build brick and steel. About $150,000. L. S. Couch, Chester St., chm Architect not selected.

Mass., Springfield—Hotel—Hotel Bridgeway, Bridge St., having plans prepared by Huestis & Huestis, archts., 145 Chestnut St., for 11 story, 80 x 125 ft., brick, concrete, steel and stone addition, rein.-con flooring, concrete foundation. About $1,000,000

Mass., Taunton—Theatre and Stores H. P. Graves, archt., 40 Middlesex St. Lowell, soon lets contract building 2 story,

Buildings (Continued)

brick and mill construction, stone or concrete foundation, for Black-Spitz Theatres, Inc., c/o architect. About $125,000.

Mass., West Springfield (Springfield P. O.)—Church—Methodist Church Societies, 4 Harvard St., plans to build brick. About $100,000. C. O. Ford, pastor. Architect not selected.

Conn., Bridgeport—Hall, etc.—S. Lebovich, archt., Meigs Bldg., soon lets contract building 1, 2 and 3 story, concrete, frame and stucco, hall with auditorium observation tower, concrete foundation, for McCormick & Barry, 1887 Fairfield Ave. About $100,000.

Conn., East Hartford (Hartford P. O.) —Church—St. Mary Roman Catholic Society, Main St., plans to build 1 story, brick and stone, on Burnside Ave. About $100,000. Architect not selected.

Conn., Hartford — School — Northwest School Dist. having plans prepared by Ford, Buck & Sheldon, Inc., archts., 60 Prospect St., for 3 story, 10 room, brick, concrete and steel, on Holcomb St. About $150,000. H U. Tuttle, chn.

Conn., Highwood (New Haven P. O.)—Church—J. A. Jackson, archt., 1123 Bway., New York City, soon receives bids building 1 story, 52 x 135 ft., brick and steel, for St. John the Baptist Society, 782 Dixwell Ave., New Haven. About $100,000. Noted Jan. 15.

Conn., Manchester — Recreation and School—Ninth School Dist. having plans prepared by F. C. Farley, archt., 333 4th Ave., New York City, for 2 story, 65 x 110 ft., brick and concrete, rein.-con. flooring, concrete foundation, on Cedar St. About $200,000. H. Cheney, chn.

Conn., New Britain—Temple—Masonic Order, Elton Pl., having plans prepared by M. J. Unkelbach, archt., 162 Main St., for 5 story, brick, rein.-con. and steel, on West Main St. About $200,000. R. J. Dixon, chn.

Conn., New London—Bank—Owner, c/o J. G. Hammond, 86 State St., having plans prepared by D. S. C. Donnelly, archt., Plant Bldg., for brick, concrete and steel. About $150,000

Conn., New London—Theatre—Chamber of Commerce, c/o D. S. Donnelley, archt., Plant Bldg., plans to build theater. About $300,000.

N. Y., Brooklyn — Court — Boro having sketches made by H. Collins, archt. and engr., 2 West 45th St., New York City, for 3 story, brick and stone, brick foundation, on Snyder Ave. between Bedford and Flatbush Aves., here. About $110,000. A. Gyer, comr. Bd. Pub. Wks.

N. Y., Brooklyn—Offices—Comr. Pub. Wks., Borough Hall, having sketches made by McKenzie, Voorhies & Gmelin, archts. and engrs., 1123 Bway., New York City, for brick, steel and stone, concrete foundation. About $5,000,000.

N. Y., Brooklyn—Temple—Congregation Mogin David, 1609 66th St., had plans prepared by M. Courland, archt. and engr., 47 West 34th St., New York City, for brick and stone, brick foundation, on 67th St., between 20th and 21st Aves. About $110,000. A. Tawil, pres.

N. Y., Brooklyn—Theatre—B. F. Keith, 1564 Bway., New York City, plans to build brick and stone, on Gold, Fleet and Prince Sts., here. About $750,000. Architect not selected.

N. Y., Buffalo—Office—M. H. Birge Co., 390 Niagara St., had plans prepared by Bley & Lyman, archts., 250 Delaware Ave., for 2 story, 110 x 127 ft., brick and concrete. About $100,000.

N.Y., Montour Falls — Academy — Bd. Trustees, Cook Academy, plans to build brick and concrete addition. About $100,000.

N. Y., New York—Bank and Office—H. R. Mainzer, archt. and engr., 105 West 40th St., soon lets contract building 6 story, 25 x 100 ft., brick and stone, brick foundation, at 349 West 34th St., for State Bank, 363 Stone Ave., Brooklyn. About $100,000. Noted April 29.

N. Y., New York—Club—W. C. Jordan, Times Bldg., having plans prepared by W. N. Smith, archt. and engr., 101 Park Ave., altering 8 story, brick and stone, at 206 West 41st St. About $175,000.

N. Y., New York—Club and Arena—Audubon Sporting Club, c/o D. F. Lang, archt. and engr., 110 West 34th St., having sketches made for 2 story, 100 x 175 ft., brick and stone, brick foundation, on 145th St. and Lenox Ave. About $300,000.

N. Y., New York—Home—Bronx Society for Prevention of Cruelty to Children, 355 East 137th St., plans to build 7 story, 96 x 134 ft., brick, steel and stone, concrete foundation, on Park Ave. and 160th St. About $350,000. Architect not selected.

N. Y., New York—Hotel—F. Savignano, archt., 6005 14th Ave., Brooklyn, preparing sketches for 12 story, brick, steel and stone, concrete foundation, on 72nd St. and Columbus Ave. About $650,000. Owner's name withheld.

N. Y., New York—Recreation Center—L. A. Abramson, archt. and engr., 46 West 46th St., preparing sketches for 4 story, brick and steel, brick foundation. About $150,000. Owner's name withheld.

N. Y., New York—Store—J. M. Gidding, 564 5th Ave., having plans prepared by B. W. Levitan, archt. and engr., 7 West 45th St., for altering 4 and 7 story, brick and stone. About $150,000.

N. Y., Schenectady — School — Bd. Educ. soon receives bids building 2 story, 126 x 175 ft., brick and rein.-con. school and 45 x 80 ft. auditorium, concrete foundation, in Mt. Pleasant Section. About $400,000.

N. J., Camden—Store—H. Pinsky & Co., 1126 Bway., having plans prepared by P. Mertz, archt., Pennsylvania Bldg., for 4 story, 48 x 140 ft., brick, on Bway. and Spruce St. About $100,000.

N. J., Middlesex (Sayreville P. O.)—School—Bd. Educ. plans to issue $112,000 bonds to build school. W. Love, dist. clk.

N. J., Newark—Nurses Home—F. Grad, archt., Amer. Natl. Bank Bldg., brick and limestone, on Baldwin and Quitman Sts., for Beth Israel Hospital, High and West Kinney Sts. About $125,000.

Pa., Bryn Mawr — Dormitories — Bryn Mawr College having sketches prepared by Savery & Scheetz, archts., 21 South 12th St., Phila., for brick and concrete. Cost to exceed $100,000.

Pa., Carbondale — New York, Ontario & Western R.R., Dundaff St., plans to construct 3 story, 50 x 100 ft., brick and steel Y. M. C. A. building, rein.-con. flooring, rock foundation. About $100,000. Architect not selected.

Pa., Johnstown — Church — Willow St. Evangelical Church plans to build 2 story, 100 x 120 ft., concrete, steel and stone, rein.-con. flooring. About $175,000. J. E. Adams, Nemo Bldg., archt.

Pa., New Castle — Church — Highland United Presbyterian Church, 708 Highland Ave., plans to build 1 story, brick and stone. About $100,000. W. A. Wilkison, secy.

Pa., Phila.—Store and Office—Peuchert & Wunder, archts. and engrs., 310 Chestnut St., soon let contract building 14 story, 50 x 80 ft., concrete and brick, at 1716 Market St., for J. Thommen c/o architects. Cost to exceed $100,000.

Pa., Pittsburgh—Sales—Dyke Motor Supply Co., c/o P. C. Dowler, archt., Magee Bldg., having plans prepared for 6 story, 50 x 110 ft., rein.-con., brick and steel, rein.-con. flooring, on Webster Ave. and Chatham St. About $125,000.

Pa., Wilkes-Barre — Clubhouse — Ancient Order Mystic Shrine Plans to build 3 story, brick and steel, rein.-con. flooring, rock foundation, on Country Rd. About $100,000. Architect not selected.

Pa., Wilkinsburg (Pittsburgh P. O.)—Theatre—Rowland & Clarke, Jenkins Arcade, Pittsburgh, having plans prepared by H. S. Bair, archt., Vandergrift Bldg., Pittsburgh, for 1 and 2 story, concrete, brick and steel, 1,500 seating capacity, on Wood St. About $150,000.

Md., Baltimore — Church — Church of Blessed Sacrament, York Rd. near Arlington Ave., having plans prepared by H. I. Kavanaugh, archt., 913 North Calvert St., for 1 story, 70 x 120 ft., stone, concrete and stone foundation. About $100,000.

Md., Baltimore—Community—Oheb Shalom Congregation, Eutaw Pl. and Lanvale Ave., having plans prepared by B. Franke, archt., 328 North Charles St., for 4 story, 50 x 130 ft., concrete, steel and brick, concrete foundation. About $150,000.

Md., Baltimore—Stores—F. H. Keiser, Pottstown, Pa., acquired site on Pennsylvania Ave. between Lafayette Ave. and Lanvale St., here, and plans to build stores. About $200,000.

Md., Baltimore — Store — Levenson & Klein, Fayette and Washington Sts., having plans prepared by L. Levi, archt., Real Estate Bldg., for 3 story, 36 x 80 ft., brick. About $100,000.

Md., Baltimore — Theatre — Capital Theatre Co., 719 Fidelity Bldg., soon receives bids building 1 story, 120 x 200 ft., concrete, steel and brick, concrete foundation, at 1518-1522 West Baltimore St About $250,000. Wyatt & Nolting, 1012 Keyser Bldg., archts.

D. C., Wash. — Church — Church of the Sacred Heart, 15th St. and Park Rd., having plans prepared by Magginis & Walsh, archts., 100 Boylston St., Boston, for church, here. About $100,000.

D. C., Wash.—Labor Temple—W. B. Wood, archt., 816 Connecticut Ave., soon receives bids building 3 story, 55 x 100 ft., brick and limestone, on 6th St., for District Carpenters' Union. About $100,000.

W. Va., Charleston—Schools—City voted $480,000 bonds to build new Junior High School, physical education building at Central Junior High School, etc. Architect not selected. Noted April 29.

N. C., Asheville—Hospital—Mission Hospital plans to build addition. About $150,000. G. H. Lord, 17 Church St., archt. Noted Feb. 19.

N. C., Durham—Hospital—Trustees Watts Hospital soon let contract building 3 story, 40 x 135 ft., brick and concrete, rein.-con. flooring, rock or concrete foundation. About $150,000. Kendall Taylor & Co., 93 Federal St., Boston, Mass., archts. Noted Jan. 1.

N. C., Winston Salem—Hospital—Memoriam Hospital soon receives bids constructing 2, 3, 4 and 5 story, hollow tile buildings. About $800,000. C. R. Keen, Bailey Bldg., Phila., archt.

S. C., Columbia—College—Chicora College, 1617 Blanding St., plans to construct 16 buildings. Architect not selected.

S. C., Columbia—Temple—F. & A. M., plan to build 7 story, 104 x 160 ft., on Sumter St. About $255,000. Architect not selected.

S. C., Greer — Church — Greer Baptist Church plans to build new church. About $100,000. J. J. Baldwin, Anderson, archt.

Fla., Jacksonville—Church—First Methodist Congregation, Newnan and Duval Sts., plans to build new church. About $200,000.

La., New Orleans—Theatre—Loew's Enterprises, 1493 Bway., New York City, having sketches made by T. W. Lamb, archt., 644 8th Ave., New York City, for brick and stone, here. About $500,000.

Tenn., Memphis—Office—See "Industrial Works."

Ky., Louisville—Auditorium and Memorial—State plans election in fall to vote on $1,000,000 bonds to construct auditorium and memorial building.

O., Alliance—School—City voted $200,000 bonds to build school.

O., Carey—High School—Bd. Educ. plans to build 2 story, 200 x 210 ft., brick. Bonds for $155,000 voted for project. McLaughlin & Hulsken, 610 Savings Bank Bldg., Lima, archts.

O., Cleveland—Hotel—Wade Park Manor Co. having plans prepared by G. B. Post, archt. and engr., 101 Park Ave., New York City, for Brick, steel and stone, on East 109th St. and Park Lane, here. About $2,500,000. Noted April 15.

O., Cleveland—Temple—Tifereth Israel Assn. having plans prepared by Hubbell & Benes, archts., 4500 Euclid Ave., for 2 story, 140 x 200 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 105th St. and Ansel Rd. About $1,000,000.

O., Cleveland Heights (Warrensville P. O.) —Schools—Village plans election May 22, to vote on $2,400,000 bonds to build concrete, steel and brick schools. Architect not selected.

O., East Cleveland (Cleveland P. O.)—Church—Park Congregational church, 11111 Ashbury Ave., Cleveland, having plans prepared by J. W. Corbusier, archt., Lennox Bldg., Cleveland, for 1 story, brick, steel and stone, rein.-con. flooring, concrete foundation, on Lockwood and Euclid Aves. About $300,000.

O., Grandview Heights (Columbus P. O.) —School—Village voted $300,000 bonds to build school.

O., Kent—High School—City voted $200,000 bonds to build high school, on Day and South Water Sts.

O., Lakewood (Cleveland P. O.)—Church —Lakewood Lutheran Church c/o J. W. Corbusier, Lennox Bldg., Cleveland, having plans prepared for 1 story, brick, steel and stone, rein.-con. flooring, brick foundation, on Detroit Ave. About $100,000.

O., Lima—School—Bd. Educ. plans to build 2 story, 67 x 150 ft., brick, in Liberty Twp. About $170,000. McLaughlin & Hulsken, Savings Bldg., archts.

O., Mark Center—School—Bd. Educ. plans to build 2 story school. Bonds for $175,000 voted for project. McLaughlin & Hulsken, Savings Bldg., Lima, archts.

Buildings (Continued)

O., McComb—School—Bd. Educ. plans to build 2 story, brick. Bonds for $395,000 voted for project. McLaughlin & Hulsken, Savings Bank Bldg., Lima, archts.

O., South Euclid — Church and Sunday School—Methodist Episcopal Church having plans prepared by Miller & Son, archts., 408 Dollar Bank Bldg., Youngstown, for 2 story, steel and brick, brick foundation. About $150,000. H. Mohn, pastor.

Mich., Detroit—Church—Bethany Presbyterian Church, c/o Stahl & Kinsey, archts., 435 Woodward Ave., having plans prepared for 2 story, 60 x 70 ft., rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation, on Seyburn and East Lafayette Aves. About $100,000.

Ill., Amboy — Bank — First Natl. Bank having plans prepared by D. H. Burnham & Co., archts., 209 South La Salle St., Chicago, for 1 and 2 story, 50 x 100 ft., brick and stone, concrete foundation. About $100,000.

Ill., Chicago—Bank—Albany Park Natl. Bank, c/o C. Hatzfeld, archt., 7 South Dearborn St., having plans prepared for 1 story, 50 x 125 ft., concrete and brick, concrete foundation, on Bernard and Lawrence Aves. About $100,000.

Ill., Chicago—Club House—Bryn Mawr Country Club, 111 West Washington St., plans to build club house on Crawford and Devon Aves. About $150,000. H. Goldstine, pres. Architect not selected.

Ill., Chicago—Hotel—Edgewater Beach Hotel Co., 5349 Sheridan Rd., having plans prepared by Marshall & Fox, archts., 721 North Michigan Ave., for three eight story and one 16 story, rein.-con. and steel additions to existing building, about 150 x 150 ft. each. About $15,000,000.

Ill., Chicago—Store—The Fair, State and Adams Sts., plans to build 16 story, 90 x 190 ft. addition, at 23-29 West Monroe St. Cost to exceed $2,000,000. Mundie & Jensen, 39 South La Salle St., archts.

Wis., Kenosha—High School—Bd. Educ. plans to build brick, rein.-con. flooring, concrete foundation. About $500,000. Architect and engineer not selected.

Wis., Kenosha—Opera House—J. Rhode, 164 Market St., plans to build brick, concrete and steel, rein.-con. flooring, concrete foundation. About $300,000. Architect and engineer not selected.

Wis., Marinette—Church—St. James English Lutheran Church having preliminary plans prepared by Brust & Philipp, archts., Free Press Bldg., Milwaukee, for brick and stone, rein.-con. flooring, concrete foundation. About $125,000.

Wis., Milwaukee—Sales—Chevrolet Motor Co., Bway. and 57th St., New York City, having plans prepared by Phelan, archt., c/o owner, for 3 story, 65 x 160 ft., concrete and brick, rein.-con. flooring, concrete foundation, on Grand Ave., here. About $75,000.

Wis., Milwaukee — Sales — Creek Motor Sales Co., 215 Wisconsin St., plans to build brick and concrete, rein.-con. flooring, concrete foundation. About $100,000. Architect and engineer not selected.

Wis., Milwaukee — Sales — Magnetic Realty Co., 185 Mason St., having plans prepared by A. C. Eschweiler, archt., Goldsmith Bldg., for 2 story, 100 x 110 ft., rein.-con. and brick, rein.-con flooring, concrete foundation, on Jefferson St. About $100,000.

Wis., Milwaukee—Store—Brust & Philipp, archts., Free Press Bldg., receive bids about May 22, building 3 story, 150 x 150 ft., brick and concrete addition, rein.-con. flooring, for E. Schuster & Co., 12th and Vliet Sts. About $225,000. Noted Feb. 19.

Ia., Bloomfield—High School—City voted $120,000 bonds to build high school. Architect and engineer not selected.

Ia., Cambria—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., Masonic Bldg., Des Moines, for 2 story, 56 x 86 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000.

Ia., Cedar Rapids—High Schools—Bd. Educ. receives bids in July, building 4 brick, rein.-con. and steel junior high schools, rein.-con. flooring, concrete foundations. About $1,400,000. Rugh & Zalesky, Security Bldg., Cedar Rapids, archts. Noted March 11.

Ia., Collins — School — Bd. Educ. having plans prepared by T. Thorson, archts., Forest City, for 2 story, 68 x 109 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $120,000.

Ia., Gilman—School—Bd. Educ. having preliminary plans prepared by Keffer & Jones, archts., 204 Masonic Temple, Des Moines, for 2 story, rein.-con. and brick, rein.-con. flooring, concrete foundation. About $100,000. R. J. Paul, pres.

Ia., Gowrie — School — Bd. Educ. having preliminary plans prepared by Keffer & Jones, archts., 204 Masonic Temple, Des Moines, for 3 story, 65 x 100 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $125,000. C. Strand, secy.

Minn., Lake Crystal—High School—Independent School Dist. 19 postponed construction of 2 story, 90 x 140 ft., rein.-con and brick. About $275,000. Stebbins & Haxby, 445 Auditorium Bldg., Minneapolis, archts. Noted Jan. 1.

Minn., Lake Park—School—Bd. Educ. having plans prepared by Sund & Dunham, archts., 312 Essex Bldg., Minneapolis, for 2 story, 60 x 90 ft., brick, here. About $100,000.

Minn., Lewiston—School—Bd. Educ. having plans prepared by Croft & Boerner, archts., 822 Palace Bldg., Minneapolis, for 2 story, brick addition. About $125,000.

Minn., Minneapolis—Theatre—Minneapolis Holding Co. having plans prepared by Fallows, Huey & Macomber, archts., 405 New York Life Bldg., for 2 story, 35 x 135 ft., fireproof, to Hennepin Ave. About $100,000.

Minn., Spring Grove—School—Bd. Educ. having plans prepared by Sund & Dunham, archts., 312 Essex Bldg., Minneapolis, for 2 story, 40 x 90 ft., brick.

Minn., Wayzata—School—Bd. Educ. having plans prepared by Hewitt & Brown, 716 4th Ave., S., and Tyrie & Chapman, 320 Auditorium Bldg., Minneapolis, archts., for 3 story, 136 x 148 ft., rein.-con. and brick. About $150,000.

Kan., Florence—School—Bd. Educ. having plans prepared by Mann & Gerow, archts., 722 Rorabaugh Wiley Bldg., Hutchinson, for 2 story, 98 x 122 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $110,000.

Kan., Hays—Hospital—Sisters of St. Agnes having plans prepared by C. A. Smith, archt., Salina, for 4 story 75 x 180 ft., brick, rein.-con. and steel addition, rein.-con. flooring, concrete foundation. About $175,000.

Kan., Liberal—Church—Methodist Episcopal Church having plans prepared by Hawk & Parr, archts., Security Bldg., Oklahoma, for 2 story, 65 x 105 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000.

Kan., Linwood—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., Hoke Bldg., Hutchinson, for 3 story, 58 x 100 ft., brick, rein.-con. and steel, rein.-con flooring, concrete foundation. About $100,000.

Kan., Newton—Dormitories, Etc.—Bethany College plans to build dormitories for men and women, dining hall and heating plant, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $500,000. L. Schmidt & Co., 121 North Main St., Wichita, archts.

Kan., Robinson—School—Bd. Educ. Dist. 3 having plans prepared by T. W. Williamson, archts., 418 Central Natl. Bank Bldg., Topeka, for 2 story, brick, rein.-con and steel, rein.-con. flooring, concrete foundation. About $100,000.

Kan., Salina—Memorial—Saline Co. having plans prepared by W. E. Hulse & Co., archts., Hoke Bldg., Hutchinson, for brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $300,000.

S. D., Flandreau—Schools—City election soon to vote on $100,000 bonds to build schools. W. G. Cowles, secy. Bd. Educ.

Ariz., Tucson — Courthouse — Pima Co. plans to build 4 story, on Court St. About $660,000. W. Curlett & Sons, Merchant Natl. Bank Bldg., Los Angeles, archts.

Okla., Durant—Dormitory—Presbyterian College having plans prepared by J. Hicks, archt., 19½ West Main St., Oklahoma, for 3 story, 95 x 100 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000.

Okla., Fairview—Court House—Major Co. having plans prepared by W. E. Hulse & Co., archts., Hoke Bldg., Hutchinson, for 3 story, 68 x 114 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $160,000.

Okla., Kingfisher—School—Bd. Educ. having plans prepared by Monnett & Ried, archts., 409 Empire Bldg., Oklahoma, for 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $110,000.

Okla., Tulsa.—Office—W. E. Wright, 616 South Cheyenne St., plans to construct 8 story addition to office building on West 3rd St. About $500,000. Architect and engineer not selected.

N. M., Las Cruces—School—School Dist. 2, Dona Ana Co. defeated $120,000 bonds to build school. Noted April 8.

Wash., Seattle—Church and Rectory—St. Joseph's Parish, 18th St., N., and East Aloha St., having plans prepared by Beezer Bros., archts., Seaboard Bldg., for 80 x 178 ft. church and 2 story, 40 x 62 ft. rectory, brick and stone. About $400,000.

Ore., La Grande — Schools — Bd. Educ. soon receives bids building 4 room addition and new 6 room grade school. About $100,000.

Cal., Los Angeles—Stores and Dance Hall—M. Spires, c/o J. C. Austin, archt., 1121 Baker-Detwiler Bldg., having plans prepared for 2 story, 130 x 150 ft., rein.-con. brick, steel and terra cotta, rein.-con. flooring, concrete foundation, on 6th and Olive Sts. About $235,000.

Cal., Los Angeles — Temple—Hollywood Lodge 355, F. & A. M., having plans prepared by J. C. Austin, archt., 1121 Baker-Detwiler Bldg., for 4 story, 75 x 179 ft., rein.-con., brick and steel, concrete foundation, on Hollywood Blvd. About $175,000. A. R. Gates, 1724 North Highland Ave., secy.

Ont., Guelph—Office, Etc.—T. Eaton Co., Ltd., 190 Yonge St., Toronto, having plans prepared by W. A. Mahoney, archt., 73 Quebec St. W., for office building, brick and timber, also 1 story addition to stove factory, concrete, brick and steel. About $115,000.

Ont., London—Collegiate—Bd. Educ. plans to rebuild London Collegiate on Waterloo St. Cost between $350,000 and $500,000. Architect not selected.

Ont., London—High School—Bd. Educ., Dundas St., having plans prepared by L. E. Carrothers, archts., for high school on Waterloo St. About $500,000. A. A. Langford, chn.

Ont., Saulte Ste. Marie—Labor Temple—Saulte Ste. Marie Labor Temple Assn., Ltd., having plans prepared by G. Drew, archt., 157 Queen St., for 3 story, 109 x 114 ft., brick and steel, concrete flooring. About $150,000.

Ont., Toronto—Theatre—Famous Players Canadian Corp., Temple Bldg., having plans prepared by J. M. Jeffrey, archt., 348 Confederation Life Bldg., for 2 story concrete and steel, concrete flooring and foundation. About $300,000.

Ont., Windsor—Civic—City, Walkerville, Sandwich and Ford municipalities plan to build 4 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $1,500,000. Address F. L. Howell, 82 Caron St. Architect not selected.

BIDS DESIRED

Mass., Boston—Chapel—Until May 16, by Allen & Collens, archts., 40 Central St., building 1 story, 25 x 105 ft., concrete and stone, concrete foundation, for Emanuel Church Society, Newbury St.

Mass., Wakefield — High School — Until May 24, by Bd. Educ., building 3 story, 210 x 250 ft., brick and steel, concrete flooring and foundation, on Main St. About $150,000. F. I. Cooper Corp., 33 Cornhill St., Boston, archts. Noted April 1.

Conn., Naugatuck—Until June 5, by Jallade & Lindsey, archts. and engrs., 37 Liberty St., New York City, constructing 3 story, brick and stone building, brick foundation, on Church St., here, for Y. M. C. A., 2 West 45th St., New York City. About $220,000. Noted April 1.

N. Y., New York—School—Until May 22, by Bd. Educ., building P. S. 59, 4 story, 92 x 194 ft., brick and stone, brick foundation, on 182nd St. and Bathgate Ave. About $120,000. Former bids rejected. C. B. J. Snyder, Municipal Bldg., archt. and engr. Noted Jan. 15.

Pa., Bethlehem—Bank—Until May 24, by Dennison & Hirons, archts., 475 5th Ave., New York City, building 1 story, 40 x 140 ft., brick and stone, brick foundation. About $100,000. H. Balcom, 10 East 47th St., New York City, engrs.

Buildings (Continued)

Pa., Phila.—Office—Until May 19, by H. Trumbauer, archt., Land Title Bldg., constructing 12 story, 60 x 90 ft., brick, stone and steel, on 17th and Cherry Sts. and Parkway, for Sun Oil Co., Finance Bldg.

Pa., Pittsburgh—Sales, etc.—Until June 9, by Autocar Sales & Service Co. constructing 1 story, 225 x 230 ft., sales and service building, concrete, brick and steel, brick fundation, on Liberty Ave. and Baum Blvd. About $120,000. H. W. Castor, St. Girard Bldg., Phila., archt.

Md., Baltimore—Convent—Until May 14, by F. E. Tormey, archt., 72 Gunther Bldg., constructing 3 story, 41.6 x 75 ft., stone, stone and concrete foundation, on Lakewood Ave. and Baltimore St., for St. Elizabeth's Catholic Church. About $100,000.

Md., Baltimore—School—Until May 26, by Bd. Awards, City Hall, building 3 story, 150 x 200 ft., stone and brick, stone foundation, on Poplar St. and Lafayette Ave. About $250,000. E. H. Glidden, 1210 Amer. Bldg., archt., H. Adams, Calvert Bldg., engr.

D. C., Washington—Store—Until May 15, by A. P. Clark, Jr., archt., 816 14th St., N. W., building 3 story, 40 x 110 ft., fireproof, for Brooks & Co., 1111 G St., N. W. About $150,000.

W. Va., Frankford—High School—Until May 29, by Bd. Educ., building 3 story, brick.

O., Akron—High School—Until June 7, by Bd. Educ., building Goodyear Heights School, on Brittain Rd. and Newton St. About $200,000. M. M. Konarski, Central High School Bldg., archt.

O., Ansonia—Bank and Theatre—Until June 5, by 1st Natl. Bank of Ansonia, building 1 story, 30 x 80 ft. and 40 x 118 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation. About $100,000. Walker & Weeks, 1900 Euclid Ave., Cleveland, archts. Noted April 29.

O., Cleveland—Home—Until June 2, by Hebrew Orthodox Home for Aged, Inc., c/o S. H. White, archt., 1032 Schofield Bldg., for 2 story, 130 x 150 ft., concrete, brick and terra cotta, rein.-con. flooring, concrete foundation, at 736 Lakeview Rd. About $250,000.

O., East Cleveland (Cleveland P. O.)—School—Until May 24, by Bd. Educ., building 2 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on Mayfair Rd. About $250,000. C. Ammerman, Williamson Bldg., Cleveland, clk. Cavanaugh & Baer, 1900 Euclid Ave., Cleveland, archts.

Ill., Chicago—Office—Graham, Anderson, Probst & White, archts., 1417 Ry. Exch. Bldg., receiving bids constructing 6 story, 73 x 100 ft., slow burning construction, concrete foundation, at 325 South Wells St., for Pennsylvania Offices, Inc., c/o architects. About $350,000.

Ia., Hawarden—School—Until May 20 (change of date), by Bd. Educ., building 2 story, 60 x 150 ft., rein.-con. and brick, to include domestic science and chemical laboratories. About $135,000. C. A. Bader, secy. G. L. Lockhart, 391 Endicott Bldg., St. Paul archt. Noted April 1.

Ia., Newhall—School—Until May 20, by Bd. Educ., building 2 story, 67 x 86 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $110,000. C. A. Dieman & Co., 408 Granby Bldg., Cedar Rapids, archts.

Ia., Poton—School—Until June 5, by Bd Educ., building 2 story, 56 x 99 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $110,000. W. E. Hulse & Co., 309 Security Bldg., Des Moines, archts. Noted Feb. 26.

Minn., Chisholm—Municipal—Until July 1, by E. Drew, town recdr., building 2 story, 64 x 298 ft., rein.-con., brick, stone and tile, rein.-con. flooring, concrete foundation, on Lake St. About $450,000. A. Puck, 801 Torrey Bldg., Duluth, archt. and engr.

Minn., Duluth—Office—See "Industrial Works."

Minn, Renville—High School—Until May 30, by Bd. Educ. building 2 story, 80 x 240 ft., rein.-con. and brick. About $300,000. Croft & Boerner, Palace Bldg., Minneapolis, archts. Noted Feb. 19.

Wyo., Gasper—Bank and Office—Until June 1, by Garbutt, Weldner & Sweeney, archts., Oil Exch. Bldg., constructing 6 story, 100 x 100 ft., rein.-con. and brick, rein.con. flooring, concrete foundation, on Wolcott and East 2nd Sts., for Wyoming Natl. Bank. About $375,000.

Cal., Bishop—High School—Until May 22, by J. H. Stofflet, clk. Union High School Dist., building 2 story, rein.-con., concrete foundation. About $140,000. W. S. Weeks, 75 Post St., San Francisco, archt.

Que., Westmount—Home—Until May 18, by Montreal Hebrew Com., Notre Dame de Grace, Montreal, building 2½ story, 250 x 300 ft. orphans home, brick, concrete foundation, on Victoria and Grosvenor Aves. About $200,000.

Ont., Leamington—School—Until May 21, by J. C. Pennington, archt., 35 La Belle Bldg., Windsor, for 2 story, 8 room, concrete, brick and steel. About $100,000.

Ont., Newmarket—Until May 25, by E. A. James Co. Ltd., engrs., 36 Toronto St., Toronto, building rein.-con. activated sludge plant including piping, diffusers, air compressors, brick compressor building, valves, etc., also outfall sewer involving 4,200 ft. 15-18 in. vitr. tile pipe. About $65,000.

Ont., Sudbury—Collegiate Institute—Until May 22, by J. G. Lowe, secy., High School Bd. building 3 story, 20 room brick, steel and hollow tile, rein.-con. foundation. About $200,000. P. J. O'Gorman, Sudbury, archt.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. H., Hanover** — Laboratory — Dartmouth College let contract building 4 story, 60 x 150 ft., brick and limestone, to Cummings Constr. Co., Woodsville. Cost $264,000.

★**Mass., Chicopee** — Housing — Dwight Mfg. Co., Front St., will build 3 story, brick and frame houses for workmen, concrete and rock foundations, near plant. About $350,000. Work will be done by day labor. Noted May 6.

★**Mass., Malden** (Boston P. O.)—Bank—Malden Savings Bank let contract building 2 story, 52 x 93 ft., brick and stone, concrete foundation, on Malden Sq., to Gascoinge & Lindenthal Co., 43 Tremont St., Boston. About $150,000.

★**Mass., Mattapan** (Boston P. O.)—Dining Room — Kendall, Taylor & Co., engrs., 93 Federal St., Boston, let contract to J. Bowen Co., 184 Dudley St., Roxbury, building 2 story, brick and steel, concrete foundation, at Boston State Hospital, here, for Commonwealth of Massachusetts, 36 State House, Boston. About $100,000.

★**Mass., New Bedford**—Theatre—J. S. McIntyre, archt., 22 Clifford Bldg., let contract to C. I. Bigney Constr. Co., 357 Westminster St., Providence, R. I., building 2 story, 70 x 140 ft., brick, stone and concrete, rein.-con. flooring, concrete foundation, on Elm St., for Empire Theatres, Inc., 2 Masonic Bldg. About $150,000. Noted April 29.

★**Conn., New Britain**—Business—Besse-Leland Co., 215 Main St., let contract building 3 story, 50 x 140 ft., rein.-con. and brick, concrete flooring and foundation, to H Wales Lines Co., 134 State St, Meriden. About $100,000. Noted April 1.

★**Conn., South Manchester**—School—St. James Roman Catholic Society, 896 Main St., let contract building 2 story, 76 x 126 ft., brick and steel, rein.-con. flooring, concrete foundation, to T. J. Gorman, 75 Linden St. About $100,000. Noted April 15.

★**N. Y., Jamaica**—School—C. B. J. Snyder, archt. and engr., Municipal Bldg., New York City, let contract building P. S. 50, on 101st and Liberty Aves., here, to Putnam Constr. Co., 271 Ft. Washington Ave., New York City. About $605,000. Noted May 6.

★**N. Y., Long Island City**—Studio—Municipal Studio Corp., 41st St. and Bway., New York City, will build 200 x 600 ft., rein.-con. and steel, rein.-con. flooring, concrete foundation, on Pierce, 8th, 9th and Washington Sts., here. About $2,000,000. Work will be done by day labor under supervision of De Rosa & Pereira, archts. and engrs., 110 West 40th St., New York City.

★**N. Y., New York**—Hospital—Knickerbocker Hospital, 131st St. and Amsterdam Ave., will build 8 story, 141 x 201 ft., brick, steel and stone, concrete foundation, on Convent Ave. and 130th St. About $1,250,000. Work will be done by day labor under supervision of J. Oakman, archt. and engr., 345 5th Ave. Noted April 29.

★**N. Y., New York**—Office—Severence & Van Allen, 111 East 40th St., will build 16 story, 60 x 126 ft., brick, steel and stone, concrete foundation, on 41st St. and Lexington Ave. About $500,000. Work will be done by day labor.

★**N. Y., New York**—Office—Seventy Five Maiden Lane Corp., c/o A. F. Gilbert, archt. and engr., 80 Maiden Lane, let contract building 12 story, brick, steel and stone, concrete foundation, at 73-79 Maiden Lane, to F. T. Ley, 19 West 44th St. About $1,200,000.

★**N. Y., New York**—Office—Astor Estate, 23 West 26th St., let contract converting 14 story brick and steel hotel into office, on 42nd St. and Bway., to M. Eidlitz, 30 East 42nd St. About $500,000.

N. J., Hoboken—School—Bd. Educ. received bids for general contract building P. S. 2, on 9th St., between Garden St. and Park Ave., from W. H. and F. W. Kane, 233 Bway., New York City, $1,599,900, J. Jewkes, 676 Montgomery St., Jersey City, $1,634,000, J. Whalen, Hoboken, $1,657,000; heating and ventilating, from J. A. Cooneyman, Harrison, $112,494, J. A. Marnell, 207 Washington St., $115,731, Gillis & Geoghan, 537 West Bway., New York City, $117,000; electrical work, from W. Coleman, Jersey City, $20,500, Ryan & Duppel, New York City, $23,768, Badaracco Bros., 155 5th Ave., $27,950. Noted April 15.

★**N. J., Moorestown**—Theatre—Criterion Co. let contract building 1 story, 50 x 140 ft., concrete, brick and steel, to J. S. Rogers, Drexel Bldg. About $100,000.

★**Pa., New Castle**—School—Bd. Educ. let contract building auditorium and additions to Lincoln and Garfield Schools, to W. H. Chambers & Son, Canton, O. About $125,000.

★**Pa., Phila.**—Office—Bell Telephone Co. of Pennsylvania, 1230 Arch St., let contract building 5 story, 75 x 100 ft., brick and limestone, on Rockland and Broad Sts., to Irwin & Leighton, 126 North 12th St. Cost to exceed $100,000.

★**Md., Baltimore**—Community—L. Levi, archt., 1408 Munsey Bldg., let contract to W. C. Richter, 38 South Liberty St., for 4 story, 40 x 150 ft., concrete and brick, concrete foundation, at 1914 Madison Ave., for Madison Ave Hebrew Congregation. About $100,000. Noted April 29.

★**Md., Baltimore**—Office—Bailey Building Co., Munsey Bldg., let contract building 25 story, 75 x 100 ft., concrete, brick, steel and stone, concrete flooring, concrete foundation, on Lexington and Calvert Aves., to Norton, Bird & Whitman, 616 Munsey Bldg. About $2,500,000. Noted April 15.

W. Va., Huntington—School—Bd. Educ. received lowest 3 bids May 3, building addition to Sims School, from C. H. Smith, Robison-Prichard Bldg., $107,000; V. E. Taylor, Huntington, $135,000; King Lumber Co., Huntington, $245,000. Noted Jan. 29.

★**Ga., Savannah**—Exhibit, etc.—Tri State Fair Assn. let contract constructing three 100 x 200 ft. and six 250 x 250 ft. exhibit buildings and five 30 x 72 ft. barns, concrete and timber, also 60 x 400 ft. grandstand, steel and concrete, to Tri State Fair Co. Inc. About $350,000, cost plus percentage basis.

★**O., Cleveland**—Commercial—Hausheer-Sloan Co., Sloan Bldg., let contract building 12 or 16 story, 130 x 190 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 18th St. and Euclid Ave. About $500,000. Architect's name withheld.

O., Cleveland—Hall—City received bids April 30, for exterior brick work on 4 story, 180 x 420 ft., fireproof (now under construction), on East 6th St. and St. Clair Ave., from Natl. Concrete Fireproofing Co., Citizens Bldg., $485,000; Central States Constr. Co., Citizens Bldg., $761,000. Total cost, $2,500,000. Noted April 22.

O., Cleveland—School—Bd. Educ. received bids May 3, for masonry work on 1 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 92nd St. and Parkgate Ave., from C. Peterson Co., 4500 Euclid Ave., $258,404, H. F. Juergens, Clarence Ave., Lakewood, $325,000; carpentry, J. Moore, Lennox Bldg., $192,795. Noted April 15.

★**Mich., Detroit**—Fire Alarm Station—Bd. Fire Comrs., Larned and Shelby Sts., let contract building 2 story, 55 x 109 ft., rein.-con., brick, steel and terra cotta, rein.-con. flooring, concrete foundation, on Macomb and Antoine Sts., to Bryant & Detwiler Co., Dime Bank Bldg., $162,987. Noted May, 6.

Buildings (Continued)

★**Ill., Chicago** — Theatres — Selwyn Theatre Corp., c/o C. W. and G. L. Rapp, archts., 190 North State St., let contract building two 1 story, 85 x 100 ft., on Dearborn and Lake Sts., to Longacre Eng. & Constr. Co., 127 North Dearborn St. About $600,000 each.

★**Wis., Milwaukee**—Convent—E. Brielmaier & Sons, archts., University Bldg., let contract to Amer. Contg. Co., 198 Milwaukee St., building 3 story, 15 x 40 ft. and 66 x 85 ft., rein.-con. and brick addition, rein.-con. flooring, concrete foundation, for St. Mary's Convent, 35th and Center Sts. About $100,000. Noted April 22.

★**Ia., Maynard** — School — Bd. Educ. let contract building 2 story, 90 x 148 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to Currie-Simpson Constr. Co., Waterloo, $139,798. Noted April 15.

★**Ia., Sioux City**—Church—St. Joseph's Roman Catholic Church let contract building church to Guarantee Const. Co., Sioux City. About $100,000.

Minn., Mankato—Dormitory—State Bd. Control, St. Paul, received bids April 27, building 3 story, 50 x 100 ft., rein.-con. and brick, at Normal School, here, from J. C. Nelson, Mankato, $96,787; E. Carlson, Mankato, $98,316; R. J. Cheney & Co., 716 11th Ave., Minneapolis, $102,811. Noted March 4.

★**Minn., Minneapolis**—Sales—Northwestern Auto Intelligence Assn., Soo Line Bldg., let general contract for 2 story, 132 x 165 ft., rein.-con. and brick, on 4th Ave. and 5th St., to Albinson Constr. Co., 1214 Marquette St. About $145,000; cost plus percentage basis.

Minn., Minneapolis—Schools—Bd. Educ. received bids May 3, building (a) Miles Standish School, 2 story, 75 x 220 ft., rein.-con. and brick, on 22nd Ave., S. E., and 40th St., (b) Minnehaha School, 2 story, 75 x 210 ft., rein.-con. and brick, on 31st St. and 29th Ave., (c) Louis Agassiz School, 2 stor 75 x 200 ft., rein.-con. and brick, on Harriet Ave. and 38th St., (1) general contract, (2) heating and ventilating, (3) plumbing, from Madsen Constr. Co., 848 Builders Exch., (a1) $244,760, (c1) $224,600; Madsen & Petersen, 646 Builders Exch., (a1) $248,900, (b1) $233,000; F. N. Hegg, 2942 Nicollet Ave., (a1) $261,142; H. Kelly & Co., 925 Plymouth Bldg., (a2) $49,349, (b2) $47,140, (c2) $49,200; Bjorkman Bros., 712 South 10th St., (a2) $49,808, (a3) $16,868, (b2) $44,942, (c2) $46,938, (c3) $15,240; C. E. Hasey, 300 Builders Exch., (a3) $15,660, (b3) $12,280, (c3) $14,400; H. O. McMillan, 2 5th St., S. E., (b1) $226,329; J. & W. A. Elliot, 906 Lumber Exch., (b1) $229.937, (c1) $232,925; Western Heating Co., 13 East 36th St., (b3) $12,185; S. M. Karlquist & Son, 747 Security Bldg., (c1) $227,886. Noted April 22.

★**Ark., Morrilton** — College—Arkansas Christian College let contract building 3 story, 140 x 140 ft., brick and concrete, to Stewart & Russell, Conway. About $150,000.

★**Col., Boulder** — College — University of Colorado will build 3 story, 50 x 275 ft., concrete and stone. Work will be done by day labor.

★**Idaho, Jerome**—School—Bd. Educ. let contract building 2 story, 200 x 200 ft., brick and concrete, to W. C. Reed, Twin Falls. About $110,000.

★**Ariz., Jerome**—Hospital—United Verde Extension Mining Co. let contract building 2 story, rein.-con. and hollow tile, rein.-con. flooring, to W. Simpson Co., Marsh-Strong Bldg., Los Angeles, Cal. About $145,000. Noted Dec. 18

Cal., Long Beach—Y. M. C. A., 121 Locust St., received bids building 5 story, rein.-con., brick and steel, concrete foundation, on American Ave., from J. D. Sherer, 1466 West First St., $197,000; C. T. McGrew, 1345 West Ocean Ave., $207,000; C. A. Reed, Long Beach, $209,995.

★**Cal., Norwalk** — Hospital — State Bd. Control, Sacramento, will construct additions to State Hospital, here, to include 2 story, brick and rein.-con. building to be used as dining room and officers quarters, cost $45,000; new administration building, $40,000, also 2 new building for housing patients, $75,000 each, brick, rein.-con. flooring and foundation. Work will be done by day labor

★**Ont., Saulte Ste. Marie**—Theatre—Famous Players Co., Temple Bldg., Toronto, let contract building brick and steel, concrete flooring and foundation, to Norman McLeod, Kent Bldg., Toronto. About $150,000.

Federal Government Work

PROPOSED WORK

Me., Ft. McKinley—Steel Hangar, Generator Building, etc.—Constr. Div., War Dept., Wash., D. C., having plans prepared and soon receives bids constructing, here. About $87,000.

Me., Ft. Williams—Steel Hangar, Generator Building, etc.—Constr. Div., War Dept., Wash., D. C., having plans prepared and soon receives bids constructing here. About $86,000.

N. H., Portsmouth—Monitor Roof—Spec. 4162 Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids dismantling part of present roof and building monitor roof, 13 ft. 9 in. wide, 7½ ft. high and 93½ ft. long, on roof of engine room Bldg. 72, at Navy Yard, here. About $4,500; $10 deposit required for plans and spec. Noted April 1.

Mass., Ft. Andrews—Steel Hangar, Generator Building, etc.—Constr. Div., War Dept., Wash., D. C., having plans prepared and soon receives bids building, here. About $59,000.

Mass., Ft. Nahant—Officers Quarters, etc.—Constr. Div., War Dept., Wash., D C., having plans prepared and soon receives bids building quarters, storage plant, barracks, steel hangar, garage, water and sewerage systems, grading, clearing and generator house, etc. About $271,000.

N. Y., Ft. Hancock—Steel Hangar and Generator—Constr. Div., War Dept., Wash., D. C., having plans prepared and soon receives bids constructing, here. About $80,000.

N. Y., Ft. H. G. Wright—Steel Hangar, Generator Building, etc.—Constr. Div., War Dept., Wash., D. C., having plans prepared and soon receives bids building, here. About $59,000.

N. Y., Ft. Terry—Steel Hangar, Generator Building, etc.—Constr. Div., War Dept., Wash., D. C., having plans prepared and soon receives bids constructing, here. About $61,000.

N. Y., Ft. Tilden—Steel Hangar, Generator Building, etc.—Constr. Div., War Dept., Wash., D. C., having plans prepared and soon receives bids constructing, here. About $66,000.

Pa., Phila.—Fence and Gates—Spec. 4187—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids building at Hospital Reservation, Navy Yard, here; $10 deposit required for plans and spec.

D. C., Wash.—Crane Runway—Spec. 4174—Bureau Yards & Docks, Navy Dept., soon receives bids building on existing foundations about 213 ton structural steel to form extension to existing Gun Park crane runway, at Navy Yard. Abou $4,400; $10 deposit required for plans and spec.

Va., Ft. Monroe—Bombproof Switchboard Building and Cover—U. S. Engr. Office, Custom House, Norfolk, rejected bids received April 20, constructing bombproof switchboard building and bombproof cover for mining casemate, here. Noted March 25.

Va., Hampton—Steel Hangar—Constr. Div., War Dept., Wash., D. C., having plans prepared and soon receives bids building 53 x 64 x 120 ft. observation balloon hangar, at Langley Field, here.

Va., Yorktown—Water Supply and Fire Protection System — Spec. 4190 — Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install, here. About $135,000.

S. C., Charleston — Radio Tower with Foundation—Spec. 4149—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids building 300 ft. steel tower on wood pile and concrete foundations, at Navy Yard, here. About $17,000; $10 deposit required for plans and spec. Noted March 11.

Tex., Ft. Worth—Cylinder Storage Building—Spec. 4142—Bureau Yards & Docks, Navy Dept., Wash., D C., soon receives bids constructing 1 story, 187 x 430 ft., wood frame building, with 20 x 35 ft. extension, concrete foundations, at U. S. Helium Production Plant, here; $10 deposit required for plans and spec.

Wash., Ft. Casey—Steel Hangar and Storage Building—Constr. Div., War Dept., Wash., D. C., having plans prepared and soon receives bids constructing, here. About $78,000.

Wash., Ft. Worden—Steel Hangar, Generator Building, etc.—Constr. Div., War Dept., Wash., D. C., having plans prepared and soon receives bids constructing, here. About $79,600.

Wash., Puget Sound—Auxiliary Equipment and Piping—Spec. 4179—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids furnishing and installing surface condenser, wet vacuum pump, new oil filter pump, piping and appurtenances for 6,500 c.f.m. reciprocating air compressor in power plant, at Navy Yard, here. About $60,000; $10 deposit required for plans and spec. Noted April 29

Wash., Puget Sound—Steel Storage Building—Spec. 4168—Bureau Yards & Docks Navy Dept., Wash., D. C., plans to construct, here.

Cal., Ft. Barry—Steel Hangar and Storage Building—Constr. Div., War Dept., Wash., D. C., having plans prepared and soon receives bids constructing, here. About $63,000.

Cal., Ft. Winfield Scott—Steel Hangar, Generator, etc.—Constr. Div., War Dept., Wash., D. C., having plans prepared and soon receives bids constructing, here. About $63,000.

Cal., Mare Island — Heating Systems—Spec. 4189—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install, in structural shop, here. About $60,000.

Cal., San Diego—Bakery Equipment—Spec. 4192—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install, here. About $17,000.

Cal., San Diego—Laundry Equipment—Spec. 4191—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install, at Marine Corps Base, here. About $17,000.

Cal., San Diego—Refrigerating Plant—Spec. 4193—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build at Marine Corps Base, here. About $50,000.

H. T., Kuahua—High Pressure Air Line—Spec. 4185—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $10,000.

P. R., Loiza—Tower and Service Connections—Spec. 4194—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to construct at radio building, here. About $110,000.

BIDS DESIRED

Mass., Boston—Dredging—Until June 10 by U. S. Engr. Office, Customhouse, dredging in Malden River; advertised in this issue.

N. Y., Stapleton—Laundry—Until June 1, by Treas. Dept., Wash., D. C., furnishing (1) labor and (2) material (except mechanical equipment), building laundry, at U. S. Marine Hospital, here. J. A. Wetmore, superv. archt.; advertised in this issue.

N. Y., Stapleton—Mechanical Equipment—Until June 1, by Treas. Dept., Wash., D. C., furnishing mechanical equipment for laundry at U. S. Marine Hospital, here. J. A. Wetmore, superv. archt.

N. Y., Tompkinsville—Buoys—Until May 18, by Supt. of Lighthouses, for 20 steel buoys with skeleton steel superstructure.

N. Y., Tompkinsville—Oil Storage Tanks—Until May 21, by Supt. of Lighthouses, for 9 steel riveted cylindrical oil storage tanks, none larger than 1,500 gal. capacity.

Md., Baltimore — Riprap Stone — Until May 18, by Supt. of Lighthouses, furnishing and placing riprap stone at Maryland Point Light Sta.

D. C., Wash.—Bridge—Until May 20, at office of Chief of Engrs., U. S. Army, Munitions Bldg., building steel sectional military bridge of high strength steel.

Fla., St. Petersburg—Operating Buildings and Quarters—Spec. 4183—Until June 2, by Bureau Yards & Docks, Navy Dept., Wash., D. C., constructing, at Naval Radio Sta., here; $10 deposit required for plans and spec. Noted May 6.

Tenn., Memphis — Steel Derricks—Until May 25, by Mississippi River Comn., 1st and 2nd Dists., Customhouse, furnishing and delivering 3 steel derricks; advertised in this issue.

N. D., Ft. Yates—Improving Water System—Until June 14, by Dept. of Interior at office of Indian Affairs, Wash., D. C., improving water system, at Standing Rock Agency, here.

Tex., Brooks Field—Steel Hangar—Until June 1, by Chief of Constr. Div., Room 1241, 7th and B Sts., Wash., D. C., building 125 x 270 ft steel frame hangar, here, advertised in this issue.

Federal Government Work (Continued)

Tex., Ft. Bliss—Hospital—Until May 31, by Constr. Div. Quartermaster Corps, building hospital, to include electric wiring, sewerage system, central heating plant, etc.

Ariz., Yuma—Earthwork—Until June 3, at office of U. S. Recl. Serv., for earthwork, at 1st Mesa Unit, Yuma Auxiliary Project, 8 mi. south of here and 4 mi. east of Somerton, involving 93,000 cu.yd. excav.; advertised in this issue.

Cal., Mare Island—Electrify Causeway and Transfer Yard—Spec. 4188—Until May 19, by Local Navy Yard, electrifying railroad track on Vallejo-Mare Island causeway and transfer yard.

Cal., San Francisco—Air Seacoast Defense Station—Until June 14, by I. L. Fredendall, Lieutenant Colonel, Quartermaster Corp, Ft. Mason, building at Presidio and Ft. Mason, here. About $1,000,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Pa., Phila.—Power Plant Piping—Spec. 4161—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract changing at quartermaster Depot, Bldg. "C", here, to W. M. Anderson, 600 Schuykill Ave., $2,860 (75 days). Noted April 8.

★Va., Yorktown — Buoys—Spec. 4068 — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract furnishing 4 mooring buoys, for Fuel Oil Sta., here, to Mansfield & Savage, 135 William St., New York City, $9,991 (120 days). Noted May 6.

★O., Cleveland—Dredging—U. S. Engr. Office, Federal Bldg., let contract dredging and removing wharf, in Huron Harbor, to Great Lake Dredge & Dock Co., Williamson Bldg., $24,191. Noted March 25.

Wash., Keyport—Storehouses, Garage and Quarters — Spec. 4048 — Bureau Yards & Docks, Nevy Dept., Wash., D. C., received lowest 3 bids, April 28, building war head and torpedo storehouses, garage and quarters for officers at Naval Torpedo Sta., here, from Colon, Martin & Wills, $109,913 (208 days); J. H. Dirkes & Co., $121,464 (210 days); J. Larson & Co., $128,777 (180 days). Noted April 1.

★Oregon—Bridge—Bureau Pub. Rds., 304 Post Office Bldg., Portland, let contract building 220 ft. bridge, single span, open spandrel, rein.-con. arch and abutments with concrete girder approaches, in Umpqua Natl. Forest, Douglas Co., to Stebinger Bros., Worcester Bldg., Portland, $28,591.

Cal., San Diego—Laundry, Bakery and Refrigerating Equipment — Spec. 4114 — Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids April 28, furnishing at U. S. Marine Corps base, here, (1) work complete, from T. Haverty & Co., 801 Maple St., Los Angles, (1) $107,850 (190 days), (2) $31,900, (3) $28,700, (4) $47,250, (5) deduct $350, (8) add $50, (9) $1,000, (10) deduct $325; York California Constr. Co., 308 Boyd St., Los Angles, (4) $49,200 (180 days), (10) deduct $315. Noted April 15.

Alaska, Ketchikan — Power House and Dormitory—Spec. 4143—Pub. Wks. Office, Puget Sound, Wash., received bids May 1, building power house and wood frame dormitory on concrete foundation, at radio sta., here, (1) work complete, from Brown & Sales, (1) $23,458, (2) $1,420 (120 days); N. Fleiniss, (1) $25,748, (2) $1,850 (140 days); Alaska Constr. & Eng. Co., (1) $26,220, (2) $2,308 (140 days).

Miscellaneous

PROPOSED WORK

Park Improvements—Bridgeport, Conn.—Bd. Park Comrs. plans to improve Seaside, Beardsley and Beechwood Parks. About $50,000.

Grain Elevators—Buffalo, N. Y.—See "Inlustrial Works."

Underground Service Connection — Central Islip, N. Y.—State Hospital Comn., Capitol, Albany, soon receives bids building underground service connections, for laundry, to include 2 turbine driven pumps, 1 feed water, two 5 x 10 x 12 ft. return tanks, etc., at State Hospital, here. About $225,000. L. F. Pilcher, state archt.

Dam — Chateaugay, N. Y. — High Falls Pulp & Paper Co., Paper Mill Rd., plans to build concrete dam on Lower Chateaugay Lake. Cost between $150,000 and $200,000.

Flood Protection—Mohawk, N. Y.—Village Bd. has petitioned State Legislature, Albany, to appropriate $25,000 to improve Fulmer Creek, for flood protection here.

Swimming Pool—Niagara Falls, N. Y.—Bd. Pub. Wks. plans to build concrete swimming pool. About $50;000.

Dike—St. Louis, Mo.—Bd. Pub. Serv. plans to reconstruct 1,575 ft. Homers Dike at chain of Rocks Dumping Sta., rock and timber. About $75,000. J. A. Hooke, City Hall, water comr.

Dam and Hydroelectric Plant—Farmington, Utah—See "Excavation and Dredging."

Subways, Culverts and Ornamental Lights—Tucson, Ariz.—City election May 15, to vote on $80,000 bonds to build two rein.-con. subways, on Stone and 6th Aves., $75,000 for concrete culverts and $35,000 for ornamental street ligting system. L. O. Cowan, clk.

Transmission Line — San Francisco, Cal.—See "Industrial Works."

Water Meters—Ottawa, Ont.—City soon recives bids furnishing water meters. About $25,000. A. F. Macullum, city engr.

BIDS DESIRED

Fire Alarm System—Brockport, N. Y.—Until May 17 (change of date), by Bd. Trustees, furnishing and installing automatic telegraph fire alarm system. C. H. Ross, clk.; advertised in this issue. Noted April 29.

Equipment and Tanks—Buffalo, N. Y.—J. T. Walsh, Brisbane Bldg., receiving bids for contractors equipment and tanks.

Stairs and Wire Enclosures—Dannemora, N. Y.—Until May 20, by J. R. Ross, medical supt., Dannemora State Hospital, for stairs and wire enclosures for northwest wing, Ward Bldg. "D"; advertised in this issue.

Sheds—Stapleton, S. I., N. Y.—Until May 27, by M. Hulbert, comr. docks, Pier "A," foot of Battery Pl., New York City, building sheds on Piers 12, 13, 15, 16, 17 and 18, here. About $2,500,000.

Paving Plant, etc.—New York, N. Y.—Until May 18, by H. H. Curran, pres. Manhattan Boro., building plant for crushing, melting and mixing old asphaltic material and altering present elevator at asphalt plant, on 90th St. and East River.

Power Plant Equipment—Allentown, N. J.—Until May 24, by Boro. Council, furnishing producer, gas engine, generator, switchboard, piping, etc., for gas producer-electric power plant; advertised in this issue.

Bricks—Phila., Pa.—G. Taylor, maintenance of way engr., Phila. Rapid Transit, 810 Dauphine St., receiving bids for 150,000 paving bricks, 3 x 8 x 9 in. with lugs or 3 x 4 x 8½ in. vertical fiber brick without lugs, f.o.b. Phila.

Power Plant Equipment—Kinston, N. C.—Until May 18 (change of date), by J. Dawson, mayor, and City Council, for power plant equipment. W. B. Coleman, clk. W. C. Olsen, Sumter, S. C., consult. engr.; advertised in this issue. Noted April 15.

Power Equipment—East Cleveland, O., (Cleveland P. O.)—Until May 24, by Bd. Educ., furnishing two 300 hp. boilers and piping for boiler house, also building brick stack. Cost to exceed $25,000. C. Ammerman, Williamson Bldg., Cleveland, clk. Bishop & Babcock, East 55th St., Cleveland, engrs.

Scenic Railway — Detroit, Mich. — Until June 15, by Ingersoll & McKee, Jefferson Ave., furnishing labor for building 1 mi. scenic railway, in Riverview Park. W. H. Adams, Vinton Bldg., ch. engr. Noted April 1.

Laying Gas Mains—Duluth, Minn.—Until May 27, by G. P. Phillips, comr. Duluth Water & Light Dept., laying gas mains from here to Morgan Park, involving 2,700 cu.yd. earth excav. and 9,000 lin. ft. 8 in. steel pipe. Cost $28,184. E. K. Coe, city engr.

Outlet—Oxnard, Cal.—Oxnard D. D. received bid building ocean outlet of two 5 ft. corrugated iron pipes, each 800 ft. long, carried into ocean on rein.-con. piles, from W. Ledbetter Co., Pacific Electric Bldg., Los Angeles, $96,328. Noted April 15 under "Excavation and Dredging."

Tractor, Elevating Grader and Dump Wagons—Wadena, Minn.—Until May 26, by E. Ross, aud. Wadena Co., furnishing 1 tractor, 25 to 40 hp. on draw bar, elevating graders of both sizes, and 8 dump wagons, 1½ cu.yd. capacity. E. Ward, city engr.

Transmission Line, etc.—Haven, Kan.—Until May 20, by G. H. Thorp, city clk., building distribution system and 14 mi. transmission line to Burrton. About $25,000. W. B Rollins, 209 Ry. Exch. Bldg., Kansas City, Mo., engrs.

Breakwaters, Buoys, etc.—St. Pierre, N. F.—Until May 15, by P. Adam, engr., St. Pierre, building (1) 2 breakwaters, each 1,200 yd. long, comprising 200,000 cu.yd. masonry; (2) dredging port of St. Pierre, 50,000 cu.yd. dirt, sand and gravel and 1,000 cu.yd. rock; (3) constructing pier, fog horns, gas buoys, bell buoys and whistling buoys; (4) furnishing one 500 hp. and four hp. boilers, one 25 ft. hp. dredge, 2 garages capable of 150 cu.yd. each, 1 floating crane of 60 ton and 1 water boat of 60 ton; (5) furnishing material for repairing boats, 15 mooring buoys, 20 dead buoys, chains and anchors, 500 ton. About $5,000,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Grain Elevator—Milwaukee, Wis.—See "Industrial Works."

★Gravel Screening and Loading Plant—Minneapolis, Minn.—Hennepin Co. let contract furnishing 1 portable gravel screening and loading plant, to Russel Grader Co., 1005 University Ave. About $1,624. Noted March 18.

★Seawall, Etc.—Boston, Mass.—City let contract building 1,350 ft. concrete seawall and back fill, on Albany St., to W. S. Rendle, 364 Border St., East Boston, $200,823. Noted April 29.

★Guide Walls — Marbletown, N. Y. — Bd. Water Supply, Municipal Bldg., New York City, let contract building masonry guide walls and doing miscellaneous work at Ashokan Spillway, here, to H. E. Fox, 81 East 125th St., New York City, $85,755. Noted May. 6.

★Lumber—New York, N. Y.—Bd. Purchase, Municipal Bld., let contract furnishing for various departments, to East River Mill & Lumber Co., 92nd St. and East River, $38,412. Noted April 29.

★Pier, etc.—New York, N. Y.—M. Hulbert, comr. docks, Pier "A," foot of Battery Pl., let contract altering pier and freight shed at foot of 5th St., East River, to Associated Contractors Corp., 17 West 42nd St., $122,790. Noted May 6.

★Steel—Detroit, Mich—Ingersoll & McKee, Jefferson Ave., let contract furnishing 425 ton steel for scenic railway, in Riverview Park, to East Side Iron Wks., Jefferson Ave., and Kellogg Structural Steel Co., 31 Stone St., Buffalo, N. Y. Noted April 1.

★Road Materials—St. George, S. I. N. Y.—C. D. Van Name, pres. Richmond Boro., let contract furnishing and delivering 35,000 wood paving blocks, to Amer. Creosoting Co., 17 Battery Pl., New York City, $3,674; 10,000 paving brick and 2,500 asphalt blocks, to C. Vanderbilt, Port Richmond, $880 and $675 respectively. Noted April 29.

★Tractor—St. George, S. I., N. Y.—C. D. Van Name, pres. Richmond Boro., let contract furnishing and delivering 1 automobile tractor and 2½ ton motor truck, to G. B. Hall, 320 Clove Rd., West New Brighton, $3,400 and $3,175 respectively; 5 ton motor truck, to White Co., Madison Ave. and 45th St., New York City, $5,177; Sedan automobile, to Richmond Garage, 163 Richmond Ave., West New Brighton, $1,685. Noted April 29.

★Trailers—Kenosha, Wis.—City let contract furnishing 4 reversible trailers for garbage collection, to Lee Loader & Body Co., 2343 South La Salle St., Chicago, Ill., $2,000 each. Noted April 22.

★Asphalt Plant—Phila., Pa.—City let contract building asphalt plant along bank of Schuylkill River near South St. Bridge, to Barber Asphalt Co., Land Title Bldg., $46,000. Noted April 8 under "Streets and Roads."

★Foundation — Ottawa, Ont. — Salvation Army, James and Albert Sts., let contract for excavating and building foundation for hospital, to G. A. Crain, 178½ Nepean St. Total cost $150,000.

★Foundation—Lorain, O.—Bd. Educ. let let contract building concrete and brick foundation for 1 story, concrete, steel and brick school, rein.-con. flooring, on East 4th and Hamilton Sts., to Drummond-Miller Co., 4500 Euclid Ave., Cleveland, $70,000. Noted Jan. 15 under "Buildings."

★Coal Storage and Conveyor System — Detroit, Mich.—Scheiwe Coal & Coke Co., 630 Mack Ave., let contract building 200 x 200 ft. coal storage and conveyor system, with 40 x 192 ft. pockets, rein.-con., rein.-con. flooring, concrete foundations, to J. F. Dayton, 979 McKinley Ave. Noted Feb. 26.

OFFICIAL PROPOSALS

Bids: May 24.

Construction of Bridge

Danville, Ill.

Sealed bids will be received by the City Council of Danville, Illinois, at the clerk's office up to 7 p.m., May 24, 1920, for the construction of a bridge over the Vermilion River. The work will be let under one contract. The bridge will be of reinforced concrete and will consist of six arch spans varying in length from about 108 feet to about 196 feet, and seven approach girder spans each about 31 feet long, the entire structure being about 1,038 feet long between abutments. The bridge provides for a 30-foot roadway and two 7-foot clear sidewalks. Pavement and approach embankments are not included in contract. Approximately 300 tons of reinforcing and miscellaneous metal, and 7,000 cubic yards of concrete will be required. Bids shall be accompanied by a certified check made payable to the order of the City Council of Danville, Illinois, for Ten Thousand Dollars ($10,000), to be forfeited as liquidated damages in case the bidder who is awarded the contract fails to execute the contract and give a satisfactory bond for fifty per cent of the contract price within twenty (20) days after the award. Contract will be awarded to the lowest responsible and competent bidder, but the Council reserves the right to reject any and all bids and to waive informalities.

Plans and specifications are now on file in the office of Harlan H. Edwards, City Engineer, Danville, Illinois, and in the offices of Harrington, Howard and Ash, Consulting Engineers, Kansas City, Mo. Copies of the plans and specifications may be secured from the Consulting Engineers by depositing $15. When such plans and specifications are returned $10 will be refunded

By order of the City Council

L. S. FRANKEBERGER,
City Clerk.

Bids: June 7

Construction of Bridges

Florence, Ariz.

Bids for Bridge work referred to herein will be received at the office of the County Highway Commission at Florence, Arizona, until 2 p.m. o'clock on the seventh day of June, 1920, at which time and place the bids will be publicly opened and read.

The right is reserved to reject any and all bids, and none will be considered except those from contractors ascertained to be experienced and responsible.

Description of work: furnishing plans and the construction of two reinforced concrete bridges across Mineral Creek, Ray-Kelvin Highway. Each structure to be 150 feet clear opening, single arch.

Profile, topographical maps and specifications for the above proposed work are on file and may be seen at the office of the County Highway Commission, and may be secured from the Highway Engineer for the sum of $10.00.

All proposals must be made on the forms and in accordance with instructions, forming a part of the specifications above referred to.

E. G. DENTZER,
Secretary Highway Commission

The publication of an advertisement on this page is an official notice that bids are wanted from other than local bidders.

It is also a guarantee that maximum competition is invited because Engineering News-Record is the *one* nationally recognized medium for Proposal advertising. Its Searchlight Section is read each week by nearly every worth-while contractor in this country who bids on public work outside his own city.

Official Proposals reaching our office in first mail Wednesday morning (9 o'clock) can usually be published in the issue out the next day. Special price for Official Proposals, 40 cents a line.

Bids: May 26.

Construction of State Highways

Dover, Del.

Sealed proposals will be received by the State Highway Department, at its office, Dover, Delaware, until 2 o'clock p.m., May 26, 1920, and at that place and time publicly opened, for the construction of 4.12 miles State Highway in Kent and New Castle Counties, Delaware, involving the following approximate quantities:

CONTRACT NO. 24

Through Town of Frederica 1.19 Miles

4,100	cu.yd. excavation.
86,000	cu.yd. borrow.
40	cu.yd. class "A" masonry.
1,200	lb. reinforcement.
60	feet 15 in. R. C. pipe.
80	feet 18 in. R. C. pipe.
34	feet 36 in. R. C. pipe.
1,000	feet B. M. sheet piling.

CONTRACT 34

Tybout's Corner—Hare's Corner 2.93 Miles

5	squares clearing.
5	squares grubbing.
5	squares stripping.
17,500	cu.yd. excavation.
1,500	cu.yd. borrow.
1,200	cu.yd. screening.
3,000	tons "broken stone base" course.
6,310	cu.yd. concrete roadway.
175	cu.yd. class "A" masonry.
80	cu.yd. class "B" masonry.
13,500	lb. reinforcement
120	linft. 15 in. R. R. pipe
160	lin.ft. 18 in. R. C. pipe.
130	lin.ft. 24 in. R. C. pipe.
60	lin.ft. 30 in. R. C. pipe.
200	lin.ft. relaid pipe 18 in. and under.
5,000	ft. 4 in. underdrains.
3,000	sq.yd. concrete gutter.
30	monuments.
6,000	ft. B. M. sheet piling.

Performance of contract shall commence within ten (10) days after execution of the contract and be completed on or before December 31, 1920.

Monthly payments will be made for 90 per cent of the construction completed each month.

Bidders must submit proposals upon forms provided by the Department.

Each proposal must be accompanied by a surety bond, certified check, or money to the amount of at least ten (10) per cent of the total amount of the proposal.

The envelope containing the proposal must be marked: "Proposal for the Construction of a State Highway under Contract No. 24 or 34.

The contract will be awarded or rejected within twenty (20) days from the date of opening proposals.

The right is reserved to reject any or all bids.

Detailed plans may be seen, and index plans and specifications may be obtained upon deposit of ten dollars ($10) which amount will be refunded upon return of plans and specifications in good condition at the office of the State Highway Department, Dover, Delaware

CHARLES M. UPHAM,
Chief Engineer.

Bids: May 17.

Stone Faced Reinforced Concrete Bridge

BRONX PARKWAY COMMISSION

Bronxville, N. Y.

Sealed bids for the construction of a stone-faced reinforced-concrete arched bridge in the Parkway Drive over the Bronx River, south of Woodland Place, White Plains, New York, will be received by Bronx Parkway Commission at its office, West Pondfield Road, Bronxville, N. Y., until 11:30 A.M., May 17, 1920.

The span length of the arch will be 52 feet 6 inches and the clear width of the roadway between curbs will be 40 feet.

Pamphlets containing information for bidders, form of proposal, specifications and contract drawings will be issued to intending bidders, at the above address and may be obtained by depositing $5.00 for each set of pamphlets.

BRONX PARKWAY COMMISSION
By JAY DOWNER,
Engineer and Secretary

Dated, Bronxville, N. Y.
April 24, 1920.

Bids: May 25.

Furnishing and Erecting Conveyors

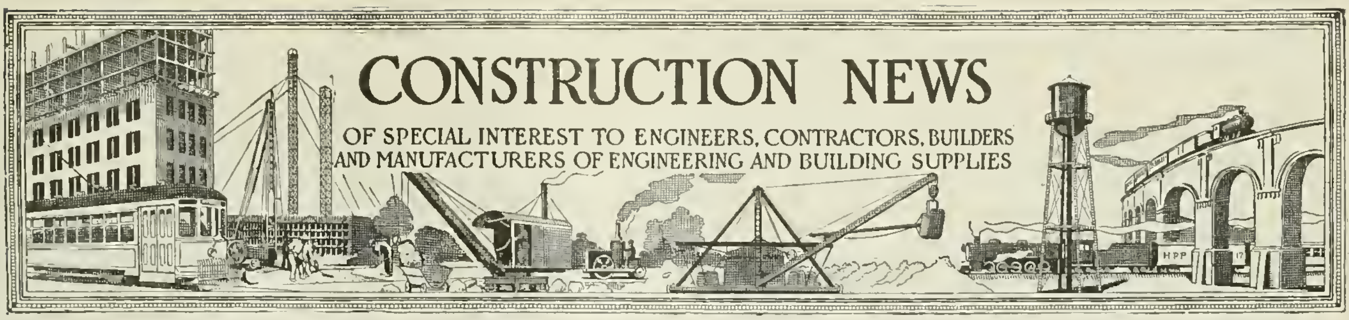
New Orleans, La.

Sealed proposals will be received by the Board of Commissioners of the Port of New Orleans, at their office, Suite 200, New Court Building, New Orleans, La., until May 25, 1920, at 8 o'clock p.m., for the furnishing and erection complete of Three Banana Conveyors for the Desire St Banana Wharf, situated on the river front at foot of Desire Street.

Specifications, plans and proposal forms and so forth are on file at the office of the Chief Engineer, Mr. Arsene Perrilliat, No 1 Canal Street, from whom full sets may be obtained upon deposit of ten dollars ($10). The same will be refunded to depositors who submit proposals and return sets in good condition.

The right is reserved to reject any or all bids.

W. O. HUDSON,
President



CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

PROPOSALS

"For proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
May 28	Gibbstown, N. J. Adv. May 6.	May 6
May 28	Shreveport, La. Adv. May 20.	May 20
May 29	Grand Forks, N. D.	May 13
June 1	Houston, Tex	Apr. 29
June 1	Elyria, O. Adv. May 20.	May 20
June 7	Haledon, N. J. Adv. May 20.	May 20

SEWERS

May 24	Haddonfield, N. J. Adv. May 13.	May 13
May 24	Detroit, Mich.	May 20
May 25	Newmarket, Ont.	May 13
May 25	Nutley (Newark P. O.), N. J.	May 20
May 27	Mandan, N. D.	May 13
May 28	Boston, Mass.	May 20
May 31	Cheyenne, Wyo. Adv. May 6.	May 6
June 1	Lock Haven, Pa.	May 13
June 1	Scarsdale, N. Y.	May 20
June 3	Milwaukee, Wis. Adv. Apr. 15 and 22.	Apr. 15
June 7	Ames, Ia. Adv. May 13.	May 13
June 7	Washington, D. C. Adv. May 13 and 20.	May 20
June 9	Ft. Madison, Ia. Adv. May 13.	May 13
June 14	Hammond, Ind. Adv. May 13 and 20.	May 13
June 15	Toledo, O. Adv. May 20.	May 20

BRIDGES

May 24	Danville, Ill. Adv. Apr. 29 to May 13.	Apr. 22
May 24	Mt. Vernon, N. Y. Adv. May 6 and 13.	May 13
May 24	Blackfoot, Idaho	May 20
May 25	Livingston, Tex.	May 26
May 26	Salt Lake City, Utah	May 20
May 28	Philadelphia, Pa. Adv. May 6 and 13.	May 6
June 1	Florence, Ariz. Adv. May 13 and 20.	May 13
June 4	Philadelphia, Pa.	Apr. 29
June 7	Florence, Ariz. Adv. May 13 and 20.	May 13
June 7	Columbus, O.	May 20
June 10	Lingle, Wyo. Adv. May 20..	May 20

STREETS AND ROADS

May 22	Pittsfield, Mass.	May 20
May 24	Brookline (Boston P. O.). Mass. Adv. May 13.	May 13
May 24	Jersey City, N. J.	May 13
May 24	Ft. Morgan, Col.	May 20
May 24	Chicago, Ill.	May 20
May 24	Cottonwood, Idaho	May 20
May 24	Detroit, Mich.	May 20
May 25	Wadena, Minn.	May 13
May 25	Columbus, O.	May 20
May 25	Newark, N. J.	May 20
May 25	Lexington, S. C.	May 26
May 25	Sterling, Col.	May 20
May 25	New York, N. Y.	May 20
May 25	Long Island City, N. Y.	May 20
May 26	Brooklyn, N. Y.	May 20
May 26	Columbus, O.	May 20
May 26	Maine Adv. May 20	May 20
May 27	Mandan, N. D.	May 13
May 27	Waycross, Ga.	May 20
May 27	Columbus, O.	May 20
May 28	Chambly, Que.	Apr. 29
May 28	Ohio	May 6
May 28	Rhode Island Adv. May 20.	May 20
May 28	Columbus, O.	May 20
May 28	St. George, S. I., N. Y.	May 20
May 28	Kenosha, Wis.	May 20
May 29	Laredo, Tex.	May 20
May 31	Arcadia, La.	Apr. 29
May 31	New Cumberland, W. Va.	May 13
May 31	St. Lambert, Que.	May 20
May 31	London, Ont.	May 20
May 31	San Angelo, Tex.	May 20
May 31	St. Joseph, Mo.	May 20
June 1	New Martinsville, W. Va.	May 6
June 1	Florence, Ariz. Adv. May 13 and 20.	May 13
June 1	Carlsbad, N. M. Adv. May 20.	May 20
June 1	Lewisburg, W. Va.	May 20
June 1	Minerva, O.	May 20
June 1	Little Falls, Minn.	May 20
June 1	Washington	May 20
June 1	Alexandria, Minn.	May 20
June 1	Detroit, Minn.	May 20
June 1	Olympia, Wash.	May 20
June 2	Mena, Ark.	May 20
June 2	Gassaway, W. Va. Adv. May 20.	May 20
June 3	Poplarville, Miss.	May 20
June 4	South Fork, Pa.	May 20
June 4	Alexandria, Minn.	May 20
June 4	Bethany, Mo.	May 20
June 7	Fayetteville, W. Va.	May 13
June 7	Red Bank, N. J. Adv. May 20.	May 20
June 7	New York Adv. May 20.	May 20
June 8	Ft. Wayne, Ind.	May 20
June 9	Freehold, N. J. Adv. May 20.	May 20
June 10	West Palm Beach, Fla. Adv. May 13.	May 13
June 10	Gainesville, Ga.	May 20
June 15	Westmount, Que.	May 6
June 15	Pennsylvania Adv. May 20.	May 20
June 15	Montgomery, Ala. Adv. May 20.	May 20
June 16	Pennsylvania Adv. May 20.	May 20
June 28	Savannah, Ga. Adv. May 13.	May 13

EXCAVATION AND DREDGING

May 28	Red Oak, Ia.	May 20
May 28	New York, N. Y.	May 20
June 2	Algona, Ia.	May 20
June 3	Boise, Idaho	May 13

INDUSTRIAL WORKS

May 24	Wakefield, Mass.	May 13
May 26	Baltimore, Md.	May 13
May 26	Cleveland, O.	May 13
May 26	New Philadelphia, O.	May 20
May 27	Cleveland, O.	May 13
May 30	Baltimore, Md.	May 13
June 1	Casper, Wyo.	May 13
June 7	Akron, O.	May 13
Sept. 1	Hutchinson, Kan.	Feb. 19

BUILDINGS

May 23	Middletown, N. Y.	Apr. 29
May 24	Bethlehem, Pa.	May 13
May 24	East Cleveland (Cleveland P. O.), O.	May 13
May 24	Chippewa Falls, Wis.	May 20
May 25	Lake Providence, La.	May 6
May 25	Detroit, Mich.	May 13
May 26	Willard, N. Y. Adv. May 6 to 20.	May 6
May 28	Beaver Falls, Pa.	May 20
May 28	Donora, Pa.	May 20
May 29	Dallas, Tex.	May 6
May 29	Frankford, W. Va.	May 13
May 29	Manitowoc, Wis.	May 20
May 31	Sheridan, Wyo.	May 20
June 1	Red Bluff, Cal.	May 20
June 1	New Orleans, La.	May 6
June 1	Conway, Ark.	May 6
June 1	Sheboygan, Wis.	May 20
June 1	Buffalo, N. Y.	May 20
June 1	Oklahoma, Okla.	May 20
June 2	Cleveland, O.	May 13
June 5	Paton, Ia.	May 13
June 5	Ansonia, O.	May 13
June 5	Naugatuck, Conn.	May 13
June 7	Columbus, O.	May 20
June 7	Linden (Columbus P. O.), O.	May 20
June 7	Loup City, Neb.	May 20
June 8	Newark, N. J.	May 20
June 9	Pittsburgh, Pa.	May 13
June 15	Harrisburg, Pa.	May 20
June 15	Harrisburg, Pa. Adv. May 20.	May 20
June 24	Rawlins, Wyo. Adv. May 20.	May 20
June 25	Newport News, Va.	May 6
July 1	Chisholm, Minn.	May 13

FEDERAL GOVERNMENT WORK

May 24	Gates and Emergency Dams —Pittsburgh, Pa. Adv. Apr. 22 to May 20.	Apr. 29
May 24	Officers Quarters and Infirmary—New Dorp, N. Y. Adv. May 6.	May 6
May 25	Rubble Mound Jetty and Pierhead, Cleveland, O. Adv. Apr. 22 to May 13.	Apr. 22
May 25	Steel Derricks—Memphis, Tenn. Adv. May 13 and 20.	May 13
May 26	Dredging — New York, N. Y. Adv. Apr. 15 to May 20.	Apr. 29
May 26	Monorail Hoists and Track Equipment—Indian Head, Md.	May 20
May 26	Turbo Generators, Exciters and Switchboards — Spec. 4169—Guam, P. I.	May 20
May 27	Emergency Dam—Detroit, Mich. Adv. Apr. 15-29.	Apr. 15
May 27	Repairing and Building Superstructure — Buffalo, N. Y. Adv. Apr. 29 to May 20.	May 6
May 27	Paving Blocks, etc. — Wash., D. C.	May 6
May 31	Hospital—Ft. Bliss, Tex.	May 13
June 1	Hydraulic Turbines, Florence, Ala. Adv. Apr. 22 to May 20.	Apr. 22
June' 1	American Portland Cement —Cincinnati, O. Adv. May 6 to 20.	May 6
June 1	Steel Hangar—Brooks Field, Tex. Adv. May 6 to 20.	May 13
June 1	Laundry—Stapleton, N. Y. Adv. May 13 and 20.	May 13
June 1	Mechanical Equipment — Stapleton, N. Y.	May 13
June 1	Motor Driven Triplex Pump —Philadelphia, Pa.	May 20
June 2	Crane Runway—Spec. 4174 —Wash., D. C.	May 20
June 2	Monitors—Spec. 4162—Portsmouth, N. H.	May 20
June 2	Radio Tower—Charleston, S. C.	May 20
June 2	Operating Buildings and Quarters—Spec. 4183—St. Petersburg, Fla.	May 13
June 3	Earthwork—Yuma, Ariz. Adv. May 13.	May 13

Bids Close		See Eng. News-Record
June 7	Dormitory — Tahlequah, Okla.	May 6
June 7	Maintenance Dredging — Providence, R. I. Adv. May 20.	May 20
June 9	Cylinder Storage Building —Ft. Worth, Tex.	May 24
June 10	Dredging—Boston, Mass. Adv. May 13 and 20.	May 13
June 14	Improving Water System— Ft. Yates, N. D.	May 13
June 14	Air Seacoast Defense Station—San Francisco, Cal.	May 13
June 15	Electric Generators, Exciters and Accessories Florence, Ala. Adv. May 6 to 20	May 6

MISCELLANEOUS

May 24	Equipment — Allentown, N J. Adv. May 13 and 20.	May 13
May 24	Power Equipment — East Cleveland (Cleveland P. O.), O.	May 13
May 25	Plumbing and Electrical Work—Philadelphia, Pa.	Apr. 22
May 25	Banana Conveyors—New Orleans, La. Adv. May 6 to 20.	May 6
May 25	Dam and Power House— Weedon, Que.	May 20
May 26	Tractor, Elevating Grader and Dump Wagons — Wadena, Minn.	May 13
May 27	Laying Gas Mains—Duluth, Minn.	May 13
May 27	Sheds — Stapleton, S. I., N. Y. Adv. Apr. 29 to May 13	May 13
June 1	Water Tube Boilers and Chain Grate Stakers — Lockport, Ill. Adv. May 6 and 13.	May 6
June 1	Breakwater—Corpus Christi, Tex. Adv. May 20.	May 20
June 2	Piers—New York, N. Y.	May 20
June 2	Heating and Sanitary Work —Kings Park, N. Y. Adv. May 20.	May 20
June 7	Road Materials—Albany, N. Y. Adv. May 20.	May 20
June 7	Pipe—Haledon, N. J. Adv. May 20.	May 20
June 9	Subway Subtrack — New York, N. Y. Adv. May 20.	May 20
June 11	Bridge Piers—Schenectady, N. Y. Adv. May 20.	May 20
June 15	Scenic Railway—Detroit, Mich.	May 13
June 21	Dike—Sault Ste. Marie, Mich. Adv. May 20	May 20

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. Y., Gouverneur—Aldrich Paper Co., Natural Dam, plans to install 40,000 gal. water tank here, to replace one recently destroyed by fire. Cost between $25,000 and $30,000.

N. Y., Niagara Falls—City plans to lay watermains in Adams, Michigan, Cleveland, Center, Harrison, McKinley, Willow, College, Garrett, James and Vanderbilt Aves., Niagara Rapids Blvd., Niagara, Bell, Sugar, Wilson, Cliff and 14th Sts. W. B. Bennett, city engr. Incorrectly noted in issue "May 13" under "New York."

W. Va., Westover—City plans to build reservoir and waterworks system.

O., Grafton—Village voted $40,000 bonds to build 18 x 20 ft. concrete pump house, 2 deep well pumps and 4 8 in. c.i water mains. M Knowles, 716 Hippodrome Bldg., Cleveland, engr.

O., Lakewood—City receives bids in summer laying 3,000 ft 8 in. main in Lake Ave About $53,500 E. A Fisher, city engr.

Mich., Muskegon Heights—Water Comm. having plans and estimates prepared by Hoad & Decker, engrs., Eng Bldg., Ann Arbor, for additional well, also filtration galleries of 500,000 gal daily capacity About $50,000.

Mich., Saginaw—City plans to trench and lay c.i. water pipes in Niagara, Hiland, Sheridan, Superior and Ring Sts., involving 18,250 ft. 8-20 in. pipe. About $90,000. H. H Eymer, City Hall, engr.

Mont., Lewistown—City voted $100,000 bonds to improve waterworks system. R. P. Longshore, 820 Corcoran St., engr. Noted Feb. 19.

Mont., Winifred—See "Sewers."

Wash., Wenatchee—City having plans prepared by M. Zachren, engr., Wenatchee, for complete water filtration plant, 2,500,000 3,000,000 gal. daily capacity. About $50,000.

Ont., Seaforth—Town Council plans to remodel waterworks system and extend mains. About $35,000. W. A. Golding, chn., water com. Engineer not selected.

BIDS DESIRED

N. J., Haledon (Paterson P. O.)—Until June 7, by Mayor, building reservoir, dam, aeration fountain and channel, gate houses, filter plant and clear water basins. J. Capp, boro. clk.; advertised in this issue. Noted Jan. 15.

La., Shreveport—Until May 28, by city, constructing 3,000,000 gal. concrete covered water basin and appurtances, c.i. pipe and specials, etc., also building 6,000,000 gal. horizontal high service and 6,000,000 gal. vertical low service pumping engine and their auxiliaries. Cester & Fleming, Union Bank Bldg., Pittsburgh, Pa., engrs; advertised in this issue.

O., Elyria—Until June 1, by H. A. Beck, Dir. Pub. Serv., building filtration plant sub-structures and appurtenant works, also supplying filter plant equipment; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Massena**—See "Miscellaneous."

★**O., Canton**—Canton Sheet Steel Co., Harrison Ave., let contract building rein.-con. reservoir, 16 ft. deep, 3,000,000 gal. capacity, to Burke Constr. Co., Canton. About $50,000.

★**O., West Park**—J. Laronge Co., 214 Williamson Bldg., Cleveland, let contract laying 3,990 ft. 8 in. c.i. water mains in Wagner Rd. West 157th and West 158th Sts., to Phillips & Bixel, Blackstone Bldg., Cleveland, $15,948.

Mich., Detroit—Water Bd. received bids furnishing labor laying 50 mi. 6-8 in. c.i. water pipe, from J. McDace, 920 Fairview Ave., $0.81 per ft.; T. C. Brooks & Son, Longfellow Ave., $0.86.

★**Okla., Pawhuska**—City let contract building dam with intake system, 35 ft. high and 450 ft. long, on shale foundation, to Hamilton Bros., Pawhuska. About $75,000.

Okla., Sallisaw—City received bids laying 22,844 ft. 10 in. c.i. pipe and building 500,000 gal. reservoir, from M. D. Michael, Durant, $15,117; McEachin & McEachin, Little Rock, Ark., $17,596; J. S. Terry, Poteau, $18,231.

★**Ont., Scarboro**—Township let contract to Central Foundation Co., Ltd., Norwich Union Bldg., Toronto, laying 20,000 lin. ft. 6 in. c.i. pipe, $0.62 per lin.ft.; 15,000 lin.ft. 8 in., $0.64; 10,000 lin.ft. 10 in. $0.72; 10,000 lin.ft. 12 in., $0.85; setting 120 hydrants, $8 each, etc.; furnishing pipe, to Natl. Iron Corp., Cherry St., Toronto.

Sewers

PROPOSED WORK

W. Va., Gassaway—See "Streets and Roads."

Mont., Winifred — City plans to build sewerage and waterworks systems. About $90,000 A Refer, Lewistown, engr.

Tex., Arlington—City voted $25,000 bonds to build extensions to sewerage systems in various streets. J. I Carter, secy.

Tex., Palacios—Palacios Sewer Co. soon receives bids laying sewer mains and building sewerage disposal plant About $35,000. J. W. Sartwell, mayor.

Cal., Alameda—City voted $175,000 bonds to build storm and sanitary sewerage system to serve all streets west of Grand Ave. C E. Hickok, city engr.

Cal., Los Angeles—City having plans prepared and receives bids about July building 11 blocks 24 in. cement pipe sewers in Bway., 6th and 7th Sts., 24 ft. deep. About $400,000. W. T. Rockwood, City Hall, sewer engr.

BIDS DESIRED

Mass., Boston—Until May 28, by city, building 2,300 ft. rein.-con. sewer conduit in Beacon St. About $275,000. T. S. Sullivan, city engr.

N. Y., Scarsdale—Until June 1, at office of Street Comr., Village Hall, building extension to sewerage system. J. R. Ross, clk.; advertised in this issue.

N. J., Nutley (Newark P. O.)—Until May 25, by Town clerk, building 2,420 ft. 6 in c.i. sewers in Hancox Ave., St. Marys Pl. and Union St. R. B. Symonds, Town Hall, engr.

D. C., Wash.—Until June 7, by Washington Suburban Sanitary Comn., Evans Bldg., constructing sewers under Contracts 15-18 S; advertised in this issue.

W. Va., Gassaway — See "Streets & Roads."

O., Toledo—Until June 15, by D. H. Goodwillie, Dir. Pub. Serv., constructing sewage pumping station, submerged outfall sewer, and appurtenances. Work divided into four contracts as follows: Contr. 4-1, substructures, Contr. 4-2, superstructures, Contr. 4-3, equipment, Contr. 4-4, outfall sewer. Fuller & McClintock, 170 Bway, New York, archt.; advertised in this issue.

Mich., Detroit—Until May 24, by Dept., Pub. Wks., furnishing labor and material, except manhole rings and covers, trenching and laying vitr. crock pipe, etc. in Alley 3,067 bounded by Ater Rd., Wayburn, Waterloo and Charlevoix Aves.; 3,287, Connors, Barrett, Harper and Crosby Aves., involving 5,249 ft. 12-24 in. pipe; 3,198, Van Dyke, Erwin, Marcos and Olymphia Aves., 1,549 ft. 12-18 in.; 3,201, Van Dyke, Erwin, Olymphia and Edgewood Aves., 1,547 ft., 12-18 in.; 3,223, Springwells, Burke, Wagner and Kirkwood Aves., 895 ft. 12-18 in.; 3,245, Ater Rd., Beaconfield, Mack and Voigt Aves., 16,224 ft. 10-24 in.; 3,257, Petosky, Dexter, Lawrence and Burlingame Aves., 2,945 ft. 15-24 in.; 3,258, Otsego, Dexter, Burlingame and Tuxedo Aves., 3,978 ft. 12-24 in.; 3,259, Otsego, Dexter, Tuxedo and Duane Aves., 3,962 ft. 12-24 in.; 3,260, Otsego, Dexter, Richton and Duane Aves., 3,952 ft. 12-24 in., 3,267, Martindale, Otsego, Collingwood and Courtland Aves., 2,484 ft. 12-24 in.; 3,268, Broad St., Martindale, Collingwood and Courtland Aves., 2,651 ft. 12-24 in.; 3,269, Yellowstone, Cascade, Burlingame and Elmhurst Aves., 1,282 ft. 12-15 in.; 3,270, Nardin, Yosemite, Burlingame and Elmhurst Aves.; 3,271, Yosemite, Yellowstone, Burlingame and Elmhurst Aves., 1,344 ft. 12-15 in.; 3,272, Broad St., Cascade, Collingwood and Elmhurst Aves., 2,188 ft. 12-20 in.; 3,278, Connors, Gratiot and Greenfield Aves., 5,619 ft. 12-20 in.; 3,282, Alter Rd., Wayburn and Kerchieval Aves., 697 ft. 12 in.; 3,284, Genesee, and Linwood Aves., Longfellow and Chicago Blvds., 5,619 ft. 12-20 in.; 3,286, Hamilton, Montclair and Harper Aves., 1,161 ft. 10-20 in.; 3,288, Holcomb, Winton, Georgia and Edgewood Aves. 1,512 ft. 12-20 in.; 3,289, Wetherby, Rangoon, Clifton and Majestic Aves., 774 ft. 12-15 in. About $103,000. C W. Hubbell, city engr.

Ore., Dallas—City receives bids about July 19, furnishing labor and material building sanitary sewer. About $35,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Wellesley (Boston P. O.)—City received bids May 12, building 4,000 ft rein.-con trunk sewer across private land, involving 3,921 ft. trenching, 800 cu.yd. rock excav., 2,350 cu.yd. concrete for 33 x 36 arch conduit, from Rendle Stoddard Co., 321 Marginal St., Chelsea, $118,157; Bruno & Petitti, 18 Tremont St., Boston, $121,659; G. Byrne Co., Old South Bldg., Boston, $122,580.

★**N. Y., Brooklyn**—E. Riegelmann, boro pres., let contract furnishing labor and material building sewer in 65th and 12th Sts., to P. Tomasetti Co., Inc., 1133 60th St., $10,493 and $1,545 respectively; President St., to J. O'Leary, 929 Peace St Pelham Manor, $5,202 Noted April 29

Sewers (Continued)

★N. Y., Massena—See "Miscellaneous."

O., Cleveland—City received bids building sewers in (a) Darwin Ave. from East 140th to East 146th Sts., (b) East 129th St. from Iroquoise Ave. to city limits, (c) Orleans Ave. from city limits to East 103rd St., (d) Scovill Ave. from East 36th to East 55th Sts., involving 5,010 ft. 12-18 in. vitr. and 1,830 ft. tile pipe, from A. Marra, Illuminating Bldg., (a) $9,137; N. Iafornaro, 3218 Murray Hill Rd., (a) $11,013; G. Assad, 251 Bradley Court, (b) $6,350, (c) $2,707; G. Sam, 2418 Central Ave., (b) $6,730; A. Joseph, 1200 Bolivar Rd., (c) $3,186; Gallagher-Burk Constr. Co., 1339 Irene Ave., Lakewood, (d) $79,516; W. McDowell & Son, 10319 Miles Ave., (d) $81,072; Manson Co., 345 The Arcade, (d) $81,710.

★O., Cleveland Heights (Warrensville P. O.)—Cedar Heights Land Co., c/o F. A. Pease Eng. Co., engrs., 804 Marshall Bldg., Cleveland, let contract building sewers and water mains in Bainbridge, Revere and Stanton Rds., Berkeley and Blanche Aves., to Hadded Mall Co., Schofield Bldg., Cleveland, $189,946. Noted May 13.

★Ia., Albia—City let contract building sanitary sewers in various streets, to J. W. Turner Impvt. Co., 309 Youngerman Bldg., Des Moines, $89,567; sewage disposal plant, to A. Phelps & Sons, Knoxville, $36,828.

★Mo., St. Louis—City let contract building sewerage system in Pub. Outlet Glaise Creek Sewer Dist. 17, involving 71 ft. 6-36 in. vitr. pipe and 1,375 ft. 48-63 in. segmental block pipe, to Meyers Constr. Co., Merchants Laclede Bldg., $23,777.

Bridges

PROPOSED WORK

Mass., Boston—Bd. Pub. Wks. soon lets contract repairing Chelsea Bridge S. over south channel of Mystic River. About $28,000.

N. Y., Herkimer—Fairfield and Herkimer Twps. voted $52,000 bonds to build concrete highway bridge over West Canada Creek, at Dempsters Crossing. Address A Corey, Herkimer, supt. highways.

N. Y., Lyons—Town Bd. having plans prepared for 101 ft. span twin arch concrete highway bridge over Mud Creek, on Newark Rd. E. J. Doyle, Albany, engr.

N. Y., Mt. Vernon—Bronx Parkway Comn., West Pondfield Rd., Bronxville, receives bids about June 17, building rein.-con. and steel driveway bridge, here. About $40,000.

N. Y., Scarsdale—Bronx Parkway Comn., West Pondfield Rd., Bronxville, receives bids about June 17, building 2 rein.-con. and steel driveway bridges, here. About $40,000 each.

N. Y., White Plains—Bronx Parkway Comn., West Pondfield Rd., Bronxville, receives bids about June 28, building 145 ft. rein.-con. and stone viaduct, 25 ft wide, on Woodland Pl., here.

Mich., Detroit—City rejected bids received May 11 building substructures for 2 bridges over River Rouge, on West Jefferson and West Fort Sts., each to have 8 piers sunk to depth of 90 ft. to rock, 2 counter weight pits, abutments, retaining walls, protection piling, etc. About $300,000 each. Work will be readvertised. Noted April 15.

Idaho, Blackfoot — Until May 24, Bd Comrs. Bingham Co. building 18 steel bridges. F. M. Fisher, clk.

Utah, Manti—See "Streets and Roads."

BIDS DESIRED

O., Columbus—Until June 7, by Comrs. Franklin Co., building 833 ft. concrete bridge, 30 ft. driveway, two 6 ft. sidewalks, over Scioto River, on Greenlawn Ave., here, involving 9,930 cu.yd. rein.-con., 13 tons steel, 2 abutments, 6 cofferdams, 1 pier. About $435,000. Braun, Fleming & Knollman, 233 South High St., engrs. Noted May 13.

Wyo., Lingle—Until June 10, by Clerks Goshen Co., building pile bent bridge over North Platte River, 2 mi. west of here. W. B. Coy, chn. co. comrs.; advertised in this issue.

Tex., Livingston—Until May 25, by E. T. Murphy, judge Polk Co., building concrete and steel bridges on Highway 35, involving 250 cu.yd. dry and 850 cu.yd. wet excav., 345 cu.yd. Class "A" and 260 cu.yd. Class "B" concrete, 750 lin.ft. wooden piling, 36,650 lb. reinforcing and 274,000 lb. structural steel, cost $48,000; concrete and steel bridges at various other points, involving 1,627 cu.yd. dry and 1,004 cu.yd. wet excav., 232 cu.yd. Class "A" and 1,777 cu.yd. Class "B" concrete, 38,619 lb. reinforcing and 229,700 lb. structural steel, $86,000. W. C. Youngs, Livingston, engr. Noted April 29.

Utah, Salt Lake City—Until May 26, by Comrs. Salt Lake Co., building 840 ft. rein.-con. and steel span memorial bridge, on concrete abutments, 30 ft. wide, over Parleys Canyon. About $300,000. G. G. Bywater, co. engr. Noted Feb. 19

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Boston—City let contract building 120 ft. steel concrete, girder type bridge, 60 ft. wide, to J. McCourt Co., 40 Wait St., Brookline, $117,308. Noted April 22.

Mass., Boston—City received bids May 13, reconstructing and replanking superstructure of roadway of Chelsea Bridge, 1,200 ft. long, 40 ft. wide, involving 150,000 ft. lumber, from Lawler Bros., Charleston, $27,671; W. H. Ellis & Sons Co., 479 Meriden St., East Boston, $34,906; Rendle Stoddard Co., 321 Marginal St., Chelsea, $37,100.

Mass., Oak Bluffs—State Highway Comn., Boston, received bids May 11, building 434 ft. concrete pile and girder bridge and road approaches over Lagoon Pond, here, 22 ft. wide, involving 1,000 sq.yd. asphalt, 1,168 cu.yd. earth excav., etc., from Randle Stoddard Co., 27 Upland Rd., Boston, $40,590; F. C. Taylor, Fairhaven, $63,925.

★Wis., La Crosse—State Highway Dept., at div. office, La Crosse, let contract building bridge over Black River, on Clinton St., to have eight 60 ft. fixed plate girded spans, 20 ft. roadway and Scharzer rolling lift span, with 60 ft. clear opening, to Wausau Iron Wks., Wausáu, $87,700. Work involves 180 ton structural and 21.5 ton reinforcing steel, 961 cu.yd. concrete, 4.5 ton machinery, 142 sq.yd. wood block paving, etc. Noted May 13.

★Minn., Winona—A. Baeurelen, aud. Winona Co. let contract building bridges on Federal Aid Project 96, State Rd. 1, to Leichter & Voelker, Winona, $32,000. Noted April 15, under "Streets and Roads."

★Ark., Conway—See "Streets and Roads."

★Wash., Seattle—Bd. Pub. Wks. let contract building 13 railroad trestles on the Skagit River RR., six 60 ft. bridges, one 100 ft., one 195 ft. and two 45 ft. spans, one 210 ft. with 75 ft. span, one 200 ft. trestle with 100 ft. span, to Culliton Bros., $43,875.

★Ont., Grand Bend—Lambton and Huron Counties let contracts building 135 ft. steel truss highway bridge on rein.-con. abutments, concrete flooring, as follows steel truss work to Canadian Bridge Co., Walkerville; concrete work, to J. Lawson, Crediton. About $16,849 and $11,000 respectively. Noted Apr 29.

Streets and Roads

PROPOSED WORK

Me., Auburn—City plans to pave various streets, brick and macadam. About $100,000 available. O Dwinell, city engr.

Mass., Attleboro—City plans to resurface 10,000 sq.yd. various streets, asphalt mixed type. About $100,000 available. H. I. Gordale, city engr.

Mass., Brockton—City plans to improve various streets, granite block, concrete and asphalt macadam. About $80,000 available. H. S Crocker, city engr.

Mass., Danvers — City plans to expend $30,000 to pave various streets, penetration method. J B. Brown, supt.

Mass., Framingham—City plans to improve various streets, concrete and bituminous macadam. About $25,000 available. F. H. Clark, city engr.

Mass., Lowell—City plans to pave 75,000 sq.yd. various streets, granite block, macadam and concrete. About $120,000 available. S. Kearney, city engr.

Mass., Lynn—City plans to pave 75,952 sq.yd. various streets, concrete, asphalt and block. W. L. Vennard, city engr.

Mass., New Bedford—City plans to pave 47,000 sq.yd. various streets, stone block and asphalt. About $150,000 available. G. H. Nye, city engr.

R. I., Westerly—City plans to pave 30,000 sq.yd. various streets, bituminous macadam. About $60,000 available. T. Mc Kenzie, city engr.

N. Y., Albany—City plans to pave 40,000 sq.yd. various streets. All types of pavement to be considered. About $250,000 available. F. R. Lanagan, city engr.

N. Y., Auburn—City receives bids in June paving 20,000 sq.yd. various streets. All types of pavement to be considered. M. F. Dullea, city engr.

N. Y., Binghamton—City plans to pave 45,000 sq.yd. various streets, asphalt, concrete, brick and wood block. About $40,000 available. W. E. Weller, city engr.

N. Y., Corning—City plans to pave 19,890 sq.yd. various streets, plain and Hillside brick and crushed stone. About $86,000 available. W. O. Drake, city engr

N. Y., Fairport—City plans to pave 23,000 sq.yd. various streets, concrete and asphalt with brick or Medina block on grades. About $110,000 available. Hopkins & Field, city engrs.

N. Y., Gloversville—City plans to resurface with bitulithic, 10,000 sq.yd. various streets. About $28,000 available. H J. Hanmer, city engr.

N. Y., Herkimer—City receives bids in June, paving 8,000 sq.yd. various streets, brick, bitulithic and concrete. About $30,000 available. C. L. Wood, city engr.

N. Y., Kingston—City plans to pave from 40,000 to 60,000 sq.yd. various streets, Willite asphalt or brick. E. B. Codwise, city engr.

N. Y., Niagara Falls—City election June 10, to vote on $37,500 bonds to improve pavements and walks at Pub. Market W. B Bennett, city engr.

N. Y., Oneida—City having plans prepared paving Mott St. Cost between $25,000 and $30,000. J. M. Hutton, city engr. Noted May 13.

N. Y., North Tonawanda—City plans to pave 30,000 sq.yd. various streets, brick, wood block, concrete and bitulithic C. L. Oelkers, city engr.

N. Y., Ogdensburg—City plans to pave 15,000 sq.yd. various streets, concrete. G A. Fate, city engr.

N. Y., Port Chester—City plans to pave 40,000 sq.yd. various streets, asphalt block. C. Astudwell, city engr.

N. Y., Rochester—City plans to pave 80,850 sq.yd. various streets, sheet asphalt, brick and Medina block. About $621,350 available. C. A. Poole, city engr

N. Y., Salamanca—City plans to pave 6,000 sq.yd. various streets, brick. About $27,000. C. C. Cheney, city engr.

N. Y., Syracuse—City plans to pave 100,000 sq.yd. various streets. H. C. Allen, city engr.

N. Y., Tonawanda—City plans to pave 21,000 sq.yd. various streets, asphalt, brick and bitulithic. T. W. Barrally, city engr.

N. Y., Watervliet—Bd. Pub. Wks. plans to pave 10,000 sq.yd. various streets. C. S. Keating, dir.

N. Y., Wellsville—Village having plans prepared paving Osborne and Hanover Sts. About $25,000.

New Jersey—State Highway Dept., Trenton, received no bids May 17, rebuilding foundation on Route 1 from New Brunswick to Hightstown, 18 ft. wide. Work will be readvertised. E. M. Vail, Hotel Windsor, Trenton, engr. Noted May 6.

N. J., Belvidere—Warren Co. plans to pave 12 mi. Morris Turnpike, 20 ft. wide, concrete. About $540,000. H. W. Vetter, Belvidere, engr.

N. J., Hackensack—Bd. Freeholders Bergen Co. plans to reconstruct last section of Paterson Plank Rd. between Carlstadt and Passaic River, total length 10 mi. About $400,000. R. P. McClave, Hackensack, engr.

N. J., Irvington—City plans to pave various streets, involving 70,000 sq.yd. concrete and asphalt block. About $500,000. I J. Casey, city engr.

Streets and Roads (Continued)

N. J., Jersey City—City plans to pave Van Winkle Ave. between Liberty and Tonnelle Aves., asphalt, also build sewers in same. About $50,000. F. A. Dolan, clk.

N. J., Paterson—Bd. Freeholders Passaic Co. plans to pave road between here and Passaic, also main street in each town, total length 4 mi. Cost to be borne by county and both cities. C. Ferguson, co. engr.

Pennsylvania — State Highway Dept., Harrisburg, received no bids May 11, improving 13,407 ft. Applications 231 and 394, Cumberland Co.; 27,596 ft. Sect. 1, Route 207, Venango and Mercer Counties; 17,250 ft. Sect. 2, Route 207, Venango Co.; 12,012 ft. Route 93, Warren Co. Noted April 22.

Pa., Beaver Falls—City plans to pave various streets, involving 50,000 sq.yd. brick concrete and asphalt. About $100,000. J. P. Leaf, city engr.

Pa., Bethlehem—City plans to pave various streets, involving 75,000 sq.yd. brick, concrete, amiesite and sheet asphalt. About $400,000. R. W. Fox, city engr.

Pa., Braddock—City plans to pave various streets, involving 22,000 sq.yd. brick and stone block. About $60,000. Herrop & Hopkins, city engrs.

Pa., Clearfield—City plans to pave various streets, involving 10,000 sq.yd. brick on concrete base. About $30,000. E. W. Hess, city engr.

Pa., Coanellsville—City plans to pave Crawford Ave., brick on 7 in. concrete base. About $177,500. S. M. Foust, city engr.

Pa., Greenville—City plans to pave various streets, involving 4,000 sq.yd. concrete or brick. About $36,000. C. P. Clarke, city engr.

Pa., New Castle—City plans to pave various streets, involving 15,000 sq.yd. brick, concrete and asphalt. About $90,000. C. H. Milholland, city engr.

Pa., Oil City—City plans to pave various streets, involving 39,000 sq.yd. brick, concrete and bituminous. About $100,000. B. B. Weber, city engr.

Pa., Scranton—City receives bids in June, paving various streets, involving 80,000 sq.yd. asphalt and stone block. About $351,372. W. A. Schunk, city engr.

W. Va., Gassaway—City plans to pave and build storm sewers in various streets. About $50,000. Robert. Eng. Co., 325 The Ruffner, Charleston, consult. engrs. Noted April 8.

N. C., Dobson—Surry Co. plans to hard surface 5 mi. Fancy Gap Rd.

S. C., Newberry—Town voted $100,000 bonds to pave various streets. Engineer not selected.

S. C., St. George—Comrs. Dorchester Co. plan to build roads. Bonds for $310,000 voted for project. Kluttz & Smith, Concord, N. C., engrs.

S. C., Sumter—Sumter Co. voted $2,500,000 bonds to build roads. Noted May 6.

Fla., Ocala—Marion Co. voted $560,000 bonds to build roads.

Ky., Hazard—City received no bids April 10, paving 2½ mi. road. W. E. Sanfley, clk. Noted March 25.

O., Cleveland—Bd. Comrs. Cuyahoga Co. receives bids in fall grading, draining, curbing and repaving 2 mi. Bway. from East 55th St. to Miles Ave., 60 ft. wide, medina block. W. A. Stinchcombe, co. engr.

O., Cleveland — Shaker Heights Impvt. Co., Williamson Bldg., receives bids in summer grading, building sidewalks and laying sewers and water mains in Yellowstone and Mayfield Rds. About $75,000. F. A. Pease Eng. Co., Marshall Bldg., engrs.

O., Greenville—City plans to grade and pave 1,700 ft. Gray Ave., 11th and Dover Sts., 30 ft. wide, involving 5,600 sq.yd. vitri brick or wood block on concrete base, 1,100 lin.ft concrete curbing, 1,100 lin.ft. guttering and 200 cu.yd. excav. About $45,000. F. Townsend, city engr.

O., Greenville—Drake Co. soon receives bids grading and graveling 2 mi. Mangue Rd., 3.5 mi. Best Rd., 1.5 mi., Hecht Rd., 24 ft. wide. About $55,000. G. Ferren, co. engr.

Mich., Ford (Wyandotte P. O.)—Village Council having plans and estimates prepared by M. L. Brown & Son, engrs., 823 Chamber of Commerce, Detroit, for grading, shaping, paving and curbing 1 mi. St. John, Antoine and Davis Sts., 26 ft. wide, 1 course concrete. About $50,000.

Mich., Marshall—Calhoun Co. soon receives bids grading, draining and surfacing with 8 in. compacted 60% gravel 2 mi. road, 9 ft. wide, Battle Creek Twp., cost $16,000; 1½ mi. road, Burlington Twp., $13,500. R. R. Cox, Marshall, engr.

Ill., East St. Louis—City plans to repair existing concrete base and resurface 1,100 ft. North 36th St. from Caseyville Rd. to Monroe Ave., involving 14,000 sq.yd. asphalt. About $13,000. A. O'Leary, street comr.

Wisconsin—State Highway Dept., at div. office 7, Court House, Rhinelander, received no bids May 7, grading and paving 3.18 mi. Crandon-Laona Rd., Federal Aid Project 155, Forest Co., 5.35 mi. Hurley-Mercer Rd., Federal Aid Project 158, Iron Co., 5.51 mi. Fifield-Radisson Rd., Federal Aid Project 130, Price Co., 4.6 mi. Rhinelander-Eagle River Rd., Federal Aid Project 170, Oneida Co., 9.51 mi. Woodruff-Fifield Rd., Federal Aid Project 165, Vilas Co., and 4.47 mi. Pelican-Crandon Rd., Federal Aid Project 73, Forest Co. Noted April 29.

Minn., Aitkin — Auditor Aitkin Co. received no bids April 21, grading and graveling 10 mi. Federal Aid Project 86, also Federal Aid Project 149, State Rd. 3. Latter involves 10 acres clearing, 13 acres grubbing, 38,153 cu.yd. earth excav., 1,853 cu.yd. hand ditching, 10,883 cu.yd. grading, 1,371 cu.yd. graveling, 48,933 lin.ft. shaping and compacting, etc. About $50,000 and $140,000 respectively. F. J. O'Hara, Aitkin, engr. Noted April 15.

Minn., Owatoona—Steele Co. rejected bids received April 22, grading 8 mi. Federal Aid Project 100, 24 ft. wide. About $48,000. C. H. Harholdt, Owatonna, engr. Noted April 1.

Neb., Auburn—City rejected bid received April 9, paving in Dist. 4. About $26,000. L. S. M'Connell, engr. Noted March 25.

Montana—State Highway Comn., Helena, rejected bids received April 19, gravel surfacing 21.72 mi. Chateau-Sun River Rd., Teton and Cascade Counties. J. N. Edy, state highway engr. Noted April 8.

Mont., Dillon—Beaverhead Co. defeated $100,000 bonds to build various roads. V. M. Baker, clk. Noted Feb. 5.

Mont., Harlowton—Wheatland Co. plans to gravel surface 7.25 mi. Harlowton-North and South Rd., 16 ft. wide. About $64,406. Federal Government is asked to appropriate toward cost. J. N. Edy, Helena, state highway engr.

Mo., Clayton—St. Louis Co. Court rejected bids received May 12, grading and paving 12.68 mi. St. Charles Rock Rd. from St. Louis to Missouri River, 18-20 ft. wide. About $590,227. W. Elbering, Clayton, engr. Noted Jan. 15.

Tex., Falfurrias—Brooks Co. voted $100,000 bonds to improve Highway 12. H. S. Bedell, Falfurrias, engr.

Tex., Franklin—Robertson Co. having plans prepared grading, gravel surfacing and building rein.-con. and steel bridges and culverts on 18 mi. Highway 14, from Nesbit to point 2 mi. north to Wheelock, 15 ft. wide, involving 100 acres clearing and grubbing, 100,000 cu.yd. earth excav., 35,200 cu.yd. gravel, 113,410 lb. structural and 61,000 lb. reinforcing steel, 540 cu.yd. Class "A" and 140 cu.yd. Class "B" concrete. About $141,627. L. Acker, Nacogoches, engr.

Tex., Jourdanton—Atascosa Co. had plans prepared grading, gravel surfacing and draining 13.17 mi. Highway 2, from Pleasanton to Bexar Co., 16 ft. wide, involving 10.3 mi. machine grader work, 26,073 cu.yd. earth excav., 126,724 sq.yd. bituminous macadam, 90,700 lb. structural and 53,811 lb. reinforcing steel, 31,624 cu.yd. gravel, 235 cu.yd. Class "A" and 258 cu.yd. Class "B" concrete. About $285,734. Lone Star Eng. Co., Natl. Bank of Commerce Bldg., San Antonio, engrs.

Tex., Laredo—Webb Co. having plans prepared gravel surfacing and draining 30 mi. Highway 2, Laredo-San Antonio Rd., 15 ft. wide, involving 10 acres clearing and grubbing, 150,000 cu.yd. earth embankment, 500 cu.yd. loose rock excav., 2,500 sq.yd. concrete pavement, 11,946 lb. reinforcing and 33,480 lb. structural steel, 2,190 cu.yd. Class "A," 207 cu.yd. Class "B" and 103 cu.yd. Class "C" concrete. About $258,798. J. G. Rollins, Laredo, engr.

Idaho, Rupert—City voted $165,000 bonds to build roads. D. P. Olsen, Boise, engr.

Utah, Grand—Moab Co. election May 29 to vote on $78,500 bonds to build roads.

Utah, Manti—San Pete Co. voted $280,000 bonds to build roads and bridges. I. R. Browning, 1516 Harvard Ave., Salt Lake City, state road engr. Noted April 22.

Wash., Seattle—City received no bids May 7, grading and paving 20th Ave., W., involving 27,000 cu.yd. earthwork, 12,530 lin.ft. armored concrete curbing, 36,540 sq. yd. 7 in. concrete paving; Elliott Ave., et al, involving 252,700 cu.yd. earthwork, 14,025 lin.ft. type "C" armored concrete curbing, 3,725 sq.yd. concrete pavements, 24,400 sq.yd. brick block pavement, 7 in. base. About $226,022 and $550,000 respectively. A. H. Dimock, engr.

Ore., Dallas—City receives bids about July 6, furnishing labor and material for 24,000 sq.yd. concrete paving.

California—State Highway Dept., Sacramento, rejected bids paving 12 mi. highway between Oil King School and Huron Rd., Fresno Co.; 13.6 mi. between Red Bluff and northerly boundary of Tehama Co.; 15.7 mi. between Redding and southerly boundary of Shasta Co. Noted April 22 and May 13.

Cal., Yreka — Siskiyou Co. defeated $1,050,000 bond issue to build highways. Noted March 11.

Ont., Hamilton—City plans to repair also lay about 35,000 sq.yd. asphalt, bitulithic or concrete pavement on London, Stirton and Catharine Sts., Kensington, Belview, Grovenor, Rosslyn, Mars and Homewood Aves. About $50,000 and $150,000 respectively. E. R. Gray, city engr.

BIDS DESIRED

Maine—Until May 26, by State Highway Comn., Augusta, building 3.92 mi. road Westbrook Twp., 2.54 mi. Belfast Twp., 4.71 mi. Newport Twp., 7.44 mi. Cominaa Twp., 5.52 mi. Dexter Twp., 8.64 mi. Windham Twp., all bituminous macadam, 7.08 mi. Gray Twp., concrete or bituminous macadam, 8.21 mi. New Gloucester and Auburn Twps., 4.57 mi. Oxford and Norway Twps., concrete, 5.18 mi. Perry and Pembroke Twps., 5.87 mi. Sherman and Crystal Twps., 3.69 mi. Island Falls and Dyer Brook Twps., 3.31 mi. Houlton Twp., gravel. P. D. Sargent, ch. engr.; advertised in this issue.

Mass., Pittsfield—Until May 22, by Bd. Pub. Wks., paving West Housatonic, Wahconah and North Sts., involving 20,000 sq. yd. cement concrete, 7,000 ft. concrete curbing, 3,500 sq.yd. vitr. brick, 4,500 sq. yd. concrete, 1,600 lin.ft. resetting curb. About $50,000.

Rhode Island—Until May 28, by Bd. Pub. Rds., State House, Providence, building Farnum Pike, Smithfield Twp and Kenyon-Cross Mills Rd., both bituminous macadam; advertised in this issue.

New York—Until June 7, by F. S. Greene, state highway comr., Capitol, Albany, repairing 2 highways in Albany, Orange, Suffolk and Tioga Counties, 1 highway in Broome, Chemung, Dutchess, Erie, Greene, Jefferson, Lewis, Montgomery, Rensselaer, St. Lawrence, Schuyler, Steuben, Tompkins and Warren Counties; advertised in this issue.

N. Y., Brooklyn—Until May 26, by E. Riegelmann, boro. pres., regulating and repaving roadway of Fair St. from Prince St. to Fleet Pl., Withers St. from Havemeyer St. to Union Ave., Fulton St. at intersection of Ashland Pl., permanent asphalt on 6 in. concrete foundation.

N. Y., Long Island City—Until May 25, by M. E. Connolly, pres. Queens Boro., regulating, grading, curbing and laying sidewalks on Bodine St. from Vernon Ave.

Streets and Roads (Continued)

to Sheman St., regulating, grading, curbing where necessary and paving with preliminary pavement of bituminous macadam, Brevoort St. from Metropolitan Ave. to Cuthbert Pl., 4th Ward, regulating and grading Nott Ave., 1st Ward, from Vernon Ave. west to bulkheads, curbing on south side from Vernon Ave. to point 730 ft. west, paving for a width of 18 ft. adjacent to southerly curb line, with permanent pavement of granite block on concrete foundation from Vernon Ave. to aforesaid line and then about 200 ft. with preliminary pavement of 2nd hand granite blocks on sand foundation.

N. Y., New York—Until May 25, by H. H. Curran, pres. Manhattan Boro., repairing asphalt pavements in railroad area, when and where directed.

N. Y., St. George, S. I.—Until May 28, by C. D. Van Name, pres. Richmond Boro, repaving roadway of Bay St from Richmond Terrace to Hannah St., granite block on present foundation, roadways of Richmond Turnpike from Manor Rd., to Jewett Ave., Rockland Ave. from Manor to Richmond Rds., Richmond Rd. from Rockland Ave. to Amboy Rd., concrete.

N. J., Freehold—Until June 9 (change of date) by Bd. Freeholders Monmouth Co., rebuilding Freehold-Adelphia Rd., Sect. 3, Freehold and Howell Twps.; advertised in this issue. Noted May 13.

N. J., Newark—Until May 25, by F. A. Reimer, engr. Essex Co., furnishing and applying liquid asphalt on highways.

N. J., Red Bank—Until June 7, by Mayor and Boro Council, improving Broad St.; advertised in this issue.

Pennsylvania — Until June 15, by State Highway Dept., Harrisburg, paving roads in counties as follows:

Allegheny Co., 15,550 ft. rein.-con.

Beaver Co., 1,606 ft. vitr. brick.

Bedford Co., 54,218 ft. bituminous macadam surface course on Telford foundation or rein.-con.

Clarion Co., 3,203 ft. rein.-con.

Clinton Co., 3,928 ft. rein.-con.

Cumberland Co., 13,520 ft. rein.-con.

Delaware Co., 2,635 ft. rein.-con.

Fayette Co., 20,996 ft. rein.-con. and Hillside vitr. brick, also 15,886 ft. vitr. brick.

Jefferson Co., 1,684 ft. vitr. brick.

Luzerne Co., 17,575 ft. rein.-con.

Lycoming Co., 52,520 ft. rein.-con.

Northampton Co., 7,441 ft. rein.-con.

Pike Co., 4,508 ft. bituminous surface course on concrete foundation of rein.-con.

Tioga Co., 42,052 ft. bituminous surface course on concrete foundation or rein.-con.

Venango Co., 50,025 ft. rein.-con. and Hillside vitr. brick.

Warren Co., 22,287 ft. rein.-con. and Hillside vitr. brick.

Washington Co., 16,137 ft. rein.-con., also 34,837 ft. rein.-con.

Westmoreland Co., 32,047 ft. rein.-con., also 2,609 ft. rein.-con.; advertised in this issue.

Pennsylvania—Until June 16, by State Highway Dept., Harrisburg, paving roads in counties as follows:

Bedford Co., 20,870 ft. bituminous macadam surface course on Telford foundation or rein.-con.

Beaver Co., 26,953 ft. rein.-con.

Crawford Co., 18,514 ft. rein.-con.

Fayette Co., 15,080 ft. rein.-con., also 14,496 ft. rein.-con. and Hillside vitr. brick and 15,323 ft. rein.-con. and Hillside vitr. brick.

Indiana Co., 25,030 ft. rein.-con. and Hillside vitr. brick.

Jefferson-Clarion Counties, 39,261 ft. rein.-con. and Hillside vitr. brick.

Northumberland Co., 26,200 ft. rein.-con.

Schuylkill Co., 10,688 ft. rein.-con., bituminous surface course on concrete foundation and vitr. brick.

Tioga-Lycoming Counties, 72,004 ft. rein.-con.

Pike Co., 3,549 ft. bituminous surface course on concrete foundation or rein.-con.

Union Co., 5,960 ft. rein.-con.

Venango Co., 3,419 ft. rein.-con.

Washington Co., 22,845 ft. rein.-con. and Hillside vitr. brick.

Westmoreland Co., 13,625 ft. rein.-con.; advertised in this issue.

Pa., Gallitzin—Until May 24, by P. S. Conrad, boro. secy., 706 Hemlock St., paving 2,500 sq.yd. Church, North Main and Hemlock Sts., 20 ft. wide, 1 course rein.-con. About $30,000. D. W. Dillman, 80 Altoona Trust Bldg., Altoona, engr.

Pa., South Fork—Until June 4, by W. H. Moore, boro. clk., furnishing labor and material (except brick), building 3,000 ft. Maple St. from Lake St. to public road, 21 ft. wide, vitr. or shale brick on 5 in. concrete base. About $30,000. Owen & Plummer, Inc., Otto Bldg., Johnstown, archts.

W. Va., Gassaway—Until June 2, by J. L. Boone, mayor, paving various streets, to include necessary storm sewers, catch basins and appurtenances. Roberts Eng. Co., 325 The Ruffner, Charleston, engrs.; advertised in this issue.

W. Va., Lewisburg—Until June 1, by Greenbrier Co., grading and paving 2 mi. James River and Kanawha Turnpike, penetration macadam. F. K. Rader, co. engr.; advertised in this issue.

S. C., Lexington—Until May 25, by Bd. Comrs. Lexington Co., sand claying 20.44 mi. Federal Aid Project 26.

Ga., Gainesville—Until June 10, by Bd. Comrs. Rds. and Revenues Hall Co., building 14.64 mi. Federal Aid Project No. 44, Gainesville-Lawrenceville Rd., involving 8,843 acres clearing and grubbing, 1,320,943 cu.yd. common and 2,816 cu.yd. rock excav., 207.74 cu.yd. Class "A" and 169.50 cu.yd. Class "B" concrete, 40,277 lb. reinforcing steel, 3,126 lin.ft. 12-30 in. vitr. clay, metal or rein.-con. drainage in headwalls. H. W. Morgan, 404 Jackson Bldg., engr.

Ga, Tifton—Until June 1, by Bd. Comrs. Rds. and Revenues Tift Co., building 6 mi. Natl. Highway from south city limits to Eldorado, (1) bituminous macadam on rolled slag and sand clay base, (2) rock asphalt or Willite on slag or crushed stone base, (3) asphaltic concrete on crushed stone or slag base; or (4) asphaltic macadam surface and base, involving 11,379 cu.yd. common excav., 3.82 mi machine grading, 56,320 sq.yd. hard surfacing, 40,356 lin.ft. 2 x 8 in. wood curbing, 34.4 cu.yd. Class "A" concrete in slab and railing, 22.02 cu.yd. Class "B" concrete walls, 10.92 cu. yd. Class "C" concrete footings, 3,278 lb. reinforcing steel, 268 ft. 15-24 in. culvert pipe, 29.48 cu.yd. Class "B" concrete in headwalls; also reconstructing road from Sta. 351-40 to Sta. 470-44 Cook Co. line, involving 2.36 mi. machine grading 21,162 sq.yd. hard surfacing, 23,808 lin.ft. 2 x 8 in. wood curbing, 10 cu.yd. Class "A" concrete in culverts, 30 ft. 12 in. c.i. and 60 ft. 12-18 in. culvert pipe. J. F. Still, Tifton, engr.

Ga., Waycross—Until May 27, by Comrs. Ware Co., building 7.064 mi. Dixie Highway from here to Braganza, 16 ft. wide, involving 14,233 acres clearing and grubbing, 33,850.5 cu.yd. excav., 66,848 sq.yd. permanent paving. 57.65 cu.yd. Class A and 103.58 cu.yd. Class B concrete, 114.7 cu.yd. Class A concrete in culverts, 8,349 lb. reinforcing steel in culverts, etc. E. V. Camp, Box 421, Atlanta, engr.

Ala., Montgomery—Until June 15, by J. L. Cobbs city treas. paving roadway Virginia Ave. from Mildred St. to Jefferson Davis Ave., brick, asphalt, bitulithic, mineral rubber, wood block, concrete, vibrolithic, concrete, asphaltic concrete, bitulithic on compact macadam base or Kentucky rock asphalt on crushed limestone, granite or slag. H. A. Washington, city engr.; advertised in this issue.

Miss., Poplarville—Until June 3, by Bd. Supervs. Pearl River Co., building 12.98 mi. Federal Aid Project 93 between here and Lumberton, involving 18.5 acres clearing and grubbing, 3,394 cu.yd. excav., 7,544 cu.yd. borrow, 112 cu.yd. concrete, 1,036 ft. culvert pipe, 70,200 ft. lumber in bridges, 2,113 lin.ft. piling, 20,340 cu.yd. gravel, 3,696 lb. reinforcing steel. A. Kramer, Jackson, state highway engr.

O., Columbus—Until May 29, by Comrs. Franklin Co., grading, draining and paving with rein.-con., 2 mi. Sullivant Ave., 16 ft. wide and 1.87 mi. Elliot Rd., 16 ft. wide, Brown Twp. About $95,592 and $34,625 respectively. C. C. Latimer, co. surv.

O., Columbus—Until May 26, by Comrs. Franklin Co., grading, draining and paving 1.17 mi. Hess Rd., 16 ft. wide, Clinton Twp., concrete, cost $50,920; 1.34 mi. Hess Rd., 16 ft. wide, Perry and Clinton Twps., bituminous macadam, $30,241. C. C. Latimer, co. surv.

O., Columbus—Until May 25, by W. H. Duffy, dir. Pub. Serv., grading, draining, curbing, paving, laying water mains and sewers in 627 ft. alley north of Frambes Ave., 20 ft. wide, cost $6,043, 425 ft. alley north of Vermont Pl., 16 ft. wide, $3,613, 1,388 ft. Ludlow St., 33 ft. wide, $16,582, 562 ft. alley west of Delaware Ave., 20 ft. wide, $5,524, 390 ft. alley, west of Ohio Ave., 16 ft. wide, $3,533, 707 ft. Pearl St., 20 ft. wide, $6,365, 294 ft. alley west of 17th St., 15 ft. wide, $2,250, brick and concrete; 1,335 ft. Columbian Ave., 24 ft. wide, $23,200, 1,321 ft. Nashoba Ave., 24 ft. wide, $23,399, bituminous macadam. Noted Jan. 1.

O., Minerva—Until June 1, by H. Glass, village clk., excavating curbing, grading and paving with brick on tar filler, Murray Ave., Line, East and 1st Sts. About $80,000.

Ind., Ft. Wayne — Until June 8, by Comrs. Allen Co., grading, draining and paving 14,993 ft. Aboite Rd., 9 ft. wide, waterbound macadam. About $32,925. A. W. Grosvenor Co., 408 Bass Bldg., engrs.

Mich., Detroit—Until May 24, by Dept. Pub. Wks., grading, shaping and paving Albert St., involving 422 cu.yd. excav., 825 sq.yd. sheet asphalt on 6 in. concrete foundation, Berea or Medina curbstone; Alter Rd., 3,124 cu.yd. excav., 6,180 sq.yd. paving; Ashland Ave., 1,354 cu.yd. excav., 12,030 sq.yd. paving; Dorchester St., 1,091 cu.yd. excav., 1,926 sq.yd. paving; Evans Ave., 1,475 cu.yd. excav., 3,080 sq.yd. paving; Holborn Ave., 1,870 cu.yd. excav., 3,710 sq.yd. paving; Lawton Ave., 2,067 cu. yd. excav., 3,304 sq.yd. paving; Pasadena Ave., 1,501 cu.yd. excav., 2,608 sq.yd. paving; Warren Ave., 4,477 cu.yd. excav., 7,478 sq.yd. paving; Wabash Ave., 2,932 cu.yd. excav., 4,871 cu.yd. paving. About $264,000 C. W. Hubbell, city engr.

Ill., Chicago—Until May 24, by Superintendent Cook Co. Pub Serv., paving 13,200 ft. Ogden Ave. west from Lawndale Ave. to Co. line, 18 ft. wide, 6 ft. earth shoulders, bituminous concrete, binder and portland cement concrete.

Wis., Kenosha—Until May 28, by B. C. Brennan, city engr., paving and building combined cement curbs and gutters on portions of Tauck Ave., Victoria, South Chicago and Newell Sts., vitr. brick, sheet asphalt or rein.-con. on 6 in. concrete foundation; Edward Grover, Brockett and Wescott Sts., sheet asphalt on 6 in. concrete base; Pine and Charles Sts., Racine and Prairie Aves., vitr. brick on 6 in. concrete base. Noted Jan. 1.

Minn., Alexandria—Until June 1, by V. Thomas, aud. Douglas Co., building 7 mi. Federal Aid Project 131, involving 20,423 cu.yd. excav. and overhaul, 1,196 lin.ft. 12-24 in. sectional concrete culverts, 140 ton mile haul of culverts, 8,234 cu.yd. load and haul gravel surface material. About $45,000. A. Webster, Alexandria, engr.

Minn., Alexandria—Until June 4, by V. Thomas, aud. Douglas Co., building 1.75 mi. State Rd. 5, County Job 2002, 24 ft. wide, involving 16,706 cu.yd. excav., 1,233 cu.yd. overhaul, 294 lin.ft. 12-24 in. corrugated metal culverts. About $25,000. A. Webster, Alexandria, engr.

Minn., Detroit—Until June 1, by J. A. Narum, aud. Becker Co., building 10 mi. Federal Aid Project 132, State Rd. 1, 24 ft. wide, involving 76,295 cu.yd. excav., 2,235 lin.ft. 12-24 in. portable culvert material and 7,136 cu.yd. graveling. About $54,000. H. W. Teague, Detroit, Minn., engr.

Minn., Little Falls—Until June 1, by auditor Morrison Co., paving 10 mi. Federal Aid Project 154, 18 ft. wide, concrete. About $350,000. J. E. Viner, Little Falls, engr.

Mo., Bethany—Until June 4, by Harrison Co., building 3.18 mi. Jefferson Highway, 24 ft. wide, Federal Aid Project 8, involving 16,780 lin.ft. grading, 30,062 sq.yd. broken stone base course and stone and 67,640 gal. bitumen for bituminous surface course, cost $71,175; also 9.39 mi. involving 63,583 cu.yd. earth and 400 cu.yd. rock excav., 34,269 lb. reinforcement for masonry and 1,032 lin.ft. timber piling, etc. $78,624.

Mo., St. Joseph—Until May 31, by Buchanan Co., building .376 mi. Frederick Ave. Rd., 33 ft wide. About $27,175. Noted April 29

Streets and Roads (Continued)

Mo., St. Joseph—Until May 31, by Buchanan Co., paving 20.02 mi St. Joseph-Atchison Rd., 18 ft. wide, asphaltic or cement concrete surface. About $715,003. J. D. Mohler, 1522 South 25th St, engr. Noted Jan. 15

Ark., Mena—Until June 2, by Bd. Comrs. Polls Co., building 15 mi. macadamized highway from here to Oklahoma state line. About $175,000. Buckley-Forgy Eng. Co., Mena, engrs.

Tex., Laredo—Until May 29, by Comrs. Webb Co., gravel surfacing and draining 17.5 mi. Highway 12, Zapata Rd, Federal Aid Project 118, 16 ft. wide, involving 10 acres clearing and grubbing, 81,038 cu.yd. borrow, 1,000 cu.yd. loose rock and 500 cu.yd. solid rock excav., 62,609 lb. reinforcing steel, 672 cu.yd. Class "A," 176 cu.yd. Class "B" and 70 cu.yd. Class "C" concrete. About $145,459. J. G. Rollins, Laredo, engr.

Col., Ft. Morgan—Until May 24, by A. S. Baker, city clk., building 59,565 sq.yd. paving, curbing, sidewalk extensions, storm sewers and other appurtenances, 1 course concrete or crushed rock base, concrete curbing and guttering and concrete sidewalks, etc. G. A. Izett, Englewood St., Denver, consult. engr.

Col., Sterling—Until May 25, by H. E. Munson, mayor, paving 64,220 sq.yd., to include curbing, guttering, sidewalk extensions and storm sewers, etc. G. A. Izett, Englewood St., Denver, engr.

N. M., Carlsbad—Until June 1, by R. A. Toffelmire, city clk., paving, curbing and draining various streets. F. L. Hancock, city engr.; advertised in this issue.

Idaho, Cottonwood—Until May 24, by village, improving various streets, involving 19,300 sq.yd. concrete or bitulithic, 4,000 cu.yd. excav., 24,700 sq.yd. waterbound macadam, 55,000 sq.ft. sidewalk and 5,500 lin.ft. curbing. Northwestern Eng. & Constr. Co., Lewiston, engrs.

Washington—Until June 1, by J. Allen, state highway comr., Olympia, clearing, grading, draining and gravel surfacing 2 mi. State Rd. 4, from Tonasket east in Okanagan Co., Post Rd., Project 65, 4 mi. Chelan-Okanogan Highway between Okanogan and Malott, Okanogan Co., Post Rd. Project 75.

Washington—Until June 1, by State Highway Comn., Olympia, surfacing 8.6 mi. Inland Empire Highway from Delany to Dodge, crushed rock, Garfield and Columbia Counties; clearing, grading and draining 3.6 mi. Olympic Highway from Montesano to Brady, Grays Harbor Co.; clearing, grading, draining and surfacing 2 mi. State Rd. 4 and 4 mi. Chelan and Okanogan Highway, crushed gravel, Okanogan Co J. Allen, state highway engr.

Que., St. Lambert—Until May 31, by town, building 6,110 ft. Tiffin Rd. and 2,500 ft. Petit Bois, 14 ft. wide, bituminous macadam (penetration method). J. R. Beatty, secy.-treas.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

New Hampshire—State Highway Comn., Concord, received bids May 7, building 2 mi. highway, East Kingston Twp., native stone macadam, from Collins Constr. Co., Andover, Mass., $37,260; R. G. Watkins, Pawon St., Amesbury, Mass., $39,076.

★**New Hampshire**—State Highway Comn., Concord, let contract building macadam highway, Amherst Twp., to Marshfield Constr Co., Marshfield, Mass. About $31,700.

★**Massachusetts**—State Highway Comn., Boston, let contract building 5,200 ft. bituminous macadam state road, 22 ft. wide, Cohasset Twp., to W. A. Jones, Barnstable, $26,352. Noted May 13.

Massachusetts—State Highway Comn., Boston, received bids May 11, building 11,660 ft. road, 22 ft. wide, Falmouth Twp., involving 20,500 sq.yd. asphalt, 12,200 cu.yd. earth excav., from M. F. Roach, East Bridgewater, $31,690; Framingham Constr. Co., Framingham, $42,689

★**Massachusetts**—State Highway Comn., Boston, let contract building 12,100 ft. road, 22 ft. wide, Saugus Twp., involving 9,330 cu.yd. concrete, 12,200 cu.yd earth and 1,630 cu.yd rock excav., 5,360 gal. bituminous material, to Hassam Constr. Co., 17 Federal St, Worcester, $211,536.

★**Mass., Boston**—City let contract paving Havelock St., 10 ft. wide, involving 1,800 sq.yd. asphalt on 4 in. concrete base, to Rowe Constr Co., 15 Milk St, $29,525. Noted May 13.

★**Connecticut**—State Highway Comn., Hartford, let contract building 9,000 ft. highway, 3 in. bituminous macadam on broken stone base, Wallingford Twp., to Immick Co., State St., Meriden, about $70,000; 5,100 ft. Howe Ave., asphalt on 6 in concrete base, Shelton Twp., to Connecticut Hassan Paving Co., 920 Chapel St., New Haven, $80,000.

★**N. Y., Brooklyn**—E. Riegelmann, boro. pres let contract building cement curb and laying sidewalks on East 7th St., to Grimm Constr. Co., 460 Harold Ave., Richmond Hill, $1,340; regulating and paving Lott Ave., Newport, West 38th, 65th and 76th Sts., to Consolidated Asphalt Paving Co., 52 9th St., $4,420, $1,533, $9,029, $14,604 and $12,669 respectively; building cement sidewalks on 66th St., J Jennings, Belle Harbor, $6,270. Noted May 13.

N. Y., Brooklyn—E. Riegelmann, boro. pres., received bids regulating and paving Stillwell Ave., from Consolidated Asphalt Paving Co., 52 9th St., $34,605, Uvalde Asphalt Paving Co., 1 Bway., New York City, $35,450; regulating, grading, curbing and laying sidewalks on 81st St., from L. Mangieri, 190 31st St., $2,929, Caponi Contg. Co., $3,127. C Gallagher, Woodhaven, $3,146. Noted May 6.

★**N. Y., Geneva**—Bd. Pub. Wks. let contract paving Poultney, South Exchange and West North Sts., bitulithic, to Brayer Bros., Pearson Blk., Auburn. About $40,000. Noted April 29.

★**N. Y., Hamburg**—City let contract paving 2 mi. Clark St., 16 ft. wide, concrete and bituminous concrete, to J Rossney, 37 Heath St., Buffalo, $47,203.

N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., received bids May 10, regulating and repaving with sheet asphalt, (a) 11th Ave. from Bway. to Newton Rd., (b) Academy St. from Wilbur to Freeman Aves., (c) Hunter Ave. from Harris Ave. to Bridge Plaza, (d) with improved granite blocks, Nott Ave. from Vernon to Hancock Sts., and from Hancock to Van Alst Ave., (e) regulating, grading, paving and repaving with sheet asphalt and granite block, Jackson Ave. from Junction Ave. to 51st St., (f) regulating and repaving with sheet asphalt, 13th Ave. from Bway to Newtown Rd., from Cleveland-Trinidad Paving Co., Flushing, (a) $34,828, (b) $37,925, (c) $23,608, (e) $192,227, (f) $22,049; Uvalde Asphalt Paving Co., 1 Bway., (a) $36,397, (b) $37,458, (c) $22,793, (e) $191,494, (f) $22,650; Consolidated Asphalt Paving Co., 52 9th St., Brooklyn, (b) $40,328, (c) $24,423; Astoria Contg. Co., 169 Hunters Ave., Astoria, (d) $37,038; H. J. Mullen Contg. Co., Fulton St., Jamaica, (d) $37,985; C. Gallagher, Woodhaven, (d) $39,010.

★**N. Y., Massena**—See "Miscellaneous."

★**N. Y., New York**—H. Bruckner, pres. Bronx Boro., let contract repaving (a) East 166th St., (b) Tinton Ave., (c) Clinton Ave., (d) Creston Ave., (e) Wales Ave., (f) East 183rd St., (g) Boston Rd., (h) East 134th St., (1) Standard Block, (2) Durax Block, to Uvalde Asphalt Paving Co., 1 Bway., (a) $24,234; J. L. Brustarr, Harlem River and 150th St., (b) $8,755; Asphalt Constr. Co., 2197 Madison Ave., (c) $72,617, (d) $15,821, (e) $22,398, (g) $38,600; Astoria Constr. Co., (f1) $29,851; Burnside Constr. Co., 270 Burnside Ave., (f2) $31,348; C. Helbrock, (h1) $19,905; Leonard Paving Co., 233 Bway., (h2) $17,500. Noted May 13.

★**N. Y., Norwich**—Common Council let contract paving Front and Mechanic Sts., to Griffin & Griffin, Norwich, $18,863 and $6,336 respectively.

N. Y., S. I., St. George—C. D. Van Name, pres Richmond Boro., received bids May 14, repaving roadway of Richmond Terrace from Davis to Campbell Aves, from C. Vanderbilt, Port Richmond, $21,594; J. Johnson Sons, Port Richmond, $22,728. Noted May 6.

Pennsylvania — State Highway Dept., Harrisburg, received bids May 11, improving roads in counties as follows:

Chester Co., 65,367 ft. Sect. 3, Route 147, from Winston & Co., Pottstown, $907,860; Union Paving Co., 30th and Locust Sts., Phila., $923,661; Keystone State Constr. Co., Franklin Bank Bldg., Phila., $957,115, also 4,963 ft. Route 142, Sutton Contg Co., Inc 640 Heed Bldg., Phila., $51,230.

Delaware Co., 27,642 ft. Sect. 1, Route 225, Union Paving Co., 30th and Locust Sts. Phila., $397,165; Keystone State Constr. Co., Franklin Bank Bldg., Phila., $415,575; Ward & Tully, Inc., and B. Turecamo, 2047 West 11th St., Brooklyn, N. Y., $417,744.

Erie Co., 7,300 ft. Sect. 1 A, Route 87, Goodroads Constr. Co., 1117 State St., Erie, $83,839; C. H. Fry Constr. Co., 19th and Cherry Sts., Erie, $86,247, also 1,635 ft. Route 87, Warren Bros. Co., 142 Berkeley St., Boston, (Spec. "D" Warrenite), $42,670.

McKean Co., 6,577 ft. Sect. 2 A, Route 96, C E. Weed, Inc., Albany, N. Y., $122,655.

Northampton Co., 34,904 ft. Sect. 1, Route 156, F. L. Cohen, Inc., 1002 Prudential Bldg., Buffalo, N. Y., $429,359; Winston & Co., Muncy; $445,823; Smith, McCormick Co. and McInerney & McNeal, Inc., Northampton Natl. Bank Bldg., Easton, $446,320.

Schuylkill Co., 38,315 ft. Route 162, Mangan & Risser, Lebanon, $550,755; Pottsville Constr. Co., Mortimer Bldg., Pottsville, $586,746; F. L. Cohen, Inc., 1002 Prudential Bldg., Buffalo, N. Y., $589,946.

Somerset Co., 27,917 ft. Sect. 4, Route 51, Keller & Ferner, Somerset, $426,829; Cumberland Contg. Co., 3rd Natl. Bank Bldg., Cumberland, Md., $502,085.

Susquehanna Co., 18,564 ft. Routes 9 and 10, Sprucks Co., Cedar and Orchard Sts., Scranton, (sheet asphalt) $430,235; C. D. Schlemmer, Islip, N. Y., (1 course) $461,679.

Venango Co., 19,033 ft. Sect. 1, Route 208, M. Dolan, 35 Fairmount Ave., Jamestown, N. Y., (1 course), $205,297.

York Co., 17,630 ft. Route 332, G. A. & F. M. Wagman Co., Dallastown, $214,689; Comerford Constr. Co., 539 Real Estate Trust Co. Bldg., Phila., $229,510. Noted April 22.

★**Pa., Johnstown**—City let contracts to R. W. Trevorrow, Johnstown, improving 6th Alley, Grove and Linden Aves. (Contr. 1), involving 5,717 sq.yd. brick and 911 sq.yd. 1 course concrete paving, 2,114 cu.yd. grading, 1,530 lin. ft. concrete curbing, 3,351 lin.ft. 6-8 in. terra cotta sanitary sewer pipe, 600 lin.ft. 6-10 in. terra cotta storm sewer pipe, etc., $55,121; Worth St., Hammer and McKinley Aves. (Contr. 2), 5,861 sq.yd. brick on concrete base and 1,770 sq.yd. 1 course concrete paving, 3,348 cu.yd. grading, 5,673 lin.ft. concrete curbing, 2,962 lin.ft. 6-8 in. terra cotta sanitary sewer pipe, 2,552 lin.ft. 6-12 in. terra cotta storm sewer pipe, etc., $74,075; Peter St., Seibert, Sarah and Hill Alleys (Contr. 3), 2,453 sq.yd. brick on concrete base and 1,551 sq.yd. 1 course concrete paving, 1,065 cu.yd. grading, 65 lin.ft. concrete curbing, 2,801 lin.ft. 6-8 in terra cotta sanitary sewer pipe, 266 lin.ft. 6-12 in. terra cotta storm sewer pipe, etc., $35,916. Noted April 22.

Delaware—State Highway Dept., Dover, received bids May 12, building (1) 3.82 mi. road from Felton to Woodside, 16 ft. wide, Kent Co., Contr. 29, involving 7,320 cu.yd. concrete and 23,000 cu.yd. earth excav., (2) 5.57 mi. road from Armstrong's Corner to Pine Tree, 16 ft. wide, Kent Co., Contr. 27, 10,670 cu.yd. concrete and 48,000 cu.yd. earth excav., (3) 1.4 mi. Christiana Ave, New Castle Co., 300 cu.yd. earth and 65,000 cu.yd. earth fill, (4) 4.14 mi. road from Townsend to Pine Tree thence to Odessa, 16 ft. wide, New Castle Co., Contr. 28 and C. N. 3, 7,950 cu.yd. concrete and 27,000 cu.yd. earth excav., (5) 3.4 mi. road from Coverdale Cross Rds. to Jacob's School, 14 ft. wide, Sussex Co., Contr. C. S. 6, 5,030 cu.yd. concrete and 22,500 cu.yd. earth excav., (6) 1.09 mi. Church, Williams and Roxana Rds., 14 ft. wide, Sussex Co., 1,620 cu.yd. concrete and 2,150 cu.yd. excav., from Kent Constr. Co., Chestertown, (1) $181,293, (5) $162,996; McNichol Paving & Constr. Co., 1923 Cherry St., Phila., Pa., (1) $193,213; Piel Constr. Co., Roland Ave., Baltimore, (1) $205,467; Keystone State Constr. Co., Franklin Bank Bldg., Phila., Pa., (2) $332,036, (3) $98,023, (4) $240,072; F. L. Cohen, Prudential Bldg., Buffalo, N. Y., (2) $387,408, (4) $280,138; R. Hopkins, 824 2nd Ave., Troy, N. Y., (2) $417,683; McLean Contg. Co., Fidelity Bldg., Baltimore, (3) $81,270; D E O'Connell, 204

Streets and Roads (Continued)

Winona St., Norwood, Ridley Park Pa., (3) $108,000; W. J. Lowe, Inc., 2413 Lombard St., Phila., Pa., (4) $274,277, (6) 45,463; Peninsula Constr. Co., Bridgeville, (5) $178,304; Empire Constr. Co., Phila., Pa., (6) $36,620; J. A. Clark, 603 West 5th St., Wilmington, (6) $41,024. Noted April 15.

★Delaware — State Highway Comn., Dover, let contract building 4.14 mi. Townsend-Pine Tree-Odessa Rd., 16 ft. wide, Rd. Contr. 28 and C. N. 3, New Castle Co., involving 7,950 cu.yd. concrete 27,000 cu. yd. excav., etc., to Keystone State Constr. Co., Commercial Trust Bldg., Phila., $240,072.

Virginia — State Highway Dept., Richmond, let contract building 8.94 mi. concrete road between Dutch Gap Rd. and Colonial Heights, State Aid Project 66, Chesterfield Co., to Perkinson & Finn, Petersburg, $346,706.

O., Canal Winchester—City received bid May 3, grading, draining and paving 1,300 ft. High St., 40 ft. wide, from Knight & Wells, Columbus, asphalt, $44,770, concrete, $34,875. Noted April 15.

O., Pataskala—Village received bids May 6, grading, draining, curbing and paving, (1) 2,470 ft. Main St., 30 and 40 ft. wide, (2) 861 ft. Town St., 24 ft. wide, (3) 198 ft. Depot St., 34 ft. wide; (a) asphalt (b) concrete, from Knight & Wells, Columbus, (1a) $75,751, (2a) $20,225, (3a) $5,689, Franklin Asphalt Paving Co., Columbus, (1a) $79,726, (2a) $21,487, (3a) $6,003, McHugh Bros., Springfield, (1b) $59,515, (2b) $15,991, (3b) $4,405, W. Drake, Marion, (1b) $60,151, (2b) $16,143, (3b) $4,450. Noted April 29.

★O., Piqua—City let contract paving Park Ave., 30 ft. wide involving 4,300 sq.yd. vitr. brick on concrete base, to L. M. Hennessy & Bros., Piqua. About $28,000.

★Mich., Detroit—City let contracts to Detroit Asphalt Paving Co., 20 McGraw Bldg., grading, shaping and paving Ranspach St., 13,376, Elsmere Ave., $20,126, Cahalan Ave., $39,094, Mason Pl., $11,533, Holmur Ave., $88,367, Hammond Ave., $12,517, Lane Ave., $11,361; Cleveland Trinidad Paving Co., 2940 Woodward Ave., Hindle St., $21,464; W. B. Brady Constr. Co., 1972 Grand River Ave., Highfield Ave., $25,654, Dailet Ave., $22,228. Noted May 13.

Mich., Detroit—City received bids grading, shaping and paving (a) Euclid Ave., (b) Pingree Ave., (c) Taylor Ave., (d) Scotten Ave., (e) 14th Ave., (f) Porter St., (g) Blaine Ave., (h) Wilson Ave., (i) Richardson Ave., (j) Thaddeus St., from Detroit Asphalt Paving Co., 20 McGraw Bldg., (a) $18,631, (b) $52,561, (c) $16,142, (d) $21,137, (e) $4,979, (f) $34,199, (g) $49,871, (h) $14,164, (i) $16,593, (j) $36,135; Cleveland Trinidad Paving Co., 2940 Woodward Ave., (a) $18,539, (b) $52,272, (c) $15,976, (d) $21,340, (e) $4,815, (f) $35,398, (g) $49,613, (h) $13,916, (i) $17,152, (j) $36,035; W. B. Brady Constr. Co., 1972 Grand River Ave., (a) $18,800, (b) $53,037, (c) $16,229, (d) $20,832, (e) $4,972, (f) $35,346, (g) $50,277, (h) $14,150, (i) $17,325, (j) $36,374. Noted April 29.

★Mich., Mt. Clemens—Macomb Co. let contract grading, draining and surfacing 1,064 mi. Rd. 46, near Richmond, 20-40 ft. wide, involving 26,000 sq.yd. asphaltic concrete on 7 in. concrete base, to Detroit Asphalt Paving Co., 20 McGraw Bldg., $122,780.

★Mich., Saginaw—Rd. Comn. Saginaw Co. let contract grading, shaping and draining 3 mi. Rd. 40, Brandt Twp., 18 ft. wide, involving 30,000 sq.yd. gravel on shale foundation, to McEwen & Crane Co., Saginaw, $84,570

★Wisconsin—State Highway Dept., at div. office, 213 South Barstow St., Eau Claire, let contract to Ofstie & Mulheron, Spring Valley, grading and paving 3.75 mi. Cornell-Bloomer Rd., Federal Aid Project 144, Chippewa Co., involving 44,020 cu.yd. earth excav., $0.56 per cu.yd., 957 cu.yd. borrow excav., $0.65, 299.6 cu.yd. concrete in culverts, $26.50, 8.26 acres clearing and grubbing, $150, etc., total cost, $37,988. Noted May 6.

Wis., Sharon — Walworth Co. Highway Comn. (Elkhorn) received bids May 13, for 9,800 sq.yd. concrete pavement, 18 ft. wide, here, from J. Gharrity, 1132 Partridge Ave., Beloit, $2.67 per sq.yd.

★Minn., Center City—Chicago Co let contract paving 19.03 mi. Federal Aid Project 95, State Rd. 1, 2 and 5, 24 ft. wide, to W. S. Harris, 1929 Vine Pl., Minneapolis, $321,000; grading, to Johnson & Anderson, Sandstone, $26,000. Noted April 15.

★Minn., Crookston—City let contract paving and curbing 6th St. from Bway. to University Ave., 30 ft. wide, to McDonald & Hussey, Crookston, $30,369.

Minn., Elbow—Lake—Grant Co., let contract building 6 mi. Federal Aid Project 28, State Rd. 6, 24 ft. wide, and 5 mi. State Aid Job 2,003, Rd. 5, 24 ft. wide, to Clear & Co., Herman, $72,000 and $36,700 respectively. Noted March 25.

★Minn., Faribault—City let contract paving 7,252 sq.yd. 4th St., concrete, to Schruth & Jackson, 633 Plymouth Bldg., Minneapolis. About $63,000.

★Minn., Preston—J. Dunford, aud. Fillmore Co., let contract building 6 mi. Federal Aid Project 137, State Rds. 1 and 6, 24 ft. wide, to Dobbleman & Rasmussen, 316 1st Ave., N. E., Minneapolis. About $30,000. Noted April 1.

★Minn., Wheaton—Comrs. Traverse Co. let contract building 15 mi., road, 24 ft. wide, Federal Aid Project 164, State Rd. 2 to Beyton & Sons, Wheaton. About $96,000. Noted April 15.

★Minn., Winona—A. Baeureln, aud. Winona Co., let contract grading 4 mi. Federal Aid Project 96, State Rd. 1, 24 ft. wide, to J. J. Leichter, Winona, $45,000. Noted April 15.

★Mont., Billings—Yellowstone Co. let contract paving 2 mi. Polytechnic Rd., to R. G. Sanner, Great Falls. About $93,000. Noted April 8

★Mont., Kalispell — Flathead Co. will gravel surface 3 mi. Columbia Falls-Whitefish Rd., involving 38,000 cu.yd. earth excav., 3,633 cu.yd. gravel surfacing, 382 lin.ft. 18-24 in. corrugated pipe, 19.44 cu. yd. Class "B" concrete and 11 M ft. lumber, etc. Work will be done by day labor. About $31,581.

★Mo., Boonville—Cooper Co. let contract building 7.8 mi. Natl. Old Trails Rd., 24 ft. wide, Federal Aid Project 27, to Pope Constr. Co., Merchants Bank Bldg., Jefferson City, $110,126. Work involves 48,765 cu.yd. earth excav. at $0.60 per cu.yd., 52,590 sq.yd. bituminous macadam surface course, spec "A," $0.857, 1,500 cu.yd. borrow, $0.45, 52,590 sq.yd. broken stone base course, $0.63 and 54.1 cu.yd. Class "C" concrete masonry, etc., $23, etc.

★Mo., St. Louis—City let contract to Granite Bituminous Paving Co., Ry. Exch. Bldg., paving, grading and curbing 2,000 ft. Garesche Blvd. from Oriole to Munika Aves., cost $30,391, 1,600 ft. Gannett St. from Morgan Ford Rd. to Ridgewood Ave., $31,868, Reber Pl. from Clifton Ave. to east line of Buchanan tract, $17,250, all bituminous concrete and concrete curbing, 4,000 ft. Northeast Kings Highway from Euclid to West Florrissant Aves., bituminous concrete and granite curbing, $186,860; Independent Quarry & Constr. Co., 4875 Ashland St., rebuilding, paving and curbing 2,400 ft. Biddle St. from 7th to 14th Sts., asphalt and granite, $56,786, 850 ft. Whittier St. from Labadie to Ashland Sts., asphalt and concrete, $25,852; Trinidad Asphalt Mfg. Co., Rankin Ave. and Wabash tracks, 4,200 ft. Locust from 14th St. to Jefferson Ave., 36 ft. wide, asphalt and granite, $104,872; W. H. Redemeyer Co. St. Louis St., 3,200 ft. Morganford Rd. from Chippewa St. to Fyler Ave., vitr. brick and granite, $84,247; Webb & Kunze Constr. Co., 5927 Fyler Ave., grading and surfacing 3,000 ft. Marmaduke Ave. from Clifton to Frisco tracks, $15,242; Eyerman Constr. Co., 1216 South Grand St., paving 500 ft. 16th St. from Poplar to Clark Ave., granite block, $34,730. Noted April 22.

★Ark., Conway—Comrs. Faulkner Co. let contract grading and building culverts and bridges in Conway-Damascus, Conway-Vilonia and Conway-Palarm Rd. Dists., to P. F Lewelling, Hot Springs. About $400,000.

★Tex., Beeville—Bee Co. let contract grading, excavating, gravel surfacing and draining 22 mi. Highway 9, 16 ft. wide, to Wright & Saunders, Alamo Bank Bldg., San Antonio, $426,000 Noted May 13

★Tex., Denton—W. E. Durbin, aud. Denton Co., let contract grading, surfacing and draining 8 mi. State Highway 40 and 40-A, Federal Aid Project 143, 16 ft. wide, to McElwrath & Rogers, Corsicana, $100,979, including 10% for engineering and contingencies. Work involves 34,408.7 cu.yd. borrowed embankment, 31,412.5 cu.yd. earth excav., 32,976 lb. reinforcing steel, 311.45 cu.yd. Class "A," 67.38 cu.yd. Class "B" and 247.8 cu.yd. 1:2:3 concrete. Noted March 25.

Tex., Fredericksburg — Gillespie Co. received bids May 12, (1) gravel surfacing 1,395 mi. Highway 9, north from here, 16 ft. wide, (2) improving 13.2 mi. Highway 9, from Mason Co. south, 16 ft. wide, (a) 40 acres clearing and grubbing, (b)) quarrying, hauling and placing 27,298 cu.yd. crushed stone surfacing, from Ririe & Monanden, 223 South Pinto St., San Antonio, (1) $26,076, (2b) $51,866; M. M. Craven, Bellaire, (1) $27,212, (2a and b) $100,690; E. M. Basye, San Antonio, (1) $35,916. Noted May 6..

★Tex., Lufkin—City let contract for 50,000 sq.yd. rock and asphalt pavement, to Hayden & Austin, Houston, $96,750; 20,000 lin.ft. combined curb and gutter, to R. B. Shearer, Lufkin, $9,000. Noted March 6.

Tex., Marshall — Harrison Co. received bids April 30, surfacing and draining (1) 4.1 mi. Highway 11 east of here, 16 ft. wide, involving 5,170 cu.yd. earth borrow excav., 23,637 gal. bituminous material, 875.4 cu.yd. trap rock cover material, 3,300 cu.yd. crushed rock, 3,832 lb. reinforcing steel, 20.3 cu.yd. Class "A," 46.8 cu.yd Class "B," and 16 cu.yd. Class "C" concrete, (2) 19.03 mi. Highway 11, west of here, 16 ft. wide, 11 acres clearing and grubbing, 4.17 mi. scarifying, 70,187 cu.yd. earth borrow, 107,160 gal bituminous material, 84,292 lb. reinforcing and 19,100 lb. structural steel, 30,338 cu.yd. gravel, 14,921 cu.yd. crushed stone, 3,963 cu.yd. trap rock cover material, 630.9 cu.yd. Class "A," 690.6 cu.yd. Class "B" and 44.9 cu.yd. Class "C" concrete, from Smith Bros. and Healey Constr. Co., c/o Smith Bros., Crockett, (1) $49,919, (2) $296,964; Haden & Austin, 727 Kress Bldg., Houston, (1) $49,951, (2) $302,2[illegible]2; East Texas Constr. Co., Shepherd, (1) $53,791, (2) $305,649.

★Tex., Orange—D. C. Bland, judge Orange Co., let contract paving with concrete, 7 in. thick in center 5 in. at sides, draining and building 2 steel bridges on 10.26 mi. Highway 3, Orange-Beaumont Rd., 16 ft. wide, to Houston Constr. Co., 3102 McKinney St., Houston, $451,783. Noted May 6.

★Tex., San Antonio—J. R. Davis, judge Bexar Co., let contracts improving 15.767 mi. Highway 9, Goliad Rd., 15 ft. wide, (a) grading, hauling, placing and surfacing road, involving 4,431 cu.yd. earth borrow, 10.05 mi. machine work, 7,080 cu.yd. unclassified earth excav., and 24,811 cu.yd. gravel, (b) topping, 42,136 sq.yd. ½ in. and 105,926 sq.yd. 1 in. bituminous macadam and 200 tons patching material, (c) paving, 3,800 sq.yd. concrete with asphalt top, (d) building rein.-con. bridges and culverts, to Uvalde Rock Asphalt Co., Swearingen Bldg., (a) $72,885, (b) $97,299, (d) $14,718; J. L. Black, San Antonio, (c) $15,858. Noted April 8.

★Colorado—State Highway Comn., Denver, let contract paving 2¾ mi. Denver-Morrison Rd., Federal Aid Project 82, to Colorado Bridge & Constr. Co., Gas & Electric Bldg., Denver, $50,143; grading and draining 2 mi. Turkey Creek Rd., Federal Aid Project 29, Jefferson Co., to W. Flick, 1556 Williams St., Denver, $59,603. Noted April 22.

★Ariz., Phoenix—City let contract to Southwestern Contg. Co., 13th Ave. and Lincoln St., grading and paving 3 blocks McDowell St. from Central Ave. to 3rd St., 30 ft. wide, involving 4,340 sq.yd. grading, cost $0.45 per sq.yd., 4,340 sq.yd. bituminous concrete paving, $2.37 except 10 sq.yd. $2.80, concrete pipe, manholes, etc., $2,621, 2,585 lin.ft. combination curbing and guttering, $1.50, 1 block 5th St. from Culver to Willetta Sts., 30 ft. wide, 1,507 sq.yd. bituminous concrete paving, $2.37 except 10 sq.yd. $2.80, 1,497 sq.yd. grading, $0.45, concrete pipe, manholes, etc., $650, combination curbing and guttering, $1.50; portions of Lynwood St, 2,329 sq.yd. grading, $0.40, 2,339 sq.yd. bituminous concrete paving, $2.30, pipe, manholes, gutters, inlets, etc., $461, 1,403 lin.ft. combination curbing and guttering, $1.30; portions of Block H, Bennett Addition, 1,445 sq.yd. grading and bituminous concrete paving, $3,964; portions of Willetta St., 30 ft. wide, 2,329 sq.yd. grading,

Streets and Roads (Continued)

$0.40, 2,339 sq.yd. bituminous concrete paving, $2.30, concrete pipe, manholes, etc., $469, 1,425 lin.ft. combination curbing and guttering, $1.50; to Warren Bros. Co., 201 Noll Bldg., 4th Ave. from Jackson to Jefferson Sts., 3,929 sq.yd. grading, $0.40, 3,939 sq.yd. bituminous concrete paving, $2.30, concrete pipe, manholes, etc., $138, 1,816 lin.ft. combination curbing and guttering, $1.50; portions of Monroe, 2nd and 3rd Sts., 30 ft. wide, 10,283 sq.yd. bituminous concrete paving and grading, $2.80 and $0.45 respectively, concrete pipe, manholes, etc., $2,473, 2,822 lin.ft. combination curbing and guttering, $1.50.

★**Ariz., Kingman**—Mohave Co. let contract paving 2 mi. Oatman-Gold Rd. Highway, Federal Aid Project 5, to Alvey & Larson, $52,398. Noted Feb. 19.

★**Ariz., Phoenix**—Maricopa Co. let contract building 278 mi. cement concrete highways, to Twohy Bros. Constr. Co., L. C. Smith Bldg., Seattle. Roads 18 ft. wide, 6 in. thick, to cost $31,404.16 per mi.; 18 ft. wide, 5 in. thick, $28,054.06 per mi., 18 ft. wide, 4 in. thick, $24,599.85 per mi., 16 ft. wide, 6 in. thick, $28,326.12 per mi., 16 ft. wide, 5 in. thick, $25,326.12 per mi., 16 ft. wide, 4 in. thick, $22,267.37 per mi., 9 ft. wide, 6 in. thick, $18,358.34 per mi., 9 ft. wide, 5 in. thick, $16,674.93 per mi. and 9 ft. wide, 4 in. thick, $14,939.22 per mi.

★**Wash., Ellensburg**—Kittitas Co. let contract paving 2.4 mi. road, 18 ft. wide, 6-8 in. concrete, to Kibler & Bartlett, Tacoma, $74,800. Noted March 25.

★**Wash., Kelso**—City let contract improving Dist. 32, involving 14,751 cu.yd. rock excav., 33,551 lin.ft. concrete curbing and 151,517 sq.ft. concrete sidewalk, to A. J. McGary, Seattle, $64,117.

★**Wash., Seattle**—City let contract building concrete walks on Beach Drive, et al, involving 11,600 sq.yd. concrete, 3,000 lin. ft. 3 in. sewer pipe and 1,500 lin.ft. 3 in. tile drain, to R. H. Travers, Arcade Bldg., $26,133; grading, filling and paving West Spokane St., et al, involving 7,900 sq.yd. concrete, 2,130 lin.ft. armor concrete curbing, 26,500 cu.yd. earth excav., to Sparger Constr. Co., Colman Bldg., $76,110.

Wash., Seattle—City received bids grading, curbing, building sewers, etc., in 41st Ave., N., et al, involving 27,000 cu.yd. earth excav. for concrete walks, 3,794 lin. ft. 3-8 in. sewer pipe, (a) clay pipe, (b) concrete pipe, from Scalzo & Co., 1708 22nd Ave., S. W., (a) $136,148, (b) $135,444; Puget Sound Bridge and Dredging Co., Central Bldg., (a) $161,817, (b) $160,635; Coluccio & Erickson, 4111 36th St. S. W., (a) $164,751, (b) $164,130. A. H. Dimock, engr.

Wash., Seattle—Comrs. King Co., received bids May 10, grading and paving 1.75 mi. Franklin-Enumclaw Highway, 20 ft. wide, involving 18,777 sq.yds. concrete, from Independent Asphalt Paving Co., Seaboard Bldg., $64,900. Noted April 29.

★**Wash., Spokane**—City will build 2½ mi. Inland Empire connection. About $31,500. Work will be done by day labor. Noted April 15.

★**Ore., Grants Pass**—Josephine Co. will grade 13.5 mi. Murphy-Williams Rd., and build road around Gething Hill between here and Murphy. Work will be done by day labor.

Ore., Seaside—City received only bid improving Roosevelt Dr. from O'Hanna Creek Bridge to north line of Bway., from J. H. Tillman & Co., $68,390. Noted April 8.

★**California**—State Highway Dept., Sacramento, let contract paving 11.3 mi. highway between Flinn Springs and Ogden Ranch, San Diego Co., Portland cement concrete, to Riley & Peterson, Calexico, $177,530. Noted April 22.

Cal., Eagle Rock (Los Angeles P. O.)—City received bids improving Central Ave., from W. Liddington, 420 East 60th St., Los Angeles, $45,760; H. E. Cox, Pasadena, $48,740. Noted April 8.

★**Cal., Martinez**—Contra Costa Co. let contract paving 4 mi. San Pablo Creek Section, concrete and bitulithic, to Bates & Borland, Oakland Savings Bank Bldg., Oakland, $112,404.

Cal., San Francisco—City received bid improving Collingswood Ave., 21st and 22nd Sts., from Eaton & Smith, 11th and Harrison Sts., $144,425. Noted Jan. 1.

Railways

PROPOSED WORK

Michigan—Detroit United Ry., Jefferson Ave., Detroit, plans to build 1½ mi. extension to present electric railway line on West 3rd St., Flint. About $75,000. W. J. Burdick, genl. mgr.

Ontario—Canadian Light Ry. Constr. Co., Ltd., Sun Life Bldg., Toronto, having surveys made for 120 mi. light railway, 36 in. gage, in northern Ontario, connecting with following mining districts: West Shining Tree, Gold Camp, Gowganda Silver, Ft. Matachewan, Kirkland Lake, Larder Lake and Boiler Creek Area. F. G. Mackenzie, secy.-treas.

Excavation and Dredging

PROPOSED WORK

Mass., Newton—Dredging—City soon lets contract deepening, widening, relocating and improving South Meadow and Paul Brooks. About $35,000.

Wyo., Greybull—Irrigation—Citizens of Greybull Valley have formed irrigation district and had plans and surveys made by J. A. True, engr., 301 Hydro Bldg., Cheyenne, for system which will irrigate 90,000 acres of land. Work includes 2 reservoirs, 1 at Upper Sunshine basin and the other at Lower Sunshine basin. About $1,750,000.

Mo., St. Louis—Bd. Pub. Wks. soon receives bids building sewers in Clifton Heights Sewer Dist., involving 4,800 ft. 12-21 in. vitr. and 1,130 ft. 24-36 in. vitr. conduit pipe, cost $25,000; excavating, backfilling and building sewer in South Harlem Pub. Sewer, 8,200 ft. 9-10 ft. 8½ in. rein.-con. pipe, $350,000; building storm sewer in Glaise Creek Sewer Dist. 17, 9,040 ft. 8-30 in. vitr. and 1,785 ft. 39-48 in. ring segmental block, $70,000; Rock Creek Storm Sewer Dist. 7, 2,970 ft. 12-30 in. vitr. clay pipe, $13,500.

Idaho, Blackfoot—Irrigation—Members of Blackfoot Irrigation Co. voted to reorganize company as irrigation district, and sell $600,000 bonds to enlarge system for storing an additional 200,000 acre ft. water.

BIDS DESIRED

N. Y., New York—Dredging—Until May 28, by M. Hulbert, comr. docks, Pier "A," foot of Battery Pl., furnishing labor and material dredging in Manhattan Boro., Contr. 1653.

Mich., Sault Ste. Marie, Mich.—Excavating—See "Miscellaneous."

Ia., Algona-Drainage—Until June 2, by Bd. Supervs. Montgomery Co., building 7 Sub-D.D.9, of D.D.4, involving 28,082 ft. 6-30 in. tile, 15 intakes, etc. E. H. Beardsley, aud.

Ia., Red Oak—Ditch—Until May 28, by Bd. Suprvs. Montgomery Co., building 7 mi. open ditch in D.D.3, involving 436,000 cu.yd. excav. P. Ostrom, aud. C. D. Forsbeck, Red Oak, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., New York**—Dredging—M. Hulbert, docks, Pier "A," foot of Battery Pl., let contract dredging in Manhattan and Richmond Boroughs, to Columbia Dredging Co., Jersey City, N. J.: $39,840 and $2,488 respectively. Noted May 6.

Industrial Works

PROPOSED WORK

Mass., Boston—G. Marsh, c/o Tuck & Gilman, archts. and engrs., 34 School St., having plans prepared for 2 story, 100 x 145 ft., brick and rein.-con. garage, concrete flooring and foundation, on Brighton Ave. About $125,000.

Mass., Boston—Womens Educational & Industrial Union, 264 Boylston St., having plans prepared by F. A. Norcross, archt., 46 Cornhill St., for 4 story, concrete storehouse and bakery, rein.-con. flooring, concrete foundation. About $65,000.

Mass., Rockland—Tuck & Gilman, archts. and engrs., 34 School St., Boston, preparing plans for 2 story, 60 x 110 ft., rein.-con. warehouse, rein.-con. flooring, concrete foundation. About $50,000. Owners name withheld.

Mass., Springfield—C. A. Nash, 120 Oakland St., having plans prepared by Andrews, Tower and Lavalle, archts., 274 Main St., for 2 story, 50 x 140 ft., rein.-con. garage, rein.-con. flooring, concrete foundation, on Oakland St. About $60,000.

R. I., Providence—Franklin Process Co., 29 Promenade St., having plans prepared by Lockwood, Greene & Co., archts. and engrs., 60 Federal St., Boston, for 2 story, 110 x 175 ft., rein.-con. dye house, rein.-con. flooring, concrete foundation. About $150,000.

R. I., Providence—Packard Motor Car Co, Bway. and 61st St., New York City, soon lets contract building 2 story, rein.-con. service station, rein.-con. flooring, concrete foundation, on Elmwood Ave., here. About $100,000. Private plans.

R. I., Woonsocket—Amer. Wringer Co., 91 Social St., soon lets contract constructing 1 story, 80 x 100 ft., brick, concrete and tile dry kiln building, 1 story, 60 x 186 ft., brick and steel mechanical roll building and 3 story, 40 x 90 ft., brick and steel addition to warehouse, rein.-con. flooring, concrete foundations. About $100,000. Cooley & Marvin Co., 711 Tremont Bldg., Boston, engrs. Noted May 6.

Conn., Bridgeport—East Side Flour & Grain Co., 1677 Seaview Ave., plans to build 2 story, 80 x 90 ft., brick and steel plant, concrete foundation. About $50,000. Private plans.

Conn., Hartford—L. White, 119 Portland St., soon receives bids building 4 story, 52 x 175 ft., brick and rein.-con. warehouse, rein.-con. flooring, concrete foundation, on Winthrop St. About $200,000. Former bids rejected. Berenson & Moses, 1026 Main St., archts.

N. Y., Burke—Burke Dairymen's League purchased Noble Farms Dairy Co., Inc., plant, and plans to build addition to same. About $50,000.

N. Y., Forestport—Forestport Pulp Mills, Inc. plans to improve and build additions to plant. About $50,000.

N. Y., Hinckley—Otsego Falls Paper & Pulp Co., Fulton, purchased Hinckley Fibre Co. plant, here, and plans to improve and build addition to same. Cost between $250,000 and $300,000. H. L. Paddock, Fulton, pres.

N. Y., Long Island City—W. Sproesser, archt. and engr., 211 12th Ave., receives bids about May 22, building 2 story, 55 x 110 ft. printing plant, rein.-con. and steel, rein.-con. flooring, concrete foundation, on Ely St and Wilbur Ave., here, for Howard Printing Co., 1720 Bway., New York City. About $50,000.

N. Y., Massena—Aluminum Co. of Amer. plans to build addition to plant. About $250,000.

N. Y., Ransomville—G. H. Foote plans to rebuild feed mill and grain elevator which was recently damaged by fire. About $50,000.

N. Y., Rochester—Eastman Kodak Co., 333 State St., plans to build 70 x 150 x 362 ft. machine shop and 98 x 98 x 146 ft. power house with radial brick chimney, steel frame. About $280,000 and $200,000 respectively.

N. Y., Rochester—M. D. Knowlton Co., 21 Elizabeth St., plans to build 2 story, 40 x 48 ft. and 1 story, 21 x 84 ft. brick shipping plant. About $110,000.

Md., Lansdowne—Natl. Steel Rolling Co., 203 Keyser Bldg., receives bids about June 10, building 1 story, 70 x 140 ft., steel rolling mill, concrete foundation. About $100,000. Private plans. Noted April 8.

N. C., Belmont—Eagle Yarn Mills plan to build mill. About $200,000. Engineer and architect not selected.

N. C., Bladenboro—Bladenboro Cotton Mills plan to build 1 story, 100 x 466 ft.

Industrial Works (Continued)

brick mill. About $200,000. R. C. Biberstein, 614 Elizabeth Ave., Charlotte, archts. and engrs.

N. C., High Point—Amos Mfg. Co. plans to build 2 story, 64 x 160 ft., brick warehouse. About $50,000.

N. C., Salisbury—Star Shirt Co., 251 5th Ave., New York City, having plans prepared building 100 x 170 ft., brick and steel factory, rein.-con. flooring, concrete foundation. About $100,000. Private plans.

S. C., Bennettsville—Marlboro Fertilizer Co. plans to build 80 x 200 ft. factory, of 200 ton daily capacity.

O., Cleveland — Cleveland Ry., Leader-News Bldg., receives bids about May 27, building 1 story, 44 x 67 ft., rein.-con., brick and steel, electric sub-station, rein.-con. flooring, concrete foundation, on East 99th St. and Claire Ave. About $100,000. L. P. Crocelius, 650 Leader-News Bldg., archt. and engr.

O., Cleveland—Goff-Kirby Coal Co., Electric Bldg., plans to build 3 story, concrete, brick and steel warehouse, garage and stable, rein.-con. flooring, concrete foundation, on East 39th St. and Payne Ave. About $150,000. Architect not selected.

O., Columbus—Columbus Transfer Co. having plans prepared by Moores & Dunford, Eng. Corp., engrs. and archts., 444 1st Natl. Bank Bldg., Chicago, for 5 story, 150 x 200 ft. concrete and brick warehouse, on Cleveland Ave. About $350,000.

O., Dover—City plans to improve light plant. About $100,000.

O., Euclid—Goff-Kirby Coal Co., Electric Bldg., Cleveland, plans to build 3 story, concrete, brick and steel warehouse, stable and garage, rein.-con. flooring, concrete foundation, here. About $150,000. Architect not selected.

O., Galion—City plans to enlarge electric light plant. About $75,000.

O., Lakewood (Cleveland P. O.)—Cleveland Cartage Co., 1394 Hird Ave., plans to build 2 story, concrete, brick and steel warehouse and garage, rein.-con. flooring, concrete foundation, on Berea Rd. About $100,000. Architect not selected.

O., Solon—Solon Tire Co., Union Bldg., Cleveland, having plans prepared by D. C. Smith, archt. and engr., Lennox Bldg., Cleveland, for 2 story, 100 x 300 ft., brick, steel and concrete factory and boiler house, rein.-con. flooring, concrete foundation. About $125,000.

Mich., Detroit—Detroit Graphite Co., 12th St., having plans prepared by Smith, Hinchman & Grylls, archts., 710 Washington Arcade, for 2 story, rein.-con., brick and steel addition to paint factory, rein.-con. flooring, concrete foundation. About $50,000.

Mich., Detroit—Dodge Bros., Campau Ave., plan to build 100 x 100 ft. power house. About $2,000,000. Smith, Hinchman & Grylls, 710 Washington Arcade, archts.

Ill., Chicago—Foell Supply Co., 331 West 22d Pl., having plans prepared by H. C. Christensen, archt., 7258 Union Ave., for 3 story, 100 x 200 ft., rein.-con. factory, concrete foundation, on 47th St. and Kedzie Ave. About $175,000.

Wis., Milwaukee—Carpenter Baking Co., 102 7th St., having preliminary plans prepared by C. Barkhausen, archt., Iron Blk., for 3 story, 36 x 160 ft., brick and concrete addition to bakery, rein.-con. flooring, concrete foundation.

Wis., Milwaukee—R. P. Hansen, 529 26th Ave., having plans prepared by O. C. Uehling, archt. and engr., 425 East Water St., for 1 story, 100 x 160 ft., brick, concrete and steel garage, rein.-con. flooring, concrete foundation, on Ogden St. About $50,000.

Minn., St. Paul—Times Auto Supply Co., 56th St. and Bway., New York City, having preliminary sketches made by Toltz, King & Day, archts., 1410 Pioneer Bldg., for 6 story, 98 x 130 ft. warehouse and office building, rein.-con. and brick, on St. Peter and 6th Sts., here. About $300,000.

Mo., Kansas City—Corn Products Refining Co., 17 Battery Pl., New York City, Co., Ltd., St. Antoine St., soon lets contract plans to build 1 story, rein.-con. and steel factory, rein.-con. flooring. About $7,000,000. Private plans.

Tex., Amarillo—Cooper-Irwin Motor Co. plans to build 2 story, 70 x 150 ft., brick garage. About $100,000.

Wash., Spokane—Overland Co., 1229 1st Ave., had plan prepared by Cowley & Wells, archts., 602 Hyde Bldg., for 3 story, 75 x 150 ft. rein.-con. garage on Madison and Sprague Sts. About $100,000.

Wash., Spokane—Twichell Motor Car Co., 411 Peyton Bldg., had plans prepared by Cowley & Wells, archts., 602 Hyde Bldg., for 3 story, 142 x 200 ft., rein.-con. garage. About $200,000.

Que., Montreal — Berliner Gramophone building 5 story, 68 x 221 ft. rein.-con. factory, on Lacoste and St. Antoine Sts. About $350,000.

BIDS DESIRED

Conn., Bridgeport—Westcott & Mapes, Inc., archts. and engrs., 207 Orange St., New Haven, receiving bids building superstructure for brick, concrete and steel power plant, rein.-con. flooring, on East Main St., along Pequonnock River, here, for United Illuminating Co., 84 Temple St., New Haven. About $1,500,000.

N. J., East Orange—Silberstein & Co., archts., 121 Springfield Ave., Newark, receiving bids building 1 story, 80 x 225 ft., brick garage, at 100 Main St., for J. D. Samuelson, 37 Hillside Ave., Newark. About $50,000.

Pa., Pittsburgh—F. L. Cornwell, c/o W. A. Balch, archt., 782 Woodward Ave., Detroit, receiving bids constructing 5 story, 56 x 220 ft. service building, concrete, brick and steel, rein.-con. flooring, on Craig St. and Grant Blvd. About $200,000.

Md., Hagerstown—Hagerstown Fdry. Co., 8 North Jonathan St., receiving bids building 2 story, 60 x 80 ft., rein.-con., machine shop, garage and service station, rein.-con. flooring, concrete foundation. About $80,000. A. J. Klinkhart, 54 West Washington St., archt.

O., Cleveland—A. Sogg, archt., 319 Hippodrome Bldg., receiving bids building 1 story, 100 x 100 ft. brick, steel and concrete machine shop, concrete and brick foundation, on St. Clair Ave., for Tool & Auto Products Co., East 73rd St. and St. Clair Ave. About $100,000.

O., New Philadelphia—Until May 26, by Weiss-McClung Co. building 3 story rein.-con., brick and steel factory, rein.con. flooring, concrete foundation. About $300,000. W. S. Ferguson Co., 1900 Euclid Ave., Cleveland, archts. and engrs. Noted March 11.

Ind., Gary—Z. E. Smith, archt., 305 East 55th St., Chicago, receiving bids building 1 story, 50 x 400 ft. steel, brick and concrete factory, concrete foundation, for O. K. Giant Battery Co., 515 Bway. About $75,000.

Ill., Chicago—C. McAdam Co., 3167 Cottage Grove Ave., receiving bids building 1 story, 65 x 250 ft., rein.-con. factory, concrete foundation, on West 27th and Troy Sts. About $100,000. J. C. Llewellyn, 38 South Dearborn St., archt.

N. S., Sydney—Dominion Steel Corp., receiving bids building 60 oven coking plant. About $3,000,000.

Que., Weedon—See "Miscellaneous."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Brunswick**—Cabot Mfg. Co. let contract building 4 story, 130 x 160 ft. brick addition to cotton mill, to H. P. Cummings Constr. Co., Fidelity Bldg., Portland.

★**N. H., Keene**—W. H. McElwain Co., Byron St., Manchester, let contract building 2 story, 55 x 290 ft., brick and mill construction addition to factory, rock foundation, on Marlboro St., to J. Bergeron, Keene. About $90,000. Noted April 29.

★**Vt., West Rutland**—Vermont Marble Co. let contract building 2 story, 100 x 330 ft., brick and steel factory, to Lackawanna Bridge Co., Bell and Abby Sts., Buffalo, N. Y. About $225,000.

★**Mass., Brockton**—G. L. Falk, archt., 63 Main St., let contract to G. Howard & Sons Co., 153 North Main St., building 3 story, 55 x 160 ft., brick and tile dry kiln plant, concrete foundation, on Cherry St., for O. A. Miller Tree Co., c/o architect. About $50,000. Noted April 15.

★**Mass., Chelsea** (Boston P. O.)—F. A. Glazer, 107 Addison St., will build 1 story, 100 x 120 ft., rein.-con. garage, concrete flooring and foundation, on Pearl St. About $80,000. Work will be done by day labor. Noted Feb. 26.

★**Mass., Dorchester** (Boston P. O.)—Stebbins & Watkins, archts. and engrs., 164 Federal St., Boston, let contract to Dillaby Constr. Co., Tremont St., Boston, building 1 story, 121 x 195 ft., brick, terra cotta and hollow tile garage, concrete foundation, on Humphrey St., for Thayer-Griffith Co., Cambridge. About $150,000.

★**Mass., Ipswich**—Ipswich Mills let contract building 2 story, 60 x 205 ft., brick, concrete and steel storehouse, rein.-con. flooring, concrete foundation, to McNally Bldg. Co., 41 Concord St., Framingham. About $100,000.

★**Mass., West Springfield** (Springfield P. O.)—C. P. Newton, archt., 318 Main St., Springfield, let contract to E. F. Carlson Co., 244 Main St., Springfield, building 1 story, brick and concrete factory, concrete flooring and foundation, on Cold Springs Ave., here, for New England Box Co., Greenfield. About $150,000. Noted May 6.

★**Conn., Old Mystic**—Mystic Woolen Co. let contract building 2 story, 50 x 160 ft., brick and mill construction factory, concrete foundation, to H. Wales Lines Co., 134 State St., Meriden. About $50,000.

★**N. Y., Batavia**—Batavia Clamp Co. let contract building concrete and steel factory, to J. Lennon & Sons, Buffalo. About $75,000.

★**N. Y., Brooklyn**—C. Fischer Spring Co., 473 Kent Ave., let contract building 4 story, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Kent Ave. and North 1st St., to Gretsch Eng. Co., 103 Park Ave., New York City. About $200,000.

★**N. Y., Brooklyn**—General Laundry, Inc., c/o Shampan & Shampan, archts., 50 Court St., will build 4 story, 40 x 100 ft., brick and steel laundry, rein.-con. flooring, concrete foundation, at 835 Myrtle Ave. About $150,000. Work will be done by day labor under supervision of architects. Noted Jan. 15.

★**N. Y., Brooklyn**—P. T. J. L. Bldg. Co., c/o E. M. Adelsohn, archt., 1778 Pitkin Ave., will build 1 story, 100 x 105 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Waverly Ave. and Fulton St. About $60,000. Work will be done by day labor.

★**N. Y., Long Island City**—Drug Products Co., 48 West 4th St., New York City, let contract building rein.-con. and steel factory and laboratory, on Jackson and Pierson Aves., here, to Gretsch Eng. Co., 103 Park Ave., New York City. About $175,000.

★**N. Y., Niagara Falls**—Kimberly & Clark Paper Co., Pine St. and Packard Rd., let contract building 2 story, 145 x 458 ft., rein.-con. and steel factory, to Lackawanna Bridge Co., Bell and Abby Sts., Buffalo. About $700,000.

★**N. Y., Niagara Falls**—Natl. Carbon Co., College Ave., let contract building 1 story, 25 x 300 ft. brick and steel factory, to J. W. Cowper Co., Inc., Fidelity Bldg., Buffalo. About $100,000.

★**N. Y., Niagara Falls**—Paper Convertible Corp. let contract building 2 story, 105 x 375 ft., rein.-con. and steel factory, to Lackawanna Bridge Co., Bell and Abby Sts., Buffalo. About $300,000.

★**N. Y., North Tonawnnda**—Niagara Radiator Co. let contract building 1 story, 70 x 190 ft., concrete and steel factory, to Lackawanna Bridge Co., Bell and Abby Sts., Buffalo. About $150,000.

N. J., South River—Bd. Pub. Wks. received bids building turbine engine plant at power house, from J. R. Proctor Eng. Co., 74 Cortland St., $197,368; Equity Eng. Co., 30 Church St., $211,726; L. Stevens Co., 120 Bway., $214,000; installing turbo generators, from Kerr Turbine Co., 30 Church St., $36,550; Genl. Electric Co., 120 Bway., $40,570; N. W. Kellogg Co., 90 West St., $46,465, all of New York City; in-

Industrial Works (Continued)

stalling boilers, from Pardell Corp., 304 Bailey Bldg., Phila., $30,556, Babcock & Wilcox, 85 Liberty St., New York City, $29,908, installing soot blowers, $1,835; condensers, air and circulating pumps, from Wheeler Condenser & Eng. Co., 149 Bway., New York City, $19,350 Noted April 29

★**N. J., Verona (Montclair P. O.)**—Eagle Rock Mfg. Co. let contract building, 2 story, 40 x 350 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, to J. W. Ferguson, United Bank Bldg., Paterson. About $250,000. Noted March 25. About $150,000. Noted March 11

★**Pa., Erie**—Hays Mfg. Co., 12th and Liberty Sts., let contract building 2 story, 100 x 180 ft., brick and steel factory, brick foundation, to Tuttle Constr. Co., Erie.

★**N. C., Goldsboro**—Export Leaf Tobacco Co., 511 5th Ave., New York City, let contract building 2 story, mill construction plant, brick foundation, here, to E. L. Bass & Bros., 708 Bainbridge St., Richmond, Va. About $100,000.

★**S. C. Gaffney**—Musgrove Mills let contract building mill, warehouse and steam power plant, to Shackleford & Potter, Greenville. Noted March 1

★**Ky., Louisville**—Avery & Sons, 7th and Lee Sts., let contract constructing several small buildings, also 5 story, 141 x 141 ft. warehouse, concrete and brick, and 2 story, 120 x 175 ft. addition to paint shop, concrete, to Natl. Concrete Constr. Co., Bd. Trade Bldg. About $400,000.

★**O., Cleveland**—Cleveland Rubber Corp. Co., 1900 Euclid Ave., let contract building 1 story, 52 x 103 ft., brick, steel and concrete boiler house, rein.-con. flooring, concrete foundation, at 2110 West 114th St., to U. S. Eng. & Constr. Co., Engineers Bldg. About $50,000.

★**O., Cleveland**—Holan Mfg. Co., 3809 Clark Ave., let contract building 1 story, 43 x 104 ft. and 41 x 100 ft., brick, steel and concrete drying kiln and mill, rein-con. flooring, concrete foundation, at 5600 Parkbrook Rd., to F. J. Jirka, 4216 Warren St. About $100,000.

★**O., Cleveland**—Natl. Lamp Co., Nela Park, East Cleveland, let contract building 2 story, 38 x 78 ft. concrete and brick factory addition, rein.-con. flooring, concrete foundation, at 1760 East 45th St., to S. W. Emerson Co., 1900 Euclid Ave. About $65,000.

★**O., Cleveland**—Natl. Malleable Castings Co., Woodhill Rd. and Quincy Ave., let contract building 1 story, brick, concrete and steel kiln, rein.-con. flooring, concrete and brick foundation, on Woodhill Rd., to Amer. Tunnel Co., New Castle, Pa. About $250,000.

★**O., Cleveland**—Natl. Woolen Co., 3157 West 33rd St., let contract building 2 story, 50 x 107 ft., brick and steel machine and engine shop, brick foundation, to H. G. Slatmyer & Son Co., 203 West Lakeside Ave. About $50,000.

★**O., Columbus**—Climax Rubber Co., Citizens Bank Bldg., will construct 2 story, 140 x 190 ft., rubber plant, brick, also 2 story, 40 x 55 ft., power and office building, on North Goodale St. Work will be done by day labor under supervision of M F. Blair, archt. and engr., Cleveland.

★**O., Kenton**—Champion Eng. Co. let contract building 1 story, 60 x 400 ft. and 20 x 160 ft., concrete and steel extensions to factory, to Foundation Co., Fulton Bldg., Pittsburgh, Pa. Cost between $150,000 and $160,000.

★**Mich., Kalamazoo**—Sutherland Paper Co., Lincoln St., let contract building 3 story, 96 x 375 ft., rein.-con., brick and steel mill, rein.-con. flooring, concrete foundation, to O F Miller, Kalamazoo.

★**Mich., Pontiac**—Genl. Motors Truck Co. let contract building 1 story, 240 x 330 ft. machine shop, brick and steel, rein.-con. flooring, concrete foundation, to DuPont Eng. Co., 135 Woodward St About $200,000.

★**Wis., Galesville**—Galesville Canning Co., Onalaska, let contract constructing 1 and 2 story cannery, to include 1 brick and mill construction buildings, concrete foundations, here, to J. E. Wallace, La Crosse. About $100,000. Noted May 6

★**Wis., Kenosha**—Winthor Motor Truck Co., North Shore Rd., let contract building 1 story, 60 x 385 ft., brick and steel factory, concrete flooring and foundation, to Wisconsin Bridge & Iron Co., North Milwaukee.

★**Wis., Milwaukee**—Lavine Gear Co., Keefe Ave., let contract building 150 x 150 ft. brick and steel addition to machine shop, concrete flooring and foundation. About $100,000 Kirchhoff & Rose, Majestic Bldg., archts. and engrs.

★**Wis., North Milwaukee**—Bernert Mfg. Co., 489 12th St., Milwaukee, let contract building 1 story, 120 x 160 ft., brick, concrete and steel factory, concrete flooring and foundation, to E. Grether, 1121 2nd St., Milwaukee; steel, to Wisconsin Bridge & Iron Co., North Milwaukee. Total cost, $80,000. Noted April 29.

★**Ia., Waterloo**—Deere & Co., 1325 3rd Ave., Moline, Ill., let contract constructing plant, to include 1 story, 120 x 200 ft. addition to foundry, 1 story, 80 x 180 ft., mill building, 3 story, 120 x 120 ft. service building, and 2 story, 40 x 40 ft. cupola building, brick, rein.-con. and steel, rein.-con. foundation, rock foundations, to Scales Constr. Co., Waterloo. About $400,000. Owner is purchasing materials.

★**Mo., Kansas City**—Lysle Milling Co., 512 Choctaw St., Leavenworth, Kan., let contract building 8 story, rein.-con. mill and warehouse, here, to Lehrack Contg. & Eng. Co., 725 Gloyd Bldg About $600,000. Noted April 22.

★**Cal., El Segundo**—Genl. Chemical Co., 25 Broad St., New York City, let contract constructing group of rein.-con. and steel buildings, concrete foundations, here, to J. G. White Eng. Corp., 43 Exch Pl., New York City. About $2,000,000.

★**Cal., Woodland**—Pacific Car Bldg. Co. let contract constructing group of factory buildings to include 1 story, 160 x 508 ft. main plant and 2 story, 40 x 160 ft. office, rein.-con., to Unit Constr. Co., Phelan Bldg., San Francisco. About $225,000.

★**Que., Montreal**—Congoleum Co. of Canada let contract building, 70 x 118 ft. rein.-con., brick and steel factory on St. Patrick St., to Atlas Constr. Co., 37 Belmont St. About $105,000.

★**Que., Montreal**—Imperial Tobacco Co., St. Antoine St., let contract building 3 story, 87 x 275 ft. rein.-con. storage warehouse, to E. G. M. Cape Constr. Co., 10 Cathcart St. About $300,000.

★**Ont., New Hamburg**—Schierholtz Furniture Co., Arnold St., will build 4 story, 50 x 65 ft. addition to factory, white brick. About $50,000. Work will be done by day labor.

★**B. C., Vancouver**—Vancouver Gas Co., 425 Carrol St., let contract building retort house plant, to Wests Gas Impvt. Co., Manchester, England. About $340,000.

★**B. C., Victoria**—Victoria Gas Co., 1016 Langley St., let contract building retort house plant, to Wests Gas Impvt. Co., Manchester, England About $216,000.

Buildings

PROPOSED WORK

N. H., Dover—Housing—Kilham & Hopkins, archts., 9 Park St., Boston, soon let contract building 2 story, brick and timber houses for workmen, rock or concrete foundations, for Pacific Mills. About $125,000

Mass., Brockton—Theatre—Dreyfus & Bardol, c/o A. H. Bowditch, archt., 44 Bromfield St., Boston, having plans prepared for 2 story, 140 x 200 ft., brick, concrete and steel, on Main St. About $300,000.

Mass., Gardner—Hall—War Memorial Com. plans to build 1 or 2 story hall. About $150,000. E. G. Watkins, chn. Architect not selected.

Mass., Malden (Boston P. O.) School—Beth Israel Synagogue, Eastern Ave and Franklin St., soon lets contract building 2 story, 65 x 110 ft., brick, terra cotta and concrete, concrete foundation, on Almond St. About $100,000 Private plans

Mass., New Bedford—School Bd. Educ. having plans prepared by LaBrode & Bullard archts. 255 Union St. for two 3 story, 20 room grammar schools About $500,000.

Mass., Walpole—Housing—Kilham & Hopkins, archts., 9 Park St., Boston, soon let contract building fifteen 2 story, brick and timber houses for workmen, rock or concrete foundations, here, for Bird & Son, Inc., East Walpole. About $100,000.

R. I., Slocum—Dormitories—State Bd. Educ., c/o T. S. McLoughlin, archt., 507 Union Trus. Bldg., Providence, having sketches made for 2 dormitories at Exeter School, here. About $100,000.

R. I., Woonsocket—Church—M. Sullivan, archt., 100 Boylston St., Boston, soon lets contract building 90 x 160 ft., brick and limestone, concrete foundation, on Social St., for Our Lady of Victory Society About $150,000.

Conn., Meriden—Business—Mag & Atwater, c/o D. Bloomfield, archt., 52 Sherman Ave., had plans prepared for 3 story, 50 x 100 ft., brick and rein.-con., and two 2 story buildings to form arcade, rein.-con. flooring, concrete foundations, on Hanover St About $100,000.

Conn., New London—High School—Bd School Comrs. rejected bids received May 12, building 3 story, brick, concrete and steel, on Williams and Mercer Sts. About $500,000. Work will be readvertised. D. S. Donnelley, Plant Bldg., archt. Noted April 29.

Conn., Shelton—High School—Bd. Educ rejected bids received April 16, building 2 story, brick, concrete and steel, on Coram Ave. About $125,000. Work will be readvertised. Brown & Von Beren, 185 Church St., New Haven, archts. Noted April 8.

Conn., West Hartford—Church—Swedish Methodist Episcopal Society plans to build 1 story, brick, on Boulevard. About $100,000. E. W. Chellger, pastor. ' Architect not selected.

N. Y., Jamestown—Schools—City election June 4, to vote on $350,000 bonds to build additions to Euclid Ave., Sherman, Falconer and Charles Sts., schools.

N. Y., Long Island City—Lodge—Loyal Order of Moose, 587 Bway., having plans prepared by W. Sproesser, archt. and engr., 211 12th Ave., for 5 story, 75 x 100 ft., brick and stone, brick foundation, on Lefferts Ave. and Bway. About $150,000.

N. Y., New York—Office—F. Begrisch and C. L. Acker, 200 Bway. plan to build 12 story brick, steel and stone, concrete foundation, on 36th St. and 5th Ave. About $3,500,000. Architect not selected.

N. Y., New York—Theatre—S. Harris and I. Berlin, 226 West 42nd St., having plans prepared by C. H. Crane and P. Pereira, archts. and engrs., 2325 Dime Bank Bldg., Detroit, for 2 story, 100 x 100 ft., brick and stone, brick foundation, at 239 West 45th St., About $400,000.

N. Y., Niagara Falls—Church—St. Pauls Methodist Episcopal Church plans to build church on 7th St. and Cedar Ave. About $100,000.

N. Y., Willsboro—School—Bd. Educ. having plans prepared by Tooker & Marsh, archts. and engrs., 101 Park Ave., New York City, for brick and steel, brick foundation. About $160,000

N. J., Newark—Schools—Bd. Educ., City Hall, having plans prepared by J. H. and W. C. Ely, archts., Firemans Trust Bldg., for school on Oliver St, and 3 story, on Bloomfield Ave. and Parker St., both concrete and brick. About $400,000 and $120,000 respectively.

Pa., Pittsburgh — Theatre, Billiard and Bowling—Roosevelt Corp., c/o H. E. Kennedy and associates, archts., 230 5th Ave., having plans prepared for 3 story, 169 x 180 ft., rein.-con., brick and steel, on East Liberty St. About $750,000.

Md., Baltimore—Bank—Natl. Bank of Commerce, 26 South St., purchased adjoining site, 22 x 100 x 106 x 180 ft., and plans to build addition, brick, stone and concrete About $250,000 E. Levering, pres.

Md., Baltimore —Office — Merchants & Manufacturers Assn., 109 East Redwood St., having plans prepared by T W. Pietsch, archt., 1210 Amer. Bldg., for converting 6 story, steel, hollow tile and marble warehouse on Light St. near Redwood St., into office. About $100,000.

Md., Towson (Baltimore P. O.) School—Maryland Industrial Training School for

Buildings (Continued)

Girls, Cary and Baker Sts., Baltimore, having plans prepared by Smith & May, archts., 1133 Calvert Bldg, Baltimore, for 1 and 2 story, fireproof construction, at Montrose Farm, here.

Va., Norfolk—Office—C. N. Whitehurst & Co., 225 Plume St., having sketches made by Herts & Robertson, archts., 331 Madison Ave., New York City, for 12 story, brick, steel and stone, brick and concrete foundation, on York and Bush Sts. About $750,000.

Va., Richmond—Office—Herts & Robertson, archts., 331 Madison Ave., New York City, making sketches for 6 story, brick, stone and steel, concrete foundation, here. About $400,000. Owners name withheld.

N. C., Salisbury—Bank—First Natl. Bank having plans prepared by A. C. Bossom, archt. and engr., 680 5th Ave., New York City, for brick, stone and marble, brick foundation. About $100,000.

Fla., Ft. Myers—School—City voted $100,000 bonds to build school.

La., New Orleans—Exchange—New Orleans Cotton Exchange, Weis Bldg., soon lets contract building 8 story, rein.-con. brick, steel and stone, concrete foundation. About $1,500,000. Favrot & Livaudais, Title Guarantee Bldg., archts.

Tenn., Severille—College—Murphy College having plans prepared by Magaziner & Eberhardt, archts., 603 Chestnut St., Phila., for three 1 and 2 story buildings, 50 x 80 ft., 60 x 120 ft. and 50 x 150 ft., concrete and brick. Cost to exceed $100,000.

O., Cleveland—Hospital—Lutheran Hospital Co., c/o F. W. George, 2609 Franklin Ave., plans to build 4 story, concrete, brick and steel, rein.-con. flooring, concrete foundation, at 2609 Franklin Ave. About $200,000. U. S. Longee, Marshall Bldg., engr.

O., Columbus—Bank and Office—Franklin Mortgage Securities Co., Hartman Bldg., having plans prepared by Hansberger, Marion, Berry & Co., 51½ East State St., for 4 story, 36.9x 111.8 ft., brick and steel, on West Gay St. About $100,000.

O., Dayton—Clubhouse—Knights of Columbus Bldg. Co., West Monument Ave., plans to build 2 story, brick, stone and rein.-con., concrete foundation. About $200,000. Architect not selected.

O., East Cleveland (Cleveland P. O.)—Hospital—East Cleveland Hospital Comn., receives bids about Aug. 1, building 3 story, 90 x 240 ft., concrete, brick and steel, rein.-con. flooring, concrete foundation, on Euclid and Strathmore Aves. About $600,000. A. M. Allen & Co., 1900 Euclid Ave., Cleveland, archts. and engrs. Noted Apr. 15

O., Sidney—Office and Theatre—C. B. De Weese Co. having plans prepared by J. Q. Adams, archt., New Southern Hotel, Columbus, for 3 story, 83 x 166 ft., concrete and brick. About $200,000.

Ind., Ft. Wayne—Schools—City plans to issue $1,732,000 bonds to build schools.

Mich., Detroit — Commercial—Greenberg & Shevitz, 195 Ferry Park, plan to build 2 story, 100 x 200 ft., rein.-con., brick and stone, rein.-con. flooring, concrete foundation, on Woodward Ave. and Rowena St. About $150,000. Architect not selected.

Mich., Detroit—High School—Bd. Educ. rejected bid building 4 and 7 story additions, rein.-con., brick and steel, rein.-con. flooring, concrete foundations, on High and 2nd Sts About $1,900,000. Work will be re-advertised. Malcolmson, Higginbotham & Palmer, 405 Moffat Bldg., archts.

Mich., Detroit—Library—Detroit Library Comn., Pub. Library Bldg., having plans prepared by Donaldson & Meier, archts., 1314 Penobscot Bldg., for 2 story, 50 x 90 ft., rein.-con., brick and stone, rein.-con. flooring, concrete foundation, on Davison Rd. and Lumpkin St. About $150,000. Noted Jan. 1.

Mich., Detroit — Mercantile — Frank & Seder, 5th and Smithfield Sts., plan to build 12 story, 120 x 150 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Woodward Ave. Architect's name withheld.

Mich., Detroit — Office — J. Stroh, 1676 Jefferson Ave., plans to build 18 story, 80 x 100 ft., rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation, on West Grand Circus Park. Architect not selected.

Mich., Detroit—Seminary—Sacred Heart Seminary, 155 McDougal Ave., having plans prepared by Donaldson & Meier, archts., 1314 Penobscot Bldg., for 3 and 4 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Linwood Ave. and Joy Rd., to include central building for school, administration building and dormitory, chapel, convent, infirmary, auditorium and gymnasium. About $2,500,000. W. W. Walker, chn. Noted March 25.

Mich., Flint—Theatre—J. Kovinsky, North Saginaw St., having plans prepared by L. J. Heenan, archt., Flint, for 2 story, 90 x 140 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on North Saginaw St About $100,000.

Mich., Grand Rapids—School Bd. Educ. receives bids about June 1, building 2 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Lafayette St. About $200,000. Former bids rejected. Noted March 25.

Mich., Highland Park (Detroit P. O.)—J. H. Kunsky, 501 Madison Theatre Bldg., Detroit, having plans prepared by C. H. Crane, archt., Huron Bldg., Detroit, for 2 story, 127 x 200 ft., rein.-con., brick, steel and terra cotta, rein.-con. flooring, concrete foundation, on Woodward and Waverly Aves. About $300,000.

Mich., Port Huron — Recreation — Womans Benefit Assn., Military and Chestnut Sts., having plans prepared by Schmidt, Gardner & Martin, archts., 104 South Michigan Ave., Chicago, for 3 story, 40 x 113 ft., rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation. About $100,000.

Wis., Milwaukee—Club House—Lodge 46, B. P. O. E., 448, Jefferson St., plans to build 17 story, brick and concrete. About $1,000,000. R. A. Messmer & Bro., Majestic Bldg., archts.

Wis., Milwaukee — Temple — Temple Emanu-El, Bway. and Martin Sts., had plans prepared by R. A. Messmer & Bro., archts., Majestic Bldg., for 1 and 3 story, 100 x 245 ft., brick and concrete, rein.-con. flooring, concrete foundation, on Kenwood Blvd. About $250,000. Noted Jan. 29.

Ia., Coin—School—Bd. Educ. plans to build school. About $110,000. Architect will be selected at once.

Ia., Grundy Center—School—Bd. Educ. having plans prepared by W. L. Pedicord, archt., Iowa Falls, for 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $120,000

Ia., Oskaloosa—Hotel—S. Wallace plans to build 4 story, brick. About $250,000. Architect to be selected at once.

Ia., Shenandoah—Office and Bank—C. G. Wenstrand plans to build 5 story, 40 x 90 ft., brick and stone About $150,000.

Minn., Morris—Armory—City having preliminary plans prepared by J. W. Henry, archt., Aberdeen, S. D., for 2 story, 64 x 169 ft., brick and stone. About $100,000

Minn., Walker—Infirmary—State Bd. Control having plans prepared by C. H. Johnston, archt., 715 Capital Bank Bldg., St. Paul, for 3 story, 65 x 120 ft., rein.-con. and brick. About $100,000

Kan., Lincoln—High School—Bd. Educ. having plans prepared by W. H. Saylor Co., archts., Mutual Bldg., Kansas City, Mo., for 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $125,000. Noted April 22.

Kan., Winfield—Bank and Office—Cowley Co. Natl. Bank, soon lets contract building 6 story, 50 x 140 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $250,000. Ivar, Vishe & Maess, 69 East Van Buren St., Chicago, Ill., archts. Noted April 29.

Neb., Fremont — Church — Methodist Episcopal Church plans to build 2 story, 62 x 115 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $110,000. W. C. Jones, 30 North LaSalle St., Chicago, archt

Wyo., Rawlins—Hospital—Bd. Comrs. Carbon Co. will sell $100,000 bonds June 24 to build hospital. A. W. Rasmussen, chm.; advertised in this issue.

Mont., Billings—Schools—City election July 10, to vote on $350,000 bonds to build schools.

Mont., Malta—Courthouse—Phillips Co. voted $150,000 bonds to build courthouse.

Mont., Miles City—High School—Custer Co. voted $250,000 bonds to build 2 story, concrete brick and stone. Noted Feb. 12.

Mo., St. Louis—Hospital—Sisters of St. Mary, 1536 Popin St., plan to build 200 x 300 ft. brick. About $250,000. Architect not selected.

Mo., St. Louis—Stores—G. Tower, 27 Vandeventer Pl., having plans prepared by T. B. Barnett & Co., archts. and engrs., Arcade Bldg., for 6 story, 88 x 150 ft., concrete and steel on 6th St.

Okla., Mangum—High School—Bd. Educ. rejected bids received April 12, building 3 story, rein.-con. and brick. About $130,000. Noted April 15.

Okla., Tulsa—Church—Orcutt Methodist Episcopal Church plans to build 2 story, 100 x 130 ft. church. About $110,000. Architect and engineer not selected.

Okla., Tulsa—Office—W. M. Thompson and J. N. Thompson, 1172 North Cheyenne St., and R. H. Hughes, 412 Robinson Bldg., are having plans prepared by Bass, Knowlton & Graham, archts., Tulsa, and receive bids in July, constructing office building, on 5th and Boston Sts. About $700,000. Noted Feb. 26.

Okla., Tulsa — Temple — Masonic Lodge having plans prepared by R .G. Schmidt & Co., archts., 104 South Michigan Ave., Chicago, Ill., for temple. About $250,000. J. Drout, 315 Kennedy Bldg., chn. finance com.

N. M., Santa Fe—Hotel—City soon receives bids building 2 and 3 story hotel. Bonds for $225,000 voted for project.

Idaho, Boise—High Schools—City voted $275,000 bonds to build 2 new high schools.

Wash., Spokane—Hospital—St. Lukes Hospital, Dean and A Sts., plans to build 4 story, 40 x 180 ft., brick and concrete. About $160,000. Rigg & Vantyne, 525 Peyton Bldg., archts.

Cal., Anaheim—Lodge and Club—B. P O. E. Lodge having plans prepared by F. K. Benchley, archt., 708 Spadra Rd., Fullerton, for 2 story, 104 x 144 ft., concrete, brick and hollow tile. About $150,000.

Cal., Lindsay—High School—Lindsay Union High School Dist. having preliminary plans prepared by E. J. Kump, archt., Powell Bldg., Fresno, for high school. About $200,000.

Cal., Vallejo—Schools—Bd. Educ. retained W. H. Weeks, archt., 75 Post St., San Francisco, to prepare plans for $250,000 high school; Perry & Clark, 1209 Sutter St., elementary school; Woollett & Lamb, Physicians Bldg., Sacramento, and Perry & Clark, 1209 Sutter St., for elementary school. Bonds for $500,000 voted for project. Noted March 11.

Que., Montreal—Schools—Catholic School Bd. Comn., 37 St. Catharine St. E., soon receives bids building 3½ story, brick, steel and stone, concrete foundation, on St. Viateur St., for St. Michael Parish, cost $300,000; 3 story, brick, steel and concrete on Craig St. E., for St. Aloysius Parish, $200,000; 4 story, brick and steel on St. Denis St., for St. James Parish, $180,000.

Que., Montreal — School — Protestant Bd School Comrs., Belmont St., soon receives bids remodeling Peel St. school. About $145,877.

BIDS DESIRED

N. Y., Brooklyn—Hospital—Until May 27, by Dept. Pub. Welfare, Municipal Bldg., New York City, for completion of Contr. 1, general construction and electrical work excluding plumbing, heating and ventilating, for hospital on Cumberland St., here. B. S. Coler, comr.

N. Y., Brooklyn—Nurses Home—Dept Pub. Welfare, Municipal Bldg., New York

Buildings (Continued)

City, received no bids April 26, furnishing labor and material building additions, on grounds of Kings Co. Hospital, Clarkson St. About $950,000. Work will be readvertised. B. S. Coler, comr. Noted April 22.

N. Y., Buffalo—Hotel and Theatre—Until June 1, by G. B. Post, archt. and engr., 101 Park Ave., New York City, building 17 story, 84 x 130 x 279 x 292 x 348 ft., brick, steel and limestone, concrete foundation, on Delaware Ave., Niagara Sq., Franklin and Mohawk Sts., for Hotel Statler Co., Washington St. About $5,500,000. Noted April 29.

N. J., Newark—Schools—Until June 8, by Bd. Educ., City Hall, building 3 story, 70 x 80 ft., on Alexander St., and 3 story, 219 x 222 ft., on 1st and 2nd Sts., both concrete and brick. About $1,125,000 for latter. J. H. and W. C. Ely, Firemans Trust Bldg., archts. Noted April 1

Pa., Beaver Falls—School—Until May 28, by Bd. Educ., building 2 story, 60 x 132 ft., rein.-con., brick and steel, rein.-con. flooring, brick foundation. About $160,000. H. E. Ewing, secy. Carlisle & Sharer, Jenkins Arcade, Pittsburgh, archts. Noted May 6.

Pa., Donora—School—Until May 28, by Bd. Educ., building 3 story, 120 x 120 ft., brick and steel. About $150,000. C. Compton, Donora, archt.

Pa., Harrisburg—Barracks—Until June 15, by T. W. Templeton, supt. Pub. Grounds and Buildings, furnishing labor and material building barracks for Troop E, State Police, near State Arsenal Grounds; advertised in this issue.

Pa, Harrisburg—Office—Until June 15, by T. W. Templeton, supt. pub. grounds and bldgs., constructing portion substructure of south office building A. W. Brunner, 101 Park Ave., New York City, archt.; advertised in this issue. Noted Jan. 29.

★S. C., Charleston — Citadel — Military College of South Carolina let contract constructing rein.-con. citadel, to include barracks, mess hall, kitchen, house for officers, etc., to Charleston Eng. & Contg. Co., 58 Broad St. About $900,000.

O., Cleveland—Theatre and Commercial —Clinton Co, c/o V. Pytolsia, 1378 Vandemar Ave., receiving bids building 2 story, 60 x 120 ft., brick, steel and concrete, rein.-con. flooring, concrete foundation, on Clinton Ave. About $100,000. Architect not selected.

O., Columbus—Schools—Until June 7, by Bd. Educ., building 2 story, 110 x 112 ft., on Fulton St., cost $125,000; 2 story, 110 x 190 ft., on Taylor Ave., $175,000; 2 story, 110 x 190 ft., on Sullivant Ave., $175,000; all concrete and brick. D. Riebel & Sons, New 1st Natl. Bank Bldg., archts. Noted May 6.

O., Linden (Columbus P. O.)—School—Until June 7, by Bd. Educ., Columbus, building 2 story, irregular shaped, concrete and brick, here. About $200,000. D. Riebel & Sons, New 1st Natl. Bank Bldg., Columbus, archts. Noted May 6.

O., Troy—Office and Theatre—Troy Amusement Co. receiving bids building 2 story, 52 x 160 ft., concrete and brick, on Main St. About $125,000. J. Q. Adams, New Southern Hotel, Columbus, archt.

Wis., Manitowoc—Bank and Office—Until May 29, by W. J. Raueber, archt., Manitowoc, building 2 story, 50 x 150 ft., brick, rein.-con. and steel, brick foundation, on 8th St., for State Bank of Manitowoc. F. Miller, chn.

Wis., Sheboygan—High School—Until June 1, by city, c/o C. U. Boley, pres. Bd Pub. Wks., building brick, rein.-con. and steel high school, rein.-con. flooring, brick foundation, to include gymnasium, swimming pool, and machine shop. About $300,000. Childs & Smith, 64 East Van Buren St., Chicago, Ill., archts.

Wis., Chippewa Falls—High School—Until May 24 (change of date), by Bd. Educ., building junior high school, 3 story, brick and concrete, rein.-con. flooring, concrete foundation. About $175,000. Beers, Schling & Bailey, Monadnock Blk., Chicago, archts. Noted May 6.

Neb., Loup City—Court House—Until June 7, by Sherman Co., building 3 story, 60 x 74 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $165,000. Henningson Eng. Co., 3rd Natl. Bank Bldg., Omaha, archts. and engrs.

Wyo., Sheridan—Office—Until May 31, by Trustees Whitney Estate, building 5 story, rein.-con., stone and brick, on Main and Loucks Sts. Link & Haire, 317 Electric Bldg., Billings, Mont., archts. Noted Oct. 9.

Mo., Carthage—Hotel—Drake Hotel Co. receiving bids building 4 story, 75 x 90 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $140,000. Shepard & Wiser, 301 R A Long Bldg., Kansas City, Mo., archts. Noted Feb. 19.

Okla., Durant—Dormitory—Presbyterian College receiving bids building 3 story, 95 x 100 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. J. Hicks, 19½ West Main St., Oklahoma, archt. Noted May 13.

Bids Wanted on 186 Projects

as follows:

Water-Works	6
Sewers	15
Bridges	11
Streets and Roads	61
Excavation	4
Industrial Works	9
Buildings	33
Government	29
Miscellaneous	18

See pages 361 and 362

Okla., Oklahoma — Mausoleum — Until June 1, by Fairlawn Cemetery Assn., 2700 North Shartel St., building 1 story, 55 x 120 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $175,000. Bailey & Alden, 1207 Concord Bldg., archts. Noted April 1.

Cal., Red Bluff—Court House—Until June 1, by H. G. Kuhn, clk. Tehama Co., building new court house. About $200,000. Noted Feb. 12.

Ont., London—Hospital—Until May 31, by J. M. Moore, arct., 425 Richmond St., building 4 story, 75 x 180 ft. brick and stone, on St. James St. About $160,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Boston — Mercantile — Snider & Druker, 18 Tremont St., will build 8 story, 60 x 100 ft., rein.-con., rein.-con. flooring, concrete foundation, on Kneeland St. About $500,000. Work will be done by day labor.

★Mass., Boston — School — Suffolk Law School, Inc., let contract building 3 story, 50 x 80 ft., brick and stone, concrete foundation, on Temple St., to H. C. Porter, Beacon St. About $150,000. Noted Feb. 26.

★Mass., Boston—Studio—C. G. Loring, archt., 7 Water St., let contract to Whidden-Beekman Co., 100 Boylston St., altering 5 story, brick and steel, on Charles and Chestnut Sts. About $100,000. Owner's name withheld. Noted April 29.

★Mass., New Bedford—Housing—Fairhaven Mills, Fairhaven, let contract building forty 2 story, frame houses for workmen, concrete foundations, here, to E. H. Kelly, 10 State St., Boston. About $250,000.

★Mass., New Bedford—Theatre—J. S. McIntyre, archt., 22 Clifford Bldg., let contract to Weiss Constr. Co., 40 Court St, Boston, building 2 story, 70 x 140 ft., brick, concrete and stone, rein.-con. flooring, concrete foundation, on Elm St., for Empire Theatres, Inc., 2 Masonic Bldg. About $325,000. Incorrectly noted in our issue of "May 13."

★Conn., Middletown — Hospital — Connecticut Hospital for Insane will build 2 story, 105 x 203 ft., brick and concrete, rein.-con. flooring, concrete foundation, on South Farms. About 175,000. Work will be done by day labor. Noted April 8.

★Conn., New London—Church—Methodist Episcopal Congregation, 193 Hempstead St., let contract building 1 story, 75 x 104 ft., brick and steel addition to church, concrete foundation, and 75 ft. tower, on Broad St., to W. H. Hamlyn & Son, Inc., 35 Greenwich St., Providence, R. I. About $150,000. Noted April 29.

★Conn., Torrington—Hotel—Torrington Corp., 68 Wilson Ave., let contract altering Conley Inn Hotel and building 3 story, brick and concrete addition, rein.-con. flooring, concrete foundation, to Torrington Bldg. Co., 197 Water St. About $200,000.

★N. Y., Brooklyn—Office and Salesroom —Tooker & Marsh, archts. and engrs., 101 Park Ave., New York City, let contract to Moodey Eng. Co., 90 West St., New York City., building 4 story, brick, steel and stone, concrete foundation, on Bedford Ave. and Sterling Pl., here, for Studebaker Corp., Main and Bronson Sts., South Bend., Ind. About $150,000. Noted April 15.

N. Y., Newtown (Flushing P. O.)—High School—Bd. Educ., 500 Park Ave., New York City, received bids May 12, altering and building addition to Newtown High School, on Etna Pl., Gerry Ave., Chicago and Parcell Sts., here, from T. A. Clarke, 122 Livingston St., Brooklyn, $986,700; T. Dwyer, Bway. and 216th St., New York City, $1,094,000; D. E. Connors, $1,063,200. Noted May 6.

★N. Y., New York—Office—Crawford, Russell, Weaver & Everett, 2 West 42nd St., are forming syndicate, to build 25 and 31 story, brick, steel and stone, concrete foundation, on Park and Madison Aves., 45th and 47th Sts. About $25,000,000. Work will be done by day labor.

★N. Y., New York—Office—E. Dwight, 56 Maiden Lane, let contract converting 8 story, brick and steel loft building on William and John Sts., into office, to Niemann & Co., 25 West 42nd St. About $150,000. Noted March 18.

N. Y., New York—Theatre—H. C. Ingalls, archt. and engr., 347 Madison Ave., receives bids about June 10, building 2 story, 160 x 110 ft., brick, steel and stone, brick foundation, on 7th Ave. and 137th St., for W. Roach, 214 West 141st St. About $200,000. Noted April 15.

★N. Y., Seneca Falls—Office—G. B. Post, archt., 101 Park Ave., New York City, let contract to Amsterdam Bldg. Co., 140 West 42nd St., New York City, building 2 story, brick and stone, concrete foundation, for Goulds Mfg. Co., 240 Fall St. About $200,000. Noted April 29.

★N. J., Mountain Lakes—School—Bd. Educ. let contract building brick and stone, brick foundation, to Oak Ridge Co., 170 Bway., New York City. About $100,000. Noted April 22.

★Pa., Chester—Lodge—Tall Cedars, let contract building 6 story, brick and stone, on 9th and Sproul Sts., to Cramp & Co., Denckla Bldg., Phila. About $500,000. Noted March 11.

Buildings (Continued)

Pa., Phila.—Stations—Dept. City Transit, 1211 Chestnut St., received bids May 11, building stations on (a) Kensington Ave. and Tioga St. and on Tioga and K Sts., rein.-con., stone, brick, steel and terra cotta; also removing present buildings on Tioga and K Sts. (Contr. 556), (b) on Kensington Ave. and Huntington St. and Kensington Ave. and B St. (Contr. 558) (c), Contr. 556 and 558 combined, (Contr. 559), from Standard Constr. Co., 1713 Sansom St., (a) $100,795, (b) $81,045, (c) $179,340; I. K. Davis Co., 6100 North 20th St., (a) $136,510, (b) $126,510, (c) $260,020. Noted April 22.

★**Pa., Pittsburgh**—Sales—Dyke Motor Supply Co., c/o P. C. Dowler, archt., Magee Bldg., let contract building 6 story, 50 x 110 ft., rein.-con., brick and steel, rein.-con. flooring, on Webster Ave. and Chatham St., to Miller Constr. Co., Empire Bldg. About $125,000. Noted May 13.

★**Md., Baltimore**—Hall—Lithuanian Hall Assn., 112 North Greene St., let contract building 3 story, 66 x 137 ft., brick and rein.-con., rock and concrete foundation, on Hollins and Parkins Sts., to S. Kramer, 906 South Sharp St. About $100,000. Noted Nov. 20.

★**Md., Baltimore** — Store — Bernheimer Bros., 302-6 West Fayette St., let contract building 6 story, brick and concrete addition, concrete foundation, to Consolidated Eng. Co., 243 Calvert Bldg. About $100,000. Noted Sept. 11.

★**D. C., Wash.**—School and Dormitory—Immaculate Seminary, Wisconsin and Nebraska Aves., let contract building school and dormitory, to Weller Constr. Co., 816 14th St. About $100,000.

★**N. C., Chapel Hill**—Dormitory—University of North Carolina let contract building 3 story, hollowtile and stucco, to J. T. Salmon, Durham, $132,500.

★**N. C., Selma** — School — Bd. Educ. let contract building 2 story, 116 x 150 ft., rein.-con. and brick, rein.-con. flooring, to J. W. Stout, Sanford. About $150,000.

★**S. C., Columbia**—Hospital—Columbia Hospital, Hampton Ave., let contract building 3 story, to C. M. Lide, Hook Bldg. About $100,000.

★**O., Cleveland**—Theatre and Commercial—Gordon Square Co., c/o A. Eyerdam, West 65th St. and Detroit Ave., let contract building 3 story, 150 x 300 ft. brick, steel and concrete, rein.-con. flooring, concrete foundation, to Drummond & Miller Co., 4500 Euclid Ave. About $300,000.

★**O., Columbus**—Office—R. L. Wirtz, 2080 Iuka Ave., had plans prepared by E. E. Pruitt, archt., 209 South High St., for 4 story, 62 x 181 ft., concrete, steel and brick, on East State St. About $250,000. Work will be done by day labor.

★**Mich, Detroit** — Sales — Packard Motor Car Co., East Grand Blvd., let contract building 3 story, 95 x 209 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Jefferson Ave. and St. Antoine St., to H. G. Christman Co., 315 Stevens Bldg. About $175,000. Noted Feb. 26.

★**Wis., Menasha**—High School, etc.—Bd. Educ. let contract building 2 story, brick and concrete addition to high school and power plant, rein.-con. flooring, concrete foundation, to C. R. Meyer & Sons Co., 50 State St., Oshkosh. About $95,000; cost plus percentage basis. Noted April 1.

★**Wis., Racine**—Store—S. Kulte, 434 South Main St., let contract building 8 story, 70 x 238 ft., brick and concrete, rein.-con. flooring, concrete foundation, on Main St., to Finlayson & Co., 139 North Clarke St., Chicago. Noted Feb. 5.

★**Ia., Council Bluffs**—High School—Bd. Educ. let contract building 3 story, 109 x 307 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to A. H. Neumann, 519-20 Hubbell Bldg., Des Moines, $344,833.3 Noted May 6.

Minn., Olivia—High School—Bd. Educ. received bids April 30, building 3 story, 63 x 150 ft., rein.-con. and brick., general contract, from O. H. Olson Constr. Co., 27 Lumbermans Exch., Stillwater, $166,760, Victorsen Constr. Co., 432 South 4th St., Minneapolis, $171,440, Bracker Constr. Co., 638 Builders Exch., Minneapolis, $172,860; heating and ventilating, from Amer. Heating Co., 1813 Winter Ave., Superior, Wis., $22,490, Beck Eng. & Constr. Co., 1137 Plymouth Bldg., Minneapolis, $25,985, Heins & Beyers, Olivia, $26,755. Noted April 22.

★**Neb., Ingleside** — Hospital, etc. — Bd. Comn. of State Asylum for Insane, Lincoln, let contract building 2 story 65 x 122 ft. rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to E. Rokahr, Lincoln. About $101,000. Noted March 18.

★**Tex., Pampa**—School—Pampa Independent School Dist. let contract building school, to J. E. Neff, Amarillo, $113,500.

★**Okla., Okmulgee**—School—Bd. Educ. let contract building West Side School, 1 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to F. P. McClure Constr. Co., New York Life Bldg., Kansas City, Mo., $108,000. Noted April 15.

★**Ariz., Phoenix**—Hotel—J. W. Walker 324 West Adams St., will build 5 story, rein.-con., on Washington St. About $250,000. Work will be done by day labor.

★**Cal., San Francisco**—Club—Womans Club let contract building 7 story, rein.-con. and steel, rein.-con. flooring, concrete foundation, on Sutter St. near Mason St., to Lindgren Co., Monadnock Bldg. About $250,000, cost plus percentage basis. Noted Jan. 1.

★**Cal., San Francisco**—School—Bd. Educ. let contract building 3 story, 82 x 98 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Harrison St., to O. Monson, Builders Exch., $128,247. Noted April 22.

★**Cal., Woodland** — See "Industrial Works."

★**Ont., Ottawa**—Bank—Hochelaga Bank, 132 St. Pierre St., Quebec, Que., let contract building 3 story, 33 x 100 ft., rein.-con. and stone, rein.-con. flooring, concrete foundation, on Rideau St., to Grant Bros., Natl. Bank Bldg., Rideau St. About $120,000.

★**Ont., Ottawa**—Lunch and Billiard—Bowles Lunch, Ltd., 149 Yonge St., Toronto, let contract building 35 x 125 ft., rein.-con., stone and brick, rein.-con. flooring, concrete foundation, on Rideau St., to W. T. Joy, 86 High Park, Toronto. About $110,000.

B. C., Prince Rupert—School—Bd. School Trustees received bid building 3 story, 12 room, rein.-con. brick and tile, flooring, concrete foundation, from J. R. Morgan & Co., Prince Rupert, $198,700.

Federal Government Work

PROPOSED WORK

Mass., Boston—Medical Officers Quarters and Tuberculosis Pavilion — Treas. Dept. Wash., D. C., soon receives bids building here. About $200,000. J. A. Wetmore, superv. archt.

Mass., South Boston—Tracks—Spec. 4196—Bureau Yards & Docks, Navy Dept., Wash., D.C., soon receives bids completing track system around drydock for special heavy drydock crane and standard gauge railroad equipment, together with necessary water mains and duct systems, at U. S. Naval Drydock, here. About $120,000; $10 deposit required for plans and spec.

Pa., Phila.—Factory—Spec. 4163—Bureau Yards & Docks, Navy Dept., Wash., D.C., soon receives bids building 2 story, 60 x 240 ft., rein.-con., at Navy Yard, here. About $95,000; $10 deposit required for plans and spec. Noted April 1.

D. C., Anacostia — Storehouse, Pigeon Loft and Hangar — Spec. 4085 — Bureau Yards & Docks, Navy Dept., Wash. D. C., plans to build, here. About $22,600; $10 deposit required for plans and spec.

Va., Hampton Roads—Seaplane Runway—Spec. 4181—Bureau Yards & Docks, Navy Dept., Wash., D.C., soon receives bids building, at Naval Operating Base, Air Sta., here. About $42,500; $10 deposit required for plans and spec. Noted April 29.

Va., Norfolk — Hospital — Treas. Dept., Wash., D. C., soon receives bids building, here. About $900,000. J. A. Wetmore, superv. archt.

Cal., San Diego—Bakery Equipment—Spec. 4192—Bureau Yards & Docks, Navy Dept., Wash., D.C., soon receives bids furnishing and installing in Industrial Bldg., Marine Barracks, Naval Base, here. About $17,000; $10 deposit required for plans and spec. Noted May 13.

Cal., San Diego—Cold Storage Insulation—Spec. 4199—Bureau Yards & Docks, Navy Dept., Wash., D.C., plans to place, here. About $125,000.

Cal., San Diego—Laundry Equipment—Spec. 4191—Bureau Yards & Docks, Navy Dept., Wash., D.C., soon receives bids furnishing and installing in Industrial Bldg., at Marine Barracks, Naval Base, here. About $17,000; $10 deposit required for plans and spec. Noted May 13.

Cal., San Francisco—Officers Quarters—Treas. Dept., Wash., D. C., soon receives bids furnishing labor and material, building, here. J. A. Wetmore, superv. archt.

P. R., Loiza—Buildings and Utilities—Spec. 4194—Bureau Yards & Docks, Navy Dept., Wash., D.C., soon receives bids constructing quarters for 50 men, operating and office building, garage, laundry, shop building, pump house and two 100 ft. steel radio towers, 30,000 gal. steel water tank on tower, water and sewerage systems, etc., at Naval Radio Control and Receiving Sta., here. About $110,000; $10 deposit required for plans and spec.

BIDS DESIRED

N. H., Portsmouth—Monitor Roof—Spec. 4162—Until June 2, by Bureau Yards & Docks, Navy Dept., Wash., D. C., dismantling part of present roof and building monitor roof, at Navy Yard, here. About $4,500; $10 deposit required for plans and spec. Noted May 13.

R. I., Providence—Maintenance Dredging—Until June 7, by U.S. Engr. Office, for maintenance dredging on Saybrook Bar, at mouth of Connecticut River, Conn.; advertised in this issue.

Pa., Phila.—Motor Driven Triplex Pump—Until June 1, by Treas. Dept., Wash., D.C., building in Post Office and Court House, here. J. A. Wetmore, superv. archt.

Md., Indian Head—Monorail Hoists and Track Equipment—Until May 26, by Bureau Yards & Docks, Navy Dept., Wash., D.C., furnishing and installing, at Naval Proving Ground and Power factory, here. About $12,000; $10 deposit required for plans and spec. Noted May 6.

D. C., Wash.—Crane Runway—Spec. 4174—Until June 2, by Bureau Yards & Docks, Navy Dept., building crane runway over Slip 5. About $4,400. Noted May 13.

S. C., Charleston—Radio Tower and Foundation—Spec. 4149—Until June 2, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building 300 ft., at Navy Yard, here. About $17,000; $10 deposit required for plans and spec. Noted May 13.

Tex., Ft. Worth—Cylinder Storage Building—Spec. 4142—Until June 9, by Bureau Yards & Docks, Navy Dept., Wash., D. C., constructing, at U. S. Helium Production Plant, here. About $115,000; $10 deposit required for plans and spec. Noted May 13.

P. I., Guam—Turbo Generators, Exciters and Switchboards—Spec. 4169—Until May 26, by Bureau Yards & Docks, Navy Dept., Wash., D. C., for 200 kw. turbo alternators, 1 turbine driven exciter, 1 motor driven exciter and switchboard, f.o.b. cars, Navy Yard, Mare Island, Cal., also for services of an erecting engineer to supervise and be responsible for installing same in power plant, at Naval Sta., here. About $33,000; $10 deposit required for plans and spec. Noted May 6.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**D. C., Wash.**—Concrete Walks—U.S. Engr. Office, War Dept., let contract building concrete walks in Meridan Hill Park, Pub. Bldgs. and Grounds, to C. H. Tomkins, Wash. About $13,700.

★**D. C., Wash.**—Track Scale—Spec. 4160—Bureau Yards & Docks, Navy Dept., let contract installing 150 ton railroad track scale, at Navy Yard, to Howe Scale Co., 341 Bway., New York City, $9,541 (90 days). Noted May 6.

★**N. C., Beaufort**—Laying Steel Pipe—U. S. Engr. Office, Norfolk, Va., let contract laying steel pontoon pipe for suction dredging here, to Machold & Riddle, Stephen Girard Bldg., Phila., Pa. About $9,000.

Federal Government Work (Continued)

Ga., Savannah—Marine Hospital Treas. Dept., Wash., D. C., received bids May 10, furnishing (a) labor, (b) material, for building, here, from R. J. Whalley, Savannah, (a and b) $18,500, Woolward & Cunningham, Savannah, (a and b) $23,500, R O. Farnsworth, New Orleans, (a) $13,700, (a and b) $30,800

O., Cincinnati—Changes in Post Office—Treas. Dept., Wash., D. C., received bids making changes in Post Office, here, from G E. Wright, Inc., 1161 Monadnock Blk., Chicago, $16,900; W. MacDonald Constr. Co., Odd Fellows Bldg., St. Louis, $18,800; D. Gordon Bldg. & Constr. Co., Burnet St. and Northern Ave., Avon, $19,765.

Mich., Port Huron—Dredging—U S. Engr. Office, Federal Bldg., Detroit, received bids May 5, dredging channel on west side of St. Clair River, involving 272,000 cu.yd. floating dredgework, from Duluth Superior Dredging Co., foot of 15th Ave., W., Duluth, Minn., $0.205 per cu.yd., total $53,710; Dunbar & Sullivan Dredging Co., 211 Dime Bank Bldg., Detroit, $0.22, total $57,640; Great Lakes Dredge & Dock Co., Williamson Bldg., Cleveland, O., $0.27, total $70,740. Noted April 8

Miscellaneous

PROPOSED WORK

Pipe Line—Jamestown, N. Y.—Niagara Petroleum Producing Co., White Bldg., Buffalo, plans to build 12½ mi. pipe line to supply city with natural gas.

Tunnel—River Rouge, Mich.—Village having plans prepared by G. Jerome, engr., 1331 Majestic Bldg., Detroit, for ½ mi. rein.-con. tunnel under River Rouge, 12 ft in diameter and carrying 42 in. water main. About $175,000.

Cleaning Water Mains—St. Louis, Mo.—Bd. Pub. Serv. soon receives bids furnishing necessary tools and cleaning 250,000 lin.ft. c.i. water mains. About $75,000. J. A. Hooke, City Hall, water comr.

High Tension Power Line—Long Lake, Wash., (Reardan P. O.) — Washington Water Power Co., 825 Trent St., Spokane, plans to build 37 mi. high tension power line from here to Chewelah. About $140,000.

Dam — Wingham, Ont. — Town receives bids about June 15, building concrete and steel dam. About $30,000. R. Patterson, Goderick, engr.

BIDS DESIRED

Road Material — Albany, N. Y. — Until June 7, by F. S. Greene, state highway comr., Capitol, Albany, furnishing and delivering lignin or sulphite liquor material f.o.b. cars at destination; advertised in this issue.

Heating and Sanitary Work — Kings Park, N. Y.—Until June 2, by State Hospital Comn., Capitol, Albany, for heating and sanitary work, service connection and additional accommodations for patients, at State Hospital, here. L. F. Pilcher, state archt; advertised in this issue.

Piers—New York, N. Y.—Until June 2, by M. Hulbert, comr. docks, Pier "A," foot of Battery Pl, building piers on Stanton St. and East River. About $200,000.

Subway Subtrack—New York, N. Y.—Until June 9, by J. H. Delaney, comr. transit constr., 49 Lafayette St., completing Sect 2, Route 8, of 14th St.—Eastern Rapid Transit R.R., extending under East 14th St. from Irving Pl. to Ave. B; advertised in this issue.

Bridge Piers—Schenectady, N. Y.—Until June 11, by E. S. Walsh, supt. Bd. Pub Wks., Capitol, Albany, building rein.-con piers of Schenectady-Scotia Bridge, across Mohawk River, extending from junction of State St. and Washington Ave., here, to point 300 ft. north of junction of Schonowee and Mohawk Aves Scotia Twp., advertised in this issue.

Concrete Mixer—Webster, N. Y.—E. D Wright, Phillips Rd., receiving bids for concrete mixer on truck with engine.

Pipe—Haledon, N. J.—Until June 7, by Mayor, furnishing 16,168 ft. 6-16 in. Class "B" c.i. pipe, 1,368 ft. 8-16 in. Class "A" B & S pipe, 12 ton B & S and 7½ ton flanged fittings, etc J Capp, boro. clk.; advertised in this issue.

Rails — Baltimore, Md. — Samler Bros., Inc., 701 W. West St., receiving bids for 500 ton 56 lb. rails.

Pumping Engines—Shreveport, La.—See "Waterworks."

Concrete Mixer—Cleveland, O.—Meyers-Kuhn Constr Co., East 46th St. and Euclid Ave., receiving bids for concrete mixer.

Locomotive Crane—Detroit, Mich.—J. A Martin, comr. Purchases and Supplies, Municipal Courts Bldg., receiving bids for locomotive crane and equipment.

Crane and Clam Shell Bucket — Port Huron, Mich.—Mueller Metals Co., Lapeer Ave., receiving bids for locomotive crane and clam shell bucket, to handle coal (used)

Steam Shovel — Mt. Clemens, Mich. — W. B. Huchioson Co. receiving bids on ½ - ¾ yd. traction steam shovel

Dike, Etc. — Sault Ste. Marie, Mich. — Until June 21, by L. H. Davis, genl. mgr., Michigan Northern Power Co., building dike above Span 5, International Bridge, also excavating bed of St. Marys Rapids; advertised in this issue.

Motor Truck—Hartford, Wis.—City receiving bids for motor truck with dump body. W. Radtke, clk.

Dump Truck — Janesville, Wis. — City Council receiving bids on 2 ton dump truck for Street Repair Dept.

Scarifier Attachment—St. Louis, Mo.—City Park Bd. receiving bids for 1 scarifier attachment for road roller. About $1,500. J. Schmoll, City Hall, dir. pub. welfare.

Water Meters—St. Louis, Mo.—City receiving bids for water meters and miscellaneous equipment. About $30,000. E. E. Wall, City Hall, water comr.

Breakwater—Corpus Christi, Tex.—Until June 1, by J. T. Bartlett, city secy., building riprap breakwater, in Corpus Christi Bay. C. J. Howard, city engr.; advertised in this issue. Noted April 8.

Dam and Power House—Weedon, Que.—Until May 25, by E. C. Gatien, secy.-treas., Sherbrooke, building concrete dam and power house, here. About $250,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Tract Development, etc.—Massena, N. Y.—Aluminum Co. of Amer. will develop tract, to include macadam highways, sewer and water lines, concrete walks and 150 dwellings. About $750,000. Work will be done by day labor.

Freight Shed and Pier—New York, N. Y.—M. Hulbert, comr. docks, Pier "A," foot of Battery Pl., let contract building freight shed and pier, to Associated Contractors, 17 West 42nd St., $181,672

★Transformer Station—New York, N.Y.—W Whitehill, archt. and engr., 55 Duane St., let contract to Clough-Bourne, 101 Park Ave., building 3 story, 45 x 75 ft., brick and steel, rein.-con. flooring, concrete foundation, on East 6th St., for New York Edison Co., Irving Pl. and 15th St. About $60,000 Noted April 1

★Bituminous Concrete, Tar, Asphalt, Trap Rock and Slag—Trenton, N. J.—State Highway Comn., Broad St., Bank Bldg., let contract furnishing bituminous concrete, 190 ton, to J. J. Barrett, 147 Lafayette Ave., $3,161, 1,665 ton, to G. W. Brewster, Highwood Ave., Tenafly, $31,000; 302,000 gal. tar, grade N, to Salmon Bros., Netcong, $17,669; Grade K asphalt, 107,600 gal., to Atlantic Refining Co., 1211 Chestnut St., Phila., $24,886, 8,500 gal., to Barrett Co., 17 Battery Pl., New York City, $6,126; 11,100 gal. heavy tar grade, to Genl. Crushed Stone Co., Drake Bldg., Easton, Pa., $55,250; 3,150 ton trap rock, to Delaware River Quarry & Constr. Co., Lambertville, $6,531; 15,600 ton crushed trap rock, to N. J. Amiesite Co., Morristown, $27,925; 3,650 ton slag, to A. Keys, Woodbridge, $19,315. Noted April 8.

★Water Meters—Harrisburg, Pa.—City let contract furnishing three hundred and fifty ⅝-2 in. disc type water meters, to Gamon Meter Co., 282 South St., Newark, N. J.

★Water Meters—Richmond, Va.—City let contract furnishing one thousand ⅝ in., two hundred fifty ¾ in. and one hundred 1 in. water meters, to Gamon Meter Co., 282 South St., Newark, N. J

Column Foundations and Steel Superstructure—Phila., Pa.—Dept. City Transit, 1211 Chestnut St., received bids May 11, building 47 concrete column foundations in Front St. and Frankford Ave. and demolishing buildings on Front and Arch Sts., from Brown-King Constr. Co., Commercial Trust Bldg., $37,299; Fish-Rutherford Co., Inc., $45,125; E. H. Vare, 1120 Race St., $50,768; building 1, 112 lin.ft. steel superstructure, from Phoenix Bridge Co., 22 South 15th St., $272,436; McClintic-Marshall Co., Morris Bldg., $307,570; Amer. Bridge Co., Widener Bldg., $315,014. Noted April 22.

★Paving Blocks—Detroit, Mich.—City let contract furnishing 30,000 sq.yd. No. 2 cedar paving blocks, to W. E. Currie Co., 20 McGraw Bldg., at $1.15 per sq.yd., total $34,500.

Street Flusher — Milwaukee, Wis. — Central Bd. Purchases, City Hall, received bids May 10, furnishing 1,500 gal. combination motor driven street flusher and sprinkler, from Pauly Motor Truck Co., 2530 North Ave., $8,775; Sterling Motor Truck Co., 46th Ave. and Rogers St., West Allis, $9,428; Amer. Auto Co., 187 Wisconsin St., $9,969. Noted May 6.

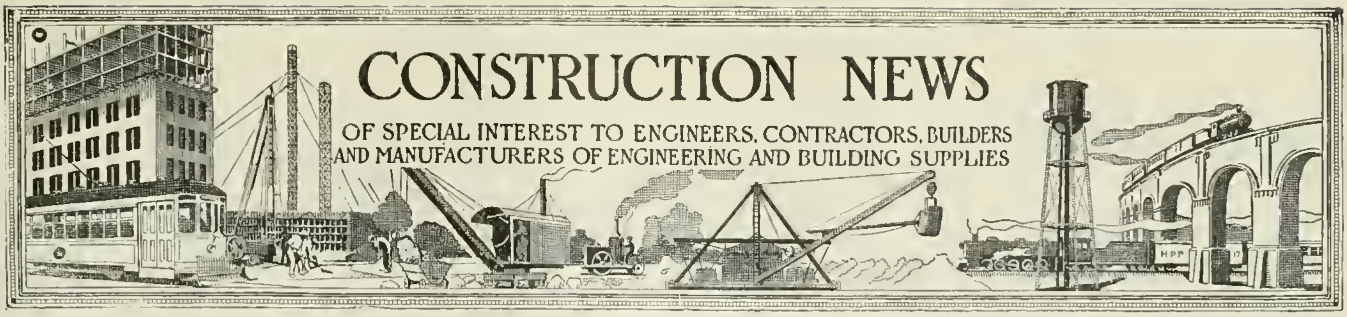
★Grain Elevator—Shawnee, Okla.—Shawnee Milling Co. let contract building rein.-con. grain elevator, 200,000 bu. capacity, to Jones-Hettelsater Constr. Co., 706 Mutual Bldg., Kansas City, Mo. About $135,000.

Bulkhead, etc. — Seaside, Ore. — City received bids building bulkhead and walk, from J. H. Tillman & Co., $106,905; furnishing labor for building pier (materials to be furnished by city), from L. Lebeck, Astoria, $11,556, W. Jacobson, Astoria, $12,356. Noted April 8, under "Streets and Roads."

★Culverts and Crushed Stone—Ontario—Dept. Pub. Highways, Toronto, let contracts building concrete culverts, grading, etc., in Hamilton, Haldimand, Murray and Brighton Twps., to Hyland Constr. Co., 82 St. Albans St., Toronto; Sects. A and B Leeds Twp., to J. M. Wilson, Gananoque; Sect. B Charlottesburg Twp., to Chisolm Wellage Co., South Lancaster; also Nepean Twp., Sects. A and B Edwardsburg Twp. to Grant Bros., Ottawa; supplying 150,000 tons crushed stone, to Canada Crushed Stone Corp., Dundas; concrete abutments and steel superstructure for bridge over Sucker Creek, Tynedinago Twp., to F. H. Armitage, Marysville, and Toronto Steel Constr. Co., 95 King St E., Toronto.

Breakwater—Toronto Island, Ont.—Dept. Pub. Wks. let contract building rubble mound stone breakwater on brushwood fascine mattress in Lake Ontario, to R MacDonald Co., Ltd., Crown Office Bldg., Toronto, $201,810.

Are You Watching
THE PROPOSALS
On Pages 361 and 362



CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

PROPOSALS

For proposals Advertised see the pages immediately following the "Construction News" Section.

WATERWORKS

Bids Close		See Eng. News-Record
May 31	Baker, Ore	May 27
June 1	Houston, Tex	Apr. 29
June 1	Elyria, O. Adv. May 20 and 27.	May 20
June 1	Eaton, O.	May 27
June 1	Lockhaven, Pa.	May 13
June 1	Scarsdale, N. Y.	May 20
June 4	Buffalo, Minn	May 27
June 7	Haledon, N. J. Adv. May 20 and 27.	May 20
June 8	Somerton, Ariz	May 27
June 8	Gastonia, N. C.	May 27
June 9	Montville, Conn.	May 27

SEWERS

Bids Close		See Eng. News-Record
June 2	Brooklyn, N. Y.	May 27
June 3	Milwaukee, Wis.	Apr. 15
June 4	New Toronto, Ont	May 27
June 7	Ames, Ia.	May 13
June 7	Washington, D. C.	May 20
June 7	Creston, Ia.	May 27
June 9	Ft. Madison, Ia.	May 13
June 14	Hammond, Ind.	May 13
June 15	Cochran, Ga Advertised May 27	May 27
June 15	Toledo, O.	May 20
June 15	St. Lambert, Que.	May 27
July 19	Dallas, Ore	May 27

BRIDGES

Bids Close		See Eng. News-Record
May 31	Owen Sound, Ont.	May 27
June 1	Trenton, N. J. Adv. May 27.	May 27
June 3	Guelph, Ont	May 27
June 4	Philadelphia, Pa.	Apr 29
June 5	Actonvale, Que.	May 27
June 5	Idaho	May 27
June 5	Rice, Ariz.	May 27
June 7	Florence, Ariz.	May 13
June 7	Columbus, O.	May 20
June 8	South Amboy, N. J.	May 27
June 8	Atlanta, Ga	May 27
June 10	Lingle, Wyo. Adv. May 20 and 27.	May 20
June 21	Clayton, Ga	May 27
June 23	Belmar, N. J	May 27

STREETS AND ROADS

Bids Close		See Eng. News-Record
May 31	Arcadia, La.	Apr 29
May 31	Auburn, N. Y. Adv. May 27.	May 27
May 31	New Cumberland, W. Va.	May 13
May 31	St. Lambert, Que.	May 20
May 31	London, Ont.	May 20
May 31	St. Joseph, Mo.	May 20
May 31	Owen Sound, Ont.	May 27
May 31	St. Elizabeth, Que.	May 27
May 31	Eastland, Tex	May 27
June 1	Fisherville, S. C.	May 27
June 1	Montague, Tex	May 27
June 1	New Martinsville, W. Va.	May 6
June 1	Newark, N. J	May 27
June 1	St. George, S. I., N. Y.	May 27
June 1	Lewisburg, W. Va. Adv. May 20 and 27.	May 20
June 1	Welland, Ont	May 27
June 1	Minerva, O.	May 20
June 1	Little Falls, Minn.	May 20
June 1	Alexandria, Minn.	May 20
June 1	Detroit, Minn.	May 20
June 1	Bellevue (Pittsburgh P. O.), Pa.	May 27
June 1	Welland, Ont.	May 27
June 1	Trenton, N. J. Adv. May 27.	May 27
June 1	Michigan	May 27
June 1	Philadelphia, Pa.	May 27
June 2	Mena, Ark.	May 20
June 2	Gassaway, W. Va. Adv. May 20 and 27.	May 20
June 2	Rhode Island Adv. May 27.	May 27
June 2	Arkansas	May 27
June 2	Bennington, Vt. Adv. May 27.	May 27
June 2	New Hampshire	May 27
June 2	Brooklyn, N. Y	May 27
June 2	Baltimore, Md	May 27
June 2	Michigan	May 27
June 2	Bedford, Que	May 27
June 3	Poplarville, Miss.	May 20
June 3	Lancaster, O.	May 27
June 3	Montreal, Que	May 27
June 4	Detroit, Mich	May 27
June 4	South Fork, Pa.	May 20
June 4	Alexandria, Minn.	May 20
June 4	Bethany, Mo	May 20
June 4	Olean, N. Y.	May 27
June 4	Missouri	May 27
June 4	St. George, S. I., N. Y.	May 27
June 5	Idaho	May 27
June 7	San Luis Obispo, Cal	May 27
June 7	Fayetteville, W. Va.	May 13
June 7	Red Bank, N. J. Adv. May 20 and 27.	May 20
June 7	New York	May 20
June 7	Seattle, Wash	May 27
June 7	Beloit, Que	May 27
June 7	St. Cesaire, Que	May 27
June 7	Harrisville, W. Va.	May 27
June 8	Ft. Wayne, Ind.	May 20
June 8	Providence, Ky. Adv. May 20 and 27.	May 27
June 8	Duluth, Minn.	May 27
June 8	San Luis Obispo, Cal	May 27
June 9	Freehold, N. J.	May 20
June 10	West Palm Beach, Fla	May 13
June 10	Gainesville, Ga.	May 20
June 11	Ontario	May 27
June 11	Columbus, O.	May 27
June 12	Quebec, Que	May 27
June 14	California	May 27
June 14	Ontario	May 27
June 14	Middlebourne, W. Va.	May 27
June 14	Coffeyville, Kan	May 27
June 15	Steubenville, O.	May 27
June 15	Cochrane, Ga Advertised May 27	May 27
June 15	Westmount, Que.	May 6
June 15	Pennsylvania Adv. May 20 and 27.	May 20
June 15	Montgomery, Ala.	May 20
June 15	Arkansas	May 27
June 16	Pennsylvania Adv. May 20 and 27.	May 20
June 18	Columbus, O.	May 27
June 19	New Martinsville, W. Va.	May 27
June 28	Savannah, Ga.	May 13
July 6	Dallas, Ore	May 27

EXCAVATION AND DREDGING

Bids Close		See Eng. News-Record
June 1	Marengo, Ill.	May 27
June 2	Algona, Ia.	May 20
June 3	Boise, Idaho	May 13
June 5	Cleveland, Miss.	May 27
July 3	Madisonville, Ky Adv. May 27	May 27

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
May 30	Baltimore, Md.	May 13
June 1	Casper, Wyo.	May 13
June 7	Akron, O.	May 13
June 15	Riviere Du Loup, Que.	May 27
June 30	Cambridge Mass	May 27
Sept. 1	Hutchinson, Kan.	Feb. 19

BUILDINGS

Bids Close		See Eng. News-Record
June 1	New Orleans, La.	May 6
June 1	Conway, Ark.	May 6
June 1	Sheboygan, Wis.	May 20
June 1	Buffalo, N. Y.	May 20
June 1	Huntingdon, Pa.	May 27
June 1	Cleveland, O.	May 27
June 1	Portland, Me.	May 27
June 1	Houston, Tex.	May 27
June 1	Montreal, Que.	May 27
June 2	Cleveland, O.	May 13
June 2	Johnstown, Pa.	May 27
June 2	Winthrop (Boston P. O.), Mass.	May 27
June 4	East Angus, Que.	May 27
June 5	Paton, Ia.	May 13
June 5	Ansonia, O.	May 13
June 5	Naugatuck, Conn.	May 13
June 5	Glenmont, O	May 27
June 7	Columbus, O.	May 20
June 7	Linden (Columbus P. O.), O.	May 20
June 7	Loup City, Neb.	May 20
June 7	Alliance, O.	May 27
June 8	Newark, N. J.	May 20
June 9	Pittsburgh, Pa.	May 13
June 9	Schenectady, N. Y. Adv. May 20 and 27.	May 27
June 14	Cleveland, O.	May 27
June 15	Harrisburg, Pa. Adv. May 20 and 27.	May 20
June 21	Three Rivers, Que	May 27
June 24	Rawlins, Wyo.	May 20
June 25	Newport News, Va.	May 6
July 1	Chisholm, Minn.	May 13
July 15	Jonesboro, Ark.	May 27

FEDERAL GOVERNMENT WORK

Bids Close		See Eng. News-Record
June 1	Hydraulic Turbines, Florence, Ala.	Apr. 22
June 1	American Portland Cement —Cincinnati, O.	May 6
June 1	Steel Hangar—Brooks Field, Tex.	May 13
June 1	Laundry—Stapleton, N. Y.	May 13
June 1	Mechanical Equipment — Stapleton, N. Y.	May 13
June 1	Motor Driven Triplex Pump —Philadelphia, Pa.	May 20
June 2	Crane Runway—Spec. 4174 —Wash., D. C.	May 20
June 2	Monitors—Spec. 4162—Portsmouth, N. H.	May 20
June 2	Radio Tower—Charleston, S. C.	May 20
June 2	Operating Building and Quarters—Spec 4183—St. Petersburg, Fla.	May 13
June 3	Earthwork—Yuma, Ariz.	May 13
June 7	Dormitory — Tahlequah, Okla.	May 6
June 7	Maintenance Dredging — Providence, R. I.	May 20
June 9	Cylinder Storage Building —Ft. Worth, Tex.	May 24
June 9	Fence and Gates — Spec. 4187—Philadelphia, Pa.	May 27
June 9	Dredging — Providence, R. I. Adv. May 27.	May 27
June 10	Dredging—Boston, Mass.	May 13
June 11	Remodeling Building — Boston, Mass.	May 27
June 14	Improving Water System— Ft. Yates, N. D.	May 13
June 14	Air Seacoast Defense Station—San Francisco, Cal.	May 13
June 15	Electric Generators, Exciters and Accessories — Florence, Ala.	May 6
June 16	Auxiliary Equipment and Piping — Spec. 4179, Puget Sound, Wash	May 27
June 23	Laundry Equipment—Spec. 4191—San Diego, Cal.	May 27
June 25	Earthwork—St. Louis, Mo., Adv. May 27.	May 27
June 28	Labor — San Francisco, Cal. Adv. May 20 and 27.	May 27
June 28	Dredge, etc.—Wilmington, N. C. Adv. May 27.	May 27
June 28	Material—San Francisco, Cal.	May 27

MISCELLANEOUS

Bids Close		See Eng. News-Record
June 1	Water Tube Boilers and Chain Grate Stokers — Lockport, Ill.	May 6
June 1	Breakwater—Corpus Christi, Tex.	May 20
June 1	Road Oil—Newark, N. J.	May 27
June 2	Glutrin Binder and Tarvia —Freehold, N. J	May 27
June 2	Road Materials—New York, N. Y.	May 27
June 2	Piers—New York, N. Y.	May 20
June 2	Heating and Sanitary Work —Kings Park, N. Y.	May 20
June 7	Road Materials—Albany, N. Y. Adv. May 20 and 27.	May 20
June 7	Pipe—Haledon, N. J.	May 20
June 9	Subway Subtrack — New York, N. Y.	May 20
June 11	Bridge Piers—Schenectady, N. Y. Adv. May 20 and 27.	May 20
June 15	Scenic Railway—Detroit, Mich.	May 13
June 21	Dike—Sault Ste. Marie, Mich.	May 20

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

Va., Bedford—City retained Diehl & Vance, archts. and engrs., Virginia-Carolina Bldg., Norfolk, to make surveys for filter plant, storage reservoir, steel tower and tank and probably 2 small pumping units.

Va., St. Paul—City plans to build reservoir and lay 4½ mi. water mains, cost between $50,000 and $60,000; grade and install sewerage system in various streets, cost between $18,000 and $20,000. C. C. Bolton, mayor.

Fla., Leesburg—City voted $65,000 bonds to improve waterworks and sanitary sewerage system.

O., Cleveland — Stillman-Redick Co., Society for Savings Bldg., plans to lay 4,000 ft. 6 in. c.i. water main in Warren Rd. About $25,000. Holland Eng. Co., Engrs. Bldg., engrs.

★Mich., Detroit—City rejected bids and will lay 50 mi. 6-8 in. watermains by day labor. About $200,000. Noted May 20.

Minn., Pine Island—See "Sewers."

Minn., Rush City—See "Sewers."

Col., Ft. Morgan—City voted $35,000 bonds to extend waterworks system. Noted March 25.

Ore., St. Helens—City plans to build concrete dam, 30 ft. long, 5 ft. high, and 6,500 ft. 12 in. cement pipe line. About $15,000. E. E. Quick, secy. Water Bd.

BIDS DESIRED

Conn., Montville—Until June 9, by Bd. Water and Sewer Comrs., Municipal Bldg., New London, building dam, reservoir, pipe line and road on Bogue Brook, here. About $200,000.

N. C., Gastonia—Until June 8, by R. G. Berry, mayor, extending waterworks and sewerage system, to include 4½ mi. 12 in. c.i. pipe, hydrants, 2,000,000 gal. filtration tank, tower and pipe, 10 mi. 5-8 in. sanitary sewer pipe, purification plant, etc. W. M. Piatt, Durham, engr.

O., Eaton—Until June 23, by Bd. Pub. Affairs, building filtration plant and repairing masonry of standpipe. About $27,000. J. H. Beatty, clk.

Minn., Buffalo—Until June 4, by village, building deep well and water system, involving 7,525 ft. 4 in. to 8 in. c.i. pipe, sixteen 6½ ft. hydrants; 2 pumps and motors, 250 g.p.m. against 100 lb. pressure; 1 auto starter for pumps; 100,000 gal. rein.-con. reservoir, 14 x 20 ft. pump house. About $60,000.

Ariz., Somerton—Until June 8, by City Clerk, furnishing and building 50,000 gal. steel water tank, with 80 ft. steel tower; furnishing 1,810 ft. 8 in., two 25 ft. 6 in. and 5,040 ft. 4 in. Class "A" c.i. pipe, or alternate of 14 gauge riveted steel pipe, also 6,020 ft. 2 in. standard black pipe, twenty-six 2-8 in. gate valves and fifteen 4 in. fire hydrants. Olmsted & Gillelen, 1112 Hollingsworth Bldg., Los Angeles, engrs.

Ore., Baker—Until May 31, by Bd. Comrs., building 120,000,000 gal. storage reservoir and road to dam site at Goodrich Creek. About $40,000. J. B. Smurthwaite, clk.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Conn., Mansfield Depot—Ford, Buck & Sheldon, Inc., engrs., 60 Prospect St., Hartford, let contract to Canuing & Leary, Harris Bldg., New London, building 1 story, 40 x 50 ft., rein.-con. filtration plant, dam and 80 ft. intake tunnel, for State Training School, here. About $35,000. Noted May 13.

★Pa., Phila.—City let contract laying 20 in. watermains in Adams Ave. and Roosevelt Blvd. between Rising Sun Lane and Orthodox St., to M. and J. B. McHugh, 892 North Markoe St. About $38,000.

★Tex., Belton—City will improve waterworks system. Bonds for $25,000 voted for project. Work will be done by day labor.

★Okla., Sallisaw—City let contract laying 22,841 ft. 10 in. c.i. water pipe and building 500,000 gal. reservoir, to M. D. Michael, Durant, $15,117. Noted May 20.

★Ida., Preston—City let contract building waterworks system, here to Puckett & Hurt, Burley. About $61,000. Noted April 8.

★Ore., North Powder—City let contract improving waterworks system as follows, tank and pipe, to Pittsburgh Diamond Steel Co., Pittsburgh Pa., $8,535; pumps, to Byron Jackson Iron Wks., 55 North Montgomery St., Berkeley, Cal., $3,464; labor, to A. J. Haskins, North Powder, $9,644.

Sewers

PROPOSED WORK

N. J., Montclair—Town soon receives bids building 11,500 ft. sanitary sewers. H. Trippett, clk.

Fla., Leesburg—See "Waterworks."

O., Akron—J. E. Root, city sewer engr., submitted report to City Council estimating cost of North Hill trunk sewer, at $117,700; Willow Run, $337,200; Girard Ave., $6,090; Sherman St., $5,870; Atwood St., $6,610; Baird St., $3,050; Talbot Ave., $3,240; Winsor and Corey Sts., $4,010; Clay Drive, $3,980; Easter Ave., $1,060; Ruth, Wall and Aberdeen Sts., $73,950; Alexander and 6th Sts., $6,240; Walnut and Hickory Sts., $2,730; Wilbur, Beardsley and Kling Sts., $11,700; West Exchange, $16,850; Bisson Ave., $8,680; Belleview Ave., $8,680; Fairmont Ave., $3,640; Lookout Ave., $1,480 Montrose Ave., $7,400; Zeller Ave., $8,050; Coventry St., $4,350; North Portage Path, $5,858.

O., Euclid—Village receives bids in fall building sewage disposal plant with concrete settling tanks, also disinfecting and screen buildings, concrete. About $150,000.

O., Lakewood—City election Nov. 2 to vote on $50,000 bonds to lay main sewer along Edgewater Dr. from Nicholson Ave. to Webb Rd. E. A. Fisher, City Hall, engr.

Minn., Pine Island — City having plans prepared building extensions to sewerage and waterworks systems. About $80,000. Druar & Smith, Globe Bldg., St. Paul, engrs.

Minn., Rush City—City having plans prepared building sanitary sewerage system and laying water mains. About $90,000. Druar & Smith, Globe Bldg., St. Paul, engrs.

N. D., Minot—City plans to lay 18-30 in. pipe at proposed sewage disposal plant. About $30,000. E. J. Thomas, city engr.

Tex., Palacios—Palacios Sewer Co. soon receives bids laying sewers and building sewage disposal plant. About $35,000.

BIDS DESIRED

N. Y., Brooklyn—Until June 2, by E. Riegelmann, boro. pres., furnishing labor and material building sewer in 71st St. between 6th and 7th Aves., building sewer basins at all 4 corners of Neptune Ave. and West 8th St., at southeast and southwest corners of West 12th St. and Neptune Ave., southwest corner Norman Ave. and Moultree St.

N. C., Gastonia—See "Waterworks."

Ga., Cochran—Until June 15, by F. L. Asbell, clk., building 25,000 ft. vitr. pipe sewers and septic tank. T. F. Bowe, Inc., Murrah Bldg., Columbus, engrs.; advertised in this issue.

Ia., Creston—Until June 7, by C. Davenport, city clk., building sewers in various streets, involving 16,830 lin.ft. 6-10 in. sewer pipe. P. K. De Voe, city engr.

Ore., Dallas—Until July 19, by City Council, furnishing labor and material building sewerage system. About $35,000. E. J. Hines, city engr. Noted May 20.

Que., St. Lambert—Until June 15, by E. Drinkwater, engr., Town Hall, laying 8 mi. main sewer in St. Lambert, Greenfield Park, Montreal South and Longueil, cost $88,065, also outfall works into St. Lawrence River, $75,000.

Ont., New Toronto—Until June 4, by E. A. James Co., Ltd., 1004 Excelsior Life Bldg., Toronto, engrs., for supply and laying 2,700 ft. 6 and 8 in. vitr. tile sewer pipe, and 6 in. c.i. water main; 32,000 sq. ft. granolithic concrete sidewalk, 800 ft. concrete pavement. About $40,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Wellesley (Boston P. O.)—City let contract building 1,000 ft. rein.-con. trunk sewer, 33 x 36 ft. concrete arch conduit, to Rendle-Stoddard Co., 321 Marginal St., Chelsea, $118,157. Noted May 20.

N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., received bids May 18, building sewer in (a) Alstyne Ave., (b) Corona Ave., (c) building receiving basin in Woolsey Ave., (d) Wilbur Ave., from Saverio & Britton, (a) $33,200; A. Paino, 2016 East 14th St., Brooklyn, (a) $35,420, (b) $593,000; N. Lascalzo, (a) $34,620; F. L. Paino, Woodhaven, (a) $10,182, (b) $597,000, (c) $1,978, (d) $1,440; Booth & Flinn, 17 Battery Pl., New York City, (b) $777,000; Kennedy & Smith, (c) $1,730, (d) $1,250; Green Contg. Co., 734 Varnon Ave., Astoria, (c) $1,740, (d) $1,285. Noted May 13.

N. Y., Ossining—C. F. Rattigan, supt. Prisons, Capitol, Albany, received bids May 18, installing underground sanitary and storm water sewerage and water distribution systems, from W. B. Armstrong Co., 3 Fulton St., Albany, $174,896; pipe connections, pumping and chlorinating apparatus, in pump house and reservoir, from F. N. Lewis, Hotel Carleton, Binghamton, $8,700, Suburban Eng. Co., 15 West 38th St., New York City, $8,976; electric underground service connections, from Jandous Electric Equipment Co., 109 West 31st St., New York City, $13,580, T. F. Jackson, 89 John St., New York City, $13,847, Wheeler Green Electric Co., 29 St. Paul St., Rochester, $14,145. Noted April 22.

★N. J., Avon-by-the-Sea—City let contract building sewerage system and settling tank, to C. Ippolito, 252 Main St., Orange. About $75,000. Noted April 8.

★Pa., Phila.—City let contract building 1,407 ft. extension to Everett St. sewer from Levick to Magee Sts., to J. J. McHugh, Leheigh and Emerald Sts., $147,214; 1,585 ft. extension to Pollock St. sewer from 24th to 26th Sts. and in 24th St. from Pollock to Packer Sts., to Cunningham & Murray, 1345 Arch St., $186,549. Noted April 29.

★S. C., Greenville—City let contract laying 8 mi. 8-12 in. vitr. sewer pipe with necessary manholes and flush tanks, in Woodside Mill Village, to Fisk-Carter Constr. Co., Main St. About $56,000; cost plus percentage basis.

★S. D., Brookings—Clerk let contract building sanitary storm and water sewers also water main, to O'Neil & Preston, 60 East 6th St., St. Paul, Minn., $23,208. Noted April 1.

★N. D., Minot—City let contract laying 3 mi. 10-54 in. storm sewer pipes, to G. Kemper, Minot. About $100,000.

★Idaho, Roxburg—City let contract building sewerage system in College Heights, to C. Thompson, 337 North 1st St., W., Salt Lake City, Utah. About $52,000. Noted April 29.

★Cal., Bishop—City let contract building sewerage system in all streets, to W. D. Walsh, 1235 Dewey Ave., Los Angeles, $31,365. Work involves 15,360 ft. 6 in. vitr. pipe at $1.25 per ft., 2,600 ft. 12 in. $1.75, 1,620 ft. 14 in., $1.75, 45 manholes, $75 each, 8 flushtanks, $125 each. Noted April 20.

★Cal., Calipatria — City let contract building vitr. pipe sewerage system, to H. J. Peterson, Calexico, $39,450. Work involves 1,620 ft. 12 in. vitr. pipe, at $1.38 per ft., 21,755 ft. 14 in., $1.45 and 60 brick manholes, $94.50 each. Noted Jan. 8.

Bridges

PROPOSED WORK

Conn., Stamford—City plans to build concrete bridge over Mill River on Richmond Hill Ave. About $75,000.

N. Y., Troy—State Legislature, Capitol, Albany, appropriated $300,000, to rebuild bridge over Hudson River and barge canal and connecting Troy and Cohoes between Albany and Rensselaer Counties. Cost to be borne by State, Albany and Rensselaer Counties and Cities of Troy and Cohoes.

Ia., Manchester—Bd. Supervs. Delaware Co. having revised plans prepared building rein.-con. arch bridge, to have two 87 ft. spans, with 26 ft. roadway, and two 5 ft. sidewalks. About $45,000. H. Klaus, co.-engr.

Mo., St. Louis—See "Miscellaneous."

Ont., London—City plans to build 500 ft. rein.-con. arch bridge, 66 ft. wide, on Ridout St. About $150,000. H. A. Brazier, engr.

Ont., Ottawa—Carleton Co. soon receives bids building rein.-con. abutments, pier and steel bridge over Rideau River, at Burritts Rapids. About $75,000. Patterson & Byrne, 71½ Sparks St., engrs.

Bridges (Continued,

BIDS DESIRED

N. J., Belmar—Until June 23, by Bd. Freeholders Monmouth Co., (Freehold), building Strauss Trunion Bascule Bridge 43, over Shark River, between here and Avon. C. E. Close, clk.; advertised in this issue.

N. J., South Amboy—Until June 8, by State Highway Comn., Trenton, for 3,400 ft. earth and 150 ft. rock borings in connection with preliminary investigations for construction of South Amboy-Perth Amboy Bridge. G. A. Mead, 790 Broad St., Newark, engr. Noted April 1.

N. J., Trenton—Until June 1, by Bd. Freeholders Mercer Co., building concrete and steel bridge on Yardville-Hamilton Square Rd. F. A. Crawford, dir.; advertised in this issue.

Pa., Phila.—See "Streets and Roads."

Ga., Claxton—Until June 21, by Bd. Comrs. Rds. and Revenues, Evans Co., building 166 ft. (1) rein.-con. or (2) concrete and steel bridge over Canoochee River, State Aid Project No. S-1-6, 7 mi. from here, involving (1) 304.11 cu.yd. Class "A" and 150.40 cu.yd. Class "B" concrete, 45,149 lb. reinforcing steel, 130 cu.yd. dry, 100 cu.yd. rock and 160 cu.yd. wet excav., 298 sq.yd. Kentucky rock asphalt, (2) 69,970 lb. structural steel, 306.8 cu.yd. Class "B" concrete, 16,120 lb. reinforcing steel, 303 cu.yd. dry and 392 cu.yd. wet excav.

Ga., Eatonton—Until June 8, by State Highway Dept., Walton Bldg., Atlanta, building 230 ft. bridge, Federal Aid Project 130, 17 ft. wide, over Little River, 6 mi. from here. Work includes approaches involving 0.895 acres clearing and grubbing, 2,628 cu.yd. excav. and borrow, 688 cu.yd. solid rock excav.; (bridge) 293.6 cu.yd. Class "A" and 512 cu.yd. Class "B" concrete, 68,413 lb. reinforcing steel; (alternate Luten designs) 190 cu.yd. Class "A" and 627 cu.yd. Class "B" concrete and 24,900 lb. reinforcing steel.

Idaho—Until June 5, by D. P. Olson, Dir. of Highways, Boise, building 429 ft. steel bridge cantilever type, with 18 ft. roadway, Federal Aid Project 8, Owsley Ferry, Twin Falls and Gooding Counties, involving 670 cu.yd. concrete and 250 tons steel. About $90,000.

Ariz., Rice—Until June 5, by T. Maddock, state engr., c/o Bd. Superv., Gila Co. (Globe), building concrete bridges and culverts, on Sects. A and B, Federal Aid Project 15, between Globe and San Carlos River, Globe-Geronimo Highway, near here. Work involves 3,360 cu.yd. excav., 986 cu. yd. concrete and 28,000 lb. reinforcing steel.

Que., Actonvale—Until June 5, by J. C. St. Pierre, secy.-treas., building concrete or steel bridge. About $70,000.

Ont., Guelph—Until June 3, by Wellington Co., building Honsinger Bridge, 45 ft. concrete truss on Concession 2; McConnell Bridge, 14 ft., Concession 4; Cherry Bridge, 14 ft., Concession 6, in Peel Twp.; Campbell Bridge, 35 ft. concrete truss on lots 25 and 26, Concession 4; Fisher Bridge, 30 ft. concrete truss, Concession 9; Wilkinson Bridge, 15 ft., on lots 25 and 26, Concession 6, Minto Twp.; Milne Bridge, 12 ft., between W. Luther and W. Garafraxa; Walkers culvert between Peel and Maryboro. About $35,000. A. W. Connor, 34 Victoria St., Toronto, engr.

Ont., Owen Sound—Until May 31, by R. McDowell, engr., Owen Sound, building 80 ft. rein.-con. arch span bridge at Clarksburg and one 50 ft. span at Faversham. About $30,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Elmira—Bd. Pub. Wks., at office of H. Moseson, clk., received lowest 3 bids May 17, building bridge over Chemung River on Main St., from T. L. Eyre, Commercial Trust Bldg., Phila., $402,575; T. Sheahan, Hagerstown, Md., $404,503; Vang Constr. Co., 21 3rd Natl. Bank Bldg., Cumberland, Md., $430,177. Noted April 29.

★Ala., Decatur—City let contract building 1,790 ft. steel and concrete highway bridge with 600 ft. approaches over Tennessee River, to Nashville Bridge Co., Decatur. About $600,000.

★Minn., Minneapolis—Hennepin Co. let contract building 140 ft. concrete bridge, over Grays Bay, to E. M. Ganley Co., 1002 Plymouth Bldg., $54,319. Noted May 13.

N. D., Bismarck—State Highway Comn. and Comrs. Burleigh and Morton Counties received bids building bridge over Missouri River, from Standish & Allen, 220 South State St., Chicago, approaches $212,134, piers, $330,266 and superstructure $122,448; Butler Bros., 1002 New York Life Bldg., St. Paul, cost plus 10% basis; Midland Bridge Co., superstructure $112,590, material $147,803, cost plus fees; Amer. Bridge Co., 208 South La Salle St., Chicago, superstructure $142,474 material, $319,017. Noted May 13.

★Montana—See "Streets and Roads."

★Nev., Bunkerville—State Highway Dept., Carson City, let contract building bridge and appurtenances, over Virgin River, near here, to Midland Bridge Co., 504 Ry. Exch., Kansas City, Mo., $54,440. Noted May 6.

★Ont., Ottawa—City let contract building 5 arch rein.-con. Cummings Bridge, over Rideau River, to T. McLaughlin, 574 Somerset St., $288,964.

★Ont., Simcoe—Town let contract building 3 bridges, 40-60 ft. long, with 20 ft. roadway and sidewalks, involving 1,800 cu.yd. rein.-con., to Paving & Mastic Co., 196 Leslie St., Toronto. About $56,500.

Streets and Roads

PROPOSED WORK

Mass., Quincy—City soon lets contract repaving 18 ft. track area on Hancock St., asphalt. About $70,000.

New York—State Highway Comn., Capitol, Albany, appropriated $104,000 to build and improve portions of state route 20, lying within Clyde and Newark Villages; $10,000,000 to build and improve public highways; $5,000 to raise grade of river road between Three River point and Schroeppel's Bridge, Onondaga Co. F. S. Greene, comr.

New York—State Highway Comn., Capitol, Albany, appropriated $35,000 to improve Albany approach to Hudson Bridge, between Albany and Rensselaer Counties; $40,000 for eastern approach; $39,000 to build road in state fair grounds. F. S. Greene, comr.

N. J., Trenton—Mercer Co. plans to pave 150 mi. roads during 1920. About $250,000. H. F. Harris, co. engr.

Va., St. Paul—See "Waterworks."

W. Va., Elkins—Comrs. Randolph Co. soon receive bids building 4½ mi. 2 in. macadam road from Roaring Creek Jct. to Upshur Co. line. About $88,000. F. A. Parson, Beverly, co. engr.

W. Va., Moundsville—Comrs. Marshall Co. soon receive bids paving 3 mi. Cameron-Popular Springs Rd., concrete. About $136,000. Purdy, co. engr.

W. Va., Summersville—Comrs. Nicholas Co. plan to grade 2.21 mi. road from here to Belva. Cost $49,000. R. Williamson, co. engr.

N. C., Greensboro—Comrs. Guilford Co. plan to hard surface 4 mi. High Point-Winston Salem Rd.

N. C., Greensboro—Guilford Co. plans election in fall to vote on $2,000,000 bonds to build roads.

O., Cleveland Heights (Warrensville P. O.)—Village receives bids in summer, grading, draining, curbing and paving with brick, asphalt, concrete or macadam, Cottage Grove Drive from Kensington to Cedar Rds., Colchester Rd. from Demington Dr. to Coventry Rd., Princeton Rd. from North Woodland to East Scarborough Rd. About $78,000. F. A. Pease Eng. Co., Marshall Bldg., Cleveland.

O., Toronto—Village plans to pave, drain, grade and curb, 5,000 sq.yd. Loretta Ave., vitr. brick. M. Boyd, Toronto, engr.

Mich., Allegan—City plans to pave, curb and gutter 2,640 ft. Ely St., 27 ft. wide, cement. About $30,000.

Wisconsin—State Highway Dept. at div. office, Stephenson Bldg., Milwaukee, received no bids May 15, buiding West Bend-Milwuakee Rd., Federal Aid Project 159, Washington Co.

Wis., West Allis—City having plans prepared paving 52nd, 53rd and 54th Aves. from Lapham to Burnham Aves., 49th Ave. from Natl. to Thomas Aves., 62nd Ave. fro Natl. to Worden Aves., 54th Ave. from Greenfield to Pershing Aves., 53rd Ave. from Natl. to Worden Aves., Natl. Ave. from 75th to 77th Aves., 61st Ave. from Natl. to Mitchell Aves., 77th Ave. from Greenfield to Lincoln Aves., concrete, asphalt or asphaltic concrete. A. Schneider, city engr.

Minn., Aitkin—H. C. Beecher, aud. Aitkin Co., received no bids April 20, grading and graveling 8 mi. County Job 2003, 24 ft. wide. About $40,000. F. J. O'Hara, Aitkin, engr. Noted April 1.

Minn., Caledonia—E. N. Newhouse, aud. Houston Co., received no bids May 11, grading and graveling 2 mi. Federal Aid Project 147, 24 ft. wide. About $27,000. C. D. Conzett, Caledonia, engr. Noted April 15.

Minn., Grand Rapids—T. Erskins, aud. Itasca Co., rejected bids received May 3, grading 7 mi. Federal Aid Project 157, 24 ft. wide, cost $42,000; 8.4 mi. Federal Aid Project 168, 24 ft. wide, $50,000; 19 mi. State Job 2003, 24 ft. wide, $54,000; 15 mi. County Job 2002, 24 ft. wide, $90,000; 23 mi. Federal Aid Project 168, 24 ft. wide, $170,000. H. A. Le Sueur, Grand Rapids, engr. Noted April 1.

Minn., Mantorville—G. L. Taylor, aud. Dodge Co. rejected bids received May 4, grading 3 mi. Job 2001, Federal Aid Project 174, 24 ft. wide. About $37,000. Noted April 1.

Minn., Park Rapids—F. Heisel, aud. Hubbard Co., received no bids May 6, building 8 mi. Job 2003, State Rd. 2, Federal Aid Project 79, 24 ft. wide, cost $48,000; 9 mi. Job 2005, State Rd. 9, Federal Aid Project 167, 24 ft. wide, $54,000. R. A. Dahms, Park Rapids, engr. Noted April 29.

Minn., Qualker—C. D. Bacon, aud. Cass Co., rejected bids received May 4, building Federal Aid Project 140, 24 ft. wide, involving 47,000 cu.yd. excav., 6,000 cu.yd. surfacing, 5,000 cu.yd. overhaul, etc., cost $27,500; Federal Aid Project 142, State Rd. 6, 24 ft. wide, 54,000 cu.yd. excav., 5,000 cu.yd. surfacing, 57,500 cu.yd. overhaul, etc., $45,000; Federal Aid Project 141, 24 ft. wide, 48,000 cu.yd. excav., 50,000 cu.yd. overhaul, 5,000 cu.yd. surfacing, etc., $80,000. A. W. Moulster, Pine River, engr. Noted April 22.

Montana—State Highway Dept., Helena, rejected bids received April 26, gravel surfacing Sects. A and C, Helena-Bozeman Rd., Federal Aid Project 77, Lewis and Clark Co. J. N. Edy, c/o state highway engr. Noted April 22.

Mo., St. Louis—City voted $360,000 bonds to widen and build various streets. M. Witter, clk.

Mo., St. Louis—City plans to remove present wearing surface and resurface with bitulithic pavement, reset curb where necessary and patch base on 12,000 lin.ft. Waterman Ave. from Laurel Ave. to Skinker Rd., cost $43,400; Hamilton Ave. from De Giverville Ave. to Delmar Blvd., $9,500; De Giverville Ave. from De Balivere to Washington Aves., $35,000; Waterman Ave. from Laurel to De Balivere Aves., $13,300; Forrest Park Blvd. from Grand to Boyle Aves., $115,000. W. W. Horner, City Hall, engr.

Tex., Dickens—Dickens Co. had plans prepared grading, gravel surfacing and building rein.-con. bridges and culverts on 7.54 mi. Highway 39 from Spur to Crosbyton, 18 ft. wide, involving 1.9 mi. grader work, 9,366 cu.yd. earth excav., 10,030 cu. yd. gravel, 21,410 lb. reinforcing steel, 55 cu.yd. 1:2:3, 230 cu.yd. Class "A" and 166.7 cu.yd. Class "B" concrete. About $36,009. K. C. Kade, Spur, engr.

Tex., Richmond—Ft. Bend Co. having plans prepared grading, gravel surfacing and draining 13.17 mi. Highway 36, from Rosenberg to Austin Co. line, 14 ft. wide, involving 190 cu.yd. concrete, 31,608 cu.yd. gravel, 109,311 cu.yd. bituminous macadam and 158,040 cu.yd. earth excav. About $248,655. Gurley & Gurley, Union Natl. Bank Bldg., Houston, engrs. Noted Feb. 5.

Tex., Whitewright—City election June 12, to vote on $50,000 bonds to build roads.

Idaho—State Highway Dept., Boise, receives bids about June, grading and paving 27 mi. Idaho-Pacific Highway from Filer Highway Dist. to Cassia Co. line, 18 ft. wide, Federal Aid Project 23, also 8.8 mi. from Buhl to Twin Falls, 18 ft. wide, Federal Aid Project 24, Twin Falls Co., concrete and bituminous macadam. About $664,000 and $280,000 respectively. Noted Dec. 18.

Ariz., Tucson—Pima Co. plans to pave 9 mi. Tucson-Nogales Rd., concrete. T. Maddock, state engr.

Cal., Visalia—Bd. Supervs. Tulare Co. soon receives bids paving 6½ mi. Orosi-Orange Cove Rd., concrete, also 9¼ mi. Elderwood-Yetta Rd., concrete and macadam. L. Moye, co. engr.

Que., Montreal—City plans to pave 1,531 ft. Laurier Ave. About $30,120. A. E. Doucet, dir.

Ont., Chatham—Suburban Rds. Comn. receives bids about June 3, paving 2-3 mi. Queen St., 20 ft. wide, involving 30,000 sq. yd. concrete. About $120,000. W. K. McGeorge, chn. and engr.

Streets and Roads (Continued)

Ont., Walkerton—Town plans to build 8,500 sq.yd. concrete and 10,000 sq.yd. asphaltic or bitulithic pavement. About $75,000. E. D. Bolton, Wallace St., Listowel, engr.

Ont., Wallaceburg—Town having plans prepared for concrete pavements, curbs and gutters. About $100,000. W. McNeice, town engr.

Ont., Whitby—City having surveys made by E. A. James Co., Ltd., engrs., 36 Toronto St., Toronto, for ½ mi. asphaltic or bitulithic paving on Main St. Cost between $30,000 and $50,000.

BIDS DESIRED

New Hampshire—Until June 2, by State Highway Comn., Concord, building 3.6 mi. gravel highway, Tuftonboro Twp. About $40,000. F. E. Everett, comr.

Vt., Bennington—Until June 2, by J. P. Morrissey, pres. and Village Trustees, at office of W. P. Hogan, village clk., improving streets and building storm sewer line; advertised in this issue. Noted April 29.

Rhode Island—Until June 2, by State Bd. Pub. Rds., State House, Providence, rebuilding 2.29 mi. state highway, North Kingstown Twp., beginning 150 ft. south of Talbot's Corner, near Wickford Village and extending south on Post Rd.; advertised in this issue.

N. Y., Auburn—Until May 31, by J. P. Jaeckel, city mgr., resurfacing portion Genesee and East Genesee Sts., involving 14,800 yd. bitulithic pavement and 4,500 yd. brick or block; advertised in this issue.

N. Y., Brooklyn—Until June 2, by E. Riegelmann, boro. pres., regulating and repaving with asphalt on present concrete foundation, roadway of Bedford Ave. from Heyward St. to DeKalb Ave., except intersection of Flushing Ave., which is to be repaved with grade 1 granite pavement on present concrete foundation, regulating and repaving Bedford Ave. from Quincy St. to Atlantic Ave., with permanent asphalt on 6 in. concrete foundation, Bedford Ave. from Atlantic Ave. to Sterling Pl., West 25th St. from Mermaid to Neptune Aves., laying sidewalks on Union St. between Bedford and Rogers Aves.

N. Y., Olean—Until June 4, by Dept. Pub. Wks., paving 1,900 sq.yd., East Pine St. from River St. to Olean Creek, brick on concrete foundation. S. M. Gaylor, comr.

N. Y., S. I., St. George—Until June 4, by C. D. Van Name, pres. Richmond Boro., repaving roadway of Van Pelt Ave. from Staten Island Rapid Transit R.R. to Washington Ave., Simonson Ave. from Division St. to Washington Ave., Sunrise Terrace from Louis St. to Trossach Rd., Ocean Terrace from Sunrise Terrace to Occident Ave., Eddy St. from Richmond Turnpike to Serpentine Rd., Marion Ave. from Cebra to Occident Aves., all bituminous macadam.

N. Y., S. I., St. George—Until June 1, by C. D. Van Name, pres. Richmond Boro., repaving roadway of Richmond Ave. from Arthur Kill to Amboy Rds., Vanderbilt Ave. from Bay St. to Tompkins Ave., Heberton Ave. from Vreeland to New Sts., Sharp Ave. from Staten Island Rapid Transit R.R. to Harrison Ave., all bituminous concrete.

N. J., Newark—Until June 1, by Dept. Streets & Pub. Impvts., City Hall, paving Ridgewood Ave. from Hawthorne to Runyon Sts., and Berger St. from Lyons to Weequahic Sts. About $25,000. Noted April 29.

N. J., Trenton Jct.—Until June 1, by Bd. Freeholders Mercer Co. (Trenton), paving Grand Ave.; advertised in this issue. Noted May 6.

Pa., Bellevue (Pittsburgh P. O.)—Until June 1, by city, improving Straw Ave., involving 623 yd. grading, 760 sq.yd. vitr. brick paving, 280 ft. stone curbing; Summer St., 2,855 cu.yd. grading, 1,923 sq.yd. vitr. brick paving, 520 ft. stone curbing; Arch St., 2,921 cu.yd. grading, 880 sq.yd. vitr. brick paving, 520 ft. stone curbing. P. H. Martin, 331 4th Ave., Pittsburgh, engr.

Pa., Phila.—Until June 1, by F. C. Dunlay, Bureau Highways, Dept. Pub. Wks., grading Brown, Burholme, Fuller, Chalmers, Champlost, Rex, Summit, St. Vincent, Faunce, Bingham, Lawndale, Tabor, Claridge, Montour and Westmoreland Sts., (Schedule A); asphalt paving Belfield and Marlyn Sts., (Schedule B); wood block repaving 8th St., (Schedule C); improving country roads, (Schedule D); repairing Belmont and Girard Ave., Passyunk Ave. and Penrose Ferry Bridges, (Schedule E); building concrete retaining wall, (Schedule F); furnishing and delivering fuel oil, (Schedule G); furnishing and delivering asphalt steam rollers, (Schedule H).

Md., Baltimore—Until June 2, by Bd. Awards, c/o City Register, grading and paving with cement concrete alleys as listed in private alley Contrs. 59 and 60. A. E Christhlif, engr.

W. Va., Harrisville—Until June 7, by Comrs. Ritchie Co., grading and draining 3.18 mi. Sect A, State Project 1098, from here to Washburn, involving 29,500 cu.yd. unclassified excav., 1,315 lin.ft. 12-18 in corrugated iron pipe, culverts, 36 cu.yd. concrete headwalls, 104 cu.yd. concrete culverts, 10,000 lb. steel reinforcing bars, etc. H. J. Grathwol, co. road engr.

W. Va., Harrisville—Until June 7, by Comrs. Ritchie Co. grading and draining 3.18 mi. Sect. A, State Project 1098, Union Dist., involving 29,500 cu.yd. unclassified excav., 1,315 lin.ft. 12-18 in. corrugated iron pipe, 36 cu.yd. concrete headwalls, 104 cu.yd. concrete culverts, 10,000 lb. steel reinforcing, etc. H. J. Grathwol, co. road engr.

W. Va., Middlebourne—Until June 14, by J. E. Smith, clk., Tyler Co., grading and draining 4 mi. Sistersville-Freindly Rd., 16 ft. wide, Federal Aid Project; building 1.2 mi. Middlebourne-Salem Rd., 16 ft. wide, Federal Aid Project 55, cement concrete. Noted April 8.

W. Va., New Martinsville—Until June 19, by S. Myers, clk. Wetzel Co., building 3 mi. Clay Dist. Bond Issue Rd., 16 ft. wide, bituminous penetration pavement. G. W. Comstock, co. road engr.

Ga., Cochran—Until June 15, by F. B. Asbell, clk., paving and curbing 2nd St. from Ash to Dublin Sts. T. F. Bowe, Inc., Murrah Bldg., Columbus, engrs.; advertised in this issue.

Ky., Providence—Until June 8, by city grading, curbing and surfacing with Kentucky rock asphalt 2½ mi. various streets. R. M. Nance, mayor; advertised in this issue.

Ohio—Until June 18, by State Highway Comn., Columbus, building roads in following counties:

Coshocton Co., Sect. "E" Coshocton-Newcomerstown Rd., 2.474 mi., grading, constructing bridges and culverts and paving with monolithic brick, $82,426 or rein.-concrete, $100,291.

Delaware Co., Sect. "B" Columbus-Sandusky Rd., 7.44 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $268,332; rein.-concrete, $323,160.

Erie Co., Sect. "A" Lima-Sandusky Rd., 3.051 mi., grading, constructing drainage structures and paving with plain concrete, $125,184.

Gallia Co., Sect "G" Jackson-Gallapolis Rd., 6.248 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $179,218.

Geauga Co., Sect. "J" Cleveland-Meadville Rd., 2.3 mi., grading, constructing bridges and culverts and paving with concrete, $52,951.

Guernsey Co., Sect. "Village of Fairview" National Rd., .54 mi., grading, constructing drainage structures and paving with brick on sandstone base, $22,277.

Sect. "Village of Old Washington" National Rd., 1.28 mi., grading, constructing drainage structures and paving with brick on sandstone base, $46,176.

Sect. "K" Cambridge-Coshocton Rd., .2 mi., grading, constructing drainage structures and paving with hillside brick, $10,354.

Jackson Co. Sect. "F" Chillicothe-Jackson Rd., 1.85 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $55,992.

Sect. "K" Chillicothe-Jackson Rd., 2.332 mi., grading, constructing drainage structures and paving with cement concrete, $116,603, bituminous macadam, $103,730, rein.-concrete, $109,565.

Knox Co. Sect. "K" Mt. Vernon-Coshocton Rd., building new bridge across Schenck's Creek, $12,050.

Sandusky Co., Sect. "L" Fremont-Perrysburg Rd., 6.542 mi., grading, constructing drainage structures and paving with brick, $323,462, bituminous macadam, $413,869.

Union Co., Sect. "D" Columbus-Marysville Rd., 2.888 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $91,493.

Sect. "E" Columbus-Marysville Rd., 5.35 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $180,198.

Wayne Co., Sect. "E" Columbus-Wooster Rd., 4.08 mi., grading, constructing bridges and culverts and paving with monolithic brick, $151,337, plain concrete, $138,212, bituminous macadam, $151,417.

O., Adena—Until June 15, by Comrs. Jefferson Co., (Steubenville), paving various roads here. About $71,000. J. N. Leech, co. surv.

O., Lancaster—Until June 3, by Comrs. Fairfield Co., building Bremen-Marietta Rd., Rushcreek Twp., water bound macadam.

Michigan—Until June 1, by F. F. Rogers, state highway comr., at office Bd. Rd. Comrs. Huron Co., Bad Axe, grading and draining 1.437 mi. State Trunk Line Rd. 27-7, 20 ft. wide, involving 16,863 sq.yd. concrete, 6,493 lb. steel, 74.3 cu.yd. 1:2:4 and 190.8 cu.yd. 1:3:6 concrete, 3,229 cu. yd. earth excav.

Michigan—Until June 1, by F. F. Rogers, state highway comr., at office off Bd. Rd. Comrs. Oakland Co., Pontiac, grading and draining 10.048 mi. Sects. A and B, Federal Aid Rd. 41, Groveland and Holly Twps. Sect. A involves 55,889 cu.yd. earth excav., 1,968 yd. station overhaul, 511 lin. ft. 12-18 in. encased tile culvert, 100 lin.ft. 12 in. vitr. tile drain, 5,572 lb. steel reinforcement, 103.9 cu.yd. 1:2:4 and 228.4 cu. yd. 1:3:6 concrete, alternate proposal, 354 lin.ft. 12 in. corrugated metal culvert, 100 lin.ft. 12 in. corrugated metal drain. Sect. B involves 31,412 cu.yd. earth excav., 3,267 yd. station overhaul, 1,150 lin.ft. 12-18 in. encased tile culvert, 300 lin.ft. vitr. tile drain, 3,635 lb. steel reinforcement, 157.3 cu.yd. 1:2:4 and 137 cu.yd. 1:3:6 concrete, alternate proposal, 582 lin.ft. 12 in. corrugated metal culvert, 300 lin.ft. 12 in. corrugated metal drain. Noted Feb. 19.

Michigan—Until June 2, by F. F. Rogers, state highway comr., at office State Highway Comn., Port Huron, St. Clair Co., grading, draining and surfacing 1.7 mi. State Trunk Line Rd. 27-11, 18 ft. wide, involving 17,947 sq.yd. concrete or bituminous concrete, 686 lin.ft. 12 in. encased and 125 lin.ft. 18 in. vitr. tile, 1,081 lb. steel, 53.1 cu.yd. 1:2:4 and 30.4 cu.yd. 1:3:6 concrete, etc.; 3.551 mi. State Trunk Line Rd. 27-10, 1n ft. wide, involving 33,223 sq. yd. special stone surface, 20,715 cu.yd. earth excav., 1,515 yd. station overhaul; 2.255 mi. State Trunk Line Rd. 27-1, 20 ft. wide, involving 17,909 sq.yd. concrete or bituminous concrete, 2,390 cu.yd. earth excav., 1,203 lb. steel, 14.2 cu.yd. 1:2:4 and 40.3 cu.yd. and 1:3:6 concrete, etc.: 1,527 mi. State Trunk Line Rd. 27-3, 20 ft. wide involving 26,067 sq.yd. concrete or bituminous concrete, 6,627 cu.yd. earth excav., etc.

Mich., Detroit—Until June 4, by city, grading, shaping and paving with sheet asphalt on 6 in. concrete base, Berea, Amherst or Medina curbstone (alleys to be paved with 1 course concrete with 2 x 6 in. retaining plank) Radford Ave. from Grand River to Quincy Aves., cost $40,320; Carter Ave. from Linwood Ave. to Dexter Blvd., $54,880; Fenkell Ave. from 12th St. to Livernois Ave., $132,300; Newport Ave. from Charlevoix to Mack Aves., $31,825; Townsend Ave. from Harper to Miller Aves., $26,570; St. Thomas Ave. from Center Line to Townsend Aves., $10,730; alley between John R and Brush Sts., Englewood and Woodland Aves., $7,360; alley between Grand River, Avery and Alexanderine Aves., $1,620; alley between Fisher, Crane, Canfield and Forest Aves., $6,140; alley between Holcomb, Belvidere, Charlevoix and Goethe Aves., $7,180; alley between Gratiot, Elmwood, Luden and Mack Aves., $2,950; alley between St. Jean, Gladwin, Sylvester and Canfield Aves., $4,770; alley between Seminole, Iroquois, Warren and Moffat Aves., $8,520; alley between Linwood Ave., La Salle Blvd., La Salle Gardens North and South, $7,540; alley between Canton, Concord, Waterloo and Charlevoix Aves., $7,640; alley between Holmur, Philadelphia and Pingree Aves. and Dexter Blvd., $5,680; alley between 12th, Wilson, Taylor and Clairmont Aves., $5,640; alley between Casgrain, Crawford and Lafayette Aves. $1,320. C. W. Hubbell, engr.

Minn., Duluth—Until June 8, by Comrs. St. Louis Co., clearing, grubbing, grading, ditching and building culverts on 6½ mi. St. Louis-Koochiching Co. Judicial Highway, 28 ft. wide, cost $65,000; 10 mi. Miller Trunk Rd., 28 ft. wide, $100,000. R. W. Acton, co. engr.

Arkansas—Until June 2, by Comrs. Rd. Impvt. Dists. 2 and 3, Polk Co. at office of State Highway Comn., Little Rock, building 22.88 mi. gravel or macadam road (minus 3.4 mi. to be built by government) involving 18.5 acres clearing and grubbing, 114,720 cu.yd. earth work, 1,000 cu.yd. loose and 2,170 cu.yd. solid rock, 2,074 lin.ft. 18-30 in. concrete, vitr. tile or metal pipe, 166 cu.yd. concrete in pipe headwalls, 1,054 cu.yd. concrete in bridge abutments,

Streets and Roads (Continued)

564 cu.yd. concrete in culverts, 34,050 lb. reinforcing steel, two 16 ft., one 20 ft. and three 30 ft. I beam steel bridges, one 40 ft., two 50 ft., three 60 ft. and one 80 ft. low truss and two 100 ft. through truss steel spans, 31,073 cu.yd. gravel, etc.; 15.52 mi. road, involving 27.5 acres clearing and grubbing, 68,400 cu.yd. earth work, 720 cu.yd. loose and 200 cu.yd. solid rock, 1,440 lin.ft. 18-30 in. concrete, vitr. tile or metal pipe, 651 cu.yd. plain concrete, 358 cu.yd. rein.-con., four 16 ft., one 20 ft., one 25 ft. and one 30 ft. I beam steel bridges, two 40 ft. and two 50 ft. low truss and one 100 ft. through truss steel spans, 21,047 cu.yd. gravel, etc. Buckley-Forgy Eng. Co., Planters State Bank Bldg., Mena, engrs.

Kan., Coffeyville—Until June 14, by C. Potteck, city clk., repaving Union St. from 7th to 6th Sts., Walnut St. from 7th to 5th Sts., Maple St. from 9th to 5th Sts., 8th St. from Elm to Spruce St., involving 15,000 sq.yd. repaving, 3,200 lin.ft. steel paving guard and 350 cu.yd. concrete. S. R. Logan, city engr.

Missouri—Until June 4, by State Highway Dept., Jackson, improving 3.18 mi. Kings Highway, 18 and 24 ft. wide, Cape Girardeau Twp. Special Rd. Dist., Cape Girardeau Co., Federal Aid Project 52, involving 6,083 cu.yd. earth and 4,046 cu.yd. borrow excav., 6,427 lin.ft. grading, 33,550 sq.yd. 1 course plain cement concrete, 42 cu.yd. Class "B" and 49 cu.yd. Class "C" concrete, etc., cost $85,654; building Whitelaw Bridge, 20 ft. span, 18 ft. roadway, involving 2.1 cu.yd. Class "A" and 182.5 cu.yd. Class "B" concrete, 14,570 lb., reinforcing steel, $5,987; Cape La Cruz Bridge, over Cape La Cruz Creek, 40 ft. span, 18 ft. roadway, 3.9 cu.yd. Class "A" and 207.7 cu.yd. Class "B" concrete and 22,250 lb. reinforcing steel, $6,945.

Ark., Van Buren—Until June 15, by Comrs. Western Crawford Rd. Impvt. Dist., Crawford Co., building 60 mi. road, involving 328,245 cu.yd. embankment, 84,000 cu.yd. classified excav., 128.7 acres clearing and grubbing, 2,604 lin.ft. 18-36 in. pipe culverts, 585 lin.ft. 15-30 ft. I-beam bridges, 530 lin.ft. 40-80 ft. truss bridges, 1,040 lin. ft. 20 ft. I-beam trestle approaches, 237 cu.yd. masonry in pipe headwalls and 1,148 cu.yd. in culvert abutments, 803.5 cu.yd. Class "A" concrete, 62,954 lb. reinforcing steel and 91,200 cu.yd. surfacing. Pritchett & Fry, Riegler Bldg., Little Rock, engrs.

Tex., Eastland—Until May 31, by Comrs. Eastland Co., building 215 mi. bituminous macadam, brick or concrete, and sand clay roads. About $5,000,000. W. R. Eccles, co. engr. Noted Jan. 8.

Tex., Montague—Until June 1, by W. T. Russell, judge Montague Co., gravel surfacing and building rein.-con. culverts and steel bridges on 11,767 mi. Highway 2 from Stoneburg to Ringold, 12 ft. wide, involving 45 acres clearing and grubbing, 10,906 cu.yd. roadway excav., 82,743 cu.yd. borrow, 1,782 cu.yd. loose and 1,253.7 cu.yd. solid rock excav., 43,986 lb. reinforcing and 68,980 lb. structural steel, 555.7 cu.yd. Class "A," 196.8 cu.yd. Class "B" and 42 cu.yd. Class "C" concrete. About $118,939. J. R. Hill, Bowie, engr.

Idaho—Until June 5, by State Highway Dept., Boise, grading and surfacing 8.9 mi. Idaho-Pacific Highway, Pocatello to McCammon, 16 ft. wide, Federal Aid Project 15, also 9 mi. Idaho-Utah Highway, Downey and Franklin Co. line, 18 ft. wide, Federal Aid Project 17, Bannock Co., cost $75,000 and $68,000 respectively; 4.26 mi. Gooding-Rupert Highway, Jerome to Hazleton, 20 ft. wide, Federal Aid Project 37, Jerome Co., $95,000, all crushed rock; grading 6.1 mi. Elk River Highway in Clearwater Highway Dist., Clearwater Co., $125,000. D. P. Olson, dir. of highway, Boise, engr. Noted May 13.

Wash., Seattle—Until June 7, by Comrs. King Co., grading and paving 2 mi. Richmond Highland-Richmond Beach Highway, involving 6,342 cu.yd. grading and 21,842 sq.yd. paving; grading and graveling 3 mi. North Park Impvt. Club Rd., 57,000 cu.yd. grading and 50,080 sq.yd. graveling; 1 mi. C. A. Z. Cragin Rd. south of Bellevue, 9,462 cu.yd. grading and 922 sq.yd. gravel. S. J. Humes, Seattle, engr.

Ore., Baker—See "Waterworks."

Ore., Dallas—Until July 6, by city, furnishing labor and material for 24,000 sq.yd. concrete paving. E. J. Hines, city engr. Noted May 20.

California—Until June 14, by State Highway Comn., Forum Bldg., Sacramento, paving 14.5 mi. highway between Los Molinos and Red Bluff, 15 ft. wide, Tehama Co., involving 50,000 cu.yd. excav. without classification, 14,300 cu.yd. Class "A" Portland cement concrete (pavement), 400 cu.yd. culverts and monuments, 2,450 lin. ft. 12-24 in. corrugated metal pipe, etc. A. B. Fletcher, state highway engr.

Cal., San Luis Obispo—Until June 7, by Bd. Supervs. San Luis Obispo Co., paving 11 mi. road towards Morro, 5 in. concrete. County to furnish cement and gravel. W. B. Burch, San Luis Obispo, engr.

Cal., San Luis Obispo—Until June 8, by Bd. Supervs. San Luis Obispo Co., paving 10 mi. road from Santa Margarita to Salinas River, 4 in. concrete, also 1 mi. concrete base at Atascadero. County to furnish cement and gravel. W. B. Burch, San Luis Obispo, engr.

Quebec—Until June 12, by B. Michaud, deputy minister of roads, Quebec, building 2 mi. macadam road with application of Tarvia, on Haut de la Cote, Contrecoeur, Vercheres Co.

Que., Bedford—Until June 2, by A. T. Gould, secy.-treas., Missisquoi Co., building 82,380 ft. waterbound macadam road.

Que., Beloeil—Until June 7, by A. M. Cormier, secy.-treas., Vercheres Co., building 2 mi. waterbound macadam road.

Que., Montreal—Until June 3, by city, paving Notre Dame and St. Paul Sts. About $500,000.

Que., St. Cesaire—Until June 7, by municipality, gravelling 3½ mi. Barbue and Jackman Rds., 22 ft. wide. A. Paradis, Parliament Bldg., Quebec, engr.

Que., St. Elizabeth—Until May 31, by Joliette Co., building 26,042 ft. St. Antoine and Rousseau Rds., 18-20 ft. wide, waterbound macadam. About $100,000.

Ontario—Until June 14, by W. A. McLean, deputy minister of public highways, Toronto, paving 9,000 ft. of Provincial Highway, Ancaster Twp. About $95,000. G. Hogarth, Parliament Bldgs., Toronto, engr.

Ontario—Until June 11, by W. A. McLean, deputy minister of public highways, Toronto, paving 2 mi. Yonge St. on Provincial Highway, 20 ft. wide, north from Newmarket, York Twp., bituminous macadam. About $35,000. G. Hogarth, Parliament Bldg., Toronto, engr.

Ont., Owen Sound—Until May 31, by Grey Co., building 9 mi. macadam and gravel roadway from Heathcote to Kimberley, 16-20 ft. wide. About $85,000. R. McDowall, Owen Sound, engr.

Ont., Owen Sound—Until May 31, by R. McDowall, engr., Owen Sound, cutting 6,000 cu.yd. rock on St. Vincent Rd., about 7 mi. east of here, for Grey Co. About $25,000.

Ont., Welland—Until June 1, by R. Cooper, clk., Welland Co., building 24 mi. waterbound macadam road in 8 secfions and 6 mi. bituminous surfaced macadam road in 2 sections, 16-20 ft. wide. About $200,000. G. Ross, McCaw Blk., engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★New Hampshire—F. E. Everett, state highway comr., Concord, let contract building 6 mi. crushed gravel highway, Concord Twp., to L. Davis, Sunapee; 2 mi. bituminous macadam highway, Lebanon Twp., to Vogel & Hadley, Manchester, $64,185. Noted May 6.

★R. I., Scituate (North Scituate P. O.)—Water Supply Bd., Providence, let contract building 3.1 mi. earth road, to Cendella Co., School St., Milford, Mass. About $126,000. Noted April 22.

★N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., let contract repaving 1st and 2nd Wards, to Sicilian Asphalt Paving Co., 41 Park Row, New York City, $16,380; regulating and grading Beddard St., to Peace Bros., Inc., 20 Main St., Flushing, $350; Maspeth Ave., to Scott Bros., Inc., $12,105. Noted May 6.

★N. Y., New York—H. Bruckner, pres. Bronx Boro., let contract repairing sheet asphalt pavement in railroad area when and where directed, to Union Paving Co., Bway. and 112th St., $29,480; repaving Webster Ave., to Leonard Paving Co., Inc., 233 Bway., $139,127; Teller Ave. and East 137th St., to Asphalt Constr. Co., 2197 Madison Ave., $38,195 and $30,090 respectively; East 153rd St., to Hastings Paving Co., 25 Broad St., $18,177; Trinity Ave., to Davney Asphalt Paving Co., Inc., 438 East 91st St., $8,481; Garden St., to J. L. Brusstar, Harlem River and 150th St., $16,139; East 197th St. and Mohegan Ave., to Uvalde Asphalt Paving Co., 1 Bway., $17,742 and $8,048 respectively. Noted May 13.

N. Y., S. I., St. George—C. D. Van Name, pres. Richmond Boro., received bids May 19, regulating and repaving with bituminous concrete roadway of Tompkins Ave. from Vanderbilt to St. Marys Aves., from Uvalde Asphalt Paving Co., 1 Bway., New York City, $57,393; J. E. Donovan, 2205 Richmond Terrace, Port Richmond, $77,362; Sicilian Asphalt Paving Co., 41 Park Row, New York City, $102,371. Noted May 13.

★N. J., Elizabeth—City let contract paving 12,000 sq.yd. Westfield and Linden Aves., to Standard Bitulithic Co., 50 Church St., New York City. About $100,000.

Pa., Dormont (Pittsburgh P. O.)—City received bid grading, paving and curbing Louisiana Ave. from Potomac to LaSalle Aves., involving 1,800 sq.yd. vitr. brick, 1,380 lin.ft. concrete curbing, and 1,500 cu.yd. grading, from P. A. Benintend & Bro., 310 Dawn Ave., Pittsburgh, $13,152; Edgehill Ave. from Espey to Miles Aves., 2,050 sq.yd. vitr. brick, 1,430 lin.ft. concrete curbing and 1,300 yd. grading, from Pittsburgh Paving Co., Bakewell Bldg., Pittsburgh, $15,700.

★N. C., Greenboro—Comrs. Guilford Co. let contract building 2 mi. Thomasville Rd., 2½ mi. Archdale Rd. and 2 mi. Greenboro-Winston Salem Highway, asphalt on concrete base, all 16 ft. wide, to R. G. Lassiter, Oxford, each $3.70 per sq.yd.

★O., Canal Winchester—Village let contract grading, draining and paving 1,300 ft. High St., 40 ft. wide, to Knight & Wells, Columbus, $34,875. Noted April 15.

★O., Cleveland—City let contract grading, draining, curbing and paving with brick, concrete and asphalt, Stewart and Helena Aves., to Burnett-Hathaway Co., c/o Pavers Exch., Society for Savings Bldg., $12,228, and $10,620, respectively; East 117th St. and Euclid Ave., G. B. Herring & Son, c/o Pavers Exch., Society for Savings Bldg., $21,335, and $3,765, respectively; Superior Ave., Baldwin Bros., 4500 Euclid Ave., $169,865; East 87th St., Bentley Bros., 1836 Euclid Ave., $52,450; Arlington Ave., Gould & Maybach, East 150th St., $50,857. Noted May 13.

O., Cleveland—S. H. Kleinman Realty Co., Natl. City Bldg., received bid May 14, grading 50,000 cu.yd. Beverly Park, from J. W. Norton, East 113th St. About $44,000.

★O., Pataskala—Village let contract grading, draining and paving with concrete, 2,470 Main St., 30 and 40 ft. wide, 861 Town St., 24 ft. wide and 198 ft. Depot St., 34 ft. wide, to McHugh Bros., Springfield, $59,515, $15,991 and $4,405 respectively. Noted May 20.

★Mich., Detroit—City let contracts to Detroit Paving Co., 20 McGraw Bldg., grading, shaping and paving Porter St., $34,199, Richardson Ave., $16,593; to W. B. Brady Constr. Co., 1972 Grand River Ave., Scotten Ave., $20,831; to Cleveland Trinidad Paving Co., 2940 Woodward Ave., Euclid Ave., $18,539, Pingree Ave., $52,272, Taylor Ave., $15,976, 14th Ave., $4,815, Blaine Ave., $49,613, Wilson Ave., $13,916, Thaddeus St., $36,035. Noted May 20.

★Ill., Chicago—Bd. Local Impvts., 207 City Hall, let contracts paving alley between West 46th, West 47th, South Hermitage and South Wood Sts. and alley between West 47th, West 48th, South Paulina and South Hermitage Sts., to Central Paving Co., 179 West Washington St., $5,783 and $7,389 respectively; alley between West Adams St., Jackson Blvd., Crawford and Karlov Aves., to P. J. O'Brien & Co., 29 South La Salle St., $4,995; Roslyn Pl. from Lakeview Ave. to North Clark St., to R. F. Conway Co., 133 West Washington St., $10,533; South Troy St. from 57th to 58th Sts., to Contg. & Material Co., 3219 South Michigan Ave., $10,294; Foster and Berwyn Aves. from Bway. to Clark St., Balmoral Ave. from Bway. to Ashland Ave., Catalpa Ave. from Bway. to Glenwood Ave., Magnolia Ave. from Bway. to Bryn Mawr Ave., Lakewood and Wayne Sts. from Foster to Bryn Mawr Aves., Glenwood Ave. from Balmoral to Bryn Mawr Aves., to White Paving Co., 17 North La Salle St., $321,700. Noted May 13.

Ill., Chicago—Bd. Local Impvts., 207 City Hall, received bids May 14, paving (1) alley between Granville, Hood, Glenwood and Greenview Aves., involving 474 cu.yd. grading, 1,040 sq.yd. 7 in. concrete paving topped with asphalt or tar, 240 ft. 10 in. tile sewer, etc., (2) alley between North Clark St., Devon, Highland and Greenview Aves., 350 cu.yd. grading and 1,370 sq.yd. 7 in. concrete paving, (3) alley between Glenlake, Norwood, Glenwood and Green-

Streets and Roads (Continued)

view Aves., 80 cu.yd. grading, 354 cu.yd. filling and 1,040 sq.yd. 7 in. concrete paving, (4) alley between Chicago, Milwaukee & St. Paul R.R. right-of-way, Winthrop Ave., Winona and Argyle Sts., 200 cu.yd. grading, 190 cu.yd. filling and 1,050 sq.yd. 7 in. concrete paving, (5) alley between Chicago, Milwaukee & St. Paul R.R. right-of-way, Balmoral, Berwyn and Winthrop Aves., 100 cu.yd. grading, 280 cu.yd. filling and 970 sq.yd. 7 in. concrete paving, (6) alley between Garfield and Sheffield Aves., Center and Bissell Sts., 424 cu.yd. grading and 1,090 sq.yd. 7 in. concrete paving, (7) alley between West 63rd, West 64th, South Ada and South Loomis Sts., 225 cu.yd. grading, 1,450 sq.yd. 7 in. concrete paving, 275 ft. 10 in. tile sewers, etc., (8) alley between East 64th and 65th Sts., Champlain and St. Lawrence Aves., 450 cu.yd. grading and 1,020 sq.yd. 7 in. concrete paving, (9) alley between East 64th and 65th Sts., Rhodes and Eberhart Aves., 655 cu.yd. grading, 1,020 sq.yd. 7 in. concrete paving, 305 ft. 10 in. tile sewer, etc., (10) alley between West 59th and 60th Sts., Normal and Parnell Aves., 350 cu.yd. grading, 1,240 sq.yd. 7 in. concrete paving, 330 ft. 10 in. tile sewer, etc., (11) alley between East 69th St., East 69th Pl., Dante and Dorchester Aves., 161 cu.yd. grading, 805 sq.yd. 7 in. concrete paving, 168 ft. 10 in. tile sewer, etc., (12) alley between East 69th Pl., East 70th St., Stony Island and Harper Aves., 200 cu.yd. grading, 810 sq.yd. 7 in. concrete paving, 170 ft. 10 in. tile sewer, etc., (13) Drexel Ave., from Drexel Sq. to East 55th St., 4,650 ft. concrete curb, 3,800 cu.yd. grading, 9,300 sq.yd. type "B" asphalt on 6 in. concrete, etc., (14) East 55th Pl. from Indiana to South Park Aves., 2,350 ft. concrete curb, 1,150 cu.yd. grading, 3,670 sq.yd. standard asphalt paving on 6 in. concrete, etc., (15) Greenleaf Ave. from point 382 ft. east of Greenview Ave. to Ridge Rd., 8,370 ft. concrete curb, 6,500 cu.yd. grading, 770 sq.yd. sandstone block paving on 6 in. concrete, 12,750 sq.yd. standard asphalt paving on 6 in. concrete, etc., (16) North Massasoit Ave. from Le Moyne St. to West North Ave., 1,250 ft. concrete curb, 600 cu.yd. grading, 1,670 sq.yd. standard asphalt paving on 6 in. concrete, etc., (17) Merrill Ave. from East 72nd to 73rd Sts., 1,220 ft. concrete curb, 800 cu.yd. grading, 1,820 sq.yd. standard asphalt paving on 6 in. concrete, etc., (18) North Waller Ave. from Le Moyne St. to West North Ave., 1,250 ft. concrete curb, 775 cu.yd. grading, 1,670 sq.yd. standard asphalt paving on 6 in. concrete, etc., (19) East 90th and 91st Sts. from Essex to Colfax Aves., Essex and Kingston Aves. from East 90th to 92nd Sts., 7,750 ft. concrete curb, 8,000 cu.yd. filling, 12,680 sq.yd. 8 in. blast furnace slag or limestone on 2½ in. crushed limestone, etc., (20) sections of Lowell, Kildare, Tripp, Keeler, Kiona, Kelso, Kasson and Leland Aves., 11,500 ft. concrete curb, 7,740 cu.yd. grading, 16,000 sq.yd. type "B" asphalt paving on 6 in. concrete, 620 ft. 10 in. tile sewer, etc., from P. J. O'Brien & Co., 29 South La Salle St., (1) $6,936, (2) $6,355, (3) $4,975, (6) $5,543, (11) $4,616, (12) $4,823; Contg. & Material Co., 3219 South Michigan Ave., (1) $6,954, (2) $6,363, (3) $5,025, (4) $5,303, (5) $4,968, (7) $7,745, (8) $5,208, (9) $7,525; Central Paving Co., 179 West Washington St., (1) $6,962, (4) $5,273, (5) $4,939, (6) $5,484, (7) $7,752, (8) $5,251, (9) $7,610, (10) $7,898, (11) $4,608, (12) $4,814; J. A. Ross & Co., 4561 Armitage Ave., (2) $6,220, (3) $4,646, (4) $4,926, (5) $4,509; J. Dillon & Co., 179 West Washington St., (6) $5,537, (7) $7,753, (8) $5,371, (9) $7,554, (10) $7,768, (11) $4,535; R. F. Conway Co., 133 West Washington St., (13) $55,033, (14) $22,447, (15) $85,187, (16) $10,606, (17) $12,097, (18) $10,852, (20) $106,881; Amer. Asphalt Paving Co., 133 West Washington St., (13) $55,465, (14) $21,932, (16) $10,469, (17) $11,717, (18) $10,668, (20) $109,957; White Paving Co., 17 North La Salle St., (13) $55,853, (14) $22,275, (15) $85,911, (16) $10,660, (17) $12,136, (18) $10,859, (20) $108,867; Calumet Coal & Trading Co., 9022 Commercial Ave., (19) $70,565; J. A. Sackley Co., 133 West Washington St., (19) $171,675; Farr Bros. Co., 356 West 111th St., (19) $73,155.

Wisconsin—State Highway Dept., at div. office, Stephenson., Milwaukee, received only bid improving Milwaukee-Fond du Lac Rd., Federal Aid Proect 160, Waukesha Co., from Dean Constr. Co., Milwaukee. Work involves 12,209 cu.yd. earth excav., at $1.35 per cu.yd., 200 cu.yd. rock excav., $3, 107 cu.yd. concrete in culverts, $32, 6,800 bbl. cement in place, $2.70, 12,503 sq.yd concrete surfacing (exclusive of cement) $2.06, 20,399 sq.yd. full width concrete (exclusive of cement), $2.04, 200 bbl. cement in place, $2.70, 10,841 lin.ft. concrete curb and gutter, $1.23, 4,884 lb. steel for blind joints in place, $0.07, etc., total cost $138,346.

★**Wis., East End**—Douglas Co. let contract building concrete roadway with 3 ft. shoulder on 6 mi. Solon Springs-Superior Rd. from Bear Creek Bridge to intersection of Grand Ave., 18 ft. wide, to Peyerson & Nelson, c/o Douglas Co., Engineer's Office, Superior, $264,900.

★**Wis., Edgerton**—City let contract grading, paving and building combined concrete curb and gutter on 1.7 mi. Fulton and High Aves., 16 ft. wide, involving 14,000 sq.yd. rein.-con., to Lehmann Bros., Watertown. About $55,000.

Wis., Elkhorn—Walworth Co. received bids May 19, building concrete pavement on Whitewater-Janesville Rd., involving 20,899 sq.yd. pavement, from Whitewater Bridge Co., Whitewater, $69,005.

★**Wis., Randolph** — Village let contract paving various streets, involving 34,093 yd. paving, 19,395 lin.ft. straight curb, 839 lin. ft. radius curb and 1,000 lin.ft. 12 in. v.c.s. pipe, to Lampert Constr. Co., 101 Main St., Oshkosh. Noted April 15.

★**Minn., Glenwood**—Pope Co. let contract building 8 mi. Federal Aid Project 145, State Rd. 9, 24 ft. wide, to F. Rogers & Curtis, Globe Bldg., Minneapolis, $71,911. Noted April 15.

★**Minn., Thief River Falls**—City let contract paving 8.15 mi. various streets, involving 53,657 sq.yd. paving, to Bitulithic Constr. Co., 354 Main St., Winnipeg, Canada, at $3.98 per sq.yd. Noted April 15.

★**Minn., Wheaton**—Traverse Co. let contract improving 7 mi. County Job 2002, State Rd. 2, 24 ft. wide, involving 82,306 cu.yd. excav., etc., to W. H. Noel, Jameston, N. D., $56,700.

★**Montana** — State Highway Dept., Helena, let contract gravel surfacing 18.26 mi. Great Falls-Belt Rd., 16 ft. wide, Federal Aid Project 64, Cascade Co., to White, Brown & Leahy, Great Falls, $224,446; gravel surfacing 19.61 mi. Missoula-Polson Rd., Missoula Co., to Comrs. Missoula Co., Missoula, $46,053, building bridges, to Buell Bridge Co., Missoula, $17,064, grading and draining, to J. O'Connor, Chinook, $52,614; paving 0.7 mi. Sect. B, Helena-Bozeman Rd., 18 ft. wide, Federal Aid Project 77, Lewis and Clark Co., concrete, to L. Johnson, 655 North Warren St., Helena, $35,297. Noted April 8 and 22.

★**Tex., Ft. Worth**—City will excavate and pave with bituminous macadam on concrete base, 5 blocks Arlington and Elmwood Aves. About $26,000. Work will be done by day labor under supervision of O. L. Lewis, city engr.

★**Tex., Fredericksburg**—Gillespie Co. let contract grading, surfacing and draining 17 mi. Highway 9, 18 ft. wide, to M. M. Craven, Houston, $127,902. Noted May 20.

Tex., Houston—Harris Co. received bids May 17, scarifying and gravel surfacing 4 mi. Highway 35, Humble Rd., 16 ft. wide, from Smith & James, Houston, $13,760; Haden & Austin, 727 Kress Bldg., $17,490; B. S. Davison, 1110 Harold Ave., $21,817. County will furnish materials. Noted May 13.

★**Tex., Linden** — Cass Co. let contract grading, gravel surfacing and draining 9.69 mi. Highway 1 from Morris Co. to 5 mi. west Powell Creek, 9 ft. wide, to Smith Bros. and Healey Constr. Co., c/o Smith Bros., Crockett, $77,010, including 10% for engineering and contingencies. Noted April 1.

★**Tex., Livingston**—Polk Co. let contract grading draining, clearing, surfacing 22 mi. State Highway 35, 16 ft. wide, to Walling & Griswold, 716 Carter Bldg., Houston. About $250,000; cost plus percentage basis. Work involves 1,250 cu.yd. concrete, 58,655 cu.yd. earth excav. and 194,216 sq.yd. bituminous macadam.

★**Tex., McKinney**—Collin Co. let contract grading, clearing, graveling, and topping with bituminous macadam on concrete base, West Collin, Weston, Westminster and Melissa-Blue Ridge Rds., 16 ft. wide, to Womack Constr. Co., McKinney. About $575,000.

Tex., Orange — Orange Co. let contract excavating, grading, grubbing and laying tile on 10 mi. various streets, involving 88,478.67 sq.yd. plain and 7,734.31 sq.yd. rein.-con., to Houston Constr. Co., 3102 McKinney St., $113,965.

★**Tex., Weatherford**—Parker Co. let contract improving 16.59 mi. Highway 1 from here west to county line, 16 ft. wide, gravel, including rolling, covering and surfacing with 2 in asphalt, to J. E. Ward, 427 Western Indemnity Bldg., Dallas, $95.772, including 10% for engineering and contingencies and material furnished by county (124,600 gal. asphalt, $17,444 and 6,000 cu.yd. cover material, $31,500); grading and building rein.-con. drainage structures on same, involving 136,175 cu.yd. earth borrow and 30 acres clearing and grubbing, to Womack Constr. Co., Sherman, $298,745, including 10% for engineering, contingencies and material furnished by county (48,663 cu.yd. gravel). Noted May 13.

★**Tex., Wharton**—Wharton Co. let contracts improving 5.9 mi. Highway 3 from San Bernard River, west, 16 ft. wide, also 6.4 mi. Highway 3 from Colorado Co. line east, 16 ft. wide, to M. M. Craven, Bellaire, $19,646 and $15,503 respectively, including 10% for engineering and contingencies. Noted May 6.

★**Colorado**—State Highway Dept., Denver, let contract grading 2.759 mi. Federal Aid Project 78, between Red Cliff and Minturn, 18 ft. wide, to Denton & Crooke, Denver, $99,574. Noted March 18.

★**Idaho**—State Highway Dept., Boise, let contract grading and gravel surfacing 5.1 mi. Idaho-Central Highway, Picabo to Carey, Blaine Co., involving 30,699 cu.yd. earth and 5,615 cu.yd. rock excav., 900 lin. ft. corrugated c.i. pipe, 8,585 lb. reinforcing bars and 160 cu.yd. concrete; also grading 3.5 mi. North and South Highway, Starkey to Glendale, 23,177 cu.yd. earth and 5,770 cu.yd. rock excav., 3,600 lb. ½ in. sq. reinforcing bars and 92 lin.ft. 24 in. corrugated c.i. pipe, to H. E. Cornell, 1411 North 17th St., Boise, $47.447 and $23,669 respectively.

★**Idaho, Rexburg**—City let contract paving various streets, including concrete curbing and guttering, to Gibbons & Reed, Kearns Bldg., Salt Lake City, Utah. About $170,000. Noted April 29.

★**Ariz., Tucson**—Pima Co. let contract graveling 28 mi. Casa Grande Rd., to Littlejohn & Singleton, Tucson, $80,450; grading, to G. Faucett; rein.-con. bridges and corrugated iron culverts, to P. Correll; furnishing 294,000 lb. reinforced steel f.o.b. Tucson, to Pacific Coast Steel Co., Union Oil Bldg., Los Angeles, $5.315 cwt. Noted March 25.

Wash., Seattle—City received bids May 14, building curbs and concrete walks on East Edmunds St., et al, involving 510 sq.yd. concrete in cross walks, 4,950 sq.yd. concrete sidewalks, 1,200 ft. 3 in. sewer pipe, etc., from J. B. Stilwell, Inc., Boston Blk., $26,998; Agostine Bros., 1335 21st Ave. S., $41,065.

★**Wash., Spokane**—Comrs. Spokane Co. let contracts grading, paving and draining 13⅓ mi. Latah-Fairfield-Waverly Rd., to R. A. Sloane, Seattle, $190,476; grading and surfacing with crushed rock 4½ mi. Mt. Hope Rt., to Genl. Constr. Co., Peyton Bldg., $62,111; Day Rd., to S. G. Kinder, Waterville, $49,545. Noted April 15.

★**Ore., Eugene**—City let contract paving High St., from 3rd Ave. to Ferry St., involving 7,000 sq.yd. concrete, to G. Pile, Eugene, $32,992; grading and graveling 12 blocks 2nd Ave. W., Lawrence and Polk St., to A. C. Mathews, Eugene, $7,804.

★**California**—State Highway Comn., Sacramento, let contract paving 13.6 mi. road between Glenwood and Los Gatos, Santa Cruz and Santa Clara Counties, portland cement concrete, to J. L. Connor, 709 Higgins Bldg., Los Angeles, $196,842. Noted April 22.

★**Cal., Eagle Rock** (Los Angeles P. O.) —City let contract paving Central Ave., 5 in. concrete, to W. Liddington, 420 East 60th St., Los Angeles, $46,753. Noted May 20.

Cal., Glendale (Los Angeles P. O.)—City received bids improving 7,500 ft. Sycamore Canyon Rd., involving (a) 14,000 ft. Class "A" cement curbing (b) 5,000 ft. Class "B" cement curbing (c) 13,000 ft. Class "C" cement curbing, (d) 89,000 sq.ft. cement walks, (e) 387,400 sq.ft. 5 in. concrete paving, including grading, (f) $14,800 sq.ft. 4 in. concrete paving, (g) 24,400 sq.ft. 6 in. oil macadam, (h) 15,000 ft. 1 in. pipe culverts, (i) culverts, from W. E. Burke and H. S. Graul, 232 South Bunker Hill Ave., Los Angeles, (a) $0.60 per lin.ft., (b) $0.47, (c) $0.25, (d) $0.19½, (e) $0.34½, (f) $0.32, (g) $0.26½, (h) $0.50 (i) $15,880, total $199,529; P. L. Ferry, 614 East Acacia St., (a) $0.75, (b) $0.66, (c) $0.56, (d) $0.24, (e) $0.28 (grading at $0.06), (f) $0.25, (g) $0.21, (h) $0.40, (i) $12,500, total $223,907

Streets and Roads (Continued)

★Cal., Napa—Comrs. Napa Co. let contract paving 1 mi. road south of Three-Mile House, to R. J. Blanco, Vallejo, $25,-689.

★Cal., Santa Monica—City let contract improving 4th St., involving 82,423 sq.ft. grading and sheet asphalt paving on 5 in. concrete base, 38 sq.ft. cement walks, 259 lin.ft. cement curbing, storm drains, etc., to Braun, Bryant & Austin, Santa Monica. About $25,000.

★Cal., South Pasadena—City let contract improving Orange Grove Ave., involving 6,031 lin.ft. cement curbing, 165,000 sq.ft. grading and 5 in. concrete paving, to H. E. Cox, 305 Slavin Bldg., Pasadena, $41,242.

★Cal., Visalia—Tulare Co. let contract improving 4 mi. Millwood Rd., 15 ft. wide, involving 4,650 cu.yd. grading and 3,705 cu.yd. 4 in. concrete paving, to E. E. Herdman, Visalia, $54,157.

★B. C., Vancouver—City will grade and hard surface various streets. About $78,-630. Work will be done by day labor.

Excavation and Dredging

PROPOSED WORK

N. Y., Fayetteville—Dredging—State Legislature, Capitol, Albany, appropriated $35,000 to deepen, widen, straighten and improve Limestone Creek, here.

La., Opelousas—Dredging—Bd. Comrs., Bayous Beouf and Waxia D.D., soon receives bids for 1,400,000 cu.yd. floating dredgework. About $320,000. W. B. Robert, Lafayette, engr.

Ia., Dakata City—Excavation—Humboldt Co. receives bids about July 1, excavating D. D. 3, involving 297,100 cu.yd. excav. M. N. Osmundson, aud.

BIDS DESIRED

Miss., Cleveland—Excavation—Until June 5, by Drainage Comrs. D.D. 10, Bolivar Co., excavating Ditch 1, involving 450,766 cu. yd.; Ditch 5, 23,118 cu.yd.; Ditch 6, 30,509 cu.yd.; Ditch 7, 18,889 cu.yd.; Ditch 8, 8,-585 cu.yd.; Ditch 9, 15,378 cu.yd., and Ditch 9A, 5,481 cu.yd. W. W. Boone, engr.

Ky., Madisonville—Ditch—Until July 3, by Hopkins Co. Drainage Bd., building 14 mi. Flat Creek Ditch, 4-15 ft. wide at bottom. J. V. Poole, engr.; advertised in this issue.

Ill., Marengo—Drains—Until June 1, by J. F. DeYarmond, secy., Coon Creek, D.D., furnishing and laying 7 mi. tile drain, 14-27 in. (over 1 mi. of 27 in. will be required). A. L Webster, Wheaton, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Newton—Dredging—City let contract deepening, widening, relocating and improving South Meadow and Paul Brooks, to Smith & Leonard Co., 530 Tremont Bldg., Boston. About $35,000. Noted May 20.

★Ore., Nyssa—Drainage—City let contract building drainage system and furnishing material (except tile and culverts,) to Pickett-Burtt Constr. Co., Boise, Idaho, $41,280.

Industrial Works

PROPOSED WORK

Mass., Boston—See "Buildings."

Mass., Boston—Tuck & Gilman, archts. and engrs., 34 School St., soon let contract building 2 story, 100 x 145 ft., brick and rein.-con. garage, concrete flooring and foundation, on Brighton Ave., for G. Marsh, c/o architects. About $125,000. Noted May 20.

Conn., Bridgeport—Summerill Tubing Co., c/o H. G. McMurtrie, archt., 1012 Walnut St., Phila., rejected bids building 2 story, 60 x 120 ft., steel factory. Work will be readvertised. Noted April 1.

Conn., Hartford—Comrs. Fire Dept. had plans prepared by Whiton & McMahon, archts., 36 Pearl St., for 2 story, 50 x 125 ft., brick and concrete machine shop, rein.-con. flooring, concrete foundation, on John St. About $125,000. Noted April 22.

Conn., Hartford—Home Tourist Candy Co., c/o Backoff, Jones & Cook, archts., Union Bldg., Newark, N. J., having plans prepared for 2 story, 60 x 100 ft., brick and mill construction factory, here. About $50,000.

Conn., Higganum—Cutaway Harrow Co. plans to build brick and steel addition to plant. About $100,000. Architect not selected.

Conn., Meriden—C. Collington, 81 Crown St., having plans prepared by H. L. Sprague, archt., 310 Main St., Springfield, for 1 story, 80 x 125 ft., brick and concrete garage, on Cook Ave. About $60,000.

N. Y., Brooklyn—J. E. Nitchie, archt. and engr., 63 Park Row, New York City, receives bids about June 2, building 4 story, 50 x 100 ft., rein.-con. and steel addition to factory, concrete foundation, at 73 Otsego St., for Keystone Varnish Co., 91 Otsego St. About $85,000. Noted April 15.

N. Y., Brooklyn—New York Pie Baking Co., 82 Sullivan St., New York City, having plans prepared by Ballinger & Perrott, archts. and engrs., 47 West 34th St., New York City, for brick, steel and concrete bakery, rein.-con. flooring, concrete foundation, on Nevins and Butler Sts., here. About $200,000.

N. Y., Long Island City—S. L. Reilly, archt. and engr., 112 West Adams St., Chicago, rejected bids building 4 story, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, for P. Van Iderstine Corp., Greenpoint Ave. Work will be readvertised. Noted April 29.

N. Y., Mt. Vernon—Armour & Co., Union Stock Yards, Chicago, rejected bids received May 1, building 5 story, rein.-con. and steel packing plant, rein.-con. flooring, concrete foundation, here. Work will be readvertised. R. C. Clark, c/o owners, archt. and engr. Noted April 29.

N. Y., New York—M. B. Schmidt, archt. and engr., 14 East 46th St., soon lets contract building 4 story, 50 x 50 ft. paint factory, rein.-con. and steel, rein.-con. flooring, concrete foundation, for W. Zinsser, West 59th St. About $50,000.

N. J., Butler—Boro. soon receives bids building 1 story, 50 x 50 ft. lighting plant, concrete and brick. Cost between $50,000 and $60,000. Runyon & Carey, 845 Broad St., Newark, engrs.

N. C., Charlotte—J. H. Cutter receives bids about June 1, building warehouse. About $300,000.

Fla., Palatka—McGuire Fertilizer Co., Morriston, plans to build mixing plant near here. About $200,000.

Fla., Palatka—United States Sugar Corp., Phila., plans to build mill, here. About $2,000,000.

O., Cleveland—City plans to build two 1 story, 60 x 110 ft. electric transmitting stations, brick, steel and concrete, rein.-con. flooring, concrete foundations on West 103rd St. and Western Ave., and Euclid Ave. and East 105th St. About $100,000 each. W. E. Davis, City Hall, engr.

O., Cleveland—Cleveland Welding & Mfg. Co., West 117 St. and Berea Rd., soon lets contract building 1 story, 90 x 155 ft., brick, steel and concrete addition to factory, rein.-con. flooring, concrete foundation. About $75,000.

O., Cleveland—Holan Mfg. Co., 3276 Clark Ave., plans to build 3 story truck body factory, brick, steel and concrete, rein.-con. flooring, concrete foundation, on Park Brook Rd. About $200,000.

O., East Cleveland (Cleveland P. O.)—Natl. Lamp Co. of General Electric Co., Nela Park, having plans prepared by G. H. Johnson, archt. and engr., Nela Park, for 1 story, brick, steel and concrete boiler plant, rein.-con. flooring, concrete foundation. About $100,000.

O., Galion—City plans to build addition to light plant. About $75,000.

Ind., Sullivan—Mutual Truck Co. having plans prepared by D. B. Shourds archt., Tribune Bldg., Terre Haute, for 400 x 750 ft. factory.

Ill., Chicago—Magnetic Motors Corp., 2521 Calumet Ave., plans to build 1 story, gasoline motor factory, on 34th Pl. and Cottage Grove Ave. About $150,000. Architect and engineer not selected.

Ill., Lawrenceville—A. L. Maxwell Co. having preliminary plans prepared by Fowler & Copelle, archts., 409 Amer. Trust Bldg., Evansville, Ind., for 2 and 3 story, rein.-con. and brick garage. About $70,-000.

Wis., Carrollville—H. J. Esser, archt., Camp Bldg., Milwaukee, soon lets contract building 1 story, 100 x 100 ft., rein.-con. and brick fertilizer plant, rein.-con. flooring, concrete foundation, for United States Fertilizer Co.

Minn., Minneapolis — Modern Fdry & Machine Co., 4725 Dupont Ave. S., having plans prepared for 1 story, 80 x 150 ft., iron and steel foundry. About $60,000. Private plans.

Tex., Houston—C. Bender & Co., 617 Willow St., soon lets contract building 3 story, 100 x 100 ft., rein.-con. and brick warehouse, rein.-con. flooring, on Congress and Caroline Sts. About $110,000. C. D. Hill & Co., Prince Theatre Bldg., archts. Noted March 4.

Tex., Vernon—Victor Pipe Line & Refining Co., Dixon Bldg., plans to build 1 story, brick refinery, with 2,000 bbl. daily capacity. About $150,000. J. W. Hudson dir.

Ont., Gananoque—Eastern Ontario Milk Products Co. plans to build brick factory here. Cost between $100,000 to $150,000. Address, L. P. Sherwood, Central Chambers, Ottawa. Architect not selected.

Ont., London—London Hosiery Co., Adelaide St., plans to build brick concrete and steel addition to factory, concrete flooring and foundation. About $100,000. Architect not selected.

Ont., Toronto—Barrett Co., Ltd., 172 King St. E., plans to build 4 story, 80 x 100 ft. concrete and brick warehouse on Keating and Salter Sts. About $150,000. Architect not selected.

Ont., Toronto—Gendron Mfg. Co., 137 Duchess St., having plans prepared by J. P. Hynes, archt., 107 Castle Frank Rd., for 1 story, 80 x 200 ft. factory for baby carriages, also 2 story, 40 x 50 ft. office building, concrete, brick and steel, concrete flooring and foundation, on Pharmacy Ave. Cost between $250,000 and $300,000

Ont., Toronto—Riverdale Garage Ltd. plans to build 2 or 3 story, rein.-con. and brick garage, rein.-con. flooring, concrete foundation, on Danforth Ave. About $90,-000.

BIDS DESIRED

Mass., Cambridge—Until June 30, by Webster & Libby, archts. and engrs., 534 Congress St., Portland, Me., building 3 story, 62 x 152 ft., rein.-con. factory. To Johnson Educator Food Co. About $100,000.

O., Ashtabula—Ashtabula Steel Co. receiving bids building 1 story, 110 x 600 ft. and 90 x 300 ft., rein.-con., steel and brick mill, concrete foundation, on State Rd. About $350,000.

O., Cleveland—Until June 1, by N. R. Cornsweet, Society for Savings Bldg., constructing 2 story, 70 x 100 ft., brick and timber factory and commercial building, brick foundation, on West 6 St. and St. Clair Ave. About $75,000.

Tex., Houston—Hogan-Allnoch, Preston Ave. and Smith St., receiving bids building 4 story, 120 x 125 ft., rein.-con. and brick warehouse, rein.-con. flooring. About $190,-000. Sanguinet, Staats & Gottlieb, 718 Carter Bldg., archts.

Que., Riviere Du Loup—Until June 15, by Union Glove Works, building 3 story, 50 x 110 ft., concrete, brick and steel factory, concrete foundation, on Principale St. About $100,000. M. C. Huart, mgr., St. Alexander St., Montreal.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Worcester—Crompton & Knowles Loom Wks., 93 Grand St., let contract building 4 or 5 story, 60 x 140 ft., rein.-con. storehouse, rein.-con. flooring, concrete foundation, to Aberthaw Constr. Co., 27 School St., Bostn. Abut $150,000.

★Mass., Worcester—Rogers Drop Forging Co., Frank St., let contract constructing 1 story, 60 x 85 ft., brick and mill construction, sand blasting building, 1 story, 130 x 150 ft., brick and steel forge shop and 40 x 50 ft., brick, concrete and steel boiler house, rein.-con. flooring, concrete foundations, to E. D. Ward Co., 82 Foster St. About $125,000.

★Conn., Hartford—Hart & Hegeman Mfg. Co., 342 Capitol Ave., let contract building, 3 story, rein.-con. warehouse and shipping platform, rein.-con. flooring, concrete foundation, on Capitol Ave., to W. J. Sexton, 847 Main St. About $50,000.

★Conn., New London—A. Grippo, 6 Truman St., will build 3 story, 40 x 100 ft., brick, concrete and steel garage and showroom, rein.-con. flooring, concrete foundation, on Bank and Truman Sts. About $50,000. Work will be done by day labor. Noted March 18.

★N. Y., Brooklyn—A. Pinover, 16 Court St., will build 200 x 294 ft. brick, concrete and steel, garage, service station and showroom, rein.-con. flooring, concrete foundation, on Bedford Ave. and Sullivan St. About $150,000. Work will be done by day labor.

★N. Y., Brooklyn—Valentine & Co., 346 Manhattan Ave., let contract altering rein.-con. and steel factory, rein.-con. flooring, on Richardson, Bayard and Lorimer Sts., to Barney-Ahlers, 110 West 40th St., New York City. About $50,000.

★N. Y., Buffalo—Klinck & Schiller, Inc., let contract building concrete and steel abbatoir, at 640 Babcock St., to G. Schautz, 860 Seneca St. About $150,000.

★N. Y., New York—Thompson Bros., 42 East 142nd St., will build 2 story, 100 x

Industrial Works (Continued)

100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 144th St. and Lenox Ave. About $50,000. Work will be done by day labor.

★**N. J., Trenton**—Ajax Rubber Co., Breunig Ave., let contract building 1 story, 60 x 100 ft., brick and steel addition to factory, on North Olden Ave., to N. A. K. Bugbee Co., 206 East Hanover St. About $60,000.

★**N. C., Raleigh**—Ford Motor Co. let contract building garage, to J. L. Crouse, Greensboro. About $150,000.

★**N. C., Raleigh**—L. J. O'Quinn let contract building 1 story, 71 x 80 ft., steel, brick and rein.-con. garage, to J. E. Beman, Raleigh. About $50,000.

★**O., Cleveland**—Modern Aluminum Fdry. Co., 4613 Payne Ave., let contract building 1 story, 50 x 143 ft., brick and steel addition to factory, brick foundation, to H G. Claxton, Vickers Bldg. About $50,000.

★**O., Cuyahoga Falls**—Falls Rubber Co. let contract building 3 story, 61 x 84 ft. brick, steel and concrete addition to factory, rein.-con. flooring, concrete foundation. About $60,000.

★**Ill., Chicago**—Chicago Solder Co., 218 North Union Ave., let contract building 2 story, 50 x 250 ft., rein.-con. and brick addition to plant, rein.-con. flooring, concrete foundation, to E. L. Scheidenheim Co., 111 West Monroe St. About $100,000. Noted Jan. 29.

★**Minn., New Ulm**—City let contract building 1 story, 90 x 90 x 40 ft., steam power plant, to J. G. Robertson, University Ave., St. Paul. $145,399. Noted April 29.

★**Utah, Ogden**—Globe Grain & Milling Co. will build 8 story, 50 x 150 ft., flour mill, rein.-con. About $450,000. Work will be done by day labor.

★**Cal., Sacramento**—California Almond Growers Assn. let contract building 4 story, rein.-con. plant, on 19th and C Sts., to Healy-Tibbetts Constr. Co., 9 main St., San Francisco. About $100,000.

★**Cal., San Diego**—Citrus Soap Co., 902 K St., let contract building 4 story, 200 x 300 ft., brick and timber factory, concrete foundation, on Union and Market Sts., to Winter Constr. Co., 2141 Sacramento St., Los Angeles. About $200,000.

★**Que., Quebec**—Quebec Preserving Co., 33 Smith St., let contract building 5 story, concrete, brick and steel storehouse, rein.-con. flooring, concrete foundation, on De Varennes St., to Cauchon, 307 Richardson St. About $70,000.

Buildings

PROPOSED WORK

Mass., Attleboro—Bank and Office—First Natl. Bank, Main St., having plans prepared by W. R. Walker & Son, archts., 17 Custom House St., Providence, R. I., for 5 story, 60 x 140 ft., brick, steel and concrete, rein.-con. flooring, concrete foundation on Park St. About $175,000. Noted March 11.

Mass., Boston—Sales, etc.—Appleton & Stearns, archts., 53 State St., soon receive bids building 3 story, 80 x 300 ft., sales and service station, rein.-con., rein.-con. flooring, concrete foundation, on Commonwealth Ave., for J. W. Maguire Co., 745 Boylston St. About $100,000.

Mass., Brookline—Sales—D Cerussi, c/o C. Allbright, archt., 6 Beacon St., Boston, having plans prepared for 2 story, 100 x 270 ft., brick and limestone, on Commonwealth Ave. About $200,000.

Mass., Leominster—Hospital—Leominster Hospital, Bd. Trustees, having plans prepared by Kendall, Taylor & Co., archts., 93 Federal St., Boston, for 3 story, brick, concrete and steel, on North Main St About $150,000.

Mass., Montague—Theatre—D. J. Shea, Turners Falls having plans prepared by Perry & McNaughton archts. 19 Congress St., Boston, for 1 and 2 story, brick, here. About $100,000.

Mass., Peabody—High School and Athletic Stadium—City plans to build 3 story, 40 room, brick. About $600,000. S. H Donnell, mayor.

Mass., Webster—Library—Town Library Comn. plans to build 1 story, stone and steel, on Main St. About $100,000.

Mass., Worcester—Theatre—S. and L. Shubert, Inc., 225 West 44th St., New York City, plan to build brick and stone, brick foundation, here. About $300,000. H. J. Krapp, 116 East 16th St., New York City, archt. and engr.

Conn., Bristol—Church—First Baptist Church Society, Main St., plans to build brick and steel. About $100,000. Architect not selected

Conn., Groton (New London P. O.)—Home Odd Fellows, I. O. O. F., Connecticut Grand Lodge, Thompsonville, plans to build large addition to home, near Thames River. About $250,000. C. J. Fowler, grand marshal. Architect not selected.

N. Y., Brooklyn—Theatre—B. F. Keith, 1564 Bway., New York City, having sketches made by H. McElfatrick, archt. and engr., 701 7th Ave., New York City, for 2 story, 165 x 250 ft., brick and stone, brick foundation, on Gold, Fleet and Prince Sts., here. About $750,000. Noted May 13.

N. Y., Buffalo—Recreation—City had plans prepared by H. L. Beck, archt., Municipal Bldg., constructing 2 story, brick, steel and concrete, 200 ft. long, 40 ft. wide at wings and 50 ft. wide in center, in Bird Island Pier. About $200,000.

N. Y., Buffalo—Theatre—S. and L. Shubert, Inc., 225 West 44th St., New York City, plan to build brick and stone, brick foundation, here. About $300,000. H. J. Krapp, 116 East 16th St., New York City, archt. and engr.

N. Y., Cortland—College—State Legislature, Capitol, Albany, having plans prepared constructing buildings at State Normal and Training School, here. Cost not to exceed $1,750,000. L. F. Pilcher, state archt.

N. Y., Lynbrook—School—Bd. Educ. receives bids about June 25, building brick and stone, brick foundation. About $200,000. Lowinson & Schubert, 366 5th Ave., New York City, archts. and engrs.

N. Y., New York—Arsenal—State Legislature, Capitol, Albany, plans to purchase site and build state arsenal, here. Cost not to exceed $700,000.

N. Y., New York—Bank and Office—A. F. Gilbert, archt. and engr., 80 Maiden Lane, receives bids about June 10, altering 16 story, brick, steel and stone, at 68 William St., for Royal Bank of Canada. About $200,000. Noted April 29.

N. Y., New York—College—College of Dental & Oral Surgery of New York, 35th St., having plans prepared by J. B. Snooks Sons, archts. and engrs., 261 Bway., for 4 story, brick, steel and stone, brick foundation, at 309-315 East 34th St. About $200,000. S. Chapin, pres.

N. Y., New York—Community—Federation Settlement, Inc., 240 East 105th St., having plans prepared by Rouse & Goldstone, archts. and engrs., 512 5th Ave., for 5 story, 60 x 100 ft., brick and stone, brick foundation, at 115-119 East 106th St. About $110,000.

N. Y., New York—Office—R. Dunther and R. Law, Inc., 25 Broad St., having revised plans prepared by A. F. Gilbert, archt. and engr., 80 Maiden Lane, for 5 story, 40 x 50 ft., brick, steel and stone, concrete foundation, at 131 Nassau St. About $100,000. Noted April 29.

N. Y., Tonawanda—School—Town having plans prepared by Bley & Lyman, archts., 250 Delaware Ave., Buffalo, for school. About $105,000. O. R. Hopkins, clk.

N. Y., White Plains—College—State Legislature, Capitol, Albany, having plans prepared constructing buildings for use of State Normal and Training School for Teachers, here. L. F. Pilcher, state archt.

N. J., Bridgeton—School—Bd. Educ. receives bids about July 25, building brick and stone, brick foundation. About $225,000. Lowinson & Schubert, 366 5th Ave., New York City, archts. and engrs.

N. J., Jersey City—Church and Rectory—St. Paul's Protestant Episcopal Congregation, Duncan Ave., plans to build new church and rectory. About $300,000.

N. J., Kearney (Arlington P. O.)—School—Bd. Educ. soon receives bids building 3 story, 8 room addition to Lincoln School, concrete and brick. About $100,000. Runyon & Carey, 845 Broad St., Newark, engrs. Guilbert & Betelle, 2 Lombardi St., Newark, archts.

N. J., Leonardo—School—Bd. Educ. rejected bids building 2 story, brick and stone, brick foundation. About $100,000. Work will be readvertised. E. A. Arend, 105 West 40th St., New York City, archt. and engr. Noted April 29.

N. J., Middletown—School—Bd. Educ. rejected bids building 2 story, brick and stone, brick foundation. About $100,000. Work will be readvertised. E. A. Arend, 105 West 40th St., New York City, archt. and engr Noted April 29.

N. J., Newark—Nurses Home—Beth Israel Hospital, High and West Kinney Sts., rejected bids building 3 story, 35 x 110 ft., brick and limestone, on Baldwin and Quitman Sts. Project abandoned. Noted May 13.

N. J., Fort Monmouth—School—Bd. Educ. rejected bids building 3 story, 40 x 60 x 90 ft., brick and stone, brick foundation. About $150,000. Work will be readvertised. E. A. Arend, 105 West 40th St., New York City, archt. Noted April 29.

Pa., Erie—Store—Boston Store, Peach and 8th Sts., plans to build two 3 story additions, one 100 x 112 ft., on Peach St., and other 48 x 82 ft., on 8th St., both brick and rein.-con. About $285,000.

Pa., Spangler—High School—School Bd. Spangler, Barnesboro, West Carroll and Barr Twps. plans to build 3 story, 100 x 140 ft., rein.-con. and brick. Site not selected. About $150,000. J. H. Westover, Spangler, chn. Architect not selected.

W. Va., Bluefield—High School—City voted $200,000 bonds to build junior high school.

W. Va., Fairmont—High School—City voted $125,000 bonds to build high school. Noted May 15.

W. Va., Huntington—High School—City voted $250,000 bonds to build junior high school.

W. Va., Logan—Jail—Comrs. Logan Co. having plans prepared by W. B. Smith, archt., Robson-Prichard Bldg., Huntington, for jail and jailers residence. About $100,000.

W. Va., Montgomery—Schools—City voted $125,000 bonds to build grade and high school.

N. C., Greensboro—Theatre—Natl. Amusement Co. plans to build theatre. About $150,000. Architect not selected

Ky., Louisville—Theatre—S. and L. Shubert, Inc., 225 West 44th St., New York City, plans to build brick and stone, here. About $300,000. H. J. Krapp, 116 East 16th St., New York City, archt. and engr.

O., Canton—Bd. Educ. had plans prepared by Thayer & Thayer, archts., Mercantile Bldg., New Castle, Pa., for J. H. Lehman School, 2 and 3 story, 150 x 250 ft., yellow buff brick and limestone, on 14th St. and Oxford Ave. About $750,000.

O., Cincinnati—Office—Amer. Druggists Fire Insurance Co. plans to build 8 or 10 story, on Canal and Walnut Sts.

O., Cincinnati—Theatre—S. and L. Shubert, Inc., 225 West 44th St., New York City, plan to build brick and stone, brick foundation. About $300,000. H. J. Krapp, 116 East 16th St., New York City, archt. and engr.

O., Cleveland—Commercial—C. A. Stone, Rockefeller Bldg., plans to build 4 story, 86 x 115 ft., brick, steel and concrete, rein.-con. flooring, concrete foundation on Carnegie Ave. near East 69 St. About $150,000. Architect not selected.

O., Cleveland—Educational—Y. M. C. A., c/o D. W. Teachout, East 22 St. and Prospect Ave., plans to build 10 story, brick, steel and concrete, rein.-con. flooring, concrete foundation. About $500,000. Architects name withheld.

O., Columbus—Theatre—C. L. Link, Denver, Col., having plans prepared by J. Goldsmith, archt., Wheeler Bldg., for remodeling Lyceum Theatre and building a 2 story, 60 x 62 ft. addition to same. About $100,000.

O., Lakewood (Cleveland P. O.)—Schools—Bd. Educ. Warren Rd., soon receives bids building additions to schools on West Clifton Blvd., Franklin St. and Elbur Ave., also on Clifton Blvd. and Summit Ave.; 2 story, concrete, steel and brick, rein.-con. flooring, concrete foundations. About $200,000. Former bids were returned to bidders unopened, owing to owners inability to sell bonds.

O., Lorain—School—City voted $1,000,000 bonds to build three 1 and 2 story, brick, steel and concrete, rein.-con. flooring, concrete foundations. Address J. Bruell, 6th St .and Hamilton Ave., clk. Bd. Educ.

Ill., Chicago—Restaurant—Canton Bldg Corp., c/o J. R. Fugard, archt., 64 East Van Buren St., having plans prepared for 3 story, 80 x 125 ft., rein.-con. and terra cotta, rein.-con. flooring, concrete foundation, on Wabash and Van Buren Sts. About $200,000.

Ill., Chicago—Theatres—S. and L. Shubert, Inc., 225 West 44th St., New York City, having sketches made by H. J. Krapp, archt. and engr., 116 East 16th St., New York City, for two 2 story, brick and stone buildings, brick foundations, here. About $500,000.

Wis., Madison—Hotel—Piper Bros., 31 North Pinckney St., had sketches made by Balch & Lippert, archts., Commercial Natl. Bank Bldg., for New Belmont Hotel, 7 and 9 story, 100 x 132 ft., brick, (to have 600 rooms.) About $1,000,000

383—387

CONSTRUCTION NEWS

UPS AND DOWNS OF THE MARKET

PIG IRON—Difficult to ship iron, but coke delivery is better, resulting in a little greater production than last week.

RAILWAY MATERIALS—Brisk inquiry for light rails, but prices remain as last month.

CONCRETING MATERIALS—Gravel advanced in Boston and New York to a level of $3 per cu.yd., which is reached also in New Orleans and exceeded in Kansas City. Sand costs $3 in Boston, 75c. in Minneapolis, which indicates the range for the country. Cement prices unchanged except in New York where net price is 30c. higher than last month. Bags will soon be charged generally at 25c. each. Prices of crushed stone advanced in Baltimore, but held steady elsewhere. No change in slag market. Lime up in Kansas City, Boston and Baltimore.

REINFORCING STEEL—Situation unchanged from last month, market dependent upon mill shipments, which are few. For example, we quote prices of triangle mesh and expanded metal lath, although there is practically no stock of these materials available.

BRICK—Common brick up in New Orleans, Boston and Baltimore. We quote paving block in New York again, but the manufacturers will accept no orders except for eventual deliveries at prices then prevailing.

Hollow Tile—Situation same as for brick. We do not quote for New York or Perth Amboy. Factories filled up with orders. Price advances noted in Boston and Montreal.

STRUCTURAL MATERIAL—Inquiries appear to be lighter, but prices remain the same as last month. Carnegie Steel Co. quotes $2.45 for plain material, while another company quotes $3.10@ $3.50, depending upon whether for regular customer. Cambria quotes $4.

STEEL SHEETS—Conditions at mills reported to be greatly improved, being better, in fact, than at any other time during the strike. Price range between the leading interest and the independents is shortening. Deliveries, however, remain few and far between, resulting in premium prices at the warehouses.

LUMBER—General decrease of $3.50 on Douglas fir in San Francisco. In New York, Southern pine advanced in price on larger sizes General decrease of $2 in Chicago; no change in St. Louis. Strong increases in Boston. In Kansas City pine timbers dropped $7, while 2-in. t. and g. dropped from $134 to $124. Drops in Montreal, Cincinnati and Los Angeles.

LABOR—In Kansas City, hodcarriers and iron workers receive 90c. and $1.10, respectively, against a former rate of 82c. and $1. Unrest in New Orleans with carpenters, hoisting engineers and pile-drivers. Increases in Montreal. In Detroit conditions are unsettled in regard to building construction, owing to scarcity of materials and difficulties of shipment.

Price advances are indicated by **heavy type**, declines by *italics*

PIG IRON—Quotations compiled by The Matthew Addy Co.:

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	$45 60	$45 60
Northern Basic	42 80	42 80
Southern Ohio No. 2	46.80	46.80
NEW YORK, tidewater delivery		
2X Virginia (silicon **2.25 to** 2.75)	49.65	49 65
Southern No. 2 (silicon **2.25** to 2.75)	49.70	49.70
BIRMINGHAM		
No. 2 Foundry	42.00@**44 00**	42 00
PHILADELPHIA		
Eastern Pa	**46 00@48 25***	45.35 45.65*
Virginia No. 2	45.00*	43 25*
Basic	44 50†	44 50†
Grey Forge	43.50*	43.50*
CHICAGO		
No. 2 Foundry Local	43 00@44 25	44.25
No. 2 Foundry Southern	47 00@48 70	47 00
PITTSBURGH, including freight charge from the Valley		
No. 2 Foundry Valley	45 65	45.65
Basic	44 40	44.40
Bessemer	44 90	44.90
MONTREAL		
Silicon 2.25 to 2.75%	43 25	43.25

* F. o. b. furnace. † Delivered.

RAILWAY SUPPLIES

STEEL RAILS—The following quotations are per ton f. o. b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Current	One Year Ago	Current	One Year Ago
Standard bessemer rails	$45 00 @ $60 00	$45 00	$45.00@$55 00	$45.00
Standard openhearth rails	47.00 @ 60 00	47.00	47.00@ 57.00	47 00
Light rails, 8 to 10 lb.	2.58½*@ 3.75	2 585*	2 585*@3.75	2.835*
Light rails, 12 to 14 lb.	2.54* @ 3.75	2.54*	2 54* @3.75	2.79*
Light rails, 25 to 45 lb.	2.45* @ 3 75	2.45*	2 45* @3.75	2.70*

* Per 100 lb.

Note.—The lower price is that of the U S. Steel Corp. but the market is mostly speculative and higher prices prevail.

RAILWAY TIES—For fair-sized orders, the following prices per tie hold:

		7 In. x 9 In. by 8 Ft. 6 In.	6 In- x 8 In. by 8½ Ft.
Chicago	Plain	**$2 00**	**$2.25**
Chicago	Creosoted	**2 25**	**2 50**
San Francisco	Douglas Fir—Green	1 74	1 24
San Francisco	Douglas Fir—Creosoted	3.36	2.38

Prices per tie at Missouri mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0.70	No. 1	$0 55
No. 2	.80	No. 2	.65
No. 3	.90	No. 3	.75
No. 4	.98		
7x9x8 white oak			1.05
7x9x8 red oak (No. 4)	$0.80	No. 5	.87

Note.—Add 36c. each for treatment.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard spikes, $\frac{9}{16}$-in. and larger	$4 00	$3 25	$3.62	$5 34	$5 65
Track bolts	6.00@6 50	4 35	4 62	Premium	6 65
Standard section angle bars	3 00@4 00	3 00	3 02	Premium	4 90

PIPE

STEEL AND IRON—The following discounts are to jobbers for carload lots on the Pittsburgh basing card, discounts on steel pipe, applying as from January 14, 1920, and on iron pipe from January 7, 1920:

Inches	Black	Galv.	Inches	Black	Galv.
BUTT WELD					
⅛, ¼ and ⅜	47	20½	¼ and ⅜	1	+25
½	51	36½	½	25½	+ 1½
¾ to 3	54	41½	¾	29½	11½
			1 to 1½	34½	18½
			2 and 2½	33½	17½
LAP WELD					
2	47	34½	1¼	24½	9½
2½ to 6	50	37½	1½	31½	17½
7 to 12	47	33½	2	28½	14½
13 and 14	37½		2½ to 6	30½	17½
15	35		7 to 12	27½	14½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
⅛, ¼ and ⅜	43	25½	¼	+7	+40
½	48	35½	⅜	23½	6½
¾ to 1½	52	39½	½	28½	15½
2 to 3	53	40½	¾ to 1½	34½	19½
			2 and 2½	34½	19½
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	45	33½	1¼	21½	6½
2½ to 4	48	36½	1½	27½	13½
4½ to 6	47	35½	2	20½	16½
7 to 8	43	29½	2½ to 4	31½	19½
9 to 12	38	24½	4½ to 6	30½	18½
			7 to 8	22½	10½
			9 to 12	17½	5½

STEEL—From warehouses the places named the following discounts hold for steel pipe:

	Black New York	Black Chicago	Black St. Louis
¾ to 3 in. butt welded	47%	54%	45%
2½ to 6 in. lap welded	42%	50%	41½%

	Galvanized New York	Galvanized Chicago	Galvanized St. Louis
¾ to 3 in. butt welded	31%	40½%	30½%
2½ to 6 in. lap welded	27%	37½%	27½%

Malleable fittings, Class B and C, from New York stock sell at + 23% list prices. Cast iron, standard sizes, net.

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York Current	New York One Month Ago	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
4 in.	$79 30	$75 30	$55 70	$78 80	$78.00	$93 55	$74.30
6 in. and over	76.30	72.30	52.70	75 80	75 00	90.56	71.30

Gas pipe and 16-ft. lengths are $2 per ton extra.

CLAY DRAIN TILE—The following prices are per 1000 lin.ft.:

Size, In.	New York Current	New York One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$35 00	$35 00	**$60 00**	$60 00	..	$33.44
4	51 00	51 00	**60.00**	80 00	$45 00	50.16
5	65 00	65.00	....	100.00	65.00	62.70
6	90 00	90 00	**110 00**	120.00	90.00	83.60
8	130 00	130 00	**195.00**	180 00	150.00	133.76

SEWER PIPE—The following prices are in cents per foot for carload lots:

Size, In.	New York Current Delivered	New York Year Ago Not Del.	St. Louis	Chicago	San Francisco	Dallas
3	$0 19	$0.081	....	$0.15	...	$0.175
4	19	.081	...	15	$0 16	.175
5	29	1215		225	20	.245
6	29	.1215	**$0 1855**	225	24	245
8	45	.189	**265**	35	34	.35
10	67	283	**371**	525	47	
12	86	365	**477**	625	64	63
15	1.30	480	**715**	90	1 00	
18	1 88	675	**935**	1 25	1 35	
20	2 25	.81	**1 15**	1 50	1 80	
22	3 00	1 08		2 00	...	
24	8 38	1 215	**1 65**	2 25	2.24	3 10
27	..	2 015	**2 45**	3.50		
30	....	2.232	**2 95**	4 00		
33	..	2 79	**3 70**	4 75		
36		3 18	**4 00**	5.50		5 60

	3	5	8	12	24	36
Boston	**$0 21**	**$0 315**	**$0 49**	**$0 94½**	**$3 15**	**$8 20**
Minneapolis	125	167	.295	495	1 87	4 37
Denver		..	29	50	1 75	
Seattle			**3850**	68		2.375
Kansas City	No prices obtainable					
Los Angeles	0975*	1525*	27	48	60*	
New Orleans	**35** per cent. off				List	
Cincinnati	53 per cent off					38%
Atlanta			34	55	2 00	
Montreal			58 per cent off			
Detroit			52 per cent. off		46%	42%
Baltimore	**192**	**283**	**448**	**964**	**2.88**	**6.56**

* 4-in., 6-in., 30-in. respectively

ROAD AND PAVING MATERIALS

ROAD OILS—Following are prices per gallon in tank cars 8000 gal. minimum f.o.b. place named:

	Current	One Month Ago
New York, 45-65% asphalt (at terminal)	$0.13*	$0.13
New York, liquid asphalt (" ")	.13*	.13
New York, binder (" ")	.13½*	13,
New York, flux (" ")	.14*	14
St. Louis, 40% asphalt	.10*	10
Chicago, 40-50% asphalt	.08	08
Chicago, 60-70% asphalt	.08½	085
Dallas, 40-50% asphalt	.07	07
Dallas, 60-70% asphalt	.08	08
Dallas, 75-90% asphalt	.10	.10
San Francisco, asphalt base, 42 gal. per bbl.	2.25	2.25

*Note—Quotations nominal in New York. Scarcity in road oils.

ASPHALTUM—Price per ton in packages (350-lb. bbls. or 425-lb. drums), and in bulk in carload lots:

	Package	Bulk
New York	**$50.00**	**$45 00**
Chicago	30.90	23.40
San Francisco	17.00	13 75
Dallas	35.00	31.00
Seattle	25.00	
Denver	40.00	36 00
Minneapolis	24.00	21 00
Kansas City	**40 00**	**32 00**
Atlanta	25.00	20.80
New Orleans	**30.00**	**35.00**
St. Louis	29 40	23.90
Baltimore	43.00	.
Los Angeles	21.15	....
Montreal	.	**37.00**
Detroit	49 00	**42.25**

PAVING STONE—

New York	5-in. granite	No quotations	
Chicago	About 4x8x4 dressed	**$3.25**	sq.yd.
	About 4x8x4 common	**2.90**	sq.yd.
San Francisco	Basalt block 4x7x8	65.00	per M
Kansas City	Granite	**3.65**	sq.yd
Boston	**5-in. granite**	110.00	per M
St. Paul	Sandstone	2.47	sq.yd.
Atlanta	Granite	2 00	sq.yd.
Detroit	Granite, 26½ blocks per sq. yd.	2.85	sq.yd
Baltimore	Common	**2.40**	sq.yd
Montreal	Granite	5.90	sq.yd
New Orleans	Granite	3.90	sq.yd

FLAGGING—

New York	Bronx	$0 24	sq.ft
	Manhattan	25	sq.ft
	Queens, 5 ft.	26	sq.ft
	6x20-in. cross-walk	.88	lin.ft
Chicago	18 in. wide	.70	lin.ft

WOOD BLOCK PAVING—	Size of Block	Treatment	Per Sq.Yd.
New York	3½	16	$3.75
New York	4	16	4.10
Boston	3	16	3.00
Chicago	4	16	4.50
Chicago	3½	16	3.50
Chicago	City specifications		5.00
St. Louis	3½	16	2.90
St. Louis	4	16	3.32
Seattle	4	16	Off market
Kansas City	4	16	3.00
Minneapolis	3½	16	**3 10**
Atlanta	3½	16	2.30
New Orleans	4	16	**3 60**
Dallas	4	18	3.57
Baltimore	3½	16	3.60
Montreal	4	16	4.60
Detroit	3½	16	3 40

CONSTRUCTION MATERIALS

SAND AND GRAVEL—Price for cargo or carload lots is as follows, per cu.yd.:

	Gravel 1½ In. Current	Gravel 1½ In. One Yr. Ago	Gravel ¾ In. Current	Gravel ¾ In. One Yr. Ago	Sand Current	Sand One Yr. Ago
New York	**$3 00**	$2.00	**$3 00**	$2.00	$1.50	$1.25
Denver	1.80	1.60	1 80	1 60	1 40	1.25
Chicago	2.15	1.65	2.15	1 85	2 15	1.35
Kansas City	3.25	2.50	3.75	3.00	1 25†	1.00
St. Louis	1 78	1.76	1.82	1.82	1.68*	1.68
Seattle, per ton	1.25	1.25	1.25	1 25	1.25	1.25
Dallas	2.50	2.25	2.50	2 25	2.00	1.35
Minneapolis	1.50	1.25	1.35	1 35	75	.60
Cincinnati	....	1.35‡	1 55	...	1.50	1 35‡
San Francisco	1.50	1.15	1.50	1 15	1 50	1 15
Boston	**3.00**	1.65‡	**3.00**	1 65‡	**3 00**	1 70
New Orleans	3.00	2.75		2 75	1.40	1.50
Los Angeles	1.25	1.02	1.25	1 02	1.15	.70
Atlanta, per ton	2.25	2.30	2.25	2 30	1 15	1 00
Detroit	2.50	1 90	2.00	1 90	1.85	1.80
Baltimore	1.40‡	...	1.60‡	1 60	.80	...
Montreal, per ton	**1 25**	1 20	..	...	1.40	1 40

* Fine white sand, Pacific and Ottawa, per ton $6.
† Kaw River sand is $1 75 per yd ‡ per ton.

CRUSHED STONE—Price for cargo or carload lots is as follows, per cu.yd.:

	1½ In.		¾ In.	
	Current	One Year Ago	Current	One Year Ago
New York	**$1.90@2.00**	**$1.65@1.75**	**$2.15**	**$1.75@1.85**
Chicago	2.15	1.60	2.15	1.70
St. Louis	1.90	1.35	1.90	1.35
Dallas	3.50	2.25	3.50	2.25
San Francisco	1.50	1.15	1.50	1.15
Boston	3.00*(del)	3.00	3.00 (del)	3.00
Minneapolis	1.50†	1.15	1.60	1.25
Denver	3.75	...	3.75	1.60
Kansas City	2.35	1.90	*2.35*	2.00
Seattle (Del.)	3.50	1.50	3.50	1.50
Cincinnati		...	1.65	
Atlanta	3.10*	2.35	.	2.60
Los Angeles	1.60*	1.12	1.70*	1.12
Detroit	1.75	1.20	1.75	1.20
Baltimore	**1.60***		**2.00***	.
Montreal	*1.75**	1.75	2.00*	2.00

* Per ton. † Limestone; traprock, $1.60 and $1.80 per ton for 1½ and ¾-in.

CRUSHED SLAG—Price of crushed slag per net ton in carload lots:

	1½-In.	¾-In.	Roofing	Sand
Lebanon or Bethlebem, Pa	$1.00	$1.00	$2.50	$0.90
Easton, Pa	1.20	1.20	3.00	1.10
Buffalo, N. Y.	1.25	1.00	2.00	1.00
East Canaan, Conn.	1.25	1.35	3.50	1.10
Birmingham, Ala.	1.25	1.25	2.05	1.00
Toledo, Ohio	1.50	1.50	...	....

LIME—Warehouse prices

	Hydrated per Ton		Lump per 200-Lb. Barrel	
	Finished	Common	Finished	Common
New York	$19.50	$18.50	$3.50*-at plant-	$3.30*
Kansas City	**27.20**	**26.20**	2.50	2.40
Chicago	.	...	2.40	1.75
St. Louis	25.00	21.00	....	2.25
Boston	**26.25**	**24.25**	*3.40*†	*3.25*†
Dallas	...	25.00	......	2.50†
Cincinnati	17.20	16.20	......	13.20‡
San Francisco	20.00	16.00	.....	2.25
Minneapolis	24.00	19.00	**1.80†**	**1.60†**
Detroit	27.20	.....	2.85†	1.80*
Seattle	30.00	.....	.....	*1.85*†
Los Angeles	2.75†	2.20†	2.75†	2.00†
Baltimore	**25.00**	**20.00**	....	**15.00‡**
Montreal	25.00	25.00	15.00‡	15.00‡
Atlanta	22.50	....	.....	.....
New Orleans	.....	2.25 (bbl.)	.....	*2.45*

* 300-lb. barrels. †Per 180-lb. barrel. ‡ Per ton.

NOTE—Refund of 10c. per barrel with 25c per ton off on hydrated

NATURAL CEMENT—Price to dealers for 500 bbl. or over, f. o. b., exclusive of bags:

	Current	One Year Ago
Minneapolis (Austin)	$1.50	$1.45
Kansas City (Ft. Scott)	1.60	1.40
New Orleans	3.36	2.52
Atlanta (Magnolia)	1.90	....
Cincinnati (Louisville)	2.85	1.50
Boston (Rosedale)	2.35	....

PORTLAND CEMENT—Current prices are for barrels in carload lots, *without* bags, to contractors:

	Current Without Bags	One Month Ago Without Bags	One Year Ago Without Bags
New York (del.)	**$3.30***	$3.20	$2.30
Jersey City (del.)	2.47	2.47	2.27
Boston	2.60	2.62	2.42
Chicago	**2.15**	2.00	2.00
Pittsburgh	**2.20**	2.05	2.05
Cleveland	**2.42**	2.32	2.32
Detroit	*2.28*	2.35	2.08
Indianapolis	**2.42**	2.27	2.27
Toledo	**2.28**	2.12	2.12
Milwaukee	**2.20**	2.11	2.11
Duluth	**2.20**	2.10	2.10
Peoria	**2.32**	2.12	2.12
Cedar Rapids	**2.40**	2.18	2.18
Davenport	**2.33**	2.14	2.14
St. Louis	**3.05**	2.80	2.20
San Francisco	2.63	2.63	2.40
New Orleans	2.96	2.96	2.44
Minneapolis	2.22	2.22	2.20
Denver	2.82	2.82	2.67
Kansas City	2.56	2.56	2.26
Seattle	3.03	3.03	2.53
Dallas	2.15	2.15	2.03
Atlanta	2.70	2.70	2.60
Cincinnati	2.90	2.90	..
Los Angeles	3.10	3.10	2.78
Baltimore (del)	3.85†	3.85	....
Montreal (including bags)	3.48	3.48†	2.50
Detroit	..	.	2.20

NOTE—Bag charge is generally 25c. each. *Delivered Manhattan, The Bronx or Brooklyn; bags **25**c. each. †Including bags.

TRIANGLE MESH—Price per 100 sq.ft. in carload lots.

PLAIN 4-INCH by 4-INCH MESH

Style Number	Sectional Area Square Inches per Ft. Width	Pittsburgh	New York*	Chicago	St. Louis	Dallas	San-Francisco
032	0.032	$0.92	$1.16	$0.98	$0.99	$1.13	$1.32
049	0.049	1.18	1.48	1.26	1.26	1.43	1.67
068	0.068	1.44	1.86	1.53	1.56	1.79	2.06
093	0.093	1.85	2.39	1.97	2.00	2.41	2.65
126	0.126	2.28	3.02	2.43	2.47	2.92	3.28
153	0.153	2.72	3.59	2.90	2.95	3.48	3.93
180	0.180	3.12	4.13	3.33	3.39	3.99	....
245	0.245	4.12	5.44	4.40	4.47	5.27	.....
287	0.287	4.76	6.29	5.08	5.16	6.10	6.86
336	0.336	5.52	7.30	5.89	5.99	7.06	....
395	0.395	6.40	8.45	6.83	6.94	8.19	.....

PAVING

Style Number	Sectional Area Square Inches per Ft. Width	Pittsburgh	New York*	Chicago	St. Louis	Dallas	San-Francisco
036P	0.036	$0.71	$0.92	$0.76	$1.77	$0.80	.....
053P	0.053	1.00	1.28	1.06	1.08	1.12	.....
072P	0.072	1.26	1.66	1.34	1.37	1.46	.....
097P	0.097	1.62	2.12	1.73	1.76	1.88	.....
049R	0.049	1.00	1.28	1.06	1.08	1.12	.....
067R	0.067	1.26	1.65	1.34	1.37	1.46	.....
089R	0.089	1.62	3.11	1.73	1.76	1.88	.....

Made in 16-, 20-, 24-, 28-, 32-, 36-, 40-, 44-, 48-, 52- and 56-in. width in rolls 150-, 200- and 300-ft. lengths. Galvanized is about 10% higher.

‡**Note—Practically no triangle mesh in New York market**

EXPANDED METAL LATH—Prices in carload lots per 100 yd. for painted are as follows:

		New York‡ Current					
Gage	Weight	Carloads	Less Carloads	Chicago	St. Louis	San Francisco	Dallas
27	233	$32.10	$32.20*	$33.60†	$35.00	$36.00	$32.75
26	250	33.45	33.65*	35.20†	36.00	.	34.50
25	300	34.90	35.00*	36.90†	......	39.00	36.75
24	340	36.50	36.65*	40.00†	39.00	44.00	39.25
22	450	39.60	39.80*	45.10†	......	......	43.30

* Delivered on job.

†Galvanized is $8 per 100 yd., additional.

*Note —**Practically no metal lath in New York market.**

BARS, CONCRETE REINFORCING—Following quotations are per 100 lb.:

ROLLED FROM BILLETS

		Warehouse, Uncut				
In.	Mill Pittsburgh	New York Current	Chicago	Dallas		San Francisco
¾ and larger	$2.35@$*3.75*	$3.52@$5.00	$3.37@$3.90	$3.87	$4.75	$5.30
⅝	2.40@ *3.75*	3.57@ 5.00	3.42@ 4.00	3.92	4.80	5.35
½	2.45@ *3.75*	3.62@ 5.00	3.47@ 4.05	3.97	4.95	5.40
⅜	2.60@ *3.75*	3.77@ 5.00	3.62@ 4.20	4.12	5.00	5.55
¼	2.85@ *3.75*	4.02@ 5.00	4.07@ 4.60	4.57	5.05	5.80

Twisted bars cut to length take extra of 29½c. per 100 lb.

ROLLED FROM RAILS

	Chicago	St. Louis	Dallas		Chicago	St. Louis	Dallas
¾ in. and larger	$3.75	$3.50	$4.25	⅜	$4.00	$3.75	..
⅝	3.80	3.55	4.30	¼	4.25		
½	2.85	3.60	.....				

BRICK—To contractors price per 1000 in cargo or carload lots is as follows:

	Common			Paving	
	Current	One Month Ago	One Year Ago	Brick	Block
New York	$25.00	$25.00	$15.00	$48.50*	$52.50*
New Orleans	**24.50**	23.00	16.25	**25.25**	.....
Chicago	14.00	14.08	12.00	.35@.50	None
St. Louis, salmon	16.00†	16.00	10.00	**35.00**	.....
Denver	17.00	17.00	12.00	......	.....
Dallas	24.00	24.00	16.07	34.00	45.00
San Francisco	15.00	15.00	12.50	......	.....
Los Angeles	13.50	13.50	12.50	....	
Boston	**32.00**	30.00	18.00	51.00*	55.00*
Minneapolis	**21.00**	20.00	10.25	.....	40.00
Kansas City	22.00	22.00	15.00	44.50	....
Seattle	15.00	15.00	15.00	.....	44.00
Cincinnati	24.00	24.00	16.50–14.00	36.00	.....
Montreal (del.)	*16.00*	17.50	14.50	55.00	.....
Detroit	23.00	23.00	13.50	40.00	....
Baltimore (del.)	**20.00–25.00**	18.00–22.00	.....	**.30@.32**	45.00

*For paving blocks 3½x8½x3 and 3½x8½x4 respectively. †Hard brick **$20.50** in St. Louis.

HOLLOW TILE—Price per block in carload lots for hollow building tile:

	New York						
	Current on Trucks	One Year Ago	Chicago	St. Louis	San Francisco	Dallas	Factory Perth Amboy, N. J.
4x12x12		$0.11475	**$0.1516**	None	$0.1125	$0.148	
6x12x12		.153	**.2274**	"	.15	.	
8x12x12	....	.204	**.2728**	"	....		
10x12x12	....	....	**.3411**	"	....		
12x12x12	....	....	**.4093**	"	......	.	

Note—Principal manufacturer is two months behind in deliveries

	4x12x12	8x12x12	12x12x12
Boston	**$0.25**	**$0.45**	**$0.70**
Minneapoli	.087	.158	.248
Cincinnati	.125	2186	.3286
Kansas City		No prices obtainable	
Denver	.12	.185	.....
Seattle	.09	.175	.30
Atlanta	.115	.19	.28
Los Angeles	.10	.175	....
New Orleans	.198	.264	.39
Detroit	.13	.26	.37
Montreal	**.22**	**.30**	**36**
Baltimore	27	48	63

STRUCTURAL MATERIAL—Following are base prices f.o.b. mill, Pittsburgh, together with quotations per 100 lb from warehouses at places named:

	Mill Pittsburgh	New York Current	New York 1 Yr. Ago	St Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in.	$2.45@$4	$4.47	$3.47	$4.04	$3.97	$5.40	$5.50
Channels, 3 to 15 in.	2.45@4	4.47	3.47	4.04	3.97	5.40	5.50
Angles, 3 to 6 in., ¼ in. thick	2.45@4	4.47	3.47	4.04	3.97	5.40	5.50
Tees, 3 in. and larger	2.45@4	4.52	3.52	4.09	4.02	5.40	5.50
Plates	2.65@4	4.67	3.67	4.24	4.17	6.30	5.75

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill Pittsburgh	Warehouse New York Current	Warehouse New York One Yr. Ago	Chicago	St. Louis	San Francisco	Dallas
¾ in. and larger	$4.50	$6.00	$5.05	$5.37	$5.44	$6.65	$7.50

CONE HEAD BOILER

	Mill Pittsburgh	Warehouse New York Current	Warehouse New York One Yr. Ago	Chicago	St. Louis	San Francisco	Dallas
¾ in. and larger	4.60	**7.10**	5.15	5.47	5.54	6.75	7.50
⅝ and 11/16	4.75	**7.25**	5.30	6.62	5.54	7.00	7.50
½ and 9/16	5.00	**7.50**	5.55	5.97	5.54	7.25	7.75

Lengths shorter than 1 in take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

NAILS—The following quotations are per keg from warehouse

	Mill Pittsburgh	New York	Chicago	San Francisco	Dallas	Montreal
Wire	$3.25@$4	$5.50	$4.15	$5.50	$6.90	$4.95
Cut	....	9.00	6.45	6.90	6.40	5.00

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows at maufacturing points:

	1-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.
No. 1 grade	$2.40	$2.90	$3.45
No. 2 grade	2.15	2.00	3.10

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft costs $3.50 per roll in carload lots and $3.75 for smaller quantities

Shingles, red and green slate finish, cost $7.75 per square in carloads; $8.00 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

Tar felt (14 lb. per square of 100 sq.ft.) per roll	$3.50
Tar pitch (in 400-lb. bbl.) per 100 lb	1.85
Asphalt pitch (in barrels) per ton	46.50
Asphalt felt (light) per ton	118.00
Asphalt felt (heavy) per ton	119.50

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Yr. Ago
No. 10	$3.55@$6.00	$7.09	$7.02	**$8.25**	$6.62@$8.00	$4.57
No. 12	3.60@ 6.05	7.09	7.07	**8.30**	6.67@ 8.05	4.62
No. 14	3.65@ 6.10	7.09	7.12	**8.35**	6.22@ 8.10	4.67
No. 16	3.75@ 6.20	7.09	7.17	**8.45**	6.82@ 8.20	4.77
Black						
*Nos. 18 and 20	4.15@ 6.30	8.10	7.80	**9.35**	7.80@ 8.80	5.17
*Nos. 22 and 24	4.20@ 6.35	8.10	7.85	**9.40**	7.85@ 8.85	5.22
*No. 26	4.25@ 6.40	8.10	7.90	**9.45**	7.90@ 8.90	5.27
*No. 28	4.35@ 6.50	8.10	8.00	**9.55**	8.00@ 9.00	5.37
Galvanized						
No. 10	5.80@ 7.50	9.60	8.50	.	8.25@10.00	5.50
No. 12	4.80@ 7.60	9.60	8.60	**10.10**	8.35@10.10	5.55
No. 14	4.80@ 7.60	9.60	8.60	**10.10**	8.35@10.10	5.60
Nos. 18 and 20	5.10@ 7.90	9.60	8.90	**10.40**	8.65@10.40	5.90
Nos. 22 and 24	5.25@ 8.05	9.60	9.05	**10.55**	8.80@10.55	6.05
*No. 26	5.40@ 8.20	9.60	9.20	**10.70**	8.95@10.70	6.20
*No. 28	5.70@ 8.50	9.60	9.50	**11.00**	9.25@11.00	6.50

*For painted corrugated sheets add 30c per 1000 lb for 5 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 15c., all gages.

LINSEED OIL—These prices are per gallon:

	New York Current	New York One Year Ago	Chicago Current	Chicago One Year Ago
Raw in barrel (5 bbl.)	*$1.73*	$1.76	$2.05	$1.78
5-gal. cans	*1.75**	1.89	2.30	1.98

*To this price must be added the cost of the cans (returnable), $2.25 for case of six

WHITE AND RED LEAD—Base price per pound:

	Red Current Dry	Red Current In Oil	Red 1 Year Ago Dry	Red 1 Year Ago In Oil	White Current Dry and In Oil	White 1 Yr. Ago Dry and In Oil
100-lb. keg	15.50	17.00	13.00	14.50	15.50	13.00
25 and 50-lb. kegs	15.75	17.25	13.25	14.75	15.75	13.25
12½-lb. keg	16.00	17.50	13.50	15.00	16.00	13.50
5-lb. cans	18.50	20.00	15.00	16.50	18.50	15.00
1-lb. cans	20.50	22.00	16.00	17.50	20.50	16.00

500 lb. lots less 10% discount; 2000 lb. lots less 10-2½% discount.

LUMBER

San Francisco—Prices of rough Douglas fir No. 1 common, in more than carload lots:

Lumber Prices in Yards at San Francisco

	6-8-12 and 14 Ft.	10-16-18 and 20 Ft.	22 and 24	25 to 32 Ft.
3x3 and 4	*$38.50*	*$39.00*	*$40.00*	*$42.00*
3x6 and 8	*39.50*	*40.00*	*41.00*	*43.00*
4x4-6 and 8	*40.00*	*41.00*	*42.00*	*44.00*
3x10 and 12	*40.00*	*41.00*	*42.00*	*44.00*
3x14	*40.50*	*41.50*	*42.50*	*44.50*
4x10 and 12	*40.00*	*41.00*	*42.00*	*44.00*
4x14	*41.00*	*42.00*	*43.00*	*45.00*

	24 Ft. and Under	25 to 32 Ft.	33 to 40 Ft.
6x10	*$39.50*	*$41.50*	*$42.50*
6x14	*41.00*	*43.00*	*43.50*
8x10	*39.50*	*41.50*	*42.50*
8x14	*41.00*	*43.00*	*43.50*

New York, Chicago and St. Louis

	Southern Pine New York* 20 Ft. and Under	Southern Pine New York* 22-24 Ft.	Southern Pine Chicago 20 Ft and Under	Southern Pine Chicago 22-24 Ft.	Yellow Pine St. Louis 20 Ft. and Under	Yellow Pine St. Louis 22-24 Ft.
3x 4 to 8x 8	$60.00	$61.00	*$68.00*	*$69.00*	$52.50	$53.50
3x10 to 10x10	65.00	66.00	*70.00*	*71.00*	57.50	58.50
3x12 to 12x12	70.00	71.00	*73.00*	*74.00*	60.00	61.00
3x14 to 14x14	75.00	76.00	*78.00*	*79.00*	65.00	66.00
3x16 to 16x16	**85.00**	**86.00**	*83.00*	*84.00*	67.50	68.50
3x18 to 18x18	**90.00**	**91.00**	*88.00*	*89.00*	72.50	73.50
4x20 to 20x20	**95.00**	**96.00**	.....	.....	......	......

* Prices from Lumbermen's Bureau

Over 24 ft.—Add $1 for each additional 2 ft. in length up to 40 ft. for sizes 12 x 12 and under; for sizes over 12 x 12 add $2. For merchantable add $2 to sizes 10 x 10 and under. For prime add $2 to the price of merchantable for all sizes.

Other Cities

	8 x 8-In. x 20-Ft. and Under P.	8 x 8-In. x 20-Ft. and Under Fir	8 x 8-In. x 20-Ft. and Under Hemlock	8 x 8-In. x 20-Ft. and Under Spruce	12 x 12-In. 20 Ft. and Under P.	12 x 12-In. 20 Ft. and Under Fir
Boston	**$100.00**	**$85.00**	..	**$80.00**	$110.00	**$105.00**
Kansas City	*54.00*	51.25	$51.25	51.25	*65.00*	51.25
Seattle		34.00	.....	....	.....	35.00
New Orleans	53.00	.....	......	......	59.00	..
St. Paul	62.00	61.00	61.00	47.50	43.00	58.00
Atlanta	62.50	64.50	66.00	76.00	79.50	82.00
Baltimore	75.00	......	......	......	87.50	......
Cincinnati	*48.00*	55.00	55.00	55.00	55.00	.....
Montreal	*80.00*	80.00	65.00	60.00	73.00*	73.00
Los Angeles †	....	*57.00*	.	....	.....	*59.00*
Denver	.....	65.00	65.00	65.00	.....	66.00

	1-In. Rough, 10 In. x 16 Ft. and Under P.	1-In. Rough, 10 In. x 16 Ft. and Under Fir	1-In. Rough, 10 In. x 16 Ft. and Under Hemlock	2-In. T. and Gr. 10 In. x 16 Ft. P.	2-In. T. and Gr. 10 In. x 16 Ft. Fir
Boston	**$115.00**	**$85.00**	$65.00	**$100.00**	**$85.00**
Kansas City	*113.50*	106.50	106.50	*124.00*	*112.75*
Seattle	....	37.50	.....	.....	38.50
New Orleans	61.00	.....	.....	**67.50**	.....
St. Paul	54.00	54.00	53.00	64.50	58.50
Atlanta	85.00	90.00	......	77.50	87.50
Baltimore (box)	65@67.50	....	.....	60–65.00	......
Cincinnati	55.00	*55.00*	*50.00*	*48.00*	*50.00*
Montreal	75.00	75.00	**66.00**	...	...
Los Angeles	.....	*58.00*	.	.....	....
Detroit			(no quotations)		
Denver	.....	62.00	67.00	140.00	127.50

* Montreal—Up to 32 ft.; over which, $3.00 per M. increase up to 30 ft.

† Base price, 2 x 3's and 2 x 4's, 8 to 14 ft., is $54.00

Detroit—Dimension stuff ranges from $60 to $68. See "ups and downs in the market."

Dallas—Yellow pine. Price per M:

1 in. rough, 10 in. and under, 16 ft. and under	$62.50
2 in., t and g., dressed and matched, 10 in. x 16 ft. and under	62.50
8 x 8 and under, 20 ft. and under	72.50
12 x 12, 20 ft. and under	75.00

FREIGHT RATES

On finished steel products in the Pittsburgh district, including plates, structural shapes, merchant steel, bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc., the following freight rates are effective in cents per 100 lb.:

Boston	$0.30	New Orleans	$0.38½
Buffalo	.17	New York	.27
Chicago	.27	Pacific Coast (all rail)	1.25*
Cincinnati	.23	Philadelphia	.24½
Cleveland	.17	St. Louis	.24
Denver	.99	St. Paul	.49½
Kansas City	.59	Detroit	.33
		Baltimore	.33

Note—Add 3% transportation tax. * Minimum carload, 50,000 lb.

CONTRACTORS' SUPPLIES

STEEL SHEET PILING—The following price is base per 100 lb. f. o. b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$2.55@$3 65	$2.55@3.65	$2.25

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Hercules red strand, all constructions	20%
Patent flattened strand, special and cast steel	20%
Patent flattened strand, iron rope	5%
Plow steel round strand rope	30%
Special steel round strand rope	30%
Cast steel round strand rope	22½%
Iron strand and iron tiller	5%
Galvanized iron rigging and guy rope	+12%.

San Francisco: Galvanized Iron Rigging and Guy Ropes, +17½%; Bright low, 25% off.

Chicago, +12½ on galvanized, 30 off on bright.

MANILA ROPE—For rope smaller than ¾-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅝-in., 8 ft., ¾-in., 6; ⅞-in., 4½; 1-in., 3½; 1⅛-in., 2 ft. 10 in.; 1¼-in., 2 ft. 4 in. Following is price per pound for ¾-in. and larger, in 1200-ft. coils:

Boston	$0.30½	Kansas City	$0 30½
New York	.29	New Orleans	29
Chicago	.27½	Los Angeles	.31
St. Paul	.27½	Seattle	.28
San Francisco	.27	St. Louis	.26
Atlanta	.29½	Montreal	.35½
Denver	.27½	Detroit	.26
Cincinnati	.27	Baltimore	27
Birmingham	.32	Dallas	.34½

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb keg for black powder.

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	80%	Black Powder
New York	......	$0.34¼	$0.34¼	....	$2.30
Boston	$.24	.235	.265	$.295	2 40
Kansas City	.2475	.27	.30	.3425	2 45
Seattle	.18	.21¾	.24¾	.29	2 45
Chicago	.2175	.2525	.2975	.34	2.45
St. Paul	.185	.2225	.2525	.2950	2.25
St. Louis	.2175	.26	.285	.295	1.90
Denver	.205	.2475	.2725	.315	2 50
Dallas	.265*	.275	.3025	....	2.60
Los Angeles	.22	.27	.31	..	2 95
Atlanta	.22	245	.265	.....	2 55
Baltimore	.225	.2575	.3075	.325	2 40
Cincinnati	.2275	.2525	.2725	.....	2 30
Montreal	30	.32	.37	.38	4 10
New Orleans	.2425	.2825	.3125	.38	2 60

* 30 Per Cent.

POLES—For plain pine poles, delivered New York, the price is as follows:

10-in. butts, 5-in. tops, length 20-30 ft	$9.00
12-in. butts, 6-in. tops, length 30-40 ft.	11.50
12-in. butts, 6-in. tops, length 41-50 ft.	12 50
14-in. butts, 6-in. tops, length 51-60 ft.	21 00
14-in. butts, 6-in. tops, length 61-71 ft.	23.50

	Dallas
6-in. x 20-ft.	$4 60
6-in. x 30-ft.	7 10
8-in. x 30-ft.	8.45
8-in. x 35-ft.	10.38

OLD MATERIAL—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and St Louis the quotations are per net ton and cover delivery at the buyer's works, including freight transfer charges.

	New York	Chicago	St. Louis
No. 1 railroad wrought	$32.00	$26.00	$26.00
Stove plate	27.50	29.50	31.00
No. 1 machinery cast	41.00	37.50	...
Machine shop turnings	15 50	10.00	14.00
Cast borings	17.00	12.00	14.50
Railroad malleable cast	30.00	26.25	26.50
Re-rolling rails	30 00	.	....
Relaying rails	54 00	55 00	50@55

SHIP SPIKES—Current prices per 100 lb.

	San Francisco		Seattle
In.	Galv.	Black	Black
¼	$9 20	$8.50	$8 55
⅜	8.75	6.75	8 25
½	8.60	6.60	8.30

Pittsburgh base, $4.50 per 100 lb.

LABOR RATES AND CONDITIONS THROUGHOUT THE COUNTRY

S means scarce; E, enough; P, plentiful

Cities	Bricklayers	Carpenters	Hoisting Engineers	Hod Carriers	Pile Drivers	Structural Iron Workers	Common Labor
Atlanta	$0.90S	$0.60–75P	$0 50–65P	$ 40–.45P	$0.60–.65	$0.75	$0 35S
Baltimore	1 00S	.80–90 S	.87½S	.46–.54S	.74P	1 00E	.35– 45S
Boston	1 00E	1 00E	1 00E	.85E	1.25E	1.00E	67½S
Cincinnati	1.25S	75E	75E	.65E	.	87½E	60S
Cleveland	1 00S	.90S	1.00E	.57½E	80E	1 00E	57½E
Dallas	1.25S	1.25S	1.00E	.60E	1.00E	1 25S	44 60S
Denver	1 12½E	1 12½E	1.00E	.68¾–.75	.	1 00E	50E
Detroit	1.25S	85@90	.90–1 00P	.65–75E	.90P	85– 90E	65– 75S
Kansas City	1 12½	1.00	1 00	.90	1.00	1 10	75
Los Angeles	1 25P	.87½P	.87½P	1.00P	.87½P	87½P	.56¼ - 62½E
Minneapolis	1.25	1.00P	1.00	.65	.80	.85	.58 70
Montreal	1.00	80–.85	.65S	.55S	55 60	50–.60	45 55P
New Orleans	1.00E	.75	.87½E	.35–.40E	1 00	1.00E	35 50P
New York	1 25	1 12½	1.25	.87½	1.12½	1 12½	75 80
Pittsburgh	1.12½S	90S	90S	80S	. .	1.00S	50S
St. Louis	1 25	1.00	1.12½–1.25	.70	1.00–1.25	1.25	52–.75
San Francisco	1 25E	1.06¼E	1.12½E	.93¾E	1.06¼E	1.12½E	.45–.50E
Seattle	1 12	.93¾	.94	.75–.80	.90	1 00	.75S

Remarks

Atlanta—Great activity in construction. Common labor scarce.

Baltimore—Generally scarce, except bridge, structural and ornamental iron-workers.

Boston—Labor scarce. Construction work slowing down.

Cincinnati—Common labor scarce.

Dallas—Common labor very scarce. Bricklayers, iron-workers and carpenters scarce.

Denver—General increase. Double pay for overtime.

Detroit—Common labor scarce. Conditions very unsettled. Construction materials scarce. See "Ups and Downs of the Market."

Kansas City—Schedule now in effect.

Los Angeles—Resident construction has declined sharply. Rates shown are union; non-union a little less; but union scale prevails generally.

Minneapolis—Rates given by Minneapolis Builders' Exchange.

Montreal—Carpenter strike expected over 8-hr. day.

New Orleans—Carpenters are asking $1 50. Hoisting engineers are arranging new demands.

New York—Agreement of Nov. 20, 1919, was modified as shown, effective May 1, 1920. Excavators, 75c.; Concrete workers, 81¼c.

St. Louis—Bricklayers' helpers receive 80c.; Carpenters' helpers, 67½c.; as to hoisting engineers, the rates are $1.12½ for one drum, $1.25 for two drums, and $1.21½ for road roller. Pile drivers receive $1.00 on wood and concrete, $1.25 on steel. Unskilled labor is classified as follows: Common, 52c.; construction, 67½c.; pipe laying, 75c.; track, 53c.

San Francisco—All lines busy.

PROPOSALS

For proposals Advertised see the pages immediately following the "Construction News" Section.

WATERWORKS

Bids Close		See Eng. News-Record
June 7	Haledon, N. J.	May 20
June 7	Milverton, Ont.	June 3
June 8	Somerton, Ariz.	May 27
June 8	Gastonia, N. C.	May 27
June 9	Montville, Conn.	May 27
June 11	Tulare, Cal.	June 3
June 16	Phoenix, Ariz.	June 3
June 18	Lennoxville, Que.	June 3
June 18	Akron, O. Adv. June 3.	June 3
June 21	Elyria, O. Adv. June 3.	June 3
June 29	Buffalo, N. Y. Adv. June 3.	June 3

SEWERS

June 7	Ames, Ia.	May 13
June 7	Washington, D. C.	May 20
June 7	Creston, Ia.	May 27
June 7	Buffalo, N. Y.	June 3
June 8	Long Island City, N. Y.	June 3
June 9	Ft. Madison, Ia.	May 13
June 10	Goodland, Kan.	June 3
June 14	Hammond, Ind.	May 13
June 15	Cochran, Ga.	May 27
June 15	Toledo, O.	May 20
June 15	St. Lambert, Que.	May 27
June 28	Waterloo, Wis.	June 3
July 1	Milwaukee, Wis.	June 3
July 19	Dallas, Ore.	May 27

BRIDGES

June 7	Columbus, O.	May 20
June 8	South Amboy, N. J. Adv. May 27 and June 3.	May 27
June 8	Atlanta, Ga.	May 27
June 9	Tipton, Ia. Adv. June 3.	June 3
June 10	Lingle, Wyo.	May 20
June 14	Detroit, Mich.	June 3
June 16	Illinois Adv. June 3.	June 3
June 16	Tavares, Fla.	June 3
June 21	Claxton, Ga.	May 27
June 21	Olivia, Minn. Adv. June 3	June 3
June 23	Belmar, N. J. Adv. May 27 and June 3.	May 27
June 28	Reno, Nev.	June 3

STREETS AND ROADS

June 5	Buffalo, N. Y.	June 3
June 7	Fayetteville, W. Va.	May 13
June 7	Red Bank, N. J.	May 20
June 7	New York Adv. May 20 to June 3.	May 20
June 7	Beloit, Que.	May 27
June 7	St. Cesaire, Que.	May 27
June 7	Harrisville, W. Va.	May 27
June 7	Allentown, Pa.	June 3
June 7	Louiseville, Que.	June 3
June 7	Longueuil, Que.	June 3
June 7	Indiana	June 3
June 7	Jefferson City, Mo.	June 3
June 7	Bemidji, Minn.	June 3
June 7	Laredo, Tex.	June 3
June 7	Winfield, W. Va.	June 3
June 8	Ft. Wayne, Ind.	May 20
June 8	Providence, Ky.	May 27
June 8	Duluth, Minn.	May 27
June 8	San Luis Obispo, Cal.	May 27
June 8	Indiana	June 3
June 8	Attleboro, Mass. Adv. May 27 and June 3.	June 3
June 8	East Aurora, N. Y.	June 3
June 8	St. George, S. I., N. Y.	June 3
June 8	San Antonio, Tex.	June 3
June 9	New Jersey	June 3
June 9	Freehold, N. J.	May 20
June 9	Wisconsin	June 3
June 9	Baltimore, Md.	June 3
June 10	West Palm Beach, Fla.	May 13
June 10	Gainesville, Ga.	May 20
June 10	Cumberland, Md. Adv. June 3.	June 3
June 10	Poughkeepsie, N. Y. Adv. June 3.	June 3
June 10	Osceola, Ia.	June 3
June 10	Brooklyn, N. Y.	June 3
June 11	Ontario	May 27
June 11	Columbus, O.	May 27
June 12	Quebec, Que.	May 27
June 14	California	May 27
June 14	Ontario	May 27
June 14	Middlebourne, W. Va.	May 27
June 14	Coffeyville, Kan.	May 27
June 14	Santa Rosa, Cal.	June 3
June 14	Gary, Ind. Adv. June 3.	June 3
June 14	El Paso, Tex.	June 3
June 15	Steubenville, O.	May 27
June 15	Cochrane, Ga. Adv. May 27 and June 3	May 27
June 15	Westmount, Que.	May 6
June 15	Pennsylvania Adv. May 20 to June 3.	May 20
June 15	Montgomery, Ala.	May 20
June 15	Arkansas	May 27
June 15	Springfield, Vt. Adv. June 3.	June 3
June 15	Orange, Tex.	June 3
June 16	Ontario	June 3
June 16	Pennsylvania Adv. May 20 to June 3.	May 20
June 17	Gilmer, Tex.	June 3
June 17	Olean, N. Y. Adv. June 3.	June 3
June 18	Ohio	May 27
June 18	Ohio	June 3
June 19	New Martinsville, W. Va.	May 27
June 23	Ft. Wayne, Ind.	June 3
June 24	Flemington, N. J.	June 3
June 24	Leonard, Tex.	June 3
June 28	Savannah, Ga. Adv. May 13 to June 3.	May 13
July 6	Dallas, Ore.	May 27

EXCAVATION AND DREDGING

June 8	Onawa, Ia.	June 3
June 16	Council Bluffs, Ia.	June 3
June 16	Waverly, Ia.	June 3
June 22	Ft. Dodge, Ia.	June 3
July 3	Madisonville, Ky. Adv. May 27 and June 3.	May 27

INDUSTRIAL WORKS

June 5	Cleveland, O.	June 3
June 5	Akron, O.	June 3
June 7	Akron, O.	May 13
June 10	Lorain, O.	June 3
June 15	Riviere Du Loup, Que.	May 27
June 30	Cambridge, Mass.	May 27
Sept. 1	Hutchinson, Kan.	Feb 19

BUILDINGS

June 5	Hawthorne, N. Y.	June 3
June 7	Columbus, O.	May 20
June 7	Linden (Columbus P. O.), O.	May 20
June 7	Loup City, Neb.	May 20
June 7	Alliance, O.	May 27
June 7	Portland, Ore.	June 3
June 7	Wakefield, Mass.	June 3
June 8	Newark, N. J.	May 20
June 8	South Hanson, Mass.	June 3
June 8	Boston, Mass.	June 3
June 8	Brooklyn, N. Y.	June 8
June 8	McKinney, Tex.	June 3
June 8	Peabody, Kan.	June 3
June 9	Pittsburgh, Pa.	May 13
June 9	Schenectady, N. Y.	May 27
June 9	Mason City, Ia.	June 3
June 9	Baltimore, Md.	June 3
June 10	Ames, Ia.	June 3
June 11	San Pedro, Cal.	June 3
June 14	Cleveland, O.	May 27
June 14	St. Marys, Ia.	June 3
June 15	Harrisburg, Pa. Adv. May 20 to June 3.	May 20
June 15	Oherokee, Okla.	June 3
June 15	Blanchard, Mich.	June 3
June 17	Frederick, Okla.	June 3
June 17	Salisbury, N. C.	June 3
June 18	New York, N. Y.	June 3
June 19	Canton, O.	June 3
June 20	Detroit, Mich.	June 3
June 21	Three Rivers, Que.	May 27
June 21	Manchester, N. H.	June 3
June 21	Media, Pa.	June 3
June 22	Miami, Okla.	June 3
June 24	Rawlins, Wyo.	June 3
June 25	Newport News, Va.	May 6
June 26	Liberty Center, Ia.	June 3
July 1	Chisholm, Minn.	May 13
July 15	Jonesboro, Ark.	May 27

FEDERAL GOVERNMENT WORK

Bids Close		See Eng. News-Record
June 7	Maintenance Dredging — Providence, R. I. Adv. May 20 to June 3.	May 20
June 8	Extending and Expanding Heating Mains—Philadelphia, Pa. Adv. June 3.	June 3
June 9	Cylinder Storage Building —Ft. Worth, Tex.	May 24
June 9	Fence and Gates — Spec. 4187—Philadelphia, Pa.	May 27
June 9	Dredging — Providence, R. I. Adv. May 27 and June 3.	May 27
June 10	Dredging—Boston, Mass. Adv. May 13 to June 3.	May 13
June 11	Remodeling Building — Boston, Mass.	May 27
June 14	Improving Water System— Ft. Yates, N. D.	May 13
June 14	Air Seacoast Defense Station—San Francisco, Cal.	May 13
June 14	Steel Lock Gates—Pittsburgh, Pa.	June 3
June 14	Mechanical Equipment — Norfolk, Va.	June 3
June 15	Electric Generators, Exciters and Accessories — Florence, Ala. Adv. May 6 to June 3	May 6
June 15	Drinking Water Fountains Phila., Pa. Adv. Jnue 3.	June 3
June 15	Road Work—Washington	June 3
June 16	Auxiliary Equipment and Piping — Spec. 4179, Puget Sound, Wash.	May 27
June 16	Radio Buildings and Utilities — Spec. 4191—Loiza, P. R.	June 3
June 16	Raising Roof, etc.—Spec. 4075—Wash., D. C.	June 3
June 21	Improving Quarry, etc. — Muscles Shoals, Ala. Adv. June 3.	June 3
June 21	Steel Hangars, Generator Houses, etc.—Wash., D. C.	June 3
June 21	Steel Hangars, Generator Houses, etc. — Portland, Me. Adv. May 27 and June 3.	June 3
June 21	Steel Hangars, Generator Houses, etc. — Boston, Mass. Adv. May 27 and June 3.	June 3
June 21	Steel Hangars, Generator Houses, etc.—New York, N. Y. Adv. May 27 and June 3.	June 3
June 21	Steel Hangars, Generator Houses, etc.—San Francisco, Cal. Adv. May 27 and June 3.	June 3
June 21	Steel Hangars, Generator Houses, etc.—Puget Sound, Wash. Adv. May 27 and June 3.	June 3
June 22	Labor—Wash., D. C.	June 3
June 22	Materials—Wash., D. C.	June 3
June 22	Materials—Norfolk, Va.	June 3
June 23	Laundry Equipment—Spec. 4191—San Diego, Cal.	May 27
June 25	Earthwork—St. Louis, Mo., Adv. May 27 and June 3.	
June 28	Labor — San Francisco, Cal.	May 27
June 28	Dredge, etc.—Wilmington, N. C. Adv. May 27 and June 3.	May 27
June 28	Material—San Francisco, Cal.	May 27
June 30	Tug Boat—Wash., D. C. Adv. June 3.	June 3
July 1	Dredging — New York, N. Y.	June 3
July 8	Charcoal Iron Boiler Tubes Charleston, S. C. Adv. May 27 and June 3.	June 3

MISCELLANEOUS

June 7	Road Materials—Albany, N. Y. Adv. May 20 to June 3.	May 20
June 7	Pipe—Haledon, N. J.	May 20
June 7	Street Sprinkling Wagon — Oakfield, Wis.	June 3
June 8	Street Lighting System— Green Bay, Wis.	June 3
June 9	Subway Subtrack — New York, N. Y. Adv. May 20 to June 3.	May 20
June 11	Bridge Piers—Schenectady, N. Y. Adv. May 20 to June 3.	May 20
June 15	Scenic Railway—Detroit, Mich.	May 13
June 15	Bituminous Concrete, Asphalt, Tar, Trap Rock, etc. —Trenton, N. J.	June 3
June 17	Road Oil—Fresno, Cal.	June 3
June 21	Dike—Sault Ste. Marie, Mich.	May 20
June 30	Pumps—Nashville, Tenn.	June 3

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. J., Sayreville—Borough plans to build waterworks system of 250,000 gal. daily capacity, to include steel tower tank to hold 200,000 gal., 12 mi. 6-10 in. mains, filters, engine house, etc. W. S. Coulter, 114 Liberty St., New York City, engr.

Tenn., Nashville—City plans to expend $2,300,000 to improve waterworks system, to include new pumping machinery, erection of filter plant, and improvement of reservoir and distribution system. Bonds for $500,000 voted for preliminary improvement. See item under "Bids Desired."

O., Akron—Until June 18, by E. A. Zeisloft, dir. Pub. Serv., handling and laying 4,700 ft. 48 c.i. pipe. G. G. Dixon, engr.; advertised in this issue.

O., Elyria—Until June 21 (change of date), building filtration plant substructure, appurtenant works and filtration plant equipment; advertised in this issue.

Mich., Pontiac—City rejected bids May 17, building water conduit. Noted April 8.

Waterworks (Continued)

Cal., Tulare—Until June 11, by City Clerk, furnishing and installing 1,000 water meters.

Que., Lachine—Town Engineer soon receives bids for extension to waterworks system. About $36,000. Noted April 1.

Que., Shawinigun Falls—Amos Waterworks Co. receives bids in June building waterworks system to comply with city supply and development of hydraulic power. About $175,000. Private plans.

Ont., Chatham—City plans to install 3 mechanical pressure filters in connection with waterworks system. About $30,000. F. Adams, city engr.

BIDS DESIRED

N. Y., Buffalo—Until June 29, by Comr. Pub. Wks., building 6,022 ft. storm water drain for Scajaquada Creek; advertised in this issue.

Ariz., Phoenix—Until June 16, by V. A. Thompson, city mgr., building infiltration intake system, involving 13,000 lin.ft. 60-in. rein.-con. pipe, also furnisbing labor and material for excavating and back-filling pipe line trench, constructing and placing foundations, trestles and other appurtenances, and installing 32 mi. 36-38 in. Redwood stave pipe line from here to point on Verde River.

Ont., Milverton—Until June 7, by S. Petrie, Main St., laying, jointing and backfilling, c.i. water mains, involving 24,350 lin.ft. 4-8 in. pipe. Municipality will furnish c.i. pipe and specials.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mich., Pontiac—City let contract building filtration plant, to Dreber Constr. Co., Smith and Kearsley Sts., Flint, $315,399; equipment for same, to Pittsburgh Filter & Eng. Co., Oil City, Pa., $85,879. Noted April 8.

★Kan., Erie—City let contract furnishing labor and material improving waterworks system, to Cannady-Price Constr. Co., Tulsa, Olka. About $60,000. Noted Feb. 26.

★Okla., Carnegie—City let contract building reservoir, power bouse and furnishing pumping equipment, to Ajax Constr. Co., Lawton, $18,739; well, to L. Sbively, Alfalfa, $2,000. Noted Jan. 29.

★Okla., Duncan—City let contract building extensions to waterworks system, involving 250,000 gal. reservoir, deep wells and pumping equipment, to N. S. Sherman Machine & Iron Wks., 18-32 East Main St., Oklahoma, $35,350. Noted May 6.

Wash., Seattle—Bd. Pub. Wks. received only bid May 14, building steel pipe line from Molasses Creek to Volunteer Park, part of Cedar River water system development, involving 16 mi. 78 in. steel pipe, from G. Smith & Co., Henry Bldg., specification 1, $3,601,025; spec. 2, $3,151,257; spec. 3, $3,311,564. Noted April 15.

Cal., Whittier—City received bids laying pipe, fittings and fire hydrants (city to furnish pipe), from T. Haverty Co., 8th St. and Maple Ave., Los Angeles, $41,260; Murphy & Ware, Los Angeles, $62,500.

Sewers

PROPOSED WORK

La., Minden—City plans to build sewerage system, cost $160,000; also improve electric light plant, $20,000. G. S. Carroll, secy.

O., Akron—City soon receives bids laying 16,400 ft. trunk sewer in South Arlington district. About $237,000. J. E. Root, sewer engr.

O., East Liverpool—City plans to install sanitary sewer in Mulberry St. About $40,000. J. George, East Liverpool, engr.

O., South Euclid—Village plans election June 8 to vote on $150,000 bond issue for laying 6 mi. 6-10 in. c.ii watermains. F. A. Pease Eng. Co., 804 Marshall Bldg., Cleveland, engrs.

Mich., Ann Arbor—City plans to lay sewers in Packard, State and Hill Sts., Olivia and Granger Ave., involving 7,170 ft. 12-27 in. vitr. and 1,645 ft. 29-30 in. segmental pipe. About $35,000. J. G. Reynolds, clk.

Mich., Muskegon Heights—City plans to build storm sewers in western section, involving 8,700 lin. ft. 12-51 in. circular vitr. and segmental block pipe, also 40,000 ft. 8 in. vitr. sanitary sewers with flush tanks, etc. C. S. Gamble, City engr.

Minn., Elmore—City having plans prepared building 6,000 ft. 8 in. sanitary sewers and 5,000 ft. 10 in. storm sewers. About $25,000. W. E. Buell, 229 Davidson Bldg., Sioux City, Ia., engr.

BIDS DESIRED

N. Y., Buffalo—Until June 7, by A. W. Krienheder, comr. Bd. Pub. Wks., building sewers in Roslyn Ave., involving 1,330 ft. 10-15 in. tile pipe, etc., Elmwood Ave., 1,144 ft. 10-20 in. tile pipe, etc., Wilkes Ave., 1,585 ft. 12-18 in. tile pipe, Joseph Ave., 1, 366 ft. 10-15 in. tile pipe, etc. G. H. Norton, city engr.

N. Y., Long Island City—Until June 8, by M. E. Connolly, pres. Queens Boro., building sewer and appurtenances in Depot Lane from Joslin to Norwood Sts., from Norwood St. from Depot Lane to Crocheron Ave., Ormond St. from Crocheron Ave. to crown about 350 ft. north, Norwood Pl. from Crocheron Ave. to State St., Milliard St. from Crocheron Ave. to State St., Lawson St. from Crocheron Ave. to State St., Kendall St. from State St. to property line 730 ft. north, Joslin St. from Jackson to Mitchell Aves. Kerman St. from State to Mitchell Ave., Hoogland St. from Jackson to Mitchell Aves., Grennell St. from Jackson to Mitchell Aves., Forbes St. from State St. to Mitchell Ave., Eagle St. from Jackson to Mitchell Aves., Dunsing St. from Mitchell Ave. to point 370 ft. south, Jackson Ave. from Joslin to Forbes Sts., State St. from Norwood to Dunsing Sts., Mitchell Ave., from Inkerman to Beeckman Sts., Crocheron Ave. from Joslin to Ormond Sts., South St. from Long Island R.R. to Rockaway Turnpike, Rockaway Turnpike from South St. to Lincoln Ave.

N. Y., New York—H. H. Curran, pres. Manhattan Boro., received bids May 21, repairing barrel sewers at (1) foot of Coenties Slip and East River, also Pier 6, Jefferson St. and East River, (2) foot of 21st, 29th and 33rd Sts., East River, from Melrose Constr. Co., 103 East 125th St., (1) $16,510, (2) $11,515; J. E. Buckley, (1) $18,322, (2) $14,970. Noted May 13.

Wis., Milwaukee—Until July 1, by Sewerage Comn., building syphon under Milwaukee River between Bradford Ave. and Wright St., involving 860 ft. 18 in. c.i. pipe and 1 valve chamber, also syphon between Concord and Auer Aves., 595 ft. 30 in. c.i. pipe and 2 valve chambers. T. C. Hatton, city engr.

Wis., Waterloo—Until June 28, by village, building sewers in various streets. W. J. Higgins, clk. Parsons & Orbert, 627 M & M Bank Bldg., Milwaukee, engrs., advertised in this issue. Noted April 29.

Kan., Goodland—Until Jue 10, by C. M. Fenno, city clk., building sanitary sewerage system. Main and outfall sewers involve 15,373 lin.ft. trenching, 15,373 lin.ft. 10-15 in. vitr. sewer pipe, 36 manholes, etc.; disposal works involve 3,167 lin.ft. 4-10 in. vitr. sewer pipe, 1 Imhoff tank, 48 in alternating siphon set in place complete, 1 sludge filter, 1,950 cu.yd. filtering material in sand filters, 30 cu.yd. concrete slope lining in sand filters, 310 lin.ft. 10 in. vitr. sewer pipe distributor encased in concrete, etc.; lateral sewers involve 46,838 lin.ft. trenching, 46,838 lin.ft. 8-10 in. vitr. sewer pipe, 72 manholes, 32 flush tanks, 5,000 lin.ft. ¾ in. galvanized iron water pipe for flush tank connection, etc. Black & Veatch, Mutual Bldg., Kansas City, Mo., engrs. Noted March 25.

★Pa., Phila.—City let contract building 190 ft. sewer in Almond St. from Lehigh St. to point 180 ft. east, to McCookson Constr. Co., $2,200; 256 ft. Alter Rd. and 260 ft. Hamilton St., from 5th to Randolph Sts., to Cunningham & Murray, 3915 Market St., $3,600 and $2,700 respectively; 717 ft. Bermuda St. from Duneau to Orthodox Sts., 503 ft. Lawrence St. from Olney to Chew Sts., 120 ft. 6th St. from Jackson to Moyamansing Sts., 142 ft. 29th St. from Alter Rd. to Peters Sts., 700 ft. Torresdale from Kensington St. to Hunting Park, to J. J. McHugh, 1430 South Penn Sq., $7,500, $6,700, $2,000, $1,900 and $13,500 respectively; 531 ft. Dicks Ave. from 63rd to 64th Sts., to A. A. Pastore, 5903 Woodland St., $13,000; 493 ft. Fermon St. from Front to 2nd Sts., 391 ft. Naudain St. from Front to 2nd Sts., 305 ft. 71st St. from Elmwood to Theodore Sts., 305 ft. 72nd St. from Elmwood to Theodore Sts., 526 ft. 63rd St. from Buist to Dicks Sts., to R. F. Higgins, 4642 Lancaster St., $5,900, $5,000, $4,300, $3,700 and $7,600 respectively; 332 ft. Kensington St. from Butler to Buskins Sts., 293 ft. 26th St. from South to Bainbridge Sts., to J. Lombardi, 1637 South Broad St., $5,600 and $5,000 respectively; 825 ft. Marvine St. from Clarkson to Magner Sts., 525 ft. 20th and Limekiln Sts. from Godfrey to Medary Sts., 1,215 ft. Wayne Ave. from Westview to Carpenter Sts., to Estate of R. P. Bennis, Chew and Price Sts., $12,000, $10,600 and $13,000 respectively; 520 Marvine St. from Norris to Diamond Sts., to R. P. Ryan, $11,000; 300 ft. Melon St. from 17th to Bouvier Sts., to C. D. Land, 28th and Cambria Sts., $3,500; 220 ft. Monastery Ave. from Freeland to Mitchell Sts., 1,581 ft. 48th St. from Osage to Walnut Sts., to F. T. Buckius, Kensington and Deal Sts., $5,600 and $28,000 respectively; 941 ft. Henry Ave. from Walnut Lane to Jamestown St., to Estate of D. McMahon, Germantown and Chelton Sts., $20,000; 295 ft. Ritner St. from 24th to Bonsal Sts., to W. H. Garson, 5033 Brown St., $4,500; 727 ft. Ruscomb St. from 5th to Marshall Sts., to P. Ellis, 3342 North 11th St., $11,500; Noted March 25.

Wis., Kenosha—City received bids May 21, building 2,300 ft. 18-30 in. vitr. pipe sewer and 12 concrete manholes in various streets, from P. Frandsen, 1126 Sellick Ave., $24,990; Thomsen & Thomsen, Kenosha, $25,722; M. Thomsen, 1020 Salem Ave., $28,900.

★Minn., Duluth—City let contract laying 5,450 ft. 6-22 in. concrete sewers in portions of Heard St., involving 6,100 cu.yd. earth and 60 cu.yd. rock trenching, to Jobnson & Kahrmen, c/o E. K. Coe, city engr., $25,207.

★Okla., Okemah—City let contract building sewers in Lateral Sewer Dist. 1, to N. S. Sherman Machine & Iron Wks., 18-32 East Main St., Oklahoma, $181,700. Noted Feb. 19.

Ore., Portland—City Comn. received bids May 12, furnishing labor and material building sewers in (a) Wygant St. from Delaware Ave. to Gay St., (b) East 13th St., (c) East 44th, East 45th and Private Property Sewerage System, (d) 71st St. S. E. from 45th Ave. S. E. to Foster Rd., (e) 49th St. S. E. and Private Property Sewerage System, (1) cement, (2) vitr., from J. Albert, 289 Brunside St., (a1) $1,579, (c1) $2,397; Lundstrom Carlson, (a2) $1,813, (e2) $5,073; Mehemarie & Co., (a1) $1,815, (c1) $2,400; R. G. McMullen, Portland, (b) $100,514; Jacobsen-Jensen Co., 407 Stanton St., (b1) $110,526; Portland Realty & Trust Co., Ry. Exch. Bldg., (d1) $5,062; J. Keating, Lumbermans Trust Co., (c1) $2,401, (e1) $5,239; Joseph & Son, (e1) $5,373. Noted April 8.

Cal., Long Beach — City received bids building vitr. pipe sewers in Hill St., et al. to include sewage pumping plant with pumps and motors, flush tanks, etc., from J. Cummings, 1290 Washington Bldg., Los Angeles, $44,650; J. Radich, Long Beach, $46,999; P. Tomich, Long Beach, $57,900.

Cal., National City—City received bids building 10.7 mi. sewerage system, involving 4-12 in. cement pipe, 113 manboles, septic tank, etc., from R. H. Downer, 668 Colusa Ave., Berkeley, $94,250; J. Engretsen, 205 McNeece Bldg., San Diego, $110,250; M. McGinnis, San Diego, $116,686.

★Ont., Stratford—City let contract laying 10,425 ft. sewer, to J. H. McKnight Constr. Co., 88 St. David St., Toronto, $74,850.

Bridges

PROPOSED WORK

Conn., Bristol—City plans to build rein.-con. bridge with concrete foundation, on Boulevard. C. W. Buell, 175 Main St., engr.

N. Y., Mt. Vernon—Yonkers, Mt. Vernon and Bronx Parkway Comn., at office of Bronx Parkway Comn., West Pondfield Rd., Bronxville, received no bids May 24, completing Broad St. viaduct, crossing New York Central R. R. tracks and Bronx River, between here and Bronxville. About $50,000. Work will be readvertised. Noted May 13.

Pa., Hummelstown—Comrs. Dauphin Co. (Harrisburg) baving plans prepared for 300 ft. rein.-con. bridge, 26 ft. wide, over Swatara Creek, on Hanover St., to have 3 arches. About $65,000. C. M. Hershey, Harrisburg Natl. Bank Bldg., Harrisburg, engr.

W. Va., Madison—See "Streets and Roads."

South Carolina—Beaufort, Jasper and Hampton Counties and State of Georgia authorized $500,000 honds issue to build steel or concrete bridge over Savannah River. J. A. L. Woodell, consult. engr.

South Carolina—Charleston, Berkeley and Williamsburg Counties authorized $1,000,000 bond issue to build steel or concrete bridge over Santee River. J. A. L. Woodell, consult. engr.

South Carolina—Florence, Marion, Horry, Dillon and Charleston Counties authorized $200,000 bond issue to build bridge over Pee Dee River. J. A. L. Woodell, consult. engr.

Bridges (Continued)

Cal., San Miguel—Bd. Supervs. San Luis Obispo Co. receives bids in July building rein.-con. bridge over Salinas River, near here, to have nine 90 ft. spans. About $100,000. F. J. Rodrigues, clk. W. B. Burch, San Luis Obispo, engr.

BIDS DESIRED

Fla., Tavares—Until June 16, by Comrs. Lake and Seminole Counties, building 226 ft. wooden bridge over Wekiva River, involving 17,000 cu.yd. filling in approaches. M. V. Simpson, chn. Lake Co. Bd. and K. A. Brumley, chn. Seminole Co. Bd.

Mich., Detroit—Until June 14, by Dept. Pub. Wks., furnishing and building 50 ft. structural steel highway bridge over Michigan Central R.R. tracks, on Vermont Ave., to have single span truss, 40 ft. wide. About $55,000. C. W. Hubbell, city engr.

Illinois—Until June 16, by Dept. Pub. Wks. and Bldgs., Springfield, building concrete bridges in Vermilion, Whiteside and Ogle Counties. C. Older, state highway engr.; advertised in this issue.

Ia., Tipton—Until June 9, by A. C. Yetter, aud. Cedar Co., building 95 rein.-con. culverts, 6 I beam and 4 pony truss spans on concrete abutments; advertised in this issue.

Minn., Olivia—Until June 21, A. O. Schmidt, aud. Renville Co., building 4 concrete and steel bridges. F. M. Shepherd, Olivia, engr.; advertised in this issue.

Nev., Reno—Until June 28, by J. E. Sullivan, city clk., building 2 girder type rein.-con. bridges across Truckee River, on Chestnut St., south bridge to have single span with 45 ft. clear water way, north bridge to have 120 ft. clear water way and not more than 3 spans, each to have an outside width of 40 ft. with 24 ft. roadway.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Vt., Brattleboro—Town received only bid May 15, building 330 ft. single span steel highway bridge, 21 ft. roadway and 6 ft. sidewalks over Connecticut River between here and Hinsdale, N. H., from United Constr. Co., 24 James St., Albany, N. Y., $68,950. Noted April 29.

R. I., Narragansett — Bd. Pub. Rds., Providence, received bids May 26, building 700 ft. bridge, 38 ft. wide, over Narrow River, here, involving 911 cu.yd. rein.-con., 400 cu.yd. concrete, 20 ton steel, 1,300 cu.yd. stone, 7,300 cu.yd. earth approach and fill, etc., from Briggs Eng. & Constr. Co., 75 Westminster St., Providence, $94,000; Rendle-Stoddard Co., Chelsea, Mass., $97,696; Hynes-Haley, 15 Westminster St., Providence, $98,814.

★**Mass., Boston**—City let contract reconstructing and repairing superstructure of roadway of Chelsea Bridge, over south channel of Mystic River, 1,200 ft. long, 40 ft wide, to Lawler Bros., 16 City Sq., Charlestown, $27,671. Noted May 20.

★**N. Y., Bronxville**—Bronx Parkway Comn., West Pondfield Rd., let contract building stone faced rein.-con. arched bridge over Bronx River, on Parkway Dr., south of Woodland Pl., White Plains, to Faillate Bros., 52 West 42nd St., New York City. About $50,000. Noted April 29.

★**N. Y., Elmira**—Bd. Pub. Wks., at office of H. Moseson, clk., let contract building bridge over Chemund River on Main St., to T. L. Eyre, 1537 Commercial Trust Bldg., Phila., $402,575. Noted May 27.

★**N. J., Newark**—Bd. Freeholders Essex Co. let contract building bridge over Morris Canal, on Sussex Ave., to Linde & Griffith Co., 4th Ave., Branch Brook. About $27,000.

★**Fla., St. Augustine**—St. John Co. let contracts building 52 rein.-con. bridges at various points, to Luton Bridge Co., West Market St., York, Pa., $396,000; also bridge across Matanzas River and 1 across North River, both rein.-con., to S. Perkins, Marion and Bridge Sts., $368,762.

★**Kan., Girard**—Crawford Co. let contract building Bridge 2, one 30 ft. Tee girder, 20 ft. roadway, Bridge 3, five 30 ft. Tee girders, 20 ft. roadway, bridge on Sta. 14 plus 39, one 10 ft. slab, 9 ft. abutments, 16 ft. roadway, bridge on Sta 25 plus 83.5, one 11 ft. slab, 8 ft. abutments, 16 ft. roadway, bridge on Sta. 34 plus 93, one 13 ft. slab, 7.5 ft. abutments, 16 ft. roadway, all on Sect. G, Federal Aid Project 40, to Maxwell Constr. Co., Columbus, $31,162. Noted April 29.

★**N. D., Bismarck**—State Highway Comn. and Comrs. Burleigh and Morton Counties let contract building superstructure for bridge over Missouri River, to Amer. Bridge Co., 629 South East 2nd St., Minneapolis, $465,000; piers, abutments and approaches, to Foundation Co., 209 South LaSalle St., Chicago, $500,000.

★**Missouri**—See "Railways."

★**Ark., Walnut Ridge**—See "Streets and Roads."

★**Wash., Olympia**—State Highway Comn. let contract building rein.-con. bridge, to have six 28 ft. spans, over Mud Bay on Olympic Highway, to Union Bridge Co., foot of Fenwick St., Portland, Ore., $32,106. Work involves 57,400 lb. reinforcing steel bars, etc. Noted March 18.

Streets and Roads

PROPOSED WORK

N. Y., Buffalo—City having plans prepared repaving 12 mi. Genesee and Sycamore Sts., Hertel, Fillmore and Bailey Aves. G. T. Norton, city engr.

N. Y., Lockport—Bd. Supervs., Niagara Co., plans to build 6 mi. concrete or brick road along River Rd. between city lines of Niagara Falls and North Tonawanda, cost $400,000; also 2.6 mi. Ridge Rd., from Dickersonville to Million Dollar Highway, $150,000.

N. J., Newark—City plans to pave Manchester Pl. from Grafton to Montclair Sts. and Hansbury Ave. from Bergen to Elizabeth Sts., concrete. About $25,000. M. R. Sherrerd, city engr.

Pennsylvania—L. S. Sadler, state highway comr., Harrisburg, rejected bids May 11, building roads in Delaware, McKean, Northampton and Somerset Counties. Noted May 20.

W. Va., Clarksburg—Harrison Co. plans election to vote on $4,000,000 bonds to hard surface roads. J. W. Wilson, co. engr.

W. Va., Madison—Boone Co. election June 10 to vote on $146,000 bonds to grade and build bridges on road between here and Clothier. J. P. Blundon, co. engr.

Fla., Orlando—Orange Co. voted $1,500,000 bonds to build roads.

Ohio—State Highway Dept., Columbus, received no bids May 28, building roads in following counties:

Belmont Co., Sect. "I" Barnesville-Woodsfield Rd. 2.061 mi. grading, constructing bridges and culverts and paving with bituminous macadam, cost $70,208.

Franklin Co., Sect. "Z" Nat. Rd., .84 mi., grading, constructing drainage structures and paving with brick, cost $131,160.

Fulton Co., Sect. "P" and "C-1" Bryan-Wauseon Rd., 6.191 mi., grading, constructing bridges and culverts and paving with concrete, $200,235.

Hardin Co., Sect. "E" Findlay-Kenton Rd., 2.08 mi. grading, constructing bridges and culverts and paving with asphaltic concrete on concrete base, $79,664.

Huron Co., Sect. "L" Norwalk-Plymouth Rd., 2.58 mi. grading, and paving with concrete, $57,142.

Jefferson Co., Sect. "M" Ohio River Rd., 1.21 mi., grading, constructing bridges and culverts and paving with brick, $69,561. Noted May 6.

O., Canton—City voted $1,600,000 to pave various streets.

O., Cincinnati—Comrs. Hamilton Co. plan to improve Symmestown Rd., cost, $35,662, Sharon Ave., $78,900. E. A. Gast, engr.

O., Columbus—Comrs. Franklin Co. received no bids May 26, grading, draining and paving 1.17 mi. Sect. 1, Hess Rd., 16 ft. wide, rein.-con., cost $50,920. Work will be readvertised. C. C. Latimer, co. surv. Noted May 20.

Mo., St. Joseph—Buchanan Co. receives bids about July 1, paving 6½ mi. Faucett-Dearborn Rd., 18 ft. wide, concrete; also 6½ mi. Rushville-De Kalb Rd., 16 ft. wide, bituminous macadam. J. D. Mohler, 1522 25th St., engr.

Mo., St. Joseph—Buchanan Co. soon receives bids paving 10 mi. Pike's Peak Highway, 16 ft. wide, bituminous macadam. J. D. Mohler, 1522 South 25th St., engr.

Mo., St. Joseph—Buchanan Co. plans to have surveys made paving 10 mi. Saxton-Easton Rd., 16 ft. wide, bituminous macadam. J. D. Mohler, 1522 South 25th St., engr.

Tex., Austin—Travis Co., Rose Hill Dist., voted $50,000 bonds to build various roads. H. W. Nolen, 511 Scarbrough Bldg., Austin, co. engr

Tex., Dallas—Dallas Co. having revised plans prepared and soon receives bids grading, clearing and paving 8.9 mi. Dallas-Seyene Rd., 18 ft. wide. Former contract rescinded. W. J. Powell, co. engr. Noted May 6.

Tex., Greenville—Hunt Co. having plans prepared grading, surfacing and building steel and concrete bridge on 11.14 mi. highway from Concord to Collin Co., 16 ft. wide, involving 66,840 cu.yd. earth excav., 1,416.7 cu.yd. concrete, 117,638 gal. asphalt, 75,000 lb. structural steel and 38,990 ton stone. About $305,967. A. D. Duck, Greenville, engr.

Okla., Sallisaw—City having plans prepared paving various streets in business section. About $100,000. F. E. Johnston, city mgr. V. V. Long & Co., 1300 Colcord Bldg, Oklahoma, engrs.

Washington — State Highway Comn., Olympia, received no bids May 10, clearing, grading, draining and gravel or crushed rock surfacing 1.2 mi. State Rd. 5 from Randle west, Lewis Co., involving 11,250 cu.yd. earth and 6,500 cu.yd loose rock excav., etc. J. Allen, Olympia, engr. Noted March 25.

Wash., Seattle—City rejected bids received May 7, grading, building concrete walks and sewers on 41st Ave., N., et al. About $113,954. Work will be readvertised. Noted May 20.

Ore., Perry—Grande Ronde Lumber Co. plans to build 4 mi. logging road from Hilgard to Upper Grande Ronde River, using 45 lb. steel. G. E. Stoddard, Perry, mgr.

Cal., Los Angeles—Bd. Supervs. Los Angeles Co. rejected bids May 17, paving 3.21 mi. Center St., Rd. Dist. 153, near Downey. Work will not be readvertised for 6 months. Noted May 6.

Cal., San Luis Obispo — Bd. Supervs. San Luis Obispo Co. receives bids about June or July 1, improving 7,200 ft. main highway through town of San Luis Obispo, 21 ft wide, 5½ in. concrete base with 1½ in. Topeka surface. F. J. Rodrigues, clk. W. B. Burch, San Luis Obispo, engr.

Cal., Santa Barbara—Comrs. Santa Barbara Co. plan to grade portions Rd. Impvt. Dist. 1, asphaltic concrete wearing surface on rock foundation. About $28,000. O. H. O'Neil, co. engr.

Que., Lachine—Town Engineer soon receives bids building permanent sidewalks. About $25,000.

Que., Montreal—City soon receives bids paving St. Patrick St. from Grand Trunk Bridge to Pitt St. About $51,938. A. E. Doucet, city engr.

Que., Montreal—City receives bids about June 9, repaving St. Ambrose, Decarie, Ontario, St. Catherine, Beaumont, Western and Wellington Sts. and Park Ave. About $500,000. A. E. Doucet, city engr.

Que., Montreal—City soon receives bids paving 2 mi. Notre Dame St. from Delormier to Montcalm Sts. Cost $35,892; Commissionors St. from Berri to Victoria Sts., $10,292; St. Paul St. from McGill to Bonsecoeur Sts., $47,000. A. E. Doucet, city engr.

Que., St. Johns—Town soon receives bids repaving Cartier St., et al. About $75,000. L. W. Bourassa, town engr.

Ont., Ottawa—Bd. Control soon receives bids resurfacing Sparks St. from Bank St. to point 64 ft. west of west side of Bay St., cost $19,862; McLaren St. from Percy St. to Bronson Ave., $4,258; Cartier St. from Lisgar St. to Argyle Ave., $15,529; Somerset St. from Bank to O'Connor Sts., $4,406; Nelson St. from Osgoode to Somerset Sts., $4,865; Chapel St. from Laurier Ave., E., Rideau St., $9,349; paving Florence St. from Bank to Kent Sts., $9,317, all asphalt. A. F. Macallum, city engr.

BIDS DESIRED

Vt., Springfield—Until June 15, by village, building bituminous macadam pavement on Clinton, Main and Valley Sts.; advertised in this issue.

Mass., Attleboro—Until June 8, by P. E. Brady, mayor, building bituminous concrete roads on portions of Pleasant, South Main and County Sts.; advertised in this issue.

N. Y., Brooklyn—Until June 10, by Park Bd., at office of Dept. Parks, Municipal Bldg., New York City, furnishing labor and material for improving Ocean Parkway Traffic Rd. between Kings Highway and Ave. W, comprising, regulating, grading, building sheet asphalt pavement on concrete foundation, sewers, curbs, sidewalks, etc.

N. Y., Buffalo—Until June 5 (change of date) by city, paving Bailey and Delevan Aves., Manden, Stanley and Townsend Sts. G. H. Norton, city engr. Noted May 6.

N. Y., East Aurora—Until June 8, by E. Jaeckle, clk., Erie Co. Bd. Supervs., Buffalo, building 13,250 ft. Center St., 12 ft. wide, 4 in. thick, bituminous macadam. G. C. Diehl, 575 Ellicott Sq. Bldg., Buffalo, co. engr.

N. Y., Olean—Until June 17, by S. M. Gaylor, comr. Bd. Pub. Wks., building brick pavement on concrete foundation with necessary sanitary and storm sewers and appurtenances on Front St. from Main to East State Sts., Garden Ave. from Front

Streets and Roads (Continued)

to King Sts., 5th Ave. from School St. to point 250 ft. north, School St. from Front St. to 5th Ave; advertised in this issue.

N. Y., Poughkeepsie—Until June 10, by Bd Pub. Wks., Eastman Park Mansion, improving various streets, involving 15,000 sq.yd. rein.-con. pavement, 16,000 sq.yd. grading and excav., 3,000 lin.ft. blue stone curbing. E. W. Sylvester, supt.; advertised in this issue.

N. Y., S. I. St. George—Until June 8, by C. D. Van Name, pres. Richmond Boro., repaving roadway of Rockland Ave. from Forest Hill to Manor Rds.

N. J., Flemington—Until June 24, by Bd. Freeholders Hunterdon Co., building Lower Valley Rd., Lebanon Twp. W. W. Foster, clk.; advertised in this issue.

N. J., Jersey City—Until June 8, by Bd. Comrs. widening and improving Mallory Ave. between Clendenny and Communipaw Aves., sheet asphalt on concrete foundation. F. A. Dolan, city clk. Noted May 6.

Pa., Allentown—Until June 7, by M. W. Gross, mayor, paving 4,400 sq.yd. Gordon St. from Jordon to 6th St.

Md., Baltimore—Until June 9, by Bd. Awards, paving 520 ft. Guilford Ave., 42 ft. wide, sheet asphalt; grading and paving alleys, cement concrete; Contr. 49-A grading 490 ft. Warwick Ave. from Mulberry to Franklin St., 40 ft. wide, involving 5,000 cu.yd. grading. Contr. 176, A. E. Christhilf, highways engr.

Md., Cumberland—Until June 10, by City Council, repaving and improving various streets. R. L. Rizer, city engr., advertised in this issue.

Va., Orange—Until June 7, by Clerk Orange Co., building 5.2 mi. road from here to New Hope; 8 mi. road from New Hope to Burr Hill and 10 mi. road from Wilderness Bridge to Plank Rd. G. P. Coleman, c/o State Highway Comn., Richmond, comr.

W. Va., Winfield—Until June 7, by Putnam Co., surfacing 4 mi. Culloden—S. Albans Rd., 16 ft. wide, bituminous macadam About $80,000. G. H. Davis, Hurricane, engr.

Ohio—Until June 18, by State Highway Comn., Columbus, grading, paving and building bridges and culverts on 3.781 mi. Sect. "B" Ashland-Wooster Rd., Ashland Co., monolithic brick or concrete. About $174,970 for brick, $158,425 concrete.

Indiana—By Bd. Co. Comrs. building roads in following counties: June 7, Switzerland Co., Vevay, 15,620 ft. G. Scott et al Rd., stone, York Twp. W. A. Reeves, aud.

Porter Co., Valparaiso, 1.24 mi. A. H. Gustafson et al Rd., gravel, Westchester Twp., and 2.29 mi. A. Hawkinson et al Rd., macadam, Portage Twp. B. H. Kinne, aud.

Jay Co., Portland, 5,378 ft. D. Campbell et al Rd., concrete, Noble Twp. H. Martin, aud.

Rush Co., Rushville, 13,375 ft. W Redenbough et al. Rd., crushed stone, Orange Twp. W. H. McMillin, aud

Crawford Co., English, 15,448 ft. W. F. Bass et al Rd., Whiskey Run Twp. O. D. Tadlock, aud.

Wells Co., Bluffton, 2,610 ft. M Wagner et al Rd., stone, Jefferson Twp. and 5,295 ft. J. E. Shebiger et al Rd. J B. Fishbauch, aud.

Vermillion Co., Newport, 26,400 ft. J. Casey et al Rd., concrete, Highland Twp. L F. Wright, aud.

June 8, Harrison Co., Corydon, 11,063 ft. A. J. Thomas Rd., stone, Harrison Twp., and 2,700 ft. W. Kinzer et al Rd., macadam, Taylor and Boone Twps. S. C. Mauck, aud.

Greene Co., Bloomfield, J. T. Baker et al Rd., Center Twp., D. Wiginton et al Rd. and T. Foster et al Rd., macadam, Washington Twp. H. Corbin, aud.

Dearborn Co.,. Lawrenceburg, 11,237 ft. J. Schaick Rd., broken stone, Harrison Twp., 7,890 ft. H. Lichtenberg Rd., Jackson Twp. and W. Walker Rd., Sparta and Clay Twps. A. E. Jackson, aud.

Warrick Co., Boonvile, 2½ mi. Lincoln Ave. Rd., broken rock, Ohio Twp. W. A. Campbell, aud.

Allen Co., Ft. Wayne, 14,993 ft. Aboite Rd., stone, Lafayette Twp. A. C. McCoy, aud.

Ind., Ft. Wayne—Until June 23, by Comrs. Allen Co., grading, draining and paving with waterbound macadam 15,538 ft Smith Rd. No. 1, 14 ft. wide. About $52,450. A. W. Grosvenor, co. engr.

Ind., Gary—Until June 14, by Bd. Pub. Wks., building and re-building streets and sewers, 11 contracts. About $440,000. W. P. Cottingham, city engr.; advertised in this issue.

Ind., Muncie—Until June 8, by Comrs. Delaware Co., improving highways, involving 10,232 ft. bituminous concrete. H. L. Janney, engr.

Wisconsin—Until June 9, by State Highway Dept., at div. Office 2, Stephenson Bldg., Milwaukee, grading and paving Milwaukee-Fond du Lac Rd., Federal Aid Project 160, Menomonee Falls Village and Waukesha Co., involving 12,209 cu.yd. earth and 200 cy.yd. rock excav., 107 cu.yd. Class "A" concrete in culverts, 10,841 lin.ft. combined curb and gutter, 12,503 sq.yd. concrete surfacing, 18 ft. wide, 7 and 8 in. thick, 20,399 sq.yd. concrete surfacing, full width, 7 in. thick, 4,884 lb. steel reinforcement for blind joints, etc.; 5.86 mi. Arcadian Ave., Federal Aid Project 179, Waukesha Co., 1.5 acres clearing and grubbing, 41,459 cu.yd. earth and 397.6 cu.yd. borrow excav., 394.6 cu. yd. Class "A" and 175 cu.yd. Class "B" concrete, 68,757 sq.yd. concrete surfacing, 45,473 lb. pavement reinforcement, 26,000 lb. structural steel, etc.; West Bend-Milwaukee Rd., Federal Aid Project 159, Washington Co., 5,795 cu.yd. earth, 245 cu.yd. rock and 173 cu.yd. borrow excav., 109.4 cu.yd. Class "A" concrete, 18,102 sq.yd. concrete surfacing, etc. Noted May 27.

Ia., Osceola—Until June 10, by city, improving various streets, involving 28,600 sq.yd. brick, 28,600 sq.yd. asphalt or 33,630 sq.yd. concrete pavement, 36,600 cu.yd. excavating and grading, 21,250 lin.ft. combined curb and gutter, 1,600 lin.ft. single curb, 830 lin.ft. double gutter, 2,650 ft. 10-18 in. storm sewers, etc. W. N. Temple, clk. E. T. Archer & Co., New England Bldg., Kansas City, Mo., engrs.

Minn., Bemidji—Until June 7 (change of date), by A. D Johnson, aud. Beltrami Co., building 10 mi. Federal Aid Project 136, Job 1903, 24 ft. wide, Div. A involves 5,740 cu.yd. excav., 6,985 cu.yd. overhaul, 3,564 cu.yd. surfacing, Div. B, 12,204 cu.yd. excav., 7,466 cu.yd. surfacing, 143 lin.ft. 18-36 in. portable culverts, 21,475 cu.yd. overhaul, cost $70,000; 6 mi. Federal Aid Project 57, Job 1901, Div. D, State Rd. 4, 24 ft. wide, 52 acres clearing and grubbing 90,928 cu.yd. excav., 3,555 cu.yd. ditching, 10,602 cu.yd. surfacing, 841 lin.ft. 15-24 in. portable culverts, 92,530 cu.yd. overhaul, etc., $42,000; 11 mi. Job 1909, State Rd. 8, 24 ft. wide, Div. A, 8 acres clearing and grubbing, 36,883 cu.yd. excav., 5,108 cu.yd. surfacing, 698 lin.ft. 12-36 in. portable culverts, 22,340 cu.yd. overhaul. Div. B, 9 acres clearing and grubbing, 34,996 cu.yd. excav., 5,730 cu.yd. surfacing, 774 lin.ft. 12-24 in. portable culverts, 18,550 cu.yd. overhaul, etc., Div. C, 5 acres clearing and grubbing, 16,163 cu.yd. excav., 4,109 cu.yd. surfacing, 344 lin.ft. 15-18 in portable culverts, 14,510 cu.yd. overhaul, etc., $65,000; 12 mi. Federal Aid Project 162, Job 1910, 24 ft. wide, 35 acres clearing and grubbing, 21,922 cu.yd. excav., 46,154 cu.yd. surfacing, 132 lin.ft. 18-30 in. portable culverts, 88,965 cu.yd. overhaul, 10,483 cu.yd. ditching, etc., $80,000; 6 mi. Federal Aid Project 143, Job 1912, State Rd. 6, 24 ft. wide 15 acres clearing and grubbing, 45,380 cu.yd. excav., 7,493 cu.yd. surfacing, 278 lin.ft. 12-18 in. portable culverts, 92,291 cu.yd. overhaul, etc., $42,000. S. D. Snyder, Bemidji, engr.

Mo., Jefferson City—Until June 7, by City Council resurfacing 9 block McCarty St. from Cherry St. to Bway, 4 block Miller St. from Washington to Adams Sts., 350 ft. Miller St. from Jackson St. to point 350 ft. east 1 block Miller St. from Bway to Washington St, 9 block Dunklin St. from Bway to Cherry St., 6 block Ashley St. from Bway to Jackson St., 6 block Bway. from McCarty to Atchison Sts., 6 block Jefferson St. from McCarty to Atchison Sts., 6 block Madison St. from McCarty to Atchisson Sts., 6 block Monroe St. from Mc Carty to Atchison Sts., 1 block Adams St. from McCarty to Miller Sts., Adams St. from Elm to Ashley Sts., 6 block Jackson St. from McCarty to Atchison Sts. and 6 block Lafayette St. from McCarty to Atchison Sts., all 80 ft. wide. Work involves 108,133 sq.yd. resurfacing, 30 per cent to be scarified and resurfaced with Tarvia "B", 1 gal per sq.yd. to be applied in 2 courses of ½ gal. each for 2 choke courses of sand, and 70 per cent to be treated with hot "A" or cold "B" Tarvia. L. F. Brown, city engr.

Tex., El Paso—Until June 14, by E. B. McClintock, judge El Paso Co., grading, surfacing and draining 12.88 mi. Highway 1 from Fabens east, 18 ft. wide, involving 104,754 cu.yd. grading, 89,869 cu.yd. earth overhaul, 133,183 sq.yd. concrete pavement, 486.04 cu.yd. Class "A" concrete and 32,418 lb. reinforcing steel. About $384,549. No bids received on May 10. L. A. White, El Paso, Co. engr. Noted April 29.

Tex., Gilmer—Until June 17, by Comrs. Upshur Co., gravel surfacing and building trestles and concrete drainage structures on 9.015 mi. Highway 42, 12 ft. wide, involving 39 acres clearing and grubbing, 26,870 cu.yd. earth borrow, 110.6 cu.yd. 1:3:6 concrete, 152 lin.ft. timber trestle, etc. About $78,363. Wilder & O'Neal, Mt. Pleasant, engr.

Tex., Laredo—Until June 7, (change of date), by Comrs. Webb Co., gravel surfacing and draining 17.6 mi. Highway 12, Zapata Rd., Federal Aid Project 118, 16 ft wide. About $145,459. J. G. Rollins, Laredo, co., engr. Noted May 20.

Tex., Leonard—Until June 24, by city, furnishing labor and material building various streets, involving 12,050 sq.yd. paving, 3,130 lin.ft. combined curb and gutter and 2,150 cu.yd. earth excav. H. E. Elrod Co., Interurban Bldg., Dallas, engr.

Tex., Orange—Until June 15, by D. C. Bland, judge, Orange Co., grading and surfacing 10.26 mi. Highway 3, Federal Aid Project 149, 16 ft. wide, involving 40,356 cu. yd earth borrow and 15,099 cu.yd. earth excav., 88,478 sq.yd. plain and 7,734 sq.yd. reinforced pavement, etc., also building five 40 ft. clear span deck girder bridge, over Cow Bayou. About $435,000. J. E. Johnsen, care of Westcott Eng. Co., Orange, resident engr. Incorrectly noted "May 27."

Tex., San Antonio—Until June 8, by J. R. Davis, judge Bexar Co., surfacing 6.77 mi. Highway 2, Pearsall Rd., section Federal Aid Project 31, 16 ft. wide, involving 62,677 sq.yd. 1 in. bituminous treatment. About $51,709, including 10 per cent for engineering and contingencies. C. E. Huff, San Antonio, engr.

Cal., Santa Rosa — Until June 14, by Bd. Supervs. Sonoma Co., improving Sonoma Rd., involving 50,000 cu.yd. excav. and 1,800 cu.yd. concrete paving. About $43,000.

Que., Longueuil—Until June 7, by J. R. Bournet, secy.-treas., City Hall, improving various streets, involving 17,000 ft. concrete curbing, 11,600 sq.yd. asphaltic concrete paving.

Que., Louiseville—Until June 7., by J. L. Desaulniers, secy.-treas., improving 5 mi. St. Antoine—Riviere du Loup Rd., 18-29 ft. wide, gravel on stone foundation. About $70,000. Dept. Rds., Quebec, engrs.

Ontario—Until June 16, by W. A. McLean deputy minister of highways, Toronto, grading portions Provincial Highway, North Gower Twp., Contracts 64 and 65. About $30,000.

Man., Dauphin—Municipality receiving bids building 175 mi. road, gravel. J. A. Gorby, clk. (Gravel to be distributed by industrial railway.)

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Pittsfield**—Bd. Pub. Wks. let contract paving West Housatonic, Wahconah and North Sts., to D. J. Walsh, 107 Fenn St., $126,594. Noted May 20.

★**Connecticut**—State Highway, Comn., Capitol, Hartford, let contract building 12,500 ft. Savin Rock Rd., 3 in. bituminous macadam, Orange Twp., to Acme Eng. Co., Hartford, cost $65,000; 5,050 ft. East Berlin-Berlin Rd., concrete and macadam Berlin Twp., to Lane Constr. Co., 37 Colony St., Meriden, $45,000.

★**Conn., Bristol**—C. W. Buell, city engr., 175 Main St., let contract paving Laurel and Center Sts. to Connecticut Hassam Paving Co., 902 Chapel St., New Haven. About $25,000. Noted May 13.

★**Conn., Shelton**—City let contract paving Howe Ave., asphalt, to Connecticut Natl. Pavements, Inc., New Haven. About $86,000.

★**Conn., West Hartford** (Hartford P. O.) —Badwell Realty Co. let contract building sidewalk on East St., involving 100,000 sq. yd. concrete, to G. F. Carlson, 47 Boulanger Ave. About $25,000.

★**N. Y., Bronxville** — Bronx Parkway Comn., West Pondfield Rd., let contract paving Bronx River Parkway Dr. between Crane Rd., Scarsdale and Woodland Pl., White Plains, to Hastings Pavement Co., 25 Broad St., New York City, $312,674. Noted April 29.

★**N. Y., Brooklyn**—E. Riegelmann, boro. pres., let contract regulating and paving roadway of Stillwell Ave., to Consolidated Asphalt Paving Co., 52 9th St., $34,605; regulating, grading, curbing and laying sidewalks on 81st St. from 17th Ave. to line about 475 ft. west, to K. Mangieri, 190 31st St., $2,929. Noted May 20.

N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., received bids May 25, improving (a) Bodine St., (b) Brevoort St., etc., (c) Nott Ave., etc., from Welsh Bros., (a) $11,792; Kennedy & Smith, (a) $18,993, (b) $6,699, (c) $18,875; Peace Bros., 20 Main St., Flushing, (a) $21,570, (b) $7,933, (c) $21,823; H. J. Mullen, Fulton St., Jamaica, (b) $5,493; Astoria Contg. Co., (c) $20,010. Noted May 20.

Streets and Roads (Continued)

N. Y., New York—T H. Curran, pres. Manhattan Boro, received bids May 25, repairing (a) asphalt pavement in railroad area, when and where directed. (b) improving 48th St., (c) 49th St., (d) 54th St., (e) 72nd St., (f) Lexington Ave., (g) 8th Ave., (h) 2nd Ave., (i) Church St., from Cleveland-Trinidad Paving Co., Flushing (a) $173,400, (b) $3,326, (c) $3,706, (d) $11,817, (e) $17,309, (f) $19,632; Sicilian Asphalt Paving Co., 41 Park Row, (b) $3,066, (c) $3,362, (d) $11,904, (e) $17,345, (f) $18,226, (g) $110,994; J. L. Brusstar, Harlem River and 150th St., (b) $4,388, (c) $4,947, (d) $11,821, (e) $18,089, (f) $20,603, (g) $107,478; Asphalt Constr. Co., 2197 Madison Ave., (d) $11,075, (e) $15,250, (g) $134,096; C. Helbroock, (h) $25,285, (i) $50,646; Burnside Constr. Co., 270 Burnside Ave., (h) $26,025; W. J. Fitzgerald, 547 West 45th St, (h) $27,112, (i) $50,181.

N. Y., Niagara Falls—City received lowest bid from Read-Coddington Eng. Co., 238 Portage Rd., paving Macklem Ave., cost, $20,561, Vanderbilt Ave., $22,048, Haeberle Ave., $292,661, Ivy Court, $6,863. Noted May 6.

★N. Y., S. I., St. George—C. D. Van Name, pres. Richmond Boro., let contract regulating and repaving Tompkins Ave., to Uvalde Asphalt Paving Co., 1 Bway., New York City, $57,393. Noted May 27.

N. Y., St. George, S. I.—C. D. Van Name, pres. Richmond Boro., received bids May 28, improving (a) Bay St., (b) Richmond Turnpike, Rockland Ave. and Richmond Rd., from Craemer & Sacks, 114 East 52nd St., New York City, (a) $105,377; J. Johnson Sons, (a) $109,188, (b) $82,543, C. Vanderbilt, 24 Elizabeth St., West New Brighton, (a) $120,820, (b) $79,009. Noted May 20.

★N. Y., Syracuse—Bd. Contr. & Supply let contract resurfacing (a) North Alvord St. from Danforth to Court Sts., (b) West Fayette St. from Geddes to Magnolia Sts., (c) East Water St. from Alvord to Pine Sts., (d) West Castle St. from Midland to Ballard Sts., (e) Grape St. from Water to Fayette Sts., (f) Walnut Pl. from Harrison St. to University Pl., (g) University Pl. from Walnut Pl. to Walnut Ave., (h) Irving Ave. from East Genessee to East Water Sts., (i) North State St. from Willow to Laurel Sts., (j) West Fayette St. from South West to Seneca Sts., (k) South Salina St. from Water to Onondaga Sts., to G. B. Dickinson, Union Bldg., (a) $5,875, (e) $10,174, (g) $22,462, (h) $13,890; F. J. Baker, University Blk., (b) $24,049, (j) $47,625; J. H. Gallup, Union Bldg., (c) $76,753, (d) $7,326, (i) $24,079, (k) $35,705

★New Jersey — State Highway Dept., Broad St. Bank Bldg., Trenton, let contract surfacing Route 14, Cape May Court House Sect., Cape May Co., 18 ft. wide, involving 14,951 sq.yd. concrete, to W. Eisenberg, Woodbine, $85,507. Noted May 6.

★Pennsylvania—L. S. Sadler, state highway comr., Harrisburg, let contract building 7,300 ft. Route 87, 18 ft. wide, Harbor Creek Twp., Erie Co., 1 course rein.-con., to Good Roads Constr. Co., Erie, $83,839; 38,315 ft. Route 162, 18 ft. wide, Pottsville City to Mechanicsville Boro. line, Schuylkill Co. ,to Mangan & Risser, Lebanon, $558,755; 18,564 ft. Route 9 and 10, North Milford Boro. and Twp., Susquehanna Co., to Sprucks & Co., Scranton, $430,235. Noted May 20.

★Delaware—State Highway Dept., Dover, let contract building 3.82 mi. Rd. Contr. 29, Felton-Dover, Kent Co., involving 7,320 cu. yd. concrete, 23,000 cu.yd. excav., also 3.4 mi. Rd. Contr. C. S.6, Coverdale Cross Rds., Jacobs School, Sussex Co., involving 5,030 cu yd. concrete, 22,500 cu.yd. excav., to Kent Constr. Co., Chestertown, Md., $181,293 and $162,996 respectively; 1.09 mi. Church and Williams Sts. and Roxanna Rd., Sussex Co., involving 1,620 cu.yd. concrete, 2,150 cu.yd. excav., to Empire Constr. Co., Phila., $36,620; 5.27 mi. Rd. Contr. 27, Armstrongs-Comer-Pine Tree, New Castle Co., involving 10,670 cu. yd. concrete 48,000 cu.yd. excav., to Keystone State Constr. Co., Commercial Trust Bldg., Phila., $332,036.

★Fla., St. Augustine—St. John Co. let contract building 111 mi. hard surfaced roads, to Ackerman & Maule, Titusville, $1,196,908. Noted April 29

Ohio—State Highway Dept., Columbus, received bids May 28, building roads in following counties:

Belmont Co. Sect. "E," New Athens-Morristown Rd., 1.454 mi., grading, constructing bridges and culverts and paving with bituminous macadam, R. L. Timmons & Son, Cadiz, $153,816.

Champaign Co. Sect. "A," Springfield-Urbana Rd., 5.068 mi., grading, constructing bridges and culverts and paving with rein.-con., Williams & Little, Cleveland Heights, $206,038; Bigler Bros., Middletown, $206,343.

Clermont Co. Sect. "I," Cincinnati-West Union Rd., 2.542 mi., grading, constructing bridges and culverts and paving with with waterbound macadam, T. D. Van Camp, Hamilton, $70,365.

Sect. "L," Cincinnati-West Union Rd., 1.821 mi., grading, constructing bridges and culverts and paving with waterbound macadam, Bittler, Connell & Lamb, West Jefferson, $149,629.

Fulton Co. Sect. "K-2," Archbold-Fayette Rd., .999 mi., grading, constructing bridges and culverts and paving with macadam, Toppan & Fouty, Toledo, $18,330; C. M. Gray, Waterville, $18,710.

Hamilton Co. Sect. "A," Glendale-Milford Rd., 2.59 mi., grading, constructing bridges and culverts and paving with concrete, Gradison Constr. Co., Cincinnati, $121,824; Williams & Little, Cleveland Heights, $122,372.

Marion Co. Sect "G," Marion-Kenton Rd., 6.106 mi., grading, constructing bridges and culverts and paving with bituminous macadam, Brady & O'Connell, Marion, $194,871; Ludwig Stone Co., Kenton, $194,914.

Medina Co. Sect. "H-1," Cleveland-Hinckley Rd., 1.49 mi., grading, constructing bridges and culverts and paving with rein.-con., S. Mellert-Weidner Co., Medina, $70,898.

Wayne Co. Sect. "F" and "G-1," Columbus Wooster Rd., 3 mi., grading, constructing bridges and culverts and paving with bituminous macadam, Lee Griggs & Anderson, Millersburg, $121,100; Smith Constr. Co., Youngstown, $121,382.

Wood Co. Sect. "B-2," Toledo-Elmore Rd., 3.378 mi., grading, constructing bridges and culverts and paving with bituminous concrete, Johnson, Van Wagoner & Johnson, Tontogany, $171,057; paving with bituminous concrete, Type "2," $168,605.

Lucas Co., Sects. "F," "H" and "J-2," in Providence and Waterville Twps., 7.4 mi., maintenance, Barrett Mfg. Co., Cleveland, tar, $4,825; A. Langenderfer, Illinois Bldg., Toledo, asphalt, $6,873. Noted May 6.

★O., Bellaire—City let contract paving Belmont, Union, Jefferson, Central, Noble, 2nd, 37th and 44th Sts., involving 66,000 sq.yd. asphalt, to Federal Asphalt Co., Columbus, $206,339.

O., Columbus—Comrs. Franklin Co., received bids grading, draining and paving 1.87 mi. Elliott Rd., 16 ft. wide, macadam, from W. O. Jewett, Plain City, $54,620; 2 mi. Sullivant Ave., 16 ft. wide, rein.-con., B. F. Patterson, 1214 Neil Ave., $95,589. Noted May 27.

O., Columbus—Comrs. Franklin Co. received bid May 20, grading, draining and paving with rein.-con., 4.277 mi. Harbor Rd., 16 ft. wide, Mifflin, Sharin and Blendon Twps., from B. F. Patterson, 1214 Neil Ave. $383,429.

★O., Columbus—Comrs. Franklin Co. let contract grading, draining and paving 1.34 mi. Sect. 2 Hess Rd., 16 ft. wide, macadam, to Billiter & Oliver, Worthington, $30,341 Noted May 20.

★Mich., Detroit—City let contracts to R E. Mercier, 746 Hudson Ave., grading, shaping and paving 1 course concrete with 2 x 6-in. retaining plank, Medina headers, Alley 1,138 between VanDyke, Parker, Agnes and Coe Sts., 20 ft. wide, $3,061, No. 1,140 between 3rd, 2nd, Selden and Alexanderine Aves., 20 ft. wide, $7,292, No. 1,141 between Eastlawn, Newport, Jefferson and Kercheval Aves., 20 ft. wide, $18,001, No. 1,142 between Wabash, 12th and Ferry Park Sts. and West Grand Blvd., 18 ft. wide, $4,617, No. 1,143 between Woodward, Calvert and Collingwood Aves., 20 ft. wide, $2,247, No. 1,144 between 2nd and Woodward Aves., Chicago and Boston Blvds., 20 ft. wide, $5,664, No. 1,145 between Field, Sheridan, Lafayette and Agnes Aves., 20 ft. wide, $5,421, No. 1,146 between Winslow, Lawton, Stanley and McGraw Aves., 20 ft. wide, $3,819, No. 1,147 between Wabash, Vermont, Marquetter and Ferry Park Sts., 17 ft. wide, $1,580, No. 1,148 between Trumbull, Lincoln, Alexanderine and Willis Aves., 18 ft. wide, $2,467, No. 1,149 between Williams, Maybury, Butternut and Ash Sts., 20 ft. wide, $1,639; to Otis Cement Constr Co., 806 Hammond Bldg No 1,139 between Chene St., Grandy, Hendry and Medbury Ave., 15 and 20 ft. wide, $8,543.

★Wis., Milwaukee—Milwaukee Co. will improve 1.6 mi. North Cape Rd., 16 ft. wide, involving 15,000 sq.yd. gravel surfacing, 6,000 cu yd. grading and 92 cu yd. concrete in culverts Former bids rejected. Work will be done by day labor.

Wis., Milwaukee—Com. Pub. Wks. received bids May 20, paving (1) Cape St from Cherry to Ship Sts., involving 2,723 sq.yd. granite block pavement, (2) alley between 28th, 29th, Locust and Chambers Sts., 1,375 sq.yd. cement concrete, (3) alley between 29th, 30th, Locust and Chambers Sts., 1,365 sq.yd. cement concrete, (4) alley between 28th, 29th, Chambers and Burleigh Sts., 1,392 sq.yd. cement concrete, (5) alley between 24th, West 24th, Burleigh and Auer Sts., 1,765 sq.yd cement concrete, (6) alley between 27th, 28th, Burleigh and Chambers Sts., 1,452 sq.yd. cement concrete, (7) alley between 28th, 29th, Locust and Hadley Sts., 1,405 sq.yd. cement concrete, (8) alley between 40th, 41st, Burleigh and Chambers Sts., 941 sq.yd. cement concrete, (9) alley between 27th, 28th, Hadley and Locust Sts., 1,406 sq.yd. cement concrete, (10) alley between 37th, 38th, Hadley and Locust Sts., 1,214 sq.yd. cement concrete, (11) alley between 38th, 39th, Locust and Chambers Sts., 1,200 sq.yd. cement concrete, (12) alley between Grant, Sherman, Hadley and Locust Sts., 1,384 sq.yd. cement concrete, (13) alley between 38th, 39th, Hadley and Locust Sts., 1,214 sq.yd. cement concrete, (14) alley between 41st, Grant, Hadley and Locust Sts., 1,214 sq.yd. cement concrete, (15) alley between 26th and 27th Aves., Becher and Grant Sts., 1,336 sq.yd. cement concrete from A. H. Prange, 228 Fowler St., (1) $5.74; Dean Constr. Co., Camp Bldg., (1) $6.10, (5) $2.60; Retzlaff Froemming & Bluhm, 948 4th St., (2) $2.36, (3) $2.36, (4) $2.36, (5) $2.33, (6) $2.35, (7) $2.36, (8) $2.39, (9) $2.36, (10) $2.39, (11) $2.39, (12) $2.38, (13) $2.38, (14) $2.38; Kehrein Constr. Co., 839-7th St., (2) $2.50, (3) $2.50, (4) $2.49, (6) $2.50, (7) $2.49, (9) $2.55, (11) $2.46, (14) $2.48; Blodgett-Clayton Constr. Co., 204 Grand Ave., (2) $2.56, (3) $2.56, (4) $2.56, (5) $2.56, (6) $2.56, (7) $2.56, (8) $2.56, (9) $2.56; M. Switalski, 765 5th Ave., (8) $2.50, (10) $2.50, (12) $2.50, (13) $2.50, (14) $2.50; O. Bodemann, 801 Winnebago St., (10) $2.15, (11) $2.15, (12) $2.15, (13) $2.15; Ryback & Sadowski, 1092-2nd Ave., (15) $2.30.

★Minn., Winona—Winona Co. let contract graveling 9 mi. Lewiston—Stockton Rd., 24 ft. wide, to Litcher & Voelker, Winona, $52,765.

★Kan., Girard—Crawford Co. let contract grading and building concrete culverts on Federal Aid Project 40, to List & Bagwell Constr. Co., Kansas City, Mo., Sect. I, $20,199, Sect. H, $25,496.

★Mo., Versailles—Morgan Co. let contract building 11.08 mi. Tipton-Versailles Rd., 24 ft. wide, to H. H. Humphrey, Sedalia, involving 44,040 cu.yd. earth excav. at $.445 per cu.yd., 14,207 cu.yd. borrow, $.40, 29,562 sq.yd. reconstructed base course, $.10, $34,012 sq.yd. gravel pavement spec. "B," $.525, 29,562 sy.yd. gravel surface course, $.245, 241.6 cu.yd. Class "B" concrete masonry, $20, 28.6 cu.yd. Class "C" concrete masonry, $18, 16,267 lb. reinforcing steel, $.07, 185 lin.ft. 12 in. and 102.5 lin.ft. 15 in. vitr. clay pipe culvert, $1.20 and $1.50, respectively, 27.5 lin.ft. relaid pipe culvert, $1, and extension to superstructure of bridge at Sta. 457, $732. Total $60,957. Noted April 29.

★Ark., Walnut Ridge—Comrs. Lawrence Co. let contract grading 5.85 mi. road from Minturn to Clover Bend, Rd. Impvt. Dist. 4; also building culverts and bridges on same, to C L. Hager, Walnut Ridge, About $127,000.

★Tex., Dallas—Dallas Co. let contract paving Zang's Blvd. from Canty to Davis Sts., bitulithic macadam, to Texas Bitulithic Co., 1101-06 Praetorian Bldg., $23,758; Madison Ave. from Davis to Neches Sts., rock asphalt, to Uvalde Paving Co., 1001 Main St., $33,654.

★Tex., Houston—Harris Co. let contract surfacing and scarifying 4 mi. Highway 35, Humble Rd., 16 ft. wide, to Smith & James, Houston, $37,889, including 10% for engineering, contingencies and and material furnished by county. Noted May 27.

★Tex., Linden—Cass Co. let contracts gravel surfacing and draining 4.949 mi. Highway 1-B from point 5 mi. west of Powell Creek to Powell Creek, 9 ft. wide, involving 6.5 acres clearing and grubbing, 11,997 cu.yd. borrow, 23,609 lb. reinforcing steel, 162.8 cu.yd. Class "A," 93 cu.yd. Class "B" and 25 cu.yd. Class "C" concrete, also 7.69 mi. Highways 1-B and 8 from Powells Creek to Sulphur River, 9 ft. wide, 8.3 acres clearing and grubbing, 10,654 cu.yd. borrow and 53,899 cu.yd. earth excav., 119,773 lb. reinforcing steel, 149 cu.yd. Class "A," 52 cu.yd. Class "B" and 46 cu.yd. Class "C" concrete, to Smith Bros. & Healy Constr. Co., c/o Smith Bros., Crockett, $49,976 (including 10% for engineering and contingencies) and $61,399, respectively.

★Tex., Marshall — Harrison Co. let contract grading, surfacing and draining, 1.1 mi. Highway 11 east from here, 16 ft. wide, to Smith Bros. and Healey Constr. Co., c/o Smith Bros., Crockett, $73,779, including material furnished by county and 10% for

Streets and Roads (Continued)

engineering and contingencies. Noted May 20.

★Tex., Marshall—Harrison Co. let contract surfacing and draining 19.03 mi. Highway 11 from here west to county line, 16 ft. wide, to Smith Bros. and Healey Constr. Co., c/o Smith Bros., Crockett, $354,617, including engineering, contingencies and materials. Noted May 20.

★Tex., Paris—Lamar Co. let contract grading and draining 52 mi. Highways 5 and 19, 18 ft. wide, to Womack, McElreath & Rodgers, Sherman, $991,000. Work involves 37.44 acres clearing, 35.74 acres grubbing, 338,244 cu.yd. unclassified borrow, 1,000 cu.yd. rock and 806 cu.yd. structural excav., 242,102 lb. reinforcing and 135,200 lb. structural steel, 2,727.55 cu.yd. Class "A" and 485.06 cu.yd. Class "B" concrete, also six 50 ft. and one 70 ft. spans, concrete approaches, piers and abutments, involving 381.75 cu.yd. Class "A," 755.08 cu.yd. Class "B" and 24.32 cu.yd. Class "C" concrete, 63,723 lb. reinforcing steel, etc.

★Tex., Tyler—Smith Co. let contract surfacing and building timber trestle and concrete drainage structures on 24.6 mi. Winona Rd. from here to Gregg Co. line, 16 ft. wide, to Healey Constr. Co., 308 Sumpter Bldg., Dallas, $386,179, including 10% for engineering and contingencies and material furnished by county. Work involves 23.4 acres clearing and grubbing, 34,160 cu.yd. earth borrow, 200 cu.yd. solid and 96,217 cu.yd. loose rock excav., 2,202 cu.yd. Class "A" concrete. County to furnish 3,303 bbl. cement, 166,532 lb. reinforcing steel, 2,064 lin.ft. timber pile and 35,783 cu.yd. gravel and clay, cost $126,111. Noted April 1.

★Okla., Okemah—City let contract paving various streets in Dists. 2 and 3, to M. A. Swatek & Co., 412 Security Bldg., Oklahoma. About $120,000. Noted Feb. 19.

★Nevada—State Highway Dept., Carson City, let contract paving 8.25 mi. highway from Washoe Summit to 1 mi. south of Huffakers, Washoe Co., to Pacific States Constr. Co., 306-8 Call Bldg., San Francisco, $135,822. Noted April 22.

★Washington—State Highway Dept., Olympia, let contracts improving 5.49 mi. Kamilche-Mill Creek Rd., Federal Aid Project 67, Mason Co., from Sta. 170 to Sta. 464, involving 14.93 acres clearing and grubbing, 53,046 cu.yd. common, 1,420 cu.yd. loose and 770 cu.yd. solid rock excav., 32,187 cu.yd. overhaul, 3,990 cu.yd. gravel surfacing, 22.24 cu.yd. 2nd class concrete, etc., to Allred, James & Hendricks, Box 826, Centralia, $73,400; 3.96 mi. Jackson Prairie-Ethel Rd., Federal Aid Project 70, Lewis Co., 18.7 acres clearing, 12.3 acres grubbing, 40,280 cu.yd. excav., 131,460 cu.yd. overhaul, 10,260 lb. reinforcing bars, etc., to Hendricks, Finstead & Hendricks, 1304 Main St., Chehalis, $62,681.

★Washington—State Highway Dept., Olympia, let contract gravel surfacing, Olympic Highway, from Kamilche to Mill Creek, Mason Co., to Allred, James & Hendricks, Chehalis, $73,400. Work involves 53,046 cu.yd. excav., 3,990 cu.yd. gravel surfacing, 7,200 lb. reinforcing steel, etc

★Washington—State Highway Comn., Olympia, let contract clearing, grading, draining and surfacing 4 mi. Natl. Park Highway from Jackson Prairie to Ethel, involving 40,280 cu.yd. excav., 131,460 cu.yd. overhaul and 10,260 lb. steel, to Hendricks, Firstad & Hendricks, Chehalis, $62,681.

★Wash., Seattle—City let contract building curbs and concrete walks on East Edmunds St. et al. to Stilwell Bros., Boston Blk., $26,998. Noted May 27.

★Wash., South Bend—Pacific Co. let contract grading and paving 2½ mi. Ocean Beach Highway, West from Lebam, also 4 mi. concrete paving from East Raymond to Gieseys crossing, to Albers & Son, Chehalis, $67,046 and $88,438 respectively.

Ore., Portland—City received bids May 12, improving (a) 29th Ave. from 50th St. S. E. to 55th St. S. E., (b) 88th St. S. E. from 65th Ave. S. E., to Foster Rd. (c) portions of 45th St. S. E. and 53d Ave. S. E., (1) asphaltic concrete No. 1, 2 in. top, on crushed rock base, 4 in. in roadway, (2) macadam in roadway, crushed rock, from Municipal Paving Plant, (a1) $1.85 per sq. yd., total $17,631, (c1) $1.95 per sq. yd., $5,409; Zimmerman, Burnes & Oliver, 488 East Burnisde St., (b2) $5.45 per cu yd., $18,522; Warren Constr. Co., Journal Bldg., (c1) $2.46 per sq.yd., $5,927.

★Cal., Los Angeles—City let contract improving 39th St., involving 113,643 sq.ft. 2 in. asphaltic surface on 5 in. bituminous base, 114,700 sq.ft. grading, 1,065 sq.ft. concrete paving, 11,334 sq.ft. concrete guttering, etc., to Los Angeles Paving Co., 2900 Sante Fe Ave., $40,027.

★Cal., San Diego—Bd. Supervs. San Diego Co let contract paving 6 mi. Lemon Grove Rd. 418 ft. wide, 5 in. Portland cement concrete, to Kier Constr Co., San Diego, $160,723. Noted May 6.

Que., Montreal—City received bids paving (a) St. Hubert St. from Decarries to Cremazie Sts., (b) St. Denis from Decarries to Isabeau Sts., (c) Decarries St. from St. Denis to St. Hubert Sts., from E. Brault, (a) $227,542, (b) $258,203, (c) $54,038; Quinlan & Robertson, 260 St. James St., (a) $237,565, (c) $57,467; Sicily Asphaltum Paving Co., 60 St. Viateur St. E., (b) $303,667, (c) $54,734.

★Ont., Ottawa—City let contract to Standard Paving Co., Central Chambers, Elgin St., paving Catherine St. from Bank to Percy Sts., $30,277; Queen St. from Bay St. to Bronson Ave., $10,440; to City Engineering Dept., City Hall, paving Blackburn Ave. from Osgoode St. to point 163 ft. northerly, $2,477. A. F. Macallum, city engr.

★Ont., Carleton Co. let contracts paving Richmond Rd., asphalt and Merivale Rd., waterbound macadam, to Standard Paving Co., Central Chambers, Elgin St.

Railways

PROPOSED WORK

North Carolina — Roanoke-Salemburg R.R. Co., Dunn, receives bids about Sept. 1, building 35 mi. railroad from Dunn to Roseboro. About $750,000.

Ontario—Temiskaming and Northern Ontario Ry. Comn., 56 Church St., Toronto, plans to purchase additional track material, $100,000; additional yard tracks, $40,000; new sidings and spur tracks, $60,000; additional locomotives, $225,000; locomotives, superheaters, coal boxes, etc., $69,500; additional weight of rail and improved fastenings, $45,000; widening cuts and fills, $10,000; fencing right of way, $25,000, change of line for reduction of grade and curvature, $10,000; road machinery and tools, $10,000; shop tools for North Bay, $45,000; coal plants at North Bay and Englehart, $60,000; additional telephone circuits between North Bay and New Liskeard, $20,000; renewing telegraph and telephone pole line equipment and stringing circuit from Matheson to Porquis Jct., $5,000; 5 metallic telephone circuits from Swastika to Kirkland Lake, $2,500; telephone line from Cobalt to Porquis Jct., $25,800. S. B. Clement, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates Award of contract)

New York—Dept. Pub. Welfare, Municipal Bldg., New York City, received only bid May 24, furnishing labor and material building new automatic coal railway and trestle, at power house of Metropolitan Hospital, Blackwells Island, from P. T. Cox Contg. Co., 150 Nassau St., New York City, $28,000.

★Missouri—St. Louis & San Francisco R.R., Frisco Bldg., St. Louis, let contract building 7 mi. single track alongside of present track, including concrete culverts, 2 steel and rein.-con. bridges, embankments and cuts, to List & Gifford Constr. Co., 415 Ry. Exch. Bldg., Kansas City, Mo.

★Oklahoma—F. Ringer, ch. engr., Missouri, Kansas & Texas Ry., Ry. Exch. Bldg., St. Louis, Mo., let contract rearranging and extending yards at Osage, including grading, building rein.-con. trestle and ballasting 5 mi. yard tracks, to List & Gifford Constr. Co., 415 Ry. Exch. Bldg., Kansas City, Mo.

Excavation and Dredging

PROPOSED WORK

O., Canton—Dredging—City voted $365,000 bonds to improve and dredge east creek.

Cal., Hanford — Reclamation — Bd. Supervs. Kings Co. approved plans for reclamation of Tulare Recl. Dist. 749. About $133,751. L. J. Israel, secy.

BIDS DESIRED

Ia., Council Bluffs—Ditch—Until June 16, by G. A. Burke, aud. Pottawattamie Co., building Farm Creek Ditch and laterals, Pottawattamie and Mills Counties.

Ia., Ft. Dodge—Drain—Until June 22, by C. A. Snook, aud. Webster Co., furnishing labor and material building tile drains at upper end of Joint Drain 16, Webster Co., also Drain 31 or 247, Calhoun Co., involving 3,500 ft. 15-32 in. double strength tile, 18,867 ft. 8-32 in. tile, 66 ft. 8-12 in. sewer pipe, etc. R. B. Dixon, aud Calhoun Co.

Ia., Onawa—Drain—Until June 8, by J. J. Riddle, aud. Monona Co., furnishing labor and material improving Upper Soldier River D.D. 29, involving 1,342,524 cu.yd. excav. and 1,900 ft. 15 in. drain tile in Sects. 1-27. C. Moriarty, United Bank Bldg., Sioux City, engr.

Ia., Waverly—Drainage—Until June 16, by F. Boedeker, aud. Bremer Co., furnishing labor and material building tile main and sub-mains on D. D. 7, involving 12,428 ft. 6-22 in. tile, bulkheads, inlets and manholes.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New York—Dredging—M. Hulbert, comr. docks, Pier "A," foot of Battery Pl., received bids May 28, dredging (a) from Piers 58 to 65, North River, (b) from 28 to 52, East River, from F. E. Jones, 17 Battery Pl., (a) $49,200, (b) $44,100; Columbia Dredging Co., (a) $50,840. Noted May 20.

N. Y., Rochester—Excavation—E. S. Walsh, supt. Dept. Pub. Wks., Capitol, Albany, received only bid May 18, completing excavation of canal channel in Genesee River and placing rock spoil protection between Elmwood Ave. and Clarissa St. Bridges, here, Constr. 202 (Revised), from J. Stewart Co., 30 Church St., New York City, $547,500. Noted April 22.

★Massachusetts — Dredging — Commonwealth of Massachusetts, 413 State House, Boston, let contract dredging in Scituate Harbor, Scituate Twp., to Bay State Dredging & Contr. Co., 62 Condor St., East Boston. About $30,000.

★Ia., Ft. Dodge—Drain—Webster Co. let contract building Drain 312, involving 18,590 ft. tile, to C. Kramme, Ft. Dodge, and Humboldt Gravel & Tile Co., Humboldt. Noted May 6.

Industrial Works

PROPOSED WORK

Mass., Boston—Tuck & Gilman, archts. and engrs., 34 School St., soon lets contract building 2 story, 75 x 200 ft., rein.-con. garage, concrete flooring and foundation, on Fordham Rd., for L. K. Alintack, c/o architects. About $150,000. Noted May 6.

Mass., Hudson—H. M. Hope Eng. Co., archts. and engrs., 185 Devonshire St., Boston, soon lets contract building 5 story, 60 x 100 ft., rein.-con. or mill construction factory, rein.-con. flooring, for Apsley Rubber Co. About $125,000.

Mass., Springfield—Pabco Flour Mills, 52 Bliss St., having plans prepared by Andrews, Tower & Lavelle, archts., 33 Lyman St., for large flour mill, on Margaret St. P. A. Breglio, pres.

Mass., Worcester—T. Hanson, 873 Main St., having plans prepared by E. T. Chapin, archt., State Mutual Bldg., for 2 story, 90 x 90 ft., brick and rein.-con. garage, rein.-con. flooring, concrete foundation. About $75,000.

R. I., Bristol—Cranston Worsted Co., 180 Thames St., having plans prepared by Jenks & Ballou, archts. and engrs., 1035 Grosvenor Bldg., Providence, for 4 story, factory, 100 x 134 ft., brick and mill construction, rock foundation. About $160,000.

Conn., Hartford—C. F. Luce, archt., 36 Pearl St., soon lets contract building 7 story, 147 x 150 ft., garage, showroom, club and office, brick, concrete and steel, rein.-con. flooring, concrete foundation, on Hicks and South Ann Sts., for Hartford Automobile Club Garage Co., 36 Pearl St. About $500,000.

Conn., New Britain—B. Jahn Mfg. Co., 6 Chestnut St., purchased large site on Cherry and Ellis Sts. and plans to build factory. Architect not selected.

N. Y., Brooklyn—Ballinger & Perrott, archts. and engrs., 47 West 34th St., New York City, receives bids about June 12, building brick, steel and concrete bakery, rein.-con. flooring, concrete foundation, on Nevins and Butler Sts., for New York Pie Baking Co., 82 Sullivan St. About $200,000. Noted May 27.

N. Y., Brooklyn—F. Savignano, archts., 6005 14th Ave., preparing plans for 2 story, 73 x 200 ft., brick and steel garage, rein.-con. garage, concrete foundation, on Bedford Ave. About $80,000. Owner's name withheld.

N. Y., Cazenovia—Monks & Johnson, archts. and engrs., 99 Chauncey St., Boston, soon let contract building 2 story, 60 x 160 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, for Diepress Co. About $70,000

N. Y., Long Island City—Horizontal Hydraulic Hoist Co., 35 25th St., Milwaukee,

Industrial Works (Continued)

Wis., plans to build 1 story, 100 x 150 ft., brick and concrete or mill construction service station, concrete flooring and foundation, here. Architect not selected.

N. Y., New York—H. Kline, 532 West 54th St., having plans prepared by S. J. Kessler, archt. and engr., 529 Cortlandt Ave., for two 1 story, brick and steel garages, rein.-con. flooring, concrete foundations, on 54th and 55th Sts. About $90,000.

N. Y., Rocky Point—Radio Corp., Woolworth Bldg., New York City, having sketches made by J. G. White Eng. Corp., engrs., 43 Exch. Pl., New York City, for wireless station, to consist of several buildings and power house, here. About $10,000,000.

N. J., Hartford—Home & Tourists Candy Co., c/o Bachoff, Jones & Cook, archts., Union Bldg., Newark, having plans prepared for 2 story, brick factory. About $50,000.

Pa., Pittsburgh — Pittsburgh Screw & Bolt Co., Preble Ave., having plans prepared by A. McKee, archt., c/o owner, for 2 story, rein.-con., brick and steel factory, rein.-con. flooring, to have 39,000 sq.ft. floor space. About $350,000.

Md., Baltimore — Delion Tire Co., 131 West Mt. Royal Ave., having plans prepared by J. O. Hunt, archt., 114 North Montgomery Ave., Trenton, N. J., for 1 story, 90 x 400 ft. and 2 story, 60 x 70 ft., concrete, brick and steel factory, power plant and office, rein.-con. flooring, concrete foundation. About $100,000.

Md., Baltimore—Wizard Check Indorser & Printing Machine Co., Inc., 457 Calvert Bldg., plans to build fireproof factory, on Key Highway and Fort Ave. About $300,000. F. S. Weise, pres.

Ky., Louisville — Peerless Pencil Co. plans to build factory. About $200,000.

Ky., Louisville—W. E. Ross receiving bids building 5 story, concrete and steel garage, at 2-3 Market St. About $100,000. Gaffney & Epping, Louisville, archts. and engrs. Noted April 15.

O., Cleveland—See "Buildings."

O., Lakewood (Cleveland P. O.)—White Sewing Machine Co., East 79th St. and St. Clair Ave., plans to build 3 story, brick, steel and concrete factory, rein.-con. flooring, concrete foundation, along tracks of Nickel Plate R.R. near Detroit Ave. About $200,000. Architect and engineer not selected.

O., Warren—Trumbull Cliffs Furnace Co., Rockefeller Bldg., Cleveland, having plans prepared by Freyn Brassert Co., engrs., 122 South Michigan Ave., Chicago, for 1 story, 600 ton capacity blast furnace, brick, steel and concrete rein.-con. flooring, concrete foundation. About $1,000,000.

Mich., Marysville—Wills-Lee Corp., Book Bldg., Detroit, plans to build 1 story, 200 x 360 ft. auto factory, concrete, brick and steel, rein.-con. flooring, concrete foundation, here. Smith, Hinchman & Grylls, Washington Arcade, Detroit, archts.

Wis., Milwaukee—Globe Electric Co., 193 Bway., soon receives bids building 1 story, 100 x 200 ft., brick and steel machine shop, concrete flooring and foundation, on Keefe Ave. Private plans.

Wis., Milwaukee—Home & Tourist Candy Co., c/o Bachoff, Jones & Cook, archts., Union Bldg., Newark, N. J., having plans prepared for 2 story, brick factory. About $50,000.

Wis., Milwaukee—Packard Motor Car Co., Blvd. and Belt Line, Detroit, Mich., plans to build 1 story, 80 x 200 ft., brick and steel garage and repair shop, concrete flooring and foundation, on 35th St., here. Architect and engineer not selected.

Wis., Racine—S. C. Johnson & Son, 1012 16th St., receives bids about June 4 building 4 story, 60 x 160 ft., brick and concrete, warehouse and varnish plant, concrete foundation, on 16th St. Guilbert, Robinson Blk., archt. Kalbperry Corp., 31 Union Sq. W., New York City, engrs.

Okla., Okmulgee—J. M Moore having plans prepared by Smith, Rea, Lovitt & Senter, archts., Parkinson Bldg., for 4 story, 100 x 100 ft., brick, rein.-con. and steel garage, rein.-con. flooring, concrete foundation. About $250,000.

Wash., Seattle—G. C. Lemcke & Co., Lippy Bldg., plan to build 4 story, 82 x 145 ft. auto truck terminal, rein.-con. rein.-con. flooring, on Railroad Ave. and Railroad Way. About $100,000. H. Bittman, Securities Bldg., engr.

Cal., Burbank — Burbank Development Co., 206 West San Fernando St., having plans prepared by H J. Knauer, archt., 1129 Story Bldg., Los Angeles, for 1 story, 62 x 142 ft. and 2 and 3 story, 52 x 114 ft. soap factories, brick and steel, concrete foundations, on Verdugo Ave. About $200,000. A. Jergens Co., Spring Grove Ave. and Alfred St., Cincinnati, O., lessee.

Cal., Los Angeles—Wilson & Co., 1000 Lyon St., plans to build oleo factory. About $100,000.

Cal., Pomona—C. R. May having plans prepared by R. H. Orr, archt., 1301 Van Nuys Bldg., Los Angeles, for 137 x 142 ft. garage, on Holt and Garey Aves.

Cal., San Francisco—Lipton Tea Co., 561 Mission St., plans to build plant. About $500,000. S. Q. Grady, mgr. Architect not selected.

Ont., Toronto — Hydro Electric Comn., University Ave., plans to build plant either here or at Hamilton. First unit to cost between $1,500,000 - $2,000,000. F. A. Gaby, Hydro Bldg., University Ave., engr.

BIDS DESIRED

Md., Baltimore — Until June 15, by J. Freund, archt., 1307 St. Paul St., building 3 story, 24 x 40 x 53 x 59 ft., brick and steel warehouse, rein.-con. flooring, concrete foundation, on 805-11 Plowman St., for N. Davis & Co., 19 South Front St. About $100,000.

Md., Baltimore—C. Read & Co., 16 North Greene St., receiving bids building 4 story, 19 x 73 ft., brick and concrete warehouse, concrete foundation, on 16 North Greene St. About $100,000.

Ky., Louisville—Prince Wells Motor Co. having plans prepared by E. T. Hutching, archt., Columbia Bldg., for 74 x 200 ft. garage, on 3rd St. and Bway. About $100,000. Noted April 15.

O., Akron—Until June 5, by Akron Grocery Co., Mill and Summit Sts., building 5 story, 100 x 210 ft., brick, steel and concrete warehouse, rein.-con. flooring, concrete foundation. About $250,000. Harpster & Bliss, Nantucket Bldg., archts.

O., Cleveland—Until June 5, by Fulton-Taylor & Cahill, arcbts., 8120 Euclid Ave., remodeling and building 2 story, 70 x 100 ft., brick and steel addition to factory on East 27th St. and Woodland Ave., for Mendelsohn Co., 2110 Woodland Ave. About $50,000.

O., Lorain—Until June 10, by J. C. Newman Cigar Co., 3803 Woodland Ave., remodeling and building 2 story, brick and steel addition to factory. About $50,000. Fulton-Taylor-Cahill, 8120 Euclid Ave., archts., Cleveland. Noted March 25.

Ill., Marseilles—Until June 7, by A. G. Zimmerman, archt., 85 9th Ave., New York City, building 8 story, warehouse and manufacturing plant, rein.-con. and steel, rein.-con. flooring, concrete foundation, here, for Natl. Biscuit Co., 10th Ave. and 15th St., New York City. About $800,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Vt., St. Johnsbury—A. H. McLeod Milling Co., Mill St., let contract building addition to plant, to W. G. Cox, St. Johnsbury. About $50,000. Noted March 4.

★Mass., Athol—L. B. Taylor, 521 Main St., will build 2 story, 50 x 140 ft., brick and concrete factory, rein.-con. flooring, concrete foundation. About $55,000. Owner's name withehld.

★Mass., Brockton—Puritan Shoe Mfg Co., 263 North Main St., will build 3 story, 50 x 170 ft., rein.-con. factory, rein.-con. flooring. About $125,000. Work will be done by day labor under supervision of Tuck & Gilman, arcbt. and engrs., 34 School St., Boston. Noted April 8.

★Mass., Campello (Brockton P O)—Plymouth Co. Ideal Factory Corp., Brockton, let contract building 4 story, 50 x 290 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, here, to M. D. Long, 227 West Elm St., Brockton. About $225,000.

★Mass., East Cambridge (Boston P. O.)—Standard Oil Co. of New York, 50 Congress St., Boston, let contract building 3 story, 50 x 100 ft., rein.-con. plant, rein.-con. flooring, concrete foundation, on Binney St., here, to S. C. Sperry Co., 300 Main St., Cambridge. About $80,000.

★Mass., Lowell—G. R. Dana, 2 East Merrimack St., let contract building 1 story, brick and rein.-con. garage, rein.-con. flooring, concrete foundation, to Edwards & Monahan Co., 6 Beacon St., Boston. About $125,000.

★Mass., Rockland—Tuck & Gilman, archts. and engrs., 34 School St., Boston, will build 2 story, 60 x 110 ft., rein.-con. warehouse, rein.-con. flooring, concrete foundation. About $50,000. Work will be done by day labor under supervision of architects. Owner's name withheld. Noted May 20.

★Mass., Roxbury (Boston P. O.)—D. Fineberg, Old South Bldg., Boston, will build 1 story, brick and rein.-con. garage, rein.-con flooring, concrete foundation, on Humboldt Ave. About $100,000. Work will be done by day labor.

★Mass., Springfield — United Electric Light Co., 73 State St., let contract building 3 story, 58 x 90 ft., power house and lighting substation, on North and Carew Sts., to A. E. Stephens Co., 73 State St. About $100,000.

★Conn., Bridgeport—Bryant Electric Co., 1421 State St., let contract building 4 story, 60 x 130 ft., brick, concrete and steel addition to factory, concrete foundation, to W. Martin & Son, 164 State St. About $125,000.

★Conn., Bridgeport—Bryant Electric Co., 1421 State St., let contract building 4 story, 60 x 160 ft. storehouse, with 60 x 66 ft. ell, brick, concrete and steel, rein.-con. flooring, concrete foundation, on Organ St., to W. Martin & Son, 164 State St. About $200,000. Noted April 22.

★N. Y., Brooklyn—F. Huber, 314 Park Ave., let contract building 2½ story, 100 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Grand Ave., to L. Dornbach, 1669 Myrtle Ave. About $50,000. Noted April 8.

★N. Y., Brooklyn—Knitwear Mfg. Co., 114 5th Ave., New York City, will build 4 story, 90 x 100 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Jefferson Ave., here. About $150,000. Work will be done by day labor.

★N. Y., Brooklyn—F. McCurdy, 189 Montague St., will build 1 story, 100 x 150 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Empire Blvd. and Bedford Ave. About $50,000. Work will be done by day labor.

★N. Y., Buffalo—Amer. Car & Fdry. Co., 383 Babcock St., let contract constructing 2 story, 50 x 211 ft. service building and 2 story, 50 x 140 ft. truck shop, brick and steel, to J. W. Cowper Co., Inc., Fidelity Bldg. About $80,000 and $60,000 respectively.

★N. Y., Buffalo—Crosby Co., 183 Pratt St., let contract building 1 story, brick and steel addition to factory, to B. I. Crooker Co., Builders' Exch. About $100,000.

★N. Y., Hudson Falls—Union Bag & Paper Co. let contract building 4 story, 93 x 390 ft., brick, concrete and steel mill, rein.-con. flooring, concrete foundation, to G. A. Fuller, 195 5th Ave., New York City. About $70,000.

★N. Y., Long Island City—W. Klein Iron Wks., 65 Bway., will build 2 story, brick and steel factory, rein.-con. flooring, concrete foundation, on Vernon and Webster Aves. About $55,000. Work will be done by day labor.

★N. Y., New York—C. Glaser and H Weprin, 22 East 105th St., will convert 6 story building at 145 West 27th St., into factory. About $60,000. Work will be done by day labor.

★N. Y., New York—O. Schwarzler, 1100 Brcok Ave., will build 7 story, 50 x 100 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, at 1006 Brook Ave. About $180,000. Work will be done by day labor.

★N. Y., New York—Tremont—Webster Bldg., Co., 1662 Boston Rd., will build 3 story, 150 x 200 ft., brick and steel addition to garage, on 187th St. and Concourse. About $250,000. Work will be done by day labor.

★N. Y., New York—V. Vivaudou, Inc. Times Bldg., let contract constructing group of rein.-con. and steel factories, rein.-con. flooring, concrete foundation on Southern Blvd. and Leggett Ave., to J. M. Brody, c/o Natl. Ice & Coal Co., 103 Park Ave. About $1,000,000.

★N. Y., New York—M. B. Schmidt, archt. and engr., 14 East 46th St., let contract to Ruggles-Robinson, 331 Madison Ave., building 4 story, 50 x 50 ft. paint factory, rein.-con. and steel, rein.-con. flooring, concrete foundation, for W Zinsser, West 59th St About $50,000. Noted May 27.

★N. Y., Oswego—Arrowhead Paper Mills let contract building 2 story, 160 x 200 ft., addition to paper mills at Battle Island, to Culkin Contg. Co., Oswego. About $200,000.

★N. J., Newark—R. Heller Co., 299 Plane St., let contract building 2 story, 100 x 100 ft., rein.-con. and brick garage, on Plane and James Sts., to Essex Constr. Co., 85 Academy St. About $100,000.

★N. J., Trenton—Thermoid Rubber Co., Whitehead Rd., let contract building 2 story, 81 x 201 ft. addition to factory, to Karno-Smith Co., Broad St. Bank Bldg. About $175,000.

★Pa., Florin — Nissley Sons Chocolate Co let contract building 4 story, 50 x 100

Industrial Works (Continued)

ft., rein.-con. factory, to J. H. Wickersham, Bren Bldg., Lancaster. About $60,000.

★**Md., Baltimore**—Baltimore & Ohio R.R., Baltimore and Charles Sts., let contract building 1 story, 28 x 140 ft. and 12 x 42 ft., brick, steel and concrete car shop, office and tool room, concrete foundation, on Pratt and Poppleton Sts., to Frainie Bros. & Haigley, 18 Clay St. About $100,000.

★**Md., Baltimore**—Maryland Color Printing Co., Holliday and Hillen Sts., let contract building 17 story, 100 x 110 x 135 ft., rein.-con. and steel plant, composition flooring, concrete foundation, to Consolidated Eng. Co., 243 Culvert Bldg. About $2,000,000.

★**Md., Cumberland**—Crystal Laundry Co., Baltimore St., let contract building 1 and 2 story, 130 x 284 ft., concrete, steel and brick laundry, garage and power house, rein.-con. flooring, concrete foundation, to W. J. Morley, 98 Bedford St. About $200,000.

★**Md., Cumberland**—Kelly Springfield Tire Co., River Rd., let general contract building 3 and 4 story, 575 x 620 ft. rubber tire plant, concrete, steel and brick, concrete foundation, to Hunkey-Conky Constr. Co., New Century Bldg., Cleveland, cost plus percentage basis: furnishing and installing 8,000 H.P. water tube boilers and two 5,000 K.W. turbine generating sets, operating at 175 lb. pressure, 100 degrees super-heat and condensing; complete plumbing and electrical equipment for boiler house, power house, pumping station and main factory building, to Riggs, Distler & Stringer, Inc., 216 North Calvert St., Baltimore. Total cost between $2,000,000 and $3,000,000.

★**O., Cleveland**—Amer. Steel & Wire Co., Western Reserve Bldg., let general contract building 1 story, 50 x 130 ft., brick and steel boiler house, rein.-con. flooring, concrete foundation, on Lakeside Ave., to Drummond-Miller Co., 4500 Euclid Ave., Cleveland.

★**O., Cleveland**—C. F. Hanger Co., 6520 Carnegie Ave., let contract building 1 story, 65 x 272 ft., brick and rein.-con., factory, rein.-con. flooring, brick foundation, at 2046 East 71st St., to Paul Bros., Citizens' Bldg.

★**Mich., Detroit**—Ewing Bolt & Screw Co., Farwell Bldg., will build 1 story, 48 x 240 ft., structural steel and brick factory, rein.-con. flooring, concrete foundation. About $350,000. Work will be done by day labor. Noted April 1.

★**Ill., Chicago**—Barco Mfg. Co., 212 West Illinois St., let general contract building 1 story, 150 x 180 ft. rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on Argyle St. and Ravenswood Ave., to W. Mayor Co., 72 West Adams St. About $125,000.

★**Ill., Chicago**—Gartland-McCarthy Co., let contract constructing 1 story, 60 x 100 ft., core building, 1 story, 90 x 260 ft., warehouse, 2 story, 40 x 40 ft. foundry, also 1 story, 121 x 300 ft. foundry with cupola wing; all brick and steel, concrete foundations, on Lawndale Ave. and 33rd St., to Austin Co.; 208 South LaSalle St. About $200,000.

★**Wis., West Allis** (Milwaukee, P. O.)—Interstate Steel & Mfg. Co., 705 South Pierce St., Milwaukee, will build 1 story, 80 x 200 ft., brick and steel fabricating shop, concrete flooring and foundation, on 47th and Rogers Sts., here. Work will be done by day labor.

★**Minn., St. Paul**—Montgomery Ward & Co., Chicago Ave. and Larrabee Sts., let contract building 8 story warehouse, on Snelling Ave., here, to Wells Bros. Constr. Co., 901 South Canal St., Chicago. About $2,500,000; cost plus basis.

★**Mo., St. Louis**—St. Louis Mall Casting Co., 7701 North Conduit St., let contract building 1 story, 40 x 100 ft., and 100 x 164 ft. concrete, steel and brick foundry, at 347-411 Thatcher St., to F. Colnon Constr. Co., Merchants Laclede Bldg., About $120,000.

★**Cal., Los Angeles**—Oil Mining Equipment Co., 2026 Sante Fe Ave., will construct group of factories to include 80 x 547 ft. main building with 60 x 150 ft. wing, 20 x 200 ft. shed, boiler house, etc., brick and galvanized iron concrete foundations. Work will be done by day labor.

Buildings

PROPOSED WORK

Mass., Athol—Church—St. Francis Lithuania Society plans to build 1 story, brick and stone, on Main St. About $100,000. A. Petraitis, pastor. Architect not selected.

Mass., Chicopee—Business—G. P. Dion, archt., 30 Center St., soon lets contract altering Clymer Blk., on Miller and Exchange Sts., timber and steel, for Chicopee Commercial Corp. About $125,000. Noted May 13.

Mass., Haverhill—School—Bd. Educ. soon lets contract building 3 story, 40 x 130 ft., brick and steel, concrete flooring and foundation, on Grove St. About $100,000. C. D. White, 191 Merrimac St., archt.

Mass., Holyoke—Home—Holyoke City Hospital, Beech St., plans to build 3 story, brick, concrete and steel. About $125,000. Architect not selected.

Mass., Mansfield — Housing — Mansfield Housing Corp., c/o Bonelli, Adams & Co., 60 State St., Boston, soon lets contract building fifty 1 and 2 story, frame houses for workmen, concrete foundations, here. About $250,000. Private plans.

Mass., Worcester—Administration—J. D. Leland, archt., 185 Devonshire St., Boston, soon lets contract bilding 4 story, 200 x 210 ft., brick and rein.-con., rein.-con. flooring, concrete foundation, on Duncan Ave., for Reed & Prince Mfg. Co. About $500,000. Noted April 15.

Conn., Danielson—School—Killingly Twp. rejected bids received May 12, building 2 story, 90 x 150 fft., brick and concrete, on School St., here. About $100,000. N. L. Greig, chn. Noted May 6.

Conn., Waterbury — Armory — State Military Emergency Bd., State Armory, Hartford, rejected only bid received May 15, building 4 story, 180 x 200 ft., on Field St., here. About $400,000. Work will be readvertised. Noted May 6.

N. Y., Brooklyn—Theatre—W. Small, 189 Montague St., having plans prepared by E. DeRosa, archt. and engr., 110 West 40th St., New York City, for brick and stone, brick foundation, on Grand Ave. Extension. About $500,000.

N. Y., Buffalo—Institution—Canisius College, Main and Jefferson Sts., plans to build 2 brick and steel wings. About $1,000,000. M. J. Ahern, pres.

N. Y., New York—Bank, Office and Stores—S. W. Straus & Co., 150 Bway., having plans prepared by Warren & Wetmore, archts. and engrs., 10 East 47th St., for 9 story, 100 x 180 ft., brick, steel and stone, concrete foundation, on 5th Ave. and 46th St. About $4,000,000.

N. Y., New York—Hospital—Beth David Hospital, 1326 Lexington Ave., soon receives bids building brick and stone addition, brick foundation. About $150,000. B. Levingson, 166 East 43rd St., archt. and engr.

N. Y., New York—Loft—Herzig Mercantile Co., c/o Keeler & Fernald, archts., 203 West 13th St., soon receives bids building 8 story, brick, steel and stone, concrete foundation, at 251 West 27th St. E. E. Seelye, 101 Park Ave., engr.

N. Y., New York—Office—Natl. Drug Stores Corp., 405 Lexington Ave., having sketches made by C. H. Seymour, archt. and engr., 405 Lexington Ave., for 22 story, brick, steel and stone, concrete foundation, on 42nd St. and 5th Ave. About $3,000,000.

N. Y., Wende (Millgrove P. O.)—Home—E. F. Jaeckle, clk. Bd. Supervs., Erie Co., Buffalo, rejected bids received April 20, building Erie Co. Home, here. Work will be readvertised in September. Noted April 29.

Pa., Morrellville (Johnstown P. O.)—Theatre and Business Block—J. Farkas & Sons, A. Joe and P. Farkas, soon receive bids building 3 story, 100 x 115 ft., brick, rein.-con. flooring, concrete foundation. About $100,000. M. Nirdlinger, Empire Bldg., Pittsburgh, archt.

Pa., New Castle—Gymnasium—Westminster College soon receives bids building 4 story, brick, to contain basketball floor, running track, gallery, and 22½ x 600 ft. swimming pool. About $100,000. O. C. and A. L. Thayer, New Castle, archts.

Pa., Phila.—Office—Franklin Trust Bldg., 20 South 15th St., having plans prepared by De Armond, Ashmead & Bailey, archts., Franklin Trust Bldg., for 11 story, 20 x 90 ft., rein.-con., brick and steel addition. About $500,000.

Pa., Phila.—Sales, etc.—L. B. Rothchild, archt. and engr., 1225 Sansom St., soon receives bids constructing 2 story, 70 x 120 ft., sales and service building, stone and concrete, on 22nd and Chestnut Sts., for Diesinger Motors Co., 1827 Chestnut St.

Pa., Reading—Theatre, Office and Store—Wilmer & Vincent, 1451 Bway., New York City, having plans prepared for 150 x 160 ft., brick and stone, brick foundation, on 10th and Penn Sts. About $650,000. Private plans

Pa., Scranton—Theatres—D. J. Bondy, 80 Wall St., New York City, having plans prepared by E. De Rossa, archt. and engr., 110 West 40th St., New York City, for remodeling theatre on Wyoming Ave., also building new one on Penn Ave., both brick and stone. About $100,000 and $250,000 respectively.

Del., Wilmington—Club House—B. P. O. E. plans to build concrete and stone. About $400,000. DeArmond, Ashmead & Bailey, Franklin Trust Bldg., Phila., archts.

D. C., Washington—Church—Greek Community of St. Sophia, 309 9th St. N. W., soon lets contract building 1 story, brick and limestone, on 8th and L Sts. About $100,000. Donn & Demming, 808 17th St. N. W., archts. Noted March 25.

D. C., Washington—Science Hall and Office—Natl. Research Council, 16th and L Sts., plans to build 2 story, stone, on 22nd and B Sts. About $2,000,000. G. Goodue, 2 West 47th St., New York City, archt.

W. Va., Athens—Dormitory—State Bd. Educ., Charleston, had plans prepared by Tutts & Jones, archts., Charleston, for 3 story, brick, at State Normal School, here. About $120,000.

W. Va., Morgantown—Law—State Bd. Control, 403 Capitol St., Charleston, rejected bids received May 1, constructing 2 story, 55 x 137 ft., brick building, here. C. W. Bates, Natl. Bank Bldg., Wheeling, arch. Noted April 22.

W. Va., New Cumberland—Court House—Hancock Co. plans election in June to vote on $100,000 bonds to rebuild courthouse recently destroyed by fire.

N. C., Charlotte—Hotel—Citizens Hotel Co., Inc. plans to build hotel. About $1,000,000.

N. C., Wilmington—Hotel—Chamber of Commerce, Murchinson Bank Bldg., plans to build 10 story hotel, on Chestnut St. About $1,000,000. J. H. Cowan, Secy.

N. C., Winston Salem—Hospital—C. B. Keen, archt., Bailey Bldg., Phila., soon lets contract constructing 3, 3, 4 and 5 story, concrete, steel and brick buildings, for Memoriam Hospital. About $800,000. Noted May 13.

Ky., Louisville—University—University of Louisville, 111 West Chestnut St., plans to construct building. About $1,000,000.

O., Akron—Office—City plans to build 7 story, 85 x 125 ft., brick, stone and steel on High and Church Sts. Bonds for $900,000 voted for project.

O., Cleveland—Commercial, etc.—G. H. Greenberg, atty., Society for Savings Bldg., is interested in company which plans to construct 1, 3 and 5 story, commercial building, market house, garage and ice palace brick, steel and rein.-con., rein.-con. flooring, concrete foundation, on East 105th St. and Euclid Ave. About $1,500,000. Architect's name withheld.

O., Cleveland—Commercial—Knight-Norris-Gibbs Co., 1017 Euclid Ave., plans to build 4 story, on Superior Ave. and East 21st St., and 6 story, on St. Clair Ave. and East 21st St., both brick, steel and concrete, rein.-con. flooring, concrete foundation. About $200,000 and $350,000, respectively. Architect not selected.

O. Cleveland—Office—J. Babin and others 13661 Euclid Ave., plan to build 20 story, 50 x 151 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, at 310 Euclid Ave. About $2,000,000. Architects name withheld.

O., Cleveland Heights (Warrensville P. O.) —Schools—Village voted $2,400,000 bonds to build 3 brick, steel and concrete, rein.-con. flooring, concrete foundations. F. C. Warner, Hippodrome Annex Bldg., Cleveland, archt. Noted May 13.

O., Euclidville (Cleveland P. O.)—School—Bd. Educ. plans to build 1 story, 100 x 145 ft., brick steel and concrete, rein.-con. flooring, concrete foundation. About $150,000. F. Warner, Hippodrome Annex Bldg. Cleveland, archt.

Mich., Ashley—High School—Bd. Educ. plans to build 2 story, concrete, brick and steel, concrete foundation. About $200,000. M. E. Greene, secy. E. M. Wood, 516 Oakland Bldg., Lansing, archt.

Mich., Birmingham—School—Bd. Educ. having plans prepared by Baxter, O'Dell & Halpin, archts., 104 Hammond Bldg., Detroit, for 3 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Main St. About $200,000.

Mich., Detroit—Office—J. H. Kunsky, Madison Theatre Bldg., having plans prepared by C. H. Crane and E. G. Kiehler, archts., Huron Bldg., for 10 story, 100 x 155 ft., rein.-con. brick, steel and stone, rein.-con. flooring, concrete foundation, on Bway. Ave.

Mich., Detroit—Office—J. Stroh, 1676 Jefferson Ave., having plans prepared by Giaver, Dinkleberg & Ellington, archts. and

Buildings (Continued)

engrs., Book Bldg., for 18 story, 80 x 100 fft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Adams Ave., W., and Park St. Noted May 20.

Mich., Detroit—Theatre and Office—J. H. Kunsky, Madison Theatre Bldg., retained C. H. Crane and E. G. Kiehler, archts., Huron Bldg., to prepare plans for 6 story, 155 x 250 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Bway and Madison Aves.

Mich., Port Huron—School—Bd. Educ. having plans prepared by G. L. Harvey, archt., Military St., for 2 story, 100 x 130 ft., brick, steel and stone, brick foundation, on Court St. About $100,000.

Wis., Chippewa Falls—High School—Bd. Educ. rejected bid received May 24, building junior high school, 3 story, brick and concrete, rein.-con. flooring, concrete foundation. About $175,000. Work will be readvertised. Beers, Schlinz & Bailey, Monadnock Blk., Chicago, archts. Noted May 20.

Wis., Fond du Lac—High School—Bd. Educ. having plans prepared by Childs & Smith, archts., 64 East Van Buren St., Chicago, for 2 story, rein.-con. and brick, junior high school, rein.-con. flooring, concrete foundation. About $300,000.

Wis., La Crosse—Schools—Bd. Pub. Wks. rejected bids received May 12, building 90 x 145 ft. grade school, on 8th St., also 50 x 70 ft. and 60 x 150 ft. junior high school, on Avon St., both 2 story, rein.-con. and brick, rein.-con. flooring, concrete foundations, for School Bd. About $170,000 and $140,000 respectively. J. C. Llewellyn, 38 South Dearborn St., Chicago, and Parkinson & Dockendorff, Linker Bldg., archts. Noted April 22.

Wis., Milwaukee—Office—C. Toy, 172 2nd St., plans to build 2 story, rein.-con. and brick addition, rein.-con. flooring. About $100,000. Klug & Smith, Mack Blk., archts. and engrs.

Wis., Milwaukee — Theatre — Colonial Amusement Co., 1512 Vliet St., plans to build 1 and 2 story addition, rein.-con. and brick, rein.-con. flooring, concrete foundation. About $100,000. Kirchhoff & Rose, Majestic Bldg., archts.

Kan., Great Bend—Hospital—Sisters of St. Dominic having plans prepared by Barnett, Haynes & Barnett, archts., Century Bldg., St. Louis, Mo., for 3 story, 50 x 150 ft., brick, rein.-con. and steel, rein.-con. flooring, brick and concrete foundation. About $150,000.

Kan., Topeka — Exchange — Bell Telephone Co. plans to construct 3 story, 75 x 110 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $115,000. Architect to be selected at once.

Mo., Brookfield—School—Bd. Educ. soon receives bids building 2 story, rein.-con., steel and brick, rein.-con. flooring, brick and concrete foundation. About $105,000. W. E. Hulse, Hutchinson, Kan., archt. Noted Feb. 19.

Col., Glenwood Springs—School—City having plans prepared by E. G. Groves, archt., Foster Bldg., Denver, for new school, here. Bonds fofr $190,000 voted for project. Noted April 29.

Cal., Long Beach—Office—A. Marx, 25 15th Pl., plans to build 8 story, 50 x 141 ft., on Ocean Blvd. and Locust Ave. Architect not selected.

Cal., Long Beach—Y. M. C. A., 121 Locust St., rejected bids building 3 story, on American Ave. Project deferred until fall. Noted May 13.

Cal., Richmond — Schools — City voted $565,000 bonds to buy sites, build and equip 6 schools. Architect not selected.

Cal., San Diego—High Schools—Bd. Educ. having plans prepared by T. C. Kistner, archt., 814 Amer. Natl. Bank Bldg., for 2 high schools. About $350,000 each. Noted March 18.

Cal., Santa Clara—High School—Bd. Educ. plans election to vote on $200,000 bonds to build high school. Architect not selected.

N. B., St. John—Municipal—City having plans prepared for Municipal building to replace Court House. About $1,000,000. A. R. Wetmore, c/o dept. pub. wks., engr.

Que., Montreal—Bank—Merchants Bank, St. James St., receives bids in June, building 3 story, 40 x 110 ft., concrete, brick, steel and stone, concrete foundation, on St. Catherine and Drummond Sts. About $100,000.

Ont., Hearst—Court House—Dept. Pub. Wks., Toronto, soon receives bids building court house here. About $100,000. F. R. Heakes, Toronto, archt.

Ont., London—School—Bd. Educ. having plans prepared by L. V. Carrothers, archt., Hydro Bldg., constructing 3 story, 18-20 room, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Waterloo St. About $500,000. Noted May 6.

Ont., Ottawa—Hospital, Soldiers Home, etc.—Dept. Soldiers Civil Re-establishment, 22 Vittoria St., plans to build hospital, soldiers homes and sanitarium. About $300,129.

Ont., Ottawa—University—Oblat Fathers, Notre Dame St., Hull, receive bids about June 10, building 4 story, rein.-con. and stone, rein.-con. flooring, concrete and rock foundation, on Woller St. About $175,000. A. Rheaume, rector.

Ont., Toronto—Parliament—Dept. Pub. Wks., soon receives bids building additions to Parliament and Departmental Buildings. About $150,000. F. R. Heakes, Toronto, archt.

Ont., Whitby — Hospital — Dept. Pub. Wks., Toronto, soon receives bids constructing hospital buildings, here. About $250,000. F. R. Heakes, Toronto, archt.

Man., Winnipeg—Institute—S. C. Oxton, deputy minister of Pub. Wks., soon receives bids building deaf and dumb institute on University site. J. D. Atchison & Co., 914 Boyd Bldg., archts.

BIDS DESIRED

N. H., Manchester—High School—Until June 21, by city, building 4 story, 50 x 100 ft., brick. About $130,000. C. R. Witcher, Manchester, archt.

Mass., Boston—School—Until June 8, by School Dept., building 2 story, brick, concrete and steel addition to Michael Angelo School, rein.-con. flooring, concrete and brick foundation, on Charter St. About $350,000. C. H. Walker & Son, 71 Kilby St., archts. Noted April 15.

Mass., South Hanson—Hospital—Until June 8, by Comrs. Plymouth Co., Plymouth, building 2 story, frame, rock foundations, here. About $100,000. J. W. Beal, 62 Summer St., Boston, archt.

Mass., Wakefield—High School—Until June 7, (change of date) by Bd. Educ., building 3 story, 208 x 250 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation, on Main St. About $450,000. F. I. Cooper Corp., 33 Cornhill St., Boston, archts. Noted May 13.

Mass., Worcester—School—Until June 9, by School Com., building 2 story, 50 x 91 ft. addition to school on Rice Sq., and 1 story, 14 x 63 ft. boiler house, brick, concrete and steel, concrete foundations. About $100,000. G. T. Tribe, 5 Dixon Ave., archt.

N. Y., Brooklyn—School—Until June 8, by C. B. Snyder, supt. school bldgs., Municipal Bldg., New York City, building P. S. 185, easterly side of Ridge Blvd. from 86th to 87th Sts., here, for Bd. Educ., 500 Park Ave., New York City.

N. Y., Hawthorne—School—Until June 5, by Stephenson & Wheeler, archts. and engrs., 2 West 45th St., New York City, building 3 story, 100 x 125 ft., brick and stone, brick foundation, here, for H. S. Carter, 66 West 55th St., New York City.

N. Y., New York—Court—Until June 18, by Bd. Estimate & Apportionment, building foundations and superstructure of courthouse, on Centre, Worth, Baxter and Pearl Sts.

Pa., Media—Office and Bank—Until June 21, by C. M. Brazer, archt. and engr., 1133 Bway., New York City, building brick, steel and stone, brick foundation, for Media Title & Trust Co., 11 South St. About $300,000. Noted Jan. 29.

Md., Baltimore—Exchange—Until June 9, by McKenzie, Vorhees & Gmelin, archts., 1123 Bway., New York City, building concrete, brick and stone, concrete foundation, on Kate Ave., for Chesapeake & Potomac Telephone Co., 5 Light St. About $250,000.

N. C., Salisbury—Bank—Until June 17, by A. C. Bossam, arch. and engr., 680 5th Ave., New York City, building brick and stone, brick foundation, for 1st Natl. Bank. About $100,000. Noted May 20.

O., Akron—Hotel—Company, c/o Henry & Murphy, archts., 523 2nd Natl. Bldg., receiving bids building 8 story, 135 x 186 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East Market St. and Cambridge Ave. About $2,500,000. Mayer & Valentine, Bangor Bldg., Cleveland, engrs. Noted April 22.

O., Canton—High School—Until June 19, by Bd. Educ., building 2 story, 150 x 250 ft. yellow buff brick and limestone, on 14th St. and Oxford Ave. About $750,000. Noted May 27.

O., Canton—High School—Until June 19, by Bd. Educ., building 3 story, 140 x 250 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on 14th St. Thayer & Johnstone, 5716 Euclid Ave., Cleveland, archts.

Ind., Hammond—School—Until June 7, by Bd. Educ., building 1 story, brick, rein.-con. and steel school. About $100,000.

Mich., Blanchard—School—Until June 15, by C. F. Grim, clk. School Dist. 4, Rolland Twp., building 2 story, rein.-con. and brick, rein.-con. flooring, concrete foundation, here. About $100,000. J. N. Churchill, 514 Oakland Bldg., Lansing, archt.

Mich., Detroit—Church—Until June 20, by Stahl & Kinsey, archts., 435 Woodward Ave., building 2 story, 60 x 70 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Seyburn Ave., for Bethany Presbyterian Church, c/o architects. Noted May 13.

Ill., Chicago—Office—Holabird & Roche, archts., 104 South Michigan Ave., are receiving bids on revised plans building 4 story (ultimate 8 story) 66 x 128 ft., brick, steel and stone rein.-con. flooring, concrete foundation, for J. T. Ryerson & Son, 16th and Rockwell Sts. About $350,000. Noted May 6.

Ia., Ames—Club—Until June 10, by Wesley Foundation of Iowa, and Proudfoot, Bird and Rawson, archts., 810 Hubbell Bldg., Des Moines, constructing 2 story, 80 x 129 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $200,000.

Ia., Liberty Center—School—Until June 26, by Bd. Educ., building 2 story, 54 x 70 ft., brick, rein.-con. and steel, rein.-con. flooring, brick foundation. About $100,000. W. E. Hulse & Co., Securities Bldg., Des Moines, archts.

Ia., Mason City—Orphans' Home—Until June 9, by State I. O. O. F., building 2 story, 58 x 140 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $110,000. J. H. Felt & Co., 800 Grand Ave. Temple, Kansas City, Mo., archts. Noted April 1.

Ia., St. Marys—School—Until June 14, by Bd. Educ., building 3 story, 56 x 86 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $110,000. W. E. Hulse & Co., Securities Bldg., Des Moines, archts. Noted March 11.

Kan., Parsons—High School—Bd. Educ. receiving bids building junior high school, 2 story, 90 x 140 ft., with 36 x 60 ft. wing, brick, rein.-con. and stone, rein.-con. flooring, brick and concrete foundation. T. W. Williamson, 418 Central Bank Bldg., Topeka, archt. Noted Feb. 12.

Kan., Peabody—Hotel—Until June 8, by Forrester Hotel Co. building 3 story, 50 x 111 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. L. Schmidt & Co., 121 North Market St., Wichita, archts. Noted April 29.

Wyo., Rawlins—Hospital—Until June 24, by R. A. Magor, clk. Carbon Co., constructing new hospital building, here. Baerresen & Porter, Cheyenne, archts. Noted May 20.

Tex., McKinney—Sanitarium—Until June 8, by H. A. Finch, mayor, building 2 story, 40 x 90 ft., rein.-con. and steel, rein.-con. flooring, for city. About $110,000. C. H. Page & Bro., Austin Natl. Bank Bldg., Austin, archts. Noted April 22.

Okla., Cherokee—Court House—Until June 15, by Alfalfa Co., building 3 story, rein.-con., brick and stone, rein.-con. flooring, concrete foundation. About $110,000. Tonini & Bramblett, 301 Terminal Bldg., Oklahoma, archts.

Okla., Frederick—Court House—Until June 17, by Tillman Co., building 4 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $250,000. Tonini & Bramblett, 417 Terminal Bldg., Oklahoma, archts. Noted May 6.

Okla., Miami—School—Until June 22, by State Bd. Pub. Affairs, Oklahoma, building school of mines, here, 2 story, 59 x 99 ft., with two 23 x 57 ft. wings, rein.-con., brick and steel, rein.-con. flooring, concrete foundations. About $110,000. Hawk & Parr, Security Bldg., Oklahoma, archts. Noted April 1.

Wash., Seattle—School—Until June 14, by F. A. Naramore, archt., Central Bldg., constructing 2 story, 70 x 140 ft., rein.-con. and brick, for Bd. Educ. About $130,000.

Ore., Portland—Hospital—Until June 7, by Comrs. Multnomah Co., for masonry work for 5 story, 150 x 210 ft. brick, rein.-con. and terra cotta hospital and boiler house, rein.-con. flooring. About $800,000. Sutton & Whitney, Lewis Bldg., archts.

Cal., San Pedro—Hospital—Until June 11, by Harbor Hospital Assn. of San Pedro, 226 West 6th St., constructing new hospital building. Separate bids will be received for (1) excavating, concrete masonry, terra cotta, carpentry, iron work, etc., (2) sheet metal work, (3) composi-

Buildings (Continued)

tion roofing, (4) plastering, (5) painting, (6) elevator, (7) electrical work, (8) hardware, (9) plastone, (10) plumbing, (11) heating. Noted Feb. 12.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. H., Nashua—Church—W. F. Fontaine, archt., Federal Bldg., Woonsocket, R. I., let contract to Belanger & Son, Nashua, altering and building 1 story, brick and steel addition, on Hollis St., for St. Louis French Catholic Society, c/o architect. About $100,000. Noted April 15.

★Vt., Rutland—Armory—State Armory Comn., Montpelier, let contract building 1 story, 60 x 120 ft., and 2 story, 50 x 100 ft., brick and terra cotta, rein.-con. flooring, concrete foundations, here, to W. A. Wentworth Co., 15 Exchange St., Boston. About $200,000. Noted April 29.

★Mass., Boston — Mercantile — Holland System, Inc., 27 Haymarket Sq., let contract building 5 story, 60 x 150 ft., brick and steel, concrete foundation, wood flooring, on Washington and Bennett Sts., to H. G. Duff, York, Me. About $125,000. Noted April 29.

★Mass., Cambridge—College—Stone & Webster Eng. Corp., engrs., 147 Milk St., Boston, let contract to General Bldg. Co., 522 Harrison Ave., Boston, building 4 story, 60 x 180 ft., brick, limestone, concrete and granite, concrete flooring and foundation, on Massachusetts Ave., here., for Massachusetts Institute of Technology, Boylston St., Boston. About $600,000. Noted April 22.

★Mass., Malden (Boston P. O.)—School Beth Israel Synogogue, c/o S. S. Eisenberg, archt., 15 Court Sq., Boston, will build 2 story, 65 x 100 ft., brick, concrete and terra cotta, concrete foundation, on Almont St. About $100,000. Work will be done by day labor under supervision of architects. Noted May 20.

★Conn., Waterbury—Bank—Waterbury Trust Co., 132 Grand St., let contract remodeling building on Grand St., to G. A. Upham, West Main St. About $100,000. Noted April 22.

★N. Y., Albany—School Bd. Contr. & Supply let contract building P. S. 23, 2 story, 101 x 182 ft., brick and rein.-con., concrete foundation, on Whitehall Rd., to J. Dyer, Jr., 6 South Pearl St. About $240,000.

N. Y., Brooklyn—Hospital—Dept. Pub. Welfare, Municipal Bldg., New York City, received lowest 3 bids May 27, for general construction and electrical work excluding plumbing, heating and ventilating, for building New Cumberland St. Hospital, here, from D. E. Connors, $672,770; J. M. Knopp, 544 West 43rd St., New York City, $735,000; J. Meehan Co., 32 Cooper Sq., New York City, $716,500. Noted May 20.

★N. Y., Brooklyn—Market—Pub. Market of Flatbush, 1210 Flatbush Ave., let contract building brick, rein.-con. and steel, on Flatbush Ave., Duryea Pl. and East 22nd St., to R. Von Lehn Sons, 2701 Ave. G. About $500,000.

★N. Y., Dunkirk—School—Bd. Educ. let general contract building 2 story brick and concrete, on East Lake Rd., to E. J. Bailey, Brockton, cost $175,000; plumbing, to H. J. Wood & Co., 1358 Main St., Buffalo, $20,000. Noted April 22.

★N. Y., Newtnwn (Flushing P. O.)—High School—Bd. Educ., 500 Park Ave., New York City, let contract building brick and stone addition to Newtown High School, brick foundation, on Etna Pl., here, to T. A. Clark, 122 Livingston St., Brooklyn, $986,700. Noted May 20.

★N. Y., New York—Exchange—New York Telephone Co., 15 Dey St., let contract altering and building brick, steel and stone addition, concrete foundation, on Webster Ave., to D. C. Weeks & Son, Inc., 1123 Bway. About $100,000. Noted May 6.

★N. Y., New York—Institutional Center—Hebrew Emigrant Sheltering & Aid Society of Amer., c/o B. W. Levitan, archt. and engr., 7 West 45th St., will convert building at 425-437 Lafayette St., into institutional center, consisting of dormitories, laundry, restaurant, etc. About $125,000. Work will be done by day labor.

★N. Y., New York—Office and Store—T. Healy, c/o W. H. Gompert, archt. and engr., 171 Madison Ave., let contract building 4 story, 40 x 125 ft., brick, steel and stone, brick foundation, on Bway. and 94th St., to G. A. Dugan Co., 200 5th Ave. About $100,000.

★N. Y., New York—School—Bd. Educ., 500 Park Ave., let contract building P. S. 59, 4 story, 92 x 194 ft., brick and stone, brick foundation, on 182nd St. and Bathgate Ave., to T. A. Clark, 122 Livingston St., Brooklyn, $647,000. Noted May 13.

★N. Y., New York — Store, Office and Showroom—Syndicate headed by D. Strausman, 160 Bway., let contract altering brick and steel, at 49-55 West 27th St., to J. G. Siegel, 471 4th Ave. About $200,000.

★N. Y., New York—Theatre—Sheridan Realty Co., c/o Reilly & Hall, archts. and engrs., 749-5th Ave., let contract building 152 x 202 ft., brick and stone, brick foundation, on Sheridan Sq., to M. Shapiro & Son, 52 Vanderbilt Ave. About $500,000. Noted April 22.

N. J., Morris Plains—Hospital—State Bd. Control, Trenton, received bids May 18, constructing (a) male treatment building, (b) female treatment building, at Insane Asylum, (general contract), from Standard Constr. Co., 1713 Sansom St., Phila., (a) $570,000, (b) $554,000, G. Rose, 43 West 27th St., New York City, (a) $638,419, (b) $622,106; plumbing, from Jaehring & Peoples, 221 13th Ave., Newark, (a) $63,518, W. G. Cornell Co., 87 Park Pl., Newark, (a) $57,390; heating, from Jaehring & Peoples, (a) $55,864, F. P. Merkel, 131 South 12th St., Newark, (a) $58,971, W. G. Cornell, (a) $59,786; electrical work, from Strang Electric Co., 214 South 7th St., Phila., (a) $26,125, Dugan-Foerst Eng. Co., Bergoff Bldg., Bayonne, (a) $29,489. Noted April 22.

★N. J., South Orange — Theatre — South Orange Theatre Co., 929 Broad St., Newark, let contract building 3 story, 67 x 150 ft., brick and limestone, on South Orange Ave. and Scotland Rd., to Rolo Co., 188 Market St., Newark. About $100,000. Noted March 25.

★N. J., Verona (Montclair P. O.)—Hospital—Hospital for Tubercular Diseases let contract constructing several hospital buildings, concrete, brick and steel, to W. G. Sharwell & Co., 377 North 5th St., Newark, $560,321. Noted April 29.

Pa., Phila. — Stations—City Transit Dept., 1211 Chestnut St., received bids May 18, building stations on (a) Frankfort and Pratt Sts., Contr. 576, (b) Kensington and Torresdale Aves., Contr. 557, from W. W. Anstine & Co., 1218 Filbert St., (a) $50,320, (b) $94,111; Standard Constr. Co., 1713 Sansom St., (a) $49,871, (b) $95,171; A. Chambley, 2057 Summer St., (a) $55,000; I. K. Davis Co., 6100 North 20th St., (b) $96,400. Noted April 22.

★D. C., Washington—Hall—District Carpenters Union let contract building 3 story, brick and limestone, on 6th St. N. W., to A. Murray, 729 12th St. N. W. About $100,000. Noted May 13.

★D. C., Washington—Store—M. Brooks & Co., 1109 G St. N. W., let contract building 5 story, 40 x 110 ft., brick, to H. F. Boryer, 1416 F St. N. W. About $125,000.

★N. C., Raleigh—Store—Gilmore Bros., Winston-Salem, let contract building 3 story, concrete, here, to C. V. York, Raleigh. About $250,000.

★Fla., Orlando—Store—Dickson-Ives Co. let contract building 5 story, 68 x 120 ft., rein.-con., brick and stone, on Central and Orange Aves., to C. E. Hillyer Co., Blum Bldg., Jacksonville. About $150,000.

★La., New Orleans—Exchange—New Orleans Cotton Exchange, Weis Bldg., let contract building 7 story, 76 x 120 ft., rein.-con., steel and stone, rein.-con. flooring, concrete foundation, on Carondelet and Gravier Sts., to Selden-Breck Constr. Co., Fullerton Bldg., St. Louis, Mo. About $1,000,000, cost plus percentage basis.

O., East Cleveland (Cleveland P. O.)—School—Bd. Educ. received bids building 2 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on Mayfair Rd., from Tenbusch-Parker Co., Union Bldg., $165,000; Kelly-Demarest Co., Amer. Trust Bldg., $182,000; Paterson Co., 4500 Euclid Ave., $182,600. All contractors of Cleveland. Noted May 12.

★O., Elyria—Bank and Office—First Natl. Bank let contract building 3 story, 25 x 132 ft., brick, steel and concrete, rein. con. flooring, concrete foundation, on Public Square, to Van Blarcom Constr. Co., East 22nd St. and Prospect Ave., Cleve-

★O., Massillon—School—Bd. Educ. let carpentry contract for 2 story, 75 x 94 ft., brick, steel and concrete, rein.-con. flooring, concrete foundation, on Pearl St., to C. Peterson Co., 4500 Euclid Ave., Cleveland. About $90,000. Total cost $200,000. O. D. Howard, 8 East Broad St., Columbus, archt.

★O., Massillon—School—Bd. Educ. let contract building 2 story, 76 x 90 ft., brick, steel and concrete, rein.-con. flooring, concrete foundation, on Cherry St., to J. Meinhardt, Massillon. About $100,000. Noted May 27.

★Wis., Scandinavia — School — Scandinavia Academy let contract building 3 story, 50 x 100 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, to Beck Eng. Co., Plymouth Bldg., Minneapolis. About $100,000.

★Ia., Council Bluffs—School—Independent School Dist. let contract building 2 story, 75 x 135 ft., rein.-con., stone and brick, rein.-con. flooring, concrete foundation, to A. H. Neumann & Co., 519 Hubbell Bldg., Des Moines, $333,561.

★Ia., Greene—High School—School Bd. let contract building 2 story, 66 x 127 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, to Miller Constr. Co., 502 Black Hawk Bank Bldg., Waterloo, $125,000. Noted April 15.

★Ia., Whitten—School—Bd. Educ. let contract building 3 story, 55 x 85 ft., brick, to W. A. Rilling & Co., Chicago, Ill., $106,000. Noted April 29.

★Kan., Wichita—Station—Arkansas Valley Interurban R.R., 126 West 1st St., let contract building 2 story, 80 x 112 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to G. H. Siedhoff Constr. Co., 121 North Market St. About $125,000; cost plus percentage basis.

★Mo., St. Joseph—Theatre—Natl. Blk. Amusement Co. let contract remodeling rein.-con. and steel, concrete foundation, to C. P. Norris, 1125 Mitchell St. About $110,000.

★Okla., Oklahoma—Bank—Liberty Natl. Bank let contract remodeling brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to C. M. Dunning Constr. Co., 2023 North Shartel St., Oklahoma. About $125,000; cost plus percentage basis.

★Ore., Forest Grove—Home—W. C. Knighton, archt., 404 U. S. Bank Bldg., Portland, let contract to R. Shelley, 204 Henry Bldg., Portland, building concrete frame for 2 story, 80 x 134 ft. and 36 x 145 ft., for Masonic Lodge, cost $48,145. Total cost, $160,000. Noted April 22.

Cal., Los Angeles—School—Bd. Educ. received bids May 19, building 1 and 2 story, 132 x 220 ft., brick, rein.-con. flooring, concrete foundation, on East 7th St., from K. R. Bradley, 1925 East 16th St., $148,986; A. Grant, Los Angeles, $163,000; Edwards, Wildey & Dixon, 515 Black Bldg., $168,000. Noted May 6.

★Que., Hull—School—Hull Technical School Bd. let contract building technical school, to E. Caron, 162 Champlain St. About $150,000; 10% commission up to $100,000, 7% beyond that amount.

Federal Government Work

PROPOSED WORK

N. J., Lakehurst—Turbo Alternators Cooling Ducts, etc.—Spec. 4128—Bureau Yards & Docks, Navy Dept., Wash., D. C. soon receives bids furnishing and installing 3 turbo alternators cooling ducts, 2 exciter sets, switchboard and electric power and lighting systems, 2 motors with controllers and belts for air compressors, also installing compressors furnished by Government, etc., at Naval Air Sta., here; $10 deposit required for plans and spec.

D. C., Wash.—Hospital—Pub. Health Dept., 8th and E Sts., N. W., plans to build 4 story, hollow tile and stucco, on Wisconsin Ave., N. W. About $90,000. E. N. Perry, engr. in charge.

Va., Norfolk—Concrete Roads and Walks—Spec. 4203—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids building concrete roads and walks including curbs, necessary excavating, filling, grading and draining, at Naval Hospital, here. About $26,000; $10 deposit required for plans and spec.

Va., Quantico—Roads and Alterations to Buildings—Spec. 4202—Bureau of Yards & Docks, Navy Dept., Wash., D. C., soon receives bids constructing concrete roads including drains, culverts, retaining wall, trestles and bridge; also altering three existing buildings including furnishing and installing 2 elevators, at Marine Barracks, here. About $85,000. Noted May 27.

W. Va., South Charleston—Scales—Spec. 4207—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids furnishing and installing one 100,000 lb. scale to be carried on structural supports furnished by Government and one 600,000 lb. to be carried on concrete pit furnished by Government, at Naval Ordnance Plant, here; $10 deposit required for plans and spec.

Ill., Chicago — Dredging — U. S. Engr. Office, 537 South Dearborn St., soon receives bids dredging in Michigan City Harbor.

Federal Government Work (Continued)

Cal., San Diego—Refrigerating Plant Equipment—Spec. 4193—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids furnishing and installing in Industrial Bldg., Marine Barracks, Naval Base, here. About $50,000; $10 deposit required for plans and spec.

Cal., San Diego—Storehouse—Spec. 4157—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids building 2 story, storehouse with 42 x 199 ft. head house and two 41 x 91 ft. wings, at Marine Barracks, Naval Base, here; $10 deposit required for plans and spec. Noted April 1.

H. T., Kuahua—High Pressure Air Piping System—Spec. 4185—Bureau Yards & Docks, Navy Dept., Wash., D. C., and Pub. Wks. Office, Navy Yard, Mare Island, Cal., soon receive bids furnishing and installing, at Naval Ammunition Depot, Pearl Harbor. About $10,000; $10 deposit required for plans and spec. Noted May 13.

BIDS DESIRED

Me., Portland—Steel Hangars, Generator Houses, etc.—Until June 21, by Chief of Constr. Div., Bldg. "C," 7th and B Sts., Wash., D. C., constructing, here; advertised in this issue.

Mass., Boston—Steel Hangars, Generator Houses, etc.—Until June 21, by Chief of Constr. Div., Bldg. "C," 7th and B Sts., Wash., D. C., constructing, here; advertised in this issue.

N. Y., New York—Dredging—Until July 1, by U. S. Engr. Office, 710 Army Bldg., 39 Whitehall St., dredging in East Chester Creek; advertised in this issue.

N. Y., New York—Steel Hangars, Generator Houses, etc.—Until June 21, by Chief of Constr. Div., Bldg. "C," 7th and B Sts., Wash., D. C., constructing, here, and in Long Island Sound; advertised in this issue.

Pa., Phila.—Extending and Expanding Heating Mains—Until June 8, at office of Officer in Charge of Constr., Frankford Arsenal, extending and expanding; advertised in this issue.

Pa., Phila.—Drinking Water Fountains—Until June 15, at office of H. J. Lumsden, officer in charge of constr., Frankford Arsenal, installing; advertised in this issue.

Pa., Pittsburgh—Steel Lock Gates—Until June 14, by U. S. Engr. Office, 2111 Farmers Bank Bldg., furnishing and delivering for Lock 6, Monongahela River; advertised in this issue.

D. C., Wash.—Labor—Until June 22, by Treas. Dept., furnishing labor for building extension to animal house, for Hygienic Laboratory, U. S. Pub. Health Serv. Materials to be furnished by Government.

D. C., Wash.—Materials—Until June 22, by Treas. Dept., Wash., D. C., furnishing building extension to Animal House, for Hygienic Laboratory, at U. S. Pub. Health Serv. J. A. Wetmore, superv. archt.

D. C., Wash.—Raising Roof, etc.—Spec. 4075—Until June 16, by Bureau Yards & Docks, Navy Dept., raising roof of shop over 4 bays and replacing existing concrete slab and roofing on same by new concrete slab and built up roofing, also removing existing gas producer building and concrete footings of certain columns, extending stock floor, additional steel and iron, new crane runway, steel sash, etc., brick walls and concrete footings, etc. About $30,000; $10 deposit required for plans and spec. Noted May 27

D. C., Wash.—Steel Hangars, Generator Houses, etc.—Until June 21, at office of Chief of Constr. Div., Building C, 7th and B Sts., constructing at Ft. Williams and Ft. McKinley.

D. C., Wash.—Tug Boat—Until June 30, at office of A. L. Flint, Genl Purch. Agt., The Panama Canal, Wash., D. C., purchasing 1 tug boat; advertised in this issue.

Va., Norfolk—Materials—Until June 7, by Treas. Dept., Wash., D. C., furnishing certain material for constructing main hospital, transformer building, gas house and extension to present boiler house, for U. S. Pub. Health Serv. Hospital, at Sewell's Point, here. J. A. Wetmore, superv.-archt.

Va., Norfolk—Mechanical Equipment—Until June 14, by Treas. Dept., Wash., D. C., installing, in health hospital, Sewell's Pt., here.

S. C., Charleston—Charcoal Iron Boiler Tubes—Until July 8, by Supt. Lighthouses, furnishing and delivering; advertised in this issue.

Ala., Muscle Shoals—**Improving Quarry, etc.**—Until June 21, by Constr Quartermaster, U. S. Nitrate Plant No. 2, improving quarry, altering and building addition to mechanical equipment at plant, building 3 mi. road with concrete culverts, also sewerage and drainage system, 4 mi. transmission line between Plants 1 and 2; advertised in this issue.

Wash., Puget Sound—Steel Hangars, Generator Houses, etc.—Until June 21, at office of Constr. Quartermaster, Ft. Mason, San Francisco, constructing, at Coast Defenses, here; advertised in this issue.

Washington—**Road Work**—Until June 15, by Bureau Pub. Rds., 204 Post Office Bldg., Portland, improving 8.5 mi. Mt. Baker Natl. Forest Rd., 16 ft. graded roadway, and one 110 ft. span highway bridge, Whatcom Co., involving 29,000 cu.yd. earth and 55,000 cu.yd. rock excav., 43 acres clearing, 30 acres grubbing, 125 ft. wooden approach trestle.

Cal., San Francisco—Steel Hangars, Generator Houses, etc.—Until June 21, at office of Constr. Quartermaster, Ft. Mason, constructing, at Coast Defenses, here; advertised in this issue.

P. R., Loiza—Radio Station Buildings and Utilities—Spec. 4194—Until June 16, by Bureau Yards & Docks, Navy Dept., Wash., D. C., constructing, here. About $110,000; $10 deposit required for plans and spec. Noted May 20.

PRICES AND CONTRACTS AWARDED

(★Indicates Award of contract)

★**Mass., Chelsea**—Building—Supt. Lighthouse, Boston, let contract construction 3 story, 35 x 80 ft., brick and steel service building, rein.-con. flooring, at Depot, here, to F. G. Coburn, 294 Washington St., Boston. About $52,000.

Md., Indian Head—Monorail Hoists and Track Equipment—Bureau Yards & Docks, Navy Dept., Wash., D. C., received only bid May 26, furnishing and installing, at Naval Proving Ground and power factory, here, (1) work complete, from Shepard Electric Co., 1406 Lexington Bldg., Baltimore, (1) $15,600 (255 days), (2) $5.90 Noted May 20.

★**D. C., Wash.**—Searchlight Towers—U. S. Engr. Office, War Dept., let contract building 7 searchlight towers, 65 ft. Type "C," to Variety Iron & Steel Wks. Co., Hamilton Ave. and East 40th St., Cleveland, O., $103,250.

★**Va., Cape Henry**—Concrete Roadway and Sidewalk—U. S. Engr. Office, Custom House, Norfolk, let contract building, here, to Tunstall Johnson Co., Norfolk, $49,716. Noted May 6.

★**Wis., Milwaukee**—Removing and Rebuilding Superstructure—U. S. Engr. Office, Federal Bldg., will remove stone filled timber superstructure and rebuild on south breakwater, Ludington Harbor, Mich. Former bids rejected. Work will be done by day labor.

★**Cal., Long Beach**—Concrete Culvert Sill Diversion Channel—U. S. Engr. Office, 725 Central Bldg., Los Angeles, let contract building, here, to United Dredging Co., Central Bldg., Los Angeles, $3,975.

P. I., Guam—Turbo Generators, Exciters and Switchboards—Spec. 4169—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids May 26, for 200 kw. turbo alternators, 1 turbine driven exciter, 1 motor driven exciter and switchboard, f.o.b. cars, Navy Yards, Mare Island, Cal., also for services of an erecting engineer to supervise and be responsible for installing same in power plant, at Naval Sta., here. (1) work complete, from Westinghouse Electric Co., 803 Hibbs Bldg., Wash., D. C., (1) $33,107 (30 days), (2) $15; General Electric Co., River Rd., Schenectady, N. Y., (1) $34,625, (1a) $500, (2) $20. Noted May 20.

Miscellaneous

PROPOSED WORK

Transmission Line—**Ft. Kent, Me.**—Ft. Kent Electric Co. plans to build 43 mi. 33,000 volt transmission line to connect at Van Buren, with Maine & New Brunswick Electric Light & Power Co. M. T Billing, supt.

Transformer Stations—**New York, N. Y.**—New York Edison Co., Irving Pl. and 15th St., having sketches made by W. Whitehill, archt. and engr., 55 Duane St., for rein.-con. and steel transformer station, rein.-con. flooring, concrete foundation, on Bowery and on 73rd St. About $150,000 each.

Dam—**West Chester, Pa.**—Boro. plans to build concrete dam across Chester Creek to connect with pumping station About $60,000. T. S. Colesworthy, boro. engr.

Dam—**St. Johns, Ariz.**—State Loan Bd., Phoenix, soon receives bids completing Lyman Dam, here, involving 25,000 cu.yd lime rock in embankment, 50,000 cu.yd earth embankment and 25,000 cu.yd. clay puddles. About $160,000. Former contract rescinded. Noted May 6.

Culverts—**Tucson, Ariz.**—City voted $75,000 bonds to build rein.-con. culverts, over Arroyo Seco, on 4th Ave., 9th and Main Sts. L. O. Cowan, clk. W. C. Lefebure, city engr. Noted May 13.

Subways and Ornamental Lights—**Tucson, Ariz.**—City defeated $80,000 bonds for two rein.-con. subways, 6th and Stone Aves., and $35,000 bonds for ornamental lights. Noted May 13.

Elevator — **Port Colborne, Ont.** — Dept. Railways & Canals, Western Blk., Ottawa, plans to spend $400,000 to build elevator, here.

BIDS DESIRED

Bituminous Concrete, Asphalt, Tar, Trap Rock, etc.—**Trenton, N. J.**—Until June 15, by State Highway Comn., furnishing bituminous concrete, asphalt, tar, crushed stone, slag, screenings, pea gravel and trap rock. A. L. Grover, ch. clk.; advertised in this issue.

Pumping Engine and Pumps—**Nashville, Tenn.**—Until June 30, by Bd. Comrs. furnishing and erecting 20,000,000 gal. turbine driven centrifugal or steam actuated equivalent condensing high service pumping engine, and two 20,000,000 gal. low service centrifugal pumps, engine driven or otherwise. Chester & Fleming, Union Bank Bldg., Pittsburgh, Pa., engrs.; advertised in this issue.

Road Machinery—**Smithville, Tenn.**—W. D. Biddell receiving bids for steam shovels, batch mixers and stone crushers.

Street Lighting System—**Green Bay, Wis.**—Until June 8, by W. Kerr, city clk., builing ornamental street lighting system, on 6 streets, using concrete posts. About $35,000. Vaughn & Meyer, Security Bldg., Milwaukee, engrs.

Street Sprinkling Wagon—**Oakfield, Wis.**—Until June 7, by H. Warner, village clk., furnishing one 500- 700 gal. street sprinkling wagon.

Cleaning Water Mains—**St. Louis, Mo.**—Until June 22, by Bd. Pub. Serv. furnishing necessary materials, tools and labor for cleaning 250,000 lin.ft. c.i. water mains. About $75,000. E. E. Wall, City Hall, engr. Noted May 20.

Road Oil—**Fresno, Cal.**—Until June 17, by Bd. Supervs. Fresno Co., furnishing 5,000-100,000 bbl. road oil.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Heating and Ventilating Apparatus**—**Brooklyn, N. Y.**—Bd. Educ., 500 Park Ave., New York City, let contract installing in P. S. 100, West 1st St. near Sheepshead Bay, and in P. S. 97, Stillwell Ave. near Ave. S, here, to W. J. Olvany, 177 Christopher St., New York City, $94,681 and $66,500, respectively.

★**Transformer Station**—**New York, N. Y.**—United Electric Light & Power Co., 130 East 15th St., let contract building 1 story, 30 x 100 ft., rein.-con. and steel, rein.-con. flooring, concrete foundation, on Elizabeth St., to J. A. Henderson, 30 East 42nd St. About $100,000. Noted April 22.

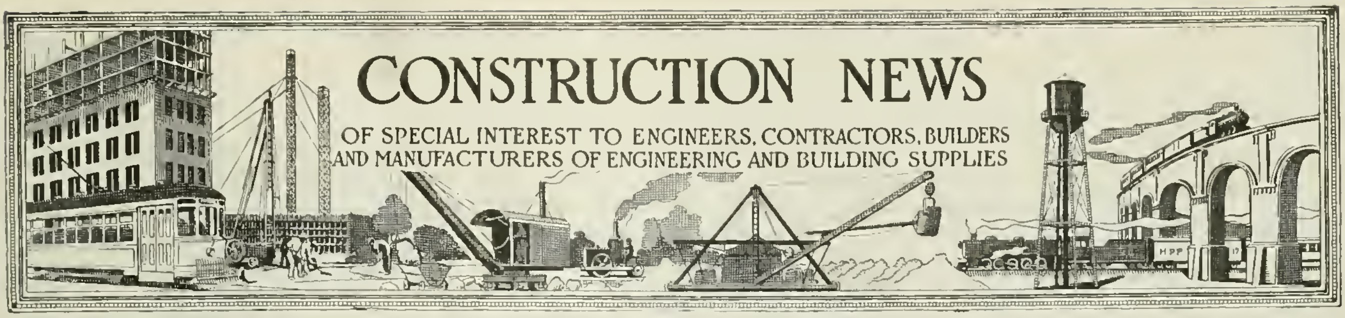
Sheds—**Stapleton, S. I., N. Y.**—M. Hulbert, comr. docks, Pier "A," foot of Battery Pl., New York City, received bids May 27, building freight sheds and appurtenances at Piers, (a) 12, (b) 13, (c) 15, (d) 16, (e) 17, (f) 18, from Post McCord, 101 Park Ave., (a) $993,400, (b) $993,400, (c) $999,860, (d) $1,055,510, (e) $491,378, (f) $499,487; Snare & Triest, 233 Bway., (a) $1,016,480, (b) $1,016,480, (c) $987,020, (d) $1,034,570, (e) $476,631, (f) $486,473; McHarg Barton, 171 Madison Ave., (e) $468,208, (f) $477,716. Contractors all of New York City. Noted May 13.

★**Vault**—**Columbus, O.**—R. W. Archer, state treas., let contract building steel vault, concrete retaining wall and foundation in State House, to Herring-Hall-Marvin Safe Co., Grand Blvd., Hamilton. About $80,000.

Mechanical Equipment—**Owatonna, Minn.**—Bd Educ. let contract for heating, plumbing and ventilating system for high school, to P. J. Gallager, Faribault, $91,833; electrical work, to Langford Electric Co., Wilmac Bldg., Minneapolis, $12,350.

★**Portland Cement, San Diego, Cal.**—City let contract furnishing 25,000 bbl. Portland cement for use in building Barrett Dam, to Spreckles Bros. Co., San Diego, $2.65 per bbl., f.o.b. Colton. Noted April 29.

★**Pipe and Tank**—**Milerton, Ont.**—Municipality let contract furnishing 24,350 lin.ft. 4-8 in. c.i. pipe, to Garthshore Thompson Co., Stuart St., W., Hamilton, $95 per ton; one 50,000 Imp. gal. steel tank on 90 ft. tower, to Chicago Bridge & Iron Wks., Bridgeburg, $8,650.



CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

PROPOSALS

For proposals Advertised see the pages immediately following the "Construction News" Section.

WATERWORKS

Bids Close		See Eng News-Record
June 15	Oakville, Ont.	June 10
June 15	North Milwaukee, Wis.	June 10
June 15	Xenia, O.	June 10
	Adv. June 10.	
June 16	Phoenix, Ariz.	June 3
June 18	Lennoxville, Que.	June 3
June 18	Akron, O.	June 3
	Adv. June 3 and 10.	
June 21	Elyria, O.	June 3
	Adv. June 3 and 10.	
June 26	Dansville, N. Y.	June 10
June 29	Buffalo, N. Y.	June 3
	Adv. June 3 and 10.	
July 1	Madill, Okla.	June 10
July 9	Collinsville, Ill.	June 10

SEWERS

Bids Close		See Eng News-Record
June 14	Hammond, Ind.	May 13
June 14	Farmersville, Tex.	June 10
June 15	Wauwatosa, Wis.	June 10
June 15	Cochran, Ga	May 27
June 15	Toledo, O.	May 20
June 15	St. Lambert, Que.	May 27
June 18	Long Island City, N. Y.	June 10
June 21	Fresno, Cal.	June 10
June 21	Beaver Dam, Wis.	June 10
June 22	Haverhill, Mass.	June 10
	Adv. June 10.	
June 24	Galva, Ill.	June 10
	Adv. June 10.	
June 28	Waterloo, Wis.	June 3
	Adv. June 3 and 10.	
June 28	Brillion, Wis.	June 10
July 1	Milwaukee, Wis.	June 3
July 1	St. George, S. I., N. Y.	June 10
July 19	Dallas, Ore	May 27

BRIDGES

Bids Close		See Eng News-Record
June 14	Detroit, Mich.	June 3
June 16	Illinois	June 3
	Adv. June 3 and 10.	
June 16	Tavares, Fla.	June 3
June 16	Fairbury, Ill.	June 10
	Adv. June 10.	
June 17	De Queen, Ark.	June 10
June 19	Nicolet, Que.	June 10
June 21	Claxton, Ga	May 27
June 21	Wenatchee, Wash.	June 10
June 21	Olivia, Minn.	June 3
	Adv. June 3 and 10.	
June 21	Auburn, N. Y.	June 10
	Adv. June 10.	
June 21	Seattle, Wash.	June 10
June 22	Wareham, Mass.	June 10
	Adv. June 3 and 10.	
June 22	Columbus, O.	June 10

STREETS AND ROADS

Bids Close		See Eng. News-Record
June 14	Ontario	May 27
June 14	Middlebourne, W. Va.	May 27
June 14	Coffeyville, Kan.	May 27
June 14	Gary, Ind.	June 3
	Adv. June 3 and 10.	
June 14	El Paso, Tex.	June 3
June 14	Wyoming	June 10
June 14	Le Sueur Center, Minn.	June 10
June 15	Elk River, Minn.	June 10
June 15	Georgetown, Tex.	June 10
June 15	North Milwaukee, Wis.	Jnue 10
June 15	Amarillo, Tex.	June 10
June 15	Newark, N. J.	June 10
June 15	St. George, S. I., N. Y.	June 10
June 15	Steubenville, O.	May 27
June 15	Cochrane, Ga.	May 27
June 15	Westmount, Que.	May 6
June 15	Pennsylvania	May 20
June 15	Montgomery, Ala.	May 20
June 15	Arkansas	May 27
June 15	Springfield, Vt.	June 3
	Adv. June 3 and 10.	
June 15	Orange, Tex.	June 3
June 16	Ontario	June 3
June 16	Pennsylvania	May 20
June 16	Manhattan Beach, Cal.	June 10
June 16	Newnan, Ga.	June 10
June 16	Wellsville, Kan.	June 10
June 16	Kingsley, Ia.	June 10
June 16	Spirit Lake, Ia.	June 10
June 16	Mt. Pleasant, Tex.	June 10
June 17	Gilmer, Tex.	June 10
June 17	Mankato, Minn.	June 10
June 17	Gilmer, Tex.	June 3
June 17	Olean, N. Y.	June 3
June 18	Ohio	May 27
June 18	Ohio	June 3
June 18	Ohio	June 10
June 18	Ontario	June 10
June 18	Idaho	June 10
June 18	Long Island City, N. Y.	June 10
June 18	New York, N. Y.	June 10
June 19	New Martinsville, W. Va.	May 27
June 19	Fairfield, Tex.	June 10
June 21	Paducah, Tex.	June 10
June 21	Casper, Wyo.	June 10
June 21	Lebanan, Pa.	June 10
	Adv. June 10.	
June 21	Clinton, N. C.	June 10
June 22	Stockton, Cal.	June 10
June 22	St. Albans, W. Va.	June 10
June 22	Columbus, O.	June 10
June 23	Belmar, N. J	May 27
	Adv. May 27 to June 10.	
June 23	Bennington, Vt.	June 10
	Adv. June 10.	
June 23	Belvidere, N. J.	June 10
	Adv. June 3 and 10.	
June 23	Ft. Wayne, Ind.	June 3
June 24	Flemington, N. J.	June 3
	Adv. June 3 and 10.	
June 24	Leonard, Tex.	June 3
June 26	Dansville, N. Y.	June 10
	Adv. June 10.	
June 28	Savannah, Ga.	May 13
June 28	Reno, Nev.	June 3
June 28	Tombstone, Ariz.	June 10
June 28	Florence, Ariz.	June 10
June 28	New Jersey	June 10
	Adv. June 10.	
June 29	St. Louis, Mo.	June 10
June 30	Freehold, N. J.	June 10
	Adv. June 10.	
July 6	Dallas, Ore	May 27
July 14	Tavares, Fla.	June 10
	Adv June 10.	

EXCAVATION AND DREDGING

Bids Close		See Eng. News-Record
June 14	Clarion, Ia.	June 10
June 14	Henderson, Minn.	June 10
June 16	Council Bluffs, Ia.	June 3
June 16	Waverly, Ia.	June 3
June 22	Ft. Dodge, Ia.	June 3
July 3	Madisonville, Ky	May 27

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
June 15	Detroit, Mich.	June 10
June 15	Riviere Du Loup, Que.	May 27
June 18	Manitowoc, Wis.	June 10
June 25	Sheboygan, Wis.	June 10
June 30	Cambridge, Mass	May 27
Sept. 1	Hutchinson, Kan.	Feb. 19

BUILDINGS

Bids Close		See Eng. News-Record
June 14	Cleveland, O.	May 27
June 14	St. Marys, Ia	June 3
June 14	Carthage, Mo.	June 10
June 15	Lima, O.	June 10
June 15	Harrisburg, Pa.	May 20
	Adv. May 20 to June 10	
June 15	Cherokee, Okla.	June 3
June 15	Blanchard, Mich.	June 3
June 15	New York, N. Y	June 10
June 15	Washington, Ia.	June 10
June 17	Frederick, Okla.	June 3
June 17	Lagrange, Ga.	June 10
June 17	Salisbury, N. C.	June 3
June 18	New York, N. Y.	June 3
June 19	Canton, O.	June 3
June 20	Detroit, Mich.	June 3
June 21	Three Rivers, Que	May 27
June 21	Manchester, N. H.	June 3
June 21	Detroit, Mich.	Jnue 10
June 21	Media, Pa.	June 3
June 22	Miami, Okla.	June 3
June 22	Westfield, N. J.	June 10
June 22	Vineland, N. J.	June 10
June 22	Clinton, N. J.	June 10
June 22	Trenton, N. J.	June 10
June 22	Cleveland, O.	June 10
June 24	Rawlins, Wyo.	June 3
June 25	Newport News, Va.	May 6
June 25	Pocahontas, Ia.	June 10
June 26	Liberty Center, Ia.	June 3
June 28	Youngstown, O.	June 10
June 29	Duluth, Minn.	June 10
June 30	New York, N. Y.	June 10
July 1	Chisholm, Minn.	May 13
July 15	Jonesboro, Ark.	May 27
July 15	Coleraine, Minn.	June 10

FEDERAL GOVERNMENT WORK

Bids Close		See Eng. News-Record
June 14	Steel Lock Gates—Pittsburgh, Pa.	June 3
	Adv. June 3 and 10.	
June 14	Mechanical Equipment — Norfolk, Va.	June 3
June 15	Electric Generators, Exciters and Accessories — Florence, Ala.	May 6
June 15	Drinking Water Fountains —Phila., Pa.	June 3
	Adv. June 3 and 10.	
June 15	Road Work—Washington	June 3
June 16	Auxiliary Equipment and Piping —Spec. 4179, Puget Sound, Wash	May 27
June 16	Radio Buildings and Utilities — Spec. 4194—Loiza, P. R.	June 3
June 16	Raising Roof, etc.—Spec. 4075—Wash., D. C.	June 3
June 16	Storehouse, Pigeon Loft and Hangar—Spec. 4085—Anacostia, D. C.	June 10
June 16	Bakery Equipment—Spec. 4192—San Diego, Cal.	June 10
June 16	Concrete Paving and Scale Pit—Philadelphia, Pa.	June 10
	Adv. June 3 and 10.	
June 16	High Pressure Air Piping System — Spec. 4185 — Kuahua, H. T.	June 10
	Adv. June 3 and 10.	
June 16	Turbo Alternators, etc.—Spec. 4128 — Lakehurst, N. J.	June 10
	Adv. June 3 and 10.	
June 16	Quarters—Spec. 4195—Alpena, Mich.	June 10
June 16	Quarters—Spec. 4195—Milwaukee, Wis.	June 10
June 16	Quarters—Spec. 4195—Buffalo, N. Y.	June 10
June 16	Quarters—Spec. 4195—Detroit, Mich.	June 10
June 16	Sewerage System — Spec. 4133—Hampton Roads, Va.	June 10
June 16	Concrete Seaplane Runway — Spec. 4181 — Hampton Roads, Va.	June 10
June 16	Incinerator—Spec. 4137 — Quantico, Va.	June 10
	Adv. June 10.	
June 16	Underground Steam Lines—Spec. 4218—Hampton Roads, Va.	June 10
	Adv. June 10.	
June 16	Well Houses, Towers, etc. —Ft. Worth, Tex.	June 10
	Adv. June 10.	
June 18	Protected Switchboard and Plotting Rooms—Boston, Mass.	June 10
	Adv. June 10.	
June 18	Heating Plant Equipment—Tacoma Park (Wash P. O.), D. C.	June 10
	Adv. June 10.	
June 19	Sand—Nahant, Mass.	June 10
	Adv. June 10.	
June 19	Sand, Stone or Gravel and Cement—Boston, Mass.	June 10
	Adv. June 10.	
June 21	Improving Quarry, etc. — Muscles Shoals, Ala.	June 3
	Adv. June 3 and 10.	
June 21	Steel Hangars, Generator Houses, etc.—Wash., D. C.	June 3
June 21	Steel Hangars, Generator Houses, etc. — Portland, Me.	June 3
June 21	Steel Hangars, Generator Houses, etc — Boston, Mass.	June 3
June 21	Steel Hangars, Generator Houses, etc.—New York, N. Y.	June 3
June 21	Steel Hangars, Generator Houses, etc.—San Francisco, Cal.	June 3
June 21	Steel Hangars, Generator Houses, etc.—Puget Sound, Wash.	June 3

Bids Close		See Eng News-Record
June 21	Altering Marine Railway — Spec. 4184 — Rockaway, N. Y.	June 10
June 21	Concrete Walks—Spec. 4206—Paris Island, S. C.	June 10
June 21	Improving Laboratory — Spec. 5182—Wash., D. C.	June 10
June 21	Power Plant Improvements—Spec. 4211—Paris Island, S. C. Adv. June 10.	June 10
June 21	Automatic Sprinkler System—Spec. 4213—Paris Island, S. C. Adv. June 10.	June 10
June 21	Additional Water Line — Spec. 4219—Paris Island, S. C. Adv. June 10.	June 10
June 21	Buildings, etc.—Spec. 4082—Lakehurst, N. J. Adv. June 10.	June 10
June 21	Revolving Landing Platform — Spec. 4223 — Hampton Roads, Va. Adv. June 10.	June 10
June 21	Storehouses, Kite Balloon Hangar and Garage—Spec. 4225—Quantico, Va. Adv. June 10.	June 10
June 21	Dirigible Hangar — Spec. 4172—Pensacola, Fla. Adv. June 10.	June 10
June 21	Hangar, Storage Building and Pier — Spec. 4152 — Newport, R. I. Adv. June 10.	June 10
June 22	Labor—Wash., D. C.	June 3
June 22	Materials—Wash., D. C.	June 3
June 22	Materials—Norfolk, Va.	June 3
June 22	Experimental Shop—Philadelphia, Pa. Adv. June 10.	June 10
June 23	Laundry Equipment—Spec. 4191—San Diego, Cal.	May 27
June 23	Railroad Track Scales — Spec. 4207—South Charleston, W. Va.	June 10
June 25	Earthwork—St. Louis, Mo., Adv. May 27 to June 10.	
June 25	Miscellaneous Buildings, Roads, Sewers, Heating Plant, etc.—Hampton, Va. Adv. June 10.	June 10
June 26	Roads, Walks, Drainage and Grading — Tacoma Park (Wash P. O.), D. C. Adv. June 10.	June 10
June 28	Labor — San Francisco, Cal.	May 27
June 28	Dredge, etc.—Wilmington, N. C. Adv. May 27 to June 10.	May 27
June 28	Material—San Francisco, Cal.	May 27
June 30	Dredging—Norfolk, Va. Adv. June 10.	June 10
June 30	Tug Boat—Wash., D. C.	June 3
July 1	Dredging — New York, N. Y. Adv. June 3 and 10.	June 3
July 2	Bulkhead, etc. — Norfolk, Va. Adv. June 10.	June 10
July 3	Structural Steel, Castings, etc.—Louisville, Ky. Adv. June 10.	June 10
July 8	Charcoal Iron Boiler Tubes Charleston, S. C. Adv. June 3 and 10.	June 3
July 8	Steel Dump Scow—Louisville, Ky. Adv. June 10.	June 10

MISCELLANEOUS

June 15	Scenic Railway—Detroit, Mich.	May 13
June 15	Bituminous Concrete, Asphalt, Tar, Trap Rock, etc.—Trenton, N. J. Adv. June 3 and 10.	June 3
June 15	Pipe—Detroit, Mich.	June 10
June 16	Phosphate Handling Machinery, Portland, Ore.	June 10
June 17	Road Oil—Fresno, Cal.	June 3
June 18	Wharf—Kushonook, B. C.	June 10
June 18	Wood Paving Blocks—New York, N. Y.	June 10
June 21	Dike—Sault Ste. Marie, Mich. Adv. May 20 to June 10.	May 20
June 21	Pier New York, N. Y.	June 10
June 22	Platform, Tracks, Deck, etc.—Philadelphia, Pa.	June 10
June 24	Heating Equipment—Hudson, N. Y. Adv. June 10.	June 10
June 21	Bulkheads, etc. Philadelphia, Pa.	June 10
June 28	Lumber and Piling—Kaufman, Tex.	June 10
June 30	Pumps—Nashville, Tenn.	June 3
July 8	Laundry Machinery—Randalls Island, N. Y.	June 10

Where nome of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. J., Freehold—See "Sewers."

Mich., Adrian—City plans election June 18 to vote on $65,000 bonds to purchase and improve Adrian Water Co. plant. G. P. Love, clk.

Minn., Winsted—City plans to lay watermains in 21 blocks. About $50,000. J. W. Shaffer & Co., 501 New York Life Bldg., Minneapolis, engrs.

Ariz., Holbrook—City plans election to vote on $100,000 bonds to build waterworks system, consisting of wells, pumping plant and distributing system. Olmsted & Gillelen, Hollingsworth Bldg., Los Angeles, Cal., engrs.

Ariz., Tucson—City voted $140,000 bonds to extend and improve waterworks system. L. O. Cowan, clk. Noted May 13.

Wash., Seattle—Bd. Pub. Wks. rejected only bid received May 14, building steel pipe line from Molasses Creek to Volunteer Park, part of Cedar River water system. About $3,000,000. Noted June 3.

Cal., Lancaster—Los Angeles Co. Waterworks Dist. 4 voted $50,000 bonds to build system, to include well, pumps, motors, steel tank and tower, 3-6 in. redwood and 2 in. lap welded metal pipe. W. Davidson (Los Angeles), co. engr. Noted March 4

BIDS DESIRED

N. Y., Dansville—Until June 26, by Bd. Water & Sewer Comrs., improving water works system. H. Rowan, village clk. Hopkins & Field, 340 Cutler Bldg., Rochester, engrs.; advertised in this issue.

O., Akron—Until June 18, by E. A. Zeisloft, dir. Pub. Serv., hauling and laying 4,700 ft. 48 in. c.i. pipe; advertised in this issue.

O., Xenia—Until June 15, by K. Riddle, city mgr., for 1,000,000 gal. water purification plant, 20,000 gal. wash water tank, 6,525 ft. 12 in. force main, 1 centrifugal pump and motor with 1,200 gal. capacity per minute against head of 60 ft. and 2 centrifugal pumps and motors, 700 gal. capacity per minute against head of 300 ft. Burgess & Niple, Columbus, engrs.; advertised in this issue.

Ill., Collinsville—Until July 9, by City Council, altering extending and repairing waterworks system; advertised in this issue.

Wis., Brillion—See "Sewers."

Wis., North Milwaukee—Until June 15, by city, furnishing and laying 6 in. water mains in various streets. About $30,000. H. Webster, city engr.

Okla., Madill—Until July 1, by Bd. City Comrs., building extensions to waterworks system. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs.; advertised in this issue. Noted May 13.

Ont., Oakville—Until June 15, by town, supplying and laying (2 contracts) 5,640 lin.ft. 12 in. c.i. and 650 lin.ft. 12 in. steel pipe with insulation covering, and 7,000 lb. structural steel. About $35,000. Chipman & Power, Mail Bldg., Toronto, engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Kan., Arkansas City—City received bids June 2, building 2,000,000 gal. reservoir, from Ray & Son, Baxter Springs, $53,940; Koss Constr. Co., 2818 5th St., Des Moines, $57,500; Burt & Tripp, $83,000. Noted Feb. 5.

★**Ont., Acton**—Town let contract laying, jointing and caulking 28,500 ft. 4-8 in. c.i. pipe, setting valves and hydrants, and excavating, to Central Foundation Co., Norwich Union Bldg., $20,537; furnishing valves, hydrants, etc., to Drummond McCall & Co. Ltd., 373 Front St. E., Toronto.

Sewers

PROPOSED WORK

N. J., Freehold—City having plans prepared for extension to sewerage and waterworks system. About $75,000. Waring, Chapman & Farquhar, 874 Bway., New York City, engrs.

S. C., Bartsville—C. C. Wilson, engr., Palmetto Bldg., Columbia, receives bids about August laying 1 mi. pipe, manholes, excavation and backfilling for sewerage system here. About $140,000.

Minn., Le Roy—City having plans prepared for 20,000 ft 8 and 10 in. sanitary sewer About $50,000. W E. Buell, 229 Davidson Bldg., Sioux City, Ia., engr.

Ariz., Holbrook—City plans election to vote on $35,000 bonds to build sewerage system involving 10-15 in. trunks and 6-8 in. laterals. Olmsted & Gillelen, Hollingsworth Bldg., Los Angeles, Cal., engrs.

Cal., Delano—City plans to build sewerage system. Cost between $50,000 and $75,000. W. W. Holton, clk.

Ont., Hamilton—City plans to build 4 mi. sanitary sewers, in various streets involving 8-12 in. vitr. pipe. About $41,469. E. R. Gray, city engr.

BIDS DESIRED

Vt., Bennington—See "Streets & Roads."

Mass., Haverhill—Until June 22, by W. W. Roberts, city clk., building sewers in various streets. L. C. Lawton, city engr.; advertised in this issue.

N. Y., Long Island City—Until June 18, by M. E. Connolly, pres. Queens Boro., building sewers in 16th Ave. from Grand to Vandeventer Aves. (1st ward); 15th St. from point 25 ft. north of Beech Ave. to Beech Ave., and Beech Ave. from Custer to Murray Sts. (3rd Ward); Lawson Pl. (24th St.) from Queens to Franconia Aves., (3rd Ward).

N. Y., S. I., St. George—Until July 1, by C. D. Van Name, pres Richmond Boro, building temporary sanitary sewers with appurtenances in Seaside Blvd. from Sea Ave. to paint 3,000 ft. west of Sand Lane and westerly from this point to extension of Cromwell Ave., Cromwell Ave. from southerly extension of existing sewer about 2,120 ft. north of Southfield Beach R.R. to point 135 ft. south of said R.R.; outlet sewer in Cromwell Ave., from point 185 ft. north of Southfield Beach R.R. into New York Bay to pier head line.

Ill., Galva—Until June 24, by C. Aby, city attry, constructing 2 sewerage systems with disposal plants; advertised in this issue.

Wis., Beaver Dam—Until June 21, by W. A. Gergen, city clk., excavating and laying 6,500 ft. 10-12 in. vitr. pipe sanitary sewers in Main St. About $40,000. Private plans.

Wis., Brillion—Until June 28, by Bd. Pub. Wks., building sewerage and waterworks system. Cost between $25,000 and $30,000. J. Donohue, North 8th St., Sheboygan, engr. Noted Jan. 8.

Wis., North Milwaukee—Until June 15, by city, laying 12-18 in. vitr. storm sewers in various streets, cost $60,000; 6 in. vitr. sanitary sewers in various streets, $15,000. H. Webster, city engr.

Wis., Wauwatosa—Until June 15, by Bd. Admin., Milwaukee Co. (Milwaukee) building intercepting sewers, rein.-con. pumping station and force mains in varous streets, involving 4,510 ft. 8-15 in. vitr. sewer pipe, 3,420 ft. 8 in. wood stave force mains, two 250 g.p.m. motor driven centrifugal sewage pumps, etc. W. G. Kirchoffer, 31 Vroman Blk., Madison, engr.

Ia., Kingsley—Until June 16, by city, laying 7,495 ft. 8 in. vitr. sewer pipe, 14 manholes and two hundred and fourteen 6-8 in. "Y's." Noted Jan. 29.

Tex., Farmersville—Until June 14, by Farmersville Sewer Co., building 40,000 ft. sanitary sewers and 2 sewage disposal plants. W. A. Canon, secy.

Cal., Fresno—Until June 21, by C. Dillon, city clk., building 90,000 ft. sewers in northern district. About $100,000. C. Murray, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Boston—City received bids May 28, building Muddy River conduit in Brookline Ave. from Beacon St. to Audubon Rd., from C. & R. Constr. Co., Boston, $280,118; W. Barrett & Co., Boston, $310,327; W. J. Barry, $318,443. Noted May 20.

★**N. Y., Scarsdale**—Village let contract extending sewerage system, to F. Bracalello, Scarsdale, $30,313. Noted May 20.

N. Y., New York—H. H. Curran, pres. Manhattan Boro., received bids furnishing labor and material cleaning sewers in various streets from P. J. Healy, Grand Central Palace, $50,000, Reilly Contg. Co., 172 East 94th St., $70,000, Melrose Constr. Co., 103 East 125th St., $75,000; altering and repairing sewer in Murray St. from West to Church Sts., etc., from P. J. Kearns Contg. Co., 2306 Creston Ave., $14,365, Walton Contg. Co., 103 East 125th St., $14,935.

O., Cleveland—City received bids building sewers in (a) Othello Ave. from East 136th to East 140th Sts., (b) Superior Ave. from East 21st to East 22nd Sts., (c) Carnegie Ave. from East 22d to East 40th Sts., involving 3,835 ft. 2c-6c concrete pipe, 2,115 ft 15-24 in. vitr. pipe 600 ft. No. 6 egg shape segmental block and 24 manholes, from A. Marra, Illuminating Bldg., (a) $16,342 and $18,042, Amato Constr. Co., 343 The

Sewers (Continued)

Arcade (a) $21,510, (c) $87,330, Iaforno Co., 3218 Murray Hill Rd., (a) $22,061, (b) $9,636, W. McDowell & Son, 340 Leader News Bldg., (b) $9,642, (c) $89,147, Manson Co., 343 The Arcade, (b) $9,984, (c) $80,790.

★**Mich., Detroit**—City let contracts to Lennane Bros., 809 Union Trust Bldg., furnishing labor and material for building Lateral Sewers 3,198, $6,527; 3,201, $6,158; 3,257, $12,640; 3,258, $14,560; 3,259, $14,185; 3,260, $15,268; 3,267, $8,346; 3,268, $8,845; 3,269, $3,888; 3,271, $3,470; 3,272, $7,320; 3,278, $20,213; 3,284, $5,294, 3,288, $21,823; 3,270, $3,466; to W. Blanck & Co., 330 Longfellow Ave., 3,067, $1,305; to Detroit Contg. Co., 827 Ford Bldg; 3,287, $28,727; 3,245, $77,368; to A. H. Haynes. 70 Davenport St., 3,282, $2,900; to N. Mancini, 400 Penobscot Bldg., 3,286, $6,660; 3,289, $3,400. Noted May 20.

★**Mich., Ford** (Wyandotte P. O.)—Village let contract furnishing labor and material building sewer in 2nd and Barney Aves., involving 4,003 ft. 36 in. vitr. crock pipe, to Oakwood Constr. Co., 512 Fort Blvd., Detroit. About $75,000. Noted May 13.

★**Wis., Viroqua**—City let contract building sewerage system, to G. W. Mulholland, Rockford, Ill. $64,210. Noted April 8.

★**Ia., Spirit Lake**—City let contract building storm sewers in various streets, to Hammen-Kruse Constr. Co., Spencer. About $66,000.

★**Ia., Winfield**—City let contract building sewers in various streets, to Harness Bros., Ottumwa; sewage disposal plant, to Layton Constr. Co., Muscatine. Total cost $135,000.

★**Minn., Wells**—Village let contract 13,415 ft. 10-24 in. sewers, 17 manholes, etc., to Gedney & Murphy Contg. Co., 613 Globe Bldg., Minneapolis, $143,783.

★**Kan., Scott City**—City let contract building sanitary sewerage system and sewage disposal plant, to M. R. Amerman, Box 222, Wichita, $76,381. Noted April 3.

★**Cal., Long Beach**—City let contract building vitr. and c.i. pipe sewers in Hill St., et al, to include concrete pumping station, motors, centrifugal pumps, etc., to J. Cummings, 1200 Washington Blvd., Los Angeles, $44,649. Noted June 3.

★**Cal., South San Francisco**—City let contract building vitr. pipe sewers in various streets, to C. B. Cowden, 1501 Larkin St., San Francisco, $25,961.

Bridges

PROPOSED WORK

Me., Westbrook—City plans to build steel bridge over Presumpscot River, on Cumberland St., 4 in. plank roadway, 20 ft. roadway, two 5 ft. concrete walks. About $50,000. A. Jones, Augusta, state engr.

N. Y., Vestal—Union and Vestal Twps. having plans prepared by State Highway Department, Capitol, Albany, building 865 ft. bridge over Susquehanna River, here. Cost $200,000. About $65,000 now available.

Mo., Fulton—See "Streets and Roads."

Mo., Ironton—See "Streets and Roads."

Mo., Jefferson City—Cole Co. and Osage Co. (Linn) having plans prepared by J. A. L. Waddell, consult. engr., 35 Nassau St., New York City, N. Y., for Osage Bridge, over Osage River, near Huber's Ferry, to have one 90 ft. vertical lift span. Work involves 80 M ft. creosoted timber in deck, 900,000 lb. structural metal, 40 cu.yd. concrete in counterweights, 9,000 lb. main, sheaves, shafts and bearings, 1,000 lb. equalizers, 2,000 lb. wire ropes, 6,000 lb. operating machinery, 570 cu.yd. concrete in shafts and piers, 5,400 lin.ft. piles below bases of piers and 120 cu.yd. concrete in end piers.

BIDS DESIRED

Mass., Wareham—Until June 22, by Dept. Pub. Wks., Div. of Highways, and Cohasset Narrows Bridge Comn., at office of Dept. Pub. Wks., State House, Boston, building highway bridge and approaches over Cohasset Narrows, Wareham and Bourne Twps.; advertised in this issue. Noted Jan. 15.

New Jersey—Until June 28, by State Highway Comn., Trenton, building plate girder bridge No. C with 49½ ft. span, 30 ft. roadway and 5 ft. sidewalk and incased I beam bridge No. D, 14 ft. 2 in. span with 30 ft. roadway, on State Highway Route 2, Roebling-Bordentown Sect., Burlington Co. A. L. Grover, ch. clk.; advertised in this issue.

Ill., Fairbury—Until June 16, by G. D. Butzer, supt. highways Livingston Co. (Pontiac), building bridge with two 45 ft. spans; advertised in this issue.

Ark., De Queen—Until June 17, by Lund & Hill, consult engrs., 527 Southern Trust Bldg., Little Rock, building steel bridges between here and Saline River, for Sevier Co. Rd. Impvt. Dist. 3. Work includes one 50 ft. bridge, on Sta. 40, Dees Creek, one 100 ft., Sta. 62, Bear Creek, one 50 ft., Sta. 512, Cossotot Creek, one 100 ft., Sta. 535, Little Cossotot Creek, one 40 ft., Sta. 665, Bellville Creek, one 30 ft., Sta. 783, Slaten Creek, one 50 ft., Sta. 942, Saline Bottoms and one 30 ft., Sta. 961, Saline Bottoms.

Wash., Wenatchee—Until June 21, by Comrs. Chelan Co., building rein.-con. bridge over Elliott River, involving 610 cu.-yd. concrete, 17,000 lb. steel and 900 cu.yd. earth approach and fill, also 1 over Sunnyslope Draw, involving 696 cu.yd. concrete, 19,000 lb. steel and 550 cu.yd earth approach and fill. About $25,000 each. J. Duff, Wenatchee, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—City let contract repairing Chelsea Bridge South over South Channel of Mystic River, involving 71 M ft. 2 and 4 in. spruce plank, 94 M ft. yellow pine plank and timber, 5 M ft. oak plank, to Lawler Bros., Boston, $27,671.

★**R. I., Narragansett**—Bd. Pub. Rds., Providence, let contract building 700 ft. bridge, 30 ft. wide, over Narrow River, here, to Briggs Eng. & Constr. Co., 75 Westminster St., Providence, $94,000. Noted June 3

★**Ia., Ames**—City let contract building cantilever deck girder bridge on concrete piers, to B. Cole, Ames, $45,258.

★**Mo., Webster Groves** (St. Louis P. O.)—St. Louis Co. let contract building bridge, near here, to Erick Constr. Co., Merchants Laclede Bldg., St. Louis, $24,268.

★**Cal., Red Bluff**—Bd. Supervs. Tehama Co. let contract building rein.-con. bridge over Deer Creek, to Cotton & McCauley Constr. Co., 16 California St., San Francisco, $69,970.

Streets and Roads

PROPOSED WORK

Mass., Boston—City plans to pave Wilbur St. from Cushing to Upham Aves., involving 1,267 sq.yd. asphalt, concrete, bituminous concrete or waterbound macadam on 4 in. concrete base, cost $6,500; Pub. Alley 710 from East Brookline to East Newton Sts., 840 sq.yd. granite block on concrete base; Easton St. from Mansfield to North Harvard Sts., 3,862 sq.yd. concrete, asphaltic, bituminous concrete or waterbound macadam, $16,000; widening Tremont St. from Park to Boylston Sts., 1,115 sq.yd. wood block; Charles St. from Beacon to Cambridge Sts., 2,149 sq.yd. granite block, $82,000; Boylston St. from Tremont to Charles Sts., 978 sq.yd. wood block, on concrete base.

Mass., Boston—City soon receives bids paving with asphalt, concrete, bituminous concrete or waterbound macadam on 4 in. concrete base, 2,300 sq.yd. Archdale Rd. from Washington to South Sts., $12,200; 4,023 sq.yd. Farquahar St. from Selwin to Center Sts., $20,900; 556 sq.yd. McCraw St. from Belgrade Ave. to West Roxbury Branch R.R.

N. Y., Little Valley—Cattaraugus Co. having plans prepared by W. H. Bowen, highway supt., building Carrollton-Bradford Rd., cost $158,500; 2½ mi. Ellicottville Rd., $37,500; 1 mi. Franklinville Rd., $15,000; 1.5 mi. Ischau Rd., $22,500; 1 mi. Portville Rd., $15,000; 1 mi. Otto Rd., $15,000; 2 mi. Lyndon Rd., $30,000; 2 mi. Hinsdale Rd., $30,000.

N. Y., St. George, S. I.—C. D. Van Name, pres. Richmond Boro., rejected bids received May 28, repaving Richmond Turnpike from Manor Rd. to Jewett Ave. About $48,000. Work will be readvertised. Noted June 3.

N. J., Newark—City soon receives bids widening, paving and grading 1,600 ft. Park Pl. from North Canal to Rector St., concrete, cost $50,000; paving 4,000 ft. New Jersey Railroad Ave. from Vanderpool to Stanton Sts., Montclair Ave. from Belmont Pl. to 3rd St., 3rd St. from Grafton to Montclair Aves., Grafton Ave. from Belmont Pl. to 3rd St., Belmont Pl. from Grafton to Montclair Aves., Montclair Ave. from Orange Bridge to Greenwood Lake R. R., concrete, 20 ft. wide. M. R. Sherrerd, city engr.

N. J., Trenton—Bd. Freeholders Mercer Co. plans to improve 5 mi. Brunswick Pike, concrete. About $300,000. H. F. Harris, Court House, engr.

Pa., Phila.—City plans to widen Chestnut St. from Broad to 15th Sts. and 15th St. from Filbert to Chestnut Sts. About $700,000. Dept. Highways, City Hall, engrs.

W. Va., Fayettesville—Fayette Co. soon receives bids building 5.2 mi. Lookout Rd bituminous macadam. About $75,000. J. K. McCrath, co. engr.

S. C., Columbia—City soon lets contract curbing, filling and draining 3,879 ft. North Main St. from Scott St. to city limits. About $25,000. T. C. Wyse, city engr. Noted April 22.

O., Columbus—City rejected bids received May 25, paving Columbian Ave. from Doren to Sullivant Aves, alley west of Delaware Ave. from 1st to 2nd Aves., alley north of Frambes Ave. from Waldeck to Indianola Aves., Ludlow St from Gay to Chestnut Sts., Nashoba Ave. from Doren to Sullivant Aves., alley west of Ohio Ave. from Mound to Fulton Sts., Pearl St. from Chittenden to 13th Aves., alley west of 17th St. from Bryden alley to Rich St. and alley north of Vermont Pl. from Michigan Ave. to Perry St. Noted May 20.

O., Cuyahoga Falls—City plans to pave Water, Poole and Newberry Sts. also lay sewers in North Wadsworth, West Broad, South 2nd and Front Sts. About $200,000.

O., Marion—City sold $133,000 bonds to rebuild Marion-Kenton Rd.

Mich., Ecorse—City having plans and estimates prepared by G. Jerome, engr., 1331 Majestic Bldg., Detroit, for grading and paving 5,000 ft. Mill St., 24 ft. wide, involving 14,000 sq.yd. concrete and concrete curbing. About $55,000.

Mich., Grosse Pointe Village (Detroit P. O.)—Village having plans and estimates prepared for grading, shaping and paving 7,500 ft. Maryland and East Kercheval Aves., 24-26 ft. wide, involving 20,000 sq. yd. 1 course concrete and 15,000 lin.ft. concrete curbing. About $80,000. T. M. Campau, 502 Whitney Bldg., Detroit, engr.

Ia., Mallard—City plans to grade and pave 15,000 sq.yd. various streets. Archer & Stevens, New England Bldg., Kansas City, Mo., engrs.

South Dakota — State Highway Dept., Pierre, soon receives bids grading, graveling and building drainage structures on 14 mi. Yankton-Alexandria Highway, 16 ft. wide, gravel, McCook Co., involving 52,000 cu.yd. excav., 16,800 cu.yd. gravel surfacing, 415 cu.yd. concrete in culverts, 30,000 lb. steel reinforcement, etc., cost $89,500; 5.7 mi. Hot Springs-Oelrichs Rd., also known as Sioux Trail, Fall River Co., 36 ft. wide, 50,000 cu.yd. excav., 900 cu.yd. gravel surfacing, 370 cu.yd. concrete in culverts, 20,000 lb. steel reinforcement, one 30 ft. span concrete arch bridge and one 90 ft. span steel truss bridge, etc., $90,000; 12.8 mi. Chamberlain-Plankinton Highway, 36 ft. wide, Aurora and Brule Counties, 64,000 cu.yd. excav., 380 cu.yd. concrete in culverts, 24,000 lb. reinforcing steel, etc., $63,300; 9.4 mi. Philip-Rapid City Rd., Pennington Co., 18 and 36 ft. wide, 47,000 cu.yd. excav., 6,000 cu.yd. gravel surfacing, 450 cu.yd. concrete in culverts, 2,300 lb. reinforcing steel, one 50 ft. steel truss bridge, etc., $70,532.

South Dakota—State Highway Comn., Huron, rejected bid received April 9, graveling 11.4 mi. De Smet-Brookings Highway, 36 ft. wide, Brookings Co. Noted March 25.

South Dakota—State Highway Comn., Milbank, received no bids April 15, graveling 9.61 mi. Clear Lake-Milbank Rd., 26 ft. wide, Federal Aid Project 55, Deuel Co., involving 4,500 cu.yd. common excav., 14,408 cu.yd. gravel surfacing with overhaul, etc. Noted April 2.

Wyo., Casper—City plans to improve various streets in Sidewalk Dist. 4, involving 10,000 cu.yd. earth excav. and 75,000 sq.ft. sidewalk. About $30,000.

Mo., Carthage—City plans to grade, curb and pave 17,800 ft. Central Ave. from Francis St. to west line of St. Louis & San Francisco R.R., Chestnut St. from West Blvd. to river and Oak St. from Florence St. to Garrison Ave., 34-54 ft. wide, involving 74,000 sq.yd. concrete and 36,000 lin.ft. concrete curbing. About $255,000. S. C. Boggers, mayor.

Mo., Houston—Texas Co. plans to improve 28 mi. Houston-Rolla Rd., 24 ft. wide, Federal Aid Project 109, involving 147,800 sq.yd. gravel surfacing, 50,227 lin. ft. grading, 100 lin.ft. 15 in. vitr. pipe culvert, 35 rein.-con. culverts, and two 30 ft. span rein.-con. bridges, etc. About $90,700.

Mo., Ironton—Iron Co plans to build 13 mi. Ironton-Potosi Rd., 24 ft. wide, Federal Aid Project 107, involving 52,000 cu.-yd earth and 2,000 cu.yd. rock excav., 19,947 sq.yd. 9 in. and 47,520 sq.yd. 4 in. gravel surfacing, 9,000 sq.yd. 1 course plain cement concrete pavement, 51 iron pipe and rein.-con. culverts, extensions to one 12 ft. arch, three 80 ft. span steel and two 48 ft span rein.-con. bridges, cost $116,206; 28.5 mi. Ironton-Piedmont Rd., 24 ft. wide, Federal Aid Project 105, 171,000 cu.yd. earth and 6,000 cu.yd. rock excav., 73,920 sq.yd.

Streets and Roads (Continued)

gravel surfacing, 1,000 lin.ft. guard rail, 640 lin.ft. underdrain, 1,000 cu.yd. rip rap, 225 iron pipe and 33 rein.-con. culverts, one 80 ft., one 210 ft. and one 150 ft. span steel, two 48 ft., one 40 ft., one 36 ft. and one 24 ft. span rein.-con. bridges, $243,633.

Mo., Marshfield—Webster Co. plans to improve 8.5 mi. St. Louis-Springfield Rd., (South Grant Special Rd. Dist.), 24 ft. wide, Federal Aid Project 104, involving 26,100 cu.yd. earth excav., 44,880 sq.yd. gravel surfacing 6 and 8 in. deep, 25 new culverts and extensions to 3 old culverts. About $30,201.

Mo., St. Joseph—Buchanan Co. rejected bids received May 31, building .376 mi. Frederick Ave. Rd., 29 ft. wide, Federal Aid Project 94, cost $27,175; improving 20.02 mi. St. Joseph-Atchison Rd., 18 ft. wide, asphaltic concrete, $715,003. Grading, paving and bridges will be subdivided and new bids taken at once. Noted May 20.

Mo., St. Louis—City plans to resurface, reset curb where necessary and pave with brick, 3,500 ft. Morganford Rd. from Gravois Rd. to Chippewa St., cost $98,600, also 2,900 ft. Natural Bridge Ave. from Union Ave. to Clara St., $59,050. W. W. Horner, City Hall, engr.

Mo., Trenton—Grundy Co. plans to improve 5 mi. Trenton-Chillicothe and Trenton-Princeton Rd. 24 ft. wide, Federal Aid Project 108, involving 42,000 cu.yd. earth excav., 28 new culverts and extensions to 4 old culverts. About $41,146.

Tex., Austin—Travis Co. having plans prepared grading, reshaping, surfacing and draining 3.1 mi. Austin-Jollyville Rd., 16 ft. wide, involving 3,000 cu.yd. earth excav., 27,380 sq.yd. bituminous macadam topping, 92.8 cu.yd. 1 : 2 : 3 concrete, 3,800 cu.yd. rock and 7,900 lb. reinforcing steel. About $47,564. H. W. Nolan, 511 Scarborough Bldg., engr.

Tex., Ballinger — Runnells Co. having plans prepared grading, surfacing and draining 5.7 mi. Highway 30, north and south through Winters, 16 ft. wide, involving 13,560 cu.yd. gravel, 20,340 cu.yd. earth excav., 12,541 lb. reinforcing steel, 221 cu.yd. 1 : 2 : 3, 127.5 cu.yd. 1 : 2 : 4 and 67.8 cu.yd. 1 : 2½ : 5 concrete. About $44,235. J. L. Dellis, Ballinger, engr.

Tex., Bay City—Matagorda Co. having plans prepared scarifying, surfacing and building concrete culverts on 10.1 mi. Highway 12-A, Bay City-Matagorda Rd., 15 ft. wide, Federal Aid Project 175, involving 48,300 lin.ft. scarifying, 13,050 cu.yd. grader work, 122.6 cu.yd. 1 : 2 : 4 concrete and 15,800 cu.yd. shell, f.o.b. About $53,290. J. C. Carrington, Bay City, engr.

Tex., Clarksville—Red River Co. plans to build roads. About $84,000.

Tex., Goozales—Gonzales Co. having plans prepared grading, gravel surfacing and building bridges and culverts on 28.2 mi. Highway 29 from Caldwell Co. to Dewitt Co., 15 ft. wide, involving 53 acres clearing and grubbing, 94,090 lin.ft. grading, 113,700 cu.yd. earth excav., 4,400 sq.yd. concrete pavement, 149,381 lb. reinforcing and 167,100 lb. structural steel, 1,168 cu.yd. Class "A" and 1,482 cu.yd. Class "B" concrete. About $278,220. J. W. Benjamin, Gonzales, engr.

Tex., Mt. Pleasant—Titus Co. had plans prepared gravel surfacing and draining 11.21 mi. Highway 1, Federal Aid Project 27, 12 ft. wide, involving 11.21 mi. shouldering and clearing ditches, 520 cu.yd. wet and 1,040 cu.yd. dry excav., 131,297 lb. reinforcing steel, 856.5 cu.yd. 1:2:4 and 738.7 cu.yd. 1:2½:5 concrete. About $153,791. Wilder & O'Neal, Mt. Pleasant, engrs.

Tex., Paris—Lamar Co. had plans prepared grading, surfacing and curbing 6.85 mi. Highway 5 east and west from here, 16 ft. wide, involving 51,200 lin.ft. concrete curb, 68,266.5 gal. asphalt oil and 12,641 cu.yd. gravel or stone. About $173,769. W. M. Fooshee, Paris, engr.

Tex., Post City—City voted $50,000 bonds to build sidewalks and pave various streets.

Tex., San Marcos — Hays Co. having plans prepared grading, surfacing and draining 7.37 mi. Austin-Fredericksburg Rd., Highway 20-A, 12 ft. wide, involving 16.75 acres clearing and grubbing, 16,800 cu.yd. earth and 1,600 cu.yd. rock excav., 2,164 lb. reinforcing steel, 11,000 cu.yd. crushed rock, 16.3 cu.yd. Class "A" and 41.7 cu.yd. Class "B" concrete. About $39,841. J. W. Puckett, Buda, engr.

Idaho—State Highway Dept., Boise, soon receives bids grading and surfacing 2.7 mi. Yellowstone Park Highway between Beachs Corner and Ucon, 18 ft. wide, Federal Aid Project 46, Bonneville Co., concrete or bituminous macadam, cost $85,500; 16 mi. Idaho-Central Highway between Arco and Howe, 16 ft. wide, Federal Aid Project 38, Butte Co., gravel, involving 57,000 cu.yd. earth and 660 cu.yd. rock excav. and 850 lin.ft. corrugated iron pipe culverts, $90,000. D. P. Olsen, dir. of highways. Noted April 15.

Ariz., Phoenix—City plans to curb, gutter and pave Washington St. from 5th to 16th Sts., 8th St. from Madison to Washington Sts., Madison St. from 7th to 8th Sts., Jefferson St. from 7th to 9th Sts., 12th St. from Washington to Adams Sts., and Adams St. from 12th to 13th Sts., 6 in. concrete; Buchanan St. from 3rd St. to east line of Central Ave., 3rd St. from Grant to Jefferson Sts., 1st St. from Madison to Jefferson Sts., and alley in block 35, 4 in. concrete base with 2 in. bitulithic top; 4th Ave. from Harrison to Jackson Sts., 3½ in. bituminous base with 1½ in. bitulithic top; 22nd Ave. from Madison to Adams Sts., 3rd St. from Van Buren to Roosevelt Sts. and East Moreland St. from 12th to 14th Sts., 2½ in. bituminous base with 1½ in. bitulithic top.

Ariz., Phoenix—Maricopa Co. plans to pave 7 mi. Grand Ave. between here and Glendale. About $200,000. Federal Government is asked to appropriate toward cost. T. Maddock, state highway engr.

Ariz., Prescott — Yavapai Co. voted $1,500,000 bonds to grade, gravel, pave, surface and drain various highways, loose and crushed rock, disintegrated granite and volcanic cinders. H. L. Fishel, Prescott, engr. Noted May 6.

Ariz., St. Johns — Apache Co. voted $175,000 bonds to build various roads. Federal Government will also appropriate $150,000 for project.

Ariz., Tucson—City voted $75,000 bonds to improve various streets. L. O. Corvan, clk.

Wash., Olympia — Comrs. Thurston Co. soon receive bids grading and paving with concrete, 8 mi. Donahue Rd. from Rochester to Grand Mound, 16 ft. wide. About $236,000. F. Brown, co. engr.

Oregon—Bureau Pub. Rds., 204 Post Office Bldg., Portland, receives bids about July 1, clearing, grubbing, grading, graveling, building trestles, culverts and bridges (largest bridge to have 70 ft. span), on 15.9 mi. road from Tidewater Hill, Lincoln Co. to Benton Co. Line. G. H. Purcell, Portland, engr.

Ore., Astoria—City passed ordinance to pave, drain and build sewer and bulkhead on Franklin, Exchange, Florence and Lexington Sts. A. S. Tee, Astoria, engr.

Cal., Orland — City soon receives bids paving 3rd, 4th, 5th, Tehama et al streets, 3½ in. asphaltic concrete with 1½ in. bitulithic surface, involving 1,480 lin.ft. corrugated iron arch culverts, 12,450 lin.ft. metal conduits, 456 lin.ft. concrete culverts, etc. C. W. Davis, city engr. Noted April 15.

Cal., San Anselmo—City plans election to vote on $95,000 bonds to pave streets, connecting with state highway.

Cal., San Bernardino—Bd. Supervs. San Bernardino Co. receives bids in July improving 17,750 ft. Hellman Ave., 24 ft. wide, 4 in. concrete paving, cement curbing and concrete culverting.

Cal., San Diego—Bd. Supervs. San Diego Co. receives bids in June or July concrete paving 6 mi. highway south from Chula Vista, 10 mi. El Cajon to Foster and 10 mi. Bernardo to north end of Poway grade. J. B. McLees, co. clk.

Cal., San Diego—Common Council adopted resolution to pave Sunset Blvd. and Ft. Stockton Drive, involving 228,955 asphaltic oil and rock screenings wearing surface on 4 in. concrete base, 1,171 lin.ft. concrete curbing, 256 cu.yd. earth excav., 483 cu.yd. earth embankment, 2,091 lin.ft. 2-4 in. Class "B" c.i. water pipe, 120 lin.ft. 4-6 in. sewer pipe. F. A. Rhodes, city engr.

Cal., Santa Barbara—S. D. Taggart, city clk., receives bids during summer, paving 3 blocks Victoria St., warrenite bitulithic; 7 blocks Sola St., warrenite or Topeka; 3 blocks Putnam St., concrete, and 1 block Salsipuedes St., warrenite. G. D. Norrison, city engr.

Que., Montreal—A. E. Doucet, city engr., soon receives bids paving Connaugh and Hampton Aves. About $23,000 and $10,746 respectively.

Ont., Wingham—Town having plans prepared by R. Patterson, engr., Goderich, for paving 1 mi. main streets, involving 12,000 sq.yd. concrete and 10,000 lin.ft. concrete curbing and guttering. About $40,000. J. F. Groves, clk.

BIDS DESIRED

Vt., Bennington—Until June 23, by President and Trustees of village, improving various streets and building storm sewer line. W. P. Hogan, clk. H. E. Breed, 507 5th Ave., New York City, engr.; advertised in this issue.

N. Y., Auburn—Until June 21, by J. P. Jackel, city mgr., resurfacing portions of Swift St., bitulithic; advertised in this issue.

N. Y., Dansville—Until June 26, by Village Trustees, improving Perine St. H. Rowan, clk. Hopkins & Field, 349 Cutler Bldg., Rochester, engrs.; advertised in this issue.

N. Y., Long Island City—Until June 18, by M. E. Connolly, pres. Queens Boro., regulating and grading roadway of Jackson Ave. from Junction Ave. to 51st St., also regulating and repaving outside railroad franchise area with sheet asphalt pavement on 6 in. concrete foundation and within railroad franchise area, with improved granite block and sheet asphalt pavement on 6 in. concrete foundation.

N. Y., New York—Until June 18, by H. H. Curran, pres. Manhattan Boro., repairing and restoring wood and granite block pavements and foundations in railroad area, involving 200 cu.yd. concrete, 9,000 sq.yd. wood block and 3,000 sq.yd. granite block pavement.

N. Y., S. I., St. George—Until June 15, by C. D. Van Name, pres. Richmond Boro., repairing with wood block pavement, roadway of Richmond Ave. from Richmond Terrace to Post Ave., Castleton Ave. from Columbia to Caroline Sts. and from West State St. to East Bway.; Columbia St. from Richmond Terrace to Carey Ave.; Bay St. from Thompson St. to Clifton R.R. crossing; New York Ave. from Clifton R.R. crossing to Bayview Ave.; Bway. from Union St. to Henderson Ave. and from Castleton to Carey Aves.; Richmond Terrace from Sharpe to Lafayette Aves. and from Westervelt to New York Aves. and Richmond Terrace from Ferry St. to Sharpe Ave.

New Jersey—Until June 28, by State Highway Comn., Trenton, grading and paving 52,196 sq.yd. State Highway Route 3, Ancora-Atco Sect., Camden Co. A. L. Grover, ch. clk.; advertised in this issue.

N. J., Belvidere—Until June 23, by Bd. Freeholders Warren Co., building Sect. 2 Washington-Buttzville Rd., Oxford and White Twps. M. S. Faust, clk.; advertised in this issue.

N. J., Freehold—Until June 30, by Bd. Freeholders Monmouth Co., rebuilding Rumson Rd. and Ocean Ave., Seabright and Monmouth Beach Boros. C. E. Close, clk.; advertised in this issue. Noted April 22.

N. J., Newark—Until June 15, by Joint Bridge Comn. of Newark and Jersey City, Court House, repairing pavement on Lincoln Highway from Blanchard St., here, to Mawy St., Jersey City, also repairing Hackensack and Passaic bridges. Work involves 25 cu.yd. concrete, 400 sq.yd. granite and 2,000 sq.yd. wood block, etc. About $25,000.

Pa., Lebanon—Until June 21, by D. M. Sharp, city clk., furnishing labor and material paving 4th, 5th, 6th, Guilford and Weidman Sts.; advertised in this issue. Noted April 22.

W. Va., St. Albans—Until June 22, by City Council, improving 3 blocks 5th Ave., involving 3,440 cu.yd. earth excav., 2,000 sq.yd. paving, 2,070 lin.ft. combined curb and gutter and 155 lin.ft. edging; 1 block Pennsylvania Ave., 450 cu.yd. excav., 1,100 sq.yd. paving, 560 lin.ft. combined curb and gutter and 190 lin.ft. edging; 3 blocks 8th Ave., 500 cu.yd. excav. and 1,851 sq.yd. 1 course cement concrete pavement. J. M. Oliver, city engr.

W. Va., Huntington—Until June 18, by city, building 1¾ mi. McCoy Rd., vitr. brick. About $70,780. A. B. Maupin, Huntington, engr.

North Carolina—Until June 21, by State Highway Comn., Raleigh, grading and surfacing 27.4 mi. Federal Aid Project 68, 16 ft. wide, Clinton, Sampson Co., also building steel, concrete and timber bridges. W. S. Fallis, Raleigh, engr. Separate bids will be considered on bridges.

Ga., Newnan—Until June 16, by Bd. Comrs. Rds. and Revenues, Coweta Co., building 4 mi. hard surfaced road between Sta. O and Sta. 211-20, north of here, on McCollum Highway, involving 37,548 sq.yd. 6 in. plain concrete paving, 58.78 cu.yd. Class "B" concrete in headwalls and 2,575 cu.yd. common excav. and borrow, also 4 mi. on same road, south of Newnan, involving 37,548 sq.yd. 6 in. plain concrete paving, 51.08 cu.yd. Class "B" concrete in headwalls, 15,000 cu.yd. common excav. and .91 acres clearing and grubbing, building 20 mi. Newnan-Griffin Rd., involving 11.6 acres clearing and grubbing, 220,000 cu.yd. common and 300 cu.yd. solid rock excav., 245.4 cu.yd. Class "B," concrete in headwalls, 19.6 mi. grassing slopes, 39,114 cu.yd. top soil surfacing, 3,920 lin.ft. 15-24 in. culvert pipe. H. G. Smith, LaGrange, div. engr. County to furnish cement.

Streets and Roads (Continued)

Fla., Tavares—Until July 14, by E. J. Close, city clk., for 25,000 sq.yd. paving. J. W. Turner, Lakeland, engr. Advertised in this issue.

Ohio—Until June 18, by State Highway Dept., Columbus, building roads in following counties:

Franklin Co., Sect. "Z" Natl. Rd., 84 mi., grading, constructing drainage structures and paving with brick (State to furnish brick), cost $101,802; sheet asphalt, $131,160.

Franklin Co., Sect. "Z" Natl. Rd., 84 mi., grading, constructing drainage structures and paving with brick (State to furnish brick) $22,296. (Contract is for paving between interurban tracks.)

O., Columbus—Until June 22, by W. H. Duffy, dir. Pub. Serv., grading, curbing, draining, paving with asphalt and laying water main in 3010 ft. 4th St. from Naghten to North State Sts., involving 8,000 ft. asphalt and 4,600 ft. brick gutter. About $95,944.

Wis., North Milwaukee—Until June 15, by city, grading and paving various streets, involving 42,000 sq.yd. asphalt, bituminous concrete or 1 course concrete and 16,000 cu.yd. grading. About $155,000. H. Webster, city engr.

Ia., Spirit Lake—Until June 16, by Comrs. Dickinson Co., grading, draining and paving 4.8 mi. Milford-Spencer Rd. and other highways, involving 9,612 cu.yd. earthwork, 51,050 sq.yd. pavement and 3,350 lin.ft. tiling. R. A. Furman, Spirit Lake, engr.

Minn., Elk River—Until June 15, by auditor Sherburne Co., building Job 2,002, State Rd. 4, involving 2,395 cu.yd. excav., 2,382 cu.yd. overhaul, 60 lin.ft. 18 in. port culverts and 410 cu.yd. gravel; Job 2.003, State Rd. 3, 1,957 cu.yd. excav., 2,140 cu. yd. overhaul, 35 lin ft. 18 in. port culverts, and 606 cu.yd. gravel; Job 2.004, 3,200 cu. yd. excav., 8,100 cu.yd. overhaul, 84 cu.yd. concrete gutters, 520 cu.yd. clay, haul ½ mi., and 523 cu.yd. gravel, ½ mi. haul. About $25,000. H. E. Chard, Elk River, engr.

Minn., Le Sueur Center—Until June 14, by S. McMillen, aud. Le Sueur Co., building State Rd. 18, involving 14,000 cu.yd. grading, 2 acres clearing and grubbing, 2,100 cu yd. graveling and 3,000 lin.ft. 6 in. tile drain; also building 4 mi. State Rd. 10, from Cleveland to Pettis R.R. crossing. About $50,000 and $25,000 respectively. R. F. Nichols, Le Sueur Center, engr.

Minn., Mankato—Until June 17, by C. L. Kennedy, aud. Blue Earth Co., building 7 mi. Federal Aid Project 153 from Lake Crystal west, 24 ft. wide, involving 68,860 cu.yd. excav., 1,026 lin.ft. 12-24 in. portable culverts, 8 rein.-con. culverts, 243 cu yd. concrete, Bridge No. 3282 100 ft. span, two 23-ft. approach spans. About $31,000. N. Moe, Mankato, engr. Noted March 25.

Kan., Wellsville—Until June 16, by city, grading, paving, curbing and guttering 15,000 sq.yd. various streets. Bids will be received on various types of pavements. Shockley Eng. Co., Graphic Arts Bldg., Kansas City, Mo., engrs.

Wyoming—Until June 14, by D. S. Calman, supt. State Highway Dept., Capitol Bldg., Cheyenne, improving Casper-Salt Creek Rd., Natrona Co., including raising of grade from end of existing concrete pavement to Salt Creek, grading and surfacing 4 mi. at extreme north end, laying 10,000 sq.yd. precast slab rein.-con. pavement and erecting 4 steel bridges; building 4 mi. section Cokeville-Star Valley Rd., south of Smoot, Lincoln Co.; and 6 wooden bridges, 3 mi. section Yellowstone Highway, south of Worland, Washakie Co.; 6½ mi. Sheridan-Casper Rd., north of Buffalo, Johnson Co.; and 2 concrete bridges; 4 mi. section Shoshoni-Lander Rd., west of Shoshoni, Fremont Co.; 3 mi. section Yellowstone Highway, Hot Springs Co., and 1 concrete bridge, south of Thermopolis.

Wyo., Casper—Until June 21, by city clk., grading "Butler Addition," Sidewalk Dist. 3, involving 83,000 sq.ft. concrete sidewalks and 4,000 cu.yd. earth excav. About $32,000. Alternate bids will be received on (1) cash and (2) payment by bonds paid at 6 months intervals through 4 years and deriving 6 per cent interest. Wheeler & Worthington, Townsend Bldg., engrs.

Mo., King City—Jackson Twp. receiving bids building 8.85 mi. Special Rd. Dist., 16 ft. wide, bituminous macadam, involving 56,000 cu.yd. earth excav., 234 sq.yd. concrete, 10,700 lb. reinforcing steel and 630 ft. 8-36 in. pipe. About $283,032. Leslie-Barnes Eng. Co., American Natl. Bank Bldg., St. Joseph, engrs.

Mo., St. Louis—Until June 29, by city, grading and paving 3,000 ft. alley in blocks 3873, 2900 and 5142, 18 ft. wide, with 3 in. vitr. blocks on 6 in. concrete base, involving 2,230 cu yd. excav., 2,750 sq yd. concrete and 3,440 sq.yd. brick. About $25,000. W. W. Horner, City Hall, engr.

Tex., Amarillo—Until June 15, by R. C. Johnson, judge Potter Co., grading and improving 5.25 mi. Highway 13 and 5 mi. Highway 33, involving 8,755 cu.yd. earth excav., 8,471 cu.yd. embankment, 4,015 cu. yd. overhaul, 7,093 lb. steel reinforcements, etc. Nagle-Witt-Rollins Eng. Co., Amarillo, engrs.

Tex., Fairfield—Until June 19, by S. W. Robinson, judge Freestone Co., grading and draining 14.667 mi. Highway 32, Dew-Buffalo Rd., 16 ft. wide, involving 21.65 acres clearing and grubbing, 14,698 cu.yd. borrowed embankment, 68,146 lin.ft. grader work, etc., cost $30,831; also building bridges on same, involving 59.533 M. ft. lumber complete in place and 1,957 lin.ft. timber piling in place, $14,000. Bryant & Huffman, 211-217 Littlefield Bldg., Austin, engrs.

Tex., Georgetown—Until June 15, by F. D. Love, judge and H. A. Hodges, aud. Williamson Co., grading, surfacing and draining 3 mi. Highway 2 from Bartlett to Granger, 16 ft. wide, involving 11,000 cu yd. gravel, 26,000 cu.yd. earth excav. and 325 cu.yd. concrete. About $30,000. R. A. Nichols, Georgetown, engr.

Tex., Gilmer—Until June 17, by D. Walker, judge Upshur Co., grading, gravel surfacing and draining 25.9 mi. Highway 11 from Gregg Co. line to Camp Co. line, 12 ft. wide. About $228,636. Wilder & O'Neal, Mt. Pleasant, engrs. Noted March 25.

Tex., Mt. Pleasant—Until June 16, by J. W. Tabb, judge Titus Co., surfacing and draining 11.21 mi. Highway 1, Federal Aid Project 27, involving 11.21 mi. shouldering and clearing ditches, 131,297 lb. reinforcing steel, 15,072.6 cu.yd. gravel, 856.47 cu.yd. 1:2:4 and 738.7 cu.yd. 1:2½:5 concrete, cost $153,791; 5.75 mi. Highway 35, Federal Aid Project 84, 16 ft. wide, 5 acres clearing and grubbing, 35,106 cu.yd. earth excav., 23,616 lb. reinforcing steel, 6,192 cu.yd. gravel, 161.8 cu.yd. Class "A" and 230 cu.yd. Class 'B" concrete, etc., $32,295; 5.11 mi. Highway 11 from here to Camp Co. line, 12 ft. wide, 5.11 mi. shouldering and ditches 4,589 lb. reinforcing steel, 6,936 cu.-yd gravel, 37.8 cu yd. Class "A" and 134.6 cu.yd. Class "B" concrete, $39,500; 7.26 mi. Highway 1 from 4 mi. east of here to Morris Co. line, 16 ft. wide, 2.064 mi. machine work, $57,000. Wilder & O'Neal, Mt. Pleasant, engrs. Noted April 8.

Tex., Paducah—Until June 21, by Comrs. Cottle Co., improving 18 mi. State Highway 4, from here to Pease River, involving 375.77 cu.yd. concrete surfacing, 92,874 cu. yd. earth and 100 cu.yd. rock excav.

Idaho—Until June 18, by State Highway Dept., Boise, grading and gravel surfacing 21.8 mi. Idaho-Utah Highway from Oxford to Franklin Co. line, 18 ft. wide, Federal Aid Project 36, involving 52,500 cu.yd. earth and 370 cu.yd. rock excav., 685 cu.yd. concrete, 21,800 lb. reinforcing steel and 2,850 ft. corrugated iron or concrete pipe culverts. About $160,000. D. P. Olson, dir. of highways, Boise, engr. Noted March 4.

Ariz., Florence—Until June 28, by Bd. Supervs. Pinal Co., grading portions of Florence-Superior Highway, involving 29,000 cu.yd. grading and 834 cu.yd. concrete for culverts, also 144 ft., 4 span concrete bridge over Queen Creek.

Ariz., Tombstone—Until June 28, by T. Maddock, state engr., c/o Bd. Supervs., Cochise Co., grading Sect. "E," Benson-Vail Highway Federal Aid Project 18, involving 38,500 cu.yd. excav. and 1,150 cu.yd. concrete.

Wash., Seattle—Until June 21, by King Co., grading and graveling 1 mi. Renton-Maple Valley Rd., 20 ft. wide, involving 11,000 cu.yd. earth excav. About $28,500. S. J. Humes, co. engr.

Cal., Stockton—Until June 22, by City Council, paving, curbing and guttering 9th St. About $38,369. W. B. Hogan, city engr.

Que., Nicolet—Until June 19, by W. Camiraud, secy. treas., paving 2 mi. St. Jean Baptiste and Notre Dame Sts. About $61,000. Dept. Rds., Quebec, engrs.

Ontario—Until June 18, by W. A. McLean, deputy minister of highways, Toronto, paving ¾ mi. Provincial Highway, 27 ft. wide, Pickering village, involving 7,500 sq.yd. concrete. G. Hogarth, Parliament Bldg., Toronto, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

New Hampshire—State Highway Comn., Concord, received bids building state road, Newbury Twp., from R. E. Bull, Fitchburg, Mass., $30,316; L. Davis, Sunapee, $35,687.

★Mass., Boston—City let contract paving Babcock and Cummington Sts., to Rowe Contg. Co., 45 Milk St., Boston, $29,556.

★Rhode Island—Bd. Pub. Rds., State House, Providence, let contract building 1 mi. Farnum Pike, Smithfield Twp., involving 29,000 gal. asphalt, 600 sq.yd. cobble gutter, 996 lin.ft. pipe culverts, 3,700 ton crushed stone, etc., to B. C. Jordan, 1244 Elmwood Ave., Providence, $41,787; 10,630 ft. Post Rd., Kenyon Twp., 58,000 gal. asphalt, 20,500 cu.yd. earth excav., 2.5 acre clearing and grubbing, 4,000 cu.yd. gravel foundations, 600 lin.ft. pipe culverts, 7,500 ton crushed stone, etc., to J. Bristow, Narragansett Pier, $80,581. Noted May 20.

N. Y., Brooklyn—E. Riegelmann, boro pres., received bids June 2, repaving (a) Bedford Ave. from Heyward St. to DeKalb Ave., (b) Bedford Ave. from Quincy St. to Atlantic Ave., (c) Bedford Ave. from Atlantic Ave. to Sterling Pl., (d) building sidewalks on Union St. from Bedford to Rogers Aves., (e) paving West 25th St. from Mermaid to Neptune Aves., from Consolidated Asphalt Paving Co., 52 9th St., (a) $79,372, (b) $60,145, (c) $87,914, (e) $14,285; Uvalde Asphalt Paving Co., 1 Bway., New York City, (a) $81,916, (b) $62,925, (c) $80,718, (e) $15,747; Sicilian Asphalt Paving Co., 41 Park Row, New York City, (a) $82,377, (b) $63,037, (c) $93,752; T. Bernhardt, (d) $753; C. Gallagher, (d) $886; Grimm Constr. Co., (d) $1,329. Noted May 27.

★N. Y., S. I., St. George—C. D. Van Name, pres. Richmond Boro., let contract repaving Bay St., to Craemer & Sachs, 114 East 42nd St., New York City, $105,277. Noted June 3.

N. Y., S. I., St. George—C. D. Van Name, pres. Richmond Boro., received bids June 1, repaving (a) Richmond Ave., (b) Vanderbilt Ave., (c) Herberton Ave., from J. E. Donovan, 2205 Richmond Terrace, Port Richmond, (a) $47,120, (b) $16,378, (c) $12,104; J. Johnson Sons, (a) $48,903; Uvalde Asphalt Paving Co., 1 Bway., New York City, (b) $17,160, (c) $13,310. Noted May 27.

N. Y., S. I., St. George—C. D. Van Name, pres. Richmond Boro., received bids June 4, repaving (1) roadway of Van Pelt Ave. from Staten Island Rapid Transit R.R. to Washington Ave., etc., (2) Sunrise Terrace from Louis St. to Trossach Rd., etc., bituminous macadam, from J. E. Donovan, 2205 Richmond Terrace, Port Richmond, (1) $51,093, (2) $23,791; J. Johnson & Sons, Port Richmond, (1) $55,829, (2) $23,138. Noted May 27.

★N. J., Elizabeth—City let contract improving Chestnut St. and Stuyvesant Ave., concrete, to C. H. Winans Co., 207 Broad St., $172,218.

★N. J., Hackensack—Bd. Freeholders Bergen Co. let contract rebuilding Paterson Plank Rd. from Carlstadt Sta. to Passaic River, to W. P. McDonnell Constr., New York City, and R. A. Earle, Hackensack, $426,000; rebuilding Ridge Rd., to M. J. O'Connell, Hackensack, $172,480. Noted May 20.

★N. J., Jersey City—City let contract repaving Hudson Blvd. between Terhune and Communipaw Aves., to E. J. Hornung, Du Bois St., West Hoboken. About $126,000. Noted May 13.

★N. J., Morristown — Bd. Freeholders Morris Co. let contract improving Washington St., to Gray Constr. Co., Franklin St. About $53,000.

★N. J., Trenton—Bd. Freeholders Mercer Co. let contract paving ½ mi. Grand Ave., 30 ft. wide, Trenton Jct., involving 6,375 sq.yd. concrete, 2,604 sq.yd. bituminous concrete and 800 cu.yd. earth excav., to L. J. Seiling, Red Bank, $67,517; applying bituminous surface tar or asphaltic oil on Mt. Rose Rd., involving 10,000 gal. bituminous dressing and 380 ton ½ in. slag dressing, to A. Keys, Woodbridge, $5,288. Noted May 27.

Delaware—State Highway Dept., Dover, received bids May 26 building 2.93 mi. highway from Tybouts to Hares Corners, Contr. 34, New Castle Co., involving 6,310 cu.yd. concrete and 19,000 cu.yd. earth excav., from R. Hopkins, 824 2nd Ave., Troy, N. Y., $185,728, D. E. O'Connell & Sons, 204 Winona St., Ridley Park, Pa., $186,279, Peninsula Constr. Co., Bridgeville, Del., $195,488; heavy filling 1.19 mi. highway through Frederica, Contr. 24, Kent Co., involving 3,600 cu.yd. earth excav. and 86,000 cu.yd. borrow, from Keystone State Constr. Co., Franklin Bank Bldg., Phila., $105,924, G. Heyman, Washington, D. C., $108,120, Field Barker & Underwood, Phila., $119,746.

★S. C., Bishopville—Lee Co. let contract improving streets, curbs and sidewalks, involving 20,000 sq.yd. concrete, 6,650 lin ft. concrete curbing and 855 sq.yd. concrete sidewalks, to Powell Paving & Contg. Co., Palmetto Bldg., Columbia. About $90,000.

★Ga., Savannah—City let contract paving 13,000 sq.yd. West Broad St. from Gwinnett to 31st Sts and repaving 42,600 sq.yd. Indian to Gwinnett Sts., to Dixon Contr. Co., Savannah, $142,290.

Streets and Roads (Continued)

Ohio—State Highway Dept., Columbus, received bids May 28, building roads in following counties:

Champaign Co., Sect. "A" Springfield-Urbana Rd., 5.068 mi., grading, constructing bridges and culverts and paving with rein.-con., Williams & Little, Cleveland Heights, $206,038.

Clermont Co., Sect "L" Cincinnati-West Union Rd., 4.821 mi., grading, constructing bridges and culverts and paving with water-bound macadam, Billiter, Connell & Laub, West Jefferson, $149,629.

Hamilton Co., Sect, "A" Glendale-Milford Rd., 2.59 mi., grading, constructing bridges and culverts and paving with concrete, Gradison Constr. Co., Cincinnati, $121,824.

Lucas Co., Sect "F-2," "H," "I" and "J-2" in Providence and Waterville Twps., 7.4 mi., surface treatment with asphalt, A. Langenderfer, Toledo, $6,873. Noted May 6.

★O., Cleveland—City let contract grading, draining, curbing and paving East 142d St. from St. Clair to Aspinwall Aves., involving 65,000 sq ft. brick block, 4,650 yd. grading, 65,000 sq.ft. 6 in. concrete base, 4 871 ft. stone curbing and 4,936 ft. 4 in. drain tile gutter, to Gould & Maybach, 823 East 150th St. $66,095.

★O., Columbus—Comrs. Franklin Co. let contract grading, draining and paving with rein.-con., 4.277 mi., Harbor Rd., 16 ft. wide, Clinton, Mifflin, Sharon and Blendon Twps., to B. F. Patterson, 1214 Neil Ave. $383,429. Noted June 3.

★O., Marysville—Union Co. let contract grading, draining and paving with water-bound macadam, 1.03 mi. Longberry Rd., 16 ft. wide, Washington Twp., to O. R. Longberry, Marysville, $6,300; 5.02 mi. Caskell Rd., 16 ft. wide, York and Liberty Twp., to O. Johnson, Lunda, $25,000; 2.034 mi. London and Marysville Rd., 16 ft. wide, to C. Diehl, Marysville, $18,004.

★Mich., Detroit—City let contracts to Detroit Asphalt Paving Co., 20 McGraw Bldg., furnishing labor and material for shaping and paving Albert St., $5,734; Alter Rd., $38,184; Ashland Ave., $13,162; Dorchester St., $12,471; Evans Ave., $19,288; Holborn Ave., $24,467; Warren Ave., $50,473; to Cleveland Trinidad Paving Co., 2940 Woodward Ave., Pasadena Ave., $17,245; Wabash Ave., $31,488; to W. B. Brady Constr. Co., 1952 Grand River Ave., Lawton Ave., $22,386. Noted May 20.

★Mich., Detroit—City let contract to R. Porath, 1131 McKinley Ave., grading and paving Alley 1,150, 15 ft. wide, 1 course concrete with 2 x 6 in. retaining plank at sides, $11,466; to Otis Cement Constr. Co., 806 Hammond Bldg., 1,151, 18 ft. wide, $5,344; 1,154, 10-28 ft. wide, $7,432; 1,159, 17 ft. wide, $6,375; 1,160, 20 ft. wide, $2,673; 1,161, 20 ft. wide, $5,987; to R. A. Mercier, 746 Hudson Ave., 1,152, 20 ft. wide, $3,036; to T. E. Currie, 20 McGraw Bldg., 1,153, 20 ft. wide, $18,245; to R. J. Powelson & Co., 1577 Iroquois St., 1,155, 18 ft. wide, $4,291; 1,156, 18 ft. wide, $5,406; to J. J. Murphy, 1292 2nd St., 1,157, 20 ft. wide, $4,941; 1,158, 20 ft. wide, $4,971.

★Mich., Mt. Clemens—Macomb Co. let contract grading, shaping and paving 1 mi. Rd. 48, 20-40 ft. wide, involving 12,000 sq yd. 2 in. sheet asphalt or 7 in. concrete base, to Detroit Asphalt Paving Co., 20 McGraw Bldg., Detroit. $8,[illegible]28.

★Mich., Pontiac—Oakland Co. let contract grading and paving 6 mi. of Eleven Mile Rd., through Royal Oak Twp., 18 ft. wide, involving 64 000 sq.yd. 1 course concrete to R. D. Baker, 1454 Penobscot Bldg., Detroit. About $250,000.

★Wisconsin—State Highway Dept., at div. office, 208 Stephenson Bldg., Milwaukee, let contract grading and paving Town Line Rd., Federal Aid Project 115, Walworth Co., to McGucken Constr. Co., 425 East Water St., Milwaukee. About $53,000; cost plus 15%. Noted April 29.

★Wis., Hartford—City let contract excavating and paving 1.7 mi. East and West Sumner St., 20, 30 and 47 ft. wide, to J. Rasmussen & Son, 7th St., Oshkosh, $98,500. Noted May 6.

★Minn., Duluth—City let contract paving 4,500 ft. Railroad St. from 7th to Garfield Aves., 30 ft. wide, to C. R. McLean, 1st Natl Bank Bldg., $98,560. Noted April 1.

★Minn., Duluth—St. Louis Co. let contract clearing, grubbing and ditching 1 mi. Job 2008, State Highway No. 4, 28 ft. wide, to Rood Constr. Co., Grand Rapids, Wis. $25,[illegible]8.

☆Minn., Hastings—Dakota Co. let contract grading 17 mi. Federal Aid Project, State Rd. 2, 24 ft. wide to S. J. Groves & Sons, 100 Kasota Bldg., Minneapolis, $0.56 per cu.yd., total $195,718. Noted April 29.

★Minn., Princeton—Millelacs Co. let contract building 17 mi. Federal Aid Project 170 from Onamia to Crow Wing Co. line, 24 ft. wide, to C. A. Pogue, Princeton, $37,[illegible]50. Noted April 29.

SUBWAY ENTRANCE—NEW YORK, N. Y.

Bids were received (lowest 3) by J. H. Delaney, comr. transit constr., 19 Lafayette St., May 20, for constructing new entrance at 168th St. station of Manhattan-Bronx Rapid Transit R.R., from (A) Booth & Flinn, Ltd., 17 Battery Pl.; (B) Rogers & Hagerty, Inc., 103 East 125th St.; (C) Rice & Ganey, Inc., 2786 Bainbridge Ave. The unit bids were as follows:

	A	B	C
3,750 cu.yd. earth excavation including disposal, except sewers, etc	$12 50	$12.50	$10 00
600 cu yd. earth excavation, including disposal for sewers, etc.	8 00	12.50	10 00
9,000 cu.yd. rock excavation, including disposal, except sewers, etc	20 00	23.00	28 00
40 cu yd. rock excavation, including disposal for sewers, etc	12 00	23 00	28.00
1,850 cu.yd. concrete masonry	25 00	27 00	28.00
900 cu.yd. protective concrete	24 00	27 00	28 00
30 cu yd. rubble stone masonry	10.00	15.00	15.00
5 cu.yd. rubble masonry, dry	7 00	7 50	10.00
190 cu.yd. brick masonry	40.00	35.00	50.00
160 cu.yd. hollow tile masonry	40 00	35.00	50.00
100 bbl. Portland cement grout	8 00	10.00	12.00
30 cu yd. broken stone or gravel	5 00	7.50	6 00
Waterproofing:			
10 sq.yd. (a) 1-ply	1 65	1.00	1.50
10 sq.yd. (b) 2-ply	1.95	1.80	2.00
3,520 sq.yd. (c) 3-ply	3.00	2.40	2.50
10 sq.yd. (d) 4-ply	2 95	3.25	4.00
10 sq.yd. (e) 5-ply	3 80	4.10	4.50
100 sq.yd. (f) 6-ply	4 70	5.00	5.00
10 sq.yd. (i) dry	1 00	1.00	.50
10 cu.yd. waterproofing brick in asphalt mastic	50 00	60.00	70.00
Pipe drain:			
115 lin.ft. (e) 4-in. vitrified	.60	1.25	.50
10 lin.ft. (g) 6-in. c.-i	1.00	2 50	2.00
125 lin.ft. (h) 4-in. c.-i	1.50	1.50	1 75
860 lin.ft. (j) 3-in. c.-i	1.20	1.25	1.50
Pipe c.-i. fitting:			
10 lin.ft. (a) 3-in	1.50	3.00	1.75
10 lin.ft. (b) 4-in	2.10	3.75	2.00
10 lin.ft. (c) 6-in	2.80	4.50	2.50
G.W.I. pipe and fitting:			
10 lin.ft. (a) 3-in	1 20	2.00	3 00
10 lin.ft. (b) 4-in	1 80	3 00	3.25
10 lin ft. (d) 6-in	2 50	5 00	4 00
130 tons rivet steel, erected and painted	200 00	210 00	210 00
1 ton re-erecting old steel, sec. No. 427	30 00	40.00	60.00
2 tons removing old steel, including disposal sec. No. 427	40 00	25.00	50.00
Remodeling old steel see. No. 427:			
50 sq.in. cross (a) cutting old steel	2.00	1.00	1.00
190 per hole (b) drilling holes	75	2.50	1.00
50 (c) removing rivets	25	.75	.50
50 (d) driving rivets	25	1.00	.50
130 tons steel, miscellaneous, painted and erected	150 00	210.00	210 00
16 tons steel, rods and bars, in concrete	200 00	200.00	150 00
1 ton miscellaneous iron castings	95.00	300.00	150.00
500 lb. special wire forms	.35	.25	.30
800 sq ft. vault lights	3 00	2.50	4.00
Street surface restored:			
340 sq.yd. (a) within curbs	3 50	4.00	4.50
600 sq.yd. (g) between curbs	8 00	7.50	6.50
150 lin.ft. (i) bluestone curb	3 00	3.00	2 00
150 lin.ft. (k) granite curb	4 25	5.00	4.00
165 lin.ft. sewers, 3 ft. 6 in by 2 ft. 4 in	15 00	20.00	15.00
Support, maintenance, safety and protection of Man-Bx. R.T.R.R property (lump sum)	15,000.00	25,000.00	3,000.00
200 lin.ft. water pipe, 12 in	4 00	2.50	4.00
170 lin.ft. water pipe, 36 in	6 00	10.00	10.00
42 tons c.-i. hub and spigot, straight	100 00	100.00	150.00
5 tons c.-i. hub and spigot, special	200 00	200.00	250.00
130 duct. ft. electric ducts and conduits, section No. 62	40	2.00	2 50
60 lin.ft. w.-i. pipe, electric duct and conduits, sec. No. 62 (b) 3 in	1.25	3.00	3.00
Tile, W.G. 3ft.x6 in.:			
5,600 sq.ft. (a) straight	1 50	1 60	1.80
10 sq.ft. (b) 1-in. radius	2 50	3 15	1.80
400 sq.ft. (c) 2½-in. radius	3 00	5 05	2.00
10 sq.ft. (d) 20-in. radius	3 00	5 05	1 80
Tile W.P.:			
800 sq.ft. (a) straight	2 00	2 10	2.25
10 sq.ft. (b) 1-in. radius	2 50	3 15	2.25
20 sq.ft. (c) 2½-in. radius	3 00	5 05	2 25
10 sq.ft. (d) 20-in. radius	3 00	5 05	2.25
600 sq.ft. mosaic and tile bands in color	2.50	2 85	2.50
20 sq.ft. mosaic and tile tablets in color	3.00	5 05	3.00
300 sq.yd. plastering arch surfaces (b) concrete	1 75	1 25	1.50
Plastering flat surfaces:			
1,200 sq.yd. (a) brick or H.T	1.50	1.25	1.50
650 sq.yd. (b) concrete	1.50	1.25	1.50
20 sq.yd. (c) metal lath	2.00	2.10	1.50
Cement work:			
1,250 sq.ft. (a) wainscot or base	20	.55	.50
7,000 sq.ft. (c) 3-in. floor finish	25	.35	.50
100 sq.ft. (d) concrete brick or H.T	30	.20	.50
Concrete work:			
120 cu.ft. (a) concrete copings	1 30	3.40	1.50
70 cu ft. (e) street landings	70	1.05	1.50
Concrete stairs:			
1,100 lin.ft. tread (a) self-supporting stairs	2.00	2 10	2.00
800 sq.ft (b) self-supporting landings	90	1 60	1.50
450 lin.ft. tread (c) supported stairs	1 00	1.60	1.25
460 sq.ft. (d) supported landings	50	1 05	1.25
1,000 sq ft. (f) non-slip treads	2 00	2.20	2.00
150 lin.ft. (g) cement bases or wall strings	.30	40	.50
180 lin.ft. (h) cement finish exposed side of stairs	20	.40	.40
60 sq.ft (l) cement finish street landings	25	.40	50
100 sq ft removing and resetting non-slip tread, see No. 220, Part II	50	.40	1 00
115 lin.ft hollow tile masonry, except ticket booths (d) 4½x13-in. flue.	75	.65	1 25
150 weep holes	.10	40	30
10 G.-I. strap anchors	1 00	55	1 00
40 sq.yd. metal lath (a) without furring	1.40	2 50	2 00
40 sq.yd. (b) with furring	2.20	3 45	2 50
Masonry ticket booths (b) type "DI" (lump sum)	3,000.00	2,050 00	1,500.00
Transport and installing hollow metal T.B. see. No. 220, Part II (lump sum)	250.00	1,150 00	250 00
Metal toilet stall partitions:			
120 sq.ft. (a) stall partitions	3.00	1.90	1 75
10 (b) posts	15 00	14 70	15 00
34 lin.ft. (c) top rail	2 25	2 60	1 50
Kalamion doors:			
5 (d) type "D"	80.00	120 00	90 00
15 (e) type "I"	75 00	125 00	90 00

3 (ee) type "EE"	75 00	130 00	90.00
4 pairs (f) type "G"	65.00	75.00	70 00
15 sq.ft. (h) type "K"	2 50	5.25	4.00
320 sq.ft. (g) type "S"	3.00	7.35	4 00
80 sq.ft. (t) type "T"	3 50	6 30	4 00
Additional hardware:			
2 (a) door checks	10 00	10 50	10.00
4 (b) swing door stops	4 50	6 30	5 00
4 (c) rubber-covered chains	3 50	6 30	4 00
2 (d) push plates	4.50	7.35	6 00
2 (e) door pulls	7 00	10 50	8 00
2 pairs (f) kick plates	10.00	12 60	15 00
Railings:			
35 lin.ft. (a) type "FS"	7 00	7 35	10 00
10 lin.ft. (e) type "LS"	10 00	8 40	12 00
500 lin ft. (g) pipe	6 00	3 15	5 00
Gates, etc.:			
12 lin.ft. (a) low sliding	15 00	15 75	45 00
25 lin.ft. (c) folding	20 00	70 00	60 00
2 (f) single gate control	50 00	45 00	120 00
2 gate open (p) c.-i. gate post cross-frames, etc	70 00	80 00	120 00
3 gate open (r) steel gate posts, cross frames, etc	70 00	57.50	105 00
40 sq.ft. signs, brackets, etc. (g) enamel sign plates	3 00	1 70	4 00
20 sq.ft. signs, brackete, etc. (k) frames—direction signs	3 50	5 25	8.00
50 lin.ft. street railings (b) type "K"	20 00	18 00	50 00
52 lin.ft. tread steel ladders (a) ladders	5 00	4 20	12 00
160 lin.ft. oak hand rail	1 50	1 50	1 50
30 lin.ft. removing and installing existing hand rail	1 00	1 05	1 00
Rough plumbing (lump sum)	2,950 00	3,700 00	3,400 00
1 sewer connection, any size	400.00	530 00	525.00
1 water connection, any size	250 00	530 00	525 00
Plumbing fixtures:			
4 (a) water closet bowls	126 00	150 00	150 00
2 (b) lavatories	90 00	110 00	105.00
2 (d) urinals	200 00	250 00	215.00
1 (g) slop sinks	130 00	165 00	150 00
6 (h) floor drains	30 00	40 00	40 00
Structural slate:			
230 sq.ft. (n) pipe chamber partitions	1 60	1 50	1.50
60 sq.ft. (o) shelves	1 50	1 25	1.30
10 sq ft. (q) floor slabs	2 08	1.60	1.50
70 lin.ft. (r) curved corners and angles	2.00	1 80	2 00
2,300 lb. steel angles, etc	12	20	30
2 register faces (a) pipe chamber partitions	13 00	16 00	25.00
1 (b) walls	13 00	19 00	25 00
Conduits:			
3,240 lin.ft. (a) ¾-in.	35	40	.45
1,070 lin.ft. (b) 1 in.	50	65	.50
730 lin.ft. (c) 1¼ in.	75	1.25	1.20
115 linft. (d) 2 in.	1 50	2.10	1 85
520 lin.ft. (f) 3 in.	2 50	3 00	2.60
50 lin.ft. (g) ¾ in	40	.50	.50
210 lin.ft. (l) 3½ in.	3 00	3 65	3.45
10 special conduit fittings with removable covers	3 50	1 25	2.00
190 c.-i. outlet boxes	80	1.70	1.50
C.-I. pull boxes:			
3 (b) 12x12x6 in.	9 00	19 00	18.00
2 (c) 12x18x6 in.	16 80	24 00	24.00
7 (f) 6x6x4 in.	2 50	7 35	7.00
2 (i) 8x8x6 in.	5.60	9.45	9.00
4 c.-i. heater boxes	60.00	42 00	38.00
1 panelboard boxes (h) 25x6x49 in. to 60 in., inclusive	75 00	57.50	55.00
27,000 sq.ft. painting (c) 2-coats plaster	045	08	04
12,000 sq.ft. (i) additional coat	02	05	.02
Removing and resetting kiosk, sec. No. 220, Part II (lump sum)	500.00	1,250 00	1,000.00
Removing and carting plumbing fixtures, etc., sec. No. 220 (lump sum)	500.00	260 00	500.00
Extended totals	$463,142	$527,232	$549,460

Streets and Roads (Continued)

★**South Dakota**—State Highway Dept. let contracts grading and draining 9.61 mi. Clear Lake-Milbank Rd., 26 ft. wide, Federal Aid Project 55, Deuel Co., involving 65,227 cu.yd. common and 452 cu.yd. structural excav., 32,786 cu.yd. overhaul, 391 cu.yd. Class "A" and 75 cu.yd. Class "B" concrete, 31,936 lb. reinforcing and 215 lb. structural steel, 680 lin.ft. rein.-con. or corrugated iron pipe culverts, etc., 11.4 mi. De Smet-Brookings Highway, 36 ft. wide, Federal Aid Project 25, Brookings Co., 77,824 cu.yd. common and 489 cu.yd. structural excav., 29,201 cu.yd. overhaul, 417 cu. yd. Class "A" and 113 cu.yd. Class "B" concrete, 31,099 lb. reinforcing and 365 lb structural steel, etc., 6 mi. Clear Lake-Milbank Rd., 36 ft. wide, Federal Aid Project 54, Grant Co., to Roach Constr. Co., Clark, $71,981, $81,448 and $71,609 respectively. Noted March 22, April 1 and 22.

★**Mo., St. Joseph**—Buchanan Co. let contract paving 2.2 mi. Mitchell Ave. Rd., 14 ft. wide, bituminous macadam, to Land & Kilbred, Balanger Bldg., $55,721.

★**Tex., Stephenville**—Erath Co let contract grading, gravel surfacing and draining 31.26 mi. Highway 10, Stephenville-Bluffdale Rd., 16 ft. wide, to O'Connor & Gilkins, Dallas, $296,963, including material furnished by county and 10% for engineering and contingencies. Noted May 13.

★**Tex., Tyler**—Smith Co. let contract grading, surfacing and raining 23 mi. Dixie Highway, 18 ft. wide, involving 10,500 sq.yd. concrete and 10,500 sq.yd. bituminous macadam, to Healey Constr. Co., Burk Burnett Bldg., Ft. Worth. About $388,000; cost plus 10% basis.

★**Okla., Mangum**—City let contract paving various streets to Municipal Excavator Co., 200 East Main St., Oklahoma, $209,891. Work involves 40,055 sq.yd. asphaltic concrete, at $3.75 per sq.yd., 9,800 cu.yd. earth excav., $1, 200 cu.yd. excav., $3.50, 3,900 cu.yd classified excav., $1.90, 10,610 lin.ft. straight concrete curb, $1.10, 2,170 lin.ft. radius concrete curb, $1.20, 730 lin.ft. 10 in. vitr. sewer pipe, $1.50, 395 lin.ft. 12 in. vitr. sewer pipe, $2.25, 690 lin.ft. 15 in. vitr. sewer pipe, $2.60, 70 lin.ft. 18 in. vitr. sewer pipe, $2.90, etc. Noted May 13.

★**Okla., Stroud**—City let contract paving various streets, to Connelly Constr. Co., 204 Scott Thompson St., Oklahoma, $56,754. Work involves 10,360 sq.yd. brick paving, at $4.35 per sq.yd., 2,700 cu.yd. earth excav., $1.25, 80 cu.yd. rock excav., $5, 800 ft. straight concrete curb and gutter, $1.25, 310 ft. radius concrete curb and gutter, $1.25, removing 870 ft. curb and gutter, $0.50, etc.

★**Idaho**—State Highway Dept., Boise let contract building 7½ mi. Arrowrock Highway, between Barber and Arrowrock dam, 16-24 ft. wide, Ada Co., to Morrison & Knudsen, Railroad and Reclamation Ave., Boise, $143,300.

★**Idaho**—State Highway Dept., Boise, let contract grading and paving road from Bannock Co. line to 2 mi. north of Yellowstone Park Highway, 18 ft. wide, Federal Aid Project 25, Bingham Co., involving 5,013 cu.yd. earth excav. and 21,120 sq.yd. bituminous macadam also 5.93 mi. Yellowstone Park Highway from Idaho Falls to Bingham Co. line, 18 ft. wide, Federal Aid Project 14, Bonneville Co., 25,028 cu.yd. earth excav., 63,365 sq.yd. bituminous macadam, 255 yd. concrete, 23,476 lb. reinforcement and 350 ft. c.i. pipe, to J. C. Maguire, Idaho Falls, grading 7.51 mi. Yellowstone Park Highway from Bonneville Co to Madison Co. line, 20-22 ft. wide, Federal Aid Project 16, Jefferson Co., 45,644 cu.yd. earth excav., 2,070 ft. corrugated iron pipe, 44,909 lb. reinforcement and 720 cu.yd. concrete, to Morrison & Knudson, Railroad and Reclamation Ave., Boise, grading and surfacing 22.43 mi. North and South Highway from Genessee to Moscow, 16 ft. wide, Federal Aid Project 18, Latah Co., crushed rock, 191,084 cu.yd. earth and 220 cu.yd. rock excav., 35,400 cu.yd. crushed rock, 707 cu.yd. concrete, 21,054 lb. reinforcement and 3,124 lin.ft. corrugated iron pipe, Standard Asphalt & Paving Co., North 517 Lincoln St., 7 mi. Malad Valley Highway, 18 ft. wide, Federal Aid Project 34, Oneida Co., gravel, 31,696 cu.yd. earth and 834 cu.yd. rock excav., to Fred Coolidge, Laramie, Wyo. Contracts on above have been awarded, subject to revised quantities. Noted May 13.

★**Idaho**—State Highway Dept., Boise, let contract building 5 mi. Grays Lake State Highway between Idaho Falls and Ammon, Bonneville Co., to Gleim & Shafer, Pocatello, $43,305. Noted March 25.

Idaho—State Highway Dept., Boise, received bids May 22, grading and gravel surfacing 10.8 mi. Idaho-Montana Highway, 18 ft. wide, Federal Aid Project 32, Clark Co., from Clark Co. Highway Dist., Dubois, $65,120; Morrison & Knudson, Railroad & Reclamation Aves., Boise, $77,418; F. Coolidge, Laramie, Wyo., $80,066. Work will be let to Highway Dist., if law can be complied with in regard to honds, etc. Noted May 13.

Ariz., Tuscon—Bd. Supervs. Pima Co. received bids gravel surfacing 7.0634 mi. Benson-Vail Highway, Sect. C, Federal Aid Project 18, from Goodman-Merrill, Box 554, Tucson, $23,363. Work involves 9,706 cu. yd. excav., $0.65, 8,854 cu.yd. borrow, $0.65, 1,369 cu.yd. overhaul, $0.05, corrugated metal pipe culvert, 48 lin ft. 18 in., $1.25, 22 lin.ft. 24 in., $1.35, 22 lin.ft. 36 in., $1.50, 291.18 cu.yd. Class "A" concrete slab structures, $27, 26.14 cu.yd. Class "B" concrete in headwalls, $23, 17,818 lb. reinforcing steel, $0.05. State furnishes reinforcing steel, corrugated metal pipes and cement in Class "A" and "B" concrete.

★**Ariz., Yuma** — City let contract improving 4th St., Orange and Madison Aves., Dist. 5, involving 31,220 sq.yd. grading, 21,580 sq.yd. Warrenite-bitulithic paving, 9,390 lin.ft. cement curbing, 7,720 lin ft. concrete guttering, 1,110 sq.ft. concrete paving and 4 concrete metal culverts, etc. to White & Miller, Yuma, $90,170. Noted May 13.

★**Wash., Seattle**—City let contract curbing, paving and building walks, etc., on 10th Ave. N. E., involving 51,700 sq.yd. 1 course concrete, 27,200 lin. ft. armored concrete curbing and 16,000 cu.yd. earth excav., to John & Bressi, Seattle, $239,561.

★**Wash., Seattle**—City let contract paving 70th Ave., involving 3,300 cu.yd. earthwork, 3,210 lin ft. type A armored concrete curb and 11,300 sq.yd. 6 in. concrete pavement, to Olympic Constr. Co., Hoge Bldg., $52,239.

★**Oregon**—State Highway Comn., Portland let contract clearing and grading 5.3 mi. Toledo-Newport Rd., Lincoln Co., to T. E. Young, 910 Chamber Commerce Bldg., Portland, $51,062. Noted May 13.

★**Ore., Astoria**—City let contract improving Grand, Madison and Lexington Aves., Taylors Addition, to McClean & Williams, Astoria, $34,665.

Ore., Portland — City received bids improving (a) Kellogg St. from Reno to St. John Aves., (b) East 76th St. from Base Line Rd. to East Glisan St., (c) Killingsworth Ave. from Union Ave. to East 9th St., (d) Ainsworth Ave. from Interstate to Williams Aves., (e) building sewer in East 45th St. and Private Property, (f) East 59th St. from Fremont to Klickitat Sts., (g) 42nd Ave. S. E., from point 140 ft. west of 46th St. S. E. to 42nd St. S. E., (h) 39th Ave. S. E. from point 30 ft. west of 54th St. S. E. to 52nd St., (1) asphaltic concrete No. 1 on 4 in. crushed rock base in roadway, (2) vitr. pipe, (3) cement pipe, from O. M. Patton, (a) $1,394; Warren Constr. Co., Journal Bldg., (b1) $2.37 per sq.yd., total $26,588, (c1) $2.34 per sq.yd., $15,819; Hetrick & Cline, foot of Salmon St., (a) $1,408; Municipal Paving Plant, (c) $1.80 per sq.yd., $12,907; United Contg. Co., Northwest Bank Bldg., (d1) $2.26 per sq.yd., $42,325; L. Lane and H. J. Pasanen, (e2) $1,736, (f2) $1,827; Mehemarie & Co., (f3) $1,796, (h) $1,383; J. Keating, Lumberman's Trust Co., (f3) $1,865, (g3) $1,993, (h3) $1,269; Lundstrom & Carlson, (g2) $1,915, (h2) $1,654; Joseph & Son, (g) $1,991.

★**Ore., Seaside**—City let contract furnishing labor and material paving and placing improvements on 7th St. and 24th Ave., involving 13,529 sq.yd. asphaltic concrete, 21,300 lin.ft. concrete shoulders, 960 lin.ft. 6 in. sewer pipe, etc., from J. H. Tillman Co., Portland, $29,690.

★**Cal., San Diego**—Common Council let contract improving Tide St., involving 208,477 sq.ft. ¾ in. asphaltum macadam wearing surface on 5 in. concrete base, 5,601 cu.yd excav., 18,625 cu.yd. embankment and 4,933 lin.ft. concrete curbing and culverts, to J Engrebretsen, McNeece Bldg., $76,348

Streets and Roads (Continued)

Cal., San Diego—Common Council received bids June 1, improving Lytton and Voltaire Sts., Chatsworth and Catalina Blvds., involving (a) 316,956 sq.ft warrenite bitulithic wearing surface on asphalt concrete base, (b) 14,419 cu.yd. excav., (c) 14,001 cu.yd. earth embankment, (d) 247 lin.ft. concrete curbing, (e) 3,528 sq.ft. oiled guttering, (f) 920 lin.ft. wooden guard rail fences, etc., from Fairchild-Gilmore-Wilton, 25 11th St., (a) $0.239 per sq.ft., (b) $1.18, (c) $0.01, (d) $0.70, (e) $0.10, (f) $1.40, total $98,684; Bryant & Austin, Inc., 1650 Compton St., Los Angeles, (a) $0.25, (b) $0.90, (c) $0.50, (d) $0.65, (e) $0.12, (f) $1.70, $105,043. Noted April 1.

★**Ont., Ottawa**—City let contract paving 1 mi. various streets, 24-48 ft. wide, involving 15,000 sq.yd. asphalt on concrete base, to Standard Paving Co., Central Chambers, Elgin St. and O'Learys Ltd., Natl., Bank Bldg. Total $52,000.

★**Ont., Ottawa** — Suburban Rds. Comm., Thistle Bldg., let contract building 1½ mi. suburban roads, 30 ft. wide, involving 26,000 sq.yd. asphalt on concrete base, to Standard Paving Co., Central Chambers, Elgin St. About $87,000.

★**Ont., Sandwich-East**—Township let contract building 4 mi. concrete sidewalks, 4-6 ft. wide, to S. West & Co., 1023 Sandwich St. About $25,000.

Railways

PROPOSED WORK

New York—International Ry., 70 West Huron St., Buffalo, having plans prepared for 12 mi. street railway. About $500,000. H. G. Tulley, pres.

Pennsylvania—Williamsport Passenger Ry., 324 West St., plans to extend line 7,900 lin.ft. on West 3rd St. from Rose to Arch Sts., also grade and pave along same. About $178,000, city to bear cost of grading, $24,000. E. H. Davis, genl. mgr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Washington**—Northern Pacific Ry., 516 14th St., Spokane, plans to repair, maintain, lay new steel tracks, raise road bed, etc., on Spokane Div. from Paradise Mont. to Pasco, Wash., also improve yards at Yardly, Wash., and Kootenai, Idaho. About $1,690,000. J. D. Koran, div. engr. Work will be done by day labor.

★**West Virginia**—Norfolk & Western Ry., Roanoke, Va., let contract building 10 mi. extension on Pigeon Creek, to H. M. Waugh, Law & Commerce Bldg., Bluefield, W. Va.

Excavation and Dredging

PROPOSED WORK

N. Y., Buffalo—Excavation—City having plans prepared widening Niagara River in and adjoining Buffalo Harbor. G. H. Norton, city engr.

Md., Sparrows Point (Baltimore P. O.)—Bethlehem Steel Co. has filed application with U. S. Engineers Office, Custom House, Baltimore, for permission to widen ½ mi. of 35 ft. channel (leading to Company's ore pier), from 90 ft. to 230 ft., involving 1,500,000 cu.yd. excav. About $100,000.

Ia., Clarion—Drain—Until June 14, by D. H. Eyler, aud. Wright Co., furnishing labor and material building Drain 193, Vernon and Wall Lake Twps., involving 19,843 ft. 6-22 in. tile; Drain 194, Boone Twp., 2,200 ft. open ditch work and 34,350 ft. 6-36 in. tile.

Mo., Agency—Drainage—Platte River D. D. 2 having plans prepared draining 2,500 acres of land, 3½ mi. long. About $75,000. W. B. Hazen, 53 Commercial Bldg., St Joseph, engr.

Minn., Henderson—Ditch—Until June 11, by F. Hoppenstedt, aud. Sibley Co., building Ditch 36, involving 35,511 ft. 5-28 in. tile drain, 1 rein.-con. bulkhead, 23 gravity intakes, 55 cu.yd. open ditch excav. About $35,000. C. H Patterson, Gaylord, Minn., engr.

Mo., Jackson—Drainage—Little River D. D. receiving bids for 7,000 lin.ft. bank protection made up of concrete material 45 ft. wide, 4 in. thick and bank revetment 36 ft wide, 4 in. thick, involving 7,000 cu yd. concrete, in Cape Girardeau, Stoddard New Madrid, Dunklin, Scott and Pemiscot Counties. Morgan Eng Co., Goodwyn Inst., Memphis, Tenn., engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**S. C., Charleston**—Dredging—Standard Oil Co., Brigade St. and Southern Ry., let contract removing 140,000 cu. yd sand, mud and clay, in Cooper River, at head of Drum Island, to Atlantic Gulf & Pacific Co., Park Row Bldg., New York City, $0.24 per cu.yd.

★**Ia., Boone**—Drain—Boone Co. let contract building extension to Drain 17, to McHose Sand & Tile Co., Boone, $43,280.

★**Ia., Atlantic**—Ditches—Cass Co. let contract building 12 mi. drainage ditches and straightening Indian Creek and its tributaries, involving 750,680 cu.yd. excav., to Lana Constr. Co., Council Bluffs. Noted May 6.

★**Ia., Ft. Dodge**—Drain—Webster Co. let contract building Drain 4, involving 100,000 cu.yd. excav., and 3,000 ft. tile, to King & Eichmiller, Frazee, Minn., and McHose Sand & Tile Co., Boone. About $25,720. Noted May 6.

★**Ia., Ft. Dodge**—Drains—Webster Co. let contract building Drain 306, involving 22,974 cu.yd. excav., and 25,000 ft. tile, to Grundon Bros. & Glick, Ft. Dodge, and Humboldt Gravel & Tile Co, Humboldt. Noted April 1.

★**Ia., Ft. Dodge**—Drain—Webster Co. let contracts building Drain 313, involving 22,800 cu.yd. excav. and 15,050 ft. tile, to C. Haugsted, Nevada, A. M. Montgomery, Ft. Dodge, and McHose Sand & Tile Co., Boone. About $26,785. Noted May 6.

★**Ia., Mason City** — Drainage — Cerro Gordo Co. let contract building D. D. 79, involving 33,200 ft. 6-26 in. tile, to Christensen Constr. Co., Iowa Falls, and Cement Products Co., Mason City. Noted May 13.

★**Utah, Filmore**—Drainage—D.D. No. 1. Millard Co. let contract excavating and laying tile for proposed system, here, to M Baer, Tremonton, cost $70,000; tile, to J. T. Corrbridge, Salt Lake City, $51,000; backfilling to Theobold & Pratt, Hinckley, $100 per mi.; open ditch work, to Foley Constr. Co. Total cost $126,000. Noted March 25.

Industrial Works

PROPOSED WORK

Me., Dixfield—Elastic Webbing Co Pawtucket, R. I., soon lets contract building 4 story, 100 x 150 ft., mill construction factory concrete foundation, along banks of Webb River, here. About $100,000. Private plans. Noted May 13.

Mass., Chelsea (Boston P. O.)—H. H. Atwood, archt., 61 Alban St., Dorchester, soon lets contract altering and building 2 story, 35 x 90 ft. brick and steel addition to power plant and laundry, rein.-con. flooring, concrete foundation, at Soldiers Home, here, for Commonwealth of Massachusetts, Boston. About $125,000.

Mass., Springfield—McClintock & Craig, archts. and engrs., 33 Lyman St., soon let contract building 2 story, 60 x 132 ft., brick, concrete and steel addition to plant, rein.-con. flooring, concrete foundation, on Wason Ave., for Bausch Machine Tool Co., 156 Wason Ave. About $50,000.

Conn., Bridgeport—Fletcher, Thompson, Inc., engrs., 1089 Broad St., soon lets contract building 3 story, brick, concrete and steel addition to plant, rein.-con. flooring, concrete foundation, for Bridgeport Elastic Fabric Co., 209 Center St. About $100,000. Noted May 13.

Conn., Bridgeport—East Side Flour & Grain Co., 1677 Seaview Ave., soon lets contract building 2 story, 80 x 90 ft., brick and steel plant, concrete foundation. About $50,000. Private plans.

N. Y., Long Island City—McEvoy & Smith, archts. and engrs., Queens Plaza Court, soon let contract building rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Ely and Sunswick Aves., for Hellman Motor Corp., c/o architects. About $75,000.

N. Y., Niagara Falls — International Paper Co., Buffalo Ave. and 13th St., had plans prepared for brick and steel addition to factory. About $65,000.

N. Y., Richmond Hill (Jamaica P. O.)—R. M Krauser, c/o C. Bauer, archt. and engr., 788 Manhattan Ave., Brooklyn having plans prepared for 3 story, 60 x 100 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on 129th St., here About $80,000.

Pa., Pittsburgh—R P. McCurdy Co., Farmers Bank Bldg., having plans prepared by Hunting-Davis Co., archts., Century Bldg., for 4 story, 60 x 120 ft. garage and sales building, concrete, brick and steel, rein.-con. flooring, on Millvale St and Baum Blvd About $125,000.

Md., Laurel—Maryland Motors Corp., 631 Munsey Bldg., Baltimore, having plans prepared by T. B. Webster, mgr and engr. for 2 story, 30 x 50 ft power plant on Patuxent River, here. About $120,000.

Md., Westport (Baltimore P. O.)—Chesapeake Iron Works plans to build 1 story, 60 x 210 ft. steel addition to plant, concrete foundation. About $50,000. Private plans. Work will probably be done by day labor.

Va., Richmond—Larus Bros. & Co., 7 South 21st St., having plans prepared by Carneal & Johnson, archts., 707 Chamber Commerce Bldg., for 5 story, 88 x 176 ft., brick factory. About $125,000.

Va., Richmond—Liggett & Myers Tobacco Co., 100 South 7th St., had plans prepared by Francisco & Jacobus, archts., 511 5th Ave., New York City, for 6 story, 96 x 130 x 195 ft., rein.-con. factory, on 6th and Canal Sts. About $350,000.

Va., Richmond—R. J. Reynolds, 12th and Byrd Sts., had plans prepared for 1 story, 49 x 53 x 266 ft. tobacco plant, brick, on Byrd St. between 10th and 11th Sts. About $25,000.

W. Va., Charleston—Charleston Storage & Transfer Co., Capitol St., having plans prepared by P. Eagan, archt., Day and Night Bank Bldg., for 2 and 4 story brick and concrete warehouse. About $200,000.

S. C., Anderson—D. Brown plans to build warehouse. About $100,000. Architect not selected.

S. C., Columbia—Columbia Ry., Gas & Electric Co., Arcade Bldg., plans to build additions, also 5 or 10 mi. pipe line and tanks to provide for several hundred thousand cubic feet of gas. About $400,000. J. G. White, Eng. Corp., 43 Exch. Pl., New York City, engrs.

S. C., Greenville—A. W. Smith soon receives bids building, 4 story, 80 x 204 ft., steel and brick mill. About $375,000. J. E. Sirrine, Greenville, archt.

O., Cleveland—J. Babin, Olmstead Hotel, plans to build 2 story, 48 x 110 ft., brick and steel garage and commercial building on Superior Ave. and East 107th St. About $100,000.

O., Cleveland — Brandt Co., Sheriff St. Market, plans to build 6 story cold storage warehouse, brick, steel and concrete, rein.-con. flooring, concrete foundation. About $300,000. Architect not selected.

O., Cleveland — Parish & Bingham Co., West 106th St. and Madison Ave., having plans prepared by E. McGeorge, archt. and engr., 1900 Euclid Ave., for 1 story, 30 x 55 ft., brick, steel and concrete boiler plant, rein.-con. flooring, concrete foundation at 10,600 Madison Ave. About $100,000.

Ind., Anderson — City passed ordinance appropriating $350,000 to enlarge light and power plant.

Mich., Bay City—Wildman Rubber Co., 816 Book Bldg., Detroit, plans to build 1st unit of plant, rein.-con. brick and steel, rein.-con. flooring, concrete foundation, on 60 acre site, along Saginaw River. About $1,000,000. Engineer to be selected at once.

Mich., Detroit—Federal Motor Truck Co., Federal Ave., plans to build 1 story, brick and steel factory, rein.-con. flooring, concrete foundation, along tracks of Detroit Terminal Ry. About $200,000. F. J. Winter, 2331 Dime Bank Bldg., archt.

Mich., Detroit—Smith, Hinchman & Grylls, archts., Washington Arcade, soon let contract building 1 story, 79 x 532 ft. and 2 story, 17 x 85 ft. additions to factory, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Artillery Ave., for International Metal Stamping Co.

Ill., Chicago—Elgin Motor Car Corp., 61st St. and Archer Ave., plans to build 2 story, 160 x 400 ft. factory addition. About $300,000. Architect not selected.

Wis., Milwaukee—Harley-Davidson Motor Co., 37th and Chestnut Sts., had plans prepared by Federal Eng. Co., engrs. and archts., Stephenson Bldg., for 1 story 45 x 210 ft. stock house, brick, steel and concrete, concrete flooring and foundation.

Mo., Aurora—Juvenile Shoe Co., Advertising Bldg., St. Louis, having plans prepared by T. P. Barnett & Co., archts., Arcade Bldg., St. Louis, for brick factory, here. About $200,000.

Cal., Fresno—Albers Bros. Milling Co., 332 Pine St., San Francisco, purchased site here, and plans to build mill. About $250,000.

Cal., Los Angeles — Miller Rubber Co., South High St., Akron, O., plans to build factory, here, 2,800 casings daily capacity. F. C. Millhoff, genl. sales mgr.

Cal., San Francisco—S Chamberlain, c/o O'Brien Bros., archts., 240 Montgomery St., having plans prepared for 5 story, 70 x 90 ft. rein.-con. garage, on Stevenson St.

Que., Gatineau—Royal Securities Corp., 164 St. James St., Montreal, soon receives bids building pulp and paper mills, 3 dams etc. in Gatineau Valley Dist for Gatineau Co., Ltd., Ottawa, Ont C. B. Thorne, Montreal, engr. About $30,000,000.

BIDS DESIRED

Pa., Waynesboro—Frick Co., West Main St., receiving bids constructing 1 story, 147 x 300 ft. foundry, and 2 story, 30 x 100 ft pattern shop and storage building, brick and steel. About $300,000. Private plans

Industrial Works (Continued)

Mich., Detroit—Until June 15, by H. T. Millar, archt., Lightner Bldg., constructing 2 story, 140 x 400 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Cardoni St., for Wood Hydraulic Hoist Co., Russell St. About $125,000.

Ill., Chicago—A. S. Alschuler, archt., 28 East Jackson St., receiving bids building 7 story, 50 x 120 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, on Washington and Sangamon Sts., for E. Katzinger Co., 120 North Peoria St. About $200,000.

Wis., Manitowoc—Until June 18, by H. Zannacker & Sons, 923 Washington Ave., constructing 3 story, 50 x 64 ft., brick, rein.-con. and steel, dry cleaning building, rein.-con. flooring, brick foundation, on 18th St. Private plans.

Wis., Sheboygan—Until June 21, by J. Smith, archt., Imig Bldg., constructing 1 story, 48 x 143 ft., brick, rein.-con. and steel garage, office and display room, brick foundation, on South Water St., for Sheboygan Lime Wks., 822 Niagara Ave. About $75,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**R. I., Woonsocket**—Amer. Wringer Co., 91 Social St., let contract building 3 story, 42 x 98 ft., brick warehouse, concrete foundation, to Flynt Bldg. & Constr. Co., 356 Main St., Palmer, Mass. About $50,000. Noted May 20.

★**Conn., Manchester** — Mutual Heating Corp. let contract building 1 story, brick and concrete heating plant, rein.-con. flooring, concrete foundation, on Main St., to Flynt Bldg. & Constr. Co., Palmer, Mass. About $50,000.

★**N. Y., Brooklyn**—J. Chambers, c/o T. Bennett, archt. and engr., 7826 5th Ave., will build 1 story, brick and steel garage, rein.-con. flooring, concrete foundation, on 4th Ave. About $50,000. Work will be done by day labor.

★**N. Y., Brooklyn**—S. Ranson, 401 West St., New York City, let contract building 1 story, 150 x 200 ft., brick and steel machine shop and transformer station, rein.-con. flooring, concrete foundation, at 518 Hamilton St., to Wharton-Green, 37 West 39th St., New York City. About $250,000.

★**N. Y., Long Island City**—Howard Printing Co., 1720 Bway., New York City, let contract building 2 story, 55 x 110 ft., rein.-con. and steel plant rein.-con. flooring, concrete foundation, on Ely St. and Wilbur Ave., here, to Genovese & Son, Clinton St., Long Island City. About $50,000. Noted May 20.

★**N. Y., New York**—Hup Realty Co., 228 East 38th St., let contract altering 3 buildings, brick and steel, rein.-con. flooring, at 226 East 42nd St., to Wharton Green Co., Inc., 37 West 39th St. About $200,000.

★**N. Y., New York**—One Hundred-Eleven West End Corp., care of F. Meister, archt. and engr., 534 West 56th St., will build 2 story, 100 x 100 ft., brick and steel garage and service station, rein.-con. flooring, concrete foundation, on West End Ave. About $85,000. Work will be done by day labor.

★**N. Y., Rocky Point**—Radio Corp., Woolworth Bldg., New York City let contract for wireless station and power house, here, to J. G. White Eng. Co., 43 Exch. Pl., New York City. About $10,000,000. Noted June 3.

★**N. Y., Yonkers**—Yonkers Electric Light & Power Co. let contract building 2 story, 100 x 225 ft., rein.-con. and steel transformer station, rein.-con. flooring, concrete foundation, on Columbus Pl., to J. Canepe Contg. Corp., Inc., Yonkers, $200,000.

★**N. J., Jersey City**—Colgate & Co., 105 Hudson St., let contract building 1 story, 45 x 50 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Marris St., to E. C. Brown Co., 70 East 15th St., New York City. About $70,000.

★**N. J., Keyport**—Whitall-Tatum Co., 46 Barclay St., New York City, let contract building 3 story, 50 x 200 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, to H. H. Vought, Grand Central Terminal, New York City About $100,000.

★**N. J., Trenton** — Bergounan Rubber Corp. of Trenton let contract constructing three 2 story, 20 x 20 ft., 25 x 80 ft. and 60 x 150 ft. factory buildings, rein.-con., brick and steel, rein.-con. flooring, concrete foundations, on Whitehead Rd., to Farrall Constr. Co., 53 West 39th St., New York City. About $250,000.

★**Pa., Frankfort Jct.** (Phila. P. O.)—Belmont Packing & Rubber Co., 133 North 2nd St., Phila., let contract building 2 story, 120 x 120 ft., brick and concrete factory, to Hogg Constr. Co., Denckla Bldg., Phila. About $100,000. Noted Jan. 29.

★**Pa., Phila.**—Phila. Electric Co., 100 Chestnut St., let contract building concrete and brick substation, at 52-54 North 6th St., J. R. Wiggins Co., Otis Bldg., $137,500.

★**Pa., Rochester**—H. C. Fry Glass Co. let contract building 2 story, 80 x 320 ft. and 90 x 120 ft., steel and corrugated iron factory, to Austin Co., Union Arcade, Pittsburgh. About $350,000.

★**Md., Pocomoke**—M. Clogg let contract building 1 story, 150 x 200 ft. brick and stone garage and warehouse, concrete flooring, concrete foundation, to McIver Constr. Co., 706 Law Bldg., Baltimore. About $65,000.

★**Va., Hopewell**—Mayhew Steel Products Co., Inc., 291 Bway., New York City, let contract constructing plant, including 3 one story buildings, rein.-con. and brick, rein.-con. flooring, concrete foundations, to Harrison Constr. Co., 15 Mcll. Bldg., Petersburg, Va. About $150,000.

★**Va., Richmond** — Amer. Tobacco Co., 2400 East Cary St., let contract building 4 story, 56 x 60 x 197 ft., brick factory, concrete foundation, on 24th and Cary Sts., to Ferro Concrete Constr. Co., Richmond and Harriet Sts., Cincinnati. About $150,000.

★**Ind., Evansville**—Indiana Atomized Fuel Co. will build 1 story, 80 x 100 ft. steel plant, concrete flooring and foundation. Cost between $125,000 and $150,000. B. U. Cain, secy. Work will be done by day labor.

★**Ind., Ft. Wayne**—General Electric Co., Bway., let contract constructing 2 and 3 story, 150 x 300 ft., lamp works and office building, rein.-con., on Winter St., to E. M. Waldron, Inc., 665 Broad St., Newark. About $400,000.

★**Mich., Detroit** — Bemb-Robinson Co., Jefferson Ave., E., let contract building 3 story, 100 x 120 ft., rein.-con. and brick garage, rein.-con. flooring, concrete foundation, on Congress St., to W. S. Pocock, 815 Hammond Bldg. About $90,000. Noted Jan. 15.

★**Mich., Jackson**—Frost Gear & Forge Co., Horton and Tyson Sts., let contract building two 1 story, 50 x 160 ft. and 40 x 100 ft., brick and steel factories, concrete foundations to Austin Co., 208 South La Salle St., Chicago. About $80,000.

★**Mich., Pontiac**—F. S. Milward, Pontiac, let contract building 2 story, 93 x 120 ft., rein.-con. and brick garage and shop, rein.-con. flooring, concrete foundation, on South Saginaw St., to Pryall Constr. Co., Pontiac. About $50,000.

★**Mich., Saginaw** — Aero Cushion Inner Tire & Rubber Co., 909 Ford Bldg., Detroit, let contract building 2 story, 80 x 200 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, to F. T. Patterson, Ford Bldg., Detroit. About $75,000.

★**Ill., Chicago**—Monighan Machine Co., 2036 West Carrol Ave., let contract building 1 story, 110 x 504 ft., steel factory, concrete foundation, on Augusta and Kilpatrick Sts., to A. Nelson & Son, 36 West Randolph St. About $250,000.

★**Wis., Kaukauna** — Thilmany Pulp & Paper Co. will build 3 story, 100 x 200 ft., concrete, steel and brick addition to mill. Work will be done by day labor.

★**Wis., Oshkosh**—Oshkosh Motor Truck Mfg. Co., High St., let contract building 1 story, 100 x 450 ft., brick and concrete assembling plant, concrete flooring and foundation, to Fluor Bros. Constr. Co., 52 State St. About $150,000.

★**Wis., West Bend** — Schmidt-Storck Wagon Co., Mill St., let contract building 1 story, 100 x 300 ft., brick, rein.-con. and steel factory, rein.-con. flooring, brick foundation, on Main St., to P. Berres, West Bend. About $100,000. Noted May 13.

★**Ia., Des Moines**—Natl. Biscuit Co., 10th and Cherry Sts., let contract building 1 story, 77 x 112 ft., brick, rein.-con. and steel warehouse, brick foundation, on East 3rd St. and Court Ave., to J. A. Benson Constr. Co., 422 Valley Natl. Bank Bldg. About $70,000.

★**Kan., Leavenworth** — Moore Lawless Elevator Co. let contract remodeling plant and building 6 rein.-con. grain storage bins, with 325,000 bu. capacity, to J. Stewart & Co., 110 South Dearborn St., Chicago.

★**Mo., St. Louis**—Liggett & Myers Tobacco Co., Folsom and Tower Grove Aves., let contract building warehouse, at 3941-55 Park Ave., to J. Black Masonry & Contg. Co., Wright Bldg. About $125,000.

★**Cal., Gilroy**—Natl. Ice & Cold Storage Co., Postal Telegraph Bldg., San Francisco, let contract constructing 1 story, rein.-con. and hollow tile storage building here, to Phelps & Radtke, Gilroy. About $100,000

★**Cal., Los Angeles**—Salt Lake R.R., 610 South Main St., let contract building 1 story tank car repair shop, rein.-con., brick and steel, concrete foundation, on 7th St., to Leonard & Peck, H. W. Hellman Bldg. About $120,000.

★**Cal., Santa Rosa**—Natl. Ice & Cold Storage Co., Postal Telegraph Bldg., San Francisco, let contract constructing 1 story, rein.-con. and hollow tile addition to storage building here, to A. M. Hildebrandt, Santa Rosa. About $100,000.

Buildings

PROPOSED WORK

Me., Auburn—Court House—City having plans prepared by H. S. Coombs, archt., 11 Lisbon St., Lewiston, for 4 story, 100 x 100 ft., brick and granite addition on Court and Turner Sts. About $130,000.

Mass., Andover—Memorial—G. Lowell, archt., 12 West St., Boston, soon lets contract building 2 story, 100 x 200 ft., stone and steel, rein.-con. flooring, concrete foundation, on campus, for Philips Andover Academy. About $250,000. Noted March 18.

Mass., Attleboro—Home and Club—B. P. O. Elks soon let contract building 3 story, 100 x 100 ft., brick and steel, concrete foundation, on Main St. About $100,000. O. M. Higgins, Briggs Bldg., archt. Noted March 18.

Mass., Boston—School—Bd. Educ. plans to build 2 story, 12 room, brick, limestone and rein.-con., rein.-con. flooring, in Lewis Dist. About $240,000. J. E. Ritchie, 8 Beacon St., archt.

Mass., Boston—School—Bd. Educ. having plans prepared by J. E. McLaughlin, archt., 88 Tremont St., for 3 story, 150 x 300 ft. brick, rein.-con. and steel, rein.-con. flooring, on Avenue Louis Pasteur, Back Bay Dist. About $1,200,000.

Mass., Boston—Schools—Bd. Educ. plans to build 2 story, 18 room, brick, limestone and rein.-con., rein.-con. flooring, in George Putnam Dist. About $360,000. Architect not selected.

Mass., East Boston (Boston P. O.)—Theatre—Funk & Wilcox, archts. and engrs., 294 Washington St., Boston, preparing sketches for 1 story, 75 x 200 ft., brick, rein.-con. and steel, rein.-con. flooring, on Day Sq. About $150,000. Owner's name withheld.

Mass., Lynn—Store—Somes & Parsons, archts., 1 Beacon St., Boston, soon let contract building 3 story, 100 x 100 ft., brick and steel, concrete foundation, on Union St., for J. Goodman, Market St. About $100,000.

Mass., Medford (Boston P. O.)—Club—Amer. Legion, Medford Post 45, having plans prepared by P. S. Avery, archt., 95 Milk St., Boston, for 3 story, 70 x 120 ft., brick and frame, on High St.

Mass., Plymouth—Memorial Hall—Town Memorial Comn. rejected bids received May 6, building 2 story, 127 x 250 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation, on Court St. About $250,000. Project postponed indefinitely. Little & Russell, 45 Bromfield St., Boston, archts. Noted May 6.

Mass., Readville (Boston P. O.)—Church—St. Annes Roman Catholic Society having plans prepared by Maginnis & Walsh, archts., 100 Boylston St., Boston, for 1 story, brick and stone, brick and rock foundation, on West Milton St. About $100,000.

Conn., Bridgeport—Theatres—S. Z. Poli Co., 24 Church St., New Haven, soon lets contract building two 221 x 223 ft., brick, concrete and steel, rein.-con. flooring, concrete and rock foundations, on Main and Congress Sts., here. About $1,000,000. T. W. Lamb, 644 8th Ave., New York City, archt.

Conn., Hartford — Club, etc.—Young Women's Hebrew Assn., 90 Homestead Ave., having plans prepared by Berenson & Moses, archts., 1026 Main St., for 4 story, to include auditorium, offices, etc. Address A. S. Bordon.

Conn., Manchester — Recreation and School—H. Cheney, chn., 9th School Dist., receives bids about July 7, building 2 story, 65 x 110 ft., stone and brick, stone foundation, on Cedar St. About $200,000. F. C. Farley, 333 4th Ave., New York City, archt. and engr.

Conn., New Britain—Store, etc.—C. C. Palmer, archt., 272 Main St., soon lets contract building 4 story, 50 x 124 ft., brick and steel, concrete foundation, on Arch St., for Raphaels Department Store, 382 Main St. About $100,000.

N. Y., Batavia—Schools—City election June 15, to vote on $153,500 bonds to build extension to William and East Main Sts. schools.

N. Y., Bolton Landing — Club — Green Island Impvt Co., Glens Falls, had plans

Buildings (Continued)

prepared by C A Patterson, archt. and engr., 50 East 42nd St., New York City, for brick and stone, brick foundation, here. About $200,000.

N. Y., Brooklyn—Bank—G Erda, archt. and engr., 826 Manhattan Ave., receives bids about June 19, building 2 story, 50 x 50 ft., brick and stone, brick foundation, on Manhattan Ave., for Home Savings Bank, c/o architect About $175,000. C. F. Bell, chn.

N. Y., Brooklyn—Bank—Midwood Trust Co., Willoughby Ave. and Jay St., having sketches made by Trowbridge & Ackerman, archts. and engrs., 25 West 41th St., New York City, for brick, steel and stone, brick foundation, on Flatbush Ave. and Dorchester Rd. About $100,000.

N. Y., Brooklyn—Store—C. L. Fraser, archt. and engr., 103 Park Ave., New York City, soon lets contract building 4 story, brick, steel and stone, concrete foundation, on Bway. between Grove and Linden Sts., for Buckley-Newhall Co., 5th Ave. and 125th St., New York City. About $250,000.

N. Y., Brooklyn—Theatre—E. DeRosa, archt. and engr., 110 West 40th St., New York City, receives bids about June 19, building brick and stone, brick foundation, on Grand Ave. Extension, for W. Small, 189 Montague St. About $500,000. Noted June 3.

N. Y., Buffalo—Home—City having plans prepared by H. L. Beck, city archt., Municipal Bldg., for 3 story, 60 x 120 ft., brick, concrete and steel. About $175,000. J. F. Malone, comr. Parks and Pub. Bldgs.

N. Y., Far Rockaway—School—Bd. Educ., 500 Park Ave., New York City, rejected bids received June 1, building addition to P. S. 39, brick and steel, brick foundation, here. About $200,000. Work will be readvertised. C. B. J. Snyder, Municipal Bldg., New York City, archt. Noted Jan. 8.

N. Y., Fredonia—High School—Bd. Educ. having plans prepared by H. E. Boebe, archt., Fredonia, for Junior High School. About $150,000. Noted March 4.

N. Y., Jamestown—Temple—Buffalo Consistory having plans prepared for temple on Main St. and 5th Ave. About $200,000.

N. Y., New York—Club—Amateur Comedy Club, 150 East 36th St., having plans prepared by O. C. Hering, archt. and engr., 8 West 33rd St., for 7 story, 50 x 100 ft., brick and stone, concrete foundation, at 122-124 East 51st St. About $200,000.

N. Y., New York—Club and Office—Auditorium Assn., c/o Slee & Bryson, archts. and engrs., 154 Montague St., Brooklyn, having plans prepared for 4 story, 50 x 75 ft., brick and stone, brick foundation, at 250 West 25th St. About $250,000.

N. Y., New York—Hospital—New York, Belleview & Allied Hopitals, 26th St. and 1st Ave., having sketches made by McKim, Meade & White, archts., 101 Park Ave., for brick and stone addition, brick foundation, on 29th St. between 1st Ave. and East River. About $800,000.

N. Y., New York—Office—A. F. Gilbert, archt. and engr., 80 Maiden Lane, receives bids about June 19, building 5 story, 40 x 50 ft., brick, steel and stone, concrete foundation, at 131 Nassau St., for R. Dunther and R. Law, Inc., 25 Broad St. About $120,000. Noted May 27.

N. Y., New York—Theatre—E. DeRosa, archt. and engr., 110 West 40th St., receives bids about June 19, building brick and stone, brick foundation, on 45th St. between Bway. and 8th Ave., for M. Klaw, Commercial Trust Bldg. About $300,000.

N. Y., Niagara Falls—Schools—City election June 22 to vote on $3,000,000 bonds to build schools.

N. Y., Richmond Hill (Jamaica P. O.)—Church—Heyl & McClaymount, archts. and engrs., 15 West 38th St., New York City, soon let contract building 1½ story, 50 x 75 ft., brick and stone, brick foundation, for 1st Church of Christ Scientist, Greenwood Ave. About $110,000.

N. J., Irvington (Newark P. O.)—School Bd. Educ., City Hall, having plans prepared by J. B. Allen, archt., 1091 Sanford Ave., for 3 story, 160 x 200 ft., concrete and brick, on Springfield St.

N. J., Newark—Church—Morton St. Presbyterian Church, c/o Acherman & Selder, archts., 45 Clinton St., plans to build 1 story, stone on Yates and Hawthorne Sts. About $100,000.

N. J., New Brunswick—Theatre—A. Slusterman, c/o H. Rosensohn, archt., 188 Market St., Newark, having plans prepared for 1 story, 98 x 196 ft., terra cotta and brick About $125,000

N. J., West Hoboken—Theatre—Roosevelt Theatre Corp., 527 Charles St., having plans prepared by H Baechlin, archt., 665 Broad St., Newark, for concrete and brick, on Summit and Courtland Sts. Cost to exceed $100,000. Noted March 4

Pa., Greenville—Church—Trinity Lutheran Church plans to build new stone church About $125,000.

Pa., Johnstown—Business—Swank Hardware Co., Main and Bedford Sts., plans to build 4 story, 46 x 116 ft., rein.-con., brick and steel. Architect not selected.

Pa., Johnstown—Lodge—R. and J Farkas soon receive bids building 3 story, 40 x 126 ft., concrete, brick and steel, rein.-con. flooring, on Fairfield Ave. About $150,000. L Nirdlinger, Empire Bldg., Pittsburgh, archt.

Pa., Lancaster—Hospital—Lancaster General Hospital, 528 North Lime St., plans to build 4 story, 40 x 120 ft., concrete and brick addition. About $250,000.

Pa., New Castle—Bank—Mowbray & Uffinger, archts. and engrs., 56 Liberty St., New York City, receive bids about July 3, building 3 story, 50 x 100 ft., brick and stone, concrete foundation, for Lawrence Savings Bank & Trust Co., 223 East Washington St. About $150,000. Noted June 3.

Pa., Pittsburgh—Sales—See "Industrial Works."

Pa., Scranton—Theatre—E. DeRosa, archt. and engr., 110 West 40th St., New York City, receives bids about June 21, building brick and stone, brick foundation, on Penn Ave., for D. J. Bondy, 80 Wall St., New York City. About $250,000. Noted June 3.

Pa., Scranton—Theatre—E. DeRosa, archt. and engr., 110 West 40th St., New York City, receives bids about June 19, altering brick and stone, brick foundation, on Wyoming Ave., for D. J. Bondy, 80 Wall St., New York City. About $100,000. Noted June 3.

Pa., Uniontown—Store—Aaron Furniture Co. receives bids about June 20, building 8 story, 55 x 76 ft., brick and steel, rein.-con. flooring, on Main St. About $200,000. A. Kahn, Marquette Bldg., Detroit, archt.

Md., Baltimore—Parish House—St. Johns Evangelical Lutheran Church, 2500 West Lombard St., plans to build 3 story, brick. About $100,000. Address J. A. Manger, Chamber of Commerce Bldg., chn. building com.

Md., Baltimore—Bd. Dirs. Y. M. C. A., Cathedral and Franklin Sts., plans to construct steel and brick building, concrete foundation. About $500,000. W. H. Morriss, chn.

Md., Leonardtown—Bank—First Natl. Bank of St. Marys Co. having plans prepared by R. L. Harris, archt., 1131 Calvert Bldg., Baltimore, for 2 story, 35 x 42 ft., rein.-con., steel and brick, tile flooring, concrete foundation. About $100,000.

D. C., Washington—Bank and Office—Amer. Security & Trust Co., 15th St. and Pennsylvania Ave. N. W., having sketches made by York & Sawyer, archts. and engrs., 50 East 41st St., New York City, for brick, steel and stone. About $1,000,000.

Va., Richmond—Temple—Odd Fellows Lodge having sketches made by Herts & Robertson, archts. and engrs., 331 Madison Ave., New York City, for brick and stone. About $600,000.

W. Va., Charleston—Hospital—A. Walker, c/o P. Eagan, archt., Day & Night Bldg., having plans prepared for hospital. About $100,000.

W. Va., Charleston—Office—Professional Bldg. Co., c/o P. Eagan, archt., Day and Night Bank Bldg., having plans prepared for 84 x 140 ft. brick, concrete, stone and steel, on Summers St. About $175,000.

S. C., Columbia—Hospital—Baptist Hospital had plans prepared by J. C. Johnson, archt., Palmetto Bldg., for 3 story, brick, on Marion St. About $300,000. Noted April 3.

S., C., Union—Hotel—Fairfax Harrison Hotel Assn. soon receives bids building fireproof hotel on Main St. About $150,000. J. Cohen, Pres. Architect not selected.

Fla., Jacksonville—Bank—Mowbray and Uffinger, archts. and engrs., 56 Liberty St., New York City, receive bids about June 23, altering brick and stone bank for Florida Natl. Bank About $100,000.

La., New Orleans—Theatre and Office—A. Pantages having plans prepared by Nolan & Torre, archts., Hennen Bldg., constructing 128 x 192 ft. on Canal St. between Rampart and Elks Pl. About $2,000,000.

La., Pineville—Administration—Louisiana College having plans prepared by R H. Hunt & Co., archts., Southwestern Life Bldg., Dallas, Tex., for 3 story, brick, brick foundation. About $190,000. C. Cottingham, pres.

O., Chester Hill (McConnellsville P. O.) School—Bd. Educ. having plans prepared by O. D. Howard, archt., 8 East Broad St., Columbus, for 2 story, 75 x 110 ft., brick and concrete. About $100,000.

O., Cleveland—Bank and Commercial—Home Savings & Trust Co., 4179 Pearl Rd., having plans prepared by C. F. Owsley, archt., Mahoning Bank Bldg., Youngstown, for 4 story, 70 x 90 ft., brick, steel and concrete, rein.-con. flooring, concrete foundation, here. About $150,000.

O., Cleveland—Sales—W. S. Gutman, 2122 Euclid Ave., plans to build 2 story, brick, steel and concrete, rein.-con. flooring, concrete foundation, on Prospect Ave. west of East 22nd St. About $150,000. Architect not selected.

O., Cleveland—Sales—Lucas & Christenson, 1730 Euclid Ave., plans to build 2 story, brick and steel, at 4120 Euclid Ave. About $200,00. Architect not selected.

O., Cleveland—Store—W. Taylor, Son & Co., Euclid Ave., having plans prepared by D. H. Burnham & Co., archts., 209 South La Salle St., Chicago, Ill., for 10 story, 69 x 200 ft. brick, steel and concrete, rein.-con. flooring, concrete foundation, at 614 Euclid Ave. About $500,000. Noted Mar. 25.

O., Cleveland—Welfare—Cleveland Worsted Mills Co., Bway., soon lets contract building 4 story, 50 x 120 ft., brick, steel and concrete, rein.-con. flooring, concrete foundation, on Bway. and Blanche Ave. About $200,000. G. S. Rider & Co., Century Bldg., archts. and engrs.

O., Kenton—School—Bd. Educ. having having preliminary sketches made by Richards-McCarty & Bulfud, archts., 584 East Broad St., Columbus, for 2 story, brick and concrete. About $125,000.

O., Prospect—High school—Bd. Educ. having plans prepared by O. D. Howard, archt., 8 East Broad St., building 1 story, brick and clay. About $125,000.

O., Springfield—Schools—Bd. Educ. having preliminary plans prepared by O. D. Howard, archt., 8 East Broad St., Columbus, for 5 new schools and additions to 3 or 4 present schools. Plans will first be drawn for four 2 story, 100 x 135 ft. brick and steel schools, to cost about $200,000 each. Bands for $1,000,000 will be issued to finance project.

Ind., Evansville—Hotel and Theatre—B. Bosse, mayor of Evansville, is representing Chicago capitalists who plan to build hotel and theatre, here. About $1,500,000.

Ind., South Bend—Hotel—Indiana Tavern Co. plans to build hotel. About $1,500,000. C. E. Leslie, B. E. Glaser and H. I. Humphries, all of South Bend, dirs. Architect not selected.

Mich., Detroit—Hospital and Office—Manufacturers Mutual Insurance Co., 484 East Jefferson Ave., having plans prepared by Stratton & Snyder and M. R. Burrowes, archts., Union Trust Bldg., for 4 story, 45 x 150 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $300,000.

Ill., Chicago—Hotel—L. Appleton and associates, c/o W. W. Alschlager, archt., 111 West Washington St., having plans prepared for 21 story, 110 x 150 ft., rein.-con and steel, rein.-con. flooring, concrete foundation, on Chicago and Michigan Aves About $4,000,000.

Ill., Chicago—Theatre and Office—Ascher Bros., 220 South State St., plan to build 11 story, 110 x 180 ft., at 16-30 West Washington St. About $1,500,000. Architect not selected.

Ill., Chicago—Theatre—H. Schoenstadt, 36 South State St., having plans prepared by H. L. Newhouse, archt., 4630 Prairie Ave., for 39 x 84 ft., rein.-con. steel and brick addition to Atlantic Theatre, concrete foundation, at 3948 West 26th St. About $100,000.

Ill., Joliet—School—Bd. Educ. plans to build rein.-con. addition to high school. D. H. Burnham & Co., 209 South La Salle St., Chicago, archts.

Wis., Fond du Lac—High School—Bd. Educ. receives bids about July 25, building 3 story, 100 x 350 ft., stone. About $300,000 exclusive of site and equipment. R. W. Fairchild, supt. Childs & Smith, 64 Van Buren St., Chicago, archts. Noted June 3.

Wis., Jefferson—Community Club—City plans to build 4 story, 100 x 200 ft., brick, rein.-con. and steel, brick foundation. About $250,000. Architect not selected.

Wis., Rice Lake—Theatre—G. E. Miner plans to build 2 story, 60 x 120 ft., brick, rein.-con. and steel, brick foundation, on Main St. Architect not selected.

Buildings (Continued)

Ia., Ottumwa—Church—First Presbyterian Church purchased site and plans to build church. About $150,000. C. D. Jacobs, pastor. M. McClelland, Gara St., chn. building com.

Ia., Whittemore — School — St. Michael's Roman Catholic Church soon lets contract building school. About $100,000. Damon & O'Meara, Mason Bldg., Ft. Dodge, archts.

Minn., Hibbing—Recreation—City rejected bids received May 18, building 2 story, 149 x 284 ft., rein.-con., brick and steel, on 1st Ave. and Jackson St. Plans to be revised. About $575,000. Halsted & Sullivan, 406 Palladio Bldg., Duluth, archts. and engrs. Noted Jan. 29.

Minn., Minneapolis—Music—State University having plans prepared by C. H. Johnson, state archt., 715 Capital Bank Bldg., St. Paul, for 3 story, 95 x 160 ft., rein.-con., brick and stone, on University Ave., here. About $500,000. C. L. Pillsbury Co., 805 Metropolitan Bank Bldg., engrs.

Kan., Great Bend—Hospital—Barnett, Haynes & Barnett, archts., Century Bldg., St. Louis, Mo., receive bids about June 15, building 3 story, 50 x 150 ft., brick, rein.-con. flooring, for Sisters of St. Dominic. About $100,000. Noted June 3.

Kan., Hiawatha—Auditorium—City soon receives bids building 1 story, 81 x 126 ft., brick, rein.-con. and steel, rein.-con. flooring, brick foundation. About $135,000. T. W. Williamson & Co., 418 Central Natl. Bank Bldg., Topeka, archts.

Kan., Lawrence—Hotel—Root, Siemans & Kurflas, archts., Scarritt Bldg., Kansas City, Mo., preparing plans for 4 story, 117 x 125 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $350,000. Owners name withheld.

S. D., Arlington—School—Bd. Educ. having plans prepared by H. Parsons, archt. 600 Builders Exch., Minneapolis, for mill construction, grade and high school. About $100,000. C. G. DeBoer, clk.

Mo., Parkville—Science Hall—Park College having plans prepared by J. H. Felt Co., archts., 800 Grand Ave. Temple, Kansas City, for 2 story, rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $110,000.

Mo., St. Louis—Hospital—Lutheran Hospital, 3500 Ohio Ave., having plans prepared by H. J. Burgdorf, archt., 2604 Virginia Ave., for 5 story, 40 x 120 ft. brick and steel addition. About $125,000.

Mo., St. Louis—Hotel—Hotel Jefferson Co. plans to build 12 story, rein.-con., steel and brick, on 12th and Locust Sts. L. T. Hay, genl mgr. T. P. Barnett Co., Arcade Bldg., archts.

Tex., Ft. Worth—Hospital—Physicians & Surgeons Hospital having plans prepared by Sanguinet & Staats, archts., 1st Natl. Bank Bldg., for 4 story, concrete and steel, concrete foundation, on Bway. Blvd. About $300,000.

Tex., San Marcos—Church—First Baptist Church having plans prepared by R. H. Hunt & Co., archts., Southwestern Life Bldg., Dallas, for 1 story, brick, with balcony. About $150,000. J. W. Gantt, Box 203, chn. bldg. com.

Idaho, Caldwell—Memorial—City election June 15, to vote on bonds to build 90 x 120 ft. concrete, brick and steel, on Blaine St. R. E. Field, Little Bldg., archt.

Cal., Glendale (Los Angeles P. O.)—Hospital—Glendale Sanitarium plans to construct hospital. 1st unit to consist of 1 story, 116 x 145 ft. operating and clinic building, rein.-con. and hollow tile, rein.-con. flooring, coincrete foundation, on Bway. and Jackson St. Within 2 years, 9 other buildings will be erected. Total cost, $400,000. L. M. Hodge, Bway. and Jackson St., archt.

Cal., Los Angeles—Bank and Office—Union Bank & Trust Co., 740 South Bway., having plans prepared by W. Burlett & Son, archts., 525 Merchants Natl. Bank Bldg., for 6 story, 110 x 116 ft., on 8th and Hill Sts.

Cal., Porterville—Lodge—B. P. O. E. Lodge having preliminary plans prepared by R. P. Renfro and W. D. Lee, archts., Porterville, for 2 storu, 98 x 110 ft., brick, concrete foundation. About $100,000.

Cal., Redwood City — Hospital — Bd. Supervs. San Mateo Co. plans to build hospital. About $150,000. E. M. Nash, clk. W. H. Toepye, 942 Market St., San Francisco, archt.

Que., Montreal—Convent—Reverend Sisters of Providence, Dufresne St., plan to build addition. About $100,000.

Water Filtration Plant—Pontiac, Mich.

Bids were received by city, May 17th, for constructing water filtration plant (Item "B), from Drener Construction Co., Smith and Kearsley Sts., Flint; (B) Cooper Widenman, 1430 Penobscot Bldg., Detroit; (C) J. E. Nelson & Sons, 3240 South Michigan Blvd., Chicago, Ill. The unit bids were as follows:

Bids were received by city, May 17th, for constructing water filtration plant (Item "C"), from (A) Pittsburgh Filter & Eng. Co., Oil City, Pa., (B) Pitt Constr. Co., Fulton Bldg., Pittsburgh, Pa.; (C) Roberts Filter Co., Darby, Pa.; (D) U. G. T. Contr. Co., Broad and Arch Sts., Phila.; $116,402; Amer. Water Softening Co., 1011 Chestnut St., Phila., $135,457. The unit bids were as follows:

	A	B	C
48-in. Venturi (lump sum)	$4,885 00	$6,500 00	$5,850.00
20-in. Venturi (lump sum)	1,500.00	2,200 00	2,070 00
Valves, etc., in inlet and mix. ch. (lump sum)	1,960.00	2,500.00	2,610.00
24-in. inlet hyd. valve (lump sum)	1,274 00	1,300.00	1,410 00
Hyd. filter control valves (lump sum)	12,250.00	10,500 00	12,100 00
10 operating tables	882.00	1,700.00	1,695.00
10 rate controllers	1,372.00	550.00	900 00
10 manifold systems	1,127 00	1,100.00	1,215 00
30 wash water troughs	311.00	250.00	440 00
187 cu.yd. filter gravel	10 00	15.00	19 00
326 cu yd. filter sand	16.00	15.00	20 00
2 orifice boxes	735.00	1,350 00	1,240 00
40 tons c.-i. pipe and specials	300 00	375.00	430 00
Filter level gage and alarm (lump sum)	196.00	200.00	175 00
2 alum tank gages	74 00	50.00	200 00
Extended totals	$85,879	$89,695	$105,668
15,900 cu.yd. excavation	$3 45	$2.96	$7.21
3,200 cu.yd. concrete	43.50	42 00	50.78
Filter water reser. (lump sum)	34,427 00	51,800 00	66,453.00
Filter water reser. (alt.) (lump sum)	....	....	....
Superstructure (lump sum)	33,360 00	43,000 00	61,900.00
Wash water tank (lump sum)	16,013.00	16,950 00	25,316.00
Steam heating (lump sum)	5,600 00	6,300 00	6,300.00
Plumbing, gas fitting (lump sum)	3,000 00	2,050 00	1,540.00
Electric wiring (lump sum)	4,000 00	2,500.00	3,225.00
Elevator (lump sum)	3,000.00	2,700 00	4,200.00
2 pumps (lump sum)	1,900 00	4,200 00	5,040.00
Coagulating machinery (lump sum)	650 00	1,700.00	1,500.00
1,000 sq.ft. cement walks	25	30	.31
1,040 sq.yd. driveways	.50	1 20	.60
70 tons outside c.-i.	120 00	220 00	212.80
Outside valves, etc. (lump sum)	3,920 00	5,000 00	15,400.00
1⅓ M.b.m. baffles, mix. ch	250.00	250 00	280 00
38 M.H. castings	40.00	55 00	40.00
12 manholes	125.00	350 00	200.00
160 ft. sewers, 36 in	11.50	9.00	33.20
300 ft. sewers, 8 in	1.50	3.00	3 12
0.75 acre seeding	25.00	500 00	310.00
960 sq.yd. sodding	.50	1 00	49
Extended totals	$315,399	$344,952	$494,941

Que., Sherbrooke — Housing—Canadian Connecticut Cotton Mills Co., Drummond Rd., plans to build 100 houses for employees. About $200,000.

Ont., Kingston—Students Union—Queens University plans to construct Students Union building. About $350,000. G. Y Chown, registrar. Architect not selected.

Ont., Walkerville—Exchange—Bell Telephone Co. plans to build 3 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Huron St. About $100,000. F. W. Dewar, mgr. Architect not selected.

BIDS DESIRED

N. Y., New York—Hospital—Until June 30, by B. Levingson, archt., 166 East 43rd St., building brick and stone addition to Beth David Hospital, at 1326 Lexington Ave. About $150,000. Noted June 3.

N. Y., New York—Loft—Until June 15, by Keeler & Fernald, archts., 203 West 13th St., building 8 story, brick, steel and stone, concrete foundation, at 251 West 27th St., for Herzig Mercantile Co., c/o architects. E. E. Seelye, 101 Park Ave., engr. Noted June 3.

N. J., Clinton—Home—Until June 22, bc F. H. Bent, archt., 142 West State St., Trenton, building 3 story, 68 x 131 ft., brick, rein.-con. and steel maternity home, here, or State Reformatory. About $100,000. Noted April 29.

N. J., Trenton—Capitol—Until June 22, by F. H. Bent, archt., 142 West State St., building east wing of capitol, 4 story, 50 x 300 ft., rein.-con. and steel, rein.-con. flooring, rock foundation, for State Bd. Administration. About $350,000.

N. J., Vineland—Dormitory—Until June 22, by F. H. Bent, archt., 142 West State St., Trenton, constructing 3 story, 53 x 104 ft., brick, rein.-con. and steel, for Feeble Minded Institution, here. About $100,000. Noted May 6.

N. J., Westfield—School—Until June 22, by Bd. Educ. building 3 story, brick and stone, brick foundation. About $175,000. Wilden & White, 50 Church St., New York City, archts. and engrs. Noted May 27.

Ga., Lagrange—Hotel and Theatre—Until June 17, by W. L. Stoddart, archt. and engr., 9 East 40th St., New York City, building 100 x 100 ft., brick and stone, rein.-con. flooring, concrete foundation, for Lagrange Hotel Co., c/o architect. About $500,000. Noted Apr. 8.

O., Cleveland—Exchange—Until June 22, by Cleveland Telephone Co., Engineers Bldg., constructing 2½ story, 70 x 130 ft. brick, steel and concrete, rein.-con. flooring, concrete foundation, on East 123rd St. and St. Clair Ave. About $200,000. Hubbell & Benes, 4500 Euclid Ave., archts. A. N. Symes, 602 Engineers Bldg., engr. Noted Nov. 27, 1919.

O., Lima—High School—Until June 15, by Bd. Educ., building 2 story, 82 x 124 ft., brick and concrete, here. About $125 000. McLaughlin & Huslkin, Savings Bldg., archts.

O., Youngstown—Hospital—Until June 28, by S. F. Sullivan, secy. Bd. Hospital Comrs., building 2 story, 60 x 150 ft., steel and brick, rein.-con. flooring, on Indianola and Homestead Aves. About $250,000. C. F. Owsley, Mahoning Bank Bldg., archt. Noted April 22.

Ind., Ft. Wayne—Hospital and Nurses Home—Until July 16, by Comrs. Allen Co. building two 3 story, 42 x 87 ft. and 3 story, 26 x 39 ft., brick, 8 mi. north of here. About $115,000. C. R. Weatherhogg, Citizens Trust Bldg., archt.

Mich., Detroit—Office—Smith, Hinchman & Grylls, archts., Washington Arcade, receiving bids building 5 story, 61 x 92 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, for Detroit Graphite Co., 12th and Fort Sts. About $100,000.

Mich., Detroit—Office and Loft—Until June 21, by L. Kamper, archt., 749 Book Bldg., constructing 10 story, 53 x 141 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Woodward Ave., for H. Scherer, c/o architect. About $1,000,000.

Wis., Sheboygan—Office, etc.—See "Industrial Works."

Ia., Pocahontas—School—Until June 25, by Bd. Educ., building 2 story, 56 x 110 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $150,000. W. J. Gilchrist, pres. W. E. Hulse & Co., 309 Securities Bldg., Des Moines, archts. Noted April 29.

Ia., Washington—Hotel—Until June 15, by Washington Hotel Co., building 4 story, 60 x 120 ft., brick, rein.-con. and steel, concrete foundation. About $150,000. C. A. Dieman & Co., 408 Granby Bldg., Cedar Rapids, archts.

Minn., Coleraine—High School—Until July 15, by A. King, clk. Bd. Educ., building 2 story, 200 x 200 ft., rein.-con., stone and brick, rein.-con. flooring, concrete foundation. About $350,000. W. T. Bray, 616 Torrey Bldg., Duluth, engr. and archt. Noted Dec. 11.

Buildings (Continued)

Minn., Duluth—School—Until June 29, by J. T. McNicholas, bishop Roman Catholic Diocese, 211 West St., building 3 story, 100 x 150 ft., rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation, on 28th Ave. E. and 4th St. About $250,000.

Mo., Carthage—Hotel—Until June 14, by Shepard & Wiser, archts., 301 R. A. Long Bldg., Kansas City, constructing 4 story, 75 x 90 ft., brick, stone and rein.-con., for Drake Hotel Co.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—Chapel—Allen & Collens, archts., 40 Central St., let contract to L. P. Soule & Son Co., 80 Boylston St., building 2 story, 25 x 105 ft. limestone and concrete, concrete foundation, for Emanuel Church Society, 15 Newbury St. About $100,000. Noted May 13.

★**Mass., Boston**—School—Suffolk Law School, 45 Mt. Vernon St., will build 8 story, 87 x 110 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation. About $300,000. Work will be done by day labor. Noted March 25.

★**Mass., Boston**—School—C. M. Parry, archt., 78 Devonshire St., let contract to Simpson Bros. Corp., 166 Devonshire St., building 3 story, 72 x 90 ft., concrete addition, rein.-con. flooring, concrete foundation, on Huntington Ave., here, for Trustees Tufts College, Medford. About $125,000. Noted May 13.

★**Mass., Easthampton** — Church — Notre Dame French Roman Catholic Society let contract building 1 story, brick and steel, brick and stone foundation, on Pleasant St., to D. T. Pepin, 87 Union St. About $125,000.

Mass., Winthrop (Boston P. O.)—School—A. S. Smith, chn., School Com., received bids June 2, building 2 story, 67 x 121 ft., brick and limestone, concrete foundation, on Almont St., from Coleman Bros., 1 Marginal St., Chelsea, $165,000; C. H. Cunningham & Son, 23 Central Ave., Lynn, $165,850. Noted May 27.

★**N. Y., Brooklyn**—Showroom—Randax Realty Co., 34 Nassau St., New York City, will build 1 story, 100 x 225 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation, on Bedford Ave. and Crown St., here. About $100,000. Work will be done by day labor.

★**N. Y., Long Beach**—Club—Long Beach Club, c/o Helmle & Corbett, archts. and engrs., 190 Montague St., Brooklyn, let contract building 2 story, 50 x 200 ft., brick and stone, brick foundation, to W. Kennedy Constr. Co., 215 Montague St., Brooklyn. About $100,000.

N. Y., Long Island City—Bd. Educ., 500 Park Ave., New York City, received bids building P. S. 39, here, from D. E. Connors, $133,750; J. MacArthur, 120 Bway., New York City, $228,000.

★**N. Y., New York**—Loft—L. Goldstein, 197 William St., will build 6 story, 72 x 96 ft., brick, steel and stone, concrete foundation, on Gold St. About $150,000. Work will be done by day labor, under supervision of G. and E. Blum, archt. and engr., 505 5th Ave. Noted April 29.

★**N. Y., New York**—Office—Five Sixty Two 5th Ave. Corp., 1552 Bway., will build 11 story, brick, steel and stone, concrete and stone foundation, on 46th St. and 5th Ave. Work will be done by day labor under supervision of Schwartz & Gross, archts. and engrs., 347 5th Ave.

★**N. Y., New York**—Office—Scandinavian Amer. Line, 1 Bway., let contract building 7 story, 32 x 59 ft., brick, steel and stone, concrete foundation, on Washington and Bridge Sts., to H. P. Wright, 25 West 42nd St. About $200,000. Noted April 22.

★**N. J., Bayonne**—Church—Greek Church let contract building brick church on East 26th St., to W. J. Meagher, Perth Amboy. About $125,000.

★**Pa., Etna** (Pittsburgh P. O.)—Theatre—Spang-Chalfont Co. let contract building 3 story, 61 x 200 ft., concrete, brick and steel, rein.-con. flooring, on Butler St., to H. Shenk Co., Century Bldg., Pittsburgh. About $175,000.

★**Pa., Sharon**—Theatre—Strand Theatre Corp., 42 East State St., let contract building 2 story, 70 x 150 ft., brick and steel, rein.-con. flooring, to Wishardt & Son, 20 Silver St. About $175,000.

★**Pa., Windber**—Theatre—Windber Theatre Corp. let contract building 2 story, 60 x 150 ft., brick and concrete, to Windber Lumber Co., Windber. About $100,000. Noted Jan. 15.

★**Pa., Woodlawn** — Bank — Woodlawn Trust Co., Franklin St., let contract building 1 story, 75 x 75 ft. brick and stone, brick foundation, at 136 Franklin St., to F. L. Ley, 19 West 44th St., New York City. About $150,000.

★**Md., Baltimore**—Office—Baltimore & Ohio R.R., Charles and Baltimore Sts., let contract converting 5 story wholesale dry goods house, on Lombard and Liberty Sts. into office building to Frainie Bros. & Haigley, 18 Clay St.; plumbing to H. L. Black & Son, 25 Clay St. Total cost $350,000.

★**Md., Baltimore**—School—City let contract building P. S. 65, 3 story, 64 x 121 ft., rein.-con., steel and brick, concrete foundation, on Poplar and Grove Sts., to Standard Constr. Co., 1713 Sansom St., Phila. About $399,000.

★**Md., Cumberland** — Store — McMullen Bros. Co., Baltimore St., let contract building 4 story, 69 x 84 ft., rein.-con. steel and brick, concrete foundation, to O. Gerlach, 14 North Water St., Frostburg. About $125,000. Noted March 11.

★**W. Va., Athens**—Dormitory—State Bd. Educ., Charleston, had plans prepared by Wypong, Tufts & Jones, archts., Charleston, for 3 story, brick, at Concord State Normal School, here. About $120,000. Work will be done by day labor. Noted June 5.

★**S. C., Greenville**—Housing—Greenville Duck Mills let contract building, 75 frame cottages, to Winter Homes Corp., Greenville. About $187,500.

★**O., Akron**—Theatre—Akron Theatre Co., c/o Frank-Wagner & Mitchell, archts., 602 Perm Title & Trust Bldg., let contract building 3 and 6 story, 130 x 160 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on South Main St., to Carmichael Constr. Co., 524 Hamilton Bldg. About $500,000.

★**O., Cedarville**—Bank—Exch. Natl. Bank let contract building 2 story, 60 x 200 ft., brick, rein.-con. and terra cotta, rein.-con. flooring, concrete foundation, on Main St., to F. Hamm, Limestone St., Springfield. About $150,000.

O., Cleveland—School—Bd. Educ. received bids building 1 story, 130 x 144 ft. brick, steel and concrete, rein.-con. flooring, concrete foundation, on East 55th St. and Portland Ave., from Tenbusch-Parker Constr. Co., 1836 Euclid Ave., $145,243, Drummond-Miller Co., 4500 Euclid Ave., $147,600; W. Moore Co., 1276 West 4th St., $149,900.

★**O., Columbus**—Church—Broad St. Presbyterian Church Building Com. let contract constructing 72 x 85 ft. addition, on East Broad St., to Frankenburg Constr. Co., Columbus Savings & Trust Bldg. About $125,000.

★**Mich., Detroit**—Office—Detroit Graphite Co., 12th and Fort Sts., let contract building 5 story, 61 x 92 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on 12th St., to M. Bartholomaei Son & Co., 466 East Warren St.

★**Mich., Halfway** (Detroit P. O.)—Bd. Educ. Dist. 2 will build 2 story, 72 x 95 ft., brick, concrete and steel, concrete foundation, on Gratiot Ave. About $100,000. Work will be done by day labor under supervision of T. Van Damme, archt., Ulrich Savings Bank, Mt. Clemens. Noted March 18.

★**Wis., Rice Lake**—Hospital—Wisconsin Methodist Hospital Assn. let contract building 2 story, 40 x 150 ft., brick and concrete, rein.-con. flooring, concrete foundation, to G. Schwartz & Co., Rochester, Minn. About $100,000. Noted April 8.

★**Ia., Stanwood**—School—Bd. Educ. let contract building 2 story, 74 x 104 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to T. Stark & Co., 1103 1st Ave. W., Cedar Rapids, $112,000. Noted March 18.

★**Minn., Minneapolis**—Business—Lincoln Motor Sales Co., 219 Metropolitan Bank Bldg., let contract building 2 story, 66 x 145 ft., mill construction on 12th St. and Harmon Pl., to Fleisher Constr. Co. 608 Builders Exch., $108,933. Noted April 22.

★**Neb., Columbus**—Hospital—C. D. Evans let contract buildings 3 story, 36 x 87 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to Home Builders, Inc., 13th and Cass Sts., Omaha. About $110,000. Noted Feb. 26.

★**Ark., Arkadelphia**—Music Hall, etc.—Ouchita College let contract building, music hall, dining hall, and dormitory, each 3 story, brick, to J. D. Brock, Arkadelphia. About $60,000, $40,000 and $150,000 respectively.

★**Tex., Brownwood**—Gymnasium and Auditorium—Howard Payno College let contract constructing 2 story gymnasium and 3 story auditorium, brick, brick foundations, to Moore Constr. Co., Ranger, $30,000 and $150,000 respectively; cost plus percentage basis.

★**Wash., Seattle**—Hotel—Shue, Ork & Mar, San Francisco, let contract building 3 story, 97 x 120 ft., concrete, tile flooring, concrete foundation, on Maynard Ave. and King St., to Jekgren, Hoard & Co., Pantages Bldg. About $140,000.

★**Wash., Spokane**—Temple—Labor Temple Assn. will build 3 story, 90 x 142 ft., rein.-con. and brick, on Madison Ave. near Sprague Ave. About $150,000. Work will be done by day labor.

Cal., Anaheim—Auditorium, Gymnasium, etc.—Anaheim Union High School Dist. received bids building addition to high school, to include 80 x 140 ft. auditorium, 50 x 75 ft. gymnasium and 50 x 70 ft. cafeteria, all 1 story, hollow tile and steel, concrete foundation, from A. L. Gribling, Anaheim, $147,951; Edwards, Wildey & Dixon, 515 Black Bldg., Los Angeles, $170,000; K. R. Bradley, 1925 East 16th St., Los Angeles, $182,000. Noted April 15.

Cal., Bishop—High School—Bishop Union High School Dist. received bids May 22, building 2 story, rein.-con., from R. W. Moller, Call-Post Bldg., San Francisco, $150,846; Young & Nunamaker, Bishop, $151,800. Noted May 13.

Cal., Martinez—High School—Alhambra Union High School Dist. received bids building 2 story, (a) rein.-con., (b) reinforced brick, from R. Trost, 26th and Howard Sts., San Francisco, (a) $135,907; Hannah Bros., 142 Sansome St., San Francisco, (a) $139,470, (b) $147,950; McLeran & Peterson, Sharon Bldg., San Francisco, (a) $144,800, (b) $149,800. Noted Feb. 12.

★**Que., Montreal**—Church—Notre Dame de Perpetual Secours Congregation, Emard St., let contract building 50 x 120 ft., brick, steel and stone, concrete foundation, on Monk Blvd., to V. Boileau, Fabre St. About $200,000.

Federal Government Work

PROPOSED WORK

Mass., Gloucester — Dismantling and Crating—Spec. 4271—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to dismantle and crate for shipment 20 portable barracks, here. Bid will be opened at local naval yard.

N. Y., Iona Island—Naval Magazine Power Plant—Spec. 4215—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to improve, here. About $27,000.

N. Y., New York—Gasoline Storage Shed—Spec. 4224—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $6,000.

Pa., Phila.—Concrete Pavement—Spec. 4214—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $13,224.

Pa., Phila.—Steam Distribution System—Spec. 4220—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build from Bldg. 83 to 103, here.

Va., Hampton Roads—Paint and Oil Storehouses—Spec. 4221—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $75,000.

Va., Langley—Roads, Sidewalks, Drainage, Several Buildings, etc.—Constr. Div., War Dept., Wash., D. C., receives bids about June 20, building, here. Cost to exceed $500,000.

S. C., Paris Island—Overhang and Gratings—Spec. 4208—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids for overhang on north side of Bldg. 11 and gratings for 12 buildings at Marine Barracks, here; $10 deposit required for plans and spec. Noted May 27.

Fla., St. Petersburg—Operating Buildings and Quarters—Spec. 4183—Bureau Yards & Docks, Navy Dept., Wash., D. C., received no bids June 2, constructing, at Naval Radio Sta., here. Noted May 13.

Tex., Ft. Worth—Gate Boxes—Spec. 4216—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build on natural gas pipe line, here. About $5,000.

Federal Government Work (Continued)

BIDS DESIRED

Mass., Boston—Protected Switchboard and Plotting Rooms—Until June 18, by U. S. Engr. Office, Custom House, constructing protected switchboard room and plotting room at Ft. Andrews and protected switchboard room at Ft. Revere, Boston Harbor; advertised in this issue.

Mass., Boston—Sand, Stone, Gravel and Cement—Until June 19, by U. S. Engr. Office, Custom House, furnishing and delivering sand, stone or gravel at U. S. Reservation, Hog Island, Boston Harbor, and cement at Boston; advertised in this issue.

Mass., Nahant—Sand for Fill—Until June 19, by U. S. Eng. Office, Custom House, Boston, furnishing and delivering, at U. S. Reservation, here; advertised in this issue.

R. I., Newport—Hangar, Storage Building and Pier—Spec. 4152—Until June 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building at Gould Island, here; $10 deposit required for plans and spec.; advertised in this issue.

N. Y., Buffalo—Quarters—Spec. 4195—Until June 16, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building at Lighthouse Depot Grounds, here. About $20,000; $10 deposit required for plans and spec. Noted May 27.

N. Y., Rockaway—Altering Marine Railway—Spec. 4184—Until June 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., raising existing 165 ft. marine railway about 4 ft. and extending outboard end about 48 ft., at Naval Air Sta., here; $10 deposit required for plans and spec. Noted April 29.

N. J., Lakehurst—Buildings, etc.—Spec. 4082—Until June 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to construct, here. About $1,126,000; advertised in this issue.

N. J., Lakehurst—Turbo Alternators, etc. Spec. 4128—Until June 16, by Bureau Yards & Docks, Navy Dept., Wash., D. C., furnishing and installing 3 turbo alternators, cooling ducts, 2 exciter sets, switchboard and electric power and lighting systems, 2 motors with controllers and belts for air compressors, installing compressors, etc., (furnished by Government), at Naval Air Sta., here; advertised in this issue. Noted June 3.

Pa., Phila.—Concrete Paving and Scale Pit—Until June 16, at Office of H. J. Lumsden, constr. officer, Frankford Arsenal, building; advertised in this issue.

Pa., Phila.—Experimental Shop—Until June 22, by H. J. Lumsden, officer in charge of construction, Frankford Arsenal, building experimental shop; advertised in this issue.

D. C., Anacostia—Storehouse, Pigeon Loft and Hangar—Spec. 4085—Until June 16, by Bureau Yards & Docks, Navy Dept., Wash., building, here. About $22,600; $10 deposit required for plans and spec. Noted May 20.

D. C., Tacoma Park (Wash. P. O.)—Heating Plant Equipment—Until June 18, at office of Constructing Quartermaster, Ward 7, Walter Reed U. S. Army Genl. Hospital, furnishing labor and material for installing heating plant equipment, here; advertised in this issue.

D. C., Tacoma Park (Wash. P. O.)—Roads, Walks, Drainage and Grading—Until June 26, at office of Utilities Officer, Walter Reed U. S. Army Genl. Hospital, furnishing labor and material for roads, walks, drainage and grading, here; advertised in this issue.

D. C., Wash.—Improving Laboratory—Spec. 4182—Until June 21, by Bureau Yards & Docks, Navy Dept., removing present roofing, roof and some steel beams from portion of Bldg. 146, altering adjoining wall, providing support on new brick wall for floor joists and adjoining building, brick, hollow terra cotta tile stuccoed, rein.-con., etc.; $10 deposit required for plans and spec. Noted April 29.

Va., Hampton—Miscellaneous Buildings, Roads, Sewers, Heating Plant, etc.—Until June 25, by Chief of Construction Div., 7th and "B" Sts., S. W., Wash., D. C., for miscellaneous work, at Langley Field, here; $10 deposit required for plans and spec.; advertised in this issue.

Va., Hampton Roads—Revolving Landing Platform—Spec. 4223—Until June 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build here. About $35,000; advertised in this issue.

Va., Hampton Roads—Seaplane Runway—Spec. 4181—Until June 16, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building at Naval Operating Base, Air Sta., here. About $42,500; $10 deposit required for plans and spec. Noted May 20.

Va., Hampton Roads—Sewerage System—Spec. 4133—Until June 16, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building at Naval Operating Base, Air Sta., here. About $20,000; $10 deposit required for plans and spec. Noted March 25.

Va., Hampton Roads — Underground Steam Lines—Spec. 4218—Until June 16, by Bureau Yards & Docks, Navy Dept., Wash., D. C., furnishing and installing at naval air station, here; $10 deposit required for plans and spec.; advertised in this issue.

Va., Norfolk—Bulkhead, etc.—Until July 2, by U. S. Engr. Office, Custom House, building bulkhead on Craney Island Flats and furnishing and placing riprap stone on existing bulkhead; advertised in this issue.

Va., Norfolk—Dredging Until June 30, by U. S. Engr. Office, Custom House, dredging upon Inland Waterway from here to Beaufort, N. C.; advertised in this issue.

Va., Quantico—Incinerator, etc.—Spec. 4137—Until June 16, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building at Marine Barracks, here; $10 deposit required for plans and spec.; advertised in this issue.

Va., Quantico—Storehouse, Kite Balloon Hangar and Garage — Spec. 4225 — Until June 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building at Marine Flying Field, here; advertised in this issue.

W. Va., South Charleston—Railroad Track Scales—Spec. 4207—Until June 23, by Bureau Yards & Docks, Navy Dept., Wash., D. C., furnishing and installing one 100,000 lb. scale to be carried on structural supports furnished by Government and one 600,000 lb. to be carried on concrete pit furnished by Government, at Naval Ordnance Plant, here. About $25,000; $10 deposit required for plans and spec. Noted June 3.

S. C., Paris Island—Automatic Sprinkler System—Spec. 4213—Until June 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing, here; $10 deposit required for plans and spec.; advertised in this issue. Noted May 27.

S. C., Paris Island—Concrete Walks—Spec. 4206—Until June 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building 6,623 lin.ft. concrete walks, 5 ft. wide, including excav., filling, grading and 2 drains at Marine Barracks, here; $10 deposit required for plans and spec.

S. C., Paris Island—Fresh Water Supply Main—Spec. 4219—Until June 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing, here; $10 deposit required for plans and spec.; advertised in this issue.

S. C., Paris Island—Power Plant Improvements—Spec. 4211—Until June 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., improving, here; $20 deposit required for plans and spec.; advertised in this issue. Noted May 27.

Fla., Pensacola—Dirigible Hanger, etc.—Spec. 4172—Until June 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., dismantling dirigible hanger and 100,000 cu.ft. gas holder at Key West and transportation to and reerecting same here; building kite balloon hanger at Naval Air Sta., here, also foundations for eight 3 in. guns at Camp Saufley, Santa Rosa Island; $10 deposit required for plans and spec. Noted April 15 under "Key West."

Ky., Louisville—Steel Dump Scow—Until July 8, by U. S. Engr. Office, 425 Custom House, furnishing and delivering; advertised in this issue

Ky., Louisville—Structural Steel, Castings, etc.—Until July 3, by U. S. Engr. Office, 425 Custom House, furnishing and delivering for Lock 44, Ohio River; advertised in this issue.

Mich., Alpena—Quarters—Spec. 4195—Until June 16, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building, here. About $20,000; $10 deposit required for plans and spec. Noted May 27.

Mich., Detroit—Quarters—Spec. 4195—Until June 16, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building at Wind Mill Point, here. About $20,000; $10 deposit required for plans and spec. Noted May 27.

Wis., Milwaukee—Quarters—Spec. 4195—Until June 16, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building at navy grounds, here. About $20,000; $10 deposit required for plans and spec. Noted May 27.

Tex., Ft. Worth—Well, Towers, etc.—Spec. 4210—Until June 16, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building, here; $10 deposit required for plans and spec.; advertised in this issue. Noted May 27.

Cal., San Diego—Bakery Equipment—Spec. 4192—Until June 16, by Bureau Yards & Docks, Navy Dept., Wash., D. C., furnishing and installing, here. About $17,000; $10 deposit required for plans and spec. Noted May 20.

H. T., Kuahua—High Pressure Air Piping System—Spec. 4185—Until June 16, by Bureau Yards & Docks, Navy Dept., Wash., D. C., and Pub. Wks. Office, Navy Yard, Mare Island, Cal., furnishing and installing, at Naval Ammunition Depot, Pearl Harbor; advertised in this issue. Noted June 3.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. H., Portsmouth—Monitor Roof—Spec. 4162—Bureau Yards & Docks, Navy Dept. Wash., D. C., received bids June 2, building on engine room, here, (1) work complete, from D. Zane Co., 350 Bway., New York City, (1) $7,050 (100 days), (2) $7,100 (100 days); C. M. Leach, P. O. Box 2285, Boston, (1) $9,623 (120 days), (2) $9,783 (120 days). Noted May 20.

N. Y., Buffalo—Repairing Piers and Building Superstructure—U. S. Engr. Office, 540 Federal Bldg., received bids May 27, repairing and building at Dunkirk Harbor, from Empire Eng. Co., North Tonawanda, $55,686; Great Lakes Dredge & Dock Co., Morgan Bldg., $58,977; Lupfer & Remick, Ellicott Sq., $63,428. Noted May 6.

N. Y., Stapleton—Laundry—Treas. Dept., Wash., D. C., received only bid June 1, furnishing labor and material (except mechanical equipment), building, at U. S. Marine Hospital, here, from M. D. Louden, New York City, $9,900. Noted May 13.

N. Y., Stapleton—Mechanical Equipment—Treas. Dept., Wash., D. C., received bids June 1, furnishing mechanical equipment for laundry at U. S. Marine Hospital, here, from B. Goldreyer and D. Walpan, Bronx $8,830; C. F. Metzinger & Son, 122 Fenmore St., Brooklyn, $16,910; J. R. Proctor, Inc., 74 Cortland St., New York City, $16,972. Noted May 13.

Pa., Pittsburgh — Gates and Emergency Dams—U. S. Engr. Office, 2111 Farmers Bank Bldg., received bids May 24, furnishing, delivering and building for Emsworth Locks, Ohio River, from Dravo Contg. Co., Diamond Bank Bldg., $168,776; Penn Bridge Co., Beaver Falls, $186,686; Independent Bridge Co., May Bldg., $187,793. Noted April 29.

D. C., Wash.—Balloon Dirigible Hangar—Constr. Div., War Dept., received bids June 1, building balloon dirigible hangar, from Stang & Mitchell, Phila., Pa., $495,000; G. W. Wyne, Wash., D. C., $524,700; McCall, Moore & McNaughton, 308-9 Amicable Bldg., Waco, Tex., $548,000.

D. C., Wash.—Steel Work—Spec. 4174—Bureau Yards & Docks, Navy Dept., received bids June 2, for steel work for building crane runway extension, from D. Zane Co., 350 Bway., New York City, ($4,280 (60 days); J. P. Havaland, 1628 Real Estate Trust Bldg., Phila., $4,314 (40 days); Stang & Mitchell, 733 Real Estate Trust Bldg., Phila., $4,700 (60 days). Noted May 20.

S. C., Charleston—Radio Tower, etc.—Spec. 4149—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 2, building at Navy Yard, here, (1) work complete, from Amer. Bridge Co., Wilkins Bldg., Wash., D. C., (1) $27,800 (225 days), (2) $10,300; Pittsburgh-Des Moines Steel Co., 59 Munsey Bldg., Wash., D. C., (1) $28,400 (190 days), (2) $4,220; Mansfield & Savage, 135 William St., New York City, (1) $61,114 (150 days). Noted May 20.

★O., Cincinnati—Round Piling—U. S. Engr. Office, 405 Custom House, let contract furnishing and delivering for Dams 34, 36 and 38, to H. A. Carpenter, St. Marys, W. Va., $30,457. Noted April 29.

Mich., Detroit—Stone and Riprap—U. S. Engr. Office, 337 Federal Bldg., received only bid May 20, furnishing labor and material for rubble mound breakwater over north entrance to Harbor Beach, and placing stone riprap along portion of face of breakwater, rubble mound 304 ft. long, involving 17,000 ton armor stone and 12,500 ton core stone, from T. L. Durosher, Detour, $124,290. Noted April 22.

★Tex., Ft. Worth—Deep Well Pumping Equipment—Spec. 4166—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract furnishing and installing, at Helium Production Plant, here, to Layne & Bowler Co., Rand Bldg., Memphis, Tenn., $23,300. Noted May 27.

Federal Government Work (Continued)

★Col., Ft. Lyon—Elevated Steel Tank—Spec. 4171—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing, here, to Chicago Bridge & Iron Co., 30 Church St., New York City, $20,240 (160 days). Noted May 6.

★Wash., Puget Sound—Steel Storehouse—Spec. 4186—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building, here, to W. T. Butler, $80,910 (225 days). Noted May 13.

★Cal., Los Angeles—Road Work—C. H Sweetser, dist. engr., U. S. Bur. Pub. Rds., 886 Mills Bldg., San Francisco, let contract improving 1.4 mi. San Gabriel Canyon Rd., in Angeles Natl. Forest, near Azusa, to Bechtel & Hoey, 625 Market St., San Francisco, $95,630. Noted April 22.

★Alaska, Juneau—Dwellings and Septic Tank—Spec. 4144—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building, here, to N. Fleiness, 1310 1st Ave., Seattle, Wash., $18,650 (100 days). Noted Feb. 26.

Miscellaneous

PROPOSED WORK

Stand Pipe — Arlington Heights, Mass. (Boston P. O.)—Commonwealth of Massachusetts, Metropolitan Water & Sewer Com., 1 Ashburton Pl., Boston, appropriated $175,000 to build brick and concrete standpipe, here. Engineer not selected.

Bowl—New Haven, Conn.—Yale University soon lets contract completing upper portion of bowl, to enlarge seating capacity Work involves rein.-con., mass concrete and earth fill. About $250,000. C. A. Ferry, 82 Church St., engr. Noted Mar. 4.

Transformer Station—New York, N. Y.—New York Edison Co., Irving Pl. and 15th St., having sketches made by W. Whitehill, archt. and engr., 55 Duane St., for rein.-con. and steel, rein.-con. flooring, at Dunwoodie. About $150,000.

Water Pipe—Detroit, Mich.—Until June 15, by Comr. Purchases & Supplies, Municipal Courts Bldg., furnishing 3,000 ton 16-24 in. Class "C" and 4,000 ton 8 in. Class "B" pipe, in 12 ft. lengths. G. Fenkell, 232 Jefferson Ave., engr.

Cables, etc.—Ft. Worth, Tex.—Southwestern Telegraph & Telephone Co., Telephone Bldg., preparing plans for improvements, to include cables and switchboard equipment for 3,000 additional telephones, etc. H. G. Brickhouse, Genl. mgr.

Stadium—Los Angeles, Cal.—City Council and Bd. Supervs. Los Angeles Co. plan to build stadium, in Exposition Park. About $800,000. J. Parkinson, 420 Title Insurance Bldg., archt.

Auditorium and Bandstand—Santa Monica, Cal.—City voted $375,000 bonds to purchase site and build auditorium and bandstand. W. R. Carter, comr. Dept. Pub. Wks.

Pier—Venice, Cal.—C. Daly, et al., organizing company to build 150 x 900 ft. double deck timber and concrete pleasure pier. About $350,000. Leeds & Barnard, Central Bldg., Los Angeles, engrs. About $350,000.

Dam—Gatineau, Que.—See "Industrial Works."

BIDS DESIRED

Heating Equipment—Hudson, N. Y.—Until June 24, by A. W. Allen, pres. Bd. Managers, New York State Training School for Girls, for replacing underground steam and water mains and heating equipment; advertised in this issue.

Pier—New York, N. Y.—Until June 21, by M. Hulbert, comr. docks, Pier "A," foot of Battery Pl., reconstructing pier at East 20th St. About $200,000.

Sewer Bricks and Wood Paving Blocks—New York, N. Y.—Until June 18, by H. M Curran, pres. Manhattan Boro., furnishing and delivering 75,000 sewer bricks and 200,000 wood paving blocks, 3 in. wide, 3½ in. deep and 8 in. long.

Laundry Machinery—Randalls Island, N. Y.—Until July 8, by I. Townsend, pres. Bd. Mgrs., House of Refuge, furnishing laundry machinery. L. F. Pilcher, Albany, state archt.

Bulkheads, etc., Phila., Pa.—Until June 24, by G. F. Sproule, dir. Dept. Wharves, Docks & Ferries, 552 Bourse Bldg., constructing new concrete bulkhead at Columbia Ave., Delaware River, (Schedule A); roof and downsprout alterations to Cherry St Pier (Schedule B); copper covering of expansion joints to McKean St. Pier (Schedule C); retubing 2 main double-end boiler on Ice breaker "John Weaver" (Schedule D).

TRACKS—NEW YORK, N. Y.

Bids were received by J. H. Delancy, comr. transit constr., 49 Lafayette St., for installation of tracks in 180th St. yard of Manhattan-Bronx Rapid Transit R.R., from (A) Slattery Engineering & Construction Co., Inc., 7 East 42nd St., Brooklyn; Thomas Crimmins Contg. Co., 624 Madison Ave. The unit bids were as follows:

	A	B
2,150 cu.yd. excavation, including the disposal of it, etc	$3 00	$5.00
100 cu.yd extra fill, in place	4 00	3.00
1,700 cu.yd. 1:3:6 cinder concrete masonry, in place	20 00	24 00
500 cu.yd. 1:2½:5 concrete masonry, in place	25 00	30 00
18 tons steel rods, angles, anchors, steps and bars built in concrete and for anchor bolts, including nuts and steel washer plates, in place	250 00	207 00
1 ton miscellaneous iron castings, such as strainers, etc., in place	300 00	500 00
Wrought-iron electric conduits, in place:		
4,000 lin.ft. (a) ¾ in	40	39
1,900 lin.ft. (b) 1 in	60	48
730 lin.ft. (c) 1¼ in	75	80
500 lin.ft. (d) 2 in	1.00	1 07
360 lin.ft. (e) 2½ in	1.50	1 52
160 lin.ft. (f) 3 in	1 75	2 03
270 lin ft. (g) 3½ in	2 00	2.97
435 cast-iron outlet boxes in place	2 50	1 35
Cast-iron pull boxes, in place:		
(a) 6x6x4-in. boxes	5 00	7.30
3 (b) 6x6x6 in. boxes	7 00	8.40
16 (c) 8x8x6 in. boxes	10 00	9.60
1 (d) 12x8x6-in. boxes	15.00	16 00
1 ton furnishing and laying cast-iron sewer pipe, all sizes, including special castings, in place in the works	300 00	500 00
108 tons bringing extra 85-lb. A.S.C.E. rails to a designated poiot or points on the site of the yard	3 00	1 00
Furnishing and delivering to the works, splice bars:		
220 (c) type C, for 100-lb. rail	1.50	3.15
575 (cs) type C, sheared for 100-lb. rail	1.50	3.65
1,100 (xx) type for 85-lb. A.S.C.E. rail	1.50	1 44
Furnishing and delivering to the works screw spikes:		
68 100-lb. (a) type A	12.50	15.00
34 100-lb. (b) type B	12.50	15.00
Untreated, class "D" yellow pine timber, 6 in.:		
8,800 lin.ft. 12-in , in place, in the works	1 00	1.87
Furnishing aod delivering to the works, bolts, iocluding outs:		
86 (a) type A	50	45
86 (b) type B	50	50
30 (c) type C	50	49
2,600 (e) type E	25	27
2,200 (x) splice bar bolts for 85-lb. A.S.C.E. rail joints	20	12
Furnishing and delivering to the works malleable iron track materials:		
3,750 (b) type B, cup washers	10	.25
120 (c) main rail braces	1.25	3.00
Extended totals	$79,825	$102,472

Platforms, Trucks, Deck, etc.—Phila., Pa.—Until June 22, by City Transit Dept., 1211 Chestnut St., building (a) station platforms on Kensington Ave., between Huntingdon and Tioga Sts., and on Front and Berks Sts.; (b) track construction, involving 7,286 ft. single track and 2 cross-overs; (c) concrete deck on Front St. from Arch to Callowhill Sts. and on Frankford St. from Dyre to Bridge Sts.; (d) platform stations and shelter on Frankford Ave. and Pratt St., and appurtenant work

Mixing Machine and Gravity Conveyors—Columbus, O.—Ironclay Brick Co., 63 Ruggery Bldg., receiving bids for mortar mixing machine and gravity conveyors.

Lumber and Piling — Kaufman, Tex.—Until June 28, by J. E. Yates, aud. Kaufman Co., furnishing 700 m. ft. lumber and 20,000 lin.ft. piling for bridges. Bids will be received on creosoted southern pine, creosoted Douglas fir, untreated Douglas fir and creosoted treatment for Douglas fir

Rock Crusher, Tractors, etc.—San Angelo, Tex.—Comrs. Tom Green Co. receiving bids for rock crusher, 2 tractors and other road building machinery for quarrying and crushing rock for road building.

Phosphate Handling Machinery—Portland, Ore.—Until June 16, by Pub. Dock Comn., for $75,000 worth of phosphate handling machinery, and 3,900 ft. 30 in. conveyor belting for same. G. B. Hegardi, engrs.

Wharf—Kuskonook, B. C.—Until June 18, by R. C. Desrochers, secy. Dept. Pub. Wks., Ottawa, building public floating wharf, here.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Electrical Work, Etc.—Brooklyn, N. Y.—E. S. Walsh, supt. Dept. Pub. Wks., Capitol, Albany, received bids May 18, for electrical and masonry work at Barge Canal Terminal, Greenpoint, Contr. 104, from T. F. Jackson, 99 John St., $17,293; Jandous Electrical Equipment Co., 109 West 31st St., $17,683. Contractors of New York City. Noted April 22.

★Transformer Station—Brooklyn, N. Y.—See "Industrial Works."

Piers—New York, N. Y.—M Hulbert, comr. docks, Pier "A", foot of Battery Pl., received bids June 2, reconstructing pier and new freight pier at Stanton St., from Lustig & Weil, 103 Park Ave., $117,074; T. J. Waters, 271 West 125th St., $162,585. Noted May 20

Road Materials—New York, N. Y.—H. Bruckner, pres. Bronx Boro., received bids June 2, furnishing and delivering (a) 1,000 cu.yd. fine sand, (b) 5,000 cu.yd. sand grit, (c) 500 ton asphaltic cement, (d) trap rock and broken stone, (e) 500 ton limestone, (f) 50 ton paving pitch, from Lannigan Bros., Bronx River and 165th St., (a) $2,850, (b) $23,000; Lenox Sand & Gravel Co., Hudson River and 157th St., (a) $2,920, (b) $21,750; Warner Quinlan Co., 79 Wall St., (c) $20,750; New York Trap Rock Co., 101 Park Ave., (d) $3,696, Ames Bldg. Material Co., 3437 Kingsbridge Ave., (d) $3,744; E. Myers, (e) $5,555; Barrett Co., 17 Battery Pl., (f) $1,500. Noted May 27.

★Glutrin and Tarvia—Freehold, N. J.—Bd. Freeholders Monmouth Co. let contract furnishing 400,000 gal. glutrin, to Glutrin Co., Trenton, $60,000; 100,000 gal. tarvia, to Barrett Co., 17 Battery Pl., New York City, $48,000. Noted May 27.

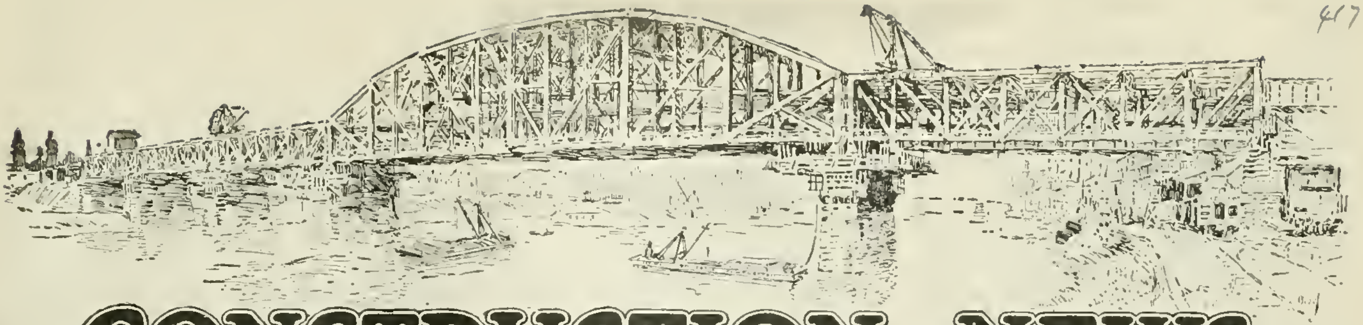
★Lamp Post Bases, Switches, etc.—Detroit, Mich.—Pub. Lighting Comn., Atwater St., let contract furnishing 544 No. 10 lamp post bases with caps, panels and brackets and 600 No. 398 Bell switches, to Russell Wheel & Fdry. Co., Chene St. and Belt Line Ry., at $0.15 per cwt., total $32,406.

★Brick—Hartford, Wis.—City let contract furnishing f.o.b. Hartford, 60 M face brick and 100 M common brick, to Burnham Bros. Brick Co., 68 Wisconsin St., Milwaukee, $40 and $16 per M.

Bulkheads—Milwaukee, Wis.—Comr. Pub. Wks. received bids May 24, building pile and timber bulkheads east of Jones Island, involving (a) 755 lin.ft. type "A" bulkhead, 15 ft. wide with cross walls, (b) 670 lin.ft. type "B," 12 ft. wide, with cross walks, (c) 539 lin.ft. type "C," 10 ft. wide, with cross walks, (d) 180 lin.ft. type "D," 7 ft. wide, (e) 60 lin.ft. type "E," 4 ft. wide, from Great Lakes Dredge & Dock Co., 216 West Water St., (a) $128, (b) $98, (c) $77, (d) $53, (e) $42; A. H. Prange, 228 Fowler St., (a) $130, (b) $102, (c) $86, (d) $61, (e) $45; Greiling Bros., 100 Blk. East Walnut St., Green Bay, (a) 139, (b) $106, (c) $89, (d) $68, (e) $48.

Asphaltum — Fresno, Cal. — Bd. Freeholders Fresno Co. received only bid furnishing 9,000 ton grade "E" asphaltum, from Standard Oil Co., Standard Oil Bldg., San Francisco, $15 per ton f.o.b. Richmond.

★Wharf and Shed—San Francisco, Cal.—State Harbor Comn., Ferry Bldg., let contract building creosoted pile wharf and shed, concrete flooring, to Healy-Tibbitts Constr. Co., 9 Main St., $11,199.



CONSTRUCTION NEWS

PROPOSALS

For proposals Advertised see the pages immediately following the "Construction News" Section.

WATERWORKS

Bids Close		See Eng. News-Record
June 21	Elyria, O.	June 3
June 22	Paola, Kan.	June 17
June 25	La Cygne, Kan.	June 17
June 25	New York, N. Y.	June 17
June 26	Dansville, N. Y. Adv. June 10 and 17.	June 10
June 28	Ironwood, Mich. Adv. June 17.	June 17
June 29	Buffalo, N. Y.	June 3
July 1	Madill, Okla. Adv. June 10 and 17.	June 10
July 9	Collinsville, Ill. Adv. June 10 and 17.	June 10
July 9	Akron, O. Adv. June 17.	June 17

SEWERS

Bids Close		See Eng. News-Record
June 21	Beaver Dam, Wis.	June 10
June 22	Alpine Tex.	June 17
June 22	Haverhill, Mass. Adv. June 10 and 17.	June 10
June 23	Brooklyn, N. Y.	June 17
June 24	Danville, Ky. Adv. June 17.	June 17
June 24	Cleveland, O.	June 17
June 24	Galva, Ill. Adv. June 10 and 17.	June 10
June 26	Ft. Collins, Col. Adv. June 17.	June 17
June 28	Waterloo, Wis. Adv. June 3 to 17.	June 3
June 28	Brillion, Wis.	June 10
June 29	St. Louis, Mo.	June 17
July 1	Milwaukee, Wis.	June 3
July 1	St. George, S. I., N. Y.	June 10
July 1	South Beach, S. I., N. Y. Adv. June 17.	June 17
July 1	Le Roy, Minn.	June 17
July 1	Elmore, Minn.	June 17
July 6	Boonton, N. J. Adv. June 17.	June 17
July 12	Bismarck, N. D. Adv. June 10 and 17.	June 17
July 19	Dallas, Ore.	May 27

BRIDGES

Bids Close		See Eng. News-Record
June 21	Claxton, Ga.	May 27
June 21	Olivia, Minn. Adv. June 3 to 17.	June 3
June 21	Auburn, N. Y.	June 10
June 21	Atlanta, Ga.	June 17
June 21	Claxton, Ga.	June 17
June 22	Wareham, Mass. Adv. June 3 to 17.	June 10
June 22	Columbus, O.	June 10
June 23	Belmar, N. J Adv. Mar. 27 to June 17.	Mar. 27
June 28	New Jersey Adv. June 10 and 17.	June 10
June 29	Beloit Wis. Adv. June 17.	June 17
July 1	Perry Ga.	June 17
July 3	Granville N. Y. Adv. June 17.	June 17
July 5	Greenfield, Ind.	June 17
July 6	Elk Point, S. D. Adv. June 17.	June 17
July 6	Yorba Linda, Cal.	June 17
July 6	Manchester, N. H. Adv. June 17.	June 17
July 7	Red Bank, N. J. Adv. June 17.	June 17

STREETS AND ROADS

Bids Close		See Eng. News-Record
June 19	New Martinsville, W. Va.	May 27
June 19	Charlottesville, Va.	June 17
June 21	Paducah, Tex.	June 10
June 21	Casper, Wyo.	June 10
June 21	Lebanon, Pa.	June 10
June 21	Clinton, N. C.	June 10
June 21	Pittsburgh, Pa.	June 17
June 21	Wellsville, Utah	June 17
June 21	College Point (Flushing P. O.), N. Y.	June 17
June 21	Detroit, Mich	June 17
June 22	Cumberland, Md. Adv. June 17.	June 17
June 22	Clayton, Mo. Adv. June 17.	June 17
June 22	Jefferson City, Mo.	June 17
June 22	Troy, N. C.	June 17
June 22	Stockton, Cal.	June 10
June 22	St. Albans, W. Va.	June 10
June 22	Columbus, O	June 10
June 22	Clayton, Mo.	June 17
June 22	Allegan, Mich.	June 17
June 22	Utah	June 17
June 23	Waterloo, N. Y. Adv. June 17.	June 17
June 23	Belmar, N. J.	May 27
June 23	Bennington, Vt.	June 10
June 23	Belvidere, N. J. Adv. June 3 to 17.	June 10
June 23	Ft. Wayne, Ind.	June 3
June 23	Montreal, Que.	June 17
June 23	Brooklyn, N. Y.	June 17
June 24	St. George, S. I., N. Y.	June 17
June 24	Flemington, N. J. Adv. June 3 to 17.	June 3
June 24	Leonard, Tex.	June 3
June 25	Carthage, Mo.	June 17
June 26	Dansville, N. Y. Adv. June 10 and 17.	June 10
June 26	Valleyfield, Que.	June 17
June 28	Savannah, Ga.	May 13
June 28	Reno, Nev.	June 3
June 28	Newton, N. J. Adv. June 17.	June 17
June 28	Tombstone, Ariz.	June 10
June 28	Florence, Ariz.	June 10
June 28	New Jersey Adv. June 10 and 17.	June 10
June 28	Minneapolis, Minn.	June 17
June 29	Roselle Park, N. J. Adv. June 17.	June 17
June 29	Wallingford, Conn. Adv. June 17.	June 17
June 29	St. Louis, Mo.	June 10
June 30	Freehold, N. J. Adv. June 10 and 17.	June 10
June 30	Rhode Island Adv. June 17.	June 17
July 1	Ft. Worth, Tex.	June 17
July 3	Tucson, Ariz.	June 17
July 5	New Madrid, Mo. Adv. June 17.	June 17
July 6	Wilmington, Del Adv. June 17.	June 17
July 6	Santa Barbara, Cal	June 17
July 6	Visalia, Cal.	June 17
July 6	Dallas, Ore.	May 27
July 12	Fergus Falls, Minn.	June 17
July 12	Madison, W. Va.	June 17
July 14	Tavares, Fla. Adv. June 10 and 17.	June 10

RAILWAYS

Bids Close		See Eng. News-Record
June 21	Michigan	June 17
July 2	British Columbia	June 17

EXCAVATION AND DREDGING

Bids Close		See Eng. News-Record
June 22	Ft. Dodge, Ia.	June 3
July 3	Madisonville, Ky.	May 27
July 7	Belzoni, Miss.	June 17

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
June 21	Baltimore, Md.	June 17
June 22	Cleveland, O.	June 17
June 25	Sheboygan, Wis.	June 10
June 28	Cleveland, O.	June 17
June 29	Comstock, N. Y. Adv. June 17.	June 17
June 30	Cambridge, Mass.	May 27
Sept. 1	Hutchinson, Kan.	Feb 19

BUILDINGS

Bids Close		See Eng News-Record
June 20	Detroit, Mich.	June 3
June 21	Three Rivers, Que	May 27
June 21	Manchester, N. H.	June 3
June 21	Detroit, Mich.	Jnue 10
June 21	Media, Pa.	June 3
June 21	Viola, Tenn.	June 17
June 22	Miami, Okla.	June 3
June 22	Presque Isle, Me.	June 17
June 22	Westfield, N. J.	June 10
June 22	Vineland, N. J.	June 10
June 22	Clinton, N. J.	June 10
June 22	Trenton, N. J.	June 10
June 22	Cleveland, O.	June 10
June 24	Rawlins, Wyo.	June 3
June 24	Milwaukee, Wis.	June 17
June 24	Lincoln, Neb.	June 17
June 25	Buffalo, N. Y.	June 17
June 25	Dedham Mass.	June 17
June 25	Newport News, Va.	May 6
June 25	Pocahontas, Ia.	June 10
June 26	Liberty Center, Ia.	June 3
June 28	Youngstown, O.	June 10
June 28	Wynne, Ark.	June 17
June 28	Trenton, N. J. Adv. June 17.	June 17
June 29	Duluth, Minn.	June 10
June 30	New York, N. Y.	June 10
June 30	Cheektowaga (Forks P. O.), N. Y.	June 17
July 1	Chisholm, Minn.	May 13
July 5	Cambria, Ia.	June 17
July 7	Gallipolis, O.	June 17
July 15	Jonesboro, Ark.	May 27
July 15	Coleraine, Minn.	June 10
July 16	Fullerton, Cal. Adv. June 17.	June 17
Aug. 2	Salina, Kan.	June 17
Aug. 16	Sioux City, Ia.	June 17

FEDERAL GOVERNMENT WORK

Bids Close		See Eng News-Record
June 19	Sand—Nahant, Mass.	June 10
June 19	Sand, Stone or Gravel and Cement—Boston, Mass.	June 10
June 21	Gate Boxes—Spec. 4216—Ft. Worth, Tex.	June 17
June 21	Altering Marine Railway — Spec. 4184 — Rockaway, N. Y.	June 10
June 21	Concrete Walks—Spec. 4206—Paris Island, S. C.	June 10
June 21	Improving Laboratory — Spec. 5182—Wash., D. C.	June 10
June 21	Power Plant Improvements—Spec. 4211—Paris Island, S. C. Adv. June 10 and 17.	June 10
June 21	Automatic Sprinkler System—Spec. 4213—Paris Island, S. C. Adv. June 10 and 17.	June 10
June 21	Additional Water Line — Spec. 4219—Paris Island, S. C. Adv. June 10 and 17.	June 10
June 21	Buildings, etc.—Spec. 4082—Lakehurst, N. J. Adv. June 10 and 17.	June 10
June 21	Revolving Landing Platform — Spec. 4223 — Hampton Roads, Va. Adv. June 10 and 17.	June 10
June 21	Gyro Room, Torpedo Racks and Crane — Spec. 4159 — South Charleston, W. Va.	June 17
June 21	Concrete Roads and Walks—Spec. 4203—Norfolk, Va.	June 17
June 21	Steam Distribution System—Spec. 4220 — Philadelphia, Pa.	June 17
June 21	Plate Racks for Steel Storage, etc. — Spec. 4227 — Mare Island, Cal.	June 17
June 21	Storehouses, Kite Balloon Hangar and Garage—Spec. 4225—Quantico, Va. Adv. June 10 and 17.	June 10
June 21	Fence and Gates — Mare Island, Cal.	June 17

Bids Close		See Eng. News-Record
June 21	Overhang and Gratings — Spec. 4208—Paris Island, S. C.	June 17
June 21	Gyro Room and Torpedo Racks—Spec. 4170—Pensacola Fla	June 17
June 21	Roads and Alternating Buildings — Spec. 1202 Quantico, Va.	June 17
June 21	Remodeling Quarters and Fireproofing Buildings — Spec. 4212 — Paris Island, S. C.	June 17
June 21	Repairing Roof Coverings — Spec. 4231—Philadelphia, Pa.	June 17
June 21	Dirigible Hangar — Spec. 4172—Pensacola, Fla. Adv. June 10 and 17.	June 10
June 21	Hangar, Storage Building and Pier — Spec. 1152 — Newport, R. I. Adv. June 10 and 17.	June 10
June 22	Labor—Wash., D. C.	June 3
June 22	Materials—Wash., D. C.	June 3
June 22	Materials—Norfolk, Va.	June 3
June 22	Experimental Shop—Philadelphia, Pa. Adv. June 10 and 17.	June 10
June 23	Laundry Equipment—Spec. 4191—San Diego, Cal.	May 27
June 23	Railroad Track Scales — Spec. 4207—South Charleston, W. Va.	June 10
June 23	Mattress Factory — Spec. 4163—Philadelphia, Pa.	June 17
June 23	Auxiliary Equipment and Piping—Spec. 4179—Puget Sound, Wash.	June 17
June 25	Earthwork—St. Louis, Mo. Adv. May 27 to June 17.	
June 25	Miscellaneous Buildings, Roads, Sewers, Heating Plant, etc.—Hampton, Va. Adv. June 10 and 17.	June 10
June 26	Laundry Machinery — Tacoma, Park (Wash. P. O.), D. C. Adv. June 17	June 17
June 26	Warehouses—Ft. Sam Houston, Tex. Adv. June 17.	June 17
June 26	Roads, Walks, Drainage and Grading — Tacoma Park (Wash P. O.), D. C. Adv. June 10 and 17.	June 10
June 28	Labor — San Francisco, Cal.	May 27
June 28	Dredge, etc.—Wilmington, N. C. Adv. May 27 to June 17.	May 27
June 28	Material—San Francisco, Cal.	May 27
June 28	Station Building and Accessories — Long Beach, N. Y. Adv. June 17.	June 17
June 30	Dredging—Norfolk, Va.	June 10
June 30	Tug Boat—Wash., D. C.	June 3
June 30	Cold Storage Insulation—Spec. 4199 — San Diego, Cal.	June 17
July 1	Dredging — New York, N. Y. Adv. June 3 to 17.	June 3
July 1	Manila Rope — Memphis Tenn. Adv. June 17.	June 17
July 2	Bulkhead, etc. — Norfolk, Va. Adv. June 10 and 17.	June 10
July 3	Structural Steel, Castings, etc.—Louisville, Ky. Adv. June 10 and 17.	June 10
July 8	Charcoal Iron Boiler Tubes Charleston, S. C.	June 3
July 8	Steel Dump Scow—Louisville, Ky. Adv. June 10 and 17.	June 10
July 8	Rubber Hose — Memphis, Tenn Adv. June 17	June 17
July 14	Seagoing Hopper Dredge Sabine—Galveston Tex Adv. June 17	June 17
July 15	Galvanized Wire, Wire Strand, Staples and Wire Rope Clips — Memphis, Tenn. Adv. June 17	June 17
July 15	Dredging — Wilmington, Del. Adv. June 17	June 17

MISCELLANEOUS

June 21	Dike—Sault Ste. Marie, Mich. May 20 to June 17	May 20
June 21	Pier—New York, N. Y.	June 10
June 22	Platform, Tracks, Deck, etc.—Philadelphia, Pa.	June 10
June 22	Wharf—Island D'Orleans, Que.	June 17

Bids Close		See Eng. News-Record
June 21	Heating Equipment—Hudson, N. Y. Adv. June 10 and 17.	June 10
June 24	Bulkheads, etc.—Philadelphia, Pa.	June 10
June 26	Culverts—Ontario	June 17
June 28	Lumber and Piling—Kaufman, Tex.	June 10
June 28	Freight Shed and Pier—New York, N. Y.	June 17
June 30	Pumps Nashville, Tenn.	June 3
July 6	Pipe—Terra Bella, Cal.	June 17
July 8	Laundry Machinery—Randalls Island, N. Y.	June 10
July 12	Tractors, Elevating Graders and Dump Wagon—Wadena, Minn.	June 17

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. Y., New York—Colombian Bureau of Information, J. A. Gongalez, vice chn., 130 West 42nd St., will be interested in catalogues of water meters for buildings.

N. J., Rahway—Middlesex Water Co., Madison Hill Rd., has been ordered by Pub. Utility Comn. to install equipment at plant which will provide for 4,000,000 gal. water daily

Fla., Leesburg—See "Streets and Roads."

Tex., Galveston—City having plans prepared building steel or concrete reservoir, with 1,750,000 gal. capacity. About $150,000. C. Wittig, city engr.

Okla., Purcell—City retained Johnson & Benham, engrs., Firestone Bldg., Kansas City, Mo., to prepare plans for waterworks system and extensions to main sanitary sewerage system.

Ore., Burns—City retained L. C. Kelsey, consult. engr., Portland and Nampa, Idaho, to prepare plans for waterworks system.

Que., St. Lambert—Town plans to expend $68,600 for extension and improvements to waterworks system, also $22,700 for new sewers.

BIDS DESIRED

N. Y., New York—Until June 25, by B. S. Coler, comr. Dept. Pub. Welfare, Municipal Bldg., furnishing labor and material for constructing and completing water supply system for fire and domestic use for 21 pavilion buildings, group buildings, dining hall and present nurses home at Seaview Hospital, also sections of new mains at Farm Colony, Richmond Boro.

O., Akron—Until July 9, by E. A. Zeisloft, dir. Pub. Serv., Delaware Bldg., constructing and equipping addition to water purification plant (Contracts 170 and 205). About $10,000 and $5,000 respectively; advertised in this issue.

Mich. Ironwood—Until June 28, by Bd. Water Comrs., building waterworks system. Bids on any or all of following: (a) laying force main, (b) building rubble pumping station, etc., (c) centrifugal pumping equipment, (d) 16 in. venturi meter, (e) valves. C. Lobb, chn.; advertised in this issue. Noted May 6.

Mich., Owosso—Until June 21, by city, furnishing 1 motor driven centrifugal pumping unit of 1,500 gal. per minute capacity against 175 ft. head. B. K. Lucas, clk.; advertised in this issue.

Ill., Crystal Lake—Until June 30, by Bd. Local Impvts., building extensions to main water supply system. Wells Eng. Co., Aurora, Ill., city engrs.; advertised in this issue

Kan., La Cygne—Until June 25, by City Clerk, improving waterworks system. Black & Veach, Interstate Bldg., Kansas City, Mo., engrs. Noted Mar 18

Kan., Paola—Until June 22, by city clk., building water filtration plant, low and high service pumps, filter house, coagulating basins and clear well, and repairing present pumping station and watermains. Black & Veach Interstate Bldg., Kansas City Mo., engrs

N. D., Bismarck—Until July 12, by Bd City Comrs., constructing complete waterworks system, including filtration plant T. R. Atkinson, Bismarck, consulting engr.; advertised in this issue

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Pa., Phila.—City let contract removing and laying water pipe in various streets, to McNichol Paving & Constr. Co., 1923 Cherry St., $23,750. Noted May 27 under "Streets and Roads."

★La., Shreveport—City let contract building 3,000,000 gal concrete covered water basin, etc., to R. A. Gibson, Shreveport, $117,250

★Ill., Decatur—City Council let contract building impounding dam, to L. N. Cope & Son, 116 Merchant St. About $1,000,000.

Sewers

PROPOSED WORK

Fla., Leesburg—See "Streets and Roads."

O., Cleveland—City soon receives bids building Easterly Sewage Treatment Works.

O., Cleveland—City has surveys made by MacDowell & Garvin, engrs., 716 Hippodrome Bldg., for new sewerage and waterworks system for outlying suburbs. About $4,000,000.

Ore., Burns—City retained L. C. Kelsey, consult. engr., Portland and Nampa, Idaho, to prepare plans for sewerage system.

Que., St. Lambert—See "Waterworks."

BIDS DESIRED

N. Y., Brooklyn—Until June 23, by E. Riegelmann, boro. pres., furnishing labor and material repairing sewer in Greene Ave. between Lewis and Marcy Avs., Green Ave. at Washington Av., also building in Bay Parkway between 81st and 82nd Sts., 82nd St. between Bay Parkway and 21st Ave and sewer basins in Bay Parkway at north and east corners of 81st St.

N. Y., S. I., South Beach—Until July 1, by C. D. Van Name, pres. Richmond Boro., St. George, building sewerage system here; advertised in this issue.

N. J., Boonton—Until July 6, by Bd. Aldermen, laying, furnishing and excavating for storm sewers. A. Taylor, ch. Street Comn.; advertised in this issue.

Ky., Danville—Until June 24, by Mayor building 5,000 ft. small sewers, also 33,000 sq.yd. paving. S. F. Crecelius, Richmond engr.; advertised in this issue.

O., Cleveland—Until June 24 by city, building sewers in Avon Ave. from East 109th to East 116th Sts., Central Ave. from East 14th to East 30th Sts., East 105th St from Kinsman Rd. S. E., to Park Heights Rd. S. E., and Lambert Ave. from East 131st to East 138th Sts., vitr. pipe. R. Hoffman 618 City Hall, engr

Minn., Elmore—Until July 1 by D. K. McInarie, city recdr. building 3,000 ft 8-12 in. vitr. clay storm sewers and 5,000 ft sanitary sewers. About $25,000. W. E. Buell, 229 Davidson Bldg., Sioux City, Ia., engr. Noted June 3.

Minn., LeRey—Until July 1, by E. W. Spencer city clk., furnishing and laying 20,000 ft 8-12 in. vitr clay sanitary sewers About $30,000 W. E. Buell, 229 Davidson Bldg., Sioux City, Ia., engr.

Mo., St. Louis—Until June 29 by Bd Pub Serv. building sewer excavating and backfilling South Harlem Pub Sewer and branch, involving 4,178 ft 12 ft rein.-con. and 3,400 ft. 6-8 ft vitr. brick pipe. About $350,000. Alternate bids will be received on brick and rein.-con for 3,400 ft 6-8 ft section. Noted May 20.

Tex., Alpine—Until June 22, by B. F. Berkeley, mayor, building sewerage system, involving 12,500 ft 6-12 in pipe, 36 manholes and small sendimentation tank. Bartlett & Ranny, Inc., 521 Moore Bldg., San Antonio, Engrs.

Okla., Purcell—See "Waterworks."

Col., Ft. Collins—Until June 26, by city building storm sewer. A. J. Rosenow, clerk W. B. Cheek, city engr; advertised in this issue.

Ont., Niagara Falls—Until June 21, by W. J Seymour, city clk., building 8,130 ft large rectangular trunk sewer, concrete; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Buffalo—A. W. Krienheder, comr Bd. Pub Wks., received bids June 7, building tile sewers in (a) Elmwood Ave., (b) Joseph St., (c) Roslyn Ave., (d) Wilkes Ave., from Dark & Co., 654 Main St., (a)

Sewers (Continued)

$6,600, (b) $7,600, (c) $4,590, (d) $6,390; J. M. Fahning, 460 Leroy Ave., (a) $7,000, (b) $7,600, (c) $3,779, (d) $5,281. Noted June 3.

★N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., let contracts building sewers in Alstyne Ave., to Saverio & Britton, $33,200; Carona Ave., to A. Paino, 2016 East 14th St., Brooklyn, $593,000; Wilbur Ave., also receiving basin in Wolsey Ave., to Kennedy & Smith, $1,250 and $1,730 respectively. Noted May 27.

N. Y., Long Island City—M. E. Connolly, pres. Queens Co., received bids June 8, building sewer and appurtenances in (1) Depot Lane from Joslin to Norwood Sts., (2) Ormond St. from Crocheron Ave. to Crown about 350 ft. north, (3) South St from Long Island R.R. to Rockaway Turnpike, from Green Contg. Co., 534 Vernon Ave., Brooklyn, (1) $13,510, (2a) $289,043, (2b) $281,828, (3) $44,275; J. Johnson Contg. Co., 455 Bway., West New Brighton, (1) $13,806; Kennedy & Smith, (1) $14,277; C. Petracca, 3506 Neptune Ave., Brooklyn, (2) $274,683; Peace Bros., (2) $290,000, (3) $42,774; N. Lascalzo, (3) $28,161. Noted June 3.

★N. Y., New York—H. H Curran, pres. Manhattan Boro., let contract repairing barrel sewers (1) at foot of Coenties Sli and East River Pier 6, and at foot of Jefferson St. and East River, (New Pier 46), (2) at foot of 21st St. and East River and foot of 29th and 33rd Sts., East River, to Melrose Constr. Co., 103 East 125th St., (1) $16,510 and (2) $11,515. Noted June 3.

★O., Cleveland—City let contract laying sewer in Darwin Ave. from East 140th to East 146th Sts., to A. Marra, Illuminating Bldg., $9,107; East 129th St. from Iroquois Ave. to city limits, to G. Assad, 251 Bradley Court, $6,350; Orleans Ave. from city limits to East 103rd St., to G. Assad, 251 Bradley Court, $2,707; Scoville Ave. from East 36th to East 55th Sts., to Gallagher-Burke Constr. Co., 1339 Irene Ave., $79,516. Noted May 20.

★O., Cleveland—City let contract building sewer in Othello Ave. from East 136th St. to East 140th St., to A. Marra, Illuminating Bldg., cost $16,342; Superior Ave. from East 21st to East 22nd Sts., to Iafornaro Co., 3218 Murray Hill Rd., $9,636; Carnegie Ave. from East 22nd to East 40th Sts., to Mansoo Co., 343 The Arcade, $80,790. Noted June 10.

★Mich., Ann Arbor—City will build sewers in Packard, State and Hill Sts., Granger and Olivia Aves., involving 7,170 ft. 12-27 in vitr. pipe and 1645 ft. 29-30 in. segmental block pipe. About $35,000. Work will be done by day labor. Noted June 3.

Ore., Portland—City received bids June 2, building (a) 33rd Ave. S. E., and 60th St. S. E. Sewerage System, (b) sewer in East 54th St. from Tillamook to Halsey Sts., (c) East 77th St. from Halsey to Oregon Sts., (d) East 61st St. from Stanton to Sacramento Sts. and Sacramento St. from East 61st to East 60th Sts., (e) East 33rd St., from Shaver to East 33rd Sts. at Simpson St., (f) improving Front St. from Miles to 1st Sts., (1) cement, (2) vitr., (3) concrete or vitr., from Jacobsen-Jensen Co., 407 Stanton St., (a1) $131,750; Lane & Pasanen, Portland, (b2) $7,012, (c2) $7,105; Lundstrom & Carlson, Portland, (b2) $7,477, (c2) $7,772; J. Keating, (b2) $7,479; Mehemarie & Co., Portland, (c1) $8,235; Azar & Co., Portland, (d1) $9,049; Parker Schram Co., 214 Lumbermans Exch. Bldg., (e3) $42,244; United Contg. Co., Northwestern Bank Bldg., (f) concrete pavement No. 3 in roadway, $2.45 per sq.yd., total $8,384.

Bridges

PROPOSED WORK

Okla., Pond Creek—Grant Co. soon receives bids building bridge across Salt Fork Arkansas River, north of here. About $225,000. R. C. Terrell, Oklahoma, state engr. Noted March 18

Ont., Dunnville — Dept. Railways & Canals, Western Blk., Ottawa, soon receives bids building bridge, here. About $28,031.

BIDS DESIRED

N. H., Manchester—Until July 6, by M. F. Shea, dir. Pub. Wks., City Hall, building bridge over Merrimack River, to replace Amoskeag Bridge; advertised in this issue.

N. Y., Granville—Until July 3, by Town Clerk, furnishing labor and material building single span, rein.-con. arch over Mettowee River on Church St.; advertised in this issue.

N. J., Red Bank—Until July 7, by Bd. Freeholders Monmouth Co., building Hubbards Bridge No. S-17, over North Shrewsbury River. W. M. Bergen, dir.; advertised in this issue.

Ga., Claxton—Until June 21, by Bd. Comrs. Rds. and Revenues, Evans Co., building 580 ft. bridge, 16 ft. wide, over Canoochee River, Savannah-Reidsville Rd., Federal Aid Project No. 52, 7 mi. from here, (a) rein.-con., (b) concrete and steel, involving (a) 691.86 cu.yd. Class "A" and 89.68 cu.yd. Class "B" concrete, 135,606 lb. reinforcing steel, 1,031 sq.yd. Kentucky rock asphalt, 572 cu.yd. dry excav., (b) 193,430 lb. structural steel 51,330 ft. lumber, 732.78 cu.yd. Class "B" concrete, 32,300 lb. reinforcing steel and 885 cu.yd. dry excav.

Ga., Perry—Until July 1, by Comrs. Rds. and Revenues, Houston Co., building rein.-con. bridge over Big Indian Creek, Georgia Federal Aid Project No. 160, Perry-Henderson Rd. Work involves 128 cu.yd. wet and dry and 4,505 cu.yd. borrow excav., 306 cu.yd. sand clay surfacing, 427.7 cu.yd. Class "A" and 107.5 cu.yd. Class "B" concrete, 1,440 lin.ft. 14 x 14 in. rein.-con. piles, 47,091 lb. reinforcing steel, 0.15 acres clearing. Alternate proposals on 420 cu.yd. Class "B" concrete in abutments and piers, 370 cu.yd. Class "A" concrete in arch rings, 80 cu.yd. Class "A" concrete in spandrels, 41 cu.yd. Class "A" concrete in wings, 55 cu.yd. Class "A" concrete in rails, and 45,000 lb. reinforcing steel.

Ga., Quitman—Until June 21, by State Highway Dept., 700 Walton Bldg., Atlanta, constructing bridge over Withlacoochee River, Valdosta-Quitman Rd., between Brooks and Lowdnes Counties, 4 mi. from here, involving 774 cu.yd. Class "A" and 278 Class "B" concrete, 3,897 cu.yd. common borrow excav., 9,200 lb. reinforcing steel, etc.

Ind., Greenfield—Until July 5, by Comrs. Hancock Co., building 5 concrete bridges. C. Boone, co. engr.

Wis., Beloit—Until June 28, by city, building 8 span rein.-con. girder bridge, 249 ft. long and 66 ft. wide. C. E. Hoebink, city engr.; advertised in this issue.

S. D., Elk Point—Until July 6, by L. J. Johnson, aud. Union Co., building steel bridge over Brule Creek, Richland Twp.; advertised in this issue.

Cal., Yorba Linda—Until July 6, by J. M Backs, clk., Orange Co. (Santa Ana) building 560 ft. extension to bridge, here, 20 ft. wide, concrete and timber. About $32,000. J. L. McBride, co engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Massachusetts—Dept. Pub. Wks., Boston, let contract building state bridge, Oak Bluffs and Tisbury Twps., to F C. Taylor, Fairhaven, $26,629.

★Mass., Boston—City let contract building 120 ft. bridge, 60 ft. wide, on Clarendon St., to J. McCourt Co., Waite St., $117,308.

★Pa., Phila.—City let contract to M. & J. B. McHugh, 892 North Markoe St., repairing bridge on Passyunk Ave., over Schuylkill River, $33,895; to Latta & Roberts, Drexel Bldg., Penrose Ferry Bridge, $1,865; to W. Klinberg & Sons, Belmont and Girard Ave. Bridge over main line of Pennsylvania R.R., $15,893. Noted May 27 under "Streets and Roads."

★Ill., Pontiac—G. D. Butzer, supt Livingston Co., let contract building McClinock Bridge, McLean Twp., Riley Bridge and Steidinger Retaining Wall, Forest Twp., to M Paternoster, Fairbury, Ill. Total $10,814; Miller Bridge, Ford Twp., Trost, Haag and Rittenhouse Bridges, Bailey and Shapland Culverts, Sullivan Twp., to Continental Bridge Co., Peotone, Ill., $9,000; Rugby and Schwendtner Bridges, Owego Twp., Stuckey Bridge, Nebraska Twp., to H. J. Eppel, Graymont, Ill., $8,172; Moon Bridge, McFadden and Viaduct Culverts, Reading Twp., Edwards Bridge, Charlotte Twp., Immke and Stoller Bridges, Metz, Hoffman and Maurer Culverts, Pleasant Ridge Twp., Colehouwer and Miller Bridges, Long Point Twp., to Joliet Bridge & Constr. Co., Joliet, Ill., $29,420

★Wis., Neenah—City let contract building bridge and retaining wall on Main St., to Blake Constr. Co., 627 South River St., Appleton, $44,535.

Ia., Nevada—Bd. Supervs. Story Co. received bids May 26, building steel plate girder bridge, over Squaw Creek on Lincoln Way, to have three 72 ft. spans, 24 ft. roadway and one 5 ft. sidewalk, from Cole Bros., Ames, $45,258; Clinton Bridge Wks., Clinton, $48,400, Koss Constr. Co., 2818 5th St., Des Moines, $52,000 Noted May 6.

★Tex., Groesbeck—Limestone Co. let contract building 2 steel bridges, all concrete bridges and all drainage structures in Groesbeck, Thornton and Ben Hur Dists. to Knox & Keeling, Mexia. About $200,000; cost plus percentage basis. Work involves 2,500 cu.yd. rein.-con., 100,000 cu.yd. earth approach and fill, 375,000 lb. structural and 216,000 lb. reinforcing steel.

★Washington — State Highway Comn., Olympia, let contract building 2 rein.-con. bridges on Olympic Highway, to N. Fleiness, Seattle, $28,983.

★Wash., Millwood—Spokane Co. (Spokane), let contract building 321 ft. bridge, 22 ft. wide, over Spokane River, here, involving 845 cu.yd. concrete and 70.89 ton reinforcing steel, to W. A. Beyers, 5518 Maple St., Spokane, $64,980.

Streets and Roads

PROPOSED WORK

Conn., Bridgeport—Bd. Pub. Wks. plans to extend Broad St. from Congress St. to Washington Ave. About $100,000. J. A. McElroy, city engr.

N. Y., S. I., St. George—C. D. Van Name, pres. Richmond Boro., rejected bids received June 4, repaving Sunrise Terrace. About $26,000. Noted June 10.

N. J., Hoboken—City plans to pave Monroe St. from 8th to 9th Sts., 10th to 11th Sts and 13th to 15th Sts., 6th St. from Jackson to Monroe Sts. and 9th St. from Monroe to Adams Sts., asphalt. Cost to exceed $200,000. D. A. Haggerty, clk.

N. J., Jersey City—Bd. Freeholders Hudson Co. plans to take over and improve Schuyler Ave. in towns of Harrison and Kearny. Cost to exceed $50,000.

N. J., Trenton—Bd. Freeholders Mercer Co. plans to improve 2 mi. Carter Rd., Princeton Twp., 20 ft. wide, concrete. About $80,000. H. F. Harris, co. engr.

S. C., Abbeville—Abbeville Co. plans to improve 15 mi. Abbeville-Honeapath Rd. F. H. Murray, Columbia, archt. Noted April 15.

Fla., Leesburg—City voted $65,000 bonds to pave various streets with asphalt, also extend sewerage and waterworks system.

Miss., Grenada—Grenada Co. plans to issue $300,000 bonds to build hard surfaced roads in Beats 1, 2, 3 and 4. Address K. Maltingly, Grenada. Engineer not selected

O., Cleveland—City plans to grade, drain, curb and pave West 65th St. from Denison to Barberton Aves., Kenneth Ave. from West 18th to 21st Sts., Orange Ave. from East 34th to East 40th Sts. and West 86th St. from Denison to Silverton Aves., concrete and brick block on concrete base. About $125,000. R. Hoffman, 618 City Hall, engr.

O., Dayton—City plans to pave 4th St. from Main to Wilkinson Sts., involving 6,000 sq.yd. vitr. brick or wood block on concrete base. About $56,000. G. Baker, city engr.

O., Middletown—City plans to pave North Main St. and Hydraulic Ave., involving 5,200 sq.yd. vitr. brick on concrete base, 1,100 lin.ft. concrete curbing, 1,100 lin.ft. concrete guttering. About $11,000 and $27,000 respectively. W. Morrison, city engr.

O., Portsmouth—City plans to pave Argonne Rd. from Bertha Ave. to Spring Lane, involving 2,700 sq.yd. vitr. brick on concrete base or concrete, 1,600 lin.ft. concrete curbing and guttering and 2,000 cu.yd earth excav. About $150,000. J. E. Chandler, clk.

Mich., Detroit—City having plans and estimates prepared grading, shaping and paving with sheet asphalt on 8 in. concrete base, Amherst or Medina curbstone, Harper Ave. from Van Dyke to Gratiot Aves., 46 ft. wide less double track space, cost $109,725; Charlevoix Ave. from Detroit Terminal Ry. to Connors Ave., 40 ft. wide, less double track space, $34,800; Marlborough Ave. from Kercheval to Waterloo Aves., 26 ft. wide, $15,430; Ida St. from Scotten Ave. to Easterly Terminus, 26 ft wide, $11,060; Concord Ave. from Lambert to Harper Aves., 26 ft. wide, $21,670; with new 1 course concrete and 2 x 6 in. retaining plank, alley between 14th, Wabash, Marquette and Ferry Park Aves., 20 ft. wide, $5,620. C. W. Hubbell, city engr.

Mich., Detroit—City plans to grade, shape and pave with sheet asphalt on 8 in. concrete foundation, Berea, Medina or Amherst curbstone, Springwells Ave. from Michigan to McGraw Aves., 26 ft. wide, involving 6,000 sq.yd. paving, cost $30,860; Philadel-

Streets and Roads (Continued)

phia Ave. from 12th St. to La Salle Ave., 26 ft. wide, 7,600 sq.yd. paving, $38,180; Heck Pl. from Garfield to Hancock Aves., 20 ft. wide, 2,800 sq.yd. paving, $14,800; Lycaste St. from Goethe to Mack Aves., 26 ft. wide, 6,200 sq.yd. paving, $30,930; Newport Ave. from Charlevoix to Mack Aves., 26 ft. wide, 7,000 sq.yd. paving, $35,150; Milford Ave. from Vinewood to Beechwood Aves., 26 ft. wide, 11,800 sq.yd. paving, $58,680; paving with 1 course concrete with 2 x 6 in. retaining plank, alleys between Brush, Beaubien, Brady and Illinois Sts., $6,430; alleys between Wildemere, Lawton, Vicksburg and Virginia Park Aves., $5,780; alleys between West Grand Blvd., Vinewood, Hancock and Warren Aves., $8,720. C. W. Hubbell, city engr.

Mich., Ford (Wyandotte P. O.)—Village having plans and estimates prepared by M. L. Brown & Son, engrs., 823 Chamber of Commerce, Detroit, grading, shaping and paving 1st St. and Riverside Drive, 24-26 ft. wide, involving 18,000 sq.yd. 2 course concrete and 13,000 lin.ft. concrete curbing. About $75,000.

Wis., Darlington—City had plans prepared paving 100,000 sq.yd. Galena, Main, Ohio and Louis Sts. Bids will be received on various types of pavement. W. F. Reichardt, Watertown, engr.

Wis., Superior—Bd. Pub. Wks. receives bids June 22 or 23, paving 2nd, East 3rd and East 4th Sts., Cass and Clark Aves. W. J. Patterson, clk.

Mo., Fulton—Calloway Co. plans to build 18 mi. Fulton-Jefferson City Rd. (New Bloomfield Special Rd. Dist.), 24 ft. wide, Federal Aid Project 97, involving 84,880 cu.yd. earth and 8,471 cu.yd. rock excav., 59,110 sq.yd. gravel surfacing, 10,664 cu.yd. borrow, 38,746 cu.yd. per 100 ft. overhaul, 35,925 sq.yd. macadam pavement, 304 lin.ft 12-24 in. vitr. clay pipe, 4,212 lb. reinforcing steel, one 100 ft., one 80 ft. and one 20 ft. span bridges and 265 cu.yd. concrete masonry. About $146,800.

Mo., Greenfield—Dade Co. plans to improve 5 mi. Lamar-Springfield Rd., 24 ft. wide, Federal Aid Project 106, involving 11,593 cu.yd. earth excav., 26,400 sq.yd. clay-bound macadam surfacing, 10 in. deep, extensions to 10 culverts and one 20 ft. span bridge. About $26,000.

Mn., St. Louis—City plans to reset curb, repair base and pave 11,000 ft. 17th St. from Washington to Lucas Sts., wood block, cost $3,700; Sigel St. from Terrace St. to Kingshighway, macadam, $12,700; Sophie St. from Ashland Ave., to Natural Bridge Rd., and Hodimont Ave. from Maple St. to Easton Ave., asphalt, $18,750 and $90,200 respectively; Meramec St. from Chippewa St. to Morganford Rd., brick, $13,400; Harney Ave. from Claxton to Emerson Sts. bitulithic, $11,600; Itaska St. from Adkins St. to Macklind Ave., concrete, $77,000.

Tex., Austin—Travis Co. having plans prepared clearing, grubbing, grading, gravel surfacing and draining 3 mi. Austin-Oak Hill Rd., 16 ft. wide, involving 123 cu.yd. 1:2:3 and 20 cu.yd. 1:2½:5 concrete, 8,700 cu.yd unclassified earth and 300 cu.yd. rock excav., 27,280 sq.yd. bituminous macadam, 3,618 cu.yd. gravel and 3,750 lb. reinforcing steel. About $26,665. H. W. Nolan, 511 Scarbrough Bldg., engr.

Tex., San Marcos—Hays Co. had plans prepared grading, graveling and draining 18.9 mi. Highway 29-B, Federal Aid Project 178, 15 ft. wide, also building concrete bridge over Blanco River, involving 32 acres clearing and grubbing, 3,100 cu.yd. gravel, 672 lin.ft. c.i. pipe, 488 cu.yd. 1:2:4, 40 cu.yd. 1:3:6 and 60 cu.yd. 1:2½:5 concrete; gravel surfacing and draining 9.68 toi. Highway 20-A, Austin-Fredericksburg Rd. 12 ft. wide, 19.5 acres clearing and grubbing, 23,200 cu.yd. earth and 2,200 cu. yd. rock excav., 7,761 lb reinforcing steel, 203.7 cu.yd. Class "A" and 49.3 cu.yd. Class "B" concrete. About $101,424 and $21,840 respectively. J. W. Puckett, Buda, engr.

Tex., Waxahachie—Ellis Co. having plans prepared surfacing and building rein.-con. bridges and culverts on 11.5 mi. Highway 14 from Navarro Co. to point 3 mi. north Garrett, 18 ft. wide, involving 43,200 cu.yd. earth borrow, 121,440 sq.yd. bituminous macadam, 25,345 cu.yd. crushed stone, 38,400 lb. reinforcing steel, 369 cu.yd. 1:2:4, 101 cu.yd. 1:2½:5 and 33 cu.yd. 1:3:6 concrete. About $208,530. G. G. Edwards, Ennis, engr.

Okla., Madill—City receives bids about July 10, paving 55,000 sq.yd. various streets. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs. Noted Jan. 29.

New Mexico—L. A. Gillett, State highway engr., Capitol Bldg., Santa Fe, soon receives bids graveling Mogellen and Santa Rita Federal Aid Projects in Silver City, Grant Co. About $300,000.

Ore., Marshfield—City receives bids about July 25, paving, concrete curbing, building sidewalks and sewers in Bway., S. About $29,500. E. K. Burton, city engr.

Ore., Union—City retained L. C. Kelsey, consult. engr., Portland and Nampa, Idaho, to prepare plans paving various streets. About $35,000.

Cal., Pomona—City receives bids in summer paving 6 streets, 5 in. concrete with ¾ in. asphaltic oil surface, expansion joints, etc. Cost to exceed $25,000. C. E. Bayley, city engr. Noted Jan. 8.

Cal., Stockton—Bd. Supervs. San Joaquin Co. having plans prepared grading and paving 3½ mi. Hammer Lane, 12 ft. wide, 2 mi. Waterloo Rd., 16 ft. wide, and 4½ mi. Copperolis Rd., 12 ft. wide, 2 in. oiled macadam surface on 6 in. gravel base. Cost $35,000, $25,000 and $45,000 respectively. F. E. Quail, Stockton, engr.

Ont., Pembroke—Renfrew Co. soon receives bids improving roads. About $250,000.

Que., St. Lambert—Town plans to expend $308,700 for sidewalks and pavements.

Que., St. Lambert—Town Council soon receives bids building concrete roadway, 20 ft. wide, along water edge from Victoria Bridge to city limits. About $400,000. E. Drinkwater, St. Lambert, engr.

Alberta—Provincial Government, Edmonton, plans to build 15 mi. highway between Ft. Smith and Ft. Fitzgerald Dominion. Government will pay 40% of cost.

BIDS DESIRED

Mass., Boston—Until June 22, by city, paving Belgrade Ave. Beach and Center Sts., 7,816 ft. long, 60-80 ft. wide, involving 15,220 lin.ft. granite curbing, 13,103 lin.ft. art stone sidewalks, 11,840 cu.yd., soft, loose or broken rock, etc. Bids will be called for on Topeka, bitulithic and filbertine pavement. About $320,000.

Rhode Island—Until June 30, by State Bd. Pub. Rds., State House, Providence, rebuilding 4.4 mi. road, Coventry and West Greenwich Twps., beginning at Washington Village and extending south and west on Nooseneck Hill Rd.; advertised in this issue.

Conn., Wallingford—Until June 29, by M. K. Pickett warden and Court of Burgesses, at office of Boro Clerk, furnishing labor and material building 12,800 sq.yd. concrete pavement, bituminous bound macadam on concrete base with asphalt top; advertised in this issue.

N. Y., Brooklyn—Until June 23, by E. Riegelmann, boro. pres., regulating and repaving with permanent Grade 1 granite pavement on 6 in. concrete foundation, roadway of Ash St. from Manhattan Ave. to Oakland St., regulating, grading, curbing, laying sidewalks and paving with preliminary bituminous macadam pavement, roadway of Neptune Ave. from West 8th St. to Stillwell Ave., fencing lots on southwest side Visitation Pl. between Richard and Van Brunt Sts., etc., regulating and repaving with permanent asphalt pavement on 6 in. concrete foundation roadway of Bedford Ave. from Atlantic Ave. to Sterling Pl.

N. Y., College Point (Flushing P. O.)—Until June 21, by M. E. Connolly, pres. Queens Boro., regulating and repaving with improved granite block on 6 in. concrete foundation, 3rd Ave. rom 1st to 13th Sts., Steinway Ave. from Flushing to Winthrop Aves.; with bituminous macadam, 5th Ave. from 21st St. to Whitestone Line, 7th and Linden Aves. from 18th St. to Fluhing Line; with sheet asphalt, 7th Ave. from 13th to 16th Sts., Grand Ave. from Hopkins Ave. to Main St. Granview Ave. from Stanhope to Lincoln Sts., also regulating and grading sidewalk and gutter spaces and laying sidewalks on southerly side of Boulevard from Beach 35th St. to bridge over Nortons Inlet, easterly side of 223rd St. from Hempstead to 105th Aves., regulating roadway and laying preliminary pavement of bituminous macadam on 104th Ave. from Farmers Blvd. to Hollis Ave.

N. Y., S. I. St. George—Until June 24, by C. D. Van Name, pres. Richmond Boro., repaving with concrete roadway of Rockland Ave. from Forest Hills Rd. to point 1,100 ft. west of Manor Rd. Former bids rejected. Noted June 3.

N. Y., Waterloo—Until June 23, by J. C. Shanks, village pres., paving various streets; advertised in this issue.

N. J., Newton—Until June 28, by Comrs. Sussex Co., paving Ross Corner-Sussex Rd., Sect. 1-C, Frankford Twp. R. L. Slater, clerk; advertised in this issue.

N. J., Roselle Park—Until June 29, by Mayor and Council, improving north side of Westfield Ave. involving rein.-con. paving and concrete or bluestone curbing. J. W. Higgins, boro. engr.; advertised in this issue.

Pa., Pittsburgh—Until June 21, by city, grading, regrading, paving and repaving 2nd Ave. from Liberty Ave. to Grant St., involving 14,058 cu.yd. grading, 16,500 sq.-yd. new standard sheet asphalt and 1,750 sq.yd. new vitr. brick paving, type No. 2 on 8 in. concrete foundation, 5,430 lin.ft. protected concrete curbing, type No. 1, etc. About $165,000. N. S. Sprague, city engr.

Del., Wilmington—Until July 6, by C. E. Grubb, comr New Castle, Co. State Highway Comn. paving 2.2 mi. Sect. A. Lincoln Highway, advertised in this issue.

Md., Cumberland—Until June 22, by City Council, paving, curbing and improving 6 streets. R. L. Rizer, city engr.; advertised in this issue.

W. Va., Madison—Until July 12, by Boone Co., grading 3 mi. road, involving 33,000 cu.yd. earth excav., 310 sq.yd. concrete, 902 ft. 15-24 double strength clay piping and 2200 lb. reinforcing bars. About $50,000.

N. C., Troy—Until June 22 by State Highway Comrs., at Div. Office Greensboro, top soiling and building necessary bridges and culverts on 16.6 mi. road, 16 ft. wide, Federal Aid Project 80 A. W. S. Fallis, Raleigh, state highway engr.

Ky., Danville—See "Sewers."

O., Cleveland—Until June 24, by city, paving West 85th, West 74th, West 65th, West 61st, West 41st Sts. and intersecting streets at the New York, Chicago & St. Louis R.R. grade elimination, involving 87,000 sq.ft. brick and 22,000 sq.ft. granite block, 12,000 cu.yd. grading, 111,000 sq.ft. ⅝ in. concrete base, 5,100 lin.ft. stone curbing, 35,000 sq. ft. Medina block and 14,000 lb. reinforcing bars. R. Hoffman City Hall, engr.

Indiana—By Br. Co. Comrs. building roads in following counties: June 23, Allen Co., Ft. Wayne, 15,538 ft. W. Smith No. 1 Rd., Pleasant Twp., stone. A. C. McCoy, aud.; June 25, Adams and Wells Counties, Decatur, F. Gallmeier Rd. between Preble Twp., Adams Co. and Jefferson Twp., Wells Co., macadam. J. Mosure, aud., Adams Co. and F. B. Fishbaugh, aud. Wells Co.; June 26, Tippecanoe and White Counties, Lafayette road between Wabash Twp., Tippecanoe Co., and Prairie and Round Grove Twps. White Co., gravel. J. C. Doyle, aud. Tippecanoe Co., F. E. Vinson, aud. White Co.

Mich., Allegan—Until June 22, by Bd. Rd. Comrs. Allegan Co., grading, drawing and gravel surfacing 6 mi. road between Laketown and Filmore Twps. About $77,150. L. F. Levin, co. engr. Noted May 13.

Mich., Detroit—Until June 21, by W. B. Mayo, chn. Street Ry. Comn., 410 City Hall, furnishing labor and material for building (Sect. 1) double track roadbed in Charlevoix, St. Clair and Crane Aves. from Hart to McDougal Aves., McDougal Ave. from Charlevoix to Mack Aves., Mack Ave. from McDougal to Riopelle Aves., Eliot St. from St. Antoine to John R. Sts., Cass Ave. from Davenport St. to Selden Ave., Selden Ave. from Cass to Lincoln Aves., Lincoln Ave. from Selden to Canfield Aves., across Grand River Ave. to Buchanan St., Buchanan St. from Grand River to Junction Aves.; single track roadbeds in Rowena St. from Riopelle to St. Antoine Sts., St. Antoine St. from Rowena to Eliot Sts., Riopelle St. from Mack Ave. to Eliot St., Eliot St. from Riopelle to St. Antoine Sts., John R. St. from Eliot to Rowena Sts., Rowena St. from John R. St. to Woodward Ave., across Woodward Ave. to Davenport St., Davenport St. from John R. St to Woodward Ave., Eliot St. from John R. St. to Woodward Ave., across Woodward Ave. to Stimson St., Stimson St. from Woodward to Cass Aves., Cass Ave. from Stimson to Davenport Sts., involving 62,750 cu.yd. earth excav., 75,000 sq.yd. 1:3:5 concrete base, 8½ in. thick, 59,600 lin.ft. 6 in. common drain tile, 4,400 cu.yd. 1½ in. crushed stone backfill, etc.; Sect. 2, double track roadbeds in St. Jean Ave. from Jefferson to Shoemaker Aves., Shoemaker Ave. from St. Jean to Montclair Aves.,

Streets and Roads (Continued)

Montclair Ave. from Shoemaker to Harper Aves., Van Dyke Ave. from Duncan St. to Harper Ave.; single track roadbeds in Duncan St. from Van Dyke to Crane Aves., Crane Ave. from Duncan St. to Harper Ave., involving 21,500 cu.yd. excav., 26,300 sq.yd. 1:3:5 concrete base, 8½ in. thick, 21,356 lin. ft. 6 in. common drain tile, 1,500 cu.yd. 1½ in. crushed stone backfill, etc.; Sect. 3, double track roadbed in Warren Ave. from Walton to Wyoming Aves., involving 10,830 cu.yd. excav., 13,932 sq.yd. 1:3:5 concrete base, 8½ in. thick, 9,100 lin. ft. 6 in. common drain tile, 765 cu.yd. 1½ in. crushed stone backfiell, etc. W. C. Markham, engr.

Minn., Fergus Falls—Until July 12, by W. Lincoln, aud. Ottertail Co., building 8.45 mi. Federal Aid Project 160, Job 2002, 24 ft. wide, and 9 mi. Federal Aid Project 159, Job 2001, 24 ft. wide. About $30,000 and $27,000 respectively. Former bids rejected. A. L. Flygard, Fergus Falls, engr. Noted April 15.

Minn., Minneapolis—Until June 28, by A. P. Erickson, aud., Hennepin Co., grading 3.8 mi. Superior Blvd. About $35,000. E E. Terrell, co. surv. Noted Feb. 5.

Mo., Carthage—Until June 25, by Jasper Co., building 2.76 mi. Joplin-Carthage Rd., Federal Aid Proj. 81, involving 7,833 cu.yd. earth and 1,200 cu.yd. rock excav., 29,259 sq.yd. one course concrete pavement, 1,874 cu.yd. Class "B" concrete 1,412 lb. reinforcement for concrete masonry. About $86,703.

Mo., Clayton—Clerk St. Louis Co. receiving bids grading and paving with Telford macadam, .57 mi. Susan Ave. from Telegraph Rd. to Blow Ave., cost $6,340; 1.47 mi. Reavis Rd. $26,523; .279 mi. Kennerly Rd. from Albert Reuhls Pl. to Concord school Rd., $3,717; .536 mi. Conway Rd. from Denny to Warson Roads, $6,849. W. Elbring, Clayton, engr.

Mo., Clayton—Until June 22, by clerk St. Louis Co., paving 1.392 mi. Mason Rd., 12 ft. wide, west from here, including necessary grading, involving 9,800 sq.yd. Telford macadam. About $16,958. W. Elbring, Clayton, engr.

Mo., Clayton—Until June 22, by clerk St. Louis Co., grading and paving 2.123 mi. road on Olive St. from limits of St. Louis to western limits of University City, 21 ft. wide, cost, $125,805, also grading, constructing bridges and culverts on 3.355 mi. Page Ave. from Spring Ave. to Link Rd., $52,813. W. Elbring, highway engr.; advertised in this issue.

Mo., Jefferson City—Until 22, by city, resurfacing 1,800 sq.yd. Monroe St., 3,650 sq.yd. Bway. 6,700 sq.yd. Lafayette St., 3,000 sq.yd. Bolivar St. 11,500 sq.yd. Madison St., 1,550 sq.yd. Havana St., 1,500 sq.yd. Clark St., 2,230 sq.yd. Harrison St., 2,400 sq.yd. High St., bituminous macadam, also building sewers in Dist. 25, involving 1,800 lin.-ft. 8 in. sanitary sewer, flush tank, 1,600 lin.ft. earth excav. and backfill, 500 lin.ft. rock excav., etc. L F Brown, Jefferson City, engr.

Mo., New Madrid—Until July 5, by Clerk New Madrid Co., improving 19.3 mi. Sect. A, State Rd. Project S. 18.93. C. V. Hansen, highway engr.; advertised in this issue.

Ark., Parkin—Until June 28, by Tyronza and St. Francis Road Impvt Dist., improving 15 mi. road, involving 105,000 cu. yd. grading, 73 acres clearing and grubbing, 200 cu.yd. concrete, 2,000 lb. steel, 2,000 lin.ft. 18-36 in pipe, and 1,210 lin.ft. timber bridge trestle. W. S. Newsum, Wynne, engr.

Ark., Searcy—City receiving bids improving, paving Dist. 1, involving 500 cu.yd. grading, 17,722 sq.yd. bituminous macadam, 7,774' lin.ft. curb and gutter, and 6,866 ton gravel. Blackshire & Mercer, Searcy, engrs.

Tex., Ft. Worth—Until July 1, by W. E. Yancy, aud. Tarrant Co., building 5.875 mi. Ft. Worth-Dallas Pike Rd.; advertised in this issue.

Utah, Manti—Until June 22, by Clerk San Pete Co., building 12.6 mi. road from Manti to Pidgeon Hollow Jct., 18 ft wide, involving 27,000 sq.yd. 2 in. butuminous topping on 5 in. concrete base. About $450,000. I R. Browning, state rd. engr

Utah., Wellsville—Until June 21, by city, furnishing labor and materials improving various street, involving 27,000 lin.ft. 4 in. sidewalk, 3,000 lin.ft. 5 in. sidewalk, 5,800 lin.ft. 5 in. street crossings and 2,000 lin.ft. 4 in crossings. T. H. Humpheries, Logan, engr.

Ariz., Tucson—Until July 3, by Bd. Superv. Pima Co., building Sect. B, Benson-Vail Highway, involving 59,000 cu.yd. excav. and 973 cu.yd. concrete in drainage structures, also 60 ft. rein.-con. bridge, over Mescal Wash on above project. T. Maddock, state highway engr.

Cal., Santa Barbara—Until July 6, by Bd. Supervs. Santa Barbara Co., grading, draining and paving 11,000 lin.ft. Rd. Dist. 1, Carpenteria, crushed rock and asphaltic concrete. O. H. O'Neil, co. engr. Noted June 3.

Cal., Visalia—Until July 6, by Bd. Supervs. Tulare Co., grading and concrete paving 9 mi. Springville North Rd.

Que., Montreal—Until June 23, by Administrative Comn., paving Western St. from Westmount city limits to Decarie Bld. St. Ambroise St. from Cote St. Paul to Beaudoin Sts., St. Patrick St. from Grand Trunk Ry. Bridge to Pitt St. R. Bauset, clk.

Que., Valleyfield—Until June 26, by J. Boyer, town clk., paving 6,629 ft. Victoria, St. Lawrence, Ellice and Fabrique Sts., 30 ft. wide, concrete asphalt. About $38,000. Dept. Rds., Quebec, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Massachusetts—State Highway Comn., Boston, received bids June 8, building Acton-Littleton Rd., involving 69,800 gal. bituminous material, 5,480 cu.yd. earth and 580 cu.yd. rock excav., from G. E. Greenough, South Acton, $98,874; Coleman Bros., Charlestown, $115,820.

Mass., Boston—City received bids June 10, grading, draining and building walks around Eagle Hill Reservoir, East Boston, (b) laying bituminous pavement on Fens St. (c) bituminous pavement on Jamaicaway, from D. M. Biggs, (a) $32,245; A. G. Thomasello & Co., (a) $32,970; J. C. Coleman & Sons Co., 1620 Tremont St., Roxbury, (a) $34,855, (b) $33,503, (c) $32,730; Warren Bros., 142 Berkeley St., Boston, (b) $28,784, (c) $29,291; Central Constr. Co., 228 Southhampton St., Roxbury, $29,578, (c) $28,730.

★Mass., Boston—City let contract building 7,000 ft. artificial stone side walks, 7 ft. wide, on Congreve, Hastings, Walk Hill and Ashfield Sts., West Roxbury, to J. Kelley & Co., $21,546; 3,350 ft. pavement, 44 ft wide, on Washington St., West Roxbury Dist., to W. J. Barry, $115,558; 1,512 ft. granite block pavement, 36 ft. wide, on Franklin St. and 970 ft. on Washington and Devonshire Sts., to J. D. Doherty, $19,342 and $18,418 respectively.

★Conn., Bridgeport—City let contract improving various streets to Warren Bros Co., 142 Berkeley St., Boston, surfacing $1.79 per sq.yd., bituminous binder, $11.50 per sq.yd., labor and material on cost plus 15% basis. About $300,000. Noted May 13.

N. Y., Buffalo—A. W. Kreinheder, comr. Bd. Pub. Wks., received bids June 5, repaving (a) Bailey Ave., (b) Delevan Ave., (c) Townsend St., (d) Manden St., (e) Stanley St., (1) asphalt, (2) brick, (3) sheet asphalt, from Rock Asphalt Constr. Co., Morgan Bldg., (a1) $146,808, (b1) $74,797, (c1) $41,700, (d1) $8,064, (e1) $18,005; H. P. Burgard Co., 1968 Fillmore Ave., (a1) $172,900, (b1) $90,340, (c1) $39,450, (d1) $7,890, (e1) $20,900; Peckham Constr. Co., Niagara Life Bldg., (a3) $204,000, (b3) $106 200, (c3) $59,900, (d3) $9,556, (e3) $22,926; Erie Contg. Co., Morgan Bldg., (b2) $103,790, (c2) $50,603, (d2) $8,900, (e2) $22,200.

★N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., let contracts improving Bodine St. from Vernon Ave. to Sherman St. to Welsh Bros., $11,792; Brevoort St. from Metropolitan Ave. to Cuthbert Pl., 4th Ward, H. J. Mullen, Fulton St., Jamaica, $5,493; Nott Ave., 1st Ward, from Vernon Ave. west to bulkheads, to Kennedy & Smith, $18,875; regulating and repaving with sheet asphalt 11th Ave. from Bway. to Newton Rd., regulating, grading and repaving Jackson Ave. from Junction Ave. to 51st St., to Cleveland-Trinidad Paving Co., Flushing, $34,828 and $191,494 respectively; regulating and repaving with sheet asphalt Academy St. from Wilbur to Freeman Aves., Hunter Ave. from Harris Ave. to Bridge Plaza, 13th Ave. from Bway. to Newtown Rd., to Uvalde Asphalt Paving Co., 1 Bway., New York City $37,458, $22,793 and $22,650 respectively; Nott Ave. from Vernon to Hancock Sts., to Astoria Contg. Co., 169 Hunters Ave., Astoria, $37,038. Noted May 20 and June 3.

★N. Y., S. I., St. George—C. D. Van Name, pres. Richmond Boro., let contract repaving Richmond, Vanderbilt and Herberton Aves., to J. E. Donovan, 2205 Richmond Terrace, Port Richmond, $47,120, $16,378 and $12,104 respectively. Noted June 10.

★N. Y., S. I., St. George—C. D. Van Name, pres. Richmond Boro., let contract repaving Van Pelt Ave., to J. E. Donovan, West New Brighton, $51,000. Noted June 10.

★N. J., Camden—City let contract repairing various streets, to J. M. Kelly Contg. Co., 10th and Pearl Sts., $39,849.

★N. J., Freehold—Bd. Freeholders Monmouth Co. let contract building 1¾ mi. concrete road from here to Adelphia, Sect. 3, to Thompson & Glickman, Freehold, $82,159. Noted May 20.

★N. J., Newark—Dept. Streets & Pub. Impvts., City Hall, let contract furnishing and applying 60,000 gal. non-asphaltic road oil, to Warner Quinlan Asphalt Co., 79 Wall St., New York City, $0.19 per gal. Noted May 27 under "Miscellaneous."

★Pennsylvania—State Highway Dept., Harrisburg, let contract building 18,121 ft. Sect. 6, Route 84, Crawford Co., to H. E. Bunce, 125 Fulton St., Olean, N. Y.; 29,716 ft. Sect. 1, Route 298, Adams Co., to Continental Contg. Co., Knickerbocker Bldg., Baltimore, Md.; 48,465 ft. Sect. 3, Route 82, Mercer Co., to Donald-McNeil Co., 6120 Jenkins Arcade Bldg., Pittsburgh; 3,055 ft. Application 254, Center Co., to J. C. Devine Co., Alliance, O.; 4,269 ft. Sect. 1, Route 130, Delaware Co., to Eastern Paving Co., 401 Colonial Trust Bldg., Phila.; 11,549 ft. Sect. 1, Route 182, Northumberland Co., to Fiss & Christiano, Shamokin Dam; 3,059 ft. Route 143, Montgomery Co., to C. C. Fish Co., 704 Real Estate Trust Bldg., Phila.; 28,575 ft. Route 129, Lancaster Co., to Freeland Constr. Co., Freeland; 3,007 ft. Route 352, Huntingdon Co., to Finn & Son, Inc., Mapleton Depot; 4,136 ft. Route 126, York Co., to Genl. Supply & Constr. Co., York; 5,033 ft. Sect. 2, Route 101, Potter Co., to Horn & Devling, Main St., Galeton; 1,720 ft. Route 27, Application A 457, Center Co., to F. Murphy, 2635 West Chestnut Ave., Altoona; 20,164 ft. Sect. 2, Route 165, Northampton Co., to MacArthur Bros., 120 Bway., New York City; 8,358 ft. Route 236, Application 640, Potter Co., to G. Metzger, Jr., 12 East 4th St., Emporium; 21,283 ft. Sect. 2-A, Route 2, Northumberland Co., to W. P. McDonald Constr. Co., 1010 Penn Sq. Bldg., Phila.; 10,620 ft. Sect. 1, Route 111, Greene Co., to Newman & Woy, Boswell; 39,279 ft., Sect. 1, Route 162, Schuylkill Co., to Pottsville Constr. Co., Mortimer Bldg., Pottsville; 5,023 ft. Route 142, Chester Co., to Sutton Contg. Co., 640 Head Bldg., Phila.; 31,663 ft. Sect. 1, Route 78, Butler Co., to C. E. Walters, Butler.

★Pa., Phila.—City let contracts to T. Connor, 3329 North 5th St., grading St. Vincent, Faunce, Launton, Tabor, Claridge and Montour Sts., also Fuller St. and Burholme Ave., $13,813 and $5,416 respectively; to R. B Wenner, 3106 Midvale St., Westmoreland St., $4,287; to J. R. Leewright, 426 Seville St., Rex Ave., $544; to Estate D. McMahon, Germantown and Chelton Sts., Champlost St., $1,175; to F. Mark Constr. Co., 2820 North 21st St., Chalmers St., $11,587; to United Paving Co., paving Marlyn Rd., also improving county road between Louden and Wiscer Sts., $11 104 and $52,948 respectively; to Eastern Paving Co., Colonial Trust Bldg., paving Belfield Ave., $25,614; to Mack Paving & Constr. Co., Nicetown Lane, Burleson Ave., $40,000; to J. Meehan & Son, 915 West Dauphin St., repaving 8th St., $3,665; to Snyder-Phillips Co., 273 West Mt. Pleasant St., building retaining wall on 55th St., $12,165; to W. W. Lindslay & Co., Harrison Bldg., furnishing steel troughs for water bureau, $15,000. Noted May 27.

★Pa., Phila.—City let contract improving Ridge Ave. from Lamonte St. to county line, to Barber Asphalt Paving Co., Land Title Co. About $134,000.

★Delaware—State Highway Dept., Dover, let contract building 2.93 mi. highway from Tybouts to Hares Corners, 18 ft. wide, New Castle Co., Contr. 34, to R. Hopkins, 824 2nd Ave., Troy, N. Y., $185,728; heavy filling Christiana Ave., Wilmington, to McLean Contg. Co., 1412 Fidelity Bldg., Baltimore, $84,270. Noted May 20 and June 10.

Va., Richmond—Bd. Pub. Wks. let contract paving (a) Broad St. from Boulevard to Roseneath Rd., involving (1) 2,000 cu.yd. excav., (2) 5,800 sq.yd. asphaltic concrete,

Streets and Roads (Continued)

(b) Hull St. from 22nd St. to Broad Rock Rd., (1) 7,000 cu.yd. excav., (2) 9,000 sq.yd. concrete. (c) Cowardin Ave. from Hull to Semmes Sts., (1) 200 cu.yd. excav., (2) 5,500 sq.yd. asphaltic concrete. (d) Porter St. from 7th to 10th Sts., (1) 200 cu.yd. excav., (2) 1,000 sq.yd. asphaltic concrete. (e) Hermitage Rd. from Seaboard Air Line Ry. to Sherwood Ave. (1) 9,000 cu.yd. excav., (2) 5,800 sq.yd. asphaltic concrete. (f) Williamsburg Ave. from Lester to Denny Sts., (1) 500 cu.yd. excav., (2) 7,800 sq.yd. asphaltic concrete. (g) Mechanicsville Turnpike from Venable St. to 1914 Corp. Line, (1) 6,300 cu.yd. excav., (2) 10,000 sq.yd. asphaltic concrte. (h) Morgan St. from 4th to 6th Sts., (1) 1,000 cu.yd. excav., (2) 1,300 sq.yd. concrete. (i) Meadow St. from Main to Ashland Sts., (1) 500 cu.yd. excav., (2) 7,500 sq.yd. asphaltic concrete. (j) 3rd Ave. from Willow St. to Brookland Park Blvd., (1) 1,000 cu.yd. excav., (2) 10,400 sq.yd. concrete, to F. J. McGuire (a1) $1.50, (a2) $2.87, (c1) $1.50, (c2) $2.97, (d1) $1.50, (d2) $2.87, (e2) $2.87, (f1) $1.50, (f2) $2.97) (g1) $1.50, (g2) $2.87, (i1) $1.50, (i2) $2.87; Allport Constr. Co., (b2) $2.52; K. L. Black & Co., 207 South Foushee St., (b1) $1.20, (e1) $1.30; Saville & Claiborne, Richmond Terminal and Saving Bldg., (h1) $1.15, (h2) $2.58; C. M. Henley, 23 South Beech St., (j1) $1.50, (j2) $2.18. Noted April 29.

★**W. Va., Logan**—Logan Co. let contract building Monitor Junction-Monaville Rd., to P. Minotti, Logan. $62,664

★**Ohio**—State Highway Dept., Columbus, let contracts building roads in the following counties:

Belmont Co., Sect. E, New Athens-Morristown Rd., 4.454 mi. grading, constructing bridges and culverts and paving with bituminous macadam, to R. T. Timmons & Sons, Cadiz, $158,816.

Clermont Co., Sect. I, Cincinnati-West Union Rd., 2.542 mi. grading, constructing bridges and culverts and paving with macadam, to T. D. Van Camp, Hamilton, $70,365.

Marion Co., Sect. G, Marion-Kenton Rd., 6.106 mi. grading, constructing bridges and culverts and paving with bituminous macadam, to Ludwig Stone Co., Marion, $194,914.

Medina Co., Sect. H-1, Cleveland-Hinckley Rd., 1.49 mi., grading, constructing drainage structures and paving with rein.-con., to G. S. Mellert-Weidner Co., Medina, $70,898.

Wayne Co., Sect. F and G-1, Columbus-Wooster Rd., 3 mi. grading, constructing bridges and culverts and paving with concrete, to Johnson, Van Wagoner & Johnson, Tontogany, $171,057.

Fulton Co., Sect. K-2, Archbold-Fayette Rd. .999 mi. grading, constructing drainage structures and paving with two-course macadam, to C. M. Gray, Waterville, $18,710.

★**O., Cleveland**—City let contract grading, draining, paving and curbing (a) Joan Ave. from West 105th St. to Lorain Ave., (b) East 124th St. from Woodland to Buckingham Aves., involving 31,885 sq.ft. brick block, 1,742 yd. grading, 31,885 sq.ft. 6 in. concrete base, 2,325 ft. stone curbing and tile gutter, to Cleveland Trinidad Paving Co., Superior Arcade (a) $19,476; Bentley Bros., Superior Arcade (b) $6,133.

Mich., Detroit—City received bids grading and paving with sheet asphalt on 8 in. concrete base, Berea or Amherst curbstone, (a) Burlingame Ave. from 12th St. to City Park, (b) Carter Ave. from Linwood to Dexter Aves. (c) Linden St. from Harrison St. to 1st alley west of Harrison St., (d) McArthur Pl. from McKinley to Vinewood Sts., (e) Mackie St. from Green to Solvay Sts., (f) Parkhurst Ave. from Woodward Ave. to John R. St., (g) Rowan Ave. from Beard to Green Sts., (h) Radford Ave. from Grand River to Quincy Sts., (i) St. Thomas Ave. from Center Line to Townsend Aves., (j) Townsend Ave. from Harper St. to Miller Rd., from Detroit Asphalt Paving Co., 20 McGraw Bldg., (a) $25,318; (b) $49,703; (c) $2,264, (d) $8,038, (e) $10,715, (f) $17,038, (g) $12,700, (h) $39,128, (i) $9,870 (j) $24,231; W. B. Brady Constr. Co., 1972 Grand River Ave., (a) $25,280, (b) $49,502 (c) $2,452, (d) $8,204, (e) $11,533, (f) $16,728, (g) $13,089, (h) $38,996; (i) $10,431, (j) $25,082; Cleveland Trinidad Paving Co., 2940 Woodward Ave. (a) $25,130, (b) $50,779, (c) $2,324, (d) $8,279, (e) $10,960, (f) $16,278, (g) $13,084 (h) $39,663, (i) $10,129, (j) $24,901.

Ill., Chicago—Bd. Local Impvts., 207 City Hall let contract paving alley between Center and Bissell Sts., Garfield and Sheffield Aves., involving 424 cu.yd. grading, 1,090 sq.yd. 7-in. concrete, to Central Paving Co., 179 West Washington St., $5,484; alley between West 63rd, West 64th, South Ada and South Loomis Sts., 225 cu.yd. grading, 1,450 sq.yd. 7 in. concrete, 275 ft. 10 in. tile sewer etc., also alley between East 64th and East 65th Sts., Champlain and St. Lawrence Aves., 150 cu.yd. grading, 1,020 sq.yd. 7 in. concrete, to Contg. & Material Co., 3219 South Michigan Ave., $7,745 and $5,208 respectively; alley between West 59th and West 60th Sts., Normal and Parnell Aves., 350 cu.yd. grading, 1,240 sq.yd. 7 in. concrete, 330 ft. 10 in. tile sewer, to J. Dillon & Co., 179 West Washington St., $7,907; Drexel Ave. from Drexel Sq. to 55th St., 1,650 ft. concrete curbing, 3,800 cu.yd. grading, 9,300 sq.yd. type B asphalt on 6 in. concrete, 18 catch basins, to R. F. Conway Co., 133 West Washington St., $55,033; East 55th Pl. from Indiana to South Park Aves., 2,350 ft. concrete curbing, 1,150 cu. yd. grading, 3,670 sq.yd. Standard asphalt on 6 in. concrete, North Massasoit Ave. from Lemoine St. to West North Ave., 1,250 ft. concrete curbing, 600 cu.yd. grading, 1,670 sq.yd. Standard asphalt on 6 in. concrete; Merrill Ave. from East 72nd to East 73rd Sts., 1,220 ft. concrete curbing, 800 cu.yd. grading, 1,830 sq.yd. Standard asphalt on 6 in. concrete, to Amer. Asphalt Paving Co., 133 West Washington St., $21,932, $10,469 and $11,717 respectively; Essex and Kingston Aves. from East 90th to East 92nd Sts., and East 90th and East 91st Sts. from Essex to Colfax Aves., 7,750 ft. concrete curbing, 8,000 cu.yd. filling, 12,680 sq.yd. 8 in. blast furnace slag or limestone on 2½ in. crushed limestone, 9 catch basins, to Calumet Coal & Trading Co., 9022 Commercial Ave., $70,565.

★**Missouri**—State Highway Dept., Jackson, let contract improving 3.18 mi. Kings Highway Cape Girardeau Twp. Special Rd. Dist., Cape Girardeau Co., Federal Aid Project 52, 24 ft. wide, also building Whitelaw Bridge, Sta. 137 x 50, and Cape La Cruz Bridge, over Cape La Cruz Creek, to Rouse, Hely & Keller, Cape Girardeau, $85,342, $5,956 and $6,950, respectively. Noted May 27.

★**Missouri**—State Highway Dept., Jefferson City, let contract building 9.31 mi. Springfield-Hollister Rd. 24 ft. wide, Christian Co., to Ozark Special Rd. Dist., $55,758. Noted Jan. 1.

★**Mo., Clayton**—St. Louis Co. let contract grading and paving 4,229 ft. Big Bend Rd. from Manchester Rd. to bridge over River des Peres, 21 ft. wide, involving 9,870 sq.yd. 2 course concrete, to Perkinson Bros. Constr. Co., 3237 Carter Ave., St. Louis, $49,978. Noted Apr. 22.

★**Tex., Cleburne**—Johnson Co. will grade, drain and build bridges on various highways, gravel, also concrete with bituminous macadam surface (main road is Cleburne-Ft. Worth Rd.), 26 ft. wide, 8 in. concrete base with 4 in. topping of bituminous macadam. About $2,000,000; cost plus percentage basis. Work will be done by day labor.

★**Tex., Groesbeck**—Limestone Co. let contract grading highways in Ben Hur Dist., to T. E. Ruby, Mart. About $25,000; cost plus 10% percentage basis.

★**Tex., San Angelo**—Tom Green Co. let contract grading, excavating and paving 10 mi. State Highways 9 and 9-A, 18 ft. wide, asphalt on concrete base, to Smith & Hicks, Hillsboro. About $262,000; cost plus percentage basis. Work involves 25,000 cu. yd. earth and 420 cu.yd. rock excav., 31,060 cu.yd. crushed rock, 400 cu.yd. concrete in drainage structure, and 62,233 gal. asphalt.

★**Washington**—State Highway Comn., Olympia, let contract clearing, grading and draining 3.6 mi. Olympic Highway from Montesano to Brady, Grays Harbor Co. to Beck & Einerson, Hoquiam, $50,391; clearing, grading, draining and surfacing with gravel 2 mi. State Rd. 4 from Tonasket east, to F. L. Anderson, Malott, $32,664, and grading and graveling 4.14 mi. Chelan and Okanogan Highway, Okanogan Co., to J. C. Buedett, Malott, $25,268. Noted May 20.

★**Wash., Goldendale**—Klickitat Co. let contract grading, draining, graveling, surfacing with crushed rock and eliminating all grades exceeding 8 per cent on 8½ mi. White Salmon-Snowden Highway, to W. Leidl, Greenwood, $98,162

★**Wash., Montesano**—Grays Harbor Co. let contract grading and graveling 2½ mi. North River Highway, to J. J. Coyne, Port Townsend, Wash. About $98,000.

★**Wash., Spokane**—City let contract grading, draining and building retaining wall on 17th and Lindeke Sts., to city limits, to DeCamp Bros. & Hurd, $25,160.

★**Cal., El Centro**—City let contract improving Lenroy, 5th, 6th Sts., et al, to G. R. Daley, McNeece Bldg., San Diego, about $50,000. Work involves asphalt paving at $0.35 per sq.ft., cement walks and curbs, $0.21 and $0.75 respectively.

★**Cal., Los Angeles**—Bd. Supervs. Los Angeles Co. let contract building 6½ mi. cement curbs and gutters, Graham, Rd. Dist. 151, to F. Hoffman, 111 East 12th St., Long Beach. About $75,000. This contract for completing job let to D. L. Gaskill in January, but abandoned by him when ¾ completed. Noted Jan. 15.

Cal., Santa Monica—City received bids improving 8,000 ft. San Vincente Blvd., 28 ft. wide, from J. D. Kneen Contg. Co., Dudley Bldg., Santa Monica, $112,692; Braun, Bryant & Austin, Santa Monica, $118,171; Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., $121,961. Noted May 13.

★**Cal., Visalia**—City let contract grading and paving 2½ mi. various streets, 1½ in. Topeka top on 3 and 4 in. base, cement curbs, concrete gutters, corrugated iron culverts, 6 and 8 in. storm drain, etc., to Federal Constr. Co., Call-Post Bldg., San Francisco, $224,533. Similar contract let to same company last year but cancelled because of errors in proceedings.

★**B. C., Victoria**—Dept. Pub. Wks. let contract paving 1.9 mi. Rds. 5 and 9, Lulu Island, Richmond Dist., asphaltic concrete on concrete base, to Harrison & Lamond, 501 Pacific Bldg., Vancouver. About $55,000.

Railways

PROPOSED WORK

Missouri—Kansas City and Leeds Electric Ry. Co. plans to build 3 mi. double track street railway, including necessary appurtenances, from 31st. and Hardesty Sts. Kansas City to Leeds., involving construction of viaducts over Kansas City Southern R. R., St. Louis & San Francisco R.R., Missouri Pacific R.R., and Chicago, Rock Island & Pacific R.R. and four 2,000 ft., wood, steel and rein.-con. bridges. W. Winner, Kansas City, chief engr.

Oregon—Pub. Dock Comn., Portland, having plans prepared by G. B. Hegardt, engr., foot of Stark St., laying 1 mi. standard track with regulation overhead trolley from St. Johns line of Portland Ry. Light & Power Co. to Municipal Terminal 4.

Michigan—Until June 21, by W. B. Mayo, chn. Street Ry. Comn., 410 City Hall, Detroit, furnishing fifty-five thousand 6 x 10 in. x 6 ft. 8 in. sawed, well seasoned white oak ties, free from Waynes.

Michigan—Until June 21, by W. B. Mayo, chn. Street Ry. Comn., 410 City Hall, Detroit, furnishing rail, splice bars, spikes, track bolts, tie rods, etc. for double track in Charlevoix Ave. from Allen Rd. to McDougal Ave., McDougal Ave. from Charlevoix to Mack Aves., Mack Ave. from McDougal Ave. to Riopelle St., Eliot St. from St. Antoine to John R. Sts., Cass Ave. from Davenport St. to Selden Ave., Selden Ave. from Cass to Lincoln Aves., Lincoln Ave. from Selden to Canfield Aves., Canfield Ave. from Lincoln to Grand River Aves., across Grand River Ave. to Buchanan, Buchanan St. from Grand River to Junction Aves., St. Jean Ave. from Jefferson to Shoemaker Aves., Shoemaker Ave. from St. Jean to Montclair Aves., Montclair Ave. from Shoemaker to Harper Aves., Harper Ave. from Gratiot to Crane Aves., Van Dyke Ave. from Harper Ave. to Duncan St., Warren Ave. from Walton to Wyoming Aves.; single track in Rowena St. from Riopelle to St. Antoine Sts., St. Antoine St. to Eliot St., Riopelle St. from Mack Ave. to Eliot St., Eliot St. to St. Antoine St., John R. St. from Eliot to Rowena Sts., Rowena St. from John R. St. to Woodward Ave., across Woodward Ave. to Davenport St., Davenport St. to Cass Ave., Eliot St. from John R. St. to Woodward Ave., across Woodward Ave. to Atkinson St., Stimson St. to Cass Ave., Cass Ave. to Davenport St., Harper Ave. from Crane to Van Dyke Aves., Duncan St. from Van Dyke to Crane Aves., Crane Ave. from Duncan St. to Harper Ave., involving 4,150 gross ton 91 lb. rail, 307,174 lb. ⅞ x 1¼ x 5 ft. 1⅝ in. tie rods 43,080 lb. ¾ in. sq. nuts, Railways (Continued)

577 kegs, 200 lb. each, $\frac{9}{16}$ x 5½ in. track spikes, 704 pair, 12,672 lb. rail splices, about 1 ton ¾ x 4 in. bolts, 80 special layouts. W. C. Markham, ch. engr.

British Columbia—Until July 2, by Dept. Railways and Canals, Western Blk., Ottawa, building 50 mi. line north from Prince Albert and 60 mi. line from that point east along Saskatoon River, for Canadian Natl. Ry., 34 Sparks St., Ottawa. C. B. Brown, Moncton, N. B., ch. engr.

Excavation and Dredging

PROPOSED WORK

Wis., Chilton—Drainage—A Sebenich Drainage Co., Harrison Twp., having plans prepared for system to drain 60 acres in Calumet Co. Work includes excavating and laying of tile. About $25,000. J. Donohue, North 8th St., Sheboygan, engr.

Mo., Chillicothe—Channels—Grand River D. D., Livingston and Linn Counties, having plans prepared by Morgan Eng. Co., engrs., Goodwyn Institute, Memphis, Tenn., for 30 mi. of cutoff channels from 10-100 ft. base, in Grand River, also river improvements, involving $4,000,000 cu.yd. dragline excav. J. T. Millbanks, chn.

N. S., Yarmouth—Dredging—Dept. Pub. Wks., Ottawa, soon receives bids dredging harbor here. About $49,880.

BIDS DESIRED

Miss., Belzoni—Dredging—Until July 7, by Belzoni Drainage Comrs., re-dredging 112 mi. drainage ditches, 12 ft. wide, 8 ft. deep, involving 550,000 cu.yd. floating dredgework. Engineer not selected.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., New York**—Dredging—M. Hulbert, comr. docks, Pier "A," foot of Battery Pl., let contract dredging (a) from Piers 58 to 65, North River, (b) from 28 to 52, East River, to F. E. Jones, 17 Battery Pl., (a) $49,200; (b) $44,100. Noted June 3.

★**Cal., San Joaquin**—Drainage—James Irrigation Dist. will build headgates, turnouts, siphons, checks, etc., involving 2,000 cu.yd. concrete. Work to be done by day labor under supervision of H. M. Crooker, resident engr., San Joaquin, and W. M. Hubbard, supt. of construction. Contract building laterals, involving 198,000 cu.yd. earthwork, let to C. H. Laiblin, Manteca, cost plus $0.02½ per cu.yd., not to exceed $0.32 per cu.yd.

Industrial Works

PROPOSED WORK

Mass., Brookline—B. Davies, c/o Tuck & Gilman, archts and engrs., 34 School St., Boston, having plans prepared for 1 story, 70 x 220 ft. brick and concrete garage, rein.-con. flooring, concrete foundation, on Brainerd Rd. About $80,000.

Mass, Lynn—General Electric Co., 84 State St., soon lets contract building 1 story, steel, brick and concrete addition to factory, rein.-con. flooring, concrete foundation. About $100,000. Private plans.

Conn, Suffield—Fords Wawbeek Springs, Inc., c/o W. E. Dibble, archt., 884 Worthington St., Springfield, Mass., having plans prepared for 1 and 2 story brick and concrete, mineral water plant, here. About $50,000.

N. Y., Brooklyn—H. Holden, archt. and engr., 242 Franklin Ave., making sketches for 1 story, 100 x 250 ft., brick, concrete and steel foundry, rein.-con. flooring, concrete foundation. About $250,000. Owners name withheld.

N. Y., Brooklyn—Packard Motor Car Co., Bway. and 61st St., New York City, having plans prepared by A. W. Kahn, archt. and engr., Marquette Bldg., Detroit, Mich., for 3 story, 100 x 200 x 400 ft. brick, rein.-con. and steel service station and showrooms, rein.-con. flooring, concrete foundation, on Bedford Ave. and Empire Blvd., here. About $250,000.

N. Y., Brooklyn—Shampan & Shampan, archts., 50 Court St., preparing plans for 1 story, 200 x 256 ft. brick and steel garage, rein.-con. flooring, concrete foundation, at 283 4th Ave. About $20,000. Owner's name withheld.

N. Y., Buffalo—J. Dold Packing Co., 745 William St., had plans prepared building 3 story, brick and steel tank house and fertilizer plant. About $250,000

N. Y., Buffalo—Stanford Seed Co., 93 Perry St., having plans prepared by W. S. Brickell, archt., 732 Ellicott Sq. Bldg., for 3 story, 70 x 150 ft., brick and concrete warehouse. About $100,000.

N. Y., New York—M. Hirsch, archt. and engr., 26 Court St., Brooklyn, preparing plans for 3 story, 100 x 340 ft., rein.-con., brick and steel garage and repair shop, rein.-con flooring, concrete foundation. About $250,000. Owner's name withheld.

N. Y., New York—Veronica Realty Corp. c/o C. E. Birge, archt. and engr., 29 West 34th St., having plans prepared for 3 story, 42 x 100 ft. newspaper press building, brick and steel, concrete foundation, at 337-339 West 58th St. About $100,000.

Pa., Phila.—A. J. Sauer, archt. and engr., Denckla Bldg., receives bids about June 22, building 6 story, 85 x 100 ft., concrete and brick addition to factory, on 3rd and Broad Sts., for G. H. P. Cigar Co., 21 North 2nd St.

Pa., Phila.—Genl. Electric Co., Witherspoon Bldg., plans to build brick and concrete plant, on Elmwood Ave., 68th and 70th Sts. About $10,000,000. Address A. Vogel, asst. Supt. Grounds and Buildings, General Electric Co., River Rd., Schenectady, N. Y.

Md., Baltimore—Presto-Lite Co., Inc., 30 East 42nd St., New York City, soon lets contract building acetylene plant, here, to include eight 1 story, brick and steel buildings, rein.-con. flooring, concrete foundations, averaging 25 x 50 ft. each. About $75,000. Private plans.

Md., Baltimore—Haskell & Barnes, archts., 301 North Charles St., receive bids about June 30, building 8 story, 100 x 186 ft., rein-con., brick and steel warehouse cement flooring, concrete foundation, on Guilford Ave., Saratoga and Davis Sts., for Whitaker Paper Co., 415-37 Guilford Ave. About $500,000. Noted Jan. 15.

Ga., Rome—Internat. Steel and Motors Corps., recently incorporated at $20,000,000 capital stock, plans to build plant to include blast furnace of 60 ton daily capacity, open hearth furnace with blooming mill for making hard and soft billets, with annual capacity of 200,000 tons, also bar and sheet mill.

Tenn., Memphis—Memphis Steel & Iron Wks. plans to build 1 story rolling mill in northern section of city. J. E. Conley, pres. About $300,000.

La., Southport (New Orleans P. O.)—Anderson, Clayton & Co., Mason Bldg., Houston, Tex., plans to build 600 ft. cotton warehouse, concrete, near here. About $1,000,000. Architect not selected.

O., Cincinnati—Bauer Auto Sales Co., 6th and North Sts., plans to build 6 story, 40 x 125 ft., rein.-con. addition to garage. Architect not named.

O., Cleveland—Strong-Cobb Co., East End Central Viaduct, plans to build 2 story drug factory, brick, steel and concrete, rein.-con. flooring, concrete foundation. About $150,000. T. F. Strong, secy. Architect not selected.

O., Huron—Universal Steel Co., 408 Schofield Bldg., Cleveland, plans to build a 1 story, 75 x 500 ft. tube and conduit mill brick and steel, here. About $300,000. Private plans.

O., Ironton—Sheridan Coal Co. plans to construct brick plant and office building, at Sheridan, near here. About $175,000. Private plans.

Mich., Detroit—M. Weil & Co., 87 Michigan Ave., having plans prepared by L. Kamper, archt., 749 Brook Bldg., for 4 story, 100 x 300 ft. brick and steel warehouse, wood flooring, brick foundation, on West Warren Ave. About $275,000.

Wis., Platteville—Peacock Cheese Co., South 12th and Jefferson Sts., Sheboygan, plans to build 2 story, 60 x 210 ft. warehouse and cold storage plant, rein.-con., brick and steel, rein.-con. flooring, brick foundation. Private plans.

Tex., Breckenridge—Breckenridge Oil & Refining Co. having plans prepared building oil refinery, with 1,000 bbl. daily capacity. About $300,000. V. P. Breckenridge, pres.

Cal., San Francisco—Angeles Candy Co., 1155 Mission St., having plans prepared by W. L. Schmolle, archt., 40 Montgomery St., for 3 story, brick and steel factory, on 3rd and Bryant Sts. About $100,000.

Ont., Toronto—Muskoka Quarries, Ltd., 271 Macpherson Ave., plan to build stone crushing plant with electrical motors and equipment.

BIDS DESIRED

N. Y., Comstock—Until June 29, by C. F. Rattigan, supt. state prisons, Capitol, Albany, building shop, at Great Meadow Prison, here. L. F. Pilcher, Albany, state archt.; advertised in this issue.

Md., Baltimore—Until June 21, by J. Freund, archt., 1307 St. Paul St., building 4 story, 34 x 57 ft., rein.-con. and brick factory, concrete foundation, at 10-12 North Frederick St., for Levenson & Zenitz, Inc. About $100,000.

O., Cleveland—Until June 28, by Mid-Continent Producers & Refiners Co., 1017 Euclid Ave., building 1 story, 30 x 44 ft., brick, steel and concrete warehouse and garage, rein.-con. flooring, concrete foundation, also three 20,000 gal. capacity steel tanks, on West 3rd St. and Jefferson Ave. About $100,000. A. Eddy, pres.

O., Cleveland—Until June 22, by J. H. Rooke, Williamson Bldg., constructing 3 story, 80 x 170 ft. brick, steel and rein.-con. factory, rein.-con. flooring, concrete foundation, on Train Ave. About $100,000. W. W. Hodges, Lennox Bldg., archt. and engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—L. K Alintack, c/o Tuck & Gilman, archts. and engrs., 34 School St., will build 2 story, 75 x 200 ft., rein.-con. garage, rein.-con. flooring, concrete foundation, on Fordham Rd. About $165,000. Work will be done by day labor under supervision of architects. Noted June 3.

★**Mass., Boston**—G. Marsh, c/o Tuck & Gilman, archts. and engrs., 34 School St., will build 2 story, 100 x 145 ft., brick and rein.-con. garage, rein.-con. flooring, concrete foundation, on Brighton Ave. About $125,000. Work will be done by day labor under supervision of architects. Noted May 27.

★**Mass., Boston**—Metropolitan Lithographing & Publishing Co., Dane St., let contract building 1 story, 50 x 162 ft. brick and mill construction plant, rein.-con. flooring, concrete foundation, to Hudson Constr. Co., 6 Beacon St.

★**Mass., Springfield**—C. A. Nash, 120 Oakland St., let contract building 2 story, 50 x 140 ft., rein.-con. garage, rein.-con. flooring, concrete foundation, on Oakland St., to E. J. Pinney, Inc., 264 Main St. About $70,000. Noted May 20.

★**Mass., Willimansett**—Rauch & Lang, Inc., Cleveland, O., let contract building 1 story, 80 x 300 ft. brick, concrete and steel plant, rein.-con. flooring, concrete foundation, here, to P. J. Kennedy & Co., Inc., 464 Maple St., Holyoke. About $150,000. Noted Jan. 22.

★**Conn., Bridgeport**—Berkshire Steel Products Co. will build 2 story, 54 x 140 ft. brick and steel warehouse, concrete foundation, on Railroad Ave. About $50,000. Work will be done by day labor. Noted March 25.

★**Conn., Hartford**—Hartford Fire Insurance Co., 125 Trumbull St., let contract building 1 story, 90 x 120 ft., brick and concrete boiler house, rein.-con. flooring, concrete foundation, on Asylum St., to M Eidlitz & Sons Co., 30 East 42nd St., New York City. About $150,000.

★**Conn., Meriden**—C. Collington, 81 Crown St., let contract building 1 story, 80 x 12[illegible] ft. brick and concrete garage, rein.-con. flooring, concrete foundation, on Cook Ave., to H. Wales Lines Co. [illegible]34 State St. About $60,000. Noted May 27.

★**Conn., New Haven**—Berger Bros. Co., Derby Ave., let contract building 3 story, 100 x 110 ft., brick and mill construction addition to factory, on Derby and Ellsworth Aves., to Larkin-Carey Co., 166 Brewery St. About $100,000.

★**N. Y., Albany**—J. L. Kinney, 234 Clinton Ave., let contract building 2 story, 80 x 85 ft. brick, concrete and steel bakery, rein.-con. flooring, concrete foundation, at 225-261 Dove St., to W. G. Sheehan Constr. Co., [illegible]8 DeWitt St. About $60,000. Noted April 22.

★**N. Y., Long Island City**—Atlantic Macaroni Co., Inc., 295 Vernon Ave., let contract building 93 x 400 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Vernon Ave. and 14th St., to White Constr. Co., Inc., 95 Madison Ave., New York City. About $1,000,000.

★**N. J., Newark**—Foster Eng. Co., 109 Monroe St., let contract building 100 x 163 ft., rein.-con., steel and brick factory, rein.-con. flooring, concrete foundation, on Monroe St., to F. H. Smith, Inc., 120 Bway., New York City. About $120,000.

★**Pa., Phila.**—L. H. Gilmer Co., Cottman and Keystone Sts., let contract building 3 story, 95 x 150 ft. concrete and brick warehouse and power house to W. D. Lukins, 432 West Walnut St., North Wales. About $200,000.

Industrial Works (Continued)

★**Del., Wilmington**—Automobile Supply Co., c o Greisler & Abramson, archts. and engrs., Lafayette Bldg., Phila., let contract building 3 story, 40 x 70 ft. concrete and brick garage on 12th and French Sts. to J. S. Hamilton, 329 Orange St. About $50,000. Noted March 4.

★**Va., Richmond**—Larus & Bro. Co., 7 South 21st St., let contract building 5 story, 110 x 172 ft., rein.-con. factory, on 21st and Main Sts., to J. T. Wilson & Co., Inc., Mutual Bldg. About $150,000; cost plus percentage basis. Noted June 10.

★**Ky., Newport**—O. Zimmerman & Sons, 5th and Sycamore Aves., Cincinnati, O., let contract building 2 story, 80 x 150 ft. printing plant, concrete, at 120 East 3rd Ave., to Fisher & Devore, Blymyer Bldg., Cincinnati, O. About $100,000.

★**O., Cincinnati**—King Machine Tool Co., Clifton Ave. and Baltimore & Ohio Southwest R.R., let contract building 1 story, 30,000 sq.ft. machine shop, brick and steel, rein.-con. flooring, to H. C. Hazen Contr. Co., 2070 Reading Rd. About $70,000.

★**O., Cincinnati**—Lunkenheimer Co., Beekman and Tremont Sts., let contract building 1 story, 350 x 400 ft. concrete, steel and brick foundry, concrete foundation, to Fisher-Devore Constr. Co., 36 Blymyer Bldg. About $100,000.

★**O., Cleveland**—Cleveland Electric Illuminating Co., Pub. Sq., let contract constructing two 1 story, 40 x 57 ft. electric apparatus buildings, brick, steel and concrete, rein.-con. flooring, concrete foundations, at 1966 East 55th St. and 5317 St. Clair Ave., to F. Hanselman, 408 Illuminating Bldg. About $100,000.

★**O., Cleveland**—Cleveland Ry. Leader-News Bldg., let contract building 1 story, 47 x 64 ft. electric sub-station, brick, steel and concrete, rein.-con. flooring, concrete foundation, on East 99th St. and St. Clair Ave., to W. Feaga Co., Citizens Bldg. About $100,000.

★**O., Mansfield**—The Ideal Electric & Mfg. Co., 153 East 5th St., let contract constructing 1 story, 160 x 450 ft. and 100 x 450 ft. brick and steel factory, and 2 story, 35 x 75 ft. office building, to McClintic-Marshall Co., Oliver Bldg., Pittsburgh, Pa. About $350,000.

★**O., Willoughby**—Zenith Tire & Rubber Co., 450 Leader-News Bldg., Cleveland, let contract constructing 3 story 100 x 620 ft. factory, 1 story 64 x 160 warehouse and 3 story 50 x 100 office building, rein.-con., brick and steel, rein.-con. flooring, concrete foundations, to W. Dunbar Co., 8201 Cedar Ave., Cleveland. About $750,000. Noted Nov. 13.

★**Mich., Detroit**—A. Colton Co., 782 Jefferson Ave., let contract building 3 story, 60 x 100 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, to O. Misch Co., Chamber of Commerce. About $50,000. Noted May 13.

★**Mich., Grand Rapids**—Oliver Mchy. Co., Clancy and Coldbrook Sts., will alter and build 1 story addition to foundry, brick and steel, concrete foundation. About $50,000. Work will be done by day labor.

★**Wis., Cornell**—Cornell Wood Products Co. let contract building 2 story, 88 x 300 ft. and 44 x 320 ft., rein.-con. plant, to W. E. Ule, Stevens Point. About $1,000,000.

★**Wis., Milwaukee**—A. Goethel Co., 301 4th St., let contract building 1 story, 60 x 120 ft., concrete and mill construction factory, concrete flooring and foundation, on 32nd St., to J. Mertz, 907 Central Ave.

★**Wis., Sheboygan**—Helming Bros. Co., 912 South 9th St., let contract building 2 story, 59 x 150 ft. rein.-con., brick and steel garage, rein.-con. flooring, brick foundation, on Erie Ave., to H. Loesing Co., 914 Superior St. About $100,000. Noted April 29.

★**Ia., Des Moines**—Des Moines Fdry & Machine Co., 311 Flynn Bldg., let contract building 1 story, 130 x 220 ft., brick, rein.-con. and steel foundry and machine shop, rein.-con. flooring, concrete foundation, on 16th St. and Wabash Ave., to F. D. Chase, Inc., 17 Battery Pl., New York City. About $350,000, cost plus percentage basis.

★**Mo., St. Louis**—Trinity Methodist Episcopal Church, 13th & Tyler Sts., let contract building 1 story, 13 x 100 ft., fire proof warehouse, at 1222-30 Tyler St., to A. G. Nolan, Times Bldg. About $51,000.

★**Tex., Galveston**—Galveston Wharf Co. let contract installing 6 high density cotton compresses with overhead monorail conveyance machinery for serving all piers on wharf from Piers 10 to 41, to J. H. W. Steele Co., 220 21st St. About $500,000.

★**Wash., Spokane**—Overland Co., 1229 1st Ave., let contract building 3 story, 70 x 150 ft., rein.-con. garage on Sprague and Madison Sts., to Hurley-Mason Constr. Co., Sherwood Bldg. About $101,000. Noted May 20.

★**Cal., Los Angeles**—Los Angeles Union Terminal Co., 7th and Central Sts., let contract building 7 story, 100 x 550 ft., rein.-con. addition to warehouse, concrete foundation, to Wurster Constr. Co., 241 Wholesale Terminal Bldg. About $2,000,000.

★**Que., Montreal**—Canadian Consolidated Rubber Co., Ltd., 201 Inspector St., let contract building 100 x 150 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Guy and St. James Sts., to Lockwood, Green & Co., 285 Beaver Hall. About $100,000.

★**Que., Shawinigan Falls**—Belgo Canadian Pulp & Paper Co. Ltd., let contract building transformer house, also addition to grinder room and boiler house, to W. I. Bishop, Ltd., 822 New Birks Bldg., Montreal.

★**Ont., Hanover**—Hanover Cotton and Woolen Co. let contract building 3 story, 45 x 90 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, to C. H. Theodorf, Hanover. About $50,000. Noted May 13.

Buildings

PROPOSED WORK

N. H., Manchester—School—City having plans prepared by W. M. Butterfield Co., archts., 801 Beech St., for 2 story, brick, concrete and steel. About $150,000. L. A. Thorp, chn.

Mass., Boston—Auditorium—New Boston Arena Co., c o Funk & Wilcox, archts. and engrs., 294 Washington St., having preliminary plans prepared for 1 story, 200 x 300 ft., brick, rein.-con. and steel, rein.-con. flooring, on St. Botolph St. About $750,000.

Mass., Boston—Office—Employers Liability Assurance Corp., Ltd., 33 Broad St., plans to construct large office building. Coolidge & Shattuck, 122 Ams Bldg., archts.

Mass., Boston—Office and Bank—Natl. Shawmut Bank, 40 Water St., plans to build 8 story, rein.-con., brick and steel addition, on Devonshire St. Parker, Thomas & Rice, 110 State St., archts.

Mass., Boston—School—School Dept. rejected only bid received June 8, building 2 story addition to Michael Angelo School, on Charter St., Eliot-Hancock Dist. About $200,000. Noted June 3.

Mass., Fall River—Schools—City plans to build 1 story grammar school on President St. and 1 story, 8 room, on Bowen St., brick, steel and stone. About $125,000 each. J. W. Grant, supt. pub. bldg. dept. Architect not selected.

Mass., Longmeadow—High School—Town plans to build brick and steel junior high school. About $125,000. Architect not selected.

Mass., Northampton—Theatre—Goldstein Bros. Amusement Co., Bridge St., Springfield, plans to build 1 and 2 story, brick, concrete and steel, on King St. About $150,000. Architect not selected.

Mass., Springfield—Hotel—Hotel Victoria, 166 State St., having plans prepared by H. L. Sprague, archt., 310 Main St., for remodeling and building 5 story, concrete, steel and brick addition, rein.-con. flooring, concrete foundation.

Mass. West Roxbury (Boston P. O.)—High School—Bd. Educ. Boston, rejected only bid received June 4, building 3 story addition, here. About $139,000. Project held up. Andrew, Rantoul & Jones, 50 Congress St., Boston, archts.

R. I., Newport—High School—School Com. having plans prepared by B. H. Seabury, archt., 21 Besse Pl., Springfield, Mass., for 3 story, brick, concrete and steel addition to Rogers High School, on Bway. About $500,000.

Conn., Derby—Y. M. C. A., 272 Main St., having plans prepared by F. A. Webster, archt., 51 West Main St., Waterbury, for brick, stone and concrete building. About $100,000.

Conn., Hartford—Church—St. Anne Roman Catholic Church, 376 Park St., having plans prepared by T. G. O'Connell, archt., 18 Boylston St., Boston, for 1 story, brick and stone on Putnam and Park Sts. About $100,000. J. V. Belanger, pastor.

Conn., Hartford—Church—St. Anthony Roman Catholic Church, 72 Talcott St., soon lets contract building 1 story, 70 x 130 ft., stone and brick, stone foundation, on Talcott St. A. Kelly, pastor. About $125,000. D. Guerriero, 647 Main St., archt. Noted April 29.

Conn., Hartford—School—Sts. Cyril and Methodeus Church, 69 Governor St., plans to build 3 story, on Groton St. About $200,000. Architect not selected.

Conn., Meriden—Business—Mag & Atwater, 10 Colony St., soon lets contract building 3 story, 50 x 100 ft., brick and rein.-con. and two 2 story buildings to form arcade, rein.-con. flooring, concrete foundations, on Hanover St. Steel contract in connection with above let to Berlin Constr. Co., Berlin. Total cost $100,000. D. Bloomfield, 52 Sherman Ave., archt. Noted May 20.

Conn., Middletown—Hospital—Middlesex Hospital, 28 Crescent St., plans to alter and build addition to hospital on Crescent St. About $250,000. Architect not selected.

Conn., New Haven—Clubhouse—Yale Athletic Club, Yale University, having plans prepared by Day & Klander, archts., 925 Chestnut St., Phila., for large clubhouse, on campus, to include gymnasium, swimming pool, etc.

Conn., Orange—School—Western School Dist. soon receives bids building 2 story, 65 x 90 ft., brick, concrete and steel, concrete foundation, on Seaview Ave. D. E. Smith, 207 Orange St., New Haven, archt. Noted March 4.

N. Y., Brooklyn—Exchange—N. Y. Telephone Co., 15 Dey St., New York City, having sketches made by McKenzie, Voorhies & Guelin, archts., 1123 Bway., New York City, for brick, steel and stone, on Coney Island Ave. and Ave. E. About $125,000.

N. Y., Brooklyn—Hospital—Dept. Pub. Welfare, Municipal Bldg., New York City, rejected bids received May 27, building brick and stone hospital, on New Cumberland St., here. About $600,000. Work will be readvertised. Noted June 3.

N. Y., Brooklyn—Showroom—See "Industrial Works."

N. Y., New York City—Exchange—New York Telephone Co., 15 Dey St., having sketches made by McKenzie, Voorhies & Gmelin, archts., 1123 Bway., for altering and building brick, steel and stone addition, at 146th St. and Convent Ave. About $500,000.

N. Y., New York—Theatres—A. L. Erlanger, 214 West 42nd St., having sketches made by F. R. Anderson, archt. and engr., 214 West 42nd St., for two 3 story theatres, brick, steel and stone, concrete foundations. About $850,000.

N. J., Roselle (Elizabeth P. O.)—School—Bd. Educ. having plans prepared by J. N. Pierson & Sons, archts., 175 Smith St., Perth Amboy, for 4 and 2 story, 77 x 118 ft., concrete and brick, in Roselle Park. Cost to exceed $100,000. Runyon & Carey, 845 Broad St., Newark, engrs.

Pa., New Castle—Bank—Lawrence Savings & Trust Co., 223 East Washington St., having sketches made by Mowbray & Uffinger, archts. and engrs., 56 Liberty St., New York City, for 3 story, 50 x 100 ft., brick and stone addition, brick foundation. About $150,000.

Pa., Newton Square—Home—C. W. Brazer, archt., 1133 Bway., New York City, receives bids about July 1, building 2 and 3 story, 50 x 288 ft., for Dunwoody Home for Convalescents, c o architect. About $250,000. Noted March 4.

Pa., Phila.—Office—N. W. Ayer, 308 Chestnut St., plans to build concrete and brick, on Chestnut and Orianna Sts. Cost to exceed $100,000. Architect not selected.

Pa., Pittsburgh—Y. M. C. A., Frick Annex, had plans prepared by B. Janssen, archt., Century Bldg., for 15 story, 80 x 120 ft., brick, steel and stone, rein.-con. flooring, on Wood St. between 3rd and 4th Aves. About $650,000.

Pa., Upper Merion—School—Bd. Educ., Norristown, plans to build 3 story concrete and brick, here. About $100,000. Architect not selected.

W. Va., Fairmont—Theatre—West Virginia Amusement Co. had plans prepared by Dreher, Churchman, Paul & Ford, archts., Fairmont, for 2 story. About $200,000.

Ga., Atlanta—Hotel—Georgian Terrace Hotel, Peachtree St. and Ponce de Leon Ave., having plans prepared by W. L. Stoddart, archt., 9 East 40th St., New York City, for 9 story, 100 x 200 ft. steel, granite and brick addition. About $1,000,000. J. N. Couch, mgr.

Buildings (Continued)

Ga., LaGrange — Church — First Baptist Church had plans prepared by S. Hamilton. archt., Flatiron Bldg., Atlanta, for brick and lumber, 1,000 seating capacity, here. About $150,000.

Tenn., Memphis — University — Presbyterian Churches of South raising $1,500,000 funds to construct University. Address B. A. Bogy, Chamber Commerce Bldg.

Tenn., Nashville—Hospital—Protestant Hospital plans to build brick addition on Bway. About $300,000. Architect not selected.

O., Canton—Business—McLaughlan-English, Inc., plans to build 8 story, 66 x 200 ft., concrete, steel and brick, on Tuscarawas and Cleveland Aves. About $700,000. C. B. Firestone, Renkert Bldg., archt.

O., Cincinnati — Club — University Club, 4th St. and Bway., having sketches made by Zettel & Rapp, archts., Mercantile Library Bldg., for altering 4 story, rein.-con., steel and brick. About $150,000.

O., Cleveland—Commercial—G. Paul, 524 Citizens Bldg., plans to build brick, steel and concrete, rein.-con. flooring, concrete foundation, on Euclid Ave. near East 40th St. About $200,000. Architect not selected.

O., Cleveland—School—Bd. Educ. plans to build 1 story school for crippled children, brick, steel and concrete, rein.-con. flooring, concrete foundation. About $350,000. W. R. McCornack, East 6th St. and Rockwell Ave., archt.

O., Cleveland—School—Bd. Educ. plans to build 3 story, brick, steel and concrete, rein.-con. flooring, concrete foundation, on Diana and Darley Aves. About $600,000. W. R. McCornack, East 6th St. and Rockwell Ave., archt.

O., Cleveland—School—Bd. Educ., East 6th St. and Rockwell Ave., plans to build addition to Rickoff School, Kinsman Rd., and 1 story, 30 room, on Spring Rd., brick, concrete and steel, rein.-con. flooring, concrete foundations. About $350,000 and $1,000,000 respectively. W. R. McCornack, East 6th St. and Rockwell Ave., archt. Election Nov. 2 to vote on bonds for project.

O., Cleveland Heights (Warrensville P. O.)—Bank—Heights Savings & Loan Co., 520 Erie Bldg., Cleveland, plans to build 2 story, brick, steel and concrete, rein.-con flooring, concrete foundation, here. About $100,000. Architect not selected.

O., Kent—High School—Bd. Educ. having sketches made by Mills & Millspaugh, archts., Marshall Bldg., Cleveland, for 3 story brick, steel and concrete, rein.-con. flooring, concrete foundation. About $450,000.

O., Springfield—Nurses Home—Municipal Hospital having plans prepared by R. C. Gotwald, 54 Gotwald Bldg., Springfield, and S. Hannaford, Hulbert Blk., Cincinnati, archts., for 4 story, 50 x 170 ft., with 45 ft. wing in rear, brick and concrete, concrete foundation, on York St. About $250,000.

Mich., Detroit—Commercial—M. Manterias, care of A. H. Gould & Son, engrs. and archts., Empire Bldg., having plans prepared for 4 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Woodward Ave. About $200,000.

Mich., Detroit—Hotel—Ft. Shelby Hotel Co., Lafayette Blvd. and 1st St., plans to build 6 story, 600 room, rein.-con., brick and steel addition, rein.-con. flooring, concrete foundation. Architect not selected.

Mich., Detroit — Office — S. E. Remey, archt., Whitney Office Bldg., preparing plans for 6 story, 80 x 200 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Woodward Ave. About $150,000. Owner's name withheld.

Mich., Port Huron—Hospital—Bd. Hospital Trustees retained G. L. Harvey, archt., Huron Ave., to prepare plans for 3 story, 50 x 80 ft. addition, concrete, brick and steel, brick foundation., on Willow and Richardson Sts. About $150,000. C. C. Clancy, pres.

Ill., Chicago—Theatre—Cohan & Harris, 226 West 42nd St., New York City, have renewed lease on Grand Opera House at 119-121 North Clark St., and plan to build new theatre. About $300,000. A. N. Rebori, 410 South Michigan Ave., archt.

Ill., Chicago—Theatre—Jones, Linick & Schaefer, 336 South State St., have securerd lease on ground occupied by McVickers Theatre, at 19 West Madison St., and plan to build new theatre. Cost between $500,000 and $1,000,000. Architect not selected.

Wis., Appleton—Hospital—St. Elizabeth's Hospital receives bids in fall building hospital. About $500,000.

Wis., Manitowoc — High School — Bd. Educ. having plans prepared by Perkins, Fellows & Hamilton, archts., 814 Tower Court, Chicago, for 3 story, 250 x 500 ft. central high school, brick, rein.-con. and steel, brick foundation. About $1,400,000. Academics building will be first to be constructed, $678,000. A. H. Zande, clk. Noted March 8.

Wis., Washburn—High School—Bd. Educ. having plans prepared by J. D. Chubb, archt., 109 North Dearborn St., Chicago, for 2 story, 98 x 165 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $200,000.

Wis., West Bend—Clubhouse and Store—Knights of Columbus plans to build 3 story, 100 x 130 ft., rein.-con., brick and steel, brick foundation, on Main St. Architect not selected.

Ia., Des Moines — Lodge — Moose Lodge, 6th and Locusts Sts., having preliminary plans prepared for 4 story, 66 x 150 ft., rein.-con. and brick, on 5th St. between Chestnut and Grand Ave. About $165,000. Architect not selected.

Ia., Lytton—School—Bd. Educ. plans to build 2 story school. About $110,000. Architect not selected.

Ia., Mapleton—School—Roman Catholic Congregation having plans prepared by W. S. Steele, archt., United Bank Bldg., Sioux City, for 2 story, rein.-con., brick and steel, concrete foundation. About $100,000.

Ia., Yetter—School—Bd. Educ. plans to build 2 story school. About $110,000. Architect and engineer not selected.

Kan., Oakley—School—Bd. Educ. soon receives bids building 2 story, 56 x 85 ft. rein.-con., brick and steel, concrete foundation. About $100,000. C. W. Shaver, Salina, archt.

N. D., Mandan — Hospital — Methodist Deaconess Hospital having plans prepared by L. Bassindale, archt., 321 Capital Bank Bldg., St. Paul, for 3 story, 40 x 125 ft., brick and rein.-con. About $125,000.

Tex., Dallas—Store—F. L. Clark, 3711 Beverly Ave., having plans prepared building 3 story, concrete and brick, concrete and brick foundation, on Wood St. About $100,000.

Ark., Hot Springs—Hotel and Club—Hot Springs Natl. Park Elks Club plans to build 10 story fireproof. About $500,000.

Okla., Holdenville — Church — Methodist Episcopal Church having plans prepared by Hawk & Parr, archts., 101 Magnolia Bldg., Oklahoma, for 2 story, rein.-con,, brick and steel, concrete foundation. About $110.000

Okla., Moore—School—Bd. Educ. having plans prepared by Bailey & Alden, archts., 1207 Colcord Bldg., Oklahoma, for 3 story, rein.-con., brick and steel, concrete foundation. About $110,000.

Ore., Corvallis — Hotel — E. Bergholtz, archt., Spalding Bldg., Portland, receives bids about Sept. 1, building 4 story, 75 x 100 ft., rein.-con., rein.-con. flooring, here. About $330,000. Owner's name withheld.

Ore., McMinnville—College—A. E. Doyle, arch., Worcester Bldg., Portland, preparing preliminary plans for 3 story, administration building, 2 story, 66 x 175 ft. gymnasium and 3 story, dormitory for women. About $400,000. Owners' name withheld.

Ore., Portland—Temple—Houghtaling & Dougan, archts., 329 Stark St., receive bids about Oct. 1, furnishing labor and material building 5 story, 100 x 150 ft., brick, steel and stone, on 11th and Alder Sts., for Elks Lodge. About $700,000.

Cal., Los Angeles—Theatres—Gore Bros. retained A. B. Rosenthal, archt., Douglas Bldg., to prepare plans for fireproof construction theatre, office and store, on Hollywood Blvd., also 10 story, 140 x 350 ft., at 550 South Main St. About $500,000 and $2,000,000 respectively.

Cal., Pasadena — Hospital — Pasadena Hospital Assn. retained M. Hunt, archt., 1107 Hibernian Bldg., Los Angeles, to prepare plans for rein.-con. hospital, on Fremont and Congress Sts. About $350,000. Noted Aug. 28.

Cal., Richmond—Schools—Bd. Educ. retained J. T. Narbett, archt., 904 Macdonald Ave., to prepare plans for school on 8th and Bissell Sts., cost $200,000; Stege School, $45,000; Fairmont School, $20,000; Nystrom School, $20,000; school in East Richmond, $15,000; Grant School, $15,000. Cost includes equipment to be installed in buildings. Bonds for $565,000 voted for project, balance to be used to purchase sites and playgrounds. Noted March 18

Cal., Stockton—Hall, Exhibit, etc.—Bd. Supervs. San Joaquin Co. retained Wright & Satterlee, archts., to prepare plans for buildings and improvements to Agricultural Park, to include 100 x 200 ft. machinery hall, 200 x 300 ft. auto exhibit building, stock and poultry exhibit buildings, inn, restaurant, dance pavilion, concession zone, electric light and power plant, alterations to present buildings, extensions to water, lighting, sewerage and fire alarm systems, street car loop, etc. About $1,000,000. Alternations and first units to be started this summer.

Que., Granby — Municipal — Dept. Pub. Wks., Ottawa, plans to construct municipal building, here. About $180,000.

Que., Montreal—School—Catholic School Bd., St. Catherine St., E., soon receives bids building school on Sanguinet St., also one on Baldwin St.

Que., St. Lambert—Fire Station and Hall—Town plans to expend $100,000 for fire station and public hall.

Ont., Belleville—School—Bd. Educ. having plans prepared by B. Jarvis, archt., 8 Campbell St., building 2 story, 12 room, concrete, brick and steel, rein.-con. flooring, concrete foundation, in Coleman Ward. About $200,000.

Ont., Tarentorous — School — Pub. School Bd., Tarentorous Twp., Saulte Ste. Marie, having plans prepared by T. R. Wilks, archt., 612 Queen St., Saulte St. Marie, for 2 story, 8 room, concrete, brick and steel, rock foundation, here. About $100,000.

Ont., Toronto — Church — Westminster Church, Bloor St., having plans prepared by Sproatt & Rolph, archts., 36 North St., for 1 story, brick, concrete flooring and foundation, on Asquith Ave. and Park Rd. About $250,000.

Where to Get a Contract

Contracts were awarded to 182 Contractors

last week on the following work: a $20,000 water-works job, 13 sewer projects aggregating $806,000, 5 bridges for $261,000, on 70 streets and roads for $5,350,000, on 2 railway projects for $2,000,000, on 9 excavating contracts for $592,000, on 34 industrial works for $14,793,000, on 36 non-residential buildings for $7,000,000, on 7 Government jobs for $392,000, and on 5 miscellaneous for $196,000, *making a total of **$31,410,000.***

When these jobs were only in the proposed stage they were noted in these pages so that contractors would have time to submit estimates.

Every week these pages tell where there is work to be had. This very week bids are being requested on 222 projects of which 36 are for buildings, 7 for industrial works, 17 for bridges, 19 for sewers, 55 for streets and roads, 10 for water works, 3 for dredging, 59 for Government work and 14 miscellaneous.

Every important project is noted in this section before it becomes a "contract let."

There is a good story in these pages; don't overlook a single instalment.

Buildings (Continued)

Ont., Toronto—Studio—E. L. Ruddy Co., 11 Wellington St., E., plans to build 3 or 4 story, 95 x 101 ft., brick and steel, concrete foundation, at 317-319 Sorolina Ave. Architect not selected.

Ont., Windsor — Sanitarium — Essex Co. Tuberculosis Sanitarium plans to construct 2 story, concrete and brick, rein.-con. flooring, concrete foundation, to replace buildings destroyed by fire. About $100,000. H R. Casgram, pres.

B. C., Victoria—Depot—Canadian Pacific Ry., Windsor St., Montreal, Que., soon receives bids building 3 story, 40 x 150 ft., brick and timber, concrete foundation on Fitzwilliam and Franklin Sts., for Esquimalt & Nanaimo Ry., 1130 Store St. About $100,000. Private plans.

BIDS DESIRED

Me., Presque Isle—School—Until June 22, by Trustees Bd. State Normal School, at office of State Supt., Augusta, building brick, at Aroostook State Normal School here. W. E. Mansur, Bangor, archt.

Mass., Dedham—School—Until June 25, by town, building 2 story, 56 x 72 ft., in Riverdale. Kilham & Hopkins, 9 Park St., Boston, archts. I. Coffin Co., 52 Sudbury St., Boston, engrs.

Conn., Wallingford—Armory—Until June 28, by State Armory Comm., Hartford, building 3 story, 38 x 75 ft. armory, and 1 story, 75 x 150 ft. drill shed, brick, concrete and steel, rein.-con. flooring, concrete foundation, on North Main St., here. About $100,000. W. P. Crabtree, 272 Main St., New Britain, archt. Noted Jan. 22.

N. Y., Buffalo—Schools—Until June 25, by Bd. Educ., at office of J. Storer, secy., New York Telephone Bldg., constructing Primary School 21, 1 story, 68 x 135 ft., brick and steel, on Amherst St. and Park Lake Ave., cost $50,000; P. S. 9, 3 story, 115 x 247 ft., brick, concrete and steel, on Polar Ave. and Doat St., $300,000; also addition to Elementary School 21, 2 story with two 40 x 140 ft. wings, on Herter Ave. and Camden St., $250,000.

N. Y., Cheektowaga (Forks P. O.)—School—Until June 30, by P. J. Inda, clk. Hallstead School, Sloan, furnishing labor and material building 2 story, 63 x 103 ft., brick and concrete, on Harlem Ave. near Parker St., here. About $100,000. W. S. Brickell, 732 Elliott Sq. Bldg., Buffalo, archt.

N. J., Salem—Community—R. E. Perst, archt., Middle City Bldg., Phila., receiving bids building 2½ story, 50 x 60 ft., concrete and stucco, for city. About $100,000.

N. J., Trenton—Hospital—Until June 28, by Dept. Architecture, 142 West State St., building walls and fireproofing stairs at State Hospital. F. B. Bent, state archt.; advertised in this issue.

Pa., McKeesport — Bank — First Natl. Bank receiving bids building 2 story, 60 x 77 ft., brick, steel and concrete, rein.-con. flooring, on 5th Ave. and Walnut St. About $100,000. Weary & Alford Co. 1732 South Michigan Ave., Chicago, archts. About $100,000.

Tenn., Viola—School—Until June 21, by Bldg. Com., Bd. Educ., constructing high school. M. Brown, chn. C. K. Colley, 4th St. and 1st Blvd., Nashville, archt.

O., Gallipolis—Cottage—Until July 7, by Bd. Administration, Oak St., Columbus, building 1 story, 78 x 117 ft., brick and concrete, at Ohio Hospital for Epileptics, here. About $100,000.

Wis., Milwaukee — Hospital — Until June 24, by E. Brielmaier & Sons Co., archts. and engrs., University Bldg., constructing 5 story, 46 x 120 ft. and 18 x 50 ft., rein.-con. and brick addition, rein.-con. flooring, concrete foundation, on 12th St., for Mt. Sinai Hospital, 246 12th St. About $300,000.

Ia., Cambria—School—Until July 5, by Bd. Educ. building 2 story, 57 x 80 ft. rein.-con., brick and steel, concrete foundation. About $110,000. W. E. Hulse & Co. Des Moines, archts. Noted May 13.

Ia., Sioux City—School—Until Aug. 16, by Bd. Educ. building north side Junior High School, 3 story, 140 x 230 ft. rein.-con., brick and steel, concrete foundation. About $400,000. Beuttler & Arnold, 235 Grain Exch. Bldg., archts. Noted Apr. 15.

Kan., Salina—Temple—Until Aug. 2, by Masonic Lodge, building 5 story rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $700,000. W. T. Schmitt, 1634 West 10th St., Oklahoma, Okla., archt. Noted Jan. 15.

Kan., Woodston—School—Until June 22, by Bd. Educ., building 2 story, 72 x 104 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $110,000. F. C. Squires, 628 Kansas Ave., Topeka, archt.

Neb., Lincoln—School—Until June 24 by Bd. Educ. building Prescott School, 2 story, rein.-con., brick and steel, rein.-con. flooring, rein.-con. foundation. About $600,000. Fiske & Meginnis, 533 Bankers Life Bldg., archts. Noted April 15.

Cal., Fullerton—Domestic Science and Art—Until July 16, by Bd. Trustees of Fullerton Union High School, constructing domestic science and art building, general work (Contr. 1), heating and ventilation (Contr. 2), plumbing (Contr. 3). O. A. Kreighbaum, clk.; advertised in this issue. Noted Feb. 12.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Cambridge— Church — Notre Dame de Petrie, c/o C. R. Greco, archt., 8 Beacon St., Boston, let contract building 1 story, 75 x 190 ft., brick, steel and stone, rock foundation, on Harvey St., to J. B. Burn, Inc., 162 Sidney St. About $150,000. Noted May 6.

★Mass., Gardner — Hospital — E. F. Stevens, archt., 9 Park St., Boston, let contract to R. D. Donaldson Co., Lincoln, building 3 story, 40 x 110 ft., brick and rein.-con., on Woodland St., for Henry Heywood Memorial Hospital. About $100,000. Noted April 22.

★Mass., South Hanson—Hospital—Comr. Plymouth Co., Plymouth, let contract building 2 story, 80 x 105 ft., frame and stucco, rock foundation, here, to W. Hanson, 567 Pleasant St., Brockton. About $100,000. Noted June 3.

Mass., West Roxbury (Boston P. O.)—School—Bd. Educ., Boston, received only bid building 3 story brick and steel addition to Mary Lyons High School, rein.-con. flooring, concrete foundation, on Elm St., here, from Langan & Shaw Constr. Co., 80 Boylston St., Boston, $226,285. Noted May 27.

★Mass., Winthrop — School — Town let contract building 2 story, 67 x 121 ft., concrete, steel, limestone and brick, rein.-con. flooring, concrete foundation, on Almont St., to Coleman Bros. & Co., 1 Marginal St., Chelsea, Mass. About $165,000. Noted June 10.

★R. I., Kingston—College—Rhode Island State College will build 3 story, 54 x 120 ft., brick, concrete and granite, rein.-con. flooring, concrete foundation. About $150,000. Work will be done by day labor.

N. Y., Brooklyn—School—C. B. J. Snyder, supt. school bldgs., Municipal Bldg., New York City, received bids June 8, building P. S. 185, easterly side of Ridge Blvd. from 86th to 87th Sts., here, from J. MacArthur, 22 Ormond Pl., $653,474; T. A. Clark, 122 Livingston St., $657,000; G. F. Driscoll Co., 548 Union St., $698,000. Noted June 3.

★N. Y., Brooklyn — School — Holy Name Catholic Church, 245 Prospect Park West, let contract building 2 story, 70 x 245 ft., brick, steel and stone, brick foundation, on Howard Pl., to H. Veit, 258 Devoe St. About $160,000.

★N. Y., Brooklyn — Theatre — Sheffield Theatrical Co., 645 Georgia Ave., will build 1 story, 85 x 200 ft., brick and stone, on Cleveland St. About $150,000. Work will be done by day labor.

N. Y., Buffalo—Office—M. H. Birge & Sons, 390 Niagara St., let contract building 2 story, brick and concrete, to B. I. Crooker Co., Builders Exch. About $100,000. Noted May 13.

★Pa., Bethlehem—Bank—Bethlehem Natl. Bank let contract building 1 story, 40 x 140 ft., brick and stone, brick foundation, to R. Pfeifle, North Bethlehem. About $100,000. Noted Feb. 12.

Md., Baltimore—Bank and office—K. Hubert, 200 East Lexington St., received lowest bid building 4 story, 32 x 125 ft., concrete, brick and steel, concrete foundation at 216 East Lexington St., from Nusz Constr. Co., 527 West Mulberry St. J. E. Moxley, 1729 Ellamont Ave., archt.

★Md., Baltimore — School — City Council let contract building 3 story, 63 x 121 ft., brick and stone, to Standard Constr. Co., 1713 Sansom St., Phila. About $400,000.

★Md., Frederick—High School—School Comrs. Frederick Co. let contract building 2 story, concrete and brick addition, concrete flooring and foundation, to L. C. Culler, Knights of Pythias Bldg.

★Fla., Tampa—Store—Maas Bros., Franklin and Zack Sts., let contract building 8 story, 105 x 112 ft. concrete and brick, to G. A. Miller, 28 Petteway Bldg. About $500,000.

★Ky., Ashland—Store—Field Furniture Co. let contract building 6 story, 30 x 145 ft. on Main St., to C. S. Cox., Ashland. About 130,000.

O., Alliance—High School—City received bids June 8 building 2 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, here, from Moore Lamb Constr. Co., 203 Stambaugh St., Youngstown, $569,000; Drummond-Miller Co., Guard Bldg., Franklin Ave., Cleveland, $595,400.

★O., Canton—School—Bd. Educ. let contract building two 2 story wings to school on Alliance St., to G. Kratt & Sons, Warren, $130,595.

★O., Cleveland—Club—Union Club, East 12th St. and Euclid Ave., let contract remodeling, hollow-tile, brick and marble, to Van Blarcom Constr. Co., East 22nd St. and Prospect Ave. About $100,000.

★O., Kent—Office and Welfare—Mason Tire & Rubber Co. let contracts constructing 2 story, 65 x 110 ft., office and 3 story, 50 x 110 ft. welfare building, rein.-con., brick and steel, rein.-con. flooring, concrete foundations, here, to Van Blarcom Constr. Co., East 22nd St. and Prospect Ave., Cleveland. About $100,000 each.

★O., Middletown—Office—Colin Gardner Paper Co. let contract building 2 story, 78 x 125 ft., concrete, brick, stone and tile, rein.-con. flooring, to J. R. Stevens Co., 106 Odd Fellows Temple, Cincinnati. About $160,000.

★Wis., Cedar Grove—Bank and Office—Bank of Cedar Grove let general contract building 3 story, 41 x 150 ft., brick and tile, brick foundation, on Main St., to Verhulst Bros., 1615 Erie Ave., Sheboygan, who sublet work to A. Groth, Joliet, Ill., and Robertson & Jackson, 221 Grand St., Milwaukee.

★Wis., Cedar Grove—Church—Presbyterian Church let general contract building 2 story, 84 x 105 ft., brick, rein.-con. and steel, brick foundation, on Main St., to Verhulst Bros., 1615 Erie Ave., Sheboygan. Cost between $75,000 and $100,000. Contractor sublet iron work, to C. Hennecke Co., 1353 North Pierce St., Milwaukee; furnishing reinforcing bars, to Worden-Allen Co., Pt. Washington Rd., Milwaukee. Noted May 6.

Wis., Oshkosh — School — Bd. Educ. received bids June 2, building 3 story addition to Punhoqua School, concrete and brick, rein.-con. flooring, concrete foundation, from C. R. Meyer & Sons Co., State St., $176,998; Fluor Bros. Constr. Co., State St., $183,886; A. Pitz, Oshkosh, $204,997.

★Wis., Stevens Point—Bank—First Natl. Bank let contract building 1 story, 54 x 82 ft., brick and concrete, rein.-con. flooring, concrete foundation, to C. R. Meyer & Sons Co., State St. About $100,000. Noted Feb. 19.

★Mo., St. Louis—Mercantile—O. R. Francis, 214 North 4th St., let contract building 10 story, 100 x 132 ft., rein.-con. and brick, at 1529-35 Washington Ave., to P. J. Bradshaw, 512 International Life Bldg. About $500,000.

★Cal., Anaheim—High School—Anaheim Union High School Dist. let contract building addition to high school, to include 80 x 140 ft. hollow tile and steel auditorium, 50 x 70 ft. hollow tile and frame cafeteria and 50 x 75 ft. hollow tile and frame gymnasium, all 1 story, concrete foundations, to A. L. Gribbing, Anaheim, $147,951. Noted June 10.

★Cal., Fresno—Office—Fidelity Trust & Savings Bank let contract building 12 story, 80 x 100 ft., on J and Mariposa Sts., to Trewhitt & Shields, Rowell Bldg. About $1,000,000.

★Cal., Los Angeles—School—Bd. Educ., 731 Security Bldg., let contract building 1 and 2 story, 132 x 220 ft., brick, concrete foundation, on East 7th St., to K. R. Bradley Co., 1925 East 16th St., $130,686. Noted June 3.

Cal., Red Bluff—Court House—Bd. Supervs., Tehama Co., received only bid June 1, building 2 story, concrete and hollow tile, from Mathews Constr. Co., Forum Bldg., Sacramento, $204,664. Noted May 29.

Federal Government Work

PROPOSED WORK

N. J., Lakehurst—Electric Traveling Platforms and Hoists—Spec. 4233—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build electric traveling platforms and hoists for dirigible hangers, here. About $75,000.

Pa., Phila.—Resurfacing Macadam—Spec. 4230—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans here. About $3,500.

D. C., Wash.—Dispensary—Spec. 4226—Bureau Yards & Docks, Navy Dept., plans to build, here. About $75,000.

Federal Government Work (Continued)

S. C., Charleston—Dolphin Pier—Spec 4228—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build Dolphin Pier, 318L, here. About $6,000.

Cal., San Diego—Installation of Telephone System—Spec. 4232—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans, here. About $15,700.

T. H., Pearl Harbor—Temporary Store House—Spec. 4229—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $30,000.

BIDS DESIRED

N. Y., Long Beach—Station Building and Accessories—Until June 28, by Treas. Dept., Wash., D. C., constructing at Coast Guard Sta. 90, here; advertised in this issue.

Pa., Phila.—Mattress Factory—Spec. 4163—Until June 23, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building, here; $10 deposit required for plans and spec. About $100,000. Noted May 20.

Pa., Phila.—Repairing Roof Coverings—Spec. 4231—Until June 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., repairing roof coverings of storehouses, here.

Pa., Phila.—Steam Distribution System—Spec. 4220—Until June 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing, here. About $20,000. Noted June 10.

Del., Wilmington—Dredging—Until July 15, by U. S. Engr. Office, dredging waterway between Rehoboth and Delaware Bays, Lewes Canal; advertised in this issue.

D. C., Tacoma Park (Wash. P. O.)—Laundry Machinery—Until June 26, at office of Utilities Officer, Ward 1, Walter Reed U. S. Army Genl. Hospital, for furnishing labor and material for installing, here; advertised in this issue.

Va., Norfolk—Concrete Roads and Walks—Spec. 4203—Until June 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C. building concrete roads and walks, here. $10 deposit required for plans and spec. About $26,000. Noted June 3.

Va., Quantico—Roads and Altering Buildings—Spec. 4202—Until June 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., constructing concrete roads and appurtenant and altering buildings, here. About $100,000; $20 deposit required for plans and spec. Noted June 3.

W. Va. South Charleston—Gyro Room, Torpedo Racks and Crane—Spec. 1159—Until June 21, by Bureau of Yards & Docks, Navy Dept., Wash., D. C., building, here; $10 deposit required for plans and spec. About $13,000.

S. C., Paris Island—Overhang & Gratings—Spec. 4208—Until June 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., for overhand on Bldg. 11 and gratings for 12 buildings, at Marine Barracks, here. About $18,000; $10 deposit required for plans and spec. Noted June 10.

S. C., Paris Island—Remodeling Quarters and Fireproofing Buildings—Spec. 4212—Until June 21, by Bureau Yards & Docks Navy Dept., Wash., D. C., remodeling and fireproofing, here. About $20,000; $10 deposit required for plans and spec Noted May 27.

Fla., Pensacola—Gyro Room and Torpedo Racks—Spec. 4170—Until June 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building, here. About $13,000; $10 deposit required for plans and spec. Noted May 27.

Tenn., Memphis—Galvanized Wire, Wire Strand Staples and Wire Rope Clips—Until July 15, by Mississippi River Comn., 1st and 2nd Dists., Custom House, furnishing and delivering 790,000 lb. galvanized wire, wire strand and staples, and 30,000 wire rope clips; advertised in this issue.

Tenn., Memphis—Manila Rope—Until July 1, by Mississippi River Comn., 1st and 2nd Dists., Custom House, furnishing and delivering, 70,000 lbs.; advertised in this issue.

Tenn., Memphis—Rubber Hose—Until July 8, by Mississippi River Comn., 1st and 2nd Dists., Custom House, furnishing and delivering; advertised in this issue.

Tex., Ft. Sam Houston—Warehouses—Until June 26, at office of Constructing Quartermaster, Mexican Border Jroject, P. O. 83, Camp Travis, building 45 warehouses, here; $25 deposit required for plans and spec.; advertised in this issue.

Tex., Ft. Worth—Gate Boxes—Until June 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building 11 rein.-con. gate boxes, each about 5 ft. wide, 5 ft. long and 7 ft. deep, having sheet steel covers, along line natural gas pipe line between here and Petrolia; $10 deposit required for plans and spec. Noted June 10.

Tex., Galveston—Seagoing Hopper Dredge Sabine—Until July 14, by U. S. Engr Office, purchasing; advertised in this issue

Wash., Puget Sound—Auxiliary Equipment and Piping—Spec. 4179—Until June 23, by Bureau Yards & Docks, Navy Dept., Wash., D. C., furnishing and installing, for air compressor, here. About $60,000; $10 deposit required for plans and spec. Noted May 27.

Cal., Mare Island—Fence and Gates—Spec. 4197—Until June 21, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building at Naval Hospital, here. About $16,000; $10 deposit required for plans and spec. Noted May 27.

Cal., Mare Island—Plate Racks—Spec. 4220—Until June 21, by Pub. Wks. Office, furnishing steel racks for steel storage.

Cal., San Diego—Cold Storage Insulation—Spec. 4199—Until June 30, by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing, here; $10 deposit required for plans and spec. About $25,000. Noted May 20.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. H., Portsmouth—Monitor Roof Spec 4162—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building at engine room, here, to W. F. Martin, 53 Franklin St., Rochester, N. Y., $5,645 (90 days). Noted June 10.

Mass., Boston—Hospital Changes—Treas Dept., Wash., D. C., received bids making changes to hospital, here, from M. Serette, 3 Tremont Row, $54,956; Howard Bros., 112 Dorchester Ave., South Boston, $57,233; A. McDonald, 3 Winchester St., $64,344.

Pa., Phila.—Fence and Gates—Spec. 4187—Bureau Yards & Docks, Navy Dept., Wash., D. C., received only bid June 9, building at Navy Yard Hospital, here, (1) work complete, from Cyclone Fence Co., 403 Stock Exch. Bldg., (1) $4,060 (75 days), (2) $5,052 (75 days), (3) $1.54, (4) $1.94 Noted May 27.

★D. C., Wash.—Crane Runway—Spec. 1174—Bureau Yards & Docks, Navy Dept., let contract building crane runway over Slip 5, to Donnell-Zane Co., Inc., 350 Bway., New York City, $4,280. Noted May 20.

Va., Norfolk—Storm Water Drainage System—Spec. 4131—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids building at Navy Yard, here, (1) work complete, from O. Daschiell, 507 South St., Portsmouth, (1) $37,945, (130 days), (2) $200, (3) $150, (4) $5, (5) $27; H. E. Crook Co., 28 Light St., Baltimore, Md., (1) $18,750 (140 days), (2) $140, (3) $4.50, (4) $6.25, (5) $14.50.

Mich., Detroit—Emergency Dam—U. S. Engr. Office, Federal Bldg., received bids May 27, furnishing and building emergency dam and bridge to have rein.-con. abutments over 3rd and 4th Locks, St. Marys Falls Canal, from S. B. Harding, 123 Marion St., Oshkosh, Wis., $127,274; Independent Bridge Co., May Bldg., Pittsburgh, Pa., $137,890; Draco Contg. Co., Pittsburgh, $116,162. Noted April 15.

Tex., Ft. Worth—Cylinder Storage Building—Spec. 4142—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 9, constructing, at U. S. Helium Production Plant, here, (1) work complete, from Central Constr. Co., 520 Beatty Bldg., Houston, (1) $89,900 (120 days), (2) $20,500 (30 days); Hyde & Baxter, 1311 G St. N. W., Wash., D. C., (1) $108,546 (120 days), (2) $27,500 (30 days). Noted May 20.

Alaska, Keethikan—Dormitory and Power House—Pub. Wks. Office, Puget Sound, Wash., received lowest 3 bids June 7, building at Naval Radio Sta., here, from Colen Brown & Sales Co., $14,872 (140 days), N. Flemiss, $14,950 (150 days), Alaska Constr. & Eng. Co., $16,420 (130 days).

Miscellaneous

PROPOSED WORK

Road Materials—New York, N. Y.—H. Bruckner, pres. Bronx Boro., received no bids June 2, furnishing and delivering 3,000 bags portland cement and 200,000 gal. asphalt road oil. About $2,100 and $25,000 respectively. Work will be readvertised.

Pier—Phila., Pa.—Dept. Wharves, Docks & Ferries, Bourse Bldg., plans to raze and replace present pier at foot of Chestnut St. About $500,000.

Pumps—Cleveland, O.—City having plans prepared by G. B. Gascoyne, engr., City Hall, for two 8,000,000 and one 4,000,000 gal. pumps. E. Shattuck, City Hall, purch. agt. Cost to exceed $25,000.

Signal System—Dayton, O.—City plans to build new signal system for Fire Dept., also brick and concrete house for central station and equipment. About $180,000. G. Baker, city engr.

BIDS DESIRED

Freight Shed and Pier—New York, N. Y.—Until June 28, by M. Hulbert, comr. docks. Pier "A," foot of Battery Pl., North River, furnishing labor and material building at foot of 20th St., East River.

Tractor, Elevating Graders and Dump Wagons—Wadena, Minn.—Until July 12, by Wadena Co., furnishing 1 tractor, 1 elevating grader and 8 dump wagons. Former bids rejected. E. Ward, Wadena, engr Noted May 13.

Pipe—Terra Bella, Cal.—Until July 6, by E. R. Clemons, secy. Terra Bella Irrigation Dist., furnishing 20,000 ft. 6 in. and 22,000 ft. 8 in. wood or riveted steel pipe.

Wharf—St. Francois D'Orleans, Que.—Until June 22, by R. C. Desrochers, secy. Dept. Pub. Wks., Ottawa, repairing 30 x 634 ft. wharf, with 50 x 51 ft. L, involving tearing down and replacing old cribwork, concrete earth fill and macadam surface. About $33,000. E. Lafleur, Western Block, Ottawa, engr.

Culverts—Ontario—Until June 26, by W. A. McLean, deputy minister of highways, Toronto, building concrete culverts in Williamsburg Twp., Sect. A (Constr. 66), Sect. B, (Constr. 67) Sect. C. (Constr. 68); Lancaster Twp., Sect. A, (Constr. 69), Sect B, (Constr. 70), Sect. C, (Constr 71); Augusta Twp. (Constr. 72); Elizabethtown Twp. (Constr. 73), involving 3,300 cu.yd. concrete, 4,000 cu.yd. stone. Steel and cement supplied by province. About $90,000. G. Hogarth, Parliament Bldg., Toronto, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Iron Castings—Boston, Mass.—City let contract furnishing 600,000 lb. common class "A", 10,000 lb. heavy Class "B" and 4,000 lb. special Class "C" iron castings, 54,000 lb. catch basin traps and pipe inlets and 700 lb. No. 2 bronze pins, to Gibby Fdry Co., East Boston, $43,795.

★Road Materials—New York, N. Y.—H. Bruckner, pres. Bronx Boro., let contract furnishing and delivering 1,000 cu.yd fine sand, to Lannigan Bros., Bronx River and 165th St., $2,850; 5,000 cu.yd. sand grit, to Lenox Sand & Gravel Co., Hudson River and 157th St., $21,750; 500 ton asphaltic cement, to Warner-Quinlan Co., 79 Wall St., $20,750; trap rock and broken stone, to New York Trap Rock Co., 101 Park Ave., $3,696; 500 ton limestone, to E. Meyers, $5,555; 50 ton paving pitch, to Barrett Co., 17 Battery Pl., $1,500. Noted June 10.

★Steel Troughs and Retaining Wall—Phila., Pa.—See "Streets and Roads."

Hydraulic Operated Sluice Gates and Pumps—Cleveland, O.—City reecived bids for 23 hydraulic operated sluice gates and 2 pressure booster pumps, from Coffin Valve Co., Wade Bldg., $34,140, and J. L. Skeldon Eng. Co., Rockefeller Bldg., $68,136.

★Tunnel—Hamtramck (Detroit P. O.) **Mich.**—Dodge Bros., Jos. Campau Ave., Detroit, will build rein.-con. and steel tunnel for passageway under tracks, rein.-con. foundations and retaining walls at portals About $40,000. Work will be done by day labor under supervision of Smith, Hinchman & Grylls, engrs., Washington Arcade Bldg., Detroit. Noted March 11.

★Grandstand—Jackson, Mich.—Jackson Co. Fair Assn. let contract building 72 x 400 ft. grandstand, rein.-con. and steel, to C. Frazier, Jackson. About $60,000 Noted Feb. 12.

★Retaining Wall—Neenah, Wis.—See "Bridges."

★Dam—St. Johns, Ariz.—State Loan Bd Phoenix, let contract completing Lyman dam, here, to Johnson & Park, St. Johns, $174,500. Noted June 3

OFFICIAL PROPOSALS

Bids July 12.

Complete Waterworks System

Bismarck, N. Dak.

Sealed bids for the construction of a complete water works system, including a filtration plant will be received by the Board of City Commissioners of the City of Bismarck, North Dakota, until eight o'clock P.M., July 12th, 1920 Plans and specifications are on file in the office of the City Auditor and at the Builders Exchange, Minneapolis and St. Paul, Minn., or may be obtained of T. R. Atkinson, Consulting Engineer, Bismarck, North Dakota, upon the payment of Twenty-Five ($25.00) dollars.

All bids shall be received upon a basis of cash payment for all work to be done.

Each bid must be accompanied by a certified check for Five Hundred Dollars ($500.00), payable to the order of A. W. Lucas, President of the Board of City Commissioners, of the City of Bismarck, North Dakota, as a guarantee that the bidder will, if successful, enter into and execute a contract for the performance of the work.

Each bid must also be accompanied by a bidder's bond in a sum equal to the full amount bid, as provided in Section 3707 of the Compiled Laws of North Dakota, 1913.

Each bidder must state in his bid the rate of interest the warrants are to bear (not exceeding seven per cent per annum) which must be received and accepted by him at par in payment for the work.

For convenience of the City, the work is divided into seven separate contracts, as follows.

CONTRACT NUMBER ONE will provide for the furnishing of the cast iron pipe, gate valves, specials, jute, lead and hydrants for the supply mains and distribution system, f.o.b. cars Bismarck, North Dakota.

Work under this contract must be completed not later than May 1st, 1921.

CONTRACT NUMBER TWO will provide for the installation of the supply mains, the distribution system, and the service connections.

Work under this contract must be completed not later than September 1st, 1921.

CONTRACT NUMBER THREE will provide for the construction of a complete filtration plant, including intake, suction well, and sedimentation basins, but exclusive of heating plant, filtration equipment, and puumping machinery and piping.

Work under this contract must be completed not later than January 1st, 1921.

CONTRACT NUMBER FOUR will provide for the installation of a complete steam heating system in the filtration plant

Work under this contract must be completed not later than February 1st, 1921.

CONTRACT NUMBER FIVE will provide for the installation of filters, filter equipment, and chemical mixing machinery in the filtration plant.

Work under this contract must be completed not later than June 1st, 1921.

CONTRACT NUMBER SIX will provide for the installation of pumping machinery and piping in the fitration plant

Work under this contract must be completed not later than June 1st, 1921

CONTRACT NUMBER SEVEN will provide for the construction of two (2) reinforced concrete reservoirs and valve chamber.

Work under this contract must be completed not later than August 1st 1921

QUANTITIES

The following approximate quantities are given for the guidance of bidders:

CONTRACT NUMBER ONE

2,941 tons cast iron pipe.
73 tons lead.
4,580 pounds jute.
151 tons cast iron specials.
32 gated hydrants and boxes.
101 hydrants.
91—6-in. hub end gate valves and boxes
20—8-in. " " " " " "
3—10-in. " " " " " "
2—12-in. " " " " " "
1—16-in " " " " " "
12—6-in. flanged end gate valves with hand wheels.
6—8-in. flanged end gate valves with hand wheels
1—10 in. flanged end gate valves with hand wheels
3—16-in flanged end gate valves with hand wheels.
6 air valves.
2,440 lin.ft. of 1-in. galvanized pipe.

CONTRACT NUMBER TWO

65,786 lin.ft. 6-in. mains.
19,763 lin.ft. 8-in. mains.
3,818 lin.ft. 10-in. mains.
9,457 lin.ft. 12-in. mains.
14,242 lin.ft. 16-in. mains.
133 hydrants.
1,200 service connections.

CONTRACT NUMBER THREE

Reinforced concrete Filtration Plant Building, 114 ft. x 79 ft.
Reinforced concrete Sedimentation Basin, 113 ft. x 73 ft.
Suction Well, Intake pipes.

CONTRACT NUMBER FOUR

Heating System.

CONTRACT NUMBER FIVE

3—Dry feed chemical machines, with hoppers.
3—Rapid sand filters of 750,000 gallons capacity.

CONTRACT NUMBER SIX

1—1,500 g.p.m. horizontal centrifugal pump, direct connected to 20 hp. motor.
1—2,100 g.p.m. horizontal centrifugal pump, direct connected to 30 hp motor, and 40 hp. gas engine.
2—1,500 g.p.m. horizontal centrifugal pumps, each direct connected to 100 hp. motor and 125 hp. gas engine.
1—1,500-2,000 g.p.m. two-speed horizontal centrifugal pump, direct connected to 200 hp two-speed motor
5—Drum type controllers.
1—400 g.p.m. vertical centrifugal pump, direct connected to 10 hp. motor, mounted in 10 foot steel framework, and connections for above.

CONTRACT NUMBER SEVEN

2—800,000-gallon reinforced concrete reservoirs.

The Board of City Commissioners of the City of Bismarck, North Dakota, reserve the right to reject any or all bids, or to accept any part of any bid, as the best interests of the City may appear.

C. L. BURTON,
City Auditor.

The publication of an advertisement on this page is an official notice that bids are wanted from other than local bidders.

It is also a guarantee that maximum competition is invited because Engineering News-Record is the *one* nationally recognized medium for Proposal advertising. Its Searchlight Section is read each week by nearly every worth-while contractor in this country who bids on public work outside his own city.

Official Proposals reaching our office in first mail Wednesday morning (9 o'clock) can usually be published in the issue out the next day. Special price for Official Proposals, 40 cents a line.

Bids: June 30.

Extension of Water Supply System

Crystal Lake, Ill.

Board of Local Improvements will receive bids until 3:00 p.m., June 30, 1920, for the construction of extensions to the main water supply system, consisting of 20,500 ft. of 4 in. pipe, 11,000 ft of 6 in. pipe, 15 hydrants, valves, valve boxes, fittings, etc Plans and specifications on file with the City Clerk and at the office of the Wells Engineering Company, Municipal Engineers, Aurora, Illinois

---

Bids. July 9.

Constructing and Equipping Purification Plant Extension

BUREAU OF WATER WORKS IMPROVEMENT
CONTRACTS NOS. 170 AND 205

Akron, O.

Sealed bids covering the construction and equipment of an addition to the Water Purification Plant will be received at the office of the Director of Public Service, Delaware Building, Akron, Ohio, until 12 o'clock noon (Central Standard Time) of Friday, the ninth day of July, 1920, and at that time and place will be publicly opened and read.

The work is divided into two separate contracts, as follows:

Contract No. 170 for Constructing Purification Plant Extension comprises the construction of the concrete and brick structures for ten rapid sand filters having a capacity of two million gallons daily each, 750 lineal feet of 30 in. vitrified pipe sewer, and a small sewage disposal tank.

The work involves the excavation of about 7,500 cubic yards of earth and the placing of about 2,500 cubic yards of reinforced concrete.

Contract No. 205 for Furnishing and Installing Filter Equipment and Piping, includes the following items in the equipment of eleven (11) filter units of 2 M.G. D capacity each:

(a) Filter sand and gravel.
(b) Filter floor or strain system.
(c) Lateral wash-water gutters.
(d) All necessary piping, valves, sluice gates, operating tables, gauges, motor-driven pumps and other auxiliary equipment.

All proposals must be made on the forms furnished by the City.

Each bidder must accompany his proposal with a satisfactory bond or certified check in the following amounts:

Contract No. 170, $10,000
Contract No 205, 5,000

A surety bond in the amount of fifty (50) per cent of the amount of the contract will be required of the successful bidder on each contract.

Plans and specifications may be seen at the office of the Director, or copies may be obtained from the Bureau of Water Works Improvement, 102 E. Mill St Akron, Ohio, upon deposit of ten dollars ($10.00), which sum will be refunded on return of these plans and specifications in good condition within ten days after the award of the contract.

The right is reserved to reject any or all bids.

E. A. ZEISLOFT,
Director of Public Service.
H. H. FROST.
Superintendent of Water Works.
G. GALE DIXON,
Engineer.

Bids: June 21.

Centrifugal Pumping Unit

Owosso, Mich.

Sealed proposals will be received by the City of Owosso, Michigan, up to 8 o'clock p.m., Eastern Standard time, of the 21st day of June, 1920, for furnising one motor-driven centrifugal pumping unit with a capacity of 1,500 gallons per minute against a total head of 175 feet

The plans and specifications under which the unit is to be furnished may be examined at the office of the City Clerk, Owosso, Michigan, or at the office of Hoad and Decker, Consulting Engineers, Ann Arbor, Michigan, and copies of same may be obtained by making a deposit of five dollars, which will be refunded upon their return in good condition.

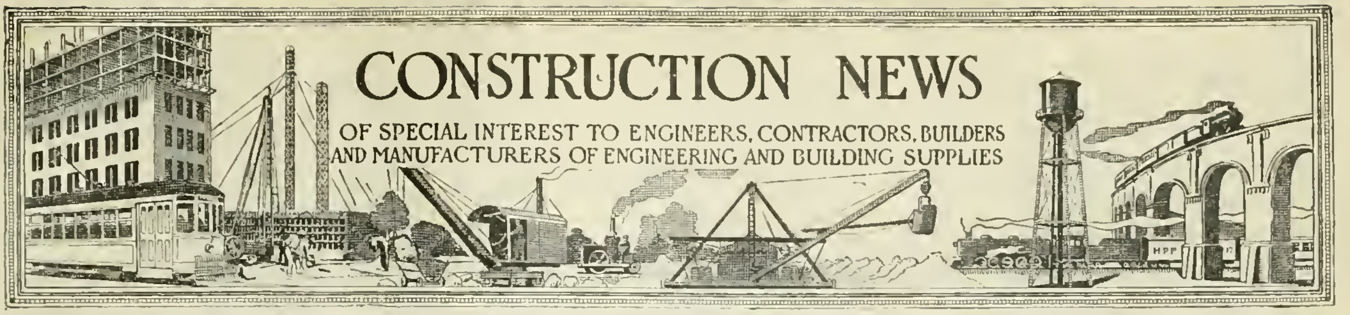
A certified check for the sum of one hundred and fifty dollars ($150.00) will be required with each proposal.

The right to accept any proposal, to reject any or all proposals, and to waive defects in proposals is reserved by the City

A T WRIGHT, Mayor.
HOAD & DECKER
Consulting Engineers,
Ann Arbor, Michigan
B. S LUCAS
City Clerk.

CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES



PROPOSALS

For proposals Advertised see the pages immediately following the "Construction News" Section.

WATERWORKS

Bids Close		See Eng. News-Record
June 25	New York, N. Y.	June 17
June 26	Dansville, N. Y.	June 10
June 28	Ironwood, Mich.	June 17
June 28	Colfax, Wis.	June 24
June 29	Ford City, Pa.	June 24
June 29	Buffalo, N. Y.	June 3
June 30	Seymour, Ind. Adv. June 24.	June 24
June 30	El Reno, Okla.	June 24
June 30	Central Islip, N. Y. Adv. June 24.	June 24
July 1	Madill, Okla.	June 10
July 1	Glendale, Cal.	June 24
July 7	Dearborn, Mich. Adv. June 24.	June 24
July 9	Collinsville, Ill. Adv. June 10 to 24.	June 10
July 23	Akron, O. Adv. June 24.	June 24

SEWERS

Bids Close		See Eng. News-Record
June 28	Brilllon, Wis.	June 10
June 29	St. Louis, Mo.	June 17
July 1	Milwaukee, Wis.	June 3
July 1	Waterloo, Wis.	June 24
July 1	St. George, S. I., N. Y.	June 10
July 1	South Beach, S. I., N. Y.	June 17
July 1	Le Roy, Minn.	June 17
July 1	Elmore, Minn.	June 17
July 6	Coatesville, Pa. Adv. June 24.	June 24
July 6	Boonton, N. J. Adv. June 17 and 24.	June 17
July 6	Danville, Ky. Adv. June 24.	June 24
July 9	Worthington, O.	June 24
July 12	Milford, Mich.	June 24
July 12	Milford, Mich.	June 24
July 19	Dallas, Ore	May 27

BRIDGES

Bids Close		See Eng. News-Record
June 28	Beloit, Wis.	June 24
June 30	Rhode Island. Adv. June 24.	June 24
July 1	Eatonville, Wash.	June 24
July 1	Perry Ga.	June 17
July 2	Lyons, N Y. Adv. June 24.	June 24
July 2	Abiquin, N. M.	June 24
July 3	Williamsport, Pa.	June 24
July 3	Granville N. Y. Adv. June 17 and 24.	June 17
July 5	Greenfield, Ind.	June 17
July 6	Elk Point, S D.	June 17
July 6	Yorba Linda, Cal.	June 17
July 6	Meridian, Miss.	June 24
July 6	Manchester, N. H.	June 17
July 6	San Jose, Cal.	June 24
July 7	Red Bank, N. J. Adv. June 17 and 24.	June 17
July 12	Chadds Ford, Pa. Adv. June 24.	June 24
July 12	Nevada Adv. June 24.	June 24

STREETS AND ROADS

Bids Close		See Eng. News-Record
June 26	Dansville, N. Y.	June 10
June 28	Savannah, Ga.	May 13
June 28	Reno, Nev.	June 3
June 28	Newton, N. J.	June 17
June 28	Tombstone, Ariz.	June 10
June 28	Florence, Ariz.	June 10
June 28	New Jersey	June 10
June 28	Minneapolis, Minn.	June 17
June 28	Tarkio, Mo. Adv. June 24.	June 24
June 28	St. George, S. I., N. Y.	June 24
June 28	Monticello, Mo.	June 24
June 28	Milwaukee, Wis.	June 24
June 28	Sirdar, B. C.	June 24
June 29	St. George, S. I., N. Y.	June 24
June 29	Jersey City, N. J.	June 24
June 29	Mayville, Wis.	June 24
June 29	Roselle Park, N. J.	June 17
June 29	Wallingford, Conn.	June 17
June 29	St. Louis, Mo.	June 10
June 30	San Diego, Cal.	June 24
June 30	Freehold, N. J. Adv. June 17 and 24.	June 10
June 30	Rhode Island Adv. June 10 to 24.	June 17
June 30	San Angelo, Tex.	June 24
June 30	Payson, Utah	June 24
June 30	Brooklyn, N. Y.	June 24
July 1	St. Lambert, Que.	June 24
July 1	Caledonia, Minn.	June 24
July 1	Ft. Worth, Tex. Adv. June 17 and 24.	June 17
July 1	Vermont Adv. June 1 7and 24.	June 24
July 1	San Diego, Cal.	June 24
July 1	Canadian, Tex.	June 24
July 2	New Mexico	June 24
July 2	Girard, Kan.	June 24
July 2	Oak Harbor, O.	June 24
July 2	New York Adv. June 24.	June 24
July 2	Winchester, Ky. Adv. June 24.	June 24
July 3	Tucson, Ariz.	June 17
July 3	Richmond, Tex.	June 24
July 3	St. Davids, Que.	June 24
July 5	New Madrid, Mo. Adv. June 17 and 24.	June 17
July 6	Wilmington, Del. Adv June 17 and 24.	June 17
July 6	Amsterdam, N. Y. Adv. June 24.	June 24
July 6	Santa Barbara, Cal.	June 17
July 6	Visalia, Cal.	June 17
July 6	Charleston, S. C. Adv. June 1 7and 24.	June 24
July 6	Baltimore, Md. Adv. June 24	June 24
July 6	Athens, Ga.	June 24
July 6	Dallas, Ore.	May 27
July 6	Parnassus, Pa.	June 24
July 6	Baltimore, Md.	June 24
July 6	New Mexico	June 24
July 7	Springfield, Ill.	June 24
July 7	Rhode Island Adv. June 24.	June 24
July 7	Jersey City, N. J.	June 24
July 7	Hood River, Ore.	June 24
July 7	Breckenridge, Minn.	June 24
July 7	Hudson Falls, N Y. Adv. June 24	June 24
July 7	Baltimore, Md. Adv. June 24.	June 24
July 7	Wisconsin	June 24
July 8	Washington, Kan.	June 24
July 9	Akron, O. Adv. June 24.	June 24
July 9	Kansas City, Kan.	June 24
July 10	Quebec	June 24
July 10	New Mexico	June 24
July 12	Fergus Falls, Minn.	June 17
July 12	Madison, W. Va	June 17
July 12	Auburn, N. Y. Adv. June 24.	June 24
July 12	Troy, Kan.	June 24
July 12	Baltimore, Md Adv. June 24.	June 24
July 13	Ft. Scott, Kan.	June 24
July 14	Baltimore Md.	June24
July 14	Tavares, Fla. Adv. June 17 and 24.	June 10
July 14	Mora, Minn.	June 24
July 15	Flemington, N J. Adv. June 24.	June 24
July 16	New Mexico	June 24
July 17	New Mexico	June 24
July 23	Garden City, Kan.	June 24

RAILWAYS

Bids Close		See Eng. News-Record
July 2	British Columbia	June 17

EXCAVATION AND DREDGING

Bids Close		See Eng. News-Record
July 3	Madisonville, Ky.	May 27
July 6	Paducah, Ky. Adv. June 24.	June 24
July 7	Montezuma, Ia. Adv. June 24.	June 24
July 17	Belzoni Miss.	June 24
June 28	Waseca, Minn.	June 24

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
June 28	Cleveland, O.	June 17
June 28	Port Washington, Wis.	June 24
June 29	Comstock, N. Y.	June 17
June 29	Milwaukee, Wis.	June 24
June 30	Cambridge, Mass	May 27
Sept. 1	Hutchinson, Kan.	Feb. 19

BUILDINGS

Bids Close		See Eng. News-Record
June 28	Youngstown, O.	June 10
June 28	Hiawatha, Kan.	June 24
June 28	Flint, Mich.	June 24
June 28	Wynne, Ark.	June 17
June 28	Trenton, N. J. Adv. June 17 and 24.	June 17
June 29	Duluth, Minn.	June 10
June 29	Belchertown, Mass.	June 24
June 30	New York, N. Y.	June 10
June 30	Cheektowaga (Forks P. O.), N. Y.	June 17
June 30	West New York, N. J.	June 24
June 30	Mapleton, Ia.	June 21
June 30	Parsons, Kan.	June 24
July 1	Chisholm, Minn.	May 13
July 1	McCallsburg, Ia.	June 24
July 5	Camden Point, Mo.	June 24
July 5	Killduff, Ia.	June 24
July 5	Cambria, Ia.	June 17
July 7	Gallipolis, O.	June 17
July 7	Warren, O.	June 24
July 15	Jonesboro, Ark.	May 27
July 15	Coleraine, Minn.	June 10
July 16	Fullerton, Cal. Adv. June 10 to 24.	June 17
July 25	Liberty Center, Ia.	June 24
Aug. 2	Salina, Kan.	June 17
Aug. 16	Sioux City, Ia.	June 17

FEDERAL GOVERNMENT WORK

Bids Close		See Eng. News-Record
June 26	Laundry Machinery — Tacoma, Park (Wash. P. O), D. C. Adv. June 17 and 24.	June 17
June 26	Warehouses—Ft. Sam Houston, Tex. Adv. June 17 and 24.	June 17
June 26	Materials and Supplies — Tacoma Park, D. C. Adv. June 1 7and 24.	June 24
June 26	Roads, Walks, Drainage and Grading — Tacoma Park (Wash P. O.), D. C. Adv. June 10 to 24.	June 10
June 28	Dredge, etc.—Wilmington, N. C. Adv. May 27 to June 24.	May 27
June 28	Station Building and Accessories — Long Beach, N. Y. Adv. June 3 to 24	June 17
June 30	Dredging—Norfolk, Va.	June 10
June 30	Tug Boat—Wash., D. C.	June 3
June 30	Cold Storage Insulation—Spec. 4199 — San Diego, Cal.	June 17
June 30	Refrigerating Plant Equipment — Spec. 4193 — San Diego, Cal.	June 24
July 1	Dredging — New York, N. Y. Adv. June 17 and 24.	June 3
July 1	Manila Rope — Memphis, Tenn.	June 17
July 2	Bulkhead, etc. — Norfolk, Va. Adv. June 17 and 24.	June 10
July 3	Structural Steel, Castings, etc.—Louisville, Ky	June 10
July 7	Incinerator—Spec. 4137—Quantico, Va.	June 24
July 7	Sewers and Watermains — Spec. 4178 — Hampton Roads, Va.	June 24
July 7	Storehouse — Spec. 4157 San Diego, Cal.	June 24
July 8	Charcoal Iron Boiler Tubes Charleston, S C.	June 3

Bids Close		See Eng. News-Record
July 8	Steel Dump Scow—Louisville, Ky. Adv. June 10 to 24.	June 10
July 8	Rubber Hose — Memphis, Tenn. Adv. June 10 to 24.	June 17
July 9	Brick Set, etc.—Athens, O.	June 21
July 12	Additions and Repairs to Conduit, etc.—Zanesville, O.	June 24
July 14	Seagoing Hopper Dredge Sabine—Galveston, Tex. Adv. June 17 and 24.	June 17
July 15	Galvanized Wire, Wire Strand, Staples and Wire Rope Clips — Memphis, Tenn. Adv. June 17 and 24.	June 17
July 15	Dredging — Wilmington, Del. Adv. June 17 and 24.	June 17
July 15	Gate and Valve Operating Machinery — Pittsburgh, Pa. Adv. June 24.	June 24
July 24	Dredging — New York, N. Y. Adv. June 24.	June 24

MISCELLANEOUS

June 28	Lumber and Piling—Kaufman, Tex.	June 10
June 28	Breakwater—Friars Head, N. S.	June 24
June 28	Freight Shed and Pier—New York, N. Y.	June 17
June 29	Wood Block — Cincinnati, O.	June 24
June 30	Pumps—Nashville, Tenn.	June 3
July 2	Pumps—Cleveland, O.	June 24
July 2	Coal Crusher—Cleveland, O.	June 24
July 6	Pipe—Terra Bella, Cal.	June 17
July 6	Pier—Bayfield, Ont.	June 24
July 6	Wharf—Ste Famille, Que.	June 24
July 8	Laundry Machinery—Randalls Island, N. Y.	June 10
July 12	Tractors, Elevating Graders and Dump Wagon—Wadena, Minn.	June 17
July 20	Terminal Freighthouse — New York, N. Y.	June 24

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. J., Trenton—City Comn. soon receives bids installing 25,000,000 gal. pump and 1,000 hp. steam turbine generator, for waterworks. About $75,000. J. R. Fell, Trenton, engr.

Minn., Albert Lea—City soon lets contract building waterworks system, to include 2 motor-driven centrifugal pumps with automatic control, 2 air compressors and 2 motors with belt drive. 1 horizontal driven double suction centrifugal pump, capacity 800 gal. per minute against 50 ft. total head direct connected to one 14 brake h.p. steam turbine. R. G. Lindgren, Albert Lea, engr.

Minn., Buffalo—Village rejected bids received June 4, building waterworks system and deep well. About $60,000. Work may be readvertised. Noted May 27.

Kan., Peru—City having plans prepared by Archer & Stevens, engrs., 609 New Engineering Bldg., Kansas City, building waterworks system. About $50,000.

Kan., Portis—City having plans prepared by Archer & Stevens, engrs., 609 New Engineering Bldg., Kansas City, constructing new well, waterworks and distributing system. About $32,000.

Mo., Fayette—City having plans prepared by Johnson & Benham, engrs., Firestone Bldg., Kansas City, Mo., for earth filled dam and pipe line. Cost between $30,000 and $35,000. T. R. Moore, clk.

Ore., La Grande—City having plans prepared by L. C. Kelsey, consult. engr., Portland, for gravity water supply system. Cost between $500,000 and $1,000,000, depending upon source of supply recommended.

BIDS DESIRED

N. Y., Central Islip—Until June 30, by State Hospital Comn., Capitol, Albany, building artesian well, at State Hospital, here. L. F. Pilcher, state archt.; advertised in this issue.

Pa., Ford City—Until June 29, by Clerk of Council building circular concrete reservoir and 12 in. rising main leading to same, also power house addition. Douglas & McKnight, Columbia Bank Bldg., Pittsburgh, engrs.

O., Akron—Until July 23, (change of date) by E. A. Zeisloft, dir. Pub. Serv. constructing and equipping addition to water purification plant. (Contracts 170 and 205). About $10,000 and $5,000 respectively; advertised in this issue.

O., Seymour—Until June 30, by Seymour Water Co. building rein.-con. sedimentation reservoir. C. H. Hurd, 1405 Merchants Bank Bldg., Indianapolis, Ind., consult. engr.; advertised in this issue.

Mich., Dearborn—Until July 7, by F. C Beamer, village clk., building water main extensions, involving 7,629 ft. 6-18 in. c.i. pipe; advertised in this issue.

Wis., Colfax—Until June 28, by T. Runnung, village clk., furnishing labor and material for building waterworks and sewerage system, involving 4,388 ft. watermains and 1,068 ft. sewer pipe.

Okla, El Reno—Until June 30, by city clerk improving waterworks system involving two high-duty steam pumping engines of 2,000,000 gal. daily capacity; 1,000,000 gal. reservoir. Burns & McDonnell Interstate Bldg., Kansas City, Mo. engrs.

Cal., Glendale—Until July 1, by City clk., furnishing and laying 6,700 ft. 16 in. riveted steel pipe, 10 gate valves and 5 fire hydrants.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

O., Akron—City received bids June 18, laying 4,650 ft. 48 in. Class "B" c.i. pipe and 9,000 cu.yd earth excav., from G. A. Gesna Co., Toledo, $46,006; Dodge Constr. Co., Rochester, N. Y., $60,288; A. W. Hinaman and R. D. Salisbury, Akron, $61,782. Noted June 10.

★O., Akron—City let contract building waterworks system, involving 19,800 cu.yd. earth and 200 cu.yd. rock excav., 25 cu.yd. concrete masonry and 29,650 ft. 4-20 in. c.i. pipe, to Gangl Constr. Co., 737 2nd Natl. Bank Bldg., $41,996.

★Mich., Detroit—City will lay water mains in Lakewood Blvd., Lenox, Montclair, Radcliffe, Kingsley, Belleterre, Fleming and Lumpkin Aves., etc., involving 10,000 ft. 6-8 in. c.i. pipe. About $30,000. Work will be done by day labor.

★Mich., Grosse Pointe Park (Detroit P. O.)—City let contract furnishing labor and material for trenching and laying 8,000 ft. 6 in. c.i. water pipe in Beaconsfield and Queen Aves., to include valves, hydrants and specials, to T. Iglehart, 209 South La Salle St., Chicago, Ill. About $25,000. Noted May 13.

Ia., Cherokee—State Bd. Control, Des Moines, receives bids about July 1, improving waterworks system at State Hospital, here. About $70,000. W. E. Buell, Davidson Bldg., Sioux City, engr. Noted Jan 15.

Tex., Cisco—City received bids building dam for waterworks system (a) earth, (b) rock fill, (c) hollow concrete, (d) solid concrete, from W. A. Wogan, Cisco, (a) $1,075,465, (b) $1,015,685; F. H. Harris, Ranger, (a) $1,082,952; H. T. Freistedt, Houston, (a) $831,534, (c) $914,050, (d) $1,154,148. Noted May 6.

Sewers

PROPSED WORK

N. Y., Greycourt—Dept. of Correction, Municipal Bldg., New York City, rejected bids building sewage disposal plant including 2,050 ft. absorption ditches and outlet pipe, here. About $50,000. Work will be readvertised.

N. Y., North Tonawanda—Bd. Pub. Wks. commissioned Chester & Fleming, consult. engrs., Union Bank Bldg., Pittsburgh, Pa., to submit report for sewerage system and sewage disposal plant.

N. J., Newark—Dept. Streets & Pub. Impvts. receives bids about July 1, building 4,000 ft. concrete sewers in Maple and Hansbury Aves. About $25,000. M. R Sherrerd, city engr.

Mich., Detroit—City soon lets contract trenching and laying vitr. crock Lateral Sewer 3,223, involving 894 ft. 12-18 in. pipe, 3,292, 11,529 ft. 12-33 in. pipe, 3,293, 13,576 ft. 12-36 in. pipe, 3,291, 4,581 ft. 10-12 in. pipe. C. W. Hubbell, city engr.

Mich., Detroit—City rejected bids June 11, building 2,587 ft. sewer in Linwood Ave. from Fenkell to Puritan Aves., Sect. 4, involving 2 ft. 9 in.-5 ft. 3 in. cylinder, concrete, brick, vitr. or concrete segmental block pipe, etc. Work will be readvertised.

Mich., Detroit—City soon lets contract furnishing labor and material building (uncompleted portion of former contract) sewers in Mack Ave. from Balfour to Bedford Aves., involving 1,755 ft. 5 ft. 6 in. brick, concrete, vitr. segmental block or rein.-con. pipe, etc. About $45,000. C. W. Hubbell, city engr.

Wis., Kilbourn—City having plans prepared by W. G. Kirchoffer, engr., 31 Vroman Blk., Madison, for 3,000 ft. 2½ x 7 ft. rock tunneling in connection with sewerage system.

Idaho, Jerome—City having plans prepared by L. C. Kelsey, consult. engr., Nampa, for sewerage system, here. About $150,000.

Ont., Ottawa—Bd. Control soon receives bids building sewers in Woodstock Ave. from Fairmont to Melrose Aves., Melrose Ave. from Woodstock to Kenilworth Sts., Kenilworth St. from Melrose to Reid Aves., Reid Ave. from Kenilworth to Ruskin Sts. and Ruskin St. from Reid to Rosemount Aves., involving 12-24 in. tile pipe, cost $26,000; also paving Cobalt Ave. from Patterson to Clemow Aves., Tarvia macadam $5,000. A. F. Macallum, city engr.

BIDS DESIRED

Pa., Coatesville—Until July 6, by City Council, furnishing labor and material building sanitary and storm sewers. F. P. Pennegar, clk.; advertised in this issue.

Ky., Danville—Until July 6 (change of date) by Mayor, building 5,000 ft. small sewers, also 33,000 sq.yd. paving. S. F. Crecelius, Richmond, engr.; advertised in this issue. Noted June 17.

O., Worthington—Until July 9, by W. P. Vest, village clk., building sewers in various streets, involving 36,615 ft. 6-24 in. pipe. About $100,000. Jennings-Lawrence Co., Hartman Bldg., Columbus, engrs.

Mich., Milford—Until July 12, by C. W. Hubbell, city engr., furnishing labor and material for 1½ mi. sanitary sewerage system, involving 8-15 in. vitri. pipe. About $25,000. Noted March 4.

Wis., Colfax—See "Waterworks"

Wis., Waterloo—Until July 1 (change of date), by W. J. Higgins, village clk., building sewers in various streets, involving 16,106 lin.ft. 8 in., 4,710 ft. 10 in. and 4,220 ft. 12 in. vitr. pipe, 72 manholes, septic tanks, etc. About $70,000. Parsons & Orbert, 627 M. & M. Bank Bldg., Milwaukee, engrs. Noted June 3.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Brighton (Boston P. O.)—City of Boston received bids June 11, building sewer in Market St., here, from A. Cefalo, $23,214; J. Barletta, $23,348; F. Drinkwater, $37,278.

O., Cleveland—City received bids June 10, building sewers in Bosworth Rd., Bellaire to Dixon Rds., from Yahya Bros., 3539 Independence Rd., $2,019; Sprague & Burkhardt, 1211 Woodland Ave., $2,065; Chestnut Hill Drive, Mapleside Rd. to Park Blvd., from Stevens & McKeon, 4208 East 96th St., $7,633; E. Cesa, 2462 Baldwin Rd., $7,724; A. Marra, Illuminating Bldg., $7,759; St. Clair Ave., East 140th to East 152nd Sts., from D. Zulo, 10501 Hudson Ave., $56,716; River Constr. Co., 12109 Mayfield Rd., $58,787; Gallagher-Burk Constr. Co., 1339 Irene Ave., $60,685.

O., West Park—S. Hendrickson, clk., Town Hall, received bids building sewer in Nichols Ave. from West 150th to West 162nd Sts., involving 2,030 ft. 3-6 ft. concrete and 2,770 ft. 12-24 in. vitr. pipe, from A. Marra, Illuminating Bldg., $47,286; Randall & Cooper, 345 Superior Arcade, $50,652; Sprague & Burkhardt, 12,011 Woodland Ave., $50,935. Contractors all of Cleveland.

Mich., Detroit—City received bids June 11, building sewer in (a) Fenkell Ave. from Linwood to Parkside Aves. and east from Linwood to Wabash Aves., involving 4 ft. 6 in.-5 ft. cylinder, (b) 670 ft. Monica Ave., 2 ft. 4 in. x 3 ft. 6 in. brick, concrete, vitr. segment block or rein.-con. pipe, from R. D. Baker, Penobscot Bldg., (a) $80,995, (b) $11,400; Jaynes & Affled, 1208 Ford Bldg., (a) $87,990, (b) $11,775; J. A. Mercier, 216 Hammond Bldg., (a) $92,624; W. Blanck & Co., 330 Longfellow St., (b) $14,694.

★Tex., Farmersville—Farmersville Water works and Sewerage Co. let contract laying 4,000 ft. 6-12 in. vitr. pipe sewer lines and installing 2 disposal plants, to J. W. Crook, Paris, $43,857. Noted June 10.

Wash., Seattle—Bd. Pub. Wks. received bids June 12, building sewers and water mains on 40th Ave., N., et al., involving 3,500 cu.yd clearing and grading, 2,620 cu.yd sub grading, 1,275 lin.ft. 6 in. concrete

Sewers (Continued)

paving, 1,275 limit type A armored concrete curbing, 1,268 lin.ft. 10 in. pipe sewer, and 3,390 lin.ft. 12 in. c.i. pipe sewer, from V. Ramaglia & Co., 4823 38th Ave. N. E., $55,247, Agostino Bros., Seattle, $58,636; F. N. Badolato, Seattle, $61,155.

Bridges

PROPOSED WORK

Conn., Bridgeport — City plans to build 450 ft. steel bridge with concrete abutments over Cedar Creek from Howard Ave. to Barnum Dyke. J. A. McElroy, city engr.

Conn., Bridgeport—City plans to build steel bridge over Ash Creek on Brewster St. About $25,000. J. A. McElroy, city engr.

Conn., Norwich—City plans to build rein.-con. bridge over Yantic River on West Main St. About $25,000. Chandler & Palmer, Thayer Bldg., archts.

S. C., Sumter—J. R. Pennell, state highway engr., Columbia, receives bids in about 60 days, building 250 ft. steel bridge over Wateree River, at Gerners Ferry Rd. crossing, for Sumter Co., (Sumter), and Richland Co., (Columbia). About $200,000.

O., Akron—Summit Co. plans to build concrete and steel bridge over Ohio canal, on Kenmore Blvd. About $200,000. Proposition will be submitted to voters at August primaries. Watson Eng. Co., Hippodrome Bldg., Cleveland, engrs.

Wisconsin—State Highway Comn., Madison, had surveys and plans prepared for Perry Bridge, three 24 x 35 ft. deck girder spans, concrete abutments, Brickway, Jackson Co.; Nashonoc Bridge, three 24 x 45 ft. concrete deck girder spans, concrete abutments, Hamilton, La Cross Co., three 8 x 20 ft., two 20 x 20 ft. and one 6 x 6 ft. rein.-con. span bridges, one 8 x 18 ft. slab span and two 4 x 4 ft. box culverts, Lafayette Co.; one 20 x 24 ft. deck girder span, one 20 x 24 ft., rein.-con. slab span, one 10 x 20 ft. and two 20 x 20 ft. concrete slab span bridges, Sauk Co.

Idaho—State Highway Dept., Boise, rejected bids received June 5, building 429 ft. steel bridge (cantilever type) over Owsley Ferry, Federal Aid Project 8, Twin Falls and Gooding Counties. About $90,000. Noted May 27.

Utah, Beaver—See "Streets and Roads"

Utah, Riverdale—State and Union Pacific R.R. plans to build 400 ft. rein.-con. and steel bridge, 22 ft. wide, over Weber River and Union Pacific R.R. tracks, here. About $140,000. I. R. Browning, Salt Lake City, state rd. engr.

Wash., Millwood—Spokane Co. (Spokane) soon receives bids building 320 ft. steel or concrete bridge, involving 93 cu.yd. rein.-con. for flooring, 704 cu.yd. concrete for piers, 198 ton steel, 165 cu.yd. stone, 508 cu.yd. excav., etc. About $50,000.

Oregon—State Highway Comn., Portland, rejected bids received June 1, building bridge on Crooked River Highway near Prineville, Crook Co., to have two 120 ft. and two 40 ft. wood truss spans, involving 35 cu.yd. Class "A" and 520 cu.yd Class "B" concrete, 9,500 lb. reinforcing steel, 520 lin.ft. standard wooden trestle and 1,000 cu.yd. excav.

BIDS DESIRED

Rhode Island—Until June 30, by State Bd. Pub. Rds., State House, Providence, building bridges 20, 145 and 146, known as Wakefield Bridge, North Kingstown, Centerdale Sluiceway, North Providence and Centerdale Bridge, North Providence and Johnston; advertised in this issue.

N. Y., Lyons—Until July 2, by C. W. Barrick, town supt. highways, at office of V. A. Berns, clk., building rein.-con. arch bridge, consisting of two 50 ft. spans with pier, abutments and appurtenant structures; advertised in this issue.

Pa., Chadds Ford—Until July 12, by G. S. Dewees, controller Chester Co. (West Chester) and O. L. Davis, controller Delaware Co. (Media), at offices of Comrs. (Chester Co.) West Chester, building twin span rein.-con. arch bridge, over Brandywine Creek, here; advertised in this issue.

Pa., Johnstown—Cambria Steel Co. receiving bids building substructure and superstructure for North Dump Bridge 6, over Pennsylvania R.R. deep cut, 185 ft. long 18 ft. roadway and 4 ft. sidewalk steel, lined with vitr. brick set in fire clay on rein.-con. foundation.

Pa., Williamsport—Until July 3, by L. O. Bower, clk. Bd. Comrs. Lycoming Co., building Shoemaker and Upper Hughesville Bridges, over Muncy Creek, both 55 ft. long and 25 ft. wide, each to have 3 concrete and steel girder spans. About $30,000. M. C. Krause, 335 Pine St., engr.

Miss., Meridian—Until July 6, by Bd. Supervisors, Lauderdale Co., building bridges and culverts. About $50,000. G. F. Hand, clk.

Wis., Beloit—Until June 28, by Bd. Pub. Wks., building 249 ft. rein.-con. bridge, 66 ft. wide, on Central St. Klug & Smith, Mack Blk., Milwaukee, consult. engrs. Noted April 1.

New Mexico—See 'Streets and Roads."

N. M., Abiquiu—Until July 2, by State Highway Dept., Capitol Bldg., Santa Fe, building Chama Bridge 12 mi. north of here, in Rio Arriba Co., involving 24,050 ft. wood for superstructure, 4,418 ft. wood for substructure and 1,032 lin.ft. wooden piling. L. A. Gillett, state highway engr.

Nevada—Until July 12, by C. C. Cottrell, state highway engr., Carson City, building one 126 ft. steel pratt truss highway span on concrete abutments, over Humboldt River in Eureka Co.; advertised in this issue.

Wash., Eatonville—Until July 1, by Comrs. Pierce Co., (Tacoma), building 160 ft. bridge over Big Machell River, here, to have two 80 ft. steel spans, 18 ft. concrete or timber roadway on concrete abutments, etc. E. A. White, Seattle, engr.

Cal., San Jose — Until July 6, by Bd. Supervs. Santa Clara Co., building 4 span rein.-con. bridge, on Congress Spring Rd. Cost to exceed $25,000. H. A. Pfister, clk.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New York—Dept. Plants & Structures, Municipal Bldg., received lowest 3 bids, June 15, building Eastchester Bridge, over Eastchester Creek, Bronx Boro., from Lupfer & Remnick, Ellicott Sq., Buffalo, $508,871; P. T. Cox, 150 Nassau St., $512,315; Rogers & Haggerty, $537,100.

O., Columbus—Comrs. Franklin Co. received bids June 7 building 833 ft. concrete bridge 30 ft. wide, with two 6 ft. sidewalks, over Scioto River, on Greenlawn Ave., from I. E. Smith, Main Street Bridge, Richmond, Ind., cost, $436,987; Fritz, Roomee & Cooke Co., Columbus, $444,639. Noted May 20.

★**Montana**—See "Streets and Roads."

★**Ariz., Florence**—Pinal Co. let contract building concrete bridge, culverts, headwalls and retaining walls on 5 mi. section of Ray-Kelvin Rd., involving 698 cu.yd. concrete, 18,949 lb. reinforcing steel, 10,500 lb. steel rails, 870 cu.yd. cement rubble masonry and 616 ft. 18-48 in. metal pipe, etc. to R. C. Sheedy Constr. Co., 1493 East 42nd St., Los Angeles, $27,559. Noted May 13.

★**Oregon**—See "Streets and Roads"

★**Ont., Ottawa**—Carleton Co. let contract building 2 steel bridges, 60 and 80 ft. long, with 20 ft. roadway, on concrete abutments, 1 over Castor River, to C. O. Wood, Union Bank Bldg., $13,360 and 1 over Carp River, at Kinburn, to Ontario Bridge Co., Toronto Office Bldg., Toronto, $16,000.

Streets and Roads

PROPOSED WORK

Mass., Marlboro — Town appropriated $60,000 to pave and improve various streets. Private plans.

N. J., Newark — Bd. Freeholders Essex Co. plans to repair roads in Belleville and Nutley. About $350,000. F. J. Reimer, co. engr.

N. J., Newark—City plans to pave Scotland, High and Washington Sts. About $226,000. F. J. Reimer, co. engr.

N. J., Newark—Essex Co. plans to resurafce Mt. Pleasant Ave., Livingston and West Orange, also Chancellor Ave. from Elizabeth Ave., Newark, through Irvington to Springfield Ave., South Orange, bituminous macadam. About $104,000 and $500,000 respectively. F. J. Reimer, co. engr.

N. J., South Orange—City plans to resurface South Orange Ave., bituminous macadam. About $36,000. F. J. Reimer, co. engr.

Pennsylvania — State Highway Dept., Harrisburg, received no bids June 15, paving 15,550 ft. Route 246, McCandless and Pine Twps., Allegheny Co.; 20,996 ft. Route 117, Dunbar Twp., also 15,886 ft. Route 366, Bullskin and Connellsville Twps., Fayette Co.; 22,287 ft. Applications 154 and 1,096, Farmington and Pine Grove Twps., Warren Co.; 16,137 ft. Route 181, Sect. 2, Somerset and Nottingham Twps., Washington Co. Noted May 20.

Pennsylvania — State Highway Dept., Harrisburg, rejected bid received June 16, paving 15,323 ft. Route 288, Perry Twp., Fayette Co. Noted May 20.

Pennsylvania — State Highway Dept., Harrisburg, received no bids June 16, paving 18,514 ft. Route 89, Sect. 1, East Mead Twp., Crawford Co.; 15,080 ft. Route 113, Sect. 2, North and South Union and Menallen Twps., Fayette Co.; 25,030 ft. Routes 223 and 314, East Wheatfield Twp., Indiana Co.; 10,688 ft. Route 141, Orwigsburg Boro., Schuylkill Co.; 3,419 ft. Route 89, Sect. 1, Plum Twp., Venango Co.; 22,845 ft. Route 181, Sect. 1, North and South Strabane Twps., Washington Co. Noted May 20.

Pa., Scranton—City passed ordinance and soon receives bids grading, paving and curbing Olyphant Ave. from Boulevard Ave. to East Parker St., sheet asphalt and stone blocks on concrete base. About $28,904. W. A. Schunk, city engr.

W. Va., Madison—Boone Co. voted $146,000 bonds to grade 10 mi. road from here to Clothier. J. P. Blunder, co. engr. Noted June 3.

N. C., Reidsville—Rockingham Co. plans to top soil 6 mi. Greensboro-Danville Rd., 16 ft. wide. About $30,000.

O., Cincinnati—City soon receives bids paving 3,000 ft. Freeman Ave. from Kenner to Central Sts., 36 ft. wide, granite block, cost $105,000; 3,000 ft. Eastern Ave. from Ferry to Lavender Sts., 40 ft. wide, granite block, $300,000; 4,600 ft. Central Ave. from Liberty to Colerain Sts., 36 and 40 ft. wide, granite block or wood block, $135,000; grading, curbing, draining, paving and laying 6 in. water mains in 1 mi. Hamilton Ave. from Belmont to North Bend Rd., 40 ft. wide, granite block, $225,000.

O., St. Clairsville—Belmont Co. plans to pave 2 mi. Colerain Pike, 16 ft. wide, concrete. About $72,000. L. Darrah, co. engr.

O., Fremont—City passed ordinance to pave Buchanan, Howland and Pine Sts. About $7.47 per ft.

Mich., Detroit—City soon receives bids furnishing labor and material grading, shaping and paving Lycaste Ave. from point 100 ft. south of Detroit Terminal R.R. to southerly terminus, 26 ft. wide, granite block on 8 in. concrete foundation, Amherst, Medina or Berea curbstone, cost $62,029; Alter Rd. from Lakeside Drive to Jefferson Ave. and Lafayette Ave. from Green to Springwells Aves., 26 ft. wide, sheet asphalt on 8 in. concrete foundation, Amherst, Medina or Berea curbstone, $116,111 and $35,770 respectively; Coplin Ave. from Kercheval Ave. to point 712 ft. north of Charlevoix Ave. and Joy Rd. from Linwood to Grand River Aves., 26 ft. wide, sheet asphalt on 8 in. concrete base, $53,710 and $156,150 respectively; alley between 2d and Cass Aves. and Stimson and Brainard Sts., also alley between 18th, 17th, Howard and Porter Sts., 20 ft. wide, new 1 course concrete, 2 x 6 in. retaining plank, Medina headers, $8,010 and $6,090 respectively; east and west alley between Lawton, Linwood, Pingree and Blaine Aves., 20 ft. wide, and east and west alley between Fisher, Crane, Mack and Sylvester Aves., 18 ft. wide, new 1 course concrete, $4,680 and $1,940 respectively. C. W. Hubbell, city engr.

Wisconsin — State Highway Comn., Div. Office 2, Stephenson Bldg., Milwaukee, rejected bids June 14, grading and paving Milwaukee-Fond du Lac Rd., Federal Aid Project 160, Menomonee Falls, also West Bend-Milwaukee Rd., Federal Aid Project 159, Washington Co. Work will probably be readvertised. Noted June 3.

Ia., Orange City—City plans to build 3 mi. road, involving 40,000 sq.yd. bitulithic pavement. About $100,000. K. C. Gaynor Co., 800 Guardian Life Bldg., St. Paul, Minn., engrs.

Minn., Alexandria — V. Thomas, aud. Douglas Co., rejected bids received June 1, building 7 mi. Federal Aid Project 131, State Rd. 1, 24 ft. wide. About $45,000. Work will be readvertised. Noted May 20.

Minn., Alexandria — V. Thomas, aud. Douglas Co., rejected bids received June 4, building 1.75 mi. State Rd. 5, County Job 2002, 24 ft. wide. About $25,000. Work will be readvertised. A. Webster, Alexandria, engr. Noted May 20.

Minn., Brainerd—Crow Wing Co. received no bids June 5, grading and graveling 12.5 mi. State Rd. 1, Div. "A," Job 1908. About $60,000. C. L. Motl, Brainerd, engr. Noted April 20.

Minn., Little Falls—Auditor Morrison Co. rejected bids received June 1, paving 10 mi. Federal Aid Project 154, 18 ft. wide, concrete. About $350,000. Work will be readvertised. J. E. Viner, Little Falls, engr. Noted May 20.

Mo., Paris—Monroe Co. plans to improve 5 mi. Paris-Louisiana Rd., involving 20,000 cu.yd. earth excav., 26,400 sq.yd. gravel surfacing and 4 rein.-con. culverts, cost $26,312; 7½ mi. Paris-Monroe Rd., 37,080 cu.yd. earth excav., 39,600 sq.yd. gravel surfacing, 8 rein.-con. culverts, and repair old bridge, $66,374.

Streets and Roads (Continued)

Ark., Harrisburg — Poinsett Co. soon receives bids grading and building culverts on 11.4 mi. and surfacing with gravel 10.7 mi. Ozark Trail Rd., 24 and 14 ft. wide respectively. Work involves 140,000 cu.yd. earth embankment, 21 acres clearing and grubbing, 400 lin.ft. concrete culverts and 88,000 sq.yd. gravel. Morgan Eng. Co., Goodwyn Institute Bldg., Memphis, Tenn., engrs.

Tex., Abilene—Taylor Co. having plans prepared grading and building rein.-con. and steel bridges on 11.36 mi. highway from Coleman Co. line to intersection of Highway 30, 24 ft. wide, involving 6.5 acres clearing and grubbing, 602.4 cu.yd Class "A" and 508.4 cu.yd. Class "B" concrete, 44,026 lb. reinforcing steel, 57,700 lb. structural steel, 45,000 cu.yd earth and 200 cu.yd rock excav., etc. About $66,140. R. W. McCargo, resident engr.

Tex., Bastrop—Bastorp Co., having plans prepared grading, surfacing and draining 8.814 mi. Highway 20-A, through Rd. Dist. 3, 14 ft. 8 in. wide, involving 5 acre clearing and grubbing, 21,120 cu.yd. embankment borrow, 16,080 cu.yd. gravel surfacing, 15,992 lb. reinforcing steel, 214.9 cu.yd. Class "A" and 185 cu.yd. Class "B" concrete, 11,495 cu.yd. earth excav., etc. About $68,993. A. F. Mitchell, Cameron, engr.

Tex., Canyon—Randall Co. having plans prepared paving and building rein.-con. culverts on 17.1 mi. Highway 33 from Canyon city to Deaf Smith Co. line, 24 ft. wide, involving 6,138 cu.yd. borrow and 85,759 lin.ft. grading. About $28,192. Nagle, Witt & Rollins, Amarillo, engrs.

Tex., Cleburne—Johnson Co. having plans prepared for grading, graveling and draining 13 mi. Highway 2-A from Burleson to Alvarado, 16 ft. wide, involving 40 acres clearing and grubbing, 1,280 cu.yd. 1:2:4 and 70 cu.yd. 1:2:3 concrete, 14,600 lb. reinforcing steel, 27,112 cu.yd gravel, 13,560 cu.yd. granite gravel, 68,600 cu.yd unclassified and 650 cu.yd. rock excav., etc. About $276,159. B. O. Whitcaker, Cleburne, engr.

Tex., Greenville—Hunt Co. having plans prepared grading, surfacing and draining 10.79 mi. Highway 1 from here to Commerce, via Neyland, 16 ft. wide, involving 8 acres clearing and grubbing, 556.3 cu.yd. Class "A" and 629.7 cu.yd. Class "B" concrete, 28,819 cu.yd. stone, 71,733 lb. reinforcing and 126,126 lb. structural steel, 75,520 cu.yd. unclassified excav., 95,691 gal. bituminous material, etc. About $298,430. A. D. Duck, Greenville, engr.

Tex., McKinney—Collin Co. election June 28, to vote on $60,000 bonds to build roads. J. B. Crockett, McKinney, co. engr.

Tex., Marshall—Harrison Co. having plans prepared grading, surfacing and draining 8.7 mi. Highway 8 from Marion Co. south to here, 12 ft. wide, involving 5 acres clearing and grubbing, 30,000 cu.yd. borrow, 15,000 cu.yd. earth and 200 cu.yd. loose rock excav., 3.33 mi. scarifying, 275 cu.yd. Class "A", 75 cu.yd. Class "B" and 50 cu.yd. Class "C" excav., 19,900 cu.yd. gravel, 22,000 lb. reinforcing steel, etc. About $92,895. G. A Duven, Marshall, engr.

Tex., Sinton—San Patricio Co. having plans prepared grading, surfacing and draining 15.517 mi. Highway 9, through Rd. Dist. 1, 16 ft. wide, involving 14.145 mi. machine grading, 9,303 cu.yd. earth borrow, 15,629 cu.yd. gravel and 27,389 cu.yd. shell surfacing, 2,768 lb. reinforcing steel, 24 cu.yd. Class "A" and 12 cu.yd. Class "B" concrete, 3,202 cu.yd. earth excav., etc. About $157,844. A. C. Pancoast, Beeville, engr.

Tex., Sinton — San Patricio Co. having plans prepared grading, draining, surfacing with gravel and shell and building steel bridges on 12.04 mi. Highway 9, Rd Dist. 5, 16 ft. wide, involving 7 acres clearing and grubbing, 560.8 cu.yd. Class "A" and 174.6 cu.yd. Class "B" concrete, 12,982 cu.yd gravel, 22,760 cu.yd. shell, 1,920 lin.ft. piling, 91,800 lb. structural steel, 38,368 lb. reinforcing steel, 32,703 cu.yd. earth excav., etc. About $191,549. A. C. Pancoast, Beeville, engr.

New Mexico — State Highway Dept., Santa Fe, received no bids June 2, building 10.859 mi. New Mexico Federal Aid Project 13-A, between Rio Puerco and Armijo, Valencia Co. Informal proposals will be considered L. A. Gillett, state highway engr.

Idaho, Caldwell—City plans to pave various streets. About $200,000. L. C. Kelsey, Nampa, consult. engr.

Utah, Beaver—Beaver Co. voted $125,000 bonds to build roads and bridges

Utah, Payson—City plans to pave Depot St., 40 ft. wide, bitulithic topping on concrete base. About $59,000. R. Manson, city clk. C. A. Swan, Provo, engr.

Utah, Provo—City plans to pave ½ mi. road, 40 ft. wide, bituminous macadam. About $52,000. C. A. Swan, city engr.

Utah, Salt Lake City—City plans to improve 7th and 8th East Sts., involving 3,600 lin.ft. concrete curbing and guttering, cost $40,000; pave 2.2 mi. North Temple St., also .35 mi. Stratford Ave., both 40 ft. wide with 5 in. bituminous on 5 in. concrete base, $85,000 and $25,800 respectively. S. Q. Cannon, city engr.

Wash., Arlington—City plans to build sidewalks and cross walks on main business streets, involving 38,910 lin.ft. 5 in. concrete sidewalk and cross walks, 7 ft. wide. About $67,260. F. Tegmeir, 1332 Grand St., Everett, engr.

Oregon—State Highway Comn., Portland, rejected bids received June 1, surfacing 9.35 mi. Elgin-Minam Sect., La Grande-Enterprise Highway, Union Co., involving 19,500 cu.yd. broken stone and 11,000 yd.-miles payhaul.

Cal., Los Angeles—Bd. Supervs. Los Angeles Co. receives bids latter part of July or beginning of August, improving 2.07 mi. 7th Ave., Rd. Dist. 166, near Puente, involving plain and rein.-con. paving, concrete curbing and guttering, rein.-con. and corrugated iron culverting, etc. A. M. McPherrin, clk.

Cal., San Diego—Common Council rejected bids received June 1, paving Lytton and Voltaire Sts., Chatsworth and Catalina Blvds. Work will be readvertised Noted April 1.

Cal., San Luis Obispo—City rejected bids grading and paving Higuera, Chorro and Monterey Sts., asphaltic surface. About $37,618. Work will be readvertised. W. B. Burch, San Luis Obispo, engr.

Quebec—Dept. of Rds., Quebec, soon receives bids building road from Magdalen River to St. Anne de Monts, Gaspe Co., waterbound macadam. About $840,000.

Ont., Ottawa—See "Sewers"

Ont., Toronto—City plans to grade 3 mi. Woodbine Ave. from Kingston Rd. to Gerrard St., also pave Walmer Rd. from Bridgman to Davenport Rds., involving 3,200 sq.yd. vitr. brick and 300,000 cu.yd earth excav. About $325,000. R. C. Harris, city engr.

BIDS DESIRED

Vermont—Until July 1, by State Highway Comn., Montpelier, building 4.03 mi. road in South Burlington and Shelburne, bituminous macadam, 4.07 mi. New Haven, Waltham and Ferrisburg, 0.71 mi. St. Albans, 0.73 mi. Barnet, waterbound macadam; 13.57 mi. Dorset, Mt. Tabor and Danby, 5.6 mi. Dumerston and 1.26 mi. East Montpelier, gravel. S. B. Bates, comr.; advertised in this issue.

Rhode Island—Until July 7, by State Bd. Pub. Rds., State House, Providence, rebuilding 2 mi. road, from point 1,000 ft. south of Nanaquaket Bridge extending south on Sakonnet Point Rd., Tiverton Twp.; advertised in this issue.

New York—Until July 2, by F. S. Greene, state highway comr., Capitol, Albany, improving road in Albany, Columbia, Dutchess, Fulton, Greene, Lewis, Oneida, Rensselaer, Ulster and Warren Counties; advertised in this issue.

N. Y., Amsterdam—Until July 6, by Common Council, paving Lyons and Van Der Veer Sts., involving 5,200 sq.yd. rein.-con. and 1,100 lin.ft. concrete curbing. T. J. Hazlett, city clk.; advertised in this issue.

N. Y., Auburn—Until July 12, by J. P. Jackel, city mgr., paving Orchard St. from James to South Division Sts.; advertised in this issue.

N. Y., Brooklyn—Until June 30, by E. Riegelmann, boro. pres., regulating, recurbing and paving with permanent asphalt on 6 in concrete foundation, roadway of Benson Ave. from 16th to 17th Aves., 55th St from 12th to New Utrecht Aves., regulating and paving with permanent asphalt on 6 in. concrete foundation, roadway of 65th St. from 11th to New Utrecht Aves., and East 15th St. from Ave. K to point about 286 ft. south, with preliminary bituminous macadam 6 in. thick, from point about 286 ft. south of Ave. K to Ave. L, regulating, grading, curbing and laying sidewalks on Carroll St. from Utica to Schenectady Aves regulating, paving and repaving with permanent grade 1 granite pavement on 6 in concrete foundation, roadway of Maspeth Ave. from Olive St. to Morgan Ave., also furnishing and delivering 7,300 cu.yd. 2½ in. broken trap rock and 2,700 cu.yd. trap rock screenings.

N. Y., Hudson Falls—Until July 7, by L. R. Lewis, village clk., paving John St., involving 3,800 sq.yd. concrete, etc.; advertised in this issue.

N. Y., St. George, S. I.—Until June 28, by C. D. Van Name, pres. Richmond Boro., repaving Richmond Rd. from Rockland Ave. to Amboy Rd., concrete. About $25,000.

N. Y., S. I., St. George—Until June 29, by C. D. Van Name, pres. Richmond Boro., repaving Rockland Ave. from point 1,100 ft. west of Manor Rd. to Richmond Rd., concrete.

N. J., Flemington—Until July 15, by Bd. Freeholders Hunterdon Co., building Lambertville-Ringoes Rd., Sections 1 and 2, Flemington-Ringoes Rd., Sect. 3, Whitehouse-Flemington Rd., Sections 4 and 5. Bids to be received in 2 groups. Group A comprising 1st and 2nd sections, Group B, 3rd, 4th and 5th sections. W. W. Foster, clk.; advertised in this issue.

N. J., Jersey City—Until June 29, by city, regulating and repaving with sheet asphalt on present stone and concrete foundation, roadway of Astor Pl. from Crescent to Summit Aves., Summit Ave. from Astor Pl. to Baldwin Ave., Baldwin Ave. from Summit Ave. to Prospect St. and Webster Ave. from Prospect St. to Paterson Plank Rd. About $500,000. F. Dolan, clk.

N. J., Jersey City—Until June 29, by City Comrs., improving Williams Ave. between Mallory Ave. and Bennett St., sheet asphalt on concrete foundation, also Congress St. between Summit Ave. and Paterson Plank Rd., old Belgian block. About $50,000 each. F. Dolan, clk.

N. J., Jersey City—Until July 7, by Hudson Co. Blvd. Comn., rebuilding Hudson Co. Blvd. between Fisher and Bergenline Aves. About $390,000.

Pa., Parnassus—Until July 6, by Boro. Secretary, improving Center Ave. from Puchety Creek Bridge to Riverview Drive, involving 2,500 cu.yd. excav., 700 lin.ft. storm sewers, 1,600 lin.ft. concrete curbing and guttering and 6,000 sq.yd. concrete paving. B. S. Dinsmore, New Kensington, engr.

Maryland—Until July 7, by State Rds. Comn., 601 Garrett Bldg., Baltimore, paving 1.94 mi. Belair Rd. from Old City Line to Hamilton Ave., Contr. BC-35; advertised in this issue.

Maryland—Until July 6, by State Rds. Comn., 601 Garrett Bldg., Baltimore, paving 2.1 mi. Philadelphia Rd. from end of sheet asphalt to New City Line, Contr. BC-34; advertised in this issue.

Maryland—Until July 6, by State Highway Comn., 601 Garret Bldg., Baltimore, graveling 6 mi. state highway from state road near Owensville toward Shadyside, Federal Aid Project 34, Contr. AA-15-A. J. N. Mackall, chn.; advertised in this issue,

Maryland—Until July 12, by State Highway Comn., 601 Garrett Bldg., Baltimore, paving 1.45 mi. Frederick Rd. from Old City Line to New City Line, Contr. BC-37. J. N. Mackall, chn.; advertised in this issue.

Maryland—Until July 12, by State Highway Comn., 601 Garrett Bldg., Baltimore, paving 2.75 mi. Harford Rd. from Old City Line to New City Line, Contr. BC-36. J. N. Mackall, chn.; advertised in this issue

S. C., Charleston—Until July 6, by J. H. Dingle, city engr., for 100,000 sq.yd. sheet asphalt paving; advertised in this issue.

Georgia—Until July 6, by State Highway Dept., at office of div. engr., Clark Co. Court House, Athens, building 1.36 mi. Athens-Monroe Rd., Federal Aid Project 4, Oconee Co., involving 3.21 acres clearing and grubbing, 15,877 cu.yd. common and 1,770 cu-yd rock excav., 5,000 cu.yd. top soil, 1,176 sta.yd. overhaul, 395 lin.ft. 18-24 in. drainage pipe, 27.16 cu.yd. Class "B" concrete in headwalls, also 30 ft. bridge over Griffeths Branch, involving 30.1 cu.yd. Class "A" and 7.8 cu.yd. Class "B" concrete, 229.6 cu.yd. cement rubble masonry, 220 cu.yd. wet and dry excav. and 5,675 lb. reinforcing steel.

Ky., Winchester—Until July 2, by Bd. Council, improving 75,000 sq.yd. streets asphalt, vitr. brick or concrete. G. T. Horine, city engr.; advertised in this issue.

O., Akron—Until July 9, by E. A. Zeisloft, dir. Pub. Serv., grading, paving and laying cement walks on 5 streets, also grading and laying cement walks on 12 streets involving 38,000 cu.yd. grading, 17,000 sq.yd. paving and 200,000 sq.ft. cement sidewalks; advertised in this issue.

O., Oak Harbor—Until July 2, by R. Gratop, village clk., grading, curbing and paving with concrete, Maple St. from Water to Portage Sts

Streets and Roads (Continued)

Illinois—Until July 7, by State Highway Dept., Springfield, paving 3,000 ft. state highway, Sect. B, Route 1, 16 ft. wide, Mason Co., involving 5,333 sq.yd. concrete and 1,908 bbl. cement, cost $13,091; 3,226 ft. Sect. E. Route 7, 10 ft. wide. Lawrence Co., 3,585 sq.yd. concrete, 10.2 cu.yd Class A concrete and 1,138 bbl. cement, $9,854; 4,000 ft. Sect. I, Route 5, 16 ft. wide, Shelby Co., 7,111 sq.yd. concrete, 12.7 cu.yd. Class A concrete and 2,564 bbl. cement, $20,002; 4,400 ft. Sect. D, Route 1, 10 ft. wide, Ford Co., 4,889 sq.yd. concrete, 8.5 cu.yd. class A concrete, 1,768 bbl. cement and 640 lb. steel, $13,195; 4,150 ft., Sect. G, Route 2, 26 ft. wide, Jo Daviess Co., 11,988 sq.yd. earth, 46.1 cu.yd. Class A concrete, 68 bbl. cement and 1,922 lb. steel, $7,285. C. Older, ch highway engr.

Wisconsin—Until July 7, by State Highway Comm., Madison, grading and paving Lake to River Rd., Federal Aid Project 140, Iowa Co., involving 0.72 acre clearing and grubbing, 45,944 cu.yd. earth, 18,024 cu.yd. rock and 1,105 cu.yd. loose rock excav., 192 cu.yd. borrow, 455.93 cu.yd. Class "A" concrete, 513 sq.yd. concrete surfacing, 370 lin.ft. concrete curbing, etc.

Wis., Mayville—Until June 29, by city, improving Main, School and Bridge Sts., etc., involving 17,500 sq.yd. rein.-con., asphalt, vitr. brick, asphaltic concrete or bitulithic, 500 lin.ft. curbing and guttering and 8,000 cu.yd. grading. J. Donohue, North 8th St., Sheboygan, engr. Noted March 18.

Wis., Milwaukee—Until June 28, by Comr. Pub. Wks., paving sections of various alleys, Atkinson and 27th Aves., Ontario, 16th, 17th and Wells Sts.

Minn., Breckenridge—Until July 7, by P. E. Traux, aud. Wilkin Co., grading 19 mi State Rd. 2, Federal Aid Project 166, Div. "A", involving 26 acres clearing and grubbing and 32,120 cu.yd. overhaul. About $95,000. J. F. O'Meara, Breckenridge, engr. Noted Jan. 8.

Minn., Caledonia—Until July 1, by E. N. Newhouse, aud. Houston Co., grading and graveling 22 mi. road from here to LaCrescent, 24 ft. wide. About $132,000. C. D. Conzett, Caledonia, engr. Noted March 11.

Minn., Mora—Until July 14, by A. V. Sander, aud. Kanabec Co., grading and graveling 16 mi. Federal Aid Project 91, State Rd. 2, 24 ft. wide. About $112,000. R. C. Streetly, Mora, engr. Noted March 30.

Kan., Ft. Scott—Until July 13, by Bourbon Co., grading and constructing culverts on 6.5 mi. Jefferson Highway, Project 6-A, 18 ft. wide, cost $75,000, also building 3.6 mi. Kansas City Rock Rd., Project 5-B, 18 ft. wide, bituminous macadam. $100,000. B. Boyle, Ft. Scott, engr.

Kan., Garden City—Until July 23, by Finney Co., building 10.1 mi. Old Santa Fe Trail, Project 22, Sects. F, G, H and I, 18 ft. wide, including grading and culverting, brick or concrete. About $450,000. R. J. Ruckel, Garden City, engr.

Kan., Girard—Until July 2, by Crawford Co., grading and building culverts on 2.98 mi. Commercial Highway, Project 40-H-I, 18 ft. wide. About $30,000. W. J. Arnold, Girard, engr. Noted April 29.

Kan., Kansas City—Until July 9, by Wyandotte Co., grading and building culverts on 3.99 mi. Fort to Fort Highway, 52-A-D, 18 ft. wide. About $40,000. O. K. Williams, Kansas City, engr.

Kan., Kansas City—Until July 9, by Wyandotte Co. and Leavenworth Co. (Leavenworth), building 7.968 mi. Federal Aid Project, Fort to Fort Rd., south of Lansing, concrete. Cost between $300,000 and $400,000. W. Beggs, clk. Wyandotte Co. and J. E. Vorhèes, clk. Leavenworth Co.

Kan., Leavenworth—Until July 9, by Leavenworth Co., grading and building culverts on 4 mi. 52-B and 4.4 mi. 13-C, Fort to Fort Highway, 18 ft. wide. About $40,000 and $50,000 respectively. L. C. Clarke, Leavenworth, engr.

Kan., Lyons—Until July 7, by Rice Co., building 5 mi. brick highway on Old Santa Fe Trail, 26-B. About $300,000. S. Ainsworth, Lyons, engr.

Kan., Troy—Until July 12, by Doniphan Co., grading and building culverts on Pikes Peak highway, Project 53-ABC, 18 ft. wide. About $75,000. R. Atkins, Troy, engr.

Kan., Washington—Until July 8, by City Clerk, improving various streets, involving 18,141 sq.yd. pavement, 7,438 cu.yd. grading, 12,507 ft. combined curb and gutter.

Mo., Monticello—Until June 28, by Comrs. Lewis Co., building 7.94 mi. Red Ball Route Highway (La Grange Special Rd. Dist.), 24 ft. wide, Federal Aid Project 39, involving 30,882 cu.yd. earth and 650 cu.yd. rock excav., 5,692 cu.yd. borrow, 3,000 cu.yd. overhaul, 4.8 cu.yd. Class "A," 471.7 cu.yd. Class "B" and 94.1 cu.yd. Class "C" concrete masonry, 35,698 lb. reinforcement for concrete masonry, 177 lin.ft. 12-15 in. vitr. clay pipe, etc., cost, $87,335; building rein.-con. slab superstructure for Mitchell Bridge, to have two 20 ft. rein.-con. spans; 2 rein. con. abutments and 1 concrete pier, 3.9 Class "A," 104.7 cu.yd. Class "B" and 17.1 cu.yd. Class "C" concrete, and 8,500 lb. reinforcement.

Mo., Tarkio—Until June 28, by J. H. Capp, city clk., constructing 1,600 sq.yd pavement, Tarvia, concrete or brick; advertised in this issue.

Tex., Canadian—Until July 1, by W. D. Fisher, judge Hemphill Co., grading, surfacing and draining 13.41 mi. Highway 4 from here to Lipscomb, Federal Aid Project 158, involving 2.8 acres clearing and grubbing, 39,391 cu.yd. borrow, 48,721 cu.yd. earth, 1,866 cu.yd. solid rock and 823 cu.yd. loose rock excav., 157.2 cu.yd. Class "A", 280.9 cu.yd. Class "B", and 32.16 cu.yd. Class "C" concrete, 51.8 cu.yd. 1:2:3 bituminous concrete, 11,307 cu.yd. clay, etc. About $82,748. Hess & Skinner, Southwest Life Bldg., Dallas, engrs. Noted April 22.

Tex., Richmond—Until July 3, by C. H. Chernosky, judge Fort Bend Co., grading, surfacing and draining 13 mi. Highway 36 from Rosenberg to Austin Co. line, involving 14,975 cu.yd. earth borrow, 105,894 cu.yd. unclassified excav., 350.49 cu.yd. Class "A" and 323.68 cu.yd. Class "B" concrete, 71,000 gal. asphalt, 29,535 lb. reinforcing steel, 3,000 cu.yd. cover material, 29,758.95 cu.yd. gravel etc. About $250,126, including 10 per cent for engineering and contingencies. Gurley & Gurley, Union Natl. Bank Bldg., Houston, engrs.

Tex., San Angelo—Until June 30, by C T. Paul, judge Tom Green Co., grading surfacing and draining 10 mi. Highway 9 and 9-A, 16 ft. 9 in. wide, Federal Aid Project 145, involving 10,815 cu.yd. earth borrow and 19,627 cu.yd. earth excav. in roadway, 31,060 cu.yd. rock, 122.77 cu.yd. Class "A" and 70.52 cu.yd. Class "B" concrete, 163.31 cu.yd. 1:2:3 bituminous concrete, 2,097 cu.yd. cover material, 12,122 lb. reinforcing steel, 65,233 gal. bituminous material, etc. Cost $266,675. Former contract rescinded. J. A. Beavers, Son Angelo, engr. Noted June 17.

New Mexico—Until July 2, by State Highway Dept., Capitol Bldg., Santa Fe, building 15.41 mi. Federal Aid Project 34, including bridges, Rio Arriba Co., involving 42,490 cu.yd. Class 1, 3,148 cu.yd. Class 2 and 1,574 cu.yd. Class 3 excav., 2,500 cu.yd. borrow, 2,000 sta.yd. overhaul, 18,070 cu. yd. 1 course gravel surfacing, 1,276 lin.ft. 18-30 in. corrugated metal culvert, 78.38 cu.yd. Class "B" concrete in headwall, 27 cu.yd. Class "A" and 117 cu.yd Class "C" concrete, 2,750 lin.ft. concrete piling, etc. L. A. Gillett, state highway engr.

New Mexico—Until July 16, by State Highway Dept., Capitol Bldg., Santa Fe, building 32.411 mi. Federal Aid Project 18, including bridges, Eddy Co., involving 75,403 cu.yd. Class 1, 11,991 cu.yd. Class 1 (grader), 12,584 cu.yd. Class 2 and 1,144 cu.yd. Class 3 excav., 8,976 cu.yd. Class 1 and 8,650 cu.yd. Class 1 (grader) borrow, 12,668 sta.yd. overhaul, 186.2 cu.yd. cement rubble masonry, 2,030 lin.ft. 18-30 in. corrugated metal culvert, 136.04 cu.yd. Class "B" and 74 cu.yd. Class "C" concrete. L. A. Gillett, state highway engr.

New Mexico—Until July 6, by State Highway Dept., Capitol Bldg., Santa Fe, building 3.902 mi. Federal Aid Project 31, Sierra Co., involving 21,458 cu.yd. Class 1 excav., 429 cu.yd. Class 1 borrow, 7,753 sta.yd. overhaul, 4,578 cu.yd. 1 course gravel surfacing, 388 lin.ft. 18-24 in. corrugated metal culvert and 17.2 cu.yd. Class "B" concrete, etc.; 15,228 mi. Federal Aid Project 47, including bridges, Grant Co., 87,659 cu.yd. Class 1, 1,713 cu.yd Class 2 and 1,531 cu.yd. Class 3 excav., 2,480 cu.yd. Class 1 borrow, 22,455 sta.yd. overhaul, 271 cu.yd. cement rubble masonry, 2,372 lin.ft. 18-36 in. corrugated metal culvert, 257 cu.yd. Class "A," 165 cu.yd. Class "B" and 137 cu.yd. Class "C" concrete, etc. L. A. Gillett, state highway engr.

New Mexico—Until July 17, by State Highway Dept., Capitol Bldg., Santa Fe, building 15.065 mi Federal Aid Project 25, Curry Co., involving 50,426 cu.yd. Class 1 excav. 30,916 cu.yd., Class 1 borrow, 70,091 sta.yd. overhaul, 20,323 cu.yd. 1 course calliche surfacing, 52.90. cu. yd. Class "A," 202.4 cu.yd. Class "B" and 95.3 cu.yd. Class "C" concrete, etc.; 11,365 mi. Federal Aid Project 24, Roosevelt Co, 30,640 cu.yd. Class 1 excav., 6,225 cu.yd. Class 1 borrow, 36,335 sta.yd. overhaul, 40,004 cu.yd. 1 course caliche surfacing, 6.2 cu.yd. Class "A" and 29.2 cu.yd. Class "B" concrete, etc. L. A. Gillett, state highway engr.

New Mexico—Until July 10, by State Highway Dept., Capitol Bldg., Santa Fe building 15.084 mi. Federal Aid Project 32 including bridges, San Miguel Co., involving 95,691 cu.yd. Class 1 and 2,960 cu.yd. Class 3 excav., 8,649 cu.yd. Class 1 borrow, 22,275 sta.yd. overhaul, 3,210 lin.ft. 18-36 in. corrugated metal culvert, 188.4 cu.yd. Class "B," 56.6 cu.yd. Class "A" and 91.3 Class "C" concrete, etc.; 12,706 mi. Federal Aid Project 33, including bridges, Mora Co., 90,764 cu.yd. Class 1 and 11,822 cu.yd. Class 3 excav., 11,809 cu.yd. Class 1 borrow, 39,522 sta.yd. overhaul, 20,279 cu.yd. 1 course gravel surfacing, 1,336 lin.ft. 18-36 in. corrugated metal culvert. 229 Class "B," 331 cu.yd. Class "A" and 860 cu.yd. Class "C" concrete etc. L. A. Gillett, state highway engr.

Utah, Payson—Until June 30, by city, paving 1.25 mi. 1st West St. to city limits, 20 ft. wide, plain concrete, bitulithic on concrete base, or crushed rock base. About $52,500.

Ore., Hood River—Until July 7, by Hood River Co., building 1.04 mi. concrete road between here and Odell. L. N. Blowers, co judge.

Cal., San Diego—Until June 30, by Bd. Supervs. San Diego Co., concrete paving 7½ mi. Chula Vista-Corondo Rd., also 9½ mi. El Cajon-Foster Rd. Noted June 10.

Cal., San Diego—Until July 1, by Bd. Supervs. San Diego Co., improving 4½ mi. Wynola Julian Rd., and 9½ mi. south from Escondido (5 alternate bids).

Que.—Until July 10, by B. Michaud, deputy minister of highways, Quebec, building 7 mi Chemin de front du Bord de L'Eau, 20 ft wide, gravel and waterbound macadam. About $75,000.

Que., St. Davids—Until July 3, by L. W. Joyal, secy. treas., building 2 mi. Chemin de Eglise, 14 ft. wide, macadam and concrete. Dept. Rds., Quebec, engr.

Que., St. Lambert—Until July 1, by town, building 2½ mi. Cote Noir Rd., 18 ft. wide bituminous macadam. About $75,000. E. Drinkwater, engr.

B. C., Victoria—Until June 28, by Dept Pub. Wks., building 5.66 mi. Sirdar-Kuskanook Rd., 14 ft. wide, involving 17.2 acres clearing, 7,000 cu yd. earth and 3,000 cu.yd. rock excav., 487 yd. gravel and 1,200 lin ft. earth gutters. About $25,000. A. E. Foreman, Dept. Pub. Wks., engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

New Hampshire—State Highway Comm., Concord, received only bid June 2, building 3.6 mi. gravel highway, Tuftonboro Twp., from Vogel & Hadley, Manchester, $56,744. Noted May 27.

★Massachusetts—State Highway Comm., Boston, let contract building Acton-Littleton Rd., to G. E Greenough, South Acton $98,874. Noted June 17.

Mass., Boston—City received bids June 14, paving Charles St. from Fruit to Allen Sts., wood block, from J. McCourt Co., 40 Wait St., Brookline, $17,972; J. Doherty, $18,386; Coleman Bros., Chelsea, $18,858. Archdale Rd. from Farquhar to McCraw Sts., (1) Topeka, (2) asphalt, from M. DeMatteo, 154 Dudley St., Roslindale, (1) $27,165, J. Landis, (1) $28,831, Central Constr. Co., 228 Southhampton St., Roxbury, (2) $31,573.

★Mass., Boston—City let contract grading, draining and building walks on Eagle Hill Reservoir, East Boston, to D. M. Biggs, $32,245. Noted June 17.

★Mass., Quincy—City let contract repaving 18 ft. track area in Hancock St., asphalt, to W. J. Barry, 439 Ashland St., Roslindale, $70,895. Noted May 27.

★Rhode Island—State Bd. Pub Rds., State House, Providence, let contract rebuilding 2.29 mi. State Highway, North Kingstown, beginning 150 ft. south of Talbot's Corner, near Wickford Village and extending south on Post Rd., to Powers Bros., 167 North Montello St., Brockton, Mass., $103,932. Noted May 27.

★R. I., Bristol—Town let contract building concrete highway on Main St., to Callan Constr. Co, Bristol About $70,000.

New York—F. S Green, state highway comr., Capitol, Albany, received bids June 7, repairing roads in following counties: (a1) Orange Co., Rd. 312, (a2) Rd. 157. (b1) Suffolk Co., Rd. 693, (b2) Rd. 5300. (c) Albany Co., Rd. 5237, (d) Rensselaer Co., Rds. 10 and 25, (e) Jefferson Co., Rd. 182, (f) St. Lawrence Co., Rd. 1032, (g) Montgomery Co., Rd. 303, (h) Broome Co.,

Streets and Roads (Continued)

Rd. 126, (i) Steuben Co., Rd. 5253, (j) Tioga Co., Rd. 5215, (k) Chemung, Schuyler, Tioga and Tompkins Counties, Rds. 28, 355, 916, 1311, 1378, 5432, 999, 1005, 1190, 1420, 5335, 5432, 1232, 845, 927, 1078, 1079, 5257, 5471, 454, 455, 606, 1001, 1004, 1132, 5467, (l) Erie Co., Rds. 530 and 531, from Schunnemunk Contr. Co., Highland Mills, (a1) $170,583, (a2) $150,424; H. J. Mullen Contg. Co., Inc., Fulton St., Jamaica, (b1) $152,407, (b2) $43,884; Fleming, O'Brien & McEntegart, Inc., 401 West 59th St., New York City, (b1) $154,623, (b2) $45,507; Willite Rd. Constr. Co., 51 Chambers St., New York City, (c) $23,320; H. W. Roberts & Co., 610 Lansing St., Utica, (d) $85,207, (e) $104,152, (h) $71,134; J. E. Flood, Hudson Falls, (d) $85,467; W. J. Semper, Watertown, (e) $104,398, (f) $78,671; A. F. McConville, Ogdensburg, (f) $75,237; Spellman Oliver Co., Lake St., Chateaugay, (f) $76,668; Dale Eng. Co., Inc., Mann Bldg., Utica, (f) $77,438; L. D. Sullivan Co., Inc., Utica, (g) $48,346; R. Wemple, Fulton, (g) $51,652; J. P. Dugan & Co., Inc., Amsterdam, (g) $52,201; Lane Constr. Co., 37 Colony St., Meriden, Conn., (h) $70,738, (j) $43,981; Holloran Bros., Elmira, (i) $36,467; A. A. Howard, Fairport, (i) $36,876; J. W. Gurnett, Watkins, (i) $37,031, (k) $45,244; N. E. Young, Union, (j) $41,618; W. Hazard, Ithaca, (k) $45,569; J. J. Crouch, Watkins, (k) $46,926; Lathrop, Shea & Henwood Co., Ellicott Sq., Buffalo, $37,661. Noted May 20.

N. Y., Brooklyn—Park Bd., at office of Dept. Parks, Municipal Bldg., New York City, received bids June 10, furnishing labor and material improving Ocean Traffic Rd., sheet asphalt, from Brooklyn Alcatraz Asphalt Co., 407 Hamilton Ave., $99,788; Consolidated Asphalt Paving Co., 52 9th St., $103,578; Uvalde Asphalt Paving Co., 1 Bway., New York City, $101,780. Noted June 3.

★N. Y., Brooklyn—E. Riegelmann, boro. pres., let contract repaving Bedford Ave. from Heyward St. to DeKalb Ave., and from Quincy St. to Atlantic Ave., also paving West 25th St. from Mermaid to Neptune Aves., to Consolidated Asphalt Paving Co., 52 9th St., $79,372, $60,145 and $14,285 respectively; Bedford Ave. from Atlantic Ave. to Sterling Pl., to Uvalde Asphalt Paving Co., 1 Bway., New York City, $80,718; building sidewalks on Union St., to T. Bernhardt, $753. Noted June 10.

N. Y., College Point (Flushing P. O.)—M. E. Connolly, pres. Queens Boro., Long Island City, received bids June 21, repaving (a) 3rd Ave. from 1st to 13th Sts., (b) 5th Ave. from 21st St. to Whitestone Line, (c) 7th Ave. from 13th to 16th Sts., (d) 7th Ave. from 18th St. to Flushing Line, (e) Grand Ave. from Hopkins to Main Sts., (f) Grandview Ave. from Stanhope to Lincoln Sts., (g) Steinway Ave. from Flushing to Winthrop Aves., (h) regulating and grading southerly side of Boulevard from Beach 35th St. to bridge over Nortons Inlet, (i) 223rd St. from Hempstead Ave. to 105th St., (j) 104th Ave. from Farmers Blvd. to Hollis Ave., from H. J. Mullen Co., Fulton St., Jamaica, (a) $86,150, (b) $31,330, (d) $49,965, (j) $6,535; Kennedy & Smith, (a) $113,075, (g) $249,888, (h) $296; Tuohy & Upton, 90 Main St., Flushing, (b) $32,523, (d) $55,129, (i) $7,100; Peace Bros., 20 Main St., Flushing, (b) $32,790, (d) $57,920, (h) $300, (i) $2,570, (j) $6,700; Uvalde Asphalt Paving Co., 1 Bway., New York City, (c) $22,525, (e) $23,416, (f) $43,050; Sicilian Asphalt Paving Co., 41 Park Row, New York City, (e) $23,416, (f) $43,055; Cleveland Trinidad Paving Co., Flushing, (c) $23,597, (e) $23,198, (f) $43,950; Astoria Contg. Co., 169 Hunters Ave., Astoria, (g) $231,267; R. A. Hess, (h) $236; C. Kurth, 917 Forest Ave., Ridgewood, (i) $1,678. Noted June 17.

N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., received bids June 18, regulating and grading roadway of Jackson Ave. from Junction Ave. to 51st St., also regulating and repaving outside railroad franchise area, etc., from Sicilian Asphalt Paving Co., 41 Park Row, New York City, $195,838 and $198,838 respectively; Uvalde Asphalt Paving Co., 1 Bway., New York City, $200,759 and $203,759 respectively. Noted June 10.

N. Y., New York—H. H. Curran, pres. Manhattan Boro., received bids June 18, repairing and restoring wood block and granite block pavements and foundation in railroad area, from Casper Helbroock Co., $78,540; W. J. Fitzgerald, 547 West 45th St., $109,050. Noted June 10.

★N. Y., New York—H. H. Curran, pres. Manhattan Boro., let contract paving and improving in railroad area when and where directed, also 72nd St., to Cleveland Trinidad Paving Co., Flushing, $173,400 and $17,309 respectively; Lexington Ave., 48th and 49th Sts., to Sicilian Asphalt Paving Co., 41 Park Row, $18,226, $3,036 and $3,362 respectively; 54th St., to Asphalt Constr. Co., 2197 Madison Ave., $11,075; 8th Ave., to J. L. Brusstar, Harlem River and 150th St., $107,478; 2nd Ave., to C. Helbroock, $25,285; Church St., to W. J. Fitzgerald, 547 West 45th St., $50,181. Noted June 3.

N. Y., S. I., St. George—C. D. Van Name, pres. Richmond Boro., received bids June 15, repairing with wood block pavement roadway of (a) Richmond Ave. from Richmond Terrace to south property line, (b) Richmond Terrace from York Ave. to Sailors Snug Harbor Dock, from J. Johnson Sons, (a) $31,182, (b) $26,720; Arco Constr. Co., (b) $28,741. Noted June 10.

★N. J., Montclair—City let contract paving and curbing Melrose Pl., to Standard Bitulithic Co., 50 Church St., New York City. About $48,000. Contract subject to the adoption of appropriation.

★N. J., Red Bank—City let contract, concrete paving 1 mi. Broad St., to Standard Bitulithic Co., 50 Church St., New York City, $102,023. Noted May 20.

Pennsylvania—State Highway Dept., Harrisburg, received bids June 15, paving roads in counties as follows:

Beaver Co., 1,606 ft. Route 77, Sect. 2 Rev. "L," from P. F. Connolly, Boston, $58,828; W. M. Keesecker and E. J. Kane, 1818 Wilson Ave., Youngstown, O., $61,979; J. C. Devine Co., Alliance, O., $65,386.

Bedford Co., 54,218 ft. Route 46, Sections 1 and 2, Providence and Hopewell Twps., from Union Paving Co., 30th and Locust Sts., Phila., $561,326; L. E. Kelly, 189 Montague St., Brooklyn, N. Y., $622,242.

Clarion Co., 3,203 ft., Shippenville Boro., from Red Bank Constr. Co., Inc., New Bethlehem, $66,632.

Clinton Co., 3,928 ft. Route 105, Chapman Twp. and Renova Boro., from T. E. Neylon, 217 9th St., Renova, $88,875.

Cumberland Co., 13,520 ft. Route 34, East Pennsboro Twp., from Ward & Tully, Inc., 2047 West 11th St., Brooklyn, N. Y., $279,809.

Delaware Co., 2,635 ft. Route 133, Upper Darby Twp. and Millbourne Boro., from C. E. Weed., Inc., Albany, N. Y., $36,084; W. C. Evans, Ambler, $37,942.

Jefferson Co., 1,684 ft. Route 64, Brookville Boro., from S. Van Shields, Brookville, $41,736; Humphrey, Sayer & Thompson, Brookville, $44,931.

Luzerne Co., 17,575 ft. Route 4, Sect. 4, Salem Twp., from Summit Contg. Co., 120 Broad St., Elizabeth, N. J., $241,566; Ward & Tully, Inc., 2047 West 11th St., Brooklyn, N. Y., $263,515; Sutton & Corson Co., 9th and Simpson Sts., Ocean City, N. J., $280,116.

Lycoming Co., 52,520 ft. Route 21, Sect. 4, Jackson, Cogan House and Lewis Twps., from Keystone State Constr. Co., Franklin Bank Bldg., Phila., $984,800; Porter Bros., Mt. Pocono, $1,007,688; Winston & Co., Muncy, $1,042,181.

Northampton Co., 7,441 ft. Routes 165 and 166, Bangor Boro., from C. E. Weed, Inc., Albany, N. Y., $110,673; R. D. Richardson Constr. Co., 828 Connell Bldg., Scranton, $116,361; Fish, Rutherford, Inc., 536 Real Estate Trust Bldg., Phila., $123,082.

Pike Co., 4,508 ft. Routes 8 and 167, Milford Boro., from H. B. Sproul Constr. Co., Inc., 218 Adams Ave., Scranton, $49,602.

Tioga Co., 42,052 ft. Route 196, Sections 1 and 2, Richmond and Tioga Twps., from F. L. Cohen, Inc., 1002 Prudential Bldg., Buffalo, N. Y., $590,557; Warren Bros. Co., 142 Berkeley St., Boston, $650,812; Adams, Evans & Co., 709 6th Ave., New York City, $691,228.

Venango Co., 50,025 ft. Route 233, Sect. 1, Victory and Sandy Creek Twps., from State Constr. Co., foot of 5th St., New Kensington, $804,689; C. F. Hamilton, Inc., 423 Trust Co. Bldg., Franklin, $829,401.

Washington Co., 34,837 ft. Route 115, Mt. Pleasant and Smith Twps., from S. Gamble Co., Carnegie, $175,646.

Westmoreland Co., 32,047 ft. Sect. 1, Derry Twp., from McCrady Bros. Co., 308 6th St., Braddock, $187,193; J. F. Casey, 935 Union Arcade Bldg., Pittsburgh, $492,090, also 2,609 ft. Route 118, Arona Boro., from J. Q. Dick, Scottdale, $10,550. Noted May 20.

Pennsylvania—State Highway Dept., Harrisburg, received bids June 16, paving roads in counties as follows:

Bedford Co., 20,870 ft. Route 46, Sect. 3, Hopewell Twp., from Union Paving Co., 30th and Locust Sts., Phila., $268,852.

Beaver Co., 26,953 ft. Route 204, Sect. 3, Darlington Twp. and Boro., from W. M. Keesecker and E. J. Kane, 1818 Wilson Ave., Youngstown, O., $414,297; Chester Genl. Contg. Co., P. O. Box 781, East Liverpool, O., $435,603; J. C. Devine Co., Alliance, O., $437,510.

Cumberland Co., 18,268 ft. Applications 231 and 391, East Pennsboro Twp. and West Fairview Boro., from Awixa Corp., $224,984.

Fayette Co., 14,496 ft. Route 247, Sect. 3, Perry and Jefferson Twps., from Petriello Bros. & Co., Brownsville, $250,183.

Jefferson and Clarion Counties, 39,261 ft. Route 64, Sections 2, 3 and 4, Corsica Boro., Union and Clarion Twps., from L. E. Kelly, 189 Montague St., Brooklyn, N. Y., $509,843; Red Bank Constr. Co., Inc., New Bethlehem, $574,195.

Northumberland Co., 26,200 ft. Route 161, Sect. 2, Shamokin, Rockefeller and Upper Augusta Twps., from Sutton & Corson Co., 9th and Simpson Sts., Ocean City, N. J., $326,035.

Tioga and Lycoming Counties, 72,004 ft. Route 21, Sect. 3, Hamilton, Bloss, Liberty and Jackson Twps. and Liberty Boro., from Porter Bros., Mt. Pocono, $1,255,633.

Pike Co., 3,549 ft. Route 8, Matamoras Boro., from H. B. Sproul Constr. Co., Inc., 218 Adams Ave., Scranton, $35,155.

Union Co., 5,960 ft. Route 176, Application 718, Gregg Twp., from T. L. Evans Sons, 344 Ferry St., Danville, $69,311; Fish, Young & Parks, 441 Hansbury St., Phila., $70,168; H. A. Moore Co., Inc., 66 Bway., Milton, $72,864.

Venango Co., 19,033 ft. Route 208, Sect. 1, Sandy Creek and French Creek Twps., from M. Dolan, 35 Fairmount Ave., Jamestown, N. Y. (1 course rein.-con.), $209,993; C. F. Hamilton, Inc., 423 Franklin Trust Co. Bldg., Franklin (bituminous macadam), $223,643; State Constr. Co., foot of 5th St., New Kensington (1 course rein.-con.), $239,524.

Westmoreland Co., 13,625 ft. Application 965, Derry Twp., from M. Bennett & Sons, Indiana, $190,931; McCrady Bros. Co., 308 6th St., Braddock, $206,121. Noted May 20.

★Pa., Pittsburgh—City let contract rebuilding and improving main approach to Allegheny County Soldiers Memorial, on 5th Ave., to North Side Constr. Co., 6939 Hamilton Ave., $29,929.

★Pa., Roslyn Farms (Carneigie P. O.)—Boro. let contract macadamizing various streets, involving 7,650 sq.yd. slag macadam, 6,800 lin.ft. stone guttering and 3,500 cu.yd. earth excav., to C. E. Worrel, Parnassus. About $30,000.

★Pa., Somerset—City let contract paving 4,000 ft. Stoyestown Rd. and Catherine St., 22 ft. wide, concrete on 5 concrete base, to Keller & Ferner, Somerset, $4.50 per sq. yd.

★W. Va., Charles—Kanawha Co. let contract grading and building bridge on 1.94 mi. Elk River Rd., to Brown & Floyd, 70 Lowenstein Bldg., $71,528.

★O., Columbus—Comrs. Franklin Co. let contract grading, constructing bridges and culverts and paving 1.87 mi. Elliott Rd., 16 ft. wide, macadam, to W. O. Jewett, Plain City, $54,260. Noted June 3.

Mich., Detroit—City received bids grading, excavating and paving with new 1 course concrete, 2 x 6 in. retaining plank and Medina headers (a) Alley 1,162 between Chicago Blvd., 12th, Wilson and Longfellow Aves., 20 ft. wide, (b) 1,163 between Seminole, Iroquois, Warren and Moffat Aves., 20 ft. wide, (c) 1,164 between Townsend, Baldwin, Canfield and Forest Aves., 18 ft. wide, (d) 1,165 between Holcomb, Belvidere, Charlevoix and Goethe Aves., 18 ft. wide, (e) 1,166 between Fisher, Crane, Canfield and Forest Aves., 18 ft. wide, (f) 1,167 between 12th, Wilson, Edison and Longfellow Aves., 20 ft. wide, (g) 1,168 between Pennsylvania, Cadillac, Waterloo and Charlevoix Aves., 20 ft. wide, (h) 1,169 between 14th, 12th and Euclid Aves. and Virginia Park, 18 ft. wide, (i) 1,170 between John R. and Brush Sts., Englewood and Woodland Aves., 20 ft. wide, (j) 1,171 between Concord, Canton, Waterloo and Charlevoix Aves., 18 ft. wide, (k) 1,172 between Cratiot, Elmwood, Ludden and Mack Aves., 20 ft. wide, (l) 1,173 between Grand River, Avery and Alexanderine Aves., 18 ft. wide, from Otis Cement Constr. Co., 806 Hammond Bldg., (a) $7,847, (b) $8,686 (c) $6,915, (d) $7,664, (e) $6,625, (f) $7,684, (g) $7,068, (h) $8,524, (i) $8,043, (j) $7,644, (k) $1,723, (l) $1,723; R. J. Powelson & Co., 1577 Iroquois Ave., (a) $7,446, (b) $8,337, (c) $6,889, (d) $7,621, (e) $6,593, (f) $7,301, (g) $6,835, (h) $8,656, (i) $7,853, (j) $7,367, (k) $2,968, (l) $1,752; T. E. Currie, 20 McGraw Bldg., (b) $7,850, (d) $6,949, (g) $6,162; Lester & Shepard, 400 Penobscot Bldg., (c) $6,525, (e) $6,337, (j) $7,224; R. A. Mercier, 746 Hudson Ave., (i) $7,708, (k) $2,922, (l) $1,636.

Streets and Roads (Continued)

★Kan., Fredonia—Wilson Co. let contract hauling and spreading gravel surfacing on 25 mi. Capitol Highway, Project 43, 16 ft. wide, involving 47,100 cu.yd. gravel to C. C. Baker, Humboldt, $151,780. Noted Feb. 5.

Kan., Garden City—Finney Co. received bids grading, paving and culverting 17.6 mi. Old Santa Fe Trail, Project 22, Sects. A, B, C, D and E, 18 ft. wide, from M. R. Ammermann, Wichita, $39,600 per mi.; A. L. Cook, Ottawa, for excav., $0.54, and borrow $0.48 per cu.yd.

★Kan., Wellsville—City let contract grading and paving 19,200 sq.yd. various streets, 8 in. concrete base, to Cock & Stucker, Ottawa. About $69,000. Noted June 10.

★Montana—State Highway Dept, Helena, let contract improving 1.995 mi. Lower Polytechnic Highway, concrete, Federal Aid Project 52, Yellowstone Co., to F. Soner, Great Falls, cost, $93,586; 0.703 mi. Railroad Ave. and Division St., concrete, Federal Aid Project 69, Whitehall Twp., to L. F. Lepp, Whitehall, $31,963; 18.47 mi. Grass Range Roundup Highway, earth, Federal Aid Project 27-28, Fergus Co., to Walker & Anderson, Roundup and Security Bridge Co., Billings, total, $136,592; surfacing 12.64 mi. Chinook-Havre Highway, gravel, Fed-Eng. Co., Chinook, and Buell Bridge Co., Missoula, $152,583; also building Savoy Creek Bridge, 75 ft. steel pony truss, Federal Aid Project 8, and Fifteen Mile Creek Bridge, 60 ft. steel truss, Federal Aid Project 81, both Blaine Co., to Buell Bridge Co., Missoula, $11,767 and $8,823 respectively.

★Mont., Kalispell—Comrs. Flathead Co. let contract clearing and grading 30 mi. road from Coram up South Fork of Flathead River in forest reserve, involving 60,000 cu.yd. common earth and 25,000 cu.yd. solid rock excav., 2,500 lin.ft. corrugated metal culverts, also building one 60 ft. queen truss bridge with five 40 ft. and three 30 ft. spans and several small stringer bridges, all made of logs, to Siems & Carlson, Realty Bldg., Spokane, Wash., About $200,000.

★Mo., Bethany—Comrs. Harrison Co. let contract building 9.39 mi. Sect. A, Jefferson Highway, 24 ft. wide, Federal Aid Project 8, involving 63,583 cu.yd. earth and 400 cu.yd. rock excav., 407 cu.yd. borrow, 389 cu.yd. Class "B" and 470 cu.yd. Class "C" concrete, 34,269 lb. reinforcement, 565 lin.ft. 15-24 in. vitr. clay pipe, etc., to F. D. Wilson & Co., Bethany, $74,876.

★Ark., Marion—Rd. Impvt. Dists. 7, 8 and 9, Crittenden Co., (Marion) and Ozark Trail Rd. Impvt. Dist., Poinsett Co. (Harrisburg) let contract hauling and gravel surfacing 110 mi. road, to G. H. Pride, 47 West 34th St., New York City.

★Tex., Eastland—Comrs. Eastland Co. let contract improving 150 mi. bituminous macadam highway, 20 mi. concrete and 39 mi. sand clay or gravel, to Fleming & Stitzer, Ranger. About $5,000,000, cost plus percentage basis. Noted May 27.

Tex., Eldorado—Comrs. Schleicher Co. received bids June 8, for (a) surfacing 7.3 mi. Highway 4, San Angelo-Sonora Rd., 16 ft. wide, involving 35,324 cu.yd. earth borrow excav. and 23,155 cu.yd. stone, (b) building drainage structures on same, involving 201.67 cu.yd. Class "A," 106.7 cu.yd. Class "B" and 55.3 cu.yd. 1: 2: 3 concrete, 17,009 lb. reinforcing steel, etc., from Schleicher Co., c/o C. A. Womack, judge, Eldorado, (a and b) $153,254; McCall-Moore Eng. Co., 308-309 Amicable Bldg., Waco, (b) $24,647.

Tex., Laredo—Comrs. Webb. Co. received bids June 7, surfacing and building rein.-con. drainage structures on 17.6 mi. Highway 12, Federal Aid Project 118, from B. S. Davidson, Houston, $145,423, W. T. Montgomery, Alamo Bank Bldg., San Antonio, $151,204, W. B. Kroeger and D. M. Basye, San Antonio, $156,749. Work involves 10 acres clearing and grubbing, 50 stations light clearing and grubbing, 81,038 cu.yd. borrow, 19,293 cu.yd. earth excav. in roadway, 1,000 cu.yd. loose and 500 cu.yd. solid excav., 1,563.88 cu.yd. Class "A," 333.17 cu.yd. Class "B," and 69.92 cu.yd. Class "C" concrete, 151,149 lb. reinforcing steel, etc. Noted June 3.

★Tex., Montague—Montague Co. let contract gravel surfacing and building rein.-con. culverts and steel bridges on 11,676 mi. Highway 2, Meridian Rd., to Montague Co., c/o W. T. Russell, co. judge, $98,195. Noted May 27.

Tex., San Antonio—Baxar Co. received bid June 8, surfacing 6.677 mi. Highway 2, Pearsall Rd., 18 ft. wide, Federal Aid Project 31, (a) trap rock, (b) Uvalde rock asphalt, from Ririe & Montondan, 223 South Pinto St., (a) $40,427; Chapin-Coglazier Constr. Co., Moore Bldg., (b) $41,367; Uvalde Rock asphalt Co., Swearingen Bldg., (b) $43,247. Noted June 3.

Tex., Van Horn—Culberson Co. received bids improving (a) 23.356 mi. Highway 12, Van Horn-Dougherty Rd., involving 58 acres clearing, and grubbing, 11,084 cu.yd. borrow, 12,750 lin.ft road grader work, 14.52 cu. yd. 1:3:6 concrete headwalls, and 1,716 cu.yd. gravel surfacing, (b) 43.167 mi. Highway 1, 35,000 cu.yd, ditching and hauling, and 30,200 cu.yd. gravel surfacing, from W. E. Hamilton, Mineral Wells, (a) $35,550, (b) $117,952; Thomas & Ratcliff, Rogers, (a) $35,402, (b) $123,226; Lee Contg.-Constr. Co., Lovington, N. M., (a) $41,816, (b) $120,577.

★Col., Ft. Collins—City will build 4,900 sq.yd. 6 in. rein.-con. pavement, 687 cu.yd. earth excav. and 610 lin.ft. concrete gutters, etc. Work will be done by day labor. Noted March 18.

★N. M., Raton—City let contract improving portion Impvt. Dist. 3, involving 42,000 cu.yd. excav. and 23,170 lin.ft. curbing and guttering, to Odell Bros., Raton. About $72,000.

Idaho—State Highway Dept., Boise, received bids June 5, grading and surfacing with crushed rock (a) 8.9 mi. Idaho-Pacific Highway from Pocatello to McCammon, 18 ft. wide, Federal Aid Project 15, (b) 9 mi. Idaho-Utah Highway from Downey to Franklin Co. line, 18 ft. wide, Federal Aid Project 17, Bannock Co., from Morrison & Knudsen, Railroad and Reclamation Aves., Boise, (a) $109,227, (b) $99,839; J. J. Carrol & Co., 1012 North 19th St., Boise, (a) $117,408, (b) $109,111. Noted May 27.

★Idaho—State Highway Dept., Boise, let contract grading 4.26 mi. Gooding-Rupert Highway between Jerome and Hazelton, 18 ft. wide, Jerome Co., involving 19,024 cu.yd. earth and 6,727 cu.yd. rock excav., 74 cu.yd. concrete, 2,578 lb. reinforcing steel and 670 ft. pipe culvert. to S. Smith, Jerome, $55,535. Surfacing above project with crushed rock will be done by force account.

★Utah, Manti—San Pete Co. and Emery Co. (Castle Dale) will grade and surface 51 mi. Salina-Emery Post Rd., 16 ft. wide, gravel or shale. About $60,000. Work will be done by day labor.

★Ariz., Florence—Pinal Co. Highway Comn. let contract grading 5 mi. Ray-Kelvin Rd., involving 45,678 cu. yd. rock and 9,638 cu.yd. earth excav., 550 cu.yd. dry rubble masonry, 2,800 ft. earth and rock ditches, etc., to B. H. Gallegher & Co., Phoenix, $82,861. Noted May 13.

★Wash., Port Angeles—City let contract grading and paving with concrete 1st St. from Lincoln to Valley Sts., to P. J. Woods & Co. Port Angeles, $77,740.

★Wash., Seattle—City let contract grading, building concrete walks, sewers et al on 41st Ave. et al, involving 8,925 lin.ft. concrete sidewalk, 27,000 cu.yd. earth excav., 2,500 lin.ft. 3 in. and 1,294 lin.ft. 8 in. sewer pipe, to Scalzo & Co., 1798 22nd Ave. S., $132,893.

Wash., Seattle—Comrs. King Co. received bids grading and graveling 2 mi. North Park Impvt. Club Rd., 24 ft. wide, from H. Pederson, 7307 Greenwood Ave., $68,500, F. Agostino Bros. Co., 1335 21st Noted May 27.

★Oregon—State Highway Comn., Portland, let contract paving Youngs Bay-Miles Crossing Sect., Astoria Seaside Project Coast Highway, 18ft. wide, involving 3,500 lin.ft., 7 in. concrete (mixer to be furnished by Highway Dept.), to Northwestern Constr. Co., Portland, $19,226; grading 6.9 mi. Mayville-Thirtymile Creek Sect. John Day River Highway, Gilliam Co., from Mayville to point about 6 mi. south of Condon, 91,500 cu.yd. excav., etc., to Copenhagen Bros., Yeon Bldg., Portland, iron pipe, $109,880; .2 mi. Ashland Overcrossing Approaches, Pacific Highway, about 3 mi. southeast of railroad section at Ashland, Jackson Co., to C. H. Natwick, Portland, $11,630; .9 mi. Ontario-Snake River Sect. Old Oregon Trail, Melheur Co., 8,350 sq.yd. 6 in. concrete paving, 3,500 cu.yd. excav., 465 lin.ft. culvert pipe, to Gilmore & Ritchie, Baker, $28,420; grading and surfacing 10.5 mi. Pilot Rock-Pendleton Sect., Oregon-Washington Highway, Umatilla Co., 58,000 cu.yd. excav., 80 cu.yd. concrete, 22,000 cu.yd. crushed gravel, etc., to Umatilla Co. Court, Pendleton, $112,224; also building 1 combined crossing over Spanish Gulch and Shaniko branch of Oregon Washington R.R. Navigation Co. on Columbia River Highway near Biggs, Sherman Co., 90 cu.yd. Class "B" concrete, 330 lin.ft. standard wooden trestle, etc., to Hord-Brooks Co., 737 Clatsop Ave., Portland, $19,799.

★Ore., The Dalles—City let contract paving 7½ blocks Bluff St., Lower West Link Dalles City-Columbia River Highway and widening Brewery Grade, to United Contg. Co., Northwest Bank Bldg., Portland, $27,605, $7,623 and $5,713 respectively; masonry work on Brewer Grade, to Tranzano Bros., The Dalles, $5,480.

California—State Highway Dept., Forum Bldg., Sacramento, received bids June 14, building Route 3, Sect. D, Div. 2, Federal Aid Project 42, Los Molinos to Red Bluff, Tehama Co., from L. S. Atkinson, Jr., 1124 5th St., Sacramento, $243,594. Work involves 50,000 cu.yd. excav. at $1.10 per cu.-yd., 14,300 cu.yd. Class "A" Portland cement concrete (pavements), $12.22, 400 cu.yd. Class "A" Portland cement concrete (culverts and monuments), $25, corrugated metal pipe, 1,200 lin.ft. 12 in., $1.00, 650 lin.-ft. 18 in., $1.25 and 600 lin.ft. 24 in., $1.50, etc. Noted May 27.

★Cal., Los Angeles—Bd. Supervs. Los Angeles Co. let contract improving 22,008 ft. Lancaster-Terra Bonita Rd., Rd. Impvt. Dist. 155, 18 ft. wide, involving 9,138 cu.yd. excav., 14,470 ton granite in 6 in. pavement, 270 ft. corrugated iron pipe, etc., to Rogers Bros. Co., 350 Merrick St., $68,900. Noted May 6.

Cal., Los Angeles—Bd. Supervs. Los Angeles Co. received bids building 2.43 mi. Rd. Impvt. Dist. 145, near Puente, 22 ft. wide, involving grading, 5 in. oil macadam paving, 540 ft. corrugated iron pipe culverting, etc., from C. W. Sparks, 257 South Lake St., $31,000; G. T. McLain, 1184 North Berendo St., $37,000; Rogers Bros. Co., 350 Merrick St., $37,800.

★Cal., San Bernardino—City let contracts to Los Angeles Paving Co., 2900 Santa Fe Ave., Los Angeles, improving 3rd St., involving 110,000 sq.ft. binder course and 2 in. Warrenite surfacing, at $0.205 per sq.ft. for surfacing, $12.50 per ton for binder material; also paving 2nd St., 20,000 sq.ft. 1½ in. Warrenite, $0.199. Noted April 8.

★Cal., Santa Monica—City let contract improving San Vicente Blvd., to J. D. Kneen Contg. Co., Dudley Bldg., $112,692, involving 461,139 sq.ft. grading at $.029 per sq.ft., 461,139 sq.ft. bitulithic paving, $0.199, 1,021 ft. cement curbing, $0.59 and radial brick storm drain, $6,950. Noted June 17.

★Cal., Seeley—City let contract paving 1 mi. main streets, 4 in. concrete, to G. H Oswald, 366 East 58th St., Los Angeles About $42,000.

★Cal., Visalia—Tulare Co. let contract grading and paving 6,507 mi. Orosi-Orange Cove Rd., involving 3,904 cu.yd. excav. and 6,393 cu.yd. concrete paving, to Davey & Kilmer, 32 Orange St., Long Beach, $48,305. Noted May 27.

★Ont., North Bay—Town let contract paving 1 mi. Main St., 42 ft. wide, bitulithic on concrete base, to Warren Bituminous Paving Co., McKinnon Bldg., Toronto. About $100,000. Noted May 6.

Railways

PROPOSED WORK

Tennessee—Tennessee Valley Iron & Ry. Co., Collinwood, plans to build 15 mi. line from Collinwood to Wayne furnace ore fields, to develop iron and timber resources.

Ontario—Canadian Pacific Ry., Windsor St., Montreal, Que., plans to build 4-6 mi. yard sidings, also 1 story, brick and wood freight shed at Windsor. About $450,000. W. Fairchild, engr.

Excavation and Dredging

PROPOSED WORK

Ark., Lake Village—Ditches—Eudora Western D. D. having plans prepared by Baxter Eng. Co., engrs, Moore & Turner Bldg., Little Rock, for 175 mi. ditches to drain 120,000 acres of land.

Ark., Readland—Ditches—Grand Lake D.D. receives bids about July 1, building 25 mi. ditches, 10-30 ft. bottoms, involving 750,000 cu.yd. dragline excav. Baxter Eng. Co., Moore & Turner Bldg., Little Rock, engrs.

BIDS DESIRED

Miss., Belzoni—Dredging—Until July 17, by Belzoni Drainage Comn., redredging 100 mi. drainage ditches, 14 ft. bottom. C. E. Miller, engr., Citizens Bank & Trust Co. Bldg.

Ky., Paducah—Drainage—Until July 6, by McCracken Co. Drainage Comrs., building Mayfield D. D. 1. J. W. Fry, pres.; advertised in this issue

Ia., Montezuma—Dredging—Until July 7, by C. H. Young ch. engr., Central States Eng. Co., Muscatine and W. C. McKee, aud. Poweshiek Co., building drainage improvements in Bear Creek D.D. 1 and 2.; advertised in this issue.

Excavation and Dredging (Continued)

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Miss., Greenville—Ditch—Riverside D. D. let contract building open ditch, with 6-10 ft. base, to reclaim area, here, involving 70,000 cu.yd. dryland dredge work, to Arpin Dredging Co., Grand Rapids, Mich., at $0.37½ and $0.45 per cu.yd.

Industrial Works

PROPOSED WORK

N. H., Portsmouth—Kendall, Taylor & Co., archts and engrs., 93 Federal St., Boston, soon lets contract building 2 story, 30 x 50 ft., brick and concrete boiler house and laundry and 15 x 30 ft concrete coal pocket, rein.-con. flooring, concrete foundation, for Portsmouth Hospital.

Mass., Boston—Edison Electric Illuminating Co., 70 State St., plans to build large 1 story power station on Bway Private plans.

Mass., Boston—Foss & Co., Inc., 595 Atlantic Ave., plans to build storehouse to replace one recently destroyed by fire. Loss $250,000. Private plans.

Mass., New Bedford—T. M. James, archt., 3 Park St., Boston, soon lets contract altering and building 3 story, brick and mill construction addition to plant, concrete foundation, on Church St. and Nash Rd., for W. C. Jones Co. About $75,000

Mass., Pittsfield—General Electric Co. soon lets contract building 1 story, 100 x 400 ft., brick, concrete and steel plant, concrete flooring and foundation. Private plans. Noted April 22.

R. I., Bristol—Jenks & Ballou, engrs., 1035 Grosvenor Bldg., Providence, soon let contract building 4 story, 100 x 130 ft., brick and mill construction addition to plant, rock or concrete foundation, for Cranston Worsted Co. About $100,000. Noted June 3.

R. I., Providence—Cudahy Packing Co., 346 Canal St., soon receives bids building 3 story, 40 x 100 ft., brick and rein.-con. packing plant, rein.-con. flooring, concrete foundation, on Canal St. About $50,000. Private plans.

R. I., Providence—Packard Motor Car Co., Bway. and 161st St., New York City, soon lets contract building 2 story, 190 x 205 ft., brick and rein.-con. garage, service station and salesroom, rein.-con. flooring, concrete foundation, on Plenty St., here. About $400,000. Private plans.

Conn., Meriden—I. Moskowitz, 3 Perkins St., having plans prepared by D. Bloomfield, archt., 52 Sherman Ave., for 3 story, brick and steel warehouse and freight elevator, concrete foundation. About $50,000.

Conn., Montville—R. Gair Paper Corp., Thomas River Div., soon lets contract building 2 story, 250 x 400 ft., plant and 1 story, 50 x 50 ft. power house, brick, concrete and steel, rein.-con. flooring, concrete foundations. About $500,000. Private plans.

Conn., Norwich—U. S. Finishing Co., Greenville, having plans prepared by Day & Zimmermann, archts. and engrs., 611 Chestnut St., Phila., rebuilding boiler plant. About $300,000.

N. Y., New York—J. M. Felson, archt. and engr., 1133 Bway., soon lets contract building 3 story, rein.-con. and steel garage and service station, rein.-con. flooring, concrete foundation, on Manhattan and 130th Sts., for S and Z Bldg. Co., care of architect. About $120,000.

N. Y., New York—J. W. Felson, archt. and engr., 1133 Bway., soon lets contract altéring brick, rein.-con. and steel garage, rein.-con. flooring, for S. Varschleisser, 215 East 67th St. About $50,000.

N. Y., Richmond Hill (Jamaica P. O.)—C. Bauer, archt. and engr., 788 Manhattan Ave., Brooklyn, receives bids about July 6, building 3 story, 60 x 100 ft., brick and steel factory, rein.-con. flooring, concrete foundation, here, for R. M. Krauser, c/o architect. About $80,000. Noted June 10.

N. Y., Yonkers—Yonkers Electric Light & Power Co. having sketches made by W. Whitehill, archt. and engr., 55 Duane St., New York City, for brick, concrete and steel substation, rein.-con. flooring, concrete foundation. About $150,000.

N. J., Newark—Clark Thread Co., Clark and Ogden Sts., soon lets contract constructing 4 story, 82 x 300 ft. and 5 story, 60 x 200 ft. additions to factory, concrete and brick. Private plans.

Pa., Phila.—Hale & Kilburn Corp., 18th and Lehigh Sts., having plans prepared by Day & Zimmermann, archts. and engrs., 611 Chestnut St., for altering plant, concrete and brick About $60,000.

Pa., Pittsburgh—Prest-O-Lite Co., 30 East 42nd St., New York City, receives bids about June 25, constructing additions

SUBWAY—NEW YORK, N. Y.

Bids were received by Transit Constr. Comn., 49 Lafayette St., for completion of Route 8, Sect. 2, of 14th St.-Eastern District Rapid Transit R.R., from (A) Patrick McGovern, 50 East 42nd St.; (B) Booth & Flynn, Ltd., 17 Battery Pl.; (C) Underpinning & Foundation Co., Inc., 290 Broadway. The unit bids were as follows:

	A	B	C
36,200 cu.yd. earth excavation above M.H.W.	$10 00	$12 47	$10 00
55,000 cu yd. back filling	7 75	2 25	10 00
35,800 cu.yd. earth excavation below M.H W	11 50	11 46	10 00
7,700 cu.yd. earth excavation above and below M H W for sewers, pipes and ducts	11 50	8 56	10 00
10,500 cu.yd. rock excavation	19 00	15 92	10 00
100 cu.yd. rock excavation for sewer pipes and ducts	19.00	14 54	10 00
1,700 fr ft. underpinning buildings less than seven stories	4 25	100 00	90 00
50 fr ft. underpinning buildings from seven stories to twelve	4 25	110 00	90 00
1,500 lin.ft. for protecting and securing building	4 00	110.00	90 00
27,600 cu.yd. concrete masonry in place	23 50	22 00	20 00
4,200 cu yd. protective concrete masonry	23 50	22 00	20 00
2,850 cu yd. rubblestone masonry	15 00	10 00	16 00
800 cu.yd. dry rubble masonry	11 00	5 00	10 00
50 cu.yd. brick masonry	38 00	40 00	40 00
70 cu.yd. hollow terra cotta brick tile masonry	33 40	41 00	40 00
1,000 bbl. Portland cement grout	6 50	7 50	10 00
1,000 lin ft. timber piles	1 00	2 00	5 00
2 M.ft.b.m. timber foundations	150 00	150 00	140 00
10 cu.yd. broken stone or gravel	5 50	7.00	9 00
26,900 sq yd. one-ply waterproofing	1 30	1 50	80
100 sq yd. two-ply waterproofing	1 85	1 95	1 25
18,150 sq.yd. three-ply waterproofing	2.40	2.50	2 00
100 sq yd. four-ply waterproofing	2 95	2.95	2 50
100 sq.yd. five-ply waterproofing	3 50	3.80	3 00
4,900 sq.yd. six-ply waterproofing	4.05	5 00	3 60
100 sq.yd. dry-ply waterproofing	80	1 00	80
4,300 cu yd. brick laid in asphalt mastic	50 00	50 00	60 00
50 lin.ft. 12-in. vitrified drain pipe	1 80	2 60	2 25
50 lin.ft. 10-in. vitrified drain pipe	1 55	2 40	2 00
50 lin.ft. 8-in. vitrified drain pipe	1 25	2.20	1 50
50 lin.ft. 6-in. vitrified drain pipe	70	1 85	1 25
300 lin ft. 4-in. vitrified drain pipe	60	1 65	1 00
100 lin.ft. 6-in. cast-iron drain pipe	2 50	3 05	3.00
100 lin ft. 4-in. cast-iron drain pipe	1 60	2.50	2 50
50 lin.ft. 10-in. cast-iron drain pipe	4 75	3.40	3 50
200 lin.ft. 3-in. cast-iron pipe, fittings and specials extra heavy	1.60	2.25	2 25
150 lin.ft. 4-in. cast-iron pipe, fittings and specials extra heavy	2.10	2.75	3 00
400 lin.ft. 6-in. cast-iron pipe, fittings and specials extra heavy	3.20	3.50	4 50
500 lin.ft. 8-in. cast-iron pipe, fittings and specials extra heavy	4.45	4.00	6 00
100 lin.ft. 3-in. galv. w.-i. pipe fittings and specials, extra heavy	1.60	2.00	1 50
100 lin.ft. 6-in. galv. w.-i. pipe, fittings and specials, extra heavy	4.00	4 50	3 00
131,560 duct ft. tunnel ducts	.20	.35	30
1,400 tons riveted steel (completion)	66.00	80 00	63 00
1,827 tons steel beams and shapes (completion)	66 00	80 00	63 00
50 tons steel rods and bars	130.00	200 00	200 00
157 tons steel rods and bars built in concrete (completion)	35 00	75 00	63 00
30 tons miscellaneous iron castings	110 00	170 00	300 00
2 tons miscellaneous iron furnishings for manholes and basins	140.00	170 00	3 00
1,130 lbs. special wire forms	15	.50	50
4,260 lin.ft. 1¾-in. hand rail	.50	.50	60
4,740 sq.ft. steel gratings	3.50	5.50	4 50
1,400 sq.ft. vault lights	2 50	2 25	2 40
7,770 sq.yd. restoration of sidewalks	2 00	4.00	3 75
10,770 sq.yd. asphalt pavement restoration	6 00	6.00	6.00
7,450 sq.yd. granite block pavement restoration	10.00	5.00	6 00
300 sq.yd. Belgian block restoration	10 00	4 00	6 00
850 lin.ft. bluestone curb in place	2 25	2 00	1 50
880 sq.yd. wooden block pavement	8 00	7.00	6 00
850 lin.ft. new 8-in. granite curb	4 00	7 00	3 00
6,100 lin.ft. ¾-in. conduits, w.-i.	45	.40	.25
300 lin.ft. 1½-in. conduits, w.-i.	1 00	1.00	.50
200 lin.ft. 2-in. conduits, w.-i.	1.50	2.00	80
5,000 lin.ft. 1-in. conduits, w.-i	70	75	40
800 cast-iron outlet boxes	1 50	1.00	2 00
10 cast-iron pull boxes	10 00	10 00	2.00
100 lin.ft. cast-iron pipe and fittings, 6-in. extra heavy	3 20	4 50	4 50
100 lin.ft. cast-iron pipe and fittings, 3-in. extra heavy	1 60	2 50	2 50
110 lin.ft. 12-in. vitrified pipe sewer	3 55	8 00	10 00
1,430 lin.ft. 15-in. vitrified pipe sewer	4 65	11.00	11 00
1,250 lin.ft. 18-in. vitrified pipe sewer	5 95	14 00	12 00
375 lin.ft. 20-in. vitrified pipe sewer	7 10	15 00	13 00
360 lin.ft. 22-in. vitrified pipe sewer	8 35	16 00	14 00
600 lin.ft. 24-in. vitrified pipe sewer	9 40	17 00	15 00
6 tons cast-iron sewer pipe, straight	140 00	80 00	150 00
4 tons cast-iron sewer pipe, special	260 00	160 00	250 00
1,550 lin ft. 3 ft. 6 in. by 2 ft. 4 in. egg-shaped sewer	11 20	25 00	20 00
650 lin.ft 4 ft. by 2 ft. 8 in. egg-shaped sewer	14 00	30.00	24 00
160 lin.ft. 4 ft circular sewer	19 50	25 00	25 00
160 lin.ft. 5-ft. circular sewer	26 00	25 00	42 00
8,430 lin ft. electric underground R.R. single track	12 00	10 00	15 00
260 lin.ft. independent motor R.R. single track	7 00	5 00	15 00
2 elevated R.R. col. supported on structure	1,800 00	1,750 00	13,000 00
2 elevated R.R. col. supported partly or off R.R. structure	1,800 00	2,000 00	13,000 00
2 elevated R.R. col. supported on R R. structure (completion)	1,500 00	1,750 00	8 000 00
2 elevated R.R. col. supported partly or off R.R. structure (completion)	1,500 00	2,000 00	8 000 00
110 lin.ft. 6-in. water pipe	80	1 00	50
3,050 lin.ft. 12-in. water pipe	1 50	2 00	1 00
1,710 lin.ft. 36-in. water pipe	4 50	6 00	4 00
115 lin.ft. 48-in. water pipe	6 50	8 50	5 00
70 service connections for water pipe	35 00	60 00	30 00
1,605 lin.ft. 4-in. cast-iron gas pipe	50	90	25
5,400 lin.ft. 6-in. cast-iron gas pipe	75	1 00	50
660 lin ft 8-in. cast-iron gas pipe	1 00	1 50	75
25 lin ft 12-in. cast-iron gas pipe	1 50	1.90	1 00
115 lin.ft. 16-in. cast-iron gas pipe	2 00	2 25	2 00
100 lin.ft. 18-in. cast-iron gas pipe	2 25	2 40	2 00
120 lin.ft 20-in. cast-iron gas pipe	2 50	2.50	3 00
100 lin.ft. 24-in. cast-iron gas pipe	3 00	4 50	3 00
7,720 lin ft 8-in. by-passing pipe w.-i	1 30	1.00	2 60
330 lin.ft. 12-in. w.-i. or riveted by-passing pipe	2 50	2.00	2 60
1,550 lin.ft. 16-in. w.-i. or riveted by-passing pipe	2 75	2.00	2 60
215 lin.ft. 20 in. w.-i. or riveted by-passing pipe	3 00	2.00	4 00
60 lin.ft. 24-in. w.-i. or riveted by-passing pipe	3 50	2 00	4 00
150 lin ft. 30-in. w.-i. or riveted by-passing pipe	4 00	2.00	5 00
810 lin.ft. type "B" cable suspension support by-passing pipe	8 40	12.00	2.00
115 lin ft. 8-in. w.-i. gas pipe, including all appurtenances	6 00	5.00	4 00
115 lin.ft 10-in. w.-i gas pipe, including all appurtenances	8 00	6 00	5 00
70 service connections for gas pipes, all sizes	30 00	30 00	30 00

	A	B	C
167 tons new cast-iron hub and spigot, straight pipe.	$120.00	$100 00	$150.00
115 lin.ft. new standard iron fittings for new w.-i. 8-in. gas pipe.	6.00	5.00	4 00
115 lin.ft new standard iron fittings for new w.-i. 10-in. gas pipe	8 00	6 50	5 00
46 tons new cast-iron special pipe.	215 00	175 00	150 00
115 lbs. new mall iron fittings for new w.-i. gas pipe	20	20	40
145 lin.ft 12-in. high pressure fire system water pipe	2 50	4 00	8.00
115 lin.ft 24-in. high pressure fire system water pipe	5 00	6 00	10 00
14 tons new cast iron spigot and groove, straight pipe	140 00	120 00	160 00
10 tons new cast iron spigot and groove pipe special castings	250 00	235.00	300 00
260 lin.ft 6-in. air pipe	5 00	1 50	1 00
115 lin.ft. new 6-in. air pipe	8 00	2 00	3 00
4,600 duct ft. electric ducts and conduits in place	50	35	50
175 lin.ft. 2½-in. w.-i. pipe electric ducts	50	75	1 00
3,705 lin.ft. 3-in. w.-i. pipe electric ducts	60	90	1 20
165 lin.ft. 3½-in. w.-i. pipe electric ducts	70	1 05	1.50
1,450 lin.ft. Johnstone 16-way ducts	.50	5 00	.50
140 service connections for electric ducts	20.00	30 00	30 00
Extended totals.	$3,363,974	$3,488,036	$3,677,975

Industrial Works (Continued)

to plant, to include 30 x 36 ft. compressor, 30 x 84 ft. purifier and drier, 24 x 26 ft. garage, 30 x 90 ft. charging, 12 x 16 ft. cylinder repair and 16 x 24 ft. oil trap buildings, 15 x 33 ft. boiler house addition, also alterations and addition to generator and compressor building, concrete, brick and steel, rein.-con. flooring, concrete foundations, on Lincoln and Tabor Sts. About $100,000. Private plans.

Md., Baltimore—Lockwood, Greene & Co., archts. and engrs., 101 Park Ave., New York City, soon let contract building 4 story, 80 x 222 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, for McCawley & Co., 400 Exch. Pl. About $650,000. Noted May 6.

Md., Sparrows Point—Bethelem Steel Corp., Bethelem, Pa., plans to enlarge plant here, to include new blast furnaces and addition of 24 miles to present tin plate plant. W. M. Tobias, Bethlehem, ch. engr.

S. C., Greenville—H. Wilkins and others plan to build factory. About $50,000. Architect not selected.

O., Cleveland—Champion Bed Springs Co., 3717 Iron Court, soon lets contract building 2 story, 58 x 172 ft., brick and steel factory, brick foundation, at 6500 Park Ave. J. P. McBeth, pres.

O., Cleveland—G. Paul, 524 Citizens Bldg., plans to build 1 or 3 story, 40,000-80,000 sq.ft., rein.-con., steel and brick factory, rein.-con. flooring, concrete foundation, on Superior Ave. between 49th and East 51st Sts. About $150,000. Private plans.

O., Cleveland—Reynolds Motor Co., 8811 Miles Park Ave., having plans prepared by H T. Jeffrey, archt., Northern Natl. Bank Bldg., for 3 story, 50 x 160 ft., rein.-con., brick and steel garage and sales rooms, rein.-con. flooring, concrete foundation. About $125,000. J. F. Reynolds, mgr.

O., Cleveland—S. H. White, archt., 1032 Schofield Bldg. soon lets contract building 1 story, 60 x 110 ft., rein.-con., brick and steel garage and sales room, rein.-con. flooring, concrete foundation, at 6820 Euclid Ave., for W. D. Sixt, c/o architect. About $75,000.

O., Cleveland—Superior Screen & Bolt Mfg. Co., 810 Hippodrome Bldg., having plans prepared by Realty Dept. of Natl. Lamp Co., archts. and engrs., Nela Park, East Cleveland, for 2 story, 130 x 250 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, at 3652 East 93rd St. About $175,000.

O., Garrettsville—McWade Tire & Rubber Co. plan to build 2 story, 30,000 sq ft. floor space, rein.-con., steel and brick factory, rein.-con. flooring, concrete foundation. About $75,000. Private plans.

O., Toledo—Bock Bearing Co. soon lets contract building 2 story, machine shop, brick and steel, concrete foundation, on Phillip Ave. About $110,000. G. B. Rheinfrauls, 601 Gardner Bldg., archt.

Mich., Bay City—Amer. Worsted Yarn C. having plans prepared by Lockwood & Green, archts. and engrs., 38 South Dearborn St., Chicago, for 4 story, 125 x 400 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Water St. About $200,000. Noted April 15.

Mich., Bay City—Wildman Rubber Co., Book Bldg., having plans prepared by Osborn Eng. Co., archts. and engrs., 2848 Prospect Ave., Cleveland, O., for 1 and 3 story, rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation. About $2,000,000. Noted June 10.

Mich., Detroit—F. M. Foster Truck Co., 980 East Jefferson Ave., plans to build 4 or 5 story, 100 x 120 ft., rein.-con., brick and steel service station, rein.-con. flooring, concrete foundation. Private plans.

Mich., Detroit—Kirby Ave. Development Co., care of Smith, Hinchman & Grylls, archts., 710 Washington Arcade, having plans prepared for 2 story, rein.-con., brick and steel garage and service station, rein.-con. flooring, concrete foundation. About $150,000.

Mich., Detroit—Walsh & O'Dell, archts., 1327 Chamber Commerce, preparing plans for 1 story, 100 x 185 ft., brick and steel factory, brick foundation, on 12th St About $50,000. Owner's name withheld.

Mich., Flint—Standard Oil Co. of Indiana, 910 South Michigan Ave., Chicago, soon lets contract building 2 story, 164 x 232 ft. distributing station, rein.-con., rein.-con. flooring, concrete foundation, to include garage, warehouse, office and tank house. About $200,000. Private plans.

Wis., Racine—S. C. Johnson & Son, 1012 16th St., rejected bids building 4 story, 60 x 160 ft. warehouse and varnish plant, brick and concrete. Work will be readvertised. Noted June 3.

Mo., Kansas City—Tarbett & Sornell, archts., Republic Bldg., soon let contract building 5 story, 100 x 113 ft. brick warehouse and office, rein.-con. flooring, concrete foundation, for Whitaker-Slessner Co. Hendrick & Huff, Interstate Bldg., Kansas City, engrs.

Tex., Bridgeport—Phoenix Clay Corp., 1215 Southwestern Life Bldg., Dallas, recently granted charter with $200,000 capital stock, and plans to build plant here, 125,000 brick or 150 ton tile, daily capacity. C. W. Martin, pres.

Cal., San Pedro—Fabri-Cord Tire Co., 917 Citizens Natl. Bank Bldg., Los Angeles, purchased site and plans to build 1st unit of factory, 3 story, 60 x 250 ft. rein.-con., on 17th St. About $80,000. S. H. Christian, pres. Architect not selected.

Que., Montreal—Natl. Drug. Co., St. Lawrence St., soon receives bids building plant in St. Henry Dist. About $175,000.

Que., Three Rivers—Lafleur & McDougall, 107 St. James St., Montreal, interested in company which plans to build steel plant, on Normand Blvd., for which bids will be received. About $750,000.

Ont., Hamilton—Hydro Electric System, City Hall, soon receives bids building steam auxiliary plant, near eastern city limits. A. Jutten, controller.

Ont., Kenora—St. Francis Pulp & Paper Co. soon receives bids building pulp and paper mill, on English River, north of here. About $500,000.

Ont., Windsor—See "Railways"

BIDS DESIRED

N. J., Paterson—McCormick Co., archts. and engrs., Century Bldg., Pittsburgh, receiving bids building 3 story, 140 x 210 ft. bakery and 2 story, 50 x 50 ft. stable, brick and steel, for Sunburst Baking Co., here. About $100,000.

O., Canton—Amer. Roll & Fdry. Co. receiving bids building 1 story, 59 x 140 ft. addition to machine shop, also 2 story, 45 x 80 ft. pattern shop, brick and steel. United Eng. & Fdry. Co., Farm Bank Bldg., Pittsburgh, Pa., engrs.

Ind., West Hammond—R. G. Pierce, archt., 10 South La Salle St., Chicago, receiving bids building 1 story, 210 x 560 ft., steel and brick plant, concrete foundation, for La Salle Iron Wks., 2305 South Halsted St., Chicago. About $650,000. N. Ronneberg, 10 South La Salle St., Chicago, engr.

Wis., Eau Claire—Standard Oil Co., of Indiana, 910 South Michigan Ave., Chicago, receiving bids building 1 and 2 story, 30 x 200 ft. distributing station, brick and steel, concrete foundation, to include warehouse, garage, barrel house, tank, office, etc. About $150,000. Private plans.

Wis., Milwaukee—Until June 29, by Comr. Pub. Wks., building 1 story, 50 x 120 ft., meter shop, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Market St. About $60,000 C. E. Malig, City Hall, archt.

Wis., Port Washington—Until June 28, by Turner Mfg. Co., building addition to factory, also 1 story, 150 x 160 ft. rein.-con., brick and steel foundry, rein.-con. flooring. F. O. Chase, Inc., 645 North Michigan Ave., Chicago, archt.

Neb., Grand Island—Tieter & Homair receiving bids building 4 story, 66 x 132 ft., rein.-con., brick and steel garage and service station, rein.-con. flooring, concrete foundation. About $80,000. G. W. Graves, 43 John R St., Detroit, archt. Noted April 1.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Vt., Brattleboro—C. F. Church Mfg. Co., Willimansett, Mass., let contract constructing 1 story plant, 1 story dry kiln building and 1 story boiler house, brick and steel, here, to E. F. Carlson Co., 244 Main St., Springfield, Mass. About $80,000.

★Mass., Cambridge—Standard Plate Glass Co., 30 Sudbury St., Boston, let contract building 4 story, 100 x 200 ft. plant, on Albany St., to W. H. and H. A. Root, 6 Beacon St., Boston; cost plus percentage basis.

★Mass., Chelsea (Boston P. O.)—H. H. Atwood, archt., 61 Alban St., Dorchester, let contract to J. Slotnick, 448 Bway., altering and building 2 story, 35 x 90 ft., brick and steel power plant and laundry addition, rein.-con. flooring, concrete foundation, at Soldiers' Home, here, for Commonwealth of Massachusetts, Boston. About $125,000. Noted June 10.

★Mass., Gardner—Amer. Fibre Corp. let contract building 1 story, brick and steel factory, rein.-con. flooring, concrete foundation, on Coleman St., to N. E. Frissell, Gardner. About $75,000.

★Mass., Quincy (Boston P. O.)—P. S. Yerxa, 1452 Hancock St., let contract building 1 story, 70 x 100 ft., brick and concrete garage, concrete flooring and foundation, on School St., to C. C. Temple Co., 40 Court St., Boston. About $50,000.

★Mass., Springfield—McClintock & Craig, archts. and engrs., 33 Lyman St., let contract to E. J. Pinney, Inc., 274 Main St., building 3 story, 60 x 132 ft., brick, concrete and steel addition to plant, rein.-con. flooring, concrete foundation, for Bausch Tool Co., 156 Wason Ave. About $75,000. Noted June 10.

★Mass., Woburn—Cambridge Paper Box Co., 196 Bway., let contract building 2 story frame addition to plant, concrete foundation, to A. J. Moore, 9 Fletcher Rd. About $50,000.

★Conn., New London—U. S. Electric Co., 108 State St., let contract building 75 x 101 ft., rein.-con. foundry, rein.-con. flooring, concrete foundation, at foot of Trumbull St., to H. T. Jackson & Co., 108 State St. About $50,000.

★N. Y., Brooklyn—S. Ageloff, 126 Reid Ave., will build 1 story, 200 x 256 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 283 4th Ave. About $200,000. Work will be done by day labor under supervision of Shampan & Shampan, 50 Court St., archts. Noted June 17.

★N. Y. Brooklyn—W. Nevin, 44 Court St., will build 2 story, 100 x 107 ft., brick and steel garage, rein-con. flooring, concrete foundation, on Waverly and Fulton Sts. About $130,000. Work will be done by day labor.

★N. Y., Brooklyn—S and R Holding Co., 175 Bay 29th St., will build 1 story, 100 x 173 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Gold and Prospect Sts. About $150,000. Work will be done by day labor.

★N. Y., Long Island City—Olga Realty Co., care of Shampan & Shampan, archts., 50 Court St., Brooklyn, will build 100 x 125 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Vernon Ave. near Freeman Ave. About $50,000. Work will be done by day labor under supervision of architects.

★N. Y., New York—Federal Reserve Bank, 15 Nassau St., let contract building 63 x 72 ft., rein.-con., brick and steel storage plant, rein.-con. flooring, concrete foundation, on Maiden Lane and Gold St., to M. Eidlitz, 30 West 42nd St About $350,000.

★N. Y., New York—L. Gold, 44 Court St., Brooklyn, will build 5 story, 100 x 100 ft., rein.-con. and steel garage and service station, rein.-con. flooring, concrete foundation, at 529 West 55th St. About $350,000. Work will be done by day labor.

★Pa., Phila.—Curtis Publishing Co., Independence Sq., let contract building 1 story addition to top of plant, concrete and brick, to Doyle & Co., 1519 Sansom St. About $600,000

Industrial Works (Continued)

★**Va., Richmond**—Standard Paper Mfg. Co., Hull and Canal Sts., let contract building rein.-con., steel and brick mill, rein.-con. flooring, concrete foundation, on Canal St., to Wise Granite Constr. Co., Amer. Natl. Bank Bldg. About $150,000.

★**O., Cleveland** — Newburgh & South Shore R.R., Jones Rd., let oontract building 1 story, 113 x 260 ft., rein.-con., steel and brick car shops, rein.-con. flooring, concrete foundation, on East 71st St. and Park Ave., to F. W. Mark Constr. Co., Leader-News Bldg. About $110,000.

★**O., Geneva**—Amer. Fork & Hoe Co., Swetland Bldg., Cleveland, let contract building 1 story, 55 x 260 ft., rein.-con., steel and brick factory, rein.-con. flooring, concrete foundation, to Rice-Jones Co., 10,600 Euclid Ave., Cleveland. About $100,000.

★**O., Massillon**—Alloy Electric Steel Castings Co. let contract building 1 story, 50 x 150 ft., brick and steel mill, brick foundation, to Boldt Constr. Co., 6110 Euclid Ave., Cleveland. About $60,000.

★**O., Ravenna**—Cleveland Worsted Mills Co., 6140 Bway., let contract building 4 story, 50 x 150 ft., brick and steel addition to factory, brick foundation, to P. L. Frank Constr. Co., Ravenna. About $100,000.

★**O., Warren**—Frost Superior Fence Co., East 131st St., Cleveland, let contract building 1 story, 60 x 220 ft., concrete, brick and steel factory, rein.-con. flooring, concrete foundation, on Kinsman Tract, here, to H. K. Ferguson, Vickers Bldg., Cleveland. About $100,000.

★**Mich., Battle Creek**—Montgomery Motor Sales Co. let contract building garage, to M. J. Morehouse, 343 South Dearborn St., Chicago. About $100,000.

★**Mich., Detroit**—Dodge Bros., Jos. Campau Ave., let steel contract for 100 x 100 ft. power house, to Russel Wheel & Fdry. Co., Chene St., and Belt Line Ry. Total cost, $2,000,000. Noted May 20.

★**Mich., Detroit** — International Metal Stamping Co., Artillery and Muster Aves., let contract building 1 story 79 x 532 ft. addition to factory, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to H. G. Christman Co., 315 Stevens Bldg. About $130,000. Noted June 10.

★**Mich., Detroit**—Sun Oil Co., Woodville St. and Belt Ry., Toledo, O., let contract building 2 story, 80 x 80 ft., rein.-con. warehouse, concrete foundation, here, to A. Bently & Sons., 201 Belmont Ave., Toledo, O. About $100,000.

★**Mich., River Rouge** — Amer. Gypsum Co., Port Clinton, O., will build rein.-con. and steel, storage and handling plant, rein.-con. flooring, concrete foundation, with concrete coal pockets and 145 ft. rein.-con. tunnel, here. About $75,000. Work will be done by day labor. Noted April 29.

★**Wis., Fond du Lac**—Bulldog Tractor Co. let contract building 1 story, 60 x 300 ft. monitor type factory, to Immel Constr. Co., 200 North Main St.

★**Wis., Sheboygan** — Sheybogan Lime Wks., 822 Niagara Ave., let contract building 2 story, 48 x 143 ft. garage, office and display room, rein.-con., brick and steel, rein.-con. flooring, brick foundation, on South Water St., to Lemke & Hilpertshauser, Sheboygan. Noted June 10.

Buildings

PROPOSED WORK

Mass., Athol—Hall—Town having preliminary plans prepared by Brainerd, Leeds, Kellogg and Thayer, archts., 89 Franklin St., Boston, for 2 story, 50 x 125 ft. memorial hall and auditorium (1,500 seating capacity). About $100,000.

Mass., Boston—Bank—Workingmen's Cooperate Bank, 101 Tremont St., haviog plans prepared by T. M. James, archt., 3 Park St., for brick and concrete, on Cornhill St.

Mass., Boston — Bathhouse, etc. — City plans to build bathhouse and headhouse at Marine Park. About $150,000.

Mass., Boston—Office and Bank—Federal Trust Co., 85 Devonshire St., having plans prepared by McLaughlin & Burr, archts., 88 Tremont St., for 10 story, 21 x 72 ft., brick, rein.-con. and steel, on Washington St. J. H. Worcester, 79 Milk St., Boston, engr.

Mass., Cambridge—Memorial—Trustees Harvard University having plans prepared by Coolidge & Shattuck, archts., 122 Ames Bldg., Boston, for large memorial building, on Huntington Ave.

Mass., Chicopee — Church — St. Joachim Roman Catholic Society, 202 Main St., having plans prepared by J. W. Donahue, archt., 496 Main St., Springfield, converting present church on Main and Maple Sts. into school and building new brick and stone church. About $150,000. G. H. Gagnon, pastor.

Mass., Holyoke—Theatre—J. H. Baker, 269 Maple St., having plans prepared by G. P. B. Alderman & Bro., archts., Alderman Bldg., for 3 story, brick, concrete and steel. About $200,000.

Mass., Lawrence—Parish—Grace Episcopal Society, Jackson and Gardner Sts., having plans prepared by Peare, Nevin, Quinn & Chickering, archts., 6 Beacon St., Boston, for 2 story, 50 x 100 ft., on Garden St. About $100,000.

Mass., Longmeadow (Springfield P. O.)—Community — Congregational Society of Longmeaddow having plans prepared by Smith & Bassette, archts., 36 Pearl St., Hartford, Conn., for 3 story, wood and stucco, on Longmeadow St. About $100,000.

Mass., Mattapan (Boston P. O.)—Dining Room—Commonwealth of Massachusetts, Comm. of Mental Diseases, 36 State House, Boston, had plans prepared by Kendall, Taylor & Co., archts. and engrs., 93 Federal St., Boston, for 2 story, brick and concrete, rein.-con. flooring, concrete foundation (west group), at State Hospital, here. About $200,000.

Mass., Mattapan (Boston P. O.)—Nurses' Home — Commonwealth of Massachusetts, Mental Disease Comn., 36 State House, Boston, soon receives bids building 2 story, brick, concrete and steel, rein.-con. flooring, concrete foundation, at east group of State Hospital, here. About $125,000. Kendall, Taylor & Co., 93 Federal St., Boston, archts. and engrs.

R. I., Arctic—Theatre—H. P. Groves, archt., 44 Middlesex St., Lowell, Mass., soon lets contract building 2 story, 70 x 140 ft., brick, steel and timber, concrete foundation, here, for Black-Spitz Theatres, Inc., Taunton, Mass. About $150,000.

R. I., Kingston—High School—School Bd. having plans prepared by F. I. Cooper Corp., archts., 33 Cornhill St., Boston, Mass., for 2 story, 80 x 130 ft.

R. I., Providence—School—City soon lets contract building 3 story, 40 x 40 ft., brick and steel, concrete foundation, on Nelson and Jastram Aves. About $100,000. Private plans.

Conn., New London—Hospital—D. S. Donnelly, archt., Plant Bldg., soon receives bids building 4 story, 50 x 86 ft., brick and concrete addition, rein.-con. flooring, concrete foundation, on Ocean Ave., for Lawrence Memorial Hospital. About $100,000. Noted April 22.

Conn., Windsor—High School—School Com. having plans prepared by Whiton & McMahon, archts., 36 Pearl St., Hartford, for 3 story, brick, concrete and steel, on Main St. About $200,000. Noted April 1.

N. Y., New York—Hotel—Hotel Des Artistes, 1 West 67th St., soon receives bids altering brick and stone. About $100,000. Starrett & Van Vleck, 8 West 40th St., archts. and engrs.

N. Y., New York—Office—Pitt & Scott, 60 Pearl St., having plans prepared by E. Schneider, archt. and engr., 29 Alberters Ave., Corona, for 5 story, 25 x 85 ft., brick, steel and stone, concrete foundation, at 55 Front St.

N. Y., Schenectady—Theatres—D. J. Bondy, 82 Wall St., New York City, having sketches made by De Rosa & Pereira, archts. and engrs., 110 West 40th St., New York City, for two brick and stone, brick and concrete foundations, here. About $400,000.

N. J. Newark—Recreation—J. H. and W. C. Ely, archts. and engrs, Firemans Trust Bldg, receive bids about July 1, building 4 story, 140 x 200 ft. brick and concrete, on Clark and Ogden Sts., for Clark Thread Co. About $350,000.

Pa., Phila.—Theatre and Office—Stanley Co. of Amer., 1214 Market St., having plans prepared by Hoffman & Henon, archts., Finance Bldg., for 16 story concrete, brick and steel, on Market and 11th Sts. About $1,000,000.

Pa., Pittsburgh—Theatre—Famous Players Corp., 485 5th Ave., New York City, had plans prepared by H. E. Kennedy, archt., Pittsburgh, for 169 x 180 ft., on East Liberty St. About $750,000.

Pa., Plainsville—School—Bd. Educ. plans to build 3 story, 40 x 110 ft., concrete, brick and stone, brick foundation, on South Main St. About $100,000. Architect not selected.

Pa., Pocono—Hotel—Price Bros. plan to build 3 story, 100 x 100 ft., brick, steel and stone, rock foundation, on Pocono Highway. About $100,000. Architect not selected.

Pa., Scranton—Church—First Christian Church plans to build 2 story, 50 x 150 ft., concrete, brick and marble, rock foundation, on North Main Ave. About $100,000. L. M. Davis, 905 Wood St., archt.

Pa., Scranton — Court House — Lackawanna Co. having plans prepared by J. Nelson, archt., Connell Bldg., for remodeling 2 story, brick, marble, stone and granite, on Courthouse Sq. About $200,000.

Pa., Sugar Notch (Wilkes-Barre P. O.)—High School—Boro plans to build 3 story, 50 x 100 ft. brick and steel, rock foundation, on Main St. About $110,000. Architect not selected.

Pa., Wilkes-Barre —Convent—St. Mary's Catholic Church, 161 South Washington St., plans to build 3 story, 50 x 100 ft., concrete, brick and stone addition. About $100,000. G. F. Schroeder and C. Schmitt, Wiltenkorn Bldg., archts. Noted June 22.

Pa., Wilkes-Barre — Parish House — St. Stephens Episcopal Church plans to build 3 story, 60 x 100 ft., brick, steel and stone, on South Franklin St. About $160,000. Architect not selected.

N. J., Ridgefield Park (Hackensack P. O.)—School—Bd. Educ. purchased site and plans to build modern school. About $245,000.

Pa., Bangor—High School—School Dist. having plans prepared by Rasmussen & Wayland, archts. and engrs., 252 West 46th St., New York City, for 2 story brick and stone, brick foundation. About $125,000. E. Flory, pres.

Pa., Beaver Falls—School—Bd. Educ. rejected bids received May 28, building 2 story, 60 x 132 ft., rein.-con., brick and steel, rein.-con. flooring, brick foundation. About $160,000. Project abandoned. Noted May 20.

Pa., Elmhurst — Asylum — St. Nicholas Greek Catholic Church of Amer. plans to build 3 story, 100 x 250 ft., brick, steel, marble and stone, rein.-con. flooring, rock foundation, on Elmhurst Ave. About $300,000. Architect not selected.

Pa., Orphanage (Sunbury P. O.)—Asylum—Independent Order Odd Fellows Orphanage having plans prepared by W. H. Lee, archt. and engr., 32 South 17th St., Phila., for 3 story, 45 x 55 ft., concrete and brick addition. About $100,000.

Pa., Phila.—Auditorium—Progress Club, 1417 Diamond St., having plans prepared by H. C. Hodgens, archt., 130 South 15th St., for 1 story, 50 x 100 ft., concrete and brick, on 15th and Diamond Sts.

Pa., Phila.—Church—Holy Spirit Catholic Congregation had plans prepared by R. A. Schuman, archt., 932 Lamberton St., Trenton, for church. About $150,000.

Pa., Philadelphia — Loft — A. J. Sauer, archt. and engr., Denckla Bldg., rejected bids building 6 story, 45 x 112 ft., concrete and brick, on 13th and Florist Sts. Owner's name withheld. Project abandoned. Noted March 4.

Pa., Phila. — Synagogue — Tikvas Israel Congregation, c/o E. L. Rothchild, archt., Penfield Bldg., having plans prepared for 3 story, 55 x 115 ft., brick and stone, on 41st and Parkside Sts. Cost to exceed $100,000.

Md., Baltimore — Office —W. G. Nolting, archt., 1012 Keyser Bldg., revising plans and soon receives bids constructing 3 story (ultimately 12 story), steel, brick and stone, concrete foundation, on Calvert and Mercer Sts., for United States Fidelity & Guaranty Co., Calvert and Redwood Sts. New building to be connected with present building by tunnel under Mercer St. About $300,000. Noted Jan. 22.

Md., Baltimore—High School—City having plans prepared by E. H. Glidden, archt., Amer. Bldg., for 3 story, 100 x 500 ft., steel and brick, rein.-con. flooring, rock foundation, on Poplar Grove St. About $600,000.

Va., Danville—School—Randolph—Macon Institute, having plans prepared by E. R James, archt., Danville, for fireproof building, to include dining hall, auditorium and dormitory. About $300,000. C. G. Evans pres.

Va., Danville—Temple—Masonic Bldg. Corp. having plans prepared by F. F. Faris, archt., Schmulbach Bldg., Wheeling, W. Va., for 10 story, fireproof. About $600,000. Noted Feb. 12.

Va., Schoolfield—School and Community—Dan River & Riverside Cotton Mills, Danville, Va., having plans prepared by E. R. James, archt., Danville, for 3 story brick. About $150,000.

W. Va., Chattaroy — High School — City approved $100,000 bond issue to build school.

W. Va., Glenville — Courthouse — Gilmer Co. soon receives bids building 2 story, 65 x 100 ft., brick and limestone. About $125,000. Wysong, Tufts & Jones, Charleston, archts.

N. C., Greensboro—Church—First Presbyterian Church plans to build new church. About $250,000. C. F. Myles, pastor.

N. C., Greensboro — Office — Jefferson Standard Life Insurance Co. having plans prepared by C. C. Hartmann, archt Greensboro, for 12-15 story, on 115 x 147 ft. site. Cost between $1,000,000 and $1,500,000. J. Price, pres.

Ky., Winchester—School—Clark Co. Bd Educ. receives bids about September or October, building 1 story, 162 x 106 ft.

Buildings (Continued)

brick, concrete, tile and steel, wood flooring. About $110,000. J. W. Crone & Son, Brown Procteria Bldg., archts.

O., Akron—City Hall—City plans to issue $900,000 bonds to build city hall.

O., Cleveland—Commercial—M. Marmorstein, 1604 Williamson Bldg., plans to build 1 story concrete, brick and steel, rein.-con. flooring, concrete foundation, at 2536 Euclid Ave. About $100,000. Architect not selected.

O., Cleveland—Dormitory—J. P. Farrelly, East 9th St. and Euclid Ave., plans to build 3 or 4 story rein.-con., steel and brick, rein.-con. flooring, concrete foundation, at University Circle. About $200,000. Architect not selected.

O., Cleveland — Sales — See "Industrial Works."

O., Cleveland—Schools—Bd. Educ., East 6th St. and Rockwell Ave., plans to build 1 story, 30 room, on Sandusky Ave., also 1 story, 16 room, on Lake Ave., both rein.-con., brick and steel, rein.-con. flooring, concrete foundation. Cost $1,000,000 and $500,000 respectively. W. R. McCornack, East 6th St. and Rockwell Ave., archt.

O., Cleveland—Schools—City election Nov. 2 to vote on $1,000,000 bonds to build 1 story, 30 room, on Harvard and East 146th Sts.; $750,000 for story, on Parkview and Mt. Auburn Sts., and $1,000,000 for 1 story, 30 room, on East Woodland and East 128th Sts., rein.-con., brick and steel, rein.-con. flooring, concrete foundations. F. G. Hogan, dir. W. R. McCormack, East 6th St. and Rockwell Ave., archt.

O., Columbus—Schools—Bd. Educ. plans to build Central Technical High School, cost $1,000,000, North High School, $1,100,000, East High School, $800,000, South High School, $800,000. Lincoln Park High School, $265,000 and 4 elementary schools, $250,000 each. D. Riebel & Sons, New 1st Natl. Bank Bldg., archts.

O., Ravenna — Office — Natl. Furnace & Stove Co. having plans prepared by D. C. Smith, archt. and engr., 4,500 Euclid Ave., Cleveland, for 1 story, 80 x 220 ft. office and foundry, steel and brick, brick foundation. About $125,000. M. Kinsman, mgr.

Mich., Detroit—Mercantile—J. G. Kastler & Co., archts., 523 Chamber of Commerce, preparing plans for 4 story, 67 x 100 ft., rein.-con., brick and steel, concrete foundation, on Martin and Michigan Aves. About $100,000. Owners name withheld.

Mich., Eloise—Dormitory—Wayne Co., Poor Bd., c/o O. P. Gulley, 27 Churchill St., Detroit, having preliminary plans prepared by MacFarlane, Maul & Lentz, archts., 1257 David Whitney Bldg., Detroit, for 2 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, (to be 1st unit of hospital and home). About $200,000. Noted April 15 under "Hospital and Home."

Mich., Pontiac—Church—Bethany Baptist Congregation soon lets contract building 1 and 2 story, 75 x 100 ft., brick, steel and stone, brick foundation, on Lincoln and West Huron Aves. About $100,000. Stahl & Kinsey, 435 Woodward Ave., Detroit, archts.

Mich., Saginaw — Bank and Office — Weary & Alford, archts., 1732 South Michigan Ave., Chicago, receive bids about July 1, building 16 story, 120 x 120 ft., rein.-con., brick and tera cotta, rein.-con. flooring, concrete foundation, for 2nd Natl. Bank, 110 North Washington St. About $2,250,000.

Wis., Appleton—Hospital—St. Elizabeths Hospital having plans prepared by V. J. Klutho, archt., Syndicate Trust Bldg., St. Louis, for 4 story, rein.-con. and brick, rein.-con. flooring, concrete foundation. About $500,000. Noted June 17.

Wis., Manitowoc—Church — Presbyterian Congregation having preliminary plans prepared by Juul & Smith, archts., Imig Bldg., Sheboygan, for 2 story, 42 x 142 ft., rein.-con., brick and steel, brick foundation, on Meadow Lane.

Wis., Marshfield — Bank — Amer. Natl. Bank plans to build 1 story, 44 x 100 ft. bank. About $100,000. Oppenhauer & Obel, archts.

Wis., Sheboygan — High School — Bd. Educ. receives bids about July 15, building 3 story, 270 x 300 ft., rein.-con. brick and steel, brick foundation, on Jefferson and 9th Sts. About $750,000. Childs-Smith, Van Buren St., Chicago, archts.

Wis., Stevens Point—Church—St. Stephens Catholic Church plans to build 50 x 136 ft. stone and timber, concrete foundation. About $100,000. Childs & Smith, 64 East Van Buren St., Chicago, archts.

Wis., Union Grove—Refectory and Dormitories—State Bd. Control, Madison, had plans prepared by A. R. Peabody, archt., Madison, for refectory, cost $50,000 and four 2 story, 40 x 150 ft. dormitories, $90,000 each. J. M. Tappins, secy.

Wis., West Bend—Office, etc.—West Bend Heating & Light Co. plans to build 4 story, rein.-con., brick and steel, rein.-con. flooring, brick foundation, on E. Main St. About $100,000. Architect not selected.

Ia., Cosgrove (Oxford P. O.)—School—Bd. Educ. plans to build school. About $100,000. Architect not selected.

Ia., Jolley—School—Bd. Educ. having plans prepared by Martin & Sutherland, archts., Storm Lake, building 2 story. 64 x 90 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $100,000.

Minn., Sleepy Eye — School — Bd. Educ. having plans prepared by K. T. Snyder, archt., 739 Plymouth Bldg., Minneapolis, for remodeling 2 story, 80 x 160 ft., and building 64 x 90 ft. addition in rear, mill construction. About $100,000. T. E. Lewis, supt.

S. D., Sioux Falls—Y. M. C. A. soon lets contract building 5 story, 131 x 151 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $350,000. Perkins & McWayne, 322 Palton St., archts.

N. D., Bismarck — Memorial — State Bd. Administration soon lets contract building 3 story, 61 x 100 ft., Bedford limestone front, on Capitol grounds. About $200,000. Keith & Kurke, Bismarck, archts. Noted March 18.

N. D., Jamestown—High School—Bd. Educ. having plans prepared by Shannon, Boyd & Boyd, archts., Jamestown, for 3 story, 230 x 240 ft., 28 room. About $200,000.

Mo., Kansas City—Hospital—Owner c/o A. C. Stowell, 2011 East 11th St., having sketches made by Keen & Simpson, archts., Reliance Bldg., for 5 or 6 story hospital.

Mo., Kansas City—Office—See "Industrial Works"

Mo., Nevada—Hospital—State Hospital 3 having plans prepared by Hawkins & Hoener, archts., Holland Bldg., Springfield, for 3 story, rein.-con., brick and steel. About $100,000.

Tex., Corsicana—Schools—City voted $600,000 bonds to build schools. J. E. Blair, supt. schools.

Tex., San Antonio — Auditorium — City plans to build 1 story, rein.-con. and steel, concrete foundation, on Komano and Navarro Sts. About $500,000.

Okla., Henryetta—Theatre—S. Petropakus having plans prepared by Smith, Rea, Lovitt & Center, archts., Parkinson Bldg., Okmulgee, for 2 story, 50 x 140 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation.. About $110,000.

Wash., Seattle — Theatre — Clemmer & James, Amer. Bank Bldg., having plans prepared by F. H. Fowler, archt., L. C. Smith Bldg., for 1 story, 60 x 108 ft. fireproof, at 1515 3rd Ave. About $200,000.

Cal., Long Beach—Schools—City voted $125,000 bonds to construct addition to Daisy Ave. School, $50,000 for arts buildng at high school, $75,000 for equipment and $50,000 to purchase sites. Architect not selected.

Cal., Los Angeles—Church—First Church of Los Angeles plans to build 3 story, 100 x 200 ft., steel, marble, granite and stone. About $1,000,000. Architect not selected.

Cal., Los Angeles—Schools—City voted $6,000,000 bonds to purchase sites, build and equip grammar schools and $3,500,000 for high schools.

Cal., Pasadena—Schools—City defeated $4,500,000 bond issue to build schools. Noted March 25.

Que., St. Anne de Monts — Church — Roman Catholic Congregation soon receives bids building church, brick, steel and stone. About $160,000. A. Boivert, pastor.

Que., Montreal—Church—St. Gertrude Congregation, Sault au Recollet, soon lets contract building 55 x 80 ft., brick, steel and stone, concrete foundation, on Gouin Blvd., here. About $120,000. A. Chausse, 72 Notre Dame St., E., archt.

Que., St. Lambert—Fire Station and Hall, etc.—Town Council soon receives bids building 3 story, brick, steel and stone. About $100,000. E. Drinkwater, engr.

Ont., Ottawa—Bible House—Ottawa Bible Society soon receives bids building bible house, to include offices, society rooms, printing house, etc. About $150,000. W. H. Crawford, dist., secy.

Ont., Toronto—Churches—Toronto Methodist Union plans to repair Queen St. Church, also build three 1 story, concrete, brick and steel, rein.-con. flooring, concrete foundations, on Dowse Rd., Fairlawn and Bedford Park Aves. About $150,000. S. W. Dean, 141 Jarvis St., secy. Architect not selected.

BIDS DESIRED

Mass., Belchertown — Dormitory, etc. — Until June 29, by Commonwealth of Massachusetts, Comn. on Mental Diseases, 36 State House, Boston, constructing 2 story, 90 x 117 ft., brick and rein.-con. dormitory and custodial building, rein.-con. flooring, concrete foundation, at State Hospital, here. About $250,000. Kendall, Taylor & Co., 93 Federal St., Boston, archts. and engrs.

Conn., Hartford—School—Until July 1, by Northwest School Dist., building 2 story, 90 x 180 ft. with 55 x 90 ft. ell, brick, concrete and steel, rein.-con. flooring, concrete foundation, on Holcomb St. About $235,000. Ford, Buck & Sheldon, 60 Prospect St., archts. Noted May 13.

N. J., West New York—School—Until June 30, by Bd. Educ., at P. S. 5, Hudson Ave. and 10th St., building new school on site of present School No. 1, Madison, 18th and Polk Sts. Cost to exceed $100,000.

O., Warren—Schools—Until July 7, by R. D. Kepner, clk. Trumbull Co., furnishing labor and material constructing 2 Junior High School buildings. Bids will be received on any or all following items, (1) excavating, masonry work and cut stone work, fireproofing, concrete and cement work, (2) lathing and plastering, (3) steel and iron work, (4) carpentry work and hardware (5) glass and glazing, (6) metal work and roofing, (7) painting and varnishing, (8) electric wiring, (9) plumbing and sewers and (10) heating and ventilating.

Mich., Flint—Theatre—Until June 28, by Van Leyen, Schilling, Keough & Reynolds, archts., Cass Ave., Detroit, building 2 story, 40 x 130 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Detroit St., for Colonial Theatre Co., c/o architects. About $100,000. Noted March 18.

Ill., Chicago—Office—Holabird & Roche, archts., 104 South Michigan Ave., receiving bids building 2 story, 38 x 110 ft., steel and brick addition, concrete foundation, at 161 North Dearborn St., for Oliver Typewriter Co., 167 North Dearborn St. About $130,000.

Ia., Killduff—School—Until July 5, by Bd. Educ., building 2 story, 57 x 84 ft. rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $100,000. W. E. Hulse & Co., 309 Securities Bldg., Des Moines, archts.

Ia., Liberty Center—School—Until July 25, by Bd. Educ., building 2 story, 54 x 70 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $100,000. W. E. Hulse & Co., 309 Securities Bldg., Des Moines, archt.

Ia., Mapleton—School—Until June 30, by Roman Catholic Congregation, building 2 story, 60 x 80 ft., rein.-con., brick and steel, concrete foundation. About $100,000. W. S. Steele, United Bank Bldg., Sioux City, archt. Noted June 17.

Ia., McCallsburg—School—Until July 1, by Bd. Educ., building 2 story, 79 x 103 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $130,000. W. L. Pedicord, Iowa Falls, archt.

Minn., Buhl—School—Until June 28, by Bd. Educ. building 3 story, 180 x 200 ft., rein.-con., brick and steel addition, rein.-con. flooring, concrete foundation, on Main St. About $350,000. L. Ruchstadt, clk. A. W. Kerr & Co., Chestnut St., Virginia, engrs. and archts.

Kan., Hiawatha — Auditorium — Until June 28, by city, building 1 story, 81 x 126 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $135,000. T. W. Williamson & Co., 418 Central Natl. Bank Bldg., Topeka, archts. Noted June 10.

Kan., Parsons—School—Until June 30, by Bd. Educ., building 2 story, 40 x 190 ft., rein.-con., brick and steel, rein.-con flooring, concrete foundation. About $175,000. T. W. Williamson & Co., 418 Central Natl. Bank Bldg., Topeka, archts. Noted June 3.

Mo., Camden Point—School—Until July 5, by Bd. Educ., furnishing labor and material for 2 story, 33 x 110 ft. school. J. H. Felt & Co., Grand Ave. Temple, Kansas City, archts.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Old Town**—School—Town Impvt. Comn. let contract building 2 story, brick and steel, concrete foundation, to O. Nelson Co., 194 Exchange St., Bangor. About $100,000.

★**Mass., Belmont** (Boston P. O.)—School—School Com. let contract building 2 story, 60 x 70 ft., brick and terra cotta addition, to Payson Park School, rein.-con. flooring, concrete foundation, to J. F. Griffin Co., 17 Milk St., Boston, $104,748.

★**Mass., Milton** (Boston P. O.) — Exchange—New England Telephone & Telegraph Co., 50 Oliver St., Boston let contract building 2 story, 51 x 166 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, on Adams St., here., to L. D. Willicut & Sons Co., 146 Sumner St., Boston.

Buildings (Continued)

★**Mass., Whitinsville**—Housing—Whitin Machine Wks. let contract building seventy-five 2 story brick and timber houses for workmen, concrete foundations, to Foundation Co., 233 Bway., New York City. About $850,000.

★**R. I., Newport**—School—School Comm. let contract rebuilding 3 story, 90 x 150 ft., brick and stone, rein.-con. flooring, on Bway., to M. A. McCormick, 137 Bellevue Ave. About $115,000. Noted June 17.

★**Conn., Hartford**—Housing—Hartford Home Bldg. Assn. let contract constructing 40 brick and frame houses on Hillside Ave., Zion, Pembroke and Catherine Sts., to T. J. Desmond Co., 31 Nassau St., New York City. About $600,000.

★**Conn., Torrington**—Church—J. A. Jackson, archt., 1133 Bway., New York City, let contract to L. Longhi & Bro., 43 Center St., building 1 story, brick and stone, concrete and wood flooring, on Union St., for St. Mary Polish Society. About $125,000. Noted March 4.

★**N. Y., Brooklyn**—School—Bd. Educ. let contract building P. S. 185, brick, steel and stone, concrete foundation, on Ridge Blvd. and 86th St., to J. MacArthur & Co., 22 Ormond Pl., Brooklyn. About $650,000.

★**N. Y., Jamestown**—Recreation—Cleveland Worsted Mills Co., 6140 Bway., Cleveland, O., let contract constructing 4 story, 60 x 120 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation, here, to Jamestown Constr. Co., 60 River St. About $150,000.

★**N. Y., Little Falls**—School—Bd. Educ. let contract building brick, steel and stone, brick foundation, to J. Hallinan, 1 West Main St. About $125,000. Noted April 29.

★**N. Y., New York**—Loft—Lerner Realty Co., c/o Shampan & Shampan, archts., 50 Court St., Brooklyn, will alter 6 story brick and stone, at 220 West 29th St. About $100,000. Work will be done by day labor under supervision of architects.

★**N. Y., New York**—Stores—F. W. Woolworth Co., 233 Bway., will build 1 story, 100 x 125 ft., brick, stone and steel, brick foundation, at 1360 5th Ave. About $100,000. Work will be done by day labor.

★**N. J., Atlantic City**—Hotel—Ritz-Carlton-Linnard Co., c/o Warren & Wetmore, archts. and engrs., 10 East 47th St., New York City, let contract building 130 x 310 ft., brick, steel and stone, concrete foundation, on Illinois Ave. and Boardwalk, to Thompson-Starrett, 49 Wall St., New York City. About $2,000,000.

★**N. J., Newark**—Schools—Bd. Educ. let contract building 3 story, 70 x 80 ft. addition, concrete and brick, Alexander St., to D. W. McGee, 142 1st St., $323,763; 3 story, 219 x 222 ft. vocational school, concrete and brick, on 1st and 2nd Sts., to F. Kilgus, 13 South 6th St., $798,800. Noted May 20.

★**Pa., Donora**—School—Bd. Educ. let contract building 3 story, 120 x 120 ft., brick and steel, to Donora Lumber Co., Donora, $135,290. Noted May 20.

★**Pa., Indiana**—School—Boro. School Bd. let contract building 3 story, 100 x 115 ft., rein.-con., brick, steel and stone, in 3rd Ward, to Powell & Justus, Punxsutawney. About $100,000.

★**Md., Baltimore**—Capital Theatre Co., 719 Fidelity Bldg., let contract building 2 story, 120 x 200 ft., concrete, steel and brick, concrete foundation, at 1518-1522 West Baltimore St., to J. H. Miller, Inc., Eutaw and Franklin Sts. About $250,000. Incorrectly noted in our issue of May 27.

★**Va., Danville**—Housing—Dan River & Riverside Cotton Mills let contract building 50 frame and stucco houses, brick foundations, in northern section of town, to J. A. Jones Constr. Co., Realty Bldg., Charlotte, N. C. About $250,000; cost plus percentage basis.

★**Va., Schoolfield**—Housing—Dan River & Riverside Cotton Mills, Danville, Va., let contract building 50 frame and stucco houses, brick foundations, here, to J. P. Pettyjohn & Co., 212 8th St., Lynchburg, Va. About $250,000 cost plus percentage basis.

★**Ky., Bowling Green**—Dormitory—Western Kentucky State Normal School let contract building 3 story, rein.-con. and brick, to Brashear & Cahill, Louisville. About $250,000.

★**O., Cincinnati**—Office—Western & Southern Insurance Co., 4th St. and Bway., let contract building 4 story, 54 x 78 ft., rein.-con. and brick, rein.-con. flooring, to M. Marcus Bldg. Co., 621 Main St. About $200,000.

O., Cleveland—School—Bd. Educ., East 6th St. and Rockwell Ave., received bids building 1 story, 212 x 212 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on East 92nd St. and Parkgate Ave., from Drummond-Miller Co., 4500 Euclid Ave., $637,300, Tenbusch-Parker Constr. Co., 1836 Euclid Ave., $647,156, P. Kirschner, Hippodrome Bldg., $708,257. Noted May 27.

★**O., Cleveland**—School—Bd. Educ. East 6th St. and Rockwell Ave., let contract building 1 story, 132 x 144 ft., rein.-con., steel and brick addition, rein.-con. flooring, concrte foundation, on East 55th St. and Scoville Ave., to Tenbusch-Parker Co., 1836 Euclid Ave., $115,243. Noted April 29.

★**O., Lakewood** (Cleveland P. O.)—Church—First Church of Christ Scientist, c/o W. F. Kees, 931 Society for Savings Bldg., Cleveland, let contract building 1 story, 100 x 100 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, at 15422 Detroit Ave., to C. R. Cummins Co., Leader-News Bldg., Cleveland. About $100,000. Noted April 15.

★**Mich., Flint**—Theatre—J. Kovinsky let let contract building 2 story, 50 x 140 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on North Saginaw St., to W. H. Isgrigg & Son, Flint. About $100,000. Noted May 20.

★**Mich., Highland Park** (Detroit P. O.)—Hotel—P. Christie, c/o S. E. Remey, archt., Whitney Office Bldg., Detroit, let contract building 4 story, 40 x 130 ft., brick, steel and stone, concrete foundation, on LaBelle Ave., to C. J. Ward & Son, Detroit. About $100,000. Noted April 1.

Ill., Ashland—School—School Dist. 212 let general contract building 1 story, 105 x 180 ft., concrete and brick, concrete foundation, to C. H. Schenk, 2068 South 5th St., Springfield. About $110,000.

★**Ill., Chicago**—Office—J. T. Ryerson & Son, 16th and Rockwell Sts. let general contract building 4 story (ultimately 8 story) 66 x 128 ft., brick and steel, rein.-con. flooring, concrete foundation, to G. Thomson & Co., 30 North LaSalle St. About $350,000.

★**Wis., Manitowoc**—Theatre—George Bros. Co., 913 South 8th St., let contract building 1 story, 115 x 130 ft., rein.-con., brick and steel, brick foundation, on 58th St., to Badger State Constr. Co., c/o A. V. Lill, 1415 Washington St. About $300,000.

★**Wis., Stratford**—Store—B. Connor Co. let contract building 1 story, 100 x 120 ft., to G. Krasen, Marshfield. About $100,000.

★**Ia., Mason City**—Home—State I. O. O. F. Lodge let contract building 2 story, 58 x 140 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to M. M. Moen & Co., Masonic City, $105,225.

★**Kan., Peabody**—Hotel—Forrester Hotel Co. let contract building 3 story, 50 x 111 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to Scott Bros., Peabody. About $100,000; cost plus percentage basis.

★**Neb., Loup City**—Courthouse—Sherman Co. let contract building 3 story, 60 x 74, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to J. Ohlson & Son, Loup City. About $102,000.

★**Mo., Carthage**—Hotel—Drake Hotel Co. let contract building 4 story, 75 x 90 ft., brick, stone and rein.-con., rein.-con. flooring, to Manhattan Constr. Co., 3rd and Fondulac Sts., Muskogee, Okla. About $189,000. Noted June 10.

★**Mo., Kansas City**—Office—F. H. Thwing, Finance Bldg., let contract building 2 story, 49 x 115 ft. brick, rein.-con. flooring, on 13th and Walnut Sts., to Pratt & Thompson, Republic Bldg. About $100,000.

★**Okla., Okmulgee**—School—Bd. Educ. let contract for West Side school 1 story, 120 x 160 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to Patti-Moore Co., Okmulgee. About $105,000; cost plus percentage basis.

★**N. M., Mescalaro**—Church—St. Joseph Church will build 1 story, 50 x 120 ft. stone church. About $100,000. Work will be done by day labor.

★**Ore., Portland**—Hospital—Comrs. Multnomah Co. let masonry contract for 5 story, 150 x 210 ft. hospital and boiler house, on Marquam Hill, to J. M. Dougan Co., Ry. Exch. Bldg., $347,435. Noted June 3.

★**Cal., Los Angeles**—Studio—Robertson-Cole Studios, Inc., Currier Bldg., let contract building motion picture studio, on Gower St. and Melrose Ave., to Milwaukee Bldg. Co., 403 South Hill St. Cost to exceed $100,000.

★**Cal., San Francisco**—Bank and Office—First Federal Trust Co., Montgomery St., let contract building 3 story, to Grace & Beonieri, 703 Market St. About $350,000. Former contract rescinded. Noted Jan. 22.

★**Cal., San Francisco**—Store and Loft—
C. C. Moore & Co., Sheldon Bldg., let con-
ny St. About $275,000. Noted April 15.
tract building 5 story, rein.-con., on 1st
and Mission Sts., to G. Wagner, 251 Kear-

★**Que., Montreal**—School—Protestant Bd. School Comrs. let general contract building Devonshire School, 3 story, 30 rooms, on Clarke, Cuthbert and Arcade Sts., to A. F. Byers Co., 310 University Ave., $326,865; heating, plumbing and ventilating, to W. J. McGuire & Co., 332 Craig St., W., $63,500.

★**Que., Montreal**—Theatre—Famous Players Corp., Transportation Bldg., let contract constructing 90 x 165 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Mansfield and Cathcart Sts., to Atlas Constr. Co., 37 Belmont St. About $350,000.

★**Ont., Hamilton**—School—Bd. Educ. let contract building 2 story, 12 room, concrete, brick and steel, rein.-con. flooring, concrete foundation, to W. H. Cooper, Clyde Bldg. About $140,000.

Federal Government Work

PROPOSED WORK

N. Y., Stapleton—Laundry and Mechanical Equipment—Treas. Dept., Wash., D. C., rejected bids received June 1, furnishing labor, material and mechanical equipment for laundry, here. J. A. Wetmore, superv. archt. Noted June 10.

D. C., Wash.—Boiler and Accessories—Spec. 4242—Bureau Yards & Docks, Navy Dept., plans to build in heating plant at Naval Observatory. About $10,000.

D. C., Wash.—Electric Traveling Cranes—Spec. 4239—Bureau Yards & Docks, Navy Dept., plans to build five 10 ton, for shipbuilding slips at Navy Yards, at New York, Phila. and Norfolk, Va. About $225,000.

D. C., Wash.—Paving Ducts, etc.—Spec. 4236—Bureau Yards & Docks, Navy Dept., plans to build paving ducts, manhole sewer and waterlines. About $102,000.

Va., Hampton Roads—Electric Underground Distributing System—Spec. 4240—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build in Block "Z," here. About $38,000.

Va., Hampton Roads—Protection Covering—Spec. 4241—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build for water piping, at Merchandise Pier 2, here. About $12,000.

S. C., Charleston—Repairing Avenue—Spec. 4237—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to repair Ave. D between 3rd and 5th Sts., here. About $8,500. Bids will be opened at local yard.

O., Cleveland—Repairing Breakwater and Placing Riprap—U. S. Engr. Office, Federal Bldg., rejected bids received May 20, repairing breakwater and placing riprap, at Cleveland Harbor. Noted April 15.

Mich., Alpena—Quarters—Spec. 4195—Bureau Yards & Docks, Navy Dept., Wash., D. C., received no bids June 16, building, here. About $20,000. Noted June 10.

Mich., Detroit—Quarters—Spec. 4195—Bureau Yards & Docks, Navy Dept., Wash., D. C., received no bids June 16 building, at Wind Mill Point, here. About $20,000. Noted June 10.

Mich., Detroit—Stone—U. S. Engr. Office, 337 Federal Bldg., rejected only bid received May 20, furnishing stone for entrance to breakwater, at Beach Harbor. Noted June 10.

Wis., Milwaukee—Quarters—Spec. 4195—Bureau Yards & Docks, Navy Dept., Wash., D. C., received no bids June 10, building at navy grounds, here. About $20,000. Noted June 10.

BIDS DESIRED

N. Y., New York—Dredging—Until July 24, by U. S. Engr. Office, 39 Whitehall St., dredging in Mattituck Harbor; advertised in this issue.

Pa., Pittsburgh—Gate and Valve Operating Machinery—Until July 15, by U. S. Engr. Office, 2111 Farmers Bank Bldg., furnishing and delivering, for Emsworth Dam, Ohio River; advertised in this issue.

D. C., Tacoma Park—Materials and Supplies—Until June 26, of office of Utilities Officer, Ward 1, furnishing and delivering at U. S. Army General Hospital; advertised in this issue.

Va., Hampton Roads—Sewers, Drains and Water Mains—Spec. 4178—Until July 7, by Bureau Yards & Docks, Navy Dept., Wash., D. C., laying sewers, drains and water mains around storehouse, here. About $40,000; $10 deposit required for plans and spec. Noted April 29.

Va., Quantico—Incinerator—Spec. 4137—Until July 7, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building at Marine Barracks, here. About $67,000; $10 deposit required for plans and spec.

O., Athens—Brick Set, etc.—Until July 9, by Treas. Dept., Wash., D. C., building brick set, down draft, fire box, heating boiler, automatic gas water heater, storage tank, etc., here.

O., Zanesville—Additions and Repairs to Conduit, etc.—Until July 12, by Treas. Dept., Wash., D. C., repairing and building additions to conduit and wiring, new lighting fixtures and furniture lighting in U. S. Post Office, here.

Federal Government Work (Continued)

Cal., San Diego—Refrigerating Plant Equipment—Spec. 4193—Until June 30, by Bureau Yards & Docks, Navy Dept., Wash., D. C., furnishing and installing in industrial building, here. About $50,000. Noted June 3.

Cal., San Diego—Storehouse—Spec. 4157—Until July 7, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building, here. About $145,000. Noted June 3.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. Y., Buffalo—Repairing Piers and Building Superstructure—U. S. Engr. Office, 540 Federal Bldg., let contract repairing and building at Dunkirk Harbor, to Empire Eng. Co., North Tonawanda, $55,786. Noted June 10.

★N. Y., New York—Dredging—U. S. Engr. Office, 39 Whitehall St., let contract dredging in Shrewsbury River, Shoal Harbor and Compton Creek, N. J., to J. R. Anderson, Albany, $27,750. Noted April 29.

★Pa., Phila.—Structural Steel Finishing—Spec. 4198—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract, at machine shop, here, to McClintic Marshall Co., 1421 Chestnut St., $34,972 (45 days).

★Pa., Pittsburgh—Gates and Emergency Dams—U. S. Engr. Office, 2111 Farmers Bank Bldg., let contract furnishing, delivering and building for Emsworth Locks, Ohio River, to Dravo Constr. Co., Diamond Bank Bldg., $168,776. Noted June 10.

Pa., Pittsburgh—Steel Lock Gates—U. S. Engr. Office, 2111 Farmers Bank Bldg., received lowest 3 bids June 14, furnishing and delivering for Lock 6, Monongahela River, involving (a) 7,450 lb. forged, (b) 14,000 lb. cast, (c) 2,200 lb. c i. (d) 242,900 lb. structural and (e) 310 lb. tool steel, etc., from Independent Bridge Co., May Bldg., (a) $0.30 per lb., (b) $0.30, (c) $0 20, (d) $0.11, (e) $1, total, $34,454; J. and J. B. Milholland Co., 714 5th Ave., (a) $0.20, (b) $0.25, (c) $0.15, (d) $0.1175, (e) $0.90, total $34,692; Penn Bridge Co., Beaver Falls, (a) $0.49, (b) $0.31, (c) $0.1125, (d) $0.1294, (e) $1.25, total $40,987. Noted June 3.

★D. C., Anacostia—Storehouse, Pigeon Loft and Hangar—Spec. 4085—Bureau Yards & Docks, Navy Dept., Wash., let contract building at Naval Air Sta., here, to Hyde & Baxter, 711 13th St. N. W., Wash., $31,826 (60 days). Noted June 10.

D. C., Wash.—Raising Roof, etc.—Spec. 4075—Bureau Yards & Docks, Navy Dept., received bids June 16, raising roof of open hearth shop, at Navy Yard, here, (1) work complete, from Hyde & Baxter, 711 13th St., N.W., (1) $39,444 (200 days), (2) deduct $625, (3) add $60, deduct $30, (4) add. $0.80, deduct $0.20; Mansfield & Savage, 135 William St., New York City, (1) $53,330 (300 days), (2) $1,800, (3) $100, (4) add $3, (5) deduct $100. Noted June 3.

★Va., Hampton Roads—Seaplane Runway—Spec. 4181—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building at Naval Operating Base, Air Sta., here, to Raymond Concrete Paving Co., 921 Munsey Bldg., Baltimore, Md., $55,864 (150 days). Noted June 10.

★Va., Hampton Roads—Sewerage System—Spec. 4133—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building, here, to H. E. Crook Co., 28 Light St., Baltimore, Md., $15,220 (75 days). Noted June 10.

★Va., Hampton Roads—Underground Steam Lines—Spec. 4218—Bureau Yards & Docks, Navy Dept., Wash. D. C., let contract furnishing and installing, here, to J. R. Proctor, 74 Courtland St., New York City, $19,380 (125 days). Noted June 10.

★Va., Norfolk—Drainage System—Spec. 4131—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building, here, to O. Dashiell, 507 South St., Portsmouth, $37,945 (30 days).

★W. Va., South Charleston—Electrical Equipment—Spec. 4146—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract furnishing and installing, at main substation, Naval Ordnance Plant, here, to Westinghouse Electric Co., Hibbs Bldg., Wash., D. C., $219,530. Noted May 27.

★S. C., Charleston—Steel Tower—Spec. 4149—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building, here, to W. F. Martens, 53 Franklin St., Rochester, N. Y., $25,568 (150 days). Noted June 10.

S. C., Paris Island—Overhang and Gratings—Spec. 4208—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids for overhang on Bldg. 11 and grating for 12 buildings at Marine Barracks, here, from Regan Constr. Co., 2 East Lexington St., Baltimore, Md., $13,288 (90 days); Central Constr. Co., 520 Beatty Bldg., Austin, Tex., $19,200 (90 days).

★Ga., Savannah—Radio Building and Towers—Spec. 4204—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract constructing 4 radio buildings and towers, here, to Donnell-Zane Co., Inc., 350 Bway., New York City, $7,865 (20 days). Noted May 27.

★Fla., St. Petersburg—Operating Building—Spec. 4183—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract constructing, here, to W. F. Martens, 53 Franklin St., Rochester, $16,775. Noted June 10.

★Ala., Florence—Hydraulic Turbines—U. S. Engr. Office let contract furnishing and delivering 4 hydraulic turbines, each 30,000 hp. with governors, to W. Cramp & Sons, Ship and Engine Bldg., Phila., Pa., $519,600. Noted April 22.

O., Cincinnati—Lockkeepers Houses—Bureau Yards & Docks, Navy Dept., Wash., D. C., will build, on Dams 28 and 29, here. Work will be done by day labor.

★O., Cincinnati—Wall Power Plant—U. S. Engr. Office, 415 Custom House, let contract building wall power plant for Dams 33 and 39, Ohio River, as follows: Lot "A," turbines, to Trump Mfg. Co., Columbus Ave., Springfield, $4,510; Lot "A," other things not given for Dams 33 and 39, and Lot "B," valve jacks, to J. and J. B. Milholland Co., 714 5th Ave., Pittsburgh, Pa., $11,699 and $17,156 respectively; Lot "C," pipe fittings, etc, to Crane Co., 824 Bway., $13,985.

★O., Cleveland—Jetty and Pierhead—U. S. Engr. Office, Federal Bldg., let contract, building at Sandusky Harbor, to Central Dredging Co., Bangor Bldg., $169,711. Noted April 22.

★Mich., Detroit—Emergency Dam—U. S. Engr. Office, Federal Bldg., let contract furnishing and building emergency dam and bridge to have rein.-con. abutments over 3rd and 4th Locks, St. Mary's Falls Canal, to Independent Bridge Co., May Bldg., Pittsburgh, Pa., $137,890. Noted June 17.

N. D., F. Yates—Improving Water System—Com'rs. Indian Affairs, Wash., D. C., received only bid June 14, improving at Standing Rock Agency, here, from Manden Plumbing & Heating Co., Manden, $14,438. Noted May 13.

★Tex., Ft. Worth—Cylinder Storage Building—Spec. 4142—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract constructing at U. S. Helium Production Plant, here, to Regan Constr. Co., 2 East Lexington St., Baltimore, Md., $83,281 (120 days). Noted June 17.

★Tex., Ft. Worth—Well Houses, Towers, Settling Basin and Piping—Spec. 4210—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building, at Helium Production Plant, here, to Regan Constr. Co., 2 Lexington St., Baltimore, Md., $13,288 (90 days). Noted June 10.

★Cal., Mare Island—Electrify Causeway and Transfer Yard—Spec. 4188—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract electrifying at Navy Yard, here, to San Francisco, Napa & Calistoga R R. Co., Napa, $11,128 (30 days). Noted May 13.

P. R., Loiza—Buildings and Utilities—Spec. 4194—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 16, constructing at Naval Radio Control and Receiving Sta., here, (1) work complete, from Hyde & Baxter, 711 13th St., N.W., Wash., D. C., (1) $219,255 (240 days), (2) deduct $12,000 (10 days), (3) deduct $16,000, (4) deduct $23,000, (5) $500, (6) deduct $1,000, (7) deduct $11,800, (8) deduct $15,700; Stuart Eng. Co., 186 5th Ave., New York City, (1) $237,450 (175 days), (2) $16,725, (3) $19,850, (4) $20,775, (5) $810, (6) $700, (7) $16,500, (8) $19,625. Noted June 3.

★P. R., San Juan—Pipe—U. S. Engr. Office, 39 Whitehall St., New York City, let contract furnishing pipe for dredging in harbor, here, to Thompson Iron Wks., 1825 Callowhill St, Phila., $24,733.

★P. I., Guam—Electrical Equipment—Spec. 4169—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract for electrical equipment, to General Electric Co., River Rd., Schenectady, N. Y., $34,125 (180 days). Noted June 3.

★Alaska—Bridge—C. E. Dole, purch. agt., Alaska Eng. Comn., Seattle, Wash., let contract building 919 ft. steel arch bridge, 300 ft. above bottom of canyon, at Hurricane Gulch on Alaska Ry. Line, to U. S. Steel Products Co., 4th St. S. and Connecticut St., Seattle, Wash., $329,323. Noted Jan 22.

Miscellaneous

PROPOSED WORK

Paving Plant, etc.—New York, N. Y.—H. H. Curran, pres. Manhattan Boro., rejected bids received May 18, building plant for crushing, melting and mixing old asphaltic material, and altering present elevator at asphalt plant, on 90th St. and East River. About $60,000. Work will be readvertised. Noted May 13.

Pier and Shed—Bayonne, N. J.—Gulf Refining Co., foot Ingraham Ave., plans to build pier and steel shed at foot of East 5th St., also stock house. About $73,000 and $28,000 respectively.

Park Improvements—Manayunk, Pa. (Phila. P. O.)—Common Council voted $60,000 bonds to improve undeveloped tract at Cresson, Silverwood, Rector and Cotton Sts.

Minn., Duluth—Great Northern Power Co., Superior St. and 5th Ave. W., plans to build dam across Boulder Lake, to develop 50,000 hp., in order to supply additional electrical power to Duluth and towns on Minnesota iron ranges. About $500,000. W. N. Ryerson, mgr.

Dam—Buckeye, Ariz.—Buckeye Irrigation Dist. had plans prepared by C. K. Fox, engr., I. W. Hellman Bldg., Los Angeles, for 3,000 ft. diversion dam, 150 ft. wide, in Gila River, 8 ft. above river bed, concrete breast and toe walls and filled between with boulders, also 75 ft. apron of boulders and wire mesh. About $450,000.

Wharf—Three Rivers, Que.—City soon receives bids building 350 ft. wharf along river front, 500 ft. deep. Z. Lambert, city engr.

BIDS DESIRED

Terminal Freighthouse—New York, N. Y.—Until July 20, by E. S. Walsh, supt. pub wks., Capitol, Albany, building at Mott Haven, Bronx Boro., here; advertised in this issue.

Wood Block—Cincinnati, O.—Until June 29, by E. Von Bargen, purch. agt., City Hall, furnishing 50,000 wood blocks.

Coal Crusher—Cleveland, O.—Until July 2, by E. Shattuck, comr. of purch. furnishing 1 motor driven power house type coal crusher.

Pumps—Cleveland, O.—Until July 2, by city, furnishing and installing two 8,000,000 gal. and one 4,000,000 gal. motor driven vertical centrifugal pumps with motors, electrical equipment, piping, valves, etc. involving 5 tons 24 in. c i. pipe. Cost to exceed $25,000. Noted June 17.

Minn., Waseca—Ditch—Until June 28, by Waseca Co., cleaning 1,100 ft. Ditch 18. Work involves 50 ft. 22 in. sewer pipe. 17,988 ft. 6-22 in. tile, 1 bulkhead and 11 surface water inlets. G. Cox, Waseca, engr.

Road Rollers, etc.—Marion, Ark.—Rd. Impvt. Dist. 7, 8 and 9, Crittenden Co., (Marion) and Ozark Trail Rd. Impvt. Dist., Poinsett Co., (Harrisburg) receiving bids for two or three 10 ton road rollers, graders, etc. Morgan Eng. Co., Goodwyn Institute Bldg., Memphis, Tenn., engrs.

Breakwater—Friars Head, N. S.—Until June 28, by R. C. Desrochers, secy. Dept. Pub. Wks., Ottawa, improving breakwater.

Wharf—Ste. Famille, Que.—Until July 6, by R. C. Desrochers, secy. Dept. Pub. Wks., Ottowa, rebuilding and repairing wharf, here.

Pier—Bayfield, Ont.—Until July 6, by R. C. Desrochers, secy. Dept. Pub. Wks., Ottawa, rebuilding portion of South Pier.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Field and Shelter Houses—Boston, Mass.—City let contract building on Eagle Hill Reservoir, to A. Piotti Co., $36,784.

Subway Subtrack—New York, N. Y.—J. H. Delaney, comr, transit constr., 49 Lafayette St., received bids June 9, completing Sect. 2, Route 8, of 14th St.—Eastern Rapid Transit R R. extending under East 14th St. from Irving Pl. to Ave. B from P. McGovern, 50 East 42nd St., $3,336,000, Booth & Flynn, 17 Battery Pl., $3,488,000, Underpining & Foundation Co., 290 Bway., $3,680,000. Noted May 20.

★Truck—Sheboygan, Wis.—City let contract furnishing and equipping 1 Winther Model 149, 7 ton truck, with 1,500 gal. capacity, Studebaker flushing unit, to Automotive Sales & Service Co., Inc., Fond du Lac, $11,975.

★Levee—Newport, Ark.—Newport Levee Dist. let contract building earth levee and concrete levee wall, to W. H. Denison, Cushman. About $125,000. Work involves 17,900 cu.yd. earth embankment, 2,700 cu yd. stripping, 3,100 cu.yd. excav. and backfill. 2,320 cu.yd. rein.-con., 140,000 lb. reinforcing steel, 78 m. ft. tongue and groove wood sheet piling, 37 m. ft. interlocking wood sheet piling, etc.

★Portland Cement—Portland, Ore.—State Highway Comn. let contract furnishing 10,000 bbl., to Beaver Portland Cement Co., Spalding Bldg., $4.26 per bbl.

★Roofing—Toronto, Ont.—City let contract building copper roof for City Hall, to W. E. Dillon, 183 George St. About $126,000. Noted April 29.

OFFICIAL PROPOSALS

July 1.

Sanitary Sewers and Septic Tanks

WORK FOR MACHINE EXCAVATOR

Waterloo, Wis.

Sealed proposals for the construction of sanitary sewers and appurtenances in Waterloo, Wisconsin, will be received until 5.00 p.m. on Thursday, July 1st, 1920.

The work comprises approximately:

16,106 lin.ft. of 8-in. Sewer;
4,170 lin.ft. of 10-in. Sewer;
4,220 lin.ft. of 12-in. Sewer;
2 River Crossings of Inverted Siphons;
72 Manholes;
Septio Tanks.

Bids will be received on both Vitrified and Concrete Sewer Pipe, subject to the choice of the Village Board.

The Village of Waterloo does not guarantee the character of the subsoil, but for the information of bidders the statement is made that nearly all the excavating is considered good machine work.

A certified check for at least five per cent (5%) of the aggregate of the bid must accompany each proposal, made payable to the village treasurer. Bidders who submit proposals on both Vitrified and Concrete pipe will use a separate blank for each but will only be required to submit a check based on the highest one.

Specifications and form of contract will be ready June 10th, 1920, and can be had by addressing the Engineers. Plans and profiles can be inspected at the office of the Village Clerk or at the office of the Engineers. Bidders desiring a set of the plans mailed to them can procure same by addressing the Engineers, enclosing $3.00 to cover the cost of blue prints

PARSONS & ORBERT, Engineers,
627 M. & M. Bank Bldg.
Milwaukee, Wis.

W. J. HIGGINS,
Village Clerk,
Waterloo, Wis.

Bids: July 15.

Reconstruction of Road

Flemington, N. J.

The Board of Chosen Freeholders of Hunterdon County will receive bids at their rooms in Flemington, N. J., on July 15, 1920, up to the hour of 11 o'clock a.m. (daylight saving time), for the reconstruction of the following sections of County Roads with bituminous macadam, penetration surface.

First Section—Lambertville, Ringoes Road From Lambertville City Line to Pancoasts Lane. Length, 1,238 miles.

Second Section—Lambertville, Ringoes Road From Jess Runkles driveway northward to Station 210-50. Length, 0.833 miles.

Third Section—Flemington, Ringoes Road From near Copper Hill Bridge southward to Rockafellows Lane. Length, 0.909 miles.

Fourth Section—Whitehouse, Flemington Rd Beginning at Birds Corner, extending southward to Flemington Borough Line. Length, 0.602 miles.

Fifth Section—Whitehouse, Flemington Rd. Beginning at over Railroad Bridge and extending to Lehigh Valley Railroad branch track. Length, 0.616 miles.

Bids will be received on the above in two groups:

GROUP "A," composing first and second sections.

GROUP "B," composing third, fourth and fifth sections.

Bids will also be received at the same time and place for a concrete pavement for Sections 4 and 5.

Specifications for the above are on file and may be examined at the office of Grant Davis, County Engineer, Whitehouse Station, N. J., also at the office of H. L. Stout, County Solicitor, Flemington, N. J.

A certified check for five hundred ($500) dollars must accompany each bid. Bid must be inclosed in a sealed enevelope addressed to the Director of the Board of Chosen Freeholders, and stating the subject of the bid.

By Order of the Board.

W. W. FOSTER, Clerk.

June 17, 1920.

The publication of an advertisement on this page is an official notice that bids are wanted from other than local bidders.

It is also a guarantee that
maximum competition is invited
because Engineerin
News-Record is the *one* nation
ally recognized medium
Proposal advertising.
Searchlight Section
each week by near
worth-while
country
work ou

Official Propo
in first mail W
o'clock) can usual
the issue out the
price for Official Pro
line.

Bids: July 20.

Construction of Barge

STATE OF NEW Y
OFFICE OF SUPERINTEN
PUBLIC WORKS

Sealed proposals will be recei
undersigned at his office in the
Albany, N. Y., until 12 o'cloch
Tuesday, July 20, 1920, at which
hour they will be publicly opened
for the construction of a Barge C
minals pursuant to the provisions
ter 746 of the Laws of 1911, an
acts amendatory thereof, as follo

TERMINAL CONTRACT No. 2

For constructing a terminal fre
at Mott Haven, Borough of Br
York City.

Contract plans, sheets 1 to 13,

Plans may be seen and detaileo
cations, engineer's estimates of qu
proposal blanks, form of contract an
required and other information fo
posers may be had at the office
Superintendent of Public Works at A
N. Y., at the office of the Assistant
intendent of Public Works for the
Division at Syracuse, N. Y., at the
of the Assistant Superintendent of
Works for the Western Division at Roc
ter, N. Y., at the canal office, Spauldi
Exchange, Buffalo, N. Y., and at the of
of the Superintendent of Public Wor
Terminal Warehouse, Pier 6, East Riv
New York City.

Copies of detailed plans or drawings m
be obtained from the State Engineer a
Surveyor at Albany, N. Y., upon paymer
to him of the cost of producing them.

Monthly estimates will be paid of ninety per centum (90 per cent) of the work done at the contract price. Every proposal for said work must be accompanied by a money deposit in the form of a draft or certified check upon some good banking institution in the city of Albany or New York, issued by a national or state bank or trust company in good credit within the state and payable at sight to the Superintendent of Public Works for five per centum (5 per cent) of the amount of the proposal.

The person whose proposal shall be accepted will be required to execute a contract and furnish bonds within ten days from the date of notice of award delivered to him or them in person or mailed to the address given in the proposal.

Upon execution of the contract and approval of bonds, the certified check or draft will be returned to the proposer unless the same shall have been presented for collection prior to such time in which case the amount of the deposit will be refunded by the Superintendent of Public Works.

The deposits of bidders other than the one to whom the award of contract shall be made will be returned immediately after the award has been made.

The bond required for the faithful performance of each contract shall be in such sum as shall be fixed by the Superintendent of Public Works, which sum shall not be less than twenty per centum (20 per cent) of the estimated cost of the work, according to the contract price, and an additional bond known as the labor bond, in the sum of ten per cent (10 per cent) of the amount of the estimated cost of the work according to the contract price, will be required as security that the contractor
pay in full at least once in each
th all laborers employed by him upon
vork specified to be done in the con-

the event that more than one surety
ny is offered as surety on said bonds
urance only will be accepted.

proposal must be addressed to the
ntendent of Public Works, Albany,
and must be endorsed on the en-
with the name of the construction
h the proposal is made.

if made, will be made to the
persons whose proposal shall be
cost to the state for doing the
which shall comply with all pro-
quired to render it formal. Before
shall be made the lowest bidder
quired to satisfy the Superin-
Public Works of his ability to
ble equipment and materials
r performance of the work.
s reserved to reject all pro-
dvertise and award the con-
ular manner if, in the judg-
dersigned, the interests of
e enhanced thereby.

EDWARD S. WALSH,
ntendent of Public Works.
6, 1920.

---

ad and Bridge
nstruction

Fort Worth, Tex.

ls addressed to W. E.
uditor, for the improve-
highways in Tarrant
received at the office of
at Fort Worth, Texas,
m., July 1, 1920, and then
and read.

of Work to Be Done

ion of 5.857 miles of rein-
pavement and all bridges,
on State Highway No. 1,
Bankhead Highway, running
County line west through
Tarrant County and being
Fort Worth-Dallas Pike.

ans and specifications of the
seen for examination, and in-
ay be obtained at the office of
ng Engineer, care Court House,
rth, Texas, and at the office of
ighway Department, State Office
Austin, Texas.

ified or cashier's check for five
dollars ($5,000.00), made pay-
ithout recourse to the order of Hugh
ll, County Judge of Tarrant County,
accompany each proposal as a guaran-
hat the bidder, if successful, will enter
contract and make bond in accordance
with requirements of the specifications. The right is reserved by the party of the first part to reject any and all proposals or to waive all technicalities. Proposals shall be submitted in sealed envelopes and marked "Bids for the Construction of the Fort Worth-Dallas Pike Road in Tarrant County." All bids received will be retained by the Department and will not be returned to the bidders.

Y. E. YANCY,
County Auditor.

Bids: July 6.

Construction of Storm Sewers

Boonton, N. J.

Sealed bids or proposals for laying, furnishing and excavating for storm sewers, together with the erection and construction of eight catch basins, will be received and opened at the Board of Aldermen Rooms, Boonton, N. J., on Tuesday, July 6, 1920, at 8:30 o'clock P.M.

The schedule of work is as follows: Parties desiring further information will apply to the Town Clerk, Boonton, N. J., by depositing a check for $5.00 will receive plans and specifications.

ARTHUR TAYLOR,
Ch. Street Com.

BINDING SECT. AUG 19 1980

TA
1
E6
v.84
cop.2

Engin.

Engineering news-record

ENGIN STORAGE

PLEASE DO NOT REMOVE
CARDS OR SLIPS FROM THIS POCKET

UNIVERSITY OF TORONTO LIBRARY